AUTODESK UNIVERSITY

AR21599

Strategizing Megaproject

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Learning Objectives

- Learn to analyze repetition in a megaproject
- Learn to strategize linking in a megaproject
- Learn to evaluate different strategies: group, link and family
- Learn to maintain and manage numerous models and contents in a megaproject

Description

Modeling strategy is the key to the success of a project especially in a megaproject. We take an imaginary project with 9 plots as a study subject. Each plot has a podium and more than 3 towers on top of it. As a multi-families residential project, the design is based on typical unit types and prototype floors repeatedly placed on levels of the towers. With more than 40 structures, more than 30 unit types and more than 20 prototype floor plans are scattered in more than 30 towers across the entire site. How can we manage a project with so many models linked together? How can we maintain numerous unit types and prototype floors as design keeps changing during the design process and development? Group, link, family strategies will be explored and an innovative method will be developed to face the challenge.

About the Speakers

Kelvin Tam

Kelvin Tam is a well-experienced US Registered Architect with 17 years of project experience across the USA, Middle East and Asia. He has been a BIM / Revit user and leader since 2005. Over the years he has been a BIM leader in corporate architecture firms in the USA, Hong Kong, Qatar, Abu Dhabi and Singapore; leading the effort of migrating from 2D CAD to 3D BIM

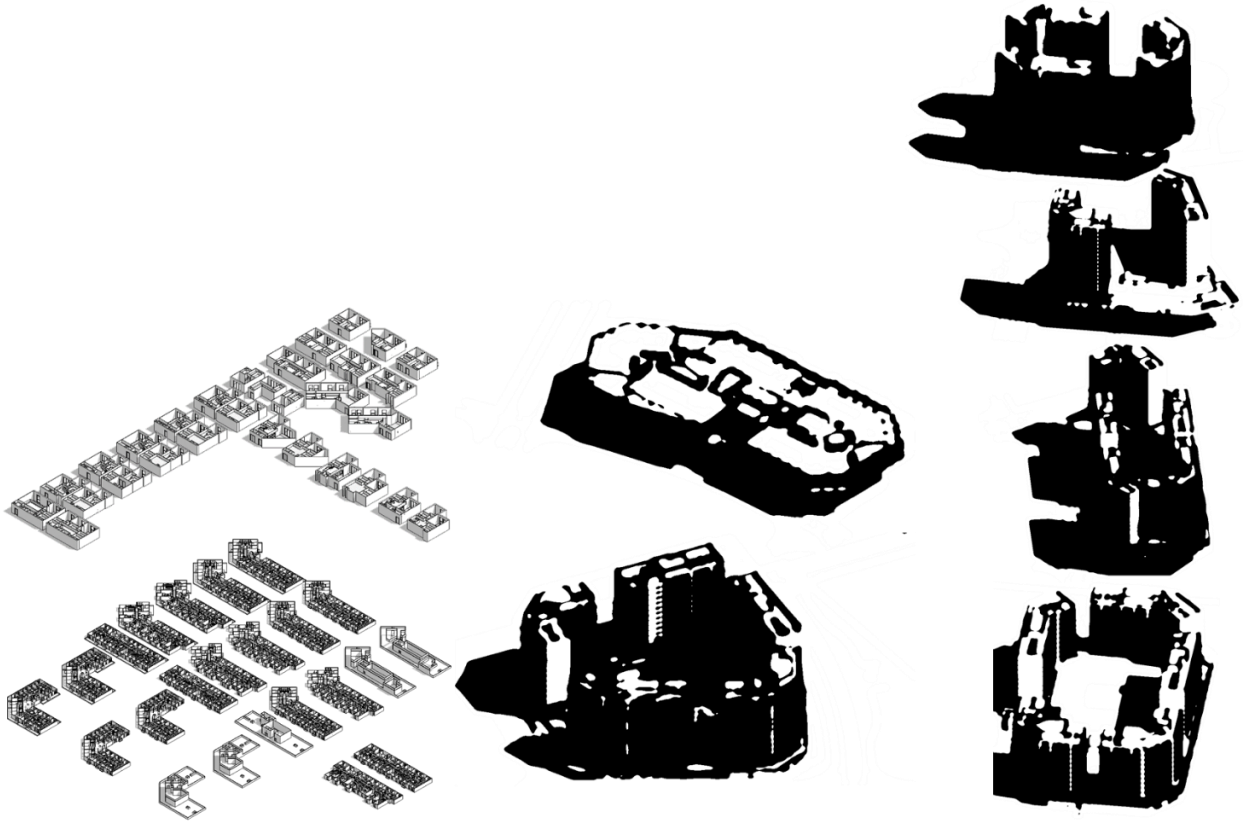
practice by implementing BIM process in projects, making firm wide BIM strategies and standards, coaching and mentoring internal users.
Kelvin relocated to Singapore in 2016 and joined DP Architects. Before joining DPA, Kelvin was the former Research and Development manager at the Hong Kong Construction Industry Council, in charge of BIM promotion and implementation for AEC industry in Hong Kong. His responsibilities include strategic planning on BIM roadmap; BIM industry Standards and Guidelines; conducting seminars, workshops and forums for industry stakeholders; and research and development on digital technology applications in building design and construction.
Since 2010, Kelvin has been actively speaking in major BIM conferences such as Autodesk University Las Vegas, Autodesk University Extension Dubai, Revit Technology Conference (Australasia, North America, Europe, Asia) and Hong Kong Institute of Building Information Modeling Conference.
Kelvin is the founder of the Hong Kong Revit User Group and a juror of the judging advisory panel of the Autodesk Hong Kong BIM Awards 2016.
Email: KelvinTam@dpa.com.sg Blog: https://revitswat.wordpress.com/

Allen Jay Holland

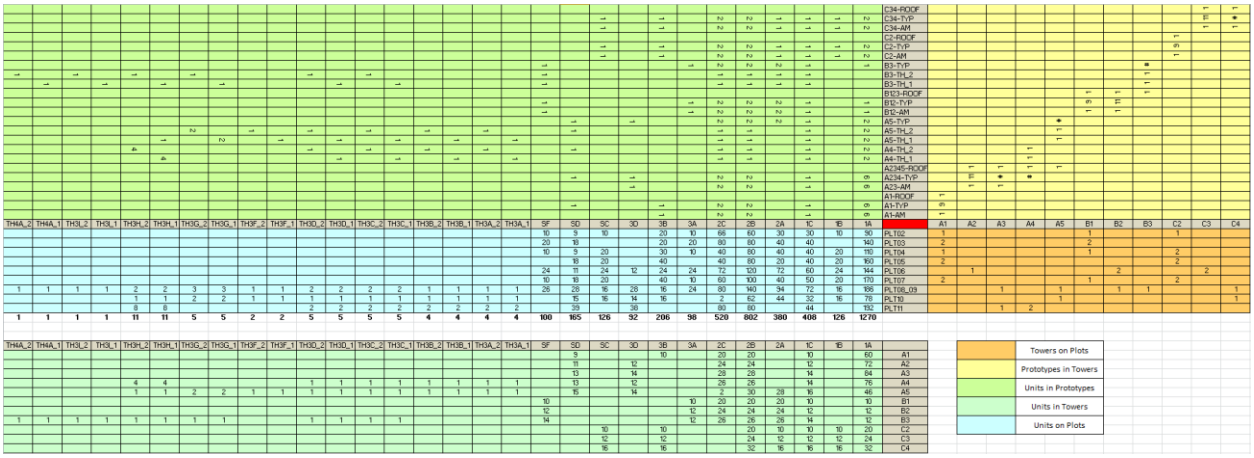
Allen Jay Holland is a Revit Architecture implementation specialist and lifelong aficionado of architectural technology. He is a former California USA licensed architect with significant experience with a variety of building types and projects, and has mentored the transition to BIM (Building Information Modeling) for several firms.
Venturing to the Middle East in 2013, Allen served as BIM Manager for the Al Wakrah FIFA 2022 World Cup Futbol Stadium and Precinct Development Project. In 2015 he was appointed as Regional BIM Manager for the Architectural and Engineering Services division of KEO International Consultants.
Allen has been involved in BIM since before the term was conceived. With more than twenty-five years in 3D architectural modeling and BIM, he has been involved in Sports, Transportation, Hospitality, Retail, Commercial and Housing projects.
Allen served for six years as the organizer of the South Coast Revit Users Group, the preeminent BIM users group in Southern California. He is the founder and Chairman of the Doha BIM Users Group (DBUG), and the organizer of Q-BIM, a professional organization formed to promote Building Information Modeling guidelines for the State of Qatar.

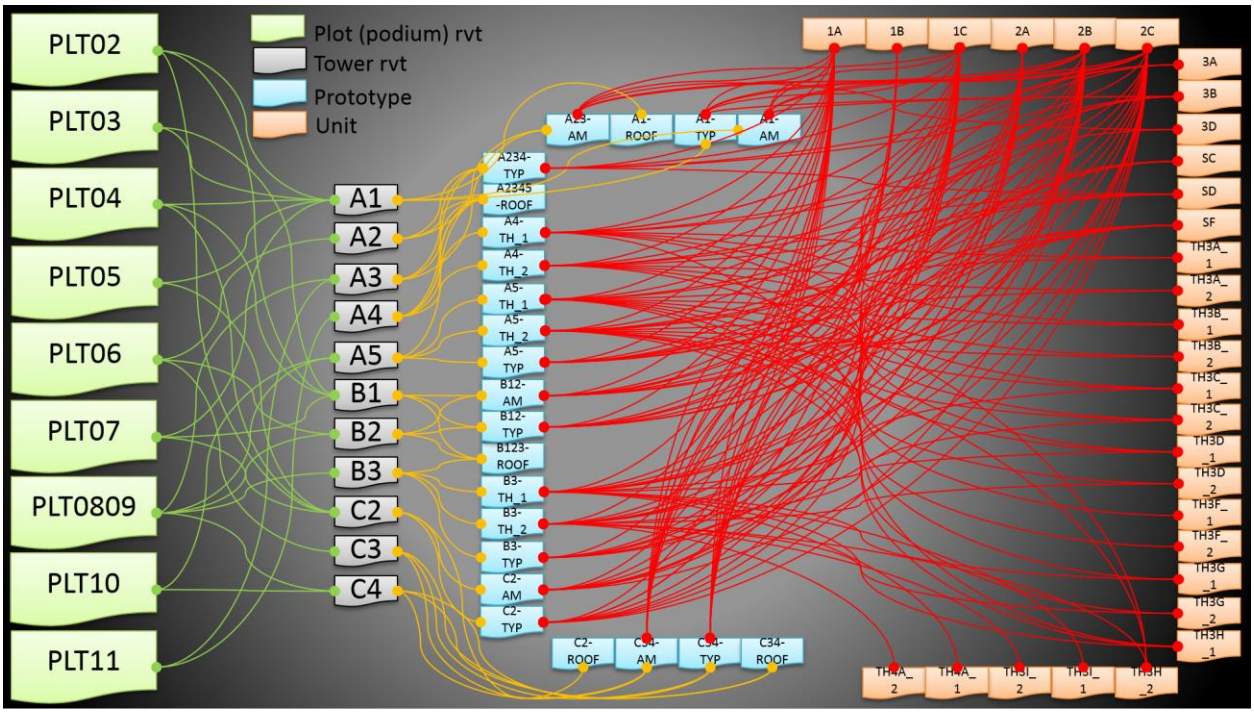
CHALLENGE

- 30 Unit types
- 23 Prototypes
- 11 Tower types
- 20 Towers on 5 Plots



Units – Prototypes – Towers – Plots

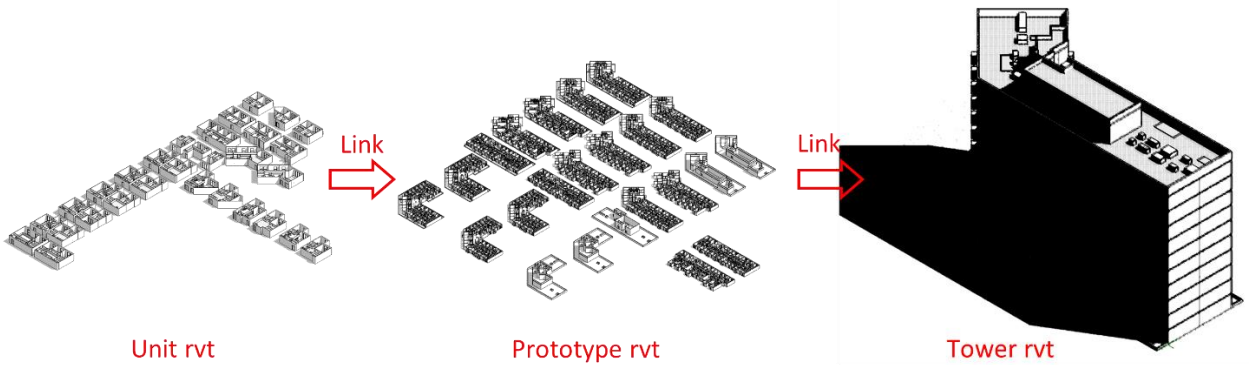


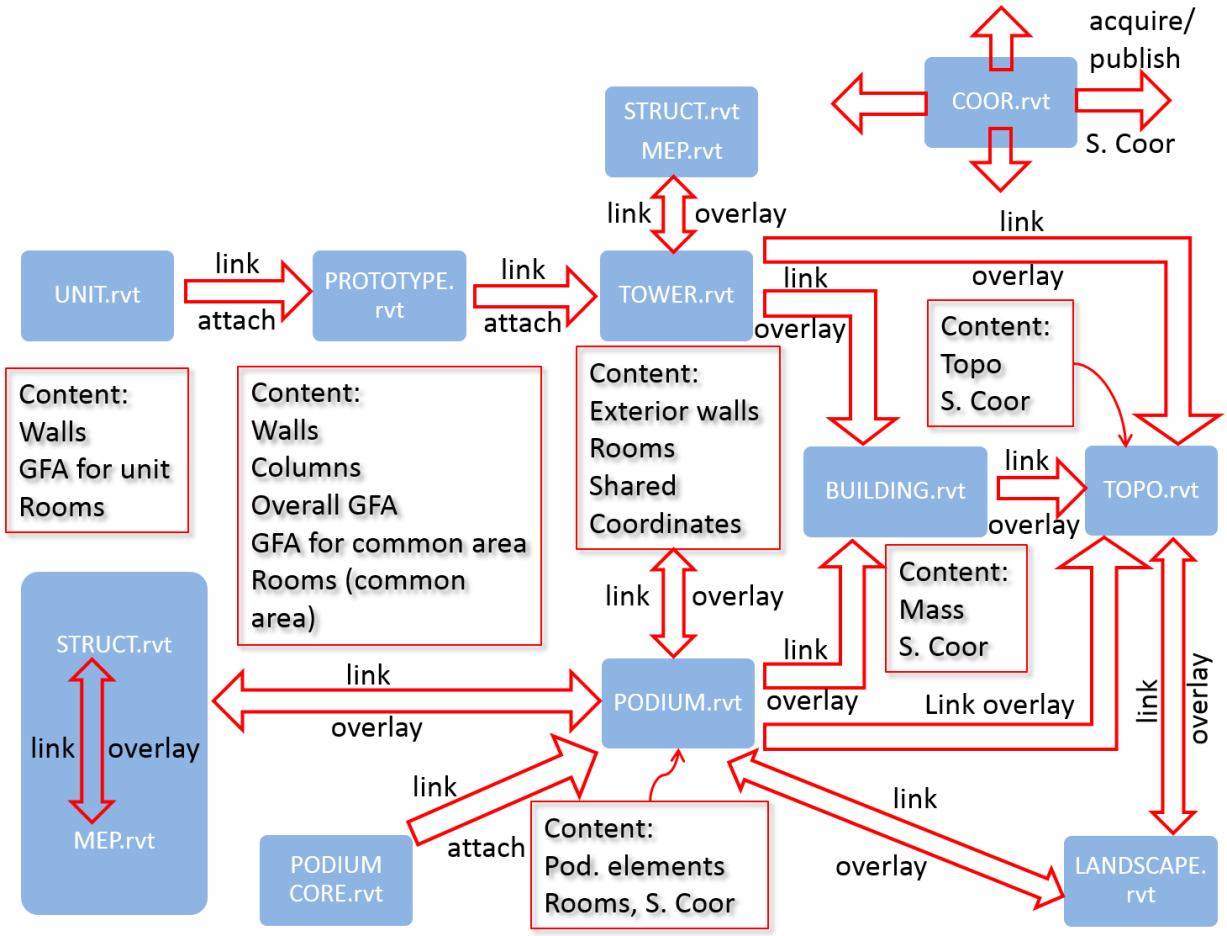


OPTIONS

- Linking Strategy
- Single File Grouping Strategy
- Link + Group Strategy
- Multiple Files Grouping Strategy
- Family Strategy

I. Linking


Link
Link
Unit rvt
Prototype rvt
Tower rvt


acquire/
publish
COOR.rvt
S. Coor
STRUCT.rvt
MEP.rvt
link
overlay
link
UNIT.rvt
link
attach
PROTOTYPE.
rvt
link
attach
TOWER.rvt
link
overlay
link
overlay
Content:
Topo
S. Coor
Content:
Walls
GFA for unit
Rooms
Content:
Walls
Columns
Overall GFA
GFA for common area
Rooms (common
area)
Content:
Exterior walls
Rooms
Shared
Coordinates
BUILDING.rvt
link
overlay
TOPO.rvt
link
overlay
Content:
Mass
S. Coor
STRUCT.rvt
link
overlay
MEP.rvt
link
overlay
PODIUM.rvt
link
overlay
Link overlay
link
overlay
link
attach
PODIUM
CORE.rvt
Content:
Pod. elements
Rooms, S. Coor
link
overlay
LANDSCAPE.
rvt

Towers

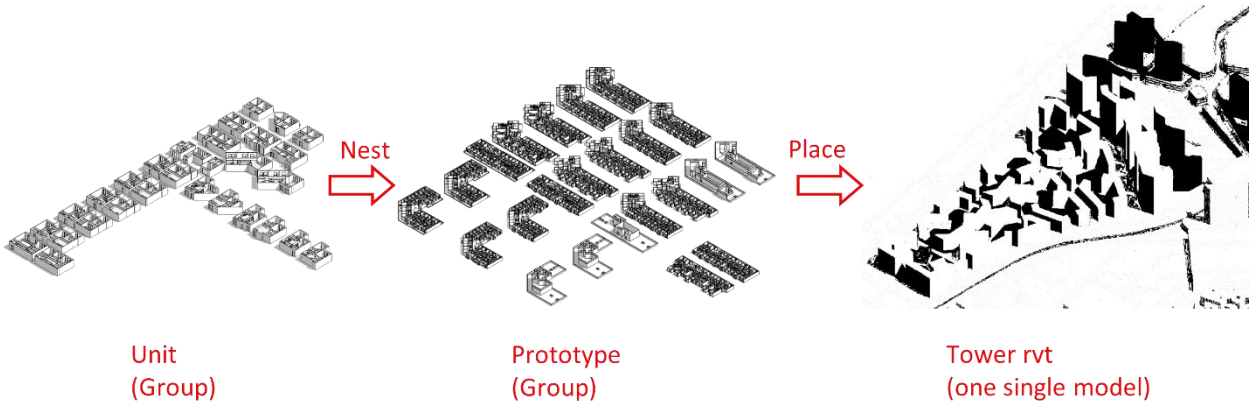
- A1: 3 links, 6 nested links, 140 link instances
- A2: 3 links, 6 nested links, 168 link instances
- A3: 3 links, 6 nested links, 196 link instances
- A4: 4 links, 16 nested links, 198 link instances
- A5: 4 links, 21 nested links, 212 link instances
- B1: 3 links, 7 nested links, 111 link instances
- B2: 3 links, 7 nested links, 133 link instances
- B3: 4 links, 19 nested links, 157 link instances
- C2: 3 links, 8 nested links, 121 link instances
- C3: 3 links, 8 nested links, 145 link instances
- C4: 3 links, 8 nested links, 193 link instances

Plots (completed building)

- Plot 6: 4 links, 21 nested links, 730 link instances
- Plot 7: 4 links, 22 nested links, 639 link instances
- Plot 8 & 9: 6 links, 46 nested links, 897 link instances
- Plot 10: 3 links, 30 nested links, 408 link instances
- Plot 11: 4 links, 29 nested links, 591 link instances

Pros	Cons	Possible Solution
Edit Units and Prototypes in relatively small size project files.	Takes long time when opening Tower files, even longer in Building files.	Worksets to control load / unload of links. Upgrade computers, network?
System families in Unit and Prototypes files are easy to edit.	Tremendous amount of time for linking Tower to Structure or MEP.	Open/close worksets not work for attached link in 2nd level link when linking arch models to MEP models. Upgrade computers, network?
Linking allows instant update of Units and Prototypes.	Computer clashes when working in Building files.	Upgrade computers, network?
	Elements cannot be scheduled by floor levels in Tower.	
	Copy / Monitor when linked to models of other disciplines not allowed.	

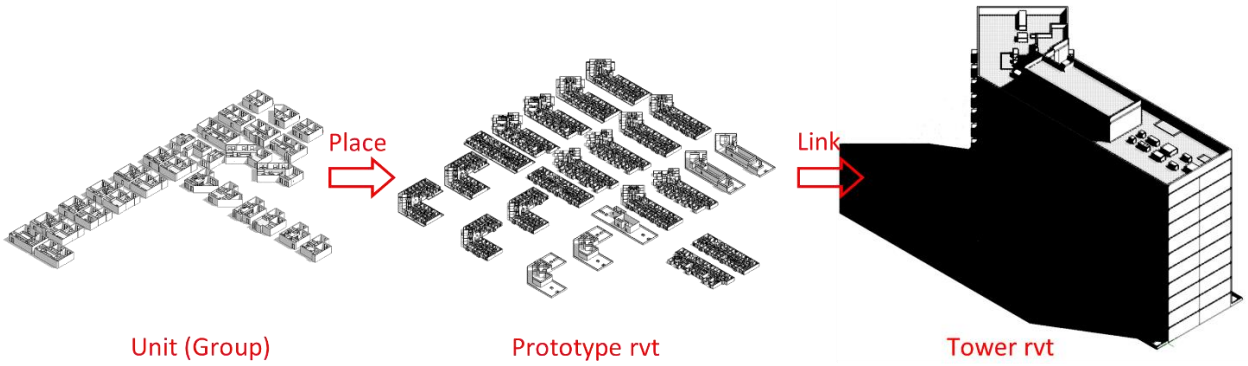
II. Single File Grouping



- Groups cannot be shared across projects, use a single file
- 30 Unit Groups (2962 group instances)
- 23 Prototypes Groups (278 group instances)
- 11 Tower Groups (20 group instances)
- Groups inside Group

Pros	Cons	Possible Solution
System families in groups are easy to edit.	Extremely huge file size (4G?)	Worksets to control load / unload elements. Upgrade computers, network?
No need to reload or link Units / Prototypes to different Towers.	Groups, groups inside group, mirroring groups will give errors.	Some elements may need to be excluded from group.
All components (families) are consistent in all Tower since it is a single file.	Updating large amount of group instances will take long time.	Upgrade computers, network?
Elements live in project allow scheduling by level.		
Allow Copy / Monitor when linked to models of other disciplines.		

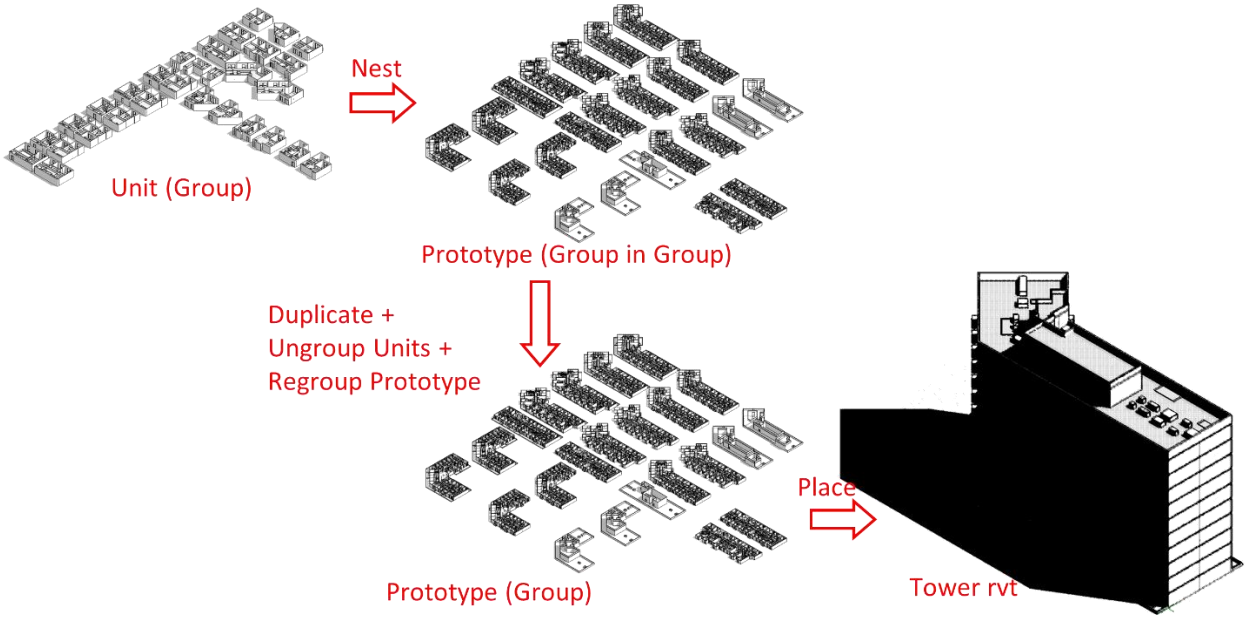
III. Linking + Grouping



- Groups cannot be shared across projects, use a master file for Unit Groups, save groups out in Unit Group folder from which groups are reloaded to Prototype file
- 30 Unit Groups inside Prototype file (rvt)

Pros	Cons	Possible Solution
System families in groups are easy to edit.	Groups are defined in each project file but they need to be consistent in all files.	Create master file to maintain groups. Update groups in Prototype by reloading group from Unit Group folder
Number of link instances reduced as the large number of units are groups	Don't know if the groups in Prototypes are the most updated version from master file.	Manual checking.
	Mirroring groups will give errors.	Some elements may need to be excluded from group.
	Elements cannot be scheduled by floor levels in Tower.	
	Copy / Monitor when linked to models of other disciplines not allowed.	

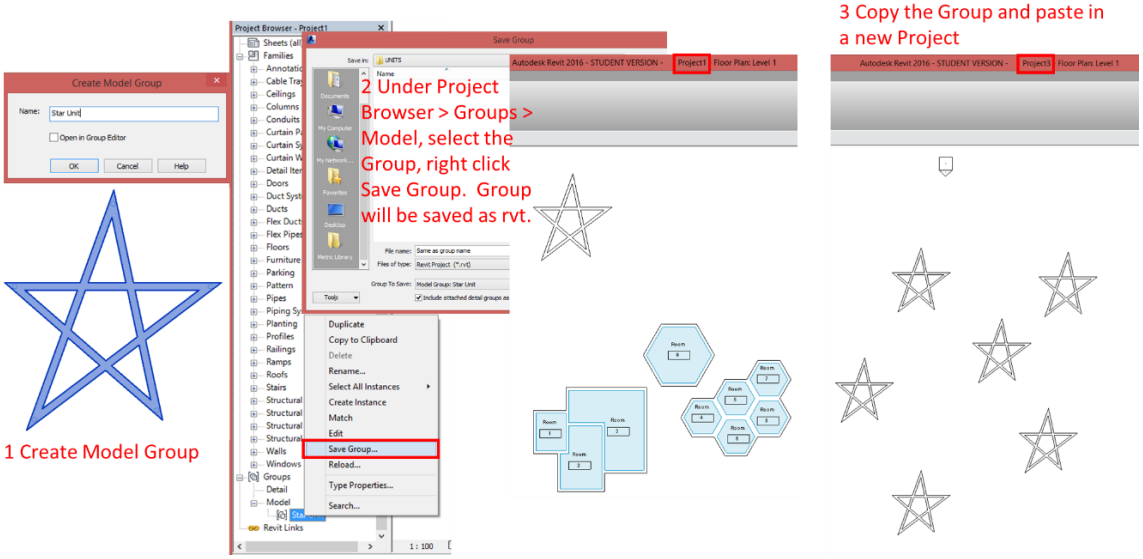
IV. Multiple Files Grouping

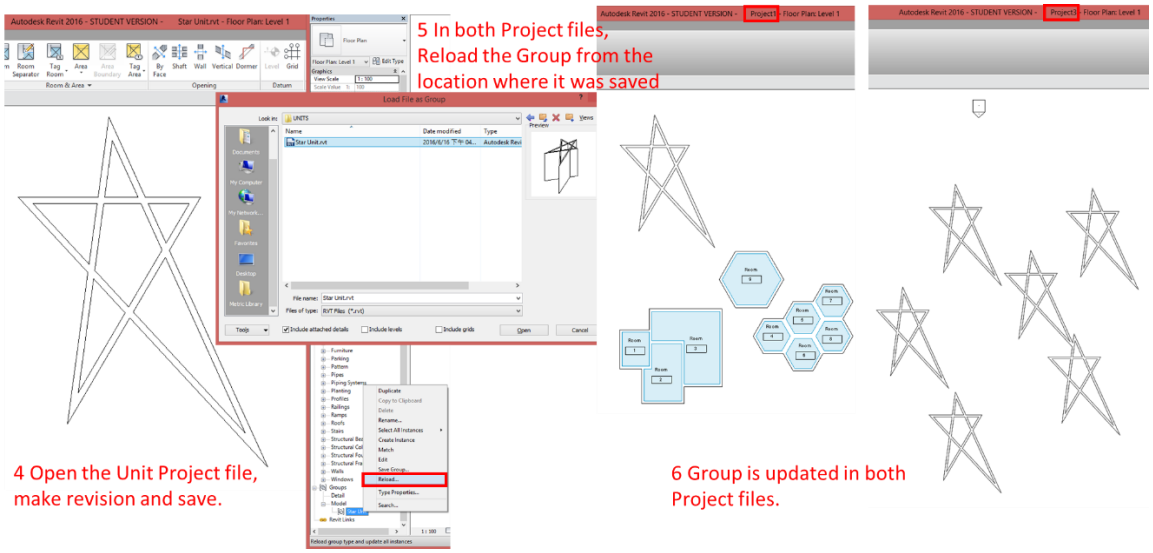


- Groups cannot be shared across projects, use a master file for Unit / Prototype Groups, save groups out in Group folder from which groups are reloaded to Tower files
- 30 Unit Groups
- 23 Prototypes Groups
- No Group inside Group, No Link

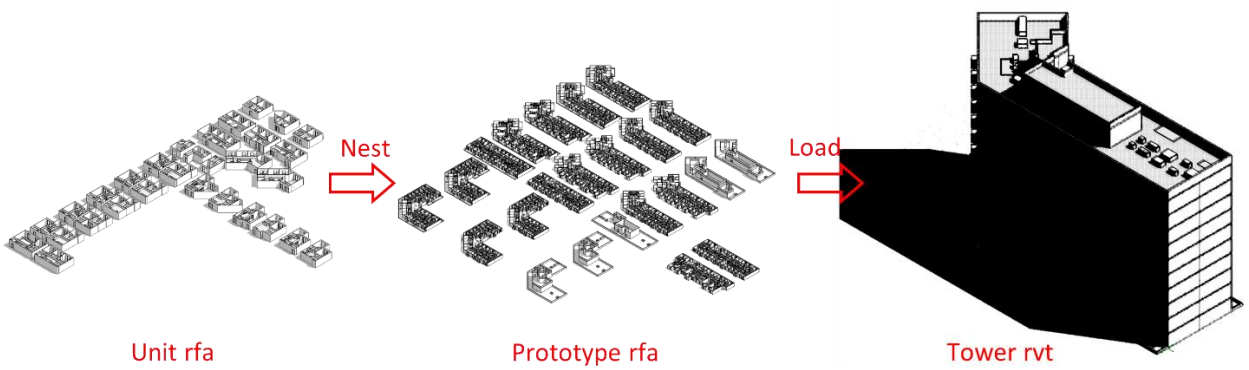
Pros	Cons	Possible Solution
System families in groups are easy to edit.	Groups are defined in each project file but they need to be consistent in all files.	Create master file to maintain groups. Update groups in by reloading group from Unit folder
No link.	Don't know if the groups in Prototypes are the most updated version from master file.	Manual checking.
Elements live in project allow scheduling by level.	Mirroring groups will give errors.	Some elements may need to be excluded from group.
Allow Copy / Monitor when linked to models of other disciplines.		

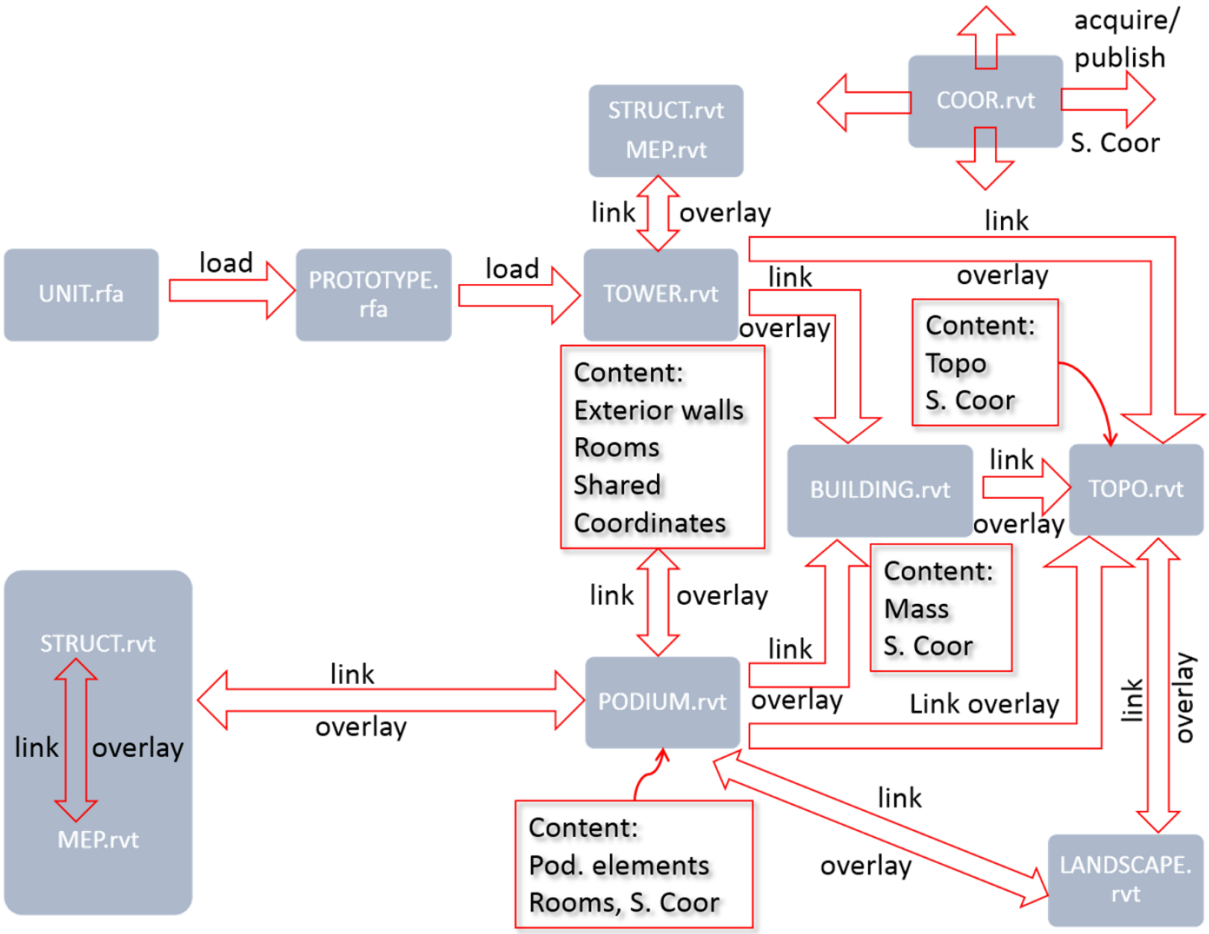
Maintaining the Groups in Multiple Projects



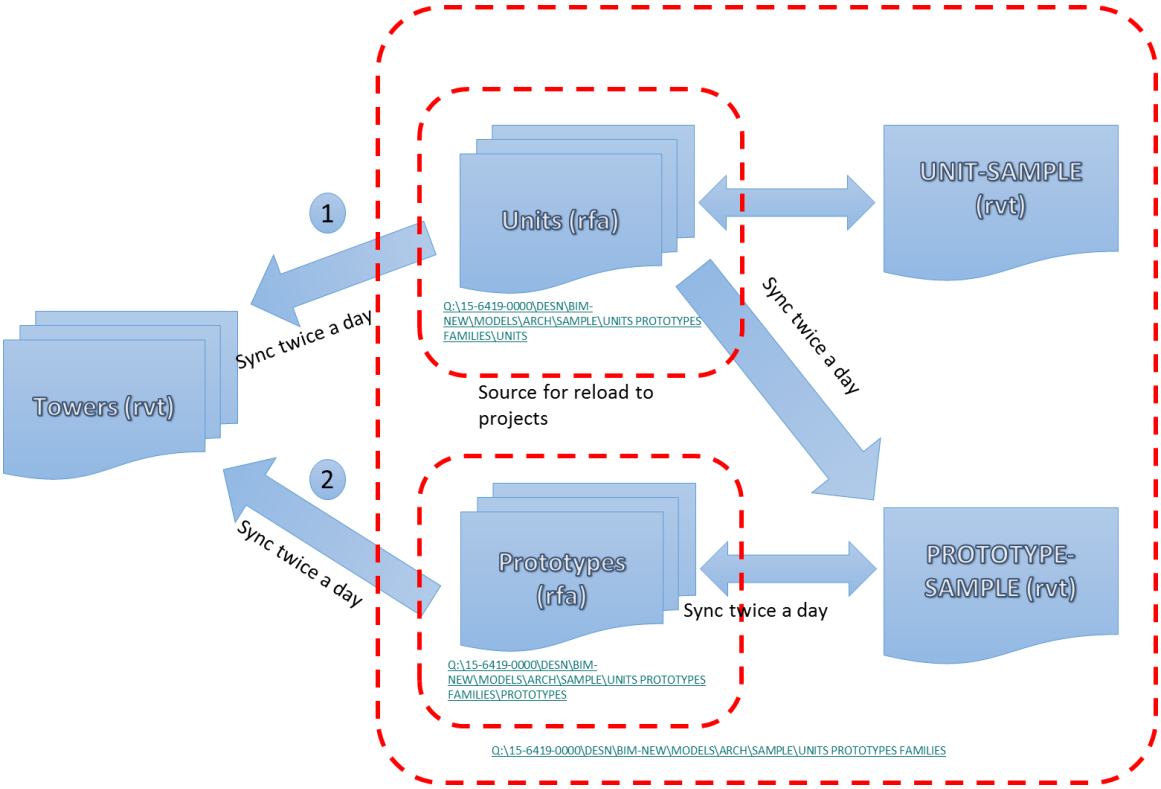


V. FAMILYING


Nest
Load
Unit rfa
Prototype rfa
Tower rvt

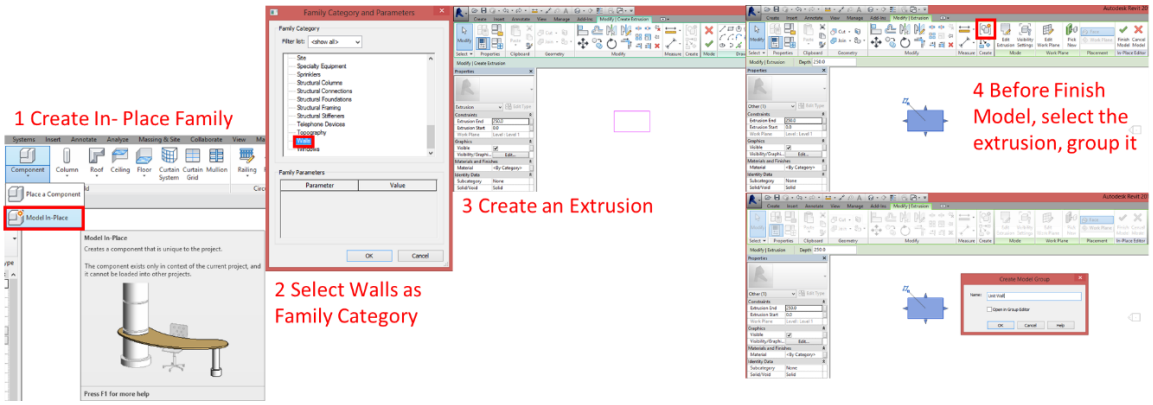

acquire/
publish
COOR.rvt
S. Coor
STRUCT.rvt
MEP.rvt
link
overlay
link
UNIT.rfa
load
PROTOTYPE.
rfa
load
TOWER.rvt
link
overlay
overlay
Content:
Topo
S. Coor
Content:
Exterior walls
Rooms
Shared
Coordinates
BUILDING.rvt
link
TOPO.rvt
overlay
link
overlay
Content:
Mass
S. Coor
STRUCT.rvt
link
overlay
MEP.rvt
link
overlay
PODIUM.rvt
link
overlay
Link overlay
link
overlay
link
overlay
Content:
Pod. elements
Rooms, S. Coor
LANDSCAPE.
rvt

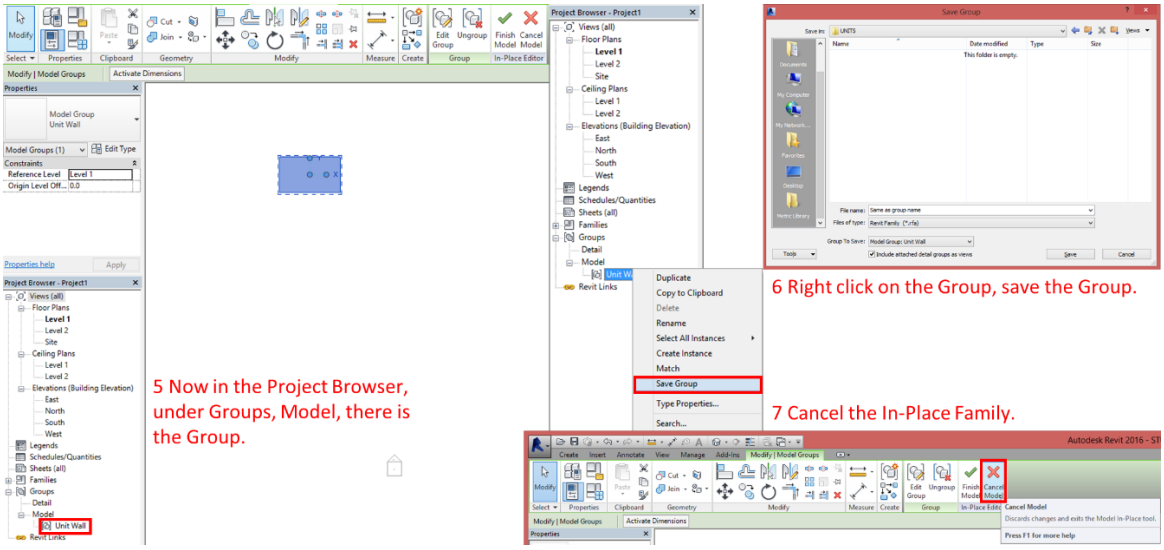
Creating and Revising Families Workflow



Unit Family

- The Unit family needs to be a loadable family for it to be shared by multiple Tower models.
- The Unit family needs to be room bounding.
- The only room bounding element in Revit is wall which is a system family.
- How to create a loadable family with category of system family (wall, ceiling, railing, roof…)?

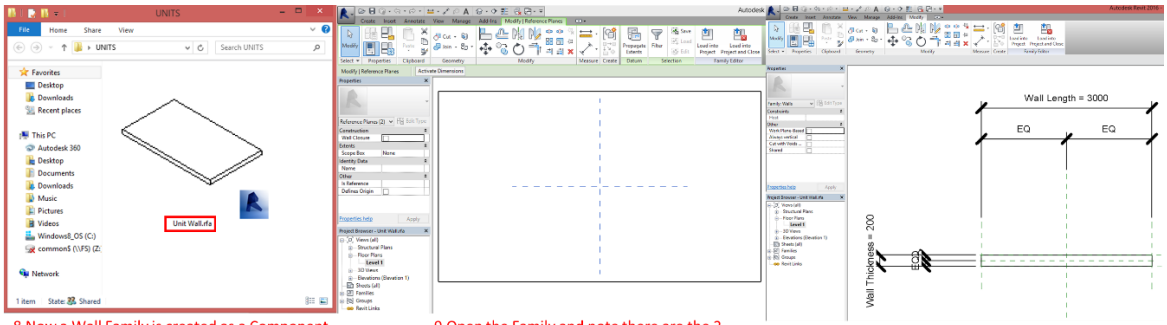




5 Now in the Project Browser, under Groups, Model, there is the Group.

6 Right click on the Group, save the Group.

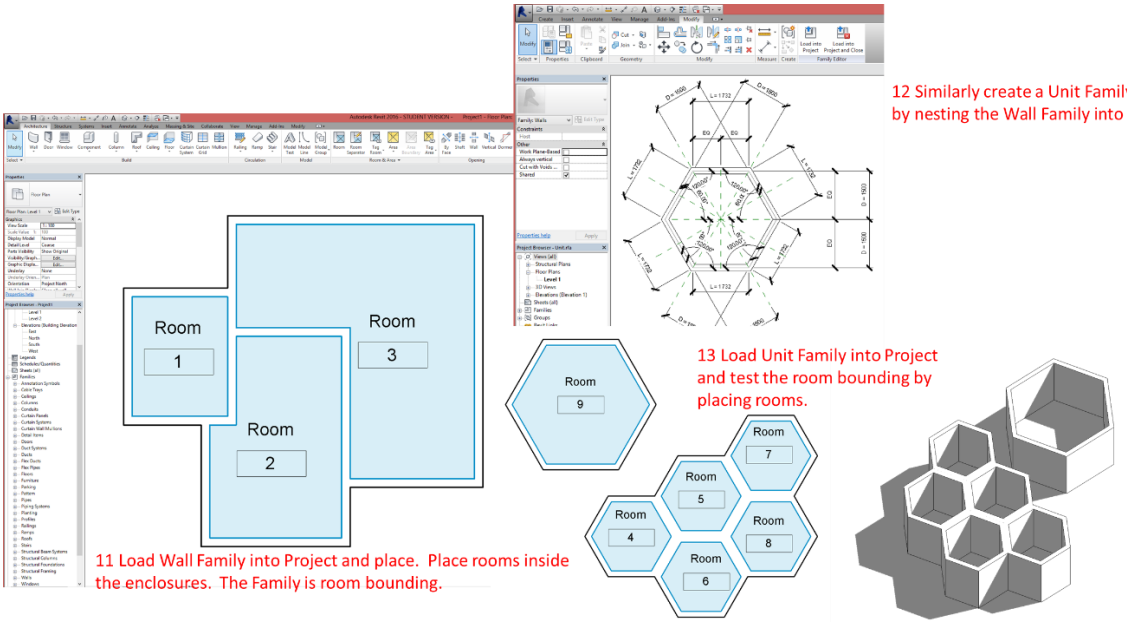
7 Cancel the In-Place Family.



8 Now a Wall Family is created as a Component Family saved in a folder.

9 Open the Family and note there are the 2 reference planes as in any Family Template.

10 Modify the Family to make it parametric.



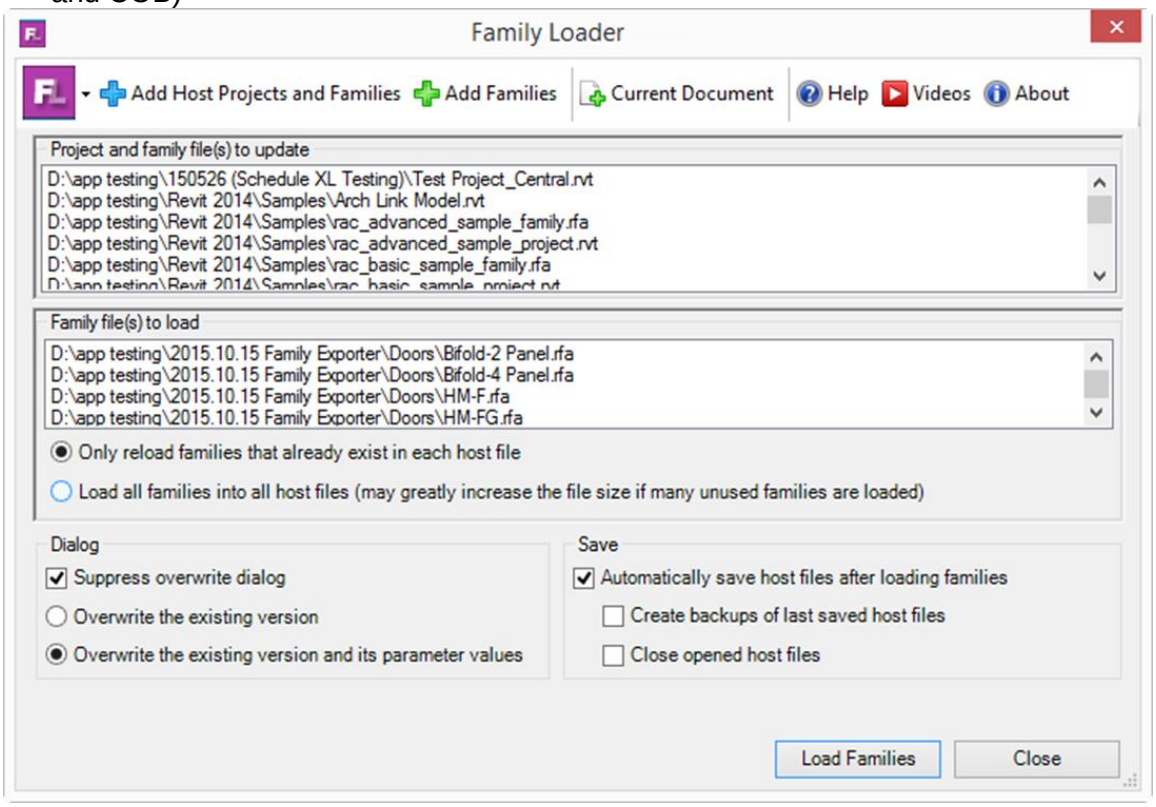
12 Similarly create a Unit Family by nesting the Wall Family into it.

13 Load Unit Family into Project and test the room bounding by placing rooms.

11 Load Wall Family into Project and place. Place rooms inside the enclosures. The Family is room bounding.

Reloading Unit and Prototype Families into Projects

- Use Family Loader (http://ctcexpresstools.com/product/bim-batch-suite-2017/) to update more than one units and prototypes in all project files (twice a day, lunch hour and COB)



- 30 Unit Families
- Unit Families nested to 23 Prototypes
- Prototypes loaded to 11 Tower projects

Pros	Cons	Possible Solution
Fast processing when opening Tower file or linking Tower to Structure or MEP.	Requires more skills and care in creating and maintaining families.	Users be more disciplined and more careful.
Edit Units and Prototypes in relatively small size family files.	Requires to load families to individual Tower file.	Use Batch Families Loader (Add-in).
Ensure all components (shared families) are consistent in all Tower file.	If families not created properly, it gives error and unable to load to project.	Audit / repair families and project files. Load families to Sample file to clean them up and then load families from Sample file to Tower files.
Elements live in project allow scheduling by level.		
Allow Copy / Monitor when linked to models of other disciplines.		

COMPARISION

	FAMILY STRATEGY	LINKING STRATEGY	SINGLE FILE GROUPING STRATEGY	LINK + GROUP STRATEGY	MULTIPLE FILES GROUPING STRATEGY
File Size	Medium	Small	Huge	Medium	Medium
Ease of Editing Units / Prototypes	Difficult	Easy	Easy but groups may give errors	Easy but groups may give errors	Easy but groups may give errors
Loading / Processing for Architecture Models	Easy	Difficult, extremely difficult in composite Building models	Difficult due to huge file size	Still a number of Prototype links, more difficult in composite Building models	Easy
Loading / Processing When Linking to Models of Other Disciplines	Easy	Extremely difficult	Difficult due to huge file size	Difficult	Easy
Update Units / Prototypes	Needs reload	Instant	Difficult, takes long time to update >2900 groups	Needs reload	Needs reload
Schedule Elements by Level	Yes	No	Yes	No	Yes
Copy / Monitor in Models of Other Disciplines	Yes	No	Yes	No	Yes