Tracking Children Location Using LORA With Body Temperature Sensing Function

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***Abstract*—Nowdays, parent always busy with work at office, construction site and etc place. By having tracking children device, the parent can monitor their children situation. Beside that, by developed exisiting technology for children safety hopefully it can function well. Using lora device technology which is LoRa-02 Module (SX1278 433mhz) as main objective and additional function as detecting the temperature body children using MLX90614-Temperature Sensor module. More than that for tell the location of the children need GPS so by using GPS NEO Module as showing the children location. Last but not least this project using concept transmitter and receiver. The transmitter device will hold children while receiver device will hold by parent. The transmitter device will always transmit their data to the receiver device that hold by parent and parent can always get the data children by open the Blynk application.**

Keywords— LoRa-02 Module, GPS Neo, Temperature Sensor module, Blynk application

I. INTRODUCTION

Nowadays, Internet of Things (IoT) are one of the important role in every day to day life. The major difference between IoT and embedded system is that a dedicated protocol/software is embedded in the chip in case of embedded system, whereas, IoT devices are smart devices, which are able to take decisions by sensing the environment around the device.The development of sensors technology, availability of internet connected devices; data analysis algorithms make IoT devices to act smart in emergency situations without human interventions. So, IoT devices are applied in different fields such as agriculture, medical, industrial, security and communication applications. Based on Tracking Children Location Using LORA With Body Temperature Sensing Function, this project provide tracking service for children safety and healthcare function which can monitor children temperature. The project using LORA, this is because LORA technology have several advantage than the old network technology. LORA device consume little power making it ideal for battery powered devices, and also it can transmit and receive the data for up 15 km suburban areas and 5 km in urban areas.Temperature reading function also adding on this tracking and monitoring device technology for checking children somehow if children caught fever normally as additional advantage.

II. LITERATURE REVIEW

This segment consist of several element study that related to the project which is part of important role. In the area which is literature are part of important role because it showns the recentness and relevance of your research problem. Specifically, your research is different from other statisticians. Beside that, It justifies your proposed methodology and demonstrates your preparedness to complete the research.
Rather than that, the literature review is focusing the overview of current knowledge, allowing you to identify relevant theories, methods, and gaps in the existing research,point that analyse,researh the fact article related which for my final year project is about "Tracking Children Location Using LORA With Body Temperature Sensing Function " , and diferrentiate from the previouse project. Therefore, A good literature review not just summarize sources but it analyzes, synthesizes, and critically evaluates to give a clear picture of the state of knowledge on the subject.

A. Related Work

Real Time Vehicle Tracking System using GSM and GPS Technology- An Anti-theft Tracking System[8]- In this project where it is to locate a stolen car, police can monitor the signal generated by the tracking device.This system is generally intended to be installed for the four wheelers, but for asian countries, where most people using two wheelers are the cheapest source of an anti-theft tracking system. Fleet operators typically use vehicle tracking systems for fleet management functions such as routing, dispatch, on-board information, and health(Maurya et al., 2012).

Tracking Unmodified Smartphones Using Wi-Fi Monitors[9]-From this work where it can be identified by using Wi-Fi surveillance equipment in an area of Interest transmissions, providing trace of a coarse-grained location for each phone that passes through the area without modifying the phone. Each WiFi transmission is provided with a unique device identifier (MAC address). Given the success of today 's smartphones, this may be an enticing way to acquire, for example Aggregate data on the trends in a area of interest. In this paper, author research the feasibility of passive smartphone Wi-Fi monitoring through a variety of real-world implementations and present a method of estimating the spatio-temporal trajectories of phones given our monitors' collection of detections(Musa & Eriksson, 2012).

Long Range SigFox Communication Protocol Scalability Analysis Under Large-Scale, High-Density Conditions[10]- Significant improvements have currently been made in IoT efficiency and also in data acquisition and processing, especially for big data. Whenever we need a communication mechanism to allow us to collect and imagine

data from a distance, referring to humidity, temperature , air quality, home automation, lighting control, parking lot management, road traffic speed, and so on, the IoT infrastructure can be used. A large number of sensors can be combined in order to transmit real-world data. In this way,ocer the next decade, we can see that everyday furniture, food contianers, and even paper documents can be accessed through the internet using same communication network, called IoT. It is estimated from statistics collected that the IoT concept would host ocer 75 billion devices linked together within the IoT network in various fields of interest by 2025(Lavric et al., 2019).

Performance Analysis and Uplink Scheduling for QoS-Aware NB-IoT Networks in Mobile Computing[11]- Currently, NB-IoT research is primarily focused onLatency, security , availability, area of coverage, energy consumption. In addition, because of the large volume of data in NB-IoT, communication delay requirements are increasingly strict. Uplink access latency is concentrated in the fundamental theories and core technologies of delay analysis. The uplink delay involves broadcast latency, latency of random access, latency of data transmission and latency of feedback. Random latency can be determined by the theory of stochastic network calculus (SNC). Conveniently constrained, which is conducive to the randomness and burstiness of device performance analysis. Once connecting to the various NB-IoT terminals Network estimation of the random access efficiency of the device is fatal. We concentrate in this paper on the quality of service (QoS) of the random access system of NB-IoT. You may summarize our primary contributions as follows(Chen et al., 2019).

III. Research Methodology

The research methodology defines what the research project is, how to proceed, how progress can be defined and what constitutes success. It provides us with a wealth of human knowledge, tools for collecting data, instruments for looking at things in life objectively; develops a logical and rational mindset, analytical reasoning to be objectively tested (Technology network inference and inductive thought); analysis skills especially during the 'information of technology era'. The research methodology is a information technology in network side that explores how network work is performed. It is the way to resolve the research problem systematically by logically taking various steps. Also it defines the way in which the data are collected in a research project.

A. Agile Model System Development Life Cycle (SDLC)

To produce best quality project with successful, an correct structure and methodology is important to serve as an aid to assist and provide guidance. For this purpose, a Agile Model software development life cycle (SDLC) approach is used in this project to develop this project. Agile SDLC model incorporates iterative and incremental process models with a emphasis on process adaptability and fast delivery customer satisfaction. Agile methods break down the product into small incremental structures. Such structures are given in iterations. Each iteration usually takes about one to three weeks to complete. Every iteration includes cross functional teams operating concurrently in various fields, such as ; Requirements, Planning, Design, implementation, Testing and Release, Track and Monitoring.

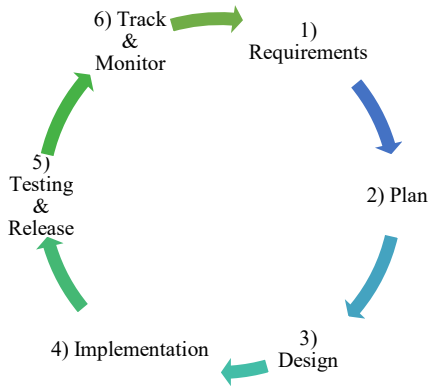

Figure 3.1 : Agile Model System Development Life Cycle(SDLC)

B. Work Breakdown Structure

Work Breakdown Structure (WBS) is a method which breaks down a project into a hierarchy of outcomes, tasks and subtasks. It is a useful tool which defines a detailed cost or time estimate and provides guidance for the development and control of schedules. Below showing the figure WBS for this project which is tracking and monitoring children using lora with infrared sensor temperature function.

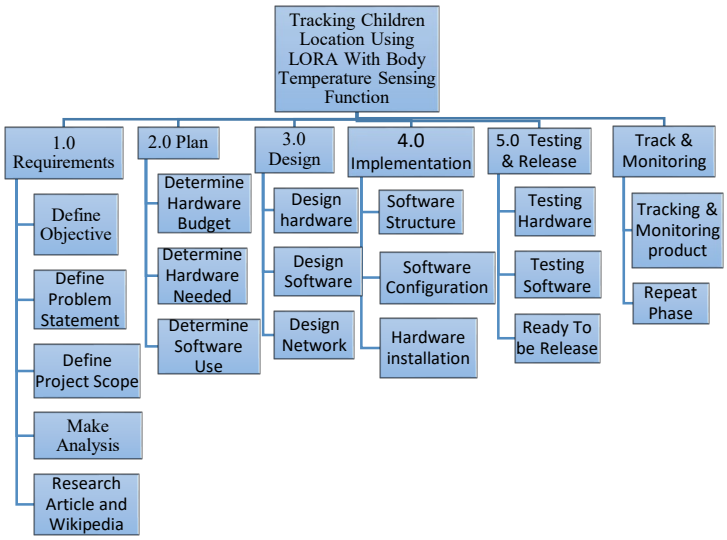

Figure 3.2 : Work Breakdown Structure (WBS)

C. Network Flow Chart

Figure below explain about network flow chart where the parent using receiver device and the child will using transmitter device. The child device will always transmit the signal with the raw data and send to the parent device which will receive the signal and the raw data from child. However it's not enough for this project because part of the objective is want the parent easily monitor child using mobile and want to saved the data into database. Beside that, the lora gateway is so expensive, then last option is using wifi. The transmitter device will

connect to the wifi for sending the raw data to the Blynk application. Last but not least, the receiver device also need connect the wifi to access Blynk application.

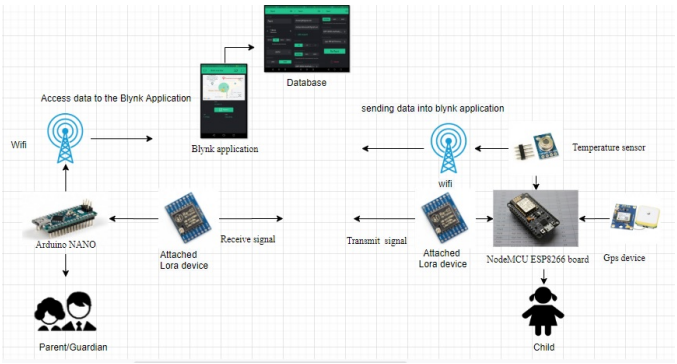

Figure 3.3 : Network Flowchart

D. System Flow Chart

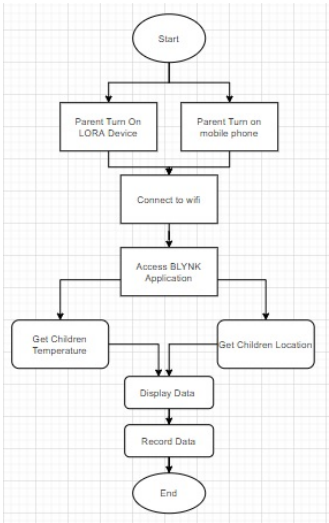

Figure 3.4 : Flow Chart

In the flow chart diagram below shows how the device works. When a guardian or parent wants to know where their child is and wants to know their child's health so they turn on the Lora device and the device will be connected to the wifi. Then the parent or guardian open the Blynk application to know the child location, and to monitor the child's health. After the data display on the Blynk application then the data will be record. After record, then the data will be save into file excel. Lastly the report will be sent via email parent or guardian.

IV. RESULT AND DISCUSSION

From this chapter, will explain and showing about the finding result after the test of this project. More than that, to ensure if the project can running in good condition. Also to know somehow every purpose of this project can achive.
The purpose of this project is to collect the data location and the temperature reading of the children. Beside that, the data have been collect will save into database. By using arduino software that are used to test the connectivity between the device that to identify somehow this two device have connection. More than that, the telegram as second test for the result data that get from receiver and transmitter device.

A. Prototype Testing

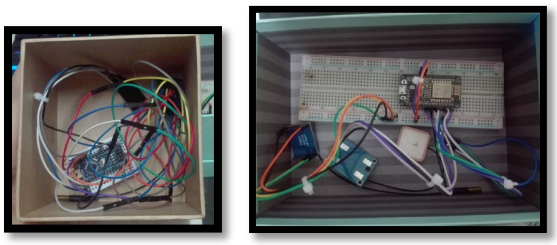

Figure 4.1 : Tracking Children Location Using LORA With Body Temperature Sensing Function prototype

This project consist of two prototype refer from figure 4.1. From the left side is receiver device and the right side is transmitter device. The receiver device will be hold by parent, while transmitter device will be hold by children. Before proceed to the blynk, don't forget to plug in the transmiiter device by using usb cable to the laptop or power bank for the power supply and turn on the wifi because to connect the internet.Then open the arduino coding on the laptop and plug in the usb cable from transmitter to the laptop. Why? It's because we want to monitor the data from the transmitter in the arduino software.Beside that, open the blynk after the receiver device plug in to the power bank. Lastly the device will run and always sending data. From this we can monitor the children temperature body and we can track the location of the children from the blynk application or the arduino software

B. The Analysis Objective

1. Analysis of the first objective

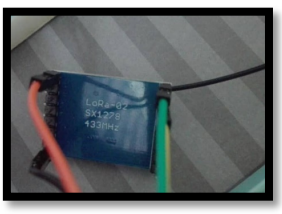

Figure 4.2 : Lora device

This devices each have lora technology compenant as connection. This lora technology compenant can connect each other up to 200m without using wifi network.The children device also have gps that can give the children location reading

which is longitude and lattitude. Figure 4.2 above example for lora device that are one of main important compenant that needed for this project. The receiver and transmitter device will have this compenant.

Figure 4.3 : Longitude and latitude result from blynk application and Arduino

While Figure 4.3 above shows the result of longitude and latitude from difference platform which left side is arduino and the right side from the blynk application.

2. Analysis of the second objective

Figure 4.4 : Temperature result from blynk application and arduino

The transmitter device also consist of temperature sensor where it's for monitor the temperature children anytime when the children touch the temperature sensor. So from this we can know if children have normal body temperature or high body temperature. Because usually, normal body temperature is shows the child is healthy. Figure 4.4 above example result we get from blynk application and arduino softtware.

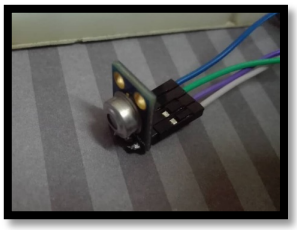

Figure 4.5 : Temperature device

Meanwhile figure 4.5 above, Example of temperature device that mention earlier which function for monitor child temperature body.

3. Analysis of the third objective

The data from the children device can be monitor from the blynk application. The blynk application children interface will shows 4 types of data which is google maps, temperature reading,longitude value and latitude value. All this data can be save on the "REPORT" section.

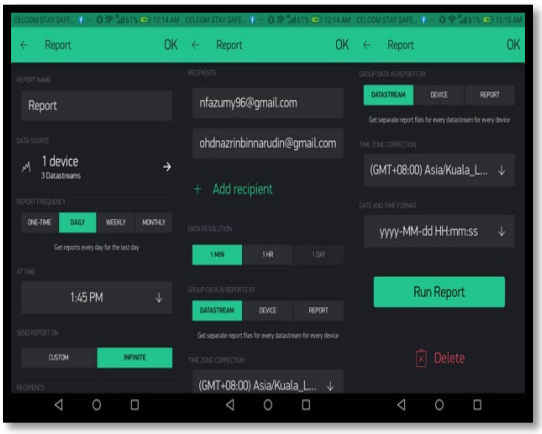

Figure 4.6 : Report section in the blynk

Figure 4.6 above example of report section that mention earlier. This section will generate the report which file format is microsoft excell.

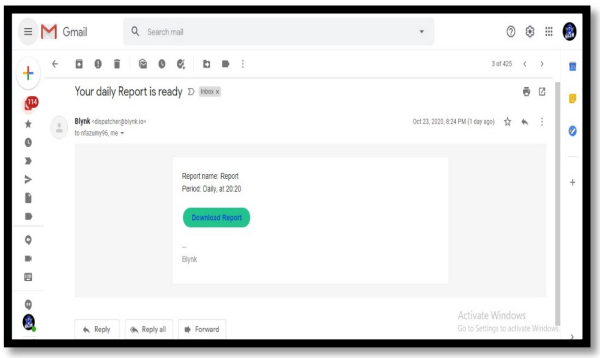

Figure 4.7 : Report send via email by blynk

Figure 4.7 above example of daily report in the email. This file will be direct send via email parent by the blynk application.

C. *Result and Network Analysis*

1. Connection between Transmitter and Receiver (Lora device only)

The earlier testing is about to verify the connectivity between transmitter and Receiver device with using arduino software. This testing connectivity is without using wifi, it's just using lora device that connect between transmitter device and receiver device. Firstly run the program from arduino software.

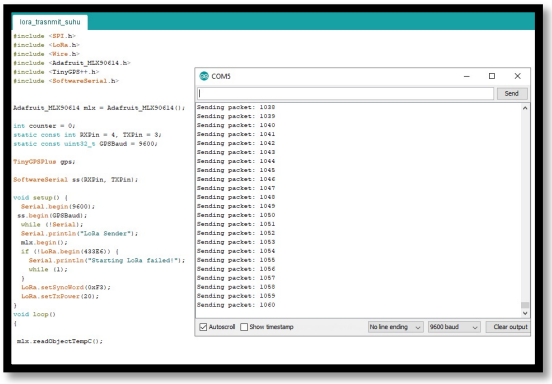

Figure 4.8 : Arduino coding for Lora Transmitter

Figure 4.8 shows the arduino coding for lora transmitter. The coding has been run and it's shows the sending packet value if it is success to send toward receiver device or failed. From figure above shows that the packet always sending to the other device which mean that the two device always connected to each other. But if sending packet failed happens it's mean that the connection is not in good shape, out of coverage or it really doesn't have connectivity at all.

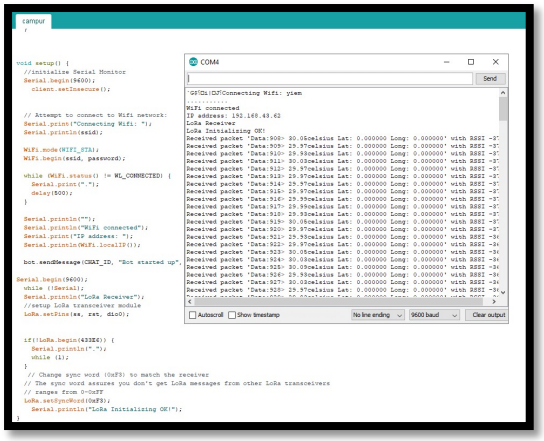

Figure 4.9 : Arduino coding for LoRa Receiver

Figure 4.9 shows the arduino coding for lora receiver. From the figure above we can see that the data success to be receive from data that have been transmit before. The data shows the packet data, the temperature reading and the location data such as longitude and latitude.

2. Connection between Transmitter and Receiver (Lora device + wifi)

The Blynk is an Internet of Things platform designed to make development and implementation of smart IoT devices quick and easy.This application is a Platform with IOS and Android apps to control Arduino, Raspberry Pi and the likes over the Internet. So what does blynk have to do with this project? So the data from the receiver will send into the blynk application. The parent will get data from the blynk application. The parent will get data anytime whatever parent want to know their child condition.

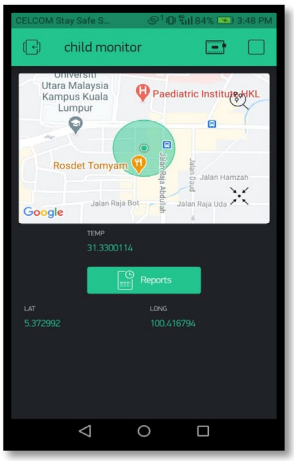

Figure 4.10 : Child Monitor interface in Blynk Application

From figure 4.10 above shows the data come out in the blynk application. The data such as temp for child temp reading. As well Lat for latitude and Long for longitude. The google maps also will be appeared and its will show where the location of the children follow by longitude and lattitude value. The blynk application is to make it easier for parents to monitor the children condition.

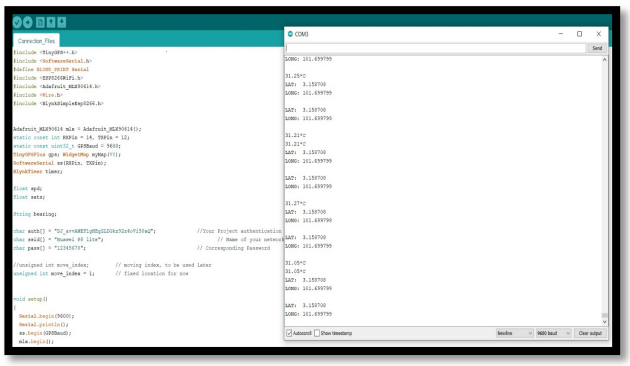

Figure 4.11: New Update Arduino Coding

Figure 4.11 is the coding that has been updated from the old coding so that when the results come out the data is organized. This makes it easier to monitor the data on the arduino software.

D. Network Analysis

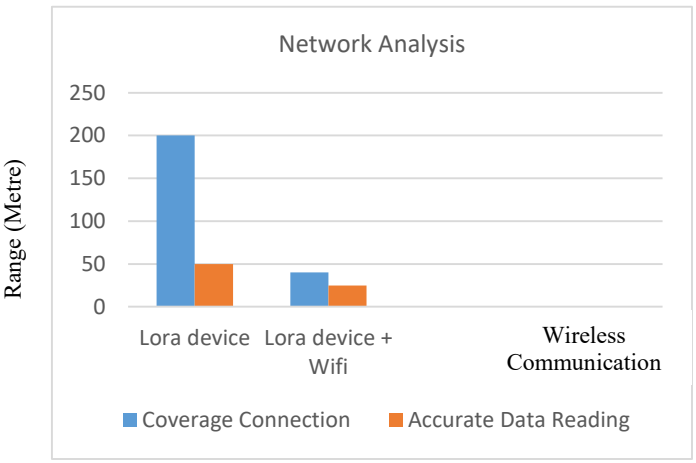

Figure 4.12: Network graph

From figure 4.12 show that the coverage connection lora device can go up to 200m while lora device plus wifi only get 50m. Meanwhile, the accurate data reading for lora device is around 50m and the accurate data reading for lora device+wifi only in 20m. From this network graph analysis we can conclude that actually lora can go to far even just using lora device without the wireless technology. Imagine if the lora device merge with lora network wireless technology, maybe it can reach until 1 km or more. But for this project, because short of budget so just only can buy basic lora device. Actually for the lora network wireless technology or many people understand as the gateway device are intermediaries that allow the transmission of data to the cloud by sensing devices.That mean if we have gateway so the prototype can connect to the internet and can access cloud like wifi. Unfortunately the gateway is so expensive. Usually only for the industry like company buying that lora gateway because for the normal price rm1000 and more. The cheaper can get from the online shooping around rm700-rm900 based on experience from the online shooping. Therfore, the solution to accessing the internet for database and for the blynk application must use the wifi merge with lora device technology as connection to the internet .

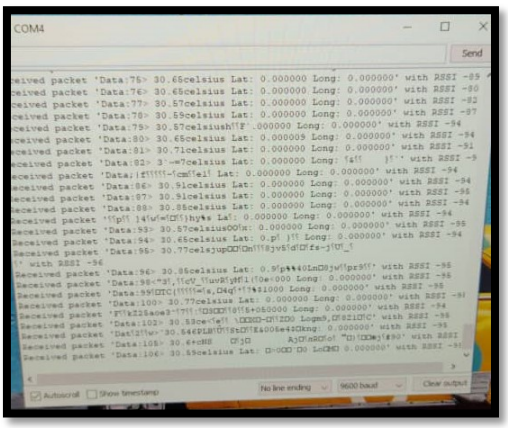

Figure 4.13: Corrupt data

Figure 4.13 are the example of limit range for the lora device can send the data. Where the data send will corrupt if the lora device reach its range limit.

V. CONCLUSION AND RECOMMENDATION

I. Conclusion

Finally, this project has successfully developed and tested. This project title tracking and monitoring children using Lora with temperature sensor reading. After completed this project, all the objective have been achieved. The project all about how the parent can monitor the body temperature of the children and track the children location from home,office or wherever parent are. Morethan that, this project using Lora compenant to create the prototype that have lora ability to communicate with other prototype. The project started with having two type of prototype that need to be build because this project use concept of receiver and transmitter. The parent will hold the receiver prototype, while children holding the transmitter prototype. The receiver prototype only have Lora compenant that connected with antenna, arduino nano board and the AI cloud inside chips which is for wifi. However for the transmitter device using many compenant which is lora compenant that connected with antenna, Node mcu ESP8266 microcontroller, gps-neo6mv2 module and temperature sensor. Beside that, don't forget to open wifi before using Blynk application and connect with this prototype so parent can monitor and track their children by just open the blynk application. The Blynk application will shows the google maps, the langitude and lattitude value. Last but not least, For database the data can be save by click the report section and the Blynk will generate the report and the report will be send via email of the parent.

II. Future Recommendation

For the future improvement of this project, there are a few aspects that can be done to this project:
1. Try using Lora gateway because the possibility is the distance can be expanding further.
2. Upgrade the database system for more efficiency.
3. Transmitter may also use cellullar connection.
4. Provide power switch for the receiver.

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