NFPinDSML Workshop

Modeling heterogeneous points of views with ModHel'X

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Outline

> ➤ Context

- ModHel'X

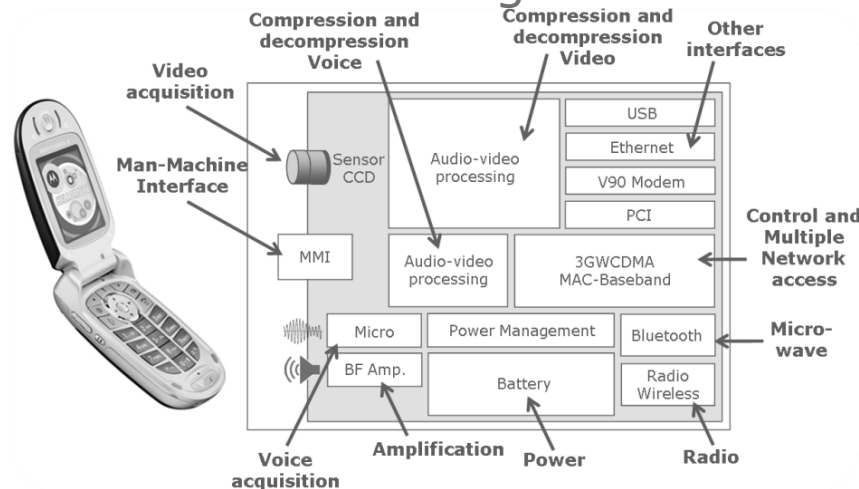- Multi-view with ModHel'X

- Conclusion & future work

Context

- **Heterogeneous systems**
  - Set of elements in interaction
    - *Embedded system (complex system: car, plane, satellite …)*
    - *Software/Hardware, digital/analog …*
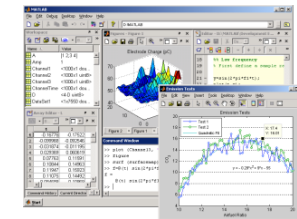
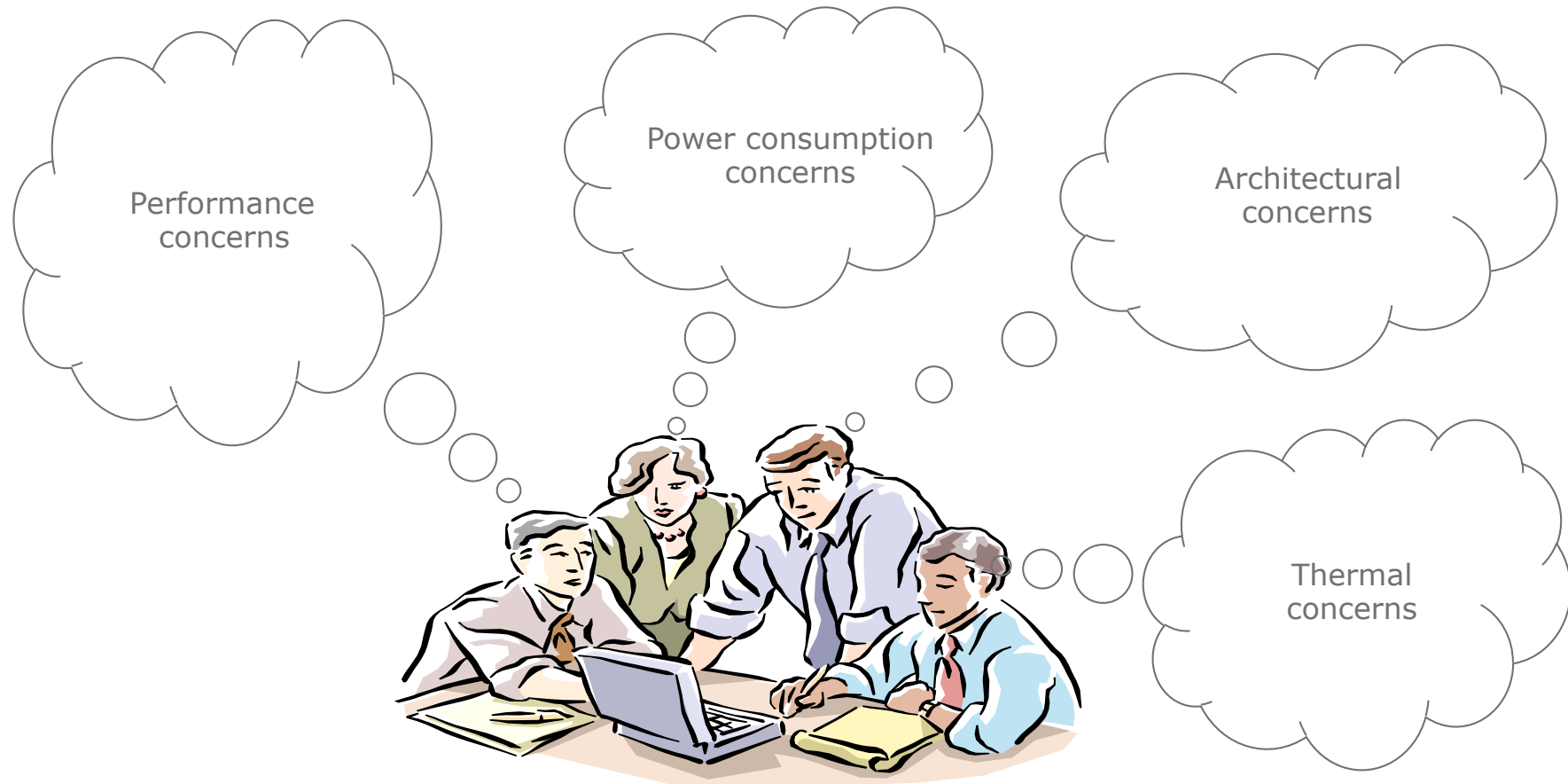- **We want to model this kind of systems**
  - We need different modeling formalisms

- **We use these models for**
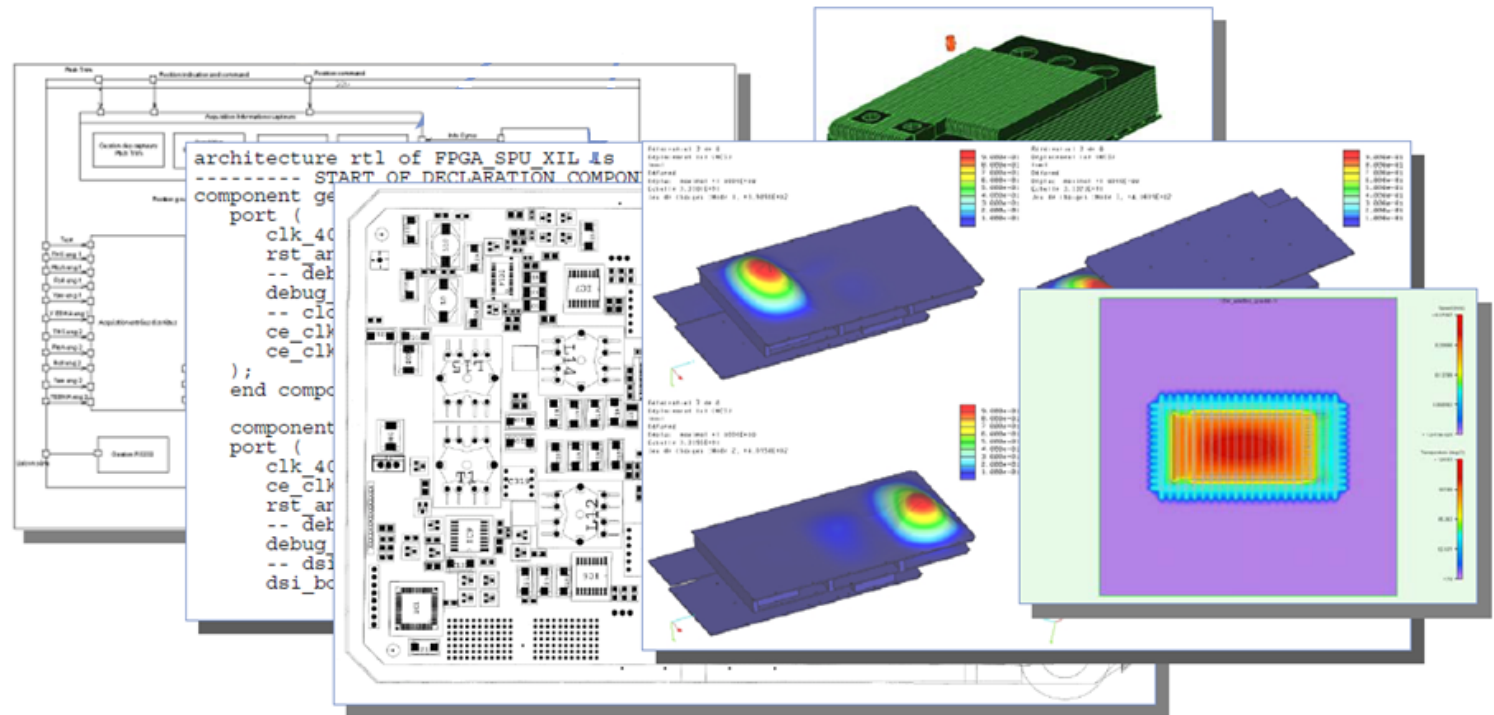 - <u>Simulation</u>, test, code generation, V&V

Context

- System => several concerns, each with its concepts and tools

Goal

- Model different points of view for our system
  - Modeling different system aspects (views) separately
    - Functional view, power consumption view, thermal view …

System

Those models must be consistent !

Outline

- Context
- ➤ ModHel'X
- Multi-view with ModHel'X
- Conclusion & future work

ModHel'X : Presentation

- Framework for modeling heterogeneous systems

  - Generic Metamodel (for describing structure)

  - Generic execution engine (for interpreting structure)
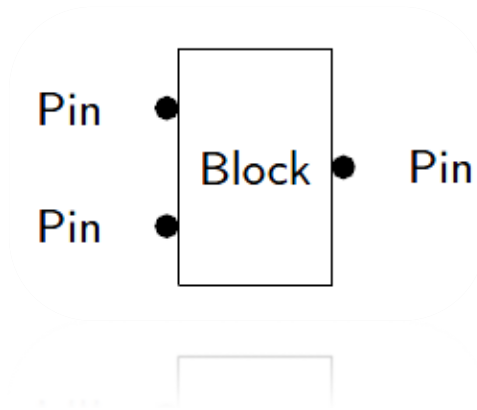
  Directed by
  A MoC

- MoC : set of rules which define the behavior of a model

  - Ex: Discrete Events (DE), Synchronous Data Flow (SDF) …

ModHel'X : Concepts (1/2)

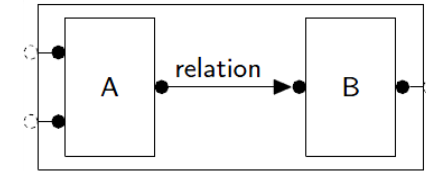■ The basic element for modeling is the **block** (black box)

■ A block is defined by

- An interface = set of Pins
- An **update** operation for observing the behavior of the block

→ The behavior of a block is observed by requiring an **update** of its interface
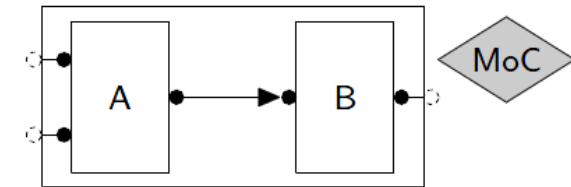
ModHel'X : Concepts (2/2)

- ## Composite Block
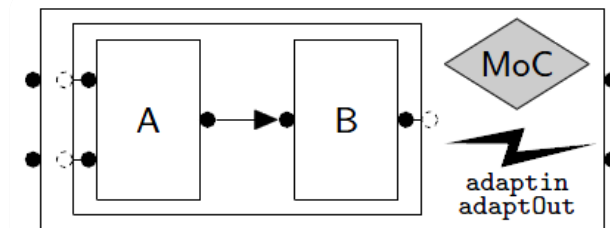 - Set of blocks with relations between their pins

- ## Model
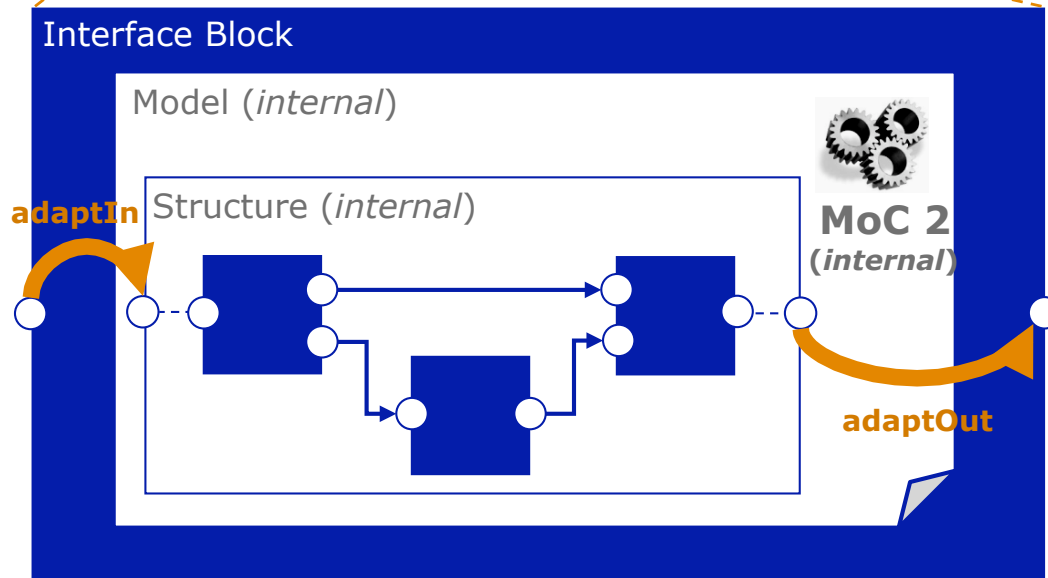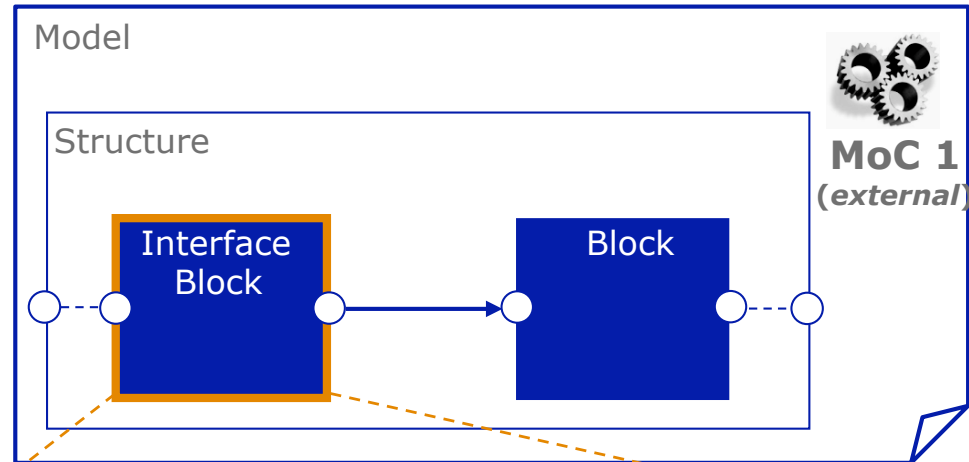 - Composite Block + MoC

- ## Interface Block
  - For hierarchical composition
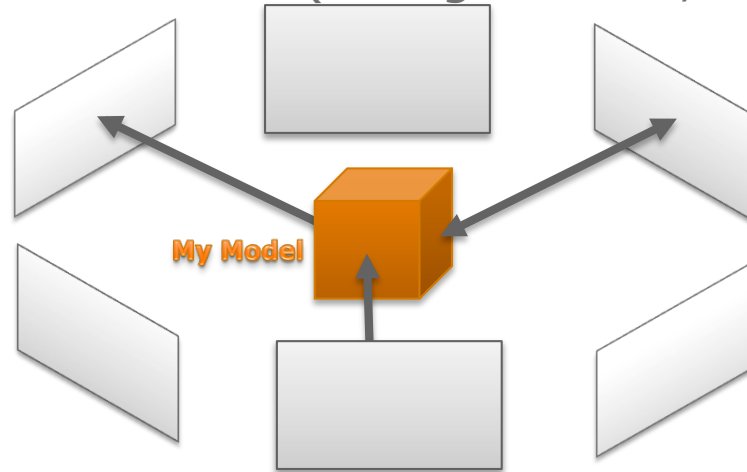 - Heterogeneity

Summary

Outline

- Context
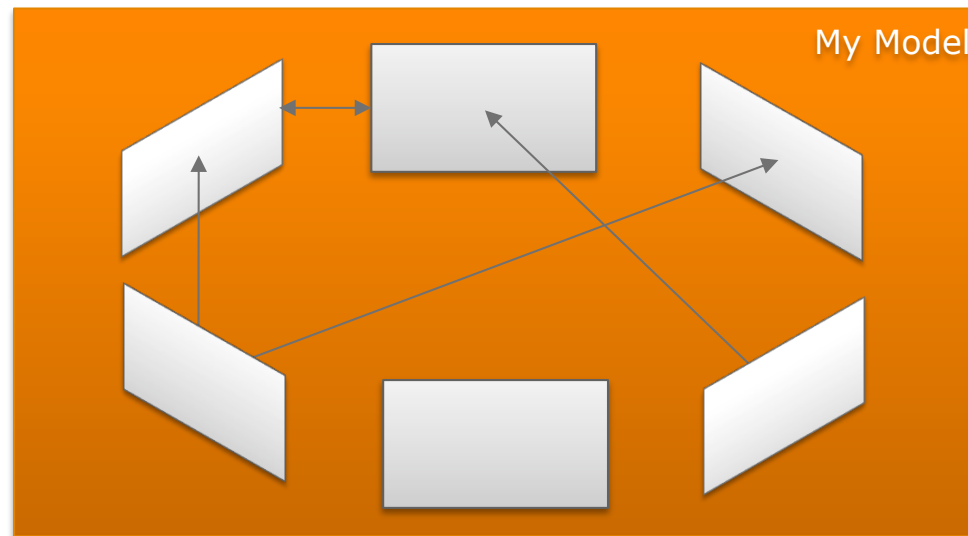- ModHel'X
- **Multi-view with ModHel'X**
- Conclusion & future work

Multi-view modeling

- Tow kinds of approaches
  - With a "reference model" (Attiogbé et al., VUML)

  - Without a "reference model" (Rosetta, Benveniste et al.)
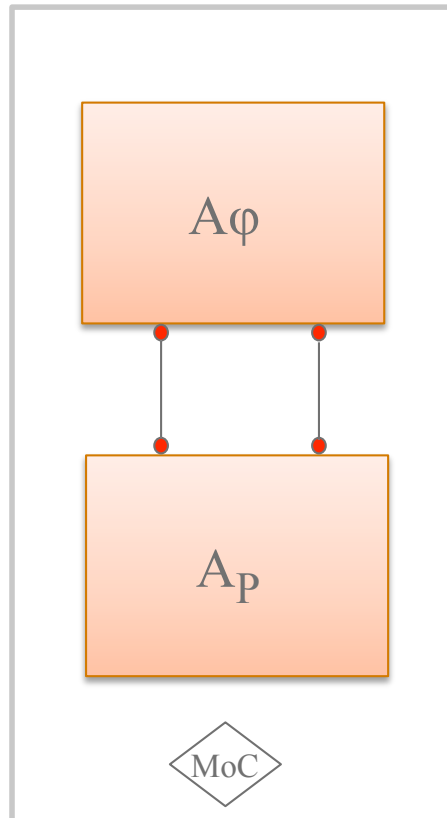

Use ModHel'X
➔ Different views of the same system

Multi-view with ModHel'X

- **Use the same abstract syntax as in ModHel'X**
  - Block, pin, relation, MoC

- **Each view is an observable behavior**
  - View = ModHel'X Block

- **Main issue**
  - ➜ Ensure consistency between views

Multi-view with ModHel'X

- A = (sub)-system
  - ▸ A_φ : Functional view
  - ▸ A_P : Power consumption view

- How to maintain consistency ?

➜ Define consistency rules using relations between pins
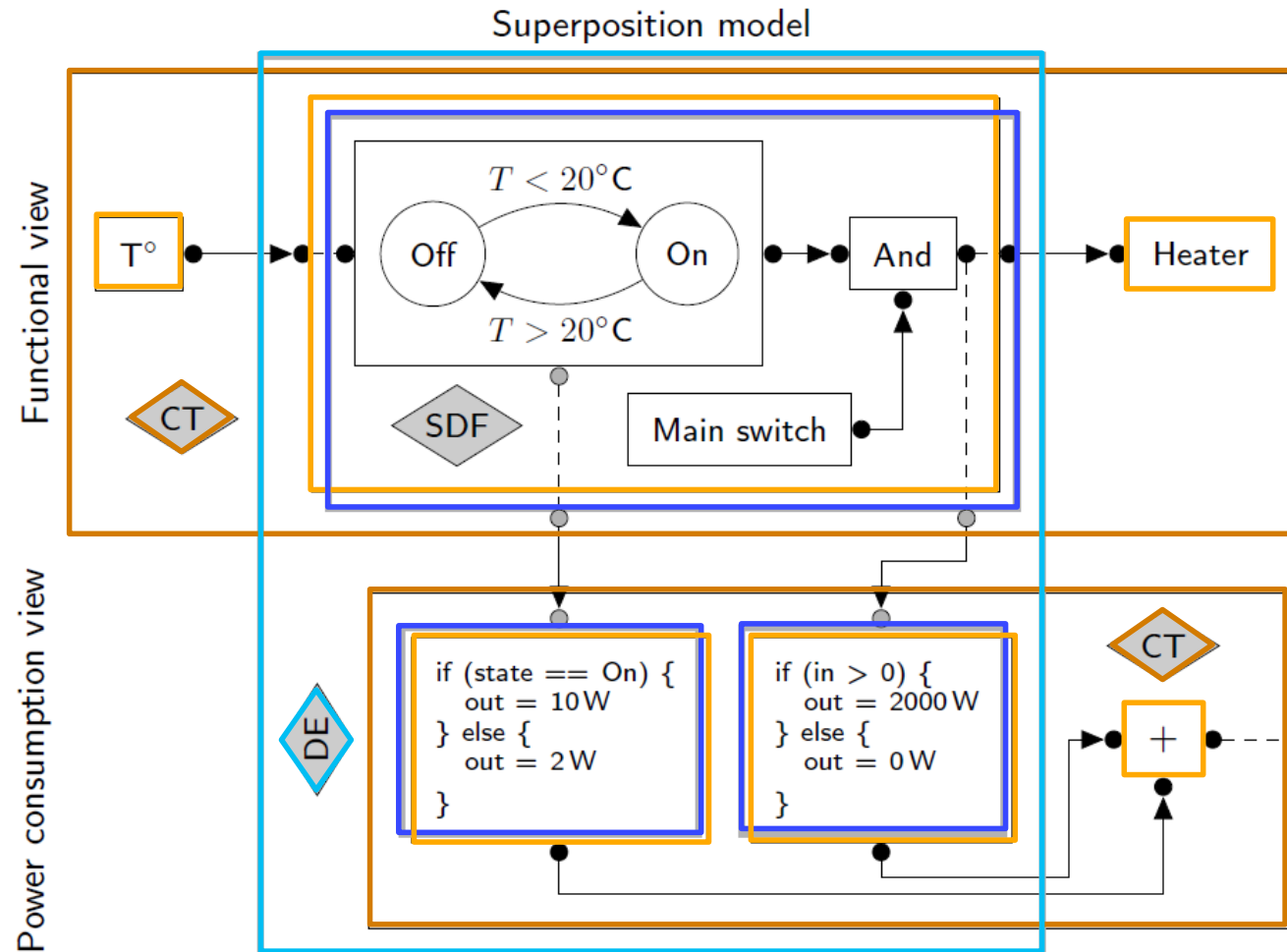
Multi-view Modeling with ModHel'X

Functional view
φ

Power consumption view
P

Superposition Model
of sub-system A

Superposition Model
of sub-system B
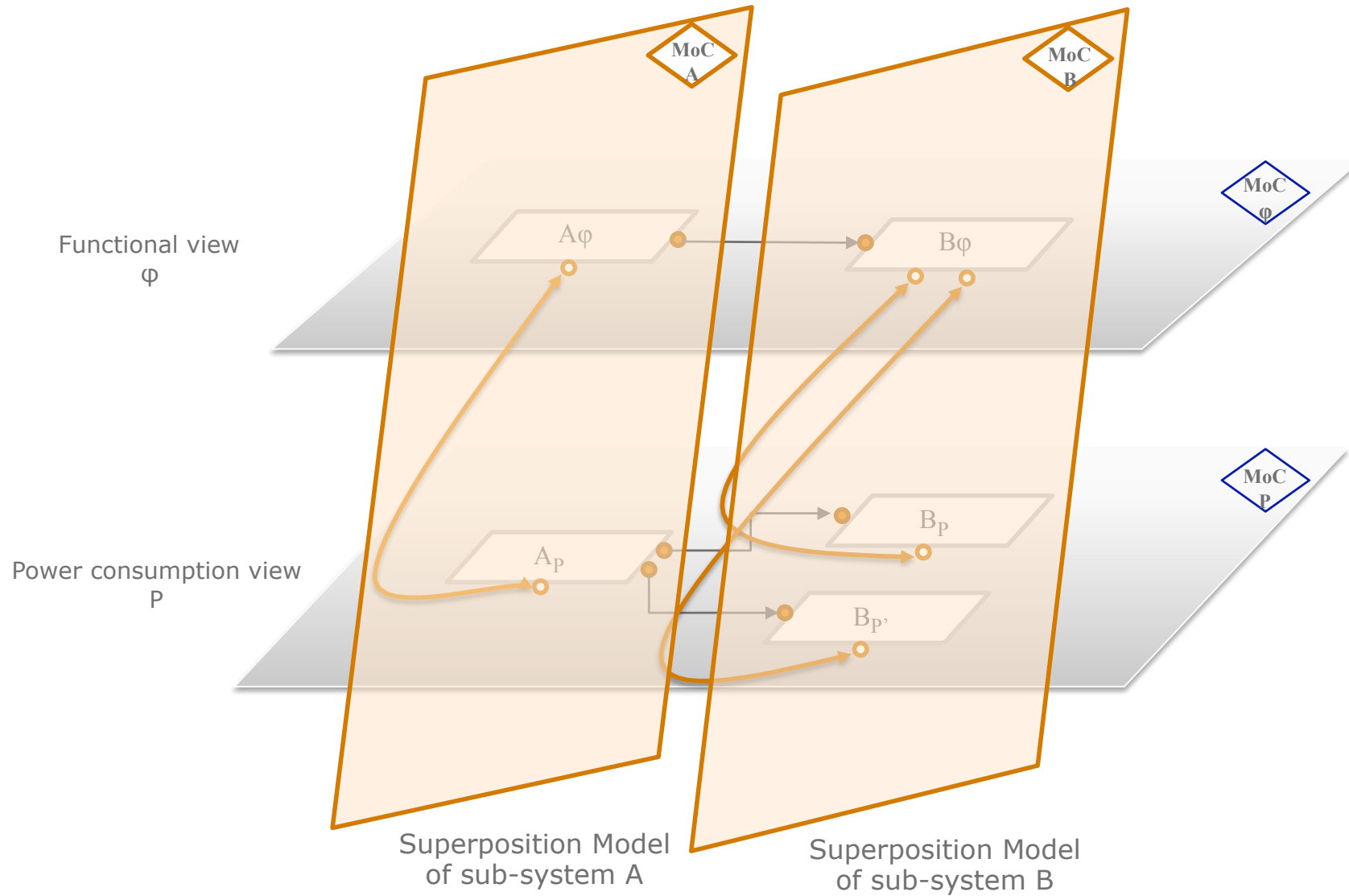
Example

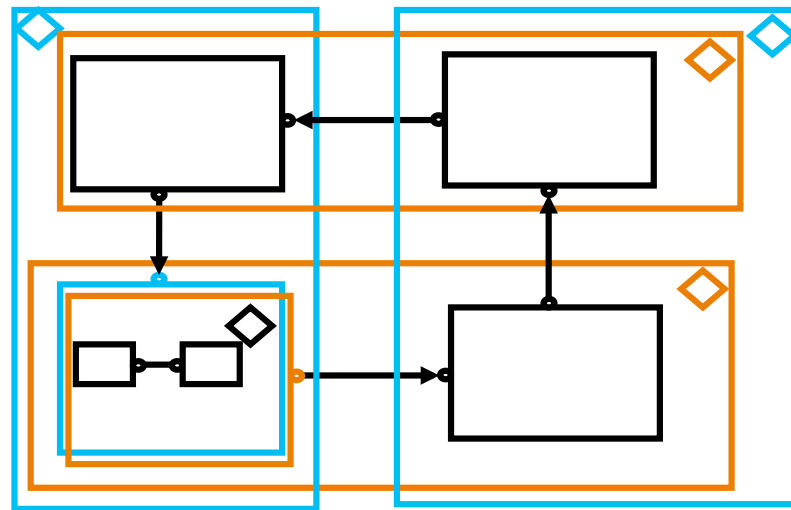■ Thermostat of a heater

Example

Outline

- ■ Context

- ■ ModHel'X

- ■ Multi-view with ModHel'X

- ➤ Conclusion & future work

Conclusion & future work

- Modeling heterogeneous system with ModHel'X

- We keep the syntax of ModHel'X, to create superposition model

- Problems
  - How to deal with the tow kinds of interfaces when computing the global behavior
  - How to define the access rights to pins

  ...

Thanks for your attention

Questions ?