POSSIBILITIES OF OPEN SOURCE COLLABORATION SOFTWARE USAGE AT THE FACULTY OF AERONAUTICS

Štefan Bartoš - Jozef Galanda

This article demonstrates the possibilities of using systems to support collaboration and brings the latest knowledge of programming tools for supporting teamwork. The project is focused on describing systems with open source licenses which are freely available for quick and easy team organization and which allow its own modification. The first part of the article is focused on theoretical information about the opportunities of collaborative software (groupware). The second part highlights the reasons for the introduction of open source software solutions to an organization and looks at the possibilities of using these systems at the Faculty of Aeronautics. The third part of the article specifies the criteria for the selection of the final groupware system. According to the specified criteria, the most appropriate solution of open source software to support collaboration for the needs of the Faculty of Aeronautics will be then used.

K e y w o r d s: Open source software, teamwork, collaboration, productivity, communication, work productivity, efficiency, coordination, eGroupWare

1 INTRODUCTON

The use of current information technology to support collaboration within the organization but also for communication with external elements is a very large competitive advantage over organizations that do not use such technology. The widespread use of the internet allows it to reach a greater number of potential customers for instance through social networks. Computer-supported teamwork is such a highly valued tool and an important element of any modern organization. Managers of organizations should strive to implement at least basic support for computer-aided collaboration. Systems that currently allow this collaboration we give the common name Groupware. These systems allow companies to reduce the cost of document archiving and communication while increasing the efficiency of their employees and increase the effectiveness of customer communications while offering a comfortable and uncluttered environment to work.

Our aim was to analyse the possibilities of systems to support team-work (Collaborative software), using one of the available Open Source licenses, and propose a model for the use of it in the Faculty of Aeronautics. Most software under open source license that allow custom modifications and software for educational purposes and personal use are often available for free. Our aim was not only to tackle the problems associated with communication, coordination and cooperation within the organization but also with groups and individuals that make up the external elements.

2 COLLABORATIVE SOFTWARE

Electronic mail and systems for team-work today are no longer the only option of interpersonal communication through computers. For a growing number of companies such systems have become a very important part of the architecture of information systems. Software to support collaboration is a software application designed to help people involved in a common task or project achieve its objectives, for example in a project involving the creation of tasks and so on groupware options are mostly related to cooperation, communication and coordination [1]. Groupware has several levels of use, namely:

- project level,
- organizational level,
- educational level.

Online collaboration is nowadays widespread, which has experienced its boom since the introduction of Web 2.0, where users were allowed to not only receive internet content, but also create it. This step was very important for the development of simple and complex applications which are intended to facilitate individuals and organizations functioning in the network. If such software is used for at least two people to work together, we can call it Groupware as already defined by Ing. Renáta Kunstová, PhD. as "*Groupware is software that allows two or more people to communicate with each other, cooperate on joint work or work activities and coordinate a team of people where communication, cooperation and coordination are all forms of collaboration. Communication means the exchange of messages, requests and instructions. Cooperation is working on a common task, documents or assignment. Coordination we understand as collaboration and harmonization of activities for the role.* "[1]

2.1 Reasons to use collaboration software

Employees often have to answer questions relating to the acquisition, creation and provision of information, allowing them to seriously complicate collaboration. A lengthy search for the necessary paper documents, reports and statements is an activity that keeps workers from their work. Simple email communication is currently insufficient and not the only way that people can communicate with each other through computers. For a growing number of organizations there is an increasing demand for these systems and groupware is becoming an important element of their IT architecture. Hence one of the first objectives of managers is becoming just the implementation of groupware. Among the main reasons why these systems are deployed in corporate environments especially are the user-friendly interface and the possibility to combine text, graphics, video and audio.

The necessity of using such a combination of forms and documents in corporate systems causes a problem with the type of technology. Therefore, the need arises to ensure the accuracy of information displayed in any corporate information systems. If the web is used, this problem is eliminated. A proper display ensures that the appropriate user can: operate with sound, video and other multimedia applications; simply and efficiently retrieve information; a timeliness of information reducing the demand imposed on users; easier data management and network advantages for geographically distant offices; financial savings and many more.

With the above findings it is clear that groupware is advisable for any organization. Organization thanks to this system increases the efficiency not only in the organizational sphere, but also in business and equally more effective communication with the customer. Business users also gain quick and easy access to the most current information needed for their work.

2.2 Collaboration systems overview

Nowadays, the trend is for Groupware to be used primarily on web based systems with which it is possible to work through any Internet browser. Such systems, and at the same time systems with open source text have been our priority for gathering information and comparing the features of different systems available on the market. At the same time, on the basis of comparable criteria we tried to find the most optimal scheme for the Faculty of Aeronautics. Within the comparison system, we also tried a proprietary system from IBM - Lotus Notes with Domino server security as a standard reference solution for the commercial world. In the area of systems with open source code we chose as representatives: eGroupWare, Redmine, VMware Zimbra, dotProject, ProjectPier and services from Google.

IBM Lotus Notes is a very well-developed software to support collaboration, but a proprietary solution for which you must pay. The software offers no solutions to support project level collaboration. It is aimed at organizational level and allows the organization of information, scheduling (you or your employees) and also many of its features are subject to the Domino server, a database and application server on which applications are located, whose services are used by client applications installed on the user's computer. Applications that run on the server are also an active database, where data is collected from client applications. Domino server is distributed, which means that Domino as a whole can be divided into several servers and thus ensure smoother operation. Domino also provides a wide variety of Internet services such as POP3, IMAP, LDAP, HTTP, and so on. The introduction of this into the Faculty of Aeronautics is possible, but the objective was to find and introduce open source groupware.

Among interesting representative systems which support collaboration is open source system eGroupWare.

It is a web-based system developed under the GNU General Public License 2.0, allowing it to be used as a framework (foundation) for creating on it a similarly built system. It is suitable for small and large businesses. This system is written in PHP language and thus uses a web interface. The system consists of modules such as calendar, address book, contact manager, IMAP email client, project manager, resources, systems, files and many more. A plus for this platform is that it is fully localized in the Slovak language and enjoys high popularity and support. The system eGroupWare is a very simple, widespread and inexpensive system that is proud of the award "Best Open Source Project of 2010", where it finished fifth. The award was presented at the CeBIT in Hanover. The system has a number of translations which are very useful for us, namely in Slovak, Czech and English. The project enjoys high popularity, which benefits its development. It has wide support from developers around the world. The system is also not difficult to manage, and installation and introduction into service takes a matter of minutes. It contains a number of tools that the Faculty of Aeronautics could take full advantage of in the need for collaboration.

Another interesting system is VMware Zimbra. It is an open groupware solution which integrates client's mail, calendaring applications, folders with contacts, task lists, real-time communications, document creation and file manager. All this is not only available through the web interface, but the system is also available through Zimbra Desktop, which can be installed on Windows and this system can even be integrated through Microsoft Outlook and many other email clients and mobile devices. Zimbra offers fully localized settings in the Slovak language but this is not part of the package. Slovak and Czech localization can be found in its own repository. This repository, although it is not an official repository, takes care of its community of followers. Zimbra is very easy to handle but a bit tricky to manage. Installing the Zimbra server is through packages for linux distribution Red Hat, SUSE and Ubuntu, or using the installation script for the Open Source version. Zimbra also offers a simple client for Windows, Linux and Mac OS, based on the Java platform. Its installation is very simple and more experienced users can configure it without the necessary instructions. Another option is to install the client for mobile devices.

We also compared the less well-known solutions such as "dotProject", "Google", "ProjectPier" and "Redmine", which are also excellent systems in their own way whose functions captivate different collaborating teams of people, though not are all major players in the market of Groupware systems.

3 CHOOSING THE BEST SOLUTION

Which Groupware software should therefore be chosen? Before the selection of the most appropriate

solution it must be presented to the organization in which the system will be deployed in order to accurately identify the requirements of the system itself. The term organization means an entity in which the performance of its functions and objectives is shared by people who need to work effectively and with the right conditions in which to perform their work. In our case the entity is the Faculty of Aeronautics, Technical University of Kosice.

3.1 Description of the target organization

The Faculty of Aeronautics (hereafter FA) is part of the Technical University of Kosice. Its primary mission is to provide, organize and ensure higher education, lifelong learning and the implementation of creative scientific research in aerospace engineering, aeronautical engineering, construction, repair and operation of aeronautical products, management, aviation security and other related issues. Some employees of the FA work in their own home, or are external to the faculty, so it is necessary to provide access to the system via the Internet. Employees also need to constantly communicate with each other to ensure effective collaboration in the management of joint projects.

3.2 Organizational Structure of the Faculty of Aeronautics

The organizational structure of the Faculty of Aeronautics is straightforward. The FA has the following main departments:

- Scientific and educational departments,
- Dean,
- Centre for further education.

The scientific and educational departments are essential organizational units of the faculty. Their main task is to provide, organize and safeguard teaching subjects based on scientific research in their areas of operation. These departments are the Department of Aerodynamics and Simulations, Air Traffic Management, Flight Training, Aviation Technical Training, Aerospace Engineering and the Department of Avionics. The head representative of each academic division is the head of the department. [2]

The Dean's Office performs economic and administrative duties for the faculty. It provides support for decision-making within the academic departments and manages staff at the FA and their performance. The Dean's Office is also the executive unit for administrative work on issues of study, scientific research, economic and personnel activities and in the field of development and foreign relations. [2]

The Dean not only operates the faculty it also represents and acts in its affairs. The Rector of the university is responsible for activities which are performed in the name of the faculty. The Dean issues and publishes regulations, coordinates the implementation of the program of activities aimed at education, research, development and management of the faculty and also coordinates the collaboration between the departments of the faculty that were mentioned above. More information can be found on the website of the faculty.

3.3 Criteria for the system

The individual criteria for the system can be divided into several groups. The first group from the perspective of the systems administrator considers the possibility of the application of the already well-established IT architecture since as the Technical University of Kosice (hereinafter referred to as "TUKE") uses a single authentication system for all its faculties, all its information systems must provide authentication via an external LDAP server. Another of our requirements is the facility to connect to the mail server of the University without the need to log in to multiple systems simultaneously. Although TUKE uses several web client services to connect to the university mail server, it is more convenient to have everything in one place.

Another criterion is the possibility of later extending functionality, which apart from the proprietary IBM Lotus Notes system, every system of the representative samples fulfils.

The third criterion is the ability to integrate and support supported applications to ensure the functions of communication, cooperation and coordination. Meeting this criterion is important so that the system can fulfil most communication functions. The main requirement is support for email communication and planning in the form of personal and shared calendars or planning tasks.

The fourth criterion is support for project management because the faculty is also an academic place of work, providing support for project planning, Gantt charts, task management, and so on. Also the rule is that the more features there are, that will improve and streamline working together on projects.

One of the criteria is the possibility of the creation and publication of the contents of documents or pages. Searching available content and therefore simplifying the circulation of information.

A final important criterion is to support workflow information. Under this feature we mean the possibility to manage users and groups in the allocation of access rights and roles and thereby control the flow of information, documents and work in the faculty setting.

Less important features of the system also play a role, such as Slovak localization, a user-friendly interface and customizable settings that will make working with the system more pleasant and allow easy and intuitive use of its features.

3.4 Comparison of systems presented

The functions of the various systems are summarized in the following table in order to obtain an overview of the possibilities provided by the individual systems.

Table 1. Systems comparison

Function \ Name	Lotus Notes	eGroup Ware	Redmine	Zimbra	Dot Project	Project Pier	Google
Email							
* mail klient	yes	yes	no	yes	no	no	yes
* mail server	yes	no	no	yes	no	no	yes
Chat	yes	yes	yes	yes	no	no	yes
Forum	no	yes	no	yes	yes	yes	yes
Calendar	yes	yes	yes	yes	yes	yes	yes
Notes	yes	yes	yes	yes	yes	yes	yes
Directory	yes	yes	no	yes	yes	yes	yes
Tasks	yes	yes	yes	yes	yes	yes	yes
Projects	no	yes	yes	module	yes	yes	module
Gantt diagrams	no	yes	yes	module	yes	yes	module
Error messages management	no	yes	yes	yes	yes	yes	yes
File management	yes	yes	no	yes	yes	yes	yes
Users management	no	yes	yes	yes	yes	yes	no
Workflow	yes	yes	no	yes	yes	yes	yes
Working with documents	yes	no	no	yes	no	no	yes
Access rights management	no	yes	yes	yes	yes	yes	yes
Full text search	yes	yes	yes	yes	yes	yes	yes
Resource planning	no	yes	no	no	yes	no	yes
Slovak localization	yes	yes	yes	module	module	no	yes
External LDAP Authentication	yes	yes	no	yes	no	yes	no
Extensions /Modules	no	yes	yes	yes	yes	yes	yes

Looking at the comparative table of features and schemes, it is clear that two projects meet the requirements of our system, namely eGroupWare and VMware Zimbra. The Lotus Notes proprietary system actually meets less than half the required criteria that open systems have to support collaboration. The systems Redmine, dotProject and ProjectPier, although not bad, don't satisfy our requirements. Although Google with its functions far exceeds any other alternatives, it does not support our requirement for user management and authentication via an external LDAP server, which would not allow logon through the university accounts of TUKE.

In order to select a single system we therefore need to further specify the systems' weaknesses. An interesting criterion for comparison is dependent on the operating system. VMware Zimbra is only available as an installation package for Linux distributions, or through source code, which is necessary but ultimately complicated because Zimbra is actually a fully-featured mail server that in fact we do not need because TUKE has its own university mail server. The EGroupWare system is completely independent from the operating system meeting the needs of the database server which supports a really large number of possibilities (MySQL, Postgress, MaxDB, MSSQL) and web servers (e.g. Apache).

Another very important criterion by which we can choose the most suitable groupware is service support in the case of system instability, detection of faults and the release of updates. While proprietary systems with technical and service support have no problem, in open systems, this is a common problem. For both systems, there are companies which provide free of charge versions of their own projects. In both cases, the free versions are missing additional functions, but the base source code is shared so when it is necessary to repair critical errors, unlike in the paid version, the correct solutions can be applied for free. In this area Zimbra system has one advantage because of the number of companies that focus on support, installation, setup and management systems for its customers. But of course you have to pay for everything. When the system eGroupWare has to solve trivial errors it has to rely on its own ability or the designated administrator, or it is also possible to discuss solutions in the project forums.

The often mentioned translation of systems into Slovak or at least Czech language is also an important criterion in the selection of our groupware. While with eGroupWare there is almost no problem with translation, we do not recommend switching on Slovak localization for guiding installation and configuration because it is confusing. Nevertheless each application and the system settings are processed and translated really well. While eGroupWare scores well in this area, Zimbra has huge gaps. According to the official website 64% of it is translated, but this fact was last updated several years ago. You won't find the official translation there. After a short search we finally gave up trying to find the Czech localization project. The translation of Zimbra however, is already provided by the above mentioned companies who are involved with precisely this groupware solution. For a fee you can install and set up the system and give its own localization. Of course for management of the system they charge monthly fees.

Expansion options are offered by both solutions, but here Zimbra has the upper hand as it has many more additional expansions in the gallery, such as in the basic installation where there is a lack of support for project management. In the gallery it is possible to download a zimlet titled "Smartsheet Project Management", which allows project management and even the creation of Gantt charts. With regard to eGroupWare, you can find many good applications for this system on the internet, but it lacks a place where all the applications concerned are brought together. In this area therefore the positive points go to the Zimbra system.

The above mentioned points comparing these two systems are put into a simple table of pluses and minuses. The evaluation comparing the systems is based on the subjective assessment of the authors.

Table 2. Systems comparison

	eGroupWare	**VMware Zimbra**
Operating system	++	+
Technical support	+	++
Localization	++	?
Extensions	+	++
Total score	**6**	**5**

From this table we obtain the result of the comparison of the two systems and also, as expected, the result is very close. In the end, however, we have chosen for application to the Faculty of Aeronautics a solution in the form of eGroupWare, as in our comparisons it achieved a greater number of points. Zimbra is, despite its

failure in comparisons, a very good system which can find application in almost every organization.

4 PROPOSAL FOR APPLICATION IN THE FACULTY OF AERONAUTICS

The intention was to design a solution that would as far as possible meet the basic requirements of the Faculty of Aeronautics. The whole system is built on the allocation of user rights and access. The system allows two-way communication, coordination and cooperation within the linear organizational structure, but also with other users and user groups. It also offers many other features that are not required.

4.1 Access Rights and Groups

For easier management of users the eGroupWare system has a very well revised and detailed management of access rights. The system administrator can configure the default settings of each application and even settings that users cannot change. The administrator can also grant the same access rights to individual applications of the system. For easier management of access rights it is possible to create groups and then assign users to established groups. Based on the organizational structure of the Faculty of Aeronautics we created groups in the system on the basis of imaginary sets according to deans and departments. A separate group consists of students.

Creating the groups is therefore the most important step for controlling the flow of information, documents, tasks, and so on. Each created group was granted access rights to the applications: Directory, Knowledge base, File Manager, Notes, Wiki, Bookmarks, FelaMiMail, Schedule, Calendar, Preferences, Project Manager, Tracker, Resources, Options, Update manager and InfoLog. These applications are an essential package that will benefit all of the groups created by us. Other applications can be allocated as needed, either to whole groups, or only selected people.

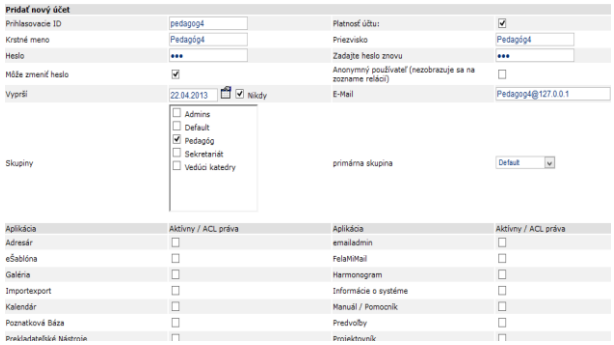

Figure 1. Managing User Accounts

After assigning users without rights to selected groups, users inherit these groups' rights. After the removal of users from a group, their access rights are automatically withdrawn. It is even possible for user groups to combine, which allows the combination of access rights for users.

4.2 Management of shared knowledge and content sharing

Cooperation on shared files (such as the creation of books, documents, etc.) can be secured through the applications "Wiki", "Knowledge base", "Bookmarks" (shared list of internet links) and simply "File Manager".

One of the possibilities for collaboration on documents is to create wiki pages through the application „Wiki". It is a very powerful tool for creating articles and various documents. This application allows you to add and change articles by all users with access to the application. Wiki pages are created using a mark-up language directly on the website that you are editing. Basic usage is very simple. The eGroupWare system makes working with Wiki straightforward.

An important application for sharing information and facilitating work on shared documents is the application "File Manager". The eGroupWare system creates a separate folder for each user and group. Using these folders manages users and groups' access to documents. For example, user "teacher1_kaas" is a member of the group "Department KAaS – teacher" and therefore has two folders "Department KAaS - teacher" and "teacher1_kaas". This application allows you to manage your own and shared folders, uploading and deleting files. In this way it is possible to circulate and collaborate on important documents within the department or the entire faculty. Easier management and collaboration on documents makes projects possible. The application File manager allows you to set sharing of your own files or folders with specific groups or users through the ACL settings (Access Control List).

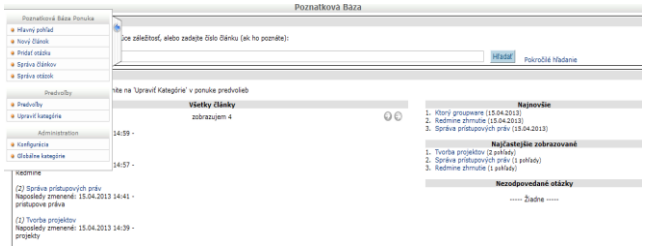

Figure 2. Knowledge base in the eGroupWare system

4.3 The communication and circulation of information

The system also allows for the circulation of information through updates. The application "update manager" is used for this. To create reports (updates) it was first necessary to establish categories of rights regarding the circulation of information. For the needs of the faculty we created the category "Faculty updates", where all groups have reading rights and groups belonging to deans, department secretaries and the group "admins" have the right to create updates. This ensures

the circulation of news via communication from the leadership of the faculty to all users.

4.4 Resource planning

Resource planning is a feature that facilitates the organization to plan and categorize the use of resources. The application "Resources" allows you to write up for example rooms, vehicles and other property in a list. All entries can be categorized and users assigned access rights to individual categories.

Before adding items to the list you need to create categories of resources with access rights. Categories can be created by clicking "Global category" in the application menu. According to requirements the category "Rooms" was created with subcategories according to each faculty building: "Building 14 - KLI, KLTP", "Building 15 - KLTP, KAaS", "Building 16 - KLI, KA", "Building 17 - school workshops", " Building 19 - KLP, KMLP" and "Building 25 – KAaS, library".

Subsequently, it was necessary to add access rights to the categories so that the resources could be used by staff of the faculty. For each category you can set several rights. The application "Resources" only allows you to add new resources after following those steps. The form for adding a new resource contains settings for the resource titled: asset number, category, location, quantity, application and the important entry of reservation, without which the resource cannot be reserved.

Meno	Popis	Aplikácia
Miestnosti	Dostupné miestnosti fakulty.	Zdroje
Budova 14 - KLI, KLTP	Miestnosti v budove č. 14	Zdroje
Budova 15 - KLTP, KAaS	Miestnosti v budove č. 15	Zdroje
Budova 16 - KLI, KA	Miestnosti v budove č. 15	Zdroje
Budova 17 - dielne školy	Miestnosti v budove č. 17	Zdroje
Budova 19 - KLP, KMLP	Miestnosti v budove č. 19	Zdroje
Budova 25 - KAaS, knižnica	Miestnosti v budove č. 25	Zdroje

Figure 3. Global resource categories

4.4 Planning meetings

Organizing and planning meetings is possible through the Calendar application. It allows users with the appropriate rights: to plan their own events regardless of other users; to plan events for someone else (for example an assistant planning a meeting with his or her boss); to plan group events (consultation within the department, the Dean's office or the project team); to reserve resources as was described above and to give comments which can be sent to an e-mail address. Access to Calendar can be set separately for each user (an assistant can write notes in the calendar of his or her boss).

A new calendar entry can be created in several ways. The most practical is but a simple click on the desired time in the calendar. It automatically creates a new event. In the form you complete: the title of the event, the start, the duration, the location and the priority (for an event with a high priority you mark it with an exclamation mark). It is possible to not block other events by using "Without blocking" which enables scheduling an event at the same time as another. It is also possible to add a description of the event, a list of participants and resources for the event.

4.5 Assigning tasks to individuals and groups

The application "InfoLog" is used for assigning tasks. With this application tasks can be assigned within work groups, departments or the entire faculty. Assigning tasks is not only for senior staff members to his or her subordinates (awarding science projects, creation of textbooks, development of new study programs, training etc.), but it is also possible to assign tasks to senior staff members (sending documents for approval, approval of resources etc.). The eGroupWare system does not recognize higher and lower built functions, everything is equal.

As an example of such a task we can specify the approval of a curriculum subject where in the place of the submitter (applicant) is "teacher3_kaas" and in the place of the executor (authorizing) is "headofdepartment_kaas". Pressing a button makes a form of new tasks appear. In the form you fill in the category, task name, contact person, resources and the start and end date of the task. In addition to these settings the form allows you to add a description ("text request"), links and attachments ("save the document for approval"). Hereinafter, in the "Delegate" tab it allows you to assign tasks to groups or individuals, in this case to the "headofdepartment_kaas". Under the tab "Project Manager" we can assign tasks to a specific project.

Figure 4. Assigning tasks in the eGroupWare system

4.6 Managing projects

For managing projects the "Project Manager" is the intended application. The form for creating projects is divided into five tabs. The first tab allows you to configure general information about the project: title, date and time of beginning and end, project progress as a percentage and project status. The second tab "Description" is used for a description of the project. The text can be edited, so it is appropriate to insert a description of the project plans and so on. The third tab allows you to configure the members of the project. Each member can modify roles (coordinator, accountant, assistant etc.), which can be adjusted directly on the tab. Roles allow the management of access on the project (reading, editing, deleting, viewing and editing the budget). Allocation of members and roles might look like as shown below.

Figure 5. Management of project members

Further, when developing projects it is also possible to add: timetables; tasks using the application "InfoLog"; resources for the project; a directory; an event calendar; report problems through the application "Monitor"; add contacts (for consultants, external members, customers etc.); entries in the calendar (for example meetings connected with the project); or even another subproject. For all these activities you can assign groups of people or individual users.

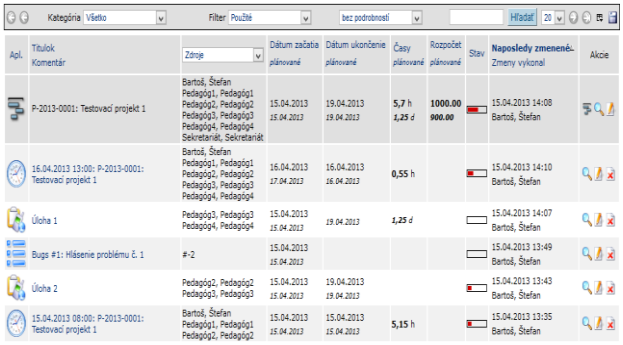

Figure 6. Breakdown of the project activities

The application "Project Manager" keeps all the necessary information and activities associated with the project maintained in a clear format in one place. Only members of the project can see the created project. Similarly, activities associated with the project, while visible to all members of the project, detailed information, procedure and comments however, will only be displayed to members who have been assigned that activity.

In a similar manner, these solutions can also be used by the dean, department or entire faculty. From the proposal it is clear that the whole system is built on the allocation of user rights and access. The system allows two-way communication, coordination and cooperation within the linear organizational structure, but also with other users and user groups. The system also offers a number of additional features but they are not all so central to the need for collaboration at the Faculty of Aeronautics.

5 CONCLUSION

Based on the knowledge of the requirements for the system and its properties, we compared several systems for supporting collaboration and selected the best candidate system with an open source licence for the requirements of the Faculty of Aeronautics. Based on the selection criteria we have identified as the most suitable solution the system eGroupWare. This system we accordingly assigned to the organizational structure of the Faculty of Aeronautics. We have described the possibilities of using the system to solve common organizational problems such as working on shared documents, organizing and planning workshops, assigning tasks, managing projects and so on. In the description we started with the idea that it was possible to use work as a general guide to the best use of the system, so we combined the usage of settings and functions with the possibilities for their use. According to our findings the system eGroupWare is a very effective tool for supporting collaboration. It offers quality sophisticated tools to support collaboration at organizational and project level and even basic support at educational level. For the successful implementation of the community-based versions, we have thought about writing a more detailed guide in the Slovak language, which would give new users faster adaption to the system.

BIBLIOGRAPHY

[1] KUNSTOVÁ, Renáta: Skupinová spolupráce, správa a řízení oběhu dokumentů. Praha: Vysoká škola ekonomická v Praze, 1999. ISBN 80-7079-647-2.

[2] Štatút Leteckej fakulty Technickej Univerzity v Košiciach z 25. septembra 2008. [Online]. 2013 [cit. 2013-03-28]. Dostupný na internete: <http://web.tuke.sk/lf/legislativa/statut_lftu.pdf>

[3] GRIFFITHS, Richard. CSCW and Groupware [online]. c2000 [cit. 2013-03-11]. Computer Supported Co-operative Work (CSCW) and Groupware. Dostupné na internete: < http://www.it.bton.ac.uk/staff/rng/teaching/notes/CSCWgroupware.html >

[4] Collaborative software: Wikipedia.org. [Online]. San Francisco: Wikipedia.org, 2012. Aktualizované 26-02-2011. [cit. 2012-11-13]. Dostupné na internete: < http://en.wikipedia.org/wiki/Groupware>

AUTHORS´ ADDRESSES

Bartoš Štefan, Ing.
stefanbartos@gmail.com

Galanda Jozef, Ing., PhD.
jozef.galanda@tuke.sk

Department of Aerodynamics and Simulations
Faculty of Aeronautics
Technical University of Košice
Rampová 7, 041 21 Košice