IoT BASED SAFETY GADGET FOR CHILD SAFETY MONITORING AND NOTIFICATION

NALAIYATHIRAN PROJECT REPORT

TEAMID-PNT2022TMID30354

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IoTBASEDSAFETYGADGETSFORCHILDSAFETYMONITOR INGANDNOTIFICATION

1. INTRODUCTION

1.1 ProjectOverview

Child tracker helps the parents in continuously monitoring the child's location. They cansimply leave their children in school or parks and create a geofence around the particular location.Bycontinuouslycheckingthechild'slocationnotificationswillbegeneratedifthechildcrossesth egeofence. Notifications will be sent according to the child's location to their parents or caretakers.Theentirelocation datawill bestored in thedatabase.

1.2 Purpose

ThesystemalsoconsistsofWi-Fimoduleused toimplementIoTandsendallthemonitoredparameterstothecloudforandroidappmonitoringonparental phone.Panicalertsystemis used during panic situations alerts are sent to the parental phone, seeking for help also the alertparametersareupdated to the cloud.

2. LITERATURESURVEY

2.1 ExistingProblem

SomeprevlousstudieshavebeenincludedfordesigningtheIoT-basedchildsecuritysmartband. It assists parents to monitor their children remotely. In case situations happen, notificationswillbesent to parents sothat actions can betaken.

2.2 References

PrakritiAgarwal,RRamya,RachanaRavikumar, SabarishG,SreenivasaSetty

MNandiniPriyanka,SMurugan,KNHSrinivas,TDSSarveswararao,EKusumaKumari.

2.3 ProblemstatementDefinition

Create a problem statement to understand your customer's point of view. The CustomerProblemStatementtemplatehelpsyoufocusonwhatmatterstocreateexperiencespeoplewilllo ve.A well-articulated customer problem statement allows you and your team to find the ideal solutionfor the challenges your customers face. Throughout the process, you'll also be able to empathizewithyourcustomers,whichhelpsyoubetterunderstandhowtheyperceiveyourproductorservi ce.

3. IDEATION&PROPOSEDSOLUTION

3.1 EmpathyMapCanvas
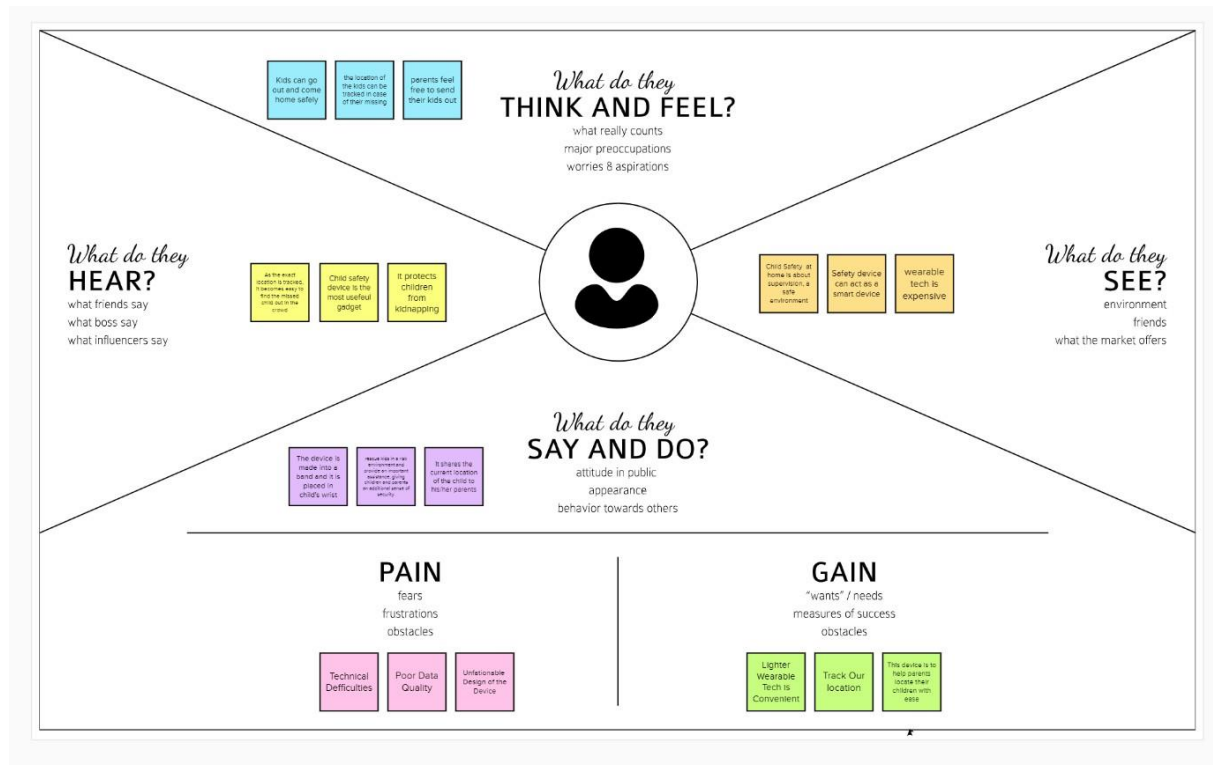
3.2 Ideation&Brainstorming

3.3 ProposedSolution

Define CS, fit into CC	1. CUSTOMER SEGMENT(S) CS Working parents or busy parents of 0-10 year old kids	6. CUSTOMER CONSTRAINTS CC Lack of affordable, reliable and hassle free technology, Lack of availability of secure and easy Ui.	5. AVAILABLE SOLUTIONS AS There are existing solutions that offer location tracking for kids but they are not very efficient, cost effective and reliable all at the same time. This trade off should be addressed.	Explore AS, differentiate
Focus on J&P, tap into BE, understand RC	2. JOBS-TO-BE-DONE / PROBLEMS J&P Instantaneous tracking and updation of child's location, geo-fencing and notifying parents of any abnormalities	9. PROBLEM ROOT CAUSE RC Customers have to do this to protect their children from potential threats and to ensure the safety while being far away from them.	7. BEHAVIOUR BE Customers panic, prevent their children from going out on their own , try using easily available technologies	Focus on J&P, tap into BE, understand RC

Identify strong TR &EM	3. TRIGGERS TR Coming across news about children being kidnapped and abducted, missing cases being reported. 4. EMOTIONS: BEFORE / AFTER EM Before : Feel insecure , worried , scared and confused. After : Relieved , calm , confident , happy.	10. YOUR SOLUTION SL Building a reliable technology that can address all the customer needs while being reliable and secure ensuring efficient functioning.	8.CHANNELS of BEHAVIOUR CH 8.1 ONLINE Tracking their kids location with their mobile phones' GPS, reading news about child safety and other child missing cases. 8.2 OFFLINE Customers accompany their children to ensure safety, send them together with other reliable people, seek for protection in public places.	Identify strong TR &EM

3.4 ProblemSolutionfit

S.No.	Parameter	Description
1.	ProblemStatement(Problemtob esolved)	With the increasing rate of child kidnappingandtrafficking and lack of tracking technology forchild,thereislimitedapplicationforchildmonit oring. Hence an IoT based safety gadgetfor child safety is probably the need of the hourtoday.
2.	Idea/Solutiondescription	Agoodsolutiontothisissuewouldbetodesignasm artwearableInternetofThingssensorbaseddevice formonitoringtheenvironmentofachildalongwit hamechanismfortrackingthechild. The gadget will make use of GPS and apython script to publish the location details totheIBMIoTplatform.Thewearablealsofunctio ns to send immediate alerts to the userthroughincaseifthechildcrossesthe geo-fence.
3.	Novelty/ Uniqueness	All the existing systems make use of GPS and amobile app to track and receive alerts regardingthechild's location, while this system make useof theIBMWatsonIOTPlatformandIBMCloudServices whichisreliableandefficientto maintainthedatabase of the child's location. The parent can setgeo- fenceandreceivealertsthroughthewebapplicationwhi chisuserfriendlyandsecurecreatedusingthe NodeRedService. .
4.	Social Impact /Custome rSatisfaction	The mainconcern ofanyparentwouldbethesafety and security of their kids. The design ofthismodeldoesnotmandatealotoftechnicalknowl edgefromtheusertooperateanditissimple. The purpose of this device is to facilitatethe guardian or parents in locating their child witheaseand ensuringitswell-being.

| 5.	Business Model (RevenueModel)	Thetargetaudienceofthisdeviceismajorlythe parents.ConsideringtheTrackingabilityofth edevice,Hardwarequality,used technology and sensors, the startingrange of price would go from Rs. 6000 andabove.Thistypeofwearablesafetysystem is of atmost importance today and wouldbeamustbuygadgetinthemarkettoda y.
6.	ScalabilityoftheSolution	With the present needs for monitoring thechild,thesystemisdesigned.Ithasalocatio ndatabasetomaintaintheentirelocation history of the child and the parentcansetthegeo- fencetodeterminethesaferboundary of the child. If there is a need forintegratingadditionalsensorstoimprovea ccuracy,itcanbedonetomakethesystem efficientinthelongrun.

4. REQUIREMENTANALYSIS

4.1 Functionalrequirement

FRNo.	FunctionalRequirement(Epic)	SubRequirement(Story/Sub-Task)
FR-1	UserRegistration	Registration through GmailRegistrationthrough message Registration through websiteRegistrationthrough App Registration through CallRegistrationthroughSocialMe dia
FR-2	UserConfirmation	ConfirmationviaEmail ConfirmationviaOTP
FR-3	AppInstallation	InstallationthroughLink InstallationthroughPlayStore/AppStore
FR-4	UserInterface	User login formAdminloginf orm
FR-5	DetectingChildLocation	DetectinglocationviaappDetecti nglocationvia SMS DetectinglocationthroughWebsite DetectinglocationthroughGPS
FR-6	UserNotification	NotificationthroughMessage NotificationthroughGmail

4.2 Non-Functionalrequirements

FRNo.	Non-FunctionalRequirement	Description
NFR-1	**Usability**	● A midget setup via the application is made in themobilethathelpsto sendSMSto parents. ● The gadget has a GSM that aids in informing theparents/guardian about the current location of theirkids which in turn helps the parents/guardians takeimmediateactionwhen anycrisisoccurs. ● The gadget is compact and effortless to operateandits applications arefoolproof.
NFR-2	**Security**	● Thedeviceisdesignedinsuchawaythatitbuildsasafe environmentforchildrentogooutside. It gives a sense of assurance to parents about theirchildren'ssecurityasthegadgetusesGPSandGSMto tracktheirlivelocation.
NFR-3	**Reliability**	● Inflatedreliabilitytowardsthemechanismandcurt ailreliabilitytowardsparents/guardians. ● It istransportable,Easytoaccess,andalsotensile. ● Wecanusethecloudtoaccumulatethesurve illancedataofthe children. ● Thewifimodulesareofassistanceinsendingthemonit oringparticulars,theuserwillbenotifiedwithan update if any errors are found, for the efficientfunctioningofthe device
NFR-4	**Performance**	Thedeviceisusedto keep tabsonyourchildevenina horde. Italsoprovidesthecurrentlocationalongwithtraveldetai ls.
NFR-5	**Availability**	Thewebpage'sloadtimeshouldbenomorethanone second for the user's elevateperformanceconcerningsimpleaidanceandsecur ity.
NFR-6	**Scalability**	If an intricacy arises parent scan see some of the attributeslikethelocation,temperature,andheartbeatof thechildalongwithlivingperspectivearoundthechildr enwithoutdeterrence.

5. PROJECTDESIGN

5.1 DataFlowDiagrams
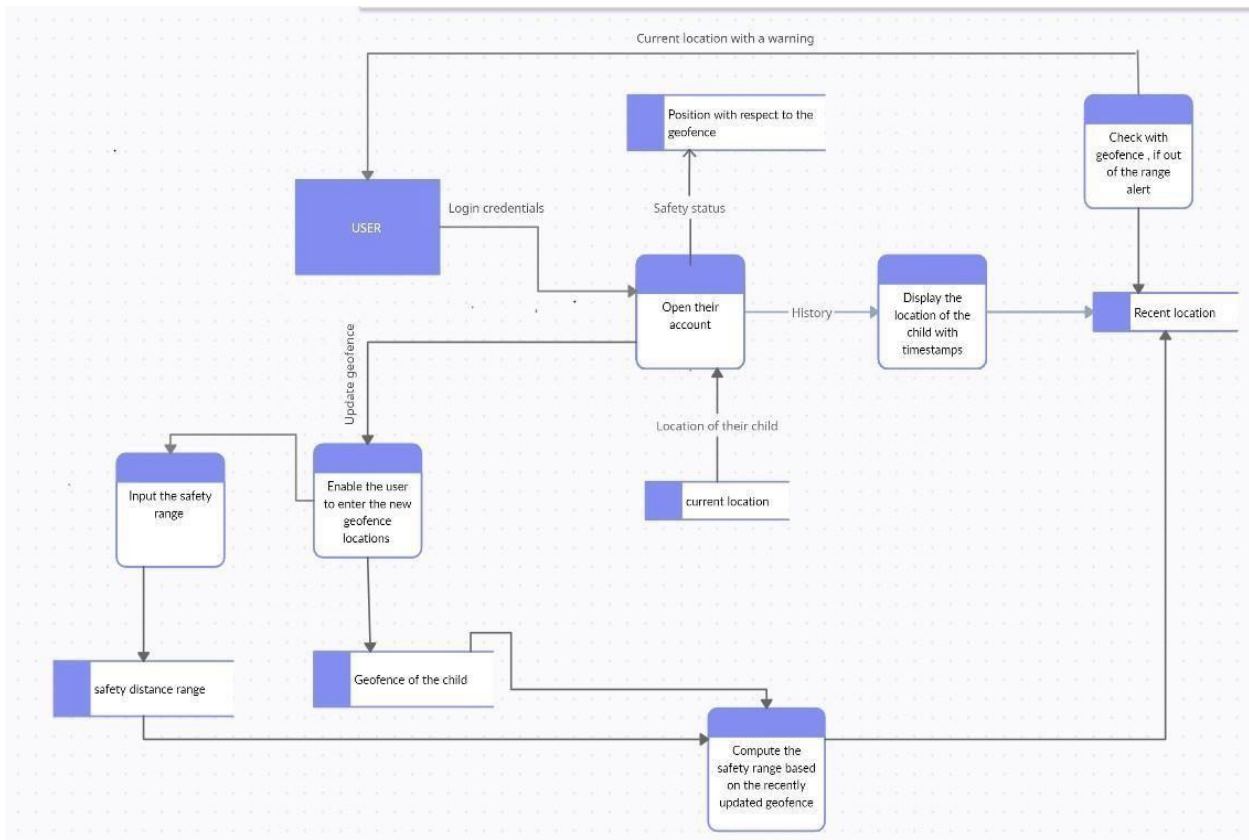
5.2 Solution&TechnicalArchitecture

SOLUTIONARCHITECTURE:

Solutionarchitectureisacomplexprocess–withmanysub-processes–thatbridgesthegap between businessproblemsand technologysolutions.Itsgoalsare to:

- Findthebesttechsolutiontosolveexistingbusinessproblems.

- Describethestructure,characteristics,behaviour,andotheraspectsofthesoftwaretoprojectstakeholders.

- Definefeatures,developmentphases,andsolutionrequirements.

- Providespecificationsaccordingtowhich thesolutionis defined,managed,anddelivered.

FEATURES:

Developmentofasafetygadgetforchildrentoensuretheirprotectionwithoutdirectmonitoringof their parents. The various features involve:

o GPS
- o Geofence
- o Notifyalertsignal

SOLUTION:

Track current location of the child using GPS and continuous monitoring of the same isdone. When the gadget detects the activity to be outside the given geo fence (as mentioned by theparent or guardian), alert messages or notifications are sent to the registered device, appropriately.Additionalfeaturessuchasrecording ofmessagescould bedoneifany kindof dangerissensed.
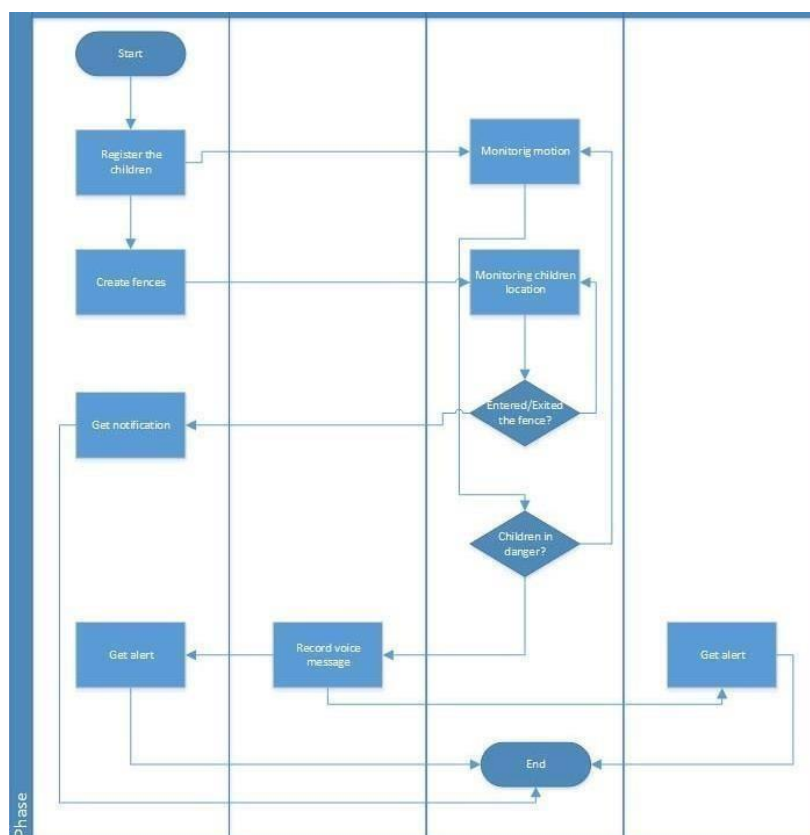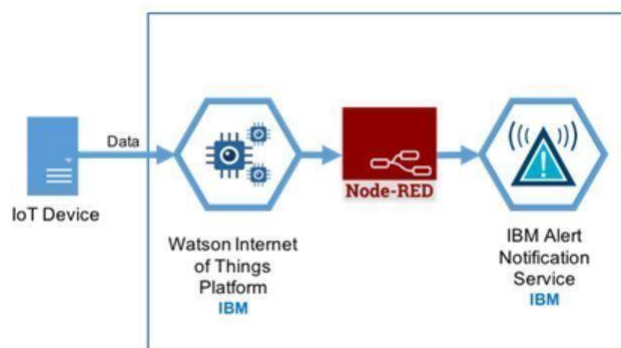
SOLUTIONARCHITECTUREDIAGRAM:

Figure: Architectureanddataflowofthechildsafetygadget system

TECHNICALARCHITECTURE

TheDeliverableshallincludethearchitecturaldiagramasbelowandtheinformationasper thetable1 &table2

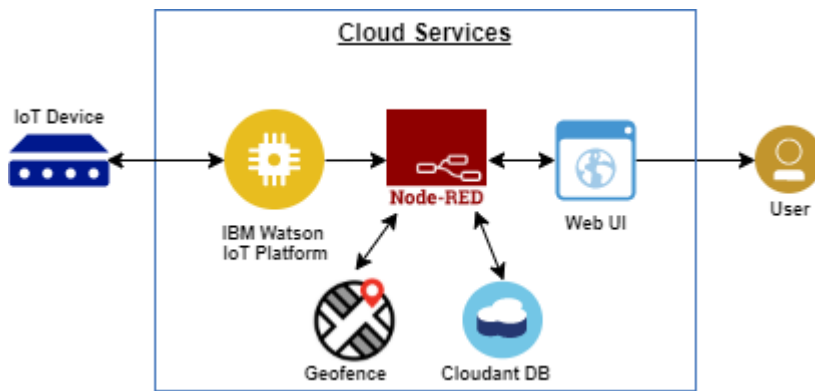## Table1:Components&Technologies:

S.No	Component	Description	Technology
•	UserInterface	The user interface (UI) is the point ofhuman-computerinteractionandcommunicationi na device.	HTML,CSS,JavaScript / Angular Js / React Jsetc.
•	ApplicationLogic-1	Registration of child's andparent'sdevic eineachother device.	Python
•	ApplicationLogic-2	TheGPSreceivercalculatesits ownfour-dimensional position in spacetimebased on data received from multipleGPSsatellites.	IBM Watson STTservice
•	ApplicationLogic-3	Theinformationistobecollected anddispatchedtotheauthenticat orviaGSMequippingtheGPSco ordinatesto efficiently locate access andmonitorthechild.	IBMWatsonAssistant

•	Database	A database is an organized collection of structured information, or data, typically stored electronically in a computer system. A database is usually controlled by a database management system (DBMS).	MySQL, NoSQL, etc.
•	CloudDatabase	Data organization on the cloud A cloud database is a database service built and accessed through a cloud platform. It serves many of the same functions as a traditional database with the added flexibility of cloud computing.	IBM DB2, IBM Cloudant etc.
•	FileStorage	File storage, also called file-level or file-based storage, stores data in a hierarchical structure. The data is saved in files and folders, and presented to both the system storing it and the system retrieving it in the same format.	IBM Block Storage or Other Storage Service or Local Filesystem
•	IBM Watson IOTplatform	Watson IoT Platform features Analytics and Watson APIs Completely manage your IoT landscape and make better business decisions.	IBM Weather API, etc.
•	NodeRED	Node-RED is a programming tool for wiring together hardware devices, APIs and online services in new and interesting ways.	Aadhar API, etc.
•	Geofence	a virtual geographic boundary, defined by GPS or RFID technology, that enables software to trigger a response when a mobile device enters or leaves a particular area	Object Recognition Model, etc.
•	Infrastructure (Server /Cloud)	Application Deployment on Local System/Cloud Local Server Configuration: IBM Watson IOT Cloud Server Configuration: cloudant DB	Local, Cloud Foundry, Kubernetes, etc.

Table-2: Application Characteristics:

S.No	Characteristics	Description	Technology
•	Open-Source Frameworks	Theframeworkforchilds afety utilizing aSensorandIoT. TheKey attribute of the system isthedeploymentofasmar tdetectorforthecollection ofData, cloud-basedanalysis,anddecision -based onMonitoring forch ildren'sSafety.	Thinger.io,andZetta
•	SecurityImplementations	To activate the alarm andfacilitatevideo recordingwhenevertheeme rgencybuttonispressed. Wecanusethecloudtoaccu mulate the surveillance data of thechildren.	e.g. SHA-256,Encryptions,IA MControls,OWASP etc.
•	ScalableArchitecture	enhancedbytheinstallationof themini camerainsideasmartga dgetfor exemplarysecurityandp rotection	Data Storage Technologies,Reliabl eMicroservices
•	Availability	It also provides the currentlocation along with traveldetails. It is a site that isavailableonline.	Temperature,Puls e sensor, GPS,GSM,Web camera,Raspberry pimicroprocessor.
•	Performance	Thecompletedataofthechi ldren'slocationwill bestockedintherepositoryan dtheexecution ofthedevicediminishesinal ess network area	GSM tracker, DeviceBattery

5.3 UserStories

UserType	FunctionalRequirement(Epic)	UserStoryNumber	UserStory/Task	Acceptancecriteria	Priority	Release
Customer(Mobile user)and(Webuser)	Registration	USN-1	As a user, I can register myaccount byentering my email,password,andconfirmingmy password.	I can access myaccount /dashboard	High	Sprint-1
		USN-2	As a user,Iwill receiveconfirmation emailonceIhaveregistered myself	Icanreceiveconfirmationemail& clickconfirm	High	Sprint-1
		USN-3	As a user, I can registerfortheapplicationthroughappleaccount	Icanregister&access the dashboardwithappleaccountLogin	High	Sprint-2
	Login	USN-4	Asauser,Icanlogintotheapplication byenteringuserid&password		High	Sprint-1
Customer CareExecutive	Login		AsIenter,Icanviewtheworking oftheapplication andscan for any glitches andmonitortheoperationandcheckif alltheusersareauthorized.	Icanloginonlywith my providedcredentials	Medium	Sprint - 3
Administrator	Login		Maintainingandmakingsure the database containingthelocationsare secure and accurate andupdatedconstantly.	Icanloginonlywith my providedcredentials	High	Sprint - 3

6. PROJECTPLANNING&SCHEDULING

6.1 SprintPlanning&Estimation

Sprint	FunctionalRequirement (Epic)	UserStoryNumber	UserStory/Task	Story Points	Priority	TeamMembers
Sprint-1	Registration	USN-1	As a Parent/ Guardian,I can register for the application by entering my email,password, and confirming mypassword.	2	High	3
Sprint-1		USN-2	As a Parent/ Guardian,Ican registerforthe application throughGmail	1	Medium	2
Sprint-1	UserConfirmation	USN-3	AsaparentIwillreceiveconnection,locationinsms/mailonceIhaveenteredthis application	1	High	3
Sprint-1	Login	USN-4	Asa parent/ guardian,Ican log intothe applicationby enteringmailand password.	2	High	3

6.2 SprintDeliverySchedule

Sprint	Total Story Points	Duration	Sprint Start Date	SprintEnd Date(Planned)	StoryPointsCompleted(as on PlannedEndDate)	Sprint Release Date(Actual)
Sprint-1	20	4Days	24Oct 2022	27Oct2022	20	29Oct2022

Sprint-2	20	5Days	28Oct 2022	01 Nov2022	20	04 Nov2022
Sprint-3	20	8Days	02Nov 2022	09 Nov2022	20	11 Nov2022
Sprint-4	20	8Days	10Nov 2022	18 Nov2022	20	18 Nov2022

7. CODING&SOLUTIONING(Explainthefeaturesaddedintheprojectalong with code)

```
import json
import
wiotp.sdk.deviceimport
time
myconfig={
     "identity":{
          "orgId":"a701la",
          "typeId":"IOT",
          "deviceId": "123"
     },
     "auth":{
          "token":"y-WFmI45YEkMF2ic2g"
     }
}
client = wiotp.sdk.device.DeviceClient(config=myConfig,
logHandlers=None)client.connect()
whileTrue:
     name=
     "Smartbridge"#in area
     location#latitude=17.42
     25176#longitude=78.54
     58842#out area
     locationlatitude=17.421
     9272longitude=78.5488
     783
```

```
        myData={'name':name,'lat':latitude,'lon':longitude}

    client.publishEvent(eventId="status",msgFormat="json",data=myData,
qos=0,onPublish=None)

        print("Data published to IBM IOT platform

        :",myData)time.sleep(5)

 client.disconnect()
```
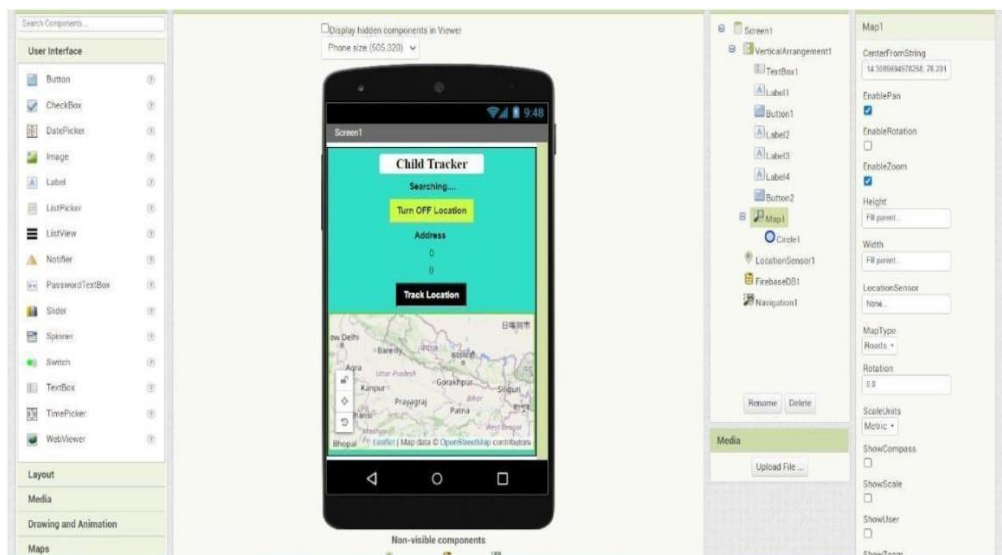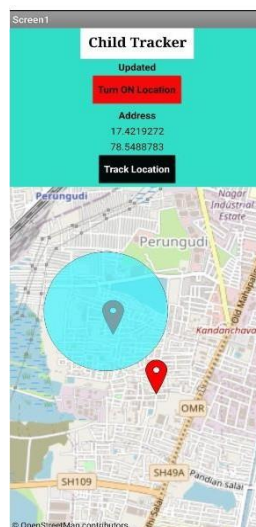
8. TESTING

8.1 TestCases

9. RESULTS

10. ADVANTAGES   &

DISADVANTAGESAdvantages:

Itassistsparentstomonitortheirchildrenremotely.Incasesituationshappen,notificationswillbesenttoparentssothatactionscanbetaken.Throughthis,childsafetycanbeensuredand crimeratewill bereduced.

Disadvantages:

Thisdevicecannotbeusedinruralareas.Figure1showstheblockdiagramoftheproposedchildsafetydevice.It consistsofinbuiltWi-Fi,GSM, GPS andBluetoothmodules.

11. CONCLUSION

This research demonstrates Smart IoT device for child safety and tracking, to helpthe parents to locate and monitor their children. If any abnormal readings are detected by thesensor, then an SMS and phone call is triggered to the parents mobile. Also, updated to theparental app through the cloud. The system is equipped with GSM and GPS modules forsending and receiving call, SMS between safety gadget and parental phone. The system alsoconsists of Wi-Fi module used to implement IoT and send all the monitored parameters to thecloud for android app monitoring on parental phone. Panic alert system is used during panicsituations alerts are sent to the parental phone, seeking for help also the alert parameters areupdated to the cloud. Boundary monitoring system is implemented on safety gadget with thehelp of BEACON technology, as soon as the safety gadget moves far away from the BLElistenergadget analert isprovided to itself.

12. FUTURESCOPE

Thissystemcanbefurtherenhancedbyinstallationofminicamerainsidesmartgadgetforbetter securityso thatlivefootagecanbeseenon parentalphoneduring panic situations.

The system can be modified by installation of small solar panels for charging thebatteryofsmart gadget to gain maximum battery backup.

SOURCECODE

```
from http import
clientimport json
import
wiotp.sdk.deviceimport
time
myconfig={
    "identity":{
        "orgId":"a701la",
        "typeId":"IOT",
        "deviceId": "123"
```

```
        },
        "auth":{
            "token":"y-WFmI45YEkMF2ic2g"
        }
    }
client = wiotp.sdk.device.DeviceClient(config=myConfig,
logHandlers=None)client.connect()
whileTrue:
        name=
        "Smartbridge"#in area
        location#latitude=17.42
        25176#longitude=78.54
        58842#out area
        locationlatitude=17.421
        9272longitude=78.5488
        783
        myData={'name':name,'lat':latitude,'lon':longitude}
    client.publishEvent(eventId="status",msgFormat="json",data=myData,qos=
0,onPublish=None)
        print("Data published to IBM IOT platform
        :",myData)time.sleep(5)
client.disconnect()
```

GitHub & Project Demo

LinkGitHublink

https://github.com/IBM-EPBL/IBM-Project-4970-1658744542

ProjectDemoLink:
https://youtu.be/mUHkiToAaw4