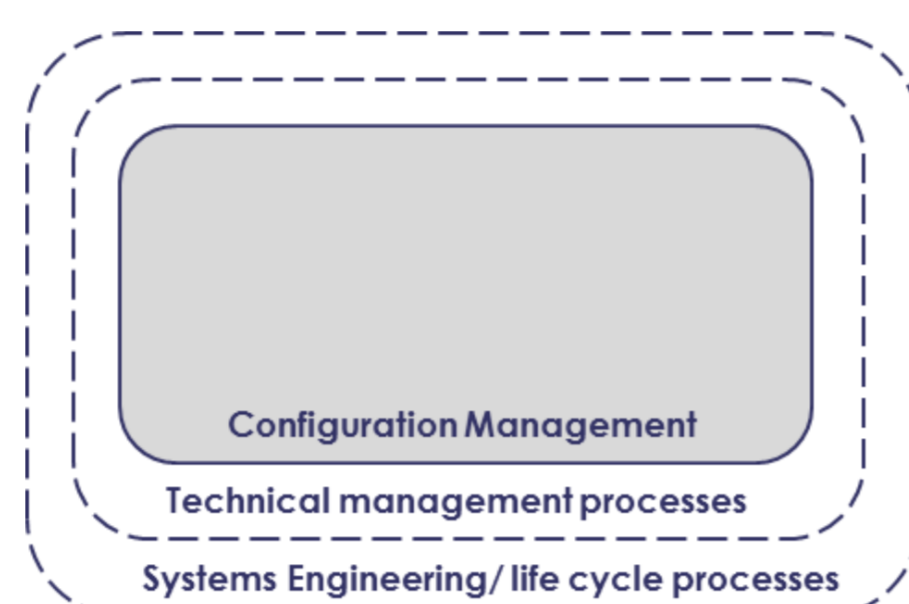


Model-Based System Reconfiguration

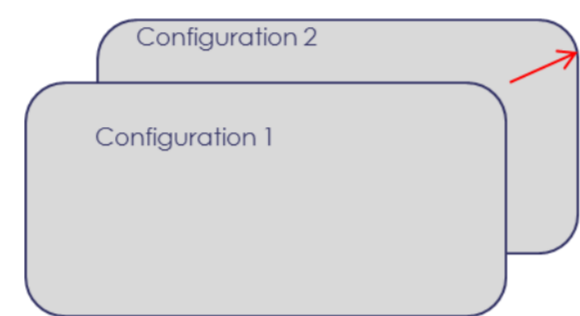
System Reconfiguration is essential in management of complex systems because it allows companies better flexibility and adaptability. System evolutions have to be managed in order to ensure system effectivity and efficiency through its whole lifecycle, in particular when it comes to complex systems that have decades of development and up to hundreds of years of usage. System Reconfiguration can be considered and deployed in different lifecycle phases.

CONTEXT & OBJECTIVES

- Systems Engineering sustains complex system activities with the aim to satisfy internal and external stakeholders needs (1,2)
- Technical Management is formalized as a set of processes during design-time & run-time for management of systems through their life cycle (1,2,3)
- System configuration is a set of elements that compose a system in terms of hardware devices, software, interfaces, human profiles and processes. The objective of system configuration management is to ensure effective management of an evolving system during its life cycle. (2)



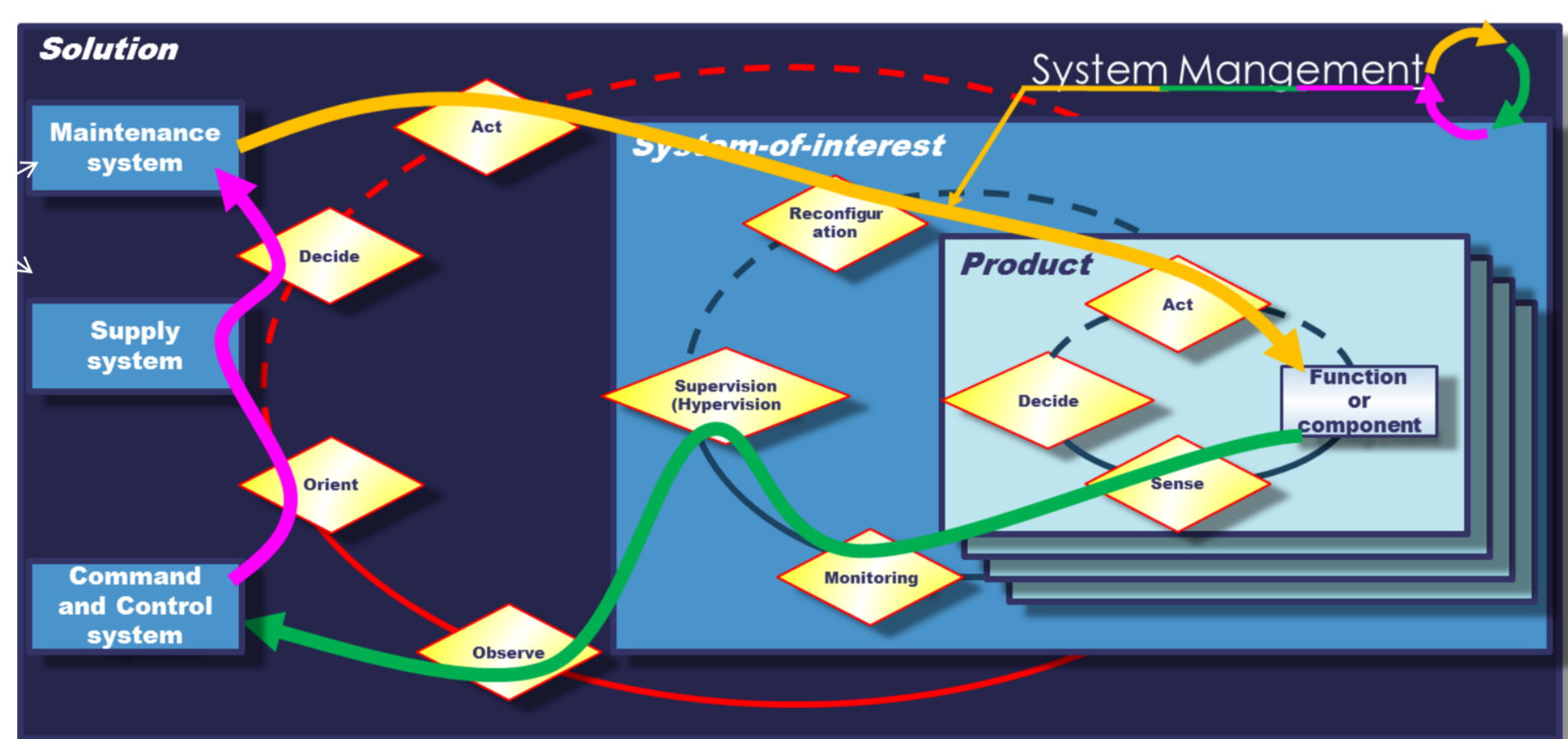
➢ **System Reconfiguration** is the subsequent changes of the system configurations with the objective of maintaining or improving the capabilities provided by the system.



Objectives of System reconfiguration

- In design-time**
- In run-time**

- Improve the performance
- Correct errors & mismatches during the development, testing & deployment
- Evolution of stakeholders' requirements
- Optimize system performance according to the context or the mission



1. ISO/IEC/IEEE 15288: Systems and software engineering - System life cycle processes. (2015).
2. INCOSE (2015). Systems engineering handbook: A guide for system life cycle processes and activities. (4th ed.) D. D. Walden, G. J. Roedler, K. Forsberg, R. D. Hamelin, & T. M. Shortell (Eds.). San Diego, CA: International Council on Systems Engineering. Published by John Wiley & Sons, Inc.
3. NASA. NASA Systems Engineering Handbook, vol. 6105, no. June. (2007).

OBSERVATIONS & ANALYSIS

Data collection

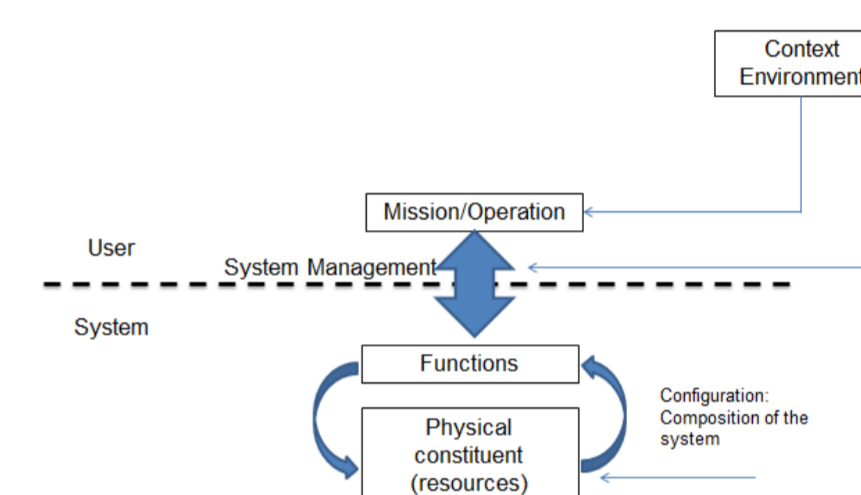
Interviews

Observations

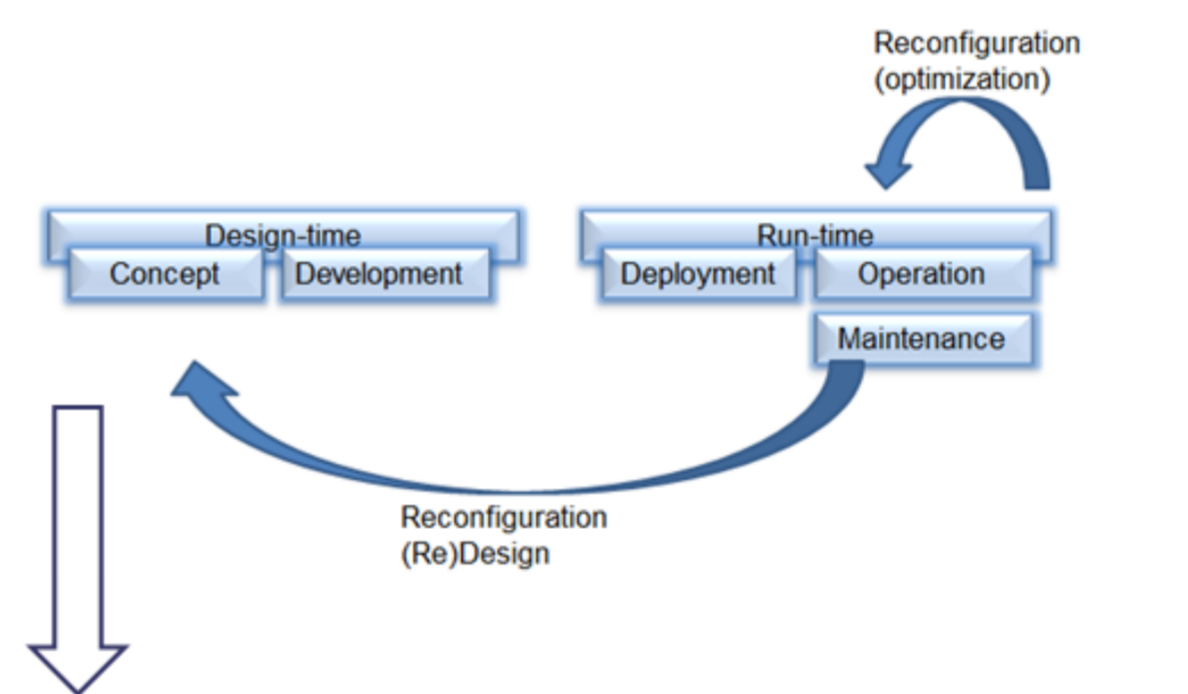
Reference documents

- To understand where challenges, limitations, and opportunities lie, interviewing can be used to support engineering design research
- 17 Thales experts have been identified.
- 2 categories of experts:
 - People working in transversal activities
 - Subject matter experts
- Participating in different meetings treating system management & reconfiguration issues
- Exploring the company reference documents for existing processes, activities & practices

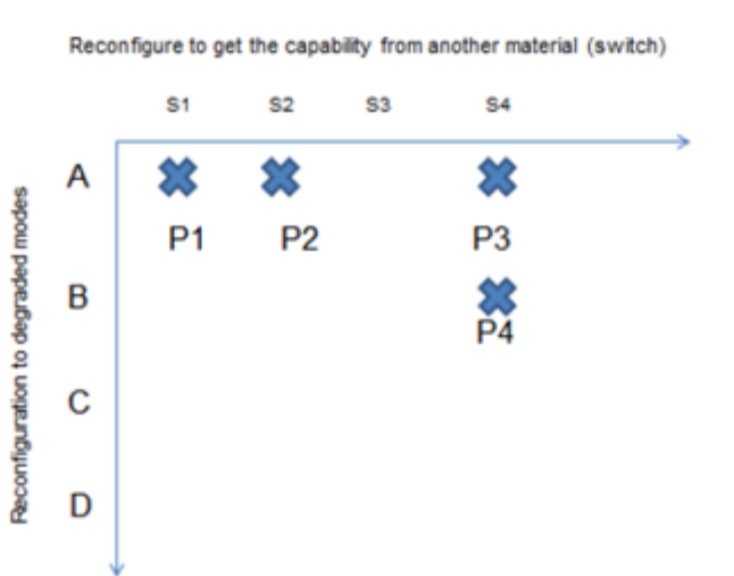
To allow system management, interviewed experts have been underlying the importance of concurrent element management (resources, functions) in different life cycle phases.



2 phases of systems lifecycle seem to be critical: design & Operation



- At Design-time:
- Reconfigure to optimize the implemented resources to achieve capabilities demanded by the customer



- At Run-time:
- Reconfigure to get the capabilities from other resources
 - Reconfigure into a degraded mode

INDUSTRIAL CHALLENGES

System & Context taxonomy:

- Very large set of system & product types (Closed system, platform, distributed system & SoS)
- Different operational contexts
- Different concerns
- Different methods & mechanisms of reconfiguration

Contracting & Certification:

- Difficulty in contracting run-time instantiated configurations
- Lack of metrics required for the certification process

Modeling issues:

- Multi-level modeling
- Modeling data of different nature

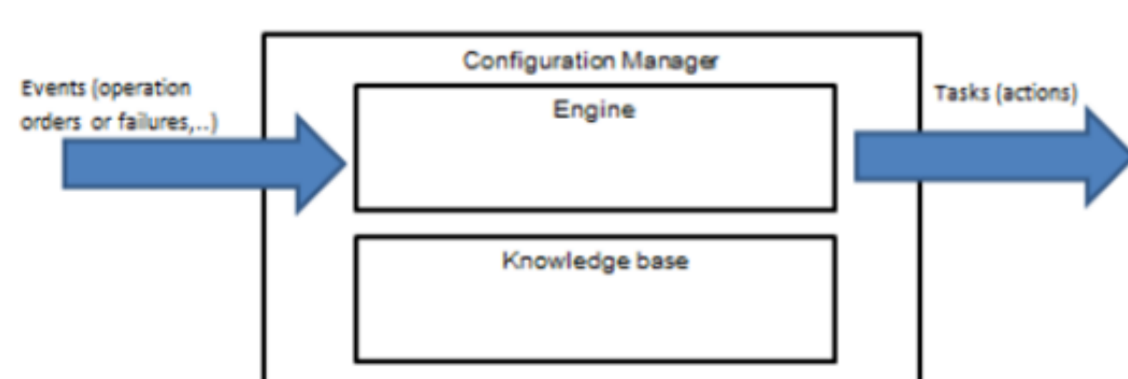
Data related challenges:

- Data availability
- Data shared across stakeholders
- Data storage
- Uncertainty & data verification
- Data combination

PROPOSAL

➢ The system management framework will be studied to propose a Configuration Manager

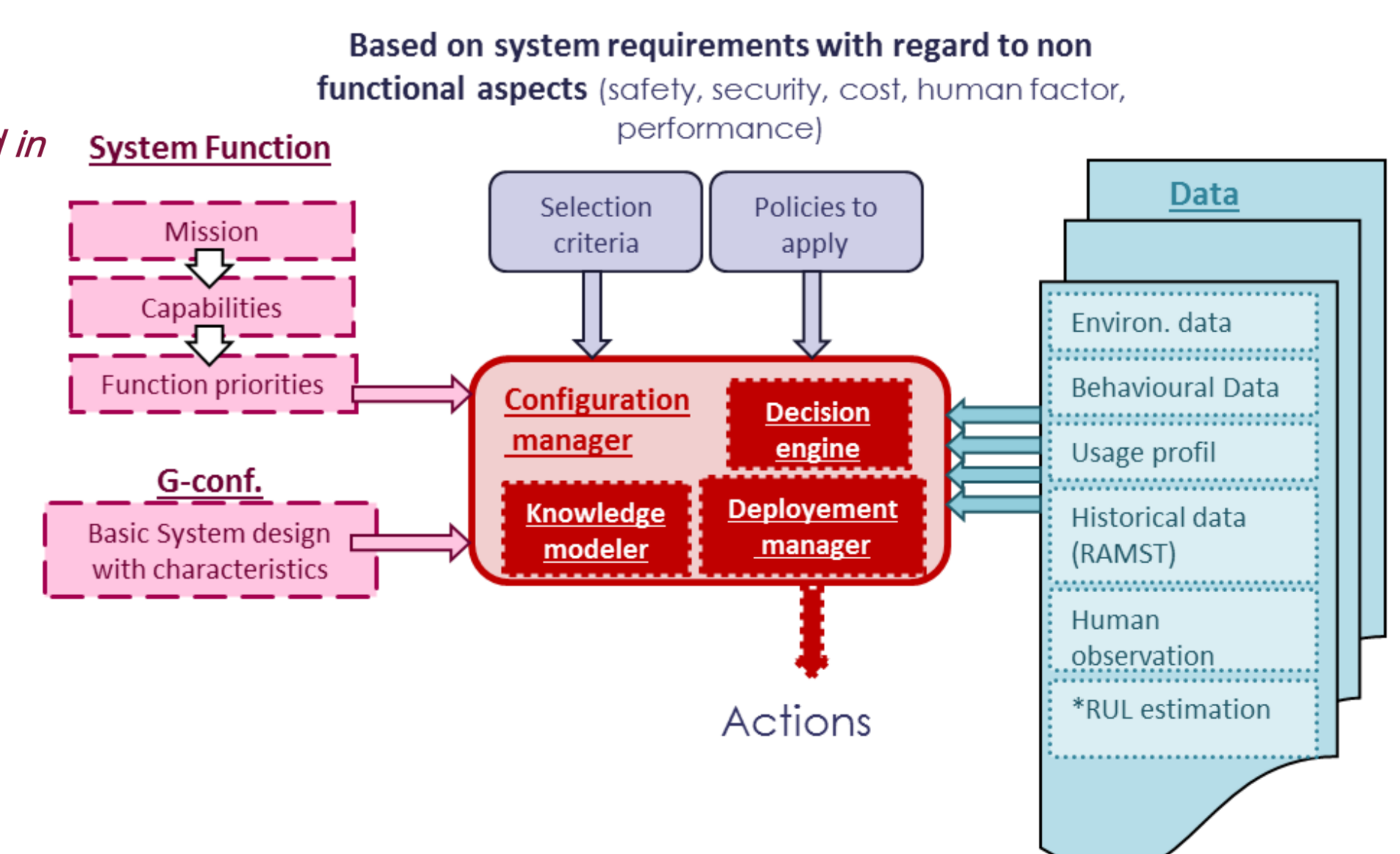
- The engine will be in charge of applying relevant configurations



- When events occur the engine will generate reconfiguration actions.
- This process is possible by referring to policies included in the knowledge base as models

- Knowledge base will contain models representing configurations & reconfiguration rules
- The models are related to technical, contractual and operational domains

➢ Identifying data & models to be included in the knowledge base is in progress.



CONTACT

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