



# IoT Data and its Application-A Preliminary Study

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**Abstract-** The world has been started moving from connecting things to capturing insights towards Internet of Things (IoT). Interconnection of devices through sensors continuously generates data 24x7 which leads to growth of data at exponential rate. Capturing, storing, processing and retrieving of these massive data is a tedious task and has a wide scope for research in the data storage and retrieval. Traditional database system does not satisfy the needs of IoT for maintaining data. Therefore, this paper suggests necessary things needed for IoT data management and its security.

Keywords- Data management, Data preprocessing, Data Source, Internet of Things (IoT), unstructured data, structured data.

## I. INTRODUCTION

Internet of things (IoT) is a great vision in today's world. It represents machine to machine communication and is a challenging technology in all aspects of our lives such as mobile devices, televisions, cars, gasoline pumps, refrigerators and raw food products. Data collected from different sensors are of heterogeneous data. Managing these data is one among the tedious tasks. Smart things and smart objects became active participants in social access, business, marketing etc., and communicate with one another for exchange of information and data. Sensors can be connected in cars, doors, kitchens, vending machines, etc. It is the next technology that is going to adapt to the changes in our environment. The IoT will move toward 50 to 100 billion devices will be [1] connected on the year of 2020.

The data collected in IoT is substantial, generating large data populating the database, querying the database and managing the database are the major components of challenges [2]. Data of different types are identified and stored in a unified format. It provides an extensive technology to extract large amounts of data from wireless sensors. Data in temperatures, humidity, and pressure is of multidimensional data through sensors. Sensors are an integral part of future things which are controlling your smart phone. A touch is used to capture insights. IoT is an enabling technology that makes the world smarter by physical and virtual things. It makes humans live smart in a network world and a wide range of communication is made. While communication data is received and transferred, it is increasing.

## II. TYPES OF DATA IN IOT

The data collected from IoT is massive data. It can be classified into three types [3]: types of data structured, unstructured and semi-structured. From the research point of view, it is shown that nearly 90% of data is unstructured data. Structured data is which can be stored in the relational database that is organized in tables or data objects. The output of data is predetermined that can be stored in traditional database systems [4]. Unstructured data which is from sensors, social media, web logs, etc., consist of audio/video, images etc., collection of these kinds of data is increasing day-to-day, but storage plays a vital role. It is understood that today's business techniques consist of more unstructured data than structured data.

### III. SOURCE OF IOT DATA

In global environment in future everything is going to be of Internet of Thing. Data sources can be divided into three categories they are [7]: Data from active, passive and dynamic data. Data from passive: Ground water saturation is an example of passive sensor .The sensor that consumes data that are not actively communicating. They must transfer data when it is on or activated and produce data [8] when it is needed only. They must me on and off when to consume data and transfer data. Data from active: The data is generated continuously that actively communicated. Data can't be lost it consumes data instantly. Jet Engine is an example of active data. The dynamic data it has all the facility to change the data and to modify the data in order to meet the IoT target. Security issues are a challenging role in these data. Storing data is to endure traditional database management approaches. Data retrieval in huge database system is challenging task. Data management is another trivial process of storing and retiring process. Data come from different sources in various formats converting intoa structured format is also the process of data management.

### IV. DATA PREPROCESSING

Data Mining is an important technique to analyze data. These data consist of data redundancies, missing of data this can be solved by data preprocessing. It consist of data cleaning, data integration-data from different data sources are combined into unified structure, handle of missing data- missing data can be replaced with suitable data, data selection-data relevant for retrieval is selected from database etc., Data may also be noisy consist of inconsistent data can also be managed.

### V. DEVELOPMENT TOOLS

#### A. Eclipse

Eclipse is a tool for the connected system includes standards and development [11] frameworks. It creates open source as building blocks for IoT through which it provides videos, tutorials, etc., beginning of IoT projects. New Eclipse project for the development of Smart Home solution focus on creating heterogeneous environment. It is framed to run on Raspberry Pi or Beagle Bone Black or Intel Edison.

#### B. KinomaJS

KinomaJS is an open source software .It is a platform to embedded application for both hardware and software in IoT devices and applications. It is a light memory footprint [12] and JavaScript based application framework .It can be run on Windows and Linux operating system. Kinoma creates of its version 2 expand the range of embedded developers.

#### C. M2MLabs Mainspring

It is an application framework for building machine-to-machine application such as remote monitoring. They use sensors like temperature, pressure for server application like vehicle tracking or machine remote monitoring. Features include[13] flexible device modeling, device configuration, communication between devices and applications, data validation and normalization, long-term data storage and data retrieval.

#### D. Node-RED

It is a visual tool for wiring the Internet of Things [14] that process of connecting IoT devices with APIs and online services. It is built on Node.js taking full advantage of event-driven. It can also run on Raspberry Pi. It can be used in social development to share the flow created in Node-Red by importing and exporting with others.

#### E. Raspberry Pi

It is a small computer with Linux operating system uses standard keyboard and mouse. It acts like a computer when it is fit into TV or monitor. It has an Ethernet port with Internet connectivity [15]. It is a small device that is used to explore computing in advanced level this low-cost computer. It is an idea for interconnecting devices in IoT.Controlling the raspberry pi through phone which the peoplecarryingtoday. The Google Play also

includes NetIO and XBMC server which can be controlled by Raspberry Pi. Explore computing with all ages and learn languages like Python.



Figure 1. Raspberry Pi

The above diagram represents the Raspberry Pi cluster projects. Andy Proctor shows us how he automates deliveries with Pi.

## VI. ENABLING TECHNOLOGIES FOR IOT

### A. *RFID*

Radio Frequency Identification (RFID) is a tremendous impact in our lives is an ID like IP address used to identify individual details it can be of any sectors such as health care, bank, education, etc., it can manage everyday activities by giving current application with detailed knowledge. The RFID –tags capture large amount of data is an impact of today's world. How the low- level information [16] is transferred to high –level information is a big challenge. It empower user by facilitating their personal RFID data and privacy level.

### B. *QT (Quick Response)*

QT is a conventional extension of Bar code [17] used in various business purposes. It can also be used as a password for Wi-Fi networks. It is much better than barcode because it can store hundred times more information than it.

### C. *NFC (Near Field Communication)*

It is a short range wireless technology requiring distance of 4 cm. NFC enables for consumers to make transaction, exchange digital content and connect electronic devices with touch. Only small number of smartphone products include NFC [18]. Apple iPhone 6 include NFC support for Apple Pay. Allows intuitive initialization of wireless networks and NFC is complementary to Bluetooth and 802.11 with their long distance capabilities at a distance circa up to 10 cm.

### D. *BLE (Bluetooth Low Energy)*

It is an inexpensive technology that overcomes the disadvantage of cabling devices such as notebook's PC's, PDAs, cameras and printers [19]. It is first designed for Personal Area Network (PAN). It uses a common communication channel called Piconet. This Piconet helps for sharing data, picture, video and sound.

### E. *ZigBee*

It is a short range technology for enhancing the features of wireless sensor networks. It is mainly used in digital agriculture, industrial control and medical applications [20]. It also provides security for data integrity by encryption algorithm.

## VII. RESEARCH DIRECTIONS

IoT is gaining more popularity in today's world. It has the capability to integrate information from the physical world to virtual world. The research trends in this have been more for recent years. Moreover it is one of the fastest growing technologies however, it has certain limitations. The research direction must take into consideration while developing IoT devices and integrating them.

- Privacy: In IoT the personal information can be passed to other persons without our knowledge .Security must be provided while transferring information from physical objects to sensor objects.
- Widespread of malware: Internet of things is of interconnecting of devices so it is easy for hackers to modify existing devices altering the operation in devices that could damage the whole system.
- Intrusion: While data management and data transformation there might be leakage of original data that can damage the devices and operations

IoT is heading towards future that will be connected to each individual. So soon it will be transform to internet of things. Like smartphone it will bring big change in the communicating world.

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