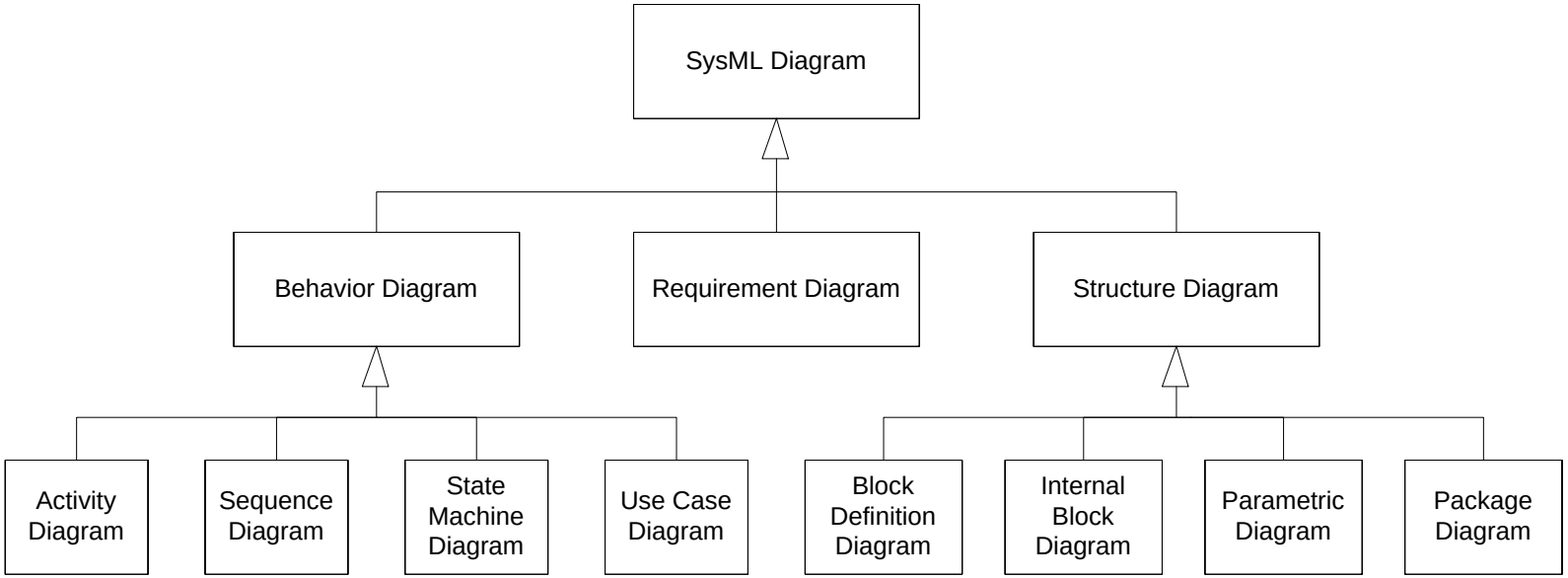
SysML Structural Diagrams 1

Introduction to Systems Engineering
I2ISE

SysML: Diagram types



Introduction

- There are 4 different types of structural diagams:
  - Block Definition Diagram (bdd) – Structural system elements called *blocks* and their composition
  - Internal Block Diagram (ibd) – Interconnection and interfaces between the *parts* of a block
  - Parametric diagram (par) – Constraints on property values
  - Package diagram (pkg) – The organization of a model into *packages* that contain model elements

Blocks

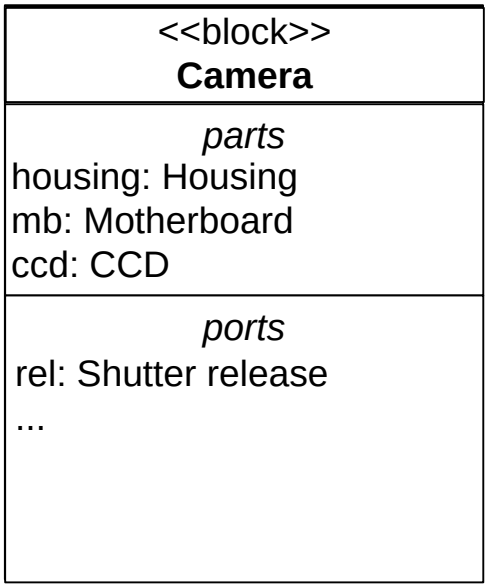
SysML structural diagrams – the *blocks*

- The *block* is the fundamental model element for describing system structure
  - Hardware, software, person, facility, water, atmosphere, files,…

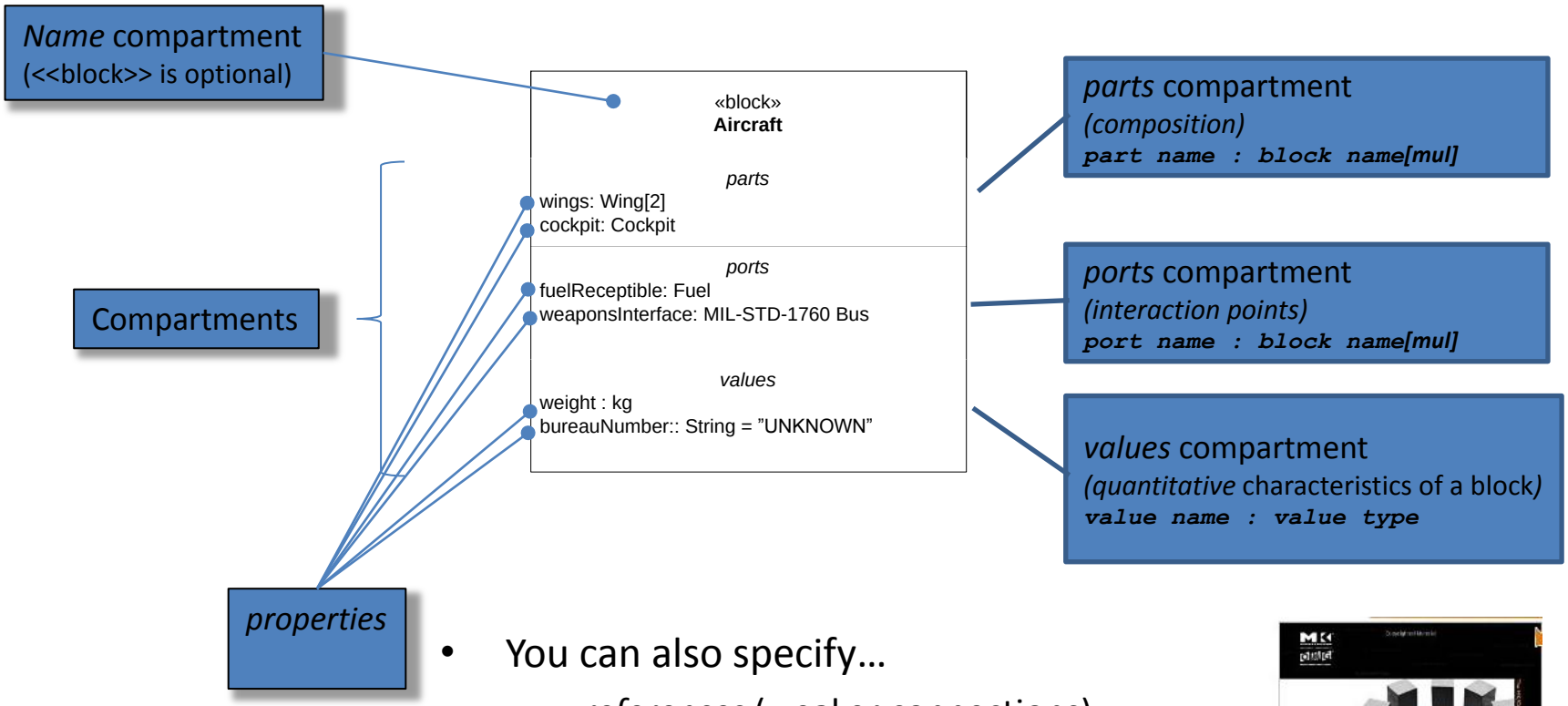
- The block is a *type*
  - A common description of similar *instances*, just like a C++ class

Blocks

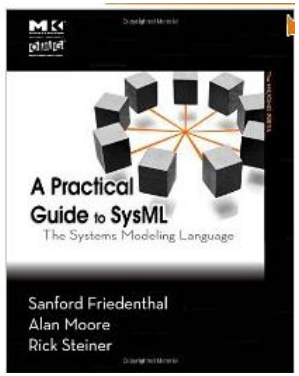
- The block is drawn as a *rectangle* on a diagram canvas
- The block may be divided into *compartments*
- The top compartment always contains the block's *name*
  - *Name* is mandatory
  - `<<block>>` is optional
- Other compartments may be used to represent other block features
  - Parts, operations, ports, …
- Each compartment contains *properties*



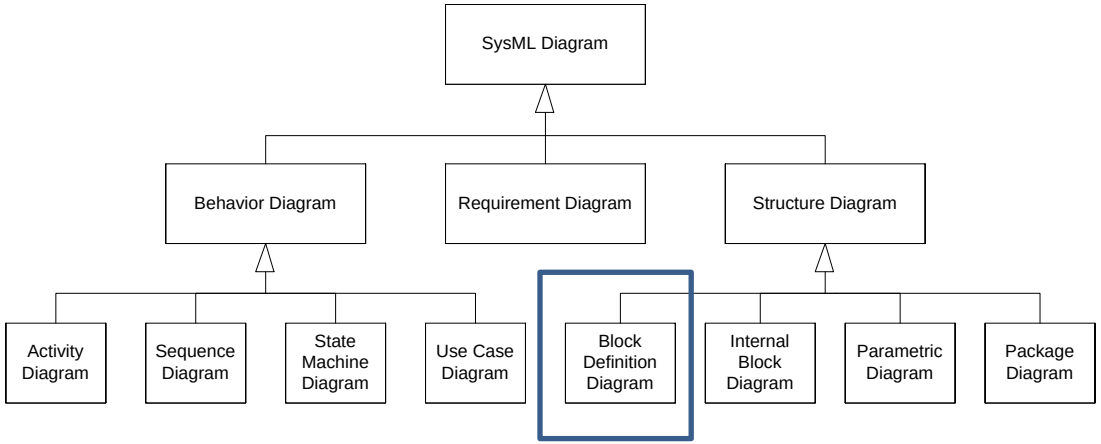
Blocks – the works



- You can also specify…
  - *references* (weaker connections)
  - *value types* and their *units* and *dimensions*
  - *read-only properties*
  - *initial* property values, their *distribution*
  - …



SysML
Block Definition Diagrams



SysML: Block definition diagram

- A *Block Definition Diagram (BDD)* is used to define *blocks* and their relationship other blocks (their *composition*)

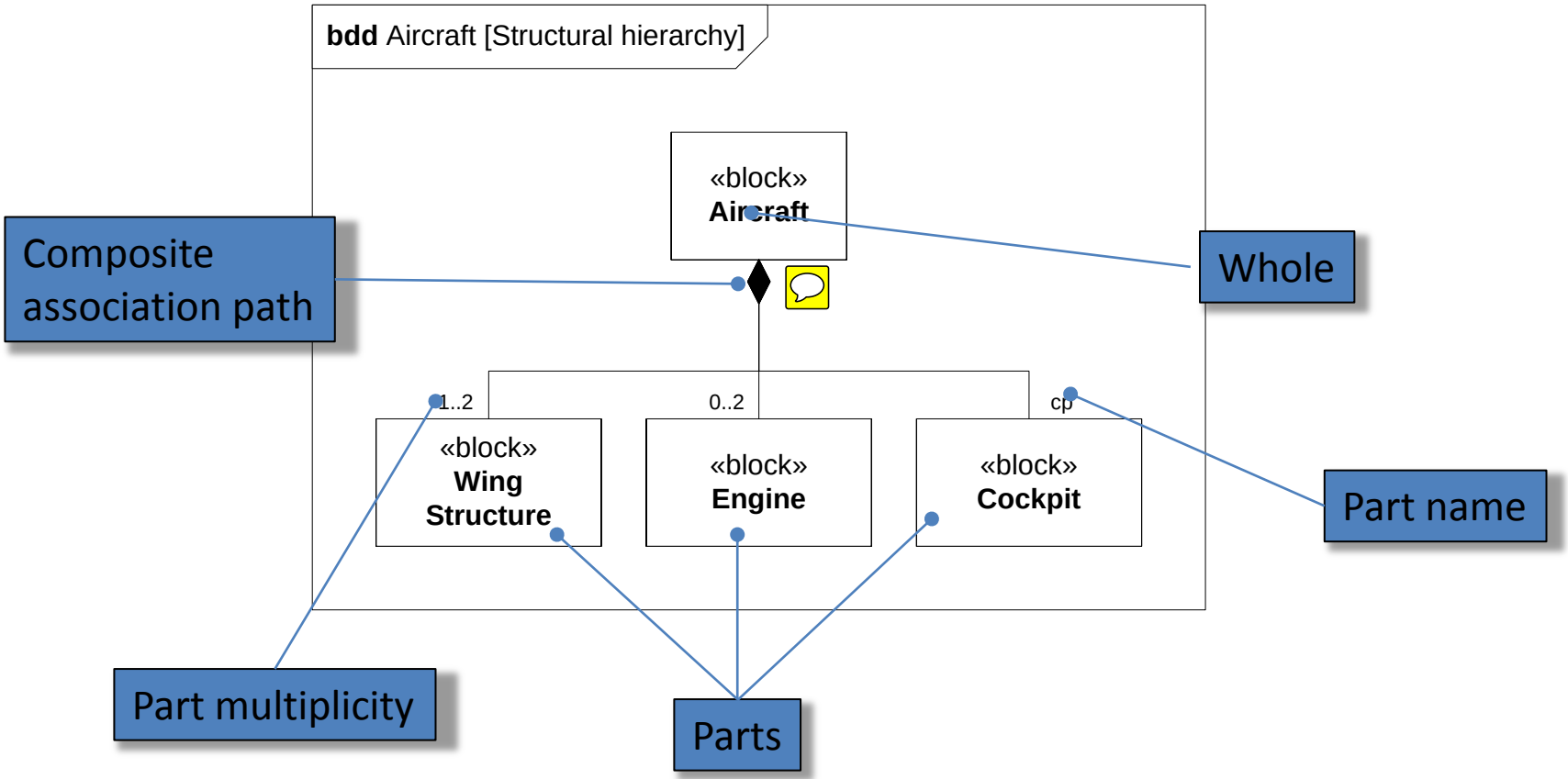
- A BDD may be used to define any kind of structure
  - Logical, physical, etc.

- BDDs are also used to define other relationships between blocks, e.g. allocation of functions to physical entities

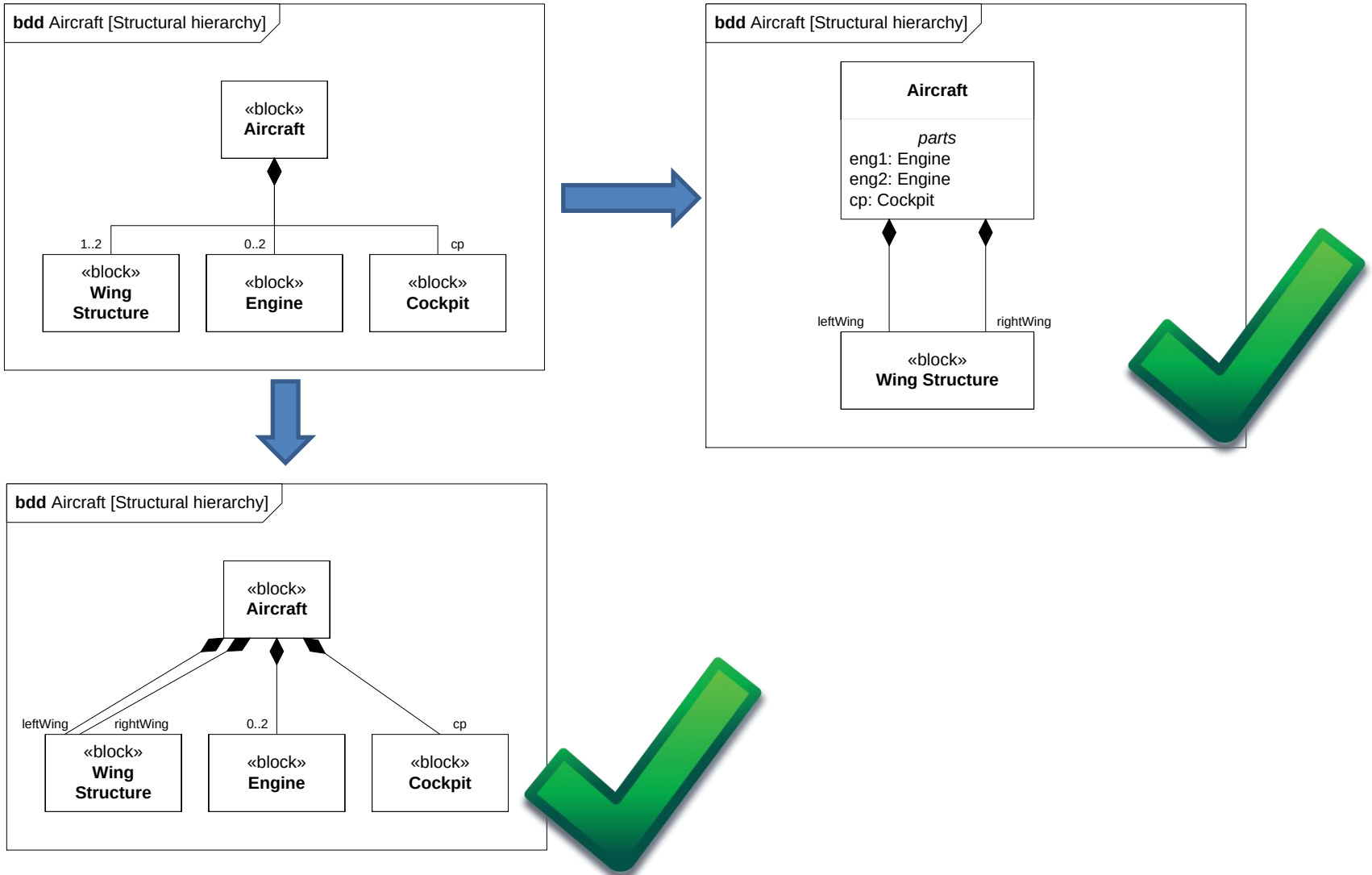
bdd: Composition relationships

The most common kind of relationship is *composition*:

- ”*Consists-of*” or ”*whole-part*” relationship, e.g. ”an `Aircraft` consists-of 1-2 `wings`, 0-2 `engines` and 1 `cockpit`”

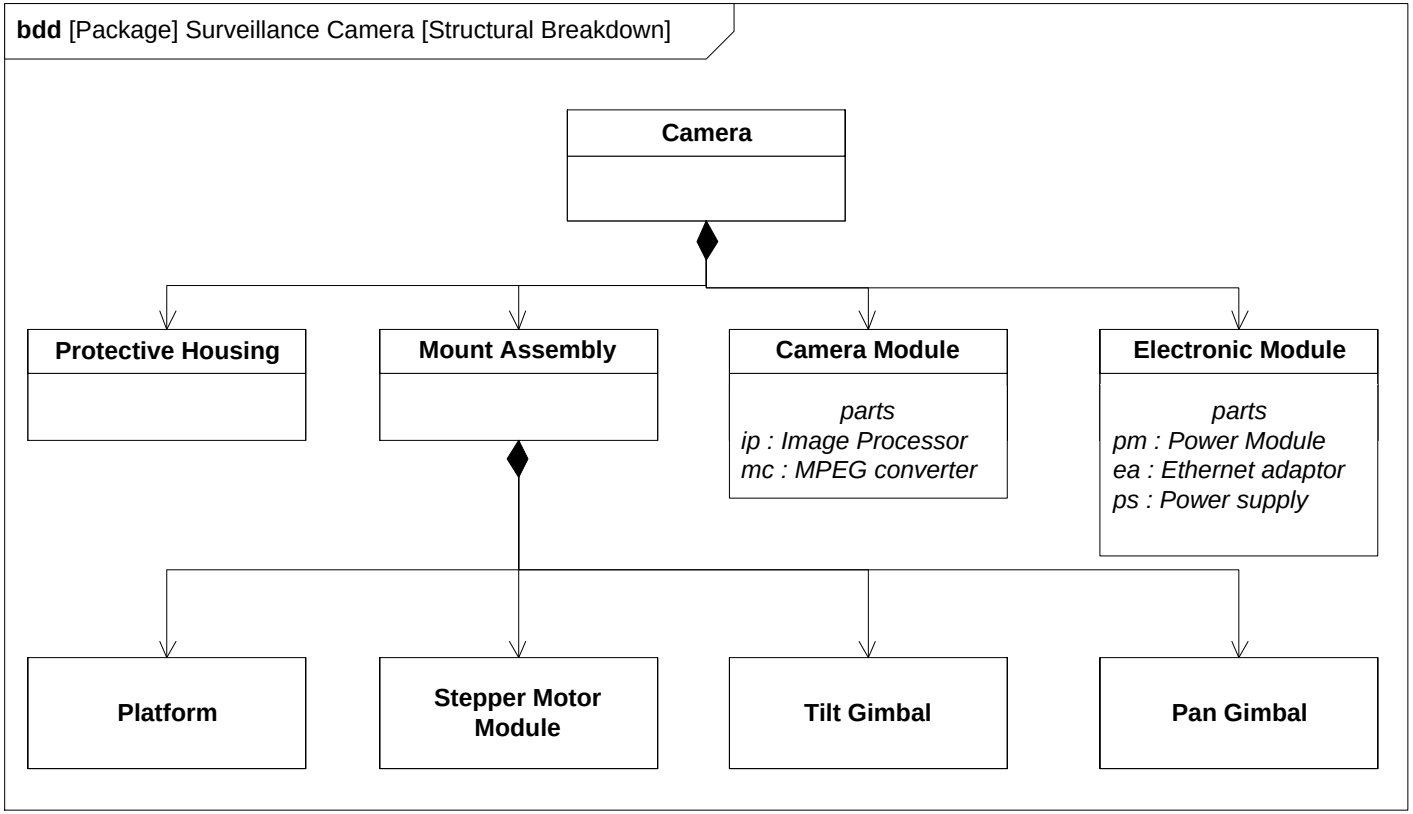


bdd: Variants

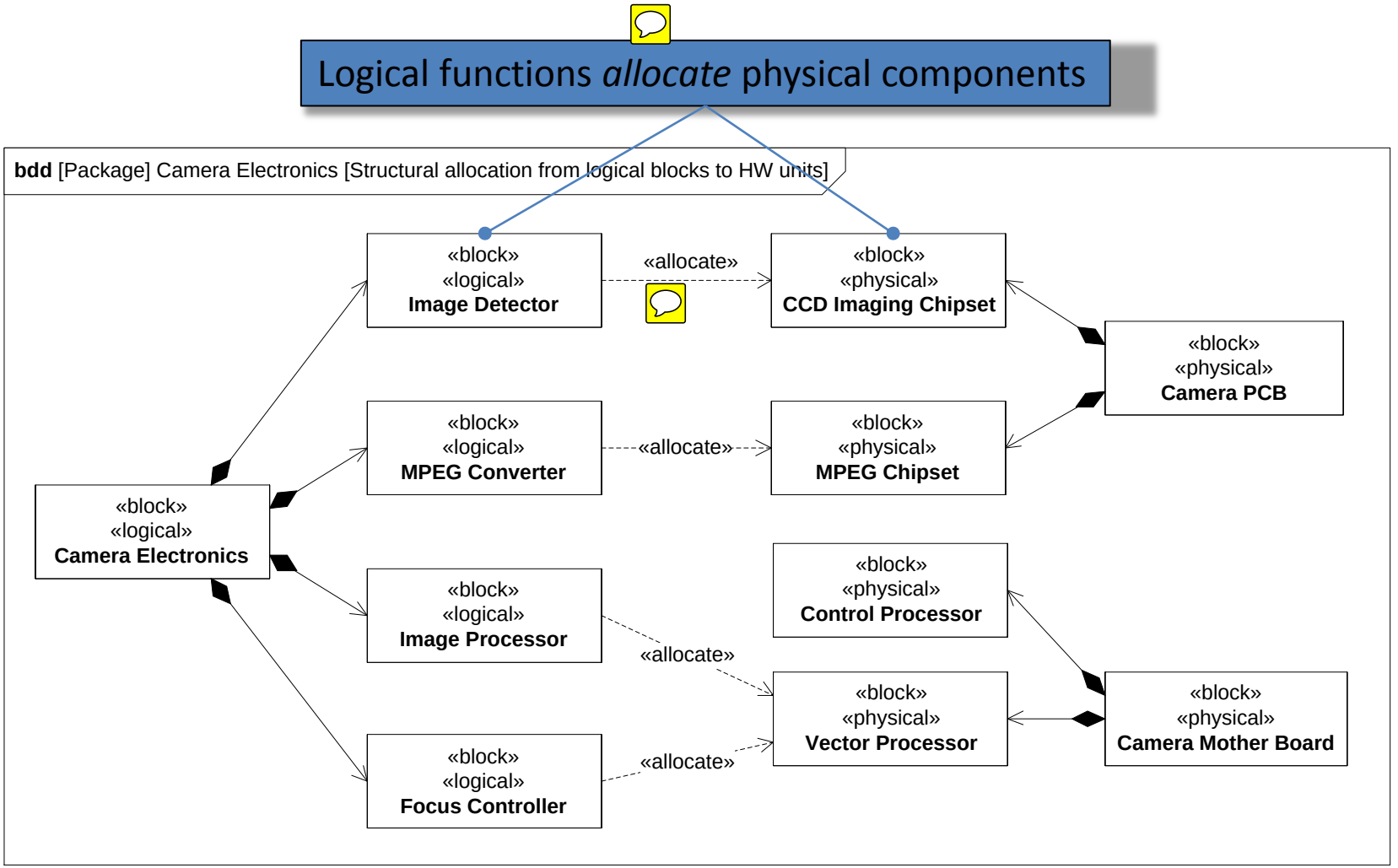


bdd: Deeper hierarchy

How would you read this diagram? *”A camera consists of…”*

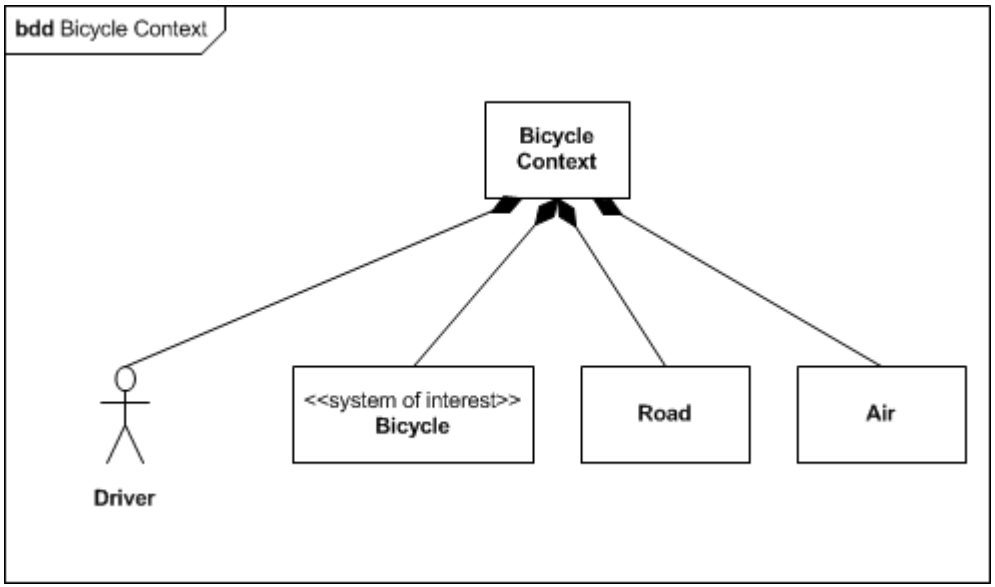


bdd: Another use



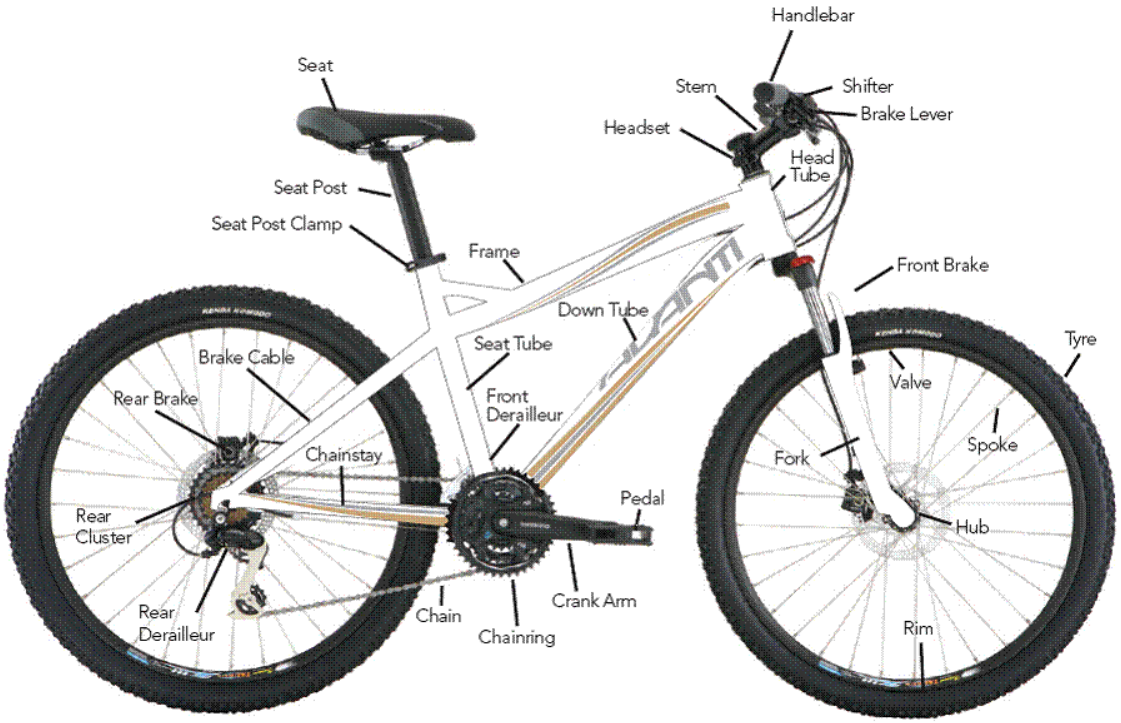
bdd: Defining the system's context

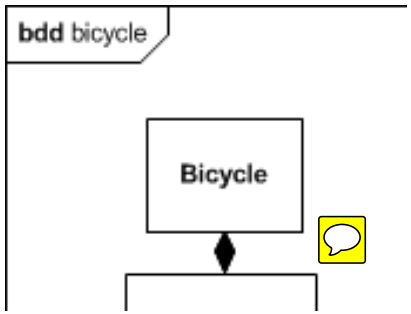
- A top-level bdd is often used to define the context of the system of interest (SOI)



Your turn!

- Describe the hierarchical structure of a bicycle in a Block Definition Diagram (bdd).
  - The bdd must contain at least 2 hierarchical levels.
  - Use *Composite Association Paths* to relate the blocks.





From last time: Your turn!

- Create a bdd for an access control system