

Implementation of Secured and Integrated Information System in any Institution or Domain on Global Network



Mohammad Ghulam Ali

Fellow, BCS, UK. Member, IAENG, Hong Kong, Member, IACSIT, Singapore
 Academic Post Graduate Studies and Research and ERP Cell

Indian Institute of Technology Kharagpur
 West Mednipur 721 302, INDIA

ali_iit@yahoo.com, ali@hijli.iitkgp.ernet.in, aliemailid@rediffmail.com, mga.iitkgp@gmail.com

Abstract : The Computer Science and Information Technology are growing very rapidly. The main thrust area in the Information Technology System is now to provide a best and sustainable security system if the system is designed and implemented on the global network. Many works are carried out in this area and are also implemented well and are also working in the well fashion manner. My aim of writing this paper is to propose a framework illustrating a sustainable security system for any information system which is accessible by global users on global network and is implemented on a corporate LAN. In this paper, 1st section briefs an introduction session, 2nd section shows the proposed framework, 3rd section briefs an implementation overview of the proposed framework and the last 4th section concludes the paper.

Key words : Software Firewall, Internet, Intranet, Secured/Private Net, Software Firewall Rules, Application Server, Database Server, Database.

INTRODUCTION

Keeping in mind the progress in communication and database technologies (concurrency, consistency and reliability) has increased the data processing potential. Various protocols are proposed and implemented for network reliability, concurrency, atomicity, consistency, recovery and replication. The current demand is now to access data from various existing databases and update database of a particular domains of interest in a much secure manner.

The data should be protected from intrusion and hacking. There should be a mechanism for intrusion detection too. A proposed framework will meet this requirement in this paper providing a better and sustainable network security system by adopting a Linux Software Firewall as shown in Fig 1 and Fig 2. Please see details about Linux Software Firewall in [1,2,3,4,5,6,7,8]. A proposed framework is concentrated on Web-based Integrated Information System to retrieve and update data by any global user authenticating through a Linux Software Firewall. This paper has addressed this issue nicely by implementing a

Linux Software Firewall between institution/organization gateway and Web-based Application Server. However, institution/organization gateway also acts as a software or hardware firewall but has limited authentication and security. Please see details about difference between software and hardware firewall [14,15,16,17,18].

Hardware and Software Firewall are used together in any organization/institution to provide us greater degree of protection.

Normally hardware firewall provides us first line of defense against common forms of attack coming from the outside world. It can generally be effective with little or no configuration, it can protect every machine on corporate LAN[14].

This is where the benefits of a software firewall come into play. Because a software firewall is running directly on a computer, it's in a position to know a lot more about network traffic than simply what port its using and where it's going -- it will also know what program is trying to access the Internet and whether it's legit or malicious (it consults a regularly updated database to determine this)[14].

Based on this information, a software firewall can either allow or block a program's ability to send and receive data. A software firewall is able to take a closer look at malicious traffic and intercept it before it leaves computer[14].

Software firewalls give us the level of protection need to keep safe from hackers and other unwanted intrusions because software is far easier for computer novices to customize. The features are suited to smaller networks[15]. Specially to my proposed private and secured network.

In Fig 1 and Fig 2 I have shown a Linux Software Firewall between an institution/organization gateway and a Web-based Application Server. The Web-based Application Server and the Database Server which is in the private and secured network and enabling us making Database Servers more secure from web clients and from unauthorized users.

I can say a Web-based Application Server and the Database Server are behind the Firewall and in the private and secured network. Implementing a firewall ensures second level security as the first level security is enforced by implementing a Gateway-cum-Firewall at the door of the Institution/organization. 2nd level firewall actually segregating Institution/organization corporate LAN into a Small island/segment which is heavily guarded.

necessary for their activities. Additionally, more control is needed over changes a user can make to data because of the many ways these changes can affect other users of the database [13].

A Network Security expert can better protect Database Servers by implementing a software firewall between an Institution/Organization Gateway and a Web-based Application Server which is behind the firewall and will examine each incoming packets coming to the Web-based Application Server from authorized web clients or from unauthorized users, will authenticate all incoming packets and will decide whether packets are to be denied, dropped or forwarded to the Web-based Application Server. For unauthorized users, the intrusion detection and protection depends on the standard of the firewall policy rules. The Database Server is also running in the private and secured network and is also behind the same firewall. A server which is implemented for a software firewall will have two network interface cards where 1st network card will be connected to the intranet and will have public IP or IP as it is allocated from the institution/organization and the second network card will be connected to the private and secured network and will have private IP where a Web-based Application Server and Database Server are running. A database server, web-based application server and all other private users will use private IPs. In the intranet zone it is not necessary that all computer machines' IP of the organization/institution are public i.e. accessible from internet zone. May be a series of other IPs as allocated by the Institution.

The DBA at Database Server will provide a better database server level and database object level security. The System Administrator at Database Server will provide a better OS level security. How to exactly tackle all these issues, I do not take into consideration in this paper.

AN IMPLEMENTATION OVERVIEW

All outgoing packets from the private and secured network to the intranet and to the internet will be examined at the Software Firewall and software firewall policy will decide whether packets are to be dropped, denied or forwarded. Similarly, all incoming packets from global users will be routed through institution/organization gateway to the proposed firewall and finally to the web-based application server. All incoming packets will be examined at the Linux Software Firewall and the Firewall policy will decide whether packets are to be dropped, denied or forwarded to the Web-based Application Server. In my proposed framework only the http packets are to be forwarded to the Web-based Application Server and the

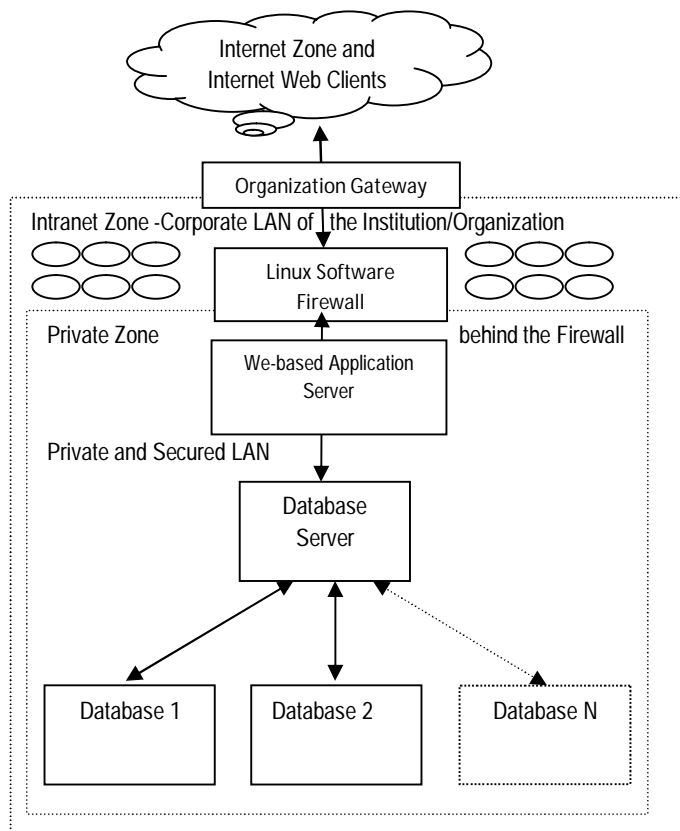


Fig 1: An Outline of the Proposed Framework

DETAILS OF THE PROPOSED FRAMEWORK

In my proposed framework, user will retrieve data and update data through a single web-based integrated application that resides on top of the Database Server System. I illustrate a proposed framework with illustrating a corporate LAN for any institution/organization as it is shown in Fig 2.

The increased usage of databases to store large amounts of data has created new security problems. Typically a database contains data of various degrees of importance and levels of sensitivity. This data is shared among a wide variety of users with different responsibilities and privileges. It is therefore necessary to restrict users of the database to those portions of the total data that are

Database Server. All other incoming and outgoing packets will be straight forward dropped.

I am sure that my proposed framework will certainly provide high level database and network security.

Linux ipchains / iptables and IP forwarding are used to configure Linux as a Software Firewall and Router. **ipfwadm** was used in Linux Kernel Version 2.0.x and Red Hat Version 5.x. **ipchains** was used in Linux Kernel Version 2.2.x and Red Hat Version 6.x, 7.0. **iptables** is

using in Linux Kernel Version 2.4.x, 2.6.x and in the later version and Red Hat Version 7.1 - 9.0, Fedora 1,2,3 and in the later version. I am not considering in depth in this paper about Firewall Rules. Please see details [9,10,11,12] for writing and implementing firewall policies/rules.

Prototype of Corporate LAN, Linux iptables Packet Filtering Software Firewall

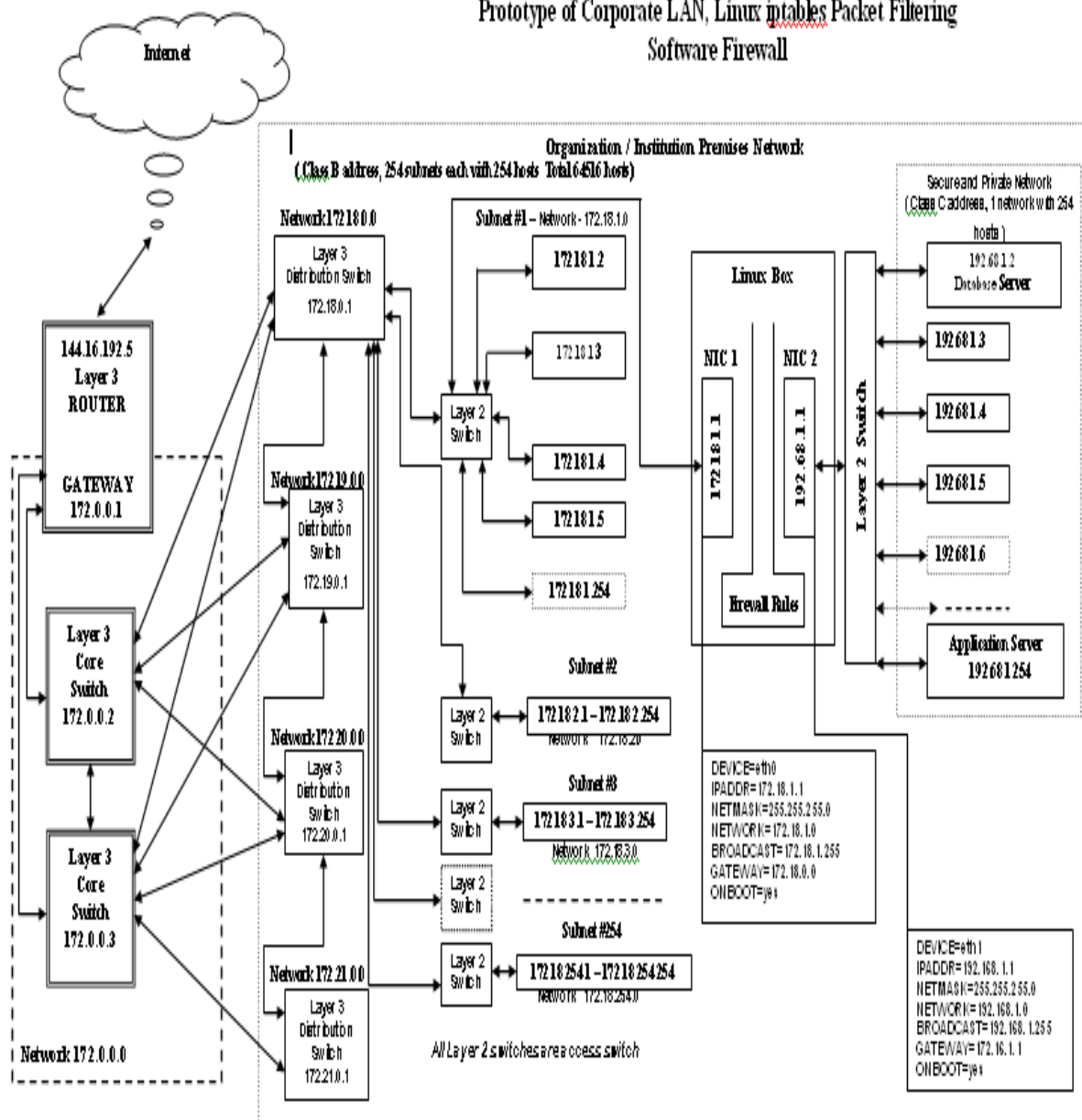


Fig 2: A Proposed Framework

CONCLUSION

Networking level security, OS level security, and Database level security are important concerned for any web-based or client-server an integrated information system. In this paper I have proposed a robust framework implementing Linux Software Firewall to provide a sustainable network security features. I shall discuss in depth about Linux Software Firewall Policies and Rules in the next paper.

REFERENCES

- [1] <http://www.tldp.org/HOWTO/pdf/Bridge+Firewall.pdf>, "Linux Bridge+Firewall Mini-HOWTO version 1.2.0".
- [2] <http://www.tldp.org / HOWTO /pdf/ Firewall-HOWTO.pdf>, "Firewall and Proxy Server HOWTO".
- [3] http://www.bglug.ca/articles/packet_ filtering_ firewall.pdf"Packet Filtering Firewall".
- [4] http://linux.about.com/od/lna_guide/a/gdelna74.htm "Linux Network Administrators Guide".
- [5] <http://grassrootssecurity.com/2010/03/routers-%E2%80%93-hardware-firewalls-vs-software-firewalls-part-2-hardware/>, "Routers – Hardware Firewalls Vs Software Firewalls Part 2 Hardware".
- [6] Olaf Kirch & Terry Dawson, "Linux Network Administrator's Guide, 2nd Edition", 2nd Edition June 2000.
- [7] <http://www.pctools.com/security-news/what-does-a-firewall-do/>, "What does a firewall do?".
- [8] <http://ecomputernotes.com/computer-etworking-notes/security/what-is-firewall-explain-its-importance/>, "What is firewall? Explain its importance".
- [9] P. Harrison, "Linux Home Networking".
- [10] M. Grennan, "Firewall and Proxy server HOWTO".
- [11] M. Hamm "Firewall".
- [12] G. Green, J. George "Linux Security".
- [13] E. Bertino, and L. M. Haas, "Views and Security in Distributed Database Management Systems".
- [14] Ronald Pacchiano, <http://www.smallbusinesscomputing.com/webmaster/article.php/3103431/Firewall-Debate-Hardware-vs-Software.htm>, "Firewall Debate: Hardware vs. Software", Published on: 09-Jun-11.
- [15] <http://personal-firewall-software-review.toptenreviews.com/hardware-firewalls-vs-software-firewalls.html>, "Hardware Firewalls vs. Software Firewalls".
- [16] <http://forums.esds.co.in/f5/difference-between-hardware-software-firewall-159/>, "Difference between Hardware & Software Firewall".
- [17] <http://www.hacker10.com/computer-security/hardware-firewall-vs-software-firewall/>, "Hardware firewall Vs. software firewall", 27 April, 2011.
- [18] Ricky Panchal, "Firewall: Hardware Vs. Software", Mrch 25, 2005.



Mohammad G. Ali He was born in Bhagalpur,

Bihar India. His date of birth is January 27, 1968. He obtained the degree of Master Diploma in Computer Science (1991) and Master of Science in Mathematics (1993) with 1st class. He stood 1st in the Computer Science in the University. He is a Fellow (BCS), British Computer Society, the Chartered Institute for IT, UK. He is a life member of IAENG, Hong Kong and IACSIT, Singapore. He is a senior member of IAEST. His two papers were published in the International Journal of Computer Science and Information Security, USA in the month of November 2009. Another paper was published in the Global Journal of Computer Science and Technology, USA in the month of April, 2010. Another paper was accepted in the International Conference, IASTED, ACIT-ICT 2010, Russia. Another paper was published in International Journal of Computer Applications, Foundation of Computer Science, New York, USA in the month of September 2010. Another paper is published in the International Journal of Computer and Electrical Engineering (IJCEE), International Association of Computer Science and Information Technology, Singapore. Another paper is published in the International Journal of Computer Theory and Engineering (IJCTE), International Association of Computer Science and Information Technology, Singapore. Another paper is published in the International Journal of Computer Theory and Engineering (IJCEE), International Association of Computer Science and Information Technology, Singapore. His one paper was accepted in the international conference, (ICMLC-2011), Singapore which was held in Feb 26-28, 2011 (The conference was sponsored by the IACSIT, IEEE, IE). His one more paper is published in the International Journal of Computer Application, Foundation of Computer Science, New York, USA. He is a member of the Editorial Board of IJCA, USA and IJCTE, Singapore, IAEST. He is a member of Reviewer Board of IAENG International Journal of Computer Science, Hong Kong. He was a Peer Reviewer of the International Conferences, ICMLC-2011, Singapore and IEEE ICCSIT 2011, China. He is a System Engineer Grade I in the Indian Institute of Technology, Kharagpur, West Bengal, India. He is associated with IT Project Management, System Analysis and Design Methods, System Development Life Cycle, Programming, Implementation and Maintenance of Client-Server DBMSs and Web Applications Development. He is also associated with Database Administration, Web Server Administration, System Administration and Networking and Network Security of the Institute. He has deployed many small to big projects in the Institute Network. He has been guiding undergraduate and post graduate students of the Institute in their projects. His areas of research are Parallel and Distributed Computing (Heterogeneous Distributed Databases/Multidatabase), Software Engineering, Networking and Network Security and Database Server Performance Tuning and Query Optimization.