Asterisk Based IP-PBX Cost Efficient Server For Small Organization

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Abstract— This paper describes IP-PBX server for small business organization based on Asterisk one of the first open source PBX software package. The traditional EPABX system can be replaced by Internet Protocol Private Branch Exchange (IP-PBX) which uses intranet as backbone as each organization has existing Local Area Network. IP-PBX is cost efficient and uses only one computer as a server having Linux based operating system called "CentOS". The clients are connected to server using hard/soft phones. Communication in the range of WiFi is also possible.

Keywords- *Asterisk, IP-PBX (Internet Protocol Private Branch Exchange), CentOS.*

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I. INTRODUCTION

The Electronic Private Automatic Branch Exchange (EPABX) is used by most of the organizations for telephony communication with internal employees and with the outside word. It is a phone line sharing device and lets you connect the extension. It resembles a mini telephony exchange. The user extension is connected with copper cables to the central electronic system. If there are two telephone lines they can be divided into eight lines and the incoming and outgoing calling can be done by using these eight numbers at same time. But EPABX is less secured and less flexible. Moreover EPABX uses lot of maintenance work and also require extra wiring and hardware for new user extension[4]. To overcome this, traditional EPABX is replaced by Internet Protocol Private Branch Exchange (IP-PBX).

Voice over Internet Protocol (VoIP) has become a very widespread technology during last decade [7]. The great development of VoIP protocols and codecs has enabled a remarkable change in the transmission of vocal communications, evolving from circuit switching to a more efficient packet switching model [5][6].

In IP-PBX system communication can be done by using computers and/or laptops and IP phones and also using smart phones having Wi-Fi facility. This technology reduces the time of installation and configuration, it does not require that much man power as EPBX system. It is easy to install and configure than proprietary phone systems. IP-PBX is cost efficient. One of the main advantage of IP-PBX is the fact that it employees important data and voice network. This means that internet access as well as VoIP communication and traditional telephone communication all are possible using a single line to each user, this provides flexibility as an enterprise grows and reduces maintenance cost.

II. BASIC IDEA

The VoIP PBX system for organization use the backbone of Local Area Network on which the extensions where configured using computer system [1].

Figure1: Local Area Network.

There is a central sever called IPPBX sever and the user get connected through their computers and/or laptops via a software called softphone. The softphone can act as a user extension number which could also run on mobile phones who has Wi-Fi facility. To design IP PBX server, for this a Linux based operating system called "CentOS" is used. The main feature of the operating system is sophisticated installation and configuration of the system. Moreover it is easy to add and delete user extension and is flexible to move the user extension without disturbing the existing network. This operating system consists of telephony package called "Asterisk".

III. OVERVIEW OF ASTERISK

Asterisk is one of the first open source PBX software package that runs on wide variety of operating systems. It was created by 'Mark Spencer' in 1999 who later formed a company named 'Digium', which is currently one of the leading providers of open source solution in telecommunication space.

Asterisk can be used to make or take calls either with PSTN or VoIP. It lets us built PBXs with the kind of features that otherwise would cost thousands of dollars. With Asterisk the source code is in the hands of user and it can be customized as required. It can do things that normal IP-PBX cannot. Asterisk was published under the GPL, making it exceedingly flexible and allowing all users to view and change the source code to adapt the PBX to their own needs. New

functions can easily added and integrated into Asterisk. Hence it is popular.

Asterisk supports various VoIP protocols such as SIP, SCCP, H.323. It can be connected with IP network and with existent telephone networks via digital/analog interface. This package consists of several features such as Interactive Voice Response (IVR), Phonebook, Ring Group, Voice mail, Call waiting, Conference calling, Call hold, Call transfer, Do Not Disturb (DND), Voice Messaging, Call Block, Call Forwarding.[2][3]

IV. NETWORK ARCHITECTURE

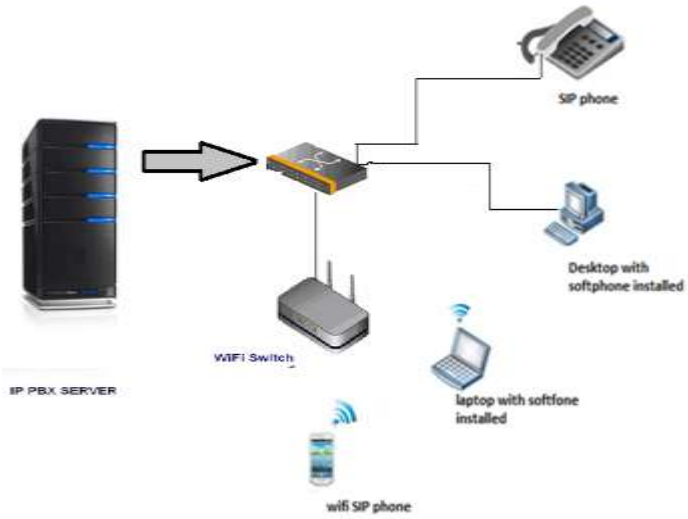

Figure2: Network Architecture

Network Architecture of IP-PBX is shown in figure2. Centrally we have IP-PBX server. It communicates with SIP phones which can be hardware or software based. Hardware based SIP phone look and behave just like normal phone. Software based SIP phones are installed on computer or laptops and uses computer headset as USB phone. For external communication VoIP gateways are used. Here switch is used to connect SIP phones together with IP-PBX sever. WiFi router is used to make communication possible for Wi-Fi phones.

V. IMPLEMENTATION OF IP-PBX

A. *Installation of Operating System*

Linux based operating system called "CentOS" is installed. During installation we require open source PBX software package "Asterisk". Without this package sever cannot proceed, hence we select this package during installation.

B. *Extension Configuration*

Once the server is installed, extension configuration can be done. Select SIP device and add SIP extension. A new extension is added by giving the user extension number and password for the extension. Figure3 shows the data flow diagram for user registration. Depending on the hardware configuration we can create more than 10,000 extensions.

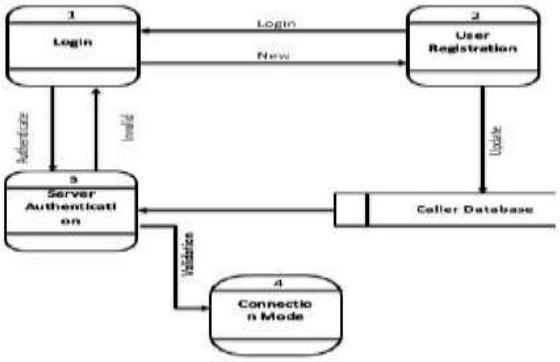

Figure3: Data Flow Diagram For User Registration

C. *SIP Phones Configuration*

Softphone is configured on user system which might be windows, Linux or Mac. For this X-lite software is used. Figure4 shows X-Lite softphone. After the installation, by entering the details in SIP proxy setting, the extension which is created in server is configured. Similarly configure the other extensions on the different user machine. Calling can be done between different user extensions.

Figure4: X-Lite Softphone

D. Wi-Fi Based Phone Configuration

Calling can also be done using Wi-Fi based phones. With IP-PBX server we cannot use our phone keypad, for calling. For this we have to install the mobile application i.e. CSIP SIMPLE. This application is used for calling. This application is VoIP application for Google Android operating system using SIP. It is an open source and free software released under the GNU General Public License.

Figure5: Calling in the range of Wi-Fi

VI. CONCLUSION

This paper describe IP-PBX server for small organization based on Asterisk which is a open source PBX software package which runs on a wide variety of operating system. This is a cost efficient system and is easy to maintain as it does not require extra hardware or wiring. It is flexible and easy to use. Even if the called user is busy or offline the calling user is able to send voicemail to the called user. Communication can also be done in the range of Wi-Fi, using devices such as laptops or smart phones. The communication within the organization will be without using SIM card and free of charge.

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