AUTODESK. UNIVERSITY

BLD322704

BIM 360 Ops for Data Centers: An Application Review

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Learning Objectives

- Leverage technologies that allow our Project Team to revolutionize the AEC project delivery workflow.
- Getting started with BIM 360 Ops on any budget.
- Understand how to build a digital experience that pleases every customer.
- Learn how to build more impactful, meaningful facilities, and increase adoption.

Description

The Internet of Things (IoT) has made it possible to gather real-time data about your critical business assets. This enables you to collect data about asset condition, performance, and usage and turn it into real actionable insights. Coupling IoT with BIM 360 Ops and by reorganizing teams to align with the customer journey, a data center owner was able to automate the management of data and switch servers.

Everyone in the organization has an idea for improving work but not everyone is empowered to deliver it. Learn how delegated development empowers anyone in the organization to innovate WITHOUT adding risk of impacting other areas of the organization. In this session, you'll learn how various systems fit in the ecosystem, and how to decide on which technologies will help accelerate digital transformation. Workflows should be designed to be flexible, robust, and efficient. Attendees will be exposed to industry best practices for workflow automation design.

Delegated development provides fine-grained control of no/low/pro code capabilities within a secure and risk-free scoped environment to ensure changes do not impact the broader business.

Speaker(s)

Ian McGaw has a dual degree in computer science and international business, focusing on the management and research and development of emerging technologies in the AEC/O sector. He is an executive business leader with broad domestic and international experience in identifying strategic and innovative technology solutions to complex business challenges. Ian’s interests, along with years of industry-related experience, have allowed him to understand complex technology process has become an influential factor in the way buildings are delivered all over the world. Ian has experience in the full value chain of project development process, starting

from early strategic planning, project planning, business IT innovation strategy and business portfolio management for long term clients all the way to project turn-over. With experiences as practitioner, product manager & project manager Ian has been developing products and services specific to the building lifecycle with a focus on improving the overall workflow delivery, Virtual / Augmented Reality, and IWMS (Integrated Workplace Management Solution) integration. Furthermore, Ian has been invited to speak at numerous conferences (including Autodesk University, BILT, & BIMForum) upon topics ranging from BIM content to the implementation of technology to virtual design & construction (VDC).

Tyler Miller is an experienced Design Director with a vast background and knowledge within the AEC industry. With a focus in electrical engineering and design, Tyler has led design teams of all MEP trades, created project standards, and oversees the project lifecycle from design phase to final build-out. Tyler also focuses his efforts on data management within BIM models, as the need for building data hand-over becomes more prevalent.

Introduction

Most organizations feel compelled to make significant changes to remain relevant and compete effectively in their markets. Some organizations are more aware than other of the need to embrace change and have established strategic transformation programs in response to the risks presented by innovative disruption.

Digital Twins and the 4th industrial revolution mean that the connection of data for analysis has become mainstream. While many of these technologies have been available for the better part of 10 years, it is only now that the price reduction in sensors and management platforms have allowed the thoughtful execution for buildings. These implementations are often limited to new or greenfield structures; however, the global economy should consider how to implement analytic sustainability for existing buildings.

A unified approach to digital asset management (DAM), across the asset lifecycle provides a true single source of truth across the organization. Traditionally, DAM focused on certain functional needs, such as storing and re-purposing assets, without taking into consideration the entire asset lifecycle. So, as many teams cobble together multiple systems for managing other aspects of the lifecycle, disconnects invariably occur and ad-hoc handoffs can lead to inconsistencies, confusion, and inefficiencies.

Automation is key to improving the efficiency of tedious, repetitive tasks that don't scale well manually. And, with the ever-changing technology landscape, moving faster on digital transformation initiatives requires effortless adoption of new technologies and evolving media trends. As your organization grows, your asset management pains grow in parallel. Being able to effortlessly scale rich workplace operations to support varying needs and global growth is critical. In a nutshell, a unified approach to digital asset management can enable your teams and empower your end users. Leverage a dynamic approach to digital asset management to unify disparate processes and functional groups, streamline asset workflows, and drive engagement.

Energy Efficiency

Energy efficiency begins with expert and accomplished building and building systems design. From there, legacy technology delivers the ability to acquire, aggregate and visualize energy usage data, which then provides associated reports, controls, alarms and management tools.

If we go beyond these legacy, rules-based, often siloed solutions and federated techniques, to include and integrate data on a broader scale, then structure that encompassing data into a model which can be analyzed, we will be able to make more informed decisions and produce better outcomes. As well, these data processes would surely transform our related business practices.

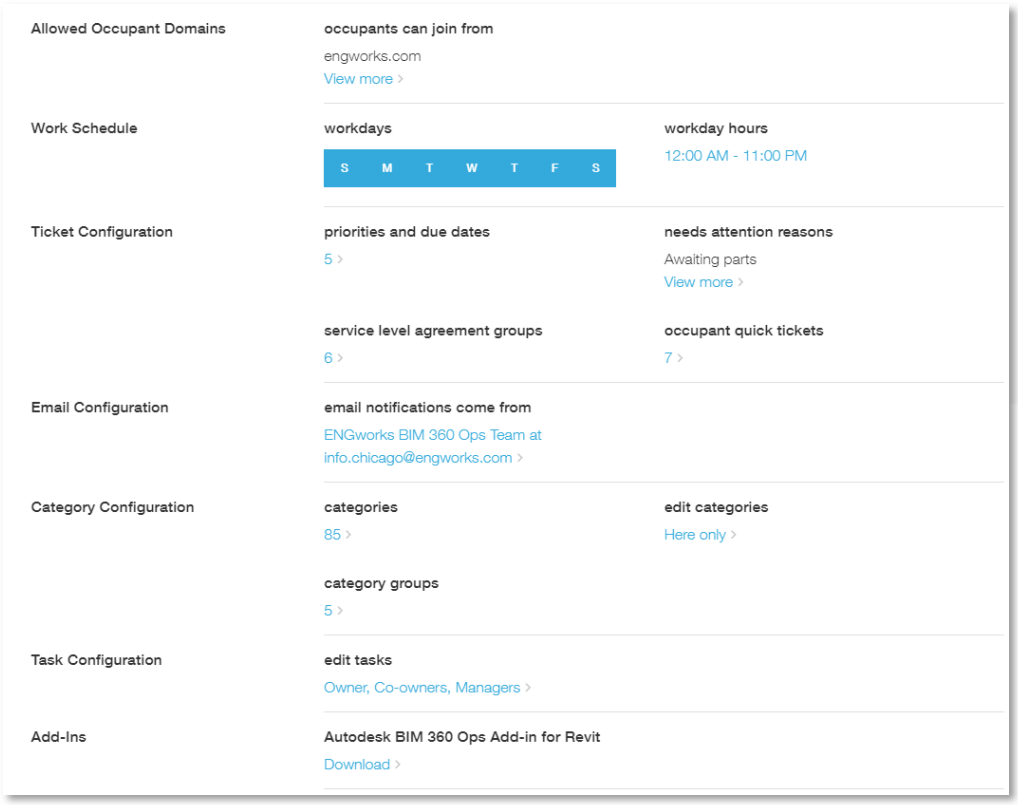
What is BIM 360 Ops?

BIM360 Ops is utilized as an asset and maintenance management platform built around the AEC industry, enhancing the value of BIM in building operations. The Ops application is designed to allow building owners to streamline the project handover process and create a centralized location for building operations once construction is complete. With the use of 3D BIM models, Ops can extract specific asset data making it available for building operations to utilize for maintenance and issue tracking. Maintenance and issues are tracked via a ticketing system that allows operations to create schedules, assign personnel and attach resource documentation.

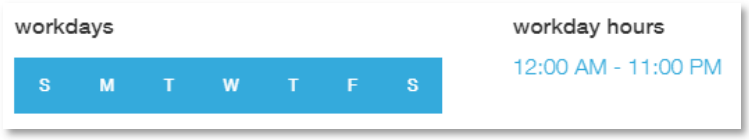
BIM 360 Ops Setup

Portfolio - Settings

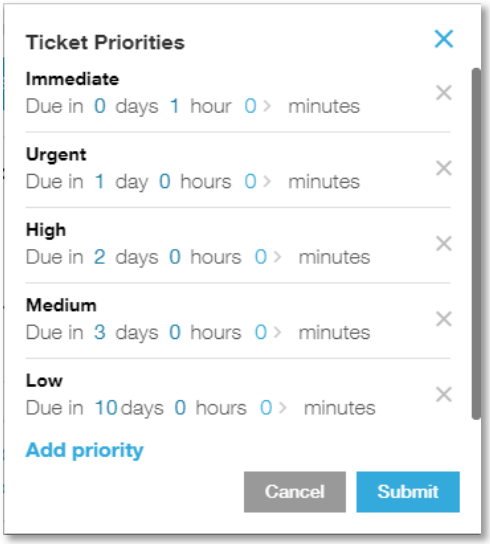
After signing up for Autodesk BIM 360 Ops it is recommended to personalize your portfolio settings. Select *Settings* from the Portfolio menu to see the below image.



- *Allowed Occupant Domains*
  - These are the domains that occupant users (that will not utilize a license) are allowed to join from.
- *Work Schedule*
  - This is a global work schedule that can be applied to building in the portfolio by default. Each building can have its own work schedule as well.



- *Ticket Configuration*
  - Priorities and Due Dates
    - This section facilitates the workflow reminders for the different priority level tickets.



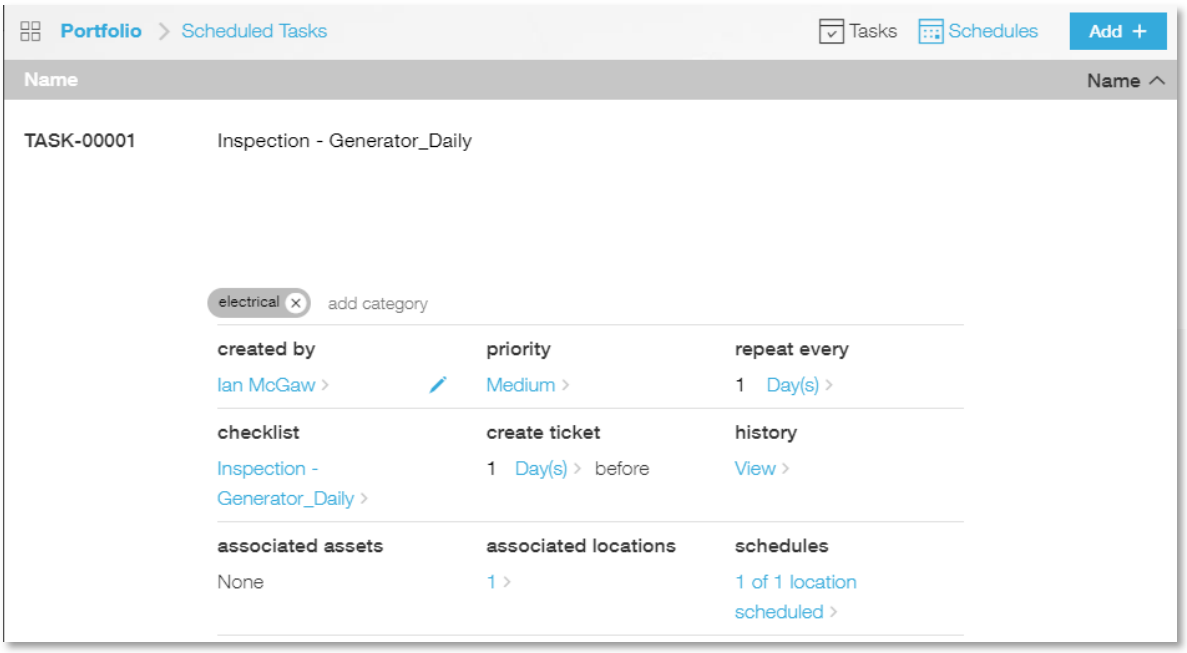
  - Needs Attention Reasons
    - Often times work orders can be held up due to a variety of reasons. This section allows the curation of drop-down options necessary during the ticketing workflow.
  - Occupant Quick Tickets
    - This is where it is possible to setup the quick tickets that occupant users will have access to of their home screen.

- *Email Configuration*
  - This is the email address that users will receive email communications from.
- *Category Configuration*
  - Categories are one of the most important features within BIM 360 Ops, they provide the filters how assets, tickets, buildings, floors, etc. are classified within Ops. These categories can also be grouped. All of the category functions assist with the visual and text-based searching with Ops as well.
  - **BIM 360 Ops Blog (Using Categories):** https://bim360ops.autodesk.com/blog/using-action-categories
- *Task Configuration*
  - Allows the administrator to specify who is able to edit and assign tasks. By default, this is set to *Owner, Co-Owner, and Managers*.

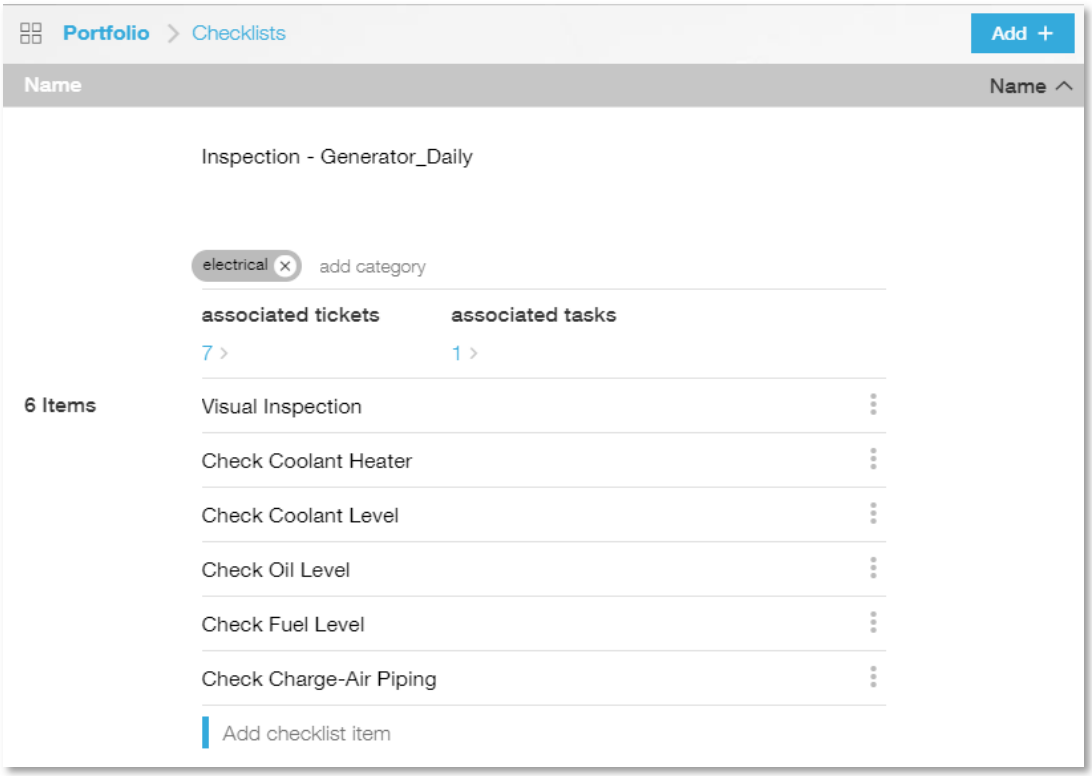
Video Link: https://youtu.be/44gSq04RriM

Portfolio – Scheduled Tasks / Checklists

- *Scheduled Tasks*
  - Scheduled tasks allow the automated creation of Work Orders (Tickets) at set intervals. These tasks can be pre-assigned to individuals that should own the work. Scheduled tasks can also reference locations or assets; however, not both.



- *Checklists*
  - Checklists are associated to Scheduled Tasks by selecting the checklist option while creating a Scheduled Task. However, checklists can be added to manually created tickets as well. When a Work Order (Ticket) is autogenerated the checklist will automatically be set to 0% complete. If a technician begins to add comments or check off items in a checklist the associated ticket will automatically change its status to *In Progress*.



BIM 360 Ops Blog (Scheduling Preventative Maintenance):
https://bim360ops.autodesk.com/blog/scheduling-preventive-maintenance-and-inspections

Video Link: https://youtu.be/sK7lGtD48nE

Facility

- Add a Building
    - Adding a building is a very simple form driven workflow that can be accessed from the Portfolio screen within BIM 360 Ops. It is very important to generate a Building prior to attempting to associate Assets from Revit.

Video Link: https://youtu.be/srKr1SY6ahM

Building Information Model (BIM)

Prior to exporting locations and/or assets it is important to install the BIM 360 Ops Exporter. This can be located by navigating to the Portfolio Page and selecting *Settings*. At the bottom of the Setting page, there will be a link to download the installer. Make sure that Revit is closed before running this installer.

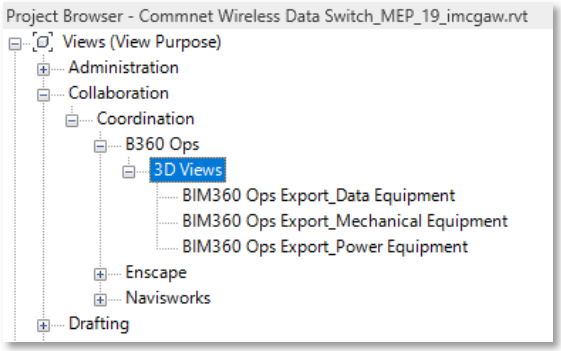
Locations

1. To Export Rooms to BIM 360 Ops, it is recommended to validate that all of the rooms are placed (ie. there are no orphaned rooms), and the naming and numbers are correct. These can of course be changed within Ops after export.
2. With regard to Floors, it is important to set the Floor to be a Building Story if it has Rooms associated to it.
3. To export Locations, it is first necessary to navigate to the previously created BIM 360 Ops Building and select the Building button at the bottom, on the Building Details page, next select *Generate Export Code* under *Revit and BIM 360 Field export code*.
4. Copy this code to your clipboard, then navigate to Revit.
5. To export Locations, open a floor plan within Revit.
6. Next Select the Export to BIM 360 Ops button from the Add-Ins tab, then pick Export Locations to BIM 360 Ops.
7. You will then be prompted for the code that was generated in step 3.

Note: Locations are based off Rooms in Revit. This means that they would need to be extracted from an Architectural model.

Assets

1. To Export Assets to BIM 360 Ops, it is recommended to setup dedicated 3D Views that display the assets that would need to be associated with a building.



2. Prior to exporting Assets from a Revit model, it is also recommended to create schedules of the assets that you wish to export. This allows you to manage the data that will be imported into BIM 360 Ops.
3. To export Assets, it is first necessary to navigate to the previously created BIM 360 Ops Building and select the Building button at the bottom, on the Building Details page, next select *Generate Export Code* under *Revit and BIM 360 Field export code*.
4. Copy this code to your clipboard, then navigate to Revit.
5. To export Assets, open a 3D view within Revit.
6. Filter/Hide the elements that you do not wish to export.
7. Select the elements you do wish to export.
    a. If the elements are not filtered & selected all elements in the project will be exported to BIM 360 Ops.
8. Next Select the Export to BIM 360 Ops button from the Add-Ins tab, then pick Export Assets to BIM 360 Ops.
9. You will then be prompted for the code that was generated in step 3.

Note: At the time of this writing, BIM 360 Ops leverages the Mark parameter for Asset Naming. It is highly recommended to apply an Asset Naming convention within the Mark parameter prior to exporting.

Note: Assets are not exported through a Linked model. Meaning that, if an Architectural model is open with a MEP link visible in the export view, those assets will not be published to BIM 360 Ops. For this reason, it is necessary to either bind the links together or simply open the linked model and publish the assets from the native model.

BIM 360 Ops Blog (Exporting Locations): https://bim360ops.autodesk.com/blog/export-locations-from-revit-to-bim-360-ops

Video Link: https://youtu.be/X5qSOoI8R4c

Video Link: https://youtu.be/QKiV1tr61vk

Additional Data

BIM 360 Ops allows Administrators to export and import data for a few different key elements. For example, we can import Assets and/or Asset Data, further it is possible to import checklists. Regarding exporting, it is possible to export basic asset data.

Data Exports

To export the basic asset data start by navigating to the Building, then Assets. When on the list of assets screen select Graph in the top right-hand corner of the screen. When the Graph loads, there is a Share Icon ( ) on the right side of the graph, by selecting this there is the option to download a CSV. This will export the Basic asset data contained within the building.

Data Imports

- Assets

  The Asset Import Excel Template can be located by navigating to the Building, then Assets. When on the list of assets or graph screen, select the *Add* drop-down button. When the Add button is selected there is a split button available for the *Import from CSV*, if the small document is selected an automatic download will be initiated for the Sample_Assets.xlsx. By filling out this template and saving it as a CSV. Next navigate back to the same *Add* drop-down and select the other side of the button to navigate to the CSV file you wish to add.

  Note: It is possible to add custom parameters and data to assets by creating new column headings, after column M.

- Checklists:

  The Checklist Import Excel Template can be located by selecting Checklists from the Portfolio screen, then selecting *Add* in the top right-hand corner of the screen. When the Add button is selected there is a split button available for the *Import CSV*, if the small document is selected an automatic download will be initiated for the Sample_Checklists.xlsx. By filling out this template and saving it as a CSV. Next navigate back to the same *Add* drop-down and select the other side of the button to navigate to the CSV file you wish to add.

Video Link: https://youtu.be/0l2QrrwnpO4

Maps

With the release of the Apple IMDF (Indoor Map Data Format), it is now possible to export maps from Revit to visualize where tickets are created with the use of heat maps. In addition, these maps can be used for navigation for users within the building.

Setup

1. From the Add-Ins tab select Indoor Map, then *Add Indoor Map IMDF Parameters.*
2. IMDF parameters will then be added to Project Information, Levels, and Rooms.
3. Make sure that the project Location is set to the correct latitude and longitude.
4. Levels
    a. Fill out the imdf_ordinal parameter with the order of the levels.
    b. Fill out the imdf_short_name parameter (only 4 characters are allowed).
        i. This parameter is used for filtering/selecting levels within the application.

00_Home Page | B360 Ops_Level Schedule

<B360 Ops_Level Schedule>

A	B	C	D	E	F	G	H	I
				Indoor Map Parameters				
Name	Elevation	Building Story	Structural	imdf_category	imdf_ordinal	imdf_outdoor	imdf_restriction	imdf_short_name
Level 1	0' - 0"	☑	☐		1	☑		L01
Level 2	10' - 7 1/8"	☑	☐		2	☑		L02
B of Steel Beam	17' - 2 1/2"	☐	☑			☑		
B of Steel Joists	19' - 2 1/2"	☐	☑			☑		
T/ Lower Roof	19' - 6"	☑	☐		3	☑		LR01
T/ Lower Parapet	19' - 11"	☐	☐			☑		
T/ Upper Roof	22' - 10"	☑	☐		4	☑		UR01
T/ Upper Parapet	24' - 4"	☐	☐			☑		

5. Rooms
    a. Fill out the imdf_alt_name.
        i. This can be the title case name of the room.
    b. Fill out the imdf_category.
        i. This will place preconfigured markers for rooms such as restrooms, etc. These codes can be located with in the Apple IMDF Resource link below.

00_Home Page | B360 Ops_Room Schedule

<B360 Ops_Room Schedule>

A	B	C	D	E	F	G	H	I
					Indoor Map Parameters			
Level	Name	Number	Area	Volume	imdf_accessibility	imdf_alt_name	imdf_category	imdf_restriction
Level 1	EXISTING RESTROOM	2	62 SF	1083.22 CF		Existing Restroom	restroom	
Level 1	STORAGE / WAREHOUSE	3	6336 SF	118883.69 CF		Storage / Warehouse		
Level 1	SPRINKLER VALVE ROOM	4	55 SF	940.19 CF		Sprinkler Valve Room		
Level 1	STORAGE	5	96 SF	1895.17 CF		Storage		
Level 1	VESTIBULE	6	46 SF	874.62 CF		Vestibule		
Level 1	EXISTING LUNCH ROOM	7	82 SF	1613.33 CF		Existing Lunch Room		
Level 1	EXISTING MENS RESTROOM	8	93 SF	720.82 CF		Existing Mens Restroom	restroom.male	
Level 1	OFFICE	14	136 SF	1042.15 CF		Office		
Level 1	VESTIBULE	15	51 SF	387.96 CF		Vestibule		
Level 1	OFFICE	16	192 SF	1532.93 CF		Office		
Level 1	RECEPTION	17	379 SF	3053.10 CF		Reception		
Level 1	CONFERENCE ROOM	18	418 SF	3422.75 CF		Conference Room		
Level 1	STORAGE / COPY	19	82 SF	1412.22 CF		Storage / Copy		
Level 1	MENS RESTROOM	20	66 SF	487.75 CF		Mens Restroom	restroom.male	
Level 1	WOMEN'S RESTROOM	21	66 SF	489.19 CF		Women's Restroom	restroom.female	
Level 1	CORRIDOR	22	347 SF	2785.57 CF		Corridor		

Export

1. Open the first-floor level of the project.
2. From the Add-Ins tab select Indoor Map, then Export Map to BIM 360 Ops.
3. It will be necessary to generate a new Export Code from the building each time a connection is to be made.
4. Repeat these steps for the subsequent floors in the model.

Note: Map exports are based off Rooms in Revit just like Locations. This means that they would need to be extracted from an Architectural model.

Apple IMDF Resources: https://register.apple.com/resources/imdf/

Video Link: https://youtu.be/GL4Y8im0AWs

Tickets

Tickets come in three (3) main classifications. The first being Quick Tickets you may recall these from the settings above. Quick Tickets allow occupants of a building to generate a pre-configured ticket. The second type of tickets are generated from Scheduled Tasks, as you may have also noted from above. The third and final type of ticket is ad hoc or generated as needed. These tickets are very flexible and can be created from either the portfolio view or from the building view within BIM 360 Ops.

BIM 360 Ops Blog (Using Ticket Status): https://bim360ops.autodesk.com/blog/using-ticket-status

Information Technology Service Management (ITSM) / Data Center Infrastructure Management (DCIM)

Information Technology Service Management

IT service management (ITSM) refers to the entirety of activities – directed by policies, organized and structured in processes and supporting procedures – that are performed by an organization to design, plan, deliver, operate and control information technology (IT) services offered to customers.

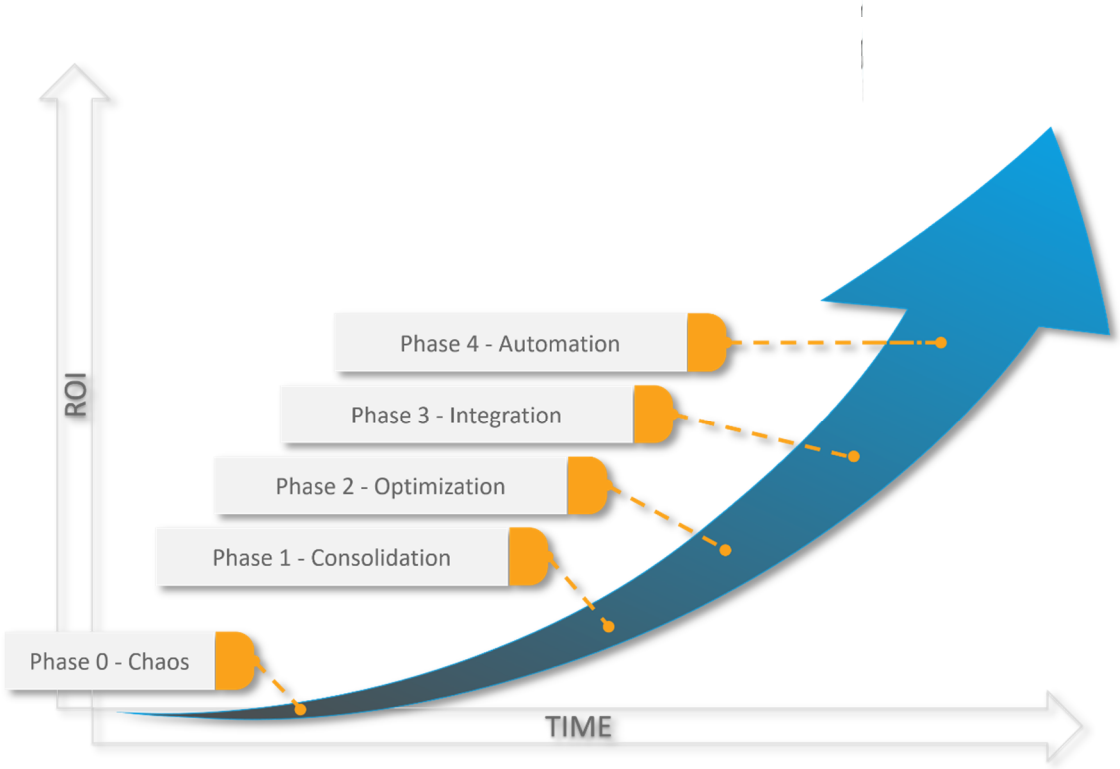
Data Center Infrastructure Management

Data center-infrastructure management (DCIM) is the integration of information technology (IT) and facility management disciplines to centralize monitoring, management and intelligent capacity planning of a data center's critical systems. Achieved through the implementation of specialized software, hardware and sensors, DCIM enables common, real-time monitoring and management platform for all interdependent systems across IT and facility infrastructures.

DCIM products can help data center managers identify and eliminate sources of risk] and improve availability of critical IT systems. They can also be used to identify interdependencies between facility and IT infrastructures to alert the facility manager to gaps in system redundancy, and provide dynamic, holistic benchmarks on power consumption and efficiency to measure the effectiveness of "green IT" initiatives.

Important data center metrics include those regarding energy efficiency and utilization of `servers, storage, and staff. In too many cases, disc capacity is vastly under-utilized, and servers run at 20% utilization or less. More effective automation tools can also improve the number of servers or virtual machines that a single admin can handle.

DCIM providers are increasingly linking with computational fluid dynamics providers to predict complex airflow patterns in the data center. The CFD component is necessary to quantify the impact of planned future changes on cooling resilience, capacity and efficiency.



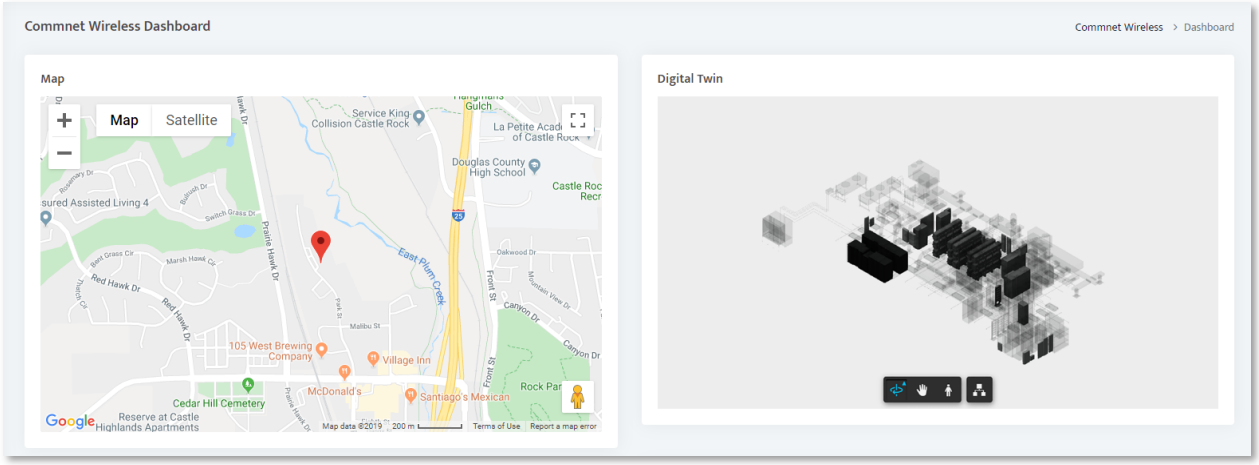
DCIM Maturity Model

IoT Beacons & Smart Sensors

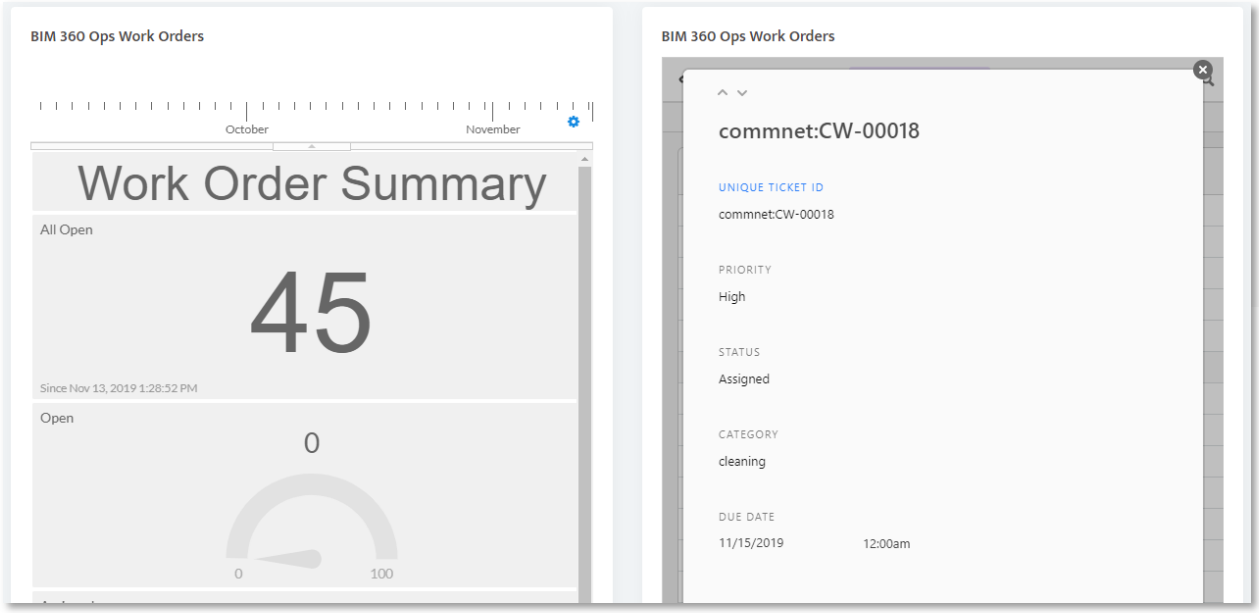
What in the world are IoT sensors?

There are two major types of IoT sensors in facility management. The first is temperature and humidity control sensors. These devices track environmental changes to keep occupants comfortable without giving them total control of a room's thermostat. The second type of sensor is machine listening and vibration detection sensors. These sensors are placed on larger mechanical assets and alert facility managers of equipment failures or performance changes. As a bonus, these sensors can record data for later review. Here's more information on how autonomous systems and smart sensors are used to benefit facility managers.

Dashboarding



Dashboarding has been around for many years regarding the visualization of data. When applying data visualization, it is important to consider the management of such facilities in seven (7) unique facets. These facets are explained below.



1. *Application Layer*

   The Application Layer is a set of software services that fulfill organizational requirements. As an example, an ERP Application is composed of accounting, payroll, inventory, and asset management software services.

2. *Platform Layer*

   The Platform Layer represents the methodology by which the application is delivered. Common Delivery Platforms are Business as a Service (BaaS), Software as a Service (SaaS), Platform as a Service (PaaS), Infrastructure as a Service (IaaS) and Nothing as a Service (NaaS).

3. *Compute Layer*

   The Compute Layer is a logical layer where processing requirements of the application are defined in an abstract form. The compute cloud would subsequently map to actual virtual or physical cores in the IT Infrastructure layer.

4. *IT Infrastructure (ITI) Layer*

   The ITI Layer is a set of physical information technology instances such as network infrastructure, servers, storage, and other IT infrastructure utilized to support application delivery.

5. *Site Facilities Infrastructure (SFI) Layer*

   The SFI Layer is the collection of facilities infrastructure components that support a Data Center Node (DCN). The SFI layer includes the power, cooling, and other infrastructure and related services that a data center node requires to meet the business requirements.

6. *Site Layer*

   A Site is an independently operated space to house instances of site facilities and IT infrastructure. The Site layer involves land, building, utilities, civil infrastructure, etc.

7. *Topology Layer*

   The Topology Layer specifies the physical locations, interconnectivity and interrelation of data center nodes. The Topology is the ultimate global map of data center nodes that depicts the characteristics of physical distribution and layout of the infrastructure that supports the business application.

Future Trends

Usability over Everything

97% of business customers mention “ease of use” as the most important quality for applications. Usability is a vital part of customer service. If your product is difficult to use, it means that you are providing poor customer service and people won't hang around. However, it's not just about ease of use of your product or service; usability should also be taken into account during the whole customer journey - from the moment people search for your product, to reaching out to you again after using the product for getting support. The whole experience should be done as easily and smoothly and possible.

Biometric Technology

Facial recognition, voice activation and eye sensors used to be for science fiction, but biology-based security systems are no longer just for the movies. They’re now the reality of maintaining cutting-edge security in many of today’s buildings. Between employees, occupants and visitors, building managers may find it difficult to confirm who is authorized to enter a facility and who is not. Biometric technology can help mitigate these concerns by verifying a person’s identity based on his or her unique characteristics (such as his or her fingerprints, handprints or facial structure).

Are biometrics are more reliable than traditional security measures?

In most cases, yes. Biometrics are difficult to duplicate and nearly impossible to share with outsiders. When paired with a “smart” identification card, biometrics can significantly boost security in your facility. It is for these reasons that biometrics continue to gain acceptance as an accurate way to confirm a person’s identity. Looking to learn more about the benefits of biometrics?

Here are examples of biometric technology, how they’re used in facilities and how they can improve security measures.

(https://home.akitabox.com/blog/biometric-security-for-facility-management)

Wearable Technology

Hands-free, wearable technology has officially entered the facilities market and is making a big impact on safety and security in buildings. Like biometric technology, which can be used to boost your security measures, authenticate identity and grant access to restricted areas, wearable technology also has the potential for data gathering and analysis within the built

environment. Wearable devices currently include a wide variety of options, including cutting-edge smartwatches, headsets and Radio-Frequency Identification (RFID) wristbands.

Wearable Technology Fun Fact:

Wearable technology can eliminate many barriers that come with the use of biometrics. For example, facilities personnel may wear personal protection equipment (PPE) like gloves, eye protection and full-body suits while in the field. Wearable technology eliminates the need to remove this equipment to present a hand, eye or face for scanning. Instead, wearables grant access to restricted areas with a simple scan of a sensor or signal. RFID technology can also be paired with a smartphone to automatically relay desired information to sensors tied to building automation systems.

Virtual Reality (VR) and Augmented Reality (AR)

In recent years, virtual reality (VR) has become incredibly popular, even making appearances in movies and video games. It's no wonder why many people love the futuristic feel of VR. When immersed in virtual reality, people get the opportunity to have fun and explore their imaginations. But what's cooler is that virtual reality isn't just for the entertainment industry; it can also be used in facility management and design. VR uses computer technology to create realistic, three-dimensional images of the built environment. Users can interact with these simulated environments as if they were real by using headsets, smartphones or desktop software. Unlike traditional user interfaces, VR fully immerses users in an interactive experience.

Autonomous Systems and Smart Sensors

The Internet of Things (IoT), smart buildings, building management systems and other building automation technology are all starting to connect and communicate with each other as part of the fourth industrial revolution. Today's smart buildings are utilizing autonomous systems and smart sensors to increase efficiency, save energy and collect data on space usage.

Security

From Zero Trust to Digital Trust. In 2010, a new paradigm called Zero Trust was introduced, which is a security concept cantered on the belief that organizations should not trust anything outside it and must verify everything trying to connect to its systems before granting access.

However, this is all changing now as security is all about trust. Security and risk are still the most persistent inhibitors to cloud adoption, and security as a service will be valued at $14.55

Billion by 2023. Trust is the most important factor that we build on for each and every interaction that we have with a customer/client/end user.

Cloud Prioritization

Industry leaders are spearheading innovation in the cloud, which is showing no sign of slowing down. An Oracle survey shows that 85% of all enterprise workloads will move to the cloud, and that those organizations involved are most likely involving their media files in the movement. In addition, 80% of organizations will have migrated away from on-premise data centers towards the cloud by 2025. Digital Asset Management tools (IWMS, CMMS) can run your way - on-premise, hybrid, Bring-Your-Own-License to any cloud or Software as a Service (SaaS).