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Comparative Analysis of different Area Network Types

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Abstract: Set of computers connected together form a network which can be categorized on different parameters such as scale and transmission technology. This paper provides information about different types of network on the basis of scale i.e. distance.

Several categories of computer networks on the basis of scale are

PAN, LAN, MAN, WAN, CAN, HAN, SAN, VPN, EPN, POLAN, GAN etc. This paper throws light on distinct types of Networks such as PAN, LAN, MAN, WAN, CAN. This paper provides overall comparison of the above mentioned area networks on the basis of speed, congestion, technology, bandwidth, communication medium etc.

Keywords: LAN, MAN, WAN, CAN, PAN

I. INTRODUCTION

Computer network is a group of autonomous computers connected together by some means of technology.[9][18] Today it is difficult to imagine the world without emails, social networking websites, online shopping etc. [16] A computer network enable users to exchange information or resources proficiently and easily with the help of some medium providing various services such as email, chats, online chat, video telephone calls, and video conferencing.[17]

Network can extend from a few computers to the millions of computers connected together. Network size can be demonstrated by the geographical area they cover as well as by the number of nodes connected in a network. Size of network can vary from a single room or building to the city, country or even the entire world. Depending upon the geographical area covered by network, it can be classified into different types.

This paper covers five main categories: PAN, LAN, MAN, WAN, CAN. [18][10]We use following criteria to compare the above mentioned networks:

- A. Ownership
- B. Speed
- C. Congestion
- D. Medium
- E. Cost
- F. Bandwidth
- G. Communication Medium
- H. Area covered
- I. Maintenance
- J. Used For etc.

II. PAN(PERSONAL AREA NETWORK)

The idea of PAN was first given by Thomas Zimmerman and other researchers at M.I.T.'s Media Lab and later was supported by IBM's Almaden research lab.[20] PAN network is a computer network that allows devices to communicate around a single person. The network is structured for a single entity which can be in a small office, a building or apartment. PAN network connects different peripherals such as computers, telephones, video game consoles. PAN network can be wired or wireless such as USB, or they can be wireless, such as infrared, ZigBee, Bluetooth. [21]. It is a subset of LAN.The basic difference between PAN and LAN is that PAN supports individual person whereas LAN supports a group. [22]. The basic purpose of PAN (Personal Area Network) is to present a communication medium to the individuals, who want to carry their personal digital devices.[23].The area covered by PAN network is 10 meters.[1][2][3][4][18][19]



Fig. 1 PAN Network

III.LAN(LOCAL AREA NETWORK)

LAN is a privately owned network. It is largely used to provide connection between personal computers enclosed in a single building e.g. house, office, company, institutions, organizations etc. By providing connection between computers, it allows sharing of resources such as printers; data etc. LAN can be wired as well as wireless. Wired LAN is building mostly from point to point links using different topologies for transmission. Example of wired LAN is Ethernet. [18][10]. WLAN known as wireless LAN is the network that connects various nodes using wireless communication medium in a restricted area such as in a single building or office etc. The advantage of using wireless communication medium is that user can move freely in the network coverage area. Due to its easy installation process and easy use, it is widely used in homes, hotels, medical centres etc. It is based on IEEE 802.11 standards and is known as Wi-Fi.[1][2][3] [5][6][7][11]

TABLE I
COMPARISON BETWEEN WIRED AND WIRELESS NETWORKS[24]

Parameters	Wired LAN	Wireless LAN
1.Operational Speed	High	Low with respect to wired LAN
2.Cost factor	Cheap as comparison to wireless LAN.	Expensive
3. Installation process	Complex and time consuming.	Easy as comparison to Wired LAN
4. Bandwidth	High	Low
5.Transmission Media	Copper cables, Fiber optic cables	Infrared and radio waves.
6. Movability	Limited	Works in the entire wireless network coverage area.



Fig. 2 LAN Network

IV. MAN(METROPOLITAN AREA NETWORK)

MAN is a computer network that merges different networks situated in various buildings into a single network. The range of this network lies between 5 to 50 kilometres. The geographical area of MAN lies between LAN and WAN i.e. it covers more area than LAN but less than WAN. MAN network can be wired as well as wireless.[8] It connects various LAN's covering the entire city. Various computers in wired MAN can be connected using different communication mediums such as: a twisted pair, optical cables and in wireless MAN with the help of radio waves etc. [12] Example of MAN network : Network between different branches of a bank in a city, cable television networks, air reservation.[1][2][3][18][14]



Fig. 3 MAN Network

V. CAN (CAMPUS AREA NETWORK)

It is a type of network built upon connection of various LAN networks within restricted geographical area. It is also known as corporate network. These are interconnected with high speed Ethernet using optical fiber. The range of CAN varies from 1 km to 5 km. Network can be said to be CAN network if two same domain buildings are connected with a network. Example of CAN network: Any campus or university network such as the Stanford University Network at Stanford University.[1][2][3][6][15]

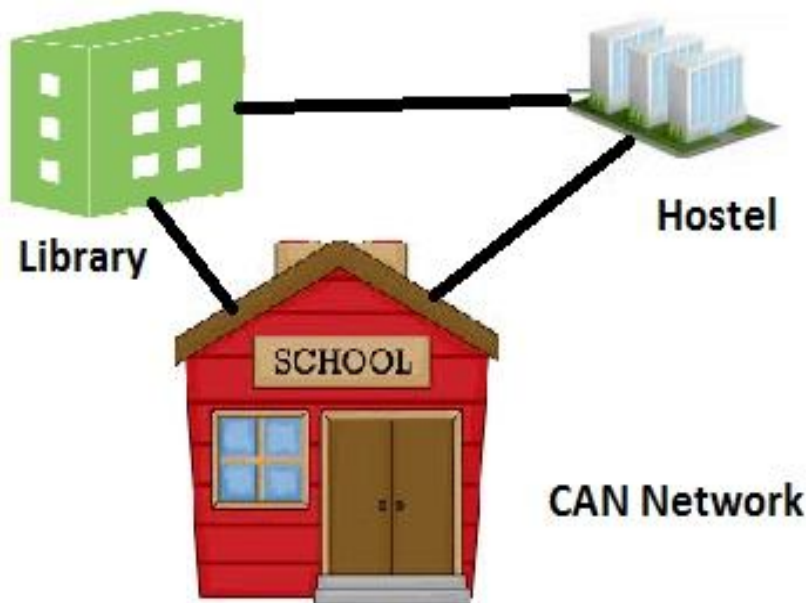


Fig. 4 CAN Network

VI. WAN(WIDE AREA NETWORK)

WAN i.e. wide area network is the connection of devices allowing communication over wide area i.e. covering a state, country even continent. Connecting devices in WAN network can be switches, routers, modems etc. WAN contains collection of hosts which are connected by a communication subnet which carries message from host to host. Mostly different people own and operate hosts and subnet. Transmission lines and switching elements are the components mostly found in WAN network. Transmission lines can be copper wire, optical fiber, radio waves etc. Switching lines popularly known as routers provides connection between these

transmission lines. Due to large area covered in this network leads to propagation delay, low data rate problems. Example: Bank with different branch offices in different cities. In the following diagram WAN connects the three branch offices of Diskon, St. Petersburg, Magadan in Russia..[1][2][3][8][18][10]



Fig. 4 WAN Network

VII. COMPARISON BETWEEN DIFFERENT COMPUTER AREA NETWORKS

Table 2 demonstrates the contrast between PAN, LAN, MAN, CAN, WAN on various parameters.

TABLE 2 Comparison of Characteristics of PAN, LAN, MAN, CAN, WAN

Sr.No.	Parameters	PAN	LAN	MAN	CAN	WAN
1.	Ownership	Private	Private	Private or Public	Private	Private or Public or Leased
2.	Design Maintenance	Easy	Easy	Difficult	Difficult	Difficult
3.	Speed	Low	High	Moderate	High	Low
4.	Congestion	Less	Less	More	Medium(More than PAN)	More
5.	Area Covered	Short up to 10m	Confined to single building such as school, office etc.	Covers up to entire city.	1Km to 5 Km	large area covering country even whole world
6.	Technology Used		Ethernet, Token Ring		Ethernet, Token Ring	ATM, Frame Delay X.25
7.	Propagation Delay	Short	Short	Moderate		Long
8.	Communication Medium	Wireless or Wired	Coaxial Cable	Optical Fiber, Coaxial Cable or wireless	Optical Fiber	Satellite Links
9.	Bandwidth		High	Moderate	High	Low
10.	Cost	Cheap	Inexpensive	Cost Effective	Cheap	Expensive
11.	Fault Tolerance		More	Less		Less
12.	Used For	Revolves around single person	Home, Office School	Cable TV Network	Enterprise, University, Government Institution	Banks Branches in a country.

VII. CONCLUSIONS

A computer network provides the basis of communication between different nodes. This paper has presented an overview of various types of computer area networks. In this paper we have compared five computer area networks: LAN, PAN, MAN, and CAN, WAN. These technologies are compared on the basis of various parameters such as speed, congestion, fault tolerance, technology used, cost, bandwidth, communication medium, design maintenance, ownership, area covered, propagation delay, used for.

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