

Jabber Based Protocol for Collaborative Mobile Work

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Abstract. In this paper we introduce an application level protocol for sharing of XML based data. This protocol is especially designed for mobile environment. It is able to deal with unreliability of the mobile wireless networks where the client's bandwidth is limited and the connection may frequently fail. We describe the synchronization process of the data from the client side as well as from the server side. The protocol can deal with data synchronization conflicts and can prevent them in most cases by using data locking mechanism. Data buffering mechanism from client and server side is supporting the re-establishing of data consistency after connection failure. The protocol has been verified by means of a scenario from a facility management domain.

1 Introduction

Fast development of miniaturized computers, e.g. handhelds like PDA (Personal Digital Assistant), smart phones and tablet PCs has brought new possibilities into our every day life. When combined with wireless networks like GSM, GPRS, EDGE or UMTS, these technologies promise to open new communication possibilities among people anywhere and anytime. Applications utilizing the possibilities of wireless networks must deal with a set of new issues connected with mobility of the user(s) and reliability of the networks. This is especially true when several users want to share some data and to collaborate on solving an upcoming problem. The currently existing data sharing and collaborative tools as well as the instant messaging tools are designed for stationary networks where the risk of connection failure is not high and therefore it is not solved by the software. Our goal is to solve some of the issues by creating an appropriate protocol for reliable data sharing and synchronization. Such a protocol is able to minimize the risk of data loss and will enable us to perform a smooth work on a shared data.

1.1 Use Case

The functionality of our system is tested and verified on a use case from the domain of facility management. In our primary use case we have a large construction site where the construction site manager is inspecting the work done. During this inspection he/she is equipped with a handheld PDA device with GPRS connectivity. The manager can download construction plans from a central database or can use plan

stored locally on the PDA device. The plans are in SVG (Scalable Vector Graphics) format [4] and they are therefore suitable for the given task (they can be zoomed without loss of quality). If the manager discovers any problem he/she is not able to solve alone, he/she can contact one or more other experts. They can start a collaborative session. During the session they can share the SVG data or any XML [5] based data and use instant messaging features. The users can browse the data and change them in a form of a shared annotations. The annotations are of multimedia nature, e.g. drawing, text, bitmap images or audio recordings. All users work on their local copies of the data. These copies are transparently synchronized with each other. In case one user loses the network connection, he/she can continue in work on the local copy. All changes will be synchronized as soon as the connection is reestablished. Finally the result of the collaboration is saved on the server and will serve for later post-processing phase.

2 Problem Definition

Work in the mobile environment brings specific requirements to the user, devices and especially to the software used. In case of a continuous collaborative work, the low reliability of the wireless network is a big problem. Short and long time disconnections may occur, the device may even change IP address or connection type (GPRS to WiFi). The commonly used communication protocols for instant messaging (Jabber, ICQ, Yahoo, MSN) are not designed to deal with problems of mobile networking and data synchronization. We have therefore designed a new application level communication protocol that allows reliable data sharing and smooth user collaboration during unexpected network reconfiguration or disconnection. The data sharing format is implemented as a generic XML based data format and its usage has been demonstrated on sharing of plans in SVG format.

3 Solution

Our solution is based on a client-server architecture see Fig 1. In such architecture the main authority controlling the process of data sharing and synchronization is the dedicated server. This server is usually placed in a static network and the communication bottleneck is therefore not critical. Each mobile client is communicating exclusively with the server and it does not need to store any connection information about other clients. Messages are distributed by the server which limits the traffic on the client side.

Our solution of design and implementation of a protocol for synchronization of data in the mobile environment is derived from an existing instant messaging protocol Jabber. The Jabber protocol uses unique user identifier similar to e-mail address, which makes it resistant to physical address change of the device. It is XML based which makes it easily extensible by introducing new namespaces. The protocol uses “store and forward” technique for data distribution which is a suitable strategy for the unreliable networks.