MOBILE COMPUTING

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ABSTRACT:
Mobile computing has fast become an important new paradigm in today's world of networked computing systems. Ranging from wireless laptops to cellular phones and WiFi/Bluetooth-
enabled PDAs to wireless sensor networks, mobile computing has become ubiquitous in its impact on our daily lives. The debut of iPhones and the proliferation of other handheld devices has spurred excitement and interest in this evolving field. In this seminar, we will study the state-of-the-art in both the research and commercial communities with respect to mobile computing. We will investigate standard protocols and platforms, the capabilities of today's commercial devices, and proposed next-generation solutions. In the process, we will seek to gain an improved understanding about where the field is headed, and what are the important remaining unanswered technical questions and challenges.

Mobile computing is a new style of computer access emerging at the intersection of the two currently dominant trends: producing portable computers in computer industry and wireless communications in telecommunication industry. This paper discusses some key issues involved in realizing a mobile wireless computing environment by examining the characteristics required of each main component: mobile computer, wireless communications network, and coordination software.

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 IP, the more popular global mobility solution, was designed to support mobility of a single host. Even though the same protocol can be applied in the case of network mobility, providing connectivity to mobile networks introduces many issues related to the scalability, security and QoS. Instead, a mobile network can be cited as a remote site, trying to establish secured communication with the home network. This view of mobile network solves many issues related to QoS, security and scalability. The objective of this paper is to explore the possibility of using different VPN techniques to provide connectivity for mobile networks and measure the corresponding end-to-end performance of real time traffic and best effort traffic patterns.

INTRODUCTION:

Mobile Computing is an umbrella term used to describe technologies that enable people to access network services anywhere, anytime, and anyplace. Ubiquitous computing and nomadic computing are synonymous with mobile computing. Information access via a mobile device is plagued by low available bandwidth, poor connection maintenance, poor security, and addressing problems. Unlike their wired counterparts, design of software for mobile devices must consider resource limitation, battery power and display size. Consequently, new hardware and software techniques must be developed. For example, applications need to be highly optimized for space, in order to fit in the limited memory on the mobile devices. For Internet enabled devices, the good old TCP/IP stack cannot be used; it takes too much space and is not optimized for minimal power consumption. Given the plethora of cellular technologies that have emerged
in such a market, it becomes extremely difficult to provide support for inter- 
device communication.

A new hardware technology solution, **Bluetooth**, has been proposed to overcome this barrier. Any device with a Bluetooth chip will be able to communicate seamlessly with any other device having a similar chip irrespective of the communication technologies they might be using. For the sake of explanation, an analogy can be drawn between the Java Virtual Machine and Blue tooth.

In the recent past, cellular phone companies have shown an interesting growth pattern. The number of customers has been steadily increasing but the average airtime per user has slowed to a constant. To increase the user average connect time, many cellular providers have started providing data services on their networks which entices the user to use the mobile device for both voice and data communication. Typical data services include chat, e-mail, Internet browsing. An example of this type of service is **SMS** (Short Message Service). It is a data service in a GSM cellular network that allows the users to send a maximum of 160-character message at a time (similar to paging). Inherently, this service is not feasible for browsing, checking e-mail or chatting. GSM networks provide another service called **GPRS** (General Packet Radio Service) that allows information to be sent and received across the cellular network.

There has also been a recent effort defining common standards for providing data services on hand-held devices. **WAP** (Wireless Application Protocol) and **KVM** (Kilobyte Virtual Machine) deserve a mention here. WAP is a protocol suite that comprises of protocols tailored for small devices. WAP has been developed by the WAP Forum and runs over an underlying bearer protocol like IP or SMS. In the WAP model, a service provider operates a WAP gateway to convert Internet content to a miniaturized subset of HTML that is displayed by a mini-browser on the mobile device. Companies like Nokia, Ericsson and Motorola have already developed WAP enabled phones. As of now, these phones are available and functional mostly in Europe.
TECHNICAL AND OTHER LIMITATIONS OF MOBILE COMPUTING

Insufficient bandwidth

Mobile internet access is generally slower than direct cable connections, using technologies such as GPRS and EDGE, and more recently 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 VPNs.

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

More car accidents are related to drivers who were talking through a mobile device. Cell phones may interfere with sensitive medical devices. There are allegations that cell phone signals may cause health problems.

MOBILE COMPUTING: IN-VEHICLE COMPUTING AND FLEET COMPUTING

Many commercial and government field forces deploy a ruggedized portable computer such as the Panasonic Toughbook or larger rack-mounted computers with their fleet of vehicles. This requires the units to be anchored to the vehicle for driver safety, device security, and user ergonomics. Ruggedized computers are rated for severe vibration associated with large service vehicles and off-road driving, and the harsh environmental conditions of constant professional use such as in Emergency medical services, fire and public safety.

Other elements that enables the unit to function in vehicle:

- **Operating temperature:** A vehicle cabin can often experience temperature swings from -20F to +140F. Computers typically must be able to withstand these temperatures while operating. Typical fan based cooling has stated limits of 95F-100F of ambient temperature, and temperature below freezing require localized heaters to bring components up to operating temperature (based on independent studies by the SRI Group and by Panasonic R&D).

  - **Vibration:** Vehicles typically have considerable vibration that can decrease life expectancy of
computer components, notably rotational storage such as HDDs.

- **Daylight or sunlight readability:** Visibility of standard screens becomes an issue in bright sunlight.

- **Touchscreens:** These enable users to easily interact with the units in the field without removing gloves.

- **High-Temperature Battery Settings:** Lithium Ion batteries are sensitive to high temperature conditions for charging. A computer designed for the mobile environment should be designed with a high-temperature charging function that limits the charge to 85% or less of capacity.

- **External wireless Connections, and External GPS Antenna Connections:** Necessary to contend with the typical metal cabins of vehicles and their impact on wireless reception, and to take advantage of much more capable external tranception equipment.

Several specialized manufacturers such as National Products Inc (Ram Mounts), Gamber Johnson and LedCo build mounts for vehicle mounting of computer equipment for specific vehicles. The mounts are built to withstand the harsh conditions and maintain ergonomics.

Specialized installation companies, such as TouchStar Pacific, specialize in designing the mount design, assembling the proper parts, and installing them in a safe and consistent manner away from airbags, vehicle HVAC controls, and driver controls. Frequently installations will include a WWAN modem, power conditioning equipment, and WWAN/WLAN/GPS/etc… tranceiver antennae mounted external to the vehicle.
FIVE TRENDS IN MOBILE COMPUTING

The next stage in mobile computing is to put some interesting plays on the stage. Okay, that is a strained comparison, but I recently attended Xconomy's Mobile Innovation in New England forum and came away impressed.

If you are in the mood to read the tweetstreams of the event, do a Twitter search on mobile. The event was sold out and speakers included Rich Miner, the managing partner of the new Google Ventures arm and Ted Morgan, CEO of Skyhook Wireless. Xconomy writer Wade Roush has a decent wrap-up of the wireless event.

Here are the five main trends I took away from the one day event -- which was one of the better events I've attended recently.

1. Appstore madness. As usual Apple has blazed the trail and now it is up to Microsoft, RIM and Google to catch up. Mobile devices and networks are simply a platform, it is up to the developers to come up with the cool apps that make a platform great. Maybe it has always been this way, but in the mobile space everyone got fixated on the device rather than the application. That is changing.

2. Business matters. Apple has never seemed to interested in the business to business marketplace. But, unlike consumers, a business will put its money where its strategy is. Business applications for mobile devices have been sorely lacking. That is changing.

3. The carriers may be finally getting it. The big carriers have been some of the biggest obstacles in getting the mobile application business moving. They were way too much in the "my way or the highway" mode of business partners. Now the carriers are suddenly interested in partnering. Carriers should do what carriers do best, build infrastructure and bill in small increments.

4. The mobile device is a platform, not an adjunct. Applications need to written for the smaller user interface and unique characteristics of the devices. Stop trying to squeeze down applications that were written for the big screen PC environment.

5. Your mobile phone knows where you and your friends are. The location determining capabilities of the mobile network continue to improve as the processing horsepower residing in the phone and on the network grows. The combination of the two will result in location aware applications that enhance social networks, banking and GPS-based services. Knowing the location of you and your friends also carries privacy concerns that need to be addressed upfront.

ADVANTAGES OF MOBILE COMPUTING

Computers are one of the major inventions of the world. The invention of computer has changed the world. During these days every field of life seems to be computerized. Later in the 21st century a new technology was introduced in the world known as mobile computing. Now-a-days computers are modified into mobile computers known as laptops.

A small introduction of mobile computing is that you can do your work
in motion. In simple words it means that you can do your work while sitting anywhere in the world. You do not have to sit at one place to do your work.

**Following are some of the advantages of mobile computing.**

The main benefit of mobile computers is that you do not have to bind yourself to a certain place. You can do your work while sitting in a car or a train. You can communicate with other people while sitting anywhere in the world. You can chat online with your friends and family members while sitting on a beach. You can do your office work while sitting anywhere.

The second major benefit is related to the first benefit. 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.

During these days there is no problem for a student to search any information that he needs for his assignment. Many people use these mobile computers for entertainment. Children play video games on these computers.

**TODAY’S BEST MOBILE WIRELESS NETWORKS**

**What is a Mobile Wireless Network?**

A mobile wireless network is simply a computer network that is implemented without the use of wires. There are various types of wireless networks including wireless Personal Area Networks (PAN), wireless Local Area Networks (LAN), wireless Metropolitan Area Networks (MAN), and more. To enable people to access wireless networks, a variety of network service providers provide wireless network coverage to offices, public places, and other small workplaces.

Mobile wireless networks frequently involve the use of cellular phone networks connecting to an Internet Service Provider (ISP); thereby, enabling the user to connect to the internet. All wireless networks consist of radio communications services carried on between mobile stations or receivers and land stations, as well as by mobile stations communicating amongst themselves. The wireless network service providers, for example Sprint and Cisco, use a wireless access point device to provide wire-free network coverage in designated areas to users. This allows various mobile devices, such as smart phones and laptops, to connect to the mobile wireless network. Currently, smart phones are by far the most commonly used mobile computing devices.
Trapeze Networks – This Company’s mobile wireless LAN Mobility System is superior to many other networks. The LAN Mobility System enhances user productivity, introduces new efficiencies, and accelerates business response time. The system also delivers secure mobility and the company offers low cost solutions.

Sprint – Sprint is a leading innovator when it comes to wireless networks. One of Sprint’s recent wireless network innovations is its 3G (3rd generation) PCS Vision network. This innovative network is easy to use, reliable, secure, and reasonably fast. Additionally, because the network is 3G, it can be accessed anywhere as opposed to only being accessed in a wireless “hot spot.”

Cisco Systems, Inc. – The Cisco Unified Wireless Network addresses several mobile computing issues, such as wireless network security, network management, network control, and more. Cisco combines the best elements of wireless and wired networking to deliver secure and cost-effective wireless networks, all the while providing instant, real-time, reliable network access.

ACHIEVING THE BENEFITS OF MOBILE COMPUTING (MOBILE FRAMEWORK)

Mobile computing is an important, evolving technology. 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.

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:

The six categories are:
- M the need for mobility
- O the need to improve operations
- B the need to break business barriers
- I the need to improve information quality
- L the need to decrease transaction lag
- E the need to improve efficiency

TECHNOLOGY WILL CHANGE

NEW TECHNOLOGIES:

Exciting new technologies are being developed that will drastically alter and improve mobile computing capabilities. Two of these technologies are low earth orbit (LEO) satellites and wearable computers. Current LEO satellite developments promise ubiquitous and high-speed network access using extremely small and low power devices. Soon, it will be possible and economical to provide all mobile workers with a connected mode for all mobile computing operations. Advances in microcomputer, display, and natural interface technologies are making the first wave of commercially useful wearable computers possible. These devices are still in the experimental stages, and are not commonplace, but are finding applications in areas like aircraft inspection; where a hands-free operating environment and access to large amounts of information is required. In the future, wearable computers are predicted to replace the myriad of personal electronic devices (computers, cell phone, pagers, tape recorders, and cameras) with an integrated and unobtrusive wearable replacement that merges the user's work space with his or her information space. (Mann, 1998) (Jastrzembski, 1997) The ways in which these types of technologies can be applied to solve problems is only limited by the creativity and skill of the developers.

ADAPTING TO CHANGE

The field of mobile computing is still evolving. Even more advanced and yet unimagined mobile technologies will certainly be discovered. Many of the advances will be evolutionary, but some will be revolutionary. The key to integrating these new technologies into the organizational information system will be forward thinking, adaptability, life-long learning, technical competence, an explorative spirit, and the use of tools such as the MOBILE framework. The result will be hardware, software, and communications systems that are even more mobile and more capable of accomplishing organizational objectives.

CONCLUSION:

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. A detailed analysis, supported by selective presentation of published literature, is used to elucidate and support these asserted benefits of mobile computing. Additionally, a set of heuristics called the MOBILE framework is developed. The MOBILE framework assists information technology professionals in achieving the stated benefits of mobile computing by defining the types of problems, opportunities, and directives that are best addressed through mobile computing technology.

REFERENCES: