

Awareness in P2P groupware systems: a convergence of contextual computing, social media and semantic web

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Motivation

- Collaborative work through virtual teams so as to undertake a common group project is a significant mode of collaboration in online learning
- This kind of collaboration requires efficient communication and sharing of information between group members
- P2P technologies can potentially foster more support for collaboration than centralized approaches as group members can interact directly with their peers
- Awareness is a vital aspect of collaborative systems, and refers to knowledge provided by the system to group members about what other group members are doing at the same time and what they did in the past

Motivation

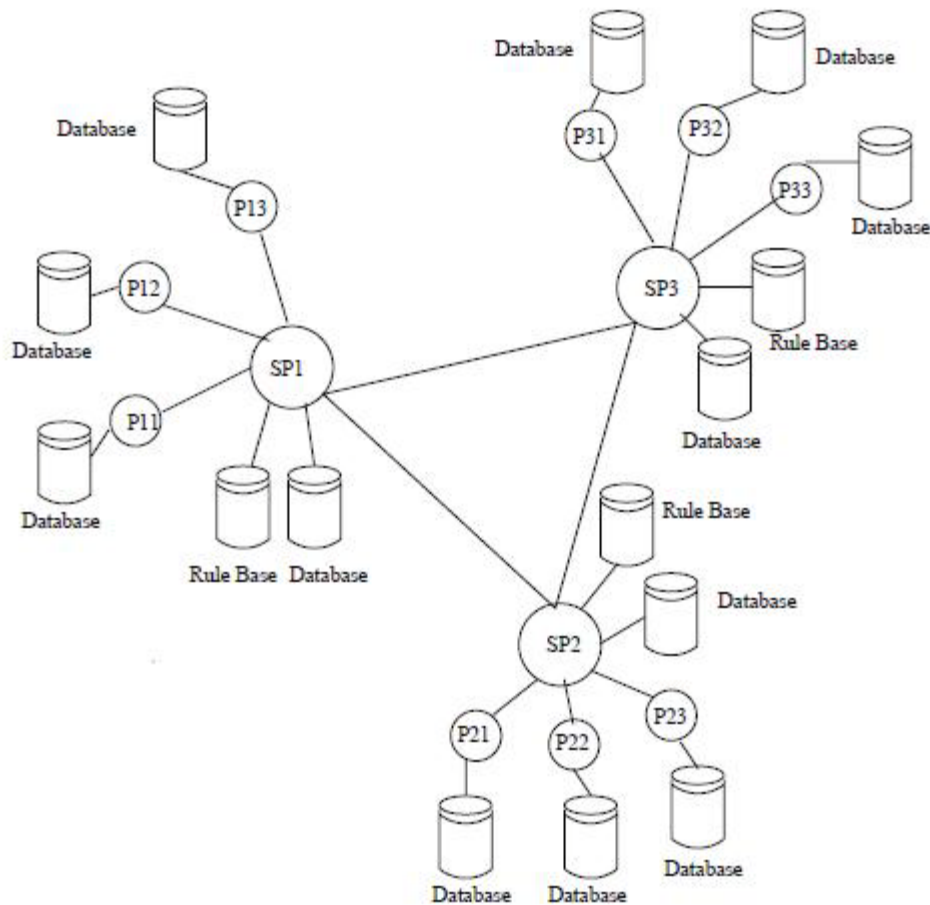
- Several challenges arise in developing groupware and awareness mechanisms in decentralized P2P systems:
 - achieving a consistent view of the groupware global state from the local states of the group members
 - issues inherent to P2P systems such as their dynamicity and heterogeneity
 - P2P systems are pervasive and ubiquitous in nature, thus requiring contextualized awareness e.g. event transformation and enrichment may be necessary
 - awareness mechanisms in P2P systems have generally been implemented as part of applications, thus having the limitation of being application dependent
 - focus has been on providing information about individuals' activities rather than on supporting group processes so as to accomplish a common group project

Our work

- Provision of service-based group awareness capabilities in P2P middleware, on top of which groupware applications can be developed
- This represents a convergence of
 - pervasive computing: network peers may be mobile as well as fixed
 - social media: groupware is founded on synchronous and asynchronous communication between peers; it is important to monitor how well a group is functioning, and when intervention by a facilitator/tutor/manager may be needed
 - semantic web: using languages such as RDF/S to represent and reason with the diverse range of information required by the P2P middleware and the awareness services

Our approach

- We propose an RDF/S-based superpeer network for supporting group awareness in P2P groupware systems:



Our approach

- Peergroups form in order to undertake group projects
- Thus peers may join or leave a peergroup at any time
- Information about the group's processes can be distributed and replicated at peers of the peergroup
- This enables efficiency due to local access to data and support of failures e.g. when peers leave or are temporarily disconnected
- Peers' operations and control information is forwarded to their superpeer which manages the replication and consistency of information within the peergroup
- Our approach aims to support both stand-alone mobile peers and mobile peers that are attached to other fixed peers through lightweight mechanisms and summary services

Our approach

- Each superpeer has Event-Condition-Action (ECA) rule processing capabilities. ECA rules hosted at the superpeer can be used to:
 - achieve replication and consistency of distributed group data and processes
 - automate the generation and propagation of global overviews and summaries from detailed information and local summaries received from individual peers
 - automate the receipt of awareness information by peers, according to their current status, status of the project they are participating in, their preferences, and their context
- Updates initiated at a peer site are executed locally and then notified to the superpeer. This decides whether the update triggers an ECA rule (or rules) causing the stated rule actions to be propagated to other peers in the peer group

Our approach – three levels

Modelling

- specifying in detail the awareness capabilities, P2P group model, distributed group processes and data persistence model, workflow model, notifications and query model, summary services model etc.

Middleware:

- design the middleware services to support these models, and implement them over the P2P infrastructure:

P2P Infrastructure:

- the RDF/S-based superpeer network with P2P ECA rules

Support for Distributed Scenario-Based Learning

- In SBL, students are given a real learning context that requires acquiring and applying knowledge and practice skills in order to forge a path through to completion of a learning activity
- In a distributed P2P environment, e.g. as at the Open University of Catalonia, group awareness is very important during the collaboration process in which a group of students are undertaking a learning scenario
- In our context, a learning scenario is defined as a set of tasks, forming a subgraph within the project workflow
- Distributed SBL can be effectively supported by our approach through its provision of activity awareness, process awareness, communication awareness, availability awareness, and context awareness.