Smart Bus Management System

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***Abstract*— Smart bus management system is based on monitoring the bus inside bus stand and in order to notify the higher officials about the departure of a bus to the particular place from a lane in time without any delay. If there is a delay a warning is given using an alarm to a bus driver and the officials regarding that delay. Our system consists of the components such as Global Position System (GPS) model attached to the bus in order to track the location of the bus inside the bus stand. A Microcontroller is used to control overall operation. An Internet of things (IoT) cloud is used to store the data which is being transferred from the GPS module through IOT Gateway. As the Gateway used to connect cloud and GPS module. A Google map (GMap) is used to locate the bus. While bus enters the bus stand it is made to occupy on the allotted lane. A time is fixed for the bus to be in the lane. It is stored in the database. If a bus occupies that lane more than the allotted time then a notification is given to the driver, the higher official and an alarm is given in bus. This monitoring by the Higher Official is done by an Android App which is installed on the Officials mobile. This system avoids the traffic inside the bus stand during the peak hours. This makes the people aware of the time of departure of each bus from the lane to the particular place. This system also maintains a secure database which can be used for the future purpose and it is cost-efficient.**

Keywords—GPS,Internet of things,Google map.

I. INTRODUCTION

In the daily operation of a bus management system, the movement of vehicles is affected by uncertain conditions as the day progresses, such as traffic congestion, unexpected delays, and randomness in passenger demand, irregular vehicle dispatching times, and incidents. In a real-time setting, researchers have devoted significant effort to developing flexible control strategies, depending on the specific features of public transport systems. This project focuses on the implementation of a Real Time bus monitoring system inside the bus station, by installing GPS devices on city buses. The Real-Time Bus Monitoring system is a standalone system designed to display the real-time location(s) of the buses in the city. This research will enable the tracking devices to obtain GPS data of the bus locations, which it will then transfer it to the centralized control unit and depict it by activating the symbolic representation of buses in the approximate geographic positions on the Google map. Specific software's will be used to interface the data received to the map.

II. HARDWARE AND SOFTWARE DESCRIPTION

A. Internet Of Things

The internet of things (IoT) is a internetworking of physical components. The interconnection via the Internet of computing devices embedded in everyday objects, enabling them to send and receive data. IoT is a community of sensors where information is exchanged, using extraordinary connectivity protocols, with systems. The exchange of the data can be bi-directional between sensors and structures. The internet of things refers to the ever-developing network of physical gadgets that feature an IP cope with for internet connectivity and the communique that occurs between these items and other internet-enabled gadgets and structures, M2M / IoT software and services. a system to machine (M2M) and internet of factors (IoT) projects observe a commonplace technological paradigm: smart devices, seamlessly connected to the net, allow remote offerings and provide actionable records.

B. Server

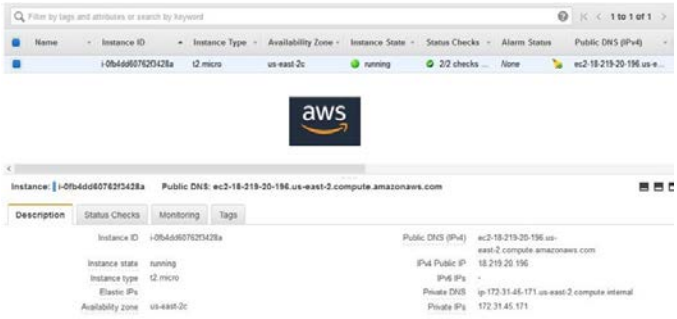

Fig. 1. *AWS Server*

Amazon Web Services (AWS) is a comprehensive, evolving cloud computing platform provided by Amazon.com.

Cloud computing is the on-demand delivery of compute power, database storage, applications, and other IT resources through a cloud services platform via the internet

Specification:

Hostname	-	EC2AMAZ-N6TJI60
Instance ID	-	i-0c111b63621c86ab3
Public IP Address	-	52.14.133.188
Private IP Address	-	172.31.47.183
Instance Size	-	t2.micro
Availability Zone	-	us-east-2c
Architecture	-	AMD64
Total Memory	-	30 GB
RAM	-	1GB

C. Nodemcu

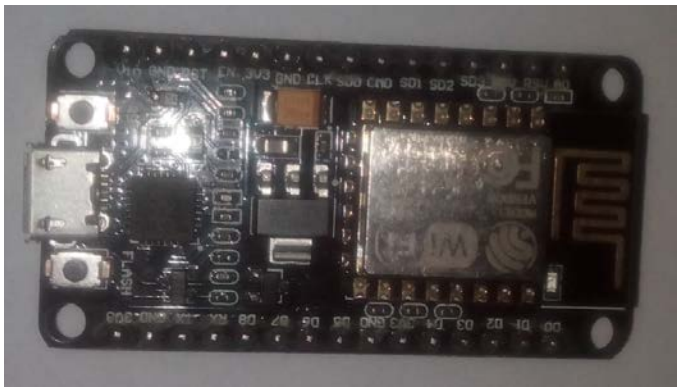

Fig. 2. *NodeMcu*

The NodeMCU is an open source software and hardware development environment that is built around a very inexpensive System-on-a-Chip (SoC) called the ESP8266. The ESP8266, contains all crucial elements of the modern computer: CPU, RAM, networking (Wi-Fi), and even a modern operating system and SDK

Specifications

- Wi-Fi Module – ESP-12E module similar to ESP-12 module but with 6 extra GPIOs.
- USB – micro USB port for power, programming and debugging
- Headers – 2x 2.54mm 15-pin header with access to GPIOs, SPI, UART, ADC, and power pins
- Misc – Reset and Flash buttons
- Power – 5V via micro USB port

Dimensions – 49 x 24.5 x 13mm

D. GPS Module

A GPS navigation device, GPS receiver, or actually GPS is a device this is able to receive statistics from GPS satellites after which to calculate the device's geographical function. using suitable software, the device may additionally show the location on a map, and it could provide instructions. The Global Positioning System (GPS) uses a global navigation satellite system (GNSS) made up of a community of no less than 24, but presently 30, satellites located into orbit through the U.S. Department of Defence.

A GPS device can retrieve from the GPS system region and time data in all weather situations, everywhere on or close to the Earth. A GPS reception calls for an unobstructed line of sight to 4 or extra GPS satellites and is an issue to terrible satellite tv for pc sign conditions. In tremendously bad sign situations, for example in urban areas, satellite signals may also exhibit multipath propagation where signals bounce off structures or are weakened by using meteorological situations. Obstructed traces of sight may additionally rise up from a tree canopy or interior a structure, which include a building, garage or tunnel. today, maximum standalone GPS receivers are used in motors. The GPS functionality of clever phones may also use assisted GPS (A-GPS) generation, which can use the base station or cell towers to provide the device vicinity monitoring functionality, especially while GPS signals are bad or unavailable. but, the cell community part of the A-GPS technology would not be to be had when the clever phone is out of doors the variety of the cell reception network, while the GPS factor might otherwise continue to be available.

Fig. 3. *GPS Module*

III. EXPERIMENTAL SETUP

A. Block Diagram

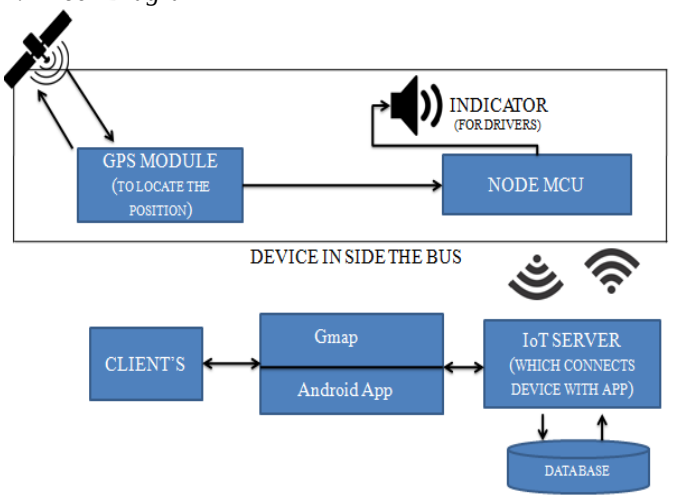

Fig. 4. *Block Diagramof the proposed system*

The proposed system consists of GPS module, NodeMcu, and buzzer. The GPS module is connected to NodeMcu and the NodeMcu is connected with a buzzer. NodeMcu connect the cloud server via Wi-Fi. The server connects the Google map and the data are stored in the database. Android app is used to monitor the bus location and also indicates the timing delay as a notification.

B. Flow Chart

A GPS module is fixed in a bus, that module collects the latitude and longitude of the current location where the bus is standing. The GPS data's are sent to cloud storage server through NodeMcu. The datum of location will be stored in cloud storage through NodeMcu. Latitude and longitude of that bus are taken from the server and locate in Google map. That location is checking for bus stand if it bus gets inside the stand the timer will ON. When the timer stops the bus location will match with the location of the bus stand, if bus remains inside the stand the buzzer will ON and a notification will send to the in-charge of that bus stand. The process will continuously update in the mobile application.

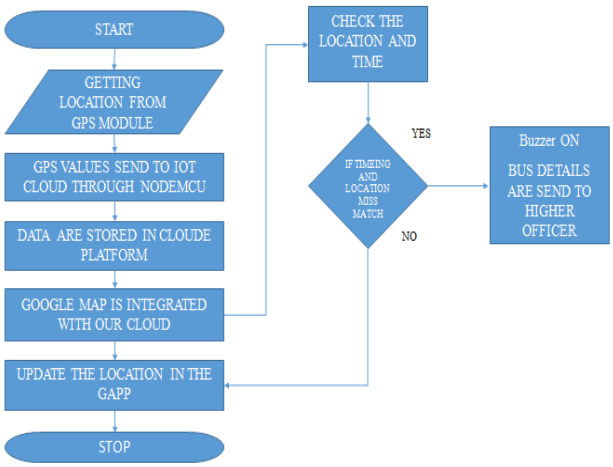

Fig. 5. *FLow chart of the proposed system*

C. Location Locking

Fig. 6. *Location Locking*

Location locking is the technique used to find the location of the bus which is in bus stand or not. This is done by collecting the latitude and longitude of a bus stand and stored in a database. When the bus's latitude and longitude will be compared with the database values if the comparison gets matched the bus remains inside the bus stand. If the comparison mismatched bus went outside the bus stand. This how the location locking is working.

D. Working

The GPS module is fixed inside in every bus. The latitude and longitude of that bus are continuously fetched by that module and that data is processed by NodeMcu. The processed data's are sent to the cloud server. The cloud server is connecting with Google map which gives the exact location of the bus. The user will able to track the bus. The latitude and longitude of the bus are fetching from the cloud server and compare with the location of the bus stand. This comparison will be used to find out that the bus is in the bus stand or not. When the bus will enter the bus stand, the timer will be ON. The bus will wait in bus stand over the time limit buzzer will start ringing until that bus will go outside the bus stand. And the details of that bus will send to the in-charge of that bus stand, Punishment will be awarded by him. Every month the bus details like places where bus travel, everywhere the bus rules are violated, and the fine amount awarded by the in-charge, those details are sent to the owner of that bus. There is an emergency OFF switch is placed in the application which is provided for that in-charge of the bus stand. That switch is used for shut down the whole system in any emergency cases.

IV. RESULTS AND DISCUSSION

Thus, the proposed system collects data from the satellite via GPS, using IOT and provides the location details of the vehicle in and around the locality through an android application. A notification will send to the in-charge of that bus stand when a bus will violating rules and a buzzer is fixed inside the bus will start ringing.

A. Excel Display

	A	B	C	D	E	F
1	Bus_no	Bus_name	In_time	Out_time	Command	Status
2	1	SNB	01:00:00	01:05:00	Bus Enter	exit properly
3	2	SRT	01:06:00	01:11:00	Bus Enter	not exit properly
4						

Fig. 7. Excel sheet display

This excel sheet display the In time, Out time and proper status of that bus.

B. Notification

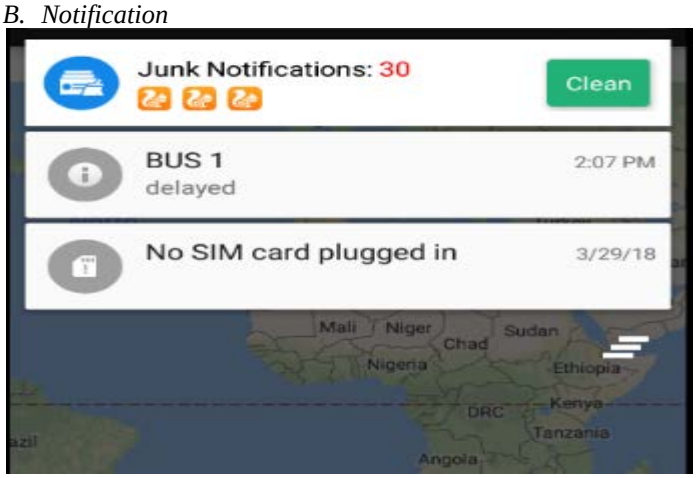

Fig. 8. *Notification*

A notification is pushed in the mobile of that in-charge in the bus stand to identify the bus will violating the rules inside the bus stand.

C. Android app display

Fig. 9. *Appscreen 1*

Fig. 10. *Appscreen 2*

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