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Author: Mr. Marcel Marin-de-Yzaguirre
i2CAT, Spain, marcel.marin@i2cat.net

Dr. Joan Adrià Ruiz de Azúa Ortega
i2CAT, Spain, joan.ruizdeazua@i2cat.net

EXPERIMENTAL DEMONSTRATION OF WILDFIRE PREVENTION USE CASE THAT INTEGRATES LEO SATELLITES WITH IOT COMMUNICATIONS

Abstract

The Internet of Things (IoT) stands as a transformative force that has reshaped the landscape of sensory data, resulting in an unprecedented surge in the volume of information at our disposal. By seamlessly connecting devices, sensors, and systems, IoT has unlocked novel possibilities for innovation and optimization. The ability to collect, analyze, and act upon real-time data has become a cornerstone in enhancing decision-making processes, improving overall productivity and the understanding of the environment that surround's us.

However, one of the main challenges of deploying IoT devices is the lack of connectivity in remote or unserved areas. As the use cases for IoT expand into new frontiers around the glove, the lack of Terrestrial Infrastructure stands as a major deterrent.

In this context, Direct-to-Satellite IoT (DtS-IoT) appears a solution intending to provide connectivity to devices located in areas where Terrestrial Networks (TN) coverage is not available. DtS-IoT uses satellite-based solutions with benefits such as global coverage and resilience to terrain.

This paper focuses on the exploration of the DtS-IoT paradigm, specifically, by demonstrating the feasibility of a DtS-IoT based system using a Low Earth Orbit satellite solutions. The solution is based on the Swarm constellation, a network of small satellites for global IoT connectivity managed by SpaceX. The paper discusses the challenges associated with deploying this kind of IoT system and the scalability of those systems.

Particularly, the papers showcase a use case for an early wildfire prevention system in remote locations on the Catalan Region. Catalonia is currently passing a severe drought and thous the risk of wildfires has increased drastically. The proposed solution uses an array of meteorological instruments in order to generate a predictive model that can indicate the risk of wildfires. The solution leverages TN and DtS-IoT in order to establish a direct communication link with the sensors deployed in the field. A total of 6 location have been monitored in the Ebre area.

Summing up, the paper contributes in (1) Presenting the results of the discussed use case, (2) presenting the developed experimental system, and it's architecture, (3) showcasing the potential of DtS-IoT applications in remote and challenging environments, and finally (4) identifies new avenues for future research and development and the need for open standardization in this field.