

AN OVERVIEW OF IOT BASED SMART PARKING SPACE

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Abstract:

Recently, the notion of smart cities has gained attention. The vision of a smart city now seems to be possible due to the evolution of the Internet of Things. To optimize the efficiency and reliability of urban infrastructure, consistent efforts are being made in the field of IoT. The IoT tackles issues such as traffic congestion, insufficient car parking facilities, and road safety. We present a cloud-based IoT integrated smart parking system in this paper. The proposed Smart Parking system consists of an on-site IoT module implementation that is used to track and report the availability status of each single parking space. A mobile application is also provided that allows an end user to check the parking space availability and book a parking space accordingly. The paper also defines a high-level view of the design of the system. In the end, the paper addresses the functioning of the scheme in the context of a use case that shows the correctness of the model proposed.

Keywords: *Cloud Computing; Cloud of Things; Internet of Things; Smart Parking; Smart City.*

I. INTRODUCTION

The idea of the Internet of Things (IoT) began with things related to communication devices for identification. The devices could be tracked, managed or monitored by means of Internet-connected remote computers. IoT expands the use of the networking internet, and thus the inter-network of devices and physical objects, or 'Things'. In IoT, the two influential terms the "internet" and "things" are here. The Internet means a huge global network of linked servers, computers, tablets and mobiles that use protocols and connection mechanisms that are used globally. The Internet makes it possible to send, receive, or communicate information. In English, things have a range of uses and significations. The dictionary sense of 'Thing' is a word used, if we do not want to be exact, to refer to a physical entity, an event or concept, circumstance or operation. In general, IoT consists of an inter-network of devices and physical objects, and a variety of objects can collect data at remote locations and interact with units in the processes and services that handle, receive, organize and evaluate data. This

offers a vision in which items (wearable, watch, alarm clock, home devices, surrounding objects) become intelligent and function alive by sensing, computing and computing. Communication by embedded small devices that communicate through connection with remote objects or individuals. Cloud computing's flexible and versatile design enables developers to build and host their apps on it. Cloud is a great IoT partner because it serves as a forum for storing and accessing all sensor data from remote locations[1]. These factors contributed to the amalgamation of both technologies, leading to the emergence of a new Cloud of Things technology (CoT). In CoT, things(nodes) can be accessed, monitored and managed via the cloud from any remote location. Any number of nodes may be added or removed from the IoT scheme on a real-time basis due to high cloud scalability. The IoT can be explained in simple terms in the form of an equation which states:

$$\text{Physical Object} + \text{Controller, Sensor and Actuators} + \text{Internet} \\ = \text{Internet of Things}$$

With the advent of the Internet of Things, the ideal of building a Smart City is now becoming realistic. Car parking facilities and traffic management systems are one of the main issues to which smart cities relate[2]. It is often difficult for drivers to find an accessible parking spot in today's cities, and it continues to get more difficult with an ever growing number of private car users. This scenario can be seen as a chance for intelligent cities should take steps to increase the utilization of their parking services, thus reducing search time, traffic congestion and road accidents. Parking and congestion issues can be addressed if drivers are able to be aware in advance of the availability of parking spaces at and near their expected destination. Recent developments in the production of low-cost, low-power embedded systems are helping developers create new Internet of Things applications. Following the advances in sensor technology, many modern cities have chosen to deploy different IoT-based systems for monitoring purposes in and around cities. A new survey conducted by the International Parking Institute indicates that the number of groundbreaking ideas relating to parking systems has increased. There are currently some parking systems that enable people to provide real-time information on accessible parking spaces[3]. These systems include the deployment of efficient sensors in the parking areas for occupancy tracking as well as fast data processing units to obtain useful insights from data obtained from multiple sources.

The smart parking system that we propose is implemented using a cloud-connected mobile application. The device allows a person to consider the real-time availability of parking spaces. The rest of the paper is structured as follows: Section II addresses the reasons responsible for the integration of Cloud-IoT. The state-of-the-art smart parking system is introduced in section III. The implementation and function of the system is defined in Section IV. The paper ends with section V.

Need of the IoT integration

IoT and cloud computing have undergone great evolution. Both technologies have their advantages, but it is possible to predict some shared benefits from their incorporation. On the

one hand, by exploiting the limitless capacities and resources of the Cloud, IoT will overcome its technical constraints, such as storage, processing and energy[4]. On the other hand, with the use of IoT, the Cloud can also expand its scope to communicate with real-world entities in a more distributed and dynamic way. Basically, in order to cover all the complexities and functionalities required to operate the application, the Cloud serves as an intermediary between items and applications. Some of the factors that led to the amalgamation of Cloud and IoT are given below.

- **Storage capacity:** IoT consists of a large number of sources of information (things) that generate large quantities of non-structured or semi-structured data. As a consequence, vast volumes of data need to be obtained, accessed, analyzed, visualized and shared by IoT[5]. Cloud offers infinite storage space, low-cost, and on-demand, making it the easiest and most cost-effective solution to deal with IoT-generated **data**. One can view and visualize the data stored on the cloud from anywhere via standard APIs.
- **Computational power:** There are minimal computing capacities for the devices being used under IoT. Data obtained from different sensors is normally transmitted to more efficient nodes where it is possible to aggregate and process it. IoT computing needs can be met by the use of limitless computational resources and the Cloud on-demand model. With the aid of cloud computing, IoT systems may conduct real-time processing of data while facilitating highly responsive applications.
- **Tools for contact.** IoT's basic functionality is to allow IP-enabled devices interact with each other via a dedicated hardware package. Cloud computing provides cheap and efficient ways to connect, monitor, and control devices over the internet from anywhere[6]. IoT systems can track and manage stuff on a real-time basis through remote locations through the use of built-in applications.
- **Scalability:** A modular solution to IoT is given by the cloud. It allows resources to be increased or decreased in a dynamic manner. When cloud integration is given, any number of "things" could be added or subtracted from the system[7]. In conjunction with the demands of items and applications, the cloud allocates capital.
- **Availability:** With cloud integration, the availability of services becomes very simple at any time. Simplicity is ensured by several cloud providers. With the cloud, the apps are still up and running and the end users are equipped with continuous services.
- **Interoperability:** the use of devices that are heterogeneous in design includes IoT. As a result of compatibility problems, these devices can have different hardware or software configurations. It's getting very, very
- It's difficult to ensure interoperability between these devices in an IoT environment[8]. The Cloud helps to solve this problem by offering a shared interface for communicating and interacting with different devices. In a format that is appropriate to them, devices are allowed to share and exchange data.

II. CONCLUSION

For mankind, the vision of smart cities has always been a fantasy. Significant strides have been made in making smart cities a reality over the past couple of years. In terms of smart cities, the advancement of the Internet of Things and cloud technology have given rise to new possibilities. Smart parking facilities and systems for traffic management have always been open. The nature of creating smart cities. In this paper, we discuss the parking problem and propose an integrated smart parking solution based on the IoT cloud. The scheme that we suggest offers information in real time about the availability of parking spaces in a parking area. Users from remote locations may use our mobile application to book a parking slot for them. The efforts made in this paper are aimed at improving a city's parking facilities and thereby enhancing the quality of life of its residents.

III. REFERENCES

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