Improvement of Scalability to IoT Gateways for an Efficient Connectivity: A Survey

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Abstract: This paper is focused on increase scalability to IoT Gateways. The Internet of things (IoT) is the network of physical devices, vehicles, home appliances and other items embedded with electronics, software, sensors, actuators, and network connectivity The Internet of Things has advanced in different directions, including the development of new architectures, platforms and applications. several approaches have proposed solutions for interoperability of these ecosystems through the delivery of services over virtual infrastructure (Cloud Computing). The main objective is to give the reader the opportunity of understanding what has been done (protocols, algorithms, proposed solutions).

Keywords—*Internet of Things , edge computing ,scalability, pipelining.*

I. INTRODUCTION

The Internet of Things (IoT) is a rapidly growing area with an estimated 25 billion connected devices anticipated by 2020. The basic idea of this concept is the pervasive presence around us of a variety of things or objects – such as sensors, actuators, mobile phones, etc. Investigate the ability to scale an IoT system above the leaf-level by using parallel computing within the gateway devices [1]. The main strength of the IoT idea is the high impact it will have on several aspects of everyday-life and behavior of potential users. Introduce the paradigm of Fog of Things (FoT) and propose the design and development of a self-organizing platform called SOFT-IoT: Self-Organizing Fog of Things [2]. Service-oriented architecture dealing with the scalability problem leveraging the Path Computation Element (PCE) concept [3]. The use of auto-regression models for estimating the server response times in the DNS server selection algorithm [4].

The remainder of the paper is organized as follows. In Section 2, we disscuss about the related works. In section 3, concept of scalability.The IoT main enabling technologies are the subject of Section 4. challenges in iot gateways are discussed in section 5. Applications of IoT gateways in Section 6. Conclusions and future research hints are given in Section 7.

II. RELATED WORK

In [2], Prazeres and Serrano propose the use of a self organizing “fog” architecture to provide scalability in IoT networks. Within a fog architecture, the devices do not necessarily connect to the Internet. The use of a self organizing “fog” architecture to provide scalability in IoT networks connect to the Internet.
The ARM plus General Purpose Graphical Processing Unit (GP-GPU) devices here as prototypical gateways as a novel contrast to other emerging [1].

As the number of devices increase, manual functions such as bootstrapping, software and security configuration, device registration and upgrade are no longer feasible. Thus, any mechanism that involves human interaction and facilitation starts becoming obsolete and impractical. Hence, all these services must automate the aforementioned processes in order to save time and act more efficiently. Devices must have in-built facilities with required bootloaders, security keys and other necessary features that will promote the process of automation when a remotely located device starts up for the first time [5].

Microservices is a contemporary architectural approach in which intricate applications are comprised of individualistic micro-processes disseminating with each other with the help of language-agnostic APIs. It is useful to divide each application into several

independent instances which are often called functional units each of which performs a separate function. Each of these functional units should work independently and executed [6].

III. SCLABILITY

In [7], Scalability means flexibility that allows us to better address and achieves the specific needs as they arise

A. Vertical Scalability

It is also referred to as scaling up which is the ability to increase the capacity of existing hardware or software by adding more resources to it

B. Horizontal Scalability

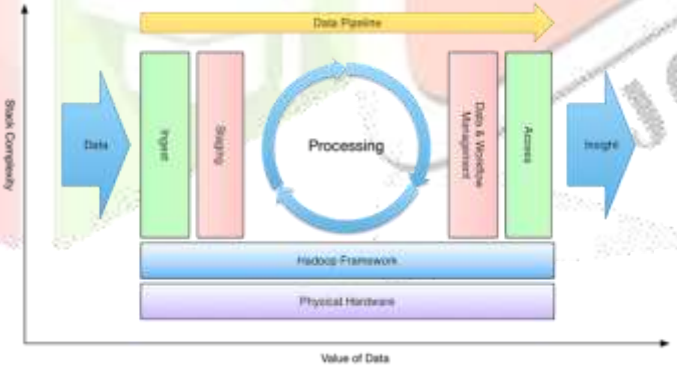
Horizontal scalability can be achieved by adding more machines into the group of resources and adding more nodes to a system for instance adding a new computer to a distributed software application

IV. ENABLING TECHNOLOGY

Edge computing refers to the enabling technologies allowing computation to be performed at the edge of the network. The various IoT concept into the real world is possible through the integration of several enabling technologies. In this section we discuss the most relevant ones. Note that it is not our purpose to provide a comprehensive survey of each technology. Our major aim is to provide a picture of the role they will likely play in the IoT.

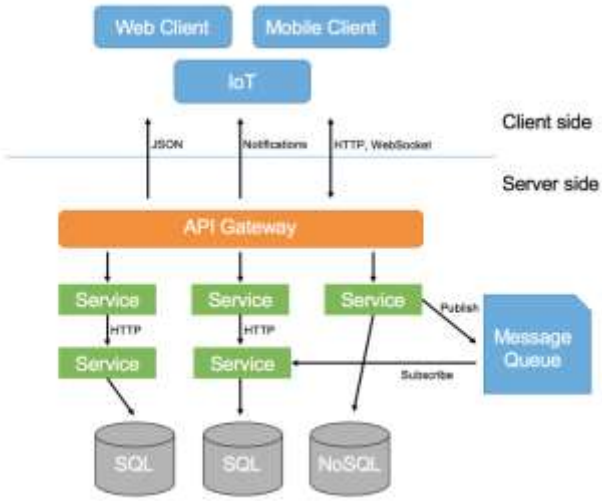
3.1 Data pipelining

Data Pipeline is an embedded data processing engine for the Java Virtual Machine (JVM). IoT applications require a data processing pipeline consisting of front-end data collectors and a set of data curation (cleaning, enrichment, transformation) functions applied on streaming data.



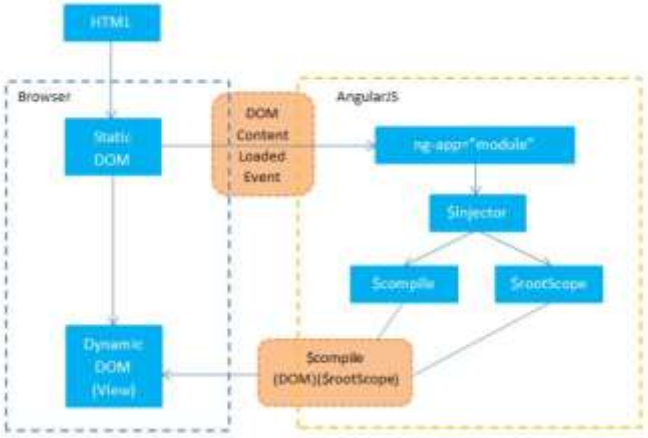
3.2 Microservice Architecture

Microservice architecture, or simply microservices, is a distinctive method of developing software systems that has grown in popularity in recent years. In fact, even though there isn't a whole lot out there on what it is and how to do it, for many developers it has become a preferred way of creating enterprise applications. Thanks to its scalability, this architectural method is considered particularly ideal when you have to enable support for a range of platforms and devices spanning web, mobile, Internet of Things, and wearables or simply when you're not sure what kind of devices you'll need to support in an increasingly cloudy future.



3.3 Automatic Bootsraping

The services must automate the aforementioned processes in order to save time and act more efficiently. Devices must have in-built facilities with required bootloaders, security keys and other necessary features that will promote the process of automation when a remotely located device starts up for the first time.



V. CHALLENGES OF EDGE COMPUTING

Edge computing provides new possibilities in IoT applications. Edge computing allows data produced by internet of things (IoT) devices to be processed closer to where it is created instead of sending it across long routes to data centers or clouds.

Trust and governance

It is essential to gain trust from the user , IoT must maintain a trust management system to ensure trust between the user and the system [7].

Security and privacy

Security and privacy can also be improve with edge computing by keeping sensitive data within the device.

Hardware Compatibility Issues

Adding external sensors and components to the legacy machines is one quick work around , making it a very challenging task.

Partitioning and offloading task

Task partitioning is usually expressed explicitly in a language or management tool. Inherently, there arises the need for developing schedulers that deploy partitioned tasks onto edge nodes [9].

Bandwidth

In addition to power and CPU, bandwidth consumption is another challenge for IoT connectivity. Bandwidth on a cellular network is expensive, especially with hundreds of thousands of IoT devices on a network sending request/response signals to your server.

VI. APPLICATIONS

The applications of IoT [8]

- IoT sensor data monitoring and analysis.
- Retail customer behavior analysis.
- Mobile data thinning.
- Compliance analysis at financial branch locations.
- Remote monitoring and analysis for oil and gas operations.

VII. DISSCUSION AND CONCLUSION

IoT Gateway, as a hardware device acts as a communication bridge between IoT Sensor Network and Cloud Server. The iot is very helpful to innovate new technologies. The Internet of Things has advanced in different directions, applications. Lot of enabling technologies. In this paper, we have presented the detailed overview study and importance of scalability. We discussed about challenges and applications of IoT , and overview about the enabling
technlogy.

Through this paper, we have provided a detailed understanding about scalability to the readers. Finally , we conclude use of data pipelining to increase the scalablility

ACKNOWLEDGMENT

We would like to thank all the reference authors, for providing access to the information and images on their IoT environment. I would like to extern my sincere thanks to guide for his continuous encouragements. The authors would like to thank all those who directly or indirectly supported us in our work.

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