



CA2: Ubicomp report (20%)

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Ubiquitous Computing Report 2019 Michal Borkowski

Foreword

‘There is no reason for any individual to have a computer in his home’ (*Ken Olson, Director of Digital Equipment Corporation, 1977*).

This is a report on interpretation of ubiquitous computing in contemporary world and its usage in future. Moore’s law is saying that number of transistors in microprocessors doubles every two years, that weaker processors becoming cheaper and cheaper. Today’s wrist watches have better computing power than computer which have been implemented in NASA’s moon program landing, and they are accessible to buy for everyone. Those facts create a new possibilities and fields for Internet of Things. IoT core idea was to shift understanding of basic PC. IoT paradigm is very wide but it generally decentralizes one main machine into multiple specialized computers. It starts from the small domestic devices built to help in every-day life’s assignments and finishes on professional equipment for governmental and big enterprises or even to modern military, aeronautics and aerospace research. The aim of this article is to try to define, structuralize and comment on Intent of Things especially on Ubiquitous Computing. As preparation for this report it was essential to outline the opportunities and limitations of new era tools powered by internet. It is often argued that Ubiquitous Computing is an Extension of Man, it complements human being in terms of detail-oriented remembering, analysing and interacting with reality itself.

Ubiquitous Computing

Prophetic Mark Weiser’s article from 1991 (*‘The Computer for the 21st Century’, 1991*) revealed new incoming technology as a dominant in modern future world. IoT is strongly connected with development of global network (Internet) and its influence. It can be defined as ‘ (...) the future of Internet technologies in which every object around us will be connected using some kind of network to every other object, and they will also have the capability to send and receive data from them. Our living, relaxing, and working environment is envisioned to be filled up with a variety of electronic devices including environment monitoring sensors, actuators, monitors, controllers, processors, tags, labels, stickers, dots, motes, stickers, projectors, displays, cameras, computers, communicators, appliances, gateways, high-definition IP TVs, and so on’ (*Pethuru Raj, Anupama C. Raman, 2017*). Now, network is embedded to independent physical devices, sensors and all external intelligent tools which can exchange quickly information between each other. As technology has progressed, so it has become more powerful and influential. Weiser (*1991*) concludes that computing was not created for single

human being but for the corporations networking. Therefore, there is need for socialization in technology, it must cooperate with the society itself one day becoming invisible due to its high level of functionality. Necessity to live together with precise powerful machines spread all around us is a new trend which defines the directions of development of computing. Proliferation of independent tools lead to many changes in contemporary world. However, Weiser (1991) defined the future connectivity and integration with external world, he did not anticipate that ubiquitousness of interactive tools controlled by internet is just a matter of time. UbiComp (abbreviation of Ubiquitous Computing, *McEwen and Cassimally, 2014*) is something more than a technology. We do not care anymore about travel routes because our GPS system will navigate easily the best direction for us and our comfortable journey. Electric sensors installed in our mobile phones can check how many steps we need to do to burn particular number of calories, they can even check our pulse while we are running to estimate our level of training and post it on our social communication platforms. For example, M2M (machine-to-machine) functionality enables modern alarm to be programmed that will raise the morning alarm earlier due to the information from weather control sensors or traffic which will give a tip to wake up bit earlier because some traffic jams can occur on the roads. Empowering world with equipment which can autonomously search for alternative sources of energy, or enhancing the cyber-security, optimization of chain supplies are only few fields of usage of UbiComp. `Wireless sensor networks have evolved from the idea that small wireless sensors can be used to collect information from the physical environment in numerous situations ranging from wild fire tracking and animal observation to agriculture management and industrial monitoring` (*Vasseur J-P., Dunkels A., 2010*). Therefore, UbiComp is more than new dimension of nature rather than new type of industrialisation. Von Krakenburg (on `1st Berlin Symposium on Internet and Society`, 2011) names these processes `collaborative power of the internet` which generates new fields for internet connectivity employment. Therefore, UbiComp is developed to make externally self-intelligent and establish fundamental quality of communication, IoT is focused on artificial representations of identified items. Overall there is a subtle difference between them. It goes without saying, that both terms in today's nomenclature usually are of the same meaning. Basically, the idea of Ubiquitous Computing is to control external objects by internet connection in real world. Next assignment to establish this new field of human creativity friendly to ourselves, to achieve ` (...) the maximum value from IoT as a technology, we have to necessarily leverage and integrate programs with other underlying technologies such as cloud and analytics`. (*Pethuru Raj, Anupama C. Raman, 2017*). Coherent protocols, cloud computing, sophisticated debugging applications are only a few components of friendly UbiComp environment.

Opportunities and threats of Ubiquitous Computing

‘Ubiquitous computing, also called pervasive computing, is a field of study based on the concept of what happens when computers move away from the desktop and become immersed in the surrounding environment’ (*Vasseur J-P., Dunkels A., 2010*).

It is a phenomenon that things can work without human intervention. Human kind in close future can be fully dependent on our useful tools. Physical internet architecture is one of the fastest growing in contemporary world. While we are using advanced software, some incompatible errors can occur among the users. Advanced reporting methods are produced to help recognize the opportunities and threats inside the UbiComp environment and outside on the system. Connected to network alarms, stations, vacuum cleaners, predicts the future of ubicomp. Whether all things are capable of being implemented into a network and whether the things like human body elements can be useful on an ubicomp level? The architects must also consider the new regulations which are intrusive after GDPR implementations. Ideas should be adopted accordingly to possibilities and limits influence (timing). The importance of integration mechanism (software language, communication protocols) among companies is crucial to establish a stable practice of all dimensions in the UbiComp platforms. Till we remotely control surrounding items everything seems to relay on us. However, enabling machines for Machine2Machine communication as mentioned before and empowering equipment with more and more intelligent processors which can gather and analyse a thousand times more data than human brain invokes a philosophical question. Whether the end users, clearly saying - humans will be still needed? If intelligent electronical object can exchange information with another intelligent electronical object it brings alive negative association with sci-fi movies like Stanley Kubrick’s Space Odyssey when the machine raises against the astronaut who primarily was setting it up and giving command or with Matrix plot where operating system was projecting to mankind alternative fake-reality instead of providing relevant measurement of reality itself. So, there is a fundamental question to which extent we can rely on machines? Is their interoperability (*Vasseur J-P., Dunkels A., 2010*) is completely inoffensive environment in which human being is on privileged position? Eventually, it is of course only a creation of writer’s or director’s imagination.

Summary

‘Like any revolution it is a rather spontaneous and multienvironmental movement, and will remain so, but in order to work effectively it has to be somehow standardized in order that trillions of devices would cooperate and understand each other’. (*Senkus P., Skrzypek A., Łuczak M., Malinowski A., 2014*).

It could be very funny today to remind engineer of Advanced Computing Systems (IBM department) in 1968 when he commented on innovating the microchip: ‘How this can be use’? Internet of Things is

a kind of Artificial Intelligence and capturing its meaning. Nowadays is developed all around us and it is transferring into UbiComp. By the end of 2025 there will be 21 billion IoT devices (Duncan G., 2014). In the beginning was founded as a tool of communication constantly and it is changing its functions and requires more sophisticated syntaxes and software. Gradually, it has changed into a new perspective for computing – enabling external objects of physical world to apply on themselves computer coding. Then generated the intelligent devices working on their own and finally enabled them to operate without human interference between each other. To sum up, Ubiquitous Computing has unlimited capabilities and originally it emerged from Internet of Things development. Overcoming the limitations of space and time it configures the sovereignty which unquestionably changes the world. UbiComp that-so-called technology can collect loads of data which is far out of reach of human limitations. On the other hand, this complex way of computing usage requires a well-matched and coherent application and software which is a big challenge for modernity. Establishing an integrated ubiquitous computing system will be a long well-demanding process. Finally, as all new concepts can bring great positive impact for future life quality but needs to be organized and harmonized with the philosophical meanings and reflection on human nature.

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