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A Review on AWS IoT for Automation and Monitoring STP System

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ABSTRACT

In this paper, cloud-based services aimed for the connectivity, monitoring, and management of the IoT devices are presented. To set up a network with a large number of devices in the constrained environment can be a challenge. Also, collecting, storing and analyzing data generated from sensors attached to the devices most often requires developing custom-made applications which imply time and cost consumption. Several cloud providers are offering IoT services that unite needed features into full solution offering connectivity between devices and the cloud, processing of data sent from devices and interaction with connected devices through the application. One of them is AWS IoT (Amazon Internet of Things) which is fully scalable, reliable and simple to use. This platform can collect data from a large number of different devices and connect them to endpoints for other tools, allowing a developer to tie received data into the independent application. Other aspects, like security, resource management, integration and centralized management are also covered. In this paper, we will evaluate the performance of the AWS IoT web services by connecting small, single board computers, like Raspberry Pi through different scenarios.

Keywords : IOT, Aws-IoT, Node-Red, Sewage Treatment Plant, Stp, Monitoring, Automation

I. INTRODUCTION

The Internet of Things (IoT) is the computing concept that describes interconnection of everyday objects that deliver Information over the Internet. Everyday growing number of objects has promoted the Internet of Things protocols and technologies as one of the most commonly used in the modern systems. Although the concept of the IoT is originated more than ten years ago, it is still one of the most widespread topics across a range of industries, including traffic industry, manufacturing, military, healthcare, sports, education - in almost every aspect of human life. IoT objects refer to a wide variety of devices which are most often equipped with electronic circuits and sensors. These devices, implemented in IoT solutions, made Internet sensory thereby achieving improved tracking and analyzing systems.

There are several challenges that need to be overcome during the implementation of the IoT technology. A typical IoT solution includes different devices used for collecting, producing, analyzing and storing data. These devices may differ by their hardware and software platform, but all must meet the requirements which can be broken up into these components: memory storage, processor, power source and power management, wireless connectivity and ability to connect sensors.

Connecting devices to the Internet enables the devices to communicate with each other and with cloud services and applications. For the purpose of the connectivity, there are a variety of communication standards and protocols used, of which most widespread are IEEE 802.15.4, Internet Protocol version 6 (IPv6) and IPv6 over Low Power Wireless Personal Area Network (6LoWPAN). Regardless the specific communication protocol used to deploy IoT solution, all the IoT devices should make their data available to the other IoT object, or application. This can be achieved by connecting devices to the cloud using Application Programming Interfaces with built in functions for end users.

Gerber in [4] discusses strategies that can be applied during the planning of data driven IoT architectures. These strategies simplify development, manage complexity, increase scalability and flexibility and can be broken up into following: adopting a layered architecture, implement security, automate operations, ensure interoperability and follow a reference architecture. Leading mentioned challenges, requirements and strategies, we have built a simple IoT solution.

II. LITERATURE

There is a progress in the technology change from automation to IoT and is currently a new challenge for the industries today. Industrial automation has over a billion connected devices but the industrial internet of things will change the design and usage of automation networks to solve problems, improve operations and increase productivity. The world is moving towards the age of digitalization where the tremendous opportunities for innovations lies. Similarly, an approach was taken by going through [7] where the authors built a prototype for fire detection and monitoring using wireless senor nodes using a microcontroller and Zigbee protocol-based transceivers with a computer or raspberry pi as the central unit to sync the nodes and monitor the status. A complete system for fire risk monitoring and detection was showcased based on wireless sensory network.

Therefore, the idea of using IoT for hazard monitoring came by looking into the paper [12] where they proposed a method for IoT based information on disaster by combining IoT/M2Mnetwork with P2P cloud service where it also provides services like SNS. They designed a rapid response system in the event of disaster by sending a SNS for damage relief to the Central Disaster Management Center.

Multi-core embedded wireless sensor network for smart city application [13] incorporating environment condition checking and garbage management.

Also [14] smart traffic system is dealt with using message passing applications viz., cab sharing, ambulance services and other emergency services.

IoT aims to connect the heterogeneous objects/devices with each other [15], in order to communicate or exchange data/information. Such an implementation of Cloud based IoT systems, have several challenges to achieve objectives such as middleware, interoperability and scalability of system.

A secure home automation system [16] using Raspberry Pi as the network gateway and MQTT protocol was created and discussed upon. Data was monitored on webpage. They claimed that their mechanism had a better and efficient advantage over protocols like COAP, HTTP etc.

In [17] a MQTT broker was built on AWS for providing IoT services for monitoring and controlling room temperature, sensing and indication via alarm for suppressing fire. Used Arduino as an end device connecting sensor and actuators via Wi-Fi. A smart home scenario was designed and was implemented in hardware and software. It was proved that MQTT and AWS is suitable technical candidate for several IoT applications. Implementation of AWS IoT is presented [18] and the authors create a vehicle traffic control system based on volume/pattern of vehicles and punctuality of public transport.

A lightweight and secure communication protocol which is MQTT was implemented for Wireless Sensor Nodes and presented in [1]

The survey on the application layer protocols that include IETFs CoAP, IBMs MQTT, HTML 5s Web socket among others, were demonstrated in [2] and also their reliability, security, and energy consumption aspects were discussed.

A comprehensive comparison of technologies used in IoT application layer protocols highlighting the protocols like IETFs CoAP, IBMs MQTT, HTML 5s Web socket among others.

Gerber in [4] discusses strategies that can be applied during the planning of data-driven IoT architectures.

[6] In this paper they describe the prominent technical components needed to enable the connection of things in order to understand IoT concepts and applications.

Also, in [8] they have demonstrated the common middleware that supports MQTT and CoAP a common programming interface. Experiments were conducted to study the performance of MQTT and CoAP in terms of overall delay and bandwidth usage. The results reveal that MQTT messages have a lower delay than CoAP messages at lower packet loss rates and conversely a higher delay than CoAP messages at higher loss rates.
In this paper [9], They build an MQTT (Message Queue Telemetry Transportation) broker on Amazon Web Service (AWS). The MQTT broker has been used as a platform to provide the IoT services which monitor and control room temperatures, alarm, and suppress fire. Arduino was used at the IoT end connecting various sensors and actuators to the platform via Wi-Fi. We created smart home setup and designed IoT messages satisfying the requirement. We show that MQTT and AWS are apt technical solutions for several IoT business applications.

In the paper [10] - This literature surveys the IOT architectures that are good enough to help understand the related tools, technology, and methodology to facilitate developer requirements. The presented architecture proposes to solve real-life problems by building and deploying of IOT notions. Moreover, research challenges have been identified to incorporate the short comings inside the current architectures to motivate the academics and industries get involved into seeking the possible way outs to apt the exact power of IOT. A main contribution of this survey paper is that it summarizes the Internet of Things architectures in various domains systematically.

III. CONCLUSION

In this paper, we presented a solution to automate any system using IoT cloud-based platform Amazon Web Services IOT by connecting small, single board computer Raspberry Pi. We have described architecture and components of the AWS IoT through implementing a simple IoT solution for the STP system. The main goal was to collect data using sensors and send data to AWS IoT web services using AWS IoT Device SDK and MQTT protocol. We have presented some of the web services available on the AWS IoT which can be invoked using AWS IoT rules. Other aspects, like security, resource management, integration and centralized management are also covered. We have used node red programming tool by integrating with raspberry pi to automate the flows which makes it easy to deploy the flows and maintain.

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