KEYWORDS: System Engineering (SE), Model-Based System Engineering (MBSE), Early V&V, Modelling complex systems and critical infrastructures, System of Systems

OUR RESEARCH AIMS

- Support the activities of designing, developing, integrating, verifying and validating systems
- Characterise as early as possible the non-functional properties of systems to improve them and respond to the industrial issues they represent: performance, security, interoperability, resilience, maintainability

FIELDS OF APPLICATION

- Mechatronics
- Design and Dismantlement for the Nuclear Industry
- Rail Transport
- Healthcare
- Company services

ACTIVITIES

Deployment of Model-Based System Engineering methods:
- Requirements Engineering
- Architecture Engineering
- Verification & Validation, Evaluation
- Developing Domain-Specific Modelling Languages (DSMLs)

SPECIFIC FEATURES

- Developing and validating complex systems and systems of systems.

- Collaborative design and verification & validation in order to achieve required levels of confidence

SCIENTIFIC EXPERTISE

System Engineering: processes, standards, techniques and tools

- Model-Based System Engineering
- Early V&V: Verification and Validation as soon as possible including the evaluation of architectures, properties proof, simulation, analysis of sensitivity and traceability
- Evaluation of non-functional properties (interoperability, performance, resilience...)

RESEARCH PARTNERS

- **Framatome:** deployment of SE to redesign a nuclear island
- **SNCF:** MAIIEUTIC project, a method for engineering critical infrastructure
- **RESULIS:** SE of needs and requirements for the development of management applications
- **THALES:** development of an R&D roadmap for the evaluation of complex system architectures
- **ECIA:** digital mockups to support the digital transition of the company through SE

IMPLEMENTATION

- Supervision of R&D work (including CIFRE thesis)
- Expert assessment
- Collaborative research
- Deployment / support
- Prototypes and proofs of concept for implementations
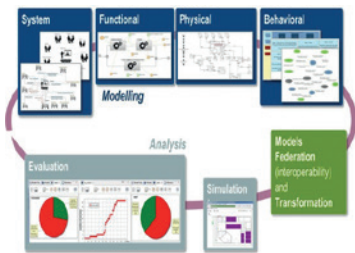

Examples of Complex Systems

Three centers leading cutting-edge research for and with companies.

ISIS

System Engineering Platform ▬

Designing, verifying and validating systems

RECENT PROJECTS

Resilient critical infrastructure engineering method

MAIIEUTIC Project

Modelling and analysis of Interactions & Interdependences and their effects in a network of critical infrastructures

This project enabled the definition and implementation of a resilient critical infrastructure engineering method
Resilience is the capacity of a system to anticipate and quickly return to a controlled state with an acceptable quality of service when subjected to serious events. The method is based on a system approach to the definition and implementation of metrics for evaluating resilience and on multi-agent simulation and evaluation mechanisms (http://maiieutic.mines-ales.fr/).

Resilience of a high-speed rail network with regard to the terrorist threat

RE(H)STRAIN

The subject of this project was the resilience of the Franco-German high-speed rail network in the face of the terrorist threat regarding:
• Prevention, to reduce the risk of attacks taking place
• Lessening the consequences in the event of an attack
• Re-establishing services.

• http://rehstrain.w3.rz.unibw-muenchen.de/

Dismantlement of a nuclear facility

Dismantlement of a nuclear facility

The aim is to define a method for characterising and piloting nuclear facility dismantlement projects. Our method combines various fields: MBSE, enterprise modelling, Early V&V, complex project management

CIFRE thesis in collaboration with the CEA

Photo credits: Thierry Allard / Objectif Gard

OUR MAIN EQUIPEMENT

• Software tools platform: design, simulation, development

• Access to the Mechatronics Platform (PFM)

You want to develop a project ?

Contact details

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