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Asterisk WiFi portable Voice Calling System using ARM11

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Abstract

An Internet Protocol Based Private Branch Exchange System consists of one or more SIP (Session Initiation Protocol) phones. The IP PBX server functions in a similar manner to a proxy server: SIP clients, being soft phone or hardware-based phones, register with the IP PBX server, and when user wishes to make a call user ask the IP PBX to establish the connection. The IP PBX has a directory of all phones/users and their corresponding SIPs address and thus is able to connect an internal call. An IP PBX is a complete telephony system that provides telephone calls over IP data networks.

All conversations are sent as data packets over the network. IP PBX can enable each and every employee/person in an organization to be provided with a voice extension, thereby multiplying his/ her productivity. Easier to manage the routine operations because of web/Graphical User Interface based configuration interface. It eliminates phone wiring as it uses existing network. There is no need to disrupt current external communication infrastructure and operations

Keywords: Asterisk, SIP, VoIP, Raspberry, USB handset

1. Introduction

The VoIP PBX system for the organization use the backbone of Local Area Network on which the extensions were configured using computer system. The "TrixBos" server is the Linux based and the clients were the windows based or Linux based using the "soft phone" for the communication. The VoIP telephone devices can be used instead of soft phone such as USB handset and Hard phone. The USB handset is the plug & play telephone which doesn't requires any specific driver to install. It uses the soft phone to run. The IP-PBX may use for a LAN where the outgoing VOIP calls will be send and the incoming calls will be come through the PBX system. We used only PC to PC communication for simulating the whole task. VOIP can be achieved on any data network that uses IP, like the Internet, Intranets and Local Area Networks (LAN).

As the modern telephone networks begun to take shape, private companies saw a greater reliance on telephone communication. Many decide to implement their own service so that they could handle calls internal to the organisation. The drawback of PBX system is that it require huge manpower, extra wiring for new connection and the extension are very difficult to manage.so instead of using PBX system the use of internet protocol which carries voice as a data called voice over internet protocol. Voice over internet protocol deals with the conversion of analog audio signal into the digital data and using internet protocol the digital data can be transmitted over the internet.

II. Objective

Designing of a Local area networking based server which allows two or three user s to communicate within an organization by providing extension.

III. Methodology

Centos Operating System- It is Linux Based Operating System. It is easy to use, easy to install, web based interfaces to setup, manage, maintain and support a complete IP-PBX system. Its Features are:

1) Call detail records

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- 2) Call recording, waiting
- 3) Caller ID
- 4) Dial by name
- 5) Voicemail
- 6) Music on hold
- 7) Blacklists Call forward on busy and on no answer

X-lite Soft phone – It is windows client telephony software. X-Lite is the market's leading free SIP based soft phone. X-Lite 3.0 is Counter Path's next-generation soft phone client, offering users all the productivity of a traditional telephone with desktop and mobile computer enhancements. Whether over wired or wireless connections, X-Lite supports a variety of headset devices to augment the modern telephony experience, severing the restrictive tethers of traditional, limited telephone receivers.

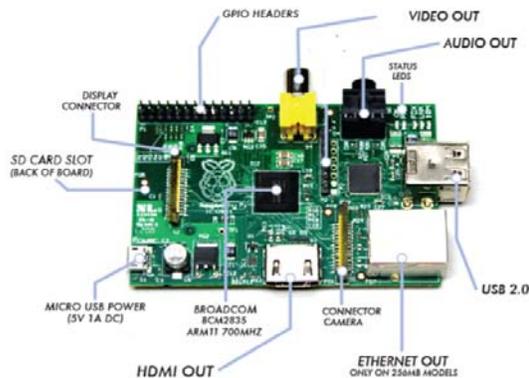


Fig 2. Architecture

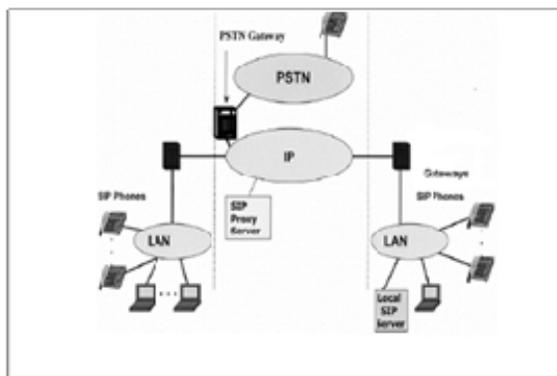


Fig.1: Local Area Networking Based PBX

IV. Working

The purest VoIP implementation uses IP capable end-user equipment such as IP phones or a computer and does not rely on a standard telephone switch. Figure is a simplified diagram of an IP telephone system connected to a wide area IP network. IP phones are connected to a LAN. Voice calls can be made locally over the LAN. The IP phones include codecs that digitize and encode (as well as decode) the speech. The IP phones also packetize and depacketize the encoded speech into IP packets. Calls between different sites can be made over the wide area IP network. Proxy servers perform IP phone registration and coordinate call signaling, especially between sites. Connections to the PSTN can be made through VoIP gateways.

V. Hardware Resources

- 1) The Raspberry Pi is a credit card-sized single-board computer developed in the UK by the Raspberry Pi Foundation.
- 2) The Raspberry Pi has a Broadcom BCM2835 system on a chip (SoC), which includes an ARM1176JZF-S 700 MHz processor, with 512 megabytes of RAM.
- 3) It does not include a built-in hard disk or solid-state drive, but it uses an SD card for booting and persistent storage.

VI. Software Recourses

- 1) Linux based Operating System - CentOS was initially released under the name RedHat. Digium is the Asterisk Company. Centos, formerly known as "Asterisk@Home", is a CentOS Linux distribution that provides an open source telephony package based on the famous Asterisk Voice-over-IP PBX. centos (formerly Asterisk@Home) is a software PBX based on Asterisk. CentOS CE's core technologies include:

- * **CentOS** - The Linux distribution on which centos is built.
- * **Asterisk** - Provides the core PBX functionality.
- * **FreePBX** - Provides a web interface for managing and configuring Asterisk through a web browser.

2) Asterisk - Asterisk is an open source framework for building communications applications. Asterisk turns an ordinary computer into a communications server. Asterisk powers IP PBX systems, VoIP gateways, conference servers and more. It is used by small businesses, large businesses, call centers, carriers and governments worldwide. Asterisk is free and open source. Asterisk is sponsored by Digium, the Asterisk Company. Asterisk provides a staggering list of capabilities and features including:

- IVR
- ACD
- Audio and Video Conferencing
- Voicemail
- Call Recording
- Fax termination
- CDR

3) Soft phone: C-Sip Simple for Android App

a)VoIP (example:- viber, whatsapp, Skype)
Voice over Internet Protocol (VoIP) is one of a family of internet technologies, communication protocols, and transmission technologies for delivery of voice communications and multimedia sessions over Internet Protocol (IP) networks, such as the Internet. Other terms frequently encountered and often used synonymously with VoIP are IP telephony, Internet telephony, voice over

broadband (VoBB), broadband telephony, and broadband phone.

4.2.1 Log in to Raspberry Pi we used Putty

On Windows you will need to download an SSH client. The most commonly used one is called Putty and can be downloaded from internet

Look for putty.exe under the heading For Windows on Intel x86.

It doesn't have an installer package; it's just a standalone .exe file. When you run it you'll see the configuration screen below:

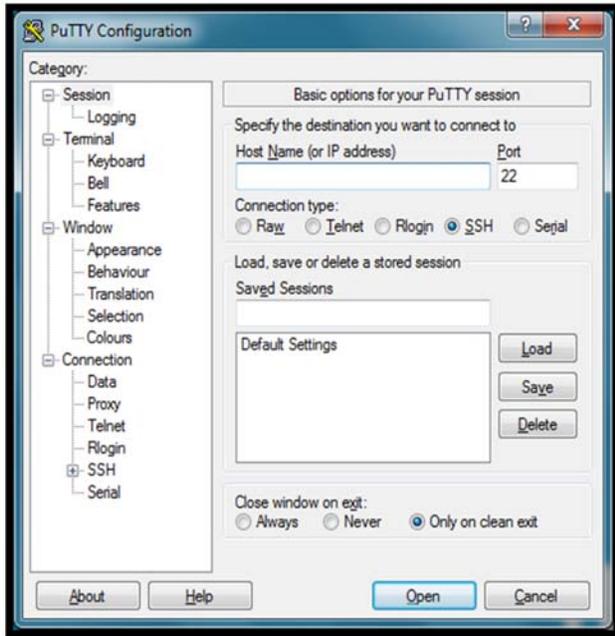


Fig. 4.2.1.1: Putty Configuration

Type the IP address of the Pi into the Host Name field and click the Open button. If nothing happens for a while when you click the Open button and eventually see a message saying Network error: Concnction timed out it's likely that you've entered the wrong IP address for the Pi.

If you don't know the IP address just type hostname -I in the Raspberry Pi command line. When the connection works you'll see this security warning (below), you can safely ignore it and click the Yes button. You'll only see this warning the first time when Putty connects to a Pi that it has never seen before.

VoIP that is Voice over Internet Protocol deals with the conversion of analog audio signals into the digital data that can be transmitted over the internet by using internet protocol. VoIP turns the standard network connection into the phone calls. Many organizations uses Electronic Private Branch Exchange System for the communication using extension numbers assigned to the users. It utilizes the man power and extra wiring for the installation as well as it doesn't support the advance facilities like call waiting, voicemail, caller ID etc.

b) SIP

SIP stands for Session Initiation Protocol. It is an application-layer control protocol which has been developed and designed within the IETF. The protocol has been

designed with easy implementation, good scalability, and flexibility in mind.

SIP is not the only protocol that the communicating devices will need. It is not meant to be a general purpose protocol. Purpose of SIP is just to make the communication possible, the communication itself must be achieved by another means (and possibly another protocol).

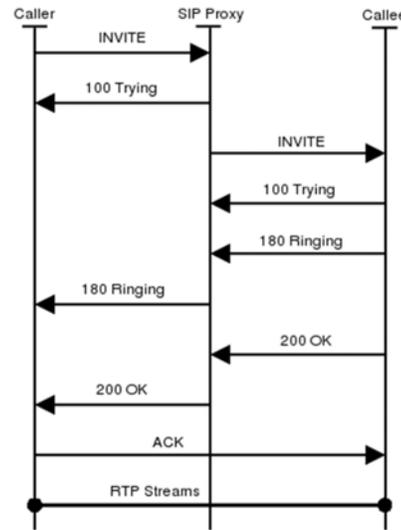


Fig. 4.2: INVITE Message Flow

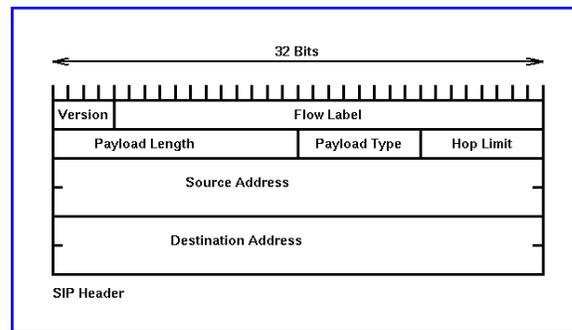
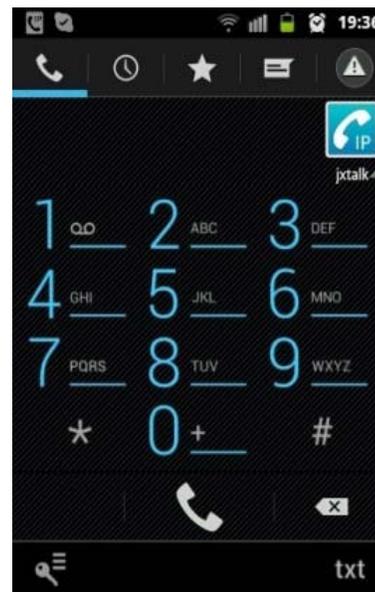


Fig. 4.3: sip in frame format



VII. Applications & Features of ARM 11 IPPBX

- 1) Low power consumption
- 2) 5V 1.2A (6W), May run on Solar Panel
- 3) Low Cost
- 4) Small in size
- 5) LAN / Wi-Fi based calling on
- 6) Android mobile phone calling
- 7) Desktop & laptop calling
- 8) Interactive Voice response

VII. Conclusion & Future Scope

This project describes one solution for a local PBX based on existing LAN hardware infrastructure. It is a low-cost and modular solution that completely meets its basic function, transporting of voice packets over IP networks. Since most of the processing is performed on a PC it provides a number of additional features.

The main advantage of the system, that it reduces the wiring cost as EAPBX system. The extensions can be easily created, deleted or shifted without disturbing the other communication. We can configure the system from any computer in the network using internet browser.

There were many advantages involved in our project:

- 01) Easy to manage using web
- 02) Voicemail facility if user is offline
- 03) Call waiting service
- 04) Audio-Video Conferencing
- 05) Wireless IP phone device
- 06) Low maintenance cost
- 07) Extensions can be created or deleted easily
- 08) Call cost reduction
- 09) No need of extra wiring
- 10) Much easier to install and configure than a proprietary phone system
- 11) Allows users to hot plug their phone anywhere in the office

The future work would include PBX system based on Wireless Network where the extensions are the wireless pocket device just like mobile phones having almost all the features of mobile phone. Mobile phones required the service provider but this system itself the service provider for the created extensions and most important that this system gives the service free of cost. There is a future research going on the feature of video with voice over Internet Protocol.

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