

HKCEE Computer Studies Coursework  
Project

Title: Local Area Network System

**Situation:**

1. Setting up a LAN system in a medium-sized trading company.

Recently, a medium sized trading company is considering computerization. Staffs require the computer system can help them finish their jobs by Information Technology, such as printing out invoice, storing of documents, accounting etc.

**Problem Analysis**

A medium-sized trading company is expected to have 30-50 computers, with several printers and fax machine. It is impossible for the company to have 30-50 printers and sharing files by diskettes. Moreover, internet connection is essential to share within this LAN.

A medium-sized trading company typically divided into several departments, accounting, administration, purchasing, customer service, sales etc. Departments need to share documents with each others, such as invoice by accounting department is sent to customer representatives to collect the fee.



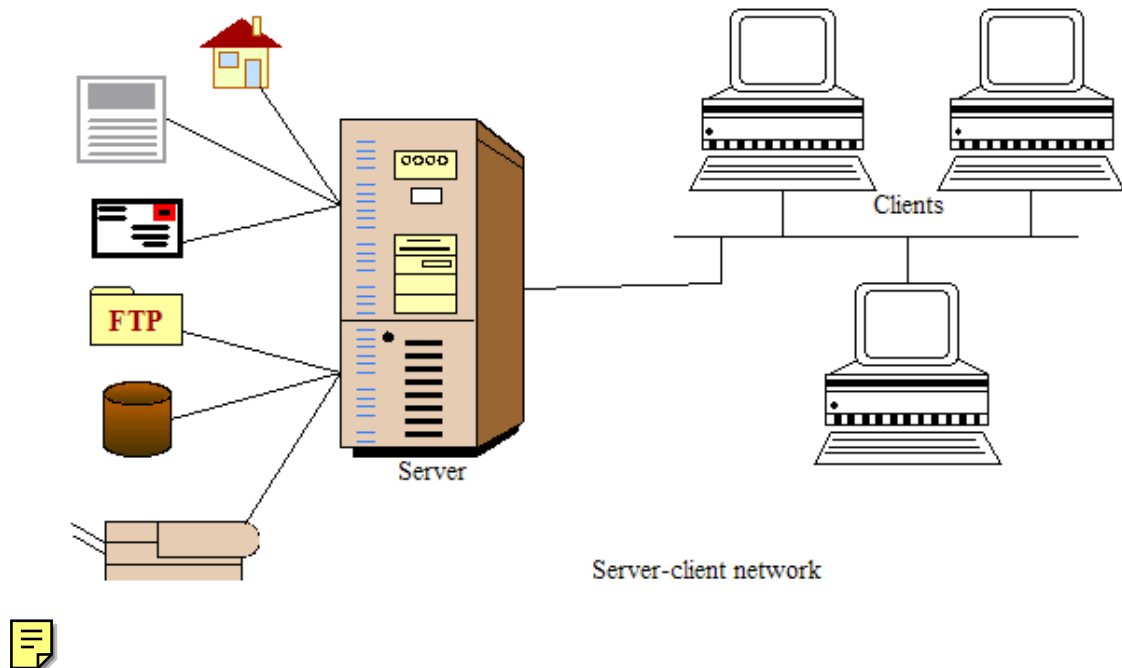
**Possible solution for this project**

Nowadays, the most common topology for LAN is **STAR Topology**, using Fast Ethernet technology as well. With its advantages of cheap, easy and fast (because less collision). In star topology, switches and twisted-pair cabling are often used. For twisted-pair cable, we will choose CAT-5e for this situation because it supports Gigabit Ethernet (which goes up to 1000Mbps) for future.

Wireless technology (802.11b or latest 802.11g) can be taken into consideration. But because wireless technology is not as fast as Fast Ethernet and the cost is pretty high. Moreover, the security of wireless technology (e.g. WEP-1, DHCP MAC address logging) is not mature enough. If the office has a lot of wall, then wireless will not work happily. Last but not least, we do not expect the computer will be moved frequently, that is the computer will always sit at a location.

Despite network infrastructure, the structure of network design also needs consideration. In medium size trading company, we expect all data, documents and

web page, mails are stored in 1 or more machine/places. In this case, we must implement **Client-server** structure rather than **Peer-to-peer** network. It's because Client-server network can *centralize the management, for its ease to control and trace everything, such as file sharing, print queue etc.* Moreover, computer serves as the role to share resource is expected to be more powerful. One very powerful server is better than a lot of powerful desktop. Once if any computer offline in peer-to-peer network, once if that computer shares resource, this resource probably goes off too. So server-client network must be implemented.



## Design of the LAN

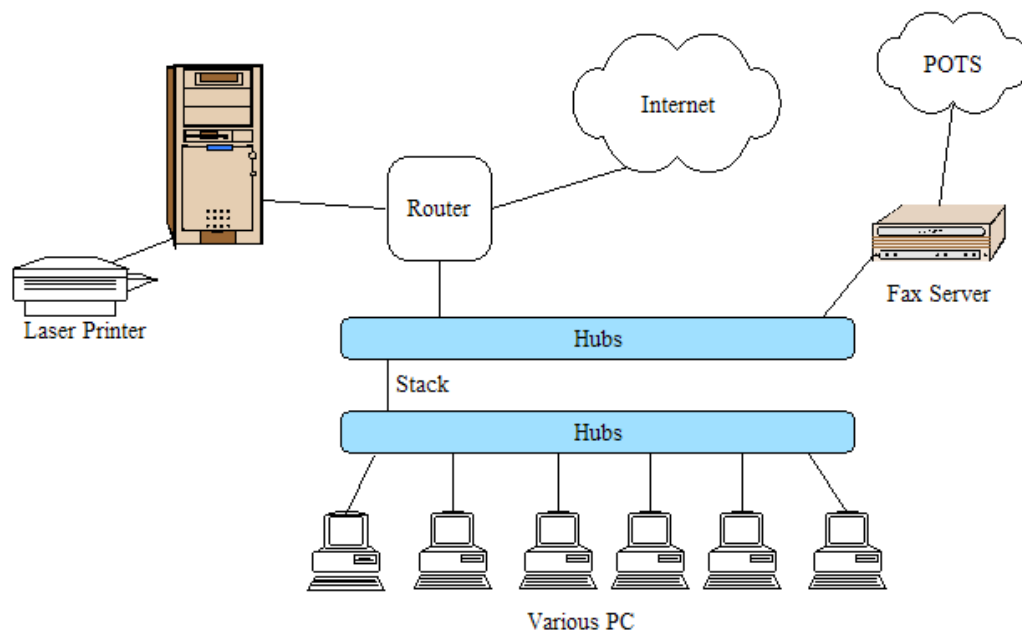
Consider Fast Ethernet. First we must have some equipment. In this case, we must have:

1. Stackable Switch, i.e. 2-3 24-port switches stacking together by optic fiber is preferable
2. Several hundred metres of CAT-5e cable, with RJ-45 plugs
3. RJ-45 Socket per node.

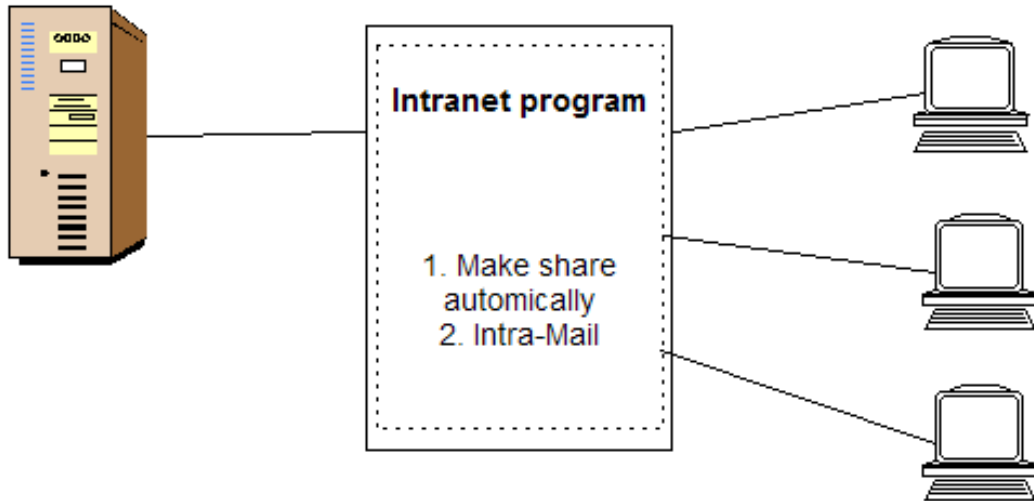
And because of the sharing of Internet Connection, a **router** which supports several common Internet connection technologies (i.e. PPPoE) is needed. For security reasons, router integrated with firewall is essential.

We need a server that can support 30-50 clients for file and printer sharing, centralized password control, and centralized fax sending/receiving. In choosing the OS, we do use Open Source OS, such as Linux, because the cost is low and the reliability is high. For clients, we use commonly used OS because most of the users are beginners.

The following diagram shows the diagram of the network design:



Despite of hardware infrastructure, intranet service should be implemented because it can act as a platform for users to communicate and share important documents. Without this, users must be properly trained. Otherwise it might cause problem and make the whole system into mess.



## Implementation

### For infrastructure:

All cabling are passed through overhead cable slot, and place a RJ-45 socket where each computer is placed. Connect all nodes to ports of switches.

### For server:

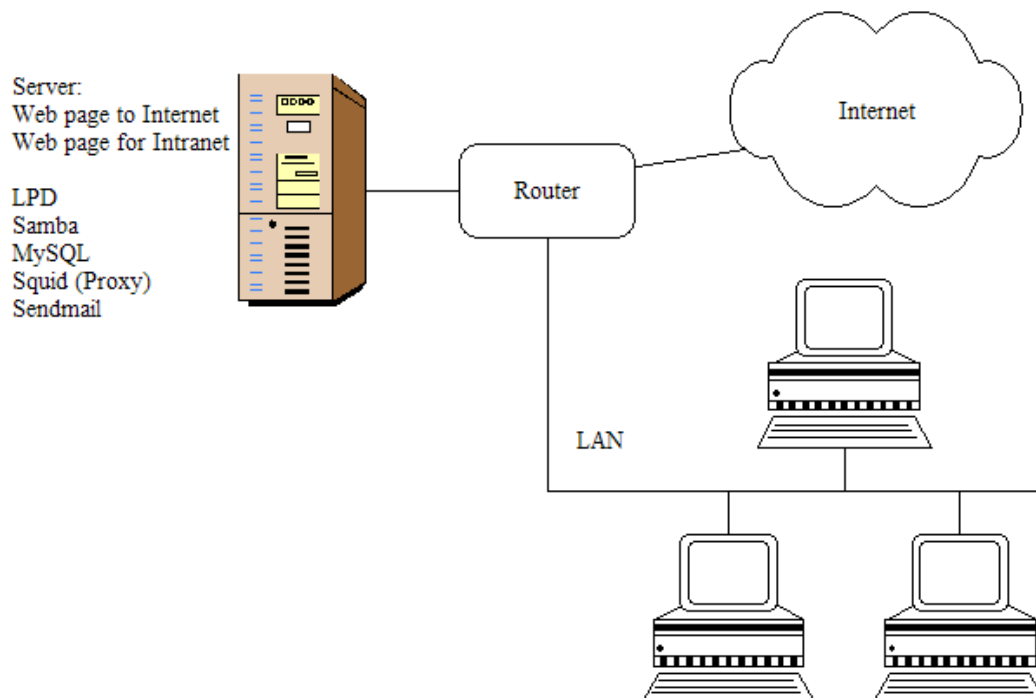
Use appropriate server software (e.g. Samba for file sharing, LPD for print sharing). Set public sharing folder and personal folder for each user. Set appropriate security level to all folders. Use firewall to avoid internal attack.

Following service must be installed and start in order to work properly.

- Samba (file sharing)
- LPD (print sharing)
- MySQL (database for accounting department)
- HTTPD (web server for internet/intranet)
- SENDMAIL (mail server for internet/intranet)
- DHCP (IP allocation)

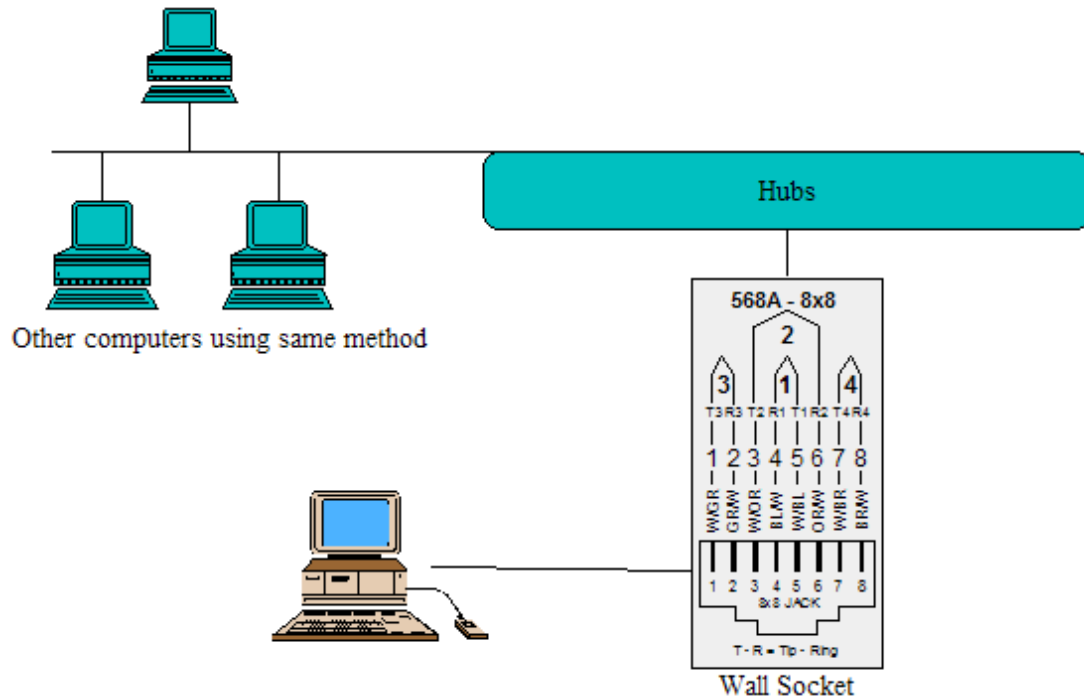
Create user accounts for each user is required. It helps to trace who do what thing. Of course setting appropriate permission for each user, deny any unauthorized access to sensitive data/document.

Because we are going to implement the intranet system, web server (HTTPD) and mail server (SENDMAIL) must be installed. Moreover, this web server can host the web page that publishes to outsiders.



For client:

Setup a client as is it is a standalone machine. Insert NIC (Network Interface Card) into each computer, and connect the client computer with patch cable and RJ-45 socket.



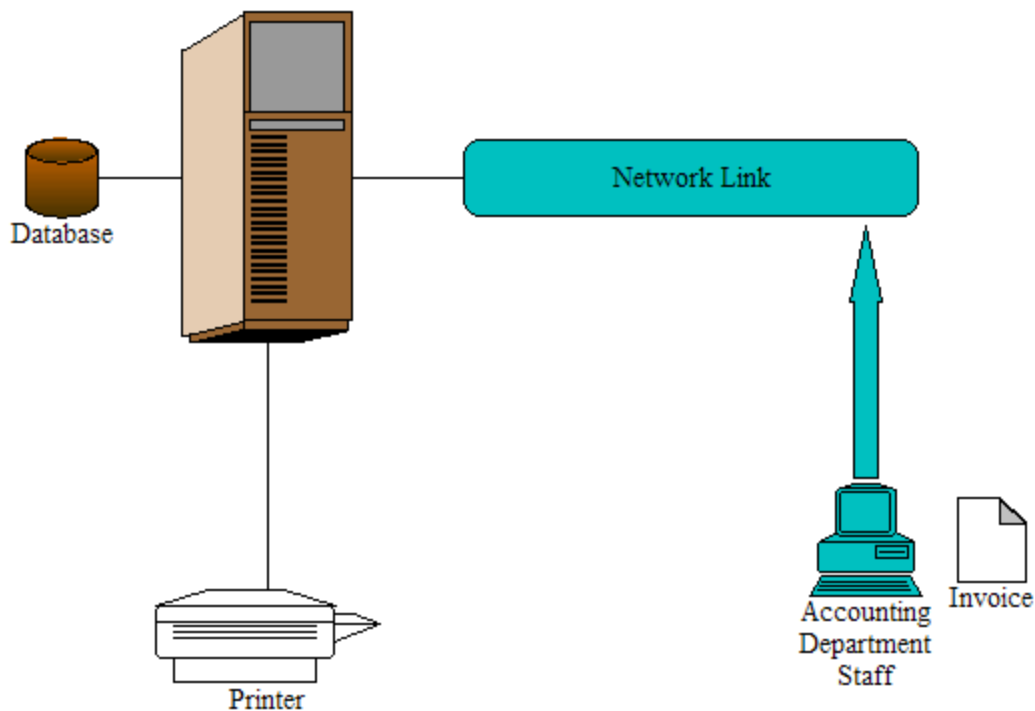
Computers communicate with certain protocol. Nowadays the most common protocol is *TCP/IP* (with *IPv4* addressing), which is using in the Internet. In order to have easy access to Internet, we use *TCP/IP* protocol too. *NetBIOS* brings too much broadcast and the network traffic will be too high. *IPX/SPX* is not common and most of the OS nowadays does not support it.



### Test and Evaluation

Each user are required to simulate the actual work by using of this LAN, at the same time, the staff should operate in both mode (that is using LAN and doing work without using LAN for redundancy). See if any problem occurred.

For example, the account department staff records an invoice and store it in a backend database (SQL in this case), then he saves the invoice in shared folder and the sales view and print the report, all by network.



Problem such as connection error, we can check the cable by cable tester, or see if the switch returns proper light signal.

Even server can cause problem. Server might have unexpected problem, such as print queue jammed, service daemon (background service) suddenly stop, even hacked or being attacked might happened. So we should use any measures to protect the system.

Using the network system saves time. Without using LAN, the staff might leave their working desk and use the computer in somewhere, but now, they can work in their own working desktop, do not need to bring the documents to and from.

## Conclusion

The above solution can solve the objective; however, there is some limitation. For example, if you want to expand the node, it can be very difficult to change. One possible solution is base on the current infrastructure and use Wireless Access Point to connect new node wirelessly.

Sales might have their own notebook computer. Add more nodes (at least more than current number of machines) in current infrastructure.

When building the infrastructure, we might face some problem due to the building itself, such as no room for the cable to pass through etc. In this case, wireless solution must be brought to consideration again.



## Acknowledgements

### - Following books/magazines provide information

1. Network Computing, CMP, Dec 2002
2. Linux 網絡架站實務, 中國青年出版社