e-ISSN: 2582-5208
International Research Journal of Modernization in Engineering Technology and Science
Volume:02/Issue:07/July-2020 www.irjmets.com

NEED FOR FOG COMPUTING IN IIOT

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ABSTRACT

Low latency is important for slow applications such as video surveillance, live streaming, and online data analysis. Fog computing enables the emergence of a latency-sensitive (IoT) network to support real-time applications. While the distance between sensing and processing is reduced in the fog network, the consistency of fog latency will still be determined. In this paper, we study the elements of network delays and develop an IoT-based latency measurement framework based on fog. The proposed framework, in particular, accurately predicts the end-to-end inter-node delay along the continuum of cloud objects. We investigate the benefits and use cases based on the latency estimated by the proposed framework. A case study was also conducted to demonstrate the validity and benefits, followed by future research directions.

KEYWORDS: Internet of Things; Industrial Internet of Things, Fog Computing.

I. INTRODUCTION

In the Internet of Things (IIoT) industry, large smart devices produce explosive information that needs to be processed. And in the context of industry 4.0, more IIoT applications, such as smart manufacturing and industrial automation, require real-time data processing. Therefore, a strong data center will be important for IIoT. In fact, cloud computing has been considered the key key to meeting the needs of IIoT applications. However, the cloud-based IIoT network still faces some challenges that can be addressed.

In the case of Big Data, it may not work well to send the largest number of cloud-based IoT devices, due to the high cost of communication bandwidth, and due to high data volumes (for example, virtual sensor readings). Instead of moving data to the cloud, it may be more effective to move applications and capabilities closer to the data generated by IoT. This concept is called "data power," and the fog compog is well suited to addressing this issue. The cloud data centers are often used remotely, leading to unbearable mobility. Alternatively, the growing data produced by smart services makes the burden of cloud computation more complex, and any error in the network can result in a significant network error. We note that fog compog is a promising solution for tackling the above challenges in cloud-based IIoT. The computer complex is processing local load in the fog area close to eliminating latency, supporting a new type of IoT applications and services that require low modularity, mobility support and geo distribution.

II. LITERATURE SURVEY

In [1] the author gives us an overview of the delay by the formulation of d_{proc}, d_{queue}, d_{seri} and d_{prop}

as $D_{end\text{-}to\text{-}end} = N \times (d_{proc} + d_{queue} + d_{seri} + d_{prop})$. The author proposes different coordination systems where coordinates represent the fog / IoT nodes to solve the latency problem.

Recently, there are many works about fog computing and improved cloud computing. In [2], the low latency and low energy consumption performance of the fog computing is validated by comparing with the traditional cloud computing; In [3], authors focused on the service allocation problem in the Combined Fog-Cloud architecture to minimize the latency experienced; In [4], [5], authors proposed a novel C-RAN architecture with the mobile cloud computing.

Proposed Model

Fig. 1 illustrates a general framework for an IoT-fog-cloud architecture that is considered in this work. There are three layers in this architecture: the layer objects, where the "objects" are located and the end users, the layer of fog, where the cloud layer is located, and the cloud, where the cloud servers are set. The cloud server can be

e-ISSN: 2582-5208
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composed of many configuration units, such as a rack of physical servers or a server with multiple processing components. In each row, nodes are separated by domains where a single IoT-fog-cloud system is used.

For example, the domain of IoT environments (factory, for example) is green, and they interact with the background of the fog areas associated with the application. An IoT domain can measure objects in a smart home, factory sensors, or soil moisture sensors on a farm where all nearby objects are considered to be one domain. Usually a larger area in one domain is placed next to each other, for example, in one zip code or building levels. Each domain is associated with a set of cloud applications for a single application. We will not apply any restrictions to the topology (any allowed topology), except for this systematic build, as this will make the model easier to present.

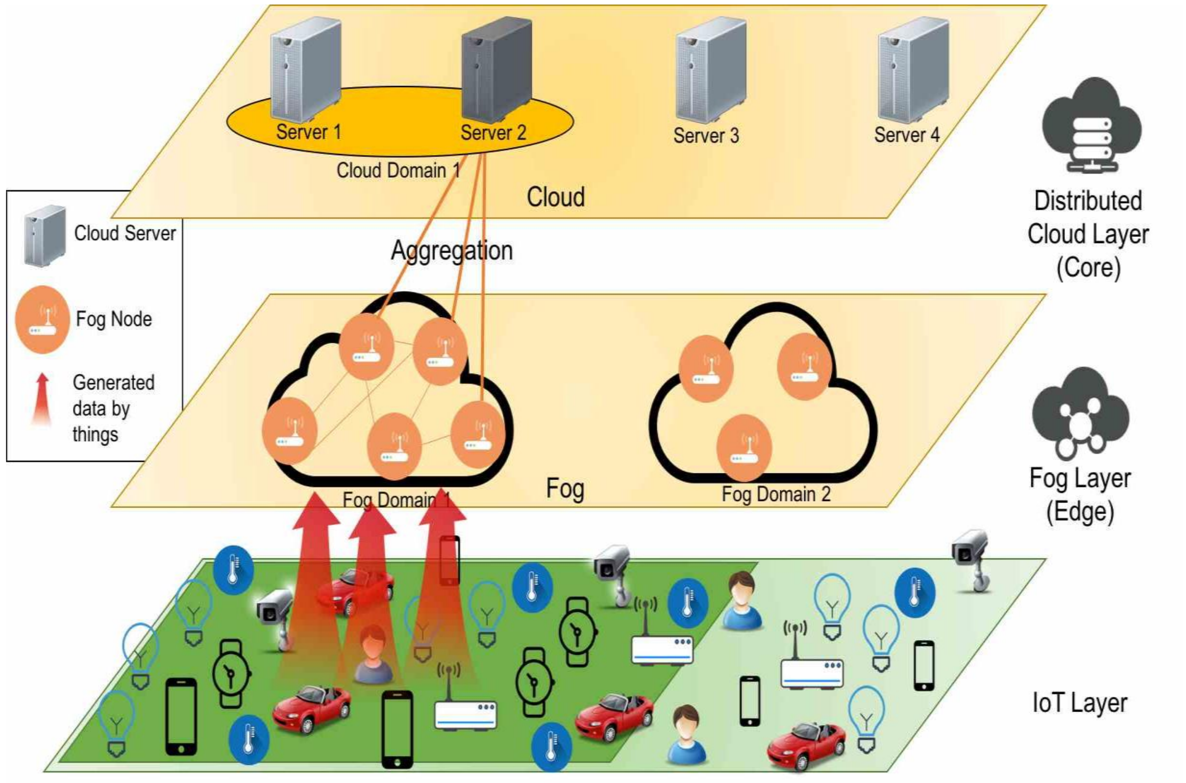

Fig-1: General Framework for IoT-Fog-Cloud Architecture. Each layer is partitioned into domains where a single application is implemented

III. THE MODEL FLOW

In this subsection, we discuss the decisions made by the fog to search or upload work to other areas of the fog. In our system, the decision to load a function is limited to the fog response time, which depends on several factors: the amount of integration required for the task, and the line status (depending on current load) and nog fode energy performance. In particular, we propose a model that considers different timeframes for processing different individual tasks. In other words, in our model there would be a difference between heavy processing activities and light immersion activities.

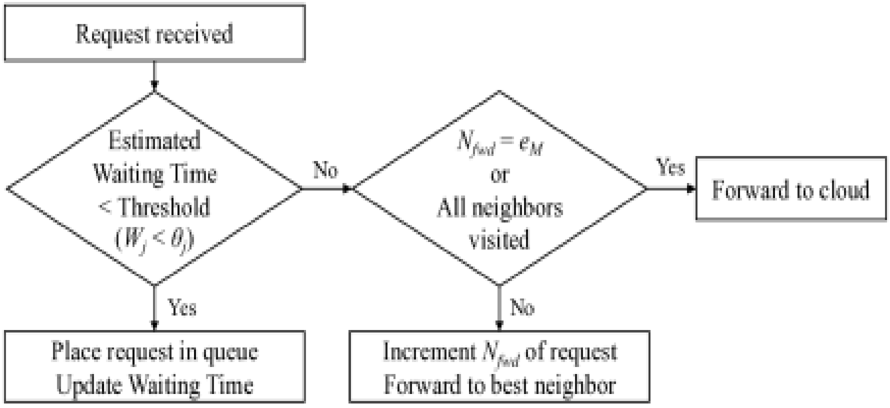

Fig-2: Flowchart of Fog Node j for handling received requests.

Here e_M (Maximum offload limit at the fog layer in domain M) , W_j (Estimated waiting time of fog node j), 0_j(Offloading threshold at fog node j). We assume requests have two types: type Light (light processing) with an average processing time of z_j at the fog node j and Z_k at the cloud server k, and type Heavy (heavy) weight with average z_j performance rate in the f and Z_k fog cloud node k. For example, requests sent by temperature sensors to fog nodes to calculate room temperature can be seen as a function of light intensity. Similarly, the request to read a license plate on a recorded video of a car, sent by a traffic camera to dense areas is an example of a difficult task. Note that, in general, there are more than two types of activities that can be considered; However, in this paper, we discuss two types of functions to facilitate presentation.

Evaluation of Fog and Cloud

We perform a fog computing paradigm analysis based on the metrics developed in Section 4, and compare its performance against traditional cloud computing. We are considering a system with 10 FIs connected to a single CSP. TNs are assumed to be evenly distributed among VCs, with the rate of data processing from each TN being one pack / s. The length of each data packet is assumed to be 65,536 bytes and the machine instruction size is assumed to be 64 bits. The speed performance of the devices at the fog center and cloud information centers are assumed to be 1256 MIP (ARM Cortex A5) and 124,850 MIP (Intel Core i7 4770k), respectively. In addition, the power required to transfer one data is 20 nJ, while the processing power is taken as 10 J / GB data..

Service latency

Data packet routing is based on a circular travel time between two terminals, and is calculated as rtt (ms) = 0.03 × distance (km) + 5. We change the percentage of requests that require access to the cloud computing center, and create an additional transmission path for all locations in the cloud. -VC against a different number of TNs (Transition Node) .Because of the increase in the number of TNs present in the lowest tire, the transmit latency increases with the line slope. In addition, as the percentage of requests is rushed to CSP (Cloud Service Providers), the increase in transfers is seen to increase.

IV. CONCLUSION

In this work, we theoretically model the fog architecture, and analyze its performance in the context of IoT applications. It was observed that for a system with a large number of real-time, low-latency IoT applications, the latency of the cloud computing service was significantly lower than that of the cloud computer. In addition, the rates of power outages due to the transfer of data to computer systems and subsequent analyzes were recorded to be very low. It should also be mentioned that fog computing is not a replacement for cloud computing; rather expecting the application of next-generation IoT and its huge demand for real-time services, the cloud compog, in conjunction with the traditional cloud computing model, will serve as a green computing platform. In the end, our future works include a visualization of fog writing from a resource management perspective as well as self-expansion and expansion in the context of big data analysis that embraces the Internet of all things.

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