A Fog Based Efficient Traffic Management System for IOT Cloud Network Using Task Prioritization

Moussa Mohamed Naji, Department of Computer Technology, Higher Institute of Engineering Technology, Sabha, Libya
Ismail Ali Mohamed Almsallati, Department of Computer Technology, Higher Institute of Engineering Technology, Sabha, Libya
Ammar Ali Ammar, Department of Computer Technology, College of Science and Technology, Sabha, Libya

Abstract - The Internet of Things (IoT) described the organization of physical articles – "things"- that are implanted with sensor, programming, and different advances to interface and trading information with several devices and frameworks over the internet. There are so many devices used in the IoT due to this usage of this device it will be affected to the cloud management and failures will occur due to large storage of data, to reduce these issues fog computing was implemented.Fog computing assists with decreasing transmission in activity and cost related expense for cloud assets, while distributed computing assists with satisfying the expanding requests of huge scope register concentrated offloading applications.The cloud computing measure are needed to gather the information from IoT devices and put away those into the server, wherein the Task Prioritization logic is applied in this paper to assess the organized assignments also, driving that into the far off cloud worker, remaining non-organized information to be kept. The idea of logistic regression algorithm is gotten in this proposed way to deal with perform proficient looking plans to recover the data from cloud condition. A local Search establishment scheme permits the framework to look for the data dependent on its highlights and recover the particular outcomes from server dependent on the component choice cycle.The data presented in the remote cloud server will be analyzed by using logistic regression algorithm and the local fog data is analyzed by using Local Search Optimization algorithm. These two algorithms are operating in hybrid manner to generate the priority token based on the trained data availability over cloud and the resulting priority token is provided to the XG Boost algorithm for classification process, based on the priority token the classification algorithm operates and provide the perfect outcome. This process of task prioritization assures the reduction over cloud traffic scenarios and provides higher searching as well as processing efficiency.

Keywords : Internet of Things(IoT), Cloud Computing, Fog Computing, Task Prioritization, XG Boost Algorithm, logistic regression Algorithm, Local Search, Security Principles.

1. INTRODUCTION

The Internet of Things (IoT) described the organization of physical articles – "things"- that are implanted with sensor, programming, and different advances to interface and trading information with several devices and frameworks over the internet. IoT is basically a stage where implanted devices are

associated with the web, so they can gather and trade information with one another. It empowers devices to

communicate, team up and, gain from one another's encounters simply like people do. The quickadvancement of Internet of Things applications, alongside the restrictions of distributed computing due chiefly to the far separation between Internet of Thing devices and cloud-based stage, has advanced a recently dispersed figuring stage dependent on joint effort between distributed computing and Fog computing. Fog Computing is a promising answer for manage the requests of the ever-expanding number of Web associated gadgets. Fog figuring is to stretch out the cloud to be nearer to the things that produce and follow up on IoT information. Rather than compelling all preparing to back-end cloud, fog computing means to deal with part of the administrations' remaining task at hand locally on mist hubs, which are filled in as a close end registering intermediaries between the front-end IoT gadgets and the back-end cloud servers. Putting assets at the edge of the organization just a couple of jumps from the information sources permits fog nodes to perform low inertness handling while idleness lenient and huge scope undertakings can in any case be efficiently prepared by the cloud. Also, the expense and scale benefits of the cloud can assist the fog with serving top requests of IoT gadgets if the assets of fog node are not sufficient.

Likewise, numerous applications require the interchange and collaboration between the edge (fog) and the center (cloud), especially for the IoT and large information investigation. Starting here of view, mist processing isn't expected to supplant distributed computing, yet to supplement it in another registering worldview, cloud-fog computing, which is to fulfill the undeniably refined applications requested by users [1].Fog computing developed cloud computing and implement on Internet of Things. These devices, called the fog nodes it can be used in any environment with a network connection. Fog computing has extra storage resources at the edges to process the requirements. Hence, the Fog server needs to adapt its services leading to management and maintenance cost [2]. Fog computing being overwhelmed by remote principally, there is a major worry for network security. Organization administrator produces arrangements physically, fog nodes being sent at the edge of Internet, enormous support cost is included. The spillage of private information is picking up consideration while utilizing networks. The end clients are more available to the Fog nodes. Along these lines, more delicate data is gathered by Fog nodes than remote cloud. Encryption strategies like HAN (Home-Area Network) can be utilized to counter these issues.The fundamental security issue is the verification of the gadgets associated with fog computing at various doors. Every machine has its own IP address. A noxious client may utilize a phony IP address to get to data put away on the specific fog node. To beat this entrance control an interruption location framework must be applied at all layers of the stage.Being associated with heterogeneous gadgets, dealing with the fog nodes, the organization, association between every nodes will be trouble except if SDN and NFV methods are appliedin the network management. Putting a gathering of fog servers so that they convey most extreme support of the local necessities is an issue. Examining the work done in every node in the server before setting them decreases the maintenancecost.Delays because of Information total, Asset over-use decreases the effectives of administrations gave by the fog servers, causing delay in processing information. Information Collection should occur before information handling, Asset restricted fog nodes ought to be planned scheduling by utilizing priority and mobility model. Since fog environmentutilize huge number of fog nodes, the calculation is appropriated and can be less energy productive. Consequently, decrease of energy utilization in fog computing is fundamental.Traffic congestion is a growing severe problem in major cities, slowing down growth and prosperity. Some cities are considering measures, like expanding toll roads or restricting the number of licensed vehicles. Such measures can be both expensive and of harsh effect on travelers [3].

In this paper, analyze due to the usage of large number IoT devices, the storage become full, traffic congestion will occur, failure will occur lots of issues will occur due to this. To afford these issues we implement multiple fog computing and it is placed near sensor. Then the Task priority will applied to the Logistic regression and Local search Algorithm. To filter the important task we use XG Boost server and

it will give to the cloud management to reduce the traffic and storage.

1.2 Fog Computing

The IoTis used to carry the availability to a natural level, penetrating each home, vehicle, and work environment with brilliant, Web associated gadgets. In any case, as reliance on our recently associated gadgets increments alongside the advantages and employments of a developing innovation, the dependability of the entryways that make the IoT a useful reality must increment and make uptime a close to ensure. As each machine, light, entryway, garment, and each other article in your home and office become conceivably Web empowered; The Web of Things is ready to apply significant worries to the current web and server farm framework. Gartner predicts that the IoT may incorporate 26 billion associated units by 2020.The famous current methodology is to bring together cloud information preparing in a solitary site, bringing about lower costs and solid application security. In any case, with the large amount of information that will be gotten from worldwide appropriated sources, this central processing structure will require backup. Additionally most undertaking information is pushed up to the cloud, put away and dissected, after which a choice is made and activity taken. However, this framework isn't effective, to make it proficient, there is a need to deal with some information or some large information in IoT case in a brilliant way, particularly if it's delicate information and need sudden activity.

To outline the requirement for quick handling of some sort of information, IDC gauges that the measure of information dissected on gadgets that are genuinely near the Web of Things is moving toward 40%, which underpins the dire requirement for an alternate way to deal with this need. To deal with this challenge Fog computing is used.Fog computing permits figuring, dynamic and activity taking to happen by means of IoT gadgets and just pushes applicable information to the cloud, Cisco begat the expression "Fog computing "and gave a splendid definition for Fog computing: "The fog stretches out the cloud to be nearer to the things that produce and follow up on IoT information. These gadgets, called fog nodes, can be conveyed anyplace with an organization association: on a plant floor, on head of a force post, close by a railroad track, in a vehicle, or on an oil rig. Any gadget with processing, stockpiling, and organization availability can be a fog node. Models incorporate modern regulators, switches, switches, implanted workers, and video reconnaissance cameras." There are so many benefits for using the fog computing, it will analyze the most time-important information at the organization edge, near where it is produced as opposed to sending huge measures of IoT information to the cloud, and it will Follows up on IoT information in milliseconds, based on policy, and it willsends chosen information to the cloud for historical investigation and longer-term storage. Fig 1 shows the processing of fog computing in IoT.

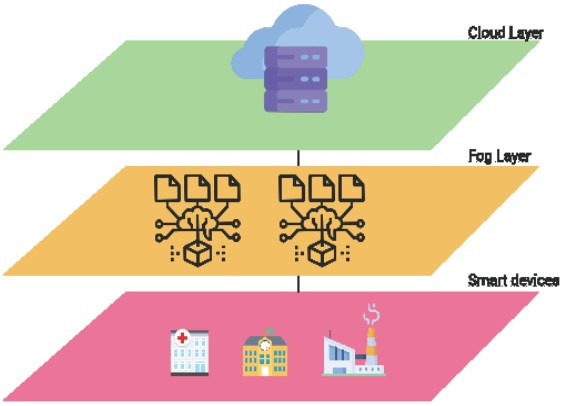

Fig 1: Process of fog computing in IoT

Fog computing isn't a substitution of distributed computing by any measure, it works related to distributed computing, advancing the utilization of accessible assets. In any case, it was the result of a need to address two difficulties, real time process and activity of approaching data and constraint of assets like transfer speed and figuring power, another factor helping fog processing is the way that it exploits the appropriated idea of the present virtualized IT assets. This improvement to the information way chain of importance is empowered by the expanded figure

usefulness that producers are incorporating with their edge routers and switches.

1.3 Applicationsand daily-life examples of Fog Computing

Fog computing has its own international supporting association named the OpenFog consortium founded in 2015. This association comprises of high tech industry companies and academic institutions across the planet aimed toward the standardization and promotion of fog computing in various capacities and fields. The consortium offers guides, use cases, marketing research and plans that help developers and IT teams understand truth value of fog computing.[3] In February 2017, OpenFog Consortium published the OpenFog Reference Architecture for fog computing. This document presents and discusses eight technical pillars for fog computing (namely; Security, Scalability, Open, Autonomy, Programmability, RAS (Reliability, Availability, and Serviceability), Agility; and Hierarchy). Considering the mixing of cloud and fog computing, the breakdown of what assignments and tasks attend fog and what goes to the cloud are application specific. This breakdown might be allocated supported a particular plan which will itself change dynamically if the network state changes. Consistent with the OpenFog architecture, applications characterized by problems with, security, cognition, agility, latency, and efficiency are advised to be assigned to the fog nodes. Applications within the fields of transportation, agriculture, healthcare, hospitality, smartcities, smart–buildings, financial services, that are network-constrained and mostly require real-time deciding , low latency, improved security, are samples of fog nodes tasks in IoT applications.

Medical care administrations and applications are defers responsive and make classified data of the patients. [4] The information produced incorporates delicate and singular information. So also, area information can be delicate in certain circumstances. Expanded unsteadiness and inertness can cause different issues in tele-health and telemedicine applications. Such sort of circumstance can make fog computing a satisfactory worldview in medical services situations [4]. Fog computing assume a significant function in crisis clinical assistance with little idleness limitations related with implantable clinical gadgets, emergency vehicle correspondences or versatile admittance to persistent clinical documents [5]. Creator in [6] proposed a framework for stroke patients.The proposed framework utilizing fog computing to recognize,predict and prevents fall by stroke patients. They utilized fall identification learning algorithm across edge gadgets and cloud resources, after analyzing the framework with different methodologies. They reached the resolution that this framework had a shorter reaction time and devoured less vitality than the methodologies utilizing in the cloud.

In traffic signal framework, the video camera that distinguishes the flash lights of a rescue vehicle can consequently change the road lights and open the tracks for the vehicle to cross the traffic. Intelligent streetlights coordinate locally with sensors and distinguish the event of the individual by walking and cyclists, and assess the separation and speed of moving toward vehicles. Other than these, intelligent lighting is naturally turned on once the sensor recognizes the development and turns off as the traffic passes. Close by canny lights that go about as fog gadgets facilitate to make a green traffic light and impart an admonition sign to move toward vehicle [7]. Traffic signal framework is helpful in, accident prevention, support of consistent traffic and assortment of significant information to assess and improve the exhibition of the framework [8]. Fig 2 shows the application of fog computing in IoT.

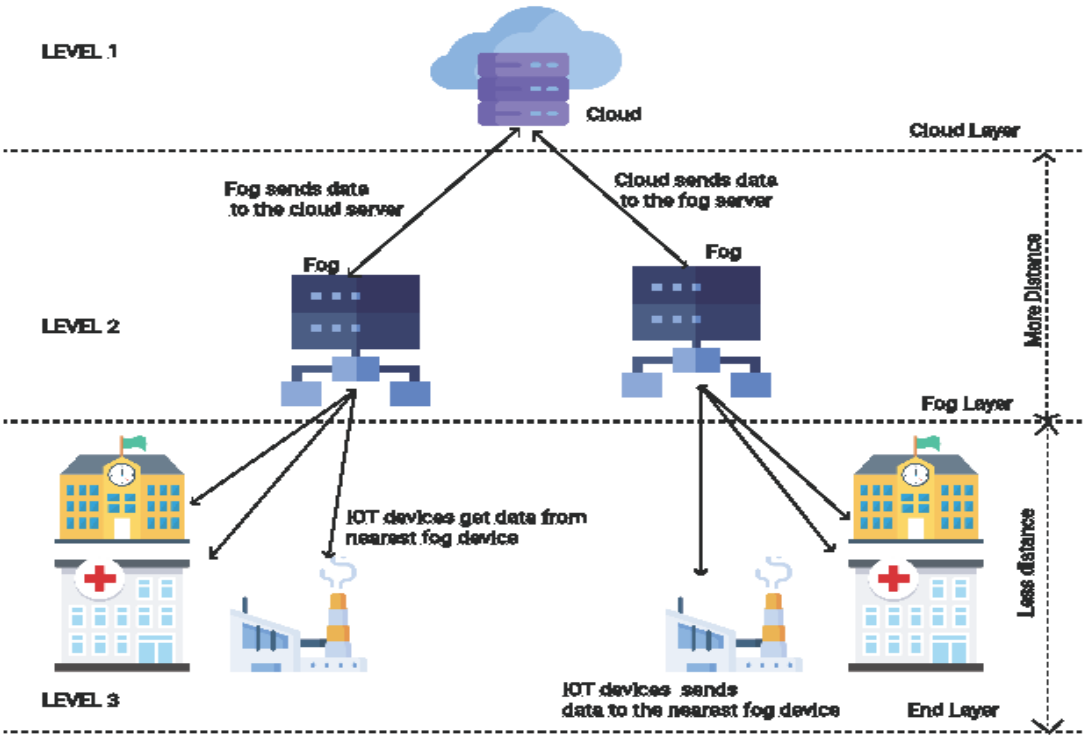

Fig 2: Application of Fog Computing in IoT

2. RELATED WORKS

Hassan et al. [9] proposed a paper regarding mobile-application development with fog logics, during which the paper clearly described regarding the procedures of fog computing also because the necessity of fog environments over cloud architecture. The fog computing devices provide sufficient manipulation assets to dynamic mobile-apps and supply enough storage capacity to handle any categories of knowledge like media, text then on. This type of applications process any quite tasks faster compare to the classical processors. Nearby fog enabled devices attains more benefits like space for storing enhancement, processing speed enhancement and supported the association of fog with regular mobile application developments. The efficiency of using such fog devices provides enough features and accessing power to the created applications. The author dictates clearly regarding the advantages of applying such fog assistance to the mobile application to enhance the efficiency of it, which is proved via graphical results over the paper.L.Pu et al., 2016 [10] proposed a paper regarding Task Offloading and network management via device to device integrations, during which the authors described regarding the aim of task offloading and the way much benefits related to that process rather than using classical task assessment process. The task generally manipulated over the local machine causes server load problems and creates a network overhead as a result, which can leads an important issue over specification. During this paper, the methodology is meant to separate the local machine process into remote task offloading process, some prioritized data is processed into the local network server, remaining low priority data is offloaded to the remote network server and over there the processing of such data happens. The result of such processed data is accumulated over the local machine and virtualizes

that to the users. Of these process are happened in micro seconds, in order that the users cannot get to understand the backend processes. These logics are clearly visualized on the paper.P.Xuan, et al., 2016 [11] proposed a paper towards task scheduling over cloud fog environments. During which it utilized virtual-systems at cloud environment as expanded assets when fog-devices did not have adequate information/resource to satisfy customers' needs. Nonetheless, it didn't consider the region of assets accessible access. The general-optimization approach targeting expense aware cloud benefits and also during which it concentrates on sensitive-reactions to customers. Besides, the expenses for fog assets need to contrast with cloud assets as these assets were likewise shared by numerous customers.D.Zeng, et al., 2016, [12] proposed a paper regarding joint optimization techniques over task scheduling process also as discussed regarding the image placing nature of fog computing and its benefits in real time scenario with hardware assistance. The optimization logic is followed over this paper to control the server processing and storage capacity, the whole storage capacity of the server is allocated supported the tasks and its prioritization. The upper end tasks like medical emergency related values and records are accumulated in top end server over cloud. Also because the low priority records are maintained over the fog server for processing. The software centric approach is followed over this paper to control the image storing nature within the proposed system of paper. This type of image processing techniques over fog environment is handled supported software associated hardware components, which is clearly described over the methodologies section of the quoted paper. Computational assets got from two sources: hardware associated customers and fog systems initiated to by remote processing servers. Cloud Storage areas might be common by the 2 customers and computing servers. This system just organized assets locally from fog gadgets and hardware associated customers. It was, in any case, unavoidable to utilize more resources from cloud since there might be huge scope errands or serious needs submitted from customers.Kaleeswaranet al. presented dynamic scheduling of knowledge using genetic algorithm in cloud computing using Ubuntu Enterprise Cloud. The tasks were scheduled supported the computation and memory requirement. The scheduling of tasks was done by first sorting all the tasks then the first task was chosen from the queue to allocate the resource which will best fit using the Genetic Algorithm. Once scheduling is completed finally the info is stored within the cloud.

3. PROPOSED MODEL AND METHODOLOGY

This paper proposed a substitution approach of dealing with the enormous information over server condition with none imperfections. The preeminent significant worry up here is that the costs and traffic the board while buying the cloud server. Since all the associations bought the private cloud server from merchants ordinarily, in that the capacity limit and recurrence will choose the value and durability of cloud server. During this case, a huge association contains numerous organizations attempting to utilize the cloud server for keeping up the records like medical care, institutional understudy participation at that point on to the server quickly through Web of Things (IoT) empowering, causes substantial traffic over the server environment.

This reason drives how to style groundbreaking thoughts of beating such circumstances and flexibly an useful answer for the referenced issue. This proposed approach centers for the most part around the treatment of constant information with traffic free communication and cost efficient nature. During this paper, a substitution approach is executed, which is only a combination of Logistic regression and Local search Algorithm. These two algorithm are joined cooperated to flexibly the least difficult cycle of creating the need token to the undertaking, during which the order algorithm called XG Boost the resultant need token and characterize the data upheld capacity standards.

This framework is effectively prepared upheld the altered modern dataset, during which it contains the standard institutional qualities and firm related things. Also, of these customized datasets contain one significant attribute called 'Status', in that field, the boundary directs "High" signifies it's an indication of high-need task and if the boundary sign is "Low" signifies it's an indication of low-prioritytask. The assignment which is deviated from now and allotted to the individual servers upheld the need token

produced by the consolidated Logistic regression and local search algorithms. The inquiry enhancement cycle of the testing and preparing blends are taken care of by this incorporated calculation over cloud and fog servers likewise as give the satisfactory token to control the undertaking further. Of these calculations are summed up plainly over the further areas together by one.

3.1 METHODOLOGY

The IoT is used to carry the availability to a natural level, penetrating each home, vehicle, and work environment with brilliant, Web associated gadgets. Due to the impact of IoT, the number of the devices increased. So the failures will occur in the cloud management and also traffic will occur and it results in storage become full. To afford this issue we use multiple fog is implanted near to the sensor. In this paper, local search and logistic algorithm is used to give the priority of the task. Then apply XG Boost algorithm to filter important data and transfer to the cloud management it will reduce traffic congestion and storage.

A. LOGISTIC REGRESSION ALGORITHM

The Logistic regression and local search algorithm are generally significant here, in which these two algorithms are giving an approach to handle the task and classify it in an effective way and relegate the need token at long last. This created token is valuable in the feeling of characterization perspective with XG Boost algorithm. The information gathered from the IoT gadgets are collected and regarded that as a testing information, which will be contrasted and the prepared information over server by methods for AI standards. This incorporated inquiry enhancement calculations proficiently measure the testing information with prepared information by methods for dataset credits, particularly dependent on the quality called "Status". When the incorporated advancement calculation finished the errand need that will be tokenized and sent to individual mist worker or cloud worker for capacity reason.

Thusly, the Local Regression Algorithm crosschecks the testing information with distantly put away prepared records and produce the prioritization results dependent on include extraction measure followed by AI standards. What's more, the local search Streamlining Calculation measure the testing information dependent on the prepared records put away into the nearby mist workers and produce the tokenization cycle as needs be just as if the created badge of the individual errand is going under low-need implies it will be driven into the nearby fog servers in a flash. These two calculations are essentially utilized for highlight determination and extraction measure over information advancement and looking through situation.

Algorithm: Local Regression and Local Search Optimization

Input: Test data from the IoT Gadgets

Output: Task Priority Token

Step-1: Accumulate the data from IoT Gadgets.

Step-2: Analyze the objective server for process the element extraction law.

Pseudocode:

```
target_acronym <<
un_list(string_split(sub(task1,task2,task3,task4,...,tas
k-n >> task_alias.list_acronyms[j]), split_task = ","))
```

Step-3: Check the test data length. If the length exceeds the threshold, then raising the loop to process further.

Pseudocode:

```
if(length(target_acronym)){
for(jx in sequence(target_acronym)){
my_pattern << past_e0([^bc-yB-ji-11]",
to_lower(target_acronym[ij]), [b-ij-A-11]")
matched_ij << concat(match, seq(pattern_ij =
my_pattern, ij = all_test_data$feature))
}
}
```

Step-4: Split the industrial dataset field attribute text into firm wise list, example institution based, hospital based and so on.

Step-5: Assign the split dataset features to the extraction principle.

Pseudocode:

```
function extract(ij, all_test_features){
data_length << sorting(all_data$test[ij])
result << seq_order(data_length)
split_features(result) << table_dataset(ij, result)
return split_features(result);
}
```

Step-6: Generate the task priority token based on the features.

Step-7: Token Generated.

B. XG BOOST ALGORITHM

XGBoost is an execution of angle supported choice trees. In spite of the fact that, it was intended for speed and execution. Essentially, it is a kind of programming library. This algorithm is used to filter the data from the task priority and transfer to the cloud management and it will reduce traffic congestion and storage.

Algorithm: XG BOOST ALGORITHM

Input: Extracted Features of Test Data and Train Data

Output: Classification Result with Priority Features and Server Storage Priority (Fog or Cloud).

Step-1: Collecting the extracted dataset features and test data features.
Step-2: Analyze the priority based on the extracted dataset attributes and test data content.

Pseudocode:

```
for(records.length<0; records.count++){
dataset{ji}(x+1) >> TestData(j{i}(x+1)
}
```

Step-3: Accumulate the dataset content for classification.

Pseudocode:

```
declare network_weights(dataset, thershold_value);
declare task_priority;
do{
for(y as each_training_data, data_priority){
data_prediction << neural_net_output(data_len, y);
actual_data << trained_output(y);
task_priority+= random_classi_ratio(data_prediction,
actual_data);
}
}
return(task_priority);
```

Step-4: Gathering the returned task priority from Step-3.

Step-5: Identify the task priority and decide the server to store the respective data.

4. CONCLUSION

In this paper, another technique of Fog computing empowered IoT based information upkeep framework over distributed computing condition is proposed. The task prioritization measure gives huge preferred position over coming about outline of information upkeep and traffic decrease in results. The cost assessment standards are applied over fog framework to forestall the costly idea of actualizing the server condition. By utilizing such fog based information the board framework, an enormous number of traffic upgrades is killed and that naturally expected to decrease the general cost. The information support over cloud server gives dependable correspondence among user and server. The organized information might be put away in the distant cloud server and the normal information are kept up into the fog server, which will be intermittently back-up by the server chairmen. For all the framework is appropriately done by utilizing AI standards, for example, XG Boost alongside Logistic regression and Local search optimization algorithm. The outcomes and conversation area demonstrated the presentation, time assessment, cost utilization and exactness proportions of the proposed framework in sensible way.

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