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A Novel Frequency Shift Keyboard Call Simulation Method

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Abstract

Hardware simulation pager usually is very expensive and can only simulate 16 subscriber line or 32 subscriber line. And in FMC (fixed and mobile convergence) system, FSK (frequency shift keying) is used to transfer information between home gateway and the program controlled switch. In this paper, a novel FSK call simulation method to design a pager is proposed to use software to simulate the interaction of FSK between home gateway and the program controlled switch during a normal call procedure, and to meet the demand of the performance and capacity testing of the FMC system. The FSK call simulation includes a back-end management system and a foreground simulation system. And the foreground simulation system consists of MP (module process) module, SP (subscriber process) module, ASIG (analog signal) module, and so on. The MP is the module's main control process, and it will control the logic of call, and transfer simulation control information between back-end management system and the other modules in the foreground. The SP is the module, in which the FSK call simulation process lying in. And ASIG module can send FSK signal to home gateway, and receive FSK signal from home gateway. The novel FSK call simulation method can test the performance and capacity of the FMC platform by the means of software, and lower the expense of testing.

Keywords*: call simulation; frequency shift keying; fixed and mobile convergence*

1. Background

This article relates to the field of communication technology in testing technology switch, and more particularly to a frequency shift support

Hardware call simulation [1-2] pager is kind of device intended to simulate the process of normal user calls. And it is used to test the traffic handling capacity of the switch. Ordinary hardware simulation pager can simulate call procedure and test call and statistics by connecting the switch from subscriber line access. But the hardware simulation pager usually is very expensive [3-4] and can only simulate 16 subscriber line or 32 subscriber line. If we want to test the traffic handling capacity of a large-scale digital program-controlled switch, heavy traffic simulation test, hundreds of hardware simulation pagers will be needed. There will be a lot of expenses to buy hundreds of hardware simulation pagers, and few companies can afford it. Even if some companies can afford the expense, it is not economical to buy so many pagers.

To simulate more subscriber line and lower the expense of buying hardware simulation pager, a novel software simulation pager is proposed in this paper. The software simulation pager proposed in this paper can test object in all processes related to normal call processing group running in MP (module processor) of a programmed controlled exchange. It ca simulation all kinds of actions corresponding to a call process, such as the action of the dialing, off hook, talking, hanging up and so on.

MP is connected to the computer. Management Software running in the computer can communicate with the process running in the MP. The processes corresponding to call

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running in the MP. And signals to trigger and end a call is sent out by the processes in SP (Subscriber Processor). To simulate the call process operator sends command to the MP by the management software. Then MP controls the simulation process running in SP to start a call procedure. Namely the simulation process running in the SP will send signals to the MP to start a call or end a call in order to simulate a normal call procedure.

FSK (frequency shift keying) [5-6] is kind of modulation technology used to display CID (Calling Identity Delivery). In the FSK technology, the high level digital signal and low level digital are modulated as different frequencies. Normally 2200Hz is corresponded to high level, 1200Hz is corresponded to low level [7-8], and data transfer rate of FSK is 1200bps. The performance of FSK is superior to the performance of DTMF (dual tone multi-frequency). So the technology of FSK if widely used in CID service.

And FMC (fixed and mobile convergence) [9-10] is a kind of new technology large-scale promoted by China Telecom. There will be good business prospects and social benefits for using FSK technology for transferring CID in the FMC. The stability of the system is based on the design and the test of the system. And there is no simulation pager support FSK technology. Therefore, the development of a process of interactive simulation support FSK pager is extremely necessary.

2. Introduction of the System

Technical problem to be solved by this paper is to provide a simulation FSK pager to simulate the interactive process of FSK beyond the basic call simulation, namely to increase the FSK signal exchange process simulation to meet some switch performance testing relating business needs.

This paper proposes a simulation pager supporting FSK interactive simulation, including background module and foreground control module. The background simulation control module, connected to the MP via TCP/IP (transmission control protocol/ internet protocol) network. And the foreground simulation module includes module processor MP, a subscriber unit processor SP unit, CID unit for identifying call ID and FSK unit for handling FSK signals.

The SP unit is used to run the call simulation process, simulate phone calls;

The CID unit is responsible for sending FSK signal;

The FSK unit is responsible for receiving FSK signals.

The background simulation control module connecting with the MP, is responsible for setting the parameters for call simulation, sending simulation FSK signal to MP thought the network communication between background and foreground, and the simulation FSK signal will be saved in the call simulation queue in the MP. And the simulation signal will sent to the SP by MP to control the simulation process in SP to simulate the start and end of a call.

The module processor is connected with SP unit, CID unit, and FSK unit separately, and will transfer data between background management module and SP unit, CID unit, and FSK unit. The MP is responsible for some actions on the data of the simulation, such actions including read, encryption, decryption, and the store of the simulation signals. The simulation signals will be saved in the appropriate queue automatically. After the starting of the call simulation process, MP will read message saved in signal queue, encrypt the message, and then send the encrypted message to the CID unit to send out to user terminal. After the FSK unit receives a FSK signal, it will demodulate the signal as an incoming message, and then send the demodulated incoming message to the MP. After MP receive the message from FSK unit, it will decrypt the message.

Further, the signal stored in the simulation queue of the MP, will be get by the call simulation process sequentially.

Further, the simulation call signal is kind of FSK signal transferred between user terminal and the program control exchange. Generally speaking user terminal is home

gateway. And the FSK signal can contain caller ID and other information transfer in voice channel.

Brief Description

Figure 1 is an overall logic diagram simulation pager background and foreground programs; Figure 2 is a principle FMC FSK interactive voice platform and home gateway.

3. FSK Simulation Pager

This paper proposes a novel method to realize simulation pager supporting simulation of FSK interaction between programs controlled exchange and user terminal. This method can meet the needs of performance measurement. Generally the user terminal is a home gateway.

Figure l, is an overall logic architecture of the simulation system.

Simulation call pager system consists of following parts:

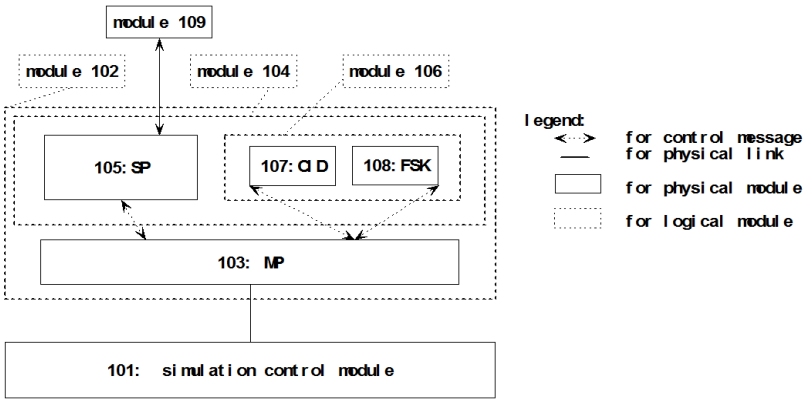

Figure 1. Simulation System Logic Architechture

101: simulator control module is running on a PC (personal computer). It interacts with front-simulation calling module via TCP/IP protocol. And it is responsible for setting parameter for a simulation call, and it will control the simulation call procedure.

102: front-simulation calling module includes all kinds of hard and software supporting the call simulation procedure in the program controlled switch, such as MP module, SP module, ASIG (analog signal) module.

103: MP module, is used to save the FSK signal simulation data in queue, to read FSK signal data, to encrypt the data to be sent to CID module, to decrypt data received from FSK module, and to transfer data between simulator control module and the PP (periphery processor).

104, PP module: PP is periphery processor, refers to all the processors beyond MP, including SP (subscriber unit processor), CID, FSK, and so on.

105, SP module: Call simulation process running on the SP, which can simulate hundreds of phone calls simultaneously.

106, ASIG module: ASIG module is used to handle physical layer signal protocol to be sent out or received. It also can management the resources lying in the ASIG board. In this paper, the resources include CID module, FSK module, DTMF resource unit, and so on. And the simulation of FSK signal is implemented by the CID unit and FSK unit.

107, CID module, is used to simulate the procedure of sending FSK signals to subscriber terminal. It will modulate the message received from MP as a signal, and send the signal to subscriber terminal.

108, FSK module is used to simulate the procedure of receiving FSK signals from subscriber terminal. It will demodulate the signal received from subscriber terminal to an internal message, and send the message to MP.

109, subscriber terminal, is a kind of home gateway, which can send FSK signal to program controlled exchange, and receive FSK signal from program controlled exchange.

The simulation system is separated into background simulation control module and front-simulation calling simulation module. The back-end simulation program running in the background on the back-end simulation control module, and foreground simulation program running in the foreground in the program controlled switch.

In the simulation system, the SP board and ASIG board are the entity of call. The upper level of unit is module. MP is the upper level of processor for SP. A SP board can support a unit of subscribers' call procedure. If a call procedure between two users in the same unit, then the SP the users belonging to can handle the call procedure independently. An MP board controls multiple SP boards. And the MP can handle call procedure between users beyond to different SP board.

Call simulation process running on the SP will get FSK simulation signal sequentially from the signal queue in MP.

Following is the working principle of FMC voice platform:

In FMC, the home gateway is a kind of access terminal, which can afford the capacity for PHS (personal handy-phone system) terminal and GSM (Global System for Mobile Communications) terminal to access the telephone network though the home gateway. And a mobile phone can handle a call on the fixed-line network through home gateway. Thus the FMC system can enable the organic integration of mobile network and fixed-line network, and balance the load between mobile network and the fixed-line network.

Figure 2 is FSK interaction architecture. The interaction is between home gateway and the FMC voice platform.

201: home gateway is connected to the ASLC (asymmetric digital subscriber line) board via PSTN telephone line, and is connected to the SP unit through ALSC.

202: FSK unit, CID unit, SP unit are connected to the T network (slot switching network) through HW (High Way, unit bus) line.

203: when the home gateway initiates a call, SP unit establishes the exchange of slots with T network under the control of MP;

204: home gateway establishes a connection with FSK and CID unit cell in turn under the control of MP.

205: FSK unit is responsible for receiving the FSK signal sent from the home gateway, and the CID unit will send a signal responsive to the home gateway.

Given the security requirements of the business, FSK signal sent by home gateway is encrypted, and FSK unit will transfer the signal after receiving the signal. So MP needs decrypt the signals.

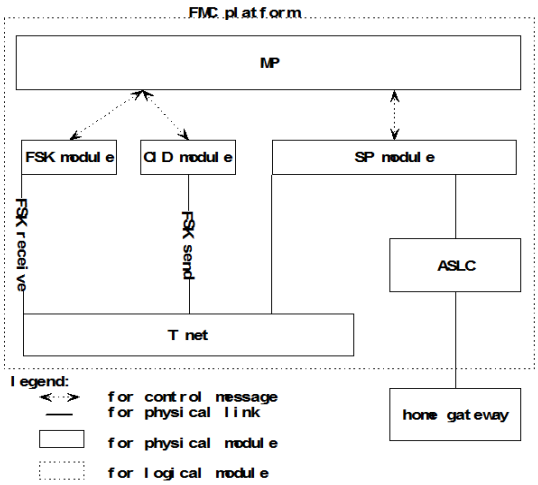

Figure 2. FSK Interaction Architechture

4. Conclusions

We have demonstrated in this paper the novel FSK simulation method, and the novel architecture of the use of the novel simulation method. And we have implement the FSK simulation system using C programming language under RMX real-time operating system and experiment the simulation system. Through the experiment of the system, the following conclusion can be made:

Compared with the existing software simulation pager, the FSK simulation method proposed in this paper can afford the capability of FSK signal interaction flow simulation. This capability is needed by the test progress of home gateway service and CID service. Compared with the hardware simulator, the present invention has a simulation call volume, low cost, simple operation advantages. And good results have been achieved by using the novel method proposed in this paper.

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