

## Study on the Wireless communication and mobile computing

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**Abstract:** The falling cost of both communication and of mobile computing devices (laptop computers, hand-held computers, etc.) is making wireless computing affordable not only to business users but also to consumers. Wireless Networks & Mobile computing is not a "scaled-down" version of the established and well-studied field of distributed computing. The nature of wireless communication media and the mobility of computers combine to create fundamentally new problems in networking, operating systems, and information systems. Furthermore, many of the applications envisioned for mobile computing place novel demands on software systems. Although mobile computing is still in its infancy, some basic concepts have been identified and several seminal experimental systems developed. This book is intended to be a high-quality textbook that provides a carefully designed exposition of the important aspects of wireless networks. The text provides thorough coverage of wireless networks, including applications, communication and networking protocols, Database, security, and management. The book is targeted toward networking professionals, managers, and practitioners who want to understand the benefits of this new technology and plan for its use and deployment. It can also be used to support an introductory course in the field of Wireless Networks & Mobile Computing at the advanced undergraduate or graduate levels.

[Kumar, G. **Study on the Wireless communication and mobile computing.** *J Am Sci* 2025;21(2):1-6]. ISSN 1545-1003 (print); ISSN 2375-7264 (online). <http://www.jofamericanscience.org>. 01 doi:[10.7537/marsjas210225.01](https://doi.org/10.7537/marsjas210225.01)

**Keywords:** Network; Computer; Mobile computing; wireless communication

## Introduction

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.

The rapidly expanding technology of cellular communication, wireless LANs, and satellite services will make information accessible anywhere and at any time. Regardless of size, most mobile computers will be equipped with a wireless connection to the fixed part of the network, and, perhaps, to other mobile computers. The resulting computing environment, which is often referred to as mobile or nomadic computing, no longer requires users to maintain a fixed and universally known position in the network and enables almost unrestricted mobility. Mobility and portability will create an entire new class of applications and, possibly, new massive markets combining personal computing and consumer electronics.

Communication Systems can be Wired or Wireless and the medium used for communication can be Guided or Unguided. In Wired Communication, the medium is a physical path like Co-axial Cables, Twisted Pair Cables and Optical Fiber Links etc. which guides the signal to propagate from one point to other. Such type of medium is called Guided Medium. The term wireless refers to the communication or transmission of information over a distance without requiring wires, cables or any other electrical conductors. Wireless communication is one of the important mediums of transmission of data or information to other devices. The Communication is set and the information is transmitted through the air, without requiring any cables, by using electromagnetic waves like radio frequencies, infrared, satellite, etc., in a wireless communication technology network. At the end of the 19th century, the first wireless communication systems were introduced and the technology has significantly been developed over the intervening and subsequent years. Today, the term wireless refers to a variety of devices and technologies ranging from smart phones to laptops, tabs, computers, printers, Bluetooth, etc. On the other hand, Wireless Communication doesn't require any physical medium but propagates the signal through

space. Since, space only allows for signal transmission without any guidance, the medium used in Wireless Communication is called Unguided Medium. In the present days, wireless communication system has become an essential part of various types of wireless communication devices, that permits user to communicate even from remote operated areas. There are many devices used for wireless communication like mobiles.

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 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

#### **Mobile Computing:**

Mobile Computing is used to describe technologies that enable the user to access the

network at any place at any time. Mobile computing is a computer paradigm that allows users to access the network not only from fixed locations, but also while moving or in transit. Mobile computing becomes more feasible which involve connection with network and data processing. Mobile computing comprises of applications in various fields such as commercial, medical, defense, networking and electronic devices etc but using phones from anywhere in the world is not mobile computing because there is no data processing and, in a laptop, while moving is not a mobile computing if there is no connection to a network. Mobile computing technology enables the mobile worker to: (a) create; (b) access; (c) process; (d) store; and (e) communicate information without being constrained to a single location. It is a major part of wireless communication technology. It is a new paradigm of computing and communication. Mobile users want to use different devices and have information formed appropriately for each. Hence wireless solutions need to address the unique needs of mobile workers. The type and availability of communication medium significantly impacts the type of mobile computing application that can be created.

#### **Modes of communication.**

A mobile computing device communicates with fixed information system can be categorized as: (a) connected; (b) weakly connected; (c) batch; and (d) disconnected. The connected category implies a continuously available high-speed connection. The ability to communicate continuously, but at slow speeds, allows mobile computers to be weakly connected to the fixed information system. A batch connection means that the mobile computer is not continuously available for communication with the fixed information system. Disconnected mobile computers allow users to improve efficiency by making calculations, storing contact information, keeping a schedule, and other non-communications oriented tasks. This mode of operation is of little interest because the mobile device is incapable of electronically interacting and exchanging information with the fixed organizational information system.

#### **Characteristics of Mobile Computing:-**

- Mobile computing enables improvements in information accessibility. The improvement is directly dependent upon the mobile hardware and communications equipment in use. For example, a PDA computer that is operating in the connected mode via a wireless local area network will have much greater information accessibility than a clamshell mobile computer that is operating in batch mode and only connects randomly throughout the day.

- Mobile computing enables improvements in the operational efficiency of organizations that integrate the technology into their fixed information systems.

- Mobile computing can improve efficiency in many ways, including: (a) saving time; (b) reducing waste; (c) cutting cycle times; (d) reducing rework; (e) enabling

- business process reengineering; (f) improving accuracy; (g) decreasing time spent on customer complaints; and (h) reducing unnecessary travel.

- Mobile computing technology can improve management effectiveness by improving information quality, information flow, and ability to control a mobile workforce. It makes the most current and accurate information available to both the mobile worker and the users of the fixed information system with which the mobile worker communicates.

- Mobile computing is an extremely versatile technology. It includes: (a) process reengineering; (b) reducing operational and administrative staff; (c) improving communications; (d) improving customer service; (e) reducing manufacturing costs; (f) shortening business cycles; and (g) many other benefits. The true versatility of mobile computing can be seen by recalling examples of how it is currently being utilized to enhance business and other operations. It delivers critical medical information from mobile emergency medical technicians to emergency rooms, so the doctors can be ready to treat the patient immediately upon arrival.

- Mobile computing is a key enabling technology for the creation of strategic information systems. The strategic role of information systems involves using information technology to develop products, services, and capabilities that give a company strategic advantages over the competitive forces it faces in the global marketplace.

#### **MOBILE COMPUTING ENVIRONMENT:**

Mobile Computing is a new computing environment related to both wireless and high speed networking technologies. Mobile users will be able to access their data and other services such as email, electronic news, and electronic banking and video telephony services while on the move. To receive these services, mobile users will be connected to fixed networks via wireless networks. For every request made by users, a mobile agent is created and searches for information appropriate to the user's requirements. When the job is completed, they bring the results to the mobile host. Mobile agents are not affected by sudden disconnection of wireless network and the situation of turning mobile host off power saving. A mobile agent supports execution in mobile computing environment although its environment has a wireless network, which causes

signal disturbance, spurious disconnection by handoff. Mobile agent techniques can solve the problems from using wireless media and changing the logical connection architecture. Mobile agents do not need of sending the request/response messages with low bandwidth wireless connection between mobile support station and mobile host. As agents it migrates, this problem can be solved efficiently. A mobile host exists in cell region but when it is disconnected, a mobile agent wants to return the result from user's request to mobile host. Then, it is designed with proxy technology in which it tries to fail the connection with mobile support station; it is saved into mobile agent proxy called Proxy Agent (PA) in mobile support station. After then, if connected, mobile agent migrates from PA in mobile support station to the specific mobile host. Mobile agent system with proxy technology, IP mobility support is used. Mobile support station knows that mobile host has already moved to another cell region using IP mobility support. Mobile agents are transferred to the corresponding mobile host [1].

In mobile computing environment, users can use the resources effectively. Mobile support station transmits messages via broadcasting to all of mobile hosts that are located on its cell regions. These wireless media hold comparatively low bandwidth and high latency. The problem in mobile computing can be solved by a mobile agent who works by transporting themselves from one host to another.

#### **APPLICATIONS OF MOBILE COMPUTING**

In many fields of work, the ability to keep on the move is vital in order to utilise time efficiently. The importance of Mobile Computers has been highlighted in many fields of which a few are described below:

**a. Vehicles:** Music, news, road conditions, weather reports, and other broadcast information are received via digital audio broadcasting (DAB) with 1.5 Mbit/s. For personal communication, a universal mobile telecommunications system (UMTS) phone might be available offering voice and data connectivity with 384 kbit/s. The current position of the car is determined via the global positioning system (GPS). Cars driving in the same area build a local ad-hoc network for the fast exchange of information in emergency situations or to help each other keep a safe distance. In case of an accident, not only will the airbag be triggered, but the police and ambulance service will be informed via an emergency call to a service provider. Buses, trucks, and trains are already transmitting maintenance and logistic information to their home base, which helps to improve organization (fleet management), and saves time and money.

**b. Emergencies:** An ambulance with a high-quality wireless connection to a hospital can carry

vital information about injured persons to the hospital from the scene of the accident. All the necessary steps for this particular type of accident can be prepared and specialists can be consulted for an early diagnosis. Wireless networks are the only means of communication in the case of natural disasters such as hurricanes or earthquakes. In the worst cases, only decentralized, wireless ad-hoc networks survive.

**c. Business:** Managers can use mobile computers say, critical presentations to major customers. They can access the latest market share information. At a small recess, they can revise the presentation to take advantage of this information. They can communicate with the office about possible new offers and call meetings for discussing responds to the new proposals. Therefore, mobile computers can leverage competitive advantages. A travelling salesman today needs instant access to the company's database: to ensure that files on his or her laptop reflect the current situation, to enable the company to keep track of all activities of their travelling employees, to keep databases consistent etc. With wireless access, the laptop can be turned into a true mobile office, but efficient and powerful synchronization mechanisms are needed to ensure data consistency.

**d. Credit Card Verification:** At Point of Sale (POS) terminals in shops and supermarkets, when customers use credit cards for transactions, the intercommunication required between the bank central computer and the POS terminal, in order to effect verification of the card usage, can take place quickly and securely over cellular channels using a mobile computer unit. This can speed up the transaction process and relieve congestion at the POS terminals. e. Replacement of Wired Networks: wireless networks can also be used to replace wired networks, e.g., remote sensors, for tradeshows, or in historic buildings. Due to economic reasons, it is often impossible to wire remote sensors for weather forecasts, earthquake detection, or to provide environmental information. Wireless connections, e.g., via satellite, can help in this situation. Other examples for wireless networks are computers, sensors, or information displays in historical buildings, where excess cabling may destroy valuable walls or floors.

**f. Infotainment:** wireless networks can provide up-to-date information at any appropriate location. The travel guide might tell you something about the history of a building (knowing via GPS, contact to a local base station, or triangulation where you are) downloading information about a concert in the building at the same evening via a local wireless network. Another growing field of wireless network applications lies in entertainment and games to enable, e.g., ad-hoc gaming networks as soon as people meet to play together.

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### Conclusion:

Mobile computing is an important, evolving technology. Mobile computing provide significant benefits in the deployment of mobile applications. It can address the variability of diverse mobile devices, and it can provide a consistent programming environment across these with high level modelling approaches .It enables mobile personnel to effectively communicate and interact with the fixed organizational information system while remaining unconstrained by physical location. Mobile computing may be implemented using many combinations of hardware, software, and communications technologies. The technologies must be carefully selected and the applications designed to achieve the business needs required from the overall organizational information system. The MOBILE framework can assist information technology professionals in determining the applicability of mobile technology to an organizational problem, opportunity, or directive. Mobile computing is a versatile and potentially strategic technology that improves information quality and accessibility, increases operational efficiency, and enhances management effectiveness. Android have overcome the actual limitations and that the future possibilities became a reality.

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1/5/2025