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SWINBURNE UNIVERSITY OF TECHNOLOGY

SAFETY FROM SPACE

Emergency Buddy System

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Introduction

The research is concerned with the technical feasibility of providing robust satellite-based messaging connectivity using low cost and low power beacons, suitable for long life operation on a battery pack. The final prototype is an emergency beacon that allows a user to send pre-canned messages and, where enabled, text messages, using a mobile phone app tethered to the beacon device. The beacons are exclusively for use during a communications blackout or other emergency.

The same beacon device will monitor an outbound broadcast channel, only decoding messages within the addressed group, which will be defined by geographical area or other metrics. This will forward notifications and messages to the user app on a mobile phone. The main goal is to deploy this network across thousands of users with compromised or threatened network access. The overarching goal is to develop an effective, efficient satellite-based messaging system tailored for emergency scenarios and resource constraints.

Aims

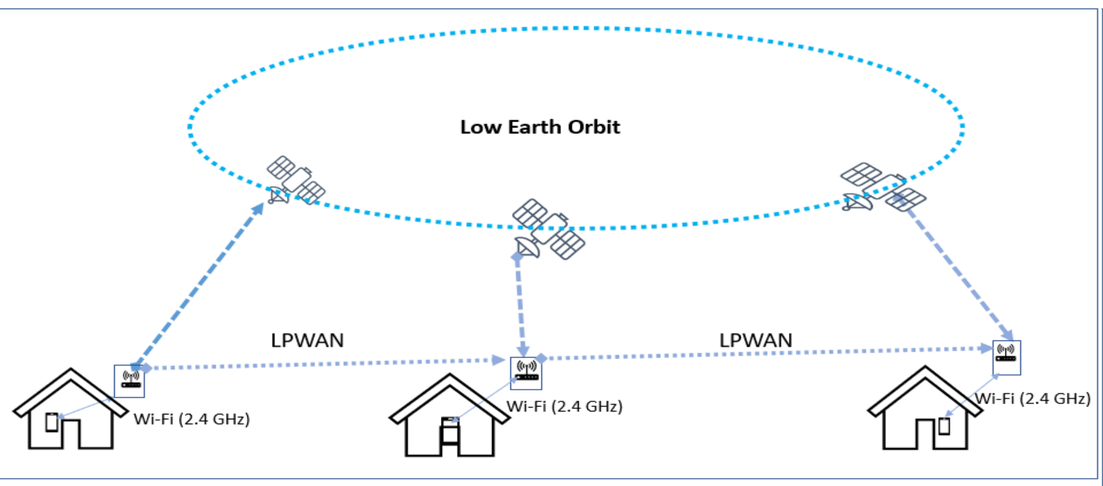
a) **Assessing Technical Feasibility:** A baseline survey to determine the technical feasibility of providing robust satellite-based messaging connectivity using low-cost and low-power beacons.

b) **Prototype Development:** - Develop prototype of an emergency beacon capable of sending pre-canned messages and, when enabled, text messages via a mobile app tethered to the beacon device.

c) **Performance Analysis:** Evaluate performance based of number on users operating within a power and bandwidth-limited channel. Transmission of small data packets, such as very low-rate encoded voice

Methods

1. Literature review and Surveys that involves examining real-world case studies of projects or deployments that have attempted to integrate satellite, LPWAN, and mobile technologies.
2. Experimental tests to assess performance of the beacons. This include Bandwidth analysis to determine efficient resource usage. Statistical analysis to measure metrics like latency and packet loss under different loads, ensuring system reliability during emergencies. Lab tests, Field Trials, and Deployments to simulate interactions between satellite, LPWAN, and mobile networks.



1.0. Emergency Buddy System Network Design

Expected Results

Technical Viability of the EBS: The research will establish if it is technically feasible to provide robust satellite-based messaging connectivity using low-cost and low-power beacons. This assessment will involve a baseline survey of existing technologies. Expected results will also include a comprehensive analysis of factors influencing feasibility, such as signal strength, data transfer rates and interoperability of Satellite, LPWAN and Cellular networks. Based on the assessment, the research will provide recommendations on the technical aspects of deploying such a system, including hardware and networking requirements.

Emergency Buddy System Prototype: The expected result of the prototype development aim is a fully functional emergency beacon prototype. This prototype will demonstrate the capability to send pre-canned messages and text messages via a mobile app when connected to the beacon device. The prototype will feature a user-friendly mobile app interface, ensuring ease of use for unskilled users. Usability Testing Feedback: User testing will provide feedback to refine the prototype's design and functionality, ensuring it meets user expectations.

Performance Analysis of the Emergency Buddy System: The research will evaluate the performance of the system by assessing its scalability. Results will indicate how well the system handles an increasing number of users within a power and bandwidth-limited channel. Additionally, Performance analysis will reveal how efficiently the system utilizes available resources, such as bandwidth under varying loads. Furthermore, The research will demonstrate the successful transmission of small data packets, including very low-rate encoded voice. Results will include measures of data packet quality and efficiency.

1.1 Prevent, Prepare, Respond and Recover

References

[1] S. C. Research, "Capability Demonstrator: I-In-The-Sky," SmartSAT, 2023. https://smartsatcrc.com/app/uploads/SmartSat_IITS_FINAL_WEB.pdf.

[2] S. C. Research, "Resilient Emergency and Search and Rescue (SAR) Communications," SmartSAT, 2023. [Online]. Available: https://smartsatcrc.com/app/uploads/SmartSat_FactSheet_SAR-project-v2.pdf.

[3] Swinburne University of Technology. Available: https://www.swinburne.edu.au/.

[4] Safety from Space, Available: https://www.safetyfromspace.com/.

Figure and table titles

1.0 Emergency Buddy System Network design that integrates satellite based communications with LPWAN and Cellular networks.

1.1. With increasing frequency and severity of Natural disasters in Australia there is a strong national focus on improving disaster resilience.

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