



BUILDING
INNOVATION 2018

National Institute of
BUILDING SCIENCES

CONFERENCE & EXPO

National Institute of Building Sciences

Provider Number: G168

Are You an AEC Game Changer? Designing the Future of Architecture Construction And The Built Environment

Session WE2A: Using Technology to Move the Industry Forward

Stephen Hagan, FAIA, CEO, Hagan Technologies @SHaganFAIA

Kim on Onuma, FAIA, President, Onuma, Inc. @KimonOnuma

January 10, 2018





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Credit(s) earned on completion of this course will be reported to **AIA CES** for AIA members. Certificates of Completion for both AIA members and non-AIA members are available upon request.

This course is registered with **AIA CES** for continuing professional education. As such, it does not include content that may be deemed or construed to be an approval or endorsement by the AIA of any material of construction or any method or manner of handling, using, distributing, or dealing in any material or product.

Questions related to specific materials, methods, and services will be addressed at the conclusion of this presentation.





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Course Description

Within our lifetime, we have seen amazing advancements in technology that dramatically change how we work and live. Much of this has even occurred within the last 5 to 10 years. One of the most exciting aspects of this trend is when radical, new, disruptive approaches are invented to tackle problems and tasks that have been otherwise addressed by entrenched, traditional methodologies for decades. This presentation will explore how this trend is impacting the design and building industry and how National Institute of Building Sciences standards and projects are enabled by game changing innovations. The speakers will present case studies of how the architecture, engineering and construction (AEC) industry is using these innovations to improve project outcomes by using standards-driven technologies for design, construction and operations. These lessons learned come from a variety of owners, architects and equipment manufacturers. The success stories come from the U.S. Department of Veterans Affairs; Defense Health Agency; Sherlock, Smith & Adams Architects; Tri W-G Medical Equipment; and many more. New methods of collaborating across the industry are emerging. Sharing these game changing solutions between government agencies and the private sector is accelerating ways to solve complex problems today.





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Learning Objectives

At the end of the this course, participants will be able to:

A. Upon completion, participants will be able to establish and prioritize the top 3 or 4 emerging technologies that interest them and their firms and pose great opportunities for the future of their practice. These innovative technologies enable the architect and architectural practice to increase the value of the built environment in terms of safety, occupant comfort and well-being, often using data and technology feedback for human-centric and experiential design processes.



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Learning Objectives

At the end of the this course, participants will be able to:

B. Upon completion, participants will be able to understand what path-breaking and leading firms are doing to dramatically improve outcomes and provide innovative services to their clients and customers. These firms have transformed their practices through the immersive use of these innovative technologies and processes, thereby increasing productivity and profitability, in addition to improving building systems, materials and methods, as well as quality and integrative of design and construction documents and follow-on construction contract administration.



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Learning Objectives

At the end of the this course, participants will be able to:

C. Upon completion, participants will be able to understand how the built environment, form and function of architecture, and everything from small components to entire buildings to regions and urban scale can be dramatically improved by new emerging technologies--whether it is wearable computing, cloud computing, or big data. A special focus of the presentations and interaction with attendees will be on critical building systems, materials and methods, as well as design and construction processes (codes and standards, environmental compliance, new as well as renovation and historic preservation).





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Learning Objectives

At the end of the this course, participants will be able to:

- D. Upon completion, participants will be able to take key ideas back to the office on Monday and create their own Innovative Technology Execution Plans for their in-house projects and firm-wide business planning. Included in the workshop is a workbook with exercises throughout the day and a process and strategy to create a personal Game-Changing Innovation Technology Execution Plan. Each attendee will select one or more of critical topic areas to address in their Execution Plan: Building systems, construction contract administration and documents, design (including urban planning), environmental and legal project constraints and opportunities, materials and methods, pre-design and historic preservation).



GAME CHANGING INNOVATION

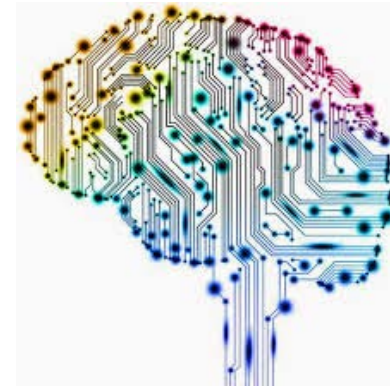
Designing the Future of Architecture Construction & The Built Environment

A'17

AIA Conference on Architecture 2017
April 27-29, Orlando

Game-Changing Innovative Dynamic Technologies

- 3D Printing
- 3D Reality Model
- Artificial Intelligence | Machine Learning
- Augmented Reality | Virtual Reality
- Big Data and Analytics
- BIM (Building Information Modeling)
- CAFM | CMMS
- Cloud Computing
- Cybersecurity
- Design Automation
- Digital Fabrication
- Drones
- Fog Computing
- Gamification
- Geo-Spatial | GIS | Location
- Internet of Things (IoT)
- Laser Scanning
- Messaging (email, sms, and beyond)
- Mobile
- Model Checking
- Pervasive Computing
- Reality Capture
- Sensors | Sensor Web
- Simulation
- Social Networking and Media
- Wearable Computing



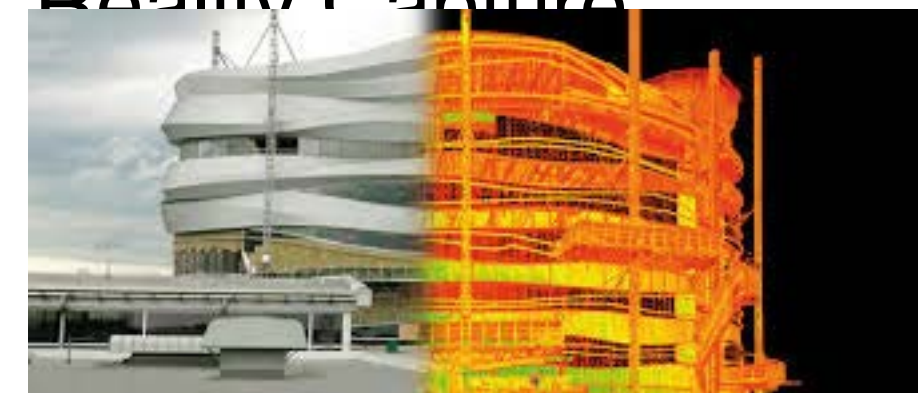
• BIM



• CAFM



• Reality Capture



• Cloud Computing



• CMMS



A Tsunami and a Jumble of Technologies

- 3D Printing
- 3D Reality Model
- Artificial Intelligence | Machine Learning
- Augmented Reality | Virtual Reality
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Game-Changing Innovative Dynamic Technologies

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- Simulation
- Social Networking and Media
- Wearable Computing

- What is Game Changing Innovation?
- Choose 2 or 3 to Focus on!
- Case Studies
- Industry-Wide Studies
- YOUR Innovation Execution Plan
- Conclusion and Looking Forward



“ If you don’t change...you’re going to perish”



“If you want to survive, you’re going to change; if you don’t, you’re going to perish. It’s as simple as that.”—*Thom Mayne, FAIA, 2005 Pritzker Prize Winner*

Game-Changing Innovative Dynamic Technologies

Model Authoring / Checking Tools

BIM
CAD
CAFM | CMMS / IWMS
Clash Detection
Model Checking
Simulation

Immersive Technologies

3D Printing
3D Reality Model
3D / Laser Scanning
4D Scheduling
Augmented Reality | Virtual Reality
Reality Capture
X-Reality

Internet Technologies

Cloud Computing
Cybersecurity
Fog Computer
Geo-Spatial | GIS | Location

Internet Technologies (cont'd)

Geo-Spatial | GIS | Location
Sensors / Sensor Web
Messaging
Mobile

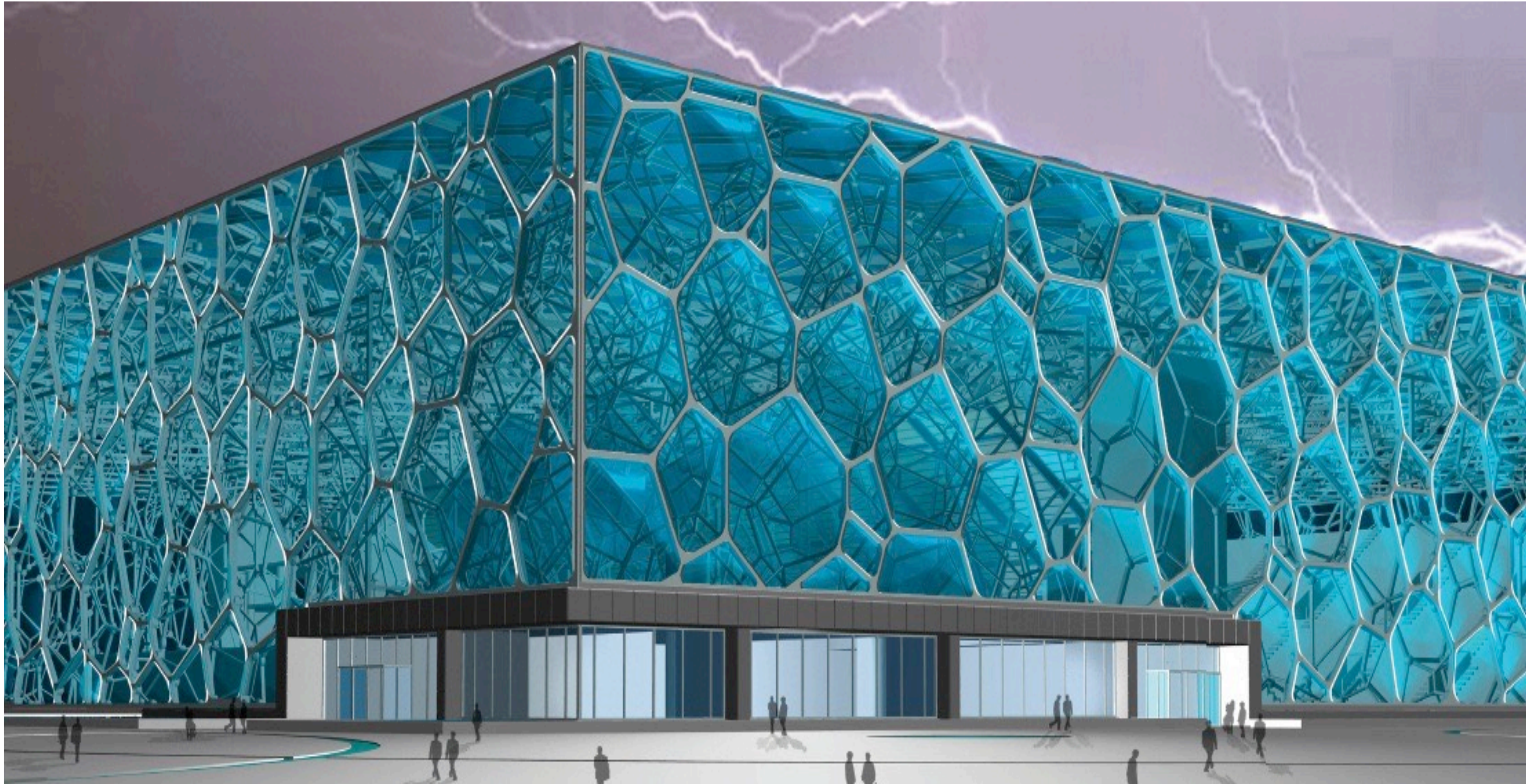
Machine / Computational Technologies

Artificial Intelligence | Machine Learning
Big Data / Analytics
Blockchain
Design Automation
Digital Fabrication
Drones
Internet of Things
Robotics
Pervasive Computing

Social Networking

Social Networking and Media
Wearable Computing
Gamification
Crowd Sourcing

Creating Stellar Architecture Using BIM



Creating Stellar Architecture Using BIM

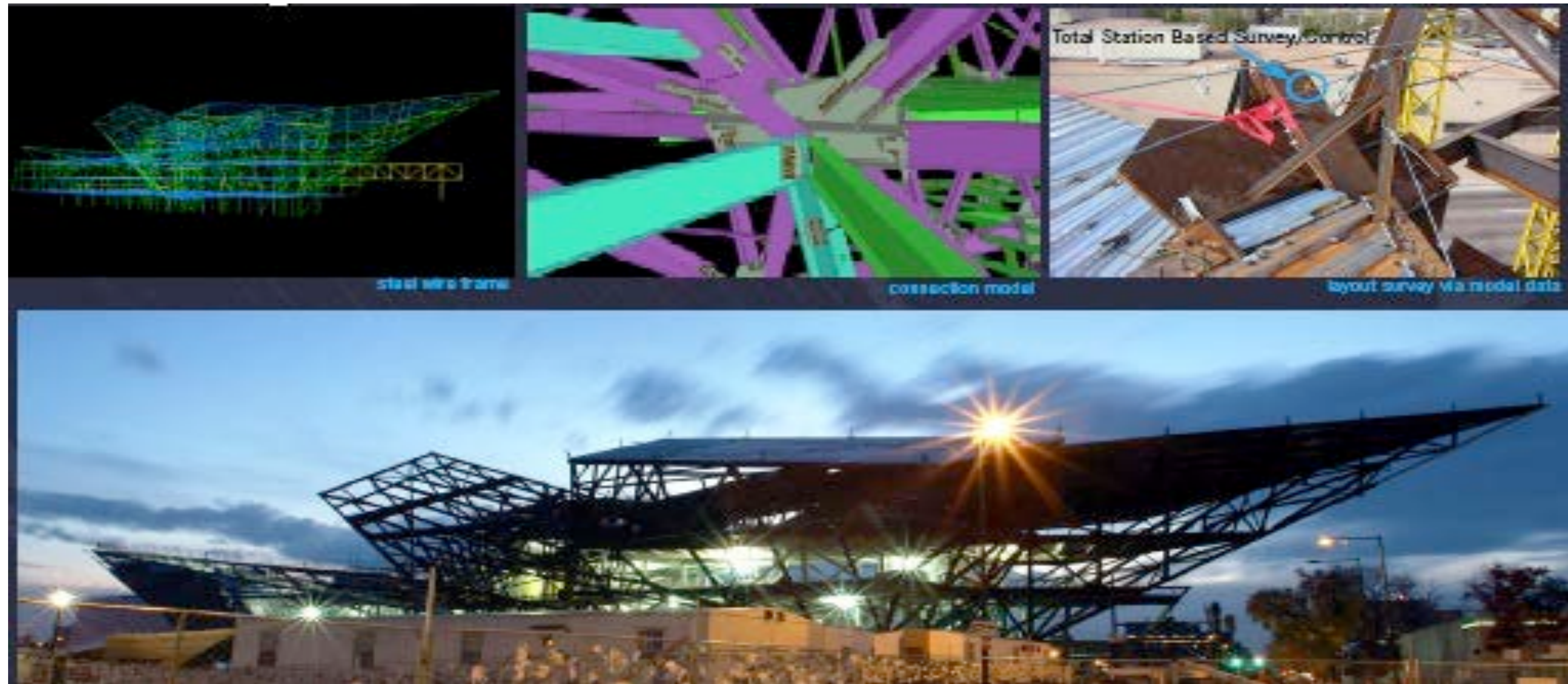


Fredric C Hamilton Building

M.A. Mortenson Company

Denver Art Museum

Creating Stellar Architecture Using BIM



Fredric C Hamilton Building

M.A. Mortenson Company

Denver Art Museum

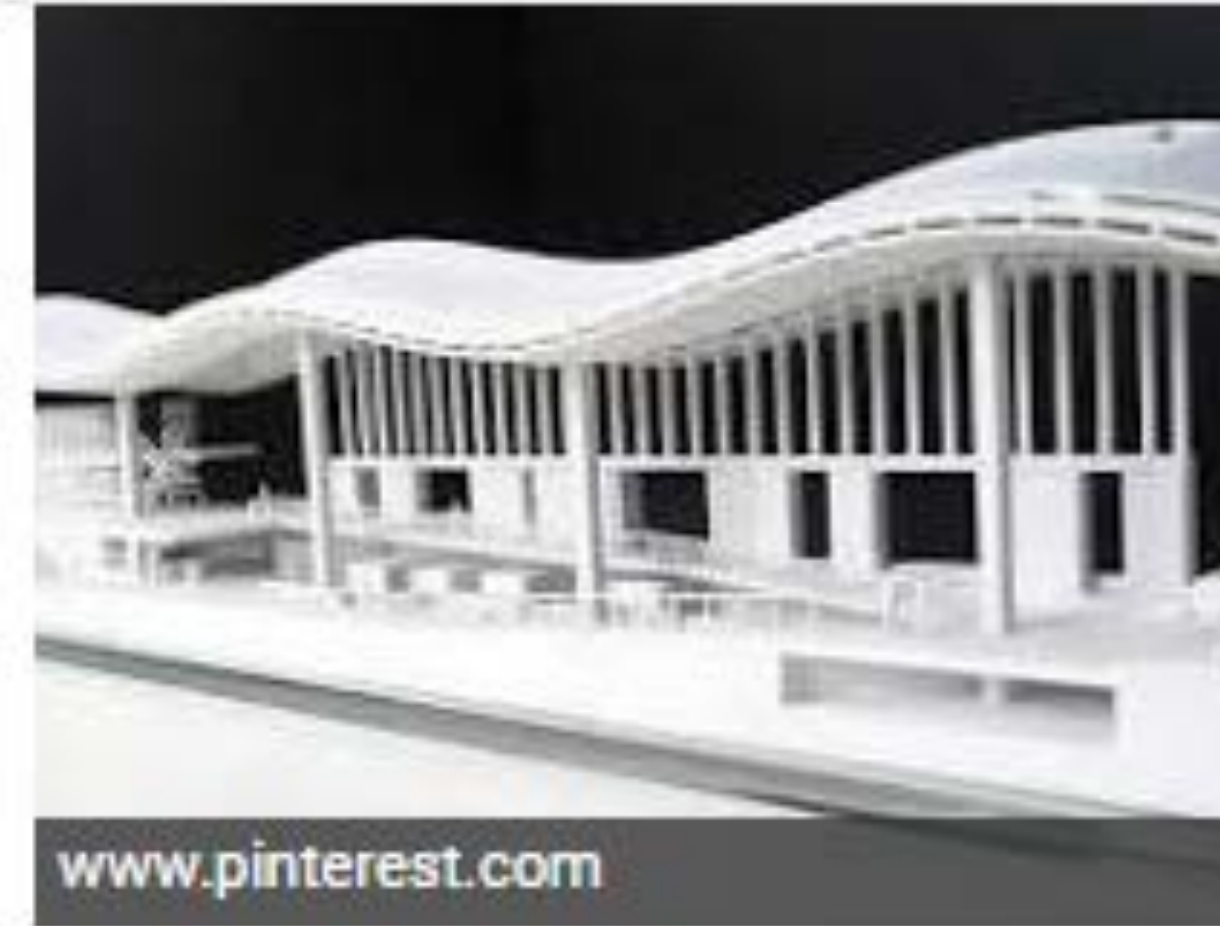
Creating Stellar Architecture Using BIM



3D Printing

3D printing realistic **architectural** models. **3D printing** is often used to promote **architectural** projects by showcasing the final result with **3D printing** models. The SLA (Stereolithography) technology is usually the best fit, along with the Polyjet technology, or even the FDM technology. A **3D Printed** Home Model.

3D printing for architecture - Aniwaa.com
www.aniwaa.com/3d-printing-for-architecture/



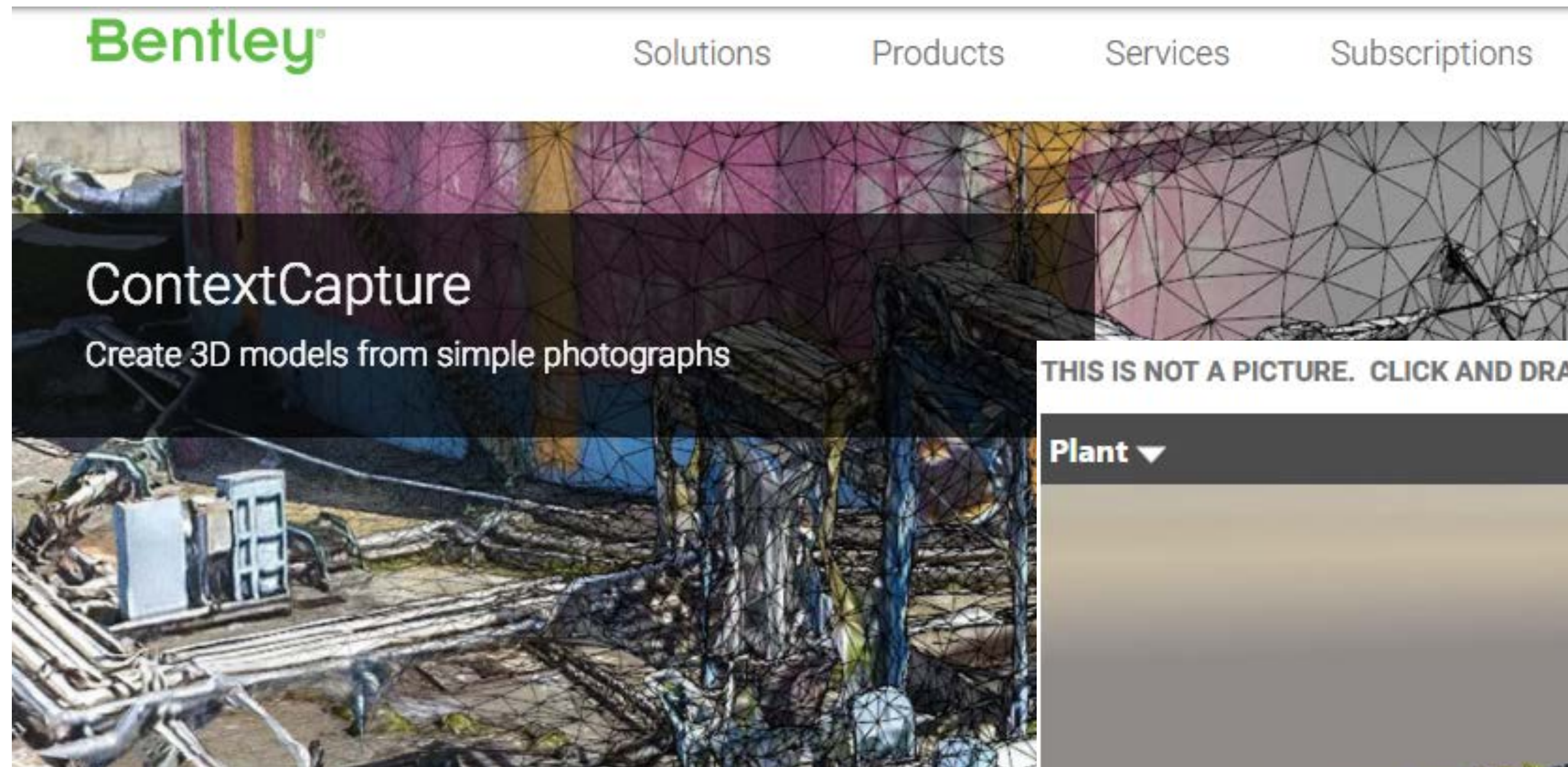
About this result • Feedback

How 3D printing will change architecture and construction - Dezeen

<https://www.dezeen.com/2013/05/21/3d-printing-architecture-print-shift/> ▼

May 21, 2013 - Existing **3D printers** are only able to produce homogeneous materials that have the same properties throughout. But graded materials would be useful for **printing architectural** elements – such as beams or façades that mimic bone, which is hard on the outside but spongy on the inside.

3D Reality Model



THIS IS NOT A PICTURE. CLICK AND DRAG TO EXPLORE THIS 3D MODEL.



Artificial Intelligence

ARCHITECTUREAU

[HOME](#) [PROJECTS](#) [AWARDS](#) [NEWS](#) [REVIEWS](#) [PRACTICE](#) [PEOPLE](#) [DISCOURSE](#) [PRC](#)

Architecture in the coming age of Artificial Intelligence

[Discourse](#) | Words [Rory Hyde](#)



Augmented Reality

PRODUCTS

Three Augmented and Virtual Reality Apps for Design and Construction

Step inside your CAD and BIM models with new software for mobile devices.

By [HALLIE BUSTA](#)



Big Data and Analytics

**BUILDING DESIGN
+CONSTRUCTION**

MAGAZINEBUILDING SECTORSBUILDING TEAMGIANTS40 UNDER 40BIM/VDCAWARDSBD+C EVENTS

There are literally hundreds of applications for deep analytics in planning and design projects. We profile some early successful applications.

BIM AND INFORMATION TECHNOLOGY | FEBRUARY 12, 2014 | DAVID BARISTA, EDITOR-IN-CHIEF



This article is part of *BD+C's* special five-part [Technology Report 2014: Top tech tools and trends for AEC professionals](#).

Cloud Computing

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Benefits of Cloud Computing for the Construction Industry



Most of the hubbub around cloud services is discussed in terms of those in business services. Companies working in the financial sector, in marketing, consulting, insurance, and other business services all can gain major advantages by migrating processes and storage to the cloud. However there are plenty of other industries out there that can enjoy the benefits cloud computing can provide. One such industry in particular is the construction industry. Contractors, architecture firms, and building material suppliers can all enjoy streamlined business operations (and competitive advantages) by utilizing the power of the cloud.



Cybersecurity

Schinnerer's 55th Annual Meeting of Invited Attorneys

Cyber Security and Cyber Insurance for the Design and Construction Industry

by Patrick J. O'Connor, Jr., Esquire

Nature of the Threat

The threat is real and growing. While the most visible targets are government agencies and financial, health care, and retail organizations, no one is immune from the risk of loss or injury due to a breach of cyber security. The U.S. Department of Energy, in partnership with the U.S. Department of Homeland Security and in collaboration with private and public sector experts, has defined cyber security risk as follows:

Cyber security risk is defined as risk to organizational operations (including mission, functions, image, and reputation), resources, and other organizations due to the potential for unauthorized access, use, disclosure, disruption, modification, or destruction of information, IT [Information Technology] and/or OT [Operations Technology]. Cyber security risk is one component of the overall business risk environment and feeds into an organization's enterprise risk management strategy and program. Cyber security risk cannot be completely eliminated, but it can be managed through informed decision-making processes.¹



Digital Fabrication

Digital fabrication is a type of manufacturing process where the machine used is controlled by a computer. The most common forms of **digital fabrication** are: CNC Machining: where, typically, shapes are cut out of wooden sheets — this is the main technology used by OpenDesk products at the moment.

Opendsk - Digital Fabrication

<https://www.opendesk.cc/about/digital-fabrication>



[About this result](#) • [Feedback](#)

Technology

Digital fabrication is so much more than 3D printing



By OLIVIA SOLON

Wednesday 13 March 2013

There is too much coverage in the press about the wonders of 3D printing and it's a distraction from the real revolution, argues [Neil Gershenfeld](#), the head of [MIT's Centre for Bits and Atoms](#). "The coverage of 3D printing is a bit like the coverage of microwave ovens in the 50s. Microwaves are useful for some things, but they

Design Automation



AIA
East Bay

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Design Automation for Prefab Construction

by AIA East Bay Staff on 03/22/2017



Tuesday, April 11, 2017
Noon-1pm
Free and open to all. BYO Lunch.
RSVP to events@aiaeb.org.

1 CES LU

For architects, prefab design can box you in.

desired design intent. In addition, manufacturing I feel. Fortunately, there is a new way to design for p for mass-customization, enabling architects to qui designs.

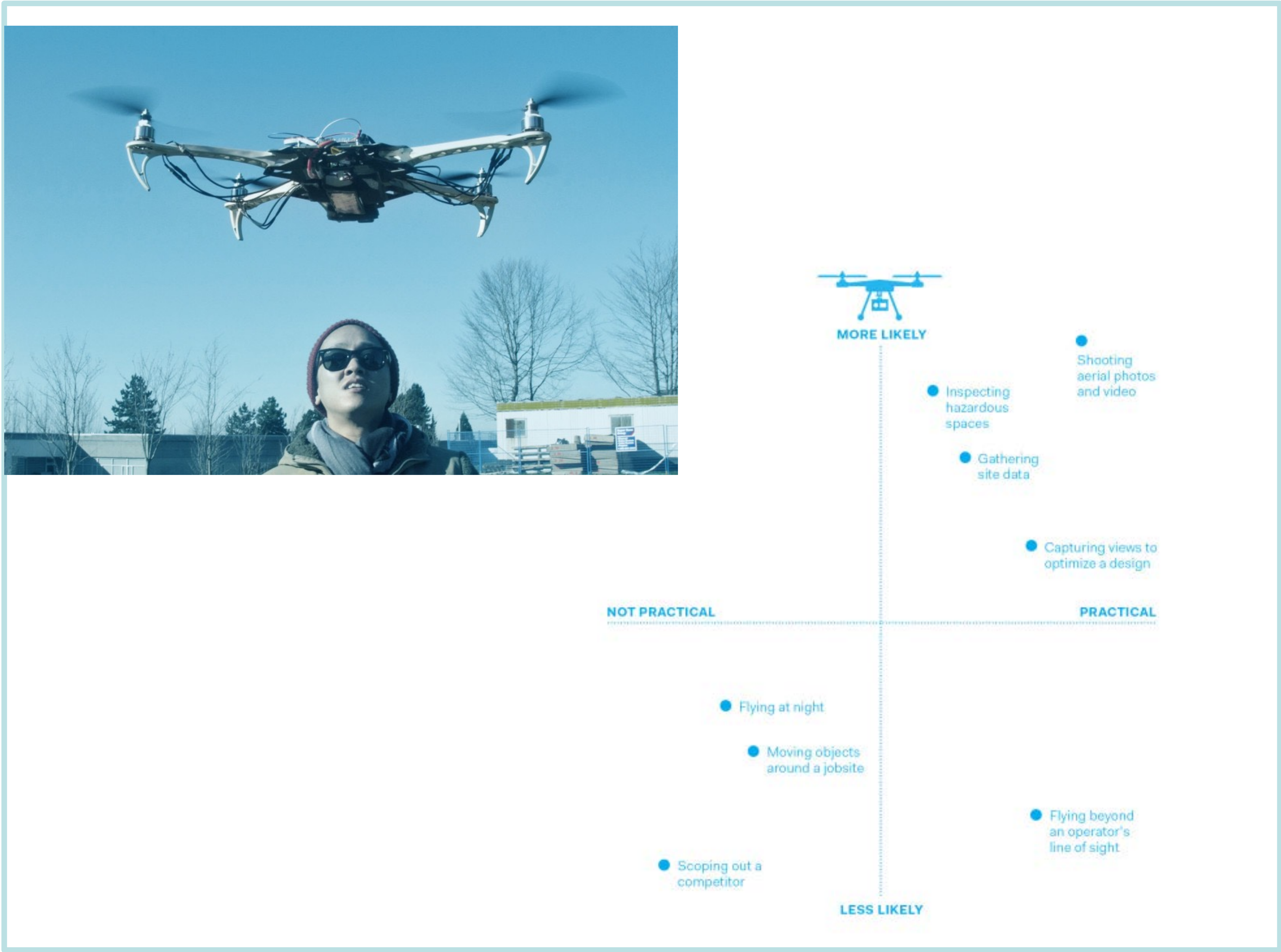
Join [Project Frog](#) for a presentation on this new too and features: instant structural validation of a Typ



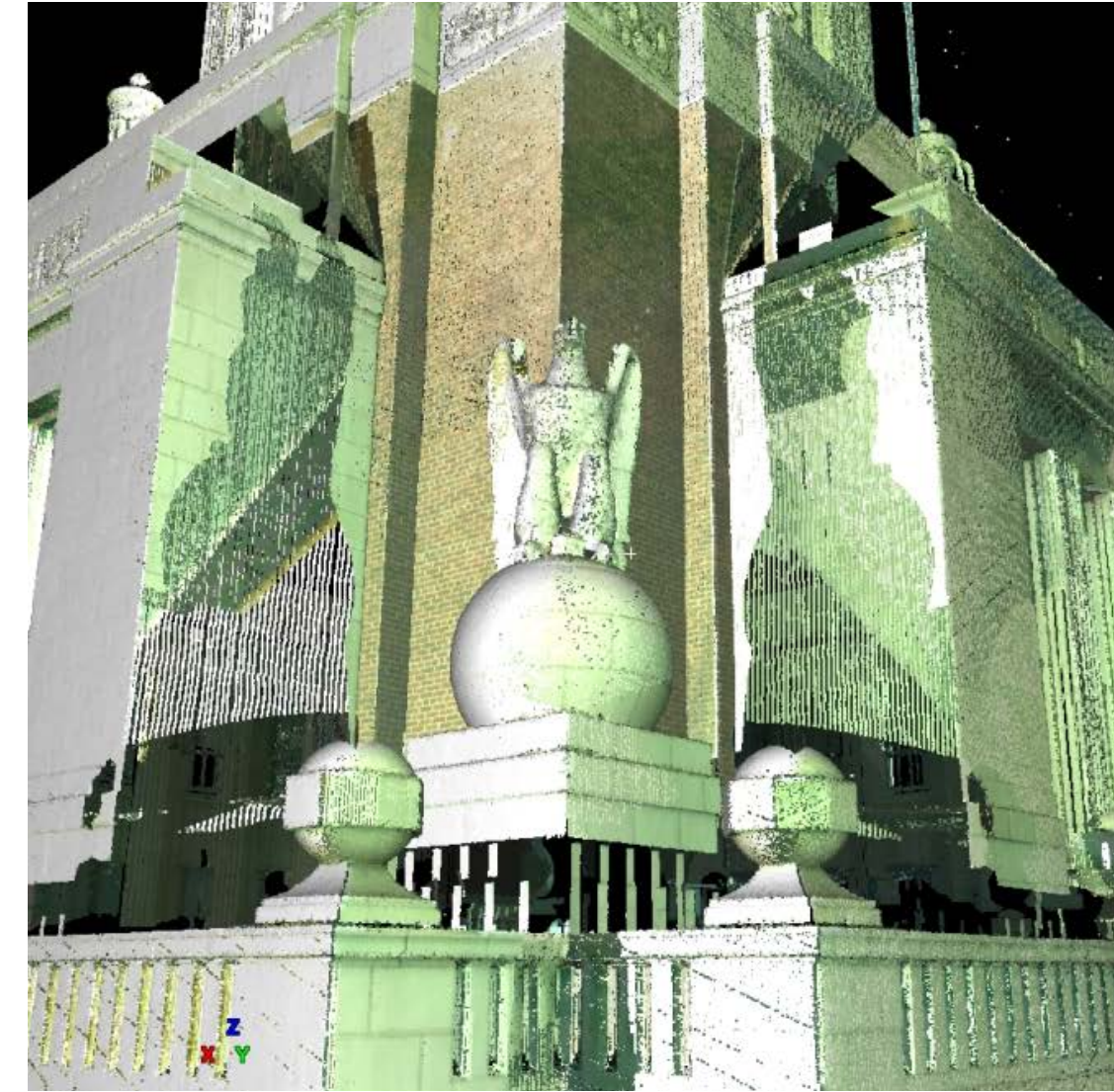
[About](#) [Products](#)



Drones



Laser Scanning and BIM: GSA



Philadelphia Custom House Envelope Repair

- Built in 1934
- 8 Roofs
- 1050 Windows
- Documentation of window types to be renovated
- Provide model to design team

Laser Scanning | Drones to Save Antiquities

Hope for Palmyra's Future

After Islamic State retreated last month, a plan to rebuild an ancient city



Temple of Bel, 2014 2016

Apple and Augmented Reality

Apple's Next Big Thing: Augmented Reality

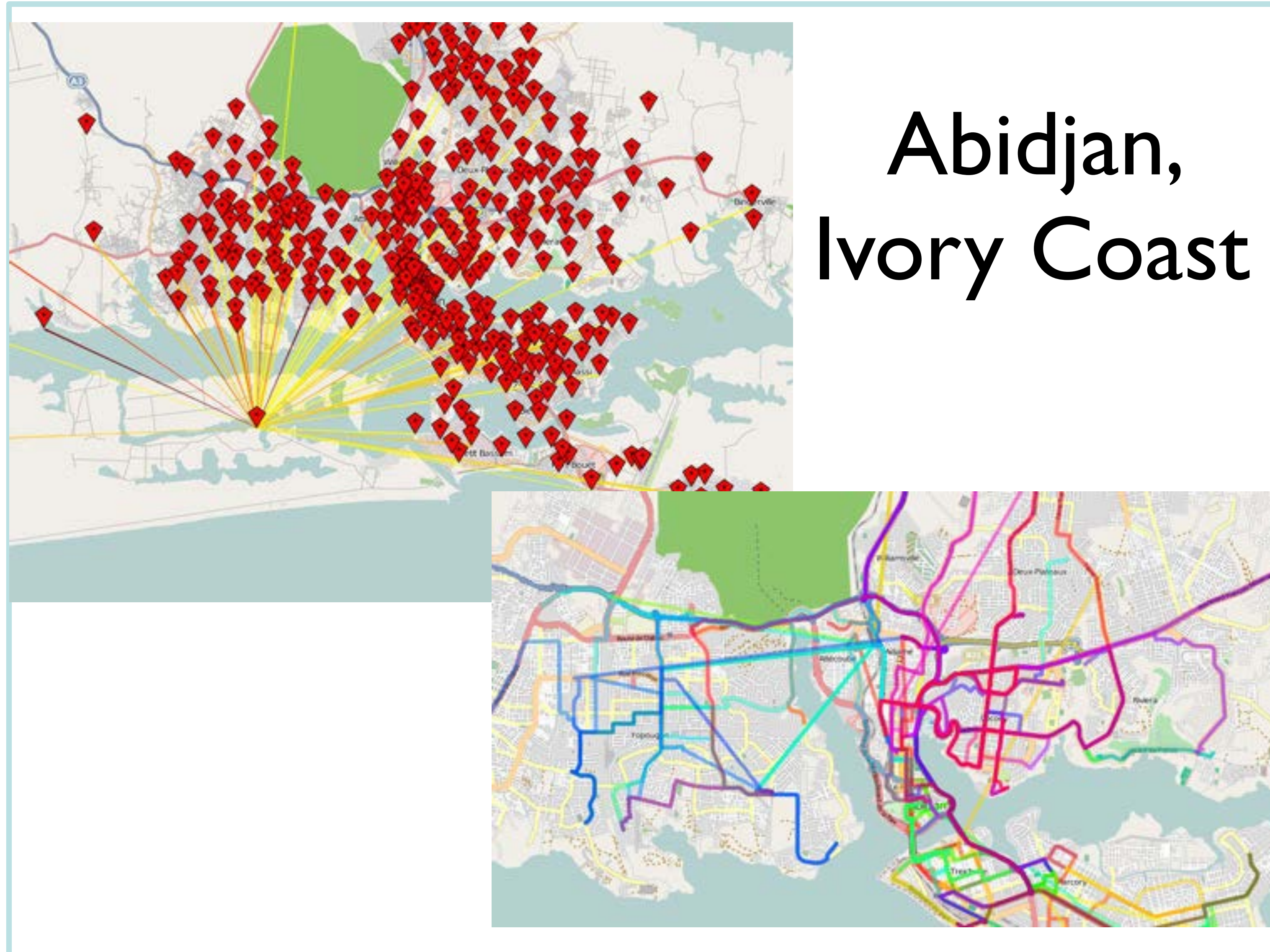
CEO Tim Cook is betting on augmented reality, a cousin of VR that he believes will keep his company on top and may even supplant the iPhone.

by **Mark Gurman**

March 20, 2017, 6:00 AM EDT



Geospatial and Big Data Optimizing Transit



Location-Based VR to Save Shopping Malls

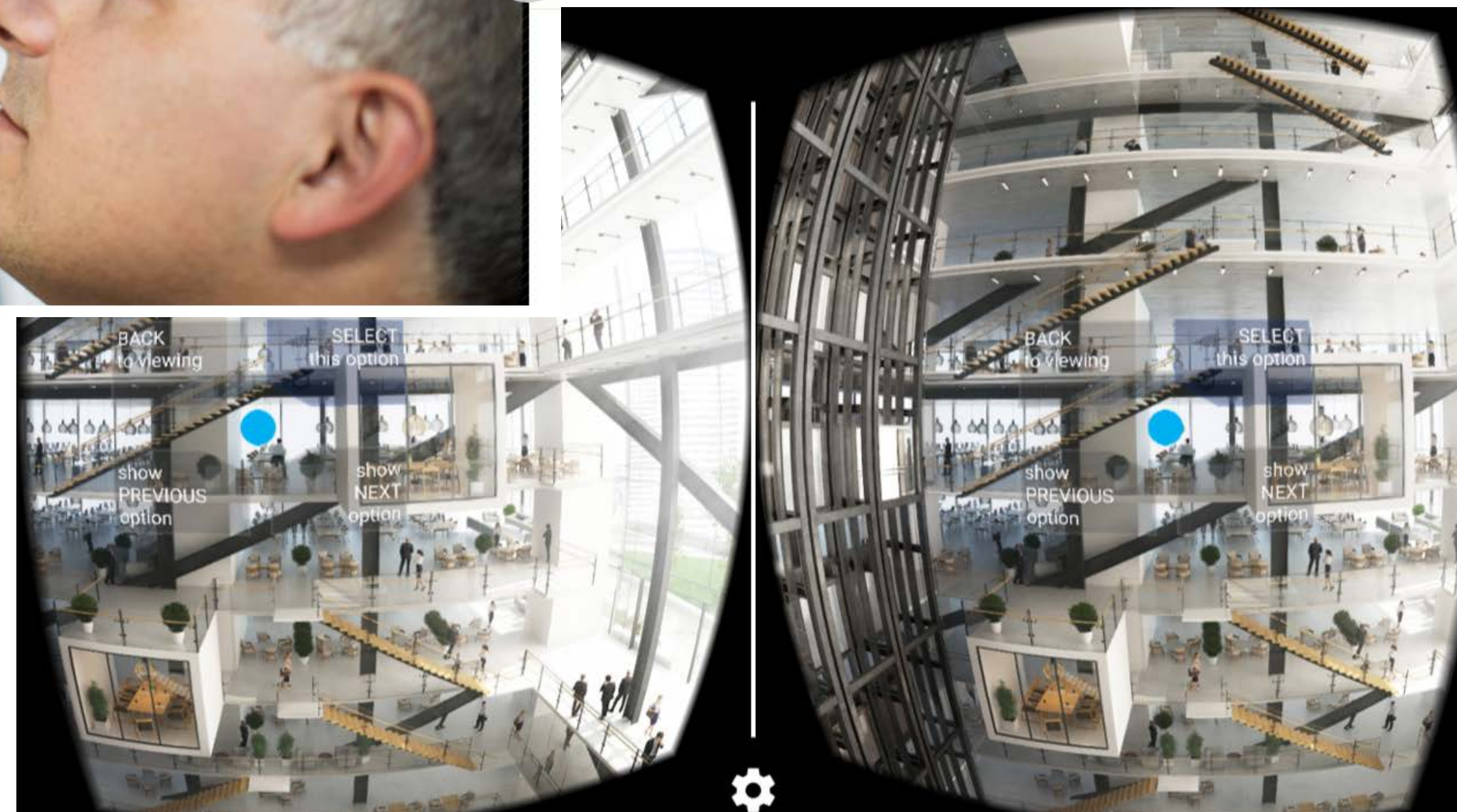


IMAGES: COURTESY OF NOMADIC

Harnessing Innovative Technologies: NBBJ

This Architecture Firm Is Turning VR Into The Next Great Productivity Tool

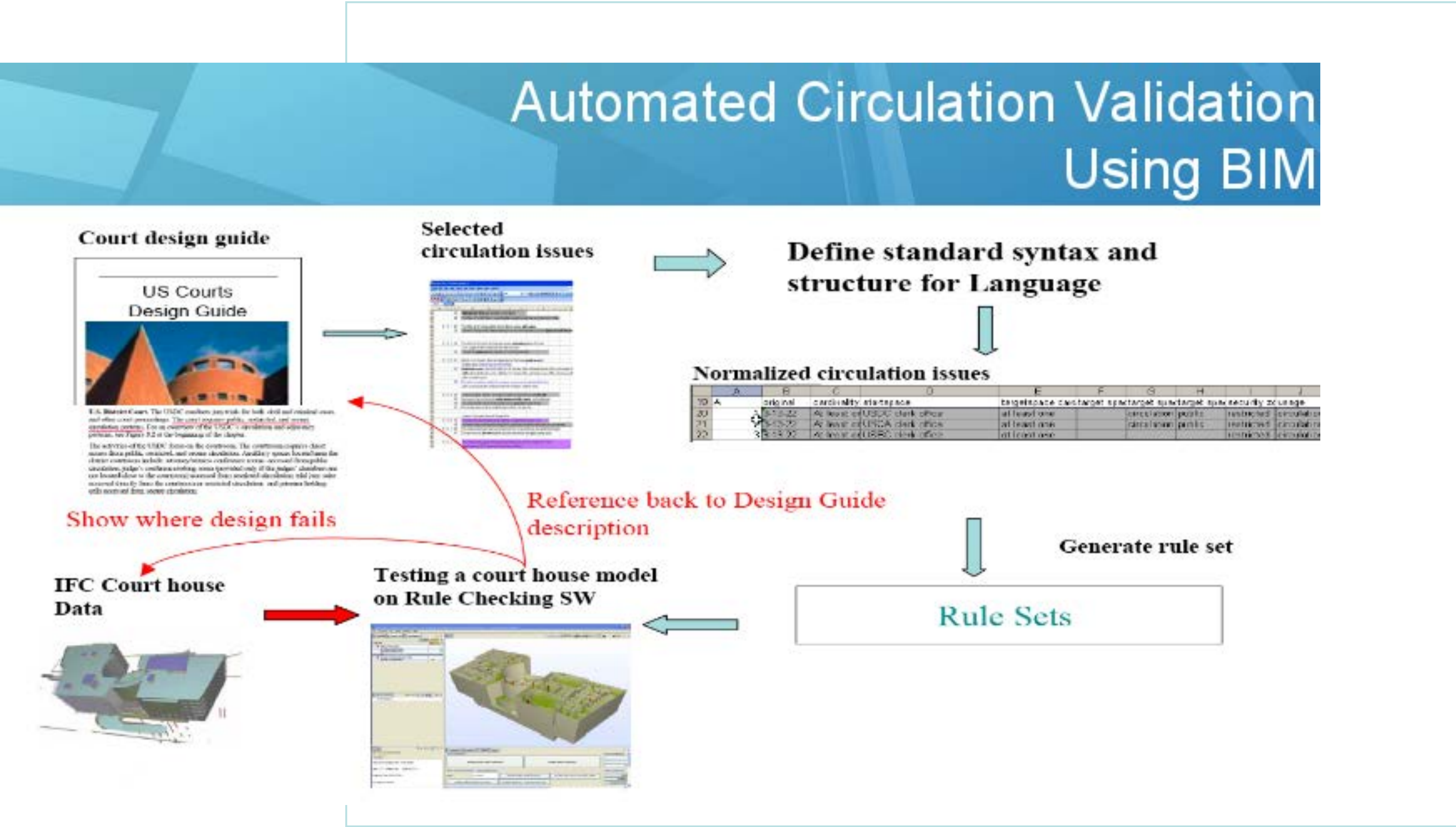
NBBJ is the first major architecture firm jumping headlong into VR—by incubating its own platform.



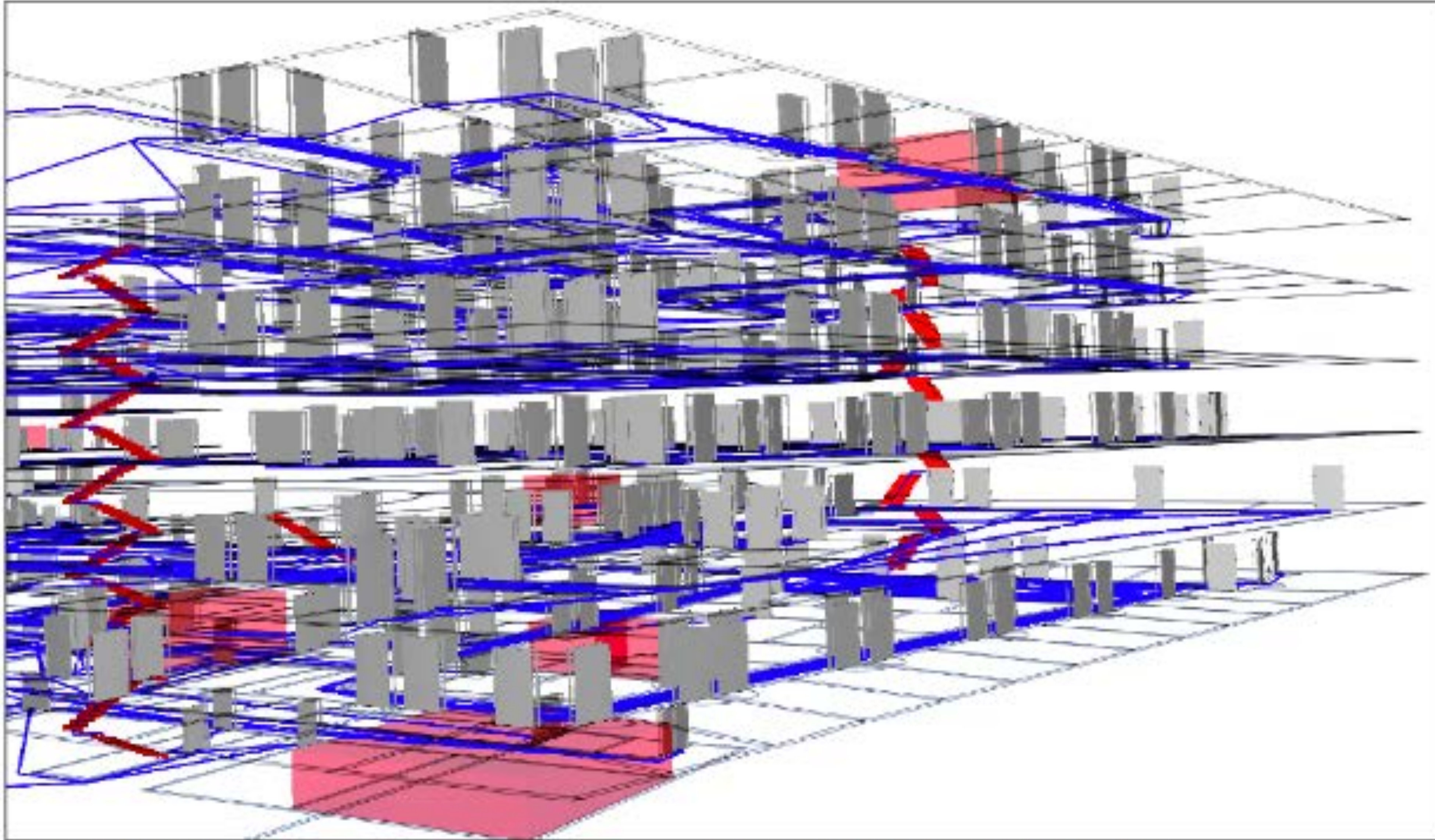
Harnessing Innovative Technologies: Skanska



Model Checking



Model Checking

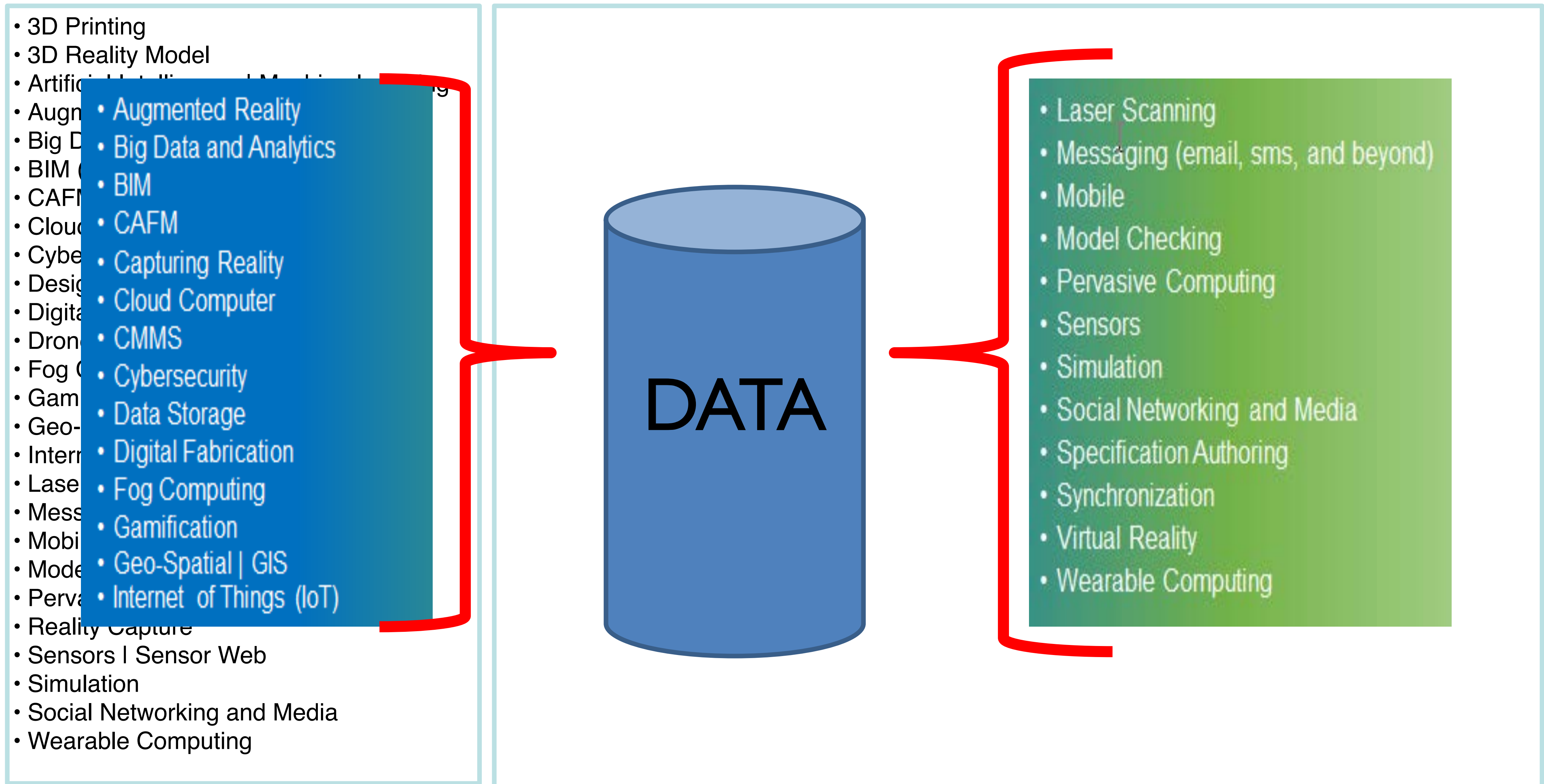


27,000 routes were tested using **302 circulation rules** in approximately **20 seconds**.

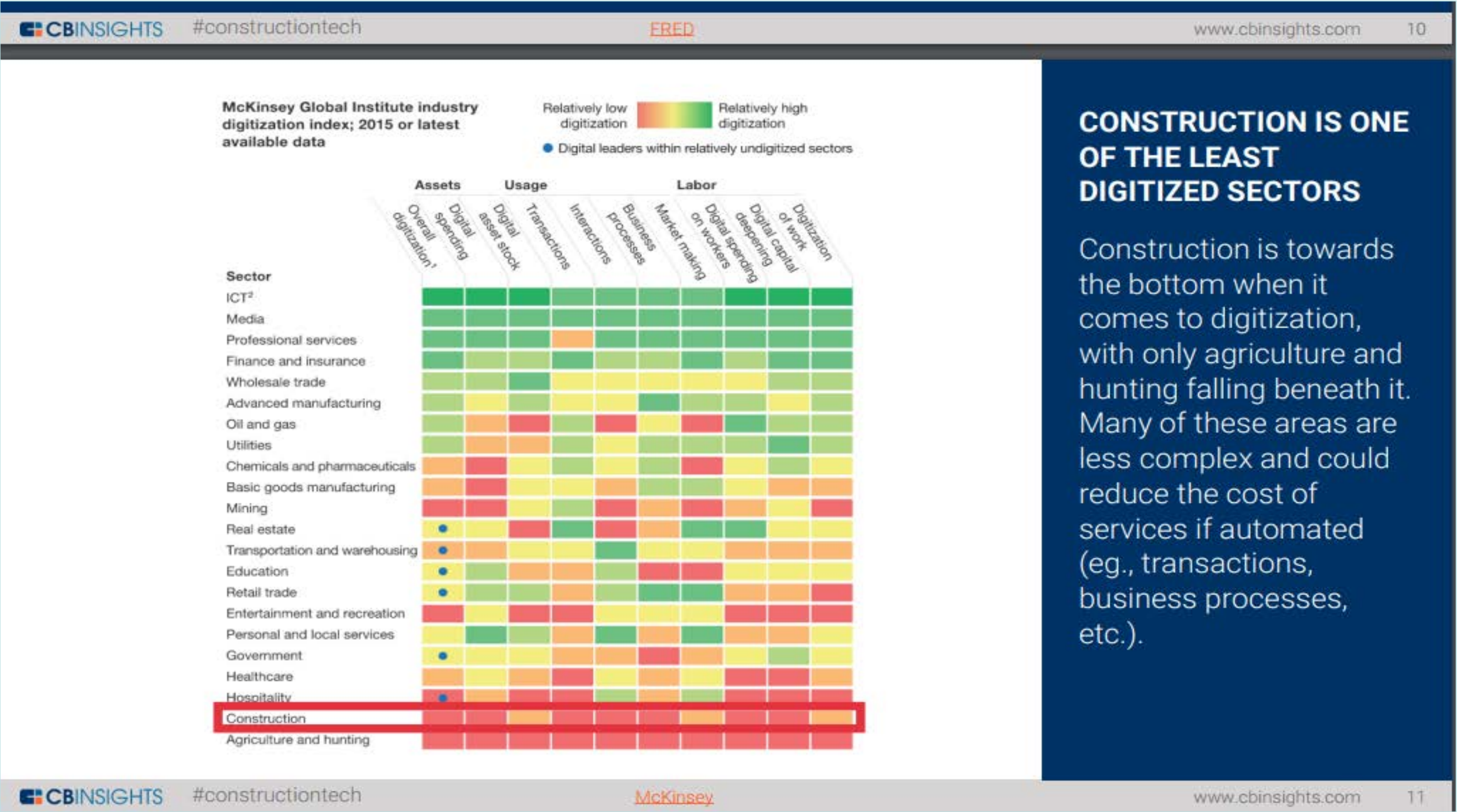
DATA

The master information delivery plan is the primary plan for the preparation of the project information (from the supplier's perspective) required by the employer's information requirements. It lists information deliverables, and sets out when project information is to be prepared, by whom, and using what protocols and procedures for each stage of the project.

Ultimately it is all about Data



2015 McKinsey Global Institute Study



A lot of back and forth between field and desk - **Total per Work Order 70 Minutes**

Calculated as
8 hour days

10 Minutes Each
x 783,917 WO =
16,332 Days

+

20 Minutes Each
to travel back to Desk
and enter data
x 783,917 WO =
32,663 Days

+

30 Minutes Each
to Complete Each
Work Order
x 783,917 WO =
48,995 Days

+

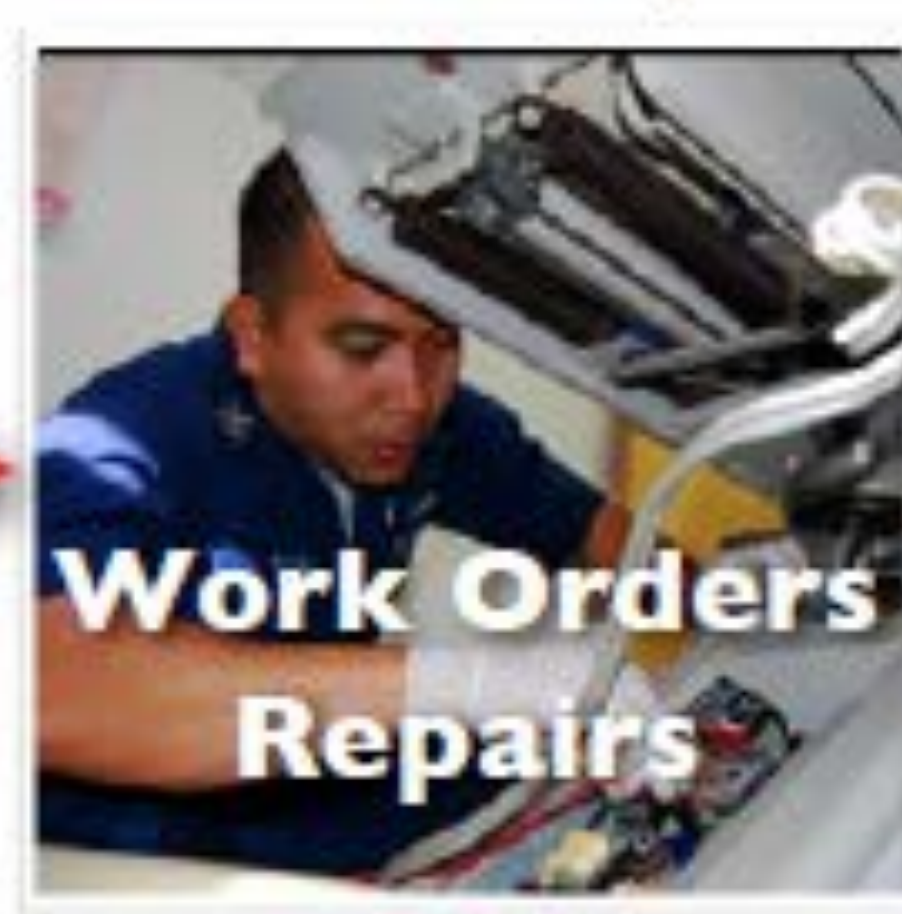
10 Minutes Each
x 783,917 WO =
16,332 Days



DoD Wide
783,917
Work Request
in 2012



Go back to
Workstation
Enter into
DMLSS FM



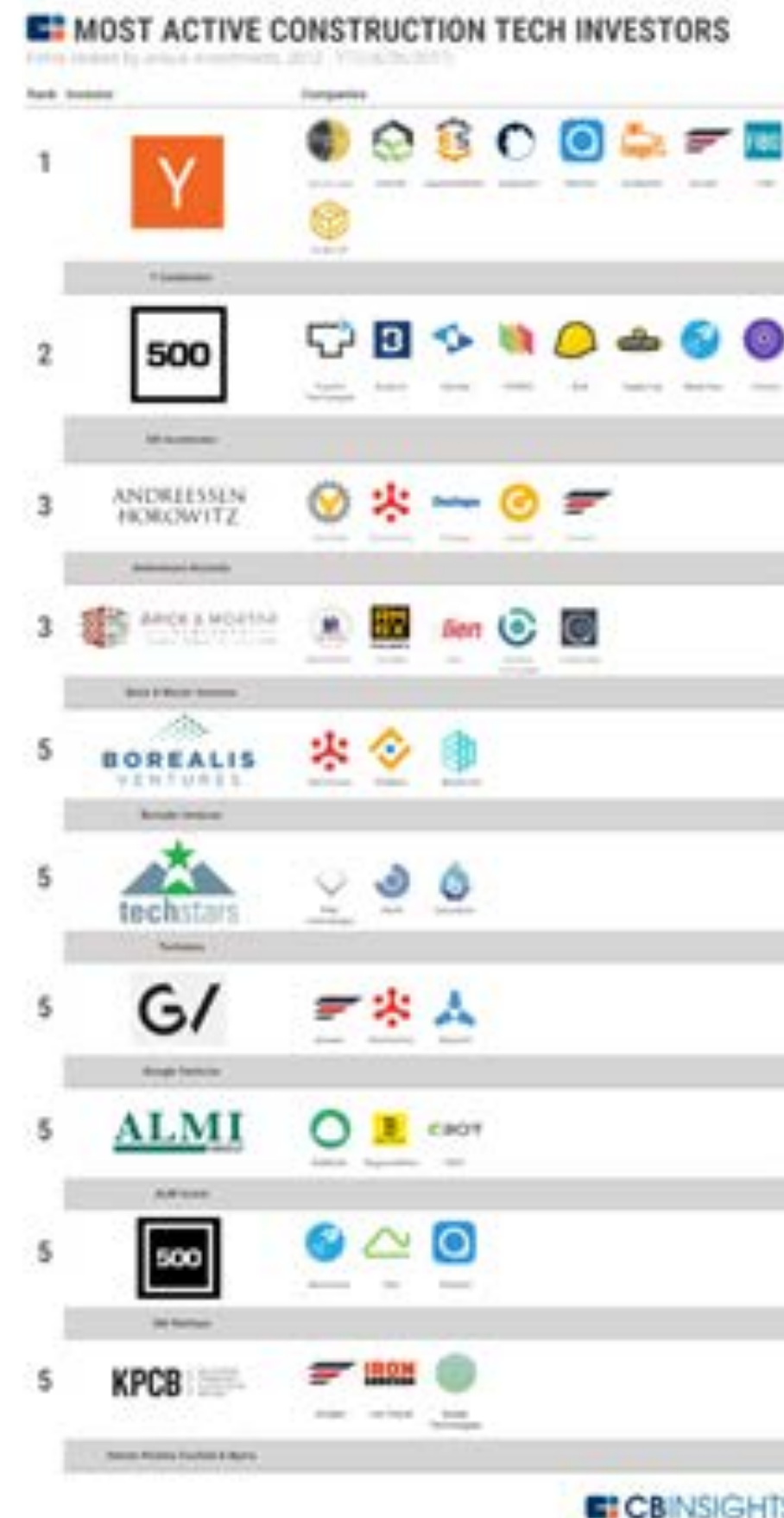
Send Field
Tech to
Respond



Close out
Work
Order

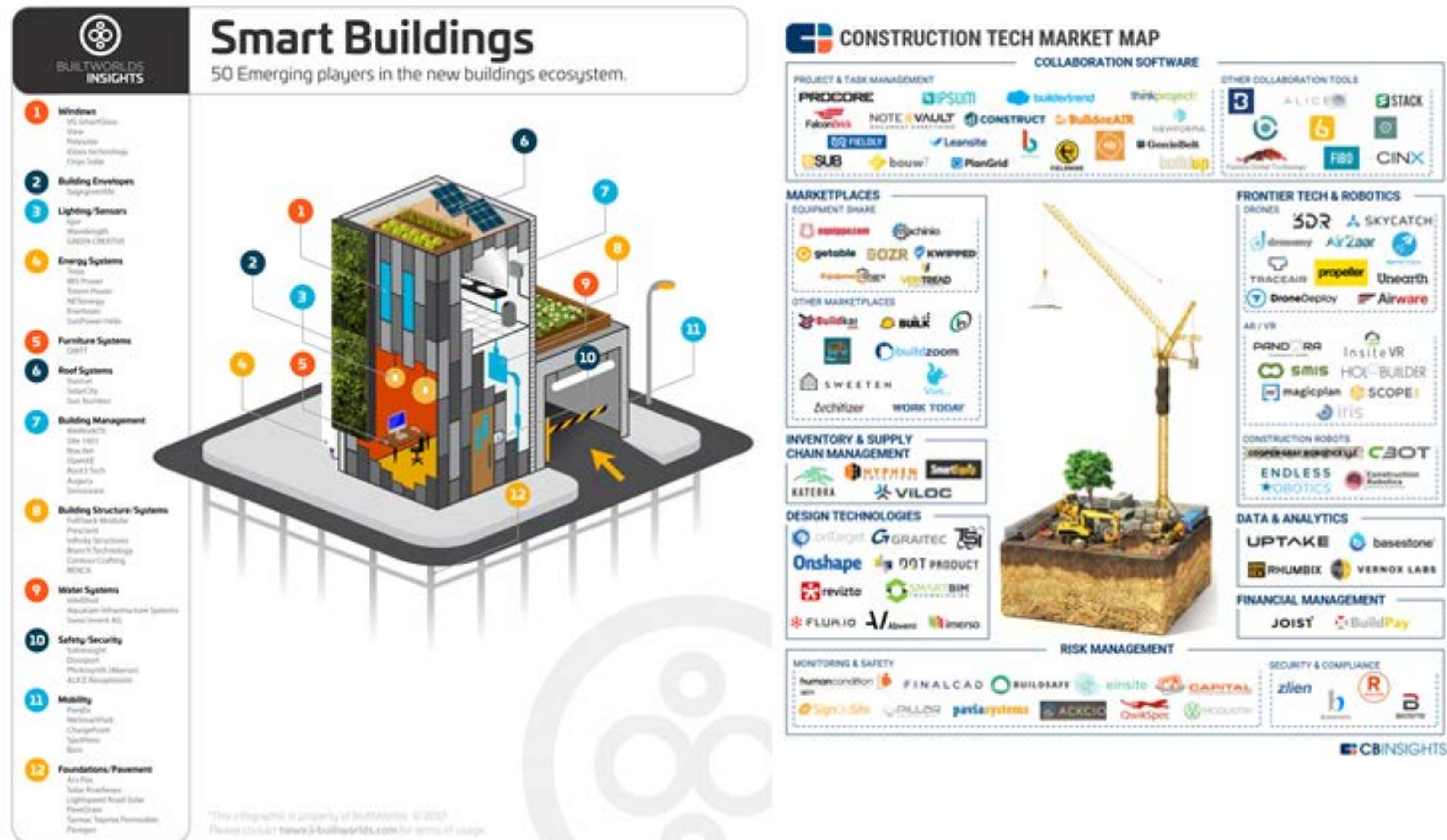
Huge Investment is Happening NOW

Construction Tech | Smart Cities Tech | Cyber Tech



From Smart Buildings to Smart Cities

Smart Buildings Smart Tech



BIM (and Technologies) Execution Planning



BIM EXECUTION PLANNING



PENN STATE
COMPUTER INTEGRATED
CONSTRUCTION

in Share 81

INTRODUCTION

Introduction Project Owner BIM Uses

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Announcements:

New Uses of BIM Document Released!
The Uses of BIM document is designed to communicate the BIM Uses classification system and BIM Use Purposes.

Version 2.0 of the BIM Planning Guide for Facility Owners Released June 2013.

Subscribe to BIM Planning's to receive a



2004 – 2018 AIA TAP Building Connections Congress– Future of Design

Building Connections Congress 2018

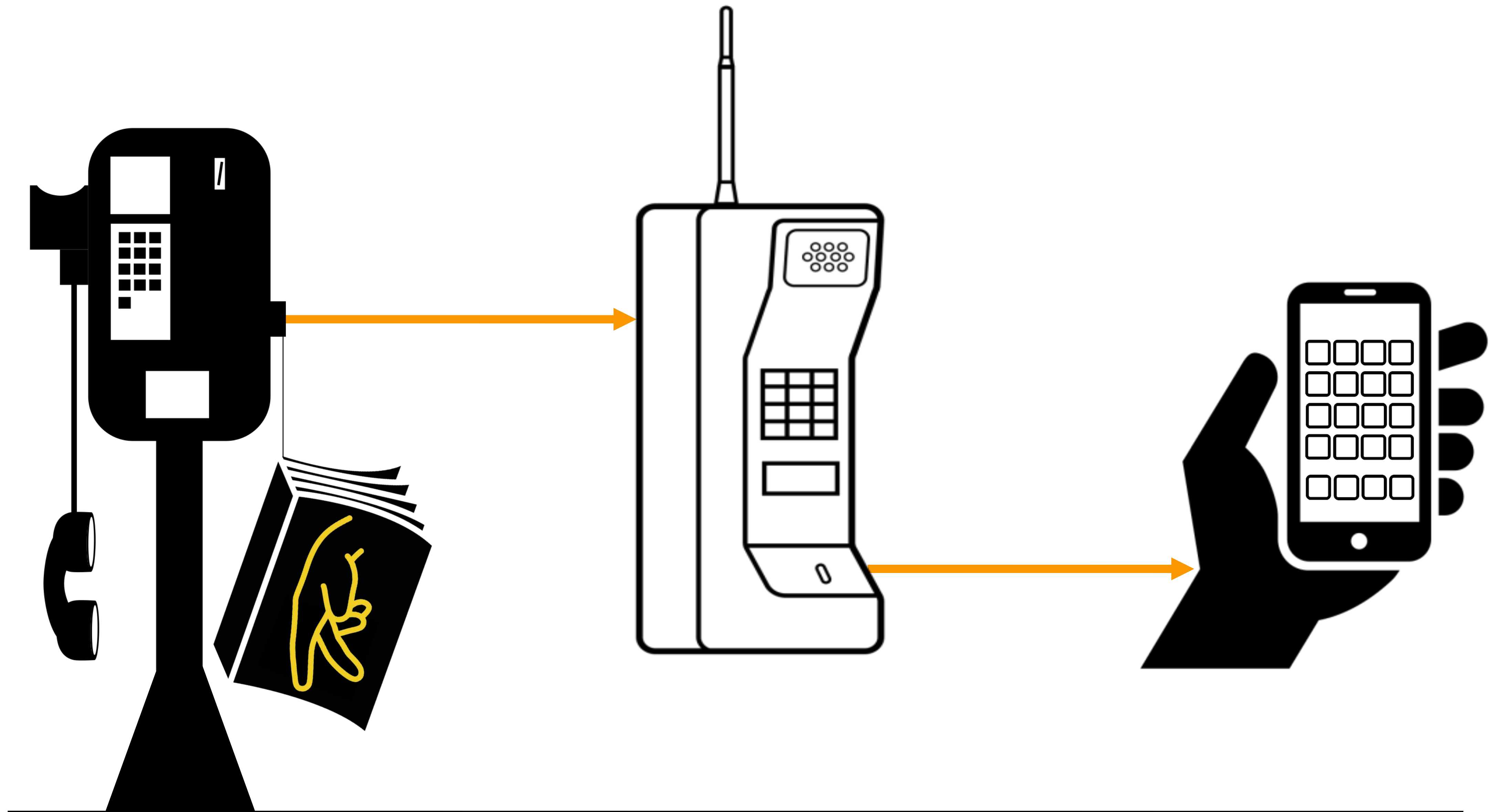
[Register Now](#)

When: Jan 8, 2018 from 8:30 AM to 5:00 PM (ET)
Associated with [Technology in Architectural Practice](#)

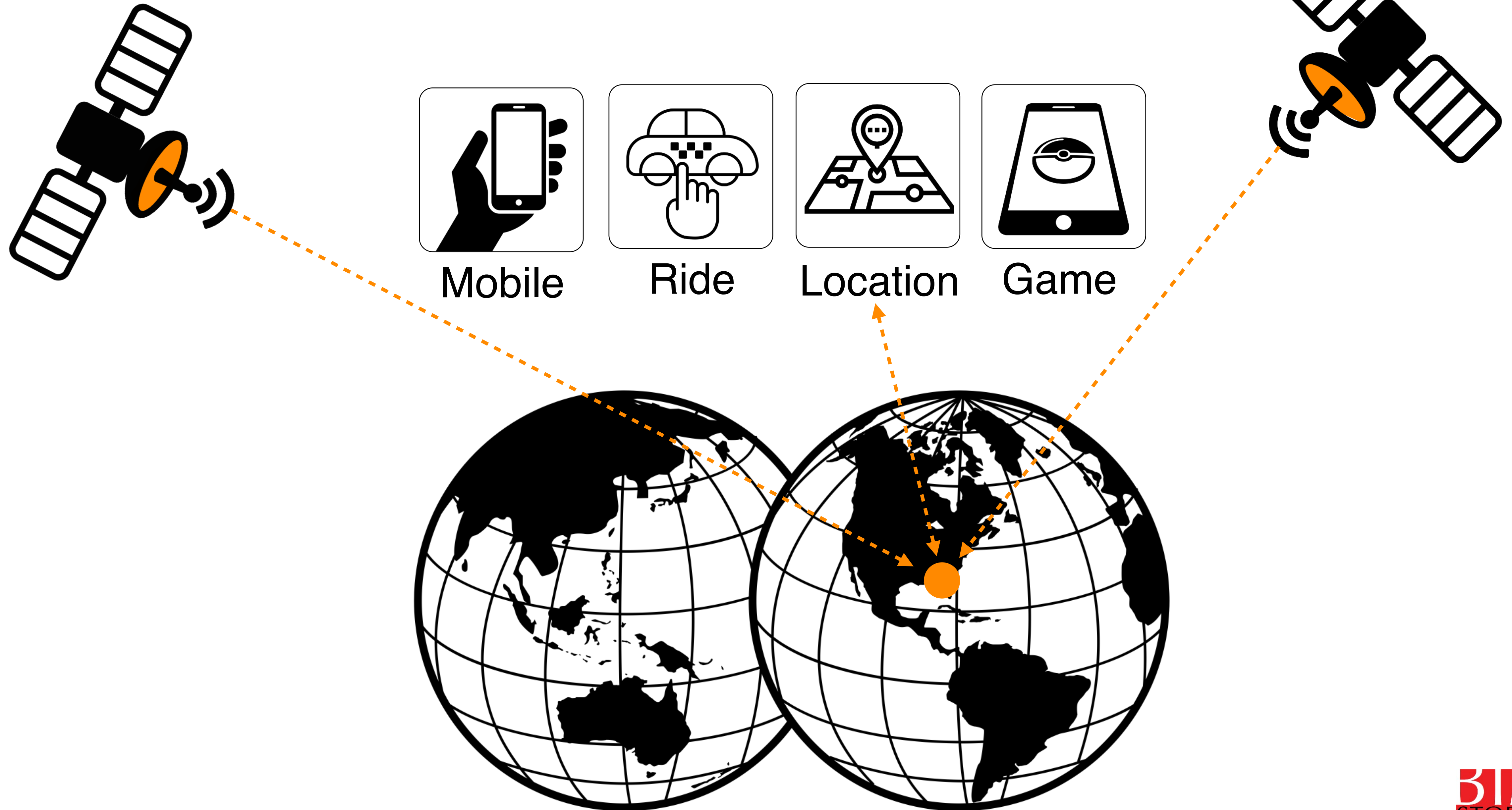


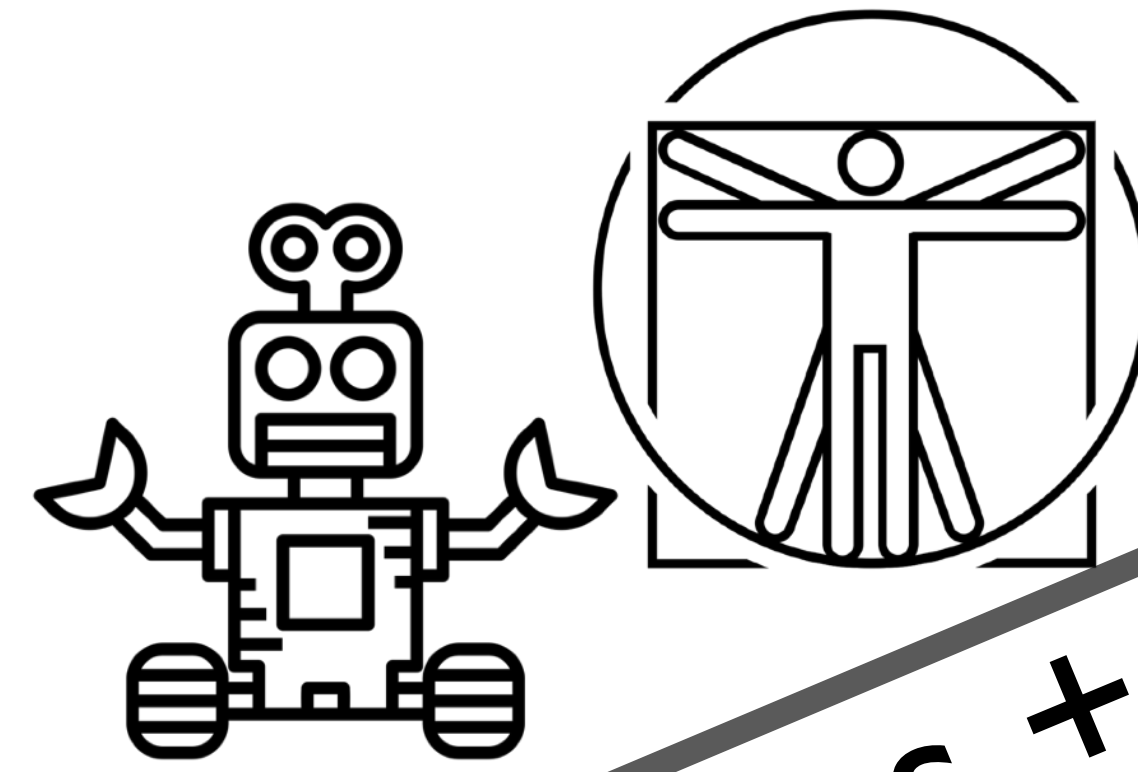
The Future of Design
TAP Building Connections Congress 2018





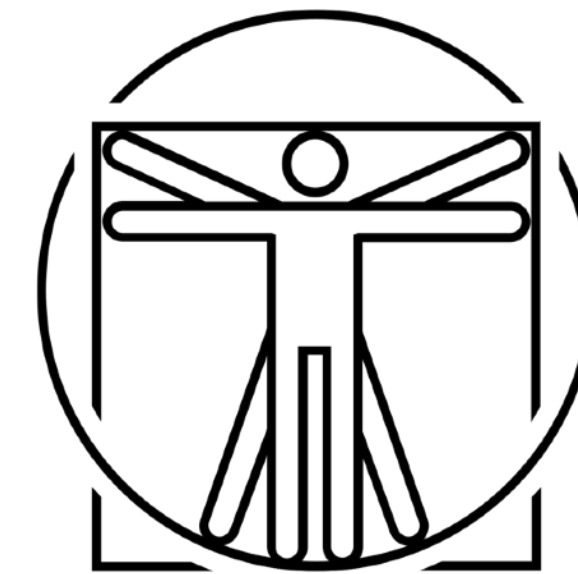
Shared Services





Machines + Humans


Complexity

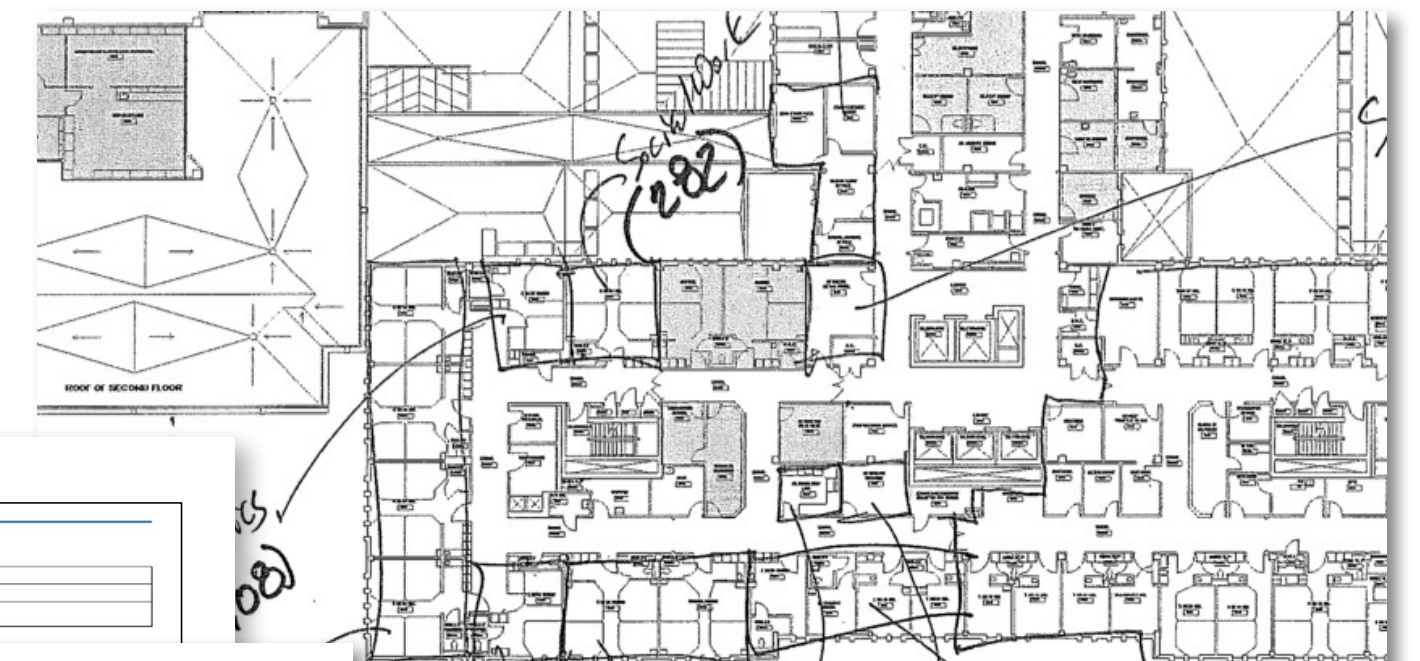
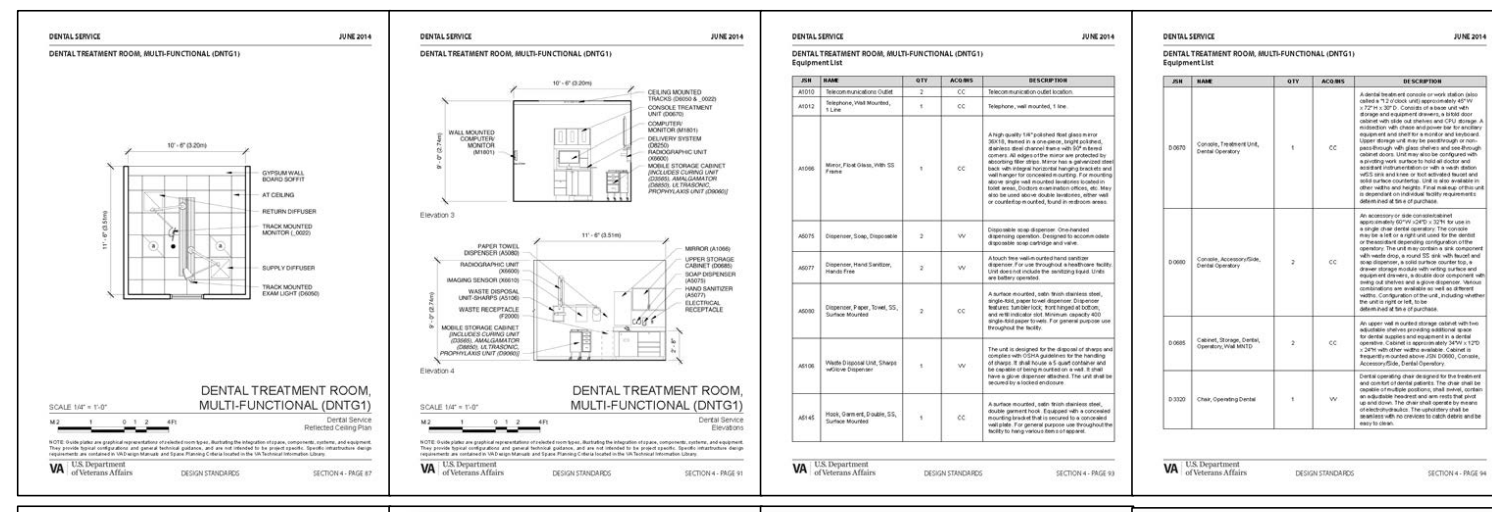


Humans

How We Process Info



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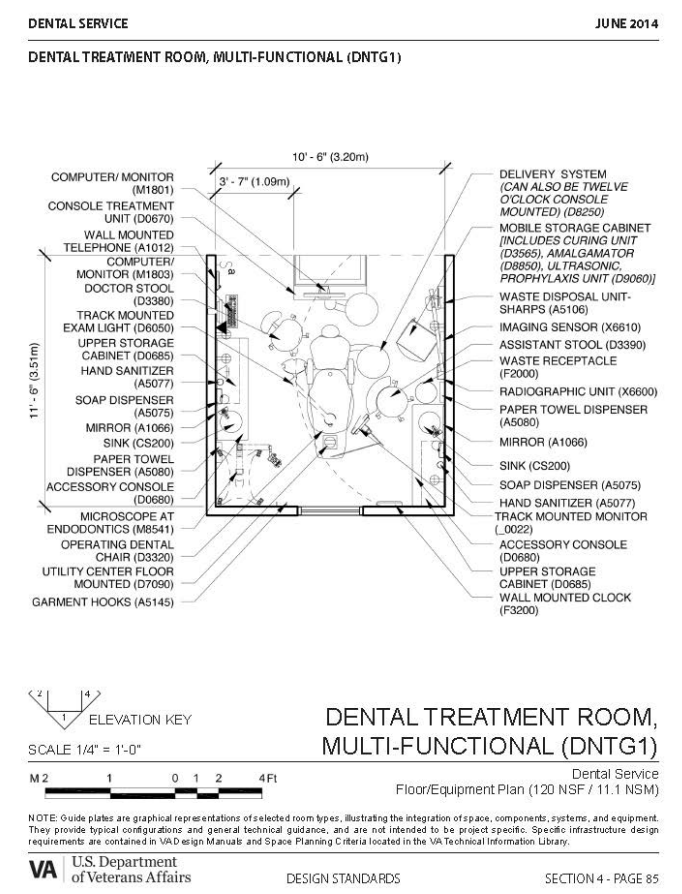
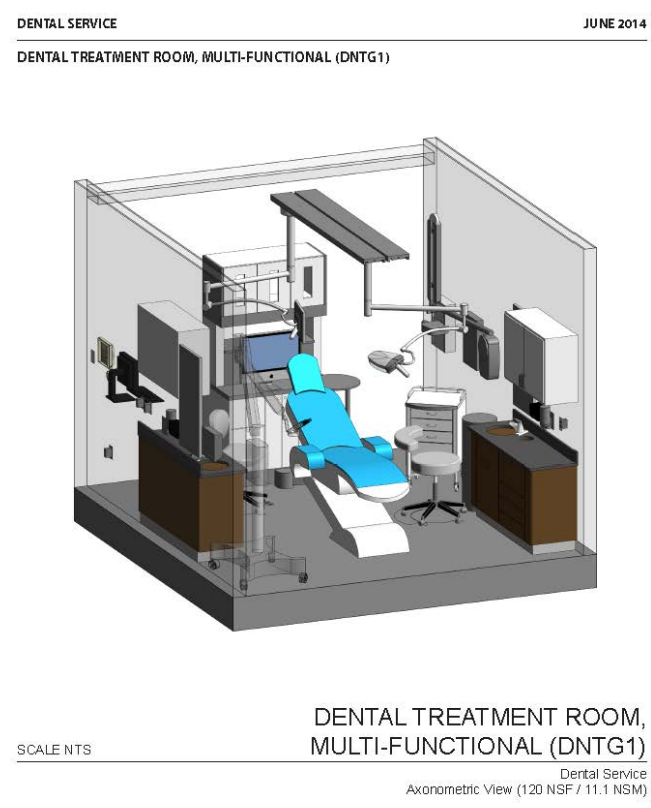
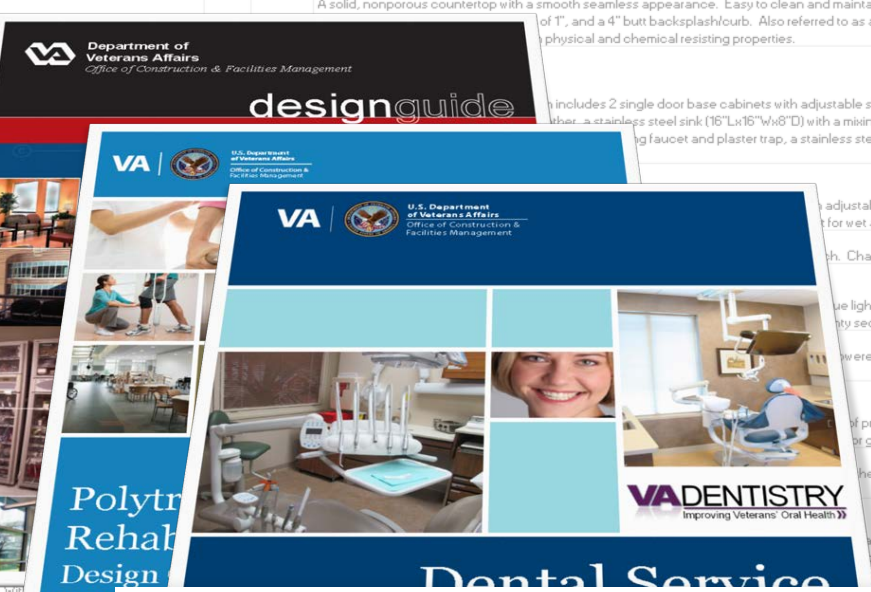
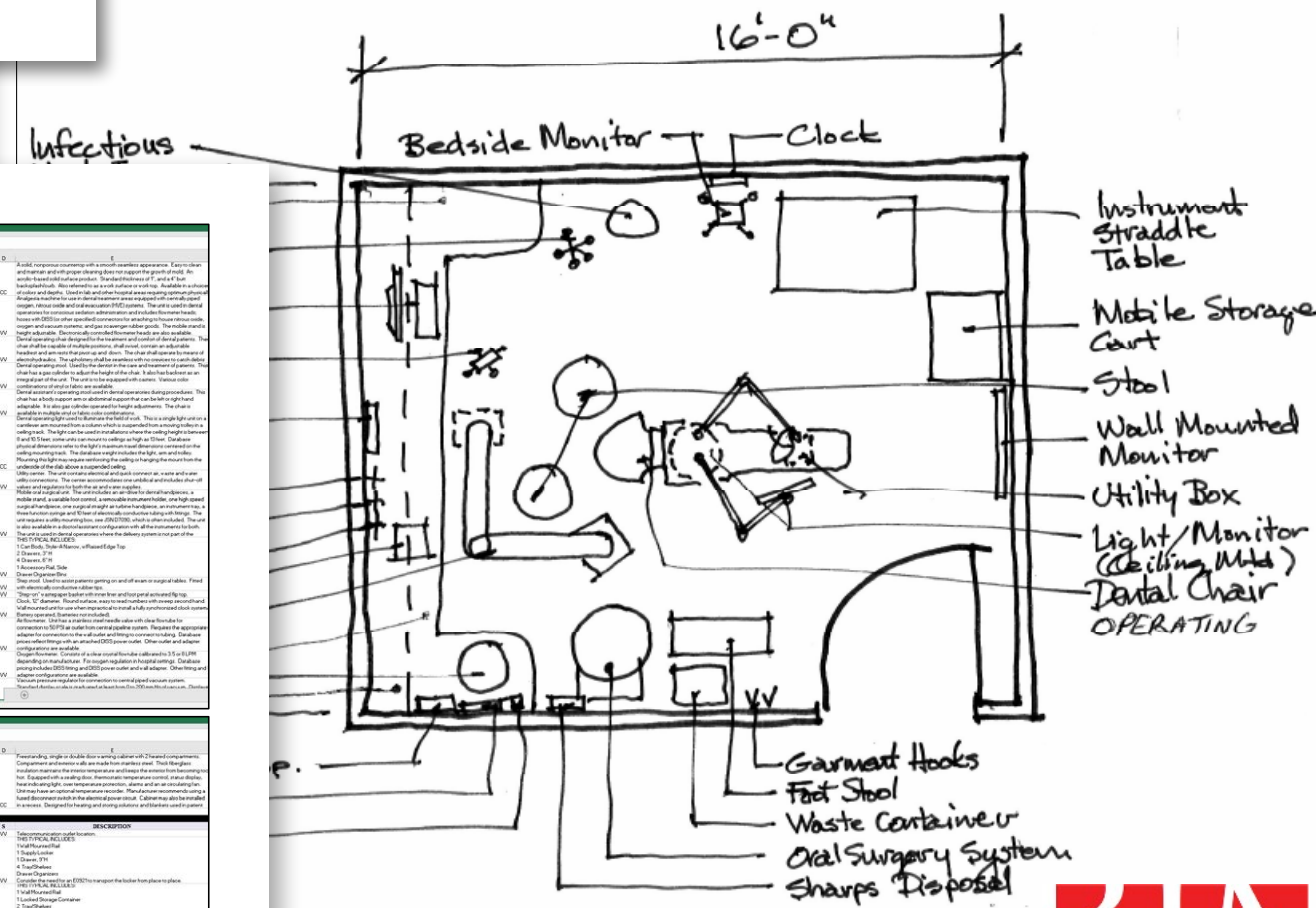
DEPARTMENT LEGEND

SURGERY

RESIDENCE

286
(286)7

Quality Resident (Neurology) (280)
Nursing Quality (100)



DENTAL SERVICE (222)

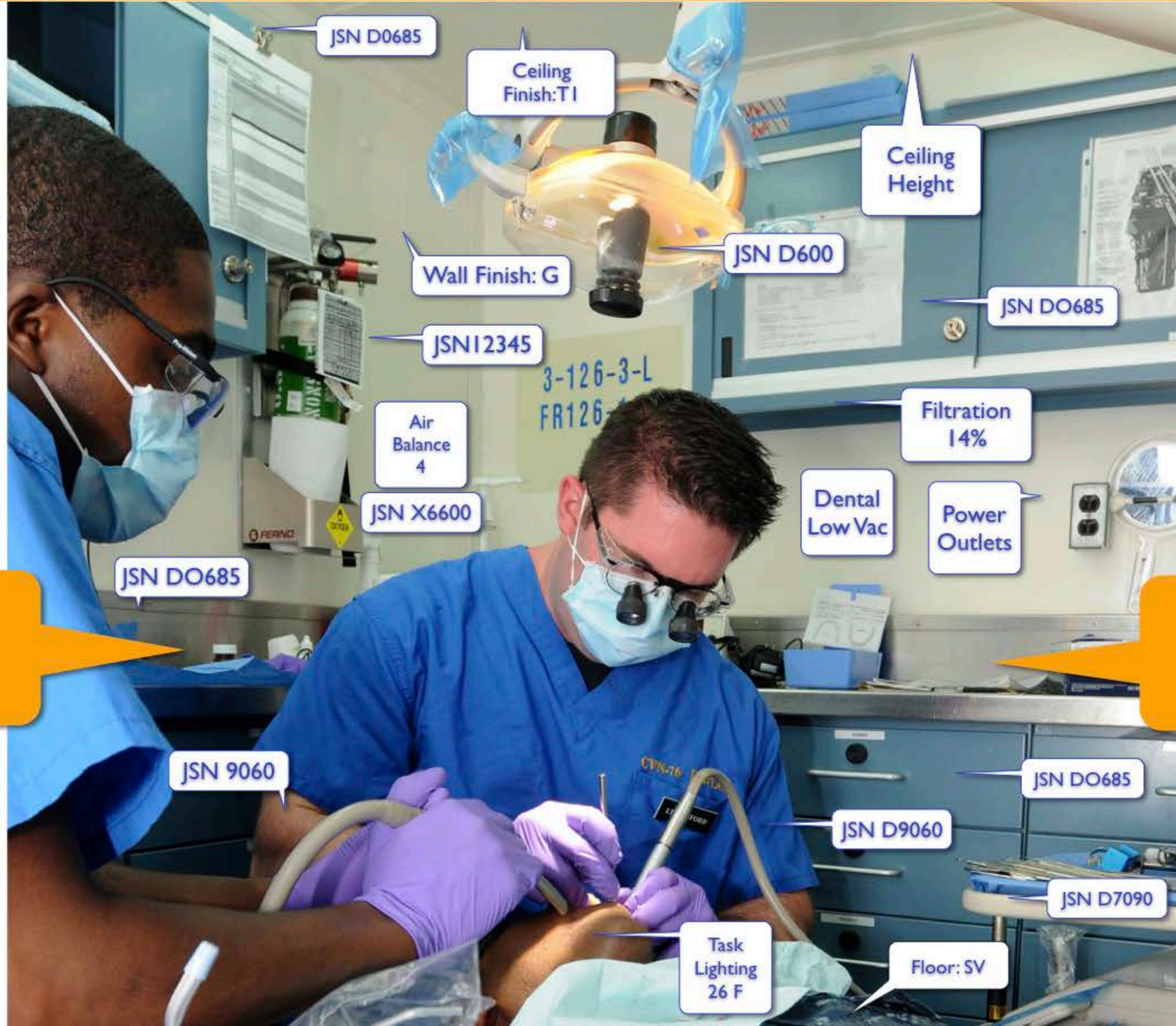
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1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22
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1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22
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1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22
1	2	3	4	5	6	7	8	9	10	11	12										

Owners are Changing



VA

Space




Department of
Defense
Defense Health
Agency

Equipment

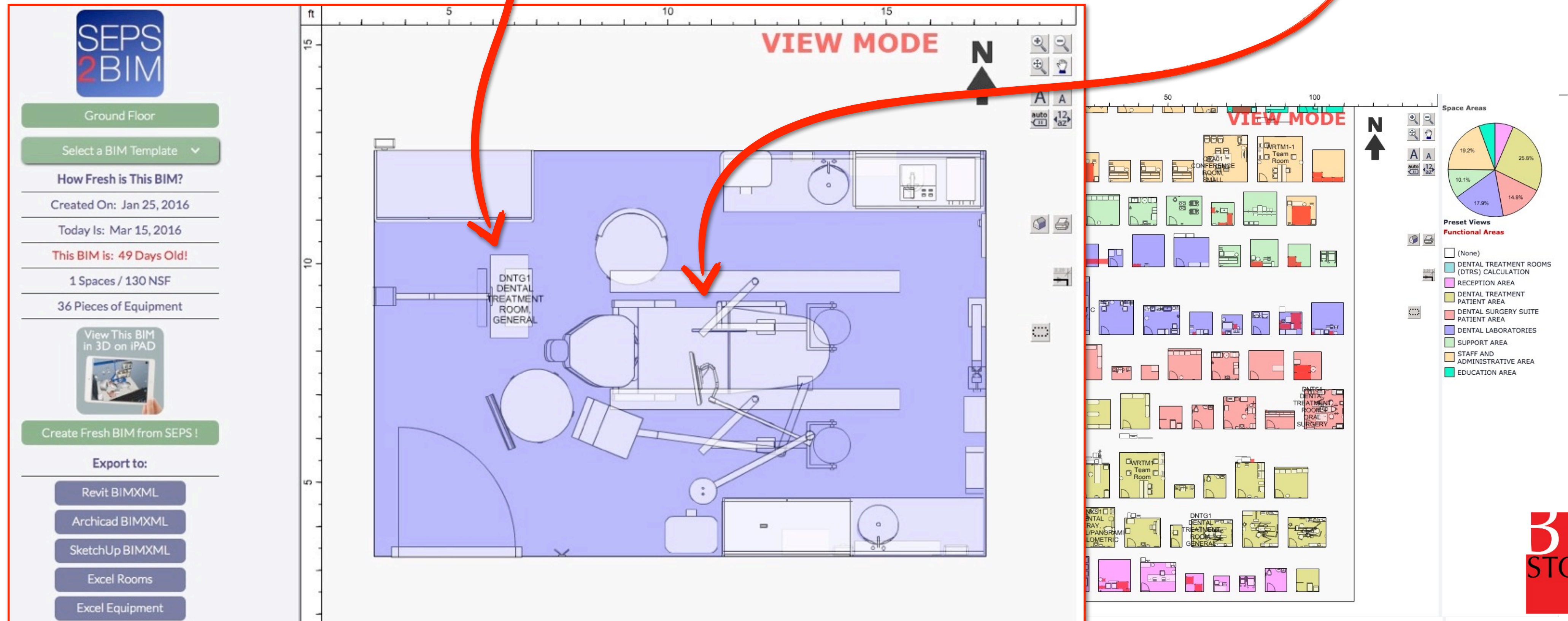
DIGITAL DATA INTO BIM

ROOMS and DEPARTMENTS

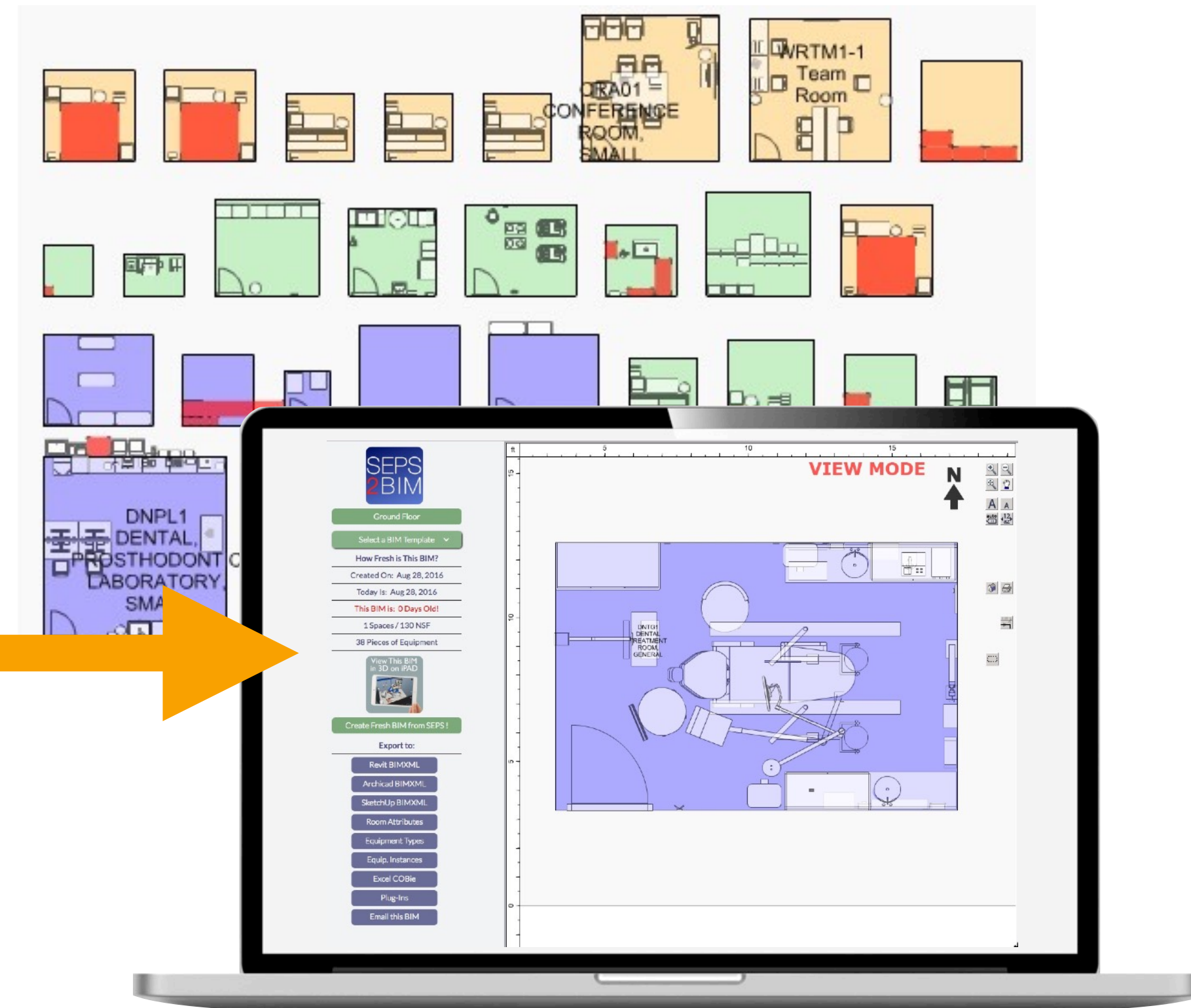
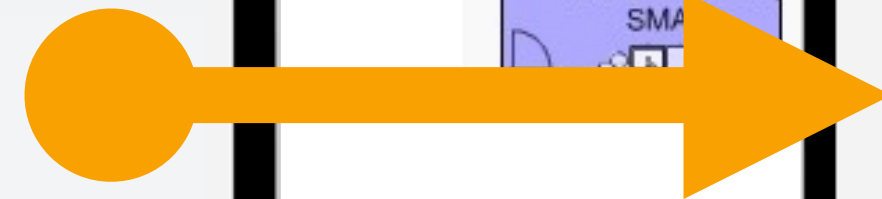
1	Project Room GUID	1	1	2	2	<div>Content is located in this room</div> <div>Unique ID Per Content</div> 
2	Project Content GUID	4	5	6	11	
4	JSN	F0230	workstation_2pc_c	F0205	Mail-18-openings	
6	QTY	1	1	6	1	
13	Content Name	Ergonomic Task Chair	U-Shaped Admin workstation	Guest Chair	Mail Distribution Center	

EQUIPMENT

1	Project Room GUID	1	1	2	2	Content is located in this room
2	Project Content GUID	4	5	6	11	Unique ID Per Content
4	JSN	F0230	workstation_2pc_c	F0205	Mail-18-openings	
6	QTY	1	1	6	1	
13	Content Name	Ergonomic Task Chair	U-Shaped Admin workstation	Guest Chair	Mail Distribution Center	

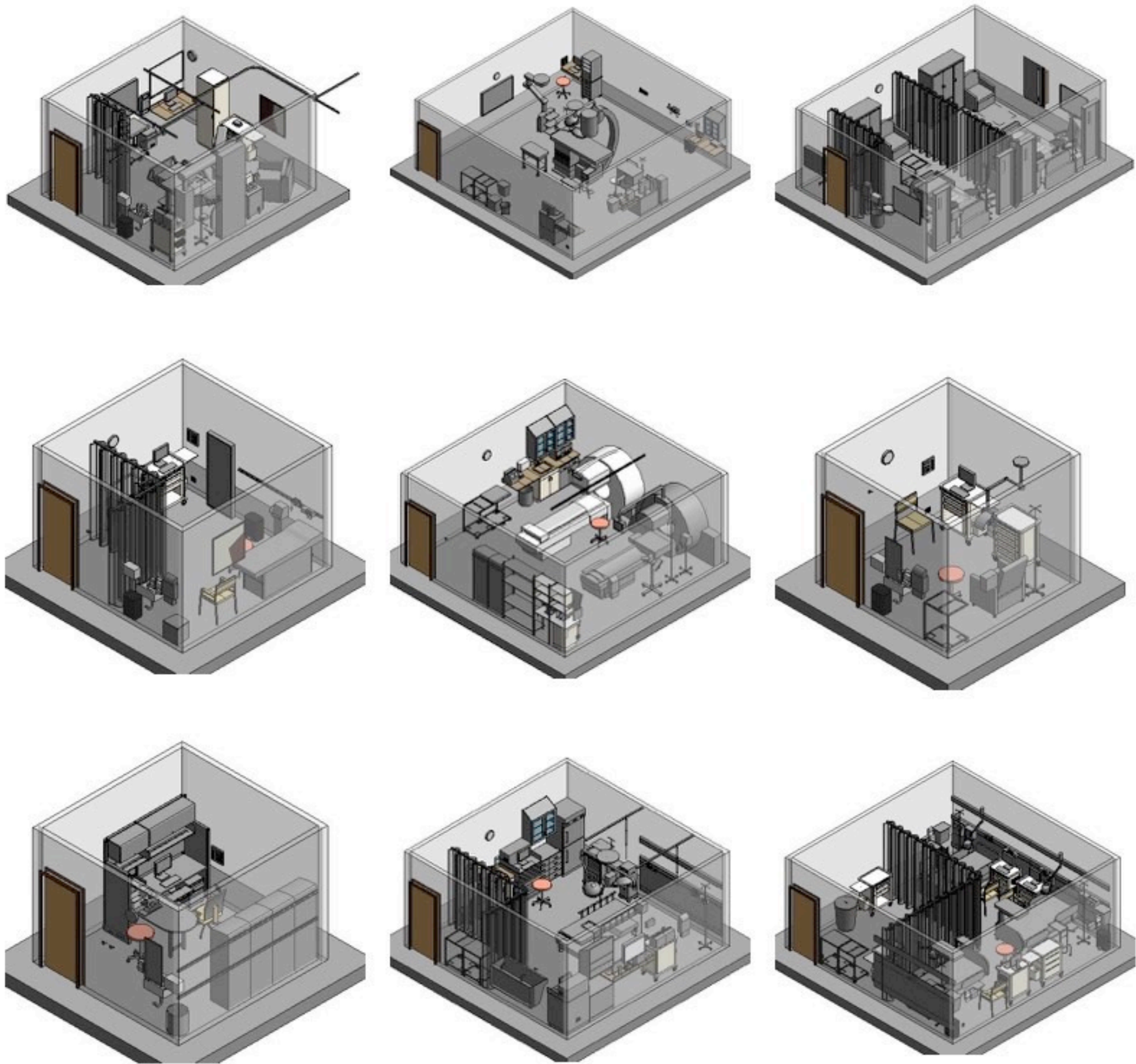


Owner's Data to BIM

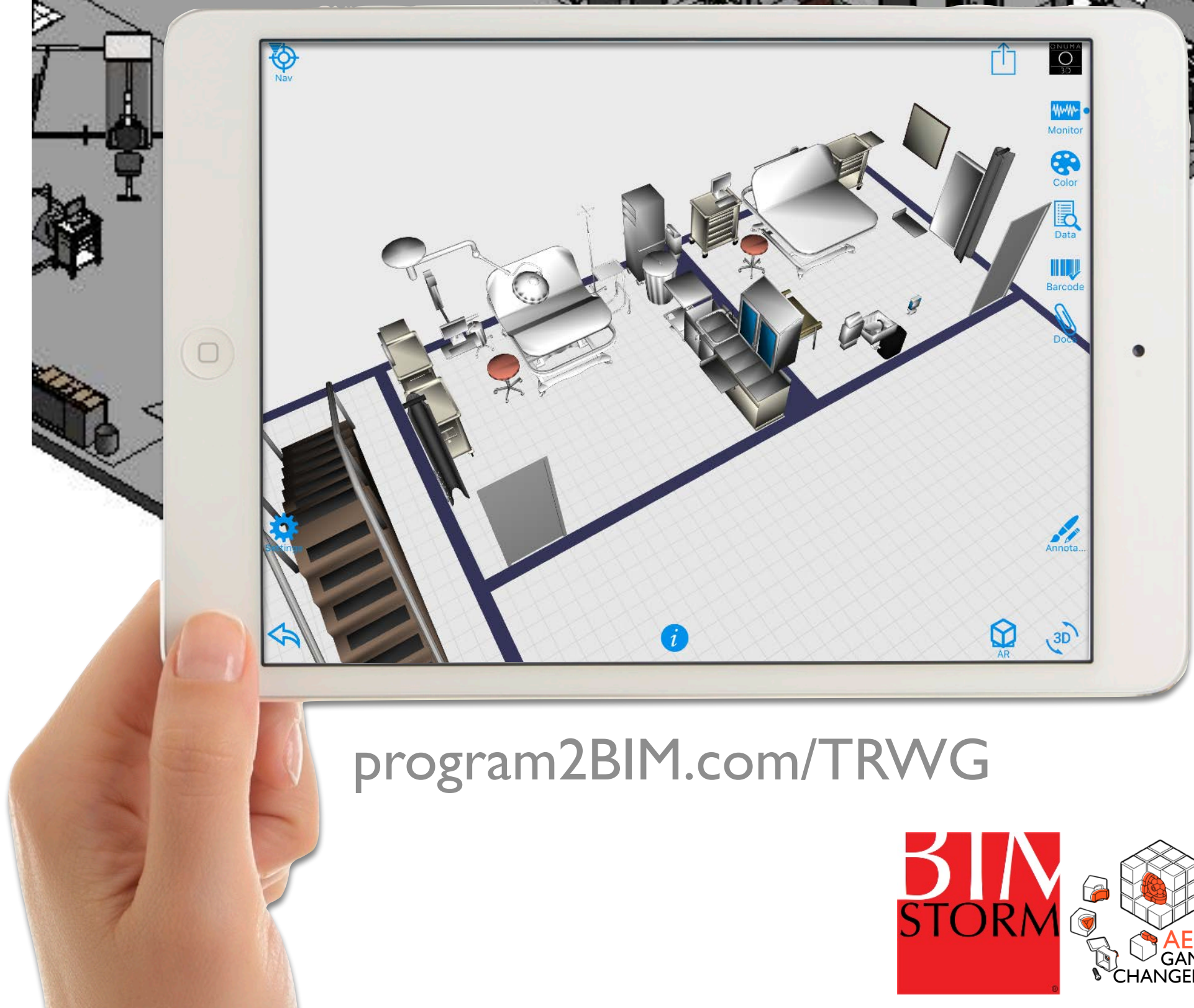


SEPS2BIM.org
Available Online

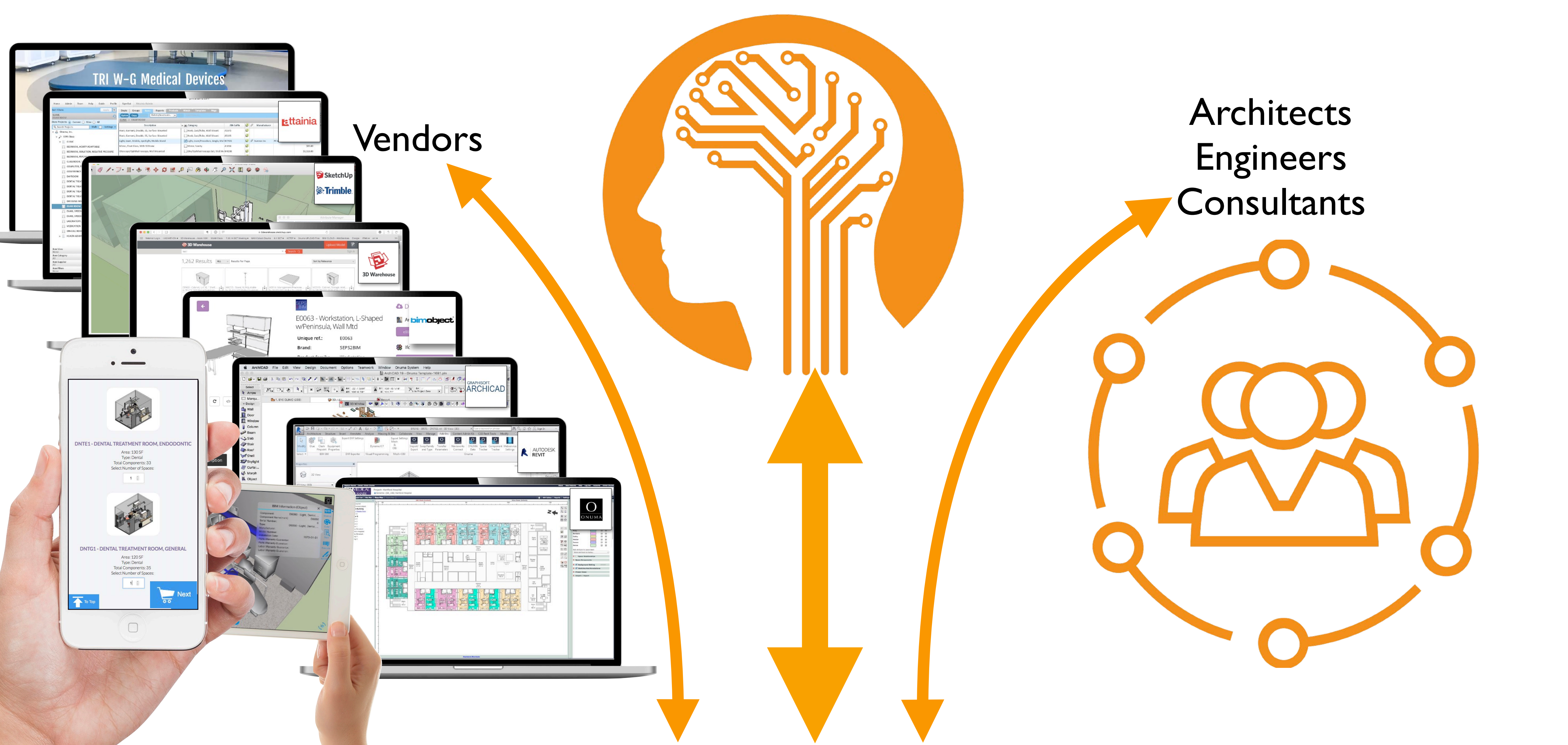




TWG1000.SD SERIES Motorized



program2BIM.com/TRWG

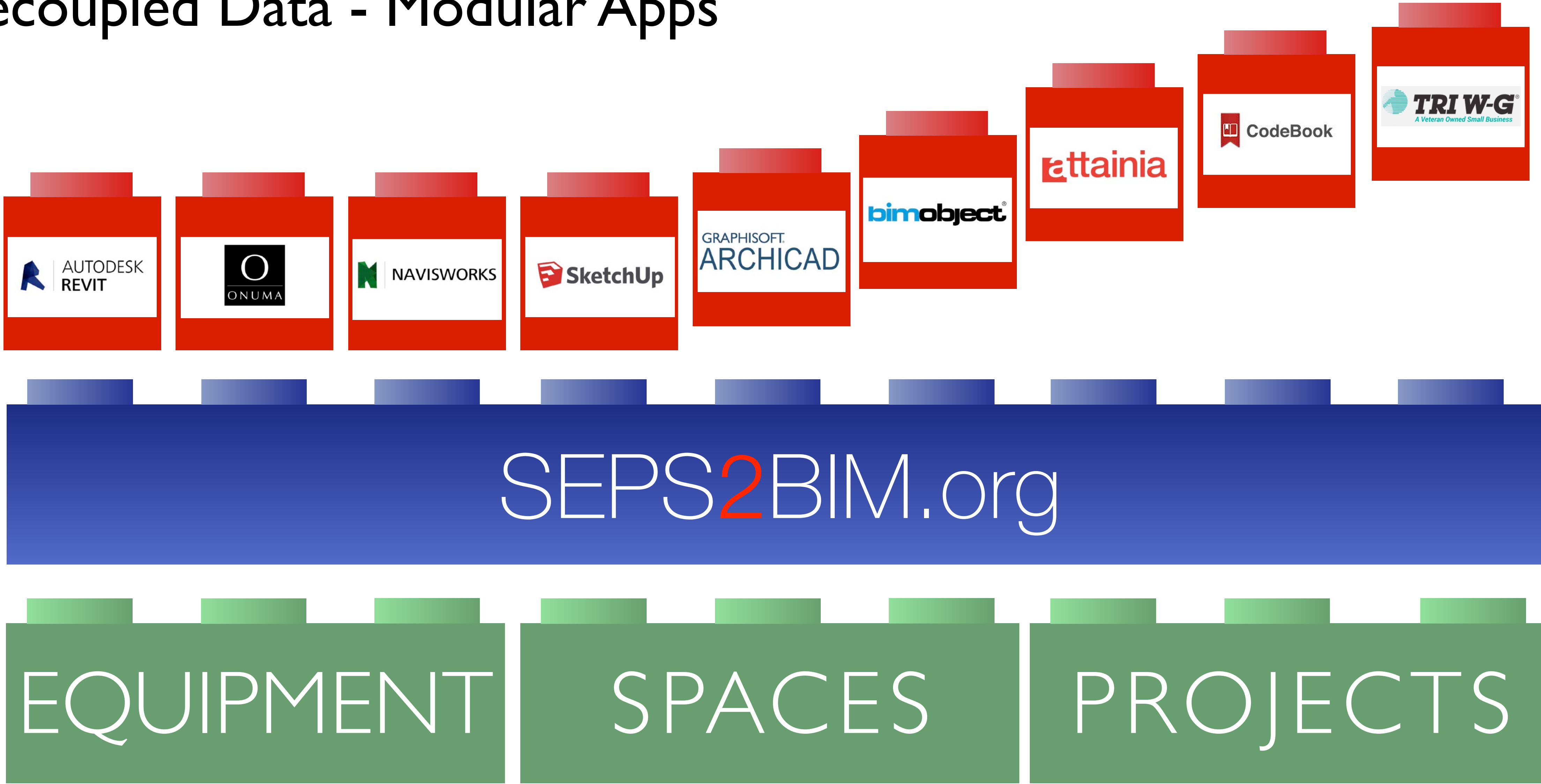


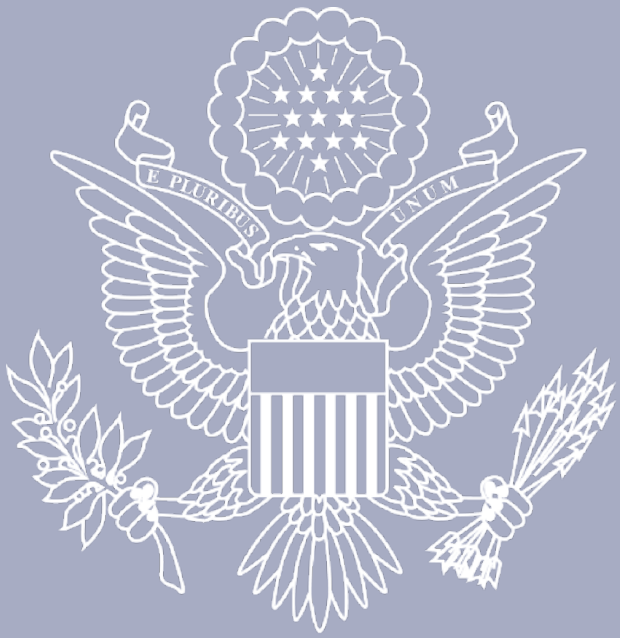
Vendors

Architects
Engineers
Consultants

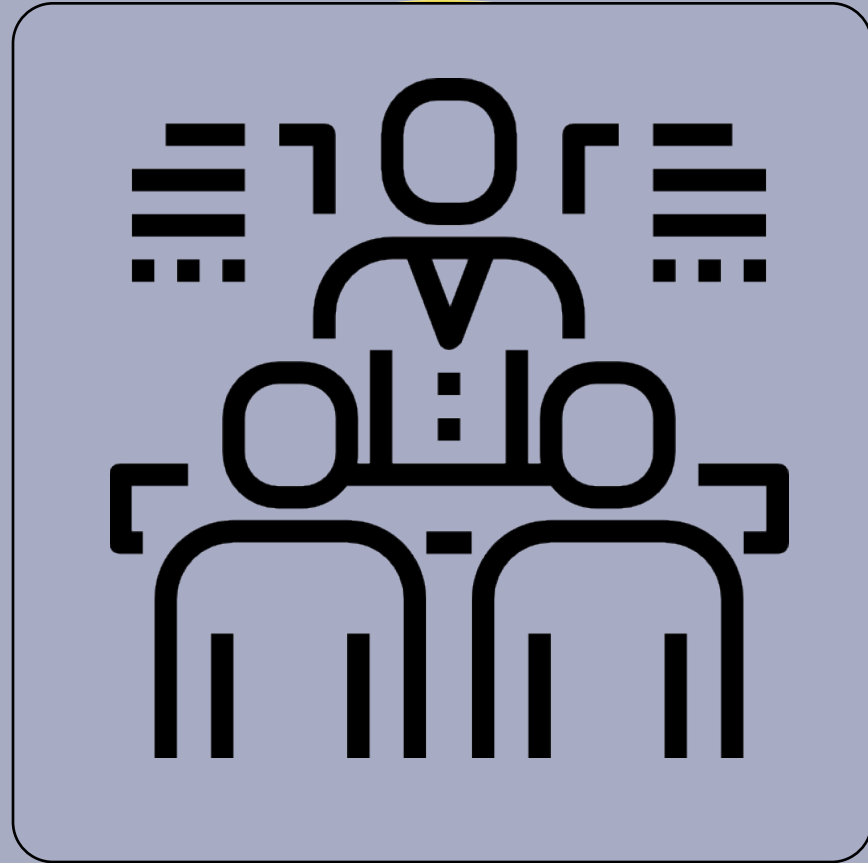
Owner's Platform

Decoupled Data - Modular Apps

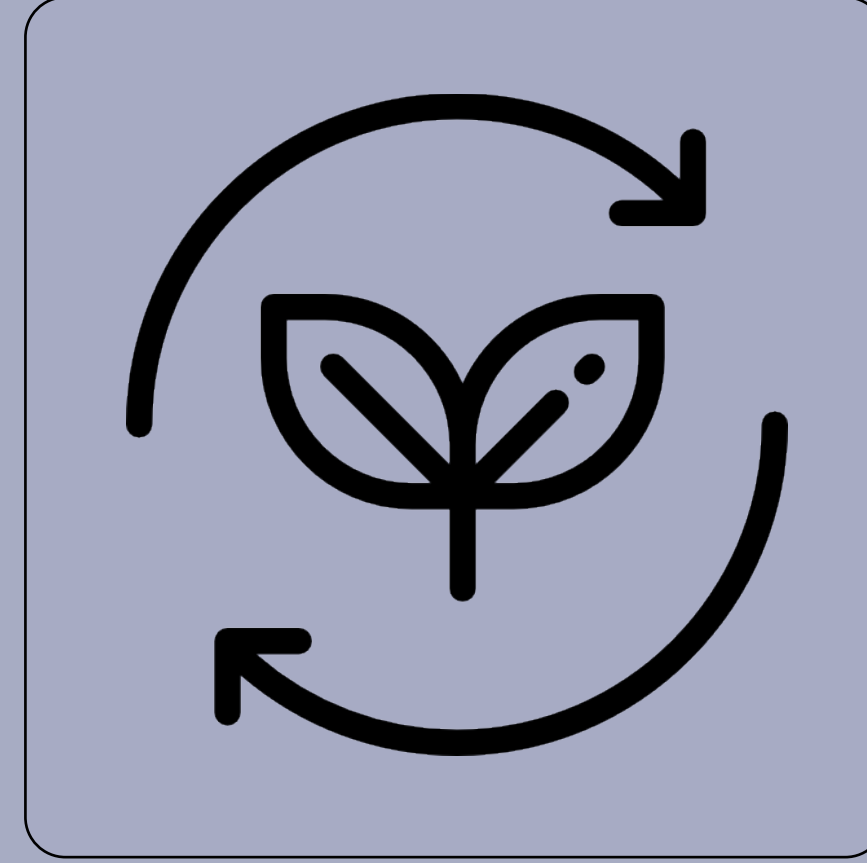




U.S. Department of State Bureau of Overseas Buildings Operations



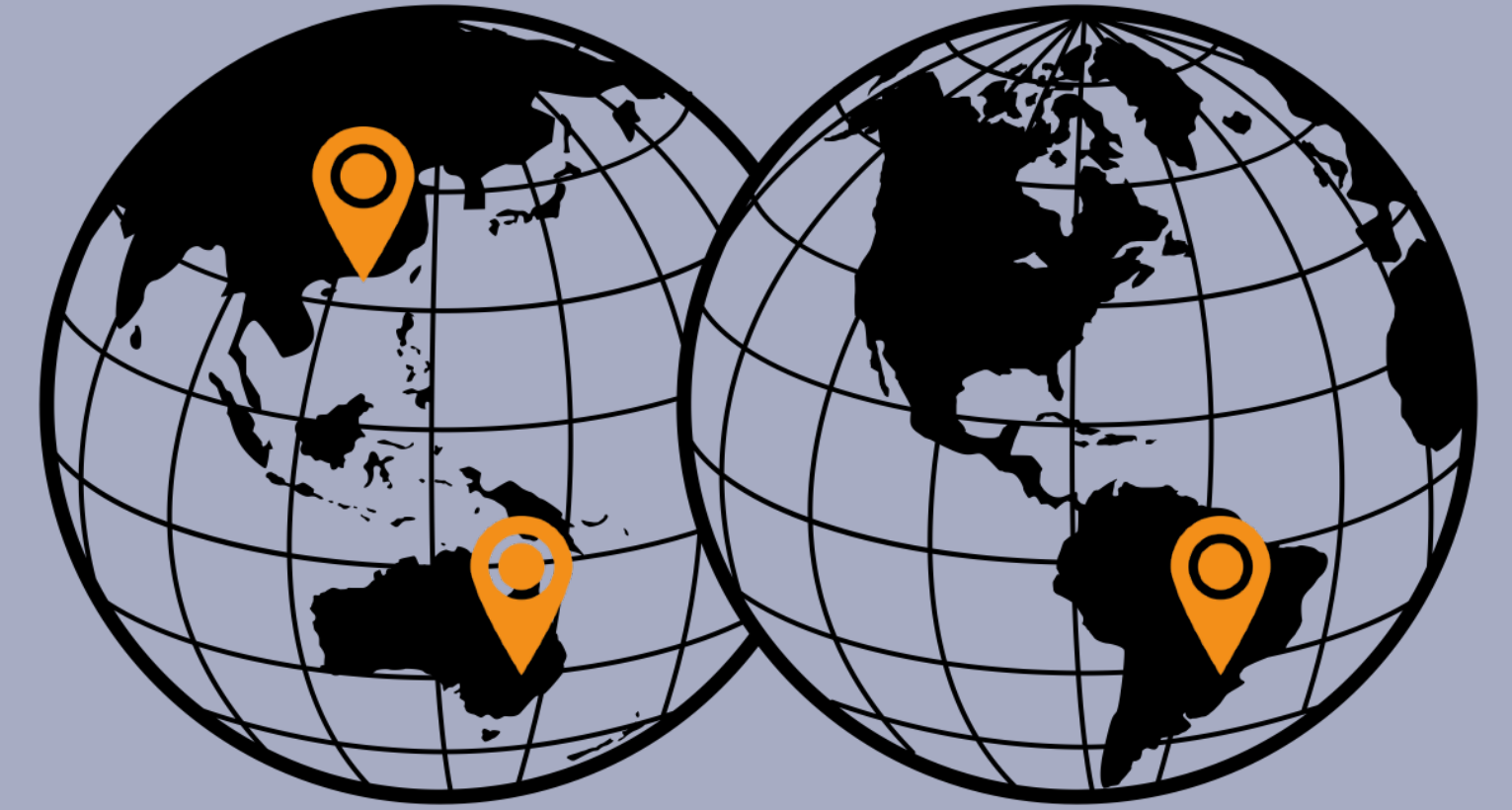
**Improved
Coordination**



**Shared Data
For Lifecycle**



**Improved
Efficiencies**

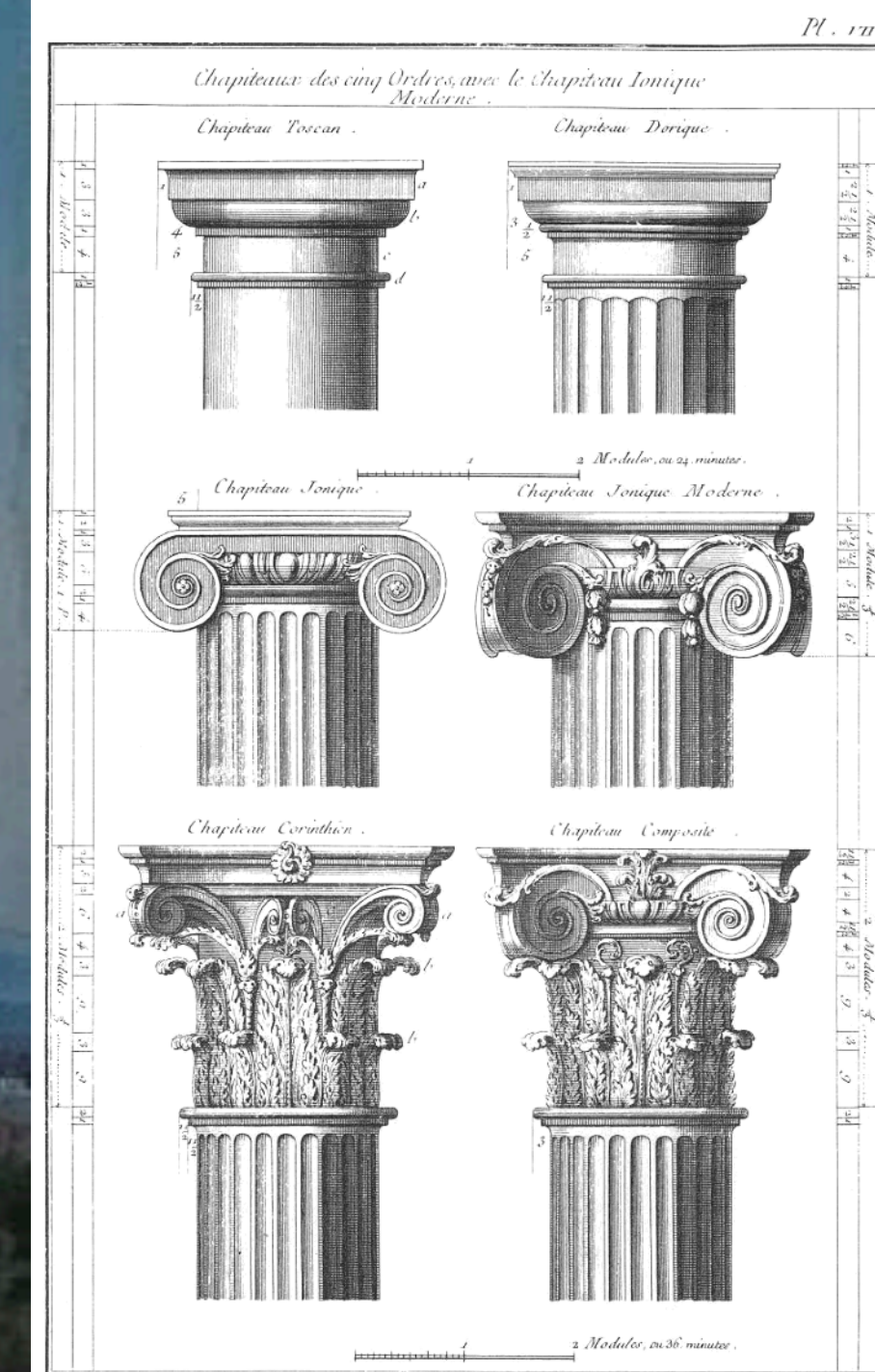


**Supporting Projects
& Portfolio**

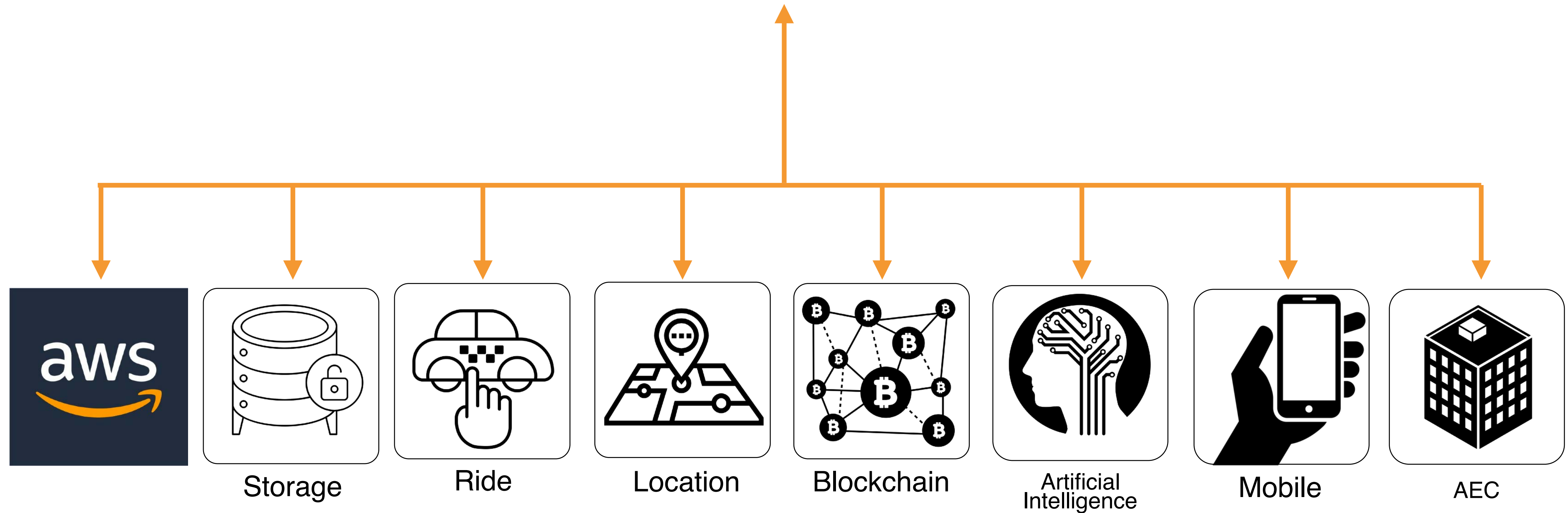


**National Institute of
BUILDING SCIENCES**
*An Authoritative Source of Innovative Solutions
for the Built Environment*

Architecture as a Platform

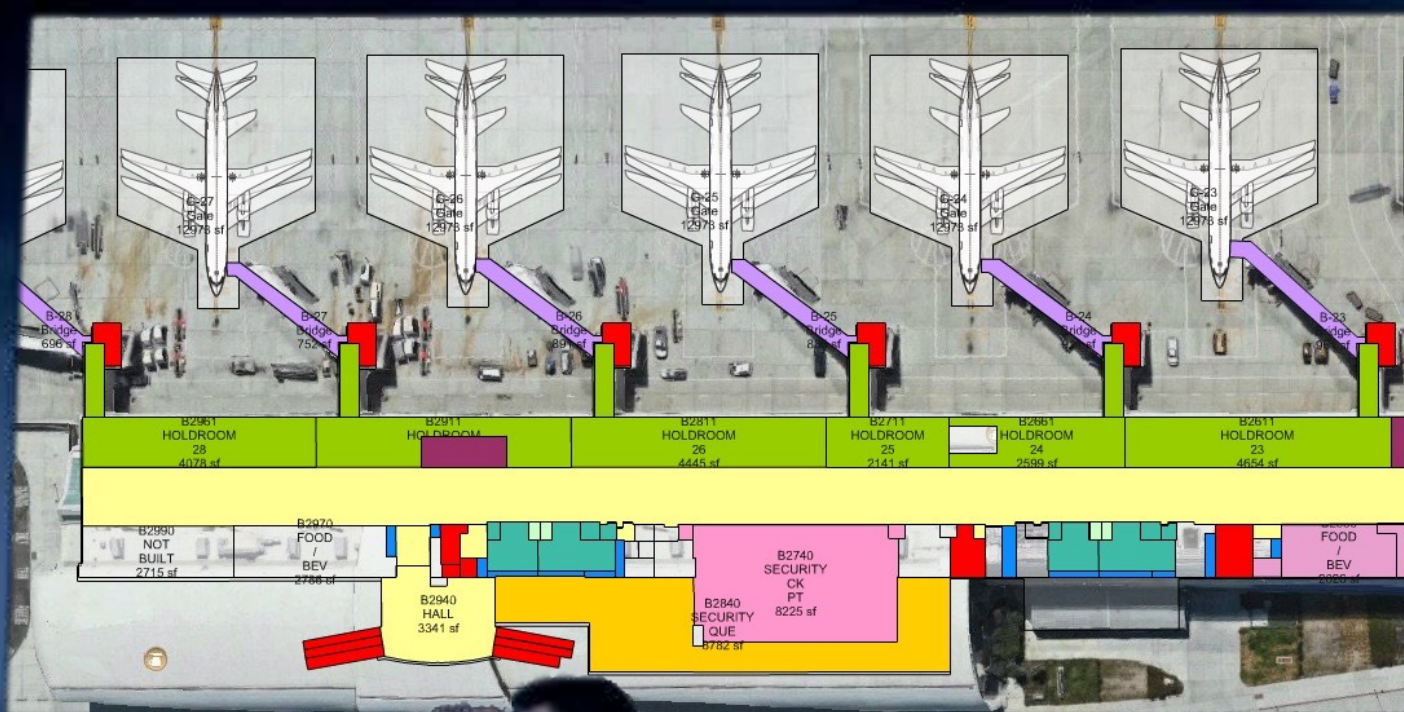


<insert name
of application>



Platforms

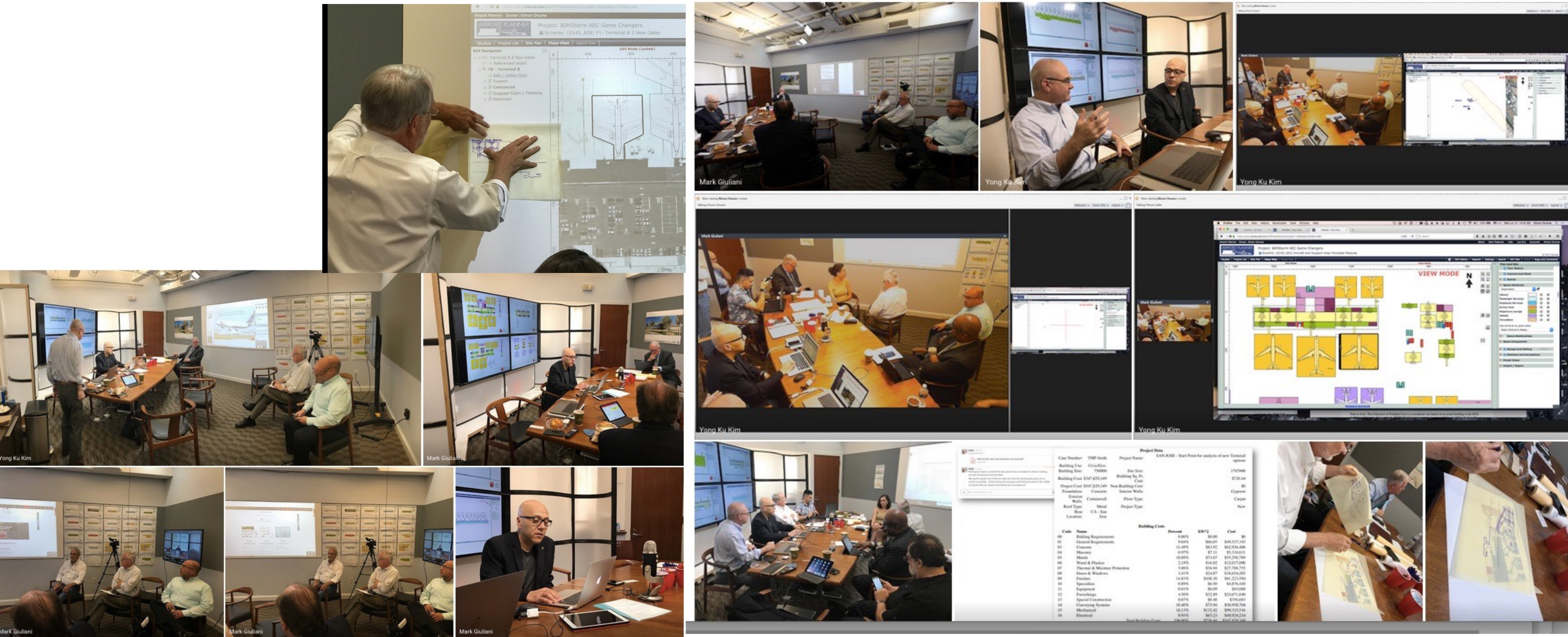
Many Databases, Many Standards, A lot of Data



SCENARIOS

- 1 - MASTER PLAN
- 2 - TERMINAL RENOVATIONS
- 3 - NEW 700,000 SF TERMINAL
- 4 - TERMINAL B NEW GATES
- 5 - RENOVATE OFFICES
- 6 - BIM TO FACILITY MANAGEMENT
- 7 - GATE SCHEDULING ASSETS
- 8 - TOTAL COST OF OWNERSHIP

Real Time Collaboration

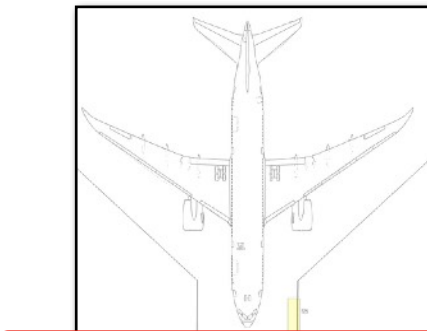


14 Scenarios

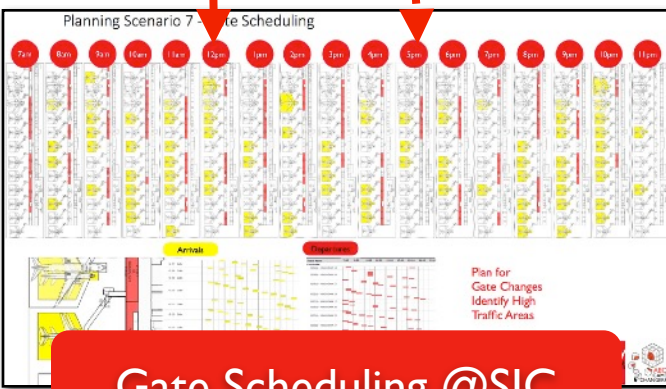
Airline Market @ Global Scale

Frankfurt
to
San Jose

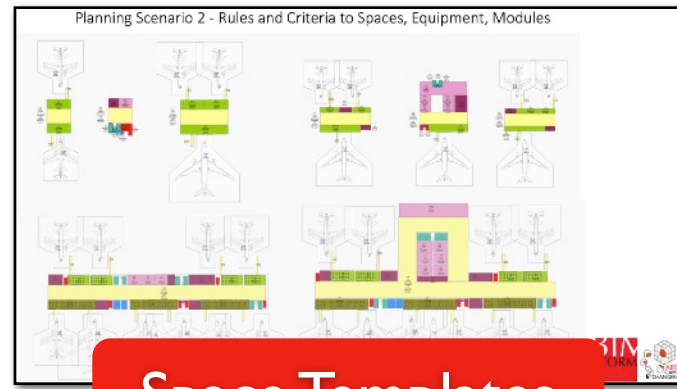
Beijing
to
San Jose



Assets (Multiple Airlines)



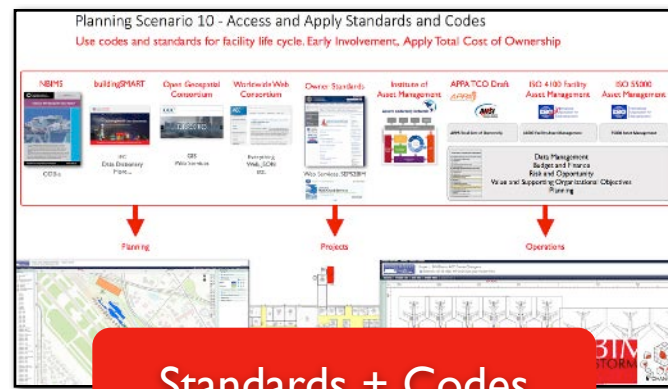
Gate Scheduling @SJC



Space Templates



Space Criteria

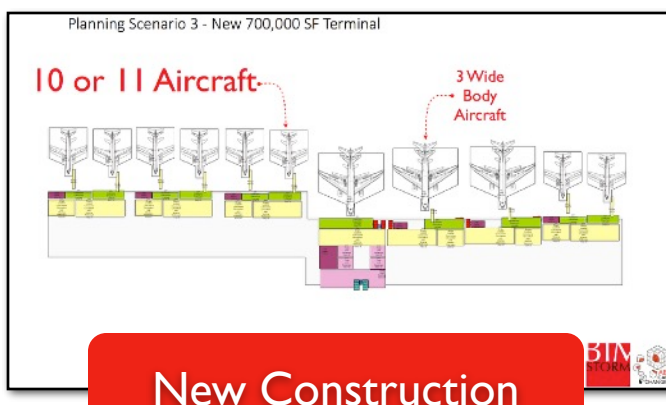


Standards + Codes

Drivers



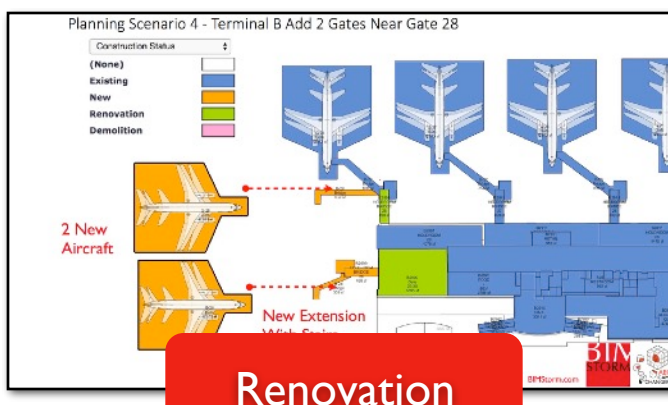
Master Planning



New Construction



Move Management



Renovation

Ongoing Projects



Infrastructure & Environment



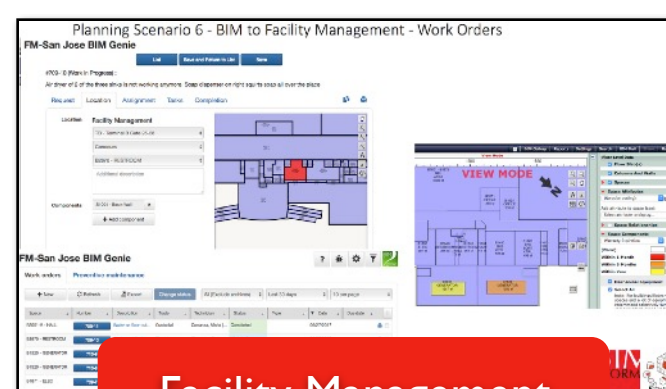
People



Technologies



Budget, Finance & Agreements



Facility Management

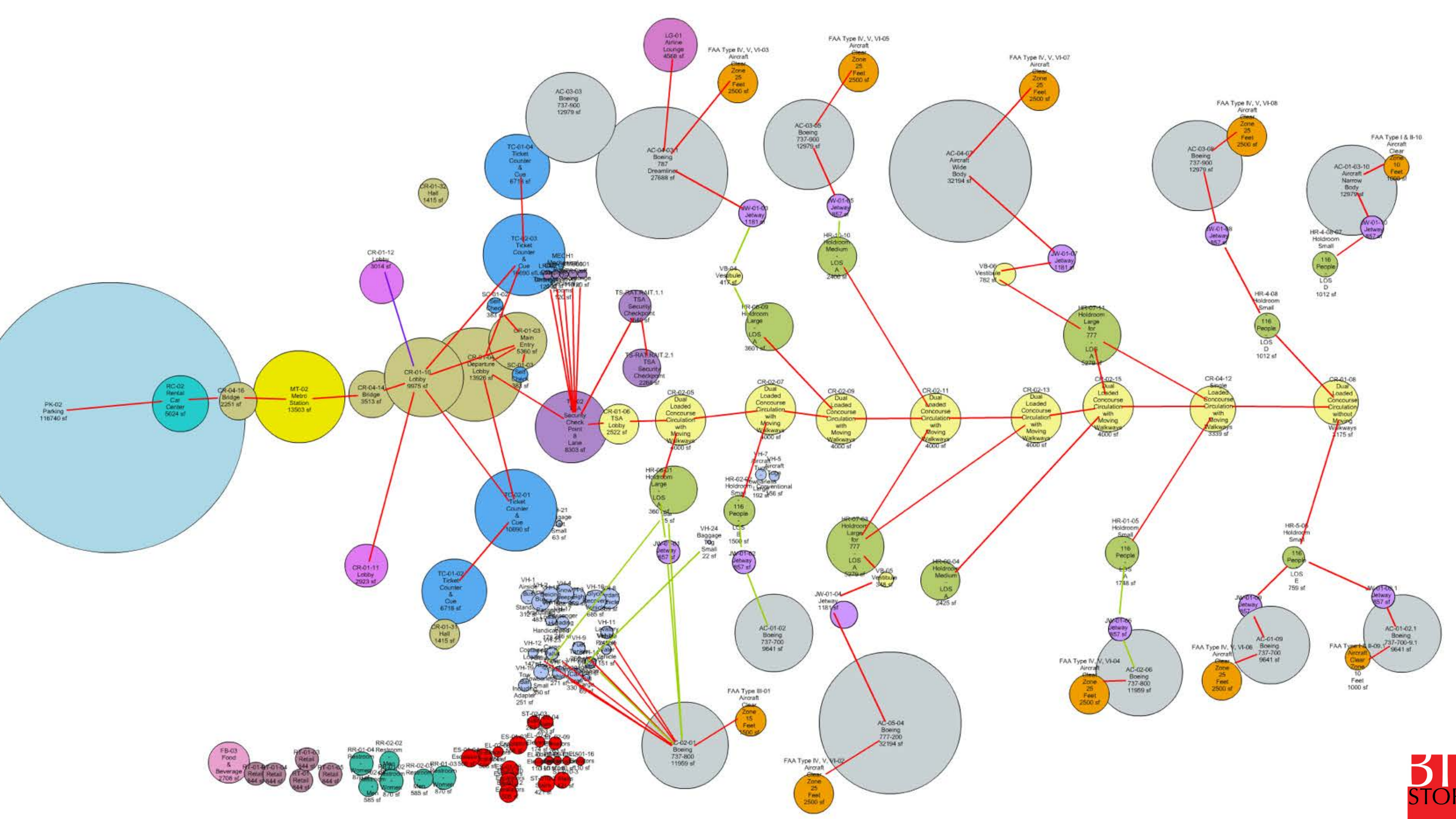


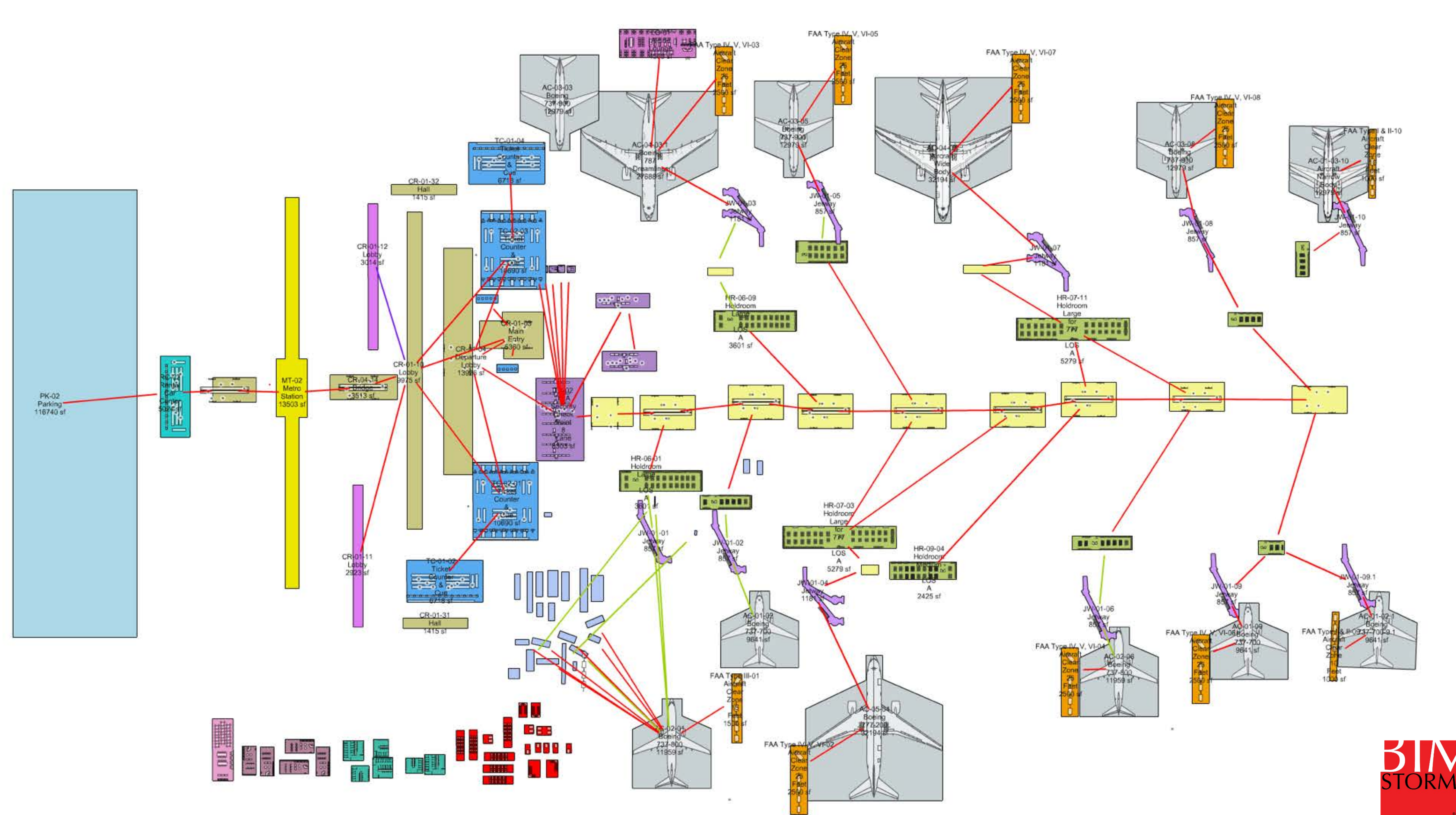
Total Cost of Ownership



Risk Management

Operations





Gate

7

Scheduling

Gate Scheduling








Scheduling

DEPARTURE

✕ ARRIVAL

Flight City (e.g. Delta 111 OR Delta Dallas)

Q

	FROM	SCHEDULED TIME	GATE	STATUS
	2121 Phoenix, AZ	10:00 AM	21	Now 09:50 AM
	172 Tokyo-Narita	10:55 AM	15	Now 10:37 AM
	1895 Chicago, IL-Midway	10:55 AM	19	Now 10:40 AM
 海南航空 HAINAN AIRLINES	7989 Beijing, China	11:30 AM	18	Now 10:57 AM
	1542 Dallas/Fort Worth, TX	10:49 AM	9	On Time
	1825 Minneapolis/St. Paul, MN	10:40 AM	7	On Time
	4180 Orange County, CA	09:50 AM	20	On Time



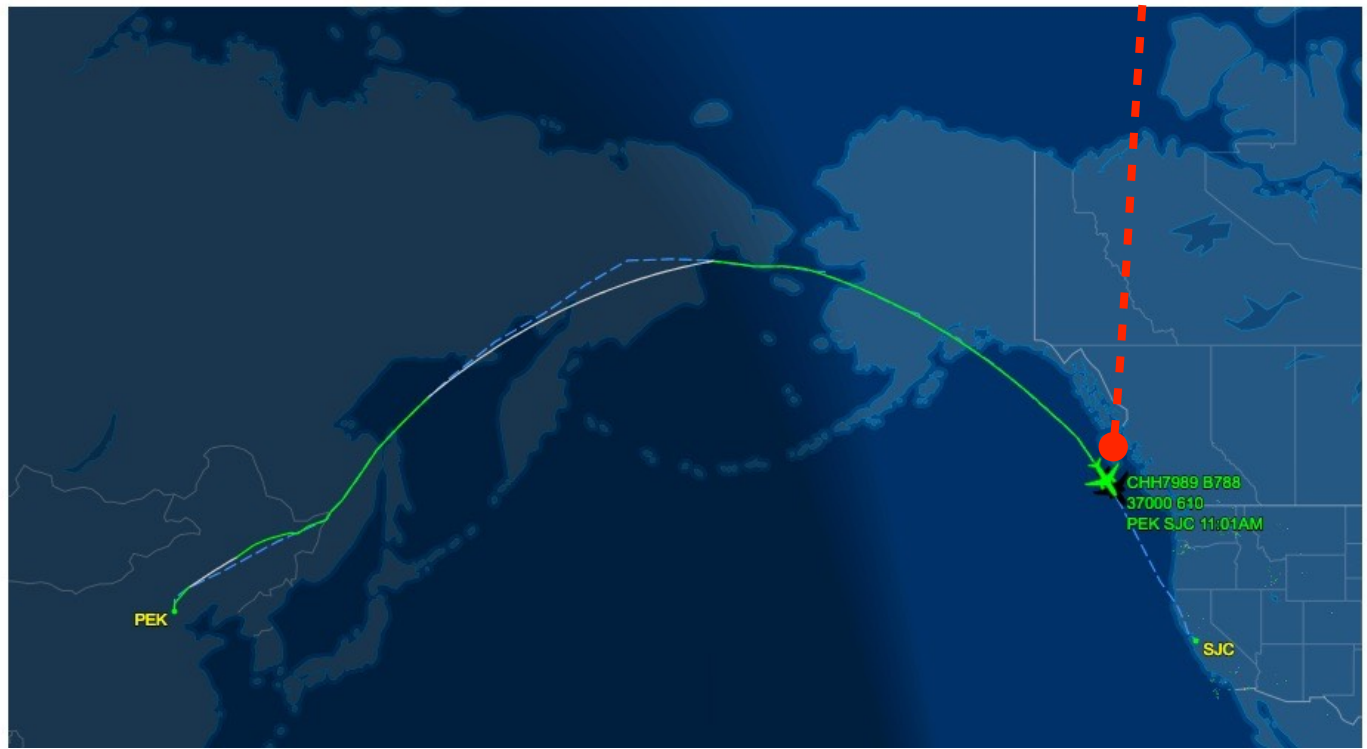
Hainan Airlines 7989 CHH7989 / HU7989
EN ROUTE AND ON TIME
Arriving in 2 hours 6 minutes



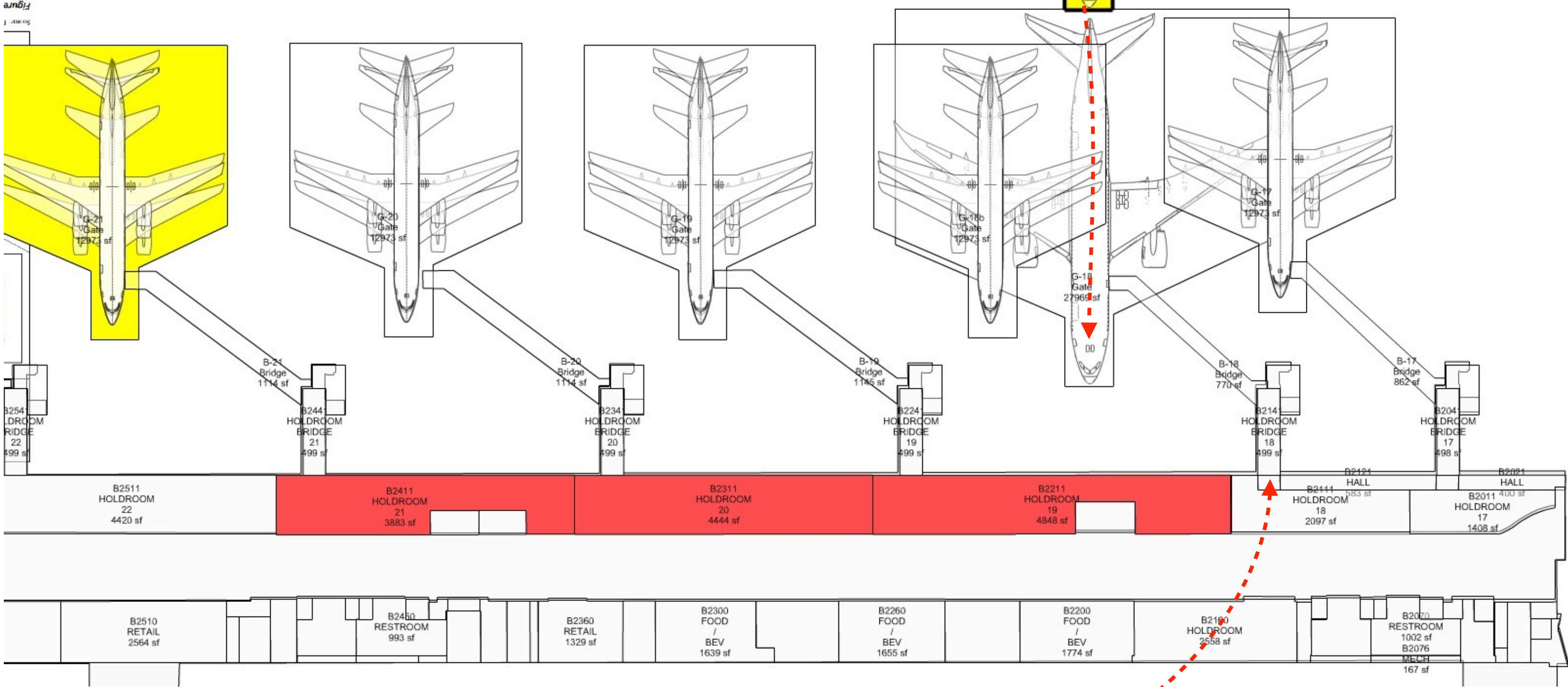
BEIJING, CHINA
left GATE 8
Beijing Capital Int'l - PEK
MONDAY 26-JUN-2017
02:51PM CST (on time)



SAN JOSE, CA
arriving at TERMINAL B
San Jose Int'l - SJC
MONDAY 26-JUN-2017
11:05AM PDT
(25 minutes early)



Park this 787 from Beijing here



Room Use Schedule

Date: 2017/06/26

Time: 11:00

Occupied

Yellow = Arrival Red= Departure

10:57am Today: Gate 18
@ SJC International Arrival



Gate

7

Scheduling

Gate Scheduling

9am

10am

11am

12pm

1pm

2pm

3pm

4pm

5pm

6pm

7pm

8pm

9pm

10pm

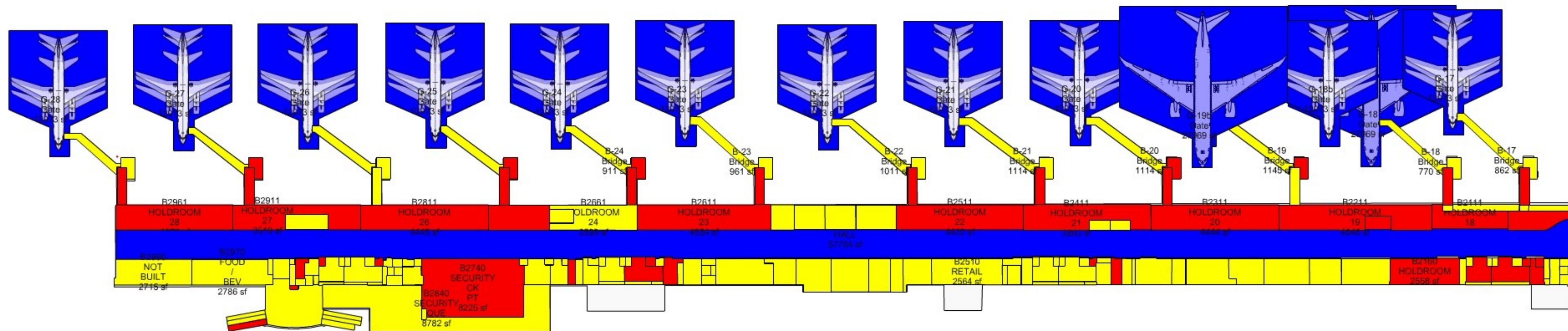
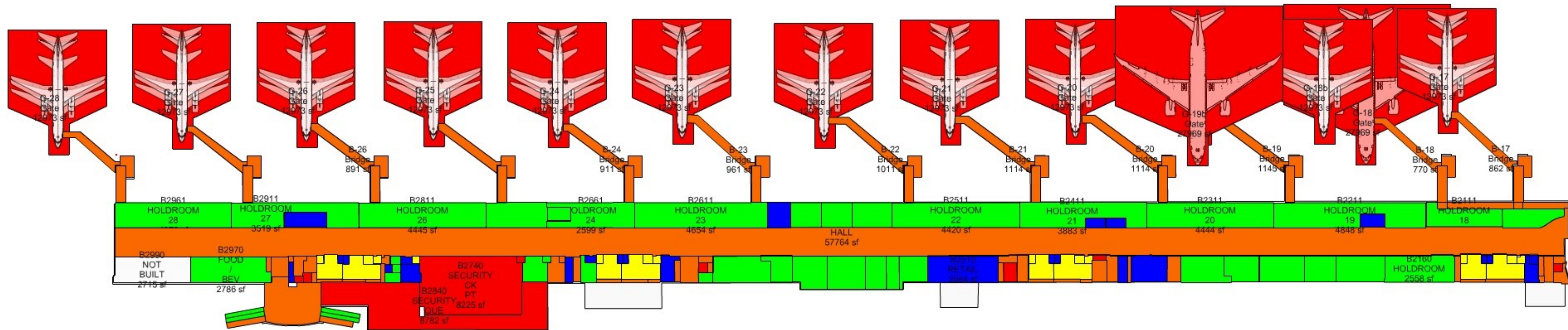
11pm

Arrivals

Departures



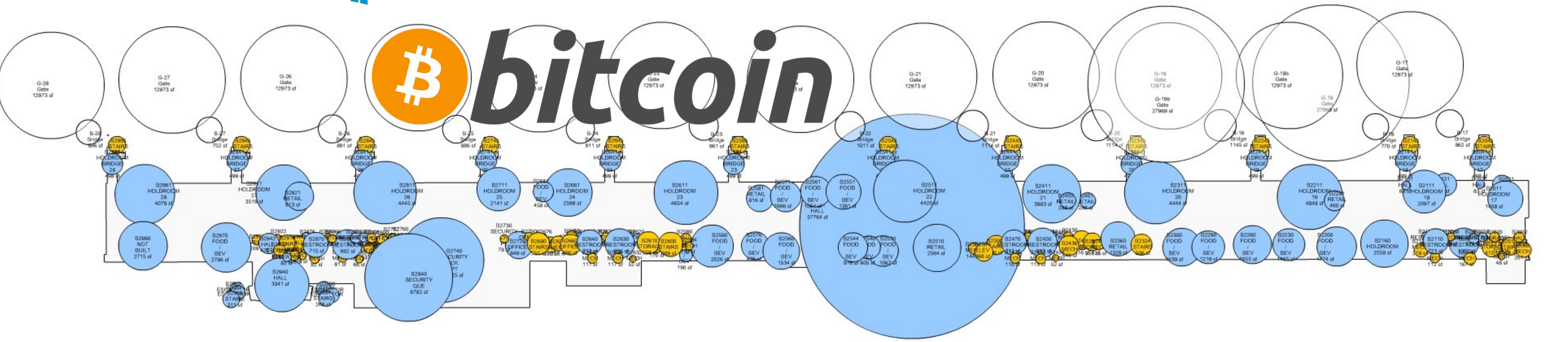
Assets, Risks, Mission Dependency, Cybersecurity

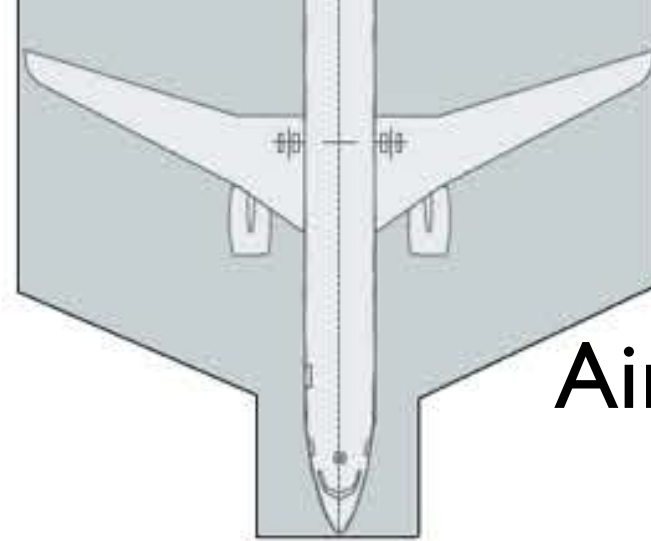
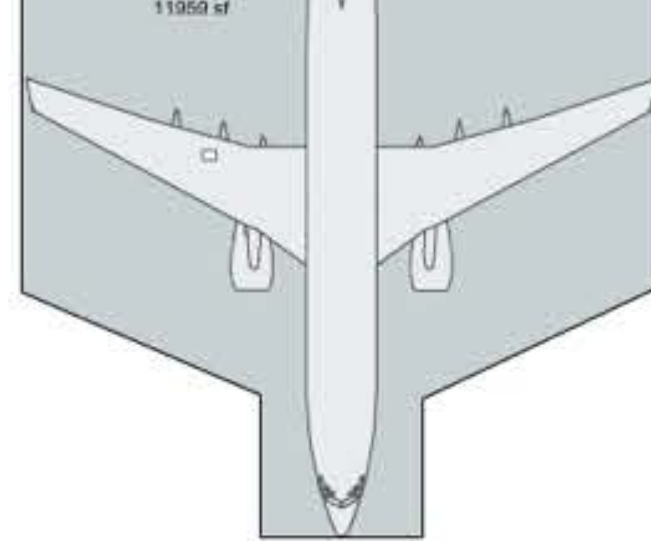
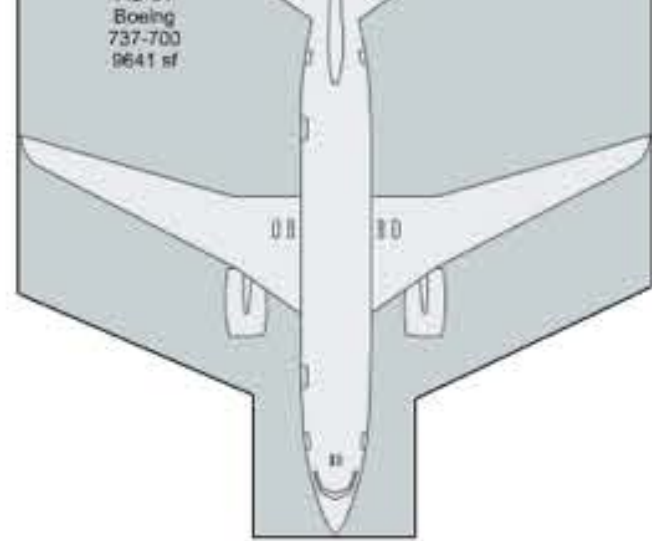


Risk of Failure?

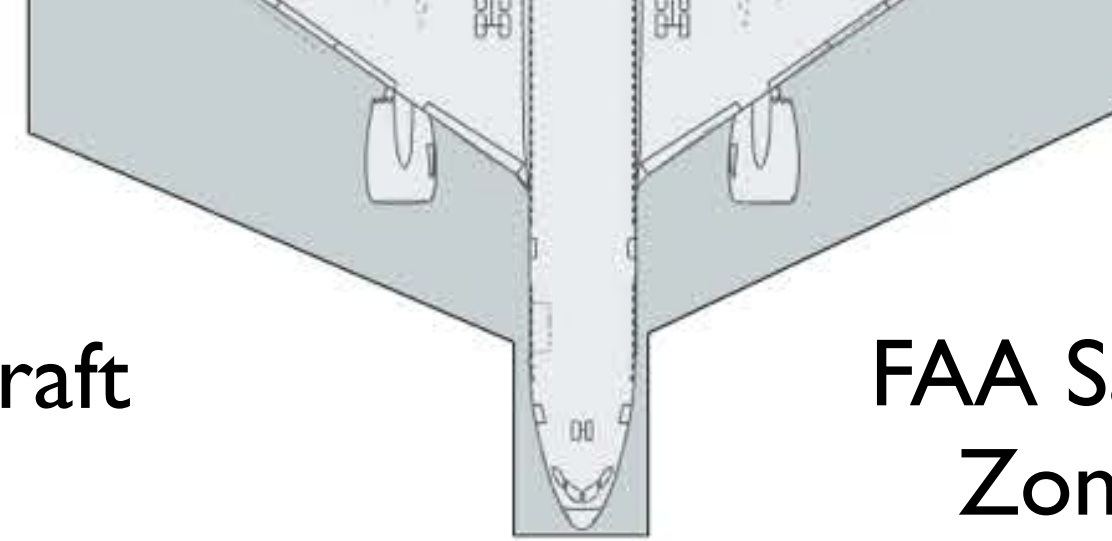
Agreement and Finances

Transparency, Collaboration, Agility

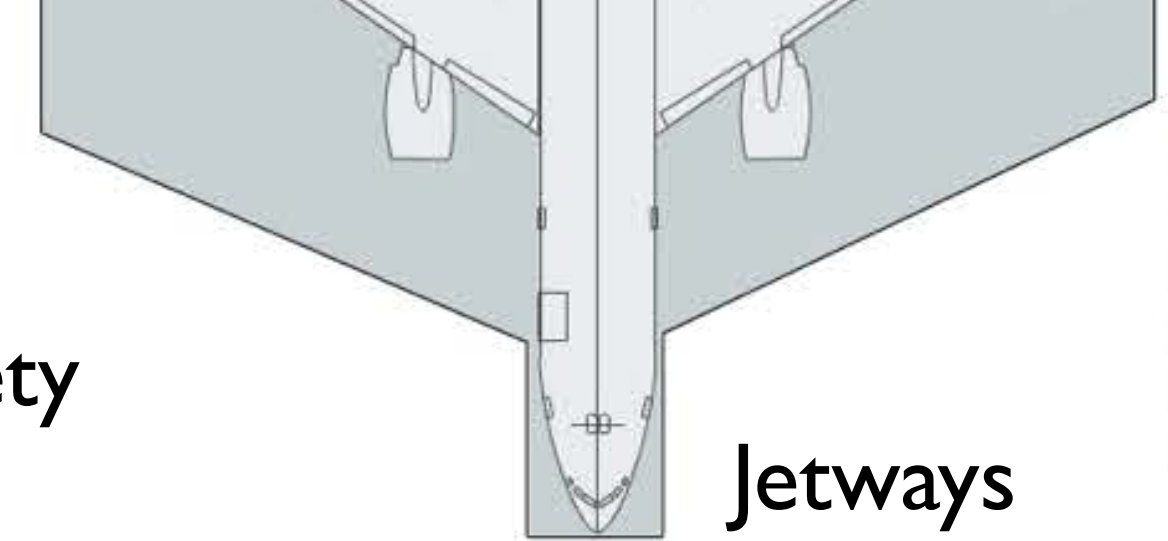




Aircraft

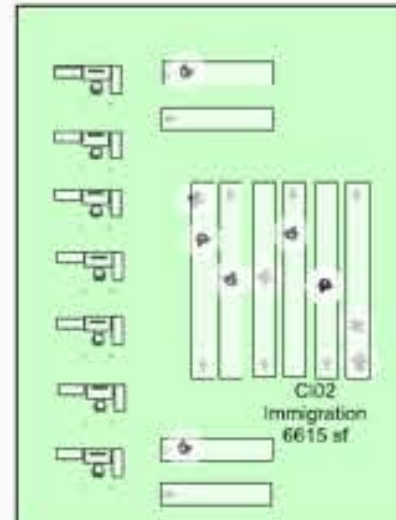
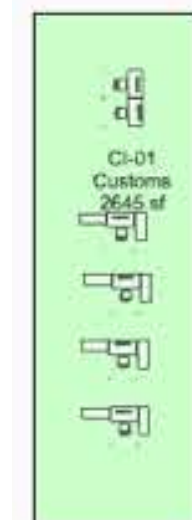
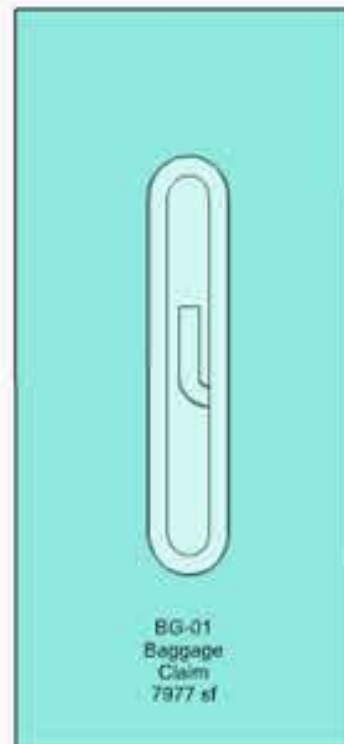


FAA Safety Zones

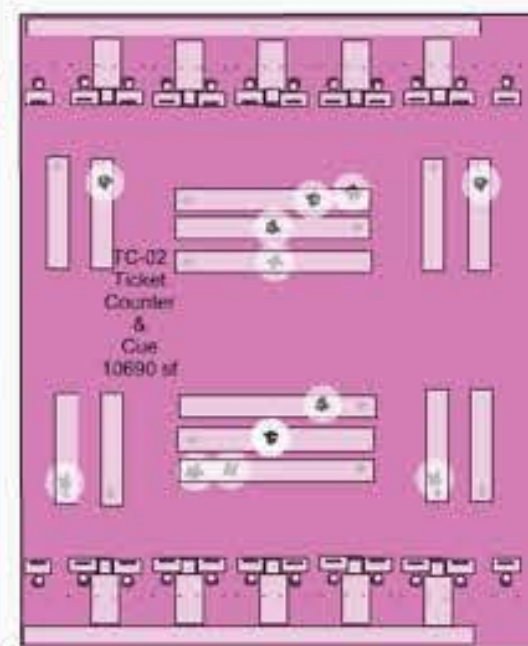
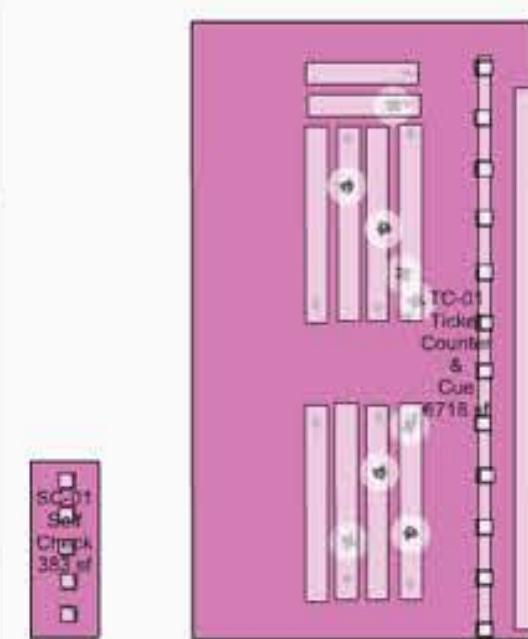


Jetways

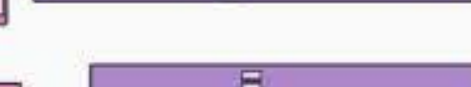
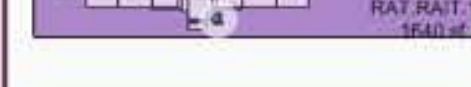
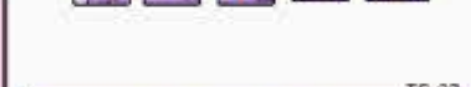
Baggage Claim



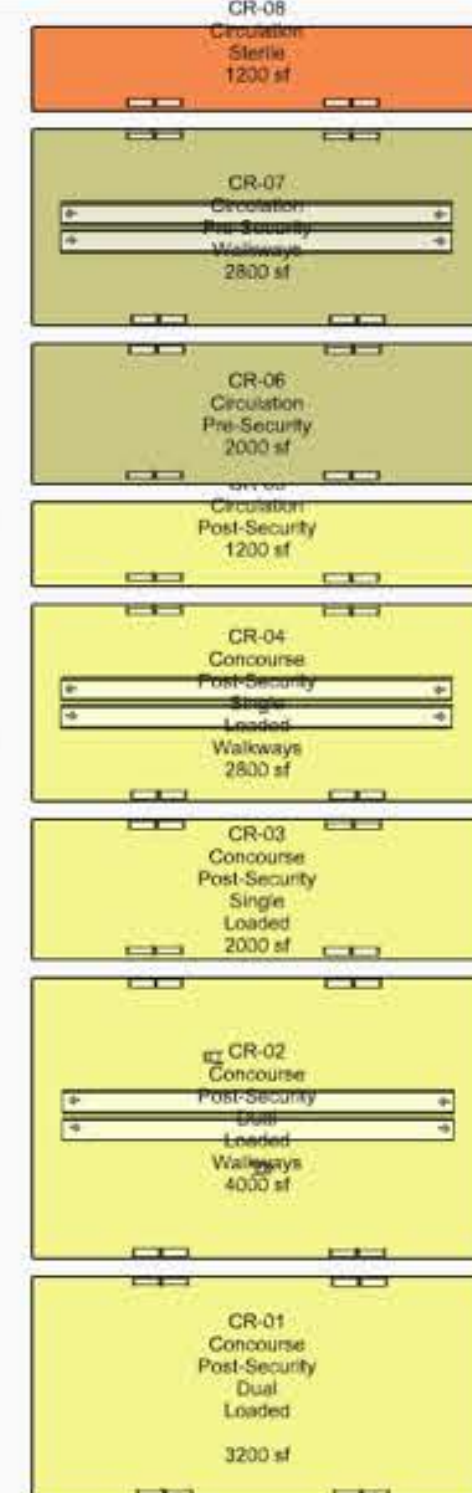
Customs & Immigration



Ticketing

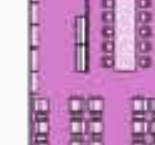
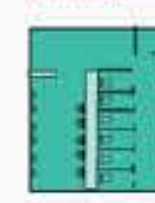
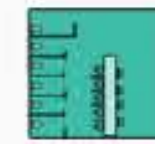
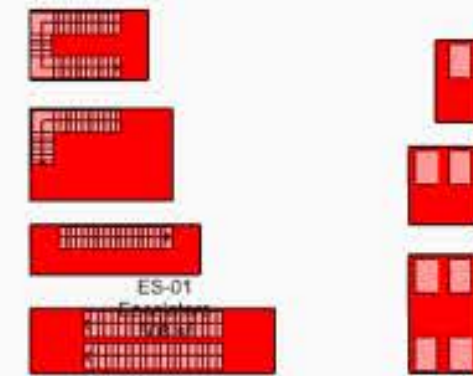


TSA

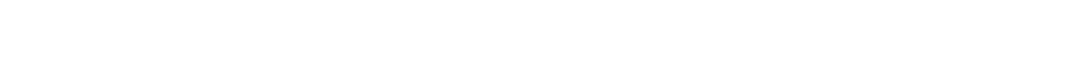
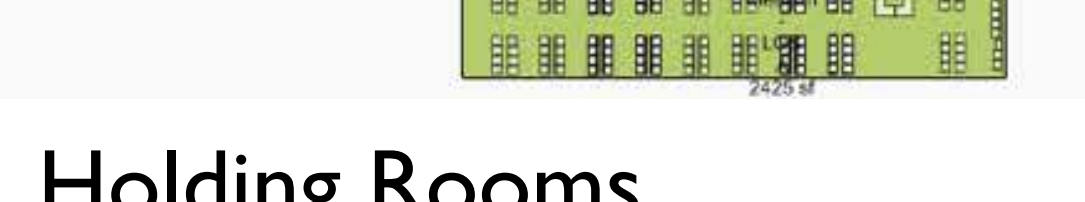
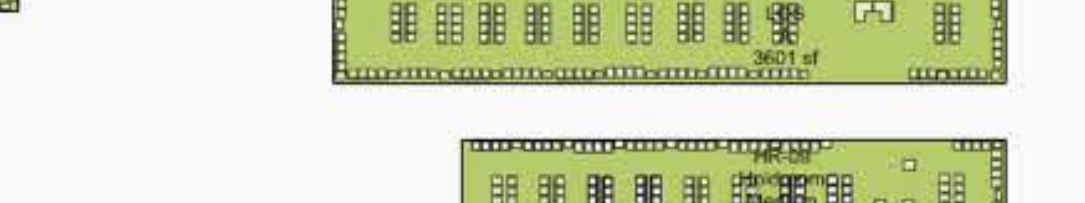
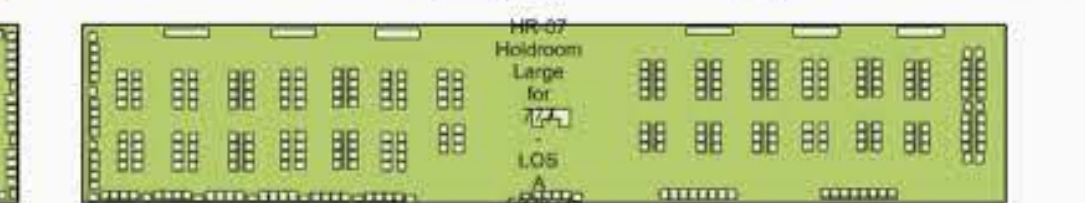
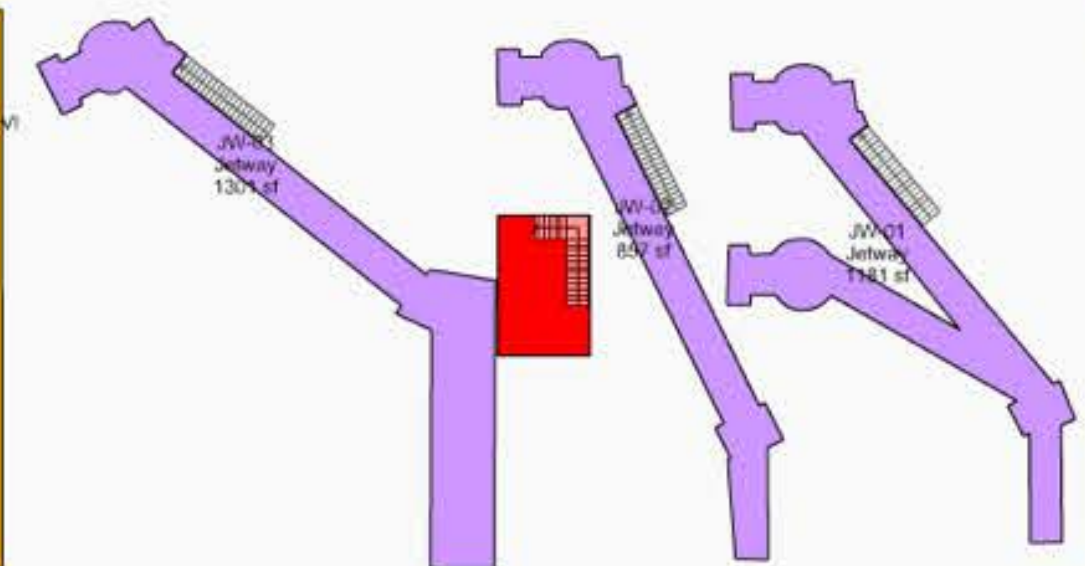
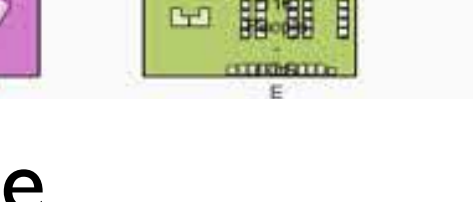
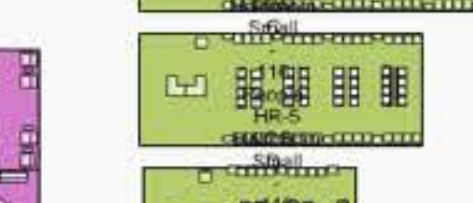
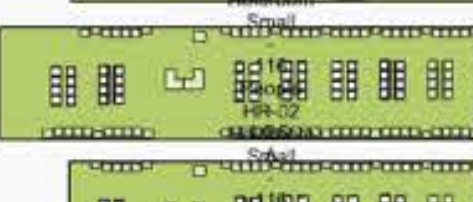
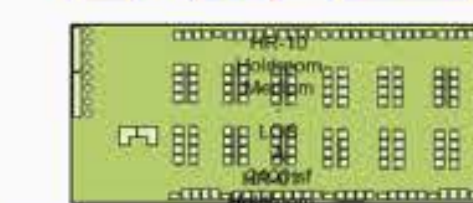
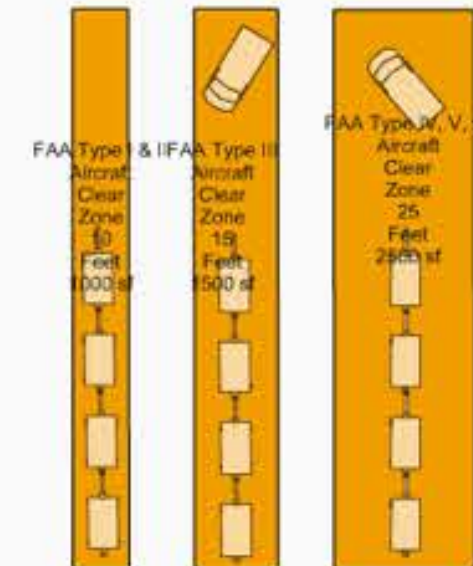


Circulation

Stairs / Elev.

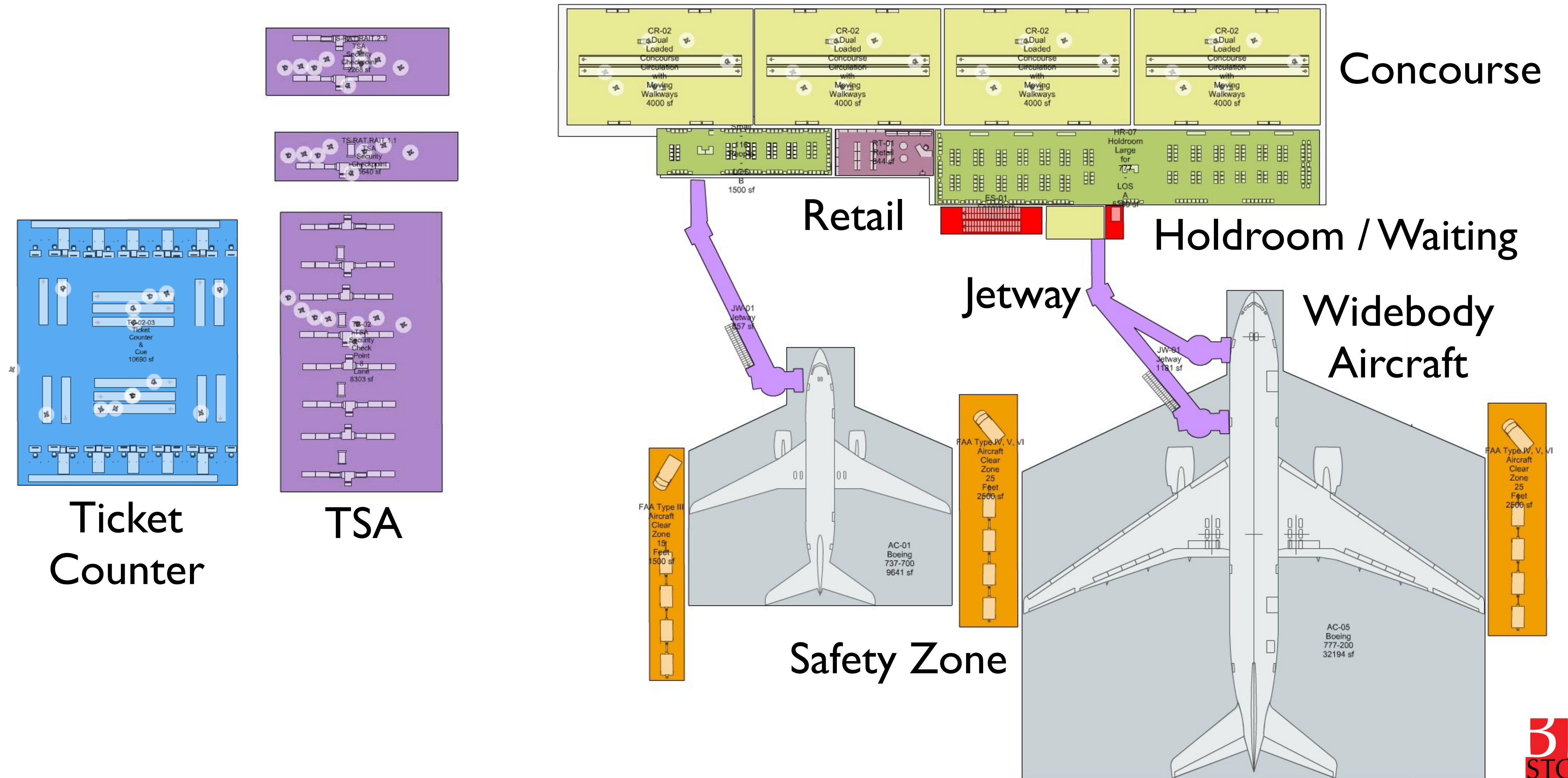


Food / Beverage
Airline Lounge



Holding Rooms
Level of Service I-5

PROGRAM2BIM.com



Federal Asset Leadership Week 2017 + ACC

Conference

42 Projects

10 Minute Exercise

2,373,306 SF

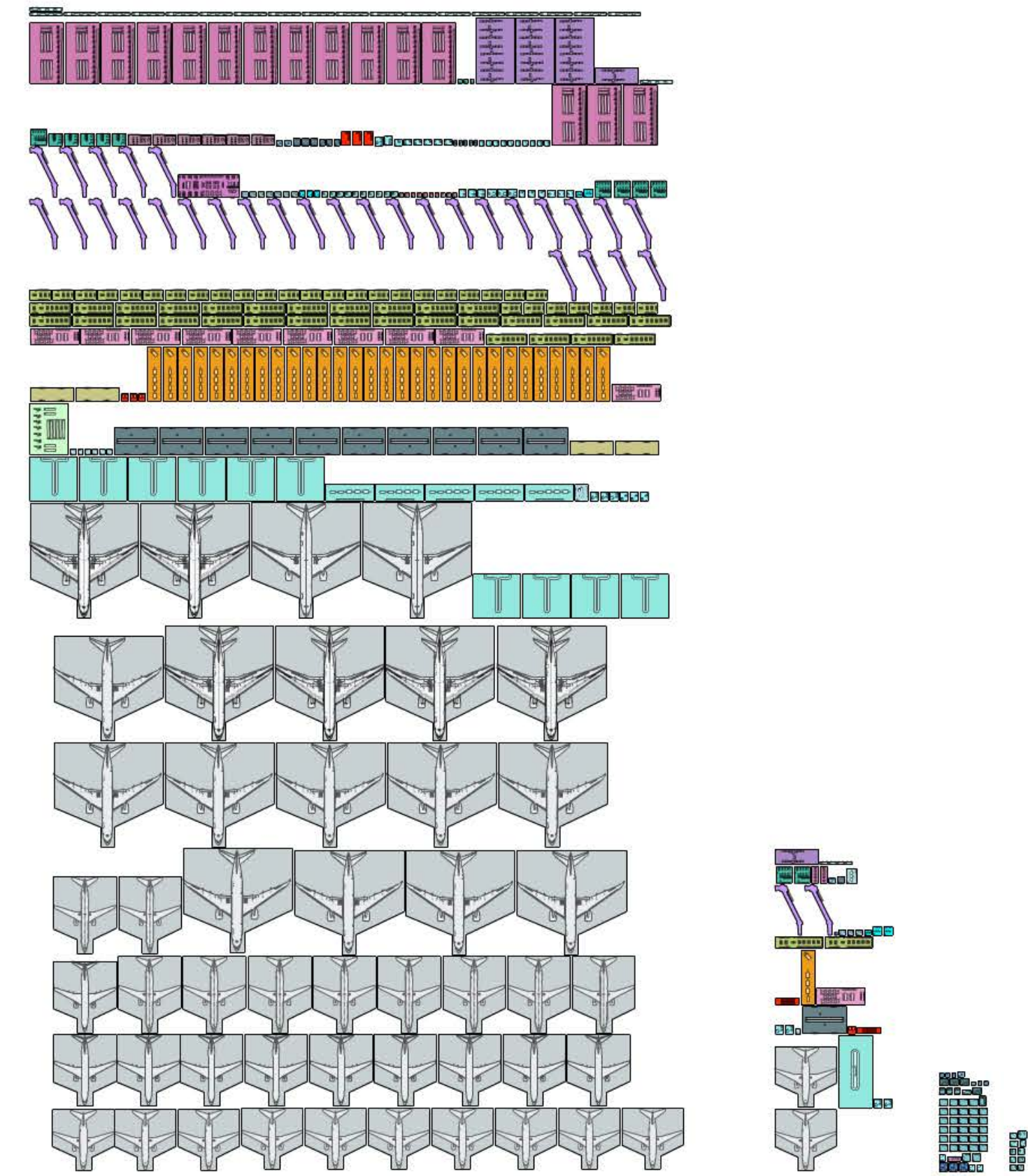
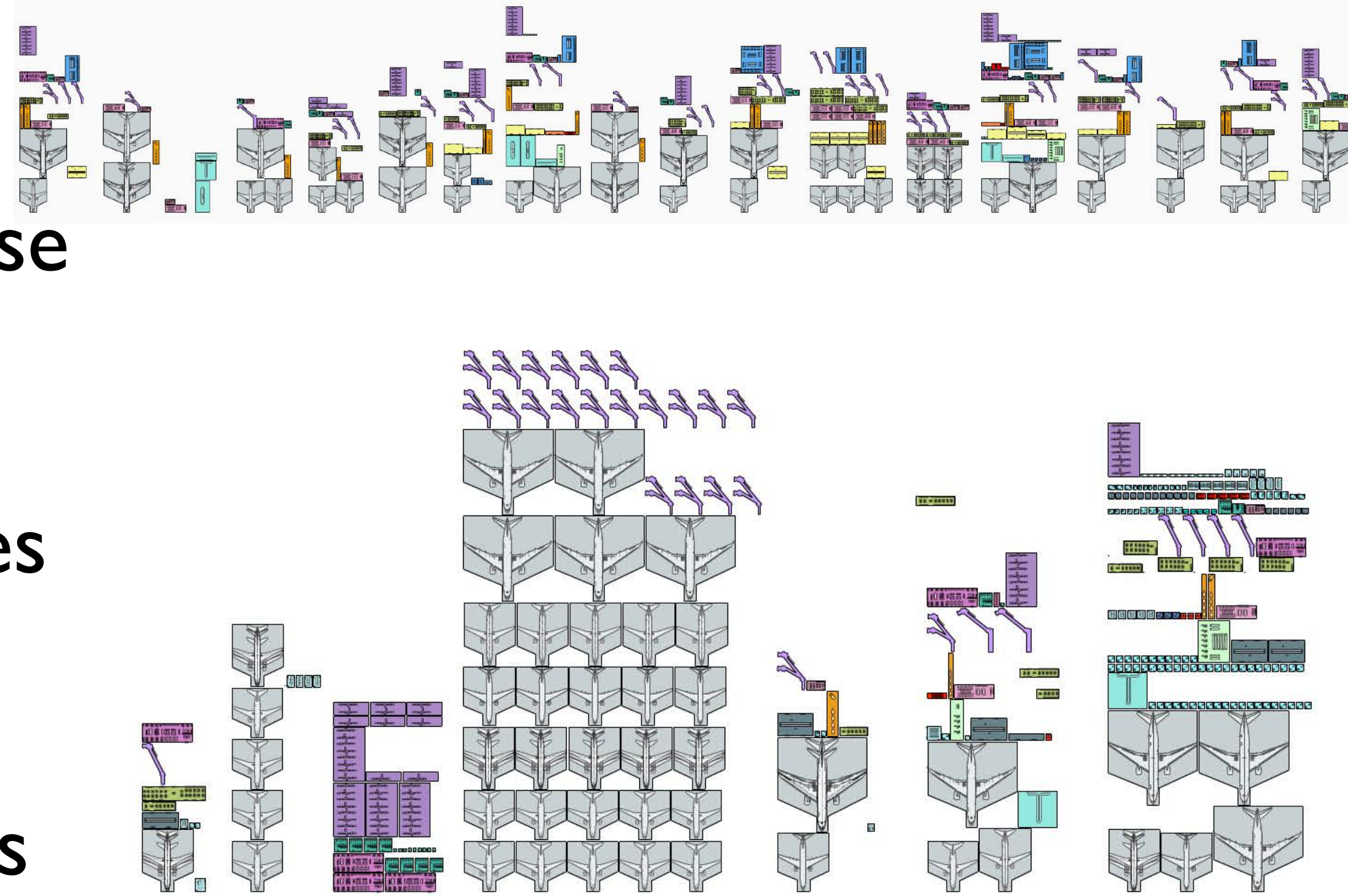
126 Aircraft

81 Jetways / Gates

93 Holdrooms

1,459 Spaces

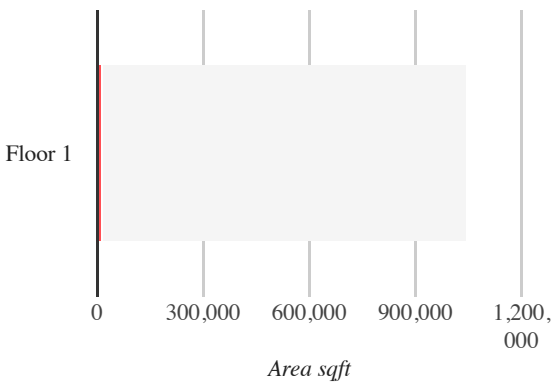
38,953 FFE Assets



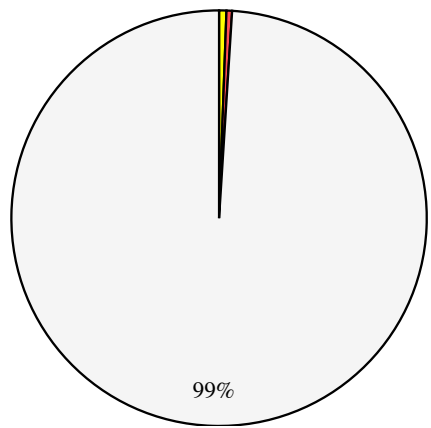
Compare Buildings		Back
Site Information		
Name	ACC Conference Live BIMstorm 13 - ALN Live Planning 11.14 from Audience Layout	
Scheme ID	(S177_554)	
Gallery Link	BIM Gallery	
Site Area	101.69 Acres	
Building Information		
Building ID	(B177_867)	
Building Name	Building 1	
Image	<div><div><div>Browse...</div></div><div>No file selected. Upload</div></div>	
Live Link	Building in Onuma System	
Building Number	TBD	
Total Estimated Building Cost	\$1,028,448,523	
Building Areas		
# of Floors	1	
Net Calculated (=modelled spaces)	1,044,924 sqft	
Gross Calculated	1,462,893 sqft	
Building Occupancy		
Capacity (aggregated from space attributes)	247	
Occupancy (aggregated from space attributes)	191	
Utilities Summary		
Electricity Use(kWh / Year)	27,648,681	
Energy Use (kBtu/Year)	131,660,384	
Steam (MLB/Year)	29,258	
Water (Gal/Year)	29,257,863	
Natural Gas (CUFT/Year)	731,447	
Waste Water (Gal/Year)	21,943,397	
Solid Waste (Lbs/Year)	131,660	
O & M Cost Summary		
Custodial	\$3,613,346	
Energy	\$4,169,245	
Grounds	\$365,723	
M&R	\$4,154,617	
Management	\$3,496,315	
Pest Control	\$190,176	
Refuse	\$117,031	
Road Clearance	\$14,629	
Security	\$716,818	
Telecom	\$365,723	

☐ Exclude areas set to "None"

Space Utilization



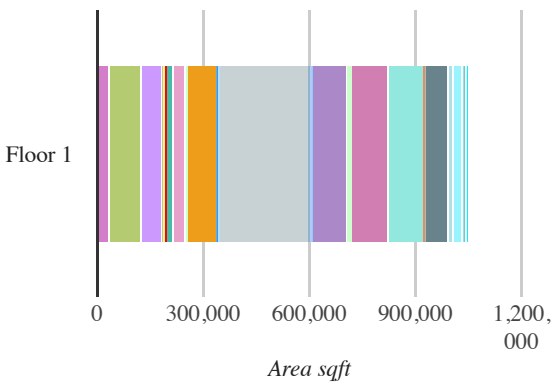
Space Utilization



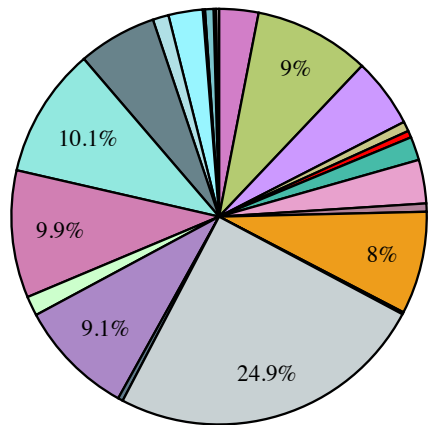
- Occupied
- >120%
- (None)

[Enlarge](#)

Departments



Departments

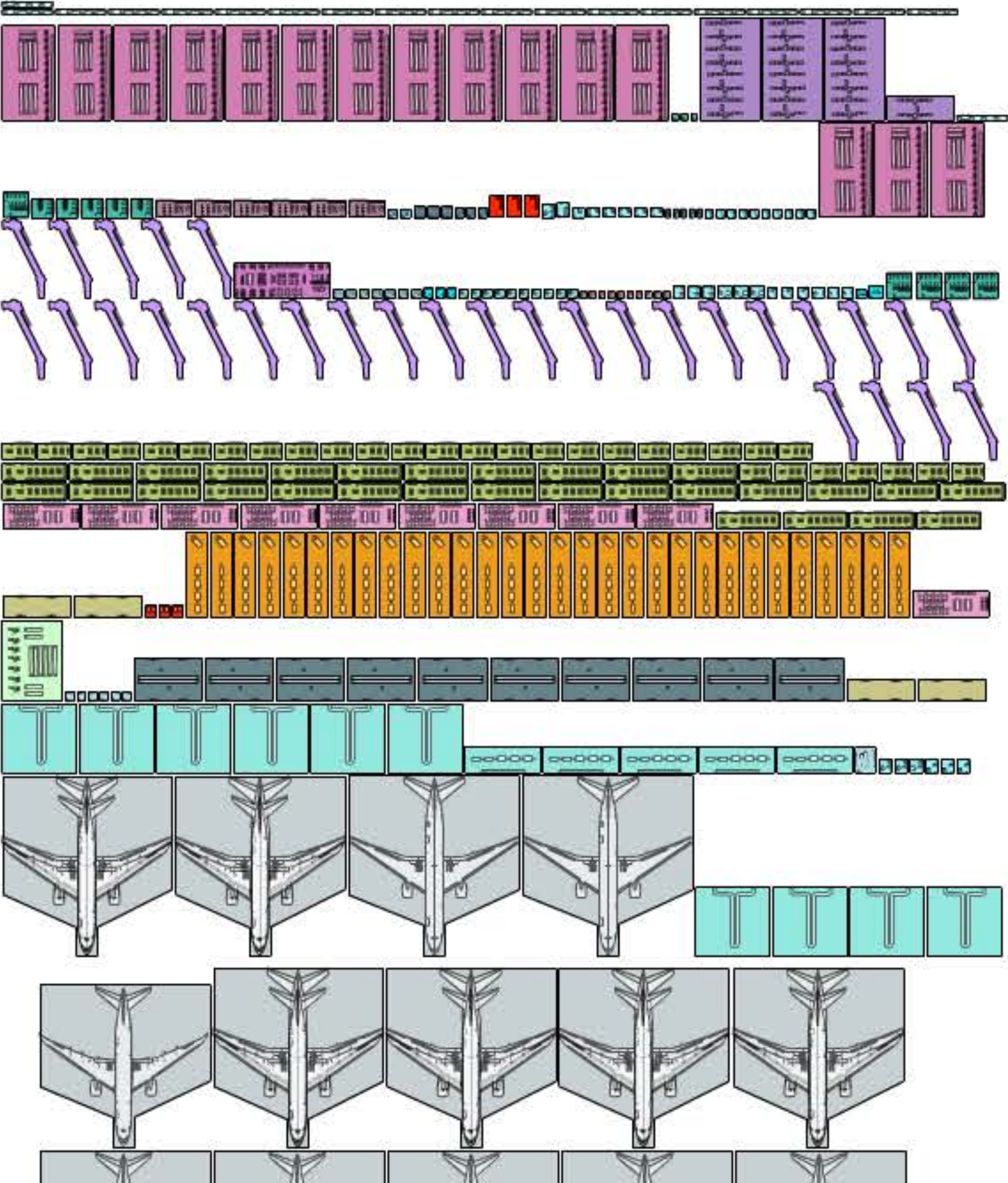


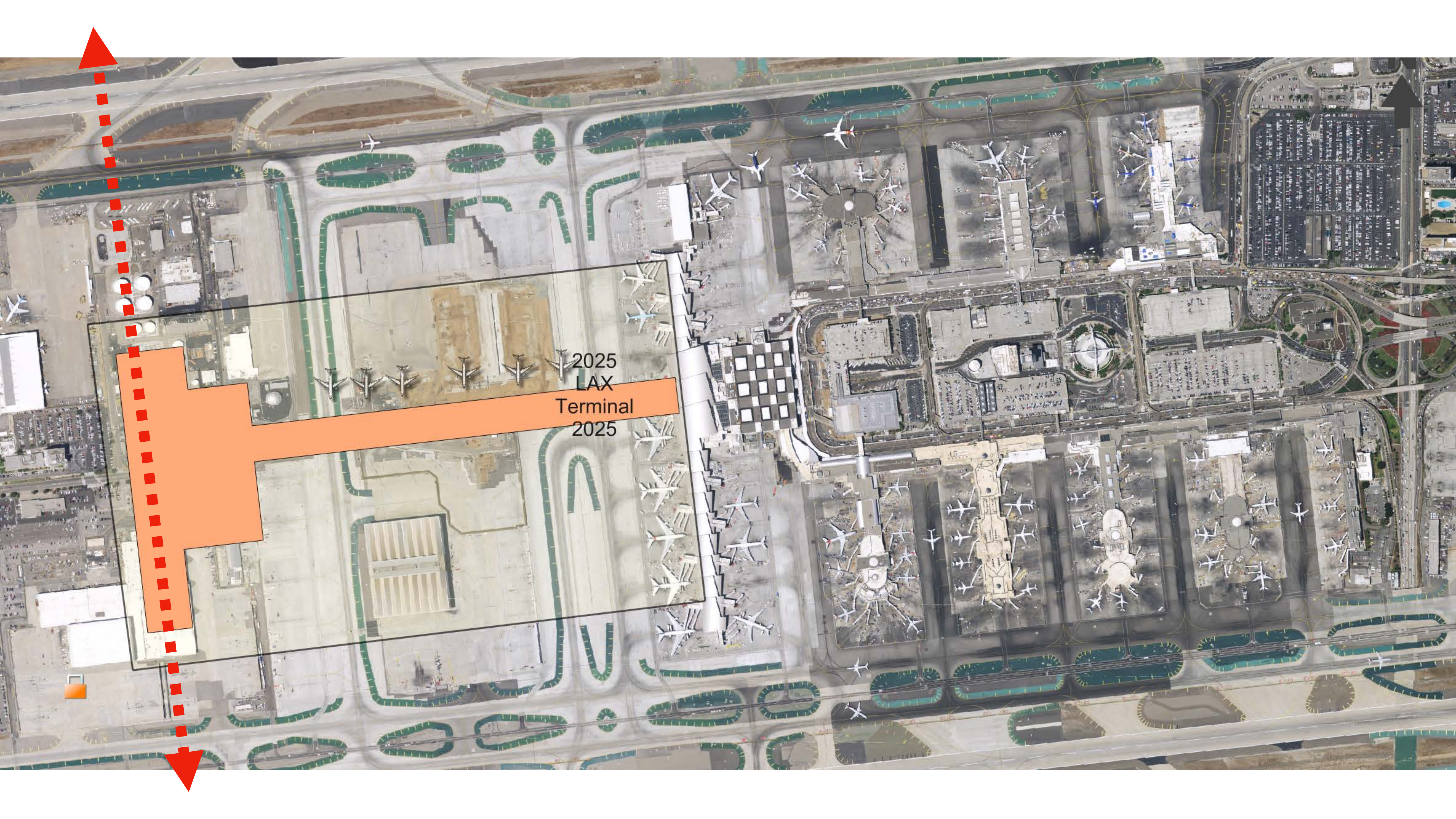
- Airline Club
- Departure Lounge
- Jetway
- Circulation Pre-Se...
- Vertical Circulation
- Restrooms
- Food Service
- Retail
- Aircraft Maintena...
- Flight and Cabin...

[1/3](#) [Enlarge](#)

\$1,028,448,523

Electricity Use(kWh / Year) 27,648,681
Energy Use (kBtu/Year) 131,660,384
Steam (MLB/Year) 29,258
Water (Gal/Year) 29,257,863
Natural Gas (CUFT/Year) 731,447
Waste Water (Gal/Year) 21,943,397
Solid Waste (Lbs/Year) 131,660





2025
LAX
Terminal
2025



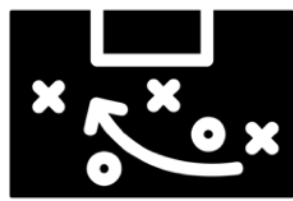
Risk



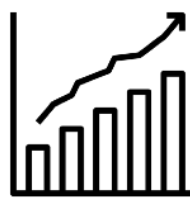
Assets



Time



Strategy



Performance



Budget



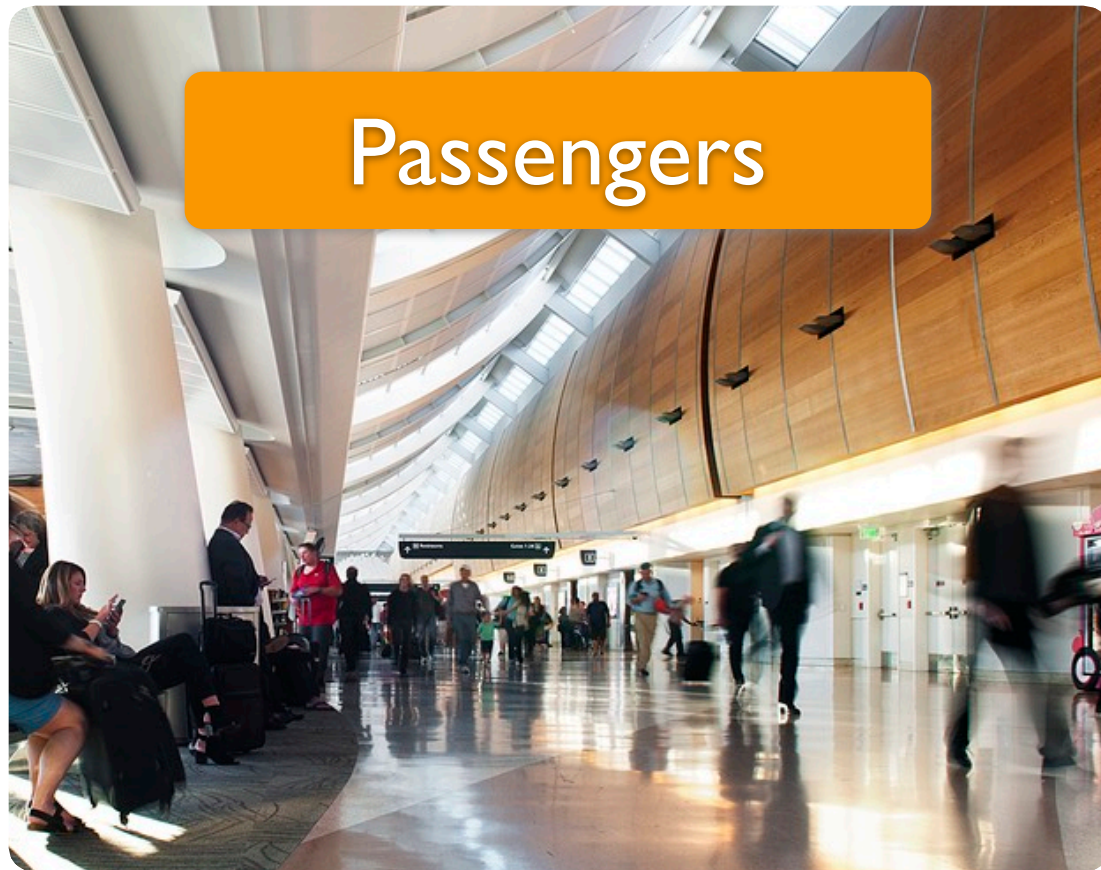
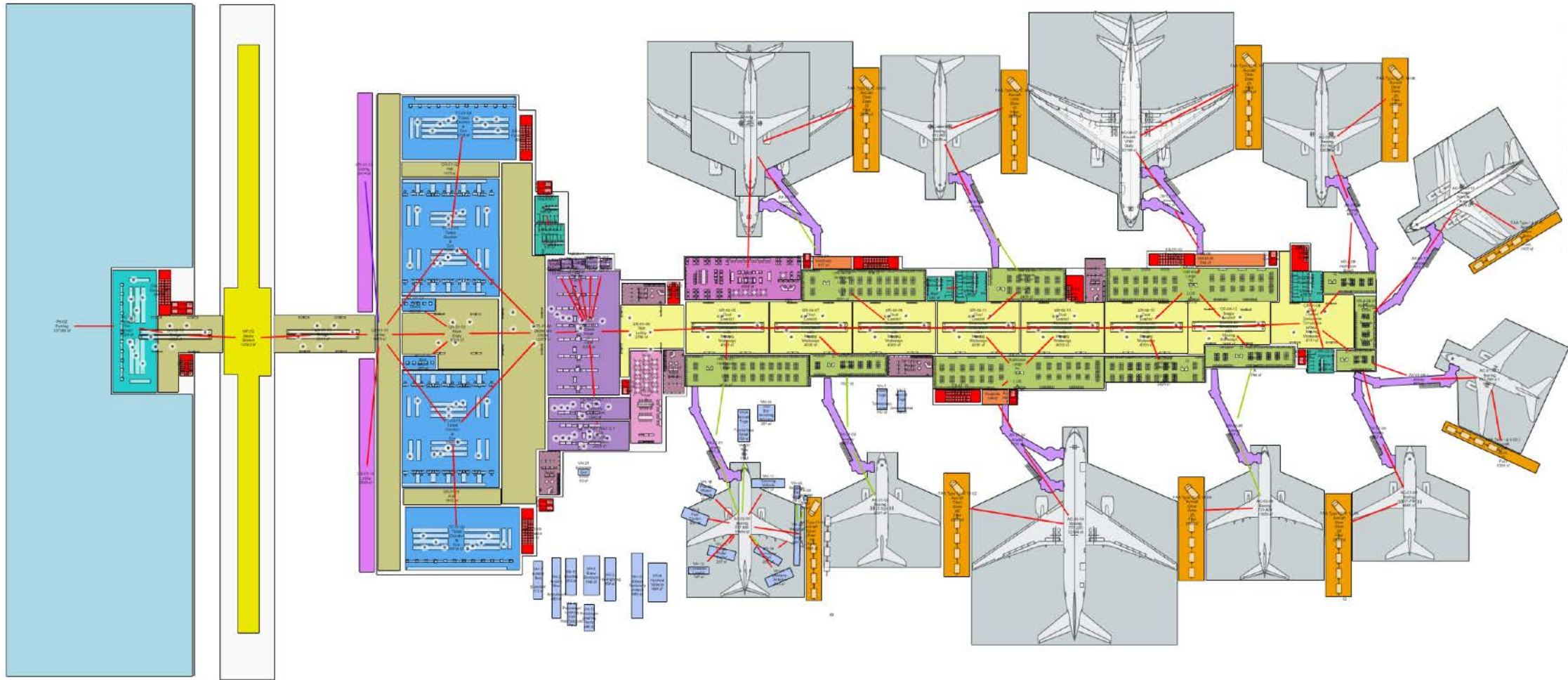
Rules



Arrivals



Departures



Aviation Platform



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Session WE2A: Using Technology to Move the Industry Forward

Stephen Hagan, FAIA, CEO, Hagan Technologies @SHaganFAIA

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January 10, 2018





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