The Bombay Salesian Society's
Don Bosco Institute of Technology
[ENGINEERING COLLEGE]
(Approved by AICTE & Affiliated to University of Mumbai)

DEPARTMENT OF ELECTRONICS AND TELECOMMUNICATION

DEVELOPING A CONTAINER GSM, GPS TRACKING SYSTEM TO ENHANCE SUPPLY CHAIN SECURITY

INDUSTRY COLLABORATION PROJECT: QDNET TECHNOLOGIES PVT. LTD.

Group Members: Group No. 04

Sanskar Kumar	26
Russel Dmello	13
Sakshi Kaveri	21
Shreyas Nanaware	34

GSM

GPS

Project Guide: Ms. Freda Carvalho
QDnet: Mr. Quentin Desouza

TECHNOLOGY FOR THE YOUNG • DBIT •

qdnet Technologies Pvt. Ltd.

OVERVIEW

PROBLEM STATEMENT

Develop and implement a low-power container GSM, GPS tracking system for monitoring and tracking of container locations and preventing theft to enhance supply chain security and ensure safe transportation of goods
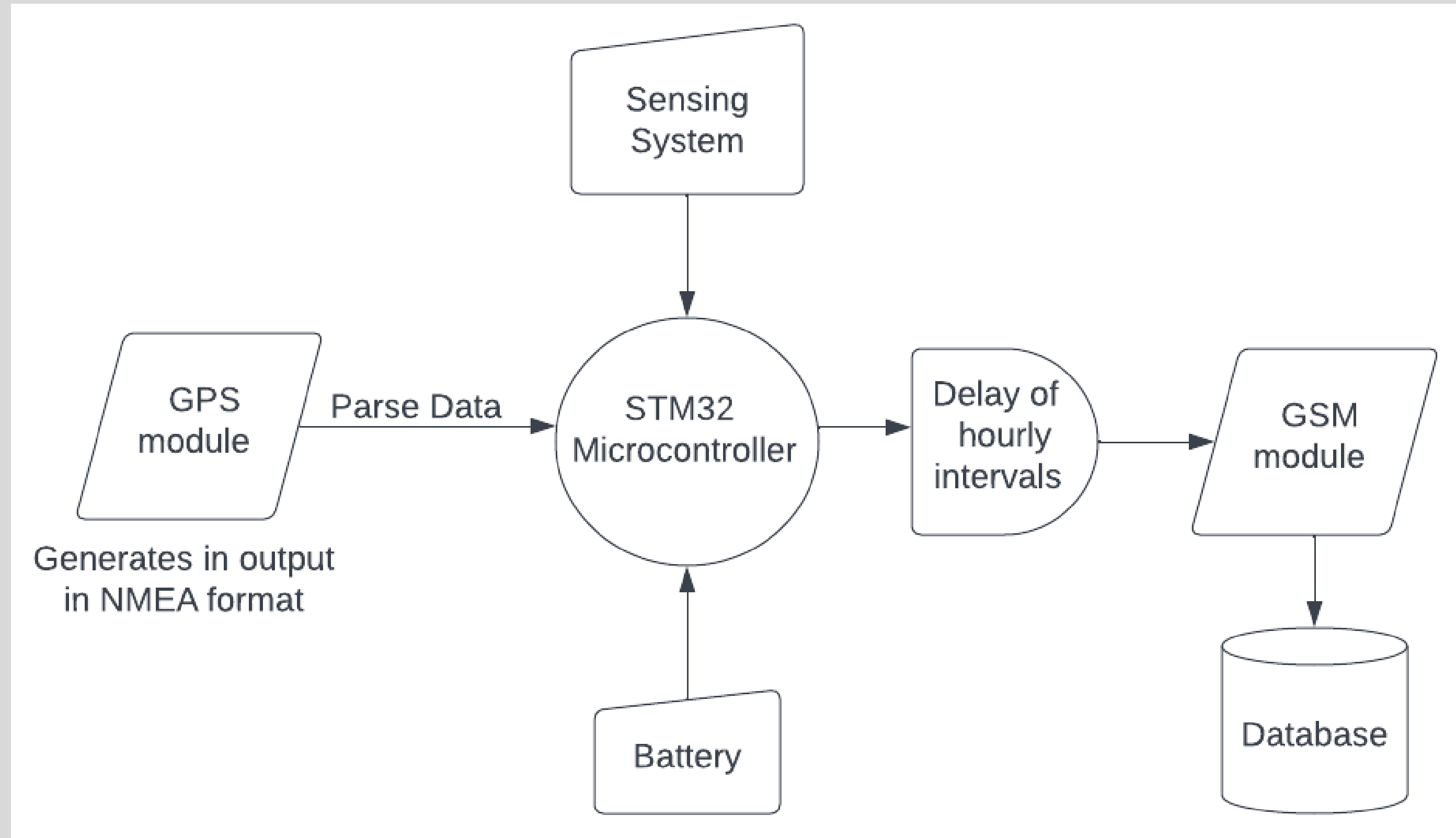
OUTCOMES

- Improved tracking difficulty

- To enhance supply chain security

- Reduced theft and loss

- Minimum power requirement

- Publication of paper

APPROACH OF PROJECT
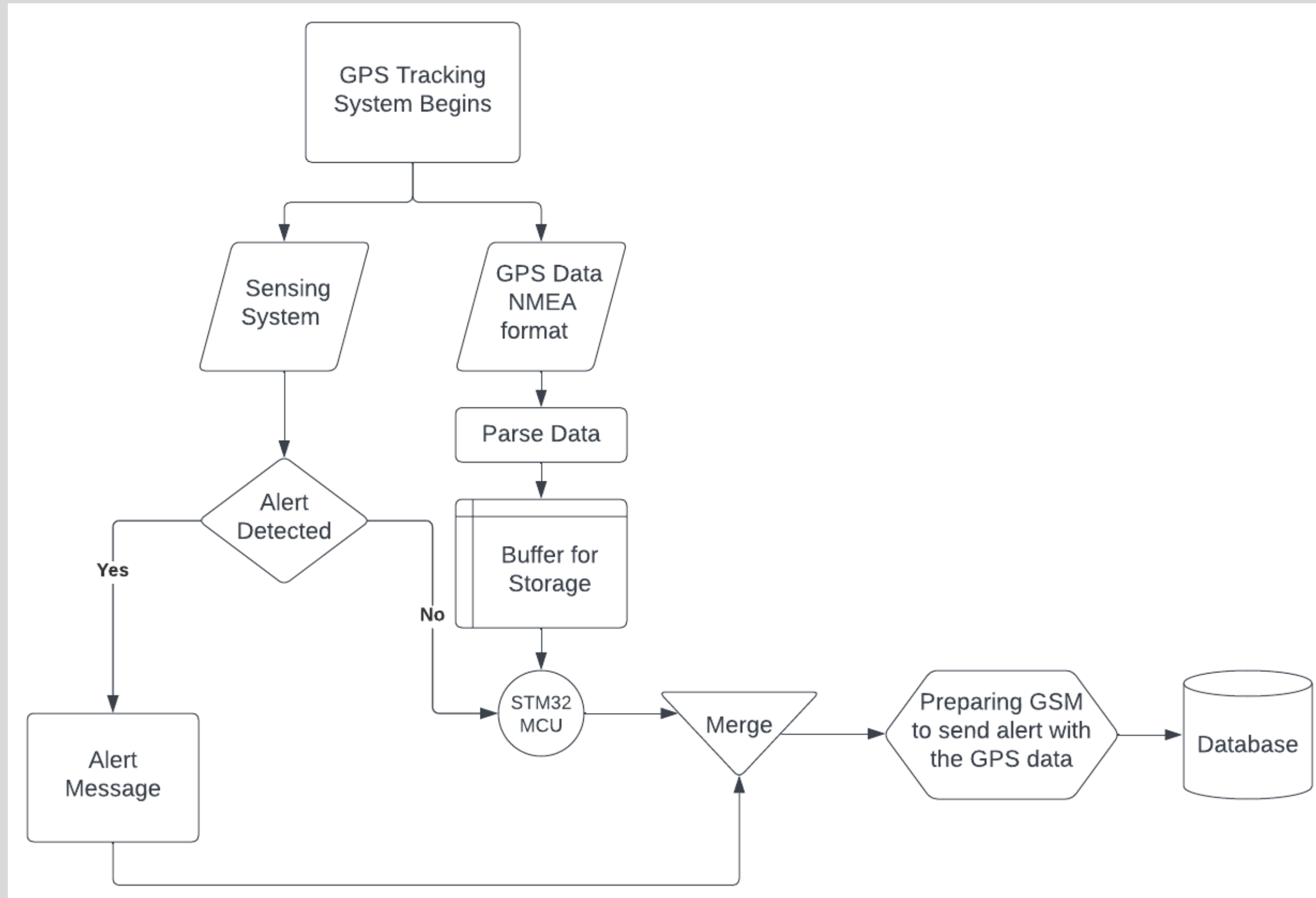
BLOCK DIAGRAM

METHODOLOGY

1) Initialize GPS module

2) Establish UART communication between GPS and STM32 microcontroller

3) Retrieve data in the form of NMEA sentences and convert it into a suitable format

4) Initialize GSM module with AT commands

5) Establish UART communication between GSM and STM32 microcontroller

6) To send the collected data from STM32 to the server via GSM

7) Repeat steps 3 to 7 at hourly intervals for continuous tracking and updating

SUGGESTIONS

- Event sensing in our system must operate in an interrupting manner, ensuring that when an event is initiated, data transfer occurs immediately, and do not rely on a fixed time

- To conduct research on how other companies, such as Amazon, implemented their tracking systems to help in provide insights into effective strategies and practices in the industry

- To ensure accurate GPS location tracking for a truck, accounting for the Doppler effect is crucial to differentiate between real and apparent positions of the container

07

ALGORITHM

1) Initialize the STM32 microcontroller, system clock, GPIO and UART peripheral

2) Include the UART ring buffer and NMEA files

3) Using infinite while loop to check if "GGA" string is received over UART

4) If "GGA" is received then copying data upto "*" character into the array and later decoding it

5) Using if loop, to check whether there is any threat or intrusion being carried out

6) If the lock system connection fails, the code within the if loop sends an alert to the user with the exact coordinates of the incident with the help of GSM module
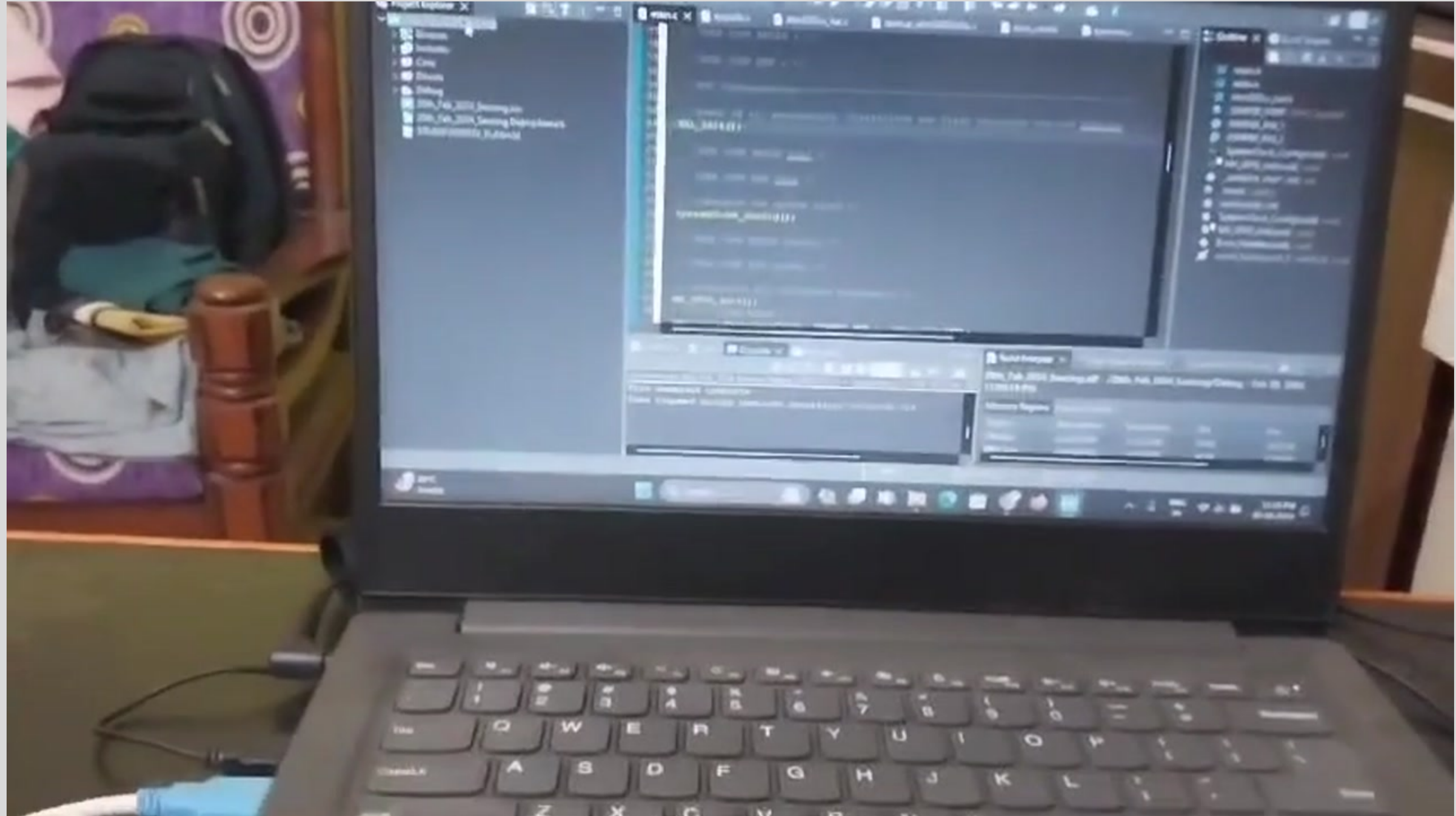
Debug ×   Project Explorer

GPS_SUCCESS Debug [STM32 C/C++ Application]
- GPS_SUCCESS.elf [cores: 0]
  - Thread #1 [main] 1 [core: 0] (Suspended : Breakpoint)
    - main() at C:\Users\sansk\STM32CubeIDE\workspace_1.14
  - arm-none-eabi-gdb (12.1.90.20220802)
  - ST-LINK (ST-LINK GDB server)

main.c ×   stm32f4xx_it.c   uartRingBuffer.c   startup_stm32f411retx.s

```
int main(void)
{
    /* USER CODE BEGIN 1 */

    /* USER CODE END 1 */

    /* MCU Configuration */

    /* Reset of all peripherals, Initializes the Flash interface and the Systick. */
    HAL_Init();

    /* USER CODE BEGIN Init */

    /* USER CODE END Init */

    /* Configure the system clock */
    SystemClock_Config();

    /* USER CODE BEGIN SysInit */

    /* USER CODE END SysInit */

    /* Initialize all configured peripherals */
    MX_GPIO_Init();
    MX_USART1_UART_Init();
    /* USER CODE BEGIN 2 */
    Ringbuf_init();
    HAL_Delay(500);
    /* USER CODE END 2 */
```
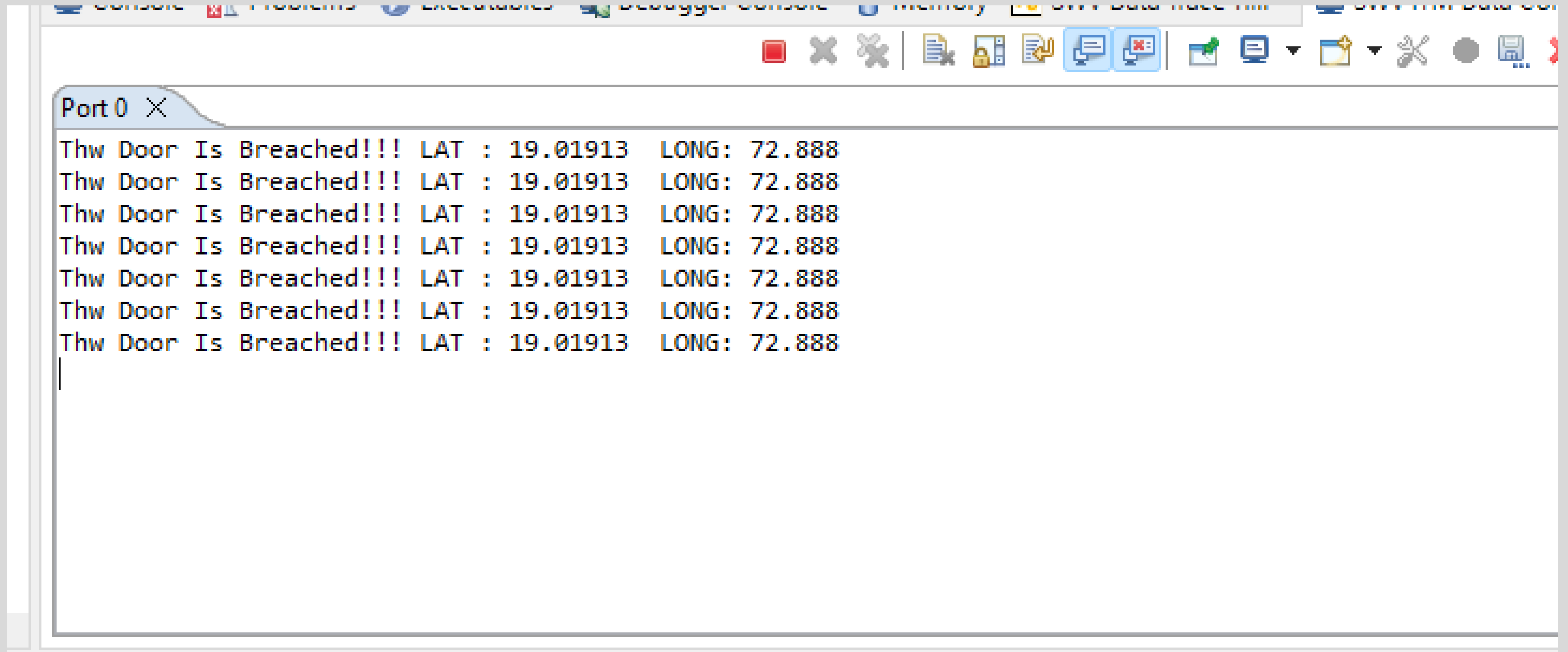
Var.. Br.. Ex.. Dis.. Re.. Liv.. × SF..

Type	Value
	[512]
unsigned char	0 '\000'
unsigned char	0 '\000'
unsigned char	2 '\002'
unsigned char	32 ' '
unsigned char	49 '1'
unsigned char	29 '\035'
unsigned char	0 '\000'
unsigned char	8 '\b'
unsigned char	97 'a'
unsigned char	24 '\030'
unsigned char	0 '\000'
unsigned char	8 '\b'
unsigned char	103 'g'
unsigned char	24 '\030'
unsigned char	0 '\000'
unsigned char	8 '\b'
unsigned char	109 'm'
unsigned char	24 '\030'
unsigned char	0 '\000'
unsigned char	0 '\b'
unsigned char	115 's'
unsigned char	24 '\030'
unsigned char	0 '\000'
unsigned char	0 '\b'

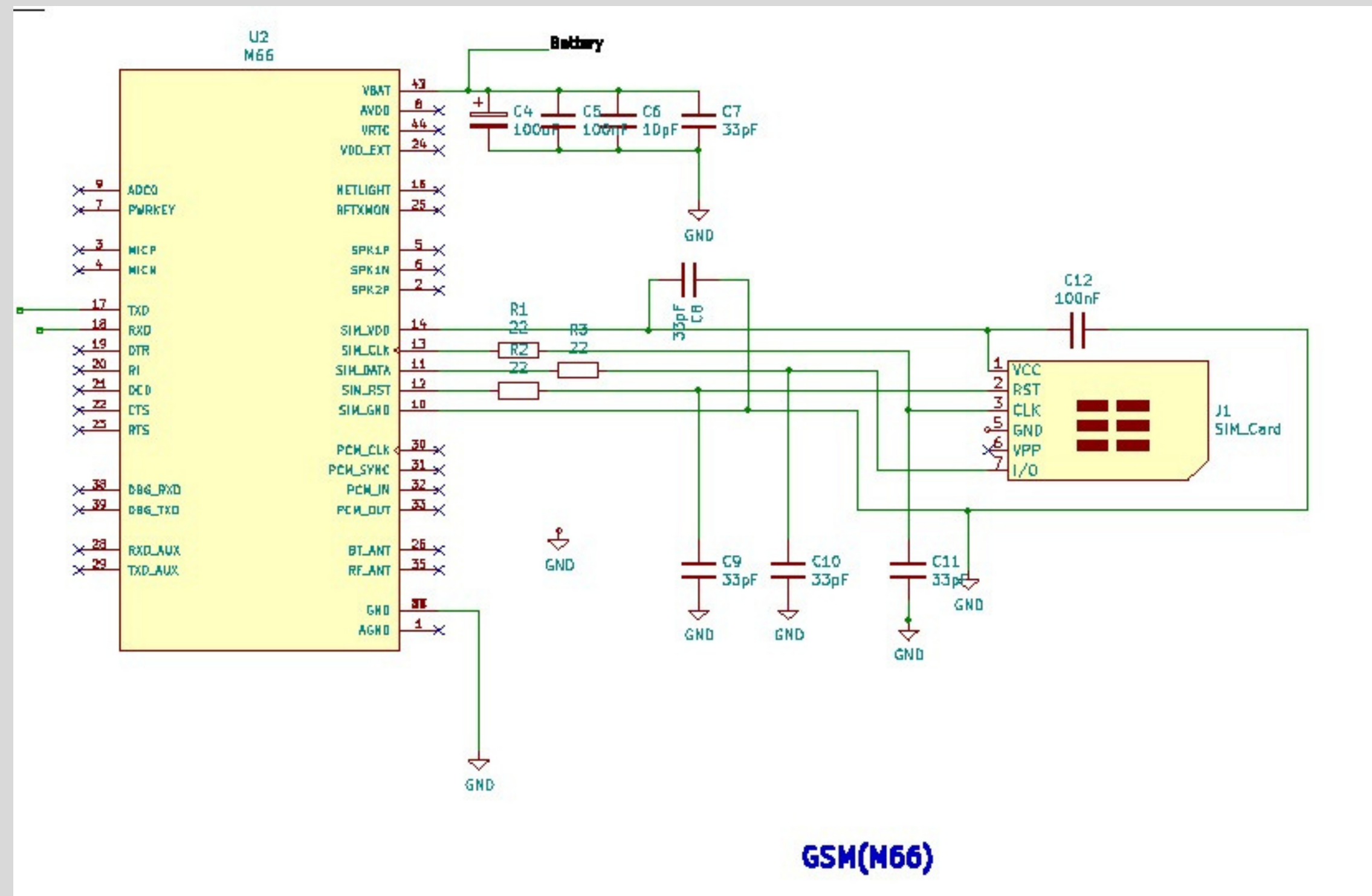Console ×   Problems   Executables   Debugger Console   Memory

GPS_SUCCESS Debug [STM32 C/C++ Application] [pid: 12]

Download verified successfully

TESTING

Port 0

```
Thw Door Is Breached!!! LAT : 19.01913  LONG: 72.888
Thw Door Is Breached!!! LAT : 19.01913  LONG: 72.888
Thw Door Is Breached!!! LAT : 19.01913  LONG: 72.888
Thw Door Is Breached!!! LAT : 19.01913  LONG: 72.888
Thw Door Is Breached!!! LAT : 19.01913  LONG: 72.888
Thw Door Is Breached!!! LAT : 19.01913  LONG: 72.888
Thw Door Is Breached!!! LAT : 19.01913  LONG: 72.888
```
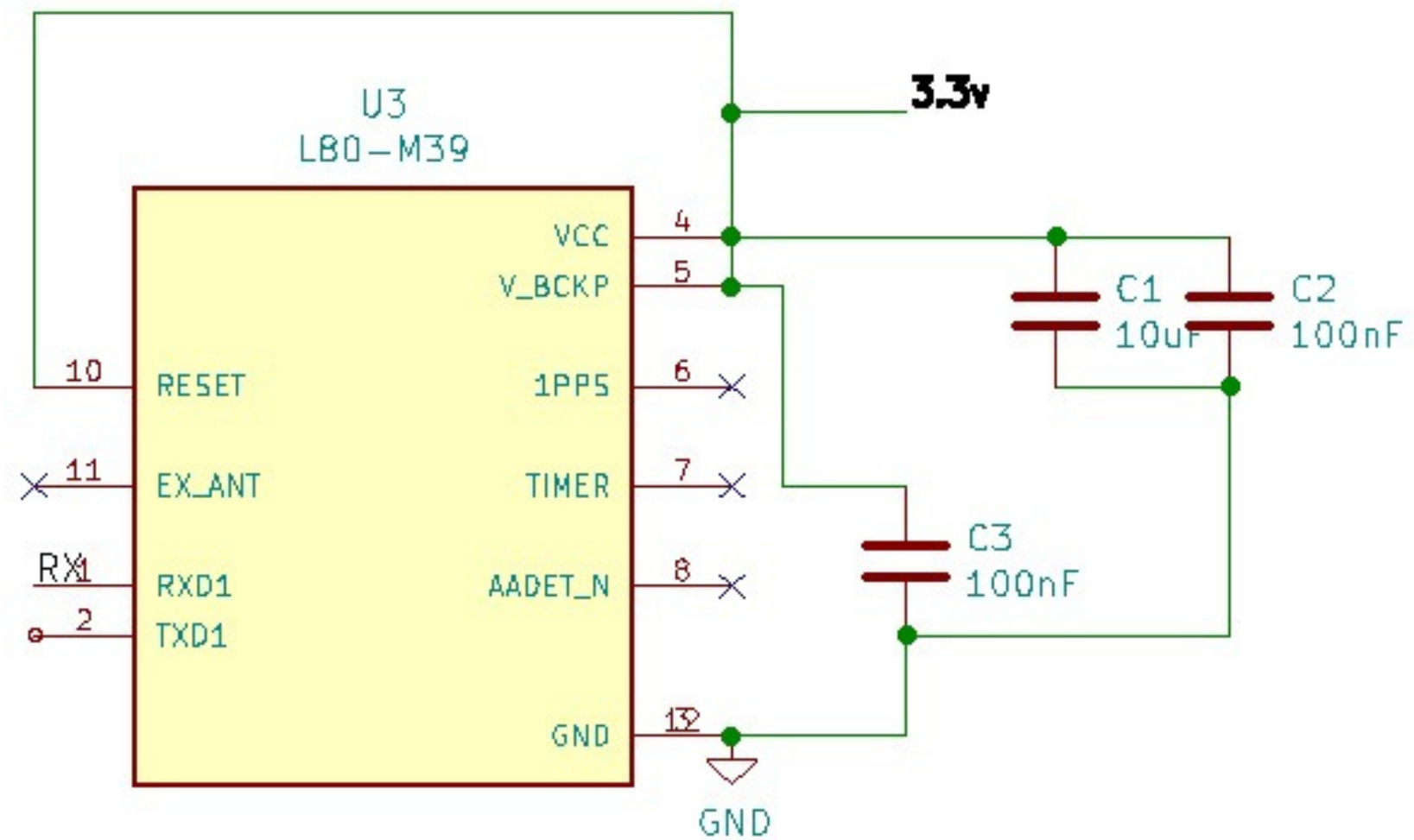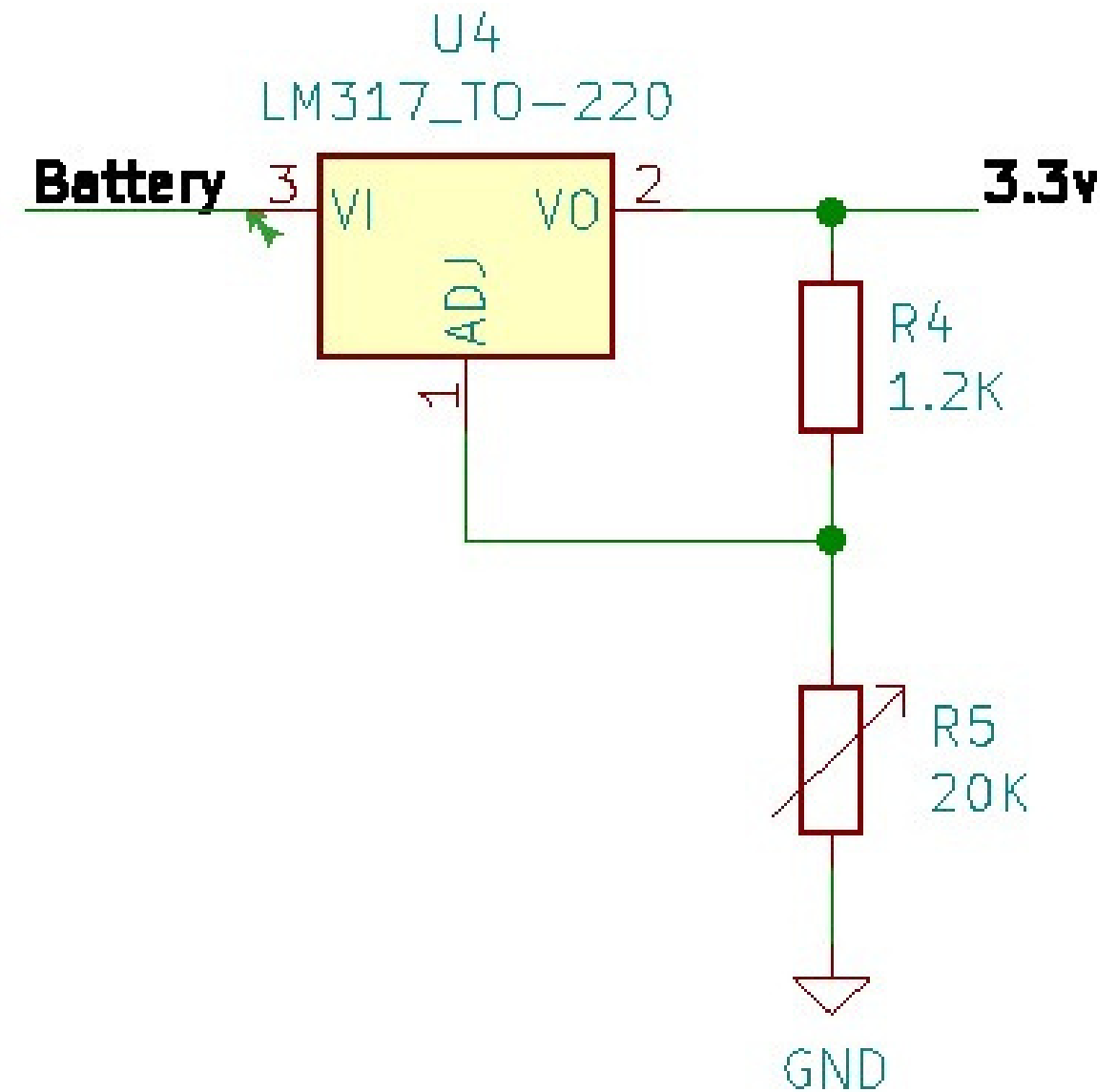
SCHEMATICS

Software: Kicad

GPS(L80)

LM317(Voltage Regulator)

TIMELINE/ GANTT CHART

Task	June	July	August	Sept	Oct	Nov	Dec	Jan	Feb	Mar
Literature Survey	▓	▓								
Finalising and working on GSM and GPS modules		▓								
Testing the GSM and GPS modules			▓							
Serial communication through Arduino				▓	▓					
Serial communication through STM32 & Sensing System						▓	▓			
Schematics, Layout and fabrication								▓	▓	
Testing										▓
Paper Publication & Project Report Writing										▓

FUTURE PLANS

- Connection establishment through STM32

- Testing and fabricating the PCB

- Power optimization

- Data Transmission

- Database management

REFERENCES

- [1] S. Ni, M. Naing, and S. Naing, "GPS and GSM Based Vehicle Tracking System," International Journal of Trend in Scientific Research and Development, vol. 3, pp. 271-275, 2019. DOI: 10.31142/ijtsrd23718.

- [2] K. Maurya, M. Singh, and N. Jain, "Real Time Vehicle Tracking System using GSM and GPS Technology - An Anti-theft Tracking System," International Journal of Electronics and Computer Science Engineering, vol. 1, 2012.

- [3] H. D. Pham, M. Drieberg, and C. C. Nguyen, "Development of vehicle tracking system using GPS and GSM modem," 2013 IEEE Conference on Open Systems (ICOS), Kuching, Malaysia, 2013, pp. 89-94, doi: 10.1109/ICOS.2013.6735054..

15

REFERENCES

- [4] W. El-Medany, A. Al-Omary, R. Al-Hakim, S. AlIrhayim, and M. Nusaif, "A Cost Effective Real-Time Tracking System Prototype Using Integrated GPS/GPRS Module," in Proceedings of the 6th International Conference on Wireless and Mobile Communications (ICWMC), 2010, pp. 521-525, 20-25 Sept. 2010.

- [5] P.B. Fleischer, A.Y. Nelson, R.A. Sowah, and A. Bremang, "Design and development of GPS/GSM based vehicle tracking and alert system for commercial inter-city buses," in Proceedings of the 2012 IEEE 4th International Conference on Adaptive Science & Technology (ICAST), 2012, pp. 1-6, 25-27 Oct. 2012.