

Network and Security Implementation at Jawaharlal Nehru Library, University of Mumbai

Nalini A Raja

This paper discusses the Library as a nervous centre of the University providing right information – global or local – at the right time to the entire academic community. The fiber optic and Cat 6 cable forms a Network connecting various data servers of the library locally and globally. This very feature invites to implement security measures to be employed logically using Active Directory Server Settings and Web OPAC server settings to protect the data to be lost accidentally or purposefully.

Keywords: Computer Networks, Network Security, Active Directory Server

1. Introduction

University of Mumbai has two campuses – Fort (Churchgate) and Vidyanagari (Santacruz). To connect both the campuses and their respective Departments at Fort and Vidyanagari; University has implemented structured cabling for networking the entire Vidyanagari campus using fiber optics. It has planned networking of both the campuses in three phases. The University Library being the sole information provider to entire University community, it was wired in the first phase. One of the important objective of any University is to enhance Research and Development work in all the fields, impart education mainly at the Post Graduation level and inculcate Continued Information Literacy in the entire University community to keep a pace with the exponentially growing information. The demand for right information at the right time, therefore, is the primary objective of the Library. Implementation of structured Network throughout the University Campus was felt necessary and the responsibility of networking all Departments/Sections/Institutions was vested with the University Computer Centre. The respective Departments/Sections/Institutions were required to give or present the proposed network layout with location of each terminal. Accordingly The Jawaharlal Nehru Library also submitted Network layout.

The University's computer Centre provides access to internet resources through the two internet service providers viz; VSNL and ERNET. With the internet access to on-line information is made available at one's own desk but scholarly communication is not available free of cost. For such information academic community still has to depend on the Library resources, which are acquired with the approval of respective subject experts in consonance of the University's objectives. Therefore, the University Library still occupies the prime position in acquiring, organizing and disseminating the information stored in the traditional forms of the documents and on-line information sources like e-books, e-journals and databases – bibliographic as well as full text. And the University Computer Centre enables access to these resources by providing links to the data server/s of the Library on University Computer Centre's Server

hosting the University Website. The important feature of any library Management Software is to provide access to bibliographic details of entire Library collection – be it print or electronic or any other as it is a right of every bonafide user to know the availability and status of the document sought before actually visiting the Library.

With this basic demand, the university has gone global. This in turn has placed in apex position the problem of implementing security measures for efficient working of network. As we all know the electronic resources are made available either on IP authentication or authentication based on the user name and password. This is to confirm that the information is made available only to the bonafides. In the University the bonafides are – the students, the faculty and other administrative staff. This paper discusses the network structure, layout and security measures implemented by the Library to provide seamless access to the print and e-resources to all information seekers on their desk. This is achieved through structured network provided by the University Computer centre. The Library provided layout of the various sections of the library and the computer terminals to be provided for various in-house activities leading to enhanced user services.

2. Network Structure and Layout

Networking of the University is planned in three phases. In the first phase Jawaharlal Nehru Library located at the Vidyanagari Campus is computerized and connected through the Fiber optics cable with the entire campus. Jawaharlal Nehru Library is a single storied building with hexagonal structure. At present four wings viz; A, B, C and D are constructed with mezzanine floors for stacking the collection. The ground floor has stacking and reading rooms. Each wing has at least four Library professionals with one of them as a Section Head. The Section Head is either Senior Professional Assistant or Assistant Librarian or Deputy Librarian. It also has support staff and the Library Attendants.

Each wing on the Ground Floor viz; A, B, C, D houses a collection classified as Arts, Science, Humanities and Miscellaneous collection viz; Library Science, Applied Psychology, Geography, Census and Gazetteers respectively. The front part of the Central Hall has “May I Help You” Desk one side and on the other “Property Counter”. Between these two – counter and desk – there are Turnstiles. Behind these there is Card Catalogue and 10 terminals for OPAC. The rear part of the Hall houses Accounts Section and Computer Lab. Computer Lab provides access to e-resources. It also houses Data Server i.e. SOUL server, Active Directory Server, NAS CD Mirroring Server, MFD Multifunctional Device (Network Printer, Scanner, and Photocopier), Digital Knowledge Centre Server and Web OPAC server. These servers are logically different but physically on the same switch.

The mezzanine floor of the C Wing houses Lending Section with One library Professional, one Library Attendant and one support staff. The mezzanine floor of the A Wing houses Book Ordering Section (BOS) with 5 professionals, one attendant and one support staff. The mezzanine floor of the D Wing houses Theses collection with one professional and one support staff.

First Floor of the A wing houses Research Room with one professional staff and a support staff. B wing houses Periodicals Section with a Deputy librarian, two professionals one attendant and one support staff. C wing houses Library Science Department with computer Lab, two class rooms, Office, and teachers' rooms.

The All the sections in Library are connected through Cat 6 LAN Cable to each other in the Library through six L2 switches located on the ground floor of all four wings viz; A,B,C and D, one in the rear part of the Central Hall i.e. in the computer lab and one on the first floor of B wing. These six L2 Switches are connected to the main connection coming from University computer Centre to the L3 Switch in the Library (Figure 1).

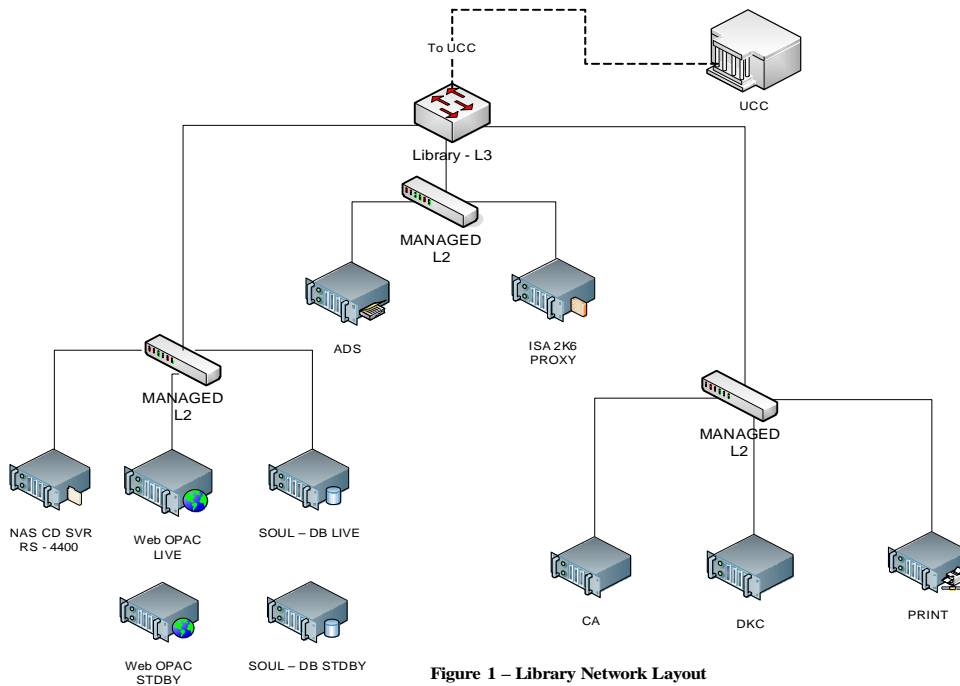


Figure 1 – Library Network Layout

As already discussed and shown in Figure 1 the main connection is coming from University computer Centre to L3 switch in the library. All the terminals have an access to INTERNET connection. These terminals are also connected to various servers in the Library.

7th Convention PLANNER - 2010

These servers are:

1. SOUL 1.0 server having about 8 lakhs records,
2. Chemical Abstracts Services CD server storing Chemical Abstract CDs from 1998,
3. Web OPAC server,
4. NAS (Network Attached Storage) and CD Mirroring Server. This server enables to mirror all the CDs received by the Library either gratis or as accompanying material or on purchase. This includes archiving of all databases' and journals' CDs. This server also has its own control like giving access rights to group of CDs or individual CDs restrict access to group of CDs or individual CDs,
5. MFD Multifunctional Device (Network Printer, Scanner, Photocopier)

Since data on these servers are crucial, access to the data should be authenticated and under no circumstances should be made available to any unauthorized user locally or globally. It was decided that where internet service is provided these databases will not be made available with some exceptions. The No of terminals located in each wing and respective sections is tabulated in figure 2 along with the floor layout.

Location	Wing/ Section/ Dept	Collection	Floor Level	Description	Total No of Terminals	SERVICES/TERMINALS						
						No. of terminals provided access to the servers and their applications						
						Internet service provided to	OPAC	SOUL	NAS and CD mirroring	CAS	MFD	
Jawahar Lal Nehru Library	"A" Wing	Arts	Ground	Stacking/ Reading	4	1	1	3	0	0	4	
			Mezzanine	Stacking/ BOS	4	1	0	0	0	0	4	
			First	Research	2		1	1	0	0	2	
	"B" Wing	Science	Ground	Stacking/ Reading	4	1	1	3	0	0	4	
			Mezzanine	Stacking	0	0	0	0	0	0	0	
			First	Periodicals	4	2	1	4	0	0	4	
	"C" Wing	Humanities	Ground	Stacking/ Reading	4	1	1	3	0	0	4	
			Mezzanine	Stacking	0	0	0	0	0	0	0	
			First	DLISc	40	0	0	0	0	0	40	
	"D" Wing	Library Science	Ground	Stacking/ Reading	4	1	1	3	0	0	4	
			Mezzanine	Stacking/ Theses	0	0	0	0	0	0	0	
			First	Periodicals	4	2	1	4	0	0	4	
	Halls	Front			May I Help "U"	2	0	0	0	0	0	2
					Photocopying	1	0	0	0	0	0	1
			Ground	OPAC	10	0	0	0	0	0	10	
			Mezzanine	Librarian	2	2		1	1		2	
		Ground	BOS	5	1	0	4	0	0	5		
Rear			Ground	Accounts	2	0	0	0	0	0	2	
			Ground	Digital Centre	20	20	20	0	20	20	20	
	First		Offices (2)	3	1	0	2	1	1	3		
		First	D N Marshal Hall	2	2	1	0	0	0	2		

FDRT Library (Proposed Plan)	Research (RR I)	Cubicles	Ground	Stacking/ Reading	10	10	2	1	5	0	10
	Research (RR II)	Exhibition	Ground	Displays	2	0	2	0	0	0	2
	Reading Room	Counter/ Reference	First	Stacking/ Reading	12	2	5	5	0	0	12
				Issue Counter	1	0	0	1	0	0	1
	Stacks	Arts	Ground	Stacking	0	0	0	0	0	0	0
		Law	Mezzanine	Stacking	1	0	0	1	0	0	0
		Language	Second	Stacking	0	0	0	1	0	0	0
		Xerox room	Ground	Museum	1	0	0	1	0	0	1
	Literature	first	Stacking	0	0	0	0	0	0	0	
	Total No of Terminals				144						

Figure 2: Location of sections and No. of terminals

To optimize the use of each Hardware components/computer systems and restrict the access to data, it was decided to configure Active Directory Server through which each server can be accessed by the user depending upon the administrative policy set by the Network Administrator on Librarian's consent. Accordingly following user groups and group policies were defined.

1. User group who is given right to access internet;
2. User group who is given right to access Chemical Abstracts available on CD;
3. User group who is given right to access Library Catalogue i.e. OPAC of SOUL 1.0;
4. User group who is given right to access only NAS server and CD Mirroring Server;
5. In addition to these groups there are groups of Library professionals who are given multiple server access rights. These are:
 - a. Junior Library Assistants,
 - b. Senior Library Assistants,
 - c. Assistant Librarians,
 - d. Deputy Librarian, and
 - e. Librarian.

Group a and b viz; Junior Assistant and Senior Assistants are not given INTERNET access in their respective sections as shown in Figure 2 However they have free access to INTERNET services in the INTERNET LAB. Where as Deputy Librarian and Librarian are provided with INTERNET connectivity on the dedicated terminals. The three types of security policies are implemented; Physical, Logical and Masking.

2.1 Physical Security

1. All the servers and MFD Multifunctional Device (Network Printer, Scanner, Photocopier) are kept in a server room. The entry to the server room is permitted only to the Network administrator.

2. Except the OPAC terminals all other terminals are kept in respective sections.
3. All the CPUs are kept in closed cabinets which are locked to prevent any hardware loss or even preventing physically powering them on/off.
4. The access to internet room is provided to all at any time during the working hours.

2.2 Logical Security

This is mainly achieved by Active Directory Server. All servers and terminals are under domain control and provided access using Active Directory Server logical and masking policies described below

1. Every Group member is provided logical access to the terminals by way of unique username and login password.
2. Every user is required to change the password on first login. Therefore misuse of password is prevented. This also helps in ascertaining accountability of user.

2.3 Security by Masking

1. Internet explorer icon is hidden from the desktop,
2. Internet Connection Wizard is disabled,
3. My Network Places icon is hidden on the desktop,
4. Wall paper changing is prevented,
5. Screen saver tab is hidden,
6. Changing Desktop toolbars is prevented,
7. Access to Command prompt is prevented,
8. Access to Registry editor is prevented,
9. CD burning feature is removed,
10. Entire network is not made available,
11. No one's computer is made visible or accessible to anyone in the entire network
12. Accessing any computer through run command is disabled,
13. Access to A, B, C drive is prevented to prevent corruption of OS or client applications installed on each terminal,
14. Changing Proxy Settings is disabled, and
15. Changing Connection Setting is disabled.

In addition to the above network security measures Library has configured separate Web OPAC server as shown in figure 3 followed by detailed explanation as to how access to Web OPAC is made available.

3. Web OPAC

The Web Online Public Access Catalog (Web OPAC) is made available globally by the Jawaharlal Nehru Library (JNL), University of Mumbai with customizations as per the requirements of the Library as well as giving application security due diligence.

As mentioned earlier the setup of Web OPAC refers to the SOUL 1.0 version. Migration & implementation of SOUL 2.0 version is under consideration.

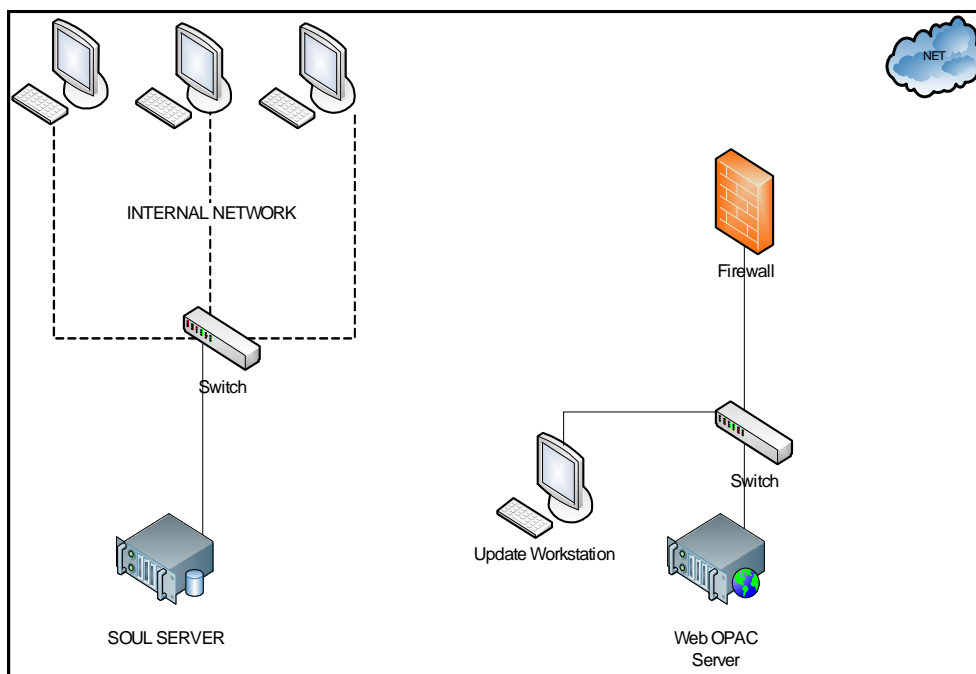


Figure 3 : Web OPAC Architecture

As is evident from above, the soul server which contains the soul database is completely separate from the Web OPAC server which is connected to the web via the firewall.

The Soul Server is accessible only via the internal network. There is no physical network connectivity between the Soul Server & the Web OPAC Server in keeping with the security best practices in mind.

Since the servers are separate the database is physically backed up at the Soul server, & then restored on the Web OPAC database via the Update workstation. Updating of the database is done twice a day, once during Lunch Hours & the other at Office closure. Thus this way the database is kept in sync with the

SOUL server and the changes are reflected everyday on the Web OPAC server with the only caveat that the changes are not reflected in real time.

3.1 Configuration of Web OPAC Server

3.1.1 Physical

The following are the Technical Specifications of the Web OPAC Server:

Dual Quad Core Intel™ Xeon™ Processor,
640 GB SCSI 15,000 RPM HDD (3 X 250 GB) in Raid 5 (hardware raid),
DVD Drive,
UPS Backup (30 Mins).

The server is run headless after the entire configuration of the software so as to have complete physical security. The server is managed remotely via a workstation which is used to manage as well as update its database.

3.1.2 Application

- a. **Operating System** : Windows Server 2003 R2 Enterprise Edition
- b. **Database Management system**: Since SOUL 1.0 as well as SOUL 2.0 uses SQL as the RDBMS at the back end, licensed copy of MS SQL 2005 Enterprise Edition is installed on the server dedicated for providing the on-line access to the Library's collection of about 8 lakhs records. All the bibliographic details of books and theses collection has been converted in to computerized catalogue using SOUL 1.0 software and made accessible globally through Web OPAC feature available in SOUL 1.0. This feature is also available in SOUL 2.0. The URL of this server is <http://library.mu.ac.in>
- c. **Internet Information Services** : Version 6 (Patched to latest updates)
- d. **Antivirus & Anti Spyware** : Kaspersky v6

3.1.3 Implementation strategies

- a. **Operating System**: All unneeded services have been stopped. All unnecessary user accounts and administrator accounts disabled. A new user is created as admin. Remote access for one user only is provided on update Workstation.
- b. **Internet Information Services (IIS)**: A separate website is created for web OPAC. It is important to note that the default website is not used as per security best practices. While setting up the

properties for WEB OPAC website created, "read only" access option is selected under the SCRIPTS properties.

- c. **OPAC:** "Opac.asp" file is customized as per the requirements of the library,
- d. **ODBC:** While creating New Data Source to SQL server the Default SQL Password is changed.
- e. **Database:** Read only access is granted all times except when a database is to be restored to reflect the most current changes of the SOUL Database. Only while restoring the latest replica of the SOUL database on Web OPAC server read only access is converted to write access. The server is always locked when no restoring work or any other activities are to be carried out on the server as per physical security best practices.
- f. **Operating System/Anti-virus Update :** Operating System as well as Anti-virus / Antispyware is kept up to date via predefined schedules so as to keep application security at its highest at all times. Apart from all the above, the site is well protected by application level attacks by the firewall deployed at University Network Operations Center. All malicious traffic is dropped instantly at the perimeter before it reaches the Web OPAC server.

As per the usage trends observed over a period of 4 months, the server has been given an assured bandwidth of 512 Kbps at all times so as to ensure uninterrupted flow of traffic to it at all times.

4. Conclusion

The security measures implemented helped achieve protecting software corruption, desktop settings alterations, unauthorized accessing of the databases, virus attack on servers/terminals, systematic downloading of the information in either hard or soft copy and providing OPAC and Web OPAC services unmanned during extended hours and on holidays.

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About Author

Miss Nalini A Raja, Assistant Librarian, JBIMS, University of Mumbai, Mumbai - 400 092

E-mail:nalinir99@gmail.com