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Big Data Analytics Application in IoT

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Abstract:

Development of big data and IoT is growing day by day and affecting all the dominant technologies and the business by growing the benefits for the individual and companies. The huge amount of data is produced since last some few decades as the trend increases of small devices which are used in IoT(Internet of things). The properties of Big data is categorized into three aspects (a) Variety (b) Volume (c) Velocity [1]. These are introduced by Gartner to describe the elements of big data challenges. Based on the capability to analyze and utilize huge amounts of IoT data many opportunities are presented, which include the applications in smart cities, smart transport systems, energy-smart meters, and remote patient healthcare monitoring devices. The increase in popularity of the Internet of Things day-by-day has made a big data analytics challenging because of the processing and collection of data through several sensors in the IoT network. The collected data form the IOT devices are completely different from the normal big data collected through the systems because of the different sensors and object involved during data collection, which include variety, noise and heterogeneity and rapid growth.

1. INTRODUCTION:

The applications of Big Data and Internet Of Things are rapidly increasing day by day and enhancing the benefits for the individual and organisation. The drastic growth in data of IoT devices has played a major role in big data. There are three V's of big data (a)variety (b)velocity 8and (c)volume[1] This aspects or categories are given by Gartner to brief the elements of challenges in big data. There are various opportunities which are presented by the calibre to analyse and use the huge amount of IoT device data, which including applications in smart cities, smart transport and grid systems, energy-smart meters, and remote patient healthcare monitoring devices. The main challenge of the big data is the more adaptability of IoT by users day by day. The main challenge is to process and collect data of IoT from different sensors in IOT network.According to a survey conducted by The International Data Corporation (IDC)big data market will reach over US$155 billion by 2020 [3]. IoT bigdata analytics is defined as the various steps examined to reveal unseen pattern ,hidden correlation and new information[4].

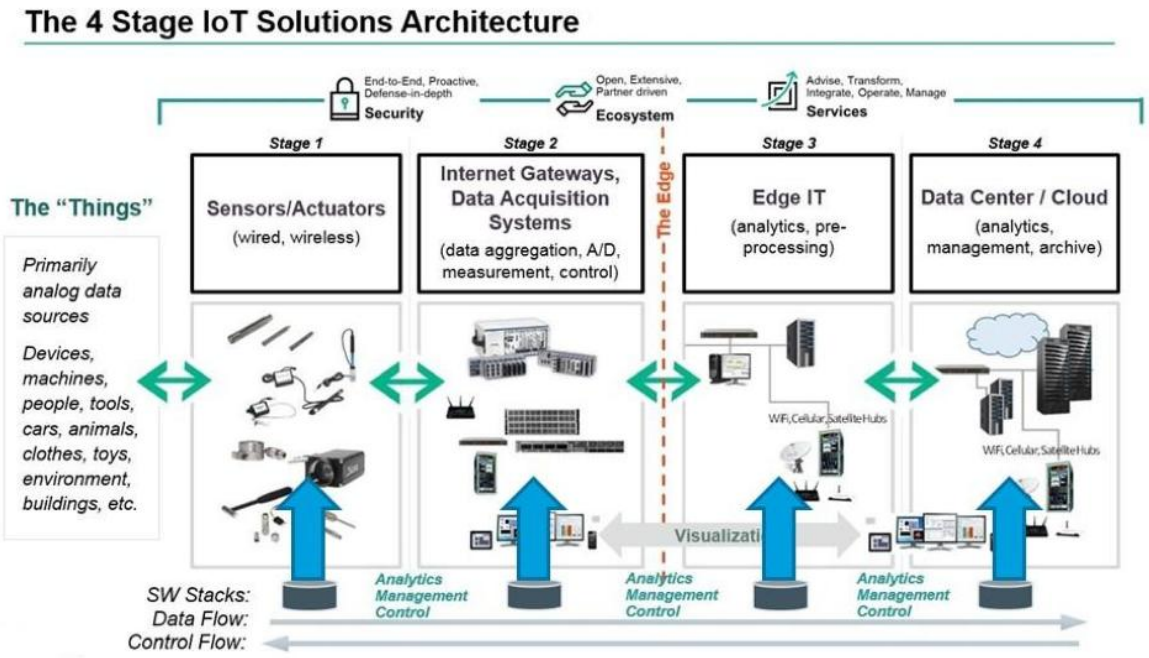
Companies and organisation is having benefits by analysing large amount of data and huge amount of data that can affect the business[5]. The main aim of big data is to understand and achieve the efficiency of data and create well informed data. Moreover, big data analytics aims to extract knowledgeable information using data mining techniques that help in making predictions, identifying recent trends, finding hidden information, and making decisions [6]. The Techniques which are used in data mining are widely deployed for both methods problem-specific methods and generalized data analytics. IoT data are totally different from normal big data collected through systems in terms of characteristics because of the various sensors and objects involved during data collection, which include heterogeneity, noise, variety, and rapid growth.

2. THE IOT

Internet of Things is a network in which real-world objects such as devices, buildings and vehicles are embedded with software, sensors which is having network connectivity through

which objects communicate with each other. IoT allows objects to be controlled remotely and sensed across the network in which it is present. Data collected through the sensors can enhance our lives and help to build a modern intelligent society. It also creates an opportunity for direct integration with the computer-based systems which helps in improving the result accuracy and also helping us economically. IoT(internet of things) offers a platform on which sensors and devices can share data information in a well-defined manner. IoT(internet of things) is recently used for making a smart office, smart retail, smart agriculture, smart water, smart transportation, smart healthcare, and smart energy. During the survey, experts say that IoT(internet of things) will consist have about 56 billion objects by 2025. Cisco and Qualcomm have using the term 'Internet of Everything' (loE). However, Qualcomm's use of the term has been replaced by the 'Internet of Things' (loT) by others. Over 50 billion devices e.g. Smartphone's, laptops, sensors, and game consoles are anticipated to be connected to the Internet through several heterogeneous access networks enabled by technologies, such as radio frequency identification (RFID) and wireless sensor networks. [9] mentioned that IoT could be recognized in three paradigms: Internet-oriented, sensors, and knowledge [10]. The recent adaptation of different wireless technologies places IoT as the next revolutionary technology by benefiting from the full opportunities offered by Internet technology.

2.1 ARCHITECTURE FOR IOT (Internet of Things)

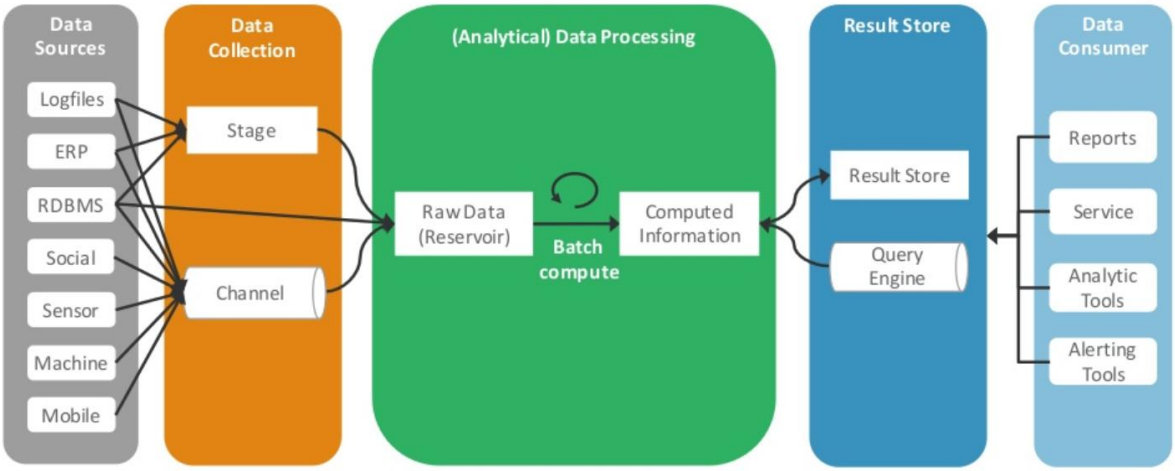


3. BIG DATA

The large volume of data produced by temperature sensors, sensors, devices, social media, health care applications, and various type of software applications that continuously produce massive volumes of structured, semi-structured or unstructured, and the data is steadily growing. This massive data production results in ``big data" [11]. Previous conventional database systems are not sufficient when storing, analyzing, and processing a rapidly increasing amount of data or big data [12]. The term ``big data" has been used in business and IT sectors[19]. An example of big data-related studies is the next frontier for innovation, competition, and productivity; McKinsey Global Institute [13] defined big data as the size of data sets that are a better database system tool than the usual tools for capturing, storing, processing, and analyzing such data [12]. ``The Digital Universe" study [15] labels big data technologies as a new generation of technologies and architectures that aim to take out the value from a massive volume of data with various formats by enabling high-velocity capture, discovery, and analysis. This past study also

characterizes big data into three aspects: (a) data sources, (b) data analytics, and (c) the presentation of the results of the analytics. BI analytics is used when the size of data is more than the memory level, but in this case, data may be imported to the BI analysis environment [16]. BI analytics is currently supported by TB-level data [17]. Furthermore, BI can help to discover strategic business opportunities from the flood of data.

3.1 ARCHITECTURE FOR BIG DATA

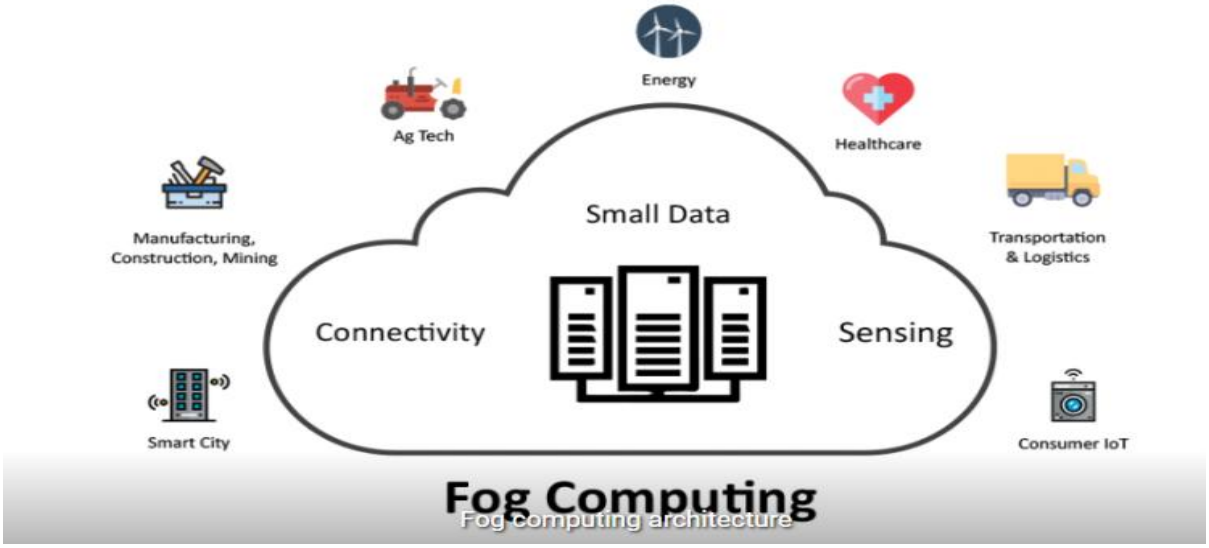


4. Fog Computing

The number of devices being connected to the Internet is drastically increasing. The reason behind this is only due to advancement and automation in the field of electronics and telecommunication. The devices that are being connected are powerful in the sense that these devices are able to communicate with each other and the are smart enough to manage the work. This type of communication is called M2M communication or Machine to Machine communication in which human involvement is not mandatory all machines have a tendency to do the target work. In other words, this paradigm is known as the Internet of Things. The devices being referred to as ―Things include sensors, physical devices for performing various tasks. We can define IoT as a network of physical objects embedded with software, electronics, sensors to achieve value and service by exchanging data with operators, connected devices through various protocols without any human interaction and involvement. With the increased number of devices being connected to each other the data produced by the devices is also huge which is transferred through the network to the Internet. In IoT cloud plays an important role. The word Cloud Computing has been in the market for so many years now and various researches and advancements have been done in the field of cloud computing. In IoT, one of the benefits we get from the cloud is the flexibility the user gets in accessing the services offered by the cloud providers through user interfaces. The cloud can pose a problem for latency-sensitive applications as IoT requires mobility support and geo-distribution in addition to low latency and location awareness. So a new platform is needed called Fog. Fog extends the cloud to the edge of the network. The term fog computing was introduced by Cisco in 2014. It was introduced so that it addresses applications which do not fit the paradigm of the cloud. These apps are 1. Apps requiring low and predictable latency 2. Geo distributed apps 3. Fast mobile apps 4. Large scale distributed control system The main advantage of fog is that it will provide benefits in computation, entertainment and other apps. It will improve QoS, reduce latency and the info will be placed near to the user. The advantage and use of Fog will not totally neglect the cloud as a whole, rather there will be an interplay between cloud and fog. The devices which are geographically distributed will generate data and transfer to the fog devices which will compute as per the resource available whether the fog device will be able to compute data and provide services or not or whether the data need to be sent to the cloud devices for further

computation. The hierarchical organization of the network, computation and storage resources will be preserved.

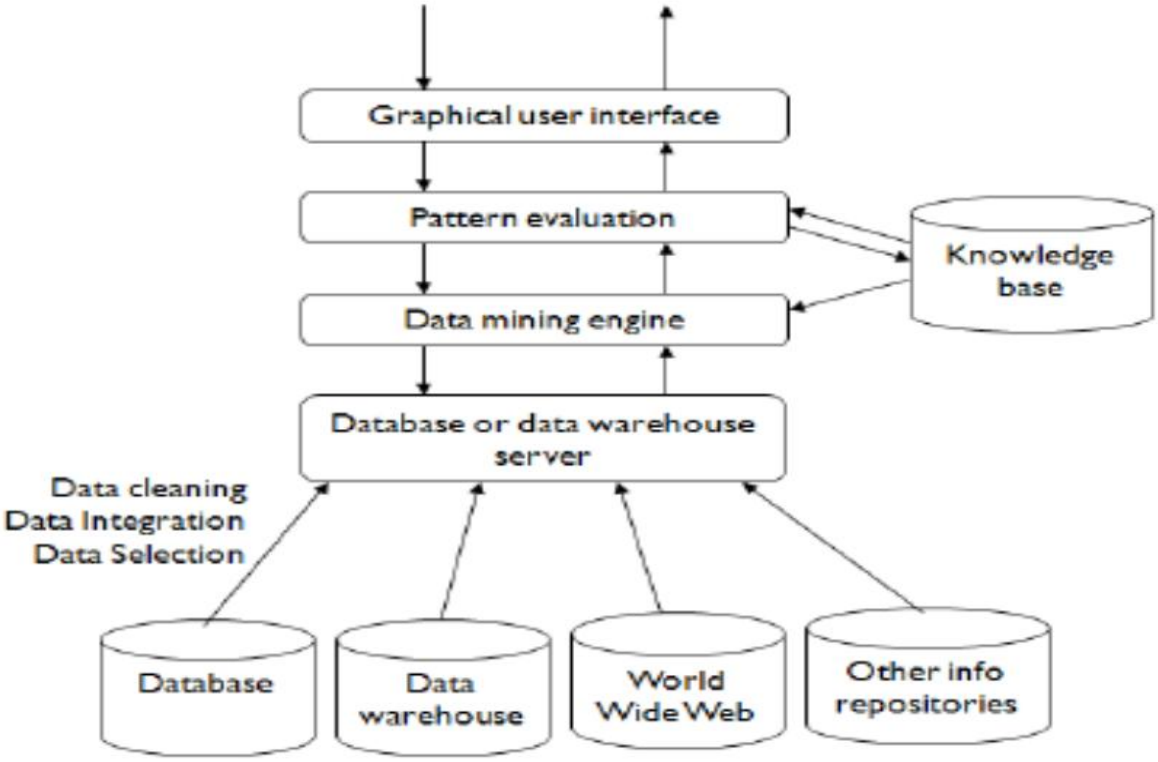
4.1 ARCHITECTURE FOR FOG COMPUTING



5. Data Mining

In this, we consider a connection between data mining and big data for IoT(internet of things) will be discussed in this section and detailed analysis and impact of data mining technologies and tools for the IoT will be given. It is very easy to create data and it is not easy to analyse the data. Until now, no of studies [18], [19] have attempted to solve the problem of inquiring big data on IoT. For developing a high-performance data mining module for IoT, the three key considerations in choosing the applicable mining technologies for the problem to be solved—the objective, characteristics of data, and mining algorithm—are as given below. •Objective (O): The assumptions, limitations, and measurements of the problem need to be specified first so as to precisely define the problem to be solved. With this information, the objective of the problem can be made crystal clear. •Data (D): Another important concern of data mining is the characteristics of data, such as size, distribution, and representation. Different data usually need to be processed differently. •Mining algorithm (A): With needs (objective) and data clearly specified above, the data mining algorithm can be easily determined.

5.1 ARCHITECTURE FOR DATA MINING



6. Conclusion

The growth rate of data generation has increased drastically over some last few years with the generation of smart and sensor devices. Now-a-day the interaction between IoT and big data is at a stage where processing, transforming and analyzing massive volumes of data at a high frequency are needed with efficient outcomes. We conducted this survey in the context of big IoT data analytics, Fog Computing and Data mining. The relationship between big data analytics and IoT was also discussed in this paper also have discussed fog computing and data mining. Further, we proposed an architecture for big IoT. Furthermore, big data analytics types, methods, and technologies for big data mining were presented. In addition, we explored the domain by discussing various opportunities brought about by data analytics in the IoT paradigm. Finally, we concluded that existing big IoT data analytics solutions remained in their early stages of development. In the future, a real-time analytics solution that can provide quick insights will be required.

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