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Low Earth Orbit (LEO) satellite constellations present unprecedented opportunities for comprehensive disaster detection and prevention through continuous environmental monitoring, real-time data transmission, and rapid emergency response coordination. However, the inherent technical challenges of LEO systems—particularly connectivity interruptions during satellite handovers—critically impede the reliable transmission of time-sensitive disaster monitoring data and emergency communications. Regular satellite handover periods create 5-15 second communication gaps during satellite transitions, establishing critical vulnerabilities for time-sensitive disaster monitoring data transmission. Environmental sensor data transmitted via UDP protocols faces irretrievable packet loss during these handovers, potentially missing crucial early warning indicators that could prevent catastrophic events.

This project aims to develop PEP-Star, a performance enhancing proxy system that enables disaster early warning systems across the ASEAN region using LEO satellite communications by: (A) developing a proxy system that enhances Transmission Control Protocol (TCP) and User Datagram Protocol (UDP) performance over LEO satellite networks; (B) implementing handover-aware mechanisms to maintain continuous data flow during satellite transitions; and (C) integrating these protocols into a disaster management system.