Ontological Mediation of Meeting Structure: Argumentation, Annotation, and Navigation

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Abstract

Compendium, a graphical hypertext system, can be used to gather a semantic group memory when used in a meeting scenario. By way of a specifically designed ontology, this structure is applied as annotation to other forms of meeting capture, such as audio and video recordings, and further employed to navigate between and through these resources.

1 Introduction

The CoAKTinG project [4] aims to advance the state of the art in collaborative mediated spaces for distributed e-Science. In doing so, the project is integrating several knowledge based and hypertext tools into existing collaborative environments (such as the Access Grid [1]), and through use of a shared ontology to exchange structure, promotes enhanced process tracking and navigation of resources before, after, and while a meeting occurs.

In this paper we concentrate upon one of these tools, Compendium, which can be used to transcribe argumentation and group memory from a meeting. We then introduce an ontology to express this structure and other resources associated with the meeting, and demonstrate how it can be used to bring together annotations, with minimal overheads. Finally we show how the same ontology is used by a web-based replay tool to build a navigational hypertext over records of the meeting.

2 Capturing meeting structure with Compendium

Compendium, first developed in 1993 as an approach to aid cross-functional business process redesign (BPR) teams, has been applied in several dozen projects in both industry and academic settings [5]. Its origins lie in the problem of creating shared understanding between the team members, typical of those attending teams working over weeks or months to design business processes: keeping track of the plethora of ideas, issues, and conceptual interrelationships without needing to sift through piles of easel sheets, surfacing and tracking design rationale, and staying on track and "bought-in" to the project's overall structure and goals [12].

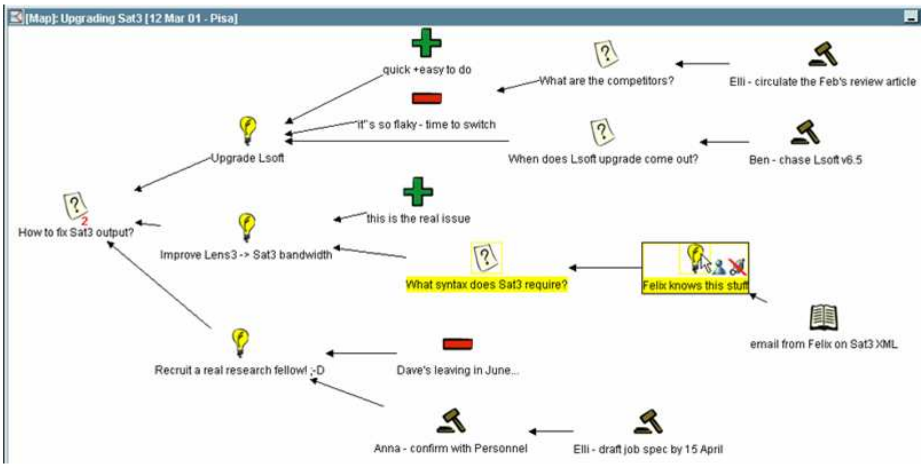

Figure 1: A Compendium map showing various node types and links

The set of techniques which represent the Compendium approach revolve around a graphical, semantic hypermedia system (figure 1) for the development and application of:

1. question-oriented templates, which serve as semi-formal ontologies to structure the subject matter of a particular project. These are constructed using a minimal set of *nodes*, which can have the type: question, idea, pro, con, reference, note, decision; and list and map *views*.

2. a set of metadata tags that can be assigned to any any concept in the database

A hallmark of the approach is the ability to move between formal and prescribed representations and informal, ad hoc communication, incorporating both in the same view if that is helpful to the participants. Hypertext nodes and links (which can be transclusive) can be added either in accordance with templates or in an opportunistic fashion.

The key feature of the early approach was the combination of an Issue-Based Information System (IBIS) concept-mapping tool [6], which supported informal and exploratory conversation and facilitation, with a structured modelling approach [7]. This allowed teams to move along the spectra of *formal to informal representation*, and *prescribed to spontaneous approaches*, as their needs dictated. It also let them incrementally formalise data [11] over the life of the project. As the approach was tested and refined over the course of several years, additional modelling methods were added, plus tools to transform Compendium's hypertext models into established organisational document forms, and vice-versa [8].

Elsewhere, we have reported a number of Compendium case studies in which the tool coupled with expert use played a key role in bringing together diverse stakeholders, capturing and integrating their perspectives in a coherent group memory system [8, 10, 9].

In our experience, Compendium introduces a distinctive element to the design space of knowledge technologies, namely, making meetings into true events for group knowledge creation which leave a *trace* - a structured, collectively owned, searchable group memory that is generated in real time as a product of a meeting. Effective, on-the-fly construction of knowledge resources does not come "for free" - the lower the effort invested at the capture stage (e.g. simply video recording all meetings, or taking conventional minutes), the more work is required for collective reuse and computational support. Naturally, we want quality knowledge resources for minimal effort, and while smart analysis technologies will continue to push the boundaries, there are pragmatic factors to consider: what is possible *now*? Compendium tackles the capture bottleneck that any knowledge construction effort must confront, by investing effort in real time quality capture by a facilitator, mediated and validated by those at the meeting.

3 AKT Reference and Meeting Ontologies

The Advanced Knowledge Technologies (AKT) project, with which CoAKTinG is affiliated, has developed a reference ontology [2] to describe the domain of computer science research in the UK, exemplified by the CS AKTive Space semantic web application. Within this domain, its vocabulary is able to express relationships between entities such as individuals, projects, activities, locations, documents and publications. For purposes of capturing meeting specific information, the reference ontology is already suitable for encapsulating:

- the meeting event itself
- meeting attendees
- projects which are the subject matter of the meeting
- documents associated with the meeting, including multimedia

For activities such as meetings, which we wish to index and navigate temporally, the way in which the ontology represents time is of particular relevance. The reference ontology contains the notion of an *Event*, which is a *Temporal-Thing* that can define a duration, start and end times, a location and *agents* involved in the event. More importantly, each Event can express a *has-sub-event* relationship with any number of other Events, and it is with this property that we build up our temporal meeting structure. Within the ontology there are also many Event sub-classes, such as *Giving-a-Talk*, *Sending-an-Email*, *Book-Publishing*, and *Meeting-Taking-Place*.

While the reference ontology provides a foundation for describing meeting related resources, the CoAKTinG meeting ontology (figure 2) extends the OWL version of AKT reference ontology to better encompass concepts needed to represent collaborative spaces and activities, including:

- time properties sufficient for multimedia synchronisation
- distributed gatherings to represent meetings which simultaneously take place in several spaces, both real and virtual

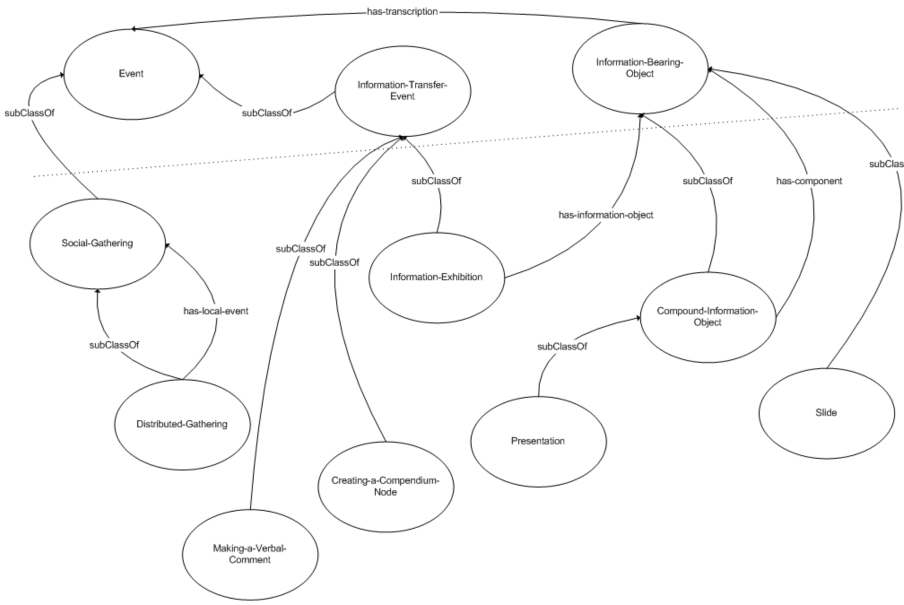

Figure 2: A simplified representation of the meeting ontology

- exhibition of information bearing objects; e.g. showing a slide as part of a presentation
- compound information objects; e.g. to describe a presentation consisting of several multimedia documents
- rendering of information objects; e.g. JPEG image of a slide
- transcription of events; e.g. a video recording of a presentation, minutes of a meeting
- annotation of events; e.g. making a verbal comment, creating a Compendium node

When a meeting takes place we "mark up" the event with metadata - details such as those listed above - to build a structured description of the activities that occur. Through use of an ontology shared and understood by several different tools, we can lower the workload needed to provide usable and useful structure.

One such tool is Compendium, which provides a powerful means of capturing the argumentation that defines a meeting. This structure can be exported as an XML file - a document transcribing the event - within which individual nodes of differing types can be referenced as resources using their URLs. Compendium also records information about when the user creates and edits nodes; these time-stamps are processed to assert *Creating-a-Compendium-Node* annotations, which are sub-events of the meeting.

4 Navigation and Meeting Replay

Once a meeting has taken place it can be useful to revisit the ideas and topics discussed. Traditionally, formal minutes are taken to record the salient points, but often these are too brief to be more than a simple aide memoire; in the typical CoAKTinG scenario (such as an Access Grid node) full audio and video logs are available, but conversely these are too verbose to be of practical use. We require the ability to select high-level points of reference from the meeting, then "zoom in" to view detailed records. e.g. a user sees from Compendium notes that a decision was made, but to understand the subtle reasoning behind that outcome wishes to view the video of discussion between participants.

The HyStream application [3] demonstrated how, with sufficient mark up, a user can navigate a video recording of a presentation using the presenters notes and slides from a web browser. The CoAKTinG meeting replay tool enhances these ideas by flexibly constructing the navigational structure using the meeting ontology.

Each meeting is described using RDF conforming to the OWL meeting ontology; this represents resources such as: the meeting time, location, attendees, audio/video recordings, any presentations given (and associated web viewable versions), and argumentation annotation from Compendium.

The Event / has-sub-event structure held within the RDF is mapped onto a more conventional time-line, which is automatically published using HTML and Javascript on a web site (figure 3). The user can navigate the meeting using the video timeline, or jump to a different point in the meeting by selecting a particular event, such as a slide being presented, or a Compendium node being created. By using the shared AKT reference ontology, we can also link to further information about resources held in other knowledge bases, e.g. when a person is referenced we link to information about them in the populated AKT triple store.

5 Conclusions and Further Work

Development of Compendium and the Meeting Replay Tool is very much a work in progress as part of the wider CoAKTinG project. We have seen that by collecting light-weight (c.f. video) annotations from Compendium, we can enhance the navigation of meeting records. Similarly, minutes taken with Compendium can be informed through references to a multimedia recording. Use of the meeting ontology enables us to easily map from the argumentation structure generated by Compendium to a navigatable hyper-structure for audio/video replay.

Furthermore, the ontology creates a foundation for gathering other meeting based information to aid replay and navigation, primarily from other tools under development within CoAKTinG:

- I-X Process Panels support collaborative planning and issue tracking. Process Panels can be used to manage tasks raised at a meeting, and when exposed through the ontology will enable navigation through all information relevant to that activity.

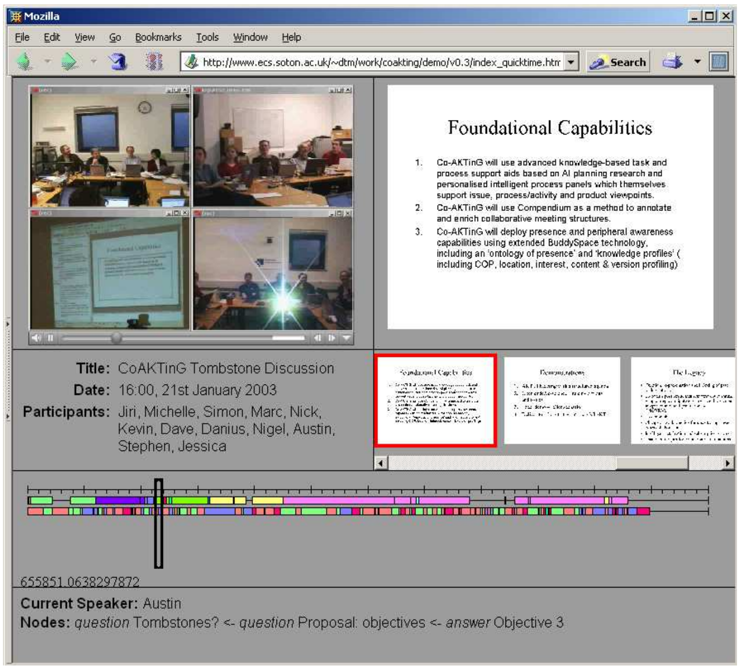

Figure 3: The meeting replay tool

- BuddySpace is an enhanced instant messaging and presence client, which acts as an extra communications medium during meetings. Logs of the text channel provide a further temporal record of the meeting, and presence gives an indication of an individuals availability and whereabouts.

Gathering information from multiple sources in a single ontology presents interesting possibilities for implied structure about a meeting. For instance, if we have events which record generation of Compendium nodes and issue modification in I-X Process Panels (both of which will be associated with particular people and projects or activities), and a BuddySpace log keyword filtered by project and activity (which already has information on who made a comment), can we infer what a specific part of the meeting was about? Can we use professional networks and communities of practise from the AKT knowledge base to automatically reference relevant work and colleagues, and then query their availability?

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