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# Pervasive Computing: A New Horizons

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***Abstract***— Pervasive Computing environment gracefully integrates networked computing devices from tiny sensors to extremely dynamic and powerful devices – with people and their ambient environment. Service discovery is an essential element for pervasive computing to accomplish "anytime, anywhere" computing without users' active attention to computing devices and network services. Privacy and security issues, however, have not been properly addressed. Therefore, devices and network services are unprotected; personal privacy is sacrificed; and devices and network services are inconvenient to use. In this paper, we will present what is pervasive computing and its applications. In particular, I will focus on how pervasive computing provides various features like history, principle, applications, characteristics, problems and challenges.

***Keywords***— ICT, Ubiquitous Computing, Calm Technology.

## I. INTRODUCTION

Pervasive computing is an emerging trend. It is associated with embedding microprocessors in day-to-day objects, allowing them to communicate information. It is also called as ubiquitous computing. The terms ubiquitous and pervasive signify "**existing everywhere**." Pervasive computing systems are totally connected and consistently available.

Pervasive computing goes past the arena of desktops so that almost any device, from apparel to kitchen appliances, could be embedded with microchips, connecting these devices to a boundless network of other gadgets. Pervasive computing creates an inconspicuous environment with full and integrated Internet connectivity. A combination of technologies are used to make pervasive computing possible, such as Internet capabilities, voice recognition, networking, artificial intelligence and wireless computing.

Section I contain the introduction of Pervasive computing , Section II contain History of Pervasive computing Section III contain Principles of Pervasive Computing Section IV consist of applications are implemented by software,

- Targeting specific needs
- Four alternatives to surf the web
- Managing the diversity

Section V explain Characteristics Of a Pervasive Computing Environment, Section VI describes Problems and challenges, Section VII concludes research work with future directions Section VIII with references.

## II. HISTORY

Pervasive computing is an emerging trend. It is associated with embedding microprocessors in day-to-day objects, allowing them to communicate information. It is also called as ubiquitous computing. The terms ubiquitous and pervasive signify "existing everywhere." Pervasive computing systems are totally connected and consistently available.

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## III. PRINCIPLES OF PERVASIVE COMPUTING

Creation of environments saturated with computing and communication capabilities, integrated with human users.

1. The purpose of a computer is to help you do something else.
2. There best computer is a quite, invisible servent. Technology should create calm.
3. Calm technology : A technology that which informs but doesn't demand our focus/attention.

 

4. Pervasive computing integrates computation into the environment, distinct objects.rather thanhaving computers which are distinct objects.

**Major Principles of Pervasive Computing**

**Decentralization**

Composition using localized interactions is a decentralized approach to service. We have implemented our decentralized service composition algorithm.

**Diversification**

In today's IT world, the customer requires an universal computer that has all the software that satisfy his needs. The user usually performs all his tasks with one all-purpose workstation.

**Connectivity**

Visions of boundless connectivity Manifold devices are seamlessly integrated in an IT world without boundaries. Exchange information through infra-red, data cable, Bluetooth. Cellular phones with GSM, CDMA also involved in the environment. Real life obstacles Platform specific issues: obstacle for application and information exchange. Devices with different persistent storage ranging from kilobytes(smart card) to gigabytes(multimedia systems) Different OS and variety of processors put various restrictions. Agreeing on common standards Achieving connectivity and interoperability between devices is possible only when the objects are supposed to follow common standards (ISO-OSI, etc…). When it comes to application data exchange across devices, JAVA is the path finder, since JAVA is platform independent. Representation of data in variety of devices of multiple characteristics is resolved by the introduction of XML. Concepts like jini or UPnP help devices to discover suitable services in a network to which they can delegate specific tasks. Automatic reconfiguration based on self-attach and detach (plug & play capabilities) implies self-explained and easy usage of network connected utilities. With jini, networks turn into a dynamic and distributed system.

**Simplicity**

Simplicity Device operations need to be easy, so that the user shall feel comfort with his needs. User Interfaces should not have complicated operations. At present ―one touch ―keys are designed for user easiness. Touch screen with relevant symbols, images help user to interact well. Handwriting recognition, speech recognition enabled interfaces, simplifies the user actions and makes him comfort with the system.

## IV.APPLICATIONS ARE IMPLEMENTED BY SOFTWARE

- Targeting specific needs
- Four alternatives to surf the web
- Managing the diversity

**Targeting specific needs**

End users will mostly have a whole bunch of specialized computers. Diversified devices are intend at best meeting the requirements of a specific group of users for a specific purpose. Applications are a seamless integration of software and hardware

They are intended to be used in a specific situation and optimized for exactly that environment.

**Four alternatives to surf the web**

- Use Internet screen phones at home and enjoy multimedia effects
- For mobile internet access, use a wireless connected handheld computer even with less graphical capabilities and small displays
- Use WAP phone which is ultra light and very handy, but can't enjoy multimedia effects
- Use of PC with single OS with multiple functionalities and workload can be used but memory requirement is high

**Managing the diversity**

- It's a challenge to manage device diversity, since each device has different capabilities.
- Each delivery platform has its own characteristics making it difficult to provide common applications.
- For example in case of e-shopping website in a WAP phone, user cannot see the images representing services or objects.

## V.CHARACTERISTICS OF A PERVASIVE COMPUTING ENVIRONMENT:

Minimal user distraction
Collaborative interaction
User mobility
Context awareness (user/time/location)
Resource and location discovery
Ambient information, calm technology
Event notification
Adaptive interfaces
Invisibility—everyday object augmentation
Anytime/anywhere

## VI. PROBLEMS AND CHALLENGES

The main arising problems of development and realisation of a pervasive system are:

- tracking user intentions
- exploiting wired infrastructure to relieve mobile devices
- adaptation strategies: applications must adapt to the needs of the system and

The system must be able to adapt to the needs of the applications as well (QoS) high level energy management, physical and performance planning context awareness.

 

Equilibrium between proactively and invisibility
- security and authentication
-

merging of pieces of information from different levels (it might be useful to extend a low-level resource information with a higher level context information)

The main goal of pervasive computing is to create a technology that can invisibly assimilate into our everyday lives. There are four main aspects to consider to reach this goal.

The first aspect is the usage and integration of smart spaces. Smart spaces are intelligent computer systems installed in common buildings, rooms, etc. When used efficiently, smart spaces are e.g. able to control the buildings features like heating and lighting of rooms according to the people's position and actions. In another point of view in smart spaces a software used by a person can change behaviour according to the user's position.

The second aspect is invisibility – according to the vision of Mark Weiser pervasive computing has got to exclude consciousness from the operation. In practice, a reasonable approximation to this ideal is minimized user distraction. If a pervasive computing environment continuously meets user expectations and rarely presents him or her with surprises it allows interaction nearly on subconscious level.

The third is local scalability – as the size of a smart space grows the number of participating devices and hence the number of interactions between the user and the surrounding entities increase. This can lead to lack of bandwidth, more power consumption and hence inconvenience for the users. The presence of multiple users will further complicate the problem. Previous works on scalability ignored physical distance – a web server should handle as many clients as possible regardless of whether they are located next door or across the country. In pervasive computing the number of interactions should decrease if the distance between the user and the smart space increases otherwise the system will be overwhelmed with interactions of little relevance. It is also important to allow users to send requests to a smart space from thousands of kilometers away.

The last one is the ability of masking areas with uneven conditions. The penetration of ubiquitous computing is dependent of many non-technical factors like organizational structure, economics and business models. Uniform penetration, if ever achieved, is many years or decades away. Hence the difference between the „smartness" of different areas will be huge. There surely will be offices and buildings with more modern equipment than others. These differences can be jarring to a user, which contradicts the goal of creating an invisible computing infrastructure.

## VII. CONCLUSION

Pervasive computing provides an attractive vision for the future of computing. We no longer will be sitting down in front of a PC to get access to information. In this wireless world we will have instant access to the information and services that we will want to access with devices, such as Smartphone's, PDAs, set-top boxes, embedded intelligence in your automobile and others, all linked to the network, allowing us to connect anytime, anywhere and transparently. Computational power will be available everywhere through mobile and stationary devices that will dynamically connect and coordinate to smoothly help users in accomplishing their tasks. Technology is rapidly finding its way into every aspect of our lives. Whether it's how we shop, how we get from one place to another or how we communicate, technology is clearly woven into the way we live. Indeed, we are hurtling "towards pervasive computing". Pervasive computing has emerged as multi-disciplinary area of research and development. Constituent disciplines and technologies bring years or decades of established results to the area of pervasive computing. However, it is in the convergence of these diverse areas, that brand new issues have emerged and provided the research and development community with a new frontier. From the original ideas of intelligent computing systems available anytime and anywhere, pervasive computing has evolved into a prolific discipline where research goes hand in hand with practical developments that are brought to the forefront of consumer market. Many technological advances made by the academia and the industry led to a plethora of systems and devices with a wide range of capabilities, many of which have been enthusiastically embraced by the consumer. The real power of the concept comes not from any one of these devices; it emerges from the interaction of all of them. Today, mobile and smart phones have established themselves as a ubiquitous device that offers a variety of functions in addition to anytime anywhere connectivity, which remains to be the main attraction to mobile users. It is the human nature to strive for connection with other individuals, groups and activities, which can be fulfilled by pervasive environments providing access to ubiquitous information services. Mobile and smart phones are currently positioned as the best tool to access such services until there are more natural and practical interfaces providing for a better interaction with pervasive environments.

 

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