

# Network in the Library Information Services

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# Network in Library Information Service System

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## Introduction

With the development of computer network technology, the library information management system has extended from single unit to computer networks. The collection, storage, processing and transmission of data is heading for distribution from integration and system architecture, to an open system instead of closing system.

Among one thousand universities in China, about one third of the university library information management systems (LIMS), have been founded, and another one third of the university LIMS are being built. For the constructed university LIMS, there has been a great difference in standards among them. About 100 key universities/colleges are affiliated with state education commissions, ministries and provinces, and generally, with a higher standard. Comparatively speaking, the LIMS of these universities are better than others. For a developing country, the construction standard of information management system in China can not be as high as that in a developed country. The main reason is that the history of information management system emerging in university libraries in China is very short, even in two famous universities of China - Tsinghua University and Peking University, the information management system has only been used for less than ten years. A second reason is because of the limited budgets, which can not compare to the university libraries in developed countries.

The staff of "211 Project" brings opportunity to the growth of universities in China, especially for the 100 universities which were selected into "211 Project" as active members. "211 Project" refers to the 100 universities which will be constructed in the next century in China, and the top 30 of these 100 universities will be the focal point and will achieve more funds from the government.

The construction of "211 Project" consists of three parts. The first, subject construction, is to advance some subjects to leading positions in the country, a few of them may even be world leaders. The second, public service system construction, including China Education and Research Network (CERNet), is a construction of instruments and equipment with great importance for education and research, and is the resources preserving and services system. The third is the construction of basic conditions, including housing, water and electric supply etc..

## CERNet and Campus Network

Step by step, the "211 Project" is carrying out the construction of information highway. CERNet is the first information highway in China that have been government supported and built for only one year, and was checked and accepted by an authorized group. The network management center of CERNet is located at

Tsinghua University. Ten nodes in CERNET were chosen in ten universities according to their location area. They are Tsinghua university, Peking University, Peking Post & Telecommunication University, Northeast University, Shanghai Jiaotong University, Southeast University, South China University of Technology, Chengdu university of Electronics & Science, Xian Jiaotong University, Huazhong University of Science & Technology (HUST). Each node is responsible for three or four provinces respectively. These ten nodes are not only connecting with each other, but their campus network has been established, and in the cities for which each node is responsible, there are about ten universities in assigned areas connected to that node. This results in the fact that there have been about 100 universities being connected at present. But with the problem of limited budgets, almost all campus networks are looking forward to improving their performance. Now those who can connect with Internet and run perfectly, still limit to the ten node universities. And the libraries in those ten key universities with nodes, are improving their own information management system. The improvement includes increasing new servers or changing host systems to those with more superior performance, implementing networks, and developing and purchasing management software. The university library of HUST is one of the ten nodes, and what I will focus my comments on.

### **The Present Situation and Reform Scheme of LIMS of HUST Library**

The LIMS of HUST library was founded in 1990, and was put into use in 1991. It is closing management system using minicomputer HP3000/925LX as host, the system has 26 terminals and 12 PC. Because the system memory of HP3000 is only 32MB, the whole system may work normally on condition that the terminals used are only 16 in fact. With the increasing types of databases, quantity of information and enlargement of application fields, growth of user numbers, the old information management system can not satisfy new and higher demands, and can not be connected to the campus network to offer library services to staff and students. At the same time, because of the increasing interests in sharing resources in different libraries there are many considerations, such as user interface, network application, etc. to work on.

As an information center, the LIMS open model is easy for expanding, connecting, processing and with good user interface must be established in the library. The most important thing in improvement is to preserve the resources including hardware and software as well as the databases. The overall plan is shown in fig. 1 and fig. 2 (not shown). As shown on fig. 1 (not shown), a HP9000/800K server is chosen as the host, combining with the original HP9000/800 E25 and HP3000/925LX. With the use of open operating system HP-UX10.0 running on HP9000 and MPE/ix on HP3000; advanced database management system, Sybase; library management software etc., and also with user PC and terminals, an application system of mixing structure of Client/Server and Host/Terminal through some network equipment, such as intelligent HUB and switch. The system can accomplish many functions including vocational work management, administrative work management and office automation, and provide many kinds of services including databases, printing of documents and e-mail. After reform, HP3000/925LX still works as a network server, and can be visited by users. The original 38 terminals can be partly reformed and put into use by employing DTC48, adding a Telnet Access Card and using HPARPA/FTP Service & DTC Manager software. Because the two host servers (HP9000 K series and HP9000

E25) constitute cluster structure, they can share mass external storage subsystem consisting of disk tower, disk array and optical disk library through F/W/D (fast/wide/differential) SCSI-2. Due to the good compatibility between HP9000 series and HP9000 E25, by using manual change-over or MC/Service guard, fault-tolerant of high level and automatic change-over is possible. When the system runs normally, it can assign and adjust work load of each node, balance the load and raise efficiency of the system. If one node does not work, its job can be moved to other nodes, and the whole process will be accomplished automatically by software. The system can join in a high speed backbone providing that FDDI or ATM network card is installed in the host; also it can connect with WAN, such as CERNet, Chinapae, Internet etc. through the router. The HP-UX10.0 running on the host cooperated with HP OPENVIEW software will implement integrated network management to the nodes all over the network. The management includes connecting allocation, monitoring the running of state of network, checking communication quantity, analyzing trouble and ability of network, etc.

As shown in fig. 2, (not shown) from the ATM switch of HUNet (the campus network) to HP9000/K400, there is a 155 MB backbone that can be regarded as the primary channel to enter the library. In the library, 100VG AnyLan HUB is adopted to join HP9000/K400 and HP Advance Stack Switch 2000, and HP/100VG AnyLan HUB is used to create multimedia subnet, through which multimedia transmission can be carried out. The subnet of library chose HP Advance Stack Switch 2000 as its center by which network exchange can be achieved. And there may be 100mhz bandwidth when users visit HP9000/K400.

Under the circumstances of Host/Terminal, terminals link with host through terminal server DTC48 and CS2600. On the other hand, when Client/Server architecture is applied, PC link with server through LinkBuilder FMSII Managed 12-port HUB. Outside the university you can enter the library network directly through CS2600 to visit the network server or optical disk library.

Using 100VG AnyLan in the network is a kind of advanced network technology, for it has been defined as IEEE standard 802.12. It provides the network a transmission rate of 100MB/s, admits all kinds of network design procedure, and provides two kinds of scale for transmission application, ordinary and prior to users, so that multimedia utilization have priorities at any time.

In HULNet, HP Openview Interconnect Manager for Windows is used as the basic network management platform, and HP Openview DTC Manager is responsible for the management of terminal server in library system subnet.

Considering document sharing, HPARPA/FTP Service running on HP3000/925 realizes document transmission to HP9000 OS HP-UX10.0. HP9000 with ATM network card installed in is linked to HUNet whose communication rate reaches 155MB/s. Terminals and PC in the library can visit HP3000 and HP9000 freely through Ethernet ThinLan. PC and minicomputers on HUNet can visit the library HULNet through ATM exchanger and 155MB FDDI.

## **The Plot of Changjiang (Yangtze River) Economic Zone Information Network HUST Science and Information Network**

In most developed countries, the direct economic output value of information industry has occupied about 15-20% of GNP. In the information society whose primary feature is the development and utilization of information and information technology, information is an important factor to propel the national economy and society forward. It is necessary for any country to set up and complete an information network, so that it will always be in a victorious position in the information society.

Wuhan with a population over 6 million, is located in central China, it takes a hub of transportation by land, water and air on the directions both from east to west and from south to north. Also, it is the cross node of post and telecommunication in both directions. Especially after China's government puts forward the go-ahead to exploit Changjiang economic zone, the Changjiang economic zone grows quickly. Since China's government shifts the emphasis of economic exploitation and openness from abroad to central and western China, Wuhan is in the top position while exploiting central and western China. It will speed the development of the communications and information industry and bring opportunities to economic exploitation in Wuhan, and it will lay a good foundation for establishing an information highway hub in both directions in and around Wuhan.

Changjiang economic zone includes Zhejiang, Shanghai, Jiangsu, Anhui, Jiangxi, Hubei, Hunan, Sichuan, Guizhou and Yunnan province. There are big cities such as Shanghai, Nanjing, Wuhan, Chongqing there. The total industrial and agricultural output value of Changjiang economic zone is over 60 percent of GNP of whole China. In order to establish the hub of Changjiang economic zone quickly, the government of Wuhan has negotiated with Hughes (USA) to prepare to establish a communication network that combines wireless and wired networks with communication equipment by Hughes. Now the government of Wuhan will make good use of library networks and the advantages of science and information resources of HUST including books, journals, proceedings, microform and microfiche, and international on-line retrieval through Chinapac and Internet, to provide information services to the department concerned.

The destination of the library of HUST is to spend about ten years on establishing a high level information center, which integrates wireless and wired network, joins in domestic and external network. The information center has not only large computers with massive storage capacity, but also has its own multimedia database, knowledge database, talent database, etc. It forms high speed information networks with Internet through communication channels, and establishes a long-term cooperation with a lot of large database companies such as Dialog, Datastar, ORBIT, ESA, BPS, STN, etc. At the same time, on the basis of this concept, we will fully use the advantages of science and engineering in the university, and introduce artificial intelligence technology, so that the system is in the best cooperative state. The information center can offer not only many decision support schemes to users, but the best selection and the realization of the best decision scheme.

After the establishment of the Intelligent Information Center (ILC), its serving methods and standards will get first-rate level domestically, and approach

international world levels in many aspects, such as information archiving, storage, transmission, and document preservation. In the ILC, there will be unified facilities, on-line domestic and external classrooms, abundant information resources, modernized intelligence networks and resource sharing systems, including for inquiry and retrieval of data, audio, graphics and images, multimedia information services. On occasion, information on new technology, products, utilization, business and finance will be issued to the department concerned by the center. It can also carry out display, presentation and popularization of multimedia products.

## **Conclusion**

China is a developing country, and will be a moderately developed country in the middle of the next century. Now, the economics and construction of China is undergoing high speed development. The original destination that the growth of the national economy by 2000 will be two times that of 1985 was achieved in 1995. It means that the enhancement of economics in China is moving more quickly than planned. And more and more people recognize the importance of information and the information industry, and the necessity to develop them first. This recognition will bring opportunities to the development of libraries. Of course, the information industry is getting more and more attention at present, the government and many departments will put more into the information service industry and libraries. This is true especially while the hardware and equipment of information technology is getting renewed and now, great attention must be paid to improve the level and quality of information service.