Newcomb & Boyd
CONSULTANTS AND ENGINEERS

Engineering an Intelligent Building

Putting People at the Center

Donny Walker

PE, RCDD

"The Smart Buildings Guy"

I wish I had more time for:
Boating and fishing with my family

Best vacation ever:
Family trip to St. Thomas

Next item on my bucket list:
Teaching my kids to wakeboard

Learning Objectives

one

UNDERSTAND THE MARKET.
You will understand the state of the market for Intelligent Building Technologies, the market forces driving strategies, and the implications for operations and occupants.

two

IDENTIFY STRATEGIES.
You will identify examples of Intelligent Building strategies in the operations and user experience realms.

three

LEARN THE PROCESS.
You will learn about the strategic planning team and process needed to engineer an Intelligent Building.

four

UNDERSTAND THE CONNECTION.
You will learn about the intersection of operational technologies and human interactions.

State of the Market

- Gaps in the Traditional Design & Construction Model
- How we are adapting the Model
- Shifting to a Building Lifecycle Model

The goal is to

solve business challenges

and implement

occupant-centric strategies

State of the Market

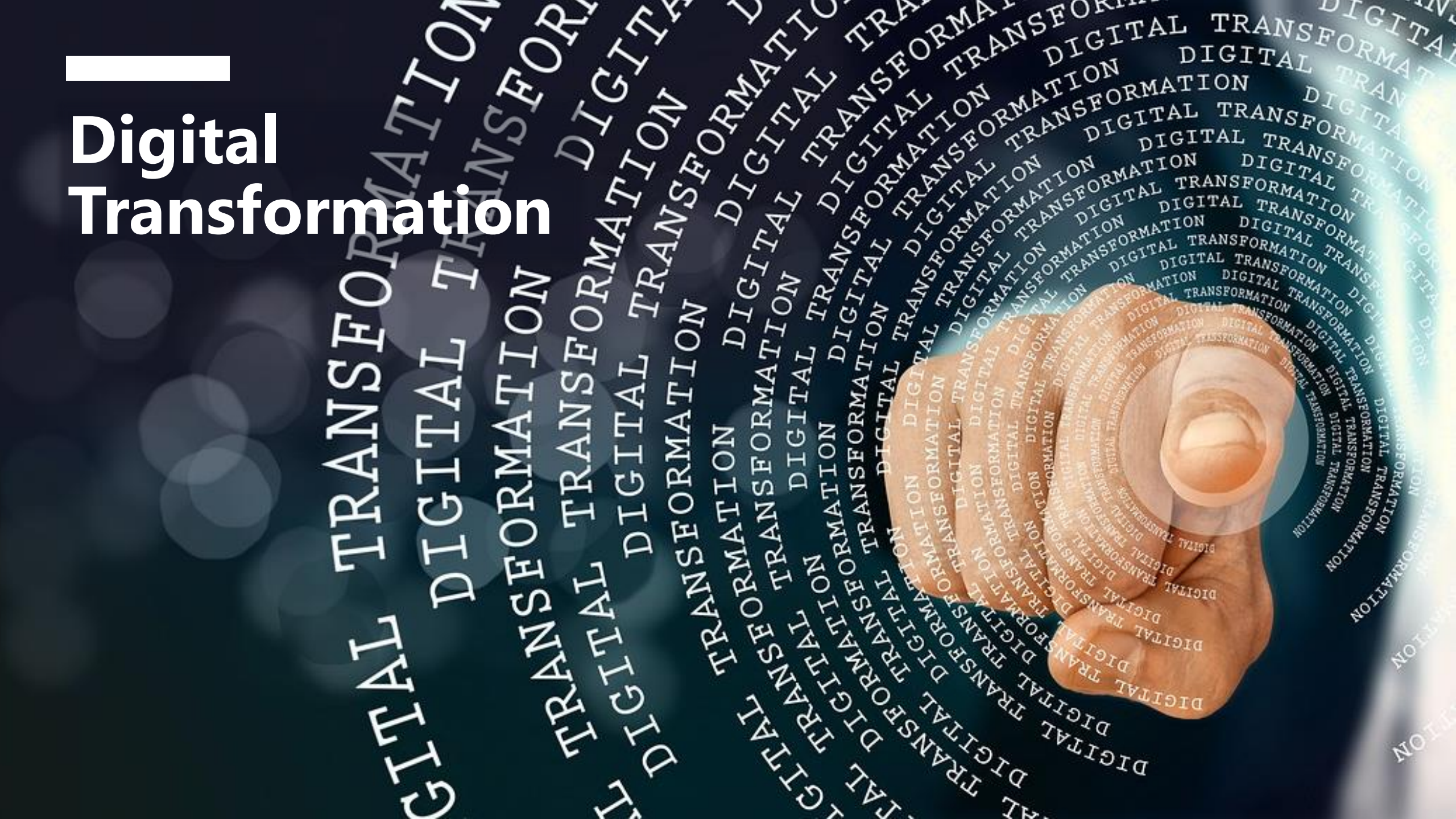
- Market Pressures on the Built Environment
- Business Drivers Impacting Building Design

Smart Building Business Drivers

It's important to recognize the underlying business/policy drivers in order to tailor and prioritize solutions.

Energy and Resource Efficiency	**Operational Efficiency**	**Building Performance**	**Cybersecurity**
Occupant Wellness & Productivity	**Attracting & Retaining Talent**	**Attracting & Retaining Tenants**	**Digital Transformation**

Digital Transformation



Key Areas

- space utilization and
- building optimization
- occupant facing amenities
  - building as a service
  - digital concierge
  - digital restroom management
  - automated work order management

Technology-Centric to Use-Case Centric

- **Is this useful?**
- **What business challenge does it solve?**

- **What occupant benefit does it provide?**
- **What is the cost vs return on investment?**

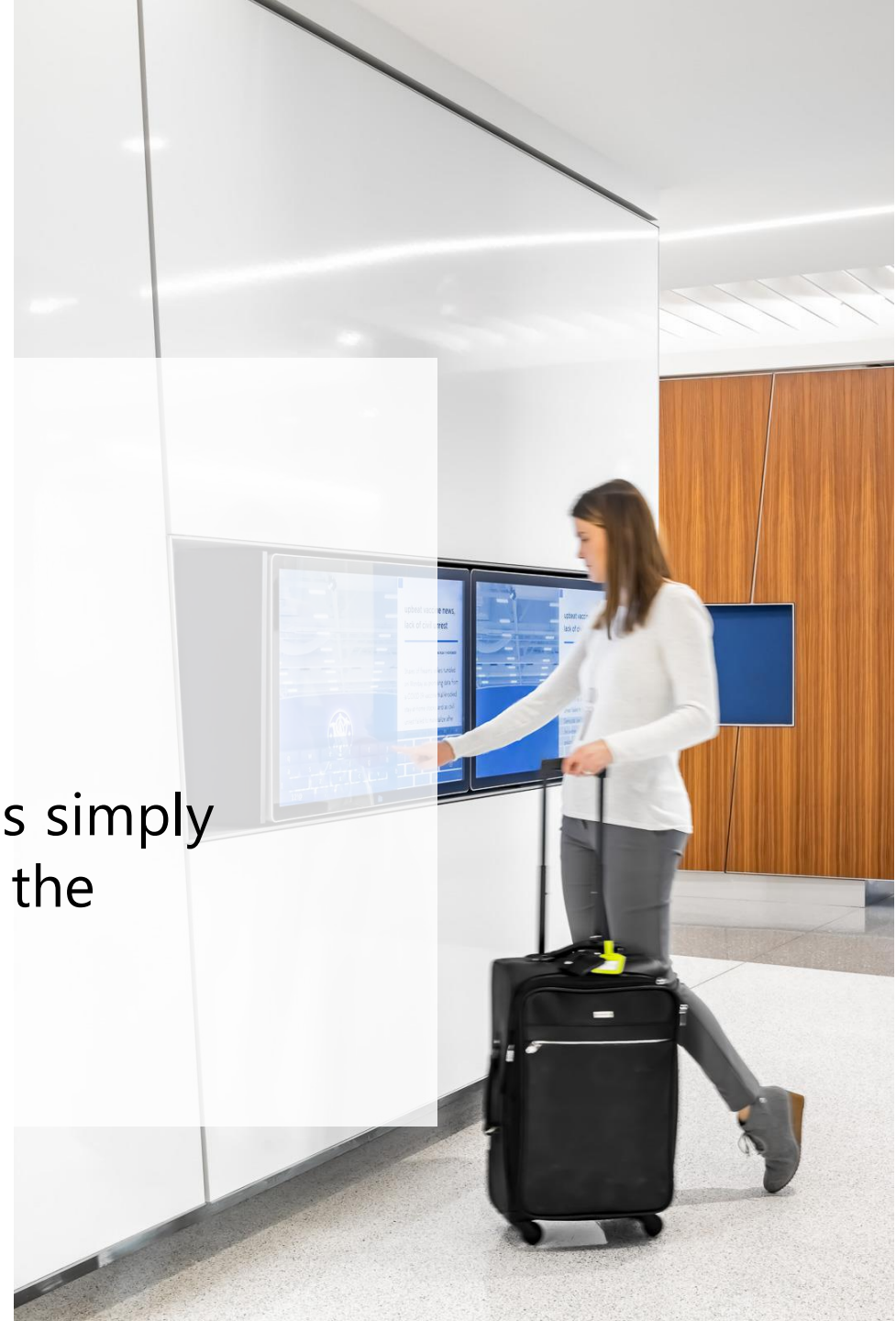
Defining a Use Case

Q

What is a Use Case?

A

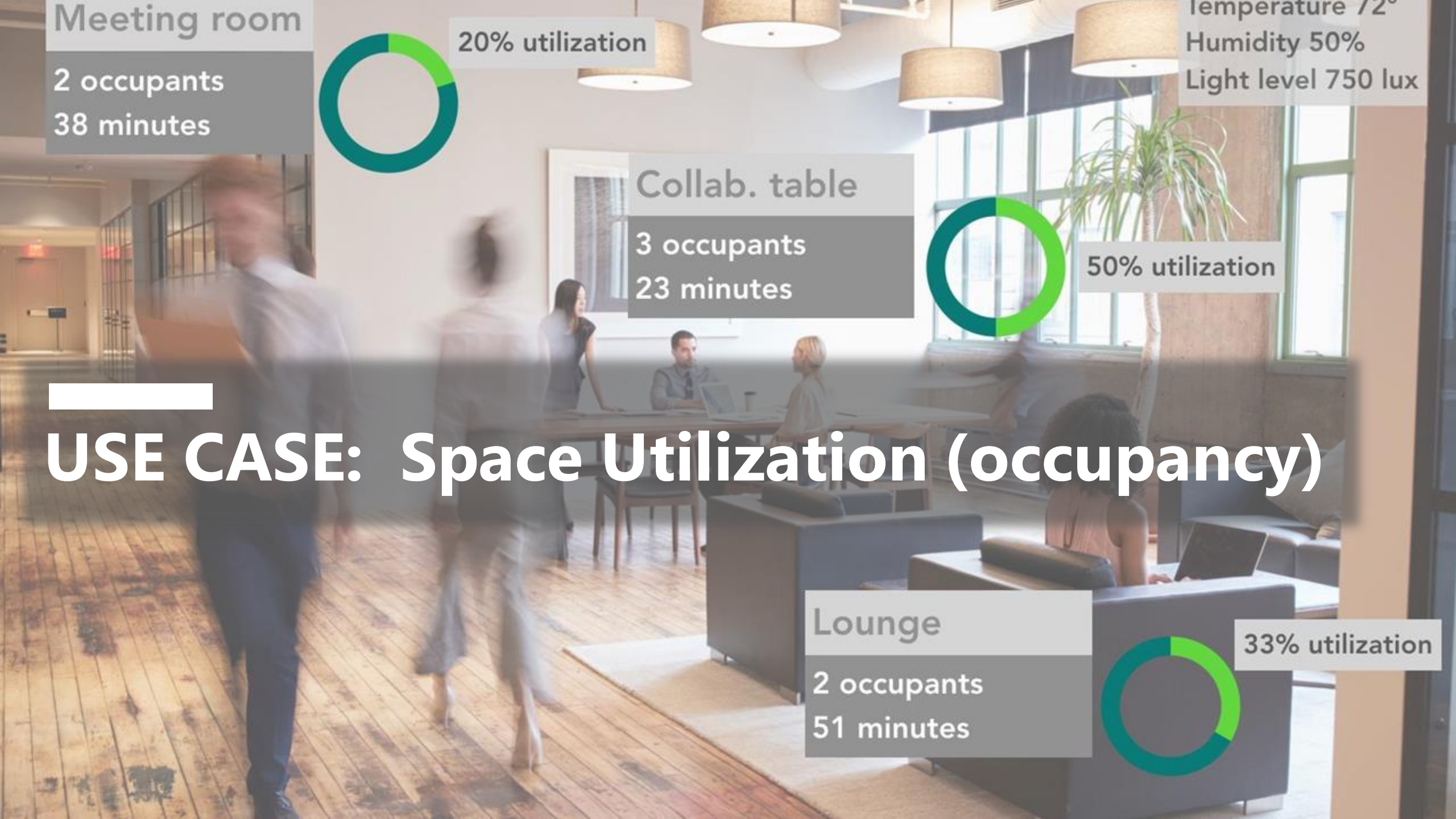
From a building perspective, a use case is simply defining how an occupant interacts with the building or a system in the building.



Building Features - Use Cases

1. Converged Building Network	8. Intelligent EV Charging
2. Integrated Building Network	9. Digital Kiosks / Guest Services
3. Employee Experience Mobile App	10. Space Utilization (occupancy)
4. Operational BIM (Digital Twin)	11. Enhanced Occupant Comfort
5. FDD with Energy Analytics	12. Rainwater & Condensate Collection
6. Intelligent Integrated Parking	13. Tenant Sub-Metering
7. Mobile Phone for Security Access	14. Smart Bathroom Amenity Services

USE CASE: Intelligent Integrated Parking



USE CASE: Space Utilization (occupancy)

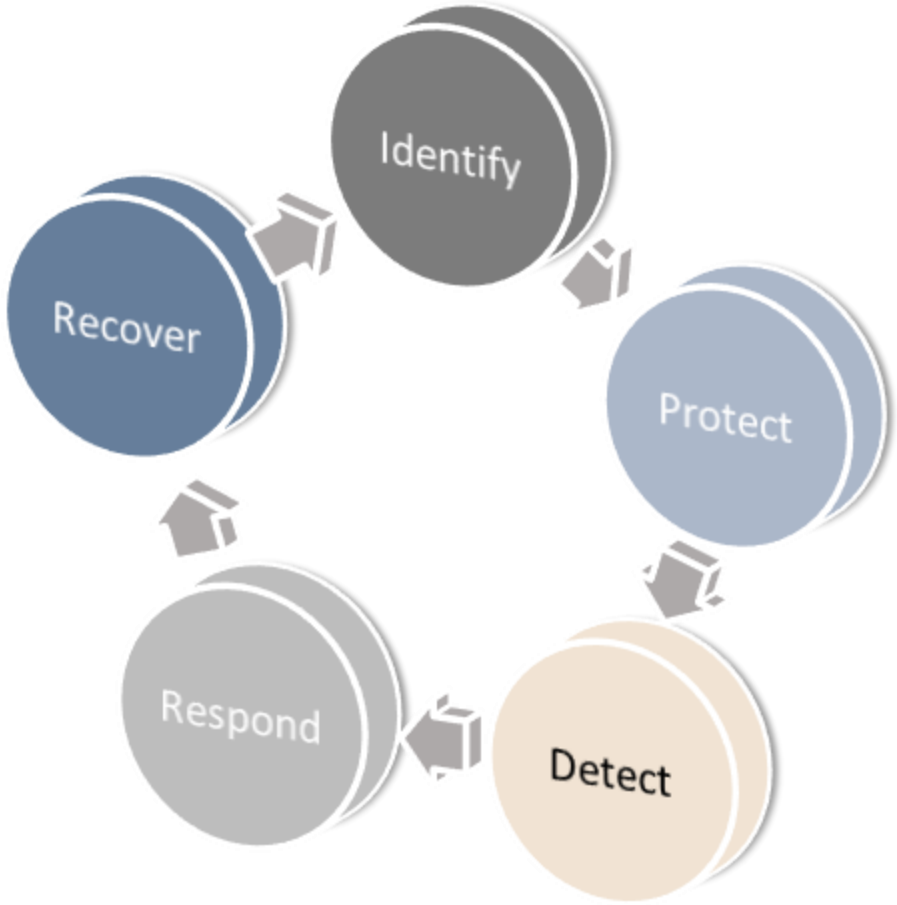
USE CASE: Employee Experience

What does it take to enable these types of technologies?

- **Cybersecurity**
- **Operational Technology Network**
- **Smart Building Framework**

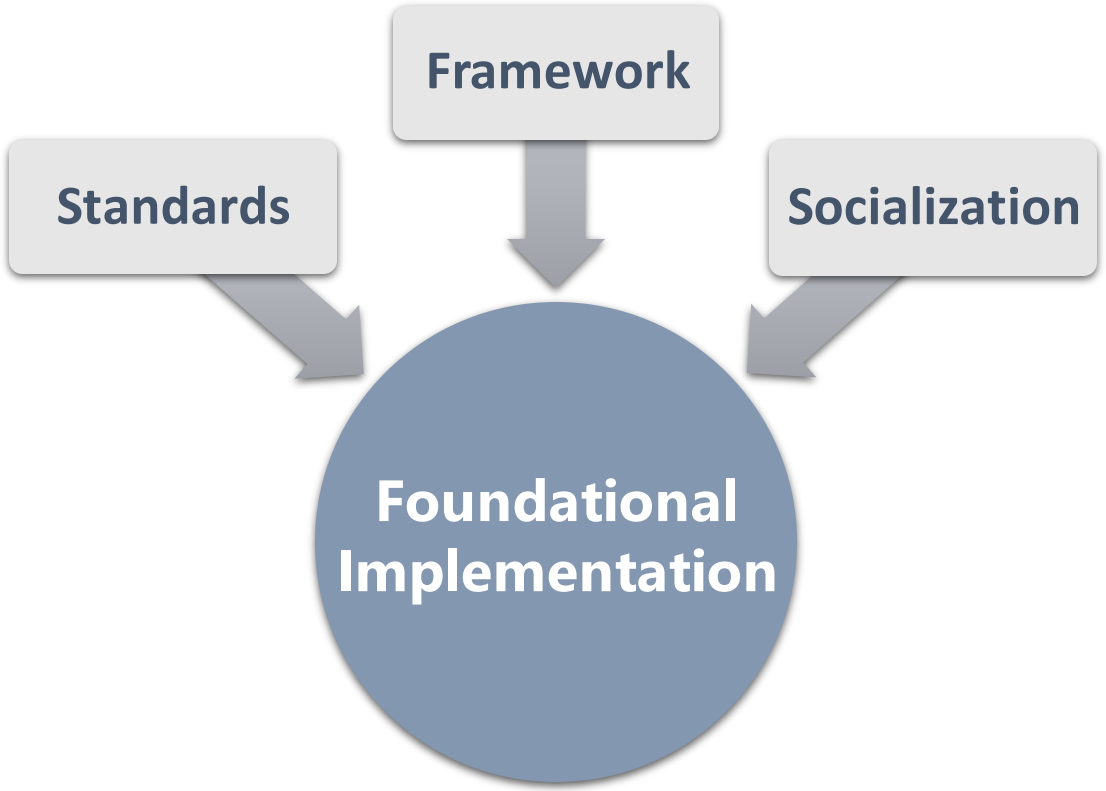
Operational Technology Cybersecurity

The art of **protecting networks, devices, and data** from unauthorized access or criminal use and the practice of **ensuring confidentiality, integrity, and availability of information and operations.**

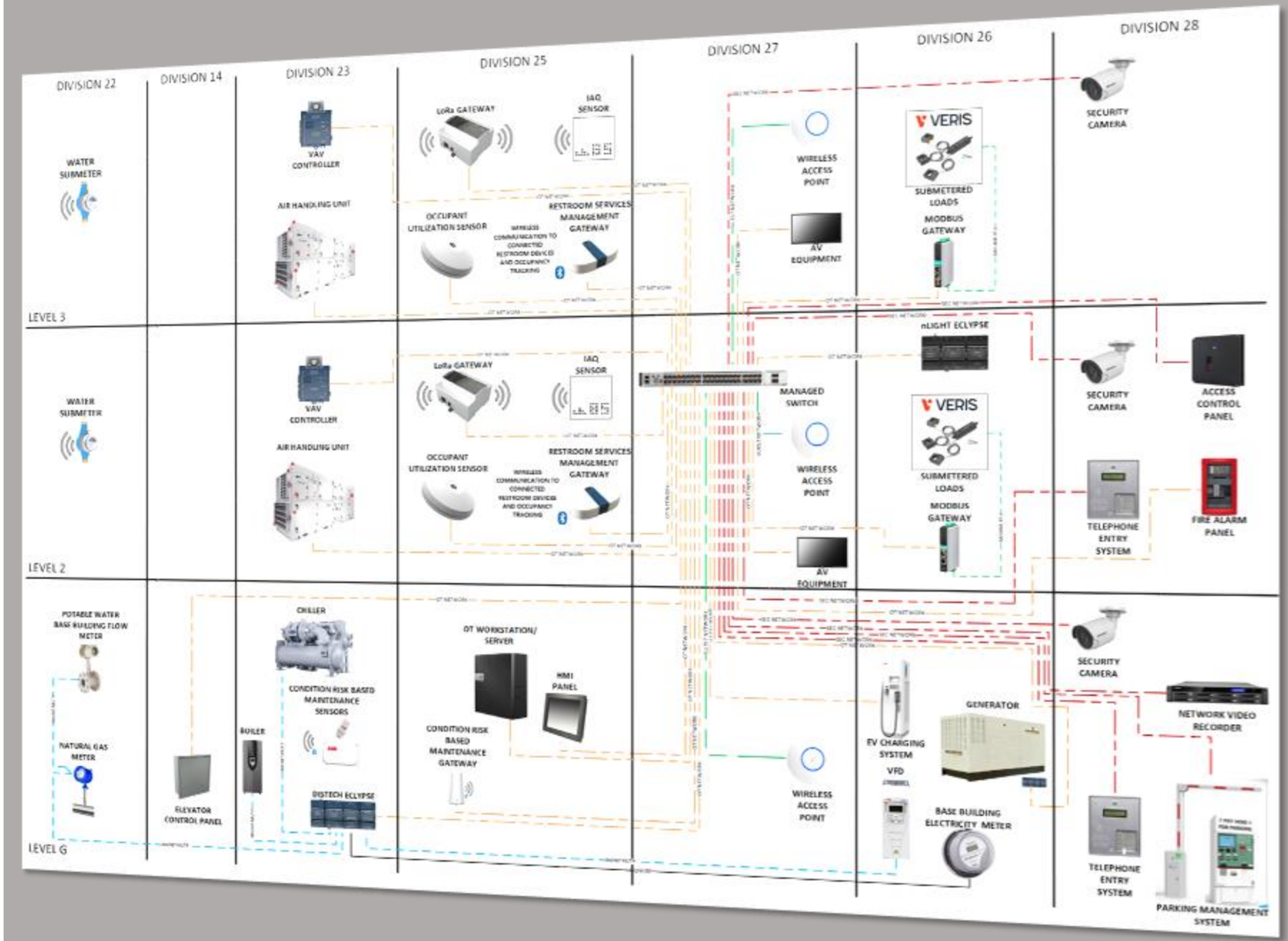


Operational Technology Cybersecurity

The art of **protecting networks, devices, and data** from unauthorized access or criminal use and the practice of **ensuring confidentiality, integrity, and availability of information and operations.**



Operational Technology Network

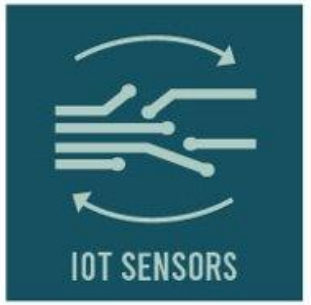


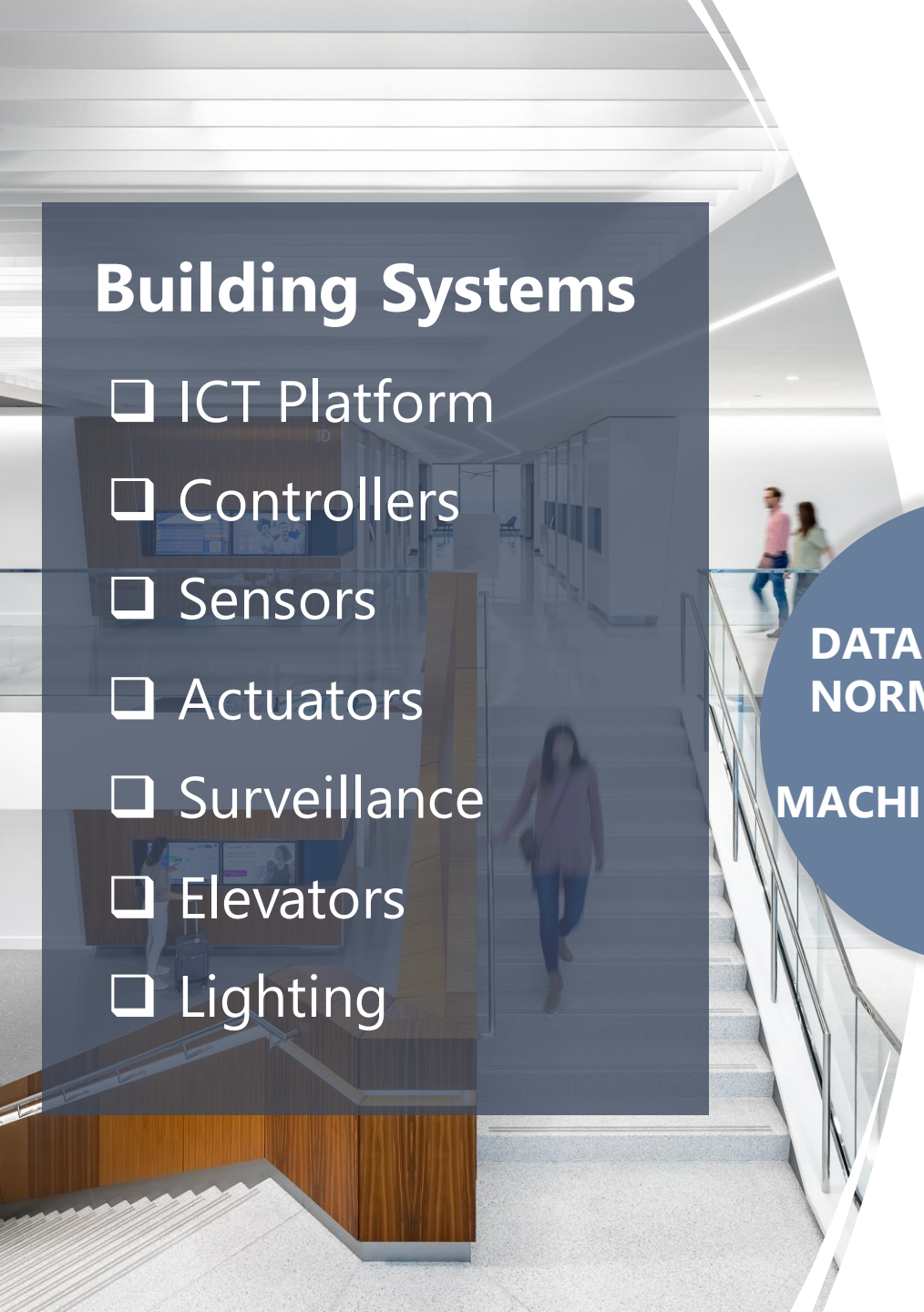
Master Systems Integrator Approach

Defining the Roles for Integrators

- Master Systems Integrator
- Controls System Integrator
- Network Integrator
- Security Systems Integrator
- Audio Visual Systems Integrator
- Structured Cabling Integrator

SMART BUILDING FRAMEWORK





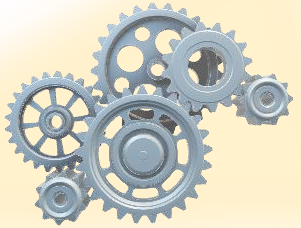
Building Systems

- ❑ ICT Platform
- ❑ Controllers
- ❑ Sensors
- ❑ Actuators
- ❑ Surveillance
- ❑ Elevators
- ❑ Lighting

DATA TAGGING & NORMALIZATION VIA MACHINE LEARNING

API

Operations Platforms

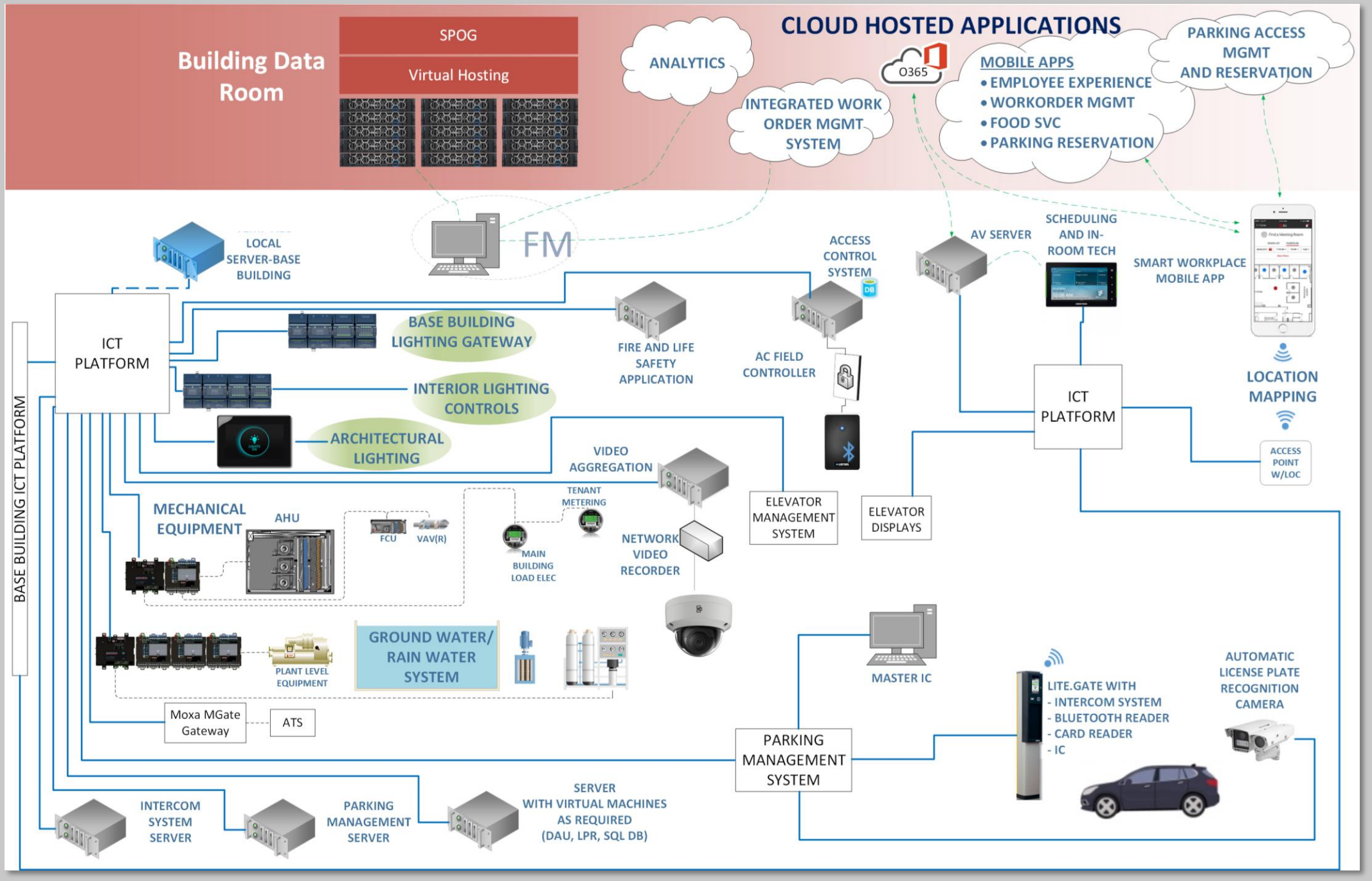


API

Customer Experience Platform

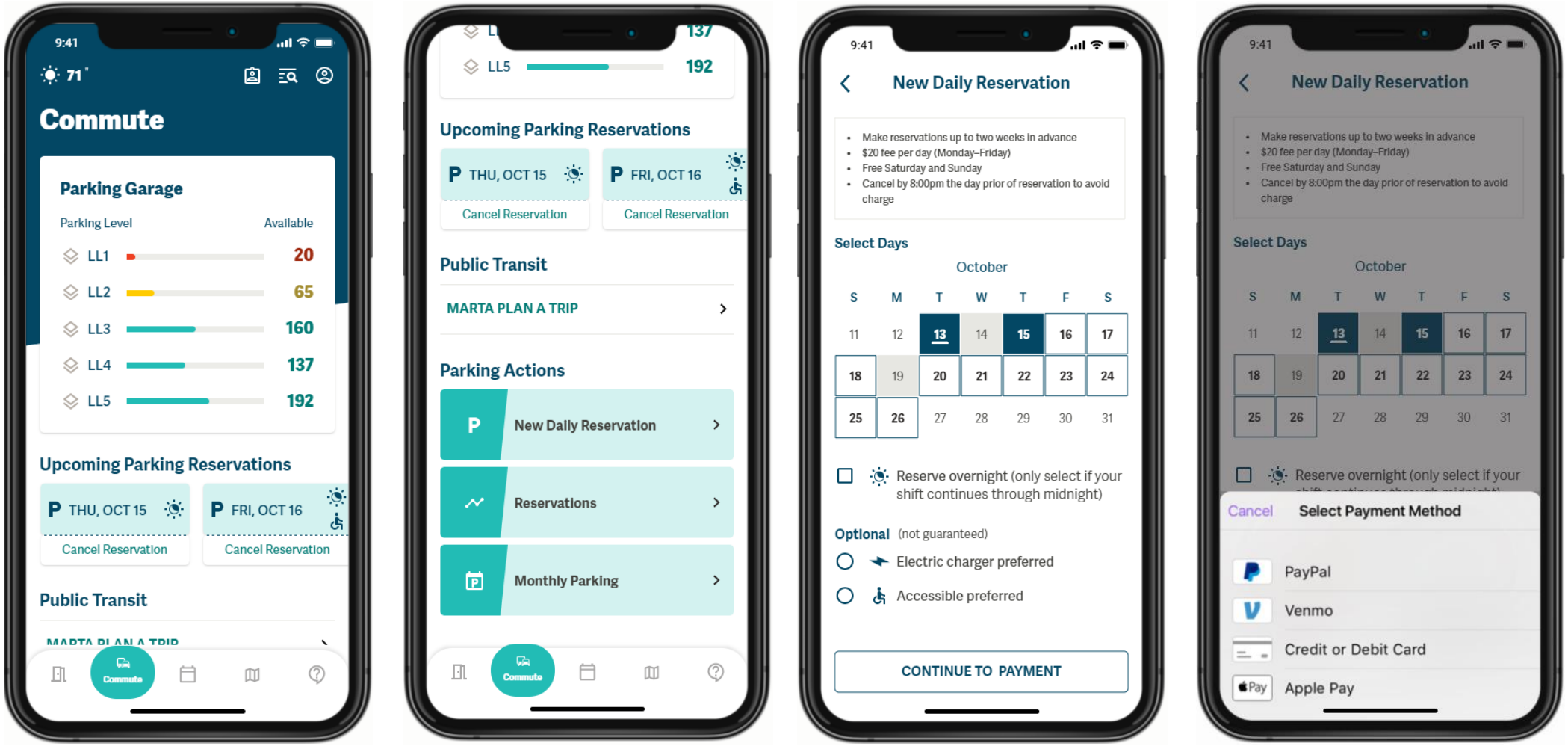
API

3rd Party Platforms

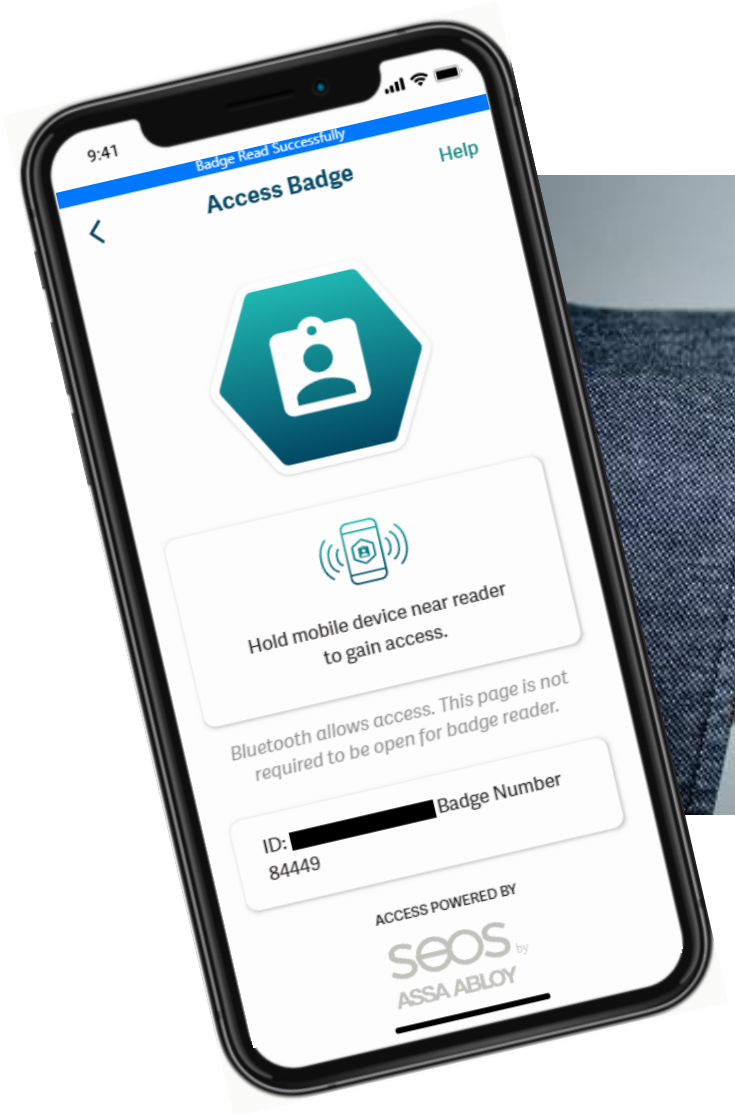

Building Data Room
SPOG
Virtual Hosting
ANALYTICS
CLOUD HOSTED APPLICATIONS
O365
MOBILE APPS
• EMPLOYEE EXPERIENCE
• WORKORDER MGMT
• FOOD SVC
• PARKING RESERVATION
PARKING ACCESS MGMT AND RESERVATION
INTEGRATED WORK ORDER MGMT SYSTEM
FM
LOCAL SERVER-BASE BUILDING
ACCESS CONTROL SYSTEM
AV SERVER
SCHEDULING AND IN-ROOM TECH
SMART WORKPLACE MOBILE APP
BASE BUILDING ICT PLATFORM
ICT PLATFORM
BASE BUILDING LIGHTING GATEWAY
FIRE AND LIFE SAFETY APPLICATION
AC FIELD CONTROLLER
INTERIOR LIGHTING CONTROLS
ARCHITECTURAL LIGHTING
VIDEO AGGREGATION
LOCATION MAPPING
ACCESS POINT W/LOC
MECHANICAL EQUIPMENT
AHU
FCU
VAV(R)
TENANT METERING
MAIN BUILDING LOAD ELEC
NETWORK VIDEO RECORDER
ELEVATOR MANAGEMENT SYSTEM
ELEVATOR DISPLAYS
PLANT LEVEL EQUIPMENT
GROUND WATER/ RAIN WATER SYSTEM
MASTER IC
Moxa MGate Gateway
ATS
PARKING MANAGEMENT SYSTEM
LITE.GATE WITH
- INTERCOM SYSTEM
- BLUETOOTH READER
- CARD READER
- IC
AUTOMATIC LICENSE PLATE RECOGNITION CAMERA
INTERCOM SYSTEM SERVER
PARKING MANAGEMENT SERVER
SERVER WITH VIRTUAL MACHINES AS REQUIRED (DAU, LPR, SQL DB)

USE CASE: Mobile Experience

Mobile Experience: parking & commute



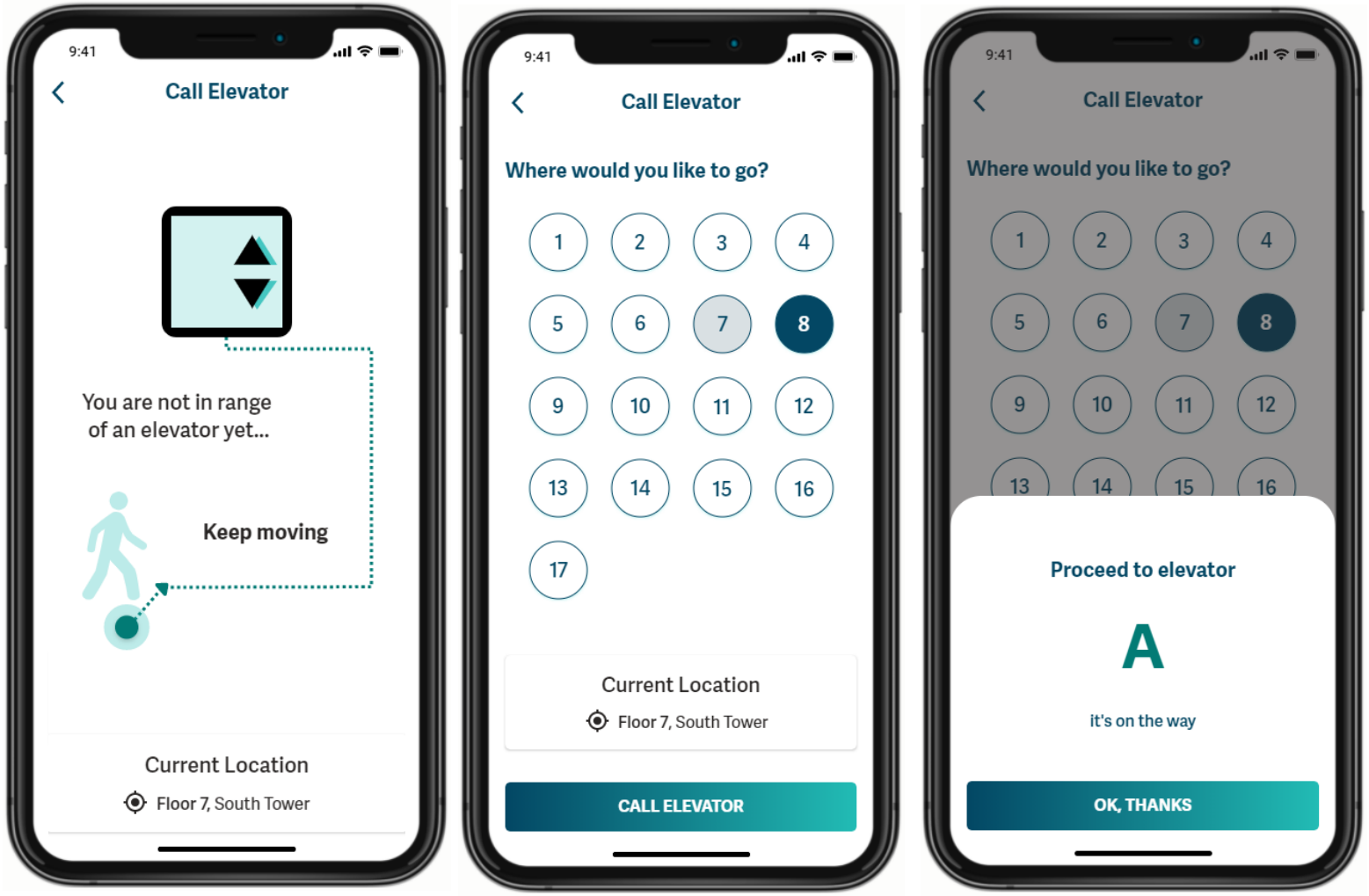
Mobile Experience: authentication, profile & access



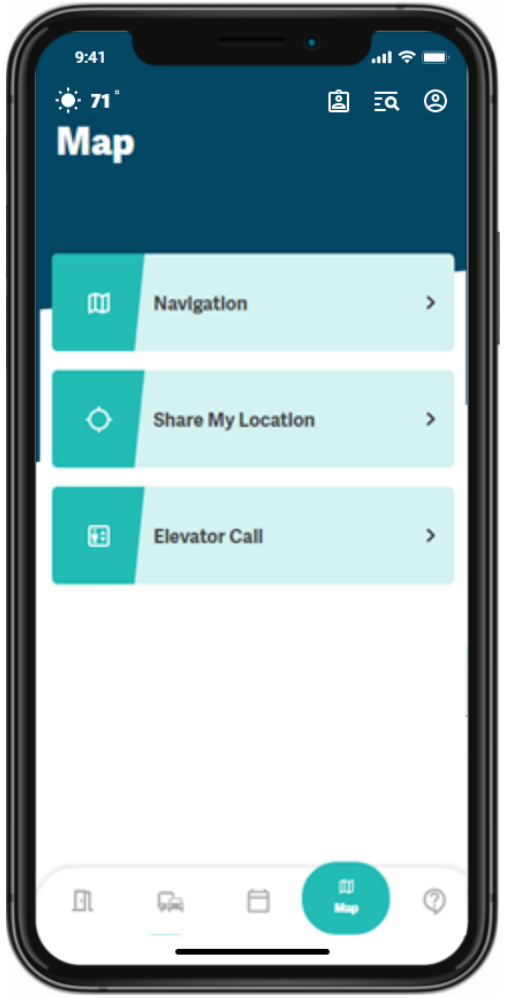
Mobile Experience: elevator call

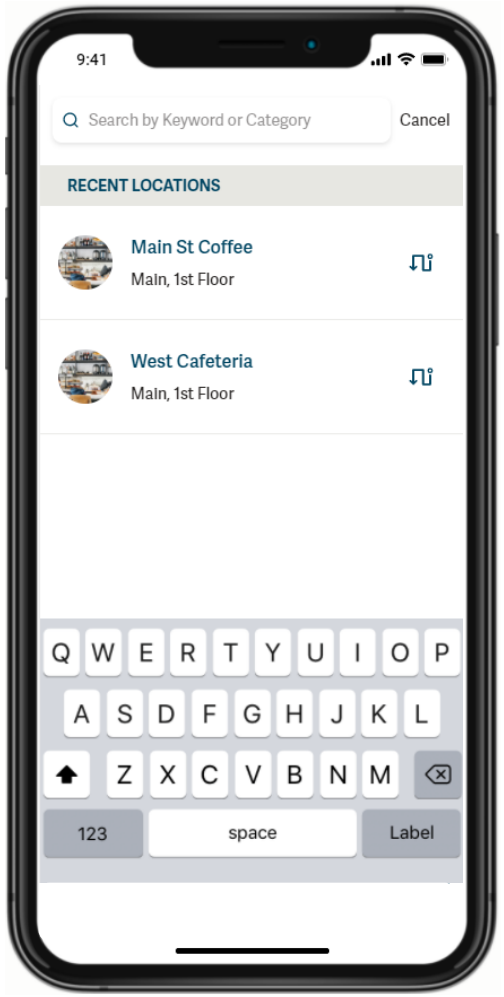
Features

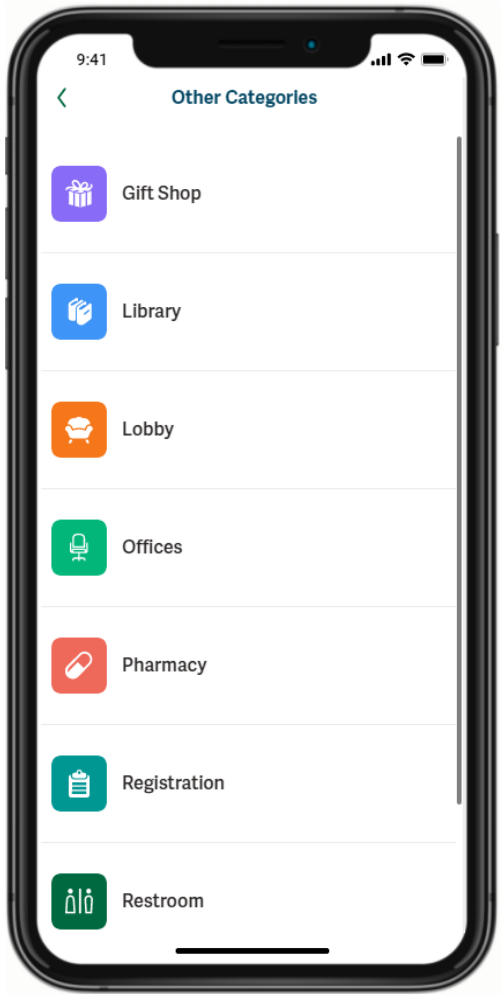
- ❑ Integrated Mobile Credential
- ❑ Integrated Destination Dispatch
- ❑ Location-Aware with Bluetooth Beacons



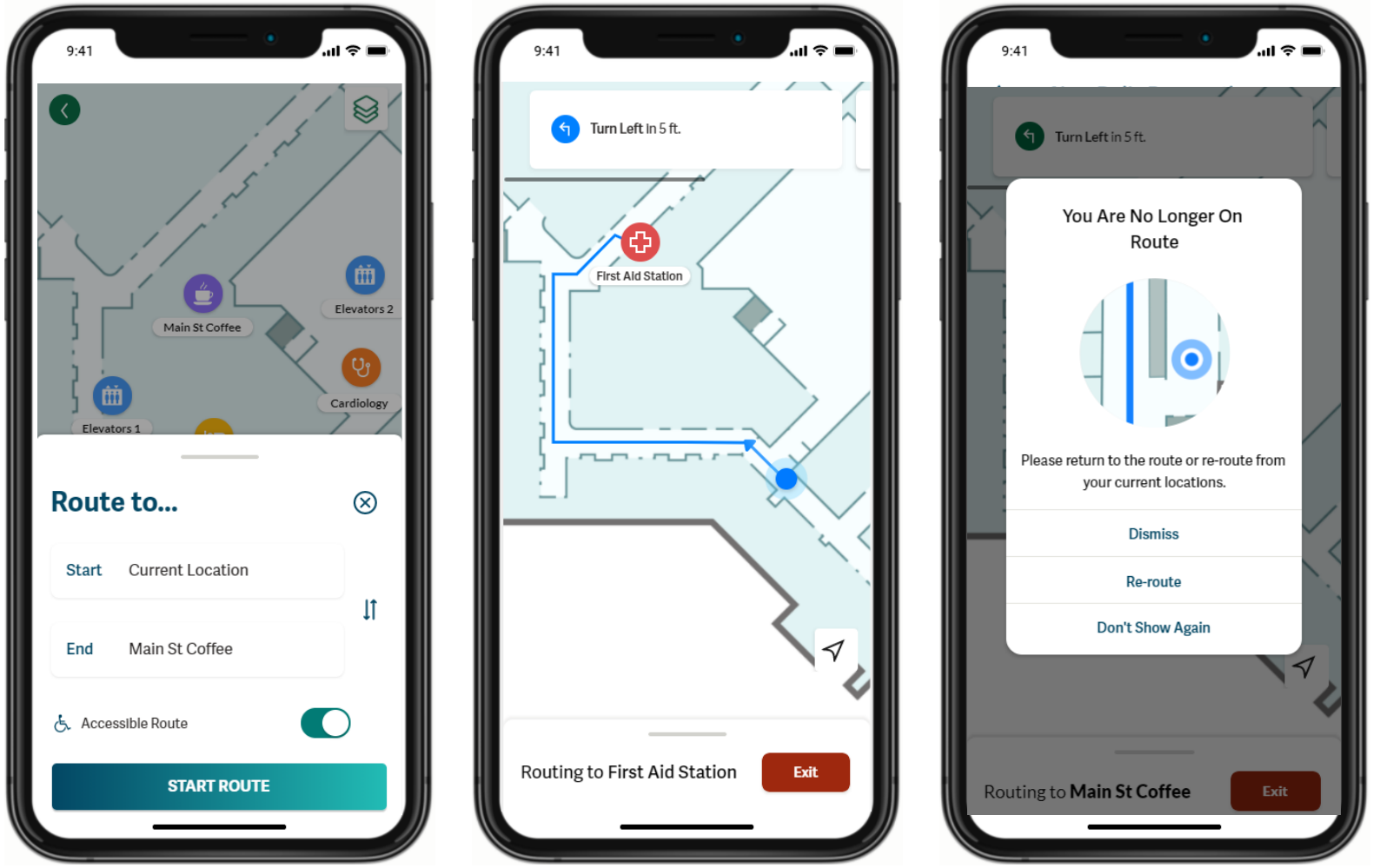
Mobile Experience: wayfinding & map



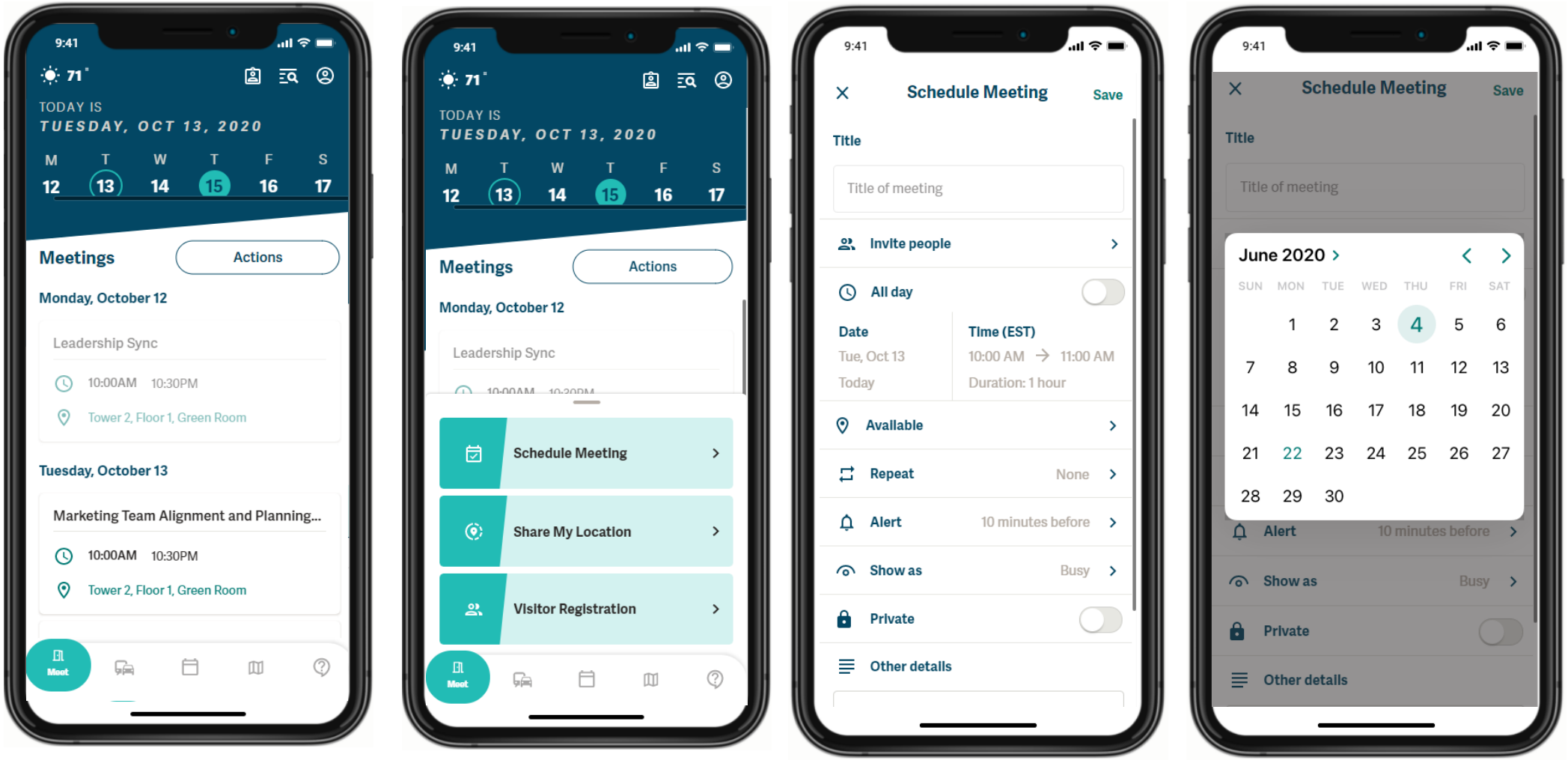




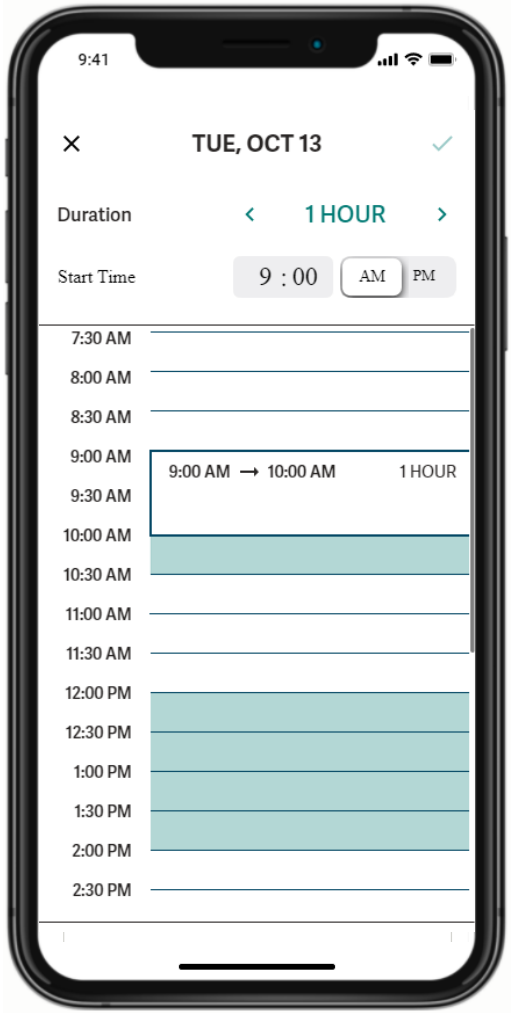
Mobile Experience: routing

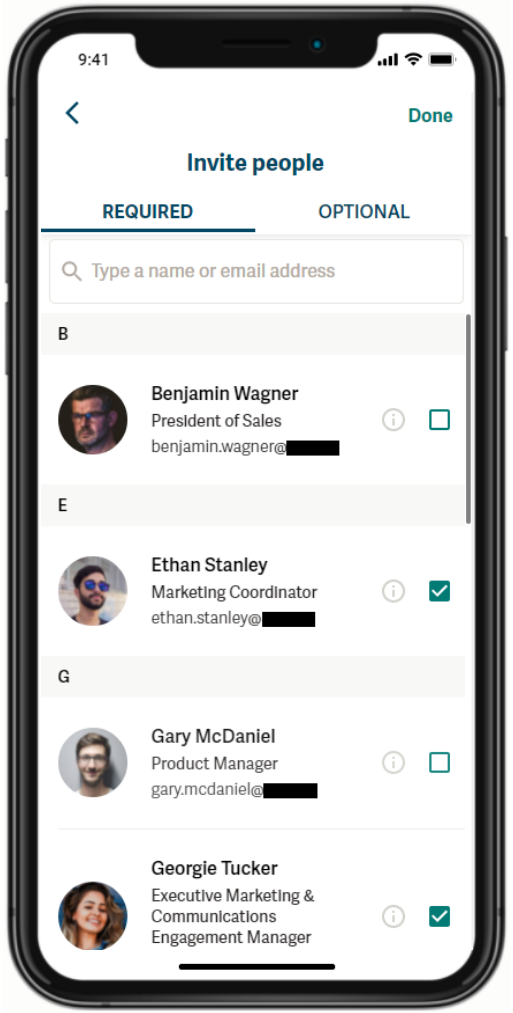


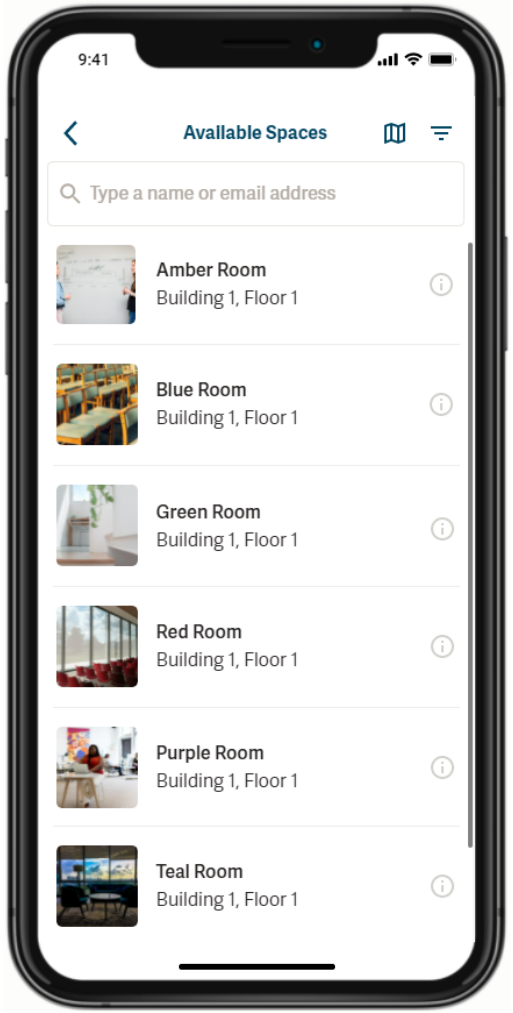
Mobile Experience: meeting scheduling

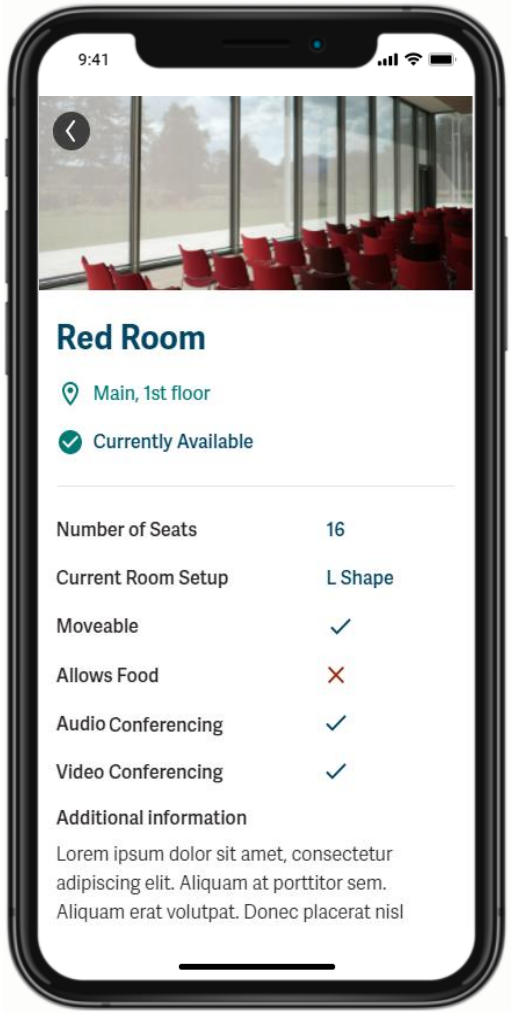


Mobile Experience: meeting scheduling

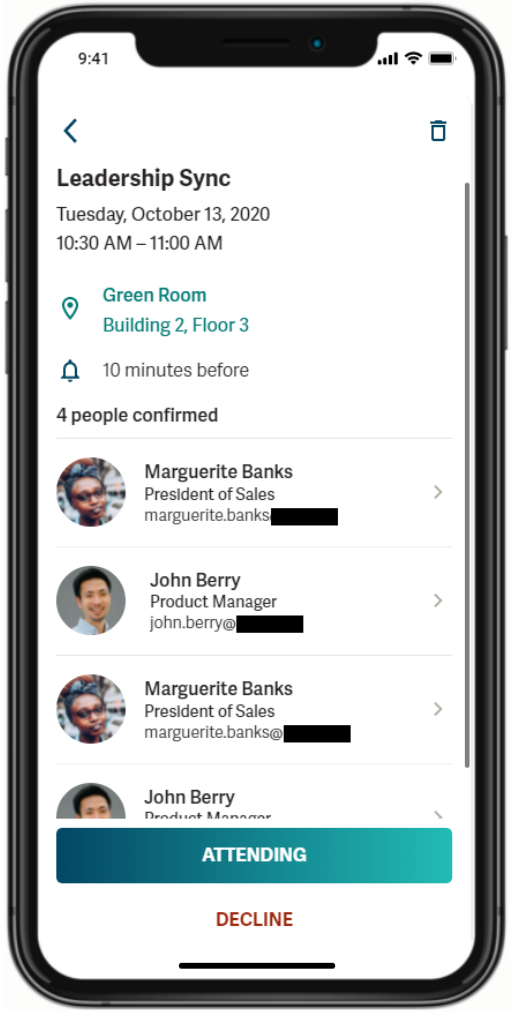


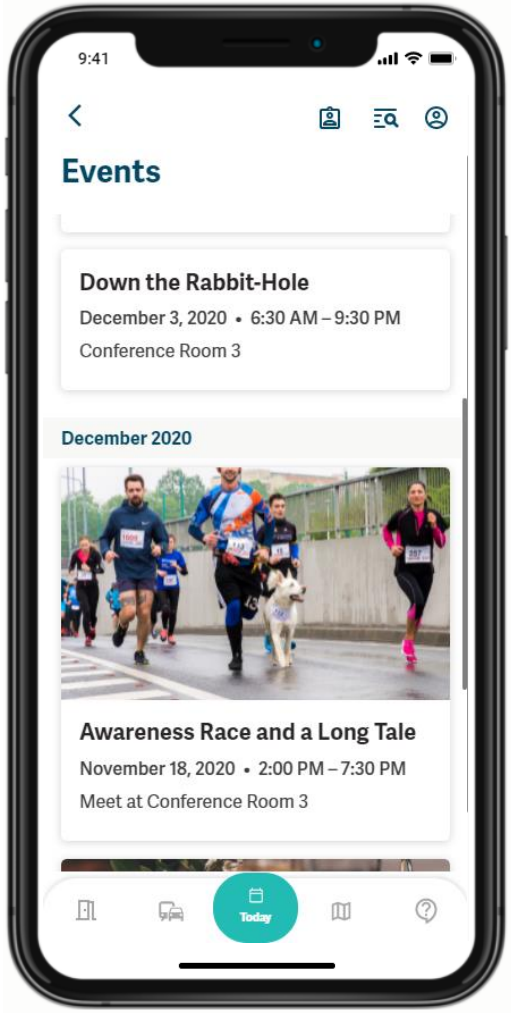




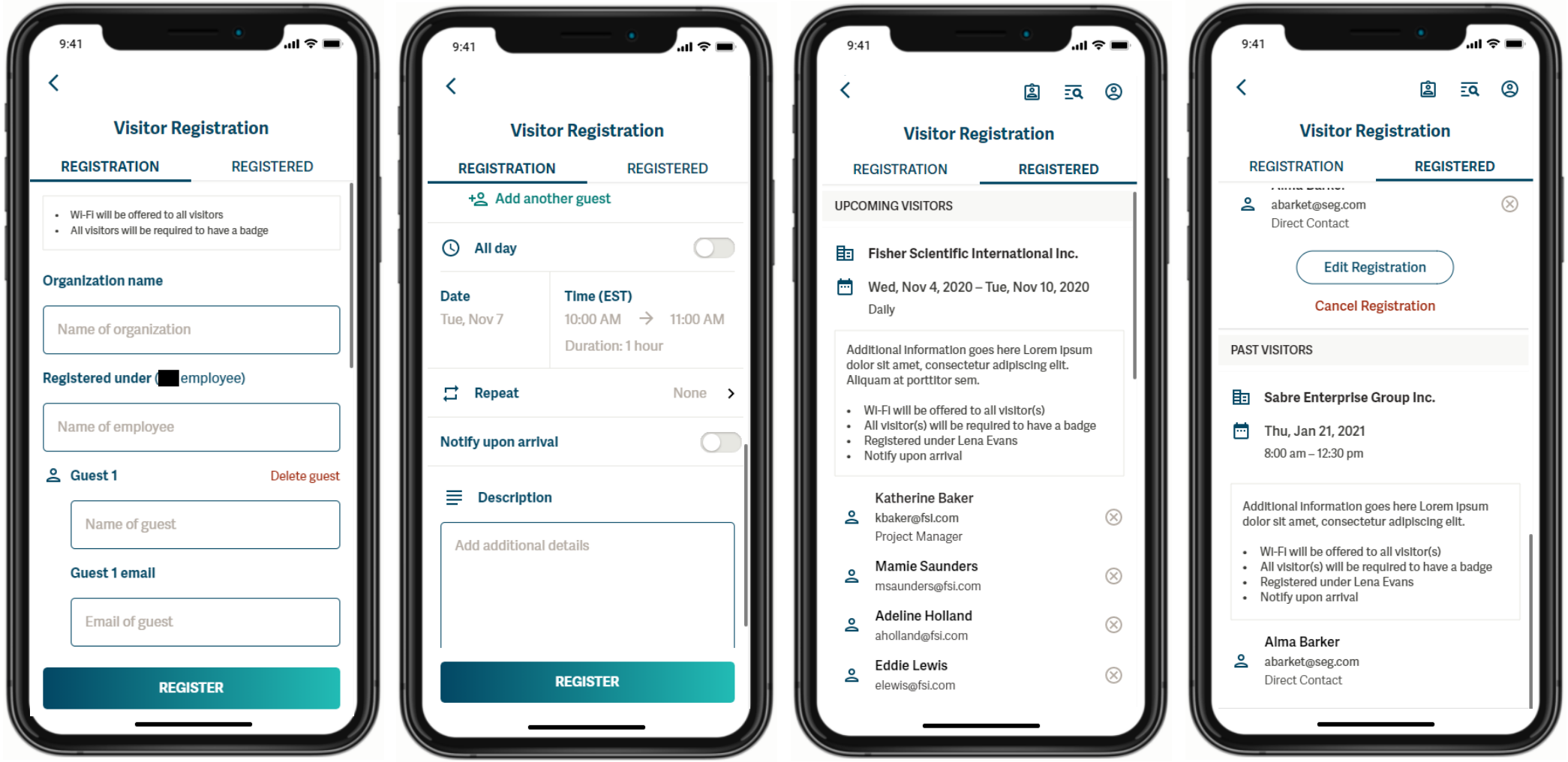


Mobile Experience: meeting scheduling & events

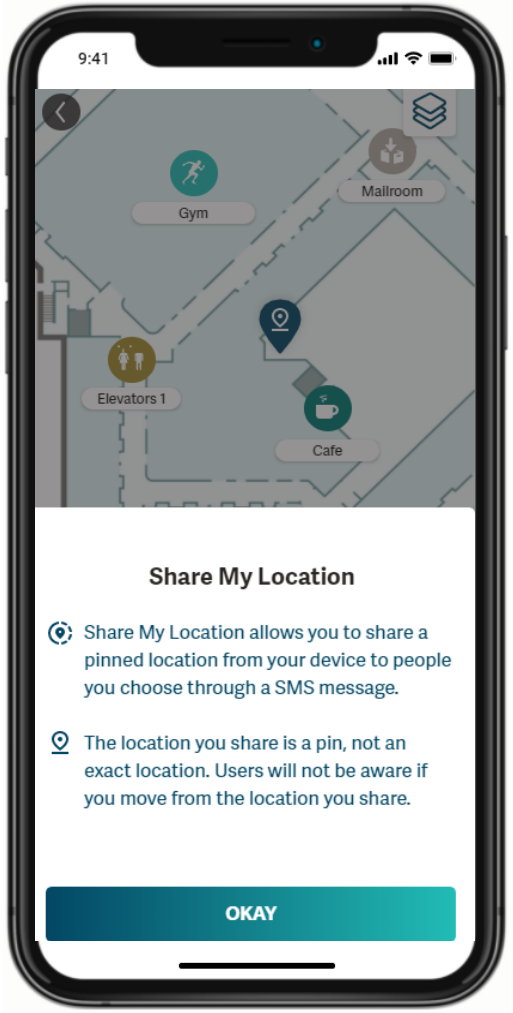


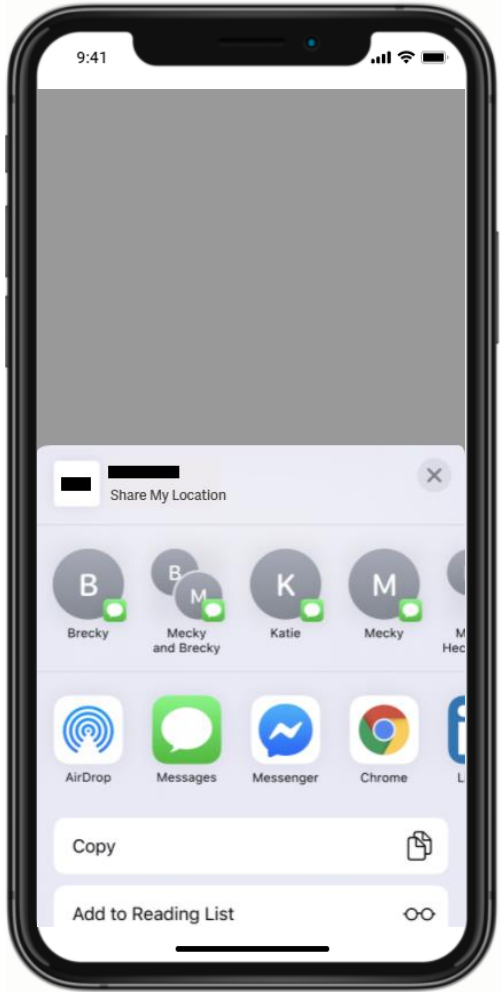


Mobile Experience: visitor registration

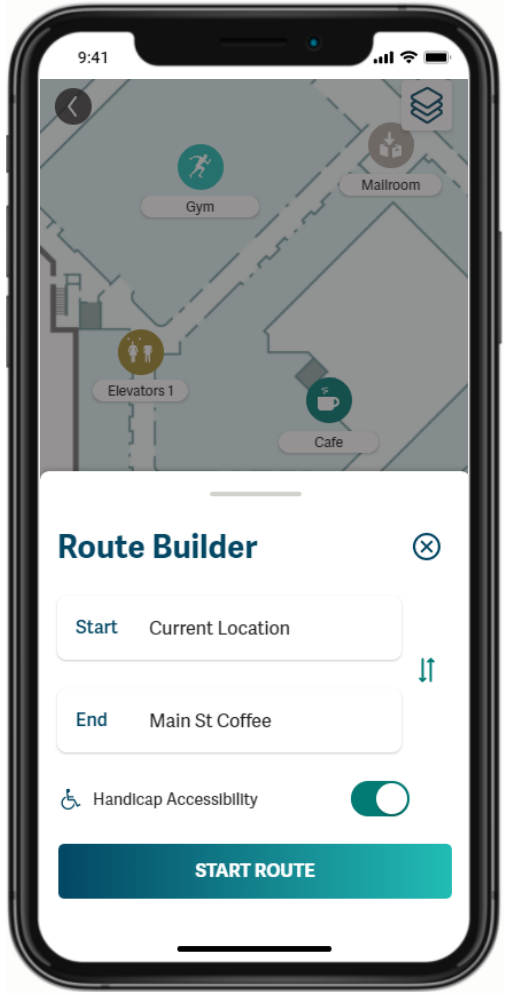


Mobile Experience: location sharing & route building

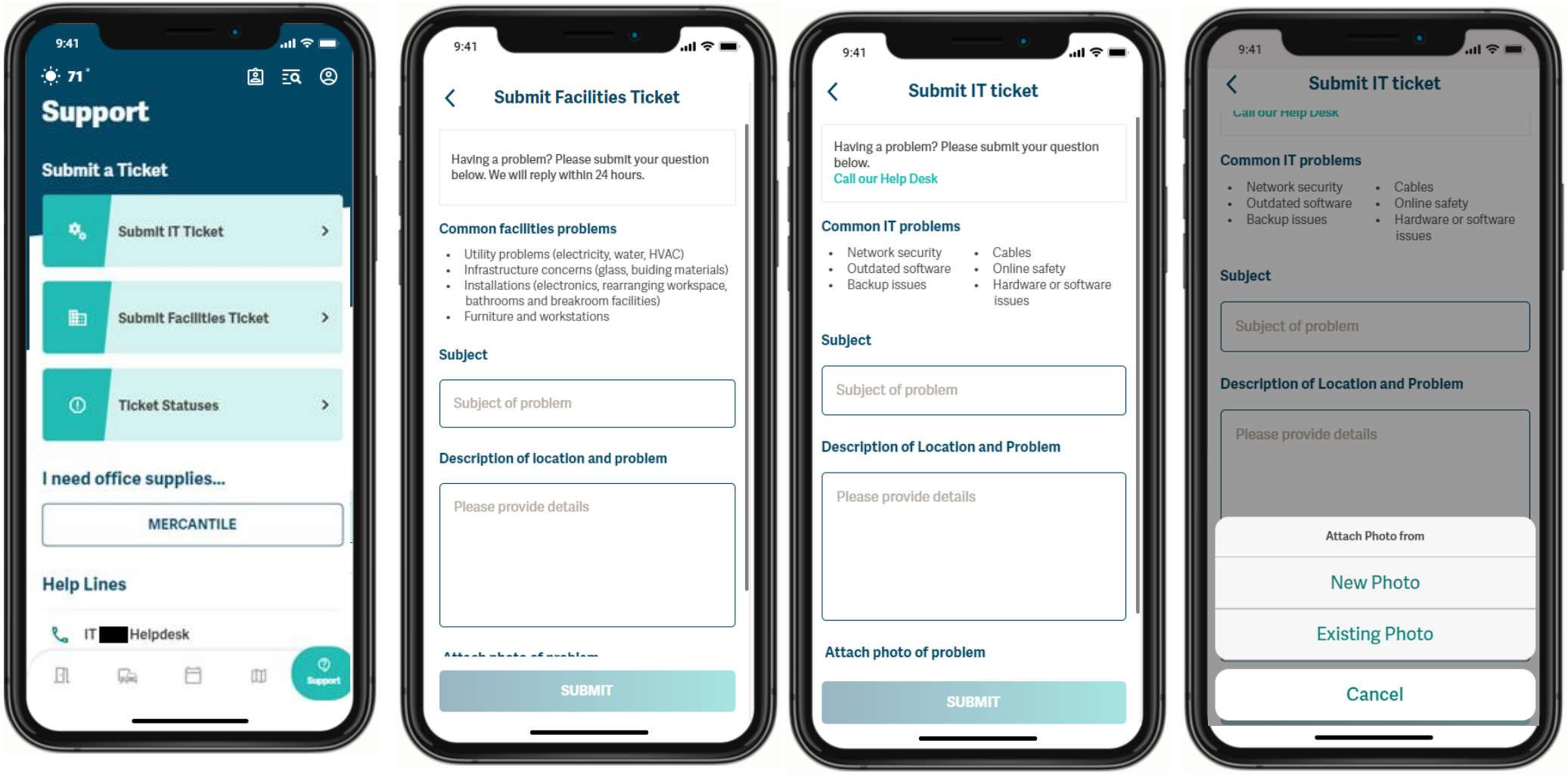




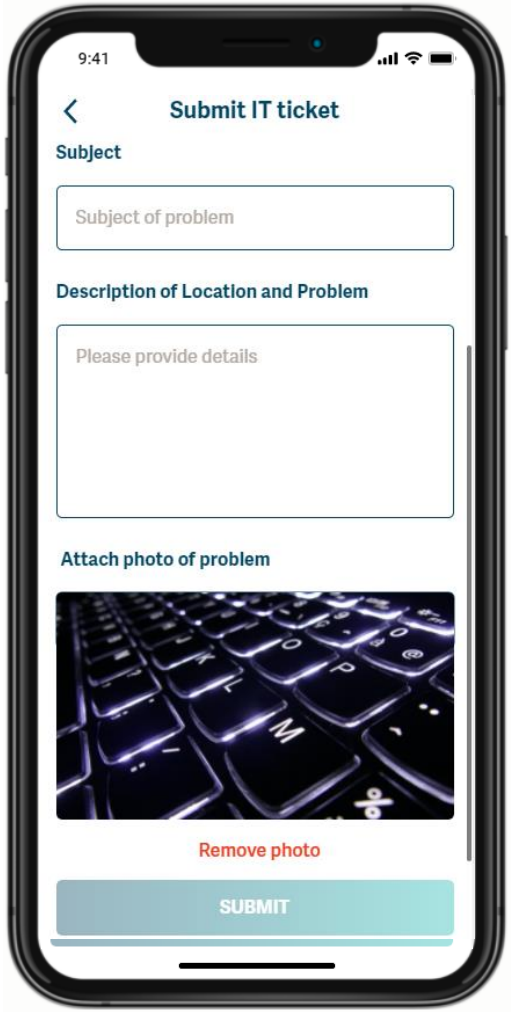
Mobile Experience: location sharing & route building

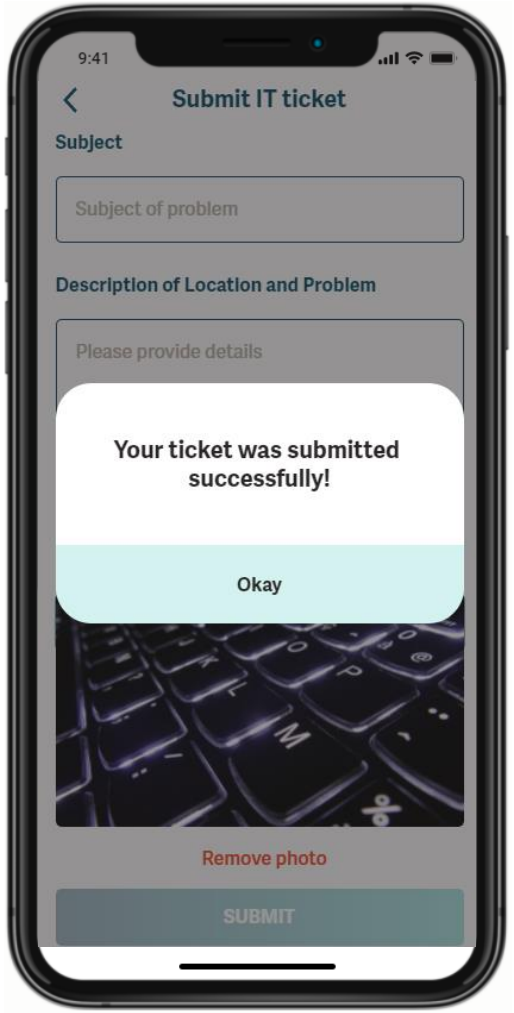


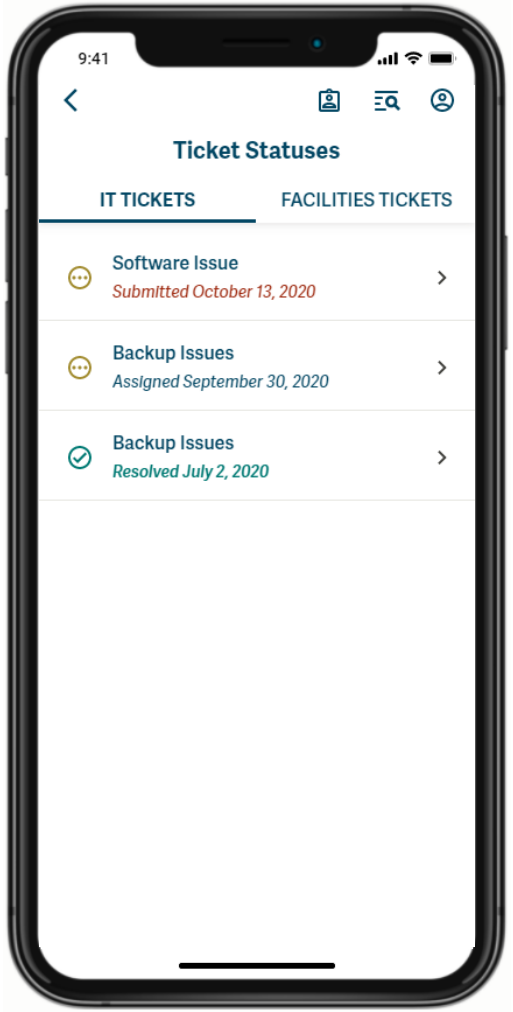
Mobile Experience: IT & facilities support ticketing

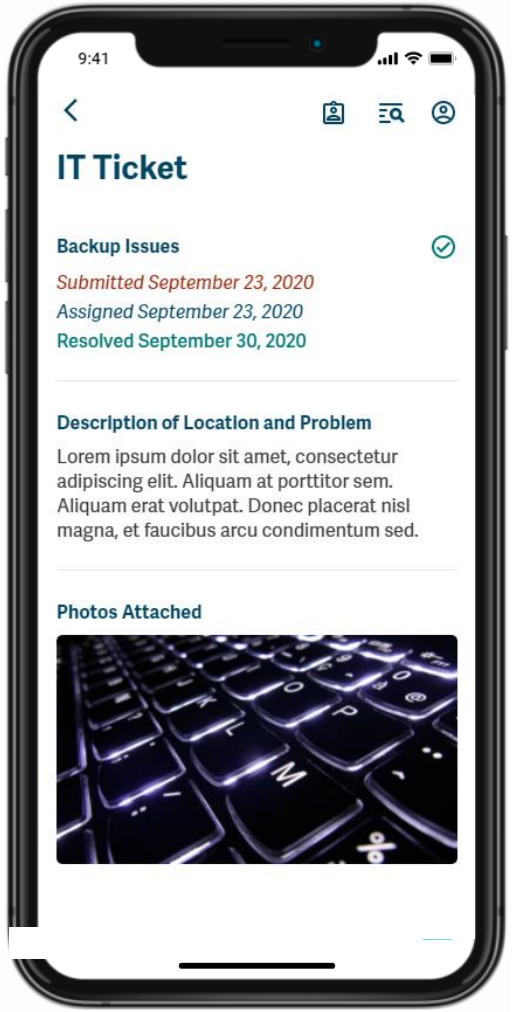


Mobile Experience: IT & facilities support ticketing









Smart Building Project - Process

Design Consultants & Engineers

Q

Do we need a Smart Building Consultant 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.

ROSETTA STONE

The Smart Building Team should be skilled to speak at various levels to all stakeholders.

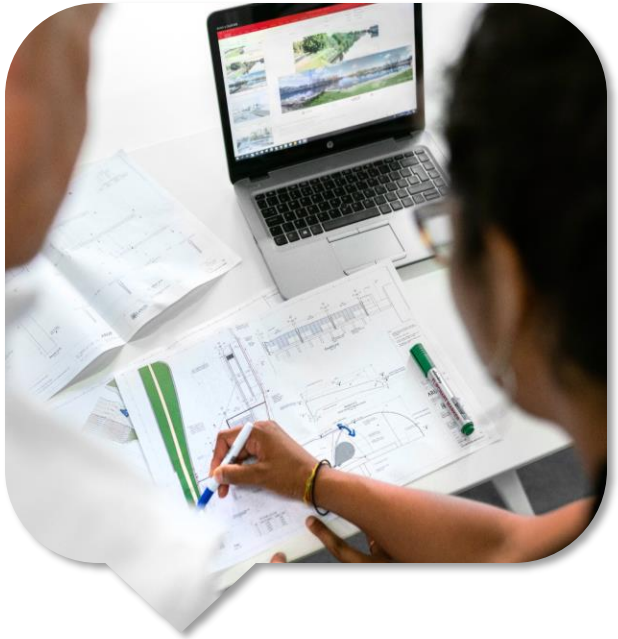
Smart Building Team

1. 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 organization.

2. Strategy Consultant

An outside consultant helps bring stakeholders together and establish a vision and methodology.



3. Design Consultant

Consultants and engineers who can advocate for smart building, lead decision-making, and implement the strategy with construction documents.

Smart Building Master Plan

Use Cases

- Enhance Visitor Experience
- Reduce Operating Costs
- Reduce Capital Costs
- Provide Data to Tenants
- Add New Revenue Streams
- Seamless Access Facility-wide

Mapping

Enabling Systems

- Building Automation Systems
- Portfolio Dashboard
- Lighting Control Systems
- Mobile Application
- Independent Data Layer
- OT Network

How To Get It Done

Master Plan

Stakeholder Input
Best Practices
Enabling Systems
Implementation Strategy
Use Cases
Master Plan
Measuring Success

OT Master Plan

why

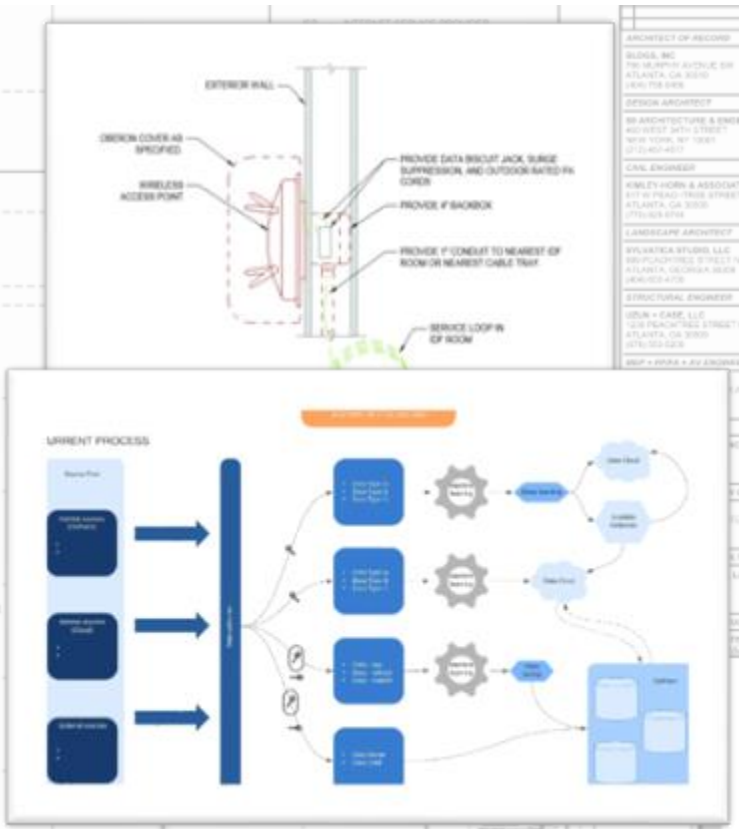
- Use Case Technology Requirements
- Technology Standards

how

- Architectural Wayfinding
- Component Design
- Operational Resources

what if

- Technology Transitional Strategy



Programmatic Design

SMALL MEETING ROOM

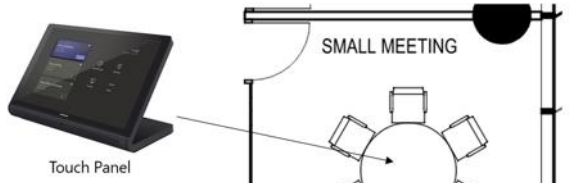
Description of System:

A flat panel display will be mounted on the presentation wall in the room. The display will be sized appropriately for the room geometry based on AV industry standards for visual acuity.

An auto-framing camera will be located on the presentation wall. This camera will provide a video conference feed from the room to remote participants. In some instances, the user may prefer for video to be "off" so that all parties focus more on content. The camera can be easily turned off on the touch panel, similarly to how this is done in the desktop environment.

Beamforming microphones and speakers will be wall mounted at the display. Based on room size, this may be integrated into the camera for an all-in-one system. The microphones will clearly pick-up participant voices in the room due to their beamforming technology, and enhanced room acoustics will further add to the intelligibility of the audio.

A control touch panel will be located on the table. This panel will offer the native Teams interface for meeting joins, dialing, and basic volume controls.



Touch Panel

Speakerbar with Camera
Below display

SMALL MEETING ROOM

Description of Room:

The meeting room system type will be used for general collaboration and conferencing. It will provide simple presentation both wirelessly or from hardwired connections at the table. It will also provide video and audio conferencing with one-button-to-press meeting joins of all common platforms.

The user experience is designed to be intuitive. As the user enters the room, the display will automatically turn on with the Invesco-branded splash screen. The user can join the Teams session on their mobile device or laptop and share their screen wirelessly. The Teams system will automatically recognize that they are in the room for an intuitive join. Or, if the user prefers the hardwired connection at the table, they can plug in to the connection that matches their device and the screen will share automatically. The user can also share via the dedicated PC in the room.

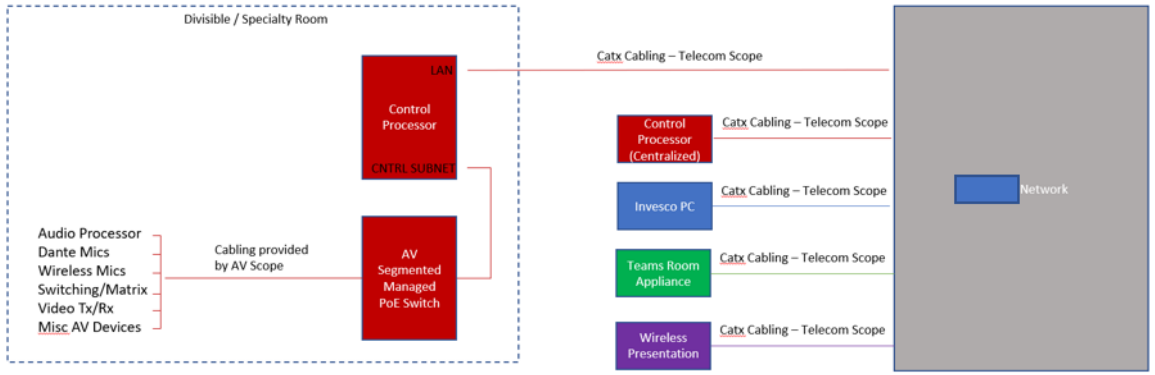
The system will allow one-button-to-press video conference joins. If the user reserves the room in their calendar (the most common application), then the room is "expecting" the meeting and will allow the user to join by a single press ready on the panel.

If the user has not reserved the room in an ad-hoc experience, they can simply share locally or invite other remote participants directly from the panel.

The panel will also include a dialer for traditional phone calls if the user needs to bring remote participants into the meeting by phone.

The system will automatically turn off and after a specified period of unoccupied time in the room.

NETWORK TOPOLOGY



COST ESTIMATE

Description:

The spreadsheet embedded herein will enable the Invesco team to review probable costs and quantities of each system type.

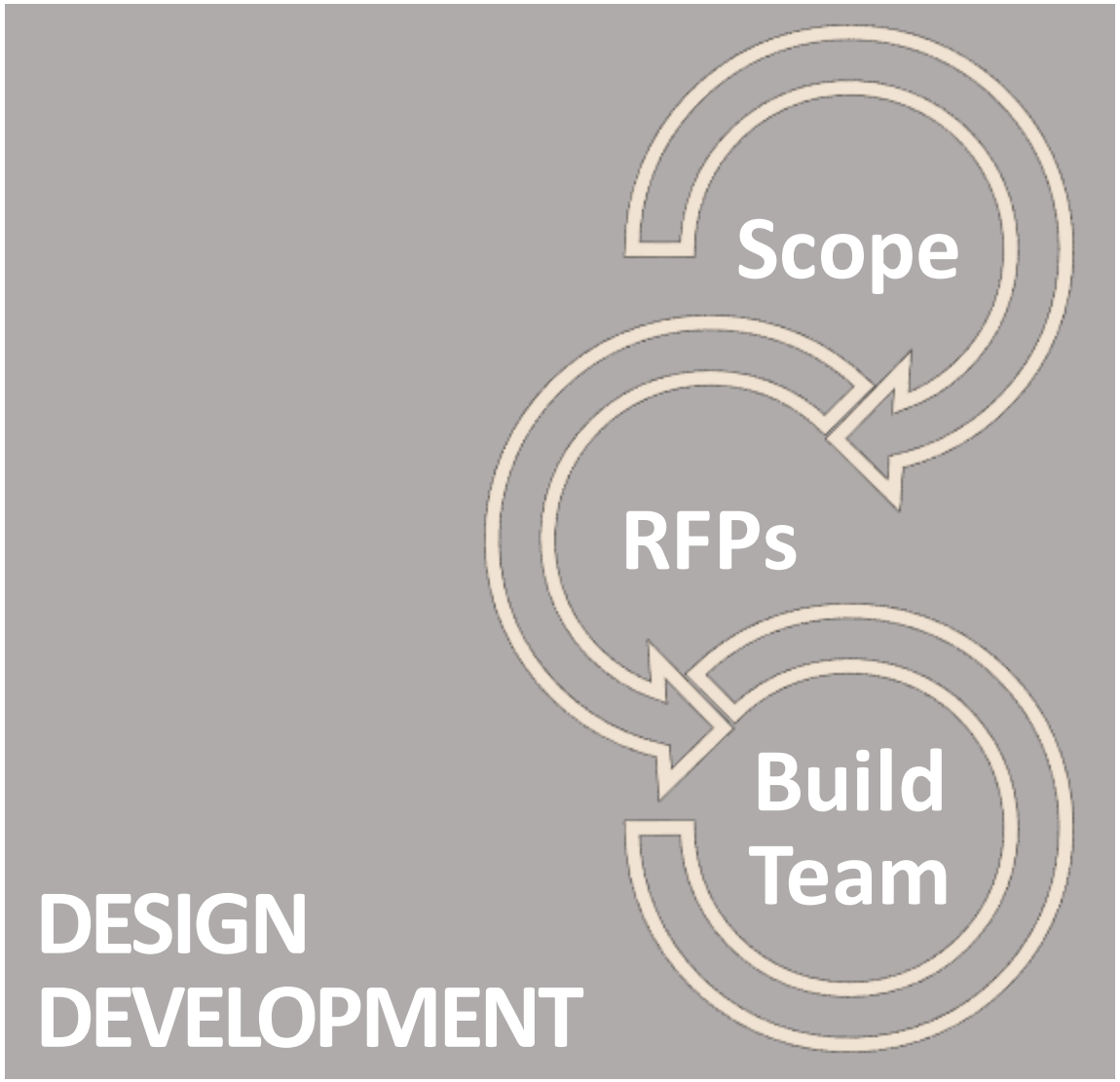
These estimates are based on the system descriptions herein and are subject to change as functional descriptions are refined. These are cost estimates only based on current market conditions and are likely to change upon contracting.

Estimate includes AV equipment, installation, labor, programming, and training.

Estimate does not include GC markups, taxes, or infrastructure costs. (Infrastructure is defined as power, pathways, conduits, boxes, blocking, and other non-active equipment to support the AV systems.)

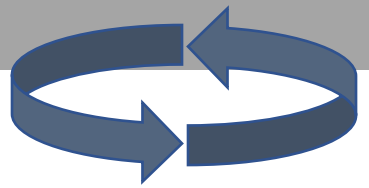
Meeting Rooms			
System Type	QTY	Estimated Cost	Extended
Small Meeting Room	18	$ 11,000.00	$ 198,000.00
Medium Meeting Room	12	$ 17,000.00	$ 204,000.00
Medium Meeting Room (Dual Display)	16	$ 22,000.00	$ 352,000.00
Large Meeting Room	2	$ 28,000.00	$ 56,000.00
Large Meeting Room (Dual Display)	3	$ 37,000.00	$ 111,000.00
Huddle Room	41	$ 8,500.00	$ 348,500.00
Project Room	8	$ 10,000.00	$ 80,000.00
Large Project Room	10	$ 27,000.00	$ 270,000.00
TOTAL			$ 1,619,500.00

Design Phase



Implementation Phase

OAC MEETINGS



Smart Building Technology Team Leadership

Vendor Onboarding

Project Initiation Document

Interdisciplinary Coordination

Submittal Reviews

RFI Responses

Installation Coordination

Site Progress Visits

Device Commissioning

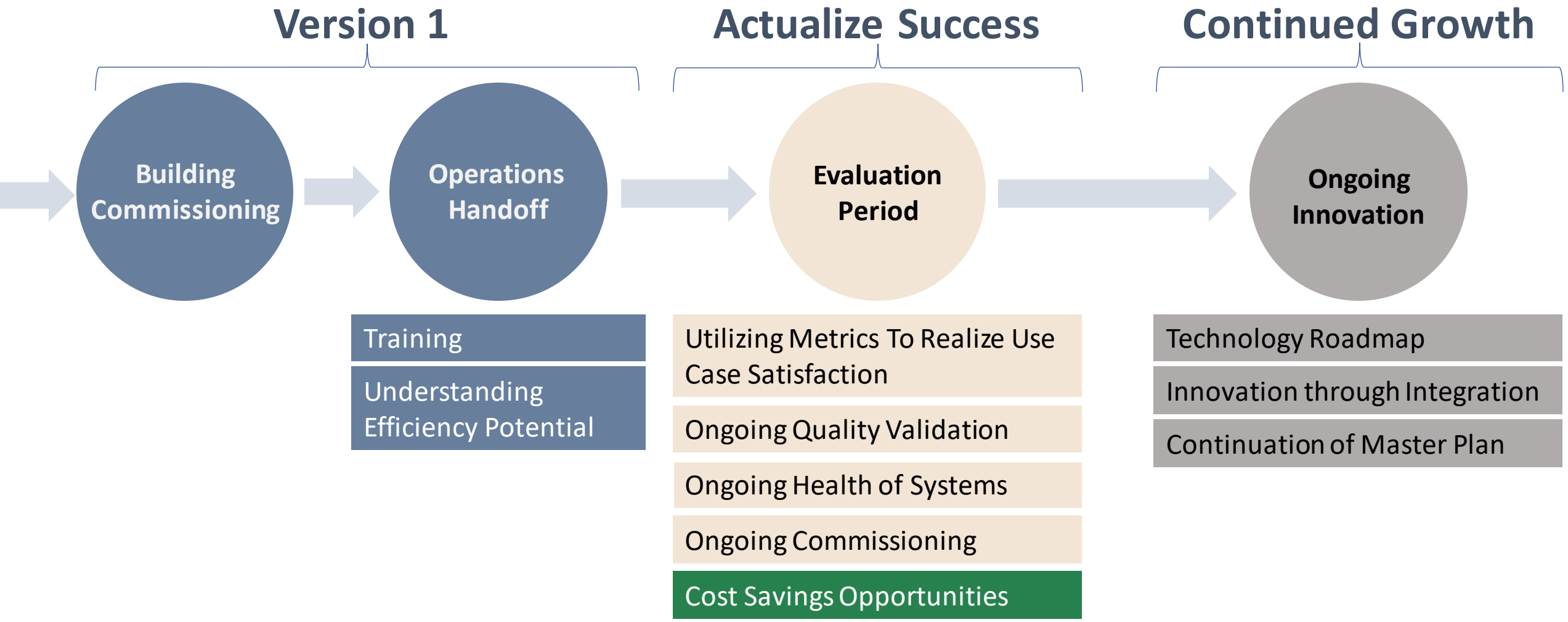
Integrations

Handoff Coordination & Support

System Commissioning

Building Commissioning

Operations and Optimization Phase



Operations: Condition Based Maintenance

- Moving from time based to condition-based maintenance
- Complete digital asset life-cycle management

USE CASE: Digital Twin

Smart Janitorial Services

- Smart restrooms with sensor
- Clean only after use
- Supply chain on-demand

Where is the Smart Building Industry Going?

- By Industry – Healthcare
- Patient Experience
- Smart Operating Rooms

Wellness Programs

Operational Technology

SITE DETAILS

All Meters

WEATHER - ATLANTA, GA

Clear

68 °F

73 °F / 45 °F

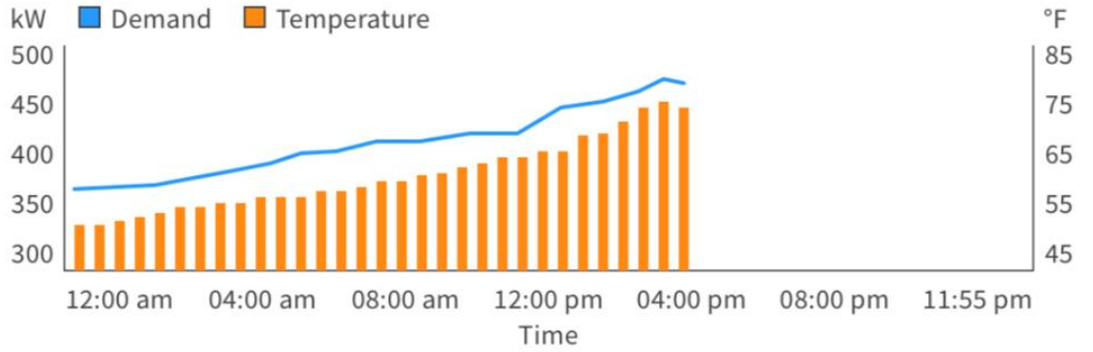
Humidity: 64 %

Precipitation: 0.0 in

Sunrise: 7:37 am

Sunset: 6:17 pm

WEATHER IMPACT ON ELECTRICITY DEMAND



ELEC PRODUCTION & CONSUMPTION

Production (Solar)

2,100.0 kWh

↑ 5.4 % from previous period

Consumption (PV + Grid)

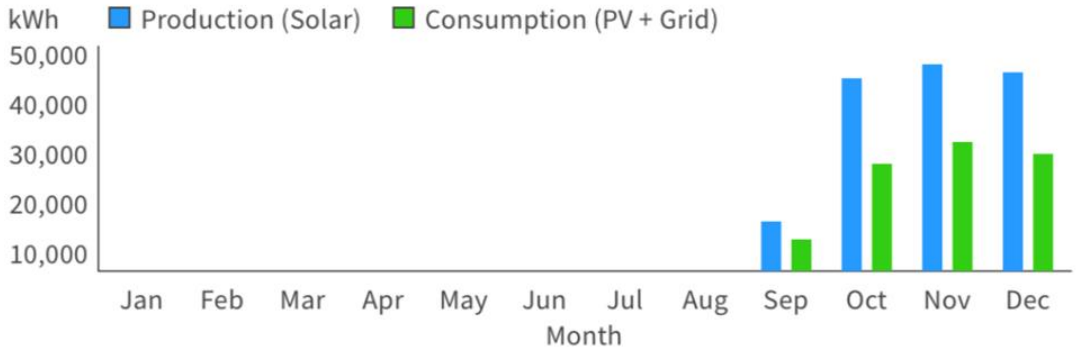
900.0 kWh

↓ 3.2 % from previous period

ELECTRICITY PRODUCTION vs. CONSUMPTION - 2019

Production: 140,000.0 kWh Consumption: 80,000.0 kWh Net +/- Rating: + 2.1 %

Day | Week | Month | Year | Opening To Date | 2019



TOTAL ENERGY COST

$240.00

75.0 % to Target

↓ 4.1 % from previous period

Engineering for Smart Cities and Campuses

Visualize

Specify

Actualize

Questions?

Connect with us!

Newcomb & Boyd

Newcomb & Boyd
CONSULTANTS AND ENGINEERS
newcomb-boyd.com