

An Overview of Networks - Advantages & Disadvantages

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Abstract: This article is proposed to overview of networks, advantages and disadvantages such as PAN, LAN, WLAN, CAN, MAN, WAN, SAN, EPN, VPN, HAN, DAN, BAN, GAN. A network is consist of group of Computer systems, servers, networking devices are linked together to share resources, including a printer or a file server. Computer Networks have fall into three classes regarding the size, distance and the structure. The geographic area they occupy and the number of computers that are part of the network can express the size of a network. Some of the different networks based on size are Personal area network (PAN), Local area network (LAN), Wireless Local Area Network (WLAN), Campus Area Network (CAN), Metropolitan area network (MAN) Wide area network (WAN). In terms of purpose, many networks can be general purpose. However some types of networks, serve a very particular purpose. Some of the different networks based on their main purpose are Storage area network (SAN), Enterprise private network (EPN), Virtual private network (VPN). Home area network (HAN), Desk area network (DAN) Body area network (BAN), Global Area Network (GAN). In order to be proficient in network security, you have to understand the different types of networks since each network type of different advantages and disadvantages.

Keywords: PAN, LAN, WLAN, CAN, MAN, WAN, SAN, EPN, VPN, HAN, DAN, BAN, GAN.

I. INTRODUCTION

In networking terminology, the smallest and most basic type of network, PAN Refers to a Personal Area Network communication from and between small handheld devices such as mobile phones, smart phones, Bluetooth etc. LANs connect groups of computers and low-voltage devices together across short distances to share the information and resources. WLANs make use of wireless network technology, such as Wi-Fi. CAN is a larger than LANs, but smaller than metropolitan area networks. They can communicate across several buildings that are fairly close to each other so users can share resources. MANs span an entire geographic area. WAN connects computers together across longer physical distances. SAN a dedicated high-speed network that connects shared pools of storage devices to several servers. The computers connected on a SAN operate as a single system at very high speeds. EPN is to securely connect its various locations to share computer resources. VPN is a virtual point-to-point connection; users can access a private network remotely. HAN is the connection of network enabled devices in a domestic home. DAN is actually a network of peripherals and it supports with the help of ATM, the exchange of information for these various peripherals with the CPU inside a computer. BAN, it is defined as the types of network that deals with the detection and for monitoring the whole systematic of the human body or the computational devices wearied by the humans for the sake of detection of chronic syndromes also is called as the body area network (Or) Body sensor network. GAN is a network used for supporting mobile across an

arbitrary number of wireless LANs, satellite coverage areas, etc. Because GANs used to support mobile communication across a number of wireless LANs, the key challenge for any GAN is transferring user communications from one local coverage area to the next. Now the evolution, types, their advantages and disadvantages were discussed in the paper.

II. EVOLUTION

What is Network? Network is a medium of connections between nodes (set of devices) or computers. The connections are established by using either cable media or wireless media. There are different types of networks, categorized by their **size and their purpose**.

Some of the different networks **based on size** are:

- ✚ Personal area network, or PAN
- ✚ Local area network, or LAN
- ✚ Metropolitan area network, or MAN
- ✚ Wide area network, or WAN
- ✚ Wireless area network, or WLAN

There are several networks **build upon the purposes**:

- ✚ Storage area network, or SAN
- ✚ Enterprise private network, or EPN
- ✚ Virtual private network, or VPN
- ✚ Campus area network, or CAN
- ✚ Home area network, or HAN
- ✚ Desk area network, or DAN
- ✚ Body area network, or BAN
- ✚ Global area network, or GAN

Network Area Definitions Abstracted

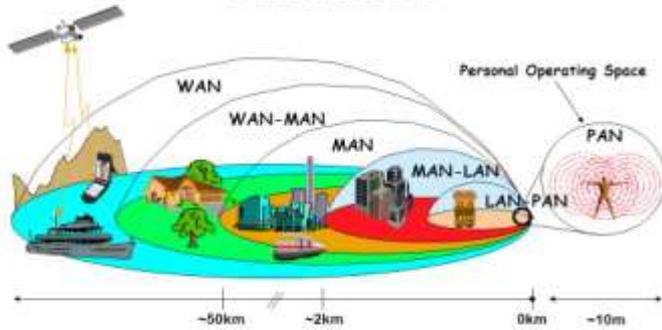


Figure1. Different types of networks based on size.

A. Personal area network (PAN):

It is a computer network for interconnecting devices centered on an individual person's workspace. A PAN provides data transmission amongst devices such as computers, smart phones, tablets and personal digital assistants. PANs can be used for communication amongst the personal devices themselves, or for connecting to a higher level network and the Internet (an uplink) where one master device takes up the role as gateway. A PAN may be carried over wired interfaces such as USB.

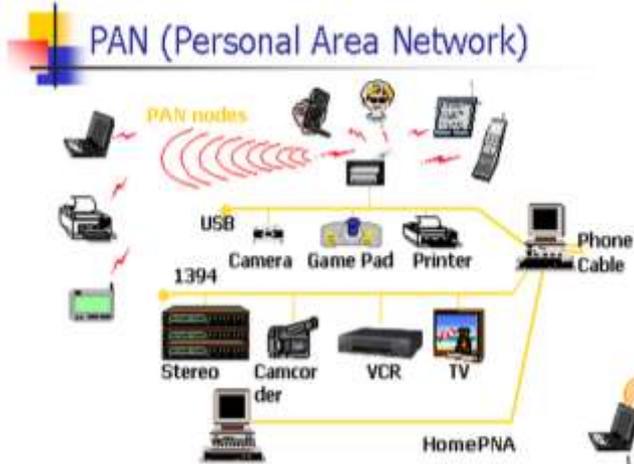


Figure2. Configuration of PAN

PAN is definitively the smallest type of network you can currently use and the name comes from Personal Area Network. It is the interconnected network of technologic devices within the reach of an individual person, but usually limited to a range of maximum 10 meters. It can be seen as a subset of LAN but supporting a single person instead of a group. PAN can be constructed with cables (USB or FireWire) or wireless (Bluetooth, Infrared, Z-Wave, ZigBee) technologies available on portable device, laptops, PDAs (Personal Digital Assistant), portable printers, cell phones (smart phones), etc.

1. Advantages of PAN

- ✚ No extra space requires
- ✚ Connect to many devices at a time
- ✚ Cost effective
- ✚ Easy to use
- ✚ Reliable
- ✚ Secure
- ✚ Used in office, conference, and meetings
- ✚ Synchronize data between different devices
- ✚ Portable

2. Disadvantages of PAN

- ✚ Less distance range
- ✚ Interfere with radio signals
- ✚ Slow data transfer
- ✚ Health problem
- ✚ Costly in terms of communication devices
- ✚ Infrared signals travel in a straight line

Generally, Computer Networks have fall into three classes regarding the **size, distance and the structure**. The size of a network can be expressed by the geographic area they occupy and the number of computers that are part of the network.

Table.1 Comparative Study of LAN, MAN, WAN

FUNCTION S	LAN	MAN	WAN
TYPE OF NETWORK	PRIVATE	PRIVATE OR PUBLIC	PRIVATE OR PUBLIC
STANDARDS	802.11A,B,G HIPER LAN2	802.11,MMDS, LMDS	GSM, GPRS, CDMA, 2.5G,3G
EARTH COVERAGE	SMALL (<1KM)	MODERATE (<100KM)	VERY LARGE (>=1000KM)
MEDIUM	COAXIAL CABLE	PSTN, OPTICAL FIBER	SATELLITE LINKS
BANDWIDTH	LOW	MEDIUM	HIGH
TRANSMISSION (SPEED)	HIGH(2 TO 54 MPS)	MEDIUM (22MPS)	LOW (10 TO 384KBPS)
MAINTANENCE	EASY	DIFFICULT	DIFFICULT
APPLICATIONS	ENTERPRISE NETWORKS	FIXED, LAST MILE ACCESS	PDAs, MOBILE PHONE, CELLULAR ACCESS
ERROR RATES	LOWEST	MODERATE	HIGHEST
EQUIPMENT COST	USES INEXPENSIVE EQUIPMENT	USES MODERATELY EXPENSIVE EQUIPMENT	MOST EXPENSIVE EQUIPMENT

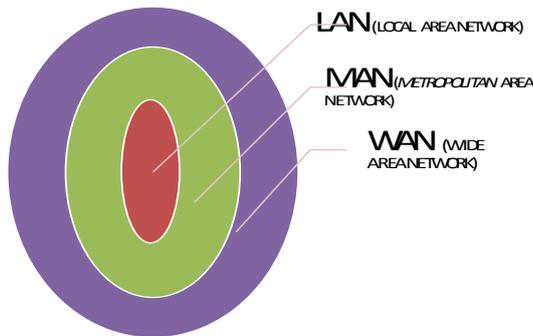


Figure3.Configuration of LAN, MAN, WAN

B. Local Area Network (LAN):

It is a designed for small physical areas such as an office, group of buildings or a factory. LANs are used widely as it is easy to design and to troubleshoot. Personal computers and workstations are connected to each other through LANs. We can use different types of topologies through LAN; these are Star, Ring, Bus, Tree etc.

LAN can be a simple network like connecting two computers, to share files and network among each other while it can also be as complex as interconnecting an entire building. LAN networks are also widely used to share resources like printers, shared hard-drive etc.

LAN offers high speed communication of data rates of 4 to 16 megabits per second (Mbps). IEEE has projects investigating the standardization of 100 Gbit/s, and possibly 40 Gbit/s. LANs Network may have connections with other LANs Network via leased lines, leased services.

1. Advantages of LAN

- + Lower in cost
- + Sharing of Resources
- + High Speed
- + Security

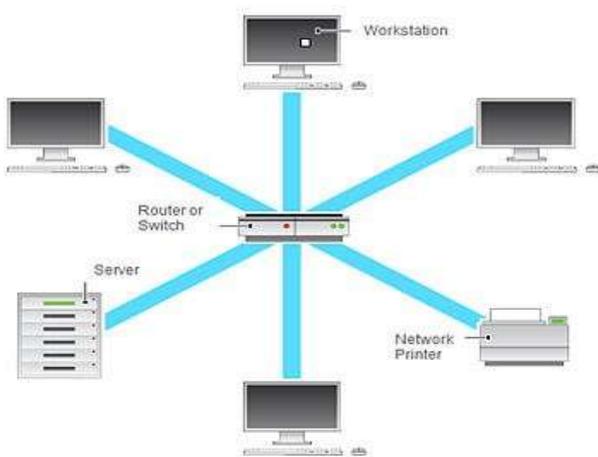


Figure4.Configuration of LAN

2. Disadvantages of LAN

- + If number of nodes increases, the performance decrease.
- + Area covered is limited.

C. Metropolitan Area Network (MAN):

It was developed in 1980s. It is basically a bigger version of LAN. It is also called MAN and uses the similar technology as LAN. It is designed to extend over the entire city.

It can be means to connecting a number of LANs into a larger network or it can be a single cable. It is mainly hold and operated by single private company or a public company.

A MAN usually interconnects a number of local area networks using a high-capacity backbone technology, such as fiber-optical links, and provides up-link services to wide area networks and the Internet

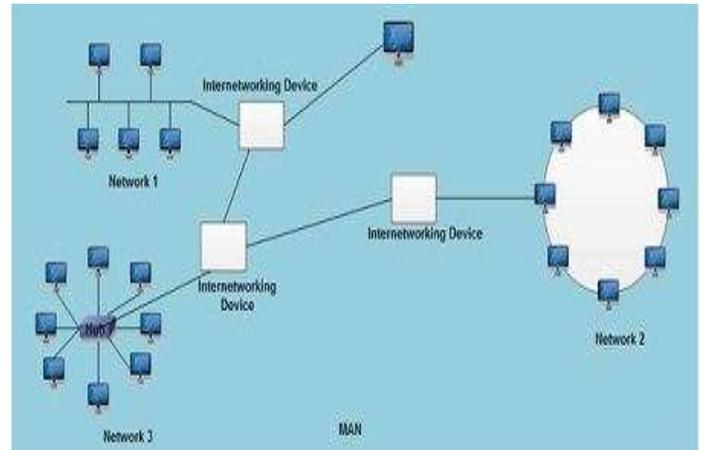


Figure5.Configuration of MAN

1. Advantages of MAN

- + It is wider area than a LAN
- + It is a large network connectedness
- + Information can be disseminated more widely, rapidly and significantly.

2. Disadvantages of MAN

- + Data rate is slow compare to LAN
- + Cost is higher than LAN, required more devices and cables to covered large area.
- + It is difficult to manage.

D. Wide Area Network (WAN)

It is also called WAN. WAN can be private or it can be public leased network. It is used for the network that covers large distance such as cover states of a country. It is not easy to design and maintain. Communication medium used by WAN are PSTN or Satellite links. WAN operates on low data rates. Switched WAN and Point-to-Point WAN. WAN is difficult to design and maintain. Similar to a MAN, the fault tolerance of a WAN is less and there is more congestion in the network.

WANs use very expensive network equipment. WAN's data rate is slow about a 10th LAN's speed, since it involves increased distance and increased number of servers and terminals etc. Speeds of WAN ranges from few kilobits per second (Kbps) to megabits per second (Mbps).

Propagation delay is one of the biggest problems faced here. Devices used for transmission of data through WAN are: Optic wires, Microwaves and Satellites.

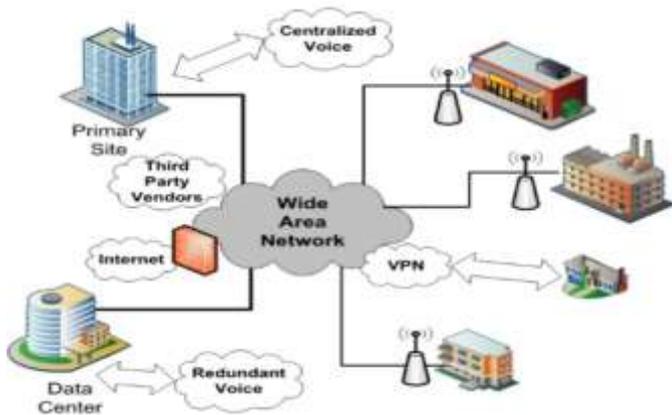


Figure 6. Configuration of WAN

1. Advantages of WAN

- + Large geographical area

2. Disadvantages of WAN

- + Complicated and complex
- + High cost
- + Required high performance devices
- + low security

E. Campus Area Networks (CAN):

A CAN is a computer network that links the buildings and consists of two or more local area networks (LANs) within the limited geographical area. It can be the college campus, enterprise campus, office buildings, military base, and industrial complex. CAN is one of the type of MAN (Metropolitan Area Network) on the area smaller than MAN.

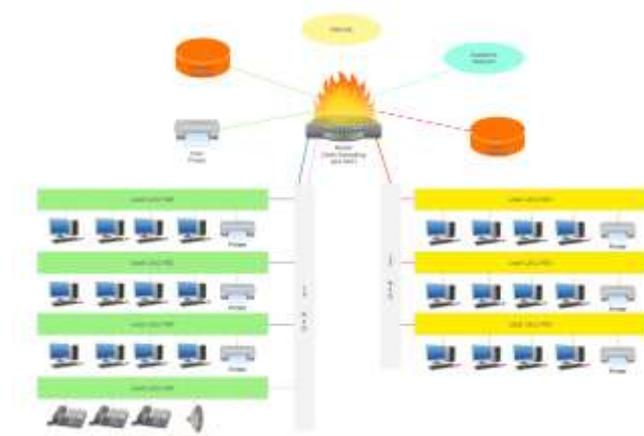


Figure 7. Configuration CAN

The Campus networks usually use the:

- + LAN technologies,
- + such as Ethernet,
- + Token Ring,
- + Fiber Distributed Data Interface (FDDI),
- + Fast Ethernet,

- + Gigabit Ethernet
- + Asynchronous Transfer Mode (ATM).

Campus network can be additional to the set of wireless connections, connect several buildings to the same network, but it is not same thing. A campus network should be broad enough to cover a large territory, while the point-to-point access simply. It found a base of knowledge for the future generations and to develop educational tools.

1. Advantages of CAN

- + Reduces wiring in various automotive applications.
- + Less complex interface in various industries.
- + Flexible in various electrical environments.
- + Supports different error detection capabilities (bit, acknowledgement, form, CRC and stuff errors).

2. Disadvantages of CAN

- + Supports up to 64 nodes due to electrical loading.
- + Supports maximum length of 40 meters.
- + Undesirable interactions between nodes.
- + High expenditure for development and maintenance.
- + The network does not specify many nodes.

F. Virtual Private Network (VPN):

A virtual private network (VPN) is a private network that is built over a public infrastructure. Security mechanisms, such as encryption, allow VPN users to securely access a network from different locations via a public telecommunications network, most frequently the Internet.

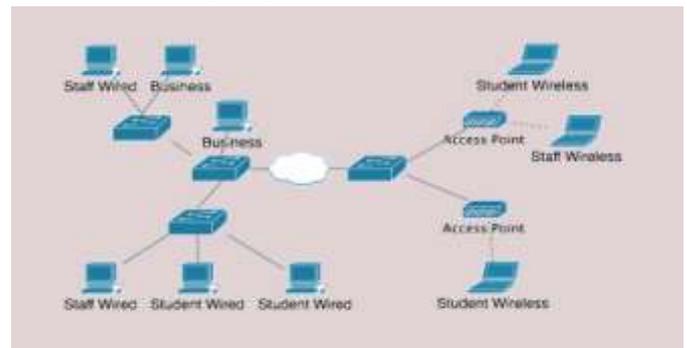


Figure 8. Configuration VAN

In some cases, virtual area network (VAN) is a VPN synonym. VPN data security remains constant through encrypted data and tunneling protocols. The key VPN advantage is that it is less expensive than a private wide area network (WAN) build out. As with any network, an organization's goal is to provide cost-effective business communication. This makes VPN a popular way to support remote workers, especially in fields where privacy is paramount, such as health care.

1. Advantages of VPN

- + Cost
- + Security
- + Scalability
- + Mobility

2. Disadvantages of VPN

- + Bandwidth
- + it easy for hacker

G. Storage Area Network (SAN):

A SAN is a collection of storage and backup devices connected together through a network that is totally separated from other servers via a switch. Fibre channel is the high-speed technology and communications protocol to connect those storage and backup devices. Fiber channel cables can be of several kilometers and its first 20 meters can be copper wire and if its length is more, then fiber optical can be used.

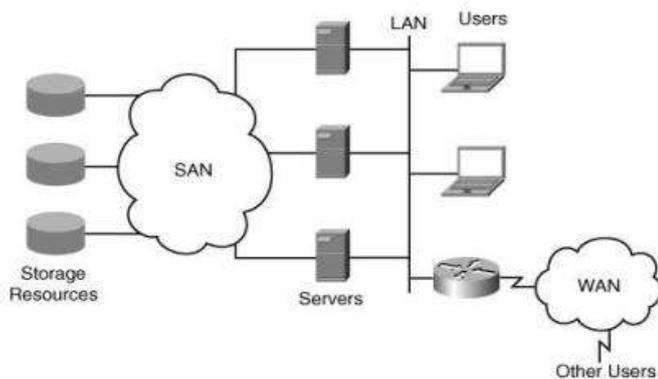


Figure9. Configuration SAN

This network connects servers directly to devices to store data. SAN moves storage resources off the common user network and reorganizes them into an independent, high-performance network, hubs, bridges, routers, multiplexors, copper to optical converters, and other relevant devices as we do for a normal communications network.

1. Advantages of SAN

- + SAN Architecture facilitates scalability.
- + SAN reduces down time.
- + Sharing SAN is possible.
- + SAN provides long distance connectivity.
- + SAN is truly versatile.

2. Disadvantages of SAN

- + SANs are very expensive as Fiber channel technology.
- + SAN investments are much difficult. It legacy storage, lack of SAN.
- + SAN storage facility seems to be wasteful one.
- + High cost and very few mega enterprises need set up.

H. Enterprise Private Network (EPN):

An enterprise private network is a network build by an enterprise to interconnect disparate offices to each other in a secure way over a network e.g., production offices, head offices etc. An enterprise private network is mainly build for sharing computer resources. It is a computer network built to share computer resources among different sites (such as production sites, offices and shops) of a business.

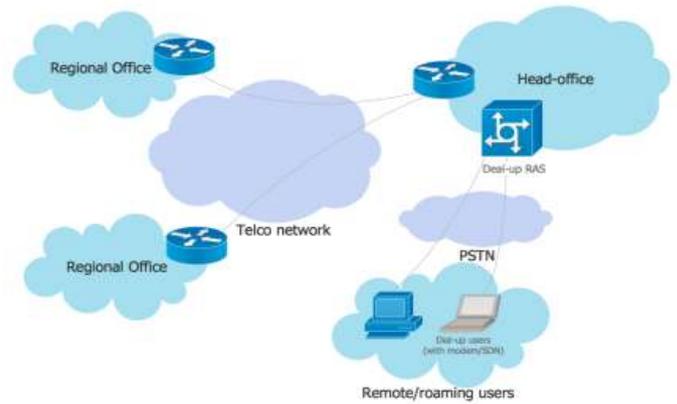


Figure10. Configuration EPN

1. Advantages of EPN:

- + Security
- + Sharing
- + Centralize
- + Cost effective and scalable.
- + They enable business continuity

2. Disadvantages of EPN:

- + High expensive
- + EPN investments to interconnect disparate offices to each other in a secure way over a network

I. Home Area Network (HAN):

It is a network contained within a user's home that connects a person's digital devices, from multiple computers and their peripheral devices to telephones, VCRs, televisions, video games, home security systems, smart appliances, fax machines and other digital devices are wired into the network.



Figur11. Configuration HAN

Purpose: A home network allows computer owners to interconnect multiple computers so that each can share files, programs, printers, other peripheral devices, and Internet access with other computers, reducing the need for redundant equipment and, in general, making everything easier to use.

There are several benefits to having a wired home network:

- + Faster and more reliable connection to the Internet.

- ✚ Increased security, as no outside users can access your network.
- ✚ Easier set-up and troubleshooting than wireless connections.

1. Advantages of HAN

- ✚ Accessibility
- ✚ Management
- ✚ Security
- ✚ Resources sharing
- ✚ Multiuser
- ✚ Life Style

2. Disadvantages of HAN

- ✚ Lack of Wi-Fi Password
- ✚ Wifi-Microwaves
- ✚ Expensive
- ✚ Internet slow

J. Desk Area Network (DAN):

Desk Area networks were initially given by Derek MC Auely and Mark Hayter which provide a workstation with multimedia capabilities and truly based on the ATM interconnections is called as DAN. It can communicate with the other connect peripheral devices with the help of the switch fabrics indicated on the ATM cells.

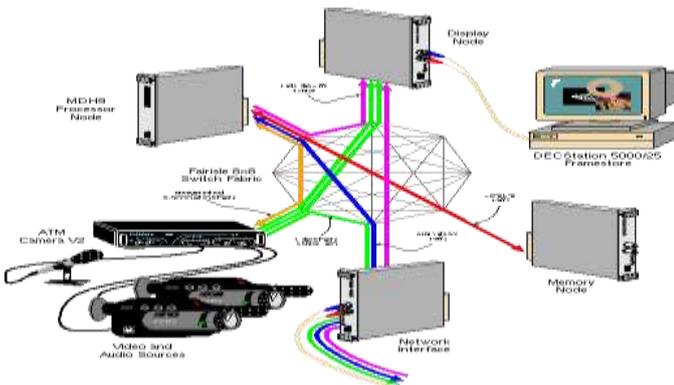


Figure12. Configuration of DAN

It basically used to investigate the entire architecture of the Desk Area Network. In other words, DAN is actually a network of peripherals and it supports with the help of ATM, the exchange of information for these various peripherals with the CPU inside a computer. DAN allows access over the network to different resources like peripherals and even more, it allows the share of resources over the network. Desk area networks are getting fame day by day because of its high performance and extra facilities for the effective communication and data transmission.

1. Advantages of DAN

- ✚ High performance.
- ✚ Permits the connection-oriented ends.
- ✚ Immediate data communication for Random points.
- ✚ High-level bandwidth.

2. Disadvantages of DAN

- ✚ Expensive due to fabrication

K. Body Area Network (BAN):

Networking media has been covered all the fields of the World such as health departments. For the detection, some kind of disease in the human body a network developed that is referred to as the body area network or BAN.

Important Components of BAN: Different types of detectors of motion, several types of monitoring sensors and accelerometers are components of the BAN.

BAN have battery, processing source, different sensors and transceiver likewise physiological sensors (ECG or EEG).

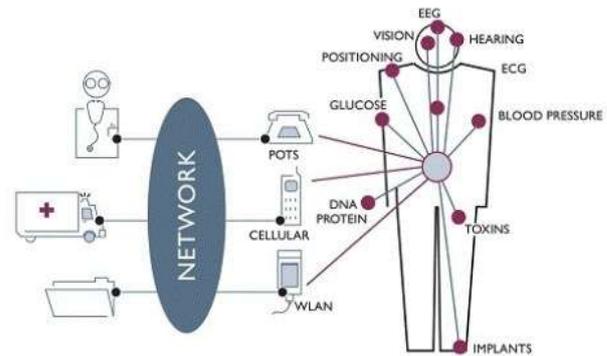


Figure13. Configuration of BAN

Challenges for Body Area Network:

- ✚ Very difficult to construct.
- ✚ Not secure ion the field of hospitality
- ✚ Decrease the efficiency.
- ✚ Transmission of data can be interrupt

L. Global Area Network (GAN):

A global area network (GAN) refers to a network composed of different interconnected networks that cover an unlimited geographical area. The term is loosely synonymous with Internet, which is considered a global area network. The most sought-after GAN type is a broadband GAN. The broadband GAN is a global satellite Internet network that uses portable terminals for telephony. The terminals connect laptop computers located in remote areas to broadband Internet.

1. Advantages of GAN

- ✚ Covers and unlimited amount of geographical areas.
- ✚ BGAN is a global satellite Internet network that uses portable terminals for telephony.

2. Disadvantages of GAN

- ✚ Only broadband GAN not for baseband GAN.

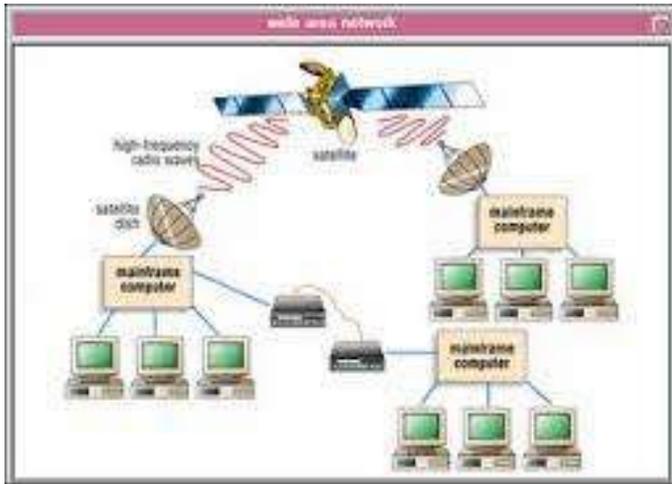


Figure 14. Configuration of GAN

III. CONCLUSION

There are many advantages and disadvantages of PAN, LAN, WLAN, CAN, MAN, WAN, SAN, EPN, VPN, HAN, DAN, BAN, GAN. In networking terminology, the smallest and most basic type of network, such as PAN Refers to a Personal Area Network communication from and between small handheld devices such as mobile phones, smart phones, Bluetooth etc. LANs connect groups of computers and low-voltage devices together across short distances to share the information and resources. WLANs make use of wireless network technology, such as Wi-Fi. CAN is a larger than LANs, but smaller than metropolitan area networks. They can be spread across several buildings that are fairly close to each other so users can share resources. MANs span an entire geographic area. WAN connects computers together across longer physical distances. SAN a dedicated high-speed network that connects shared pools of storage devices to several servers. The computers connected on a SAN operate as a single system at very high speeds. EPN is to securely connect its various locations to share computer resources. VPN is a virtual point-to-point connection; users can access a private network remotely. HAN is the connection of network enabled devices in a domestic home. DAN is actually a network of peripherals and it supports with the help of ATM, the exchange of information for these various peripherals with the CPU inside a computer. BAN deals with the detection and for monitoring the whole systematic of the human body or the computational devices wearied by the humans for the detection some kind of disease in the human body a network developed. GAN is a network used for supporting mobile across an arbitrary number of wireless LANs, satellite coverage areas, etc. Because a GAN is used to support mobile communication and broadband GAN is used to global satellite Internet network. Hence, each type of network has its own advantage and disadvantage that helps to understand efficiently the cost and the requirement of the type of the network.

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