



August 21, 2025

The research vessel of Middle East Technical University has been equipped with LoRaWAN technology through the Connecta IoT Network

METU's flagship research vessel R/V Bilim-2 will be tracked for 45 days using a satellite-based tracking system developed by Plan-S.

The R/V Bilim-2 research vessel, operated by the METU Institute of Marine Sciences (DBE)—one of Türkiye's leading institutions in marine research—will now be tracked using an IoT device developed by Plan-S. Serving as a multidisciplinary platform for studies in oceanography, marine biology and fisheries, marine geology and geophysics, and environmental monitoring, the vessel is capable of operating continuously for up to 45 days and is equipped with advanced scientific instruments that support numerous research projects.

Plan-S has integrated its Connecta IoT Tracker Lite into the R/V Bilim-2, enabling uninterrupted satellite-based vessel tracking. Unlike traditional GSM-based systems, this solution provides seamless monitoring even in remote open seas. Since early August, the system has been tracking the vessel's 45-day scientific voyage from Mersin-Erdemli across the Mediterranean, Aegean, Marmara, and Black Seas using satellites in orbit.

Satellite Tracking in Oceanographic Observation Systems

For oceanographic observation systems developed by the ODTÜ Institute of Marine Sciences, satellite-based solutions are critical to transmitting data in regions outside GSM coverage. The constant movement of autonomous devices, such as those tracking surface currents, makes reliable data transfer even more challenging.

Plan-S addresses this need with its **LoRaWAN-enabled satellite tracking technology**. LoRaWAN (Long Range Wide Area Network) is a low-power, wide-area communication protocol designed for secure, long-range data transmission. The tracker uses LoRa modulation to transmit data packets of up to **50 bytes per pass**, which are then relayed to the Connecta IoT Network satellites orbiting the Earth. By



integrating LoRaWAN into its communication infrastructure, Plan-S ensures ultra-low power consumption, robust signal transmission over thousands of kilometers, and efficient connectivity for devices operating in GSM-deprived maritime environments. Before deploying the technology in autonomous platforms, ODTÜ and Plan-S agreed to test the system on a moving research vessel. Ahead of its latest expedition, the device was quickly integrated into the R/V Bilim-2 and became fully operational. This marked the successful trial of an **innovative LoRaWAN-based satellite tracking technology for mobile platforms**.

Satellite Tracking System

The **Connecta IoT Tracker Lite** automatically activates every two hours to determine and log the vessel's location. During satellite passes, the stored data is transmitted in bulk via the **LoRaWAN protocol** to the Connecta IoT Network, and subsequently delivered to the METU Institute of Marine Sciences. With additional satellites planned for launch, Plan-S aims to increase transmission frequency to **less than 15 minutes**, providing near real-time tracking.

Thanks to its compact design, the device requires no extensive installation and can be easily mounted on any point of a ship or boat with a clear line of sight to the sky. The use of LoRaWAN also enables **secure end-to-end encryption, low bandwidth usage, and scalable connectivity**, making the system adaptable for a broad range of marine research applications.

Field Durability and Reliability Tests

During the voyage, stress tests were conducted by relocating the device to different positions on the vessel. The tracker successfully transmitted all stored location data without any loss, proving the **resilience of LoRaWAN-based satellite communication** under challenging marine conditions.

Marine Observation Systems Integration

Plan-S CEO Özdemir Gümüşay highlighted the significance of the collaboration for scientific research: "This system represents the first step in building the infrastructure that will allow data from buoys and other autonomous systems used by METU in marine research to be transmitted via satellite, even in regions without GSM coverage."

By leveraging **LoRaWAN's low-power, long-range communication capabilities**, data from marine observation systems developed by METU can now be delivered to land stations. This will enhance field observation capacity and support the development of effective early warning mechanisms.



A Step Toward the Future

The Connecta IoT Tracker Lite is the first in a series of three asset-tracking devices (Solar Panel, Hybrid, and Lite) developed by Plan-S. Data gathered from the R/V Bilim-2 expedition will also contribute to the optimization of solar-powered and hybrid models. This milestone represents a key step toward the widespread adoption of domestically developed satellite-based tracking technologies in Türkiye's marine research.

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About Plan-S:

Plan-S is a technology company established in Ankara in 2021, specializing in the development of next-generation satellite and space technologies. Through its constellation of low-Earth orbit satellites, Plan-S provides satellite-based solutions for IoT communication, Earth observation, remote sensing, and space-as-a-service applications.

Plan-S's satellite-based IoT communication network, **Connecta IoT Network**, provides low-power, cost-effective, and reliable connectivity in areas where terrestrial infrastructure is insufficient. This system, which connects millions of devices across sectors such as energy, agriculture, infrastructure, and logistics, is currently in active use.

Plan-S also aims to provide accessible data solutions for environmental monitoring, disaster management, and decision-support processes in agriculture through its Earth observation satellites named **Observa**.

Plan-S develops its satellite platforms, payloads, and software with its own engineering team and manages global data communication through ground stations in Ankara, Erzurum, and Sweden. Having successfully launched 17 satellites to date, the company aims to establish a large satellite constellation consisting of hundreds of satellites by 2030.

Plan-S aims to contribute to a more connected and intelligent future by bringing Turkey's indigenous and national space technologies together with globally competitive solutions.

