IoT Protocol Based Data Monitoring System

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Abstract: Nowadays Internet of Things (IoT) is changing the world, In addition, it is also making various connectivity mechanism. Human to machine and machine to machine communication is only possible today due to the Internet of things. From last 15 years, Internet of Things (IoT) is the main application which is extended from smart connected homes to wearable to healthcare. Industry 4.0 is the recent revolution in the industry. It contains cyber-physical systems(CPS) monitor the production and manufacturing process of the factory and make independent decisions. In a wireless sensor network, the sensor senses the data from the device and that collected data will be sent to the router. That Sensor may be different as per its applications. As So many devices will be connected to the Internet of Things(IoT), it will generate massive data. To extract hidden information from the generated data we have to apply different types of algorithms. A large amount of data can be monitor and controlled with the use of Wi-Fi, internet of things (IoT), cloud computing (CC) and cyber-physical system (CPS).

Keywords— Industry 4.0, Internet of Things(IoT), MQ Telemetry Transport protocol(MQTT), Wi-Fi, ESP8266, wearable IOT device

I. INTRODUCTION

The architecture, protocols, applications, security, real-world implementation, and future trends of IoT are elaborately explained in[1].Technologies are rapidly changing today. People are moving toward an "always connected" system. Wired and wireless networks are available, for particularly addressing procedure open standards are allowed and defined. Concepts related to the "Future Internet" are being researched in recent time.In various industries, there is a growing interest in using IoT technologies. Lots of industrial IoT projects have been done in, food processing, surveillance, agriculture, environmental monitoring, security, and many more[2]. By the end of 2020 Somewhere 26 to 50 billion "things" connected to the internet. IoT has given us a promising way to build powerful industrial systems and applications by using wireless devices, Android, and sensors[3].Today Everyone wants to connect their system to cloud and make it powerful. Not only Electronics and IT field people, many other industries also want to integrate their manufacturing line with IoT devices to control and monitor data in real time scenario from anywhere from the earth without any hurdle. IIoT is the basic premise for the implementation of Industry 4.0[4]. IoT is continually evolving and is a hot research topic where opportunities are infinite.[5].MQTT is the one of the best IoT protocol which is implemented in IoT to exchange the data from the sensor to cloud and cloud to the sensor. For industry safety purpose it's almost necessary to watch all activity going through an industry inner environment for the better safety of employees working in the industry. The IoT can connect real-world elements and set the intelligent component in a communication system. Therefore, IoT is a key which can enable the different types of advantageous applications and services which can support, environment transportation, economies, and health that we never think before sometime.

Figure. 1 The loT general scenarios[1]

The TCP/TP was defined long time ago. This protocol plays an important role in the digital communication area. Therefore, the IoT will connect a number of devices, which will make a tremendous traffic of data. It also needs a huge amount of storage capacity to store that data. Hence, the new standard design and protocols are necessary for safe data transmission in IoT technology. Improvement of IoT depends on the different types of useful applications and business models with advances in the technology of IoT.

With the industry's broadest IoT-ready portfolio of wired and wireless connectivity technologies, microcontrollers, processors, sensors and analog signal chain and power solutions[6].

Layer	Protocols
Application Layer	CoAP, MQTT, XMPP, AMQP, RESTFUL, Websockets
Transport Layer	UDP, DTLS
Internet Layer	RPL, 6LoWPAN
Physical/Link Layer	IEEE 802.15 Series, IEEE 802 11 series

Figure. 2 IoT layers and stack[7]

Figure 2 shows the different IoT layers which make the whole IoT data transmission easy and secure. Each and every layer has its unique task to perform. The protocol is defined as the special set of rules and regulations that endpoint in a telecommunication connection. It uses when they need to communicate with one another Opposite side endpoint which connected to the same or different network. At the end of whole the discussion we can conclude that with the help of data acquisition we can have the lots of data at the end point. So as per our requirement we can filter our search result from different nodes and the junctions.

II. RELATED WORK

However, in the new era of internet technology, there are various protocols has been introduced in last 5 to 6 years. Advanced Message Queuing Protocol (AMQP), MQ Telemetry Transport protocol (MQTT), Constrained Application Protocol (CoAP) and many more. For the best data transferring and secure messing services, MQTT(MQ Telemetry Transport) comes in the picture. MQTT (Message Queue Telemetry Transport) AMQP and MQTT protocols give surety that, when a client reconnects to a server, it does not repeat messages and resumes the previous session with the message broker[8].

AMQP will not be used for industrial safety system because connect and disconnect will change the information sequence from FIFO (First Input First Out) to LIFO (Last Input First Out). HTTP will not be used for the system because it is request-response type protocol, also it consumes more bandwidth so more energy it requires so it is not used. CoAP will not be used for safety system because packet loss rate under degraded network condition as well as the implementation of CoAP is more complex due to its unavailability is open source[9].

III. METHODOLOGY

In 2016, one research paper was published which shown the one concept of making smart cities as a part of Industry 4.0[10]. it was published by Kallappa, B. B. Tigadi. By connecting different IoT devices this system can be expected to change logistics and transportation system with the best infrastructure.
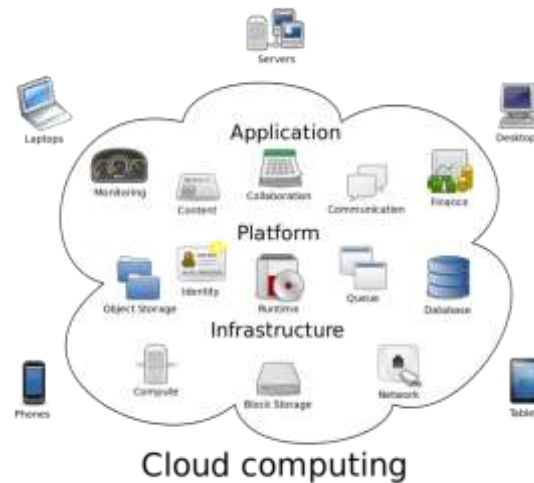
Figure. 3 The concept of FOG Computing

Here we can see that in a smart router, many processes are will going to take place in the round of the network or a smart device.

Industry 4.0 also using this FOG Computing concept in the industry. Where it can powerfully divide the source data. Only the data which is used will be provided to management level, control and for the analysis[12].

In this paper, they have covered the concept of Industry 4.0 and the Smart City idea. Although the definition is different, the principles are should be the same. They have tried to see the Industry 4.0 industry as the first step of smart cities, like the smart campus, smart building, smart street etc. Another important part is also FOG Computing. That exactly transmits only the necessary data to the server. The first city in the Czech Republic which is going to be the 1st smart city smart city is Pikes. cloud computing is considered as a promising solution to deliver services to end users and provide applications with elastic resources at low cost. [13].

Big data analysis is briefly explained here[14] by Sunghae Jun. Data analysis is the most important part of the IoT network. We are in the age of big data [15],[16]. Big data has three typical characteristics which are volume, variety, and velocity [17]. That is, the size of big data is extremely large, the data types of big data are diverse such as number, text, and figure. In addition, the data processing of big data is so rapidly. So we should consider these characteristics when we analyze the big data. The BDL is a technique of learning from big data [18]. Once Data acquisition is done data should be analyzed for the final result. In this paper, they have cover the topic of Big data learning. Data analysis was done on the basis of IEEE and KIPRIS Paper and patent. They have shown the different Top-ranked keywords content and after that make the SNA graph co-related with that data.
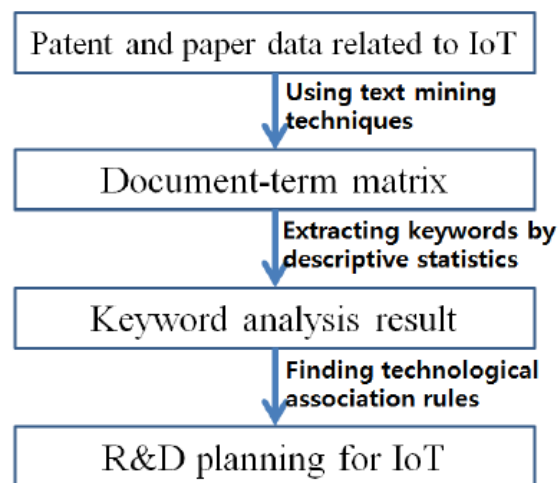

Figure. 4 IoT analysis by BDL[14]

First, they have searched papers and patents documents related to IoT from the databases such as IEEE explore, USPTO, KIPRIS. These data are too big because they include text, number, and others. So now they applied the BDL to analyze paper and patent data. After that, they transform the text data into structured data which is called as document-term matrix [19].In the Matrix the row and column are defined as the document and term respectively. For this transformation, they have used text mining techniques and social analysis by "tm" and "sna" packages of the R project [19], [20]. By descriptive statistics for keyword analysis, they extract high ranked keywords in the end.

IV.   RESULTS AND DISCUSSION

Table. 1 Top-ranked Key Words: Patents[14]

Rank	Frequent Term
1st	Control,data,device,information,intelligent,management,monitoring system, technology
2nd	Terminal
3rd	Gateway, equipment
4th	Communication, platform, service
5th	Access, network, wireless
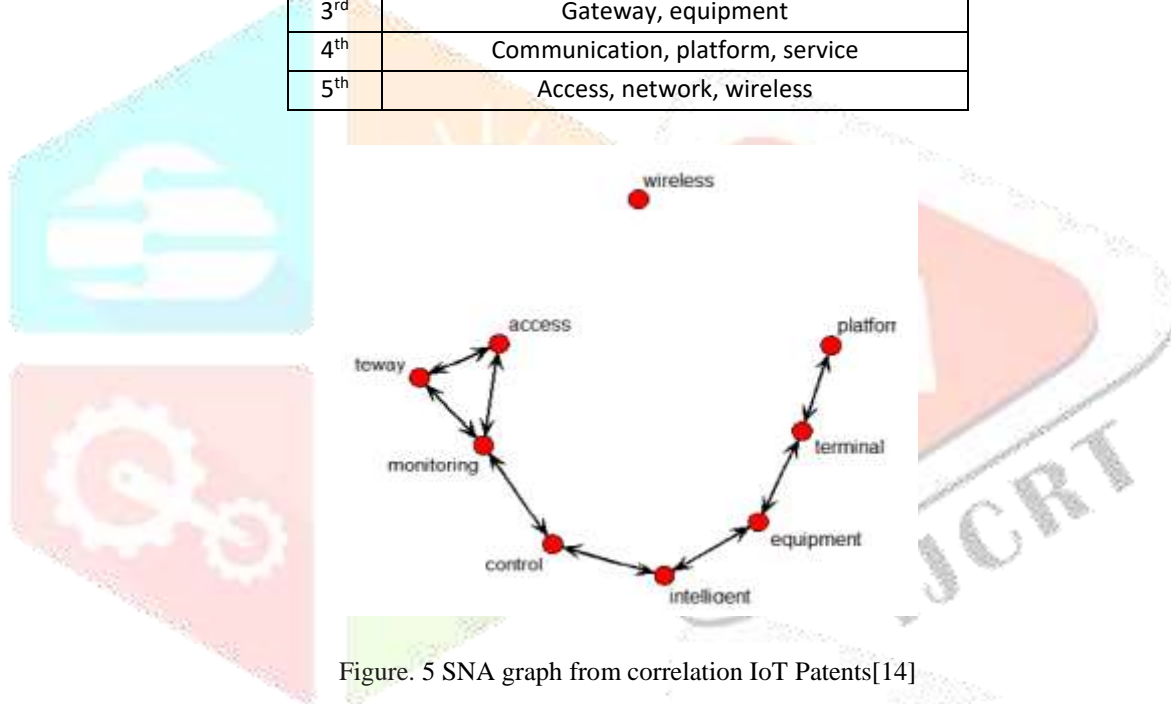
Figure. 5 SNA graph from correlation IoT Patents[14]

Table.2 Top-ranked Key Words: Papers[14]

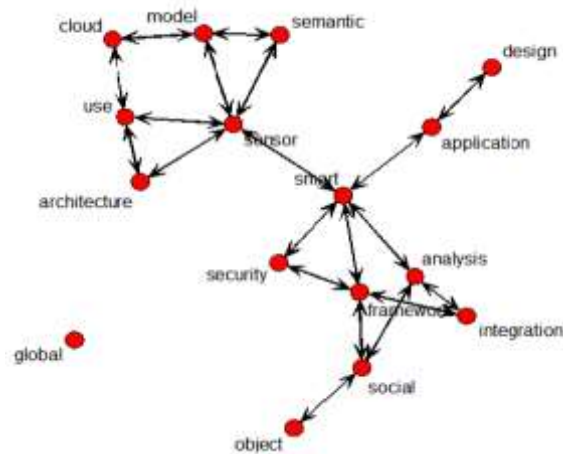| Rank	Frequent Term
1st	Application, information, network
2nd	Data, system, technology, smart
3rd	Management, architecture, communication
4th	Model, framework, social, use, device, object, security
5th	Service, cloud, analysis, design, global, semantic, integration, sensor

Figure. 6 SNA graph from correlation of IoT Papers[14]

Above both, the graphs show the data evolution of the Patents and papers top ranked keywords. They have made structured data for descriptive statistics, and SNA. Also, the results of statistics and SNA graph provided the understanding the technological relationship in IoT technology. From this one, we can say that there is lots of research scope available in Big data analysis in IoT.

V.   CONCLUSION

The IoT gives assurance to deliver a change in separate" quality of life and enterprises" concept. With the help of a wide extending, and locally intelligent network of smart devices, the IoT has the potential to enable extensions and enhancements to fundamental services in logistics, transportation, education, healthcare and security other areas, while providing a new ecosystem for application development. Just as the Internet aspect happened the Internet of Things has touched every conditions of our lives in less time. In this work I have presented a model of IOT based data acquisition and analysis system for the different applications of educational purpose & other organizations. I can conclude that Industry 4.0 is going to be the biggest platform to perform the task in today's industry. There are three major states for IoT implementation: Data acquisition, security, and data analysis. While transferring the growth of IoT, Security of the data is the most important for reliable data transferred between the millions of smart application. Here I have concentrated on MQTT protocol on application layer for safe data transmission. By the different methods of big data analysis, a person can separate the particular data as per he wants. This one is Different from other IoT review papers because it mainly focuses on industrial IoT applications and Big data analysis and possible research opportunities for future industrial researchers.

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