IOT Based Smart City

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Abstract- *Most of the population today lives in cities due to rapid growth of the population density in urban cities, infrastructure and digital technologies, to meet the needs urban public and city development smartly, the smart cities have been accoutred with different electronic device on the basis of Internet of Things, thus interconnecting thousands of iot devices while communicating with each other over internet to establish a smart system, therefore becoming smarter than before. The aim of this article is that of providing a overall review on the concept of smart cities and on their motivational and application.*

I. INTRODUCTION

Smart City solutions are presently based on several framework, standards and platforms, which have led to a highly shattered environment. In order to allow cities to share data across systems, it is essential to break these silos. A way to achieve the motive is sensor virtualization, revelation and data restoration. Accordingly, there has been an astounding growth of digital devices, such as actuators, smart phones and smart appliances, computation, communication protocols, services and semantics which impel to huge commercial objectives of the Internet of Things (IOT),. In the smart city application we will have vast data to be collected from various applications and database which needs to be classified and evaluated. In the past, it was difficult or even impossible to combine these digital devices. Likewise, gathering their information for day-to-day management of activities and long-term development planning in the city is essential. For example, some public transport information, applications and real time location , traffic jams , tenancy of parking areas, sewer managment and other data like weather conditions, noise pollution and air pollution status, disaster management ,water contamination, governance, safety, energy consumption, etc. should be convened continuously. To this end, different technologies have been applied to address the specific features of each application. The required technologies cover a wide range and layer from the physical level to the data and application layers.

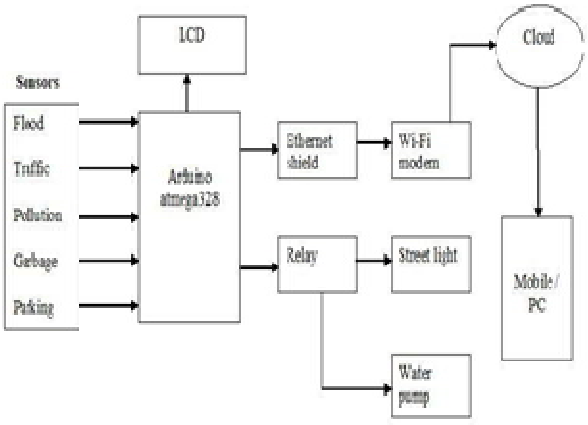
The most basic architecture of Iot is three layer architecture. It has three layers namely, the perception layer, the network layer, and the application layer. The perception layer is a physical layer which includes a group of Internet-enabled devices that are able to perceive, detect objects, gather information, and exchange information with other devices through the Internet communication networks. The example of perception layer devices are Radio Frequency Identification Devices (RFID) tag, barcode labels, cameras, sensors, Global Positioning Systems (GPS). Forwarding data from the perception layer to the application layer under the restraint of devices' capabilities, network limitation and the applications' restraint is the job of the network layer. Network layer collect the data perceived by the perception layer. Short range networks communication technologies such as Bluetooth and zigbee are used in IOT system which are used to carry the information from perception devices to a nearby gateway based on the capabilities of the communicating parties with the network layer is responsible for connecting to other network devices, smart things and server. Internet technologies such as wi-fi, 2G, 3G, 4G and power line communication (PLC) carry the information over long distance based on the application.

II. LITERATURE REVIEW

Byun, Kim, Sa, and Others (2016) in the proceeding paper,Smart City Implementation Models based on IOT (Internet of Things) Technology‟, outlined IOT based smart city business(service) model[1]. Gaur, Scotney, Parr, and Mcclean (2015) stated in their paper, Smart City Architecture and its Application Based on IOT‟, that the IOT and wireless sensor network contribute a large amount of data. In order to take advantage of the increasing amounts of data, there is a need for new methods and techniques for an effective data management for the IOT[2]. Meanwhile, Park and Rue (2015) introduced in their paper, „Analysis on Smart City Service Technology with IOT‟, the technologically advanced countries‟ IOT based smart city service models. Examples of this are the smart grid, parking management system, smart home, smart farms using foreign cases, and basic introduction[3]. Ji, Ganchev, O‟droma, Zhao, and Zhang(2014) presented in their paper, „Cloud-Based Car Parking Middleware for IOT-Based Smart Cities: Design and Implementation‟, the generic concepts of using cloud-based intelligent car parking services in smart cities as an important application of the Internet of Things paradigm. They showed a high-level view ofthe smart parking system middleware and demonstrated the provision of car parking services[4]. Internet

of Things is maturing and continues to be the latest, most hyped concept in the IT world. Over the last decade the term Internet of Things (IOT) has attracted attention by projecting the vision of a global infrastructure of networked physical objects, enabling anytime, anyplace connectivity for anything and notonly for any one [5]. The Internet of Things can also be considered as a global network which allows the communication between human-to-human, human-tothings and things-to-things, which is anything in the world by providing unique identity to each and every object [6]. IOT describes a world where just about anything can be connected and communicates in an intelligent fashion that ever before. Most of us think about "being connected" in terms of electronic devices such as servers, computers, tablets, telephones and smart phones. In what's called the Internet of Things, sensors and actuators embedded in physical objects—from roadways to pacemakers—are linked through wired and wireless networks, often using the same Internet IP that connects the Internet. These networks churn out huge volumes of data that flow to computers for analysis. When objects can both sense the environment and communicate, they become tools for understanding complexity and responding to it swiftly. What's revolutionary in all this is that these physical information systems are now beginning to be deployed, and some of them even work largely without human intervention. The "Internet of Things" refers to the coding and networking of everyday objects and things to render them individually machine-readable and traceable on the Internet [7]-[12].

III. METHDOLOGY



The IOT is a broadband network that uses standard communication protocols while its convergence point is the Internet. The main concept of the IOT is the universal presence of objects that can be measured, inferred, understood and that can change the environment. On this basis, IOT is enabled by the developments of various objects as well as communication technologies. Involved things in the IOT consist of smart devices including mobile phones and other objects like foodstuff, appliance, landmark, monument, work of art that can cooperate together to provide a common target. The impact of the IOT on the life of users can be considered as its key feature. Some of the IOT-related technologies are discussed in the following.

1. Flood alert circuit:

Floods are natural disasters that cause excessive loss of life and property, when the water level rises the situation of flood arises. By implementation of flood detection mechanism the loss caused due to flood can be reduced. The aim of this quantized project is to monitor the flood situation at the earliest & in case of danger notification is send on webpage. The notification sent can be read globally through IOT. A flood detection mechanism is connected to the arduino that measures the value of water in the dams or rivers and sends that information to the arduino. The arduino sends that notification through the internet on the webpage using IOT network.

2. Smart traffic management:

Smart Traffic management system (STMS) is a one of the important feature for urban ontology. Currently traffic management and alert systems are not fulfilling needs of STMS. Providing better service for traffic management is more expensive and highly configurable. This concept proposes a low cost RealTime smart traffic Management System to provide better service by utilising traffic indicators to update the traffic details instantly. Low cost vehicle detecting sensors are embedding in the middle of road for every 500 meters or 1000 meters. Internet of Things (IOT) is being used to acquire traffic data quickly and send it for processing. There are several analytical methods to analyze the traffic density and provide solution through predictive analytics. A mobile application is developed as user interface to explore the density of traffic at various places and to manage the traffic in alternate way.

3. Environmental Detection:

Most of the cities uses expensive device monitoring stations for observing pollution and weather conditions. However, most of these can't be monitored in real time. New systems have emerged over time containing many more sample points. In addition to this identifying the source of potential problems becomes easy, faster, and more efficient systems. They also provide invaluable data for planning.

Basically, urban ontology residents will be able to monitor their environment in real-time.

4.Smart Bin collection:

Smart sensing can allow cities to analyze and optimize the way they deploy the services. This application opens the gateway to a greater extent to opportunities. This technology can help cities plan individual truck rolls or collection routes. This not only save time, but also adds efficiency to the process.

5. Smart Street Lighting:

Analysts have cited smart lighting as one of the prominent urban ontology applications deliberated upon for quite some time now. The popularity of this application is related to its impressive early growth, as well as its clear business case. The application is increasing its significance by reusing the lighting column as a communications hub.

6. Smart Parking:

The whole point of introducing the concept of parking was to reduce congestion; however, the business case was unclear with most of the cities. However today, IOT has introduced significant number of advances that will not only help save costs, but also encourage citizens to change their behaviour to make these places an enjoyable visit.

IV. WORKING

In this project we are using ATMEGA328 microcontroller and various type of sensors. The first sensor is the float sensor for detecting flood, the sensor is placed at ground level in which there are two electrodes to know whether water is there or not; but that is not sufficient we also want to know the amount of water. Here the float sensor touched to ground level the shaft which is attached upward to the angular potentiometer.one pin is connected to ground and the other to VCC. The shaft is connected to A0 pin of microcontroller. IF there is no water the float will be touched to ground then the voltage will be zero, if there is rise in water level the float will also rise; as the float rises the voltage at shaft will increase and by this voltage we will know how much is the flooding.

Now the second sensor is traffic sensor, so for sensing traffic we can use IR sensor. IR sensor detect how many vehicle's has passed, but there are some risk of using IR sensor that it may give false reading if its alignment is shifted, IR sensor can also detect human so to overcome this problem we use BUMP sensor. BUMP sensor is basically a metal plate, there is a micro switch whose one end is connected to ground and other point is sent to microcontroller and that point is pulled up by a resistor and also there is a heavy duty spring. This sensor gets triggered by weight of 500kg and more. When a vehicle is passed it will give pulse output. If the vehicle is slow then the sensor will be pressed for long time, supply will be ground and we get active low trigger. And if speed is high then then the output will be low trigger. Now we do sampling of 1min if the pulse width is low in 1min hen we will say traffic is moving fast and if pulse is continuous ON then traffic is jam.

Pollution sensing we are using MQ6 sensor. This sensor sense LPG gas. There are heater plates in this sensor to which we supply power and one point is grounded. The output of sensing plate will be across load. When we supply power to the heater plate it gets heated up and when gas enter because of heating ions are formed; this ion when go to the sensing plate it generate a flow of electron across resistor we will take it as voltage. So more the gas, more the ions and higher the voltage. By this we can calculate the pollution. For parking management we use inductive proximities switch. At the front sensing part of this switch there is a coil, the coil is oscillated at a fixed frequency. This sensor is fixed on the road, when there is no vehicle the oscillation is constant and when the metal is detected the oscillation frequency changes. The output is applied to the microcontroller to A3 pin. If no metal then logic is 0 and if the metal is detected logic will be high.

Garbage bin sensor, there is a LED with a current limiting resistor and a photodetector. Emitter will be grounded and load will be applied to collector with a supply of 5V and output will be given to microcontroller. When there is no garbage the lower LED will blink. The photodetector junction will break so leakage current will flow, the transistor will be ON and supply will be grounded so the output will be zero. If the garbage is full the transistor will be OFF output will be 5V.

To know whether the sensor are working or not LCD display is used , Ethernet shield there is a RJ45 jack. Serially we need to send data. Ethernet has to exchange data on internet continuously and also to verify if the data has been sent or not. We use a Arduino board under the Ethernet and also a ATMEGA328 microcontroller on theta Arduino board. The work of this microcontroller will be to handle the data of internet .0 and 1 pin of microcontroller will be Rx and Tx pin which we will serially interface. Now if the control room gives any command then to take this command we will give output of microcontroller to the transistor. Pin no 9, 10, 11, 12 the emitter will be grounded and the collector will be attached to

the relay pf 12V. The relay will be connected to the street light. If the contact of relay are open the street light will be OFF but if we get the signal to ON the light then the transistor will be ON and supply will be grounded, coil will be magnetized, contact will be close and light will be ON.
Fourth relay there will be supply of 230V and a pump. This 230V supply is step down to 12V by step down transformer. There is a cloud service which we use to transfer data over Internet.

V. RESULT

Smart technologies can provide solution for cities by helping them save money, reduce carbon emissions and manage traffic flows. Adding smarter technologies with their economic development and public services plans and considering how growing technology help them achieve existing goals more effectively.

VI. CONCLUSION

This study is significant in utilising general information about IOT such as definition market size and status of IOT which has become a hot IT topic nowdays and in presenting applicable IOT business models to help business entities and research institute participating in related project build a smart city as part of the future vision of local government by reflecting the new information model of IOT.

VII. FUTURE SCOPE

There is lot of talk about smart city created with IOT technologies as the future of urban living. Transportation, energy, healthcare, water &waste are some of the government sectors looking at integrating information and technology to make the live of resident better. Yet, while each sensor and IOT application contribute value in its own way, they are only individual pieces of the vision of what smart city can bring.

REFERENCES

[1] Gauer, A.: Smart city Architecture and its applications based on IOT, Procedia computer science, (2015), Vol.52, pp.1089-1094
[2] Bagula, A., Castelli, L and Zennaro, M.: On the design of smart parking networks in the smart cities: An optimal sensor placement model, Sensors, (2015), Vol.15, No.7, pp.15443- 15467. 3. D. Kyriazis, T. Varvarigou, A. Rossi, D. White, and J. Cooper, "Sustainable smart city IOT applications: heat and electricity management & Eco-conscious cruise control for public transportation," IEEE 14th International Symposium and Workshops on World of Wireless, Mobile and Multimedia Networks, pp. 1–5, 2013.
[3] M. Parvania, and M. Fotuhi Firuzabad, "Demand response scheduling by stochastic SCUC," IEEE Trans. Smart Grid, vol. 1, pp. 89–98, 2010.
[4] Kosmatos, E.A., Tselikas, N.D. and Boucouvalas, A.C. (2011) Integrating RFIDs and Smart Objects into a Unified Internet of Things Architecture. Advances in Internet of Things: Scientific Research, 1, 5-12. http://dx.doi.org/10.4236/ait.2011.11002
[5] Aggarwal, R. and Lal Das, M. (2012) RFID Security in the Context of "Internet of Things". First
[6] International Conference on Security of Internet of Things, Kerala, 17-19 August 2012, 51-56. http://dx.doi.org/10.1145/2490428.2490435
[7] Biddlecombe, E. (2009) UN Predicts "Internet of Things". Retrieved July 6.
[8] Butler, D. (2020) Computing: Everything, Everywhere. Nature, 440, 402-405. http://dx.doi.org/10.1038/440402a
[9] Dodson, S. (2008) The Net Shapes up to Get Physical. Guardian.
[10] Gershenfeld, N., Krikorian, R. and Cohen, D. (2004) The Internet of Things. ScientificAmerican, 291, 76-81. http://dx.doi.org/10.1038/scientificamerican1004-76
[11] Lombreglia, R. (2010) The Internet of Things, Boston Globe. Retrieved October.
[12] Reinhardt, A. (2004) A Machine-to-Machine Internet of Things.