



National Institute of
BUILDING SCIENCES™

The Intersection of Artificial Intelligence & Building Sciences

A New Era of Intelligent Infrastructure

NATIONAL INSTITUTE OF BUILDING SCIENCES

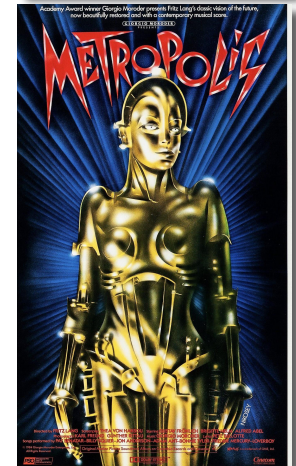
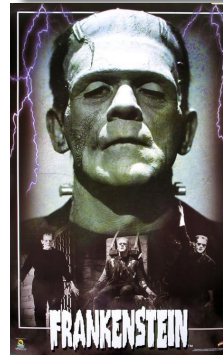
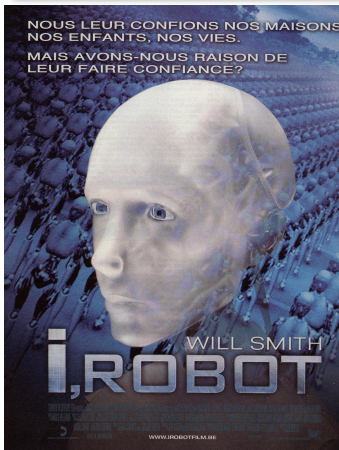
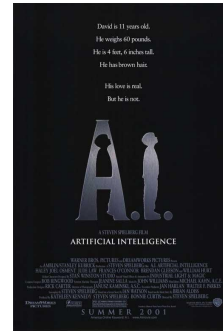
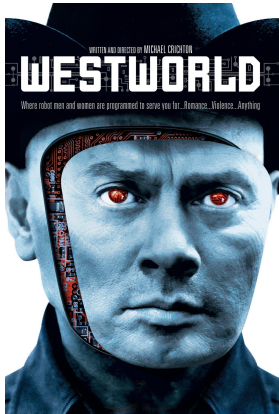
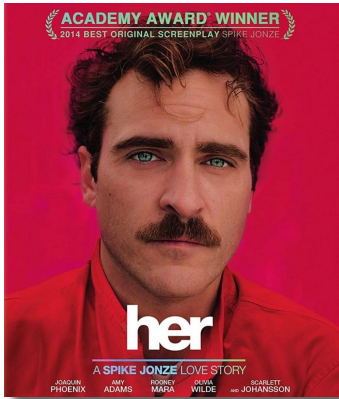
ONUMA Inc.

September 6, 2023

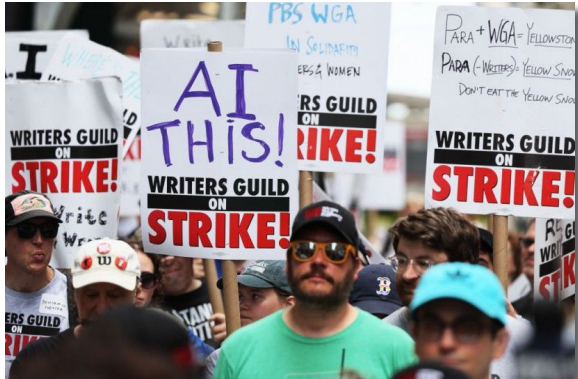
National Institute of Building Sciences



What is Artificial Intelligence and Why Should I Care? Ai and Media



What is Artificial Intelligence and Why Should I Care? Ai and Media



The ChatGPT Lawyer Explains Himself

In a cringe-inducing court hearing, a lawyer who relied on A.I. to craft a motion full of made-up case law said he "did not comprehend" that the chat bot could lead him astray.

Give this article



Steven A. Schwartz told a judge considering sanctions that the episode had been "deeply embarrassing." Jeffrey Szust for The New York Times

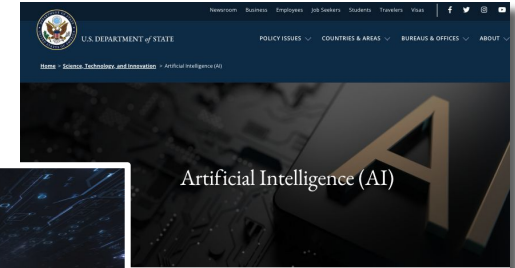


Will architects really lose their jobs?



**Smaller firms will benefit...
Larger firms will benefit...
Many views...**

"A survey conducted by design technology firm RevitGods found that 55% of US architects are "moderately concerned" about being replaced by AI in the future, with a further 20% "very concerned"

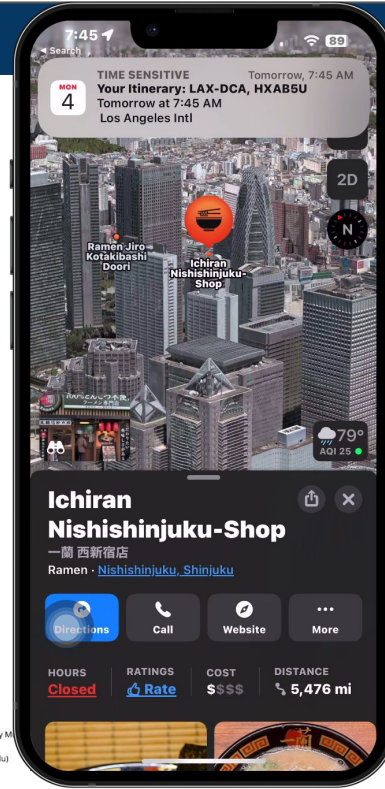
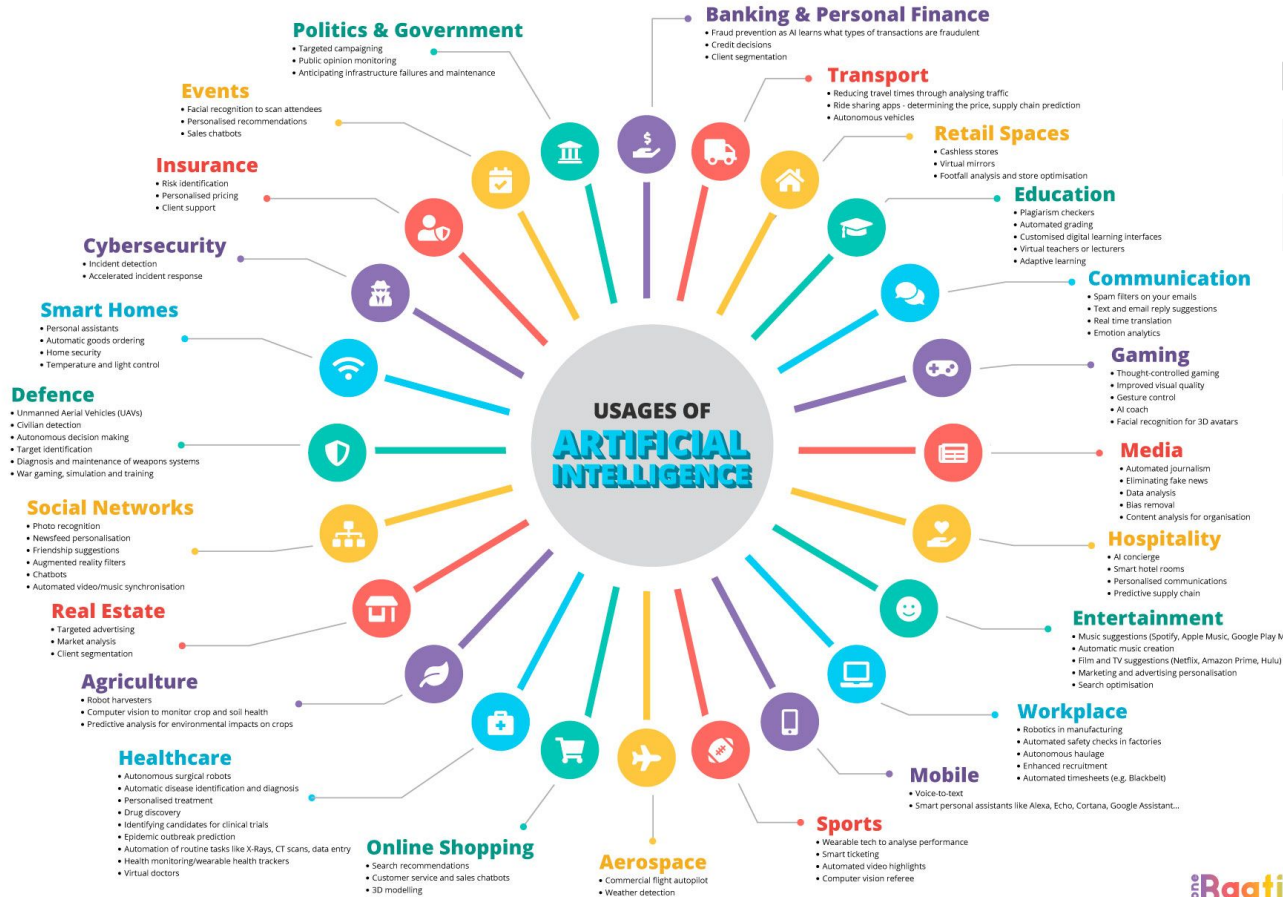


NATIONAL ACADEMIES Sciences Engineering Medicine About Us Events Our Work Publications

Artificial Intelligence and Machine Learning to Accelerate Translational Research



Ai is Being Used in our Everyday Lives



PRESENTERS



Roger Grant
Vice President,
Building Technology
Industry Standards Expert
National Institute of
Building Sciences



Jay Kline
BIM Program Manager
National Institute of
Building Sciences
U.S. Department of State
Bureau of Overseas Buildings
Operations



Kimon Onuma
FAIA
Architect
Onuma, Inc. /
BIMStorm.com



Artificial Intelligence
“AI”

OUR AREAS OF IMPACT

NATIONAL INSTITUTE OF BUILDING SCIENCES

NIBS represents an industry that has more than 733,000 employers* and creates over 7.56 million** construction jobs, as of December 2021. Each year, the industry creates nearly \$1.4 trillion worth of structures.

*<https://www.bls.gov/iag/tgs/iag23.htm>

**<https://www.agc.org/learn/construction-data>



Industry Leadership and Advocacy



Security and Disaster Preparedness



Facility Performance and Sustainability



Information Resources and Technology

INDUSTRY CHALLENGES DRIVING NIBS NATIONAL BIM PROGRAM

13-21%

Increased Efficiency

Estimated savings via increased efficiencies in design and construction assembly in the next 10 years (Boston Consulting Group)

15%

Construction Cost

Potential public construction cost savings (UK Government Construction Strategy)

41%

Diminishing Workforce

Portion of the U.S. labor force will retire by 2031, diversify through industrialized construction processes driven by digital automation (McKinsey)

60%

Construction Productivity

long-term increased construction productivity through design-to-manufacturing processes supported by digital information (McKinsey)

100%

AECO Profitability

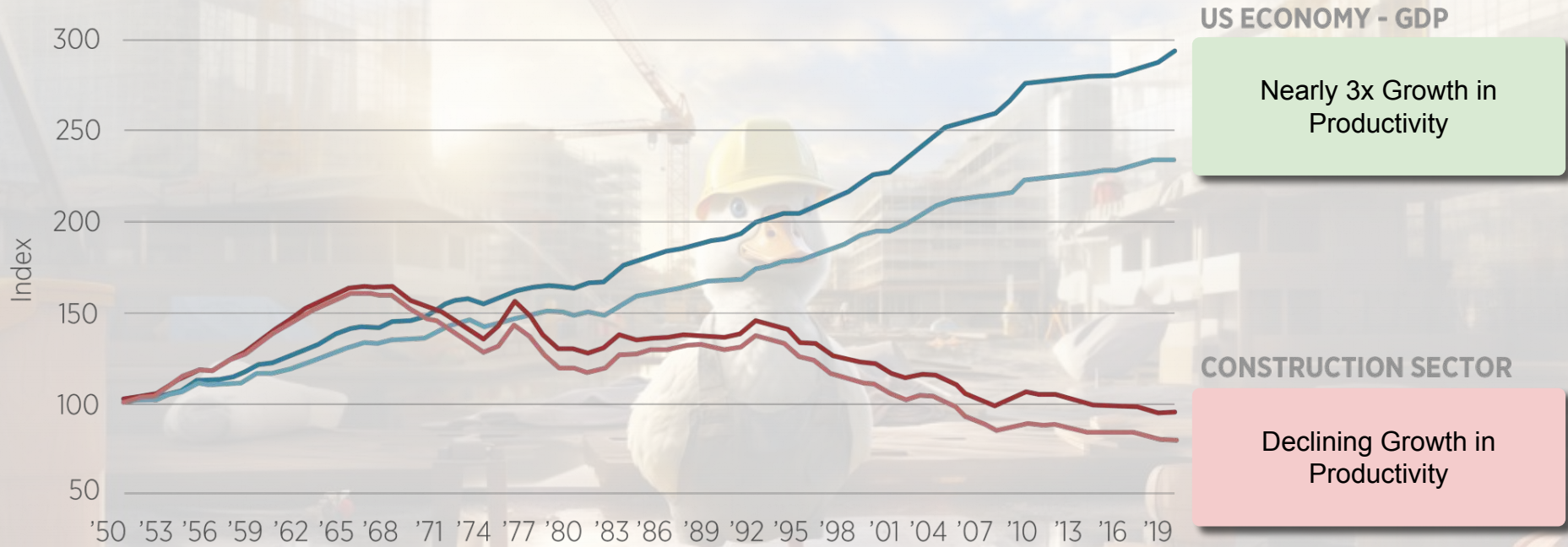
Proposed potential increase in profits for AECO players (McKinsey)

50-52%

Greenhouse Gas/ Carbon

Reduce Greenhouse Gas emissions from 2005 by 2030. (Executive Order 14057 and IRA)

Indexes of Value Added Per Full-Time-Equivalent (FTE) Worker and Total Factor Productivity (TFP), Overall US Economy and Construction Sector (BEA Data)

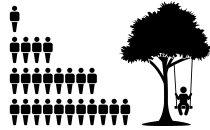


Note: This figure shows indexes of US construction sector labor productivity and total factor productivity (TFP) from 1950 to 2020. For comparison, it also plots the same indexes for the overall economy. Throughout the 1950s and well into the 1960s, both measures of construction sector productivity grew steadily. Indeed, they outpaced their whole-economy counterparts during that period. By 1970, however, the construction sector's labor productivity and TFP had both begun to fall. This downturn was not temporary; the decline has continued for the past half-century.

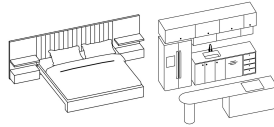
Many Locations



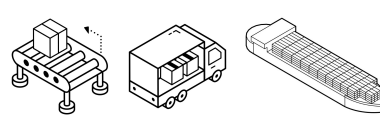
Many Natural Systems



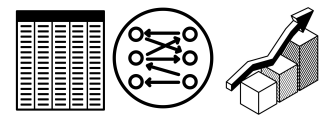
Many Spaces



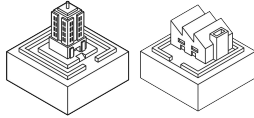
Many Supply Chains



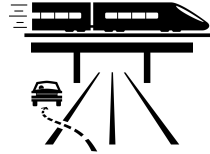
Many Datasets



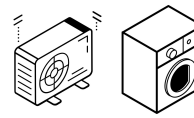
Many Verticals



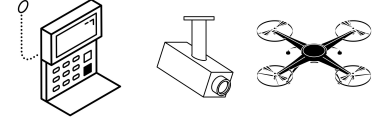
Many Horizontals



Many Assets



Many Artificial Dynamic Systems



Many Stakeholders



National Institute of Building Sciences
BUILDING INNOVATION
Conference







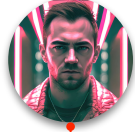




September 6, 2023

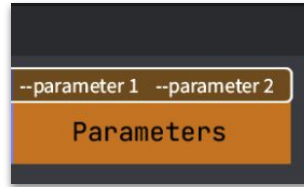
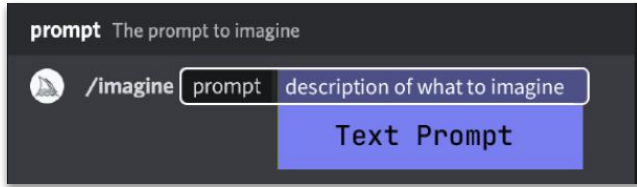
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Audience Participation #2: You can chat with AI: 4 min.



Jay: Guide about prompts, now we show you.

1 Min



Imagine: A living room on the 20th floor in Tokyo. A large balcony is to the left with views to the water and city beyond.

--Minimalist modern design. Render a hyper-real image.



Types In prompts into Midjourney, show result

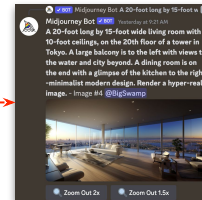


While this renders, get suggested prompts from audience. 2 prompts.



Audience Input

Types In prompts



Show results live

Is Wave 3 suffering a Solow Paradox 2.0?

Digitization everywhere but uneven across sectors

Relatively low digitization  Relatively high digitization

● Digital leaders within relatively un-digitized sectors

2015 or latest available US data

Sector	Assets			Usage				Labor			GDP share %	Employment share %	Real productivity growth, 2005–15 %
	Overall digitization ¹	Digital spending	Digital asset stock	Trans- actions	Inter- actions	Business processes	Market making	Digital spending on workers	Digital capital deepening	Digitization of work			
ICT	Green	Green	Green	Green	Green	Green	Green	Green	Green	Green	6	3	4.4
Media	Green	Green	Green	Green	Green	Green	Green	Green	Green	Green	2	1	4.5
Professional services	Green	Green	Green	Orange	Green	Green	Green	Green	Green	Green	8	6	-0.4
Finance and insurance	Green	Green	Green	Green	Green	Green	Green	Green	Green	Green	7	4	0.8
Wholesale trade	Green	Green	Green	Green	Green	Green	Green	Green	Green	Green	6	4	0.6
Advanced manufacturing	Green	Green	Green	Green	Green	Green	Green	Green	Green	Green	3	2	1.7
Oil and gas	Green	Red	Red	Green	Green	Green	Red	Green	Green	Green	1	0.2	2.0
Utilities	Green	Red	Red	Green	Green	Green	Green	Green	Green	Green	2	0.4	-0.1
Chemicals and pharmaceuticals	Red	Red	Red	Green	Green	Green	Red	Green	Green	Green	2	1	1.0
Basic goods manufacturing	Red	Red	Red	Green	Green	Green	Green	Green	Green	Green	6	5	1.0
Mining	Red	Red	Red	Green	Green	Green	Red	Green	Green	Green	1	0.3	-0.6
Real estate	●	Yellow	Red	Green	Green	Green	Green	Green	Green	Green	13	1	1.9
Transportation and warehousing	●	Red	Yellow	Green	Green	Green	Green	Green	Green	Green	3	3	-0.7
Education	●	Green	Red	Green	Green	Green	Red	Green	Green	Green	1	2	-0.6
Retail trade	●	Green	Red	Green	Green	Green	Green	Green	Green	Green	6	11	-0.1
Entertainment and recreation	Red	Red	Red	Green	Green	Green	Green	Green	Green	Green	1	2	0.2
Personal and local services	Red	Red	Red	Green	Green	Green	Green	Green	Green	Green	5	10	0.1
Government	●	Yellow	Yellow	Orange	Orange	Orange	Orange	Yellow	Green	Green	13	15	0.1
Health care	●	Red	Red	Orange	Yellow	Yellow	Yellow	Yellow	Red	Red	7	13	-0.2
Hospitality	●	Red	Red	Orange	Yellow	Yellow	Yellow	Yellow	Red	Red	3	9	-1.3
Construction	Red	Red	Red	Red	Red	Red	Red	Red	Red	Red	4	5	-1.5
Agriculture and hunting	Red	Red	Red	Red	Red	Red	Red	Red	Red	Red	1	1	0.6

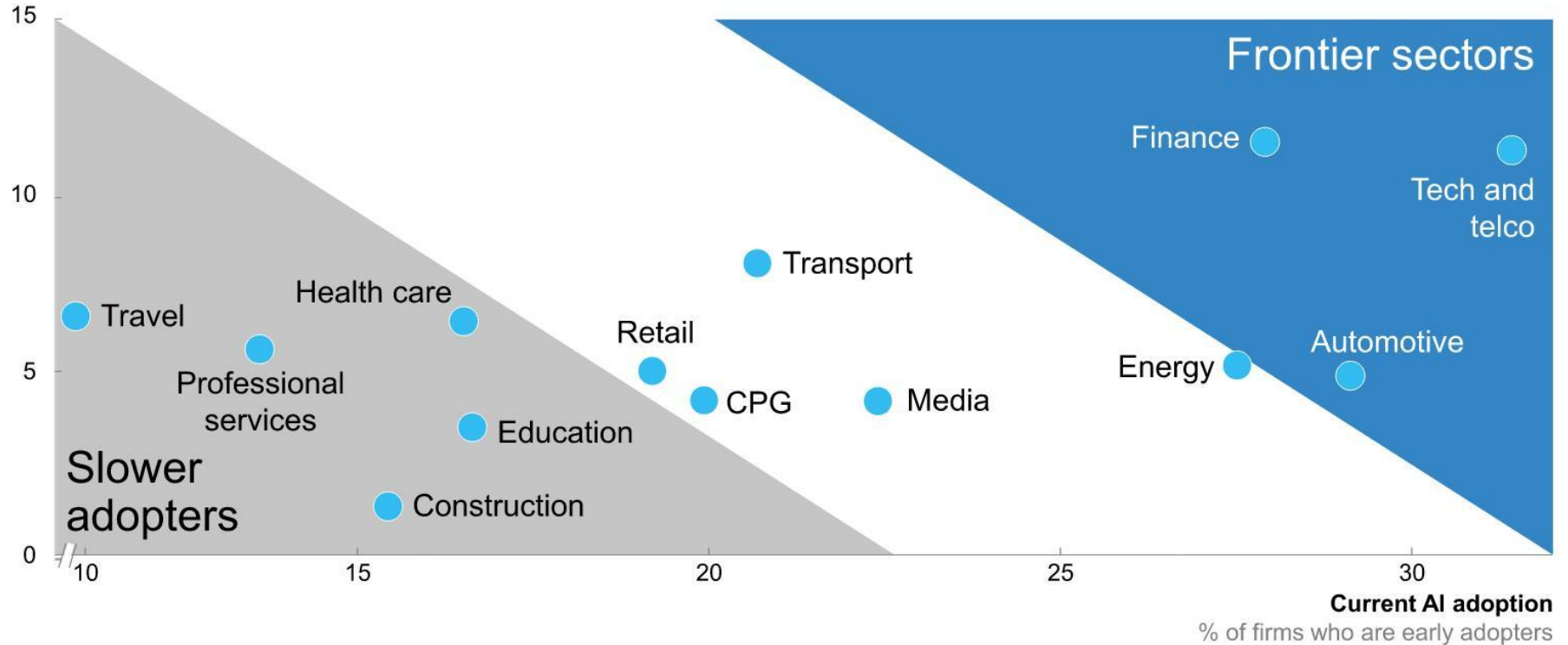
- Knowledge-intensive sectors that represent the digital frontier, well-digitized across most dimensions
- Capital-intensive sectors with significant room to further digitize their physical asset base
- Service sectors with long tail of small firms and opportunities to digitize customer transactions
- B2B sectors with the potential to digitally engage and interact with their customers and users
- Labor-intensive sectors with the potential to provide digital tools and skills to their workforce
- Quasi-public or highly localized service sectors that lag across most dimensions of digitization

SOURCE: BEA; BLS; US Census; IDC; Gartner; McKinsey social technology survey; McKinsey Payments Map; LiveChat customer satisfaction report; Appbrain; US contact center decision-makers guide; eMarketer; Bluewolf; Computer Economics; industry expert interviews; McKinsey Global Institute analysis

Currently AI adoption is uneven across sectors

Future AI demand

% Δ AI spending 2017–20



Result of Midjourney Prompt: About 1 Minute to Generate

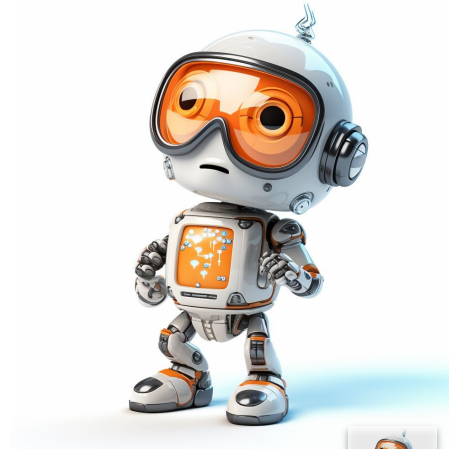


A 20-foot long by 15-foot wide living room with 12-foot ceilings, on the 20th floor of a tower in Tokyo. A large balcony is to the left with views to the water and city beyond. A dining room is on the end.--minimalist modern design. Render a hyper-real image.



What IS AI?

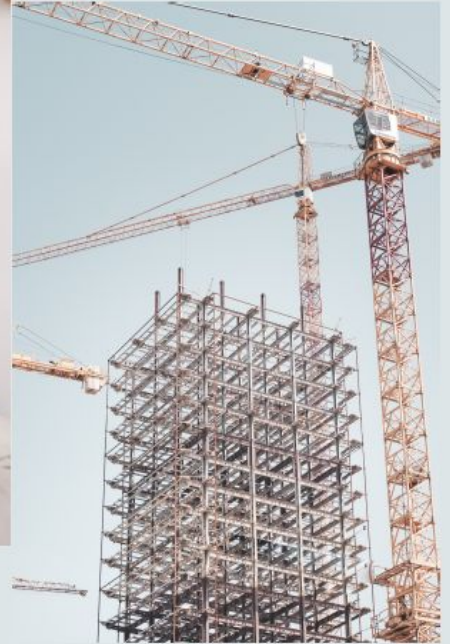




The autonomous engineer

Reduces cost, risk and carbon,

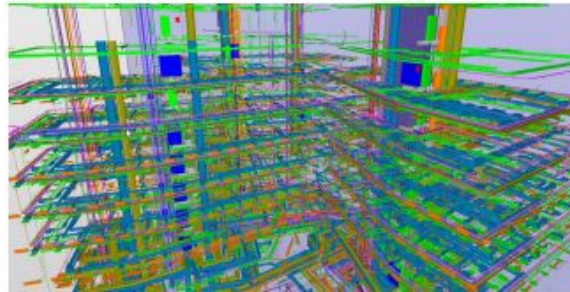
Contribute to a more sustainable real estate industry, use AI and mathematics for optimised design and planning



CONSIGLI

Optimization using AI

Precision



Performance



Materials



CONSIGLI

OPTIMISATION

Plant room

Room size reduction

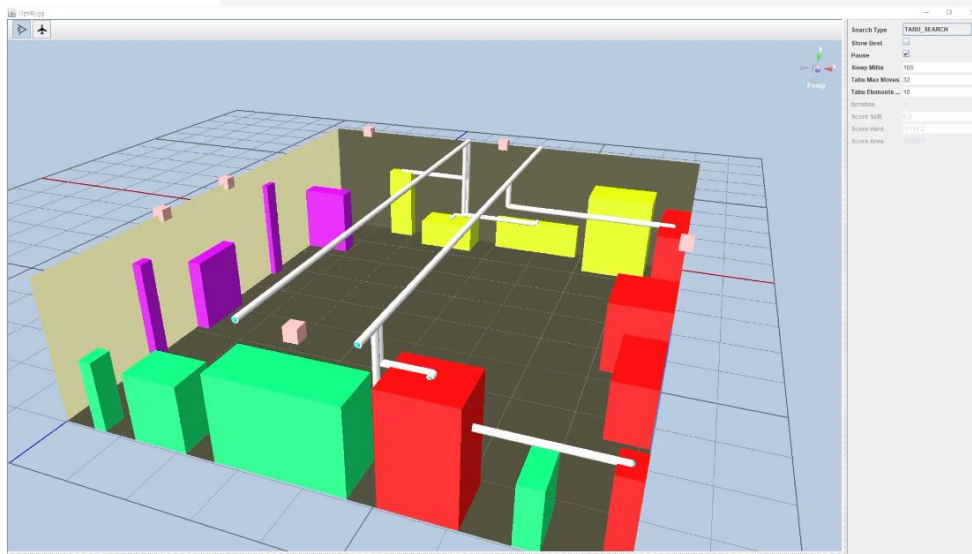
50%

Reduce the space needed for technical installations and get more lettable/sellable space

Reduced embodied carbon

20%

Reduce the amount of materials used in ducts, pipes and electrical installations, and reduce your embodied carbon



Input and Output

Complete tender

Consigli output

3d model with all components

Ventilation zones

Floorplans per discipline (DWG, IFC)

Floorplans cross disciplinary

Shaft sizes

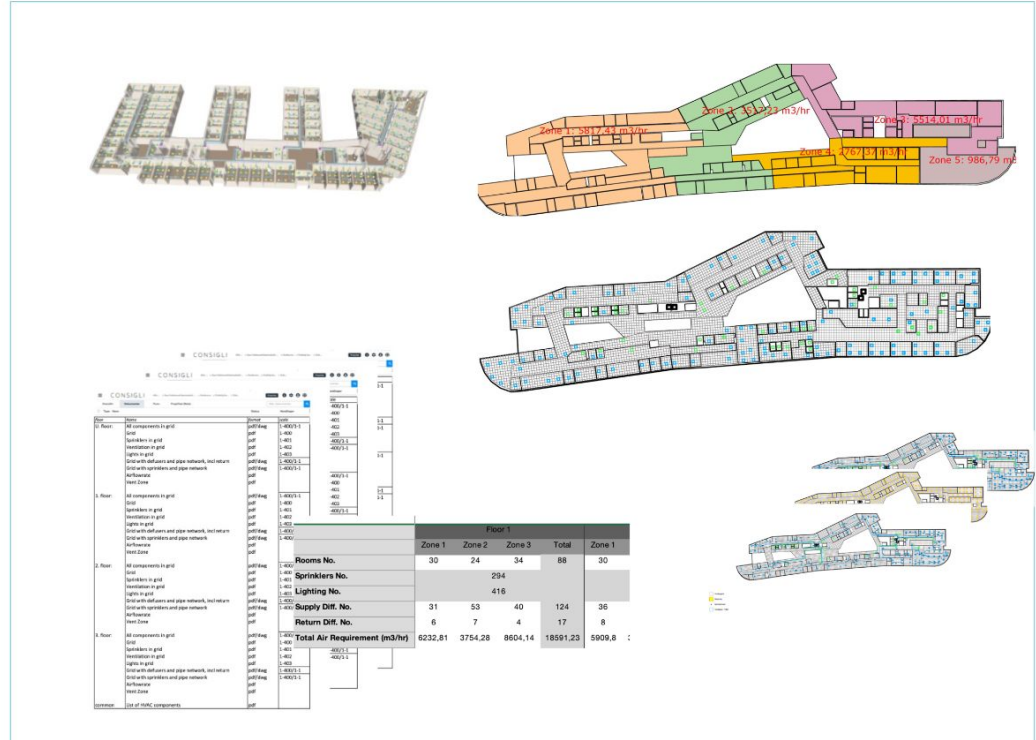
Placeholders for plant rooms

Material/component list

Air flow/pressure drop calculations

Dimension list

Quality assured technical descriptions and tender documents



CONSIGLI



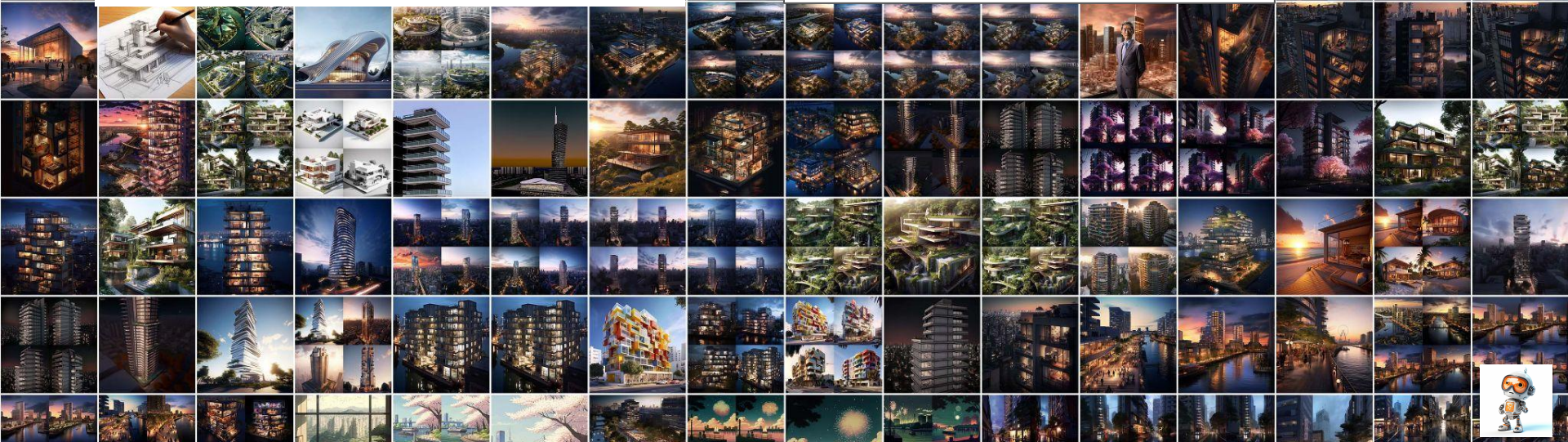


**BIM
STORM**

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ARCHITECTS 0101001
100001011&1010010
110101010MACHINES
000101101110001010
000101101110010010
JOIN 1ONLINE 011JST
5.27.2023 101110AM

AiAIA

AIA Japan



September 6, 2023

National Institute of Building Sciences



Ai Driven by Digital Twins : System of Systems Connected to Each in Simulations of the Physical World

PortsSTORM Solution Suite



VesselSight
Vessel Forecasting & Berthing



BerthSight
Maximize Waterside Performance



YardSight
Optimal Container Stacking



DispatchSight*
Schedule & Route Equipment



EquipmentSight
Failure Prediction



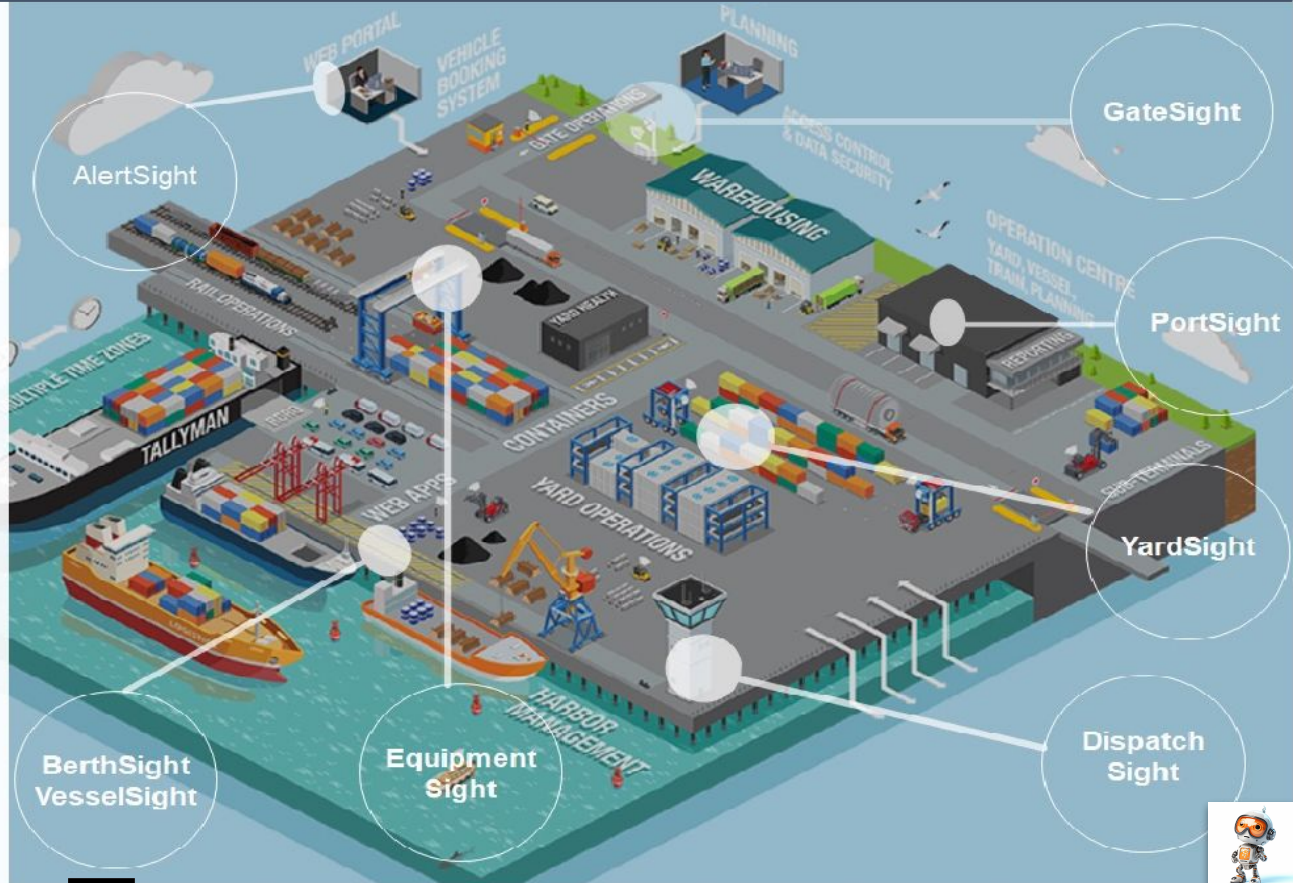
GateSight*
Maximize Landside Performance



PortSight
Terminal Performance



AlertSight
System Health



Digital Twins and Business Processes Connected to Simulations and Governed by Asset Management

GOVERNED BY ASSET MANAGEMENT

Terminal INTEGRATED MANAGEMENT SYSTEM

Diagram explorer

- 1 Terminal INTEGRATED MANAGEMENT SYSTEM (7 child diagrams)
- 1.4 Risk Management (3 child diagrams)
- 1.5 Planning Process (0 child diagrams)
- 1.6 Executing Process (11 child diagrams)
- 1.8 Incident Management (5 child diagrams)
- 1.9 Performance Measurement (3 child diagrams)
- 1.10 Management Review (1 child diagrams)
- 1.11 Corrective and Preventive Actions & Continual Improvement (0 child diagrams)

Business Process Maps for a Container Terminal
Terminal INTEGRATED MANAGEMENT SYSTEM

Terminal Integrated Management System

PLAN

- 1 Terminal Business Plan
- 2 Terminal Policy
- 3 S.A.M.P.
- 4 Risk Management
- 5 Planning Process

DO

- 6 Executing Process

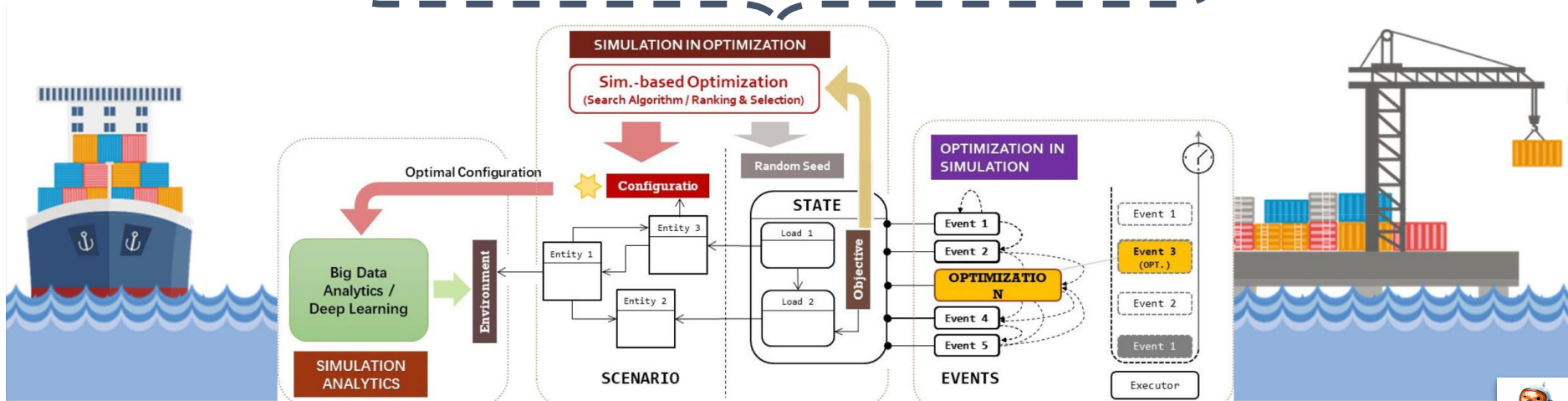
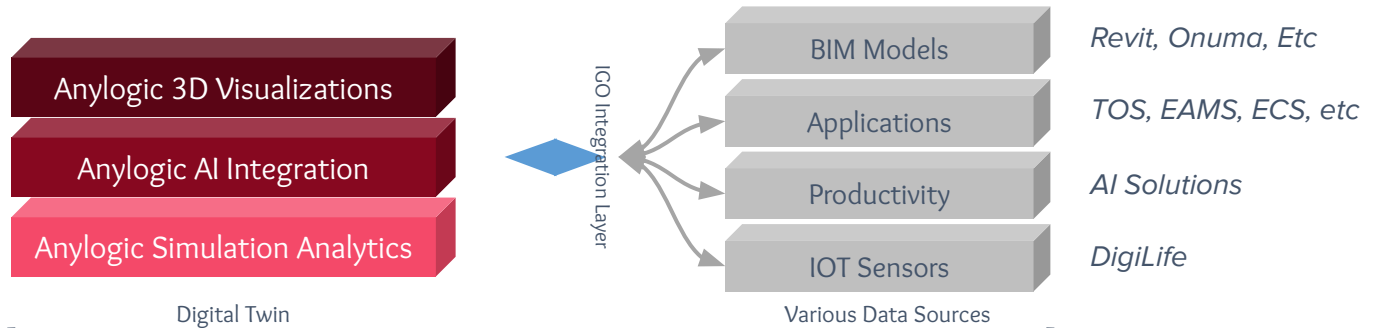
ACT

- 9 Performance Measurement
- 8 Incident Management
- 10 Management Review
- 11 Corrective and Preventive Actions & Continual Improvement
- 16 ACT

Flowchart Details:

- 1 Terminal Business Plan leads to Strategic Objectives.
- Strategic Objectives leads to 2 Terminal Policy and 3 S.A.M.P.
- 2 Terminal Policy and 3 S.A.M.P. lead to 4 Risk Management.
- 4 Risk Management leads to 5 Planning Process.
- 5 Planning Process leads to Plans + Targets.
- Plans + Targets leads to 6 Executing Process.
- 6 Executing Process leads to 18 Has any Incident Occurred?
- 18 Has any Incident Occurred? (Yes) leads to 8 Incident Management.
- 8 Incident Management leads to 9 Performance Measurement.
- 9 Performance Measurement leads to 10 Management Review.
- 10 Management Review leads to 11 Corrective and Preventive Actions & Continual Improvement.
- 11 Corrective and Preventive Actions & Continual Improvement leads to 16 ACT.
- 16 ACT leads to Minutes Management Review + "Action Plan", which feeds back into 2 Terminal Policy and 3 S.A.M.P.
- 16 ACT also leads to 15 CHECK.
- 15 CHECK leads to Analyses Performance Measurements, which feeds back into 4 Risk Management.
- 15 CHECK also leads to 9 Performance Measurement.
- 15 CHECK leads to 18 Has any Incident Occurred? (No).
- 18 Has any Incident Occurred? (No) leads to 6 Executing Process.
- 18 Has any Incident Occurred? (No) also leads to 9 Performance Measurement.

Digital Twins Visualized by Linking the Simulations to the Physical World and Scenarios

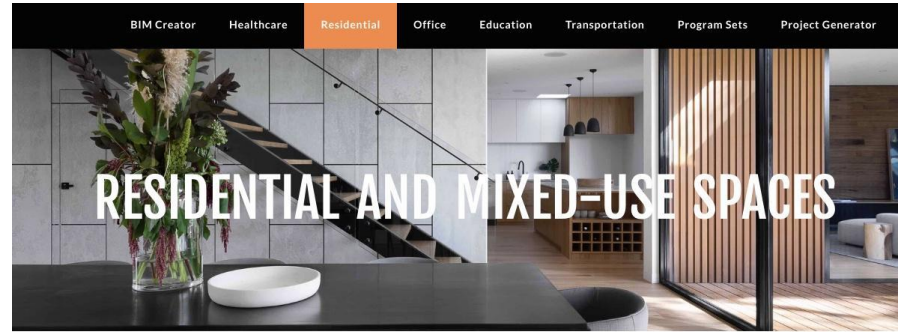


Owner Program Requirements and BIM BEP

SPACE



<https://program2bim.org/residential.html>



Residential and Mixed-Use BIM Room Templates

SEARCH

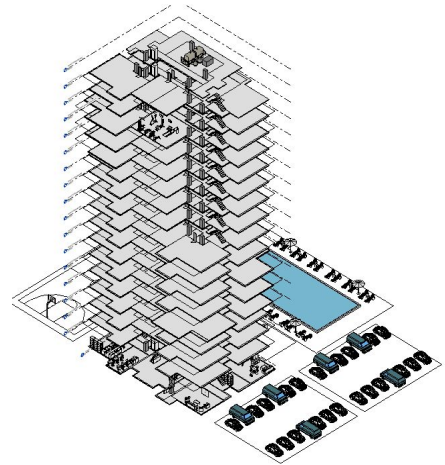
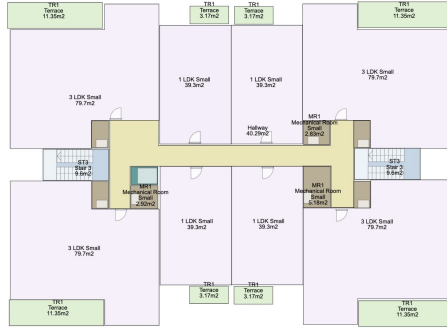
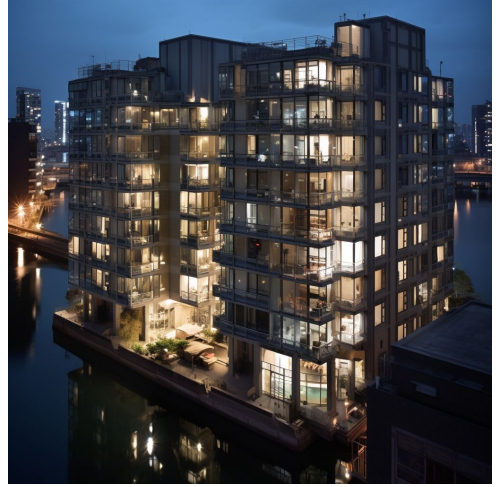
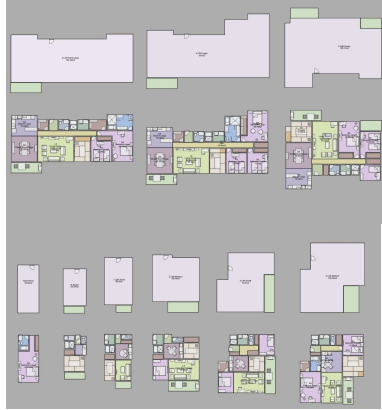
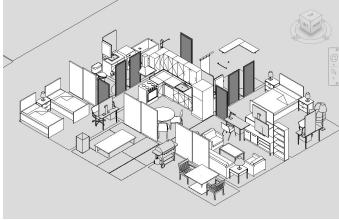
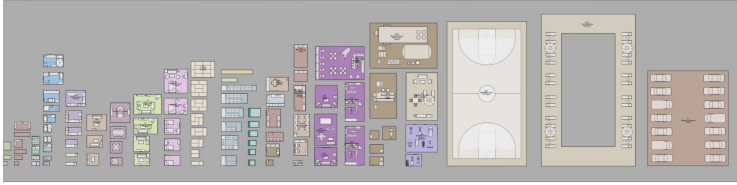
BIM Room Templates for residential and mixed-use projects with furniture and equipment are available here. Choose rooms and add them to your cart to use in BIM applications. The ONUMA System creates dynamic templates that adapt to project-specific requirements and can be customized to meet owner or office standards.

- Living Rooms
- Dining Rooms
- Kitchens
- Bedrooms
- Bathrooms
- Dens
- Japanese Style Rooms
- Laundry Rooms
- Lobby, Lounges
- Exercise and Recreation
- Circulation, Stairs, Elevators
- Janitor, Trash, Mail, Maintenance, Storage
- Offices

↑ TO TOP

🛒 CART

Live Planning Session



PortsStorm: Assets, Rules, and BIM Linked to the PortsStorm Digital Twin and Business Process Models

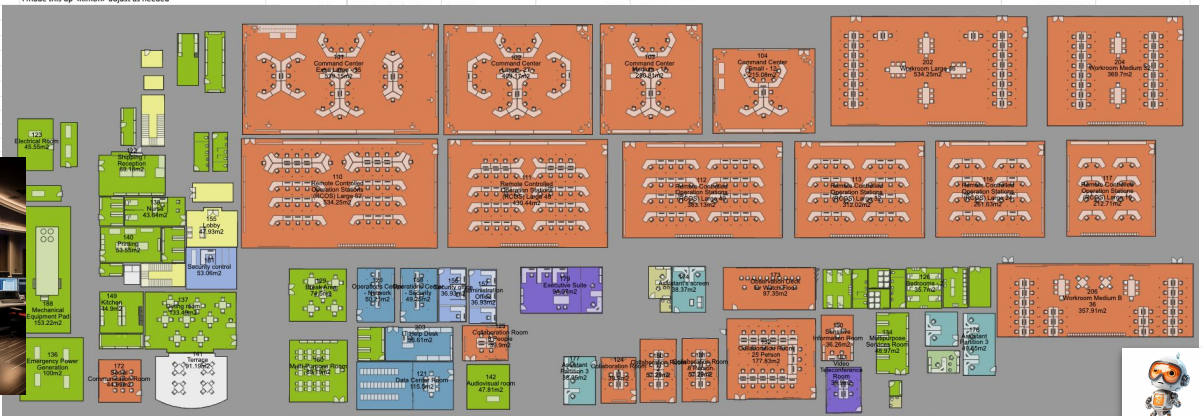
Port Asset Calculator	Edit These Values	Calculations	Workstations / Office Space	Personnel Needed	Building SM	Notes
1 Berth Length (Pull down to select other value)	400					
2 Berth Rule of Thumb per crane	100				Meters	Jon is this an ok first input to recalculate the items below?
3 Ship to Shore Crane (STS)		4			STS Cranes	Is this the correct Rule of thumb?
4 Rubber Tyred Gantry Crane (RTG)	3	12				Jon please confirm, calc, 3 RTG per 1 STS
5 Cargo Ship Length	400					
6 Cargo Ship (400 M)		1			Cargo Ships	
7 Rule of thumb for Yard Storage Per Cargo Ship	1000					I made this up <Kimon> adjust as needed
8 Containers in the Yard		1000				I made this up <Kimon> adjust as needed
9 RCOS Workstations Needed Per STS	1					Jon I see you adjusted this from 3 to 1, thanks
10 RCOS Workstations Needed Per 6 x RTG	2					Jon please confirm, calc, RCOS for STS and RTG total
11 RCOS Total Number of Workstations		6	6			
12 RCOS Number of Shifts per Day	3					I made this up <Kimon> adjust as needed
13 RCOS Maximum Number of Personnel all Shifts				18		I made this up <Kimon> adjust as needed
14 RCOS SM Per Workstation including Circulation	15					I made this up <Kimon> adjust as needed
15 Remote Controlled Operation Stations (RCOS) Total Area SM					90	Terminal Building
16 Command Centre Workstations Needed Regardless of STS	20					Fixed number regardless of STS or RTG, 15-20, using 20 for now
17 Command Center Number of Workstations		20				I made this up <Kimon> adjust as needed
18 Command Center SM Per Workstation including Circulation and Data Wall	20					I made this up <Kimon> adjust as needed
19 Command Centre Total Area					400	Terminal Building
20 Planning Room	1		6			Jon, added planning room with 6 workstations per your email
21 Personnel needed in Yard Per Crane, Includes all shifts	50					I made this up <Kimon> adjust as needed
22 Total Number of Personnel in Yard?				200		
23 Canteen/Rest Area SM Needed Per Employee	2					
24 Maintenance / Repair Workshop SM needed per STS	200				400	
25 Maintenance / Repair Workshop SM needed per RTG					800	
26 Housing Provided for percent of staff	20%					
27 Total Personnel Housing		44				
18 Story Condo for Personnel Offsite					11104	
Total Office Space Needed			32			
Total Personnel all Shifts				218		
Total Building Area Needed						

Program2BIM PortsStorm

File Edit View Insert Format Data Tools Extensions Help

Menus 100% \$ % .0 .00 123 Arial 10 B I A

	A	B	C	D	E	F
	Floor	Space Code	Space Number	Space Name	Area	Quantity
1						
2	Ground Floor	PT68	101	Stair 1	276	1
3	Ground Floor	PT31	102	Elevator	82.49999	1
4	Ground Floor	PT69	103	Stair 2	319.9548	1
5	Ground Floor	PT39	104	Lobby	515.8775	1
6	Ground Floor	PT61	105	Security control	571.1737	1
7	Ground Floor	PT64	106	Shipping / Reception	744.6908	1
8	Ground Floor	PT11	107	Cafe	296.7172	1
9	Ground Floor	PT70	108	Storage area	218.2349	1
10	Ground Floor	PT30	109	Electrical Room	149.1797	1
11	Ground Floor	PT33	110	Emergency Power Generation	1076.391	1



PortsStorm: Ai BIM from Data

Port AI Textbox

This is a space program for room types on a Port Operations Center driven by the number of cargo ships the port supports. The RCOS is the main driver for other spaces based on number of cargo ships. Based on needing to support up to 3 cargo ships create a spreadsheet in this exact format and select the correct RCOS space. Then add some of the other support spaces needed. You can make assumptions since the other rows do not have descriptions yet.

Let's start by reading the provided Excel file to understand

Finished working Show work

The spreadsheet contains the following columns:

- Floor:** The floor on which the space is located.
- Space Code:** A unique code for the space.
- Space Number:** A unique number for the space.
- Space Name:** The name of the space.
- Area:** The area of the space in some unit (e.g., square meter).
- Quantity:** The number of such spaces.
- Description:** A column that mostly contains NaN (no numerical descriptions are not provided).

You mentioned the RCOS space being the main driver and RCOS space based on the requirement of supporting up to any RCOS spaces in the data.

Finished working Show work

From the data, we have various Remote Controlled Operations sizes, each designed to support a different number of cargo requirement to support up to 3 cargo ships, we should select "Supports up to 3 Cargo Ships".

Now, I'll create a new spreadsheet with the selected RCOS the other support spaces. However, since the other rows do make assumptions on which ones to add.

Finished working Show work

I have selected the RCOS space that supports up to 3 cargo spaces from the original data as other support spaces.

Now, I'll save this data to a new Excel spreadsheet for you.

Finished working Show work

I've saved the data to a new Excel spreadsheet. You can do

Let me know if there's anything else you'd like assistance with

PortAITemplateV3.xlsx

This is a template of space types for architectural program to design a Port Terminal building. The main driver is the number of cargo ships the Terminal needs to support, which then changes the number of RCOS, Command Centers, and other spaces. Columns F-J indicate the number of spaces shown in each row that are needed to support 1-5 cargo ships. Using this template create a new Excel file in this format, that lists only the spaces needed to support 1 cargo ship. Create a new column called "Space Number" and starting from the first floor, Ground, number the spaces 100,101, 102 etc, Then Floor 2, Services number them 200,201 etc. Then Floor 3 Offices, 301, 302, 303 etc, then Floor 4, Command 401,402, then floor 5 Operations 501,502

Now do the same for four cargo ships

Finished working Show work

I've created the Excel file for four cargo ships with the specified format. You can [download the updated file here.](#)

Now do the same for five cargo ships

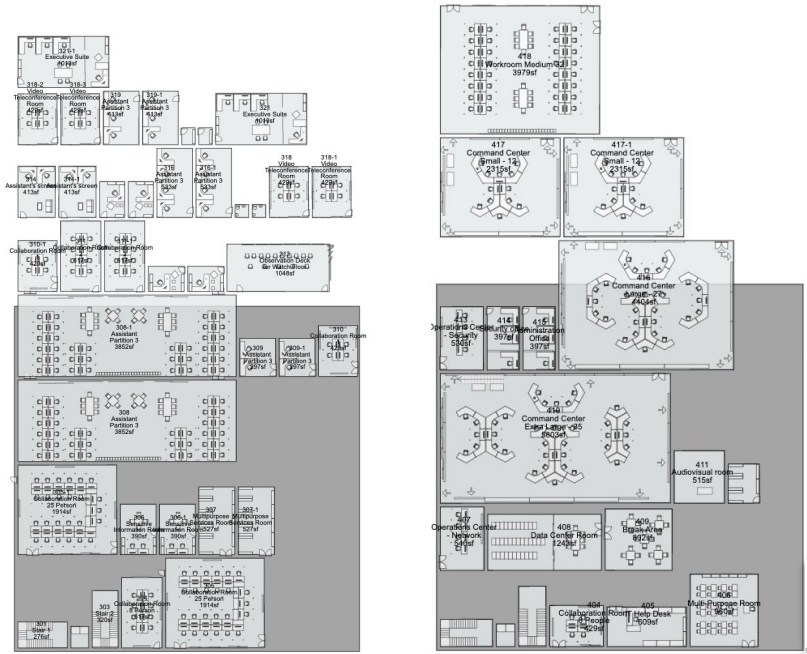
Finished working Show work

I've created the Excel file for five cargo ships with the specified format. You can [download the updated file here.](#)

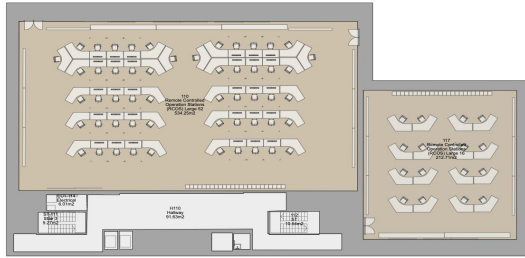
Program2BIM

Kimon Onuma

<input type="checkbox"/>	1 Cargo Ship Terminal					2023-08-14	177_1450
<input type="checkbox"/>	2 Cargo Ship Terminal					2023-08-14	177_1451
<input type="checkbox"/>	3 Cargo Ship Terminal					2023-08-14	177_1452
<input type="checkbox"/>	4 Cargo Ship Terminal					2023-08-14	177_1453
<input type="checkbox"/>	5 Cargo Ship Terminal					2023-08-14	177_1454
<input type="checkbox"/>	Command Center Space Types						



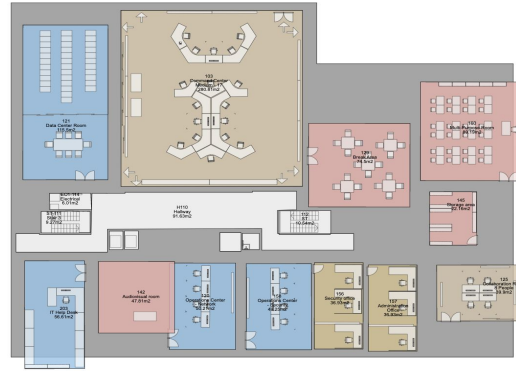
Terminal Building Five Floors



5th Floor RCOS



2nd Floor Canteen & Support



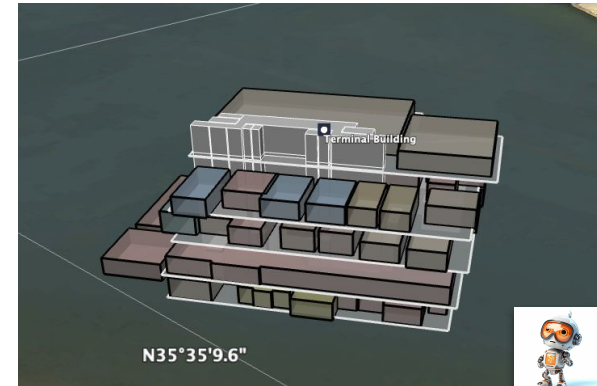
4th Floor Command Center



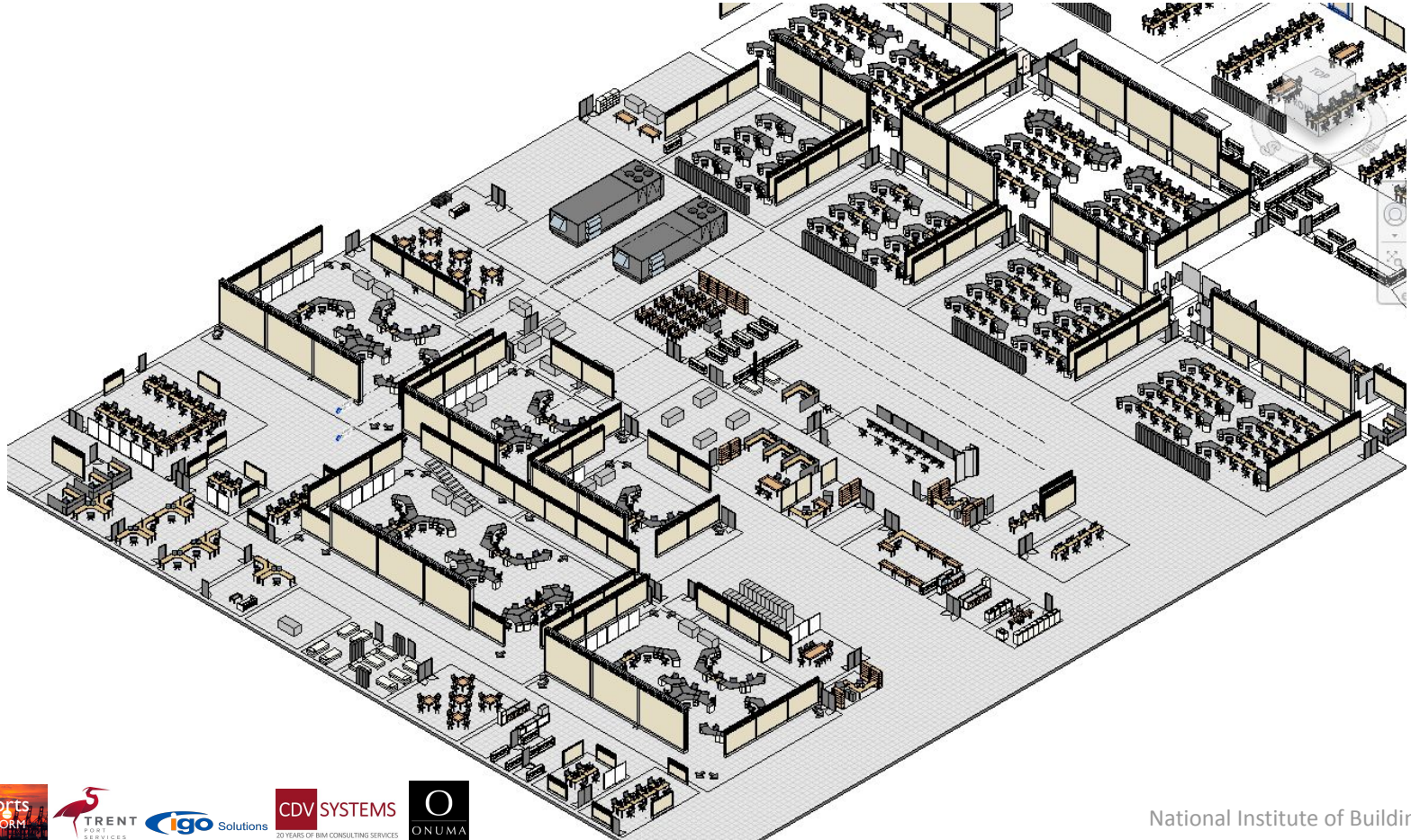
Ground Floor - Support, Security



3rd Floor - Offices



Terminal Building Room Types for any Port X in Revit BIM from ONUMA System Export



Port Command Center on 5th Floor Overlooking the Port





OpenAI ChatGPT 4.0



3 Create an architectural program for design in a table using these room types to account for a population of 5000 customers and extrapolate any additional spaces needed

Sure, here's an example of an architectural program table that accounts for a population of 5000 customers:

Note that this is just an example and the actual architectural program may differ depending on the specific needs and requirements of the clinic. Additionally, the extrapolation of any additional spaces needed would require more information about the specific needs and requirements of the clinic.

Room Type Name	Quantity	Area Per Room (sq ft)	Occupancy (occ)	Total Area (sq ft)	Total Occupancy
Cashier	2	60	1	120	2
Computer Room	4	110	2	440	8
On-Call Room	3	120	3	360	9
Exam, Screening	50	120	2	6000	100
Lobby, Seating Area	1	200	12	200	12
Lockers, Personal Property	2	30	6	60	12
Mechanical Rooms / Electrical Rooms	1	120		120	
Reception	2	120	4	240	8
Staff Lounge	1	120	4	120	4
Storage, Charging, Battery/Equipment	2	170		340	
Storage, Refrigerators, Freestanding	1	60		60	
Storage, Shelving	2	120		240	
Secure Storage, Vault	1	120		120	



Learn this list of assets for a microgrid that can provide power to the field hospital:

Microgrid Specs : 2-Asset List Published

Timestamp	Asset Name	Width	Depth	Height (optimal)	Does this asset consume or produce energy?	Quantity	ID C161	F162
5/23/2022	CURA Healthcare Pod	8	20	80	Consume	1	F102	
5/11/2022	Containerized Solar Microgrid				Produce		F102	
5/11/2022	20kW Microgrid w/ Back-Up 20kW Diesel Genset	8.5	40	10	Produce		F103	
5/11/2022	Palletized Solar Microgrid				Produce	2	F103	
5/11/2022	Port Structure				Produce	2	F103	
5/11/2022	Galvanized Steel Poles	2	7	2	Produce		F104	
5/11/2022	Connectors, Stakes, Ties	3	4	2	Produce	1	F105	
5/11/2022	PowerPack 20 Units				Produce	6	F107	
5/11/2022	20kW Solar Array	12	4	5	Produce	6	F108	
5/11/2022	20W MUE Bunkie	2	1	4	Produce		F109	
5/11/2022	1KW Solar ChargeTarp	4	4	0.5	Produce		F110	
5/17/2022	14kW Tesla Mobile Power Unit	4	4	5	Produce		T101	
5/17/2022	10kW Solar Array	6	4	5	Produce		T103	
5/15/2022	Genset 1 MW (Diesel)	8	40	8.5	Produce		T104	
5/15/2022	Genset 2 MW (Diesel (Large crane operation))	8	40	8.5	Produce		T105	
5/15/2022	Containerized Resistive Load Bank	8	20	8.5	Produce		T106	
5/16/2022	PowerPack Reeler Container MCCG-C500H	8	20	8.5	Produce		T107	
5/16/2022	Energy Storage (est. 105kWh)	8	20	8.5	Produce		T108	
5/16/2022	EV Charging Station with 20 x 15kWh fast charging ports	8	15	8	Produce		T109	
5/15/2022	Genset 1 MW NH3 Ammonia	8	40		Produce		T110	
5/15/2022	Genset 2 MW NH3 Ammonia (Large crane operation)	8	40		Produce		T111	
5/23/2022	40R Containerised Home (basic fit out)	8	40		Consume		T112	
5/23/2022	40R Containerised Office (basic fit out)	8	40		Consume		T50	
5/23/2022	40R Containerised Medical Unit	8	40		Consume	20		



Based on the list of assets for a microgrid, I can suggest a setup for a temporary field hospital. I'll consider the available assets that produce and consume energy and prioritize those that can provide a stable energy supply for the field hospital:

These assets will provide power for the following energy-consuming assets in the field hospital:





A 20-foot long by 15-foot wide living room with 12-foot ceilings, on the 20th floor of a tower in Tokyo. A large balcony is to the left with views to the water and city beyond. A dining room is on the end.--minimalist modern design. Render a hyper-real image.



BIM of Program Requirements, Cost & Energy Estimate

Ai Studies for Top Floors

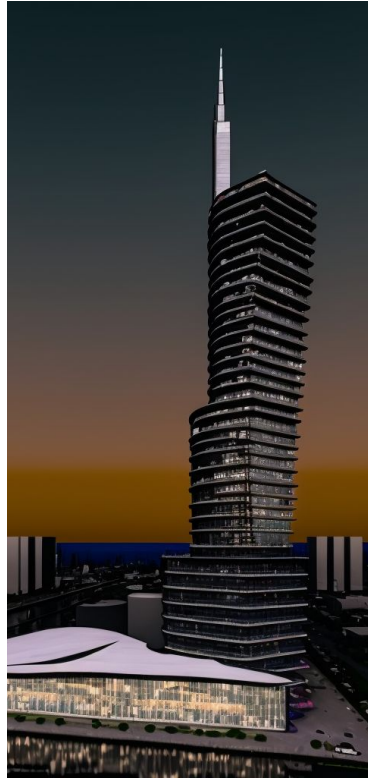
Ai Adjusted Massing Curves + Base

Architectural Prompt: Render the top four floors looking down at city. Night time view into units

\$288,570,110
¥39,387,944,309

Building Name: Retirement Housing 30 Floors

Building Gross Area: 21,901.66 m²
Energy Generated kW: [Energy Generated kW]
Energy Consumed kW: [Energy Consumed kW]
Asset Category: [Asset Category]



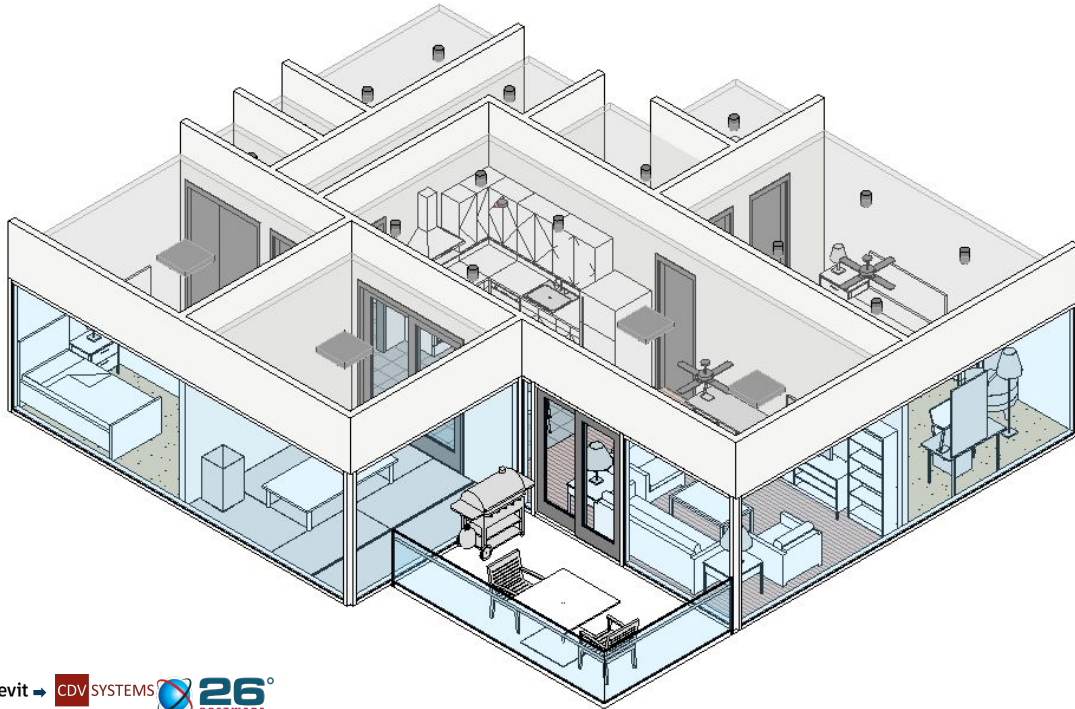
Midjourney



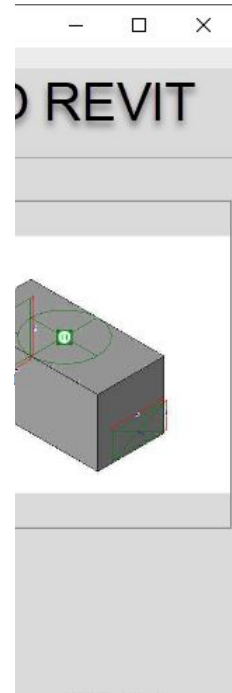
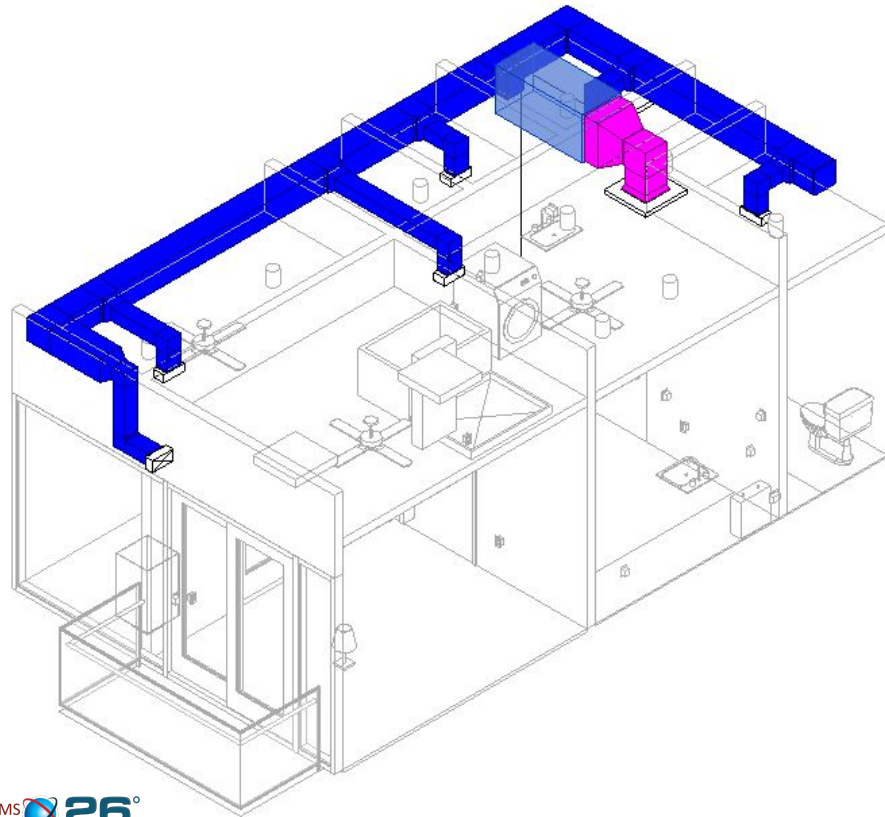
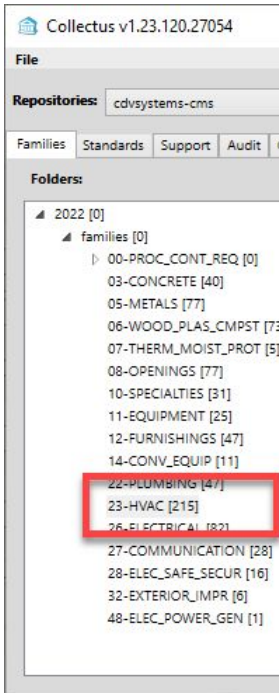
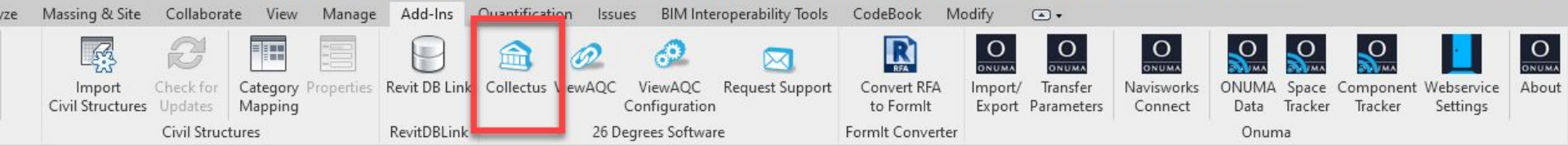
File | Massing & Site | Collaborate | View | Manage | **Add-Ins** | Quantification | Issues | BIM Interoperability Tools | CodeBook | Modify

Import Civil Structures	Check for Updates Civil Structures	Category Mapping	Properties	Revit DB Link RevitDBLink	Collectus	ViewAQC	ViewAQC Configuration 26 Degrees Software	Request Support	Convert RFA to FormIt FormIt Converter	Import/Export Parameters	Transfer Parameters	Navisworks Connect	ONUMA Data Tracker	ONUMA Space Tracker	Component Tracker	Webservice Settings	About
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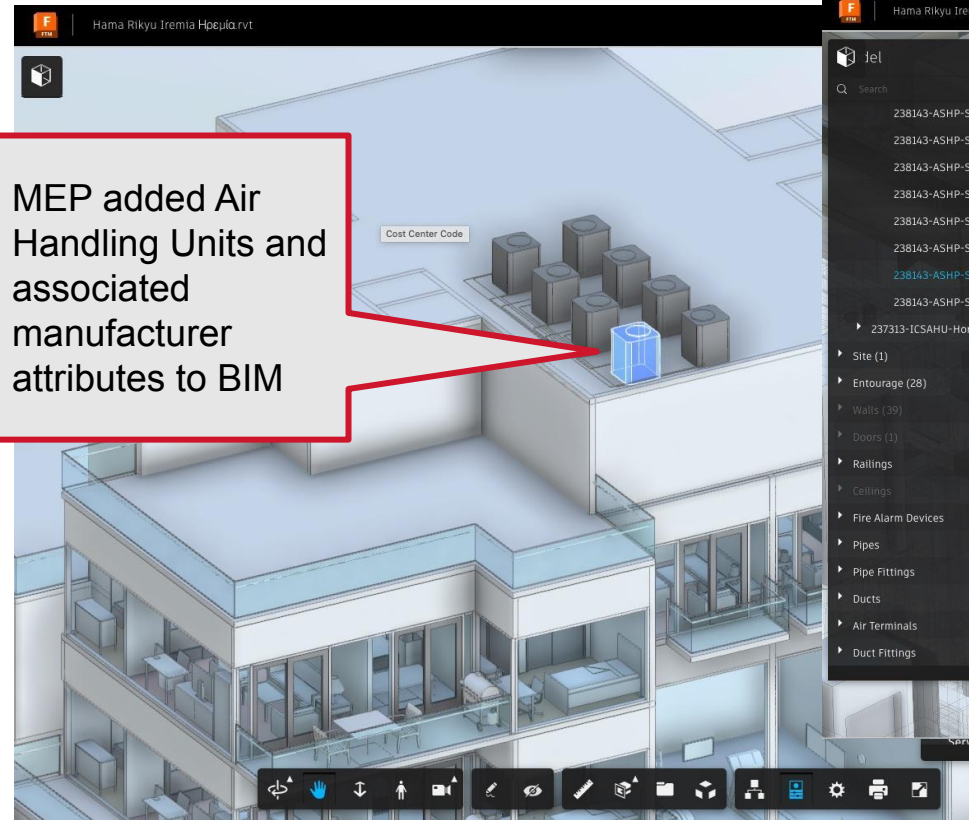
UNITS: CDV-RL.rvt / CDV-RM.rvt



Autodesk Revit 2022.1 - TOKYO BIMSTORM AIAIA DATA-DRIVEN CHARRETTE



Energy Monitoring



Search

- 238143-ASHP-Split System
- 238143-ASHP-Split System
- 238143-ASHP-Split System
- 238143-ASHP-Split System
- 238143-ASHP-Split System
- 238143-ASHP-Split System
- 238143-ASHP-Split System
- 237313-ICSAHU-Horizontal
- Site (1)
- Entourage (28)
- Walls (39)
- Doors (1)
- Railings
- Ceilings
- Fire Alarm Devices
- Pipes
- Pipe Fittings
- Ducts
- Air Terminals
- Duct Fittings

238143-ASHP-Split System

Service Ven...	JOHNNY COOL SPOT
Service Ven...	800-COOL-SPOT
Condition C...	NEW
Condition a...	02 MAY 2023
Substantial ...	16 MAY 2023
Type Name	7kw
Assembly C...	
Cost	\$2000.00
Description	AIR SOURCE HEAT PUMP CONDENSER UNIT
Keynote	
Manufacturer	CARRIER
Mech EQ Co...	HP
Mech Gas H...	No
Model	25VN
Type Comm...	
Type Image	

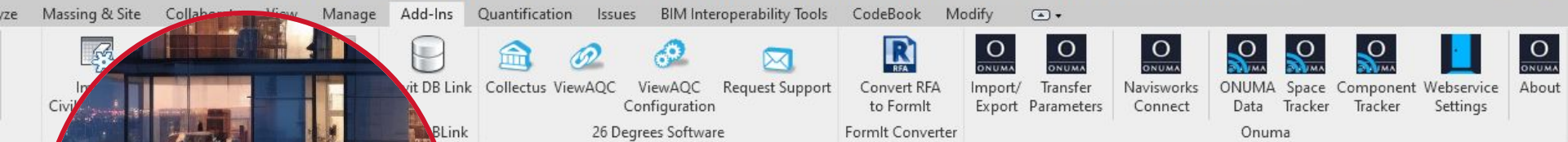
System Uptime: 23 days, 16:21:01

Building Power and OA Temperature - 1 Year

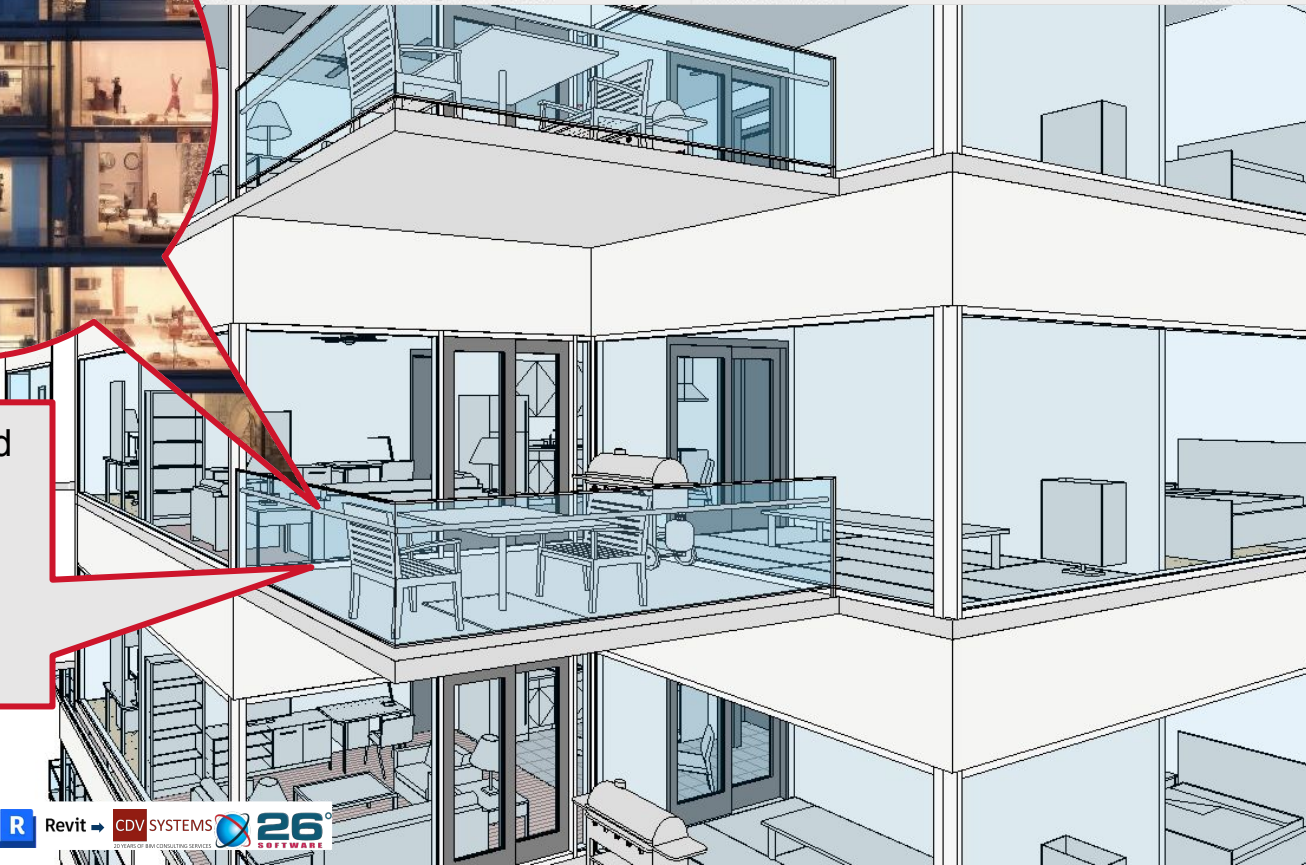
kW - Peak

°F





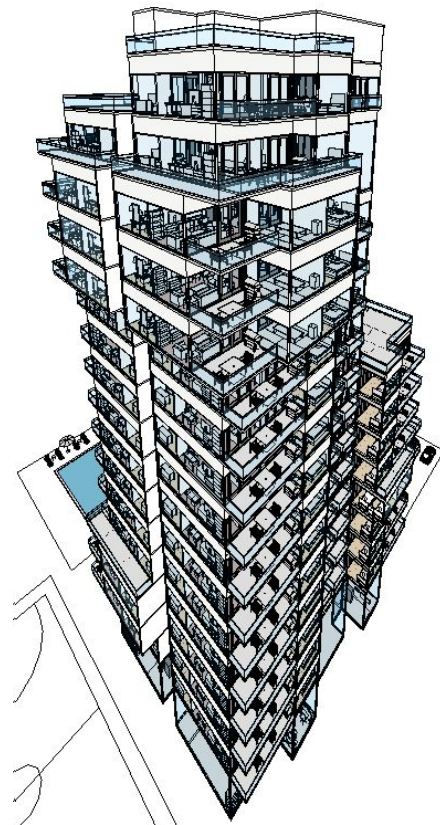
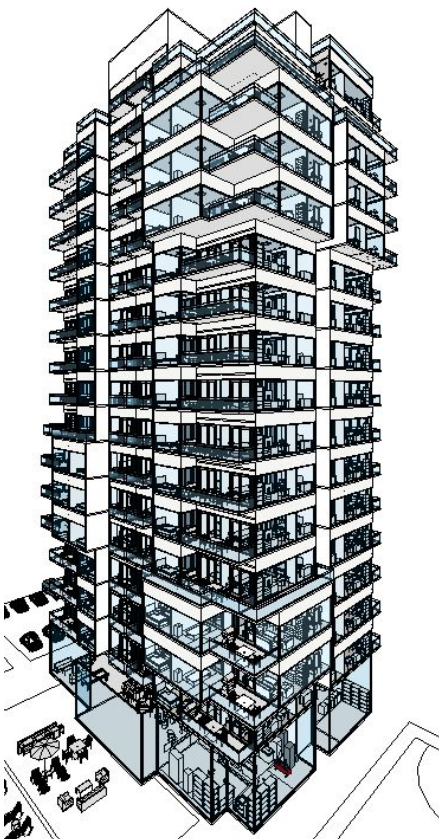
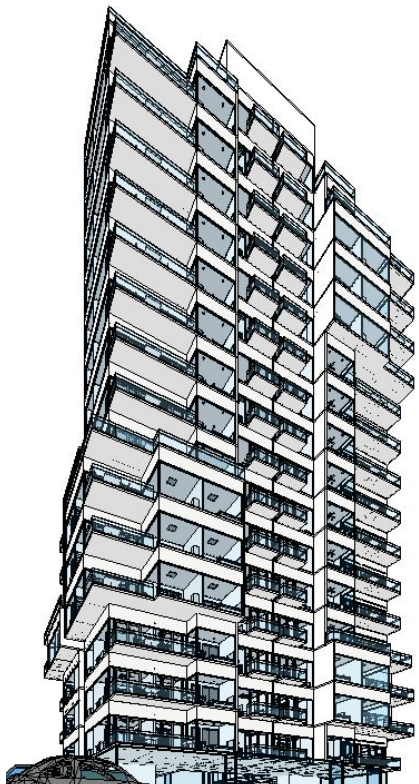
Architect adjusted the balconies in BIM with glass rails based on concept image generated by AI



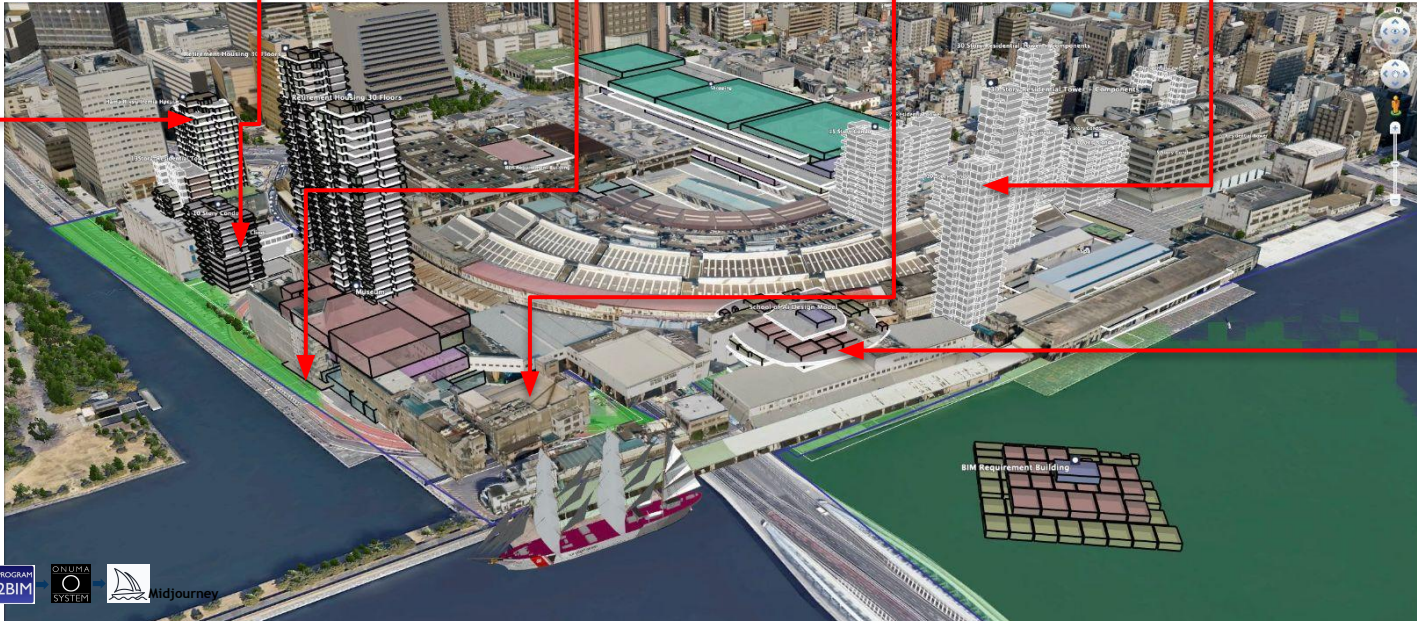
Autodesk Revit 2022.1 - TOKYO AREA AIAA DATA-DRIVEN CHARRETTE

File Edit View Massing & Site Collaborate View Manage Add-Ins Quantification Issues BIM Interoperability Tools CodeBook Modify

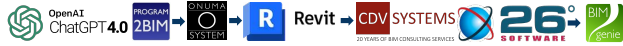
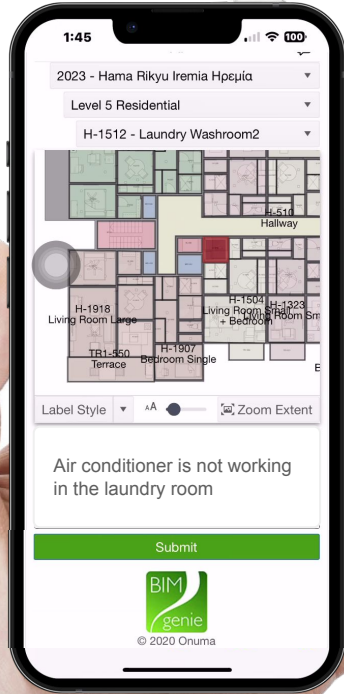
Import Civil Structures	Check for Updates Civil Structures	Category Mapping	Properties	Revit DB Link RevitDBLink	Collectus	ViewAQC	ViewAQC Configuration 26 Degrees Software	Request Support	Convert RFA to FormIt FormIt Converter	ONUMA Import/Export	ONUMA Transfer Parameters	ONUMA Navisworks Connect	ONUMA Data Tracker	ONUMA Space Tracker	ONUMA Component Tracker	ONUMA Webservice Settings	ONUMA About
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Program



Delivery Back to Owner and a Digital Twin for the Life Cycle of Facilities - Real Time Work Orders

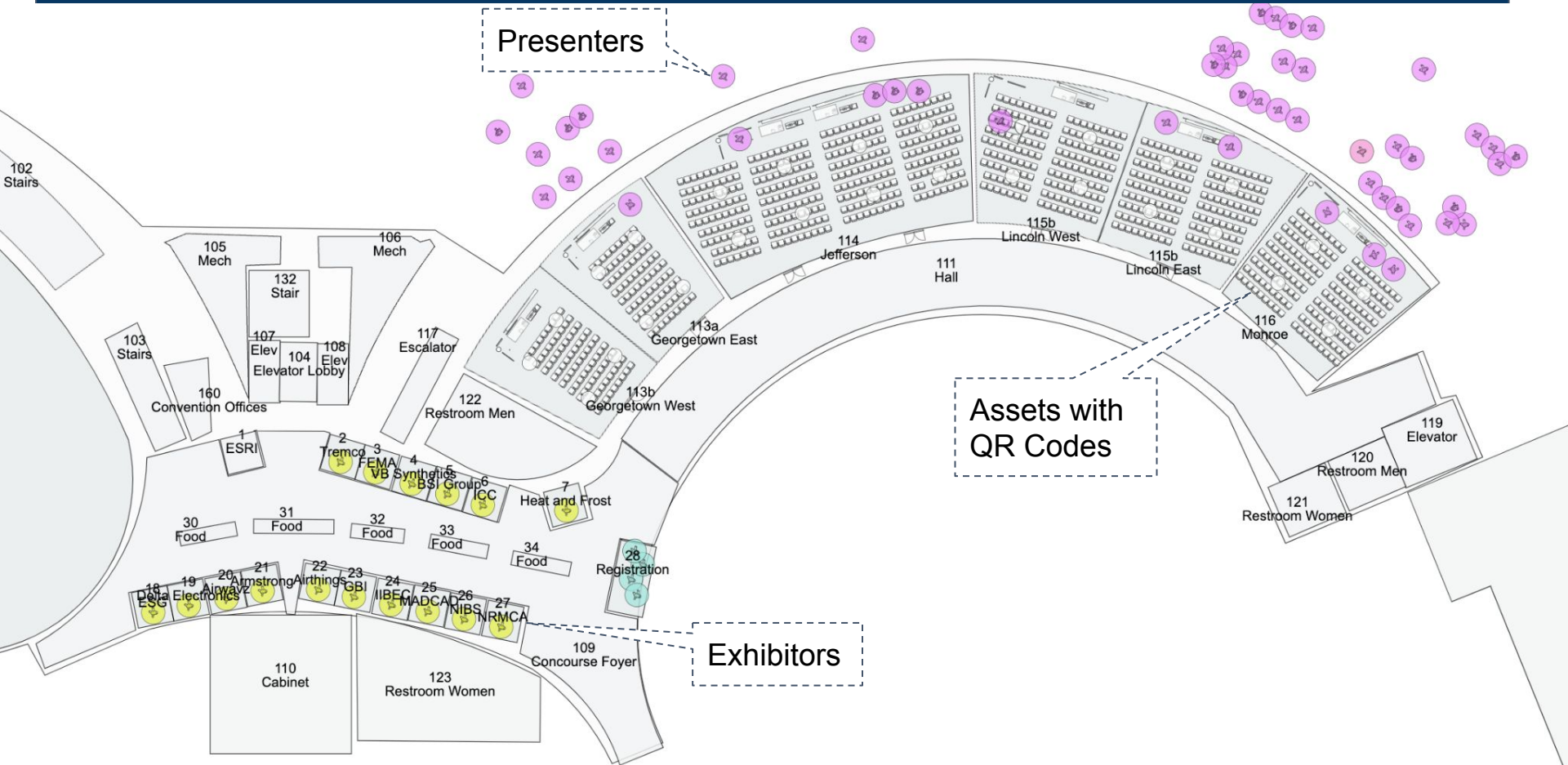


Audience Participation #1: Digital Twin and AI BIMgo

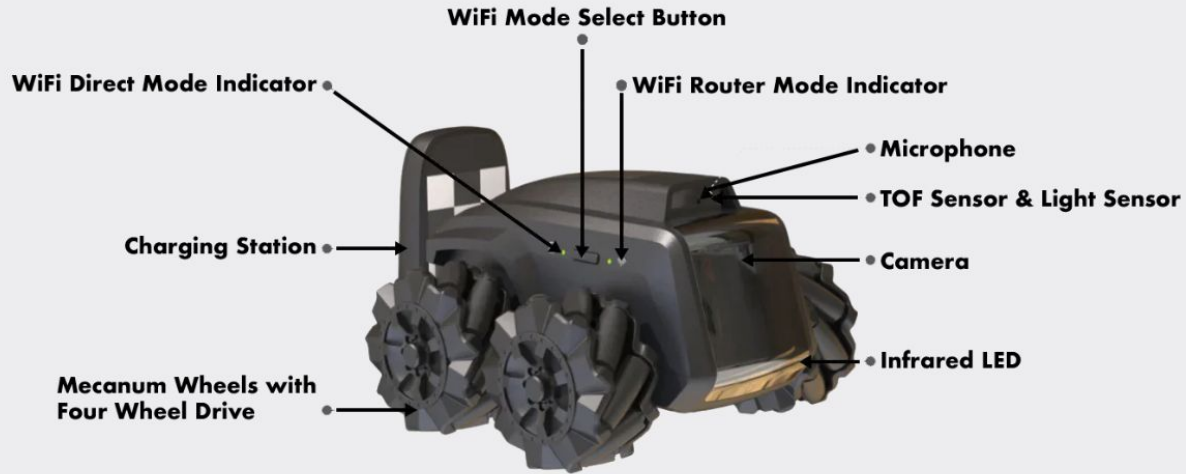


- How to Participate:**
- 1 **Scan the QR code:** This will open a digital map of the room.
 - 2 **Describe your request:** E.g., "The lights are flickering."
 - 3 **Click 'Select':** Take a photo of an asset or a selfie.
 - 4 **Enter your details:** Provide your name and email.
 - 5 **Click 'Submit':** Your work order is now in the digital twin.
- Bonus:**

Audience Participation #1: Digital Twin and AI BIMgo: Show Results



Giveaway: One 4 Wheel Drive AI Driven Robot Connects to Your Smart Home

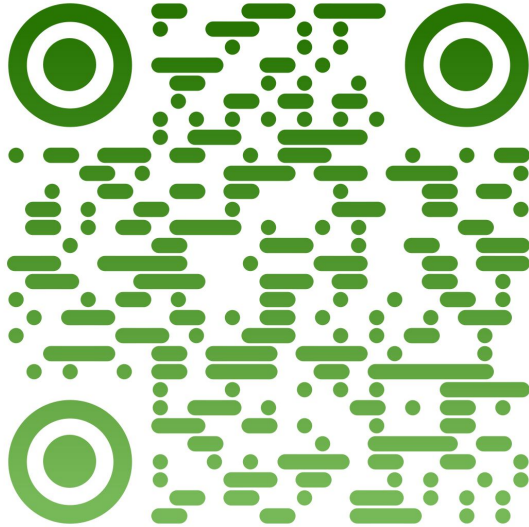


Are You Ready For a Robot?

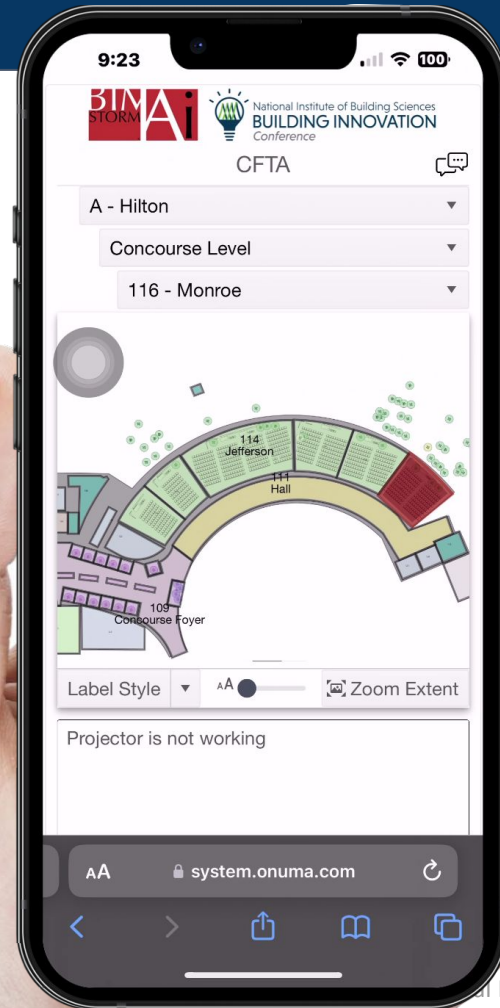
Submit a Work Request to the Digital Twin



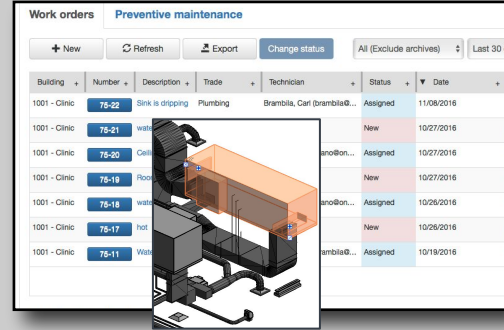
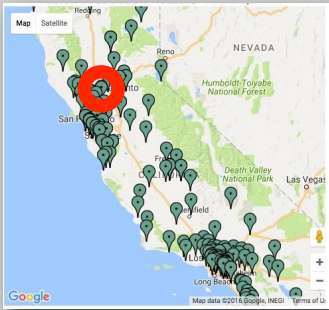
Live



BIMStorm.com/NIBS



Digital Twin of the California Community Colleges 61



72 Districts
~5,000 Buildings
~90M sf / 8M sm

One District Level Such as:
Los Angeles Community Colleges
~742 Buildings, ~12M SF / 1.1M sm

Buildings and Spaces
Building Information Models
Accurate Geometries

Asset Management
Work Orders
Preventive Maintenance

Building and Space Inventory at State Level

Individual Asset at District Level



AI to Analyze Data

Work Orders & Preventative Maintenance

LACC

Work orders Preventive Maintenance

CDCA - CHILD DEVELOPMENT CTR A

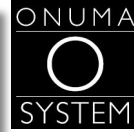
Roof

301 - Roof North

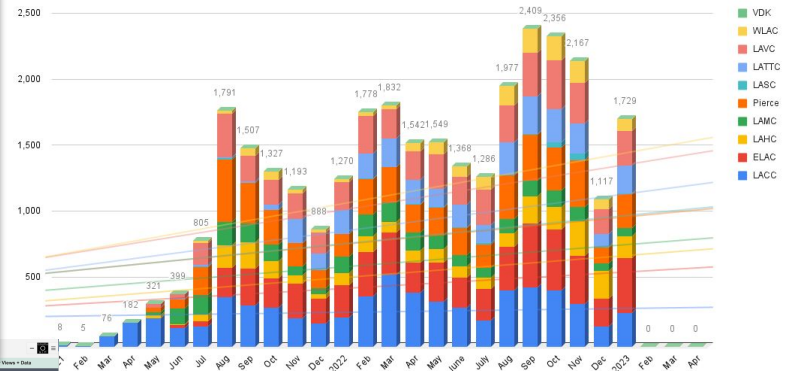
Label Style AA Zoom Extent

Air handler AH1 not working

Site	Building	Space	Number	Description	Trade	Technician	Status	Total cost	Date	Submitter	Assignee	Priority
26 - Los Angel	MJLB - MJLB		866-0346	Reports of lat...		Katie Hamilton	Not specified		10/01/2021			
26 - Los Angel	CDCA - CHIL		811-0332	Check clocks...	Electrical	Cardenas, Ar...	Assigned	0	10/01/2021	Angela Galicia	Vera Tysen	When possible
26 - Los Angel	HER - HER		866-0331	Please report l...	Electrical	Ulan, Maria...	Work In...	316.6	10/01/2021	ULIAN MARILU	Ornara System	When possible
26 - Los Angel	TRIA - TRIA		866-0339	Please report l...	Electrical	Ulan, Maria...	Work In...	259.28	10/01/2021	ULIAN MARILU	Ornara System	When possible
26 - Los Angel	P1 - FRANKL	B1 - Stor 1	866-0333	Please place L...	Custodial	Michael Lopez	Assigned	0	10/01/2021	Michael Lopez	Elizabeth Luna	Post specified
26 - Los Angel	SJ - STUDEN	309 - Bergant...	878-0222	On the outside...	Custodial	Monel, Dorne...	Assigned	0	10/01/2021	Michael Lopez	Elizabeth Luna	Post specified
26 - Los Angel	KR - KINGSB	136 - Laundry	865-0216	good morning...	Electrical	Cardenas, Ar...	Assigned	0	10/01/2021	JOSÉ M URG...	Vera Tysen	When possible
26 - Los Angel	AD - CESAR	200C - Office	866-0214	Please instal...	Paint	Stavencas, N...	Assigned	0	10/01/2021	Lauren Casillo	Vera Tysen	When possible
26 - Los Angel	S8B - STUDE	193 - OSSB Bule	1418-8209	Deck in front...	Electrical	Cardenas, Ar...	Assigned	0	10/01/2021	Michae Mattier	Vera Tysen	When possible
26 - Los Angel	JH - JEFFER	207 - Custodial	866-0305	Hooper room L...	Carpentry	Shawn, Chae...	Assigned	0	09/30/2021	David Lopez	Vera Tysen	Urgent
26 - Los Angel	CHEM - CHEM	C2 - Class Lab	866-0304	Help, This is L...	Custodial	Monel, Dorne...	Assigned	0	09/30/2021	Elizabeth Peger	Elizabeth Luna	Post specified



Number of Work Order Requests



Project PRE - LACCO

Map Satellite

Background map settings

Project PRE - LACCO

BIM Navigation

Navigation

Project PRE - LACCO

3D Model Settings

Label settings

Component color coding

Presentation Chat GPT: Querying a Database - 2 min Live



Kimon: Shows ChatGPT Interaction



LACCD Wide.xlsx

Looking at just the work order descriptions with the lowest sentiment, summarize the top five, and from which Site and Building they originated from. Include recommendations for the top five issues based on patterns throughout the entire data.



LACCD Wide.xlsx

Looking at just the work order descriptions with the lowest sentiment, summarize the top five, and from which Site and Building they originated from. Include recommendations for the top five issues based on patterns throughout the entire data.

Hey ChatGPT, what insights can be you give us from one year of our digital twin facility and asset data?

- **Strengths:** Quick response to security requests and efficient handling of landscaping requests contribute to a secure and attractive environment.
- **Areas for Improvement:** HVAC, electrical, custodial, and auto shop requests show longer than expected completion times, potentially affecting occupant comfort and satisfaction.
- **Persistent Issues:** These delays suggest possible needs for additional resources or revised preventive maintenance for HVAC/electrical trades, more custodial staff or revised cleaning procedures, and a solution for auto shop request backlog.
- **Recommendations:** Additional training or staff for HVAC and electrical trades, a review of custodial procedures, and potential outsourcing or augmentation of auto shop services.
- **Expected Outcomes:** These actions should enhance service delivery, improve occupant satisfaction, and optimize resource use.



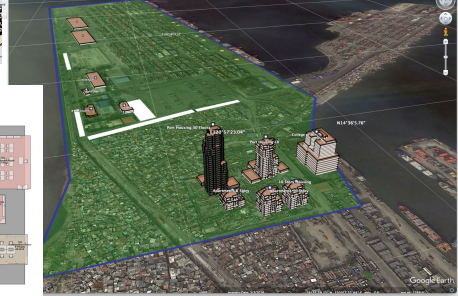
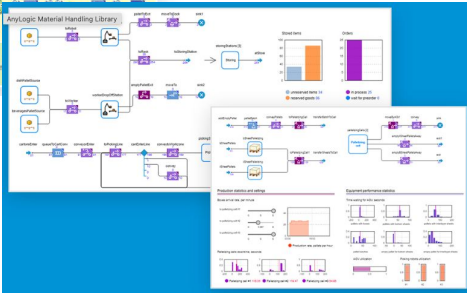
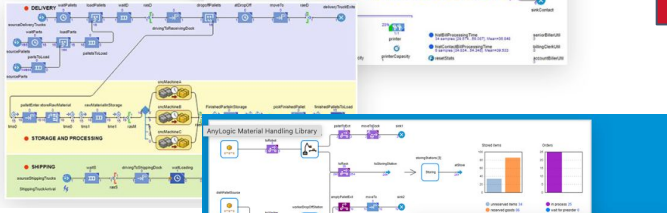
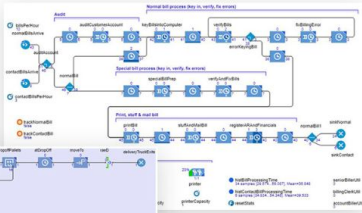
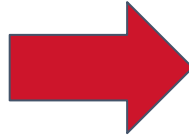
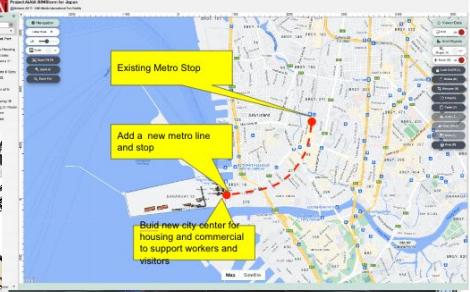
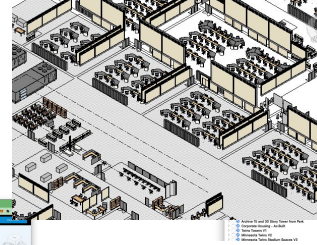
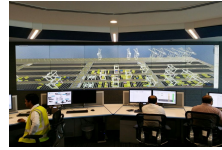
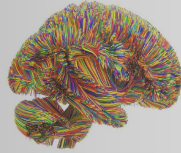
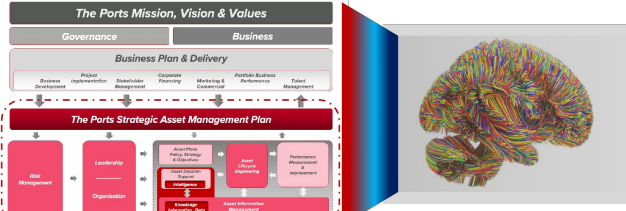
The Tools of BIMStorm Ai : Digital Twins, BIM and Artificial Intelligence



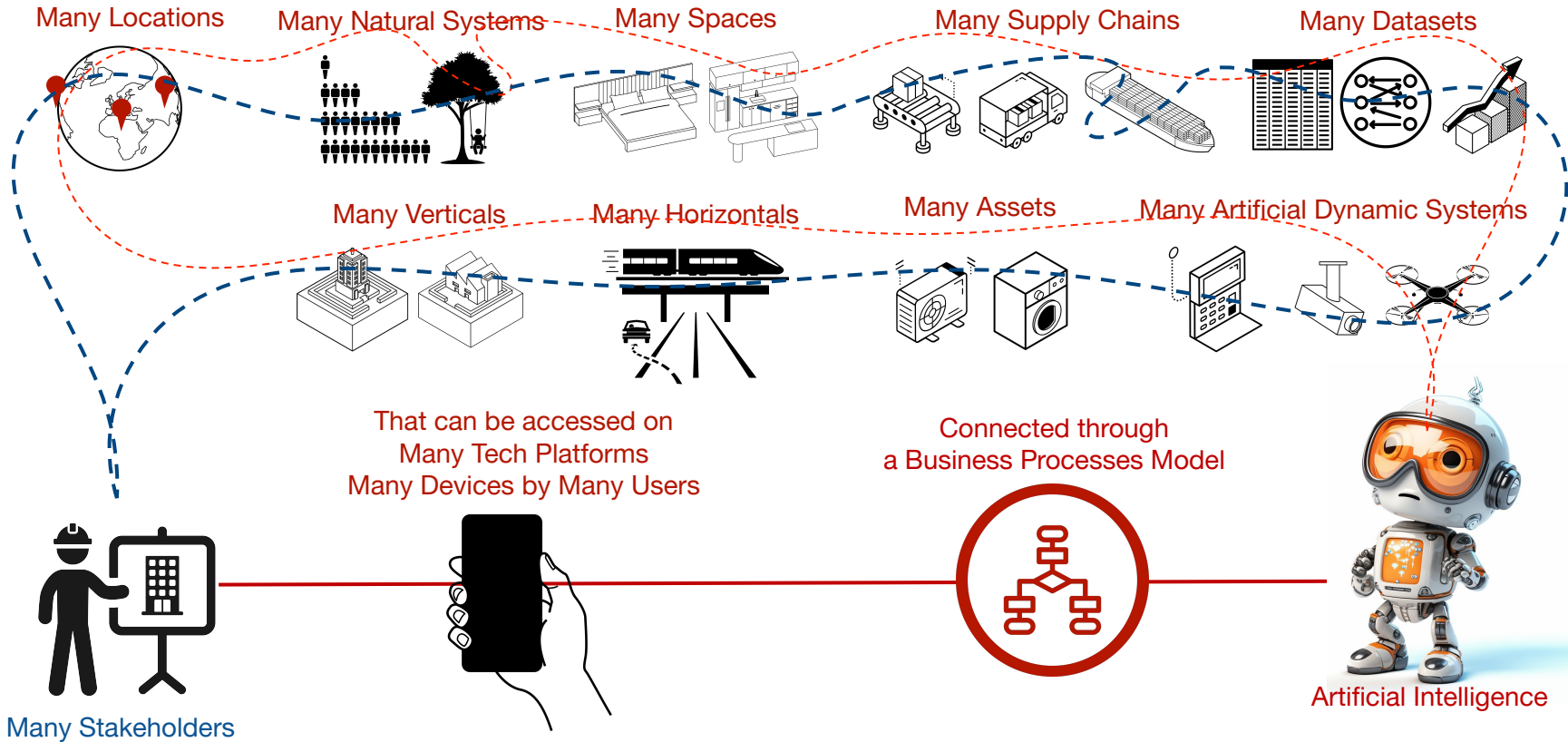
- Owner Standards in **CDV Systems BIM Execution Plan (BEP)**
- **ChatGPT** to analyze patterns, import to BIM
- **Program2BIM** to create BIM spaces from owner standards
- **ONUMA System** as a **BIM Server** and for collaboration
- **Consigli** for MEP and Space Plan Optimization
- **Google Workspaces, Earth** and **Midjourney** for visualization
- **Revit** BIM for design and construction from **ONUMA System**
- **CDV Systems Collectus Revit** harvests BIM data per the **BEP**
- Data harvested by **Collectus** to **BIMgenie** for facility management
- **Collectus BIM, ONUMA System, BIMgenie, Opto22** delivered to the owner for use as a **Digital Twin**
- **IGO and Trent** for Port Operations Digital twins



Business Process and Rules Driving into Digital Twins and AI



Digital Twin Portfolio, Lifecycle, Assets and Business Process





September 6, 2023

National Institute of Building Sciences







September 6, 2023

National Institute of Building Sciences



Industry and Owner Standards at NIBS.org

U.S. NATIONAL BUILDING INFORMATION MANAGEMENT PROGRAM

Objective

The National Institute of Building Sciences (NIBS) is leading the development and dissemination of the next-generation of practice standards and processes for the built environment. The U.S. National Building Information Management Program will provide a step-change in capacity, creating a platform and community to support for digital innovation.

Why Does The U.S. Need a National BIM Program?

Building information modeling is now a widely used technology providing a data foundation for increasingly digitized processes, yet practices and procedures across the architecture/engineering/construction/operation (AECO) marketplace operate under no common standards for data formats. This program offers the opportunity to improve the relationships, performance and profitability of the increasingly digitized U.S. AECO industry.

Demand for construction is expected to increase to address these challenges and opportunities:

-  The public sector requires \$2 trillion in infrastructure investment, which is being funded in part by the Infrastructure Investment and Jobs Act.
-  Schools need upgrading to provide better and safer learning environments.
-  Coastal communities require building and infrastructure adaptation to cope with rising sea levels and climate change.
-  New energy infrastructure is needed to transition to carbon-free power sources.
-  New data centers and labs are required to support innovation and enhance growth and competitiveness.

Effective digital processes supported by common ways of working based on open standards are key to cost effectively realizing these benefits.



Critical outcomes of the program:



Allow owners to build and renovate more buildings, bridges and roads with less money by enhancing the efficiency of design, construction and asset operation.



Accelerate delivery, manage costs, and increase sustainability through information standards and protocols shared across the supply chain.



Build on U.S. leadership in AECO technology development to enable the next generation of building technology.



Strengthen U.S. industry access to global markets with U.S. standards compatible with worldwide programs.



Integrate buildings, lifelines and infrastructure for seamless management of the built environment to improve safety, security, resilience and sustainability.



Expand innovation in the development of new digital solutions and practices throughout the AECO industry.

usbimprogram.nibs.org

What are the top drivers for a National BIM Program?

13-21%

savings via increased efficiencies in design and construction assembly in the next 10 years (Boston Consulting Group)

60%

long-term increased construction productivity through design-to-manufacturing processes supported by digital information (McKinsey)

100%

increase in profits for AECO players (McKinsey)

15%

public construction cost savings (UK Government Construction Strategy)

41%

of the U.S. labor force will retire by 2031, diversify through industrialized construction processes driven by digital automation (McKinsey)

NBIMS V4.0 BIM USES BEP COBie

BIM and Digital Twin Subcommittee

2:30 – 3:30 PM TODAY!

BIM and Digital Twins: A Formal Position on Successful Integration for the AECO Industry



1: Arriving to a Smart Home

Lyle's home uses smart technology.

The gate opens, the outdoor lights come, and the garage door opens as he pulls into the garage

The a/c reached a comfortable temperature an hour earlier.

As he enters the house, the stereo system is playing the Talking Heads, picking up the music where he left exiting the car.

Looking in the fridge he asks his smart voice assistant for a recipe for the chicken and asparagus he has.

Continues in BIM and DT Framework User Story...



AI for the Built Environment
Express your interest!



PRESENTERS



Roger Grant
Vice President,
Building Technology
Industry Standards Expert
National Institute of
Building Sciences



Jay Kline
BIM Program Manager
National Institute of
Building Sciences
U.S. Department of State
Bureau of Overseas Buildings
Operations



Kimon Onuma
FAIA
Architect
Onuma, Inc. /
BIMStorm.com



Artificial Intelligence
“AI”



National Institute of
BUILDING SCIENCES™

The Intersection of Artificial Intelligence & Building Sciences

A New Era of Intelligent Infrastructure

NATIONAL INSTITUTE OF BUILDING SCIENCES

ONUMA Inc.



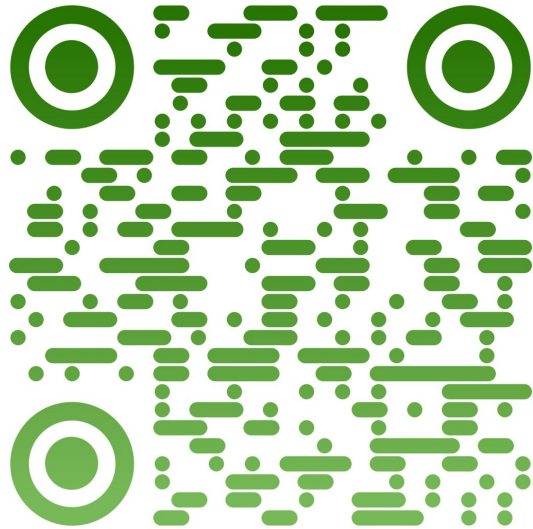
National Institute of Building Sciences

September 6, 2023

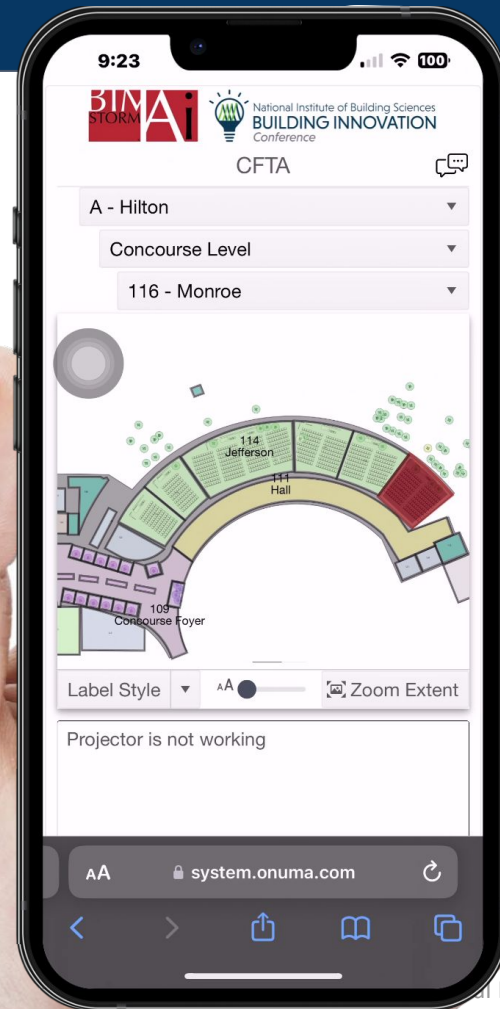
Submit a Work Request & Get More Information



Live



BIMStorm.com/NIBS



Work Order Exercise Results



Building	Floor	Space	Request Number	Request Type	Request Description
A-Hilton			2621-1017	Event	Moore Bot - "Please release me from my captivity so I can roam"
A-Hilton	Concourse Level	116 - Monroe	2621-1001	Event	There are humans in the room. Please replace with AI.
A-Hilton	Concourse Level	116 - Monroe	2621-999	Vandalism	some one put a duck on the screen
A-Hilton	Concourse Level	116 - Monroe	2621-1028	Event	The soup is delicious.
A-Hilton	Concourse Level	113a - Georgetown East	2621-1026	HVAC	It is REALLY hot in this room.
A-Hilton	Concourse Level	116 - Monroe	2621-998	Event	We are here; room temp is better that it was at breakfast room.
A-Hilton	Concourse Level	115b - Lincoln East	2621-1029	Event	Room is a bit warm.
A-Hilton	Concourse Level	116 - Monroe	2621-1031		screen lights in room too bright for projection
A-Hilton	Concourse Level	116 - Monroe	2621-1023	Electrical	the lights are bright
A-Hilton	Concourse Level	113a - Georgetown East	2621-1027	HVAC	Too hot. Please check controls or lower setpoint.
A-Hilton	Concourse Level	116 - Monroe	2621-993	Electrical	The lights are flickering.
A-Hilton	Concourse Level	116 - Monroe	2621-1033	Other	Room too cold
A-Hilton	Concourse Level	116 - Monroe	2621-1032		More comfortable seats please
A-Hilton	Concourse Level	116 - Monroe	2621-1022	Office & Workstation Reconfig	I prefer screen in the center with presenters to the side. Also will you share the slide deck?
A-Hilton	Concourse Level	116 - Monroe	2621-997	Other	chair is too comfy
A-Hilton	Concourse Level	116 - Monroe	2621-1018		all is well thank you for checking! Beautiful view from the room btw ?
A-Hilton	Concourse Level	116 - Monroe	2621-1021	Event	need more coffee. This is critical path
A-Hilton	Concourse Level	116 - Monroe	2621-1012	Other	what is the future of the designer and coordinator work force if AI is going to replace them. I'd assume the work force will get smaller and more exclusive. Thoughts?
A-Hilton	Concourse Level	116 - Monroe	2621-990	Building Maintenance	Welcome BI23 Attendee-4-Enter your request here: not cool enough
A-Hilton	Concourse Level	116 - Monroe	2621-1011	Other	Need hotter coffee.
A-Hilton	Concourse Level	116 - Monroe	2621-992	Electrical	light fixture is broken and lamp is causing excessive glare
A-Hilton	Concourse Level	116 - Monroe	2621-996	Custodial	it smells like fish in here.
A-Hilton	Concourse Level	116 - Monroe	2621-1005	HVAC	Welcome BI23 Attendee-96-Enter your request here: too hot in here.
A-Hilton	Concourse Level	116 - Monroe	2621-1007	Appliances	The screen need to be higher up to view from back of room.
A-Hilton	Concourse Level	116 - Monroe	2621-991		I am here at the NIBS Conference in the Hilton Washington DC.
A-Hilton	Concourse Level	116 - Monroe	2621-1019	Event	Hello world
A-Hilton	Concourse Level	116 - Monroe	2621-1013		The presenters are poorly lit. They remain in shadow. The screen is not tall enough to enable audience to see 100% of display
A-Hilton	Concourse Level	116 - Monroe	2621-1009	Electrical	
A-Hilton	Concourse Level	116 - Monroe	2621-1002	Event	Great presentation!
A-Hilton	Concourse Level	116 - Monroe	2621-1016	HVAC	its a little dry in the room, it's making my throat itch.
A-Hilton	Concourse Level	116 - Monroe	2621-1014	Other	Its a little dry in the room, it's making my throat itch.
A-Hilton	Concourse Level	116 - Monroe	2621-1020	Other	Welcome BI23 Attendee-16-Enter your request here: make the Monroe room larger
A-Hilton	Concourse Level	116 - Monroe	2621-1000		lights are to bright
A-Hilton	Concourse Level	116 - Monroe	2621-1030		attending the BIM and Digital Twins session
A-Hilton	Concourse Level	116 - Monroe	2621-995	Electrical	lighting is poor for presenter
A-Hilton	Concourse Level	116 - Monroe	2621-1010		Select a request type (optional) Please redesign the interior in a Richard Neutra or similar modernist style
A-Hilton	Concourse Level	114 - Jefferson	2621-1035	Building Maintenance	Loose ceiling panel near exit.
A-Hilton	Concourse Level	113a - Georgetown East	2621-1024	Electrical	The lighting in this room for the NBP session is too bright.
A-Hilton	Concourse Level	116 - Monroe	2621-1008	Electrical	The decorative light fixtures in the ceiling are not on.
A-Hilton	Concourse Level	116 - Monroe	2621-994	Building Maintenance	missing sconce cover
A-Hilton	Concourse Level	116 - Monroe	2621-1006	Custodial	carpet cleaning needed.
A-Hilton	Concourse Level	116 - Monroe	2621-1015	Other	this room needs new carpet.
A-Hilton	Concourse Level	116 - Monroe	2621-1003	Custodial	floor is dirty. Please vacuum floor
A-Hilton	Concourse Level	116 - Monroe	2621-1004	HVAC	too cold
A-Hilton	Concourse Level	117 - Monroe		Electrical	repair light flicker. There is also two other lights that are surging. Guess is either dimmer or bulb incompatibility.
A-Hilton	Concourse Level	118 - Monroe		HVAC	The temperature feels great in here.
A-Hilton	Concourse Level	119 - Monroe		Event	Zahra gets young leader award
A-Hilton	Concourse Level	120 - Monroe		Building Maintenance	Loose ceiling panel near exit.

Work Order Exercise Results: Redesign Request

Roark



Did anyone submit a request that would trigger a renovation of the room?

Please redesign the interior in a Richard Neutra or similar modernist style

Stephanie



More comfortable seats please

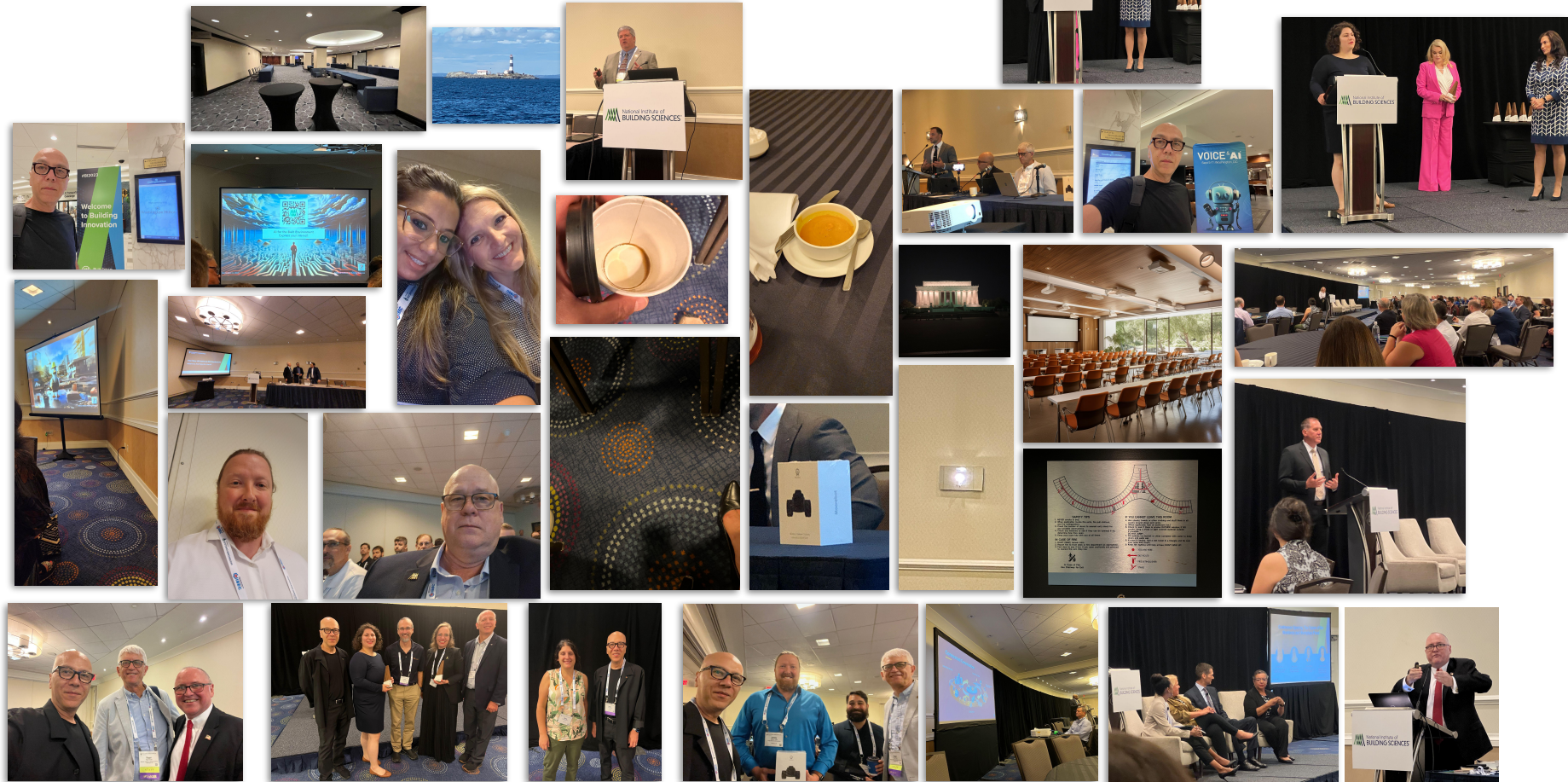
Carpet cleaning needed.



Here is the redesigned conference room for 150 people from a Midjourney prompt. A modern conference room for 150 people, set up in theater seating, designed to mimic Richard Neutra... in 32 seconds.



Work Order Exercise Attached Photographs to Requests



BI 2023 - Awards for Artificial Intelligence & Building Sciences

Who submitted the most work orders, attached photos, and put in unique or useful requests and should receive an award?

AI Robot *1
ONUMA System License *2

Ashley Turpin *1*2

Matthew Corrigan *2

Mariangelica Carrasquillo-Mangual *2

Nikhil Ghose *2

William Lakos *2

Maria D'Ambrosio *2

There are humans in the room. Please replace with AI.

