OGN

glidernet.org

OGN/IGC Trackers Project

Angel Casado & Pawel Jalocha

International Gliding Commission

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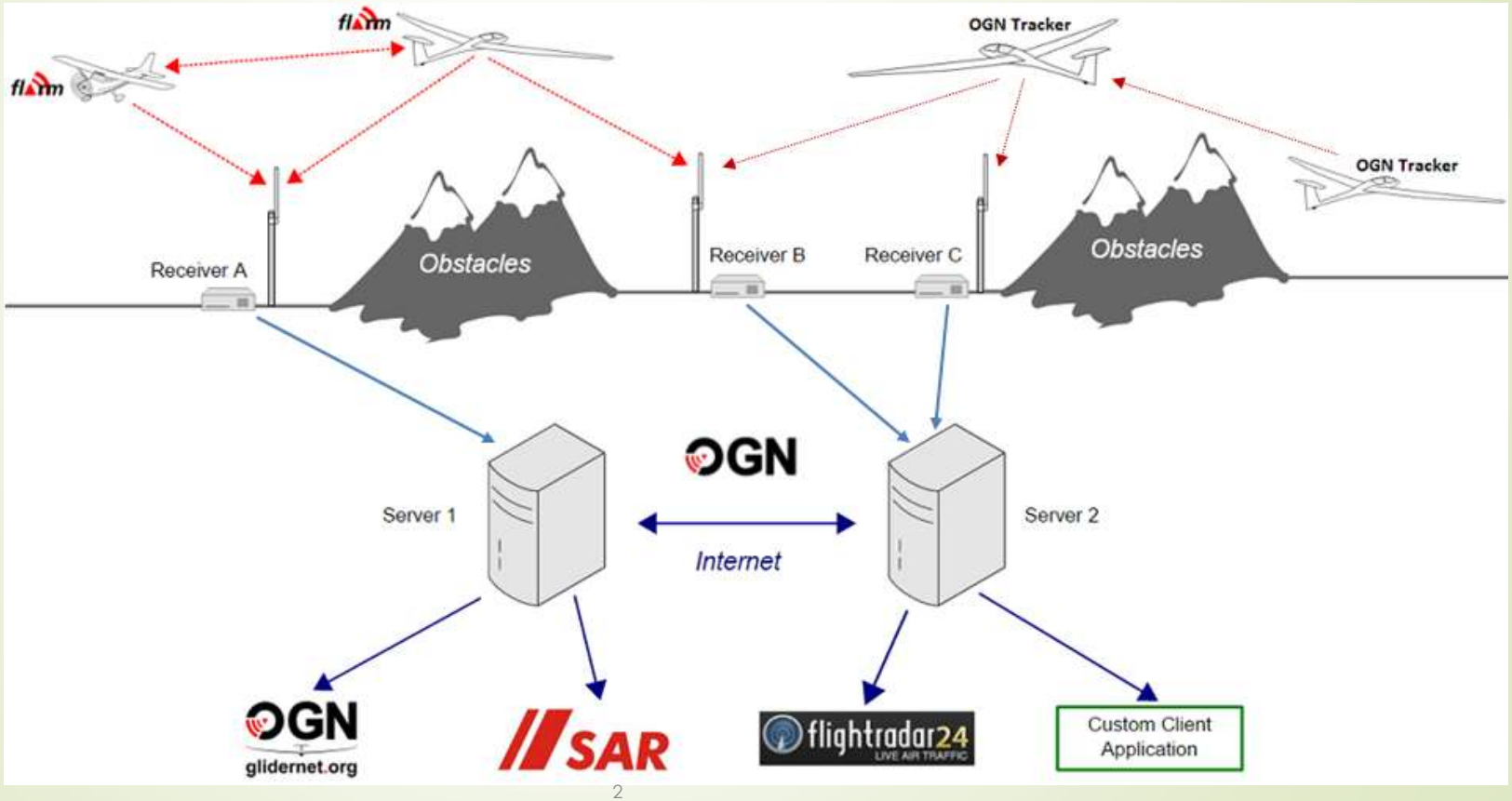
How Open Glider Network works:



The goal of this project is:
Separate Collision Avoidance from Live Tracking

- Leave **Flarms** as the main vehicle for collision avoidance:
  - Use the Flarm feature **NOTRACK** on all the FLARM devices during the competition.
  - The **OGN** stations honor that request already.
  - Flarms devices do not pass the information to other digital devices, if **NOTRACK** is already enable (aka Serial RS232 or Bluetooth).
  - Use the Flarm feature **Random Radio ID** during the competition.
- Develop a **new** device - **OGN/IGC trackers** used just for live tracking:
  - Based on an **evolution** of the current OGN tracker used in the SGP competitions.
  - The OGN/IGC tracker will send the information on the payload **encrypted**.
  - Only **authorized** apps (for safety purposes) will display the data in real time.
  - The IGC has the control of the encryption keys.
  - Other apps will receive/display the information with some **time delay**.
  - The OGN/IGC tracker will be **mandatory** in IGC sanctioned championships, if they want to have live tracking.
- Today we are suggesting to use the OGN, tomorrow we may be using the 5G or … you can think of the IGC tracker as the **official IGC telemetry device.**

It is critical to avoid tactical tracking

We can accomplish that with a combination of technology and sporting rules

IGC/OGN trackers requirements:

- **OGN/IGC trackers** will contain in addition to an OGN tracker a secured FR, following the same standards of the current FR as defined in the ANNEX B of the section 3 of the sporting code. That way we will cover all the security aspects of preserving the data file and can be used as a backup FR.
- **OGN/IGC trackers** will follow the specs of the OGN tracking protocol (OGNTP) so it will be fully compatible with the OGN network. Details of the OGNTP protocol is on: http://wiki.glidernet.org/ogn-tracking-protocol Those trackers will use a barometric capsule in order to get the BARO altitude.
- **OGN/IGC trackers** will do **RELAY** of other trackers and FLARMS in order to improve the coverage.
- **OGN/IGC trackers** will register regular FR data such as the sailplane position, altitude, etc. They will also register the data from the OGN network, like station name, signal strength, switch ON/OFF time, temperature, relay information, version information, telemetry data (flaps position, energy used, ..), etc., … That information will be critical to detect any misbehavior by the pilots.
- **OGN/IGC trackers** will have BlueTooth (BT) and WiFi interfaces, so as soon the glider lands into the airfield, it will be able to transmit thru a secure channel the whole flight data to the organizers, avoiding that way the manual intervention. In addition OGN/IGC trackers will have a removable media like Micro SD and/or a visible USB storage, so in case of problems with the WiFi or Bluetooth, we can always can retrieve those flights.
- **OGN/IGC trackers** will be able to transmit the required data to have (delayed) REAL TIME SCORING as defined by the SSWG.
- **OGN/IGC trackers** may be shown on a screen and/or transmit on BlueTooth, al least two of the basic elements of the scoring, altitude and speed, so the flight computers can display it.
- **OGN/IGC trackers** will send the position information **encrypted**, so only authorized applications can handle it.
- **OGN/IGC trackers** will have the software/firmware signed and protected, so it will be practically impossible to change the software.

Infrastructure

- The current OGN stations handle the OGNTP protocol and honor the FLARM **NOTRACK** request.
- The **FAI server** is ready to handle all the aspects of decrypting and re-broadcasting the position to other applications.
- **No change** or minimum change on the current web live tracking applications (aka: live.glidernet.org, onglide.com, glidertracker.org, …).

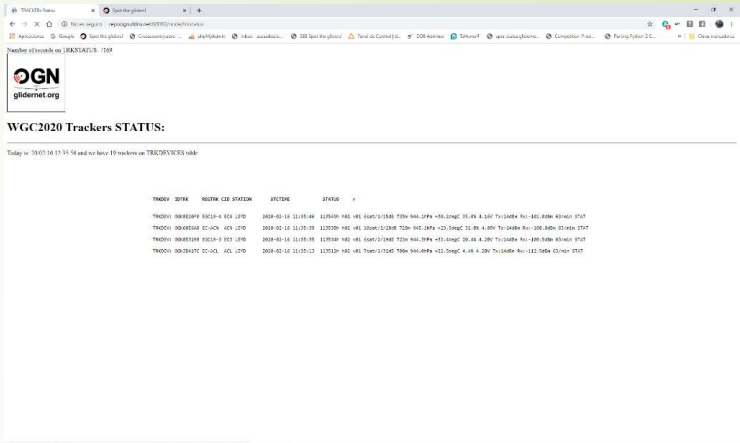
OGN/IGC trackers features

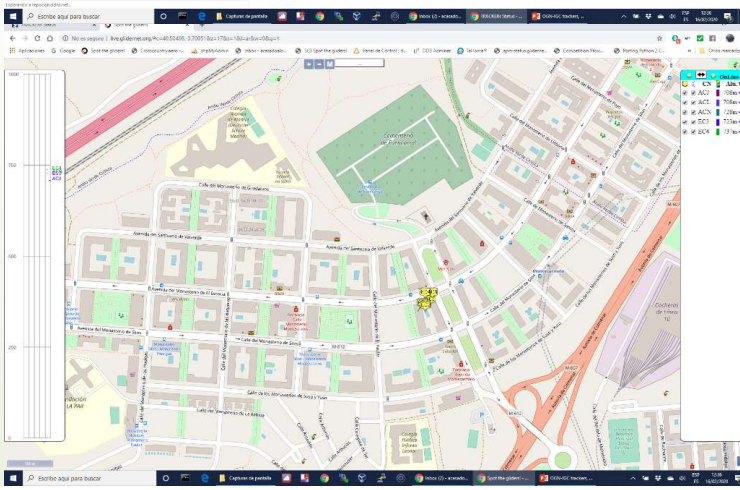
- Use the modern ESP32 CPU.
- It has WiFi and Bluetooth built-in.
- Little OLED screen for control.
- A SD card to store the flight on IGC format.
- Internal GPS antenna.
- Internal battery lasting 12h+
- External power 5-13V.
- USB micro connector for charging as well.
- External antenna connector (SMA).
- Can use the glider external antenna as well.

OGN/IGC trackers management

- It is critical to have a program to manage the large set of trackers (~150).
- Control of the battery level, RF status, etc., number of RELAYs…
- Control of temperature, pressure.
- Control reception GPS.
- Control of the broadcast DELAY.
- Interface with SWS and scoring.
- Loading and control of the encrypting keys.

- It requires a small Raspberry Pi (RPi) in order to load the encryption keys into the OGN trackers.





Security features:

- The data is transmitted encrypted by the OGN/IGC tracker.
- The data is decrypted by the FAI server and distributed with a delay to other servers.
- It uses a strong symmetrical encryption schema.
- The information is binary encoded with the bits flipped.
- The keys are protected by a RSA encryption key of 2048 bits.
- The encryption keys are defined and loaded into the trackers by Championship event, however it can be changed at any day.
- The level of security is similar to the one used by your banking applications.

Is this solution totally bulletprof ???

- **NO, however it will make the cracking very difficult, very expensive and very time consuming and perhaps not worth it … for just an IGC competition.**

“The weakest point is not the technology, it is the people”

We need a well defined sporting rules about cheating and unsporting behavior.

Status of the project:

- What is ready:
  - Hardware and software design.
  - Interface with OGN (OGNTP).
  - Encryption/decryption mechanism (tracker & FAI server).
  - Gen of IGC files on the SD Card, digital signature (G record) ready
  - Random ID ready if required.
  - Tracker Management program (RPi + web pages).
- What is yet missing:
  - WiFi downloading of the flight.
  - BlueTooth interface with Flight Computer, FES or smart phone.
  - Full load test (To be done during WGC2022).
  - FR certification to GFAC only for IGC Cat I competitions.

Interfaces for LX-NAV computers

- As a daughterboard – similar to FLARM
- As an external device connected thru a serial cable (USB)
- As an external device connected thru Bluetooth or Wi-Fi