A REVIEW PAPER ON MOBILE COMPUTING

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ABSTRACT

The increasing availability of wireless communication technology makes possible ubiquitous mobile computing: access from anywhere, at any time, to computer networks and rich set of services attached to them. Mobile computers provide a powerful interface to services that allow a mobile user to access diverse source of information, exchange electronic messages, interact with other users, in real time, and utilize remote computing resource.

Mobile computing environment has a wireless network, which can cause signal disturbance, spurious disconnection by handoff, voluntary disconnection to use power efficiently and unpredictable transmission error. Mobile agent system is used to provide optimized solution for mobile computing environment in spite of having more problems.

The design of mobile memory prosthetics, devices used to augmented memory. First, different forms of memory then how people augmented their memories currently, list making, reminders. The mobile phone landscape changed with the introduction of smart phones running Android, a platform marketed by Google. Android mobile phones are the first credible threat to the iPhone market. Android is a success by Google on the basis of market share and the number of available applications. Google offers Android phone as an open source solution, any handset manufacturer can use it as a software development platform.

Keywords: Mobile computing, mobile agent, Android, Context-Aware computing, Mobile Framework.

INTRODUCTION

Mobile Computing is used to describe technologies that enable the user to access the network at any place at any time.

Mobile computing is a computer paradigm that allows users to access the network not only from fixed locations, but also while moving or in transit. Mobile computing becomes more feasible which involve connection with network and data processing. Mobile computing comprises of applications in various fields such as commercial, medical, defense, networking and electronic devices etc but using phones from anywhere in the world is not mobile computing because there is no data processing and, in a laptop, while moving is not a mobile computing if there is no connection to a network.

Mobile computing technology enables the mobile worker to: (a) create; (b) access; (c) process; (d) store; and (e) communicate information without being constrained to a single location. It is a major part of

wireless communication technology. It is a new paradigm of computing and communication. Mobile users want to use different devices and have information formed appropriately for each. Hence wireless solutions need to address the unique needs of mobile workers. The type and availability of communication medium significantly impacts the type of mobile computing application that can be created.

Modes of communication.

A mobile computing device communicates with 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 speeds, 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. Disconnected mobile computers allow users to improve efficiency by making calculations, storing contact information, keeping a schedule, and other non-communications oriented tasks. This mode of operation is of little interest because the mobile device is incapable of electronically interacting and exchanging information with the fixed organizational information system.

Characteristics of Mobile Computing:-

- Mobile computing enables improvements in information accessibility. The improvement is directly dependent upon the mobile hardware and communications equipment in use. For example, a Penslate computer that is operating in the connected mode via a wireless local area network will have much greater information accessibility than a clamshell mobile computer that is operating in batch mode and only connects randomly throughout the day.
- Mobile computing enables improvements in the operational efficiency of organizations that integrate the technology into their fixed information systems.
    - 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.
- 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.

- Mobile computing is an extremely versatile technology. It includes: (a) process reengineering; (b) reducing operational and administrative staff; (c) improving communications; (d) improving customer service; (e) reducing manufacturing costs; (f) shortening business cycles; and (g) many other benefits. The true versatility of mobile computing can be seen by recalling examples of how it is currently being utilized to enhance business and other operations. It delivers critical medical information from mobile emergency medical technicians to emergency rooms, so the doctors can be ready to treat the patient immediately upon arrival.

- Mobile computing is a key enabling technology for the creation of strategic information systems. The strategic role of information systems involves using information technology to develop products, services, and capabilities that give a company strategic advantages over the competitive forces it faces in the global marketplace.

MOBILE Framework [2] : -

The MOBILE framework is used to determine when it is most appropriate to use mobile computing technology to address a problem, opportunity, or directive. The name MOBILE is derived from the first letter in each of the six categories that make up the framework.

The six categories are:

M the need for *mobility*, Information must be gathered, accessed, or processed during movement or while at a remote location.

O the need to improve *operations* like business operations in which Management is not able to properly oversee operations due to a lack of information, Workers lack information required to operate at their full potential.

B the need to break business *barriers* like cost in which Current processes carry significant costs in labor, inventory, operating locations, or travel expenses, structure i.e. current communications capabilities and the existing business structure lack the agility, ability, and information required to support innovative operations and strategic alliances.

I the need to improve *information* quality i.e. Information sent to or received from mobile personnel is not timely, current, accurate, complete, concise, or relevant enough.

L the need to decrease transaction *lag*. The mobile worker cannot quickly complete a transaction while at the remote location because access to information or

authorization from a central location is required.

E the need to improve *efficiency.* Data is input from paper, input more than once, or not captured at its source. Method of data capture is slow, awkward, or labor intensive. Materials or supplies are wasted by people or machines.

Literature review:-

[1] The author aims to design mobile agent architecture to provide application service in mobile computing and analyzes about mobile agent system. A mobile agent system can support more efficient execution in the mobile computing environment although it has wireless network, which can cause signal disturbance.

[2] In this paper , author illustrate that mobile computing is versatile that improves information quality and accessibility, increase operational efficiency and management effectiveness. The mobile frameworks assist information technology in determining the applicability of mobile technology to an organizational problem, opportunity, or directive.

[3] The author proposed a complete design of the network layer and transport layer in a manner that best addresses the problems of the mobile environment.

[4] A mobile Context and usability issues impede users performance for speed with web tasks on a handheld. Context-aware computing is paradigm in which application of mobile comping can discover by authors.

[5] To achieve high performance, mobile computers utilize wireless networks to access the resources of powerful but less mobile computers. In this paper, author discusses each of issues which affect user applications.

[6] Author describes the feature, & suitability of Android for mobile devices. Mobile devices have approximately 3.5 times more usage than PC's.

Objectives of mobile computing

The main objectives of mobile computing are:-

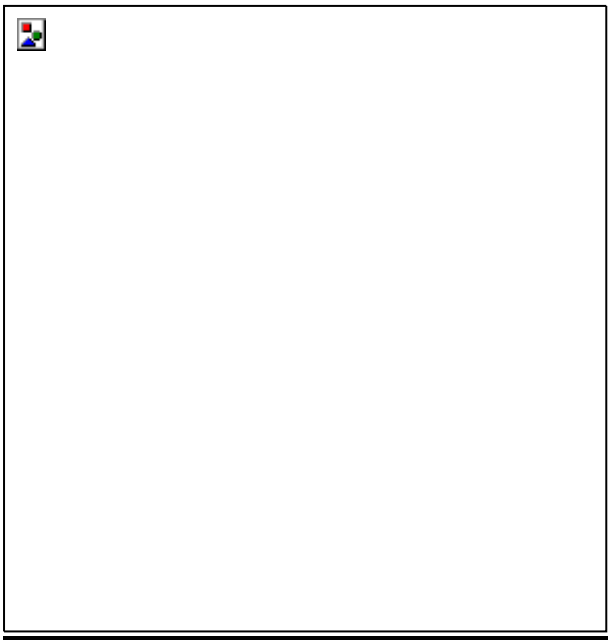
1. It enables the user to access the network at any place at any time.
2. Its main objective is to allows users to access the network not only from fixed locations, but also while moving or in transit.
3. The networking concepts relevant to modern wireless systems.
4. Emerging mobile computing ideas and best practices
5. Provides updated coverage of recent trends and developments in mobile computing.
6. To achieve high performance, mobile computers utilize wireless

networks to access the resources of powerful.

MOBILE COMPUTING ENVIRONMENT:-

Mobile Computing is a new computing environment related to both wireless and high speed networking technologies. Mobile users will be able to access their data and other services such as email, electronic news, and electronic banking and video telephony services while on the move. To receive these services, mobile users will be connected to fixed networks via wireless networks. For every request made by users, a mobile agent is created and searches for information appropriate to the user's requirements. When the job is completed, they bring the results to the mobile host. Mobile agents are not affected by sudden disconnection of wireless network and the situation of turning mobile host off power saving.

A mobile agent supports execution in mobile computing environment although its environment has a wireless network, which causes signal disturbance, spurious disconnection by handoff. Mobile agent techniques can solve the problems from using wireless media and changing the logical connection architecture. Mobile agents do not need of sending the request/response messages with low bandwidth wireless connection between mobile support station and mobile host. As agents it migrates, this problem can be solved efficiently. A mobile host exists in cell region but when it is disconnected, a mobile agent wants to return the result from user's request to mobile host. Then, it is designed with proxy technology in which it tries to fail the connection with mobile support station; it is saved into mobile agent proxy called Proxy Agent (PA) in mobile support station. After then, if connected, mobile agent migrates from PA in mobile support station to the specific mobile host. Mobile agent system with proxy technology, IP mobility support is used. Mobile support station knows that mobile host has already moved to another cell region using IP mobility support. Mobile agents are transferred to the corresponding mobile host [1].



Mobile Computing Environment

In mobile computing environment, users can use the resources effectively. Mobile support station transmits messages via broadcasting to all of mobile hosts that are located on its cell regions. These wireless media hold comparatively low bandwidth and high latency. The problem in mobile computing can be solved by a mobile

agent who works by transporting themselves from one host to another.

Mobile Agent Architecture:- Mobile agent architecture to provide application service in mobile computing environment. Mobile agent architecture and user interface are installed in a mobile host. Mobile agent architecture and the added functionality are installed in a mobile server.

Mobile Computing Applications:

Mobile computing applications can generally be divided into two categories:-

1. Horizontal

2. Vertical.

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 laptops with systems software such as Windows 95.

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 transaction oriented and normally interface with a corporate database.

CONTEXT-AWARE COMPUTING

[4]**:-** It is mobile computing paradigm in which applications can discover and take advantage of contextual information i.e. user location, time of day, nearby people and devices. The word *Context* is defined as interrelated conditions in which something exists or occurs. *Schilit* divides context into three categories:-

a. *Computing context* includes network connectivity, communication bandwidth and near resources such as printers, displays and workstations.

b. *User Context,* such as user profile, location, people nearby.

c. *Physical Context,* such as lighting, noise levels, traffic conditions and temperature.

d. *Time Context* such as time of a day, week, month and season of the year.

When the contexts such as *Computing, User, and Physical* are recorded across a time span, a context History obtain which could be useful for certain application.

Context is the set of environmental states and settings that either determines an

application's behavior or in which an application event occurs and is interesting to the user.

Schilit defines *CONTEXT-AWARE COMPUTING* by dividing context aware applications as follows:

a. Proximate Selection, a user interface technique where the objects located nearby are easier to choose.

b. Automatic contextual reconfiguration, a process of adding new components, removing existing components.

c. Contextual information and commands, which can produce different results according to context in which they are issued.

d. Context-triggered actions, simple IF-THEN rules used to specify how context-aware systems should adapt.

TYPES OF CONTEXT-AWARE COMPUTING:-

1. Active Context Awareness: - An application automatically adapts to discovered context, by changing the application's behavior. For e.g. In Shopping Assistant application active context is Customer's location within the store. The device guides the shoppers through the store, provide details of items, and help locate items, point out items on sale. There is a privacy concern since the store maintains the customer profiles.

2. Passive Context Awareness: - An application presents the new or updated context to an interested user or makes the context persistent for the user to retrieve later. For e.g. In Fieldwork, Passive context is User's location and current time. The system concentrates o providing a set of tools to assist in the fieldworker's observation and data collection activities i.e. helping user record information about their environment.

Mobile operating system:

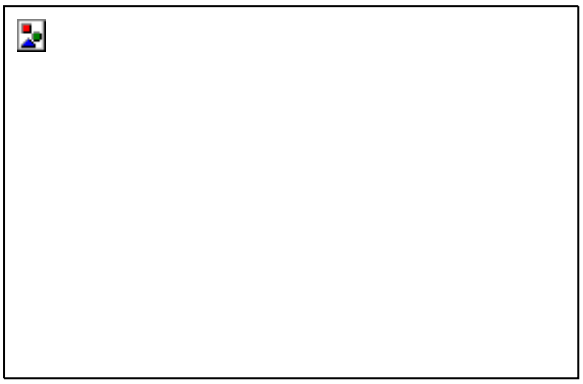
Google android:-

Android is a software platform and operating system for mobile device bases on Linux kernel Developed by Google and later the Open Handset Alliance (OHA). Android uses Linux for its device drivers, memory management, process management, and networking. Android written in C/C++ internally, but you'll be calling them through Java interfaces. In this layer you can find the Surface Manager, 2D and 3D graphics. It supports wireless communications using:

- GSM mobile-phone technology
- 3G
- Edge
- 802.11 Wi-Fi networks

Android Architecture [7]:-

Android consist of number of layers as Applications, Application framework, Libraries, Android runtime & Linux kernel. Application layer is the uppermost layer which provides a set of core applications including an email, SMS program, calendar, maps, browser, contacts, and others. All applications are written using the Java programming language. It should be mentioned that applications can be run simultaneously; it is possible to hear music and read an email at the same time. The Application Framework is a software framework that is used to implement a standard structure of an application for a specific operating system. With the help of managers, content providers and other services programmers it can reassemble functions used by other existing applications. Layer which is present below Application framework consist of two parts as Libraries which are all written in C/C++. They will be called through a Java interface. This includes the Surface Manager, 2D and 3D graphics, Media Codecs like MPEG-4 and MP3, the SQL database SQLite and the web browser engine WebKit. Second part is Android Runtime which includes a set of core libraries that provides most of the functionality available in the core libraries of the Java programming language. Every Android application runs in its own process, with its own instance of the Dalvik virtual machine. The Dalvik VM executes files in the Dalvik Executable (.dex) format which is optimized for minimal memory footprint. The lowest layer is Linux Kernel, Android basically relies on Linux version 2.6 for core system services such as security, memory management, process management, network stack, and driver model. The kernel also acts as an abstraction layer between the hardware and the rest of the software stack.



Android Architecture

Security :-Android is a multi-process system, in which each application (and parts of the system) runs in its own process. Most security between applications and the system is enforced at the process level through standard Linux facilities, such as user and group IDs that are assigned to applications.

Limitations: - 1. Bluetooth limitations: - Android doesn't support:

Bluetooth stereo

Contacts exchange

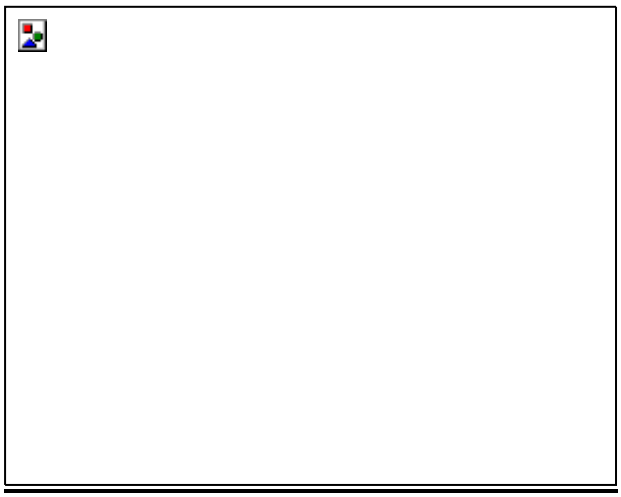
Modem pairing

Wireless keyboards

But it'll work with Bluetooth headsets, but that's about it.

2. Firefox Mobile isn't coming to Android: - Applications in Android Market need to be programmed with a custom form of Java, Mozilla won't have that.

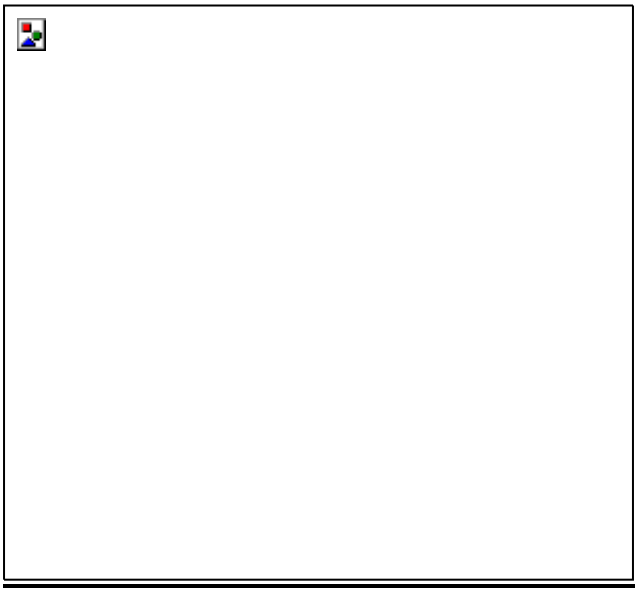
DISCUSSION:-



Android has been well received by the market. Vendors are now delivering Android devices across a broad range of price points, from high-end products.

Future scope:

It is interactive for the rapid transmission of programs from a remote server. We have become used in future version because of their quick response times. The spread of graphical interfaces and multimedia has only served to increase our expectations. The rapid technological advancements in Artificial Intelligence, Integrated Circuitry and increases in Computer Processor speeds, the future of mobile computing increasingly exciting. 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. 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.



Major Trends in Computing

Interactive television and Video Image Compression already imply a certain degree of mobility in the home, i.e. home shopping etc. The future of Mobile Computing is very promising indeed, although technology may go too far.

Conclusion:-

Mobile computing is an important, evolving technology. Mobile computing provide significant benefits in the deployment of mobile applications. It can address the variability of diverse mobile devices, and it can provide a consistent programming environment across these

with high level modelling approaches .It enables mobile personnel to effectively communicate and interact with the fixed organizational information system while remaining unconstrained by physical location. Mobile computing may be implemented using many combinations of hardware, software, and communications technologies. The technologies must be carefully selected and the applications designed to achieve the business needs required from the overall organizational information system. The MOBILE framework can assist information technology professionals in determining the applicability of mobile technology to an organizational problem, opportunity, or directive. Mobile computing is a versatile and potentially strategic technology that improves information quality and accessibility, increases operational efficiency, and enhances management effectiveness. Android have overcome the actual limitations and that the future possibilities became a reality.

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