

## Network Models for Library and Security Issues

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### **Abstract**

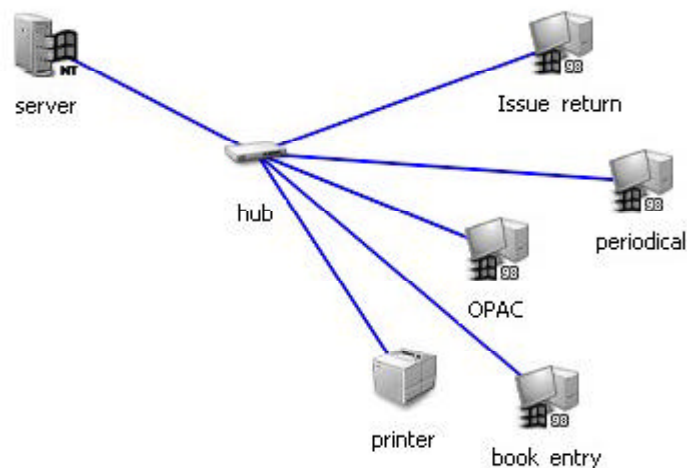
*The contribution of networking technologies for a library is significant. The library network and its security are major issues for the library professionals. Libraries and information centers are changing rapidly towards digitization. Now a day's stand-alone computer is of no use. It must be on network to utilize the resources. Computer networking involves connecting desktop computers, laptops, hubs, switches and other connectivity devices. Library professional requires inside planning in establishing library network in respect of data transmission speed and library applications. This paper presents model for library networks from low bandwidth application to the multimedia rich high bandwidth intensive library applications. The paper is also concentrating on library network security.*

**Keywords :** Library Network, High-speed Network, Network Security, LAN

### **0. Introduction**

Digital Library systems are the computerized information storage and retrieval systems connected to computer networks and have maximum flexibility, durability, immunity, stability, scalability, accessibility and compatibility with other media at minimum cost, space and maintenance. Library network provides transmission of information dissemination of catalogues; abstract and full text formats as well as various basic functions of libraries like acquiring, digitizing and archiving of contents. The networking of library resources means that users or patrons can access the information from their desktops irrespective of their physical location. The library networks provides library without walls [1].

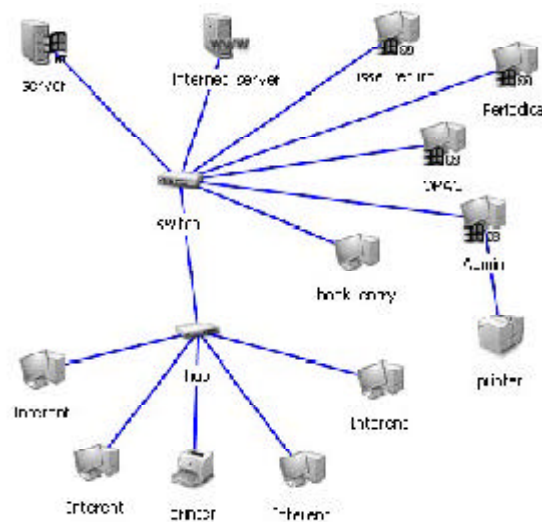
### **1. Traditional Library Network Model**



**Figure 1:** Traditional library network setup with one server and four client machines.

Traditional library network setup was established with Ethernet technology and fewer clients and server machines. Ethernet has become the most commonly used LAN (Local Area Network) technology worldwide. More than 85% of all installed network connections are using Ethernet technology, according to International Data Corporation [2]. As a transport protocol, Ethernet operates at 10Mbps data transmission speed and Layers 1 and 2 of the 7-layer OSI networking model, delivering its data packets to any device connected to the network cable [3].

This type of network have very limited infrastructure. The hardware and software is used make library network it includes one server machine and 5 to 10 client machines connected to gather. The server is responsible for all library related activities and like storage and retrievals. The same server runs library management software like SOUL and provides resources to the clients. The other hardware requires is hub/switch, network interface card (NIC) etc. while software need is generally network client software and network card drives. The figure 1 shows the typical library network. This setup has only one server, which provides library management information, database storing and retrieving, running library software for library with limited support for services [4].



**Figure 2:** Middle level network setup with two servers running NT and supporting www services.

## 2. General Network Model

Traditional library networks model operate at 10Mbps speed. At these speed libraries that use extremely large files such as transferring audiovisual contents to desktop, can experience long delays when sending such data across the network. This model uses the extended version of Ethernet called fast Ethernet, which is simply, an extension of existing Ethernet technology, running 10 times faster at 100 Mbps[4].

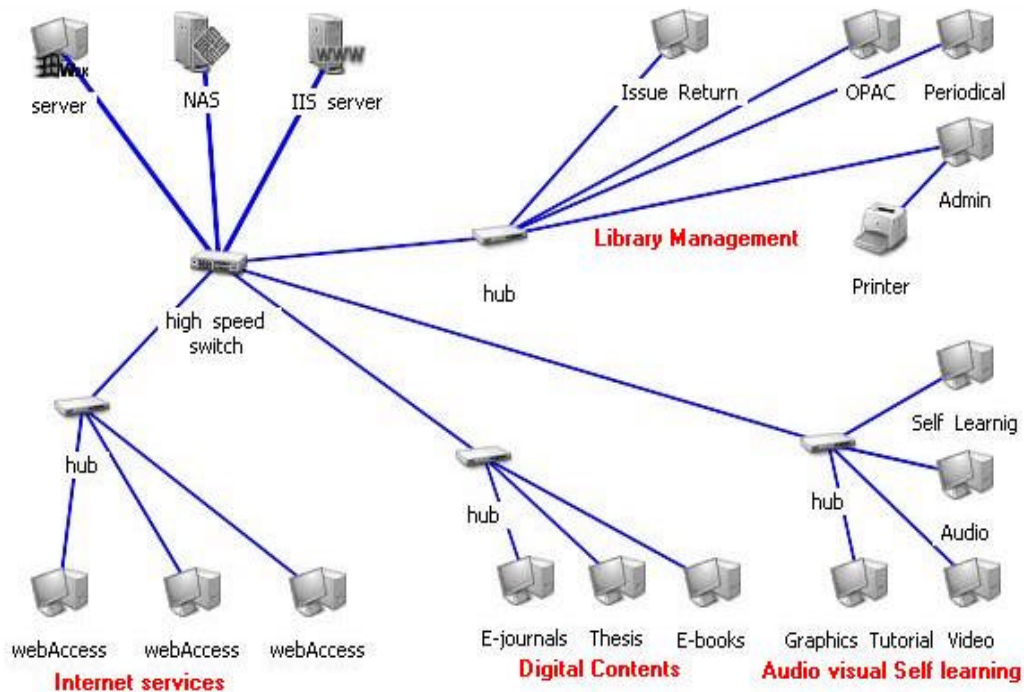
The general network setup for libraries is shown in figure-2. This setup model has two servers one for library applications and the other is for Internet access through remote location. These two servers provide

information to switch, which is of 100Mbps. Both the server NIC are of 100Mbps, which is little, bit higher than the traditional network setup. The figure-2 shows four machines like issue return, periodical, OPAC and Admin machine are directly connected to switch with 100Mbps NIC installed on each machines, giving total bandwidth of 100Mbps.

The Windows NT server provides user authentication and library management services to the various clients connected to it. While Internet server provides Internet services with remote online libraries, and Internet services.

### 3. High Speed Network Model

Traditional and general setup model operates at 10/100Mbps speed, while high speed network operates at gigabit 1000Mbps speed. Easy and straightforward migration to higher performance level without disruption, low cost of ownership including purchase and support cost and flexibility in network design are prime criteria for the high speed network model. This model is 100 times faster than regular 10 Mbps Ethernet and 10 times faster than 100Mbps fast Ethernet [4].



**Figure-3:** High speed library network model with three servers and one high speed layer-2 switch supporting four subnets

The high-speed model as shown in figure-3 shows the server farm to switch connection is of 1000Mbps gigabit Ethernet. This also employs the same protocol, same frame format and same frame size as its

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predecessors like 100Mbps fast Ethernet. This model setup has three main server connected to central switch with 1000Mbps gigabit data transmission speed. All three-server has gigabit Ethernet card Installed. The high speed network switch has 1000Mbps network link and distributes network traffic to four hub/switch segments like Internet services, digital content reading room, audiovisual learning and finally library management. Out of four hub/switch segments three are working at 100Mbps speed with 100Mbps fast Ethernet cards installed on each desktop machines. The hub connection has also 100Mbps link support.

The fourth segment named audiovisual self-learning as shown in figure-3 needs more than 100Mbps because the data transmission is of high-end audio and video graphics files. Transferring this high bandwidth intensive file on the shared Ethernet makes network busy or low so that this segment must of 1000Mbps.

This high-speed network segment provides simultaneous access to all the clients with streaming audio and video without any hustle form network speed. The high-speed performance is possible because the traffic is segmented. The figure-3 shows library management, user authentication etc. services from windows-NT sever while NAS (Network Attached Storage) server provides database, digital books, thesis, journals audio and video learning material storage [5]. The NAS server has very large capacity storage with 1000Mbps gigabit card installed on it. This server provides automatic storing and transfer of data on network with supporting domain server. IIS server provides Internet access and web services of any other digital library from Internet.

#### 4. Network Security

The process of securing your library network begins with realizing what the library stands to lose if security is not pursued. Network security is not just “another thing to do.” Its importance lies in protecting the library’s network resources.

Network resource means the equipment, software, and data that make up a networking system, including the user data that is shared over the network. In terms of network communication, this includes the servers, workstations, hubs, switches, routers, firewalls, and telecommunications links that make up a network. In terms of usage, this includes shared printers, database systems, shared software, user accounts, the shared or user-specific files stored on a central server, and the keystrokes and form information that travel across the network [6].

#### 5. Implementing Network Security

I divide the realm of network security in libraries into seven main categories: physical security, password security, hardware security, server security, workstation security, perimeter security, and financial security. These areas are expanded in the *Checklist* by separating out specific configuration issues related to web servers and general administrative issues related to budgeting, planning, and policy development. There are many sections in the security checklist :

- ✍ General security
- ✍ Physical security of computers and network equipment
- ✍ Password security
- ✍ Hardware security
- ✍ Workstation security
- ✍ Network server security

- ✍ Network equipment security
- ✍ Switch/Router/Hub security
- ✍ Web server security

## 6. Local Area Network Security

Securing any computer in a library must be achieved without any compromise to these three basic concepts: public service, user privacy and legal access. In an office or business environment, security is a matter of making sure those documents and transactions haven't been tampered with, corporate information is protected, personal employee information is kept private, and data is available when the business wants it to be. Network and computer security in a library setting faces these same challenges and a few additional ones [7]. The major local area network security points are: Password Security, Hardware Security, Workstation Security, LAN/Domain Server Security, and Network Equipment Security. As a librarian we have to protect these levels of security in the network.

### Password Security :

The least expensive and most important aspect of network security is the use of appropriate passwords. Password protection is inherent in various aspects of the network.

- ✍ Administrative access to server functions
- ✍ Workstation access to various files and services (such as the Internet)
- ✍ Administrative access to network hubs, switches, routers, and firewalls
- ✍ Access to administrative files, such as confidential personnel files or reports

Here are the checklist items related to password security :

- ✍ Develop written password policy and provide to all staff and patrons using specific user logons
- ✍ Develop written instructions in creating strong passwords and provide to all staff and patrons using specific user logons
- ✍ Document passwords for all network equipment, servers, and workstations
- ✍ Store password documentation in secure location known only by library director and one other person

**Hardware Security :** Hardware security is a convenient category used to classify miscellaneous items related to your computer and network hardware. The first set of items relate to the BIOS (the Basic Input/Output System) of your servers and workstations. The BIOS is a well-known feature on all Intel/AMD PC-compatible servers and workstations. It performs basic tests of internal components to be sure they are working satisfactorily. It also stores and manages the configuration of many of the parts inside the CPU case.

**Workstation Security :** Properly securing workstations is a very important part of the overall network security in a library. There are a large number of configuration issues to address when securing workstations. Using the Windows NT Workstation/2000 Professional operating system provides a better security foundation than does Windows 98[8]. Those libraries using Windows 98 on public workstations are highly encouraged to install special software to secure many of the workstation functions.

- ✍ Configure NT Workstation/2000 Professional partitions with NTFS file systems
- ✍ Windows NT/2000, unlike Windows 98, includes a feature known as file system security

### LAN/Domain Server Security

This paper assumes the use of Windows NT/2000 as the library's server operating system. In most small library local area networks, there will be one or two servers: a main server, usually a *domain controller* under Windows NT/2000, which verifies the logins of all users, and a file server used with the library automation system. In some libraries, these two services are combined on one server. It is possible to operate in a very small environment with just Windows NT Workstation/2000 Professional-based computers and no server at all, but it is more difficult to maintain security in this environment [9]. So this base level of security assumes the presence of at least one server. The following items are needed to secure the local area network servers in the library.

- ✍ Configure all NT Server partitions with NTFS file systems
- ✍ Configure separate operating system and data partitions (both NTFS)
- ✍ Mirror server drives (or implement RAID), if funding allows, for redundancy
- ✍ Configure servers with private IP addresses (LAN-wide recommendation)
- ✍ Remove unnecessary services
- ✍ Remove unnecessary files/programs
- ✍ Configure file system with proper file/folder access permissions
- ✍ Restrict access to the Network Monitor Agent
- ✍ Disable anonymous user logons
- ✍ Disable caching of user logons
- ✍ Configure account policy to restrict unauthorized logon attempts
- ✍ Create logon-warning message (a warning against unauthorized logon or access and use of restricted resources)
- ✍ Create alternative Administrators group and restrict membership
- ✍ Restrict privileges of default Administrators group
- ✍ Create alternative Administrator account (with new name) with full privileges
- ✍ Disable default Administrator account
- ✍ Configure auditing of Administrator account logon attempts (to track hacking attempts)
- ✍ Set a strong password for current administrator account
- ✍ Use different passwords for domain/server accounts than for local workstation accounts, or use different account names
- ✍ Restrict access permissions for the everyone group
- ✍ Disable Guest account if enabled
- ✍ Create appropriate user and group accounts (minimum of three groups: Patrons, Staff, and Administrators)
- ✍ Set appropriate group access permissions
- ✍ Implement procedures for file backups according to backup plan
- ✍ Restrict access to backup program

- ✍ Create and maintain current Emergency Repair Disks, and store in a controlled location
- ✍ File all server component documentation (papers/ manuals/disks) for use by service technicians

### **Network Equipment Security**

Network equipment refers to all the devices required to get data signals from one computer to another. Generally, these include hubs, switches, routers, and firewalls. Libraries should be purchasing network equipment that provides management capabilities. This provides the possibility of remote management of the network even if the library does not contract for that service initially.

- ✍ Set appropriate network management protocol (SNMP) passwords/community strings
- ✍ Record and secure any password settings created by staff or contractors

These two items minimize the risk of network equipment configurations being altered by unauthorized personnel. When the library hires a vendor to install and configure network equipment, be sure to document all passwords used to secure the equipment. It is the library's responsibility to secure these passwords by documenting them and storing the documentation in a secure (preferably locked) location.

- ✍ Configure audit logs properly, if available
- ✍ Implement procedure for monitoring audit logs
- ✍ Schedule periodic installation of firmware updates
- ✍ Document equipment settings for future use in reconfiguring equipment
- ✍ File all network equipment documentation (papers/ manuals/disks) for use by service technicians.

## **7. Conclusion**

A Library network service is an assemblage of digital computing, storage and communication machinery together with the software needed to reproduce, emulate and extend the services provided by the conventional libraries. The analysis of depicted models indicates that scalability in the increasing processing capabilities of digital computing of workstations and servers providing services to the clients, larger and larger storage needs and effective management of storage and increasing requirements of network bandwidth and high speed data transfer are the prime issues of information technologies. The library network once established is not secured from the administrators' point of view but must provide network security policy for servers, clients and other connectivity devices to provide satisfactory level of network security.

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