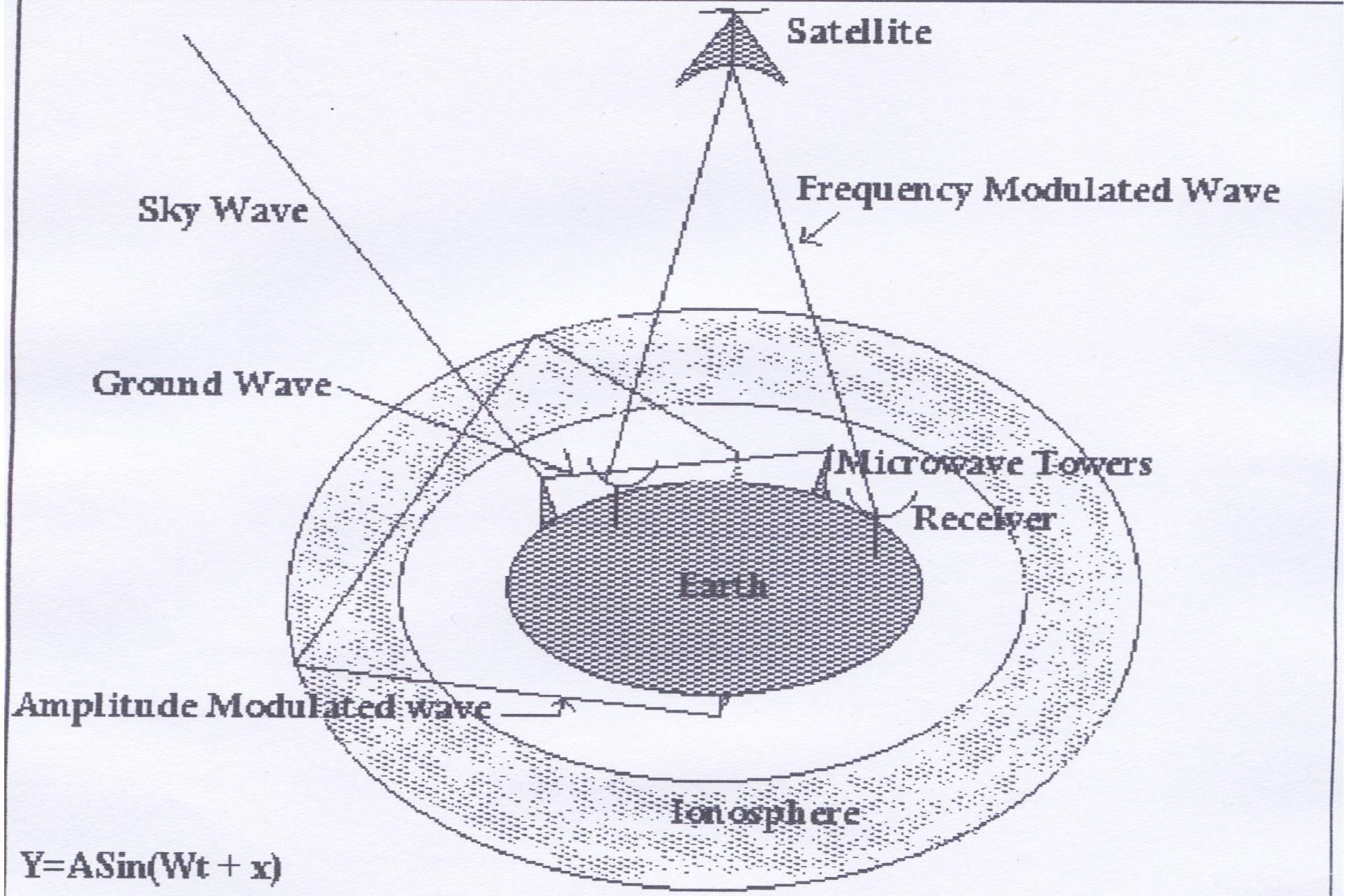
Latest trend in Networking: Software Defined Network (SDN)

J K Mandal

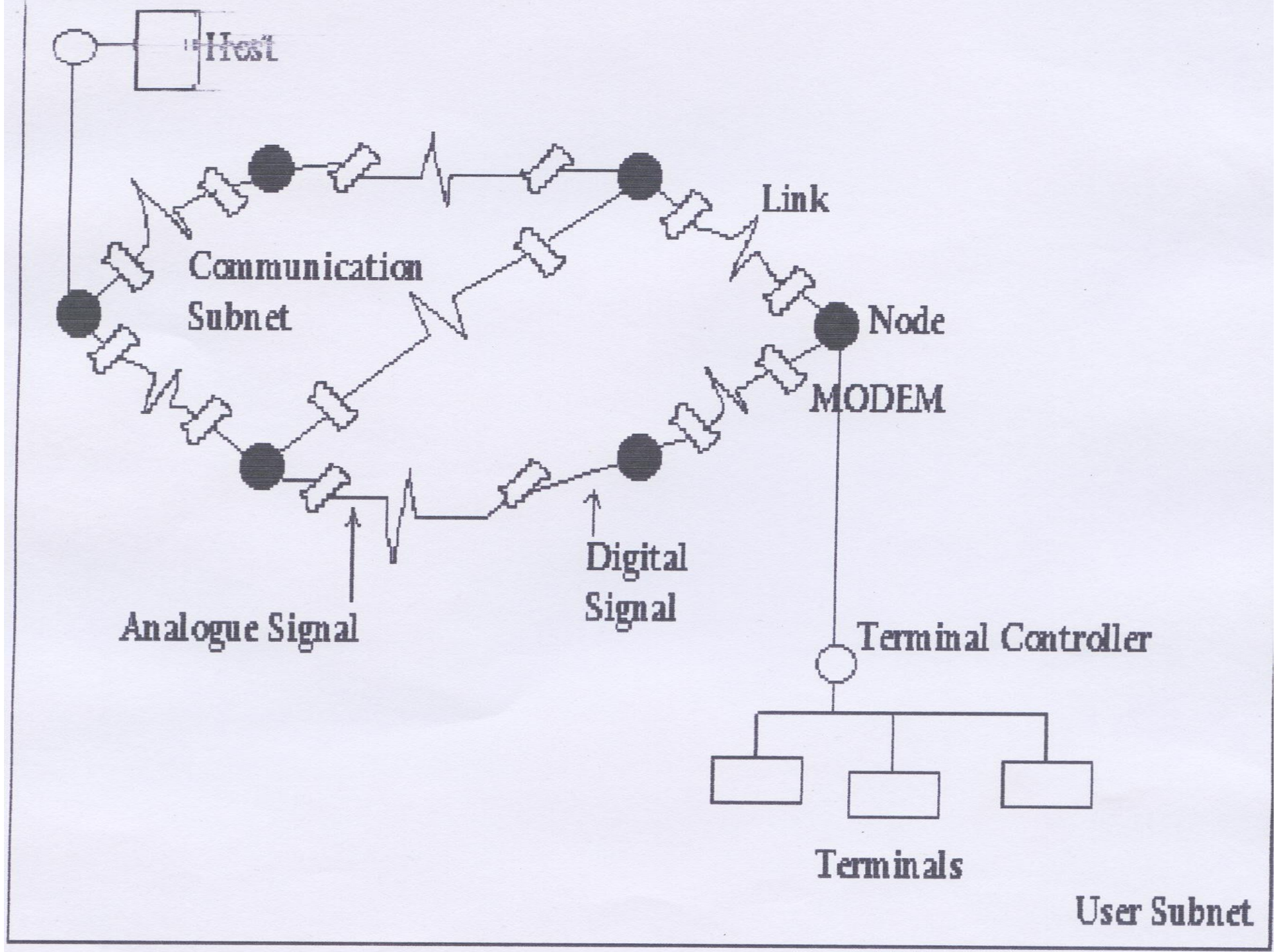


Y=ASin(Wt + x)

A=Amplitude x= Phase

W=Frequency

Communication


Host
Communication
Subnet
Link
Node
MODEM
Analogue Signal
Digital
Signal
Terminal Controller
Terminals
User Subnet

INTRODUCTION

-In the early 1980s when desktop computers began to proliferate in the business world, the intent of their designers was to create machines that would operate independently of each other. The computing idea was summed up with "One User, One Computer" which means that individuals were free to manage information on their own desktop.

Some of the common objectives of computer communication networks are:

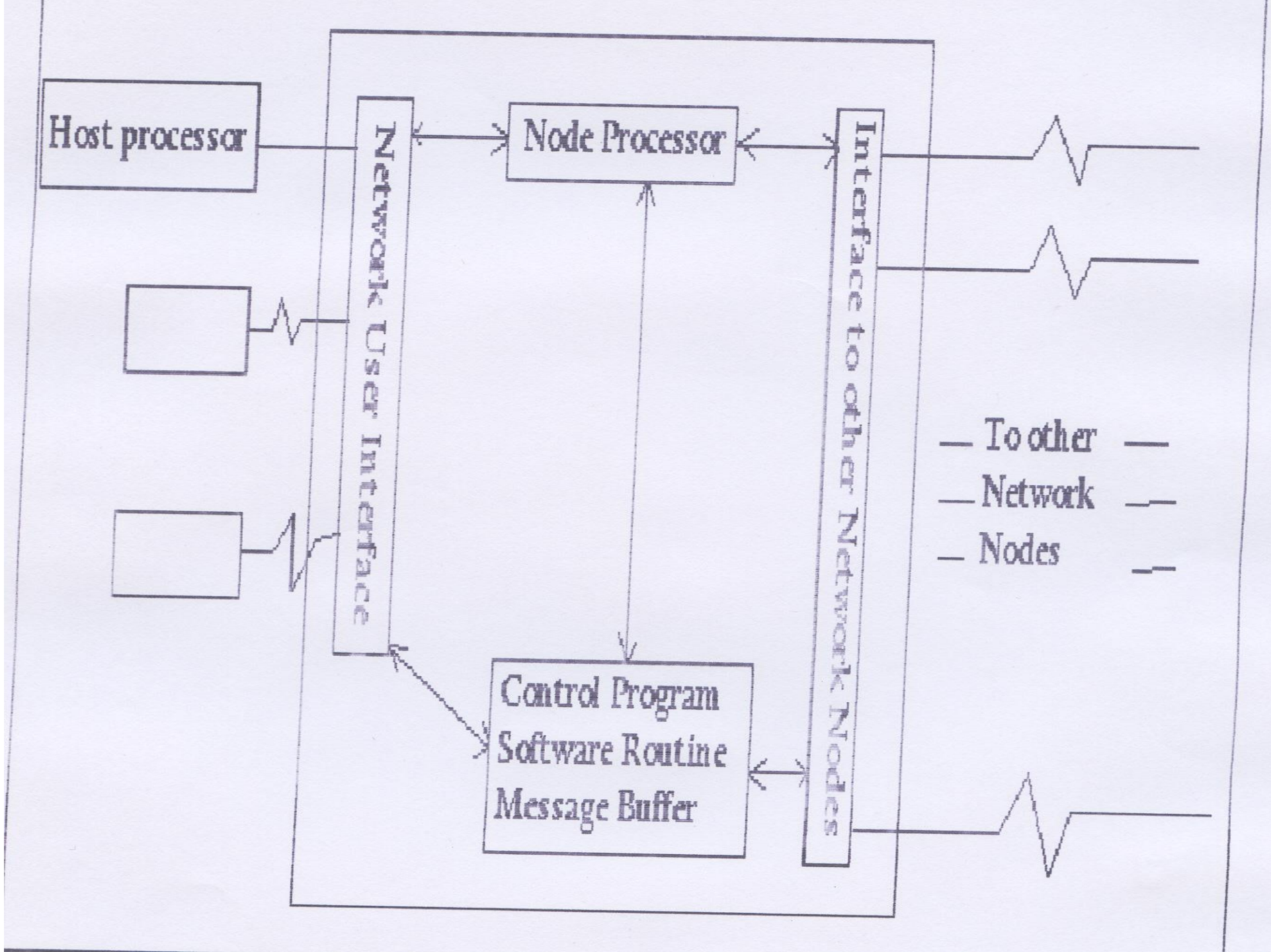
- **To provide sharing of (distant) resources such as information (database) or processors(CPUs). Resource sharing is perhaps the most common objectives providing networks, within the constraints of cost and reliability of transmission links.**
- **To provide inter-process communication, such as among users (or processes) and processors. Network users, located geographically apart, may converse in an interactive session through the network.**
- **To improve reliability of network through backup and redundancy. If one processor breaks down, another processor in the network can take its place.**
- **To furnish centralized control for geographically distributed system.**
- **To provide centralized management allocation of network resources**
- **To provide compatibility of equipment and software.**
- **To provide network users better performance at minimum cost .**

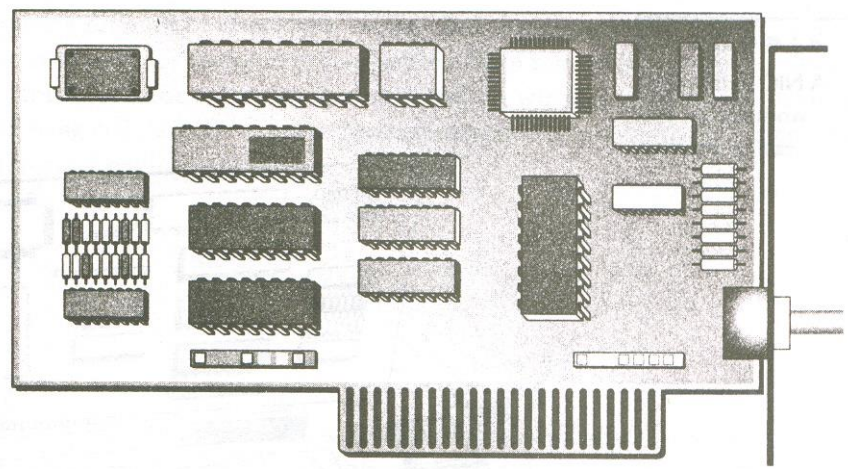
There are three types of functions in network nodes

Source-destination Function

Store-and-Forward Function

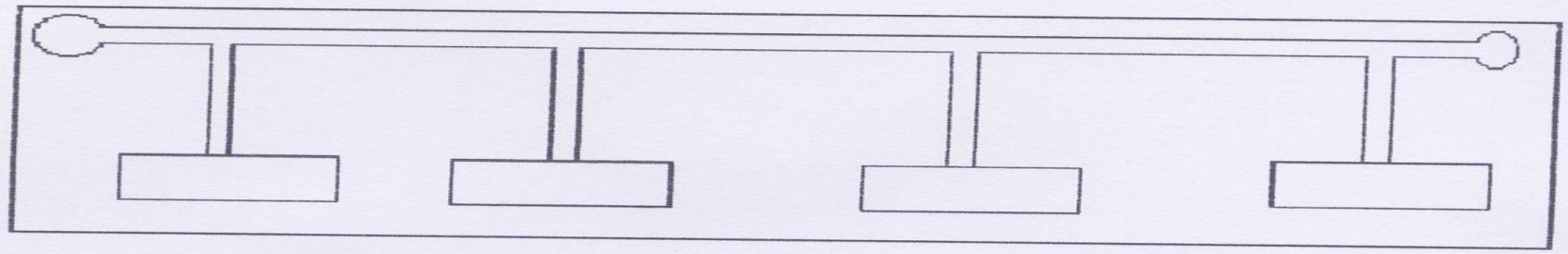
Networkwide Functions

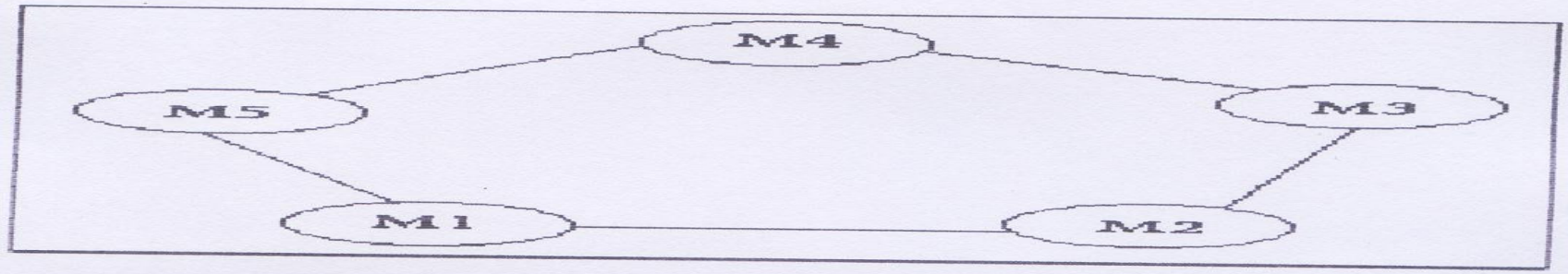

Host processor
Network User Interface
Node Processor
Interface to other Network Nodes
To other
Network
Nodes
Control Program
Software Routine
Message Buffer

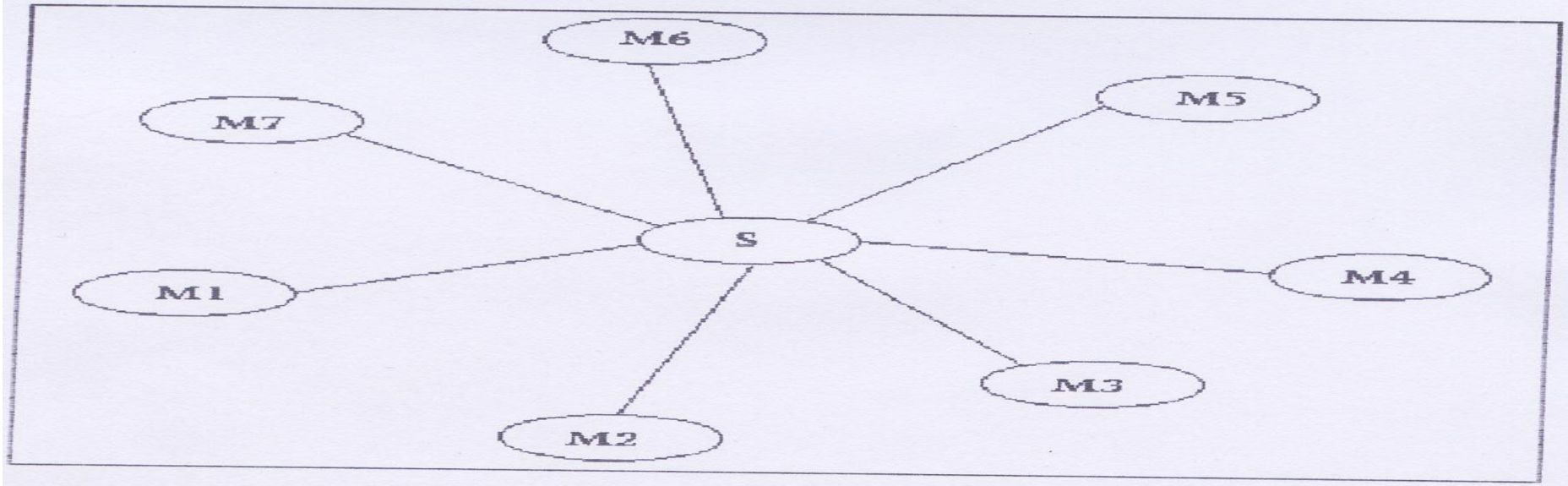


TOPOLOGY

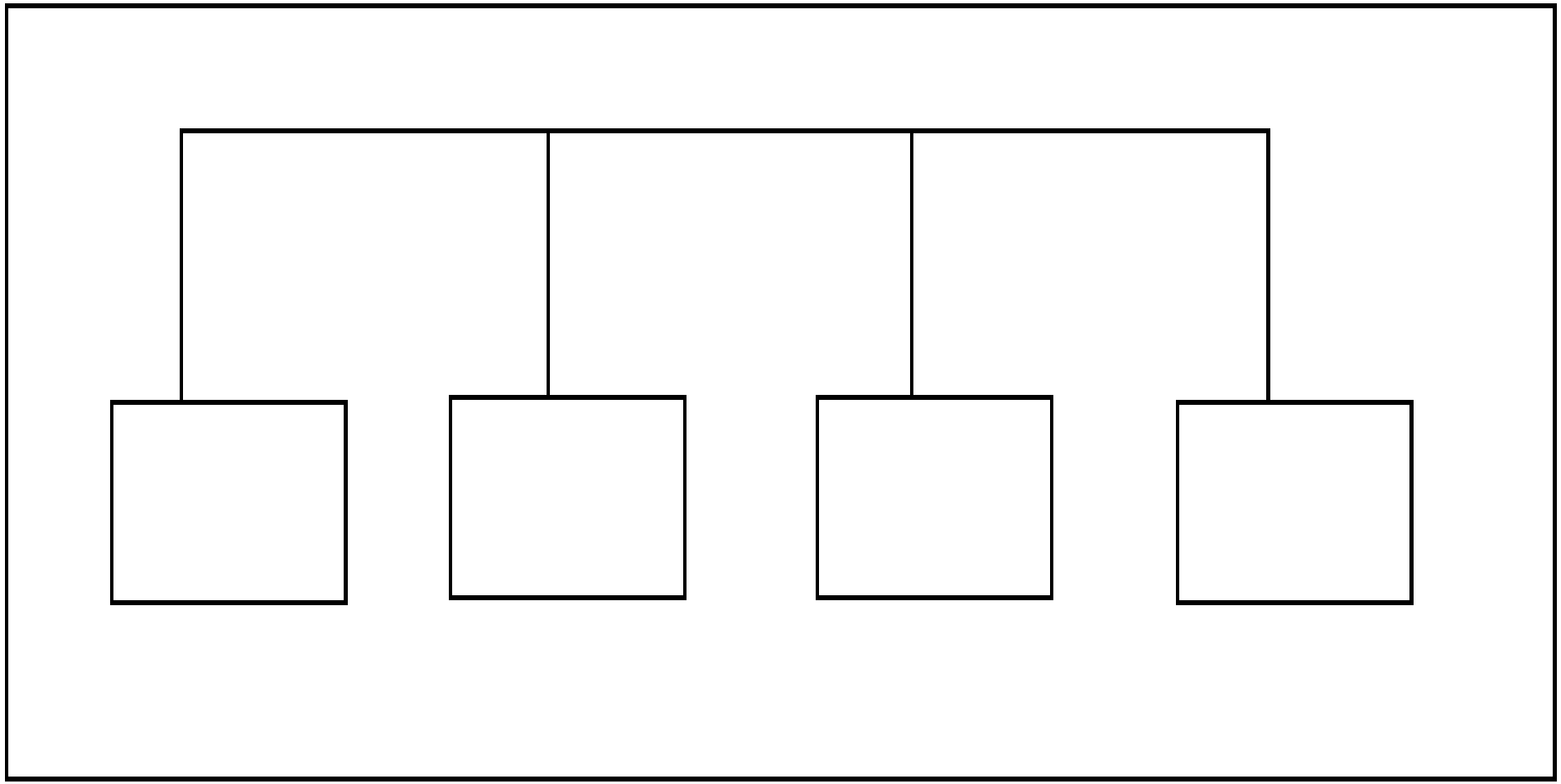
- POINT-TO-POINT CHANNELS
  - Star
  - Loop
  - Tree
  - Intersecting Loop
  - Irregular
- BROADCAST CHANNELS
  - Bus
  - Satellite or Radio
  - Ring

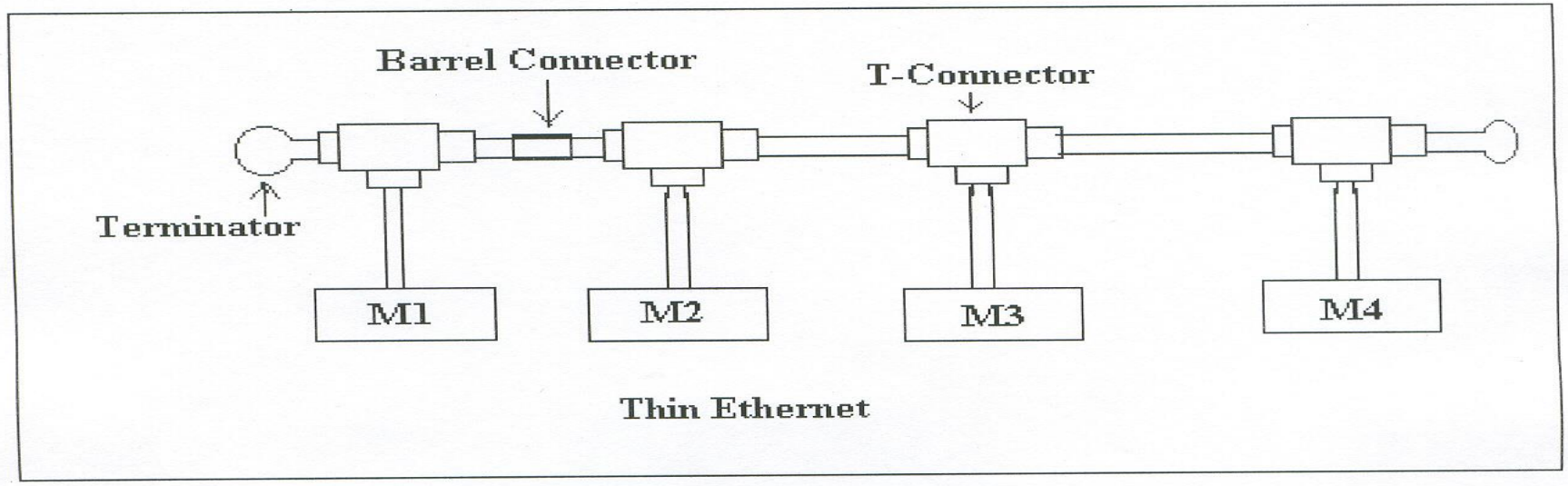



M4
M5
M3
M1
M2

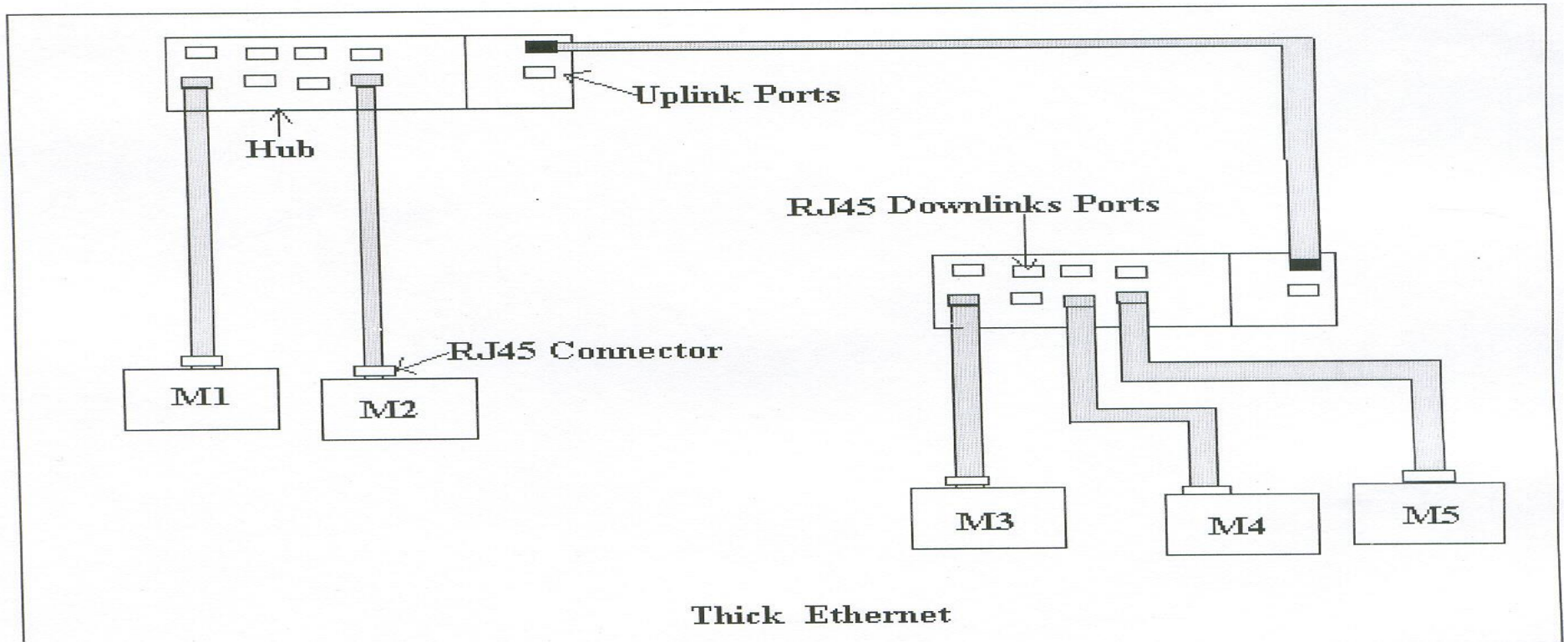

M6
M7
M5
S
M1
M4
M3
M2

BUS TOPOLOGY OF LAN

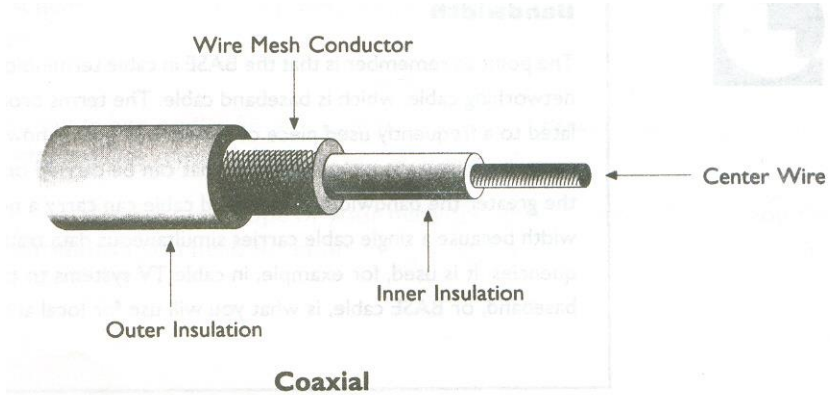




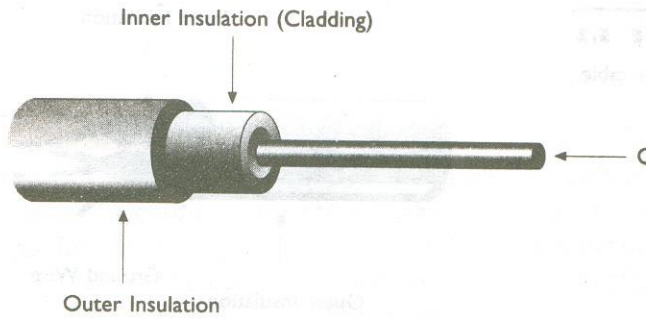
Thin Ethernet



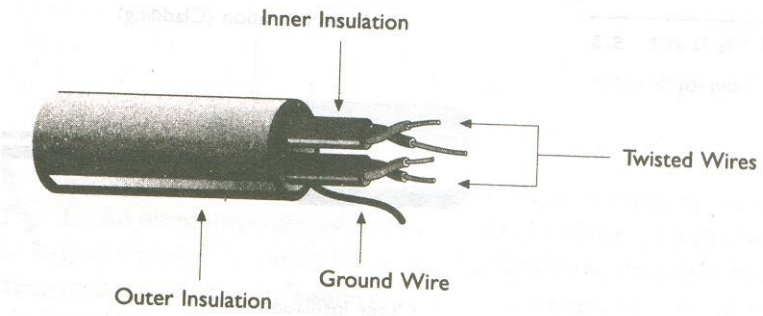
Thick Ethernet



Coaxial



Fiber-Optic

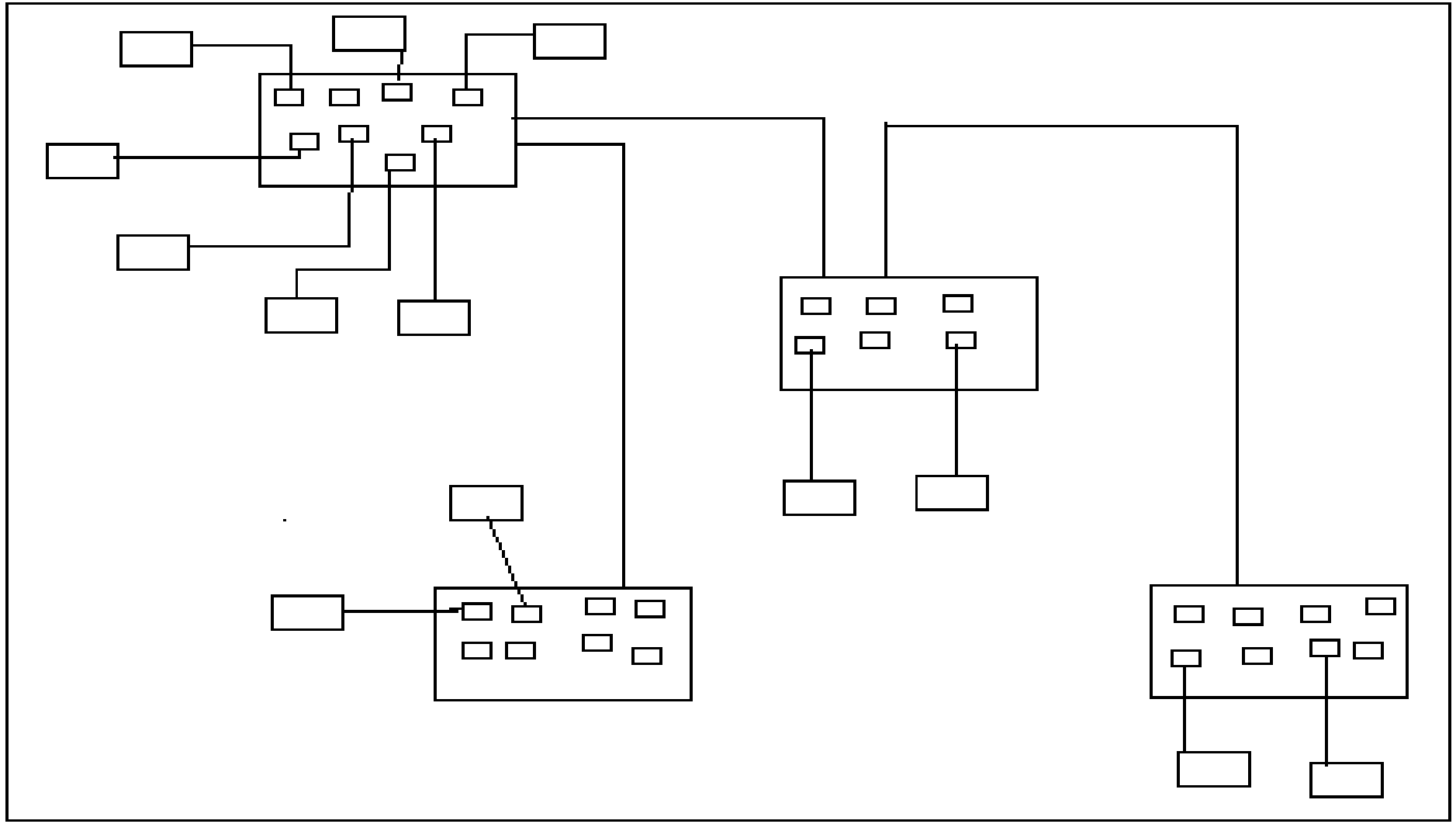


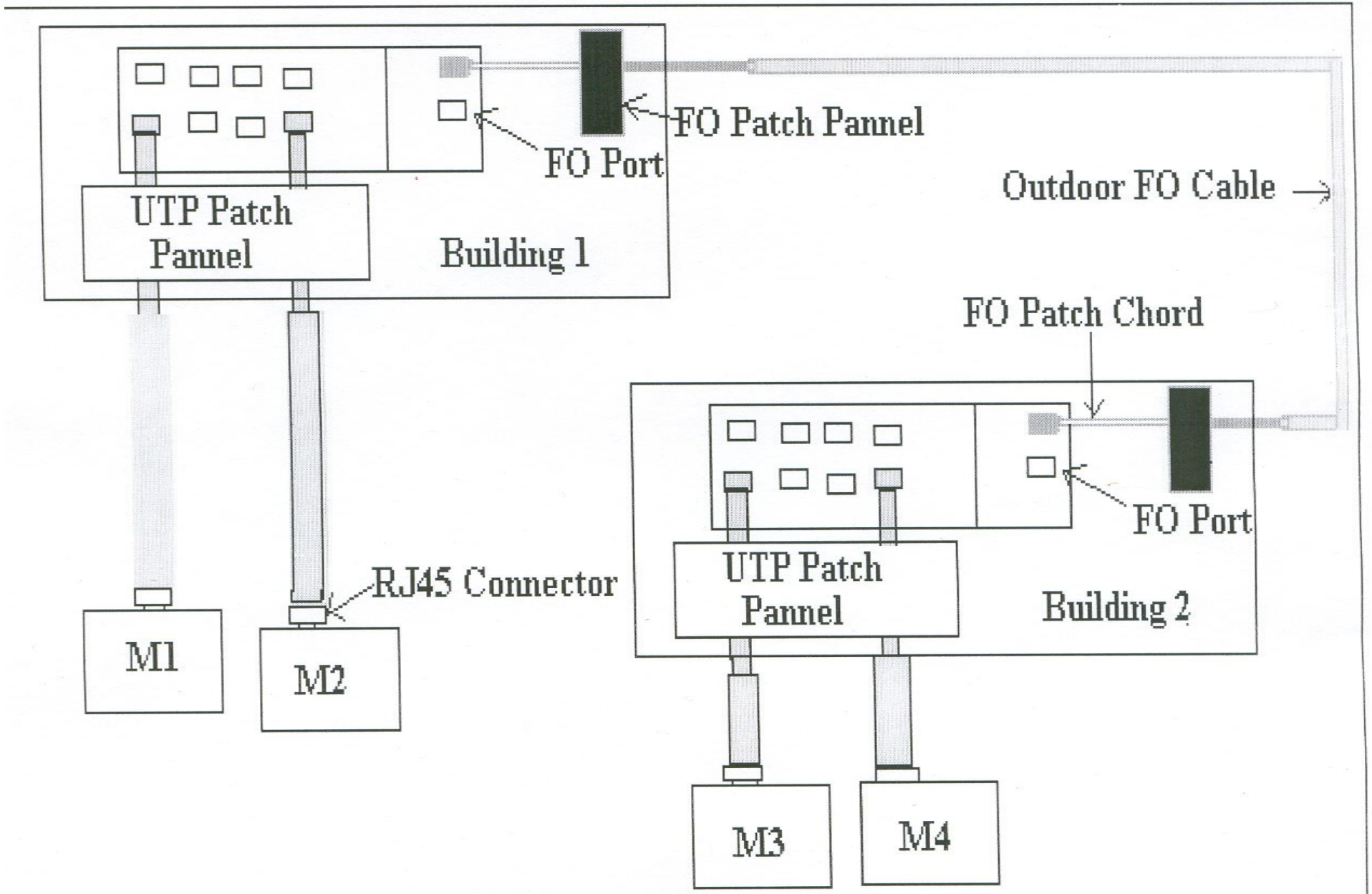
Twisted-Pair

SWITCHING TECHNOLOGIES

- CIRCUIT SWITCHED NETWORK
- MESSAGE SWITCH NETWORKS
- PACKET SWITCHED NETWORKS

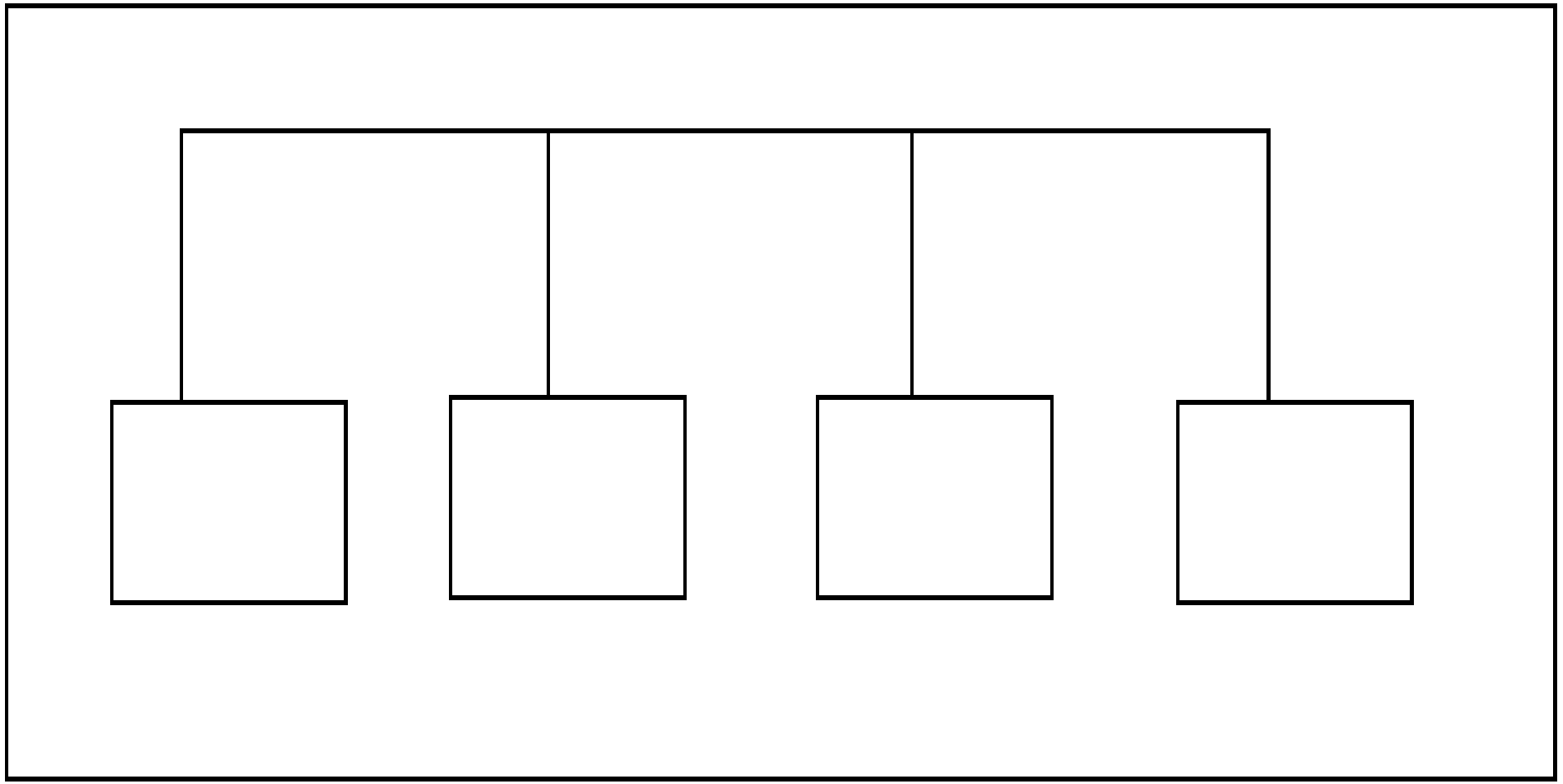
HUB/SWITCH BASED LAN



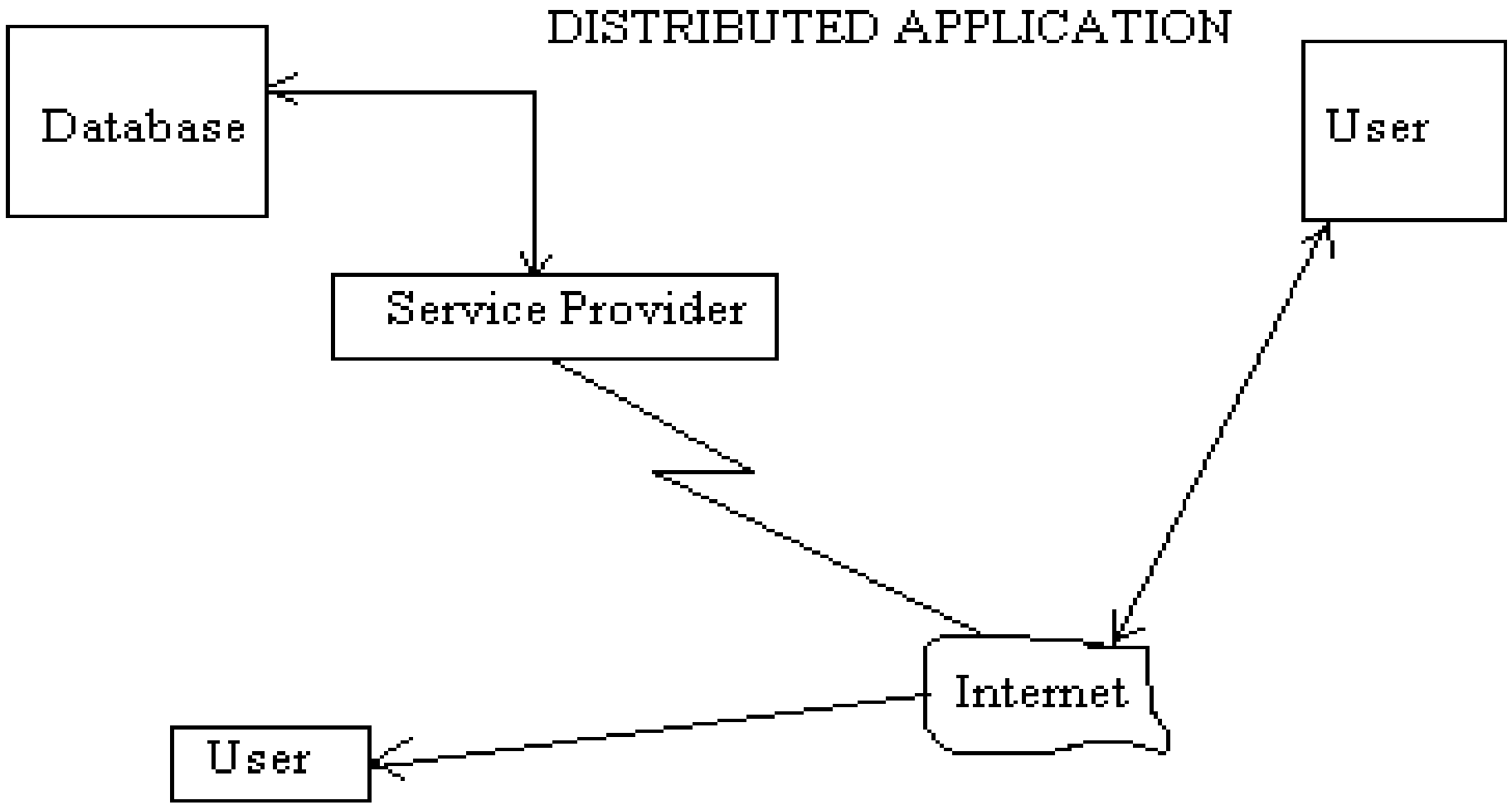


Composite FO/UTP Network for different Buildings

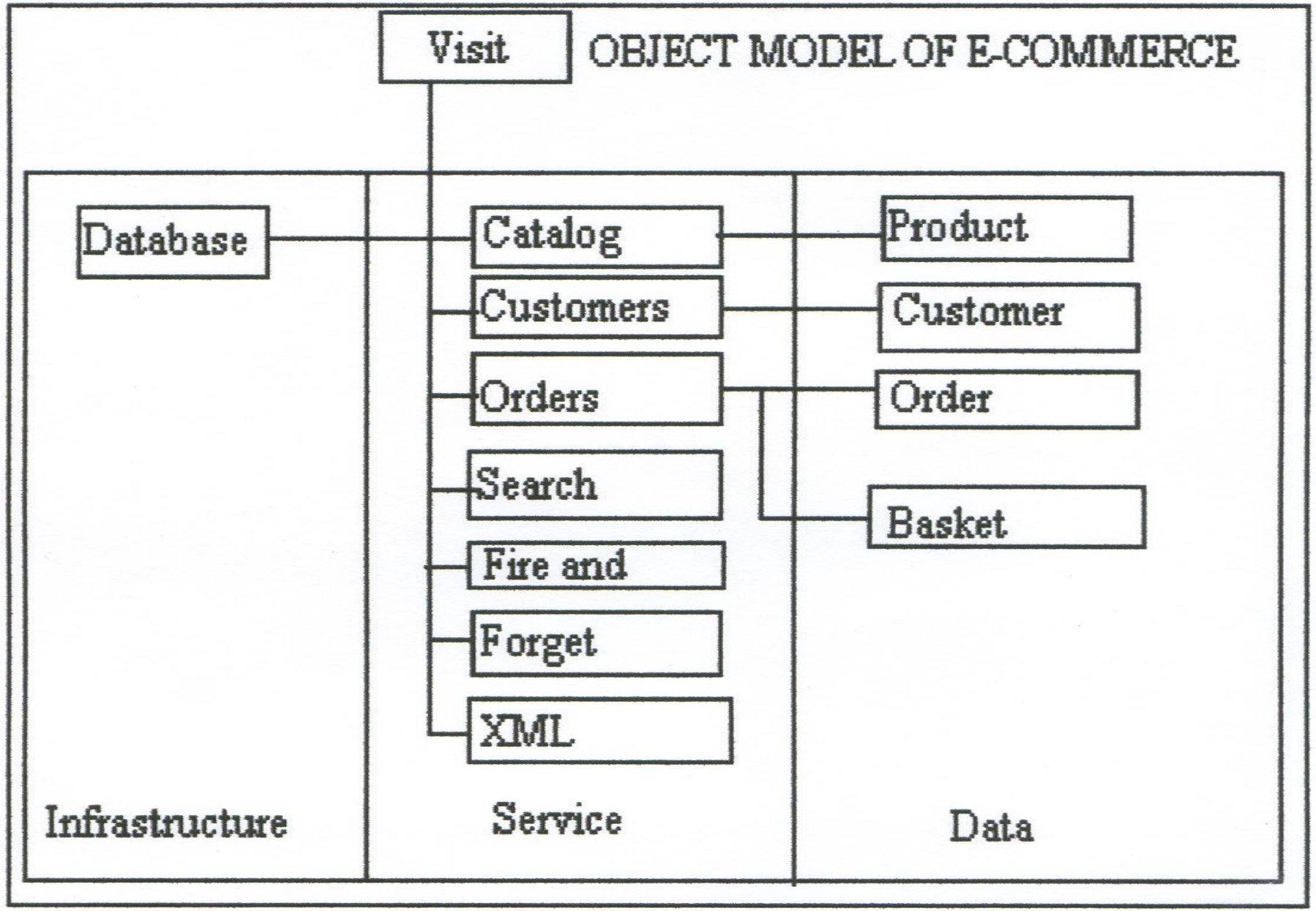
BUS TOPOLOGY OF LAN



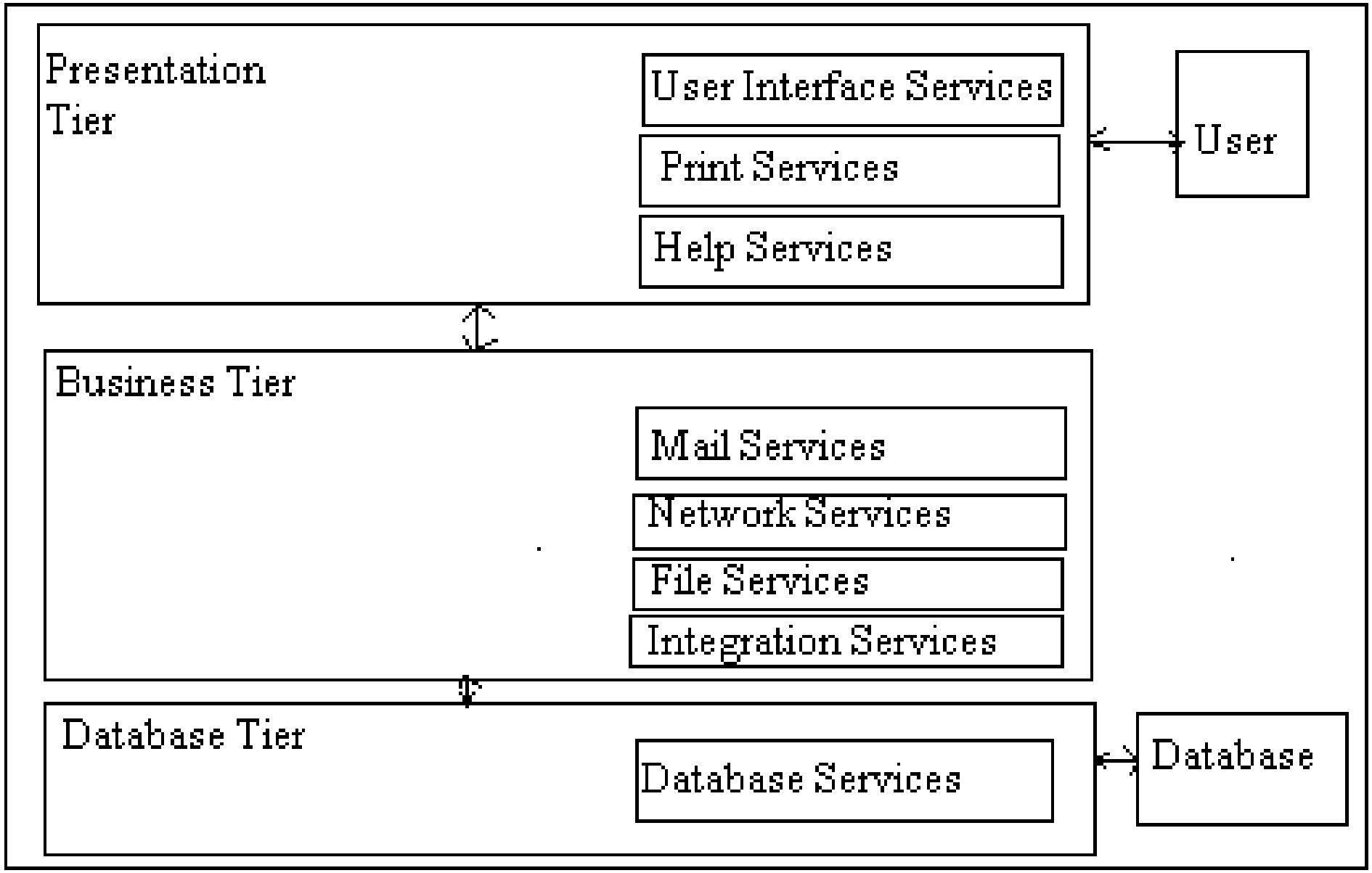
DISTRIBUTED APPLICATIONS IN E-COMMERCE



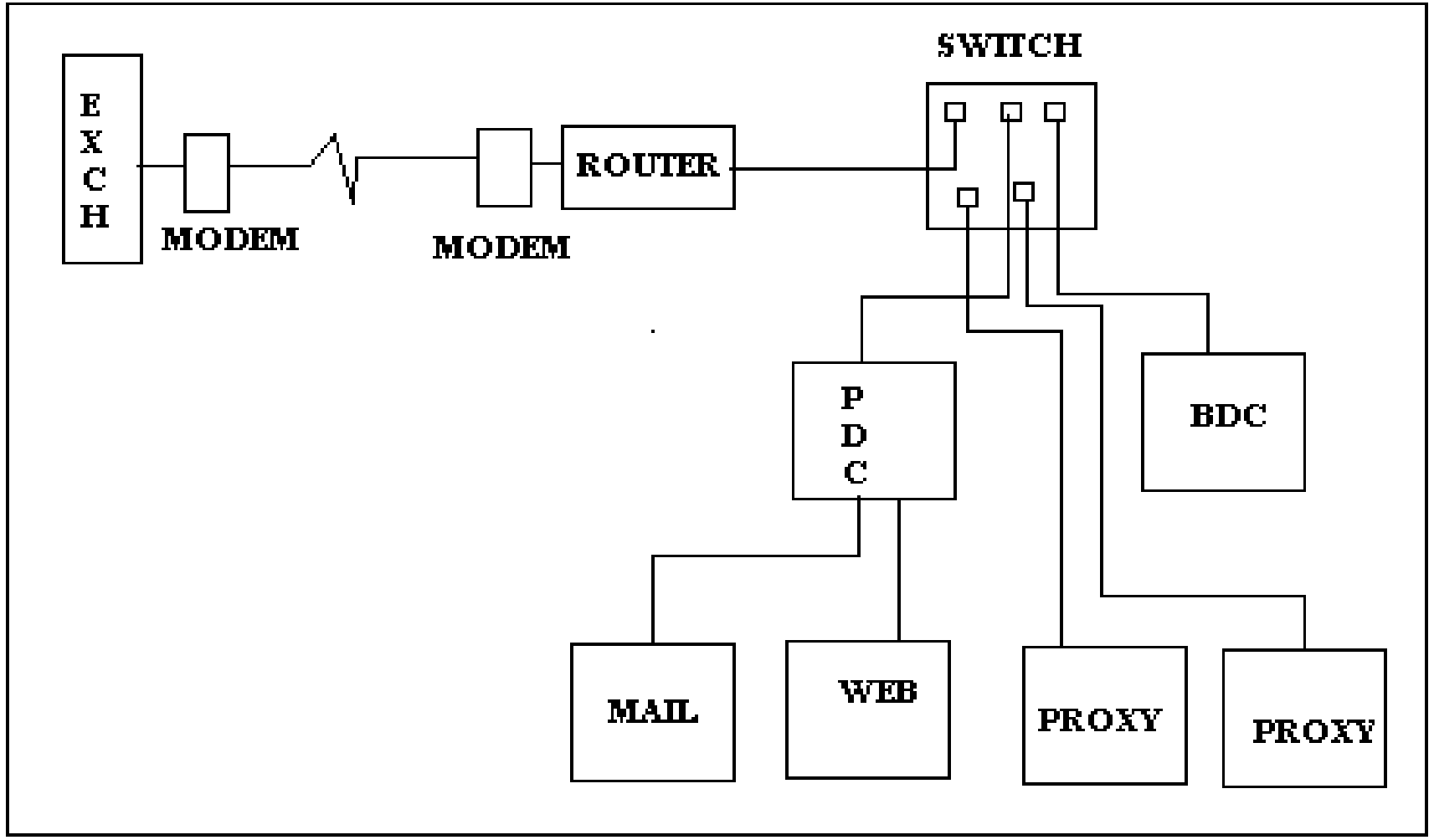
OBJECT MODELS OF E-COMMERCE



3-TIER SYSTEM OF E-COMMERCE



WEB SERVER CONFIGURATIONS



TELEPHONE CONNECTIVITY THROUGH EXISTING CAMPUSWIDE LAN SETUP

Various Departments (buildings) are connected through 6-core multimode FO Cable, where two cores are being used for data network. Each department has a CISCO (Managed) Switch. FO cables are connected to these switches either through direct FO port or through FO/UTP Converter. Connectivity within a department is made through UTP Cabling. There is at least one connection in each department.

TELEPHONE CONNECTIVITY THROUGH EXISTING CAMPUSWIDE LAN SETUP

It is proposed to have a central EXCHANGE compatible with this FO network and this will be located at main switching room of computer center under the existing central UPS connectivity. Initially five telephone connectivity (from external telephone exchange) to be integrated with this Exchange from existing P&T junction box already installed inside the switch room of computer center. The external connectivity will be distributed throughout the campus using existing FO network from the exchange. So exchange must have capability of integrating external telephone connectivity through this FO backbone .

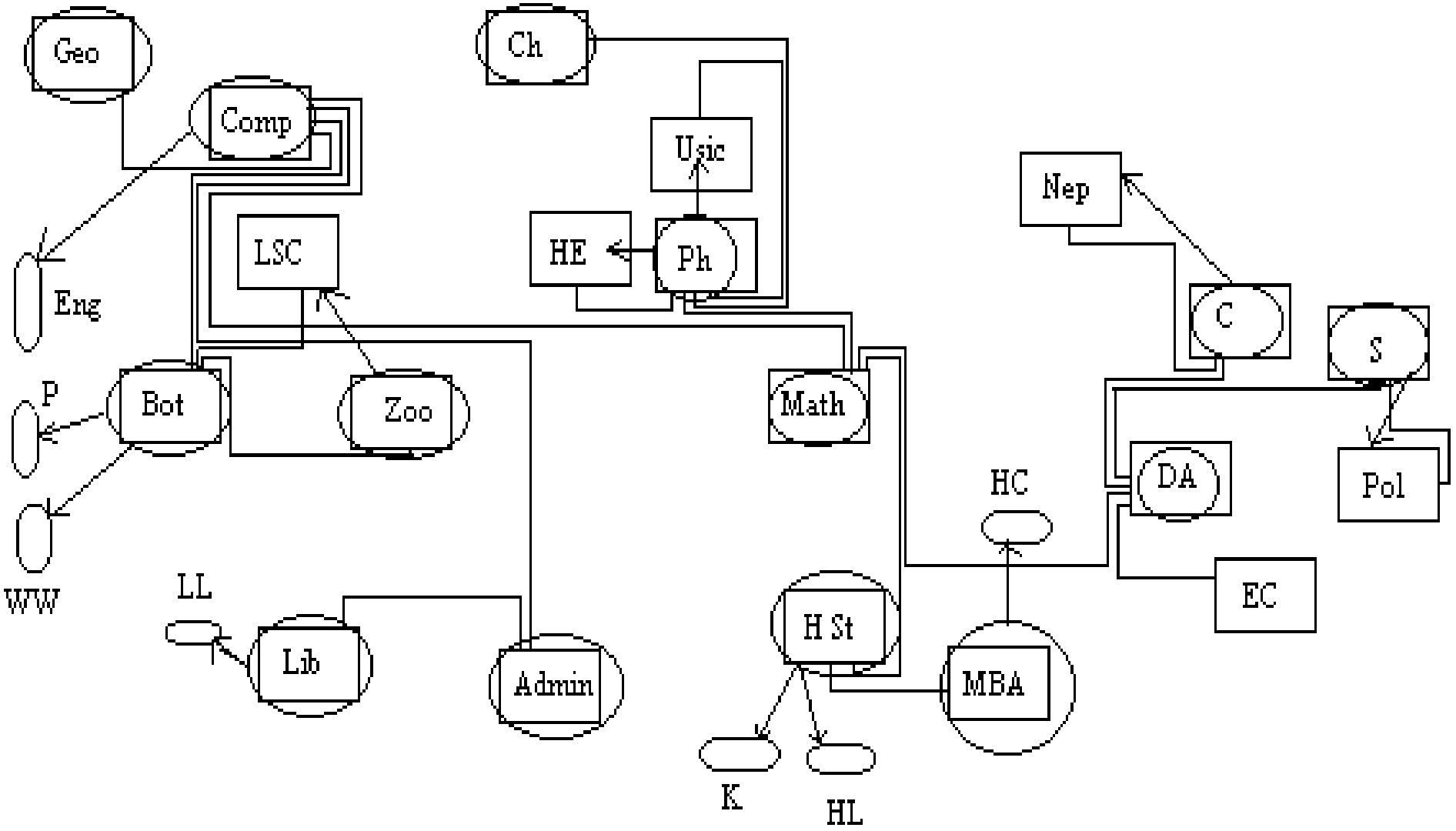
Main EPABX should have

1. Fully digital with distributed Processor / Supply Architecture
2. Non-blocking Architecture
3. Module-wise expandability up to 248 ports or in the same box and beyond with additional box
4. Provision for Ch E1, ISDN BRI, ISDN PRI, E&M ports etc.
5. Welcome voice message with different level voice guidance.
6. Direct dialing of Extn. / Automated Operator assistance.
7. Detail Accounting / Budget of calls.
8. Automated call restriction / STD locking for internal /external lines
9. Integratable with FO network, CISCO Switches and DLINK HUBs

Major features of these VoIP Boxes includes

1. 1 no. 10/100 Base Tx UTP port
2. 8/24 nos. voice ports
3. Voice compression
4. H.323 compliant
5. SNMP supported
6. Web-based management

Detailed Layout of the Telephone Connectivity



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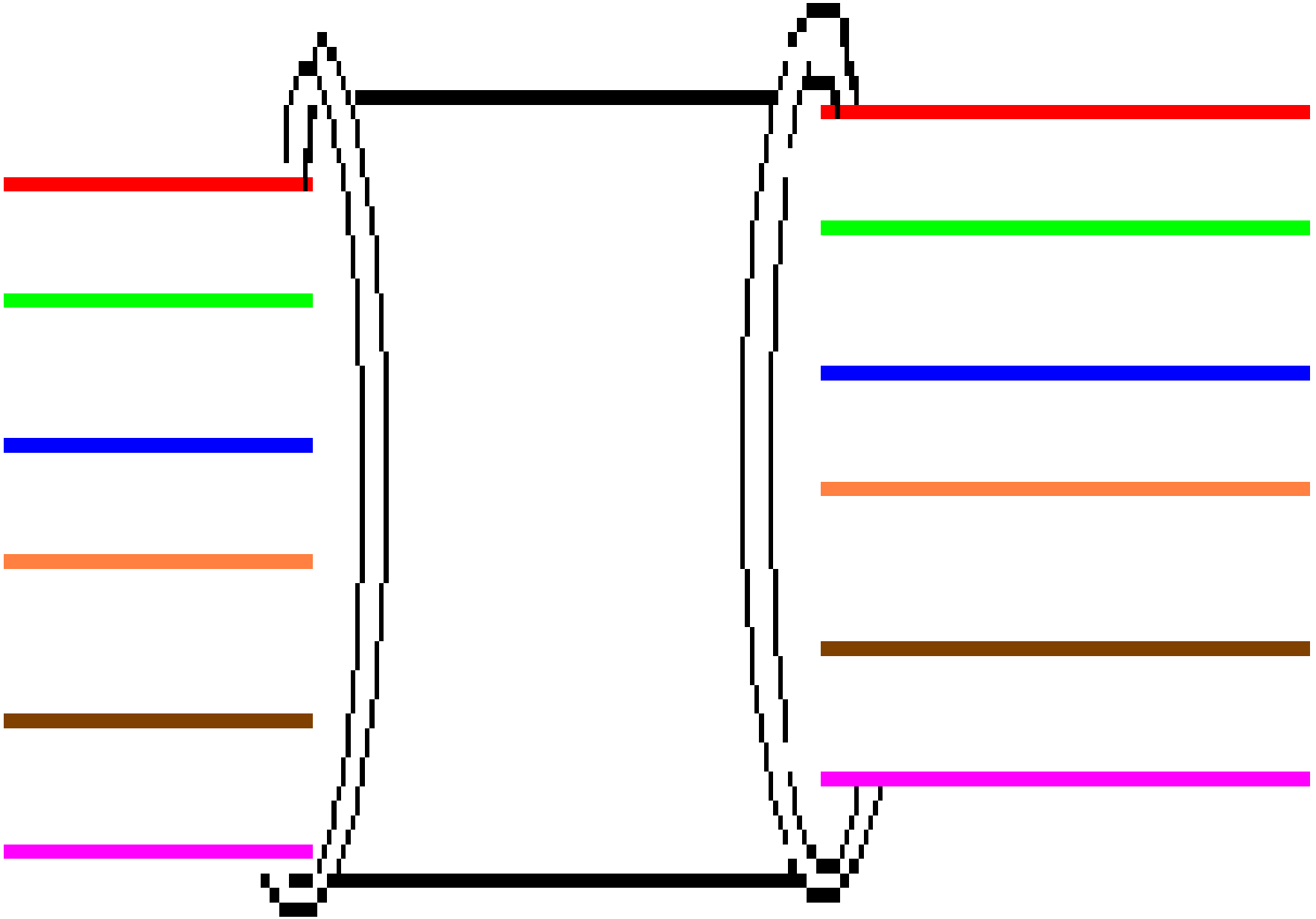
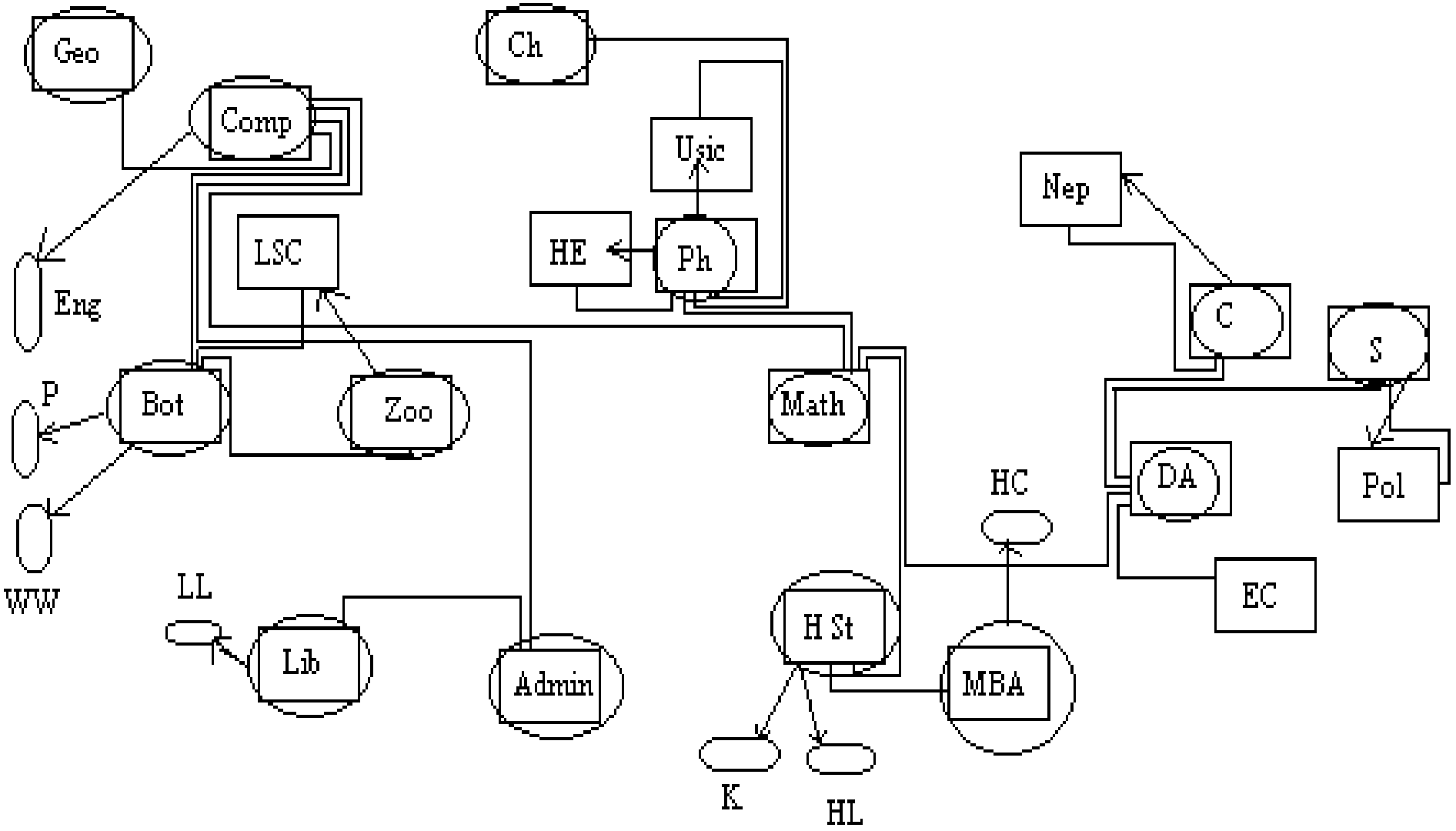


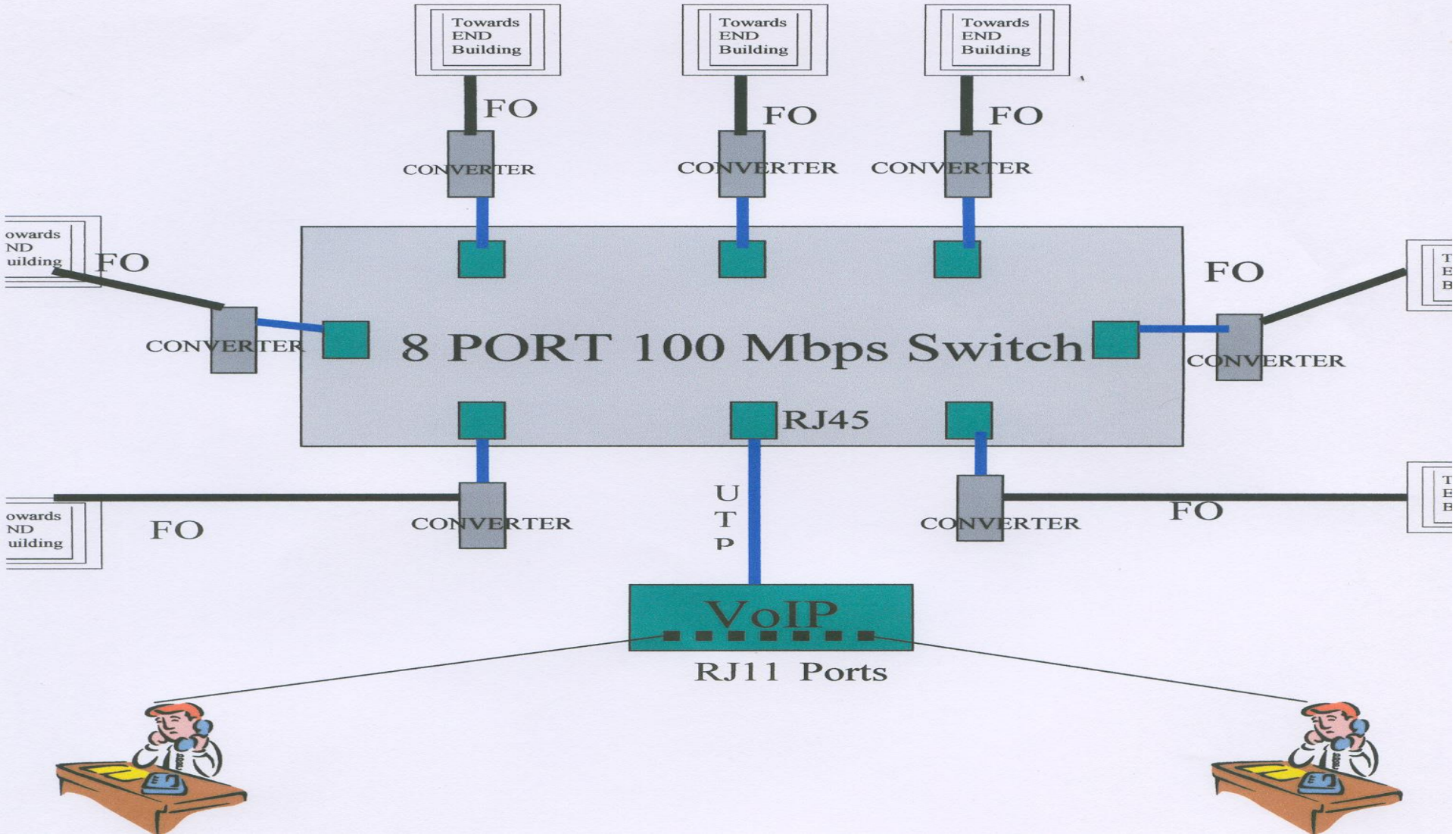
- Optimal design using existing infrastructure
- No outdoors wiring among VoIP boxes and proposed exchange – it will use only existing LA backbone
- Routing of incoming calls to individual departments/person should be done without manual intervention.

Detailed Layout of the Telephone Connectivity

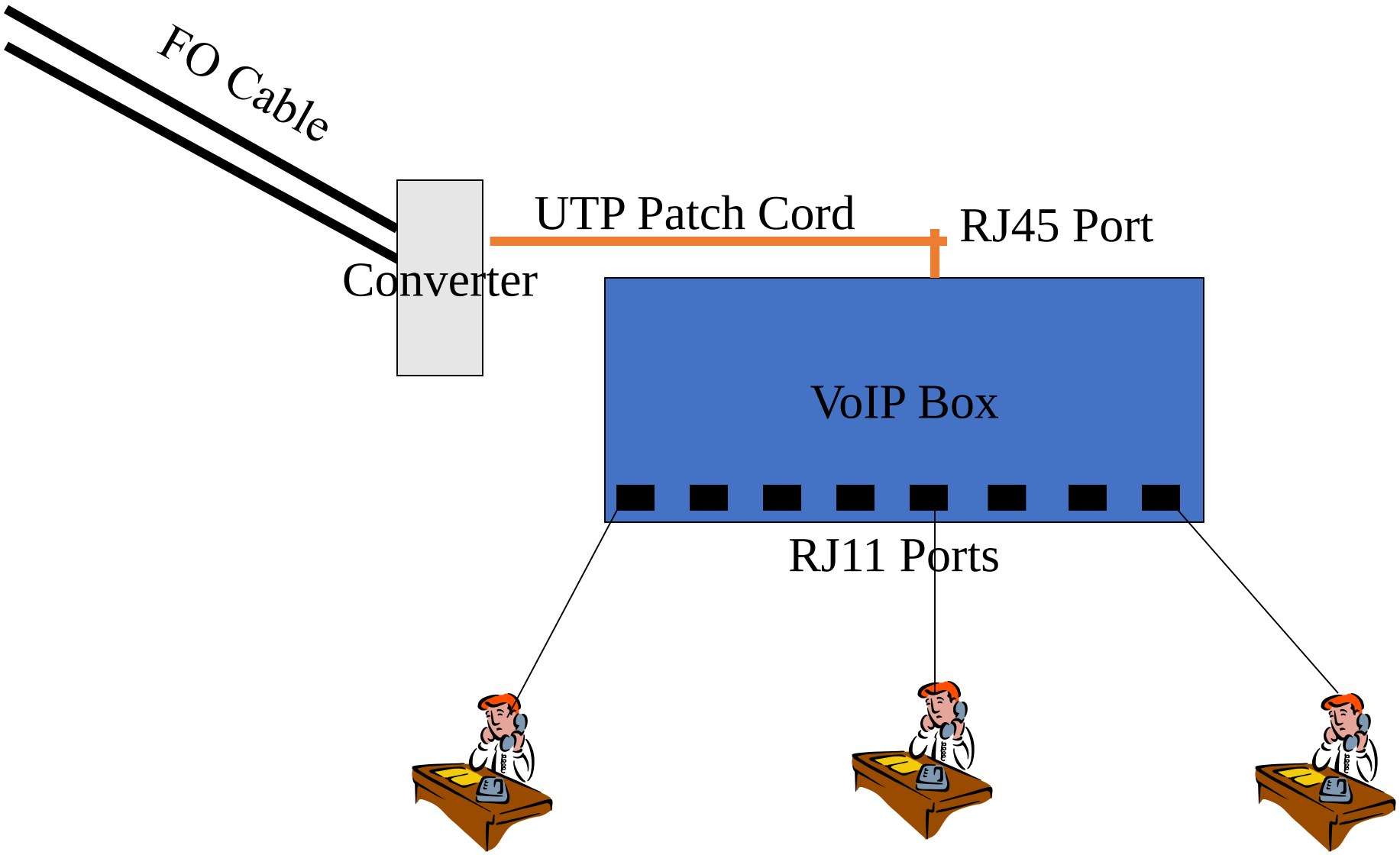


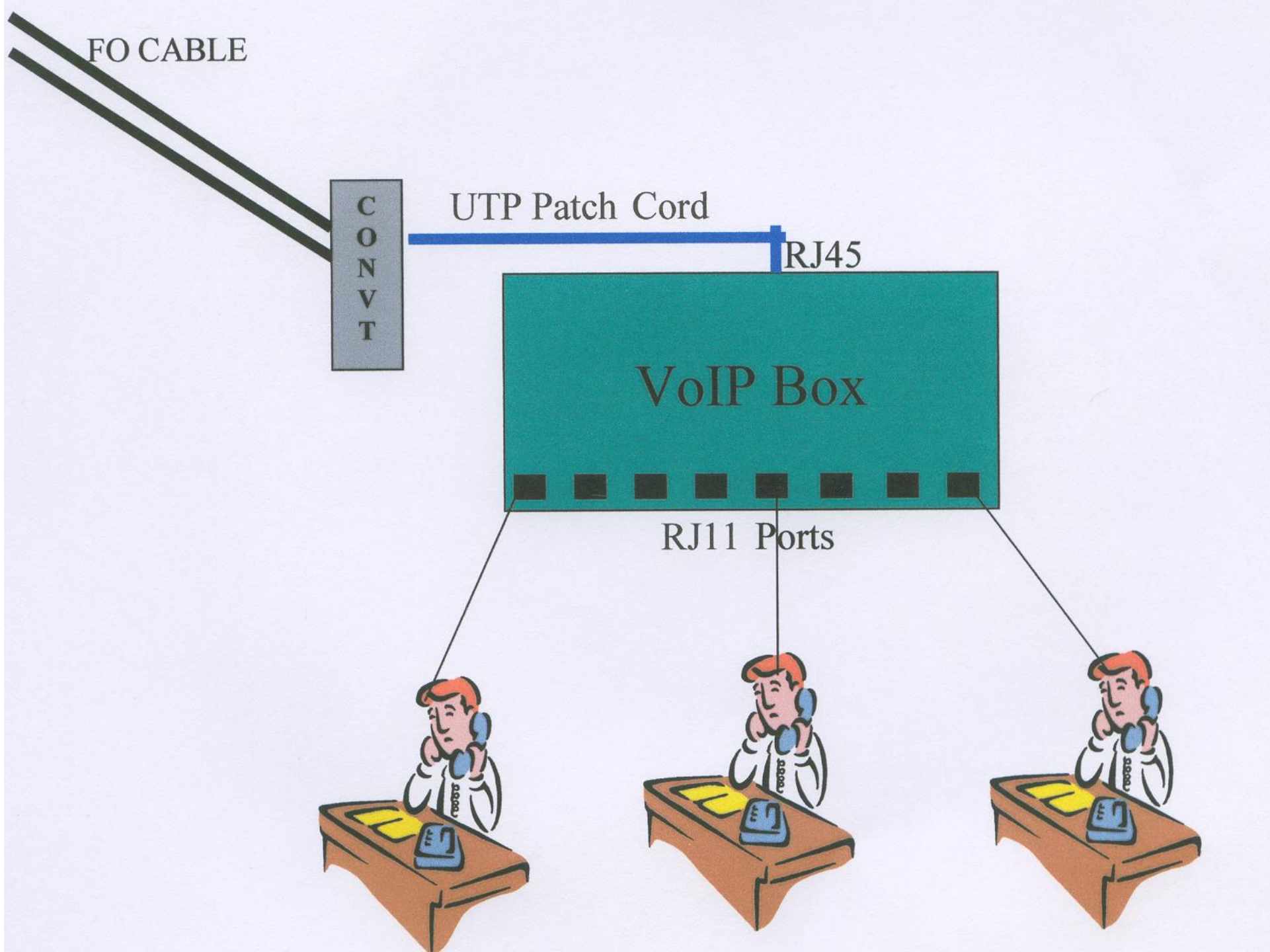
CONNECTIVITY OF DISTRIBUTOR BUILDINGS

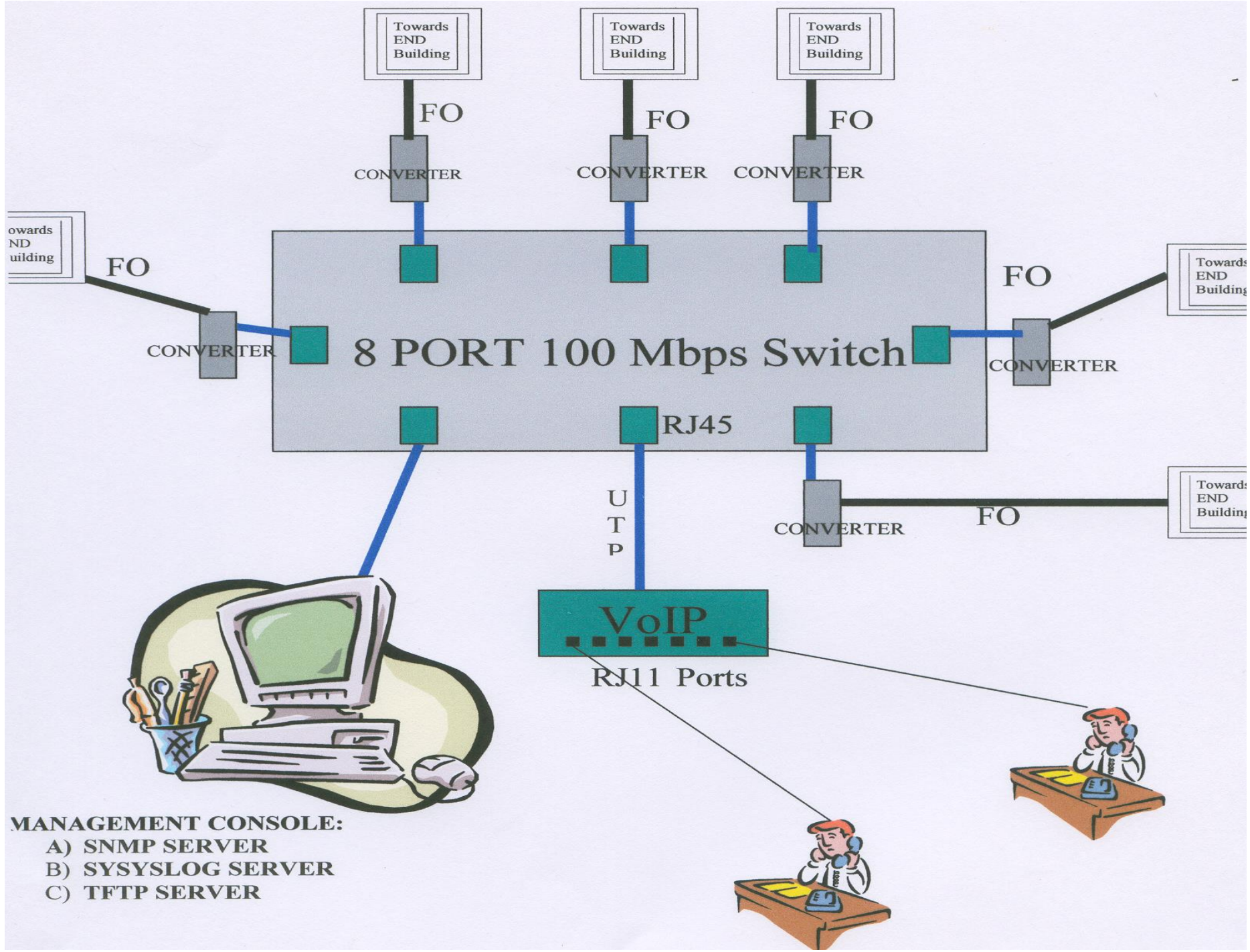
THE BUILDINGS UNDER THIS CATEGORY: 1) MATHEMATICS
2) DEAN ARTS



END BUILDINGS



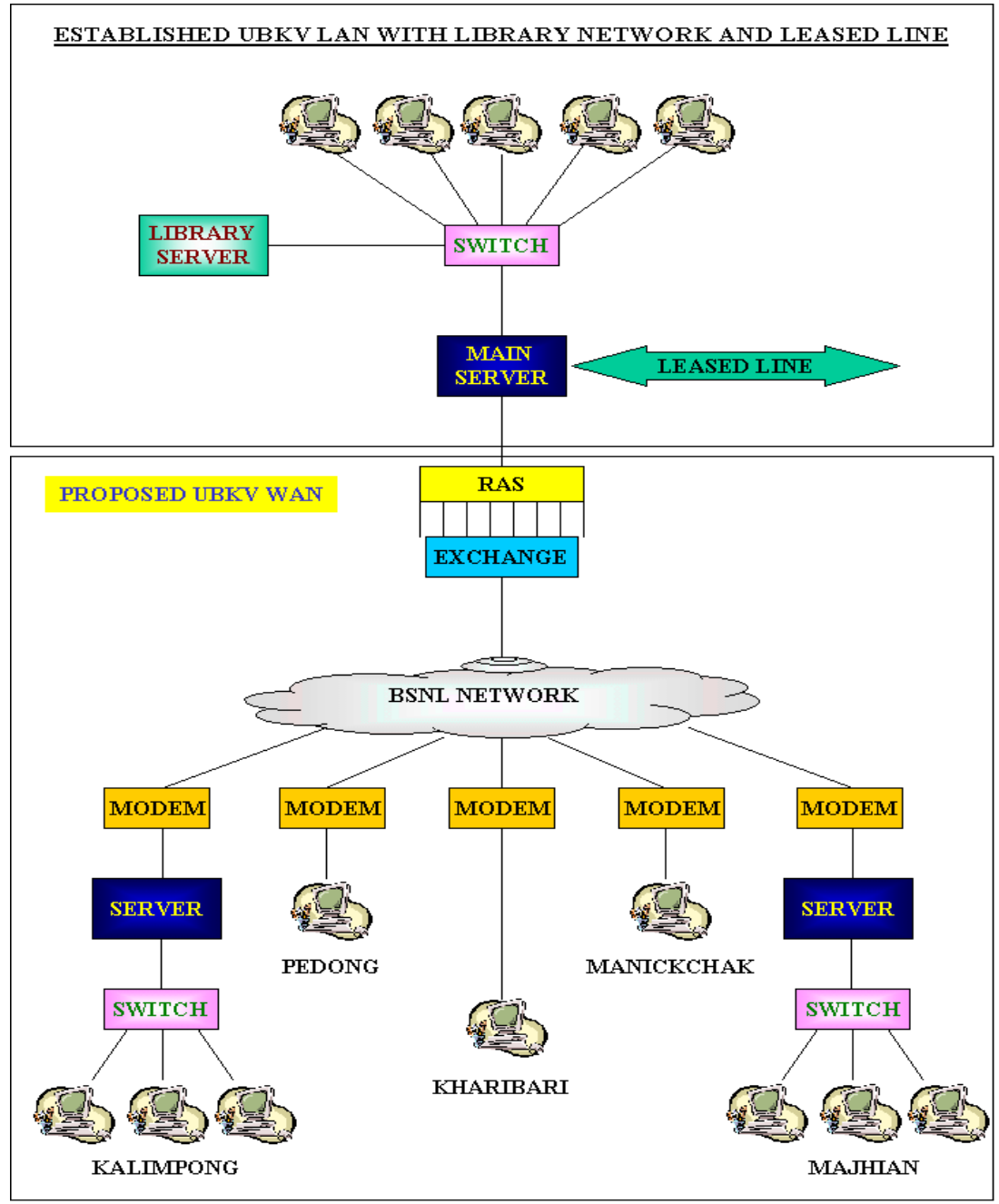

FO CABLE
CONVT
UTP Patch Cord
RJ45
VoIP Box
RJ11 Ports


Towards END Building
Towards END Building
Towards END Building
FO
FO
FO
CONVERTER
CONVERTER
CONVERTER
owards ND uilding
FO
CONVERTER
8 PORT 100 Mbps Switch
FO
CONVERTER
Towards END Building
RJ45
U T P
CONVERTER
FO
Towards END Building
VoIP
RJ11 Ports
MANAGEMENT CONSOLE:
A) SNMP SERVER
B) SYSYSLOG SERVER
C) TFTP SERVER

Connectivity Plan between University and its Constituent Colleges

- A central router come RAS may be proposed at Main Switching room with two channelised E1 port.
- At a, time maximum 60 (2 x 30) colleges can get connected.
- The remote colleges will use PSTN dial-up line.
- One PC at each remote location is proposed with in-built modem, multimedia and compatibility to Video Telephony.
- Channelised E1 is preferred connectivity between NBU and nearest exchange

Connectivity between Local Exchange and Main Switching Centre may be replaced by Fiber Optical cables for effective communication.



PROPOSED STRUCTURE OF THE UBKV-WAN

Connectivity Plan between University and its Constituent Colleges

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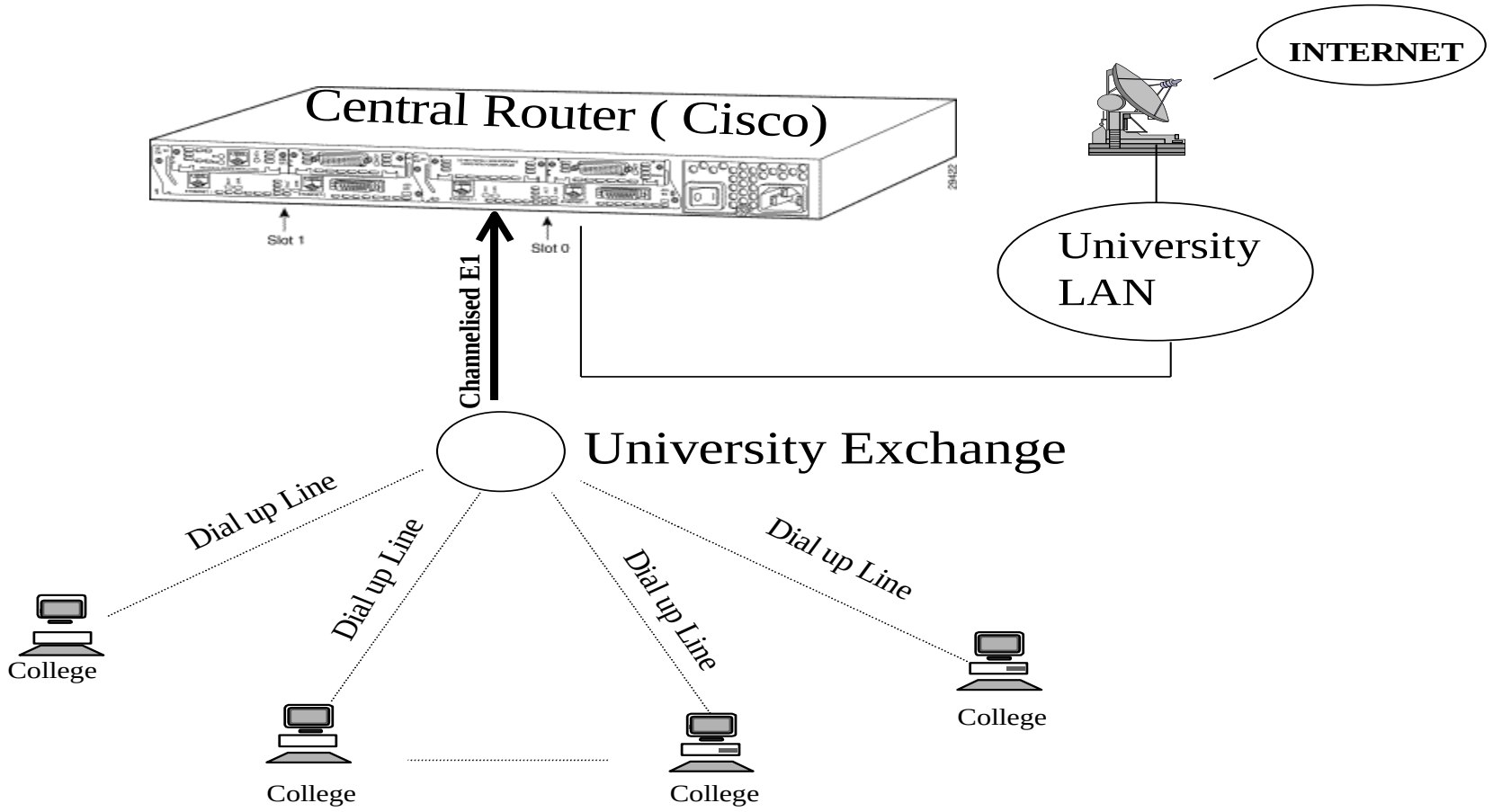
Salient feature of the proposed backbone :

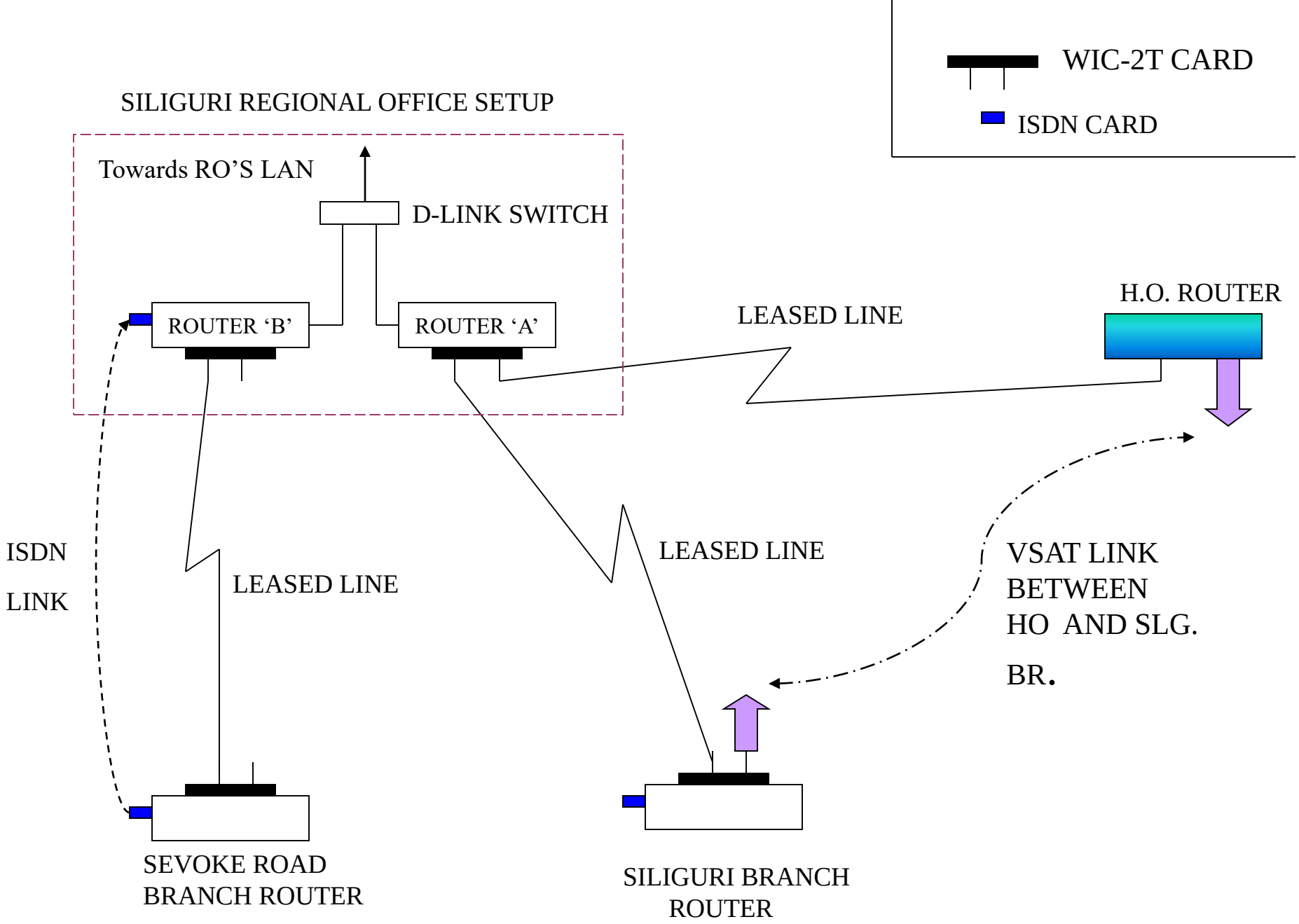
- ✓ End to end connectivity
- ü All colleges may be covered
- ü Video Telephony Enabled
- ü Browsing of Internet through NBU LAN
- ü Channelised E1 for elegant and better managability, and cost-effectiveness
- ü Enough provision for future upgrade
- ü Investment Protection
- ü Same Router can be used for ISDN lines without any additional investment in router
- ü File transfer from remote colleges to University

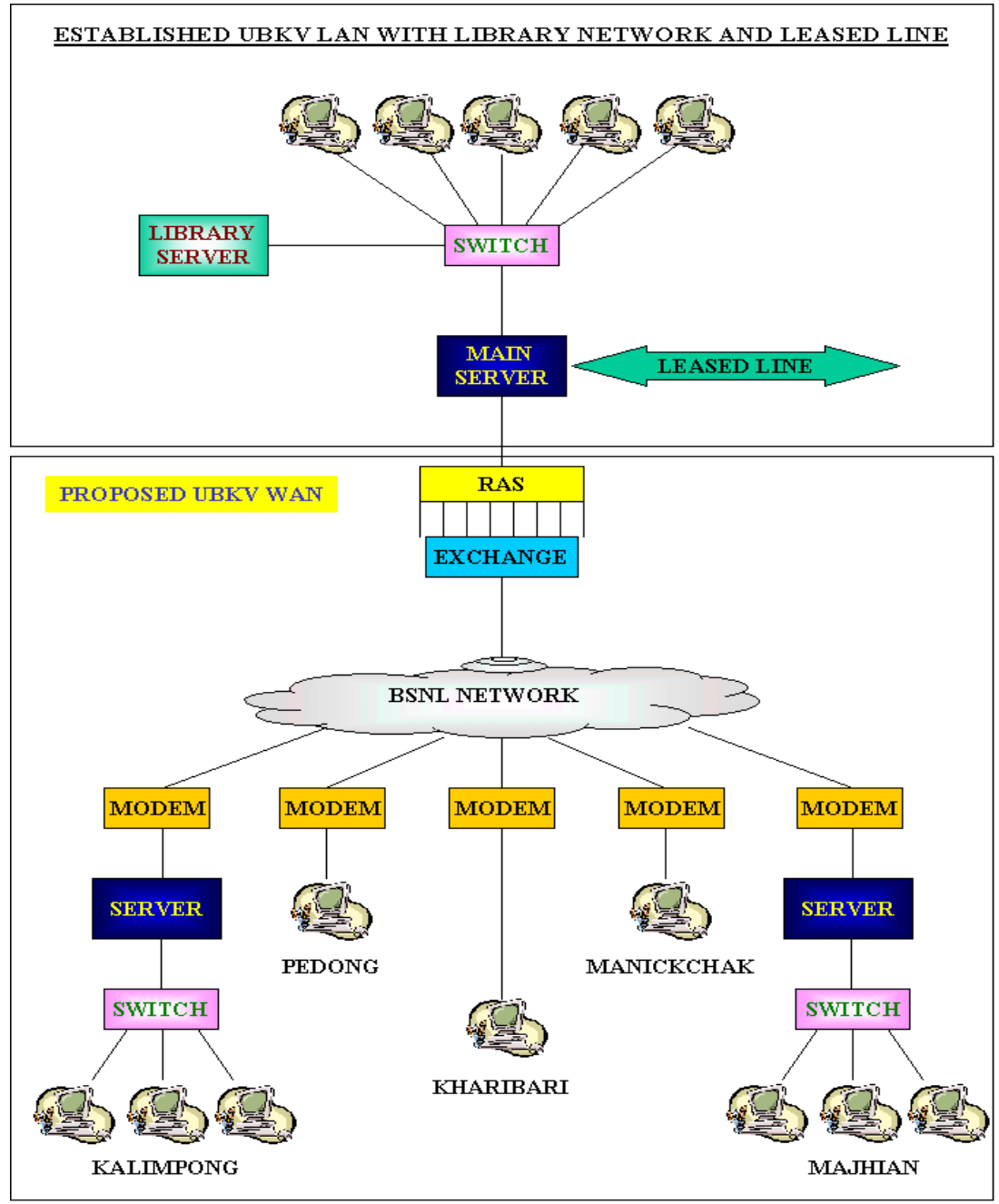
Access to University LAN, including servers, from remote colleges

SCHEMATIC DIAGRAM OF CONNECTIVITY THROUGH E1 CHANNEL



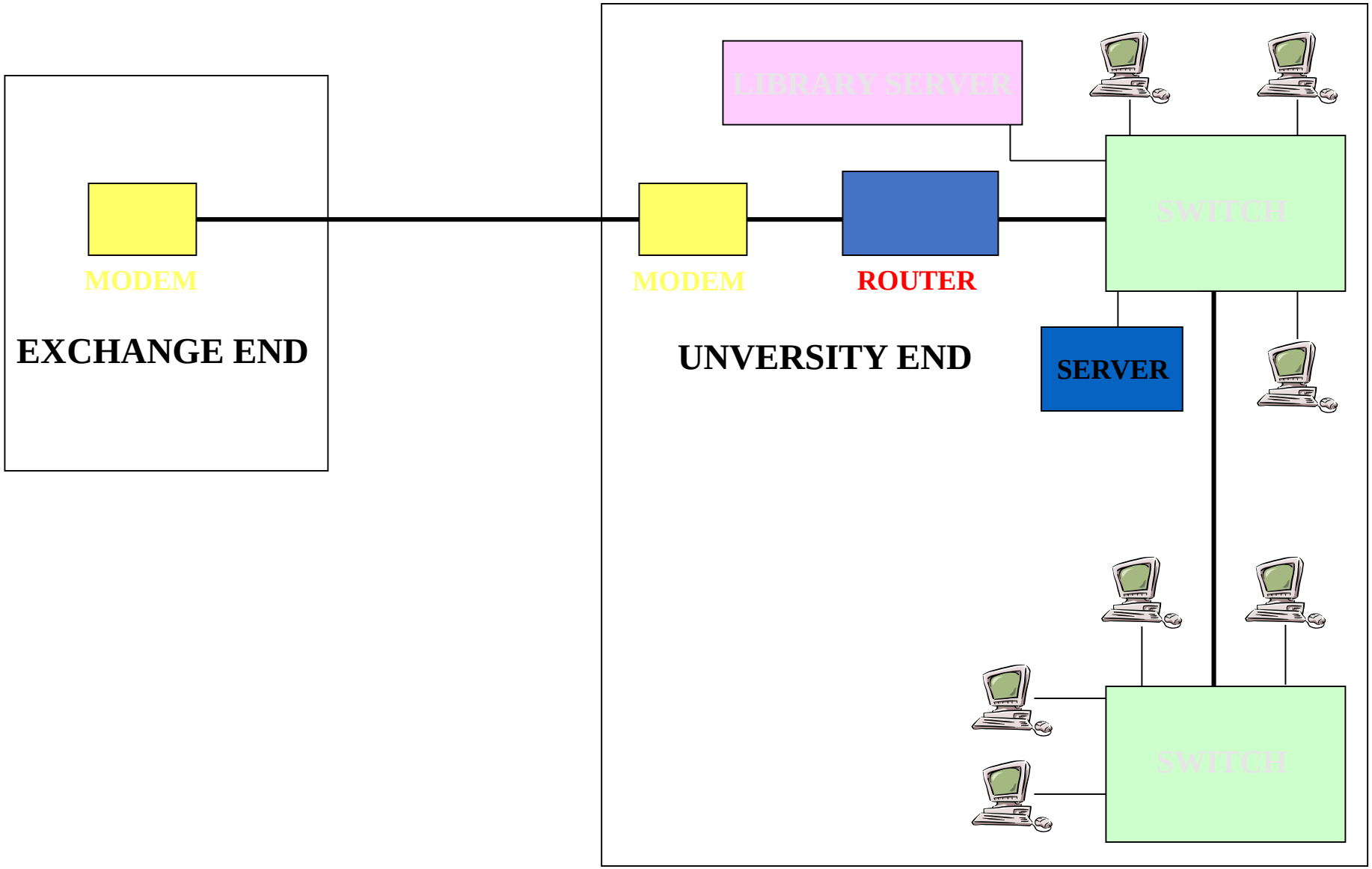
Connectivity between University and Constituent colleges under it


WIC-2T CARD
ISDN CARD
SILIGURI REGIONAL OFFICE SETUP
Towards RO'S LAN
D-LINK SWITCH
ROUTER 'B'
ROUTER 'A'
LEASED LINE
H.O. ROUTER
ISDN
LINK
LEASED LINE
LEASED LINE
VSAT LINK
BETWEEN
HO AND SLG.
BR.
SEVOKE ROAD
BRANCH ROUTER
SILIGURI BRANCH
ROUTER



PROPOSED STRUCTURE OF THE UBKV-WAN

OVERALL REPRESENTATION OF THE LAN & INTERNET SYSTEM



Inter City connectivity