BISON
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Biology-Inspired techniques for
Self Organization in dynamic Networks

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Partners: Telenor Communication AS (Norway),
Technische Universität Dresden (Germany),
IDSIA (Switzerland),
Santa Fe Institute (USA)

1   Executive Summary

We report on the state of the Project after one year of activity. Main objectives for the reporting period were:

- develop abstract models of complex adaptive systems (CAS) from biological systems, develop guidelines as to which CAS and network topology are most conducive for achieving which function,

- develop models for basic services including routing in mobile ad-hoc networks and information search in peer-to-peer networks,

- develop and evaluate models for advanced services including load balancing and content sharing,

- develop the simulation environment architecture.

Technical progress during the reporting period has been excellent, achieving the stated goals and milestones. We note the following as highlights of our results:

- expansion of our "bag of tricks" for drawing inspiration to include three new biological CAS (*amoebae*, *neurons* and *viruses*) and three new mechanisms (*diffusion*, *epidemics* and *chemotaxis*),

- realization that *topology* is of fundamental importance for functions in dynamic networks and identification of *topology management* as a fundamental service for establishing, maintaining and repairing desired topologies despite dynamism and failures,

- identification of *aggregation* as a basic service and developing extremely fast and robust epidemic-style protocols for solving it in overlay networks of arbitrary size,

- development of novel biology-inspired solutions to routing, load balancing and searching,

- identification of "power-constrained connectivity" as an important problem in mobile ad-hoc networks and formulating it as an integer programming problem,

- development of the open-source simulation environment PeerSim that is able to simulate dynamic overlay networks of up to a million nodes.

There have been no variations in the consortium composition or in the work plan and all deliverables have been submitted on schedule. Project management has not encountered any major obstacles during the reporting period. Several partners have experienced slight delays in the hiring of temporary staff which has resulted in a reduction of the actual effort figures and the sustained costs for the reporting period. Nevertheless, the changes have not had any impact on the work plan as the reduction in the temporary staff effort has been compensated by an increase in the permanent staff effort devoted to the Project.

BISON represented a brand-new activity for all of the consortium partners rather than being an incremental extension to some on-going collaboration. Indeed, none of the partners knew each other prior to the Project. Despite this handicap, the first year has served to establish and bond close relations leading to an *esprit de corps* for productive cooperation between the partners. Links have also been established with other FET projects COSIN and DELIS as well as the network of excellence EXYSTENCE paving the way to fruitful cooperations in the coming years. Information dissemination during the reporting period has been limited to setting up and maintaining the project web site, publishing early results in conferences/workshops and presenting the Project in various forums.