

Outbound Call Route Selection on IP-PBX Using Unstructured Supplementary Service Data

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Abstract. Selecting the outbound call route on IP-PBX phone system using Fixed Channel Technique and Pattern Matching has been found that both methods are not able to choose the outbound route through mobile phone service providers, and cause high traffic between GSM network operators. Therefore, this research proposed a using of Unstructured Supplementary Service Data or USSD technique. The experiment was carried out by using Asterisk Server as an IP-PBX system, which was connected with Sim3000CZ Micro Controller board to select the route. The results of this research show that this method can select the outbound call route correctly and efficiently as well as reduce the traffic between the networks. Furthermore, it can greatly reduce the overhead when calling an external network. Therefore, we claim that this is a more suitable technique for the call route selection.

Keywords: Asterisk, USSD, Unstructured Supplementary Service Data, IP-PBX, GSM, Outbound Call Routing.

1 Introduction

Currently, IP-PBX phone system has become very popular because the price of the system has gone down while the efficiency has increased. For these reason, many organizations have increasingly switched the former private branch exchange system to IP-PBX. Although IP-PBX telephony system is much more efficient, two outbound call route selection techniques used by the system – the outbound call indicating the correct route and pattern matching – are not good enough. This is because both techniques cannot choose the route by referring to the network's gateway. The majority of outbound calls from IP-PBX phone system to the terminal phone number that the users require are fixed to use the channel which is connected with mobile phone on Fixed Line Terminal. The call is then forwarded called to the terminal phone number. This connection does not enable the users to know which network of phone number is required to call. This has led to a problem of IP-PBX not being able to select an appropriate route efficiently.

Several years ago, several groups of researchers have studied and researched on selecting the outbound call route by using various techniques such as routing the outbound call by using data mining technique called K-Nearest Neighbors (KNN) [4].

This technique uses the algorithm to classify the information that can be used to select an appropriate route. Other researchers have used algorithms with data mining to assist in choosing the route by using Decision Tree Technique [5]. The accuracy of this method that classifies the destination phone number by using the algorithm is at good level, but its accuracy level depends on the amount of phone numbers which are stored in a database. Some researchers choose the outbound call method by using the analysis of DTMF (Dual Tone Multi Frequency) tone technique to operate the engine to run at the specified duties or command and control the remote devices to follow the order by sending two frequency signals simultaneously [6]. In this case, choosing the route by sending DTMF signal is suitable for the command that the length of its key press is not very long. Selection the outbound call route of some researchers is the technique on Voice over IP technology which applies the protocol of the source devices [7] such as SIP, MGCP and H.323. This method must be worked with a server that supports the protocol that is used to select the route together.

Due to the mentioned limitations of the existing techniques, we propose a new method for choosing an outbound call route on IP-PBX system by using a technique called Unstructured Supplementary Service Data or USSD [3].

The structure of this paper is as follows. Section 2 presents the IP-PBX background knowledge. Section 3 provides the description and explanation of our tools, method and algorithm. The results are shown in Section 4. Section 5 concludes the paper.

2 IP-PBX Background Knowledge

2.1 IP-PBX

IP-PBX (Internet Protocol – Private Branch Exchange) is the Private Branch Exchange telephony system that runs on Internet Protocol. Its properties are similar to a PBX phone system used in the office. It is used to receive the external call which is connected to the internal extension to communicate with each other. This IP-PBX mainly supports these protocol as SIP (Session Initiation Protocol), IAX (Inter-Asterisk eXchange Protocol), and SCCP (Skinny client Control Protocol). Currently, the most widely used IP-PBX system is Asterisk. It is the software that acts as an IP-PBX or Soft-switch that includes all the capabilities of a typical PBX. Therefore, the researcher used Asterisk which is able to run on a lot of architectures such as Linux, Sun Solaris, FreeBSD operating system in this experiment.

2.2 Outbound Call Routing in IP-PBX

Current IP-PBX phone systems running on Asterisk has two settings for outbound call patterns. The first technique is fixed channel of outbound call that identifies the call to the available channels such as channel 1 or channel 2. With this technique, the route for outgoing calls has already been pre-specified. The problem with it is the inflexibility and inscalability.

The second technique is pattern matching where the outbound number is checked whether or not its header matches the known structures. In this case, if the prefix