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ijirset@gmail.com

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A Portable VOIP Server Using Raspberry Pi

¹D.S.Eneeyasri, ²K.Vijaya

Student, Department of Computer Science and Engineering, Velalar College of Engineering and Technology, Thindal, Erode, India¹

Assistant Professor, Department of Computer Science and Engineering, Velalar College of Engineering and Technology, Thindal, Erode, India²

ABSTRACT: A network is a group of two or more computer systems that are linked together. Network computer devices that originate, route and terminate the data are called network nodes. Nodes can include hosts such as personal computers, phones, servers as well as networking hardware. Firewall is used to prevent the entire computer network and monitors the both incoming and outgoing packets. It also enables the content filtering, mac based ip for the network computers. Each of these techniques is implemented in a large sized servers and it is complicated to implement and maintain. A new server is developed with VoIP is implemented in a raspberry pi board which makes the implementation and maintenance of the server easy. VoIP is use to provide a free voice and video call with conference facility between the users in an intranet.

KEYWORDS: CentOS, VoIP, Raspberry pi, Compatible server.

I. INTRODUCTION

NETWORKING

In recent years there has been a push by telecommunications service providers to move to Internet Protocol (IP) based telephony. Voice over Internet Protocol (VoIP) is used to reduce telephone call cost and it is possible via an Internet connection by using a VoIP phone adapter or a computer application. This allows the connection to an Internet Telephone Service Provider (ITSP) to make free or low cost VoIP calls to the Public Switched Telephone Network (PSTN) worldwide. Such systems work by converting the analog signal to a digital format that is sent over the Internet. A VoIP user desiring to call regular PSTN numbers, must first establish an account with an ITSP which then enables VoIP calls via their analog telephone, computer, or mobile device software. VoIP users are able to make free calls to other users of the ITSP system and local, long distance, and international calls to PSTN numbers for a fraction of what it costs via traditional PSTN.

Over the course of the last few decades, the Internet has matured into a repository of human knowledge, a medium for dissemination of ideas, and more generally, an all-encompassing portal for planet-scale connectivity. It has also become an integral part of the global economy. So much so that in the period between 2006 and 2012, it accounted for 26% of Gross Domestic Product (GDP) growth in developed countries. In addition, maturity in the Internet ecosystem has resulted in a higher standard of life. This Internet blackout can be attributed to a set of technological, social, and economic factors. To bridge this connectivity gap, researchers, social entrepreneurs, and industry specialists have explored and deployed a number of radical solutions. These range from wireless networks driven by WiMAX, satellite, ZigBee, long-distance Wi-Fi, wireless mesh, and cellular links to wired technologies enabled by optical, dial-up, and analog cable networks. These backbone and last mile access network technologies are augmented by a similarly rich array of conventional and unconventional optimizations, including aggressive caching, pre-fetching and offline access, Peer to Peer (P2P) content sharing, and village level kiosks. Unfortunately, Internet backbone connectivity is still a bottleneck factor due to its high-cost.

RASPBERRY PI

The engineers with a pragmatic approach are the biggest boon to a society. The application of ideas, theories and new innovations is what drives them. For years the work was done on Adriano boards but with the launch of the very cheap Raspberry Pi it all changed. Raspberry Pi's inception began in 2006 it was finally released on 19 February 2012 as two models: Model A and Model B. After the sale of 3 million units in May 2014, the latest Model B+ was announced in July 2014. It contains many minor improvements based on the user suggestions without any increase in price.



Raspberry Pi board costs only \$35 and does the work of a computer costing hundreds of dollars. Though its purpose is not to replace computers, laptops etc. but to work in supplement with them. This card is stunning in style and design and its looks aren't far away from a James Bond style gadget. Boot it up, and you have a got a fully functional powerhouse. Grab a four gigabyte SD card and flash it with the free Linux based operating system on the Raspberry Pi Foundation's website. Put the SD card into the slot, apply power, and you've got a 700 megahertz workstation with hardware accelerated 3-D graphics something that would have been state of the art in 2001 and set you back several thousand dollars.

Computers are now utilities essential for communicating, entertainment, and accessing all kinds of business and government services. But in the process of becoming so crucial, computers have become increasingly locked down. It's not impossible to tinker with the guts of a computer running Windows or Mac OS, but it's tricky and getting trickier with every new release. It's also risky if you depend on the machine to do your homework. And few kids have the courage to seriously mess with Dad's computer. But parents generally condone this behaviour.

The Raspberry Pi offers another path: encouraging experimentation by lowering the cost of accidentally breaking when you're trying to be making. The computer was conceived of by Eben Upton, formerly a lecturer at the University of Cambridge, U.K., who created the Raspberry Pi Foundation to make it a real product. Upton is also a veteran of several years at chip maker Broadcom, designing the kind of chips that make it possible to sell a complete computer for \$35. It is a small computer, same as the computers with which you're already familiar. It uses a many different kinds of processors, so can't install Microsoft Windows on it. But can install several versions of the Linux operating system that appear and feel very much like Windows.

The device use the ARM processor which does nearly all of the hard work in order to run the Raspberry Pi. RASPBIAN, PIDORA, OPENELEC, RASPBMC, RISC OS, CENT OS, WINDOWS 10 IOT and ARCH LINUX these are few software's which are used. All this software's can be downloaded easily and these are free from the official forum under the NOOBS (new out of the box software) category. It supports Python as the main programming language for functioning and coding. It also supports BASIC, C, C++, JAVA, and Perl and Ruby languages.

II. LITERATURE SURVEY

TELECOMMUNICATION SYSTEM USING SIP [1]

Voice over Internet Protocol (VoIP) technologies is integral to modern telecommunications because of their advanced features, flexibility, and economic benefits. Internet Service Providers initially promoted these technologies by providing low cost local and international calling. At present, there is also a great deal of interest in using IP-based technologies to replace traditional small and large office telephone systems that use traditional PBX's (Private Branch exchange). Unfortunately, the large majority of the emerging VoIP based office telephone systems have followed the centralized design of traditional public and private telephone systems in which all the intelligence in the system is at the core, with quite expensive hardware and software components and appropriate redundancy for adequate levels of reliability. In this paper, it is argued that a centralized model for an IP-based telecommunications system fails to exploit the full capabilities of Internet-inspired communications and that, very simple, inexpensive, elegant and flexible solutions are possible by deliberately avoiding the centralized approach. This paper describes the design, philosophy and implementation of a prototype for a fully distributed IP-based Telecommunication System (IPTS) that provides the essential feature set for office and home telecommunications, including IP-based long-distance and local calling, and with the support for video as well as data and text. The prototype system was implemented with an Internet-inspired distributed design using open source software, with appropriate customizations and configurations.

TECHNOLOGY OF RASPBERRY PI[2]

The Raspberry Pi is a very powerful, small computer having the dimensions of credit card which is invented with the hope of inspiring generation of learners to be creative. This computer uses ARM (Advanced RISC Machines) processor, the processor at the heart of the Raspberry Pi system is a Broadcom BCM2835 system-on-chip (SoC) multimedia processor. This review paper provides a description of the raspberry pi technology which is a very powerful computer. Also it introduces the overall system architecture and the design of hardware components are presented in details. It uses a many different kinds of processors, so can't install Microsoft Windows on it. But can install several versions of the Linux operating system that appear and feel very much like Windows.

Raspberry Pi is also used to surf the internet, to send an email to write a letter using a word processor, but you can to do so much more. Simple to use but powerful, affordable and in addition difficult to break, Raspberry Pi is the perfect device for aspiring computer scientists. This small computer features amazing HD (high-definition) quality, video playback, also sports high quality audio and has the capability to play 3D games.



The device use the ARM processor which does nearly all of the hard work in order to run the Raspberry Pi. RASPBIAN, PIDORA, OPENELEC, RASPBMC, RISC OS, and ARCH LINUX these are few software's which are used. All this software's can be downloaded easily and these are free from the official forum under the NOOBS (new out of the box software) category. It supports Python as the main programming language for functioning and coding. It also supports BASIC, C, C++, JAVA, and Perl and Ruby languages.

VIRTUAL PRIVATE NETWORK SERVER USING RASPBERRY PI [3]

VPN-Despite the fact that the device is connected to an open Wi-Fi network, this project seeks to secure security details. One can easily utilise the Raspberry Pi Proxy server while connected to the unsecured Wi-Fi network, allowing your network to courageously use accessible Wi-Fi after interconnecting to a Raspberry Pi VPN server. Here far more intriguing aspect is using the Internet of Things to connect all devices with the home organization. Individuals that travel frequently are aware of this type of issue. Similar difficulties prompted everyone can build a VPN server in a Raspberry Pi. By using a Raspberry Pi as a VPN, you can demonstrate it, a NORD VPN installation. For expanded security, utilization of a Virtual Private Network (VPN) is frequently prescribed while associated with a public organization, particularly for touchy information. People can look over an assortment of VPN suppliers today, however they are generally needed to download a product for every one of their gadgets they need to associate with the VPN. My task includes the utilization of a Raspberry Pi filling in as a VPN switch to give secure web admittance to associated gadgets. The Pi is associated with the web by means of either a remote or wired ethernet interface, and thus gives a VPN association through a remote passageway. At the point when a PC or cell phone interfaces with the Pi, all traffic is directed through the VPN burrow prior to arriving at the web. The point of organization VPN Router is to impart information to different gadgets on the nearby organization. The information put away is unlimited as far as organization and documents that should be hung on. Because programmers as well as additional hacking software program use channel 22 for getting close to the server, this resolve be the standard channel; nevertheless, the Internet protocol drive not be constant while setup. If your switch has never been restarted, or if it is switched off, it will be assigned a DHCP address. Watching movies, responding to a slew of requirements, and so on are all instances of extreme load data. Clients can use the Raspberry Pi's system configuration file to show the home catalogues as VPN networks. Raspberry Pi's greatest benefit is surely its low cost. Raspberry Pi's greatest benefit is surely its low cost. Contrasted with involving a total Linux PC as a VPN server, both the buy and running expenses are altogether lower. The gadget is likewise fit for remaining associated with an organization day in and day out, without cooling and negligible power utilization, keeping up with the uprightness of your VPN tunnel. Another significant benefit is that NORD VPN. Since there are more tricks and programmers in this present reality, remote innovation frameworks are very powerless and they can be handily altered by programmers and they are available to interchanges that can be safeguarded from cyber attacks. Clients require a private meeting every time they interact with a mysterious company. The initiative provides us with the information we need to established up a VPN on a Raspberry Pi, a little computer that offers us complete switch over estimated device

A REVIEW ON RASPBERRY PI [4]

The Raspberry Pi is a very powerful computer having the dimensions of a business card. The application of ideas, theories, and new innovations is what drives them. For years the work was done on Adriano boards but with the launch of the very cheap Raspberry Pi it all changed. Raspberry Pi's inception began in 2006 it was finally released on 19 February 2012 as two models: Model A and Model B. After the sale of 3 million units in May 2014, the latest Model B+ was announced in July 2014.

It contains many minor improvements based on the user suggestions without any increase in price. Raspberry Pi board costs only \$35 and does the work of a computer costing hundreds of dollars. Though its purpose is not to replace computers, laptops etc., but to work in supplement with them. This card is stunning in style and design and its looks aren't far away from a James Bond style gadget. Boot it up, and you have a got a fully functional powerhouse. Grab a four-gigabyte SD card and flash it with the free Linux-based operating system on the Raspberry Pi Foundation's website. Put the SD card into the slot, apply power, and you've got a 700 megahertz workstation with hardware accelerated 3-D graphics—something that would have been state-of-the-art in 2001 and set you backs several thousand dollars. Computers are now utilities essential for communicating, entertainment, and accessing all kinds of business and government services. But in the process of becoming so crucial, computers have become increasingly locked-down. It's not impossible to tinker with the guts of a computer running Windows or Mac OS, but it's tricky and getting trickier with every new release. It's also risky if you depend on the machine to do your homework. And few kids have the courage to seriously mess with Dad's computer. But parents generally condone this behaviour.



The Raspberry Pi offers another path: encouraging experimentation by lowering the cost of accidentally breaking when you're trying to be making. The computer was conceived of by Eben Upton, formerly a lecturer at the University of Cambridge, U.K., who created the Raspberry Pi Foundation to make it a real product. Upton is also a veteran of several years at chip maker Broadcom, designing the kind of chips that make it possible to sell a complete computer for \$35.

EDUCATIONAL MANUAL OF RASPBERRY PI[5]

The Raspberry Pi is a computer, very like the computers with which you're already familiar. It uses a different kind of processor, so you can't install Microsoft Windows on it. But you can install several versions of the Linux operating system that look and feel very much like Windows. If you want to, you can use the Raspberry Pi to surf the internet, send an email or write a letter using a word processor. But you can also do so much more. Easy to use but powerful, affordable and (as long as you're careful) difficult to break, the Raspberry Pi is the perfect tool for aspiring computer scientists. What do we mean by computer science? We mean learning how computers work so you can make them do what you want them to do, not what someone else thinks you should do with them. And who do we mean by computer scientists? We mean you. You may finish this manual and decide you want to be next Tim Berners Lee, but even if you don't, we hope you have fun, learn something new and get a feel for how computers work.

SYSTEM METHODOLOGY

Now day's servers are large in size and hard to maintain and update. All institutions/organization uses a PSTN (Public Switched Telephone Network), which is used to provide an intercom facility within the institutions/organizations for a pay of some amount for that service. But in this we can exchange a data in form of voice only and it needs high cost for implementation and maintenance on this. Major part on this system was maintenance; because all the nodes are connected with a telephonic cable only so if there any fault accrued means the recovery solution was difficult to find and resolve. It requires n number of phones for n number of users;so it requires high amount for the implementation and maintenance. In this system there is possible for cross talk or loss of data during the exchange of data in mode of voice.

Drawbacks of Existing System

- ❖ Needs individual servers for each technique.
- ❖ High cost to implement.
- ❖ Needs larger space for implementation.
- ❖ Hard to upgrade and maintain the server.
- ❖ High power consumption due to individual servers.

In Proposed System, Raspberry pi is a very small computing device with affordable price and which is used to reduce the cost of implementation, space and maintenance issues in the computing environment. On this device we can implement the light weighted OS for the computation process. In this we are using centos in this device to enables the VoIP. Reason for choosing the centos for this device was both the communicational and security packages are available and easy to setup and configure for any type of the network. Communicational packages are used to establish the communication between all the connected nodes and the transmission of the data is based on text, voice and video. Security packages are used to protect the entire network from the unrestricted and unauthorized users; it also enables the tracking of all transmission in the network.

In this VoIP was used to establish the intercom facility in the intranet for an organization/industry or an institution. In existing system we can exchange only voice in the intercom option but in this proposed we can exchange the voice as well as the video. This can be done by using the centos communicational packages and the audio and video codecs. Users can access this by using their unique user id and secret key for their account. Only by this details only user will registered into the network otherwise they can't able to get the access. In this system users can able to make voice call, video call or a conference call in both voice and video; it has a capable of managing n number clients in a single channel due its communicational package's source of connectivity.

SYSTEM ARCHITECTURE

This section shows the all architecture diagrams which are used in this proposed system design. The list of architecture diagrams are

- ❖ Raspberry pi Architecture
- ❖ VoIP Architecture



RASPBERRY PI ARCHITECTURE

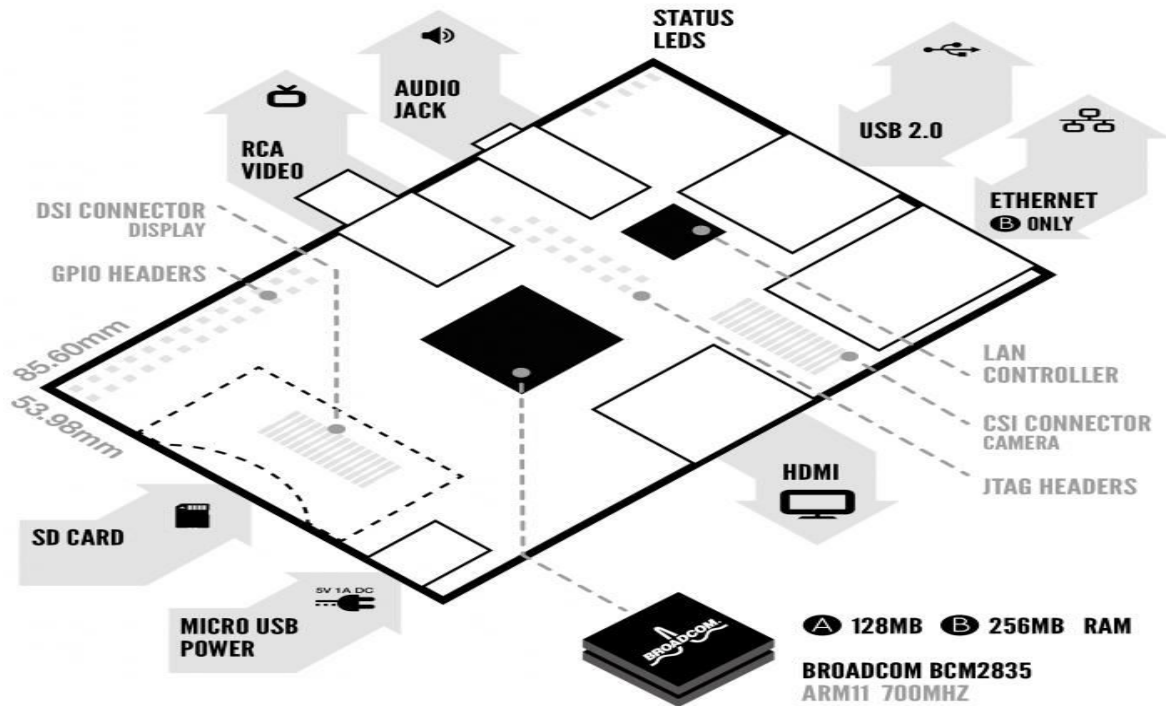


Figure 1.1 RASPBERRY-PI ARCHITECTURE

VOIP ARCHITECTURE

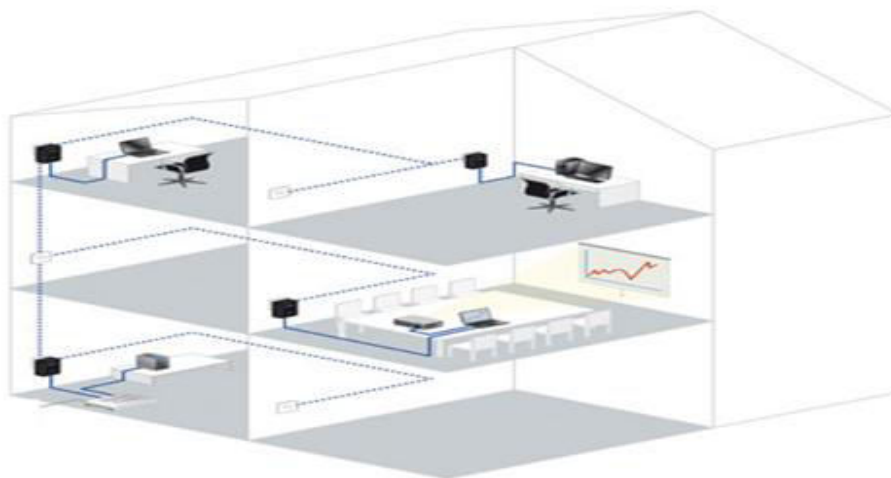


Figure 1.2 VOIP ARCHITECTURE



III. CONCLUSION

This project “A PORTABLE VOIP SERVER USING RASPBERRY PI” has been developed, tested and accepted. This is developed and run successfully to satisfy the industry/organizations. It has been proved that it is possible to implement the both voice and video calls in a single raspberry pi kit with good quality within the network. One challenging problem of paying rent for intercom usage communication is highly reduced in this proposed work through LAN communication. The proposed work shares the information through the Local Area Network without any intercom billing. The land-line inter-com is carried out using the video calling and conference calls. The internet based information sharing improves the data transfer rate with the minimal processing time. It also proved that by using this raspberry pi kit we can reduce the cost of implementing the servers like VOIP infrastructure. It ensures that the maintenance and the updating processes of this pi is very simple and easy comparing to the normal big sized servers.

This paper is developed a compatible and efficient server for VoIP server. In this system the performance of the firewall is in beginner level, so there is a need for improvements in the performance. VoIP allows particular voice and video codecs only, in future need to improve the quality of the codecs and as well as the number of codecs to support user’s voice and videos. Regarding its configuration up gradation is a necessary one, because this system is not suites for big networks due to its configuration. Over all security level of this server is low due firewall rules, because the firewall is set with the beginner level rules that can’t able control the unauthorized users and harmful attacks. So, to further we have to improve its performance, configuration and security levels.

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