



Software Plattform Embedded Systems 2020

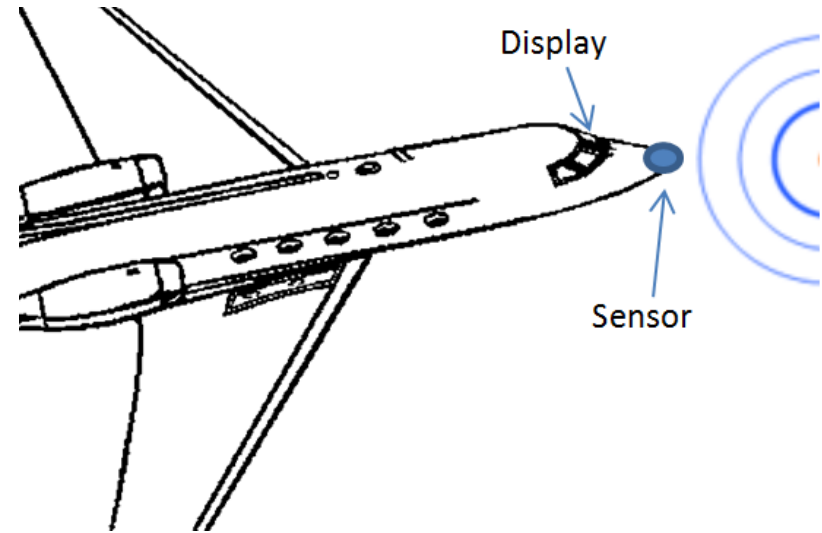
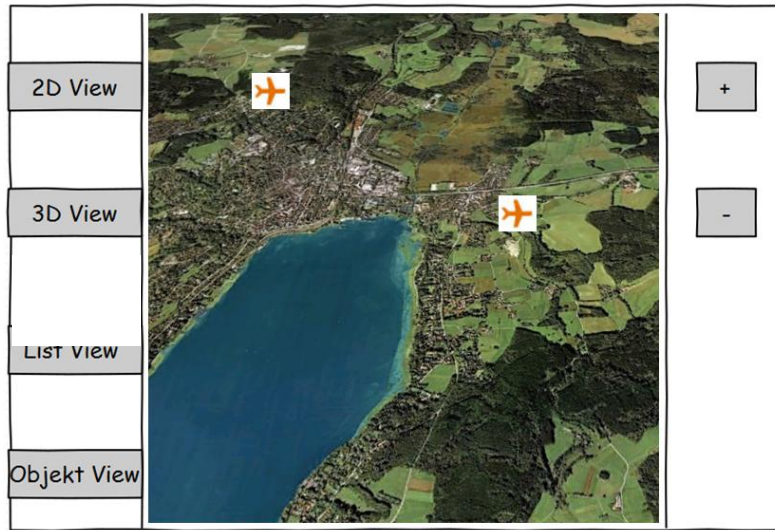
Situation Awareness Modelling of an Avionic Case Study

SPES Deliverable D.1.2.C-4

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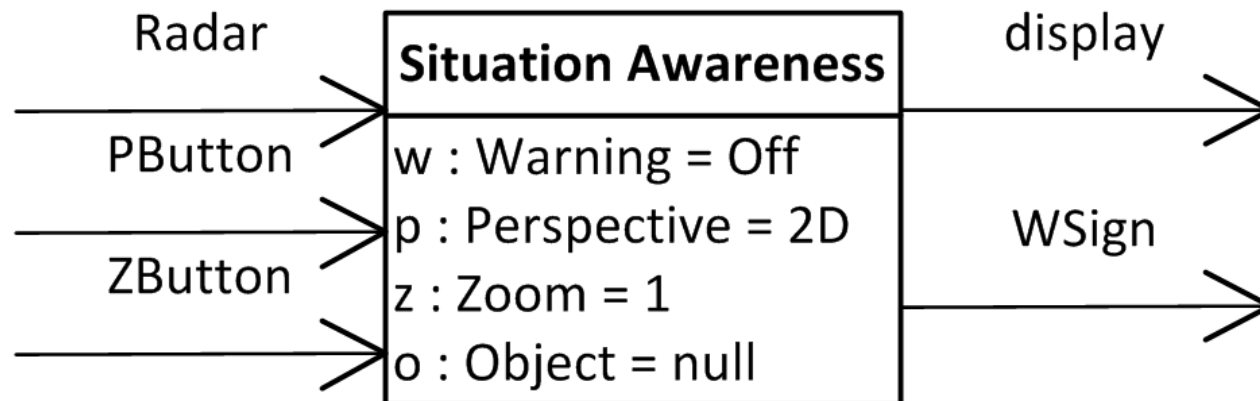
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Starting with Requirements



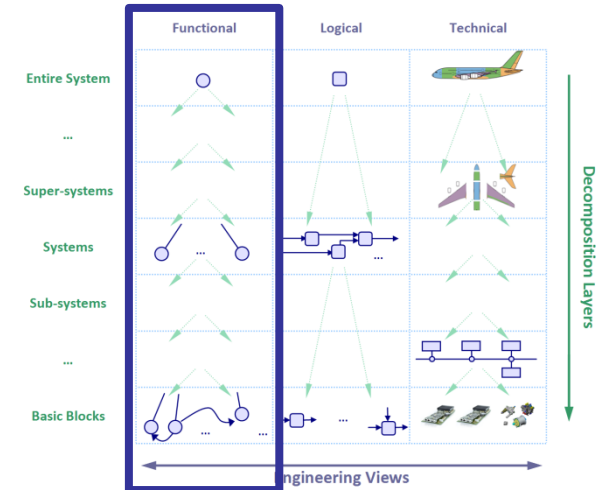
- The system shall detect objects (e.g. other aircrafts) in the surrounding area via radar signals collected by the sensor.
- The user can switch between *2D-View*, *3D-View* and *Object-View* by means of the buttons on the left side of the display.
- If the *2D-View* or the *3D-View* is selected, the user can zoom in and zoom out by pushing the + or – button on the right hand side of the display.
- If the *Object View* is selected, the user can switch between the different objects detected in the surrounding area by pushing the + or – button.
- The system distinguished between the *Normal Mode* (no objects within 500m range) and the *Warning Mode* (one or more objects within the 500m range).
- If the distance to another flying object is less than 500m the system switches to the *Warning Mode*.
- If the *Warning Mode* is activated the system automatically switches the display to the *Object-View* and shows the closest object.
- In *Warning Mode* all other perspectives are disabled and cannot be activated by the user.
- If the *Normal Mode* is activated the system offers switching between the *2D-*, *3D-* and the *Object-View*.

- Defining abstract states the system can be in
 - **Mode** Warning = {On, Off}
 - **Mode** Perspective = {2D,3D,Obj}
 - **Mode** Zoom = {1,2,3}
 - **Mode** Object
- Embedding the system in a context



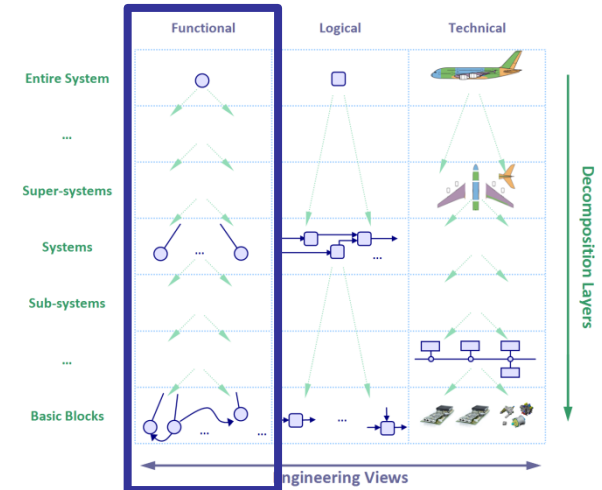
Functional Perspective

- Describes **User Functions** of a system
- Services describe interaction between the system and its environment
- Interfaces between user and system are described as perceived by the user (no technical details, etc.)
- User functions can be derived from operational descriptions

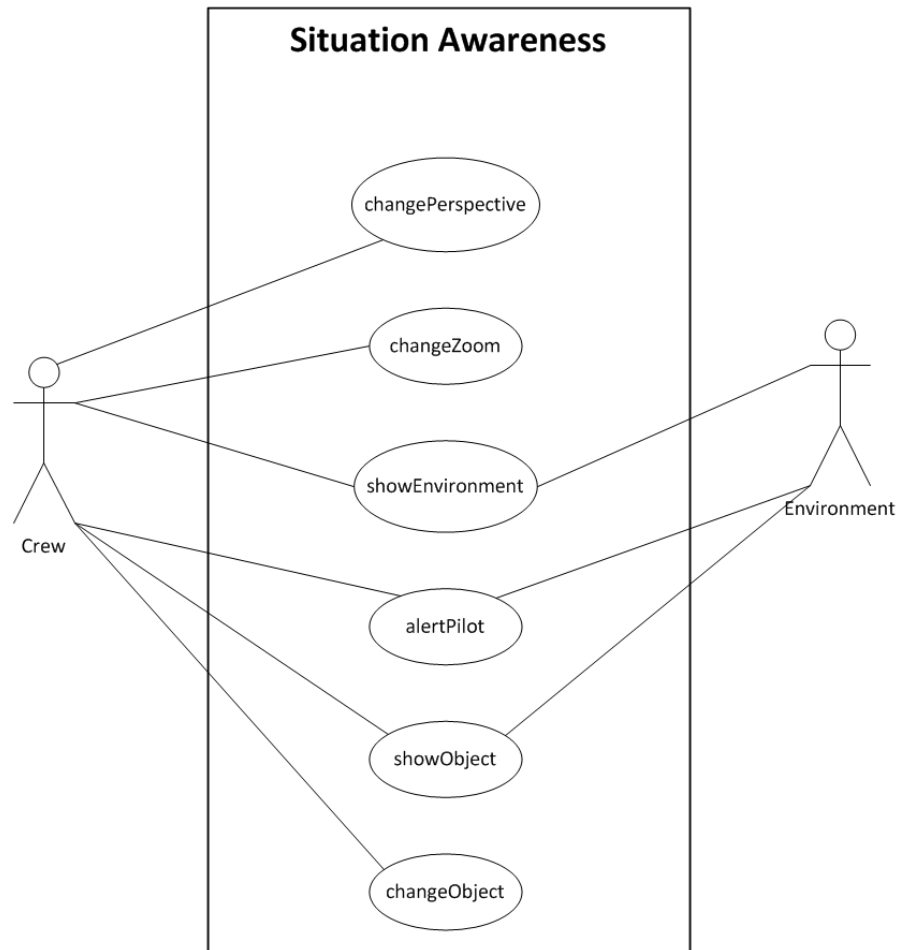


Goals:

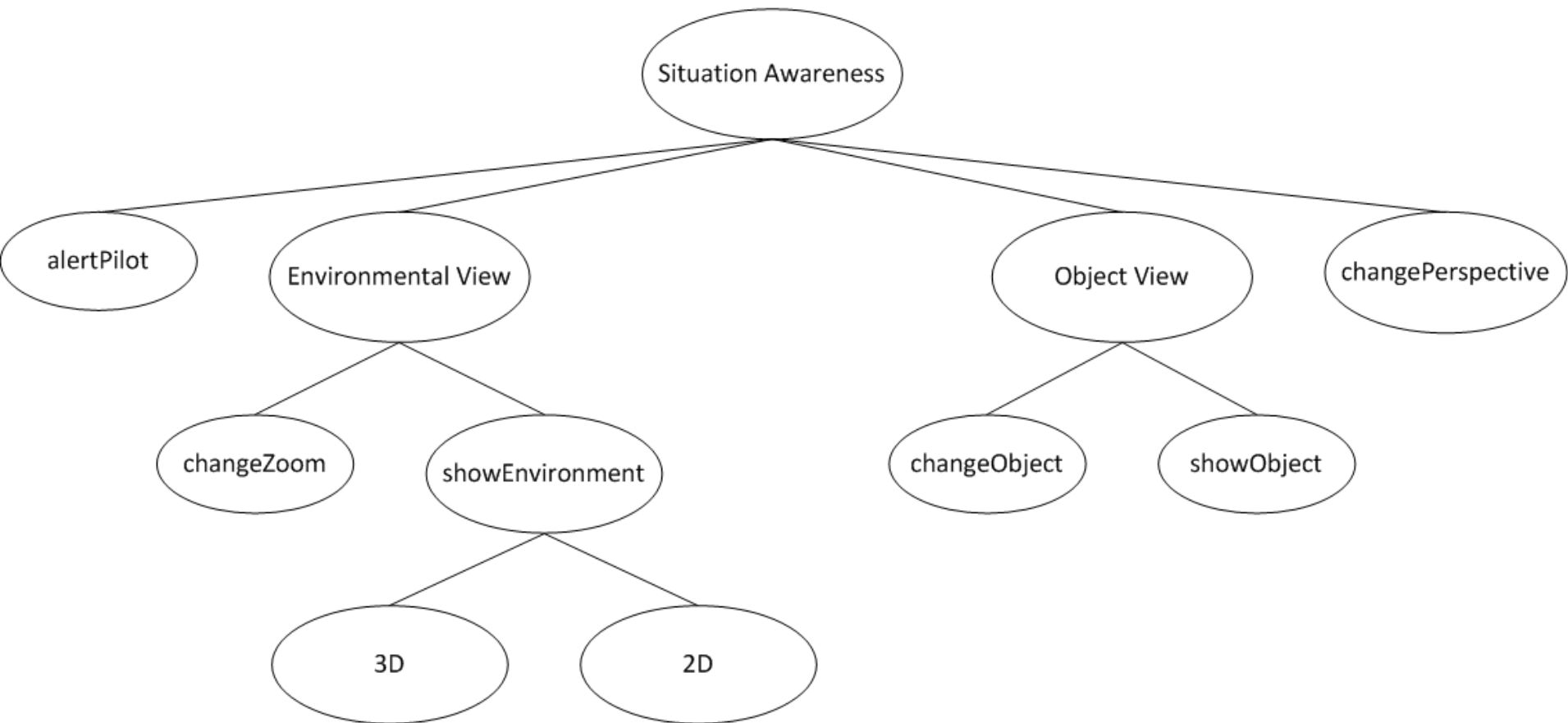
- The functional perspective reflects the functional requirements of the system
- The functionality of the system can be derived from the functionality of its sub-systems
- Syntax and semantics of the functional perspective is well-defined formally



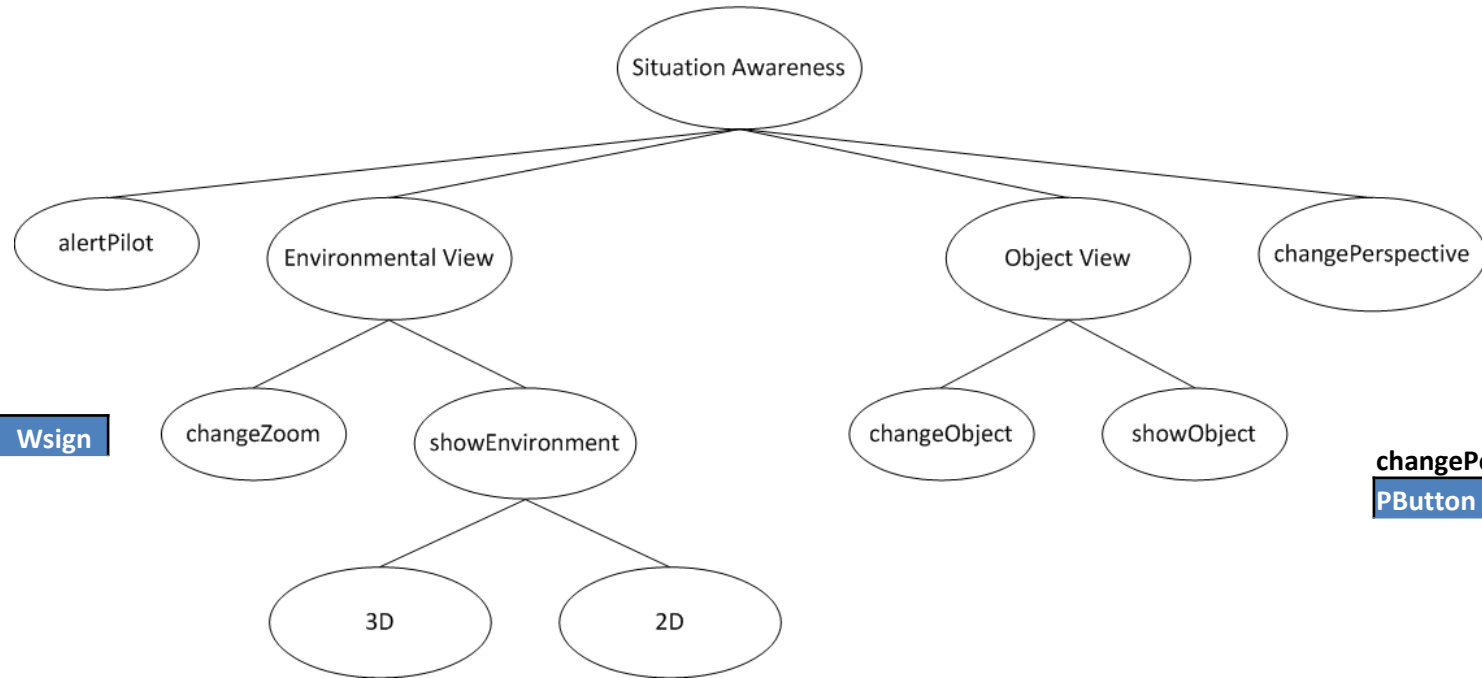
Functionality specified by the requirements



Intuitive structuring of Use Cases (Functions)



Syntactic Interfaces and States



alert Pilot
Radar w w' Wsign

changePerspective
PButton w p w' p'

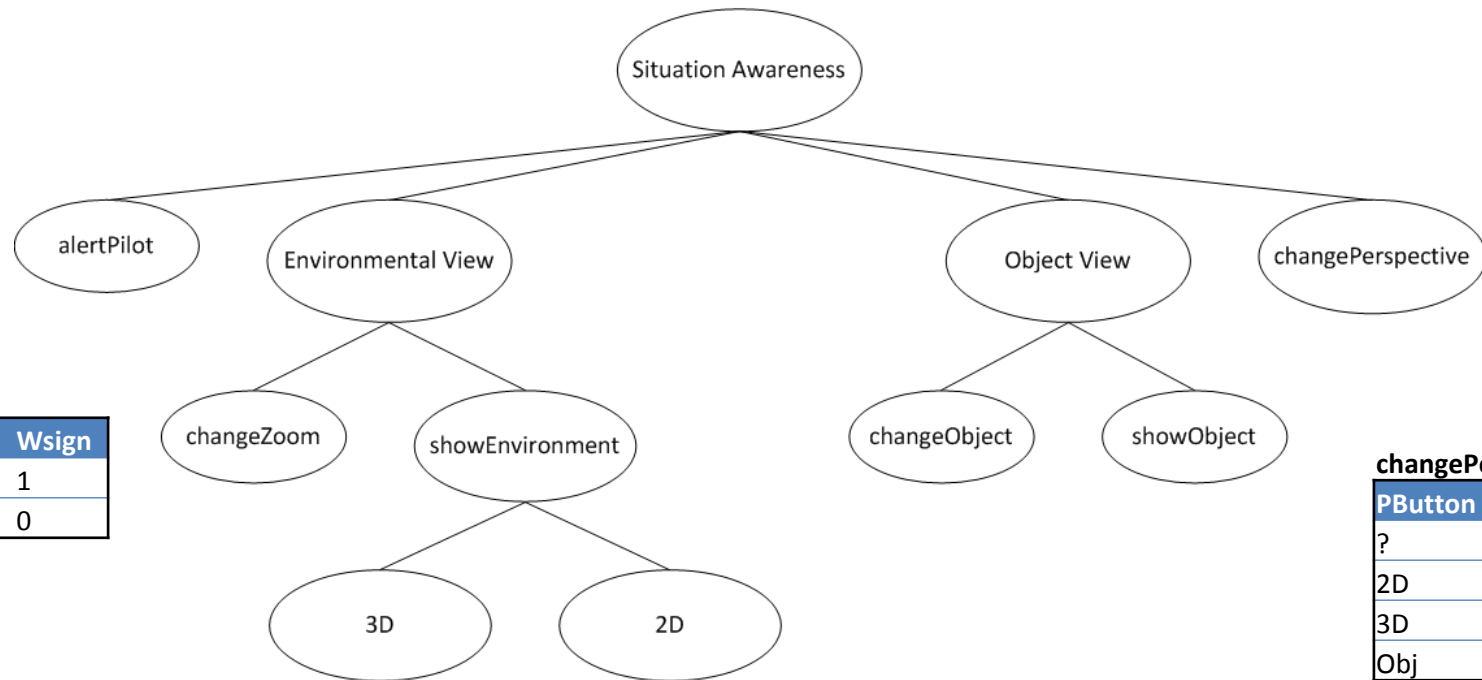
changeZoom
ZButton z p z' p'

2D/3D
Radar p z p' z' display

changeObject
Radar ZButton o w p o' w' p'

showObject
o p o' p' display

Adding Behaviour



alert Pilot

Radar	w	w'	Wsign
alert(o)	?	On	1
-alert(o)	?	Off	0

changePerspective

PButton	w	p	w'	p'
?	On	?	?	Obj
2D	Off	?	?	2D
3D	Off	?	?	3D
Obj	Off	?	?	Obj

changeZoom

ZButton	z	p	z'	p'
?	z	Obj	z	?
+	1	-Obj	2	?
+	2	-Obj	3	?
+	3	-Obj	3	?
-	1	-Obj	1	?
-	2	-Obj	1	?
-	3	-Obj	2	?

2D/3D

Radar	p	z	p'	z'	display
?	-2D	?	?	?	?
os	2D	z	?	?	pic(os,z)

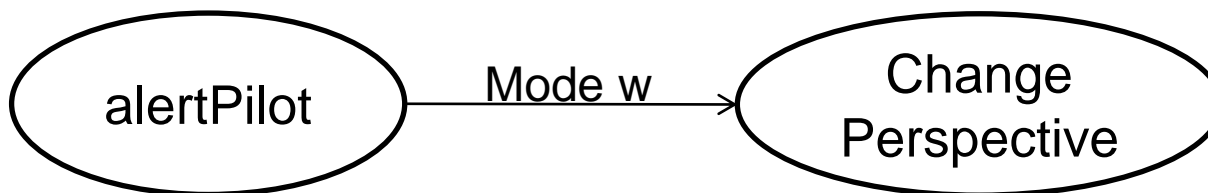
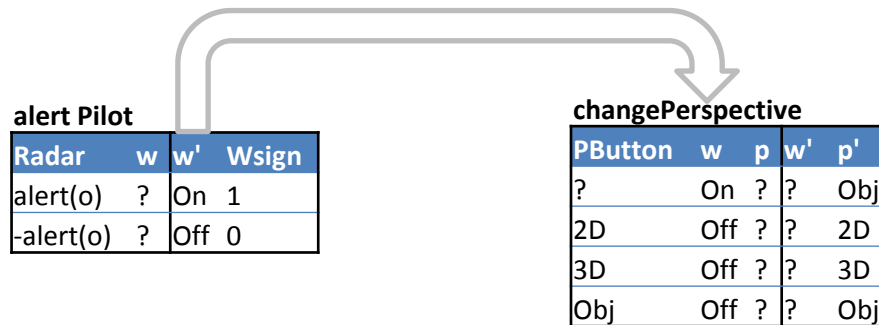
changeObject

Radar	ZButton	o	w	p	o'	w'	p'
os	?	o	On	?	closest(os)	?	?
os	+	o	Off	Obj	next(o,os)	?	?
os	-	o	Off	Obj	prev(o,os)	?	?

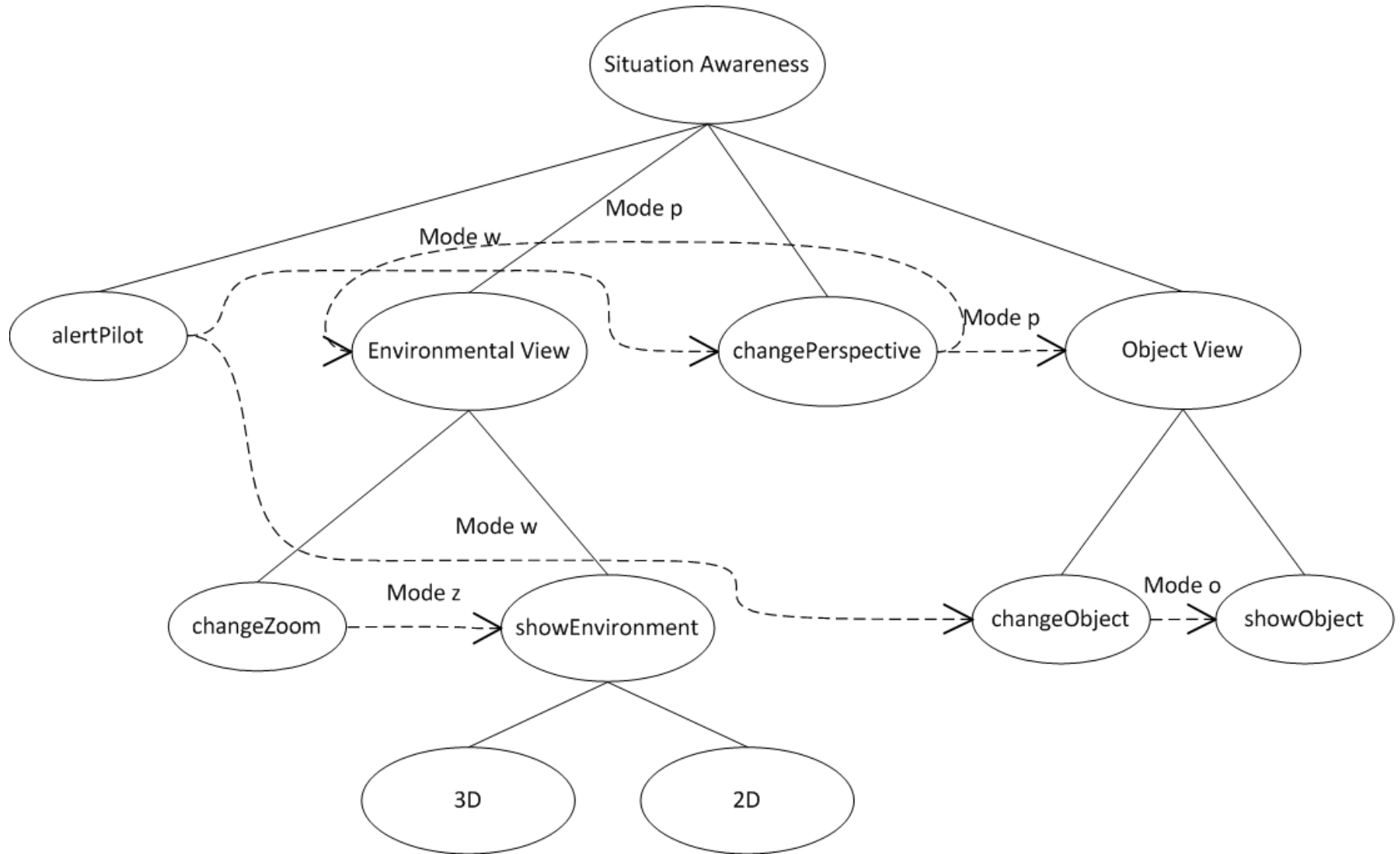
showObject

o	p	o'	p'	display
?	-Obj	?	?	?
o	Obj	?	?	pic(o)

Characteristic of a Feature Interaction in this situation:
A feature interaction is a relation between two services where one service affects an abstract system state that influences the other service.

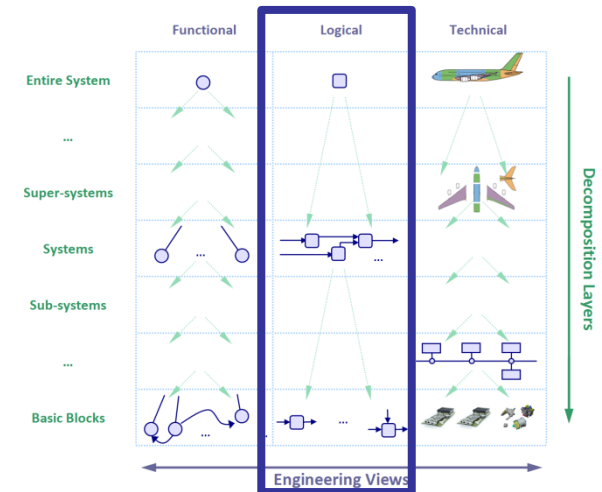


Annotated Service Hierarchy



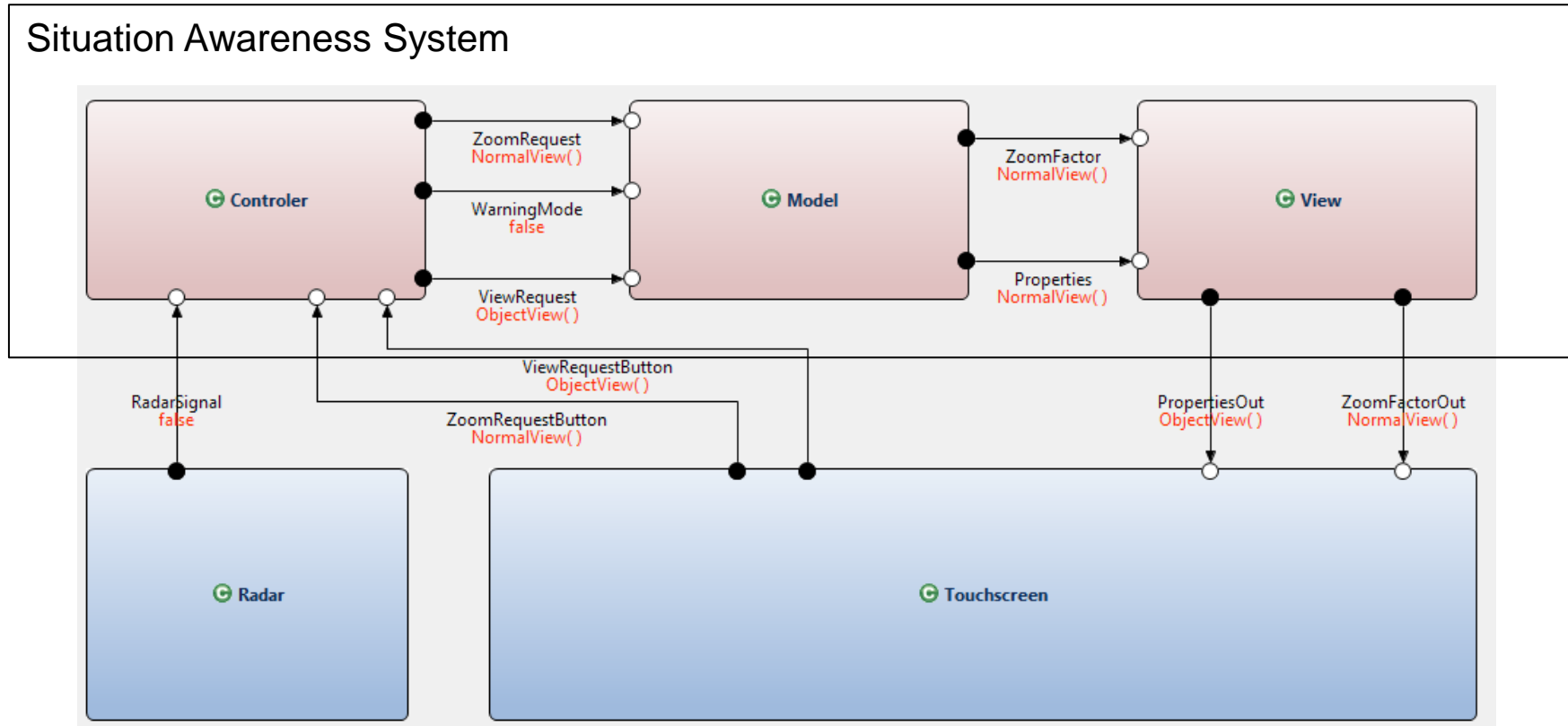
Logical Perspective

- The logical perspective describes system in terms of logical components and their interaction
- **Non-functional requirements** play an important role in the design of the logical perspective
- Can significantly differ from the design of the functional perspective
- Interfaces are defined with logical data types (e.g. int, bool, etc.)
- Requirements for the case study:
 - NFR: Separation of data and view is supposed to increase extendability for new displays
 - Achieved by implementing MVC-Pattern

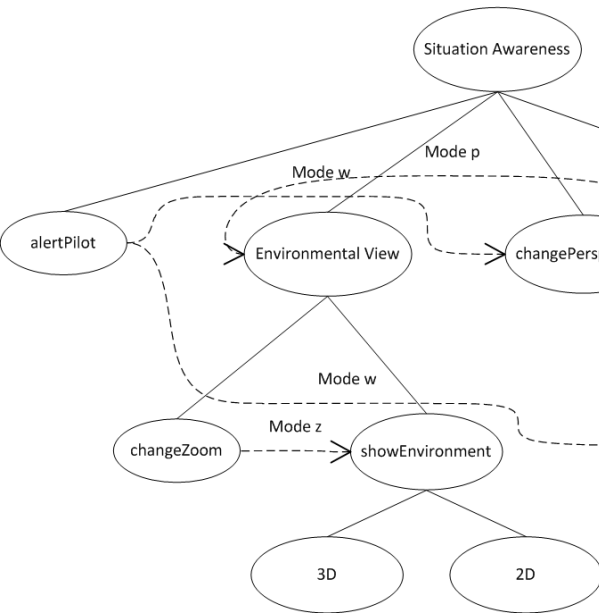


Logical Component Architecture

Realization of the functionality by an architecture of components

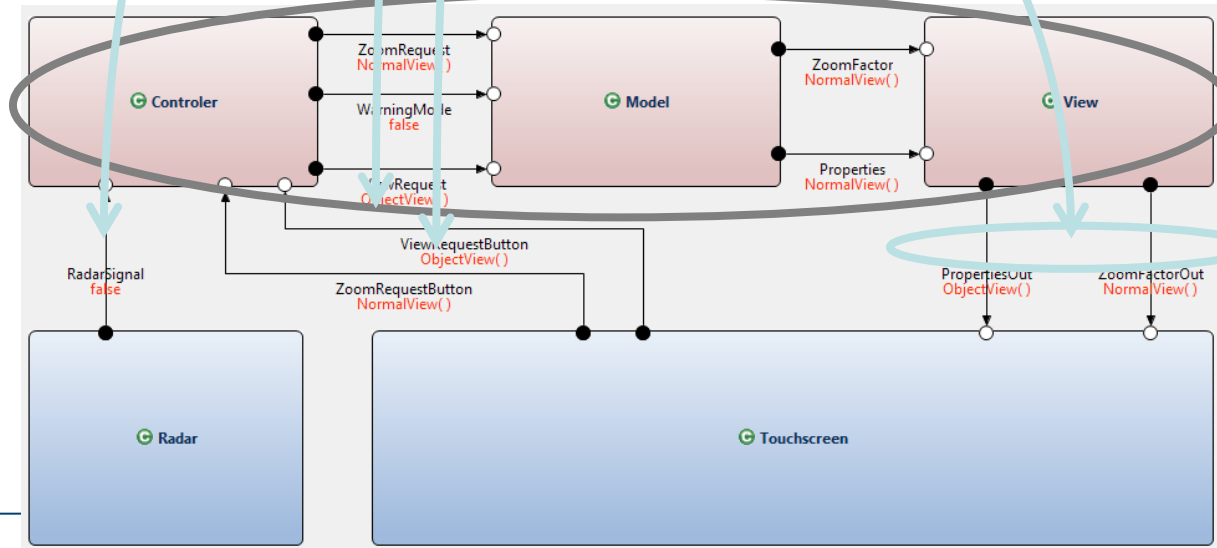


Relation between FA and LA



Situation Awareness

Radars	PButton	ZButton	o	w	p	z	Display	o'	w'	p'	z'	Wsign
(s	Obj	+	o	off	2D	3	pic(os,z)	o	off	2D	z	0



Deployment

