

Computer System and OS Details

- **Main Computer:**
 - **Raspberry Pi 3B**
- **Operating System:**
 - **Raspberry Pi OS (32-bit version)**
 - **Linux-based**
- **Purpose:**
 - Acts as the central control unit for the autonomous catamaran, interfacing with sensors, actuators, and communication modules.
- **Key Features:**
 - **GPIO Pins:** Used to interface with sensors, ESCs (via ESP32), and other peripherals.
 - **USB Ports:** For connecting GNSS/GPS, IMU, and other USB devices.
 - **Network Connectivity:** For remote monitoring, data logging, and software updates.
 - **Linux OS:** Provides a robust and flexible environment for running custom control software, sensor fusion algorithms, and communication protocols.

Integration with Other Components

- **ESP32 Module:**
 - Used to generate PWM signals for controlling ESCs (for thrusters and servos), and may communicate with the Raspberry Pi via serial (UART), I2C, or SPI.
- **Sensors:**
 - **GNSS/GPS, IMU, Ultrasonic, LIDAR** are interfaced with the Raspberry Pi either directly or via the ESP32, depending on your wiring and software architecture.
- **Power System:**
 - **LiFePO4 Battery (12.8V, 40Ah)** powers the thrusters, ESCs, and electronics (via buck converters if needed).
- **Communication:**
 - **Telemetry Module** enables wireless data transmission and remote control.

Summary Table

Component	Details/Notes
Main Computer	Raspberry Pi 3B
Operating System	Raspberry Pi OS (32-bit, Linux-based)
Sensors	GNSS/GPS, IMU, Ultrasonic, LIDAR
Control Module	ESP32 (PWM for ESCs, communication with Pi)
Propulsion	T100 Thrusters, ESCs, Servo Motors
Power	LiFePO4 Battery (12.8V, 40Ah), Voltage/Current Sensor
Communication	Telemetry Module
Structure	Waterproof Enclosure, Hulls, Cross Beams, Mounting Hardware
Optional	Camera, Wind Sensor, AIS, Solar Panels