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Implementation of webcom on hybrid architecture and integration of a reliable multicast protocol (rmp) For the webcom system.

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ABSTRACT: *This work describes an extended communication framework, **WebCOM**, which addresses issues of performance, portability, scalability, accessibility and reliability in groupware implementation over the Internet. The objectives **of WebCOM** are to provide quick response for group communication on the Internet, portable to any platform, scalable to support a large number of users, with continued operation of the system despite some participants or servers having failed, and to provide reliable data transmission over the network. webCOM has built using the java language and java API's which runs on a hybrid architecture. We develop the WebCOM hybrid architecture (peer-to-peer and client/server) and integration of a reliable multicast protocol (RMP) for the WebCOM system.*

Keywords—*Computer Supported Cooperative Work, World Wide Web, Work Group Application, Web-Multicasting*

I INTRODUCTION

In conventional working, people work individually, attend frequent meetings to make a decision on certain issues, and spend much time, energy and money on travel and physical meetings. Nowdays, people have moved towards a group style of work to accomplish their task. The field that studies the use of computer technologies to enable people to work together by co-operating directly using shared resources in a small, closed group, is called CSCW (Computer- Supported Co-operative Work).the benifits from working in a group are:

- People spend less time attending meetings and more time completing the task.
- A decision can be distilled from many ideas in a group.
- A big task can be accomplished more easily by sharing the work among people in a group.

From these benefits, there has been demand for groupware applications to be developed to support daily tasks in a group.

Thus to accomplish a groupware communication framework, a hybrid architecture of WebCOM system has been developed and LRMP was integrated.

An LRMP(Light-Weight Reliable Multicast Protocol) is derived from the Scalable Reliable Multicast Protocol (SRM) but introduces some simplifications and improvements. It was designed to be scalable and light-weight, but was not designed with the tight delivery constraints of real-time traffic. LRMP provides totally ordered packet delivery and rate based traffic flow control. It offers end-to-end reliable and ordered data delivery service to application.

II. RELATED WORK

This section discusses related work on how WebCOM is implemented in this study. Firstly, a number of Java-based collaboration frameworks have been developed. Many systems, such as JETS (Shirmohammadi ei al., 1998) and Promondia (Gall and F.J.,1997), take advantage of the elegance and portability of the Java applet. In such systems, the application components with which users interact are distributed as an applet and a program on the server manages shared state, synchronisation, and dissemination of events. The centralised structure is a consequence of applet security restrictions. Basing the design of a collaborative framework on applets has several ad- vantages. Besides portability, the centralised architecture simplifies handling of many communication and synchronisation issues, compared to distributed solutions. The work in this thesis, WebCOM, uses the methods described above and also extends the technologies to work in a distributed structure.

TANGO (Beca and et. al., 1997) is a Web-based collaboration system that aims to support both synchronised and independent views of related information. Like Web- COM, TANGO uses applets and provides an API to enable the applets to communicate with other programs on the local host or other computers. TANGO also allows the applets to work in a stand-alone fashion or a collaborative fashion. While TANGO is written in Java, it includes APIs for Java, C/C++ and Javascript to provide language independence. A major difference between WebCOM and TANGO is that TANGO uses a centralised server for all communication, whereas WebCOM uses a hybrid architecture.

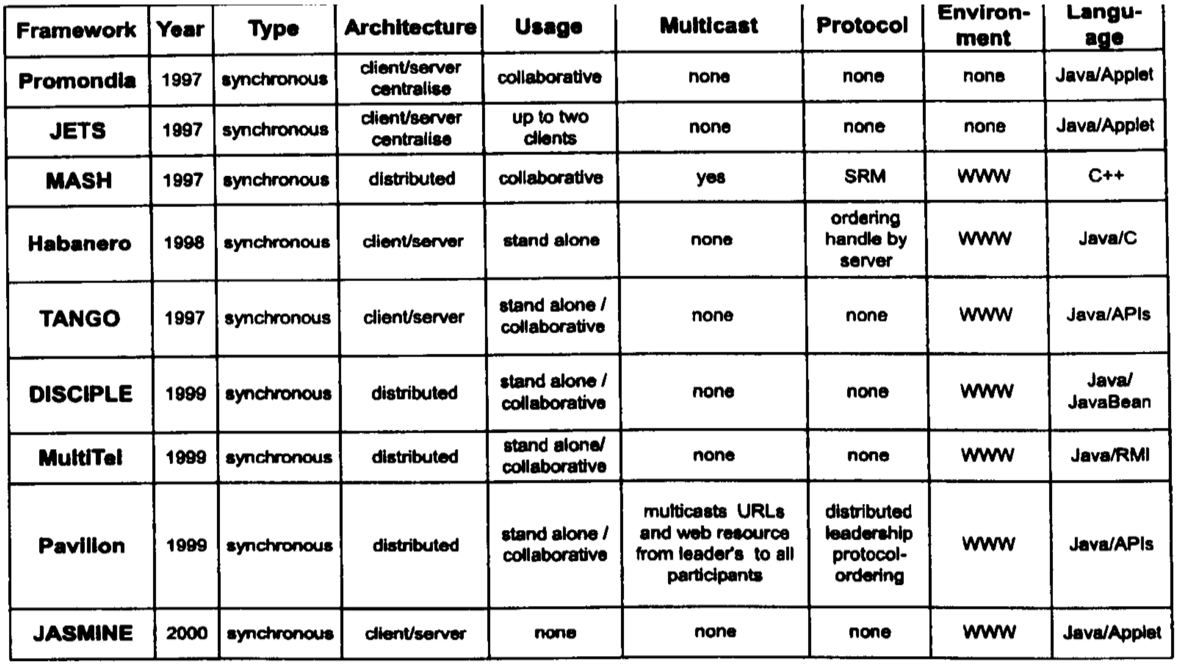
DISCIPLE (Marsie, 1999) is a Java-based synchronous groupware system that uses the JavaBean component architecture to construct distributed applications. The frame- work can support any application that is written as a JavaBean, whether designed for collaborating groups or for single users. DISCIPLE uses the Java delegation event model to support dissemination of events from one instance of the application to others. A "collaboration bus" supports all communication services among instances of the application, including reliable multicasting. As with applet-based frameworks, the DISCIPLE framework is very elegant, with well-defined interfaces and composition methods. The target application domain of WebCOM is somewhat more general than that of DISCIPLE, and the primary focus of WebCOM is on communication performance.

By the authors, however, use of Java can produce performance problems. Although WebCOM provides similar capabilities to MultiTel, the goals of the projects are complementary. Whereas MultiTel focuses on functionality and ease of use, WebCOM is focused on performance issues.

MASH (McCanne et al., 1997) addresses the communication aspects of collaborative applications and supports high-bandwidth data transfers such as streaming media. MASH can be used to interconnect different components or extend existing components. The MASH project uses the SRM protocol (Floyd et al., 1997) for reliable multicasting, a flexible proxy server for layered transmission and transcoding (Chawathe et al., 1998), and a component for HTML distribution called MASHCast. Many of the MASH components are legacy systems written in C/C++. WebCOM uses the LRMP protocol (Liao, 1997) for reliable multicasting and is written using the Java language.

Pavilion (McKinley et al., 1999a) is a middleware framework that supports the development of collaborative Web-based applications. Pavilion enables a developer to construct new collaborative applications by inheriting and extending the default functionality of Pavilion. A key-principle followed in Pavilion is integration of existing applications, including various types of browsers and data-specific interfaces. In Pavilion several components have been used including the proxy server, Web browser interface, and reliable multicast protocol. Pavilion used WBRM (Web-Based Reliable Multicast) as a reliable multicast protocol, while WebCOM used LRMP 88 a reliable multicast protocol. Pavilion and WebCOM are written in Java to provide language independence. WebCOM focuses on communication issues and a major difference between the projects is that Pavilion uses a distributed architecture for all communication, whereas WebCOM uses hybrid architecture.

III. Table 1.1 given below shows existing frameworks using JAVA applets in a Web environment that has been discussed above



Framework	Year	Type	Architecture	Usage	Multicast	Protocol	Environ-ment	Langu-age
Promondia	1997	synchronous	client/server centralise	collaborative	none	none	none	Java/Applet
JETS	1997	synchronous	client/server centralise	up to two clients	none	none	none	Java/Applet
MASH	1997	synchronous	distributed	collaborative	yes	SRM	WWW	C++
Habanero	1998	synchronous	client/server	stand alone	none	ordering handle by server	WWW	Java/C
TANGO	1997	synchronous	client/server	stand alone / collaborative	none	none	WWW	Java/APIs
DISCIPLE	1999	synchronous	distributed	stand alone / collaborative	none	none	WWW	Java/ JavaBean
MultiTel	1999	synchronous	distributed	stand alone/ collaborative	none	none	WWW	Java/RMI
Pavilion	1999	synchronous	distributed	stand alone / collaborative	multicasts URLs and web resource from leader's to all participants	distributed leadership protocol-ordering	WWW	Java/APIs
JASMINE	2000	synchronous	client/server	none	none	none	WWW	Java/Applet

Table 1.1 Exixsting Implementations on Web

IV. PROBLEM DEFINITION AND ARCHITECTURE

The purpose of work in this study, as described above, is to develop the WebCOM System, which includes:

- Implementation of Web COM on hybrid architecture (peer-to-peer and client/server).
- Integration of a reliable multicast protocol (RMP) for the WebCOM System.

  Looking at the current implementation of Java applets in a Web environment as shown in Table 1.1, a number of limitations/strengths are identified:
- Most of the frameworks run in synchronous mode. Although synchronous mode is the communication mode used in most previous CSCW applications, a generic CSCW application should support both modes of interaction: asynchronous and synchronous.
- uncasing is a standard method and is adopted by many authors to develop their applications/model.

This method is very well known and does not need to be described here. However, currently multicasting has received more attention with many researchers beginning to investigate the potential of multicasting to provide an alternative method of communication. In the CSCW area, few studies have used multicasting. As reported by Maihofer (2000), multicasting might save network bandwidth and offers an efficient communication technique for a group communication purpose. Moreover, multicasting provides scalability and speed performance (Maihofer, 2000);

Most of the frameworks use client/server or distributed architecture. And each architecture has its own advantages and disadvantages. Most of the works preferred to use either one of these architecture.

V. ARCHITECHTURE OF THE WEBCOM

WebCOM has used a hybrid architecture to give advantages to group communication compared to the client/server architecture. The client-server architecture is not suited to a large size of group environment because:

- processing cost of a server increases with the number of users accessing the server.
- Response time increases with the number of users accessing the server .
- User cannot communicate directly to other users unless they are connected to a the same server. If the server is down, the communication cannot be established.
- Every user needs to have a connection to a server in order to communicate with other users.

The above problems as a group requirement can be solved by proposing WebCOM as the communication framework. The objectives of WebCOM architecture are to give advantages to the participant and the server by eliminating the server dependent processes, decreasing server load and decreasing network traffic. For example, users are not totally dependent on a Web server if a Web server is down or fails.

This study has merged the client/server architecture with the peer-to-peer architecture to produce a three-tiered architecture for WebCOM as shown in Figure 2.1. The three-tiered architecture is divided into three layers. All clients are categorised into the first layer, **Java Application Server(JAS)** and HTML (Home page of the prototype system) are categorised into the second layer, and the databases is categorised into the third layer. The first layer is located on a local or remote network, and the second and the third layers are located on a local or remote Web Server. The client/server architecture is implemented for client-Web server communication and the peer-to-peer architecture is implemented for client-client communication.

Two types of communications are used in the hybrid architecture i.e, unicasting and multicasting. Unicasting is used for client-HTML(web server components) communication in which a client communicates with the web server to download java applets. When clients first use the prototype system, all clients need to download a java applet by accessing the server HTML pages using unicasting. The communication between HTML-databases and JAS-databases uses internal communication on the server .

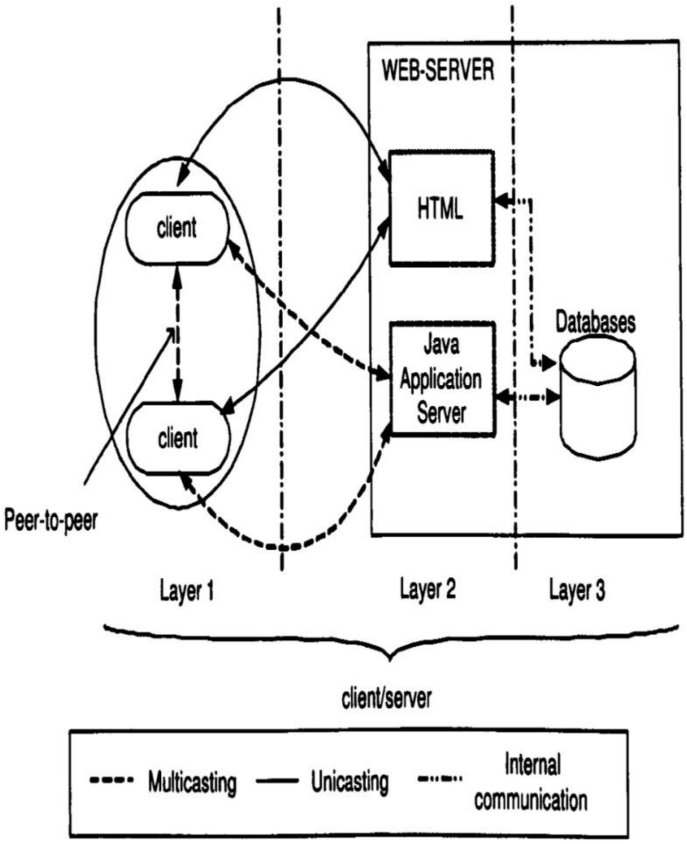
Multicasting is used for client-client communication and clients-JAS communica- tion. After the clients have downloaded the java applet from a web server, all activities in the system use multicasting as the medium of communication either between clients or with JAS. The activities includes:

- updating data in databases through JAS by clients,
- ommunication between client and client,
- communication between client and a JAS,
- joining a group in the system, and
- communication between clients using shared application which created with JAS or self-created by an authorised client.

A communication made by a shared application that has been created by an au- thorised client rather than delivered from the server, operates independently from the JAS. In other word, all activities and data are not recorded and traced by the JAS. Furthermore in this thesis, data distributed among clients and not recorded in the databases limits development of the system, and is seen as an area for further research.

The hybrid architecture offers the advantages of client/server and peer-to-peer architectures in that it is central point independent, provides easy management, and reduces bottlenecks. The benefits for this extended architecture are:

- processing cost of server is reduced even though the number of users using WebCOM has increased.
- Response time is no longer dependent on the server.
- users can communicate directly with other users without establishing the connection to the server if they have the same copy of an application as downloaded from the server
- Every user does not need to have a connection to a server in order to communicate with other users in a group.



VI. FIGURE2.1: Hybrid architecture for WebCOM

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From Figure 2.1, Layers 1, 2 and 3 are from client/server architecture, whereas internally layer 1 is from peer-to-peer architecture. A difference between the WebCOM architecture and client/server architecture is that multicasting has been used in the WebCOM as a communication method for a group interaction, which is shown shaded in Figure 2.1.

VII. CONCLUSION

In this paper we proposed a hybrid architecture that offers an advantage of client/server and peer-to-peer architecture in that it is a central point independent, provides easy management, and reduces bottleneck. The benefits of this extended architecture are:

- processing cost of server is reduced even though the number of users using WebCOM has increased.
- Response time is no longer dependent on the server.
- users can communicate directly with other users without establishing the connection to the server if they have the same copy of an application as downloaded from the server.
- Every user does not need to have a connection to a server in order to communicate with other users in a group.

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