

Hardware and Software Based Automated System for Telecommunication Network Data Recording and Storing

V.G. Zimakin¹, Yu.A. Naumenko^{2,*}

¹Telecommunications network of radio television station "Terentin", Rakhov, Ukraine

²Department of automated production control systems, Zaporozhstal Integrated Iron and Steel Works JSC, Zaporozhye, Ukraine

Abstract The suggested solution of hardware and software enables recording and registration of phone calls based on a personal computer. The given solution enables recording incoming and outgoing calls, registering them in the database and playback of conversations.

Keywords Telecommunication Network, Phone Calls, NGN, Utilities

1. Introduction

Phone calls recording is a new service that nowadays has been actively implementing by providers. Complicated life and work issues, often resulting into conflicts and misunderstandings can be solved or prevented with the help of the phone conversation recording system. The factors, mentioned above, make implementation of the system attractive not only for firms and enterprises but also in other fields of human life. The conversation record can become the only and crucial proof in solving of preventing different negative life issues. The specially developed corresponding computer program enables recording and storing of the conversation data. Nowadays safety issues are becoming more and more important for every company or enterprise. So controlling data streams becomes a crucially important task for the management. The information stored on hard disk drives or in employee's minds is believed to be easily accessible, especially considering the highly developed industry of phone tapping and spyware programs. This is why protecting the organization network and providing offices with electronic surveillance devices managers often forget that the confidential information leak can be caused through an ordinary phone talk.

Nowadays there is a whole variety of the software and hardware for phone calls recording. The review of implementation of these systems is given below.

Recording and storing dispatching phone calls

In order to analyze their efficiency, industrial enterprises and some state organizations must record incoming calls. Phone call recording systems (PCRS) enable automated recording of the incoming calls and their storing in the

database for further controlling. PCRS is especially well suited for call centers and trade organizations, enabling to discover operators' mistakes and basing on the phone calls results develop appropriate training systems for personnel.

Labor discipline improvement

According to the research data, most of the employees use their work phones for their personal purposes. After talking to his friend a sibling about weekend plans or parties, for employee it's hard to concentrate again on his job responsibilities, for example, accounting report, which results into his efficiency decrease, delaying his job and financial loss for the company. So applying phone call recording systems helps discipline employees.

Phone order database maintenance

Registering all phone calls with printing their date and time enables salesmen to keep track on different orders and their performance.

Recording conference and important phone calls

In order to make efficient managing decisions, it's reasonable to record phone calls, conference calls and calls from partners and clients.

Decrease of trunk communication

Very often employees have to write down a lot of information during trunk phone calls, so using phone call recording systems enables decrease of trunk communication time and cost by storing required data in the audio file. The system also won't allow dishonest employees use corporate phones for trunk communication for their personal purposes.

Solving conflict situations with clients

If the company provides different services that can be ordered via phone, phone calls recording system becomes a necessary equipment for their business. In such firms conflict situations often appear. The client may say she ordered a cat suit and she was sent a one piece suit. The phone call recording system would be a good solution for solving this conflict. It would enable the firm employee to find the conversation of the appropriate date, identify the

* Corresponding author:

yuriy_rm@mail.ru (Yu.A. Naumenko)

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source of the problem and solve the conflict situation.

Decrease of insider information leak

If some of the firm employees are suspected in using the corporate phone for selling the corporate insider information to the rivals, the phone recording system would enable weather to proof or discharge the company's employee.

Family

Another problem the phone calls recording system can solve is conflicts with the child caused by mutual misunderstanding. Very often teenagers try to prove their self sufficiency to their parents and friends and don't even share their plans with parents, don't even introduce their new friends. Whenever parents try to talk, they consider it as an intrusion to their personal life and don't even answer parents' questions. In such a case the phone call recording system can become a solution to the problem, enabling parents to have the information on recent and current events in the life of their child.

PCRS can become a good alternative for magnetic medium recording systems

It's absolutely inconvenient and too expensive to use magnetic medium recording systems. For example, for controlling a line of 15 phones a bunch of tapes and a separate room for storing them would be needed, which would cause a lot of inconvenience and lead to additional expenses for the enterprise. Phone call recording system would become a good solution for recording, storing and registering phone call conversations.

Buying a phone call recording system gives multiple advantages and one can identify the goal he is willing to reach by setting the PCRS.

2. Phone Network Utilities

PSTN(*Public Switched Telephone Network*) signal transmission and connection adjustments are made through a single communication line from source commutation system to addressee's commutation system. The process involves all the communication systems' connection channels, so if the addressee is busy, it would lead to all the other connections failure.

PSTN uses ITU-T standards. The following standards enable easy access to international network connections. The global address space is designed for phones based on E.163 and E.164 standards. Different network combinations and united numeration system enable any phone in the world dial any other phone.

The analog phone network with channel commutation renders services of after-commutation 'dot-to-dot' connection for packet network[1].

Regular phone line enables transmission of voice signals of up to 3kHz between subscribers, which as absolutely sufficient for conversation transmission. Addressees are connected by a twin core copper cable with 0,4-0,5 mm square. During the talk signals from both subscribers are simultaneously transmitted in both directions. In standby

mode the phone network voltage is 60V, and varies from 10 to 15 volts during the talk[2].

Considering factors, mentioned above, this research is aimed at finding a solution of a safe signal transmission from the phone line to the computer sound card, minimizing device's interference to the phone connection quality enabling automated audio data record and easy conversation database navigation.

3. Hardware Structure

Voice record system consists of hardware and software. Hardware is a device (see Figure.1) that matches computer sound card and phone line signal levels and protects the sound card while number dialing or incoming call.

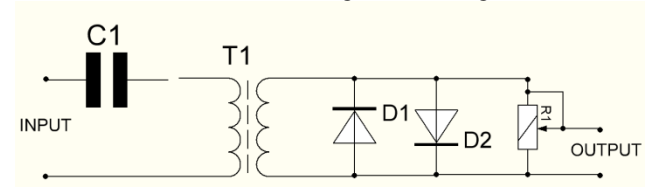


Figure 1. Signal division device scheme

1) Input – Phone line input is plugged in parallel to the phone line. Polarity doesn't matter.

2) C1 – is a nonpolar capacitor of 2,2 mF not less 250 Volts that separates constant signal component from the primary transformer coil. Connecting the transformer to the phone line without separating capacitor leads to the line engagement.




3) T1 – is a transformer that consists of two coils, 1000 loops each made of SEW 0,12 wire. Loops are to be thoroughly isolated from one another.

4) D1 and D2 are pulse diodes 1N4148. Diodes, connected oppositely help prevent the sound card damage by dropping the sound card voltage input to ~0.7Volts (when each diode transmits each half wave respectively).

5) R1 is the rheostat. The resistance may be set at 10. The rheostat enhances the line signal[3].

6) Output is made of 3,5mm jack connected to the sound card line input.

Components' look and features:

Component mark	Component feature	Look
C1	2,2 mkF 250V CL21	
T1	Not less than 1000 loops	
D1/D2	1N4148 0.2A 100V	

In order to avoid noise while recording the audio file, the computer should be connected to the line through the shielded cable.

Telecommunications network of radio television station "Terentin" and NGN (New Generation Network) layouts for applying the voice record system are given below:

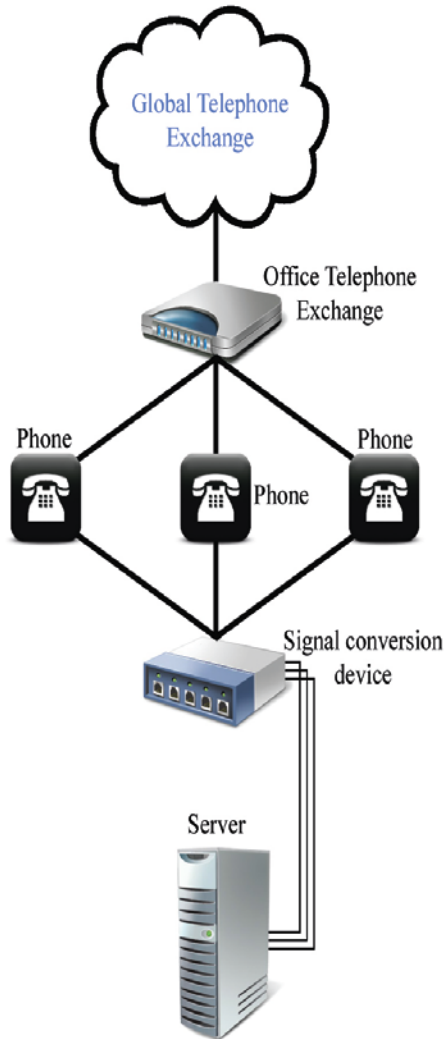


Figure 2. Regular phone network layout

The Next Generation Network (NGN) is a new kind of network providing all kinds of media traffic transfer, quality service (QoS) and enabling an unlimited range of telecommunication services with any desirable additions or adjustments. In fact, NGN represents an evolution of existing networks by uniting existing network and new technology. NGN can be defined in several ways, based on service providing principles. One of the most appropriate definitions is the following: 'New Generation Network is a term used for

defining and infrastructure providing perspective kinds of services that in future would be provided by cell phone and network providers and in the same time providing all existing kinds of services. New Generation networks use packet data transfer and switching and are basing on physical layer of optical channels providing complete interaction with existing networks'.

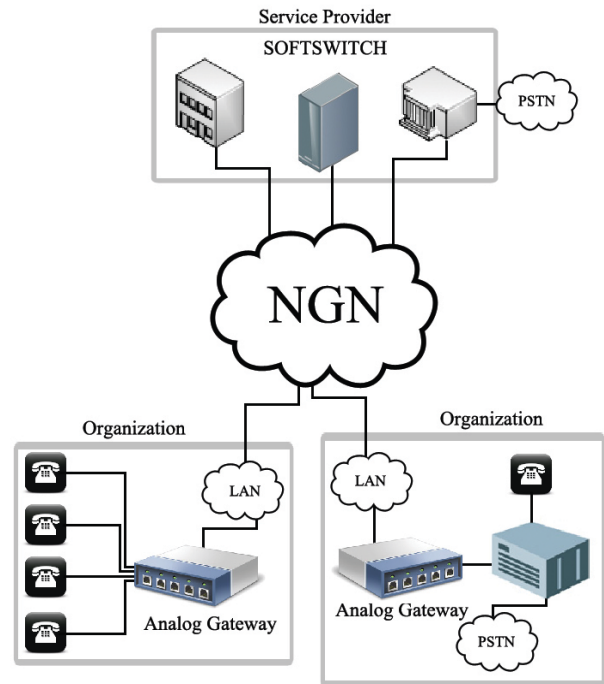


Figure 3. NGN layout

Some developers use the following definition: NGN is a universal multipurpose network for speech, image, and data transfer, using packet switching. In fact, it is the result of the Internet and phone network merge, that unites their advantages. In practice it guarantees quality of the voice and data transfer in critical applets. The NGN architecture is characterized by the following: packet transfer, routing, basic traffic structure elements (such as channels, routers, switches, and gates) are physically and logically separated from call directing and access proving devices.

IP connection is one of the new generation network services. Comparing to the regular phone network, new generation network provides telephony as only one of its services. According to the new generation network implementation experience, they significantly reduce the cost of the telephony services in comparison to regular phone network due to its multiservice ability[4]. The structure of the phone and computer network is given in the figure 3.

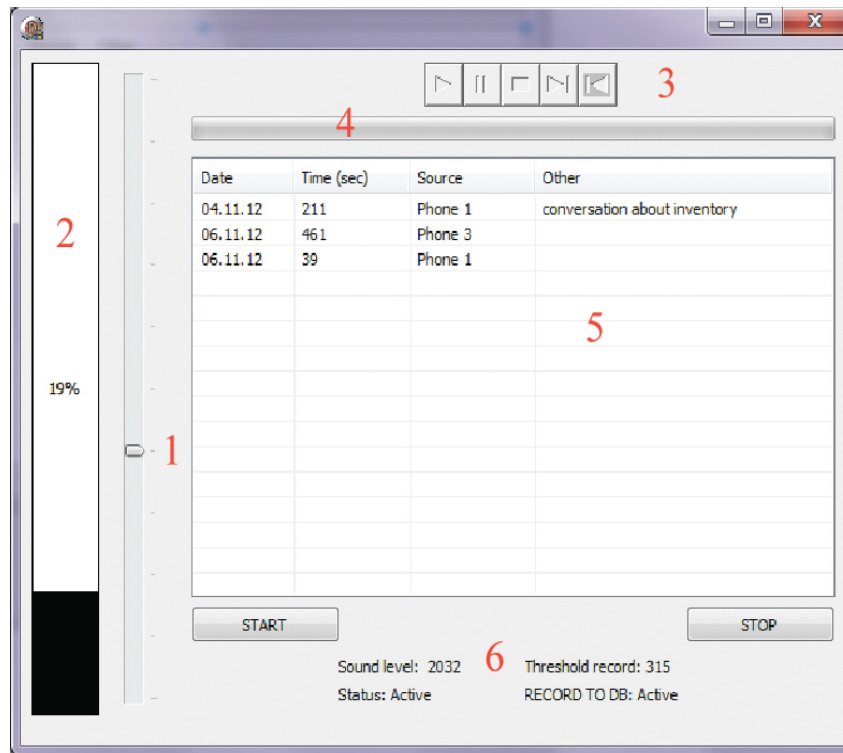


Figure 4. Program interface

4. Software operation features

After the program is started, the incoming call line in tapping mode is run. Due to the natural noises the signal volume never equals 0, but varies in the minimal range, depending on the phone line quality and its noises. In order to avoid system false response, the program enables to set the record starting volume level. After the receiver is picked, the gateway sends a long beep increasing the preset sound threshold, the program starts recording the audio file from the line in data.

If the threshold lowers less than program presets, the 10 second timer is run. If after 10 seconds the sound volume would increase, the record would continue, but if it won't the record would stop. The data received would be put into the database audio file, available for listening any time.

The program also enables to note a short conversation description in the appropriate field. Putting key words into the field makes record search easier.

Program keys description:

1. Record threshold regulator.
2. Current volume level indicator.
3. Database recorded conversations start and stop button.
4. Current database file playback position indicator.
5. Conversation database navigation shows all the recorded conversations with such features as date, duration is seconds, phone source and record marks.
6. Buttons of tapping stop, status of tapping and record.

The program is written in Object Pascal in Embarcadero Delphi 2010 environment. The following programming language and environment has all the functions necessary for creating all the functions required from such software.

The software was developed by the WINAPI programming interface

5. Conclusions

The suggested hardware and software solution for recording phone calls has very simple layout and low cost price. Little number of components and warming details provides reliability and high operation features.

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