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Research Paper

Automation of an IoT hub using artificial intelligence techniques

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Abstract

Fog computing is used for reducing the complexity level of a network architecture and processes the data in a fog node IoT Hub. The Internet of Things (IoT) will connect billions of devices, such as smart objects, which are heterogeneous in terms of hardware software and communication interfaces. The IoT has to this point grown as numerous vertical idea of the IoT, rather than focusing at the real creation of a highly interoperable infrastructure for the development of applications. For managing the various devices present in the hub we create an IP-based infrastructure so that the elements can be able to balance the diversified devices and the network elements are used to enhance the direct end to end communication which is much required. With all the above considerations we propose a Fog node i.e. an IoT hub that can be placed at the end of multiple networks thereby increasing the capability by implementing various functions such as allocation of resources border routers cache proxy servers etc. As the implementation of fog node is through the IoT hub here we would like to automate the resource allocation that takes place in the IoT hub

Keywords: *Fog node; Fuzzy logic; Proxy automation; Resource allocation; Internet of Things.*

1. Introduction

Fog Computing" is a virtual platform which enables various services such as computing, storing and networking between the devices and the monotonic cloud data. It is not physically present at the corner of a network. The child of cloud i.e. Fog is used in three different interests like connected data, smart grid, wireless sensor and actuator network the diversified applications of fog put the fog computing stand out of the crowd and is entirely different from the age-old Internet of Things. Usually these have a very few things in common like real time analysis and initiation of an action. Actions generally include communication between both the human and the machine. It can be illustrated through numerous examples such as creating a pie chart, sending various technical alerts for repair. It has unlimited amount of possibilitieThe fog node implements service assisted communication to act as a mediator between the devices and the back-end solutions. The goal of such communication is to create a bidirectional and a trustworthy communication between the fog node and the devices in the physical arena

2. Problem Statement

The main objective of this work is to minimize the resource allocation problem in the IOT hub to the maximum extent. Resource allocation is very much needed in case of a collection of multiple networks as many computers are connected over a shared memory. In such cases a resource must be given to a processor if and only if it is in the idle state rather than in the busy state. For finding out whether the processor is idle or busy we need to use various mathematical or statistical techniques and thus we have used the artificial intelligence techniques. We have various artificial intelligence techniques such as search techniques, fuzzy problem-solving techniques, heuristic techniques etc. Our technique for consideration is the fuzzy problem-solving technique which is an easiest way to check whether a processor is busy or idle. The fuzzy problem-solving technique uses the binary logic which uses the 0's or 1's logic system. We can define the fuzzy system based on our interest and hence we considered 1 to be the idle state and 0 to be the busy state. Our system therefore follows this logic and we will send a resource allocation if and only if the processor is idle that is it is showing 1. Hence the problem of congestion and flooding can be thus eliminated, and resources can also be allocated properly in the IOT hub.

3. Literature Survey

Fog computing, also known as fog networking or fogging, is localized computing in which various resources such as the data, computed values and their storage along with the applications are divided in a well-organized way between the source data and the cloud data. Fog computing generally enhances the cloud computing and it also extends the services at the edge of a network by binding the advantages and the ability of the cloud closer to both the creation and usage of data. The main aim of fogging is to improve coherence and thereby decrease the data that is sent to various phases such as processing analysis and storage. This is repeat-

edly done to improve productivity, although it is used for security and consent issues.
The data is usually produced and retrieved from the edge devices and sensors, they don't have multiple resources for computing and storing in order to perform improvised analysis and expert system tasks. Even though the cloud servers can do these tasks they are usually afar for processing and responding in stipulated time. All the end to end devices are connected and raw data is sent to cloud over the web and the data has privacy security and legal implications, while dealing with with fragile data that subjects to statute in various continents
In a fog space, the management takes place in a data hub on intelligent devices routers or gateways, thus diminishing the amount of data that is being transferred to the cloud. The main thing that is to be noted is fogging adjuncts cloud computing. Fogging generally allows transient analytics at the edge and cloud performs intensive vast analytics. Gadgets must either get connected to or initiate routers to most commonly used amenities and they are contemplated with the fog node the conveyance path between gadget and service or between gadget and gateway is shielded at the application protocol layer.

Gadgets should initiate to most commonly used amenities and well know facilities as they are contemplated with Fog node i.e. IOT hub the conveyance path between gadget and amenities or between the gadget and gateway is shielded at the application protocol layer.

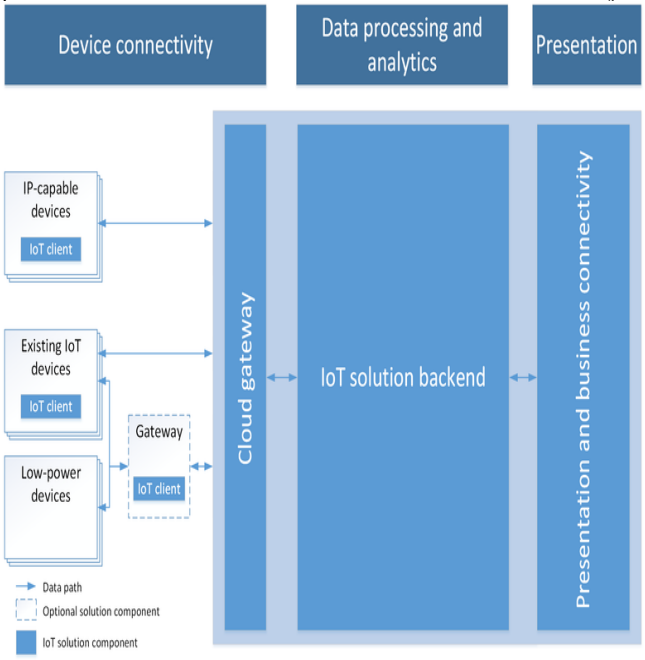

Figure 1.1: Architecture of IoT Hub

Figure 1.1 shows the gadget congruence in the IoT hub model is interpreted as the grouping of data from heterogeneous networks and advancing it onto a data managing and analytics center where the data acquired will be analyzed and the data is extracted from IP apt gadgets such as smart phones etc. The other form of data is extracted from the prevailing IoT devices such as software, actuators, and network connectivity that entitles these objects to accumulate and interchange data. The next form of data is from low power gadgets such as wrist watch, Bluetooth etc.. All these data is acquired and then see Figure 1.1 shows the gadget congruence in the IoT hub model is interpreted as the grouping of data from heterogeneous networks and advancing it onto a data managing and analytics center where the data acquired will be analyzed and the data is extracted from IP apt gadgets such as smart phones etc. .The other form of data is extracted from the prevailing IoT devices such as software, actuators, and network connectivity that entitles these objects to accumulate and interchange data. The next form of data is from low power gadgets such as wrist watch, Bluetooth etc... All these data are acquired and then shifted to the data analytics and processor through a gateway or an IoT client.

The main objective of this paper is understood, and various papers were also reviewed to find the various artificial intelligence techniques to allocate the resources in an IoT hub.
There are various functions that take place in an IoT hub they are Border router, service and resource discovery, resource directory, origin server, proxy, cache. Shifted to the data analytics and processor through a gateway or an IoT client.
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4. Proposed system: fuzzy problem-solving technique

Fuzzy logic is a technique in artificial intelligence that usually results between 0 or 1 and the result obtained is any real value in that range. It is a mere contrast to Boolean logic where the truth values are 0 or 1. Fuzzy logic is heterogeneously applicable to various fields like control theory, machine learning etc.

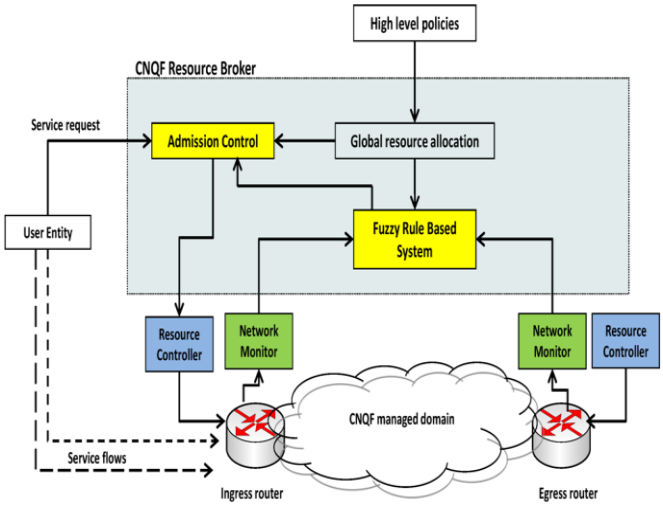

Figure1.2: Resource Allocation

The Figure 1.2 describes the resource allocation problem reduction using the fuzzy logic artifical intelligence techniques. We have the ingress router that collects the information from various processors into the system.The exgress router is used to send the information whether the processor is idle or busy to the user.The two routers are connected together with the help of a CNQF domain.We have the network monitor that monitors the network whether the no of packets are full or empty in the network and thereby helps the user to send or recieve a packet over the network based on its status .The user sends the request and its service is controlled by the admission controller which controls the admission of a packet into the network using the fuzzy logic solving technique .The fuzzy rule based system follows the binary logic or the fuzzy logic that is 0's or 1's .Global or high priority resources are allocated in the global resource allocation.The resource controller controls the admission of the resources into the system.This is the proposed system of our project work and can lead to a greater efficiency than the other techniques.

5. Working Principle

The working principle of our project is defined by the fuzzy problem-solving technique where in the network monitor is used to monitor the traffic in the network and helps in reducing the congestion or collision that takes place. There are various phases in our model where the first phase refers to the collection of data and transmission of data through and with the help of ingress and egress routers. After the first phase of data collection we move to the next phase that is transfer of data. The transfer of data is done over a network and to transfer the network must be free from various congestion and collisions. So, the network monitor does this work and then it checks with the resource controller's resource controller is used to control the various resources that flow in and out of the system. After these two phases we can move the request to the admission controller which controls the admission of the resources and thereby gives access based on the fuzzy logic-based system in the next phase. The fuzzy logic based system is used to check true or false that is whether the processor is idle or busy. Hence the resource allocation in our project is done using this technique to improve the effectiveness and efficiency of a system.

6. Advantages

There are various advantages in system of resource allocation using the fuzzy problem-solving techniques, they are:
1.It is cost efficient.
2.Effective way of resource allocation.
3.Conflict free logic based system.
4.Increases the efficiency of the processor.
5.Distributed over a network.
6.Shared memory is used, so no wastage of memory.
7.Less time consumption.

7. Conclusion

FIoT also known as fogging is an enhanced way of developing and implementing fogging platforms for the Internet of Things. As in fogging sector of data processing and amenity issuing actions are accomplished locally in tiny retainers and data processing which needs huge computational resources can happen in cloud.

7. Future Scope

Furthermore, Fog of Things paradigm goes beyond Fogging in various directions: -

i) By utilizing all the processing volume of the network edge through dispatching data processing and amenity delivery on gadgets, gateways (very small servers) and small confined retainers

ii) By describing IoT amenities at the edge of a network

iii) By dispensing these IoT amenities in the network edge via a note and amenity specified middleware

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