THALES
Building a future we can all trust

RMIVV Presentation

Capella days

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What kind of product are we talking about ?

Equipments for airborne systems

Several operational capabilities	• Tactical Reconnaissance • Advanced Targeting
High integrated technology and processing	• High resolution sensors • High performance image processing • Strongly constraint by Size Weight and Power (SWAP)
Multi-disciplines engineering	• Optical • Hardware • Mechanical • Thermician • Software • Firmware

https://www.thalesgroup.com/en/attack-recce-navigation

Trends for Future products

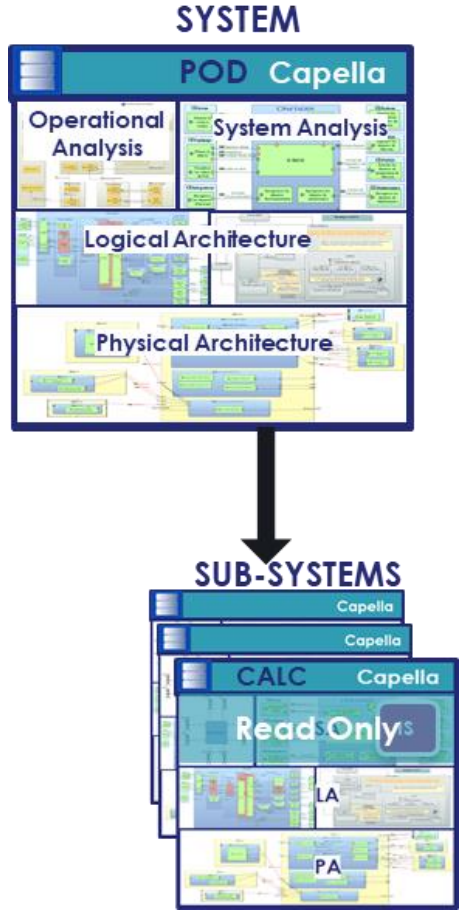
More operational capabilities

- Detection, reconnaissance, identification, localisation
- More sensors and more imaging channels
- More functionalities and coopération
- Introduction of embedded artificial intelligence

Several operational capabilities

- Multiple sub-systems (sensing, processing, thermal dissipation, …)
- Highly distributed embedded systems
  - ► More HW boards
  - ► More CPUs and image co-processors
  - ► More algorithms to allocate
  - ► But in the same range of SWAP …
  - ► … and strong expectations on competitiveness

MBSE becomes essential to master complexity



https://www.thalesgroup.com/en/attack-recce-navigation

Engineering transformation to reach these challenges

Promoting co-engineering activities

Based on iterative and incremental developpement

Based on pull-schedulling

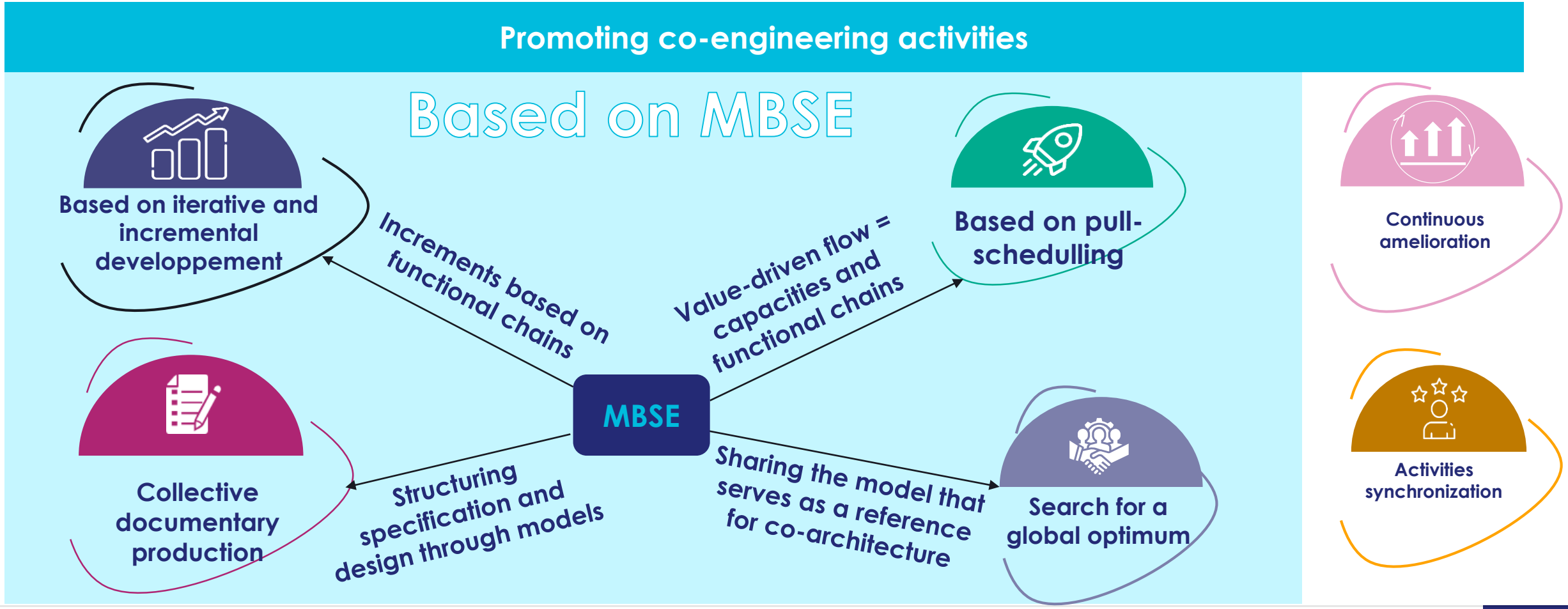
Continuous amelioration

Collective documentary production

Search for a global optimum

Activities synchronization

Engineering transformation to reach these challenges



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IVV-Based incremental development

Capabilities and Functional chains drive the definition of the development increment content

- **An increment** is a deliverable with content that brings value to the "customer" level (in the sense of the increment's consumer). It can be applied at system, subsystems and software levels
- Its definition is driven by the value analysis of **capabilities and functional chains** from System Analysis (SA)
- The granularity of the increment can be
  - One or several functional chains end-to-end
  - A subset of functional chains

IVV shall be implied early in the functional analysis to challenge functional scenarios

- The IVV must have knowledge as soon as possible of the functional chains and associated functional scenarios
- Sytem architect translates SA-level functional chains into logical and physical levels, and ensures traceability.
- IVV scenarios are developed by the IVV discipline on the basis of functional chains and operational scenarios.
- IVV contributes to the construction of development increments
- Functional chains and scenarios are refined at each engineering level; system and sub-system.

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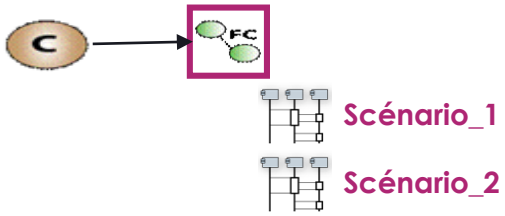
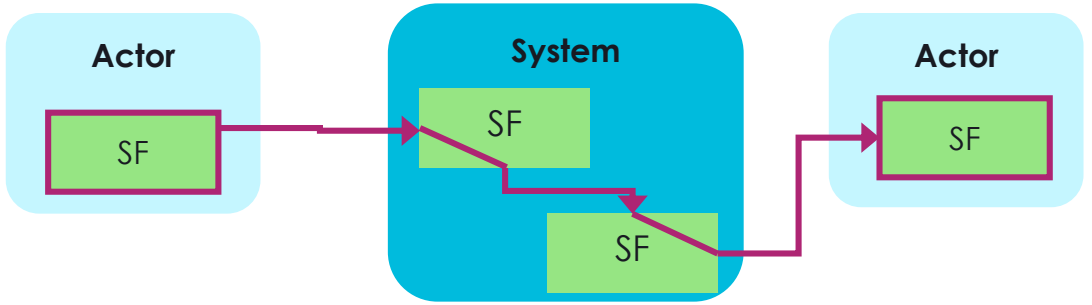
Increment definition based on components

NEEDS

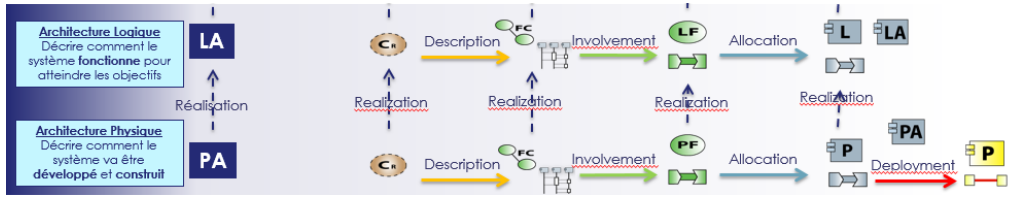
Identification of Capabilities and Functional chains for releases



Definition of functional chains at System Analysis level



SOLUTION



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Increment definition based on components

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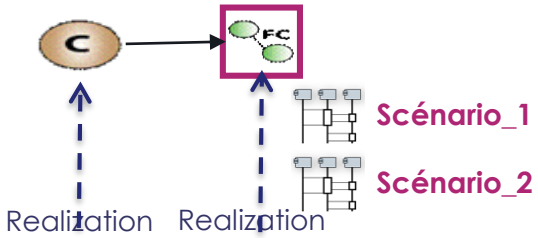
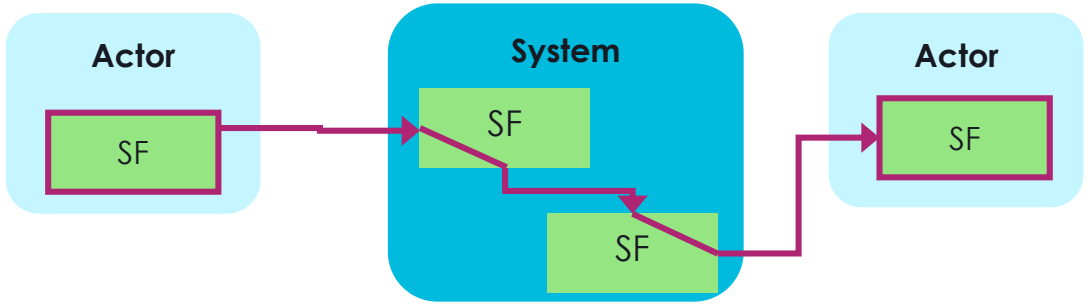
Identification of Capabilities and Functional chains for releases

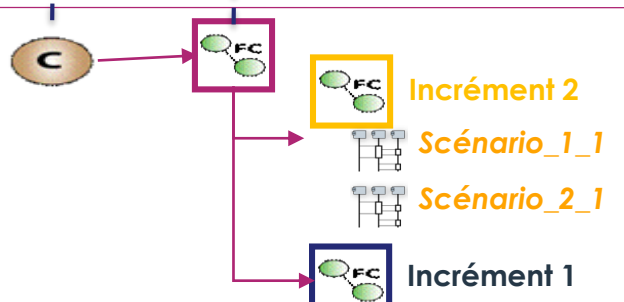


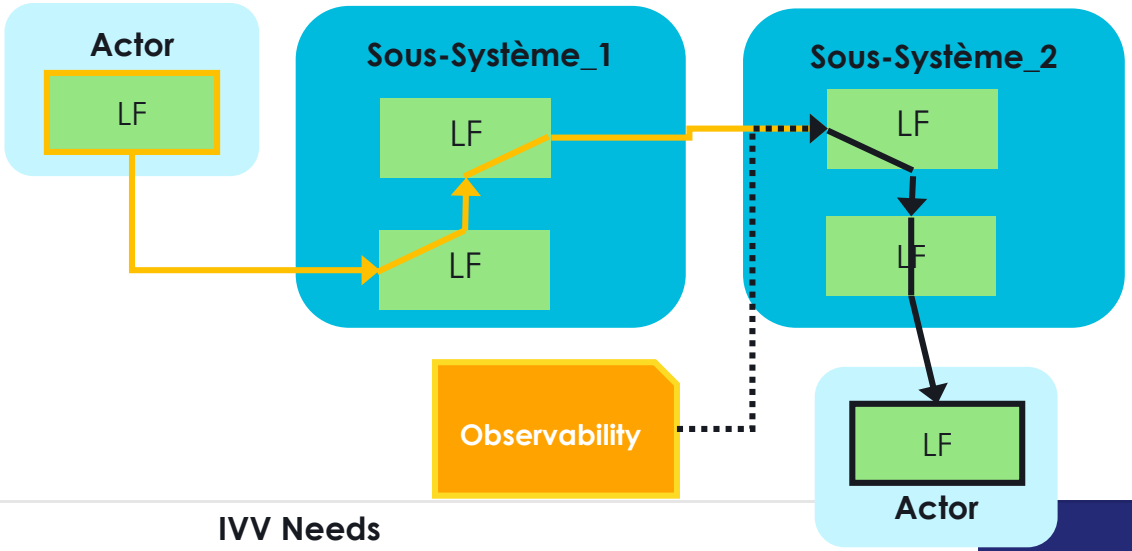
Definition of functional chains at System Analysis level

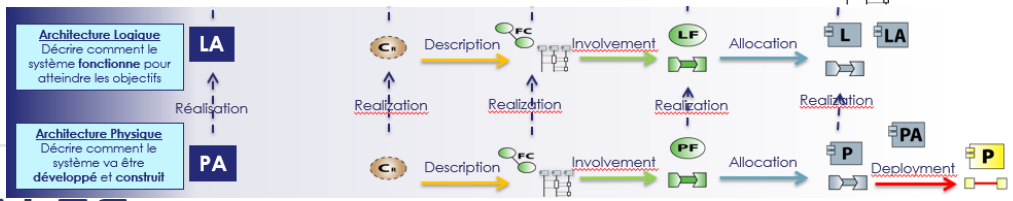


SOLUTION

Identification of development increments to implement the releases







IVV Needs

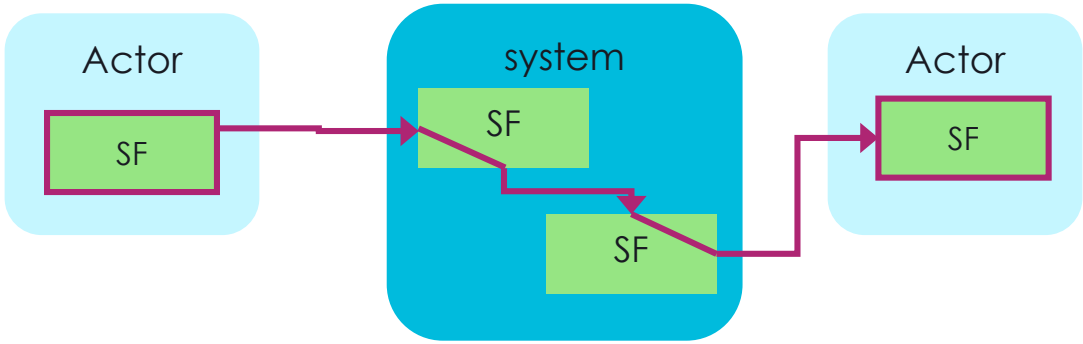
Increment definition by end-to-end FC refinement

BESOIN

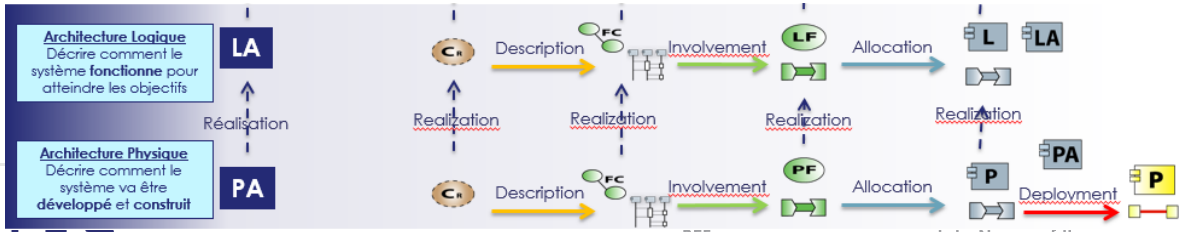
Identification of Capabilities and Functional chains for releases

Scénario_1

Scénario_2



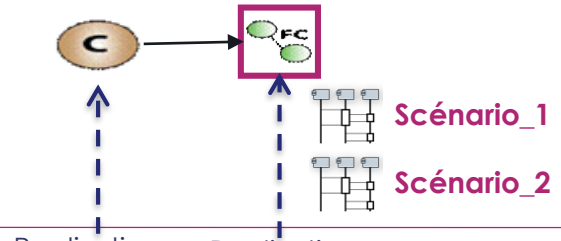
SOLUTION

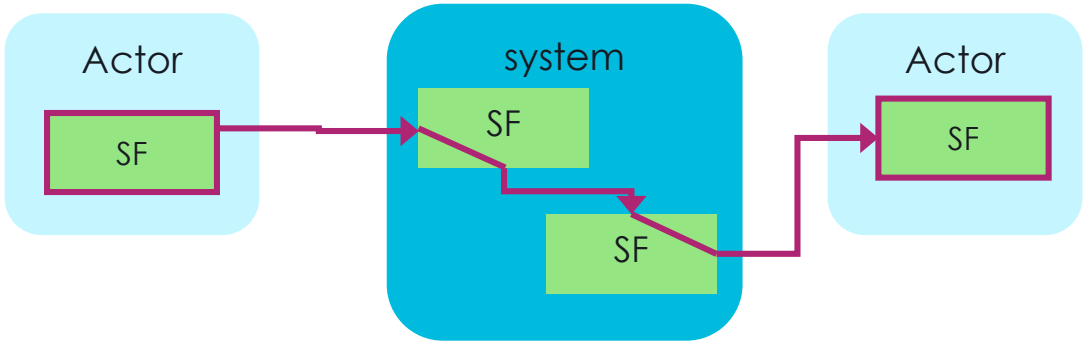


Increment definition by end-to-end FC refinement

BESOIN

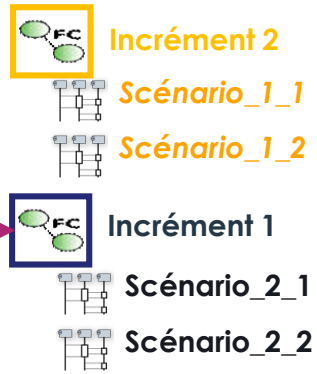
Identification of Capabilities and Functional chains for releases

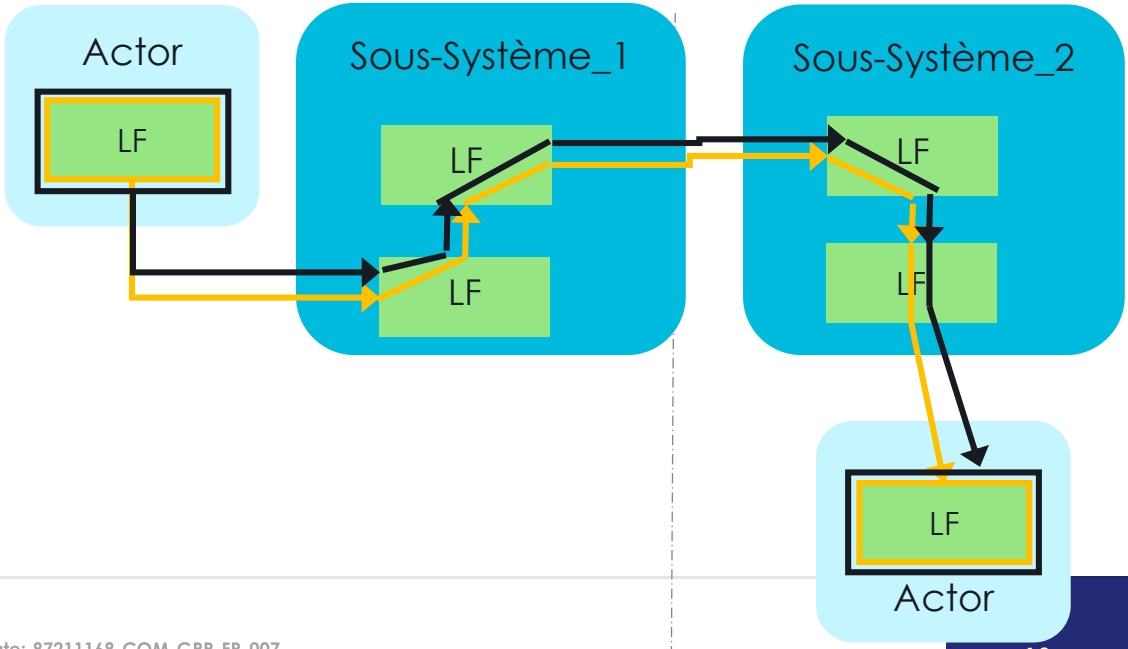


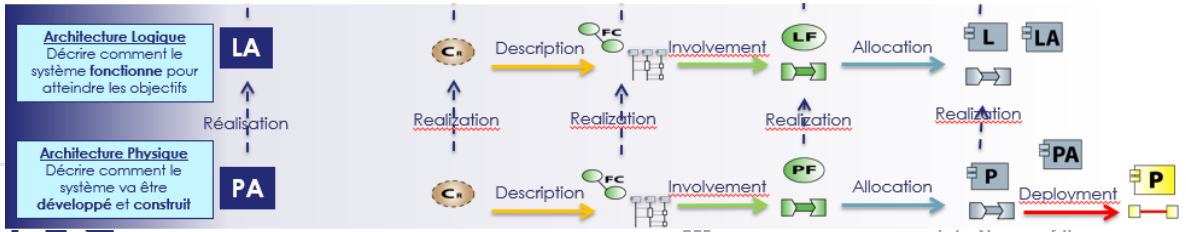


SOLUTION

Identification of development increments to implement the releases







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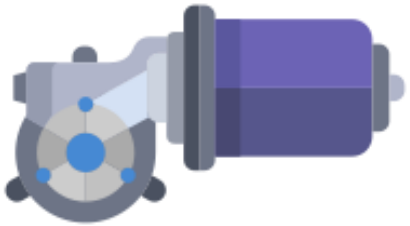
What is an increment ?

TIME

INCREMENT 1	INCREMENT 2	INCREMENT 3	INCREMENT 4
			

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How to define an increment ?

STEP 1

DEFINE WHAT IS **REQUIRED**

STEP 2

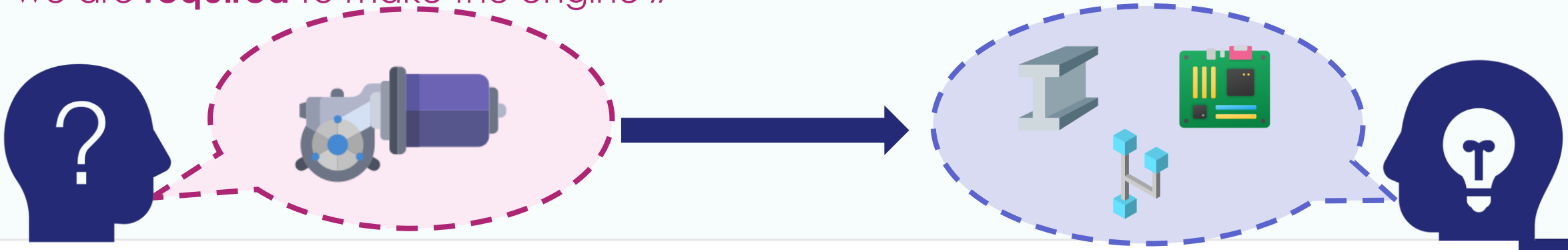
DEDUCT WHAT NEEDS TO BE **DEVELOPED**

(TO MAKE WHAT IS **REQUIRED**)

EXEMPLE

« we want to create a car therefore we are **required** to make the engine »

« To make our car, we will **develop** these items… »



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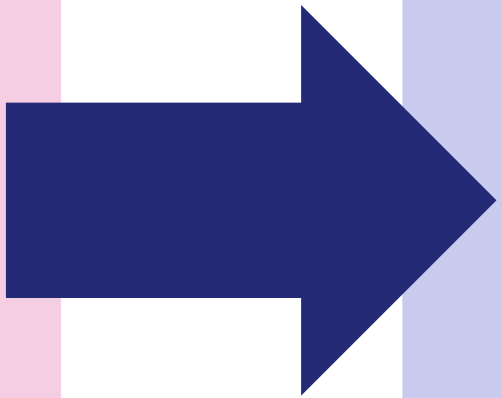
How to define an increment ?

STEP 1

REQUIRED
=
A NEED



STEP 2

DEVELOPED
=
A SOLUTION

{OPEN}

How to define an increment ?

STEP 1

REQUIRED

=

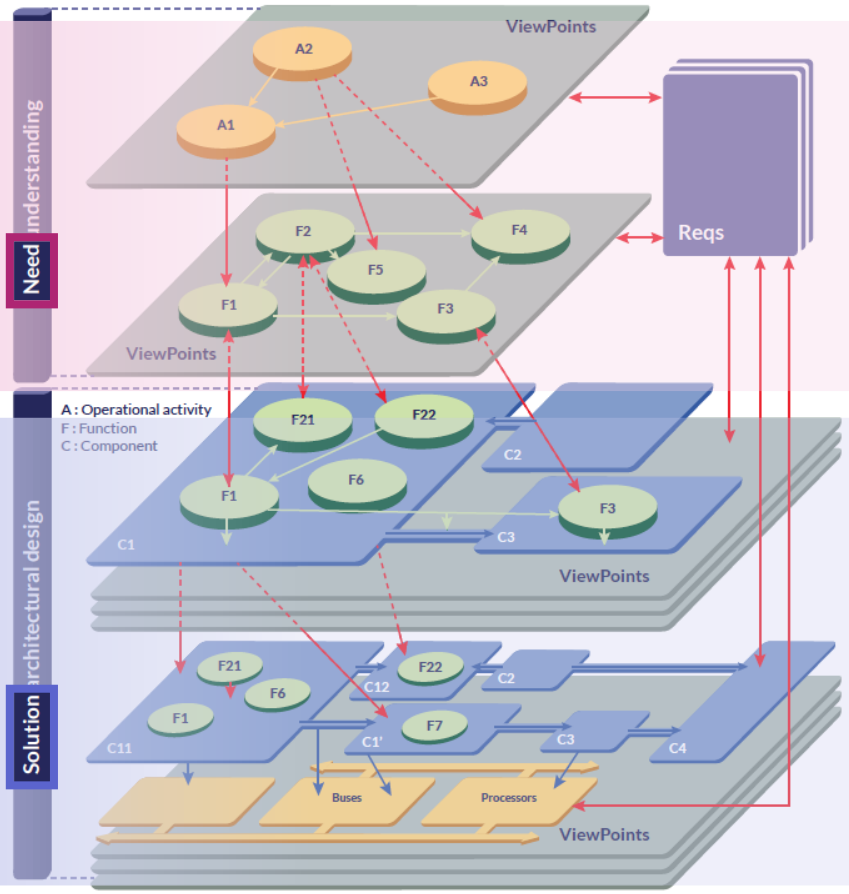
A NEED

STEP 2

DEVELOPED

=

A SOLUTION



Operational Analysis
What the users of the system need to accomplish

OA

Functional & Non Functional Need
What the system has to accomplish for the users

SA

Logical Architecture
How the system will work to fulfill expectations

LA

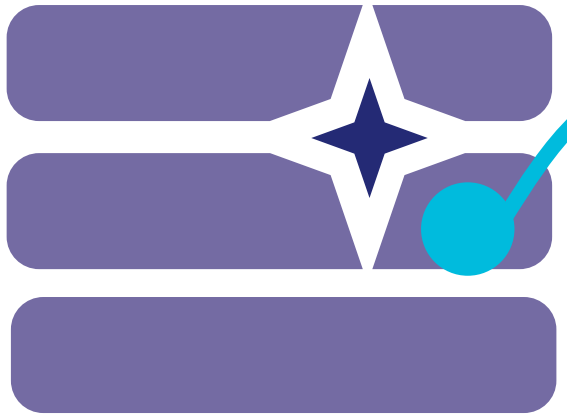
Physical Architecture
How the system will be developed and built

PA

{OPEN}

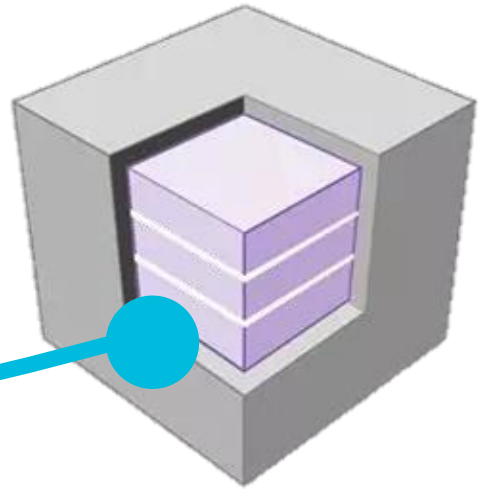
THE FACTS → We have 2 processes

The creation of a model in **Capella**



They **share** common concepts (Need/Solution)

The definition of **increments**



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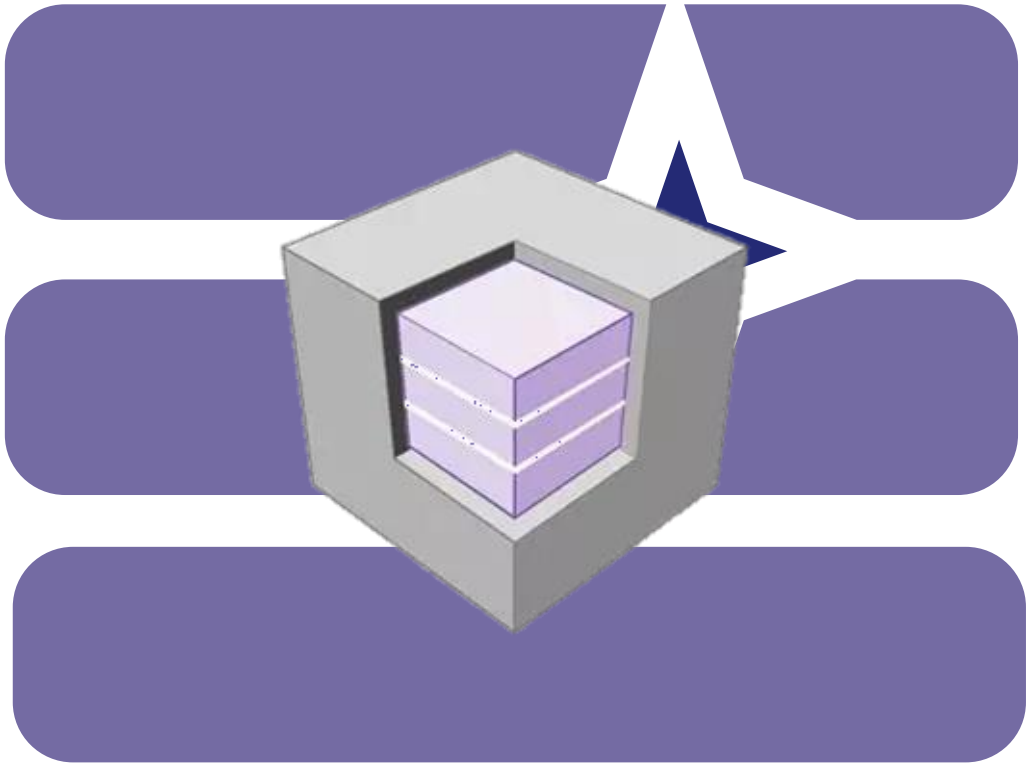
Create the increments IN Capella

THE IDEA



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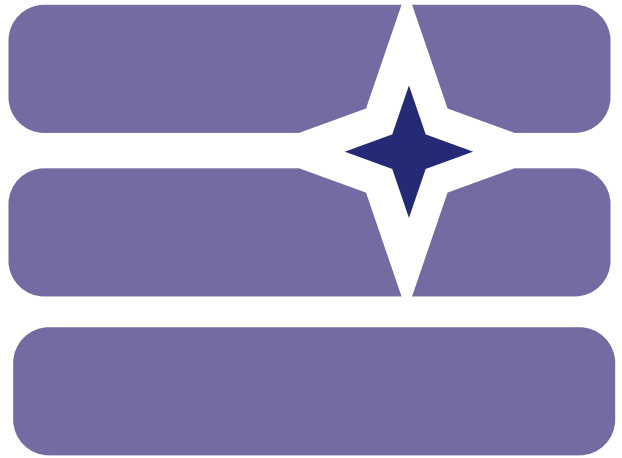
The Add-on

RMIVV

THE SOLUTION



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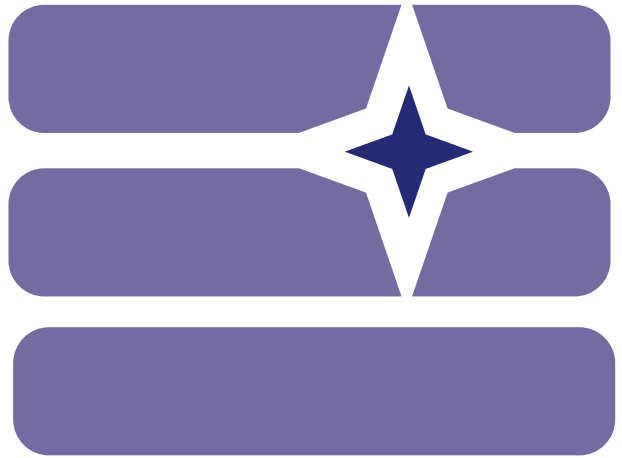
The Add-on

Release Management and VV

THE SOLUTION



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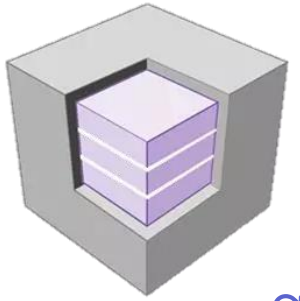
The Add-on

Release Management

Simplifies increment creation and management



STEP 1 **REQUIRED** → STEP 2 **DEVELOPED**

and

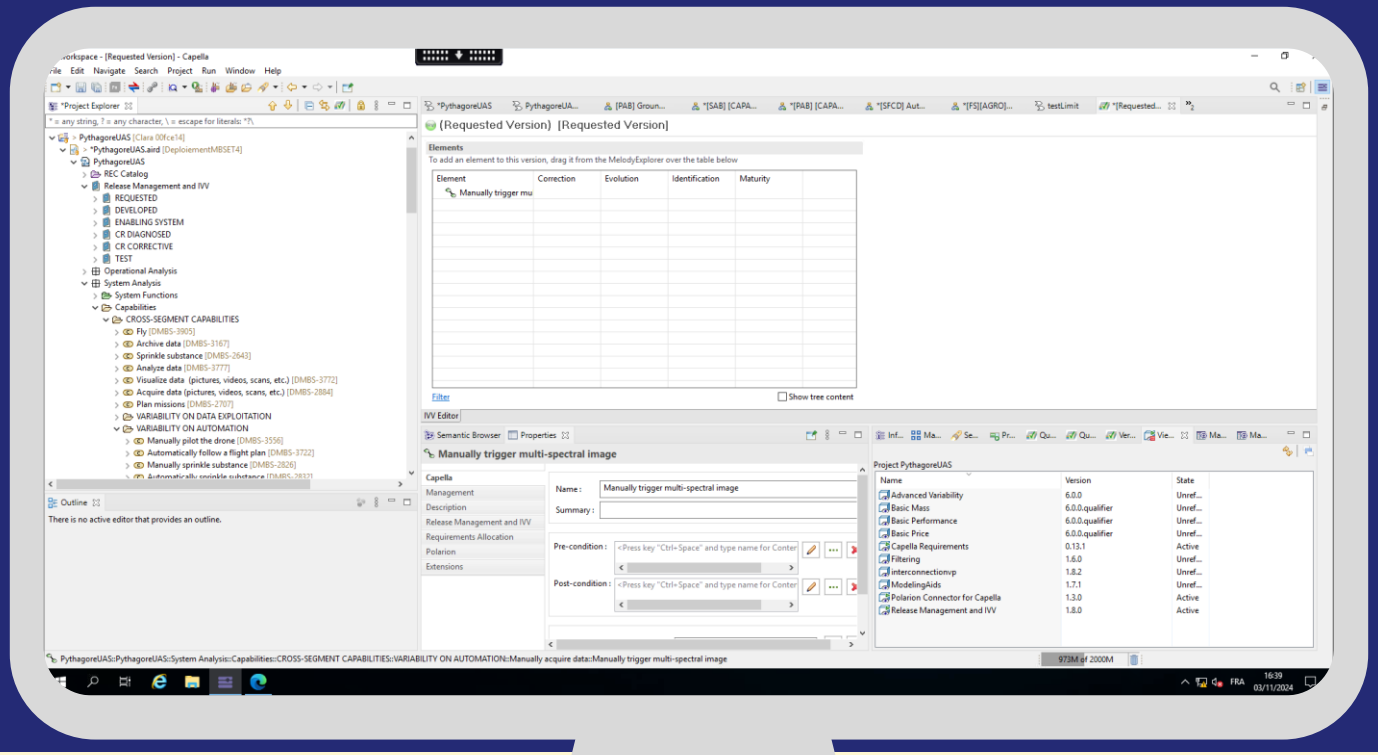
IVV

Provides the IVV manager with information to help him make decisions about testing

STEP 3 **TESTABILITY**

{OPEN}

4. THE PLANNED PROCESS : PRACTICE



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MY RECAP

THEORY

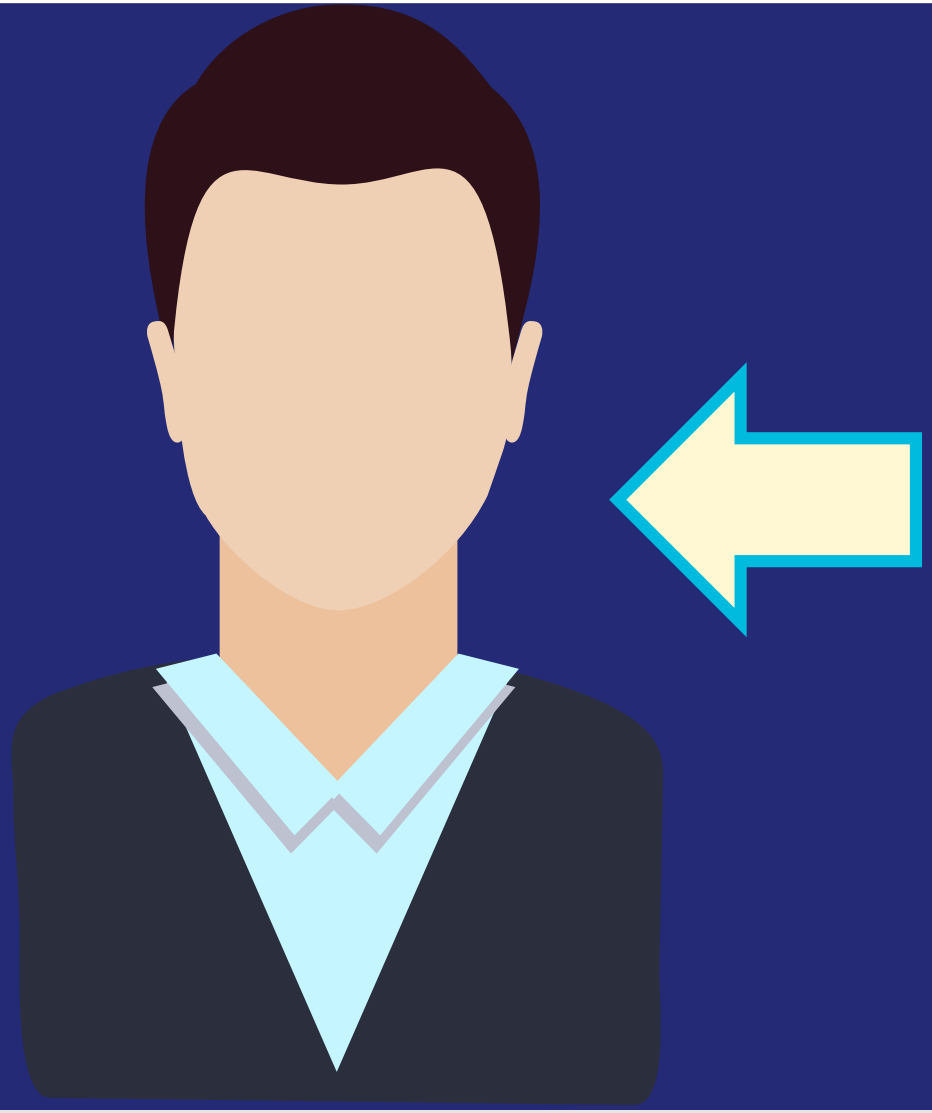
DEFINITION

STEP 1 Identify the **requested** elements

STEP 2 Deduce the **developed** elements

STEP 3 Evaluate the **testability**

4. THE PLANNED PROCESS : PRACTICE



IVV Manager

ONE OF HIS JOB

Work with the co-engineer to **create increments**

HIS MISSION

Provide expertise on **Integration, Verification, Validation**

THE PROJECT

Pythadrone

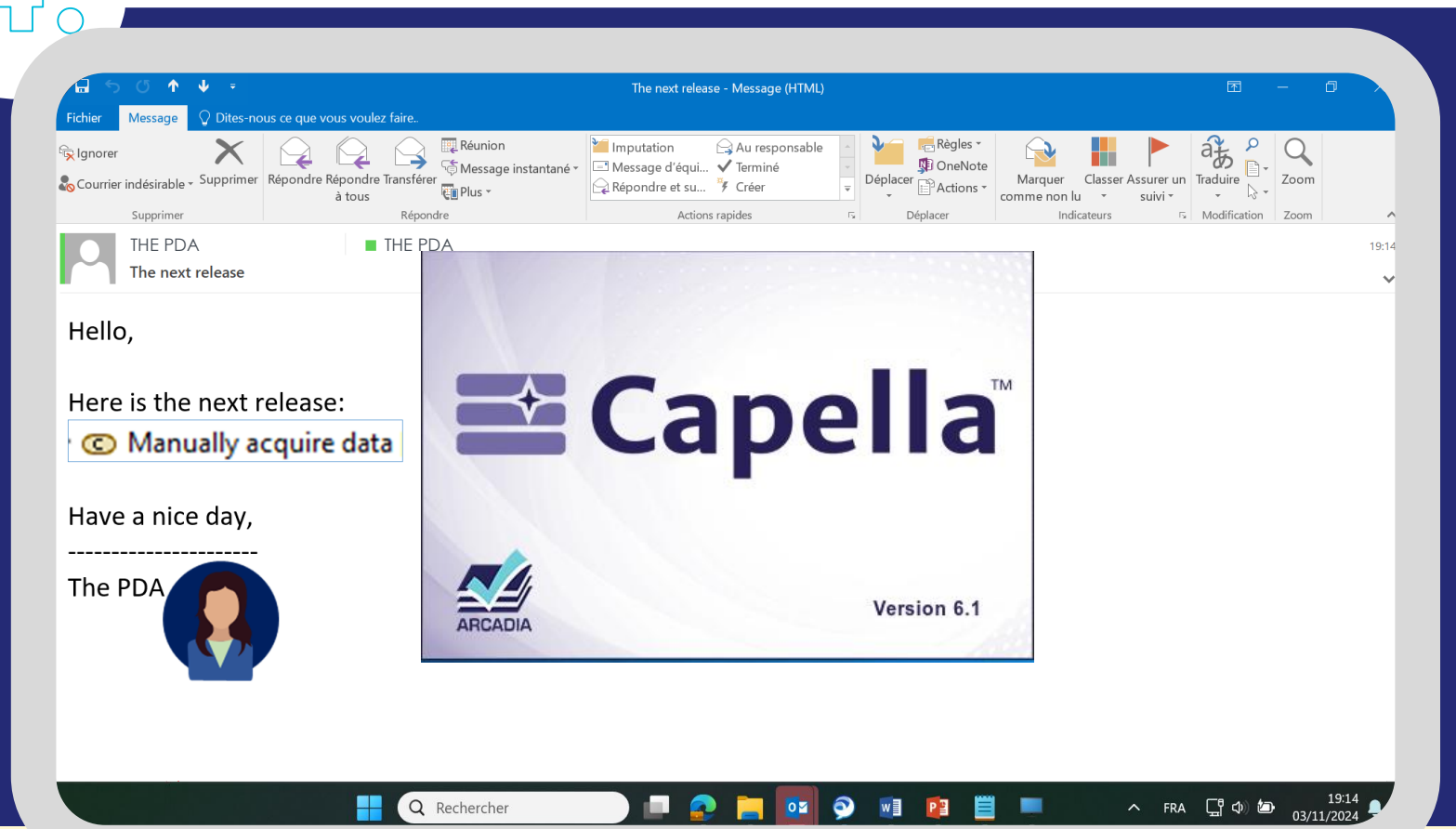
4. THE PLANNED PROCESS : PRACTICE

{OPEN}

4. THE PLANNED PROCESS : PRACTICE

{OPEN}

4. THE PLANNED PROCESS : PRACTICE 0.A. FIND THE RELEASE



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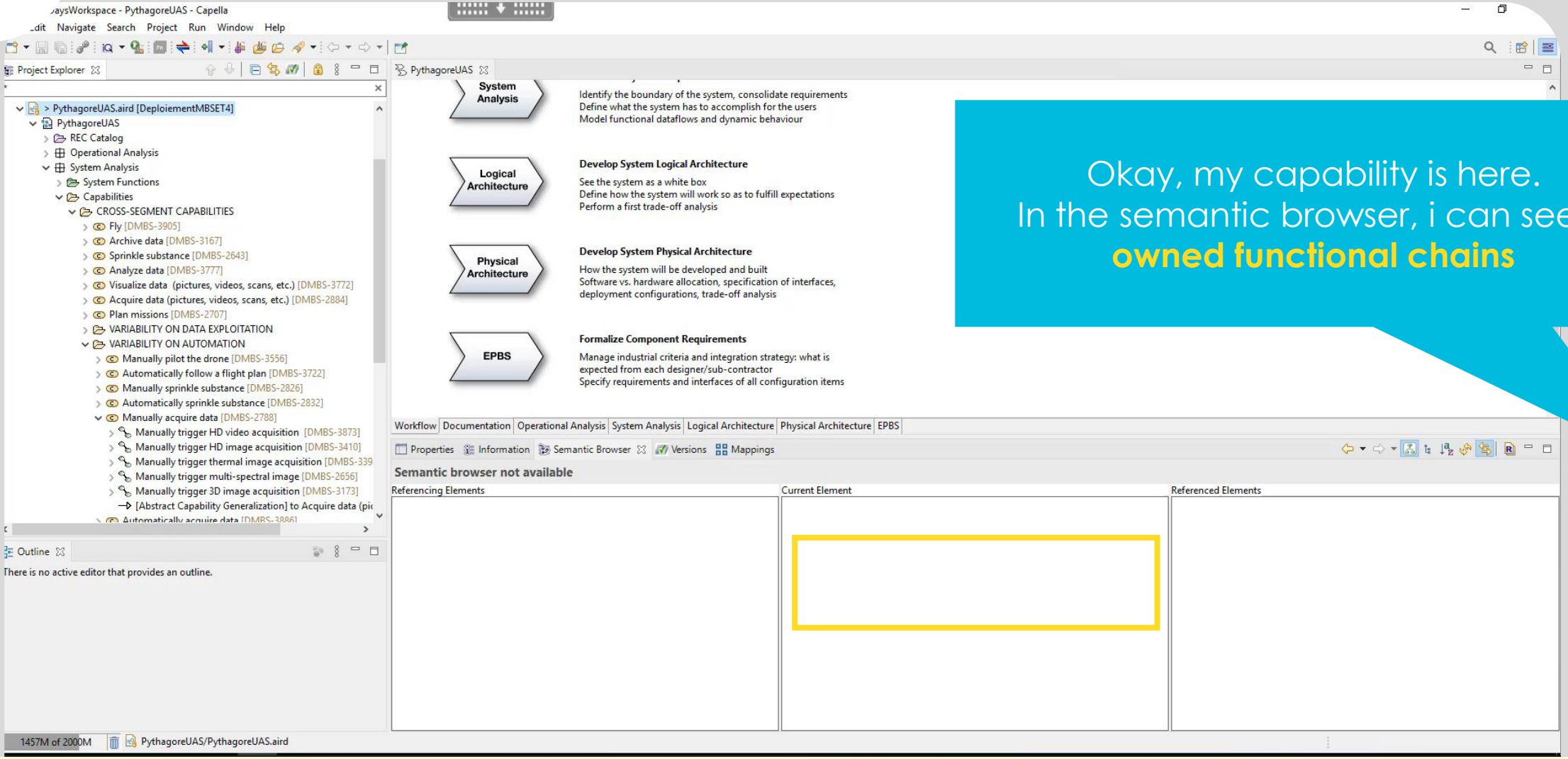
MY RECAP

	THEORY	PRACTICE
STEP 0	DEFINITION	A Identify the **release** 
STEP 1	Identify the **requested** elements	
STEP 2	Deduce the **developed** elements	
STEP 3	Evaluate the **testability**	

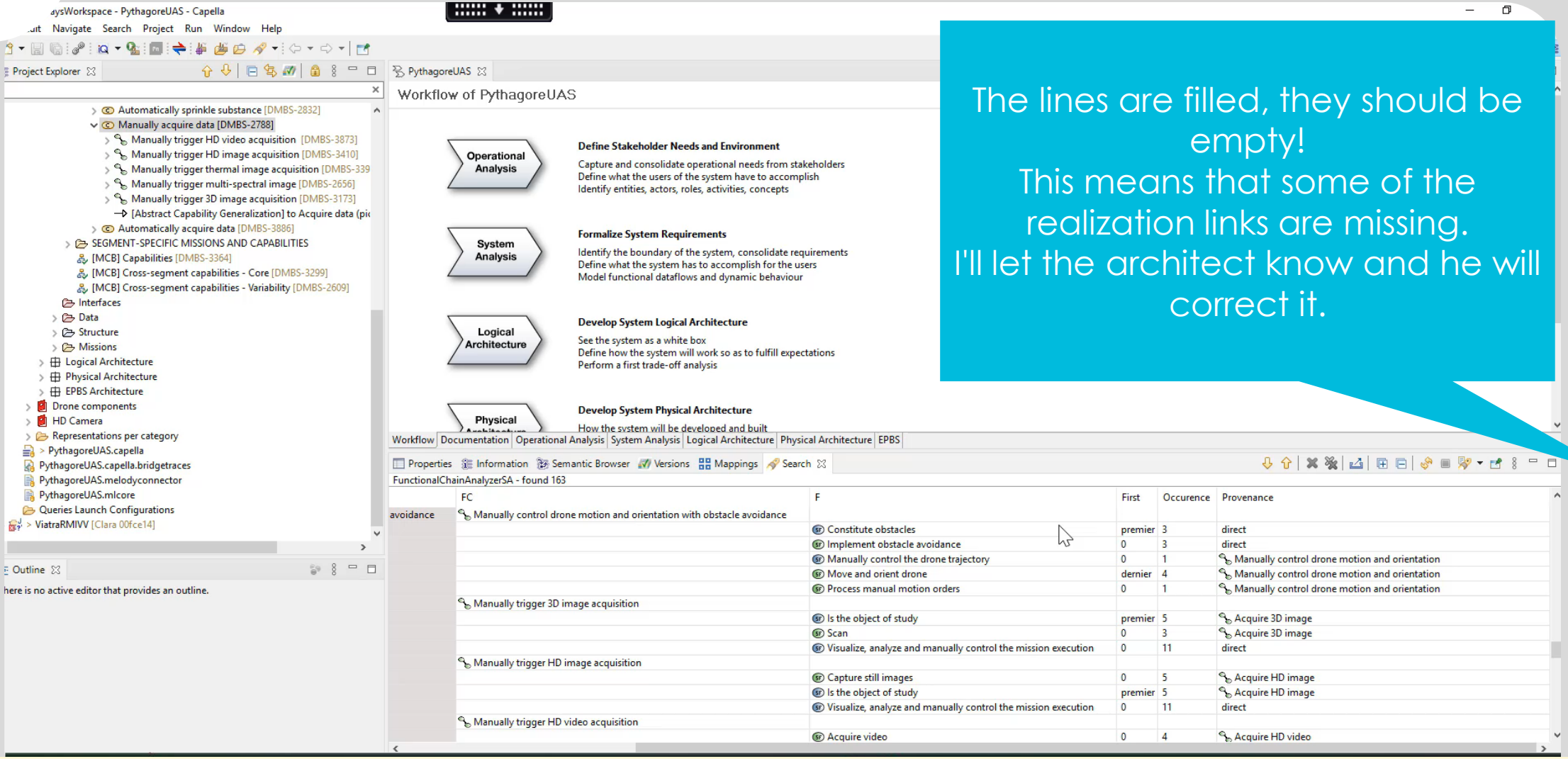
4. THE PLANNED PROCESS : PRACTICE 0.A. IDENTIFY THE RELEASE



MY RECAP

	THEORY	PRACTICE
STEP 0	DEFINITION	A Identify the **release**  B Verify that no **realization link** has been forgotten in the model 
STEP 1	Identify the **requested** elements	
STEP 2	Deduce the **developed** elements	
STEP 3	Evaluate the **testability**	

4. THE PLANNED PROCESS : PRACTICE 1.A. VERIFY THE MODEL



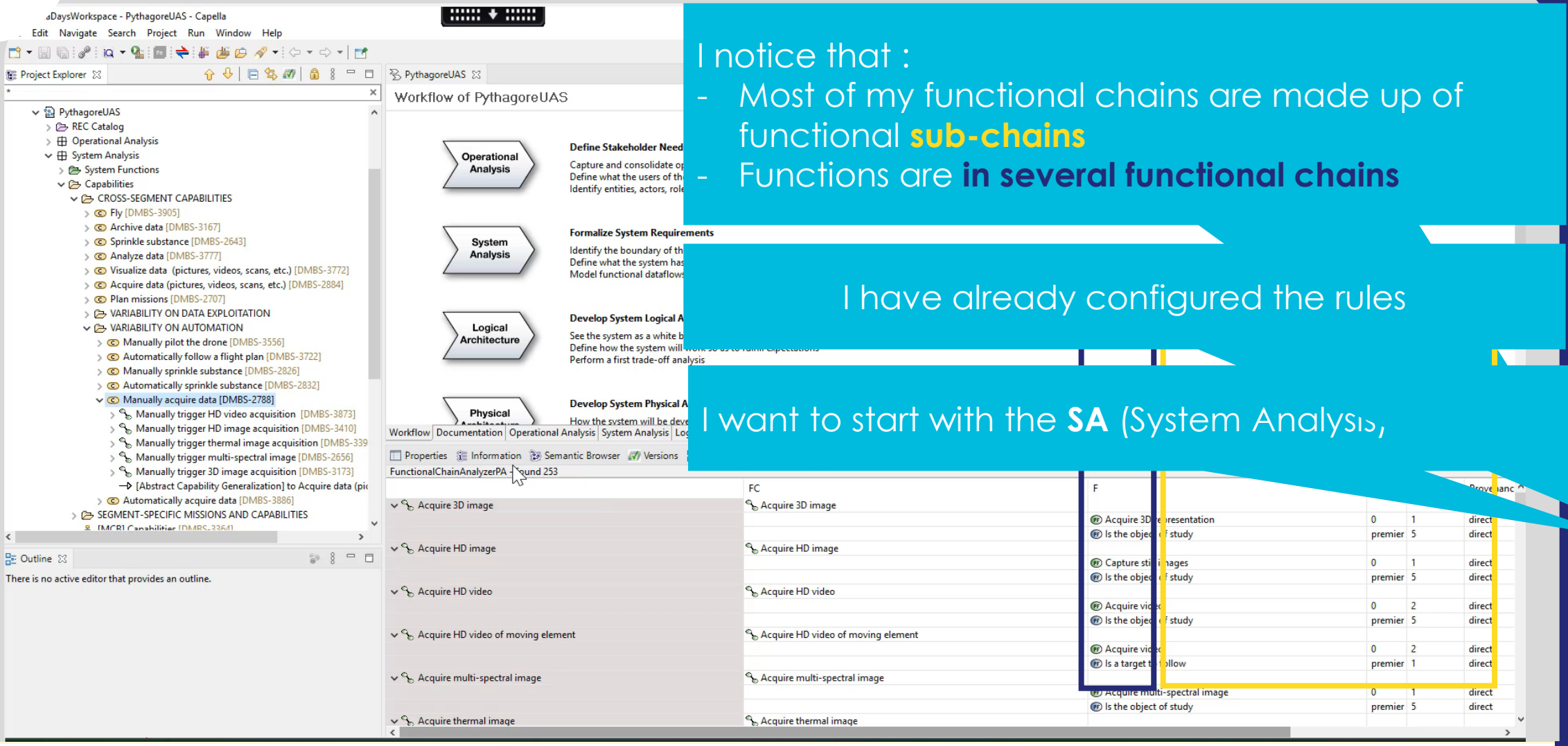
The lines are filled, they should be empty!
This means that some of the realization links are missing.
I'll let the architect know and he will correct it.

{OPEN}

MY RECAP

	THEORY	PRACTICE
STEP 0	DEFINITION	A Identify the **release**  B Verify that no **realization link** has been forgotten in the model 
STEP 1	Identify the **requested** elements	A Analyze the model with : **Diagrams** + **Viatra Analysis Rules**  
STEP 2	Deduce the **developed** elements	
STEP 3	Evaluate the **testability**	

4. THE PLANNED PROCESS : PRACTICE 0.B. ANALYSE THE MODEL



I notice that :

- Most of my functional chains are made up of functional **sub-chains**
- Functions are **in several functional chains**

I have already configured the rules

I want to start with the **SA** (System Analysis)

{OPEN}

MY RECAP

THEORY

PRACTICE

STEP 0

A — Identify the **release**

B — Verify that no **realization link** has been forgotten in the model

DEFINITION — **RMIVV**

STEP 1

Identify the **requested** elements

RV = **Requested Version**

A — Analyze the model with : **Diagrams** + **Viatra Analysis Rules**

B — Create and define the **RV**

New

Reminder
Layer: SA
Element : FC

STEP 2

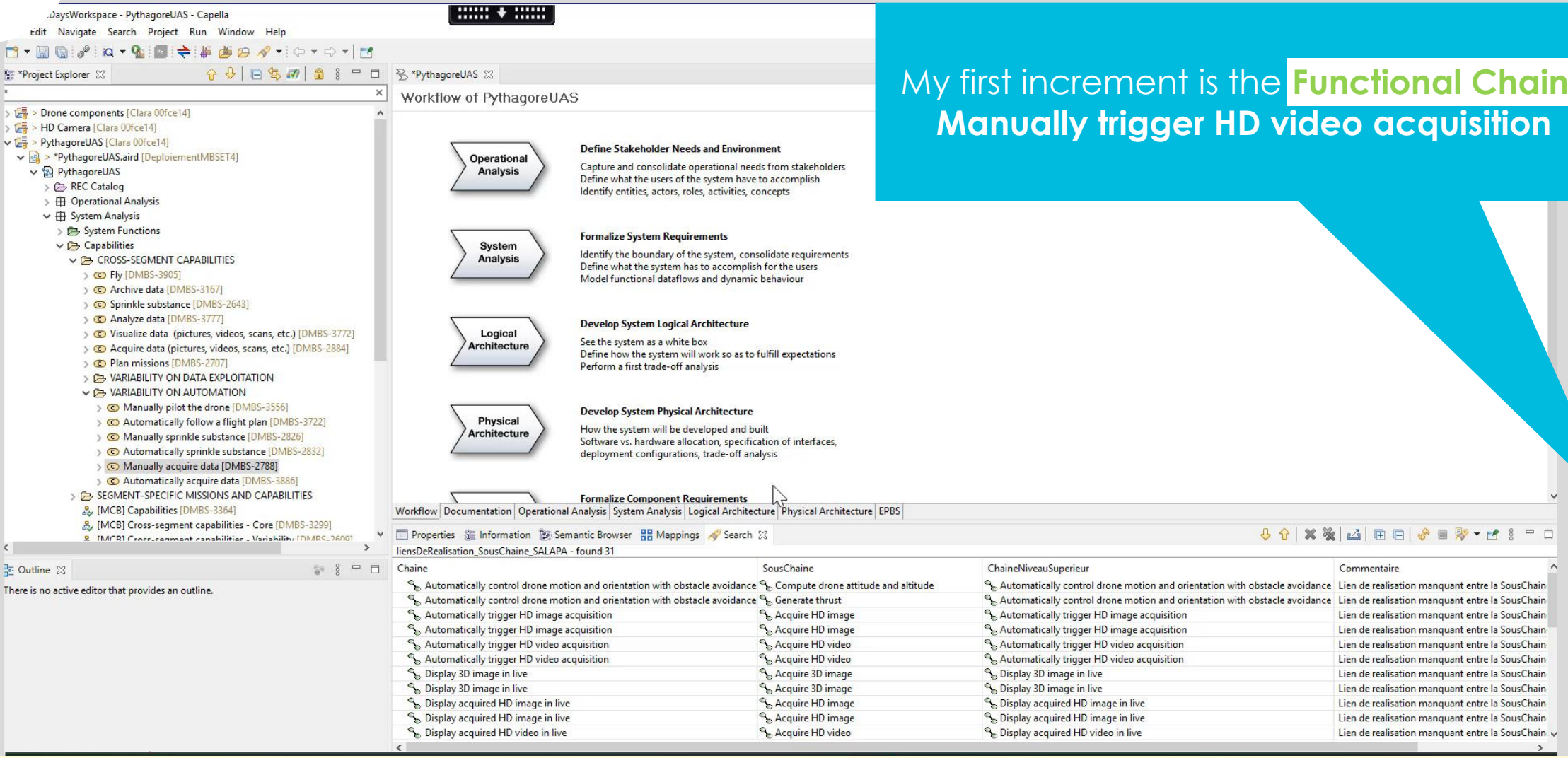
Deduce the **developed** elements

STEP 3

Evaluate the **testability**

4. THE PLANNED PROCESS : PRACTICE 1.B. CREATE THE RV

My first increment is the **Functional Chain** :
Manually trigger HD video acquisition



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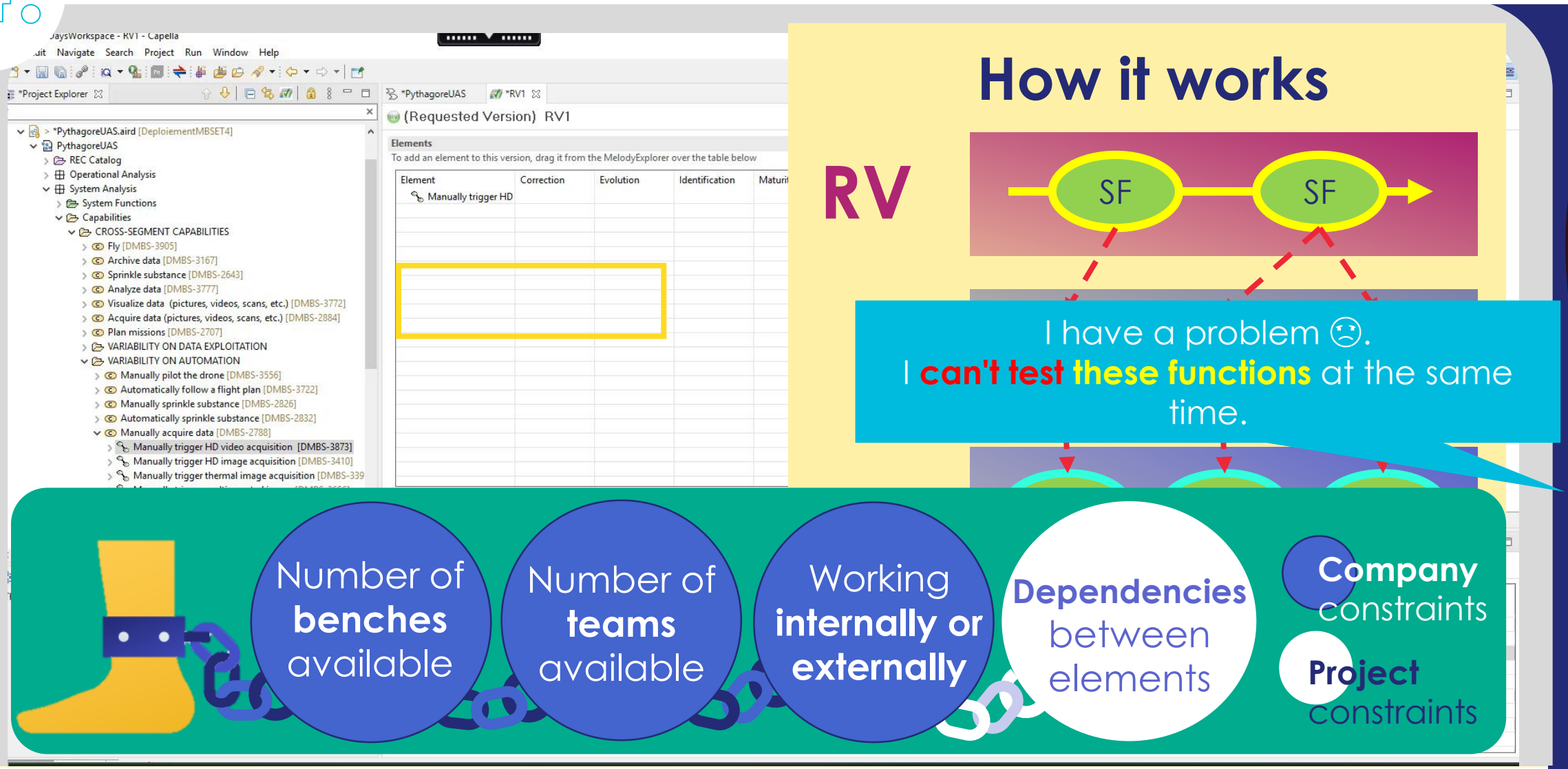
MY RECAP

	THEORY		PRACTICE
STEP 0			A Identify the **release**  B Verify that no **realization link** has been forgotten in the model 
STEP 1	DEFINITION Identify the **requested** elements	RMIVV **RV** = Requested Version	A Analyze the model with : **Diagrams** + **Viatra Analysis Rules**   B Create and define the **RV** New **Reminder** **Layer**: SA **Element** : FC
STEP 2	Deduce the **developed** elements	**DV** = Requested Version	A Generate the **DV THEORIC**  **Reminder** **Layer**: LA & PA **Element** : PC, PF, LC, LF
STEP 3	Evaluate the **testability**		

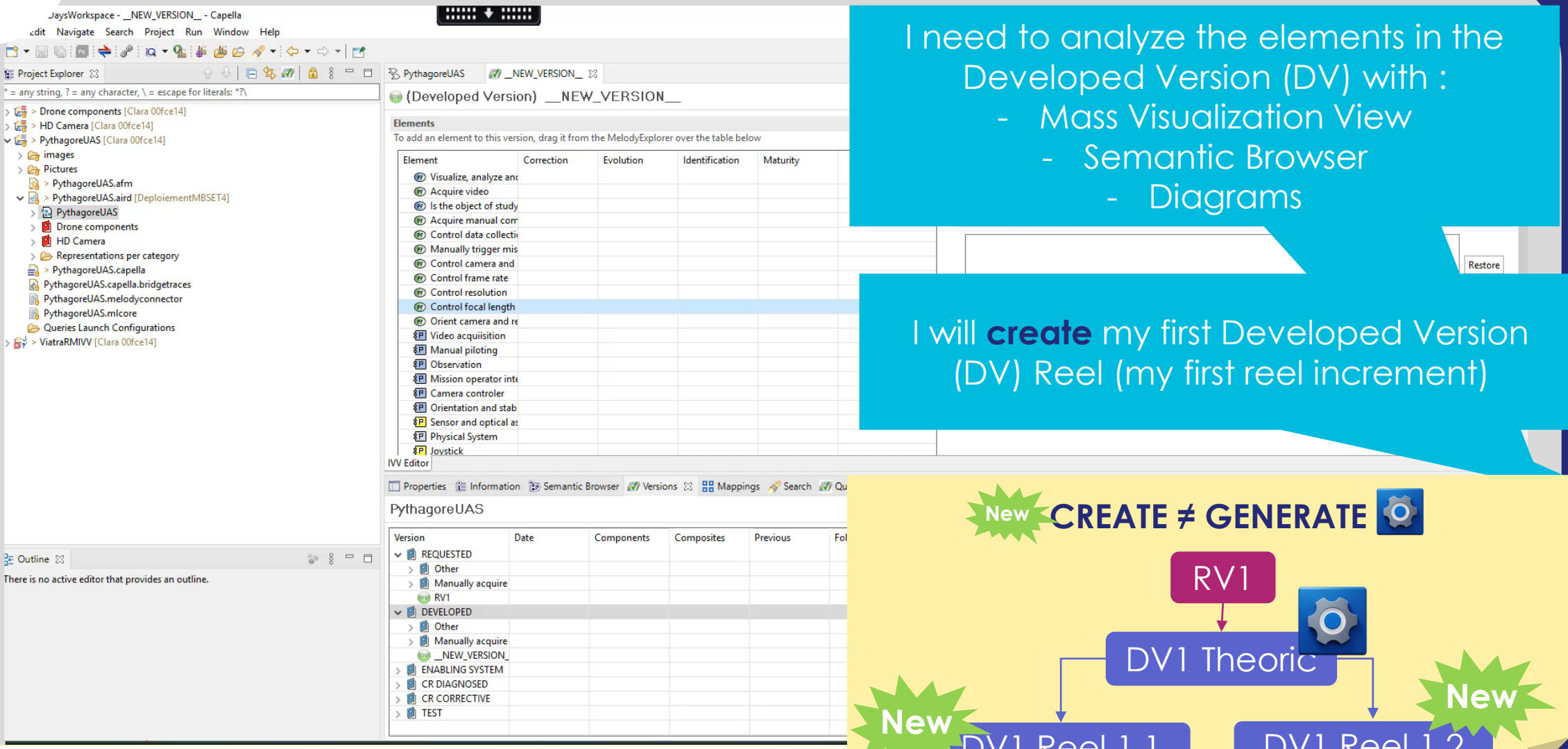
4. THE PLANNED PROCESS : PRACTICE 2.A. GENERATE THE DV THEORIC



MY RECAP

	THEORY		PRACTICE
STEP 0			A Identify the **release**  B Verify that no **realization link** has been forgotten in the model 
STEP 1	Identify the **requested** elements	**RV** = Requested Version	A Analyze the model with : **Diagrams** + **Viatra Analysis Rules**   B Create and define the **RV** New **Reminder** **Layer**: SA **Element** : FC
STEP 2	Deduce the **developed** elements	**DV** = Requested Version	A Generate the **DV THEORIC**  **Reminder** **Layer**: LA & PA **Element** : PC, PF, LC, LF B Divide the **DV REEL**  **Reason:**  Company constraints
STEP 3	Evaluate the **testability**		

4. THE PLANNED PROCESS : PRACTICE 2.B. DIVIDE THE DV REEL



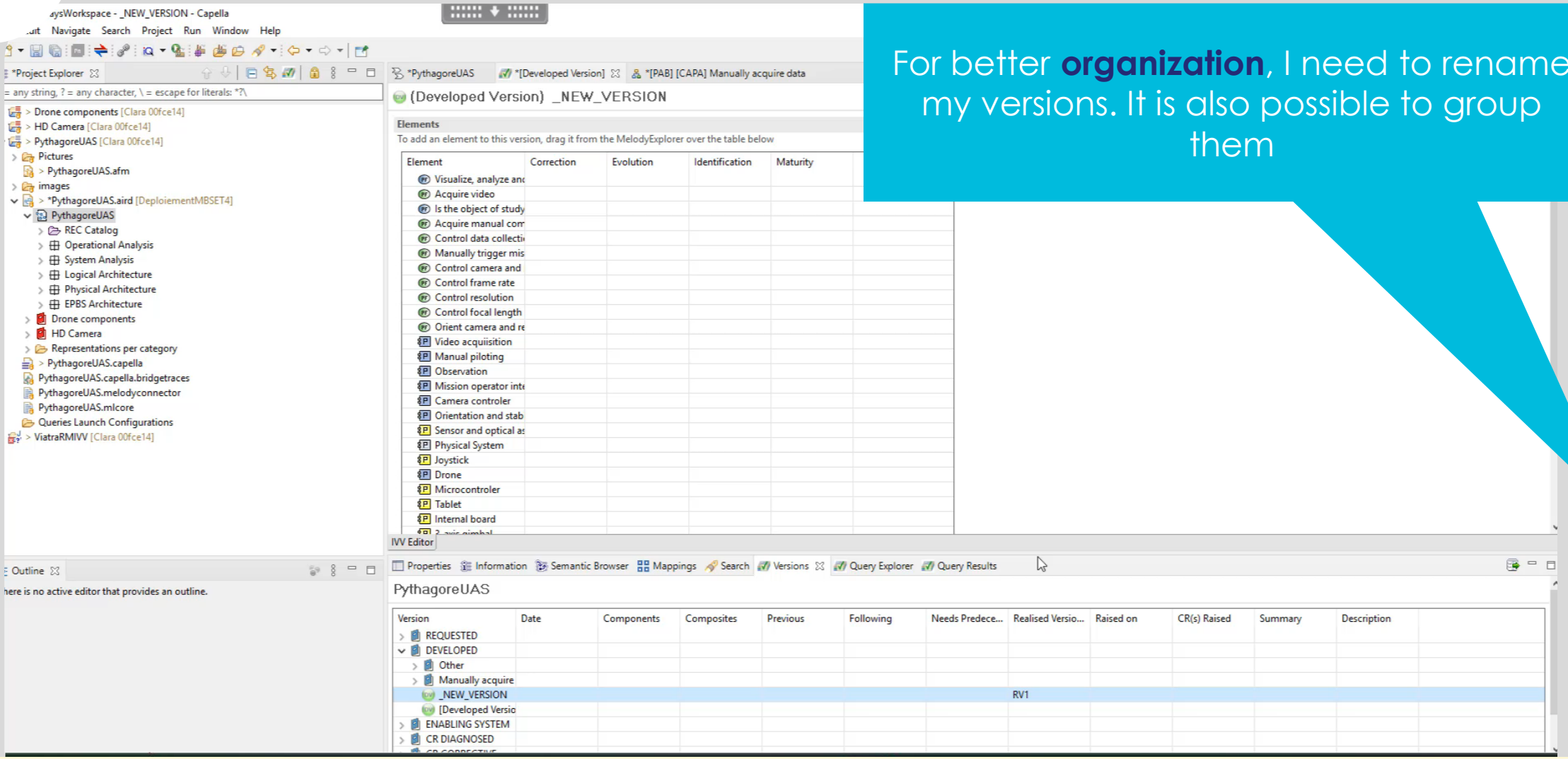
I need to analyze the elements in the Developed Version (DV) with :

- Mass Visualization View
- Semantic Browser
- Diagrams

I will **create** my first Developed Version (DV) Reel (my first reel increment)

{OPEN}

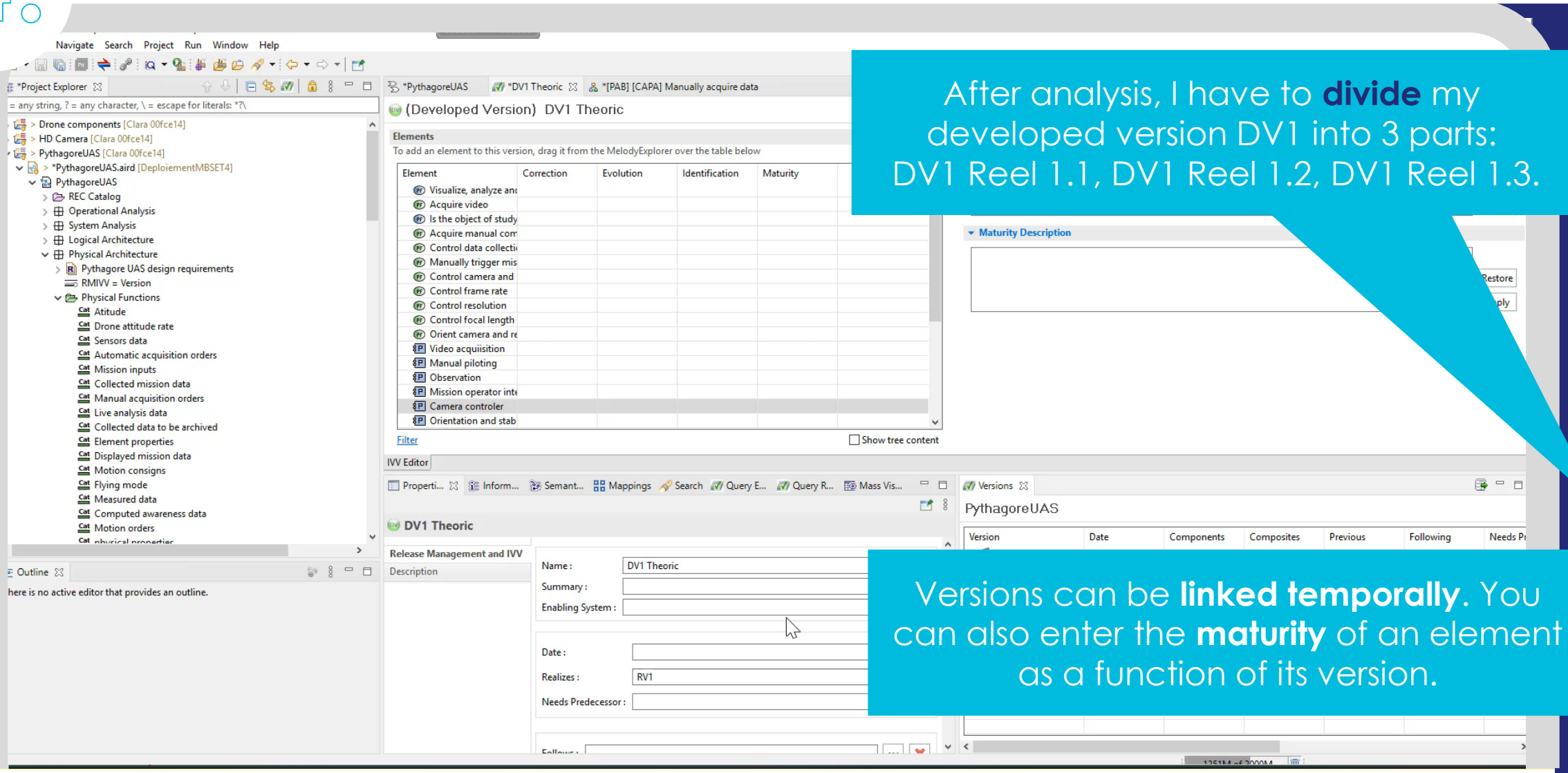
4. THE PLANNED PROCESS : PRACTICE 2.B. DIVIDE THE DV REEL



For better **organization**, I need to rename my versions. It is also possible to group them

{OPEN}

4. THE PLANNED PROCESS : PRACTICE 2.B. DIVIDE THE DV REEL



After analysis, I have to **divide** my developed version DV1 into 3 parts: DV1 Reel 1.1, DV1 Reel 1.2, DV1 Reel 1.3.

Versions can be **linked temporally**. You can also enter the **maturity** of an element as a function of its version.

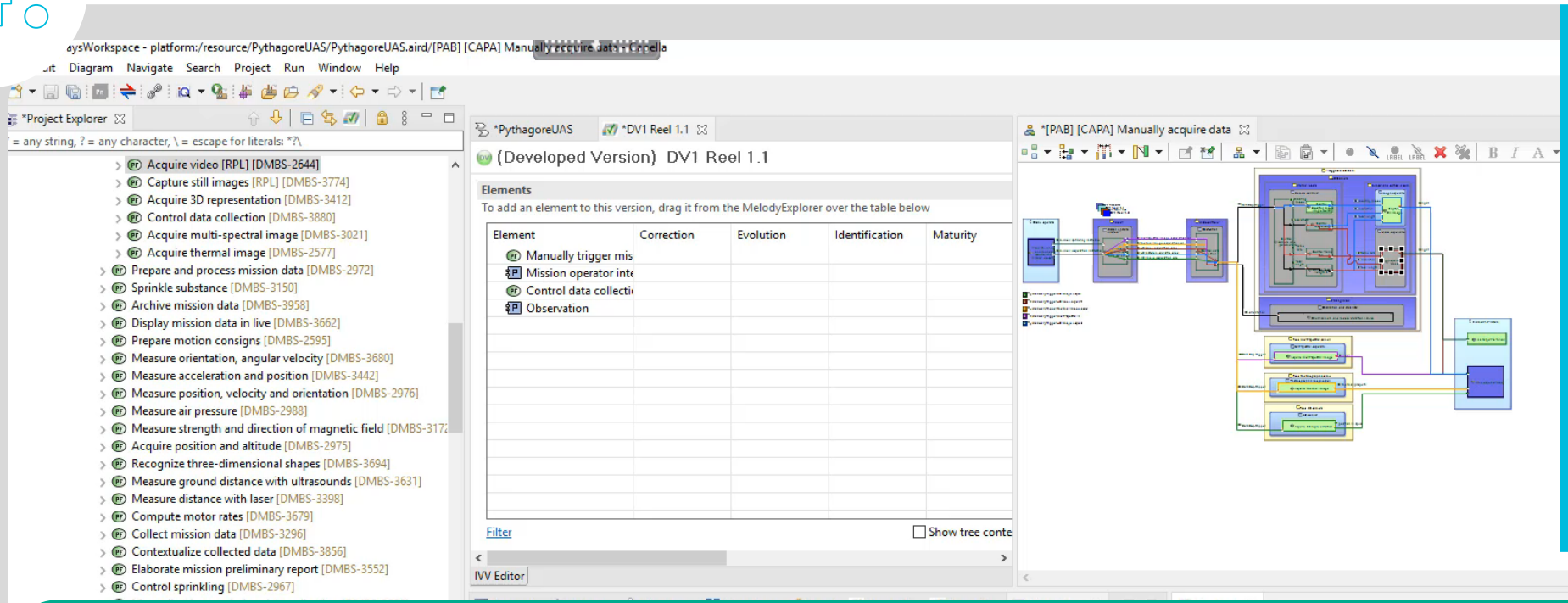
{OPEN}

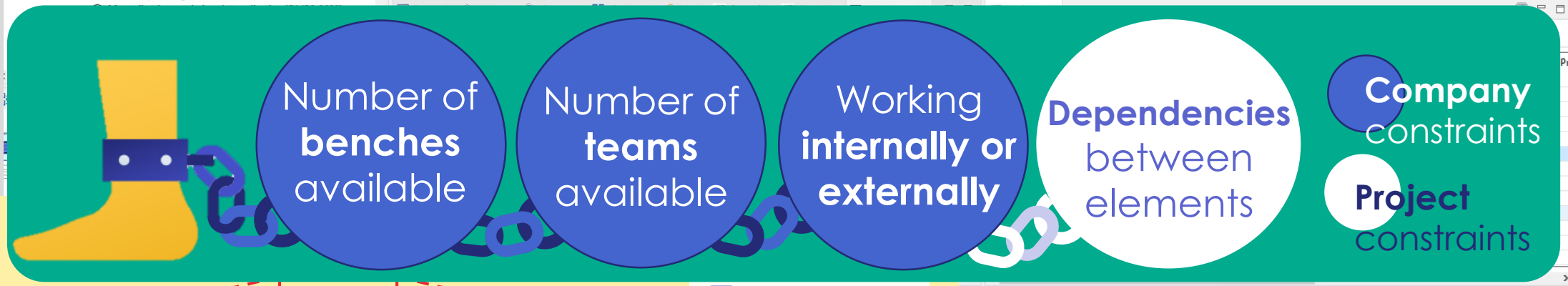
MY RECAP

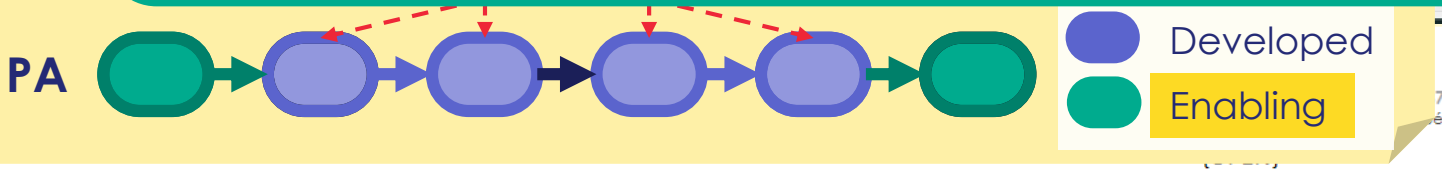
	THEORY		PRACTICE
STEP 0	DEFINITION	RMIVV	A Identify the **release**  B Verify that no **realization link** has been forgotten in the model 
STEP 1	Identify the **requested** elements	**RV** = Requested Version	A Analyze the model with : **Diagrams** + **Viatra Analysis Rules**   B Create and define the **RV** New **Reminder** **Layer**: SA **Element** : FC
STEP 2	Deduce the **developed** elements	**DV** = Requested Version	A Generate the **DV THEORIC**  **Reminder** **Layer**: LA & PA **Element** : PC, PF, LC, LF B Divide the **DV REEL**  **Reason:** Company constraints 
STEP 3	Evaluate the **testability**	**ES** = Enabling System	A Generate the **ES**  **Reminder:** need to **simulate**, **plug or already developed** to test this increment

4. THE PLANNED PROCESS : PRACTICE 3.A. GENERATE THE ES

I need to generate an Enabling System (ES) per DV Reel. In the ES, we'll find the elements which have **links with the elements in the DV Reel** , and we'll **need to simulate, plug or already developed** to test this increment.







MY RECAP

	THEORY		PRACTICE
STEP 0			A: Identify the **release**  B: Verify that no **realization link** has been forgotten in the model 
STEP 1	DEFINITION: Identify the **requested** elements	RMIVV: **RV** = Requested Version	A: Analyze the model with : **Diagrams** + **Viatra Analysis Rules**   B: Create and define the **RV** New — **Reminder** Layer: SA Element : FC
STEP 2	Deduce the **developed** elements	**DV** = Requested Version	A: Generate the **DV THEORIC**  — **Reminder** Layer: LA & PA Element : PC, PF, LC, LF B: Divide the **DV REEL**  — **Reason:** Company constraints  C: **Modify** DV Reel (if it's necessary)   **Reason:** Project constraints
STEP 3	Evaluate the **testability**	**ES** = Enabling System	A: Generate the **ES**  — **Reminder:** need to **simulate**, **plug or already developed** to test this increment B: Analyze the model with **tools** — **Tolls:** Mass Visualization View, Diagrams, Semantic Browser, …

5. CONCLUSION

Feedback from an IVV manager who tested the RMIVV add-on along with his process

Task Simplification:

- Information extracted from the model (time-saving)

Visualization:

- Diagram colorization (better visibility)
- Visual management, and temporal aspect

Definition and Sharing:

- Interest in co-engineering
- V-cycle integration

Export:

- Useful for data import into other tools

{OPEN}