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INTERNET OF THINGS – A SURVEY

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ABSTRACT

Internet of Things (IoT) is a concept of encompasses the various objects and methods of communication to exchange information. Today IoT is the descriptive term of a vision that everything should be connected to the internet. IoT will be fundamental in the future because the concept opens up opportunities for new services and new innovations. It also provide an overview of some of the key IoT challenges presented in the recent literature and provide a summary of related research work. Moreover, the explore the relation between the IoT and other emerging technologies including Big Data Analytics and Cloud and Fog Computing. The needs for better horizontal integration among IoT services are also presented.

Keywords: Internet of Things, Services in Smart City.

I INTRODUCTION

Internet of Things (IoT) has been considered the technology for seamlessly integrating classical networks and networked objects [1]. IoT is the idea of connecting all things in the world of internet. It is expected that things can be identified automatically and also can communicate with each other, and can even make decisions by themselves. In fact, it is even anticipated that the emergence of IoT as a service provider will be a trend although not all the technologies used are brand-new.

Every day the modern people expect new device and new technology to simplify their day to day life. The innovators and researchers are always trying to find new things to satisfy the people but the process is still infinite. In the 1990s, Internet connectivity began to proliferate in enterprise and consumer markets, but was still limited in its use because of the low performance of the network interconnects. In the 2000s Internet connectivity became the norm for many applications and today is expected as part of many enterprise, industrial and consumer products to provide access to information. However, these devices are still primarily things on the Internet that require more human interaction and monitoring through apps and interfaces. One research reveals, the Internet of Things (IoT), which excludes PCs, tablets and smart phones, will grow to 26 billion units installed in 2020 representing an almost 30-fold increase from 0.9 billion in 2009[2].

The Internet of Things is a new era of intelligence computing and it's providing a privilege to communicate around the world. The objective of IoT is Anything, Anyone, Anytime, Anyplace, Anyservice and Anynetwork [3].

Fig.1 describes the Objective of IoT. That reveals, people and things can be connected Anytime, Anyplace, with Anything and Anyone, ideally by using in Anypath/network and Any service. This implies addressing elements such as Convergence, Content, Collections (Repositories), Computing, Communication, and Connectivity in the context where there is seamless interconnection between people and things and/or between things and things.

Fig. 1. **Objective Of IoT**

II LITERATURE SURVEY

Wherever IoT allows people and things to be connected Anyplace, Anytime with anyone and anything, by using ideally in any network/path and any service. IoT has come as a bonus to a variety of sectors like transport, education, energy, business, home and many more. IOT's possibility is unrestricted only to smart homes, but it encompasses huge application domains. The following figure 1 represents the various application of IoT.

Time Series

Time series analysis comprises methods for analyzing time series data in order to extract meaningful statistics and other characteristics of the data. Time series forecasting is the use of a model to predict future values based on previously observed values.

1999-The Internet of Things term is coined by Kevin Ashton managerial director of the Auto-ID Center: "I could be wrong, but I'm fairly sure the phrase "Internet of Things" started life as the title of a presentation I made at Procter & Gamble (P&G) in 1999. Linking the new idea of RFID in P&G's supply chain to the then-red-hot topic of the Internet was more than just a good way to get executive attention. It summed up an important insight which is stil often misunderstood."

1999: Neil Gershenfeld was speaking about similar things from the MIT Media Lab in his book When Things Start to Think and when establishing the Center for Bits and Atoms in 2001

2000: LG announced its first Internet of refrigerator plans

2001: David Brock, co-director of MIT's Auto-ID Center, writes in a white paper titled "The Electronic Product Code (EPC): A Naming Scheme for Physical Objects"

2002: The Ambient Orb created by David Rose and others in a spin-off from the MIT Media Lab is released into the wild (and is still on the market) with NY Times Magazine naming it as one of the Ideas of the Year. The Orb monitors the Dow Jones, personal portfolios, weather and other data sources and changes its color based on the dynamic parameters.

(2003-2004): RFID is deployed on a massive scale by the US Department of Defense in their Savi program and Walmart in the commercial world.

2005: The UN's International Telecommunications Union (ITU) published its first report on the Internet of Things topic 2008: Recognition by the EU and the First European IoT conference is held

2008: U.S. National Intelligence Council listed the Internet of Things as one of the 6 "Disruptive Civil Technologies" with potential impacts on US interests out to 2025.

(2008-2009): The IoT was born according to Cisco's Business Solutions Group and 2008- US National Intelligence Council listed the IoT as one of the 6 "Disruptive Civil Technologies" with potential impacts on US interests out to 2025.

2010: Chinese Premier Wen Jiabao calls the IoT a key industry for China and has plans to make major investments in Internet of Things.

2011: IPv6 public launch-The new protocol allows for 340, 282, 366, 920, 938, 463, 463, 374, 607, 431,768, 211, 456 (2128) addresses. Gartner, the market research company that invented the famous "hype-cycle for emerging technologies" included a new emerging phenomenon on their list: "The Internet of Things".

2014: Gartner marked the IoT as at the pinnacle of the Gartner Hype Cycle for emerging technologies and predicted the plateau would be reached—where practical implementations would reach the mainstream—in 5 to 10 years.

III OVERVIEW OF THE SERVICES IN SMART CITY

The analysis of the services described that it is evidently emerge that most Smart City services are based on a federal architecture, where a intense and assorted set of side-line devices deployed over the city area generate different types of data that are then delivered through suitable communication technologies to a control center, where data storage and processing are performed.

Waste Management: Nowadays, many cities faces much more troubles in handling the Waste management. Waste in the roadside and garbage cleaning is a prime factors, due to the cost of services and the problems in storing the garbage. In order to overcome the cost of services optimized truck routes which detect level of loads and the improve the quality of recycling through an end device which shall connected to IoT intelligent waste containers [6]. In order to control center where optimization software processes the data and determines the optimal management of the collector truck fleet.

Air Quality: The European Union with authorization adopt a 20-20-20 Renewable Energy Directive setting climate change reduction goals for the next decade. The targets call for a 20% reduction in greenhouse gas emissions by 2020 compared with 1990 levels, a 20% cut in energy consumption through improved energy efficiency by 2020, and a 20% increase in the use of renewable energy by 2020. To such an extent, a city IoT can provide means to monitor the quality of the air in crowded areas, parks, or fitness trails [7]. In addition, communication facilities can be provided to let health applications running on joggers' devices be connected to the infrastructure. In such a way, people can always find the healthiest path for outdoor activities and can be continuously connected to their preferred personal training application. The realization of such a service requires that air quality and pollution sensors be deployed across the city and that the sensor data be made publicly available to citizens.

Noise Monitoring: Noise can be seen as a form of acoustic pollution as much as carbon oxide (CO) is for air. In that sense, the city authorities have already issued specific laws to reduce the amount of noise in the city centre at specific hours. A city IoT can offer a noise monitoring service to measure the amount of noise produced at any given hour in the places that adopt the service [8]. As well building a space-time map of the noise pollution in the area, such a service can also be used to put into effect public security, by means of sound detection algorithms that can recognize, for instance, the noise of glass crash or scuffle. This service can hence improve both the quiet of the nights in the city and the confidence of public establishment owners, although the installation of sound detectors or environmental microphones is quite contentious, because of the obvious privacy concerns for this type of monitoring.

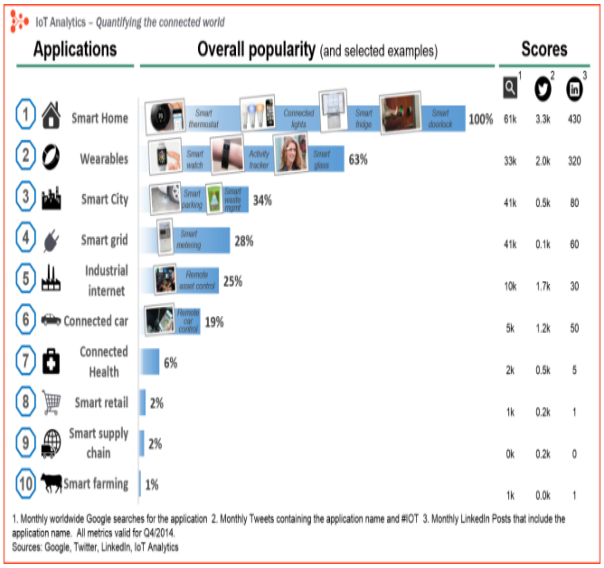
Traffic Congestion: On the same line of air quality and noise monitoring, a possible Smart City service that can be enabled by city IoT consists in monitoring the traffic congestion in the city. Even though camera-based traffic monitoring systems are already available and deployed in many cities, low-power widespread communication can provide a denser source of information. Traffic monitoring may be realized by using the sensing capabilities and GPS installed on modern vehicles [9], and also adopting a combination of air quality and acoustic sensors along a given road. This information is of great importance for city authorities and citizens: for the former to discipline traffic and to send officers where needed and for the latter to plan in advance the route to reach the office or to better schedule a shopping trip to the city centre.

City Energy Consumption: Together with the air quality monitoring service, an city IoT may provide a service to monitor the energy consumption of the entire city, thus enabling authorities and citizens to get a clear and detailed view of the amount of energy required by the different services (public lighting, transportation, traffic lights, control cameras, heating/ cooling of public buildings, and so on). In turn, this will make it possible to identify the main energy consumption sources and to set priorities in order to optimize their behavior. This goes in the direction indicated by the European directive for energy efficiency improvement in the next years. In order to obtain such a service, power draw monitoring devices should be integrated with the power grid in the city. In addition, it will also be possible to enhance these service with active functionalities to control local power production structures (e.g., photovoltaic panels).

Smart Parking: The smart parking service is based on road sensors and intelligent displays that direct motorists along the best path for parking in the city [10]. The benefits deriving from this service are manifold: faster time to locate a parking slot means fewer CO emission from the car, lesser traffic congestion, and better-off citizens. The smart parking service can be directly integrated in the city IoT infrastructure, because many companies in Europe are providing market products for this application. Furthermore, by using short-range communication technologies, such as Radio Frequency Identifiers (RFID) or Near Field Communication (NFC), it is possible to realize an electronic verification system of parking permits in slots reserved for residents or disabled, thus offering a better service to citizens that can legitimately use those slots and a well-organized tool to quickly mark violation.

Smart Lighting: In order to hold up the 20-20-20 directive, the optimization of the street lighting efficiency is an important feature. In particular, this service can optimize the street lamp intensity according to the time of the day, the weather condition, and the presence of people. In order to properly work, such a service needs to include the street lights into the Smart City infrastructure. It is also possible to exploit the increased number of connected spots to provide WiFi connection to citizens. In addition, a fault detection system will be easily realized on top of the street light controllers.

Mechanization and Salubrity of Public Buildings: Another important application of IoT technologies is the monitoring of the energy consumption and the salubrity of the environment in public buildings (schools, administration offices, and museums) by means of different types of sensors and actuators that control lights, temperature, and humidity. By controlling these parameters, indeed, it is possible to enhance the level of comfort of the persons that live in these environments, which may also have a positive return in terms of productivity, while reducing the costs for heating/cooling [11].



IV CONCLUSION

IoT promises to user with a innovative, fully interconnected "smart" world, with affairs between objects and their environment object and people. The Internet of Things is happening now, and there is a need to address its challenges and maximize its benefits while reducing its risks. The objective is to provide the most relevant the overview of services in smart city and IoT communication models. Currently there are 9 billion interconnected devices and it is expected to reach 24 billion devices by 2020. Finally, detailed service use-cases, to illustrate the different communication models and services in smart city presented in the paper fit together to deliver desired IoT services.

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