

A Survey on Latest Wireless Technologies

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Abstract - Wireless communication is among technology's biggest contributions to mankind. Wireless communication involves the transmission of information over a distance without help of wires, cables or any other forms of electrical conductors. The transmitted distance can be anywhere between a few meters (for example, a television's remote control) and thousands of kilometres (for example, radio communication). It is used as an advantage for working professionals in remote areas to remain in touch with their main headquarters. Moreover, it is wireless so it can be easily accessible without cables and wires. It is cheaper to install and maintain.

IndexTerms – wireless communication, radio communication, cables, information.

I. INTRODUCTION

Wireless technology is the process of sending information through invisible waves in the air. Information such as data, voice, and video are carried through the radio frequency of the electromagnetic spectrum. Wireless operations permit services, such as a long-range communications, that are impossible or impractical to implement with the use of wires. The term is commonly used in the telecommunications industry to refer to telecommunications systems (e.g. radio transmitters and receivers, remote controls etc.) which use some form of energy (e.g. radio waves, acoustic energy, etc.) to transfer information without the use of wires.[1] Information is transferred in this manner over both short and long distances.

II. DIGITAL LIVING NETWORK ALLIANCE (DLNA)

DLNA (Digital Living Network Alliance) is a communication technology that allows devices to share content over an existing wired/wireless network. DLNA-enabled devices range from smartphones, tablets, televisions, gaming consoles, media players and cameras. It allows live streaming and easy sharing of music, video, and photos; and even supports printing over the network. Once connected to the network, DLNA-enabled devices detect each other easily and allow for seamless sharing with no setup required. Many smartphones like Nokia N8, Samsung Galaxy S II, HTC Sensation and Sony Ericsson Xperia Arc S come with DLNA integrated. Media players like Western Digital's TV Live Hub have it too. It can be enabled on most tablets by installing applications.[1][2]

III. WI-FI DIRECT

To connect two devices wirelessly, you would typically require a Wi-Fi setup in which a router broadcasts a network and your devices - be it a PC, phone, laptop, notebook, or TV - all connect to the router. The router in turn, acts as starting point, enabling connected devices to communicate with each other. Opposed to this conventional way, with Wi-Fi Direct, compatible devices can connect directly by generating their own wireless network. While most devices across gadget categories (TV, Printers, etc.) have Wi-Fi connectivity in-built as an option, moving forward, Wi-Fi Direct will be the easiest way to share data. Devices like Samsung's Galaxy S/ SII and LG Optimus Black P970 and even printers that can work with Wi-Fi Direct are available in the market.[1][3][4]

IV. NEAR FIELD COMMUNICATIONS (NFC)

NFC, or Near Field communications is a technology that uses magnetic fields to connect devices. It is a short range wireless technology that can work up till a few centimetres. It is very fast and takes just a second to connect to a NFC-ready device when within range. It can be used for financial transactions, sharing content, streaming multimedia, initiating multiplayer gaming, pairing Bluetooth and to read various NFC tags for identification, coupons, and advertisements and so on. Google's recently launched 'Wallet' is a great example that highlights the growth of mobile payments via NFC. Devices such as Samsung's Nexus S, most of the Blackberry OS7 range and new Nokia Symbian range have NFC integrated.[1]

V. FOURTH GENERATION (4G)

LTE, WiMax and HSPA+ are the three technologies that come the aegis of 4G because of their ability to transfer fast data. What matters the most here is that 2G and 3G work for both voice and data while 4G works only for data transfer. The noticeable improvement that 4G would offer over 3G is better coverage area and higher browsing speeds of up to 100mbps (depending upon the device used). Since it works using a wider frequency range of 2 - 8Ghz, data transfer speeds are not that affected by number of users.[1]

VI. WI-FI 802.11AC

Wi-fi is one of the best wireless technologies for data transfer. Currently in its 4th generation, Wi-Fi is differentiated on the basis of standards – 802.11b, 802.11g and 802.11n - with 802.11n being the latest, capable of speeds of up to 600 Mbps and offering extended range. It works using the 2.4GHz and 5GHz channel. Now, Wi-Fi will step into its 5th generation with the 802.11ac standard. The new standard dictates a theoretical maximum transfer speed of up to 3.6 Gbps and uses the 5GHz channel for data transfers. It will improve upon signal range, will support better connectivity with multiple devices and consume less power - so important for the battery powered smartphones and laptops of tomorrow. This standard will also make it easier to stream full HD videos and transfer large amounts of data between devices wirelessly. Devices featuring this new standard of Wi-Fi are expected to be demonstrated/launched at the upcoming CES 2012 expo by Broadcom and various other device manufacturers.[1]

VII. WIGIG: HIGH-SPEED WIRELESS

Known by the technical spec 802.11ad, this new Wi-Fi protocol will connect at theoretical speeds of 10Gbps using the 60GHz radio band. Today, the latest 802.11ac spec connects at up to 1Gbps using the 40GHz radio band. In a corporate setting, one potential early application is monitoring a building using extremely high-definition video cameras that send their signal over Wi-Fi instead of a wired connection, according to Nick Ilyadis, CTO at wireless chipmaker Broadcom. WiFi as you know it today operates in the 2.4GHz or 5GHz unlicensed ISM band spectrum. There has been a steady stream of improvements to WiFi standards over the last decade, from b, g, n, and recently 802.11ac, each added more speed, stability, and capacity. There is a limit to the theoretical maximum data speed at 2.4GHz or 5GHz.[5]

In order to get wireless speeds up to 10Gbits/s or more, 802.11ad makes use of the 60 GHz wireless spectrum, often called millimeter wave spectrum. The drawback of using 60 GHz is that the range will be extremely short, even compared with today's WiFi. Signals at 60GHz cause resonance in oxygen molecules, which attenuates the signal even more rapidly than normal.

Also, a new frequency band means new hardware, so existing routers, computer, and phones will all need new radios and antennas to make use of the 802.11ad protocol.

VIII. BLUETOOTH SMART: LESS ENERGY

This short-range wireless technology has a distinct advantage over existing Bluetooth: While both connect over a similar 30-foot range, Bluetooth Smart isn't constantly sending out a signal and uses less power. According to the official Bluetooth SIG working group, businesses will start using the new Bluetooth signal this year and into next for authentication (using gadgets such as the Bionym Nymi, which verifies users based on their heartbeat) and collaboration (by syncing devices and sharing documents). Bluetooth Smart is now appearing in Lightbulbs, Chargers, Smart Devices and Medical Devices. Bluetooth Low Energy (BLE), also called Bluetooth Smart, is a new protocol standard for Bluetooth which still uses the 2.4 GHz spectrum, but has a much more power efficient protocol for handling ad hoc sessions. This means that devices do not have to transmit constantly, and thus they can save quite a bit of power. BLE is used in new beacon based location proximity systems, like Apple iBeacon.[5]

BLE allows sensors and consumer devices, like the Automatic OBD sensor or AirFinder GPS tracker to easily communicate

IX. APPLE IBEACON: TRANSMIT RETAIL DEALS TO iOS DEVICES

iBeacon devices are actually a retail-oriented use of Bluetooth Smart. However, the concept relies on Apple technology to transmit a signal to the iPhone or iPad. As you walk by a store shelf, your phone can connect over a short-range to receive a discount. "These emit information that can be picked up by apps on your phone, creating an in-store sensor network that can provide shoppers with product information, electronic coupons and deals. Now the store shelves can talk to you," says Erick Schonfeld, a producer for the DEMO conferences for emerging technology.[5]

X. LONG RANGE WiFi: WiFi 802.11 AH

WiFi 802.11ah, which is a sub GHz version of WiFi that offers lower data rates, but much longer range. The main issue is that there is no worldwide standard sub GHz spectrum. In the Americas, the 915 MHz ISM band will be used, but in Europe, the smaller 868 MHz RFID band is the only spectrum available.

Many believe this band will be widely used in Internet of Things applications, given the superior range and building penetration abilities of sub GHz radios.[3]

XI. WIRELESS CHARGING

The smart team over at WiTricity have developed a method of coupling the near field of lower frequency radio transmissions (9.9 MHz) to wirelessly "beam" power between devices like a charger and a phone (or electrical vehicle). The chip-maker is developing a system that can handle up to 20 watts of power -- about four times the amount available from the wireless charging mats already available for some smartphones.[5][7]

XII. ZIGBEE

ZigBee technology is interestingly named after the Waggle Dance that bees do when coming back from a field flight, to communicate to others in their hive the distance, direction and type of food they found. This analogy hints to the mesh nature of ZigBee, where data hops from node to node in multiple directions and paths throughout large scale networks.

Based on the IEEE 802.15.4 link layer standard, ZigBee is a low-throughput, low-power and low-cost technology. It mainly operates in the 2.4-GHz ISM band although the specification also supports the 868-MHz and 915-MHz ISM bands. ZigBee can deliver up to 250KBps of data throughput, but is typically used at much lower data rates. It also has the capability to maintain very long sleep intervals and low operation duty cycles to be powered by coin cell batteries for years. New ZigBee devices coming to the market can even enable energy harvesting techniques for battery-less operation.

The ZigBee standard is maintained by the ZigBee Alliance. The standard defines the higher networking layers on top of the 802.15.4 link layer and various application profiles enable full-system interoperable implementations. ZigBee can be used in multiple applications, but it has gained the largest momentum and success in smart energy, home automation and in lighting control applications, each of which has a specific ZigBee profile and certification. ZigBee standard has done so well in these application areas is because of the mesh network topology that can include up to thousands of nodes. To connect to the IoT, ZigBee networks require an application-level gateway. The gateway participates as one of the nodes in the ZigBee network and in parallel runs a TCP/IP stack and application over Ethernet or Wi-Fi to connect the ZigBee network to the Internet.[8][9]

XIII. FIFTH GENERATION (5G)

5G technology is going a new mobile revolution in mobile market. Through 5G technology now you can use worldwide cellular phones. With the advent of cell phone alike to PDA now your whole office is on your finger tips or in your phone. 5G technology has extraordinary data capabilities and has ability to tie together unrestricted call volumes and infinite data broadcast within latest mobile operating system. 5G technology has a bright future because it can handle best technologies and offer priceless handset to their customers. May be in coming days 5G technology takes over the world market. 5G Technologies have an extraordinary capability to support Software and Consultancy. The Router and switch technology used in **5G network** providing high connectivity. The 5G technology distributes internet access to nodes within the building and can be deployed with union of wired or wireless network connections. The current trend of 5G technology has a glowing future.[10][11]

XIV. CONCLUSION

Mobiles have become very essential part of our everyday life. Their current development is the outcome of various generations. In this paper we review the various mobile wireless technology, their evolution, performance, and applications. This field is still full of research opportunities. In conclusion, our survey reveals that there are following major area of research:

- 1.) Real wireless world with no more limitation with access and zone issues.
- 2.) Wearable devices with AI capabilities.
- 3.) Internet protocol version 6 (IPv6), where a visiting care-of mobile IP address is assigned according to location and connected network.
- 4.) Pervasive Networks providing ubiquitous computing: The user can simultaneously be connected to several wireless access technologies and seamlessly move between them.

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