
NETWORK SECURITY AND VIRUS PROTECTION IN DIGITAL LIBRARIES

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ABSTRACT

Network security is an important part of keeping homes, businesses, institutions, and organizations computer safe from invasion by unauthorized users. As more and more people become “connected” increasing number of people need to understand basic security in a networked world. Creating a security for network not only keep unauthorized users at bay but also protects network from data theft. This paper gave overview discussions on digitalization in libraries, computer networking in libraries, the services and impacts of networking in libraries. Network security and its benefit in libraries, the challenges of network security in libraries were also discussed. This paper also discussed the security risk and counter measures associated with internet connectivity. Some common network security threats in digital libraries were identified and measures for proper network security were also discussed. Recommendations such as consulting system support personnel for adequate maintenance of network security, installing antivirus protection software, use of firewall, turning off computers or disconnect from network when not in use, make regular backup optical data for disaster recovery, installing front ended and back ended security, scanning computer system always to detect, freeze and flush out viruses among others were recommended for adequate network security and virus protection in digital libraries.

Introduction

Library development in Nigeria has witnessed tremendous progress within the last decade due to the constant changes in technology globally. Today we are living in virtual realities where library services are now in cyber space. Networking in libraries is beginning to replace the conventional library services by presenting new modes of conducting basic activities in libraries. However, the application of ICTs in libraries has provided the opportunities for libraries to have access to activities of other libraries by connecting different libraries to access and share information resources; it also enables the collection of electronic journals in software agents that support inquiring; access to emails, internet and even personal information collections from any repository domain. The truth is that digitalization has dramatically changed and rebrands library practices in the 21st century whereby information resources are digitalized for online access to all potential users across the globe. These technological developments gradually gave birth to what is now known as digital library.

Digital library is a system in which all the texts and spoken books are stored in electronic files for easy access and retrieval to meet the information needs of its potential users. A digital or virtual library is the online access provided by other facilities or it may mean a website which offers link to various sites with a large store of information in a catalogued or archived form. A digital library generally is part of a network with linkage to other libraries. These are libraries in which computer and telecommunication technologies make access to a wide range of information resources possible. Irokwe (2001) defined digital library as a library that harnesses digital technologies as infrastructure to search, collect, organize, store and distribute cultural, historical and scientific information whether it is text, visual images or sound. This requires that all operations of the library be computerized. This is the basis for networking in the 21st century library. Gray (2004) defined network as a window on the world, extending the capacity and enabling the sharing of resources. While Ikegbune (2003) described network as a number of group or system whose members are connected in some ways. However, computer network in libraries is the connection of many computers of automated libraries with the purpose of meeting the user's information need. Digital libraries therefore have every need to bridge the security gap by protecting their information resources from theft, hackers and intruders.

The realities of the present information age as a result of the evolutions of ICT technology has brought radical changes in our present libraries, these technologies are powerful tools which need security mechanisms to be protected and safe guard from invaders. Network security is an important part of keeping homes, businesses, institutions, and organizations computer safe from invasion by unauthorized users. As more and more people become "connected" increasing number of people need to understand basic security in a networked world. Creating security for network not only keeps unauthorized users at bay but also protects network from data theft. Computer network security is a sensitive and important issue in all spheres of life. One of the objectives of any type of library in the world is to provide and protect information resources within its domain. Therefore the key part of computer security is the analysis of the possible threats as well as the actual impact of attacks for better protection, thus reducing risk of unauthorized users in digital libraries.

Digital libraries required some security mechanisms to safe guard their information resources on net. However, securing a reasonable and reliable network in digital libraries is accomplished through hardware and software, such soft ware are constantly updated and managed to protect computer network from emerging threats. The essence of network security in digital libraries is to minimize and monitor unauthorized access, use, modification, or denial of a computer network service and network accessible. It is obviously that any digital library without network security mechanisms are more likely to be victims of security threats and virus attacks because intruders are always discovering new vulnerabilities (holes) to exploit into computer software. But then, when holes are discovered, it is the responsibility of librarians in the digital library to obtain and install the patches or correctly configure the software to operate more securely and safe from invaders. With network security in place most connected libraries experience many benefits such as library resources are protected against disruptions, blocking the threats of unauthorized users and reduced the illegal actions of data theft.

Computer Networking in Digital Libraries

Library is a place entrusted with the acquisition, processing, preservation, storage, retrieval and dissemination of information materials in whatever format it appears. Networking in libraries tends to rebrand librarianship and library practices. Traditionally, libraries were collection of books, manuscripts, journals, and other sources of recorded information. In the recent year, libraries have increasingly developed into information providers and services in a variety of ways across geographical boundaries. Networking had dramatically changed the ways in which governments, public, private sectors and libraries operate all over the world. The emergence and convergence of information and communication technologies (ICT) has therefore remained at the centre of global social-economic transformations. Ogunsola and Okusaga (2008) opined that libraries are now extending their traditional roles of facilitating self-education and individual enrichment by providing low-cost or free computer access to online resources.

Library network is a public library cooperation serving many libraries, the mission is to provide and facilitate quality services developed through collaboration of member libraries. However, Library networking is in the form of certain varieties such as Local Area Network (LAN), Wide Area Network (WAN) and Regional Area Network (RAN) with a technology circuit and starting up a web server making it possible to exploit such advantages as the sharing of resources associated with computer such as data, software and hardware. In the view of Ikegbune (2003) that a typical LAN consists of two or more personal computer, printers and high capacity disk storage devices called files servers which enables each computer on the network to access a common set of files. In a related development Dahl (2000) remarked that library services and digital resources are delivered over the internet which depends on network operating system running on the web server computers.

However, library network is based on connected link of number of libraries for the purpose of cooperation and sharing of resources for participating members. Such library network server are socially configured to allow users access various areas of the library and run many applications that are crucial in service delivery of digital resources. The applications of library network depend on relational database for organization, storage, retrieval and dissemination of information. It is worthy to note that the enabling technologies in library are web –based technologies that include web design using hypertext markup language (HTML) Extensible markup (XML) cascading style sheet (CSS) etc. This confirms the view of Oyinloye (2004) that there are many soft ware packages specially designed for libraries these include TIN LIB, ISIS XLIB etc. However, Malumfashi (2009) highlighted the concepts of online technology in libraries as follows:

- The development of more efficient information and information retrieval software.
- Efficient tele-communication network that will facilitates effective information storage and delivery.
- Efficient method of storage of large machine readable recorded information computer and other technologies.

However, library network in most cases provides the largest reservoir of vital information to users in all discipline all over the world. It provides avenue for the

dissemination of information and assist in the actual identification of the right users of the information being provided. Networking in libraries ensure better resource sharing, facilitates speedy delivery of document, enable participants to keep abreast of new developments and provide cross fertilization of ideas. However, internet as an information source is uniquely important to the library in the provision of information by providing several opportunities for academic communities because it is used for providing access to abundant information to support, teaching, learning and research activities. Oyinloye (1999) outlined the main objectives of library network as follows:

- Cooperative cataloguing and building of bibliography standard and tools.
- The development of shared data –base.
- The development of inter-library loan or document delivery network.
- Cooperative sharing or expertise in answering user reference questions.
- Cooperative books and journals acquisition of materials.
- To provide accurate and timely information.

Services and Impact of Networking in Digital Libraries

Internet has become part of the library environment and it has added great values to library and information services delivery. The emergence of networking in libraries has improved tremendous opportunities in the field of library and information science, particularly in library routine tasks such as acquisition, cataloguing and users services. Networking in libraries is beginning to replace the conventional library services by presenting new modes of conducting basic activities in libraries. Most importantly, application of ICTs in libraries has provided the opportunity for libraries to have access to activities of other libraries. A librarian may provide other information services, including computer provision and training, coordination of public programs, basic literacy education, assistive equipment for people with disabilities, and help with finding and using community resources.

However, Vagiswari (2000) opined that the impact of networking in libraries t of the services facilitate cooperation among libraries and allow easy integration of various activities in the library. Ajibero (2001) ascertained that library networking facilitates online catalogue access as well as other library connectivity. Library networking operations are performed faster, more reliable, precise, comprehensive and up to date. However, the main service of network in libraries is to connect different libraries to access and share information resources. It also enables the collection of electronic journals in software agents that support inquiring, access to emails, internet and even personal information collections from any repository domain. However, Ulla (2006) gave the summaries of the networking services in libraries as follows:

- Accessing and searching for library catalogues worldwide for author/ title. Copy cataloguing and the creation of bibliographies.
- Offering local and remote library patrons to full –text data-base via webs.
- Placing order with vendors of software, books and other information resource materials.
- Accessing public domain, shareware and free ware program, text files,

- Sharing information resources among connected libraries.
- Communicating with others –The internet impact individuals, communities and a whole region by changing the way people communicate with one another.
- Down loading information through the library catalogue website.
- Subscriptions of electronic journals and other electronic resources.
- It enhances cooperation and relationship with other similar networks regionally or internationally.
- It promotes global flows of information and data within the organization and world over.

Network Security and its Benefits in Digital Libraries

Network security is referred to any activities designed to protect network specifically these activities protect usability, reliability, integrity and safety of network and data. In other words Computer network security is the process of preventing and detecting unauthorized use of other people's computer. Network security does as it title explains. It secures the network as well as protecting and overseeing operations being done, this is accomplished through hardware and software. Network security consists of components, ideally all components work together, which minimizes maintenance and improves security. It also consists of the provisions and policy adopted by a network administrator to prevent and monitor unauthorized access, use, modification, or denial of a computer network and network accessible resources. Gray (2004) is of the view that network security involves the authorization of access to data in a network, which is controlled by the network administrators. The basis of network security in digital libraries is confidentiality, integrity, availability and accessibility of information to those who are authorized to have it.

However, network security covers a variety of computer network, both public and private that are used in everyday transactions and communication among business, government agencies, institutions and individuals. Most organizations today are conscious of reliable and unified security, so that organizations can monitor network performance and bandwidth consumption, catalogued application in use and detect problematic changes in network activities most effectively. This confirms the view of Allen (2005) that network security protects libraries that are connected from the threat of unauthorized users and reduces the illegal actions of data theft. Ultimately, network security helps to protect the reputation of connected libraries which is one of its important assets thereby effectively target variety of treats and stops them from entering or spreading. However, Benson (2005) gave an over view benefits of network security as follows:

- A secured network has much less likely hood of unauthorized access which could result in corrupted data, stolen data, or malicious damage to database.
- Some forms of encryption are usually used to make data unreadable even if it is stolen.
- Data, files and personal information are protected from unauthorized access from both people in and outside the network.
- It protects information been shared on the network.
- It protects physical computers from harm based attacks on the network.

- It provides level of access if the network has many computers attached, some computers may have access more than others.
- Private network can be closed from the internet for protection from outside attacks and safe from virus attacks.
- It ensures privacy and safety of information resources.
- It protects computer from viruses, Trojans, worms, hackers etc

Network Security Threats in Digital Libraries

Managers and administrators of computer network are confronted with some network security threats that are against networked computers. Most computers are left unprotected, and if computers are left unprotected there is nothing the network can do to protect that PC. PCs that are left widely open to attack can be used as platform to launch attacks on the network not to mention the files and data stored on the PC itself. This is a situation where an unauthorized user gain access to some of the computers(network spy) breaking into the card catalogue of a library to see if a particular information resource material is checked out or available. This was reason why Maidabino (2011) opined that university libraries face a number of security challenges with their collections (print and non- print).

Today, many network security threats are spreading over the globe through intruders. Intruders are also referred to as hackers, attackers or crackers, who may not care about the identity of a library and institutions before launching attacks to gain control on other computer systems. This is dangerous because there are tool kits used in the underground community which allows unskilled bad guys to penetrate this attack. Users session is taken over e.g. when users are on e-mail the attackers sees the e-mail and then execute any commands they wish, anything a user can do legitimately can now be done illegitimately by attackers .meanwhile, Intruders also watch all actions on the systems or cause damages to computers by formatting hard drive or changing people's data and hiding their true locations. However, Grassian (2004) highlighted the followings as common ways intruders gain control to network.

- Viruses, worms and Trojan attack –This is a common way for intruders to trick into back door programs, such as virus or worms which leverage unprotected window, It is sometimes refers to as social engineering. It allows intruders easy access to other computers without the knowledge of the owner.
- Unprotected window share- Unprotected window share can be exploited by intruders in an automated way to place tools on large number of windows -based computer attached to the internet. Because site security on the internet is interdependent, a compromised computer not only creates problem for the computer owners but it also a threat to other sites on the internet.
- Denial of services Attacks- This is another form of attack which causes computers to crash or to become so busy processing data that are unable to be used. These attacks are probably the nastiest and most difficult threat because it is easy to launch and not easy to refuse the request of the attacker. It is a type of attack that brings network services down to its knees by flooding the network with excessive traffic.

- Backdoor and remote administration program once installed on a window computer, it can allow unauthorized people to access and control computers. Backdoor and remote administration program has three tools commonly used by intruders to gain unauthorized access to other computers these are Back orifice, Net bus and Sub seven. However, Gray (2004) identified other network security threat as follows:-
 - Malicious and destructive codes.
 - Networking shares propagate.
 - Guessing of passwords
 - Spyware and adware
 - Unauthorized access of documented or records
 - Hackers attack, hijacking and theft of data.

Measures for Proper Network Security in Nigerian Digital Libraries

Couple with the numbers of threats that are found on the internet today, many computer users invest in a computer security system to avoid potential problems. Although a solid computer security system can be effective for protection. Capron (2000) stated the measures to be considered for proper network security in digital libraries as:

- Risk analysis
- Disaster recovery
- Writing security policies.
- Password protections
- Installation of front and back ended security
- Protection against virus attack

A) Risk analysis - Risk analysis is the process of assessing every component of a system and determines whether there is anything worthwhile protecting and if so, determines whether it is exposed to any security threats. A Key part of computer network security is the analysis of the possible threats as well as the actual impact of attacks that have occurred. Such an analysis is predictive in terms of examining where the network might be attacked and reactive in terms of evaluating attack and how to compromised network security. The risk analysis leads to either strengthening of the network to resist possible attack or mitigation of the effects so that the damage is limited and controlled. It is widely known that proper level of security is determined by what is to be protected. The server that stores the bibliographic records for a particular library automation system deserves highest level of security, but an inexpensive PC that only supports word processing deserves little or no security. However, Dalh (2001) identified three steps to be considered in network risk analysis as follows:

- Assess the system and determine which components are at risk, consider the hard ware and also consider which applications and data would need to be replaced if a disaster struck.

- Examine how threats can manifest either through blackout, natural disaster, software failures, hackers, viruses and human error which result in lost or corrupted data.
- Assign cost-effective safe guards. Include a safe guard that protects, detects, prevents, deters and recovers from virus attacks or lost of data.

B) Disaster Discovery–It is the responsibility of the librarians to maintain the accuracy and integrity of the information provided to its potential users. It is also important that a librarian provides a safe and secured environment to work. This is the backup plan which helps to recover from the disaster; this whole process is called disaster recovery. It is important to back up critical data in case the hard drive crashes or a tape fails or lost of data as a result of a virus attack.

C) Writing security policies–If risk is reduced to an acceptable level then security policies to help maintain security is adopted. Security policies define the aspects of the system which needs to be protected and outlines a general approach for dealing with network security problems. Security policies should not include the details on how to protect a system. Basic policy might include these four sections.

- Purpose, which is a brief statement explaining the purpose of the document.
- Scope, which explains who and what are covered by the policy
- General policy statements, which states the rule such as who is in charge of security? Who is permitted to use the facilities? What are computers used for? What document should be protected and what are the consequences of misusing the system?
- Standards which are specific activities that support the general policy statements.

D) Password protection –password is an important security mechanism which protects the system as a whole. Passwords are important first line of defense against intruders and it is in the interest of every individual, institutions and organizations to give this principal mode of protection some serious thought. It is referred to as a secret code which enables users to operate a system.

E) Installation of front ended and back ended security–Front ended security system is right out, where everyone can see them. It is referred to as first line security programs which operating system is user-friendly. The best front ended security for libraries is secured menu system because it offers basic levels of security and it presents a friendly interface for patrons, explaining what resources and services are available on a given PC.

Meanwhile Back-ended security is referred to a program that runs behind the scenes providing a second line of defense. PC security developed by tropical software is a popular shareware file locking application that offers different modes of security such as lock access to particular file such as text files. Another mode enables lock access to programs such as sysedit exe and notepad exe. A mode called explorer control offers several levels of protection ranging from locking files and restricting access to control panel.

F) Protection Against Viruses- Viruses are small computer program that attach themselves to applications and system files and can reside in computer memory or on its hard drive. In the case of macro viruses, data files can also be infected. There are several things to help avoid getting virus but the best single thing is to install antivirus software. Antivirus software greatly reduces the chance of experiencing a viral infection in computers. Antivirus scans all files currently on hard disk to see whether they contain any viruses. They also install memory-resident programs that keep a continuous lookout for any suspicious activity that would indicate a virus.

Conclusion

In most developed countries, unauthorized and illegal network invaders of digital libraries is no longer a worrisome issue as government agencies, institutions and organizations are conscious of reliable and unified security to protect their information online, thereby monitoring network performance and bandwidth consumption, catalogued application in use and detect problematic changes in network activity most effectively. Network security enables administrators to scrutinize network's incoming and ongoing data using a command line interface (CLI). However, in Nigerian context, digital libraries are still in their infancy stage. It is disgusting that in Nigeria, digital libraries as in other developing countries is different to that of developed countries because most libraries are yet to embrace digitalization and the few digital libraries are not actually security conscious. They have limited opportunities for protecting electronic information resources and feel the stings of cyber intruders.

Unfortunately, some libraries in academic environment are yet to be automated. the few libraries that are connected to the internet requires appropriate and adequate network security mechanisms to discover and block sophisticated threats or trouble shoot issues in the network using advanced threat detection techniques to protect information resources for better service delivery to its potential users. Digital libraries need contingency plans to fall back on i.e. backup plan help in responding to crisis, protect and safe guard's information on the net. If any of these goes wrong, that jeopardized the responsibilities of the librarians in the digital libraries. network security solutions include firewall security and intrusion prevention, advanced behavior analytics, and sophisticated threat detention engines, all designed to protect network in order to provide maximum security, integrity and flexibility of the digital libraries in Nigeria.

Recommendations

- Consult system support personnel for adequate maintenance of network security.
- Antivirus protection software should be installed in the system and be kept updated often.
- Use firewall which indicates possible presence of known virus blocks and eliminate unwanted traffic.
- Computer system should be turn off or disconnect from network when not in use to avoid attack.
- Make regular backup of critical data for disaster recovery.



- Installing front ended and back ended security.
- Systems should be scanned always to detect, freeze and flush out viruses.
- Install emergency power supply system and surge suppressors

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