Integration module 2 – S-FRAME

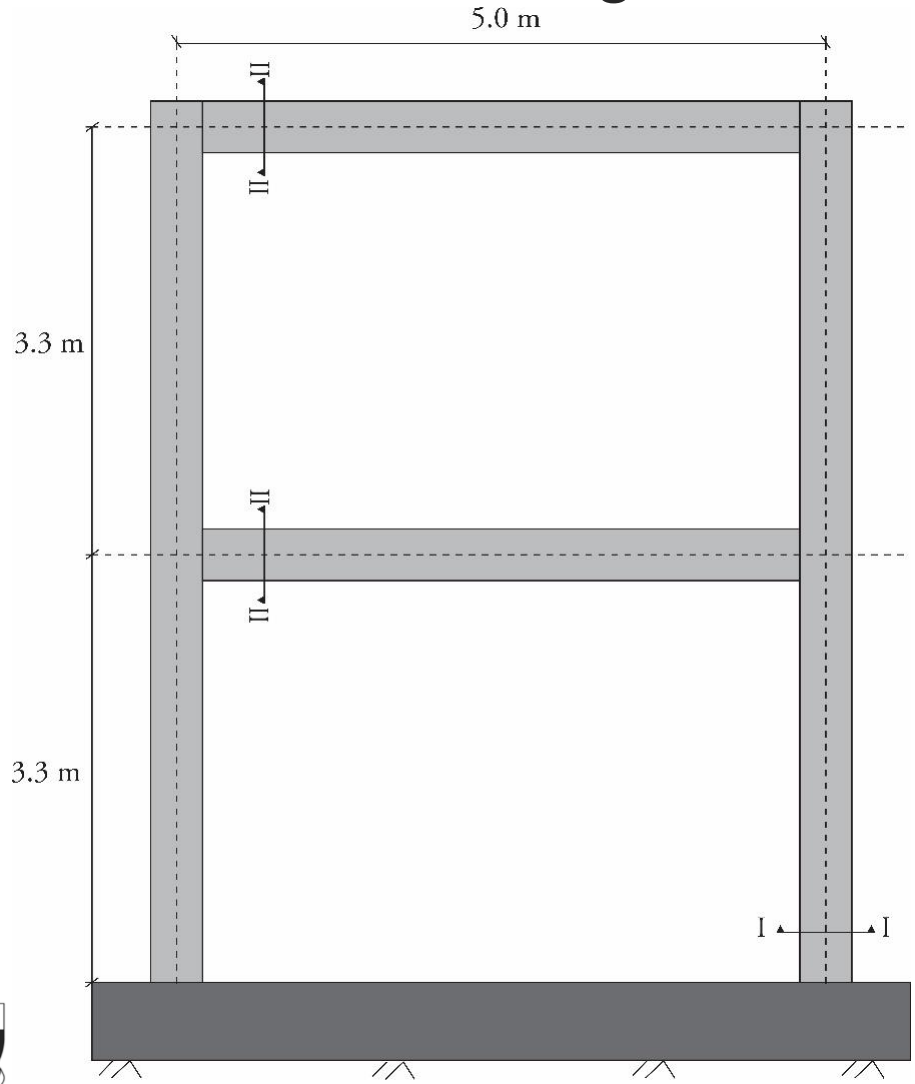
Xu Huang

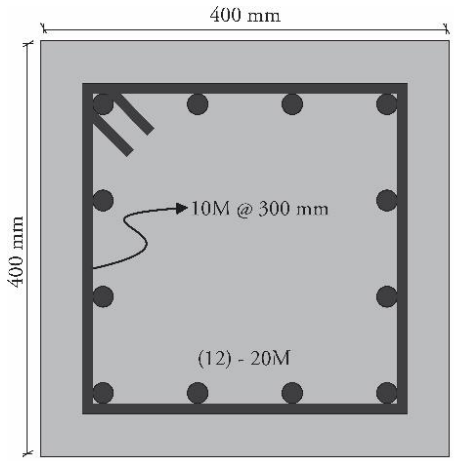
Outline

- **Example Structure**
  - Structural configuration
  - S-FRAME model
- **Simulation Method**
  - Decomposition
  - Substructure module – VecTor 2
  - Communication overview
- **Integration Module (S-FRAME)**
  - Numerical model
  - Communication configuration
  - Results
- **Application Example**

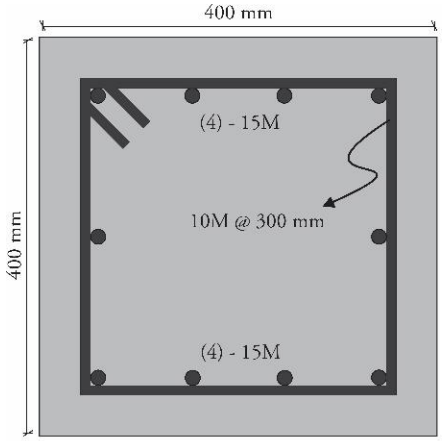
Example Structure

- **Structural Configuration**





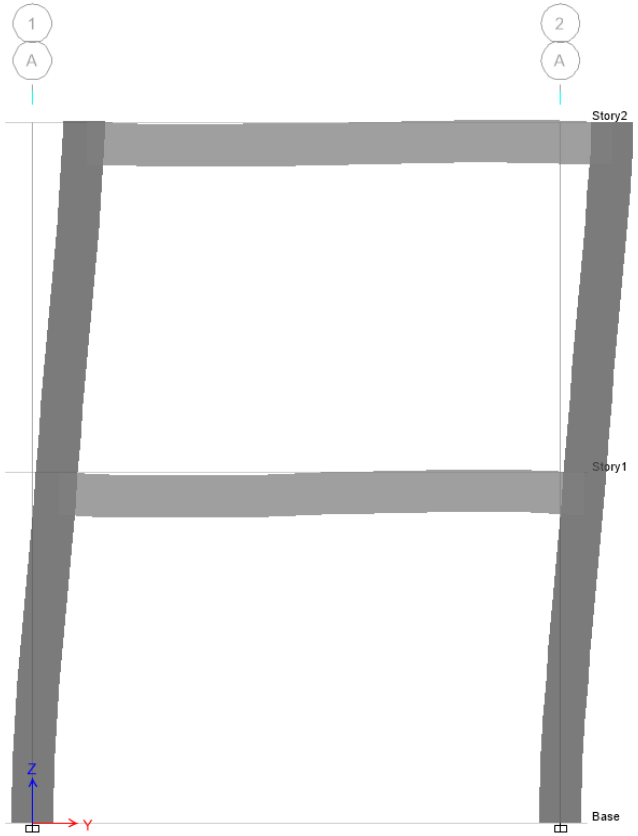
Section I-I: Column details



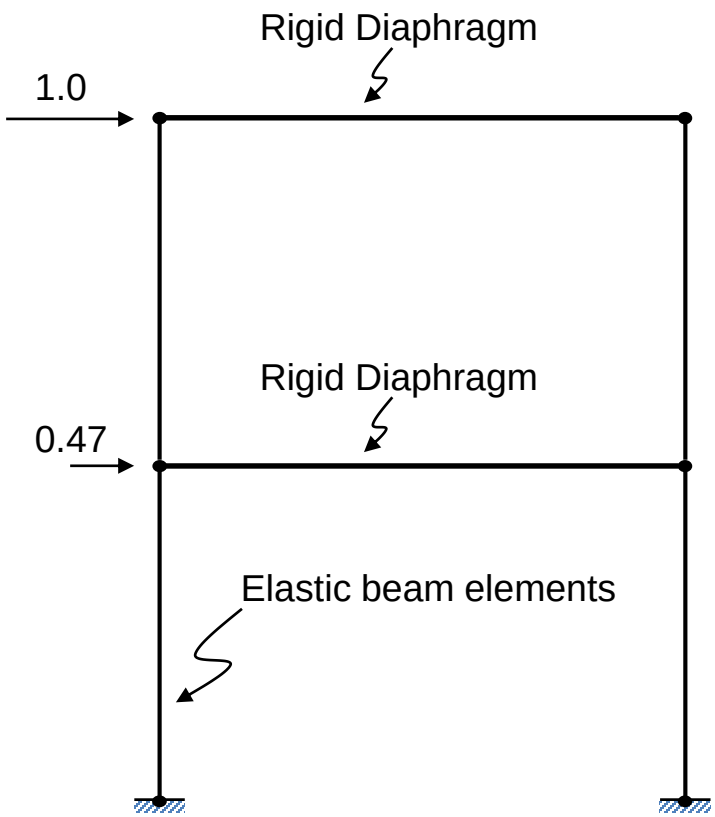
Section II-II: Column details

Example Structure

- **S-FRAME model**

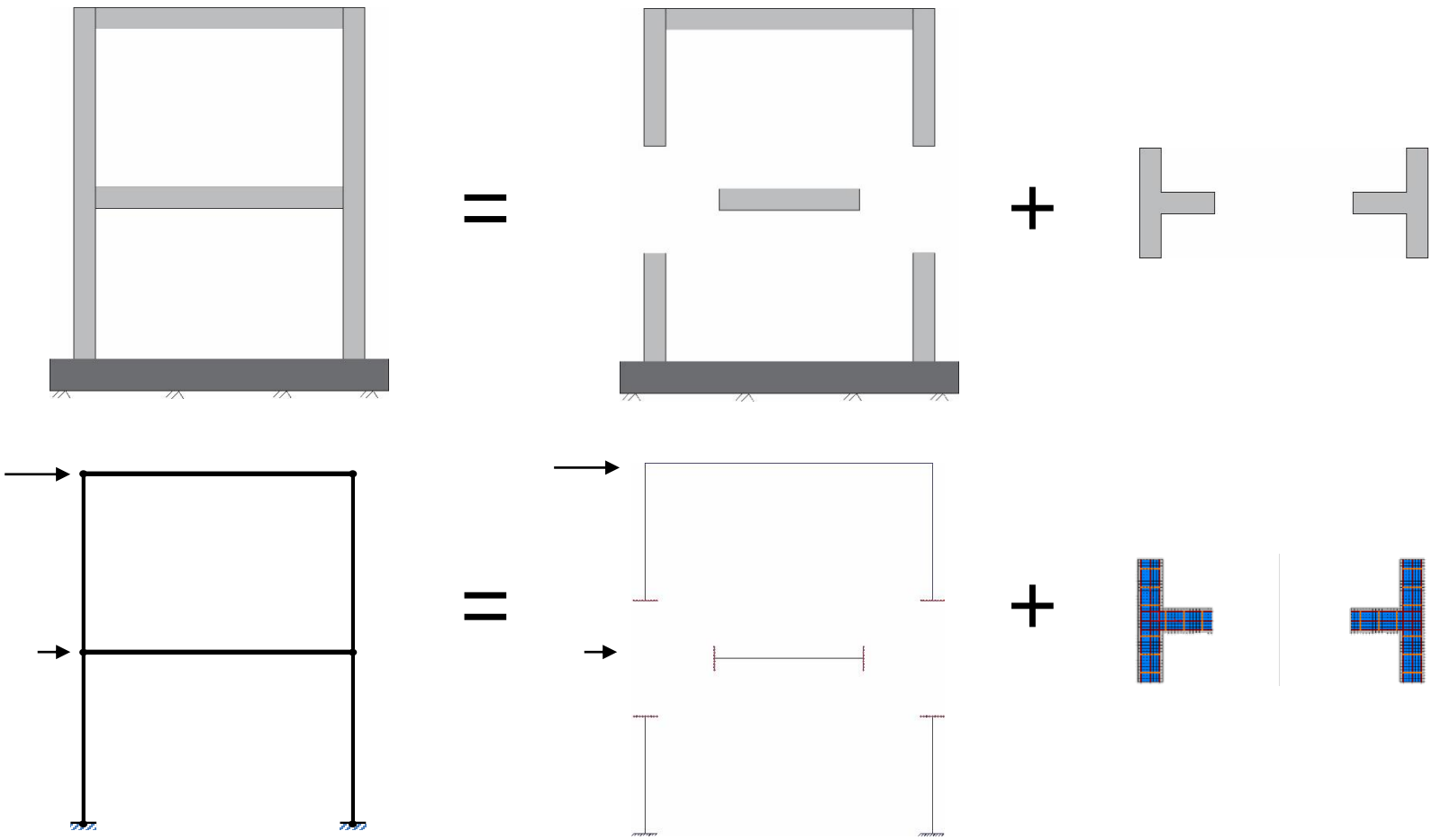


First mode (T=0.4 s)



Integrated Simulation Method

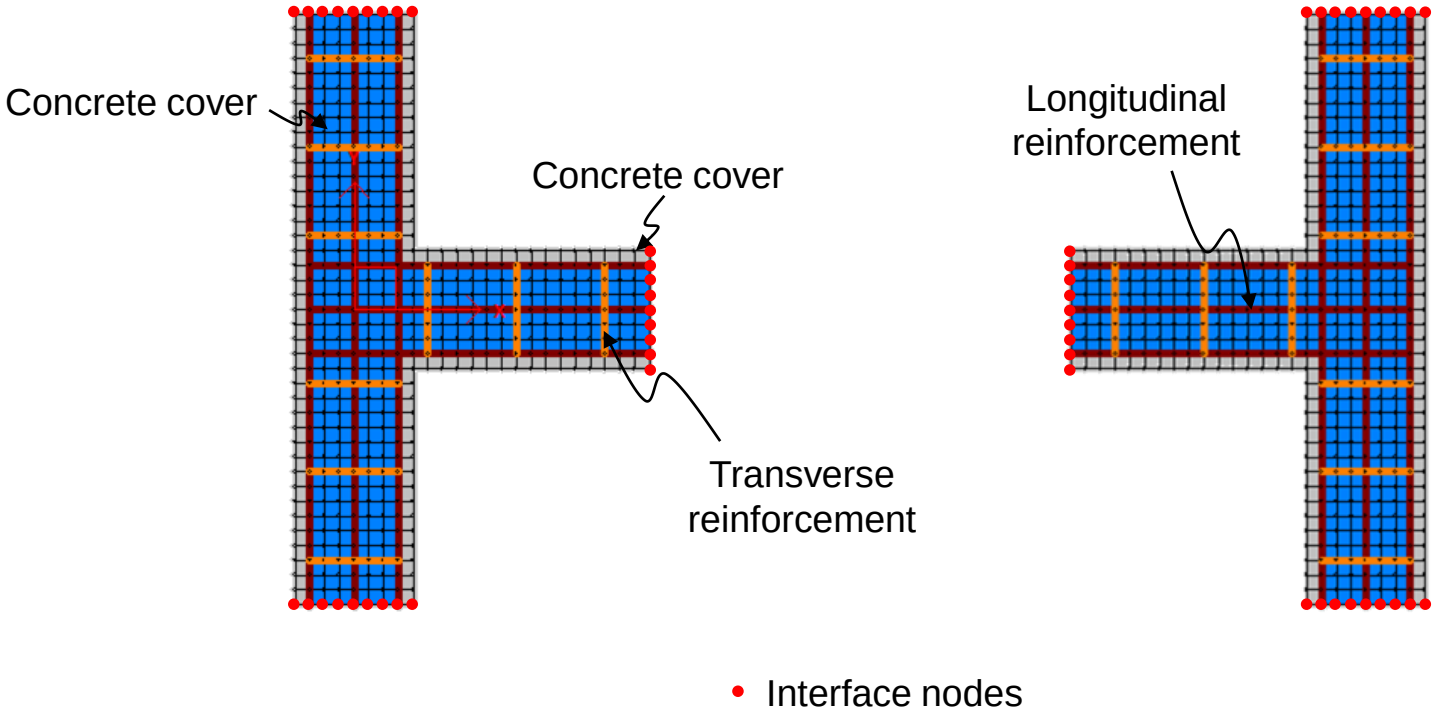
- **Decomposition**



Complete model S-FRAME model VecTor2 model

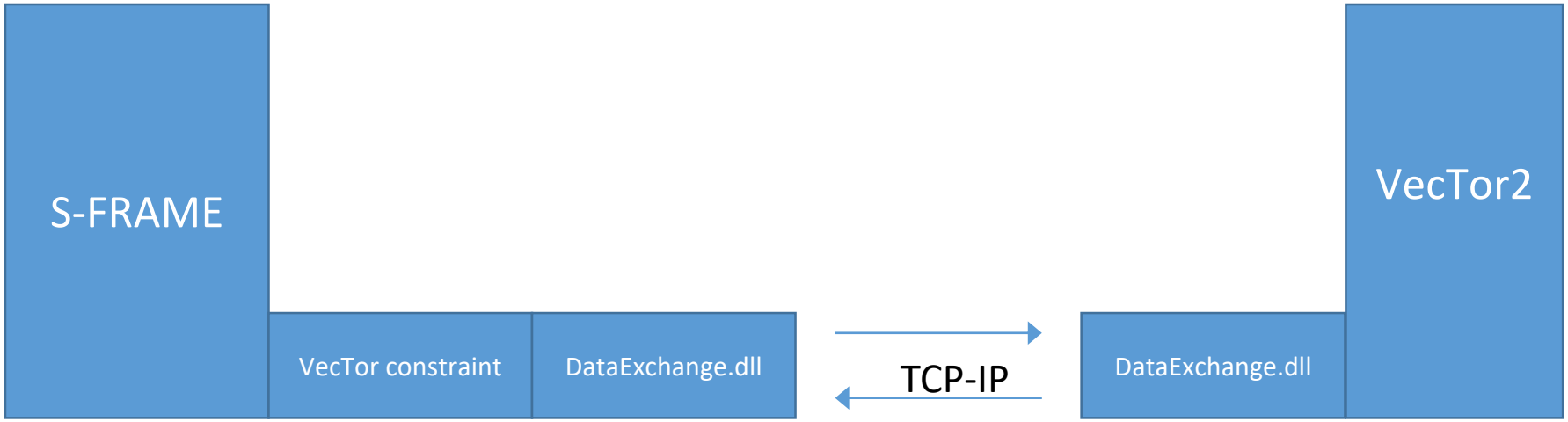
Integrated Simulation Method

- **Substructure module – VecTor2**



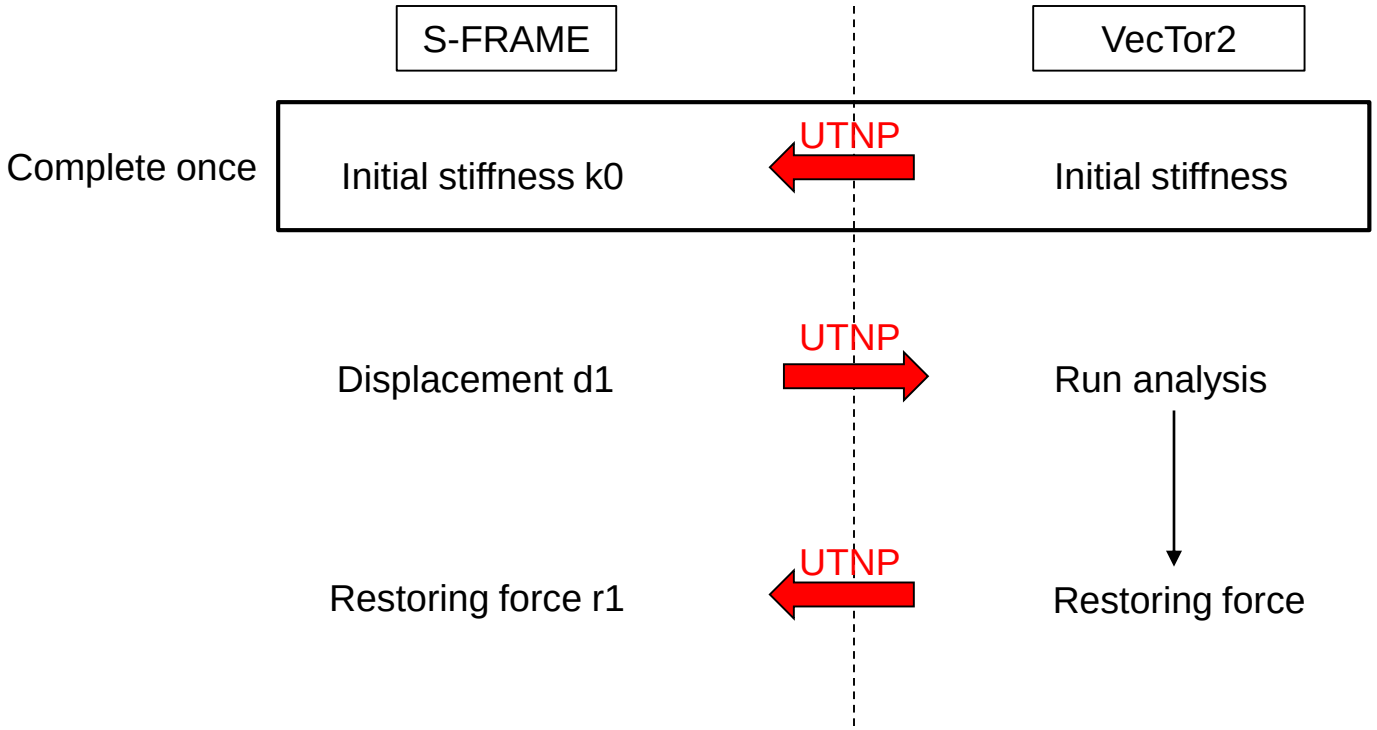
Simulation Method

- **Communication overview**
  - S-FRAME to VecTor2



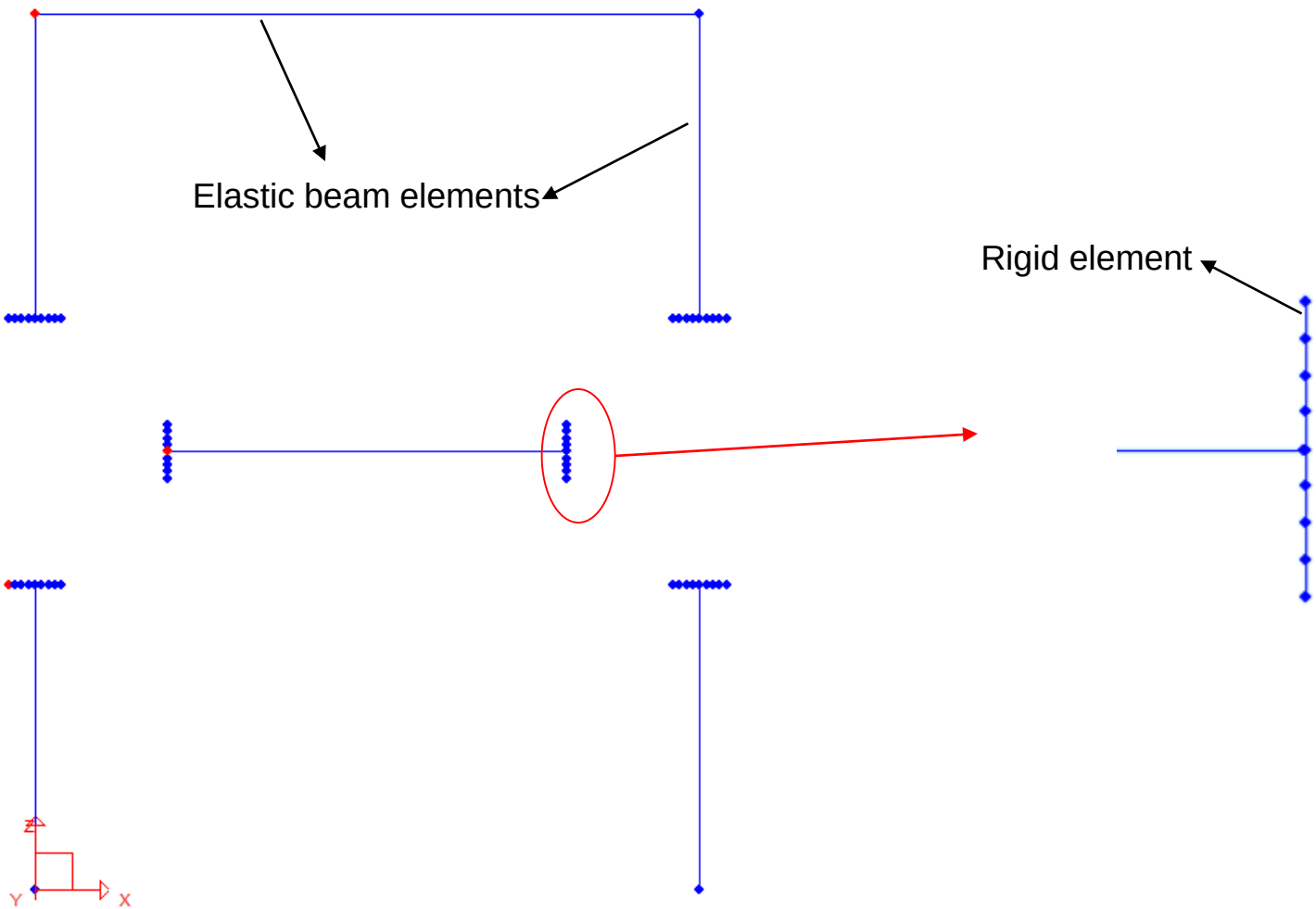
Simulation Method

- **Communication overview**
  - S-FRAME to VecTor2



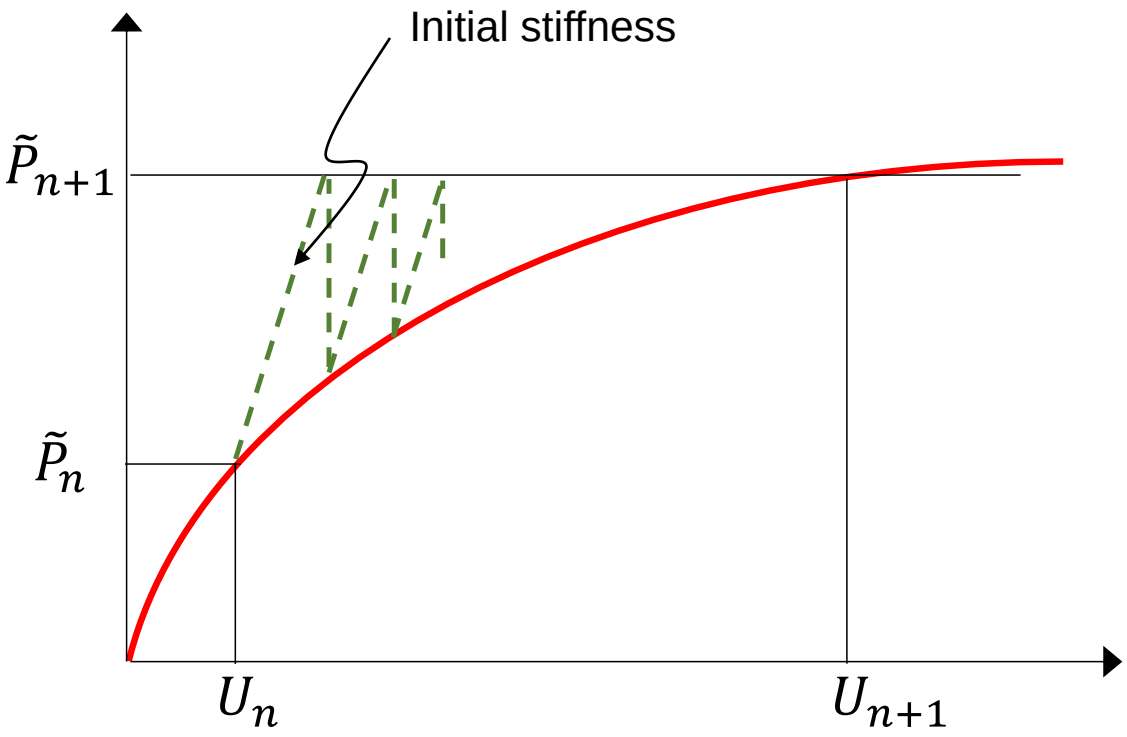
Integration Module (S-FRAME)

- **Numerical model**



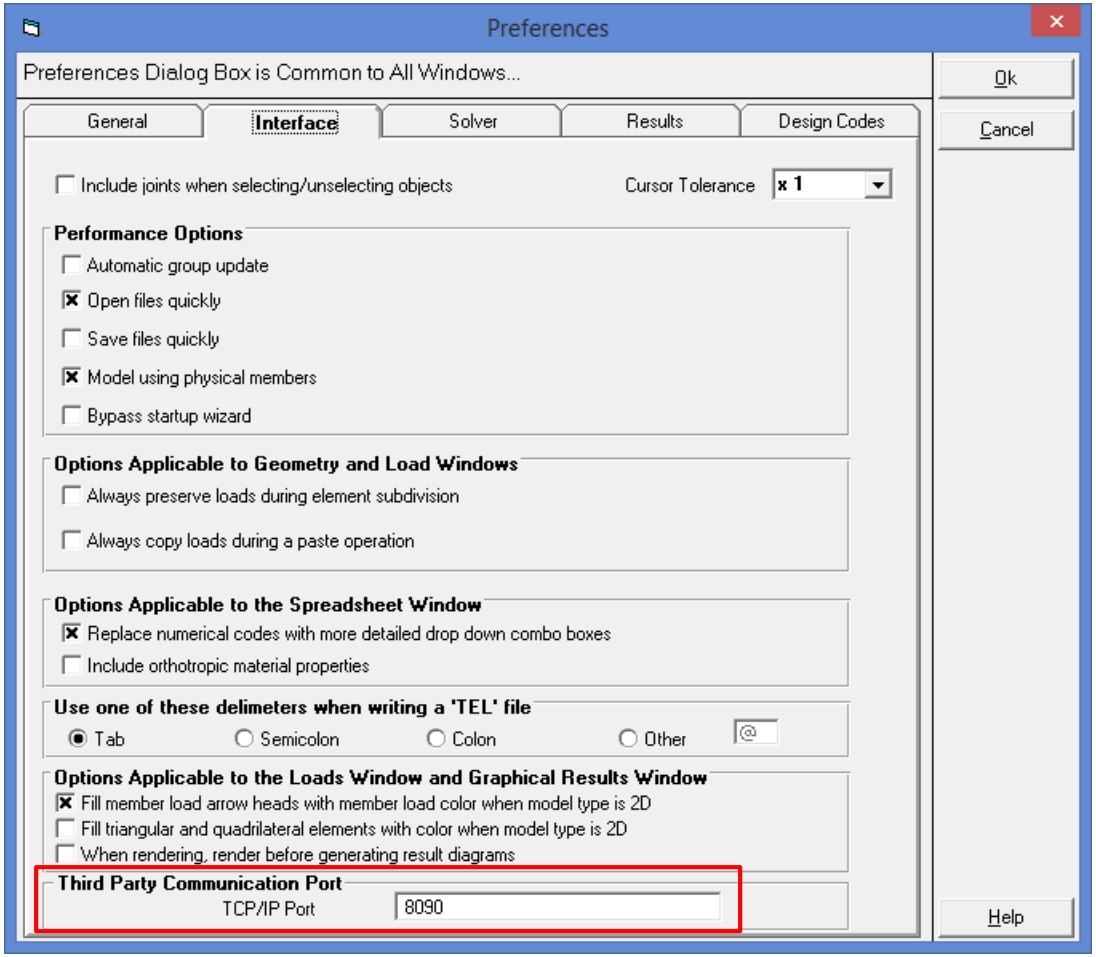
Integration Module (S-FRAME)

- **Static nonlinear solution method**
  - Newton Raphson's method



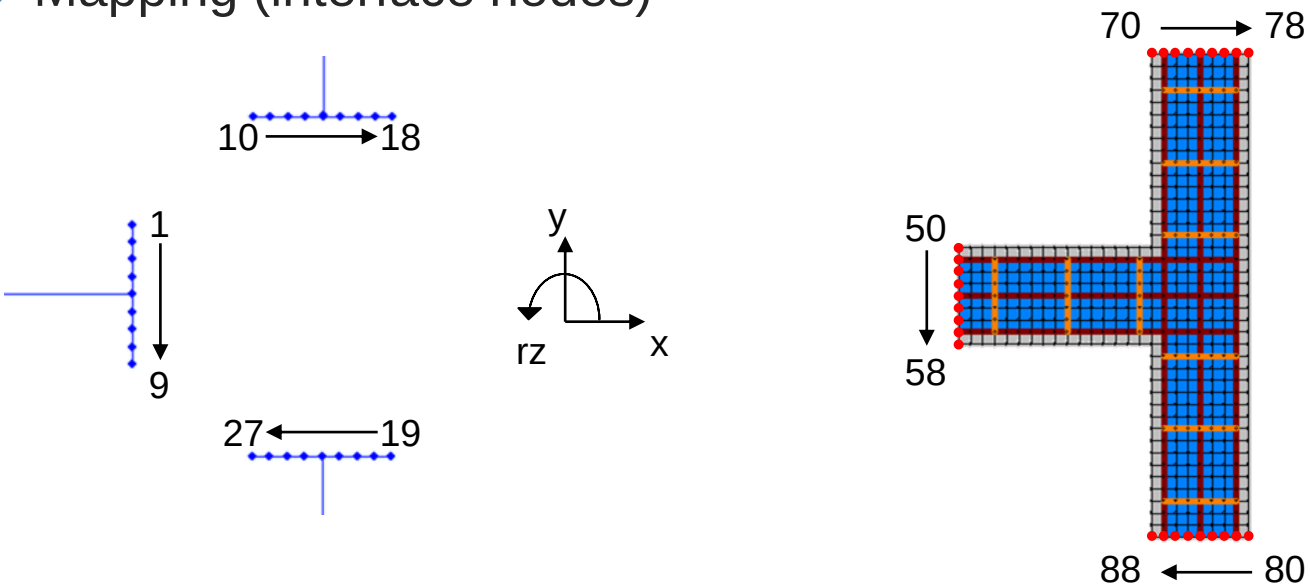
Integration Module (S-FRAME)

- **Communication configuration**
  - Port number



Integration Module (S-FRAME)

- **Communication configuration**
  - Mapping (interface nodes)

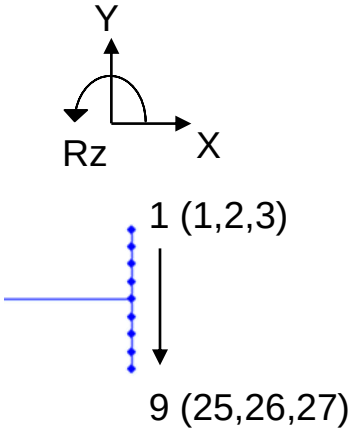


S-FRAME	1-9	10-18	19-27
VecTor2	50-58	70-78	80-88

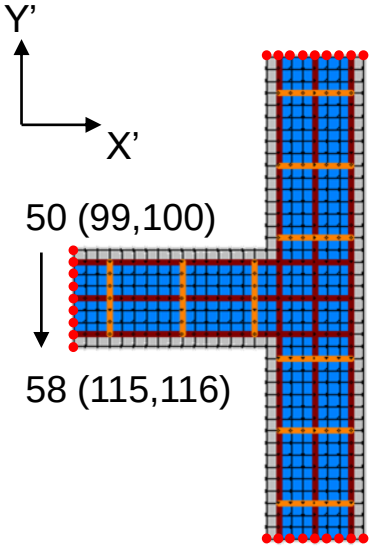
Integration Module (S-FRAME)

❑ Communication configuration

- Mapping (interface dofs)

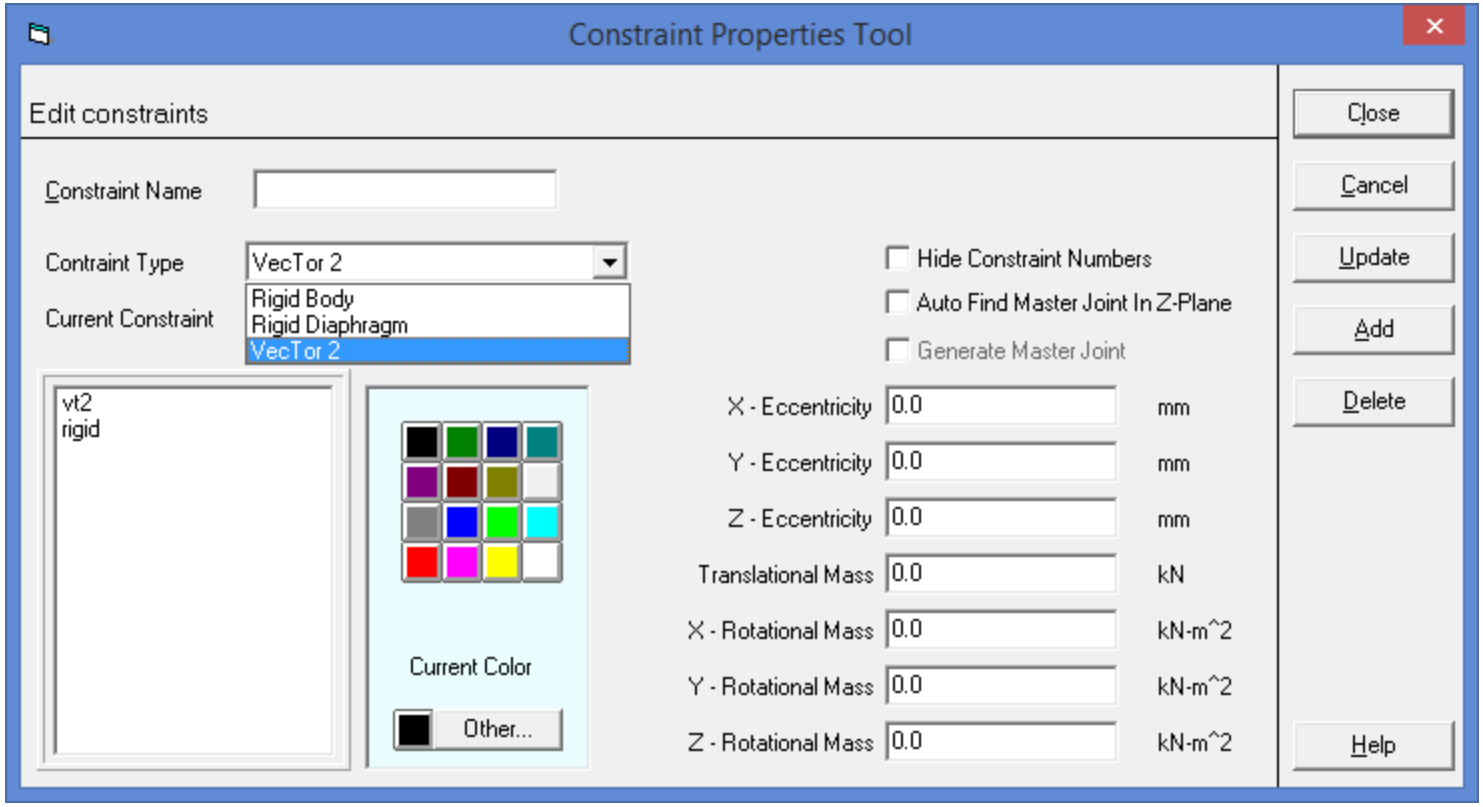


S-FRAME		VecTor2s	
Node	DOF	DOF	Node
1	1	99	50
	2	100	
2	4	101	51
	5	102	
3	7	103	52
	8	104	
4	10	105	53
	11	106	
5	13	107	54
	14	108	
6	16	109	55
	17	110	
7	19	111	56
	20	112	
8	22	113	57
	23	114	
9	25	115	58
	26	116	



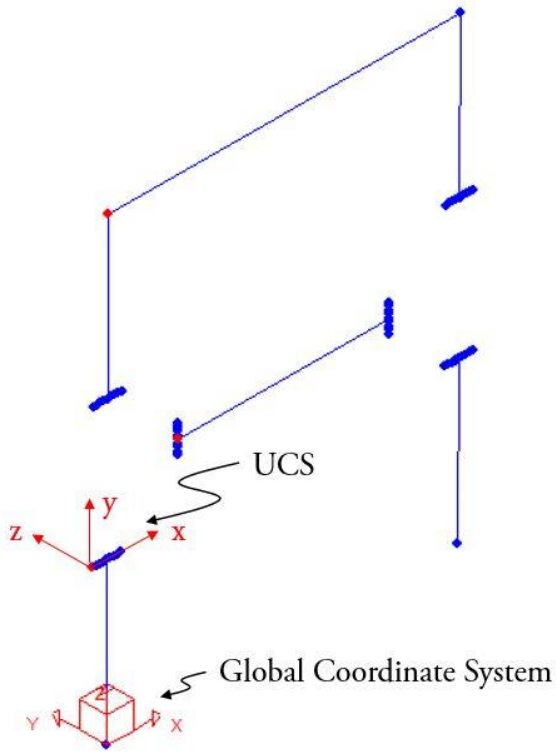
Integration Module (S-FRAME)

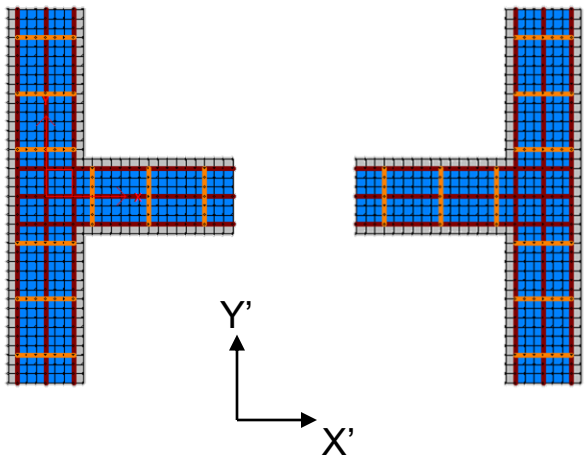
- **Communication configuration**
  - VecTor2 constraint



Integration Module (S-FRAME)

- **Communication configuration**
  - User Coordinate System



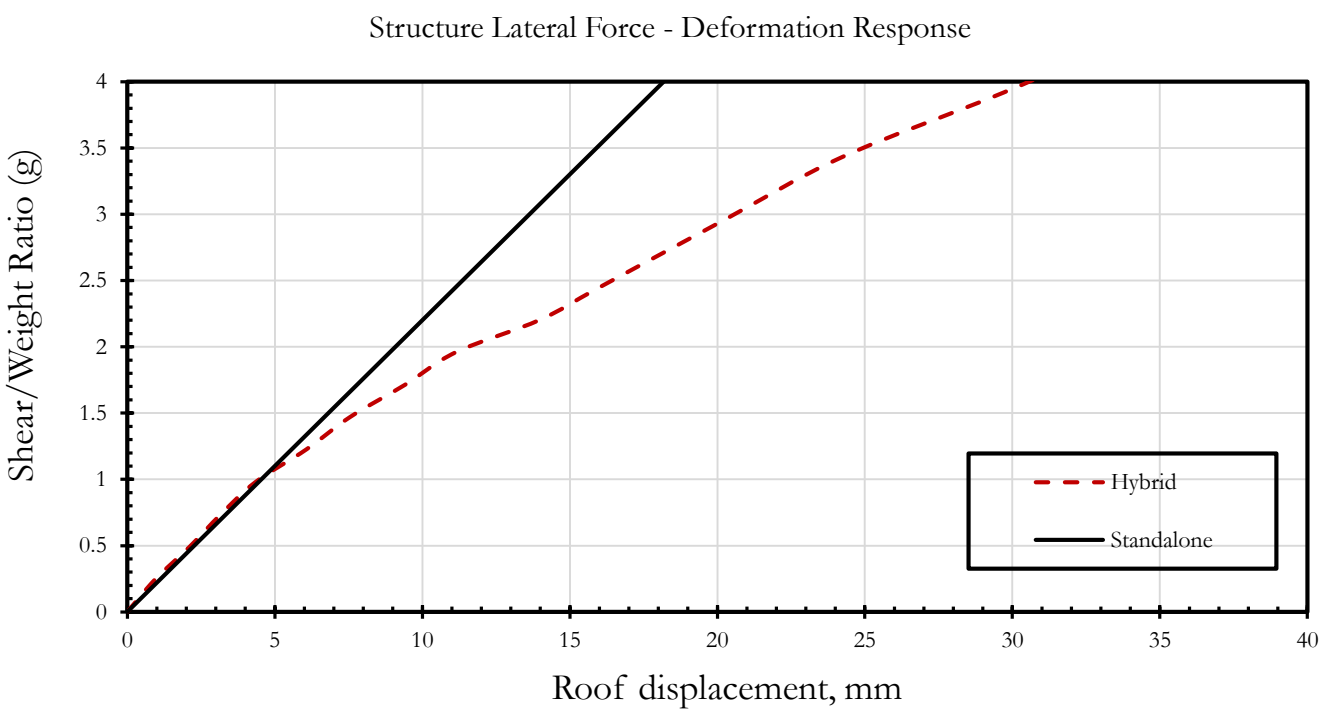


Integration Module (S-FRAME)

- **Steps**
  - Define Port number (Setting→Preferences→Third Party Communication Port)
  - Add a VecTor2 type constraint
  - Define User Coordinate System (UCS) for substructure module
  - Assign the VecTor2 type and UCS to the interface nodes. The first interface node will be considered as a master node while the others are slave nodes.

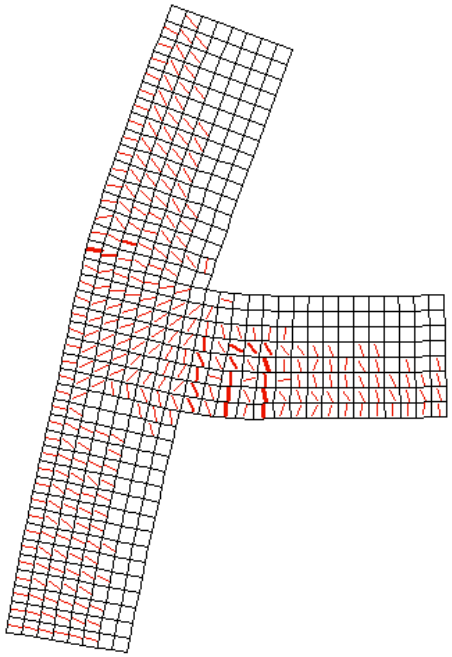
Integration Module (S-FRAME)

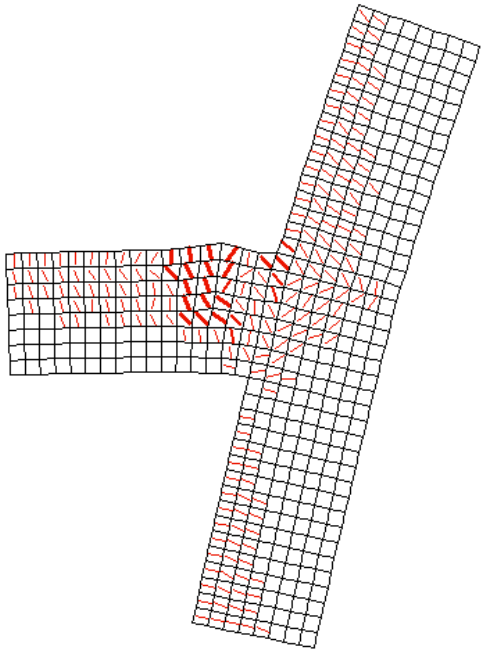
- **Result**



Integration Module (S-FRAME)

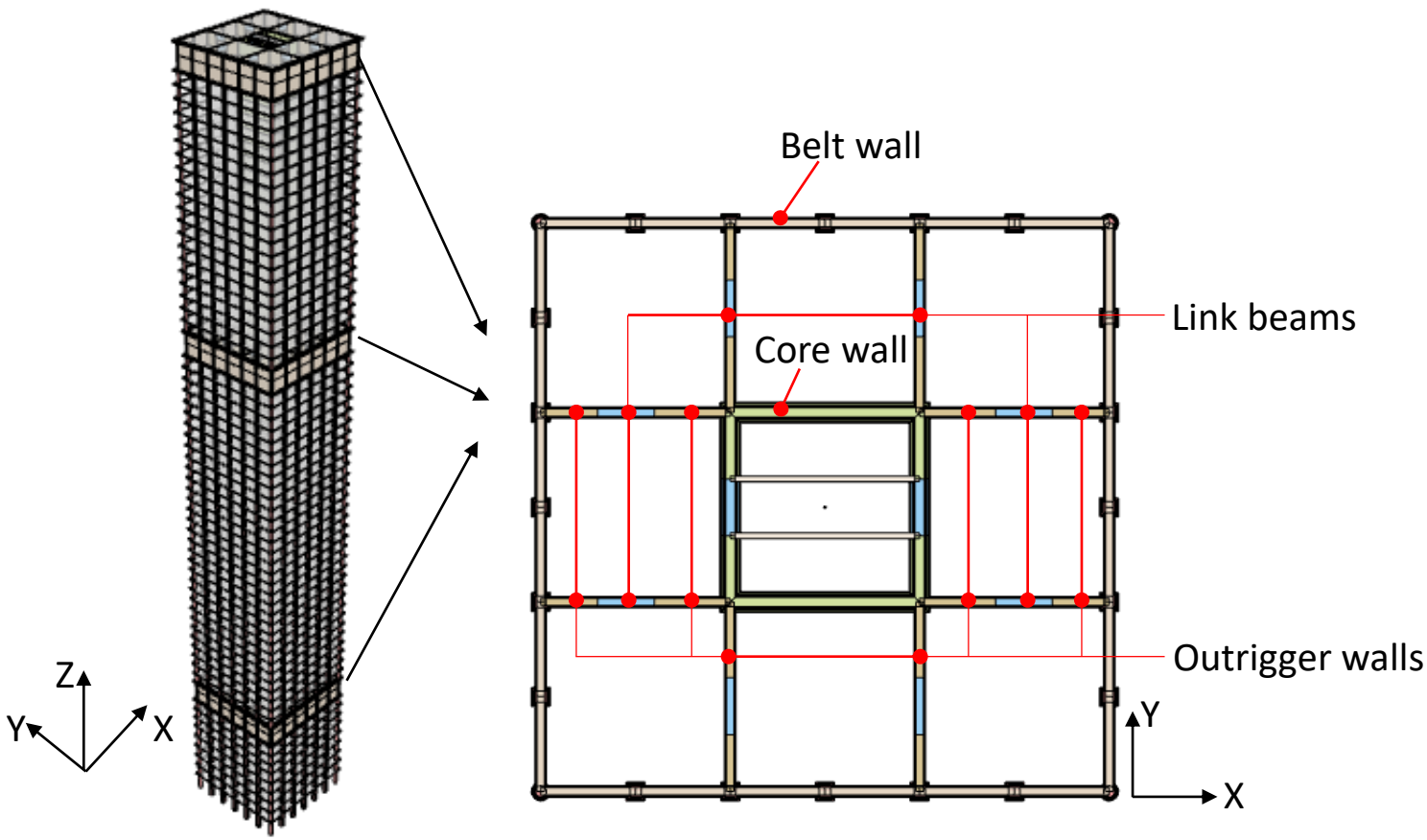
- **Result**





Application Example

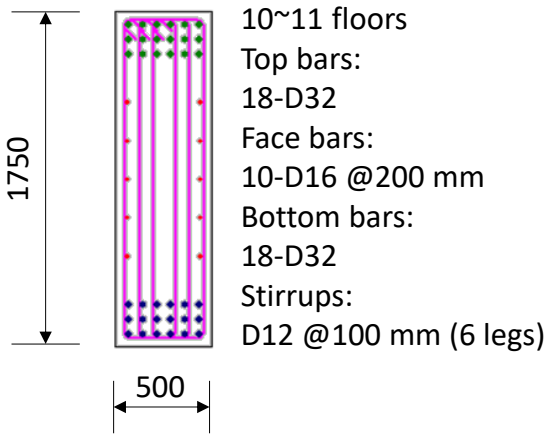
- High-rise building



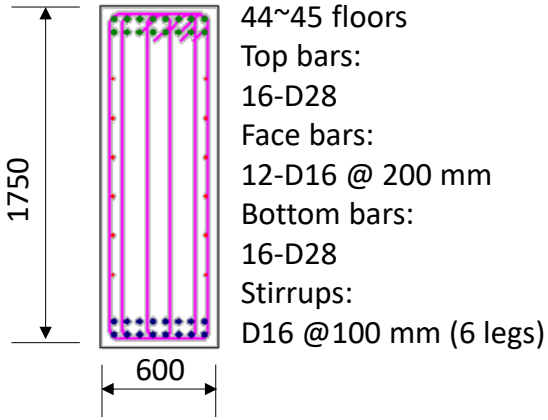
(a) 3D view (b) Plane view

Application Example

- VecTor2 model (Link beams)

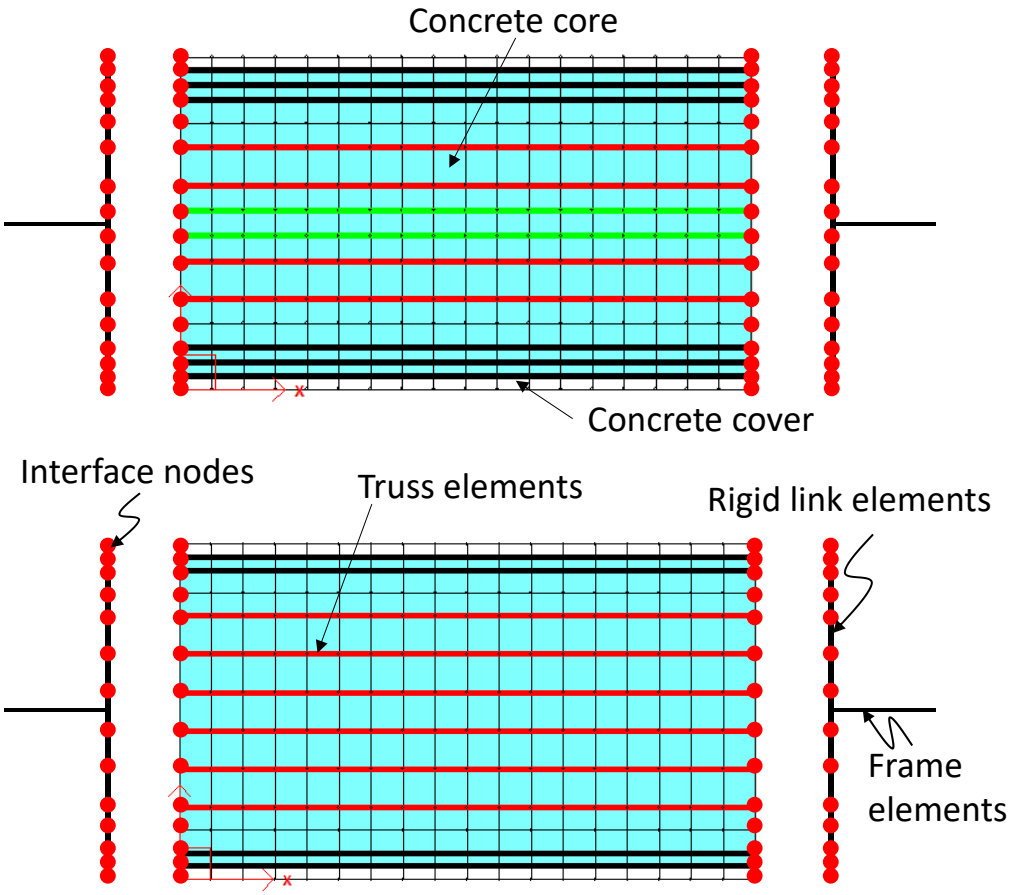


10~11 floors
Top bars:
18-D32
Face bars:
10-D16 @200 mm
Bottom bars:
18-D32
Stirrups:
D12 @100 mm (6 legs)



44~45 floors
Top bars:
16-D28
Face bars:
12-D16 @ 200 mm
Bottom bars:
16-D28
Stirrups:
D16 @100 mm (6 legs)

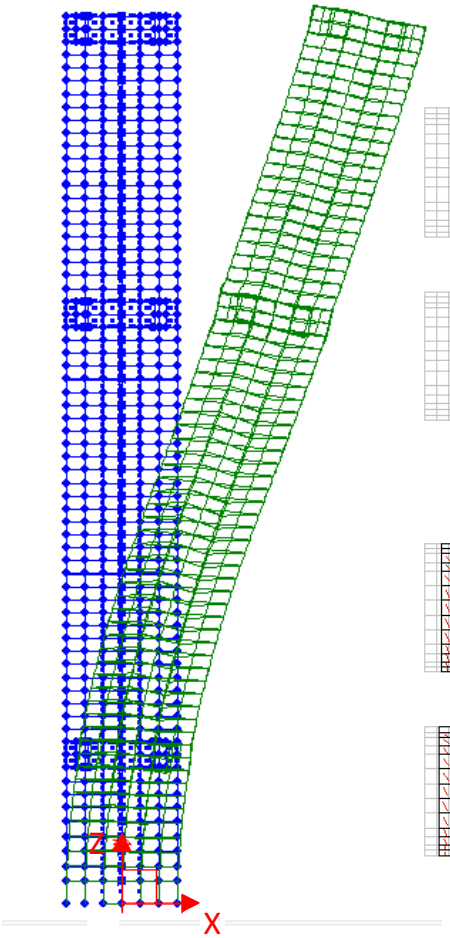
(a) Section properties



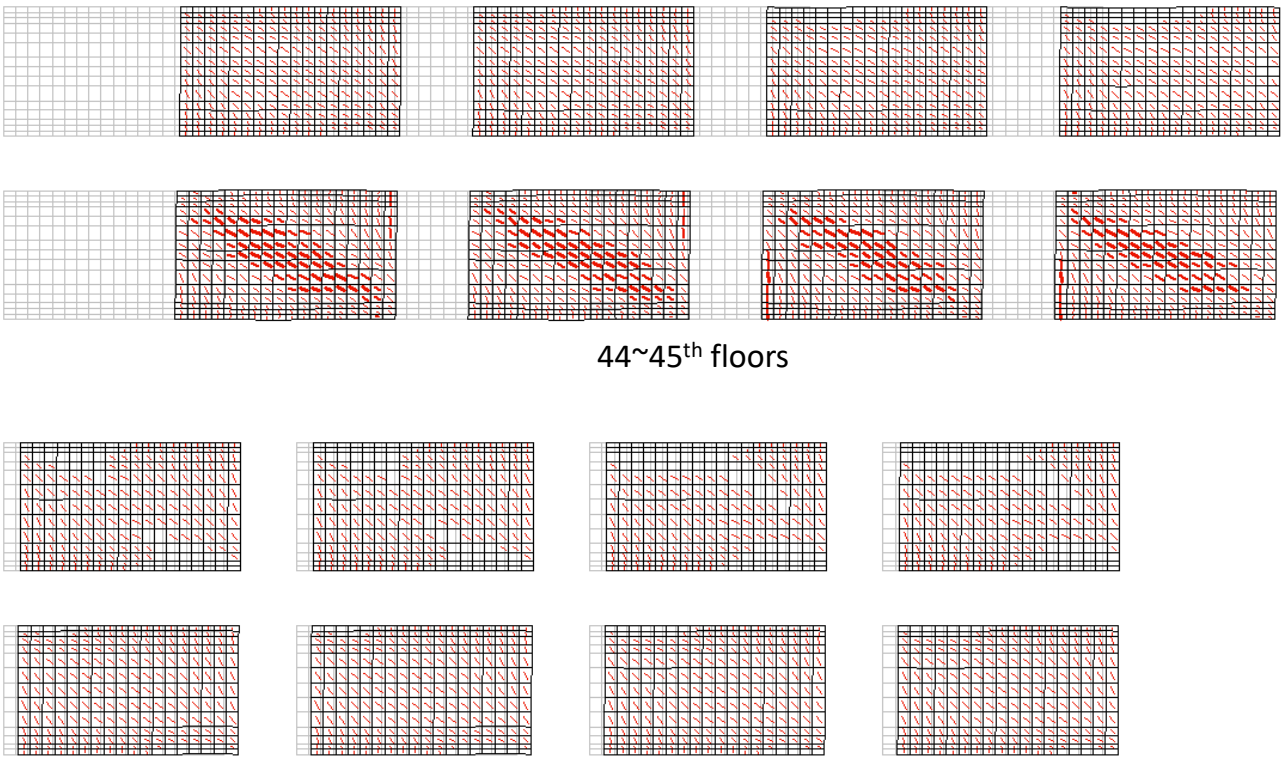
(b) VecTor2 model

Application Example

- **Pushover analysis**



(a) S-FRAME model



(b) VecTor2 model

Thanks for your attention!

Questions?