

WAN & REMOTE CONNECTIVITY

WAN concepts

- A Wide Area Network (WAN) is a network that covers a broad area (i.e., any telecommunications network that links across metropolitan, regional, or national boundaries) using private or public network transports.
- Business and government entities utilize WANs to relay data among employees, clients, buyers, and suppliers from various geographical locations.
- In essence, this mode of telecommunication allows a business to effectively carry out its daily function regardless of location.
- The ***Internet*** can be considered a WAN as well, and is used by businesses, governments, organizations, and individuals for almost any purpose imaginable.

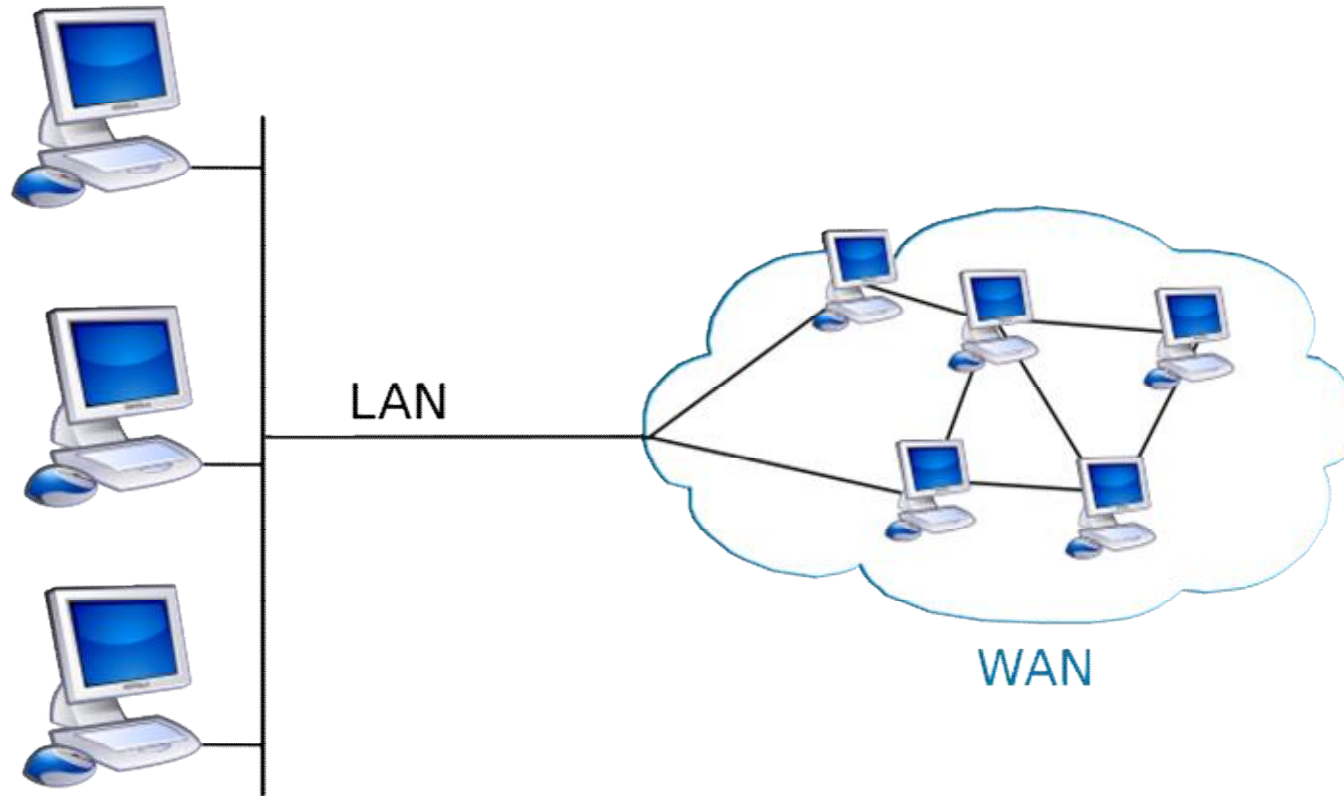
WAN concepts

- A WAN is a computer network spanning regions, countries, or even the world. However, in terms of the application of computer networking protocols and concepts, it may be best to view WANs as computer networking technologies used to transmit data over long distances, and between different LANs, MANs and other localized computer networking architectures.
- This distinction stems from the fact that common LAN technologies operating at Layer 1/2 (such as the forms of Ethernet or WiFi) are often geared towards physically localized networks, and thus cannot transmit data over tens, hundreds or even thousands of miles or kilometers.

WAN concepts

- A WAN spans a large geographic area, such as a state, province or country. WANs often connect multiple smaller networks, such as local area networks (LANs) or metro area networks (MANs).
- The world's most popular WAN is the ***Internet***. Some segments of the Internet, like Virtual Private Networks (VPN)-based extranets, are also WANs in themselves.
- Finally, many WANs are corporate or research networks that utilize leased lines.
- WANs generally utilize different and much more expensive networking equipment than do LANs. Key technologies often found in WANs include Synchronous optical networking (SONET) , Frame Relay, and Asynchronous Transfer Mode (ATM).

WAN concepts



Remote connectivity

- Since WANs, by definition, cover a larger distance than LANs, it makes sense to connect the various parts of the WAN using a virtual private network (VPN). This provides protected communications between sites, which is necessary given that the data transfers are happening over the internet.
- Although VPNs provide reasonable levels of security for business uses, a public internet connection does not always provide the predictable levels of performance that a dedicated WAN link can. This is why fiber optic cables are sometimes used to facilitate communication between the WAN links.

Connection technologies

- Many technologies are available for wide area network links. Examples include circuit-switched telephone lines, radio wave transmission, and optical fiber.
- New developments in technologies have successively increased transmission rates. In 1960, a 110 bit/s (bits per second) line was normal on the edge of the WAN, while core links of 56 kbit/s to 64 kbit/s were considered fast.
- As of 2014, households are connected to the Internet with Dial-Up, ADSL, Cable, Wimax, 4G or fiber. The speeds that people can currently use range from 28.8 kbit/s through a 28K modem over a telephone connection to speeds as high as 100 Gbit/s over an Ethernet 100GBaseY connection.

The following communication and networking technologies have been used to implement WANs.

- *Asynchronous Transfer Mode*
- *Cable modem*
- *Dial-up internet*
- *Digital subscriber line*
- *Fiber-optic communication*
- *Frame Relay*
- *ISDN*
- *Leased line*
- *SD-WAN*
- *Synchronous optical networking*
- *X.25*

Problems With Wide Area Networks

- WAN networks are much more expensive than home or corporate intranets.
- WANs that cross international and other territorial boundaries fall under different legal jurisdictions. Disputes can arise between governments over ownership rights and network usage restrictions.
- Global WANs require the use of undersea network cables to communicate across continents. Undersea cables are subject to sabotage and also unintentional breaks from ships and weather conditions. Compared to underground landlines, undersea cables tend to take much longer and cost much more to repair.