

WIRELESS AND MOBILE NETWORKS

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I. INTRODUCTION

Wireless systems have the unique capability of maintaining the same contact number even if one moves from one location to another. This has made them increasingly popular. The wireless telephones are not only convenient but also provides flexibility and versatility . There have been growing number of wireless phone subscribers as well as service providers. A combination of wireless communication and computer technologies have revolutionized the world of telecommunications.

Wireless and mobile communications have found usefulness in areas such as commerce, education ,defence, etc. According to the nature of particular application they can be used in home based and industrial systems or in commercial or industrial environment.the wireless communications can be employed for purchase or selling of goods and services.

The difference between wireless and mobile devices is not much and they are used interchangeably. A wireless device has some sort of network connectivity. Wireless is next giant leap in information services. this new paradigm of connectivity enables business to operate faster, better , more cost effectively and more profitably through the use of always ON , always connected and always available content and applications.

II. MOBILE PHONE NETWORK

the most common example of a cellular network is a mobile phone (cell phone) network. a mobile phone is a portable telephone which receives or makes call through a cell site, or transmission tower. Radio waves are used to transfer signals to and from the cell phone.

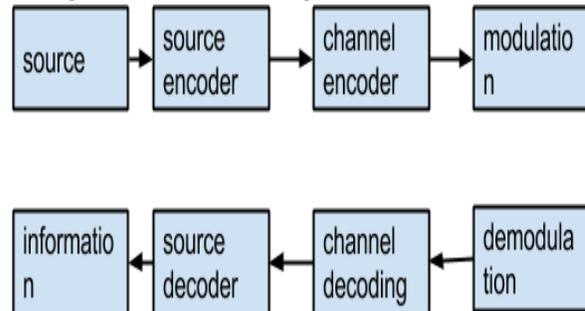
Modern mobile phone networks use cells because radio frequencies are limited, shared resource. cell sites and handsets change frequency under computer control and use low power transmitters so that the usually limited number of radio frequencies can be

simultaneously used by many callers with less interference.

A cellular network is used by the mobile phone operator to achieve both coverage and capacity for their subscribers. Large geographic areas are split into smaller cells to avoid line-of-sight signal loss and to support a large number to active phones in that area.

III. WIRELESS COMMUNICATION SYSTEM

The major function of the communication system is to convert information into a format appropriate for the transmission medium and to modulate analog signals or bits for transmission over channel. wireless communication system exchange electronic data among different users through a wireless media.



analog communication systems convert analog systems into modulated signals whereas digital communication systems convert information in the form of bits into digital signals. computers naturally generate information as a bits. Analog signals can be converted into bits by quantizing and digitizing for use in digital communications.

A typical wireless communication consisting of transmitter and receiver. the transmitter receives the information from the source and encodes it using the source encoder. the source encoder is used to encode the message from source into a continuous stream of bits. methods for source encoding are waveform coding, linear predictive coding etc. the channel encoder encodes the signal for error correction and

detection by adding some redundant bits. the encoded signal is modulated by using the digital modulated schemes such as binary phase shift keying (BPSK), quadrature phase shift keying (QPSK) etc the modulated signal is sent over a wireless medium the receiver demodulates and decodes the signal to obtain the transmitted information.

An important parameter in communication channel is bandwidth. for digital communications bandwidth of channel is defined as maximum number of bits transmitted per second whereas for analog systems bandwidth is defined in terms of hertz. shannon capacity defines maximum possible data rates system with noise and distortion. In noisy channel data rate C is defined as:

$$C = B \log_2(1 + S/N) \text{ bps}$$

where B is bandwidth in hertz and S/N is signal to noise ratio.

IV. EMERGING MOBILE AND WIRELESS NETWORKS

mobile and wireless networks are also experiencing a significant progress in the form of wireless local area networks (WLANs), satellite based networks, wireless local loops (WLL), mobile internet protocol (IP), and wireless asynchronous transfer mode (ATM), one emerging technology is bluetooth which provides short range radio links. For wireless connections

Wireless LANs

Wireless local area networks are designed to provide coverage in a small area such as building, hallway, park etc. The main attraction is the flexibility and mobility supported by a wireless LAN. Bandwidth considerations are secondary unlike cellular networks where a frequency is allocated users in WLAN frequencies, which may lead to collisions. the choice of frequency depends upon whether microwave, spread spectrum or infrared communication is used. interference and security depends upon type of communication method used in WLAN.

Wireless LAN standard

There are several wireless LANs that have been proprietary in the past such as motorola's altair and AT&T's waveLAN. some progress have been made in standardizing wireless LAN: two wireless standards are IEEE 802.11 and HIPERLAN.

Wireless Application Protocol.

Currently, many different wireless access technologies exist that are not interoperable.

Designing and building network and business applications for each technology would be a nightmare for developers. This problem, combined with redesigning all Web sites to support downloading by mobile users is even more difficult. Even if all of this can be achieved, the information content still has to be adapted for transmission over wireless links and is an effort to solve these problems: it allows development of applications that are independent of the underlying wireless access technology. WAP also adapts the existing Web site contents for transmission over wireless links and display on mobile devices. WAP specifications have been developed by the WAP Forum (www.wapforum.org), a consortium of leading wireless companies. The main contribution is the interoperability of different wireless networks, devices and applications using a common set of application and network protocols. the protocol architecture is similar to that of the word such as the use of wireless markup language optimized for mobile devices.

Mobile OS: A general purpose operating system which is not suitable for small handheld devices due to real time requirements, smaller processing powers memory, and screen size, and because of the types of applications that may be running, such as voice. Therefore, an OS with a small footprint and reduced storage capacity is needed to support the computing related functions of digital wireless devices. The available OS for mobile devices vary in footprint size from 300 KB (Palm OS) to 2MB (Windows CE). For example, GEOS 3.0, the OS used in the Nokia 9000 Communicator, uses a footprint of 300 KB. Many of these operating systems have attracted developers to build applications to run on handheld and other smaller devices.

Accessing different mobile and wireless networks

In order to access different networks and services; to increase coverage for a wireless user; to be able to use a single device; to be able to have a single bill; for providing reliable wireless access to a user even under failure or loss of a network or networks; and to reduce the total cost of access to several networks. There are several important issues in accessing different wireless networks. Three possible

architectures for supporting access to several different mobile and wireless networks.

Accessing several wireless networks using multimode/multifunction devices. Some very early examples of this architecture are the existing dual-function cell phone AMPS/CDMA and the emerging GSM/DECT (cordless) architecture. This architecture may lead to higher completion of calls and/or increase in the effective coverage area. Since there may be overlapped coverage, this architecture will also provide reliable wireless coverage in case of network, link, or switch failure. The network design may include factors such as the type of other networks, their pricing, regulations, and bandwidth. The handoff between networks may be initiated by the user, the device, or the network. Most of the additional complexity is introduced in the device as neither wireless networks are modified nor interworking devices are employed. Each individual network can deploy a database that keeps track of user locations, device capabilities, network conditions, and user preferences.

Accessing several wireless networks using an overlay network

In this architecture, a user accesses an overlay network consisting of several Universal Access Points (UAPs). These access points choose a wireless network for the user based on availability, QOS-specified, and user-specified choices. A UAP performs protocol and frequency translation, and content adaptation. By using an overlay network, the handoffs are not performed by the user or the device but by the overlay network as the user moves from one UAP to the other. UAP stores user, network, and device information/capabilities and preferences. This architecture will support single billing and single subscription for users as UAPs can keep track of various resources that have been used by a user.

Accessing several wireless networks using the common access protocol

This architecture can be used if wireless networks can support one or two standard access protocols, and requires interworking between different networks. One possible way to support this architecture is to use wireless ATM, meaning every wireless network must

allow the transmission of ATM cells with additional headers (or WATM cells) requiring changes in the wireless networks.

Wireless Network Elements

The telecommunications network at the physical layer also consists of many interconnected wireless network elements (NEs). these NEs can be stand alone systems or products that are either supplied by a single manufacturer, or are assembled by the service provider (user) or system integrator with parts from several different manufacturers.

Wireless NEs are products and devices used by a wireless carrier to provide support for the backhaul network as well as a mobile switching center(MSC).

Reliable Wireless service depends on the network elements at the physical layer to be protected against all operational environments and applications. The important part is the NEs that are located on the cell tower to the base station (BS) cabinet. the attachment hardware and the positioning of the antenna and associated closures /cables are required to have adequate strength, robustness, corrosion, resistance, and rain/solar resistance for expected wind, storm, ice, and other weather conditions. Requirements for individual components, such as hardware, cables, connectors, and closures, shall take into consideration the structure to which they are attached.

V. MOBILE NETWORK

A cellular network or mobile network is a radio network distributed over land areas called cells, each served by at least one fixed-location transceiver, known as a cell site or base station. In a cellular network, each cell characteristically uses a different set of radio frequencies from all their immediate neighboring cells to avoid any interference.

When joined together these cells provide radio coverage over a wide geographic area. This enables a large number of portable transceiver to communicate with each other and with fixed and support system transreceivers and telephones anywhere in the network, via base stations, even if some of the transreceivers are moving through more than one cell during transmission.

cellular network offers a number of desirable features:

- More capacity than a single large transmitter, since the same frequency can be used for multiple links.
- more devices use less power than with single transmitter or satellite since the cell towers are closer .
- larger coverage area than a single terrestrial transmitter, since additional cell towers can be added indefinitely and are not limited by the horizon.

Although originally intended for cell phones, with the development of smart phones, cellular and telephone networks routinely carry data in addition to telephone conversations:

Global system for mobile communications (GSM):

The GSM network is divided into three major systems: the switching system, the base station system, and the operation and support system. The cell phone connects to the base system station which then connects to the operation and support station; it then connects to the switching station where the call is transferred to where it needs to go. GSM is the most common standard and is used for a majority of cell phones.

Personal communication services(PCS): PCS is a radio band that can be used by mobile phones in North America and South Asia. Sprint happened to be the first service to set up a PCS.

D-AMPS: Digital Advanced Mobile Phone Service, an upgraded version of AMPS, is being phased out due to advancement in technology. The newer GSM networks are replacing the older system.

Advantages of wireless and mobile networks

Through the most common forms of wireless, cell phone, and wireless E-mails devices have been commonly available for some time, wireless data connectivity in the form of local area network is still new fairly:

Convenience: being able to easily have connectivity wherever we are is convenient.

Productivity: the universal access to internet and network can translate into real savings.

Cost: Especially in the form of 802.11 WLANs are now cheap.

Mobility: no longer are we restricted by access to a to a phone and usually unreliable wireless connectivity.

Temporary deployment WLAN is alternative to a significant investment in wired network infrastructure

Disadvantages of wireless and mobile networks

At different level individual vulnerabilities of specific private networks are being shared with others. Business weak reported that some folks are actually making public areas where private wireless networks are accessible outside the buildings.

Diminished security: security is diminished over wireless networks.

Speed: especially when setup securely WLAN currently slow things down.

Safe wireless: roaming wifi where mobile users take advantage of public networks, creates a challenge to overall cooperative security.

Interference: the reliability of wireless in environments where other electrical or transmission equipment may be used can be problematic.

VI. CONCLUSIONS AND FUTURE ASPECTS

Wireless and mobile networks are the two merging fields of computer networking. There have been defined various wireless standards i.e. IEEE 802.11 and HIPERLAN. Through wireless networks hoe agent knows about location of mobile through developing GPS technology and foreign agent knows about the mobile. During the past five years research has focused on the wireless devices i.e. new wireless devices have been developed i.e. wireless routers developed by asus which provides wireless connectivity over a wide range of area.

More and more companies are focusing to build a wireless router which requires no battery or new technologies develop from analog to digital and from 3G to 4G which is to be launched by this year.

Many Australian companies have announced that changes to frequency ranges to be used for wireless devices and it will be more useful and helpful to the country as well as other countries. And they have developed the wireless router which provides the wireless connectivity to the whole city.

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