Mobile Computing

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ABSTRACT

Overview of Mobile computing is being able to use a computing device even when being mobile and therefore changing location and Portability is one aspect of mobile computing. Advances in wireless networking have prompted a new concept of computing, called mobile computing in which users carrying portable devices have access to a shared infrastructure, independent of their physical location. This provides flexible communication between people and (ideally) continuous access to networked services. Mobile computing is Revolutionizing the way computers are used and in the coming years this will become even more perceptible although many of the devices themselves will become smaller or even invisible (such as sensors) to users. This essay attempts to give an insight into mobile computing, in particular, software design issues (models, algorithms and in particular middleware) are considered. Such issues arise from the need for wireless networking, the ability to change location and the need for unencumbered portability as well insuring security standards comparable to that found is distributed systems or central systems.

KEYWORDS:MobileComputing,Nomadic,Traditional distribution system, Security issues

1. INTRODUCTION

In the last 10 years, the advent of mobile phones as well as laptops has dramatically increased the availability of mobile devices to businesses and home users. More recently, smaller portable devices such as PDAs and especially embedded devices (e.g. washing machines, sensors) have slowly changed the way humans live and think of computers. Computing is drifting away from just being concentrated on computers and relates more and more towards society, its people and its infrastructures. This is particular true where sensors are being developed to be so minute that they are literally embedded in clothing and even humans! Mobile computing is associated with the mobility of hardware, data and software in computer applications. The study of this new area of computing has prompted the need to rethink carefully about the way in which mobile network and systems are conceived. Even though mobile and traditional distributed systems may appear to be closely related, there are a number of factors that differentiate the two, especially in terms of type of device (fixed/mobile), network connection (permanent/intermittent) and execution context (static/dynamic).

1.1 OBJECTIVE

The main objective of the paper is to give an idea about wireless data connections used in mobile computing. There are three general forms. Cellular data service uses technologies such as GSM, CDMA or GPRS, and more recently 3G networks such as W-CDMA, EDGE or CDMA2000.In Section 1 describes the main characteristics and differences between mobile and fixed distributed systems. In Section 2 attempts to give a brief insight into the theory of mobile computing.

2.DIFFERENT TYPES OF MOBILE SYSTEMS

In many ways, mobile computing has several characteristics reminiscent of distributed systems. In order to understand mobile systems, one must first understand where the similarities and the differences of distributed and mobile systems lie. The following section is an explanation of the different types of distributed systems ranging from the traditional type to nomadic, ad-hoc and finally unambiquitous 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. The bandwidth in traditional systems is very high too. Furthermore, the execution context is said to be *static* as opposed to a *dynamic* context whereby host join and leave the network frequently. In a traditional system, location rarely changes as well and hosts are much less likely to be added or deleted from the network. Traditional distributed systems also need to guarantee non-functional requirements such as scalability (accommodate a higher load at some time in the future), openness (possibility to extend and modify the system easily), heterogeneity (integration of components written using different programming languages, running on different

operating systems, executing on different hardware platforms),fault-tolerance (recover from faults without halting the whole system) and finally resource-sharing (some form of access control).

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. There are problems that arise from such shifts in location. 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. Such problem can be solved by forwarding packets to the foreign network with the help of Mobile IP. Nevertheless, Mobile IP also suffers from efficiency (routing issues), QoS, security (authentication of mobile host at foreign network and end-to-end security required) and wireless access (reduced capacity) problems. 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. However, compared to ad-hoc networks, nomadic systems still have comparatively reliable connections and services since most of these are actually supported by the fixed infrastructure ("backbone") of the network. The non-functional requirements mainly differ, compared to the traditional distributed systems, in the heterogeneity (affected by the presence of both fixed and mobile devices across the network as well as the variations in technologies (e.g.: wireless)), resource sharing (must take into account different issues when the resources need to be discovered) and fault tolerance of the system (considered to be quite the norm). Quality and provision of these resources must be carefully considered too.

3. THEORY IN MOBILE COMPUTING

This section is only an introductory section so it will not go into any detail other than state what the current trend of search in these fields related to mobile computing are.

3.1 Models

Models permit the precise description of existing languages and system semantics. In fact, they enable the formal reasoning about the correctness of such semantics. Models are very much used to emphasize parallels and distinctions among various forms of mobility (logical and physical) and are concerned with the formulation of appropriate abstractions useful in specification and evaluation of such mobile systems. Models are mainly concerned with the characteristics of mobile units such as the unit of mobility (who is allowed to move), its location (where a mobile unit is positioned in space) and its context (determined by the current location of mobile units). There are many existing models and many more are still in research.

- Random mobility model(s)
- Markovian model
- Exponential Correlated Random Model
- Nomadic Community Model

4.SECURITY ISSUES IN MOBILE COMPUTING

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 Smartphone. More and more users and businesses use Smartphone 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, Smartphone 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.

All Smartphone, as computers, are preferred targets of attacks. These attacks exploit weaknesses related to smart phones that can come from means of communication like SMS, MMS, Wi-Fi networks, and GSM. There are also attacks that exploit software vulnerabilities from both the web browser and operating system. Finally, there are forms of malicious software that rely on the weak knowledge of average users.

5.LIMITATIONS

5.1 Range & 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 and 4G networks. These networks are usually available within range of commercial cell phone towers. Higher speed wireless LANs are inexpensive but have very limited range.

5.2 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.

5.3 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.

5.4Transmission 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.

5.6. Potential health hazard

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. Questions concerning mobile phone radiation and health have been raised.

5.7 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.

6. APPLICATIONAL ISSUES

The applications includes in mobile computing are as follows,

6.1 Technical Design

First comes the Technical Design Issues, which consist of network design, capacity planning, response time calculations, data compression considerations, system availability design and security issues. The technical design plays a key role in a mobile computing project and offers unique challenges to the system professionals.

6.2 Network Design:

Issues regarding Wireless LAN design and Wide Area Radio Network Design which network design comprises are discussed below.

6.2.1.Wireless LAN design issues

- The number of mobile users who will use wireless LAN and the number of them active during the peak period.
- The types of LAN application accessed by them. (Keeping in mind that wireless LANs will not be acceptable for the intended users as they operate at much slower speeds than wired LANs).
- Use of notebook with a wireless NIC as a primary and user device.
- Roaming areas, location & range of needed access point.
- Impact of construction materials in single penetration.
- Preferred technology-spread spectrum or frequency hopping.
- Radio frequency interference from any other devices in office, factory or campus etc.

6.2.2. Wide Area Radio Network Design Issues

- The need of building a private radio network.
- Most appropriate radio network technology for the suite of applications.
- Matching of user application-usage profiles to a given network capacity.
- Integration of RNA technology with a radio network infrastructure.
- Ensuring good coverage & minimum number of dead spots.
- If distributed wireless network design with several MCSSs must be used?
- Managing the way logic networks will be influenced by network design options.

The Capacity Planning & response time Calculations.

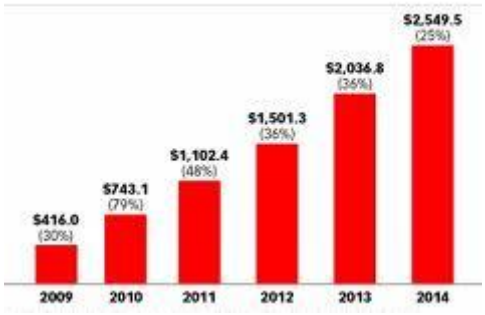
A mobile computing application transaction has to cover a synchronous set of hardware as well as software components before it reaches the destination server. Diverse physical links, wireless & wired line in between the end user's client application software and the information server are present in its reverse path too. So scheduling on a network requires complex rules, which makes it difficult to build a mathematical model to estimate response times. Planning reliable capacities in advance is a hard task still. The network providers give an estimate using complex queuing models or rule-of thumb calculation based on the other customer's experience.

6.3. Data compression considerations

As the bandwidth of wireless network is scarce & inexpensive it is necessary to compress data to get the maximum out of this bandwidth. This is usually done in the modem by going beyond the modem hardware in reducing the quantity of traffic on wireless networks using client application programs.

6.4 .System availability Design

Rather than sticking on with the general base station hardware & network controllers, redundancy & message switches are typically built on fault-tolerant platforms. Public shared network providers must be approached for details of their redundancies. MCSS is another vital component that badly needs inbuilt redundancy.



7. ADVANTAGES:-

1. Selling a product or service in quicker time.
2. Streamline business process.
3. Reducing transaction cost from one a/c to another a/c.
4. Competitive pricing.
5. Reducing time to order for any products.Everything can be done through mobile internet.

8. DISADVANTAGES:-

1. Quality of connectivity.
2. Security concern.
3. Lots of power consumption.
4. Working bandwidth using here is very less.

9. CONCLUSION

The mobile computing offers a potential large economic market in networks. Nevertheless, the greatest challenges that are to be solved are namely security, portability, and scalability and power control issues. This promising field of research is still at an early stage but advances are made to improve the quality and the availability of mobile systems.

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