

# **Future Networks, Society, and Modeling (FuNeSoMo)**

## Project description

### 1. Background

The project is built on the existing collaboration between Finland and universities and research institutes in the USA. In the past, a large part of the collaboration has taken place between Helsinki Institute for Information Technology HIIT and University of California at Berkeley (UCB), with special focus on the International Computer Science Institute (ICSI), but also other major US universities have been included. The current project Future Networks, Society, and Modeling (FuNeSoMo) is an extension of the existing Finland-ICSI Center for Novel Internet Architectures (FICNIA) project in 2007-2011. FICNIA focused on collaboration between Finnish universities and companies and universities in the US in the area of Future Internet, with visitors to ICSI, Massachusetts Institute of Technology (MIT), Carnegie Mellon University (CMU), and Stanford University. Other past and current related collaboration includes the exchange program between Tekes and ICSI as well as HIIT's collaboration with the School of Information (iSchool) at UCB.

As a mark of the high level of activity, for example in the FICNIA project over the past 3 years, a total of 10 researchers have been in the US for over 10 visits, ranging from shorter 3 month visits to visits of up to 1 year, including several repeat visitors as part of continued collaboration. The visits have resulted in several joint publications, often at the top international conferences. The collaboration has had a major impact and benefit for the Finnish and US research communities and it is clear that there is a strong need for such exchanges also in the future.

### 2. Mission and Research Agenda

The mission of the FuNeSoMo project is twofold. First, it provides a framework for research exchange with major US universities, with particular focus on continuing the Tekes/ICSI collaboration. Second, in order to ensure a smooth take-up of collaboration, the project contains a research component, which focuses on a set of

carefully chosen thematic research areas where we already have on-going collaboration, e.g., with ICSI. The goal of the research component is to enable *fundamental research in the chosen thematic areas*, aiming at *significant contributions towards the future development of those research areas* that addresses its present problems and challenges. Furthermore, it intends to further strengthen the international visibility and dissemination of the Finnish research both in the U.S. and the global scientific community. FuNeSoMo work can also be arranged into specifically developed joint *research agendas* (TBD).

The FuNeSoMo project covers funding for a number of researchers working on the thematic areas listed below. This base funding ensures the continuity of the current research exchanges (Tekes-ICSI collaboration and FICNIA project) and will give guarantees of this continuity to both the Finnish and US institutions involved, this being needed to obtain long-term commitments from both sides. Equally importantly, FuNeSoMo-project also acts as a **framework**, under which separate projects can join, for example, other projects that are funded by Tekes, provided that the thematic areas of the project match those of FuNeSoMo core research agenda.

The initial research areas will be revised and updated regularly to reflect the latest developments in the field. The research areas reflect the thematic areas of on-going collaboration and they are chosen as the main initial themes of FuNeSoMo because we already know that collaboration on these thematic areas yields very good results. The rationale for this is to use the current momentum to ensure a smooth take-up of FuNeSoMo and open the doors for expanding into other areas in the future, possibly through other sources of funding.

### **Main thematic research areas**

The FuNeSoMo project has initially three main thematic areas of research. These currently correspond to key research areas at HIIT and our current US partners. Joint areas of interest ensure that actual collaboration is possible. Together, the existing work and on-going collaboration ensure that future work planned in the FuNeSoMo project will lead to fruitful collaboration between Finland and US.

#### 1. Future Networks

Efforts on building the Future Internet have received a lot of attention and funding recently. Networking has been a traditional strong field of research both at HIIT and at ICSI and the past FICNIA project was directly aimed at

networking research. FuNeSoMo will continue supporting this track of research. Important topics that will be covered in FuNeSoMo include *traffic analysis, accountability, data center networks, information-centric networking, services, and software-defined networking*. A new, emerging field of research, *green IT*, is also a topic researched both at UCB and HIIT and this is likely to yield future collaboration potential as well.

## 2. Users in the network society

During the past ten years HIIT has had strong collaboration with universities in the USA in the areas of 1) mobile user experience and human-computer interaction, 2) user-centric research on design and use of digital services, and 3) legal, business and social constructs that support the development of future network society. The planned research work in this project continues research in all of three aforementioned tracks. A big part of this work is closely related to the CalSizzle project with iSchool at UCB. Visit <http://otasizzle.wordpress.com/tag/calsizzle/> for more information on CalSizzle.

The research questions in this thematic area cannot be answered within one academic discipline, and researcher candidates are expected to represent different disciplines: Social Psychology, Service Design, Cognitive Science, Human-Computer Interaction, Business Strategy and Marketing, and Legal Studies.

## 3. Computational modeling and data analysis

Within the fields of computational data analysis and machine learning there are excellent collaboration opportunities, some of them already being utilized. There are two relevant Centers of Excellence affiliated with Helsinki Institute for Information Technology HIIT and many other groups in Helsinki and Finland, several top-level groups in ICSI, Berkeley, Stanford and MIT.

Computational modeling-powered interaction and interface techniques are a field rapidly rising in importance. There are strong Finnish groups in HIIT working on machine learning and interface aspects – speech, image analysis, proactive interfaces, and interaction. The areas of research in this thematic area thus include at least the following: novel machine learning techniques and signal processing, in particular probabilistic modeling, to infer users'

attention and goals from measurement signals of the user and the surroundings; proactive/multimodal interfaces and interaction; computational methods in genomics.

### 3. Organization

The current plan covers the timeframe 1.1.2011 – 31.12.2013, i.e., three years. Initially the project will be administered by HIIT at Aalto University in order to provide a smooth transition from the current exchange project FICNIA, which is also administered at HIIT. HIIT is a joint research institute of University of Helsinki and Aalto University and thus opens the possibility for easy access to the FuNeSoMo-project for research groups from both of these universities.

One important fact to note is that Helsinki is one of the 5 nodes in the EIT ICT Labs KIC of the European Institute of Innovation and Technology (EIT), with Aalto University, Nokia, and VTT as the core members and University of Helsinki among the affiliate members. The kind of international collaboration proposed in FuNeSoMo is a very good match to the topics of EIT ICT Labs, and we will explore the possibility of moving the administrative responsibility of FuNeSoMo under the EIT Helsinki node, once the node and EIT ICT Labs are fully up and running. A likely scenario is that EIT ICT Labs will be partly administered through Aalto University; hence a transfer of responsibility from HIIT to EIT would possibly only be an Aalto-internal transfer. However, this remains to be confirmed.

As mentioned above, a key component of FuNeSoMo is the framework under which research projects can participate in the research exchange. In this framework role, FuNeSoMo-project will negotiate collaboration contracts with US partners, and establish the rules under which other Finnish project can join the framework. Thanks to the framework construction, additional projects with other sources of funding can also take advantage of the possibilities for researcher exchange to the US.

Another part of FuNeSoMo is the research component, which focuses on the thematic areas and concrete proposals mentioned above. The list is not intended as an exhaustive list of the work in the project; instead it highlights current, on-going work which is known for sure to take place in the near future. *The research topics are periodically evaluated by the steering group*, which can decide how the thematic work in the project should evolve.

The organization of the FuNeSoMo-project:

- The *Director* will lead the work of the project according to the research agenda and the more detailed research plans derived from it. The director also represents the project towards the scientific community, industry, and funding organizations.
- A *Steering Group* will contribute to the development and implementation of the research agenda and to directing the annual 2-3 calls thematically and also decides on acceptance and rejection of the applications. The Steering Group is composed from senior researchers in ICSI and HIIT and from companies committed to the project.
- The *Coordinator* manages the daily operations of the research exchange in practice.

#### 4. Practical Operation

The research agenda will be implemented partly by coordinated research taking place in HIIT and the US institutions, in particular at ICSI and partly by complementary research at HIIT. We will complement the researcher exchange with other joint activities, such as joint events and other activities, educational activities, and regular joint meetings (both face-to-face and virtual). A significant aspect of the research agenda is active participation in the research community, including the standardization activities in IETF/IRTF and other bodies.

A close collaboration between the partners is a fundamental prerequisite for the success of FuNeSoMo. Apart from the joint research agenda, this will be ensured by the following activities such as the following:

- *Research visits*
- *Joint physical meetings*
- *Joint virtual seminar* where researchers will present and discuss their current work.
- *Joint public events* such as seminars and workshops, possibly in association with major international conferences.
- *Joint events* aimed at collaborating industrial companies.

## 5. Funding Structure

The funding for FuNeSoMo comes from TEKES and Aalto University. Relevant Finnish companies participate via the steering group, as outlined above. If the planned administrative move under EIT ICT Labs is successful, it is possible to obtain additional funding through EIT.

The funding from FuNeSoMo covers the following expenses:

- **Salaries for researchers.** Ideally, the exchange visitors are at postdoc or more senior level, but also doctoral students are considered as candidates. The emphasis on more senior people is warranted, since their visits can lay the groundwork for long-term collaboration on an efficient level. As detailed in the section “Expected Outcomes and Impact”, current collaboration with ICSI is focusing on larger, joint efforts, which require additional manpower at HIIT in order to be successful and yield good results. This level of personnel allows for work to proceed both in Finland and in the US, as opposed to just sending a researcher to work alone in the US. The lengths of the visits may vary between 2 weeks to 6 months (for senior researchers) to 3-11 months (for junior researchers) and are decided on on basis of the applications by the SG.

Note that these salaries can also be used to pay for visiting researchers from the US during their stays in Finland. At HIIT we have received several expressions of interest from different institutions in the US regarding longer research visits, thus it is quite likely that during the lifetime of the project we would also be able to attract top-level researchers to Finland.

- Half-time **coordinator** at HIIT for the duration of the project.
- **Travel expenses, necessary equipment and relocation expenses.** Travel includes both traveling between Finland and US and also possible travel to conferences during exchange visits.
- **Support for housing** during the exchange.
- **ICSI framework payments for 3 seats per year**

## 6. Expected Outcomes and Impact

FuNeSoMo is a research-oriented project and the expected outcomes are research papers, joint research activities, and research prototypes. It is expected that high quality publications at top international venues will result directly from the collaboration between Finnish and US researchers. As one piece of evidence of this potential, past exchanges over the last 3—4 years have resulted in 2 papers at ACM SIGCOMM, 2 at ACM HotNets, 2 at ACM Internet Measurement Conference, as well as several others at other highly respected venues. It is clear that when the research topics have been defined jointly with the US partners, as is the case with the proposed themes in FuNeSoMo, such high impact, high visibility work is almost certain to result. Publications at such venues will significantly raise the visibility of Finnish research in the global research community and it would be extremely difficult, if not impossible, to obtain such impact and visibility without collaboration with the US researchers.

Currently the collaboration between HIIT and ICSI is moving towards a phase where we have the possibility to run larger, joint efforts focused on important and timely topics. One example of this is the on-going work on data center networks run by Prof. Sasu Tarkoma and Prof. Scott Shenker. On the UCB side, the CalSizzle project described above represents another such closely knit collaboration. These kinds of projects require commitment from both sides and constant effort; hence researchers must be active on both sides. Such efforts are likely to yield a large number of high quality publications at top venues.

It is expected that research done in the context of FuNeSoMo can also lead to spin-off companies founded in Finland.

In summary, we expect FuNeSoMo to provide a large amount of excellent international visibility for Finnish research and raise Finland to the top international level in the thematic areas of FuNeSoMo and cement its position as a leader in these fields.