THALES

Model-based System Engineering #4

ENSTA ROB 308

Session #4 : Logical Architecture

Methodological Overview

1

Operational Analysis

2

System Needs Analysis

3

System Logical Architecture

4

System Physical Architecture

System architecture

The 2 previous perspective (OA/SA) allow to define the need: specify the operational need and what the system has to accomplish for satisfying the operational need

Logical and Physical Architecture allow us to:

- Define solution behavior thanks to functional and non-functional analysis
- Define the components : their scope (functional expectations) and their interfaces (between them and with external actors)
- Evaluate the architecture against different concerns (e.g. performance, safety, cyber, …)

Logical Architecture

Logical Architecture Purpose

Major Goal : to manage complexity

- Capture the big decisions of the solution, with a moderately detailed vision of what the architecture of the system will be
- Without taking care of design details, implementation constraints, and technological concerns (provided that these issues do not influence architectural breakdown at this level of detail)

By this way, major orientations of architecture can be defined and shared, while hiding part of the final complexity of the design, and without dependency on technologies.

Main concepts

Logical Component

- Logical Components are the artefacts enabling a notional decomposition of the system as a "white box", independently from any technological solutions, but dealing with major system decomposition constraints
- Logical components are identified according to logical abstractions (i.e. functional grouping, logical interfaces)

Component Exchange

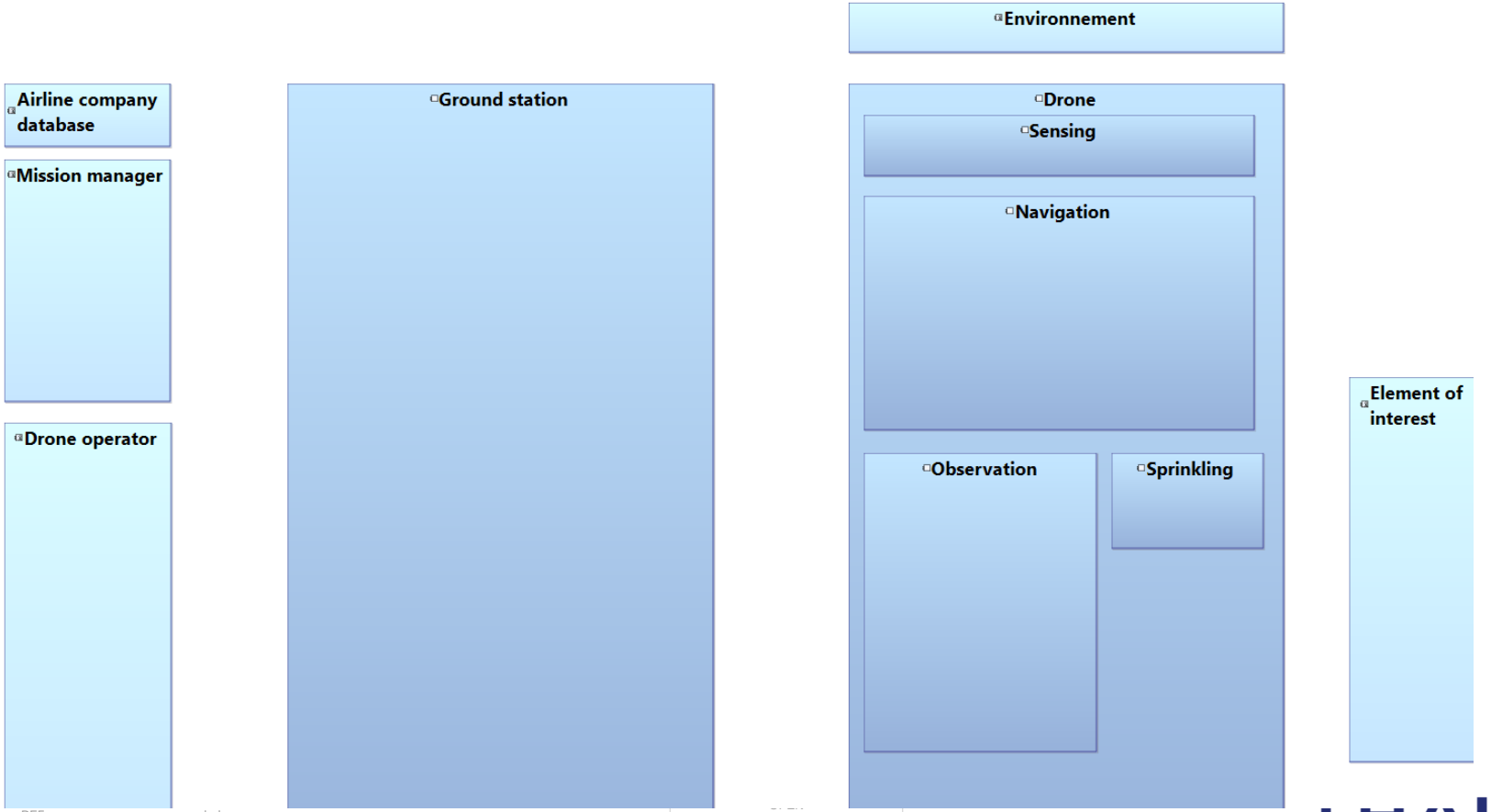
- Represent the interactions between Logical Components. Exchanges connects Component Ports.

3’

What could be the conceptual architecture of the PythaDrone® system?

PYTHAGORE

Example of Logical Architecture



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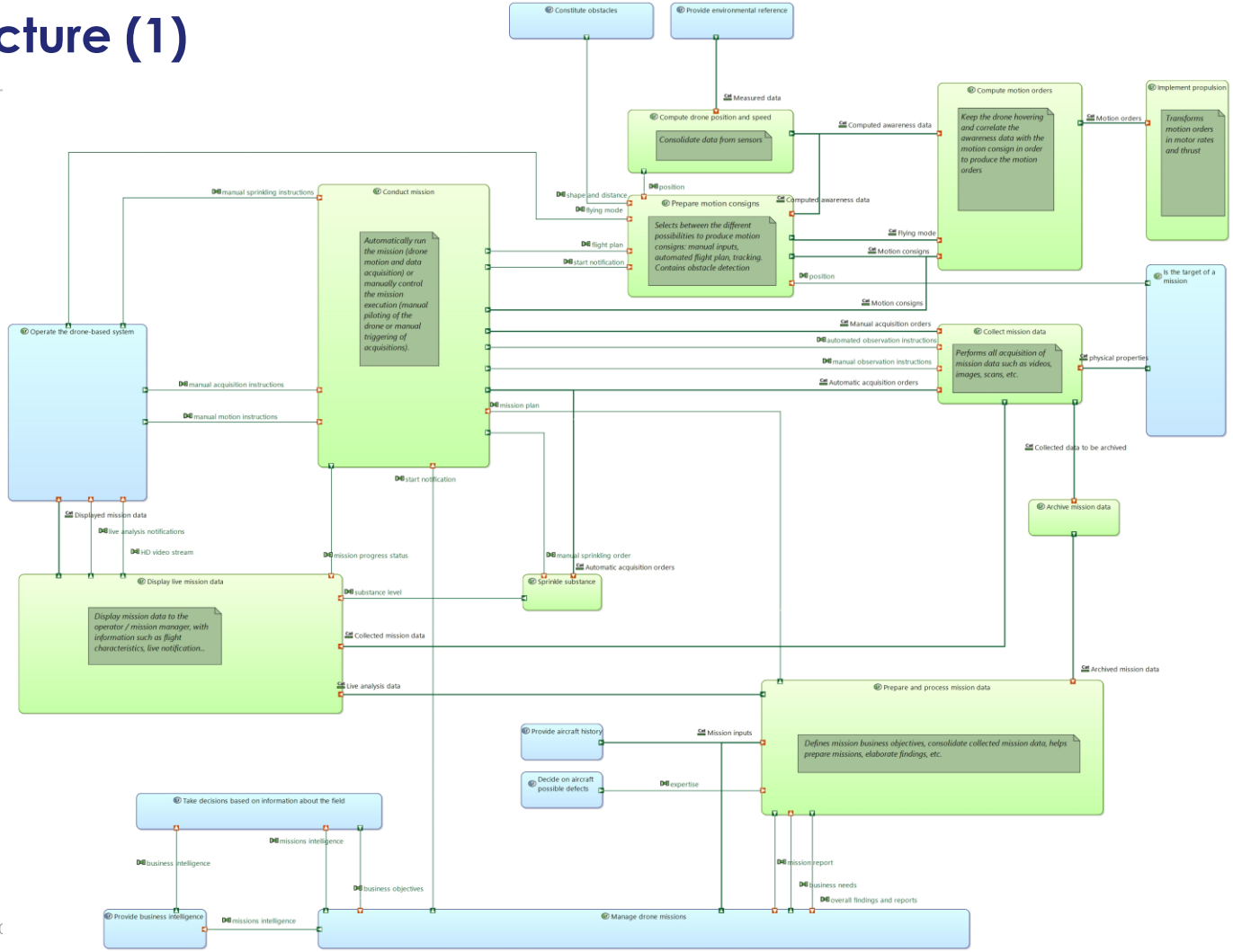
QUESTION

What are the high level functions of the PythaDrone® system?

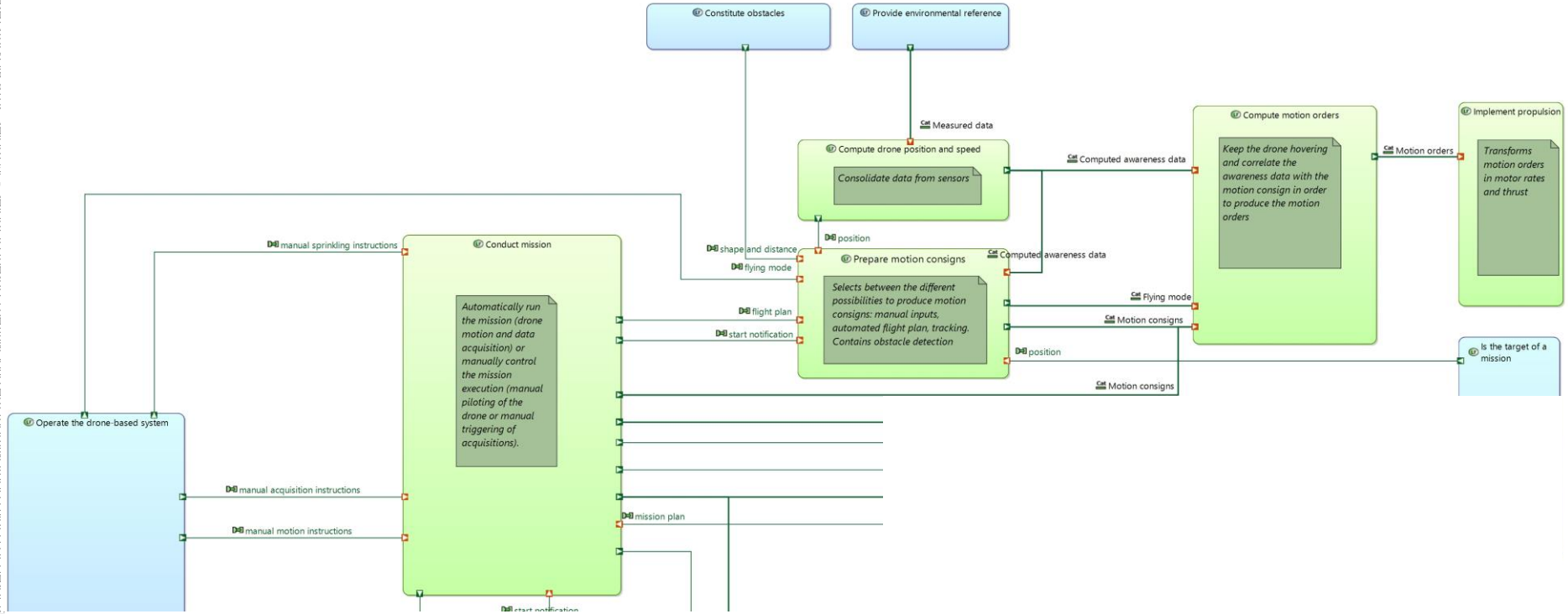
PYTHAGORE

Functional architecture (1)

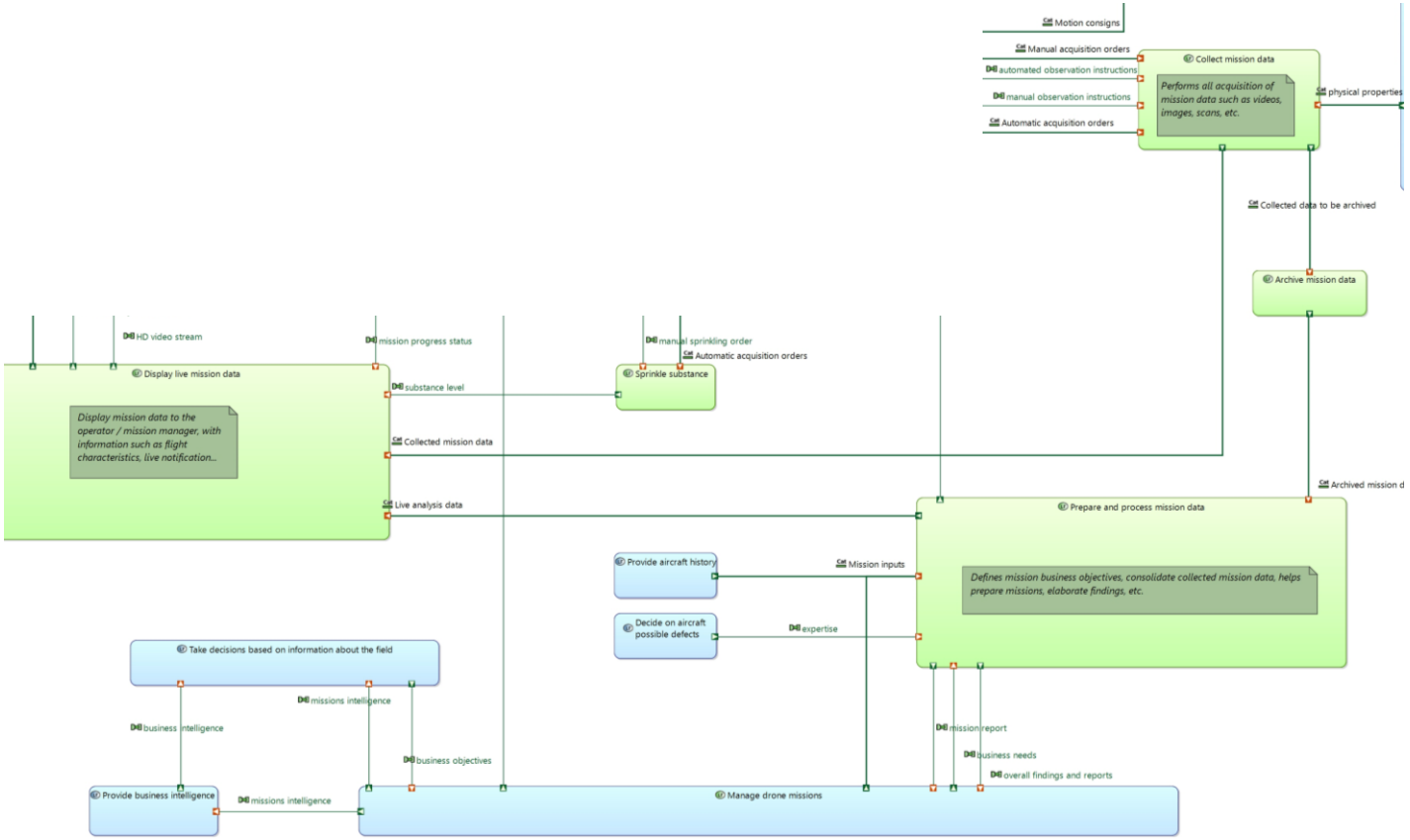
Overview of the functional dependencies



Functional architecture (2)



Functional architecture



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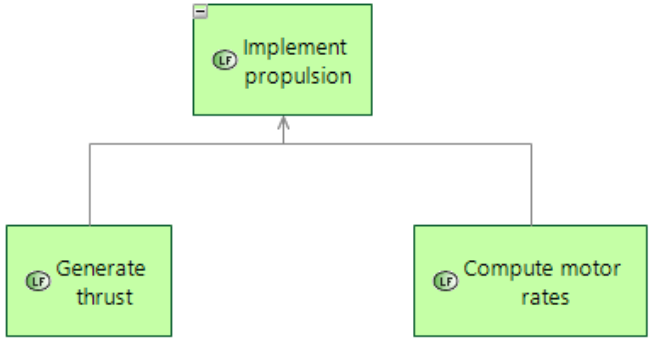
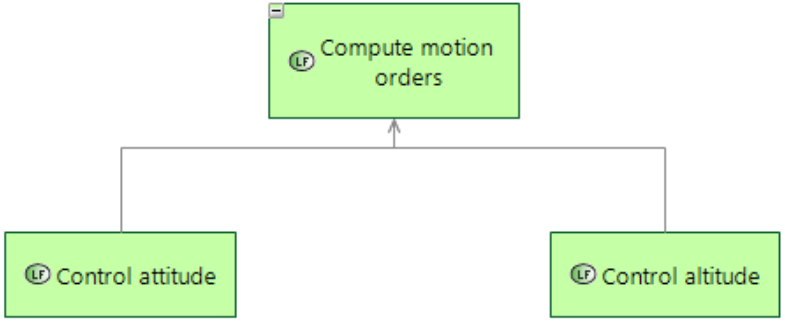
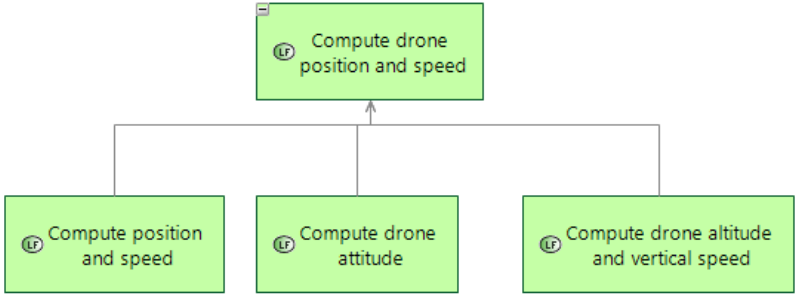
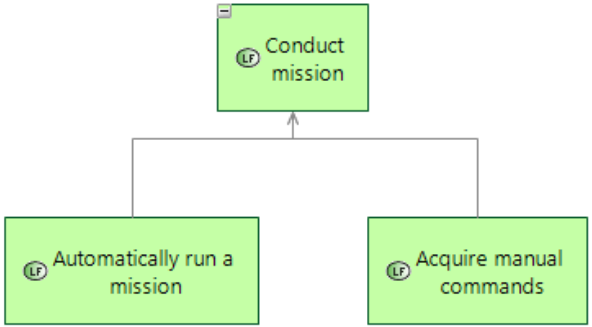
Functional refinement (or grouping)

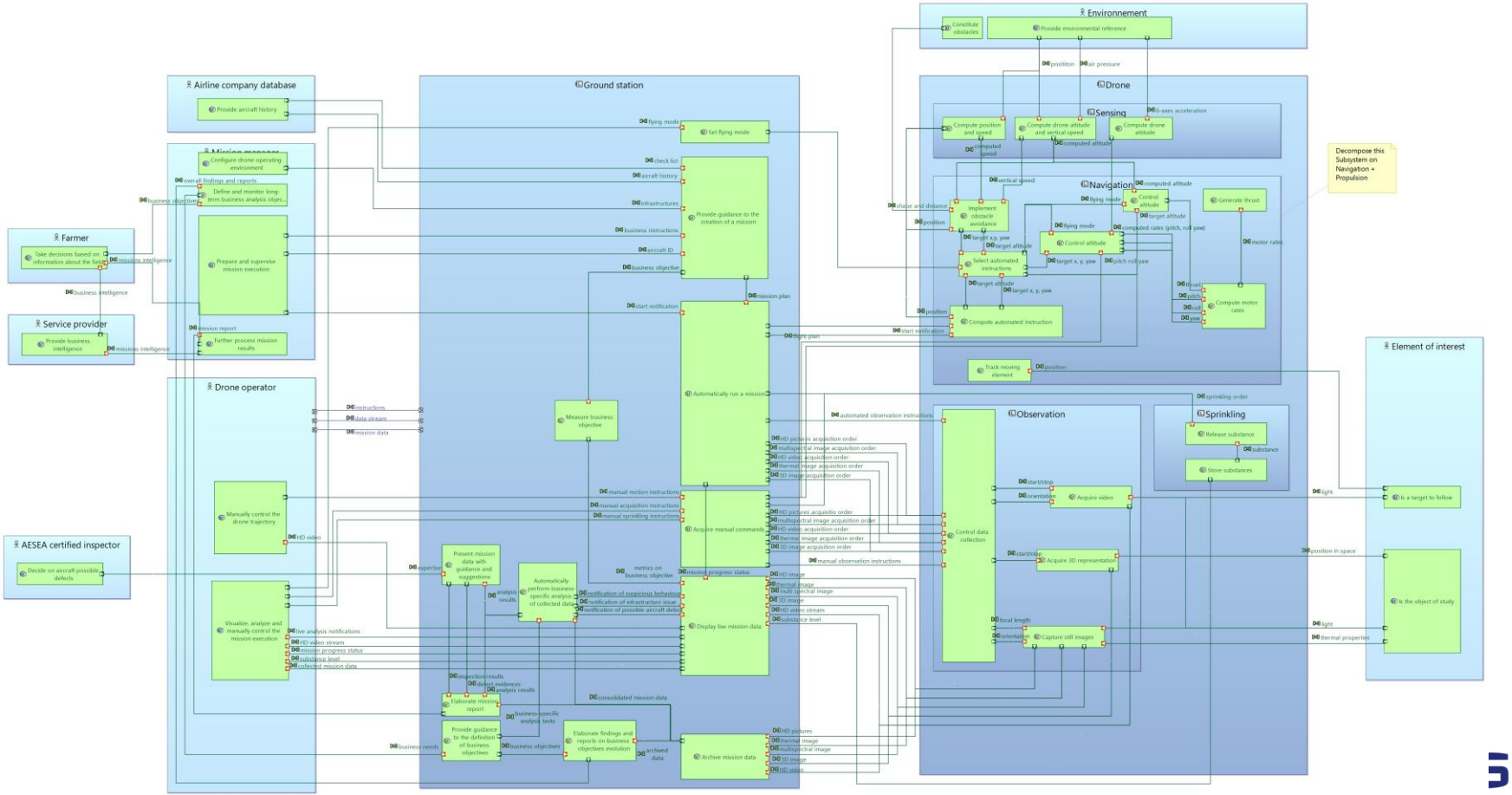








Allocation of functions



Logical architecture – What engineering choices did we make?

Ground base vs drone responsibilities

- More intelligence on the drone itself, or on the ground base?
- Who is in charge of executing the flight plan?

Concept of the drone

- Dedicated components for sensing, control and propulsion
- Dedicated component for payload control and standardized interfaces, allowing for future variability on the payload(s)

What choices are still open?

- Kind of sensors
- Kind of input and visualization device
- Kind of communication between the drone and the control devices

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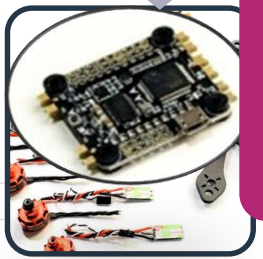

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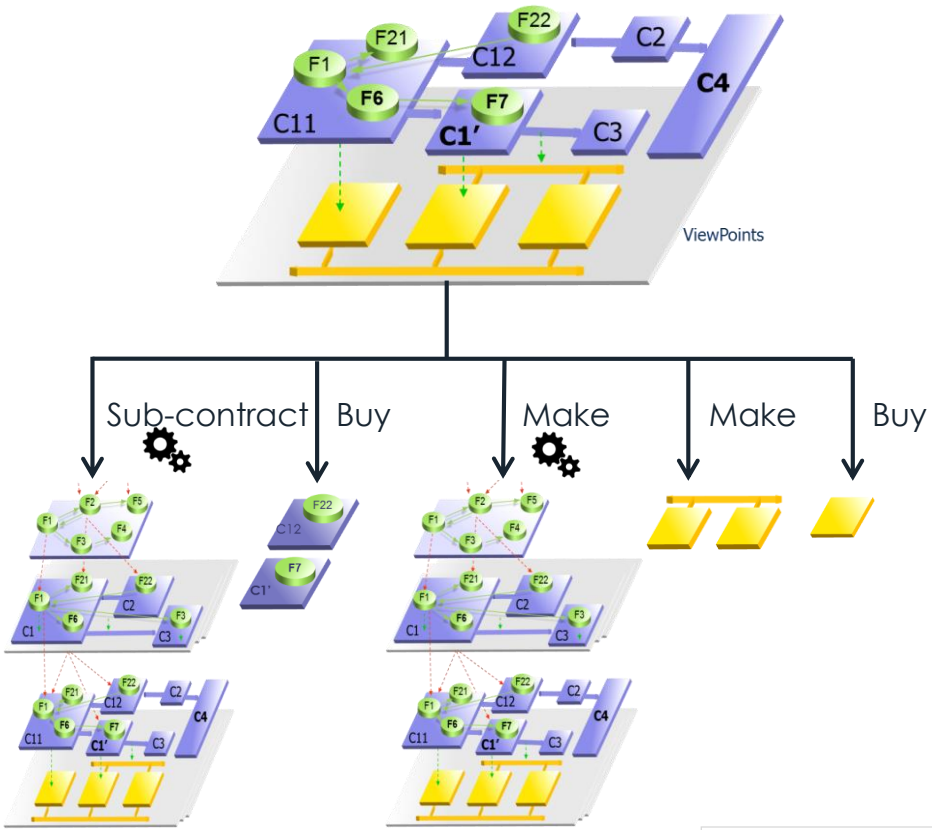
Specification of sub-systems

Transition to subsystem

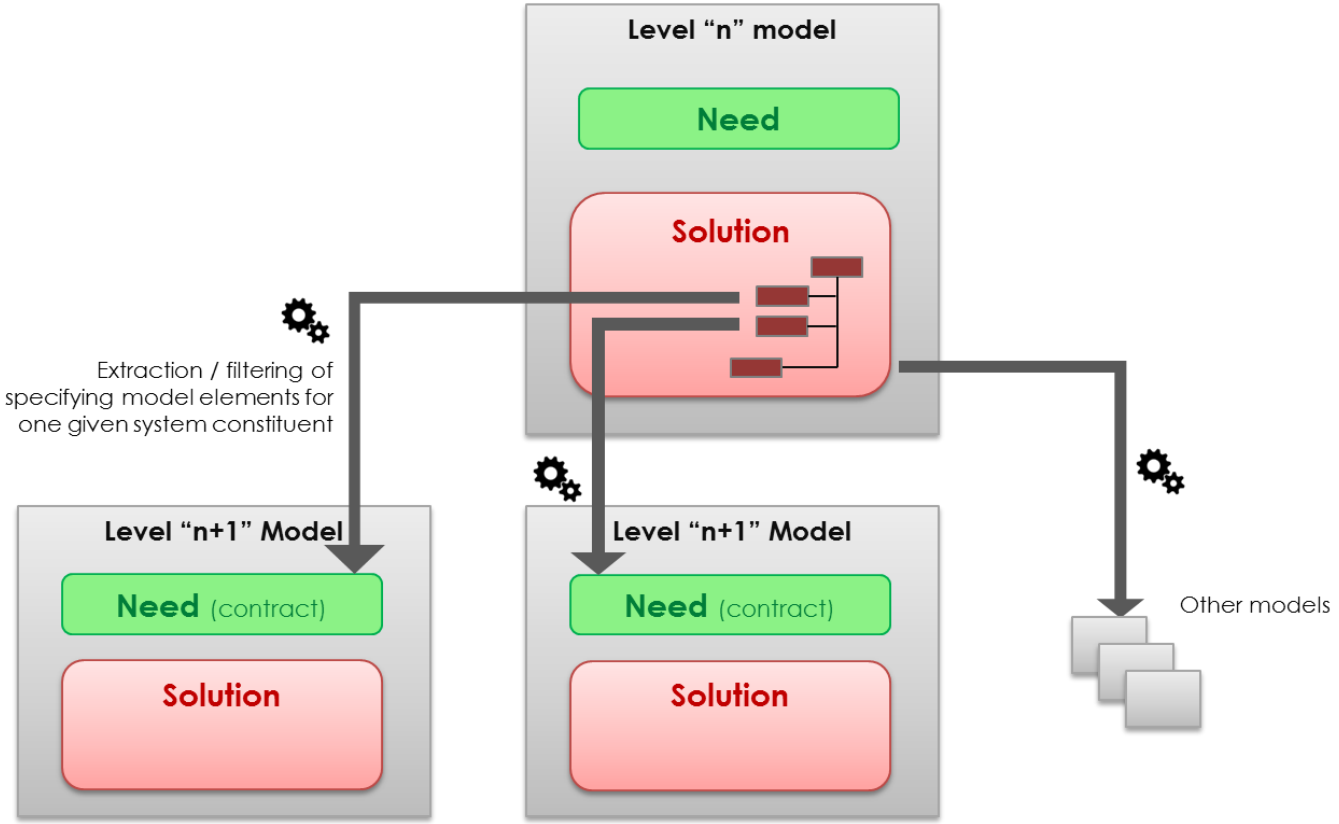
A recursive approach



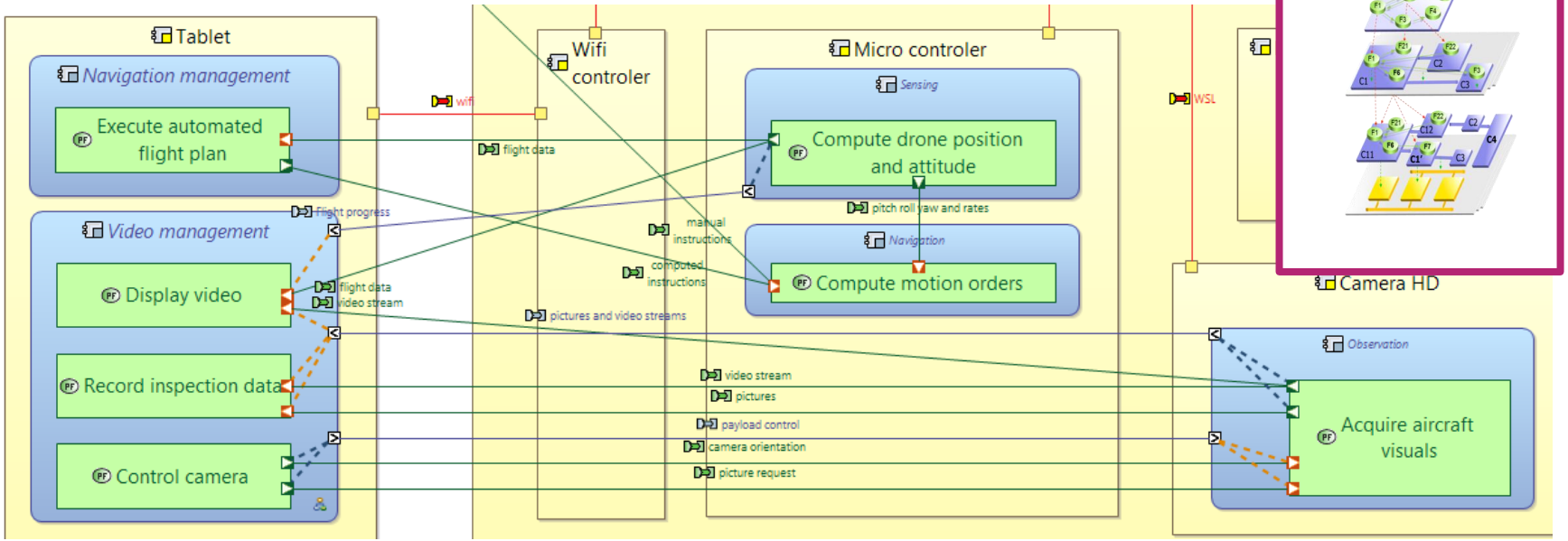
System Architecture (logical or P¨hysical) is the place for co-engineering
(SYS, SW, HW)

Contracts towards sub-contractors are deduced from physical architecture

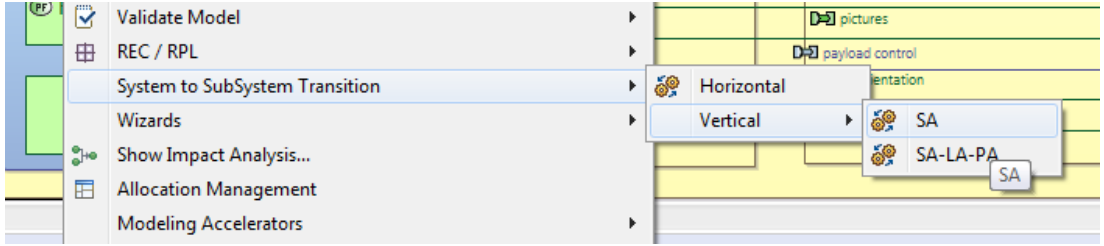
A recursive approach

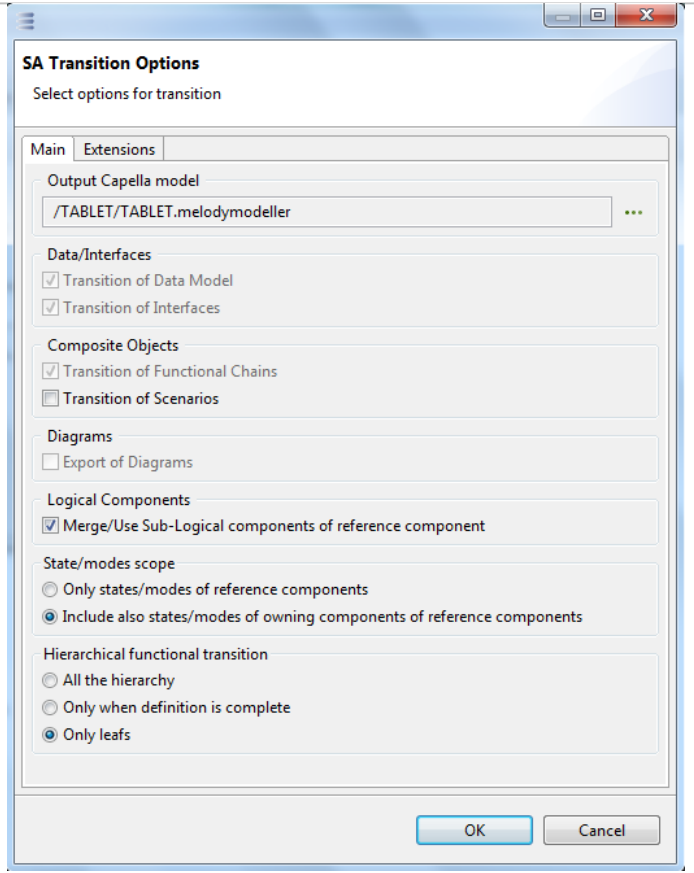


Example



Example





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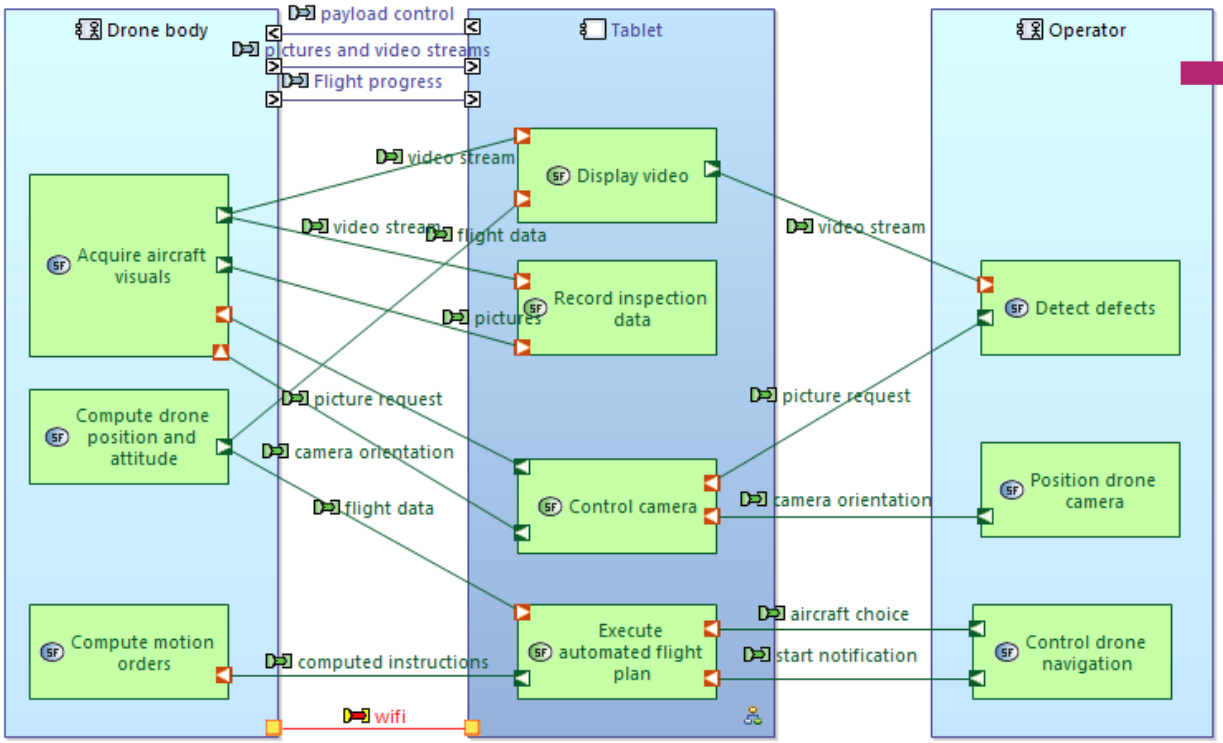
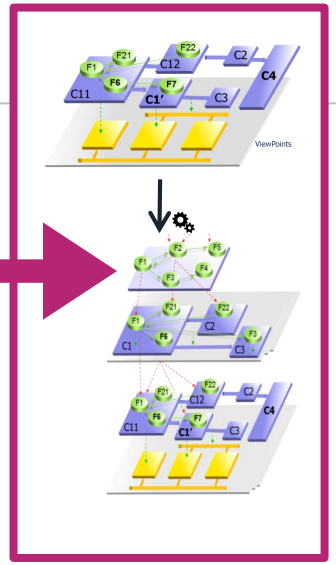
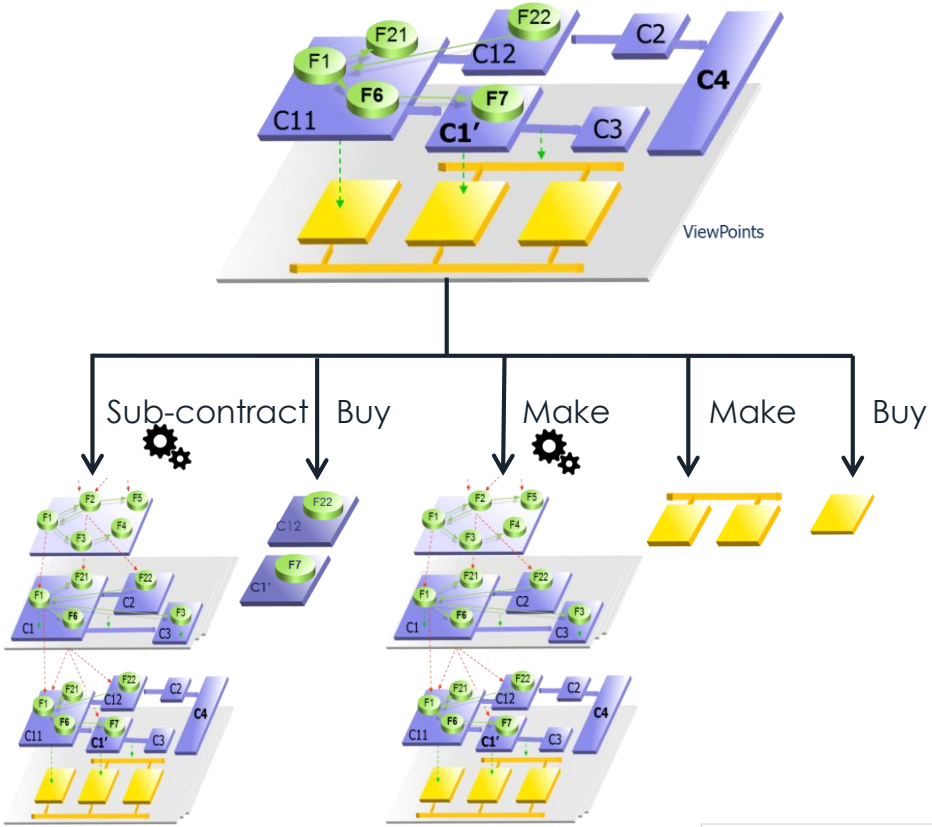




System – Subsystems Transition



Logical / Physical Architecture is the place for co-engineering (SYS, SUBSYS, SW, HW)

Contracts towards sub-contractors are deduced from logical / physical architecture

System – Subsystems Transition