

“DO IT YOURSELF MOVES AND CHANGES” PBXOIP SYSTEM

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To my beloved husband and mother

## ABSTRAK

Pada masa sekarang, komunikasi adalah satu elemen yang penting di dalam perniagaan baik untuk organisasi yang besar ataupun yang kecil. Namun begitu, walaupun komunikasi ini penting untuk perniagaan, sistem telefoni seperti Private Branch Exchange (PBX) adalah mahal untuk diimplementasi. Walaupun terdapat teknologi komunikasi yang baru yang dinamakan Internet Protocol (IP) PBX yang lebih murah dari tradisional PBX, namun produk yang berada di pasaran masih mahal, susah untuk dikonfigurasi dan diselenggara. Private Branch Exchange over Internet Protocol atau PBXoIP System adalah satu kos efektif sistem yang menawarkan penyelesaian kepada masalah-masalah bagi produk IP PBX yang berada di pasaran. Sistem '*Lakukan sendiri perubahan atau pergerakan*' atau lebih komersil dikenali sebagai '*Do it yourself moves and changes*' PBXoIP System' mengandungi sistem pengurusan berasaskan web yang mesra pengguna di mana aplikasi penggunaannya dipermudahkan untuk membantu syarikat kecil dan sederhana untuk melakukan konfigurasi sendiri terhadap system PBXoIP mereka. Sistem ini dibangunkan untuk memberikan syarikat satu kemudahan sistem telekomunikasi yang lengkap pada harga yang murah.

## **ABSTRACT**

In this modern era, communication is an important element for organizations being it big organizations or small organizations. However, even though communication is crucial to business, telephony systems such as the PBX systems are expensive. IP PBX is another option for communication that is cheaper than the traditional PBX system, but the price is still high for small and medium enterprises to purchase. Most IP PBX solutions are hard to configure and maintained. Private Branch Exchange over Internet Protocol (PBXoIP) is a cost effective solution that does not only offer IP PBX communication, but also provide a user friendly web based management system that has been simplified for easy configuration. It is a “do it yourself moves and changes” PBXoIP system that helps organization to manage and control their PBXoIP. This feature is an advantage over other IP PBX solutions. PBXoIP is targeting to improve communication for small and medium enterprises for its cost effective and complete solution.

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**LIST OF ABBREVIATIONS**

PBX	Private Branch Exchange
VoIP	Voice Over IP
IP PBX	Internet Protocol Private Branch Exchange
SME	Small and Medium Enterprise
IVR	Interactive Voice Response
LAN	Local Area Network
WAN	Wide Area Network
PBXoIP	Private Branch Exchange Over Internet Protocol
IPT	Internet Protocol Telephony
PSTN	Private Switch Telephone Network
CAPEX	Capital Expenditure
SIP	Session Initiation Protocol
QoS	Quality of Service
VPN	Virtual Private Network
CTI	Computer Telephony Integration
MGCP	Media Gateway Control Protocol
IAX2	Inter-Asterisk Exchange2
IETF	Internet Engineering Task Force
TCP	Transmission Control Protocol
UDP	User Datagram Protocol
HTTP	Hypertext Transfer Protocol
API	Application Programming Interface
I/O	Input Output

ICT	Information Communication and Technology
DAGS	Demonstrator Application Grand Scheme
MSC	Multimedia Super Corridor
PERL	Practical Extraction and Report Language
TBD	To be defined
CPU	Central Processor Unit
UML	Unified Modelling Language

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## **CHAPTER 1**

### **PROJECT OVERVIEW**

#### **1.1 Introduction**

In this modern era, communication is crucial to business. Business and society are increasingly relying on a communication system such as traditional telephony Private Branch Exchange (PBX) system, Voice over IP (VoIP) service, or an Internet Protocol Private Branch Exchange (IP PBX) system.

Traditional telephony has underserved the small and medium enterprise (SME) market due to the high capital infrastructure and maintenance expense of on-premise PBX equipment and software. Because of the high up front cost of capital, until now the SME had to do without auto attendants, interactive voice response (IVR), intelligent call routing, call center and other sophisticated PBX features. Even large enterprises have been complaining that PBX systems are difficult to program and costly to adapt and extend to changing business requirements.

The telecom industry is changing and there are many forces driving to that change. IP PBX is a trend now as IP networks provide the richest possible software

development environment. Moving to an open trend, packet based PBX solves many of the problems mentioned above. A PBX and Local Area Network (LAN) typically serve only one building or part of a building. However, LANs can be inexpensively provisioned and LAN segments are easily subdivided using switching such as hubs or routers. IP telephony has also proven that packet voice can be supported on WAN.

Realizing that the trends are overwhelming has triggered an idea to come out with an IP PBX solution for SMEs. The project is called PBX over IP (PBXoIP) aims to give consumers a cost effective IP PBX solution taking advantage of the open system, as well as the packet based PBX that uses LAN infrastructure. PBXoIP includes a user friendly web-based management system for easy system configuration and maintenance. The project highly aims to give flexibility for users to control and manage the PBXoIP as an extra feature that most of the commercial products do not offer. It is a “do it yourself moves and changes” to their IP PBX’s system.

## **1.2 Problem Background**

Implementing IP PBX is easy, but getting them to work consistently, all the time and for all right reasons is not. That is not the answer for most people to hear, but the reality can be seen in the planning and initial homework that each organization completes before purchase (Matt, 2004).

The statement above indicates that each organization needs to hire or retain a skilled technical savvy staff to maintain their IP PBX’s system as commercial product do not offer simple application or interface to configure and control the system. Hiring and retaining a skilled IT staff to maintain the organization’s IP PBX

system is an expensive proposition. These expensive IT personnels definitely bring another cost issue especially in adaptation and extension to changing business requirements. Organizations will also need to spend more time planning and studying the configurations in order the planned system be working well.

In a public network environment, in order for products from different vendors to interoperate with each other, they need to conform to standards. However, most IP PBX systems do not have the flexibility to actually have a conversion mechanism to conform to another IP PBX's standard. This eventually has brought in an interoperability and inflexibility issues. Enterprises have to choose to use standards that are rapidly gaining more acceptances in the communication arena.

### **1.3 Problem Statement**

Current IP PBX solutions are expensive as it is built in to manufacturer or vendor specific components. This has eventually makes it inflexible and prohibitive to program and extend for enterprises.

Most solutions use Windows operating system or their own proprietary operating system as the platform, and very few uses open system. The solutions' applications for configuration were developed for highly skilled technical person. Without proper planning and homework, enterprises will have difficulties in the configuration. To save time in the implementation, enterprises have to rely on the vendor's support which eventually will result in lacking of control of the system for the enterprises.

In order to solve problems stated above, PBXoIP is proposing a cost effective solutions that provides comprehensive features as well as a user friendly “do it yourself moves and changes” web based management system that will benefit implementers such as the SMEs.

#### **1.4 Project Objective**

The objective of this project is to design a comprehensive IP PBX and cost effective solution named ‘Do it yourself moves and changes’ PBXoIP system by:

- i) integrating compatible IP PBX components that uses open system platform
- ii) developing a user friendly and simplified web based management system for non-technical personnel to accommodate easy maintenance and configurations of the system.
- iii) developing a total telecommunication solution that is at low cost and affordable to SMEs.

#### **1.5 Project Scopes**

The scopes for this project are as follows:

- i) To understand the overall concept and architecture of an IP PBX system.
- ii) To research on different IP PBX compatible components of hardware and software.

- iii) To design an IP PBX system by integrating the components. Testing should be done to check the compatibility.
- iv) To have a hands-on experience in configuring the integrated IP PBX system
- v) To develop a user friendly and simplified web based management system to accommodate with the PBXoIP configuration and control.
- vi) To implement a prototype system as a proof of concept for commercialization

## **1.6 Project Importance**

It is important to have good communication for enterprises to grow. Good communication will eventually bring in good business as enterprises could identify productivity improvements possible using commodity telephony systems, assess the business opportunity to raise customer satisfaction in voice services, develop a vision and business objectives for applying telephony advances and enhanced operational responsiveness.

The PBXoIP system is a very important project as it will eventually delivers a number of advantages especially to SMEs. The major advantages are as follows:

- i) Cost reduction – Providing a framework or a combination of different hardware components using an open system as the platform will create a solution at a fraction of the price of commercial IP PBX solutions. The deliverables of the project is important to cater the SMEs to have comprehensive and updated technology in communication at a lower cost
- ii) Development of valuable personnel – PBXoIP allows any user to take control of their phone system. The user friendly web based

management system will open up opportunity for non-technical personnel to be responsible for configuration and maintenance of the organization's system which will eventually higher up their skills and becomes valuable personnel to that organization.

- iii) Simplification of management issues – a web based management system will keep the organization's profile. The web based system will be available all the time; therefore will help the organization in managing the system. The availability, real time interaction and access will eventually simplify the management issues.

## **1.7 Summary**

This chapter describes the project overview as a whole. The objectives of the project have been identified based on the problems seen in the current scenario. The deliverables of this project has its importance as it is hoped to benefit enterprises especially the SMEs. Within a limitation of time, the project scopes have also been laid out with the hope that a prototype will be produced.