ANEXO BECAS DE PASANTÍAS
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INTERNSHIP SUBJECTS 2008-2009

Subjects list by RESEARCH CENTERS :

INRIA Nancy Grand Est
INRIA Rhône Alpes
INRIA Saclay - Ile-de-France
INRIA Sophia Antipolis Méditerranée

INRIA Nancy Grand Est RESEARCH CENTER

Title: A study of Semantic Wikis within the context of Semantic Web and collaborative work
Contact: Amedeo Napoli - EPI **Orpailleur** - INRIA **Nancy** Grand Est

Description of the subject:

The Wiki systems allow people to achieve some kinds of collaborative work, e.g. collaborative edition where people edit in a simple and straightforward form documents that have to be collected on a Web site. These systems have contributed a lot to lower the complexity of complex tasks such as sharing documents or collaborative work, leading to the apparition of community Web sites [Volkel 06, Chen et al. 07].

However, the edition of a document is not a complete whole task in the context of collaborative work for a community: the document will have a certain life, will be read, modified, reused in other contexts, shared, disseminated, etc. In other words, when editing a document, it is also interesting to think of the future of the document to allow an easy retrieval, understanding, and manipulation of that document, based on the content of the document, e.g. for comparing the document with another, classifying the document, searching for documents that are more general or more specific, or that can be related with this one.

This view of document manipulation is in accordance with Semantic Web view, where the content of documents has to be understood by machines. For that, it is important to be able to take advantage of an ontology related to the domain of the documents that are under consideration.

Here an ontology has to be understood as a knowledge base made of concepts and relations encoded into a knowledge representation formalism (e.g. description logics or OWL) and capturing knowledge of a given domain [Fensel et al. 03, Staab and Studer, 04]. In this way, there exists a meeting point between collaborative work (such as collaborative edition) in Wiki systems and Semantic Web technology (through ontologies), giving birth to the framework of Semantic Wikis [Volkel 06, Chen et al. 07]. The idea is to define and design an environment where collaborative edition can be achieved while preparing the manipulation of the documents in the future, being guided by domain knowledge lying within documents.

Then, collaborative edition is no more the only central task, but is envisioned and combined with other activities allowing organization of the content of the documents, in such a way that content-based retrieval, annotation of documents with respect to the ontology, and even reasoning involving documents, i.e. searching for more general, more specific, or analogous documents, can be facilitated.
This way of doing is in accordance with the actual involvement of people within the so-called Web 2.0.

Today, the design of Semantic Wikis is an important and realistic challenge, thinking in terms of theory, practice, and economy. In this context, the subject of this Master work is to study the current research trends on Semantic Wikis, beginning with a thorough investigation of the literature (see below). Then, the main principles of Semantic Wikis will be extracted and studied in details, trying to analyze the potentialities, their links with, on the one hand, collaborative work (and synchronization problems) and, on the other hand, their links with Semantic Web technology, including knowledge representation and reasoning, but also knowledge discovery, that may be applied for studying document features and Web communities. A catalog of systems (operational platforms) and principles will be established. As well, concrete and running leading examples will be set on for illustrating these principles and the results of the study.

Short bibliography.

D. Fensel, J. Hendler, H. Lieberman and W. Wahlster editors, Spinning the Semantic Web, The MIT Press, Cambridge (MA), 2003.

S. Staab and R. Studer editors, Handbook on Ontologies, Springer, Berlin, 2004.

M. Völkel editor, Proceedings of the First Workshop on Semantic Wikis - From Wiki To

Semantics at ESWC, 2006.

(www.eswc2006.org/technologies/usb/proceedings-workshops/eswc2006-workshop-semantic-wikis.pdf)
L. Liming Chen, P. Cudré-Mauroux, P. Haase, A. Hotho, and E. Ong - Proceedings of the International Workshop on Emergent Semntics and Ontology Evolution (at ISWC 2007), 2006.
(km.aifb.uni-karlsruhe.de/ws/esoe2007)

Title: Analysis of Non-repudiation Protocols

Location: INRIA **Nancy**-Grand Est, LORIA

Research Team: **Cassis** project (and VanaWeb INRIA associated team)

Contact : Laurent Vigneron

Description:
Security protocols are used in many applications and permit toguarantee properties like confidentiality or authentication.

Other protocols, with the purpose to guarantee the participation ofagents to a communication (non-repudiation), are more rare and muchmore difficult to analyze. T he work proposed consists, first in studying how to specify security protocols in the AVISPA Tool, then to study some non-repudiation protocols, to specify them in AVISPA, and to verify if they really guarantee the properties for which they have been designed. A second part of the work will be to consider the role of a judge, in case of a dispute about a communication. He is supposed to build proofs of honest behavior for the participants of a communication, according to the guarantees that they can bring. The objective will be to (automatically?) build the judge actions, and to check that the result is a real proof of non-repudiation.

The AVISPA Tool has been partially developed by the CASSIS project; this is a free software, widely used by international companies, research centers and universities.

Title: Positioning in information retrieval systems

Location: **LERIA**, Angers

Research Team: Metaheuristics, Optimisation and Applications (and VanaWeb INRIA

associated team)

Contact : Frederic Saubion

Description:
I n the context of information retrieval, search engines generally index the documents of the target corpus. Then, given a query, they provide a set of answer documents, supposed to be pertinent with regards to that request. The indexing methods can be based, for instance, on the vector model and the criteria for assessing the relevance of a document can rely on the concept of similarity.

However, real information search engines (Google, Yahoo) use specific and extremely complex technologies and it is difficult to forecast the results of a query. Therefore, for the designers of documents (sites, simple pages, articles.) the web positioning becomes crucial. The purpose of a web site or document is generally to satisfy to a specific expectation of the user of the search engine (a service, an information via an article or opinion, the presentation of a city or a person). Therefore, the desire of the designer (and especially the sponsor of the document) is that its document appears to be best for a set of queries for which he has implicitly built this document. He may then wonder how it is possible to refine his document in order to make it more relevant with regards to its original function.

To address this complex problem, we may identify at least two crucial stages:
- Development of a set of queries, which we wish to answer on a priority basis
- Diagnosis of the positioning of the document on a set of reference engines.
We want then to detect and gather fragments of other relevant documents in order to reorganize the original document and improve it. There is an underlying combinatorial problem subjected to multiple criteria and we plan to develop an approach based on multi-objective optimisation.

In the field of information retrieval, we have already applied similar approaches to the generation of composite documents and to the automatic segmentation of text.

Main goals

Bibliographic study of web positioning problem

Reformulation of queries to identify the main purposes of a document
Definition of a set of requests for tests
Extraction and analysis of documents to a given set of query
Definition of evaluation criteria and metrics adapted.
Design and test of algorithms.

We have already a set of algorithms for information retrieval, text segmentation and text indexing.

References

S. Lamprier, T. Amghar, B. Levrat, F. Saubion, SegGen : a Genetic Algorithm for Linear Text Segmentation, Proc. of the 20th International Joint - Conference on Artificial

Intelligence p 1647-1652, 2007.

T. Amghar, B. Levrat, F. Saubion, An Evolutionary Approach in Information Retrieval. International Conference on Computational Science, pp 603-610, LNCS 3991, Springer, 2006.

Title: Distributed Constraint Solving for Web Service Composition

Location: INRIA **Nancy**-Grand Est, LORIA

Research Team: **Cassis** project (and VanaWeb INRIA associated team)

Contact : Christophe.Ringeissen@loria.fr

Description:
The composition problem for web services consists in building a new service from existing ones in such that way that it satisfies a given goal or a given query. This problem has attracted a considerable interest in the last years. Many variations of this problem have been studied, together with solutions based on a bunch of techniques: planning, situation calculus, conversational transition systems, or model-checking. Our approach is to consider this problem as a constraint satisfaction problem for which on has to develop dedicated constraint reasoning techniques. Some preliminary works have been already done in this direction. With this project, we want to strengthen the current works in order to cope with the distributed nature of web services and sophisticated ways of composing software components. In this direction, it is very interesting to apply existing algorithms developed for distributed constraint solving.

The topic of this internship is related to a INRIA-CONICYT project (CoreWeb, with UTFSM, Valparaiso) and to an INRIA associated team (VanaWeb, with UTFSM, Valparaiso).

Workplan:

- Study the litterature on distributed constraint solving
- Apply these techniques to web service composition
- Propose a modelisation and develop the kernel of a dedicated solver
- Study the privacy problem occurring in this context

Title: Application of Coordination Languages to Web Service Composition
Location: INRIA **Nancy**-Grand Est, LORIA
Research Team: **Cassis** project (and VanaWeb INRIA associated team)
Contact : Christophe.Ringeissen@loria.fr
Description:

The composition problem for web services consists in building a new service from existing ones in such that way that it satisfies a given goal or a given query. This problem has attracted a considerable interest in the last years. Many variations of this problem have been studied, together with solutions based on a bunch of techniques: planning, situation calculus, conversational transition systems, or model-checking. Our approach is to consider this problem as a constraint satisfaction problem for which on has to develop dedicated constraint reasoning techniques. With this project, we want to apply a powerful coordination language in order to have a fine-grained control of constraint solving mechanisms used for web service composition.

The topic of this internship is related to a INRIA-CONICYT project (CoreWeb, with UTFSM, Valparaiso) and to an INRIA associated team (VanaWeb, with UTFSM, Valparaiso).

Workplan:
- Study the existing approaches using coordination languages in the context of web services
- Apply a coordination language to control a solver dedicated to web service composition
- Study how such language can be used as tool to monitor the execution of a composed web services

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Title: Brain-Machine Interface: toward the understanding of cortical signals controlling manual dexterity

Location: INRIA **Nancy** - Grand Est (LORIA)

Contact:Laurent Bougrain

Research Team: **CORTEX** The Cortex INRIA project-team at LORIA/INRIA Nancy - grand est develops neural networks to understand information processing in the brain and designs numerical distributed and adaptive algorithms in interaction with biology and medical science.

Description:
We are interested to achieve the essential scientific knowledge to develop a brain-machine interface (BMI) for the use of cortical activity for controlling a commercially available biologically inspired robotic hand, such as the Shadow Dextrous Hand. To better understand how cortical signals control manual dexterity, two approaches will be used: a top-down approach for which data analysis techniques extract properties of underlying

neural activity and bottom-up approach for which mathematical neural modeling aims for the understanding of experimental data.

The candidate will work on the first approach which needs to investigate and integrate several unsupervised methods and supervised methods to extract features and obtain mappings between various neuronal signals (SUA, MUA, LFP) collected in the motor cortex and EMG activities.

The recorded electrophysiological data, such as Local Field Potentials measured in primary motor cortex (M1), the EMG or the hand muscle forces, are expected to be high-dimensional, non-stationary in time and may exhibit a low signal-to-noise ratio. To extract the main features of such signals, the future internship student will apply a combination of an unsupervised clustering algorithm and an improved Principal Component Analysis. This combination allows to identify pieces of low-dimensional time series, which reflect the major underlying dynamics of the systems, i.e. the neuronal populations in M1 and the hand muscles. Other robust machine learning techniques will be applied in parallel to obtain several mappings of features. The findings of the latter methods represent control information (EMG prototypes, muscles activity prototypes) to control the robotic hand in future works.

Candidate should be studying for a master degree in computer science or an equivalent degree.
The applicant would need some knowledge in data analysis and machine learning and need to show interest in computational neuroscience.

INRIA Rhône Alpes RESEARCH CENTER

Title : Pushbroom cameras calibration for 3D reconstruction of planet Mars
Location : INRIA **Grenoble** RA
Research Team : **PERCEPTION**
Contact : (name and email) :Emmanuel.Prados
Tel: +33 476 61 52 32.

Description:
The goal of this internship is to provide and test some calibration softwares for pushbroom cameras (cameras used in satellite imagery). The task consists in implementing some algorithms already published in the literature by other groups as for example the linear model and to adapt and exploit some related work published by our group; see in particular Peter Sturm's publications. The implemented softwares will be tested on planet Mars images handled by the Seismology Group of the "Institut de Physique du Globe de Paris". The results will serve to apply the 3D reconstruction algorithms developed in our group. The project will be carried out in the PERCEPTION group at INRIA Grenoble Rhône-

Alpes, under the supervision of Dr. Peter Sturm and Dr. Emmanuel Prados. This internship takes place in the context of a collaboration with Anne Mangeney (who works on simulation of terrestrial and Martian landslides) from the Seismology Group of the "Institut de Physique du Globe de Paris" and with Nicolas Mangold ("extra-terrestrial geologist") from IDES-Orsay.

INRIA Saclay - Ile-de-France RESEARCH CENTER

Title: Secure peer-to-peer backup system

Location: INRIA **Saclay** IF

Research Team: **ASAP**

Contact: (name and email) :Fabrice LE FESSANT

Description:

The need to backup personal data is increasing tremendously with the spread of digital cameras and the generalized use of emails for family communications. Current backup solutions are either too complex or too expensive for most users. As a consequence, peer-to-peer backup has become an interesting option, as most users have huge unused storage on their computers and can share this space to help other users backup their personal data. Although some projects have been started around peer-to-peer backup and some theoretical solutions proposed, there are currently no such systems available, and this shows that the path from theory to practice is far from being as easy as written in the litterature on the subject. The objective of this internship and/or Ph.D is to design, evaluate and potentially deploy a collaborative peer-to-peer backup system in which peers backup their data on a set of other peers. We are aiming at a reliable yet efficient storage system where confidentiality is ensured. The stress will be put on the maintenance of the backup, an issue that has often been put on the side by other works. Especially, the student will have to design an adaptive system, that will monitor the data stored on remote peers and generate new replica adaptively, at a pace such that data can be restored without saturating the user link to the Internet. This work will be done in the ASAP team located in Paris/Saclay. The ASAP team studies massively distributed systems, with an emphasis on peer-to-peer systems, both structured and unstructured, and gossip-based protocols.

Title: Mathematical modeling for microbial ecology (MSc-thesis project)
Contact: Rapaport Alain, EPI **MERE** (**Montpellier**) - INRIA **Sophia Antipolis** Méditerranée

Subject description:

In natural ecosystems, such as wastewater treatment plants or soils, billions of micro-organisms from hundred or even thousand of different species are playing purifying activities or participate to the large carbon and nitrogen biochemical cycles. Recent progresses in molecular biology and microscopy provide new means of observing microbial communities. Therefore, microbial ecology suddenly became a new investigation area for theoretical ecology, because the spatial and temporal scales allow experiments with many generations of large populations, which is generally impossible for other ecosystems.

Depending on the scientific background and motivations of the candidate, two kinds of subjects can be considered:

1. analysis of stability and transient behaviors of theoretical models of ecosystems (models for "understanding" the role of biodiversity),

2. determination of optimal policies for improving efficiency and reducing undesirable outputs of ecosystems (models for providing new "decision-making" tools). Both modeling rely on systems of ordinary differential equations and control theoretic tools (feedback, observers, optimal control,...) in the spirit of the textbook whose reference is given below.

The team MERE gathers mathematicians and control theory scientists, in connection with two research groups in microbial ecology(INRA LBE and IRD SEQBIO).

Reference:

H.L.Smith and P.Waltman. The theory of the chemostat, dynamics of microbial competition. Cambridge University Press 1995.

Prerequisites:
General principles of the theory of ordinary differential equations.

Title: High performance finite element solver for charge conservation in plasma dynamics
Contact : Stéphane Lanteri - **NACHOS** - INRIA **Sophia** Antipolis - Méditerranée research

center.

Description: The activities of the NACHOS project-team at INRIA Sophia Antipolis-Méditerranée Research Center are concerned with the formulation, analysis and evaluation of numerical methods and high performance resolution algorithms for the computer simulation of certain evolution problems in complex domains and heterogeneous media. One of the application domains of these works currently considered in the team is the numerical modeling of the dynamics of charged particles in interaction with an electromagnetic field.

Physical phenomena involving charged particles take place in various physical and technological situations such as in plasmas, semiconductor devices, hyper-frequency devices and charged particle beams. The dynamics of charged particles in interaction with an electromagnetic field can be modeled by the three dimensional Vlasov-Maxwell coupled system of equations. The Vlasov equation describes the transport in phase space (position and velocity) of charged particles. It is non-linearly coupled to the Maxwell equations which describe the evolution of the self-consistent electromagnetic. field.

The numerical method which is mostly used for the solution of these equations is the Particle-In-Cell (PIC) method. Its basic idea is to discretize the distribution function F of the particles which is the solution of the Vlasov equation by a particle method, that consists in representing F by a finite number of macro-particles and advancing those macro-particles using Newton's equations of motion. The algorithm of the PIC method, after the initialization phase, is based on a time loop which consists of the following steps: 1) particle advance, 2) charge and current density deposition on the mesh, 3) field solve, 4) field interpolation at particle positions. Since January 2007, the NACHOS project-team as started the development of a parallel numerical methodology for the resolution of the 3D Vlasov/Maxwell equations using a Particle-In-Cell method. For the numerical resolution of the time domain Maxwell equations, we make use of a discontinuous finite element method based on a piecewise polynomial approximation, usually referred as a discontinuous Galerkin method, designed on tetrahedral meshes and associated to a second-order leap-frog time integration scheme. Moreover, realistic applications require the numerical résolution of these equations in complex 3D geometries. For these simulations, parallel computing is a mandatory path in order to reduce computing times while allowing the use of discretization methods and meshes that are compatible with the expected accuracy. It is well known that the charge and current densities resulting from the PIC method can induce a loss of the charge conservation property inherent to the Maxwell equations. Several strategies exist to overcome this problem. One of the most efficient and robust methods can be viewed as an elliptic correction of Gauss's law and involves the numerical resolution of a Poisson problem. The objective of this master project will be to study such an approach in the context of a discontinuous Galerkin discretization method on tetrahedral meshes, and to design scalable (from both the numerical and parallel viewpoints) solvers for the associated algebraic systems of equations. In particular, multilevel and domain decomposition techniques will be investigated for this purpose.

Keywords: applied mathematics, scientific computing, Poisson problem, finite element method, discontinuous Galerkin method, tetrahedral mesh, linear algebra, high performance computing.

Title: Model-checking of distributed programs with numerical variables.
Contact (name/project) : Regis Gascon, Eric Madelaine, **OASIS** team - INRIA **Sophia Antipolis** - Méditerranée research center

Subject description:

General context

The OASIS team is working on the design of programming paradigms, languages, and middlewares for (component-based) distributed systems. Specifically, we contribute to the development of the Grid Component Model (GCM), in the context of the CoreGrid european network of excellence, and its implementation with the ProActive middleware. Our middle term goal is to provide a specification language that will be on one side machine-checkable (proving properties of the specification), and on the other side allow for generation of code skeletons that will be "safe by construction" with respect to this property.
Our tools platform include the generation of behaviour models, a graphical editor for UML-based specifications, and connections with state-of-the-art model-checkers. This allows us to verify temporal properties of distributed components. Those properties are essentially about messages exchanged between components, including some data flow.
Formal verification of distributed systems is a difficult problem. A high-level formal modeling of such systems, accessible to non-specialist developers, requires the use of unbounded parameters. These parameters depend for example on the data (clocks, counters) or the communication channels. A consequence is that the formal model has infinitely many states and the formal analysis of infinite-states systems implies to consider very large sets of states. However, several effective methods for representing and manipulating infinite sets have been introduced to tackle this problem.

Subject of the proposed work :

Currently, the model-checkers used by Vercors rely on a finite abstraction of the unbounded parameters and explicit representation of the resulting state space. The goal of this internship is to include some infinite-state techniques in the verification process that will improve the xpressiveness of the verification by removing the finite abstraction. Moreover, it is interesting to compare the efficiency of both techniques when finite abstraction can preserve safety properties. The model-checker will be implemented as an Eclipse plugin that can be included in the platform, using the libraries related to Vercors formal model.
For simplicity, one can first restrict the type of data used in the system to integers (possibly

unbounded). For such systems, there are different techniques defined for the verification of systems with counters that could be used for our purpose. This will be done either by

interfacing with existing tools, or by a direct implementation.

Planned duration: 5 months.

Title: Confluence of a distributed object calculus and its formalisation
Contact (name/project) : Ludovic Henrio, **OASIS** team - INRIA **Sophia Antipolis** - Méditerranée research center

Subject description:

Context:
The OASIS team develops a Java library for supporting distributed applications, and deploying them, for example on Grids; this library is named ProActive.
To provide a model for the library, the ASP calculus has been designed [1]. This calculus is an imperative distributed object calculus, with Futures, and asynchronous method calls as the communication paradigm.
More recently, a functional (and simpler) version of ASP (ASPfun) has been designed and modeled in the Isabelle/HOL theorem prover, including an small-step operational semantics. For the moment, we have been able to define a type-system for ASPfun and to provide quite a lot of basic proofs on the calculus and its type-system.
Objective
The objective of this internship is to provide a framework for proving the confluence of the ASPfun calculus. Considering the difficulty of the task, we split the internship into the following subgoals, which can be realised on paper, or formalised in Isabelle/HOL:

* Preliminary study/investigate confluence of ASPfun based on some examples, and on

partial proofs on paper,

Design a parallel reduction for the ASPfun calculus,
* Design a reduction rule allowing to merge several activities, or services,

* Prove basic properties on the preceding rules, including subject-reduction on some properties,

* Prove the diamond property with the new semantics.

The objective of the internship is not necessarily to achieve all these goals. Strong basis in semantics of programming languages are required.

Prerequisite:
Semantics, object-oriented languages
Reference:
[1] A Theory of Distributed Objects. Denis Caromel and Ludovic Henrio. Springer 2005

Title: An Eclipse editor for the "Java Distributed Component" Description Language
Contact (name/project) : Antonio Cansado, Eric Madelaine, **OASIS** team - INRIA **Sophia Antipolis** - Méditerranée research center

Subject description:

General context

The OASIS team is working on:

The design of programming paradigms, languages, and middlewares for distributed systems. The strong trends in these research areas are currently on component systems. Specifically, in the Grid area, we contribute to the development of the Grid Component Model (GCM), in the context of the CoreGrid european network of excellence, and its implementation with the ProActive middleware.

However, the GCM components are currently only supported at the level of programming language. Our work provides support to software engineers at an early conceptual phase of development. We rely on the definition of a novel specification language for distributed components. The language takes the form of a Java-like language, and allows to describe both the structure and the behaviour of components. The specifications are precise enough so they allows to generate behaviour models of distributed components that can be model-checked, and to generate the control code of distributed components. The latter aims at producing components with guaranteed behaviour.

We also develop tools for analysing such specifications. The tools include the generation of behaviour models, a graphical editor for UML-based specifications, and connections with state-of-the art model-checkers. This allows us to verify temporal properties of distributed components. Those properties are essentially about messages exchanged between components, including some data flow information.

Subject of the proposed work :

The goal of this internship is to develop an IDE for the specification language described above. Concretely, the IDE will take the form of a plugin for Eclipse, allowing to inherit the main features of the Java editor found in Eclipse.

The internship builds on a model driven architecture (MDA) framework using sophisticated software engineering techniques for fast software development. The internship should attract students willing to experiment with emerging techniques in Eclipse, and on

component programming.

Planned duration: 5 months.

Title: Simulation of an evolving dissemination protocol in delay tolerant networks
Contact (name and email): Sara Alouf (Sara.Alouf@sophia.inria.fr), Giovanni Neglia (Giovanni.Neglia@sophia.inria.fr)

Location: INRIA **Sophia Antipolis** - Méditerranée research center
Research Team: **MAESTRO**

Description:

The proposal lies within a new trend that calls for the design of completely distributed self-organizing systems. The major advantage of such systems is their ability to cope with the size and the fast dynamics of future networks. Moreover completely distributed solutions are more robust to failures and they appear able to implement communication, storage and computational services at a very low cost. The potential impact of this research is also confirmed by efforts from many important companies, like IBM (autonomic computing), Microsoft (dynamic systems initiative), HP (adaptive enterprise) and Alcatel-Lucent Bell Labs (self organizing networks are a focus of the new joint research lab with INRIA). We consider as specific networking application the design of epidemic routing schemes for Delay Tolerant Networks (DTNs). DTNs with opportunistic (i.e. not scheduled or predictable) contacts are a case where autonomic operation appears necessary. In fact, the time a central authority would need to discover network operation conditions and enforce particular behaviors at the nodes could be much longer than the network dynamics timescales. Different epidemic routing schemes have been proposed for data delivery in DTNs, each achieves a tradeoff between delivery delay and resource consumption. However, an important issue is still open or not adequately addressed: for a given network scenario and a given optimization goal what is the best forwarding scheme to employ and how should it be configured? At Maestro project-team, we have developed an evolutionary

forwarding protocol, which adapts its parameters through a genetic algorithm in order to produce the fittest scheme [1]. The first objective of this internship is to perform extensive simulations with OMNET++ to evaluate the performance of the evolving protocol in terms of speed of convergence and reactiveness to changing conditions. At a later stage, the intern will explore alternative approaches, such as reinforcement learning and adaptive control, to lead the system towards optimal performance. References: [1] S. Alouf, I. Carreras, D. Miorandi, G. Neglia, "Embedding Evolution in Epidemic-Style Forwarding", In Proc. of IEEE MASS 2007, October 2007, Pisa, Italy. Available at http://www-sop.inria.fr/maestro/personnel/Giovanni.Neglia/publications/neglia07bionetworks.pdf
Prerequisites: sound knowledge in programming (C/C++) and data processing. Knowledge of OMNET++ simulator, genetic algorithms and reinforcement learning is a plus.