***Types of Networks***

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***LAN (Local Area Network)***

*A* ***Local Area Network (LAN)*** *is a network that covers a small area, such as a building, school, or home. LANs are commonly used to connect personal computers, workstations, or other devices within a limited area to* ***share resources like printers, files, and internet connections****, and to* ***exchange information quickly and securely****. LANs are usually* ***high-speed and privately managed****, making them ideal for offices, schools, and homes where devices need to communicate efficiently. LANs can be connected using* ***wired technologies like Ethernet cables****, which provide fast and stable connections, or* ***wireless technologies like Wi-Fi****, which allow devices to connect without cables and offer flexibility in movement.*

***Types of LAN***

### *****Wired LAN*****

***A Wired LAN is a type of Local Area Network where devices, such as computers and printers, are connected using physical cables, usually Ethernet cables. This type of LAN provides fast, stable, and reliable connections, making it ideal for offices, schools, and computer labs where high-speed data transfer is important. Because the connections are physical, Wired LANs are generally more secure than wireless networks, as it is harder for outsiders to access the network. Wired LANs are widely used to share resources like printers, files, and internet connections among multiple devices in a small area.***

### *****Wireless LAN*****

***A Wireless LAN (Wi-Fi) is a type of Local Area Network where devices connect to the network without using physical cables, instead using radio waves to communicate. Wireless LANs provide flexibility and mobility, allowing users to move their devices freely while staying connected. They are commonly used in homes, offices, schools, and public places to share resources like printers, files, and internet connections. Although Wireless LANs are convenient, they are generally less secure than wired LANs because signals can be intercepted if proper security measures are not applied.***

### *****Virtual LAN*****

*A* ***Virtual LAN (VLAN)*** *is a type of Local Area Network where a single physical LAN is* ***divided into multiple logical networks****. This means that devices can be grouped together* ***based on function, department, or project****, even if they are not physically in the same location. VLANs improve* ***network management, security, and performance****, because devices in one VLAN cannot directly access devices in another VLAN unless permitted. They are commonly used in* ***large organizations*** *to separate departments, control traffic, and protect sensitive information while still using the same physical network infrastructure.*

*In a school, a* ***Virtual LAN (VLAN)*** *can be used to separate* ***teachers and students*** *into different networks, even though they are using the same physical network. For example, all teacher computers can be in one VLAN and all student computers in another VLAN. This allows the school to* ***control access****: teachers can access administrative files and resources, while students can only access educational resources and the internet. Using VLANs in this way* ***improves security and organization*** *without needing separate cables for each group.*

*****Peer-to-Peer LANs:*****

***A Peer-to-Peer (P2P) LAN is a type of Local Area Network where all computers are equal peers, and there is no central server controlling the network. In a P2P LAN, each computer can share its resources—such as files, printers, or internet connections—directly with other computers on the network. This makes it easy and inexpensive to set up, especially for small networks like homes or small offices. However, P2P networks are harder to manage as they grow larger, and security depends on each individual computer because there is no central control.***

*****Client/Server LANs*****

***A Client/Server LAN is a type of Local Area Network where one or more computers act as servers to manage and provide resources, and other computers act as clients that request and use those resources. The server stores files, manages printers, runs applications, and controls access, while the clients connect to the server to use these resources. This setup allows for centralized management, better security, and easier backup of data, which is why it is commonly used in offices, schools, and large organizations. Unlike Peer-to-Peer LANs, the server controls the network, and if the server goes down, clients may lose access to resources.***

# ***Metropolitan Area Network (MAN)***

*A* ***Metropolitan Area Network (MAN)*** *is a computer network that covers a large geographical area, usually a city or a group of nearby towns. It is bigger than a Local Area Network (LAN), which connects devices in a home, school, or office, but smaller than a Wide Area Network (WAN), which connects countries and continents. A MAN is often built and managed by an Internet Service Provider (ISP) or a government authority to give high-speed internet and network services across the city. The main purpose of a MAN is to connect different LANs in a city to share resources and exchange data, as well as to provide internet access to users. A MAN typically covers a geographic area of several kilometers and is larger than a LAN but smaller than a WAN.*

*It connects many LANs together using technologies like fiber optic cables, cellular towers, or microwave links. Examples of a MAN include city-wide Wi-Fi, broadband networks, or the mobile networks (like 4G/5G) that cover an entire city. MANs are important because they allow millions of users in a metropolitan area—big cambus, and factories—to share resources and access the internet efficiently.*

### ***Public MAN***

*A* ***Public MAN (Metropolitan Area Network)*** *is a city-wide network provided by an* ***Internet Service Provider (ISP)*** *such as Jio, Airtel, or BSNL. It connects many users across a city using* ***cellular towers*** *and* ***optical fiber cables****. Anyone in the city can subscribe to this service for Internet or phone access. For example, when you use a Jio SIM card, your phone connects to the nearest tower, which is part of the MAN that links the whole city.*

### ***Private MAN***

*A* ***Private MAN*** *is a metropolitan network owned and managed by a single* ***organization*** *instead of an ISP. It is used only by that organization to connect its different buildings or campuses across a city. For example, a university might connect its different colleges, hostels, and labs in the same city using optical fiber to create a private MAN. Unlike the public one, this network is* ***not open to everyone*** *— only the organization’s users can access it.*

## *****Advantages of MAN*****

* *MAN offers high-speed connectivity in which the speed ranges from 10-100 Mbps.*
* *The security level in MAN is high and strict as compared to WAN.*
* *It support to transmit data in both directions concurrently because of dual bus architecture.*
* *MAN can serve multiple users at a time with the same high-speed internet to all the users.*
* *MAN allows for centralized management and control of the network, making it easier to monitor and manage network resources and security.*

## *****Disadvantages of MAN*****

* *The architecture of MAN is quite complicated hence, it is hard to design and maintain.*
* *This network is highly expensive because it required the high cost to set up fiber optics.*
* *The network* ***stops working easily if a part fails****.*
* *The Data transfer rate in MAN is low when compare to LANs.*

## *****Additional Information*****

* ***Resource Sharing:*** *A MAN allows multiple LANs in a metropolitan area to share resources such as printers, storage devices, and other peripherals.*
* ***Disaster Recovery:*** *A MAN can provide a secondary communication channel in the event of a disaster or other emergency that disrupts the primary communication channel.*
* *MANs can be both wired and wireless. Wired MANs use fiber optic cables for high-speed connectivity, while wireless MANs use radio frequencies for communication.*
* *MANs can be used in a variety of industries, including finance, education, healthcare, and government. For example, MANs can be used in hospitals to share patient records and medical imaging data between different departments.*
* *MANs can be interconnected with other networks, such as WANs and the internet, through* [*gateways*](https://www.geeksforgeeks.org/computer-networks/introduction-of-gateways/) *or routers. This allows users in a MAN to access resources and services outside of the network.*

***Wide Area Network (WAN)***

*A* ***WAN (Wide Area Network)*** *is a type of computer network that connects* ***multiple smaller networks****, such as* ***LANs (Local Area Networks)*** *or* ***MANs (Metropolitan Area Networks)****, over a* ***large geographical area*** *like cities, countries, or even globally. WANs are typically established using* ***leased telecommunication circuits, fiber optic cables, satellites, or radio waves****, and they rely on devices such as* ***routers*** *to connect different networks and facilitate communication. WANs allow users to* ***share data, files, applications, and resources*** *remotely, making it possible for employees, clients, or students to access information from anywhere in the world.*

***private WAN*** *allows a company to securely connect its offices in different cities or countries without using the public Internet. By using* ***dedicated fiber optic cables, leased lines, or MPLS connections****, employees can access files, servers, applications, and other resources from anywhere within the network. This makes data sharing* ***fast, secure, and independent of the Internet****, allowing the company to maintain control over its communications and resources.*

*A* ***WAN (Wide Area Network)*** *is used by companies to securely connect multiple offices or networks over long distances and protect their data. If the WAN is* ***private****, it does not use the public Internet, making it highly secure and reliable. However, if the WAN is connected to the Internet, it can create* ***security risks****, such as hackers trying to access sensitive information or malware spreading to the network. To protect their data, companies use* ***firewalls, VPNs, encryption, MPLS, and access control****, which allow secure communication even over public networks. This ensures that employees can access resources remotely while keeping the network safe.*

## ***Advantages of WAN***

* *It covers large geographical area which enhances the reach of organisation to transmit data quickly ,cheaply and securely.*
* *With WAN, a company can* ***keep all data in one central place*** *and employees in different locations can* ***access it safely and quickly****.*
* *WAN* ***reduces the need for physical travel*** *because employees can access work and data remotely, which saves money and time.*
* *WAN lets individuals and organizations* ***connect worldwide, share data, and conduct business globally*** *without needing to be physically present.*

## ***Disadvantages of WAN***

* ***Traffic congestion:******data transfer slows down*** *because many devices or offices are trying to use the network at the same time, similar to a jam on a busy highway.*
* ***Low fault tolerance:*** *because it is* ***hard to quickly fix or reroute data*** *over very long distances, unlike LANs where backups and rerouting are easier.*
* *Data passes through many connection points, WAN experiences a higher amount of noise and errors.*
* *WAN data transfer is slower than LAN because of distance and many connected devices.*

### 

***Comparison***

|  |  |  |  |
| --- | --- | --- | --- |
| ***Features*** | ***LAN*** | ***MAN*** | ***WAN*** |
| ***Area Covered*** | *Small area: home, office, classroom* | *City: multiple LANs across a city* | *Large area: cities, countries, continents* |
| ***Ownership*** | *Usually private* | *Can be private or ISP-managed* | *Can be private or public* |
| ***Speed*** | *Very fast* | *Medium* | *Slow* |
| ***Cost*** | *Low* | *High* | *Very high* |
| ***Reliability*** | *High (easy to maintain)* | *Less* | *Low (hard to reroute over long distances)* |
| ***Security*** | *High* | *Medium* | *Private WAN = high, Public WAN = riskier* |
| ***Resource Sharing*** | *Printers, storage, files* | *Printers, servers, resources across city* | *Files, applications, servers, printers across large distances* |
| ***Data Transfer Rate*** | *Very high* | *Medium* | *Slow (due to distance and many devices)* |
| ***Examples*** | *Home Wi-Fi, office network* | *Big campus,factories* | *Internet, multinational company private WAN* |
| ***Advantages*** | *Fast, low cost, easy to manage* | *Covers city, connects multiple LANs efficiently* | *Global connectivity, remote access, centralized data storage, global business* |
| ***Disadvantages*** | *Limited area* | *Expensive, lower fault tolerance* | *Traffic congestion, noise/errors, slower speed, expensive* |

***Why internet consider as a WAN?***

*The* ***Internet*** *is considered a* ***WAN (Wide Area Network)*** *because it connects* ***millions of smaller networks****, such as LANs and MANs, across the* ***world****. Just like a WAN, the Internet allows devices and computers in different countries, cities, and offices to* ***communicate, share data, and access resources remotely****. It uses technologies like* ***routers, fiber optic cables, satellites, and TCP/IP protocols*** *to transmit data over long distances. While a private WAN may connect only a company’s offices, the Internet is the* ***largest public WAN****, accessible to everyone, which makes it a real-world example of a WAN on a* ***global scale****.*

***Extra Notes:***

### ***What is CAN?***

*A* ***CAN (Campus Area Network)*** *is a computer network that connects multiple LANs within a limited area like a* ***university campus, hospital, military base, or company campus****. It is bigger than a LAN but smaller than a MAN.*