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A Review: Industrial Internet of Things using 5G

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Abstract: ***Since 5G is the latest technology with a higher performance for the technologies. The 5G works as the product of the communication of the devices of the IoT in any industrial project. The faster speed with the proper efficiency will increase in the profit of the companies as these technologies will be helpful for the manufacture, storage and security of the plant and product. The error while using this technology is very less and the production in these will be high. In this paper, we will review about the new technologies and how they are useful in combination for the industries. The 5G and Internet of Things (IoT) combination in industries will be the next step of computer evolution.***

Keywords: Internet of Things, IIoT, 5G, Smart, M2M

I. INTRODUCTION

The communication system of the world for long distance had been advanced, as the communication system of simply transferring data via telephone over the time, thus conquering the new approaches to do the task of data transfer in a efficient and fast way are discovered. The technology for the transfer of data from 1G, 2G, 3G which are the part of the previous technology in which it was impossible for transferring data in Gigabyte in seconds. But after those, 4G and LTE makes it look possible. But with the further development in the technologies, the new generation of the radio technology is going to be the best, efficient and superfast mode of communication and data transferring. This technology along with the Internet of Things (IoT) are a new future in every need of the mankind. The combination of these technology in any type of the industry is going to be the biggest change for the products, users and company. The Industrialization of IoT is the combination of any type of process for the company to be performed by the IoT devices. The manufacturing, logistics, security etc. are to be performed and maintained with the help of these devices. The communication for these devices has to be very efficient and fast, here the 5G is going to be useful.

II. INDUSTRIAL INTERNET OF THINGS (IIoT)

The Industrialization of IoT is referred to the process of performing the real time analyzing and collecting the industrial data from the smart machine which are generated by the Machines for years. The IIoT is known as the use of sensors like sensors and actuators for the improvement of the manufacturing and industrial process. The IIoT thus explain that the smart machine are better in understanding the data and providing with the real time analysis. This superioress of the machines over the people can be used to make business choices quickly and correctly [1]. The feature of analyzing using the sensors and actuators for early identifying the problems and inefficiencies will help the industries to take the decision in more intellectual ways, saving the time and money. The following are the potential of improving in the IIoT:

1) Methods for green manufacture and its sustainability
2) Supply chain efficiency
3) Control of quality
4) Supply chain traceability

IIoT is essential to activities like Predictive maintenance (PdM), improved field service, energy management, and asset tracking in an industrial setting [1].

A. How does IIoT work?

The Industrial Internet of Things (IIoT) are a connection of intelligent devices with one another for creating a system that exchange, collect the data and after that analyze it.

A typical industrial IoT ecosystem includes:

1) Devices which can communicate and store the information on its own;
2) Public and/or private data communications infrastructure;
3) The system for producing business information used for analytics from raw data;
4) Devices for the storage of data which is generated by IIoT devices; and
5) People.

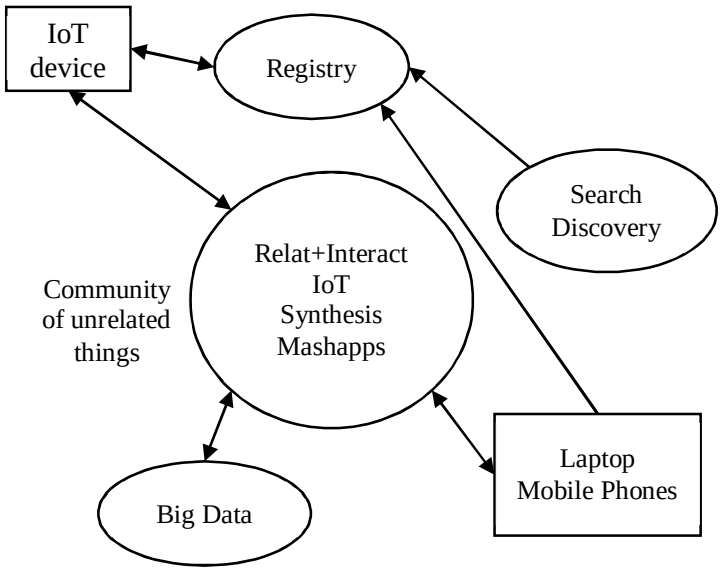

Fig 1: Architecture of IIoT

The performance of the equipment can be detected by transforming the data into useful information which are directly transferred to the data communications network from the intelligent assets and edge devices. Predictive maintenance and business process optimization can both benefit from this data [1].

B. Industries using IIoT

The wide range of business are utilizing the IIoT. Some of the industries that connected with the IIoT to enhance their business are as follows:

1) *Healthcare:* The healthcare are utilizing the IIoT in every way possible. They are using the IIoT for a long period of time. The use of the IIoT in medical waste management, patient monitoring, robotic surgery, and many more. Many healthcare devices which are based on the IIoT are also able for the commercial purposes [2].
2) *Oil and Gas Factory:* The oil and gas reservoirs are the huge data collection center which will help in enhancing the process and producing the efficient system for the reservoirs to monitor, control, automate and enhancing connectivity. The system consists of different sensors, analytics and feedback control system [2].
3) *Manufacturing:* The manufacturing is made more reliable and efficient using the IIoT. The production of the product to delivering can be monitored and controlled using the IIoT. The inventory for the warehouse and the other technical enhancement increases the productivity, shorter time and safety [2].
4) *Smart Building:* The use of sensors in the building for reducing electricity cost, the fire detection sensors, the sensors for the controlling of heat and cooling, escalators, and all these sensors being wireless have connectivity over the network for controlling and monitoring [2].
5) *Smart Agriculture:* The Internet of Things (IoT) is performing an important role in the field of smart farming. This type of smart farming is a new and emerging concept as the devices and sensors are capable of providing data about the field in real-time. The IIoT is used with smart agriculture techniques to monitor the fields, environmental factors, and crop conditions using different sensors and device [2].

C. Risks and Challenges of IIoT

The risks of having the IIoT is security-related. These are the most ones that a user of IIoT are concerned about. The IIoT device always has their default password while at the time of the production too. They also converse with the other device in the form of clear text, no crypted method is used. These problems are sufficient for the hackers the flow of data in the IIoT devices. The hackers can also utilize the unsecure network of IIoT to control the network and perform their task and make that network their base to attack other networks [1].

For the business to work with the IIoT devices the security issue is the major concern, the people in charge are not only concerned about the security only but also the management of the devices. The prevent the hackers to attack and use the information in any ways the companies has to identify the devices and also the management of the devices is essential, having a system just to uniquely identifying each device which can be used for the operations like broken devices or device refresh [1].

The IIoT has another challenge where the firmware updates are affecting the business. This is significantly difficult for the IIoT devices the management of patch. The firmware updates are creating inconvenience in running the business. The organizations must have tools or reliable method to learn whether devices are running the latest version of the firmware. The business must follow organizations defined maintenance plan for these devices too [1].

D. IIoT Application and Examples

The deployment of IIoT in the robots are used to monitor the maintenance of the real- world robots, using linked sensors to suggest repairs of the robot parts if they break down. ABB, power and robotics company uses these in their own robots.

The company Airbus, also uses these IIoT in their equipment. They are the manufacture of commercial jetliners. The started with IIoT is called the factory of the future which is digital drive for manufacturing in which they embedded their equipment and machines with sensors and distribute the personnel with wearable technology, such as industrial smart glasses to increase output and improve operation along with reduce errors [1]. Another company Fanuc, uses the IIoT technology in their robot using sensors and cloud-based analytics to identify when the parts in there robots are going to break. This method helps in saving unnecessary downtime, expenses and time for planning maintenance [1].

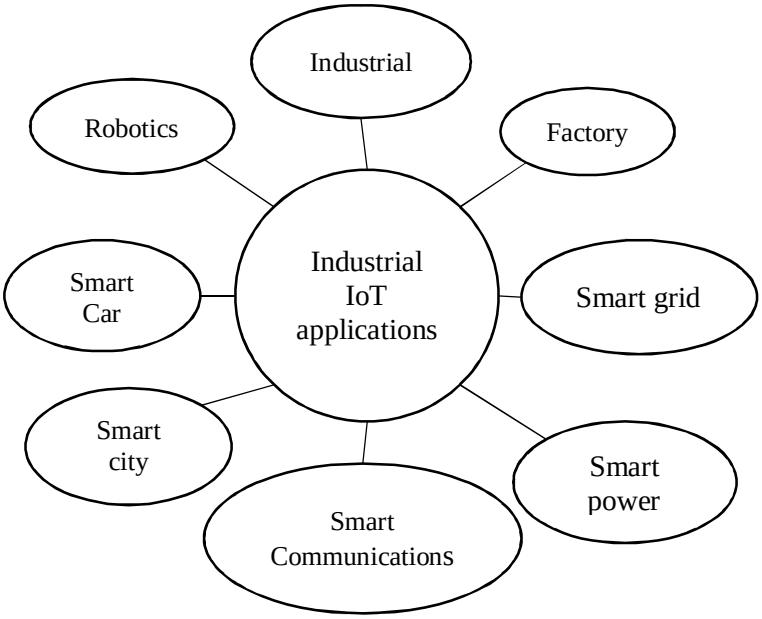

Fig 2: IIOT Applications

Another application of IIoT is by Magna Styr, an Austrian automaker, who builds a system that will track the assets as well as tools and car parts. The system also able to purchase many stocks when they run low. The Bluetooth-enhanced smart packaging is a business like wise to track components in a warehouse [1].

III. 5G

The golden era of the technology is where we are in now, some called it the digitalized era. The task in the day-to-day life where performed with just a single click of a button and working or performing any task without them is impossible to imagine. As the technology around us is advancing the connectivity with the old speed is causing troubles. Thus, for the advancement of technology and everything high speed in the connectivity is required. In the new digitalized era, the latest version in the category of radio system and advanced network architecture, also the 5th generation in this field called 5G which will provide the extreme broadband, low latency connectivity, ultra-robustness and massive networking between the IoT and the humans.

The programmable world will transform the individual lives, the society and economy with the help of 5G. The new technology will be useful to overcome the property of connectivity as before the 4G and LTE, it is difficult to think about connectivity in Gigabytes per seconds.

Few years back one couldn't think that the speed of internet would be such fast that we can download a 2gb file in half an hour, this was the magic of 4G and LTE. With this we can think what 5G has in store for us. As it is based on network function virtualization and software defined networking technology, it's speed will be much more-faster than what we have today at our hands and surely it will provide an upper hand to various industries like IT sector, Agriculture, Entertainment, Education sector and many more. 5G services has the native support for M2M communication. Above all, 5G terminals are sufficient to gain the ZigBee network which already exist and it will provide a better data transmission and will definitely give us an era of wireless communication which one can ever think of.

A. Features of 5G

1) 5G is the new face of mobile networking for the present generation and next decade to come.
2) It will augment the existing service and will provide with better options which we lag in present
3) network.
4) Speed of 5G services will be beyond imagination (10 Gbps).
5) Latency is almost zero.
6) 5G services have faster response time.
7) It is a reliable network.

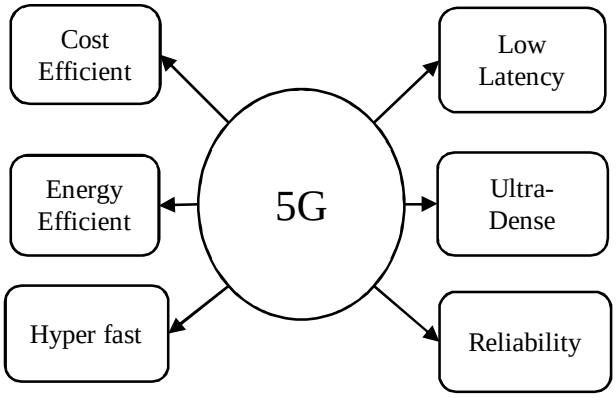

Fig 3: Features of 5G

TABLE I SUMMARY TABLE

Reference no.	Author	Journal/Conference /Online/Book	Year	Major Conclusion	Limitation/ Future Scope
[3]	Kaur et al.	IJIT	2020	The paper described the different components which will be helpful for the 5G.	The future progress using the 5G using different technologies is rapid.
[4]	Mourtzis et al.	Procedia CIRP	2021	The paper presents the challenges and trends of the 5G network and interaction between the 5G and Tactical Internet (TI).	The future work will be in the field of the wireless VR/AR. One more issue is the use of low-complexity 52

[5]	Longo et al.	IFAC-PapersOnLine	2021	The paper elaborate the concept of having 5G for the interaction of human-machine and human-robot network.	The ongoing test to evaluate the 5G technologies for the technologies that never accept and implement these for the industrial use.
[6]	Taiwo et al.	ResearchGate	2021	The paper discusses about the new technology and its benefits and also the shortcomings are also discussed.	The future work of 5G including the IoT is suggested to make the technologies smart.
[7]	Sandeep et al.	EAI/Springer Innovations in Communication and Computing	2022	The paper discusses the proper understanding of the characteristics of many services and the platforms.	The limitation described is that none of the cloud platforms are not perfect.
[8]	Nazim et al.	Journal of Sustainability Outreach	2022	The paper describe how the mobility technologies will be advanced with the help of the 5G network.	The limitation of the paper is the security of the network.
[9]	Khan et al.	IJCS	2021	The paper discusses the challenges and the characteristics about the new technologies.	The future vision is for the uses of the existing technology and also work on the 6G.

IV. CONCLUSION

The paper reviewed the different contribution of the 5G and IoT in combination in different industries for different purposes. The paper also highlights the challenges, trends and limitation that are in the technology. The Future work of the different paper are also be explained. In simple words, the different approaches used for the communication in the Industrial IoT having fast speed and efficiency known as 5G is explained.

V. ACKNOWLEDGMENT

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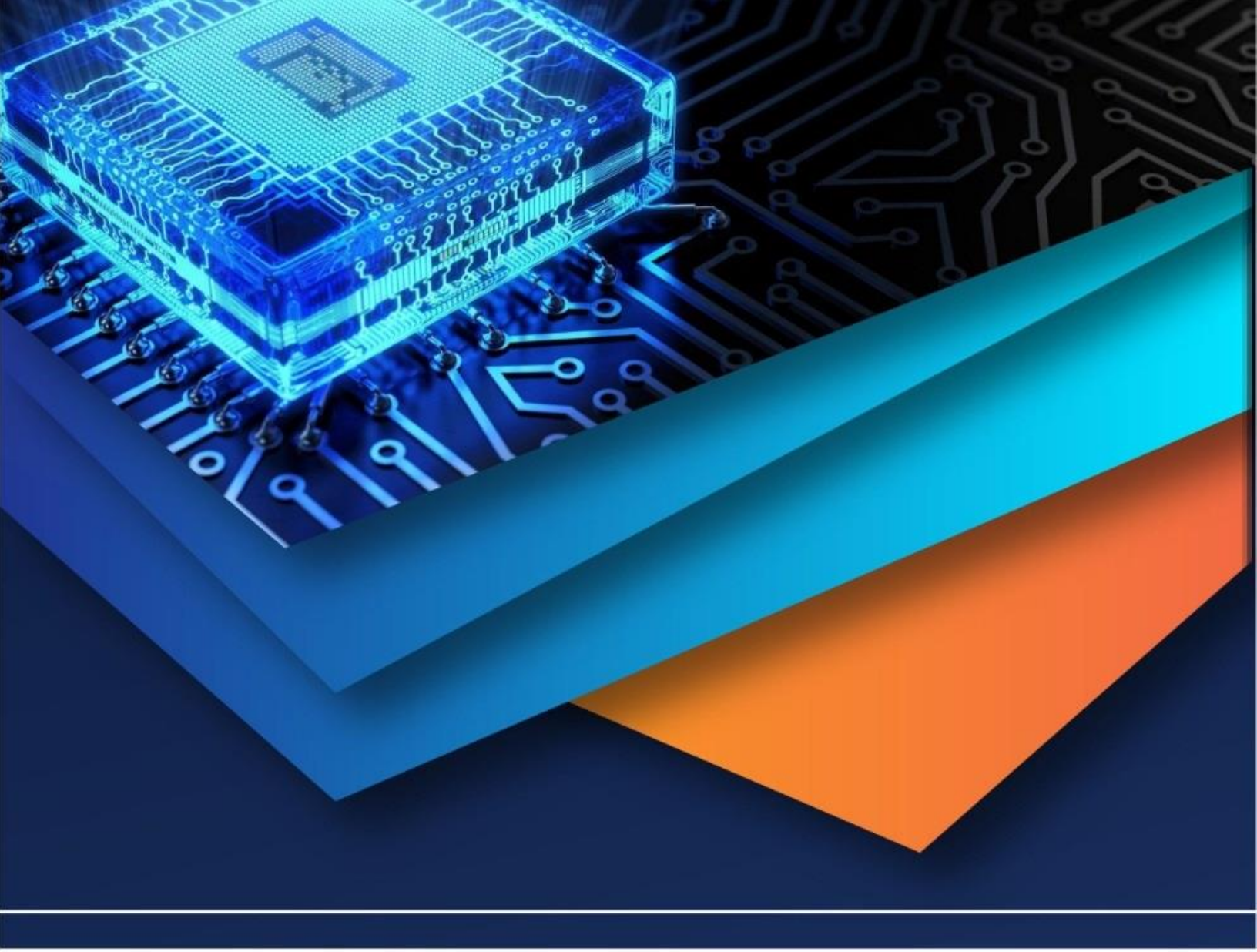

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