

Smart City Prototype Design and Development of IOT-Enabled Applications

Khamruz Zama¹, Ramakrishna Prasad A L², Shiva Murthy G³

¹Dept. of Computer Science & Engineering, Visvesvaraya Technological University, CPGS Bengaluru Region, VIAT, India

²Assistant Professor, Dept. of MCA, Visvesvaraya Technological University, CPGS Bengaluru Region, VIAT, India

³Professor & Head, Dept. of MCA, Visvesvaraya Technological University, CPGS Bengaluru Region, VIAT, India

Abstract: The name “Smart City” is reaching to the extremity in concurrent eco-machinery and techno-diversifying approach of the future eon in fast moving inventions. Combining Thousands, Millions, trillions of devices, intercommunication among them is a big challenging task in front of all future engineers, developers and government bodies of any nation. The main geographies of a smart city include a rich motivation towards ITC integration and a wide-ranging solicitation of data resources. The indispensable modules of inner-city expansions for a smart city should take account of Smart-Agriculture, Smart -Industries, Smart-Homes, Smart-Livings and many more smart applications. In this paper we have come up with a prototype Framework model for the design and Implementation of some of the applications. We organize it as section I elaborates the introductory about IOT and Smart city, Section II defines the related works , section III Proposed system Architecture and ending with the conclusion and results that gives the future directions to the application support.

Keywords: IOT, Smart City, Sensor Technology, ARM, GSM

1. Introduction

We all are at the era of Internet of Things (Future of Computing) Where we are surrounded by, thousands, millions of devices, globally connected which are more powerful for daily life for analyzing, sensing, information processing & interfacing inter-disciplinary services. IOT refers as a more of the most & powerful future computing, in which more than 60 Billion devices will be connected by the end of year 2025[13].

IOT deals with many service areas like energy utilization, typical application – oriented security, interface with multiple software, collaborative services & many research challenges. The figure 1 shows the broad classification of wider services provided by IOT. It can connect diverse devices, platforms, interfaces, many governments, across the globe. It classified & works in different based platform, Organization-based platform and Business-logic based platform and private-sector based platforms.

Three fourth of world’s population are now living in cities’ due to rapid growth in the increased urbanizations. According to one survey, the 80% of the population will live in cities by 2020. As the cities increases, the demand for services also increases and should be digitized such as Smart Resources (Energy), Regenerative energy, Smart communication networks, Smart Government , Smart Homes, Smart Irrigation, Smart Logistics, Smart manufacturing etc.,

Smart city is a new revolutionary model that is based on existing conditions of city developments. As the increase of industries, the scalability of cities have widened drastically with increased urbanization, increasing the demand of the cities and technical improvements. Of course, increase in cities has resulted in some negative effect such as demand-supply issues, increase in day to day things, over usage of resources, environment pollution and natural imbalance. To overcome these issues, challenges and problems, many

concepts related to cities are developed over many decades such as eco-city, knowledge city, live able city, electronic city, Low carbon city, green city and digital city [16].

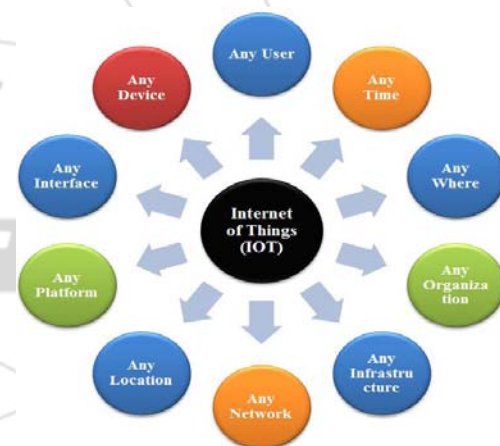


Figure 1: Internet of Things (Everything)

These concepts have provided a new avenue for the development of “Smart City.”

2. Related Work

The Internet of Things (IOT) enables to joint evidently flawlessly very huge numeral of indifferent and assorted end machines and equipment’s, by basically enabling open source access to digitized services and enlargement for the solution to the IOT designed architecture. The huge devices are integrating together, diverse podium devices and multi-platform and service-concerned resolution for research challenges to prove alive and working.

The main theme of this literature survey is to discuss IOT and smart city relationship in wider sense and eminence on emerging technologies applications and research-learning issues and the prototype building framework for smart city.

The IOT is endowed by the latest development in Radio Frequency Identification (RFID), integrated sensors, cross-platform technologies and inter domain protocols. The primary moto of the literature is to have intelligent sensor dealing directly to control systems to provide and deliver a smart applications support. Basically in this review, the architectural framework with applications to build smart city project is discussed and implementation of prototype modules which helps in our daily life easy and smooth.

Many researchers, developers, engineers, architects and government and private agencies are trying to find the solutions to the daily citizen’s problems, hence, the goal of literature is in the same future directions by following the reviews and artifacts.

3. Proposed System Architecture

The Present system of cities in urban area is not fully digitized. The rate of digitization is not increasing due to many reasons.

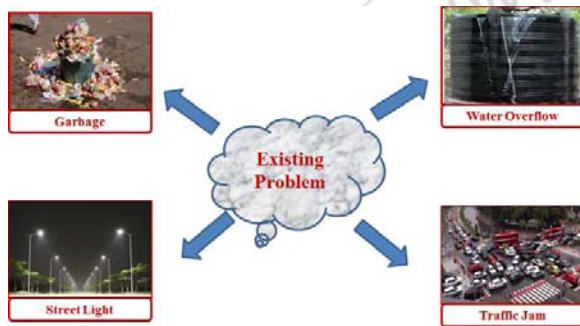


Figure 2: Present Urban Scenario

To overcome the above existing problem, herewith concept of “Smart City” is developed to make the technology into action and useful for the society.

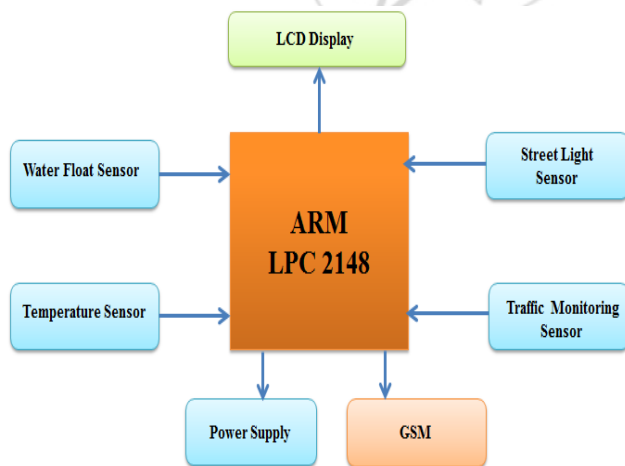


Figure 3: System Architecture

The proposed system is designed based on the concepts of “smart city” means digitized city with the help of technology i.e., Internet of Things and Wireless sensor networks. The major aim of the project is to design and implementation of Smart City application/ services are:

- **Smart Street Light** - Each Streetlight sense humidity level and automatically switch ON and switch OFF the lights.
- **Temperature Monitoring System** – Detection of cold (min) and hot (max) temperature.
- **Water leakage prevention system** – Recognition of Water Level inside the Tank.
- **Smart Traffic Monitoring System**- Traffic lights can be adjusted to regulate traffic flows and traffic jams.

4. Experimental Results

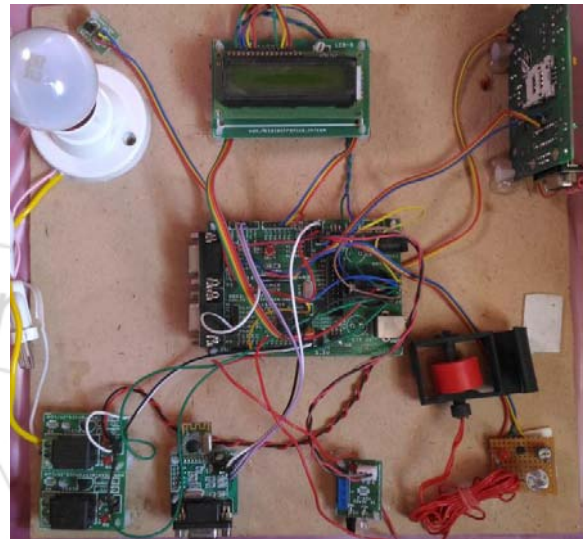


Figure 4: Proposed Work

This design is implemented for building the Smart city application using the Internet of Things. The implementation phase is yet another step of development of software and Hardware. In this we used several sensors like LM35, IR, LDR & Water_float sensors that detects or measures the physical property and record it, then sends its measured value to microcontroller. μc convert this value into “signal”, which can be read by an observer or by an instrument. Later it displays a message in LCD or sends sms via GSM to particular mobile phone or corporate office.

5. Conclusion

The thrill about smart cities is contagiously intensifying. In fact about 10 years back the citizens were hearing about smart phones and smart objects through a series of rapid technology advancements all over the world. Now the concept of smart cities is mounting to its top rating and every country want to go with it. As per demand for the revolution and scarcity of natural resources started, every country want to save its resources in all the fields.

In this project, the design and execution of smart city is proposed by using the concept of IOT and sensor technologies. The project explains the applications and role of many application oriented sensors such as water level sensor to measure the water level in many applications, Temperature sensor related applications such in smart factories, cold storages, green farming etc. Infrared sensors cover traffic congestion, object recognition etc. LDR sensors are used in the applications for measuring Light intensity,

smart homes and humidity etc. The project covers prototype design of four applications and implementation is done.

Therefore, the smart city venture desires to be planned wisely, considering the different government organizations needs and requirements along with the solutions to the common problems of the citizens. As much as the visualization of smart cities is inconceivable and coherent, its operation on India at the present conditions is very difficult to adopt by the country with respect to investment and maintenance.

References

- [1] Andrea Zanella, Nicola Bui, Angelo Castellani, Lorenzo Vangelista and Michele Zorzi, "Internet of Things for Smart Cities", vol.1, no.1, Feb 2014.
- [2] Ivan Ganchev, Zhanlin Ji and Mairtin O Droma, " A Generic IOT Architecture for Smart Cities" CTICT 2014, Limerick, June 26-27, 2014
- [3] Anbhule pooja, Thite Dharani, Rathod Swati, Prof. T Praveen Blessigton and Dr. Y S Angal, "Design & Implementation of Smart City Using Controlled Area Network Protocol for controlling purpose", International Journal of Emerging Technology and Advanced Engineering, Volume 5, Issue 4, April 2015.
- [4] Abhishekh Murthy, Dong Han, Dan Jiang and Talmai Oliveira, "Lighting Enabled Smart City Application and Ecosystems based on the IOT" IEEE 2015.
- [5] Levgeniia Kuzminykh, "Development of Traffic Light Control Algorithm in Smart Municipal Network ", TCSET – 2016, Lviv-slavkse, Ukraine, 2016.
- [6] FNtambi, CP Kruger, BJ Silva and Hancke, "Design of a Water Management System", IEEE 2015.
- [7] Thorsten Kramp, Rob Van Kranenburg and Sebastian Lange, "Introduction to the Internet of Things", Chapter 1 & 2, 2016
- [8] Luca Calderoni, Dario Maio and Paolo Palmieri, "Location-aware Mobile Services for a Smart City: Design, Implementation and Deployment", Journal of Theoretical & Applied Electronic Commerce Research, Vol. 7, Issue 3, December 2012, 74-87.
- [9] Ruthbea Yesner Clarke, "Smart Cities and the Internet of Everything: The foundation of delivering Next-Generation citizen services", IDC Government Insight, No. GI243955, October 2013.
- [10] Gianni Andreottola, Alberto Borghetti, Clarissa Di Tanno, Carlo Alberto Nucci, Roustam Asimor, David Brunelli, David Macii, Gianmichele Panorelli, "Energy Systems for Smart Cities" 2016.
- [11] Hafedh Chaurabi, J Raman Gil-Gorcias, Theresa A Pardo, Tacwoo nam, Sehl Mellauli, Hans Jochen Schod, Shawn Walker and Karine Nahon, "Understanding Smart Cities: A Integrative Framework" IEEE 2012.
- [12] Sandip Ray, Yier Jin and Arjit Raychowdhury, Senior Member, IEEE 2015.
- [13] Krishnakanth Gupta, Sapna Shukla, "Internet of Things: Security Challenges for Next Generation networks, 1st International conference on Innovation and Challenges in cyber security (ICICCS) - 2016.
- [14] Soumya Kanti Datta, Thomas Cauglin, "Internet of Things as Enabler of Digital Senses", International

Conference on Consumer Electronics (ICCE)- 2016 IEEE 2016.

- [15] Pawani Porambage, Mika Ylianttila, Corinna Schmitt and Pradeep Kumar, "The Quest for Privacy in the Internet of Things", IEEE Cloud Computing 2016, PP 36-45, 2016.

Author Profile

Khamruz Zama received the B.E (CSE) from East Point College of Engineering in 2012 and M.Tech from VIAT in 2016. The areas of interest are Internet of Things, Wireless Sensor Networks and 5G Networks.