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Development of Automatic Facsimile System Using IP Private Branch Exchange

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Abstract

This paper presents the designed and development of automatic facsimile system with an Interactive Voice Response (IVR) via Voice over Internet Protocol (VoIP) technology. This software has the ability to function as a PABX, which is expensive. With the system's development, the user can select to browse files from web pages, add a number of pages of documents, and fax number of the recipient. The system will generate a cover page and to create an auto call to a fax machine then the system will merge the cover page and the document file and send it out automatic. The result of testing system can be applied in accordance with the objectives set as well.

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Keywords: Facsimile system, Interactive Voice Response, VoIP, and PABX

1. Introduction

The importance of communication, telecommunication networks, telephone system, and the transmission of information are enormous in every organization, both for internal and external usage. Sending a fax message has been used for a long time and the fax machine is a popular device in many organizations. The machine is a device that can send a fax diagram map lines from the source to the destination, both domestically and abroad correctly like a copy of the data source. However, there are limitations in terms of quality, it may not be clear and there might be some form of distortion. Also it uses a lot of paper and it is costly to buy the machine.

This paper proposes an approach to solve such problems with the design and development of automatic facsimile system via Voice over Internet Protocol technology and this software has the ability function as a PABX, which is expensive. If the system is developed, the user can select to browse files from web pages add a number of pages of documents, and fax number of the recipient. The system will generate a cover page and can create an auto call to a fax machine. It will also merge the cover page and the document file and send it out automatic.

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2. Overview

VoIP (Voice over Internet Protocol) [1] is a new technology that allows us to get transmission via the Internet or Intranet. It requires a hardware equipment and a software. VoIP technology was invented by the Advance Research Project Agency Network (ARPANET) in 1973 and is a cost-saving technology. Its value-added network applications are useful and efficient. The performance of the VoIP converts the voice signal from the source in the form of small Packet sent to the recipient. It is based on the protocol at the Internet Protocol to transmit audio signal to the receiver.

VoIP technology is a voice communication via the Internet. It converts the audio signal from the sender to the analog to a digital signal through a network device and then forwarded via the Internet to the recipient. It then converts the signal back to a digital signal. It is a technology that can help reduce communication cost.

The protocol of VoIP [2] defines procedures, format and type of data used in communicating between devices. There are 2 protocols implemented on VoIP technology. These are the 1)SIP (Session Initiation Protocol) and 2) H.323 protocol. These 2 have important functions in the control connection. This research is developed through SIP system because it is a popular standard and the procedure is not complicated.

The Asterisk [3] is a software phone system IP-PBX perfect which can run on multiple operating systems such as Linux, Mac OS X, OpenBSD, FreeBSD and Sun Solaris. The PABX (Private Branch eXchange) is a high-quality built-in support Asterisk with VoIP (Voice over IP) protocols such as SIP, H.323, IAX, MGCP, SCCP, which supports a standard telephone equipment. Affordable hardware and Asterisk Open source are published under the GNU General Public License (GPL), which means that a free download Asterisk requirements can be used.

Ubuntu operating system [4] is a Linux Distribution built to the later development of Debian. Development sponsored by Canonical Ltd. The name 'Ubuntu' is derived from Zulu and Xhosa (the language in South Africa). It means "humanity towards others" in English. Ubuntu differed from Debian directly. Its new version is released every 6 months, and it has a duration of 18 months. The current version of Ubuntu is 9.10 code Karmic Koala.

3. Design and Development

3.1 VoIP systems to create the fax receiving and send to the E-mail.

Design and development of VoIP and Fax E-mail has been sent to different parts of the design in Fig. 1.



Fig. 1. Feature fax and sent to the recipient via Email

Diagrams for the flow of information and functionality. To start the sequence of Fig. 2.

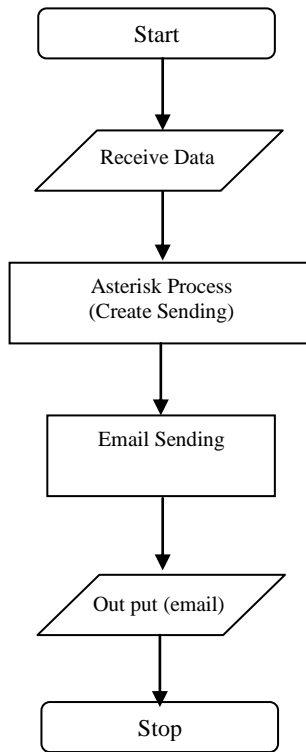
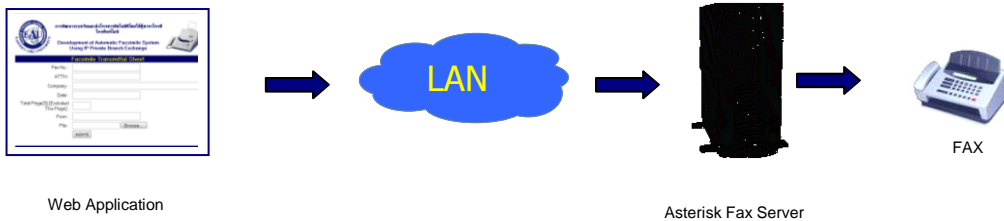


Fig. 2. Flow of information and get faxes sent to the recipient via Email

1. Users to send faxes from the fax machine.
2. System to scan and send documents to the Asterisk Server.
3. Asterisk Server detects the fax. Dial plan and process to be created.
4. Document is sent to the email address of the recipient.

3.2 VoIP systems to create the fax sent by webpage

Design Design and development of the webpage to the VoIP fax machine. Fax recipient. Has been designed in Fig. 3.



Data flow diagram

Fig. 3. To send a file from the webpage to the receiving fax machine

Diagrams for the flow of information and functionality. To start the sequence of Fig. 4.

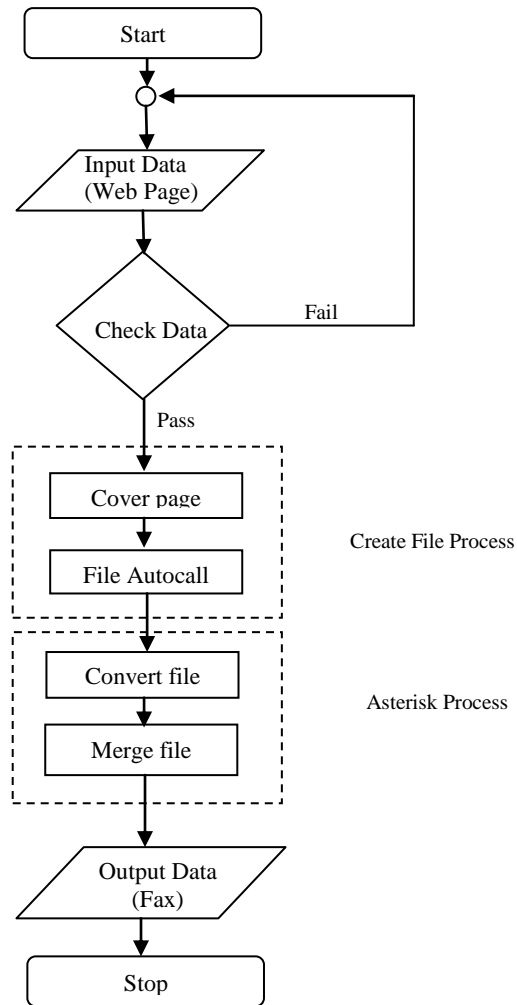


Fig.4. Data flow to send a file from the webpage to the receiving fax machine

1. Users browse the file you want to fax.
2. Program to create a cover page and create PDF files Autocall to run Asterisk automatic call.
3. Sent to the Asterisk Server and converted from a PDF file and then merge tif files, browse to the combination.
4. Sent the file to the recipient's fax machine.

3.3 Design and development of user interfaces for websites

This section is designed of a Graphic User Interface to make it easier to use. Browse by having the text and files that you want to send a fax by using HTML, PHP and Java script to help in the process of designing and developing user interfaces. This file is stored at / var / www /. The detail of design and development are as follows.

sendfax.html.

The screenshot displays a web browser window with a title bar. The main content area shows a form titled 'Facsimile Transmittal Sheet'. At the top left is a logo for 'FAI' (Faculty of Applied Information Technology) and the text 'Development of Automatic Facsimile System Using IP Private Branch Exchange'. The form fields are: Fax No. (with a red asterisk and note '*Number only and use "-" between Fax'), ATTN (with a red asterisk), Company, Date, Total Page(s) [Excluded This Page], From (with a red asterisk), and File (with a 'Browse...' button and a red asterisk). A 'Send Fax' button is located below the File field. At the bottom right, there is a footer with the name 'Miss Mulika Tawasin', Student ID 'S1411031', and 'Master of Science in Information Technology'. The browser's status bar at the bottom shows 'Done' and 'Internet'.

Fig.5. Webpage user interface to browse files to send fax.

3.4 Functional description of the file sendfax.html

The user of the site is required to complete the various fields and fields with an asterisk * are fields that users have to complete. If not completed, a message warning that the Fax No., ATTN, From the File will appear. After completing all the fields, users have to press the button to browse the file they want to send. When the users press the Send Fax button to send the file to send.php, it will create file to send to send.php to get the value from sendfax.html.

3.5 Functional description of the file send.php

Send.php begins the command to run the function to print values derived from sendfax.html into a cover page as a pdf file and convert the pdf cover page to .tif files. They then merge into a user browser file to send a fax. After pressing the send fax button, it will create an asterisk auto call to make a call to a fax number, and all the files in the asterisk server will be sent out to the recipient's fax machine.

Example command file send.php function to generate the cover page and made auto call

```
<?php
function Header()
{
    $this->Image('eaulogo.jpg',10,8,33);
    $this->SetFont('Arial','B',15);
    $this->Cll(72);
    $this->Cell(72,10,'Facsimile Transmittal Sheet',1,0,'c');
    $this->Ln(30);}

function Footer()
{
    $this->SetY(-15);
    $this->SetFont('Arial','T',8);
    $this->Cell(0,10,'Page '.$this->PageNo().':/{nb}',0,0,'C');}
for($i=0;$i<$j;$i++)
{
    $makeCall = fopen($splitFax[$i].".call","w");
    $str1="Channel:SIP/1000\n";
    fwrite($makeCall,$str1);
    $str1="Context:default\n";
    fwrite($makeCall,$str1);
    $str1="Extension:".$splitFax[$i]."\n";
    fwrite($makeCall,$str1);
    $str1="Priority:1\n";
    fwrite($makeCall,$str1);
    fclose($makeCall);
}
```

?>

Dial Plan

First, SIP Accounts in this set are defined by 2 numbers, 1000 and 2000, the number of user A and B, respectively. Second, the numbers for 5000 and 6000 and fax numbers 5001 and 6001 are set respectively, as shown in Fig. 6.

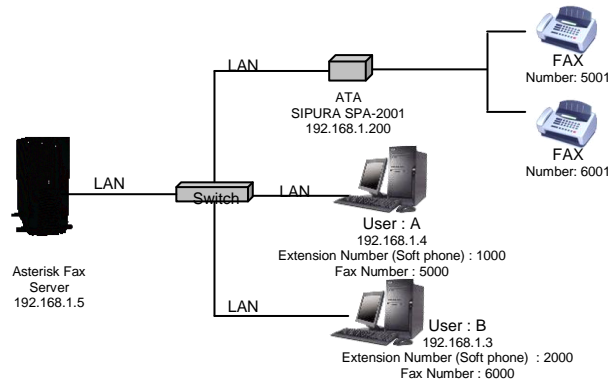


Fig. 6. Define SIP Account for User A and User B

Example Command File

```
[1000]
type=friend
username=1000
secret=1000
host=dynamic
qualify=yes
disallow=all
allow=ulaw
t38pt_udptl = yes
```

Example Command File for Dial Plan

```
exten=>1000,1,Dial(SIP/1000,15,r)
exten=>1000,n,hangup
exten=>2000,1,Dial(SIP/2000,15,r)
exten=>2000,n,hangup
exten => 5000,1,answer
exten => 5000,n,ReceiveFAX(/usr/src/fax_in.tif)
exten => 5000,n,System(mutt -s "Automatic Facsimile System" -a /usr/src/fax_in.tif -- mui@eau.ac.th<
/usr/src/mailmessage.txt)
exten => 5001,1,answer
exten => 5001,n,SendFAX(/usr/src/fax_out.tif,a)
```

4. The Results of Research and Testing

Test equipments have to be connected to a LAN Network with the same IP Address System to receive faxes and send to email recipients. Then, Dial Extensions 5000 by sending e-mail to User A mui @ localhost. When checking the mail to find a message from "root" Automatic Facsimail System, a text message "You received fax

from Automatic Facsimile System Using IP Private Branch Exchange” appears, you can get good results. The automated fax system using an IP PBX phone "and have a fax-in.tif attached” is illustrated in Fig. 7.

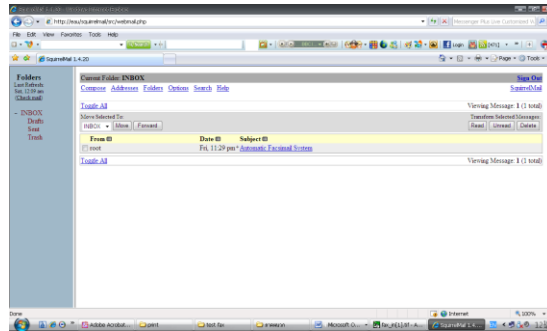


Fig.7. Mailboxes for User A

Open attachment using ACDSee to open the attached file will look like Fig. 8.

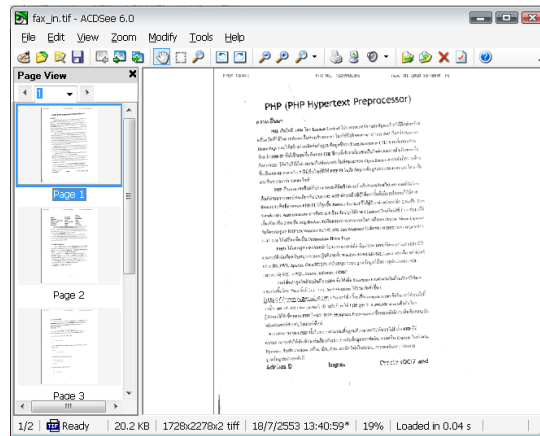


Fig. 8 The attachment in the mail box

The system can send faxes from a webpage to the recipient's fax machine by opening a web page with http://192.168.1.5/MS_project/sendfax.html. Fields marked with * are required to be filled in. Then browse the button to select the file you want to fax. The file is available in .tif and imageMAKER. The .tif file is shown in Fig. 9.

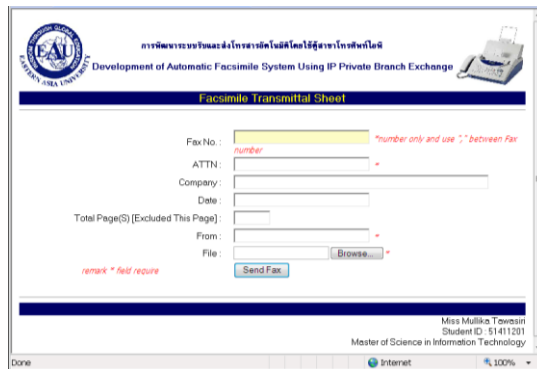


Fig. 9. Example of a Web page to fax

To check the validity of the statistical test used in the research, the documents via fax and received fax documents are tested using e-mail message. The results are as follows.

Table 1. Shows the test results submitted by fax and email recipients

Document 1 page	Document 3 page	Document 5 page	Document 7 page	Document 9 page	Cannot sent.	Total number of tests.	Accuracy %
3	3	3	3	3	0	15	100%

Table 2. Shows the results of the submission of the page

Document 1 page	Document 3 page	Document 5 page	Document 7 page	Document 9 page	Cannot sent.	Total number of tests.	Accuracy %
3	3	3	3	3	3	15	80%

The system can send a document from a fax machine to Asterisk Server and sent to the email address of the user as specified in the Dial plan correctly.

The system can send documents through the browser of the page. The sending can accommodate nine sheets if attachments.

5. Conclusion of the Study

This paper presents an automated fax system using an IP PBX phone. The VoIP technology is applied to the system of submission. Asterisk Server using a central user interface. In the document, the document can be obtained through the Asterisk Server and can be sent the document to the user's email as listed in the Dial plan correctly. The submission of the page to select files of the machines and systems to create a cover page and documents to be sent by fax to the fax number in the Dial plan. Functional testing of the system shows that the system is working correctly to the extent set forth. This makes it easier to use and reduce the consumption of paper.

Although this research cannot be achieved because of some limitations, the system should be developed to cover the following.

1. to receive and send faxes out through the PSTN or other VoIP providers too.
2. to be able to browse the files other than files .tif for faxing as well.
3. to allow users to set various parameters in the Dial Plan simply and easily. It should be characterized by the GUI (Graphic User Interface).

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