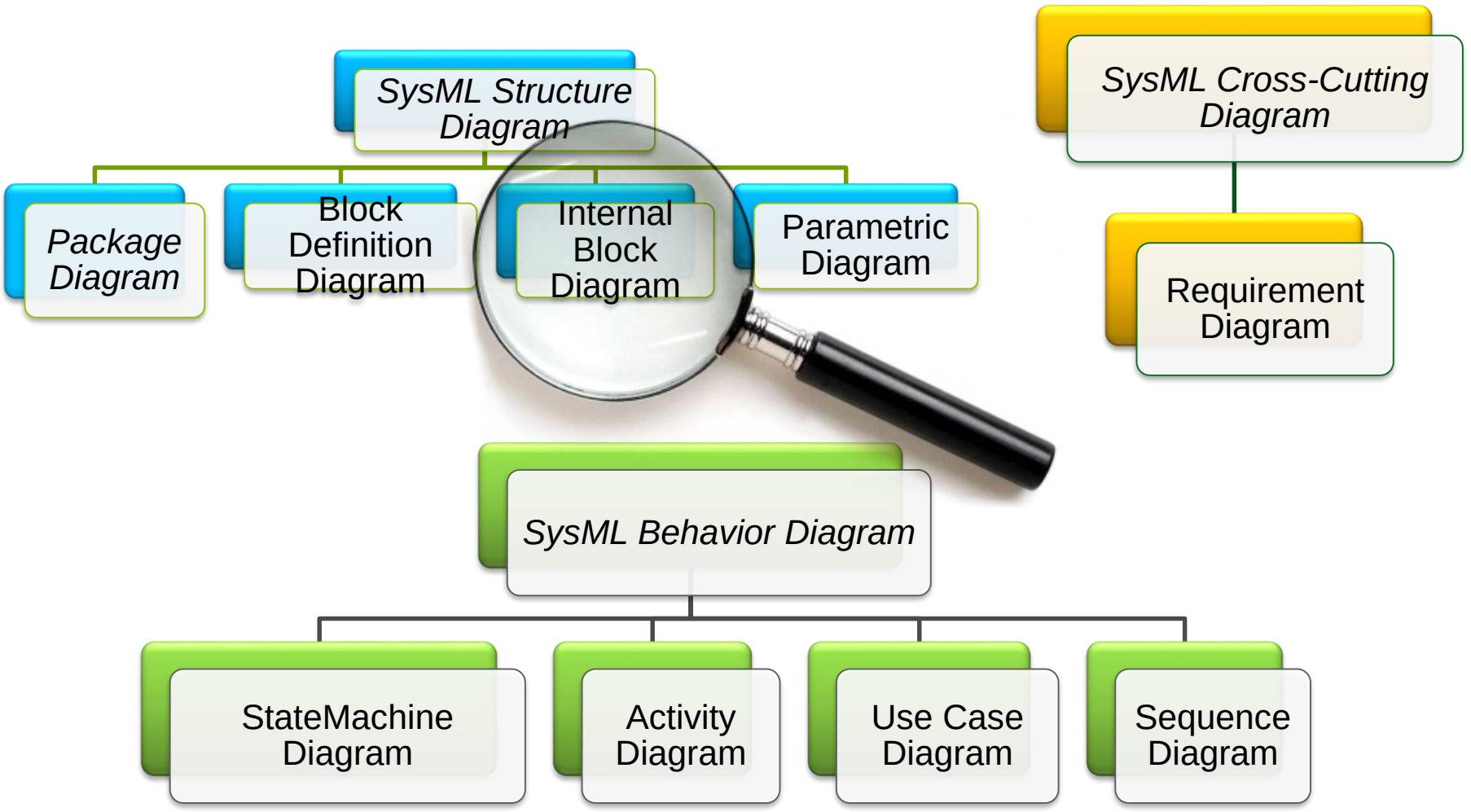
DE LA RECHERCHE À L'INDUSTRIE

STRUCTURAL ARCHITECTURE MODELING WITH SYSML

Software and system engineering department (DILS)
Laboratory of model driven engineering for embedded systems (LISE)

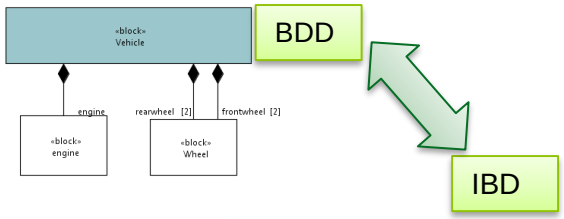
www.cea.fr

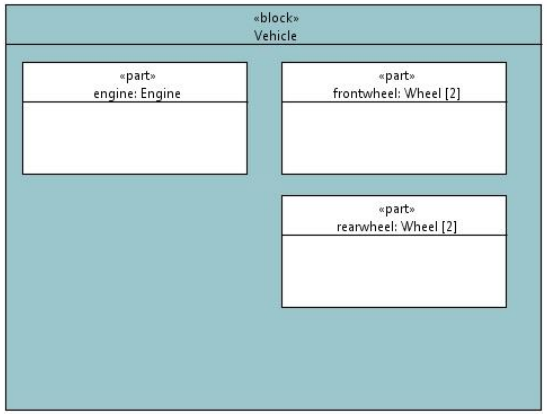
INTERNAL BLOCK DIAGRAM



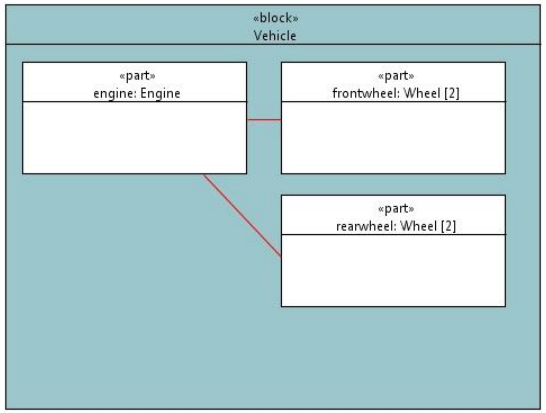
Internal Block Diagram (IBD)

- Describes the internal structure (architecture) of a block, which is the context of the IBD.
- In the BDD we already defined block properties (part, references, etc), but in IBDs :





(1) we have a different view, in which properties are represented as squares inside the Block



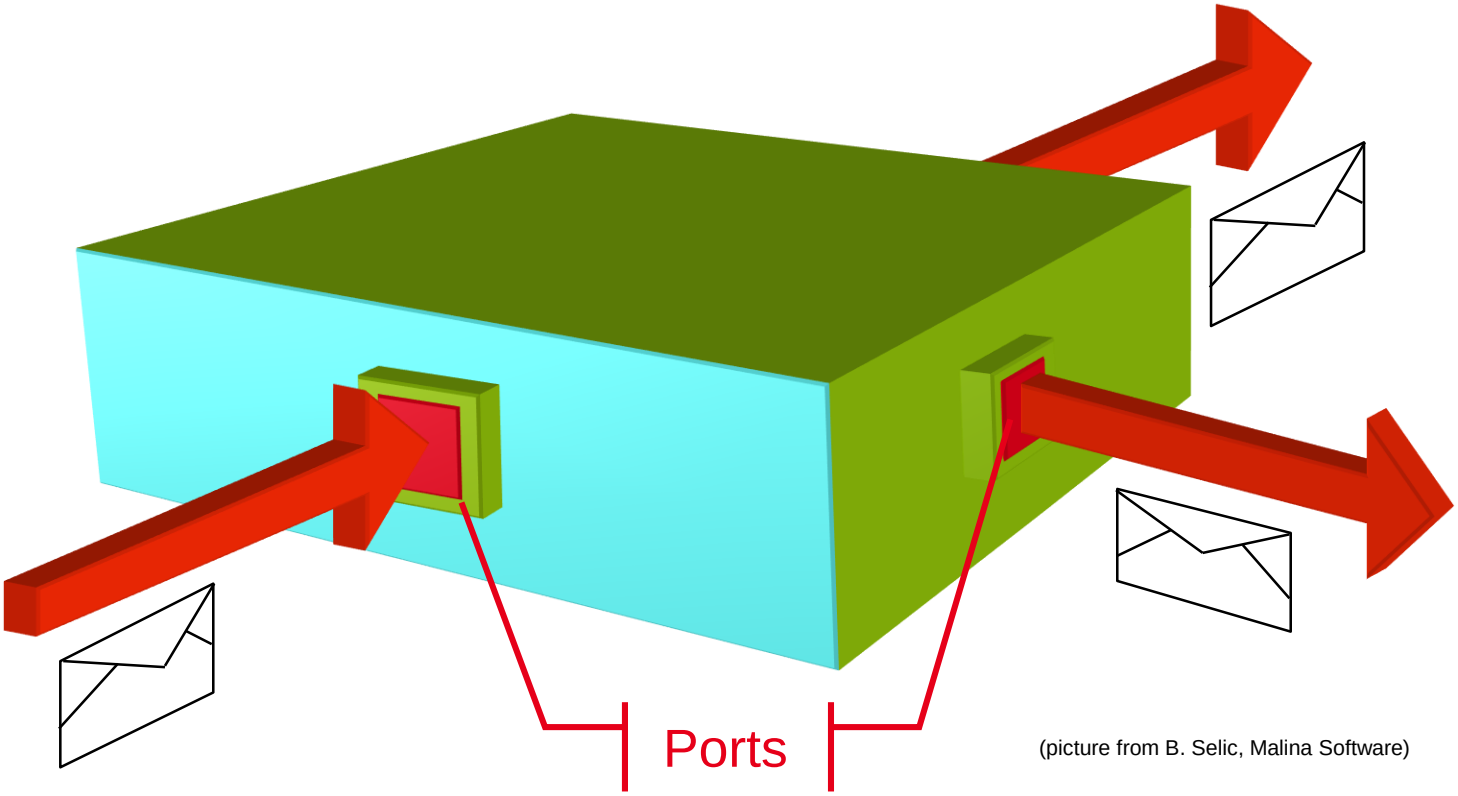
(2) we can add information about logical or physical wires (connectors) connecting these properties

The IBD allows describing the connection 'logic' through ports

- The services provided and required through standard UML Ports. A standard port specifies the services the owning block provides (offers) to its environment as well as the services that the owning block expects (requires) of its environment. In general **standard ports are used in the context of service-oriented components** and/or architectures, either when specifying software components or applying a service-based approach to system specification
- The flows produced and consumed through SysML Flow Ports. A flow port specifies the input and output items that may flow between a block and its environment. Flow ports are interaction points through which **data, material, or energy can enter or leave the owning block**. The specification of what can flow is achieved by typing the flow port with a specification of things that flow.

Ports are interaction points

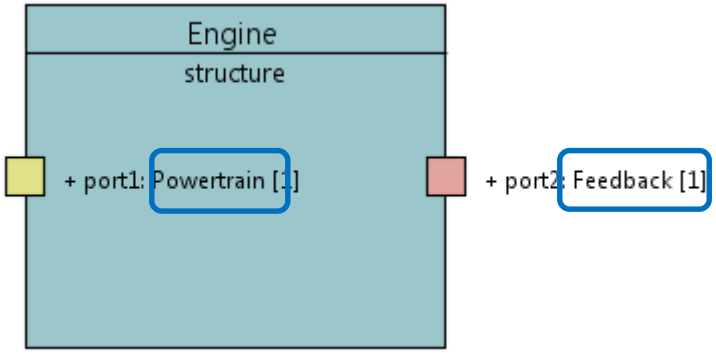
- Between the class/part and its internal structure
- Between the class/part and its environment



(picture from B. Selic, Malina Software)

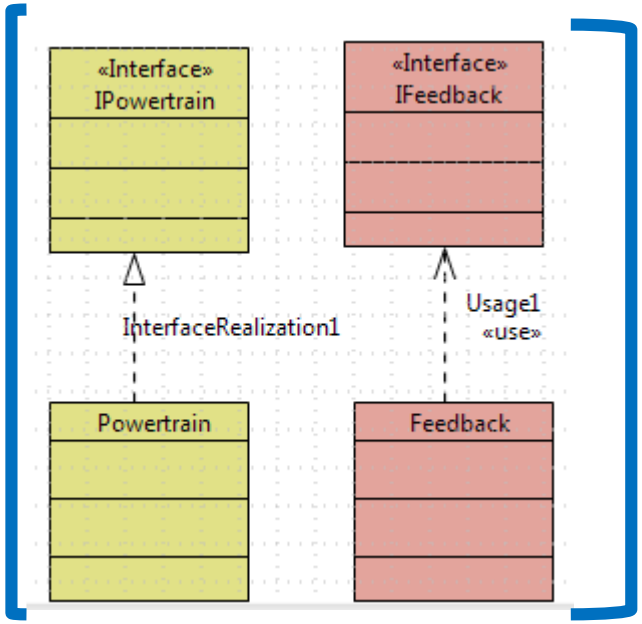
REQUIRED/PROVIDED SERVICES THROUGH STANDARD PORTS

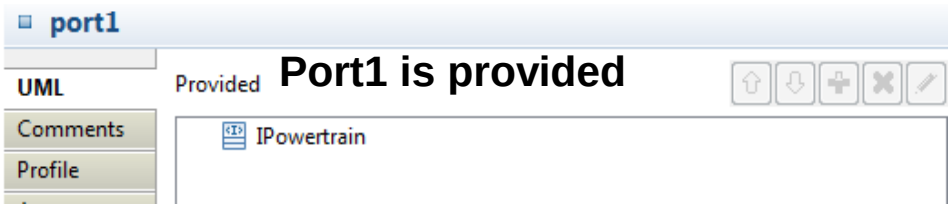
The Engine block has two ports typed by Powertrain and Feedback.



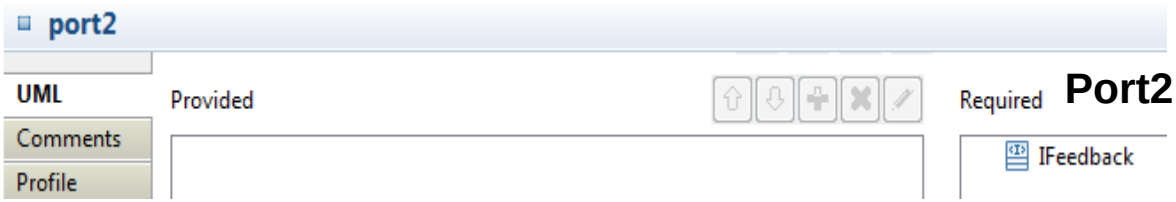
Powertrain realizes the IPowertrain interface

Feedback uses the Ifeedback interface





Port1 is provided



Port2 is required

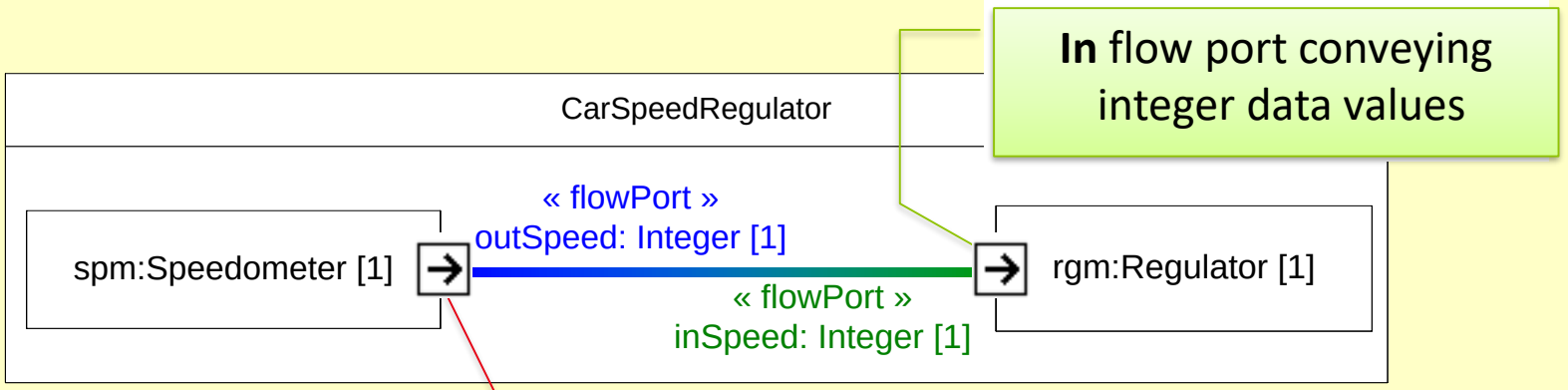
Two Types

FlowPort deprecated in SysML 1.4!

- Atomic (single flow)
- Non-atomic (aggregation of flows of different nature)

Atomic Flow Ports :

- Name
- Direction = {IN, OUT, INOUT}
- Type: type of item sent or received on the port. It can be a block, a datatype , primitive type or a value type
- Multiplicity (by default = 1)



FLOW PORT (NON-ATOMIC)

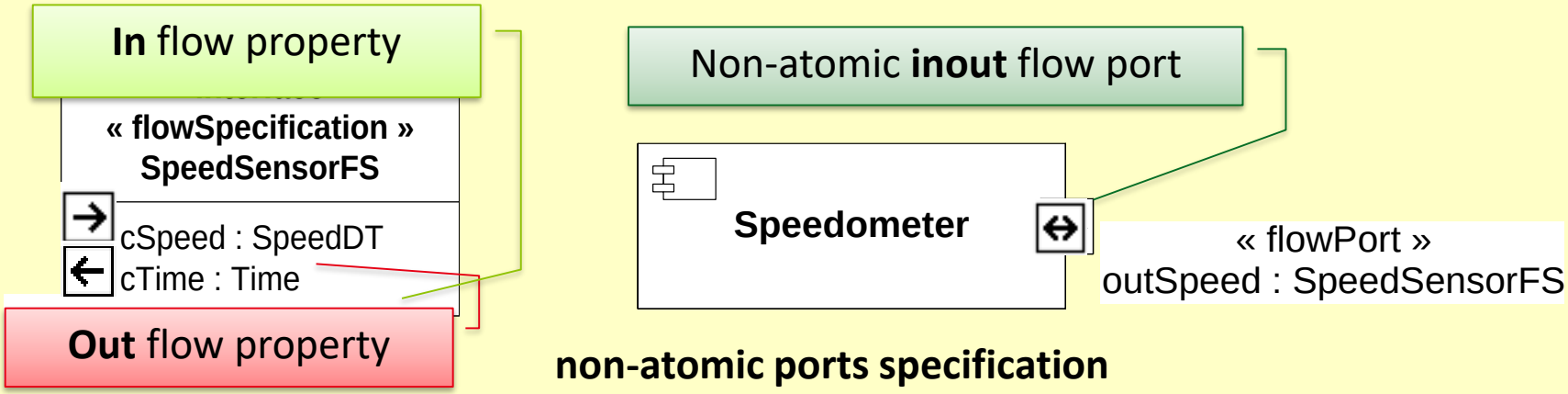
FlowProperty

- A FlowProperty specifies a single flow element to/from a block. A flow property has the same notation as a Property. It has a direction prefix (in | out | inout). Flow properties are listed in a compartment labeled “flowProperties” of a FlowSpecification.

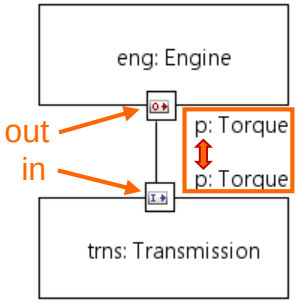
FlowSpecification

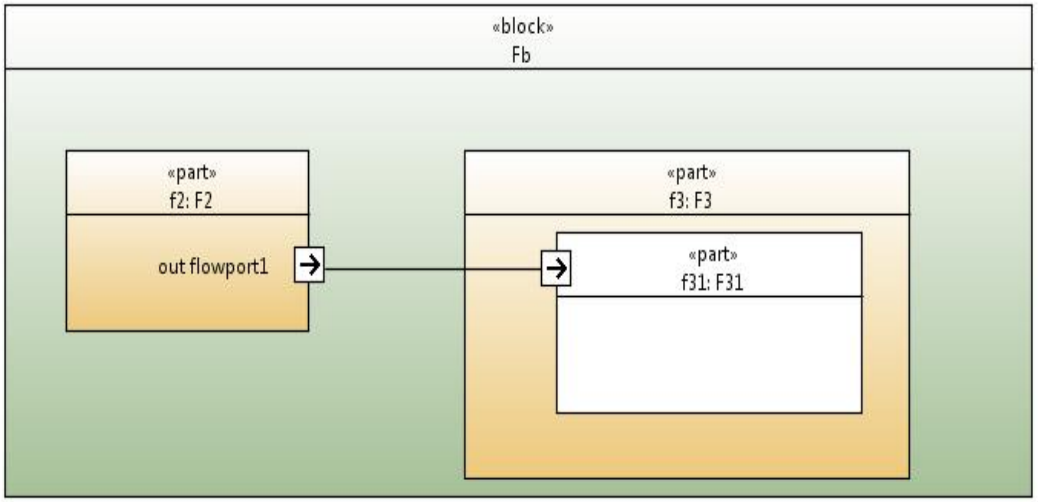
FlowSpecification deprecated in SysML 1.4!

- A FlowSpecification specifies inputs and outputs as a set of flow properties. It has a “flowProperties” compartment that lists the flow properties.



- **Connector** specifies links that enables communication between two or more ports or parts.
- **Connected FlowPorts must have a compliant definition**: opposite direction on each side (or inout on both sides)
- **Connectors are owned by the block (Fb)**. The connector **can cross** a part boundary if the encapsulating block (F3) is not a black box (isEncapsulated attribute of Block equal to false)





Your turn

- Design the internal architecture of the parts of the system. This implies the definition of internal block diagram for each part that is worth a refinement.
- Add the port that enable the exchange of information between part.
- Those ports must be typed.
- Use connectors to relate the ports that will exchange information.

Do it in Papyrus

- Create an IBD diagram for the Rover and Remote Blocks