Research on the Performance of JavaScript-based IoT Service Platform

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Abstract: In the past, we were placed in a highly constrained environment between smart devices, the size of smart devices, and the limitations of smart devices, such as network speeds. However, as the communication technology has gradually developed, various smart devices are rapidly miniaturized, we are all connected via the Internet, and we have a new phase called Internet of Things. IoT suggests that it means not only a simple smart device but also a combination of all things that can be connected to the Internet. In the case of smart devices and sensors, not only have their own hardware specifications, but mostly they are using different operating systems. As a result, it was necessary to provide an additional device that can analyse and convert each other's communication for coupling between each device, it led to the additional cost. Therefore, the need to do normalized standards with no additional costs has been emphasized, began to be interested in joining based on the Web. In this paper I would like to compare and analyze the performance of Javascript based IoT service platform. We measure the connection and communication speed of things, analyze the performance, and try to mention the role of Javascript on the IoT service platform.

Keyword: Internet of Things, Javascripts, Frameworks, Web of Things, Networks.

1. INTRODUCTION

In the past, we were placed in a highly constrained environment between smart devices, the size of smart devices, and the limitations of smart devices, such as network speeds. However, as the communication technology has gradually developed, various smart devices are rapidly miniaturized, we are all connected via the Internet, and we have a new phase called Internet of Things(IoT)[1], [2]. IoT suggests that it means not only a simple smart device but also a combination of all things that can be connected to the Internet. However, the problem is that the fragmented device and the OS will be generated in all combinations via the Internet[3], [4].

In the case of smart devices and sensors, not only have their own hardware specifications, but mostly they are using different operating systems. As a result, it was necessary to provide an additional device that can analyse and convert each other's communication for coupling between each device, it led to the additional cost[5]-[7]. Therefore, the need to do normalized standards with no additional costs has been emphasized. So

attempts were made based on various languages such as C #, C ++, Python, among them, began to be interested in joining based on the Web[8].

In this paper, we plan to investigate Javascript among web based methods in order to solve the problem caused by the separation between smart devices. Therefore, we first looked at the Java script based IoT service platform, we would like to discuss the limits and the direction of improvement of JavaScript based IoT service platform.

2.   RELATED RESEARCH

JavaScript was developed in 1995 with a simple scripting language. Now it is popular language as it is in most websites. It can be run with most web browsers, no need to install another compiler or interpreter; it has various advantages such as application of many APIs, plugins and libraries through Node.js, event processing and so on. Therefore, various IoT service platforms using it have been developed[9].

A. IoT.js

IoT.js is a Web-based IoT platform that connects lightweight, smart devices. This was developed in order to solve the problem of connection occurring each device has different OS and application. Therefore, IoT.js focuses on providing an internal service platform based on Web technology, ultimate goal of this is "to provide valuable services optimized for each user". It is expected to support various devices because it is based on JerryScript. Moreover, anyone who is interested in IoT can easily develop an IoT app because it support Node.JS[10].

B. Node-RED

Node-RED is a visual tool used to connect hardware devices for IoT. As shown in Figure 1 it encoded with the Drag & Drop method to enhance user's accessibility. it can use Node.js to use more than 255,000 modules in the Node's Package repository, it is possible to operate even with inexpensive hardware such as Raspberry Pi. Also, since all flow generated by Node - RED is stored in the JSON format, import and export are easy. So it is convenient for mutual collaboration with other developers to be convenient[11].
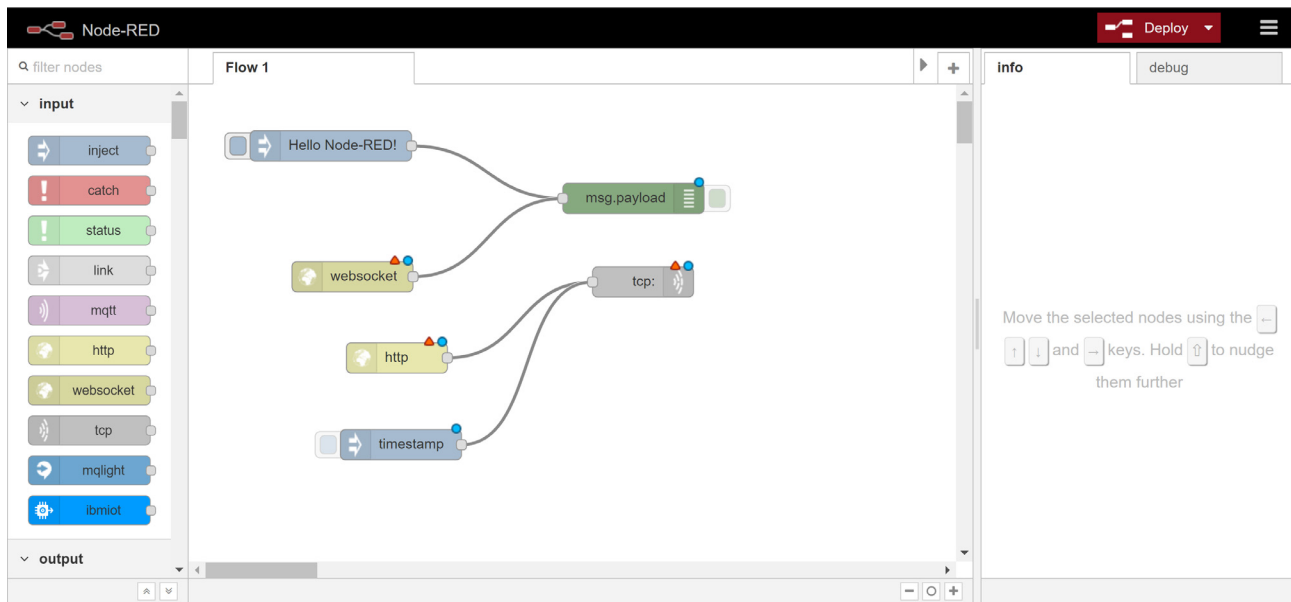

Figure 1: Actual Node-RED drive screen[11]

C. Cylon.js

Cyclon.js is a JavaScript IoT framework for robotics, physical computing, and the IoT based Node.JS. Supporting more than 50 types of hardware including Arduini, it can also be used with I2C, GPIO, and can control various hardware and sensors at the same time. In order to support browser and mobile application, it can also be accessed directly from the browser, or it can be executed through chrome application and PhoneGap mobile application[12].
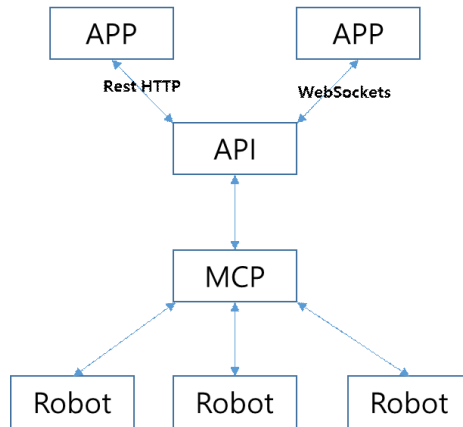
Figure 2: Cylon.js Master Control Program Structure

3.   PERFORMANCE ANALYSIS

In this paper, we measured the performance and the data transfer rate for measuring the performance of the IoT service platform. Arduino has each platform installed, communication speed with things(sensors) was compared and analyzed. Things used temperature, sound, LED sensor. We requested 50 connections and data transfers to each platform and measured the time the operation was completed.
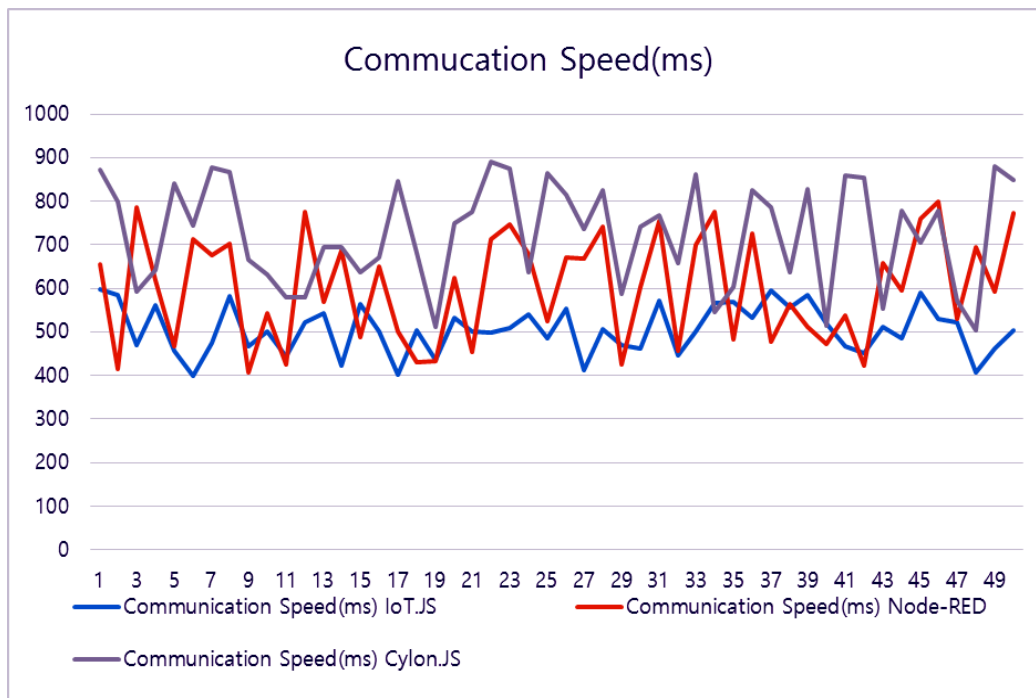
Figure 3: Communication Speed with Platform

Figure 3 shows the results of the communication speed between platform and sensors. In the graph, the horizontal represents the number of times of communication and the vertical represents the speed. The speed between 400 ms and 1000 ms was measured, and the platform that showed the fastest speed on average was the IoT.JS platform.
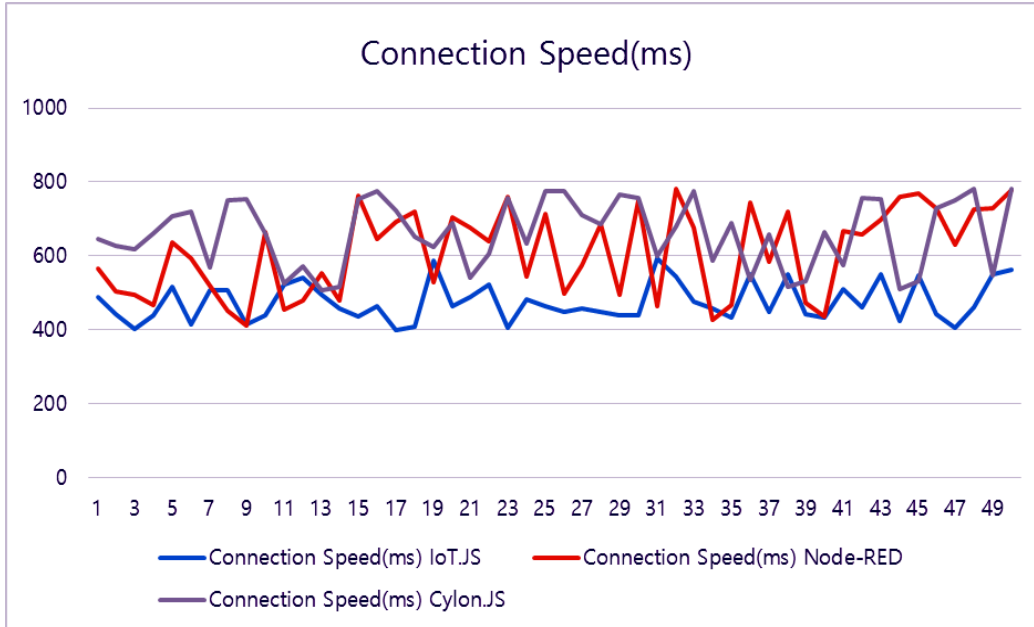

Figure 4: Connection Speed with Platform

Figure 4 is the result of measuring the speed with which the sensor is connected to the platform. The connected speed was measured between 400 ms and 800 ms, and the connection speed was measured at IoT. JS most quickly.
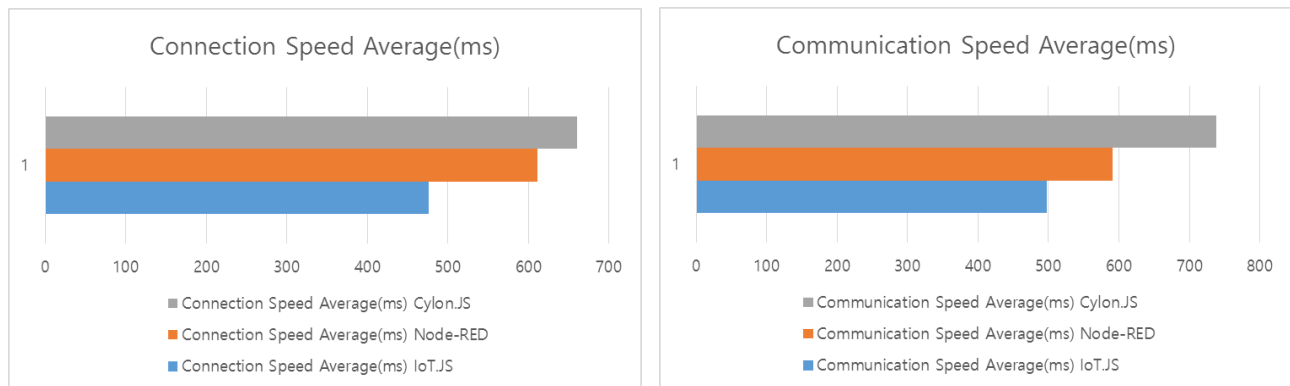

Figure 5: Average speed

Figure 5 shows the average speed for connection and data communication. It was measured that IoT.JS showed the fastest speed and the speed of Node-RED, Cylon.JS was fast behind it.

The fast speed of IoT.JS would be to use a lightweight script engine called Jerryscript. Jerryscript is a JavaScript engine for IoT and is an engine optimized for very low specification equipment. The difference between the other platform and the IoT.JS platform is to place restrictions on memory and RAM specifications, which affects connection and communication speed.

This experiment was carried out with only basic items as conditions. For further detailed performance analysis, further experiments must be carried out under various conditions.

4. CONCLUSION

In this paper, I analyzed the JavaScript based IoT service platform that can be used to solve problems caused by fragmentation of smart devices that may occur in the IoT service environment. In terms of extensibility, JavaScript can never overlook it in IoT service.

In this paper, we conducted a comparative analysis of the speed of data transfer, and speed of connection in the IoT JavaScript platform As a result, We know that memory and RAM affect speed, in the future, research under various conditions will be necessary. Also, with the exact standard of IoT undecided, rapid growth will only accelerate the fragmentation of the IoT. Therefore efforts for standardized establishment of IoT equipment as well as IoT platform will continue to do.

Acknowledgment

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