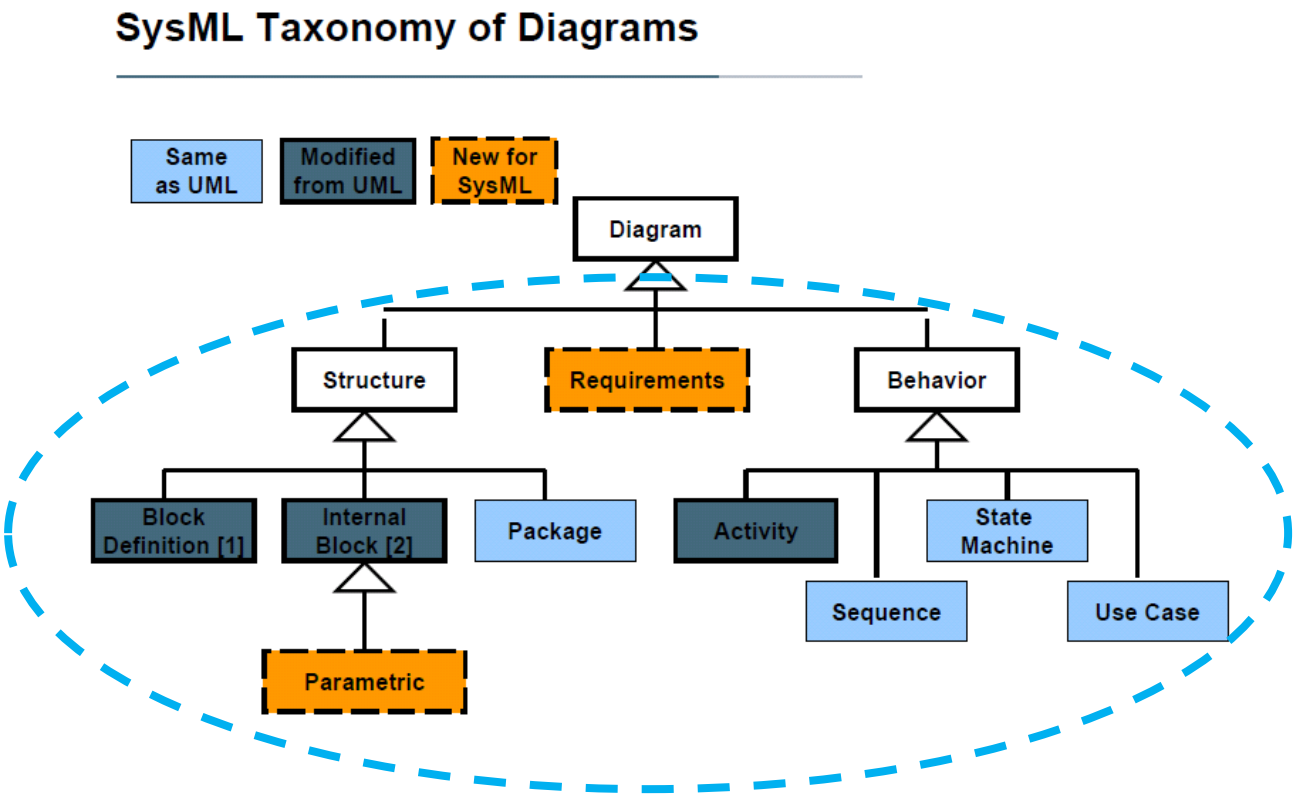
SysEng 6542
Model Based Systems Engineering

Modelling Cross-Cutting Relationships
(Model Traceability)

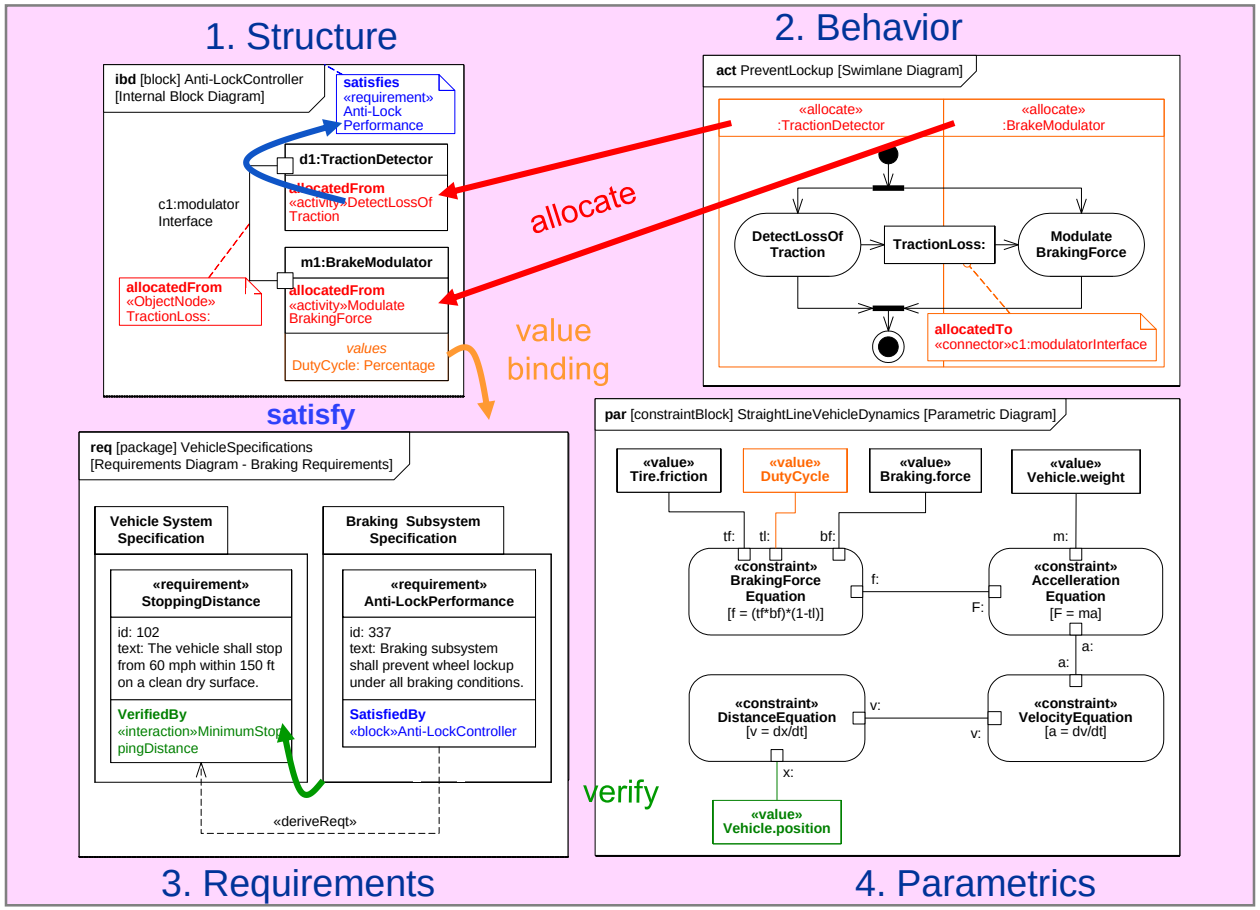
Dr Quoc Do

Modelling Cross-Cutting Relationships (Model Traceability)



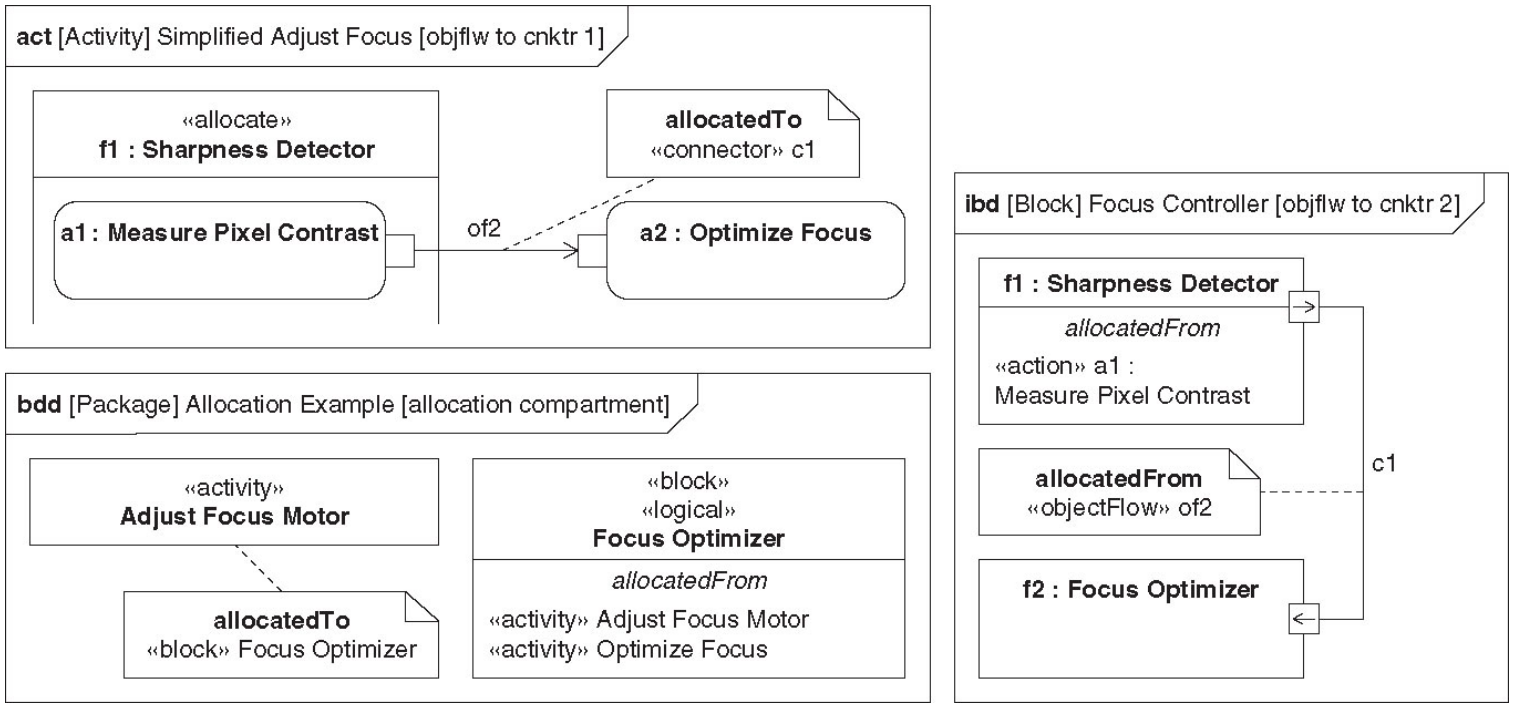
Model Traceability

- Cross-cutting relationships are achieved using SysML Allocations



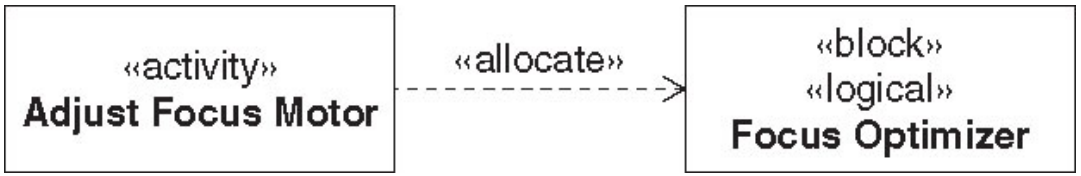
SysML Allocations

- Two Types:
  - Allocation of Definition: Allocating activities to blocks, etc.…
  - Allocation of Usage: Allocating actions to parts etc.…

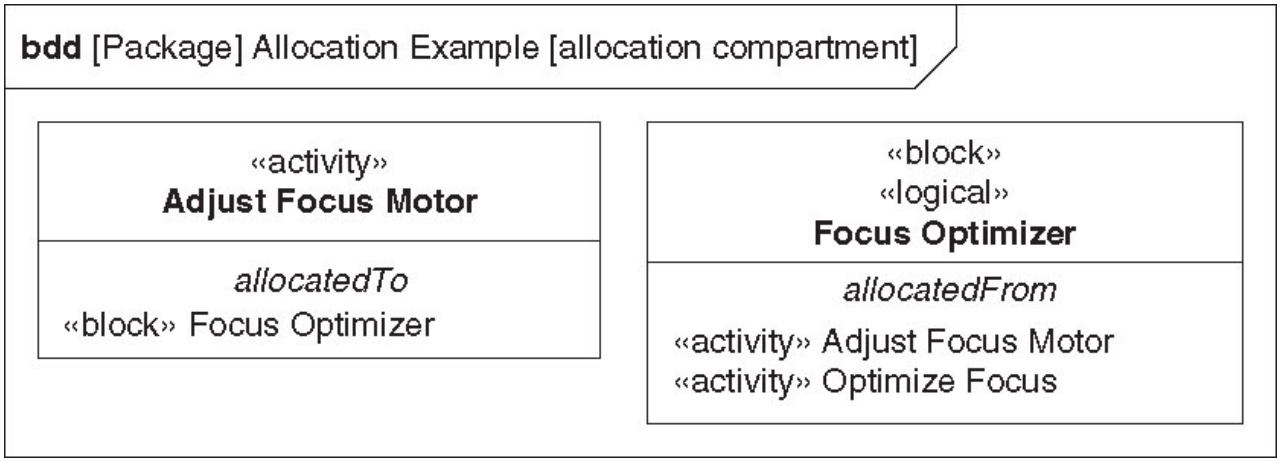


SysML Allocations

- Direct allocation of a relationship

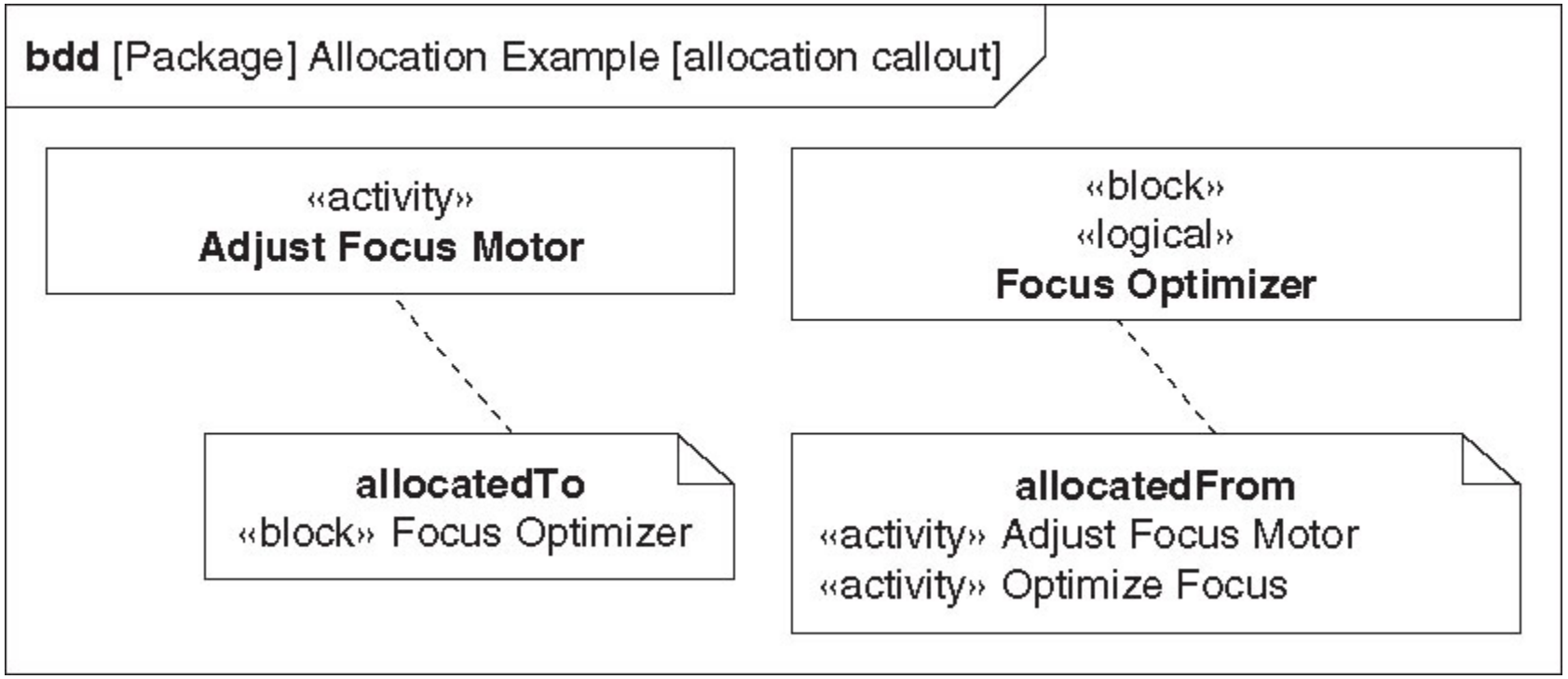


- Allocation relationship in compartment notation



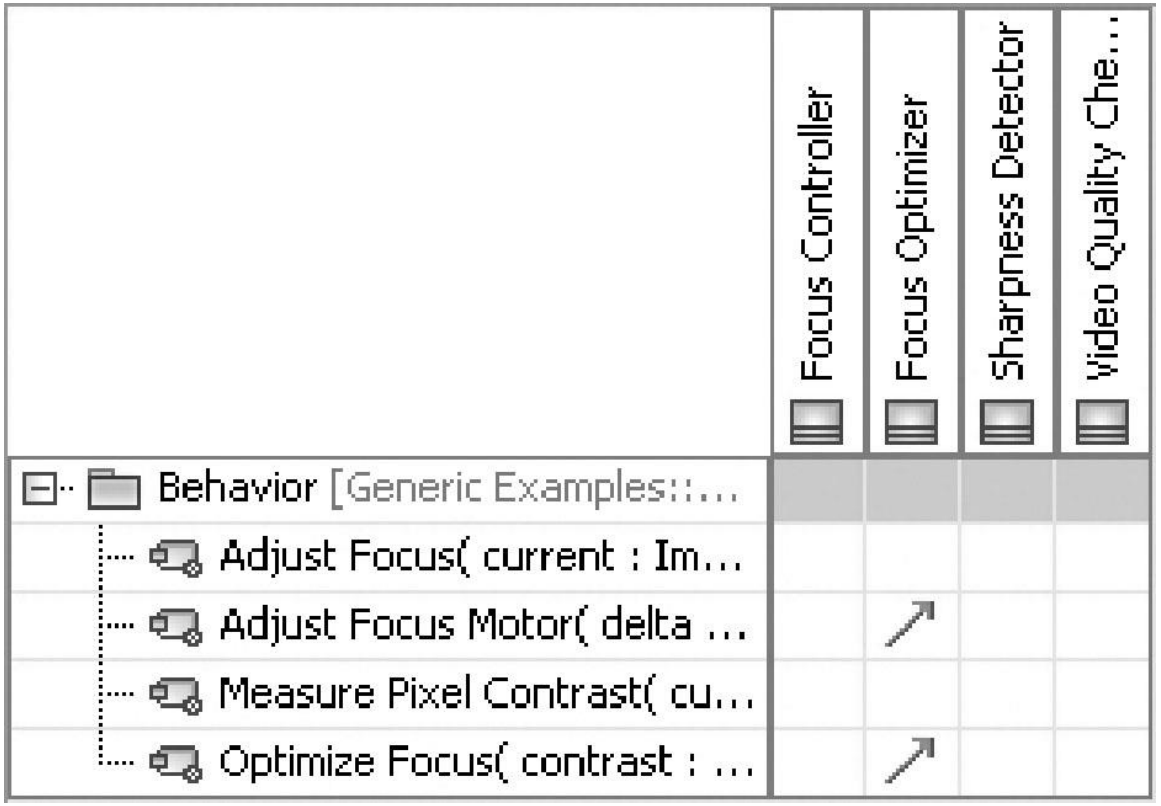
SysML Allocations

- Allocation relationship using callout notation



SysML Allocations

- Allocation relationships using tabular or matrix format



Types of SysML Allocations

- **Allocation of Requirements** – Map a source requirement to other derived requirements, and model elements that satisfy the requirement.

Various uses of "Allocation" and How to Represent in SysML

Kind of Allocation	Relationship	From	To
Requirement allocation	Satisfy	requirement	named element
	DeriveReqt	requirement	requirement
	Refine	named element	requirement
	Allocate	activity	block
		action	part
	Allocate	block	block
		port	port
		item flow	item flow
		connector	parts and connectors
	Allocate	object flow	connector
		object flow	item flow
		object flow	item property

Allocation Relationships

- **Allocation of Behaviour or Functions -** Allocate behavioural model elements *(activities, actions, states, object flow, control flow, transition, messages)* to structural model elements *(blocks, properties, parts, ports, connectors).*

- **Allocation of Flow:** Represent the flow of energy, mass, and/or information between model elements:
  - Specify item flow between activity diagram and internal block diagram; and
  - Specify object flow between action nodes on activity diagrams.

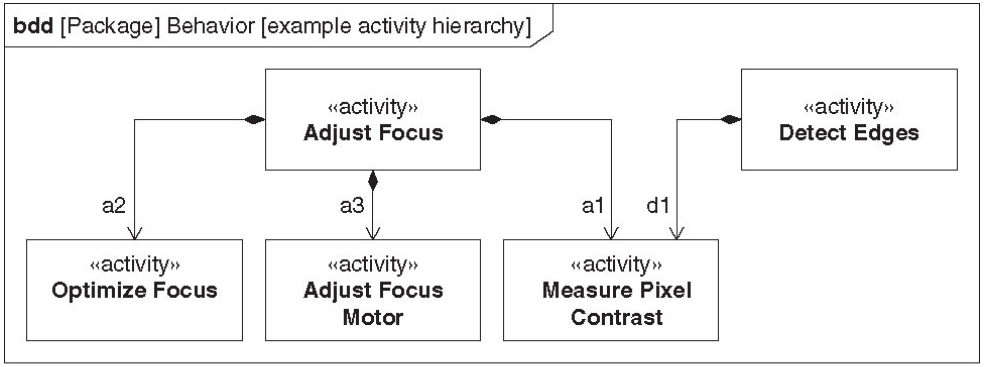
Types of SysML Allocations

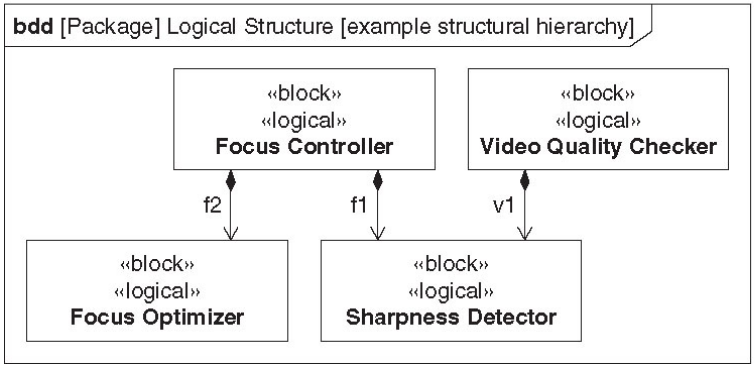
- **Allocation of Structure** – Map abstract software elements to hardware elements. This is similar to UML concept of deployment, allocating required software components to platforms or processing nodes.

- **Allocation of Properties** - Allocate overall systems performance, measures of effectiveness or physical properties to different model elements (i.e. overall weight can be allocated to each individual sub-systems or components)

Functional Allocation

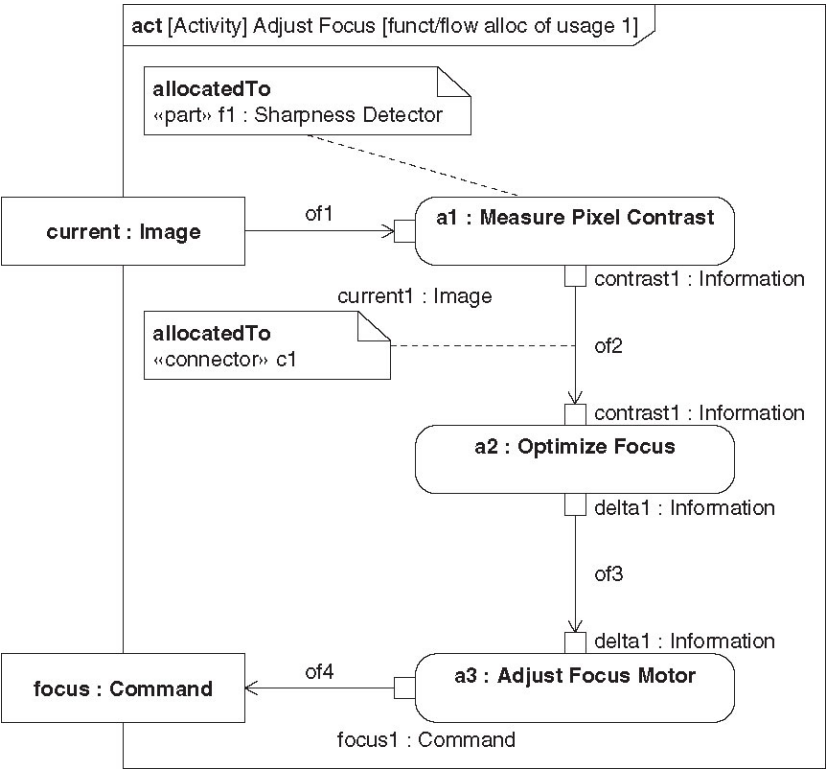
- Allocate functions to system components (see example below)
  - Measure Pixel Contrast is used by more than one activity
  - Sharpness Detector is used by more than one block

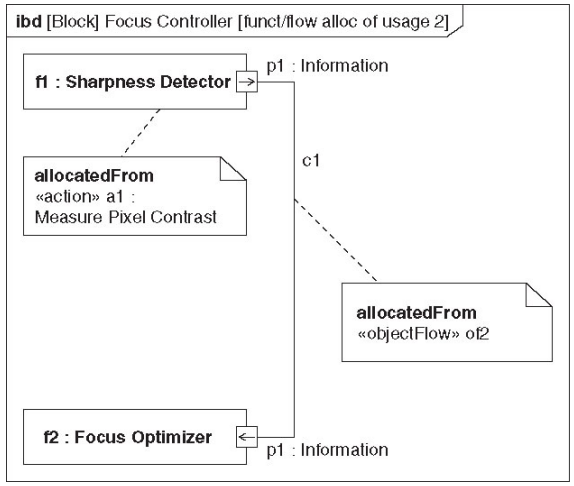


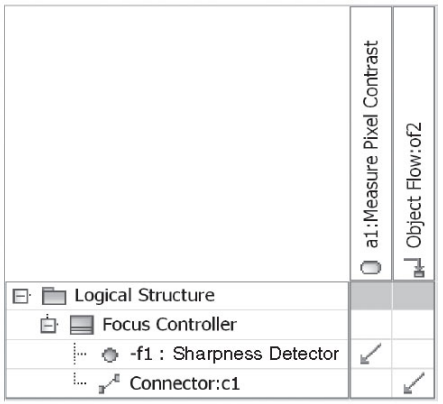


Functional Allocation

- Allocation of Usage (e.g. action to part)

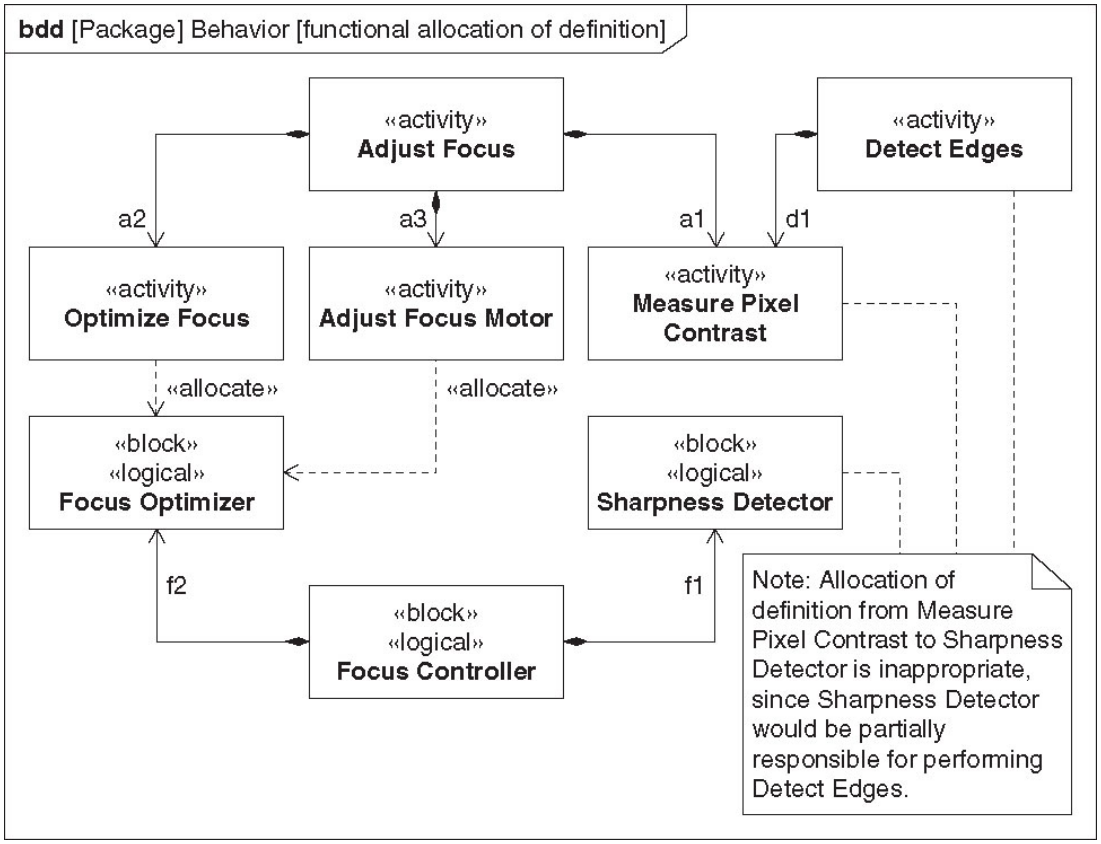






Functional Allocation

- Allocation of Definition (e.g. activity to block)



Program Completed

Missouri University of Science & Technology