Computer Supported Cooperative Work – An Example for Implementing a Web-based Platform Application

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Abstract: The paper presents the process of implementation of the BSCW cooperative platform (Basic Support for Cooperative Work) under the Linux operating system. In the last year, the major growth of the World Wide Web provides a great deal of potential in supporting cross-platform cooperative work within widely-dispersed working groups. The BSCW project at GMD1 is attempting to accomplish this potential through development of Web-based tools which provide cross-platform collaboration services to groups using existing Web technologies. The BSCW system uses the World Wide Web as a platform for communication and offers a number of functions for supporting collaboration in an educational environment. The basic idea is to provide the cooperation among partners with a shared workspace on the Internet. More than that, cooperation support tools for the working group are the main subject in the case of many educational projects. The team leader of the Comenius 2.1. European Project FISTE (A Future Way For In-Service Teacher Training Across Europe) decided to install a BSCW shared platform at Valahia University of Targoviste. This platform is available at http://bscw.ssai.valahia.ro.

Keywords: World Wide Web, Computer Supported Cooperative Work, Information sharing, BSCW.

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1. Introduction

The World Wide Web already accounts for more Internet network traffic than any other application, including e-mail and simple file transfer. It is also a collaborative technology in a weak sense of the word – it allows people to share information. 5

The Web has a number of distinguish advantages as the basis for tools to support collaborative information sharing:

- Web client programs (browsers) are available for all popular computing platforms and operating systems, providing access to information in a platform independent manner;

- Browsers offer a simple user interface and consistent information presentation across these platforms;

- Data formats which can not be presented directly by the browser can easily be delegated to external 'helper' applications for further processing;

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1 http://bscw.fit.fraunhofer.de/

- Web browsers are already part of the computing environment in an increasing number of organizations, requiring no additional installation or maintenance of software for users to cooperate using the Web;

- Many organizations have also installed their own Web servers as part of an Internet presence or a corporate Intranet and have familiarity with server maintenance and, in many cases, server extension through programming the server API.

Another way to understand the organizational impact of the Web is by looking at the practical difficulty of widely distributed user-oriented applications. This is a well-known problem that can be analyzed in terms of the following three sub-problems:

- The problem of remote installation.
- The problem of user buy-in.
- The problem of heterogeneous user environments.

The wide acceptance of the Web infrastructure has made these issues disappear: a Web application does not require remote installation, provides an interface the user is already familiar with, and is capable of interconnecting users equipped with heterogeneous platforms. This change makes feasible applications that span the whole spectrum of organizational arrangements, from market to teams. 8

A WWW based groupware application that proposes a system of "shared workspaces" where a group of distant partners can share information with the aid of a standard web browser is the BSCW platform – Basic Support for Cooperative Work. It is already a well-known tool used for supporting collaboration in the educational projects. Having in view its facilities adapted to distant education, the partnership of the Comenius 2.1. European Project FISTE (A Future Way For In-Service Teacher Training Across Europe) took the decision to install a BSCW shared platform at Valahia University of Targoviste (http://bscw.ssai.valahia.ro). A series of alternatives were discussed before the installation process but due to the economic and functional aspects the implementation under the open source Slackware Linux was chosen.

2. The BSCW Shared Workspace System

The BSCW Shared Workspace system is an extension of a standard Web server through the server CGI Application Programming Interface. A BSCW server (Web server with the BSCW extension) manages a number of shared workspaces; repositories for shared information, accessible to members of a group using a simple user name and password scheme. In general a BSCW server will manage workspaces for different groups, and users may be members of several workspaces (e.g. one workspace corresponding to each project a user is involved with).

A shared workspace can contain different kinds of information such as documents, pictures, and URL links to other Web pages or FTP sites, threaded discussions, member contact information and more. The contents of each workspace are represented as information objects arranged in a folder hierarchy. Members can transfer (upload) information from their machines to the workspace and set access rights to control the visibility of this information or the operations which can be performed for others. In addition, members can download, modify and request more details on the information objects by clicking on buttons - HTML links that request workspace operations from the BSCW server, which then returns a modified HTML page to the browser showing the new state of the workspace.
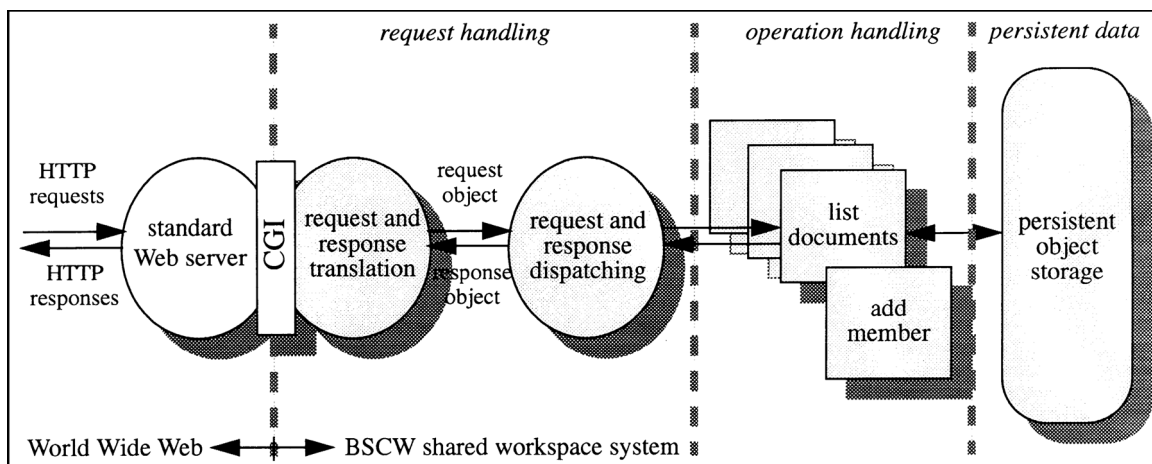

Figure 1. Architecture of the BSCW system. 2

The BSCW system provides a modular extension of the World Wide Web's client-server architecture without requiring modification to Web clients, servers or protocols. The core is a standard Web server extended with the BSCW software through the standard server API, or Common Gateway Interface (CGI). The system is written entirely in the interpreted programming language Python and the only additional software required to use the system besides a Web server is the Python interpreter. It currently runs on most Unix platforms, including the public domain version Linux and Windows. A graphical representation of the BSCW system architecture is presented in Figure 1.

The system uses the 'basic authentication' method supported by standard Web browsers and servers to obtain the identity of the end user. This requires each user to type their password at the start of their session with BSCW, but thereafter request authentication is handled automatically by the Web browser, transparently to the user. By default, access is restricted to users who possess a valid login, but access to information stored in a shared workspace can be provided for any user with a Web browser through the anonymous group mechanism.

The shared workspace metaphor supported by the BSCW system allows members of a workspace to store information to make it available to other workspace members. Without any further mechanisms, this implies that everyone who is a member of the workspace has the same capabilities for manipulating this information, including editing and deleting documents. Where workspaces and member groups are relatively small, this approach may be suitable, but experience from user feedback from the previous version of the system revealed that for some tasks there is a need to both increase and decrease the degree of sharing for workspace information. 3

3. Implementation of the BSCW system

The main steps for BSCW platform implementation that were done by the server administrator and FISTE technical team are presented below:

- Purchasing the server architecture to satisfy the hardware requirements. The hardware platform consists of an IBM xSeries 206 Server with Intel Pentium IV CPU, two SCSI hard drives and one gigabit network interface. Figure 2 presents the main characteristics of the server machine architecture, using the phpSysInfo2 software.
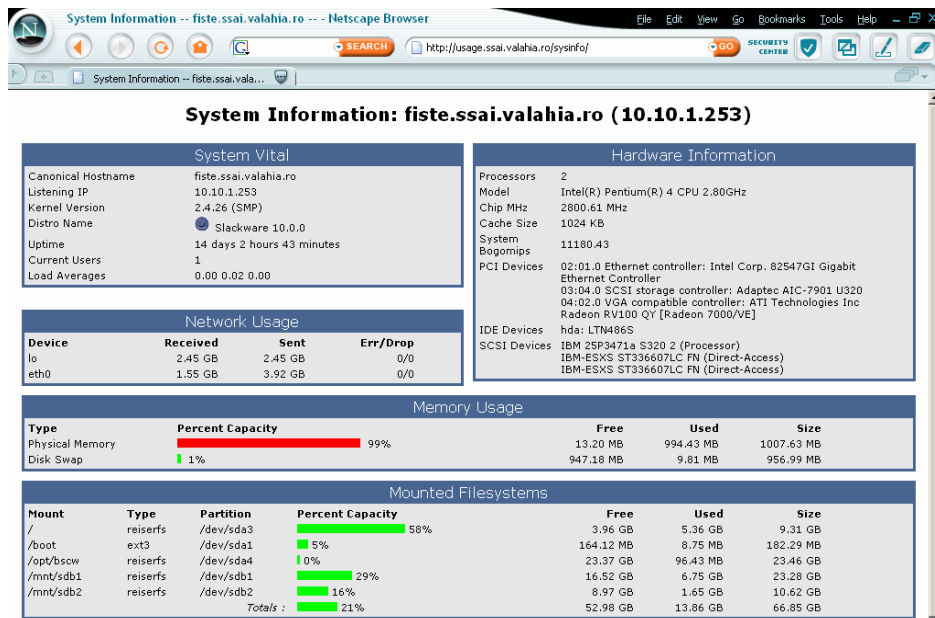

Figure 2. Server system information

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2 http://phpsysinfo.sourceforge.net

- Preparing software platform required by the BSCW shared workspace: installing Linux Operating System on the server platform, the Apache Web Server and Python interpreter. The process of installing the BSCW shared platform at Valahia University of Targoviste was made under Linux operating system. Slackware Linux currently enjoys a reputation as a solid server defined by stability and simplicity. To benefit from the hardware architecture, the operating system kernel has been compiled using large memory support and symmetric multiprocessing options. Versions of the software that interact with the BSCW are described in table 1.

Table 1. Software used for BSCW integration

Operating System	Linux Slackware 10.0 3
Programming language	Python 2.3.5 4
Web server	Apache/2.0.52 5
Mail server	Sendmail 8.12.11 6
Antivirus	Clamav 0.88 7

- Because the BSCW platform runs under normal user, special accounts and file permissions were created. Important attention was given to security system: BSCW instance directory is not accessible to the web server daemon.

- BSCW 4.2 has been installed running the *setup* command in the instance directory. In order to obtain the best performances the BSCW Server was installed on the same file system with the HTTP Server. After successful installation the BSCW server was automatically started.

- HTTP Server configuration has been changed using the *apache.conf* file provided with the BSCW distribution. Because the Web Server is hosting multiple sites, the HTTP server was configured for virtual host support and *bscw.ssai.valahia.ro* was set as the default virtual web site.

- Local configuration details of the BSCW instance are held in the configuration file at *<bscwinstance>/src/config.py*. The proper settings were made to BSCW shared workspace to become accessible via web interface. In this stage, the platform can be administrated using HTML interface.

- After the installation of the *Clamav Antivirus*, the BSCW Server has been configured to scan every file uploaded on the site by registered users using the *Clamav* antivirus program. The antivirus software was set to update the virus definitions database at every 60 minutes.

- Last stage for BSCW installation was to create a startup script and make the proper settings to run administrative jobs without administrator intervention (e.g. garbage collection, database backups).

The server is protected by a firewall system installed on a secondary machine. The firewall is running under Slackware Linux operating system and was built using free tools (*iptables*) provided by Netfilter (www.netfilter.org).

4. BSCW system administration and management

There are three methods to administer the BSCW server:
- through a HTML interface available to those users who have been registered as server administrators - in the variable SERVER_ADMINS of the BSCW server instance configuration file;
- by direct editing the configuration files with a text editor of the users' choice;
- through the *bsadmin* scripts which are available in the instance directory of the BSCW server - the *bsadmin* script may only be invoked by the user who installed the BSCW instance.

BSCW provides for the administrators a web interface with restricted functions set. The access for the administrators web interface is restricted by the IP address declared in the configuration file of the BSCW system. Using this interface, users can modify the BSCW Server settings by editing the configuration file, manage the user settings, view and upgrade the BSCW license. The administrator's web interface is presented in Figure 3.

All software described in this paper is freely available for downloading:

3 http://www.slackware.org

4 http://www.python.org

5 http://www.apache.org

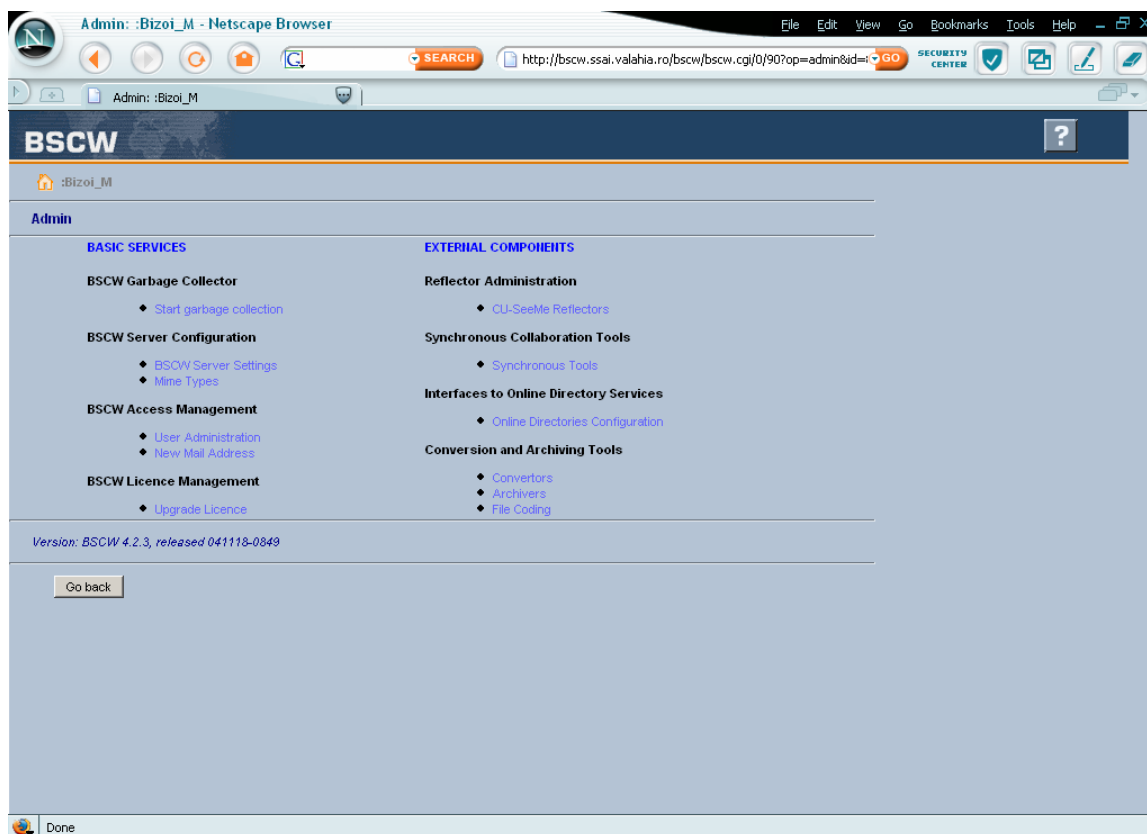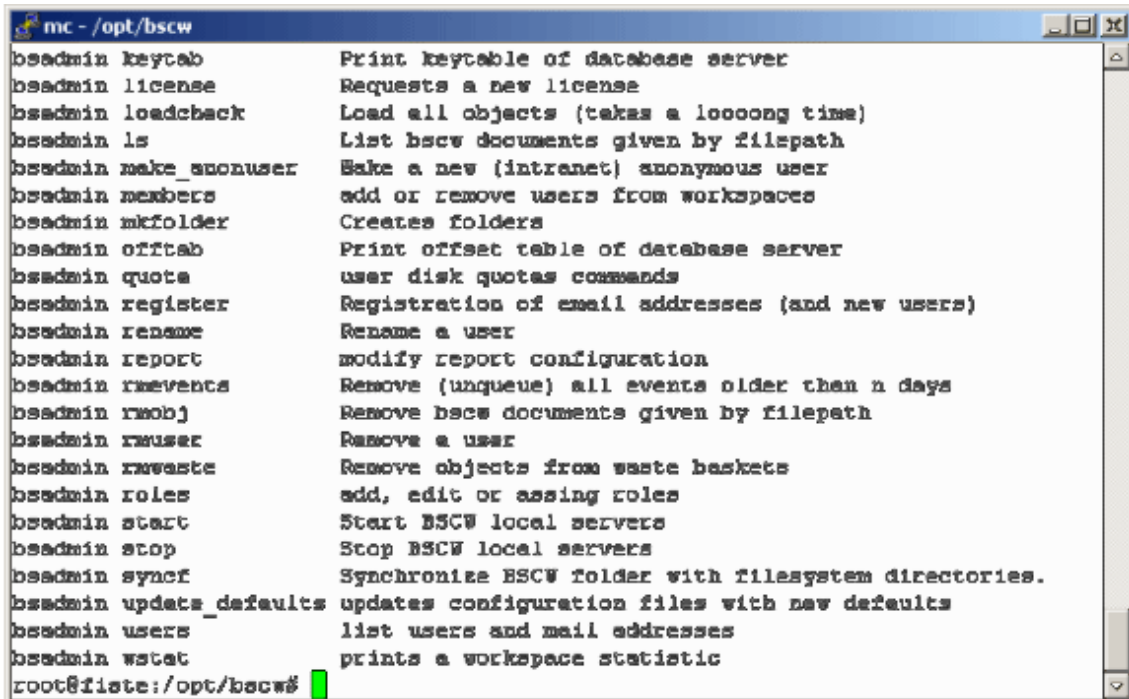6 http://www.sendmail.org

7 http://www.clamav.net

Figure 3. Administrators web interface

Using the HTTP interface, administrators can perform maintenance tasks (e.g. garbage collector), access and modify the main configuration file, view or change the BSCW License, administrate registered users and invite new users to work on the platform. To enable the "Admin" button, you must have a login on the BSCW server and your login name must appear in the SERVER_ADMINS list in *config.py* on *nix systems.

The operating system administrators have the command line full feature tools, for make the proper settings on the BSCW shared workspace. The data of the BSCW server is held in the BSCW data store and handled through the BSCW database server. The BSCW database server is managed with the *bsadmin* script, which is located in the BSCW instance directory. An example of using the *bsadmin* script is provided in Figure 4. This tool could provide the following tasks made by system administrators:

- Check configuration, make the database directory and verifying the missing files;
- Manage the BSCW user list (create, remove, rename, change password);
- Report usage and statistics information (BSCW document, owner statistics, owner files);
- Generate configuration file for Apache Web server;
- Manage the BSCW database (check for integrity, print record sizes in database file, find an artifact, find references of given objects);
- Request new license;
- Manage the users disk quotas;
- Start / stop the BSCW local servers;
- Print workspace statistics;

Figure 4. Using the bsadmin - BSCW administrator tool

5. Results

One of the main outputs of the Comenius 2.1. European Projects FISTE is the preparation of an on-line course that presents methods for integrating face-to-face and web-based learning tools. This on-line course is provided to the teachers through BSCW, an e-learning environment mostly used to support collaboration in educational projects. In this framework the teachers could get not only the manuals, tutorials, or documents related to the on-line course, but also a platform that combines chats, news, whiteboards, tutors' on-line, bulletin boards, meeting points, etc, in order to share all the needed information.

In this project, the BSCW Shared Workspace System (developed by GMD and OrbiTeam Software Ltd.) supports the work of 300 users. It is accessible over the Web for registered and anonymous users at: http://bscw.ssai.valahia.ro. The process of training on BSCW – made through distance learning – was not as easy as was expected by the coordinating team. Every tutor was guided to set-up a BSCW shared workspace with the course materials and to send an electronic invitation to his/her students group in order to register in BSCW and share this area. Each learner has been able to share new private or public workspaces to collaborate with others. Tutors from each institution / country have shared another workspace to coordinate the tracking of the course. The coordinating team had also a permanent job in answering to all the requests that came from the tutors concerning the difficulties encountered in using and managing the shared workspaces on BSCW.

The BSCW server offers a power tool (JMonitor) that allows the administrator to monitor the co-workers availability and activity within BSCW. It basically provides two views: one for online users and one for recent events. Using the JMonitor tool it could be seen who's currently online, receive instant notification about other user's actions inside the shared workspaces and contact the online co-workers.

In addition, managing a local BSCW Server allows finding some inefficient usages of the environment, having also the possibility to correct and optimize some user processes. However the most important gain for the users remains the great experience earned on group cooperation and joined work.

6. Conclusions

The current standards for Web components like HTML and HTTP reflect the emphasis to date on the Web as a tool for information browsing. This allows information providers to design and retain control of the form and content of their information and publish it via a Web server. Consumers can then access the information by sending requests via their Web browsers.

The CGI server programming interface allows extension of the Web within this provider-consumer framework, so that servers can generate responses on-the-fly as well as serve static Web pages stored in files on the server file system.

The BSCW Shared Workspace system is a Web-based CSCW tool offering basic facilities for collaborative work. BSCW is based on the notion of a *shared workspace*, a joint storage facility that may contain various kinds of objects such as documents, tables, graphics, spreadsheets or links to Web pages.

BSCW as a professional platform for any kind of cooperation in a team proved to be an adequate means to support the design and implementation of project work. The whole development of the BSCW system is done in close cooperation with our user groups in research, education and a variety of different companies.

From the educational point of view, BSCW has a series of qualities that support a variety of possibilities – it promotes not only interaction between learner and tutor but also interaction between learners. In addition, the experience of the coordinating team in installing and using this platform shows that BSCW attests to be a strong stable system and very friendly to manage and a good option to combine specific activities concerning group cooperation and distance education.

Acknowledgements

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