Zeno: Groupware for Discourses on the Internet

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„To achieve sustainable development with greater participation of interested parties more efficiently", with this goal we try to support discourses between planners, contractors, clients, concerned parties and facilitators with our Internet groupware Zeno. We introduce the new version, planned for release in Summer 2001, which will address a range of tasks: participatory problem solving, consensus building, mediated conflict resolution and consulting.

1 Introduction

It is our belief that processes of innovation, if they shall lead to sustainable solutions, must be open for participation, clear and fair. They must be designed so that everyone, persons involved, affected or interested, can contribute to their issues in the most effective way. Action spaces must remain open, development and design options must be recognizable and usable.

Innovation processes have to be conducted as social discourses, but we claim that only networked computer provide the infrastructure to extend traditional discourses in the required way. Our work addresses the research issues resulting from these extensions.

- Computer networks allow us to open participation: anyone can participate at any time from anywhere. As more people get involved (hundreds or even thousands), we have to find rules and techniques to properly manage the process, to distribute, split and aggregate discussions.
- Computer networks allow us to increase clarity: much more data can be captured and recorded, such as documents and facts, goals and criteria, opinions, polls and votes, options and analyses, compromises and decisions, versions and revisions. To cope with the information overload, we must be able to condense discourses, to find ways to embed discourses into the context of their subject matter with seamless access to potentially relevant information (for example, a map with references to a discussion). User interfaces should help to perceive multiple perspectives and to track the evolution of the process.
- Computer networks empower the individual: every participant can contribute to the discussion, raise issues, options and criteria. To elicit opinions and come to decisions argumentation outcomes have to be combined with online polls and votes. New analysis tools are needed to measure progress and divergence, to identify points of conflict, key issues, actors and actions.

Our approach is not limited to a particular school of argumentation, class of problems, or type of domain. Trying to explore variations, identify adequate parameters and provide suitable interfaces, both conceptually and technically, is the most distinctive characteristic of our approach. Consistently, the most promising result will be the spectrum of applications and cross-platform interoperability.

2 Discourses in scenarios

Zeno was originally designed to support online mediation of discussions about political and planning issues [Gordon and Karacapilidis 1999]. Our new projects have varied this theme and broadened our scope.

2.1 Teaching design through rationales

A rationale is an argumentative structure justifying a solution. It identifies the issues or objectives which have to be achieved, the options for achieving them, and arguments or criteria for choosing between the options. Different frameworks have been proposed for rationales, with different types of elements and different relations between them. Consistently, being able to customize the vocabulary of rationales became a requirement for Zeno in WINDS, a project in the European program on Information Society Technologies (IST). In WINDS students and teachers from 20 European universities of architecture and civil engineering will use Zeno to construct design rationales. As learning from precedents and reuse of designs is an important principle, teachers can create an associative network of concepts that indexes the elements of design rationales together with other learning material. For this purpose, Zeno will be integrated with a tool for concept indexing [Voss, Nakata and Juhnke 2000], [Voss, Giretti and de Grassi 1999].

2.2 Facilitating discourses and decision making

A discourse is a structured conversation with categorized speech acts and procedural rules. Tools that support moderated discourses differ slightly in their vocabulary, which may be as simple as issues and comments for brainstorming [Facilitate.com], [MeetingWorks], [Group systems Online] or as sophisticated as Rittel's IBIS framework [Rittel and Webber 1984] for dealing with wicked problems, which distinguishes issues, positions and arguments [Conklin and Begemann 1988], [Questmap], [DRAMA]. Beyond moderated structured discourses, group decision support tools offer polling and voting functions, notably [Decision Explorer], [Resolver], [Facilitate.Com].

The new Zeno will be a competitive group decision support tool with a graphical interface, with customizable discourse grammars, as required in WINDS, and with APIs to voting and polling tools. In KogiPlan, a project funded by the German ministry of education and research (BMBF), Zeno will be combined with [Descartes] for powerful visual analysis of votes and polls [Andrienko and Andrienko 1999]. In the IST project DEMOS, Zeno will support large scale discourses, which may break into subgroups and later be merged and aggregated consistently.

2.3 Document-centered discourses

In a document-centered discourse, the topics of the discussion are the parts of a document. We assume that documents have a primarily hierarchical structure and can deal with XHTML documents and their XML element structure, as well as with Web sites and their directory structure. In the new Zeno, the parts of the documents are automatically cross-referenced with threads in the discussion. The functionality may be compared to D3E, an environment for discussing HMTL documents [Sumner and Shum 1998].

Beyond D3E Zeno will support concurrent discussions about a single document in different groups, so that the cross-references presented to a particular user depend on his/her group memberships and access rights. One example are journals on the Web with annotations shared between reviewers only and public annotations from the readers. Another example are business processes on the Intranet whose steps may be annotated with private comments, with comments shared with the team, and with comments that are public to the whole organization.

2.4 Knowledge portals

By a knowledge portal we mean a Web site intended to communicate knowledge within a community. Boards of experts may be established that collect information, discuss topics or elaborate documents. While the work is performed in a protected workspace, the results are presented at the portal to the entire community. Every reader of the site may comment or become an author and submit contributions, as input to the boards of experts or more directly for publication at the portal.

While the current Zeno already offers shared workspaces and discussion forums, the new version will provide APIs to dynamically publish selected content on specially designed Web sites. This requires a strict separation of content and form, indexing of text and meta keywords, as well as export and import of Web sites without breaking relative links. A first portal supported by Zeno has been developed in [KOMM!], the next one for the BMBF-project ITA is in preparation.

2.5 Engineering knowledge intensive tasks

Data mining in the IST project Sol-Eu-Net and decision support for industrial site planning in the BMBF project KogiPlan are two examples of knowledge intensive tasks, where a range of special purpose tools is made available. Zeno may be among these tools, being used for rationales, moderated discussions or document-centered discourses. But the new challenge in these scenarios is to support cooperating engineers or analysts in choosing and combining the appropriate tools.

We plan to use Zeno to elaborate the task structure, and to operationalize it by associating elementary tasks with task-specific tools and their results. Task structures may be saved for re-use, and templates may be created for different kinds of site selection problems.

3 Requirements and concepts

Although the scenarios come from very different applications, they exhibit a number of common features, which suggests them to be cast into a common conceptual framework.

- **Units of content** All scenarios deal with atomic units of content. They have a short description, title or subject, to be used as a label in presentations. They may contain plain text or HTML, which could carry a message, contain a section of an HTML document, or an abstract of an enclosed document in another medium (video, audio, image, other MIME types). They may have attachments like an email, or enclosures like a business letter. Units of content may have properties, and different types of units would have different properties.
- **Content structures** Units of content may be connected in various ways. Connections may be directed or undirected, representing threads, compositional structure, temporal, causal or producer-consumer relationships, or very free associations. Since the Web is an open information source, we cannot assume that every Web resource is modeled as a unit, so that some connections may lead to external resources.
- **Management contexts** All scenarios include one or more management contexts. They define the rules of access, layout, and the types of admissible types of units of content.

Given the diversity of scenarios, it had been difficult to find common and meaningful names for these concepts. Eventually, we agreed on the notions of journals and articles.

Journals and articles resemble folders in their ability to contain other information resources, but differ from them due to their special functionality in the context of Zeno. The notion of a "journal" covers both the private records of individuals and the records of various kinds of public discourse, including newspapers, periodicals and, interestingly, the records of deliberative and legislative bodies. Zeno offers journals as organisational units and articles as content units for collaborative work. Following the metaphor of a journal, Zeno distinguishes the roles of editors, authors and readers. Editors of journals determine form and layout, the types and characteristics of articles, the rules of composition and admissible (cross-)references. Authors compose and revise articles, creating new versions as needed.

Journals and articles may be nested, which makes up the primary or compositional structure. It is always a tree. In addition, an arbitrary secondary or referential structure may be established by references to and from articles, journals or Web-addressable content. The latter comprises documents as elementary units of content, and folders as mere containers for Web resources.

An article does not contain organisational information like a journal. It can carry some information of its own, in its head and body, and can exist in several versions. The body of an article may be written in plain text including URLs, images and other media, and it can be used for various purposes, such as a short communication, a covering letter, or a summary. The head, consisting of a set of attributes, serves as a form sheet for further information about the article. By default, Zeno will maintain cre-

ation and modification dates, author, and publishing status. The structure of article heads may be customised for different types of articles, and each journal may declare different types of articles. Articles may have arbitrary attachments of any MIME type. Articles may also have subordinate articles such as follow-up articles, replies or other components.

4 User interfaces

Zeno will continue to offer several user interfaces. With the HTML interface users will be able to navigate through the hierarchy of journals, and along the primary and secondary structure of a journal. With the Java power interface, users can directly manipulate journals and articles, expand and contract journals, drag and drop, and inspect the content of a selected journal or article. The look and feel and the interaction is similar to the Windows explorer.

With the power interface, users will have four options for viewing the content of a journal. They may see the tree of articles representing the primary structure of the journal. Or users may get a listing of articles, which may be sorted by the standard attributes. Thus they can see at a glance who wrote/modified which articles, which articles are new, or find articles of a particular type. The third option is the pad, a two-dimensional presentation of the articles with their primary and secondary structure. The icons of the articles and the colors of the edges can be selected by the editor. The fourth option lists the full content of the journal, not just its articles, but also the subjournals, folders and documents.

5 Design

Cross-platform interoperability, based on advanced Internet technologies, has always been an important technical goal for the development of Zeno. The new Zeno server will be fully implemented in standard Java, and can be installed at Web servers supporting servlets, WebDAV (for collaborative authoring), and LDAP (for user and group administration). The Zeno server communicates with clients using HTTP. The optional Java shell is portable to any operating system supporting the Java 2 runtime environment, including Linux, Macintosh and Windows.

6 Summary

We claimed that the most distinctive characteristics of our approach are its interoperability and ability to cope with a spectrum of applications, such as knowledge management in virtual enterprises, participation of citizens at regional and European levels, distributed site selection, urban and regional planning, annotation of business processes in teams and organizations, or distance learning in a virtual university of architecture and urban planning. We then sketched the bundle of features that will allow Zeno to support such a range of applications:

- The structure of articles can be specified for each journal. The format is powerful, it covers relational structures, directories, as well as Web documents.
- Any content that can be represented in a journal can become the subject of multiple discourses, deliberations or metalevel argumentation.
- Articles may reference any Web-addressable content so that discussions can be integrated, for instance, into maps and CAD models that are made accessible on the Web.

- Journals can be distributed to multiple servers for concurrent development, be downloaded for offline processing and later be merged consistently.
- Journals under construction may be analyzed in various ways via an API, for instance to identify concept occurrences, to retrieve associated resources, to give intelligent advice, to classify articles, to cluster articles or to create summaries.
- Different needs of different users are taken into account by a range of user interfaces: Zeno's HTML interface, a power interface for direct and graphic manipulation, or any custom-designed Web portal that is connected to Zeno via an API.
- Since Zeno builds on DAV, the coming standard for collaborative authoring on the Web, it will be possible to manipulate Zeno resources with other WebDAV tools and, vice versa, manipulate other DAV resources in Zeno.
- Since Zeno builds on LDAP, existing LDAP directories can be reused for user and group administration. Vice versa, other Web services can profit from Zeno's address book.

In the next three years, Zeno will be evaluated by our clients and in several European and national projects. Revisions are planned and will help to improve our design. The new version of Zeno will be distributed freely using a GNU open-source license.

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Descartes	http://allanon.gmd.de/and/
DRAMA	http://www.environs.com/drama
D3E	http://d3e.open.ac.uk
ExpertChoice	http://www.expertchoise.com
Facilitate.com	http://www.facilitate.com
Group Systems Online	http://www.ventana.com
KOMM!	http://www.kommforum.net
LDAP	http://www.openldap.org
MeetingWorks	http://www.meetingworks.com
SOL-EU-NET	http://SoleEuNet.ijs.si
QuestMap	http://www.softbiccle.com/questmp.html
Resolver	http://www.barrettsaunders.com
Solutions-PROSPER	http://www.dssinfotech.com
WebDAV	http://www.webdav.org
	http://www.ics.uci.edu/ietf/webdav
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