

<u>Name</u>	<u>Organisation</u>	<u>Project title</u>	<u>Decision No.</u>	<u>Decision date</u>	<u>Funding period</u>	<u>Funding</u>
Codreanu, Marian	OY	OPTimal cross-layer control for Wlreless NETworks (OPTWINE)	133289	29.09.2009	01.01.2010 - 31.12.2012	273 000

Project description

The main goal of this project is to establish an independent research team which will focus on cross-layer optimization and control techniques for future wireless networks. The team will contain two doctoral students which will be recruited and advised by the applicant. Unlike the cross-layer techniques developed so far, in this project particular emphasis is on the time varying aspects of the wireless networks. Specifically, stochastic networks with wireless and/or wireline components, randomly arriving traffic, and time varying channels with possible disconnections and user mobility are considered. The concrete goal is to integrate various network protocol layers into a unified optimization framework, by regarding them as components (or sub-problems) of a general utility maximization problem which are distributed over the network. Coordinated by a master program, these local algorithms attempt to achieve a global objective. The general network will be modeled as a queuing system with transmission rates that depend on resource allocation decisions and time varying channel states. Cross-layer control techniques for the flow control, routing, node scheduling and radio resource allocation will be derived in order to achieve joint optimal performance. Particular emphasis is on deriving algorithms and protocols which allow distributed implementation. Different performance criteria, including throughput, delay and robustness against topology changes, will be investigated. The ultimate goal of this research is to develop a general theory of time varying networks which includes all aspects mentioned above. This is indeed a very ambitious objective, which requires advanced mathematical skills to interconnect and apply knowledge from different disciplines, including Information Theory, Control Theory, Optimization Theory, Queuing Theory, Lyapunov Theory, Statistics and Signal Processing. However, such theory will have a breakthrough-making impact. In addition to the direct application on the wireless communication networks, it will likely impact the science of network in other fields, including economics, transportation, biology, etc. In this research project, special attention is paid to determined and personalised supervision of doctoral students. The applicant will provide all the support necessary for the students' continuous development and progress as researchers. Publications in the most prestigious international scientific journals and conferences as well as doctoral theses and inventions will be produced as a concrete outcome of the project. Specifically, approximately 7 (seven) journal papers, 15 (fifteen) conference papers, and 2 (two) doctoral theses are expected.