

## Challenges, Limitation and Security issues on 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 has become an important new paradigm in today's world of networked computing systems. Beginning from wireless laptops to cellular phones and Wi-Fi/ Bluetooth-enabled PDA's to wireless sensor networks, mobile computing has become found in its impact on our daily lives. The objective of this paper is to point out some of the limitations, challenges, advantages and issues of mobile computing. In this paper, we also discuss security issues arising from the use of mobile components in distributed systems. We find that mobile agents can be used to overcome intrinsic problems of wireless networking. We know the operational model of our mobile computing environment, where we plan to show our proposed solutions. We also discuss security problems and challenges in mobile computing model.

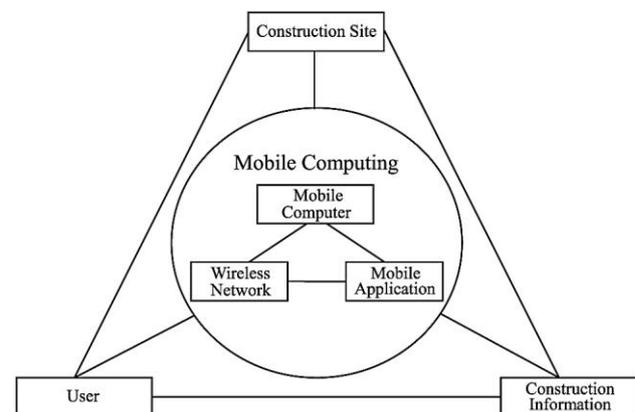
**Keywords:** Mobile, Mobile Computing.

### 1. Introduction

The evolution of "mobile computing" in the field of computing and information systems. The concept of mobile computing is derived from the realization that as computing machinery decrease in size and increase in computing power users will demand this machinery to be part of their everyday life, accompanying them in the carrying-out of their everyday tasks. Researchers in this new field envisage that mobile computing units, such as today's laptops and palmtops, in the future will be communicating with each other via wireless networks, whilst providing location transparency to the user. This notion of transparency is carried-over from that in distributed computing, in which the user is unaware of the remote physical location of the resources being used by the distributed computing system. In the case of mobile computing, however, several differences emerge (Hardjono, 1995).

The major difference - and in contrast to distributed computing is precisely the mobility or the non-fixed positioning of some of the computing elements. This difference in itself presents various new challenges to researchers in the field. The growing interest in mobile computing as a real possibility for the future has been driven partly by the popularity of mobile telephone systems, which to a certain extent has increased the desire on the part of the users to have computing available in a similarly mobile manner. The nomadic nature of some mobile computing elements has introduced new problems which were non-existent in the traditional areas of

computing. Wireless networking has experienced remarkable growth during the last few years and has every indication of reaching even higher levels of subscription. With the coming of the next generation, air interface standards will exist that will allow even more users to access cellular systems.



**Figure: 1**

Mobile computing in the next generation will allow for applications such as high-speed access to the corporate Intranet, and to the public Internet via the World Wide Web (WWW). The web is generally seen as the most prominent application driving consumer markets and is the most widely recognized and used application in the consumer base. With the arrival of Digital Subscriber Lines (DSL) and cable modem technologies, high speed Internet to the home is becoming a reality and is expected to generate a huge market (Sharma, March 2011).

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Figure: 2

**2. General Architecture of Mobile Networks**

The vision of mobile wireless computing requires ubiquitous wireless network connectivity, adequate wireless bandwidth and a small, portable computing platform that provide sufficient functionality. The essential networking infrastructure (called PCN, for personal communication network) is still very much under debate, although it will most likely be based on the cellular networking architecture. The cellular (in future, microcellular and picocellular) architecture is capable of providing voice and data services to users with hand-held devices. Continuous coverage of cellular service is restricted to metropolitan regions. Wide-area moves require the user to inform the network of his new location. The available bandwidth is very low for most data intensive applications. CDPD, which stands for Cellular Digital Packet Data, is another emerging technology. It transferred packet- based data over existing analog networks for voice communications, using frequency hopping. The CDPD device listens to a channel. When it finds an idle time in a call, it transmits the packets using the full bandwidth. If the channel is full, it hops to another channel and repeats the similar process. The main advantage with CDPD is that it has low cost, while billing is based on amount of data rather than time. Finally, the so-called PCS (Personal Communication Services) technology can provide local area services such as audio, video, fax and data communication. The benefits of PCS over cellular networks are that it will offer a wider bandwidth. Wireless LAN is a traditional LAN architecture extended with a wireless interface to service small low-powered portable terminals capable of accessing the wireless. The wireless LAN is again connected to a more extensive fixed network such as LAN or WAN. It has limited range and is designed to be used only in local surroundings. There are two types of wireless LAN architectures: ad-hoc networks and infra structured networks. The Wide-Area Wireless Networks are special mobile radio networks that provide wide coverage for low bandwidth data services. In other technology, paging networks the service is usually receive-only and has very low bandwidth. The starting applications for satellite systems are voice; paging and additional services planned include messaging and fax transmission.

**3. Challenges in Mobile Computing**

Mobile wireless device is characterized by four constraints (Sharma, March 2011):

- 1). *Mobile elements are resource-poor relative to static elements:* For a given cost and level of technology, considerations of weight, power, size & ergonomics will exact a penalty in computational resources such as processor speed, memory size, and disk capacity. Mobile elements will always be resource-poor relative to static elements.
- 2). *Mobility is inherently hazardous:* A stockbroker is more mugged on the streets and has his laptop stolen than to have his workstation in a locked office be physically subverted. In addition to security concerns, portable computers are more vulnerable to loss or damage.
- 3). *Mobile connectivity is highly variable in performance and reliability:* Some buildings may offer reliable, high-bandwidth wireless connectivity while others may only offer low-bandwidth connectivity. Outdoors, a mobile client may have to rely on a low-bandwidth wireless network with gaps in coverage.
- 4). *Mobile elements rely on a finite energy source:* While battery technology will undoubtedly improve over time, the need to be sensitive to power consumption will not diminish. Concern for power consumption must span many levels of hardware and software to be fully effective.

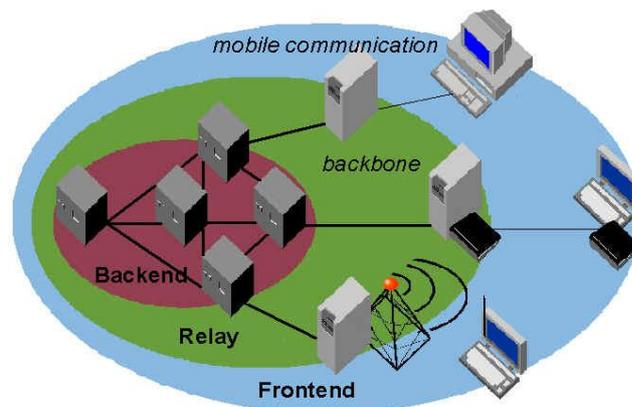


Figure: 3

**4. Operational Problems in Mobile Computing**

The essential properties of mobile computing are:

1). *Wireless Communications*

**Disconnection:** Wireless communications suffer from frequent disconnections due to a higher degree of noise and interference as well as the process of inter-cell hand-offs. Disconnections can be hidden by asynchronous operation.

**Bandwidth and Interface instability:** Bandwidth can shift one to four orders of magnitude, depending on whether the system is plugged in or using wireless access or switching interfaces.

**Heterogeneous network:** To achieve wireless communication a mobile host must get connected to different and heterogeneous networks. The common

problem of heterogeneity can be addressed by exploiting emerging distributed systems standards.

### 2) Mobility

**Address Migration:** This consequence of mobility and several techniques such as selective broadcast, central services, home bases and forwarding pointers may provide solutions.

**Location-dependent Information:** Information needed to configure a computer, such as the local name server, available printers and time zone is location dependent. Mechanisms are needed for obtaining configuration data appropriate to each location.

**Privacy:** Answering dynamic location queries requires knowing the location of other mobile users. Personal information should be protected against misuse and this can be achieved by denying users the availability to know other users' location.

**Inter-realm support:** Designing distributed services to support the mobile user. Providing authentication, accounting and management over a wide area and across organizations.

### 3). Portability

**Low Power:** usage of Power is a very important design issue and affects portability.

**Transactions risk:** Disconnection of a user, during a transaction with his bank or the stock market might prove disastrous and a number of techniques and policies have been proposed.

**Risks to data:** Making computers portable increases the risk of physical damage, unauthorized access, loss and theft. The security risks can be reduced by minimizing the essential data kept on board.

**Less user interface:** Solutions are virtual reality displays, handwriting recognition and voice recognition.

**Less storage capacity:** To reduce the size of program code is to interpret script languages instead of executing compiled object codes.

These constraints are not artifacts of current technology, but are essential to mobility. Together, they complicate the design of mobile information systems and require us to rethink traditional approaches to information access.

## 5. Security Controls in Mobile Computing Systems

Our work on the security of mobile computing aims to address the problems pertaining to the security of information within the following three sub-areas of the mobile environment:

1. The security of information residing in the mobile units, considering device constraints,
2. The security of information as it travels 'over the air' between mobile units and mobile support stations. An important consideration in this area is the power consumption of the algorithms that implement this secure data transfer.
3. The security of information within the rest network (wired hosts). This includes the security of databases holding control data used for the operations and management of the mobile wireless network.

4. Mobile security or mobile phone security has become increasingly important in mobile computing. It is of particular concern as it relates to the security of personal information now stored on the smart phone. More and more users and businesses use smart phones as communication tools but also as a means of planning and organizing their work and private life. Within companies, these technologies are causing profound changes in the organization of information systems and therefore they have become the source of new risks. Indeed, smart phones collect and compile an increasing amount of sensitive information to which access must be controlled to protect the privacy of the user and the intellectual property of the company (Bedre, April 2013).

5. All smart phones, as computers, are preferred targets of attacks. These attacks exploit weaknesses related to smart phones that can come from means of communication likes SMS, MMS, WIFI NETWORKS. There are also attacks that exploit software vulnerabilities from both the web browser and operating system.

6. Different security counter-measures are being developed and applied to smart phones, from security in different layers of software to the dissemination of information to end users. There are good practices to be observed at all levels, from design to use, through the development of operating systems, software layers, and downloadable (Heeramani1, 2013).

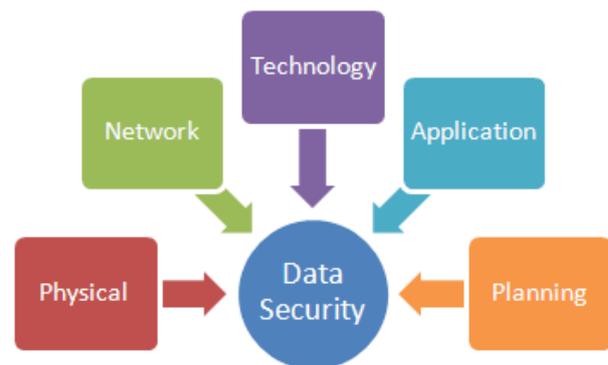


Figure: 4

## 6. Limitations

- 1).Insufficient bandwidth: Mobile Internet access is generally slower than direct cable connections higher speed wireless LANs are inexpensive but have very limited range (Tanenbaum)
- 2) 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 (Heeramani1, Research Issues of InteractiveMultimedia for Advanced Computing & Communication for Challenging Applications, April 2012).
- 3) 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.

4). 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.

5). 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. (While this may seem obvious, there is considerable discussion about whether banning mobile device use while driving reduces accidents or not.) Cell phones may interfere with sensitive medical devices. There are allegations that cell phone signals may cause health problems.

6). 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 (Heeramani1, 2013).

## 7. Advantages

1).Improved decision making: Mobile Computing lets you conduct business at the point of activity. The ability to collect, access and evaluate critical business information quickly and accurately means better decision making that can have a far-reaching effect on company's ability to compete successfully.

2) Increased productivity and reduced costs: Mobile computing can lead to increased individual productivity, increased sales per sales person, more service calls per repair person, less time spent by professionals on administrative work, and much more--all of which ultimately translates into higher sales at lower cost. And, on-the-spot invoice production in service vehicles can lead to shorter payment cycles and better cash flow.

3) Improved customer relations: The success of a business can often be measured by its ability to satisfy customers. Mobile computers gives your field worker the ability to answer customer questions, check order status and provide other services any time their customers need them from wherever they happen to be. (Bedre, April 2013)

4).Portability: The main benefit of mobile computers is that you do not have to bind yourself to a certain place. It is possible to do work while sitting in a car or a train& communicate with other people while sitting anywhere in the world. Chat online with friends and family members, office work while sitting anywhere.

5) Economy: When people can do their work while sitting anywhere they will do more work. This will play an important role in the economy of the country and the world.

## Conclusion

The tension between autonomy and interdependence is intrinsic to all distributed systems. Mobility exacerbates this tension, making it necessary for mobile clients to tolerate a far broader range of external conditions than has been necessary hitherto. Adaptation is the key to mobility. Mobility will influence the evolution of distributed systems in ways that we can only dimly perceive at the present time. In this sense, mobile computing is truly a seminal influence on the design of distributed systems (Sharma, March 2011) . Mobile computing offers significant benefits for organizations that choose to integrate the technology into their fixed organizational information system. Mobile computing is made possible by portable computer hardware, software, and communications systems that interact with a non-mobile organizational information system while away from the normal, fixed workplace. Mobile computing is a versatile and potentially strategic technology that improves information quality and accessibility, increases operational efficiency and enhances management effectiveness. Here in this paper we have in term identified some of the challenging issues, applications of mobile computing along with few of the characteristics of Mobile computing (G, 2012).With developments of latest technologies mobile computing still requires many other technologies to be collaborated for fulfilling the changing needs of users worldwide, Mobile computing promises to provide any kind of functionality for challenging requirements but it has to resolve & enhance in various disciplines to convert promise into real things (Bedre, April 2013).

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