IBM Internet of Things

Revit to Maximo

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Planning for COBie data exchange

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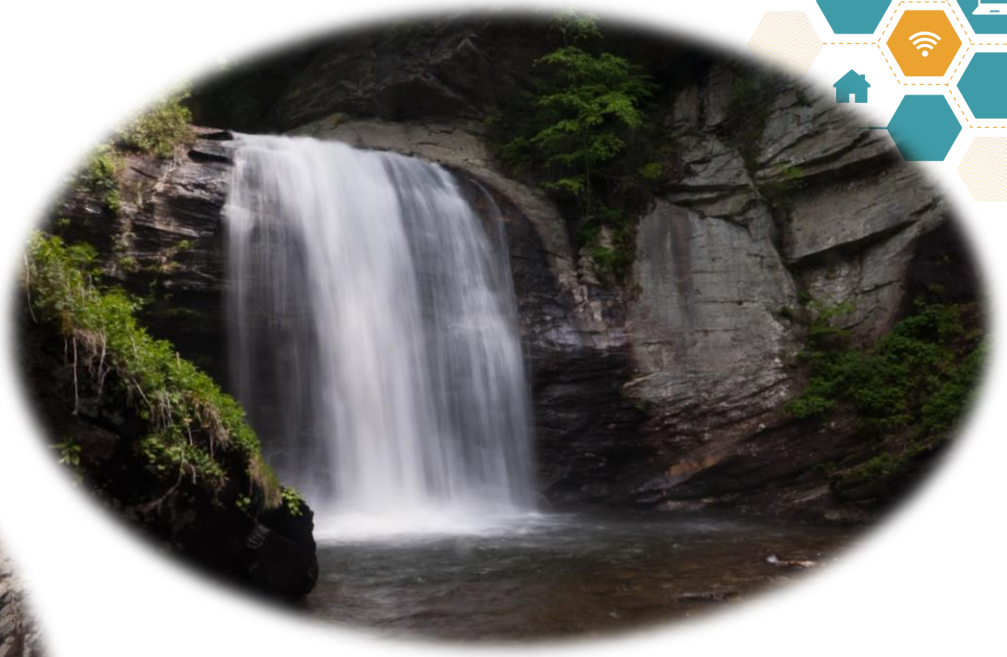
Digital Handover will overwhelm the owner with data

Hand-over data before BIM



Hand-over data After BIM

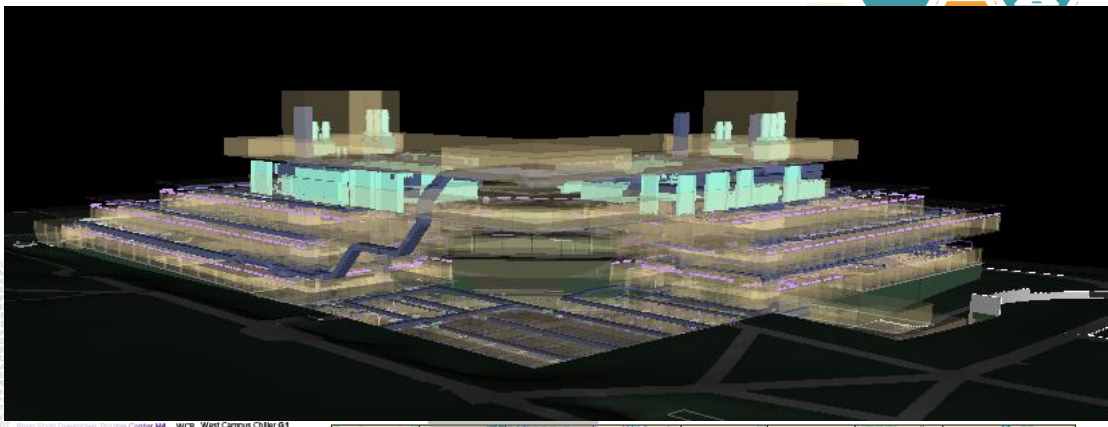
What the owner wants for hand-over

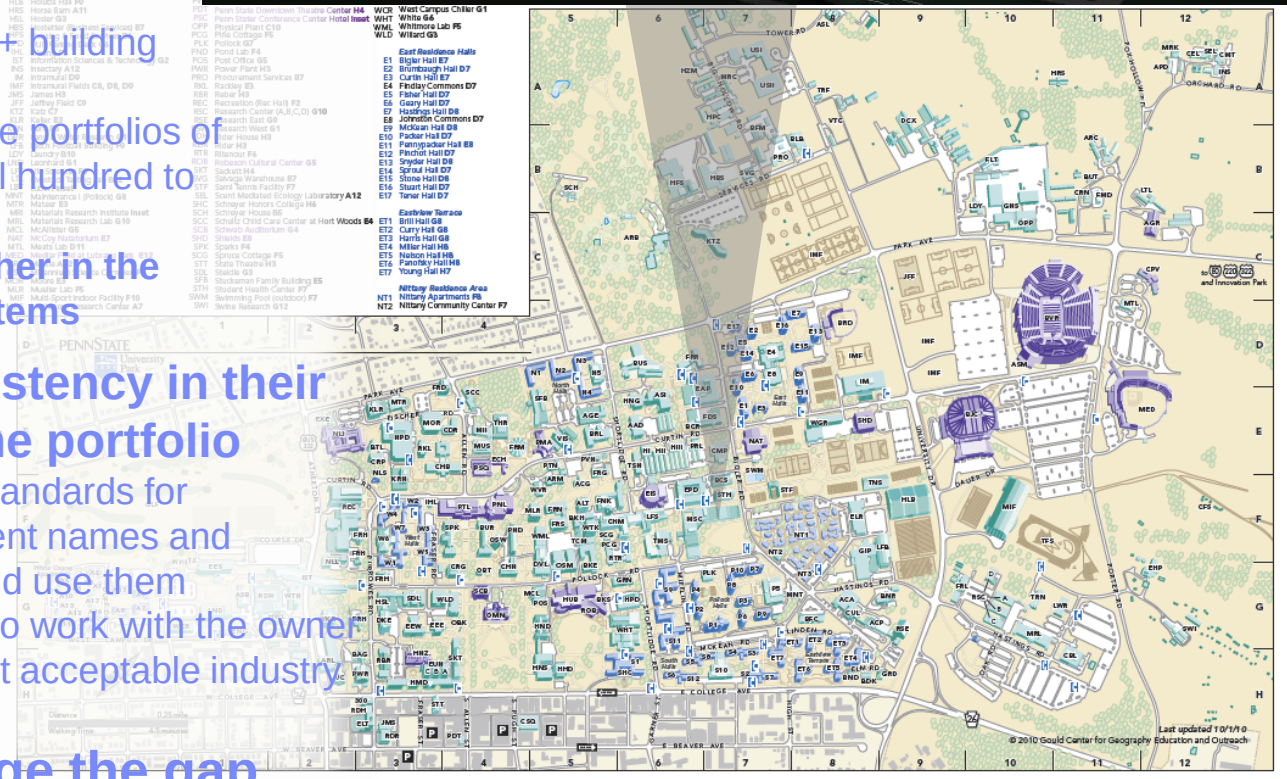
The model needs to be filtered when hand-over data is generated. Hand-over data should only include:

- 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.

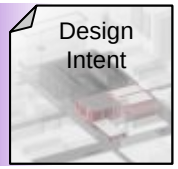
Design

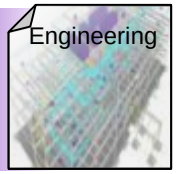
Specification

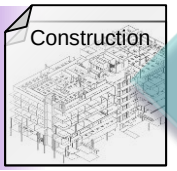
Construction

Operations

Retrofit

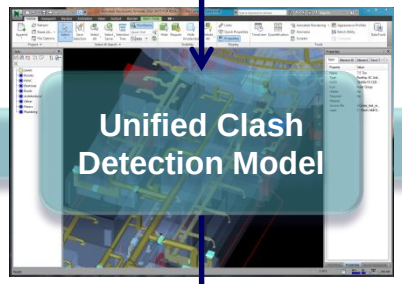




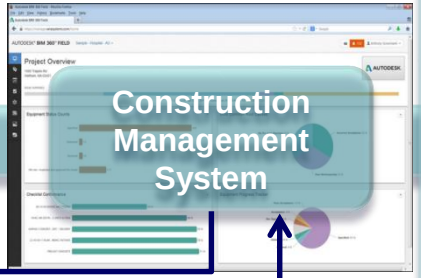


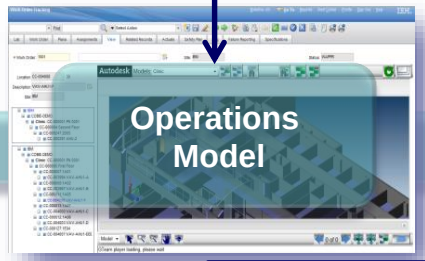
Design Model

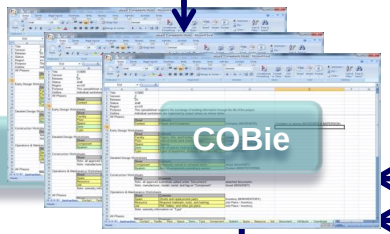
Bid Model

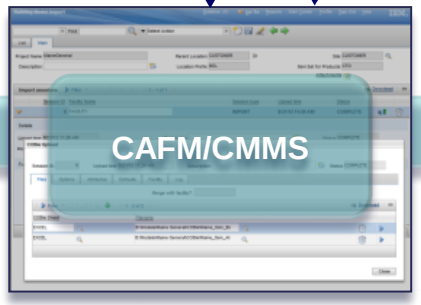


FAB Models









Document Management

Product Catalog

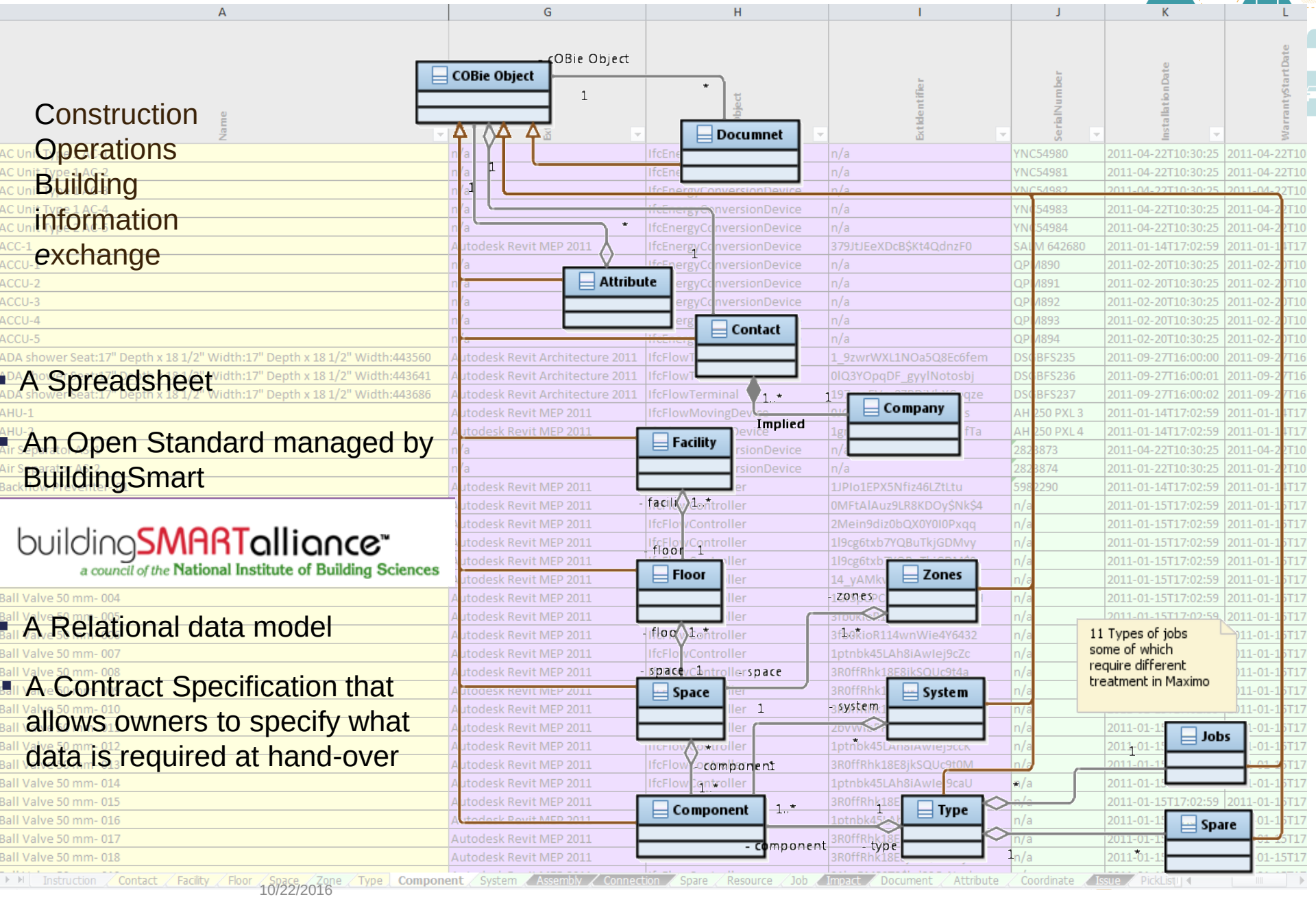
What is COBie?

Construction Operations Building information exchange

- A Spreadsheet
- An Open Standard managed by BuildingSmart

buildingSMARTalliance™
a council of the National Institute of Building Sciences

- A Relational data model
- A Contract Specification that allows owners to specify what data is required at hand-over



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

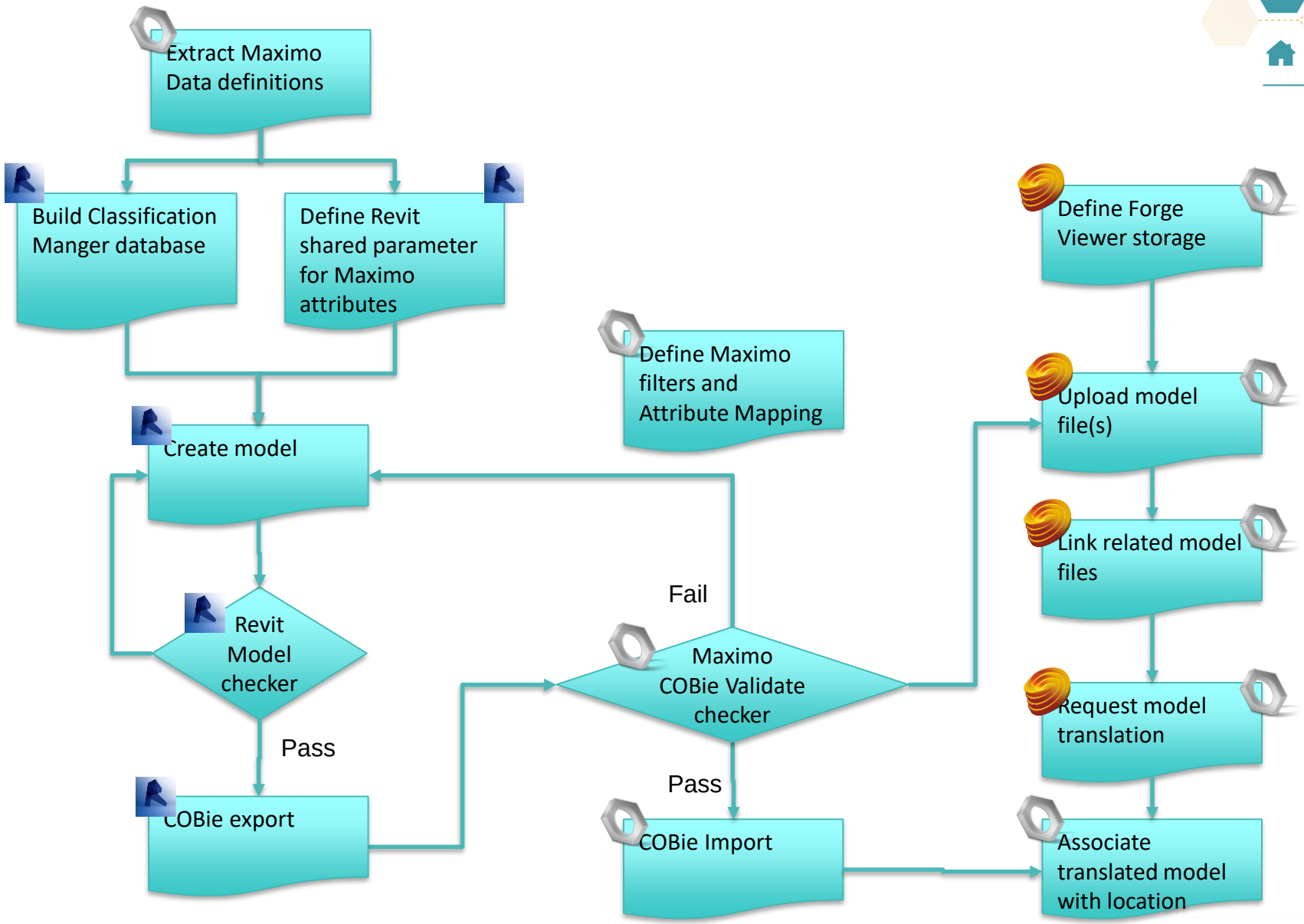
Attributes: Properties- Name-value pairs
- Can reference any row on any other table

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

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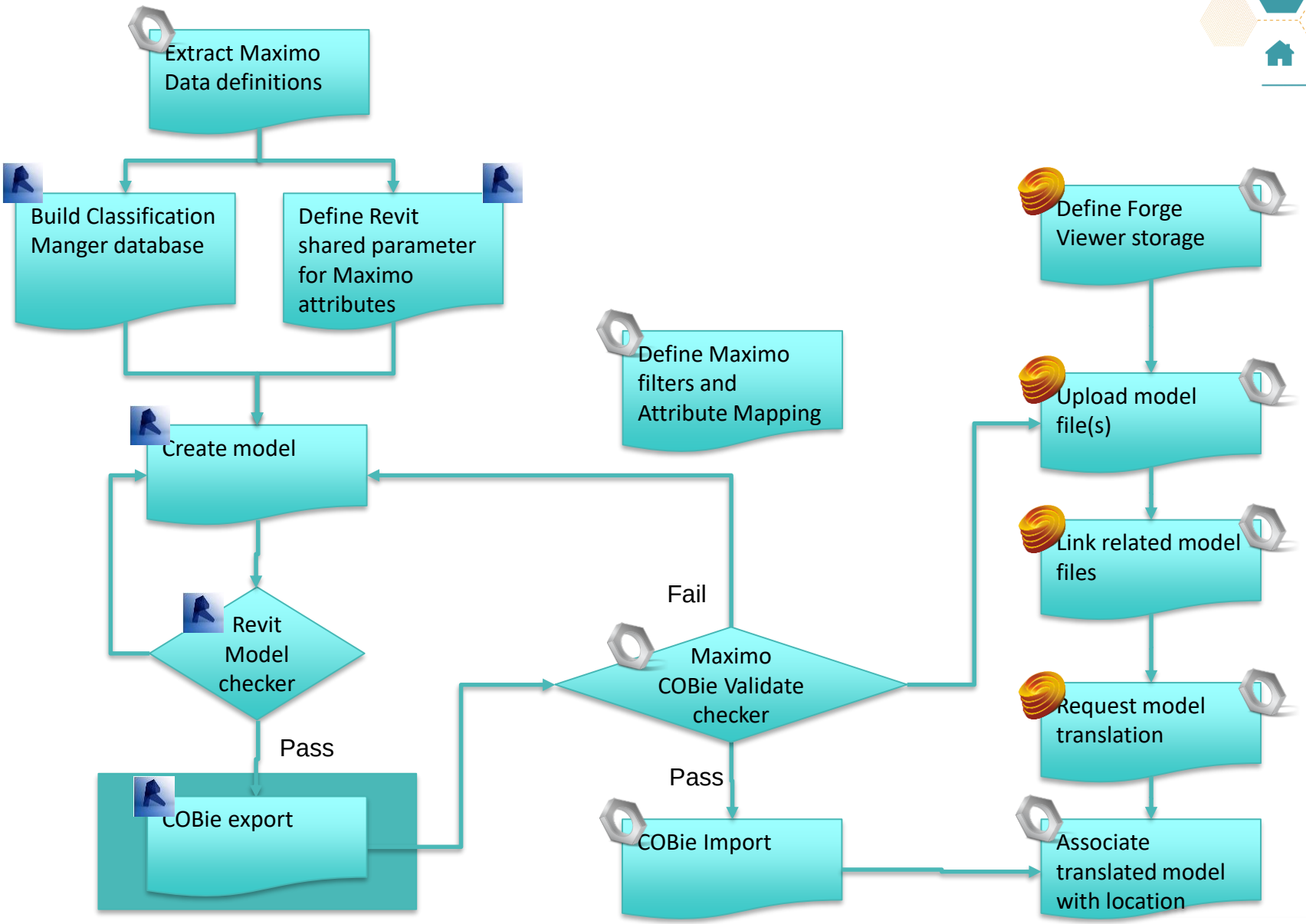
Revit COBie Export

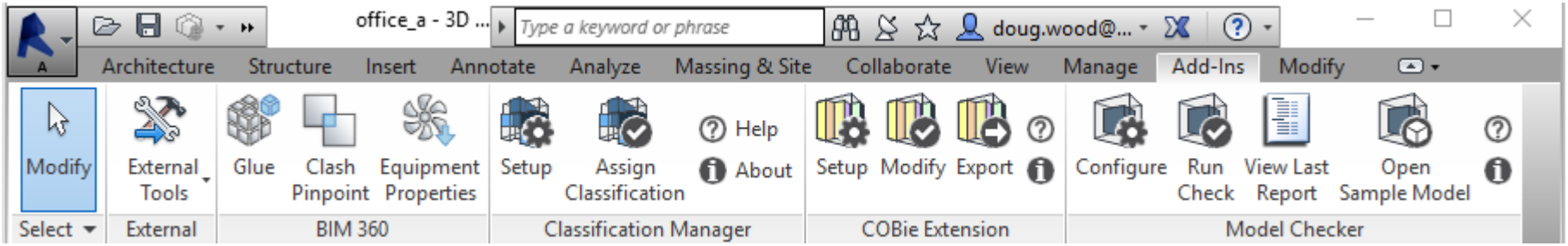


Get the right toolkit

http://www.biminteroperabilitytools.com/

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

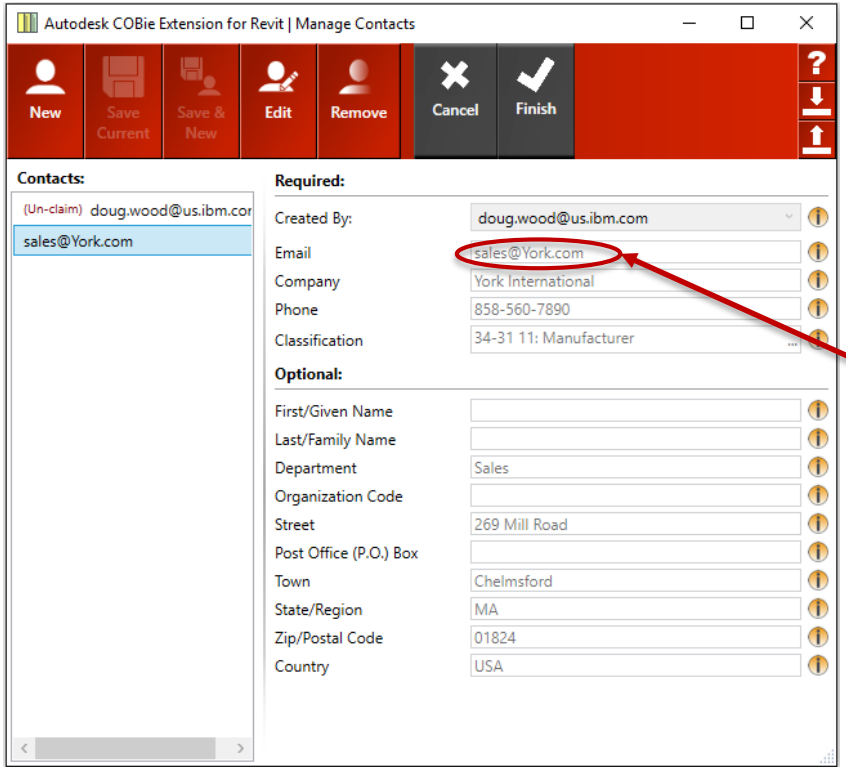
- ❑Zone Manager: Create Zones
- ❑Elements: Select Family, Type, and Elements to export
- ❑Other Elements: Copy data to COBie schedules

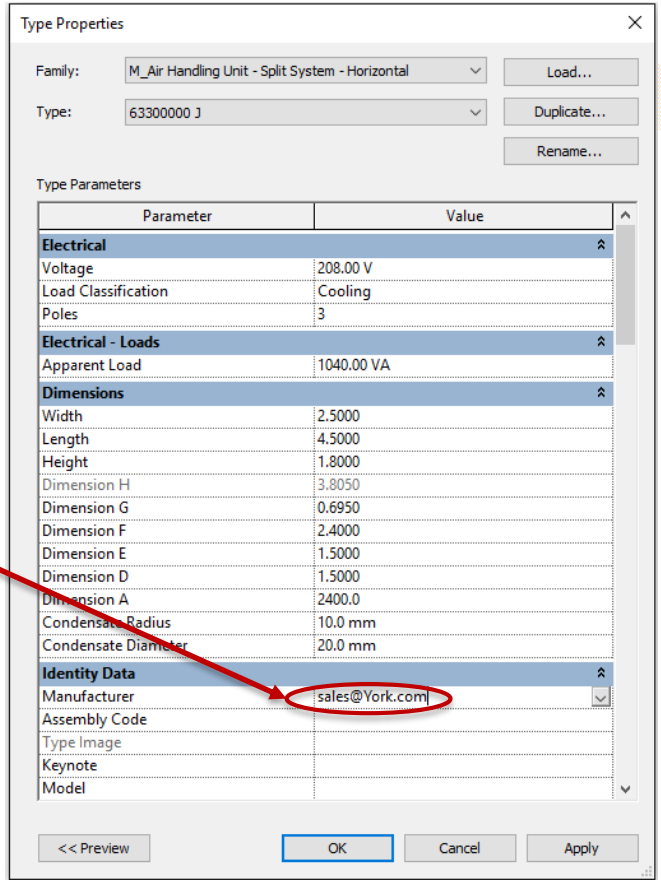
Export

- ❑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



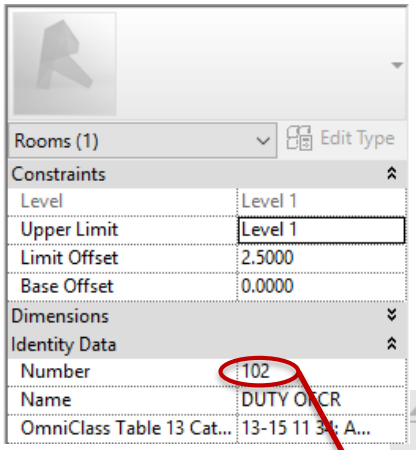


Companies for the contact list are used for the Manufacture property in Revit type. The email from the contact definition is used as the value of the Manufacturer property

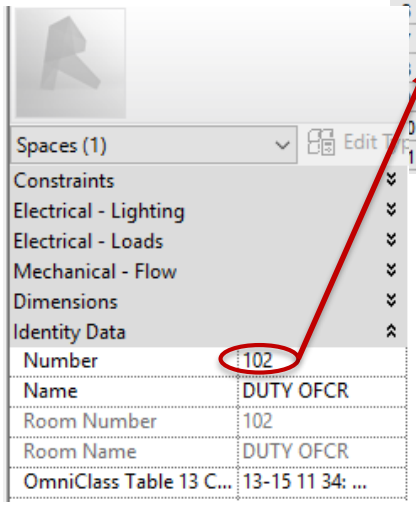
A	F	G	H	I	J	K	L	M	N	O	P	Q	R	S
Email	Phone	ExternalSystem	ExternalObject	ExternalIdentifier	Department	OrganizationCode	GivenName	FamilyName	Street	PostalBox	Town	StateRegion	PostalCode	Country
sales@cooperindustries.com	770-486-4800	n/a	n/a	n/a	sales	n/a	n/a	n/a	1121 Highway 74 South	n/a	Peachtree City	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

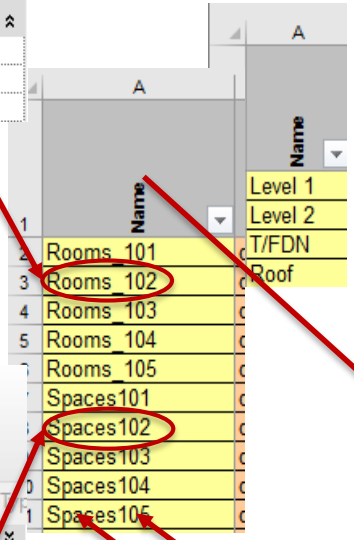
Room and Space – Typical use

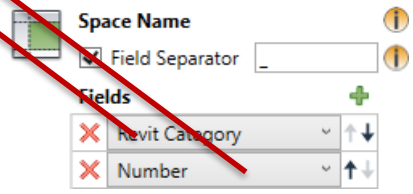
COBie data for all files in the model are concatenated together to create a single COBie file. When elements with the same name appear in different model files, the name must be disambiguated before it is added to the COBie file

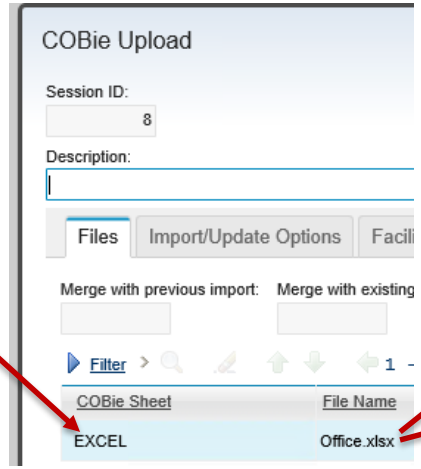


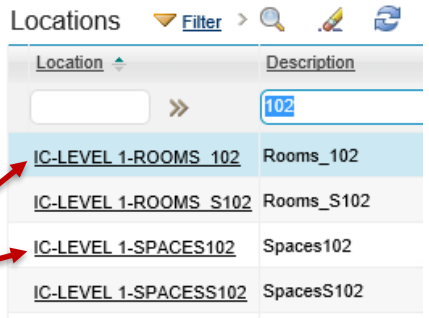
Revit category is added to space and room names to disambiguate them





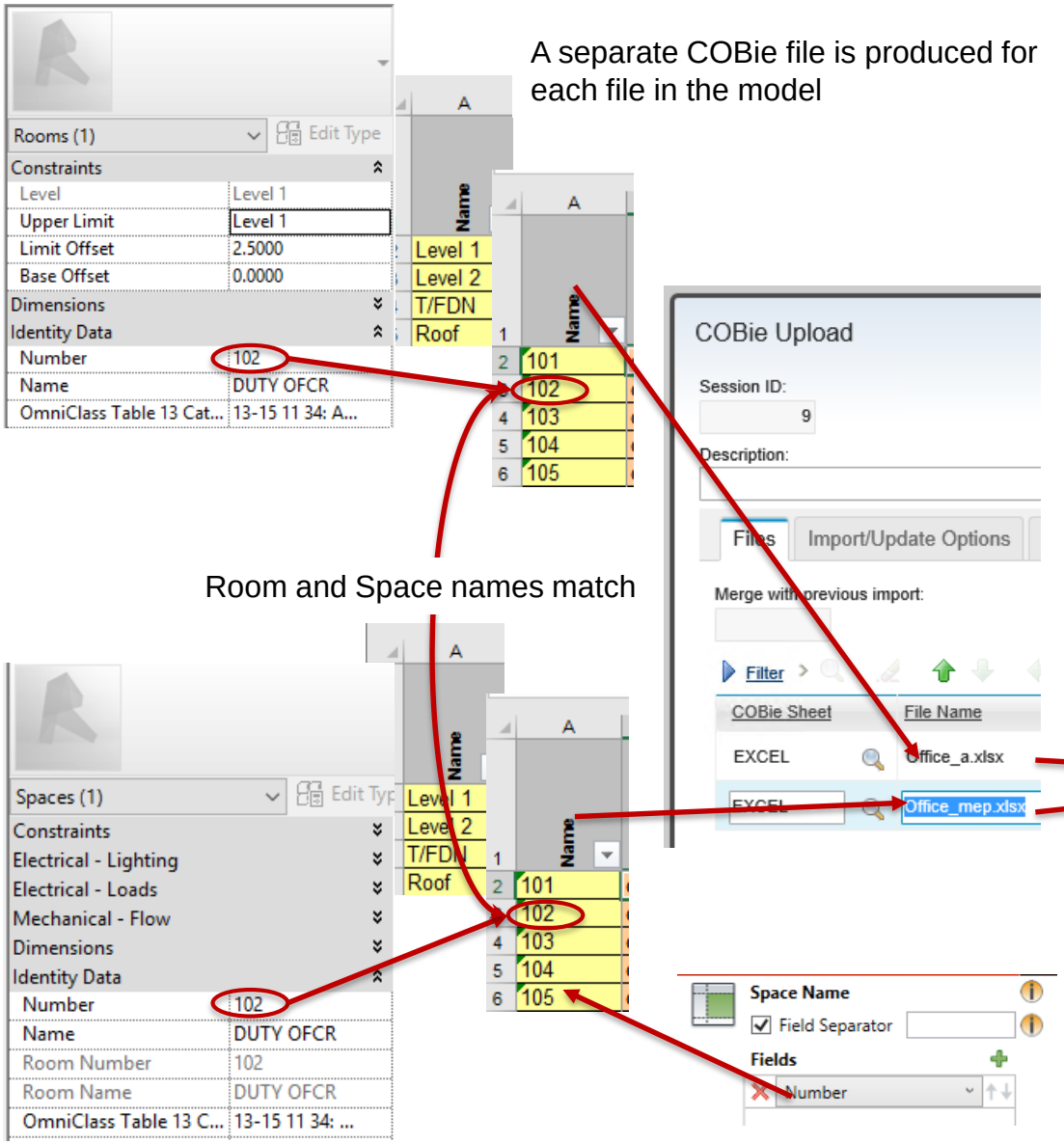






Two Maximo records are created for the same physical space

Room and Space setup – For Maximo



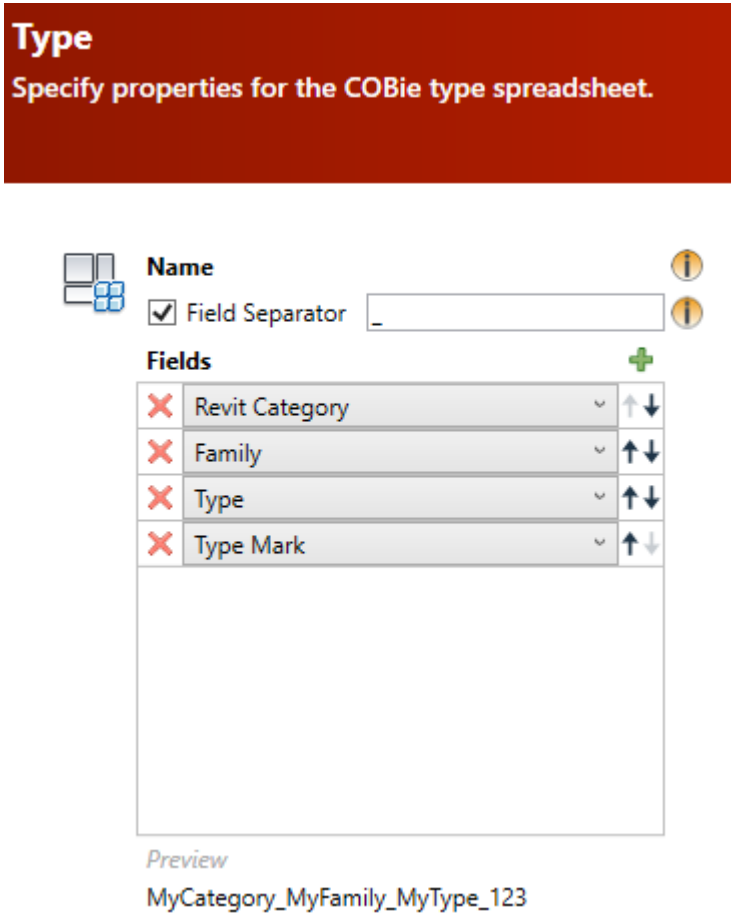
Room or Space?

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.

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

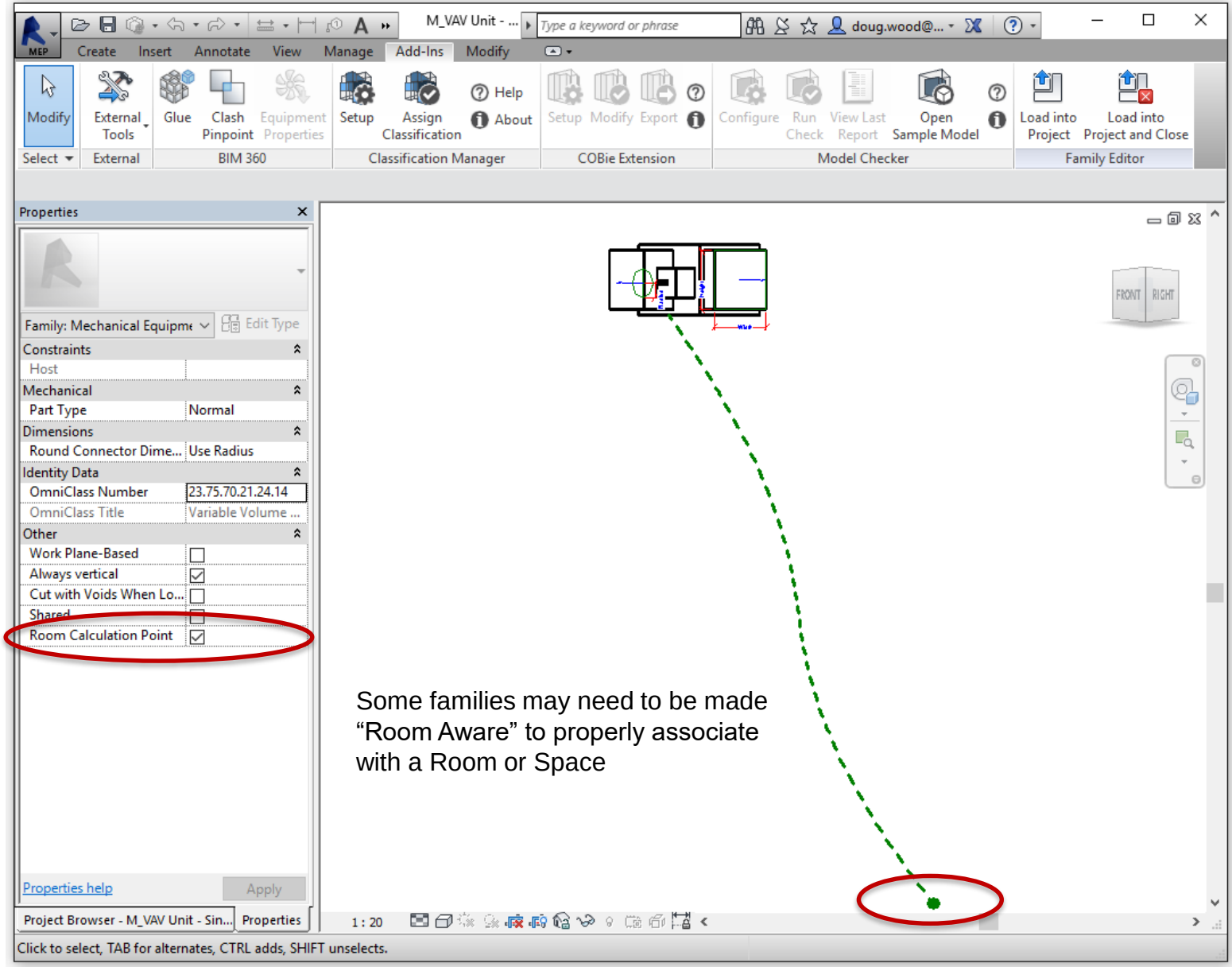
COBie Type name

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.



COBie Type name becomes the Maximo Product Name

Making Revit Families Room Aware



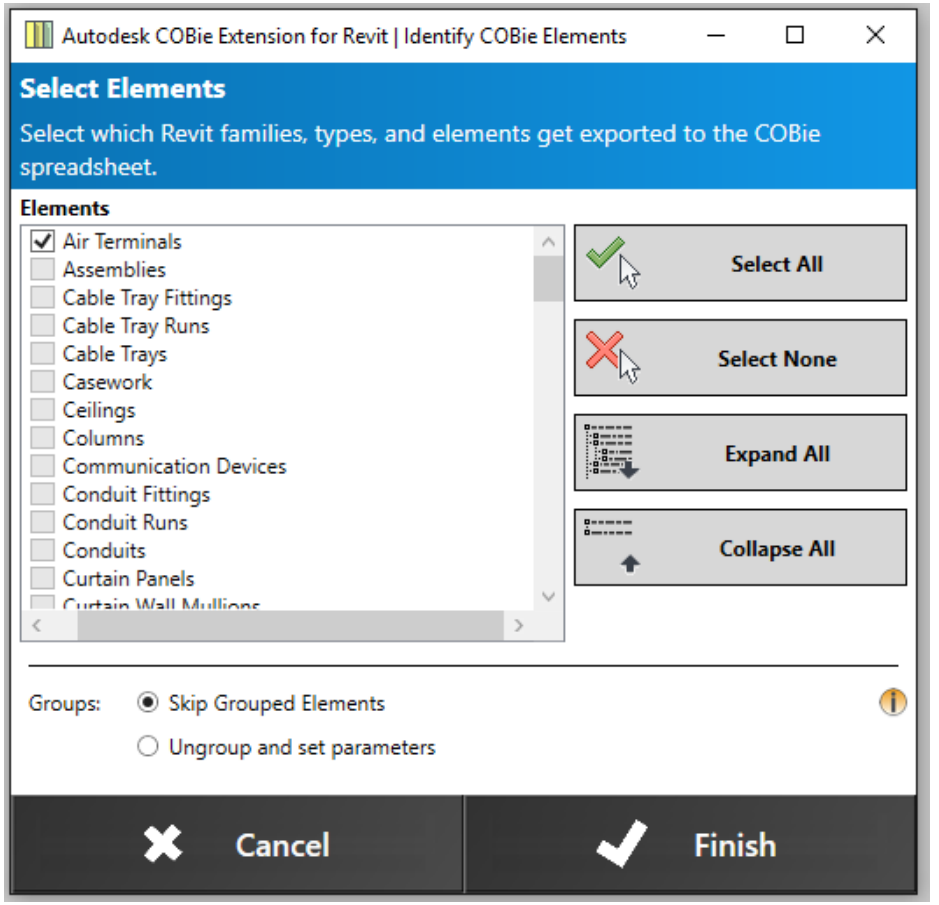
Some families may need to be made "Room Aware" to properly associate with a Room or Space

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 check for the element. It is best to review this tab anytime the model has been modified since the last COBie export

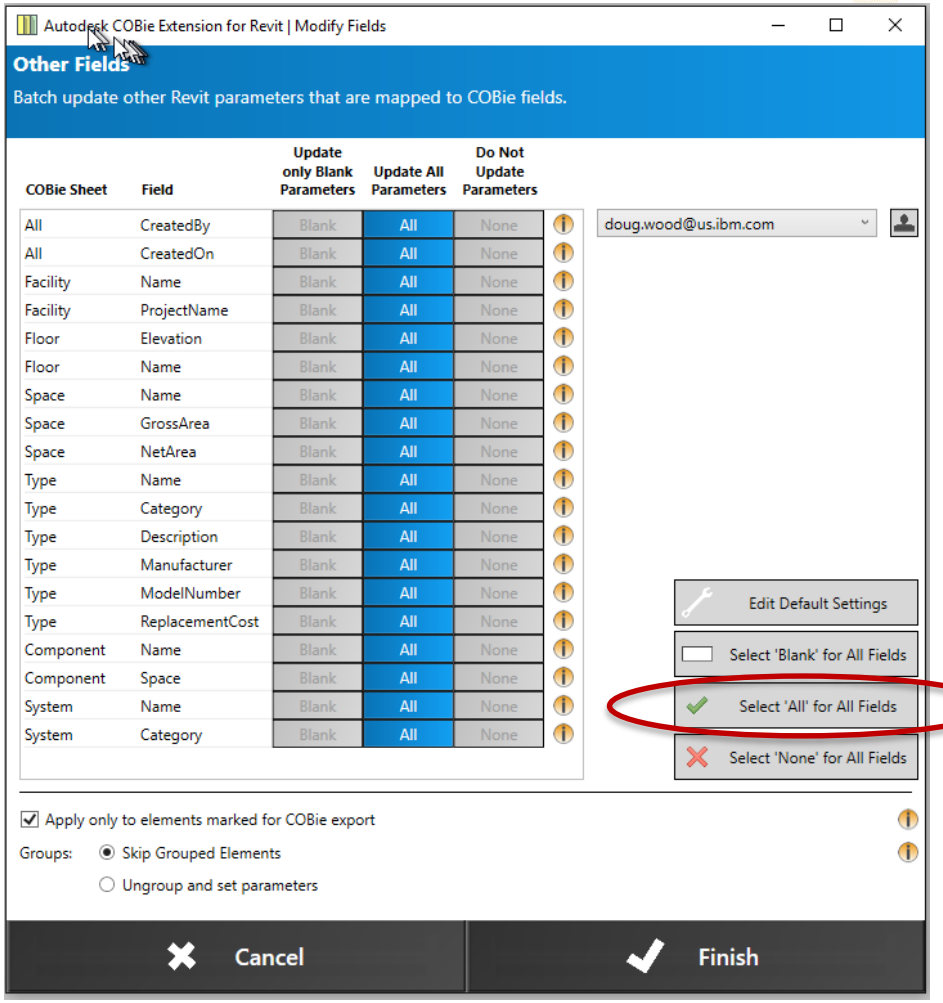


Other Fields

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.

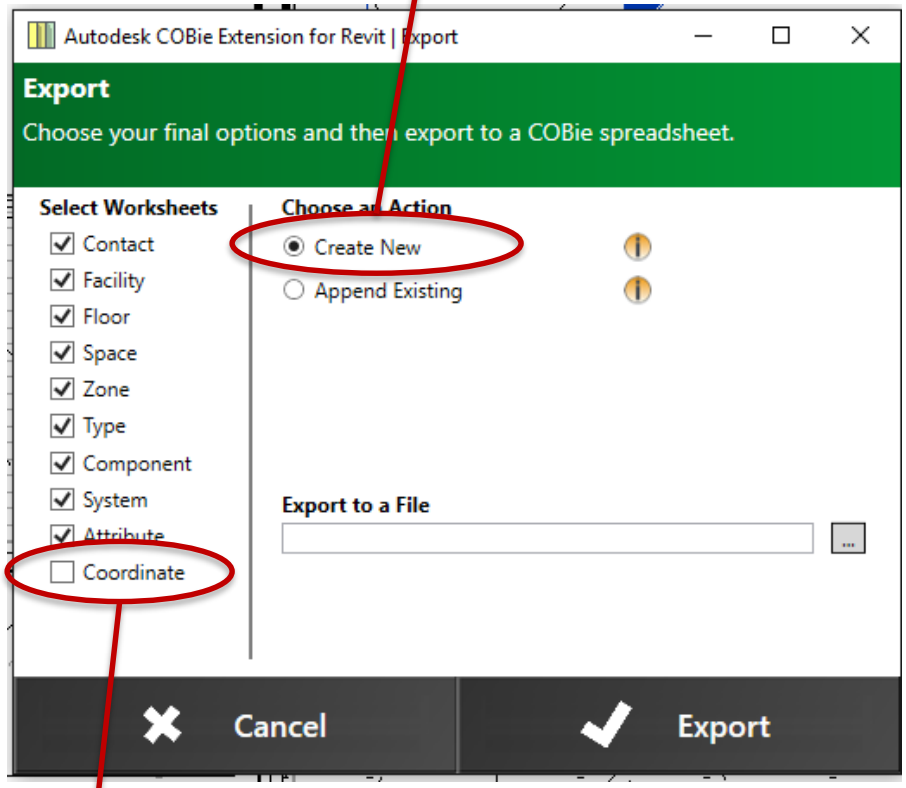
Best practice is to not override any values provide by the toolkit. Instead to insure that the necessary data in the model is provided so the toolkit generated the needed values.

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



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

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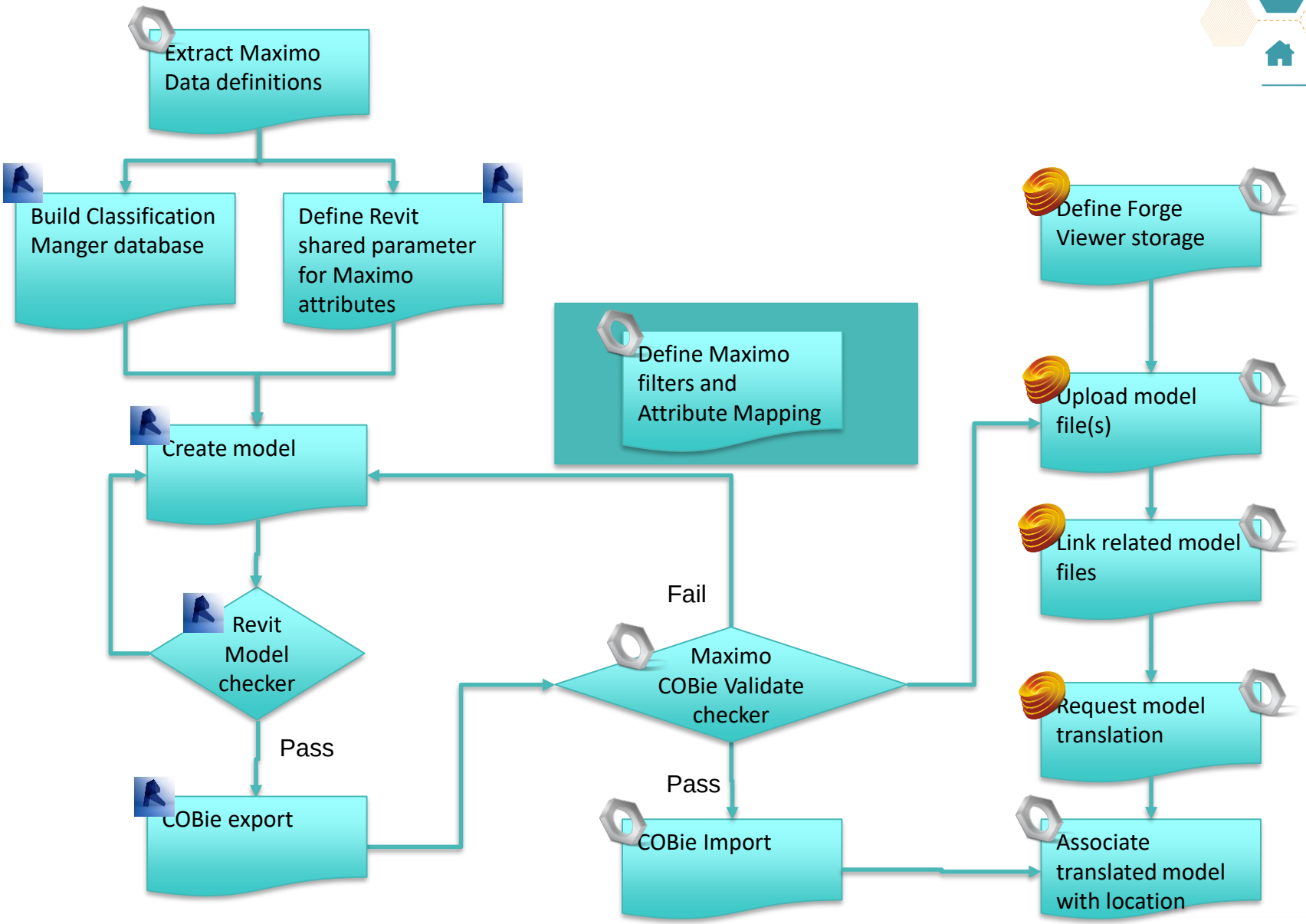
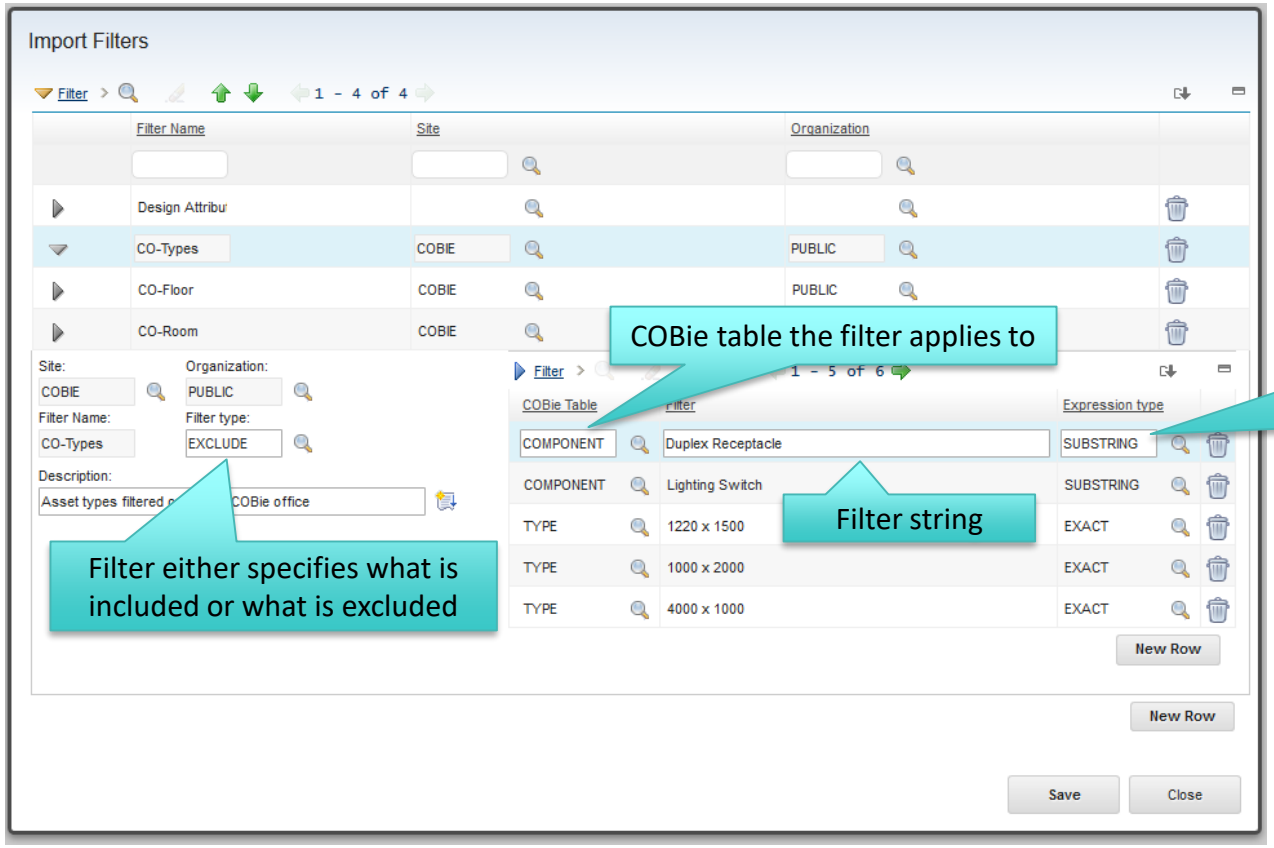
Maximo Model Validation



Define filters



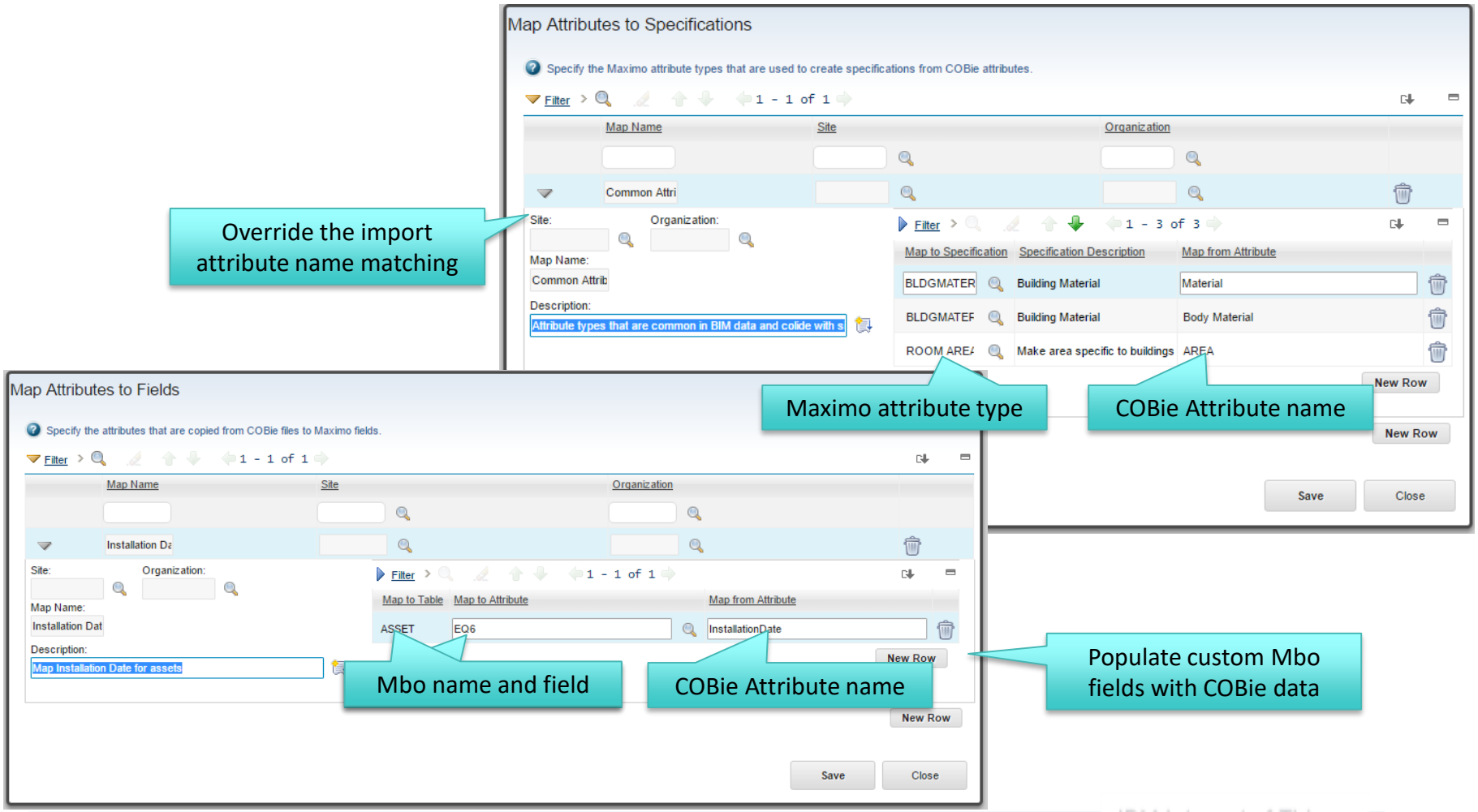
Filters provide control over what COBie data is imported.

- 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



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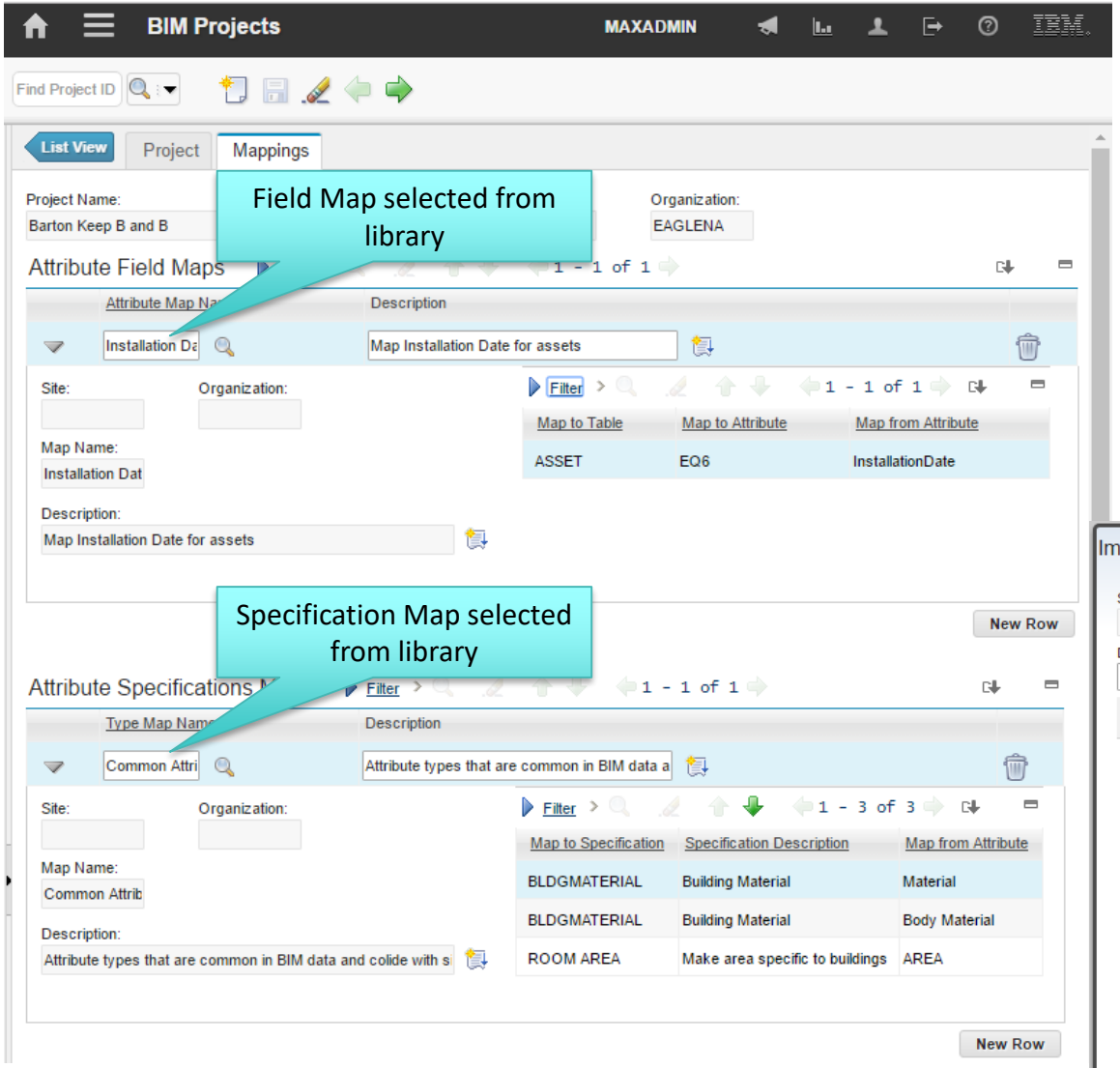
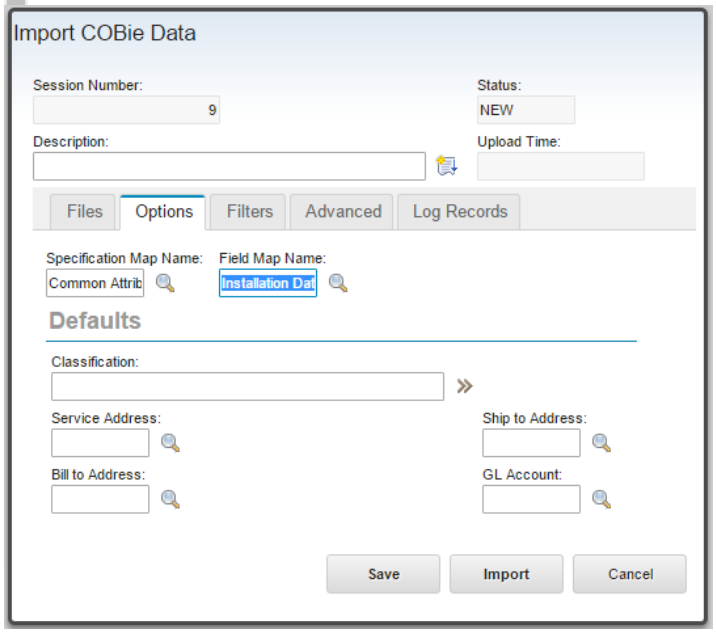
Add Attribute Maps to the Project



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

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



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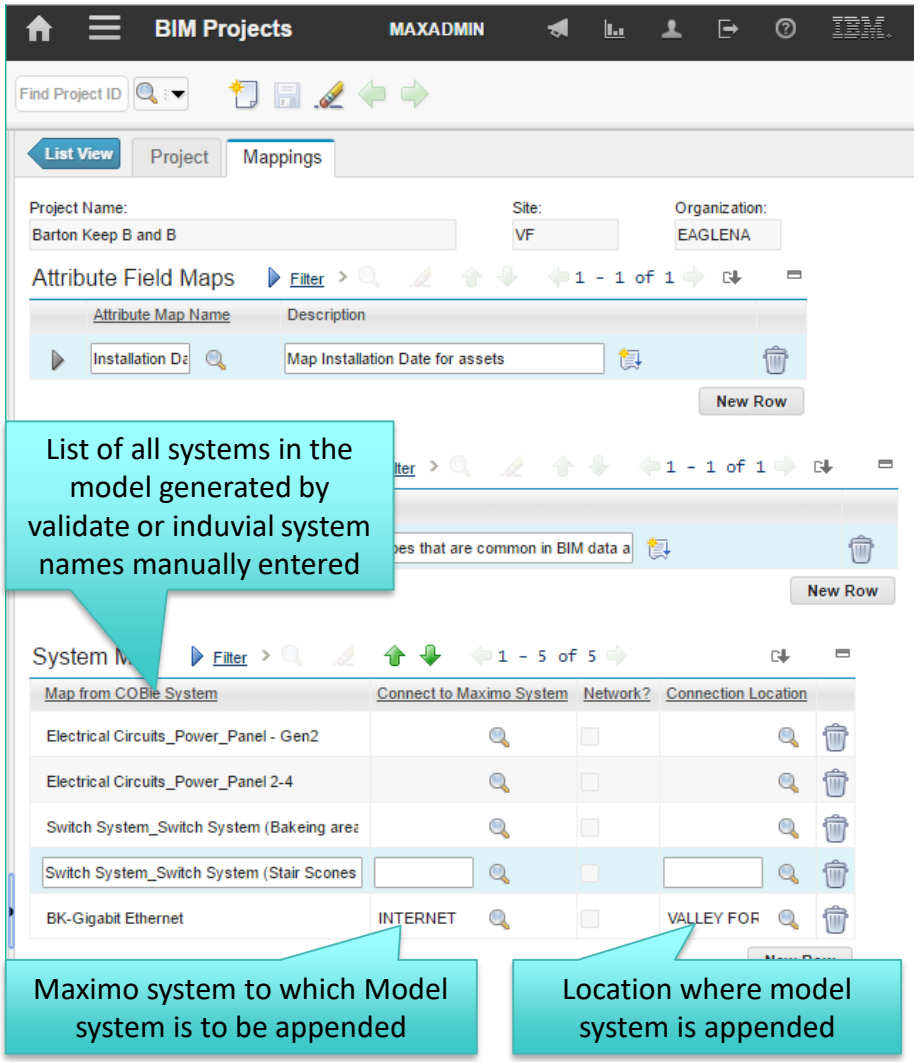
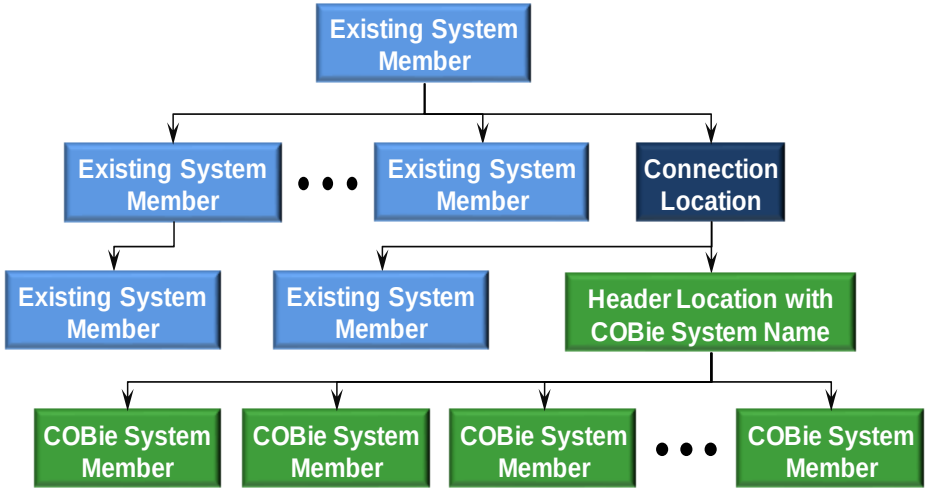
Map COBie systems to Maximo Systems



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



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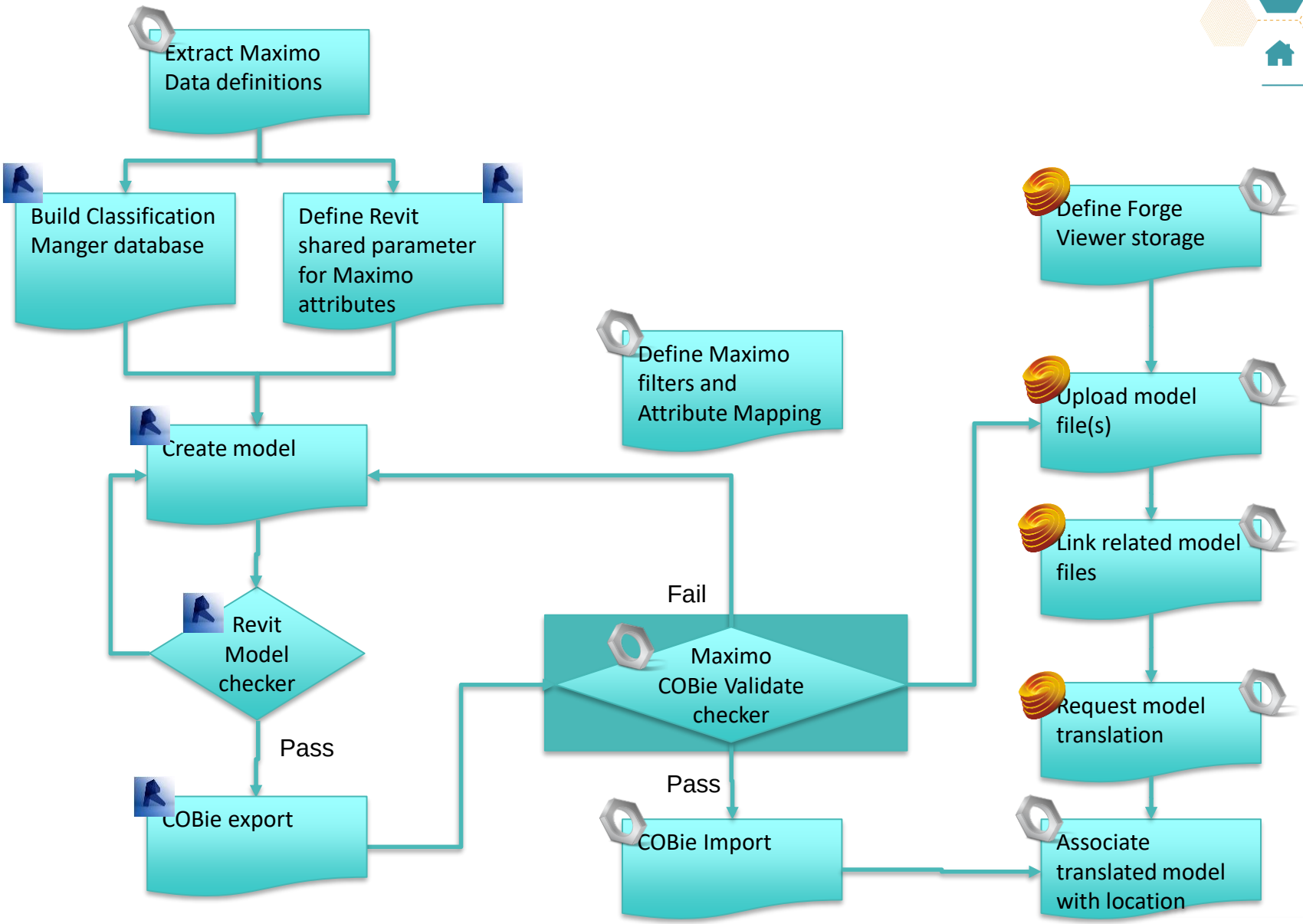
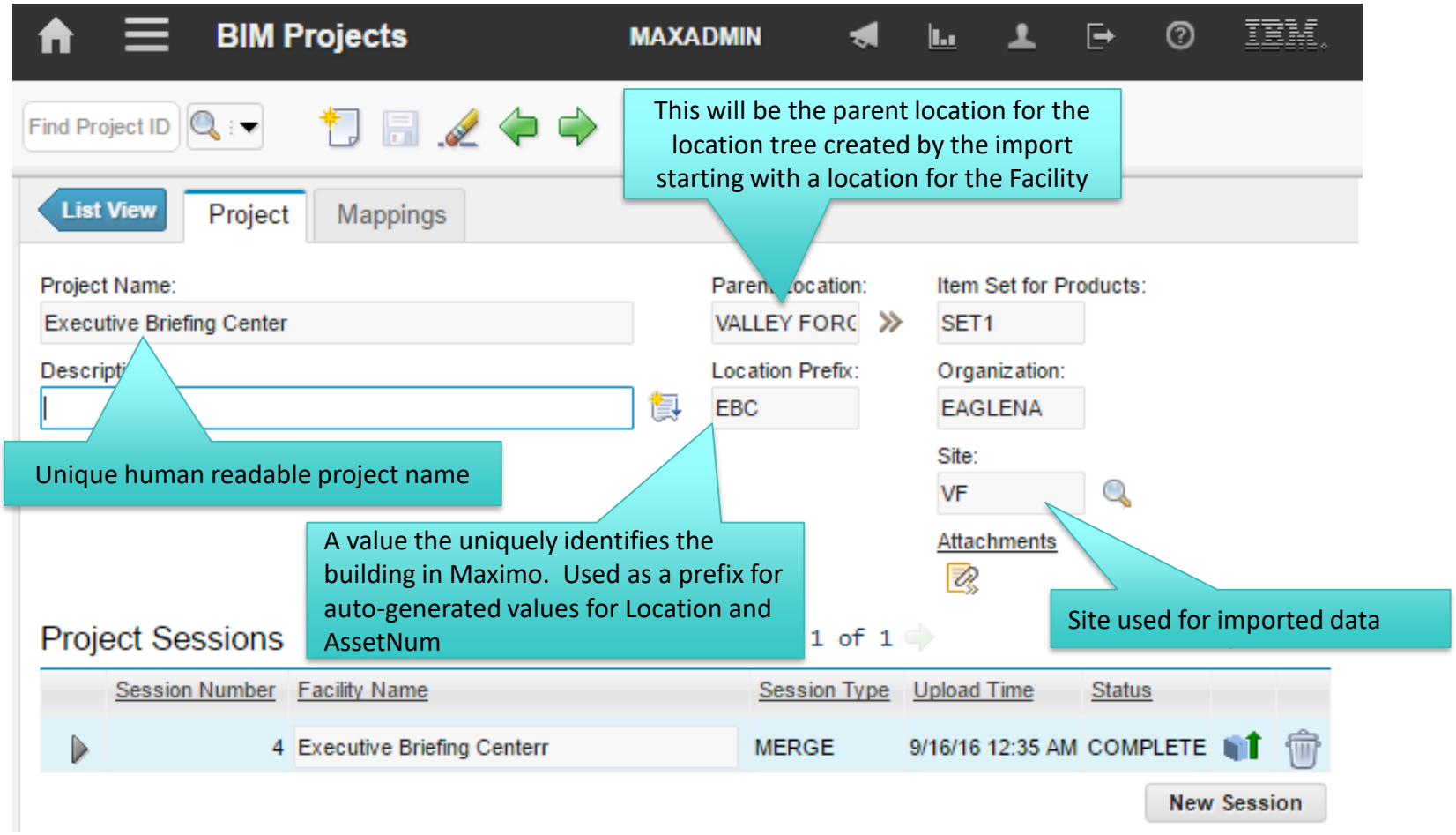
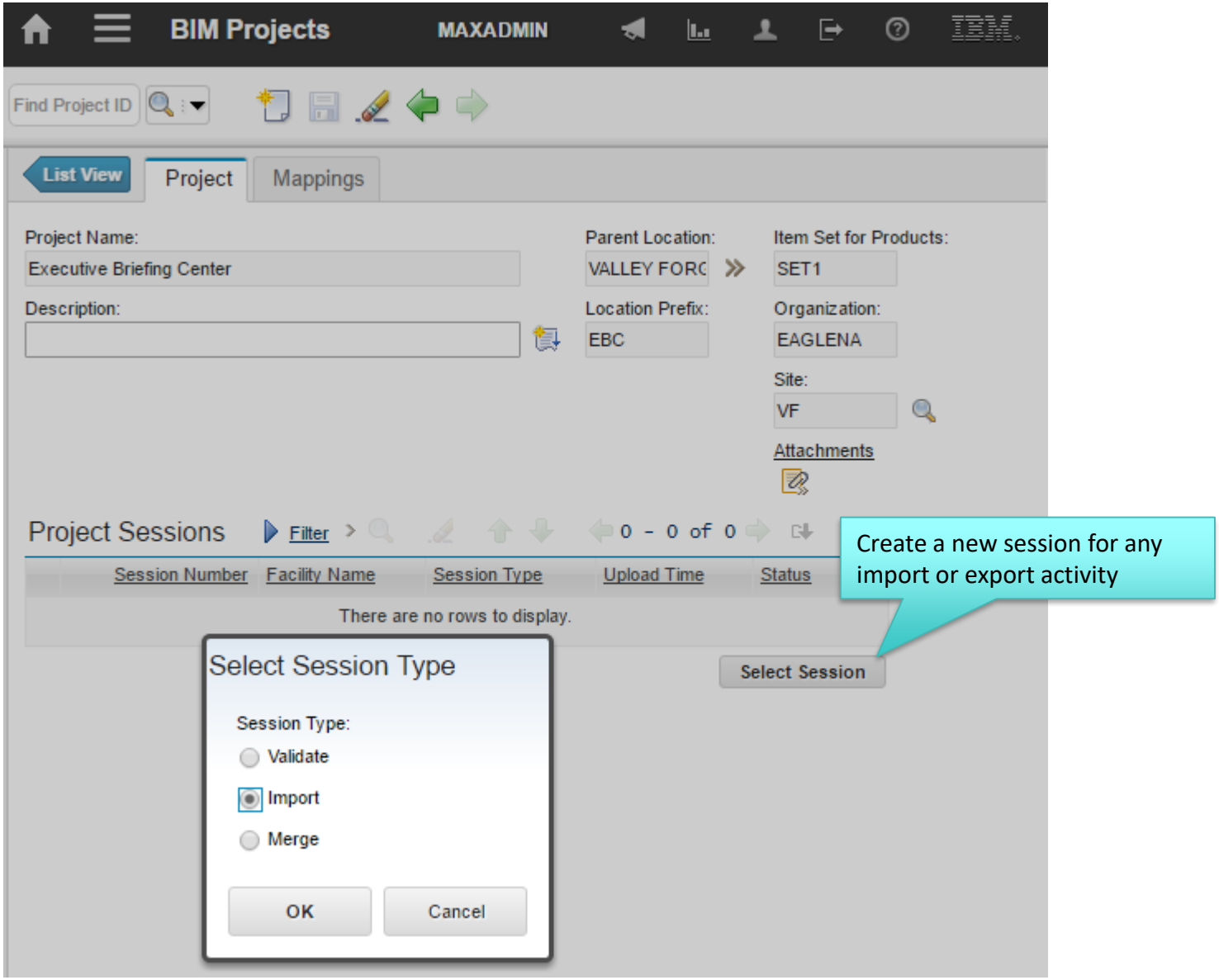
Maximo Model Validation



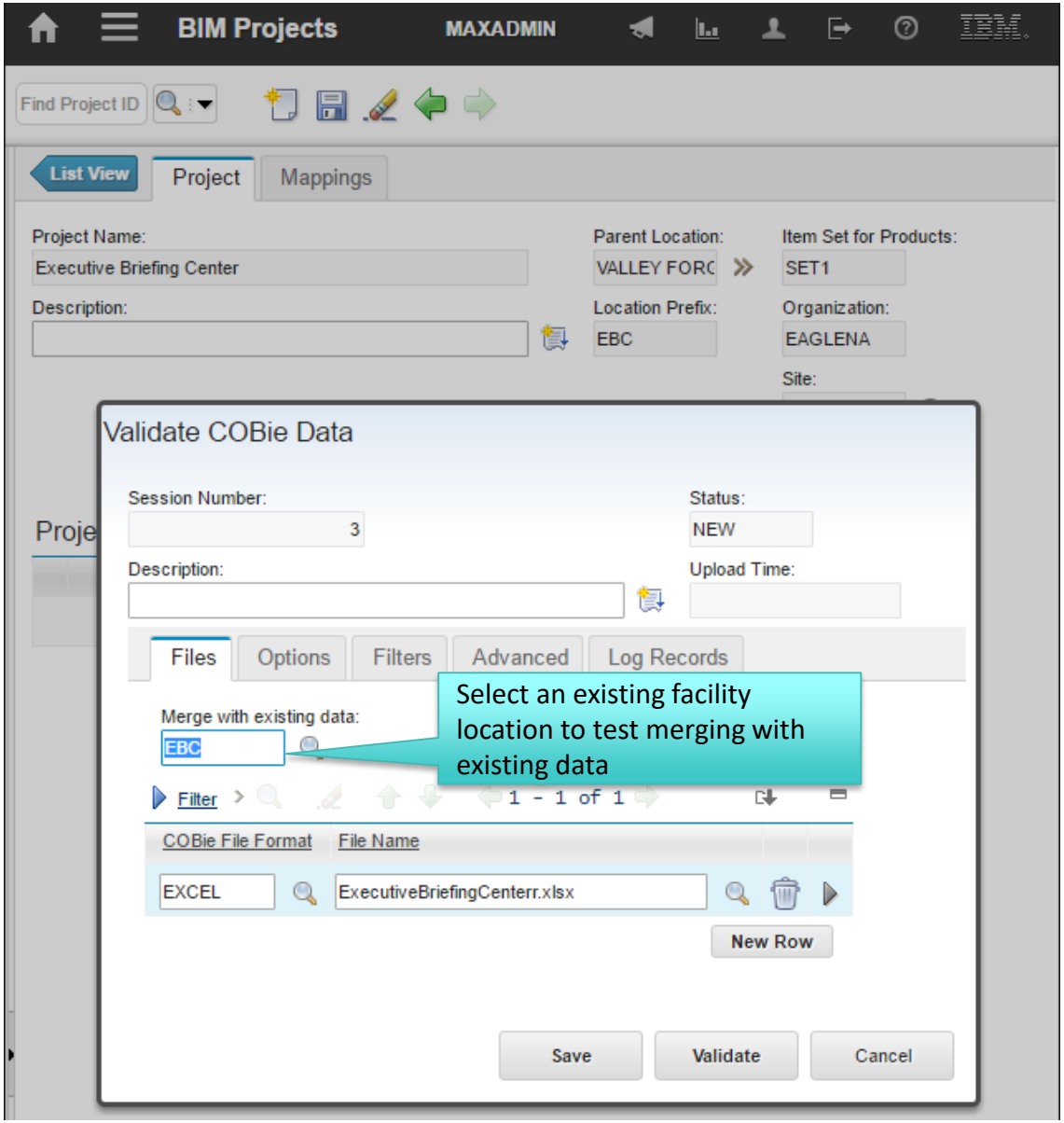
Model Validation – Create Import Project



Model Validation – Create Validate Session



Model Validation – Merging Models



If model data is to be add 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 imprort 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

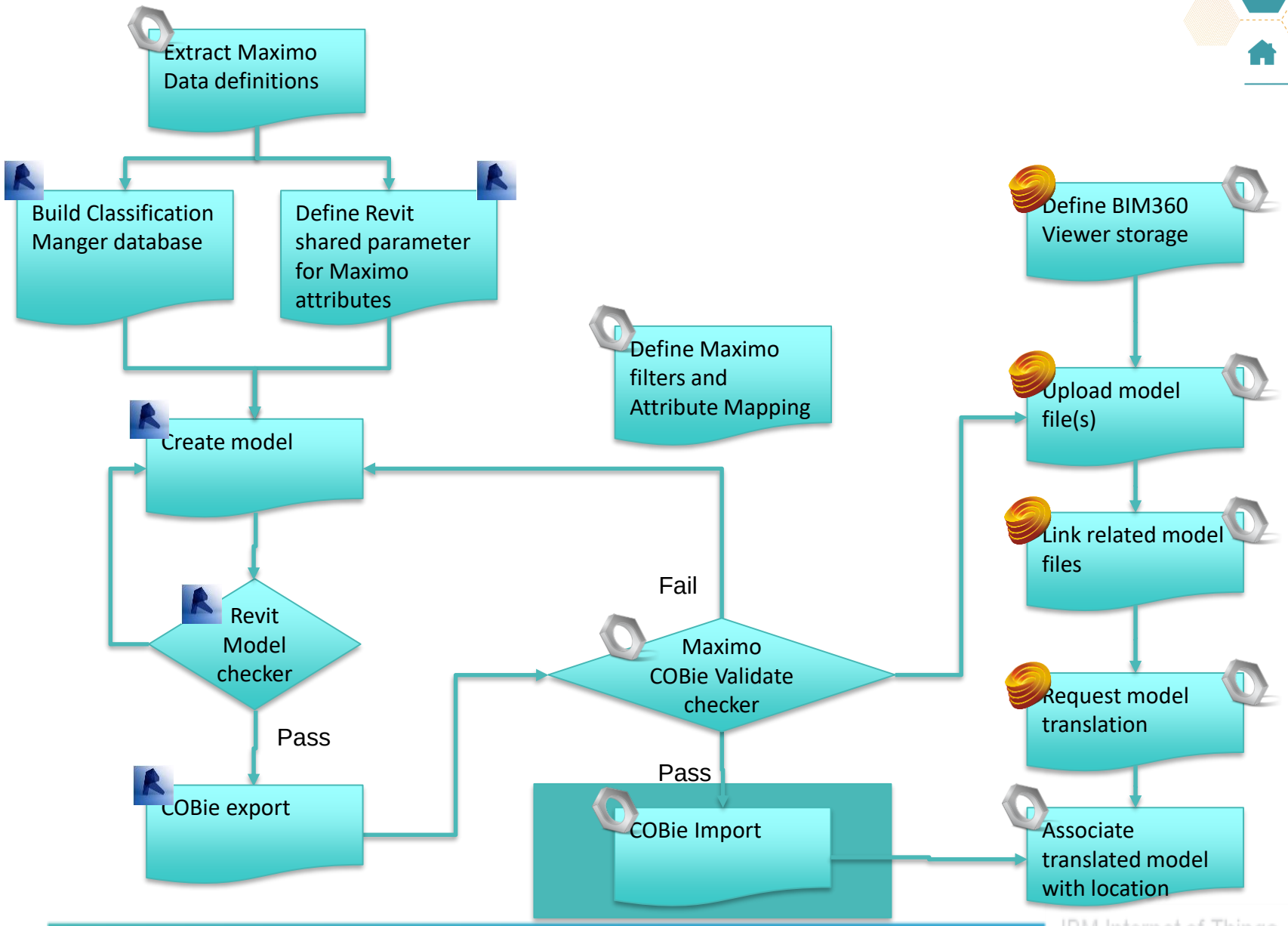
Validate FLOOR ===> Level 1

Validate SPACE ===> 104

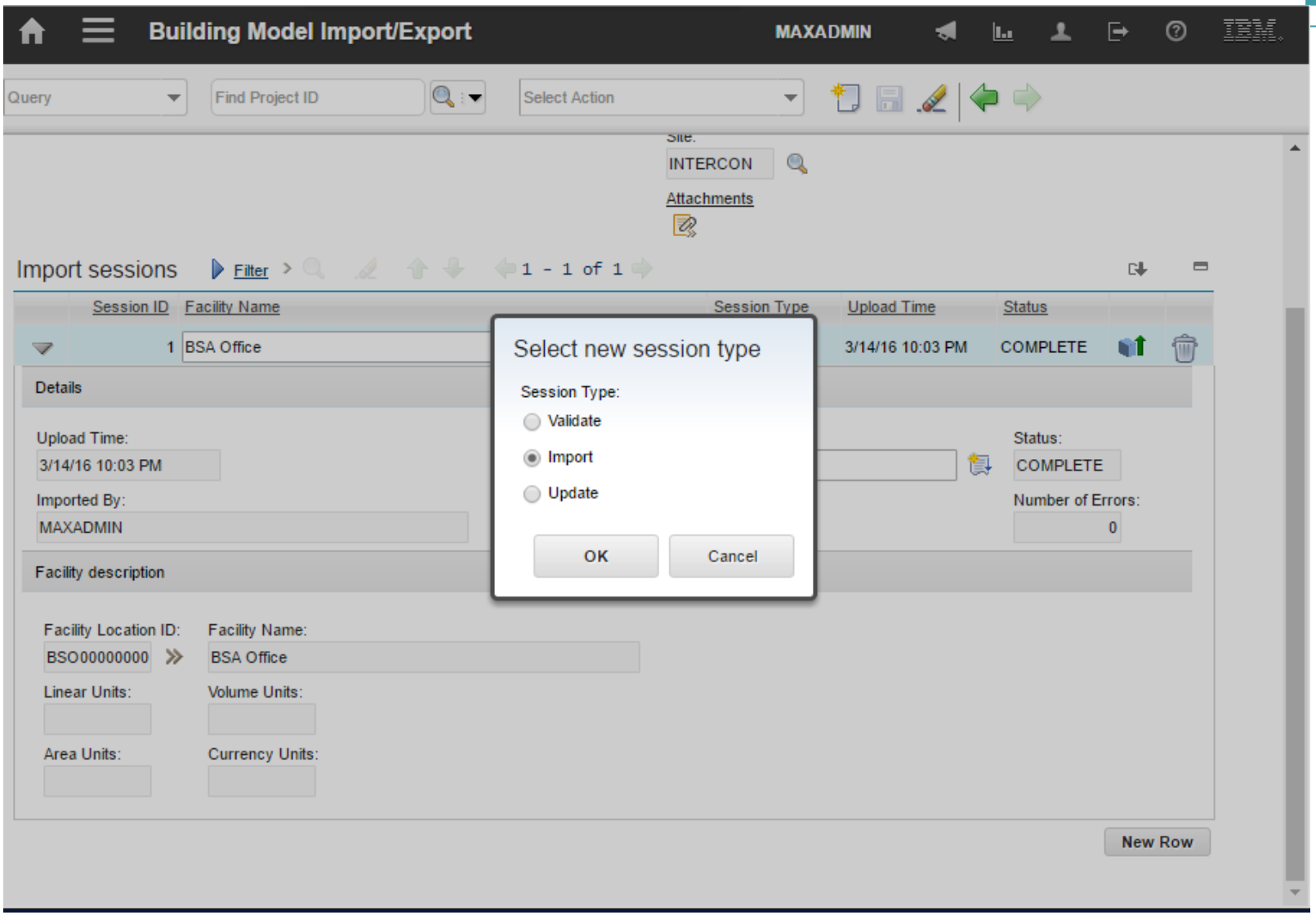
Validate COMPONENT ===> Lighting Devices_646165

Validate SYSTEM ===> Switch System

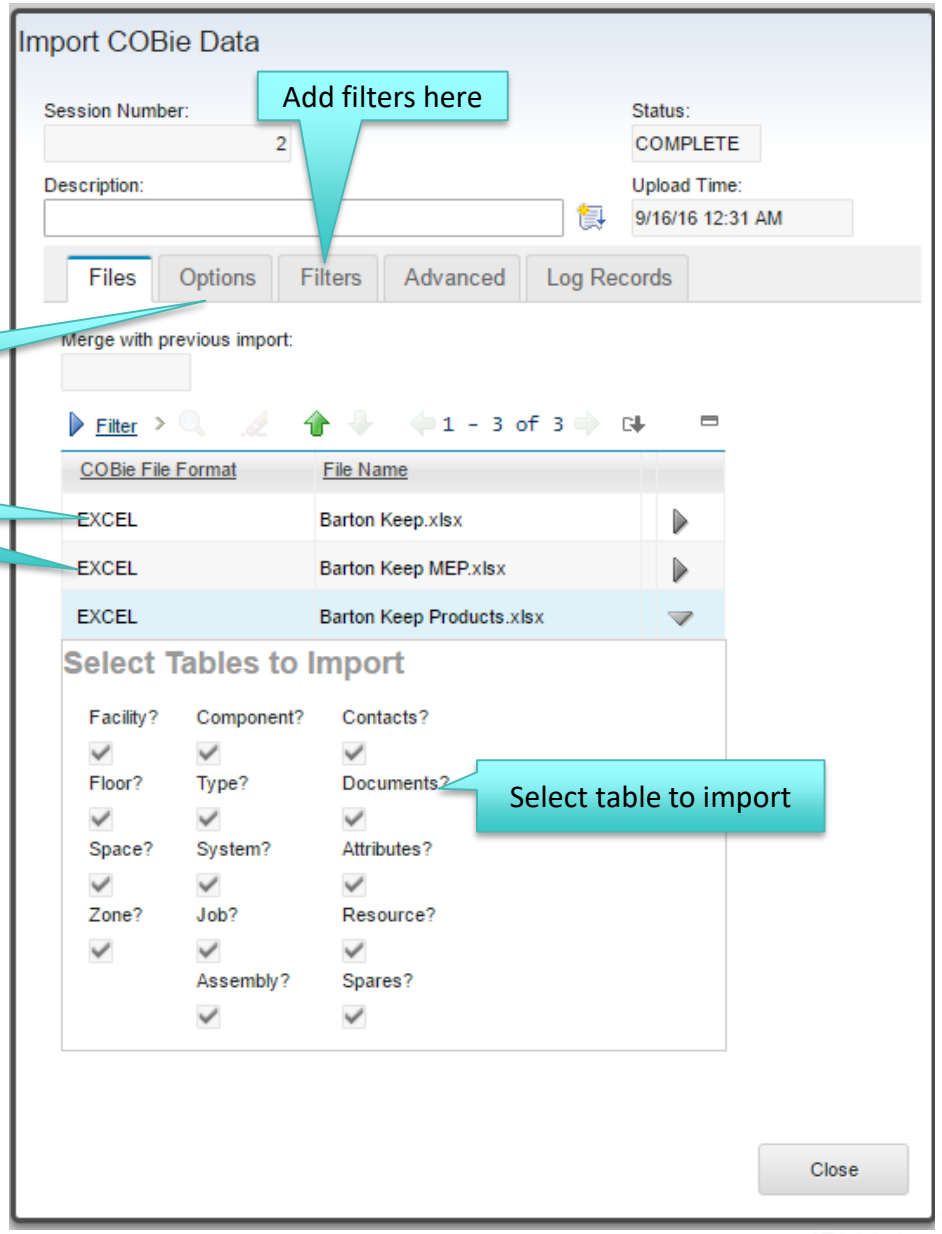
Maximo Model Validation



COBie Upload



Importing COBie files

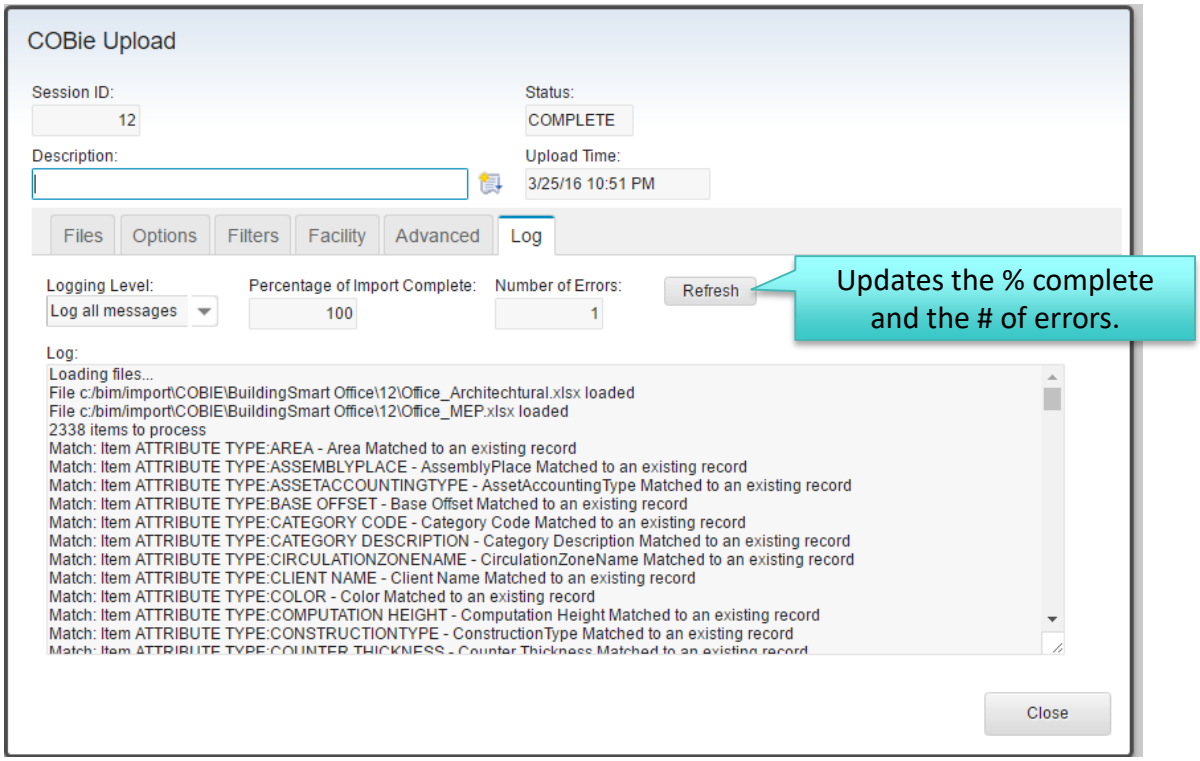


Specify the attribute map here

COBie files from linked models are merged here

Select table to import

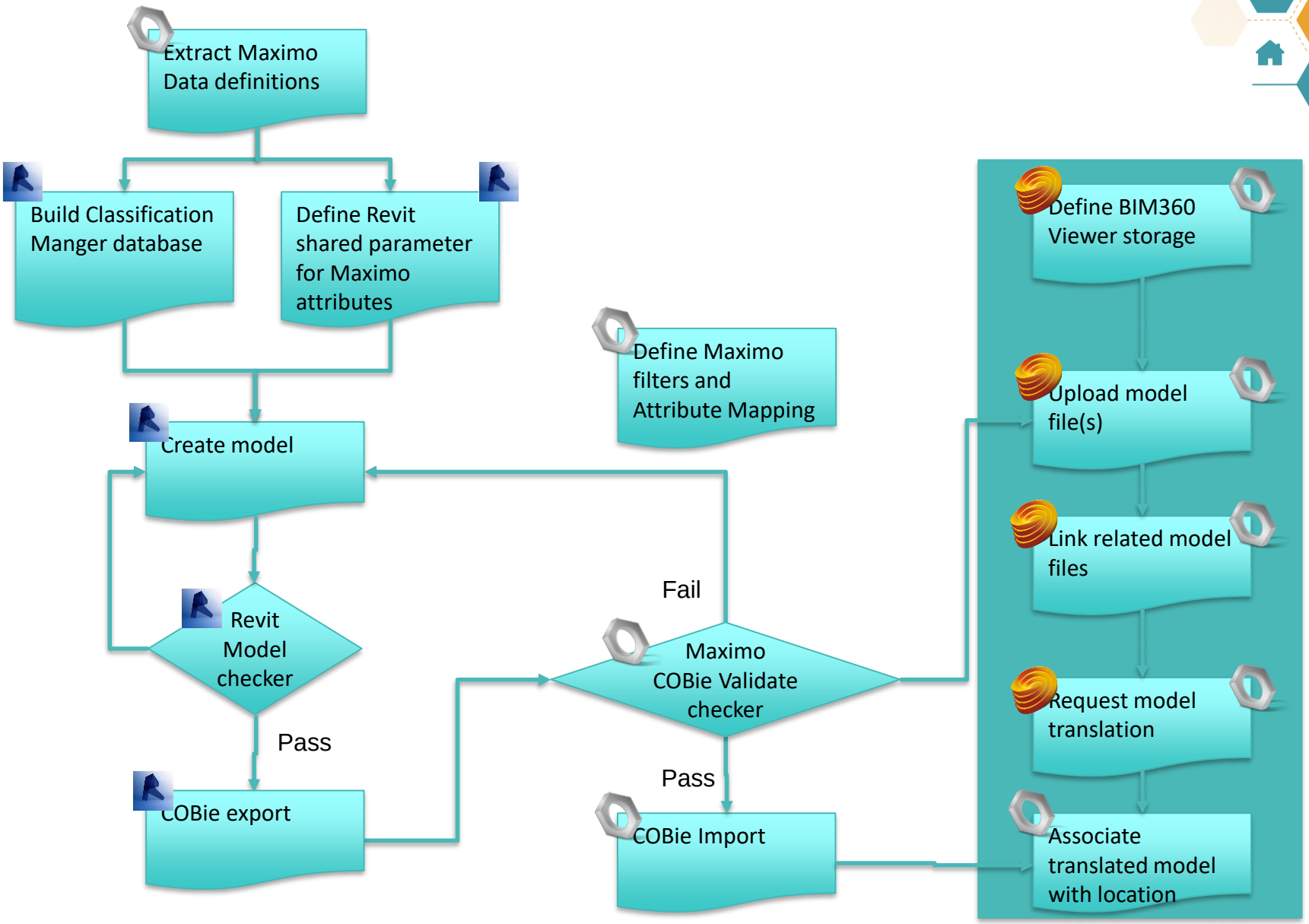
COBie Log Record



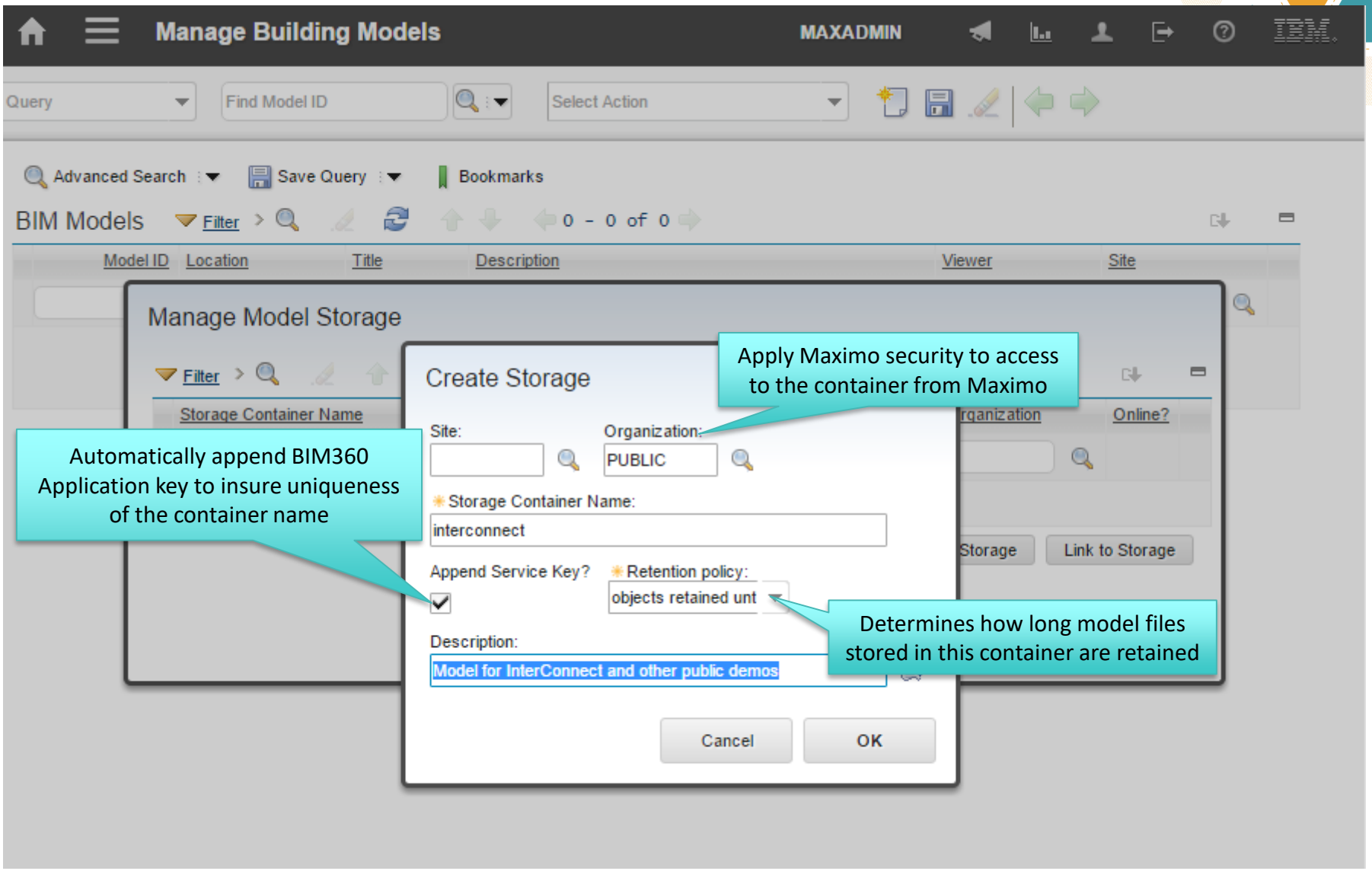
Once started, all of the COBie processes such as the import show here run in the background.

- 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

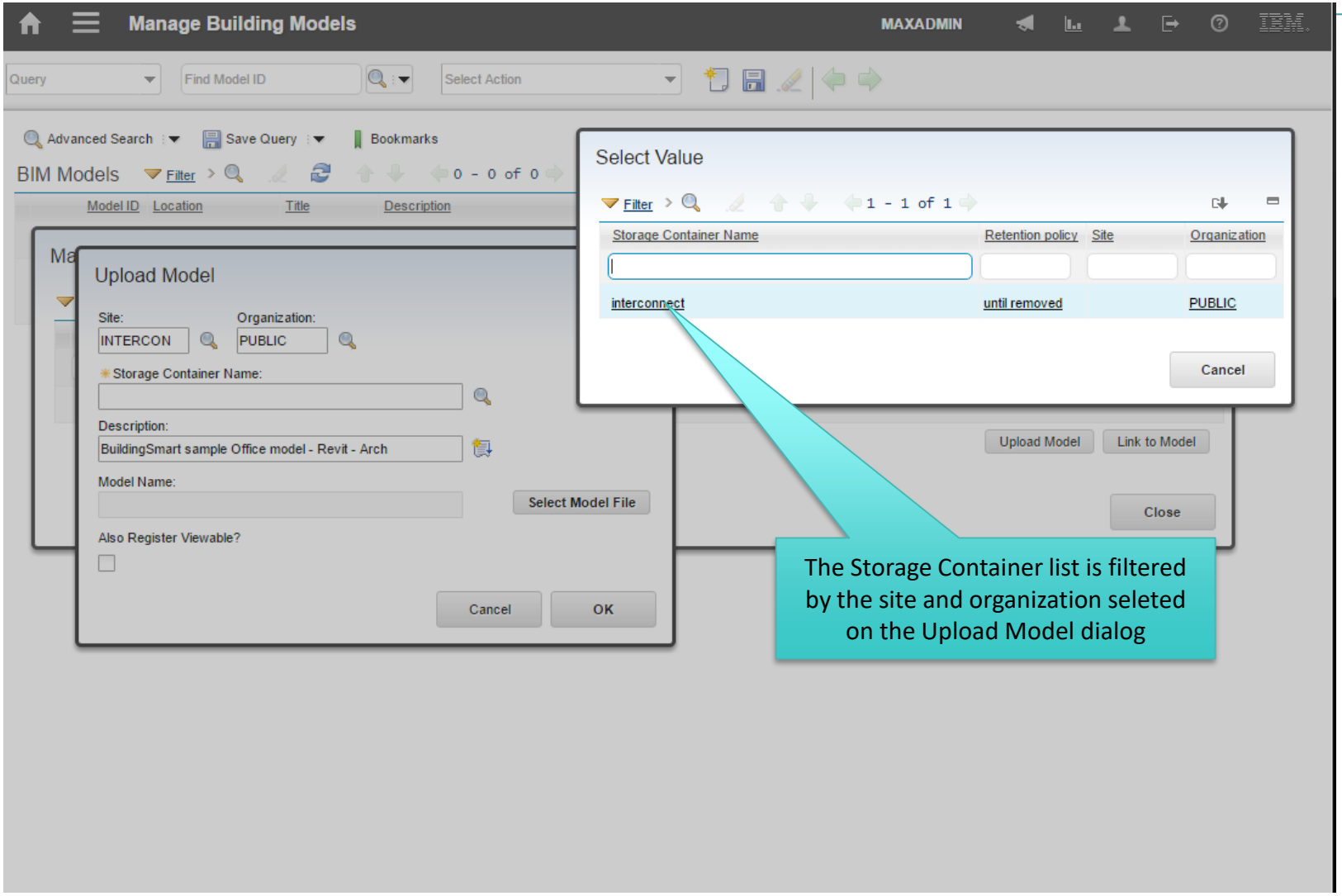
Maximo Model Validation



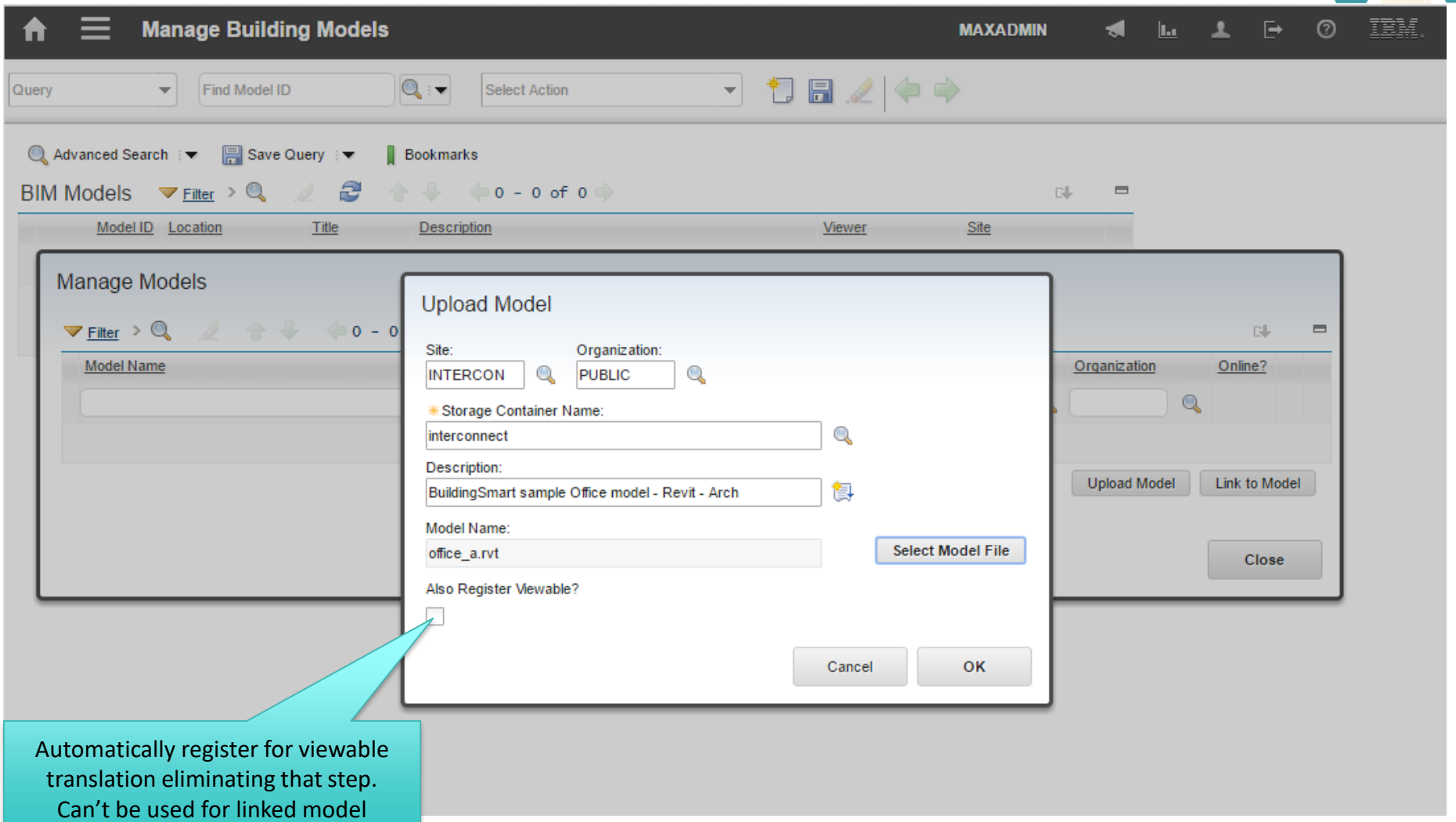
Creating storage containers



Model upload – Select storage container

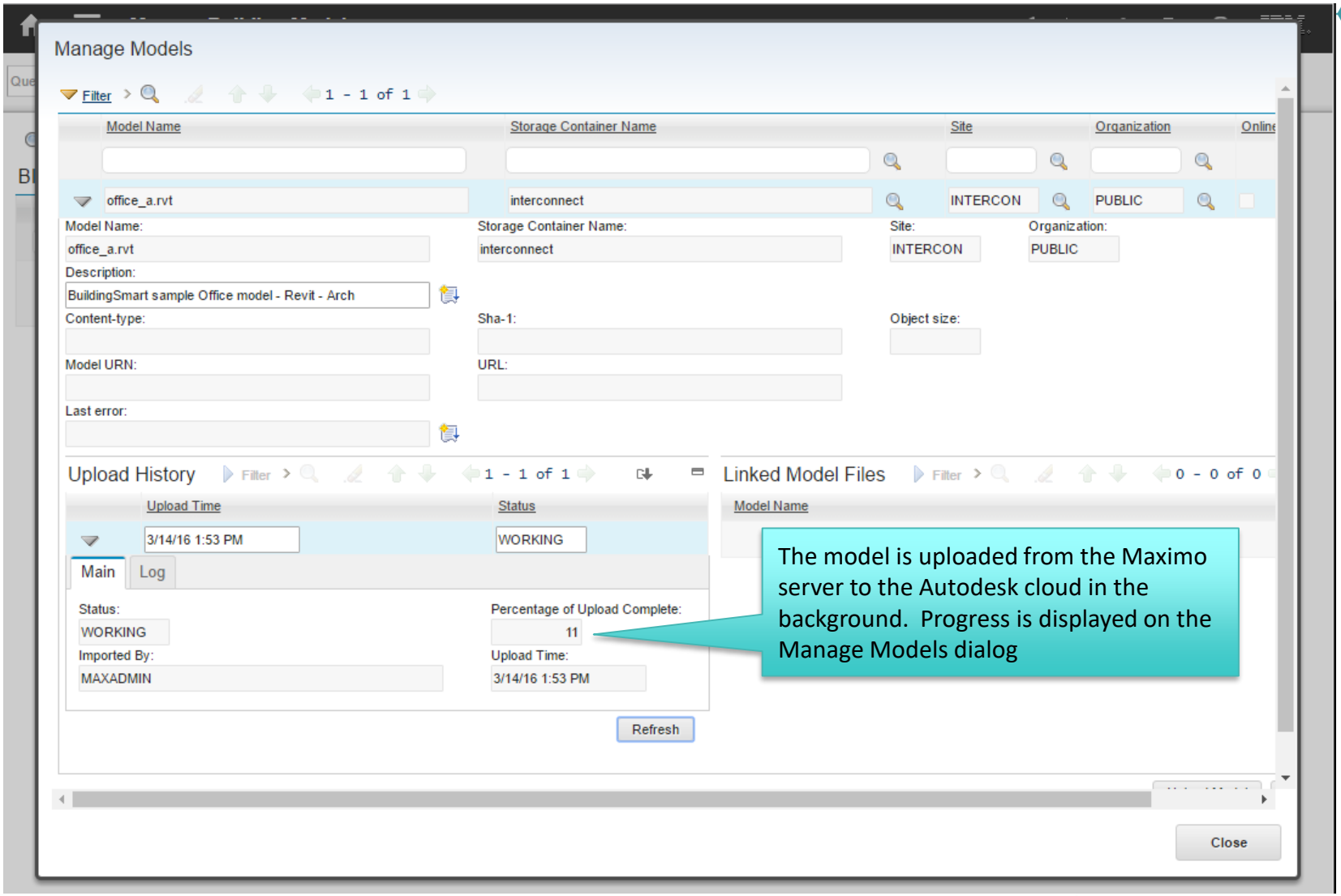


Model upload – Specifying the model file

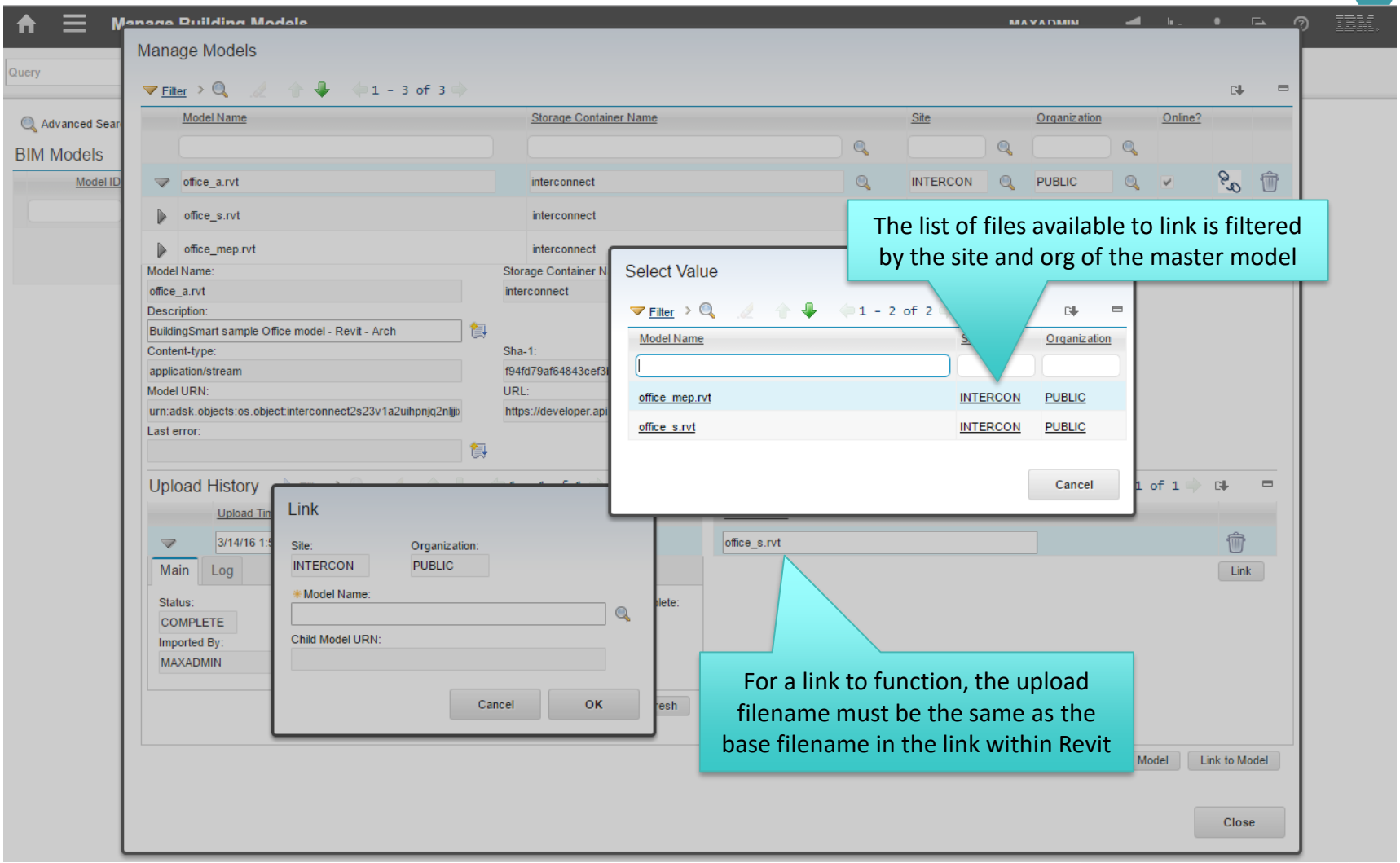


Automatically register for viewable translation eliminating that step. Can't be used for linked model

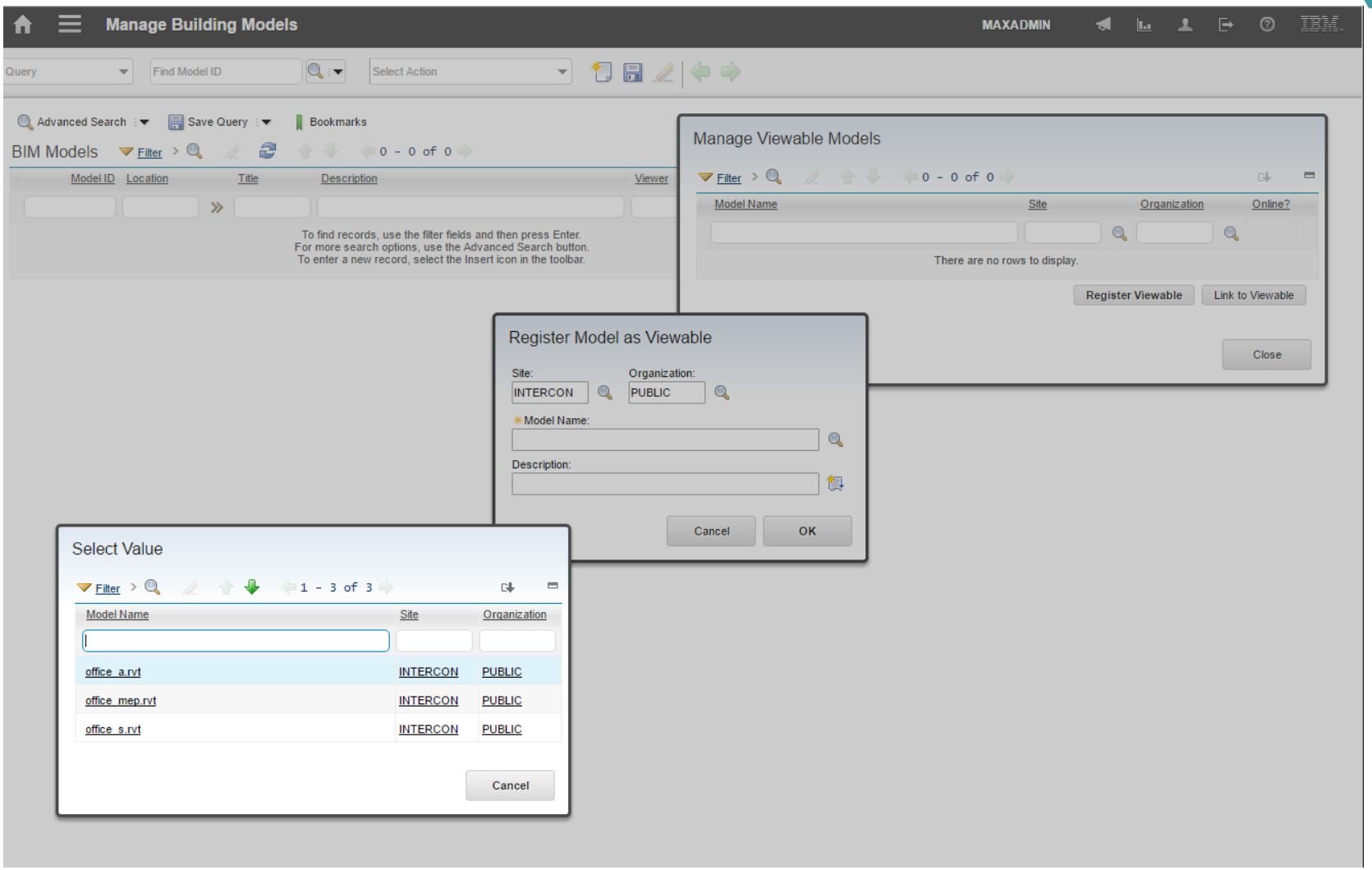
Model upload – Background processing



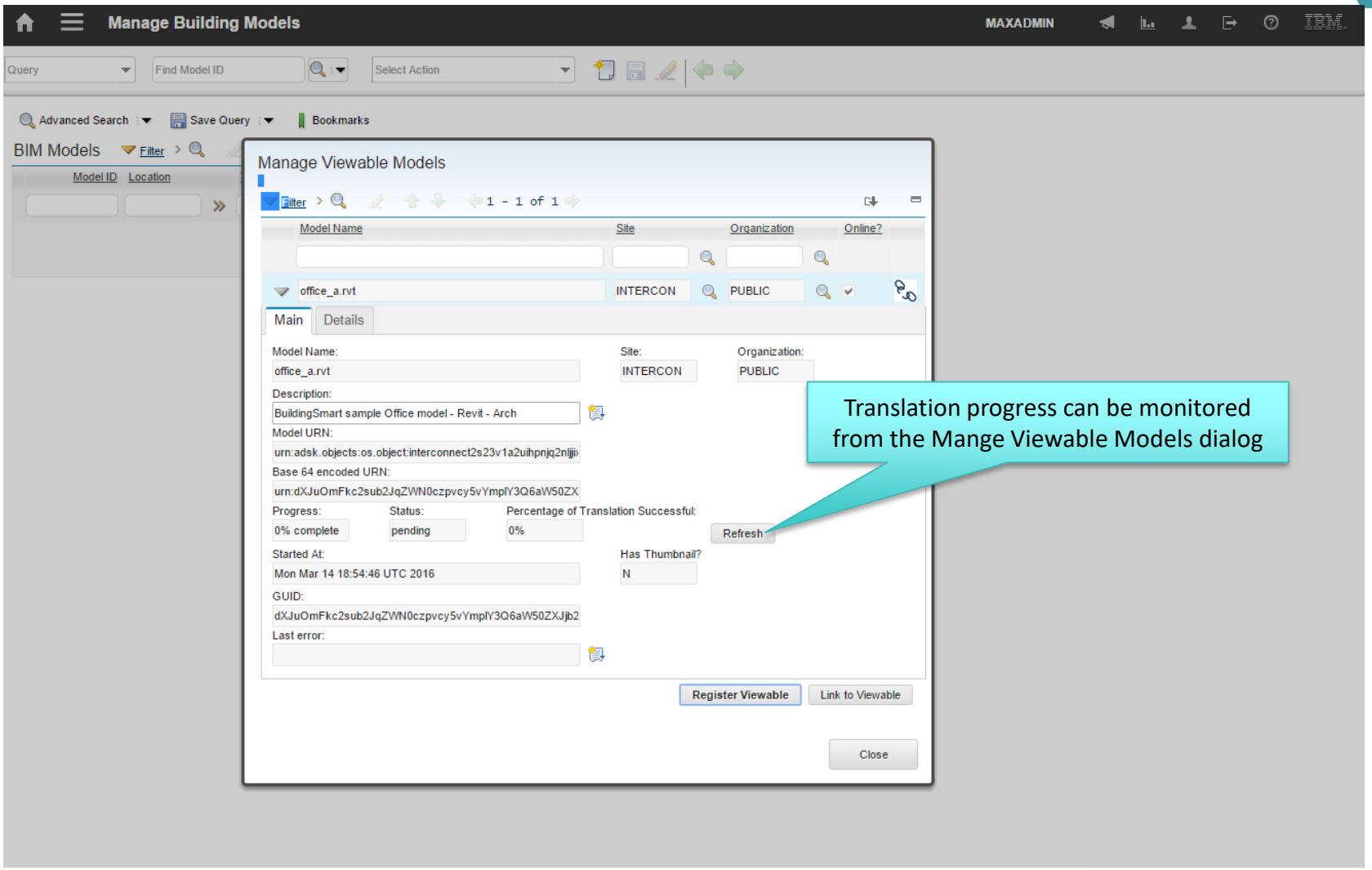
Model upload – Defining links



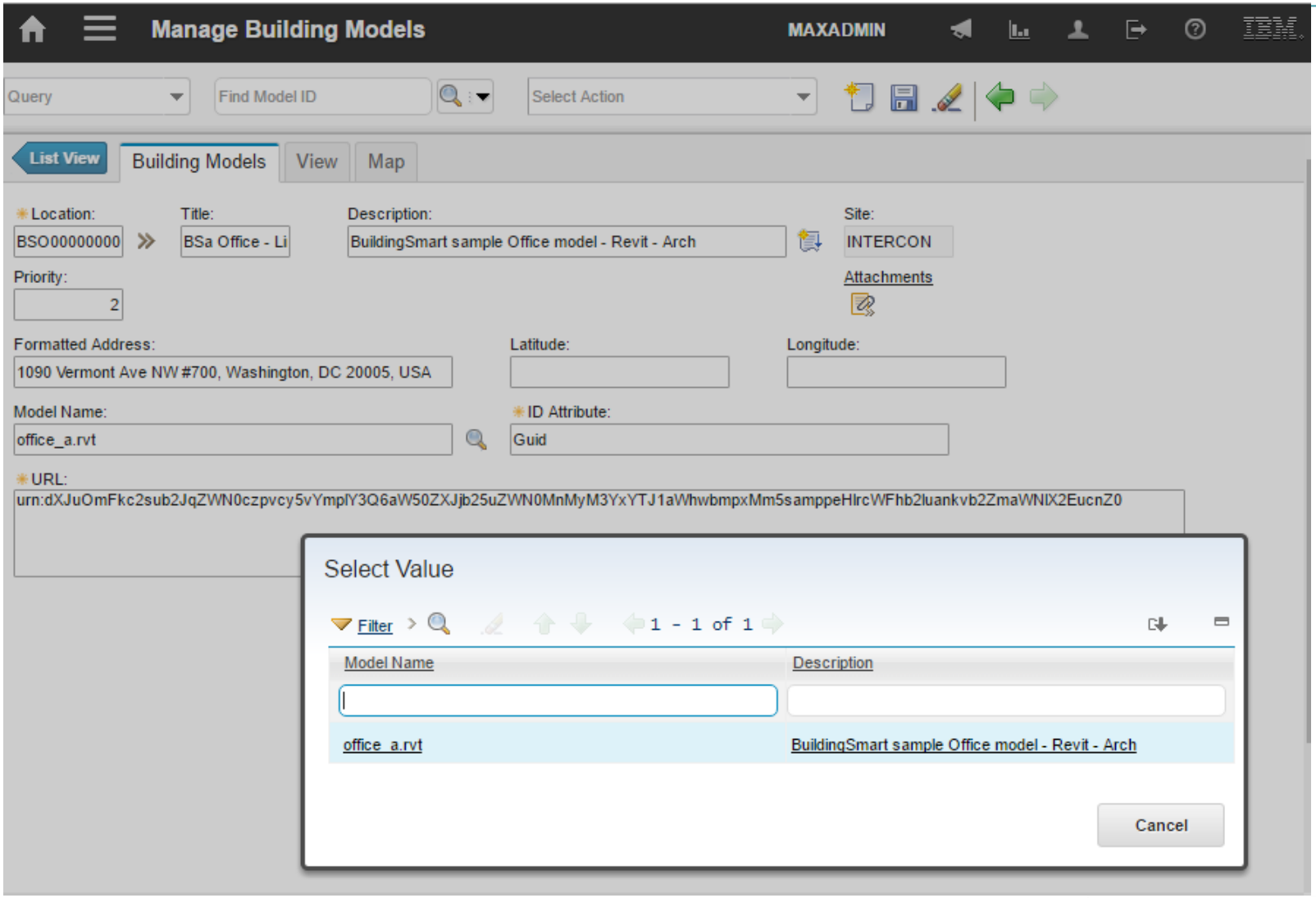
Model Registration

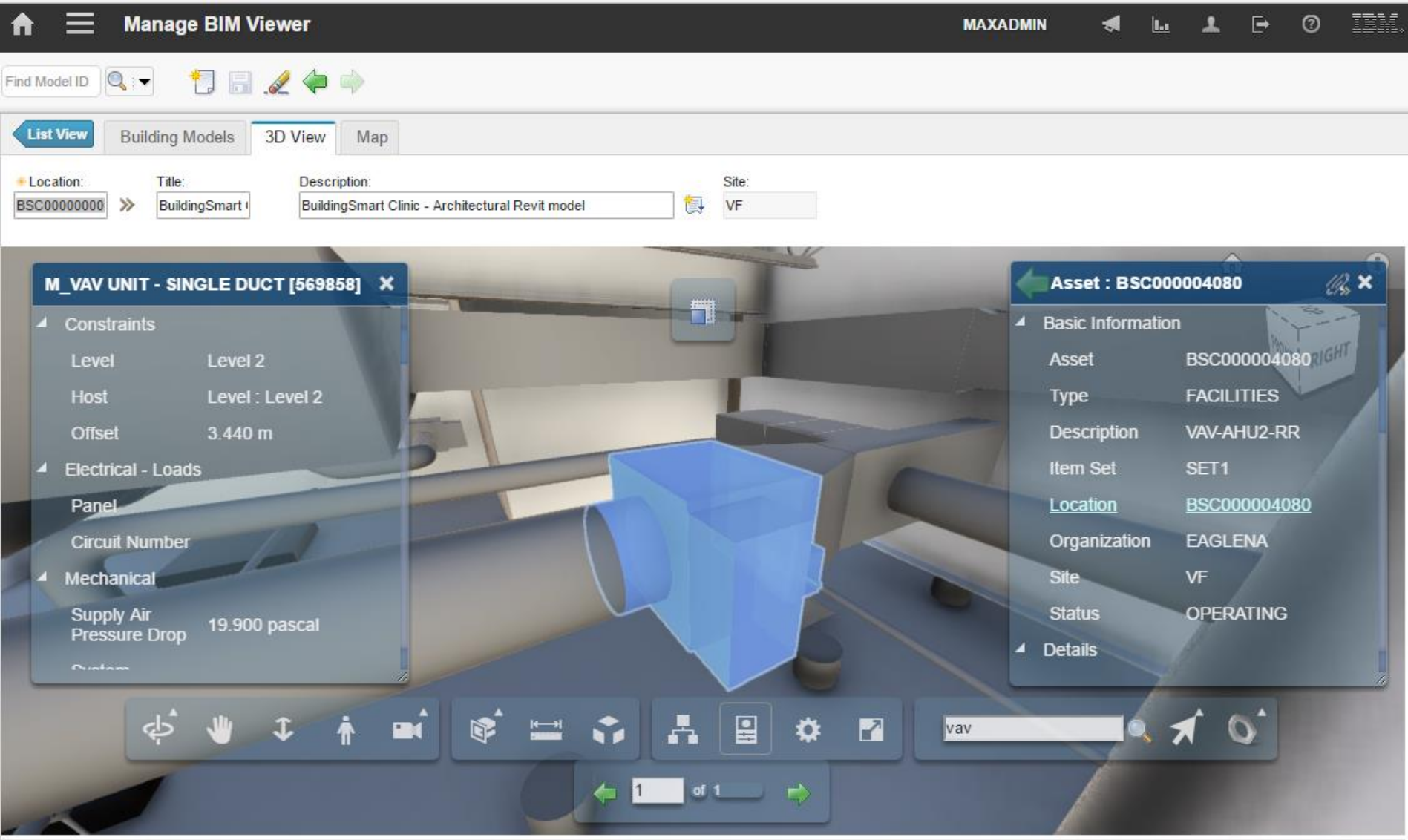


Model Registration – Monitoring Progress



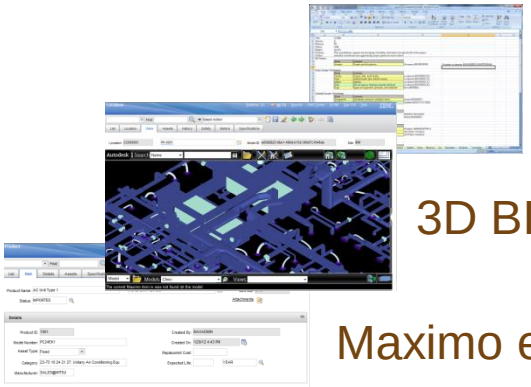
Associate Model with a location




Manage BIM Viewer
MAXADMIN
Find Model ID
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]
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
Basic Information
Asset
BSC000004080
Type
FACILITIES
Description
VAV-AHU2-RR
Item Set
SET1
Location
BSC000004080
Organization
EAGLENA
Site
VF
Status
OPERATING
Details
vav
1
of 1

Building Information Model Extensions for Maximo

What's Included?



COBie data import

3D BIM Viewer

Maximo extensions for BIM data

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)

Available on the ISM Library ISM Library
http://www.ibm.com/software/ismlibrary?NavCode=1TW10MA44.

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

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