

A Survey on Mobile Computing and Its Applications

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Abstract— Mobile Computing is a technology that allows transmission of data, voice and video via a computer or any other wireless enabled device without having to be connected to a fixed physical link. This tutorial will give an overview of Mobile Computing and then it will take you through how it evolved and where is the technology headed to in future along with the classifications and security issues involved.

Key words: Bandwidth, Devices, Data Dissemination, Principals, Applications, Current Trends

I. INTRODUCTION

Mobile Computing is a technology that allows transmission of data, voice and video via a computer or any other wireless enabled device without having to be connected to a fixed physical link. The main concept involves –

- 1) Mobile communication
- 2) Mobile hardware
- 3) Mobile software

A. Mobile Communication:

The mobile communication in this case, refers to the infrastructure put in place to ensure that seamless and reliable communication goes on. These would include devices such as protocols, services, bandwidth, and portals necessary to facilitate and support the stated services.



B. Mobile Hardware:

Mobile hardware includes mobile devices or device components that receive or access the service of mobility. They would range from portable laptops, smartphones, tablet Pc's, Personal Digital Assistants.



C. Mobile software:

Mobile software is the actual program that runs on the mobile hardware. It deals with the characteristics and requirements of mobile applications. This is the engine of the mobile device. In other terms, it is the operating system of the appliance. It's the essential component that operates the mobile device.



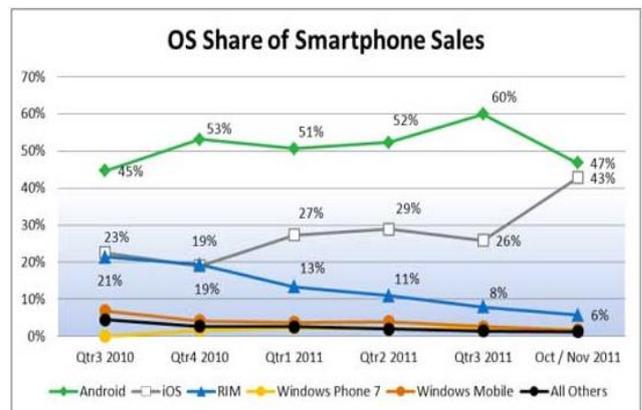
D. Distributed System

This is one of the major development areas in distributed computing, embed the same functions found in a normal computer into hand-held devices such as mobile phones. The use of *distributed system* technology to enable users who are not fixed in a single physical position to communicate.

II. MOBILE COMPUTING EVOLUTION

In today's computing world, different technologies have emerged. These have grown to support the existing computer networks all over the world. With mobile computing, we find that the need to be confined within one physical location has been eradicated. We hear of terms such as telecommuting, which is being able to work from home or the field but at the same time accessing resources as if one is in the office.

The constant and ever increasing demand for superior and robust smart devices has been a catalyst for market share. Each manufacturer is trying to carve a niche for himself in the market. These devices are invented and innovated to provide state-of-the-art applications and services.



III. CURRENT TRENDS IN MOBILE COMPUTING

Mobile computing devices are becoming smaller, lighter, and more dominant than their predecessors. They also come in various types and connectivity options.

A. 3G

3G or third generation mobile telecommunications is a generation of standards for mobile phones and mobile telecommunication services fulfilling the International Mobile Telecommunications-2000 (IMT-2000) specifications by the International Telecommunication Union. Application services include wide-area wireless voice telephone, mobile Internet access, video calls and mobile TV, all in a mobile environment.

B. Global Positioning System (GPS)

The Global Positioning System (GPS) is a space-based satellite navigation system that provides location and time information in all weather, anywhere on or near the Earth, where there is an unobstructed line of sight to four or more GPS satellites. The GPS program provides critical capabilities to military, civil and commercial users around the world.

C. Long Term Evolution (LTE)

LTE is a standard for wireless communication of high-speed data for mobile phones and data terminals. It is based on the GSM/EDGE and UMTS/HSPA network technologies, increasing the capacity and speed using new modulation techniques. It is related with the implementation of fourth Generation (4G) technology.

D. WiMAX

WiMAX (Worldwide Interoperability for Microwave Access) is a wireless communications standard designed to provide 30 to 40 megabit-per-second data rates, with the latest update providing up to 1 Gbit/s for fixed stations. It is a part of a fourth generation or 4G wireless-communication technology.

E. Near Field Communication

Near Field Communication (NFC) is a set of standards for smartphones and similar devices to establish radio communication with each other by touching them together or bringing them into close proximity, usually no more than a few centimeters.

IV. DEVICES USED IN MOBILE COMPUTING

Mobile computing devices, portable computer, compact, lightweight units including a full character set keyboard and primarily intended as hosts for software that may be parameterized as laptops[3], notebooks, notepads, etc.,

- 1) Mobile computing
- 2) Smart cards
- 3) Wearable computers

A. Mobile phones:

It includes a restricted key set primarily intended but not restricted to for vocal communications as smart phones, cell phones, feature phones, etc,

B. Smart cards:

It can run multiple applications but typically payment, travel and secure area access.

C. Wearable computers:

Mostly limited to functional types and primarily intended as incorporation of software agents, as watches[3], wrist bands, necklaces, keyless, implants, etc.,

V. MOBILE COMPUTING PRINCIPALS

A. Portability

It facilitates the movement of devices within the mobile computing environment. These devices may have limited capabilities and limited power supply but should have sufficient processing capability and physical portability to operate in a movable environment.

B. Connectivity:

It is connected to minimal amount downtime, without being affected by movement. Quality of service of the hardware connectivity.

C. Interactivity:

The nodes belonging to a mobile computing system are connected with one another to communicate and collaborative through active transactions of data.

VI. MOBILE COMPUTING APPLICATIONS

A. Airline and Railway Industries:

The FCOM manuals in the cock pit can be entirely replaced with PDA's and Tablet PC's. Take the load and trim sheet to the tarmac on the tablet PC's. The PDA's or Tablet PC's can be used for grading in a simulator Training environment. It also helps the user to keep access to flight schedule and ticket information.

B. Transporting Industry:

The real time drop shipments or pickups can be achieved using Computer Aided Dispatch (CAD). Customer service can be enhanced with time tracking system for exact delivery. In mobile network system the two ways communication can be achieved, that is between the fleet drivers and the dispatch centers.

C. Manufacturing and Mining Industries:

The LAN extension problems can be resolved using broad spectrum networks. With the development of mobile computing applications, the portable computers find space in shop floors, vehicles and mines. They can be used for in-process monitoring.

D. Banking and Financial Institutions:

Wireless banking transactions such as funds transfer, checking of account balance and the payment of the bill can be fulfilled from a PDA or a smart phone. The handheld devices are connected wirelessly to ATM's through Bluetooth.

VII. MOBILE COMPUTING ADVANTAGES

Mobile computing has changed the complete landscape of our day-to-day life. Following are the major advantages of Mobile Computing –

A. Location Flexibility:

This has enabled users to work from anywhere as long as there is a connection established. A user can work without being in a fixed position. Their mobility ensures that they are able to carry out numerous tasks at the same time and perform their stated jobs.

B. Saves Time:

The time consumed or wasted while travelling from different locations or to the office and back, has been slashed. One can now access all the important documents and files over a secure channel or portal and work as if they were on their computer. It has enhanced telecommuting in many companies. It has also reduced unnecessary incurred expenses.

C. Enhanced Productivity:

Users can work efficiently and effectively from whichever location they find comfortable. This in turn enhances their productivity level.

(iv)Ease of Research: Research has been made easier, since users earlier were required to go to the field and search for facts and feed them back into the system. It has also made it easier for field officers and researchers to collect and feed data from wherever they are without making unnecessary trips to and from the office to the field.

D. Entertainment:

Video and audio recordings can now be streamed on-the-go using mobile computing. It's easy to access a wide variety of movies, educational and informative material. With the improvement and availability of high speed data connections at considerable cost, one is able to get all the entertainment they want as they browse the internet for streamed data.

E. Streamlining of Business Processes

Business processes are now easily available through secured connections. Looking into security issues, adequate measures have been put in place to ensure authentication and authorization of the user accessing the services.

VIII. MOBILE COMPUTING LIMITATIONS

In range and bandwidth, the mobile internet access is generally slower than direct cable connections, using technologies such as GPRS and EDGE, and more recently HSDPA, HSUPA, 3G and 4G and also the upcoming 5G networks[6]. These networks are usually available within range of commercial cell phone towers, high speed network wireless LANs are inexpensive but have very limited range. The security standards while working in mobile, one is dependent on public networks, requiring careful use of VPN.

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. The human interface with screens and keyboards tend to be small which may make them hard to use. Alternate input methods such as speech or handwriting recognition require training.

IX. CONCLUSION

Today's computing has rapidly grown from being confined to a single location. With mobile computing, people can work from the comfort of any location they wish to as long as the connection and the security concerns are properly factored. In the same light, the presence of high speed connections has also promoted the use of mobile computing.

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