Overview

In the last few years, there is an increasing demand for voice conferencing applications in the vehicular environment. Such applications are highly useful for vehicle dispatch services as well as in many other scenarios.

At present, communication for vehicle dispatch services is mostly conducted via hand-held radio transceivers, or walkie-talkies, which have the following significant shortcomings:

- A separate radio network needs to be built.
- The bandwidth efficiency is low because any transmission is broadcasted in the whole coverage area.
- The range is limited to several kilometers.

A cost-effective solution is to make use of Voice over Internet Protocol (VoIP) over the mobile network. Push-to-talk over cellular (PoC) is such VoIP conferencing service and is particularly suitable for supporting always-on voice conferencing communications because of its advantages that consist of high bandwidth efficiency, low power consumption, and the ubiquitous coverage provided by the mobile network.

In this project, we design and analyze such a PoC conferencing system. This system will provide conferencing capability particularly suited for vehicle dispatch services.

Methodology

General Description

The system can be divided into two parts: the server side and the client side.

As shown left, only one client is allowed to speak at a given time. The server will forward the voice packets from the speaking clients to the listening clients.

PoC Server

The PoC server is built on a desktop computer with an operating system Ubuntu 16.04. The server consists of the following two parts:

- The conference part: in charge of PoC session initiation and coordination, and forwarding the voice packets.
- The control part: in charge of user account management, call record storage and performance analysis.

PoC Client

Hardware: Intel Atom Board, HSDPA Modem, Remote Speaker Microphone

Software: PHSIP SIP Softphone

Results & Discussion

Flow Charts

Talk Burst Control is used to determine which client has the right to speak. Talk Burst Control messages are sent in the form of Session Initiation Protocol (SIP) messages.

Results & Discussion

Measured by the control part of the PoC server, bandwidth consumption of an uplink from client to server using different codecs is shown below:

When no client is talking, the bandwidth consumed is kept in a very low level.

When one client is in the talking state, the total bandwidth consumed = N * Pbw. N is the total number of clients, Pbw is the value specified in the above chart.

From these results, we have shown that the system is very efficient in terms of bandwidth consumption.