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Developing an Internet Based Groupware System

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ABSTRACT

In this paper we present a groupware system developed to support an initiative called IT-Forum to coordinate IT activities across the departments of Munich University of Applied Sciences. The groupware system was developed on the basis of the web application server ZOPE and the database mySQL. Beside the operative use within the IT-Forum and project-orientated courses it will be a platform for research in the field of groupware systems.

1.1 Introduction

Information technology plays an important role in almost every part of business and science. Therefore MUAS (Munich University of Applied Sciences) set up an initiative called IT-Forum to coordinate and support information technology related activities across its fourteen departments.

For example members of the Department of Computer Science and the Department of Electrical Engineering established a team 'Security in W-LAN'.

Other groups are e.g. 'Information Technology in Business' or 'Definition of a basic IT curriculum for students of any subject' etc.

A team 'Groupware' was established to provide an Internet based groupware application (Wheeler et al. 1999). The 'Groupware' team has two central objectives.

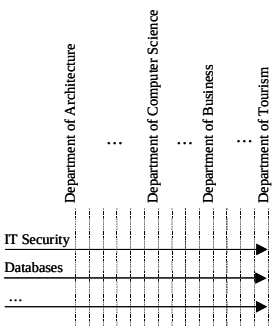
Firstly the development of a groupware system was some kind of remittance work for the IT-Forum to support the communication of the teams in the IT-Forum. Since the IT-Forum is intended to be a platform across departments and bring together people with different backgrounds it is highly decentralized and asynchronous. So it became obvious that there was a need for a communication platform that is accessible 'anytime' and from 'anywhere' (Johansen 1988).

Besides that project work plays an important role in the training of the students of MUAS. So as a side effect the groupware system shall support this kind of education.

Secondly the 'Groupware' team has had the intentions to do research in this field. Research interests cover technological as well as more application oriented aspects of groupware.

Technological aspects are e.g. assessment of possible implementation technologies, the role of XML and others. Application oriented aspects cover e.g. context dependent end user acceptance of groupware systems (e.g. Chen et al. 2002; Choi et al. 1998).

Figure 1: Coordination of information technology across the university



Although a large number of commercial and non-commercial groupware applications are available the 'Groupware' team decided to develop its own system. The main reasons were to really experience and deeply understand the technology behind such a system and to be more independent of third party products to gain more flexibility in research.

As the result of a tool and technology analysis the project team decided to develop the groupware system on the basis of the open source content management system / web application server ZOPE (www.zope.org; Latteier et al. 2000). We named the groupware system after the IT-Forum and use the abbreviated form ITFG (IT-Forum Groupware).

In this paper we will present the structure of ITFG and give a perspective for further evaluation and research in combination with the system.

The paper is organized as follows. We will give a short overview over groupware systems in section 2. Then, in section 3, we will describe ITFG. In section 4 we will give a conclusion and a prospect on plans for further research and development.

1.2 Groupware Systems

For many years groupware systems have played an important role in the support of office work (e.g. Baecker 1993). Basically groupware systems use information technology to support workgroups members who are separated by time and/or space. In accordance to the dimension of time synchronous and asynchronous work environments can be distinguished. According to space one can distinguish between centralized and decentralized teams (see Figure 2).

A synchronous work environment is characterized by 'real-time' collaboration among a geographically distributed group. The term CSCW (Computer Supported Cooperative Work systems) is often used for synchronous groupware systems. Functionalities for synchronous groupware systems include voice or video communication facilities. Microsoft NetMeeting (www.microsoft.com/windows/netmeeting/) would be a typical synchronous groupware system.

Since asynchronous groupware systems decouple workgroups from the time dimension they require functionalities like email, file sharing etc. Lotus Notes / Domino (www.lotusnotes.com) is a well known asynchronous groupware systems (for an application of Lotus Notes in a university environment see e.g. Tuninga 1999).

Besides the time and space dimensions the successful application of groupware systems depends on several other work specific factors, beginning from the background of the team members, IT facilities and the characteristics of the project (time pressure, complexity of the project etc.).

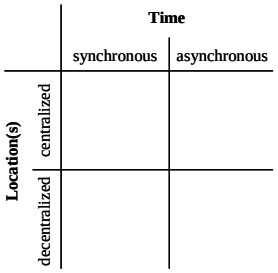
1.3 ITFG System

Overview over the Basic Architecture of ITFG

The architecture of ITFG consist of three dimensions

- Groupware functions
- Layers
- User roles

Figure 2: Basic dimensions of groupware system environments



Basically ITFG provides the following groupware functions:
- News
- Announcements
- Discussion Groups
- Mailing Lists
- Resources (like file sharing, references and hyperlinks)

To build complex group structures these functions can be used on three different layers within ITFG:
- (public) ITForum
- ITFBoards
- ITFWorkgroups

that are hierarchical ordered by [1] to [0..n] relationships (Figure 3).

Besides the discussion group which is not provided on the first layer (the public part of the ITFG) every groupware function can be used on every layer (see Table 1).

Additionally to these groupware functions administrative rights (e.g. the admission of new users, new boards, the setup of a mailing list etc.) are features of ITFG.

The accessibility of a function depends on the certain layer and the assigned user role.

Basically the following roles are defined within ITFG (incl. the pseudo-role 'Guest'):
- ITFWebmaster (technical administrator)
- ITFAdministrator
- ITFBoardModerator
- ITFMember
- (Guest)

The detailed rights of these roles will be described in section 3.3.

Screen Design

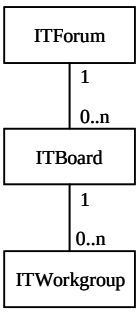
The user interface of ITFG consists of three different parts (see Figure 4):
- Navigation Menu
- Login and Path Information
- Work Space

Detailed Structure

ITFG Layers

The three layer architecture of ITFG allows designing any hierarchical project structure within ITFG.

Figure 3: Hierarchical structure of ITFG



(Public) ITFG

The first layer (public ITFG) is intended to be a general information resource for the projects in an organization. In our case it gives an overview over ITFG, general announcements and shows the ITFBoards that are established in the system.

Although the first layer provides almost the same functionality as the ITFBoards it is intended to deal with administrative topics of ITFG and should not represent a project itself.

ITFBoards

An ITFBoard is the central 'container' for a project. For each project an ITFBoard should be created. Full access to an ITFBoard is limited to subscribers of the board while read-only access for any guest can be provided by the ITFBoardModerator.

ITFBoards can be setup in two different modus, in an open and closed modus:
- Closed Modus. The idea behind the ITFBoard is to give the project manager a platform to administer his project. Therefore the functions like file-uploading, sending mails via a mailing list etc. are restricted and can only be used by the ITFBoardModerator to manage the project. The actual workplaces for the team members are the ITFWorkgroups that do not have such restrictions.
- Open Modus. In small projects however we expect that the distinction between administration and 'real' workplace creates an unwanted overhead. Therefore an ITFBoard can be run in an open modus where the team members have almost the same rights in the ITFBoard as they have in an ITFWorkgroup, e.g. file upload. Normally in this modus no ITFWorkgroups should be necessary any more.

ITFWorkgroup

The ITFWorkgroup is the central place for project work. It is intended to provide important tools for sub-teams in a project like discussion groups, file sharing, mailing list etc. In an ITFWorkgroup every member has the same rights; there is no hierarchical structure or formal administrator in the group.

ITFG Roles

ITFG has a role concept that consists of the following roles: ITFWebmaster, ITFAdministrator, ITFBoardModerator, ITFMember and

Figure 4: Screenshot of ITFG

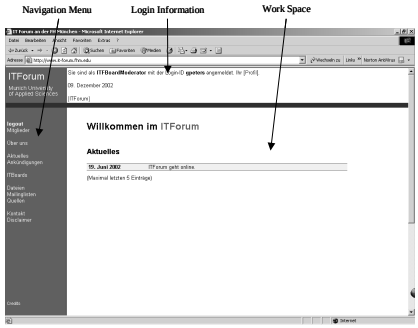


Table 1: Mapping of the groupware functions to the ITFG layers

	Public ITForum	ITFG Board	ITFG Workgroup
News	x	x	x
Announcements	x	x	x
Discussion Group		x	x
Mailing List	x	x	x
Files	x	x	x
Resources	x	x	x

Guest. (Besides Guest any role must be explicitly assigned to the users of ITFG.)

ITFWebmaster

The ITFWebmaster is defined as system administrator. He has the all rights of any other role within ITFG.

However, due to simpler implementation, his rights to not cover administration of the mySQL database and system functions of ZOPE. If required these functions must be operated directly in mySQL respectively in ZOPE.

ITFAdministrator

The ITFAdministrator is defined as central administrator for ITFG. It is the only role that has administrative and write/update rights on the first layer of ITFG (besides the ITFWebmaster). In detail the ITFAdministrator can post news, announcements and references create mailing lists and upload files on the first layer.

Furthermore the ITFAdministrator can approve, change and delete ITFBoards. He can approve or reject applications of new members. The ITFAdministrator has the right to assign any role - besides the ITFWebmaster role - to new members.

However, to keep the ITFBoards private, the ITFAdministrator has no rights within an ITFBoard as long as he is not approved by the responsible ITFBoardModerator.

ITFBoardModerator

The main task of an ITFBoardModerator is to administer ITFBoards. Therefore he can apply for a new ITFBoard. Furthermore he can approve applicants to the ITFBoards he is responsible for. On ITFBoard level he has the rights to post announcements and references, create mailing lists and upload files etc.

Furthermore the ITFBoardModerator has the right to setup ITFWorkgroups within his ITFBoard and assign members to them.

ITFMember

ITFMembers have the right to apply for membership in an ITFBoards. As a member of a closed-modus ITFBoard the ITFMember has read-only rights in the ITFBoard. In an open-modus ITFBoard he has the same rights as in an ITFWorkgroup he is member of. These are e.g. the rights to post announcements and references, create mailing lists and upload files etc.

Guest

A Guest is everybody who has not subscribed to the ITFG. Guests have read-only rights on the first layer of ITFG. The first layer is public and provides guests functions like news, announcements and access to resources like files, references or hyperlinks.

Furthermore an ITFBoardModerator can make his ITFBoard public and provide a guest the same read-only rights as the guest has on the first layer. The ITFWorkgroups are private by definition and can not be made public.

Summary

The following tables give a more detailed insight in the assignment of functions to the roles of ITFG.

We use the following abbreviations:

A = administrative rights

C = rights related to the content

cdur: c = create, d = delete, u = update, r = read

- = no rights

Ø = not available

Implementation Platform

ITFG is realized on the basis of ZOPE and MySQL and runs on Microsoft Windows NT/2000/XP or Linux. After a study of alternative technologies like openCMS (www.opencms.com) as CMS, PHP or Java as programming languages we selected ZOPE as development platform.

Although the project team already developed web applications with PHP (Peters 2001, 2002) and had no experience with DTML and Python the main reasons for selecting ZOPE were the integrated user administration and its strong object-orientation.

The most critical fact about ZOPE has been the use of DTML and Python. Although the combination of HTLM, DTML and Python offers a great framework for the development of dynamic web applications these technologies seem to be not that much used by web engineers in comparison to PHP, Java or ASP (see e.g. Qu 2000 for a groupware system based on J2EE).

According to the theory of network externalities (e.g. Andersen et al. 2000, Brynjolfsson et al. 1996, Economides 1996, Gandal 1995) even excellent products that do not have a large network (e.g. many user) are endangered not to survive.

But since the ZOPE community seems to be very active and devoted to this platform and the excellent web application functionalities of ZOPE we expect that ZOPE will have a long future.

Within ZOPE the whole business logic is implemented on the basis of HTML, DTML and Python. Furthermore the user administration is implemented by ZOPE functionalities. Any other data is stored in a mySQL database - besides the uploaded files.

Although mySQL offers the blob-type (binary large object) which is suitable to store files we use the classical directory structure of the OS. There is not special reason for this design since it has some disadvan-

Table 2: Public ITFG (first layer)

	ITF Webmaster		ITF Administrator		ITF Board Moderator		ITF Board Member		Guest	
	A	C	A	C	A	C	A	C	A	C
News	Ø	cdur	Ø	cdur	Ø	r	Ø	r	Ø	r
Announcements	Ø	cdur	Ø	cdur	Ø	r	Ø	r	Ø	r
Discussion Group	Ø	Ø	Ø	Ø	Ø	Ø	Ø	Ø	Ø	Ø
Mailing List	cdur	cdur	cdur	cdur	-	r	-	r	-	r
Files	cdur	cdur	cdur	cdur	-	r	-	r	-	r
Resources	cdur	cdur	cdur	cdur	-	r	-	r	-	r

Table 3: ITFBoard

	ITF Webmaster		ITF Administrator		ITF Board Moderator+		ITF Board Member+		Guest	
	A	C	A	C	A	C	A	C	A	C
Board itself	cdur	cdur	cdur	c	r	cdur	-	r	-	r
News	Ø	cdur	Ø	r* -**	Ø	cdur	Ø	cdur' r''	Ø	r* -**
Announcements	Ø	cdur	Ø	r* -**	Ø	cdur	Ø	cdur' r''	Ø	r* -**
Discussion Group	cdur	cdur	-	r* -**	cdur	cdur	-' -''	cdur' r''	-	r* -**
Mailing List	cdur	cdur	-	r* -**	cdur	cdur	cdur' -''	cdur' r''	-	r* -**
Files	cdur	cdur	-	r* -**	cdur	cdur	cdur' -''	cdur' r''	-	r* -**
Resources	cdur	cdur	-	r* -**	cdur	cdur	cdur' -''	cdur' r''	-	r* -**

+ Rights within the subscribed ITFBoard. The rights within other ITFBoards equal the Guest role. The rights to change, delete and update content is limited to the entries that were created by the user himself.

‘ Open modus: unrestricted rights / ‘’ Closed modus: restricted rights

* Public / ** Not public

Table 4: ITFWorkgroup

	ITF Webmaster		ITF Administrator		ITF Board Moderator+		ITF Board Member+		Guest	
	A	C	A	C	A	C	A	C	A	C
News	Ø	cdur	Ø	-	Ø	cdur	Ø	cdur	Ø	-
Announcements	Ø	cdur	Ø	-	Ø	cdur	Ø	cdur	Ø	-
Discussion Group	cdur	cdur	-	-	cdur	cdur	cdur	cdur	-	-
Mailing List	cdur	cdur	-	-	cdur	cdur	cdur	cdur	-	-
Files	cdur	cdur	-	-	cdur	cdur	cdur	cdur	-	-
Resources	cdur	cdur	-	-	cdur	cdur	cdur	cdur	-	-

+ Rights within the subscribed workgroup

Table 5: User administration

	ITF Webmaster		ITF Administrator		ITF Board Moderator		ITF Board Member		Guest	
	A	C	A	C	A	C	A	C	A	C
User	cdur	cdur	cdur	u* r**	cr	-	-	-	-	-

* Only own user data.
** If publicly accessible.

tages in comparison to a data management in mySQL, especially related to security and access rights. Although the 'directory' solution makes no difference to the end-user it is only second best. So in a further version the files should also be stored in the mySQL database.

First User Tests

Groupware systems are used around the world at many educational institutions to support teaching (e.g. Choren et al. 2000; Drummond et al 2001; Fuks 2000; Fukset al. 2002; Manning et al. 2000; Martz et al. 2000; Shaikh et al. 2001; Werner et al. 2001). Therefore we started to evaluate ITFG in a student's project. The evaluation had the characteristic of a ß-test before using the system in the IT-Forum itself.

The project lasted eight working days, fifteen students took part. Since the students worked in no more than two rooms with tight timelines both characteristics (anytime, anywhere) for the support of a groupware system were not fully given.

Consequently some functions of ITFG, like mailing lists and discussion groups, were not used. Although primarily the file sharing service of ITFG was used in the project the other functions were tested and evaluated.

As a first feedback the students thought that ITFG will be helpful in projects where the project members are geographical separated and/or projects that are timely interrupted (asynchronous groupware).

From the administrative point of view ITFG is easy to handle and offers an integrated solution for project work. In comparison to single solutions (file sharing in an OS, mailing list with Majordomo etc.) the integrated concept of ITFG makes the preparation of a project much easier.

Although ITFG is much more integrated than our former solutions it is far from being complete. A real integrated project environment would be a portal solution that additionally includes applications like word-processing, spreadsheet, project management etc. Of course the development of such a really integrated platform would be far exceeding the resources of our university.

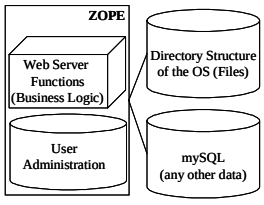
CONCLUSION

ITFG is an integrated platform particularly for asynchronous groupware. First tests of the systems have shown that it offers important functions to support highly decentralized and asynchronous teamwork. The platform seems to be stable and reliable.

Operatively ITFG is used as an easy to use groupware system to support work and communication in the IT Forum at MUAS.

We will use it in project orientated class work. Besides the objective to improve project work we are planning to analyse the degree of support this groupware system can offer in different circumstances. Depending on the acceptance and resources we are planning to further improve the system.

Figure 5: Technical structure of ITFG



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