Integrative Project In Industrial Electronics and Computers Engineering

Sensoring System for Superficial Sea Streams

5S – Drifter

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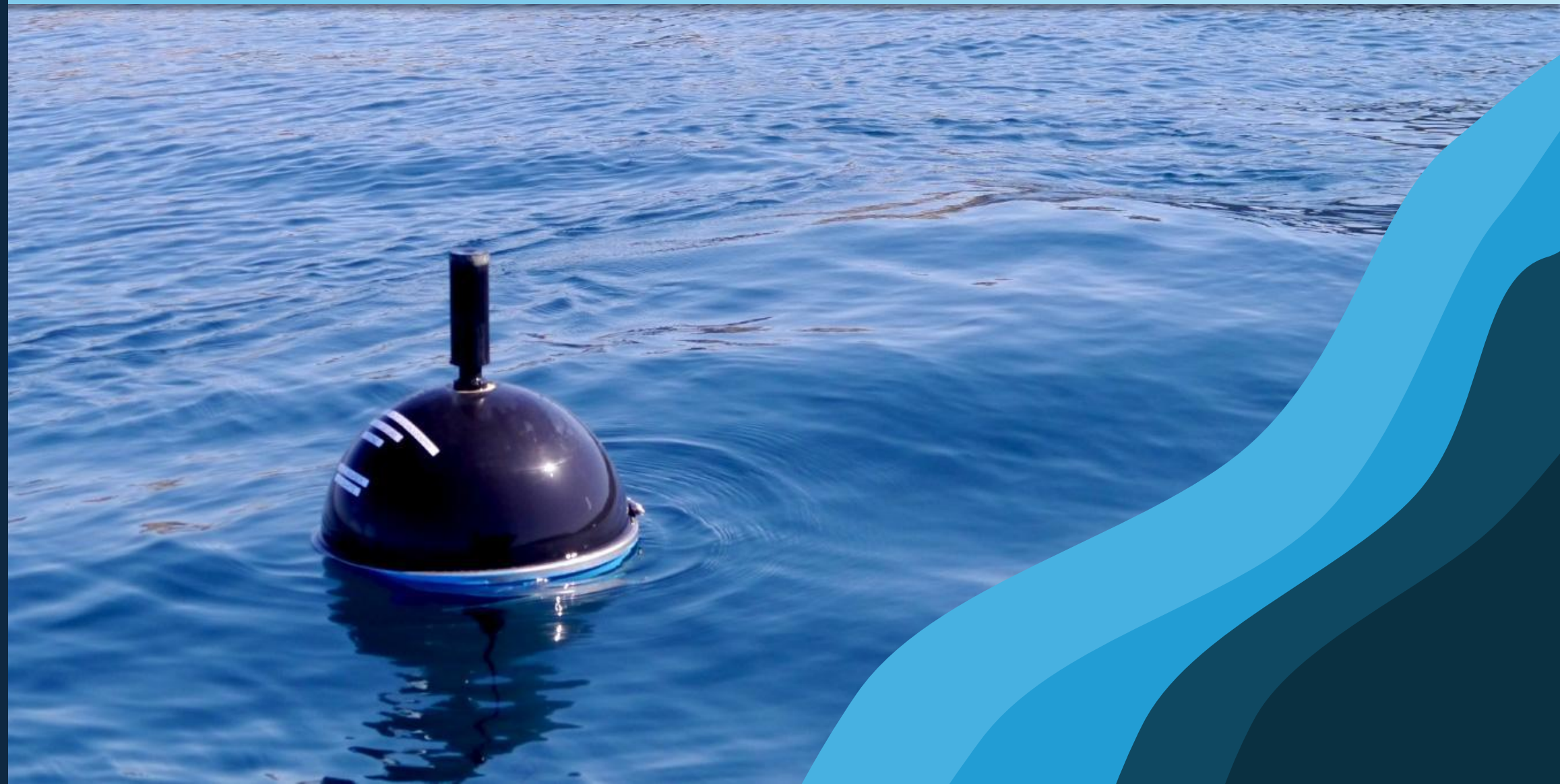
Agenda

- Introduction
  - Project Statement
  - Project Statement Analysis
- Analysis
  - Requirements
  - Constraints
  - State of the Art
  - System Architecture
- Design
- Implementation

Introduction

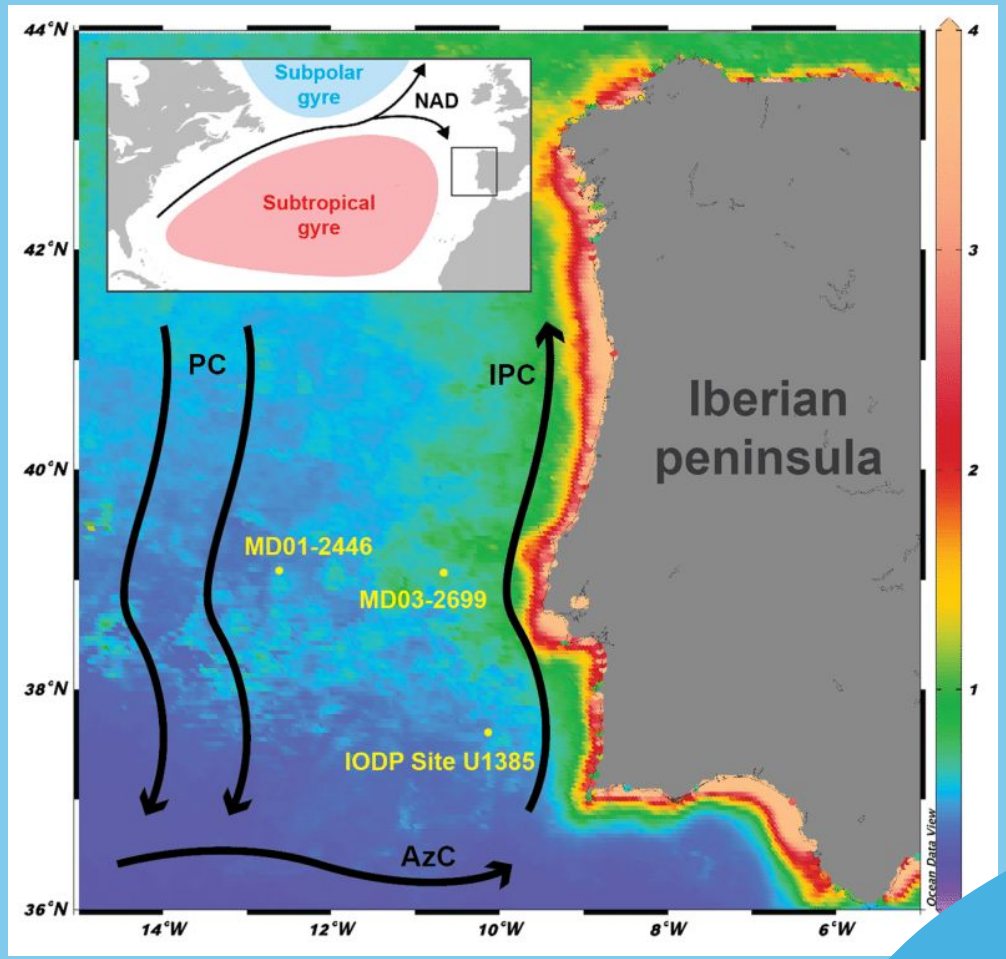


Project Statement

- 20 to 26% of the ocean is mapped (superficial and deeper areas) .
- Around 80% of commercial trades are made by the sea.
- Risky environment.
- IPC as a commercial rout at Portugal scale.

Project Statement

- IPC (Iberian Poliward Current)



NAD: North Atlantic Drift
PC: Portugal Current
IPC: Iberian Poleward Current
AzC: Azores Current.

This map shows chlorophyll concentration

Project Statement Analysis

- Data acquisition
  - Power Level
  - Wave Intensity
  - Position
  - Temperature
- Send Data Wirelessly
- Store Data Locally
- Autonomy (Low Power)
- Resistant and buoyant outer shell

Analysis

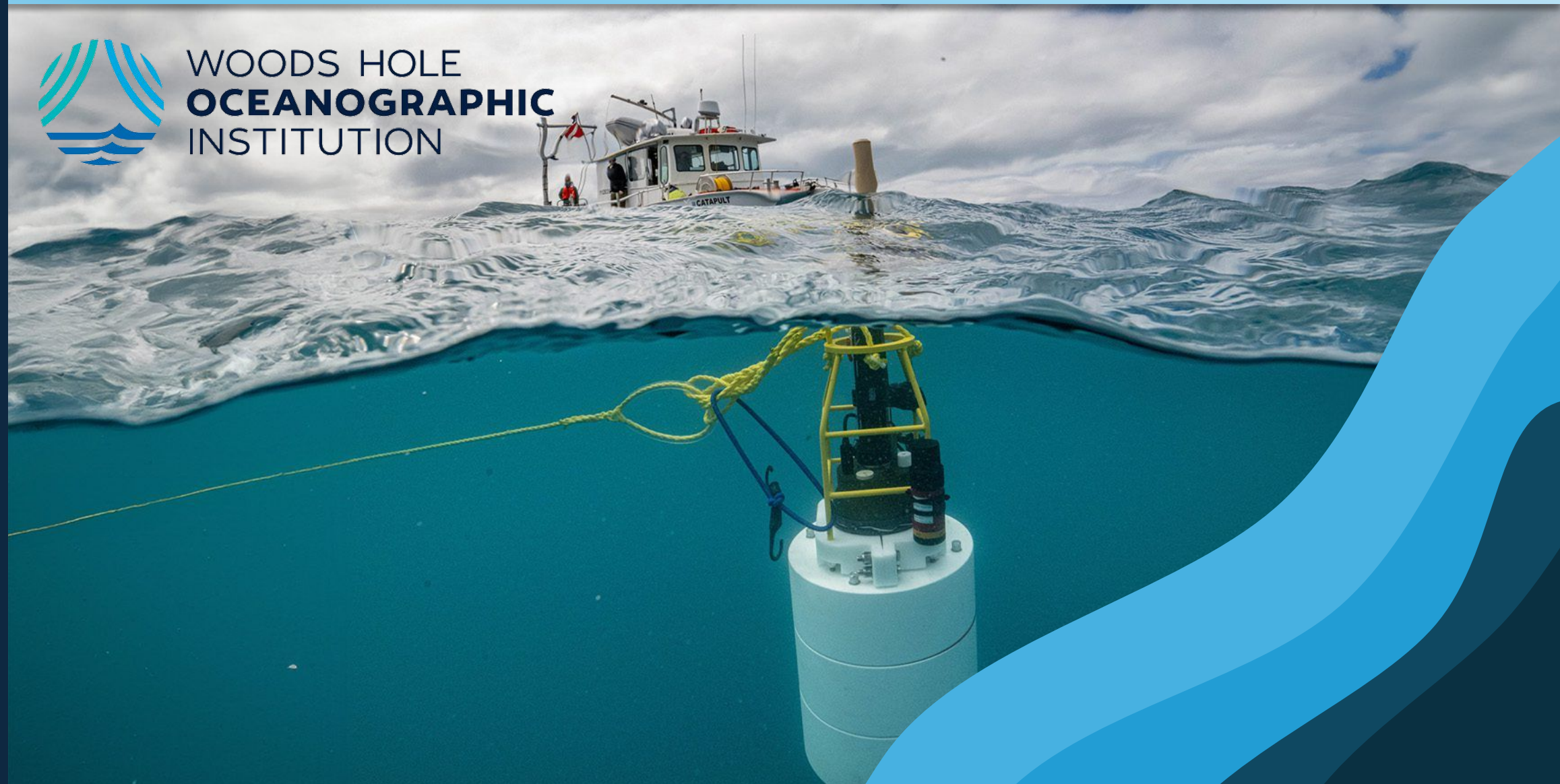
- Microcontroller
- GNSS
- Mobile Communication
- Power Source
- Sensors
  - IMU
  - Temperature
  - Power Source Level

State of Art


NOAA
NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION
U.S. DEPARTMENT OF COMMERCE
Drift Study

State of Art

State of Art



State of Art

State of Art

UMINHO
CMEMS
CENTER FOR MICROELECTROMECHANICAL SYSTEMS

- Next Sea – Next generation monitoring of coastal ecosystems in a scenario of global change
- Sonda – Synchronized Atmospheric and Oceanic Data Acquisition

State of Art

- Border Control
- Climate Modeling
- Traffic management
- Aquaculture management
- Public oceanographic research
- Marine spatial planning
- Defense and security

Requirements

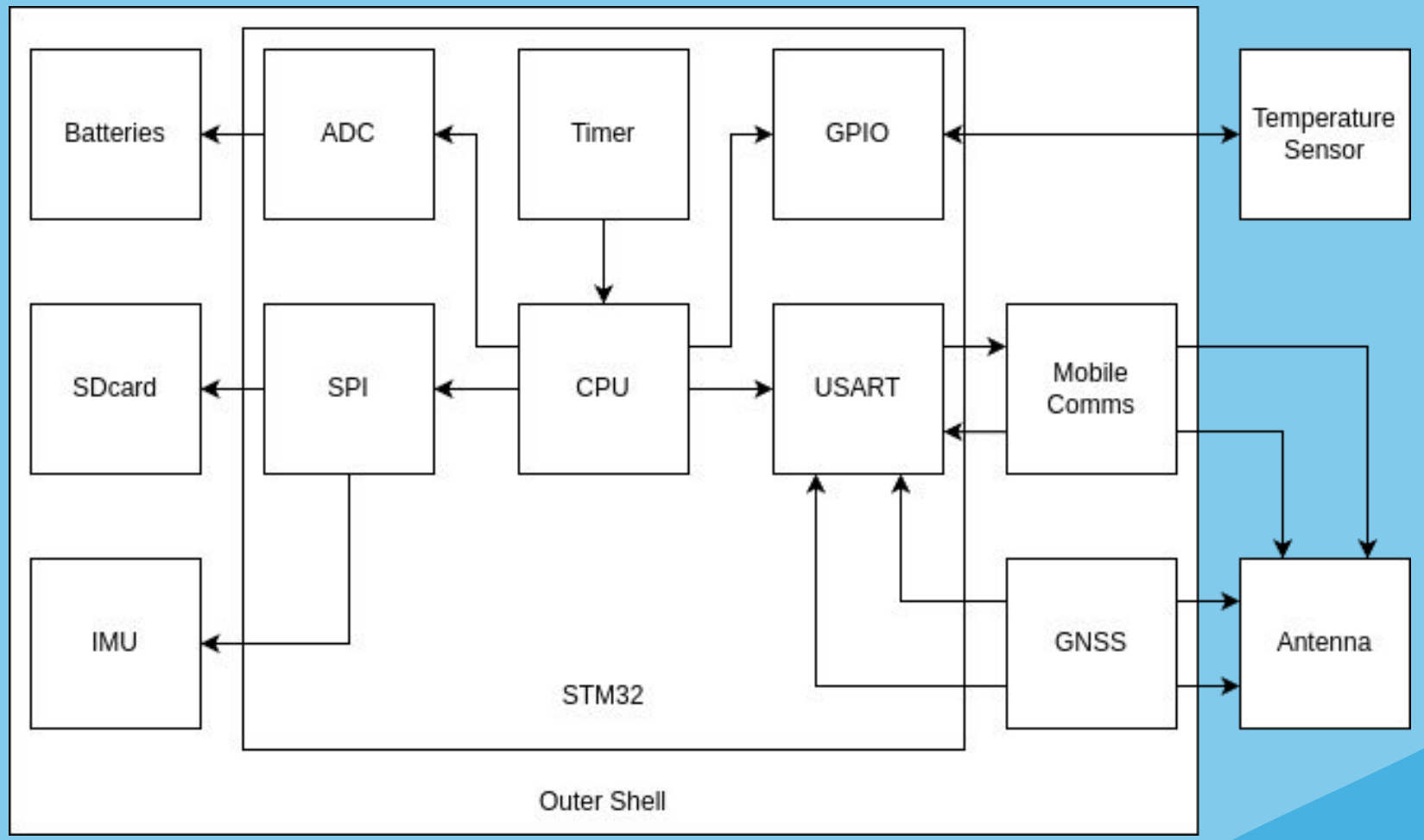
- Search and selection of hardware components
  - Low Power and Low Cost
- Software/Hardware design
  - Communication within modules and peripherals
- PCB design*
- Energy Harvesting*
- 5S outer shell as a 3D design
- Product realization
- Laboratory Tests
- Documentation

* On analysis

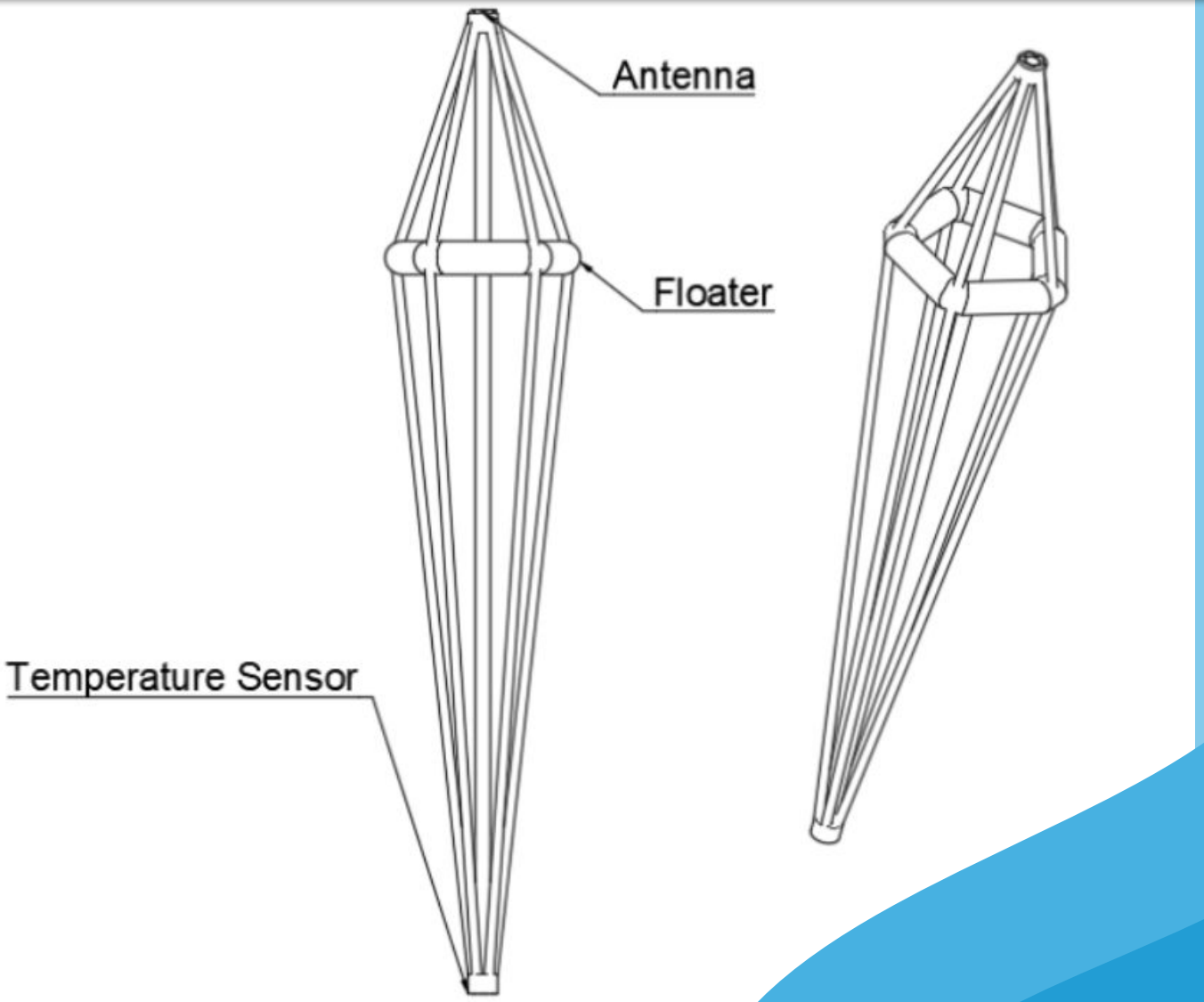
Constraints

- Be presented for evaluation within deadline
- Limited team.
- Be validated at the ocean.
- Have an autonomy of a month at minimum
- Due to the low power consumption and lab availability, an STM32 will be used.

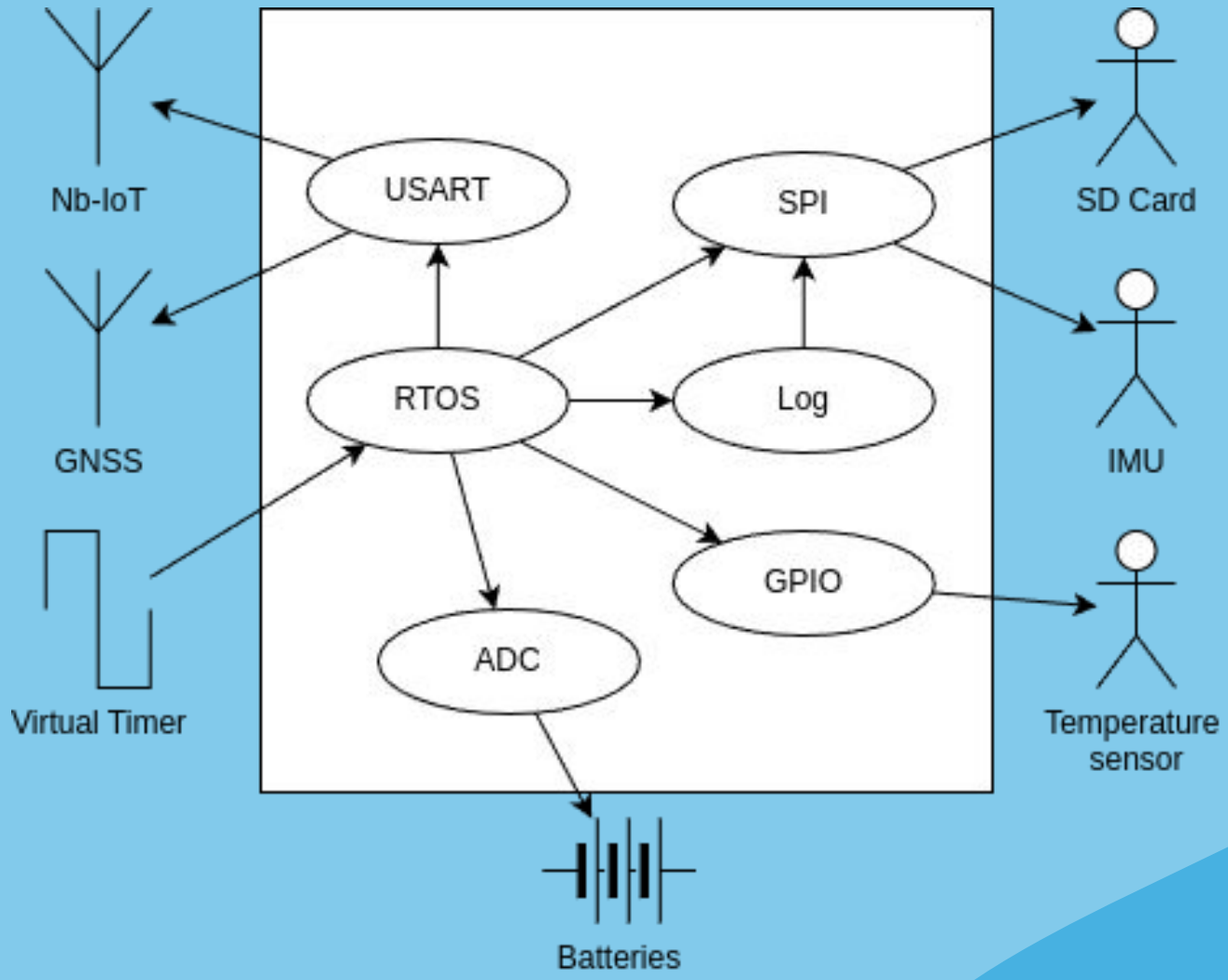
System Architecture



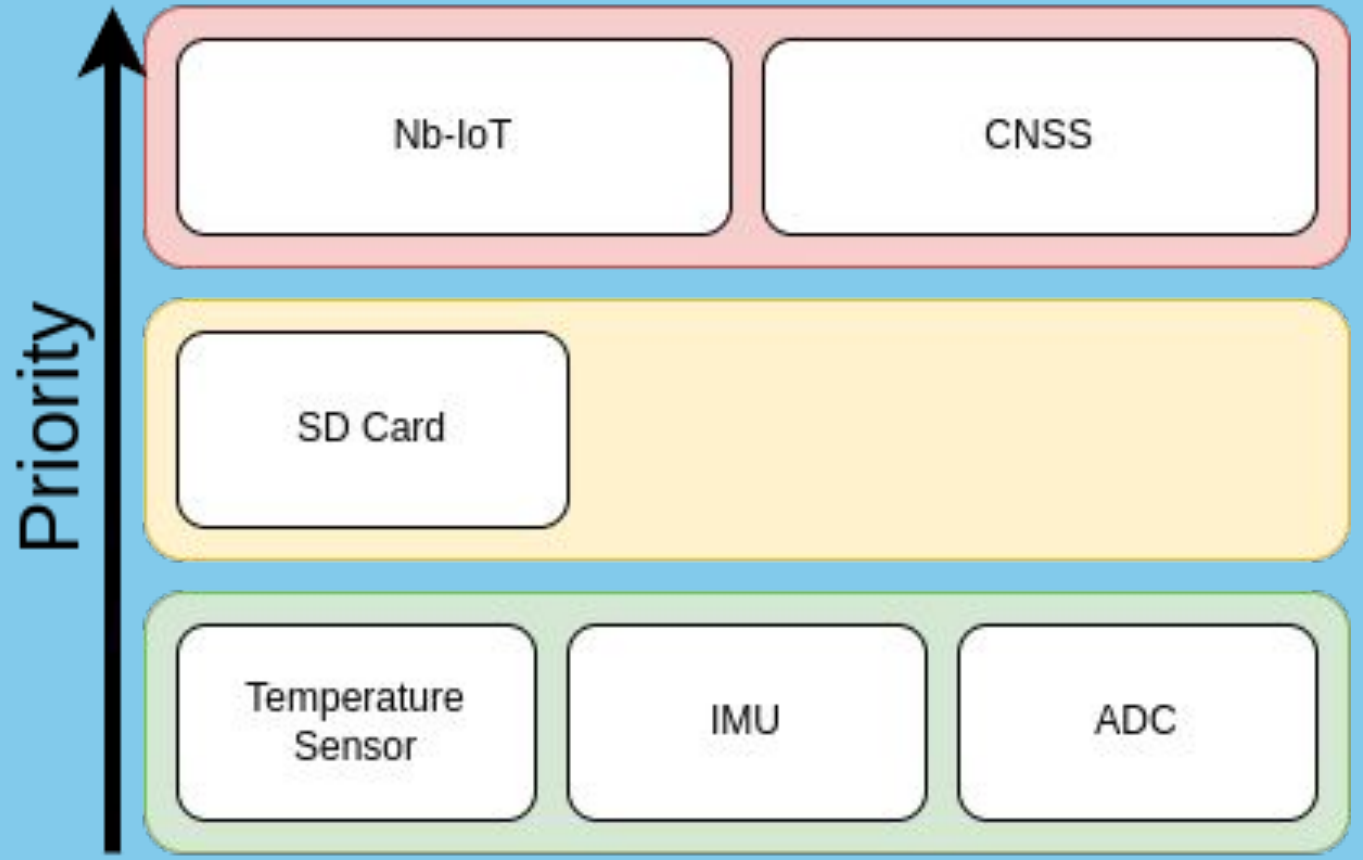
Drifter Architecture



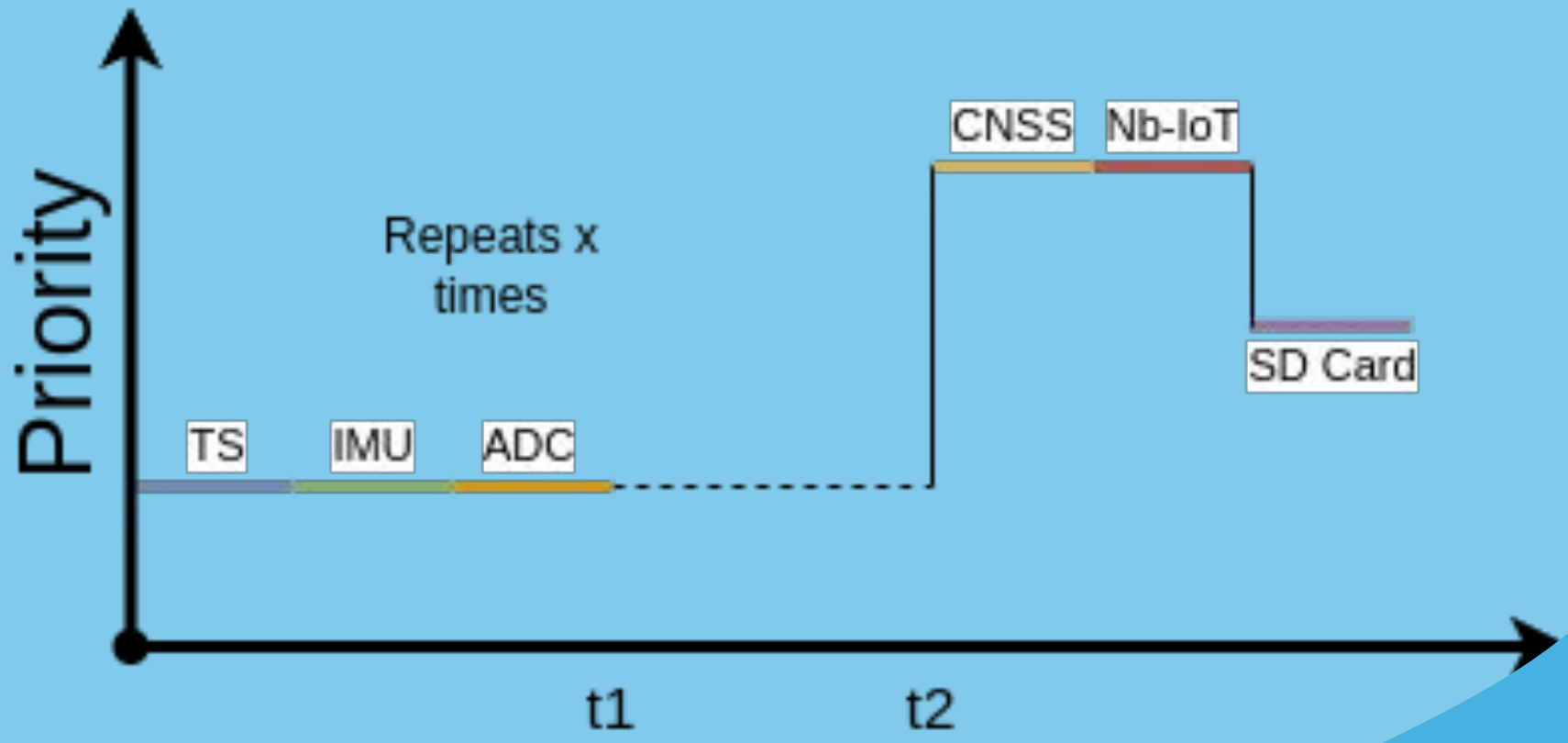
Peripheral Architecture



System Architecture



System Architecture



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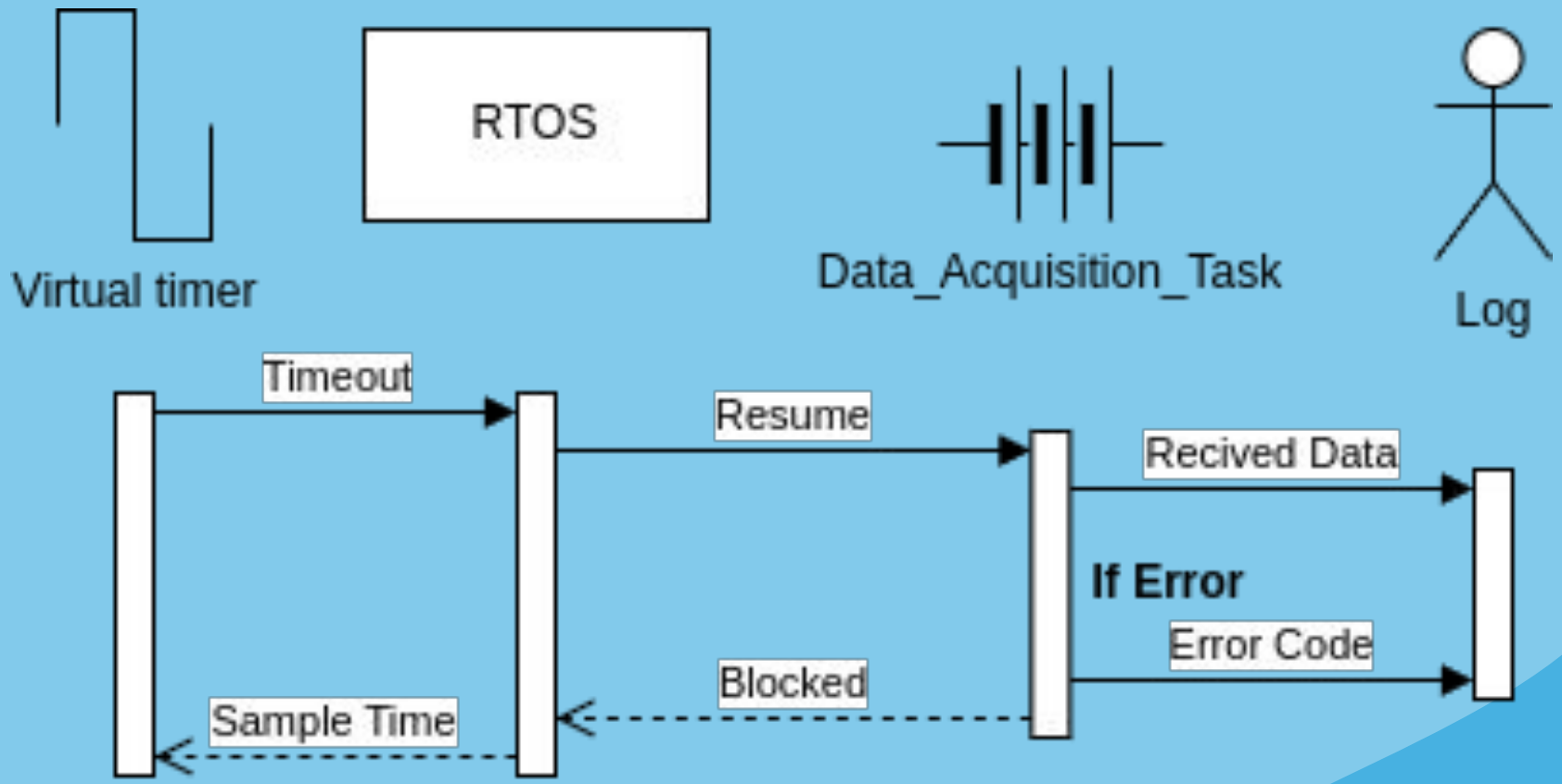

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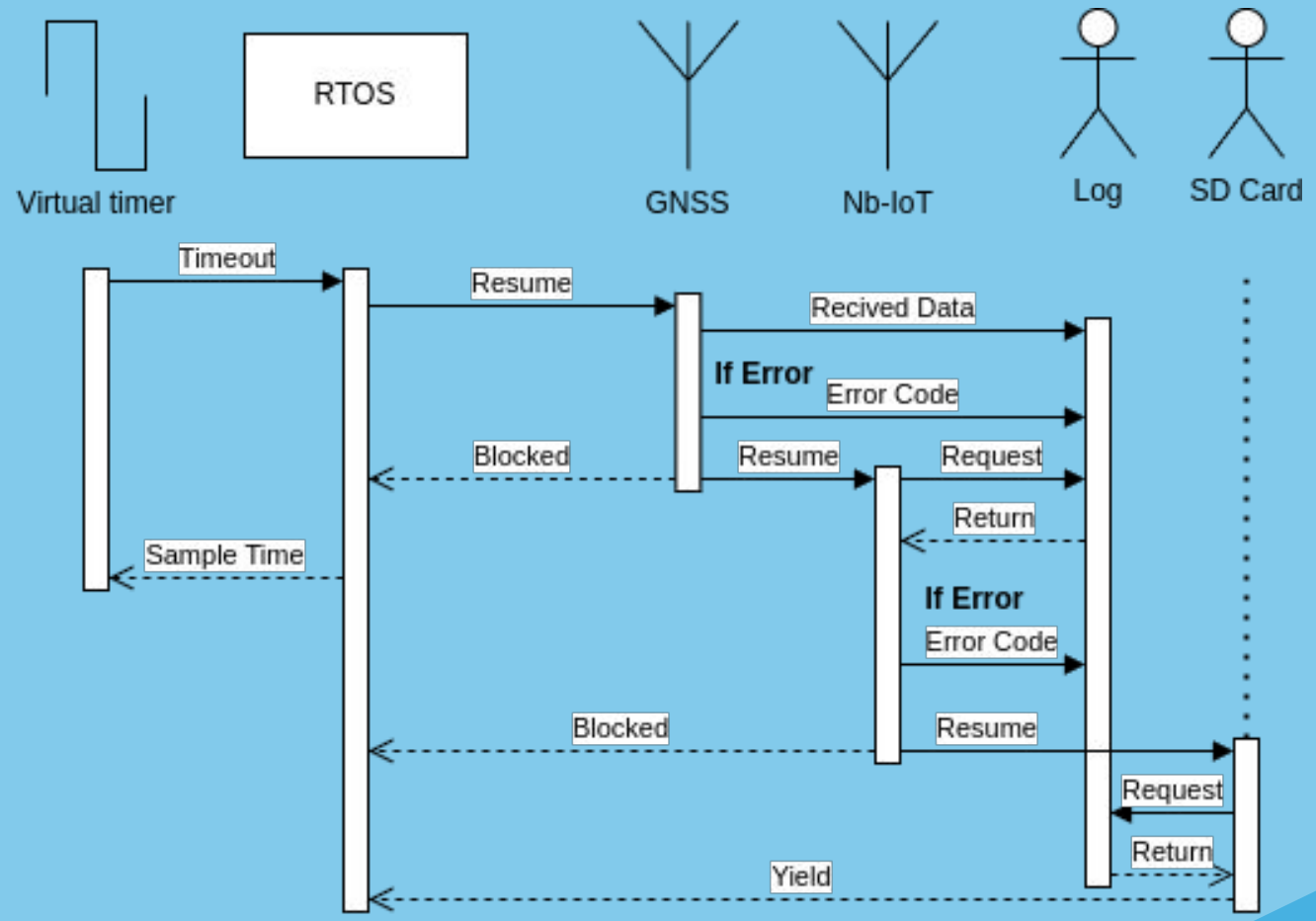
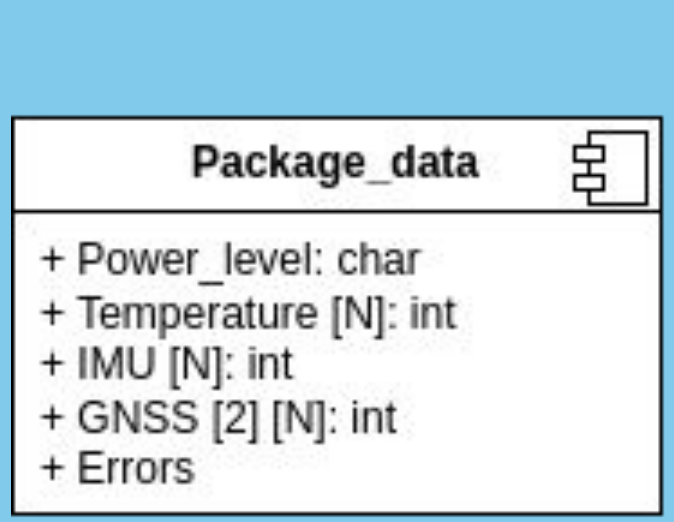
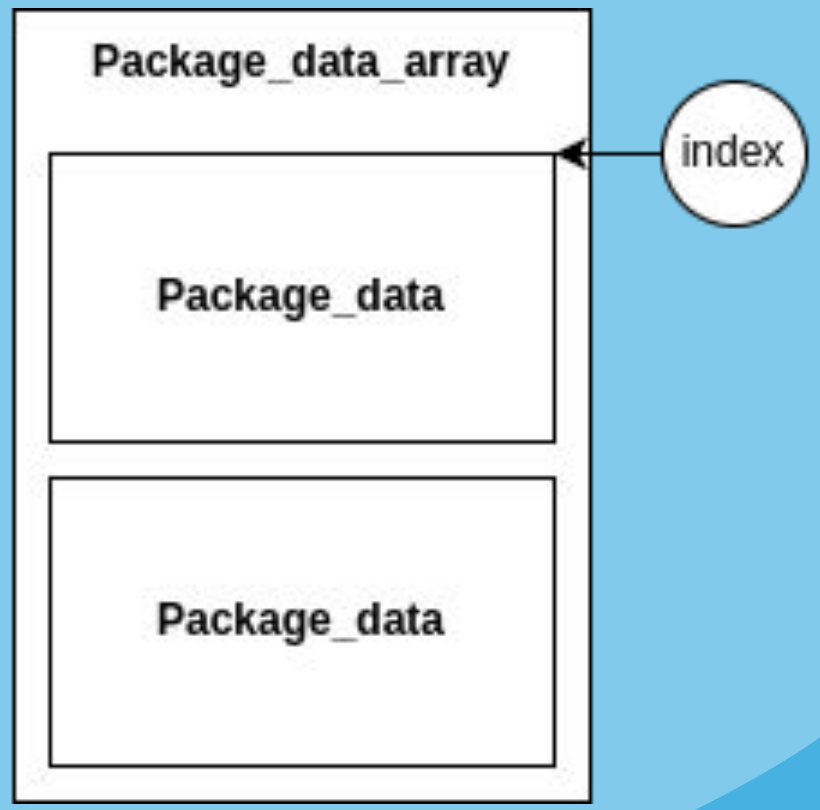
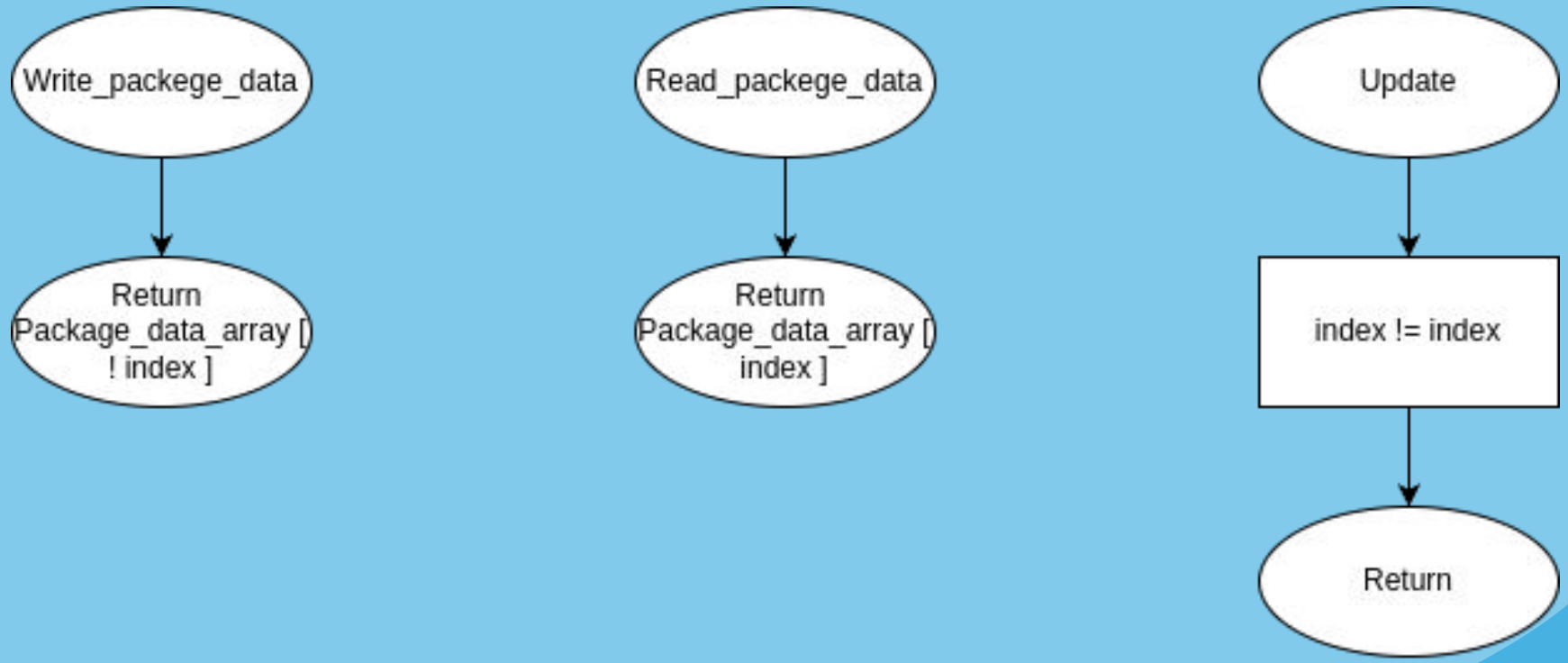


Memory Architecture





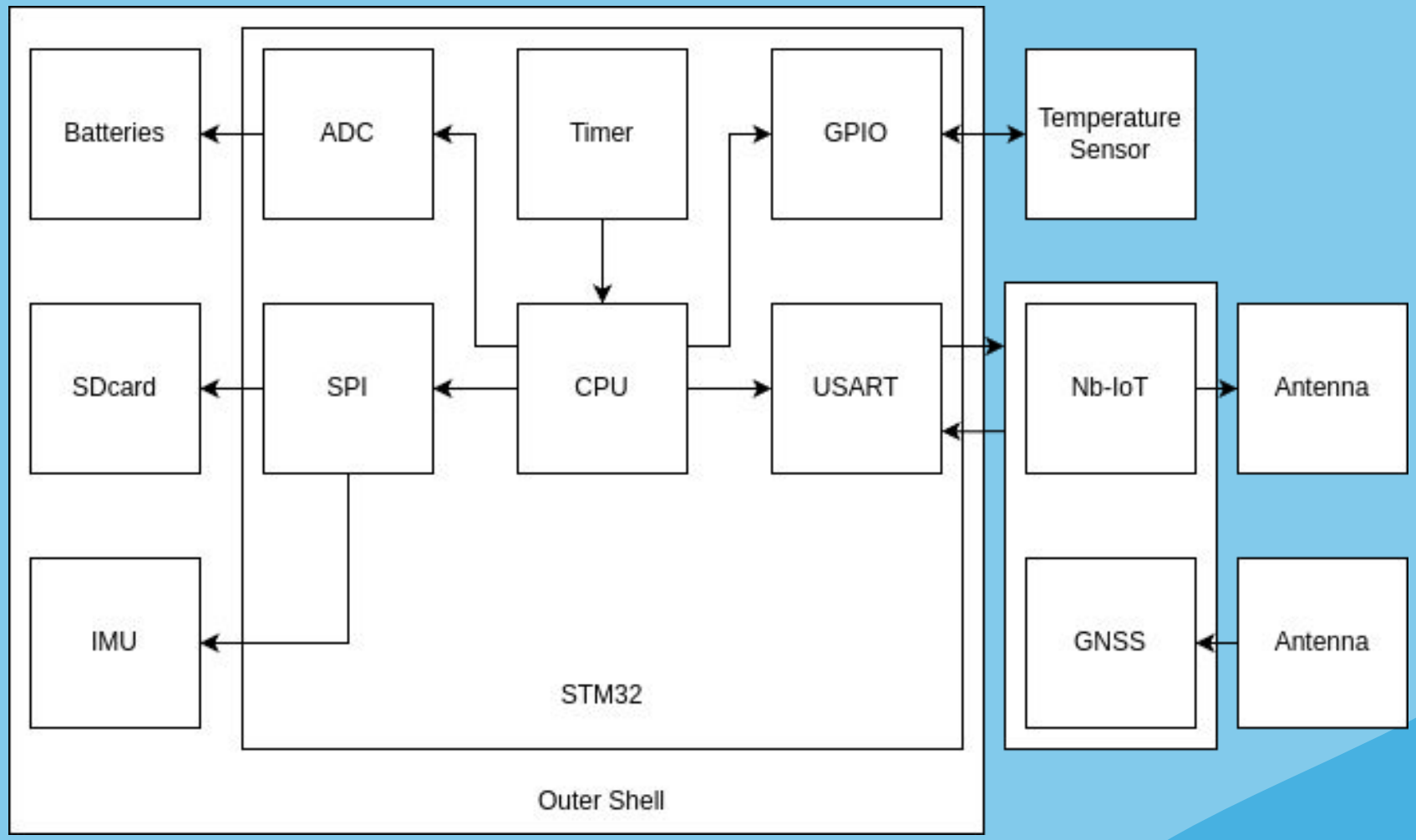
Memory Architecture



Design

- Microcontroller: STM32
- GNSS and Nb-IoT: ST87M01 evaluation kIT
- Sensors
  - IMU: ISM330BX
  - Temperature: DS18B20
- Batteries
  - Solar energy
    - Controller: AEM10941
    - Panel: SM111K06L
  - Batteries:

Design


Batteries
ADC
Timer
GPIO
Temperature Sensor
SDcard
SPI
CPU
USART
Nb-IoT
Antenna
IMU
GNSS
Antenna
STM32
Outer Shell

Implementation

Thanks :D

Any questions?