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الإسم: يمني محمد حافظ عطيه حلاوه

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Wireless Local Area Network

(WLAN)

https://en.vcenter.ir/network/wireless-local-area-network-wlan

What is Wireless Local Area Network (WLAN)?

Before I talk about Wireless LAN, I will talk about what is LAN (Local Area Network).

A local area network (LAN) is a group of computers connected together in one geographic space, such as a house, office, or home. A LAN may be small or big, ranging from a home network with one user to a corporate network of thousands of users and computers in an office or school.

There are two types: -

- Wireless LAN
- Traditional LAN

A WLAN, or wireless LAN, is a network that enables devices to connect and communicate wirelessly. It stands for "Wireless Local Area Network." In comparison to a traditional wired LAN, where devices communicate through Ethernet cables, devices communicate through Wi-Fi on a WLAN. Although a WLAN can look different from a traditional LAN, it works the same way. Usually new systems are added and installed using DHCP (Dynamic Host Configuration Protocol). They could communicate the same way they would on a wired network with other devices on the network. How the data is distributed is the key distinction. In a LAN, data is sent in a sequence of Ethernet packets over physical

cables. Packets are distributed over the air via a WLAN. Using a bridge that ties the two networks, LANs and WLANs may be combined together. Wireless routers that have Ethernet ports will merge wired and wireless devices into the same network automatically.It provides all the features and benefits of traditional LAN technologies without the limitations of wires or cables.

WLAN follows a standard named IEEE 802.1,And it's brand name is Wifi.

The world's first wireless computer networking network, ALOHAnet, was created by Norman Abramson, a professor at the University of Hawaii. In 1971, the system became operational and featured seven computers spread over four islands to communicate without using phone lines with the central computer on Oahu Island. Initially, wireless LAN technology cost so much that it was only found in areas where cabling was difficult or impractical as an alternative to cabled LAN. Early production included solutions and proprietary protocols unique to the industry, Many development technologies have taken place until they reach what they are today.

How does WLAN work?

To transmit data from one point to another without wires, WLANs use radio, infrared and microwave transmission. Therefore, WLAN provides a way to build a cable-free local area network. This WLAN will then be linked to a wider network .that already exists, such as the Internet

A wireless LAN consists of connection points and nodes. A node is a computer or a peripheral (such as a printer) with a network adapter that has an antenna in the case of WLANs. Access points operate between the nodes themselves, or between the nodes and another network, as transmitters and receivers.

One of the following technologies performs WLAN data transmission on its own: -

- Frequency Hopping Spread Spectrum (FHSS)
- Direct Sequence Spread Spectrum (DSSS)
- Infrared (IR)

Spectrum Frequency Hopping Spread: - Spectrum Frequency Hopping Spread The Frequency Hopping Spread Spectrum (FHSS) uses a narrowband carrier that adjusts the frequency in a pattern that both the transmitter and the receiver know. Properly synchronised, creating a single logical channel is the net result. FHSS tends to be short-duration impulse noise to an unintended receiver.

Direct Sequence Spread Spectrum (DSSS): -A redundant bit pattern for each bit to be transmitted is provided by Direct Sequence Spread Spectrum (DSSS). This pattern of bits is called a chip (or chipping code). The longer the chip, the greater the chance of recovering the original data (the more bandwidth required also). Even if one or more bits of the chip are damaged during transmission, without the need for retransmission, statistical techniques may recover the original data. DSSS

appears as low-power wideband noise to an unwanted receiver and is ignored by the majority of narrowband receivers.

Infrared (IR): - Very high frequencies, just below visible light in the electromagnetic spectrum, are used by infrared (IR) systems to transport data. IR is not capable of penetrating opaque objects like light; it is either directed (line-of-sight) or diffuse. Cost-effective guided systems provide a very restricted range (3 ft) and are often used in particular WLAN applications. For mobile devices, high-performance guided IR is inefficient and is thus used only to implement fixed subnets. No line-of-sight is needed for diffuse (or reflective) IR WLAN systems, but cells are restricted to individual rooms.

Benefits of wireless LAN

Flexibility: in radio coverage, nodes can communicate without other restrictions. Radio waves can penetrate walls, transmitters, and receivers can be located anywhere (not visible, for example, on devices, fences, etc.).

Planning: only ad hoc wireless networks allow communication without prior planning. Each cable network requires wiring plans.

Design: wireless networks allow the design of small independent devices that can keep in a pocket, for example. Cables restrict not only users but also designers of small laptops, PDAs, etc.

Robustness: wireless networks can cope with disasters such as earthquakes, floods, etc.

Cost: The cost of installing and continuing a WLAN is, on average, lower than the price of establishing and maintaining a traditional wired LAN for two reasons. First, adding additional users to a network does not add any cost once the first user has obtained wireless access to the wireless network through an access point. Second, the wireless LAN eliminates direct wiring and labor costs for installation and repair.

Ease of use: the wireless LAN is easy to use, and users need very little new information to take advantage of WLANs.

Disadvantages of wireless LAN

Naturally, wireless networks are less reliable than wired networks. Any wireless computer may attempt to link to a WLAN, so if security is an issue, restricting access to the network is critical. This is usually achieved using wireless authentication that encrypts the communication, such as WEP or WPA. In comparison, cellular networks, including brick walls, are more vulnerable to intrusion by other signals or physical obstacles. LANs are now used by many business and government networks because they provide the best efficiency and security.

Architecture:

The IEEE 802.11 WLAN architecture is designed to serve a network where the bulk of decision making is spread to mobile stations. There are many benefits of this style of architecture. In all the WLAN services, it is tolerant of faults and removes potential bottlenecks that a centralized architecture would bring. The architecture is scalable and can comfortably accommodate both large, semi-permanent or permanent networks and small temporary networks. The design and protocols can have substantial power savings and extend the battery life of mobile devices without sacrificing network access.

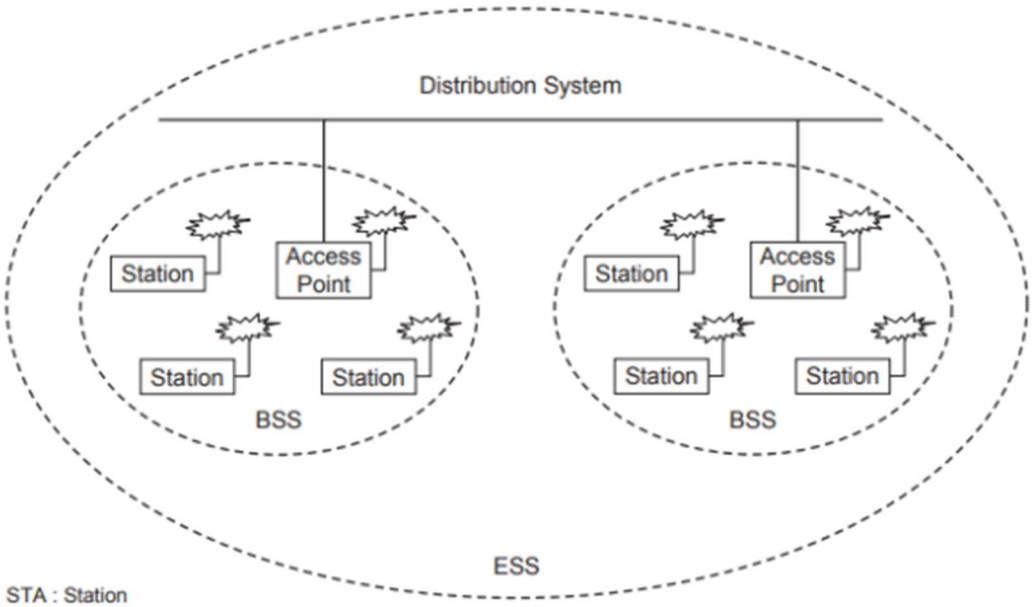

Fig1: BSS and ESS configuration of IEEE 802.11 WLAN

https://www.ques10.com/local/search/page/?q=WLAN+architcture

Two network architectures are defined in the IEEE 802.11 standard:

Infrastructure network: An infrastructure network is the design of the network to provide connectivity between wireless clients and services of the wired network. The transfer of data from the wireless medium to the wired medium takes place through the AP. The coverage area is defined by the AP and its associated wireless clients. All the instruments together form a simple service package.

Point-to-point (ad-hoc network): The architecture used to facilitate shared contact between wireless clients is an ad hoc network. An ad-hoc network is usually randomly generated and does not support connections to wired networks. There is no AP needed for an ad-hoc network.

Three basic topologies for WLANs, the separate basic service set (IBSS), the basic service set and the extended service set are provided by IEEE 80211. (ESS). The MAC layer supports IBSS, basic service package, and ESS settings implementations

Independent basic service set: The IBSS setup is referred to as an ad-hoc network or an independent configuration. An IBSS setup is equivalent to a peer-to-peer office network in which there is no need for any single node to act as a host. IBSS WLANs include a set of nodes or wireless stations which, on an ad-hoc, peer-to-peer basis, communicate directly with each other. Implementations of IBSS typically occupy a small area and are not connected to any large network. An IBSS

is usually a short-lived network that is built for a specific reason, with a limited number of stations.

Basic Service Set: The design of the Basic Service Set depends on an AP that serves as the logical server for a single channel or cell of the WLAN.

Extended Service Set: The ESS setup consists of several simple service set cells that can be connected by a distributed system called either wired or wireless backbones. IEEE 802.11 supports ESS configurations that use the same channel in multiple cells, and configurations that use separate channels in multiple cells to improve overall throughput. The ESS and all of its mobile stations tend to be a single MAC layer network, where all stations are physically stationary, to network the facilities outside the ESS. The ESS thus conceals the mobility of mobile stations from everything beyond the ESS

WLANS types (modes): -

WLANs work in two basic types, infrastructure and ad hoc, as standardised by IEEE 802.11: -

Infrastructure Mode: Mobile devices or clients link to an access point (AP) that links to the LAN or Internet through a bridge. The client transmits frames through the AP to other customer

Ad Hoc Mode: Clients transmit frames in a peer-to-peer manner directly to each other.

Bridge: To link networks, usually of various kinds, a bridge may be used. A wireless Ethernet bridge enables computers on a wired Ethernet network to be linked to a wireless network. The bridge serves as the point of connectivity to the wireless LAN.

Roaming

For wireless LAN roaming, there are two definitions:

- **Internal roaming**
- **External roaming**

Internal roaming: - When the signal strength is too poor, the Mobile Station (MS) transfers inside a home network from one access point (AP) to another AP. An authentication server (RADIUS) carries out MS re-authentication via 8021.x (e.g. with PEAP). (e.g. with PEAP). (e.g. with PEAP). QoS billing is on the network at home. Roaming the Mobile Station from one access point to another also interrupts the flow of data between the Mobile Station and the network-attached application. For example, the Mobile Station periodically tracks the existence of alternate access points (ones that will provide a better connection). The Mobile Station agrees to re-associate with an access point having a stronger wireless signal at some point, based on proprietary mechanisms. However, a link to an access point

can be lost by the Mobile Station before connecting to another access point. The Mobile Station must typically provide software that provides session persistence in order to provide secure connections to applications.

External roaming: - Another Wireless Internet Service Provider (WISP) transfers the MS (client) into a WLAN and takes its services (Hotspot). A foreign network can be used by the user independently of their home network, provided that the foreign network enables users to visit their network. Unique authentication and billing schemes for telecommunications networks on a foreign network have to be in place.

Applications

Wireless LANs are applicable to all sectors involving the use of mobile computers or where physical media installation is not feasible. Wireless LANs are particularly useful when employees are required to process on-the-spot information, directly in front of customers or colleagues, through electronic forms and interactive menus. Wireless networking allows portable devices, such as physicians, nurses, warehouse clerks, inspectors, claims adjusters, real estate agents, and insurance salespeople, to be placed in the hands of mobile front-line staff.

The wireless networking coupling of portable devices to a common database and specialized applications meets accessibility needs, avoids

paperwork, reduces errors, reduces process costs and improves performance. The alternative to this, which many businesses still use today, is to update documents, process inventories, and file claims using paperwork. This technique slowly processes information, generates redundant data and is subject to errors caused by unreadable handwriting. The method of wireless computers using a centralized database is obviously superior.

References

- "History of Wireless". Johns Hopkins Bloomberg School of Public Health. Archived from the original on 2007-02-10. Retrieved 2007-02-17.
- http://www.wireless-nets.com/resources/tutorials/how_roaming_works.html
- 802.11 Wireless Networks: The Definitive Guide, Second Edition by Matthew S. Gast (2005)
- https://open.alberta.ca/dataset/08c59918-a30d-48cc-a16d-a17235c7f58e/resource/a0b75464-a716-4b16-a178-933d6e2be698/download/5640353-2011-wireless-guide-2011-publication-edition.pdf