

Wireless and Mobile Computing: Build Secure and Maintain Wireless Solutions

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ABSTRACT

Today's fast growing world needs faster communication. Technology is making rapid progress and is making many things easier. The innovative ideas that have been emerged from the tender minds of young scientists led to the evolution of many techniques where our present topic 'MOBILE COMPUTING' fits in.

"MOBILE COMPUTING" and COMMUNICATIONS is a major part of wireless communication technology. Mobile computing in means computing done by intermittently connected users who access network resources. It requires a wireless medium such as cellular radio, radio nets and low-orbit satellites. It incorporates wireless adapters using cellular telephone technology to connect portable computers with the cabled network.

Mobile voice communication is widely established throughout the world and had a very rapid increase in the number of subscribers to the various cellular networks over the last few years. An extension of this technology is the ability to send and receive data across these cellular networks. This is the principle of mobile computing.

KEYWORDS: *about wireless and mobile application*

Mobile data communication has become a very important and rapidly evolving technology as it allows users to transmit data from remote locations to other remote or fixed locations. This proves to be the solution to the biggest problem of business people on the move- mobility. We in this paper describes about the Mobility Services Architecture which supports applications by a middleware stub. Mobile Computing evolved during the last few years as a result of shrinking portables and growing wireless networks. It enlarges the usability of computers, but raises demanding challenges.

The paper describes about the methodology, problems in wireless industry, and how J2SE is used in this technology. The paper concludes with the pros and cons of this mobile computing and its future.

INTRODUCTION

The most familiar aspect of mobile computing technology is the hand phone. About two decades ago, a hand phone was bulky and was only used for voice communication. It was merely an extension of the fixed line telephony that allowed users to keep in touch with colleagues. Now the hand phone is not only used for voice communication, it is also used to

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send text and multimedia messages. Future mobile devices will not only enable Internet access, but will also support high-speed data services.

In addition to the hand phone, various types of mobile devices are now available, for example, personal digital assistants (PDAs) and pocket personal computers (PCs). Road warriors use mobile devices to access up-to-date information from the corporate database. A police officer at a crime scene may send a fingerprint picked up there for matching with data in a central database through a wireless network, hence leading to faster identification and arrest of potential suspects. The global positioning system (GPS) is used in search and rescue missions, for monitoring and preservation of wildlife, and for vehicle theft prevention. Though many of us are unaware of when mobile computing technology is being used, it has permeated all aspects of our lives.

What is mobile computing? Simply defined, it is the use of a wireless network infrastructure to provide anytime, anywhere communications and access to information. There are many aspects of mobile computing and, sometimes, different terms are used to refer to them. This chapter gives an overview of

what mobile computing has to offer and how it improves the quality of our lives. Later chapters discuss the underlying wireless networks and technologies that make mobile computing applications possible.

Evolution of Wireless Networks and Services:-

The first generation (1G) wireless network was analog. The first in North America was advanced mobile phone system (AMPS), which was based on frequency division multiple access. A total of 1664 channels were available in the 824 to 849 MHz and 869 to 894 MHz band, providing 832 downlink (DL) and 832 uplink (UL) channels. AMPS, widely used in North America, supports frequency reuse. The underlying network is a cellular network where a geographical region is divided into cells. A base station (BS) at the center of the cell transmits signals to and from users within the cell.

The second generation (2G) systems onward are digital. Digital systems make possible an array of new services such as caller ID. The Global System for Mobile Communications (GSM) is a popular 2G system. GSM offers a data rate of 9.6 to 14.4 kbps. It supports international roaming, which means users may have access to wireless services even when traveling abroad. The most popular service offered by GSM is the Short Message Service (SMS), which allows users to send text messages up to 160 characters long.

2.5G systems support more than just voice communications. In addition to text messaging, 2.5G systems offer a data rate on the order of 100 kbps to support various data technologies, such as Internet access. Most 2.5G systems implement packet switching. The 2.5G systems help provide seamless transition technology between 2G and third generation (3G) systems. The following are 2.5G systems:

High-Speed Circuit-Switched Data (HSCSD): Even though most 2.5G systems implement packet switching, HSCSD continues support for circuit-switched data. It offers a data rate of 115 kbps and is designed to enhance GSM networks. The access technology used is time division multiple access (TDMA). It provides support for Web browsing and file transfers.

General Packet Radio Service (GPRS):

GPRS offers a data rate of 168 kbps. It enhances the performance and transmission speeds of GSM. GPRS provides always-on connectivity, which means users do not have to reconnect to the network for each transmission. Because there is a maximum of eight slots to transmit calls on one device, it allows more

than one transmission at one time; for example, a voice call and an incoming text message can be handled simultaneously.

Enhanced Data Rates for GSM Evolution (EDGE): EDGE works in conjunction with GPRS and TDMA over GSM networks. Its offered data rate is 384 kbps. EDGE supports data communications while voice communications are supported using the technology on existing networks.

Third-generation (3G) wireless systems are designed to support high bit rate telecommunications. 3G systems are designed to meet the requirements of multimedia applications and Internet services. The bit rate offered ranges from 144 kbps for full mobility applications, 384 kbps for limited mobility applications in macro- and microcellular environments, and 2 Mbps for low-mobility applications in micro- and Pico cellular environments. A very useful service provided by 3G systems is an emergency service with the ability to identify a user's location within 125 m 67% of time. Figure 1.1 shows the evolution of wireless standards.

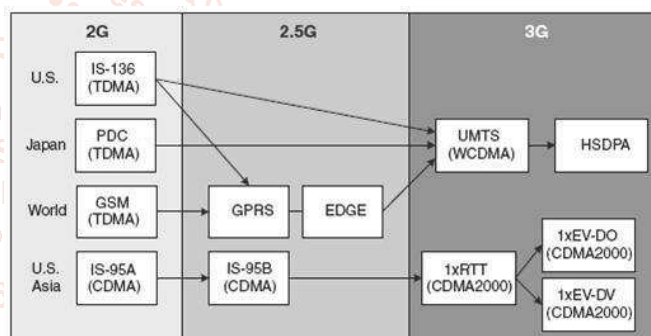


Figure 1 Evaluation of wireless standards

Initially, the International Telecommunication Union (ITU) intended to design a single 3G standard; however, due to a number of difficulties, it has ratified two 3G standards. The two standards are CDMA2000, which provides a bit rate of up to 2.4 Mbps, and wideband CDMA (WCDMA), which provides a bit rate of up to 8 Mbps. The high bit rate enables new wireless services that can be classified into three categories:

1. Information retrieval: It permits location-aware applications to remotely download information from a corporate database.
2. Mobile commerce: It allows users to book a flight or pay bills.
3. General communication: It permits users to make or receive phone calls, send or receive messages, or activate an air conditioner at home.

Compound wireless service enables users to combine different types of services to carry out specialized functions. For example, you can take a photo using a camera phone and send it to a friend using the

multimedia message service (MMS). A more useful application would be to combine a home alarm system with a wireless service so that when an intruder is detected, a photo of the intruder is captured by the surveillance camera and sent to the authorities, while the owner is alerted via mobile phone.

A compound service comprises a fundamental wireless service (one that cannot be partitioned into smaller identifiable services), a utility service (one that carries out a function within a particular compound service sequence), and possibly another compound service. For example, consider a courier service driver who has to deliver a document before a certain deadline and he has to find the fastest and least congested route to his destination. He makes use of a route planning application on the wireless terminal in his van, which consists of three fundamental wireless services:

1. A location service to determine the current location of the driver.
2. A travel route computation to determine the least congested and fastest route to his destination.
3. Traffic information retrieval to obtain traffic information from various sources.

The compound service consists of continuous iterations of these services: determine the current location and provide it to the wireless terminal, compute the least congested route from the current location to the destination, and retrieve the most updated traffic information. It involves executing step 1 and deciding whether to repeat step 2. Going back to step 1 is the utility service.

TYPES OF MOBILE COMPUTING:-

Mobile computing is a generic term describing one's ability to use technology while moving, as opposed to portable computers, which are only practical for use while deployed in a stationary configuration.

Many types of mobile computers have been introduced since the 1990s, including the:

- Wearable computer
- Personal digital assistant
- Smartphone
- Carputer
- Ultra-Mobile PC

Wearable computers:-

Wearable computers are computers that are worn on the body. This type of wearable technology has been used in behavioral modeling, health monitoring systems, information technologies and media development.

Wearable computers are especially useful for applications that require computational support while

the user's hands, voice, eyes, arms or attention are actively engaged with the physical environment.

"Wearable computing" is an active topic of research, with areas of study including user interface design, augmented reality, pattern recognition, use of wearables for specific applications or disabilities, electronic textiles and fashion design. Many issues are common to the wearables, mobile computing, Pervasive computing, Ambient intelligence and ubiquitous computing research communities, including power management and heat dissipation, software architectures, wireless and personal area networks.

PDA:-

A personal digital assistant (PDA) is a mobile device, also known as a palmtop computer. PDAs are used to organize a person's life by taking notes, holding contacts, and connecting to the Internet. Newer PDAs commonly have color screens and audio capabilities, enabling them to be used as mobile phones (smartphones), web browsers, or portable media players. Many PDAs can access the Internet, intranets or extranets via Wi-Fi, or Wireless Wide Area Networks (WWANs). Many PDAs employ touch screen technology.

The term PDA was first used on January 7, 1992 by Apple Computer CEO John Sculley at the Consumer Electronics Show in Las Vegas, Nevada, referring to the Apple Newton.

Smart phone:-

A smart phone is a mobile phone offering advanced capabilities, often with PC-like functionality (PC-mobile handset convergence). There is no industry standard definition of a smartphone. For some, a smartphone is a phone that runs complete operating system software providing a standardized interface and platform for application developers. For others, a smartphone is simply a phone with advanced features like e-mail, Internet and e-book reader capabilities, and/or a built-in full keyboard or external USB keyboard and VGA connector. In other words, it is a miniature computer that has phone capability.

Carputer:-

Carputer is the predominant term used to describe a category of mobile computer, designed or modified to specifically be installed and run in automobiles. Historically these were based on industrial personal computer technology, but as smartphones and PDAs have become more powerful, and have included useful technologies like GPS and bluetooth they have become the predominant base platform for developing carputers.

Ultra-Mobile PC:-

In personal computers, Ultra-Mobile PC (often abbreviated UMPC) is a term for a small form factor and specification for tablet PCs. Originally codenamed Project Origami, the project was launched in 2006 as collaboration between Microsoft, Intel, Samsung, and a few others. As of late 2009, there were very few devices on the market and UMPC device category was expected to go extinct soon, according to CNET.

Technical and other limitations of mobile computing:-

➤ Insufficient bandwidth

Mobile internet access is generally slower than direct cable connections, using technologies such as GPRS and EDGE, and more recently 3G networks. These networks are usually available within range of commercial cell phone towers. Higher speed wireless LANs are inexpensive, but have very limited range.

➤ Security standards

When working mobile one is dependent on public networks, requiring careful use of VPNs.

➤ Power consumption

When a power outlet or portable generator is not available, mobile computers must rely entirely on battery power. Combined with the compact size of many mobile devices, this often means unusually expensive batteries must be used to obtain the necessary battery life.

➤ Transmission interferences

Weather, terrain, and the range from the nearest signal point can all interfere with signal reception. Reception in tunnels, some buildings, and rural areas is often poor.

➤ Potential health hazards

More car accidents are related to drivers who were talking through a mobile device. Cell phones may interfere with sensitive medical devices. There are allegations that cell phone signals may cause health problems.

➤ Human interface with device

Screens and keyboards tend to be small, which may make them harder to use. Alternate input methods such as speech or handwriting recognition require training.

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Portable computing devices:-

There are several categories of portable computing devices that can run on batteries but are not usually classified as laptops: portable computers, keyboard less tablet PCs, Internet tablets, PDAs, Ultra Mobile PCs (UMPCs) and smart phones.

Portable computers

The Compaq Portable; the first portable IBM PC compatible.

A Portable computer is a general-purpose computer that can be easily moved from place to place, but cannot be used while in transit, usually because it requires some "setting-up" and an AC power source. The most famous example is the Osborne 1. Portable computers are also called a "transportable" or a "luggable" PC.

Tablet PC

HP Compaq tablet PC with rotating/removable keyboard

A Tablet PC that lacks a keyboard (also known as a non-convertible Tablet PC) is shaped like slate or a paper notebook, features a touchscreen with a stylus and handwriting recognition software. Tablets may not be best suited for applications requiring a physical keyboard for typing, but are otherwise capable of carrying out most tasks that an ordinary laptop would be able to perform.

Internet Tablet

A Nokia N800 Internet tablet

An Internet tablet is an Internet appliance in tablet form. Unlike a Tablet PC, an Internet tablet does not have much computing power and its applications suite is limited, and it cannot replace a general purpose computer. Internet tablets typically feature an MP3 and video player, a web browser, a chat application and a picture viewer.

PDA

The Palm TX

A Personal digital assistant (PDA) is a small, usually pocket-sized, computer with limited functionality. It is intended to supplement and to synchronize with a desktop computer, giving access to contacts, address book, notes, e-mail and other features.

Ultra Mobile PC

An Ultra Mobile PC is a full- featured, PDA-sized computer running a general-purpose operating system.

Smartphone



A Smart phone is a PDA with integrated cellphone functionality. Current smartphones have a wide range of features and installable applications.

Carputer

A Carputer is a computing device installed in an automobile. It operates as a wireless computer, sound system, GPS, and DVD player. Also contains word processing software and its bluetooth compatible.

Mobile Computing Application Issues:-

The programs used in mobile devices like mobile phones, laptops, palm computers, etc. for internet connectivity and other computer related activities are called mobile computing applications. The various issues and designs of mobile computing application are discussed under various headings below.

Technical Design:-

First comes the Technical Design Issues, which consist of network design, capacity planning, response time calculations, data compression considerations, system availability design and security issues. The technical design plays a key role in a mobile computing project and offers unique challenges to the system professionals.

Network Design:-

Issues regarding Wireless LAN design and Wide Area Radio Network Design which network design comprises are discussed below.

A. Wireless LAN design issues

- The number of mobile users who will use wireless LAN and the number of them active during the peak period.
- The types of LAN application accessed by them. (Keeping in mind that wireless LANs will not be acceptable for the intended users as they operate at much slower speeds than wired LANs).

- Use of notebook with a wireless NIC as a primary and user device.

Wide Area Radio Network Design Issues:-

- Most appropriate radio network technology for the suite of applications.
- Matching of user application-usage profiles to a given network capacity.
- Integration of RNA technology with a radio network infrastructure.
- Ensuring good coverage & minimum number of dead spots.

Data compression considerations:-

As the bandwidth of wireless network is scarce & inexpensive it is necessary to compress data to get the maximum out of this bandwidth. This is usually done in the modem by going beyond the modem hardware in reducing the quantity of traffic on wireless networks using client application programs.

System availability Design:-

Rather than sticking on with the general base station hardware & network controllers, redundancy & message switches are typically built on fault-tolerant platforms. Public shared network providers must be approached for details of their redundancies. MCSS is another vital component that badly needs inbuilt redundancy.

Security issues:-

It is tough to track down securing information by unauthorized access. Common security breaches of mobile computing applications include,

- Network by criminal elements.
- Physical breach security at communication centers mainly unmanned base stations.
- Interception of credit card authorization over wireless network.
- Careful security considerations including on-the-air encryption & firewalls must be used.

Other than technical design the next major issue under Mobile computing application is Ergonomics & Logistics Design where the designers evaluate the following.

- Form factor of end user devices
- Battery life
- Input method-keyboard, pen, touch or voice
- Ruggedness
- Whether Portable or fixed
- Safety & Health issues.

Mobile computing application deals with the future of computer usage and is therefore of great relevance.

Conclusion:-

The world of personal computing is becoming more connected. The advent of the World Wide Web has

caused an explosive growth in the population of Internet users. Everyday new members join the network community. It is changing the way we work, the way we think. Every day one reads another story about the "global network" and the way it is changing the world. Major computer companies have built entire advertising campaigns around this very idea, and the future promise of bringing it about. Providing on-line services to the home user has become a multi-million dollar business.

The world of computing is becoming more interactive. The days of batch computing are all but gone. We have become used to, and have come to expect, quick response times. Even as we move to a more decentralized, remote model of computing our expectations stay the same. In fact, the spread of graphical interfaces and multimedia has only served to increase our expectations. The effect on the computing world of the graphical, multimedia based nature of the Web stands as testimony to this.

The world of computing is becoming more mobile. Mobile computers are becoming smaller and more powerful every day. However, people do not want to give up connectivity for mobility.

With the more connected, more interactive, more mobile paradigm comes the need for the rapid transmission of programs from a remote server. The recent and continuing advances in network technology will help alleviate this problem by providing greater bandwidth, but network usage seems to always increase to fill the amount of bandwidth available. In addition, while network technology is improving rapidly, advances in wireless computing still lag far behind that of wire-based media.

We also showed that the performance of the continuous compiler is strongly dependent on the design of various aspects of the compiler. Specifically, the strategy used to replace source code with native code and the order in which the translation from source code to native code is carried out both have a strong affect on performance.

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