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The Most Demanding Computing Technology that Sets Off a New Era of Technological Transformation

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ABSTRACT: The technological advancement is going to that level where it is time to think about the very remarkable technology with the intention of energizing the upcoming technological transformation. Pervasive computing or ubiquitous computing is the budding development towards implanting microprocessors in daily objects so they can converse information. If you can dream of your doctor sensing the problem related to the working of your pacemaker from a remote place or your refrigerator reordering vegetables, then you are ready to welcome the next Internet revolution which is mainly rooted in ubiquitous computing. The paper tries to give an insight to ubiquitous computing, by mentioning its significance towards the forthcoming Internet revolution. The paper concludes by relating major concerns and few ongoing researches/projects in the field of ubiquitous computing.

KEYWORDS: Communication, Computing, IoT, Pervasive, Ubicomp, Ubiquitous

I. INTRODUCTION

Ubicomp is an idea in software engineering. [8] Ubiquitous computing, allows computing to appear everywhere without any time constraints. The words ubiquitous and pervasive mean "existing everywhere". Pervasive computing devices are entirely connected and continuously available. Any device can be set up for the occurrence of ubiquitous computing by merging the necessary technologies involved in that. We all know that desktop computing cannot happen with all devices irrespective of place and format. But ubicomp makes sure that computing can occur using any machine, in any place, and in any format. [1] Mark Weiser, the great scientist, introduced the term ubiquitous computing in 1988 to depict a future in which invisible computers, fixed in everyday objects, replace PCs.

II. THE DEVICES INVOLVED IN PERSVASIVE COMPUTING

Ubicomp computing devices are not exactly personal computers, but are very minute and even unseen devices. The ubicomp devices can be either transportable or immovable. [9] The ubiquitous computing devices can be implanted in any type of objects including consumer goods as per the requirement. With the support of more and more interconnected networks, ubicomp ensures the communication of all the devices involved in that throughout.

III. ESSENTIAL TECHNOLOGIES

The underlying technologies to support ubiquitous computing include the following:

Microelectronics: [12] Microelectronics is involved in the miniaturization, development, manufacture and application of integrated circuits (IC). The development in microelectronics is in the direction of even greater incorporation density, minor structures and lessening unit costs. Many researches going on in nanotechnology are looking at how quantum effects can be used at the sub - molecular and atomic levels to achieve further miniaturization of microelectronics.

Power supply: It is essential to provide power to various electronic systems for the utilization of applications which are connected with pervasive computing. The continuous power supply is one of the major challenges and heaviest component which is quite relevant today with most of the applications we use. A range of researches are going on micro fuel cells for generating electricity from hydrogen or methanol.



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Sensor technology: One of the key characteristics of ubicomp is capturing and analyzing the real world. The major disputes in the development of sensor technology devices include dropping the size and heaviness of sensors and sensor systems and their integration in complex semiconductor systems, declining sensors' power consumption, rising their performance and reliability and developing lower-cost production technologies.

Communication technology: In general, communication technology is combined with information technology and referred to collectively as information and communication technology (ICT) in order to emphasize the have common characteristics between the two fields.

Localization technologies: One interesting facet of pervasive computing is that equipping smart objects with appropriate transmitters and receivers enables precise localization. There are currently three types of localization systems: satellite-supported, cellular-supported and indoor localization systems.

Security technologies: A central feature of pervasive computing is that nearly all smart objects can exchange information. Security, which ensures that only authorized persons and objects can access the data meant for them, is thus essential in pervasive computing.

Device – device communication: Pervasive computing systems will be extremely distributed systems with thousands or millions of spontaneously interacting components. [7] The regularization of suitable device-device interfaces and their development are thus extraordinarily important for pervasive computing.

Individual – device interface: The user interfaces of smart objects in pervasive computing should go beyond the principle behind the interaction between keyboard and monitor. These days, the human-machine interface serves nearly all of the human senses. A central challenge for the individual-device interface is to construct a semantic model of the real world, which would allow the meaning of a spoken sentence to be understood.

IV. BENEFITS OR USES OF PERVASIVE COMPUTING

Once we experience the services of ubicomp, we'll definitely get pleasure from its' remarkable benefits. As part of ubicomp, the environments will become smart by embedding computing technology tools that are quite invisible. When the buildings become smart, that can obtain a better social response from residents because the user interfaces in the form of invisible computers are embedded within the architecture. The smart surroundings also help inhabitants to make better choices as per the need of their daily lives. [2] The smart setting induces dynamic behavior for acquiring better adaptability. Since this computing technology offers a nervous system to the environment, information processing will become easier without frequent inputs from user. It is for sure that when computers are ubiquitously embedded in our environments, it will be an appealing experience for its users. The inter connection of digital technologies as part of ubicomp allows sharing which can eliminate the time consumption of monotonous tasks. Since systems pull the data from shared digital locations, the chances of errors also would be reduced.

The business uses of ubicomp are connected with healthcare, vending, micropayments, military etc. The personal uses of ubiquitous computing can be associated with tracking personal information, flight schedules, location, home interaction etc.

V. THE LINK BETWEEN PERVASIVE COMPUTING AND INTERNET OF THINGS

[5] Ubiquitous computing and Internet of Things (IoT) are strongly connected with each other. This well-built association can instigate the forthcoming Internet revolution. In ubicomp, a user interacts with the computer, which can exist in many different forms. The Internet of Things is a collection of connected devices and services that work together to do something useful. [3] Peter Lewis coined the term "Internet of Things"—IoT, in 1985 to describe how a ubiquitous network of sensors connected to the Internet can convey information about the material world directly to enterprise systems without human intervention. There is also a myth that the British entrepreneur Kevin Ashton coined the term in 1999 while working at Auto-ID Labs.

IoT is a support of the Future Internet. Internet of Things will comprise many billions of Internet-connected objects (ICOs) or "things" that can sense, communicate, compute, as well as have intelligence [11]. The IoT incorporates concepts from pervasive, ubiquitous, and ambient computing. IoT will be an enabler of ubiquitous sensing.



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VI. MAJOR CONCERNS OF UBIQUITOUS COMPUTING

Since the foundation of ubiquitous computing is invisible computers, there will always be an anxiety among its users on what is controlling what, where the information is stored, whether the information is safe and so on. If everyone should accept this computing technology, it is very important that the environment it creates should be trustworthy and highly responsive.

As we all are aware of the impact of mobile phones on human memory, it is quite unpredictable that how this technology is going to affect the efficiency of human beings when invisible computers are ready to take up the responsibilities related to most of our day to day activities. When this technology is well – accepted, we can also foresee the concerns in connection with employability too. Definitely ubicomp will be able to replace humans from various tasks by providing an environment which is fully automated. There can also be a negative impact on the environment by this computing technology, if the invisible devices involved here are not environment friendly. If not taken care of well, ubicomp can give rise to various psychological, social and ethical issues.

VII. ONGOING RESEARCHES/ PROJECTS IN CONNECTION WITH PERSASIVE COMPUTING

To conduct researches efficiently with regard to ubiquitous computing, it is also necessary that large areas of computer labs should be equipped with ecological sensing control devices that can be accessed over a network. Many researches and projects are going on by well established organizations and Universities for revisiting service-oriented and middleware paradigms for pervasive computing to leverage today's ubiquitous networking environment.

Carnegie Mellon University, Private Research University in Pittsburgh, Pennsylvania, characterizes its Aura project as “distraction free ubiquitous computing.”

The University of California at Berkeley's Endeavour project an academic effort that focuses on the specification design, and prototype implementation of a planetscale, self-organizing, and adaptive “information utility.”

The Oxygen project, an MIT initiative, envisions a future in which computation will be freely available everywhere, like oxygen in the air we breathe.

In its Portolano project, the University of Washington seeks to create a testbed for investigating pervasive computing.

[13] AT&T Laboratories, Cambridge, UK, is collaborating with the Cambridge University Engineering Department on the Sentient Computing project. The project explores user interfaces that employ sensors and resource status data to maintain a world model shared by users and applications.

Hewlett-Packard's pervasive computing initiative, Cooltown, focuses on extending Web technology, wireless networks, and portable devices to create a virtual bridge between mobile users and physical entities and electronic services.

The EasyLiving project of Microsoft Research's Vision Group is developing architecture and related technologies for intelligent environments.

IBM's pervasive computing work, WebSphere Everyplace, focuses on applications and middleware that extend its WebSphere software platform.

Even though most of these researches/projects are exposing a number of areas that are not well understood initially in connection with ubicomp, further researches need to be done to make ubicomp technically and socially feasible. Portability, power consumption and privacy are the major themes which are to be dealt with key focus to make ubicomp as a reality, which can be accepted by everyone in the world without any hesitation. Sustaining simplicity and control concurrently is still one of the most important questions faced by ubiquitous computing research. To make ubicomp, acceptable by everyone, the ongoing researches/projects related to this computing technology also focuses to rectify the crucial issues with that to provide a safer computing experience.

VIII. CONCLUSION

Pervasive computing is the result of computer technology progressing at exponential speeds. It is the idea that more or less any device, from outfits to gadgets to appliances to vehicles to homes to the human body to utensils, can be implanted with chips to connect the device to an endless network of other devices. [10] It is sure that ubicomp will be a prolific foundation of demanding research problems in computer systems for many years to come. Pervasive computing



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fuses many disjoint areas of research such as human computer interaction, software agents, expert systems, and artificial intelligence.

Let us all dream of an era where pervasive computing will be able to understand our various situations and predict our needs and proactively act in our best interests. Consequently, in the nearby future, we can expect our surroundings to be equipped with network intellectual devices that obviously support our information and communication requirements like a genuine friend or guardian or as our parents in an environment friendly manner.

We can expect that the adoption of ubiquitous computing will create an analogous impact that the adoption of Internet has generated in various application areas. [4] Pervasive computing is regarding building our lives easier through digital surroundings that are responsive and adaptive to human needs. Ubiquitous computing offers new beginnings for the audacious and the twitchy — a rich exposed space where the regulations have yet to be written and the limits yet to be drawn.

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BIOGRAPHY

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