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Real Time Bus Tracking and Fuel Monitoring System Using IoT Technology

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ABSTRACT

Reliability in public transport is of great importancetoday. Millions of people travelling by public buses waste a lot oftime waiting at bus stops. This paper focuses on presenting ato tackle the said problem by harnessing IoT technologystack. If the people travelling get accurate real time location of thebuses along with estimate time for arrival at bus stop based on thereal time traffic conditions, it will facilitate an overall increase inreliability on the public buses. The solution proposed in this paperinvolves using the existing internet enabled devices on the bus (likethe e-ticketing system) or a simple android tablet to capture thereal time location and send to the servers. Accessing this locationdata from servers will be facilitated by Representational StateTransfer (REST) APIs which users can access through androidapplication, SMS or web-portals. The system proposed will havedistributed architecture in order to tackle high number of requestsfrom users.Although there are existing solutions which harness theuse of Global Positioning System (GPS) for bus tracking, theyaren't ready to handle high demand on the backend which will existin the near future. We have addressed this problem. The primarycontribution of this paper is that it shows that a backend based onMessage Queue Telemetry Transport (MQTT) instead of thetraditionally used Hypertext transfer protocol (HTTP) based RESTwill be light weight, data efficient and scalable. We have proposedand implemented the backend as well as the front end required forthe tracking system and presented the improvements.

Keywords: Internet of Things, Smart transport, Location based, services, Android, MQTT, HTTP, GPS, smart phones, publictransport, bus tracking

I. INTRODUCTION

Transportation is a major pain area for cities today. With the ever increasing load on public transport systems, it is really necessary to increase efficiency in these systems. Due to extreme traffic conditions, over-crowding and many other similar issues, public buses lack punctuality and reliability. There is a dire need to tackle this issue. The required solution should not only facilitate improvement in the services, but should also be ad riving factor for increase in truston the public bust rans port systems. Reliability in public transport will be facilitated when the traveller accurately knows when a bus will arrive to the bus stop or when will the bus reach the destination. The solution proposed in this paper harnesses the real time location of the buses tocalculate the estimated time for reaching a particular position. By saving location data on the server along with corresponding timestamps, we can estimate the time for the bus to arrive as a bus stop, or time to reach a destination, using services like Google maps [1].This paper presents a simple and cost effective solution to make public transportation services 'smart'. The paper will present the concept, technology stack, components and the outcomes of implementing the solution. The primary goal of the

proposed solution is to minimize the costs involved in implementation and to create a backend that can scale up easily with increase in demand. The location data collected from the buses should be accessible by users as well as developers to harness the collected data to create more value from collected data.

II. PROPOSED SYSTEM

Our system provides the relevant information regarding all the bus numbers going from users source & destination along with the route details, real time location. Generally our system is operated by GPS which is attached with the bus. Firstly GPS receives the satellite signals and then the position co-ordinates with latitude and longitude are determined by it. The location is determined with the help of GPS and transmission mechanism. After receiving the data the tracking data can be transmitted using any wireless communications systems. A real time clock (RTC) is a computer clock that keeps track of the current time. In this project Arduino UNO is a microcontroller to program with RTC. Based on IoT the students/staffs can access this information of a bus based on users source and destination through the android application. Our proposed system gives the real time location of bus. Smart bus tracking technology is advantageous for tracking and monitoring a college bus.

Block diagram of transmitter:

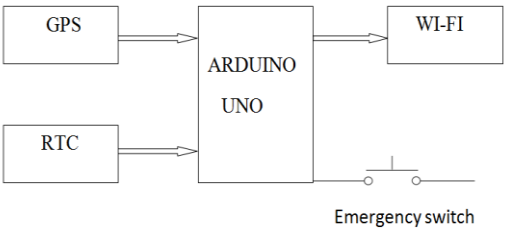

Figure 1

Block diagram of receiver:

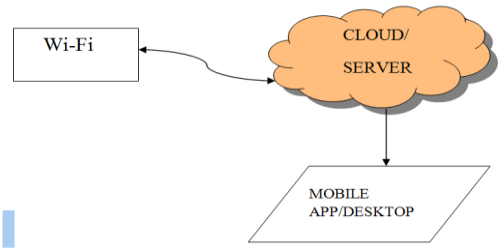

Figure 2

1.LCD

This is an LCD Display designed for E-blocks. It is a 16 character, 2-line alphanumeric LCD display connected to a single 9-way D-type connector. This allows the device to be connected to most E-Block I/O ports. The LCD display requires data in a serial format, which is detailed in the user guide below. The display also requires a 5V power supply. Please take care not to exceed 5V, as this will cause damage to the device. The 5V is best generated from the E-blocks Multi programmer or a 5V fixed regulated power supply. The 16 x 2 intelligent alphanumeric dot matrix displays is capable of displaying different characters and symbols. A full list of the characters and symbols is printed on pages 7/8

Figure 3

1.1 ADC

The Analog-to-Digital (A/D) Converter module has five inputs for the 28-pin devices and eight for the 40/44-pin devices. The conversion of an analog input signal results in a corresponding 10-bit digital number. The A/D module has high and low-voltage reference input that is software

selectable to some combination of VDD, VSS, RA2 or RA3. The A/D converter has a unique feature of

being able to operate while the device is in Sleep mode. To operate in Sleep, the A/D clock must be derived from the A/D's internal RC oscillator.

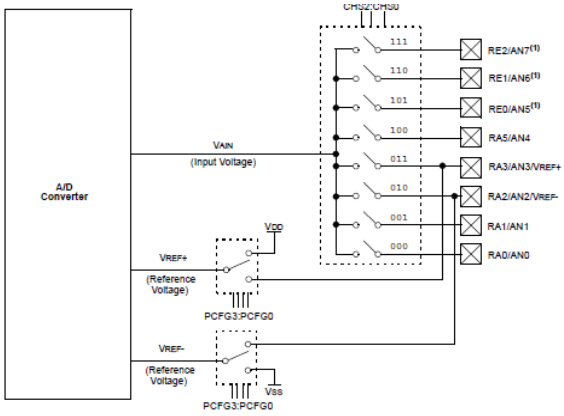

Figure 4

1.2 UART(Universal Asynchronous Receiver Transmitter)

start|< five to eight data bits >| stop bit(s)

0 ---- - - - - - - - - - - Space (logic low)

S	1	2	3	4	5	6	7	8	S	S

1 - - - - - - - - - - - -------- Mark (logic high)

In asynchronous transmitting, teletype-style UARTs send a "start" bit, five to eight data bits, least-significant-bit first, an optional "parity" bit, and then one, one and a half, or two "stop" bits. The start bit is the opposite polarity of the data-line's idle state. The stop bit is the data-line's idle state, and provides a delay before the next character can start.

In synchronous transmission, the clock data is recovered separately from the data stream and no start/stop bits are used. This improves the efficiency of transmission on suitable channels since more of the bits sent are usable data and not character framing. An asynchronous transmission sends nothing over the interconnection when the transmitting device has nothing to send; but a synchronous interface must send "pad" characters to maintain synchronism between the receiver and transmitter. The usual filler is the ASCII "SYN" character

1.3 MOTOR DRIVE

The L293D is designed to provide bidirectional drive currents of up to 600-mA at voltages from 4.5 V to 36 V. devices are designed to drive inductive loads such as relays, solenoids, dc and bipolar stepping motors, as well as other high-current/high-voltage loads in positive-supply applications. All inputs are TTL compatible. Each output is a complete totem-pole drive circuit, with a Darlington transistor sink and a pseudo-Darlington source. Drivers are enabled in pairs, with drivers 1 and 2 enabled by 1,2EN and drivers 3 and 4 enabled by 3,4EN. When an enable input is high, the associated drivers are enabled, and their outputs are active and in phase with their inputs. When the enable input is low, those drivers are disabled, and their outputs are off and in the high-impedance state. With the proper data inputs, each pair of drivers forms a full-H (or bridge) reversible drive suitable for solenoid or motor applications.

The Device is a monolithic integrated high voltage, high current four channel driver designed to accept standard DTL or TTL logic levels and drive inductive loads (such as relays solenoids, DC and stepping motors) and switching power transistors. To simplify use as two bridges each pair of channels is equipped with an enable input. A separate supply input is provided for the logic, allowing operation at a lower voltage and internal clamp diodes are included. This device is suitable for use in switching applications at frequencies up to 5 kHz. The L293D is assembled in a 16 lead plastic package which has 4 center pins connected together and used for heat sinking

The L293DD is assembled in a 20 lead surface mount which has 8 center pins connected together and used for heat sinking.The methodology of this project design can be divided into two sections,

hardware and software implementation.It is advantageous as it offers reliability and privacy on both sides. It is authenticated and encrypted on the receiver side, hence it offers only the person concerned to view the details .Necessary action can be taken in short span of time in the case of emergency conditions such as elderly person falling sick, military areas, smart homes, offices, industries etc. ,Future work is to locate the number of persons located exactly on that area and their position so that accurate information can be obtained on the receiver side.

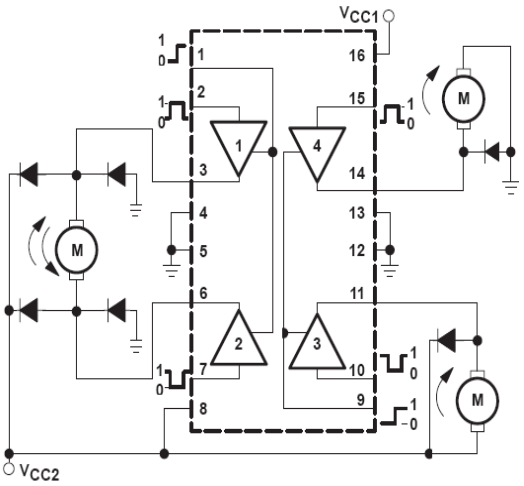

Figure 5

1.4 IR SENSOR:

An infrared sensor is an electronic device, that emits in order to sense some aspects of the surroundings. An IR sensor can measure the heat of an object as well as detects the motion. Usually in the infrared spectrum, all the objects radiate some form of thermal radiations. These types of radiations are invisible to our eyes, that can be detected by an infrared sensor.

The emitter is simply an IR LED (Light Emitting Diode) and the detector is simply an IR photodiode which is sensitive to IR light of the same wavelength as that emitted by the IR LED. When IR light falls on the photodiode, The resistances and these output voltages, change in proportion to the magnitude of the IR light received.

Figure 6

1.5 LDR SENSOR

A light dependent resistor works on the principle of photo conductivity. Photo conductivity is an optical phenomenon in which the materials conductivity is increased when light is absorbed by the material. When light falls i.e. when the photons fall on the device, the electrons in the valence band of the semiconductor material are excited to the conduction band. These photons in the incident light should have energy greater than the band gap of the semiconductor material to make the electrons jump from the valence band to the conduction band. Hence when light having enough energy strikes on the device, more and more electrons are excited to the conduction band which results in large number of charge carriers. The result of this process is more and more current starts flowing through the device when the circuit is closed and hence it is said that the resistance of the device has been decreased.

Figure 7

1.6FUEL SENSOR

Level sensors detect the level of liquids and other fluids and powders that exhibit an upper free surface. Substances that flow become essentially horizontal in their containers (or other physical boundaries) because of gravity whereas most bulk solids pile at an angle of repose to a peak. There are many physical and application variables that affect the selection of the optimal level monitoring method for industrial and commercial processes. The selection criteria include the physical: phase (liquid, solid or slurry), temperature, pressure or vacuum, chemistry, dielectric constant of medium, density (specific gravity) of medium, agitation (action), acoustical or electrical noise, vibration, mechanical shock, tank or bin size and shape.

Figure 8

2.Working with PIC MICROCONTROLLER

This illustration demonstrates to you best practices to catch and process pictures from pic microcontroller Board module utilizing the Support Package for pic microcontroller.

2.1 Introduction

Circumstances that we find ourselves in today in the field of microcontrollers had their beginnings in the development of technology of integrated circuits. This development has made it possible to store hundreds of thousands of transistors into one chip. That was a prerequisite for production of microprocessors, and the first computers were made by adding external peripherals such as memory, input-output lines, timers and other. Further increasing of the volume of the package resulted in creation of integrated circuits. These integrated circuits contained both processor and peripherals. That is how the first chip containing a microcomputer, or what would later be known as a microcontroller came about.

2.2 PIC MICROCONTROLLER

microcontrollers". RISC stands for Reduced Instruction Set Computer. Microcontrollers with von-Neumann's architecture are called 'CISC microcontrollers'. Title CISC stands for Complex Instruction Set Computer. Since PIC16F877 is a RISC microcontroller, that means that it has a reduced set of instructions, more precisely 35 instructions. All of these instructions are executed in one cycle except for jump and branch instructions. PIC16F87 usually reaches results of 2:1 in code compression and 4:1 in speed in relation to other 8-bit microcontrollers in its class

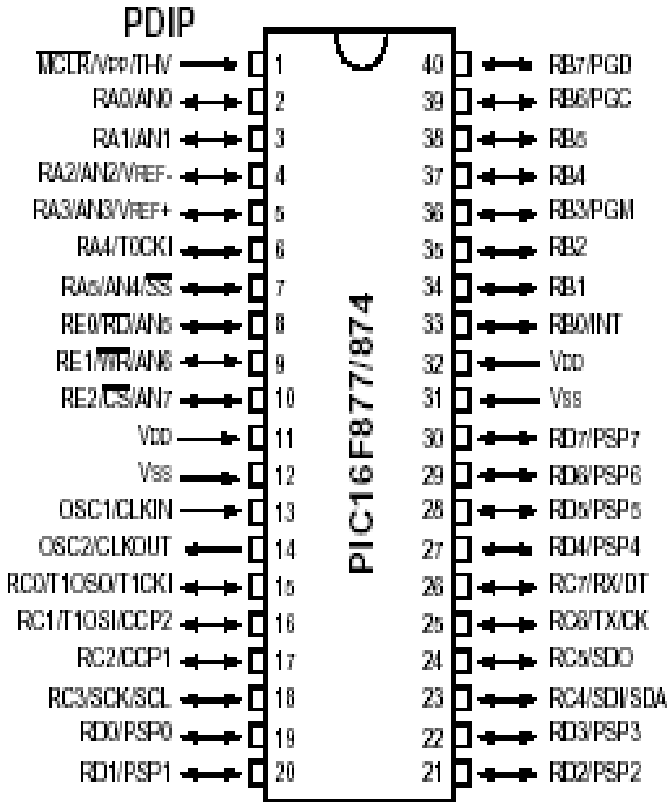

Figure 9

2.3 POWER SUPPLY

A power supply provides a constant output regardless of voltage variations."Fixed" three-terminal linear

regulators are commonly available to generate fixed voltages of plus 3 V, and plus or minus 5 V, 9 V, 12 V, or 15 V when the load is less than about 7 amperes.

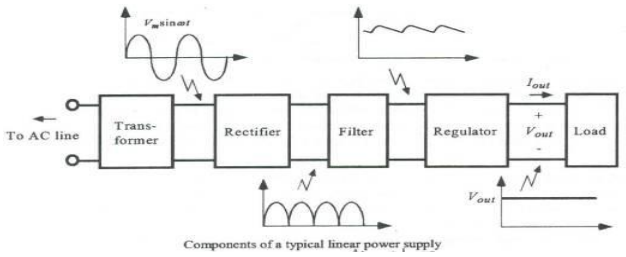

Figure 10

2.4 GPS WITH INTERNAL ANTENNA

The Global Positioning System (GPS) is a global navigation satellite system that provides location and time information in all weather conditions. The GPS operates independently of any telephonic or internet reception, though these technologies can enhance the usefulness of the GPS positioning information. GPS satellites transmit signal information to earth. This signal information is received by the GPS receiver in order to measure the user's correct position.

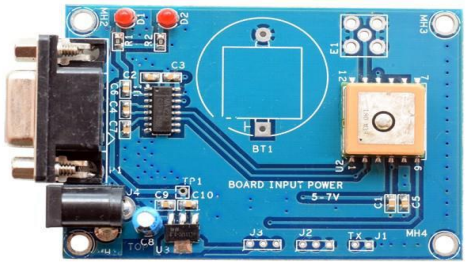

Figure 11

2.5 CRYSTAL OSCILATOR

A crystal oscillator is an electronic circuit that uses the mechanical resonance of a vibrating crystal of piezoelectric material to create an electrical signal with a very precise frequency. This frequency is commonly used to keep track of time (as in quartz wristwatches), to provide a stable clock signal for digital integrated circuits, and to stabilize frequencies for radio transmitters/receivers

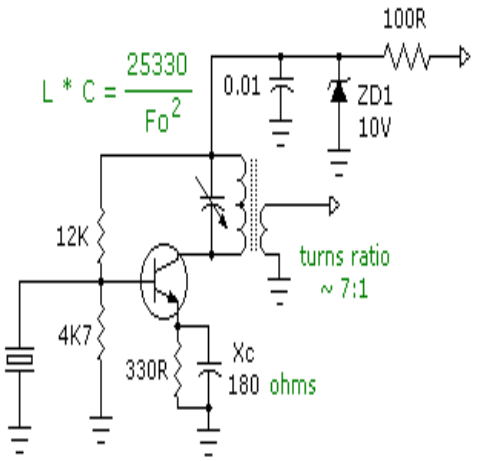

Figure 12

3.LIQUID CRYSTAL

A liquid crystal display (LCD) is an electro-optical amplitude modulator realized as a thin, flat display device made up of any number of color or monochrome pixels arrayed in front of a light source or reflector. It is often utilized in battery-powered electronic devices because it uses very small amounts of electric power.

Each pixel of an LCD typically consists of a layer of molecules aligned between two transparent electrodes, and two polarizing filters, the axes of transmission of which are (in most of the cases) perpendicular to each other. With no liquid crystal between the polarizing filters, light passing through the first filter would be blocked by the second (crossed) polarizer

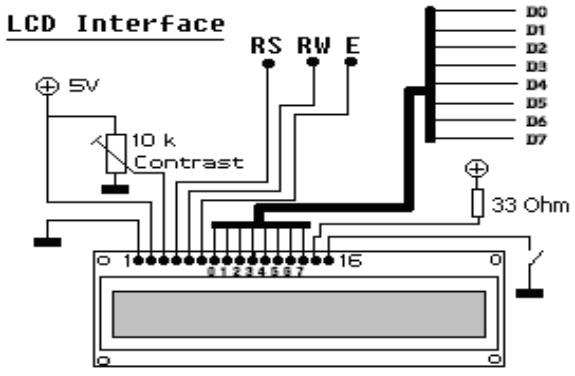

Figure 13

III. CONCLUSION

In this paper we have reviewed a various existing techniques of college bus tracking. By implementing this idea, we can improve the transportation safety and the quality of services to the college buses.

The system will have latest technology and optimized algorithms with moderate cost. The system may focus on accurate arrival time and position of the bus.

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