IT&C PLATFORMS FOR REAL TIME MONITORING INTERNET OF THINGS IN SMART CITY

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REZUMAT. Internetul obiectelor - IoT, este proiectat pentru a fi integrat în utilizarea noastra de zi cu zi, într -o mare varietate de domenii, cum ar fi : uz casnic, uz industrial, de gestionare a oraşului, a sistemului de taxe, a transportului, etc. Serviciile IT&C ar trebui să ofere platforme adecvate, interconectate, pentru toate domeniile de activitate ce se desfasoara intr-un oras inteligent, pentru a sprijini cererile locuitorilor şi de asemenea, să fie utilizate cu uşurinţă de către acestia .

Cuvinte cheie: IoT, platforme IT, oras inteligent.

ABSTRACT . Internet Of Things is designed to be integrated in our daily use in a wide variety of domains, like : home use, industrial use, city management , taxes, etc. The IT Service should provide adequate platforms for all domains. We need various IT Platforms to support our requests and also to be used easily by any user in a smart city.

Keywords: IoT, IT platforms, smart city.

1. INTRODUCTION

The Internet of Things (IoT) is considered to be the third wave in the Internet development. The first wave in the 1990s' connected over 1 billion users while in the 2000s' the mobile communication connected over 2 billions of users. The IoT has the potential to connect an enormous number of 28 billion "things" to the Internet by 2020 (this is 10X the first two waves added), going from bracelets to cars. Personal lives, workplace productivity, consumption and communication will all change. Plus, this technology comes with a plus on the new businesses area, from those that will expand the Internet coverage , to those that will analyze the streams of data, to those that will invent new things based on this technology. In the recent years, the Internet of Things (IoT) platform has become, a point of interest in any discussion about IoT investment . IoT platforms are offered by a range developers and sometimes industrial engineers for their own products. The challenge, however, is that many of these platforms focus on only one aspect of the platform, whether device connectivity, connectivity, application management, different analytics. The "platform of platforms" represents a center point that integrates these solutions as well as providing additional capability.

2. INTERNET OF THINGS FOR A SMART CITY

Our days are perfect for "enabling" all the users in the IoT, we have lots of advantages on our side like:

– Cheap Sensors (average price dropped from 1.30$ in the last 10 years, to 60 cents);

– Cheap Bandwidth (the price for bandwidth dropped almost 40 times in the last 10 years);

– Cheap and Smart Processing (in the last 10 years the processing power has grown limitless, but the price dropped almost 60 times);

– Smartphones (those gadgets, are becoming our personal gateway for IoT, we can use them as a remote control or as a hub for different sensors like health sensors, car sensors, etc.);

– Great Wireless Coverage (we can say that we have wireless coverage almost everywhere for free, so it is easy to stay connected all the time);

– Big Data (with a big processing power, of course we can process big data sets in real time), IPv6 (almost any equipment supports this protocol nowadays, the old IPv4 could only handle 4.3 billion addresses, this protocol can handle 3.4 x 1038 addresses);

– Data management capabilities include machine data collection and storage as well as data integra-

tion services. Some platforms offer capabilities to store and analyze vast amount of machine data. In the context of trends like "Big Data" these capabilities are promoted heavily.

Other platforms focus on integrating data from different sources on the basis of simple data integration ("mashup") environments. They promise to integrate structured as well as unstructured data from social sources. Identity management allows administrating user identities as well as resources, e.g. devices or application services across the platform. Granting and revoking access to resources as well as providing authentication services are fundamental capabilities for executing security policies. Furthermore, monitoring and analyzing access logs are the basis for auditing and security analysis. Device management provides capabilities to provision, activate and manage devices. This covers functionalities such as remote access, configuration, administration, software management, device monitoring, and troubleshooting. Furthermore, some platforms support the automated delivery of firmware and configuration updates during run-time.

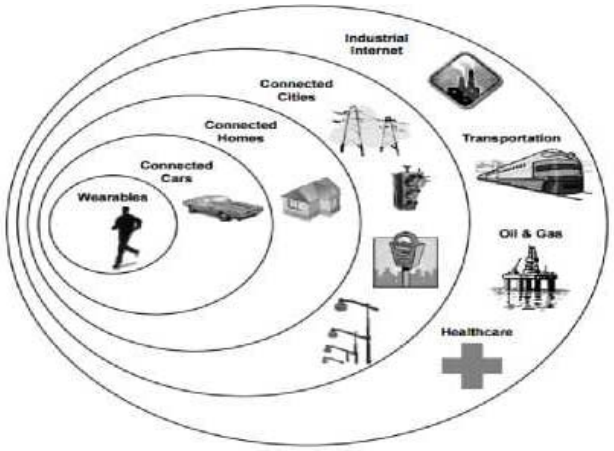

Fig. 1. IoT landscape.

The infrastructure. As an example, before there could be millions of cars in a country, programs for roads systems are developed. Without those roads systems, traffic jams would be unbearable and we would still travel by train. The same things applies today for the IoT . Expanding the satellite pipelines, cable and telecom that carry traffic through Wi-Fi networks is a critical part. But the key is represented by the sensors, memory chips and necessary software for communication (platforms).

3. THE APPLICATIONS

The IoT applications are addressing the society needs and advancements to enable technologies such as nanoelectronics and cyber-physical systems.

Using this super-network we could use a big blocks of data:

– For daily usage (like : remote set the climate control before you arrive home)

– Electrical efficiency (use big consumers like the washing machine when electricity usage and prices fall in the middle of the night)

– Maintenance without a specialist (car engine diagnostics, auto diagnostics for electronics, full-body health monitors)

To accomplish this we need to establish common software standards, we need reliable platforms that others can build from (open source), the goal is to analyze more data than has ever been analyzed. This is the base for fully unlocking the potential of the IoT.

Wearables. The wearables are categorized as nano-electronics, organic electronics sensors, low power computing and embedded software. Those are key technologies from the point of view of intelligent system brought to clothes, fabrics, patches, watches and other body- attached devices. Providing fully automated closed- loop solutions developed in the healthcare, well-being and safety domains, wearables are connected with smarty buildings, energy, lighting and mobility in the Smart City. At the end of 2014 more than 35 millions of users connected wearables. Statistics are saying that over 75% of consumers that bought a wearable device, stopped using it within 6 months. The goal for the developers is to create apps that are seamlessly integrated into everyday life and integrate them with other IoT applications. The growing in this area is considerable, the prediction for 2018 is that 285 millions of units will be sold, 6 times more than in 2014.

Smart Health and Wellness. Health monitoring devices is currently characterized by application specific solutions that are mutually non-interoperable and are constructed on diverse architectures. The IoT can have a clinical use, in the hospitalized patients that need physiological status update in real time, non-invasive monitoring. This requires sensors to collect the big data blocks, gateways, clouds for storage and device for real-time data processing. In addition, the technology can be used for remote monitoring, internal wireless networks only for this purpose. With these solutions we could securely capture patient health data from a variety of sensors, processed with complex algorithms and share it in real time with medical professionals who can take appropriate decisions. The IoT plays an important role in healthcare applications, from monitoring a disease that needs close attention to prevention of diseases. These systems can provide seamless services and handle flexible connectivity while users are moving through their daily living.

Smart Homes and Buildings. The Wi-Fi got a bigger role in our homes, as the deployed electronics are becoming part of the home IP network and due to the increasing rate of adoption of mobile computing devices (tablets, smartphones, etc.). The solutions are based on open platforms that are using remote displays to control an intelligent network of sensors. These sensors are monitoring all the systems starting with energy generation and metering; ventilation; heating; HVAC; lighting; security; environmental key performance. Network providers are bringing online streaming services or network playback and they can see them on at least 2 devices. The smartphones are ensuring the consumers that they can become a hub for the electronics connected to the network. In this context, big companies are considering the integration of a platform for all in one services (building automation with entertainment, healthcare, energy, etc.).

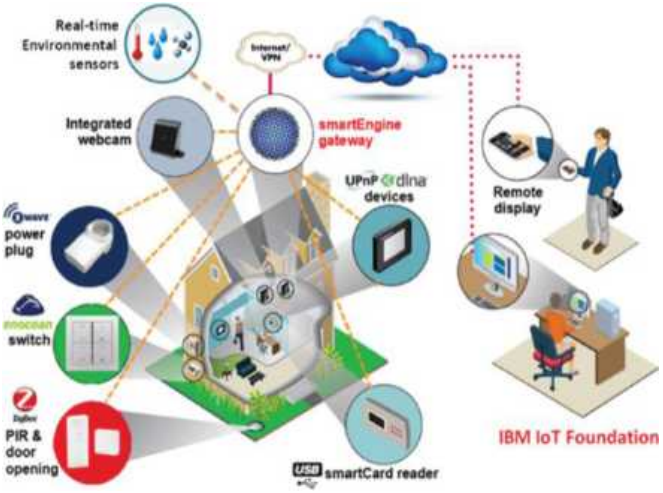

Fig. 2. Home appliances.

Smart Energy. In future, our energy supply should not be based on fossil resources or nuclear resources. We should be based on renewable resources and for this we should also focus on our energy consumption behavior. This kind of resource (renewable) has a volatile nature, this is why it demands intelligent and flexible electrical grid, this grid must be able to redirect resources and consumers, respond to power fluctuations. The grid must control the sources, the storage and to auto reconfigure. Such functions are based on intelligent enabled devices and the grid infrastructure elements, largely based on IoT concepts. Those future solutions for energy are also characterized by a high number of distributed small and medium sized energy sources and power plants which may be combined virtually ad hoc to virtual power plants. Also new solutions for security and maintenance will come with this technology, like the isolation in case of disasters (certain areas may be isolated from the grid and only supplied from internal resources).

Fig. 3. Smart energy concept in smart city.

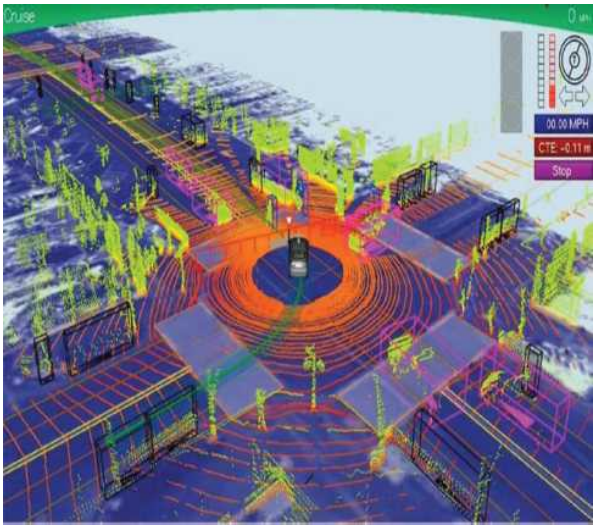

Fig. 4. Google car vision.

Smart Mobility and Transport. The connection of daily drivers and other transport solutions to the Internet, gives rise to a wealth of new possibilities and applications. New functionalities for the individuals will come, so the transport will be easier for all (consumer, manager, administrator) and safer. In this context we see an image of the Internet of Vehicles (IoV) connected with the Internet Of Energy (IoE). The new mobile ecosystems based on trust, security and convenience to mobile/contactless services and transportation applications will assure the consumer based transactions and services. Self-driving vehicles today are in the prototype phase . But tomorrow ? Using automotive vision chips that can be used to help vehicles understand the environment around them, detecting pedestrians, traffic lights, collisions, drowsy drivers and road lane markings, self-driving cars could be soon available for home users and enabled in the smart network. The ultimate concept for the intelligent mobility is represented by technical elements from the smart vehicle , on board sensors that will acquire data about the driver and all the car systems, interacting with external systems (traffic control systems, parking management, vehicle sharing managements, electric vehicle charging infrastructure).

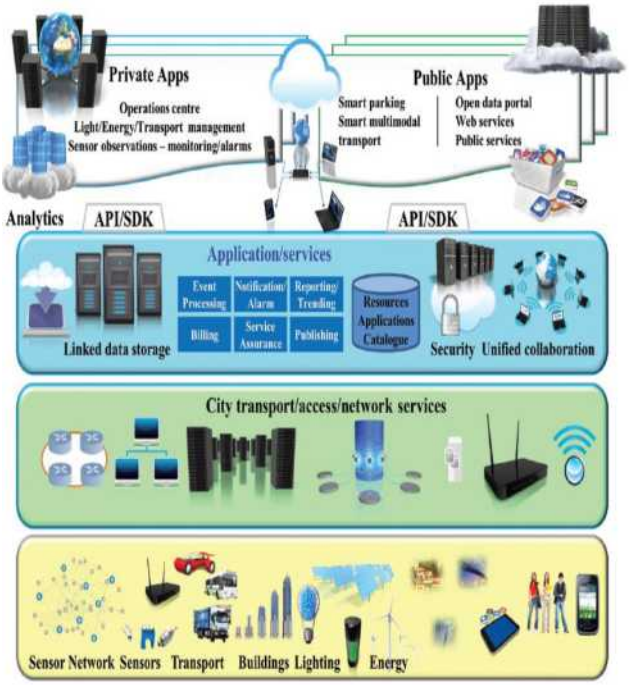

Fig. 4. Smart city layers.

Smart Cities. A smart city is the city where all critical infrastructures like : roads, bridges, tunnels, rail/subways, airports, seaports, communications, water, power, major buildings are being monitored via Internet. Those important points of the city with the help of the Internet Of Things, could achieve a better optimization for the resource usage, plan its preventive maintenance activities and monitor aspects of life and security while maximizing services to its citizens. Emergency response management to both natural as well as man-made challenges to the system can be focused and rapid. The technologic features, like : advanced monitoring systems, built-in smart sensors, big data blocks, big processing power, real time data processing could enhance the city management's decision-making. There are a number of key elements needed to form a Smart City, the focus is on the smart society but we also should count : smart buildings, smart energy, smart lighting, smart mobility, smart water management, etc. The basic infrastructure is starting with sensors/ actuators, connectivity solutions and is ending with electronic systems/devices and software. The communication gateway is a key enabler for the interconnection of systems in many domains like: Internet of Energy (IoE), Internet Of Vehicles (IoV), Internet of

Buildings (IoB) and Internet of Lighting (IoL). A smart city represents the developed urban area that is creating sustainable economic development and high quality of life by excelling in multiple key areas : economy, mobility, environment, people, living and government.

4. SECURITY

One of the biggest concerns in the IoT is about privacy and security ("OK, I now come home to a warm house, but did I just compromise my credit card and provide people with knowledge of my whereabouts to achieve that?"). The key is to find "that things" that will make our lives better, save our money, conserve natural resource or improve our power consume. At every wave of the Internet evolution we discovered key areas that are the best for us. Things are being connected more and more in areas like :

– home security, lighting, entertainment, appliances, HVAC and assisted living;

– Industrial processes for manufacturers (machines monitoring, factory connections);

– resources management (smart electricity grids, electric vehicles).

5. CONCLUSIONS

1. Nowadays, with every device connected we have specific software to enable it to communicate with other devices and the producer databases. This is how the process of gathering data to make our lives more efficient.

2. The IoT concept comes with a brand new different process of gathering data, everything will be different. As a comparison, the first wave of the Internet evolution came with common software like Windows and Google. The second wave of the Internet evolution came with Android and iOS systems provided on large numbers of smartphones, that were enabled to easily communicate, the third wave, the IoT wave will also require common software and new standards, for easily enabling them.

3. The emerging idea of the Internet of Things (IoT) is rapidly finding its path throughout our modern life, aiming to improve the quality of life by connecting many smart devices, technologies, and applications in a smart city area.

4. This paper presented an overview of the premise of this concept, its enabling technologies, protocols, applications, and the recent research addressing different aspects of the IoT.

5. We finally presented the need for new "smart" autonomic management, data aggregation, and protocol adaptation services to achieve better horizontal integration among IoT service.

6. Finally, detailed application-use cases were presented to illustrate typical protocol integration scenarios to deliver desired IoT services.

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