

# GPS Tracking System

Real-Time GPS Tracking with Portenta H7 and IoT GNSS Shield

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# Introduction I

## Overview of Presentation

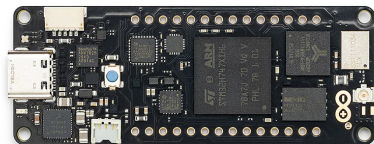
- **Portenta H7:** A powerful microcontroller board designed for industrial applications.
- **Cat. M1/NB IoT GNSS Shield:** A shield that adds cellular connectivity and GNSS capabilities.
- **Purpose:** To integrate these two components for enhanced IoT solutions.
- **Benefits:**
  - Expanded connectivity options.
  - Real-time geolocation data.
  - Suitable for remote and industrial IoT applications.

# About Portenta H7 I

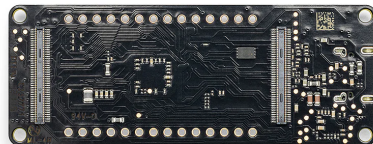
## Key Features

- **Processor:** Dual-core ARM Cortex-M7 (480 MHz) and Cortex-M4 (240 MHz).
- **Memory:** 8MB SDRAM, 16MB NOR Flash, 1MB SRAM.
- **Connectivity:** Wi-Fi, Bluetooth, Ethernet, USB, CAN, and more.
- **Industrial Grade:** Suitable for critical and demanding applications.
- **Versatile:** Can be programmed with Arduino, Mbed, and other IDEs.

# Portenta H7 I



**Figure1: Arduino PortentaH7**  
**Top [Ard24c]**



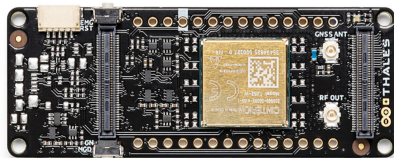
**Figure2: PortentaH7 Bottom**  
**[Ard24c]**

# About Cat. M1/NB IoT GNSS Shield I

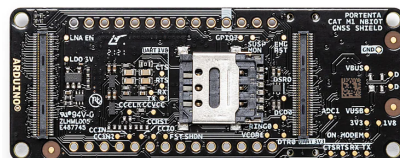
## Key Features

- **Connectivity:** LTE Cat M1, NB-IoT for wide area network communication.
- **GNSS:** Supports GPS, GLONASS, Galileo, BeiDou for precise positioning.
- **Low Power:** Optimized for low power consumption, ideal for battery-operated devices.
- **Applications:** Suitable for asset tracking, remote monitoring, and IoT deployments.

# Portenta H7 Cat. M1/NB IoT GNSS Shield I



**Figure1: Portenta H7 Cat.  
M1/NB IoT GNSS Shield  
TopView**  
[ArduinoIOTGNSSstore:2024]



**Figure2: Portenta H7 Cat.  
M1/NB IoT GNSS Shield  
BottomView**  
[ArduinoIOTGNSSstore:2024]



# Benefits of Integration I

## Benefits of Integration

- **Enhanced Connectivity:**

- Multiple network options including cellular and Wi-Fi.
- Reliable communication in remote areas.

- **Real-time Geolocation:**

- Accurate tracking of devices in motion.
- Useful for logistics and fleet management.

- **Low Power Consumption:**

- Extends battery life for IoT devices.
- Suitable for remote and long-term deployments.

- **Industrial and Remote Applications:**

- Monitoring environmental conditions in agriculture.
- Tracking assets in supply chain management.

# Technical Specifications I

## Technical Specifications

- **Portenta H7:** [Ard24e]
  - Processor: Dual-core ARM Cortex-M7 (480 MHz) and Cortex-M4 (240 MHz).
  - Memory: 8MB SDRAM, 16MB NOR Flash, 1MB SRAM.
  - Connectivity: Wi-Fi, Bluetooth, Ethernet, USB, CAN, and more.
  - Operating Temperature: -40 to +85 degrees Celsius.
- **Cat. M1/NB IoT GNSS Shield:** [Ard24a]
  - Modem: LTE Cat M1, NB-IoT for IoT applications.
  - GNSS: Supports GPS, GLONASS, Galileo, BeiDou.
  - Power Consumption: Ultra-low power, ideal for battery-operated devices.
  - Antenna: External antenna for improved signal reception.

# Integration Process I

## Integration Process

### Hardware Connection:

- Stack the Cat. M1/NB IoT GNSS Shield on top of the Portenta H7.
- Ensure secure connection of pins and proper alignment.

### Software Setup:

- Install necessary libraries in the Arduino IDE.
- Configure settings for cellular and GNSS functionalities.

### Writing and Uploading Code:

- Develop code to handle connectivity and data transmission.
- Upload the code to the Portenta H7 and test the integration.

# Project: Real-time GPS Tracker I

## Sample Project: Real-time GPS Tracker

The goal of this project is to create a real-time GPS tracker using the Portenta H7 microcontroller board and the Cat. M1/NB IoT GNSS Shield. The tracker will capture GPS coordinates (latitude, longitude, and altitude) and send this data over a cellular network to a remote server.

### Components:

- Portenta H7
- Cat. M1/NB IoT GNSS Shield
- Power source (e.g., battery or power adapter)

### 1 Connect the Hardware:

- Stack the Cat. M1/NB IoT GNSS Shield on the Portenta H7.
- Attach the GNSS antenna to the shield.
- Insert the SIM card with a data plan into the shield.

### 2 Set Up the Software:

- Install Arduino IDE from <https://www.arduino.cc/en/software>

# Project: Real-time GPS Tracker II

## Sample Project: Real-time GPS Tracker

- Add Portenta H7 board and necessary libraries: MKRGSM and Arduino\_MKRGPS

### 3 Write the Code: [Ard24b] [Ard24d]

- Initialize GSM and GPS modules.
- Capture GPS data.
- Send data to server via cellular network.

### 4 Upload the Code:

- Connect the Portenta H7 to your computer using a USB cable.
- Select the Portenta H7 board and the correct port in the Arduino IDE.
- Upload the code to the Portenta H7.

### 5 Test the Tracker:

- Open the Serial Monitor in the Arduino IDE to see debug messages and GPS data.
- Ensure the GPS coordinates are captured and sent to the server correctly.

# Use Cases and Applications I

## Use Cases and Applications

- **Asset Tracking:**

- Real-time location monitoring.
- Reduces loss and improves asset management.

- **Remote Monitoring and Control:**

- Monitor environmental conditions remotely.
- Control devices and machinery from a distance.

- **Environmental Monitoring:**

- Track weather conditions, air quality, and other environmental factors.
- Useful for smart agriculture and urban planning.

- **Smart Agriculture:**

- Monitor soil moisture, crop health, and livestock tracking.
- Optimize resource usage and improve yield.

- **Industrial IoT:**

- Monitor and control industrial processes.
- Enhance efficiency and reduce downtime.

# Quellen I

## Bibliography / References

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<https://docs.arduino.cc/hardware/portenta-h7/>.