

PhD THESIS ABSTRACT

“Contributions to the Architecture and Security of Mobile Distributed Infrastructures”

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This PhD thesis brings contributions to the field of mobile distributed infrastructures by providing a detailed analysis of distributed computing architectures and their specific security infrastructures, and further proposing a novel architectural solution integrating two types of distributed architectures (Grid and P2P) into a consolidated hybrid model Peer-to-Grid (P2G), with specific benefits compared to the classic architectures. The new model may be applied for implementing a wide range of infrastructures for complex data-driven use-case scenarios. The thesis presents the OMU Workflow platform and underlying toolkit developed by the author for simulating the practical use-case scenario chosen.

Chapter 1 - *Introduction* – provides an overview of the thesis, including the brief description, by chapters, of the research topics approached in this thesis.

Chapter 2 - *The framework for the Mobile Grid architecture* – presents the evolution of the Mobile Grid concept based on the convergence of Grid and Mobile computing technologies, and the Agent Technology from the perspective of the support provided to mobile distributed architectures.

Chapter 3 - *The Mobility and Security aspects of the OGSA architecture standard* – analyses the OGSA (Open Grid Services Architecture) standard, the SOA framework implemented by the distributed Grid architectures, and related standards. The chapter discusses the process of introducing ‘mobility’ to OGSA, specific security aspects related to OGSA framework, as well as research efforts underway for applying OGSA framework to the P2P (Peer-to-Peer) environments.

Chapter 4 - *Use-case scenarios for the implementation of the hybrid mobile distributed architecture* – introduces the P2G (Peer-to-Grid) hybrid architectural concept proposed by the author and discusses the applicability by describing several use-case scenarios. It further details the Paramedical Emergency Operations Scenario, comprised of 3 components: the medical infrastructure (static & mobile entities), the interactions and real-time communication between entities, the ambulances fleet management. It addresses data discovery and integration from static & mobile data sources within a virtual ‘on-the-fly’ environment.

Chapter 5 - *Architecture options for the Paramedical Emergency Operation Scenario: Mobile Grid and Mobile Peer-to-Grid (P2G)* – comparatively analyses 2 mobile distributed architecture options that may be implemented for meeting the requirements of the scenario proposed: the first option is based on the Mobile Grid concept for integrating static and mobile Grid nodes, while the second (more complex) is based on the integration of Mobile Grid and Peer-to-Peer technologies into the hybrid mobile architecture the author called Mobile Peer-to-Grid (P2G). The second architectural option is introduced to provide a new intelligent context-aware distributed architecture that brings stability and efficiency advantages.

Chapter 6 - *The Security infrastructure for the Architecture options proposed* – describes the design of the security infrastructures required by the two architecture alternatives described, including the particular aspects of the Mobile Grid and Peer-to-Peer security systems, as applied to the chosen use-case scenario. For the second architectural option, the chapter discusses the integration of Grid and P2P security components, in the view of the security services to be extended and made available to both distributed environments, according to their requirements.

Chapter 7 - *On-Site Authentication and Authorization* – describes the Authentication and Authorization operations and mechanisms at the level of a mobile node within the distributed infrastructure (respectively, an ‘on-site’ ambulance-vehicle during a rescue operation).

Chapter 8 - *Workflow Simulation of the Paramedical Emergency Operation Scenario* – presents the OMU Workflow platform and underlying toolkit (workflow-type Java simulation environment) the author developed based on the Triana Workflows environment, for implementing the Workflow Management of the Paramedical Emergency Operations scenario within an intelligent context-aware mobile distributed Peer-to-Grid (P2G) infrastructure.

Chapter 9 - *Conclusions, personal contributions and future research work.*