DEUKS internship: On the Interconnection of Heterogeneous Overlay Networks

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Overview

1. Introduction
2. Overlay Networks
3. Babelchord
4. Application Demo
5. Further Work
6. Cote d’Azur
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1 Introduction
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DEUKS - Doctoral School towards European Knowledge Society, Tempus Project JEP - 41099 - 2006

Consortium Members:
- Universita Degli Studi di Udine (I)
- University of Novi Sad (RS)
- Institut National de Recherches en Informatique et en Automatique - Sophia Antipolis (FR)
- Mathematical Institute of the Serbian Academy of Science And Arts - Belgrade (RS)
- State University of Novi Pazar (RS)
- Universidad Politecnica de Valencia - Valencia (ES)

Individual experts:
- Prof. Pierre Lescanne, Ecole Normale Superieure de Lyon (FR)
- Prof. Pawel Urzyczyn, University of Warsaw (PL)
Main objectives of DEUKS:

- Promotion of the current European landscape of doctoral programmes in Serbia;
- Building-up and implementing pilot doctoral programme according to the European innovative recommendations;
- Introduction of improved and new teaching methods: acquisition and exchange of knowledge in the specific fields of teachers’ and students’ interests;
- Building-up the environment for linking the EHEA and ERA.
My Participation

- Internship at INRIA Sophia Antipolis - LOGNET Team
- Team leader: Luigi Liquori
- Collaborators: Francesco Bongiovanni and Cédric Tedeschi
- Duration of stay: February 27th, 2009 - May 25th, 2009
- Main goal to develop a software which will follow algorithm described in the paper:
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Definition (Overlay Networks)

An overlay network is a (computer) network which is built on top of another network. Nodes in the overlay can be thought of as being connected by virtual or logical links, each of which corresponds to a path, perhaps through many physical links, in the underlying network.
Basic Terms

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Definition (Distributed Systems)
Systems without any centralized control or hierarchical organization in which each node runs software with equivalent functionality.
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Definition (Distributed Systems)
Systems without any centralized control or hierarchical organization in which each node runs software with equivalent functionality.

Points of Interest
Scalability, resource discovery, failure recovery or routing efficiency, in particular in the context of information retrieval.
Chord Protocol

- Ring of nodes
Chord Protocol

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- Supports one operation: for a given key it maps it onto a node
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- Simple - Proved correctness - Proved performance
Chord Protocol

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- Supports one operation: for a given key it maps it onto a node
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- Uses consistent hashing to assign keys to nodes
Golden Rules of Chord

Notation

\[ \text{Key}_x = H(\text{Key}) \]
\[ \text{IP}_y = H(\text{IP}) \]
Golden Rules of Chord

Notation

\[ \text{Key}_x = H(\text{Key}) \]
\[ \text{IP}_y = H(\text{IP}) \]

Golden Rules

1. Invariant: \( \text{Key}_x, \text{IP}_y \) iff \( x \leq y \)
2. After JOIN keep GR1
3. After LEAVE keep GR1
Chord - Example
Chord - Example - Lookup procedure
Chord - Example - Joining of the new node
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Babelchord - Introduction

- Motivation: Merging of two Chord rings is costly
- Connecting smaller Chord networks in an unstructured way
- Nodes as *neural synapses*
Social component
Babelchord - Protocol

- Social component
- Rings as Floors
Babelchord - Protocol

- Social component
- Rings as Floors
- Multi-floor routing
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Babelchord - Example
Eclipse demo

- Implementation is based on openChord 1.0.5
- Developed by: Distributed and Mobile Systems Group Lehrstuhl fuer Praktische Informatik Universitaet Bamberg
- Written in Java
- GNU public licence
Simulation and Test Results

Figure: Simulation: Exhaustiveness

Figure: Deploying JSynapse\(^1\): Exhaustiveness

\(^1\) JSynapse: Another implementation by LogNet team members
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Further Work

- Publishing paper
- "Babelize" other protocols for overlay networks
- Apply these techniques in other fields
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- Places
- Events
- Other
Merci Beaucoup!
Questions?