From BIM to Manufacturing and Back: Bridging the Gap Through Automation

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Class summary

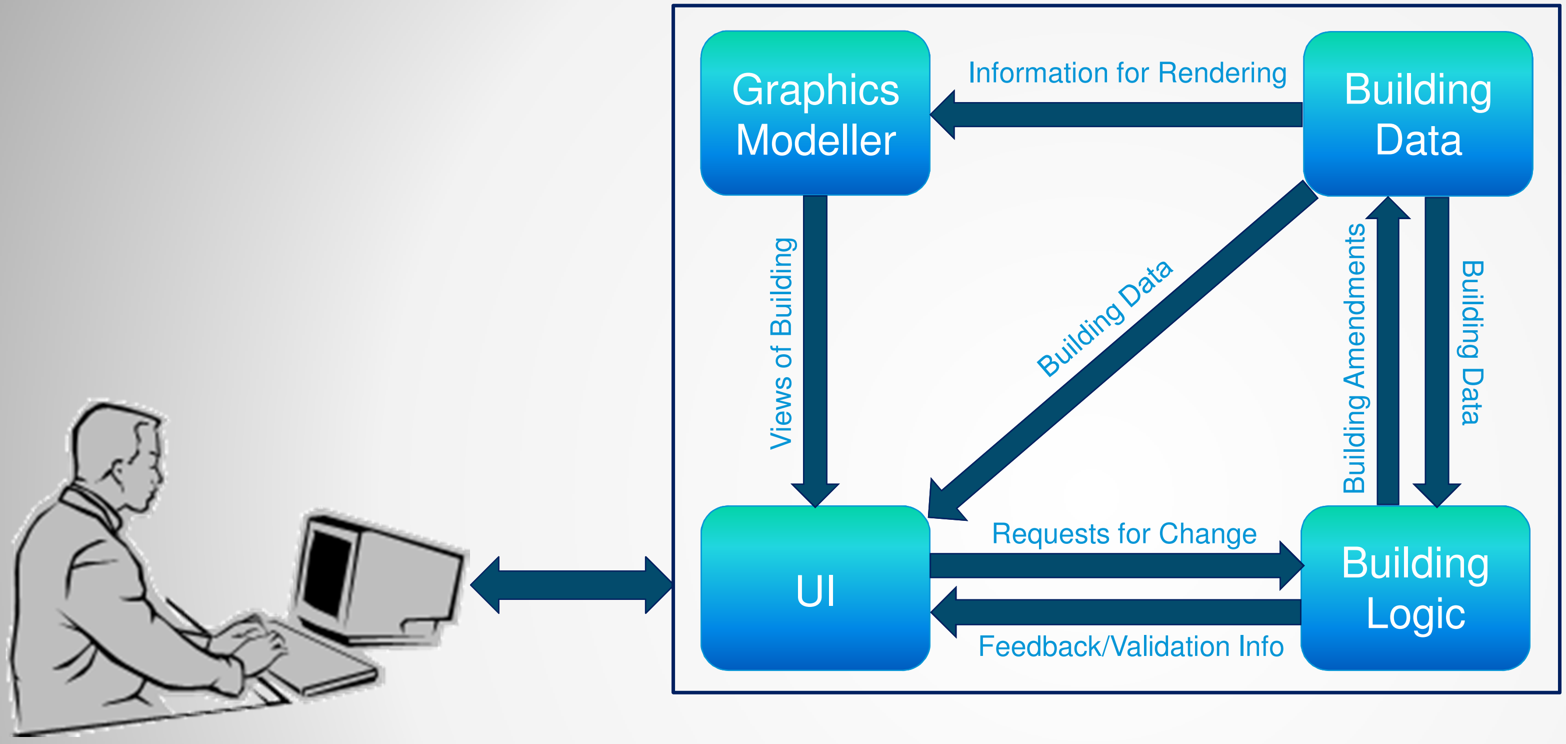
Explore architectures and tools to capture and automate workflows between Building Information Modeling (BIM) systems and engineering and manufacturing systems.

Key learning objectives

At the end of this class, you will be able to:

- Explain how data and models can flow effortlessly between BIM tools and engineering tools
- Describe several different architectures for automating these workflows
- List techniques using specific software tools, including Autodesk Revit ® Autodesk Inventor®, and Autodesk Inventor Engineer-to-Order ®
- Identify when your projects would benefit from these approaches

Revit

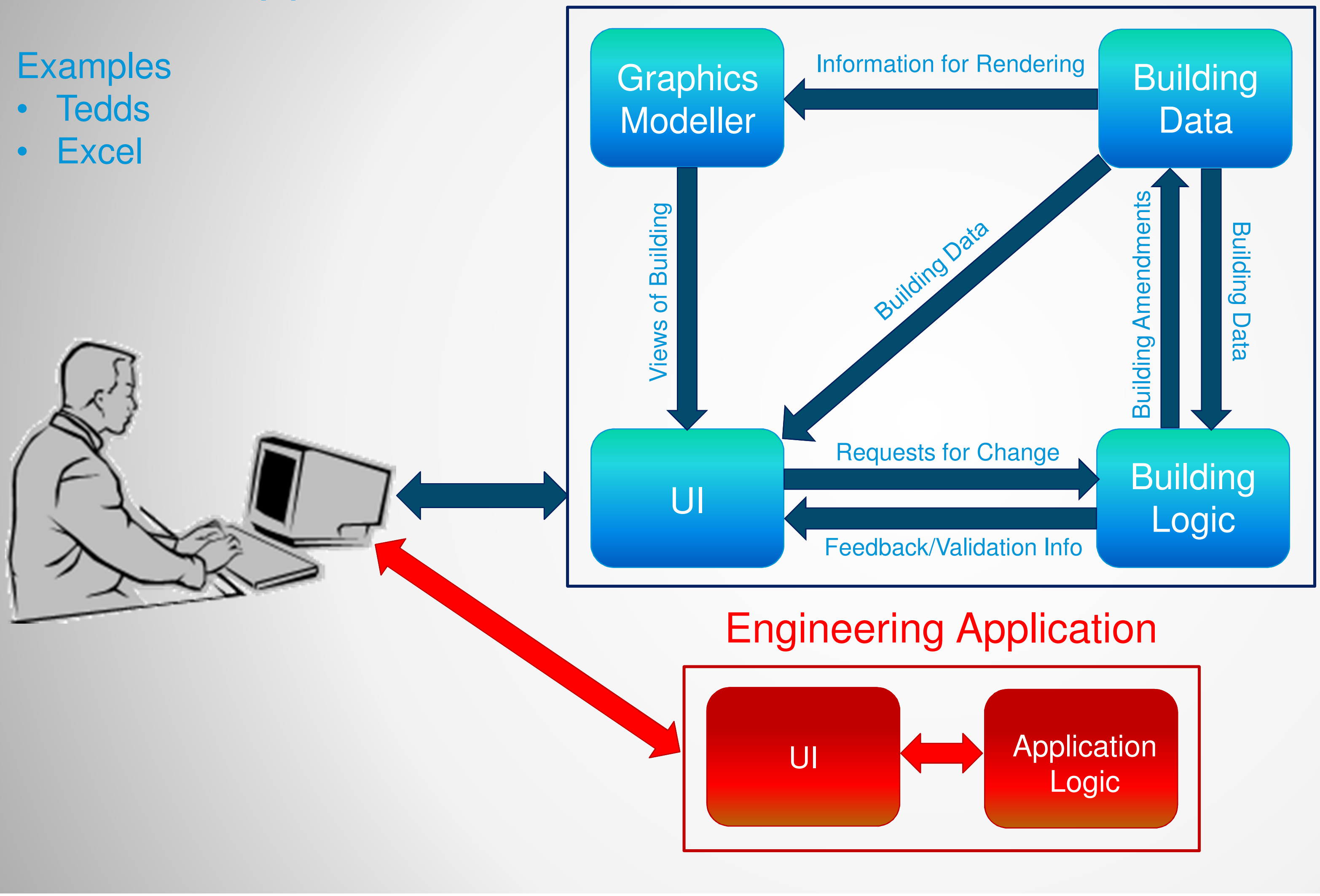

Graphics Modeller
Information for Rendering
Building Data
Views of Building
Building Data
Building Amendments
Building Data
UI
Requests for Change
Building Logic
Feedback/Validation Info

External Application

Examples

- Tedds
- Excel

Revit



Graphics Modeller

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Building Logic

Engineering Application

UI

Application Logic

Considerations

- Engineering Done

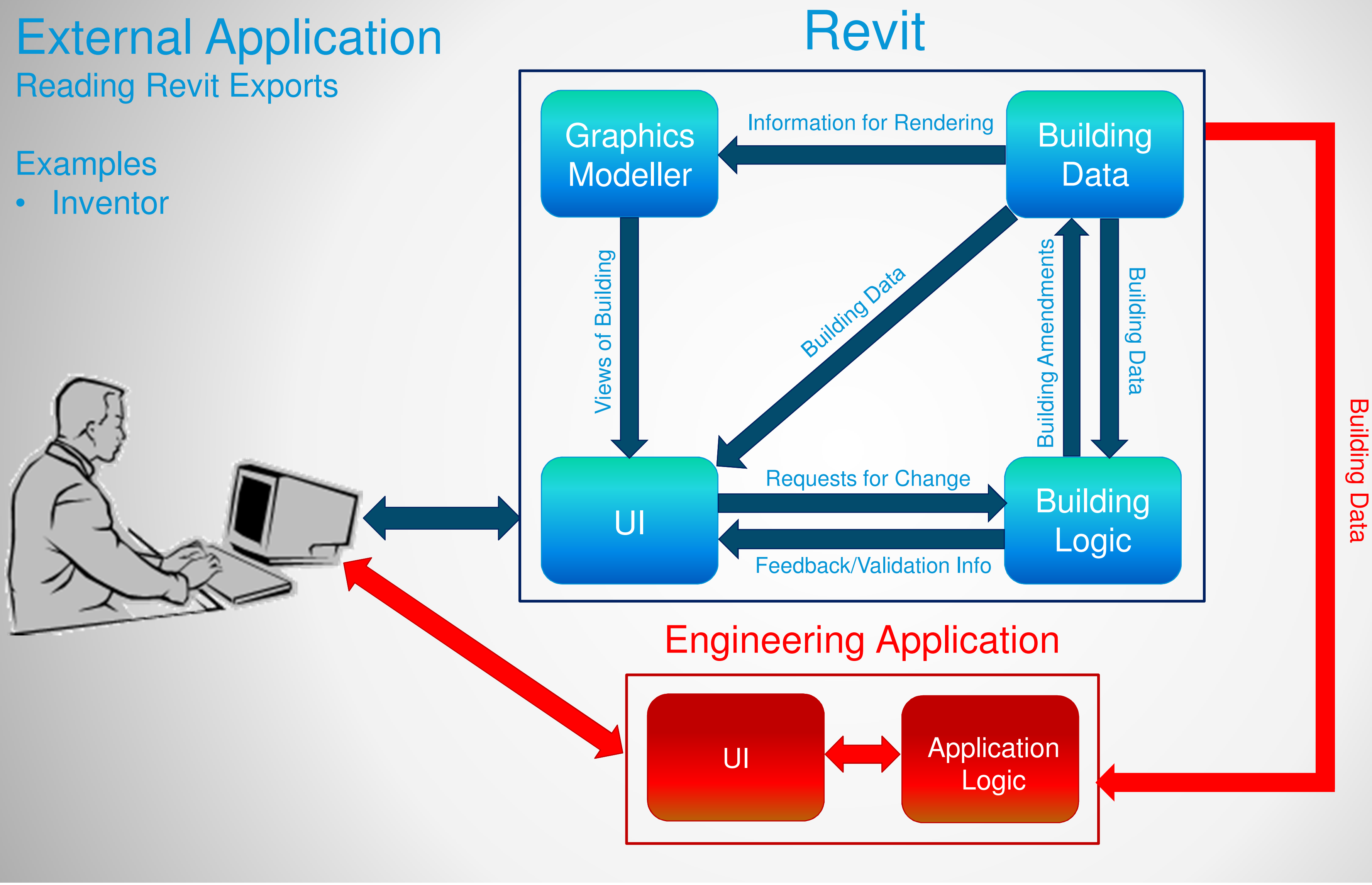
- Time Intensive
- Error Prone

External Application

Reading Revit Exports

Examples

- Inventor



Considerations

- Engineering Done
- No input errors

- Limited Information
- No Integration
- Manual Updates

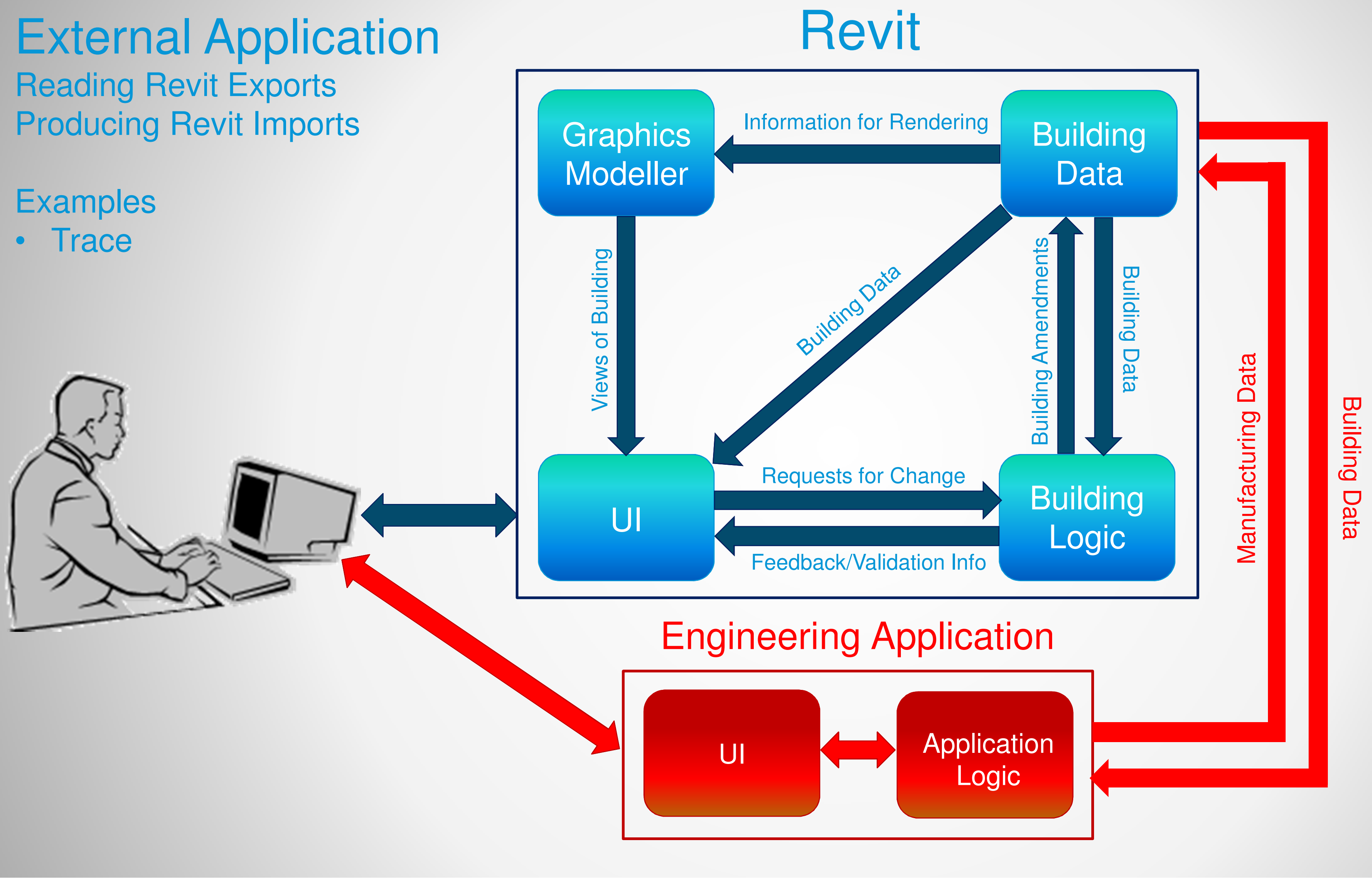
External Application

Reading Revit Exports

Producing Revit Imports

Examples

- Trace



Considerations

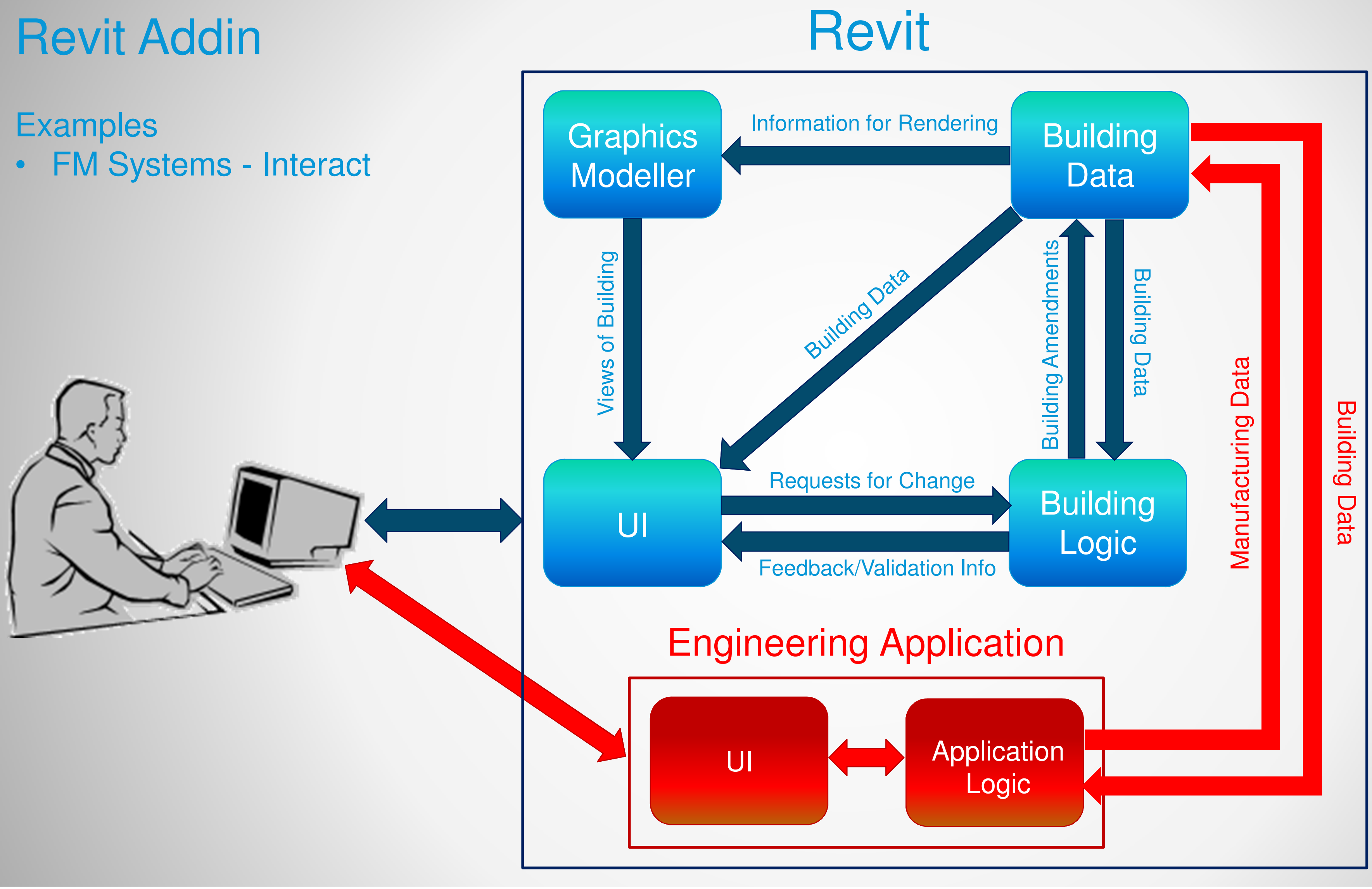
- Engineering Done
- No input errors
- No output errors
- Automatic Updates

- Limited Information
- Limited Updates

Revit Addin

Examples

- FM Systems - Interact



Considerations

- Engineering Done
- No input errors
- No output errors
- Automatic Updates
- Limited Information
- Limited Updates

- No Magic (Building Logic)

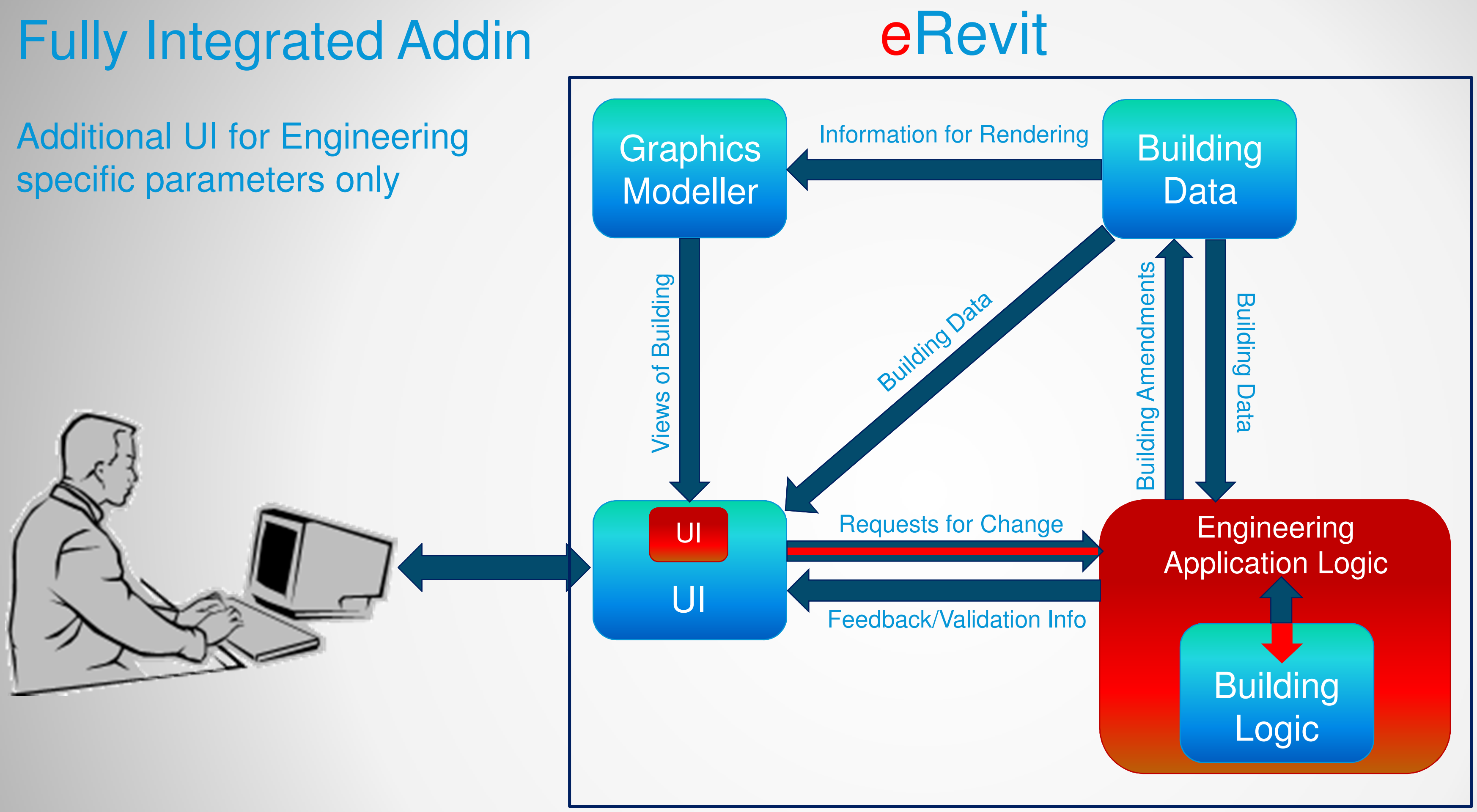
Revit's "Magic" Building Logic

- Creation, deletion and maintenance of smart content (families)
- Content Interaction Logic
- Enforcement of constraints and validation
- Selections – input and output
- Outputs – BOM/Drawings
- Undo/Redo
- Worksharing
- Interactivity

Can't our Engineering Application have this too ?

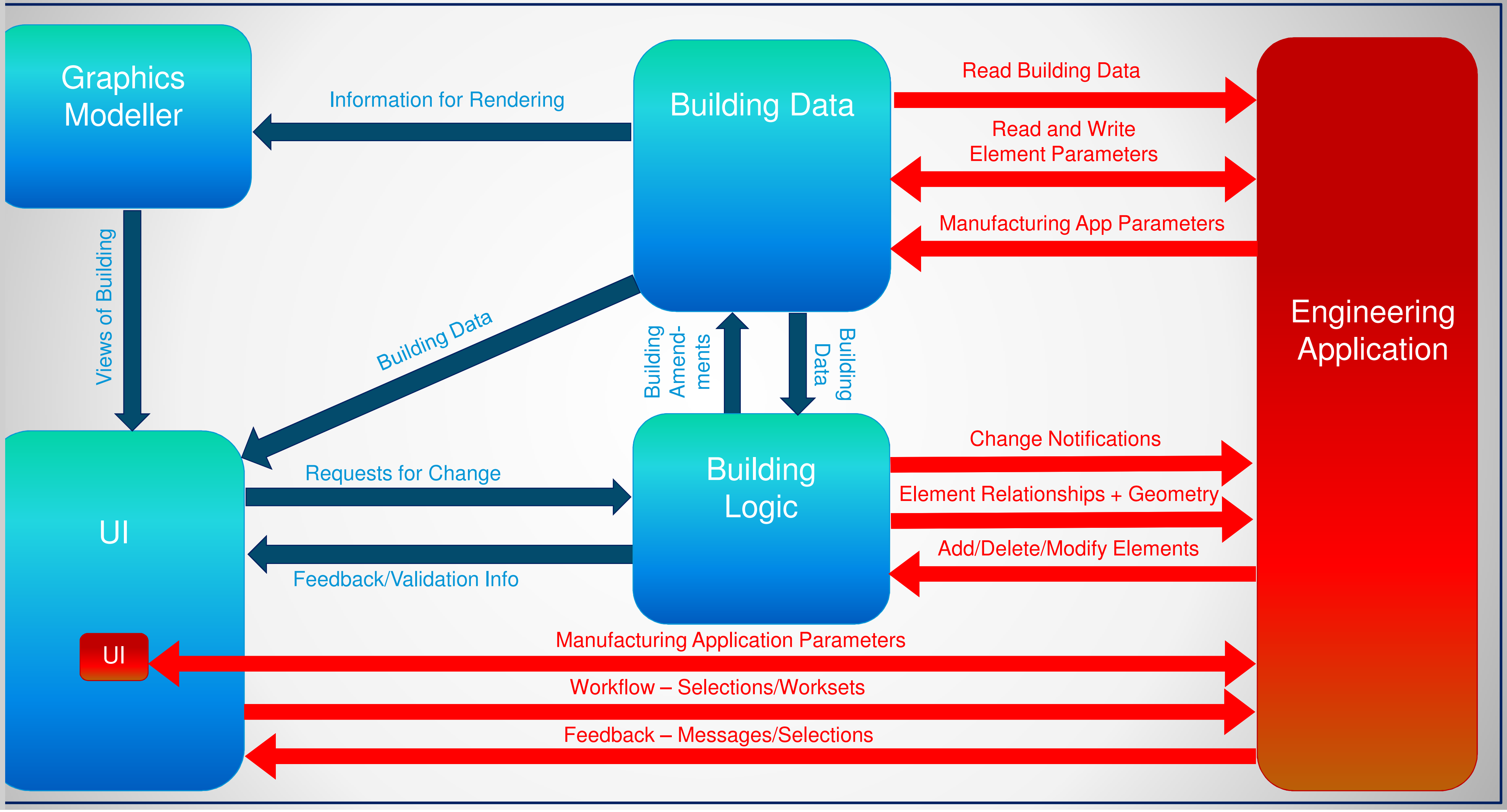
Fully Integrated Addin

Additional UI for Engineering specific parameters only



Engineering Application Wrapped Around Building Logic

eRevit



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Read and Write Element Parameters
Manufacturing App Parameters
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Building Data
Building Amend-ments
Building Data
Change Notifications
Element Relationships + Geometry
Add/Delete/Modify Elements
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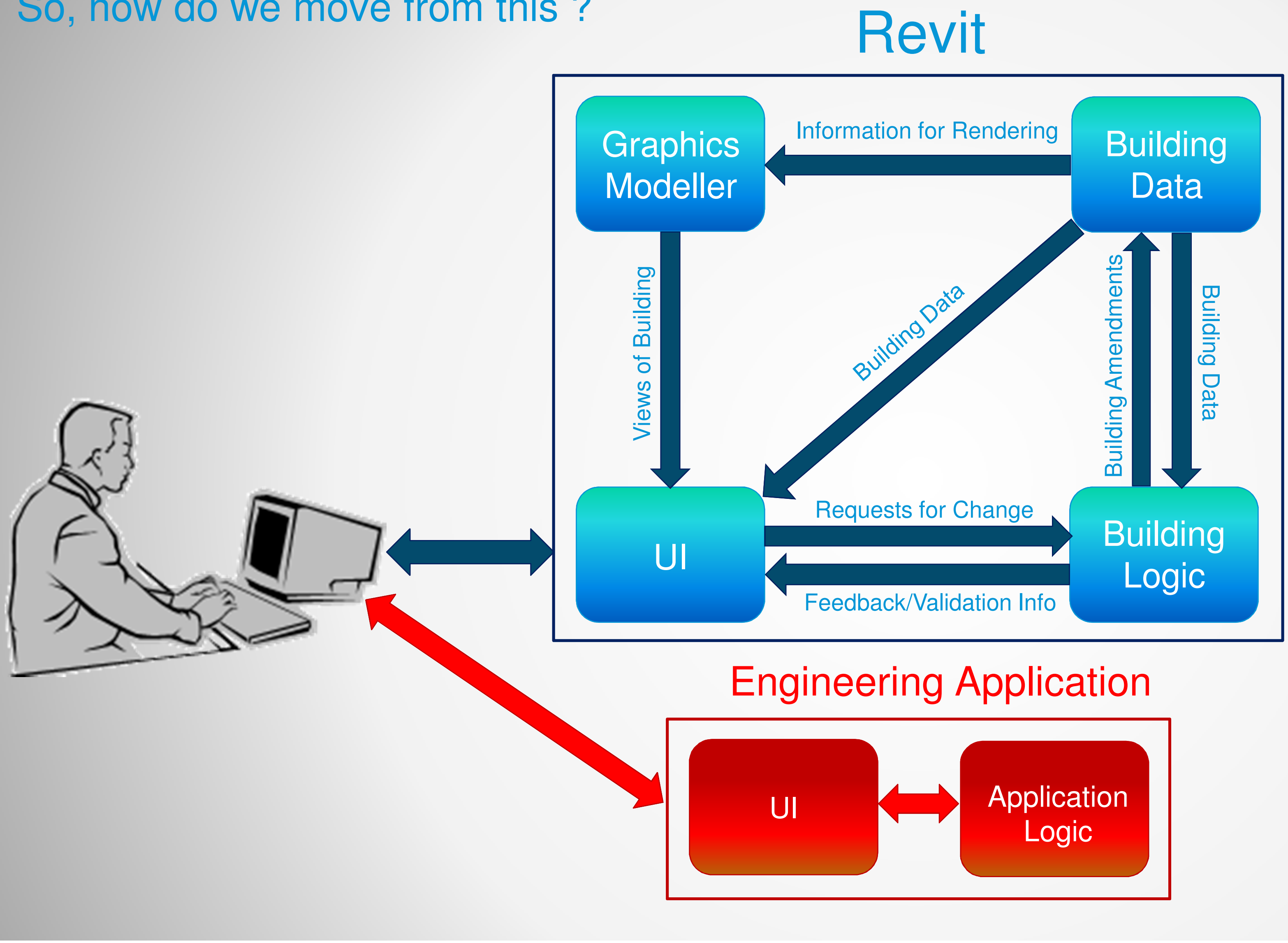
UI
Manufacturing Application Parameters
Workflow – Selections/Worksets
Feedback – Messages/Selections

So, how do we move from this ?



Different types of application

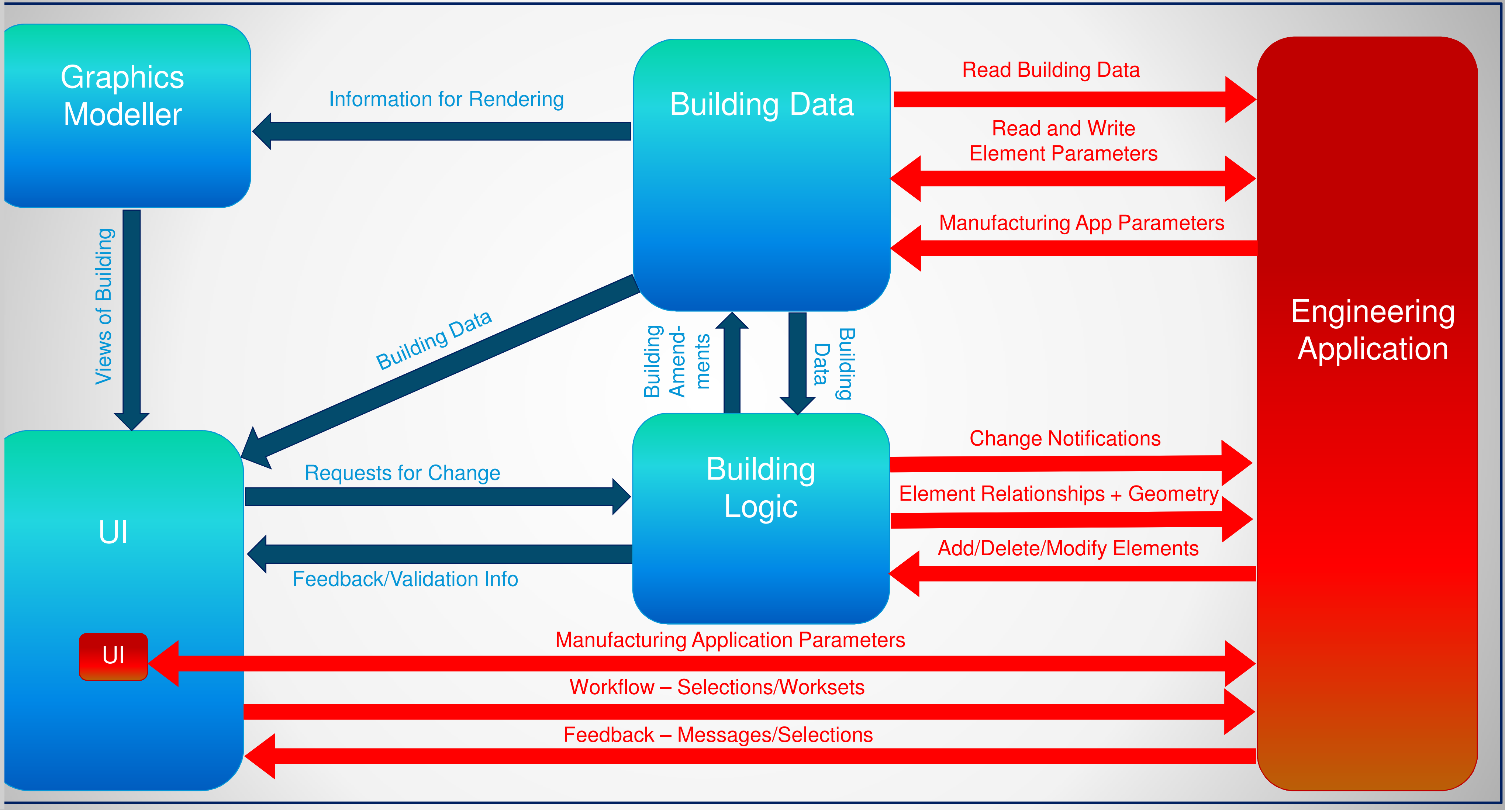
1. Desktop Application
   e.g. Inventor Engineer-to-Order

2. Application Service
   e.g. Engineer-to-Order Server

3. Web Service
   e.g. Configurator 360

… to a solution that looks like this

eRevit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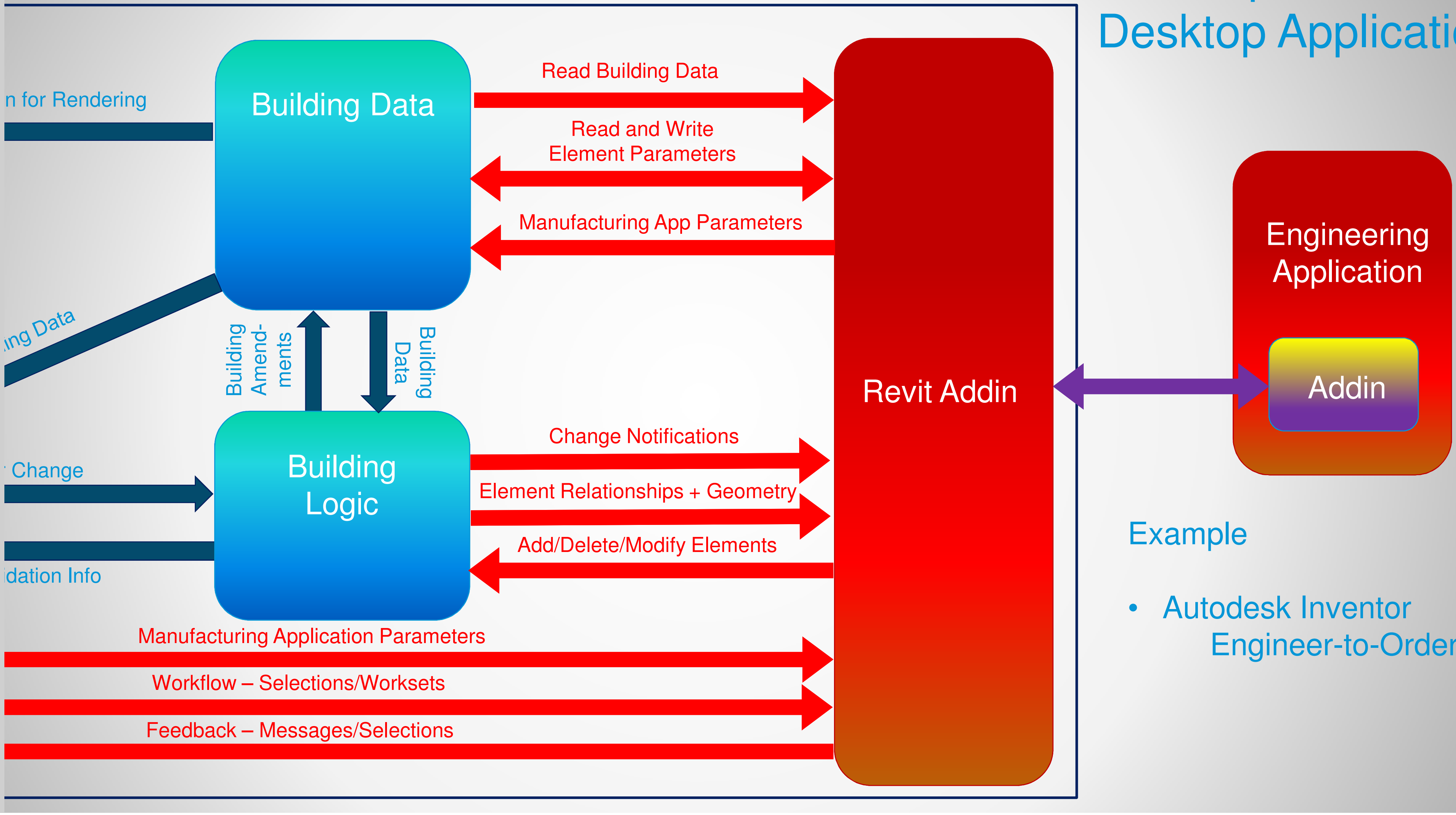
eRevit



Option 1
Desktop Application

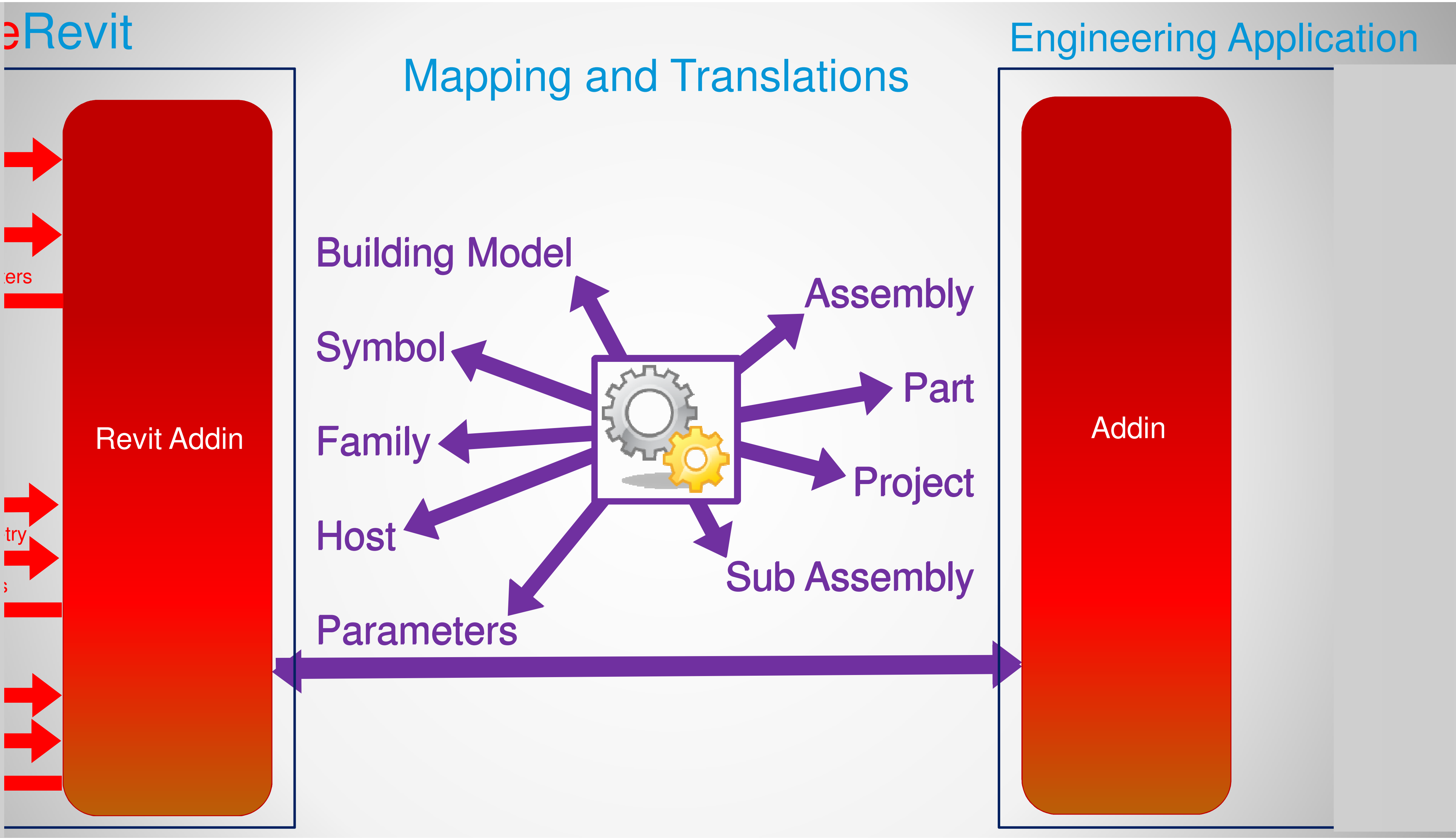
Example

- Autodesk Inventor Engineer-to-Order

Demo

- How does this look ?

Mapping and Translations



Why Autodesk Engineer-to-Order

- One Framework – Multiple Applications
- Best of breed rules based engine
  - Clear Code – VB like
  - No Order-of-Execution code necessary
  - Creates, deletes and maintains parts automatically
  - Understand manufacturing concepts
    - Assembly and Sub-Assembly Trees
    - Bills-of-materials
    - Geometry
    - Maths
    - External link – Excel, SQL etc.

Demo

- Door in Long Walls

‘Door in Long Walls’– ALL the code

```
Design DoorsInLongWalls : RvDocument
  Rule Units As String = "Millimetres"

  Rule LongWalls As List
    For Each wall In bim.walls.wall
      if wall.length > 4000 then LongWalls = LongWalls + {wall}
    Next
  End Rule

  Child Doors As :Door, Quantity = length(LongWalls)
    Wall = nth(child.index,LongWalls)
  End Child
End Design
Design Door : RvGeneratesElements
  Parameter Rule wall As Any = Required

  Child doorinstance As :RvCreatedHostedFamily
    RevitFamily = (If wall.length > 7000 then "Double Doors" else "Single Doors")
    RevitSymbol = (If wall.length > 7000 then "1810 x 2110mm" else "810 x 2110mm")
    RevitSymbolHostID = wall.id
    RevitSymbolLocation = wall.startpoint + wall.length / 3 * wall.dirvector
    Owner = wall.id
  End Child
End Design
```

Units Handled Automatically

Building Model Accessible

Families Created Easily

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End Design
```

Collect all walls over 4m long

Add a door to each one

Walls over 7m get double doors

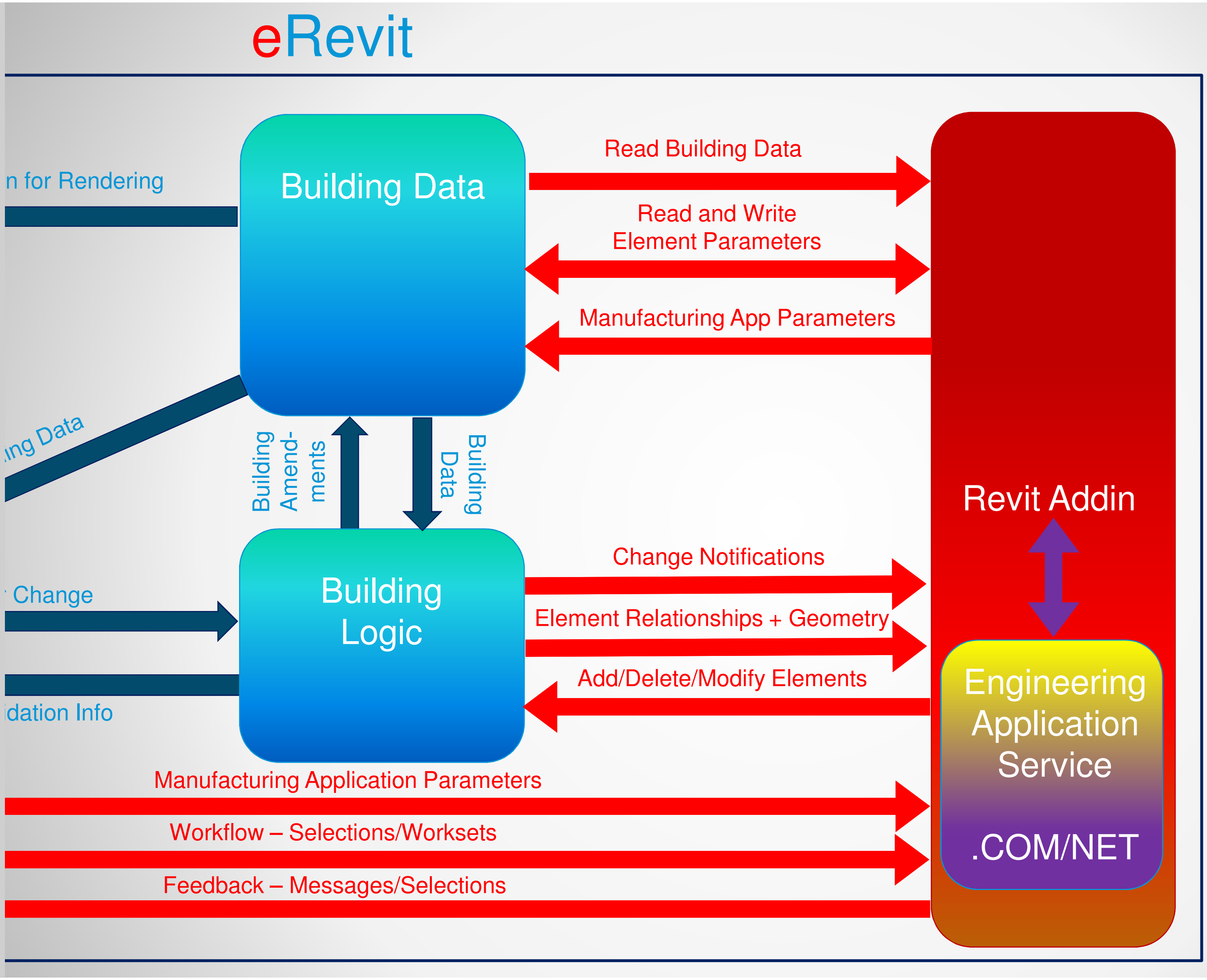
Doors positioned 1/3 along walls

Other Types of Engineering Applications

What about

- Service Based Applications
- Web Based Applications

Option 2
Application Service



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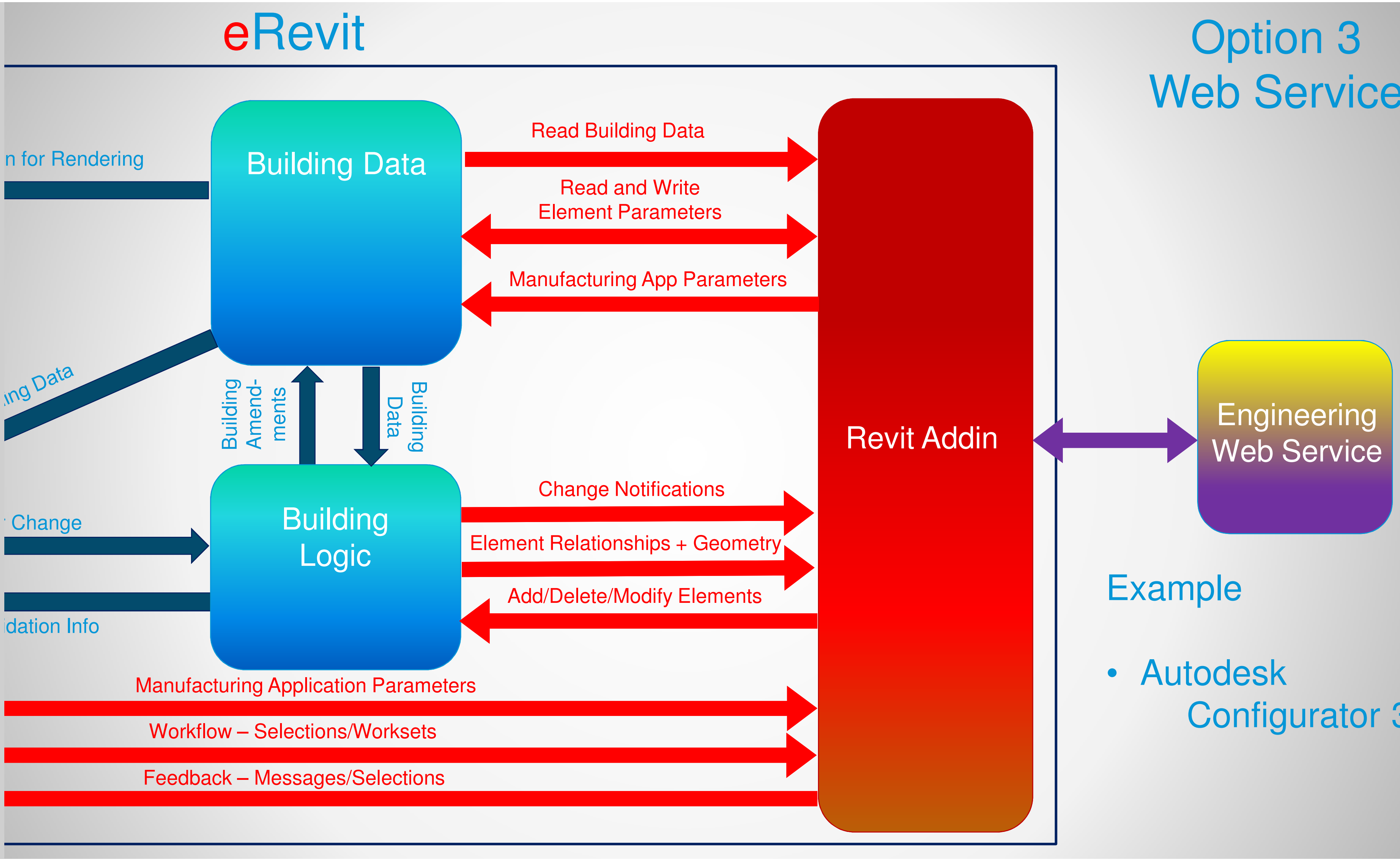
Revit Addin
Engineering Application Service
.COM/NET

Example

- Autodesk Engineer-to-Order Server

Option 3
Web Service



Example

- Autodesk Configurator 360

Applications

- Engineering where BIM specifies criteria
  - SIPS
  - Formwork/Falsework
  - Steel Reinforced Concrete
  - Roof Systems
  - Glazing
- Large Projects
- Companies who have their own engineering systems
- Powertools – immediate feedback
- Intellectual Property Protection

Questions ?

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