Some Remarks on Collaborative Systems Framework

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DARPA Intelligent Collaboration and Visualization Program [DARPA1997] developed a general framework for the collaborative systems architecture for the audit of these systems. The authors applied the framework for different applications and for collaborative project management [Niţchi2006]. In different particular type of collaborative systems were developed other frameworks. By these, but also from our experience we developed a new general framework for collaborative systems. This note would be a short presentation of this framework used by the authors in development of the CSCW for the collaborative systems in business and also in education .

Introduction

The globalization and the Internet made many changes in the main human activities. The individual or local team activities were transformed in distributed, cooperative ones and the real world in a virtual one. The cooperation involves communication and a specific kind of coordination. From these three elements result the development of a new paradigm of the collaborative activities. The partners are working in different locations and collaborate by Internet, Intranet, Extranet or in wireless being in this respect, a Virtual Team. All components have their philosophy and knowledge systems. These heterogeneous knowledge systems are necessarily to be integrated and synchronized. These activities need support systems, as general CSCW (Computer Supported Cooperative Work) which in particular cases, as for example in education, could be translated in Collaborative Learning Work.

2. The general framework

Our framework will have a pyramidal structure (Figure 1).

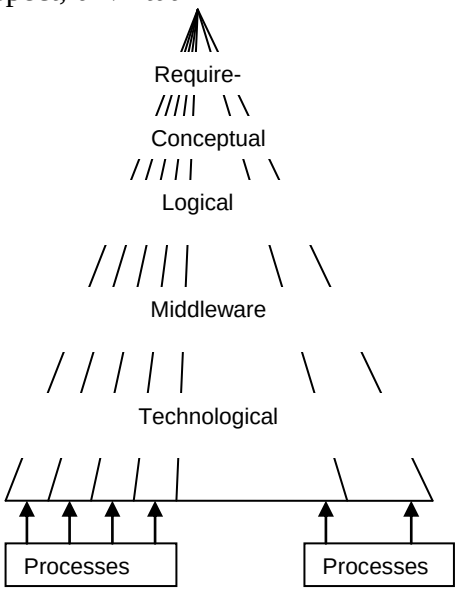

Figure 1. The proposed collaborative system framework

It means that we have a multi-tier system, organized radial on processes.

3. Requirements tier

The requirements tier describes the general specifications of the system. In very similar problems the requirements can be different and can be defined at a high level or at a lower level. To illustrate we will focused on

the collaborative education. It can specify some cases:

- Generally, in collaborative learning the requirement is the creation of a mutual knowledge structure which is derived from group consensus. The work group engaging in the process of design and implementation of a system which put together their individual knowledge in order to create a new product. They will eventually create a shared meaning, which would allow them to take action together to carry out the design.
- In ANTS (Anonymous peer-to-peer open source file sharing) used in collaborative learning, the requirement is to provide a generic multi-user collaborative framework. Being a complex distributed challenge, it is necessary to base on distributed technologies as well as provide generic CSCW services to the user and developer communities [Lopez2005]. In a P2P (peer-to-peer) collaboration for mobile users the requirements are to create an interoperable environment based on semaphores.
- The combination of tasks and the number of peers involved in the learning is determined by the subject domain being taught, the learning theory adopted, and the capability of the system [***2]. Not all combinations of two or more peers represent collaboration. We can have different requirements and consequently collaborative or partial collaborative environment designs as follows:
  - A mediating tool formed by a computer supporting, two or more peers satisfies the communication need but it is not necessary a collaborative support because it not play an active cooperative role.
  - An active tutor, which can be an agent, controls and directs the collaborative interaction of two or more peers is collaborative.
  - Two or more peers working at the same workstation or in a network collaboratively having eventually a tutor or a coach is also collaborative, etc.
- The specification can be more precise. In academic partnership the requirements can be stated at the general level as the following [***1]: collaborative academic activity promoting institutional strategic goals by developing and different links. It assures benefits for University, for students and staff and also for partners, associates, potential collaborators, support providers etc. These partnership activities include many collaborative activities as it follows: formal collaborative provision, research and academic enterprise links, joint supervision for postgraduate research programmers, placement learning (including international student exchange), employer links (for example Foundation Degrees), external awards, commercial collaborations, alliances and consortiums, etc.
- In problem based learning using mobile computing the requirements are [Weider2005] to engage team members in structuring solutions to deal with real life, relevant, contextualized problems. For the learning the environment need to include discussion forums, faculty mentoring process, and collaborative research, team members become more actively involved in learning etc.

4. Conceptual tier

This assures the development of a conceptual design of the collaborative project according to requirements. At this level we use four categories of objects (similar with [DARPA1997] but also a set of conceptual scenarios. The four categories of conceptual objects are:

- work tasks describing the main activities and tasks from the collaborative systems as: planning, brainstorming and group creativity, decision making, cognitive conflicts, coalitions and negotiations, bargaining, competitive performances, dissemination and information etc.
- transition tasks assuring the relations between the work tasks and contain: summarizing the outcome of the last task, assigning action items to members of the group, noting dates for expected completion of assignments, taking role in a group, requesting changes to an agenda, locating missing meeting participants, summarizing the discussions and transmit these to group members, startup and shutdown for members connected to the collaborative systems etc.

- social protocols, which depend by the collaboration nature, elements concerning the meeting conduct (chair, agenda, hierarchies support, floor control etc.), communication standards (type, security, interaction), awareness (expectations, influences, locations, objects, actions etc).
- group characteristics is depending by time (spontaneity, duration, asynchronous or synchronous), dimension (number of members, homogeneity, duration of the group, etc).

The scenarios are described in natural language, WordNet, which is a semantic lexicon combining the English dictionary and thesaurus and used mainly in text analysis and AI, heterogeneous structure or H-structures which is an adaptation made by the authors, of the heterogeneous algebras to the structure theory, or Faceted First Order Horn Logic [Nițchi1999]. The main remarks are:

- The natural language is inconsistent and incomplete, the H-structures are consistent, but are incompletes, which means that are possible to be extended obtaining a new ontology.
- The conceptual tier is divided in two levels: the global and the local levels and can be represented by a lower ontology as the natural language or a higher one as the heterogeneous structures or the HFOPLS.

5. The logical tier

The logical tier represents the image of the conceptual tier objects and relations by more appropriate to CSCW logical forms. At this tier is described the functionality, that is needed to support the different conceptual objects at logical level.

The main images of the sections from the conceptual tier are:

- logical images of the work tasks concerning on work spaces (access and contributions types), supports for object types (images, sounds, text, etc), object manipulations (creating, deleting, moving, etc.), object management (coordinating, linking, removing, protecting, setting, monitoring).
- logical images of transition tasks from conceptual tier are: collaboration coordination (summarization, playback facility, integration, distribution of objects, translation of objects between modalities), collaboration planning capabilities (agenda, calendar support, meeting notification, voting), locator capabilities (locate possible collaborators, locate group members, locate objects), etc.
- logical social protocols as: awareness indicators (abstraction, temporal, aggregation, traceability, information provision, perspective), meeting conduct (support for multiple collaborations, floor control, document/object access control, synchronize feature), communication (side chats, message passing, message leaving, n way communication, 1 way communication, gesturing, pointing, agreeing, disagreeing, feedback channel, private communication, security of the communication, anonymous communication), etc. For ontology it can be used these some more specific possibilities. In this respect it can be used the semantic nets and more exactly the standardization of them or scenarios standardization [Nilson88], But also *SUMO* (Suggested Upper Merged Ontology) which is a mapping to WordNet, *Cyc* an AI project to assemble a comprehensive ontology and database, *CIDOC CRM* (*Conceptual Reference Model)*, etc.

6. Middleware

The middleware contains different types of services that can be used in developing CSCW. It can use the functionality of various types of services to support the logical objects and scenarios. A list of the main components for the various services from this tier can be: E-mail, chat, Internet connections, telephone conversation, multicast audio and video, half and full duplex audio, duplex audio, white and black boards, shared workspace and applications, encryption, recording, history mechanism, lists of objects, participants, possible collaborators, version control, simultaneous sessions, collaborative space management and navigation, object repository, object control, import/ export facilities, semantic web facilities, etc. To represent the scenarios we can use a frame system [Nilson1988] or some special languages based on frames KM (Knowledge Machine) of F-Logic (Frame

Logic) used for knowledge representation, KIF (Knowledge Interchange Format) created to serve as a syntax for FOPL for describe processes. For markup ontology it can uses many languages, as for example, OWL (Ontology Web Language), a markup language specified by World Wide Web Consortium (W3C) together with RDF (Resources Description Framework), also developed by W3C, and other components and tools used in Semantic Web projects. It can be used also as middleware the intranet, but also agent communities generated by OAA (Open Agent Architecture) or other supports.

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