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# An effective and reliable IoT solution to enhance child safety

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**Abstract-**In this paper, we propose aIoT solution for enhancing the child safety. The Child safety is essential for healthy growth of children and therefore parents should ensure that their children are away risks which may adversely affect them mentally. In recent days child safety has been a critical issue. The children should be protected from kidnappers, molesters and who prey on kids. Portable GPS tracking systems are providing to be an effective and reliable solution to enhancing child safety that would provide parents a way to monitor every location where child goes with relative ease. GPS tracking system can be one of the simplest and most efficient ways to boost the safety of many children, who honestly believes that a zigbee can tell everywhere the child goes. Some of the car tracking systems can also be used by people for child tracking because the trackers are so compact and movable. Since the GPS tracking system are smaller than a cellular phone, carrying the devices is easy and nonevasive. The parent could then have access to everywhere their child is at all the time throughout the day, making it easy to know the exact movement a child arrived at the bus stop, or got to a friend's house. At this point in time, the best and most effective type of monitoring the safety of the child can be achieved with GPS along with zigbee.

**Keywords-** Child Safety, Global Positioning System (GPS), Internet of Things (IoT), Zigbee.

### I INTRODUCTION

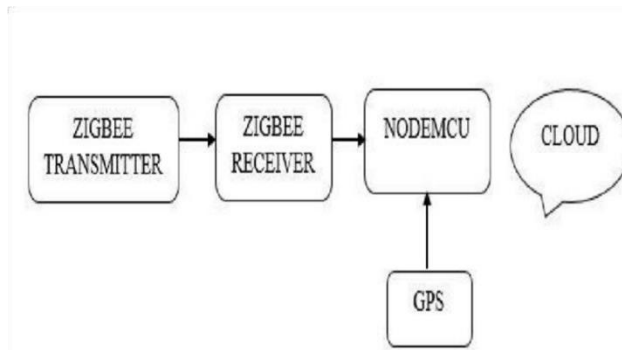
The Internet of Things (IoT) is a system of interrelated computing devices, mechanical and digital machines, objects, animals or people that are provided with unique identifiers and the ability to transfer data over a network without requiring human-to-human or human-to-computer interaction. A thing, on the Internet of Things, can be a person with a heart monitor implant, a farm animal with a biochip transponder, an automobile that has built-in sensors to alert the driver when tire pressure is low or any other natural or man-made object that can be assigned an IP

address and provided with the ability to transfer data over a network. IoT has evolved from the convergence of wireless technologies, micro services and the internet. The convergence has helped tear down the silo walls between Operational Technologies (OT) and Information Technology (IT), allowing unstructured machine-generated data to be analyzed for insights that will drive improvements.

Al-Ali designed a mobile RFID tracking system for tracking the cars[1].T.Kakuda proposed new generation children tracking system based on mobile Ad Hoc networks consisting of android mobile terminals for ensuring the child safety[2]. Morii.K proposed a new generation children tracking system using bluetooth MANET composed of android mobile terminals for tracking the child [3].

Al-Suwaidi proposed a concept of locating a friends and familys with the help of GPS using mobile phone[4]. Almomani I.M design the vehicle tracking and management System with the help of GPS module[5]. Chandra.A proposed a concept of location tracking and sharing using GPS for Java Enabled Handhelds used for the purpose of tracking a cars and sharing the location[6].

## II CONSTRUCTION OF ZIG-CLOUD MODULE



**Figure 1 :zig-cloud module**

This section provides the information of hardware modules used in the system design such as Zigbee, GPS, Node MCU and software modules used in the system design such as Android IDE, ThingSpeak, XCTU Software.

Zigbee is an IEEE 802.15.4 based specification for a suite of high-level communication protocols used to create personal area networks with small, low-power digital radios, such as for home automation, medical device data collection, and other low-power low-bandwidth needs, designed for small scale projects which need wireless connection. Hence, Zigbee is a low-power, low data rate, and close proximity (i.e., personal area) wireless ad hoc network. The technology defined by the Zigbee specification is intended to be simpler and less expensive than other wireless personal area networks (WPANs), such as Bluetooth or more general wireless networking such as Wi-Fi. Applications include wireless light switches, home energy monitors, traffic management systems, and other consumer and industrial equipment that requires short range low-rate wireless data transfer. Its low power consumption limits transmission distances to 10–100 meters line-of-sight, depending on power output and environmental characteristics. Zigbee devices can transmit data over long distances by passing data through a mesh network of intermediate devices to reach more distant ones. Zigbee is typically used in low data rate applications that require long battery life and secure networking (Zigbee networks are secured by 128 bit symmetric encryption keys).

The high performance UBX-G7020 multi-GNSS chip supports GPS, GLONASS, QZSS and SBAS. It delivers exceptional sensitivity and acquisition times. u-blox 7 features ultra-low power consumption, thanks to innovative single die architecture and enhanced software algorithms. This gives the UBX-G7020 best in class power consumption for GLONASS reception. The extended voltage supply range and 1.8 V and 3.0 V I/O

compliance supports a wide variety of user applications.

Sophisticated RF-architecture and interference suppression using active continuous wave detection ensure maximum performance even in GNSS-hostile environments. The UBX-G7020 is available in your choice of miniature WLCSP and QFN packages and features an ultra-small solution footprint of only 30 mm<sup>2</sup>.

The built-in LNA, LDOs and DC/DC converter, and on-chip ROM mean that only the smallest possible external BOM is required. By supporting TCXOs or lower price GNSS oscillators the UBX-G7020 further ensures a minimal Total-Cost-of-Ownership. The ultra-small UBX-G7020CT is the perfect choice for portable consumer applications with demanding size and cost constraints. With its rigorous Automotive quality and manufacturing standards (AEC-Q100, ISO/TS 16949) the UBX-G7020-KA is ideal for automotive applications.

NodeMCU is an open source IoT platform. It includes firmware which runs on the ESP8266 WiFi SoC from Espressif Systems, and hardware which is based on the ESP-12 module. The term "NodeMCU" by default refers to the firmware rather than the dev kits. The firmware uses the Lua scripting language. It is based on the eLua project, and built on the Espressif Non-OS SDK for ESP8266. It uses many open source projects, such as luacjson, and spiffs. NodeUSB is an open IoT platform about the size of a standard USB stick. It was designed to leverage NodeMCU (Lua) for easy programming and has the extra feature of USB capability. It is ideal for Plug-n-Play solutions, allowing easy prototyping for developers. The ESP8266 is a low-cost Wi-Fi microchip with full TCP/IP stack and microcontroller capability produced by Shanghai-based Chinese manufacturer, Espressif Systems.

The chip first came to the attention of western makers in August 2014 with the ESP01 module, made by a third-party manufacturer, Ai-Thinker. This small module allows microcontrollers to connect to a Wi-Fi network and make simple TCP/IP connections using Hayes-style commands. However, at the time there was almost no English-language documentation on the chip and the commands it accepted. The ESP8285 is an ESP8266 with 1 MB of built-in flash, allowing for single-chip devices capable of connecting to Wi-Fi.

The open-source Arduino software (IDE) makes it easy to write code and upload it to the board. It runs on Windows, Mac OS X and Linux. The environment is written in Java and based on processing and other open source software. It provides comprehensive facilities to computer programmers for software development. Programs written using Arduino software (IDE) are called sketches. These

sketches are written in the text editor and are saved with the file extension.

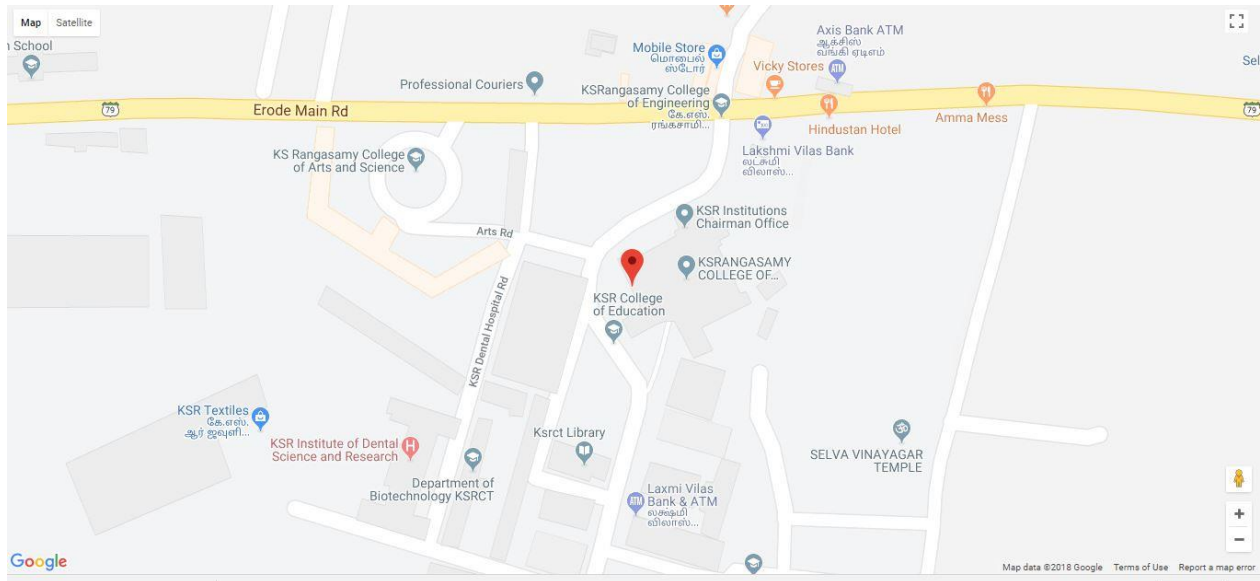
ThingSpeak is an open source Internet of Things (IoT) application and API to store and retrieve data from things using the HTTP protocol over the Internet or via a Local Area Network. ThingSpeak enables the creation of sensor logging applications, location tracking applications, and a social network of things with status updates.

ThingSpeak has integrated support from the numerical computing software MATLAB from MathWorks. Allowing ThingSpeak users to analyse and visualize uploaded data using Matlab without requiring the purchase of a Matlab license from Mathworks. ThingSpeak has a close relationship with Mathworks, Inc. In fact, all of the ThingSpeak documentation is incorporated into the Mathworks Matlab documentation site and even enabling registered Mathworks user accounts as valid login credentials on the ThingSpeak website. The terms of service and privacy policy of ThingSpeak.com are between the agreeing user and Mathworks.

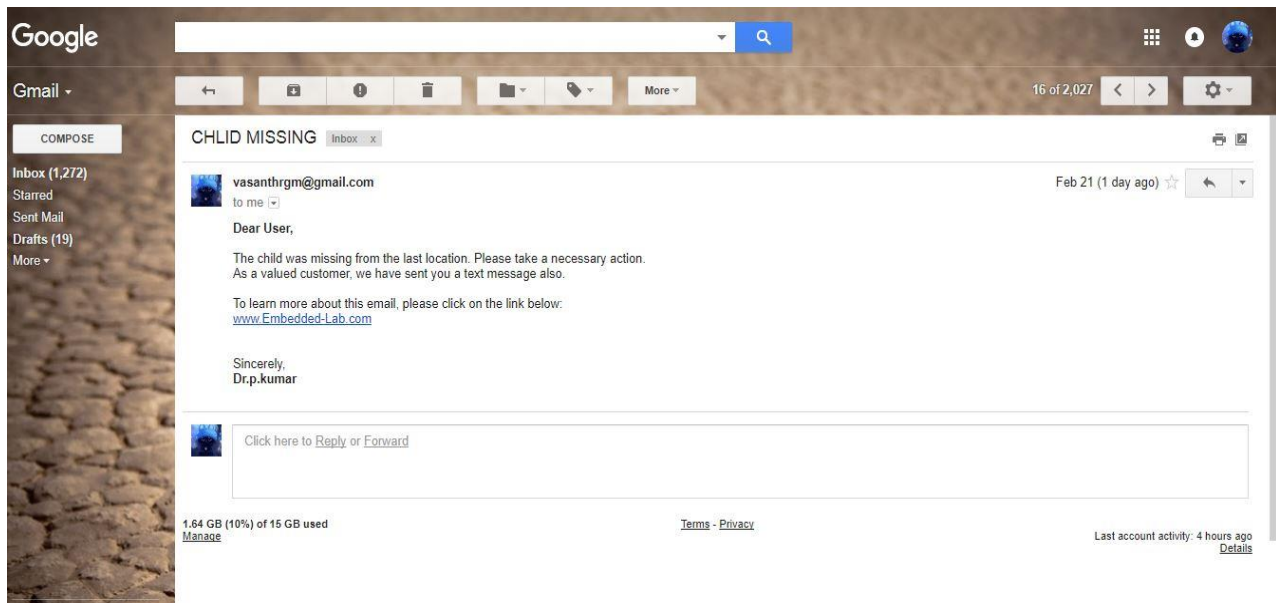
X-CTU is free software provided by Digi which we use to configure and manage XBees, and test XBee networks. The tool provides a GUI and terminal interface to configure the modules as well as a built in tool to test the Xbee range and reliability of packet transmissions.

### III RESULTS AND DISCUSSION

The child's latitude and longitude through Google Map showing child's location. The GPS location sensor was able to respond back with precise latitude and longitude coordinates to the user's cellphone, which then the user would click on the received Google maps URL which would, in turn, open the google maps app and display the pinpoint location. In all the scenarios the GPS module was tested, it would respond back to the user's cellphone within a minute. The GPS turned out to be so precise with the location that it performed even better than the GPS on an expensive smartphone.



**Figure 3: Last Location of Missing Child**



**Figure 4: Screen Shot of Alerting Mail Sent to User**

The experimental arrangement for the child safety. Zigbee transmitter continuously transmits the ping message. Then, the Zigbee receiver receives the ping message from the Zigbee transmitter. The receiver receives the data and the location is transmitted to the cloud through the Node Mcu. Through Node Mcu the data can be transmitted to the cloud and stored in it. The data in the cloud is processed, analyzed and the information is stored. If the ping message is stopped the receiver analyses and sends the past location of

the child through email. From this the parents should analyzed the child is missing.

**IV CONCLUSION**

This application is designed for locating missing children. The solution represented in this paper takes the advantages of smart phones which

offers rich features like Google maps, GPS, SMS etc. Some of the best works implemented in past relies on SMS based tracking which is not helpful to get an accurate location in our proposed system we have provided real time tracking. Tracker that allows parents to monitor their children commuting to and from school. A simple working prototype was developed to track the movement of the school vehicle using GPS and to identify the children using GPS. Parents can view this information and the map that depicts the child's movement through a website. A small-scale market validation has been conducted to determine the level of acceptance of the intended users towards the system. As a conclusion, GPS tracker provides a solution that addresses the issue of school transportation safety thus giving the parents confidence that their children are safe when commuting to school. It is also a low-cost method of monitoring school children when they commute to school.

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