

Mobile Computing Challenges and Solutions: A study

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Abstract—

Mobile computing is human-computer interaction by which a computer is expected to be transported during normal usage. With increasing use of small portable computers, wireless networks, and satellites, a trend to support “computing on the move” has emerged. This trend is known as ‘mobile computing’ or nomadic computing. A goal of mobile computing research is to make any changes that might occur in location or type of network connection transparent to user thus allowing the mobile users to work in the same manner and with the same productivity no matter where they are, how they are connected.

Keywords— Computing, Networks, Nodes, Wireless,

I. INTRODUCTION

Migration is important for survival. Mobility originated from the desire to move either toward resource or away from scarcity. Mobile computing supports both physical and logical computing entities that move. Physical entities are computers that change locations. Logical entities are instances of running user application or a mobile agent. Mobile agents can migrate anywhere over the Internet. But applications can only move to a local cluster of computers. *Mobile computing is the technology that allows transmission of data, via a computer, without having to be connected to a fixed physical link.* It is defined as the ability to deliver any application to any type of mobile device, at any moment in time. Mobile computing does not only involve mobile computing devices which are designed to be carried around, but also the mobile networks to which these computers are connected.

II. NEED FOR MOBILE COMPUTING

- It is a Device-independent communications anytime, anywhere.
- To Gain Information support for “Mobilers”
- To Gather external information
- To Provide external information to Mobilers



Fig 1 Mobile Computing Connectivity

III. MOBILE NETWORKS

Security issues have not been completely solved in 2G mobile communication protocols and networks (GSM). The deficiencies and limitations include lack of mutual authentication, end-to-end security, non-repudiation, and user anonymity, together with protocol weaknesses. In 3G wireless networks (IMT-2000), comprehensive requirements are considered, in categories related to access, radio interface, terminal, user association, network operation, security management, etc. As 4G vision is paving its way to reality, more topics of wireless and mobile networks need to be concerned, e.g. mobile ad hoc networks, WLAN.

IV. WIRELESS COMMUNICATION NETWORKS

A wireless network is any type of computer network that uses wireless data connection for connecting network nodes. Terrestrial microwave, communication satellites, cellular and PCS system, radio and spectrum technologies, free-space optical communication are some of the wireless links. Each wireless technology is defined by a standard that describes unique function at both the physical and the data link layers of OSI model. Each standard varies in geographical range, thus making one standard more ideal than the next depending on what it is one is trying to accomplish with a wireless network^[1].

- Portable information appliances
- Laptops, notebooks, sub- notebooks, and MNCs.
- Hand- held computers.
- PDAs and smart phones.

V. CELLULAR NETWORKS

A cellular network, also known as mobile network is a communication network where the last link is wireless. The network is distributed over land areas called cells, each served by at least one fixed location transceiver, known as cell site or base station. In cellular network each cell uses a different set of frequencies from neighbouring cells, to avoid interface and provide guaranteed bandwidth within each cell. When joined together these cells provide radio coverage over a wide geographic area. This enables a large number of portable transceivers like mobile phones, pagers etc., to communicate with each other and with fixed transceivers and telephones anywhere in the network, via base stations even if some of the transceivers are moving through more than one cell during transmission. [1]

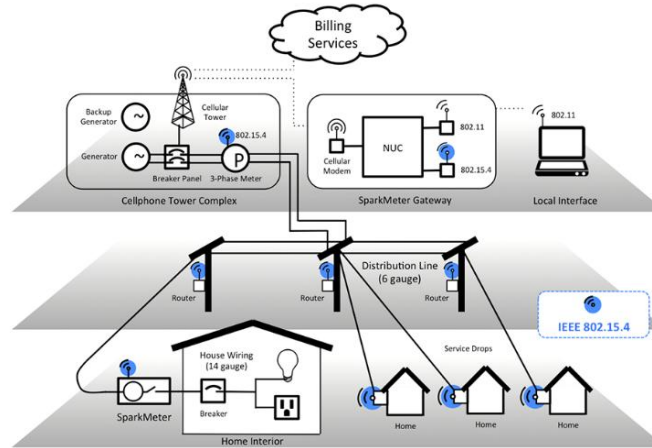


Fig: 2 Cellular Network

VI. MOBILE PHONE NETWORK

The most common example of cellular network is mobile phone network. A mobile phone is portable telephone which receives or makes call through a cell site(base station), or transmitting towers. Radio waves are used to transfer signals to and from the cell phone. The main objective of using a cellular network in mobile phone operator is to achieve both coverage and capacity for their subscribers. There are number of different digital cellular technologies, including GSM, GPRS, EV-DO, EDGE, UMTS, DECT, IS-136/TDMA, iDEN.

VII. ENCODING CELL SIGNAL

To distinguish signals from several different transmitters, FDMA (Frequency Division Multiple Access) ,CDMA(Code Division Multiple Access) were developed. With FDMA, the transmitting and receiving frequencies used in each cell are different from frequencies used in each neighbouring cell.

The principle of CDMA is more complex, but achieves the same result, the distributed transceivers can select one cell and listen to it. Other available methods of multiplexing such as polarization division multiple access (PDMA) and Time Division Multiple Access (TDMA) cannot be used to separate signals from one cell to the next since the effect of both vary with position and this would make separation practically impossible. Time division multiple access, however is used in combination with either FDMA or CDMA in a number of system to give multiple channels within the coverage area of single cell.

VIII. NEW FORMS OF COMPUTING

- Wireless Computing
- Nomadic Computing
- Mobile Computing
- Ubiquitous Computing
- Pervasive Computing
- Invisible Computing

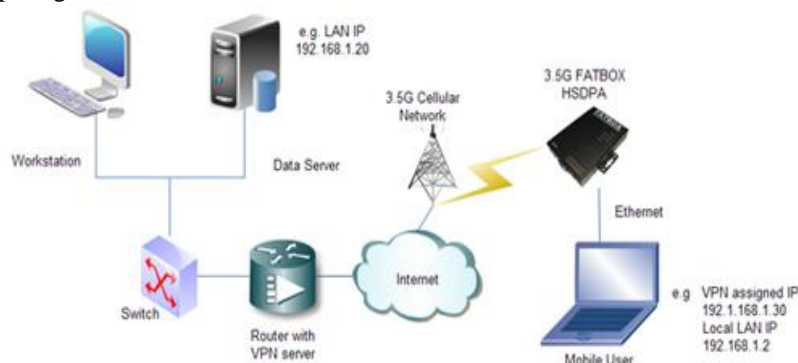


Fig: 3 Mobile Computing Architecture

IX. PORTABLE COMPUTING DEVICE

A portable computer is a general-purpose computer that can be easily moved from place to place, but cannot be used while in transit, usually because it requires some "setting-up" and an AC power source. The most famous example is the Osborne 1. Portable computers are also called a "transportable" or a "luggable" PC. A personal digital assistant (PDA) is a small, usually pocket-sized, computer with limited functionality. It is intended to supplement and to synchronize with a desktop computer, giving access to contacts, address book, notes, e-mail and other features. An ultra-mobile PC is a full-featured, PDA-sized computer running a general-purpose operating system. A smartphone has a wide range of features and install-able applications. A carputer is installed in an automobile. It operates as a wireless computer, sound system, GPS, and DVD player. It also contains word processing software and is bluetooth compatible^[2]. A Pentop is a computing device the size and shape of a pen. It functions as a writing utensil, MP3 player, language translator, digital storage device, and calculator³. An application-specific computer is one that is tailored to a particular application. For example, Ferranti introduced a handheld application-specific mobile computer (the MRT-100) in the form of a clipboard for conducting opinion polls. Boundaries that separate these categories are blurry at times⁴. For example, the OQOUMPC is also a PDA-sized tablet PC; the Apple emate had the clamshell form factor of a laptop, but ran PDA software. The HP omnibook line of laptops included some devices small enough to be called ultra-mobile PCs. The hardware of the Nokia 770 internet tablet is essentially the same as that of a PDA such as the Zaurus 6000; the only reason it's not called a PDA is that it does not have PIM software. On the other hand, both the 770 and the Zaurus can run some desktop Linux software, usually with modifications.

X. 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. Being an ever growing and emerging technology, mobile computing will continue to be a core service in computing and Information Communication and Technology.

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