REMOTE SERVER MANAGEMENT USING

CELL PHONE TECHNOLOGIES

BY

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DECLARATION

I declare that this research project is my original work and has not been presented before or submitted anywhere for the ward of any degree. I also certify that this Research project contains no material written or published by other people unless where due reference is made and author duly acknowledged.

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AND have certified that all corrections that the Research project panel and examiners recommended have been fully addressed.

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ABSTRACT

Server management has the capability to provide configuration, operations, problem fixing and performance management services between the servers and clients in different locations on the network, this is basically a responsibility ensured by Systems Administrators but it acquires them to administer and be present at the site every time leading to excessive workload. However there exist remote server management (RSM) tools but they have some limitations which include slow performance and delay that lead to inefficient inherence in reactive problem solving, lack of operation, support and capability due to off-line internet access which could be supported by Short Message Services (SMS) operation.

Since these limitations do exist in the current systems then there is a need to suggest another application that can improve by applying remote server management while using a Cell Phone technology specifically SMS, which will help to track the server's configuration, performance and fault management in real time.

Key words: Remote Server Management (RSM), Cell Phone Technology, Short Message Services, Real Time Access

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DEDICATION

I dedicate this research to my lovely fiancé Lucy Wagenchi and my parents Mr. KatendeSamsbaker Zephaniah and Mrs. BettyKatende. Your presence in my life has always been a motivation.

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I humbly thank God the Almighty for the knowledge and wisdom that has enabled me to come this far in the production of this research.

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LIST OF ACRONYMS

DTMF   Dual Tone Multi Frequency

GSM   Global System Mobile

IP   Internet Protocol

IT   Information Technology

RSM   Remote Server Management

SA   System Administrator

SMS   Short Message Services

SMSC   Short Message Services Center

HLR   Home Location Register

ISA   Internet Security and Acceleration

Terms and Definition

Remote Server Management (RSM)-these are tools that are installed no the client machines and the servers for gathering information. The information collected from the client's locationregarding the software and hardware is sent to the information technology service provider. This provides a number of tools like support and user information through a complete interface, remote desktop monitoring and trouble ticket tracking. (http://www.techopedia.com, 2014)

Cell Phone Technology-A cellular phone is a telecommunication gadget that uses radio waves over a networked environment (cells) and is distributedvia a base station or cell site at a particular location, allowing calls to go through wirelessly over a wide range, to a fixed phone or through the world wide web, (http://www.techopedia.com, 2014)

Short Message Services-This is a service that is used to transmit messages over mobile phones. This is made up 160 characters in total per sent out, though some other services use 5-bit mode, which can be able to supportup to 224 characters. SMS was mostlymeant for mobile phones that have the capability to use GSM (Global System for Mobile) communication, but of current all the major companies that deal in cell phone technologies support it, (http://www.techterms.com, 2014)

Real Time Access -Relates to a system in which input and output of data is processed within milliseconds to enable immediate feedback to the process from which it is generating,(http://www.oxforddictionaries.com,2014)

CHAPTER ONE

1.1.   Introduction

The ability to manage servers remotely is critical for ease of administration and reduction in the number of open remote desktop connections Apple(2010). But for better management this will include interpreting, controlling and monitoring the behavior of resources to be distributed. In addition Ramilli and Prandini(2009) suggested that remote administration is a requirement for the vast majority of the network servers; in a manner that a service can run on the intended system, by either providing the system administrator with a remote access of the locally existing administration tools (e.g. remote terminal, remote desktop), or establishing a back-end for the running of the very complex commands transmitted through the corresponding front-end (e.g. web-based administration interfaces).

Remote checking, intelligent maintenance and control are the most vitalways for maximizing output and server management availability Ramamurthy et-al(2010). However Ahmad et-al(2011) suggested that Server Management improves the server virtualization by making it possible to run various applications and operating systems on small hardware resources in order to improve utilization.

Support services parties for server management include: Windows and Linux server, dedicated server, co-locaters and end users, whereas the server control services include immediate software upgrades, service monitoring, and expert knowledge with server problems(2014).

Most systems administrators use laptops/ desktops at their offices within working/ regular hourseven off-hours. Usually the work load done in off-hours is accomplished at their homes using a high-speed internet or dial-up connection for effectiveconnection, however to achieve this they rely heavily on the availablestandards set of available applications such as mobile phone, web browsers, email communication, and instant messaging.

However systems administrators' primarily source their information from the web with help of search engines and more web-based available tools for activities likeproblem monitoring, scheduling and timesheet reporting. These tools are categorized in three types: command-line, graphical system admin consoles and web-based administration tools. But systems administrators often manage their client machines through physical contact, rather than managing remotely using terminal application for monitor sharing tools and text-based access to interact with the computers normally as mentioned by Barrett et-al (2004).

Due to the fact that system's administrators work within a big, complex/ hard environments which provide significant technical, social, cognitive, and business problems that lead to excessive workload and extra working periods continuous and untimely, stated by Barrett et-al (2004). There is a way to motivate them in order to improve on their support, transformation and quality of life which is through remoteness by using remote server management agents that can help in some responsibilities of server operations.

Advantageously, one of the agents include remote server management while using a phone that involves flexibility, emergency support, visibility and quick response time usage which

help to reduce downtime, fix recurring problems, optimize IT services as first as possible and work across diverse and complicated environments in an integrated way, Pavlou et-al (2001).

Also home area networks provides communication among appliances, homemade systems, entertainment gadgets, and information equipment in a home so that they can operate cooperatively and use the same information; this is done through GSM based remote Monitoring and Control System in relation with microcontrollers. Ahmad et-al (2011).

1.2.   Problem Statement

Server management has the capability to provide configuration, operations, problem fixing and performance management services between the servers and clients in different locations on the network, this is basically a responsibility ensured by Systems Administrators but it acquires them to administer and be present at the site every time leading to excessive workload. However there exist RSM tools but they have some limitations which include slow performance and delay that lead to inefficient inherence in reactive problem solving, lack of operation, support and capability due to off-line internet access which could be supported by SMS operation.

Since these limitations do exist in the current systems then there is a need to suggest another application that can improve by applying remote server management while using a Cell Phone technology specifically SMS, which will help to track the server's configuration, performance and fault management in real time.

1.3. Objectives of the Study

1.3.1. General Objective

The general objective of this project is to use a cell phone technology in order to assist System Administrators and other IT personnel to remotely configure and maintain computer servers and their network client computers.

1.3.2. Specific Objectives

- To review the existing remote server management models.

- To design the proposed model for remote server management

- To implement a proposed model for remote server management

- To test and validate the designed model

1.4. Anticipated Outcomes

The application is anticipated to be capable of communicating, interpreting and executing the messages from the modem to the Server giving services to other clients; it implies that there will be timely and good performance of this RSM tool that will help to identify problems or any changes made and report to the administrator immediately.

1.5. Scope

The study is bound to cover a specific aspect of the GSM technology which will be the use of SMS (Short Message Service) for communication on the network between the different

interacting devices. It is a fast and relatively cheap means of interaction between distant devices in real time compared to other means.

1.6. Justification of the study

The project is aimed at using of the cell phone technology (SMS) by the system administrators to remotely configure and maintain the proper working of the servers and the network client machines in real time.By sending a message from his/ her mobile phone to the server having a modem that interpret the message as a command so as to cause a particular effect to either the server or the client machines.This will eliminate the use of web based applications which required you to have internet on your device in order to configure the servers and this was expensive and inaccessible in some part of the country.

CHAPTER TWO: LITERATURE REVIEW

2.1.   Introduction

In this chapter we define and compare the existing remote server management tools/models used by different individuals including the systems administrators, shows the exemplary studies and concludes with the research gaps and limitations existing in the current tools/models used.

2.2.   Remote Server Management

With Remote server management, this is basically a process that involves two different roles, with one party being the manager (sender) of management commands and the agent (recipient), on the other end. Here the partycontrolling the service platform is the operator (server) and themanager of the service platform getting the management instructions is known as the management agent (client) as defined by Kyuchang et-al (2008).

The client/ server environment currently with the growing needs of dialup or remote access has generatedthe need for the implementation of remote application access and so this has brought out the need of increased security at this point (Ronak and Sudha, 2011). However Ahmad et-al (2011) suggested that Remote configuration and the control of the equipment is one of the fields where by a software can be developed to make life better for System Administrators.

2.3. Remote Server Management Types Tools

Emerson et-al (2007) suggested a vital aspect of effectively managing a large and complex computer network is to increaseon the amount of analysis and repair that can be done remotely. Remote sever management tools are used to facilitate, analyze and service server problems also help to maintain a network in good working order by the network management personnel.

While using these tools, a System administrator may find problems and in some particular cases, problems are solved without any delay and expense that accompanies any of the on-site service call to a distant location, added by Emerson et-al(2007).

This section describes the existing tools used in relation to Remote Server Management; these tools are mostly classified into three categories which include; command-line tools, graphical system admin consoles and web-based administration tools as outlined by Barrett et-al (2004).

2.3.1. Command-line tools:

These are tools used for interacting between the computer programand the human user, or between applications like where the user/ operator (or client) gives the commands using a line of text (a command line) to a computer program; they usually provide a very concise and more powerful ways to control a program as described by IBM (2014). Command-line tools mostly include basic UNIX utilities;

Winrm.cmd is a command-line tool used by Windows Remote Management to perform its operations. These operations include Get, Put, Invoke, and Enumerate. The command-line tool also has several switches to allow for remote operations, credentials, and hash tables.

RACADM (Remote Access Controller Admin) utility is also a command line tool that allows remote management of Dell Servers via the DRAC (Dell Remote Access Controller). This tool is also available for Dell blades Chassis Management Controller (CMC) as defined (2014). An example is a command RACADM.EXE allows you to view managed server information, perform power operations on the managed server, perform firmware updates on the DRAC and server, set system time, and more features remotely. However system administrators can create scripts control and updates to Dell systems in a one-to-many fashion due to the command-line compatibility.

Active Directory Domain Services (ADDS) Tools – help in remotely managing Active Directory Domain Services using command-line tools and snap-ins. They also use Active Directory Domain Controller Tools for remotely managing ADDS such as ypclear.exe, filescrn.exe and storrept.exe etcwhichincludes Active Directory Sites and Services,Active Directory Domains and Trusts,command-line tools, Active Directory Users and Computers, and other snap-ins.

Using an action with sudo!! **("Bang bang") in Linux**

Figure 2.3 linux

This is the prefixing command with sudo making your system execute with super user rights. But when you forget to sudo, the!! Or "bang bang" comes in as an alternative. When you've perfectly written a long command that does exactly what you want, press Enter, and if youdon't have enough access privileges, you can sudo!! To repeat the last command with super user rights.

2.3.2. Graphical System Administration Consoles:

In some cases with network access to local system consoles this provides a solution for remote system management to deploy a Console Server which allow the System Administrators to manage resources (servers or applications) as well as add or edit user information. However,to perform management and recovery tasks a server administrator must interact through a Special Administration Console (SAC), mentioned by Perle(2008).

Console Servers are meanly used for UNIX systems, in which the actual operating system can be configuredthrough a serial port with a command line based system. Microsoft TM systems, though,need a full GUI control, which can be meantusing a serial console port with a particular software such as Such as Microsoft Management Console andIBM DB2 Control Center, also discussed by Perle(2008).

Another way for remote management is to use graphical applications based on remote control applications like KVM over IP, VNCand PC Anywhere.

2.3.3. Web-based Administration tools:

These tools are used to manage by providing a familiar graphical-based environment for use by the inexperienced operators and simplify the access to an increasingly powerful computer resources by helping them in the installation of the software on their various computers; whichinclude Oracle Enterprise Manager Console, BEA WebLogic Workshop and Webmin, etc. also include the web browsers, discussed by Barrett et-al (2004).

Webmin is application which provides a web-based interface for use by the system administration on UNIX. Using any recent web browser, you can be able to setup DNS,Apache, file sharing, user accountsand much more. Webmineliminates the need to manually carry out UNIX configuration files, and lets you configure the system either from the console or remotely, as accessed (2014).

However for the BEA WebLogic Workshop management a WebLogic Server domain is used and has a logically connected group of WebLogic Server which provides resources that you manage and configure as one whole unit; it also has WebLogic Server clusters that can operate together to enhancehigh-availability and scalability for applications. The WebLogic Server domain is centrally managed by administration server where the administration Console is, from here any Web Application can be accessible from any available Web browser with network access to the Administration Server, discussed by Oracle Inc(2008).

Webmin can be accessed easily since it's an open source software, and istypical web based application that is configured on the Linux system administration. With the availability of this tool we are able toconfigure internal system configuration like setting up disk quotas,user accounts, services configuration such as PHP or MySQL, Apache, file sharing,DNS and

many more. Webmin applications is configured on Perl module and it uses TCP port10000 with OpenSSL library for interacting throughbrowser.
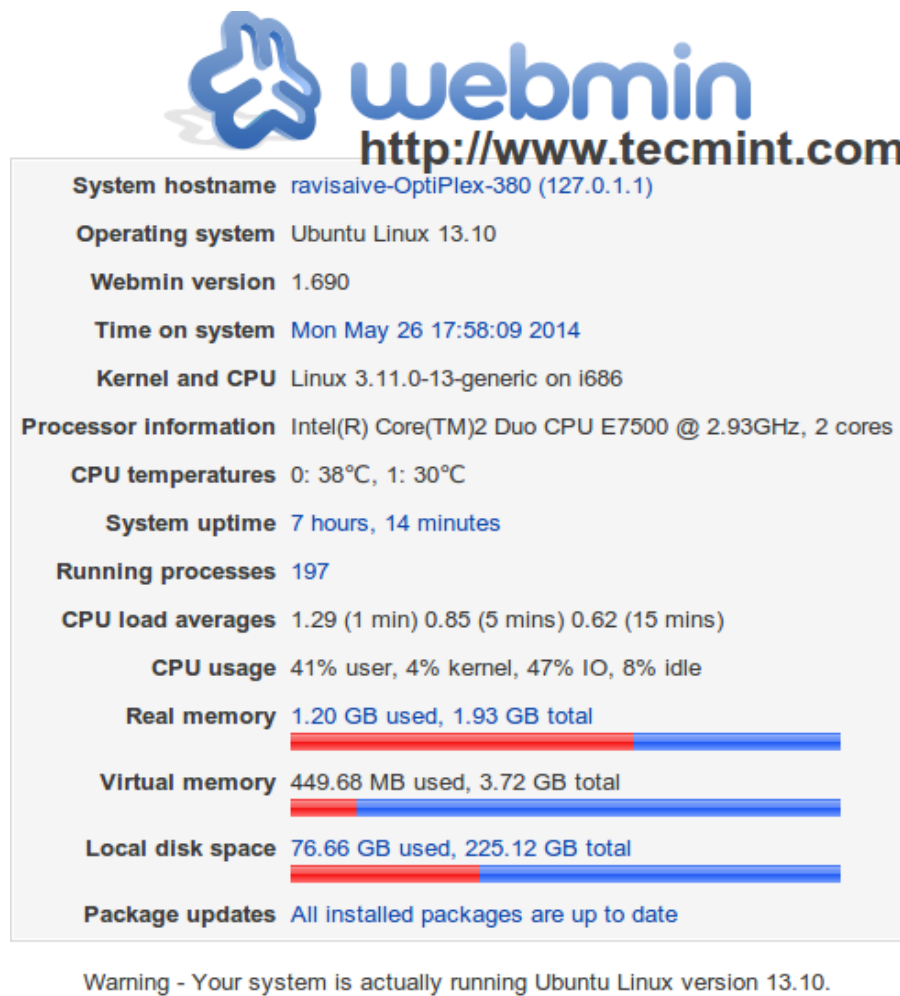

Figure 2.3.3.1webmin

2.4. Remote Server Management Applications

Most of the RSM applications are classified into the different tools that were mentioned before, however many information technology firms also use remote Desktop to facilitate technical support; i.e. Cisco systems (among others) enables engineers to look in on issues and correct them using remote desktop. This configuration method can reduce time and

money for many industries; however the study of this research is more on the Graphical tools because they are used more than other types of RSM methods.

RSM applications include the Windows Remote Desktop Connection and TeamViewer which are the most commonly used plus also others which do exist like; LogMeIn, ThinVNC, Instant Housecall, UltraVNC, etc.

This study is based on mostly TeamViewer and Windows Remote Desktop Connection which are the most commonly used applications in different companies and organizations due to their fair affordability and use. However other applications that exist do share almost the same features and limitations as these ones detailed below.
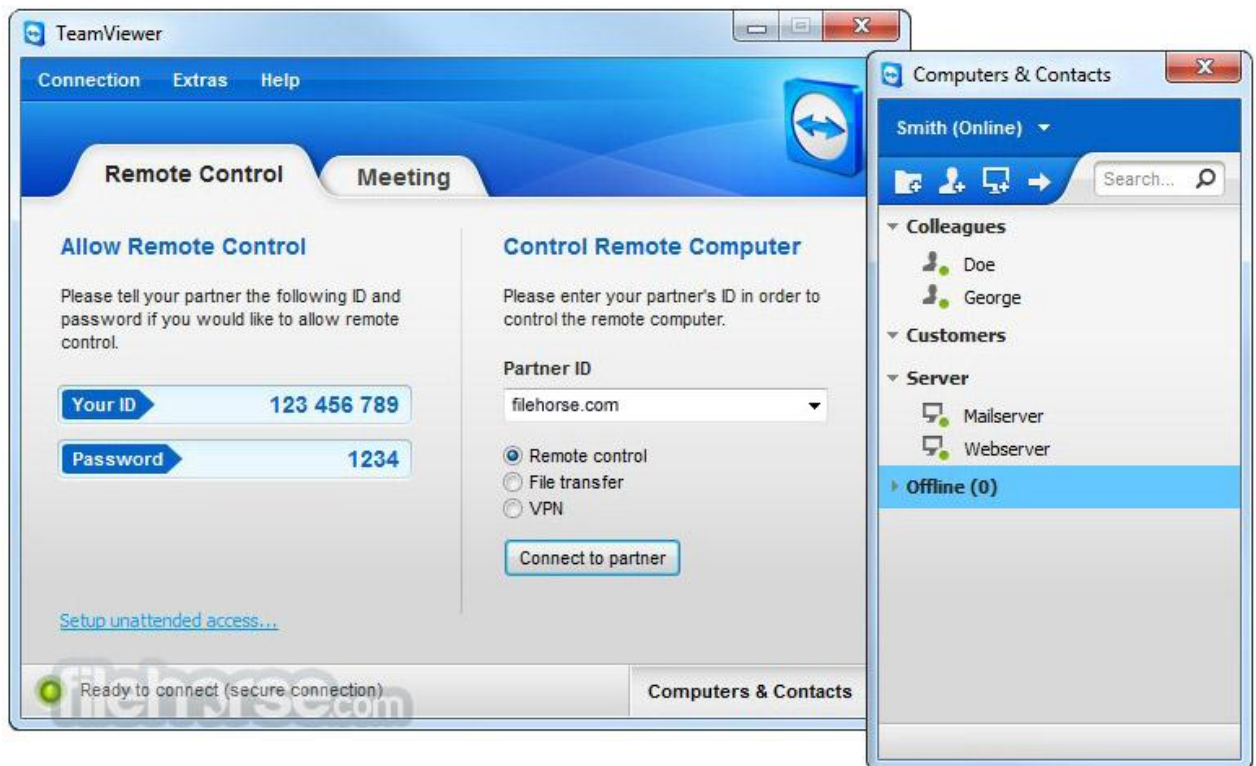
2.4.1. TeamViewer

Figure 2.4.1 (http://www.filehorse.com/download-teamviewer/screenshots/, 2014)

It provides remote desktop access for newbies since it's a very common application. It is simple to install and to check the interface, it also takes advantage of the Partner List of frequently connected clients. In connection: when you start TeamViewer it generating the unique TeamViewer id and password and supplying those to the partner at the other end, a session can be started.After setting up the communication, the active user can take control of the desktop of the remote computer and be able to provide any type of technical support, transfer files etc. however the application is free for non-commercial use only, available for Linux, Windows, and Mac even for mobiles like Smart phones and iPhones. It is free and limited in service for the trial version which isn't commercial but if u go commercial it is expensive to buy.

Some of the important features used for technical support while using this application include: Recording of actions that take place, has a built-in VPN tool that lets you create a VPN tunnel between the two connected machines, you'll have access to the client's network and other networked hardware. This can be handy when you're trying to troubleshoot connections to printers or other hardware a client might be having problems with. This also allows for the easy sharing of files. Lastly it helps in setting up Windows authentication in order to get around with the Windows User Access Control.

Limitations of TeamViewer:

TeamViewer is quiet a wonderful application to deal with but it has some limitations that are appended to its operations, which include;

- The slow Performance: Although this application is helpful to most Administrator, it still has a challenge of its speed being slow which reduces its steady performance and inability to react to problems as fast as possible, sometimes this comes as a result of long distance, loose Internet Connection and also the capability of the Computers themselves.

- Sometimes the CIA can be compromised: Gaining full access to computer resource is crucial but by doing so the Confidentiality, Integrity and Availability could be completely compromised. Thus, impact to a severe security risk and proper controls should be in place in order to make this scenario impossible

- Information disclosure is a limitation in that this type of threat goal, if realizes, has impact on confidentiality either complete or partial, but has no impact on integrity and availability. One possibility for information disclosure is for the attacker to come into the possession of some piece of information from the computer running TeamViewer application itself, like some important system file.

- No off-line duties: It so happens that for this application to work is only when the internet is available, however if the Internet is off then the application cannot be able to perform its operations as usual

- It has also a problematic feature of having the possibility of bypassing firewall control.
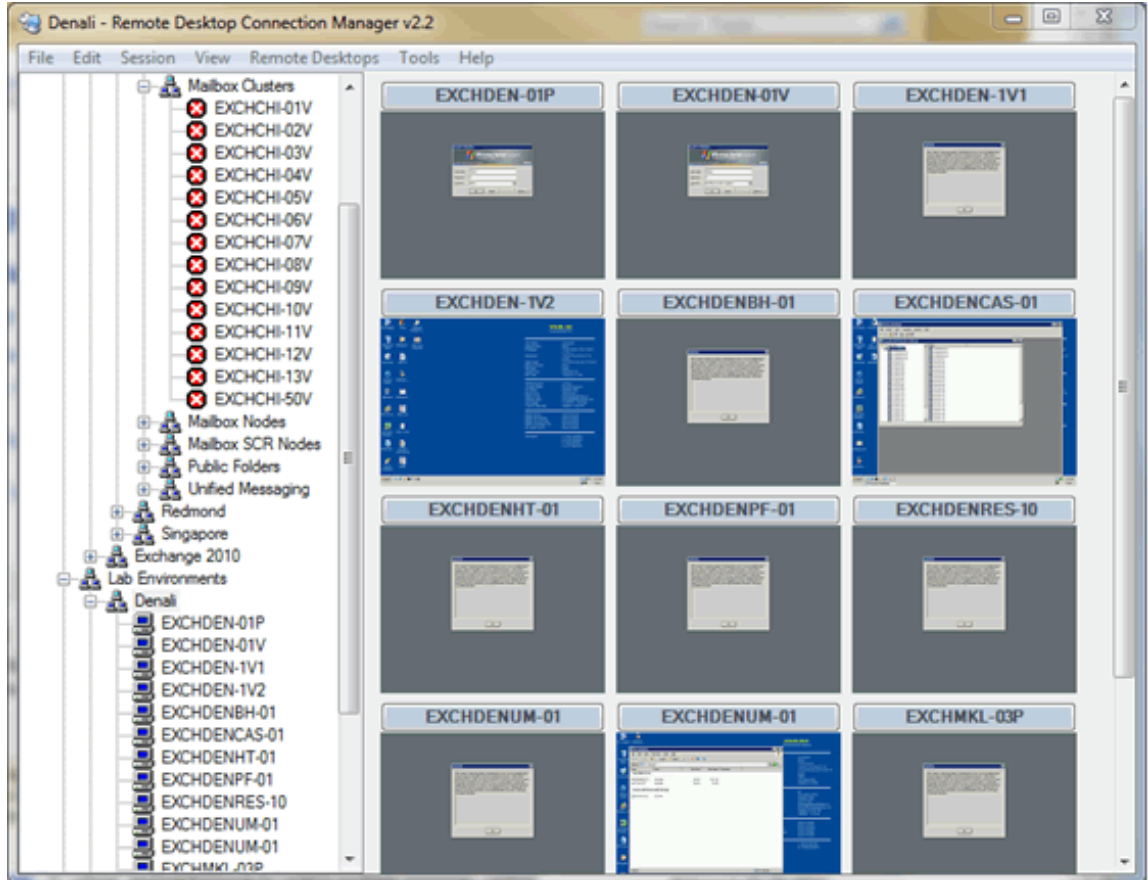
2.4.2. Windows Remote Desktop Connection

Figure2.4.2(www.google.com/search?q=windows+7+remote+desktop+connection+screensh
ot, 2014)

This tool is part of the Windows installation pack. It is good enough to provide remotely
access to any computer if you are using Windows system and it can be used as some sort of
technical support method. This tool is beneficial in a way that it includes; IP stay onsite,
Centralized backups and lower cost of individual developer hardware. However this tool is
based on the windows community only hence not supporting other operating systems. This
application handles the remote access of documents from anywhere, and storage of IRC
(internet relay chat) and IM clients open on one machine and then connect to your computer
from other places.

Limitations of WRDC

- Reduction in speed (performance): this application is easy to use but it reduces in its performance when other users run heavy compile jobs, also running modern development tools (like: Eclipse, IntelliJ IDEA etc.) via remote desktop may annoyingly slow the operation of the computer.

- Internet sensitivity: in that if the network or server goes down, then all computers go down. Also if working offsite without VPN/terminal access then there will not be connectivity.

- Limited Connectivity: This application can connect up to 2 additional computers remotely simultaneously but it leads to limited port usage in that, if each dev. wants to launch a J2EE container on port 8080 they can't, unless each user can have virtual interfaces.

- It mostly works best when the network is sharing the same domain/ workgroup.

2.4.3. Remote Server Management Vendor-Specific Tools

Due to the fact that it is significantly easier to manage and monitor data center servers remotely usinglaptops, home-based personal computers and smartphones is getting very new and up graded remote server management technologies from software vendors and hardware like IBM,HP, BMC ,Dell, and CA have also come up:

RSM Tool Functionality and Features

i. Automatic deployment jobs such as BIOS updates, initial OS installation, and disposal of retired systems for both non-IBM and IBM systems IBM Director Remote

is possible the Deployment Manager, Remote Deployment Manager (RDM). The jobs are carry out remotely to reduce travelling and labor costs.

ii. Providing Support for configuringVMware ESX Server, Linux and Windows; support fornon-IBMand IBM hardware which conform to the industry standards like WOLand PXE (Pre-boot-execution).

iii. You can allowusers to remotely perform setup, power and thermal control,health monitoring, and remote administration of ProLiant DL,ML, and BL servers using the HP ProLiant Onboard Administrator which is powered by Integrated Lights-Out 2 (iLO 2), HP ProLiantiLO 2. It can be found from any location using a Web browser.

iv. Also due to robust server management features, this application has some energy-efficiency aspects, such aspower supply high-efficiency mode and server fan control to ensure that power supplies work at the peak effectively under all situations .

v. You can anywhere and anytime use remote management to, monitor, troubleshoot, and upgrade the server independent of the operating system usingDell OpenManage Integrated Dell Remote Access Controller (iDRAC), iDRAC.

vi. Delivery of early notification of system failures and power management featuresare possible with the Use of remote access functions based on industry standards.

vii. Remote System Control enbles remote management and configuration software for Sun Fire V490, Sun Fire V480, Sun Fire V890 and Sun Fire V880 servers. It is a guiding feature on all these products.

viii. For Solaris servers, provides tools for event notification through interactive interfaces, e-mail or pager for any hardware or software break down; remote internal

environmental control; the ability to view boot logs and run logs; remote power on, power off and reset.

ix. Shows change requests by business impact, location and priority; allowing or refusing change requests on the road; update the BMC Remedy system as first as a change is implemented.

x. It enables IT managers to carry out over 500 functions from a smart phone using the Rove Mobile Admin, Mobile Admin which is configured behind a corporate firewall, where the Mobile Admin Server communicates to dozens of several different types of servers and monitoring systems.

xi. The client is available for Windows mobile devices, Blackberry and a Web-browser interface.The tool integrates with performance manager, BMC Remedy and Nagios,VMware,Microsoft systems management tools, and others.

Limitation of RSM vendor-specific tools

i. Different vendors offer remote management tools of vendor-specific servers through Web-based provision, and many of the systems are becoming more complicated and expensive most of the time due to the fact that it also involves specific software and hardware.

ii. There is still a limitation for a way to detect remote command failures and improve progress indicators when using the different tools.

iii. Remote Server Management Studies

2.4.4. CONDOR-G:

Frey et-al (2002) discussed the tool as a computation management agent for Multi-Institutional Grids that enables inter-domain operation on remote resources that uses standard guidelines that grants access to resources that are controlled by other resource management systems and requiresuser authentication. The agent carry's out user computations on the distant resources and also uses remote execution environments:

It also allows anoperator to treat the Grid as a fully local resource, withcommand line toolsand an API that allow the operator to carry out job management work.

2.4.5. MOBYLE

Néron et-al (2009) defined it as a generic web-based platform that includes advanced applicationlikedataflow mechanisms, remote execution and web services; it set out major end-user challengescoming from the use of complicated bioinformatics systems and use Mobyle servers.

It is a well-designed web user interface, allowing easy navigation and data management within a user workstation, workflow authoring and using tools to support protocols,allowing access to and putting together the use of local and remote services, APIs and command-line, configuration to simplify system maintenance, extension and, also includes visualization of results using special-purpose graphics componentsNéron et-al (2009).

2.5.   Remote Server Management technologies

This section reviews the different technologies that can be implemented to come up with remote management or control applications while using cellphone technologies which mostly use GSM control based technologies and also the wireless technology standards which include Bluetooth, Zigbee and RFID as the most used well known standards.

2.5.1.0 Global System Mobile Communication (GSM)

As defined by Golam et-al (2011) the most commondigital network, wireless, wide area is the GSM (Global System for Mobile telephony) mobile network which is also known as digital cellular network, first intended for voice cell phone. Beh et-al (2008) explained that today's environment GSM phone networks carry high quality,very secure mobile phone voice and data services (such as SMS/ Text Messaging) with full roaming connectivityall over the world. However GSM technology is in use by the worldglobally and continues to grow with a lot of users worldwide annually.

GSM phone technology is implemented in different systems for interactionamong user and the distant devices to enable the easy access over differentgadgets under GSM coverage, hence this helpsin immediate control and allows it to be more compatible in relation to already present systems, discussed by Pavlou(2008).
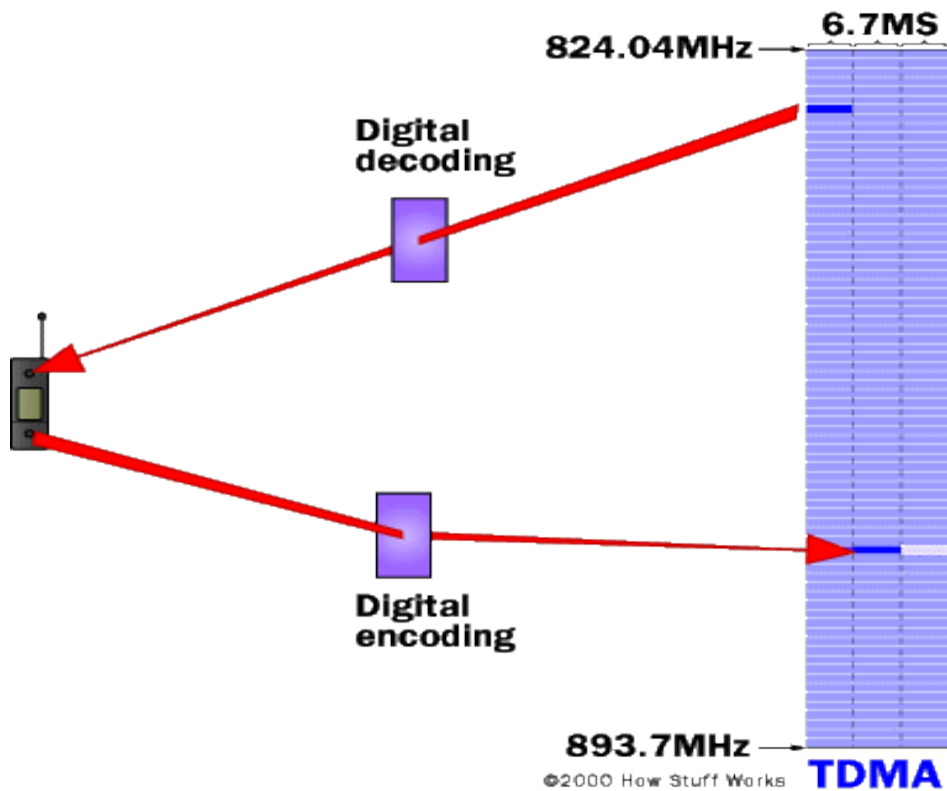
Figure 2.5.1.1 TDMA

The GSM system usingTime Division Multiple Access (TDMA) transmission methods to split a frequency into time slots.

Ramamurthy et-al (2010)defined a GSM modem as a particularmode of modem thatallows a SIM card, and runs over a registered mobile phone operating company, similar to a mobile phone. It is usually a reserved modem device having a Bluetooth connection mode, USB or serialit can also be a mobile cellphone that enables GSM modem capabilities.

However for remote management systems GSM networks use DTMF (Dual Tone Multi Frequency) technology, SMS technology and GPRS (General Packet Radio Service)

technology to immediatelyinteract with the mobile cell phone and the machine, described by Ahmad et-al (2011).

2.5.1.1 DTMF

A Dual Tone Multi Frequency system mostly implemented by touch-tone phones to control home appliances, it gives a specific line of frequency (involving of two different tones) to every key so as it can simply be known by the processor. Golam et-al in [10] stated that regarding the first approach a system of configuring the devices using DTMF was made, in which the operator had to call a mobile phone line attached to the system over the head set, then after the phone call is received (auto answer) the operatorwillinput two/three digit code. Afterentering of the codes a particular operation is carried out by processor, and this can be either ON or OFF on aparticular device, a code that shows completion of a function will be sent back to the operator's mobile phone. Here system also enablesthe security by providingan alarm for the user when there is an intrusion.

Das et-al (2008) discussed that, in its operation the mobile phone enters the GSM user's phone number, so immediately a communication is started a DTMF is forwarded to the GSM receiver who transfers it to the decoder so that it is able to be monitored on either side to show its consistency, eventually the GSM mobile receiver and transmitter all together show a successful connection over GSM mobile network. On the completion of DTMF and microcontroller enforces the proper voltage to be monitored at the appropriate devices control interfaces.

However the credential tests for proper operation in such a way that a simulated mix of right and wrong password is sent to the processor, the reaction of the processor is monitored for every inputted passwords where it allows access and operation to all appliances to the proper passwords, discussed by Das et-al (2008).

2.5.1.2 SMS

As discussed by Sj,din(2001) SMS (Short Message Service) is a service offered by most digital cellular network operator more specifically GSM that allow the forwarding of short messages (also commonly known as text messaging service). Using SMS and GSM modem having information server, can forward and receive SMS to a user with a mobile telephone. The SMS is a text message having contents that can be executed using anyavailable program so as to carry out commands like for monitoring and configure operations, likeapplications are usually written with a help of Java language.

The texts are usually small in size (160 characters) and the delayed time from forwarding a message until it is received is usually around 10-20 seconds, but delays in the relation to hours could at times be experienced, mentioned by Sj,din(2001). However, SMS' power is in its wide usage by the users since the amount of mobile phone owner is high; an information server that uses SMS will be queried by a large number of the potential users (without the necessity to upgrading any cell phones). Another way is, an SMS can be used to forward a confirmation that some operation was successfully done, e.g. a system administrator could

ask a system to carry out some self-check, and when the system finishes the check an SMS is forwarded with the outcome, discussed in (2009).

The SMS is a text message where content can be configured using any available program in order to run the commands for monitoring as well as controlling operations. Such applications are usually written using Java language, mentioned by Al-Qutayri et-al (2008).

2.5.2   Wireless Based Technologies

Besides the GSM based technologies there exist also the wireless based technologies which include Bluetooth, Zigbee, Zwave and RFID. However the most familiar standard with the GSM technology is the BLUETOOTH which is widely used than other standards.

2.5.2.1 BLUETOOTH

Mahmoud and Jeedella(2011) defined Bluetooth is a global radio interconnection that enables several electronic devices, like mobile phones, sensors to interact wirelessly through a short range radio connection which makes it an open requirement for wireless RF communication as well as networking, it is a standard that provides interfaces for a wide range of communications protocols, also includes point-to-point and point-to- multipoint data with voice communication. The space covered with the Bluetooth transmitter is approximately 10 meters and Peak data transfer rate is 1 Mbps.

Figure 2.5.2.1   Bluetooth

Systems use Bluetooth enabled devices to allow wireless ad-hoc networking since they will not be in a fixed location. New services and users can be provided to the network and no configuration and driver installation required as well as without cables. In this case data transfer between network server and mobile access pointshappen over a Bluetooth radio connection, and also Bluetooth chips are designed and integrated into computers machines, mobile phones, PDAs, sensors, measurement devices and computer system peripherals. It is also likely to use availablestandards like TCP/IP, WAP and RFCOMM on top of Bluetooth.

Cheng and Kunz (2009) stated that in the structure of the Bluetooth mechanism there also exists a mobile cell phone that interacts with the home server based on SMS which is forwarded through a mobile phone, which later communicates to a Bluetooth device. Security wise a shared key is used for authentication in order to communicate safely.

2.6. Underlying Features used: Technologies

The above mentioned models/technologies are used for remote server management but they also include underlying technologies amongst them in order for them to work efficiently which mostly comprise of the mobile/cell phones and the information servers together with other personalized devices or controllers.

2.6.1. Mobile/Cell Phone:

Jansen and Karen (2008) defined a Cell phone also called as a wireless phone, cell phone, or cellular telephone is a small portable radio telephone that is primarily simple voice and messaging communication device. Mobile Phone can work as powerful tool for the global communication. The cell Phone is a communication service that is generally available by people, who make them practically always contactable and possible to forward commands to configure the parameters in the companies. The use of cell phones or handsets has increased exponentially in a periodof years. As the number of cell phone owner's increase, the technology and devices supporting the handsets have also changed to cope with the current traffic generated by the several users, mentioned by Ramamurthy et-al (2010).

The cell phone can be used to interact over a large coverage without wires. It operates by communicating with a close by base station (also called a "cell") which joins it to the main phone network. As the cell phone changes position, like if the mobile phone goes too far away from the cell it is connected to, that cell forwards a message to another cell to inform of

the new cell to take over the control of the call known as handoff, mentioned by Jansen and Karen (2008).

2.6.2. Information Servers

Sj,din(2001) stated that any computerized device can be a likely information source. But, in order to get that source, or to upgrade it, an information interface is wanted which is termed as an information server machine that has the ability to forward (or receive) information that is directed for (or produced by) a human user. Currently, most information servers were using proprietary communications standards, information encoding schemes, and user terminals. But, with recent technology and existing evolving standards for information exchange, we now have the privilege to build standardized information servers computers that can interact with a variety of user terminals, developed by many several vendors. A terminal can, be any component that is capable of forwarding and/or receiving information and showing it to its user, the most widely used type of standardized terminals a round is the mobile phone. However, many other devices such as palm top computers, PDAs or web pads can also be used as terminals.

Sj,din(2001) further investigated that with an installed information-server and a modem for dial-up communication to the device, the service and support can be greatly more sufficient. Many challenges can be resolved remotely by the system administrator, removing the need to visit the customer's website. Even if you visit the customer's site the technician can carry out remote diagnostics and sure that the right replacement parts are used. In both of these

situations, the customer's experience of the service offered and support provided by the manufacturer is up gradedbecause to small response times from the manufacturer.

For remoteness with Long distances, terminals help to connect to the devices/servers through a network; since this can be a digital cellular network (GSM) or the internet (or a combination of the two). Due to the fact that the number of information servers available is tremendous, for interaction a user must properly request for information from a specific information server, e.g. by placing a data call straight to a modem that is connected to the information server, discussed (2009).

2.6.3. OSGi Architecture

OSGi is an evolving open standard for developing services to smart home environments and typically a service-oriented component type. Managed software components developed in the OSGi platform are known as "bundles," and the bundles can be managed by installing, updating, or removed on the fly without causing any disruption to the operations of the device. Bundles are libraries or programs that can dynamically find out other services from the directory or can be used again by other bundles, discussed by Chao-Lin et-al (2008).
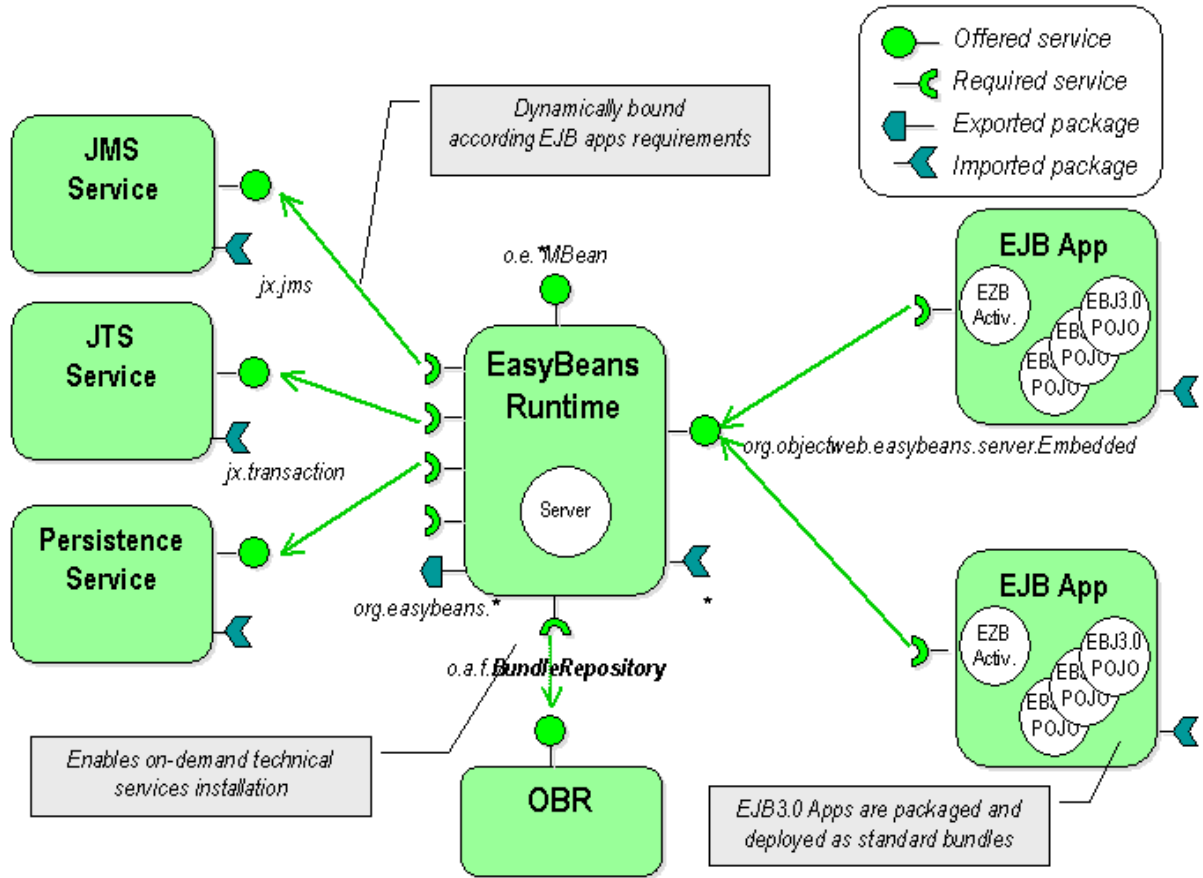
Figure 2.6.3 OSGi Architecture

The primary OSGi architecture is developed on a platform where auserrunsquiet a big network of service models. It knows that the service models are whollyconfigured by the user and are used to execute services applications from many various service providers. Hence, the OSGi alliance describes the remote management reference architecture, discussed by Zeadally and Kubher(2006). Therefore, also the monitoring of the equipment is supposed to be carried out by the remote operator. Hence, we want the remote management system as wealso propose remote control platform for home server.

Kang et-al (2008) also classified the OSGi (Open Services Gateway Initiative) as the known open gateway standard for computerized monitoring of home electrical facilities and application.

2.7 Critique of Literature:

From above it can be noted that there are different systems that are in place that can allow remote configuring of the servers across a number of platforms and this include Command-line tools, Graphical System Administration Consoles, Web-based Administration tools, TeamViewer, Windows Remote Desktop Connection, Remote Server Management Vendor-Specific Tools. The remote server management tools and applications have some similarities though there are different in some areas, some will provide fast and easy connection to the server but the system administrators must have a computer to enable remote log-in or internet connection to have access to the server which in turn creates so many open sockets to the server and this can create a loop hole to be used by the hackers later. Also the current remote server management tools do not provide for any mobility in that the system administrator must have his/ her computer at all times even if is off duty or at home. Therefore remote server management using cell phone technology will provide cheap, convenient, flexible and real time system to be used by the administrators in configuring the servers.

CHAPTER THREE: RESEARCH METHODOLOGY

3.1.   Introduction

The chapter provides the guiding principles and specifically the objectives of the study which are supposed to be achieved; Most of the information of this research is obtained by secondary data through a documental research from related Literature. It discusses the research study population, sampling procedure, data collection methods and tool, quality of research tool, technologies and data testing and validating. However the appropriate approach for the study is considered while using an agent based simulation which includes client-server architecture communicating with a cell phone.

3.2.   Study population

The targeted population constitutes of two categories: mostly the System administrators and IT department staff. Their contribution will also be very crucial to the design of an application that can manage a network even in their absence while using an SMS. The East African University is my case study for the project

3.3.   Sample Selection

The study will be carried out using purposive sampling method. The method will be used to identify key respondents that are directly involved in Networking and SMS services since they are well informed and participate in Networking and messaging. As a non-probability sampling strategy, purposive sampling plays a key role in-depth analysis related to the central issue being studied and does not miss out on the vital respondents required for the study.

3.4. Data Collection methods

This section discusses the methods used in the research. However among the techniques going to be used to acquire information comprises the one on one interview and questionnaires that will be applied for data collection with the aim of collecting reliable and comprehensive data for developing this application that can allow a System administrator manage a network using his / her mobile phone. In addition, the research progress will be accompanied by the existing literature review in-order to update on the existing and new technology developments.

3.4.1. Questionnaire

Self-administered questionnaires will be used to in the collection of data from the Telecom Software Developers, System Administrators and IT department staff. They will cover key concepts and issues related to SMS services and network administration. However for quick response the use of emails and forums to administer the questionnaires will be employed. There will be a comparison between the results got and the existing literature in order to establish the requirements and relevant information to back up the proposed prototype.

3.4.2. Interview

One to one interviews will be used but on a less extent in-order to obtain information from System Administrators and IT personnel who use the existing tools. It is the best source of achieving qualitative information from different respondents.

3.5. Tool for the Data Analysis

An analysis tool will be used to sort out anomalies in the information collected in-order to ensure completeness, accuracy and consistence. Coding of the data will be done in order to derive summary and meaning out of the data. However simple statistical manipulation to establish percentages and frequencies will be done using Statistical Package for Social Scientists (SPSS) tool which is a software application version 11.0.

3.6. Software Development Life Cycle

The System Development process will encompass all activities involved in the development of the application system. Such activities include requirements gathering, analysis, design, construction, implementation, and maintenance.

SDLC shall be used in developing the application in a well-defined, disciplined, and standard approach. It provides a methodological approach and a platform for the management, directing, monitoring and controlling of the processes of the application or software building, plus the description of the process and deliverables.

3.7. Testing and validating the prototype

Testing will be undertaken to find out whether the application meets the requirements of the sampled Organizations. However validating of the application is a testing phase, in which the proposed prototype will be applied to real world while using the data obtained. It also involves the use of a series of assessment questions, to be answered by the System Administrators in-order to assess the patterns of Reliability, Usability, Completeness, Flexibility and Capability of each artifact in the prototype.

3.8.   Technology to be used

The NetBeans IDE software which includes the java packages, J2ME will be used for the java platform to create the server and client environment and sockets and also database connectivity will be created using the Glassfish Application server.

Also among the tools includes Kannel software which is a compact and very powerful open source WAP and SMS gateway, used globally for serving trillions of short messages (SMS) Logan et-al (2007). However computers communicate using socket-based communication that provide an interface for programming networks at the transport layer, it includes a concept of logical access point and ip address used to allow a two-way exchange of a sequence of services and data Lars Wizenius (2001).

Java is the programming language, and we use it to design the interface. It used since its platform independent that is, It runs on all operating systems so even if the network has computers of different operating systems. This solution can be of help since

Kannel is an Open Source SMS gateway.

MySql is the database engine we are using.

J2ME is for mobile applications and for only phones that run J2me.The database is Mysql with Mysql-connector for Java not Glassfish, and there are no sockets involved.

The other software that can be used include the following:

Instead of Java, Visual C#, Visual C++ or visual basic could be used but those are Microsoft languages and only run on windows which provides a barrier on the other platforms.

Instead of Kannelwhich is free (open source), Ozeki SMS Gateway could work but it is a commercial product, same applies to NowSMS which is also commercial.

Instead of MySQl, Oracle could work as the database but it's a licensed product and very expensive to implement.

3.9.   General architecture and Design of the System

The user will compose a message on the phone keyboard or laptop that is sent to a sim-card in the GSM modem, where it is received by a server then the program from the Server will interpret it and execute it as a command to act on the client machines using its ip address, These commands are found in the database of the Server. The type of the execution to be donewill depend on the nature of the SMS sent. The nature in which the application is developed is fairly simple and cheap.

CHAPTER FOUR: CONCEPTUAL MODEL

4.1 Introduction

This part shows the conceptual frame work of the proposed system/ solution.

4.2 Conceptual frame work

This shows the relationship between the various components and how they relate within the system until the final product/ outcome is reached. It also describes the frame work based on qualitative assumption about its elements, their interconnections and system boundaries.

A System's administrator starts by sending an SMS which will be forwarded by GSM radio channel to the SMSC.

The GSM radio channel gives the SMS Text to the Server on the network which it stores in the database. The Administrator's terminal is the application client. It is also a management entity. More generally, clients on the network are all equipped with a terminal capable of reading and writing to the database.

The server management entity is a module installed on the server machine of the network. The application can be installed or configured on this machine. The SMSC communicates with the server by modem connected to a COM port.

At the reception of the Text, the server interprets it based on the information contained in the text. If it is a valid command, then an application entity takes on its execution. This execution will imply the calling of Transmission Control Protocol (TCP/IP) or Open system interconnect (OSI) functions of management. If not, the client receives an SMS notification on behalf of the server of the application entity. An Application must be configured and

installed on each station of the network. The conceptual model of the system is illustrated below

GSM PHONESERVER WITH GMS

MODEM
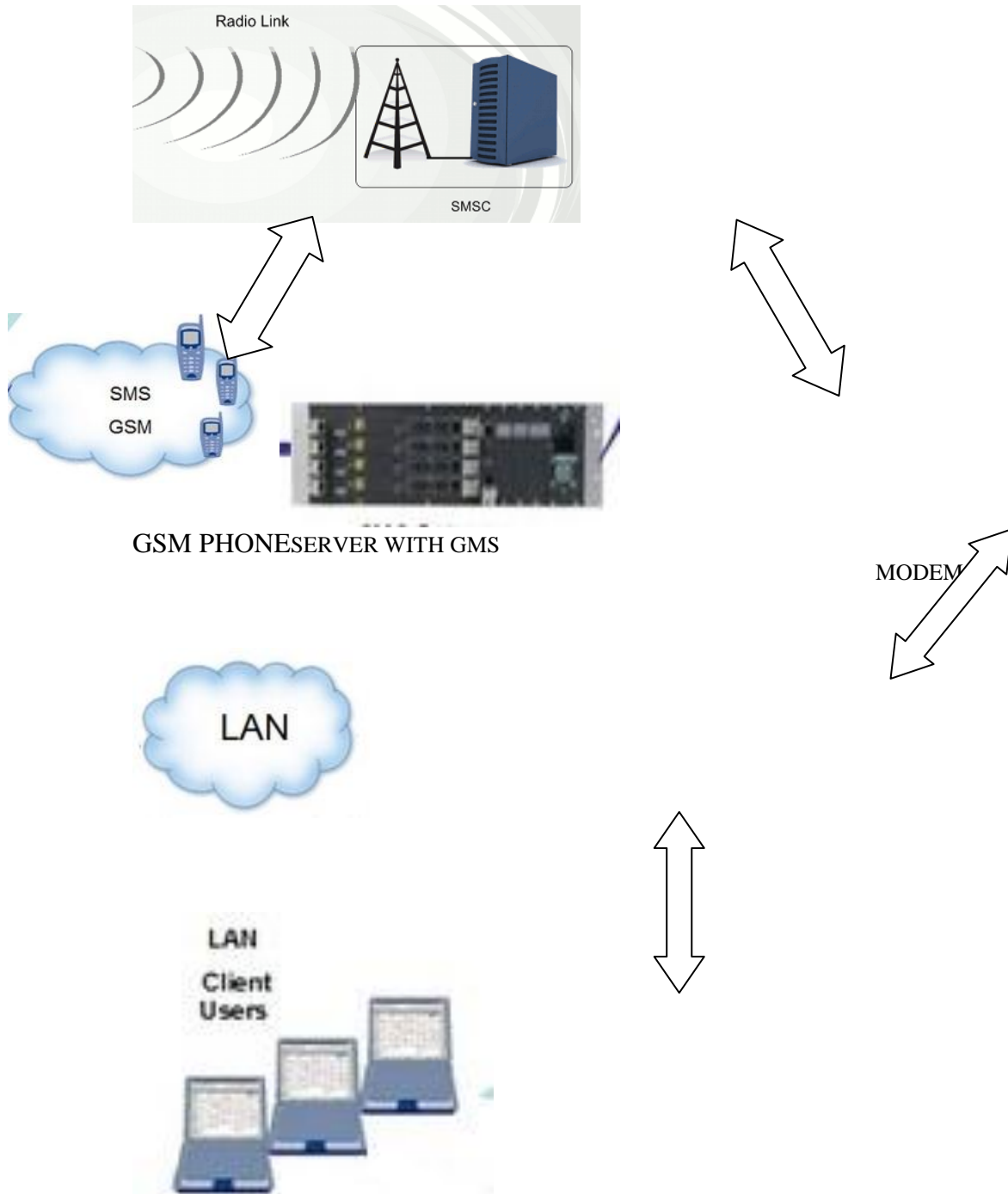
Figure 4.1: conceptual design

GSM Radio link is meant to access the mobile network so that your phone can be able to send an SMS.

SMSC is an SMS center.Immediately a message is forwarded, it is accepted by a Short Message Service Center (SMSC), thatwill get it to the desired mobile phone device (modem sim).To execute this, the SMSC forwards a SMS Request to the home location register (HLR) to check for the roaming user. Immediately the HLR gets the request, it will send to the SMSC with the user's status: 1) inactive or active 2) where subscriber is roaming.

If the response given back is "inactive", means that the SMSC cankeep onto the message for a given period of time. When the user accesses his device, the HLR forwards a SMS Notifying the SMSC, and the SMSC will try delivery.The SMSC changes the text in a Short Message Delivery Point to Point mode to the operating system. The applicationinforms the device, and where it responds, then the message was delivered.

The SMSC receives notification that the text was received by the subscriber, then categorizes the message as "forwarded" and will not attempt to forward again.

We are to use a GSM modem on our SERVER and a kannel software (Software capable of reading modem messages and triggering the Modem to send an SMS). This modem must be GSM Modem (with SIM card).

The Kannel software has the capability of reading a message from a modem and forward it to a web service, the web service can then receive and store in the database.

The application will pick it from there, read from the database, execute the command, write the response back to database and trigger the kannel on the SMSC to send the response back

to the GSM mobile phone to notify the about the changes made and if there is any no changes to be made.

4.3 Remote Management Model using internet security and acceleration (ISA) Server Enterprise Edition

In ISA Server 2006 Enterprise Edition, you connect the remote machine to the Configuration Storage server. When you want server-specific information from the remote computer, the Configuration Storage server immediately connects to the arrays to get that information. A physical or virtual private network (VPN) connection is required to ensure connectivity with the Configuration Storage server and the arrays. This is shown in the figure below.
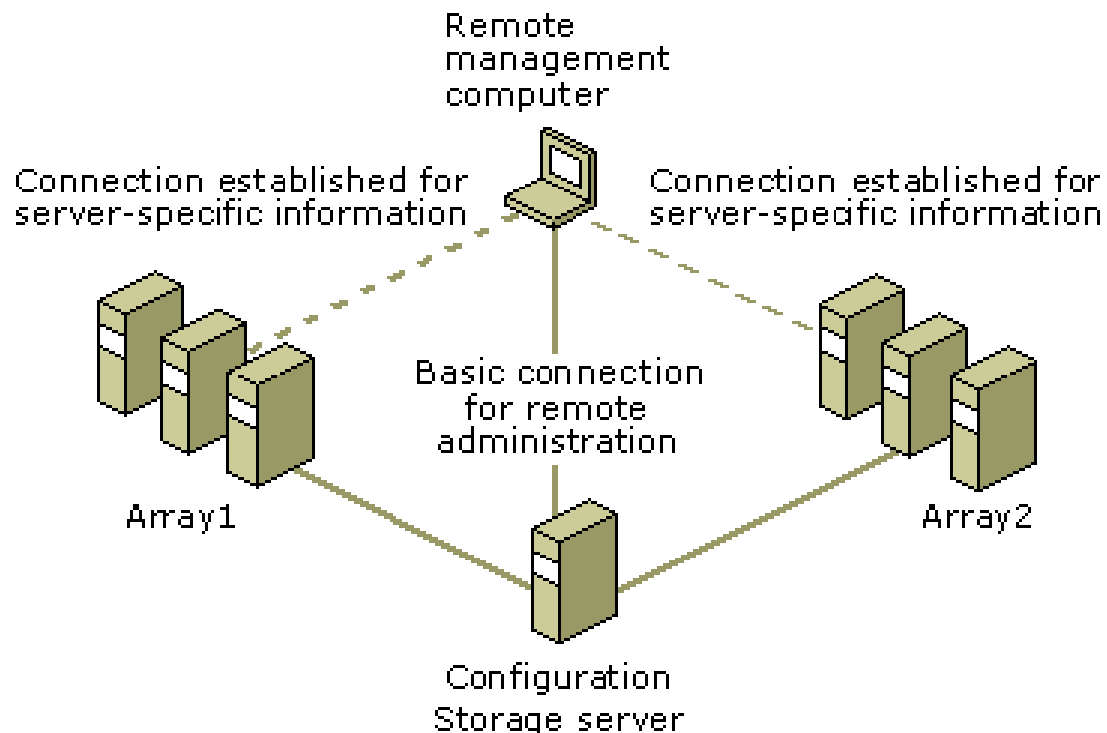
Figure 4.2: Remote Management model

The following limitations will be experienced:

- If you want to get connected to a Configuration Storage server that is installed on an ISA Server array member and not on a separate machine, you will only be able to do so for the array on which the remote management computer set is known.

- To configure computers in different arrays, add an access rule on the remote administration computer, to grant communication between it and the remotely configured ISA Server computers. The access rule should show that the outbound Microsoft (MS) Firewall Control protocol is granted from the original network Local Host to the final network on which the configured ISA Server computers are located.

- You will only be connected to one Configuration Storage server at a particular time. When you initiate the Configuration Storage Server Connection Wizard again, and connect to another Configuration Storage server, you will be immediately disconnected from the first Configuration Storage server.

CHAPTER FIVE: IMPLEMENTATION MODEL

5.1 Introduction

This chapter discusses the implementation stages of the remote server management using SMS. It shows all the components required for the success of the system on both the server and the client machines on the network.

5.2 Implementation

This system of controlling a computer network by SMS requires two applications. One that runs on the server computer (The computer that has the database, and kannel) and the other that runs on all other machines on the network (Clients). For the process to run effectively they all have to be running.

The following screen shots represent the different responses that occur when some codes are invoked by the server from either the GSM Phone or network clients.

Figure 5.2.0. NetBean IDE software used for the coding of the applications
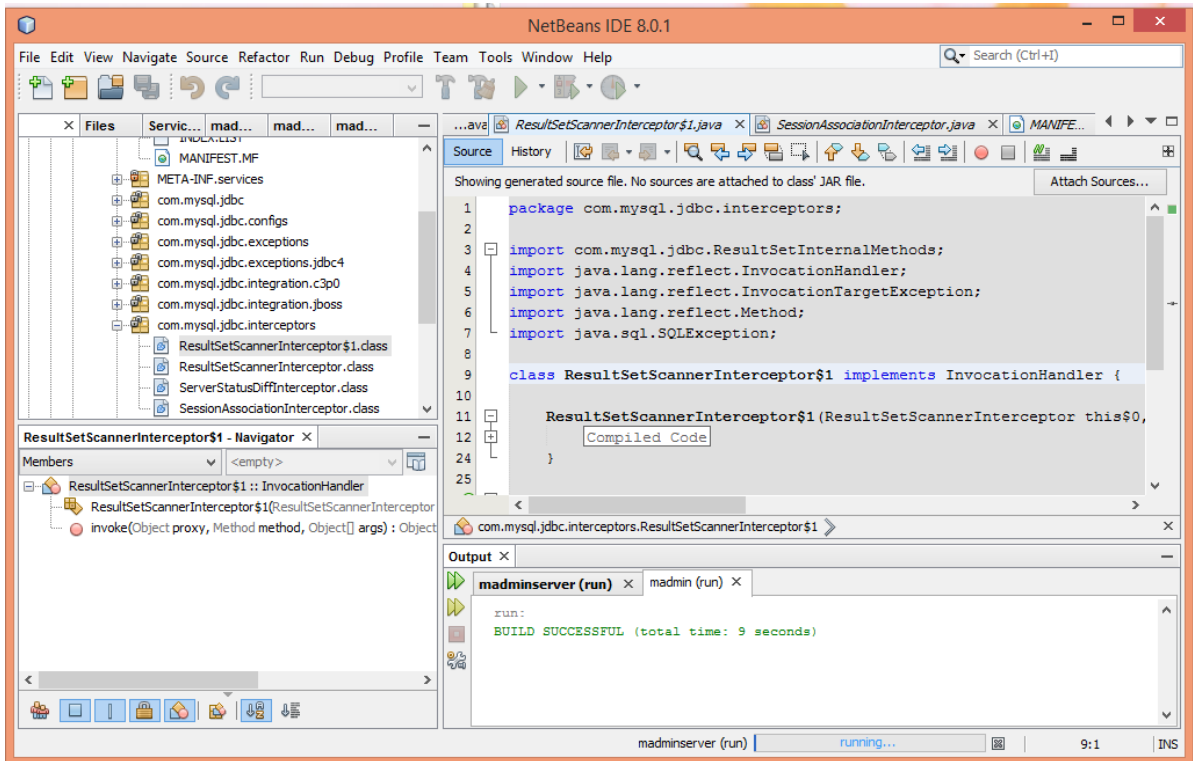
Figure 5.2.1. Client application
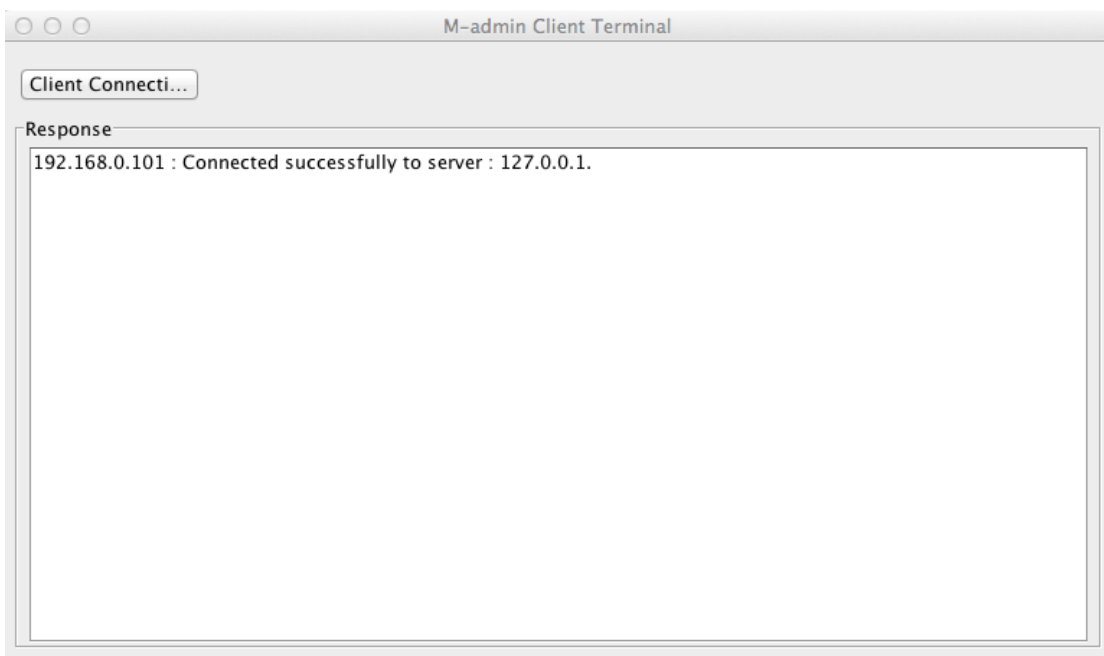
Figure 5.2.2client response

Shows the client application (192.168.0.101) connected to server at 127.0.0.1. This application looks for a message from the server (database) that it has to process every after 3 seconds. Remember when sending the messages you include the IP address of the computer on the network to process the sent command. Example(192.168.0.101 ping –c 2 192.168.0.102) If you want the computer 192.168.0.101 to ping the computer 192.168.0.102.
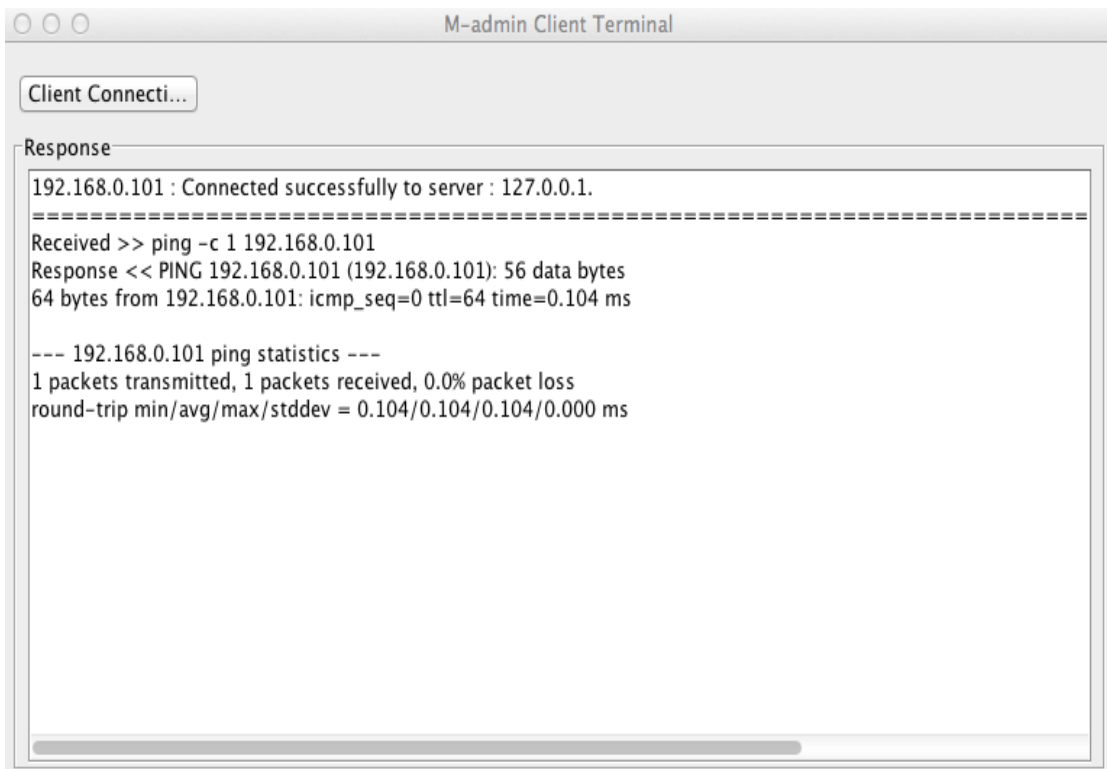
Figure 5.2.3:

Shows the application after receiving the message and the kind of response it has sent to the administrator.

Since this application fetches all commands from the mysql database running on the server. The client application will require to privilege and a user account on the database to access fetch commands sent via SMS.

Below is the interface where credentials are set up on the client application
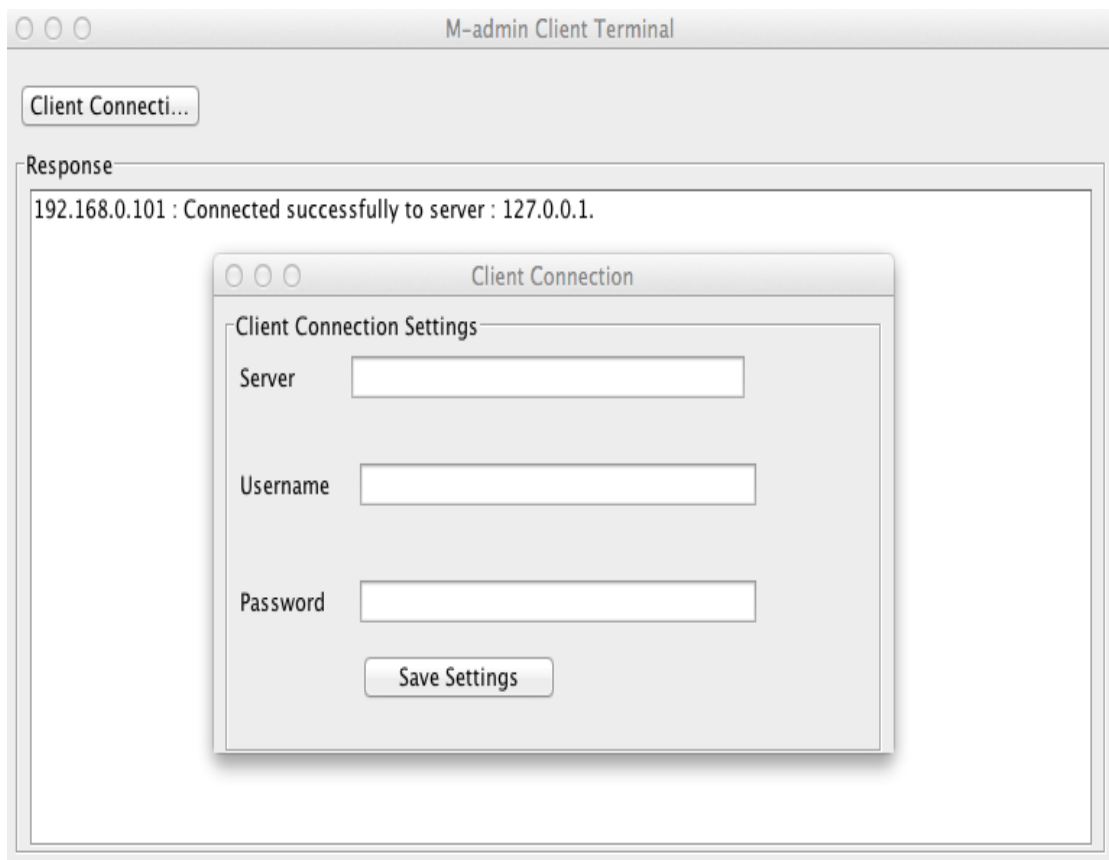
The server is the IP address of the server that runs the database, username is the username created for the IP address of the client application and password is the password created for the client's IP on the server.

Figure 5.2.4: Server application

Shows how the server application looks, it shows the recent commands received.
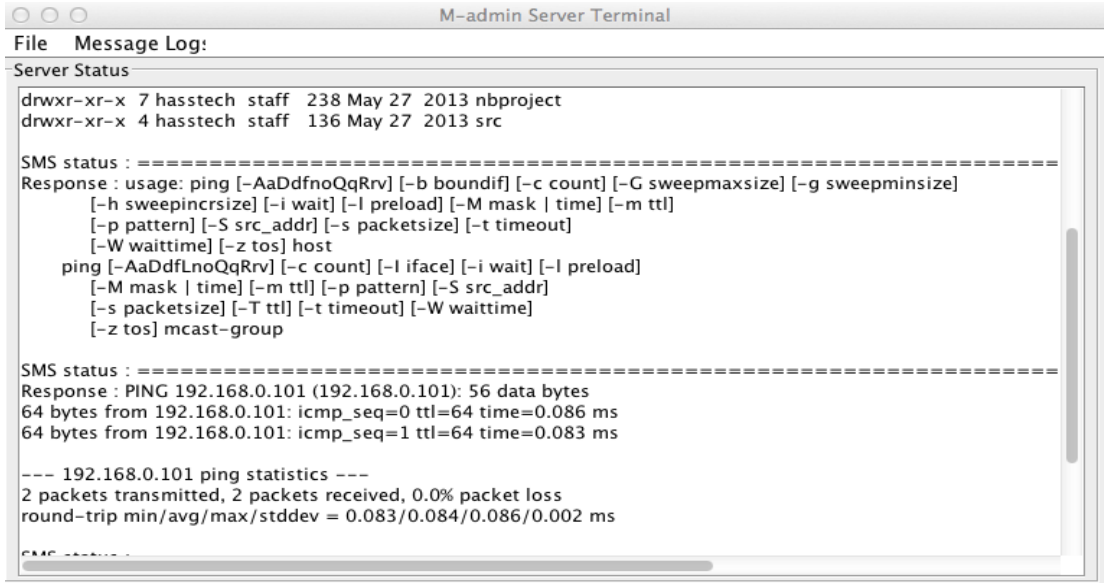
Figure 5.2.5:

Show all the outgoing messages to the administrator, the status of the messages i.e. they are

pending (They are not yet processed) or success (They are successfully processed).
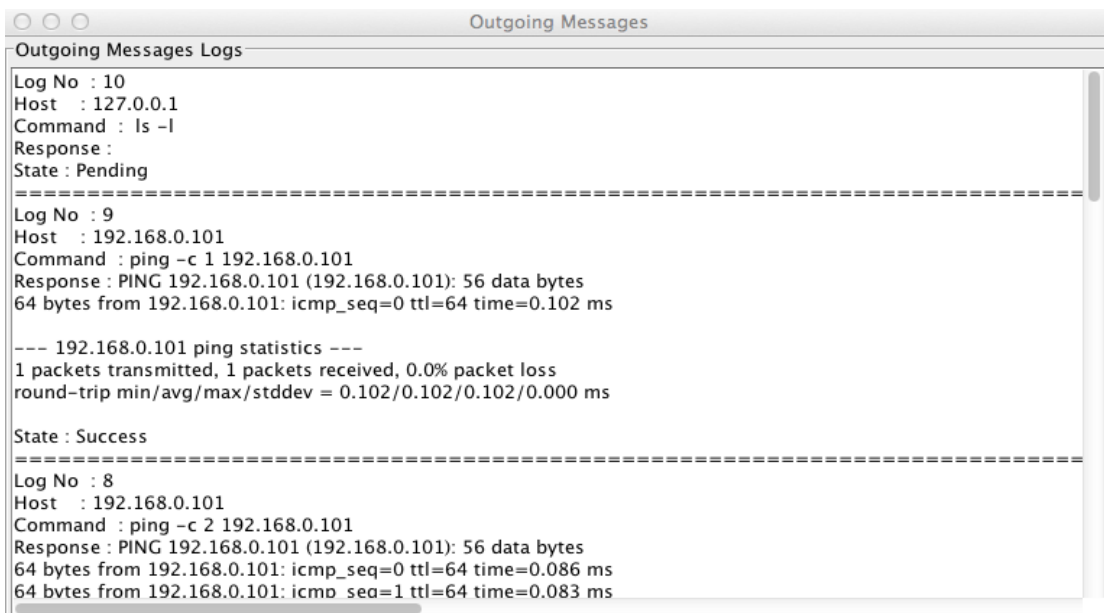
Figure 5.2.6 shows the SMS Kannel(SMSBOX) platform installed on the server where all

messages are received, interpreted and sent to the respective computer (server or client

machine). It directs the messages depending on the IP Address contained in the message

Figure 5.2.6 SMSBOX

Figure 5.2.7 shows the Bearerbox used by the smsKannel.conf

Figure 5.2.7 Bearerbox

Figure 5.2.8 shows both Bearerbox Kannel and SMS Box running on the server so that they monitor any message that is sent to the server.

Bearerboxreceives data from store file and channels them to the defined SMSC. SMSbox acknowledges / verity's the message queuing requests and deposits them into the store file.

Figure 5.2.8 BearerboxKannel and SMS Box

CHAPTER SIX: RESULTS, CONCLUSIONS AND RECOMMEDATIONS

6.0 Introduction

This chapter contains results, conclusions and recommendation from the project under taken that is 'Remote Server Management Using Cell Phone Technologies (SMS)'. The chapter starts with a discussion containing results/solution achieved in the implementation of the project.

6.1 Discussion of results

Remote server management technologies have become very popular due to the flexibility that comes with it and to stop the system's administrators from having to be around all the time to configure and carry out maintenance work on the server

This project was designed and built to enable system's administrators to control and configure the servers and client machines using the SMS technology of a GSM mobile phone without any internet connection on his/her phone by simply sending a message to the server or the client machine.

SMS technology provides an effective and a cheap way to work on the server from anywhere and anytime without being restricted in any way since most of the mobile phone companies have the feature that you can register for diary SMS bundles at a very low cost like KSHS10 for 100 messages. Also the administrator does not need to buy an expensive smart phone for just sending an SMS.

The application running on server listens for response from clients and commands kannel to send an SMS to administrator and application on the client listens for commands it has to execute, executes them and sends a response to the database. This is done in real time so as to provide the systems administrator with more information about the state of the server and the client machines on that network.

To achieve this the SMS Kannel keeps running on the server and checks for any incoming message every after 30 seconds both from the GSM phone or the client computers on the network. This allows for an easy and timely configuring of the server.

In the implementation phase, there are different setting to be configured on the server depending on the type/ model of the MODEM used like HUAWEL mobile broadband and HSUPA USB Stick from the ZTE Corporation therefore this requires prior knowledge on the type to be used.

Also in the configuration phase I had to set the message center of the SIM card that I used so as to enable the relaying of the messages on the SIM card inserted in the MODEM. And for Airtel Kenya is +254733000810. Also the SIM card had to havesome money or SMS bundle for it to send messages back the systems administrator in response to the configurations made on the server or the client machines.

6.2 conclusion

With all the available remote server management technologies, the usage of the SMS has provided for a cheap, reliable and real time management of the server and the client machines from anywhere and anytime.

6.3 Further Works

There is need to develop mobile phone Appsfor smart phones to help in remote server management which is also compatible to all the different operating systems either android and windows 8 plat form for the graphical user interface so as to provide more flexibility to the systems administrators. This will also provide additional help to the systems administrator since they can choose from either SMS technologies or Mobile phone Apps.

6.4 Recommendations

There is need to integrate the kannelSMS gateway application software in all windows operating systems so as to make it possible to use the SMS technologies with minimum configurations on both the server and the client machines.

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