



Real Time School Bus Tracking System with Biometrics, GPS and GPRS using ARM Controller

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ABSTRACT: School bus tracking system is a service that gives real time notifications and updates about child location using GPS and Biometric identification from a few minutes before child boards the bus till the child reaches home safely. This system is integrated with high performance STM32 Arm controller. This project gives a methodology of client server communication using http protocol. Project introduces programming techniques to enrich the stability and consistency of a system. Programming System uses board support package generated by STM32 cube MX tool.

KEYWORDS: HTTP protocol, BSP (Board Support Package), Real-time, Biometric identification.

I.INTRODUCTION

HTTP is based on the client-server architecture model and a stateless request/response protocol that operates by exchanging messages across a reliable TCP/IP connection. An HTTP "client" is a program (Web browser or any other client) that establishes a connection to a server for the purpose of sending one or more HTTP request messages. An HTTP "server" is a program (generally a web server like Apache Web Server or Internet Information Services IIS, etc.) that accepts connections in order to serve HTTP requests by sending HTTP response messages. The request method indicates the method to be performed on the resource identified by the given Request-URI. The method is case-sensitive and should always be mentioned in uppercase. The following table lists all the supported methods in HTTP/1.

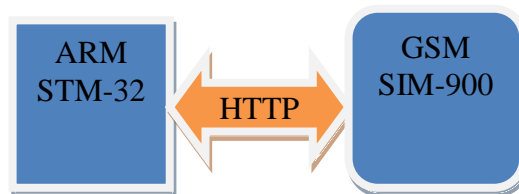


Fig.1 HTTP protocol between GSM and ARM controller

The protocol used for the communication between web server and web browser is Hyper Text Transfer Protocol or HTTP protocol. This protocol defines all the basic frame work of web communications by handling requests and also by providing control information to be transferred between browser and server. To obtain a web document, the browser and server should establish a connection at Port. Establish a connection. To open a web document, client and server should establish their connection to port. This is done by means of sockets. Client will open a socket and bound it on a port. If successful, a virtual document is created where we can read and write. This project for fast development of system BSP (Board support package) is used. STM32 cube tool is used to create BSP file. This STM32 cube tool generate keil compatible C file.

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II. RELATED WORK

Numerous approaches to vehicle tracking, monitoring and alerting system has been proposed so far. AnkitKesharwasni, VaishaliSadaphalt proposed system to overcome problem of public transportation. Wireless sensor network used for monitoring of bus transportation system and record of arrival time of buses at bus stops. The system is Detecting the delay and arrival time of bus at bus stops [2]. KunalMaurya, Mandip Singh and Neelu Jain proposed an anti-theft tracking system. Vehicle tracking system is real time system which is working on the GPS and GSM technology which provide the location of vehicle to the vehicle owner in the case of vehicle is stolen. It can also be used in wildlife tracking, asset tracking and in stolen vehicle recovery [2].Xing Jianping, Zhang Jun, et al. proposed GPS real time vehicle alarm monitoring and alerting system used GPRS and CSD on the embedded system. Compared with the conventional single mode of GPRS, this method makes up the disadvantage of the high time delay and the incertitude of the time delay in data transmission [1].Transportation is a very important shared resource that enabling efficient and effective use of resources like GSM modem and GPS unit that can be installed on a vehicle and used to track its location. This system is located on the bus and GSM modem communicates via SMS with a serverconnected to a basic GSM phone [1].R. Anil kumar, G, Jyothirmal and K. Rameshbabu Proposed Vehicle positioning System Based on ARM with combination of GPS and GSM can upload the information of the vehicle such as the position and speed to the Monitoring center in time and make it convenient to control the traffic. The vehicle position system has advantage of small size, scalable, reliable and powerful expansibility [2]

III. DESIGN METHODOLOGY

This project consists of four basic key bloks as shown in Fig.2. Biometric sensor is used for finger print identification. GPS and GPRS module is used for vehical location and internet connectivity ,mini USB port for programming and debugging purpose . Lcd and keyboard is interfaced with System for user interface . power full ARM cortex M series controller is used in this system. Basic information like deiver name ,school name, driver id, etc. are store in external EEPROM.

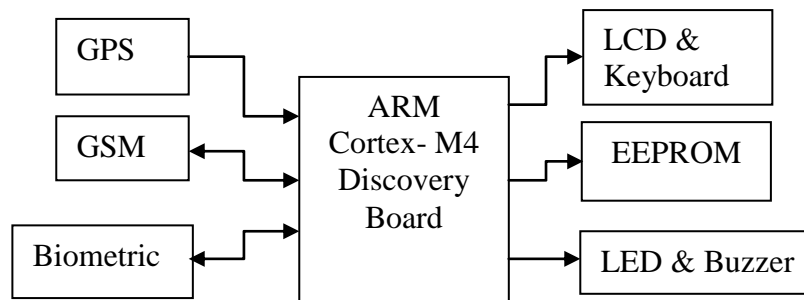


Fig.2 Basic Block Diagram

System consists of STM-32 discovery board. The board has on board programming and debugging facility. The device starts with initializing the internal setting and checks connectivity of all hardware modules. If anyone module is missing it displays an Error message. Once hardware is ok then system asks for driver login. For diver login driver have to type 11 digit driver unique ID. And his fingerprint needed to add. Once driver is get login the data is verified through server. Now onwards for system login driver only need to pace finger on biometrics module and enter school ID for system login. Driver have to select pick or droop option while bus start to pick or drop child. Once system logged in student have to punch there finger. This punch information along with driver id, GPS location and pick or drop status is send to server. System sends bus location after every 30 second to server [1].

A GSM modem is a specialized type of modem, which accepts a SIM card, and operates over a subscription to a mobile operator, just like a mobile phone. Here HTTP protocol is used which defines a set of rules to enable computers to communicate over a network. Device sends 4 types of data to the server using http get:-

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- 1) GPS data (device will send GPS data in every 30 sec) - type=1
- 2) New fingerprint en-roll data (driver or child) -type=2
- 3) Punch clock data (device will send punch clock data whenever device recognize a known user) (driver or child) - type=3
- 4) Verify before insert data (driver or child or school) -type=4

Abbreviation	Meaning
1) t	Type of URL
2) md (c or d or s)	Mode either child ,driver,school
3) dci	Child ID or Driver ID or School ID
4) di	Current driver ID

Table 1. URL Abbreviations and meanings

The device sends four types of URLs to the server. Table 1. Shows abbreviation used in URL and there meanings. Each fired URL gets response through server. For server communication specific initialisation steps have to follow. This project uses AT commands for server communication.

IV. RESULT AND DISCUSSIONS

HTTP is the protocol Web use to communicate with browser. HTTP rules the standard mode of sending and process requests, rules the message format between browser and sever and the format of all kinds of control information. Type-4 URL and their response is shown bellow

<http://hopchu.triage-tech.com/HopchuAPI/HopchuApi.php?t=4&md=d&dci=00037&di=00037>Reply :-,0,Thorat Kaka,

type4 URL gives name after two commas. In above URLs Thorat kaka is a response given by server. For ID 00037 Thorat Kaka is registered. Once response taken it stores in EEPROM (AT24c64A). biometric device store fingerprint of driver i.e. Thorat Kaka and stores name against ID. Now onwards whenever same finger detected by biometric device it display name on lcd and gives ID against which it stored. In this paper sim900 module and discovery board is interfaced. Fig.3 shows the hardware setup. Filezilla software is used to see server file. Fig.4 shows all fired URL and their responses are date wise logged in log file.

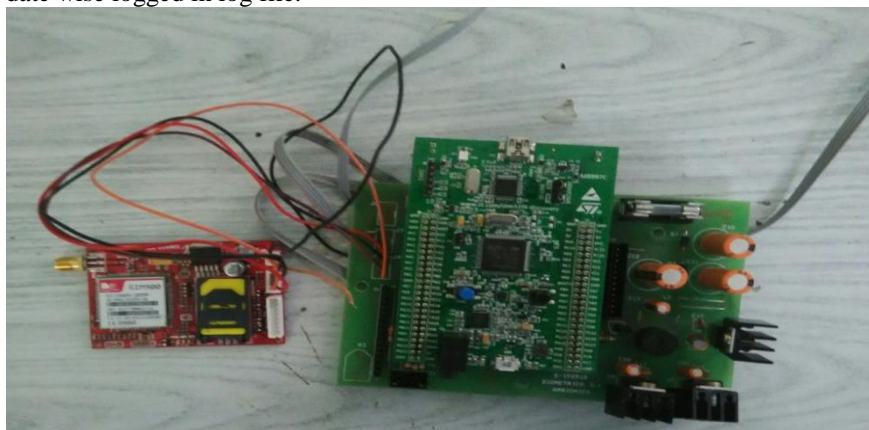


Fig.3 Device setup for GSM interface



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The modem needed only 3 wires (Tx, Rx, GND) except Power supply to interface with microcontroller/Host PC. The built in Low Dropout Linear voltage regulator allows you to connect wide range of unregulated power supply (4.2V - 13V) to send & Read http data [7]. Each url takes time to fire server. Type4 url fires the driver or child or school id to the server accordingly sever fires the name. This process takes around 8 to 10 sec. Remaining three url takes 5 to 7 second to send data to server. This time depends on range server availability, network and envioremental conditions.

```
20 May 2015 - Notepad
File Edit Format View Help
[[2015/05/20 04:04:16] URL fired values:- t=3&md=d&dcid=00028&id=00028&pd=p[2015/05/20 04:04:16] T3 Response:-
,0,00028,p,d,0, device_id=00028 driver_id=00028 pd=p[2015/05/20 04:04:16] URL fired values:-
t=1&di=00028&lt=18deg31.6644&lg=073deg50.4816&si=005&pd=p[2015/05/20 04:05:11] URL fired values:-
t=1&di=00028&lt=18deg31.6644&lg=073deg50.4816&si=005&pd=p[2015/05/20 04:05:41] URL fired values:-
t=1&di=00028&lt=18deg31.6644&lg=073deg50.4816&si=005&pd=p[2015/05/20 04:06:11] URL fired values:-
t=1&di=00028&lt=18deg31.6644&lg=073deg50.4816&si=005&pd=p[2015/05/20 04:06:41] URL fired values:-
t=1&di=00028&lt=18deg31.6644&lg=073deg50.4816&si=005&pd=p[2015/05/20 04:07:11] URL fired values:-
t=1&di=00028&lt=18deg31.6644&lg=073deg50.4816&si=005&pd=p[2015/05/20 04:07:43] URL fired values:-
t=1&di=00028&lt=18deg31.6644&lg=073deg50.4816&si=005&pd=p[2015/05/20 04:08:12] URL fired values:-
t=1&di=00028&lt=18deg31.6644&lg=073deg50.4816&si=005&pd=p[2015/05/20 04:08:42] URL fired values:-
t=1&di=00028&lt=18deg31.6644&lg=073deg50.4816&si=005&pd=p[2015/05/20 04:09:12] URL fired values:-
t=1&di=00028&lt=18deg31.6644&lg=073deg50.4816&si=005&pd=p[2015/05/20 04:09:41] URL fired values:-
t=1&di=00028&lt=18deg31.6644&lg=073deg50.4816&si=005&pd=p[2015/05/20 04:10:14] URL fired values:-
t=1&di=00028&lt=18deg31.6644&lg=073deg50.4816&si=005&pd=p[2015/05/20 04:10:44] URL fired values:-
t=1&di=00028&lt=18deg31.6644&lg=073deg50.4816&si=005&pd=p[2015/05/20 04:11:12] URL fired values:-
t=1&di=00028&lt=18deg31.6644&lg=073deg50.4816&si=005&pd=p[2015/05/20 04:11:41] URL fired values:-
t=1&di=00028&lt=18deg31.6644&lg=073deg50.4816&si=005&pd=p[2015/05/20 04:12:11] URL fired values:-
t=1&di=00028&lt=18deg31.6644&lg=073deg50.4816&si=005&pd=p[2015/05/20 04:12:42] URL fired values:-
t=1&di=00028&lt=18deg31.6644&lg=073deg50.4816&si=005&pd=p[2015/05/20 04:13:12] URL fired values:-
t=1&di=00028&lt=18deg31.6644&lg=073deg50.4816&si=005&pd=p[2015/05/20 04:13:42] URL fired values:-
t=1&di=00028&lt=18deg31.6644&lg=073deg50.4816&si=005&pd=p[2015/05/20 04:14:07] URL fired values:-
t=4&md=c&dcid=5830000002&rdi=00028[2015/05/20 04:14:07] T4 Response:- ,6, Child_code=5830000002 driver_id=00028
[2015/05/20 04:14:31] URL fired values:- t=4&md=d&dcid=00028&rdi=0000000000[2015/05/20 04:14:31] T4 Response:- ,7,
driver_child_id=00028 device_id=0000000000[2015/05/20 04:14:45] URL fired values:-
t=1&di=00028&lt=16deg&lg=0.0deg&si=005&pd=p[2015/05/20 04:22:19] URL fired values:- t=3&md=d&dcid=00019&rdi=00019&pd=p
[2015/05/20 04:22:19] T3 Response:- ,0,00019,p,d,0, device_id=00019 driver_id=00019 pd=p[2015/05/20 04:22:45] URL
fired values:- t=1&di=00019&lt=00deg00.0000&lg=000deg00.0000&si=002&pd=p[2015/05/20 04:23:20] URL fired values:-
t=1&di=00019&lt=00deg00.0000&lg=000deg00.0000&si=002&pd=p[2015/05/20 04:23:45] URL fired values:-
t=1&di=00019&lt=00deg00.0000&lg=000deg00.0000&si=002&pd=p[2015/05/20 04:24:15] URL fired values:-
t=1&di=00019&lt=00deg00.0000&lg=000deg00.0000&si=002&pd=p[2015/05/20 04:24:45] URL fired values:-
t=1&di=00019&lt=00deg00.0000&lg=000deg00.0000&si=002&pd=p[2015/05/20 04:25:15] URL fired values:-
t=1&di=00019&lt=00deg00.0000&lg=000deg00.0000&si=002&pd=p[2015/05/20 04:25:45] URL fired values:-
t=1&di=00019&lt=00deg00.0000&lg=000deg00.0000&si=002&pd=p[2015/05/20 04:26:15] URL fired values:-
t=1&di=00019&lt=00deg00.0000&lg=000deg00.0000&si=002&pd=p[2015/05/20 04:26:46] URL fired values:-
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Fig.4 Log file data

STM32 discovery board is interfaced with sim900 GSM module. The baud rate of interfacing is 57600b/s. This device uses HTTP get AT command to communicate with server. Discovery board has on board programmer and debugger.

VI.CONCLUSION

Thus by using HTTP protocol it is possible to communicate with sever. Four type of URLs fire to server and accordingly server gives response. SIM-900 GSM module is used for communicating with server. AT commands are used for GSM module interface. The system overcomes the limitations such as limited memory, cost of system, performance, power consumption, reliability, compactness and good appearance [1]. With this system parents can know route of bus, location of bus and pick drop point of their children status, without any trouble. Hence this system in modern busy life is very essential.

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