

WLAN stands for Wireless Local Area Network. WLAN is a local area network that uses radio communication to provide mobility to the network users while maintaining the connectivity to the wired network. A WLAN basically, extends a wired local area network.

WLAN Architecture

Components in Wireless LAN architecture as per IEEE standards are as follows:

Stations: *Stations consist of all the equipment that is used to connect all wireless LANs. Each station has a wireless network controller.*

Base Service Set(BSS): *It is a group of stations communicating at the physical layer.*

Extended Service Set(ESS): *It is a group of connected Base Service Set(BSS).*

Distribution Service (DS): *It connects all Extended Service Set(ESS).*

Types of WLANs

As per IEEE standard WLAN is categorized into two basic modes, which are as follows:

Infrastructure: *In Infrastructure mode, all the endpoints are connected to a base station and communicate through that; and this can also enable internet access. A WLAN infrastructure can be set up with: a wireless router (base station) and an endpoint (computer, mobile phone, etc). An office or home WiFi connection is an example of Infrastructure mode.*

Ad Hoc: *In Ad Hoc mode WLAN connects devices without a base station, like a computer workstation. An Ad Hoc WLAN is easy to set up it provides peer-to-peer communication. It requires two or more endpoints with built-in radio transmission.*

Working of WLAN

WLAN transmits data over radio signals and the data is sent in the form of a packet. Each packet consists of layers, labels, and instructions with unique MAC addresses assigned to endpoints. This enables routing data packets to correct locations.

Characteristics of WLAN

- *Seamless operation.*
- *Low power for battery use.*
- *Simple management, easy to use for everyone.*
- *Robust transmission technology.*

- *Advantages of WLAN*
- *Installation speed and simplicity.*
- *Installation flexibility.*
- *Reduced cost of ownership.*
- *Reliability.*
- *Mobility.*
- *Robustness.*

Disadvantages of WLAN

- *Slower bandwidth.*
- *Security for wireless LANs is the prime concern.*
- *Less capacity.*
- *Wireless networks cost four times more than wired network cards.*

IT STACK

Ethernet is the most widely used LAN technology and is defined under IEEE standards 802.3. The reason behind its wide usability is that Ethernet is easy to understand, implement, and maintain, and allows low-cost network implementation. Also, Ethernet offers flexibility in terms of the topologies that are allowed. Ethernet generally uses a bus topology. Ethernet operates in two layers of the OSI model, the physical layer and the data link layer. For Ethernet, the protocol data unit is a frame.

There are different types of Ethernet networks that are used to connect devices and transfer data.

Let's discuss them in simple terms:

1. Fast Ethernet: *This type of Ethernet network uses cables called twisted pair or CAT5. It can transfer data at a speed of around 100 Mbps (megabits per second). Fast Ethernet uses both fiber optic and twisted pair cables to enable communication. There are three categories of Fast Ethernet: 100BASE-TX, 100BASE-FX, and 100BASE-T4.*

2. Gigabit Ethernet: *This is an upgrade from Fast Ethernet and is more common nowadays. It can transfer data at a speed of 1000 Mbps or 1 Gbps*

(gigabit per second). Gigabit Ethernet also uses fiber optic and twisted pair cables for communication. It often uses advanced cables like CAT5e, which can transfer data at a speed of 10 Gbps.

3. 10-Gigabit Ethernet: This is an advanced and high-speed network that can transmit data at a speed of 10 gigabits per second. It uses special cables like CAT6a or CAT7 twisted-pair cables and fiber optic cables. With the help of fiber optic cables, this network can cover longer distances, up to around 10,000 meters.

4. Switch Ethernet: This type of network involves using switches or hubs to improve network performance. Each workstation in this network has its own dedicated connection, which improves the speed and efficiency of data transfer. Switch Ethernet supports a wide range of speeds, from 10 Mbps to 10 Gbps, depending on the version of Ethernet being used.

Key Features of Ethernet

Speed: Ethernet is capable of transmitting data at high speeds, with current Ethernet standards supporting speeds of up to 100 Gbps.

Flexibility: Ethernet is a flexible technology that can be used with a wide range of devices and operating systems. It can also be easily scaled to accommodate a growing number of users and devices.

Reliability: Ethernet is a reliable technology that uses error-correction techniques to ensure that data is transmitted accurately and efficiently.

Cost-effectiveness: Ethernet is a cost-effective technology that is widely available and easy to implement. It is also relatively low-maintenance, requiring minimal ongoing support.

Interoperability: Ethernet is an interoperable technology that allows devices from different manufacturers to communicate with each other seamlessly.

Security: Ethernet includes built-in security features, including encryption and authentication, to protect data from unauthorized access.

Manageability: Ethernet networks are easily managed, with various tools available to help network administrators monitor and control network traffic.

Availability: Ethernet is a widely available technology that can be used in almost any setting, from homes and small offices to large data centers and enterprise-level networks.

Simplicity: Ethernet is a simple technology that is easy to understand and use. It does not require specialized knowledge or expertise to set up and configure, making it accessible to a wide range of users.

Broad compatibility: Ethernet is compatible with a wide range of protocols and technologies, including TCP/IP, HTTP, FTP, and others. This makes it a versatile technology that can be used in a variety of settings and applications.

Ease of integration: Ethernet can be easily integrated with other networking technologies, such as Wi-Fi and Bluetooth, to create a seamless and integrated network environment.

Support for multimedia: Ethernet supports multimedia applications, such as video and audio streaming, making it ideal for use in settings where multimedia content is a key part of the user experience. Ethernet is a reliable, cost-effective, and widely used LAN technology that offers high-speed connectivity and easy manageability for local networks.

Advantages of Ethernet

Speed: When compared to a wireless connection, Ethernet provides significantly more speed. Because Ethernet is a one-to-one connection, this is the case. As a result, speeds of up to 10 Gigabits per second (Gbps) or even 100 Gigabits per second (Gbps) are possible.

Efficiency: An Ethernet cable, such as Cat6, consumes less electricity, even less than a wifi connection. As a result, these ethernet cables are thought to be the most energy-efficient.

Good data transfer quality: Because it is resistant to noise, the information transferred is of high quality.

Ethernet LANs consist of network nodes and interconnecting media, or links.

Disadvantages of Ethernet

Distance limitations: Ethernet has distance limitations, with the maximum cable length for a standard Ethernet network being 100 meters. This means that it may not be suitable for larger networks that require longer distances.

Bandwidth sharing: Ethernet networks share bandwidth among all connected devices, which can result in reduced network speeds as the number of devices increases.

Security vulnerabilities: Although Ethernet includes built-in security features, it is still vulnerable to security breaches, including unauthorized access and data interception.

Complexity: Ethernet networks can be complex to set up and maintain, requiring specialized knowledge and expertise.

Cable installation: Ethernet networks require the installation of physical cables, which can be time-consuming and expensive to install.

Physical limitations: Ethernet networks require physical connections between devices, which can limit mobility and flexibility in network design.

