# System of Systems Engineering Collaborators Information Exchange (SoSECIE)

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#### Modeling Process for the Design of System of Systems Evolution

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#### Abstract

System-of-systems (SoS) engineering is a challenging research direction because an SoS has distinctive characteristics in comparison to other distributed systems. According to Maier (1998) constituent systems in an SoS retain operational and managerial independence. Maier’s “stable intermediate forms” architecting principle (Rechtin, 1991) assumes evolutionary development, that is, the SoS evolves in such a way that the SoS should be usefully operable even at intermediate steps, before full deployment. Evolution is the norm in the context of SoS.

OMG’s UPDM and SysML standards provide adequate frameworks and notations which help in the process of modeling and architecting SoS. The former enumerates viewpoints and views that are considered relevant when architecting an SoS, according to practices at US DoD and UK MOD. Other frameworks such as NAF (NATO’s framework) or UAF play a role similar to the one of UPDM. The latter defines abstract syntax used to express numerous views of UPDM, in terms of a structured model, in the sense of model-driven engineering (MDE).

To deal with SoS evolution, the architect needs to model configurations. It is indeed key before we can model the evolution itself. In this seminar, we will explain a new modeling process, based on UPDM and SysML, that helps the architect in designing the configuration of an SoS.

Based on the case study of an emergency service, the presentation will describe what are the most relevant UPDM’s views to identify the SoS configurations. Then we will present a process to guide the architect to design an SoS evolution. In conjunction with this process, we introduce reconfiguration patterns as documentation elements of the designed reconfiguration. We will use the case study to illustrate the process step by step.

#### Biography

The presentation is a joint work of Franck Petitdemange, Isabelle Borne and Jérémy Buisson.

Franck Petitdemange defended his PhD thesis on December 2018. He has a Master’s degree from the University of Montpellier, France. Isabelle Borne is full professor at the University of Bretagne Sud and head of the local site of the IRISA laboratory. She received a PhD and habilitation à diriger les recherches from the University of Pierre-et-Marie-Curie (now Paris Sorbonne universities). Jérémy Buisson is associate professor at Ecoles de Saint-Cyr Coëtquidan and member of the IRISA lab at the University of Bretagne Sud. He currently serves as Deputy Director of the “cyber operations and crisis management” curriculum for the French Army. He has a PhD and a Master’s degree, both from the National Institute of Applied Sciences of Rennes.