

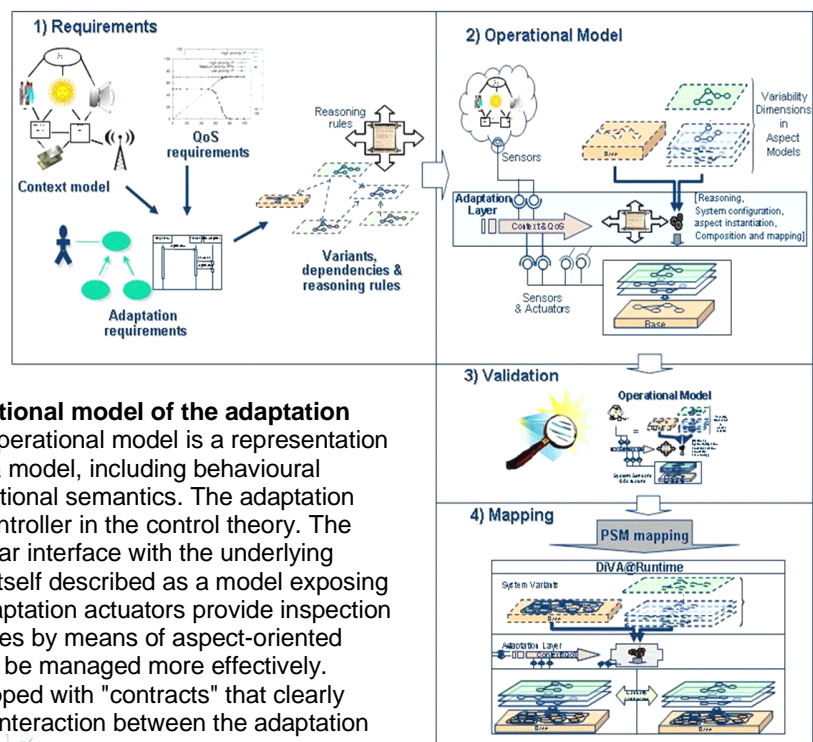
Dynamic Variability in complex, Adaptive systems



DiVA Lifecycle

DiVA offers a methodology that covers the whole process of specification, deployment and change of configurations. The DiVA lifecycle is made of four steps that can be repeated several times in an incremental way if an overall spiral lifecycle is chosen.

- **The first step** in the DiVA lifecycle is to **elicit the adaptation requirements** of a system. We focus the identifying of variations that may occur at runtime as well as identifying co-existing, co-dependent variants. Another focus is on understanding the trade-offs of alternative transformation paths and understanding the effect of making changes to a specific configuration (or other configurations that may be co-existent and co-dependent on it).



- **The second step** is to **build an operational model of the adaptation layer** based on the requirements. An operational model is a representation of the underlying reality in the form of a model, including behavioural aspects that are described using operational semantics. The adaptation layer plays a role similar to that of a controller in the control theory. The model of the adaptation layer has a clear interface with the underlying system and platform. This interface is itself described as a model exposing sensors and actuators. In DiVA the adaptation actuators provide inspection and manipulation of crosscutting features by means of aspect-oriented techniques, and hence, adaptation can be managed more effectively. These sensors and actuators are equipped with "contracts" that clearly define assumptions/guarantees of the interaction between the adaptation layer and the system and platform layer.

- **The third step** is to **validate the model** of the adaptation layer with respect to several operational profiles simulating various aspects of the application and platform behaviour. This is accomplished using recent advances in executable meta-modelling by having simulation runs of the operational model of the adaptation layer connected to the operational profiles. Errors in the adaptation policy can be detected when contracts between the adaptation layer and the system layer are violated.

- **The fourth step** is to use MDE technology to automatically **translate the model** of the interface with the underlying system and platform to a concrete API on the platform. At the same time, it also translates (through either compilation or embedded interpretation) the model of the adaptation layer into a concrete runtime adaptation layer using the above API.

DiVA will provide a new tool-supported methodology with an integrated framework for managing dynamic variability in adaptive systems and combines aspect-oriented and model-driven techniques.

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