



## PROJECT AND TEAM INFORMATION

### Project Title

GPS Tracker

### Student / Team Informationa

Team Name: Team # On Canvas:	<u>Phone Snatchers</u> Group #13
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## Abstract(15 pts)

*(Summarize your project (motivation, goals, system design and results). Max 300 words).*

*The motivation we had for this project was originally to create a device that would help track your smart devices in a method that would function the same as “Find my iPhone”. However later on we changed the scope to instead be a device to **track any target regardless of its value or “intelligence”**. We hoped to create a GPS Tracker that could be attached to anything and upload its coordinates to a Cloud Server for our user-base to track.*

*The project outline that we had was that our TTGO device is connected to a GPS Module (GT-U7) where it would collect Lat, Lng, Time, and Speed which we would later upload via a WiFi connection to our AWS server. At which it would display a map that showed the current location alongside a “Log Files” that would display all the “location occurrences”. We additionally created one of those logfiles to only display “critical values” such as when the Lat / Lng changes drastically, if speed spikes (7 km/hr), or if enough time has passed (30 minute intervals).*

*Overall we were able to complete the standards that we set out for ourselves above, where the device does indeed track location and upload it to our AWS server. However there are features that we can implement in the future that should’ve been implied in the original outline of our product that we’ll discuss later on.*

## Introduction (15 pts)

### Motivation / Background (3 pts)

*(Describe the problem you want to solve and why it is important. Max 300 words).*

*Losing track of personal belongings is a common and frustrating experience. Whether it’s forgetting your phone, wallet, or keys at home, or misplacing them during your daily routine, these incidents range from minor inconveniences to serious concerns—especially when expensive or essential items are involved. The anxiety of potentially losing a \$500 phone or an ID-loaded wallet can be overwhelming.*

*Our goal is to reduce this stress by developing a GPS tracking device that can be attached to any valuable item. The device will provide real-time location updates and maintain a history of location changes, helping users quickly locate their items and identify critical moments when objects are lost or moved unexpectedly.*

*Beyond everyday forgetfulness, this solution also has important applications in theft prevention. By alerting users and recording a trail when an object moves beyond a certain range or exhibits unusual behavior, the device offers a level of protection that goes beyond traditional lost-and-found approaches. This added layer of awareness can help users safeguard their property and maintain peace of mind.*

## Project Goals (6 pts)

*(Describe the project general goals. Max 200 words).*

### **Hardware / Sending information to AWS Server:**

*Overall for our hardware we had a base outline set out for “bare bones” construction plan where we just wanted a simple device at the moment that would collect Lat / Lng at the minimum and then have the capabilities to upload that information via WiFi connection. This was planned to be done with just the GT-U7 module and our standard TTGO.*

*We additionally had “reach goals” for our project where we hoped to additionally make the TTGO much more compact and “incognito”.*

### **Displaying AWS Server:**

*For displaying the information we wanted a very achievable minimum goal to create a Log File that would just be a long list of the tracking history with an “optimized” version which would display critical values previously outlined.*

*For our “reach goals” we wanted to utilize some form of map service (preferably the AWS location service) at which we can port the Lat / Lng coordinates to display the location akin to how “google maps” would. Additionally if there was a way to visualize the “path” that the device took we would want to achieve that.*

## Assumptions (3 pts)

*(Describe the assumptions (if any) you are making to solve the problem. Max 180 words).*

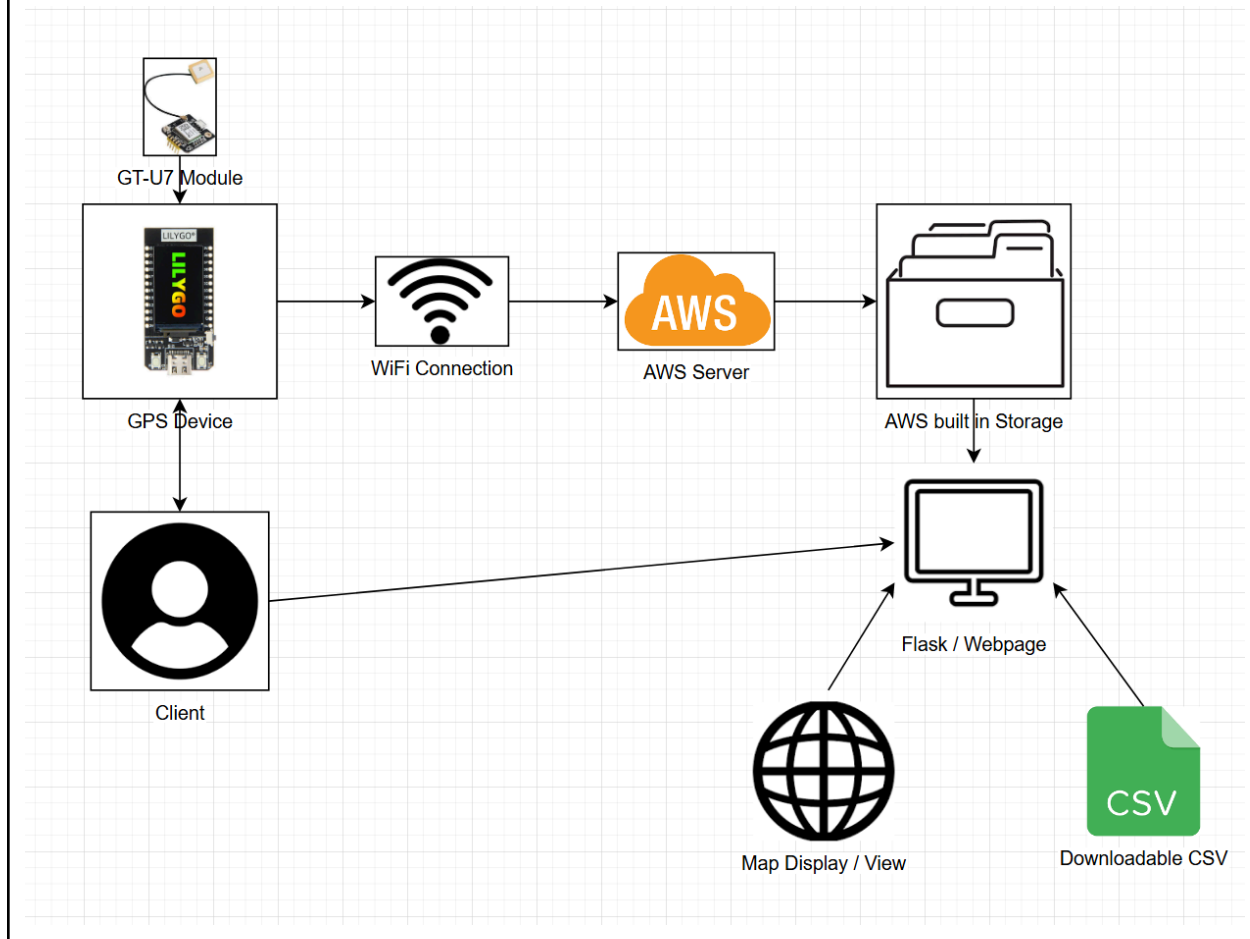
*Some assumptions we made for the current device / solution for our problem is that the device that it's connected to is able to act as a power supply and WiFi connection (hot spot) for our device. Currently in the prototype state we left our product in, our device doesn't have an independent / stable WiFi connection nor does it have an independent power supply. However we still consider our device to be in prototype phase and before it would be published these problems should be addressed.*

*Furthermore after testing with our device we were able to determine that the GPS tracker works most accurately outdoors due to it's reliance on satellite imaging to triangulate it's location, so we work under the assumption that at some point the user would step outside and be “findable” by a number of satellites at periodic times.*

## System Architecture (20 pts)

(Describe the final architecture you have implemented listing sensors, communication protocols (Wi-Fi, BLE, ...), cloud services and user interfaces. Include a block diagram of the system. Max 300 words).

The final architecture we have is the GPS (GT-U7) module that is connected to our TTGO. After the TTGO captures the GT-U7 coordinates using satellite positioning, it uploads via WiFi to our AWS server. Afterwards we display the server via a web page hosted by Flask. At which we have multiple tabs, including a map to visualize location, log files to see the current session coordinates / paths, and a master CSV to show a total history of the GPS coordinates.



## Final List of Hardware Components (5 pts)

(Write the final list and quantity of the components you have included in your system)

<i>Component/part</i>	<i>Quantity</i>
<i>LilyGO TTGO ESP32</i>	<i>1</i>
<i>GPS Device (GT-U7)</i>	<i>1</i>
<i>Wiring</i>	<i>4x Wires</i>

## Project Implementation (30 pts)

### Tasks/Milestones Completed (15 pts)

(Describe the main tasks that you have completed in this project. Max 250 words).

<b><i>Task Completed</i></b>	<b><i>Member</i></b>
<i>Soldering new GT-U7</i>	<i>Ethan Fox</i>
<i>Creating circuit (Researching ports and constructing breadboard)</i>	<i>Ethan Fox</i>
<i>Getting AWS Server Up (Bare form - Can receive / store data but not display)</i>	<i>Alan Yin</i>
<i>Configuring code to extract coordinates from GT-U7</i>	<i>Ethan Fox / Alan Yin</i>
<i>Setting up Flask</i>	<i>Alan / Ethan</i>
<i>Adding Map to AWS / Flask, Adding Tracking, Log files</i>	<i>Alan</i>

## Challenges/Roadblocks (5 pts)

*(Describe the challenges that you have faced and how you solved them if that is the case. Max 300 words).*

*Our first challenge came from our initial project outline, we wanted to use phone's gps device in order to capture the gps coordinates via bluetooth then afterwards uploading it through WiFi to our AWS server. After research we learned that in order to grab the GPS coordinate through a app software which we didn't want to do since it felt like it was out of the project scope so we opted to swap to a GPS module to cut out the phone altogether. Furthermore we had difficulties connecting both bluetooth and WiFi (since we wanted to connect to the phones WiFi / cellular) but didn't get to that point b/c of previous complications.*

*Furthermore getting the Google map / API to set up to automatically update the coordinates on the map was a challenge, however Alan pushed through and was able to make it work after tedious research.*

## Tasks Not Completed (5 pts)

*(Describe the tasks that you originally planned to complete but were not completed. If all tasks were completed, state so. Max 250 words).*

<b>Task</b>	<b>Reason</b>
<i>All the basic outlined tasks were completed for us However we didn't finish some work that would've been appropriate for the project.</i>	
<i>Making a actual case for the GPS tracker</i>	<i>Honestly we didn't want to spend the money on buying a nice case. We also didn't want to mess up our breadboard or TTGO in a way that would make it so we could do other projects in the future.</i>
<i>Adding a battery pack / source for our TTGO</i>	<i>Same as above, wanted to save money and overall wasn't vital to the project succeeding or failing.</i>
<i>Adding independent WiFi / Cellular</i>	<i>Wanted to save money and wasn't vital to the project being finished or not, overall. Supplemented with</i>

## Weak Points / Future Work (15 pts)

*(Mention at least two points of your project that have room for improvement. These points can be additions to the existing project setup (components) or improvement of the current implementation. Max 200 words).*

*Like previously mentioned the tasks beforehand, the physical product itself leaves a lot to be desired, with a dedicated body to house the GPS that is smaller and independent with a SIM card or a battery source*

*Furthermore with the raw data that we upload to the it's very difficult to determine the "theft prevention" side of our project. Right now we currently have it so that if speed spikes it marks it as "critical", however if the client themselves are moving fast with their phone, although it's higher value info there's no way to tell if the phone is being stolen or if it's the client's daily activities.*

*Following this, we would probably want to implement a direct alert system that would send an email or sms to our client so that it would alert them immediately / give warnings in real time without having to access the web page.*

## SOURCE CODE (25 pts)

*Please include a link to the source code of your project. A link to a repository (like GitHub) is preferred*

<https://github.com/AYYin001/Final-IoT.git>