SELF-ADAPTIVE AND FAULT TOLERANT DATA PROCESSING IN IOT BASED ON FOG COMPUTING

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ABSTRACT

Now a days, the IoT system has been instrumental in reducing the load of resources. IoT has multiple devices interconnected to generate large amounts of data every second[9]. Cloud computing is used to handle such large data. The problem of low latency due to IoT is minimized by fog computing in which the data goes through the fog device to the first core nodes and sends the results to the client. These papers proposed the Ravens-based Sensor Data Processing Framework (REDPF)[1] to improve the reliability of data transmission, improve system resources and speed up the process. To achieve reliable data transmission, a fault tolerant mechanism is to be developed that will receive data from portable devices and then check the integrity of the received data. The collected data will then access the auto-optimization filter to ensure resource allocation. Finally the RCA (RVINS based computing and analysis)[1] will generate results according to predetermined rules and send them to the client for feedback.

Keyword : - IoT, Latency, Fog Computing, REDPF, Fault-tolerant, Self -Adaptive, RCA .

1. INTRODUCTION

Internet of Things (IoT) is a network of interconnected devices. IoT also offers the ability to remotely control various devices on the IoT network. Using smart objects, they can be integrated to provide intelligent services for remote monitoring. This creates a greater demand for storing and processing large volumes of low latency data. As a time sensitive service, traditional cloud computing may not necessarily participate because sensor data takes too much time before arriving at core storage and processing nodes. To address this problem, the idea of fog computing was adopted in recent years. Data is not sent directly to the node. Fog device sensors receive data and provide processing results. The major problem is the fast and efficient processing of large amounts of complex data with limited computational capacity. A typical approach to tackle this problem is to cut huge volumes of data. The algorithm used in this paper is called Variable Neighborhood Search, (VNS). The main problem with this method is that calling subrutin can be very time consuming. A simple solution is proposed for this problem, the Ravens-based Sensor Data Processing Framework (REDPF). In this way the solutions are randomly drawn in RVNS. Complex subroutines are replaced by random point selection in each neighborhood.

The proposed architecture of REDPF is as follows:

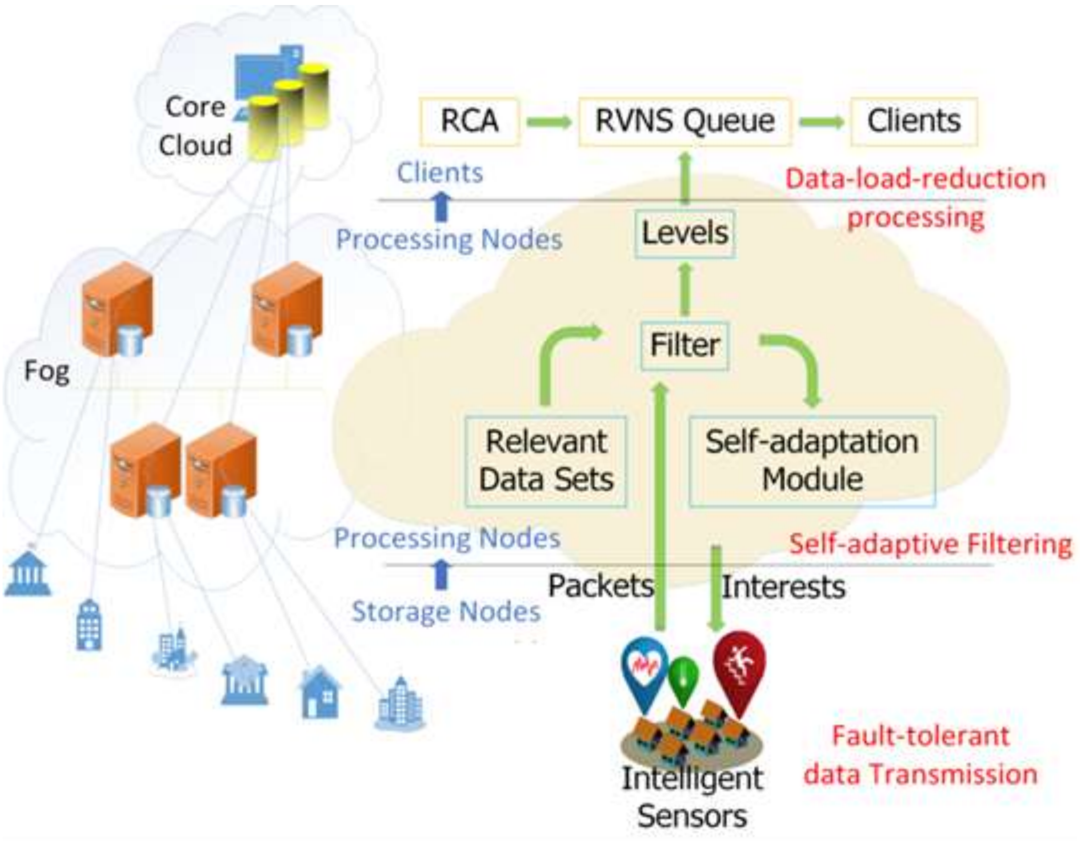

Fig.1- Structure of REDPF

FAULT TOLERANT- The IoT system needs to quickly retrieve and process accurate sensor data and provide the right decisions. During this process, any bugs or failures can cause serious problems. Therefore, how a system integrates data can be trusted, is a symptom of the absolute. To ensure reliable transmission, it is important to combine some fault tolerant algorithms. Fault-tolerant data transmission ensures transmission reliability between storage nodes and therefore process nodes.

FOG COMPUTING- Fog computing adds an extra layer of computational power between the device and the cloud to reduce the time it takes to request an answer. Without having to send all their data to each individual cloud, each device becomes a process that can handle small, time-sensitive tasks. Fog Computing In supported IoT systems, fog devices have storage nodes and processing nodes.

A storage node is used to store sensing element data collected from intelligent sensors. These fog storage nodes upload their stored information to the Core Cloud for future reference. When a user proposes a request, the processing nodes will retrieve the relevant data from the storage nodes and return the retrieved results.

2. LITERATURE SURVEY

Samuel Greengard, "Adaptive and fault tolerant Data processing in healthcare IoT Based on fog Computing"[1]**,** The algorithm used in this paper is called Variable Neighborhood Search (VNS) . The main point related to this method is that calling subroutine can be very time consuming. Data transmission has less reliability. The processor has the opportunity to access the data immediately obtained to speed up the process. REDPF (RVNS-based sensor data processing framework) is proposed to overcome these problems.

Amir M. Rahmani, "Using Temporal Logic and Model Checking in Automated Recognition of Human Activities for Ambient-Assisted Living"[2], The main problem in this paper is the automatic monitoring and identification of activities of daily living (ADL). It simply provides the resources to fill the gap between the low-level observations taken by sensing devices and the high-level concepts needed to detect human activity. Defined as an ARA (automatic identifier of ADL) that helps achieve temporal logic and model detection for real-time ADL detection in a smart environment. To reduce the complexity of user-defined tasks, ARA (ADL's automatic identifier) has been proposed to detect human activity and behavior in sensitive environments.

Simon Monk,"PEACE An Efficient and Secure Patient-centric Access Control Scheme for eHealth Care System"[3], This paper proposes an efficient and safe patient-centered access control (PEACE) plan for managing electronic health care (eHealth) systems. To ensure the privacy of patients' personal health information (PHI), access privileges are defined by their role. It guarantees PHI integrity and privacy with the help of digital signature and pseudo-identification techniques. It uses cryptography to ensure patient information securely. The drawback is that it is too expensive and too late to communicate.

P. Hansen and N. Mladenovic, "Enhancing the Performance of Mobile Healthcare Systems Based on Task-Redistribution"[4], This paper considers latency, system availability level, and battery lifetime as critical factors for the success of the M-Health system. Proposed a work-redistribution optimization approach to develop adaptive m-health systems. For task redistribution, system QoS performance is estimated by a computer model for a particular function. It also proposes performance metrics such as developing the MADE framework in real-world mobile healthcare systems to evaluate the feasibility of time, task reorganization, and the usefulness of task redistribution based adaptations for task restructuring. The limitation of this system is that it requires attention to resource optimization, and timely control of response is also a critical factor in an emergency.

B. Y. Xu, L. D. Xu, H. M. Cai, C. Xie, J. Hu, and F. Bu, "Urban Transition in the Era of the Internet of Things: Social Implications and Privacy Challenges"[5], Here an IoT technology is used that provides devices with the option to connect to each other and to collect and send data from the Internet. So there is potential for urbanization. This paper proposes legal development and privacy and social security of individuals. One drawback is that if this technology is implemented as an ideal of urban development and is needed to maintain a personal right to privacy and to meet the burden of institutional privacy in an urban context, then it may lose the connection between human connection and humanity.

Y. Cao, S. Chen, P. Hou and D. Brown, "Distributed Multiparty Key Management for Efficient Authentication in the Internet of Things"[6], A distributed key management plan is developed using Chebyshev polynomial and chaotic maps for cryptographic operations. In phase-1, a session key is created between the group head and the server. In the second phase they propose an intra and inter group secret key installation scheme. It also thrives in the DMK scheme where GH uses one-way hash functions based on a messy map to ensure message integrity. Chebyshev polynomials forms are used to establish key and generate cipher text. The limitation of this system is that it does not guarantee the integrity of the message.

C.S.R.Prabhu , "Efficient and Privacy-Preserving Medical Data Sharing in Internet of Things With Limited Computing Power"[7], In this paper an effective medical data sharing scheme in cloud storage is implemented. ABF (Attribute Based Bloom Filter) is used to hide the entire attribute. During the decryption stage, the original user is able to reconstruct the attribute mapping function and decrypt the cipher text. Online / offline encryption technology is used to encrypt content. According to security analysis, this system is extremely secure. It is proposed to verify that the cipher text stored on the cloud server does not interfere. If it interferes, it should be identified in time. The limitation of this system is that it may require a lot of computation work during the encryption phase and then stores it in sensors and smartphones.

Peter Waher, "Ubiquitous data accessing method in IoT-based information system for emergency medical services"[8], Using IoT technology in healthcare gives doctors and managers the benefit of gaining access to a variety of data sources, but there may be problems accessing heterogeneous IoT data. This paper achieved three main findings. Helps Secondit has proven how global IoT data can be accessed everywhere. And third, the use of UDA-IoT in medical services for emergencies means that data from patients, doctors, nurses and ambulances can be collected through IoT notes and transferred to cloud computing platforms. The problem is that industries become environmentally complex as a large number of companies are involved. To overcome this problem, the UDA-IoT method was proposed which would be appropriate for the information industry involved in small-value chains.

3. SYSTEM ARCHITECTURE

This is a system architecture of "Self-adaptive and fault tolerant data processing in IoT based on fog computing".

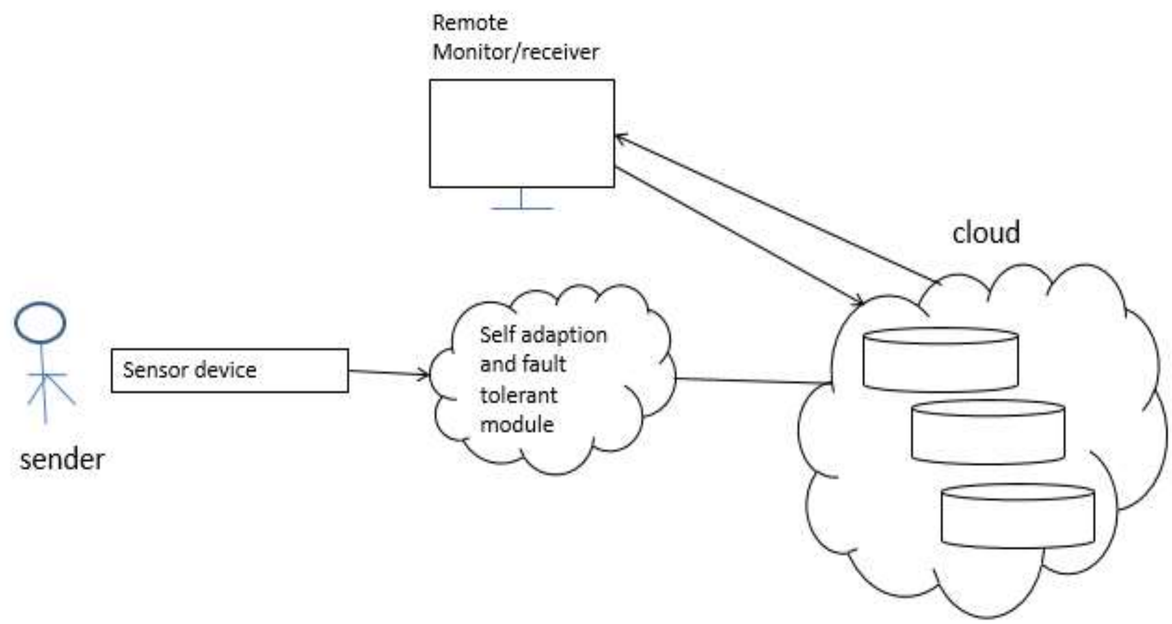

Fig.2: System Architecture

4. METHODOLOGY

The RVNS-based sensor data processing framework(REDPF) has to be developed to increase the reliability of data transmission, processing speed, fault-tolerant data transmission, self-adaptive - littering and data-processing by designing the RVNS (Reduced Variable Neighborhood Search) efficiently with various requests from customers.

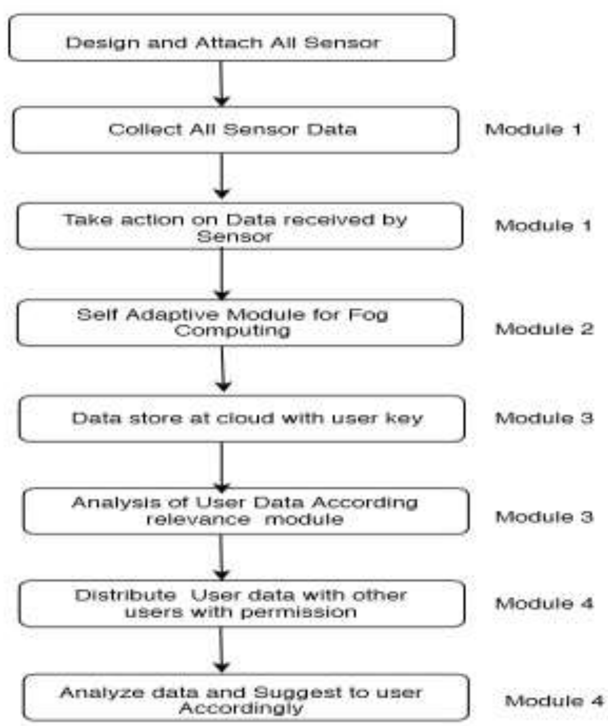

Fig. 3- Step by step Module

Basically the proposed system will perform the following steps:

1. First all the required devices are attached to each other. After the sensor will sense the data.
2. Next it will send to the self-adaptive module for allocating the resources.
3. Then the data will get stored at cloud with its user key which is unique and is analyzed.
4. After the data will be made available for only the permitted users.

This proposed system will have following modules:

1. **Fog node creation module:-**
   At this module the required devices are connected to each other.
2. **Data collection module:-**
   This module will sense the data and take the action accordingly.
3. **Self-Adaptation filter Module:-**
   After collecting the data it will send to this module. This filter is designed to ensure the effectiveness of data. It skips the invaluable data. In addition, a self-adaptation module is to be used to achieve the fault-tolerant mechanism.
4. **Data analysis module:-**
   The collected data will get analyzed to extract only meaningful data and skips the unwanted data.
5. **Data Distribution module:-**
   Finally the data is made available to the legal users.

5. REFERENCES

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