# Methodological and Theoretical Background for Temporal Modelling of Intelligent Grids

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Establishing the theoretical foundations of the generic Grid systems is highly important for the development of the next generation Grids. We propose to tackle one particular aspect of the development of such theoretical foundations for a multi-layer self-organizing generic Grid architecture, which will automatically manage reconfiguration of components-based Grid platforms in a safe and optimal way. In the lower layer of our system, the Component Model Layer, we specify and build requests, which will be later addressed to the second, Problem-Solving Layer. At this level, we aim at providing goal-directed automated procedures to search for solutions. The support for the communication between these two layers is thought to be carried out by a semantic interpreter, which provides efficient information flow to enable passing the requests from the Component Model Layer to the Problem Solving Layer and the solutions back. In the development of the Component Model Layer the use of component calculi, mainly focusing on the Asynchronous Sequential Processes calculus and its component extensions are essential. The underlying idea of the Problem Solving Layer is to extend the erotetic problem-solving and proof techniques to the temporal framework. In the development of the semantic interpreter we incorporate automata-theoretic approach and temporal logic normal form. This enables us to devise rules to convert the requests from the component model into temporal normal form (and vice versa), either directly or via automata-based representation in the linear and branching-time setting. We show the relevance of our research to the Web Service Resource Framework and describe the methodological and theoretical background for the proposed multi-layer system. Finally, we identify the components of our previous research in the areas of Grid modelling, Performance evaluation, Component modelling, Logic Based Specification and Verification and Problem Solving, which will be essentially used in the design of the proposed system.