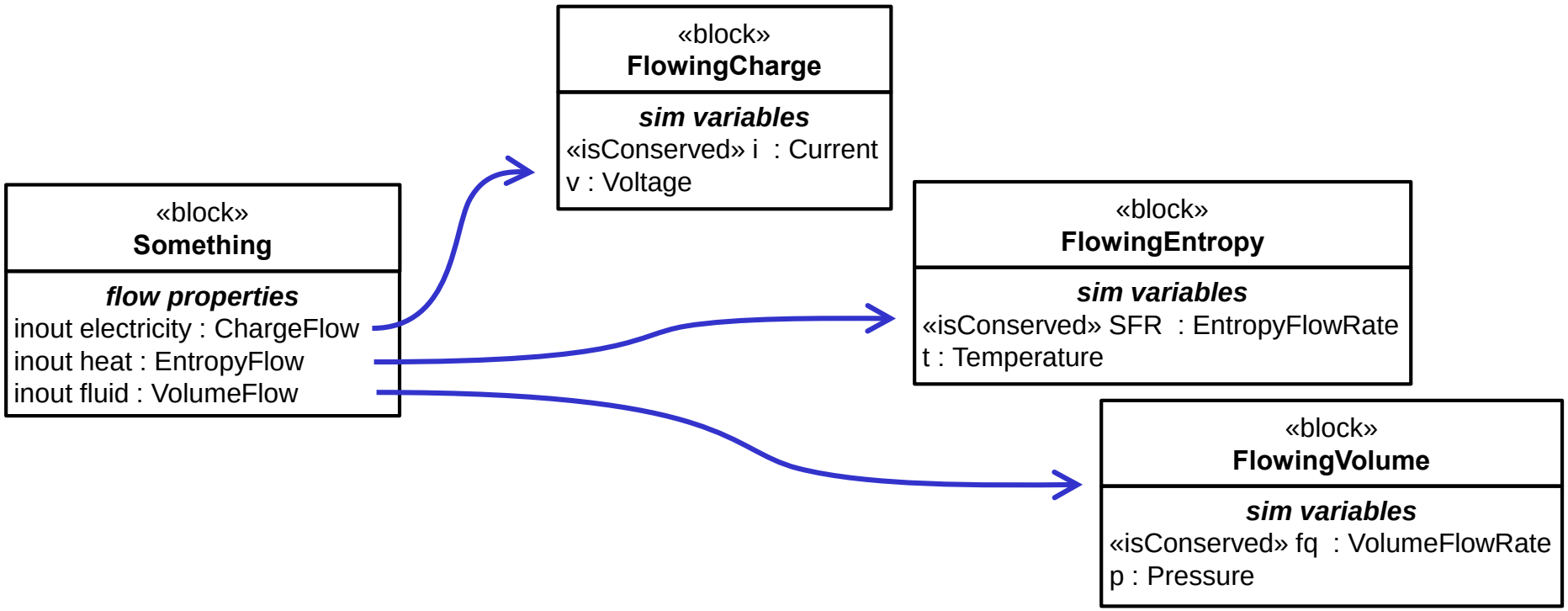
Where to put physical flow variables?

SysMLPISF FTF

SimVars & Port Types

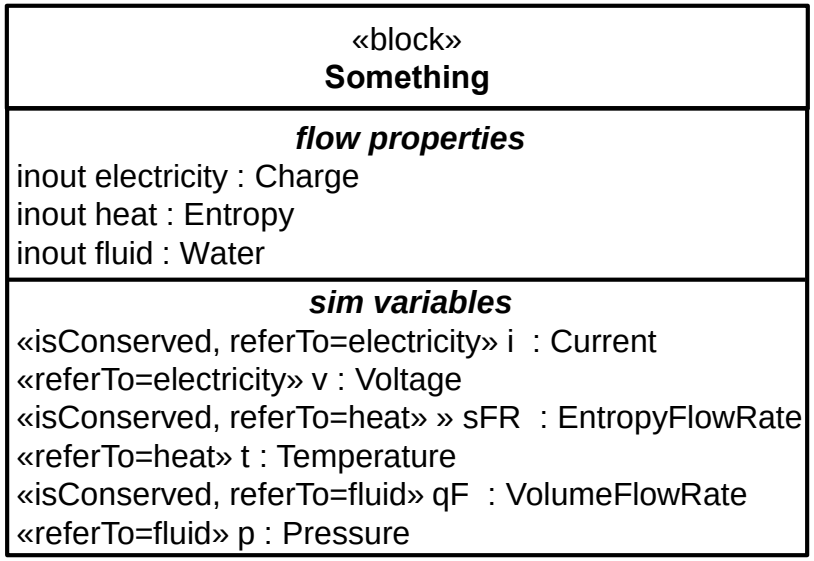
- What block owns simulation variables (SimVariable) for physical interactions?
- Options:
  - Flow property types (kinds of things flowing).
  - Port/block types (kinds of things / boundaries through which physical substances flow).
  - SimBlocks (separate blocks from flow property types and port/block types).

1. SimVars on Flow Prop Types?



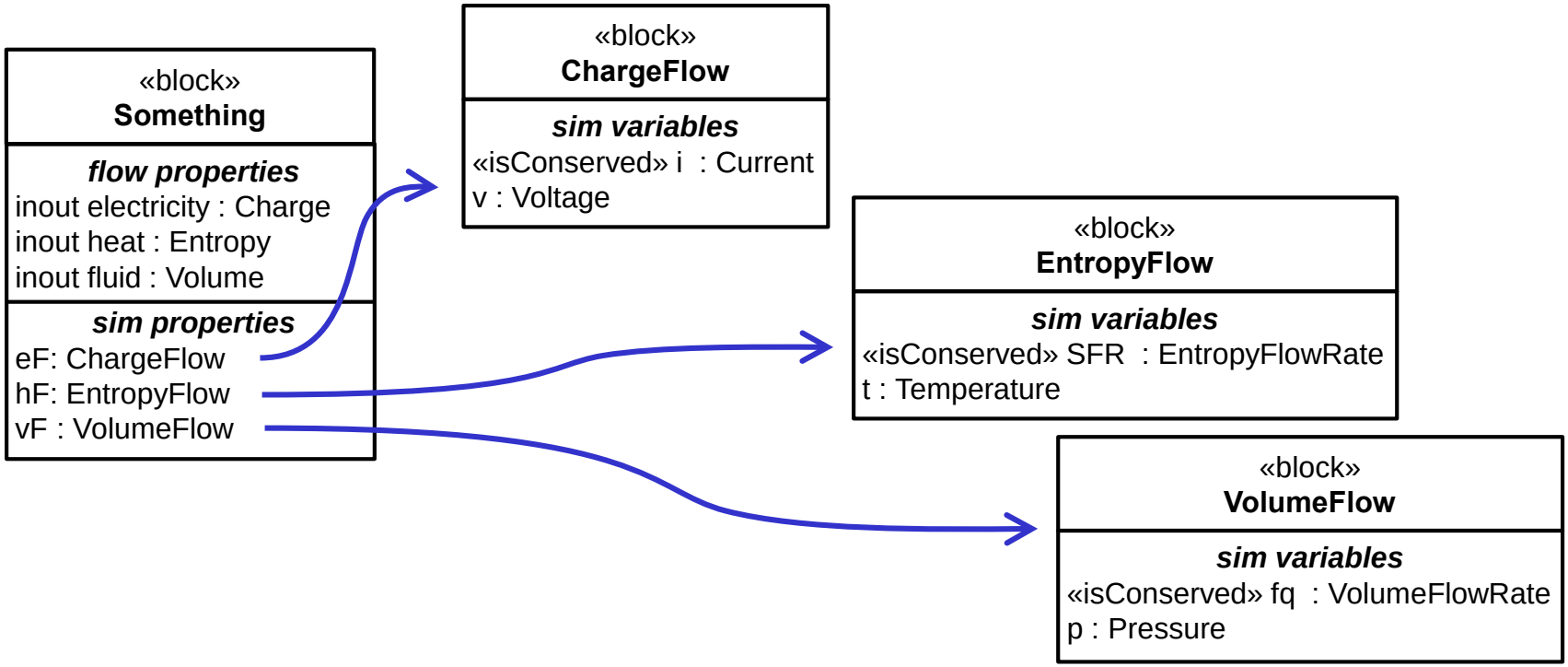
- **Flow rate (and potential) are relative to ports or object boundaries the substances flow through.**
- **Flow rate and potential are not characteristics only of the kind of thing flowing.**

2. SimVars on Port Types?



- **SimVariables for all flow properties on the port/block type.**
- **Reflects that potential and flow rate are relative to the port/block boundary.**

3. SimVars on SimBlock?



- **SimVariables on separate block, not flow property type or port/block type.**

Pros/Cons

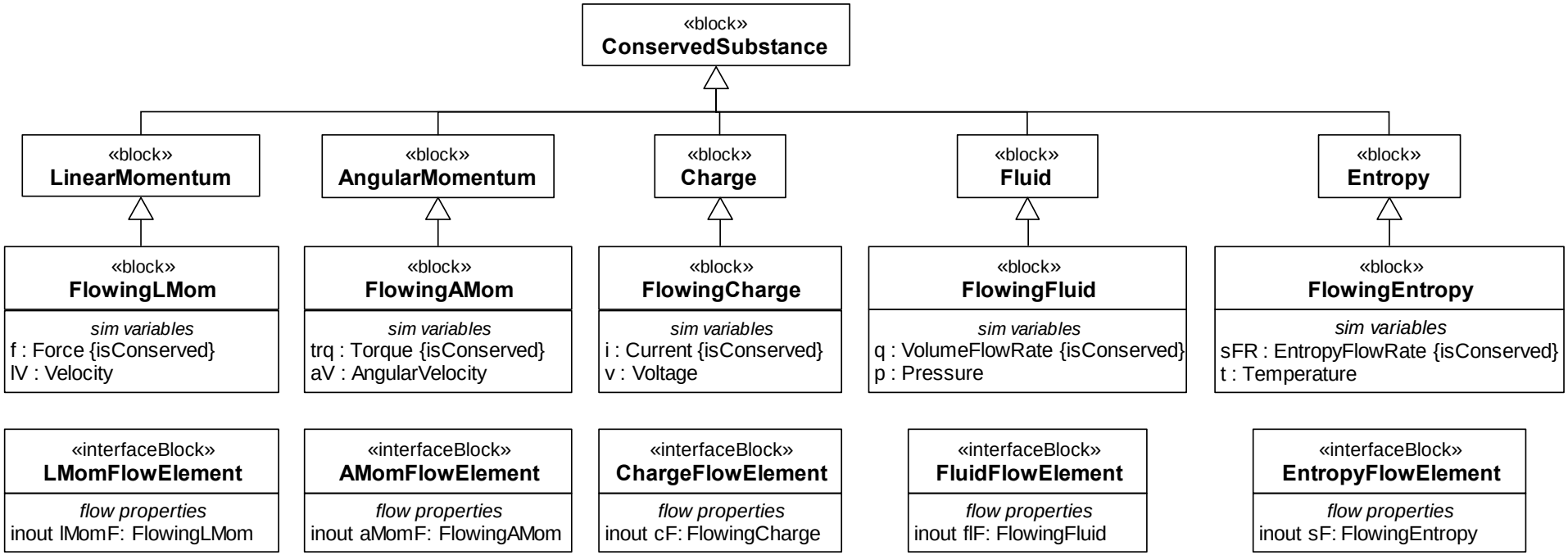
Sim variables on ↓	Clutter on block / port type	Fidelity to the thing being modeled
1. Flow property types (the kind of thing flowing)	Low	Low
2. Port types	High	High
3. SimBlocks (separate from flow property type & port types)	Medium	Medium

Discussion

- **Lack of fidelity to the thing being modeled can be resolved by**
  - **This kind of simulation treats the things flowing as continuous (eg, charge, not electrons).**
    - **Flow properties always have values (always giving potential and flow rate).**
  - **Flow properties can be typed by role types[1] (eg, FlowingCharge) specialized from substance types.**
    - **Role types only classify substances that are values of flow properties, adding sim variables that are relative to the port.**

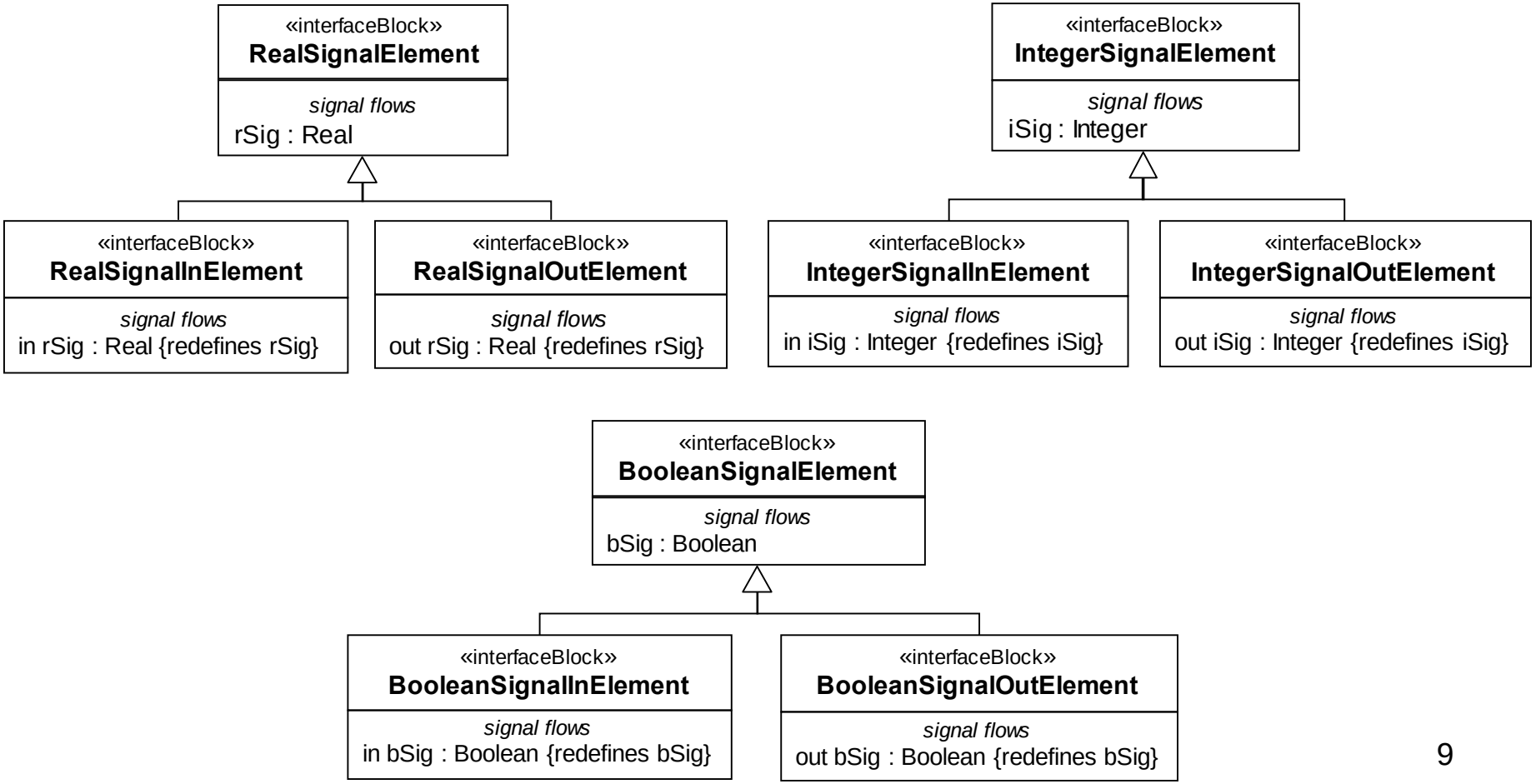
Discussion

- If fidelity issues are resolved, we can pick solution with least clutter (#1).
- Physical interaction library would be:



Discussion

- **Signal flow library would be:**



Discussion

- **The stereotypes would be:**