Mobile Home Security with GPRS

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Abstract

This paper presents research-in-progress on the development of a home security system for use on mobile devices. Mobile Home Security (MHS) is a system that uses the wireless high-speed technology GPRS. An effective system requires the delivery of good quality images and video to the mobile device. Existing wireless networks have low bandwidth and hence are not capable of providing this service. The introduction of GPRS offers a number of advantages including high bandwidth and low operational cost. Our research is investigating how effectively video and images can be captured and sent across a radio network. Results of this work will provide an awareness of the problems and we will provide guidelines for implementing a mobile security system. Further our research will provide insights into future bandwidth hungry video data applications, not only in wireless security applications but also in other related areas of mobile communication technologies.

1   Introduction

The use of mobile devices that allow users to roam freely without being tied to ground based wires is increasing at a dramatic rate. With the introduction of the Wireless Application Protocol (WAP) for mobile devices we have seen an increasing demand for higher speed mobile applications. WAP enables the mobile user to connect to various Internet applications wirelessly with the ability to roam freely. However the low data speed and cost involved with each connection presents many limitations in the implementation of those types of applications.

For our MHS and other applications involving video data transmission a higher speed mobile service needs to be used to cope with the larger band-

width requirements. GPRS is a relatively new technological advance in the mobile communication market. GPRS enables higher speed data rates and the always-online technology only charges the user for data transfer. Rysavy [1] states that, in theory, speeds of 170 kbps are possible. Operational speeds were in the range of 28 - 40 kbps in early 2001 and in the range 56 - 110 kbps by early 2002. There are however known problems and complications involved with GPRS and the integration of this new technology with the existing radio network [1,2]. Our research aim is not only to create a home security application but also to determine if the system is reliable and effective over the GPRS network. Reliability tests will be performed with respect to the packet switch network over the Global System for Mobile communications network (GSM).

2   The System

Figure 1 shows the major components of the system and the interconnection between the devices. Currently the system consists of a standard generic web cam connected to a personal computer. The main purpose of the computer is to act as a dedicated web cam server. The server needs to have a permanent connection to the Internet with a static IP address. The web cam we are using is a Logitech WebCam Express with USB connection and is capable of capturing video feeds with audio. Still snapshot images can also be captured to produce higher resolution images. As the web cam does not have motion sensors we are using Inetcam iVista™ [3] software to detect movement or changes. The software works by comparing frame after frame for differences, including light intensity differences. Inetcam iVista™ can be configured for different levels of motion sensing and light settings.

All video and image files captured are placed in a local folder on the server which can only be accessed via a File Transfer Protocol (FTP) client. Our server's FTP server allows access only to users with login accounts. A HP Jornada Pocket PC was the chosen receiving device for video and images from our server. This runs WinCE and Pocket Internet Explorer. The GPRS Internet connection will be accessed with an external mobile phone with GPRS compatibility. The mobile phone will act solely as a GPRS modem unit. Our system, however, currently accesses the Internet via a docking station which shares any desktop computer's internet and network resources.

We are about to begin the testing phase of our security system. Tests for reliability of the packet-switch network in comparison to that of the existing circuit-switch will be examined. The main focus of reliability testing is on data

travel from the web cam to the mobile device and vice versa. The data will be presented in the format of compressed images and video feeds with and without audio. Park's [4] prototype of the GPRS architecture has been redesigned to accommodate our test operation. This prototype, which acts as a base to conduct performance calculations, is a simplified version of an actual GPRS network.
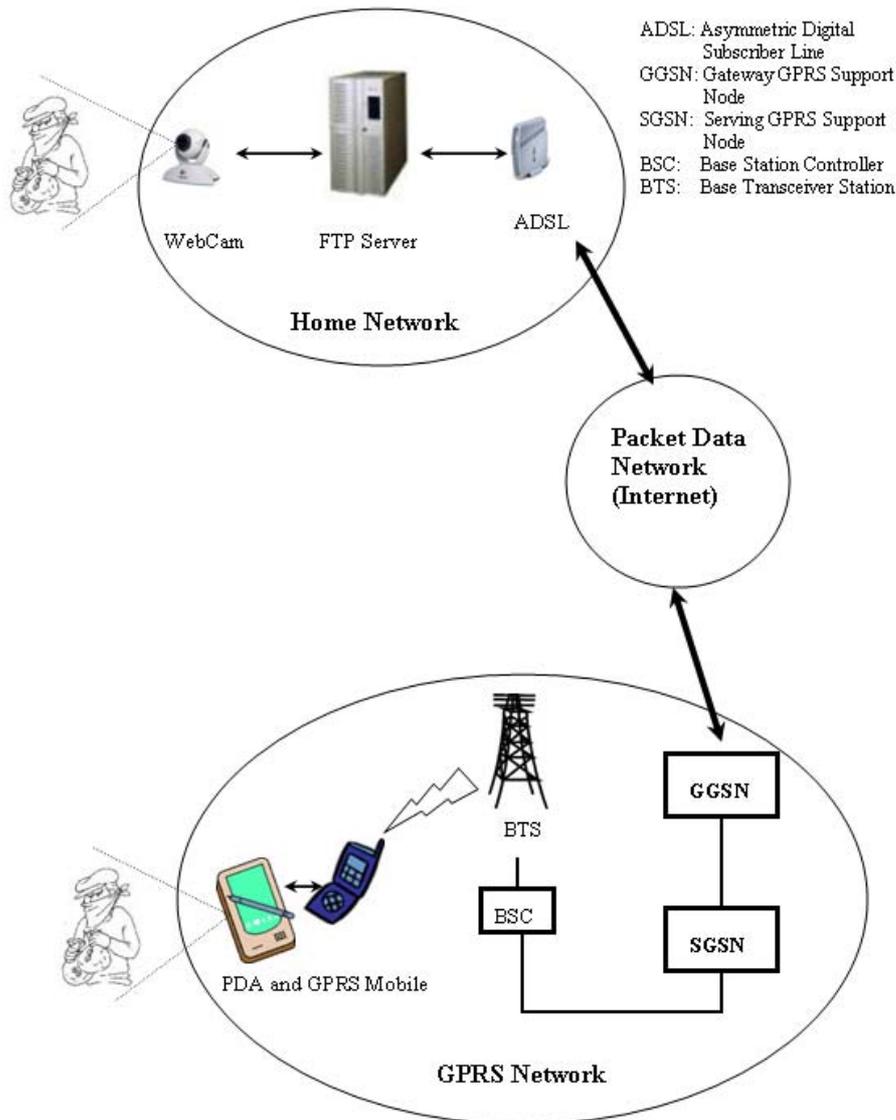

Figure 1 Mobile Home Security

Experiments using different video quality capture rates will be conducted to determine the optimum data stream for the GPRS network. Further, we will investigate potential problems or limitations with the system due to image quality.

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3 References

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