Active Learning and Interaction Engine Web (ALIENWeb)

User Guide

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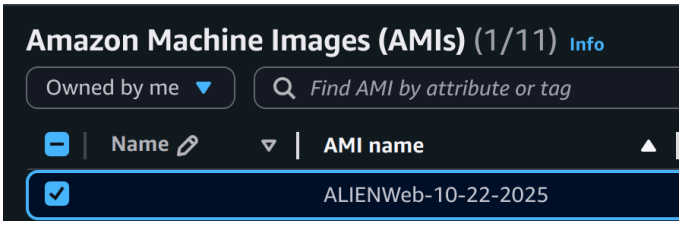
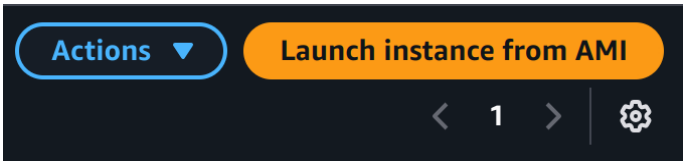
LAUNCHING an AWS EC2 Instance via ALIENWeb AMI

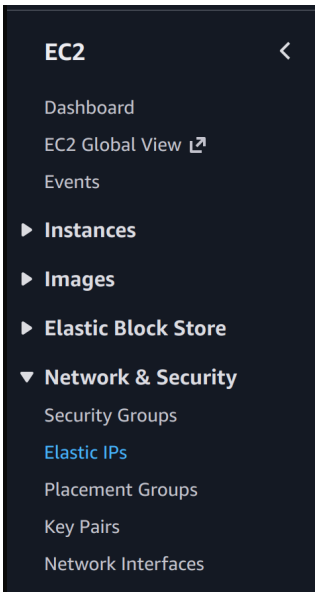
- Obtain the latest ALIENWeb AMI from the AWS store
- Select the AMI from your AMI List



- Launch an EC2 Instance from that AMI



- Go to the Elastic IP Page in EC2 Sidebar Menu

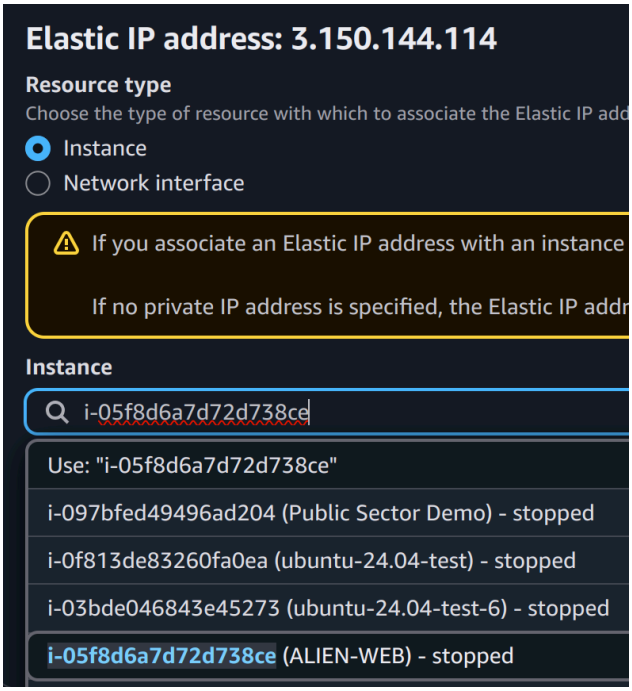


- Allocate an Elastic IP Address to your Instance

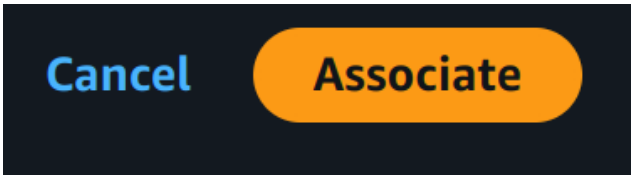
- You will get a confirmation at the top of the page with your **`ALIEN.WEB.ELASTIC.IP`**

- Associate the IP Address with your Instance

- Select the EC2 Instance you create earlier

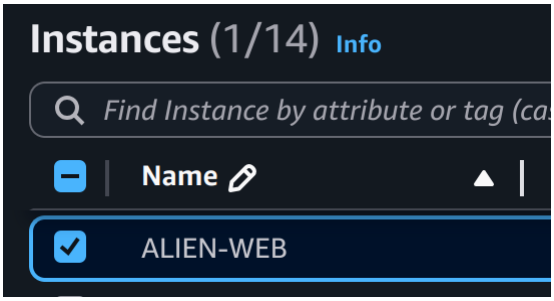


- Click Associate

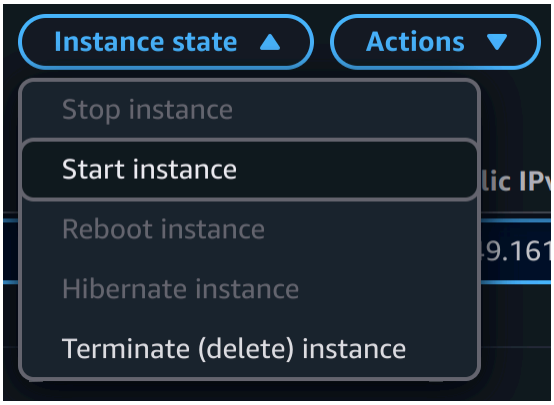


- Start your EC2 Instance (if not already started)

- From your Instances list, select the EC2 Instance



- In the top right corner, select the Instance State dropdown and Start

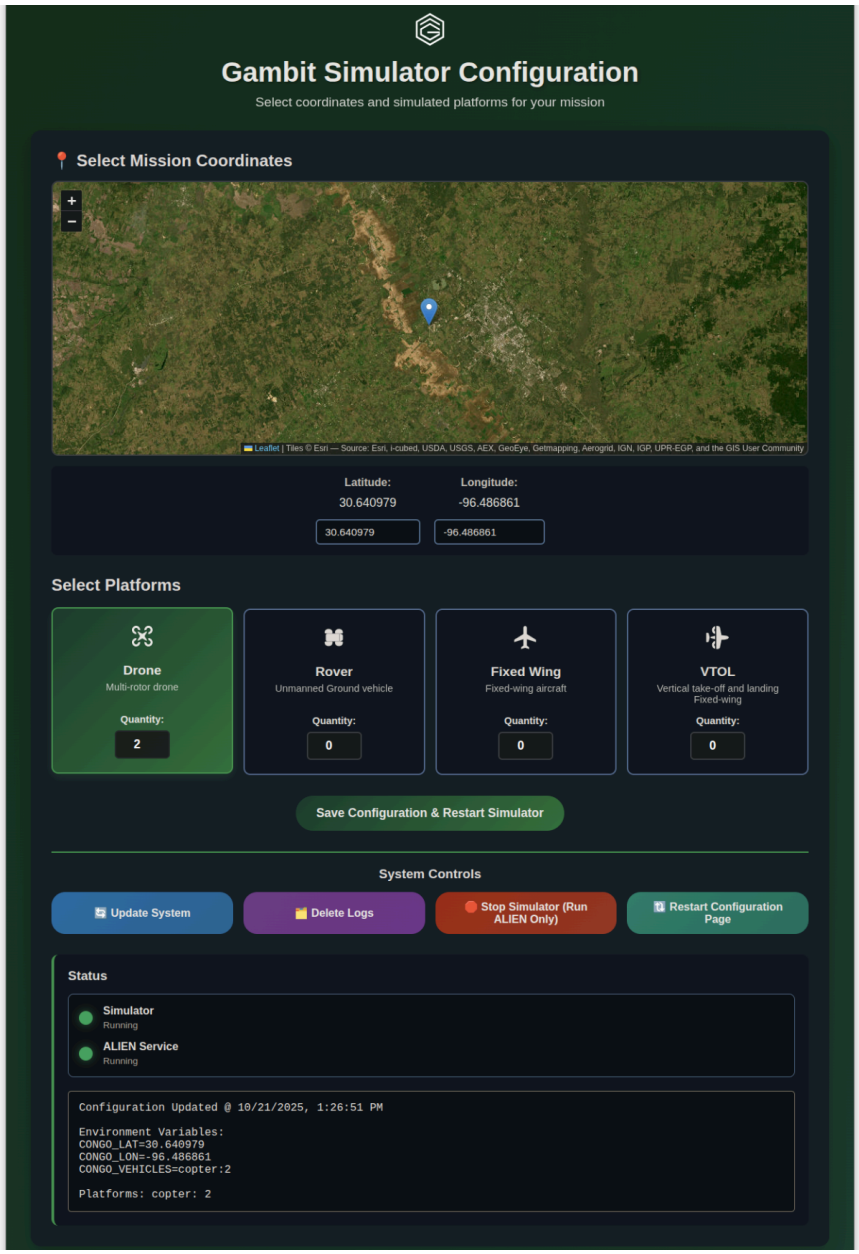


- Wait about 3 minutes for the Instance to spin up and settle
- Open Google Chrome
  - To view ALIEN:**`YOUR.ALIEN.WEB.ELASTIC.IP:8282`**
  - To view the Simulator Config: **`YOUR.ALIEN.WEB.ELASTIC.IP:7777`**
- Follow the ALIENWeb User Guide for further details on how to use the simulator

OPERATING ALIENWeb

ALIENWeb Config and Sim

ALIENWeb comes with a bootloader simulator so that you can practice and plan missions even without robots attached. The simulator will start automatically with the number and type of platforms you choose.



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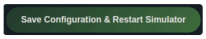
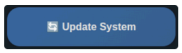
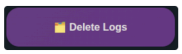
Button	Description	Time to Complete
	Saves off the lat / lon and platforms selected by the user and restarts ALIEN and the simulator.	~3 min
	Updates ALIEN to latest version	~5-10 min
	Empties the `/logs` folder within ALIEN. Removing logs and any mission reports. After deleting logs press “Save Configuration & Restart Simulator”	Immediate
	Runs ALIEN only, shutting down the simulator. This mode is for using ALIENWeb with real HW.	~3 min
	Restarts the configuration web page service. Not typically used, done if there is an update to the web page code.	~10 seconds

If you want to use real robots with no simulated robots, stop the simulator using the “Stop Simulator” button and follow the network and platform setup section

Mission Execution Icons

Not Started

In Progress

Finished

Drone Icons

VTOL

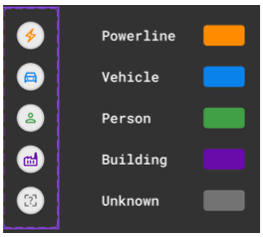
Quad

Drone Alerts

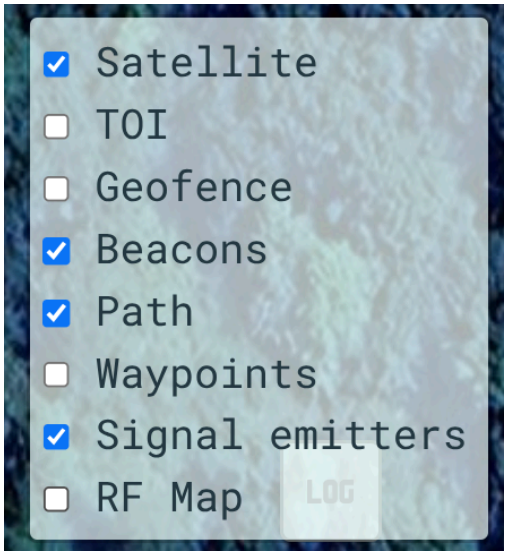
Low Battery

Low Signal

Targets of Interest



Map Layers



Satellite: Turn on/off the satellite map
TOI: Visual Targets of Interest detected
Geofence: “No fly zone” outside of AOI
Beacons: Robotic platforms available to mesh
Path: Waypoint paths
Waypoints: Calculated waypoints
Signal Emitters: Medium confidence location of 915MHz emitter (Requires add on radio)
RF Map: Signal Strength Map for radio emissions

Behaviors

ALIEN supports the following features for all behaviors. Note that some features are mutually exclusive (indicated by numbered superscript).

Feature	Description
Dynamic Replanning	The periodic assessment & replanning of a behavior if the number of platforms assigned to the behavior change due to factors such as communication loss, manual Return to Base (RTB) command, hardware loss / failure, etc.
Loop Behavior[1]	Platforms respectively navigate to their first waypoint once their final waypoint is reached for currently executing behavior. Initial position / starting waypoint is ignored.
Return to Base (RTB) on Completion[1]	Platforms respectively navigate back to their initial position / starting waypoint after reaching their final waypoint for currently executing behavior.
Land on Completion[1]	Platforms respectively “land” upon navigating to their final waypoint for currently executing behavior.

Patrol Behaviors

Dynamic Replanning	Looped Behavior	RTB on Completion	Land on Completion
✅	✅	❌	❌

Patrol subdivides a specified Area of Interest (AOI) into *n* areas, where *n* is equal to the number of platforms assigned to the behavior, & creates a patrol route for each assigned platform.

Platforms performing their route will loop & continue their patrol route until notified to perform a different behavior by the user or the triggering of a safety threshold, such as but not limited to, reaching platform battery safety limit. Patrol behaviors support dynamic replanning & will periodically reassess if a new plan is required.

Vertical and Horizontal Patrol

Vertical Patrol and **Horizontal Patrol** are characterized by the use of directional patrol lanes to generate lawnmower patrol routes for a user-specified Area of Interest (AOI). AOI size & platform waypoint Acceptance Radius are taken into account when calculating patrol routes to provide a form of passive collision avoidance.

Patrol Behavior Execution

1. **Open the Mission Panel**
    a. Move your cursor to the top right side of the screen.
    b. Click the “+” icon or mission drawer toggle.
    c. The mission panel expands in the bottom left corner displaying Behavior, Neurons, and Altitude Settings.
2. **Flight Settings**
    a. Under Behavior select Patrol
    b. Select desired amount of Neurons
    c. Input Altitude Settings
3. **Draw mission**
    a. For Patrol’s you must draw a polygon with at least 3 points around the boundary of your AOR
4. **Plan Mission**
    a. Select Plan in the middle of the screen
    b. You can press LOG in the bottom right to make sure there are no problems and to see successful messages
    c. Wait for logs to read Planning successful or the red mission box to appear on the map.
5. **Execute**
    a. When you press execute the mission name will populate in the top right with the mission running icon showing.
    b. You will see the drone moving on the map in real time.
6. **Ending a mission**
    a. The drones will continue to Patrol until recalled by user or the battery falls below threshold
    b. For termination of the mission by the user you have multiple options
        i. Select RTB All
            1. Not recommended as it will lock out all drones currently connected to ALIEN

ii. Select the individual drone from the left side and press RTB
iii. Select the mission from the top right and press either RTB or Dismiss

NOTES:

- **Landing** for multi-VTOL flights: The best way to ensure safe landing is to RTB platforms one at a time, from closest to furthest away from the desired landing point.
- When operating with VTOL, only use horizontal or vertical patrol.
- Users are responsible for manual review of planned routes and manual control intervention to prevent incidents.
- Plan on one VTOL for every 500 square meters, no more than 3 per 1 square kilometer.
- When flying multiple VTOL's in either Horizontal or Vertical Patrol, on the first pass, a VTOL will fly past its way point and turn while the other VTOL is headed to its first way point. This may cause a collision depending on weather conditions.
- Set the landing altitude to the current behavior altitude to avoid drastic altitude changes. Example if performing patrol at 50m, use 50m when planning a land behavior.

Waypoint Behaviors

Dynamic Replanning	Looped Behavior	RTB on Completion	Land on Completion
❌	❌	❌	✅ / ❌

Set Waypoints and **Land** enables a user to specify a sequential series of waypoints followed by Land or Hover / Loiter action at the final waypoint. Dynamic Replanning and Looped Behavior are not currently supported in these behaviors. VTOL will loiter (fly in a loop) vs hover and its planned path will not be displayed in ALIEN.

Landing Behavior

For multi-VTOL flights, the safest way to ensure landing is safe is to RTB from closest to furthest away from the desired landing point.

When ready to complete the mission, select the VTOL which is closest to the Ground Control Station and manually RTB, open the platform information panel and ensure the VTOL has received and is executing RTB.

Once confirmed, select the next closest VTOL and do the same, continue until all VTOL's have RTB'd.

Note also that using the "Land" behavior will overshoot on its first approach & then circle back when transitioned to land

Set the landing altitude to the current behavior altitude to avoid drastic altitude changes. Example if performing patrol at 50m, use 50m when planning a land behavior.

Waypoints Execution

Open the Mission Panel

a. Move your cursor to the top right side of the screen.
b. Click the "+" icon or mission drawer toggle.
c. The mission panel expands in the bottom left corner displaying Behavior, Neurons, and Altitude Settings.

Flight Settings

d. Under Behavior select Waypoint or Land
e. Select desired amount of Neurons
f. Input Altitude Settings

Draw mission

g. For Waypoint and Land you must draw a line with at least 2 points on the path and to the destination you desire.

Plan Mission

h. Select Plan in the middle of the screen
i. You can press LOG in the bottom right to make sure there are no problems and to see successful messages
j. Wait for logs to read Planning successful or the red mission box to appear on the map.

Execute

k. When you press execute the mission name will populate in the top right with the mission running icon showing.
l. You will see the drone moving on the map in real time.

Ending a mission

m. If you selected land behavior then the drone will land and wait further instructions
n. If you selected waypoint behavior then the drone will hover at final way point
o. The termination procedure will be the same as patrol.

Saving a Mission

1. Click the Add Mission Icon at the top right 
2. You will see this at the top of the mission planning panel

3. Build your mission (see instructions in “RUNNING A MISSION” section below)
4. Select the Save Mission as Preset Button 
5. You will see the Save as a new preset change to the preset.

Note: Currently you can’t change the name of the saved mission, so take note manually

Note: Currently the save mission feature will only save the AOI for a PATROL BEHAVIOR mission.

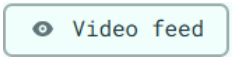
Using a Presaved Mission

1. Select the presaved mission from the dropdown
2. Select the Checkmark
3. The mission will populate on the map
4. You can adjust mission parameters and then Plan and Execute as normal

Deleting a Presaved Mission

1. Select the presaved mission from the dropdown
2. Select the Trash Icon 
3. Mission will be removed from the list

View Video Stream

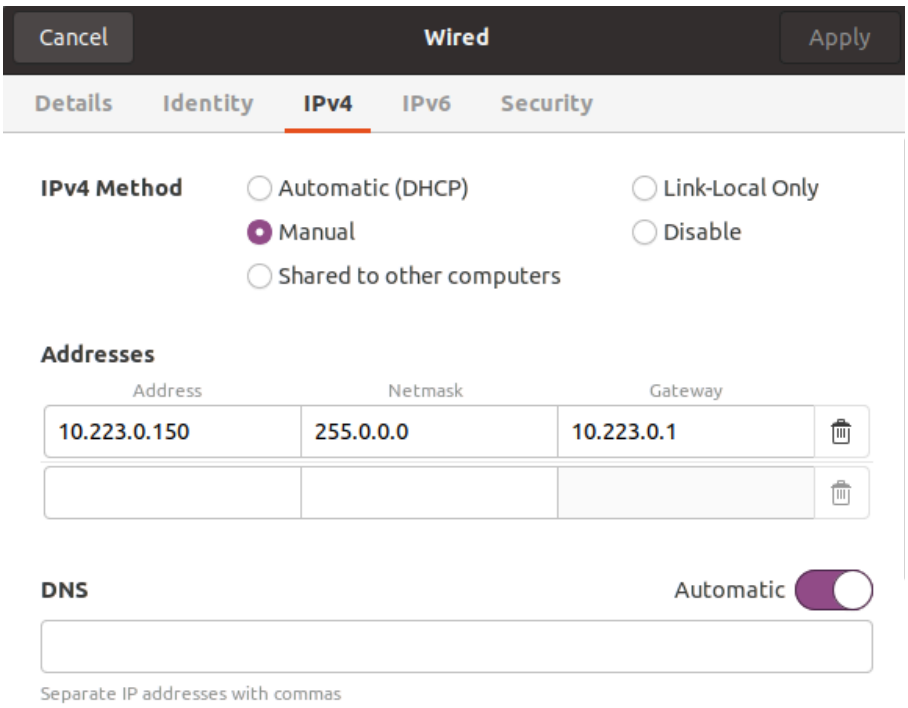
1. Select Drone on the left side of the screen
2. Select 

3. To Exit the video mode select 

NETWORK & PLATFORM SETUP

Connect Doodle Labs Radios

- Connect USB-C to laptop attached to Doodle labs radios connected to ALIENWeb
- Turn on radio by holding button on bottom of battery
- Go to Laptop Network Settings
- Set Static IP (10.223.0.150) and Subnet Mesh (225.255.0.0) in Wired IPv4 settings
    - This is typically a one time setup



Stage Robotic Platforms

- Position Platforms 10m apart (limitation of Doodle Labs Mesh Network) Insert photo

Power on Robotic Platforms

- Plug in power supply on staged platforms
- Neurons will appear in the ALIEN Vehicle List
- Ineligible neurons will be greyed out.

- Recycle power on UxS to clear errors.

Insert Photo

SHUTTING DOWN ALIEN

Stop ALIEN

This stops the services and shuts down the program

Backup ALIEN Logs

This zips up the previous logs and clears the application memory

COMMON BUGS AND SOLUTIONS

VTOL

Manual Control When a user takes over manually, the VTOL will stay in whatever mode it was previously in.

Boot Error

Sometimes when the quads boot there is an error and when a mission is executed some of the quads won't take off. To avoid this when you first turn on the drones,

1. Click on each drone and check altitude, there should be micro adjustments. If you see the drone's altitude has not changed:
2. Unplug the battery from the drone and plug it back in and recheck.
3. If all drones in the mission batteries are in constant change then they are ready to fly.

When to restart ALIEN

1. Every time you press "RTB all" power cycle the robots and restart ALIEN entirely
2. If UI is frozen and a refresh of the browser does not fix the issue, restart ALIEN

Best Battery Practices

- **Lithium Polymer**
    - **Storage**
        - Store at 3.8V per cell (about 50-60% charge)
        - Keep them in a fireproof LiPo bag or ammo can
        - Store in a cool, dry place away from direct sunlight
    - **Charging**
        - Use the provided balance charger
        - Charge at 1C rate or lower
        - Stop charging if the battery puffs or swells and discard
    - **Usage**
        - Don't discharge below 3.3V per cell
        - Let batteries cool to room temperature before charging
        -
    - **Lifespan Tips**
        - Do not leave them fully charged for more than 2-3 days
        - Check voltage monthly if storing long term
        - Expect ~250 charges before decommission
- **Lithium Ion**

- **Storage**
    - Store at 3.7V per cell (about 40-50% charge)
    - Less volatile than LiPo but still use a safe container
    - Store in a cool, dry place away from direct sunlight
- **Charging**
    - Use the provided balance charger
    - Charge at .5C-1C rate
- **Usage**
    - Don’t discharge below 3.0V per cell
    - Let batteries cool to room temperature before charging
- **Lifespan Tips**
    - Do not leave them fully charged for more than 2-3 days
    - Check voltage monthly if storing long term
    - Expect ~500 charges before decommission

Instruction Manuals

T2 Cruza

https://www.heewing.com/pages/t2-instruction-manual

ModalAI Starling

https://www.modalai.com/products/starling-2?variant=48173890208048

CQ3 Battery Charger

https://www.ev-peak.com/wp-content/uploads/2023/04/CQ3.pdf