Applications and Benefits of Mobile Computing

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Abstract:
Mobile computing is becoming increasingly important due to the rise in the number of portable computers and the desire to have continuous network connectivity to the Internet irrespective of the physical location of the node. Mobile computing offers significant benefits for organizations that choose to integrate the technology into their fixed organizational information system. Ranging from wireless laptops to cellular phones and Wi-Fi/Bluetooth enabled PDA's to wireless sensor networks, mobile computing has become ubiquitous in its impact on our daily lives. Mobile computing is a versatile and potentially strategic technology that improves information quality and accessibility, increases operational efficiency, and enhances management effectiveness. The goal of this paper is to point out some of the limitations, characteristics, applications and issues of mobile computing.
Keywords: Mobile Computing, Wireless Technology, Application , Issues, Limitation

1.Introduction

What is mobile computing?

Mobile computing is human–computer interaction by which a computer is expected to be transported during normal usage. Mobile computing involves mobile communication, mobile hardware, and mobile software. Mobile computing is the ability to use computing capability without a pre-defined location and connection to a network to publish and subscribe to information .Mobile computing as a generic term describing ability to use the technology to wirelessly connect to and use centrally located information and application software through the application of small, portable, and wireless computing and communication devices.

The term "Mobile computing" is used to describe the use of computing devices, which usually interact in some fashion with a central information system--while away from the normal, fixed workplace. Mobile computing technology enables the mobile worker to create, access, process, store communicate information without being constrained to a single location. By extending the reach of an organization's fixed information system, mobile computing enables interaction with organizational personnel that were previously disconnected. Mobile computing is the discipline for creating an information management platform, which is free from spatial and temporal constraints. The freedom from these constraints allows its users to access and process desired information from anywhere in the space.

The state of the user, static or mobile, does not affect the information management capability of the mobile platform being constrained to a single location.

2 .Different types of mobile systems

The following section is an explanation of the different types of distributed systems ranging from the traditional type to nomadic, ad-hoc and finally ubiquitous ones.

2.1.Traditional Distributed Systems

Traditional distributed systems consist of a collection of fixed hosts that are themselves attached to a network–if hosts are disconnected from the network this is considered to be abnormal whereas in a mobile system this is quite the norm. These hosts are fixed and are usually very powerful machines with fast processors and large amount of memory.Traditional distributed systems also need to guarantee non-functional requirements such as scalability, openness, heterogeneity, fault- and finally resource-sharing.

2.2. Nomadic Distributed System

This kind of system is composed of a set of mobile devices and a core infrastructure with fixed and wired nodes. Mobile devices move from location to location, while maintaining a connection to the fixed network The mobile host has a home IP address and thus any packets sent to the mobile host will be delivered to the home network and not the foreign network where the mobile host is currently located.. These systems are susceptible to the uncertainty of location, a repeated lack of connections and the migration into different

physical and logical environments while operating.

3 .How Mobile Computing Work

In mobile computing platform information between processing units flows through wireless channels. The processing units (client in client/server paradigm) are free from temporal and spatial constraints. That is, a processing unit (client) is free to move about in the space while being connected to the server. This temporal and spatial freedom provides a powerful facility allowing users to reach the data site (site where the desired data is stored) and the processing site (the geographical location where a processing must be performed) from anywhere. This capability allows organizations to set their offices at any location.

High-tier digital cellular systems include

> - Global System for Mobile Communications (GSM)
> - IS-136 TDMA based Digital Advanced Mobile Phone Services (DAMPS)
> - Personal Digital Cellular (PDC)
> - IS-95 CDMA-based cdmaOne System

Low-tier telecommunication systems include

> - Cordless Telephone 2 (CT2)
> - Digital Enhanced Cordless Telephone (DECT)
> - Personal Access Communication Systems (PACS)
> - Personal Handy Phone Systems (PHS)

Here is how mobile computing works

 1.The user enters or access data using the application on handheld computing device.

2.Using one of several connecting technologies, the new data are transmitted from handheld to site's information system where files are updated and the new data are accessible to other system user.

3.Now both systems (handheld and site's computer) have the same information and are in sync.

4.The process work the same way starting from the other direction.

The process is similar to the way a worker's desktop PC access the organization's applications, except that user's device is not physically connected to the organization's system. The communication between the user device and site's information systems uses different methods for transferring and synchronizing data, some involving the use of radio frequency (RF) technology

4.Characteristics of Mobile computing

Mobile computing is accomplished using a combination of computer hardware, system and applications software and some form of communications medium. Powerful mobile solutions have recently become possible because of the availability of an extremely powerful and small computing devices, specialized software and improved telecommunication. Some of the characteristics of mobile computing are based on following:

4.1. Hardware:

The characteristics of mobile computing hardware are defined by the size and form factor, weight, microprocessor, primary storage, secondary storage, screen size and type, means of input, means of output, battery life, communications capabilities, expandability and durability of the device.

4.2. Software:

Mobile computers make use of a wide variety of system and application software. The most common system software and operating environments used on mobile computers includes MSDOS, Windows 3.1/3.11/95/98/NT, UNIX, android etc. These operating environments range in capabilities from a minimalist graphically-enhanced-pen-enabled DOS environment to the powerful capabilities of Windows NT. Each operating system/environment has some form of integrated development environment (IDE) for application development. Most of the operating environments provide more than one development environment option for custom application development.

4.3. Communication:

The ability of a mobile computer to communicate in some fashion with a fixed information system is a defining characteristic of mobile computing. The type and availability of communication medium significantly impacts the type of mobile computing application that can be created. The way a mobile computing device communicates with a 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 4peeds, 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. Mobile computers may operate in batch mode over communication mediums that are capable of continuous operation, reducing the wireless airtime and associated fees. Disconnected mobile computers allow users to improve efficiency by making calculations, storing contact information, keeping a schedule, and other non-communications oriented tasks.

5. Applications and benefits of mobile computing:

The real power of mobile computing becomes apparent when mobile hardware, Software, and communications are optimally configured and used to accomplish a Specified mobile task. Although many varied applications exist, mobile computing applications can generally be divided into two categories--horizontal and vertical.

5.1.Horizontal:

Horizontal applications have broad-based appeal and include software that performs functions such as: (a) email; (b) Web browsing; (c) word processing; (d) scheduling; (e) contact management; (f) to-do lists; (g) messaging; (h) presentation. These types of applications usually come standard on Palmtops, Clamshells, and laptops with systems software such as Windows 95.

5.2.Vertical:

Vertical applications are industry-specific and only have appeal within the specific Industry for which the application was written. Vertical applications are commonly used in industries such as: (a) retailing; (b) utilities; (c) warehousing; (d) shipping; (e) Medical and (f) law enforcement and public safety. These vertical applications are often transaction oriented and normally interface with a corporate database. Other application areas include: (a) mining; (b) forestry; (c)agriculture; and (d) surveying etc.

Benefits of mobile computing

Mobile computing technology offers a quick and easy way to increase efficiency, productivity and profitability while gaining better control of our operations. The power and data storage capacity of today's handheld PCs and Personal Digital Assistants (PDAs) has made low-cost mobile computing a practical reality. Today's world mobile computing is using in various fields.

1. Improved Information Accessibility:

Mobile computing enables improvements in information accessibility. The degree of improvement is directly dependent upon the mobile hardware and communications equipment in use. Mobile computing technology (hardware, software, and communications) provides a wide range of options that can be mixed and matched to fit the needs of each individual mobile computing application. The improvements in information accessibility enabled by mobile computing result in improved information flow both to and from the central fixed information system. The mobile computer enables quick and efficient information retrieval from the central information system. The ability to access central information and make fixed or ad hoc queries of corporate databases enables employees to get the information they need to complete the job. The mobile computer also enables transmission of current operational data, in native digital format, from the mobile user to the central fixed information system. Once transmitted to the fixed information system, the data from the mobile user can be processed and made available for all other users of the central information system. Thus, the information available to a mobile user from the central information system reflects current information from other mobile users as well. Mobile computing eliminates the delay that occurs when an employee must physically return to the office at the end of the day and submit paper forms so that data entry personnel can enter the information into the central information system. Even employees that are not continuously connected to the fixed organizational information system via a wireless link will experience significantly improved information accessibility through mobile computing. One phone call at the end of the day from the mobile user via a standard modem is all that is required to transmit the entire day's transactions to the central

computer, saving travel and data entry time. Additionally, any scheduling or assignment changes for the mobile employee for the following day can be transmitted to the employee during the same phone call. Mobile computing also significantly speeds information accessibility when other media, such as: (a) facsimile; (b) audio files; or (c) still images are concerned. Digital images or audio files can be accessed by the mobile user or transmitted from the mobile user to the central fixed organizational information system. If matched properly to the work environment and task to be accomplished, the mobile computer will always be in the possession of the mobile worker during the course of the day. Especially in the connected or weakly connected modes of operation, this means that the mobile employee may be contacted throughout the workday via the mobile computing device. Additionally, it means that the employee has access to other mobile employees via email or other messaging schemes. As with many mobile computing applications, the type of mobile application and the hardware, software, and communications used to support it will normally determine the degree and type of information accessibility. The direct measurable results of improved information accessibility-both to and from the mobile worker are many. They include: (a) improved customer service; (b) reduced cycle times; (c) greater accuracy; (d) fewer complaints; and (e) a reduction in required intermediate support staff.

2. Increased Operational Efficiency:

Mobile computing enables improvements in the operational efficiency of organizations that integrate the technology into their fixed information systems. It enables the computing power and information contained within the fixed information system to be structured around the optimum work flow of a mobile worker, instead of altering the mobile worker's work flow to meet the optimum configuration for

computing. The mobile computer stays with the mobile employee, instead of the employee being required to travel to the computer. 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.

3. Increased Management Effectiveness:

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. These benefits can be seen in all areas of the information System, often, it is the improved ability to manage operations that is partly responsible for the performance improvements seen in companies that introduce mobile computing technology.

4. For Estate Agents:

Estate agents can work either at home or out in the field. With mobile computers they can be more productive. They can obtain current real estate information by accessing multiple listing services, which they can do from home, office or car when out with clients. They can provide clients with immediate feedback regarding specific homes or neighborhoods, and with faster loan approvals, since applications can be submitted on the spot. Therefore, mobile computers allow them to devote more time to clients.

5. Emergency Services:

Ability to receive information on the move is vital where the emergency services are involved. Information regarding the address, type and other details of an incident can be dispatched quickly, via a Cellular Digital Packet Data (CDPD) system using mobile computers, to one or several appropriate mobile units, which are in the vicinity of the incident.

6. In courts:
Defense counsels can take mobile computers in court. When the opposing counsel references a case which they are not familiar, they can use the computer to get direct, real-time access to on-line legal database services, where they can gather information on the case and related precedents. Therefore mobile computers allow immediate access to a wealth of information, making people better informed and prepared.

7. In companies:

Managers can use mobile computers in, say, and 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.

8. Credit Card Verification:

At Point of Sale (POS) terminals in shops and supermarkets, when customers use credit cards for transactions, the intercommunication is 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.

9. Field Sales:

The operational efficiency of sales personnel is significantly enhanced through mobile computing. An excellent example of these improvements can be seen by examining how mobile computing improves the efficiency of remote insurance and financial planning sales. The mobile computer frees the sales agent to meet with the client at the client's home, office, or other location. Customer data is collected, estimates and comparisons are immediately calculated, the customer decides on the program of choice, the central computer is immediately updated, and the customer is enrolled in the insurance or financial planning program. Without mobile computing, this sales process would take days instead of minutes. In addition to accessing and updating customer account information, mobile sales personnel can accomplish tasks such as printing invoices or other information to leave with the customer.

10. Transportation and Shipping:

Using mobile computers in conjunction with GPS/GIS and an accompanying vehicle information system (VIS), the operations of an entire transportation fleet can be managed from a central location. The central office knows the location, status, and condition of all vehicles, and operators have two-way communication with the operations center. Using this information, vehicles can be optimally dispatched to maximize efficiency as measured by: (a) time; (b) fuel consumption; and (c) delivery priority. The mobile computers enable significant performance improvements,

achieved simultaneously with operational cost reductions.

11. General Dispatching:

Mobile computers used in conjunction with Global Positioning System (GPS) and Geographical Information System (GIS) data allow significant improvements in the operational efficiency of various dispatch operations. For example, the central computer at a taxi company can track the location and status of all its taxicabs and electronically dispatch the most appropriate car to a customer's location. Additionally, the central computer can calculate an accurate approximation of when the taxi will arrive, enabling improved customer service.

12. Hotel Operations:

Connecting the cleaning and hospitality staff of a hotel with mobile computing can significantly improve the efficiency of hotel operations. As guests check out and rooms are vacated, the central computer wirelessly signals cleaning staff that the rooms are ready for cleaning. Problems that are identified during cleaning, such as broken appliances or faulty plumbing, are immediately communicated to the mobile maintenance team for action. As soon as cleaning is complete and repairs are accomplished, the cleaning staff member wirelessly updates the central computer and the room is immediately available for check-in by a new guest. The same system can be used to efficiently direct mobile hospitality personnel in response to guest requests for information and service.

13. News Reporting:

 Mobile computers dramatically improve the efficiency of news media operations. Reporters equipped with mobile computers and accompanying electronic devices can cover news or sporting event, take digital video or still photographs, digitally record audio interviews, compose the text of the news story, and transmit the completed product back to the central agency for editing and immediate publication. In the media industry, the timing and quality of news coverage is critical. Mobile computing increases the quality of the information from the media crews and significantly decreases the time required to process and transmits the story for publication.

14. Health Care:

Mobile medical care, whether in-home, on the road, or within a hospital, is more efficient with mobile computing. The mobile healthcare worker can access patient records for reference purposes, and is able to update records with current diagnosis and treatment information. Emergency medical technicians (EMTs) responding at the scene of an accident can use mobile computers to capture patient information, treatments accomplished vital signs, and other critical data. This information is wirelessly transmitted to the receiving hospital, which then prepares to receive and treat the patient, or recommend another hospital facility with more appropriate treatment facilities depending upon the nature and severity of the injuries. The more efficient hand-off between ambulance EMTs and hospital staff made possible by mobile computing can save lives that otherwise might have been lost.

15. Fieldwork:

Almost any form of fieldwork can be made significantly more efficient through the application of mobile computing. Parking control officers and utility inspectors are two examples of field workers who can receive operational benefits from mobile computing. Parking control officers use handheld computers to check the registration and violation history of parking offenders. Parking violations are issued immediately and towing/backup can be requested when required. Utility inspectors have historically used paper forms to capture information such as consumer power consumption and utility equipment status (transformers, transmission towers, etc.). Using mobile computers, inspectors can be given instructions on inspections to be accomplished and information can be captured and validated at the source.

16. Mobile Automation:

General business travelers also reap the benefits of mobile computing. E-mail, Spreadsheets, presentations, and word processing are the four primary tasks accomplished by these business travelers. Laptops, Palmtops, and portable Clamshell computers with usable-size keyboards enable businesspeople to stay in touch and accomplish the tasks they need for job effectiveness. Using powerful mobile computers in conjunction with high-speed connectivity, mobile workers can perform work normally accomplished at the office while on the road or in the field.

17. Results: Just as mobile computing enables improved operational efficiency, it also enables improved management effectiveness. Mobile computers make more timely and accurate information available to managers. Mobile computers improve the manager's ability to track work in progress. They also improve the ability of managers to communicate with mobile personnel. Additionally, mobile computers provide better information to mobile employees, so they can make more informed decisions locally and minimize the need for management decisions from the central office

6.conclusion

Mobile computing is an important, evolving technology. It enables mobile personnel to effectively communicate and interact with the fixed organizational information system while remaining unconstrained by physical location. Mobile computing offers significant benefits for organizations that choose to integrate the technology into their fixed organizational information systemMobile computing is a versatile and potentially strategic technology that improves information quality and accessibility, increases operational efficiency, and enhances management effectiveness.

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