A Survey: Smart City Services

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Abstract:
Smart city is defined as the ability to incorporate multiple technological solutions in secure fashion to manage the city assets. Smart City represents one of the most promising, prominent and challenging applications. In the last few years, indeed, the smart city concept has played an important role in academic and industry fields, the concept of smart city uses event processing. Event processing is nothing but processing of the past or real-time dataset to generate the new conclusion. These conclusions are helpful to find the opportunities or threats about any particular event. We have distinct approaches in processing of smart cities, so that ecosystems are not able to communicate between them. For this, there is necessary to provide a global common approach, for this purpose we are presenting a survey on processing of smart cities. This paper also presents challenges in this research area.

Key words: Event Processing, smart city, information of communication technology (ICT).

1. INTRODUCTION

Cities are growing steadily and urban living poses major challenges in our daily lives. As of 2007, 50% of the world population was living in cities rather than rural areas. The United Nations Population Fund forecasts that by 2030approximately 60% of the world population will live in an urban environment. As of 2007, 50% of the world population was living in cities rather than rural areas. In India, according to the 2011 census the rural-urban distribution is 68.84% and 31.16% respectively, the level of urbanization increased from 27.81% in the 2001census to 31.16% in the 2011 census. In this context, Information and Communication Technologies (ICT) together with local governments and private companies, play a key role for implementing innovative solutions, services and applications to make smart cities a reality. Smart cities aim is to decrease the challenges that cities face, such as scarcity of energy resources, healthcare, housing, water and deteriorating infrastructure (roads, schools and transportation).they also suffer from instability, climate opportunities and social benefits.

Smart City Requirements

It is useful to identify the main requirements, in terms of ICT-based services and solutions that a city presents. To this purpose, by following the same approach introduced in,

We make reference to two different types of requirements, that are:

1) service/application, considered from the point of view of the citizens and 2) operational, seen from the city authorities and administrators of the networks viewpoint. Concerning the service/application aspects, the end-users devices equipped with multiple radio technologies and several sensors and actuators deployed all over the cities, make possible the individuation of novel services and applications for the citizens.

These services will have specific features, like:

a) user-centric: based on the specific context and the preferences of the users, b) ubiquitous: reachable everywhere and from any devices, and c) highly-integrated: based on the integration of services and data from several and different applications or on the social cooperation of multiple users. Of course, beyond the citizens, also the stakeholders of a city, like educational institutions, healthcare and public safety providers, governmental organizations, etc. will be in conditions to exploit the key features of these new services that make the city more sustainable.

The smart city objects:

Smart Meters

A smart meter system has benefits for the customer and the company. It consists of smart meters, communication infrastructure, and control devices. Smart meters can calculate electricity usage, and provide information to the company to regulate power and monitor and control devices.

Smart Home

The papers reviewed had different views of the smart house. Some viewed the house in terms of its dependence on modern technology. However, we view the modern smart house as controlled by the occupant/owner. The smart house obeys the owner's wishes in terms of protection and comfort. Technologies that support the communication of the smart house with the owner are mobile, computer, and internet networks, whether the owner is inside or outside the home. The goal of smart building is to satisfy both the owner and the occupant, and not everything that one customer requests is requested by another. One solution provided by a smart building is lighting control; an intelligent lighting system provides lighting everywhere so that the occupant never has to enter a dark room. Energy and temperature controls provide cooling or heating in the home. Security and safety are provided by temperature and movement sensors, which can also turn off lights and lock doors when you exit, and sound the alarm if intruders appear. Entry and exit is controlled by pass codes entered on a keypad.

Smart Water

A smart city uses a variety of techniques and systems that contribute to reducing water use. Poor management and suboptimal use of water have large negative consequences. We need to have smart systems to maintain our natural wealth

through 1-monitoring and control of environmental water such as natural rainfall, surface water, groundwater, wastewater and agriculture water, 2-analysis and response to the data to improve the efficiency of use, which requires cooperation with all stakeholders, 3-ensuring the safety and health of the network and making sure ongoing maintenance is performed, 4-controlling pollution and strengthening the capacity to respond in an emergency, 5-using smart water meters that predict the population's consumption of water, 6-designing green spaces which help reduce evaporation, and 7-using local plants and trees which require little water.

Smart Health Care

Smart cities provide multiple solutions, but require cooperation among local hospitals and private networks for the exchange of the necessary information to increase efficiency for the treatment of patients and link with pharmacies to provide drugs quickly and easily. Special wireless access to emergency departments can help with medical emergencies by transmitting vital information. Automated diagnosis and health care can be provided for the patient in a dangerous situation. Sensor devices can be put on the patient's clothes or skin and information sent to the hospital. The devices can monitor temperature, rate of breathing, etc. in real time.

Smart Food

A smart food system consists of a tracking system which monitors the food supply, production, processing, transportation, and risk control. Another element is ensuring compliance with health and safety systems. An emergency system can provide early warning of food security problems.

2. LITERATURE SURVEY

In the last few years, the government has decided to provide a national project to implement smart infrastructure. The first step, which is based on maintaining wireless infrastructure by Enterprise Resource Planning (ERP), is replacing the old infrastructure with a new one. The smart city maintains a smart database resource, a smart building management system, and a smart interface. The goal of this system is to improve operations and maintenance and reduce operating costs. (Al-Hader, Rodzi, Sharif, & Ahmad, 2009a). Smart cities are called by many names such as: e-city, digital city, information city, smart communication and digital communication. The main smart cities in the world are: Malta, Dubai internet city, Dubai media city, Dubai festival city and Kochi. Building a smart city improves the infrastructure and use network, contributes significantly to reducing administrative cost, and enhances the quality of services, because it provides initial guidance to improve operations and maintenance. The development of the smart city needs 1- infrastructure preparation, 2-building a database, and 3-building a management system. (Al-Hader, et al., 2009b) Adam Dunke is one of the top 35 innovators in the last 35 years in the field of micro-sized IP-based technology. He discussed challenges in managing the growth of a city, observing water supply and energy, and ensuring safety. He also discussed factors that influenced the development of an IP-based sensor network such as that the people did not have awareness and network skills; sensor networks working on wireless networks require special knowledge. (Vasseur & Dunkels, 2010). Smart cities rely on their existing infrastructure, with several improvements and modifications. "SOA technology" is used to build the information system in the smart city and improve the management of the system, increasing its speed and reliability in addition to safety.

(Duravkin, 2010). The "Eco-system" concept takes into consideration NANO-bots, found in computer devices, smart buildings and smart cities. NANO-bots are used in smart phones, cameras, smart objects and home robots. Though their use may threaten the environment, in the end, their usefulness is worth the risk. (Duval & Woo, 2010). The objective was to create a platform with infrastructure depending on electricity, consisting of three layers: physical, data transfer and information flow. But there are some challenges to creating the platform. Smart cities are changing the economic system, the financial system and the social system on the basis of an infrastructure based on electricity and energy. The power system component of a smart city consists of smart buildings, smart meters, a smart grid and a transitional phase. (Lugaric, Krajcar, &Simic, 2010). In this section, we will discuss the articles included in the survey that cover the issue of the smart city in a more general sense. Technology has caused a sensation in the world. It has led to the creation of the first smart cities. The first smart city in South Korea is "ECO-U-CITY" aka Huaseong Dengtan. It was completed in 2008, and six more smart cities are being designed. South Korea developed Eco-U-City as a smart city with green technology for greater safety and comfort with less carbon emissions. An Integrated Service Management Platform (ISMP) system was created which consists of 3 layers: service, middle ware, and infrastructure. (Jungwoo, et al., 2011) City infrastructures have faced crises and severe pressure, due to increased demand for water, energy, transportation, health care, education, and safety. Migration and urban growth have caused these problems, and smart city technology can be the solution to meet the future needs of the citizenry this is sought by many countries such as the United States, Brazil, Denmark, South Korea, and others. However, still there are many obstacles and problems, whether technical, socioeconomic, or political, that must be faced. (Naphade, et al., 2011) A smart city consists of smart infrastructure, people, management, phone, transmissions, the internet, cloud computing and IOT to improve efficiency. Smart cities start with ICT, focusing on broadband infrastructure. However, the government must approve the development of the smart city, and there may be higher priorities. This paper presents some models such as a fire project that consisted of end users and researcher, an IEFIS project for utility management, and an ELLIOT project for service, transmission, and environment. (Schaffers, et al., 2011) Smart cities have to be smart in mobility, living, economy, environment, government, and the people. They must provide service anywhere and anytime. In disaster management, we need quick response to situations as well as risk management. For success in the workplace, we need cooperation on policies, experience, equipment, and employees; also, development by using grid and cloud technology. (Asima kopoulou &Bessis, 2011) Cisco joined the Songdo project in 2009 and has invested US $47 million in order to make Songdo a smart city and the most wired in the world. This goal is expected to be achieved in 2018. The project is focused on buildings and has collaborated with developers to build its networking technology into new buildings. These buildings will include telepresence capabilities and many new technologies. This domestic offering is only the first step; Cisco aims to link energy, communications, traffic, and security systems into one smart network. (Strickland, 2011). The Sens city project provided a platform between "M2M" and the network to allow access to the web. Some of these services were smart metering and traffic and parking management. M2M system infrastructure consists of devices, sensors and actuators. A multi-agent

organization using the MOISE framework for smart parking management helps drivers find parking spaces, and reduces traffic and pollution. (Persson, Picard, & Ramparany, 2011). When an accident happens, the connections in the network are disabled, and it is important to help people in danger, using audio and video technology such as push-to-talk, real-time text messaging, broadcast/multitasking, "UMTC" satellite communication, terrestrial trucked radio, Wifi, and Wimax. ERCN infrastructure is perfect for emergency and disaster events; it connects different types of networks by "WMN ". (Fragkiadakis, et al., 2011)

3. KEY CHALLENGES

Smart city being a gigantic information system, comprising sub information systems, bring enormous challenges. Smart city initiatives are fundamentally based on ICT. The latest developments in cloud computing, Internet of Things, open data, semantic web, and future internet technologies will be leading technologies to enable smart city development. These technologies can altogether provide infrastructure, applications and turn-key solutions for offering various services. ICT has immense potential to enhance the management and functioning of a city which in turn will benefit citizens. However, all these technologies have their inherent challenges and limitations. Combining all these technologies to form a complex system, like smart city, will magnify the amplitude of many long-standing challenges.

A. IT Infrastructure
The development of ICT infrastructure, from communication channels to sensors and actuators in physical space remains a huge barrier in taking a smart city initiative. Lack of infrastructure is a significant barrier in achieving smart city objectives. Reliable, scalable and high speed network connectivity and infrastructure is a key foundation for integrating information systems across city. This infrastructure has to be in place before smart city services are offered to stake holders. Consequently, the adequate reliable IT infrastructure which tends to be scalable is a critical challenge for the implementation of smart city.

B. Security and privacy
As the trend move towards smart city, and different gadgets becomes integrated within everyday lives, personal data collection creating privacy issue is intrinsic. For example, an intelligent traffic management app that updates user about traffic congestion will require that location of the user is collected. To meet the security and privacy requirements is a fundamental challenge for smart city system where huge amount of sensitive data processing is involved. Threats from hackers, intruders, viruses, worms, Trojans etc has immense potential to disrupt the services and bring down the whole system resulting in enormous losses. Extensive security approaches are required to secure sensitive data at levels including collecting, processing, storing and disseminating. Security and privacy are significant not only in making data and services available, but they are also essential in building citizens trust and confidence in using these systems.

C. Big data Management
Understandably, huge amount of data will be generated from all smart city systems. To handle various types of data, with varying velocity an efficient big data management system is required. This system has to be reliable and scalable with no downtime. Continuous generation, collection, processing and storage of massive heterogeneous data from countless smart city sensors has its own intrinsic challenges. Nevertheless, big data collected across city is extremely useful and is vital for achieving objective of smart city. For example, GPS sensors installed on vehicles may give valuable information about transport flow but it will generate huge amount of high velocity data.

D. Cost
Smart city evidently would require acquiring enormous IT infrastructure. Huge financial investment is to be obtained to put the system in place. Millions of sensors, thousands and thousands of networking equipment and computing devices will be needed to get end to end connectivity. Similarly, requirement of IT professional and consultancies will make up a considerable amount of expense. This investment is not limited to one time only, operational and maintenance cost of such a huge real time system will be much higher. To meet stringent reliability and efficiency requirements more resources will be required leading to higher overheads. For example, in case of smart traffic management system each car has to fitted with a sensors and thousands of road side units must be installed. Such system cannot afford a downtime and must be highly efficient and reliable. In a typical urban city, cost of implementing such a project may be around millions of dollars.

E. Heterogeneous environment and Interoperability
Smart city architecture is characterized by Heterogeneity of networks, applications, devices, platforms etc. For instance, Vehicular networks may require adhoc networks like VANETs while close range wireless devices may work on zigbee. The legacy applications and their integration with emerging technologies will also be significant challenge.

F. Efficiency, Availability and Scalability
Critical systems cannot afford downtime and requires very high availability. Challenge of meeting the tough requirements of availability is directly proportional to the size and complexity of the system. Smart city, not only have a huge infrastructure but its size and complexity will be increasing leaps and bounds as it goes operational. Massive amount of data generated across the city will make availability, scalability and efficiency a critical challenge.

G. Social Adaption
The smart city seems to be an ideal solution to overcome existing and emerging urban population problems. Although, researchers have also identified challenges with reference to inequality, digital divide and changing cultural habits. Social adaption of such a system requires changing social habits of citizens generally and city management people specifically.

H. App development
Faster development of new and innovative applications will require so that citizens can take maximum advantage of data that is being collected. If application development is limited to city management, it is very likely that people will be disappointed by slow application development. For example, one of the key reasons behind Android 's success and wide adaption is its play store, its huge app base where countless applications are uploaded every day.

4. CONCLUSION:

Technology has made many fantasies about the lifestyle of the future a reality. The smart city is just one of the technical

applications that have done this. The idea of smart cities is applied to multiple images in many parts of the world such as the United States, Brazil, Denmark, South Korea, Malta, Songdo, China, Taiwan and others. These cities will make a qualitative leap in the quality of life. Smart cities are built to suit the needs and potential of the modern city. Some of the nomenclature used is the "smart" city, digital city, information city, smart communication, and digital communication. The smart city depends on building a smart infrastructure based on a wireless sensor network (WSN) which represents the backbone of the city depending on the global network. WSN still faces many problems; the Moving Sensor Unit (MSU) been established as a solution to address one of these problems. An ICT system is much more sophisticated and complex; there must be integration of data from different sources, and the cities must have the ability to respond "smart" for different requirements of daily living; for example, the fire system sends an urgent communication to the fire station nearest the site of the fire. Nearby hospitals are alerted to the arrival of patients. The entire system relates to the central system for administration of the city. ICT covers all areas such as government facilities, buildings, traffic, electricity, health, water, and transport. The concept of the smart city is still in the initial stages and we cannot yet prove the efficiency of "smart" cities because the concept has been applied only in small areas. People should be receptive to the use of this technology which is characterized by its interaction with the user.

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