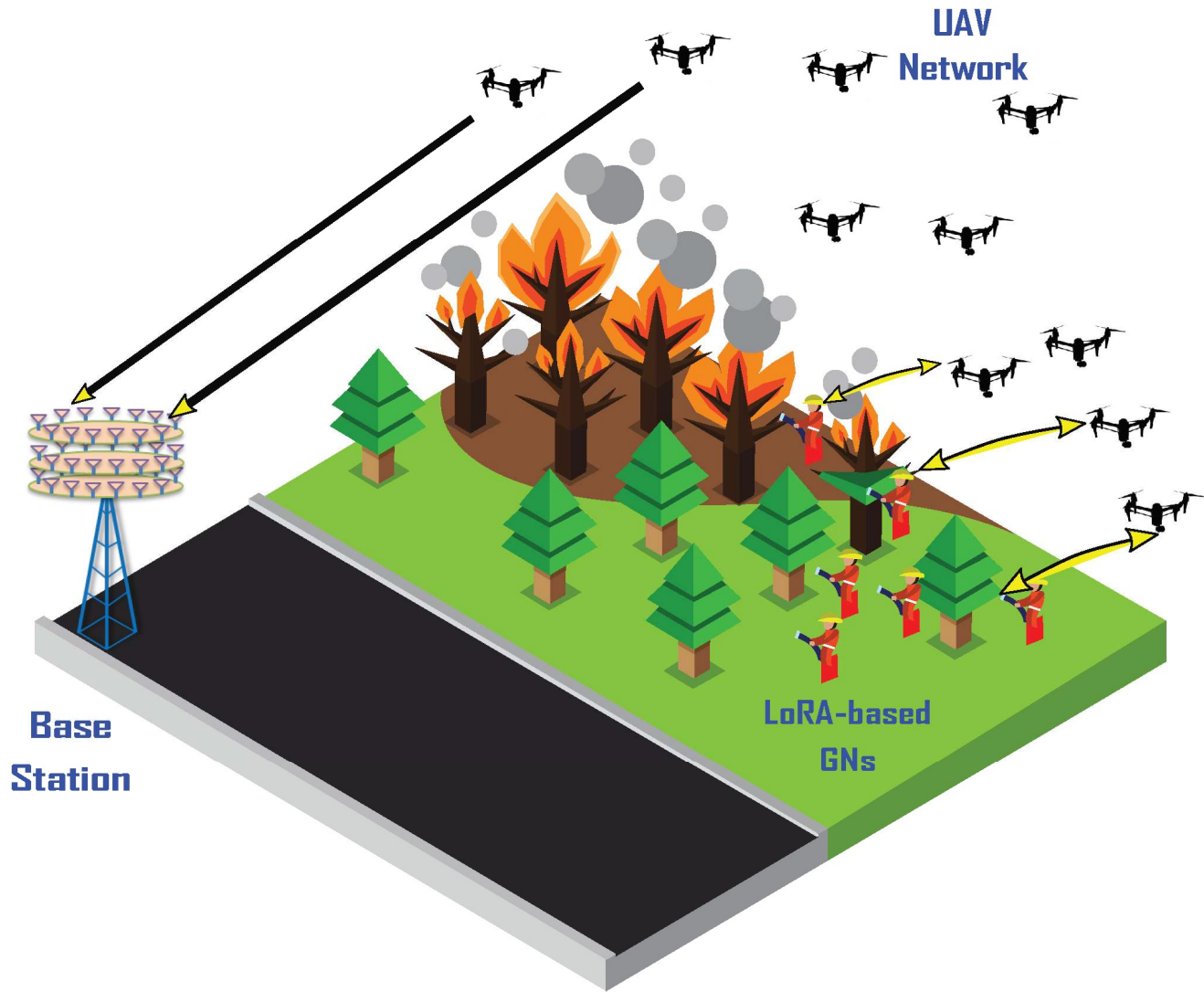


Topic: How LoRA based Communication in Disaster Works?

Webinar Brief Report



National Institute of Disaster Management, Ministry of Home Affairs, Govt. of India

Date and Time: 23rd June 2023, (Friday); 02:30 PM - 04:30 PM (IST)



Webinar
on

NIDM
WEBINAR SERIES - 6

HOW LoRA BASED COMMUNICATION IN DISASTER WORKS?

DATE : 23RD JUNE, 2023 (FRIDAY)

TIME: 02:30 PM - 04:30 PM (IST)

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SESSION CHAIR



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FLOOD MONITORING & WARNING SYSTEM



MODERATOR



MS. AVIPSHA MOHANTY

COORDINATOR



DR. ANURAG NIYOGI

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Introduction

Disasters causes devastating disturbances to a community's functioning that surpass the community's ability to manage and utilize the resources. Natural events, human activities, and technical risks, as well as many elements that impact a community's exposure and vulnerability, together contribute to disasters. Countries like India are more prone to disaster due to their huge population, unplanned infrastructure, geological and climatic reasons.



During the entire phases of Disaster Management, LoRA (Long Range) technology has pivotal role to play. For example in the aftermath of an earthquake, regular communication infrastructures such as mobile telephony networks, wired Internet connections and landlines (either fibre- or copper-based) have a high probability of suffering service outages. Seismic events can affect infrastructures in diverse ways, for instance fibres and cables can break due to excessive tension, base station towers crumble, and precisely-aligned antennas can become misaligned and cease operation. In addition to hardware breakdowns, lack of electrical power can render most equipment unusable until power is restored. This, in turn, can happen as a consequence of the destruction of utility infrastructures, but also as a preventive mechanism to avoid risks. Because of these limitations in the infrastructure availability, accessibility, and flexibility, it is often advisable to use the LoRA technology basically to address the concern.

Internet of Things (IoT) and LoRA technology interventions offer significant advantages in order to deal with the disasters of high frequency and intensity of current times. LoRA is a low-power, wide-area network (LPWAN) technology that enables long-range communication with low data rates. LoRA-based communication in disaster scenarios provides a cost-effective, energy-efficient, and reliable solution for collecting and transmitting critical data over long distances. It enables real-time monitoring, situational awareness, and effective decision-making, ultimately assisting in disaster response and recovery efforts.

Objectives:

1. To facilitate knowledge sharing and exchange among professionals and stakeholders about the significance of LoRA technology in disaster management.
2. To understand the LoRA Technologies' roles in disaster management.
3. To assess the scope and availability of LoRA Devices for the society.
4. To ensure the applicability and implementation mechanism of LoRA technology in disaster management prospects.

Broad Points Covered

- a) **Overview of LoRA Technology:** The webinar provided much informative knowledge to the participants regarding the brief overview of LoRA technology. It conveys that the LoRa operates on the principle of low-power, wide-area networking (LPWAN). It utilizes chirp spread spectrum modulation to achieve long-range communication while consuming minimal power.
- b) **Applications:** Participants basically learned about the LoRa-based communication systems applications in disaster scenarios can be used for various purposes, including real-time monitoring of environmental conditions, early detection of hazards, tracking and locating survivors, asset management, and remote control of devices.
- c) **Functional Mechanism:** It provided knowledge regarding the functional mechanism and efficacy of LoRA technology through the help of dummy dashboard and LoRA Sensors. It also conveys that LoRa-based systems can also facilitate remote monitoring and control of devices and infrastructure in disaster-affected areas. This allows operators to remotely manage critical systems, such as water pumps, power grids, or environmental monitoring stations.

This webinar on "How LoRA based Communication in Disaster Works?" educated the participants about the principles, techniques, and technologies involved in LoRA. The webinar aimed to provide a comprehensive understanding of disaster management systems that can collect real-time data, enable efficient communication, and facilitate informed decision-making in critical situations. The long-range, low-power characteristics of LoRa make it a valuable tool for ensuring effective disaster response and recovery.

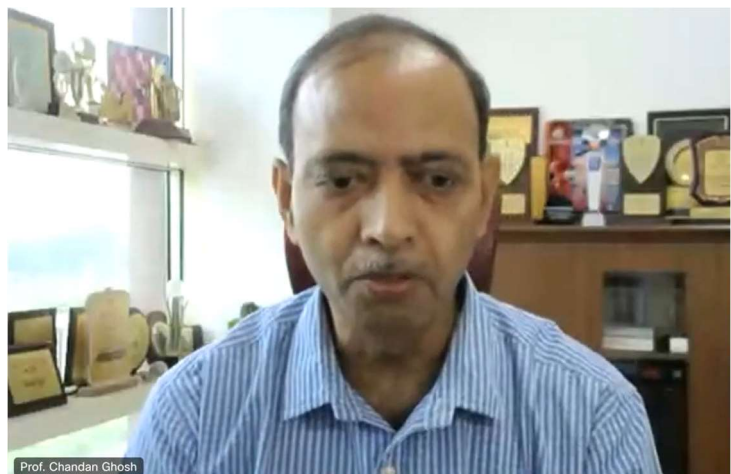
Session Summary

Miss Avipsha Mohanty, Young Professional, RI Division, NIDM gave opening remarks and moderated the entire session. Dr. Anurag Niyogi Young Professional, RI Division, NIDM has coordinated for successful completion of the webinar.

The webinar started with a welcome note and context set by Prof. Chandan Ghosh. Head, Resilient Infrastructure Division, NIDM. He welcomed all the available dignitaries.

He explained the purpose of this webinar and shared his views on the following aspects:

- Relevance of LoRA-based communication from a disaster resilience perspective.
- Need of LoRA sensors in Flood Management.
- Challenges faced due to lack of IoT-based interventions or use of traditional technology in the present century.
- Explained the concerns of Flood Management and Dam Protection of Mountainous region case study in Japan and the need of LoRA devices to provide the effective results.



Deliverables by Guest of Honors



Sh. Vishal Kumar Saini, Executive Director, NHPC Limited, Faridabad- He shared his thoughts on the vibrancy of the sensors-based interventions in the current era. Also, he discussed their current projects and the need for LoRA applications in their domain particularly in Flood Water Management from rivers.



Sh. Ratan Das, Group Senior Manager (Geology), NHPC Limited, Faridabad- He discussed the challenges currently faced by NHPC in the early warning system, and flood water management particularly in remote areas due to the lack of IoT-based interventions in the respective fields.

Main Session:

Mr. YK Gauba, CEO, MD, Country Head, Mutelcor GMBH

He shared his views on the following aspects:

- Brief Introduction of LoRA Technology
- Importance of LoRA sensors in early warning system
- Functional Mechanism of LoRA devices for Fire based hazards, earthquakes, and floods.
- Discussed LoRA-based sensors in Air Quality Monitoring
- Explained LoRA-based applications in both Pre and Post Disaster Scenarios.
- Discussed the behavioral graphs interpreted from LoRA devices through the demo-dashboard.
- He shows a practical demonstration regarding the working principle of Panic buttons, Smoke detectors, Manhole Sensors, Door Sensors, Air Quality Monitoring Sensors, etc.
- Conveyed the complete integrated solution for Flood Management in Remote Areas through LoRA sensors application.



Followed by the prime session and Q & A session, Prof. Chandan Ghosh delivered the concluding remarks. At the end of the webinar, Ms. Avipsha Mohanty delivered the vote of Thanks.

Major Key Takeaways

The major key takeaways of the session are as follows:

- a. **Overview of LoRA technology:** LoRA is a long range sensors that were initially introduced by NASA for data aggregation from Space. Later on it was handed over to the institutional authorities to explore and utilize the resource. In India, the LoRA frequency is 865 to 867 MHz which is license free for local use.
- b. **Significance of LoRA Technology in Disaster Management:** The significance of LoRa technology in disaster management lies in its ability to provide reliable, long-range communication, efficient data collection, resilience, and cost-effective implementation. By leveraging LoRa, disaster response efforts can be enhanced, facilitating timely and informed decision-making, effective coordination, and better allocation of resources.
- c. **Applicability for LoRA Devices/Sensors:** LoRa devices and sensors have wide applicability in various aspects of disaster management. Some of the key areas where LoRa devices/sensors find utility are as follows:
 - Environmental Monitoring,
 - Water level Monitoring,
 - Seismic Activity Monitoring,
 - Structural Monitoring,
 - Gas & Air Quality Monitoring
 - Fire Detection
 - Asset Tracking & Management
 - Remote Control and Actuation
 - Communication & Coordination
 - Data Collection & Analysis

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