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Type A - Critical Review

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Contents

1 Introduction

This report is about the critical review of the paper "Internet of Things for Smart Cities" in the Internet of Thing Journal published in February 2014. The author of the paper aims to propose an approach to building a Smart City system. It is the system that allows citizens to be able to observe the traffic status of his current location and decide what direction he could choose to avoid traffic congestion, a system could control the temperature and atmosphere of the vicinity environment to help the citizens have a comfortable life. And not only that the Smart City project also provides many other kinds of services with the purpose of providing a better living condition for citizens (Hall et al., 2000). In this report, I will summarize the main idea of the paper. The following sections focus on my evaluation and my conclusion on the paper.

2 Summary

In the first part of Zanella et al. (2014), the authors try to summarize the basic idea of Smart City and explain the 9 services that Smart City system could provide to the citizens as indicated in the figure 1. On the second part, I will use the figure 2 to demonstrate a simple process for the Smart City system according to the paper. The first layer is the groups of device nodes. They are usually small sensor devices for collecting different kinds of information such as the temperature or GPS data. As the growth of mobile technology, smartphone could also be considered as device node carrying multiple sensors like GPS or heart rate. Device nodes transfer its collected data to a nearby gateway, which is responsible for transfer data to the centralized server for processing and analyzing. End users could be able to gain access to the real-time information from the Smart City system by using web application. It is the responsibility of the server to provide the web services for the clients.

According to the author, there are two types of IoT devices in the Smart City system, which are constrained and unconstrained IoT nodes. The small sensor devices with low energy consumption and limited processing capability are considered as the constrained devices, while The type of constrained ones is the group of devices with strong processing capability without being limited by the power such as computers or Raspberry Pi devices.

Figure 1: Services of Smart Cities

These devices are also designed to be able to work with the traditional communication technologies like Ethernet or wireless connection.

Depending on what type of devices, the system will apply a different technology during the process of transferring data. For example, if a device belongs to the constrained type, it will use Efficient XML Interchange (EXI) instead of XML for the format of data in order to reduce the size of transfer and hence improve the performance of the system. Regarding the final part of the paper, the authors demonstrate the feasibility of the system by showing the implementation of Smart City in the city of Pavoda, Italy as a proof-of-concept for their research.

3 Critical Review

In this paper, the group of authors are able to solve difficulties in the problems of IoT application in general and Smart City project in particular. By applying two kinds of a protocol stack for different types of IoT devices in each network layer, the system is able to optimize the performance of transmission as well as to resolve issues relating to the incompatibility of communication technologies. For example, the paper mentions to adapt the Constrained Application Protocol (CoAP) with UDP for the constrained type of device nodes to improve the poor performance in transmitting small size of data Zanella et al. (2014).

The paper is also able to prove the feasibility of the system by demonstrating the Smart City Pavoda implementation as a proof-of-concept and the collected result from the project in four different kinds of data, which are temperature, humidity, light, and ben-

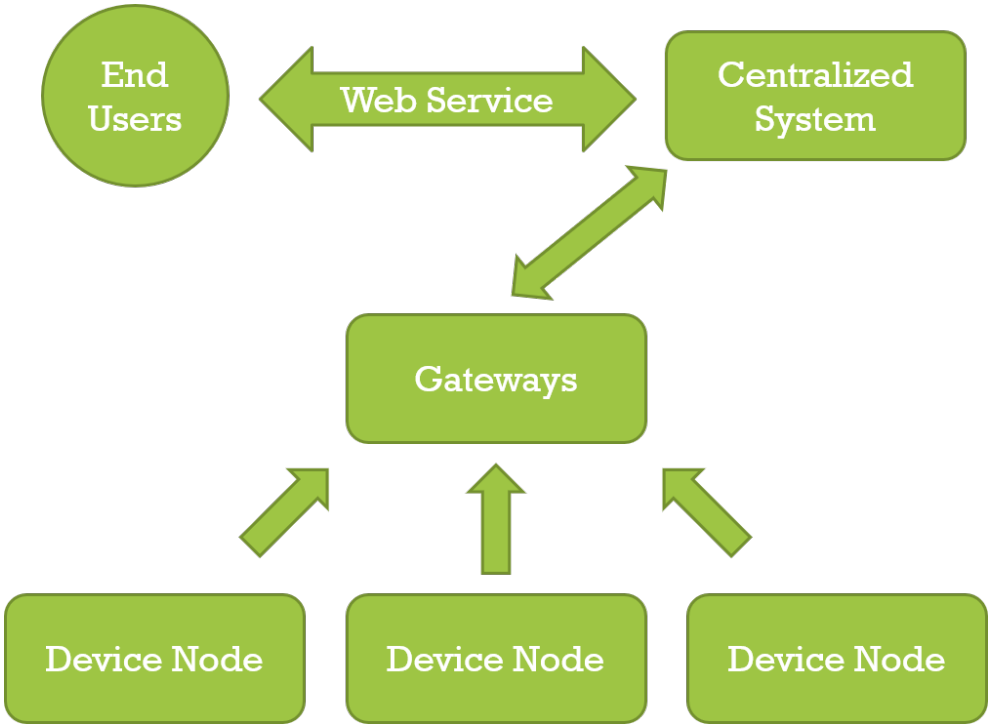

Figure 2: Simple structure of Smart Cities

zene. Due to the structure of the system, the Smart City project is able to provide a wide range of services to support both citizens and administrations of the city as indicated in figure 1.

Even though the authors propose an approach to building a Smart City system that could address many issues in transmission, they do not mention the problems relating to security. It is an essential area that every network application needs to deal with in order to guarantee the reliability of the application. According to Hossain et al. (2015) and Popescul and Radu (Genete, 2016(@), Smart City project encounters many challenges in security and several attacks have been reported with a big impact on in users' privacy and city's economy. Because of this, it is essential to discuss problems in security when you want to build a network application containing sensitive information of citizens such as GPS.

In the Smart City Pavoda implementation of the paper, the authors show a simple diagram of how the system works. The diagram indicates that there is a secure Virtual Private Network (VPN) connection between the remote users and the web service and they do not explain anything about this. In my opinion, the process of establishing a VPN connection and using it to exchange the data could affect the transmission speed of the web application dramatically (Qu and Srinivas, 2002).

According to my understanding of the paper, the gateway is not only responsible for transferring data from sensor nodes to the central server, but it also has the role of resolving the difference of communication technologies between devices. For example, the constrained device nodes use CoAp and UDP protocol for transmitting the collected data

while the constrained devices use HTTP and TCP for in the application and transport layer for receiving data. It is the task of the gateway to transparently resolve these differences and allow both IoT nodes and centralized server to be able to communicate properly. However, in my opinion, it could cause an overhead for the gateway due to the increasing number of device nodes and a large number of requests. This requires a strong processing capability gateway in order to address the problem but increases the cost for the project significantly.

4 Conclusions

The paper addresses many difficulties in Smart City system and is able to prove its feasible implementation by applying the approach in Pavoda city. However, the paper does not mention the approaches to solve the problems in security, which are essential in any network application. Besides, due to the process of converting the communication protocols between IoT nodes and the control server, the system is required to be equipped with strong gateway processors to be able to handle these tasks, which could cost a large amount of money. In general, I believe that this paper plays an important role in the process of improving the Smart City system for the future of IoT projects.

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