

# SysML Fundamentals

## SysML Exercises

KROB Daniel (INCOSE Fellow) – SUN Jiaheng

Wechat ids: daniel-krob – s18501379086



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# Case study for all exercises

## THE PHOTO DRONE SYSTEM



*The photo drone system*

As a result of a strategic decision of the board of directors, the technical director of your commercial drone company is in charge of the realization – in close contact with the marketing director and the operations director – of a standard offer for a **new photo drone system** which shall be offered to the international market.

As a MBSE modelling expert, you are personally in charge – mandated directly by the technical director since the situation is critical – of creating as soon as possible a **system model of the technical scope** resulting from this decision.

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## SysML Exercises

### Chapter 1 – Operational Architecture

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## CHAPTER 1 – OPERATIONAL ARCHITECTURE • SESSIONS 1.1-1.2 – EXERCISE ON SYSML

**1** Use BDD & IBD to analyze stakeholders

**2** Use REQ to organize needs

### Exercise on SysML

**3** Use STM to define lifecycle

**4** Use UC / SD to specify use cases

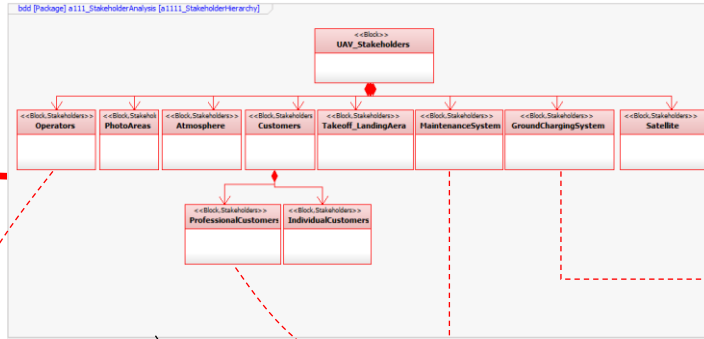
### Exercise on SysML



# Stakeholder & need analysis – Exercise

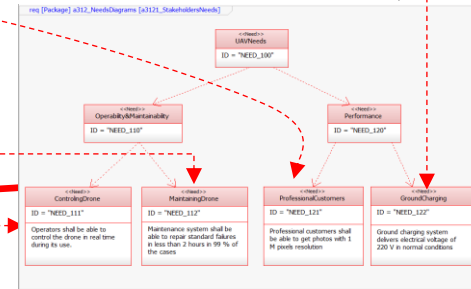
## OVERVIEW

### Deliverable 1: stakeholder hierarchy



The **stakeholder hierarchy** shall be modelled with a **block definition diagram (BDD)**

The **need hierarchy** shall be modelled with a **requirement diagram (REQ)**



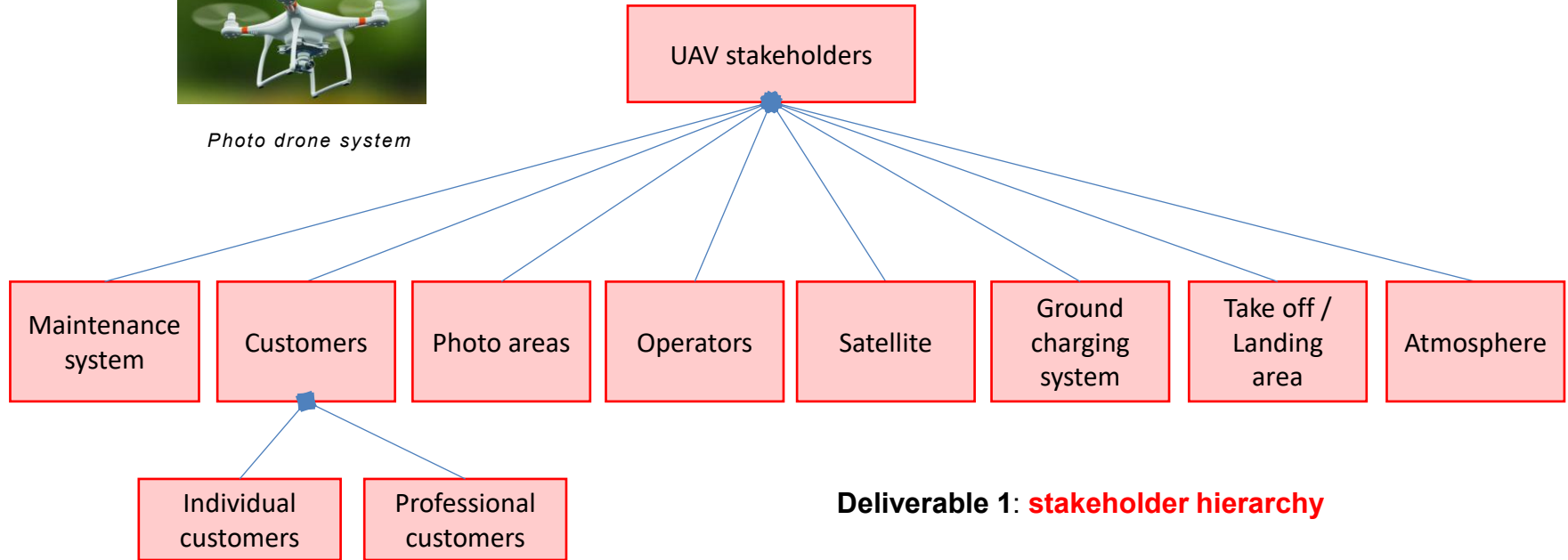
### Deliverable 2: need hierarchy

# Stakeholder & need analysis – Exercise

## SYSTEM ARCHITECTING – STAKEHOLDER ANALYSIS



*Photo drone system*



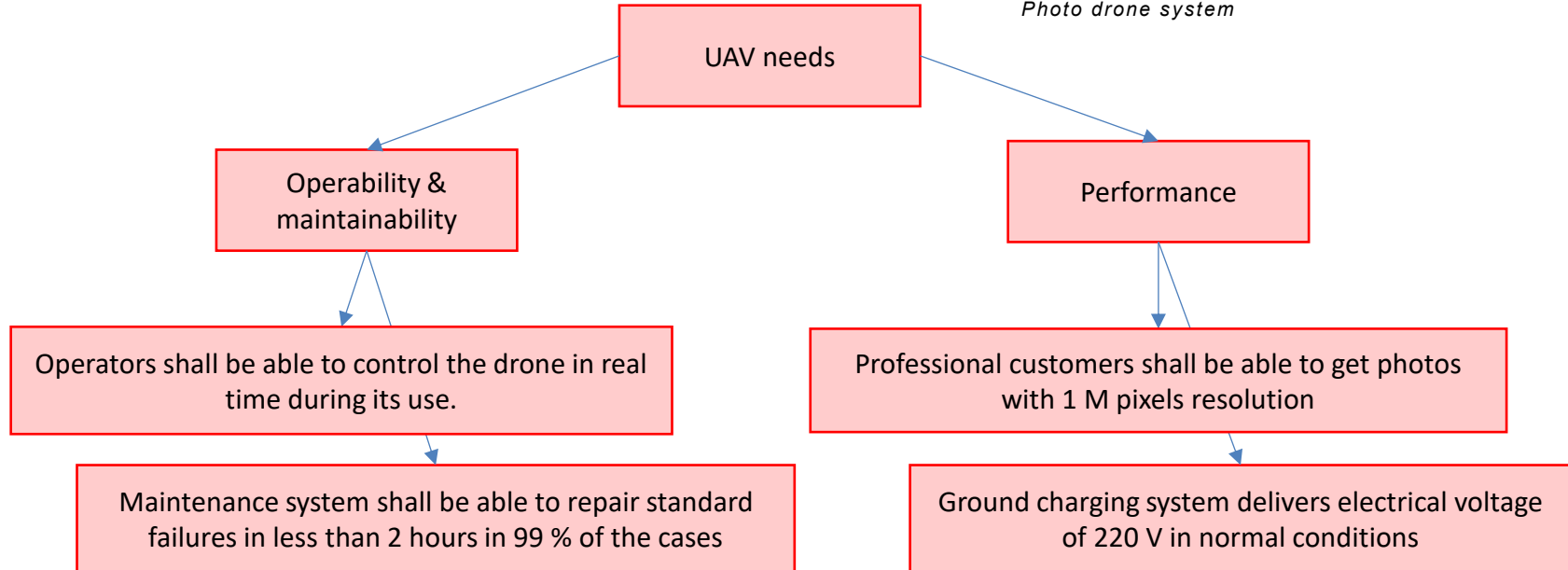
**Deliverable 1: stakeholder hierarchy**

# Stakeholder & need analysis – Exercise

## SYSTEM ARCHITECTING – NEED ANALYSIS



Photo drone system



### Deliverable 2: need hierarchy

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## CHAPTER 1 – OPERATIONAL ARCHITECTURE • SESSIONS 1.3-1.4 – EXERCISE ON SYSML

**1** Use BDD & IBD to analyze stakeholders

**2** Use REQ to organize needs

Exercise on SysML

**3** Use STM to define lifecycle

**4** Use UC / SD to specify use cases

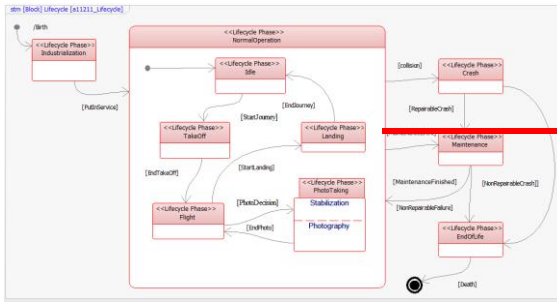
**Exercise on SysML**



# Lifecycle & use case analysis – Exercise

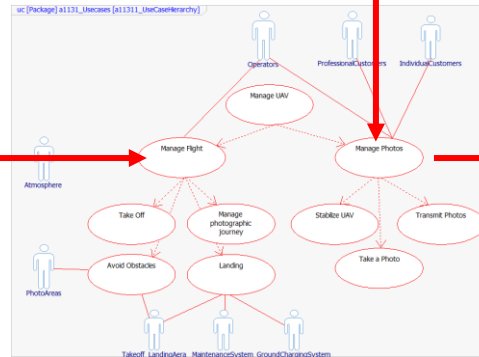
## OVERVIEW

### Deliverable 1: lifecycle



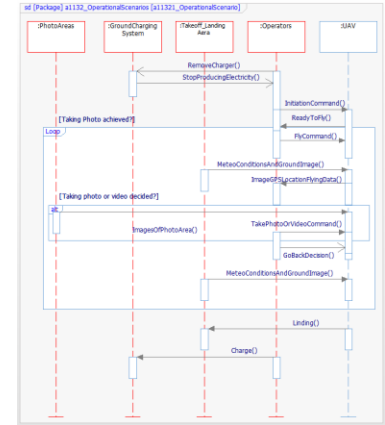
The **system lifecycle** shall be modelled with a **state machine diagram (STM)**

### Deliverable 2: use case hierarchy



The **use case hierarchy** shall be modelled with a **use case diagram (UC)**

### Deliverable 3: operational scenario



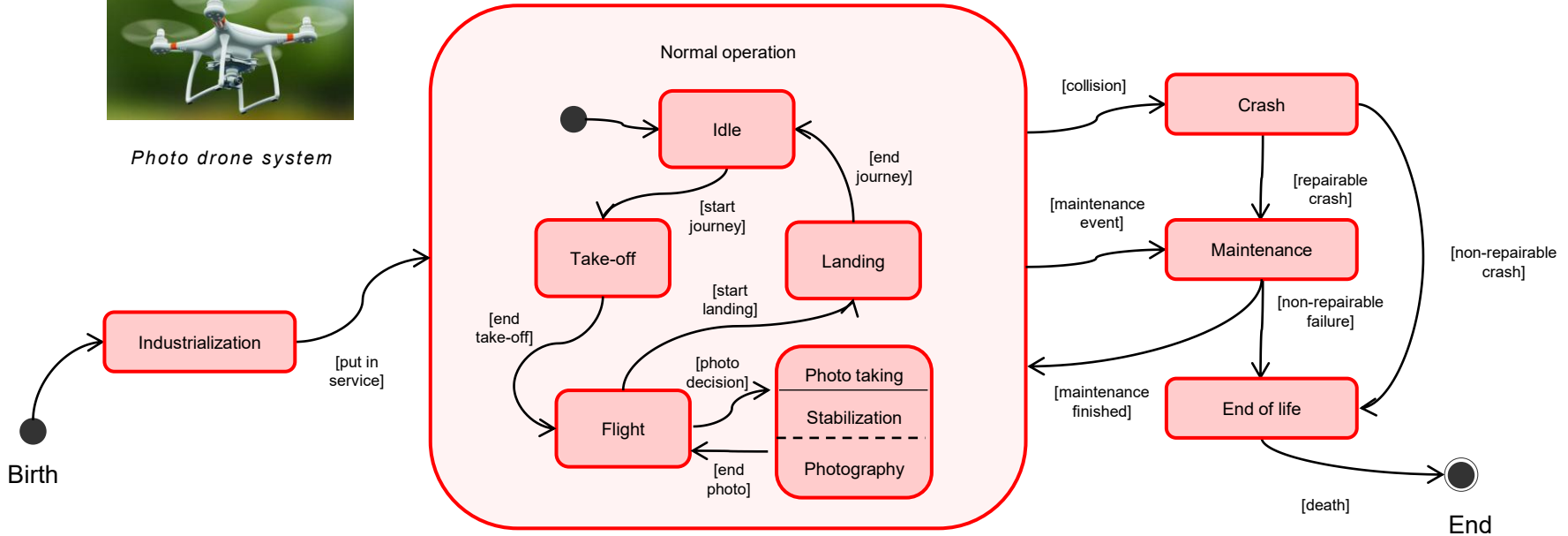
The **operational scenarios** shall be modelled with a **sequence diagram (SD)**

# Lifecycle & use case analysis – Exercise

## SYSTEM ARCHITECTING – LIFECYCLE ANALYSIS



Photo drone system



**Deliverable 1: lifecycle**

UAV system lifecycle

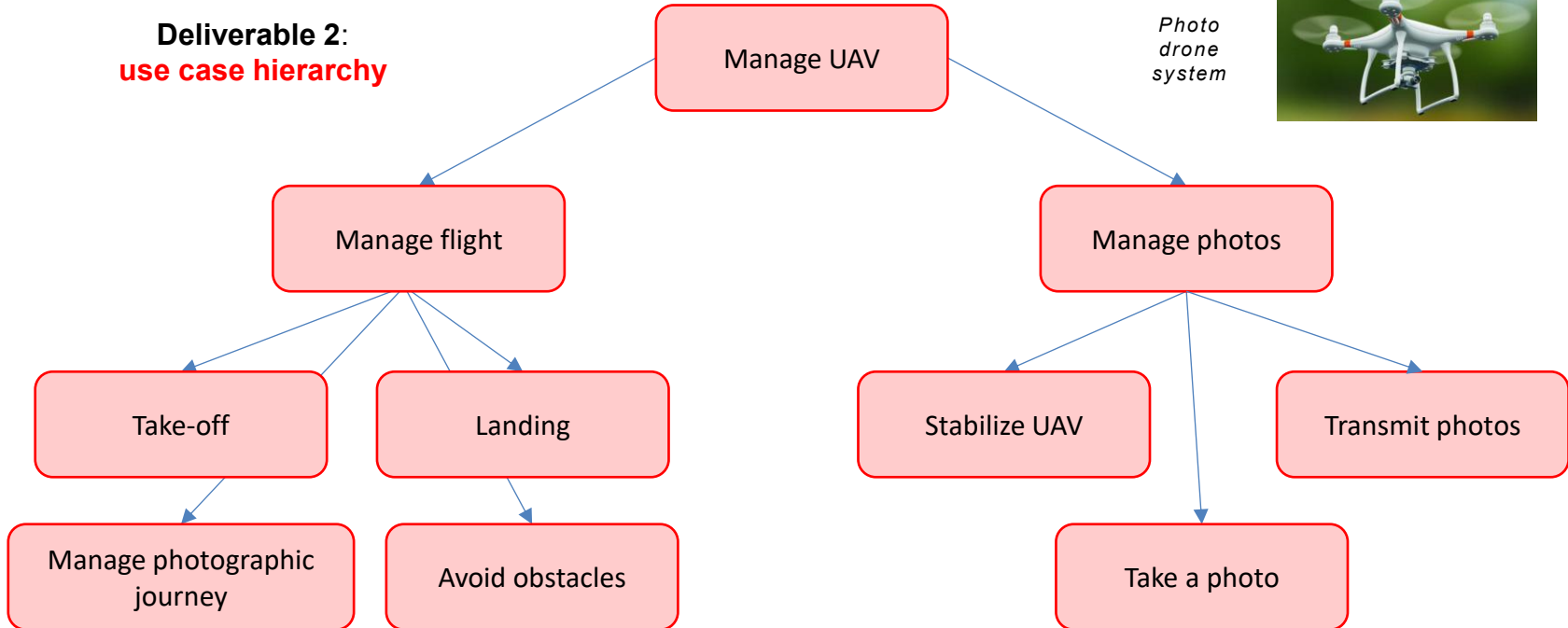


# Lifecycle & use case analysis – Exercise

## SYSTEM ARCHITECTING – USE CASE ANALYSIS – USE CASE HIERARCHY



### Deliverable 2: use case hierarchy



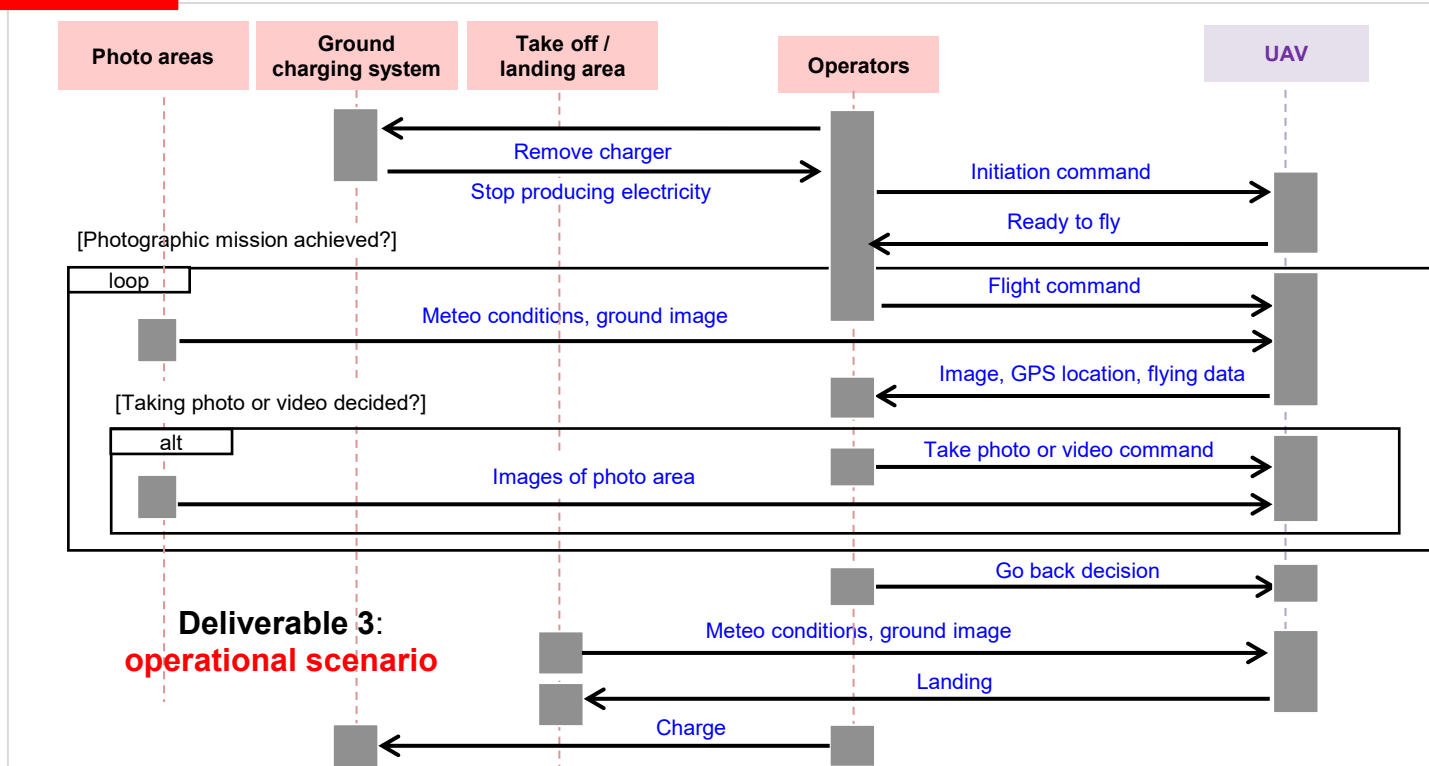
# Lifecycle & use case analysis – Exercise

## SYSTEM ARCHITECTING – USE CASE ANALYSIS – OPERATIONAL SCENARIO

Photo  
drone  
system



### Take a photo



# SysML Fundamentals

## SysML Exercises

### Chapter 2 – Functional Architecture

KROB Daniel (INCOSE Fellow) – SUN Jiaheng

Wechat ids: daniel-krob – s18501379086



系思迈

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## CHAPTER 2 – FUNCTIONAL ARCHITECTURE • SESSION 2.1 – EXERCISE ON SYSML

- 1 Use BDD & IBD or ACT to organize functional architecture and SD or ACT to specify functional scenarios

### Exercise on SysML

- 2 Use REQ to define functional requirements
- 3 Use STM to define functional modes

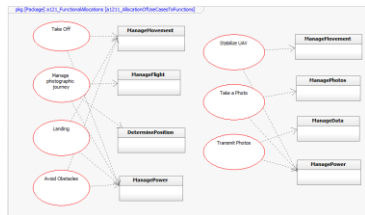
### Exercise on SysML



# Functional analysis – Exercise

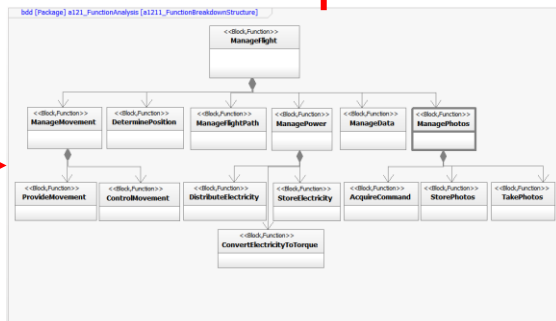
## OVERVIEW

### Deliverable 1: use cases to functions allocations



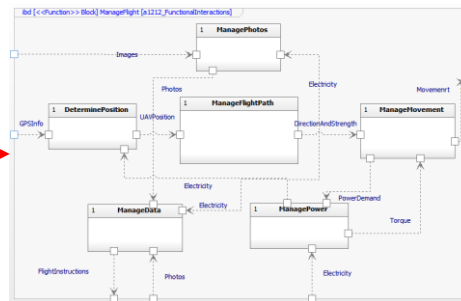
The **use cases to functions allocations** shall be modelled with a **requirement diagram (REQ)**

### Deliverable 2: functional breakdown structure



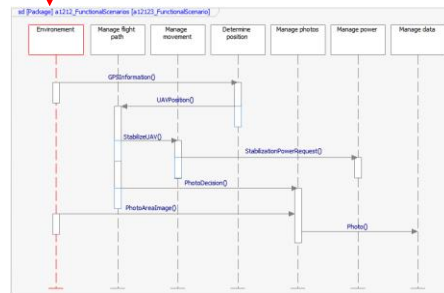
The **functional breakdown structure** shall be modelled with a **block definition diagram (BDD)**

### Deliverable 3: functional interactions



The **functional interactions** shall be modelled with a **internal block diagram (IBD)**

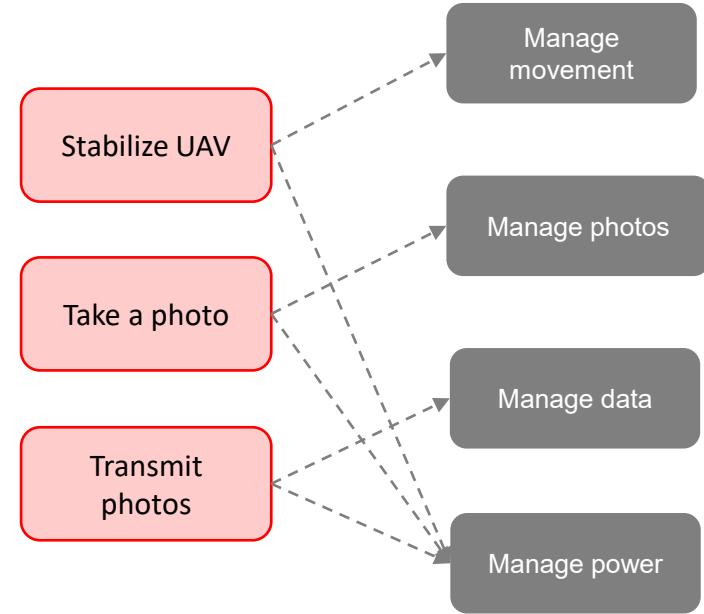
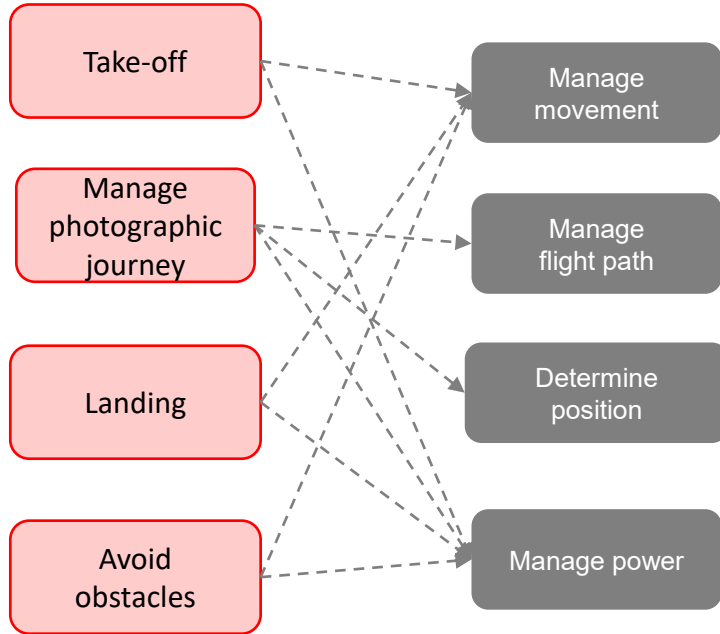
### Deliverable 4: functional scenario



The **functional scenario** shall be modelled with a **sequence diagram (SD)**

# Functional analysis – Exercise

## STEP 1: SYSTEM ARCHITECTING – FUNCTIONAL ANALYSIS – IDENTIFY ALL FUNCTIONS

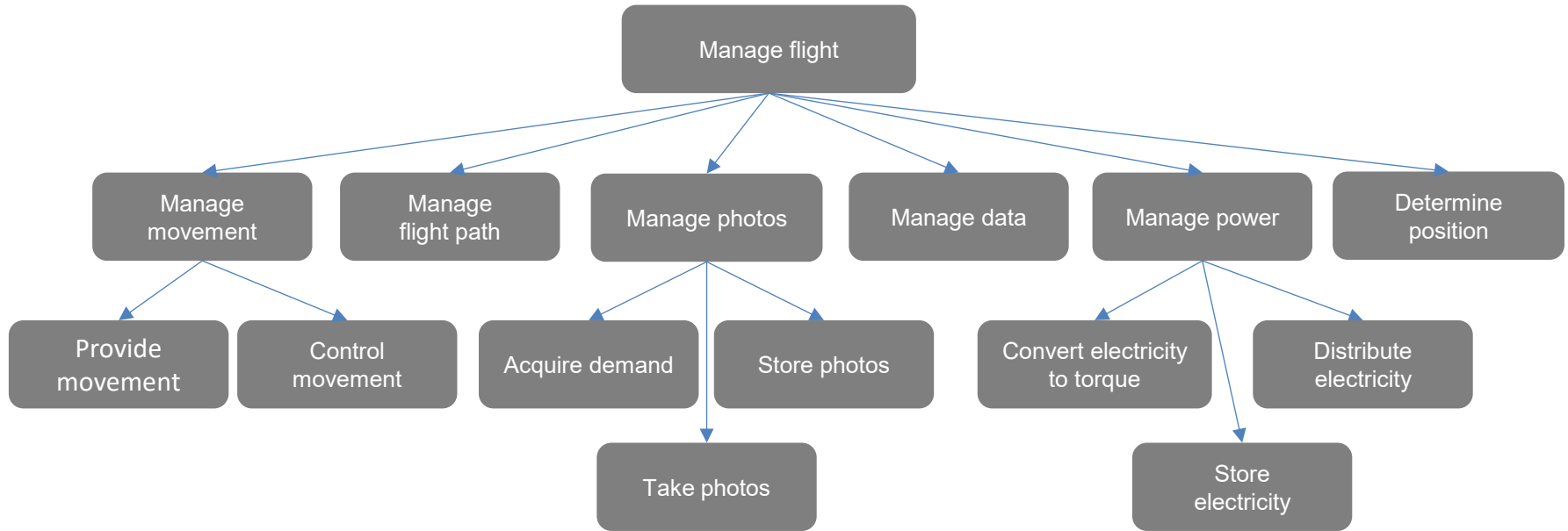


**Deliverable 1: use cases to functions allocations**



# Functional analysis – Exercise

## STEP 2: SYSTEM ARCHITECTING – FUNCTIONAL ANALYSIS – FUNCTIONAL BREAKDOWN STRUCTURE

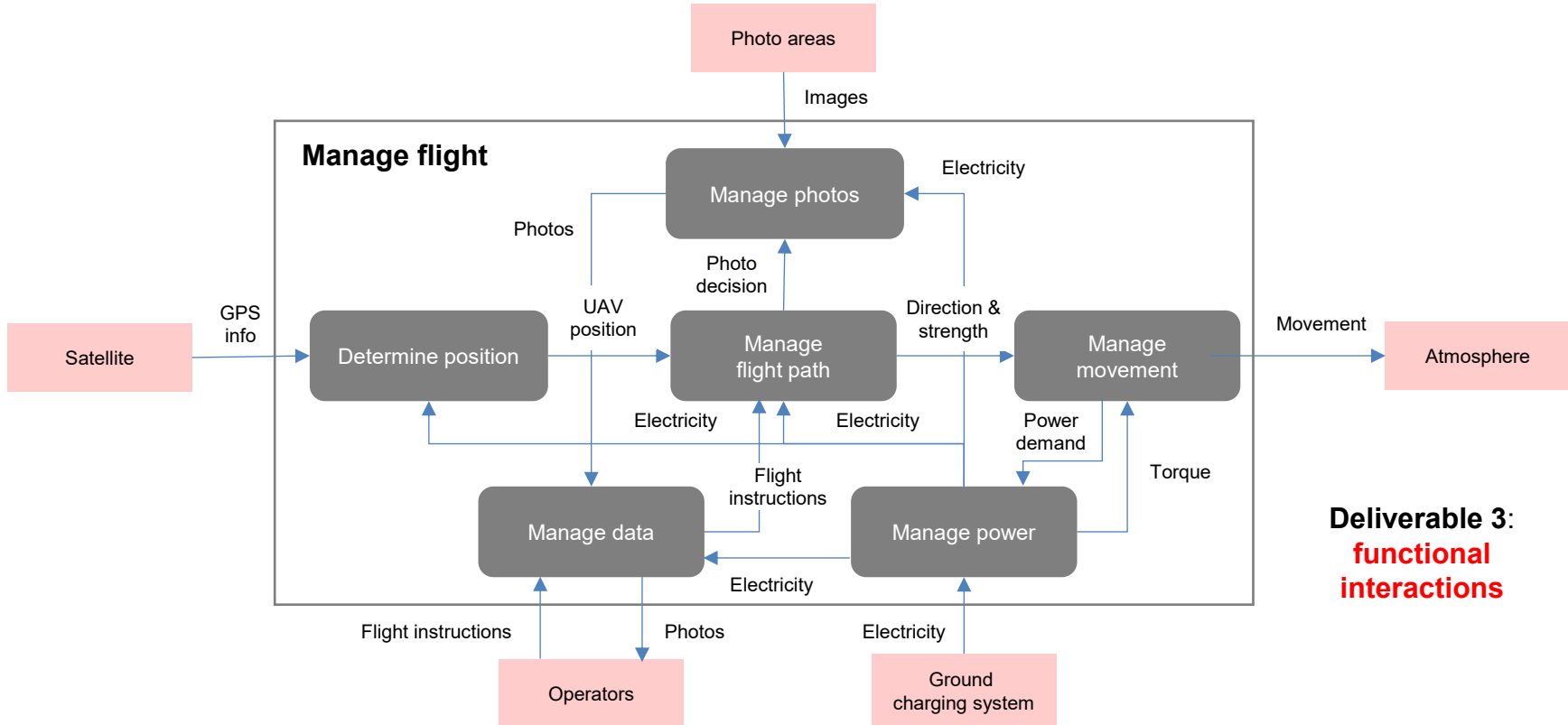


### Deliverable 2: functional breakdown structure



# Functional analysis – Exercise

## STEP 3 : SYSTEM ARCHITECTING – FUNCTIONAL ANALYSIS – FUNCTIONAL INTERACTIONS

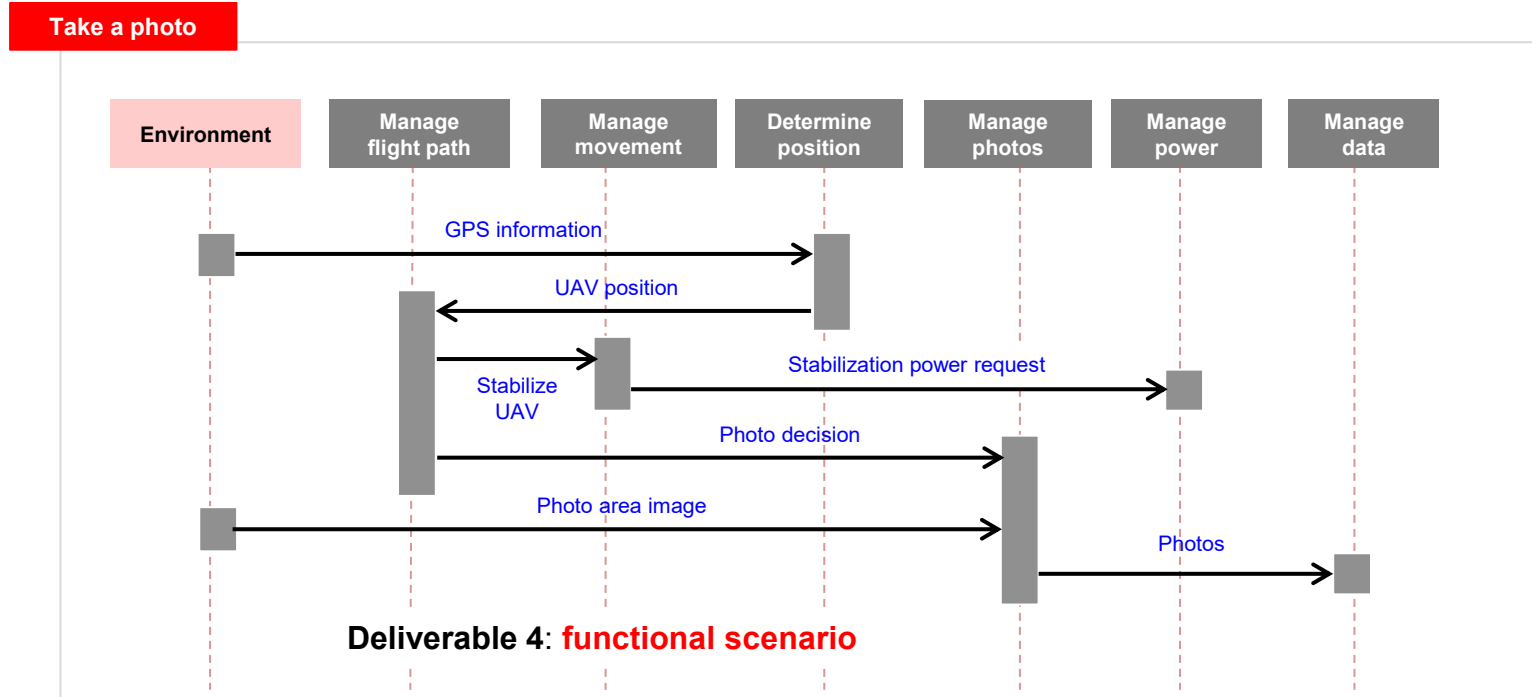


**Deliverable 3:**  
**functional**  
**interactions**



# Functional analysis – Exercise

## STEP 4: SYSTEM ARCHITECTING – FUNCTIONAL ANALYSIS – FUNCTIONAL SCENARIO



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## CHAPTER 2 – FUNCTIONAL ARCHITECTURE • SESSIONS 2.2-2.3 – EXERCISE ON SysML

**1**

Use BDD & IBD or ACT to organize functional architecture  
and SD or ACT to specify functional scenarios

Exercise on SysML

**2**

Use REQ to define functional requirements

**3**

Use STM to define functional modes

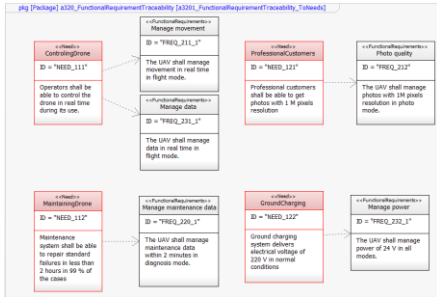
**Exercise on SysML**



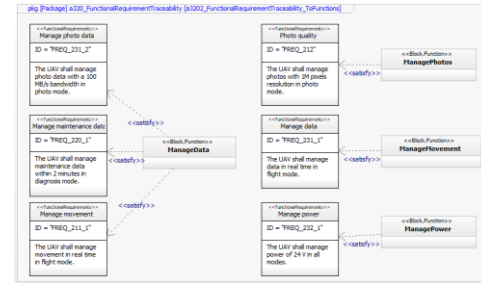
# Functional requirements & functional modes – Exercise

## OVERVIEW

### Deliverable 1: needs to functional requirements allocations



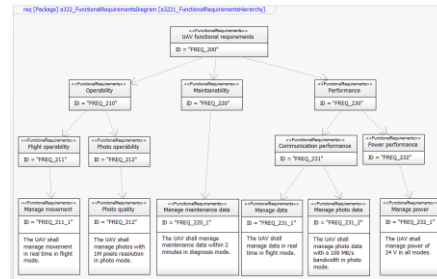
### Deliverable 3: functional requirements to functions allocations



The **needs to functional requirements allocations** shall be modelled with a **package diagram (PKG)**

The **functional requirements to functions allocations** shall be modelled with a **package diagram (PKG)**

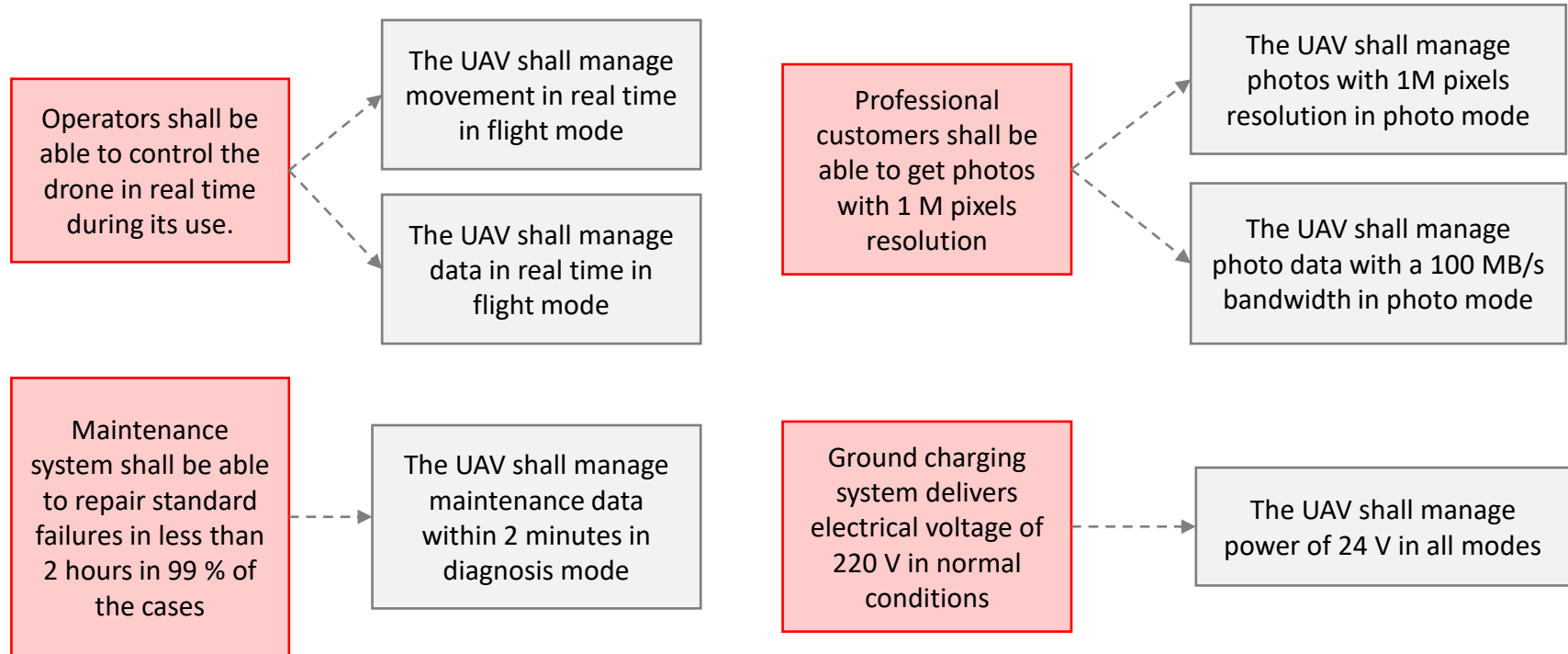
### Deliverable 2: functional requirements hierarchy



The **functional requirements hierarchy** shall be modelled with a **requirement diagram (REQ)**

# Functional requirements & functional modes – Exercise

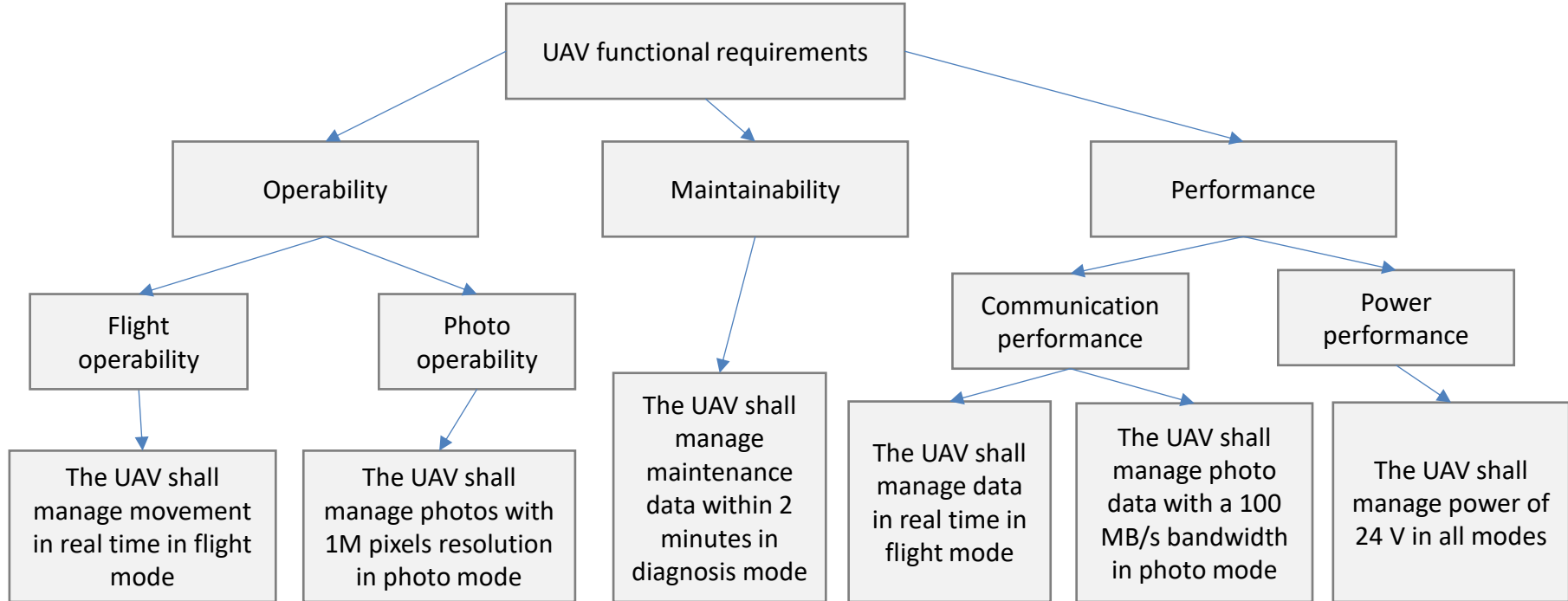
## SYSTEM ARCHITECTING – TRACEABILITY FROM NEEDS TO FUNCTIONAL REQUIREMENTS



### Deliverable 1: needs to functional requirements allocations

# Functional requirements & functional modes – Exercise

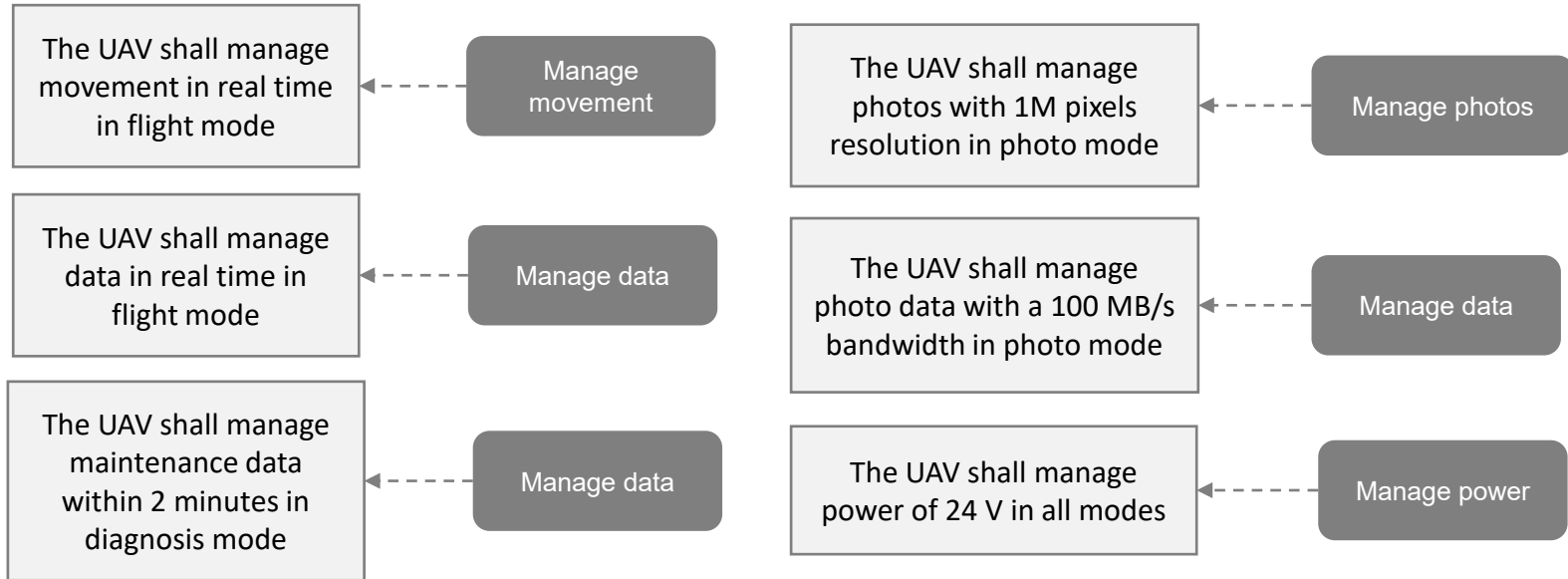
## SYSTEM ARCHITECTING – FUNCTIONAL REQUIREMENTS HIERARCHY



### Deliverable 2: functional requirements hierarchy

# Functional requirements & functional modes – Exercise

## SYSTEM ARCHITECTING – TRACEABILITY FROM FUNCTIONAL REQUIREMENTS TO FUNCTIONS



### Deliverable 3: functional requirements to functions allocations



# SysML Fundamentals

## SysML Exercises

### Chapter 3 – Logical Architecture

KROB Daniel (INCOSE Fellow) – SUN Jiaheng

Wechat ids: daniel-krob – s18501379086



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## CHAPTER 3 – LOGICAL ARCHITECTURE • SESSION 3.1 – EXERCISE ON SYSML

**1**

Use BDD & IBD to organize logical architecture  
and SD to specify logical scenarios

### Exercise on SysML

**2**

Use REQ to define technical requirements

### Exercise on SysML

**3**

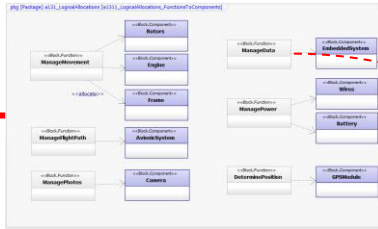
Use STM & BDD to define technical modes



# Logical analysis – Exercise

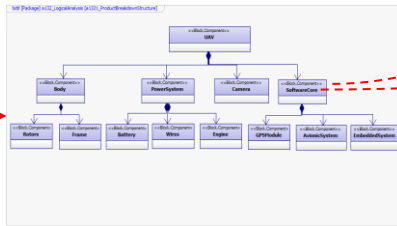
## OVERVIEW

### Deliverable 1: functions to components allocation table



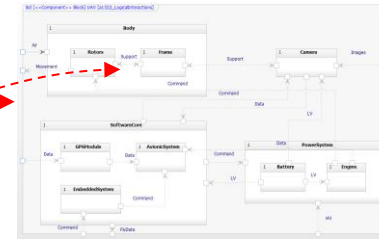
The **functions to components allocation table** shall be modelled with a **requirement diagram (REQ)**

### Deliverable 2: product breakdown structure



The **product breakdown structure (PBS)** shall be modelled with a **block definition diagram (BDD)**

### Deliverable 3: logical interactions



The **logical interactions** shall be modelled with an **internal block diagram (IBD)**

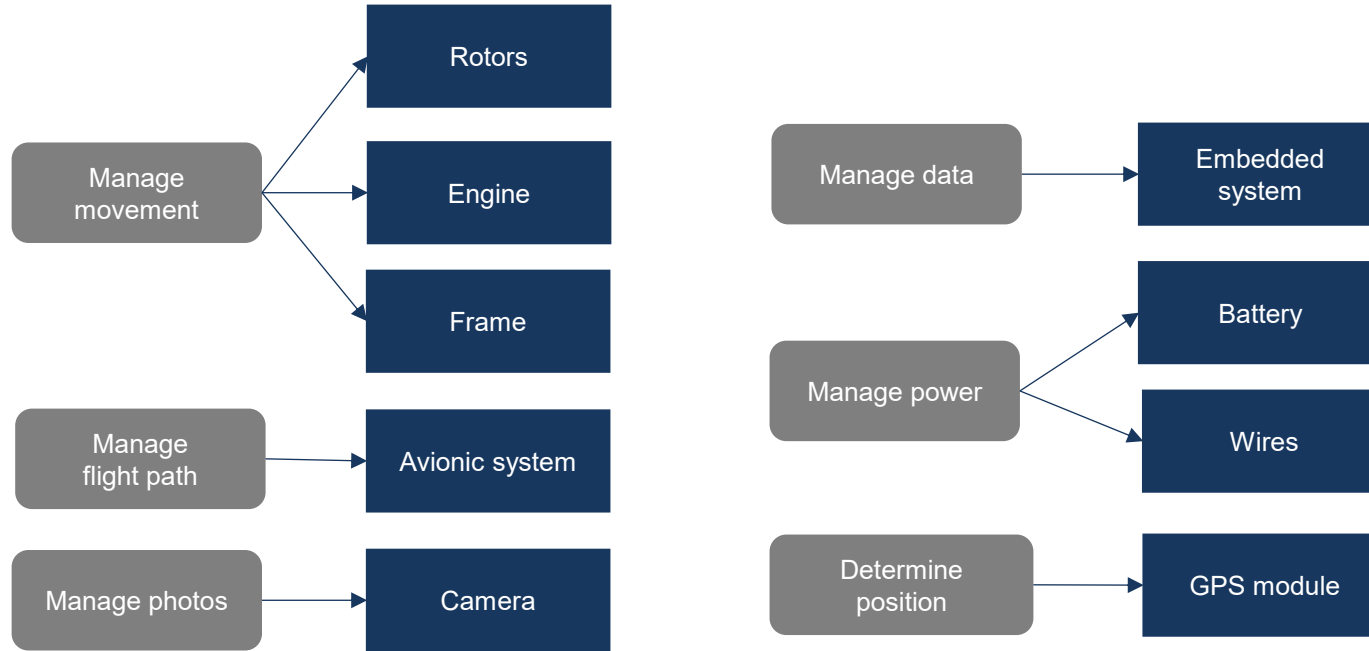
### Deliverable 4: logical scenario



The **logical scenario** shall be modelled with a **sequence diagram (SD)**

# Logical analysis – Exercise

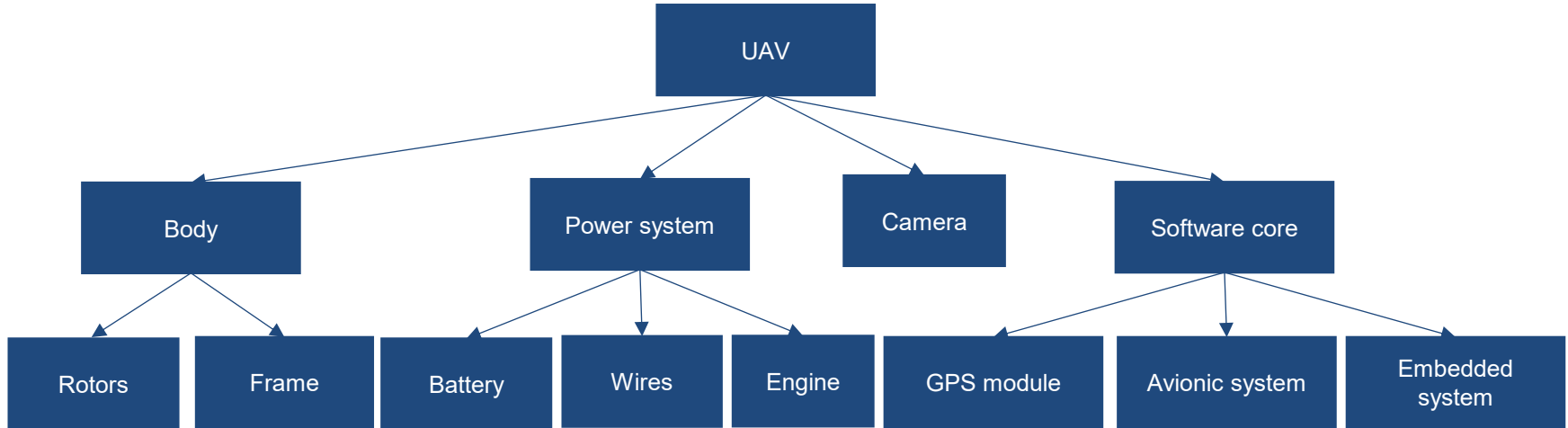
## SYSTEM ARCHITECTING – TRACEABILITY OF COMPONENTS TO FUNCTIONS



### Deliverable 1: functions to components allocation table

# Logical analysis – Exercise

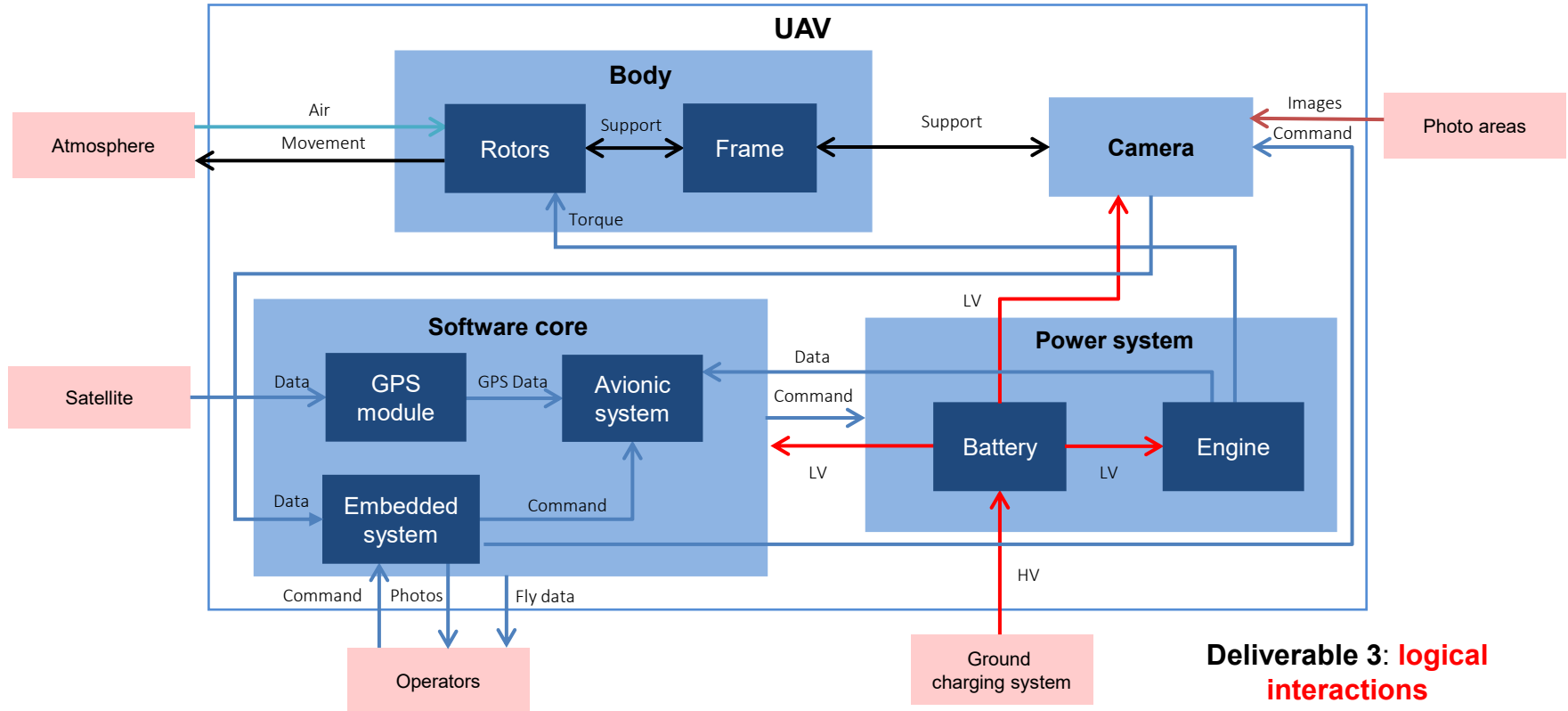
SYSTEM ARCHITECTING – IDENTIFY & ORGANIZE ALL COMPONENTS WITH THEIR INTERACTIONS (1/2)



**Deliverable 2: product breakdown structure**

# Logical analysis – Exercise

SYSTEM ARCHITECTING – IDENTIFY & ORGANIZE ALL COMPONENTS WITH THEIR INTERACTIONS (2/2)

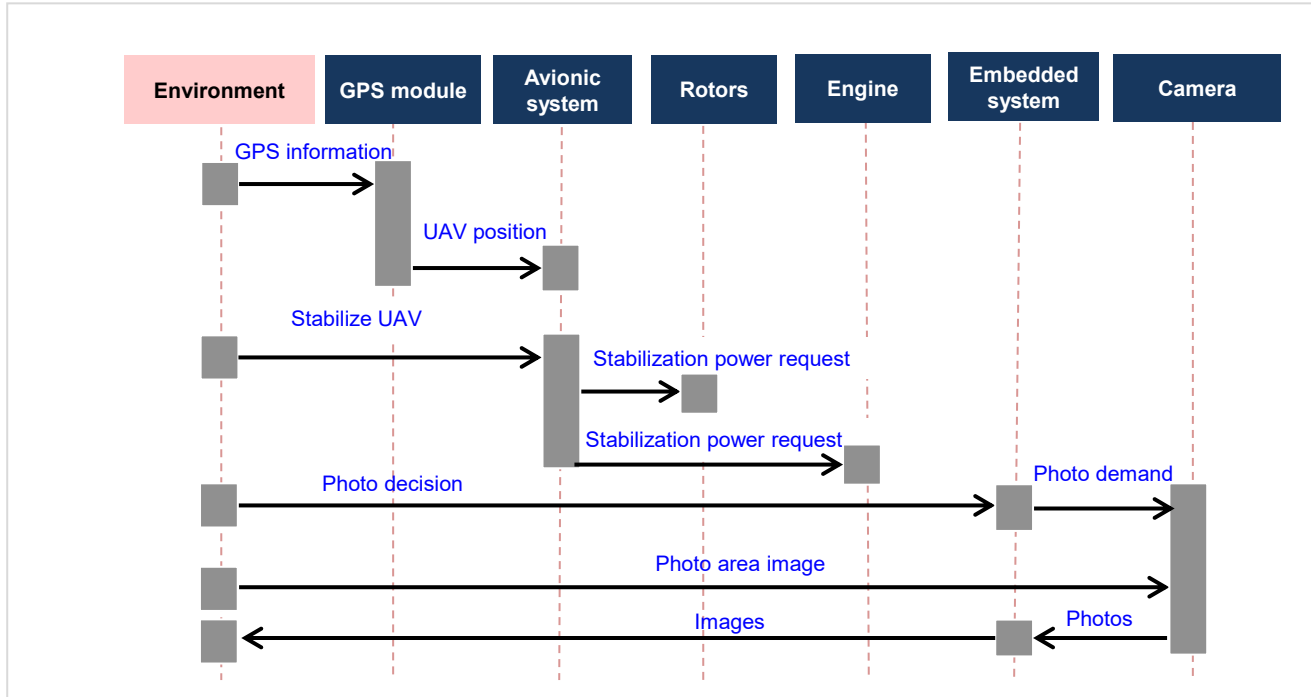


**Deliverable 3: logical interactions**



# Logical analysis – Exercise

## SYSTEM ARCHITECTING – ANALYSE THE LOGICAL SCENARIO ASSOCIATED WITH A FUNCTIONAL SCENARIO



### Deliverable 4: logical scenario

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## CHAPTER 3 – LOGICAL ARCHITECTURE • SESSION 3.2 – EXERCISE ON SYSML

**1**

Use BDD & IBD to organize logical architecture  
and SD to specify logical scenarios

Exercise on SysML

**2**

Use REQ to define technical requirements

**Exercise on SysML**

**3**

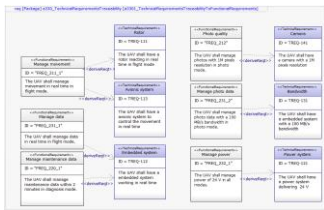
Use STM & BDD to define technical modes



# Technical requirements – Exercise

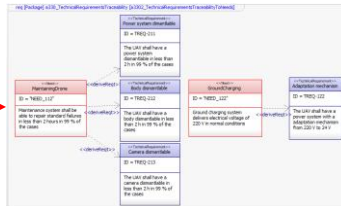
## OVERVIEW

### Deliverable 1: traceability from functional requirements to technical requirements



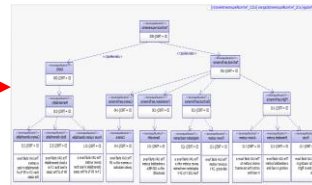
The **traceability from functional requirements to technical requirements** shall be modelled with a **requirement diagram (REQ)**

### Deliverable 2: traceability from needs to technical requirements



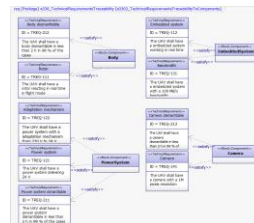
The **traceability from needs to technical requirements** shall be modelled with a **requirement diagram (REQ)**

### Deliverable 3: technical requirements hierarchy



The **technical requirements hierarchy** shall be modelled with a **requirement diagram (REQ)**

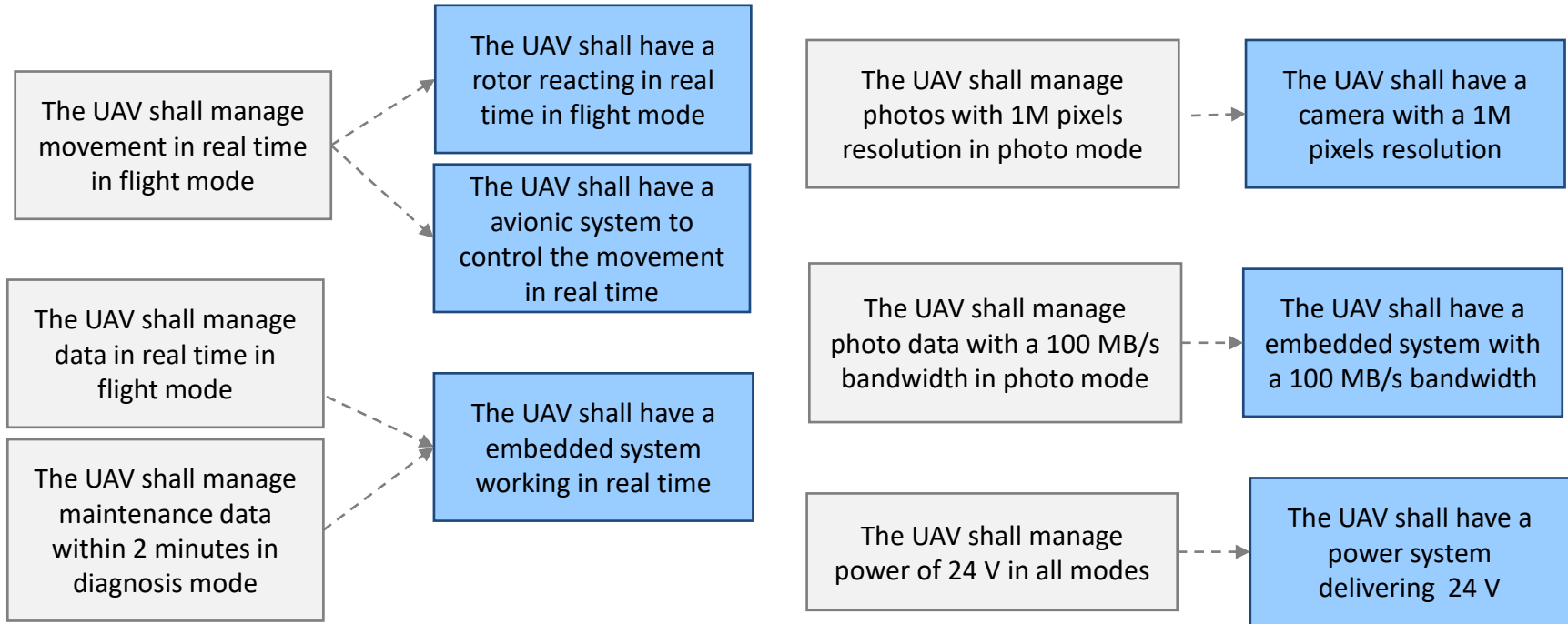
### Deliverable 4: traceability from technical requirements to components



The **traceability from technical requirements to components** shall be modelled with a **requirement diagram (REQ)**

# Technical requirements – Exercise

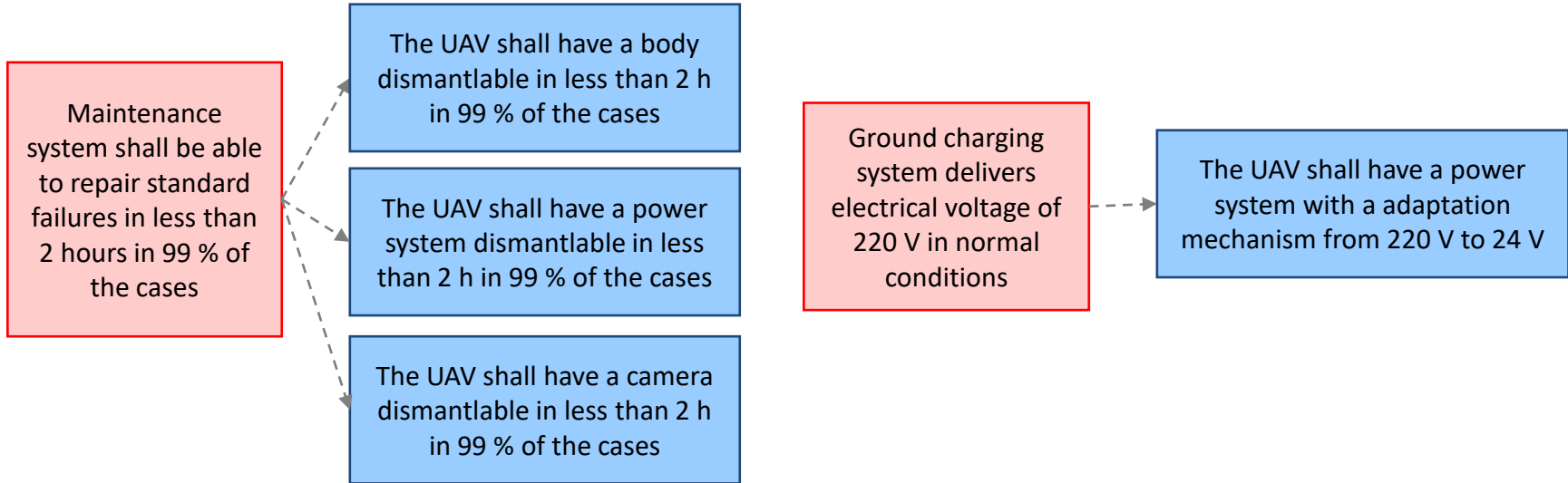
## SYSTEM ARCHITECTING – ANALYSE THE TRACEABILITY FROM FUNCTIONAL REQUIREMENTS TO TECHNICAL REQUIREMENTS



### Deliverable 1: traceability from functional requirements to technical requirements

# Technical requirements – Exercise

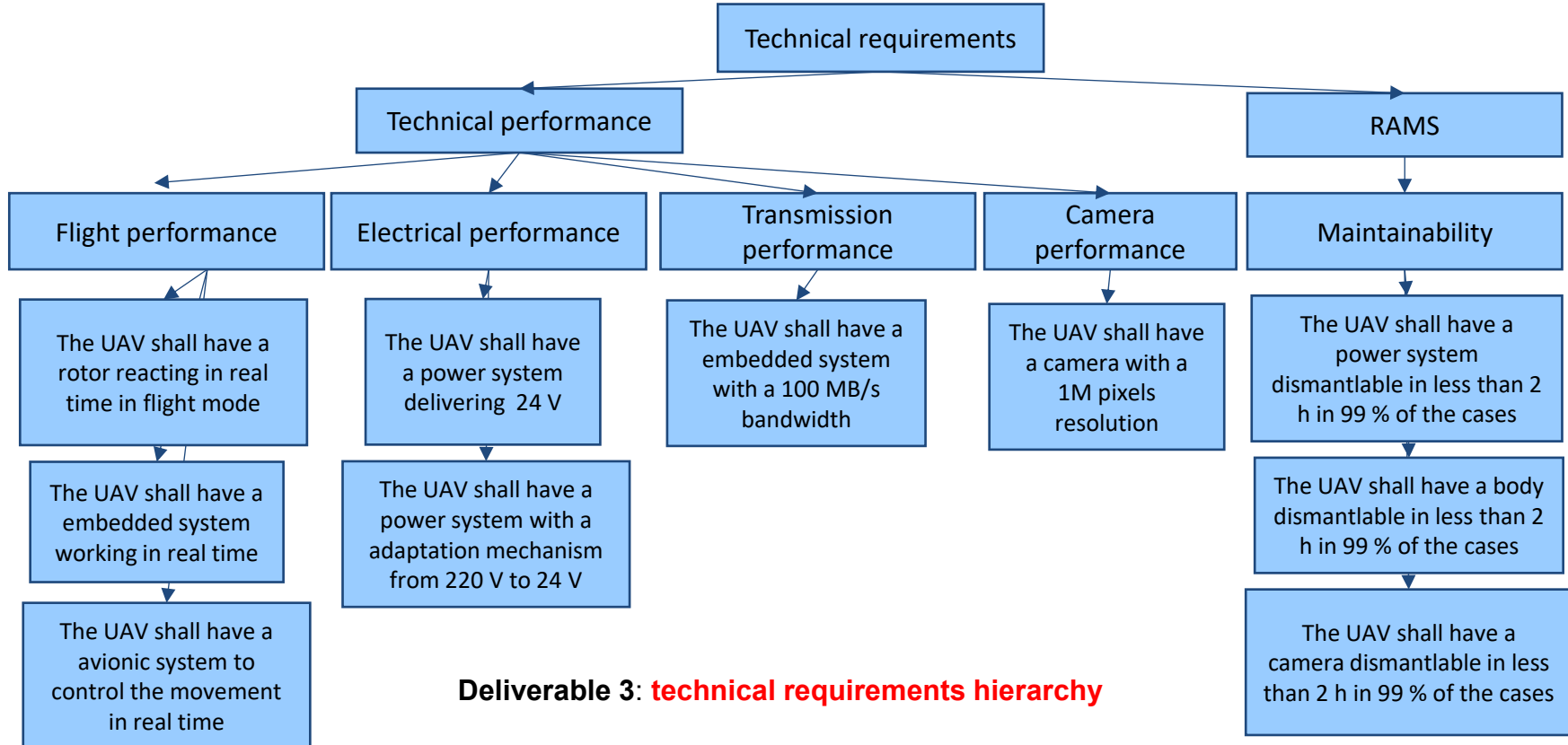
## SYSTEM ARCHITECTING – ANALYSE THE TRACEABILITY FROM NEEDS TO TECHNICAL REQUIREMENTS



**Deliverable 2: traceability from needs to technical requirements**

# Technical requirements – Exercise

## SYSTEM ARCHITECTING – ANALYZE THE TECHNICAL REQUIREMENTS HIERARCHY

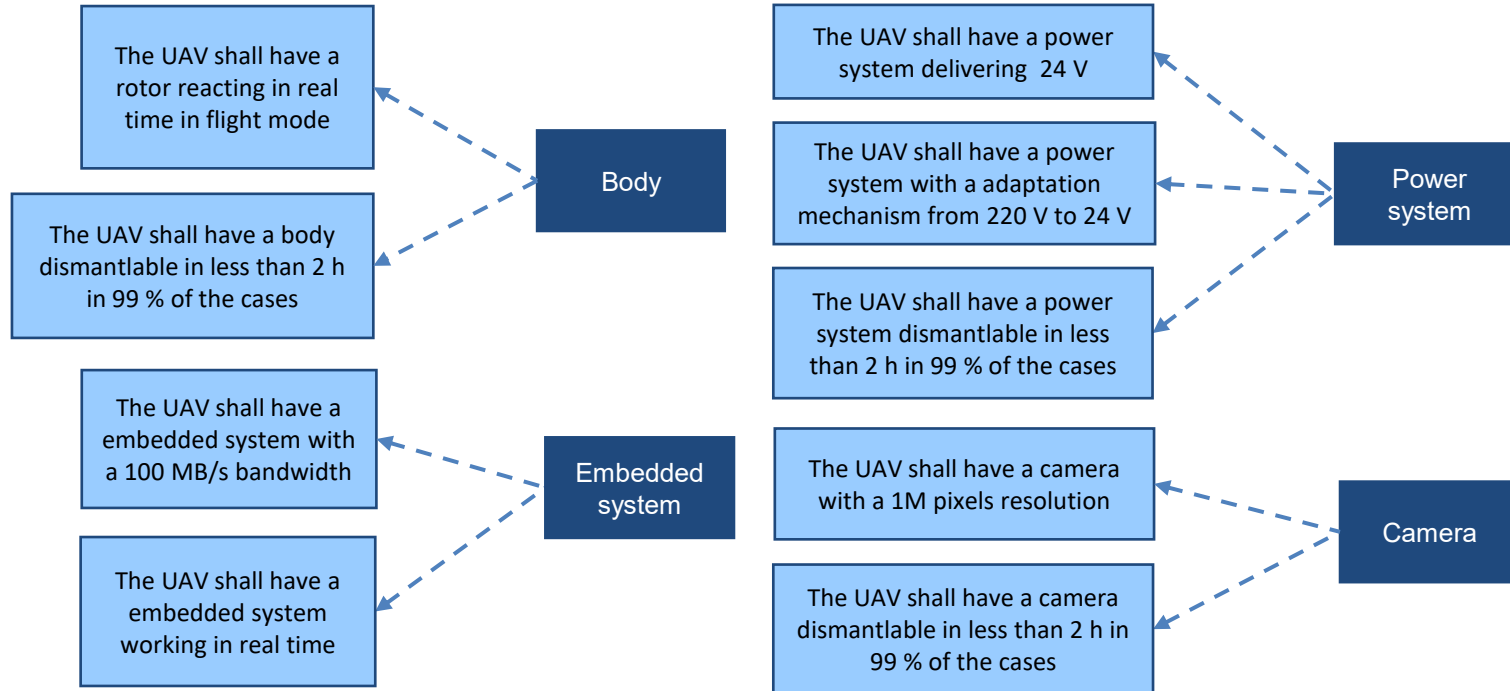


**Deliverable 3: technical requirements hierarchy**



# Technical requirements – Exercise

## SYSTEM ARCHITECTING – ANALYSE THE TRACEABILITY FROM TECHNICAL REQUIREMENTS TO COMPONENTS



### Deliverable 4: traceability from technical requirements to components



# Contact

For any questions on the SysML Fundamentals course, you can join:  
email: [contact@cesames.cn](mailto:contact@cesames.cn) – Wechat ID: CESAMESChina

**Systemic Intelligence Consulting Management (Shanghai) Co Ltd**  
**系以思以迈管理咨询(上海)有限公司**

WOFE – Share capital: 205,000 SGD – Business License: 41000002202312190012

Legal address: 中国（上海）自由贸易试验区环龙路65弄1号三层、四层

Website: <http://www.cesames.cn>



**系思迈**