FULL DUPLEX WIRELESS COMMUNICATION AND NETWORKING THROUGH LoRa FOR IoT DEVICES

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Abstract: The internet of things (IoT) aims to enable conventional sensing devices to communicate with other devices and to cooperatively provide intelligent service. For example, IoT can be used to monitor air quality in a city to provide real-time information and warnings to inhabitants as well as to control air pollution. Another example is transfer data among IoT devices. In contrast to existing short-range wireless communication technologies currently used for indoor IoT sensors, several techniques have been proposed for providing long-range and outdoor wireless communication, such as LoRa/LoRaWAN.

Many techniques exist to transfer data from the widely distributed sensors that make up the internet of things (IoT e.g., using 3G/4G networks or cables), these methods are associated with prohibitively high costs, making them impractical for real-life applications. Recently, several emerging wireless technologies have been proposed to provide long-range communication for IoT sensors. Among these, LoRa has been examined for long-range performance. Although LoRa shows good performance for long-range transmission in the countryside, its radio signals can be attenuated over distance and buildings, trees, and other radio signal sources may interfere with the signals.

Full duplex data transmission means that data can be transmitted in both directions on a signal carrier at the same time. LoRa devices consist of transceivers which can send and receive signals which make it a full duplex.

In this project, we construct full duplex LoRa/LoRaWAN Network. In this network we only have two nodes each node act as transceiver. Each node has LoRa protocol. This is Wireless protocol.

1. INTRODUCTION

Now-a-days we are living in an era of Information Technology where each and every person has to become IT incumbent either intentionally or unintentionally. Technology plays a vital role in our day to day life since last few decades and somehow we all are depending on it in order to obtain maximum benefit and comfort. This new era equipped with latest advents of technology, enlightening world in the form of Internet of Things (IoT).

Internet of Things can be defined as the collection of two terms: one is Internet, which is defined as networks of networks which can connect billions of users with some standard internet protocols. Internet connects several different sectors and department while using different technologies. Several devices like mobile, personal systems and business organizations are connected to Internet. The second term is Thing, this term is basically mean to these devices or objects which turn into intelligent objects. Moreover this it is also a part of all objects of this real world. If we want to define IOT then we cannot define it precisely and concisely but Vermesanetal defined the Internet of Things as simply an interaction between the physical and digital worlds. The digital world interacts with the physical world using a plethora of sensors and actuators.

IoT can also be defined as “An open and comprehensive network of intelligent objects that have the capacity to auto-organize, share information, data and resources, reacting and acting in face of situations and changes in the environment”.

2. LITERATURE SURVEY

Different communication technologies aimed at low power, wireless IoT communication have been proposed and deployed. As indicated above, these grossly fall within two categories:

• Low power local area networks with a less than 1000-m range. This category includes IEEE 802.15.4, IEEE P802.1ah, Bluetooth/LE, etc., which are applicable directly in short-range personal area networks, in body area networks or, if organized in a mesh topology, also in larger areas.

• Low-power wide area networks, with a greater than 1000-m range, essentially low-power versions of cellular networks, with each "cell" covering thousands of end-devices. This category includes LoRaWAN, but also protocols, such as Sigfox, DASH7, etc. This section provides a perspective on LoRaWAN by giving a brief overview of these related IoT communication technologies.

3. EXISTING MODEL

Now-a-days every system/thing uses the internet for communicating information from one place to another. Without using internet it is difficult to transfer information from one person to another. This method of transferring information is expensive. It also uses more battery life.

- We cannot transfer information in cyclone affected areas.
- It uses more battery life.
- It costs more for equipment.

4. PROPOSED MODEL

We are proposing a system in which we can transfer information without using internet from one place to another. This method of transferring data is less expensive. It uses low battery life which means there is no need of changing batteries for nearly 3-5 years.

- It can be used in cyclone affected areas.
- It can be used for military purposes.
- It costs less for equipment.
- Battery life lasts long.

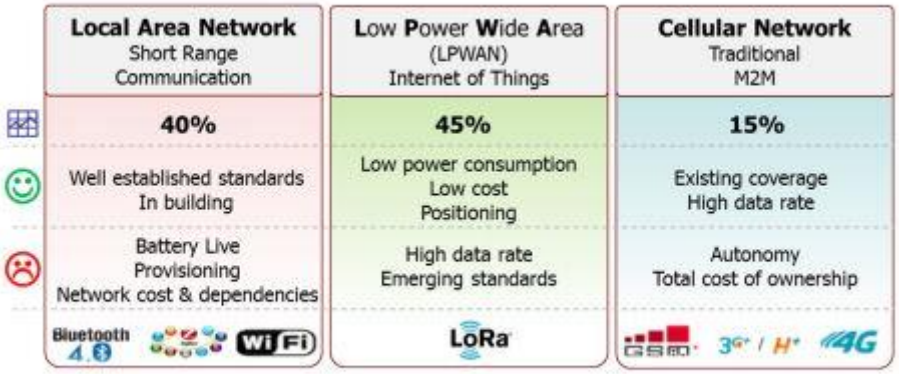

Fig-1: Proposing System

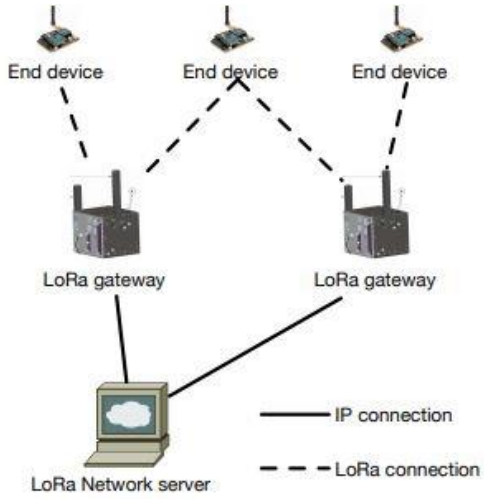

Fig-2: LoRa Architecture

5. RESULTS

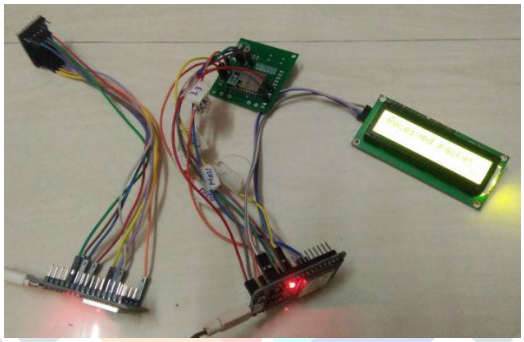

Fig-3: Sender and Receiver Modules

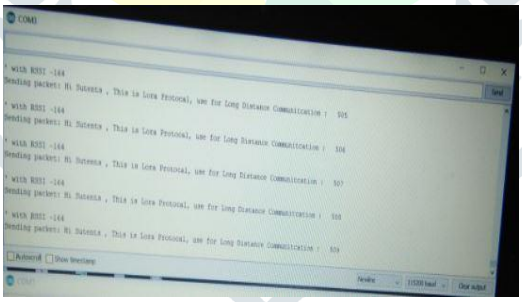

Fig-4: Result on serial port of sender module

Fig-5: Result for displaying the message on LCD display

For 0-500 meters it takes maximum 3minutes time.

For 501-1000 meters it takes maximum 5minutes time.

For 1km-5kms it takes maximum 7minutes time.

For more than 20kms we need to arrange them different topologies to communicate. Otherwise it is difficult to communicate to large distances.

6. CONCLUSION

LoRa is a long-range and low-power telecommunication system for the "Internet of Things". The physical layer uses the LoRa modulation, a proprietary technology with a MAC protocol. LoRaWAN is an open standard with the specification available free of charge.

This gives a comprehensive analysis of the LoRa modulation, including the data rate, frame format, spreading factor, receiver sensitivity, etc. A testbed has been built, to experimentally study the network performance, documented in this. The results show that LoRa modulation, thanks to the chirp spread spectrum modulation and high receiver sensitivity, offers good resistance to interference. Field tests show that LoRa can offer satisfactory network coverage up to 3 km in a suburban area with dense residential dwellings. The spreading factor has significant impact on the network coverage, as does the data rate. LoRa is thus well suited to low-power, low-throughput and long-range networks.

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