

# BIM-based facility management: Does it work for small projects? Part 1

David Stone

Director, Virtual Construction

HITT Contracting





# Agenda

1. Introduction
2. Learning objectives
3. Project approach
4. The case for 6D/FM
5. FM systems comparison
6. Stakeholders
7. Workflow samples
8. Challenges
9. Takeaways





# Informal Survey

## WHO IS IN THE ROOM?

Owners

Contractors

Designers

Vendors

Building Engineers/ Facility Managers

## FOR OWNERS – WHAT IS YOUR TYPE OF REAL ESTATE?

Office

Commercial

Institutional

Healthcare

Multifamily

## WHAT BENEFITS ARE YOU LOOKING FOR IN FM SOLUTIONS?

- Reduce downtime
- Reduce cost of management
- Monitor and troubleshoot assets
- Manage space
- Way finding for assets

## WHAT IS AN ACCEPTABLE PREMIUM FOR FM IMPLEMENTATION VS. CONSTRUCTION?

- 0%
- 1–2%
- 3–4%
- 5% or more

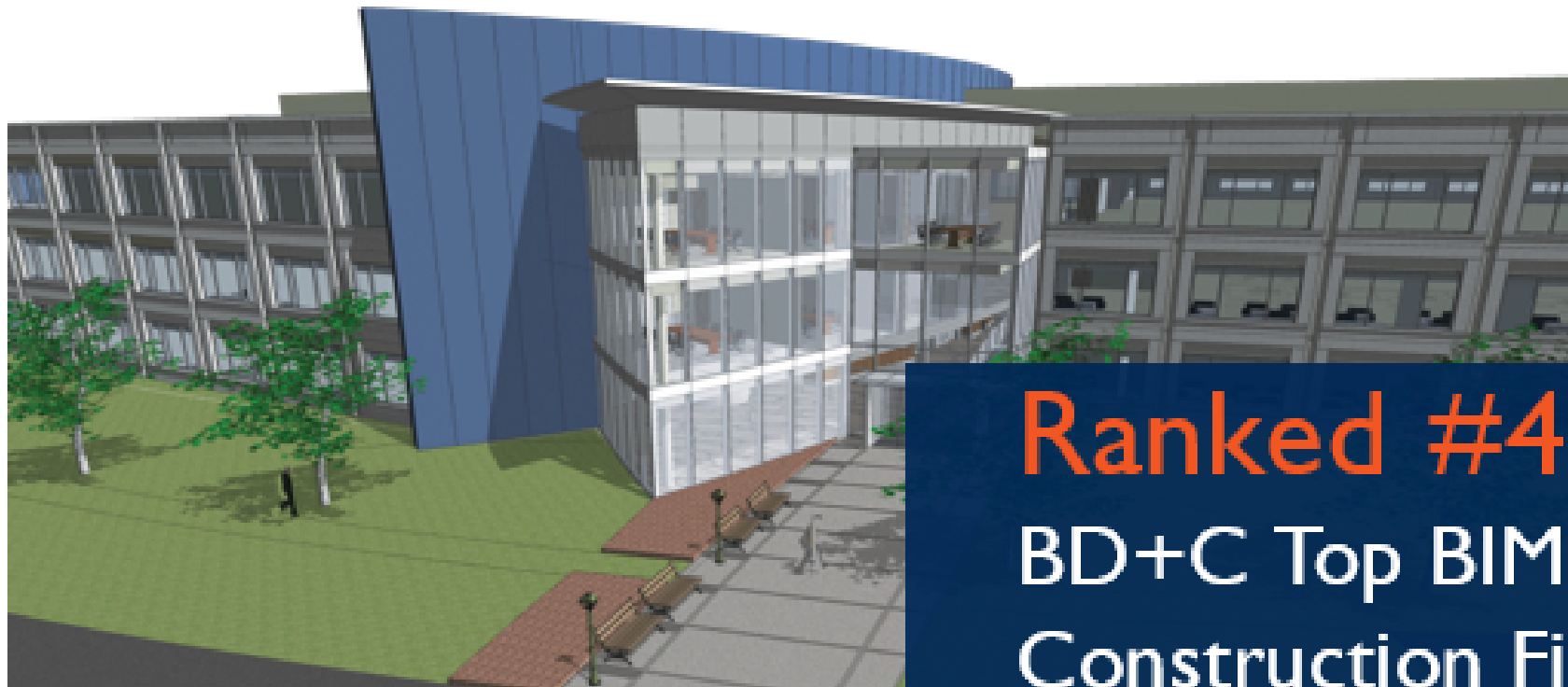


## About the speaker

David Stone, LEED AP, AIA, DBIA  
Director, Virtual Construction HITT  
Contracting

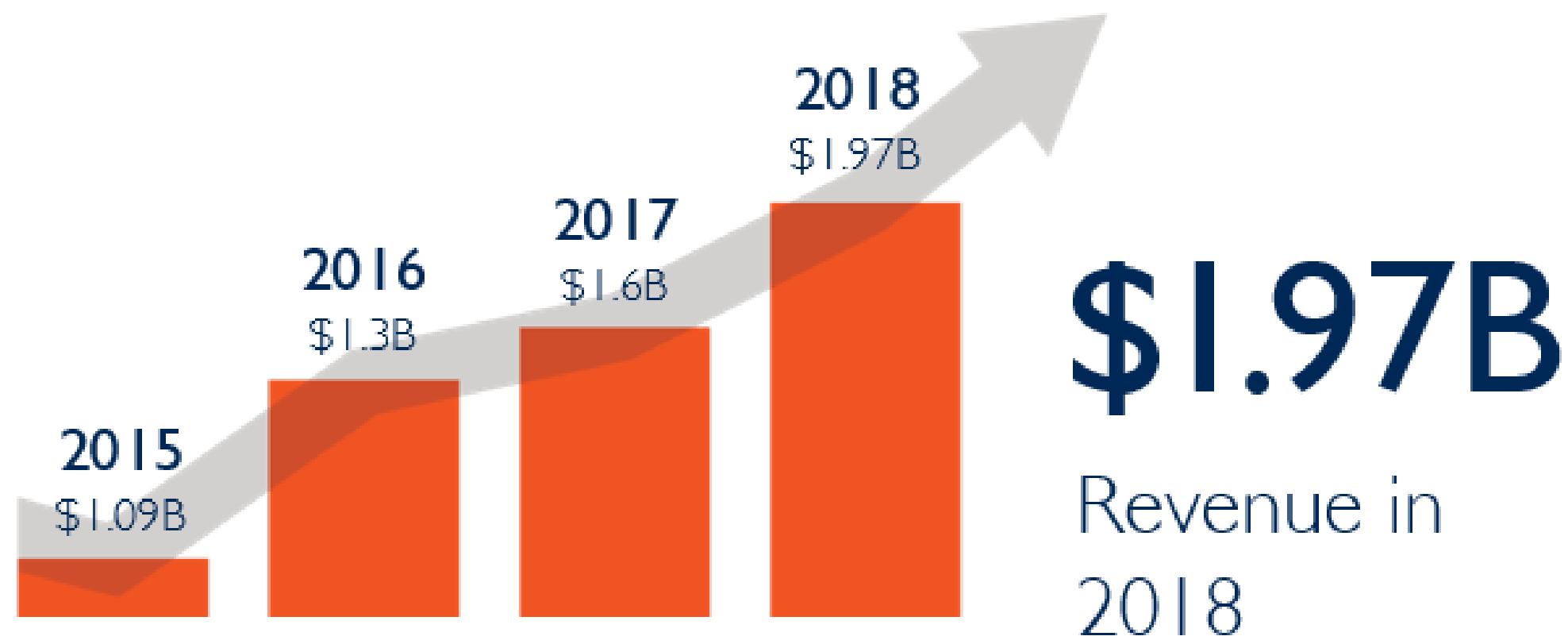
- 20 years of experience in architecture and construction.
- Responsible for developing the vision and strategy for the implementation of VDC processes
- Research and Development
- Collaborates with all Business Units to identify and address challenges unique to team objectives
- AIA, DBIA professional, LEED AP
- Twitter: @David\_Stone\_A

# About HITT Contracting

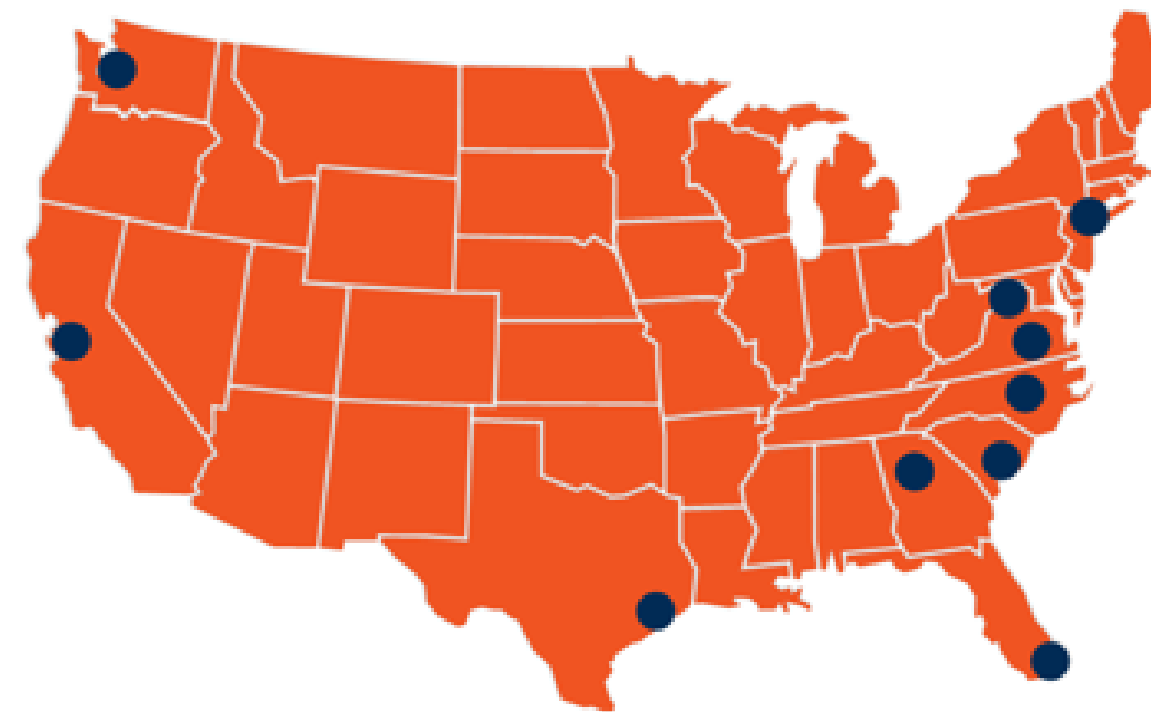


**Ranked #47**  
BD+C Top BIM  
Construction Firms

## FINANCIAL GROWTH



## NATIONAL PRESENCE: HITT OFFICES



- Washington, DC
- Atlanta
- California
- Charleston
- New York
- Raleigh
- Richmond
- Seattle
- South Florida
- Texas

## HITT BY THE NUMBERS

**38** 2019  
ENR  
Ranking

**175+** LEED  
Projects

**1055** Employees



# Project Baseline and Approach

## Timeline

1. Discuss design required BIM LOD 400 but no structured FM data
2. Utilize reality capture and BIM for 3D coordination
3. Propose facility management research project
4. Adopt existing BIM to FM solutions
5. Set up and implement selected FM systems for one year
6. Evaluate





# Learning Objectives

## LEARNING OBJECTIVE 1

Learn how to evaluate items to track for facility management.

## LEARNING OBJECTIVE 3

Learn about the effort and cost of implementing an FM solution on a small project.

## LEARNING OBJECTIVE 2

Narrow down the options for facility management solution types.

## LEARNING OBJECTIVE 4

Gain a checklist of metrics to determine value and ROI.

# Project Approach

## MAKING THE CASE FOR 6D

- If maintain a building is 80% to 90% of the cost for life of facility.
  - How does efficiency of maint. Effect savings?
- Unique opportunity as a builder to own and test new ways to operate building.

## EVALUATING SOLUTIONS

- How much functionality is enough?
- What type or Functionality?
- How easy is it to use?

## INITIATION OF SYSTEM

- Signing contracts & setting up a project
- Retrieving all necessary data
- Getting end user feedback



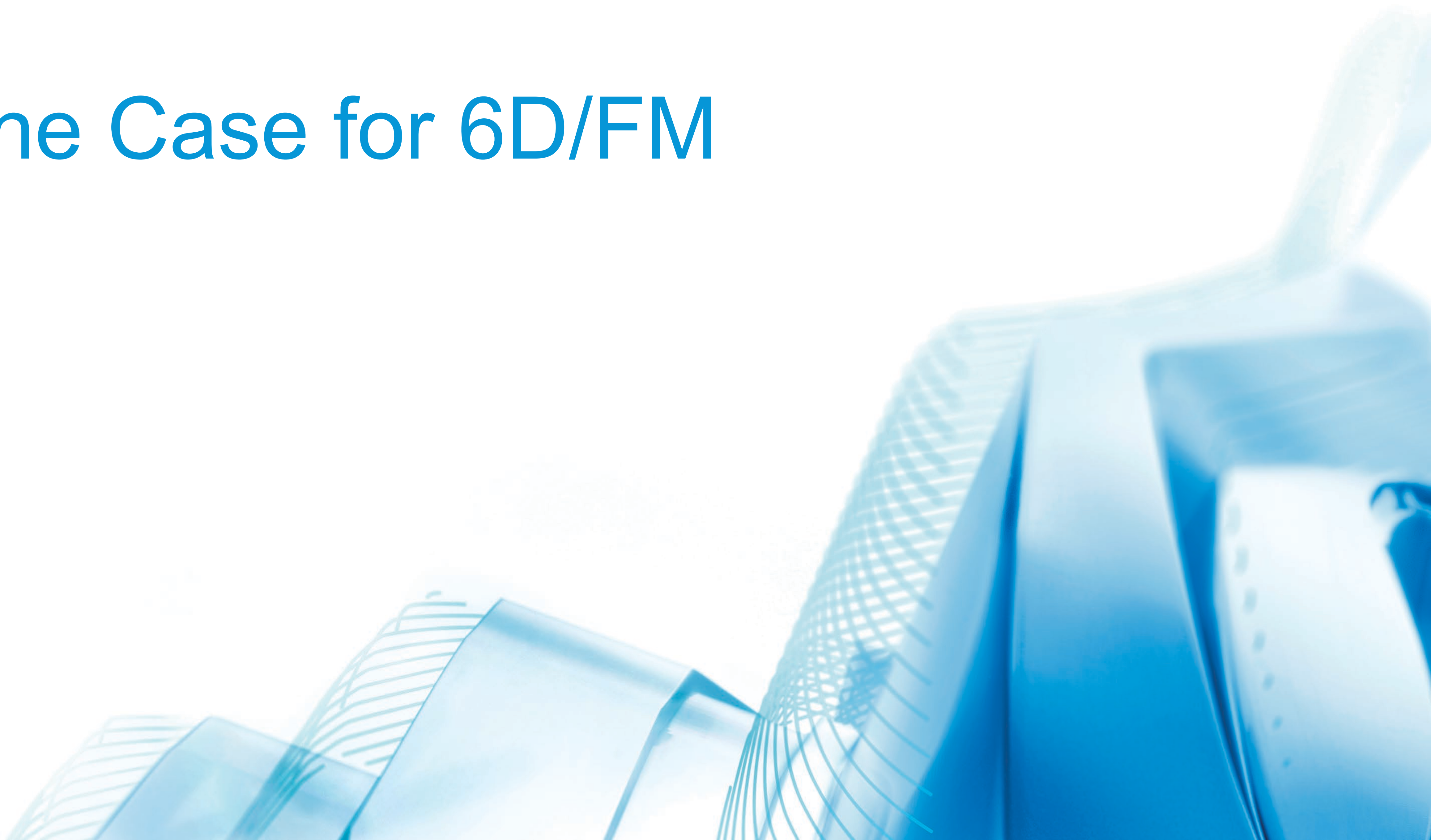
# Introduction to Co|Lab

Co|Lab is a space dedicated to bringing ideas to life and building change within our industry.

- Building construction type IV – Mass Timber
- Gross square feet – 8,600
- Net Zero, LEED Platinum, and LBC Petal certification
- Main spaces
  - Lobby
  - 4 multi-function work bays – 2 stories high
  - Large conference room
  - Multiple open space work locations
  - Rooftop balcony



# The Case for 6D/FM





# Phases / Stages

## STAGE A

### R&D PROPOSAL

3 months prior to project completion, develop the R&D proposal to implement FM/6D post construction phase

## STAGE B

### ONBOARDING

Collect all the relevant data and models, create a baseline and introduce solutions to stakeholders

## STAGE C

### IMPLEMENTATION

Start using the solutions in the everyday operations of the building

## STAGE D

### LESSONS LEARNED

Determine how feasibility of approach and next steps

# R&D Project Concept

- **R&D project idea:**
  - Our objective is to test three distinctly different facility management solutions that utilize:
    - BIM DIY approach – BIM 360 OPS
    - Integrator approach – Ecodomus
    - Vendor Approach - SYYCLOPS, Inc.
- **Hypothesis:**
  - We anticipate the scale of the Co|Lab project will allow relatively easy adoption of unstructured data.
  - Facility management team will choose to leverage the solution that is easiest to use.
- **Business purpose:**
  - Address client needs to maintain and reduce downtime in facility
  - Position HITT as a preferred GC
  - Inform strategic direction by exploring process, stakeholders required, and total effort entailed in offering this service
  - Establish ROI for facility management
    - Even a modest improvement will result in offsetting the cost of this R&D project
    - This improvement percentage is expected to increase over the years of building occupancy as maintenance needs increase



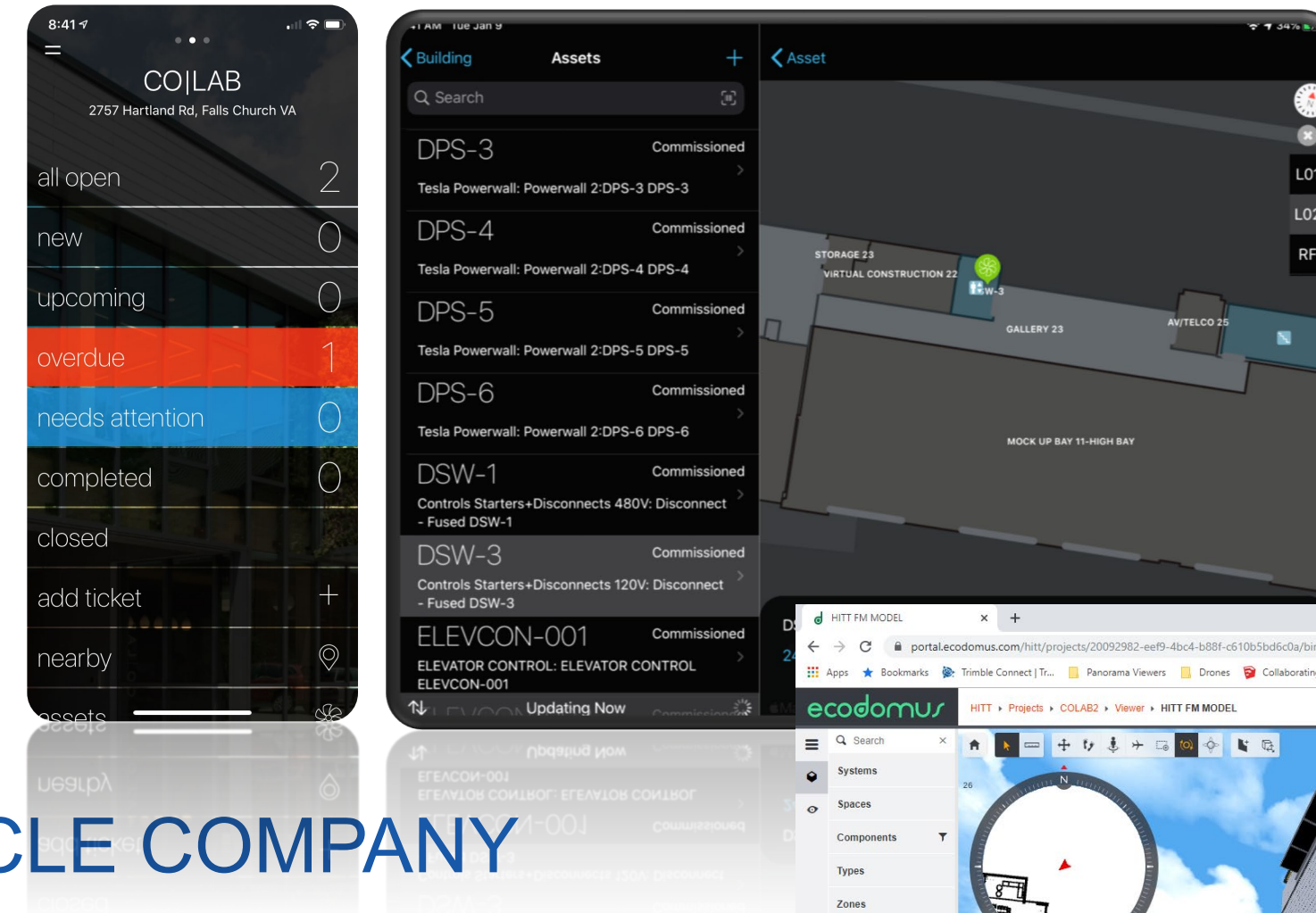
# R&D Project Concept

- **Quantifying Success:** Engage with facility maintenance staff to use the selected platforms and give input on the comparative benefits of each system.
  - How intuitive or easy to use is it?
  - Track and compare the time taken to perform tasks
  - Determine how the process is performing preventative maintenance? Automated?
  - Outside of preventative maintenance, establish what maintenance issues came to light through the platforms: did anything surface that would otherwise have gone undiagnosed?
  - Discuss ease and accuracy of tracking assets compared to typical processes
  - Discuss ease of tracking work performed: how intuitive is the historical data?
  - Reflect on the platform's flexibility for various project types (building size, building type, etc.): how can we scale this information to our diverse sectors?
- Due to the multi-use nature of the Co|Lab, we anticipate applying lessons learned to many project types.
- Due to the lack of a baseline on the Co|Lab, we will rely on the experience of the senior staff and available industry standards for comparative data.

# Facility Management Systems Comparison

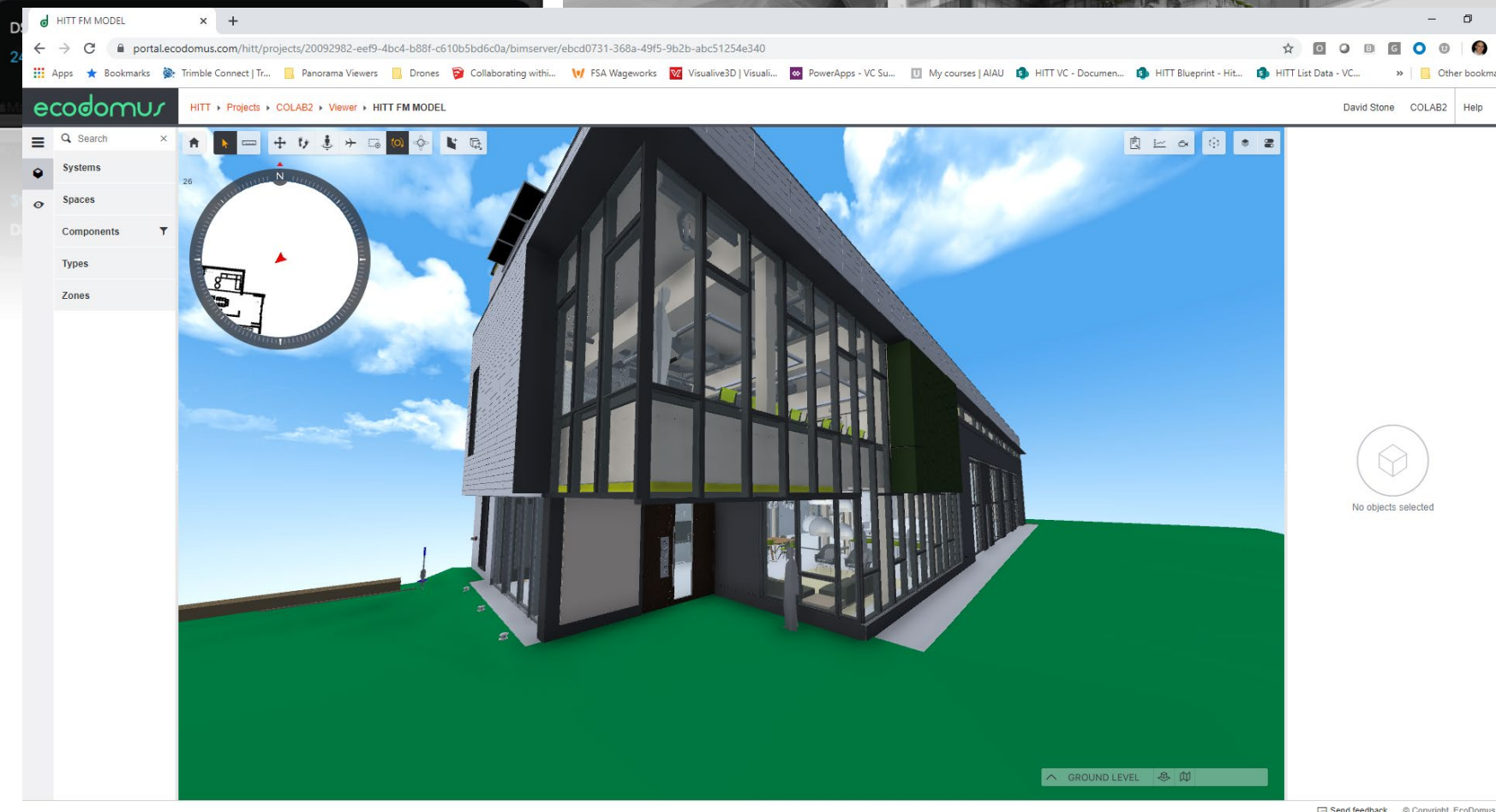
## BIM 360 OPS

- Mobile device focus
- Ease of use
- Task oriented



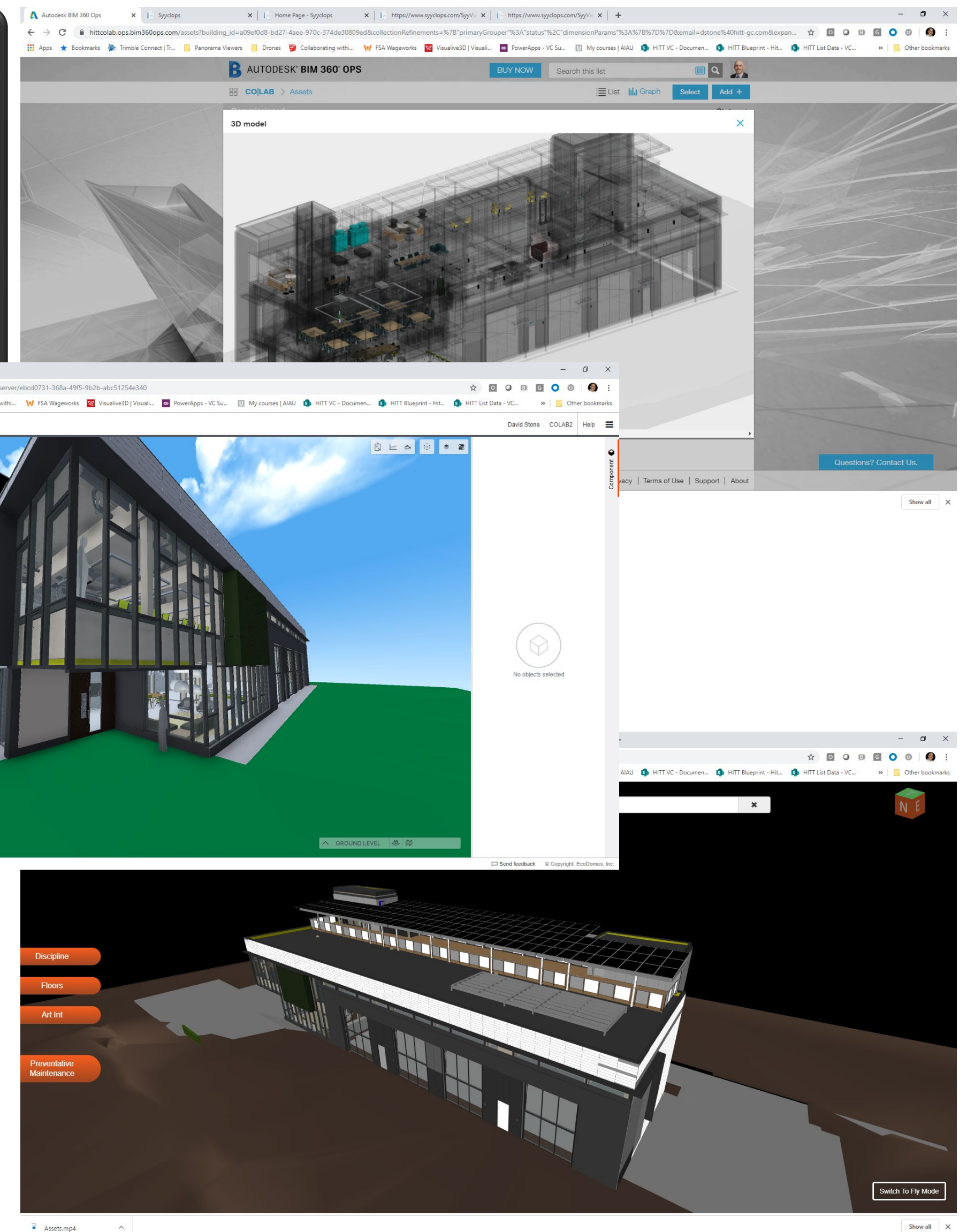
## ECODOMUS – THE LIFECYCLE COMPANY

- Integration with BAS
- Robust 3D and
- Robust 2D navigation



## SYYCLOPS INC.

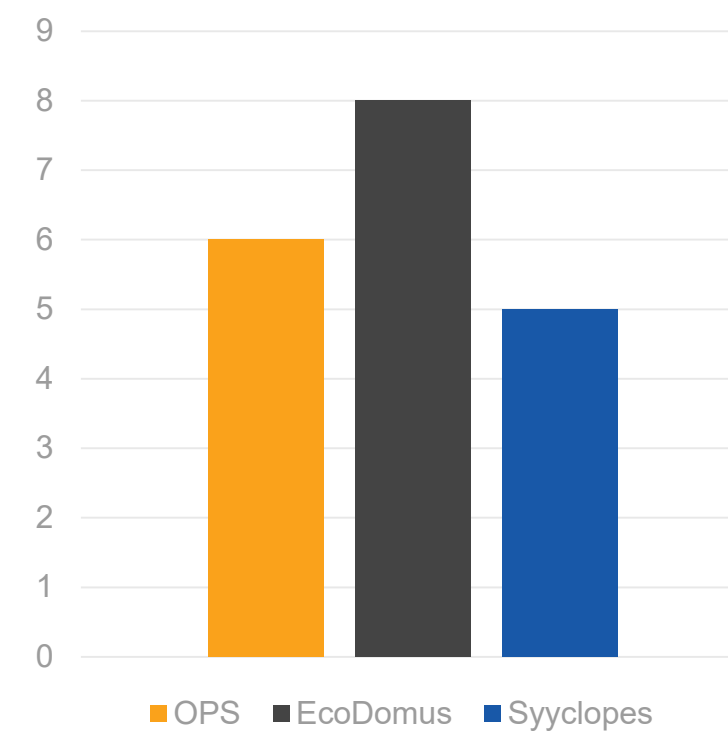
- Total cost of ownership
- Purchasing and automated RFPs
- 3D navigation
- AFDD – (Automatic fault Detection & Diagnostics) for analyzing live equipment data for diagnosis
- Heat Map for problem areas





# Value-add Comparison

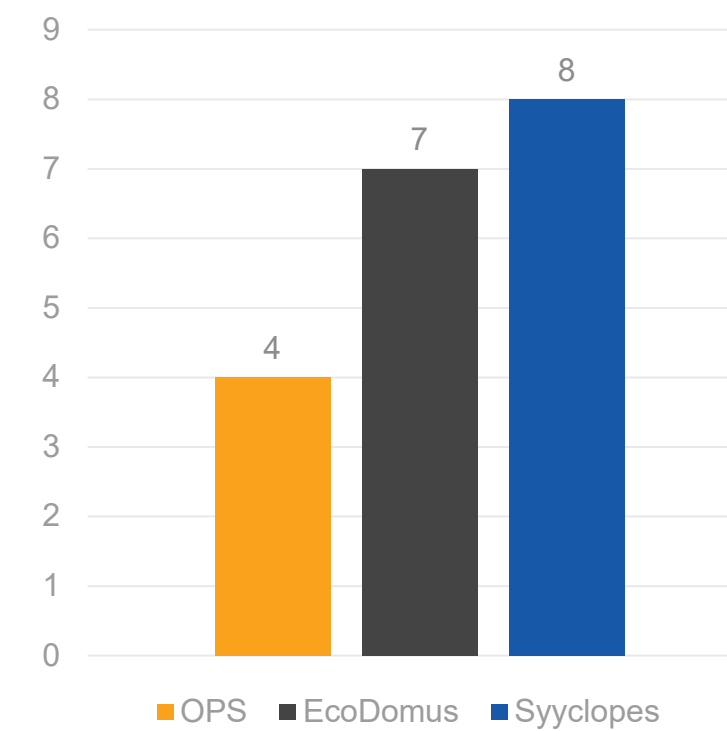
## Navigation 2D/3D



### ECODOMUS

2D can be used to navigate to 3D location by level, making navigation more intuitive

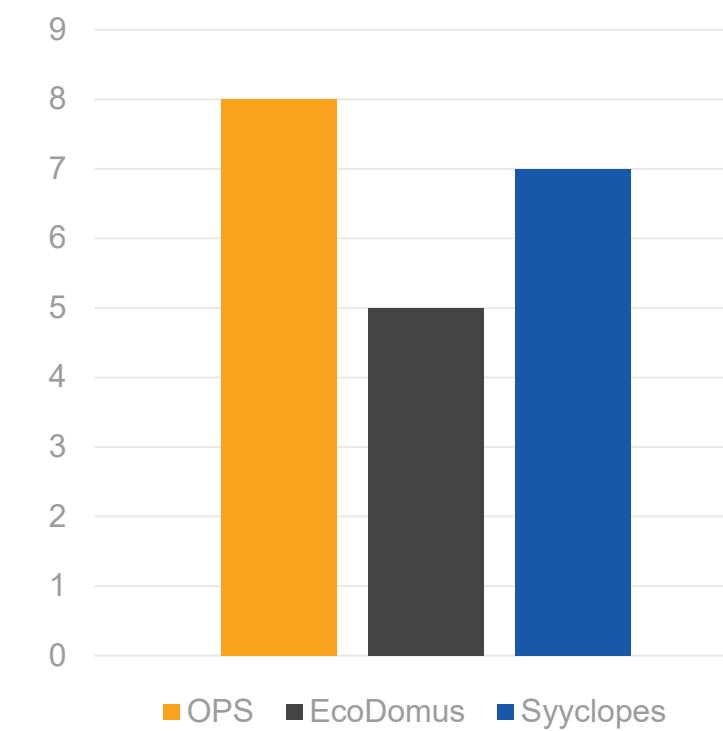
## Cost of Ownership



### SYCLOPPS, INC.

Focus on tracking utilities and expected life of assets

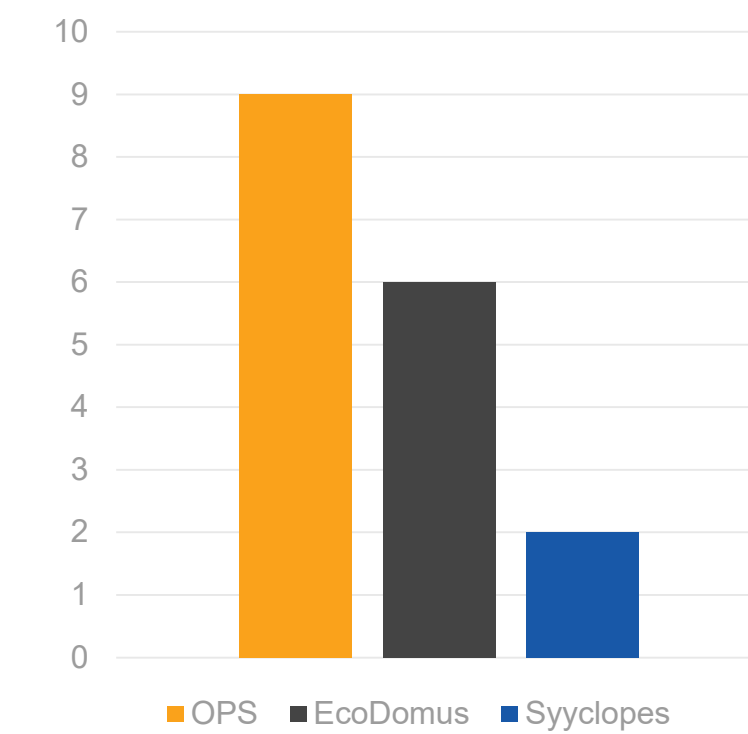
## Learning curve



### BIM 360 OPS

End user is not required to understand any model navigation or focus on tasks

## Mobile Friendly



### BIM 360 OPS

This solution has many is focused on mobile first approach

# Budgeting

## COST OF SOFTWARE

FM Solution	License Cost	Hosting Cost	Implementation Integration
BIM 360 OPS	\$125/Month	N/A	
EcoDomus	\$125/Month	N/A	\$5,000
Syclopps Inc.	N/A	\$300/Month	

## TIME FOR SETUP

Project Manager – 100 hours (5 months) for R&D proposal, communication meetings, and OPS setup

Facility Manager – 40 hours (3 months) to input assets and PMs, communication meetings, and onboarding

Building Engineer – 40 hours (3 months) to input assets and PMs, communication meetings, and onboarding

## INITIATION OF SYSTEM

Once the proposed solutions have been reviewed in the HITT R&D request process, we reached out to the providers to understand what data will be needed to implement Facility Management at the CO|LAB.



# Stakeholders and Priorities

## OWNER (HITT)

Cost management

Space utilization

Efficiency

Transfer of Knowledge

## FACILITY MANAGER

Ease of use

Work tickets

Space planning

## BUILDING ENGINEER

Access to information – visual 3D and documentation

Actionable issues and resolution

Preventative maintenance workflow





# Data Collected / Needed

## CLOSEOUT DOCUMENT

- PDF drawings and BIM
- Owner's manuals
- Submittals / specifications

## SETTING UP BIM FOR FM

- Cleaning up the model
- Updating for as-built including FFE
- Importing to FM solution

## PREVENTATIVE MAINTENANCE

- Preventative maintenance schedule
- Tickets
- Checklists

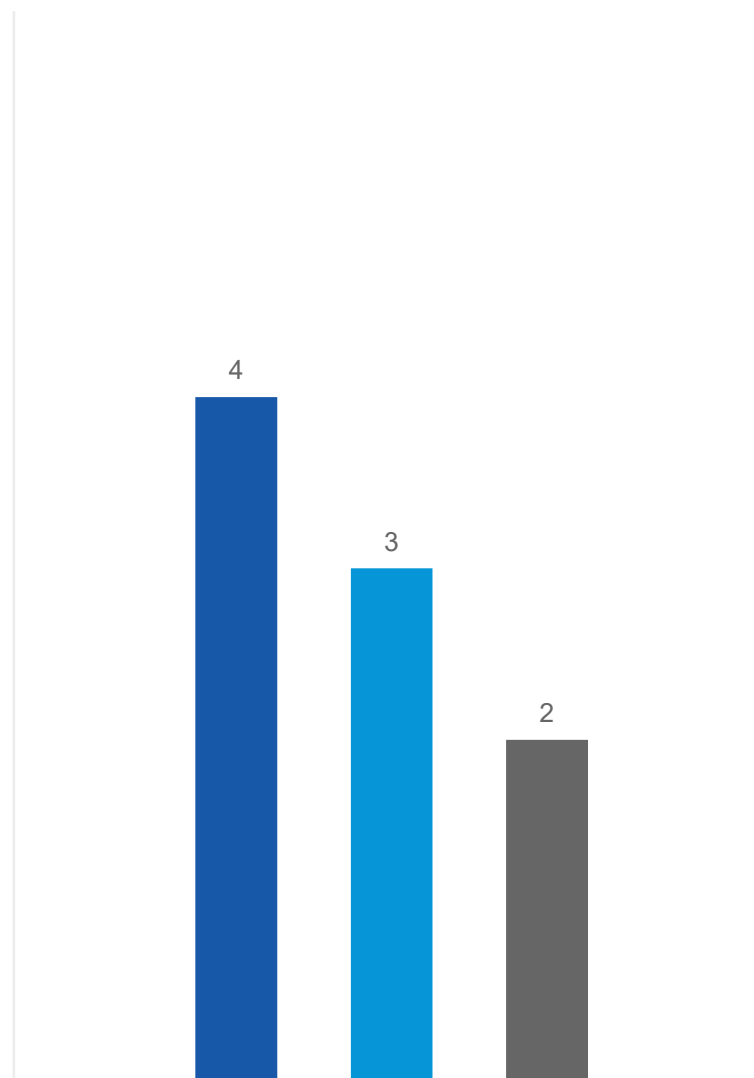




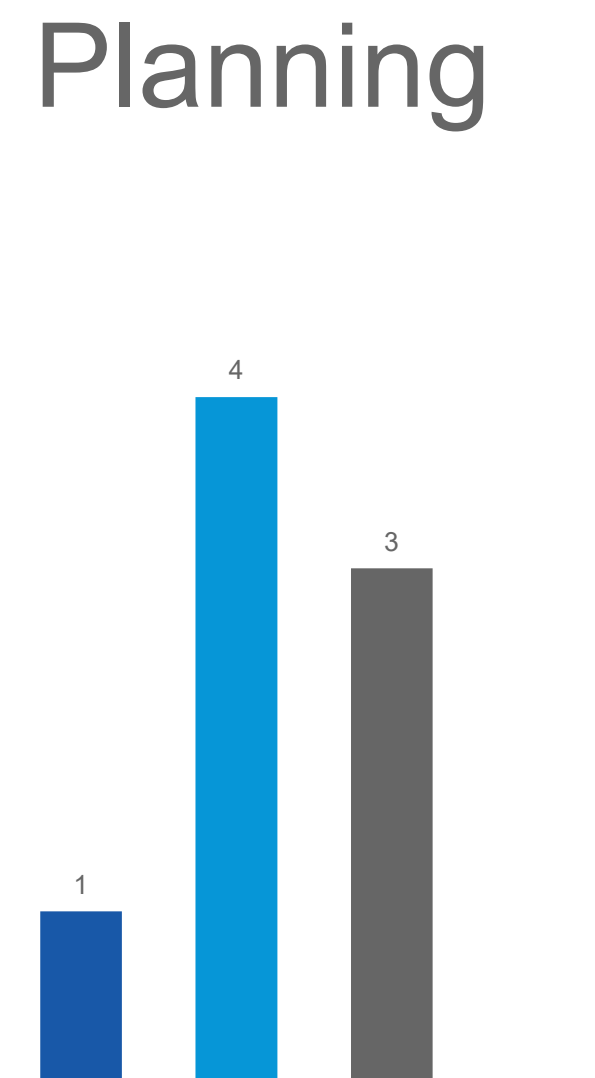
# Added Value for Each Solution

The following reflect the initial understanding of each software's capabilities beyond basic functionality.

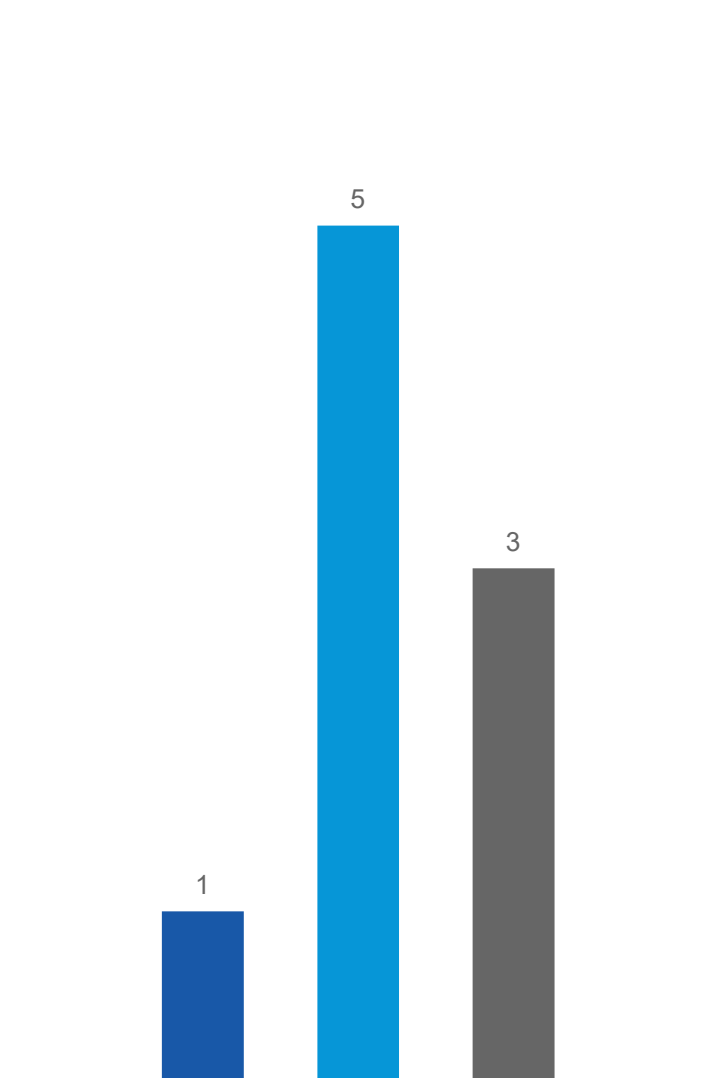
## Way Finding



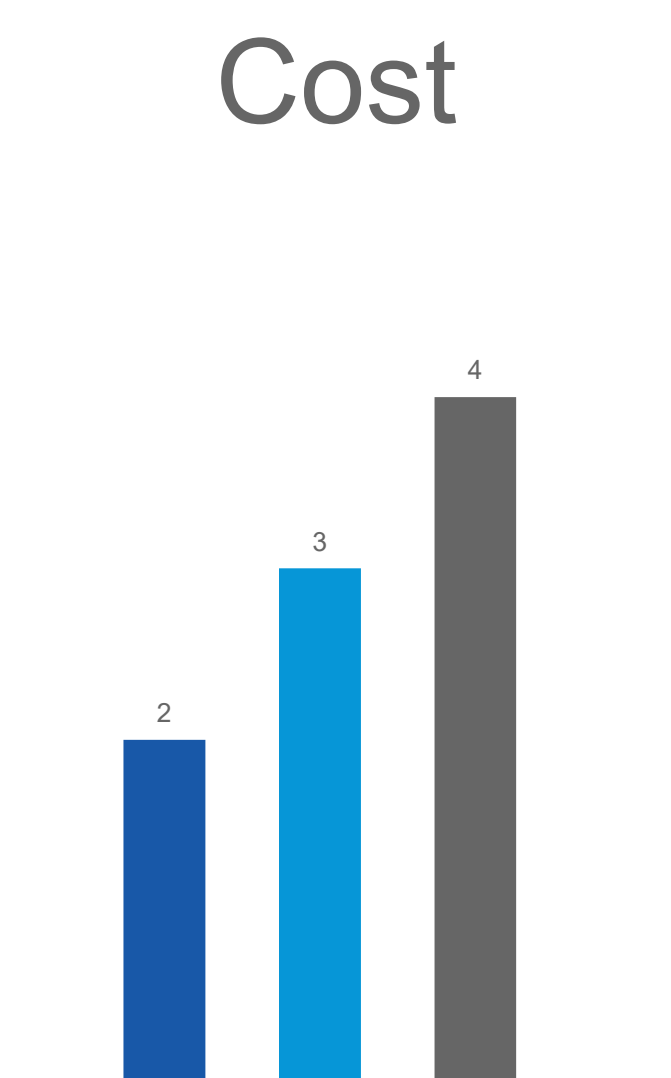
## Space Planning



## Integrations



## Operations



■ BIM 360 OPS

■ EcoDomus

■ Sycclops Inc.

# Costs of Implementing FM

Design + Construction	Cost / SF	FM Cost	Ratio
\$7,800,000	\$1,000	\$30,000	LESS THAN 0.5%
Net area = 8,600SF	\$300/SF	Includes:	1.2%
	\$200/sf	• FM Software	1.7%
	\$100/sf	• Manhours	3.5%
		Not including BAS	Based on sim. size



# Items Targeted for Tracking in FM

## MEP/FP

- HVAC: quarterly
- Plumbing / Fixtures – Annually
- Sprinkler / Backflow – Quarterly + Annual
- Fire Alarm panel – Annual + Quarterly tests
- In-Floor Heat - Annual
- Big Ass Fans – Semi-Annual

## FACILITY MANAGER

- Furniture
- Green wall: monthly + (spring / fall major)
- Events
- Landscaping
- Cleaning

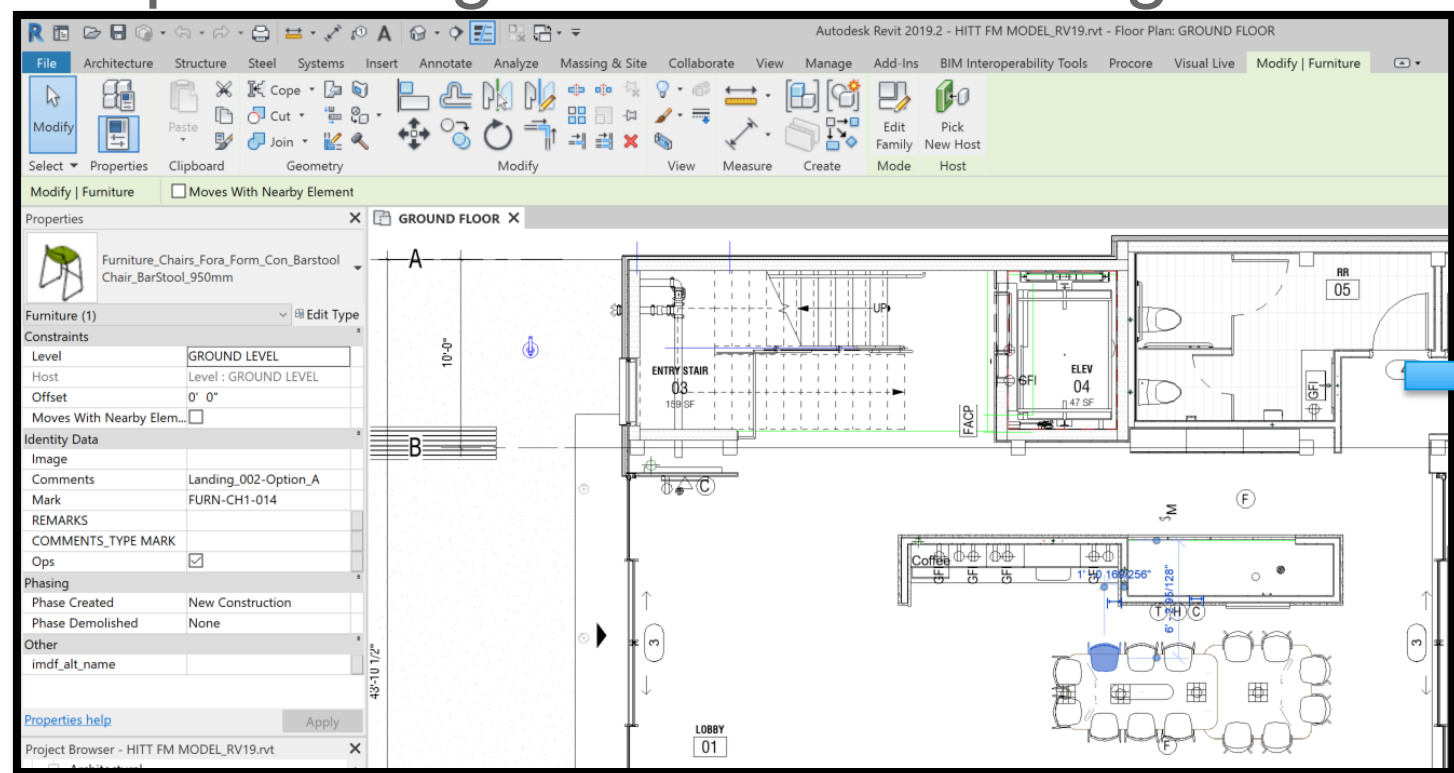
## OTHER

- Elevators: quarterly + semi-annually
- Roof: Annual inspection + monthly clean
- Cameras: annual
- A/V: Quarterly
- Bathrooms
- Appliances: DW, fridge, disposal, coffee maker
- Concrete floors: Daily, weekly, monthly
- Stainless steel: Bi-annually + annually
- Powder coating: Annually

# Revit to BIM 360 OPS – Workflow

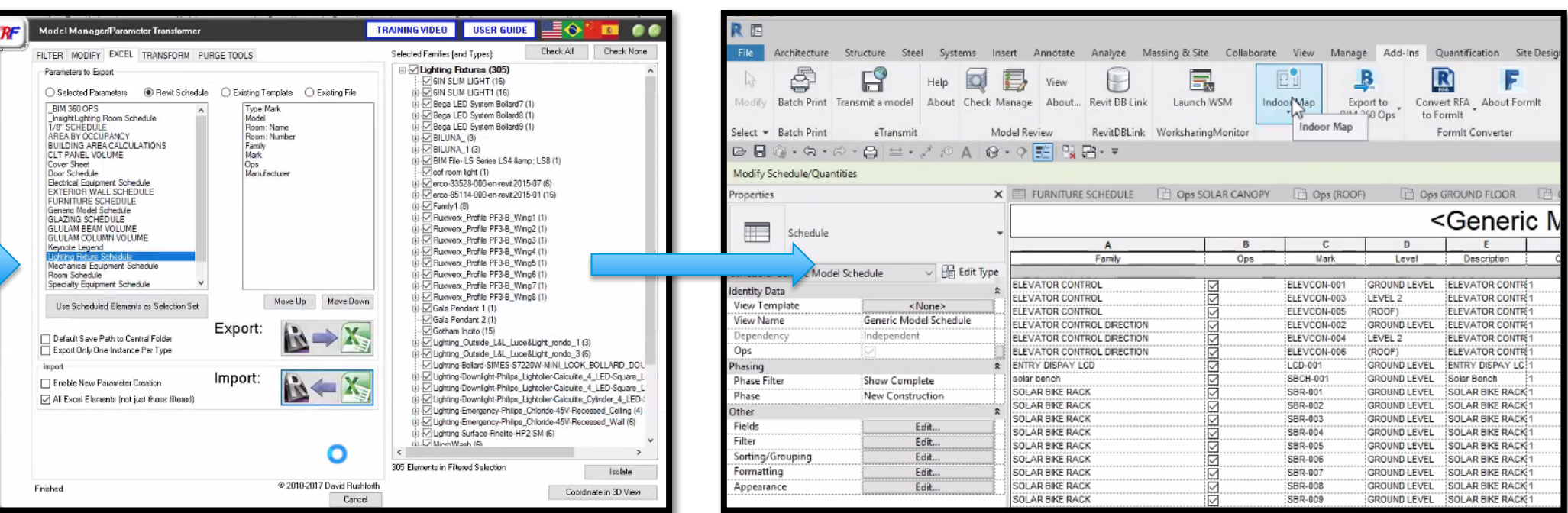
## MODEL CLEAN-UP

Adopt naming conventions to organize via schedules



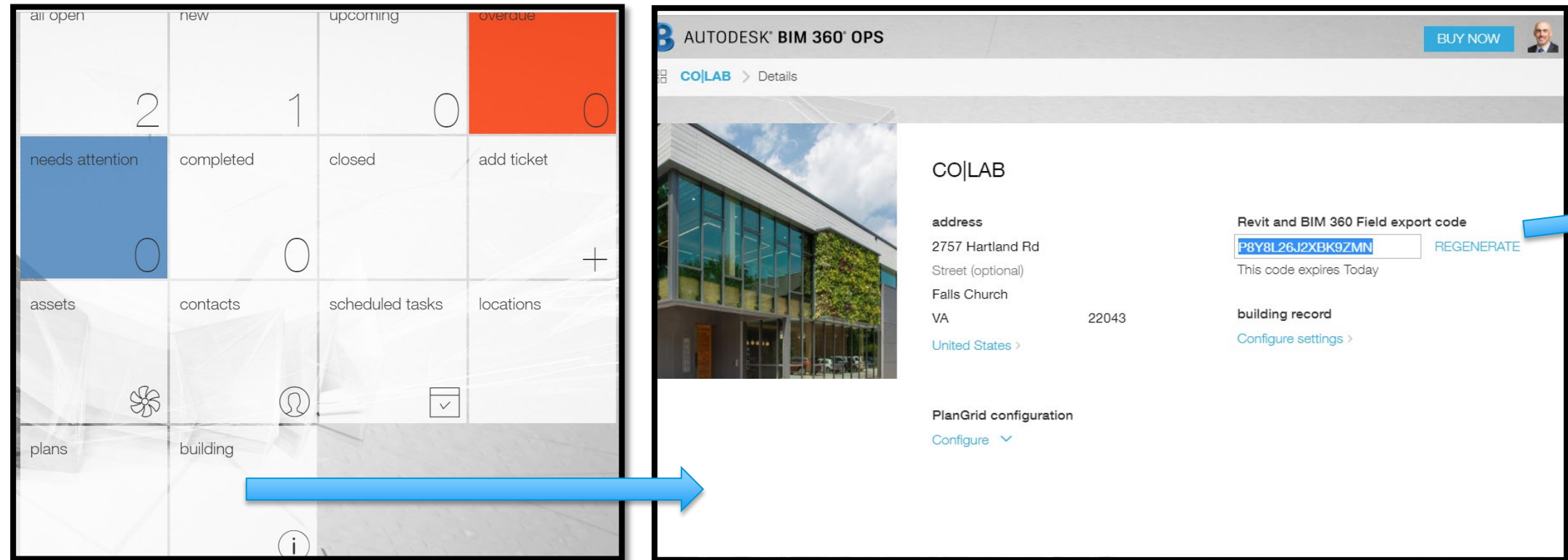
## ASSET RENAMING

Bulk assignment of naming convention via excel



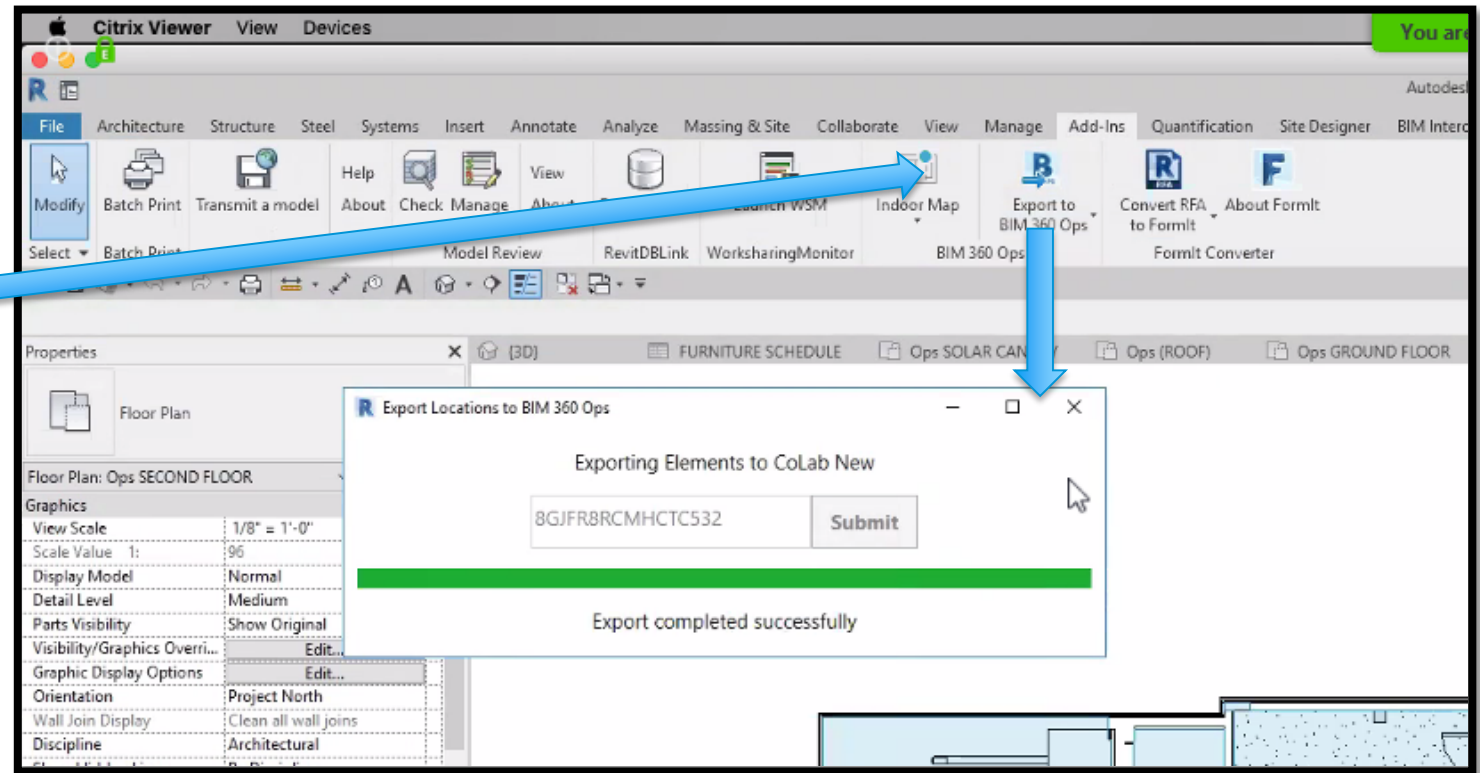
## START OPS PORTFOLIO AND BUILDING

Request an export link



## EXPORT FROM REVIT TO OPS

Export assets and data, or data only





# Creating a Checklist from O&M

## LOCATE PM WITH O&M

- Folder structure
- Separate PM items

26 0923 - Lutron Lighting Controls O&M.pdf

26 2412 - Switchgear O&M's.pdf

26 2653 - Electric Vehicle Charger O&M.pdf

O&M.pdf

Warranties.pdf

Warranties.pdf

pdf


al.pdf


M.pdf


sprinkler O&M.pdf


Maintenance Instructions


2 1/2" – 6" (65 – 150mm)














⚠ WARNING

Prior to servicing any Watts valve, it is mandatory to shut down the water system by closing both the inlet and outlet shutoff valves. After shutoff valves are closed, open test cock #2, #3 and #4 to relieve pressure within the backflow assembly.

1. After #3 test cock has been opened to relieve pressure, remove #3 test cock from housing. (Figure A)

2. Insert a #3 screwdriver through the hole on the top of the cover sleeve and using both hands rotate the cover sleeve approximately 1/4-turn clockwise and 1/4-turn counterclockwise to break the sleeve O-ring seals. Using the screwdriver, slowly slide the cover sleeve to the downstream side of the housing. (Figure B)

6. To clean or inspect either check module, insert a #3 screwdriver through the downstream side of the check module as shown in Figure D and E. When the screwdriver is in place, remove the E-clip (Figure F) and pin connecting the structural members and the check clapper will open with no tension.

7. Thoroughly clean the seating area. The sealing disc may be removed, if necessary, by removing the screws connecting the keeper plate to the clapper. The sealing disc may be reversed and reinstalled if the elastomer is cut or damaged.

8. Wash check module and O-ring and inspect for any damage. If damaged, reinstall new parts.

9. After thorough cleaning, lubricate O-ring w/FDA approved

## CHECKLIST FROM PM

- Portfolio
- Checklist
- Create

AUTODESK® BIM 360® OPS

BUY NOW

CO-00002 > Checklist

Done

Backflow Prevention PM

☐

After #3 test cock has been opened to relieve pressure, remove #3 test cock from housing. (Figure A)

Add comment

☐

Insert a #3 screwdriver through the hole on the top of the cover sleeve and using both hands rotate the cover sleeve approximately 1/4-tu

Add comment

☐

Using the screwdriver, slowly slide the cover sleeve to the downstream side of the housing. (Figure B)

Add comment

☐

Remove the stainless steel check retainer from the housing. (Figure B)

Add comment

☐

Remove the #1 check module (Figure C) by inserting two flat blade screwdrivers into the slots on either side of the check module and gent

Add comment

☐

Remove #2 check module with the same instructions as in #4 above. For servicing 6" (150mm) checks, see 8" – 10" (200 – 250mm) instruction

Add comment

☐

To clean or inspect either check module, insert a #3 screw-driverthrough the downstream side of the check module as shown in Figure D and

Add comment

☐

Thoroughly clean the seating area. The sealing disc may be removed, if necessary, by removing the screws connecting the keeper plate to t

Add comment

## UPLOAD O&M'S

- Specific to task

RP/IS-757/757DCDA

Installation, Maintenance, & Repair

Series 757, 757DCDA & LF757DCDA

Double Check Valve Assemblies

Double Check Detector Assemblies

Sizes: 2 1/2" – 10" (65 – 250mm)\*\*

⚠ WARNING

Read this Manual BEFORE using this equipment. Failure to read and follow all safety and use information can result in death, serious personal injury, property damage, or damage to the equipment.


Keep this Manual for future reference.

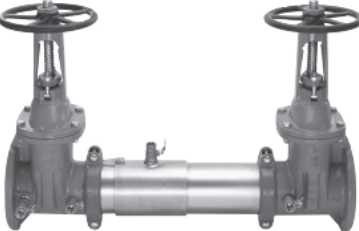
⚠ WARNING

You are required to consult the local building and plumbing codes prior to installation. If the information in this manual is not consistent with local building or plumbing codes, the local codes should be followed. Inquire with governing authorities for additional local requirements.

⚠ WARNING

**Need for Periodic Inspection/Maintenance:** This product must be tested periodically in compliance with local codes, but at least once per year or more as service conditions warrant. If installed on a fire suppression system, all mechanical checks, such as alarms and backflow preventers, should be flow tested and inspected in accordance with NFPA 13 and/or NFPA 25. All products must be retested once maintenance has been performed. Corrosive water conditions, and/or unauthorized adjustments or repair could render the product ineffective for the service intended. Regular checking and cleaning of the product's internal components helps assure maximum life and proper product function.





757 OSY

Installation Guidelines

Most field problems occur because dirt and debris present in the system at the time of installation become trapped in the #1 check. The system should be flushed before the backflow valve is installed. If the system is not flushed until after the backflow valve is installed, remove both check modules from the valve and open the inlet shutoff to allow water to flow for a sufficient time to flush debris from the water line. If debris in the water system continues to cause fouling, a strainer can be installed upstream of the back-flow assembly.

Watts Series 757 and 757DCDA/LF757DCDA may be installed in either horizontal or vertical position as long as the backflow assembly is installed in accordance with the direction of the flow arrow on the assembly and the local water authority approves the installation. The assembly should be installed with adequate clearance around the valve to allow for inspection, testing and servicing. 12" should be the minimum clearance between the lower portion of the assembly and the floor or grade.

## CREATE A PM TASK

AUTODESK® BIM 360® OPS

BUY NOW

Search this list

CO|LAB > Scheduled Tasks

Tasks Schedules Add +

Name

Name ^

TASK-00001

Backflow Monthly PM

pipe accessories add category

created by

Mike Koechlin >

priority

Medium >

repeat every

1 Month(s) >

more v

checklist

Backflow Prevention PM >

create ticket

1 Week(s) > before

View >

associated assets

None

associated locations

1 >

history

View >

schedules

1 of 1 location scheduled >

Photos and Videos

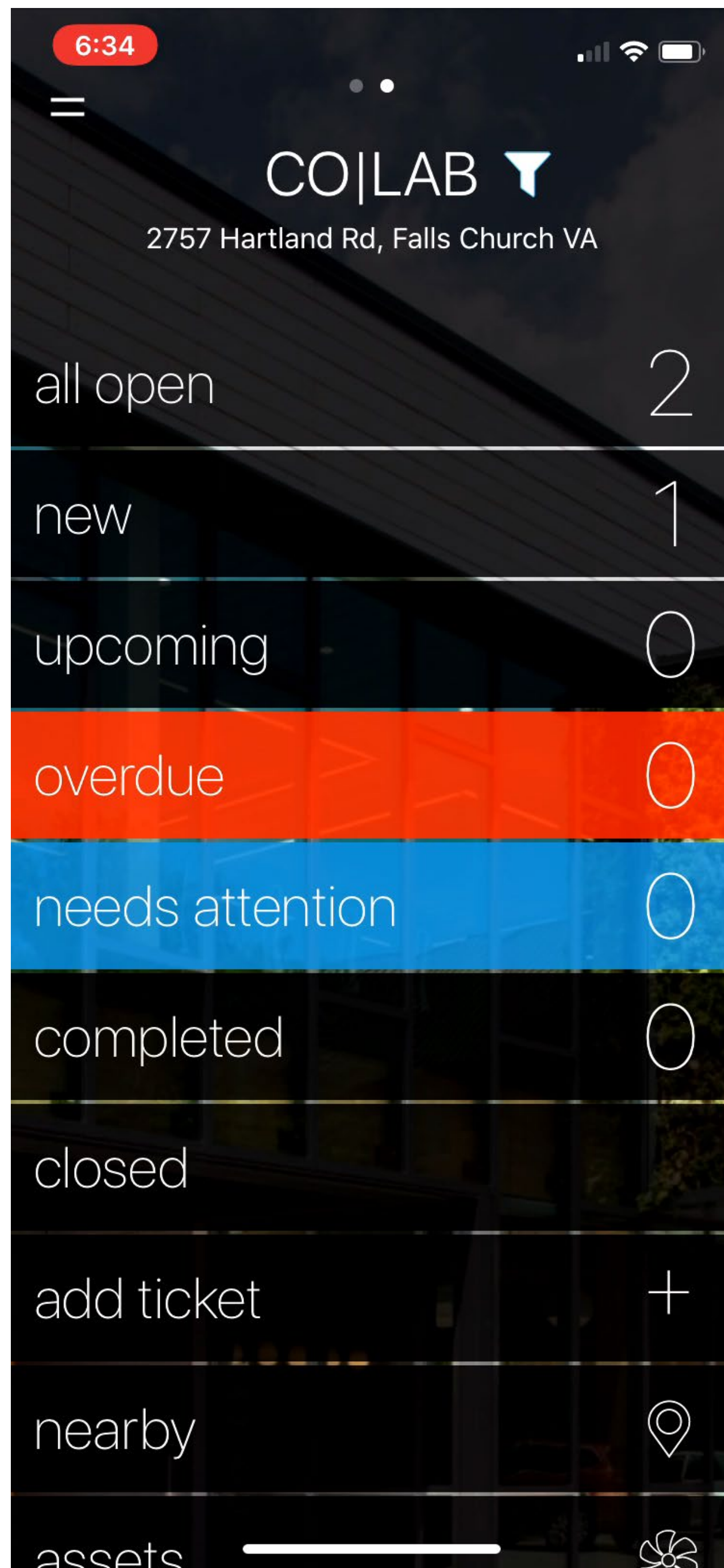
Add Photo or Video

Documents and Manuals

Add PDF

PM Watts RP-US

Backflow Preven

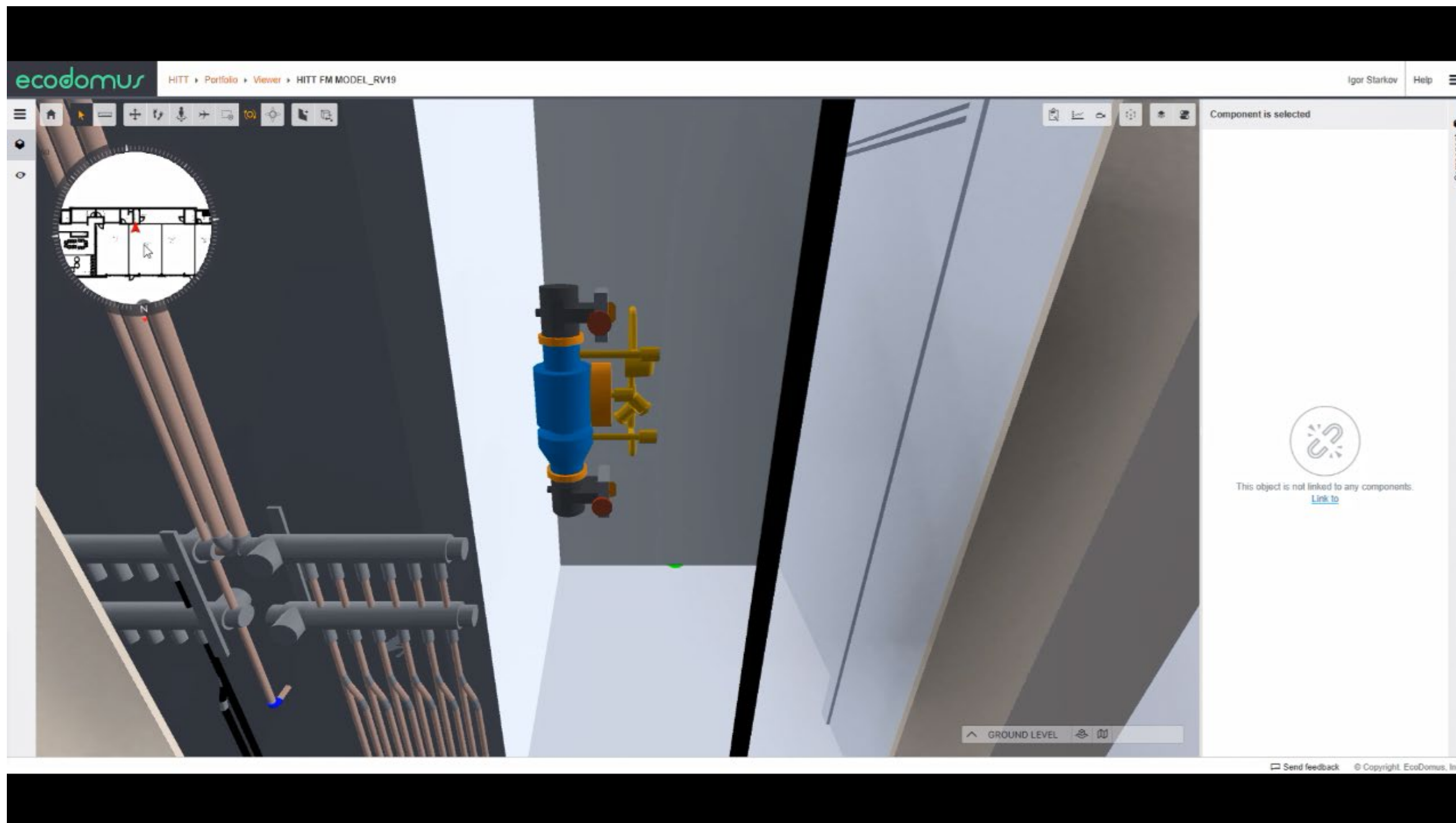


# BIM 360 OPS

## Workflow sample

- Creating a task
- Assigning a task
- Completing a task
- Closing a task

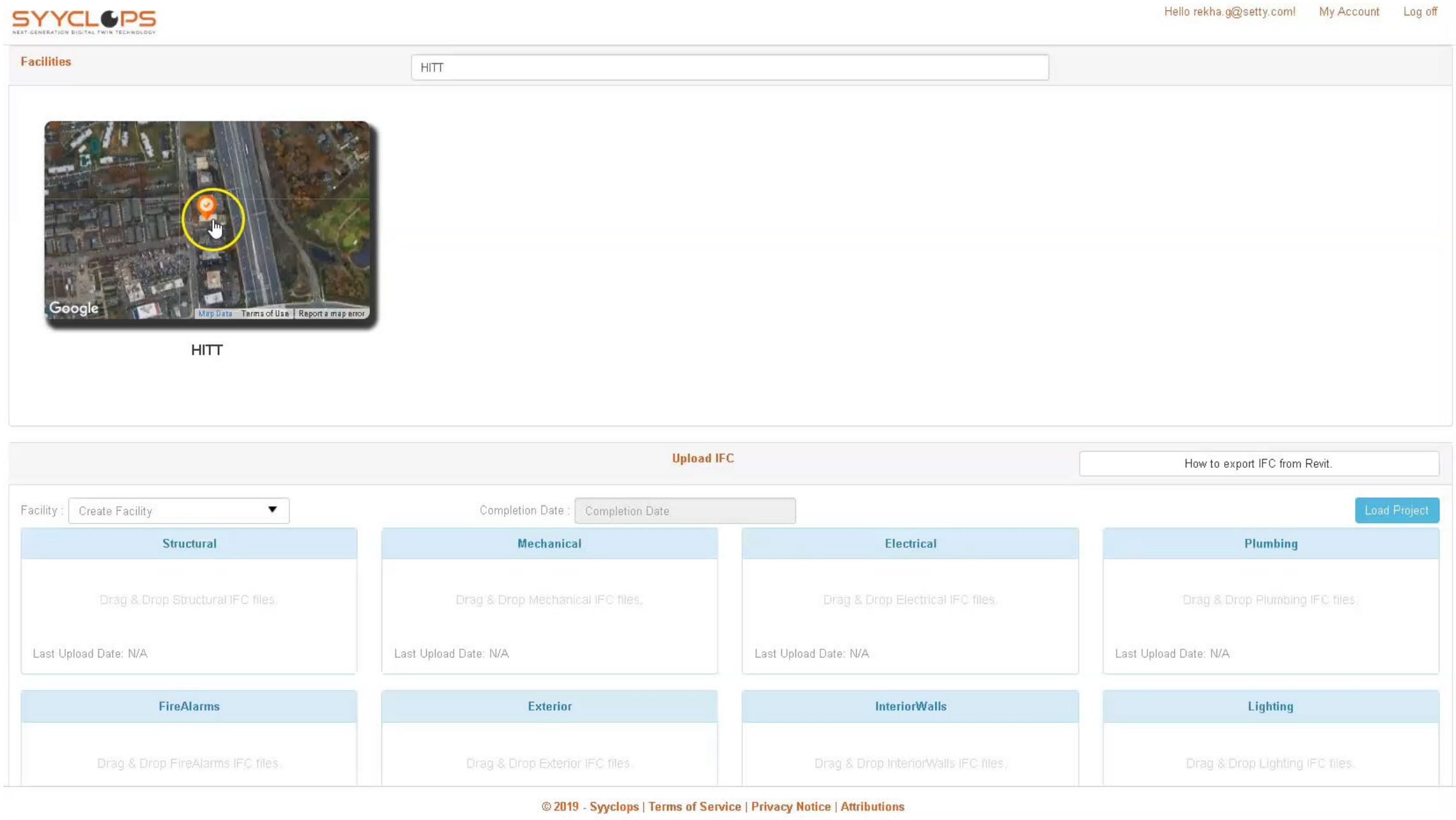




# EcoDomus

## Workflow sample

- Creating a task
- Assigning a task
- Completing a task
- Closing a task



# Syyclops Inc.

## Workflow sample

- Creating a task
- Assigning a task
- Completing a task
- Closing a task



# Takeaways



# Takeaways... so far

## DATA COLLECTION

- Owner's manuals – 2 month delay
- Format of O&Ms – breakdown to assets
- FFE was not included in closeout document
- BAS system – 5 month delay
- PM's checklists should have been required

## STAKEHOLDER INPUT

- Building engineer and facility manager had no set template to create a baseline
- Facility manager never used a facility management system
- Building owner was not familiar with FM systems

## BIM MODEL

- Updating to match as-built
- Model assets do not match O&M's
- Missing FFE elements in the model
- Proper naming conventions and data fields (example: FURN-TBL1-001)

## IMPLEMENTATION

- How do you effectively run 3 solutions simultaneously?
- What are the metrics we want to track?





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