SEREBRO: Facilitating Student Project Team Collaboration

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ABSTRACT
In this demonstration, we show SEREBRO, a lightweight courseware developed for student team collaboration in a software engineering class. SEREBRO couples an idea forum with software project management tools to maintain cohesive interaction between team discussion and resulting work products, such as tasking, documentation, and version control. SEREBRO has been used consecutively for two years of software engineering classes. Student input and experiments on student use in these classes has directed SEREBRO to its current functionality.

Categories and Subject Descriptors
D.2.9 [Software Engineering]: Management – productivity, programming teams, software configuration management.

H.5.3 [Information Interfaces and Presentation]: Group and Organization Interfaces – asynchronous interaction, computer-supported cooperative work, web-based interaction.

General Terms
Management, Documentation

Keywords
Collaborative software tools, software project management, social networking, computer supported cooperative work

1. INTRODUCTION
Communication throughout the software development process is a key aspect of the group dynamic [1, 2]. Undergraduate students expect similar communication mediums on teams to those used every day in social forums. More than that is the need to capture their discourse and allow them to relate the emerging ideas and concepts directly to the artifacts needed as part of software engineering milestone requirements. The goal of the SEREBRO courseware is to present a cohesive, collaborative environment that couples idea management and tracking with typical project management tools.

SEREBRO was initially developed as a web application to promote creativity [3-5] in software engineering as part of a pilot study funded by the National Science Foundation CreativeIT program. SEREBRO has been used by two undergraduate Software Projects courses at the University of Tulsa since Fall 2009. Since Fall 2010 it has also been used in an undergraduate software engineering class to examine its broader appeal. Early on, the tool consisted of only an idea network, which allowed for posting, response, and refinement of expressed ideas [6, 7]. Aggregating student feedback from surveys and comments posted in the class discussion site on SEREBRO throughout the semesters, we saw both the requests for and benefits of incorporating artifact creation and project management tools with the existing idea management system to facilitate moving discussion to production. These requested features included wikis for documentation, source code version control, task management, file sharing and a calendar for team scheduling.

There are many project, idea and software management tools for team collaboration. Basecamp [8] places a heavy emphasis on threaded idea posting, chat, email notifications, file sharing and task scheduling. Kohive [9] also has task management, messaging, chat and scheduling, however it is aimed at a much wider audience than project teams. Another collaboration tool, Spigit [6], allows ideas to be rated, scored and traded to increase innovation among participants. None of these tools have project management tools integrated into their idea based environment.

Rational’s Team Concert [10] and Microsoft’s Team Foundation Server [11] are feature-rich source control management (SCM) tools highlighting application lifecycle management features such as work item tracking, build automation, and scheduling tools. In these tools, documentation construction and idea management activities, which embody design rational, remain disjoint from the SCM capabilities. Redmine [12] has similar features and includes a wiki for potential documentation creation. However, it also lacks an idea management system. SEREBRO has all of the basic features of these tools with the exception of time and issue tracking features. Instead, it relies on its task scheduling and idea network to cover these capabilities to the extent needed in a class environment. Overall, SEREBRO is distinct in that its learning curve is the equivalent of one class period, it allows project teams to seamlessly move from discussion to source code to documentation and iteratively back again, and it can be manipulated given its modular tools for team collaboration outside of the software engineering environment.

Over the course of roughly two years, SEREBRO has evolved from a simple tool providing only basic idea management, to a robust courseware for student software development teams to communicate about their project and direct that communication...
towards generating project artifacts. Our video shows the authors using SEREBRO to demonstrate its functions and features.

2. SEREBRO AS COURSEWARE
The major benefits of having an environment in which students can easily and quickly communicate and work include containing their activity so that their progress can be closely monitored, interacting with them as a team member/manager rather than formally as their instructor, and quickly previewing their artifacts to help refine them toward more successful milestone completion. It also allows the team members to immediately recognize how their team best collaborates, including the strengths and weaknesses of team members.

2.1 Idea Network
The core communication medium in SEREBRO is an idea network for managing team discourse, as depicted in on the left side of Figure 1 for a topic labeled ‘Presentation’. Light bulbs indicate unread posts. Hovering over nodes displays the post, while clicking on a post makes it persist for a response. Threads of discussion begin with an initial brainstorm (blue node), created by any team member. Team members, as well as the individual that posted the brainstorm, can agree, disagree or comment. Agree posts (green triangles in Figure 1) let a team member elaborate on the positive aspects of the parent idea. Disagree posts (inverted orange triangles in Figure 1) allow a user to state a counter argument, approach, or idea, so that flaws can be freely uncovered and better solutions emerge. Comments represent neutral statements, general questions, or requests for idea clarification. These unique reply options set the visual idea network communication apart from similar forum discussion models. Thus, ideas in the network are critiqued, elaborated and ultimately refined by the project team in a unique graphical view.

The idea network has undergone many changes to improve user experience. Initially, topics were only displayed as a vertically threaded list of ideas, typical of online forums. Discussion was hard to trace in long threads, so the graphical view became the default view for idea networks.

2.2 Wiki
The SEREBRO wiki allows student teams to rapidly construct documentation artifacts as wiki pages. The wiki accepts simple text input, Markdown, and HTML to generate richly formatted web pages. When wiki updates are performed, a change message and associated tags can be attached. Collaborating teams have access to each revision of a wiki page to track changes and correct mistakes. Each change is viewable via a utility for detecting differences between two documents.

2.3 Version Control
Maintaining a central repository of the source code for the software is essential to ensuring effective implementation collaboration within the team. SEREBRO allocates a Subversion repository (SVN) to each project giving complete control to the team to maintain single or multiple branches of their code. As expected from an SCM tool, each revision is tracked and can be reverted to or modified at any time. Each commit can be accompanied by messages describing the commit and tagged to connect it to other artifacts. SEREBRO parses all activity in each project’s repository and logs character changes.

2.4 Tasking, Scheduling, and Sharing
The task manager allows for scheduling in the form of a customized Gantt chart. Tasks can be tagged and assigned to a team member. Gantt chart creation is part of software engineering training and incorporating it within the SEREBRO environment provides a natural reference area for team organization and management of individual deadlines. A calendar tool in SEREBRO gives the team a shared space for events and meetings. SEREBRO also provides a shared space for file upload using standard web forms. Uploaded files are an alternative to using the version control system, allowing quick sharing of individual files or archives. There also exist items which do not work well with version control systems, such as binary files which can be tracked by using the uploaded files area within SEREBRO. Uploads can also be accompanied by descriptive messages and tagged.

2.5 Tagging
Any SEREBRO idea, SVN commit, wiki page, upload, calendar event and task can be tagged using semantic descriptors created by the project team, providing explicit connectivity across all SEREBRO ideas and artifacts. For the users, the tags serve primarily as an organizational tool. For example, users may tag discussions about requirements documentation with the requirements tag, and later draft an SRS in the wiki and apply the same requirements tag. When given the requirements tag, the SEREBRO tag search facility returns the initial ideas, discussion around the requirements, and the drafted documentation located in the project’s wiki pages. The tagging input fields utilize autocomplete to suggest tags while the user is typing them. In this way, SEREBRO attempts to reduce the creation of different tags with equivalent semantics.

3. USER SPECIFIC FEATURES
SEREBRO allocates a profile where users store personal information, review their status, and customize system alerts. Students pick an icon to display with their posts to give a sense of individuality to the team interaction. Users reach certain status levels depending on their level of participation in SEREBRO throughout a milestone. These status levels are visible in their profile as well as publically displayed on the left hand side of the posts. The first status type is the Badge. Badges in Figure 1 are the circular icons with Roman numerals to the left of the post content within the green box. User_11 in Figure 1 has acquired 4 Badges. Badge scores accumulate according to posting trends by the user and where their posts are on the tree. The Badge points are propagated upward through the tree, decreasing the award amount at each node until the brainstorm is reached. The initial reward system increased Badge status to signify greater creative contribution [5].

Role status is calculated by weighting certain SEREBRO activities (e.g. wiki changes, uploads, etc.) according to the responsibilities assigned to the user. For example, a user with a programming role would have a higher weight on their SVN commits than inserting design diagrams into the wiki [4]. User_11 has Amateur status which is level 3 out of 10 possible levels.

Reputation is calculated by others rating the user’s posts using the stars in the upper right of the post and the ‘thumbs up’ in the lower left. User_11’s reputation is 219. Though seen in the video, but not in the post above, SEREBRO awards medals when certain tasks or a number of tasks are completed by users.
For teams to work synchronously and asynchronously, SEREBRO deploys a variety of notifications. The system leverages real-time popup notifications within the browser. These popup messages appear in the bottom left of the user interface and are partially transparent. Notifications disappear after a short period. They aid team members that are on the system simultaneously to coordinate their individual actions within the context of the project. Email notifications are sent to users to asynchronously notify them of all team activity on SEREBRO. Finally, an RSS web feed is published for each project. Users are able to read the feed with any feed reader, such as Google Reader, and SEREBRO presents the feed at login.

4. CONCLUSIONS
In our demonstration, we present SEREBRO, a lightweight courseware for use in student software development teams. The goal of SEREBRO is to aggregate a discussion forum with project management tools as an environment of collaboration. In SEREBRO, teams can review decisions, follow work product development and stay on task. SEREBRO is easy to learn and captures a vast amount of data that is currently being analyzed to form conclusions about how teams work. It is also being configured for use in other classes that have team projects.

The video demonstration is available for public streaming on YouTube and for direct download on our website. The URLs have been included in line for clarity.

http://www.seat.utulsa.edu/serebro/video.php
http://www.seat.utulsa.edu/serebro.php#video

5. ACKNOWLEDGMENTS
This material is based upon work supported by the National Science Foundation under Grant No. 0757434. Any opinions, findings and conclusions or recommendations expressed in this material are those of the author(s) and do not necessarily reflect the views of the National Science Foundation.

6. REFERENCES