

Overview of techniques to analyze the issues in VoIP Gateway

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Abstract- The technology that allows real time transmission of voice signals through packets over Internet Protocol (IP) is called Voice over Internet Protocol (VoIP). It discusses Quality of Service (QoS) challenges associated with VoIP. The paper also discusses in detail different types of issues like echo, delay, jitter, and packet loss in VoIP gateways and the techniques resolve them. The issue resolving techniques of dimtrace and core dump analysis have been described with their advantages and disadvantages. Also there is focus on the procedure to solve any software issue with the help of above mentioned techniques.

Keywords— Voice Over Internet Protocol, Quality of Service, Packet loss, Dimtrace, Core dump.

I. INTRODUCTION

The VoIP technology allows real time transmission of voice signals, through packets over IP (Internet Protocol). VoIP provides voice and video communications e.g. Skype to Skype call. The H323 and SIP protocol belong to peer-to-peer and MEGACO (Media Gateway Control) and MGCP (Media Gateway Control Protocols) are two important protocols that belong to master/slave protocol. A VOIP gateway is a device which converts telephony traffic into IP for transmission over data network [1].

The steps followed in originating a VoIP call are signaling and media channel setup, digitization of the analog voice signal, encoding, packetization and transmission of voice as IP packets. On the receiving side, similar steps in the reverse order such as reception of the IP packets, decoding of the packets and digital-to-analog conversion to reproduce the original voice are carried out [2]. Since the transmission of the packet occurs through an IP network, the quality of communications is less reliable than a circuit switched telephone network. There is no such network mechanism to ensure that data packets are not lost and are delivered in sequential order [3].

There are various components in VoIP system as End User Equipment, Network component, call processor, Gateway and Server. The VoIP Gateway is used to manage the traffic between IP network and the end points [4]. There are different types of hardware and software issues related to gateway. The hardware issues are rarely found. For example PCB (Printed Circuit Board) track issues, cooling fan issues, loose soldering joints. But the software issues like Call progress tones reported with the wrong duration, DSP hang under load, the Gateway system crash due to short packet and many more. To deal with these different types of issues various techniques are used.

The techniques include dimtrace analysis and core dump analysis which are discussed in detail in this paper. There is detail procedure which is followed to resolve the issues in VoIP gateway using any one of the above mentioned techniques. The dimtrace consist of the information related to various parameters of the modules of the gateway in the log format. The core dump analysis includes the memory files which contain the values of parameters related to the modules of the gateway which are extracted through Code Composer Studio (CCS).

II. QUALITY OF SERVICE (QOS) IN VOIP

The network's ability to provide better services which satisfy the customers is called QoS in VoIP [5].

1] Delay

Delay can be defined as the total time it takes since a person communicating another person, speaks words and hearing them at the other end. Delay can be categorized into three categories: delay at the source, delay at the receiver and network delay [5].

2] Jitter

In IP network, there is variation in packet's delivery time, which may give rise to transmission delay. This variation is known as jitter which has effect voice quality. Jitter may lead to the loss of voice packets. The acceptable level of jitter variation is less than 100ms in a network. Excess jitter results in breaking up of calls. Jitter can be reduced to a certain extent by use of jitter buffers [6].

3] Packet Loss

Packet loss occurs when one or more data packets fail to reach their destination. Packet loss can occur due to variety of reasons including link failure, high congestion levels, misrouted packets, buffer overflows and a number of other factors. Packet loss causes degradation in voice quality. Packet loss can be controlled using Packet Loss Concealment (PLC) techniques within the playback codec [7].

4] Echo

In VoIP, Echo occurs when caller at the sender side hears a reflection of his voice after he talks at the microphone. Echo that exists in VoIP is called acoustic Echo [8].

5] Throughput

The maximum bits received out of the total bits sent during an interval of time is called throughput. Throughput in VoIP depends on number of concurrent users and the codec used.

III. ISSUES IN VOIP GATEWAY

Gateways create connectivity of H.323 networks to various networks such as ISDN, PSTN, etc. The connectivity of networks is achieved by converting media format among the various networks and translating protocols for call setup and release. The issues in VoIP gateway are of two types i.e. hardware and software. The hardware issues for example PCB (Printed Circuit Board) track issues, cooling fan issues, loose soldering joints are rarely found. But the software issues like Call progress tones reported with the wrong duration, DSP hang under load and many more occur frequently. The key software issues are discussed as follows:

1] Call progress tones are reported with the wrong duration:

When the frequency is 550 Hz or lower, the issue is prominent. It looks like the degradation isn't linear – it either happens or it doesn't – for example, at 800, 750, 700, 650, 600 and 575 Hz, it detects 300 ms tone for approximately 320 ms. At 550 Hz and below it detects for less than 200 ms.

2] The Gateway system crashes due to short packet:

This is the case for UDP (User Datagram Protocol) length is less than 20 sent by DSP. UDP length '20' means the packet only have UDP / RTP (Real Time Protocol) header and no payload data.

3] One or more cores on that DSP report that they are not receiving any packets after reset:

This happens on all channels running on that particular DSP core. On the failing core, packets are always reported as being transmitted, but not received. This problem has something to do with improper DSP initialization somehow. It should not have anything to do with individual calls, because as mentioned when a DSP is reset and the "problem" happens it is only on 1 or 2 cores usually. The frequency of occurrence seems to vary, sometimes it happens more frequently, but more recently the problem is only seen once in a while upon a DSP reset.

4] Multiple RFC (Request For Comments) 2833 digit detections when packets arrive out of order:

There is a problem with RFC 2833 digit detection under certain network conditions. Specifically if the RTP packets arrive out of order the DSPs can report up more digits than are actually present.

5] DSP hang under load:

Periodically a DSP chip hangs and stops responding to any messages until reset. The only thing is that the system is under load so the DSPs are handling a lot of messages.

IV. TECHNIQUES TO ANALYZE THE ISSUE IN VOIP GATEWAY

There are two techniques to analyze the software issues in VoIP gateway. They are:

- 1] Dimtrace Analysis
- 2] Coredump Analysis

We will discuss these issues in detail.

1] Dimtrace Analysis:

A log containing all the information about the configurations that are required for the proper functioning of the gateway is called Dimtrace. It allows us to actually define the issue in a particular module of the Gateway. The procedure for dimtrace analysis is mentioned below:

- a] Firstly, the title of the issue is analyzed from theoretical point of view.
- b] The next step is to reproduce the issue by referring to the parameters mentioned in the dimtrace.
- c] The different modules of the DSP have specific parameters associated with each one of them.
- d] The suspected module which is likely to be associated with the issue is identified firstly to verify the parameters.
- e] The selection of the module depends on the experience of the person who is analyzing the issue. The well experienced person will choose the module which is exactly close to the one in which the issue has occurred. Selecting the exact module may take some time.
- f] Once the module with the issue is identified, the interdependent modules are also seen to analyze the issue further.
- g] Firstly, the module in which the exact issue has occurred is chosen from the dimtrace and the values from the dimtrace are configured to reproduce the issue.
- h] If still there is problem in reproduction of the issue, then the parameters of the interdependent modules are verified from the dimtrace to reproduce the issue further.
- i] Once the issue is reproduced the next step of root cause analysis is done and the issue is fixed and tested for the same fix.

The main advantage of this technique is that less amount of time is required to resolve the issues. The configuration related issues are fixed only by analyzing them from the dimtrace. The disadvantage is that expert or experienced resolver is required for the quick analysis of the issue using this technique.

2] Coredump Analysis:

Coredump are basically the memory files that contain the values of the parameters when the issue had occurred. The files required for the coredump analysis are image file, gel file. The image file is the output file whereas the gel files consist of DSP related initialization of the gateway.

- The steps followed for the coredump analysis are:
- a) Change the extension of .dump to .ext0
 - b) Change path into .bat file.
 - c) Execute .bat file. After that .dat files are created.
 - d) Open Code Composer Studio with following configuration:
 - i) C64x+
 - ii) Platform: Simulator
 - iii) Big Endian
 - e) Select C64x+ CPU Cycle Accurate Simulator, Big Endian
 - f) Load the image file
 - g) Load the .dat file
 - h) Load the .gel files
 - i) Run the simulation by specifying the number of channels for the respective build

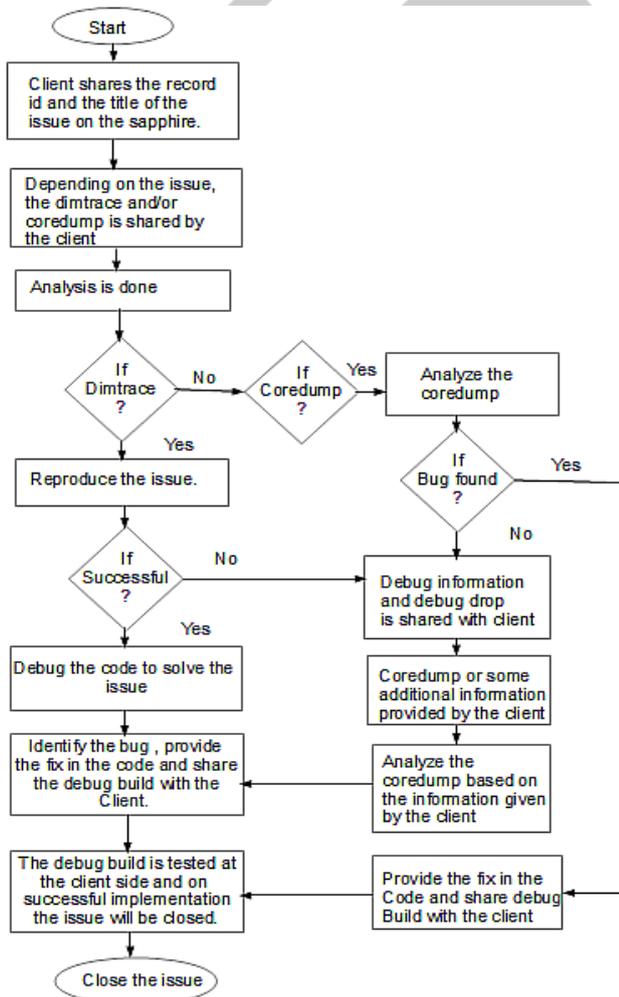
The above whole procedure will give you the values of the parameters when the issue had occurred. The suspected values are noted down by comparing it with the values in original case without the issue. The values are further checked in the code to specify the module in which the issue has occurred. And then the root cause analysis is done to fix the issue further.

This technique has the advantage of resolving the issues that directly influence the parameters of different modules of the DSP in gateway. Also there is no need of experience while using this technique. The major disadvantage is that number of days required to resolve issues are more as compared to the dimtrace analysis.

V. PROCEDURE TO RESOLVE THE ISSUE IN VOIP GATEWAY

The overall procedure to resolve the issue has been shown in the fig 1. The steps start with the client raising the issue either sharing the dimtrace or coredump. With the help of dimtrace or coredump by following the steps discussed above, the issue is reproduced. Further the bug is identified through root cause analysis and the image file with the fix of the issue is shared with the client. The client verifies and confirms for the fix and then closes the issue.

Fig.1. Flowchart of proposed steps for handling the issue



VI. CONCLUSION

This paper has given brief information about the various factors like delay, packet loss, jitter that affect the performance of the VoIP. The software issues in the gateway like Call progress tones reported with the wrong duration, DSP hang under load, the Gateway system crash due to short packet and many more are resolved using techniques of dimtrace analysis and core dump analysis. The dimtrace analysis resolves the issues related to configurations whereas the parameter related issues are resolved using coredump analysis. Lots of experience is required to use the dimtrace analysis as compared to coredump analysis. But dimtrace analysis is still preferred over the coredump analysis as more information is obtained from the logs of the dimtrace and less number of days are required to resolve the issues. Coredump requires more iteration to reproduce the issue hence its use is rarely preferred for issue analysis.

REFERENCES

- [1] Floriano De Rango. "Overview on VoIP: Subjective and Objective Measurement Methods", IJCSNS International Journal of Computer Science and Network Security, VOL.6 No.1B, January 2006.
- [2] Urjashee Shaw, Bobby Sharma, "A Survey Paper on Voice over Internet Protocol (VOIP)", International Journal of Computer Applications, Volume 139 No.2, April 2016
- [3] Troubleshooting Common issues in VOIP, Whitepaper, 2014.
- [4] Greg S Tucker, "Voice over Internet Protocol (VoIP) and security", October 2004.
- [5] P. M. Athina., A. T. Fouad and J. K. Mansour, "Assessing the Quality of Voice Communications Over Internet Backbones", IEEE/ACM Transactions on Networking, Vol. 11, No. 5, Oct. 2003.
- [6] Qiu, P.Q., Monkewich, O., and Probert, R.L., "SIP Vulnerabilities Testing in Session Establishment and User Registration" ICETE (2), 223 - 229, 2004.
- [7] J. B. Meisel, M. Needles, Voice over Internet protocol (VoIP) development and public policy implications, Info 7, 2005.
- [8] Advisory Committee on International Communications and Information Policy (ACICIP), 2005.

