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Overview of Mobile Computing: A Review

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Abstract

Mobile computing is a form of human– computer interaction by which a computer is expected to be transported during normal usage. Mobile computing has three aspects: mobile communication, mobile hardware, and mobile software. The first aspect addresses communication issues in ad-hoc and infrastructure networks as well as communication properties, protocols, data formats and concrete technologies. The second aspect is on the hardware, e.g., mobile devices or device components. The third aspect deals with the characteristics and requirements of mobile applications. Intent of this paper is on study, performance, applications, current status of mobile computing, future and of mobile computing.

Keywords: Mobile computing.

Introduction

Mobile computing is associated with mobility of hardware, data and software in computer applications. Mobile computing has become possible with convergence of mobile Communications and computer technologies, which include mobile phones, personal digital Assistants (PDA), handheld and portable computers, wireless local area networks (WLAN), Wireless wide area networks and wireless ATMs. The increasing miniaturization of virtually all System components is making mobile computing a reality (Alonso and Korth, 1993; Forman and Zahorjan, 1994).[1] The technical challenges that mobile computing must resolve are hardly trivial. However, some of the challenges in developing software and hardware for mobile computing systems are quite different from those involved in the design of today's stationary networked systems (Forman and Zahorjan,1994).[2]. Wireless connection enables virtually unrestricted mobility and connectivity from any location within the radio coverage. Establishing a connection requires knowledge of the location of the party we want to establish a connection with. This implies that locating a person is the same as reading the location data of that person. Such read operations may involve an extensive search across the whole network as well as a database look up. Writing the location may involve updating the location of the user in the local database as well as in other replicas of this data item (Imielinski & Badrinath, 1994)[3].

Characteristics of Mobile Computing

One important characteristic about mobile computers is that they have severe power restrictions. A battery represents the largest single source of weight in a portable computer. Power can be conserved not only by the design of energy efficient software, but also by efficient operation[5]

Power management software can power down individual components when they are idle, for example, spinning down the internal disk or turning off screen lighting. Applications may have to conserve power by reducing amount of computations, communication, and memory, and by performing their periodic operations infrequently to amortise the start-up overhead. The other characteristic of mobile computing is that the cost of communication is asymmetric between the mobile host and the stationary host. Since radio modem transmission normally requires about 10 times as much power as the reception operation, power can be saved by substituting the transmission operation for a reception one. For example, a mobile support station (MSS) might periodically broadcast information that otherwise would have to be requested frequently. In this way, mobile computers can obtain this information without wasting power to transmit a request. The other important characteristic of mobile computing is the frequent disconnections and dozing of mobile computers[6]. The main distinction between the disconnection and a failure is its elective nature. In traditional distributed systems[7], the loss of

connectivity is considered to be a failure and leads to the network partitioning and other emergency procedures. Disconnections in mobile computing[8] (Kistler, J.J. Disconnected Operation in a Distributed File System), on the other hand, should be treated as planned failures, which can be anticipated and prepared for. There may be various

degrees of disconnection ranging from a complete disconnection to partial or weak disconnection, eg., a terminal is weakly connected to the rest of the network via a low bandwidth radio channel. The reasons for disconnections may be due to costs involved, as it is expensive to maintain an idle wireless communication link. Also, it could happen that there are no networking capabilities at the

current location.

Applications of Mobile Computing

The importance of Mobile Computers has been highlighted in many fields of which a few are described below:

- **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 neighbourhoods, and with faster loan approvals, since applications can be submitted on the spot. Therefore, mobile computers allow them to devote more time to clients.
- **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.
- **In courts:** Defence 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.
- **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

- **Stock Information Collation/Control**: In environments where access to stock is very limited ie: factory warehouses. The use of small portable electronic databases accessed via a mobile computer would be ideal.
- **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.
- **Taxi/Truck Dispatch**: Using the idea of a centrally controlled dispatcher with several mobile units (taxis), mobile computing allows the taxis to be given full details of the dispatched job as well as allowing the taxis to communicate information about their whereabouts back to the central dispatch office
- **Electronic Mail/Paging:** Usage of a mobile unit to send and read emails is a very useful asset for any business individual, as it allows him/her to keep in touch with any colleagues as well as any urgent developments that may affect their work. Access to the Internet, using mobile computing technology, allows the individual to have vast arrays of knowledge at his/her fingertips. Paging is also achievable here, giving even more intercommunication capability between individuals, using a single mobile computer device.

Current Status of Mobile Computing
Research:

Mobile computing is a rapidly emerging research and development area. From the above examples . we see the various new applications of mobile computing. A number of research groups have been set up all around the world to deal with the various aspects of mobility. It is easy to notice that current computer applications follow the rapid advancements

in the telecommunications industry. Eventually, information systems will be influenced by the rapid evolution of the wireless segment of this industry. Since mobility affects many assumptions upon which today's distributed systems are based, such systems will have to move to where tomorrow's technology can support them. Wireless data technology is foreseen to be a main infrastructure platform for future applications, which are naturally distributed, dynamic and require much flexibility and mobility.

The Future

With the rapid technological advancements in Artificial Intelligence, Integrated Circuitry and increases in Computer Processor speeds, the future of mobile computing looks increasingly exciting. With the emphasis increasingly on compact, small mobile computers, it may also be possible to have all the practicality of a mobile computer in the size
of a hand held organizer or even smaller. The working lifestyle will change, with the majority of people working from home, rather than commuting. This may be beneficial to the environment as less transportation will be utilised. This mobility aspect may be carried further in that,
even in social spheres, people will interact via mobile stations, eliminating the need to venture outside of the house. This scary concept of a world full of inanimate
zombies sitting, locked to their mobile stations, accessing every sphere of their lives via the computer screen becomes ever more real as technology, especially in the field of mobile data communications, rapidly improves and, as shown below, trends are very much towards ubiquitous or mobile computing. The future of Mobile Computing is very promising indeed, although technology may go too far, causing detriment to society.

Limitations

- **Insufficient bandwidth:** Mobile Internet access is generally slower than direct cable connections, using technologies such as GPRS and EDGE, and more recently HSDPA and HSUPA 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 VPN. Security is a major concern while concerning the mobile computing

standards on the fleet. One can easily attack the VPN through a huge number of networks interconnected through the line.

- **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**: People who use mobile devices while driving are often distracted from driving and are thus assumed more likely to be involved in traffic accidents [9]. (While this may seem obvious, there is considerable discussion about whether banning mobile device use while driving reduces accidents or not[10][11]) 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 hard to use. Alternate input methods such as speech or handwriting recognition require training.

Conclusions

This paper provides an overview of concepts, achievements, research issues and challenges in
mobile computing and its limitations. Mobile computing, as it stands today, offers many exciting opportunities. However, the challenges that the research community faces are quite significant. These challenges include mobility aspects, power, frequent connections/disconnections, bandwidth
limitations, cost factors, resource scheduling and management, advanced concurrency, replication and synchronisation algorithms.

References

[1] ALONSO, R. and KORTH, H.F. (1993): Database System Issues in Nomadic Computing, MITL, International Conference on Management of Data, *ACM SIGMOD RECORD*, Vol.22: 388-392

[2] ASOKAN, N.(1994): Anonymity in Mobile Computing Environment, *IEEE Workshop on Mobile Computing Systems and Applications*, Santa Cruz, CA, USA. Also is available electronically:http://snapple.cs.washington.edu: 600/library/mcsa94/asokan.ps

[3] AUSTEL (1996): "Fact Sheet 1", available on http://www.austel.gov.au/info/factsheets/ fs01.htm

[4] BADRINATH, B.R., ACHARYA, A., IMIELINSKI, T. (1993): Impact of Mobility on Distributed Computations, *ACM Operating System Review*, Vol.27, No 2: 15-20.

[5] Ebling, M.R. Evaluating and Improving the Effectiveness of Caching for Availability. PhD thesis, Department of Computer Science, Carnegie Mellon University, 1997 (in preparation).

[6] Howard, J.H., Kazar, M.L., Menees, S.G., Nichols, D.A., Satyanarayanan, M., Sidebotham, R.N., West, M.J. Scale and Performance in a Distributed File System. ACM Transactions on Computer Systems 6(1), February, 1988.

[7] Kistler, J.J., Satyanarayanan, M. Disconnected Operation in the Coda File System. ACM Transactions on Computer Systems10(1), February, 1992.

[8] Kistler, J.J. Disconnected Operation in a Distributed File System. PhD thesis, Department of Computer Science, Carnegie Mellon University, May, 1993.

[9] MH Repacholi, "health risks from the use of mobile phones", Toxicology Letters, 2001 -Elsevier

[10] Landay, J.A. Kaufmann, T.R., "user interface issues in mobile computing", Workstation Operating Systems, 1993.

[11] T Imielinski, BR Badrinath "mobile wireless computing, challenges in data management-Communications of the ACM, 1994