ProjectReport

Date	17Nov2022
TeamID	PNT2022TMID19258
Project	SignswithSmartConnectivityfor BetterRoadSafety

1. INTRODUCTION:

1.1 ProjectOverview:

- TheObjectiveofthisistoreplacethestaticsignboards. Instead,smartconnectedsignboardsare used.

- ThesesmartconnectedsignboardsgetthespeedlimitationsfromawebappusingweatherAPIandupdateautomatically.Basedontheweatherchanges thespeedmayincrease ordecrease.

- Basedonthetrafficandfatalsituationsthediversionsignsaredisplayed.Guide(forSchools), Warning,andService (Hospitals,Restaurants)signsarealsodisplayedaccordingly.

1.2 Purpose:

ThePurposeofthisprojectistodevelopadigitalsignboardsystemwherethenormalsignsaredisplayedwiththeiractualnames.Andalso,tocreateawarenessoftheroadsafetytoeveryoneandobeythetrafficrules.Tocreateabetterviewandwarninthenighttime.

2. LiteratureSurvey:

2.1:ExistingProblem:

- Damagecriteriainstaticsignboards:
  - Paintdeterioration
  - FoldedSheets
  - PoleBent
  - ConcealmentbyVegetation
- Driverscanfaceconfusingroadsignsat certaincircumstances.
- TheNationalCrimeRecordsBureau(NCRB)2022reportstatesthattherewere155, 622fatalities, highestsince2014,out ofwhich69,240deathswereduetotwo-wheelers.
- AstudybyIITDelhipointsoutthatthenationalhighwaysconstituteonly2%ofthe lengthof roadsinIndia,buttheyaccountfor30.3%of totalroadaccidentsand36%ofdeaths.
- Deathsbyaccidentsonroadsincreasedbyalmost17per centin2021,indicatinganincreaseintherateof deathsper1,000vehicles.

S.No.	Title andAuthor	YearandPublication	Inferences
1.	**Wirelessdigitaltrafficsignsofthefuture.** ChaiK.Toh,Juan-CarlosCano,CarlosFernandez-Laguia,PietroManzoni,CarlosT. Calafate.	2018,Institutionof EngineeringandTechnology(IET).	Theissuesandchallengesfacingcurrenttrafficsigns, andhowitwillevolveintoa next-generationtrafficsignarchitectureusingadvancedwirelesscommunicationstechnologies.
2.	**TrafficSignBoardDetectionandRecognitionusingAugmented**	2020,International ResearchJournalof	Real-timeapproachforfastan

	Reality. AkshataAnantPrabhu,Deepika V.D.,Muralikrishna.N,P.Vaishna viAcharya,A.R.Manjula	Engineeringand Technology(IRJ ET).	frameworkfortrafficsignr ecognitionWhichsuperim posesvirtualobjectsontoa realsceneunderalltypesof drivingsituations,includi ngunfavorableweatherco nditionsandgivesavoiceal ertwiththehelpofspeakers .
3.	**AutomaticSignboardDetectionS ystem bythe Vehicles** Anushree.A.S,HimanshuKumar,Id ahIram,KumarDivyam,Rajeshwari .J	2019,IJESC.	Signboarddetectionsyst eminthevehiclewhichw illdetectthesignboardan dwarnthedriveraboutit. Itdisplaysthealertmessa georinformationonprov idedLCDandvoicealertt hroughspeakers.
4.	**DevelopmentandTestingofRoadSi gnsAlertSystem Using aSmartMobilePhone** EricM.Masatu,RamadhaniSinde,an dAnaelSam	2022,HindawiJourna lofAdvancedTransp ortation).	ThepaperisbasedonthereSearchaboutAdvancedDr iverAssistancesystemwh ichisoneofthesalientfeatu resofintelligentsystemint ransportation.
5.	**AWi-FibasedElectronicRoadSignforEn hancingtheAwarenessofVehicle.** ABhawiyuga,RASabriansyah,WYa hya,REPutra.	2016, IOP PublishingLtd.	Employmentof vehicularnetworkconcept inwhichavehiclecancom municatewithothervehicl esorwiththeinfrastructure installedalongtheroad.
6.	**AutomaticDetectionofRoadSignsto ControlVehicleSpeed** AnujaNanal,PoojaMotwani,	2019,InternationalJo urnalofComputerAp plications.	ElectronicDisplaycontrol lermeantforcontrollingve hiclespeedandmonitorsth ezones,

	PragatiPawar,RajatNirhale,RahulPatil.		andwhichcanalsodisplay thespeedtotherfreaderwithhelpofunitattachedin thecar.

2.2. References

1. Torralba, J. P.García-Martín, J. M. González-Romo, M.García-Castellano,J.Peral-LópezandV. Pérez-Mira, "AnAutonomous, IntelligentSignControlSystemUsingWirelessCommunicationandLEDSignsfor RuralandSuburbanRoads,"inIEEEIntelligentTransportationSystemsMagazine, vol.14,no.2, pp. 115-128,March-April2022, doi:10.1109/MITS.2021.3049375.

2. Toh, C.K., Cano, J.-C.,Fernandez-Laguia, C.,Manzoni, P. andCalafate, C.T.(2019), Wirelessdigitaltrafficsignsofthe future.IETNetw., 8:74-78.https://doi.org/10.1049/iet-net.2018.5127

3. A., Aparna& Shiravale, Sankirti. (2016).RealTimeTrafficSignboardDetectionandRecognitionfrom StreetLevelImageryfor SmartVehicle.InternationalJournalof ComputerApplications. 135. 18-22.10.5120/ijca2016908267.

4. A BhawiyugaRA Sabriansyah, W YahyaandREPutra*etal*“AWi-FibasedElectronicRoadSignfor EnhancingtheAwarenessofVehicleDriver”, inIOPPublishingLtd2017*J. Phys.: Conf. Ser.*801012085

5. KarthikeyanD,Enitha C, BharathiS,DurkadeviK,2020, TrafficSignDetectionandRecognitionusingImageProcessing, INTERNATIONALJOURNALOF

ENGINEERINGRESEARCH&TECHNOLOGY(IJERT)NCICCT– 2020 (Volume8– Issue08)

6. BhawnaSaini1, RachnaDevi2, Shilpi Dhankhar 3, Mohammad-ziaul-Haque4,JagandeepKaur 5, SmartLEDDisplayBoards, InternationalJournalofElectronicandElectricalEngineering. ISSN0974-2174Volume7,Number 10(2014), pp.1057-1067.

7. Ramalingam, Mritha& chandrasegar,&gowrishankar,. (2014).Asurveyoflightemittingdiode(LED)DisplayBoard.IndianJournalof ScienceandTechnology. 7. 185-188.10.17485/ijst/2014/v7i2.3.

8. EricM. Masatu, RamadhaniSinde, AnaelSam,Development andTestingofRoadSignsAlertSystemUsinga SmartMobile Phone, Journalof AdvancedTransportation, 10.1155/2022/5829607,**2022**, (1-14), (2022).

9. ZoltánFazekas, GáborBalázs, CsabaGyulai, PéterPotyondi,PéterGáspár,Road-TypeDetection BasedonTrafficSignandLane Data,JournalofAdvancedTransportation, 10.1155/2022/6766455,**2022**, (1-19), (2022).

10. JuanhongXie,GuojianShi, WeizhiZhu,IntelligentRecognitionTechnologyfor theSegmentationof TrafficIndicationImagesConcerningDifferentPavementMaterials,AppliedBionicsandBiomechanics,10.1155/2022/6278240,**2022**, (1-7), (2022).

2.3. ProblemStatementDefinition:

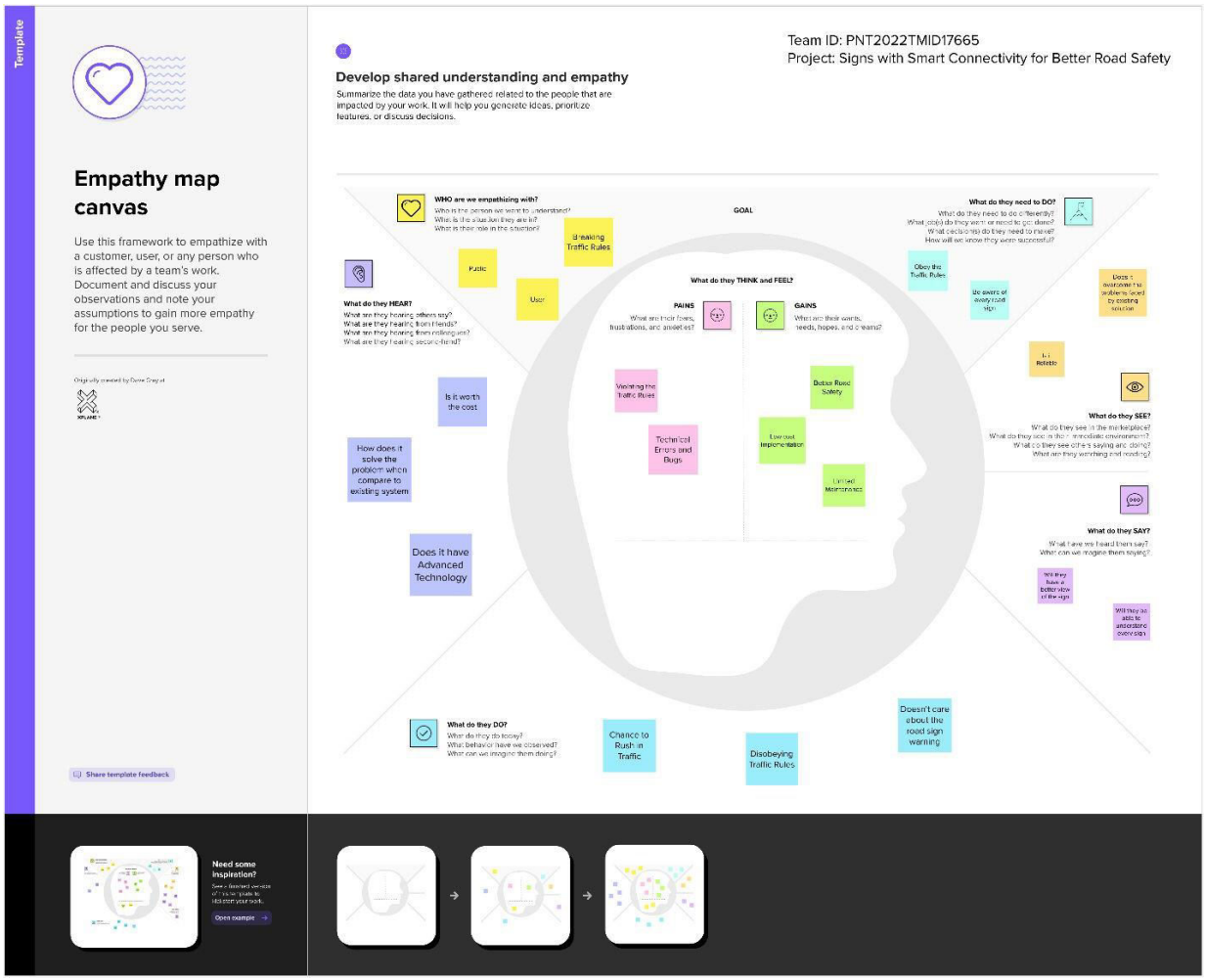
Toreplacethestaticsignboards, withsmart connecteddigitalsignboards.ThesesmartconnectedsignboardsgetthespeedlimitationsfromweatherAPI

andupdateautomatically.

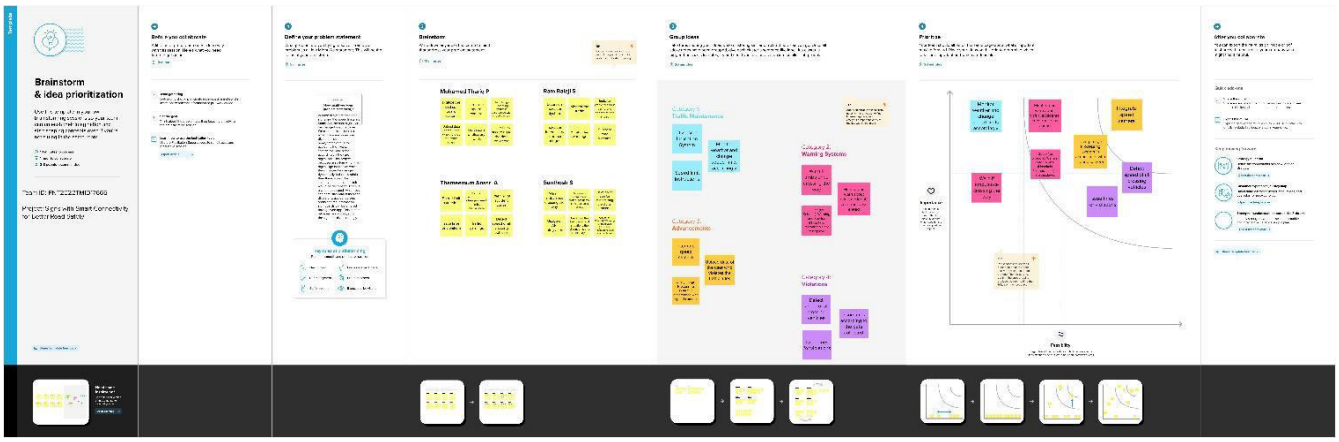
Basedontheweatherchangesthespeedmayincreaseordecrease.Itwilldisplaythenormalsignsinnecessaryplaceswithwordingstobeawareofthe signs.Based onthetraffic andfatalsituationsthediversion signs aredisplayed. Guide(Schools), WarningandService(Hospitals, Restaurant)signsare alsodisplayedaccordingly.Changeofmodeswilltakeplaceautomatically.

3. IdeationandProposedSolution:

3.1. EmpathyMapCanvas:



3.2. Ideation&Brainstorming:



3.3. ProposedSolution:

S.No.	Parameter	Description
1.	ProblemStatement(Problemtobesolved)	InpresentSystemstheroadsignsandthespeed limitsareStatic.Buttheroadsignscanbechang edinsomecases.Wecanconsidersomecases whentherearesomeroaddiversionsduetohea vytrafficorduetoaccidentsthenwecanchang etheroadsignsaccordingly,iftheyaredigitaliz ed.Thisprojectproposesasystemwhichhasdi gitalsignboardsonwhichthesignscanbechan geddynamically.Ifthereisrainfallthentheroa dswillbeslipperyandthespeedlimitwouldbe decreased.Thereisawebappthroughwhichy oucanenterthedataoftheroaddiversions,acci dentproneareasandtheinformationsignboar dscanbeenteredthroughwebapp.Thisdataisr etrievedanddisplayedonthesignboardsaccor dingly.
2.	Idea/Solutiondescription	TheIdeaistoreplacethestaticsignboards.Inst ead,smartconnectedsignboardsareused.The sesmartconnectedsignboardsgetthespeedli mitationsfromawebappusingweatherAPIan dupdate

		automatically.Basedontheweatherchangesthespeedmayincreaseordecrease.Basedonthetrafficandfatalsituationsthediversionsignsaredisplayed.Guide(forSchools),WarningandService(Hospitals,Restaurant)signsarealsodisplayedaccordingly. Additionally,Speedcameraintegratedwithimageprocessingtechniqueisaddedtodetectanytrafficspeedviolationsandchargefines.
3.	Novelty/Uniqueness	UsageofspeedcameraintegratedwithImageProcessingtechniquefordetectionofspeedviolation.
4.	SocialImpact/CustomerSatisfaction	DiversionIndicationSystemiftrafficorconstructionsahead.SpeedlimitInstructions.Guide(forSchools),WarningandService(Hospitals,Restaurant)signsaredisplayed.
5.	BusinessModel(RevenueModel)	SinceImageProcessingandAPIsareusedformonitor,thisprojectemploysadecentbusinesstrategyandenhanceservices.
6.	ScalabilityoftheSolution	Low-costImplementationandMaintenance.Durabilityisoftheproductishigh.

3.4. ProblemSolutionFit:

Project Title: Signs with smart Connectivity for Better Road Safety

Project Design Phase-I - Solution Fit Template

Team ID: PNT2022TMID17665

Define CS, fit into CC

1. CUSTOMER SEGMENT(S) CS

Who is your customer?
i.e. working parents of 0-5 y.o. kids

The public who are violating traffic rules like speed violation,..

6. CUSTOMER CONSTRAINTS CC

What constraints prevent your customers from taking action or limit their choices of solutions? i.e. spending power, budget, no cash, network connection, available devices.

If the public violate the traffic rules they will charged with fines.

5. AVAILABLE SOLUTIONS AS

Which solutions are available to the customers when they face the problem
or need to get the job done? What have they tried in the past? What pros & cons do these solutions have? i.e. pen and paper is an alternative to digital notetaking

Wireless sign board for the future, Static Sign Board System, Accurate Road Safety Level Assessment for Effective Road Safety, IoT-Driven Road Safety System.

Explore AS, differentiate

Focus on J&P, tap into BE, understand RC

2. JOBS-TO-BE-DONE / PROBLEMS J&P

Which jobs-to-be-done (or problems) do you address for your customers? There could be more than one; explore different sides.

In present system, the road signs and the speed limits are static.

There are some cases when road diversions due to heavy traffic or accident zones or construction works ahead situations arise.

Monitoring traffic violations especially speed violations.

9. PROBLEM ROOT CAUSE RC

What is the real reason that this problem exists?
What is the back story behind the need to do this job?
i.e. customers have to do it because of the change in regulations.

Increased number of Traffic violations day to day. The data shared by police showed that total 1,38,02,973 traffic violations were reported last year as compared to 1,05,80,249 in 2019.

7. BEHAVIOUR BE

What does your customer do to address the problem and get the job done?
i.e. directly related: find the right solar panel installer, calculate usage and benefits; indirectly associated: customers spend free time on volunteering work (i.e. Greenpeace)

Obey the traffic rules.
Awareness of most traffic signs.

Focus on J&P, tap into BE, understand RC

Identify strong TR & EM

3. TRIGGERS TR

What triggers customers to act? i.e. seeing their neighbour installing solar panels, reading about a more efficient solution in the news.

Monitoring traffic violations and charging fines

4. EMOTIONS: BEFORE / AFTER EM

How do customers feel when they face a problem or a job and afterwards?
i.e. lost, insecure > confident, in control - use it in your communication strategy & design.

Violating the Traffic Rules.
Technical Errors and Bugs.

Better Road Safety.
Aware of most road signs.

10. YOUR SOLUTION SL

If you are working on an existing business, write down your current solution first, fill in the canvas, and check how much it fits reality.
If you are working on a new business proposition, then keep it blank until you fill in the canvas and come up with a solution that fits within customer limitations, solves a problem and matches customer behaviour.

The Objective of this is to replace the static signboards. Instead, smart connected sign boards are used. These smart connected sign boards get the speed limitations from a web app using weather API and update automatically. Based on the weather changes the speed may increase or decrease. Based on the traffic and fatal situations the diversion signs are displayed. Guide (for Schools), Warning and Service (Hospitals, Restaurant) signs are also displayed accordingly.

8. CHANNELS of BEHAVIOUR CH

8.1 ONLINE
What kind of actions do customers take online? Extract online channels from #7

8.2 OFFLINE
What kind of actions do customers take offline? Extract offline channels from #7 and use them for customer development.

Data of the violated user will be uploaded to the cloud. The respected authorities monitor it regularly and take necessary actions

Identify strong TR & EM

4. Requirements:

4.1. FunctionalRequirement:

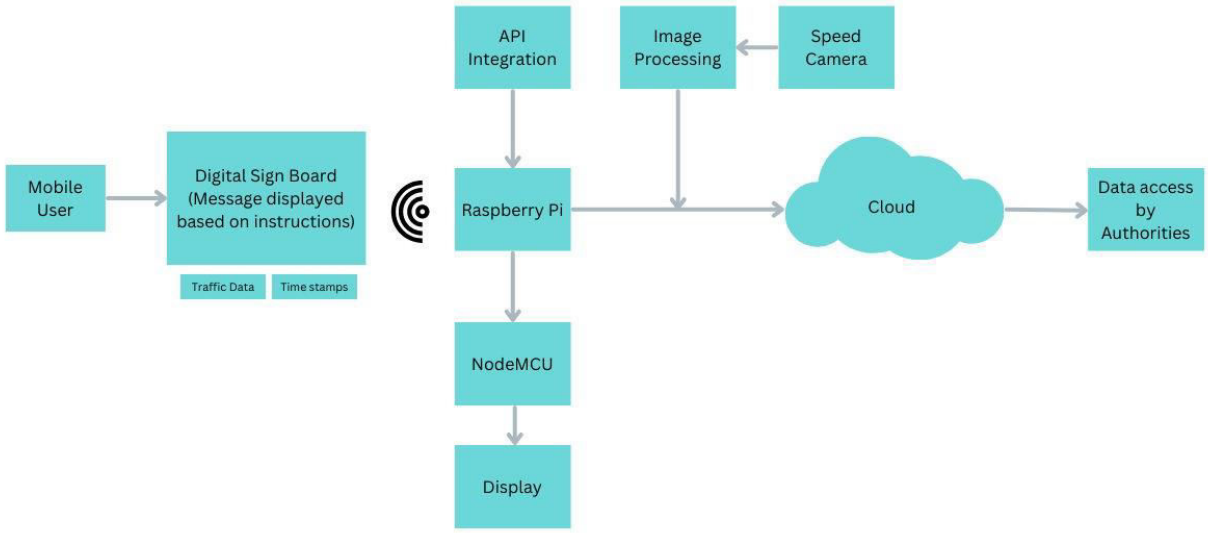
FR No.	FunctionalRequirement(Epic)	SubRequirement(Story/Sub-Task)
FR-1	UserVisibility	SignBoardwillhaveand clearandinteractiveUIsothatitwillbeclearlyvisibletoal
FR-2	UserUnderstanding	Thesignsthataretobedisplayedinthesignboardwillbewithitsrespectivenames,sothattheuserscanclearlyunderstandeverything
FR-3	UserConvenience	Signswillbedisplayedflawlesslysuchthatit willbeofbetterconvenience.

4.2. Non-FunctionalRequirement:

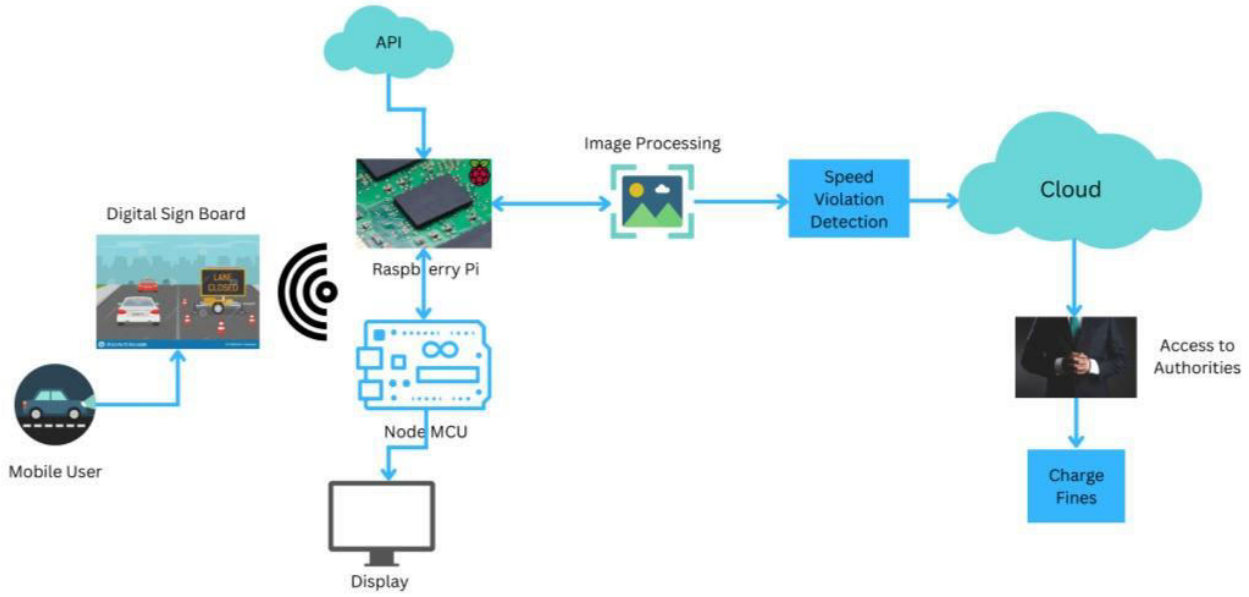
FR No.	Non-FunctionalRequirement	Description
NFR-1	**Usability**	Formultiplesigndisplay,timestampswillbeallocatedforeachsign. It willautomaticanddynamicallychangeable.Noneedformanualoperations.
NFR-2	**Security**	Onlyrequiredcanwillbeshowed.Nochanceofsecurityvulnerability.
NFR-3	**Reliability**	Morereliablethantheexistingsystem
NFR-4	**Performance**	Acceptableperformancewithdynamicupdatingofdataregardingweather,traffic,etc.
NFR-5	**Availability**	Itwillavailableforworkingevery24/7.
NFR-6	**Scalability**	ImplementationandMaintenancecostwillbeless,sothattheproductishighlyscalable.

5. ProjectDesign:

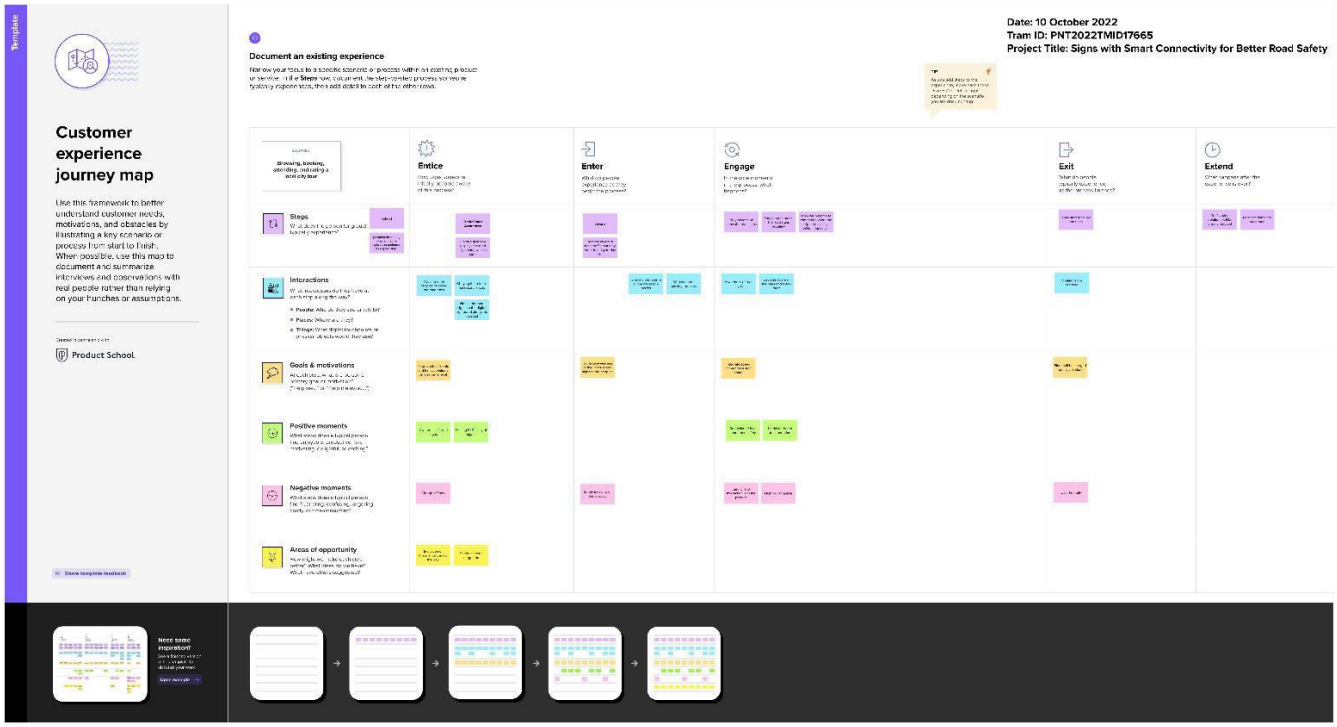
5.1. DataFlowDiagram:



5.2. SolutionandTechnicalArchitecture:



5.3. UserStories:



6. ProjectPlanning&Scheduling:

6.1. SprintPlanning&Estimation:

Sprint	FunctionalRequirement(Epic)	UserStory/Task	Story Points	TeamMembers
Sprint-1	UserRegistration	Asauser,Icanregisterontheweb sitebyenteringmyemail,passw ord,andconfirmingmypasswor d.	3	RamBalajiS
	AdminRegistration	Asanadmin,Icanlogintothewebsit eusingmycredentialsandaccessth edata.	3	SanthoshS
	Login	UserandAdmincanlogintothewe bsitebyenteringemail&password .	1	Thameemum AnsariA
	Dashboard	Developadashboardforthewebsitefor knowledgeaboutroadrules	3	MohamedThariq P
Sprint	**FunctionalRequirement(Epic)**	**UserStory/Task**	**Story Points**	**TeamMembers**
Sprint-2	Node-RedUI	DevelopaNode-RedUIFlow.	2	RamBalajiS
	Node-RedDashb	DevelopaNode-RedUIDashboard.	2	Thameemum AnsariA
	Node-RedWebpage	DevelopaNode-RedWebpagefordisplayingthed ata.	3	MohamedThariq P
	Node-RedDataCheck	CheckthedatadisplayedontheNode-RedDashboardUI.	3	SanthoshS

Sprint	FunctionalRequirement(Epic)	UserStory/Task	Story Points	TeamMembers
Sprint-3	APIIntegration	Integratethenecessary API's.	3	MohamedThariq P
	DevelopPythonCode	DevelopPythoncodetoin tegratethenecessaryAPI s.	2	RamBalajiS

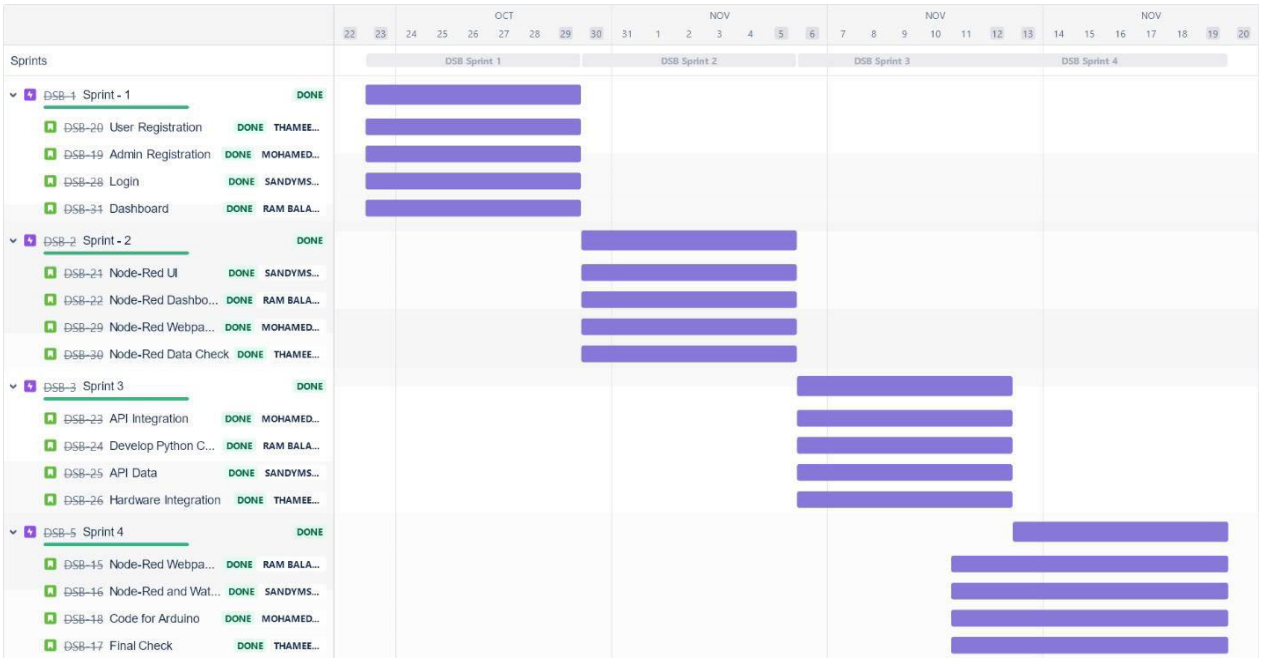
Sprint	FunctionalRequirement(Epic)	UserStory/Task	Story Points	TeamMembers
	APIData	Checkthedatafromweatherapi.	2	SanthoshS
	HardwareIntegration	IntegrateArduinowithTFTDisplayviasimulation.	3	Thameemum AnsariA

Sprint	FunctionalRequirement(Epic)	UserStory/Task	Sprint Points	Team Members
Sprint-4	Node-RedWebpage Data	Developcodetodisplaydataonthewebpageandchecktheneccessary.	2	SanthoshS
	Node-RedandWatson	ConnectNode-RedwithIBMWatsonplatformfordataprocessing(RandomDataGeneration).	3	MohamedThariq P
	CodeforArduino	Developcodetodisplaydatainthedisplayscreen.	3	Thameemum AnsariA
	FinalCheck	Checkingallthesimulationandservicesworkingperfectlyanddisplaydataandfinalsubmissionofproject.	2	RamBalajiS

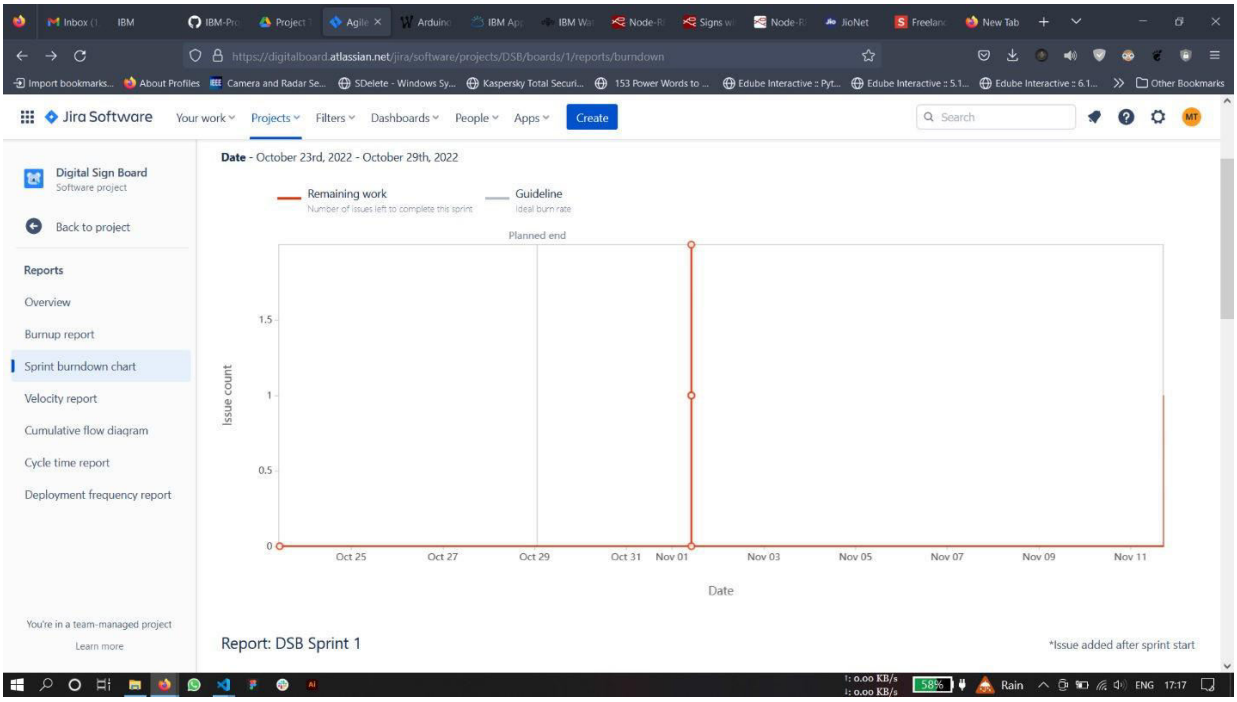
6.2.SprintDeliverySchedule:

Sprint	Total Story Points	Duration	SprintStart Date	SprintEnd Date(Planned)	StoryPointsCompleted(asonPlannedEnd Date)	Sprint Release Date(Actual)
Sprint-1	10	6 Days	24 Oct 2022	29 Oct 2022	10	29 Oct 2022
Sprint-2	10	6 Days	31 Oct 2022	05 Nov 2022	10	05 Nov 2022
Sprint-3	10	6 Days	07 Nov 2022	12 Nov 2022	10	12 Nov 2022
Sprint-4	10	6 Days	14 Nov 2022	19 Nov 2022	10	19 Nov 2022

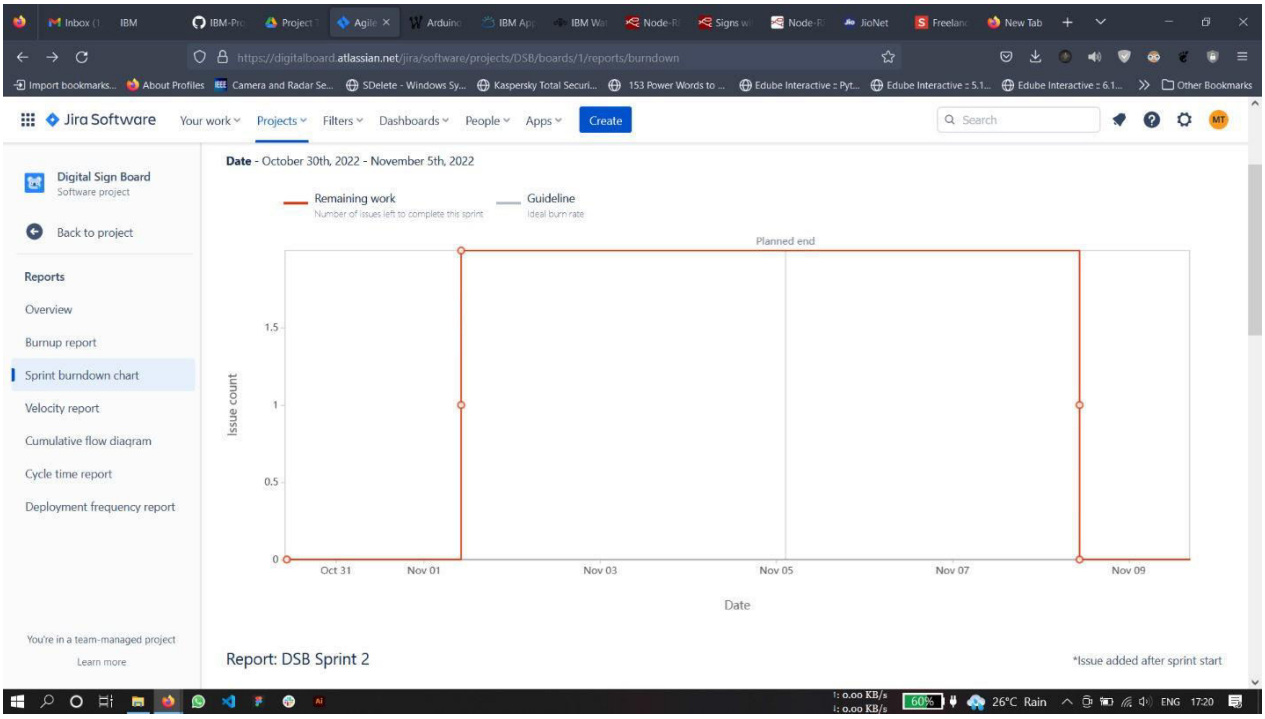
6.3.ReportfromJira:



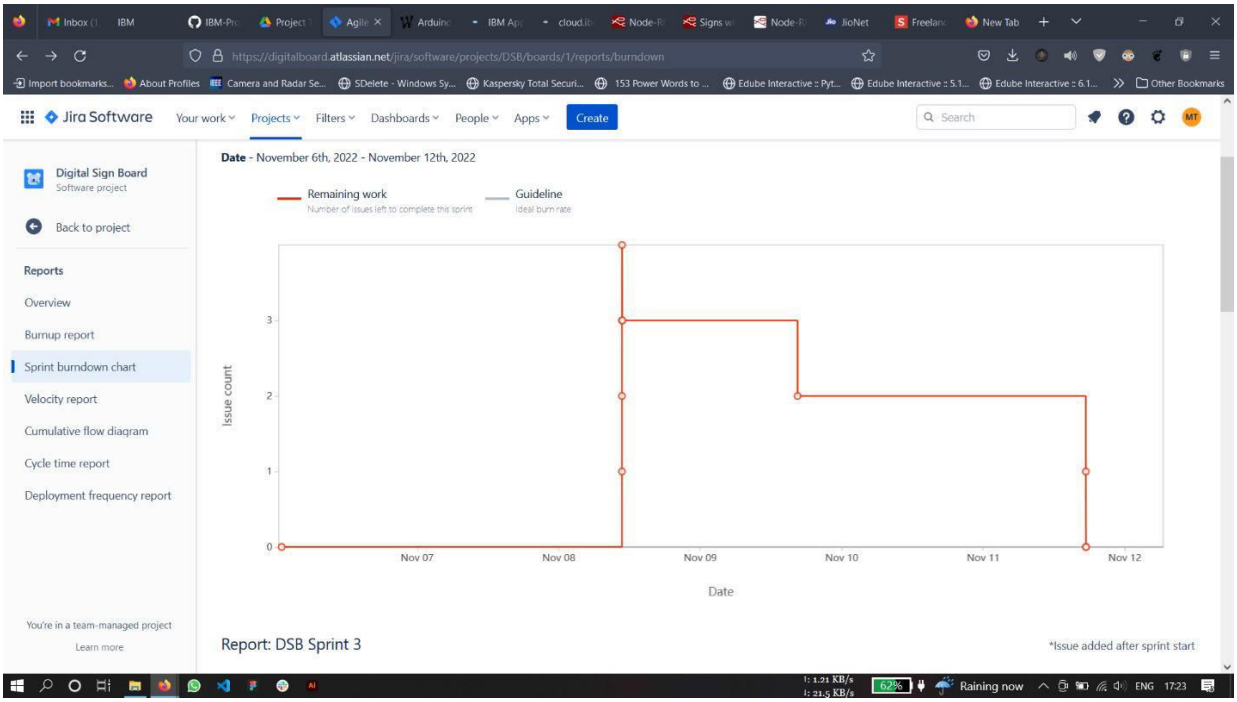
Sprint–1Burndown chart:



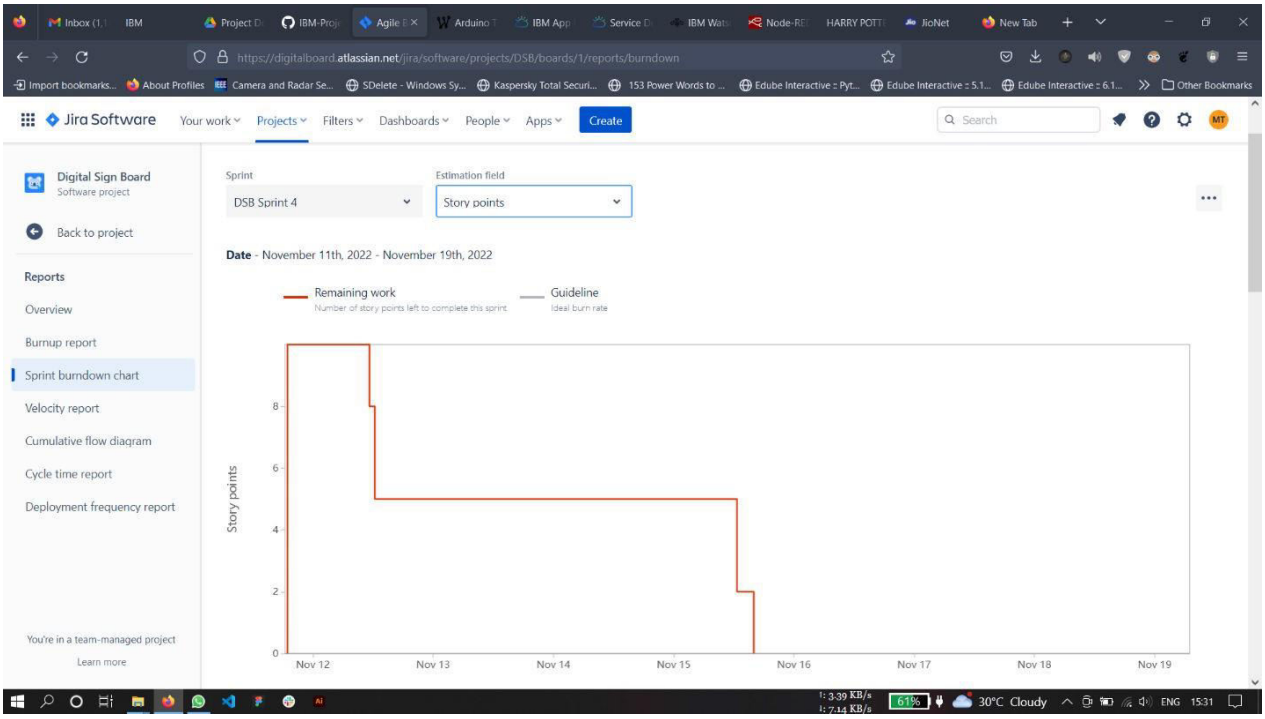
Sprint–2Burndown Chart:



Sprint–3Burndown Chart:



Sprint–4BurndownChart:



7. Coding&Solutioning:

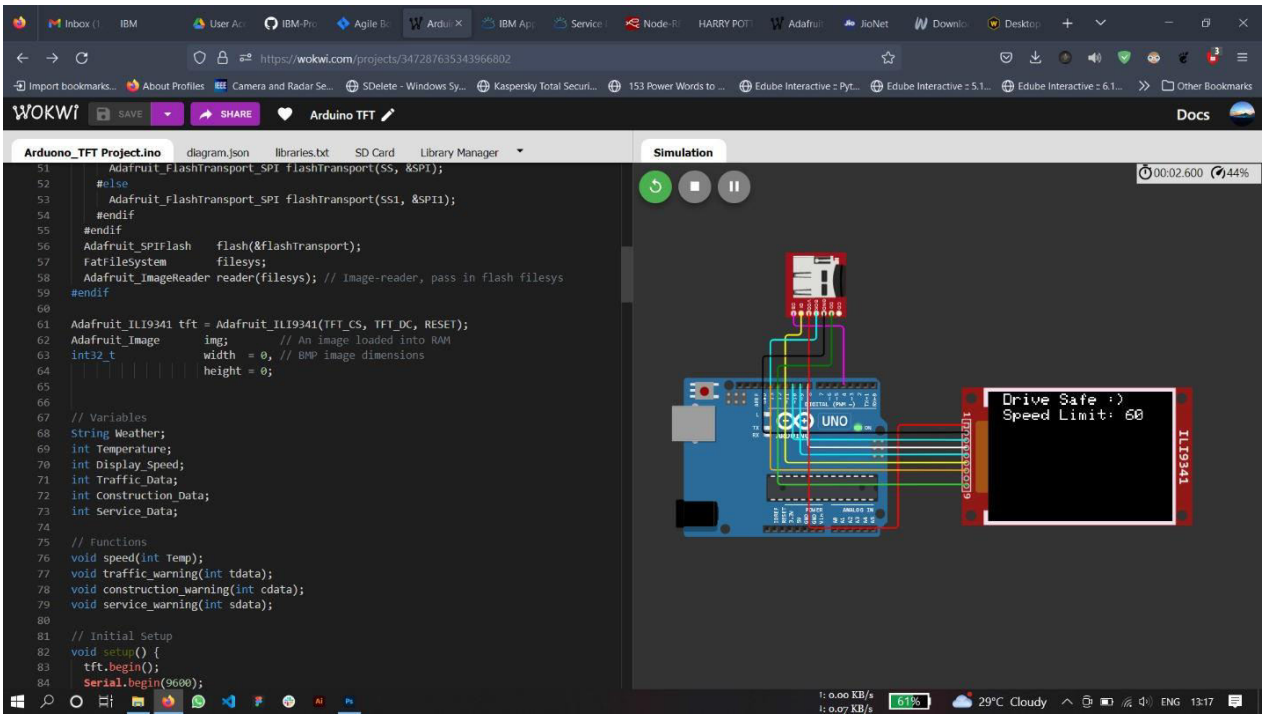
7.1. Feature1:

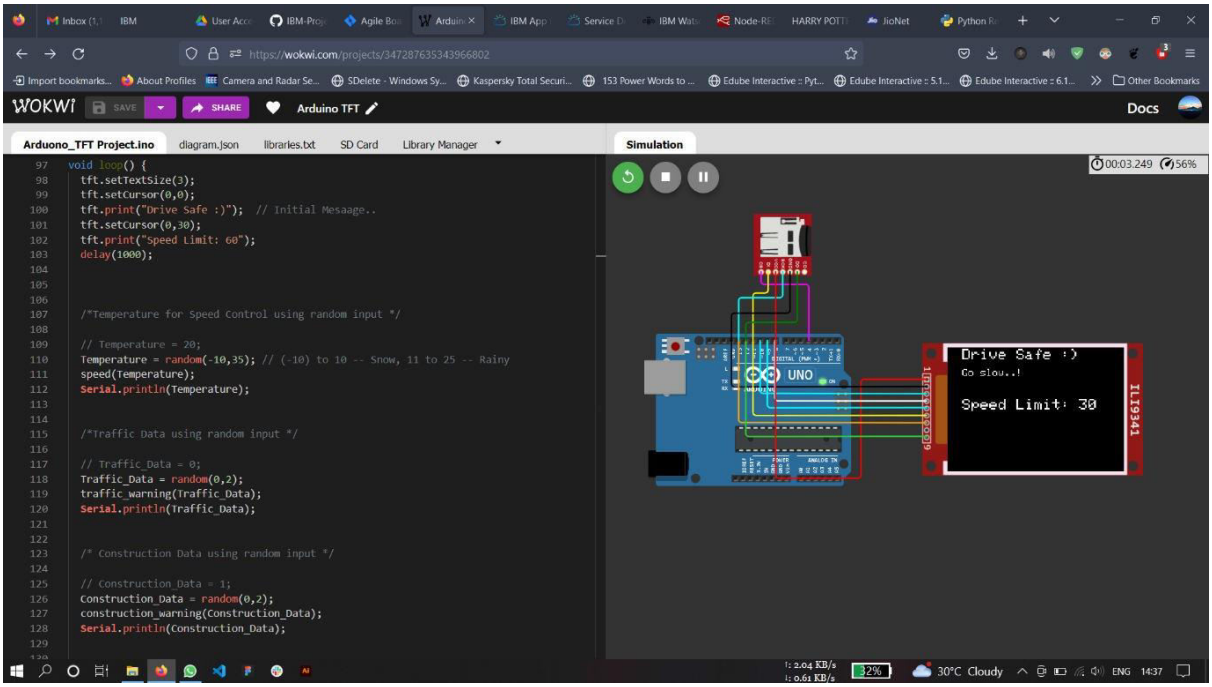
Climatepredictionisdonefromtemperaturedatafromtheopeanweatherapi. Butasfornowrandomvaluesareused. Speedisincreasedordecreasedbasedontheclimateprediction.

```
  /*Temperaturefor SpeedControlusingrandom input*/

  //Temperature =20;
  Temperature=random(-10,35);//(-10)to 10 -- Snow,11 to25 --
  Rainyspeed(Temperature);
  Serial.println(Temperature);


/*Speed Controlprocess..
*/voidspeed(int Temp)
{
  tft.fillScreen(Black);
  if(Temp >=-10 &&Temp <=14) //It's Snow
  {
```

```
    Weather="Snowy";tft.setCursor
    (0,0);tft.print("DriveSafe
    :)");tft.setTextSize(2);tft.s
    etCursor(0,40);tft.print("Gos
    low..!");tft.setCursor(0,100)
    ;tft.setTextSize(3);tft.print
    ("SpeedLimit:
    30");delay(3000);tft.fillScre
    en(Black);
  }
  elseif(Temp >=15&&Temp <=25)//It's Rainy
  {
    Weather="Rainy";tft.setCursor(0,0
    );tft.print("DriveSafe:)");tft.se
    tTextSize(2);tft.setCursor(0,40);
    tft.print("SlipperyRoad
    Ahead");tft.setCursor(0,70);tft.p
    rint("GoSlow..!");tft.setCursor(0
    ,100);tft.setTextSize(3);tft.prin
    t("SpeedLimit:
    40");delay(3000);tft.fillScreen(B
    lack);
  }
  else
  {
    tft.setCursor(0,0);tft.print(
    "DriveSafe!!");tft.setCursor(
    0,30);tft.print("SpeedLimit:
    60");delay(3000);tft.fillScre
    en(Black);
  }
  tft.fillScreen(Black);
}


/*Traffic WarningSystem */

voidtraffic_warning(int tdata)
{
```

```
  tft.fillScreen(Black);
  if(tdata ==0)
  {
    tft.setCursor(0,0);tft.prin
    t("DriveSafe :)");
    //tft.setTextSize(2);tft.setC
    ursor(0,40);tft.print("Traffi
    cAhead..");tft.setCursor(0,80
    );
    //tft.setTextSize(3);tft.print
    ("DriveCarefully!");delay(3000
    );tft.fillScreen(Black);
  }
  if(tdata ==1)
  {
    tft.setCursor(0,0);tft.print(
    "DriveSafe
    :)");tft.setTextSize(2);tft.s
    etCursor(0,40);tft.print("Tra
    fficAhead..");tft.setCursor(0
    ,80);
    //tft.setTextSize(3);tft.print("
    TakeDiversion--
    >");delay(3000);tft.fillScreen(B
    lack);
  }
}
```

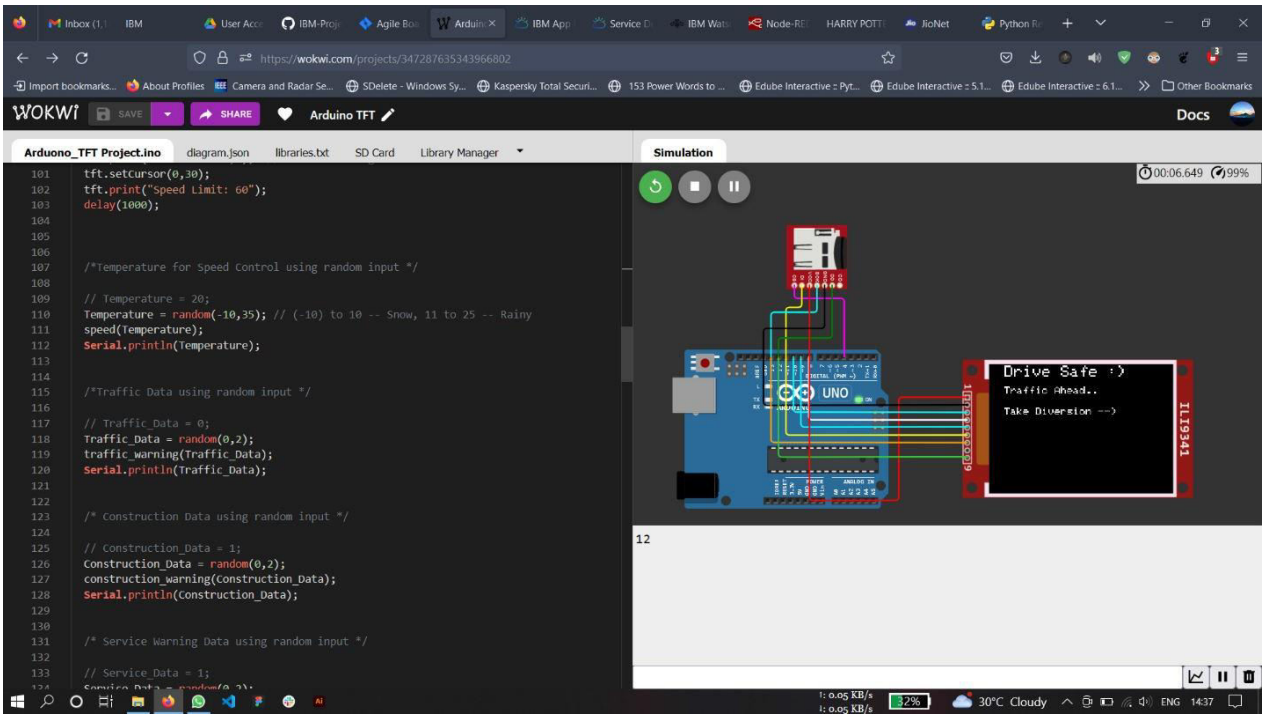


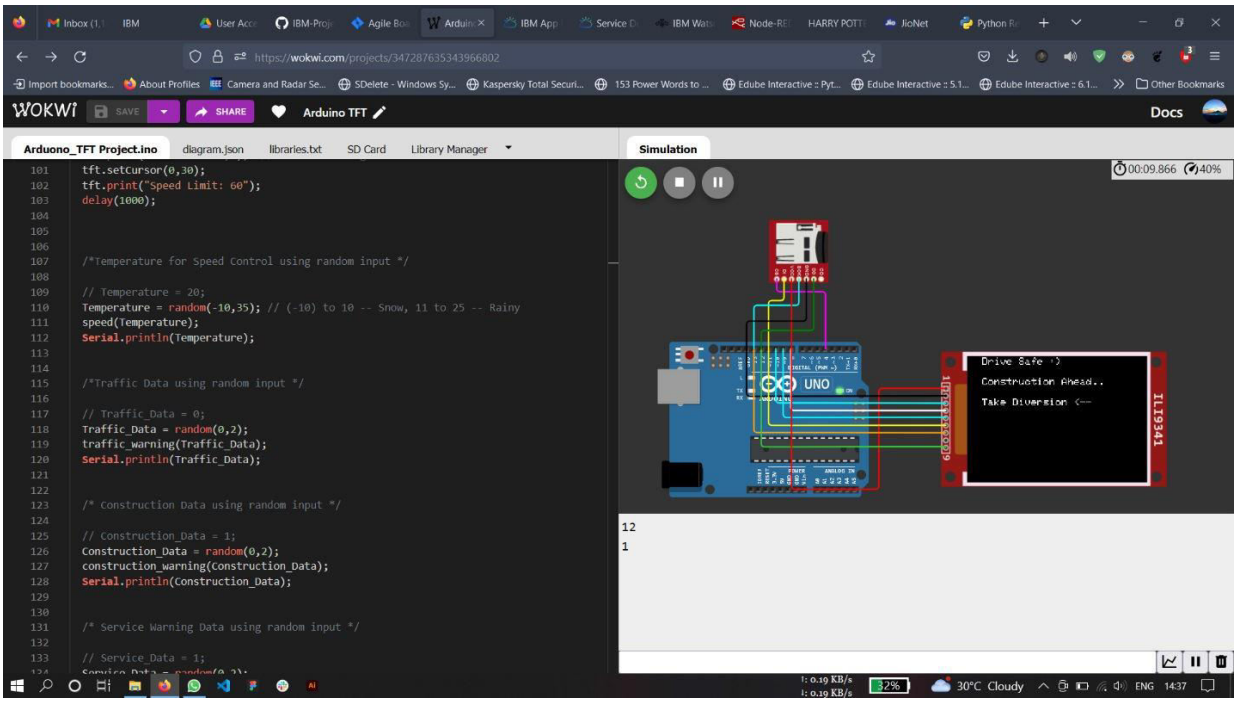


TrafficdataandConstructionwarningdataare givenwithrandominputs. Basedontrafficandconstructiondata, warningaredisplayed.

```
  /*TrafficData usingrandom input*/

  //Traffic_Data
  =0;Traffic_Data=random(0,2);tra
  ffic_warning(Traffic_Data);Seri
  al.println(Traffic_Data);


  /*Construction Datausing randominput*/

  //Construction_Data
  =1;Construction_Data=random(0,2);construc
  tion_warning(Construction_Data);Serial.pr
  intln(Construction_Data);

/*Traffic WarningSystem */

voidtraffic_warning(int tdata)
{
  tft.fillScreen(Black);i
  f(tdata ==0)
  {
    tft.setCursor(0,0);tft.prin
    t("DriveSafe :)");
    //tft.setTextSize(2);tft.setC
    ursor(0,40);tft.print("Traffi
    cAhead..");tft.setCursor(0,80
    );
    //tft.setTextSize(3);tft.print("D
    riveCarefully!");delay(3000);tft.
    fillScreen(Black);
  }
  if(tdata ==1)
  {
    tft.setCursor(0,0);tft.print(
    "DriveSafe
    :)");tft.setTextSize(2);tft.s
    etCursor(0,40);tft.print("Tra
    fficAhead..");tft.setCursor(0
    ,80);
    //tft.setTextSize(3);tft.print("T
    akeDiversion--
    >");delay(3000);tft.fillScreen(Bl
    ack);
```

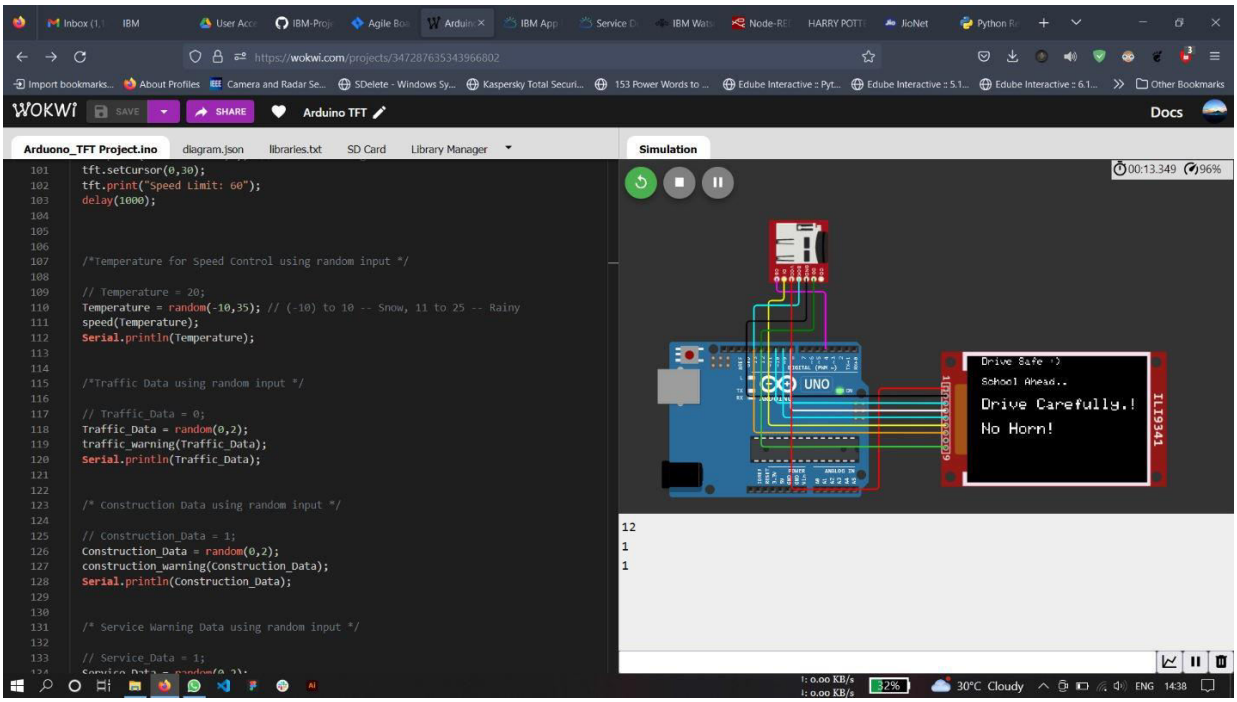
```
  }
}


/*Construction WarningSystem

*/voidconstruction_warning(int

cdata)
{
  tft.fillScreen(Black);
  if(cdata ==0)
  {
    tft.setCursor(0,0);tft.print("Driv
    eSafe
    :)");tft.setTextSize(2);tft.setCur
    sor(0,40);tft.print("ConstructionA
    head..");tft.setCursor(0,80);tft.s
    etTextSize(3);tft.print("DriveCare
    fully..!");delay(2000);tft.fillScr
    een(Black);
  }
  if(cdata ==1)
  {
    tft.setCursor(0,0);tft.print("Driv
    eSafe
    :)");tft.setTextSize(2.5);tft.setC
    ursor(0,40);tft.print("Constructio
    nAhead..");tft.setCursor(0,80);tft
    .setTextSize(2.5);tft.print("TakeD
    iversion <--
    ");delay(2000);tft.fillScreen(Blac
    k);
  }
}
```


https://wokwi.com/projects/347287635343966802
WOKWI
SAVE
SHARE
Arduino TFT
Docs
Arduono_TFT Project.ino
diagram.json
libraries.txt
SD Card
Library Manager
Simulation
00:06.649
99%
tft.setCursor(0,30);
tft.print("Speed Limit: 60");
delay(1000);
/*Temperature for Speed Control using random input */
// Temperature = 20;
Temperature = random(-10,35); // (-10) to 10 -- Snow, 11 to 25 -- Rainy
speed(Temperature);
Serial.println(Temperature);
/*Traffic Data using random input */
// Traffic_Data = 0;
Traffic_Data = random(0,2);
traffic_warning(Traffic_Data);
Serial.println(Traffic_Data);
/* Construction Data using random input */
// Construction_Data = 1;
Construction_Data = random(0,2);
construction_warning(Construction_Data);
Serial.println(Construction_Data);
/* Service Warning Data using random input */
// Service_Data = 1;
UNO
Drive Safe :)
Traffic Ahead..
Take Diversion --)
ILI9341
12
30°C Cloudy
ENG
14:37


https://wokwi.com/projects/347287635343966802
WOKWI
SAVE
SHARE
Arduino TFT
Docs
Arduono_TFT Project.ino
diagram.json
libraries.txt
SD Card
Library Manager
Simulation
00:09.866
40%
tft.setCursor(0,30);
tft.print("Speed Limit: 60");
delay(1000);
/*Temperature for Speed Control using random input */
// Temperature = 20;
Temperature = random(-10,35); // (-10) to 10 -- Snow, 11 to 25 -- Rainy
speed(Temperature);
Serial.println(Temperature);
/*Traffic Data using random input */
// Traffic_Data = 0;
Traffic_Data = random(0,2);
traffic_warning(Traffic_Data);
Serial.println(Traffic_Data);
/* Construction Data using random input */
// Construction_Data = 1;
Construction_Data = random(0,2);
construction_warning(Construction_Data);
Serial.println(Construction_Data);
/* Service Warning Data using random input */
// Service_Data = 1;
UNO
Drive Safe :)
Construction Ahead..
Take Diversion <--
ILI9341
12
1
30°C Cloudy
ENG
14:37

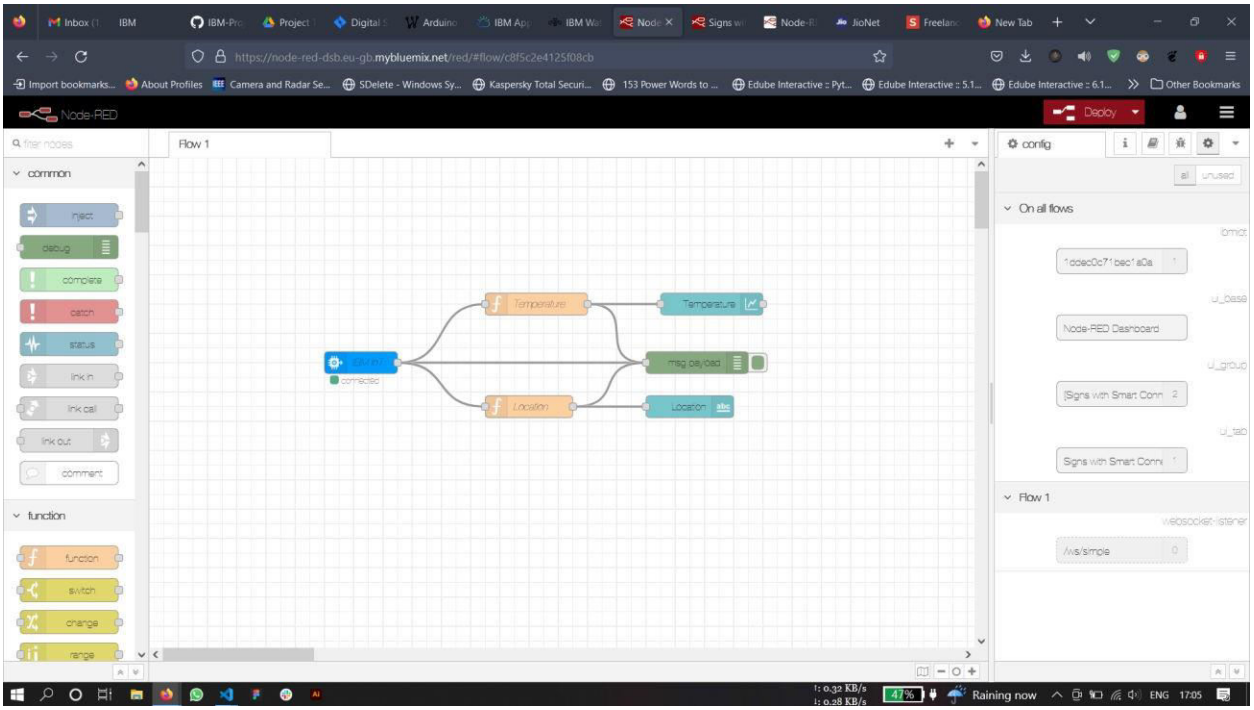
Servicewarningslikeschools, hospitalsandholyplacesaredisplayed.

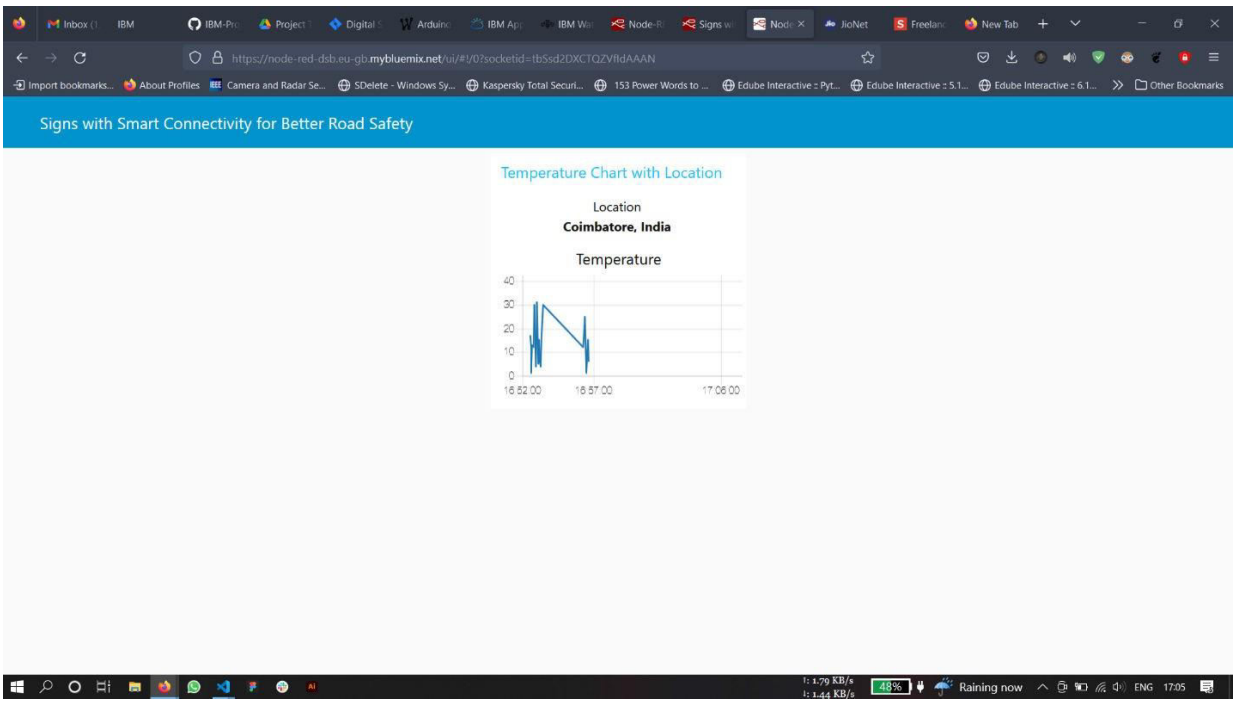
```
  /*ServiceWarningData usingrandom input*/

  //Service_Data
  =1;Service_Data=random(0,2);se
  rvice_warning(Service_Data);Se
  rial.println(Service_Data);

/*School, HospitalWarning

System*/voidservice_warning(int

sdata)
{
  tft.fillScreen(Black);
  if(sdata ==0)
  {
    tft.setCursor(0,0);tft.print
    ("DriveSafe
    :)");tft.setTextSize(2);tft.
    setCursor(0,40);tft.print("S
    choolAhead..");tft.setCursor
    (0,80);tft.setTextSize(3);
    tft.print("DriveCarefully.!\nNoHorn!");del
    ay(2000);
    tft.fillScreen(Black);
  }
  if(sdata ==1)
  {
    tft.setCursor(0,0);tft.print("
    DriveSafe
    :)");tft.setTextSize(2.5);tft.
    setCursor(0,40);tft.print("Hos
    pitalAhead..");tft.setCursor(0
    ,80);tft.setTextSize(2.5);
    tft.print("DriveCarefully.!\nNoHorn!");del
    ay(2000);
    tft.fillScreen(Black);
  }
}
```

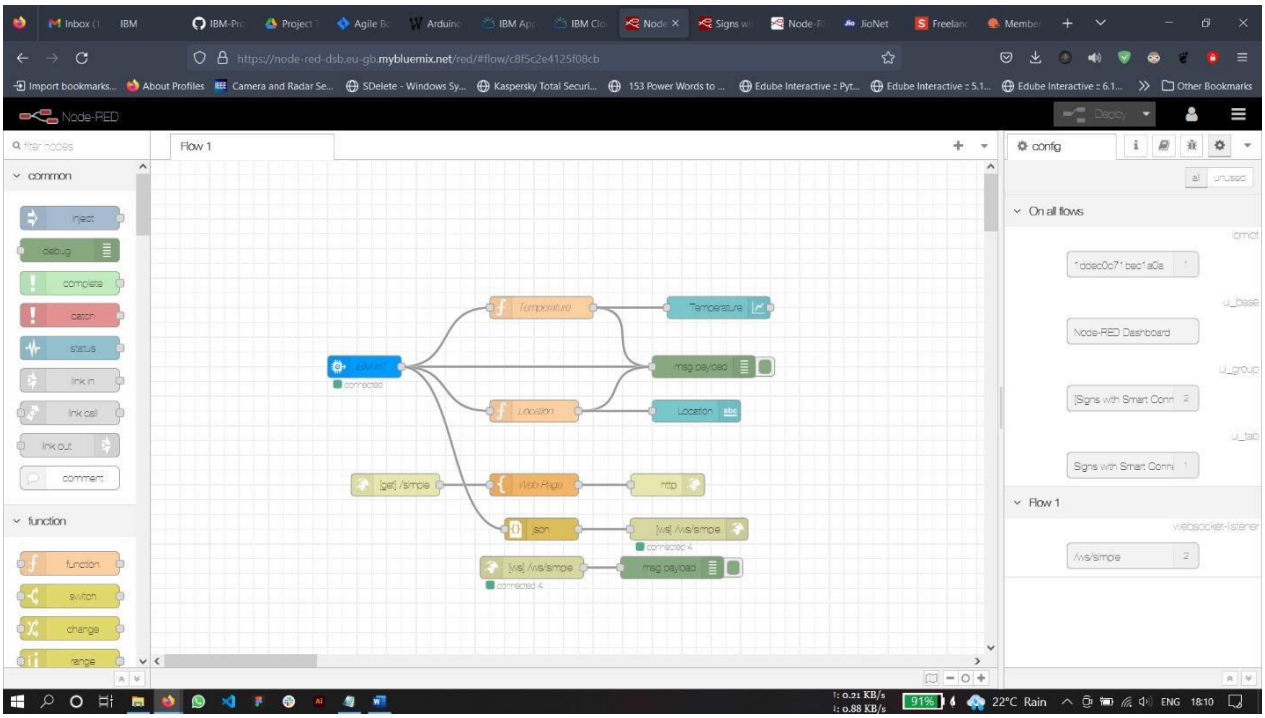

https://wokwi.com/projects/347287635343966802
WOKWI
SAVE
SHARE
Arduino TFT
Docs
Arduono_TFT Project.ino
diagram.json
libraries.txt
SD Card
Library Manager
Simulation
00:13.349
96%
tft.setCursor(0,30);
tft.print("Speed Limit: 60");
delay(1000);
/*Temperature for Speed Control using random input */
// Temperature = 20;
Temperature = random(-10,35); // (-10) to 10 -- Snow, 11 to 25 -- Rainy
speed(Temperature);
Serial.println(Temperature);
/*Traffic Data using random input */
// Traffic_Data = 0;
Traffic_Data = random(0,2);
traffic_warning(Traffic_Data);
Serial.println(Traffic_Data);
/* Construction Data using random input */
// Construction_Data = 1;
Construction_Data = random(0,2);
construction_warning(Construction_Data);
Serial.println(Construction_Data);
/* Service Warning Data using random input */
// Service_Data = 1;
UNO
Drive Safe :)
School Ahead..
Drive Carefully.!
No Horn!
ILI9341
12
1
1
30°C Cloudy
ENG
14:38

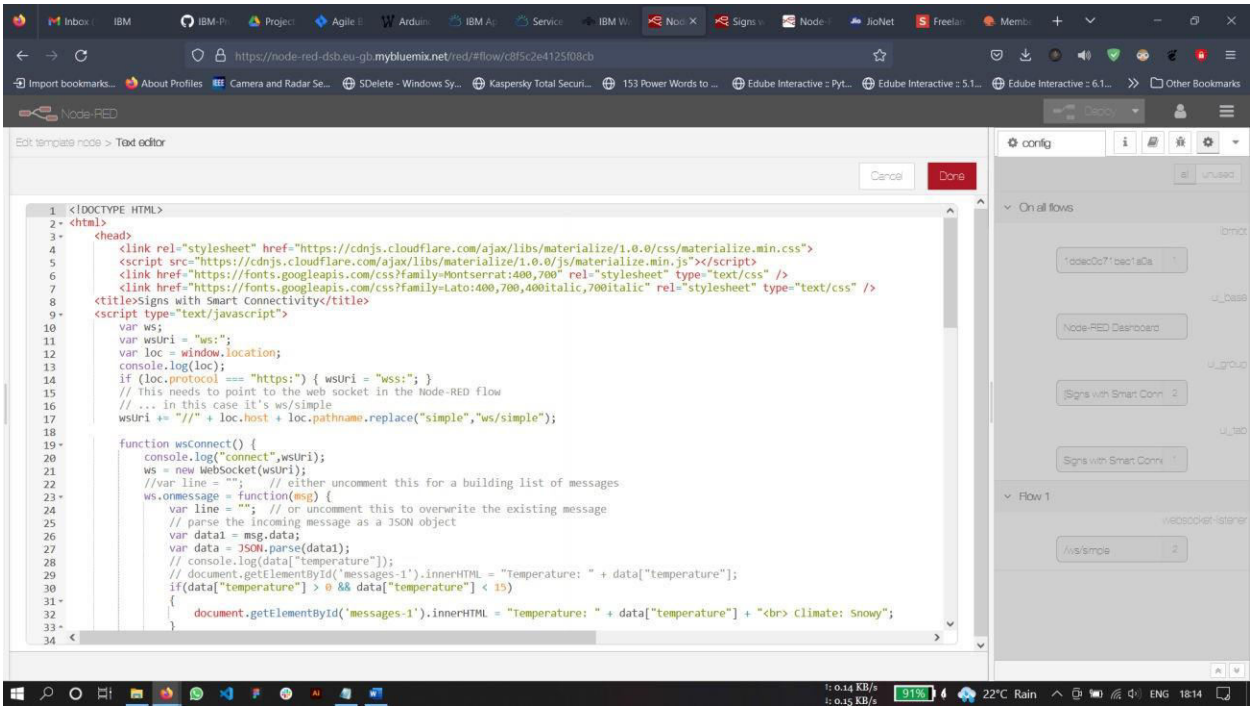
7.2. Feature2:

Thetemperatureandthelocationdata areexactlydisplayedinthewebpageusingNode– RedandtheforthatisrandomizedusingIBMWatson.Adeviceiscreated forthatpurposeandissimulatedto senddatatonode– red.

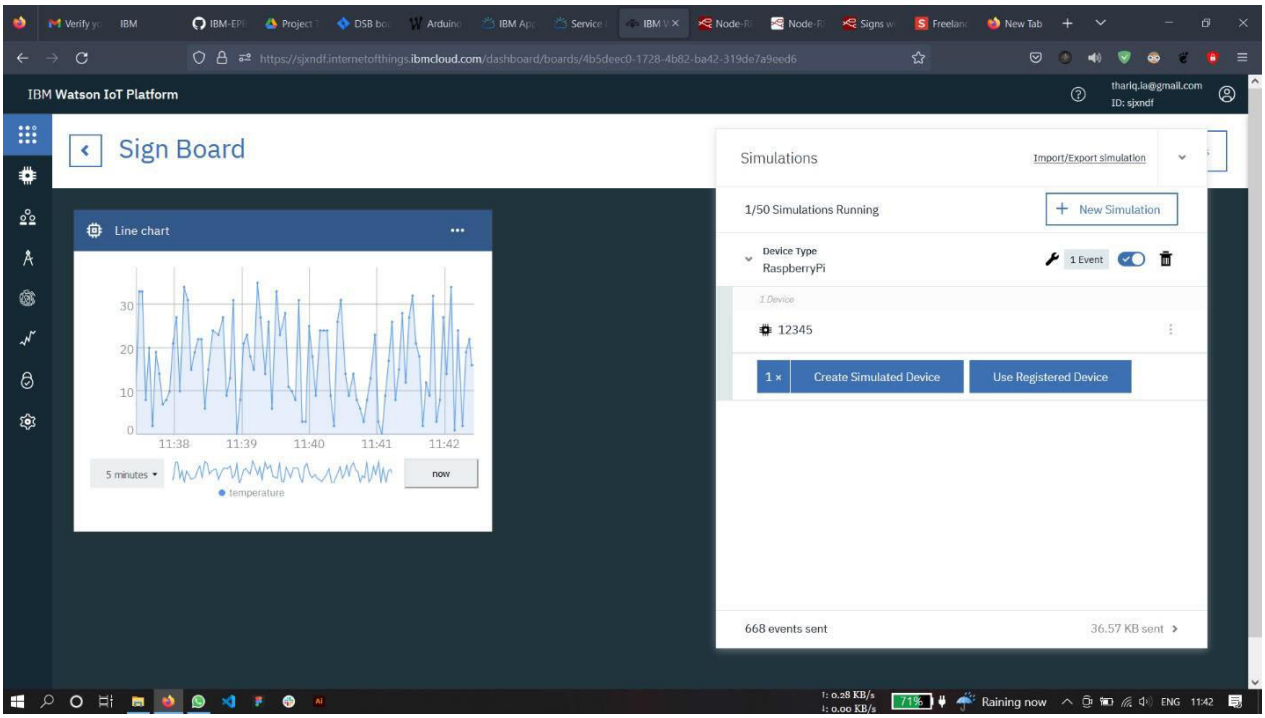


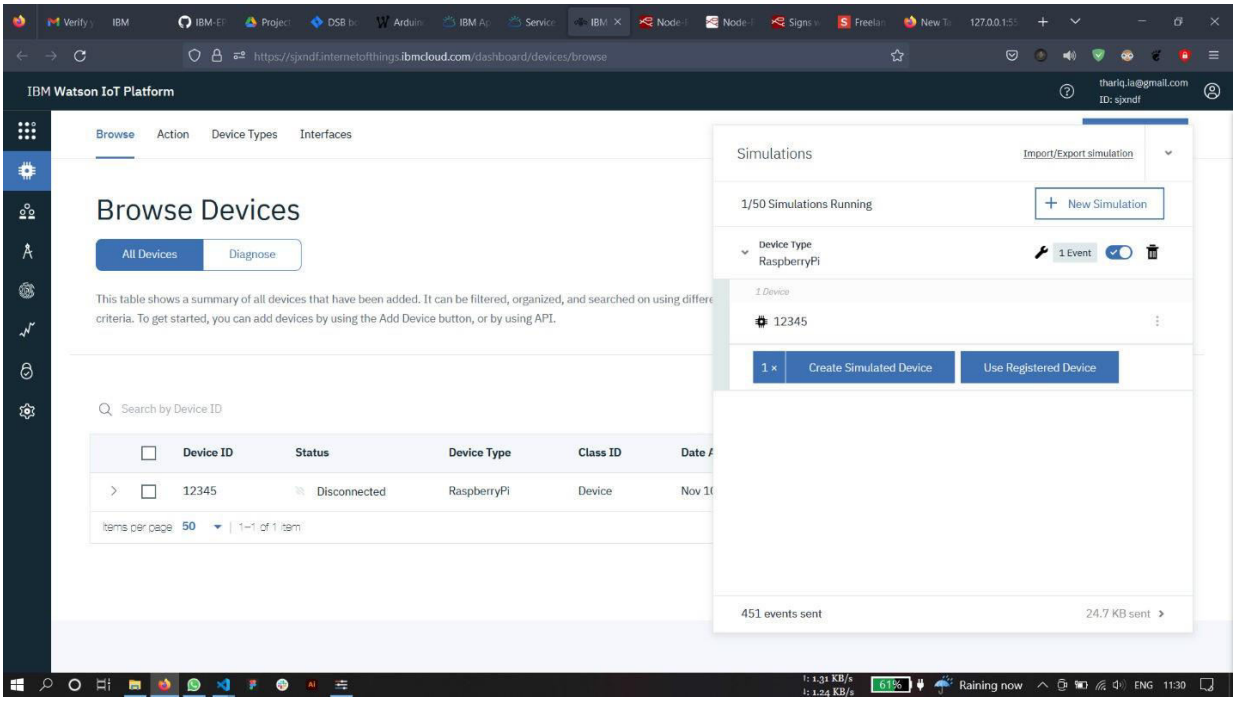


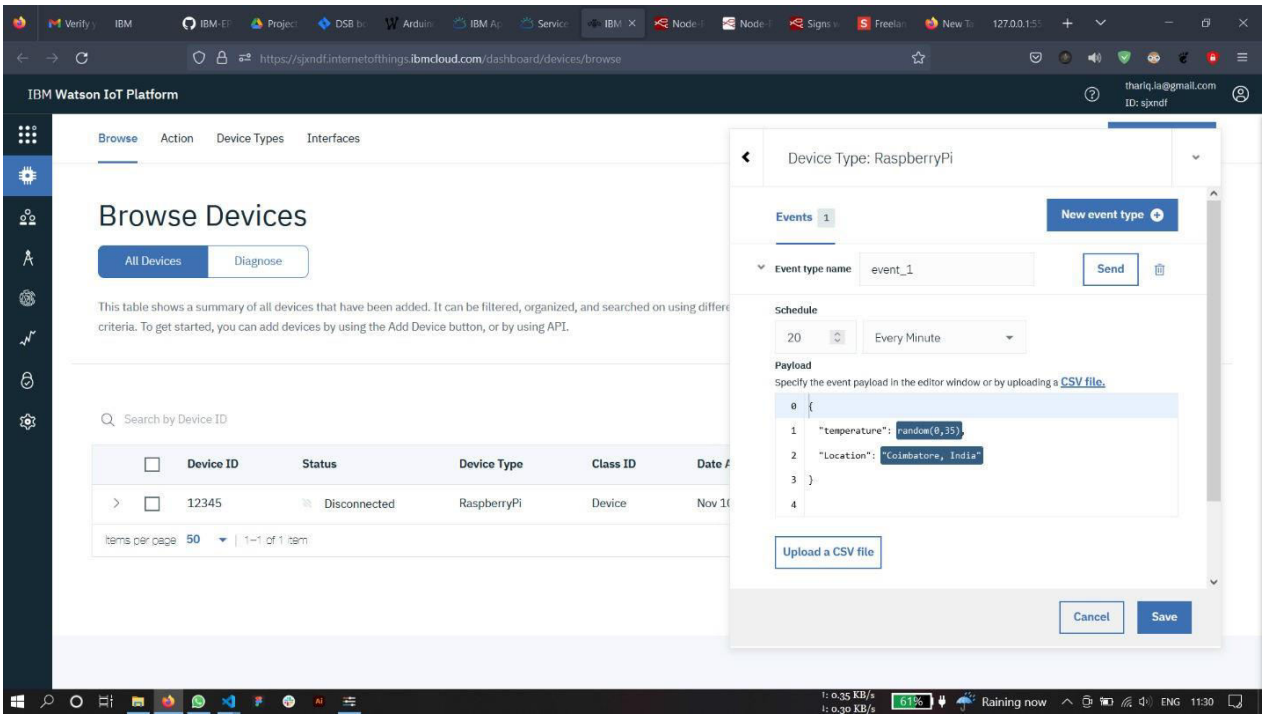





```
<!DOCTYPE HTML>
<html>
    <head>
        <link rel="stylesheet" href="https://cdnjs.cloudflare.com/ajax/libs/materialize/1.0.0/css/materialize.min.css">
        <script src="https://cdnjs.cloudflare.com/ajax/libs/materialize/1.0.0/js/materialize.min.js"></script>
        <link href="https://fonts.googleapis.com/css?family=Montserrat:400,700" rel="stylesheet" type="text/css" />
        <link href="https://fonts.googleapis.com/css?family=Lato:400,700,400italic,700italic" rel="stylesheet" type="text/css" />
    <title>Signs with Smart Connectivity</title>
    <script type="text/javascript">
        var ws;
        var wsUri = "ws:";
        var loc = window.location;
        console.log(loc);
        if (loc.protocol === "https:") { wsUri = "wss:"; }
        // This needs to point to the web socket in the Node-RED flow
        // ... in this case it's ws/simple
        wsUri += "//" + loc.host + loc.pathname.replace("simple","ws/simple");

        function wsConnect() {
            console.log("connect",wsUri);
            ws = new WebSocket(wsUri);
            //var line = "";    // either uncomment this for a building list of messages
            ws.onmessage = function(msg) {
                var line = "";  // or uncomment this to overwrite the existing message
                // parse the incoming message as a JSON object
                var data1 = msg.data;
                var data = JSON.parse(data1);
                // console.log(data["temperature"]);
                // document.getElementById('messages-1').innerHTML = "Temperature: " + data["temperature"];
                if(data["temperature"] > 0 && data["temperature"] < 15)
                {
                    document.getElementById('messages-1').innerHTML = "Temperature: " + data["temperature"] + "<br> Climate: Snowy";
                }
```


https://sjxndf.internetofthings.ibmcloud.com/dashboard/boards/4b5deec0-1728-4b82-ba42-319de7a9eed6
IBM Watson IoT Platform
tharlq.la@gmail.com
ID: sjxndf
Sign Board
Line chart
30
20
10
0
11:38
11:39
11:40
11:41
11:42
5 minutes
now
temperature
Simulations
Import/Export simulation
1/50 Simulations Running
New Simulation
Device Type
RaspberryPi
1 Event
1 Device
12345
1 ×
Create Simulated Device
Use Registered Device
668 events sent
36.57 KB sent
Raining now
ENG
11:42


https://sjxndf.internetofthings.ibmcloud.com/dashboard/devices/browse
IBM Watson IoT Platform
tharlq.la@gmail.com
ID: sjxndf
Browse
Action
Device Types
Interfaces
Browse Devices
All Devices
Diagnose
This table shows a summary of all devices that have been added. It can be filtered, organized, and searched on using differe
criteria. To get started, you can add devices by using the Add Device button, or by using API.
Search by Device ID
Device ID
Status
Device Type
Class ID
12345
Disconnected
RaspberryPi
Device
Items per page 50
1–1 of 1 item
Simulations
Import/Export simulation
1/50 Simulations Running
New Simulation
Device Type
RaspberryPi
1 Event
1 Device
12345
1 ×
Create Simulated Device
Use Registered Device
451 events sent
24.7 KB sent
Raining now
ENG
11:30



Thefollowingfeaturesaresomeideaswedecidedtoimplementbutwedidn’thad muchtime...

Additionally, a speed cam willbeintegratedwiththedigitalsign boardwhichuseImageprocessing&AI,togetthedetailsof thedriverwhobreaksthetrafficrules(especiallyspeed) willbeupdatedinthecloudatabase.

Also, forNoparkingandOnewayruleviolationscanalsobedetectedandappropriateactioncanb etaken. ViolationsofstopsignsinintersectionwillalsobedetectedusingAI.

8. Testing:

8.1. TestCases:

Date	17-Nov-22
Team ID	PNT2022TMID17665
Project Name	Project - Signs with Smart Connectiv
Maximum Marks	4 marks

Test case ID	Feature Type	Component	Test Scenario	Pre-Requisite	Steps To Execute	Test Data	Expected Result	Actual Result	Status	Comments	TC for Automation(Y/N)	BUG ID	
TC_OO1	Functional	IBM cloud	Create the IBM Cloud services which are being used in this project.	IBM Cloud Login ID & Password	1.Go to IBM Cloud signup page 2.Enter e-mail id and other credentials 3.Enter a password	https://cloud.ibm.com/login	User should sign up IBM cloud and details should be verified	Working as expected	Pass	Results verified	No		Mohamed Thariq P, Santho
TC_OO2	Functional	IBM Cloud	Configure the IBM Cloud services which are being used in completing this project.	IBM Cloud Login ID & Password	1.Go to Cloud login 2.Enter user ID & Passsword 3.Verify login by the popup display	https://cloud.ibm.com/login	User login to IBM Cloud and should be navigated to IBM Cloud dashboard page	Working as expected	Pass	Results verified	No		Mohamed Thariq P, Santho
TC_OO3	Functional	IBM Watson IoT Platform	IBM Watson IoT platform acts as the mediator to connect the web application to IoT devices, so create the IBM Watson IoT platform.	IBM Watson IoT Platform Login ID & Password	1.Login to IBM Cloud 2.Click Catalog 3.Search IoT and click create 4.Go to resource list and search Internet of Things platform 5.Press Launch and click Sign in IBM Watson Platform	https://sixndf.internetofthings.ibmcloud.com/dashboard/devices/browse	User should be navigated to IBM IoT Watson Platform	Working as expected	Pass	Results verified	No		Mohamed Thariq P, Santho
TC_OO4	Functional	IBM Watson	In order to connect the IoT device to the IBM cloud, create a device in the IBM Watson IoT platform and get the device credentials.	IBM Watson IoT Platform Login ID & Password	1.Login to IBM Watson Platform 2. Click Add Device 3.Enter the details and click Finish. Create Device ID & Device type 4.Turn on Device Simulator and click simulation running. Enter the values of temperature & Location. 5.Click Send & Save. Verify the displayed result of the levels.	Temperature sensor values and Location are generated randomly in simulation	Temperature sensor values and Location are generated randomly in simulation	Working as expected	Pass	Results verified	No		Mohamed Thariq P, Santho
TC_OO5	Functional	IBM Cloud(Node Red)	Configure the connection security and create API keys that are used in the Node-RED service for accessing the IBM IoT	Node Red Installation	1.Install node red and open node red in command prompt 2.Select IBM input in IoT	https://node-red-dsb.eu-gb.mybluemix.net/red/#flow/c8f5c2e8125f08cb	User should be able to see the Node Red page	Working as expected	Pass	Results verified	No		Mohamed Thariq P, Santho
					1.Select IBM IoT Input in Node. In IBM IoT Watson Platform, go to apps and click on generate API keys. 2.Copy & paste generated API key and token in the IBM IoT input. After entering all details, click the done button. 3.Add debug to the IBM IoT and rename as Msg.payload and click	Values of sensors and button for light ON/OFF is displayed	Values of sensors and button for light ON/OFF should be displayed						

Gas Leakage Testcases | Testscearnios

Test case ID	Feature Type	Component	Test Scenario	Pre-Requisite	Steps To Execute	Test Data	Expected Result	Actual Result	Status	Comments	TC for Automation(Y/N)	BUG ID	
TC_OO6	Functional	Node Red	Create a Node-RED service.	Node Red Installation	1.Select IBM IoT Input in Node. In IBM IoT Watson Platform, go to apps and click on generate API keys. 2.Copy & paste generated API key and token in the IBM IoT input. After entering all details, click the done button. 3.Add debug to the IBM IoT and rename as Msg.payload and click on done. Click chart from the dashboard and fill the details & add functions to the chart. Check the generated values from the debug message. 4.Edit function node, connect them, add another chart and functions, name them as "Temperature" & "Location" 5.Finally add light ON/OFF buttons to the IBM IoT and debug. Verify the output from NODE RED using	Values of sensors and button for light ON/OFF is displayed	Values of sensors and button for light ON/OFF should be displayed	Working as expected	Pass	Results verified	No		Mohamed Thariq P, Santho
TC_OO7	Functional	Python 3.7.0	Develop a python script to publish random sensor data such as temperature, humidity level and Gas level to the IBM IoT	Python 3.7.0(64 bit) installation	1.Download and install Python 3.7.0 2.Develop python code	https://www.python.org/downloads/release/python-370/	User should be able to develop a python code	Working as expected	Pass	Results verified	No		Mohamed Thariq P, Santho
TC_OO8	Functional	Python 3.7.0	After developing python code, commands are received just print the statements which represent the control of the devices.	Python 3.7.0(64 bit) installation	1.Downlinstall Python 3.7.0 2.After python code	Get the output from the code	User should be able to get the results from the developed code	Working as expected	Pass	Results verified	No		Mohamed Thariq P, Santho
TC_OO9	Functional	M Cloudant	Publish Data to The IBM Cloud	IBM Cloud Login ID & Password	1.Run the python code 2.Verify the displayed output	Publishment of python code	User should be able to publish the c	Working as expected	Pass	Results verified	No		Mohamed Thariq P, Santho
TC_O10	Web UI	Node Red & MIT Inventor	Create Web UI in Node- Red	Node Red Webpage Data Display	1.Go to Node Red. Select http in & http response. Add functions and select another http in and http response. Connect them to IBM IoT output and function.Print the	Sensors values and command values can be seen in the mobile application	Sensors values and command values should be seen in the Node - Red Webpage	Working as expected	Pass	Results verified	No		Mohamed Thariq P, Santho

Gas Leakage Testcases | Testscearnios

8.2. UserAcceptanceTesting:

1. *PurposeofDocument*

Thepurposeofthisdocumentistobrieflyexplainthetestcoverageandopenissuesofthe[ProductNam e]project at thetime oftherelease to User AcceptanceTesting(UAT).

2. *DefectAnalysis*

Thisreportshowsthenumberofresolvedorclosedbugsateachseveritylevel,and howtheywere resolved

Resolution	Severity1	Severity2	Severity3	Severity4	Subtotal
By Design	10	4	2	3	20
Duplicate	0	2	2	0	4
External	2	3	0	1	6
Fixed	11	2	4	17	34
NotReproduced	0	0	1	0	1
Skipped	0	0	0	1	1
Won't Fix	0	1	0	3	4
Totals	23	12	9	25	70

3. *TestCaseAnalysis*

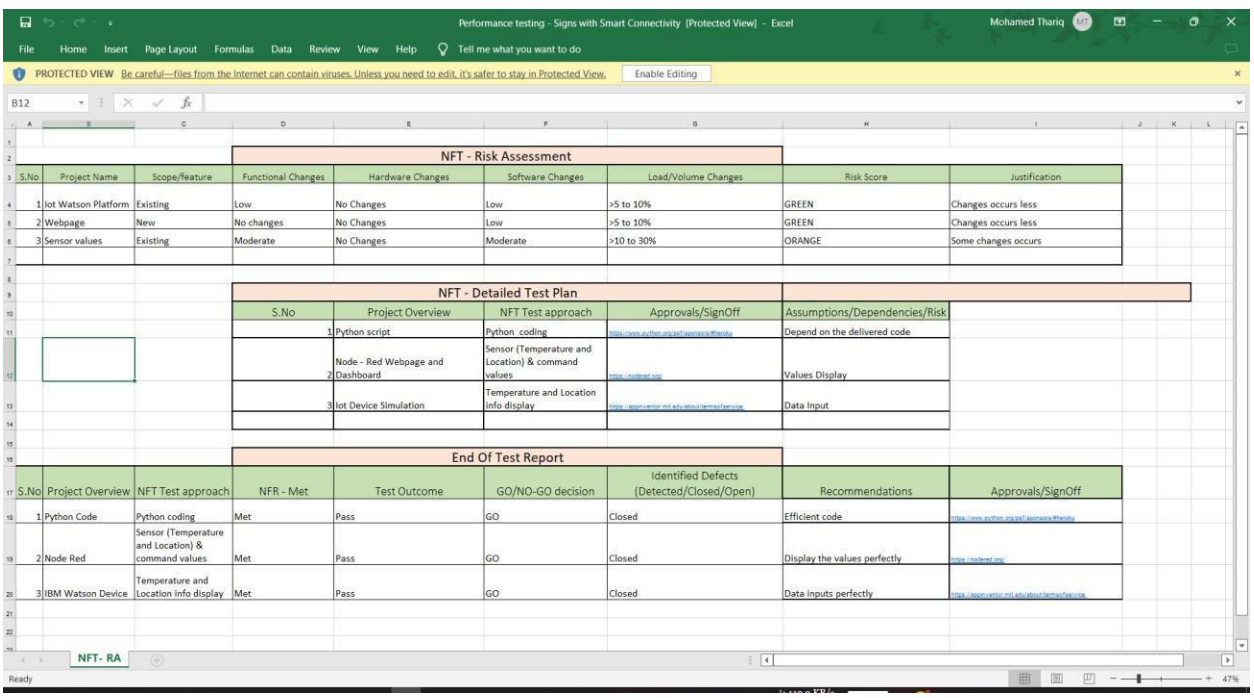
Thisreportshowsthenumberoftestcasesthathavepassed,failed,anduntested

Section	TotalCases	NotTested	Fail	Pass
PrintEngine	20	0	0	20
ClientApplication	38	0	0	38
Security	3	0	0	3

OutsourceShipping	3	0	0	3
ExceptionReporting	5	0	0	5
FinalReportOutput	10	0	0	10
VersionControl	3	0	0	3

9. Results:

9.1. PerformanceMetrics:



NFT - Risk Assessment

S.No	Project Name	Scope/feature	Functional Changes	Hardware Changes	Software Changes	Load/Volume Changes	Risk Score	Justification
1	Iot Watson Platform	Existing	Low	No Changes	Low	>5 to 10%	GREEN	Changes occurs less
2	Webpage	New	No changes	No Changes	Low	>5 to 10%	GREEN	Changes occurs less
3	Sensor values	Existing	Moderate	No Changes	Moderate	>10 to 30%	ORANGE	Some changes occurs

NFT - Detailed Test Plan

S.No	Project Overview	NFT Test approach	Approvals/SignOff	Assumptions/Dependencies/Risk
1	Python script	Python coding	https://www.python.org/psf/sponsors/#heroku	Depend on the delivered code
2	Node - Red Webpage and Dashboard	Sensor (Temperature and Location) & command values	https://nodered.org/	Values Display
3	Iot Device Simulation	Temperature and Location info display	https://appiot.ventor.mit.edu/about/termsofservice.	Data Input

End Of Test Report

S.No	Project Overview	NFT Test approach	NFR - Met	Test Outcome	GO/NO-GO decision	Identified Defects (Detected/Closed/Open)	Recommendations	Approvals/SignOff
1	Python Code	Python coding	Met	Pass	GO	Closed	Efficient code	https://www.python.org/psf/sponsors/#heroku
2	Node Red	Sensor (Temperature and Location) & command values	Met	Pass	GO	Closed	Display the values perfectly	https://nodered.org/
3	IBM Watson Device	Temperature and Location info display	Met	Pass	GO	Closed	Data inputs perfectly	https://appiot.ventor.mit.edu/about/termsofservice.

10. Advantages&Disadvantages:

Themainadvantageof thisprojectisthatitisadynamicsystemwhichcanchangedifferentmodesofoperationsautomatically.

Itgathersweatherdata fromopenweatherAPIanddisplayspeedaccordingbasedontheclimate.

Displayservicewarningslikeschools, hospitalsandholyplaces andwarntoslowdownandbesilent.

TrafficdataandConstructionwarningdataare givenwithrandominputs. Basedontrafficandconstructiondata, warningsaredisplayed.

Additionally, a speed cam willbeintegratedwiththedigitalsign boardwhichuseImageprocessing&AI,togetthedetailsof thedriverwhobreaksthetrafficrules(especiallyspeed) willbeupdatedintheclouddatabase.

Also, forNoparkingandOnewayruleviolationscanalsobedetectedandappropriateactioncanbetaken. ViolationsofstopsignsinintersectionwillalsobedetectedusingAI.

11. Conclusion:

Theprojectconcludedbyreplacingthestaticsignboardswithsmartconnecteddigitalsignboards.Digitalroad signs are animportant partof moderninfrastructureandare becomingincreasinglycommon. Digitalroadsignsarebecomingmorecommonastechnologyimprovesandmorestatesadoptthem. Theuseofdigitalroadsignsisexpectedtocontinuetogrowinthefuture asitwouldbeobserveduser-friendly,economic, environmentfriendly,profitablepromotingroadsafety.Digitalroadsignsaredesignedtoimproveroadsafetyandefficiencybyprovidingreal-time informationtodrivers.Thesesignscandisplaya varietyofinformation, includingspeedlimits, trafficconditions, andweatherwarnings. Digitalroadsignscan helpdriversbyprovidinginformationthatisnotalwaysavailablefromtraditionalstaticsigns.

12. FutureScope:

- Inthefuture aspeedcam willbeintegratedwiththedigitalsign board.
- UsingImageprocessing&AI, thedetailsof thedriverwhobreaksthetrafficruleswillbe updatedintheclouddatabase.
- NoparkingandOnewayruleviolationscanalsobe detectedandappropriateactioncanbetaken.
- Violationsofstopsignsinintersectionwill also bedetectedusingAI.

13. Appendix:

Code:

```
/*tft.setTextColor(ILI9341_RED);Futur

eScope:

  Image

    Processing:Spee

    dCam

    NoParking

    One-Way

    Stopsignintersection

*/



//NodeMcUPinsConnection

//#defineTFT_MOSID7

//#defineTFT_SCLKD5
```

```
//#defineTFT_CSD2
//#defineTFT_DCD4
//#defineTFT_RSTD3



//LibraryFuctions
#include"SPI.h"
#include"Adafruit_GFX.h"
#include"Adafruit_ILI9341.h"
#include<SdFat.h>
#include<Adafruit_SPIFlash.h>
#include<Adafruit_ImageReader.h>

//Colours
#defineBlack0x000000
#defineWhite0xffffff

//ArduinoPinsConnection
#defineUSE_SD_CARD
#defineSD_CS    4 //SDcardselectpin
#defineTFT_DC9
```

```
#defineTFT_CS10

#defineRESET 8





//ImageInitalization..

#ifdefined(USE_SD_CARD)

  SdFat                SD;         //SDcardfilesystem

  Adafruit_ImageReaderreader(SD);//Image-readerobject, passinSDfilesys

#else

  //SPIor QSPIflashfilesystem(i.e. CIRCUITPYdrive)

  #ifdefined(__SAMD51__) ||

    defined(NRF52840_XXAA)Adafruit_FlashTransport_QSPIflash

    Transport(PIN_QSPI_SCK,
PIN_QSPI_CS,

      PIN_QSPI_IO0,PIN_QSPI_IO1, PIN_QSPI_IO2,PIN_QSPI_IO3);

  #else

    #if (SPI_INTERFACES_COUNT== 1)

      Adafruit_FlashTransport_SPIflashTransport(SS,&SPI);

    #else

      Adafruit_FlashTransport_SPIflashTransport(SS1, &SPI1);

    #endif
```

```
  #endif
  Adafruit_SPIFlash
                          flash(&flashTransport);F
  atFileSystem          filesys;
  Adafruit_ImageReaderreader(filesys);//Image-reader,passin flash filesys
#endif

Adafruit_ILI9341tft= Adafruit_ILI9341(TFT_CS, TFT_DC,RESET);
Adafruit_Image       img;
                     //AnimageloadedintoRAMint32_t
                     width=0,//BMPimagedimensions
                  height=0;


//VariablesString
Weather;intTem
perature;
intDisplay_Speed;int
Traffic_Data;
intConstruction_Data;int
Service_Data;

//Functions
```

```
voidnormal_signs();void
speed(intTemp);
voidtraffic_warning(inttdata);
voidconstruction_warning(intcdata);vo
idservice_warning(intsdata);

//InitialSetupvoid
setup() {
  ImageReturnCodestat;t
  ft.begin();Serial.begin(
  9600);tft.setRotation(1)
  ;
  tft.setTextColor(ILI9341_WHITE);
}



//Normalsignswithwordings
//Weather --Speedchange
//Traffic
//Construction
//School, HospitalWarnings
```

```
voidloop()
  {tft.setTextSize(3);tft.setCurs
  or(0,0);
  tft.print("DriveSafe:)");
  //InitialMesaage..tft.setCursor(0,30);
  tft.print("SpeedLimit:60");delay(1000
  );

  /*NormalSignsDisplay*/normal_sign
  s();



  /*TemperatureforSpeedControlusingrandominput*/

  //Temperature = 20;
  Temperature = random(-10,35);//(-10)to10-- Snow, 11to25--
  Rainyspeed(Temperature);
  Serial.println(Temperature);
```

```
/*TrafficDatausing randominput*/

//Traffic_Data =0;Traffic_Data
=
random(0,2);traffic_warning(Tr
affic_Data);Serial.println(Traffi
c_Data);


/*ConstructionDatausingrandominput*/

//Construction_Data
=1;Construction_Data=
random(0,2);construction_warning(Constru
ction_Data);Serial.println(Construction_Dat
a);


/*ServiceWarningDatausingrandominput*/

//Service_Data
=1;Service_Data =
```

```
random(0,2);
```

```
  service_warning(Service_Data);Serial.printl
  n(Service_Data);
}

/*NormalSignsImageDisplaywithwordingsfor
awareness*/voidnormal_signs()
{
  stat= reader.drawBMP("/wokwi.bmp",tft, 0,
  0);reader.printStatus(stat);
}

/*SpeedControl process..
*/voidspeed(intTemp)
{
  tft.fillScreen(Black);
  if( Temp>=-10&&Temp<=14)//It's Snow
  {
    Weather
    ="Snowy";tft.setCursor(0,0);tf
    t.print("DriveSafe:)");tft.setTe
    xtSize(2);
```

```
  tft.setCursor(0,40);tft.print("G
  oslow..!");tft.setCursor(0,100);
  tft.setTextSize(3);tft.print("Sp
  eedLimit:30");delay(3000);tft.
  fillScreen(Black);
}
elseif(Temp>=15&&Temp<=25)//It'sRainy
{
  Weather =
  "Rainy";tft.setCursor(0,0);tft.prin
  t("DriveSafe:)");tft.setTextSize(2
  );tft.setCursor(0,40);tft.print("Sli
  pperyRoadAhead");tft.setCursor(
  0,70);
  tft.print("GoSlow..!");tft.setCu
  rsor(0,100);tft.setTextSize(3);t
  ft.print("SpeedLimit:40");
```

```
    delay(3000);tft.fillScr
    een(Black);
  }
  else
  {
    tft.setCursor(0,0);tft.print("Dr
    iveSafe!!");tft.setCursor(0,30)
    ;tft.print("SpeedLimit:60");del
    ay(3000);tft.fillScreen(Black);
  }
  tft.fillScreen(Black);
}



/*TrafficWarningSystem*/


voidtraffic_warning(inttdata)
{
  tft.fillScreen(Black);
```

```
if (tdata ==0)
{
  tft.setCursor(0,0);tft.print("Dri
  veSafe:)");
  //tft.setTextSize(2);tft.setCurs
  or(0,40);tft.print("TrafficAhea
  d..");tft.setCursor(0,80);
  //tft.setTextSize(3);tft.print("D
  riveCarefully!");delay(3000);tf
  t.fillScreen(Black);
}
if (tdata ==1)
{
  tft.setCursor(0,0);tft.print("Dri
  veSafe:)");tft.setTextSize(2);tf
  t.setCursor(0,40);tft.print("Tra
  fficAhead..");tft.setCursor(0,8
  0);
```

```
    //tft.setTextSize(3);tft.print("Tak
    eDiversion--
    >");delay(3000);tft.fillScreen(Bl
    ack);
  }
}



/*ConstructionWarningSystem*/


voidconstruction_warning(intcdata)
{
  tft.fillScreen(Black);i
  f (cdata ==0)
  {
    tft.setCursor(0,0);tft.print("Drive
    Safe:)");tft.setTextSize(2);tft.set
    Cursor(0,40);tft.print("Constructi
    onAhead..");tft.setCursor(0,80);
```

```
    tft.setTextSize(3);tft.print("Dr
    iveCarefully..!");delay(2000);t
    ft.fillScreen(Black);
  }
  if (cdata ==1)
  {
    tft.setCursor(0,0);tft.print("Drive
    Safe:)");tft.setTextSize(2.5);tft.se
    tCursor(0,40);tft.print("Construct
    ionAhead..");tft.setCursor(0,80);t
    ft.setTextSize(2.5);tft.print("Tak
    eDiversion<--
    ");delay(2000);tft.fillScreen(Blac
    k);
  }
}
```

```
/*School, HospitalWarningSystem*/


voidservice_warning(intsdata)
{
  tft.fillScreen(Black);i
  f (sdata == 0)
  {
    tft.setCursor(0,0);tft.print("Dr
    iveSafe:)");tft.setTextSize(2);t
    ft.setCursor(0,40);tft.print("Sc
    hoolAhead..");tft.setCursor(0,
    80);tft.setTextSize(3);
    tft.print("DriveCarefully.!\nNoHorn!");dela
    y(2000);
    tft.fillScreen(Black);
  }
  if (sdata == 1)
  {
    tft.setCursor(0,0);
```

```
    tft.print("DriveSafe:)");tft.setTextSi
    ze(2.5);tft.setCursor(0,40);tft.print("
    HospitalAhead..");tft.setCursor(0,80
    );tft.setTextSize(2.5);
    tft.print("DriveCarefully.!\nNoHorn!");dela
    y(2000);
    tft.fillScreen(Black);
  }
}
```

Node–RedDashboard(Flow)Link-https://node-red-dsb.eu-gb.mybluemix.net/red/#flow/c8f5c2e4125f08cb

Node–RedDashboard(UI)Link-https://node-red-dsb.eu-gb.mybluemix.net/ui/#!/0?socketid=fsJfHymZb0JMNE0bAAAD

Node–RedDashboard(Webpage)Link-https://node-red-dsb.eu-gb.mybluemix.net/simple

GitHubProjectLink-https://github.com/IBM-EPBL/IBM-Project-43785-1660719573

VideoDriveLink-
https://drive.google.com/drive/folders/1KnLe_wOO9nI6Aw2jGRKzIU6zvHhYKSt3?usp=sharing