Self-Awareness in Autonomic Systems

agenda

14:00 Wide Hogenhout: overview of Proactive Initiative
14:20 Martin Wirsing: Engineering Autonomous Ensembles
14:45 Franco Zambonelli:
15:10 Q&A
15:30 coffee
16:00 Proposers forum
17:30 End of meeting
Managing Systems is getting harder

- Increased technology complexity makes systems unmanageable
- Different devices and heterogeneous platforms being connected into one system
- Different programming models being combined
- Collections of nodes may exhibit behaviour that was not designed
Self-Awareness in Autonomic Systems

Awareness of Context

- Context internal to system
  - changes in topology
  - resource needs and availability
- Context external to system
  - user behaviour
  - system performance
  - disruptions and malfunctions

Social context
Network status
Computational status
Self-Awareness in Autonomic Systems

background

Distributedness, autonomy, awareness and learning

- Awareness as a form of learning
  - Learning as a means to reduce human intervention
- Autonomy: selecting the right information to obtain from the system or pass on to others
  - Considering the cost of information flow
- Exposing or hiding low level details
  - Adjusting the abstraction level as the requirements change
Self-Awareness in Autonomic Systems

rationale and objectives

General objective

create autonomic computing and communication systems which are able to optimise overall performance and resource usage in response to changing conditions, adapting to both context (such as user behaviour) and internal changes (such as topology).

- nodes need to build up an awareness relating to higher and even global levels.
- reconsider the tradition of fixing abstraction layers at design time
New concepts, architectures, foundations and technologies for:

1. **Creating awareness** at the level of autonomic nodes, by allowing them to interactively and selectively collect information about the system, and use it effectively.

2. **Dynamic self-expression**, namely the ability to autonomically use awareness to adapt the trade-off between abstraction and optimisation.

**Requirements**

- investigate usability in larger context
- demonstrator
Self-Awareness in Autonomic Systems
inspirations and challenges

Inspirations

- Biology (societies; reproduction; evolution)
- Autonomic systems (autonomicity; self-*; dynamicity; situatedness)
- Global Computing (heterogeneity; mobility and concurrency; resource virtualisation)
- Social science; Semantics; Ontology

Challenges:

- Global versus local awareness
- Separation versus integration of concerns
- Prediction and evolution
Earlier call « Situated and Autonomic Communication »

- **HAGGLE**
  - Opportunistic networking (cross-layer)
- **BIONETS**
  - Autonomic service evolution
- **ANA**
  - Beyond IP self-org.
- **CASCADAS**
  - Autonomic communication elements

**Common research issues:**
- Security, resilience, self-* (organisation, evolution, healing, …)
- Interaction of new paradigms with society

**New Architectures**

**Situated Services**
Mobius

MOBIUS will investigate trust and security for small devices which are functioning as a part of global computers. The main focus is on proof carrying code aimed at checking previously created proofs with modest computational resources.

Sensoria

Sensoria will develop a novel methodology for engineering service-oriented overlay computers and for building a framework for context-adaptive, personalisable global services.

Aeolus

Aeolus aims at developing algorithmic principles and implementing the basic functionalities (i.e., programming tools, trust management, secure distributed computation) to enable transparent and efficient access to an internet-based global computer.
Self-Awareness in Autonomic Systems
ICT-2009.8.5, Call 5

• Budget: 15 M€
• Funding schemes:
  STREPs (RT 1. or 2.), IPs (RT 1. and 2., >50%)
• Contact: wide.hogenhout@ec.europa.eu
  ruediger.martin@ec.europa.eu
• Background document
  - FET workshop ‘Overlay Computing & Communication’, Jan. 08
  - ‘Shaping future FET Proactive initiatives’, Sep. 07