IOT PHASE 3

Development part 1

Topic: Traffic control management systems

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INTRODUCTION

- In an old automatic traffic controlling a traffic light uses timer for every phase.
- Using electronic sensors is another way in order to detect vehicles, and produce signal that to this method the time is being wasted by a green light on an empty road.
- Traffic congestion also occurred while using the electronic sensors for controlling the traffic.
- All these drawbacks are supposed to be eliminated by using image processing. We propose a system for controlling the traffic light by image processing.
- The vehicles are detected by the system through images instead of using electronic sensors embedded in the pavement.

INTRODUCTION

- A camera will be placed alongside the traffic light.
- It will capture image sequences.
- Image processing is a better technique to control the state change of the traffic light.
- It shows that it can decrease the traffic congestion and avoids the time being wasted by a green light on an empty road.
- It is also more reliable in estimating vehicle presence because it uses actual traffic images.
- It visualizes the practicality, so it functions much better than those systems that rely on the detection of the vehicles' metal content.

REQUIRED COMPONENTS

- Raspberry Pi
- Camera
- Yellow green and red indicators
- Ultrasonic sensors
- ThingSpeak- iot platform
- Smart counter unit

SMART COUNTER UNIT

- This unit counts the number of vehicle passing on the road.
- Hardware and system code make this unit smart i.e. capable of counting two wheeler and four wheeler vehicles separately per minute.
- This unit also counts the total number of vehicles.
- Unit uses separate two counters for two type of vehicles i.e. two wheeler and four wheeler.
- Prototype road is made in such a way that the smart counter unit can count vehicle counts individually.

RASPBERRY PI

- System is using raspberry pi 3 B+ model as a controller. Raspberry pi is used to perform operations and control the system flow.
- Reference [6] the Raspberry Pi 3 Model B+ is the latest product in the Raspberry Pi 3 range.
- ¨ Broadcom BCM2837B0, Cortex-A53 (ARMv8) 64-bit SoC @ 1.4GHz
- ¨ 1GB LPDDR2 SDRAM
- ¨ 2.4GHz and 5GHz IEEE 802.11.b/g/n/ac wireless LAN, Bluetooth 4.2, BLE
- ¨ Gigabit Ethernet over USB 2.0 (maximum throughput 300 Mbps)
- ¨ Extended 40-pin GPIO header
- ¨ Full-size HDMI
- ¨ 4 USB 2.0 ports

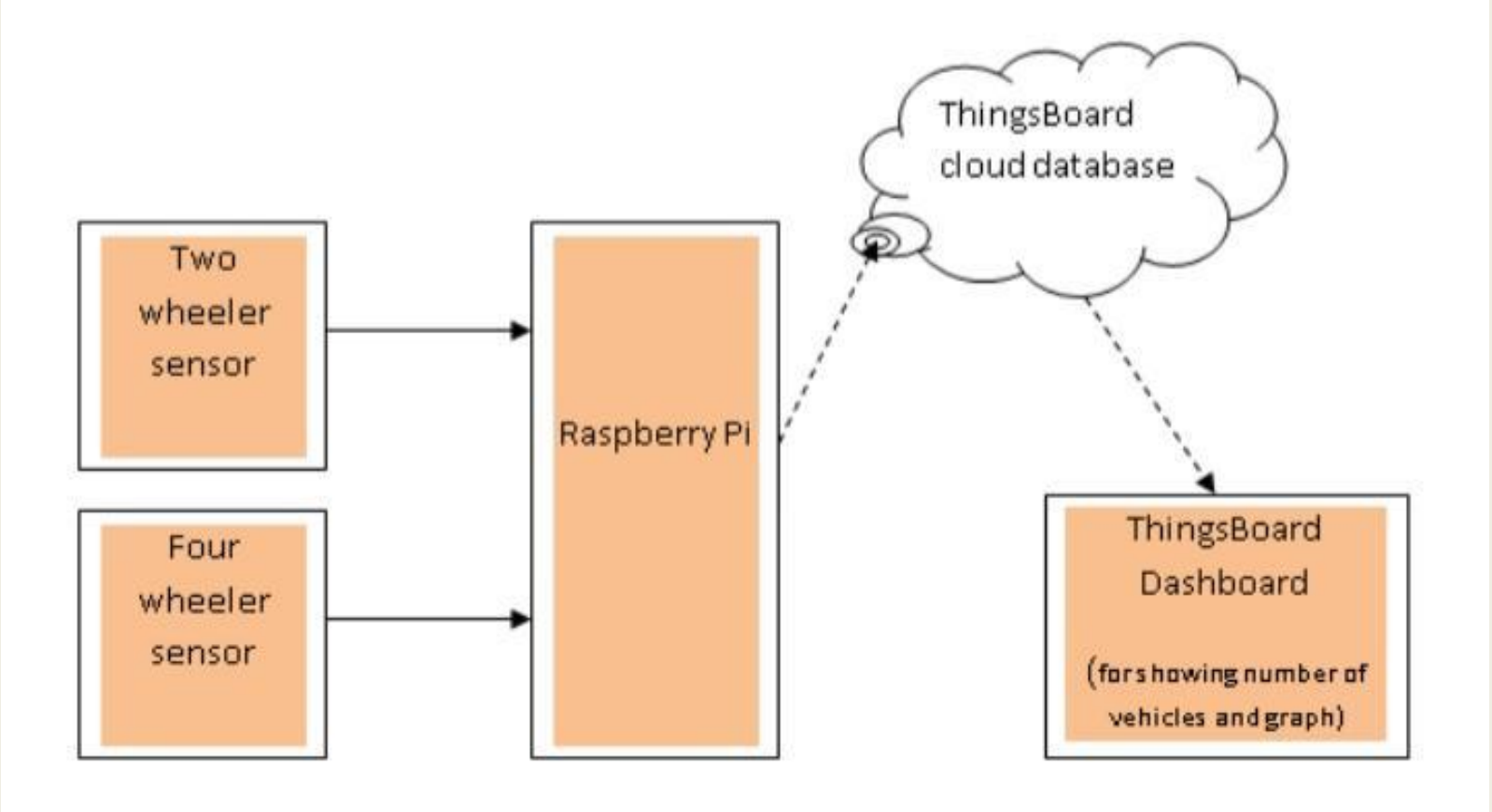
RASPBERRY PI

- ¨ Extended 40-pin GPIO header
- ¨ Full-size HDMI
- ¨ 4 USB 2.0 ports
- ¨ CSI camera port for connecting a Raspberry Pi camera
- ¨ DSI display port for connecting a Raspberry Pi touchscreen display
- ¨ 4-pole stereo output and composite video port
- ¨ Micro SD port for loading your operating system and storing data
- ¨ 5V/2.5A DC power input
- ¨ Power-over-Ethernet (PoE) support (requires separate PoE HAT)

System Implementation

- System uses hardware comprising of counting unit, WiFi enabled raspberry pi, LED screen.
- Software has python code to control the flow through raspberry pi and ThingsBoard open source IOT platform.

BLOCK DIAGRAM



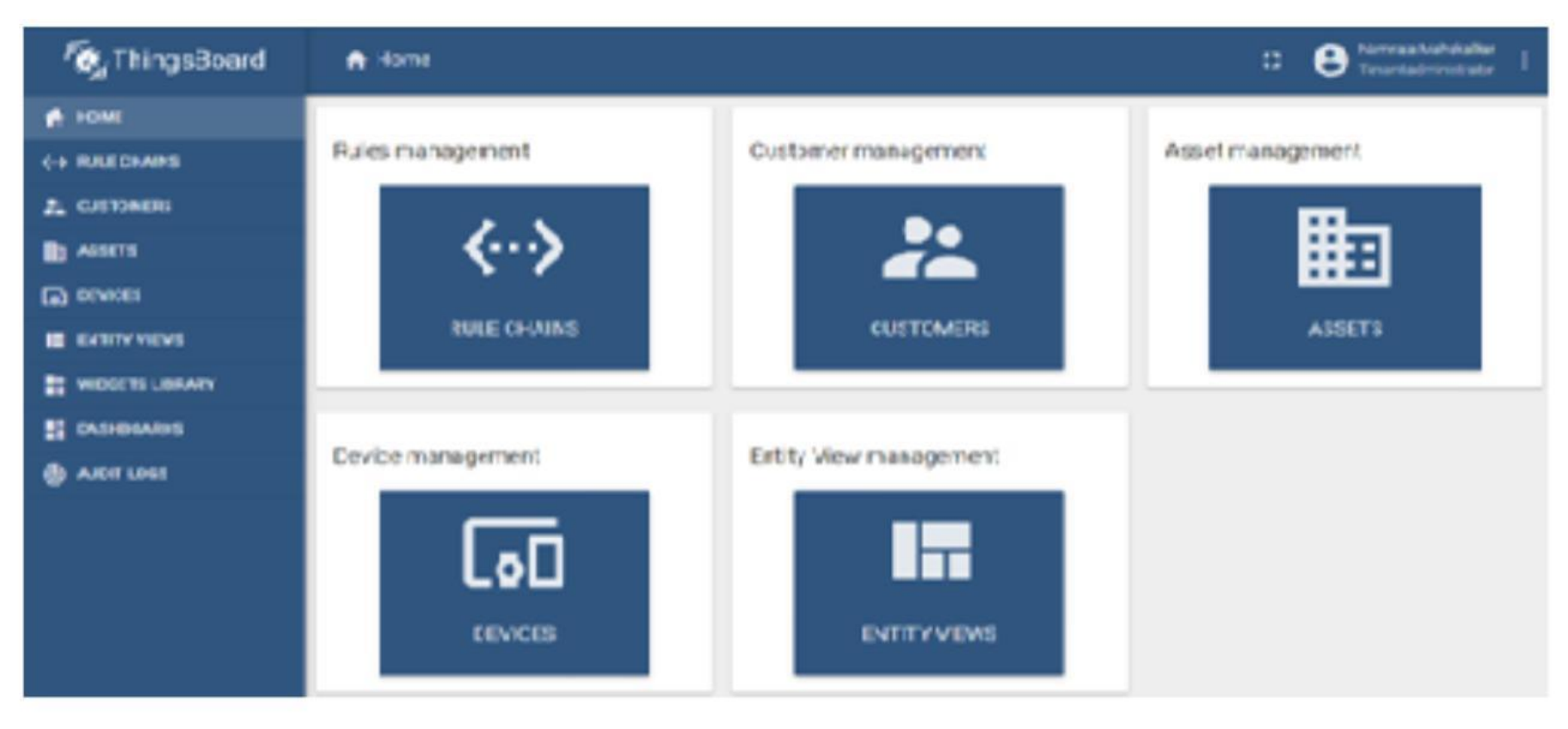
STEPS

- Sensor sense the data and send to the raspberry pi.
- Raspberry pi increment the counter value with the help of python script.
- Raspberry pi is WiFi enabled and the data transmitted over MQTT to the ThingsBoard dashboard via internet cloud.
- ThingsBoard provide the user friendly interface. User has to first create the account on ThingsBoard.
- All the setup related information is given in reference .

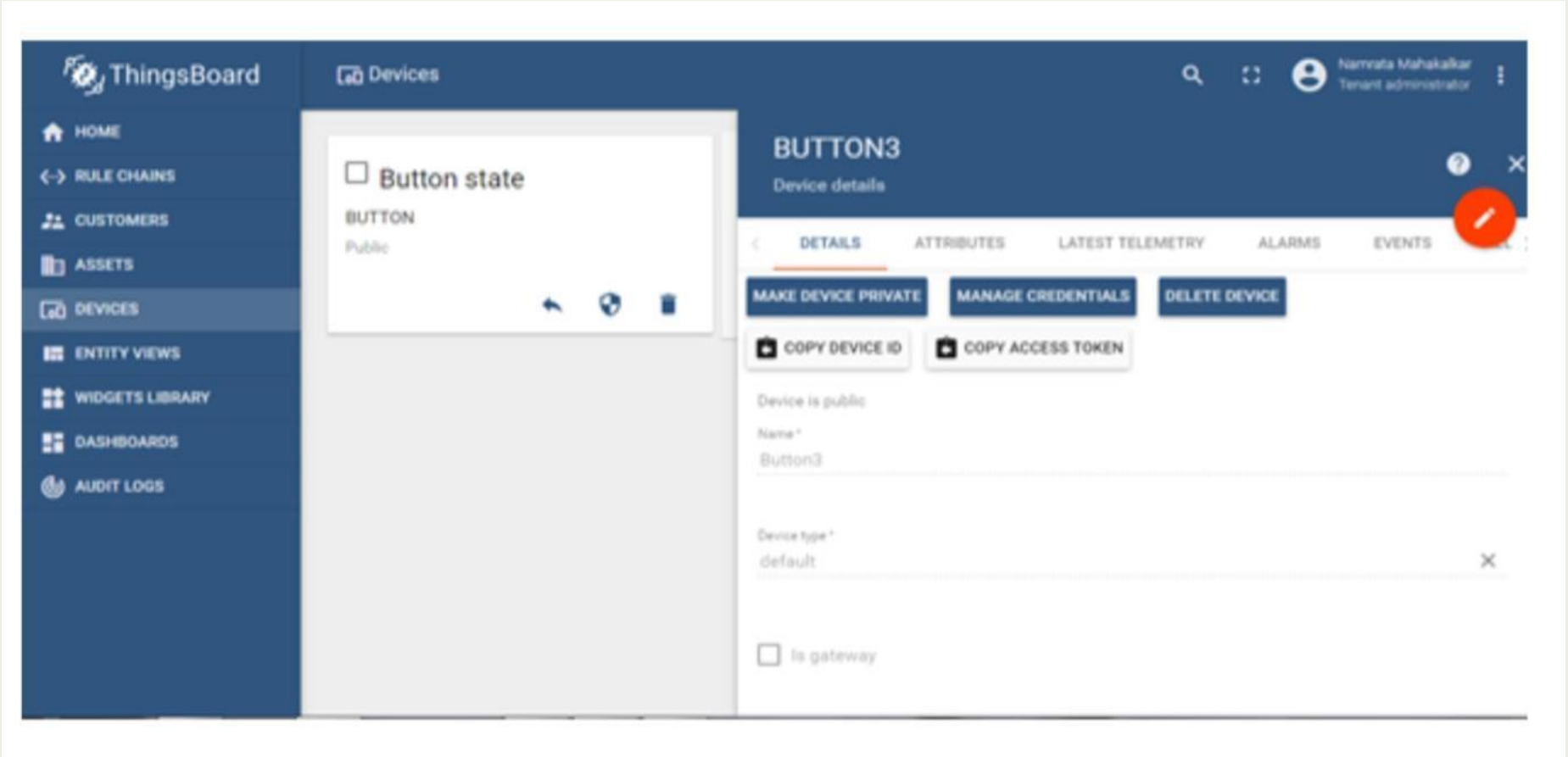
STEPS

- User can create the device, dashboard, component linking defining relationship among them.
- User can also configure and see various type of graphs and can attach to the devices so that analysis becomes easy.
- User can even set the permission for different customer to different devices.
- User can also make the device as public so anyone can access the information with the help of given link.

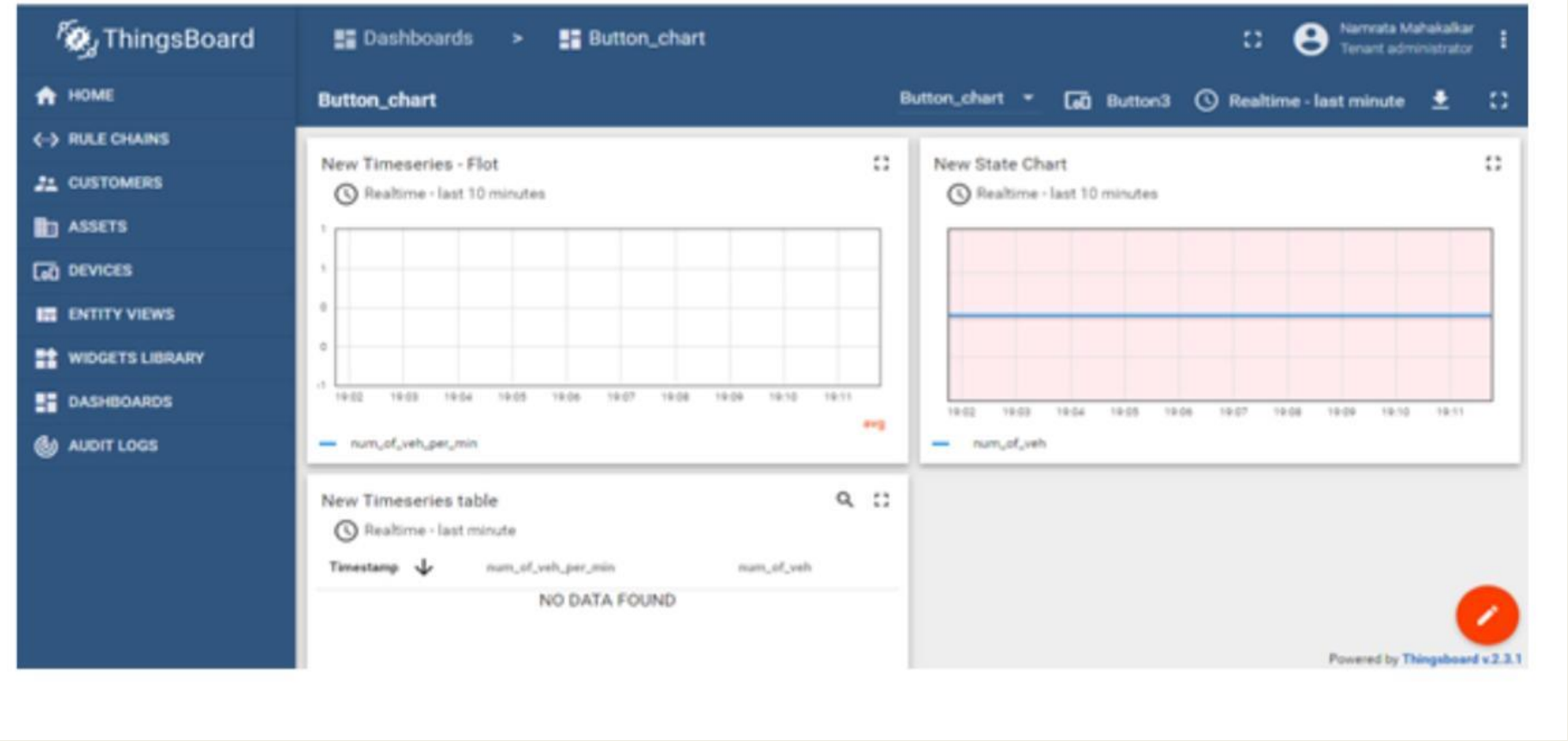
ThingsBoard: Home page



ThingsBoard: Create a new device

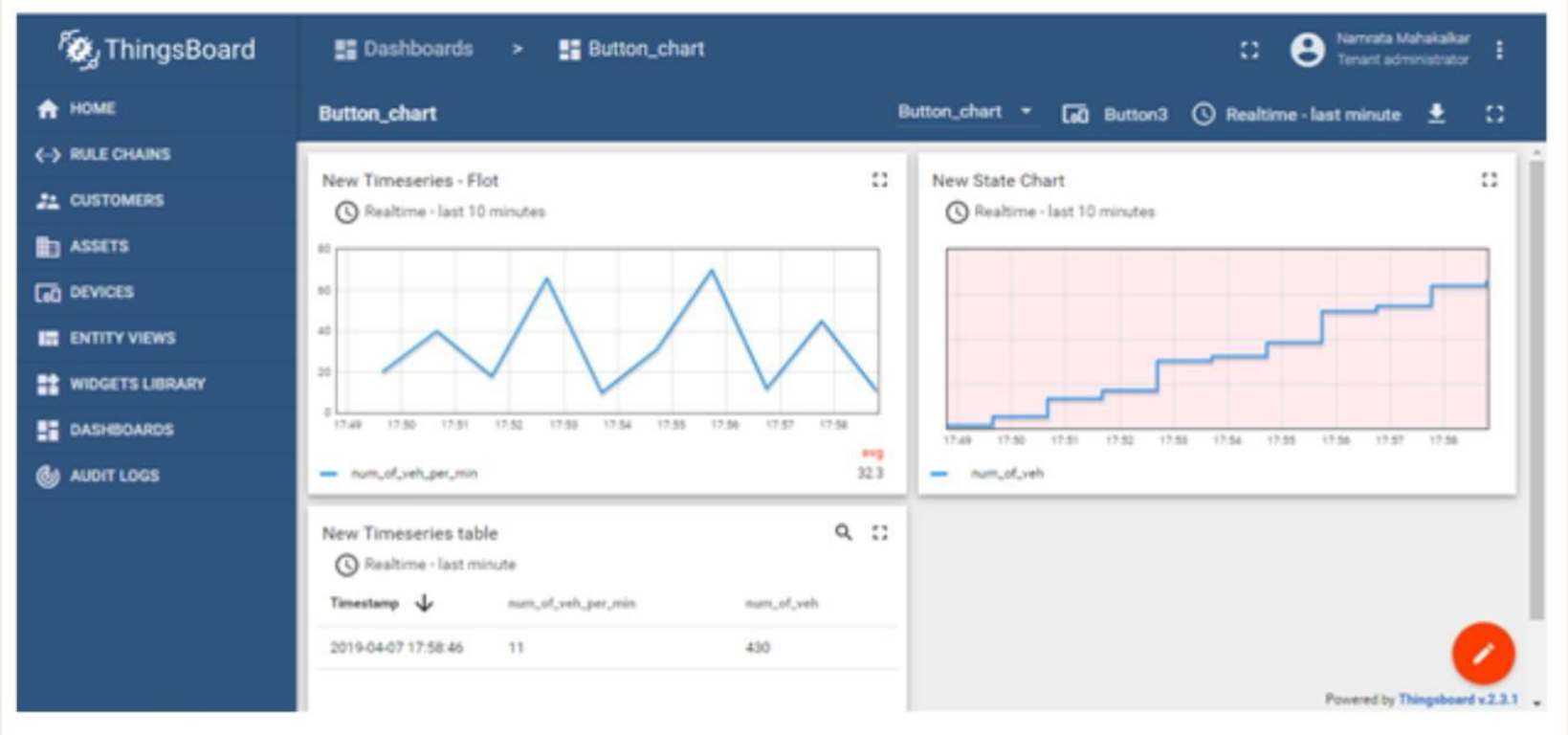


ThingsBoard: Create a new dashboard



Result on ThingsBoard dashboard

- Here two charts for the number of vehicle per minute and number of total vehicle passed with time are shown respectively.
- Third chart is a card shows number of vehicle per minute in numerical values.



Python code

```
mqtt.Client.connected_flag=False#create flag in class
mqtt.Client.suppress_puback_flag=False
client = mqtt.Client("python1") #create new instance
#client.on_log=on_log
client.on_connect = on_connect
client.on_disconnect = on_disconnect
client.on_publish = on_publish
broker="demo.thingsboard.io"
port =1883
topic="v1/devices/me/telemetry"
#need to edit user name
username="xyx" #device house --- Enter your own user name
password=""
```

```
if username !="":
pass
client.username_pw_set(username, password)
client.connect(broker,port) #establish connection
while not client.connected_flag: #wait in loop
client.loop()
time.sleep(.1)
time.sleep(.3)
data=dict()
# set GPIO24 as an output (LED)
#for i in range(100):
while True:
num_of_veh_per_min= 0
for i in range(6000): # the counter is incrementing every 10 mSec. the data is updated every 60 Sec i.e. every 1 min. Hence 6000 * 10 mSec = 1 min
```

```
channel=GPIO.wait_for_edge(3, GPIO.RISING, timeout= 10)
# wait if a vehicle passes with a time out of 10mSec - debounce time
if channel is None:
if i%100 == 0: # print the timer value after every second beacuse printing timer value every 10mSec increases delay
print('Data will be uploaded after ',60 - i/100,' Seconds')
else:
num_of_veh = num_of_veh +1 # increment the total number of vehicles
num_of_veh_per_min=num_of_veh_per_min+1 # increment the vehicle per min count
print("Number of vehicle",num_of_veh) # print the total numner of vehicle counted till now
time.sleep(0.01)
data["num_of_veh"]=num_of_veh
data["num_of_veh_per_min"]=num_of_veh_per_min
data_out=json.dumps(data) #create JSON object
print("publish topic",topic, "data out= ",data_out)
ret=client.publish(topic,data_out,0) #publish
client.loop()
client.disconnect()
```

Conclusion

- This project presents an Image Processing Based Intelligent Traffic Control System by using Raspberry pi which we are going to implement using PYTHON Programming Language.
- “Image Processing Based Intelligent Traffic control using Raspberry Pi” technique that we propose overcomes all the limitations of the earlier (in use) techniques used for controlling the traffic.
- Earlier in automatic traffic control use of timer had a drawback that the time is being wasted by green light on the empty.
- This technique will avoid all this problem.