

IBM Internet of Things



Revit to Maximo
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Planning for COBie data exchange

Digital Handover will overwhelm the owner with data



Hand-over data
before BIM



Hand-over
data After BIM



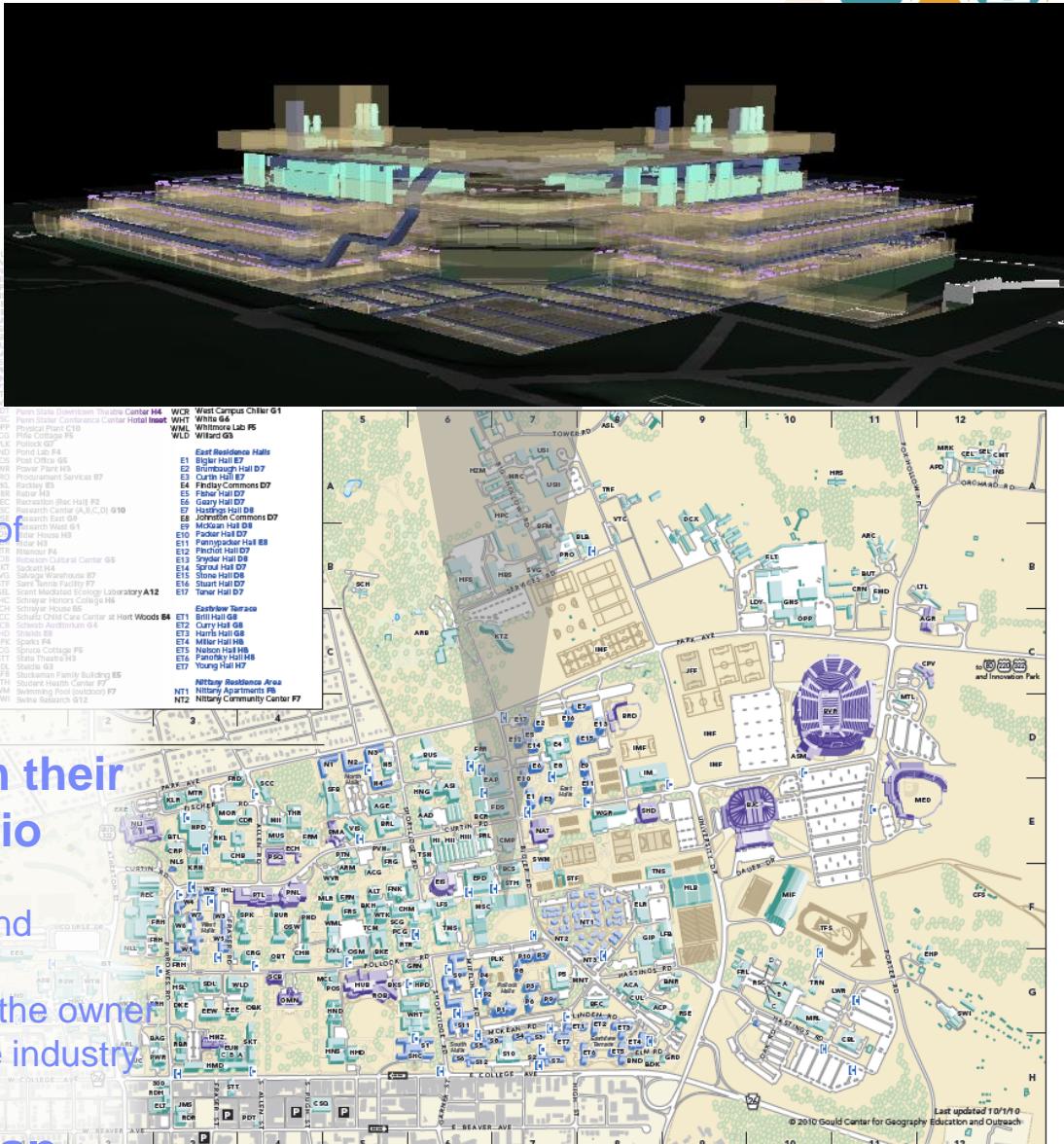
What the owner wants for hand-over

The model needs to be filtered when hand-over data is generated. Hand-over data should only include:

- All floors and spaces
- Only assets that have:
 - Significant capital cost
 - Maintenance requirements that require tracking
 - Regulatory requirements
- Product data for all included assets
- Attribute meaningful to the FM process

Project vs. Portfolio

- The AEC Industry has a project centric view of buildings
 - Each project is unique with its own team contract approach, and data standards
- Owner has a portfolio centric view
 - Example:
 - Major US university has 1800+ building over 2000 sq ft
 - US government agencies have portfolios of buildings ranging from several hundred to tens of thousands
 - All those building exist together in the owners CAFM and IWMS systems
- The Owner needs consistency in their CAFM system across the portfolio
 - If the owner has established standards for location/room names, equipment names and classification, the project should use them
 - If not, the project team needs to work with the owner to establish standards or select acceptable industry standards,
- Hand-over has to bridge the gap



Agreements required for a successful Digital hand-off



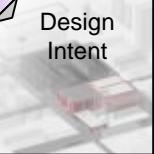
- For which asset will data be provided?
- For each class of assets, What set of attributes are expected?
 - What classification hierarchy will be used?
 - Is hand-over data expected in a standard format such as COBie
 - How is Equipment named?
 - When is the data expected?
 - If there is to be more than one drop,
 - what data is required for each drop?
- Is digital product and maintenance documentation part of the Hand-over package?
 - If not, how are these files to be organized and delivered
 - What System will the owner use to store and manage these files?
- How and when are barcodes assigned?

Model Evolution

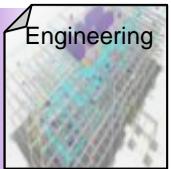
The model should evolve from design concepts to operations without any data loss recapture or reentry.



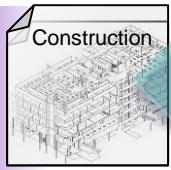
Design



Specification



Construction



Operations

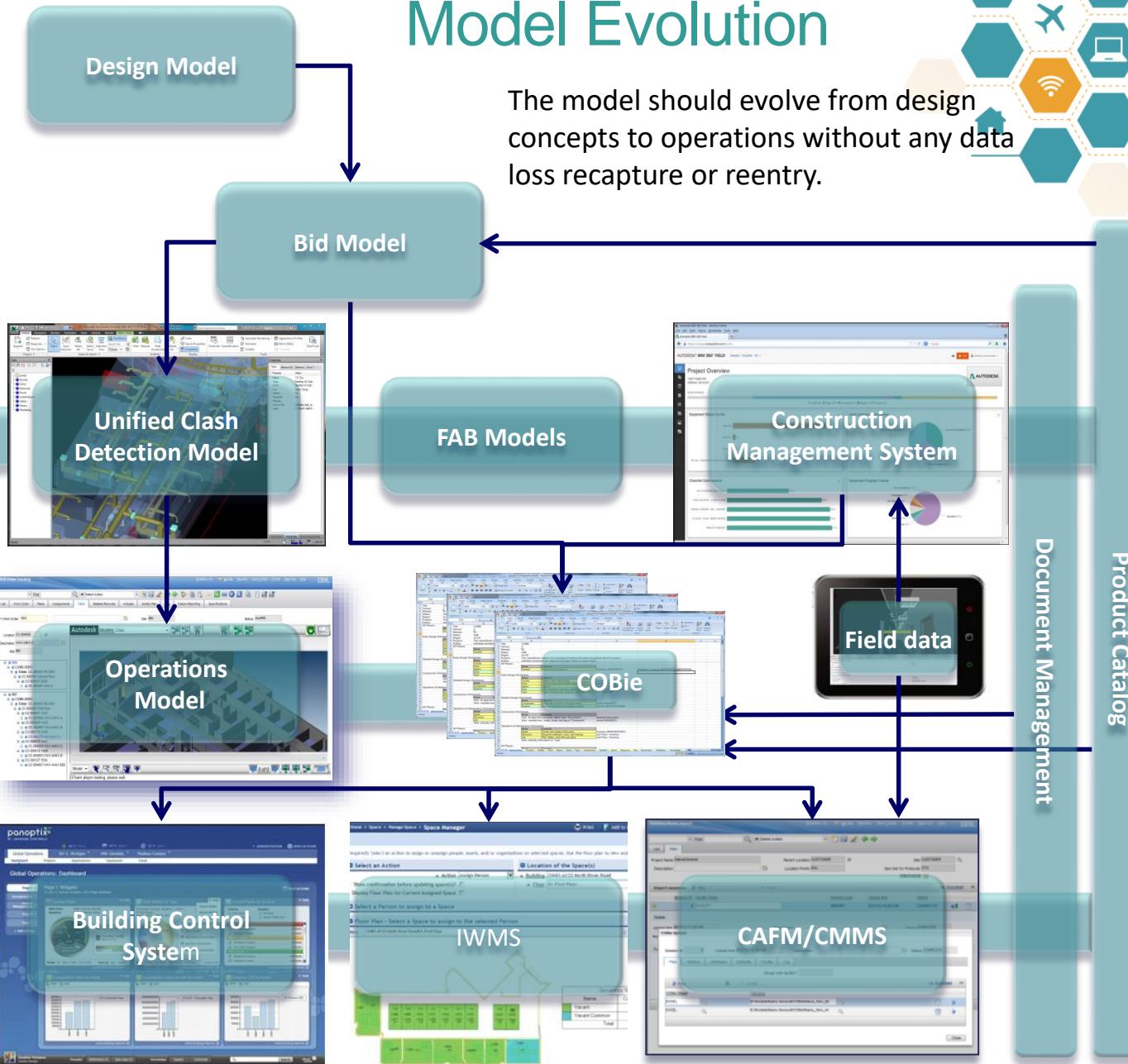


Retrofit



Product Catalog

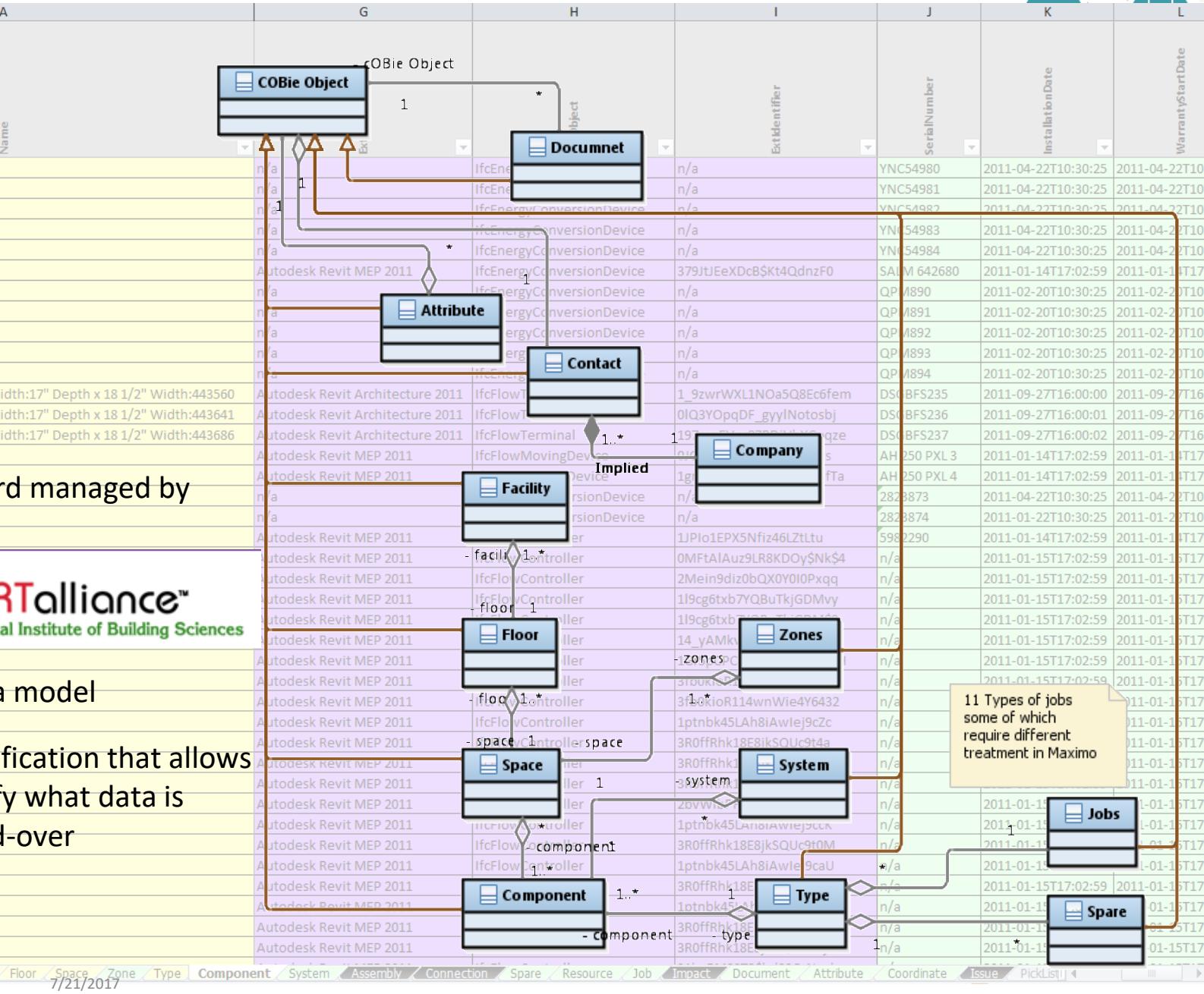
6



What is COBie?



Construction
Operations
Building
information
exchange





COBie Structure

Facility: Single record describing Facility, Site, and Project

- Every COBie package must have exactly one Facility

Floor: Level or Floor,

- Implicitly reference Facility

Space: Rooms or other indoor or outdoor bounded spaces

- References Floor

Component: Any building element that is not a space.

- References Space and Type.

Type: Think Family. Describes characteristics common to many components

- References Contact

Zone: A collection of Spaces

System: A collection of Components

Job: A sequential set of steps describing a maintenance procedure

- References Space and Type.

Contact: Contact reference by email. May imply a company

Attributes: Properties- Name-value pairs

- Can reference any row on any other table

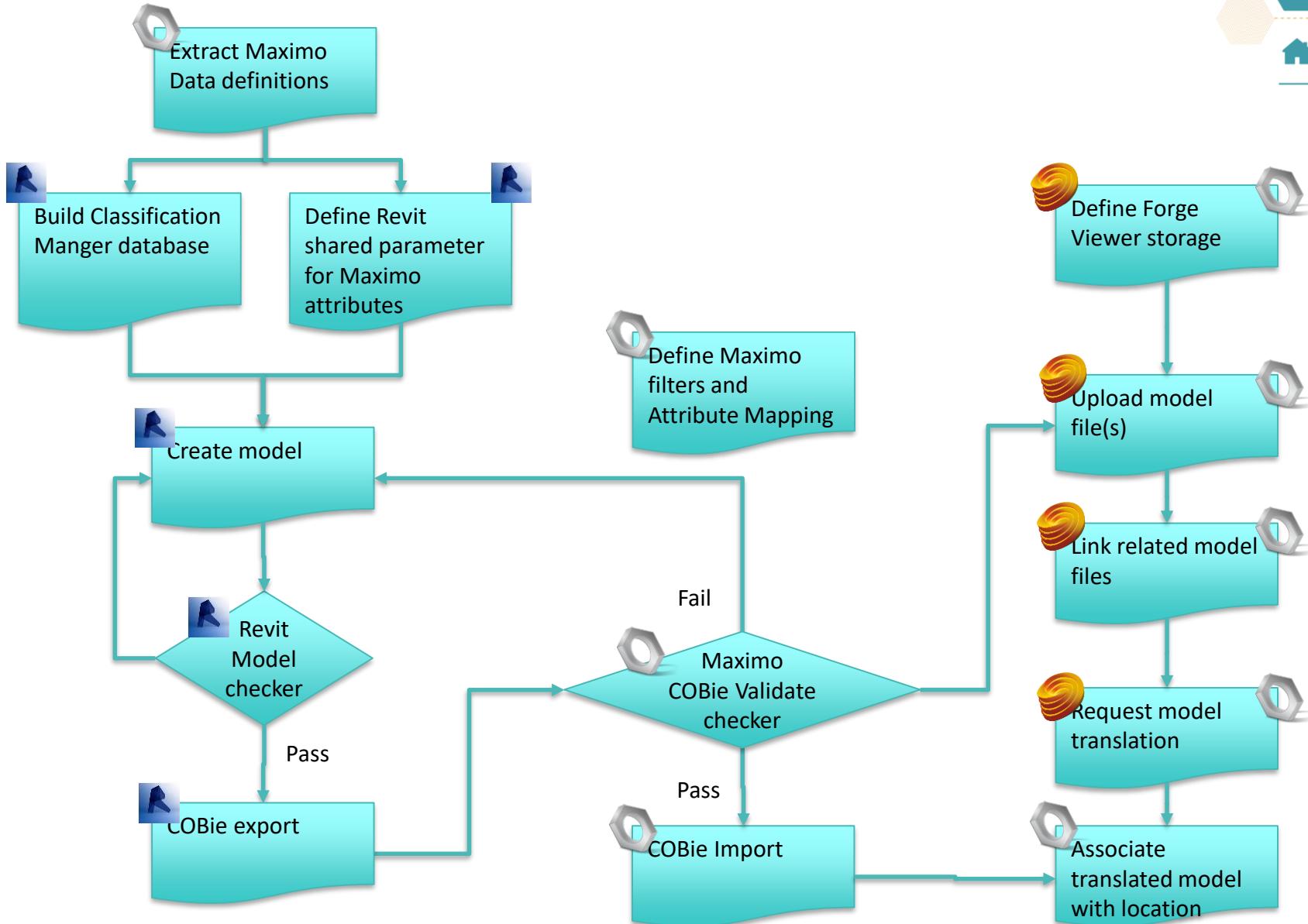
Document: References to files or URLs

- Can reference any row on any other table

Design models such as those done in Revit contain:

- Facility (Implied)
- Floor, Space, Component, Attributes
- Some Types
- May have system or zone

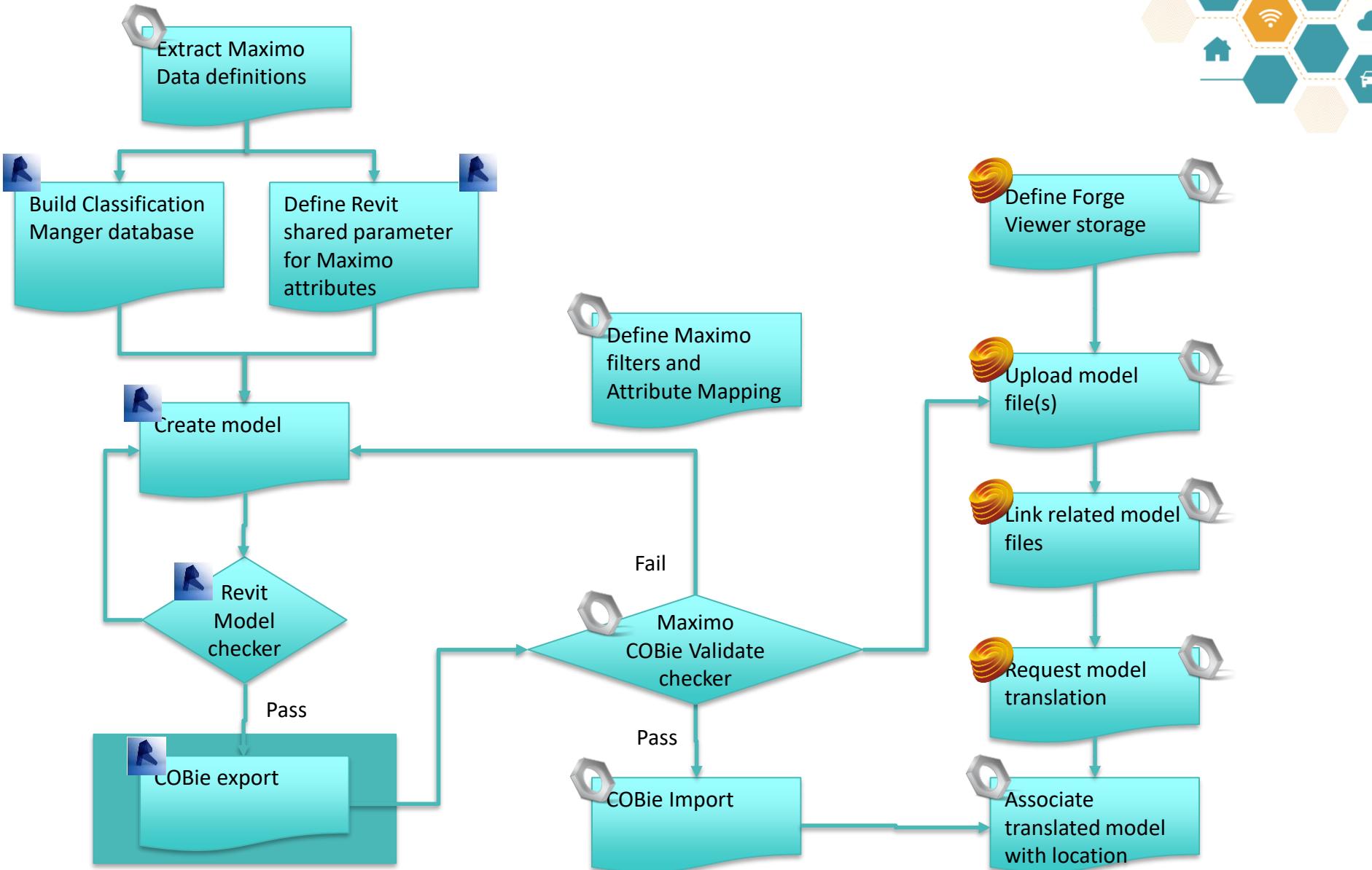
BIM data flow from Revit to Maximo





Data Export from Revit

Revit COBie Export



Get the right toolkit

<http://www.biminteroperabilitytools.com/>



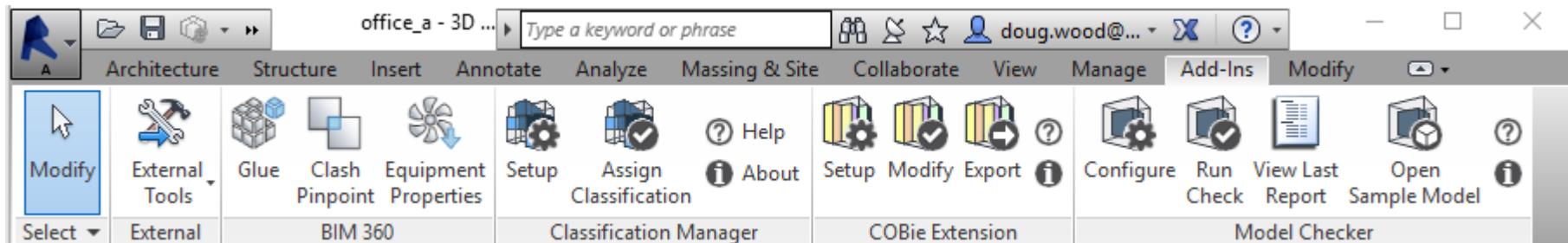
BIM Interoperability Tools

Free add-ins for Autodesk Revit® to help architects, engineers, contractors and owners with their Building Information Modeling (BIM) workflows.

Autodesk Model Checker for Revit	Autodesk Model Checker Configurator for Revit	Autodesk COBie Extension for Revit	Autodesk Classification Manager for Revit
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Revit includes free add-in toolkits to validate that the model is COBie compliant, and to extract COBie data from the model

Version 2.0 icons are different from previous version so you can tell what is installed



Steps to Run COBie Export



Setup

- Contacts
 - Create Contact
- Settings
 - Specify ID formats: Space, Type, Component, System
 - Select attributes for export

Modify

- Zone Manager: Create Zones
- Elements: Select Family, Type, and Elements to export
- Other Elements: Copy data to COBie schedules

Export

- Select sheets and run export

Contact setup

A company registry is build in the COBie toolkit contact tool.
This list becomes the Contact table of the COBie file

The screenshot shows the Autodesk COBie Extension for Revit interface. On the left, there's a list of contacts with one item selected: '(Un-claim) doug.wood@us.ibm.com sales@York.com'. The main area is a 'Contact' creation dialog with sections for 'Required' and 'Optional' fields. In the 'Required' section, the 'Email' field contains 'sales@York.com', which is circled in red. A red arrow points from this circled email address to the 'Manufacturer' field in the 'Type Properties' dialog.

The screenshot shows the 'Type Properties' dialog for the type 'M_Air Handling Unit - Split System - Horizontal'. It displays several parameters under sections like 'Electrical', 'Electrical - Loads', 'Dimensions', and 'Identity Data'. In the 'Identity Data' section, the 'Manufacturer' field is populated with 'sales@York.com', which is circled in red. A red arrow points from this circled manufacturer email back to the 'Email' field in the 'Required' section of the contact creation dialog.

Companies for the contact list are used for the Manufacture property in Revit type. The email from the contact definition is used as the value of the Manufacturer property

A	F	G	H	I	J	K	L	M	N	O	P	Q	R	S
Email	Phone	ExternalSystem	ExternalObject	ExternalIdentifier	Department	OrganizationCode	GivenName	FamilyName	Street	PostalBox	Town	StateRegion	PostalCode	Country
sales@cooperindustries.com	770-486-4800	n/a	n/a	n/a	sales	n/a	n/a	n/a	1121 Highway 74 South	n/a	Peachtree City	GA	30269	USA
sales@dataaire.com	714-921-6000	n/a	n/a	n/a	sales	n/a	n/a	n/a	230 W. Blue Ridge Avenue	n/a	Orange	CA	92865-4225	USA
sales@eaton.com	412-893-3300	n/a	n/a	n/a	sales	n/a	n/a	n/a	1000 Cherrington Parkway	n/a	Moon Township	PA	15108	USA

Unique Identifiers



Autodesk COBie Extension for Revit | Default Settings

General

These settings affect all elements across multiple COBie worksheets.

Locality

United States (US)
 United Kingdom (UK)

Identification

Revit Element ID
 Global Unique Identifier (GUID)
 Mapped Parameter

Configure Model Data

Specify the default values for all imported, validated, merged, updated, and exported sessions for the site.

Site: VF Organization: EAGLENA

COBie File **Generate ID** **Attributes**

Promote Spaces? Convert IFC IDs to GUIDs?
Promote Components? Convert Revit Unique IDs to Export GUIDs?

There are 5 types of identifiers in common usage

- Revit Element !D: An 8 digit number
- Revit uniqueID: A 45 character concatenation of a internal Revit GUID and the Revit Element ID
- Revit Export GUID: A GUID formed by Xoring the Element ID portion of the uniqueID with the last 8 character of the GUID portion of the uniqueID
- IFC GUID: Used by IFC, including IFC format exported from Revit. It is a standard GUID represented in base64. If the IFC is generated from Revit, it's a base 64 encoding of the Revit Export GUID
- Custom: Any unique value the user provides may be used, but the user must have a means of generating it, and if it is going to be used with a viewer, it must be stored in a model property.

Maximo ID conversions on import

- Convert the Revit uniqueID to the Revit Export GUID
- Convert a base64 IFC QUID to a Hex representation.

Best Practice:

- Select Globally Unique Identifier on the COBie export
- On import, select “Convert Revit UniqueID’s to Export GUIDs”

Room and Space – Typical use



COBie data for all files in the model are concatenated together to create a single COBie file. When elements with the same name appear in different model files, the name must be disambiguated before it is added to the COBie file

Rooms (1) Constraints
Level: Level 1
Upper Limit: Level 1
Limit Offset: 2.5000
Base Offset: 0.0000
Dimensions
Identity Data
Number: 102
Name: DUTY OFCR
OmniClass Table 13 Cat... 13-15 11 34: A...

A
Name
1
2 Rooms_101
3 Rooms_102
4 Rooms_103
5 Rooms_104
6 Rooms_105
7 Spaces101
8 Spaces102
9 Spaces103
10 Spaces104
11 Spaces105

Revit category is added to space and room names to disambiguate them

Spaces (1) Constraints
Electrical - Lighting
Electrical - Loads
Mechanical - Flow
Dimensions
Identity Data
Number: 102
Name: DUTY OFCR
Room Number: 102
Room Name: DUTY OFCR
OmniClass Table 13 C...

COBie Upload
Session ID: 8
Description:
Files Import/Update Options Facility
Merge with previous import: Merge with existing
Filter File Name Office.xlsx

Location	Description
	102
IC-LEVEL 1-ROOMS_102	Rooms_102
IC-LEVEL 1-ROOMS_S102	Rooms_S102
IC-LEVEL 1-SPACES102	Spaces102
IC-LEVEL 1-SPACES102	SpacesS102

Space Name
Field Separator: -
Fields
Revit Category
Number

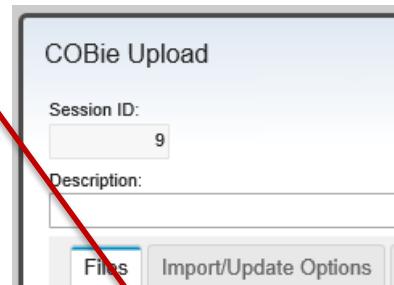
Two Maximo records are created for the same physical space

Room and Space setup – For Maximo



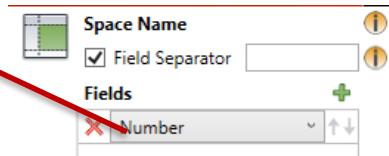
A screenshot of a CAD software interface showing room constraints and a room list. The constraints pane shows Level 1, Upper Limit, Limit Offset, Base Offset, Dimensions, and Identity Data. The room list pane shows rooms: Level 1, Level 2, T/FDN, and Roof. A red circle highlights the room number 102.

A separate COBie file is produced for each file in the model



A screenshot of a CAD software interface showing space constraints and a space list. The constraints pane shows Electrical - Lighting, Electrical - Loads, Mechanical - Flow, Dimensions, and Identity Data. The space list pane shows spaces: Level 1, Level 2, T/FDN, and Roof. A red circle highlights the room number 102.

Room and Space names match



Room or Space?

The COBie tool kit has a page to select which components are associated with a room, and which with a space. The defaults assume a single model file that contain both rooms and spaces. If linked models are being used and a given file only contains one or the other, then everything should be set to use what is in the model.

Location	Description
IC-LEVEL_1	Level 1
IC-LEVEL_1-101	101
IC-LEVEL_1-102	102
IC-LEVEL_1-103	103
IC-LEVEL_1-104	104

Rows with the same name in different files are merged on import into Maximo creating a single Maximo record

COBie Type name



Goal: To create an Identifier for COBie types that is both unique and human readable. How this is done depends on what data is in the model and what is desired in Maximo. A generally workable set of choices is displayed to the right. The Type Mark is expected to be unique. The other fields provide human readable information.

Type

Specify properties for the COBie type spreadsheet.

Name			
<input checked="" type="checkbox"/> Field Separator	<input type="text"/>		
Fields			
X	Revit Category	▼	▲
X	Family	▼	▲
X	Type	▼	▲
X	Type Mark	▼	▲

Preview

MyCategory_MyFamily_MyType_123

COBie Type name becomes the Maximo Product Name

Making Revit Families Room Aware



The screenshot shows the Revit interface with the MEP tab selected. The main workspace displays a 3D model of a VAV unit. On the left, the Properties palette is open, showing the 'Mechanical Equipment' type. A red circle highlights the 'Room Calculation Point' checkbox under the 'Other' section. A dashed green line extends from this point on the properties palette to a specific location on the 3D model of the VAV unit, indicating its association.

Properties

Family: Mechanical Equipment Edit Type

Constraints

Host

Mechanical

Part Type: Normal

Dimensions

Round Connector Dime... Use Radius

Identity Data

OmniClass Number: 23.75.70.21.24.14

OmniClass Title: Variable Volume ...

Other

Work Plane-Based

Always vertical

Cut with Voids When Lo...

Shared

Room Calculation Point

Properties help Apply

Project Browser - M_VAV Unit - Sin... Properties

Click to select, TAB for alternates, CTRL adds, SHIFT unselects.

Some families may need to be made "Room Aware" to properly associate with a Room or Space

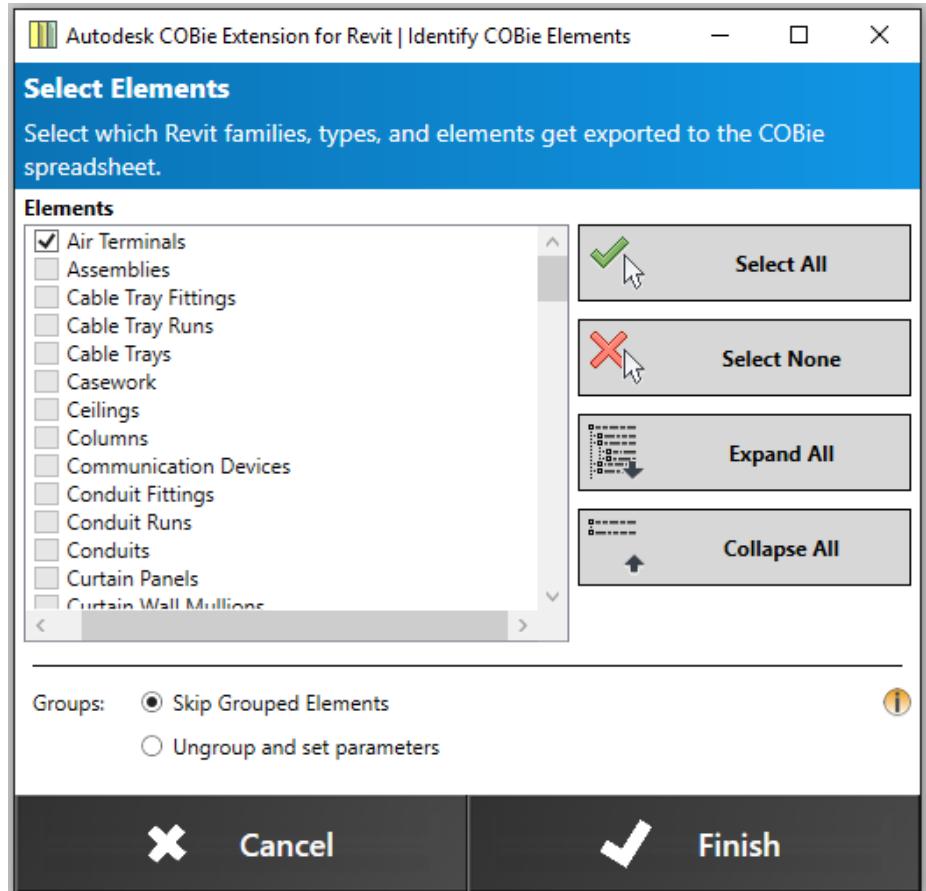
Select Elements



Select by family and type what is exported

Recommendation:

- If you are getting your COBie from someone else, err on the side of caution and request anything you might want, then filter at the Maximo import
- If you are doing your own import, then its worth spending some time fine tuning this and working with the import filters
- When new elements are added to the model, by default they are not included in the COBie data even if the top level family is checked for the element. It is best to review this tab anytime the model has been modified since the last COBie export



Other Fields



The COBie toolkit uses several instance and type parameter prefixed with COBie to store data before generating the COBie spreadsheet. Some of these field are copied directly from Revit properties, some are calculated, and some must be entered by the modeler. This step updates the copied and calculated field. It is possible to manually override the copied and calculated fields. The toolkit provides several options for updating these fields to prevent overwriting of manual overrides.

Best practice is to not override any values provide by the toolkit. Instead to insure that the necessary data in the model is provided so the toolkit generated the needed values.

If this is followed, then each time an updated COBie spreadsheet is to be generated, this screen must be visited and “Select All” clicked to cause all fields to be updated

Autodesk COBie Extension for Revit | Modify Fields

Other Fields

Batch update other Revit parameters that are mapped to COBie fields.

COBie Sheet	Field	Update only Blank Parameters	Update All Parameters	Do Not Update Parameters
All	CreatedBy	Blank	All	None
All	CreatedOn	Blank	All	None
Facility	Name	Blank	All	None
Facility	ProjectName	Blank	All	None
Floor	Elevation	Blank	All	None
Floor	Name	Blank	All	None
Space	Name	Blank	All	None
Space	GrossArea	Blank	All	None
Space	NetArea	Blank	All	None
Type	Name	Blank	All	None
Type	Category	Blank	All	None
Type	Description	Blank	All	None
Type	Manufacturer	Blank	All	None
Type	ModelNumber	Blank	All	None
Type	ReplacementCost	Blank	All	None
Component	Name	Blank	All	None
Component	Space	Blank	All	None
System	Name	Blank	All	None
System	Category	Blank	All	None

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Edit Default Settings

Select 'Blank' for All Fields

Select 'All' for All Fields (highlighted with a red oval)

Select 'None' for All Fields

Apply only to elements marked for COBie export

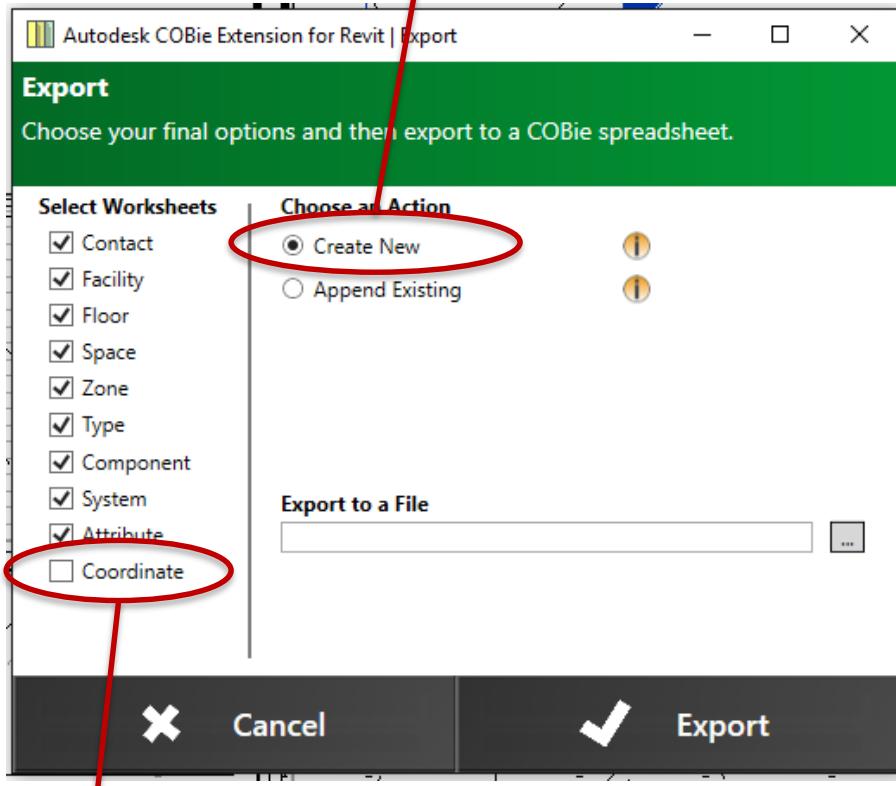
Groups: Skip Grouped Elements
 Ungroup and set parameters

Cancel Finish

COBie Export



For Maximo, always select “create new” allow Maximo to merge the COBie file from linked models



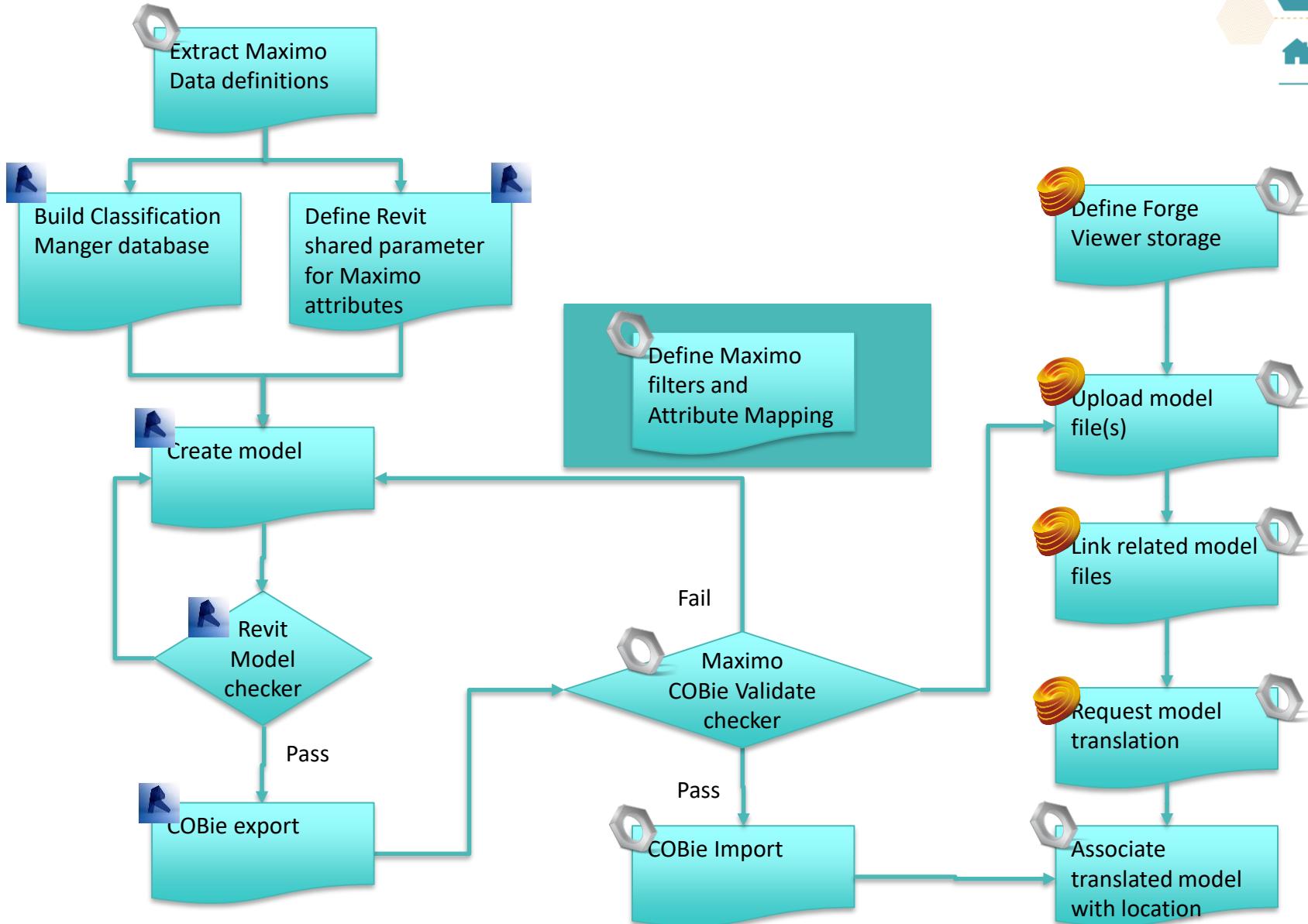
Maximo does not support the Coordinate table

Note: There are performance issue with the Excel interface. Writing large COBie data sets can take days to complete. Most of the data is attributes. Some careful though about what attributes are actually needed can improve export performance.



Data Import into Maximo

Maximo Model Validation



Define filters



Import Filters

Filter > Filter > COBie Table > Filter

COBie Table	Filter	Expression type
COMPONENT	Duplex Receptacle	SUBSTRING
COMPONENT	Lighting Switch	SUBSTRING
TYPE	1220 x 1500	EXACT
TYPE	1000 x 2000	EXACT
TYPE	4000 x 1000	EXACT

Filter either specifies what is included or what is excluded

COBie table the filter applies to

Filter string

Save Close

- Filter Type
- Substring
 - Exact Match
 - Regular Expression

Filters provide control over what COBie data is imported.

- Filters are applied to the name field of the specified COBie table
- Filters stack. For exclude, if an item matches any filter it is excluded. For include, if an item matches any filter it is included
- Filters cascade.
 - Excluding a type excludes all components that reference the type.
 - Excluding a space excludes all components that reference it
 - Excluding a floor excludes all spaces, and therefore all components that reference it

Define Attribute Maps



There are two types of Attribute Map

- Mapping COBie attributes to fields in a Maximo table (Mbo). This is particularly useful when tables have been extended with custom fields that need to be populated with COBie data
- Overriding the attribute type name matching provided by the import. This is useful when the parameter names in the model don't conform to the enterprise standards

Map Attributes to Specifications

Specify the Maximo attribute types that are used to create specifications from COBie attributes.

Map Name	Site	Organization
Common Attr		

Site: Organization:

Map Name: Common Attr

Description: Attribute types that are common in BIM data and collide with s

Map to Specification Specification Description Map from Attribute

Map to Specification	Specification Description	Map from Attribute
BLDGMASTER	Building Material	Material
BLDGMAF	Building Material	Body Material
ROOM AREA	Make area specific to buildings	ARFA

Override the import attribute name matching

Map Attributes to Fields

Specify the attributes that are copied from COBie files to Maximo fields.

Map Name	Site	Organization
Installation Da		

Site: Organization:

Map Name: Installation Data

Description: Map Installation Date for assets

Map to Table Map to Attribute Map from Attribute

Map to Table	Map to Attribute	Map from Attribute
ASSET	EQ6	InstallationDate

Mbo name and field

COBie Attribute name

Maximo attribute type

COBie Attribute name

Populate custom Mbo fields with COBie data

Save Close

Save Close

Add Attribute Maps to the Project



BIM Projects

MAXADMIN

Find Project ID

Mappings

Project Name: Barton Keep B and B Organization: EAGLENA

Attribute Field Maps

Attribute Map Name: Installation Date Description: Map Installation Date for assets

Site: Organization:
Map Name: Installation Date

Description: Map Installation Date for assets

Map to Table: ASSET Map to Attribute: EQ6 Map from Attribute: InstallationDate

Specification Map selected from library

Attribute Specifications

Type Map Name: Common Attr Description: Attribute types that are common in BIM data a

Site: Organization:
Map Name: Common Attr

Description: Attribute types that are common in BIM data and colide with s

Map to Specification: BLDGMATERIAL Specification Description: Building Material Map from Attribute: Material

BLDG MATERIAL Building Material Material

BLDG MATERIAL Building Material Body Material

ROOM AREA Make area specific to buildings AREA

Specification Map selected from library

New Row

Specification and Field maps are created independently of an import project in a reusable library then associated with projects and sessions

Session map can over ride project map.
Session maps should be used sparingly. They
are only intended to address project
compliance issues.

Import COBie Data

Session Number: Status:

Description: Upload Time:

[Files](#) [Options](#) [Filters](#) [Advanced](#) [Log Records](#)

Specification Map Name: Field Map Name:
 Common Attrib Installation Dat

Defaults

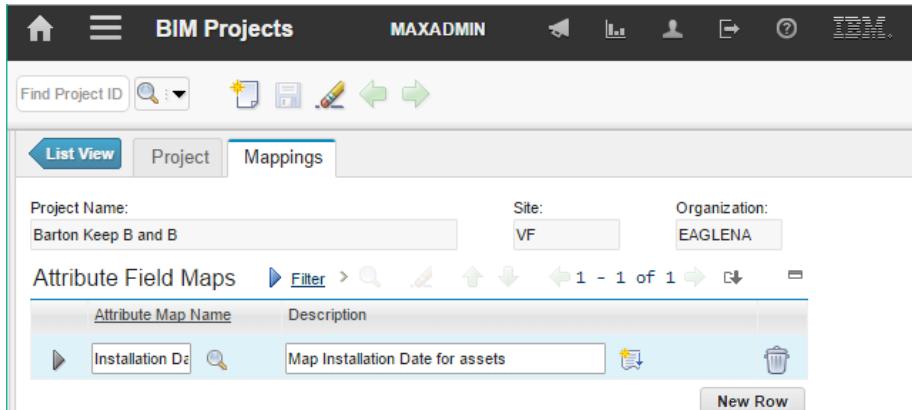
Classification:

Service Address: Ship to Address:

Bill to Address: GL Account:

[Save](#) [Import](#) [Cancel](#)

Map COBie systems to Maximo Systems



BIM Projects MAXADMIN

Find Project ID

List View Project Mappings

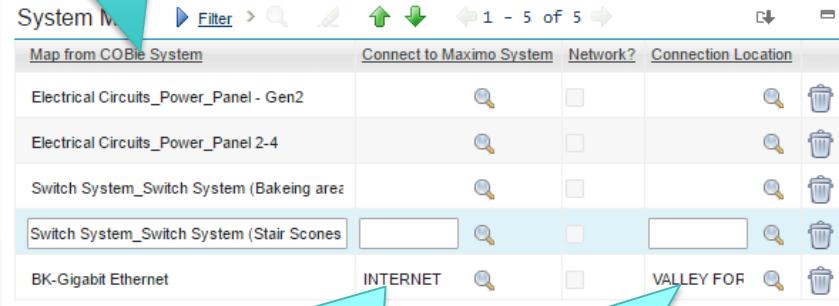
Project Name: Barton Keep B and B Site: VF Organization: EAGLENA

Attribute Field Maps

Attribute Map Name	Description
Installation Date	Map Installation Date for assets

New Row

List of all systems in the model generated by validate or individual system names manually entered



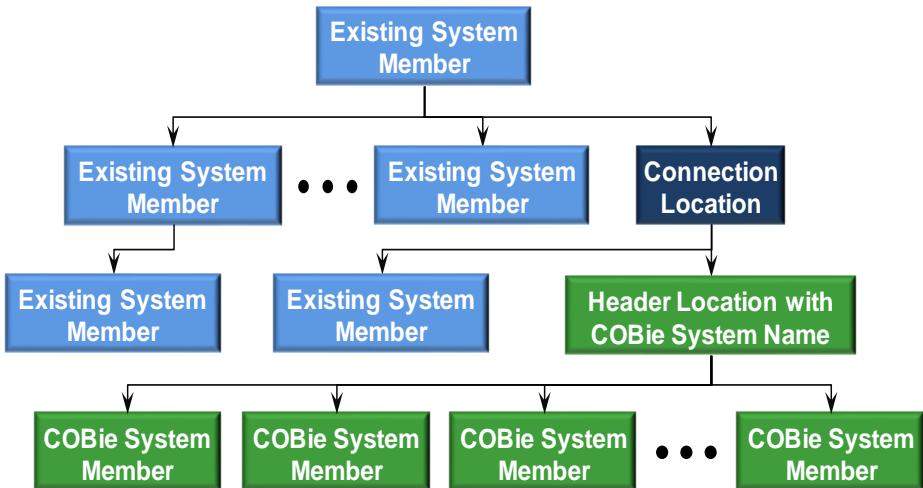
Map from COBie System	Connect to Maximo System	Network?	Connection Location
Electrical Circuits_Power_Panel - Gen2	<input type="button" value="Search"/>	<input type="checkbox"/>	<input type="button" value="Search"/> <input type="button" value="Delete"/>
Electrical Circuits_Power_Panel 2-4	<input type="button" value="Search"/>	<input type="checkbox"/>	<input type="button" value="Search"/> <input type="button" value="Delete"/>
Switch System_Switch System (Baking area)	<input type="button" value="Search"/>	<input type="checkbox"/>	<input type="button" value="Search"/> <input type="button" value="Delete"/>
Switch System_Switch System (Stair Scones)	<input type="text" value="INTERNET"/>	<input type="checkbox"/>	<input type="button" value="Search"/> <input type="button" value="Delete"/>
BK-Gigabit Ethernet	<input type="button" value="Search"/>	<input type="checkbox"/>	<input type="button" value="Search"/> <input type="button" value="Delete"/>

Maximo system to which Model system is to be appended

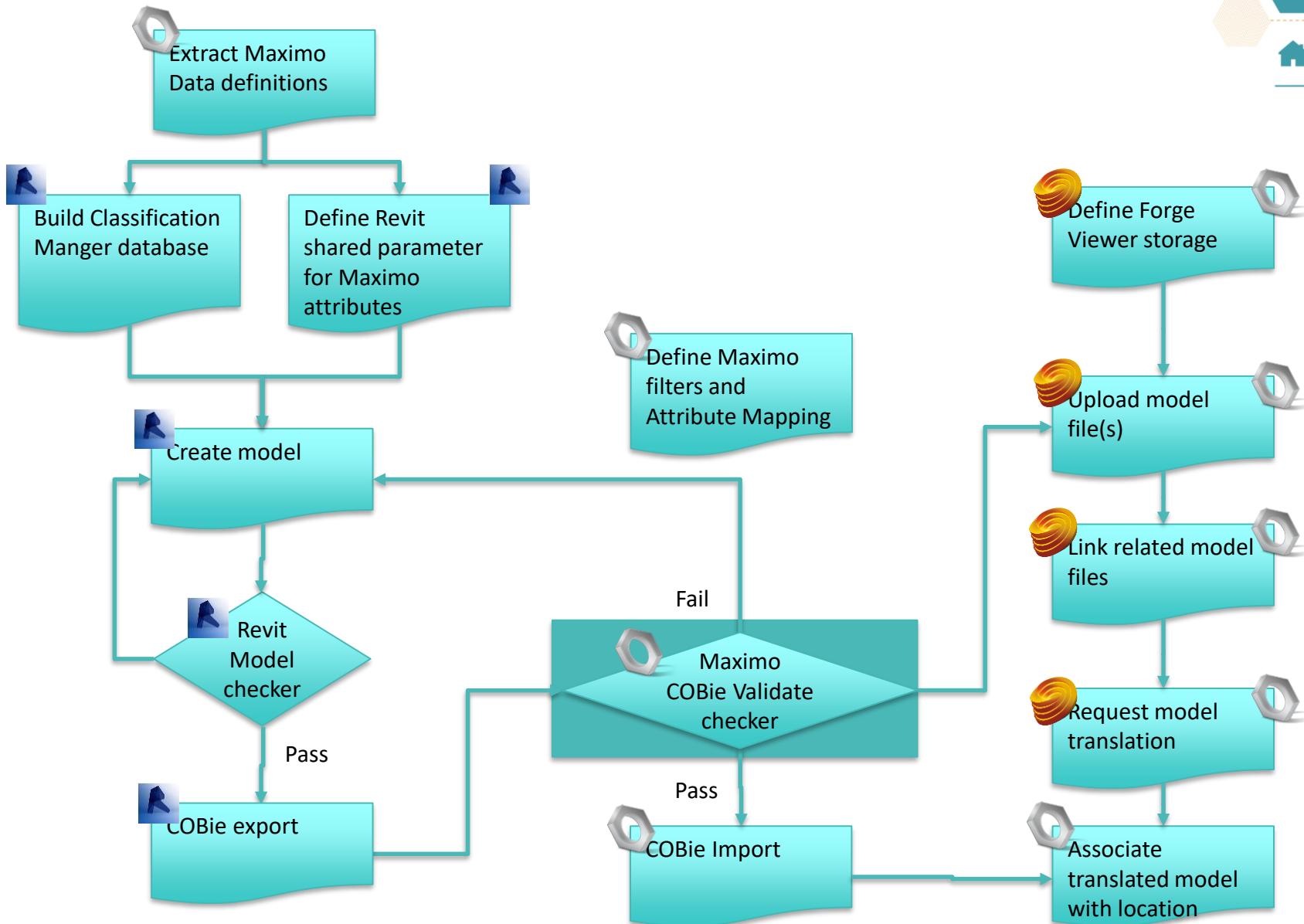
Location where model system is appended

BIM models typically have a large number of small flat systems. For example: Each electrical circuit is a system. Maximo typically has a small number of large deep systems For example: The electrical grid for a site. The system map allows systems from a COBie file to be appended to an existing Maximo system at a specified point instead of creating a new Maximo system.

The list of all systems in a model may be extracted by running a validate session



Maximo Model Validation



Model Validation – Create Import Project



BIM Projects MAXADMIN IBM.

Find Project ID

List View Project Mappings

Project Name: Executive Briefing Center
Description:

Parent Location: VALLEY FORCE Item Set for Products: SET1

Location Prefix: EBC Organization: EAGLENA

Site: VF Attachments

Unique human readable project name

A value that uniquely identifies the building in Maximo. Used as a prefix for auto-generated values for Location and AssetNum

Project Sessions 1 of 1

Session Number	Facility Name	Session Type	Upload Time	Status
4	Executive Briefing Center	MERGE	9/16/16 12:35 AM	COMPLETE

New Session

Model Validation – Create Validate Session



BIM Projects MAXADMIN IBM.

Find Project ID

List View Project Mappings

Project Name: Executive Briefing Center

Parent Location: VALLEY FORCE

Item Set for Products: SET1

Description:

Location Prefix: EBC

Organization: EAGLENA

Site: VF

Attachments

Project Sessions 0 - 0 of 0
Session Number Facility Name Session Type Upload Time Status

There are no rows to display.

Select Session Type

Session Type:

Validate

Import

Merge

OK Cancel

Select Session

Create a new session for any import or export activity

Model Validation – Merging Models



The screenshot shows the IBM Maximo BIM Projects interface. At the top, there are tabs for 'List View', 'Project' (which is selected), and 'Mappings'. Below the tabs, there are fields for 'Project Name' (Executive Briefing Center), 'Parent Location' (VALLEY FORGE), 'Item Set for Products' (SET1), 'Location Prefix' (EBC), 'Organization' (EAGLENA), and 'Site'. A large modal window titled 'Validate COBie Data' is open. It has fields for 'Session Number' (3), 'Status' (NEW), 'Description', and 'Upload Time'. Below these are tabs for 'Files', 'Options', 'Filters', 'Advanced', and 'Log Records' (which is selected). A tooltip says 'Select an existing facility location to test merging with existing data'. Under 'Merge with existing data:', there is a dropdown set to 'EBC'. At the bottom of the modal are buttons for 'Save', 'Validate', and 'Cancel'.

If model data is to be added to or overloaded on existing Maximo data for the facility, then a Merge session should be used.

For a Merge session to work, the location and assetnum field values generated by the import need to match the values of the Maximo records they are to be merged with. There are several strategies to accomplish this. Careful use of both the COBie toolkit ID generation setting and the Maximo COBie import ID generation settings can help, but there will usually be some amount of manually work

Once the merge is complete, the Maximo records are linked to the model and subsequent import and updates will automatically match against the data. The linking also allows the viewer to be used for these records

Model Validation – Sample validate messages



ATTRIBUTE:SYSTEM:Mechanical Supply Air 1:Number of Elements is a duplicate

COMPONENT:Mechanical Equipment_41_593090 is missing a reference to SPACE

The reference in TYPE:Plumbing Fixtures_M_Grab Bars_8370-001420 to CONTACT:Bradley Corporation cannot be resolved

Validate ATTRIBUTE TYPE ===> Supply Air Inlet Diameter

Warning: ATTRIBUTE TYPE Supply Air Inlet Diameter Invalid units HVAC_DUCT_SIZE. Units must be defined in Maximo before they can be imported

Validate ATTRIBUTE TYPE ===> Lighting - Dwelling Unit Connected

Warning: ATTRIBUTE TYPE Lighting - Dwelling Unit Connected Invalid units ELECTRICAL_APPARENT_POWER. Units must be defined in Maximo before they can be imported

Validate CONTACT ===> doug.wood@us.ibm.com

Warning: Item CONTACT:doug.wood@us.ibm.com - Category Software Architect not found. Categories must be a valid Maximo classification

Validate FACILITY ===> BSA Office

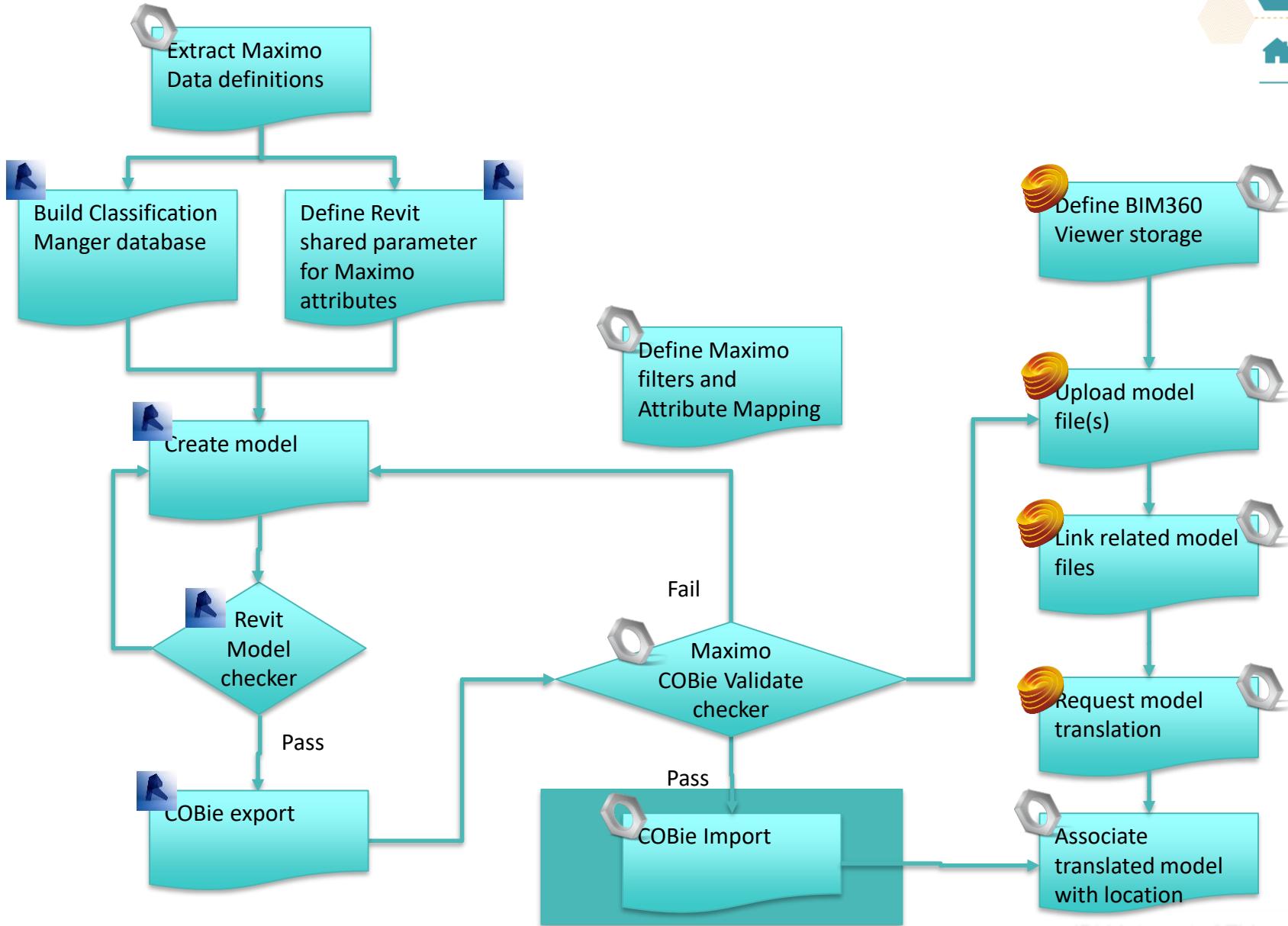
Validate FLOOR ===> Level 1

Validate SPACE ===> 104

Validate COMPONENT ===> Lighting Devices_646165

Validate SYSTEM ===> Switch System

Maximo Model Validation



COBie Upload



Building Model Import/Export MAXADMIN IBM

Query Find Project ID Select Action Site: INTERCON Attachments

Import sessions Filter 1 - 1 of 1

Session ID	Facility Name	Session Type	Upload Time	Status
1	BSA Office	Import	3/14/16 10:03 PM	COMPLETE

Details

Upload Time: 3/14/16 10:03 PM
Imported By: MAXADMIN

Facility description

Facility Location ID: BSO00000000 Facility Name: BSA Office
Linear Units: Volume Units:
Area Units: Currency Units:

Select new session type

Session Type:

Validate

Import

Update

OK Cancel

New Row

Importing COBie files



Import COBie Data

Session Number: 2 Add filters here

Description:

Status: COMPLETE
Upload Time: 9/16/16 12:31 AM

Files Options Filters Advanced Log Records

Merge with previous import:

COBie File Format	File Name
EXCEL	Barton Keep.xlsx
EXCEL	Barton Keep MEP.xlsx
EXCEL	Barton Keep Products.xlsx

Specify the attribute map here

COBie files from linked models are merged here

Select Tables to Import

Facility?	Component?	Contacts?
<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
Floor?	Type?	Documents?
<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
Space?	System?	Attributes?
<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
Zone?	Job?	Resource?
<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
	Assembly?	Spares?
	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>

Select table to import

Close

COBie Log Record



COBie Upload

Session ID: 12 Status: COMPLETE
Description:

Upload Time: 3/25/16 10:51 PM

Files Options Filters Facility Advanced Log

Logging Level: Log all messages Percentage of Import Complete: 100 Number of Errors: 1 Refresh

Updates the % complete and the # of errors.

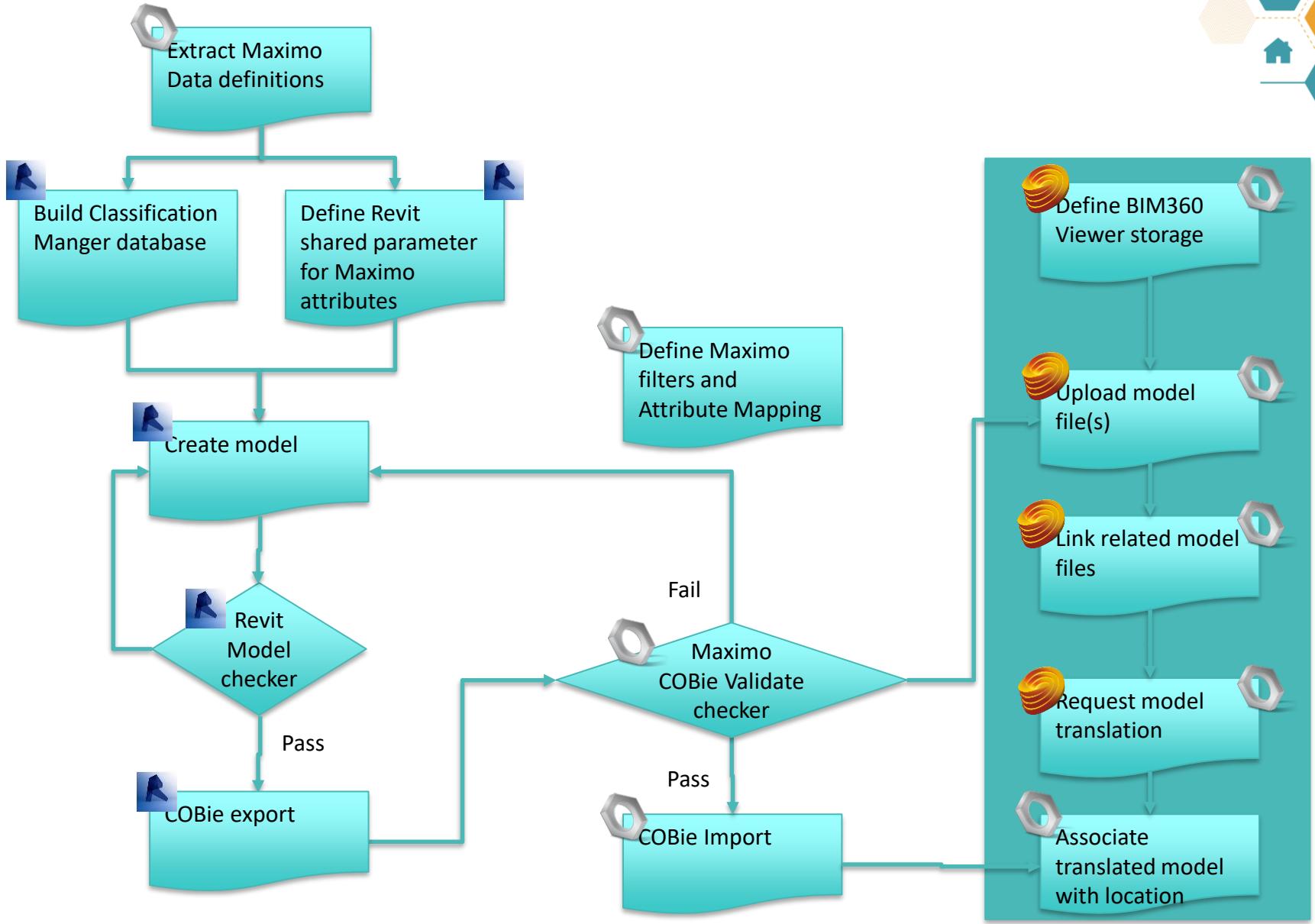
Log:
Loading files...
File c:/bim/import/COBIE/BuildingSmart Office\12\Office_Architechtural.xlsx loaded
File c:/bim/import/COBIE/BuildingSmart Office\12\Office_MEPM.xlsx loaded
2338 items to process
Match: Item ATTRIBUTE TYPE:AREA - Area Matched to an existing record
Match: Item ATTRIBUTE TYPE:ASSEMBLYPLACE - AssemblyPlace Matched to an existing record
Match: Item ATTRIBUTE TYPE:ASSETACCOUNTINGTYPE - AssetAccountingType Matched to an existing record
Match: Item ATTRIBUTE TYPE:BASE OFFSET - Base Offset Matched to an existing record
Match: Item ATTRIBUTE TYPE:CATEGORY CODE - Category Code Matched to an existing record
Match: Item ATTRIBUTE TYPE:CATEGORY DESCRIPTION - Category Description Matched to an existing record
Match: Item ATTRIBUTE TYPE:CIRCULATIONZONENAME - CirculationZoneName Matched to an existing record
Match: Item ATTRIBUTE TYPE:CLIENT NAME - Client Name Matched to an existing record
Match: Item ATTRIBUTE TYPE:COLOR - Color Matched to an existing record
Match: Item ATTRIBUTE TYPE:COMPUTATION HEIGHT - Computation Height Matched to an existing record
Match: Item ATTRIBUTE TYPE:CONSTRUCTIONTYPE - ConstructionType Matched to an existing record
Match: Item ATTRIBUTE TYPE:COUNTER THICKNESS - Counter Thickness Matched to an existing record

Close

Once started, all of the COBie processes such as the import show here run in the background.

- Both the dialog and the browser can be closed and returned to at a later time
- The log is stored in the database providing a permanent record of the import

Maximo Model Validation



Creating storage containers



Manage Building Models MAXADMIN

Query Find Model ID Select Action Advanced Search Save Query Bookmarks

BIM Models Filter Model ID Location Title Description Viewer Site

Manage Model Storage

Storage Container Name

Automatically append BIM360 Application key to insure uniqueness of the container name

Create Storage

Site: Organization: PUBLIC

* Storage Container Name: interconnect

Append Service Key? * Retention policy: objects retained until

Description: Model for InterConnect and other public demos

OK Cancel

Apply Maximo security to access to the container from Maximo

Determines how long model files stored in this container are retained

This screenshot shows the 'Create Storage' dialog box within the 'Manage Model Storage' interface. The dialog includes fields for Site, Organization (set to PUBLIC), Storage Container Name (set to 'interconnect'), Append Service Key (checked), Retention policy (set to 'objects retained until'), and a Description (set to 'Model for InterConnect and other public demos'). A large callout box on the left points to the 'Storage Container Name' field with the text 'Automatically append BIM360 Application key to insure uniqueness of the container name'. Another callout box at the top right points to the 'Organization' field with the text 'Apply Maximo security to access to the container from Maximo'. A third callout box at the bottom right points to the 'Retention policy' dropdown with the text 'Determines how long model files stored in this container are retained'.

Model upload – Select storage container



Screenshot of the Manage Building Models interface showing the 'Upload Model' dialog and a 'Select Value' modal.

The 'Upload Model' dialog shows:

- Site: INTERCON
- Organization: PUBLIC
- * Storage Container Name: interconnect
- Description: BuildingSmart sample Office model - Revit - Arch
- Model Name: (empty)
- Also Register Viewable?
- Select Model File button
- Cancel and OK buttons

The 'Select Value' modal shows:

- Storage Container Name: interconnect
- Retention policy: until removed
- Site: PUBLIC
- Organization: (empty)
- Filter button
- Cancel button

A large cyan arrow points from the 'interconnect' entry in the 'Storage Container Name' field of the 'Select Value' modal to the 'interconnect' entry in the 'Storage Container Name' field of the 'Upload Model' dialog.

A cyan callout box with black text states: "The Storage Container list is filtered by the site and organization selected on the Upload Model dialog".

Model upload – Specifying the model file



Manage Building Models

MAXADMIN

Query Find Model ID Select Action

Advanced Search Save Query Bookmarks

BIM Models Filter 0 - 0 of 0

Model ID Location Title Description Viewer Site

Manage Models

Filter Model Name

Upload Model

Site: INTERCON Organization: PUBLIC

Storage Container Name: interconnect

Description: BuildingSmart sample Office model - Revit - Arch

Model Name: office_a.rvt

Select Model File

Also Register Viewable?

Cancel OK

Automatically register for viewable translation eliminating that step. Can't be used for linked model

Organization Online?

Upload Model Link to Model Close

IBM Internet of Things 41

Model upload – Background processing



Manage Models

Filter > 1 - 1 of 1

Model Name	Storage Container Name	Site	Organization	Online
office_a.rvt	interconnect	INTERCON	PUBLIC	<input type="checkbox"/>

Model Name: office_a.rvt
Description: BuildingSmart sample Office model - Revit - Arch
Content-type:
Model URN:
Last error:

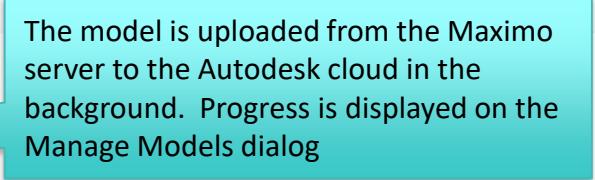
Storage Container Name: interconnect
Sha-1:
URL:
Object size:

Upload History Filter > 1 - 1 of 1

Upload Time	Status	Model Name
3/14/16 1:53 PM	WORKING	

Main Log Status: WORKING Imported By: MAXADMIN Percentage of Upload Complete: 11% Upload Time: 3/14/16 1:53 PM Refresh

Linked Model Files Filter > 0 - 0 of 0

**The model is uploaded from the Maximo server to the Autodesk cloud in the background. Progress is displayed on the Manage Models dialog**



Model upload – Defining links



The screenshot shows the "Manage Building Models" interface in MAXADMIN. A modal window titled "Select Value" is open, showing a filtered list of available files to link. The main interface shows an "Upload History" section with a completed upload for "office_a.rvt".

Select Value

Model Name	Site	Organization
office_mep.rvt	INTERCON	PUBLIC
office_s.rvt	INTERCON	PUBLIC

Link

Site: INTERCON Organization: PUBLIC

Model Name:

Child Model URN:

Cancel OK

Upload History

3/14/16 1:5 Main Log

Status: COMPLETE Imported By: MAXADMIN

office_s.rvt Link

For a link to function, the upload filename must be the same as the base filename in the link within Revit

The list of files available to link is filtered by the site and org of the master model

Model Registration



Manage Building Models

MAXADMIN

Query Find Model ID Select Action

Advanced Search Save Query Bookmarks

BIM Models Filter 0 - 0 of 0

Model ID Location Title Description Viewer

To find records, use the filter fields and then press Enter. For more search options, use the Advanced Search button. To enter a new record, select the Insert icon in the toolbar.

Manage Viewable Models

Filter Model Name Site Organization Online?

There are no rows to display.

Register Model as Viewable

Site: INTERCON Organization: PUBLIC

* Model Name:

Description:

Cancel OK

Select Value

Filter Model Name Site Organization

Model Name	Site	Organization
office_a.rvt	INTERCON	PUBLIC
office_mep.rvt	INTERCON	PUBLIC
office_s.rvt	INTERCON	PUBLIC

Cancel

Model Registration – Monitoring Progress



Manage Building Models

MAXADMIN

Query Find Model ID Select Action

Advanced Search Save Query Bookmarks

BIM Models Filter

Model ID Location

Manage Viewable Models

Model Name Site Organization Online?

office_a.rvt INTERCON PUBLIC

Main Details

Model Name: office_a.rvt Site: INTERCON Organization: PUBLIC

Description: BuildingSmart sample Office model - Revit - Arch

Model URN: urn:adsk.objects:os.object:interconnect2s23v1a2uihpnjq2nlij

Base 64 encoded URN: urn:dXJuOmFkc2sub2JqZWN0czpvcy5vYmplY3Q6aW50ZX

Progress: 0% complete Status: pending Percentage of Translation Successful: 0%

Started At: Mon Mar 14 18:54:46 UTC 2016 Has Thumbnail? N

GUID: dxJuOmFkc2sub2JqZWN0czpvcy5vYmplY3Q6aW50ZXJjb2

Last error:

Register Viewable Link to Viewable Close

Translation progress can be monitored from the Mange Viewable Models dialog

Associate Model with a location



Manage Building Models MAXADMIN

Query Find Model ID Select Action

List View Building Models View Map

* Location: BSO000000000 Title: BSa Office - Li Description: BuildingSmart sample Office model - Revit - Arch Site: INTERCON

Priority: 2

Formatted Address: 1090 Vermont Ave NW #700, Washington, DC 20005, USA Latitude:

Longitude:

Model Name: office_a.rvt * ID Attribute: Guid

* URL: urn:dXJuOmFkc2sub2JqZWN0czpvcy5vYmplY3Q6aW50ZXJjb25uZWN0MnMyM3YxYTJ1aWhwbmpxMm5samppeHrcWFhb2luankvb2ZmaWNIX2EucnZ0

Select Value

Filter 1 - 1 of 1

Model Name	Description
office_a.rvt	BuildingSmart sample Office model - Revit - Arch

Cancel



Manage BIM Viewer

MAXADMIN



List View Building Models 3D View Map

Location: BSC00000000 Title: BuildingSmart Description: BuildingSmart Clinic - Architectural Revit model Site: VF

M_VAV UNIT - SINGLE DUCT [569858] X

Constraints

Level Level 2
Host Level : Level 2
Offset 3.440 m

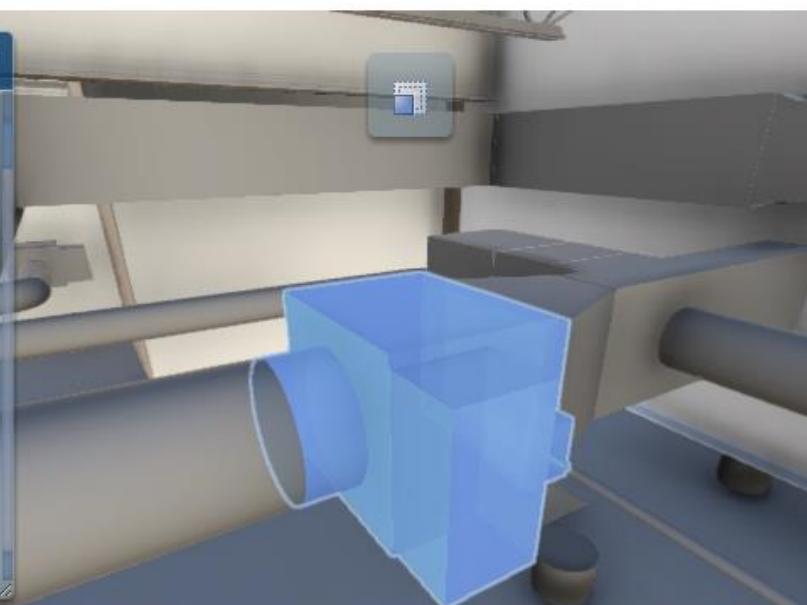
Electrical - Loads

Panel

Circuit Number

Mechanical

Supply Air Pressure Drop 19.900 pascal



Asset : BSC000004080 X

Basic Information

Asset BSC000004080
Type FACILITIES
Description VAV-AHU2-RR
Item Set SET1
Location BSC000004080
Organization EAGLENA
Site VF
Status OPERATING

Details



1 of 1



Using Navisworks Files

Navisworks .NWD files can be used with the Forge viewer

Using Navisworks files has several possible advantages:

- Navisworks has a visual representation of Room and Space object which Revit does not
- It is easy to customize the visual representation of a Navisworks file, such as color coding objects by type
- It may be possible to import file formats not normally usable by the Forge viewer into Navisworks and display them

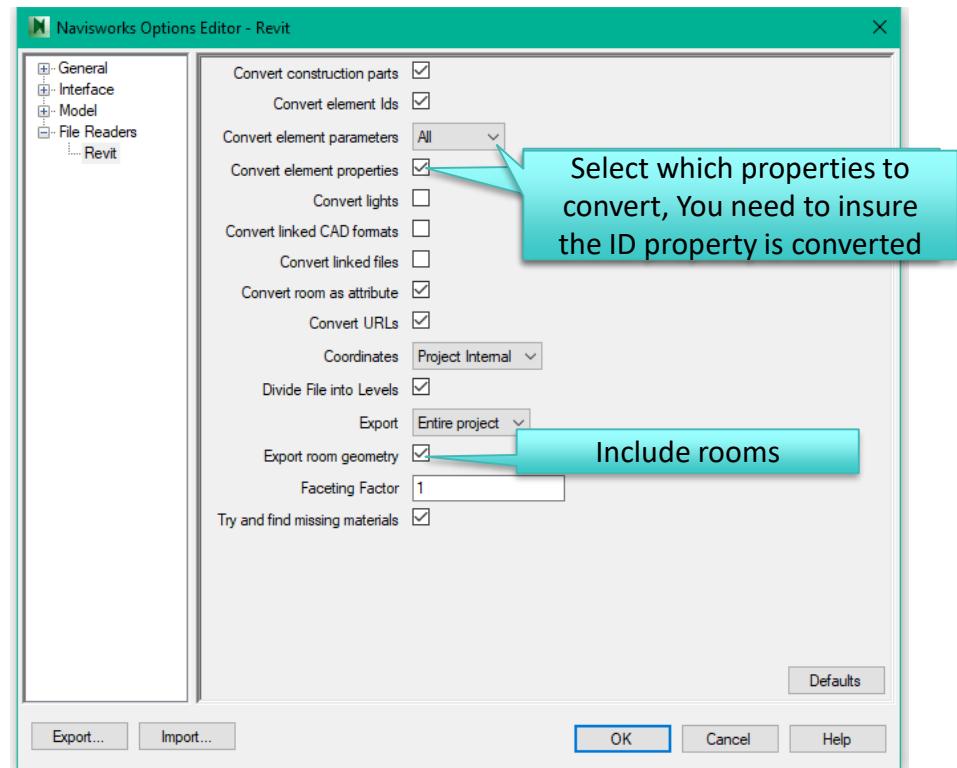
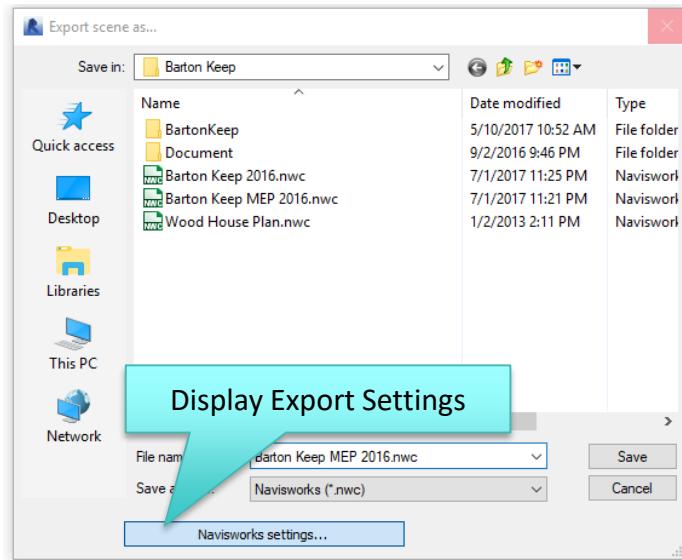
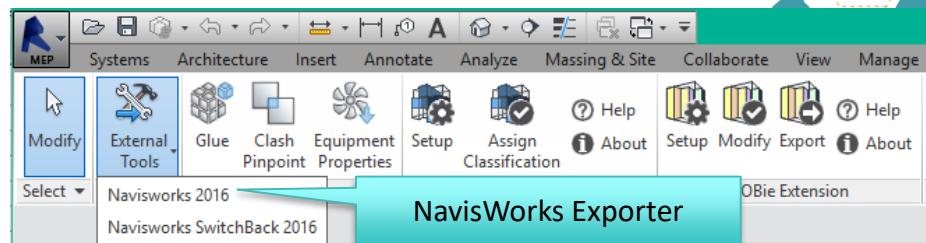
This example assumes that Navisworks is being used to display Room objects, that space object are not displayed, and that the original source is a Revit model consisting of an Architectural and. an MEP file. This assumes that the mechanism described here: [Room and Space – Typical use](#) was used for the COBie import

The following steps are required to create the Navisworks .NWD file and configure it for use in Maximo:

1. Export .nwc files from each revit model file
2. Merge the .nwc files into a single Navisworks model
3. Override color and transparency of Room and any other desired objects
4. Hide Spaces objects and any other objects not desired in to be seen in the Forge viewer
5. Set the default view
6. Save the models as an .nwd file
7. Upload the .nwd file to the Forge service and request translation (See slides [Model upload – Specifying the model file](#))
8. Associate the model with a Maximo location (See slide [Associate Model with a location](#))
9. Configure the property binding between Maximo and the model

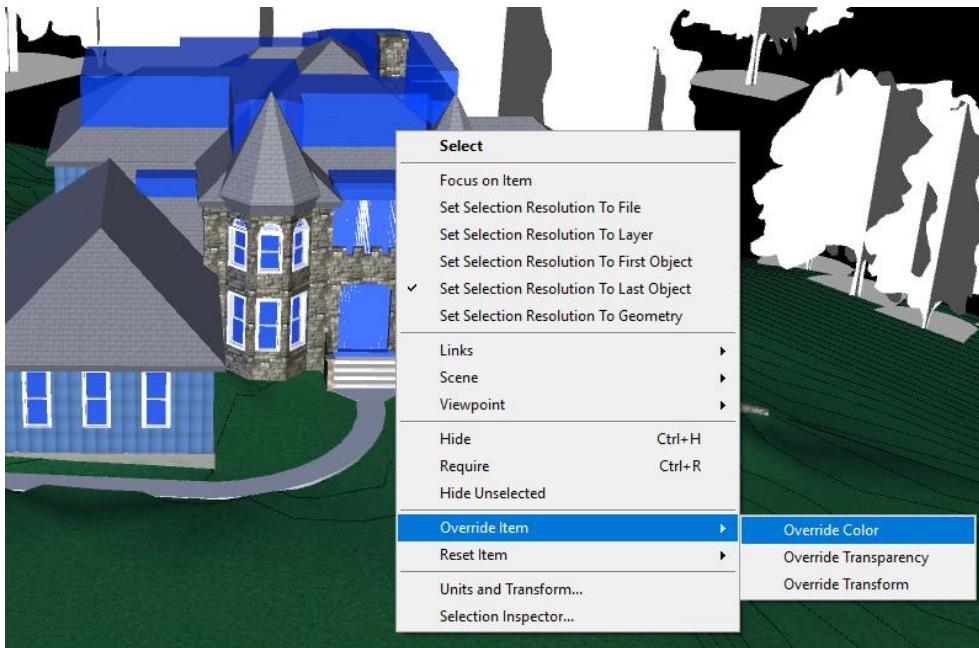
Export Navisworks Files from Revit

Use the Revit plug-in to export a .nwc file from each Revit model in the project. The Exporter provided better control and translation than opening the Revit model directly in NavisWorks



Build .NWD file

Use the property browser to fin and select all the room all the rooms



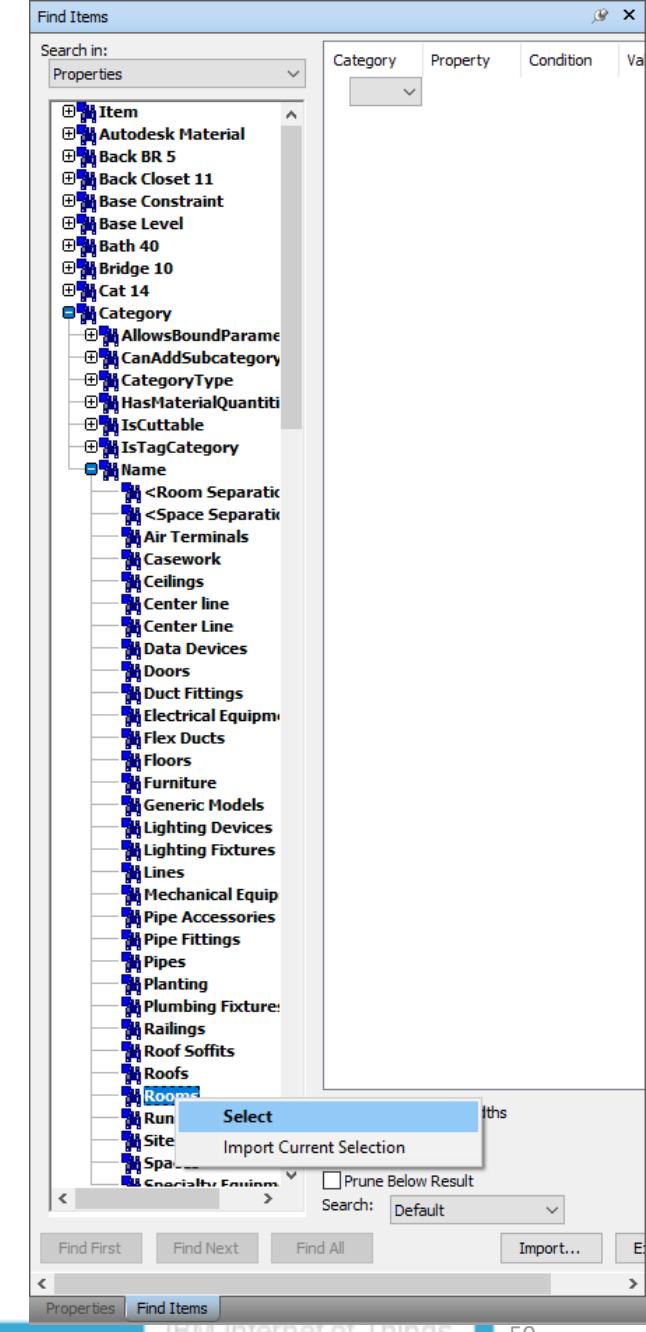
Display the property menu for the selection, Override Color and Transparency to create the desired visual effect. By default rooms are almost invisible

Select all the spaces, and hide the space.

Setup the view desired in the view. This may include hiding additional object or overriding color. It is fairly easy to use the category tree to color code elements based on category

Save the file as a .NWD file. The view visible when the file is save is what is imported in the Forge viewer

Upload and translate the .NWD file



The screenshot shows the Autodesk Property Browser window. At the top, there's a search bar labeled "Find Items" with "Properties" selected. Below the search bar is a toolbar with buttons for "Category", "Property", and "Condition". The main area is a category tree on the left and a toolbar on the right. A context menu is open at the bottom right, with "Select" highlighted in blue. Other options in the menu include "Import Current Selection" and "Prune Below Result".

Find Unique ID in the model



Locations MAXADMIN IBM

List View Location Assets History Safety Meters Requirements Specifications Service Address Map 3D View

Location: BK-GEN-01 Import ID: bc54018b-adf6-4f8c-b5de-010baccd40e3 Site: VF

Gas Emergency Power Generator_7.2 kW_1

Maximo ID for location or asset – From COBie import

Navisworks property that matches the Maximo ID

It is usually GUID or Guid

Open the NavisWorks Property dialog here

GAS EMERGENCY POWER GENERATOR

Item	Gas Emergency Power Generator
Name	Gas Emergency Power Generator
Type	Electrical Equipment: Gas Emergency Power Generator: 7.2 kW
GUID	bc54018b-adf6-4f8c-b5de-010baccd40e3
Icon	Insert Group
Hidden	No
Required	No
Material	
Source File	Barton Keep MEP 2016.rvt
Layer	Basement
Element ID	Value 877434
Element	Name 7.2 kW
Type	7.2 kW
Family	Gas Emergency Power Generator

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Set Navisworks name of ID property



Manage BIM Viewer MAXADMIN IBM

Find Model ID Building Models 3D View Map

*Location: BKBNB Title: Barton Keep - Description: Barton Keep - Doug's House - NavisWorks Site: VF

Priority: 0

Formatted Address: 1002 E Swedesford Rd, King of Prussia, PA 19406, USA Latitude: 40.0818 -75.4043798000

Model Name: barton keep 2016.nwd *ID Attribute: GUID

*URL: urn:dXJuOmFkc2sub2JqZWN0czpvcy5vYmplY3Q6dmFsbGV5X2ZvcmdIN2FwZmtvd3RvbHN4ZXJnY2FicWp2ZzNvYmdndW5oZGEvYmFydG9uJTIwa2VlcCUyMDlwMTYuBndk

Name of Navisworks property from previous step

COBie External Identifier
Converted from Revit UniqueID to
GUID on Import

Name	CreatedBy	CreatedOn	TypeName	Space	Description	ExtSystem	ExtObject	ExtIdentifier
Data Outlet - Floor Standard	D design@ea	2016-10-27	Data Outle	Office	n/a	Autodesk	Data Devic	e909e718-f39c-422c-97de-0ba99ab9c8f9-000fe2d3
Data Outlet - Floor Standard	D design@ea	2016-10-27	Data Outle	Office	n/a	Autodesk	Data Devic	e909e718-f39c-422c-97de-0ba99ab9c8f9-000fe3b0
Gas Emergency Power Genera	D design@ea	2016-10-27	Gas Emer	Mech Pad	n/a	Autodesk	Electrical	ebc54018b-adf6-4f8c-b5de-010bacc02399-000d637a

Building Information Model Extensions for Maximo

What's Included?



COBie data import



3D BIM Viewer

Maximo extensions for BIM data

Available:

COBie import: Maximo feature Pack 7.6.0.6

Forge Viewer Plug-in: on the ISM Library

<https://www.ibm.com/developerworks/community/wikis/home?lang=en#!wiki/IBM%20Maximo%20Asset%20Management/page/Maximo%20BIM%20Forge%20Viewer%20PlugIn>

Standards

- IFC <http://www.iai-tech.org/ifc/IFC2x4/beta3/html/index.htm>
- gbXML <http://www.gbxml.org/>
- COBie <http://www.wbdg.org/resources/cobie.php>
- OMNIClass <http://www.omniclass.org/>

COBie Certified

<http://buildingsmartalliance.org/index.php/newsevents/proceedings/cobie2011challenge>

COBie to Maximo Mapping	
COBie	Maximo Import location
Facility	Location and COBie import project
Floor	Location
Space	Location
Component	Location and Asset
System	System (Category configurable)
Zone	System (Category configurable)
Type	Product (New for COBie support), Item
Attribute	Specifications for: Location, Asset, Product, Item
Contact	Person, Company, Company Contact
Document	Attachment
Job	Job Plan, InvVendor, PM, ProductJob (New)
Resource	Toolitem, Job Plan Tools
Spare	Product parts (New)

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