**Introduction to LAN, WAN and MAN: Networking Form Two Notes**

A computer network consists of two or more computers that are interconnected with each other and share resources such as printers, servers, and hardware and exchange the data in the form of files, facilitating electronic communication. Computers on a network can be connected through twisted pair cables, telephone lines, radio waves, satellites or optical fiber cables. The first computer network designed was the ‘Advanced Research Projects Agency Network (ARPANET)’ by the United States Department of Defense. Since then, myriads of new computer networking technologies have been designed. This tutorial only covers the first three network technologies i.e LAN, WAN and MAN. However, currently there are multiple networking technologies in use which have been enlisted below.

* Local Area Network (LAN)
* Wide Area Network (WAN)
* Metropolitan Area Network (MAN)

**Local Area Network (LAN)**

A Local Area Network (LAN) is a network that is restricted to smaller physical areas e.g. a local office, school, or house. Approximately all current LANs whether wired or wireless are based on Ethernet. On a ‘Local Area Network’ data transfer speeds are higher than WAN and MAN that can extend to a 10.0 Mbps (Ethernet network) and 1.0 Gbps (Gigabit Ethernet).

LAN networks can be implemented in multiple ways, for example twisted pair cables and a wireless Wi-Fi with the IEEE 802.11 standard can be used for this purpose. One end of the twisted pair cable is plugged into switches using ‘RJ-45 connectors’ whereas the other end is plugged to a computer or in another network. All new routers use the b/g/n IEEE 802.11 standards. The ‘b’ and ‘g’ operate in the 2.4 GHz spectrum, and ‘n’ operates in 2.4 and 5.0 GHz which allows better performance and less interference.

Computers and servers (provides services to other computers like printing, file storage and sharing) can connect to each other via cables or wirelessly in a same LAN. Wireless access in conjunction with wired network is made possible by Wireless Access Point (WAP). Devices with WAP functionality provide a bridge between computers and networks. A WAP is able to connect hundreds or even more of wireless users to a network. Servers in a LAN are mostly connected by a wire since it is still the fastest medium for network communication. But for workstations (Desktop, laptops, etc.) wireless medium is a more suitable choice, since at some point it is difficult and expensive to add new workstations into an existing system already having complex network wiring.

**Token Ring and Fiber Distributed Data Interface (FDDI)**

With Ethernet, ‘Token Ring’ and ‘Fiber Distributed Data Interface (FDDI)’ are also considered the major ‘Local Area Network’ technologies. In Token Ring network all computers are connected in a ring or star topology for prevention of data collision and with a data transfer rates of either 4 or 16 megabits per second by IEEE 802.5 standard version. In FDDI for data transmission optic fiber are used that extend the range of a LAN up to 200km and supports thousands of user.

**Wide Area Network (WAN)**

Wide Area Network is a computer network that covers relatively larger geographical area such as a state, province or country. It provides a solution to companies or organizations operating from distant geographical locations who want to communicate with each other for sharing and managing central data or for general communication.

WAN is made up of two or more Local Area Networks (LANs) or Metropolitan Area Networks (MANs) that are interconnected with each other, thus users and computers in one location can communicate with users and computers in other locations.

In ‘Wide Area Network’, Computers are connected through public networks, such as the telephone systems, fiber-optic cables, and satellite links or leased lines. The ‘Internet’ is the largest WAN in a world. WANs are mostly private and arebuild for a particular organization by ‘Internet Service Providers (ISPs)’ which connects the LAN of the organization to the internet. WANs are frequently built using expensive leased lines where with each end of the leased line a router is connected to extend the network capability across sites. For low cost solutions, WAP is also built using a ‘circuit switching’ or ‘packet switching’ methods.

**Metropolitan Area Network (MAN)**

A Metropolitan Area Network (MAN) is a network that connects two or more computers, communicating devices or networks in a single network that has geographic area larger than that covered by even a large ‘Local Area Network’ but smaller than the region covered by a ‘Wide Area Network’. MANs are mostly built for cities or towns to provide a high data connection and usually owned by a single large organization.

A Metropolitan Area Networks bridges a number of ‘Local Area Networks’ with a fiber-optical links which act as a backbone, and provides services similar to what Internet Service Provider (ISP)  provide to Wide Area Networks and the Internet.

Major technologies used in MAN networks are ‘Asynchronous Transfer Mode (ATM)’, ‘Fiber Distributed Data Interface (FDDI)’ and ‘Switched Multi-megabit Data Service (SMDS, a connectionless service)’. In most of the areas, these technologies are used to replace the simple ‘Ethernet’ based connections. MANs can bridge Local Area Networks without any cables by using microwave, radio wireless communication or infra-red laser which transmits data wirelessly.

‘Distributed Queue Dual Bus (DQDB)’ is the Metropolitan Area Network (MAN) IEEE 802.6 standard for data communication. Using DQDB, networks can extend up to 100km-160km and operate at speeds of 44 to 155Mbps.

**Conclusion**

LAN is a private network used in small offices or homes usually within 1km range with high speed transfer data rate and fulltime service connectivity in low cost. WAN covers a large geographical area for example, a country or a continent. Its data transfer data is usually low as compared to LAN, but it is compatible with a variety of access lines and has an advanced security. MAN covers an area bigger than LAN within a city or town and serves as an ISP for larger LAN. It uses optical fibers or wireless infrastructure to link the LANs therefore, providing high speed regional resource sharing.

# LAN vs. WAN

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**LAN**, which stands for **local area network**, and **WAN**, which stands for **wide area network**, are two types of networks that allow for interconnectivity between computers. As the naming conventions suggest, LANs are for smaller, more localized networking — in a home, business, school, etc. — while WANs cover larger areas, such as cities, and even allow computers in different nations to connect. LANs are typically faster and more secure than WANs, but WANs enable more widespread connectivity. And while LANs tend to be owned, controlled and managed in-house by the organization where they are deployed, WANs typically require two or more of their constituent LANs to be connected over the public Internet or via a private connection established by a third-party telecommunications provider.

## Comparison chart

| LAN versus WAN comparison chart | | |
| --- | --- | --- |
|  | **LAN** | **WAN** |
| **Stands For** | Local Area Network | Wide Area Network |
| **Covers** | Local areas only (e.g., homes, offices, schools) | Large geographic areas (e.g., cities, states, nations) |
| **Definition** | LAN (Local Area Network) is a computer network covering a small geographic area, like a home, office, school, or group of buildings. | WAN (Wide Area Network) is a computer network that covers a broad area (e.g., any network whose communications links cross metropolitan, regional, or national boundaries over a long distance). |
| **Speed** | High speed (1000 mbps) | Less speed (150 mbps) |
| **Data transfer rates** | LANs have a high data transfer rate. | WANs have a lower data transfer rate compared to LANs. |
| **Example** | The network in an office building can be a LAN | [The Internet](http://www.diffen.com/difference/Internet_vs_World_Wide_Web) is a good example of a WAN |
| **Technology** | Tend to use certain connectivity technologies, primarily [Ethernet](http://www.diffen.com/difference/Cat5_vs_Cat5e) and Token Ring | WANs tend to use technologies like MPLS, ATM, Frame Relay and X.25 for connectivity over longer distances |
| **Connection** | One LAN can be connected to other LANs over any distance via telephone lines and radio waves. | Computers connected to a wide-area network are often connected through public networks, such as the telephone system. They can also be connected through leased lines or satellites. |
| **Components** | Layer 2 devices like [switches](http://www.diffen.com/difference/Hub_vs_Switch) and bridges. Layer 1 devices like hubs and repeaters. | Layers 3 devices Routers, Multi-layer Switches and Technology specific devices like ATM or Frame-relay Switches etc. |
| **Fault Tolerance** | LANs tend to have fewer problems associated with them, as there are smaller number of systems to deal with. | WANs tend to be less fault tolerant as they consist of large number of systems. |
| **Data Transmission Error** | Experiences fewer data transmission errors | Experiences more data transmission errors as compared to LAN |
| **Ownership** | Typically owned, controlled, and managed by a single person or organization. | WANs (like the Internet) are not owned by any one organization but rather exist under collective or distributed ownership and management over long distances. |
| **Set-up costs** | If there is a need to set-up a couple of extra devices on the network, it is not very expensive to do that. | For WANs since networks in remote areas have to be connected the set-up costs are higher. However WANs using public networks can be setup very cheaply using just software (VPN etc). |
| **Geographical Spread** | Have a small geographical range and do not need any leased telecommunication lines | Have a large geographical range generally spreading across boundaries and need leased telecommunication lines |
| **Maintenance costs** | Because it covers a relatively small geographical area, LAN is easier to maintain at relatively low costs. | Maintaining WAN is difficult because of its wider geographical coverage and higher maintenance costs. |
| **Bandwidth** | High bandwidth is available for transmission. | Low bandwidth is available for transmission. |
| **Congestion** | Less congestion | More congestion |