A Survey on Internet Of Things

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Abstract- *The Internet of Things (IoT) is a global information network that consists of Internet connected objects, such as sensors, and actuators, as well as some instruments and smart appliances that are becoming an integral component of the Internet. Into the industry marketplace we have seen IoT solutions making their way. Critical role has played by Context-aware communications and computing throughout the last few years of pervasive computing and are expected to play a significant role. In this paper, we examine various popular and innovative IoT solutions in terms of context-aware technology. The survey is being carried out to serve the conceptual framework for context aware products to be used in the IoT paradigms. It provides a systematic learning strategies of existing IoT products in the marketplace. It also highlights a number of research directions and trends.*

Keywords- IoT, Context-Awareness, Product Review, IoT-marketplace.

I. INTRODUCTION

The Internet of Things (IoT) has gained significant attention from both industry and academics using any path, network, and any service. It allows 'people and things to be connected Anytime, Anyplace, with Anything and Anyone'. Such technology will help for better development of world for human beings, where objects will help us to know about what we like, what we want, what we need, and we can act upon that without any instructions. The term was introduced in the late 1990s. Different type of organizations like academic institutions, government organizations, startups have been introduced the solution to the IoT marketplace.

To enable intelligent interactions two different type of keys are used that are context aware communication and computing. Now we will introduce some of the terms which will be helpful for understanding the remaining sections. Information which can be used for describing the situation of entity is called context. An entity can be place, person, piece of software or software service. For interaction between application and user we can consider object. An ability of system to provide information or services to user using context information depend on user tasks can be defined as context awareness.

IoT solution that have been designed, proposed, developed are reviewed. industrial oganizations have brought this into marketplace. The organizations ranges from startups, small and medium enterprises to large corporations. In academics, industrialists and researchers it is vital to understand the context aware technologies that are used in IoT solutions. then We can identify industry requirements, trends, innovation opportunities and demands.

II. INTERNET OF THINGS MARKETPLACE

The vision of the IoT has been heavily energized by statistics and predictions. In this section, we discuss some of the statistics and facts related to the IoT which allows us to understand how the IoT has grown over the years and how it is expected to grow in the future. Further, these statistics and facts highlight the future trends in the industry marketplace.

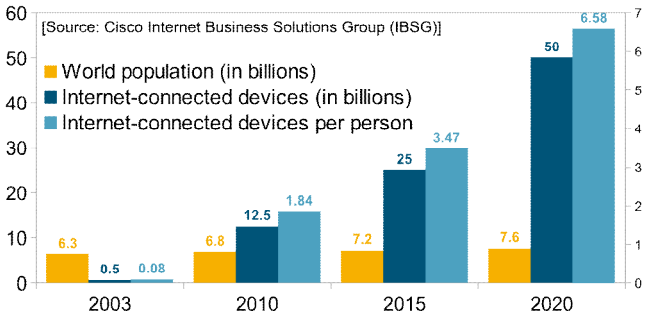

Figure 1. Growth in Internet-Connected Devices/Objects by 2020.

It is estimated that there about 1.5 billion Internet-enabled PCs and over 1 billion Internet-enabled mobile phones today. These two categories will be joined by Internet-enabled smart objects in the future. By 2020, there will be 50 to 100 billion devices connected to the Internet, ranging from smartphones, PCs, and ATMs (Automated Teller Machine) to manufacturing equipment in factories and products in shipping containers . As depicted in Fig. 1, the number of things connected to the Internet exceeded the number of people on Earth in 2008. According to CISCO, each individual on earth will have more than six devices connected to the Internet by 2020.

According to BCC Research's 2011 market report on sensors, the global market for sensors was around $56.3

billion in 2010. In 2011, it was around $62.8 billion. It is expected to increase to $91.5 billion by 2016, at a compound annual growth rate of 7.8%. in term of market, smart homes, smart grid, smart healthcare, and smart transportation solutions are expected to generate the majority of sales. According to Markets and Markets report on Smart Cities Market (2011 - 2016), the global smart city market is expected to cross $1 trillion by 2016, growing at a CAGR of 14.2% as illustrated in Fig. 2.

The interconnection and communication between everyday objects, in the IoT paradigm, enables many applications in a variety of domains. As in and Gascon have listed 54 application domains under 12 categories, as: smart cities, smart environment, smart water, smart metering, security and emergencies, retail, logistics, industrial control, smart agriculture, smart animal farming, domestic and home automation, and eHealth. After analyzing the industry marketplace and careful consideration, we classified the popular existing

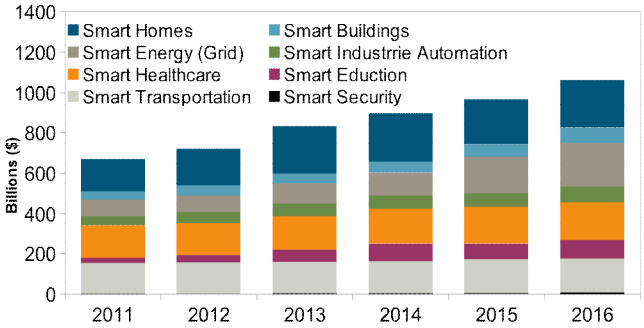

Figure 2. Smart Product Sales by Market in 2016.

IoT solutions in the marketplace into five different categories, as: smart wearable, smart home, smart city, smart environment, smart enterprise. In this paper, we review over 100 different IoT solutions in total.

III. EVOLUTION OF CONTEXT-AWARE TECHNOLOGY

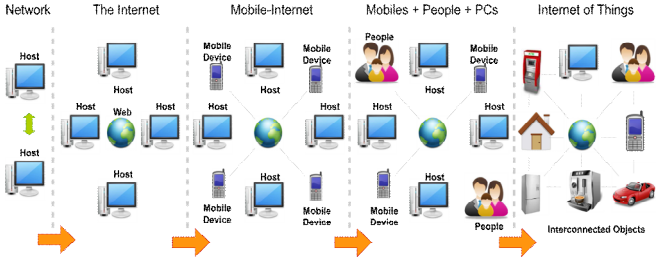

Figure 3. Evolution of the Internet in five phases.

The evolution of Internet begins with connecting two computers together and then moved towards creating World Wide Web by connecting large number of computers together. The mobile-Internet emerged by connecting mobile devices to the Internet. Then, peoples' identities joined the Internet via social networks. Finally, it is moving towards Internet of Things by connecting every day objects to the internet

The evolution of the Internet needs to be understood before discussing the evolution of context-aware technologies. The Internet is broadly evolved in five phases as illustrated in Figure 3. The evolution of Internet begins with connecting two computers together and then moved towards creating the World Wide Web by connecting large number of computers together. Mobile-Internet emerged when mobile devices were connected to the Internet. People's identities were added to the Internet via social networks. Finally, the Internet of Things emerged, that is comprising of everyday objects which are added to the Internet. During these phases, the application of context-aware communication and computing changed significantly.

In the computer networking in which the computers were connected to each other in point-to-point fashion at that time, context-aware functionalities were not widely used. Providing help to users based on the context (of the application currently open) was one of the fundamental context-aware interactions provided in early computer applications and operating systems. Another popular use of context is context aware menus that help users to perform tasks tailored to each situation in a given application.

Over the last few years social networking has become popular and widely used. Context information gathered through social networking services (e.g. Facebook, Myspace, Twitter, and Foursquare) has been fused with the other context information retrieved through mobile devices to build novel context-aware applications such as activity predictions, recommendations, and personal assistance.

IV. LATEST IOT DEVICES

Day to day inventions are done in many organizatios they are as follows:

A) SenseAware :

SenseAware (senseaware.com) is a solution developed to support real-time shipment tracking. As illustrated in Fig. 4, it collects and processes contextual information such as location, temperature, light, relative humidity and biometric pressure, to enhance the visibility and transparency of the supply chain. SenseAware uses both the hardware and software components in their sensor-based

logistic solution. Such data collection allows different parties to engage in supply chain to monitor the movement of goods in real-time and accurately know the quality of the transported goods, and plan their processes effectively and efficiently.

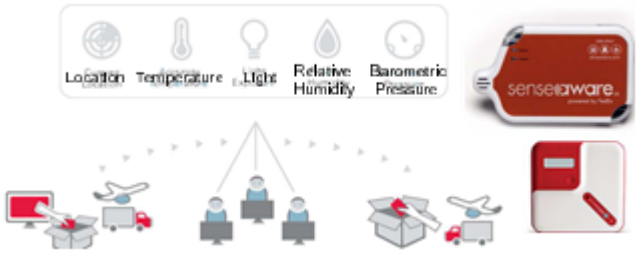

Figure 4. SenseAware

B) MIMO

Mimo (mimobaby.com) has built a smart nursery system, where parents learn new insights about their baby through connected products like the Mimo Smart Baby Monitor .In this product ,turtle is the device that collects all primary contextual information. Then, the data is transferred to an intermediary device called lilypad. Such offloading strategy allows to reduce the turtle's weight at minimum level and to increase the battery life. The communication and processing capabilities are offloaded to the lilypad device that can be easily recharged when necessary. We can see Mimo Smart Baby Monitor uses some parts of the data flow architecture .interface provided by Mimo and the data flow within the solution presented perform the additional processing functionality, and the summarized data is pushed to the mobile devices for context presentation. In the user interface side, parents are presented mostly the secondary context information such as baby movement and baby's sleeping status. Accelerometers are used to discover such secondary context information by using pattern recognition techniques.

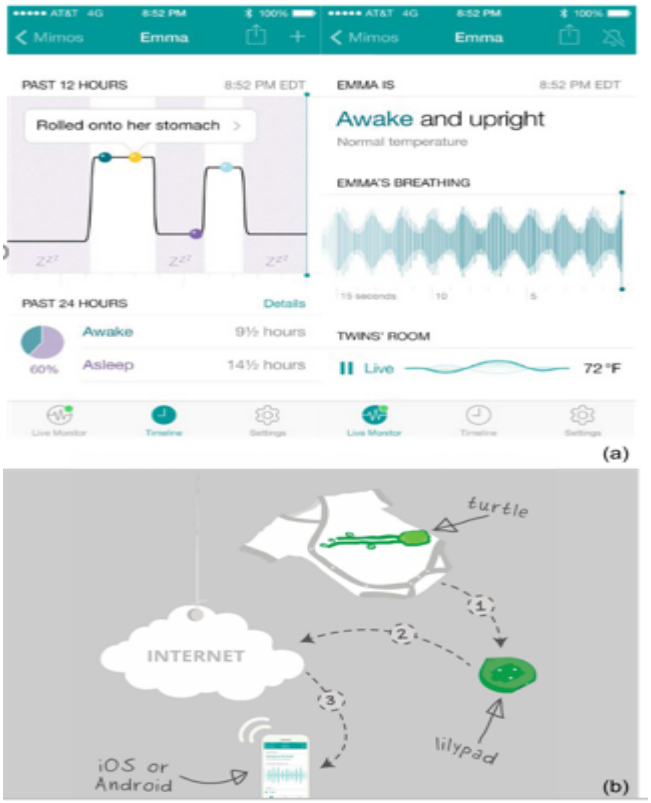

Figure 5. MIMO

C) FITBIT ARIA

This is a Wi-Fi smart scale that helps you track your weight, lean mass, body fat percentage and BMI. In case just looking at these numbers is not enough to give you serious fitness goals, Aria works over the Wi-Fi and is synced to your Fitbit dashboard, displaying charts and graphs of your progress. This gives a much more realistic picture of your fitness over a long period of time.

Aria can recognise up to eight different users and sends their stats straight to their private Fitbit accounts.

Figure 6.

D) CarIQ

This hardware startup from Pune has developed a plug and play device that can be used in any car and claims to collect data on a real time basis. This data is collected from various electronic systems inside a car and displayed to the end user through an app.

The device displays critical information about your vehicle ranging from the 'headlight on' warning, technical problems, service alerts to the fuel economy produced by your car. You can also download the entire driving data including location information, towing alerts, crash alerts, over-speeding alerts, battery health and more.

CarIQ has also embedded a social tangent to the device with an option of sharing statistics of your vehicle on social media platforms (Facebook and Twitter) and likewise allotting social badges for drivers and car condition.

It also monitors any sort of rash driving and gives you personalised tips for driving based on your driving pattern.

Figure 7. CarIQ

E) SEN.SE

Sen.se mother uses its own freewheel sensors called Cookies to collect the data pertaining to any activity that you assign them for. The device then displays the data to the end user through the corresponding app for which the sensor was used. These apps include – Walk, Sleep, Door, Teeth, Medication, Presence, Temperature, Check, Drink, Habits and Coffee.

'Mother' is a universal monitoring solution and can be used for a range of tasks around the house. Four cookies provided with each unit can be used for – monitoring the brushing habits of a child, keeping track of your walking regime, having a check on anyone entering the house or tracking your sleeping cycles and can be used to keep track of your medication or your water/coffee intake as well. How cool is that?

Once the sensor is no longer necessary for a particular task, it can be reprogrammed for another purpose and used yet again. At an additional cost, a 'Credit Pack' can be purchased for the device which will alert you with regular updates for any task through text messages.

Figure 8. Sen.se

F) INOHO

The INOHO is an abbreviation for INnOvative HOmes. This system consists of 3 different components – a home controller that controls multiple switchboard modules, a switchboard module to convert conventional switchboard panel to a smart device panel and an INOHO app which allows users to control these devices through their smartphone or laptop. As it is completely wireless, INOHO requires no electrical rewiring or change in the interior décor whatsoever.
This home control system lets you control most of the electronic connections in your house through an app on your smartphone. It works irrespective of your location and is done over the internet.

In simple words, you can operate lights, fan speed, lighting settings of your house, timer setting for any device through this system.

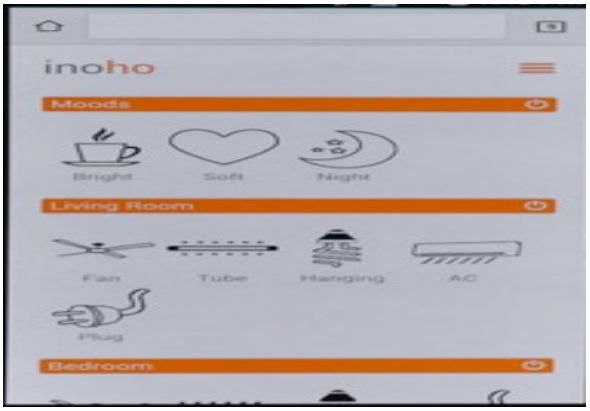

Figure 9. inoho

G) GOOGLE GLASS

Google Glass is an optical display that can be mounted on head similarly as the eyeglasses. It is designed in the shape of a pair of spectacles (as shown in the fig.9). It was developed by Google X. The main mission of these glasses is to produce a ubiquitous computer. The Google Glass displays information in a smartphone-like hands-free format. Since it is wearable, the wearer can communicate with the Internet via natural language voice commands. It also contains a camera, microphone, display and generally revolutionize the wearable device market.

Figure 10. Google Glass

V. CONCLUSION

In this survey, we studied and examined the important concepts in the industry marketplace according to the context-aware computing parameters and also examined some of the IoT solutions for future development of IoT. We have also shortly highlighted the evolution of recent context-aware technologies that have become increasingly popular and used in most of the applications nowadays. We also surveyed various IoT products to identify the features of context-awareness that are supported by these products.

V. ACKNOWLEDGMENT

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