

IoT-Based Safety Gadget for Child Safety

Monitoring & Notification

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ABSTRACT

Children are the heartbeat of every parent. Children are less secure nowadays and have many issues concerning their security purpose. Many Family members spent more time in work and social accountability when they need to take care of their children. The current status in our country is not habitable for monitoring children. With the absence of a child monitoring system, it is hard to monitor the children every second.

Today, there is an increased concern for their safety especially when crimes against children are increasing rapidly. Primarily special children require continuous monitoring from their parents thus restricting their freedom. With the lack of availability of affordable child monitoring systems, it is hard to monitor the whereabouts of children. The safety of children is very critical since they cannot protect themselves.

This project proposes a smart IoT Based device that can help reduce parents' insecurity with regards to their children's whereabouts in real-time. Our project assists the parents to continuously monitor their child's

location. The paper provides a smart solution for deflecting losing kids while going out alone or with their parents based on the Internet of Things (IOT). Our proposed system will ensures utmost security and ensure live tracking for kids. It proposes a model for child safety through smartphones that can track their children's location and provide the precise coordinates of the child's location in real-time Anywhere by monitoring the activities, the security state of the children are examined.

INTRODUCTION

Networking technologies enable IoT devices to communicate with other devices, applications, and services running in the cloud. The internet relies on standardized protocols to ensure communication between heterogeneous devices is secure and reliable. Standard protocols specify rules and formats that devices use to establish and manage networks and transmit data across those networks. The Internet of Things is increasingly finding a place at the heart of many business automation strategies.

Companies are using sensors in the logistics chain to help them track where delivery is with extraordinary accuracy. The motivation for this wearable comes from the increasing need for safety for little children in contemporary times as there could be scenarios of the child getting a drift in a major crowded sector.

A geofence also called a “circle of safety” is created around the child within a particular location. This guarantees that the parent can leave their child within the geofence and the child's location is continuously monitored. If the child crosses the geofence by any chance notification

will be generated. These notifications will be sent according to the child's location to their parents or caretakers.

LITERATURE SURVEY

1. Title: Child monitoring using GPS tracking system

Authors:

Sadhana B

Navya A

Nidhishree

Vidhyashree

Vishwa

In this project, a child belt is attached with sensor in order to keep track of child's Activity. Whenever child get into school bus from home the parents will get message and through GPRS the location of child is monitored by parents through a developed software. Whenever Child get into classroom the camera inside classroom get activated and the video clip is send to parents. Here Cloud Computing is used to store video. And whenever child play in the playground the information is sent to parents. Hence these are safety zone for child.

2. Title: IoT-based Child Security Monitoring System

Authors:

Lai Yi Heng

Intan Farahana Binti Kamsin

An IoT-based wearable smart band for children is proposed in this research for child security purposes. Some of the sensors used are heart rate, sleep quality, motion, and temperature sensors. The altimeter and pedometer are also included in this smart band. The information indicating children's status, along with reference values will be sent to parents' devices with the app installed and if this data is not along the reference values then an alert notification is sent to the parent. Also, when children leave geofences, a notification will be sent to parents' devices

3. Title: Smart and Secure IOT based Child Monitoring System

Authors:

Dipali Badgujar

Neha Sawan

Prof. Dnyaneshwar Kundande

This system mainly focuses on a child remote monitoring system. Obstacle sensors which will detect the alert when the child enters the danger zone or else he/she is approaching towards harmful object then alert will be given to the caretaker through the mobile using an alarm or notification. For sensing purpose Waterproof Ultrasonic Obstacle Sensor is used which are placed in the simple locket that is given to the baby so that locket will give an alert to the caretaker and for battery backup, we are using a solar panel through which the energy will get stored in the care taker's shoes and this energy will be dependent on the steps covered by the caretaker.

4. Title: **Child monitoring system using IoT**

Authors:

Vibha Chandrala

Niveditha N

Neha B Reddy

Urmila N

It will share the current location of the child using GSM, GPS, G-MAPS, CLOUD,CAMERA and RFID. It will detect when the child entering and leaving the school. This can be monitored by the parents time to time. It has a panic button, if it is pressed the will send a message to the nearby police stations and hospitals

5. Title: **Child Safety Monitoring System Based on IoT**

Authors:

N. Senthamilarasi

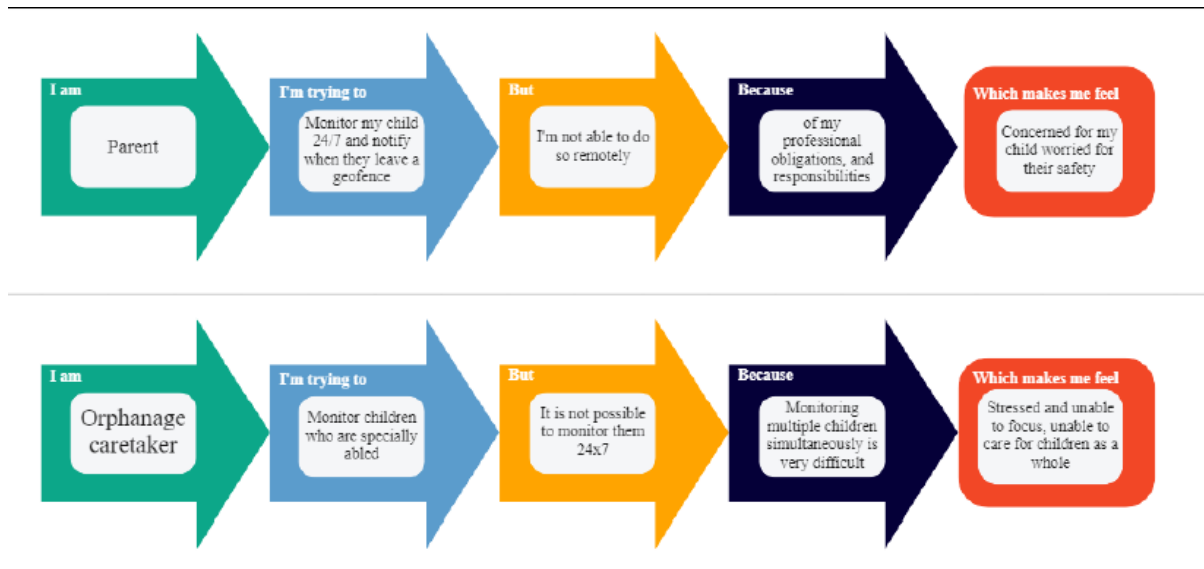
N.Divya Bharathi

D.Ezhilarasi

R.B.Sangavi

In this autonomous real-time monitoring system, the collected values are used to detect the child's status and alert the respective guardians using GSM. The major components are temperature, pulse sensors, GPS, GSM, Web camera, and Rasberry Pi. Any abnormal rise or fall in temperature will be notified to the parent and they can also monitor the child lively through a web camera following they can check the live location through GPS as well. If the device moves out of that boundary the server transfers an alert call by activating the GSM to the user.

PROBLEM STATEMENT



Today, parents are working hard and looking after their kids at the same time. Due to the increasing security risks faced by children, both the parents need to monitor their child's activities. Children are the backbone of one's nation, if the future of children was affected, it would impact the entire growth of that nation. Due to the abuse, the emotional and mental stability of the children gets affected which in turn ruins their career and future. These innocent children are not responsible for what happens to them. So, parents are responsible for taking care of their own children. But, due to economic condition and aims to focus on their child's future and career, parents are forced to crave for money. Hence, it becomes difficult to cling on to their children all the time.

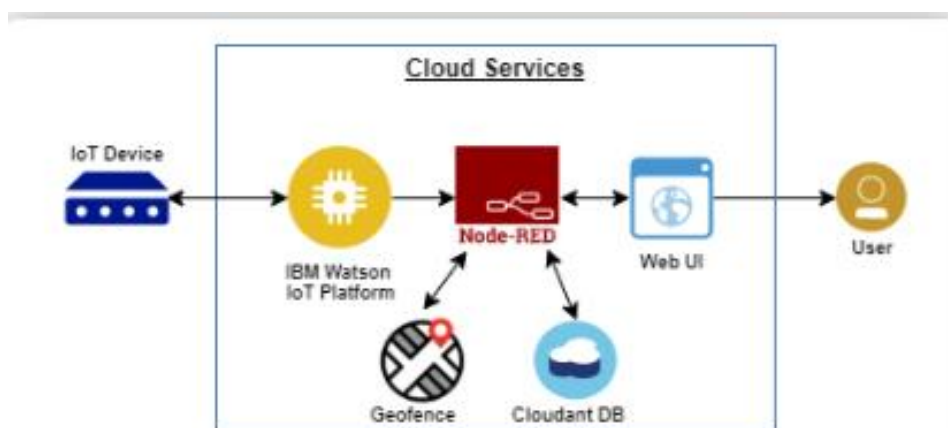
EXISTING SYSTEM

The system is equipped with a video camera that can be operated using the instructions from the Android phone's software hand function. The usage of technologies/methodologies such as the Internet of Things (IOT), Live Video Monitoring System, Cloud Computing (Data Storage), and User Friendly Web Application helps to build smartness and innovation (for User Controls). Nowadays, crime rate associated with children keeps increasing due to which draws peoples' attention regarding child safety. This particular research is conducted to propose a child security smart band utilizing IoT technology. By this parents know what is happening remotely and can take actions if something goes wrong. Through information obtained, a smart band have been proposed to monitor the safety of children. Online questionnaire and semi-structured interview are methodologies used to collect data. The online questionnaire gains feedbacks by sending questions electronically, where answers need to be submitted online. The future improvements of this device will be adding functions and software to make it works like a phone such as messaging, gallery, Google, YouTube, meanwhile, adding more child security features so that child safety is guaranteed.

PROPOSED SYSTEM

In our system, we provide an environment where this problem can be resolved in an efficient manner. It makes parents to easily monitor their children in real time just like staying beside them as well as focusing on their own career without any manual intervention. . It can also provide the parents with the necessary information about the child's location. There are various ways through which the child can be monitored

Child tracker helps the parents in continuously monitoring the child's location. They can simply leave their children in school or parks and create a geofence around the particular location. By continuously checking the child's location notifications will be generated if the child crosses the geofence. Notifications will be sent according to the child's location to their parents or caretakers. The entire location data will be stored in the database.



The novelty of this project is that immediate notifications would be sent to the parent or caretakers as soon as the child crosses the geofence. This can ensure that the required actions can be taken by the parent.

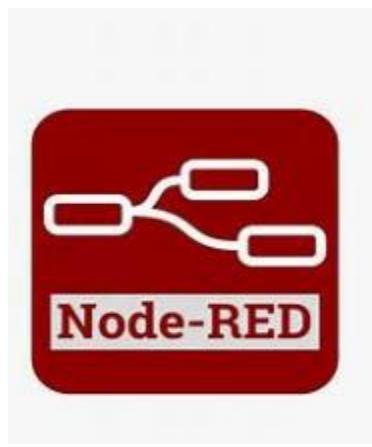
Through this, child safety can be ensured and the crime rates can be reduced. Through this project, the location of the child can be stored in a database as well.

According to parents, children with special needs requires to be in their sight while enjoying their own freedom. This project improves the safety index of places. This project can be sold to parents having special children on a monthly subscription basis.

In our system, we use several components like:

- ✓ Node RED
- ✓ IBM Watson
- ✓ Firebase
- ✓ MIT App Inventor
- ✓ IBM IoT Platform

Node RED:



NODE-RED is a stream based advancement instrument for visual programming and basically its main focus on visual apparatus for wiring the Internet of Things. This programming instrument is developed for wiring together equipment gadget(Hardware), APIs and online administrations in new and intriguing manners.

IBM Watson:



Watson Studio allows you to train, deploy, and manage your AI models, and prepare and analyse information during a single integrated environment.

Firebase:



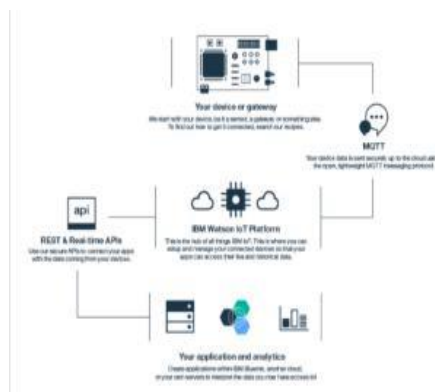
Firebase is a set of hosting services for any type of application. It offers NoSQL and real-time hosting of databases, content, social authentication, and notifications, or services, such as a real-time communication server.

MIT App Inventor:



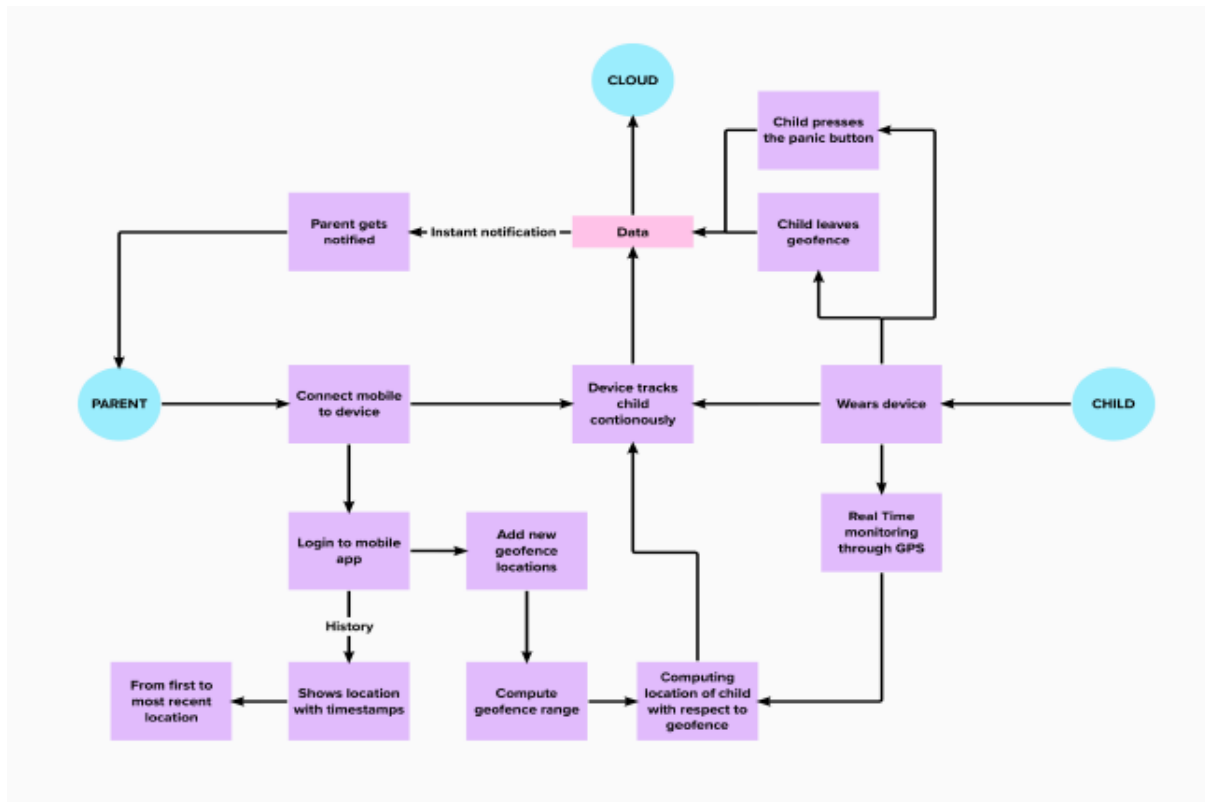
MIT App Inventor is an intuitive, visual programming environment that allows everyone – even children – to build fully functional apps for Android phones, iPhones, and Android/iOS tablets. The MIT App Inventor project seeks to democratize software development by empowering all people, especially young people, to move from technology consumption to technology creation.

IBM IoT Platform:



The Internet of Things (IoT) is the billions of physical devices around the world that are now connected to the internet, all collecting and sharing data. By combining IoT data with IBM Cloud technologies, businesses can extract valuable insights to improve virtually every aspect of their operations and enable innovative, new business models.

WORKING



The child has the device on his/her hand like a tag that will sense the current location, temperature, and heartbeat of the child. To achieve this, the program has been written in python which is connected to IBM Watson by using the organization ID, device name, device ID, authentication key, and API token.

Then, IBM Watson is interlinked with the node-red through the IBM IoT. The temperature and heartbeat are displayed in the IBM Watson dashboard. Also, in case of an emergency, the child has the option to press the Panic Button.

These data have been monitored by the parent through the SChild mobile application which was designed using MIT App Inventor 2. In order to get into the application, the user needs to signup with the email id and password which will be sent to the Firebase DB.

Then the user needs to verify the account by clicking the "Verify" button. The verification link has been sent to the user's email id so that hitting the link leads to an authorized user for sign-in. Then the user can be able to sign in with the SChild application.

Once the user signs in he/she can see his/her child's location and he/she will be notified through the SChild app as well as in the notification bar if her/his child went out of the geofence. When the child press the panic button the notification will be sent to the mobile notification bar.

Through the SChild app, the user can be able to monitor the child's heart rate and temperature. The location, heart rate, and temperature are been made available in the Firebase DB for future reference.

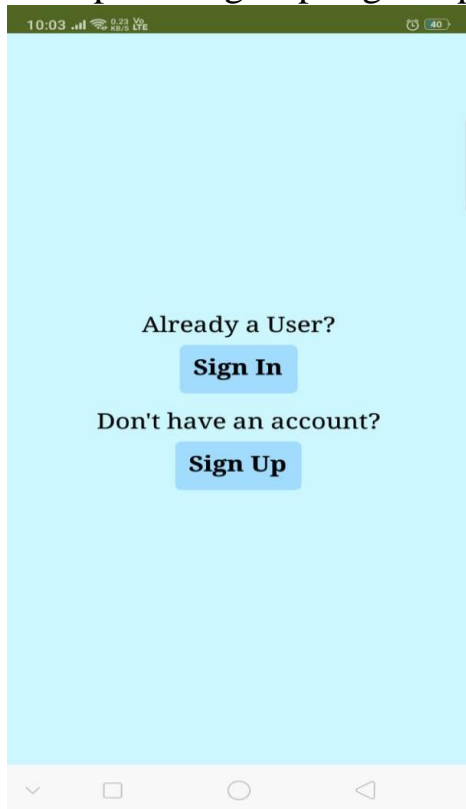
OUTCOME

Registration

App logo is displayed



Prompt for Sign-up/Sign-in page



10:03 5.23 KB/s LTE 40

Already a User?

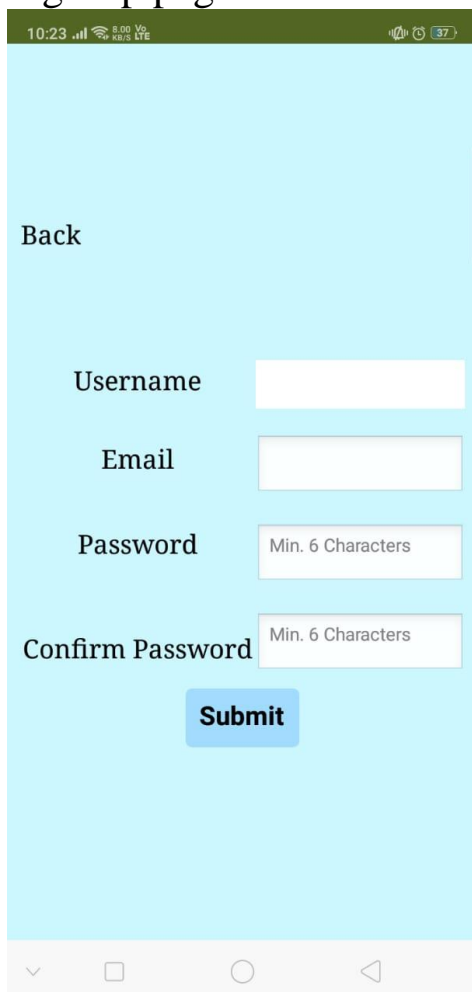
Sign In

Don't have an account?

Sign Up

This screenshot shows a mobile application interface with a light blue background. At the top, there is a status bar with the time 10:03, signal strength, 5.23 KB/s LTE, and a battery icon at 40%. The main content area contains two options: 'Already a User?' with a blue 'Sign In' button, and 'Don't have an account?' with a blue 'Sign Up' button. The bottom of the screen shows a white navigation bar with standard Android icons.

Sign-up page



10:23 5.00 KB/s LTE 37

Back

Username

Email

Password

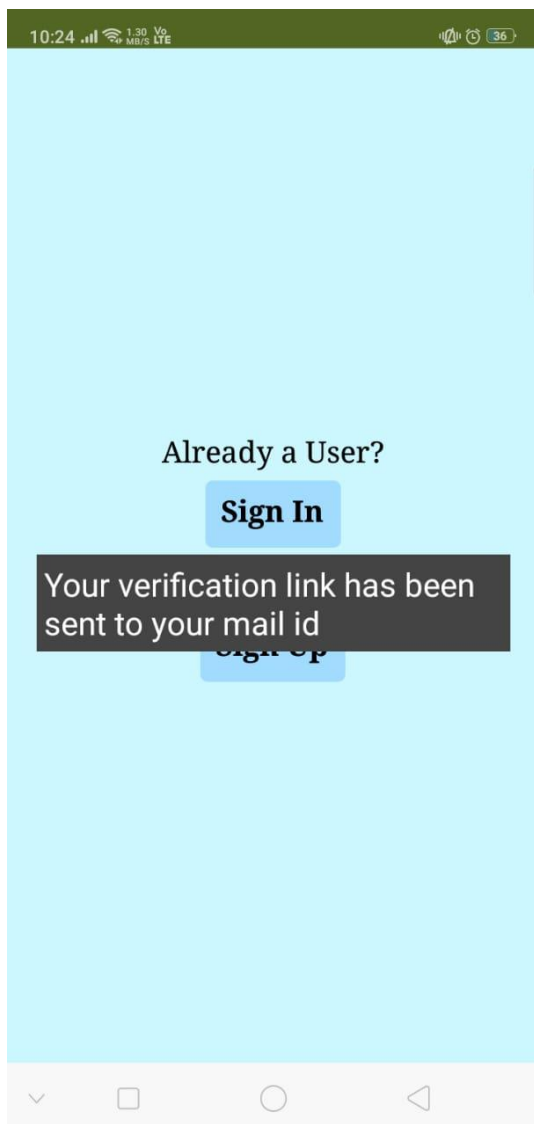
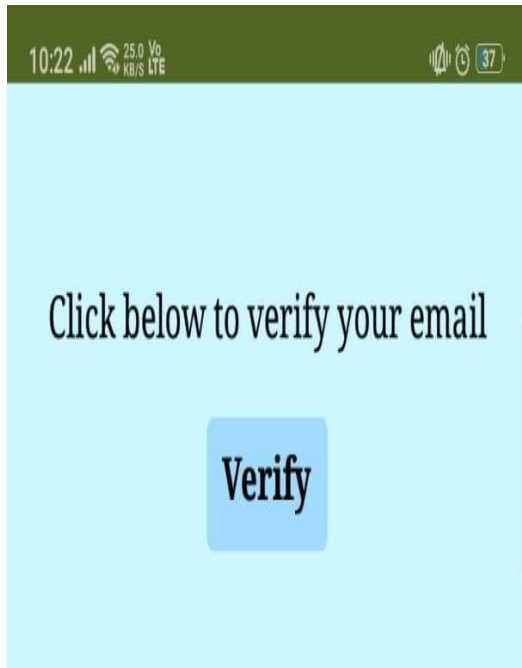
Confirm Password

Submit

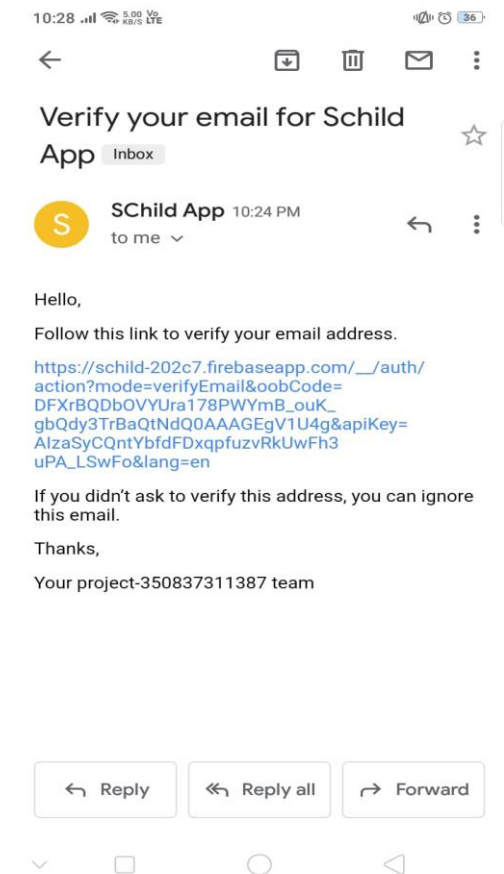
This screenshot shows a mobile application interface for a sign-up page. The status bar at the top displays the time 10:23, signal strength, 5.00 KB/s LTE, and a battery icon at 37%. The page has a light blue background. At the top left, there is a 'Back' link. Below it, there are four input fields: 'Username', 'Email', 'Password', and 'Confirm Password'. The 'Password' and 'Confirm Password' fields have a placeholder text 'Min. 6 Characters'. At the bottom, there is a blue 'Submit' button. The bottom of the screen shows a white navigation bar with standard Android icons.

Confirmation

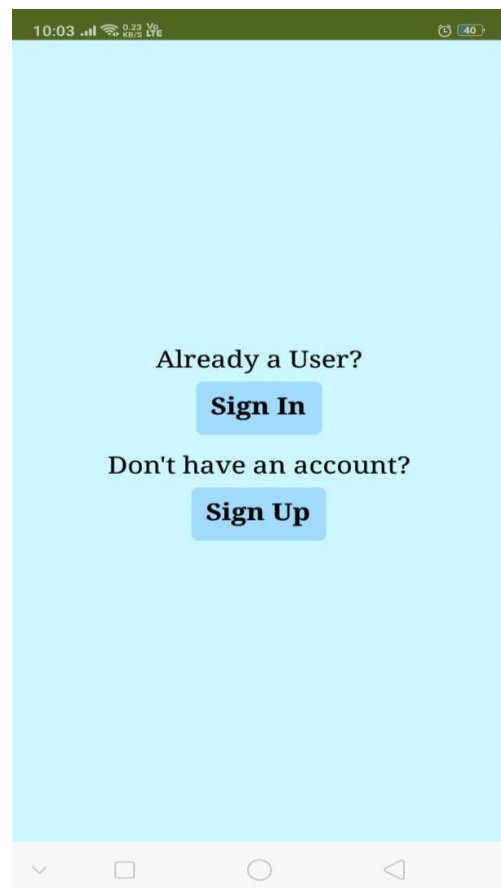
Verification Email will be sent



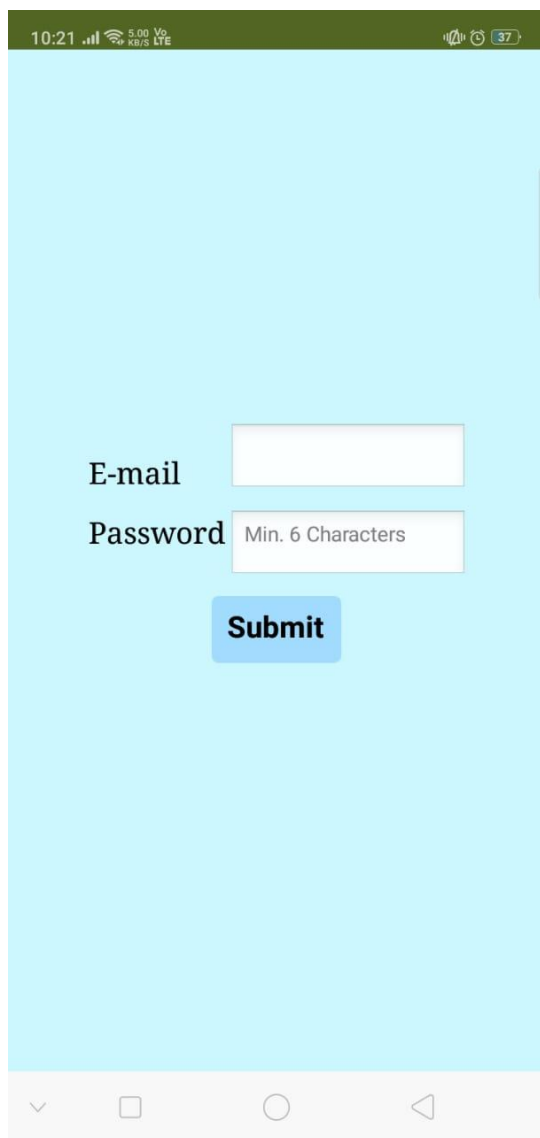
Verification Email



Login



Existing Users can sign -in

A screenshot of a mobile application's login screen. The screen has a light blue background. At the top, there is a dark green status bar with white text showing '10:21', signal strength, '5.00 KB/S LTE', and battery level '37'. Below the status bar, the main content area is light blue. It contains two input fields: 'E-mail' and 'Password'. The 'E-mail' field is a simple white rectangle. The 'Password' field is a white rectangle with a small grey text hint 'Min. 6 Characters' inside. Below these fields is a blue button with the word 'Submit' in white. At the bottom of the screen is a white navigation bar with four icons: a downward arrow, a square, a circle, and a left-pointing triangle.

10:21 5.00 KB/S LTE 37

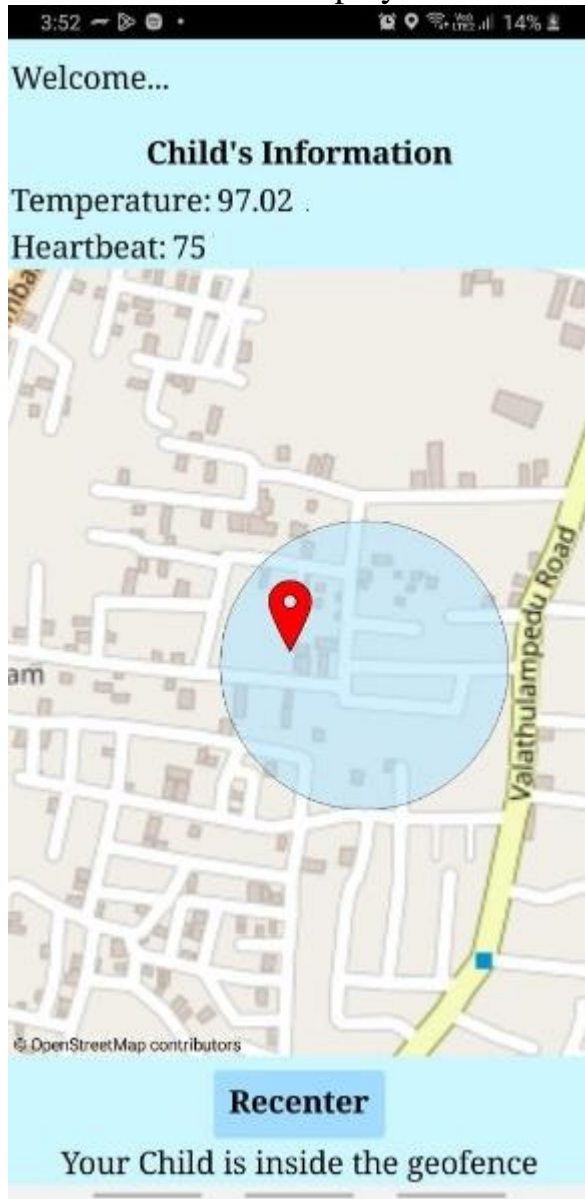
E-mail

Password Min. 6 Characters

Submit

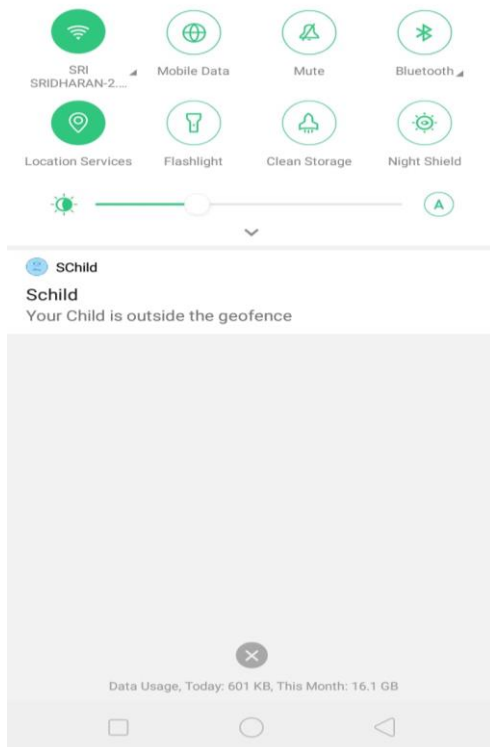
Dashboard

Child's location is displayed on the dashboard

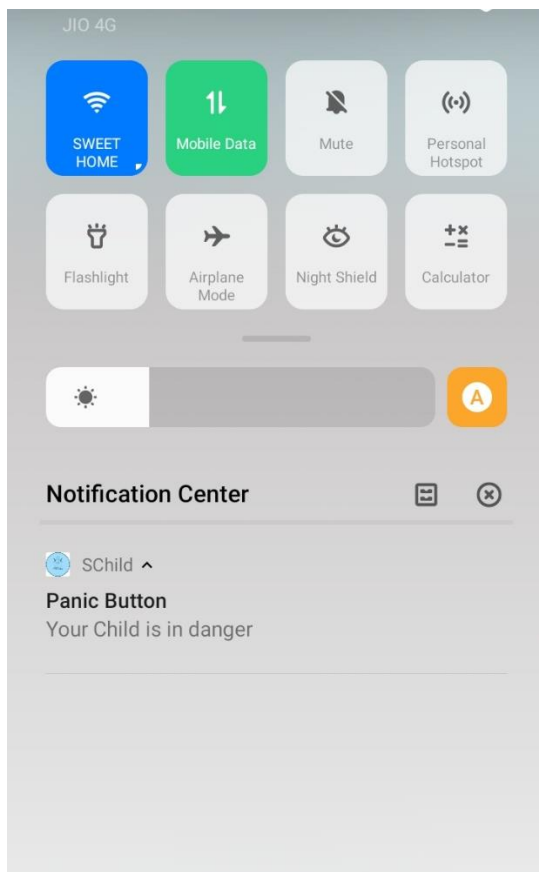


Notification

A notification is sent to the user if the child leaves the geofence

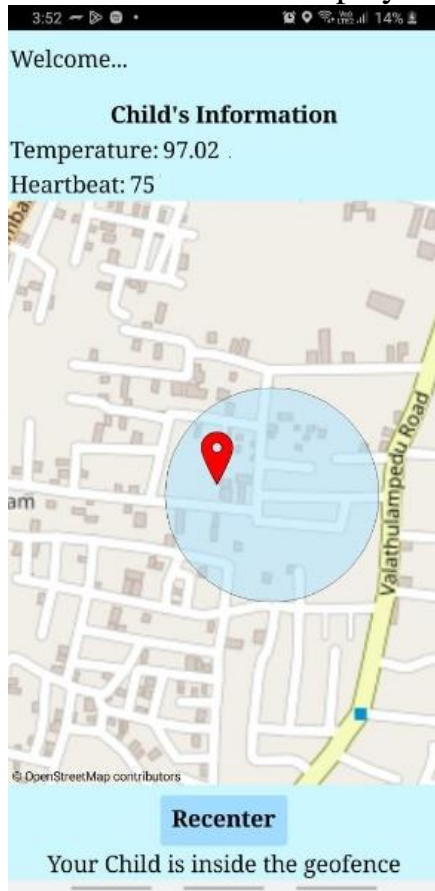


A notification is sent if the child presses the panic button



Application

The child's data is displayed on the dashboard



IoT Device – Watson Communication

Python code:

```
import time
import sys
import ibmiotf.application
import ibmiotf.device
import random
```

#Provide your IBM Watson Device Credentials

```
organization = "zyb99x"
```

```
deviceType = "IBM"
```

```

deviceId = "08"
authMethod = "token"
authToken = "12345678"

# Initialize GPIO
def myCommandCallback(cmd):
    print("Command received: %s" % cmd.data['command'])
    status=cmd.data['command']
    if status=="Buttonpressed":
        print("Child in danger")
    else:
        print("please send proper command")

try:
    deviceOptions = {"org": organization, "type": deviceType,
"id":deviceId,"auth-method":authMethod, "auth-token":authToken}
    deviceCli=ibmiotf.device.Client(deviceOptions)
    #.....

except Exception as e:
    print("Caught exception connecting device: %s" % str(e))
    sys.exit()

#connect and send a datapoint "hello" with value "world" into the cloud as
an event of type "greeting" 10 times
deviceCli.connect()

while True:

```

```
#get sensor data from DHT11
childtemp=random.uniform(96.70,99.30)
childtemp=round(childtemp,2)

childhb=random.randint(55,85)
data={' childtemp': childtemp, 'childhb': childhb}
#print data
def myOnPublishCallback():
    print ("Published Child Temperature =%s F" % childtemp,
"Heartbeat=%s BPM" %childhb,"to IBM Watson")

    success=deviceCli.publishEvent("IOTSensor","json",data,
qos=0, on_publish=myOnPublishCallback)
    if not success:
        print("Not connected to IOTF")
        time.sleep(10)

    deviceCli.commandCallback=myCommandCallback

#disconnect the device and application from the cloud
deviceCli.disconnect()
```

```
*Python 3.7.0 Shell*
File Edit Shell Debug Options Window Help

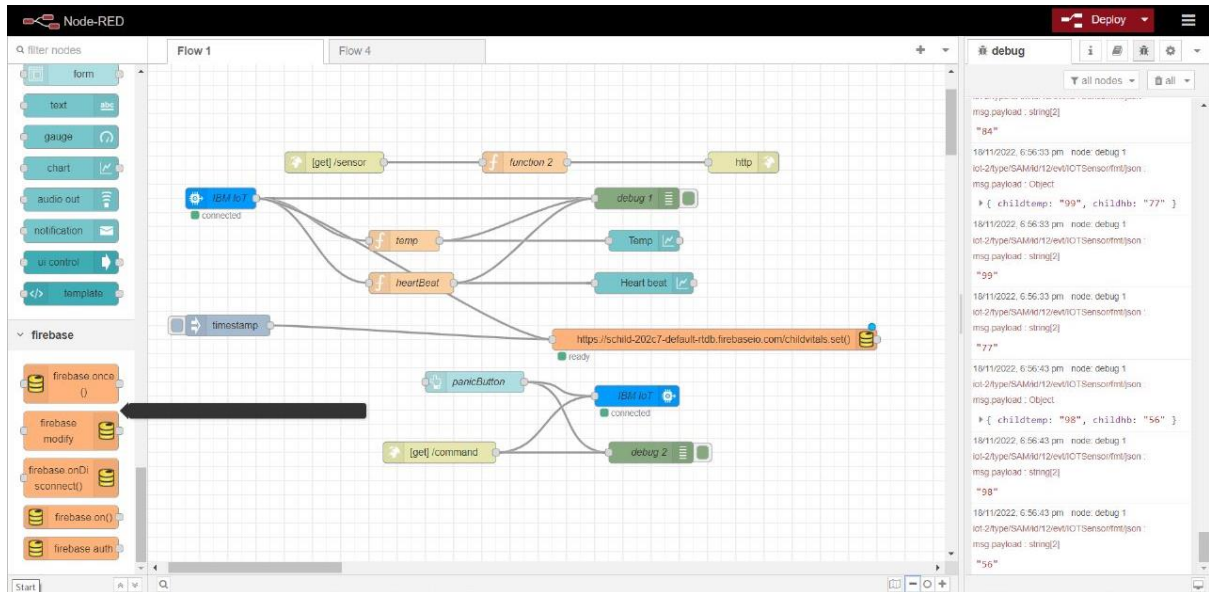
Python 3.7.0 (v3.7.0:1bf9cc5093, Jun 27 2018, 04:59:51) [MSC v.1914 64 bit (AMD64)] on win32
Type "copyright", "credits" or "license()" for more information.
>>>
===== RESTART: D:\College\IV year\VII SEM\IBM\Code\Project Script.py
=====
2022-11-18 12:33:56,405 ibmiotf.device.Client INFO Connected successfully: d:zyb99x:IBM:08
Published Child Temperature =97.09 F Heartbeat=77 BPM to IBM Watson
Published Child Temperature =98.66 F Heartbeat=74 BPM to IBM Watson
Command received: Buttonpressed
Child in danger
Command received: Buttonpressed
Child in danger
Published Child Temperature =99.04 F Heartbeat=57 BPM to IBM Watson
Published Child Temperature =97.27 F Heartbeat=57 BPM to IBM Watson
```

IBM Watson:

<input type="checkbox"/>	Device ID	Status	Device Type	Class ID	Date Added	Descriptive Location
▼	08	Connected	IBM	Device	Nov 14, 2022 2:14 PM	→ ...
Identity Device Information Recent Events State Logs						
The recent events listed show the live stream of data that is coming and going from this device.						
Event	Value	Format	Last Received			
IOTSensor	{"childtemp":97.05,"childhb":59}	json	a few seconds ago			
IOTSensor	{"childtemp":98.22,"childhb":67}	json	a few seconds ago			
IOTSensor	{"childtemp":97.52,"childhb":72}	json	a few seconds ago			
IOTSensor	{"childtemp":98.13,"childhb":69}	json	a few seconds ago			

0 Simulations running

Watson – Node RED Communication



Edit ibmiot in node

Delete Cancel Done

Properties

Authentication: API Key

API Key: 7a4f5d1e573b8f36

Input Type: Device Event

Device Type: ☒ All or +

Device Id: ☐ All or device id e.g. ab12cd231a21

Event: ☒ All or +

Format: ☐ All or json

QoS: 0

Name: IBM IoT

Service: registered

Use the Input Type property to configure this node to receive Events sent by IoT Devices. Commands sent to IoT Devices. Status

☐ Enabled

DeleteCancelDone

⚙️ Properties

🔑 Authentication

API Key

🔑 API Key

7a4f5d1e573b8f36

✎

⚙️ Output Type

Device Command

🔑 Device Type

IBM

👤 Device Id

08

🔑 Command Type

cmd

📄 Format

json

📊 Data

data

⚙️ QoS

0

🏷️ Name

IBM IoT

🏷️ Service

registered

☐ Enabled

DeleteCancelDone

⚙️ Properties

🏷️ Name

Cheartbeat

📄

⚙️ Setup

On Start

On Message

On Stop

```
1 msg.payload = msg.payload.childhb
2 global.set("h",msg.payload)
3 return msg;
```

☐ Enabled

Edit function node

Delete

Cancel

Done

Properties

Name

childtemp

Setup

On Start

On Message

On Stop

1

msg.payload = msg.payload.childtemp

2

global.set("t", msg.payload)

3

return msg;

4

Enabled

Edit function node > JavaScript editor

Cancel

Done

1

msg.payload = {"childtemp":global.get("t"),"childhb":global.get("h")}

2

return msg;

Edit firebase modify node

Delete

Cancel

Done

Properties

Firebase

https://schlid-202c7-default-rtdb.firebaseio.com

Child Path

temperature

> Method

set

()

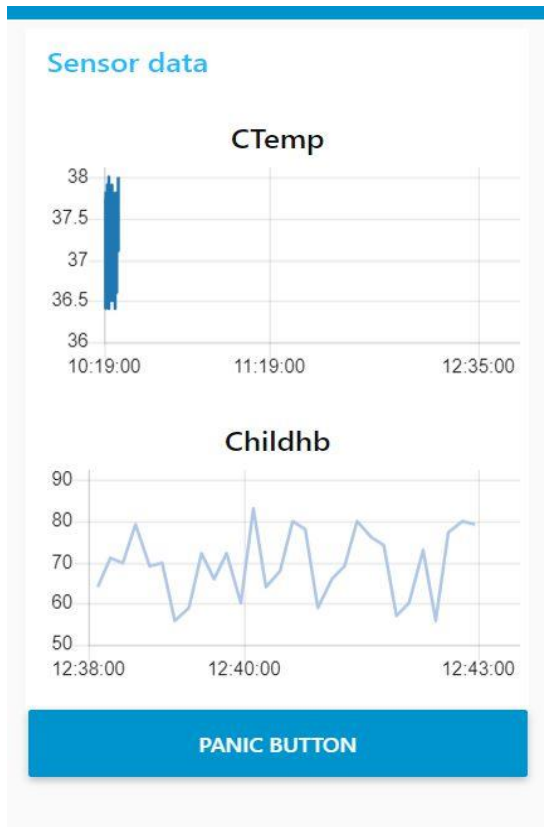
Value

msg.payload

Name

Name

Enabled



Node RED - Database

Schild ▾ Go to docs 🔔 ⓘ

Realtime Database

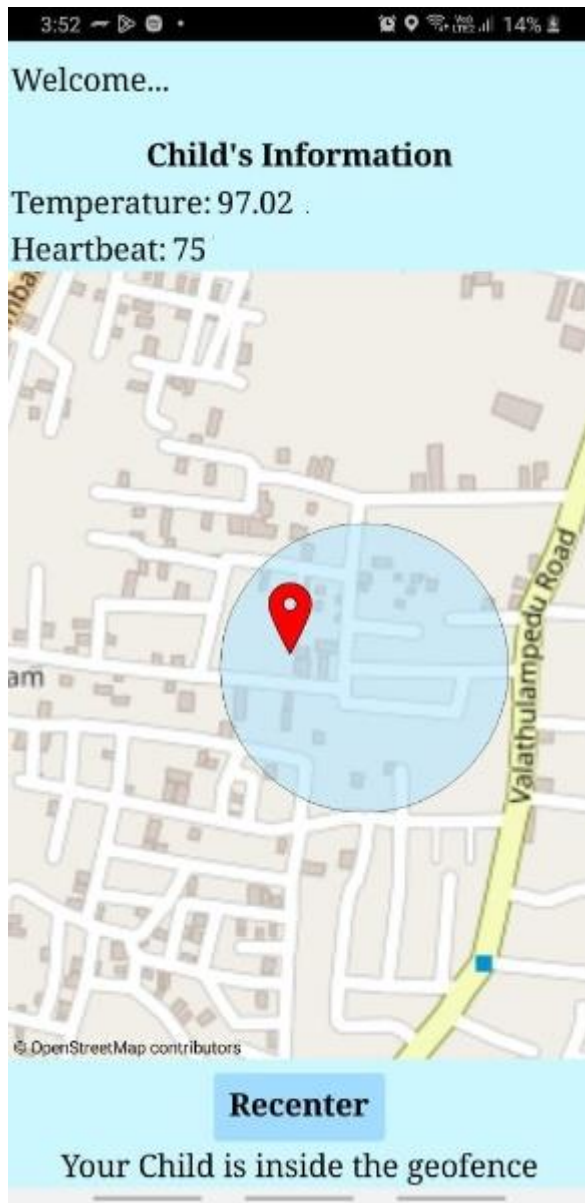
Data Rules Backups Usage

🔗 <https://schild-202c7-default-rtdb.firebaseio.com>

```
childvitals: ""
└─ temperature
   └─ childhb: "57"
      childtemp: "98"
```

Geofence

When the child is within the geofence, their location is displayed

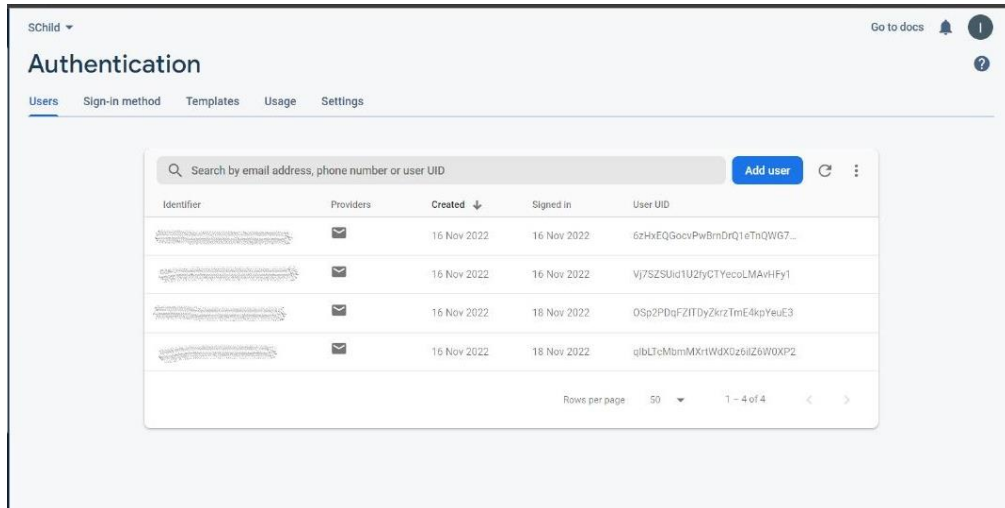


When the child goes beyond the geofence, the app notifies the parent instantly



Data Security

The login credentials of the users are stored securely in the database.



The screenshot shows the 'Authentication' section of the Firebase console. It features a search bar at the top with the text 'Search by email address, phone number or user UID' and an 'Add user' button. Below the search bar is a table with the following columns: Identifier, Providers, Created, Signed in, and User UID. The table contains four rows of user data. At the bottom right of the table, there is a pagination control showing 'Rows per page: 50' and '1 - 4 of 4'.

Identifier	Providers	Created	Signed in	User UID
62HxTQ9GocwPwBmDrtQ1eTnQW67...	✓	16 Nov 2022	16 Nov 2022	62HxTQ9GocwPwBmDrtQ1eTnQW67...
Vj7SZSuid1U2fyCTYecolMAvHfy1	✓	16 Nov 2022	16 Nov 2022	Vj7SZSuid1U2fyCTYecolMAvHfy1
0Sp2PDqFZITDyZkrzImE4kpYeuE3	✓	16 Nov 2022	18 Nov 2022	0Sp2PDqFZITDyZkrzImE4kpYeuE3
qIbLTcMbmMXrtWdX0z6iIZ6W0XP2	✓	16 Nov 2022	18 Nov 2022	qIbLTcMbmMXrtWdX0z6iIZ6W0XP2

CONCLUSION

IoT is getting upgraded day by day simultaneously its security is also upgraded. We are mainly focusing on child remote monitoring system which allows the parent to focus on their professional obligations and responsibilities. This app allows parents to easily monitor their children in real-time just like staying beside them as well as focusing on their own careers without any manual intervention. The child safety and protection device is proficient in acting as a smart IoT device. It equips parents with real-time location, the child's temperature, and heartbeat and along with a panic button for their child to alert their parent during an emergency situation.

REFERENCES

1. Child monitoring using GPS tracking system

Authors: Sadhana B, Navya A, Nidhishree, Vidhyashree, Vishwa

<https://www.ijeast.com/papers/329-337,%20Tesma0701,IJEAST.pdf>

2. IoT-based Child Security Monitoring System

Authors: Lai Yi Heng, Intan Farahana Binti Kamsin

<https://www.atlantis-press.com/proceedings/iciic-21/125960807>

3. Smart and Secure IOT based Child Monitoring System

Authors: Dipali Badgujar, Neha Sawan, Prof. Dnyaneshwar Kundande

<https://ieeexplore.ieee.org/document/8125876>

4. Child monitoring system using IoT

Authors: Vibha Chandrala, Niveditha N, Neha B Reddy, Urmila N

<https://iopscience.iop.org/article/10.1088/1742-6596/1362/1/012012/pdf>

5. Child Safety Monitoring System Based on IoT

Authors: N. Senthamilarasi, N.Divya Bharathi, D.Ezhilarasi, R.B.Sangavi

<https://iopscience.iop.org/article/10.1088/1742-6596/1362/1/012012>