INTELLIGENT INTERNET OF THINGS [IOT] FRAMEWORK FOR SMART CITY

Ms. Archana A
Department of Computer Science and Engineering,
Channabasaveshwara Institute of Technology,
Gubbi, Karnataka, India.

Mr. Girish L
Department of Computer Science and Engineering,
Channabasaveshwara Institute of Technology,
Gubbi, Karnataka, India.

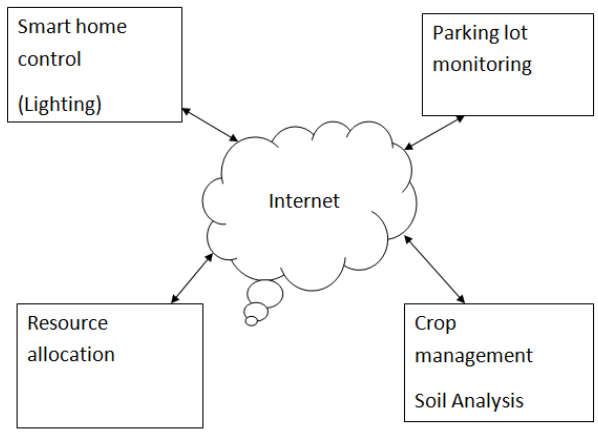
Abstract—
IOT incorporates large number of heterogeneous end systems. It is also known as machine to machine, machine to infrastructure, machine to environment, internet of intelligent things, intelligent systems. Internet of things is the network of physical objects accessed through internet. It provides open access to the selected data for the development of digital services. Building a general architecture for IOT is a complex task because it involves large variety of devices, link layer technologies and services. Here our focus is on urban IOT system and decreasing the level of light pollution, electric energy waste and vision of improvements in monitoring the vehicles in parking lots. Urban IOT are designed to support the smart city vision which uses advanced communication technologies. Comprehensive survey of enabling technologies, protocols and architecture of urban IOT and architectures of proposed systems are included. Most of the existing systems for vehicle parking are automated systems and they have overheads like high power, less energy efficient, incompatible size of lots, space. The proposed idea is to use COAP (Constrained Application Protocol)and developing Pipark system helps user to identify parking spaces easily. COAP is created by IETF. The proposed idea uses multi hop flat technology. This technology makes the acuters to feel convenient with vehicle parking. We aim to minimize the time required to find the parking lot as well as increase the energy efficiency.

Index Terms— Acute Parking Lots, Pipark, CoAP , Internet of Things, Vehicle Monitoring

INTRODUCTION

Entering a latest compute technology, called as the Internet of Things (IoT) it is also known as Machine to Machine, Machine to Infrastructure, Machine to Environment, Internet of Everything, Internet of Intelligent Things, Intelligent Systems [1]. The Internet of Things (IoT) is a recent communication paradigm in which the objects of everyday life will be equipped with microcontrollers, transceivers for digital communication, and suitable protocol stacks i.e. these objects contain embedded technology in order to interact with external environment. This paradigm finds application in many different domains, such as home automation, industrial automation, medical aids, mobile healthcare, elderly assistance, intelligent energy management and smart grids, automotive, traffic management, and many others. The aim is to make a better use of the public resources, increasing the quality of the services offered to the citizens, while reducing the operational costs of the public administrations. This objective can be pursued by the deployment of an urban IoT, i.e., a communication infrastructure that provides unified, simple, and economical access to public services, thus allowing development capacity to have full effect and increasing transparency to the citizens. An urban IoT, indeed, brings benefits in the management and optimization of traditional public services, such as transport and parking, lighting, surveillance and maintenance, maintenance of public areas, garbage collection, salubrity of hospitals and schools.

IOT



.

Smart parking management systems are a part of the smart transportation systems. A parking management system can help in solving some of the problems like more efficiently using existing parking spaces and by making the process of finding parking space quicker and less frustrating. The proposed idea has a vision of making improvements in monitoring the vehicles in parking slots based on Picamera. The existing parking systems is cluster based, and has its own overheads like high power, less energy efficiency, incompatible size of lots, spaces. Car-park management system operate by monitoring the availability of car parking spaces and making that information available to the customers and facility administrators. Customer use this information to select parking space and administrators use this to look after management and planning. Picamera are used for this purpose because they monitor each parking slot accurately.

The goal of this work is to,

- create a web address for car parking lot via Copper Web Browser.
- User can log onto the web address and enter his/her car number and parking duration via his/her mobile devices.
- Camera module in the parking lot give in order regarding the accessibility of the car in the slots of the exacting parking lot.

  - According to the period of the drivers require, slot are allocated.
  - As of request by driver, free parking slot will be displayed in his/her mobile device, thus dropping the time spent for discovering free space.

I. OBJECTIVE OF THE PROJECT

In this project we propose a framework for the realization of smart cities through the Internet of Things (IoT).The framework encompasses the complete urban information system, from the sensory level and networking support structure through to data management. This IoT vision for a smart city is applied to smart parking management to adapt for the enhancement in the delivery of important city services.

I. RELATED WORK

Car parking application uses protocol such as LEACH (Low Energy Adaptive Clustering Hierarchy) and TEAN (Threshold sensitive Energy Efficient sensor Network) [2]. By using such protocols, Consumption of energy as well as traffic towards the sink is greater. To overcome such issues CoAP, which is an rising open application layer protocol planned to support resource controlled machine-to-machine application environment [3] is used. The main challenge in CoAP is interoperability, which is held in that of application layer [4]. CoAP protocol was deploy in mobile environmental observe system for transmission of a resource report and sensor environmental records from IoT nodes and vehicle tracking devices [5].So this protocol better suit for car parking application. To overcome Interoperability, Web services have demonstrated to be necessary in enable interoperable interactions between computers on the traditional Internet [6]. CoAP is a re-design from scratch following the REST architectural style [7]. It close space between microcontroller-based low-power devices and the web of things as HTTP over TCP is not sufficient for controlled environments. Restful applications use URIs for addressing and uniform interfaces for communication. Therefore URI (Uniform Resource Identifier) is created for accessing the application via browser. Thus CoAP has been implemented for a variety of applications and this paper places of interest CoAP for Car parking Applications. Constrained Application Protocol (CoAP) is a specialized web transfer protocol which suits for constrained nodes as well as for unconstrained networks [8].

The method definitions involved in constrained application protocol are GET, POST, PUT, and DELETE. Message types involved are Confirmable, Non confirmable, Acknowledgement, Reset messages. Confirmable requires Acknowledgement whereas Non Confirmable doesn't require Acknowledgment. Reset message indicates missing of few contexts.

- GET-The GET process help in retrieve information from that server.
- POST-The POST process requests the server to release data for the user.
- PUT-The PUT process helps in update or create the information in the corresponding URI.
- DELETE - The DELETE method helps in erase the information stored.

There are two responses in CoAP namely

- Piggy-backed Response
- Separate Response

A Piggy-backed Response used for acknowledge whereas Separate Response is send by an Empty message. The handling of CoAP in car parking application is to structure a client-server relationship, whereas drivers make use of the browser as client and the server program runs in the GUI for update the browser vigorously. Thus the Method definitions are used powerfully for parking application.

For almost everyone, driving is one of the most convenient ways of travelling and commuting.However, with an ever increasing number of cars on the roads the impact of CO2 emissions on the environment is reaching a critical level [9][10]. A contributing factor to these high levels of damaging emissions is cars idling and making unnecessary extended journeys around city and town centres during peak traffic hours looking vainly for a space in which to park. We have created a solution called *PiPark*; a smart parking system (SPS) that utilises a Raspberry Pi®with a camera attachment.

II. . IMPLEMENTATION

A. Proposed System

The Fig.1 shows the system architecture which comprises of Car parking lot, Pipark(Raspberry Pi with camera attachment), Server ,Clients using mobile devices with internet connectivity. The free parking slots are intimated to the user via web address as per request. The data transmission from internet to that of user uses a protocol termed as Constrained Application Protocol.

The PiPark is designed for use in covered and open car parks as well as for street-side parking. This is achieved by mounting the devices above the car park, either at the top of a lamppost (where it can make use of the lamppost's power supply) or onto the wall or ceiling of an indoor car park. After an initial setup, which typically takes five to ten minutes, the PiPark uses its camera to survey its surroundings monitoring the availability of multiple parking spaces

at a time. Periodically the PiPark relays availability information to a central server, which stores and presents the data on a webpage allowing users to view how many spaces are free and where the free spaces are. The software we have created for both the Raspberry Pi® and the server allows for multiple units to be used in a single car park, and multiple car parks to be used on the website. The website shows users a list of car parks with the available spaces in each one, and easily allows car park administrators to add, remove or edit car parks. With this system, people are able to view the webpage before they set out on a journey.

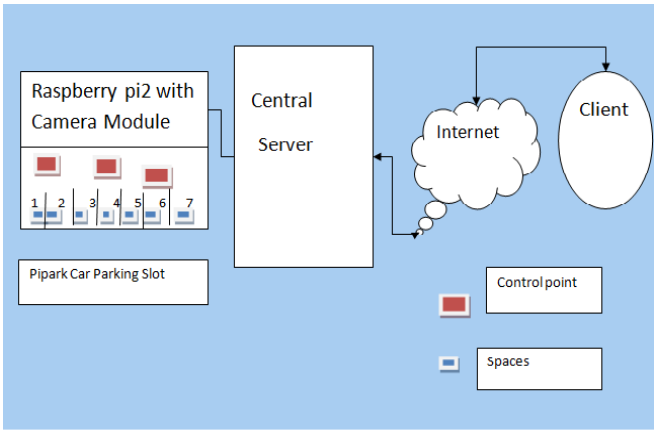


Fig.1.Architecture of proposed System

As per Fig.2 nodes use for parking application can be classified in to three categories such as one node acts as Server, one as Pipark and Clients may be in any number.

- Server. we will be setting up the server on a test environment using the XAMPP program to host a server on a computer .
- Pipark – pi camera module keeps on capturing images on parking slot. Enabling of it helps in connection between that of client as well as server to that of CoAP web Address.
- Client - A CoAP client cycles during 4 resources on event finding such as GET, PUT, PUSH, and DELETE. It get connected to the server via multihop topology.

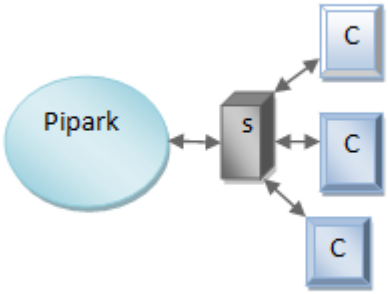
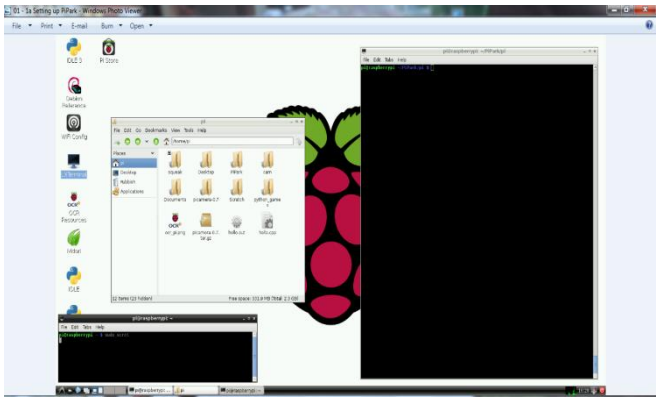


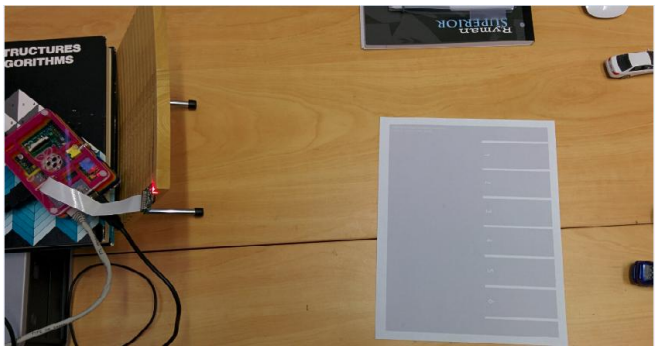
Fig.2. Communications between Pipark, Client and Server.

The contact among server and clients are of multi hop fashion. The data from the motes are send to that of Copper Web Browser [15] which can be view by the user

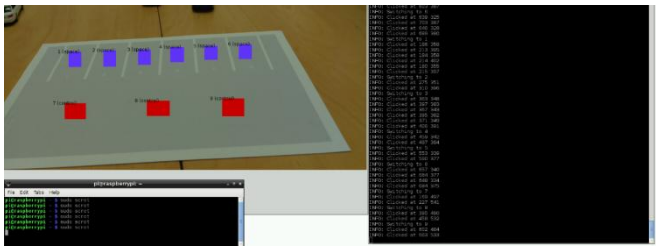
IV.RESULTS



A. Setting up Pipark

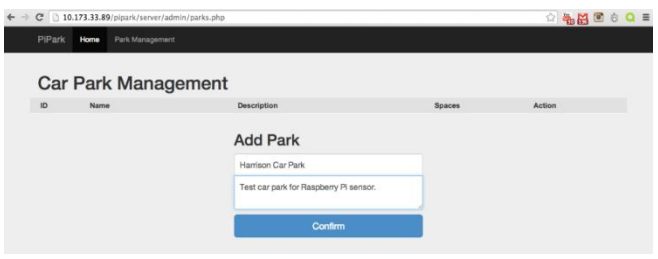


B. View from Camera

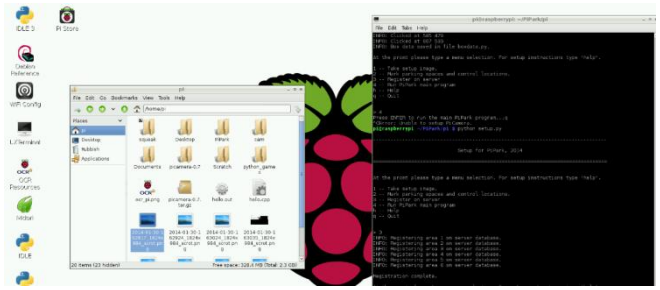


C. Setup Car Parking Spaces

D. Starting Server

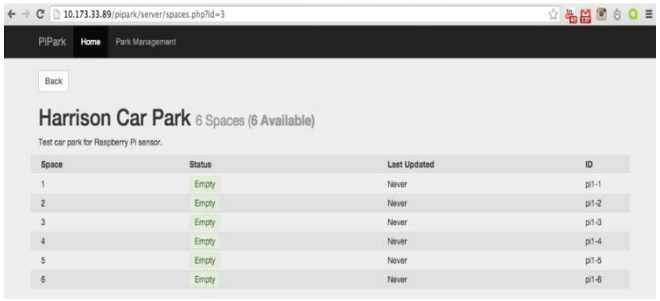


E. Creating Car Park

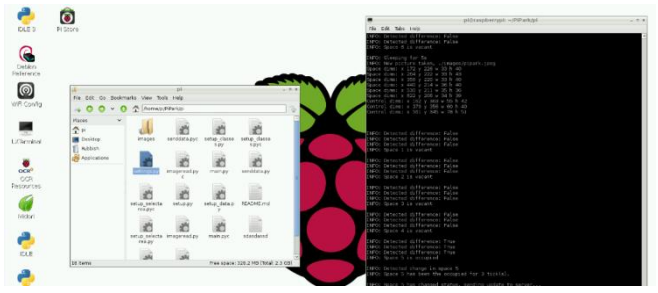


F. Registering Spaces on Server

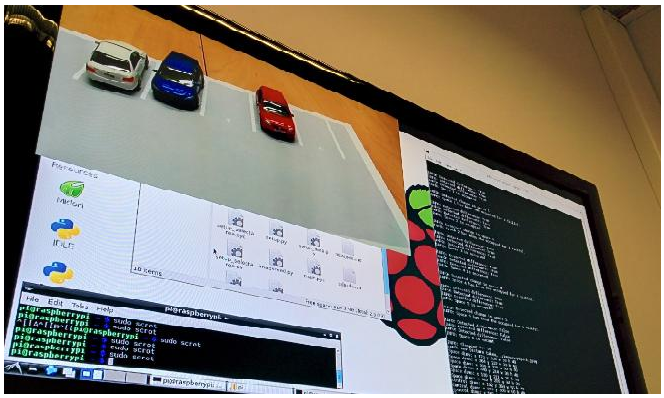
G. Registering Spaces on Server



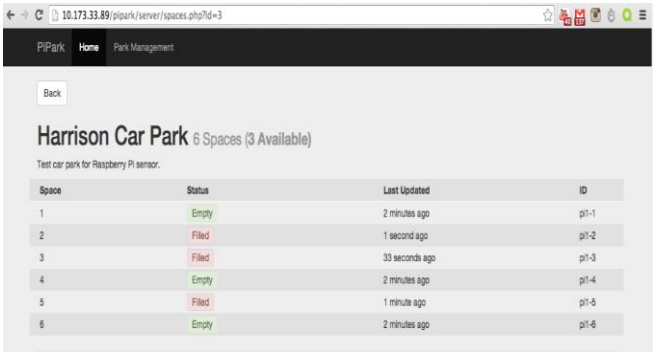
H. Registering Spaces on Server



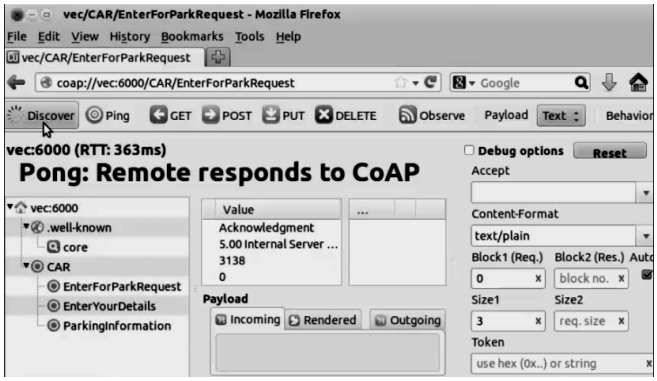
I. Starting main Program



J. Filling Spaces 2 and 5



K. Filling Spaces 2 and 5



L. User Can Log On a Copper COAP Web Browser

V. CONCLUSION

The Pipark car parking system helps to update empty and filled parking spaces in parking slot to server.
The Graphical User Interface is fashioned via CoAP address than *http* address as a gateway between the driver of the car and the parking lot manager. CoAP has the following advantages: asynchronous in nature, designed for 6LoWPAN (IPv6 over Low Power Wireless Personal Area Networks), multicasting, building resource discovery, and security. CoAP is analyzed for its effectiveness over HTTP. The search time of the driver gets decreased comparatively. Deploy this application in cloud with high security factor will be the future work.

REFERENCES

[1] Kaivan Karimi and Gary Atkinson, "What the Internet of Things (IoT) Needs to Become a Reality", *White Paper, FreeScale and ARM*, 2013.

[2] Faheem1, S.A. Mahmud, G.M. Khan, M. Rahman and H. Zafar,"A Survey of Intelligent Car Parking System", October 2013

[3]http://www.environmentalprotection.org.uk/committees/air-quality/air-pollution-and-transport/car-pollution/

[4]http://www.popularmechanics.com/technology/gadgets/news/smart-parking-systems-steer-drivers-to-open-spaces

[5] Luis Ostiz, Urdiain, Carlos Pita Romero, Jeroen Doggen, Tim Dams and Patrick Van Houtven, "Wireless Sensor Network Protocol for Smart Parking Application Experimental Study on the

Arduino Platform", *Second International Conference on Ambient Computing, Applications, Services and Technologies*, pp. 45-48, 2012.

[6] Jonathan P. Benson, Tony O'Donovan, Padraig O'Sullivan, Utz Roedig, Cormac Sreenan, John Barton, Aoife Murphy and Brendan O'Flynn, "Car-park management using wireless sensor networks", *Proceedings of 31st IEEE Conference on Local Computer Networks*, pp. 588-595, 2006.

[7] Libelium, "Smart Parking: Technical Guide", Available at: www.libelium.com, 2013.

[8] R. Aarthi and A. Pravin Renold, "Car parking Applications based on sensor networks: A Survey", *Proceedings of the TEQIP II Sponsered National Conference on Wireless Networks Computing and Communication*, pp. 30-36, 2014.

[9] Paventhan, Sai Krishna Allu, V. Gayathri, Sameer Barve and N. Mohan Ram, "Leveraging CoAP towards monitoring agriculture sensors network", *ERNET India R&D Centre*, 2012.

[10] R.P. Vinob Chander, Susan Elias, Subramanian Shivashankar and P. Manoj, "A REST based design for Web of Things in smart environments", *2nd IEEE International Conference on Parallel Distributed and Grid Computing*, pp. 337-342, 2012.

[11] Tomislav Dimcic, Srdan Krco and Nenad Gligoric, "CoAP (Constrained Application Protocol) implementation in M2M Environmental Monitoring System", *E-society Journal*, Vol. 21, 2012.

[12] Berta Carballido Villaverde, Dirk Pesch, Rodolfo De Paz Alberola, Szymon Fedor and Menouer Boubekeur, "Constrained application protocol for low power embedded networks: A survey", *Sixth IEEE International Conference on Innovative Mobile and Internet Services in Ubiquitous Computing*, pp. 702-707, 2012.

[13] Matthias Kovatsch, "CoAP for the web of things: from tiny resource-constrained devices to the web browser", *Proceedings of ACM conference on Pervasive and ubiquitous computing adjunct publication*, pp. 1495-1504, 2013.

[14] Constrained Application Protocol (CoAP), "draft-ietf-core-coap-18", 2013.

[15] Mozilla Firefox add-ons, "Copper", Available at: http://people.inf.ethz.ch /mkovatsc/copper.php, 2013.

First Author: Archana A was born in Karnataka, India. She received the B.E Degree in Computer Science and Engineering from Visvesvaraya Technological University Belgaum Dist., India in 2013 and Mtech Degree in Computer Science and Engineering from the same University. Her research interests are in the area of Internet of things[IOT] for Smart city .

Second Author: Girish L M-tech, was born in Karnataka, India. He is working as Assistant Prof. inComputer Science Engineering Dept., CIT, Gubbi, Tumkur (district), and Karnataka, INDIA.Area of interest in Cloud computing,SDN,Bigdata.

