Utilization of the QZSS DC Report in Support of the Early Warnings for All Initiative

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32 Member Countries and 5 Advisor Countries

Background

ADRC MILESTONES OF FISCAL YEAR 2022

Information Sharing

7,700+ Accumulated GLIDE numbers issued towards the end of FY2022

2,595 Items of accumulated "latest disaster information" on the online database

28 Requests activated by Sentinel Asia

1 Asian Conference on Disaster Reduction (ACDR2022) organized

1 Tsunami Seminar organized

1 Workshop organized at the BOSAI KOKUTAI 2022

Human Resource Development

126 Accumulated total of Visiting Researchers (VR) as of FY2022

6 JICA-commissioned DRR Training Courses implemented

2 Interns accepted

2 Short-term programs conducted

International Cooperation

14 international events that ADRC engaged in (e.g., GP2022 and APMCDRR)

3 Collaborative projects implemented

2 Regional initiatives, where ADRC served as co-chair (i.e., EPWG, Sentinel Asia)

Asian Disaster Reduction Center

Project Stakeholders of QZSS DC Report Demonstration

	Companies	Roles
Supervisor	Cabinet Office of Japan	• Supervise of the project • Manage the system of the Michibiki satellites
Project leader	NTT Data Corporation	• Project management • Create prototype • Perform validation tests
Partners	Keio University	• Create service design • Develop services • Support for events and seminars
	Pasco Corporation	• Survey of disaster prevention and EWS for the 3 target countries • Create scenarios for systems using EWS for the 3 target countries • Support for planning validation tests
	Asia Air Survey Co., LTD.	• Research to determine additional target countries based on existing EWS and QZSS's restriction • Plan and perform demos in target countries
	Asia Disaster Reduction Center	• Support for project operation

Issues in transmitting early warning information

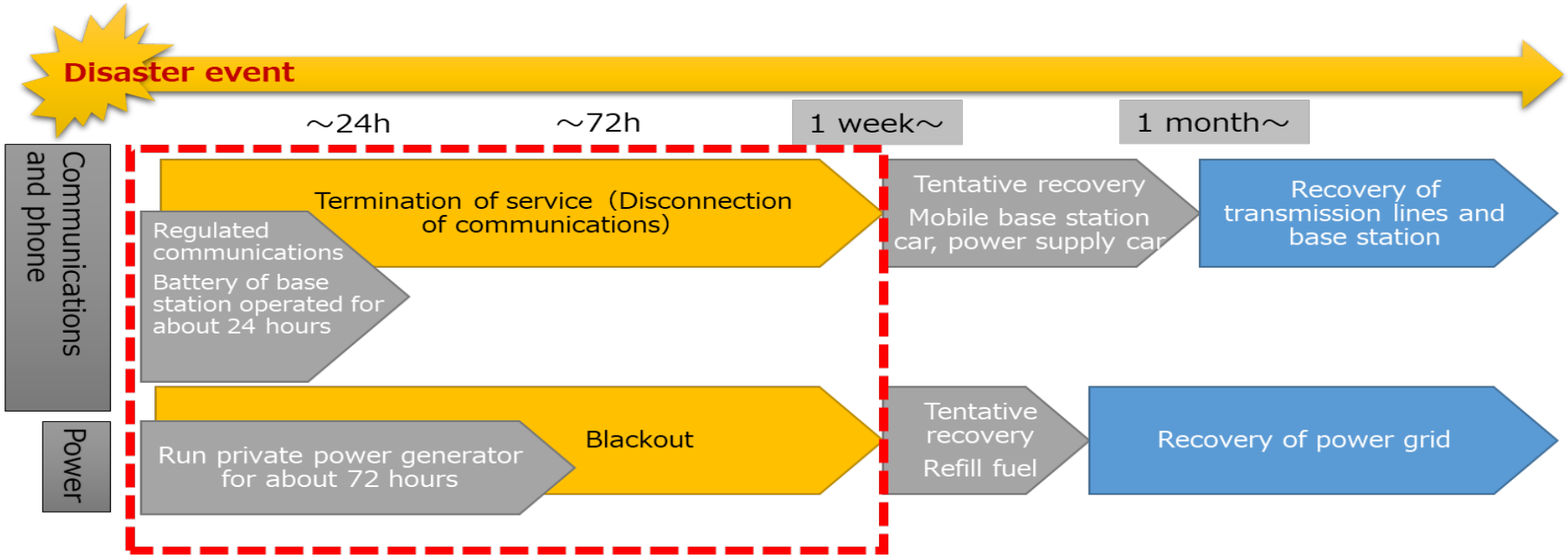
Results of survey from 10 ADRC Member countries in 2022

- Communication systems **disruption** (e.g., *Philippines*)
- **Delayed** arrival of information to the communities-at-risk (e.g., *Bangladesh*)
- Information sent to **incorrect** areas (e.g., *SMS mass dispatch*)
- Limited network **coverage** (e.g., islands of Fiji, mountainous areas of Nepal)

Why not transmit the information through satellites?

QZSS DC Report is one of the solutions

Disruption of Communications System and Power Outage



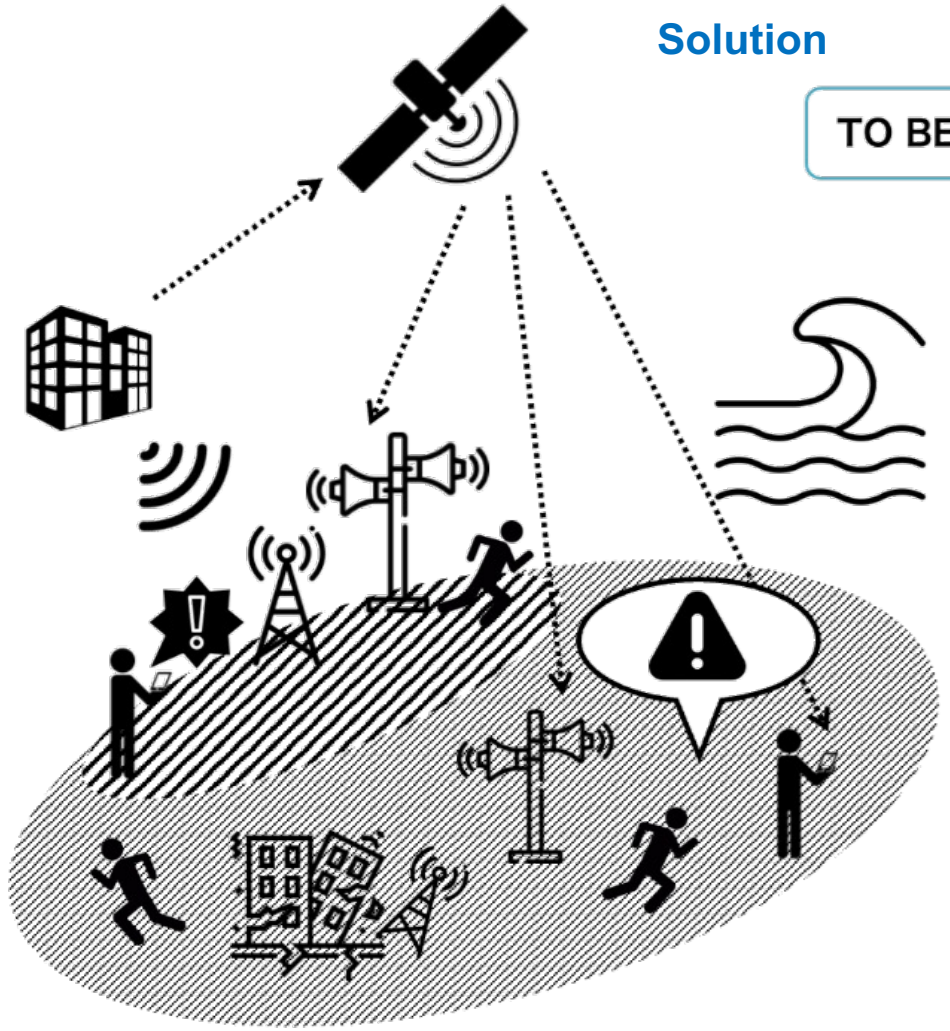
Satellite Report for Crisis and Disaster Management (DC Report)

AS IS

Issue to resolve

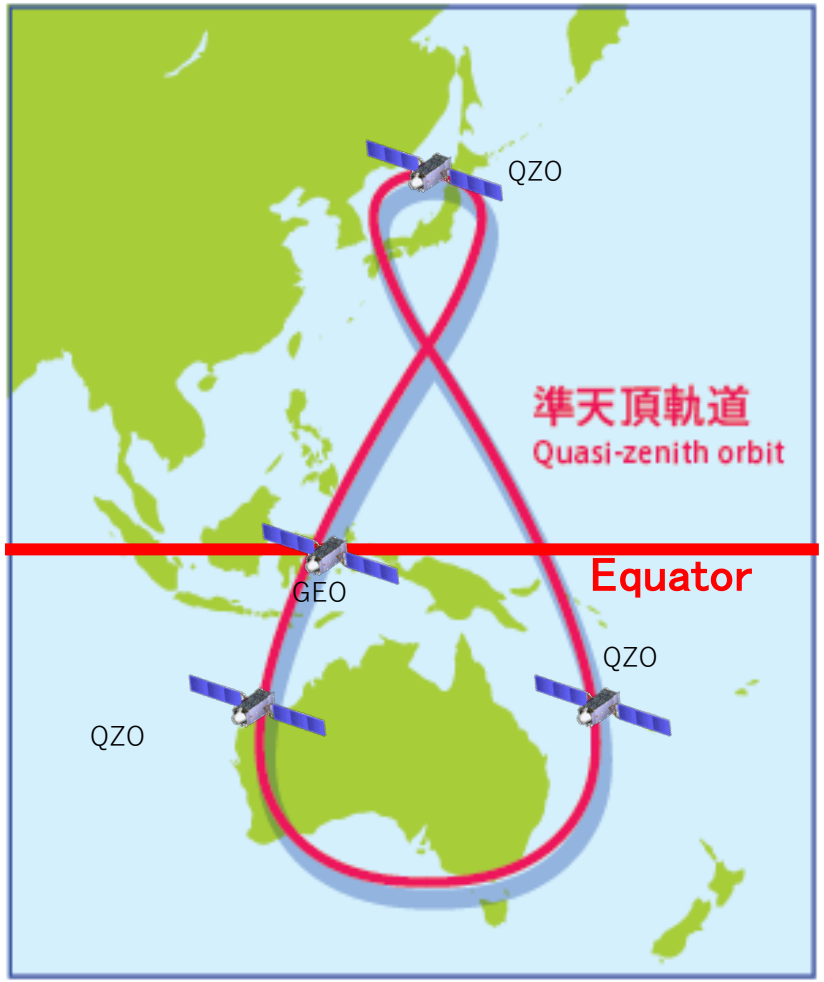
Solution

TO BE



What is QZSS or “Michibiki”?

- Quasi-Zenith Satellite System (QZSS) or “Michibiki”
- Currently 4 satellites, but it will be 7 by 2025 (Asia Pacific region)
- Satellite Report for Disaster and Crisis Management (DC Report) can be used where one or more satellite can be observed with elevation angle of more than 10 degrees



Orbit of Michibiki

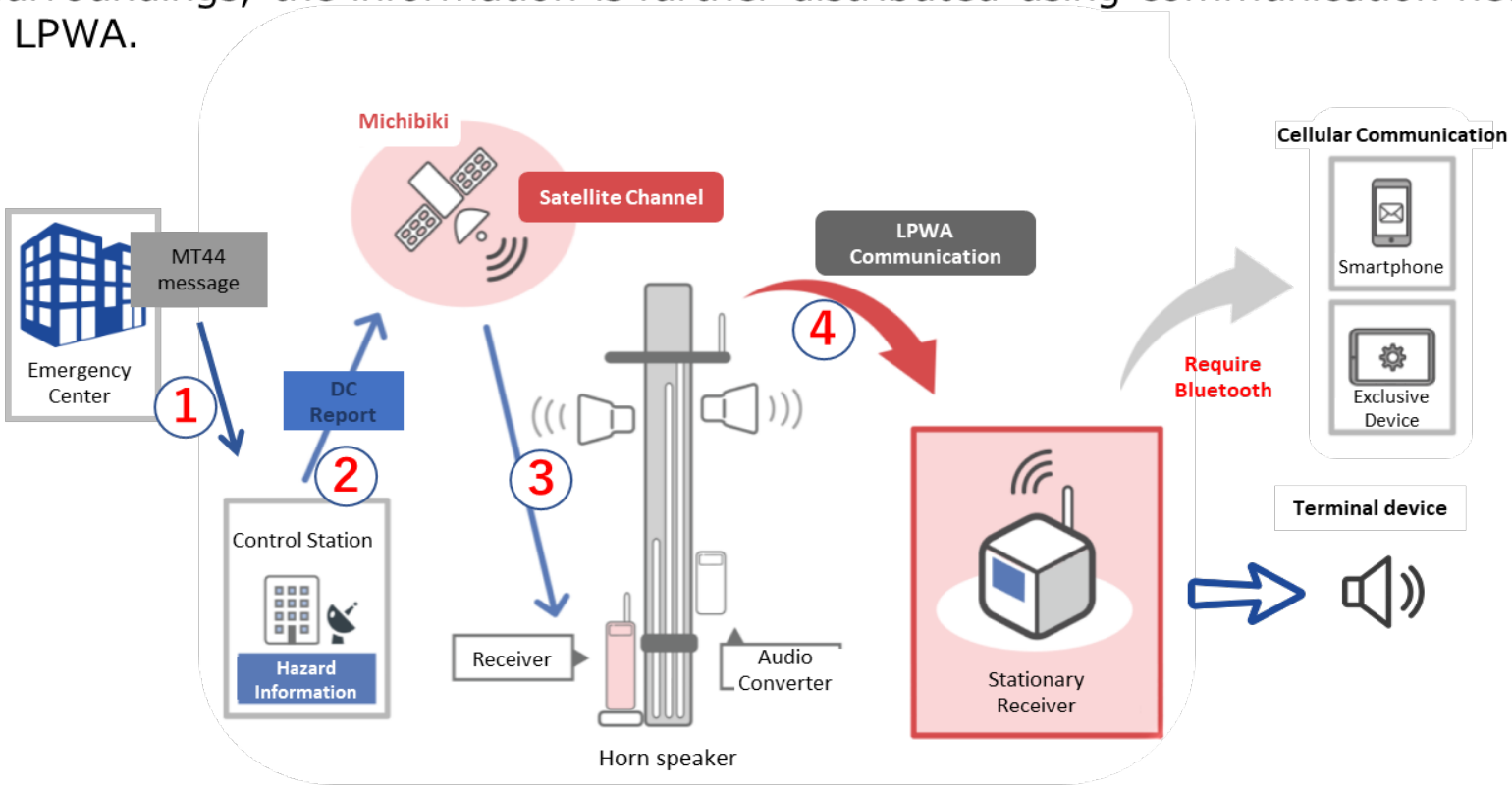
Conceptual Model

① MT44 message for crisis management information is created in emergency center of your country.

② From control station (in Japan), DC report is transmitted to Michibiki satellites.

③ DC report is received in target area, and deliver information to surroundings by horn speaker, etc.

④ In the surroundings, the information is further distributed using communication network such as LPWA.



Portable

Michibiki

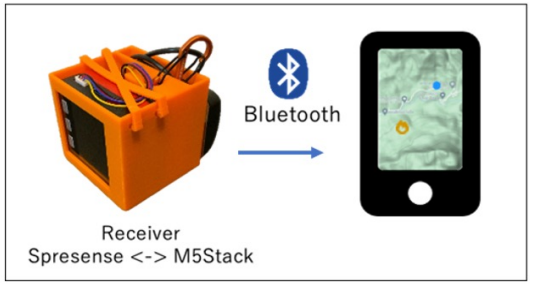
Sending Segment

Control station (Japan)

QGIS Plugin
(Sending Software)
At DRM Institution

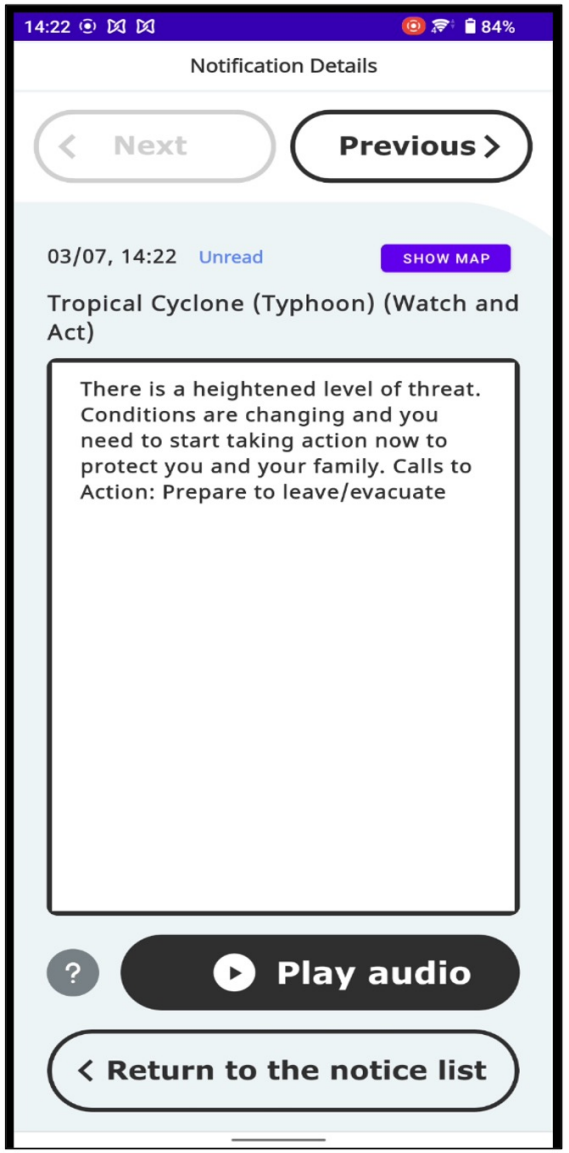
Prototype Receivers

Receiving Segment



Receiver
Spresense <-> M5Stack

Spresense <- USB -> Smartphone



Sample App used
in the demonstration experiment

Base Station

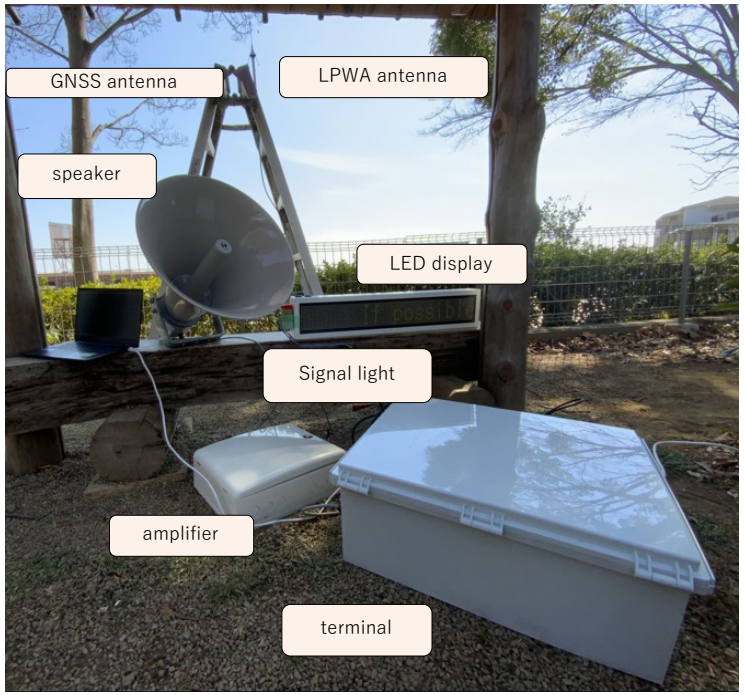
Sending Segment

Control station (Japan)

QGIS Plugin
(Sending Software)
At DRM Institution

Disaster mitigation
communication system
Broadcasting device

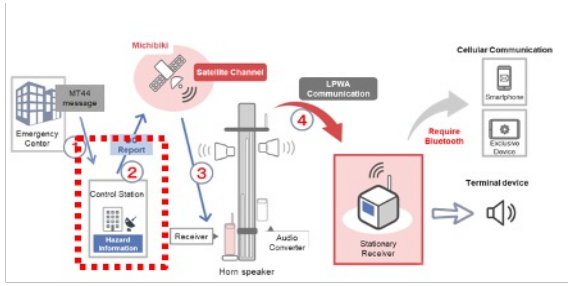
Prototype Base Station
Receiver



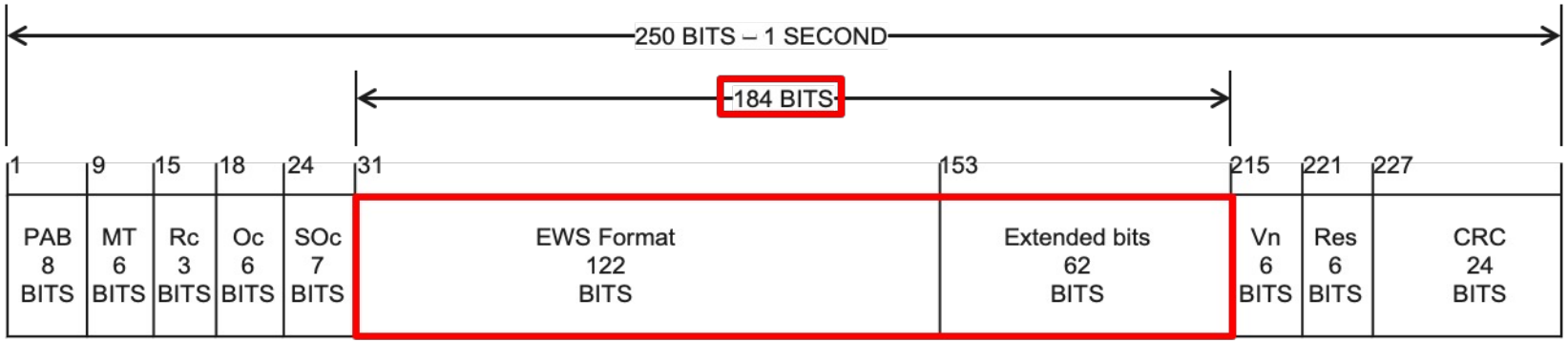
Station device prototype

- DC report is received in base stations of target area equipped with GNSS antenna.
- Issue warning to surroundings using speaker

Creating/Sending Message to QZSS

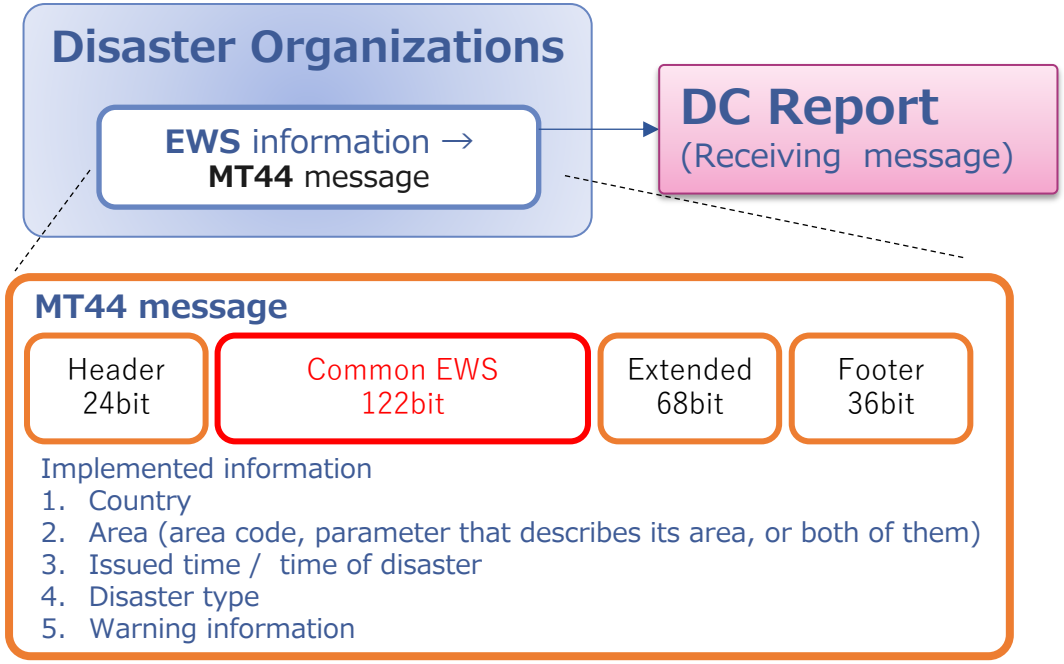


- Message is transmitted from the control center in Japan to Michibiki satellite.
- DC report contains Common EWS and Extended bits. Common EWS is a common format used by Michibiki (Japan) and Galileo (EU) and includes information of country name, target area (by ellipse), hazard type, warning level, etc.
- Extended bits is a unique section of Michibiki satellite and can be designed based on the needs of your country.



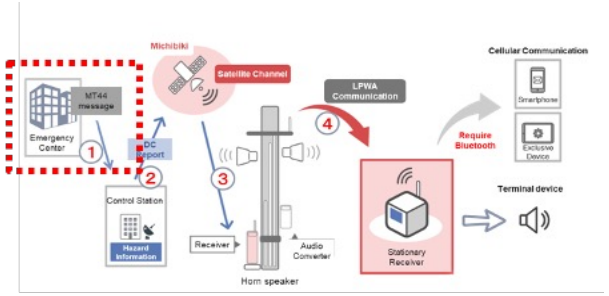
MT44 Format

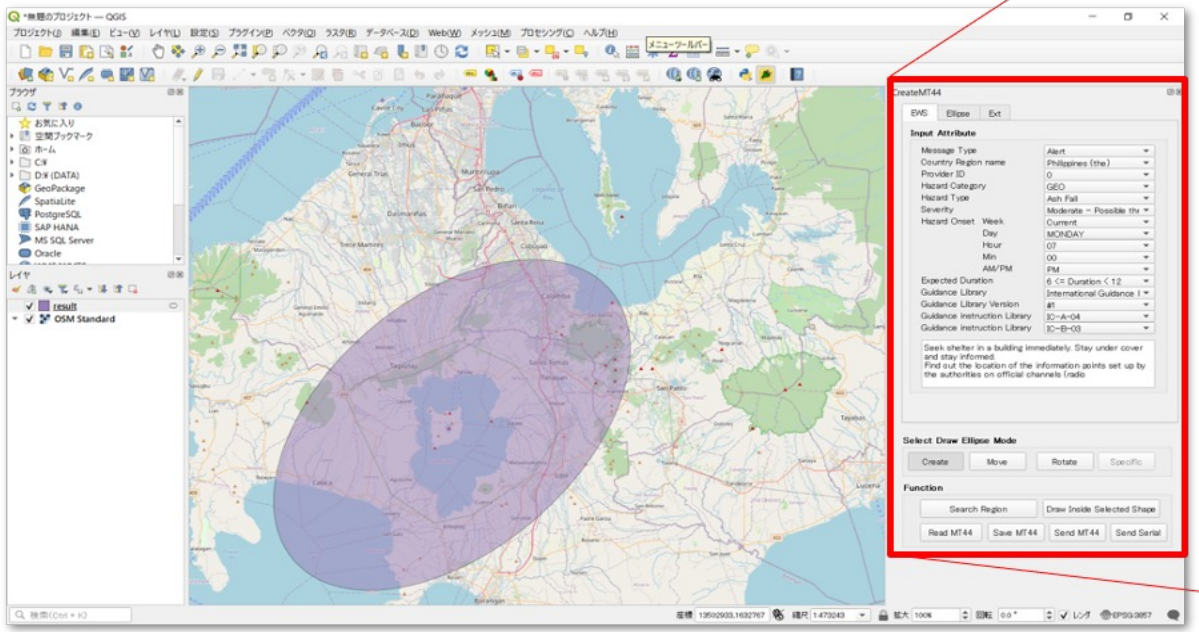
- DC report is a service to transmit crisis management information issued from disaster organizations through Michibiki satellites.
- The information is transmitted by MT44 style message. Within the information contained in MT44, the crisis management information is managed by common EWS format, which is same as EU Galileo satellite.

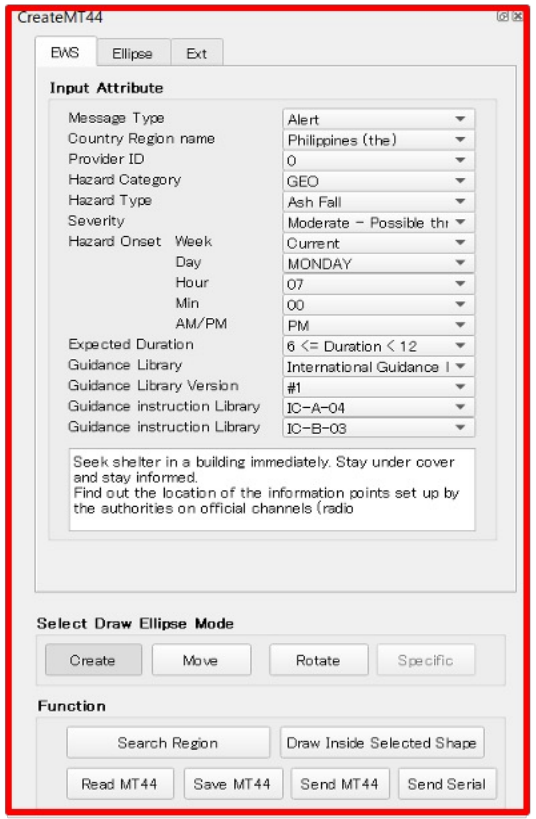


QGIS Plugin

- QGIS plugin is used to create MT44 message.
- The plugin will be released from this project by free of charge.







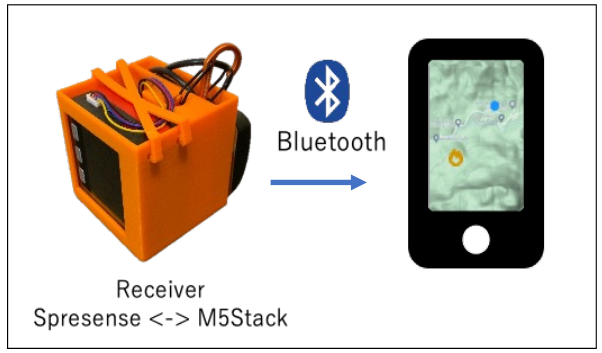
QGIS (Open Source GIS Software)

Receiving Message from QZSS

Notification is received when the user is in the alert area!

- **Portable model**

Receiver device receives DC report and transmits to smartphone via Bluetooth.

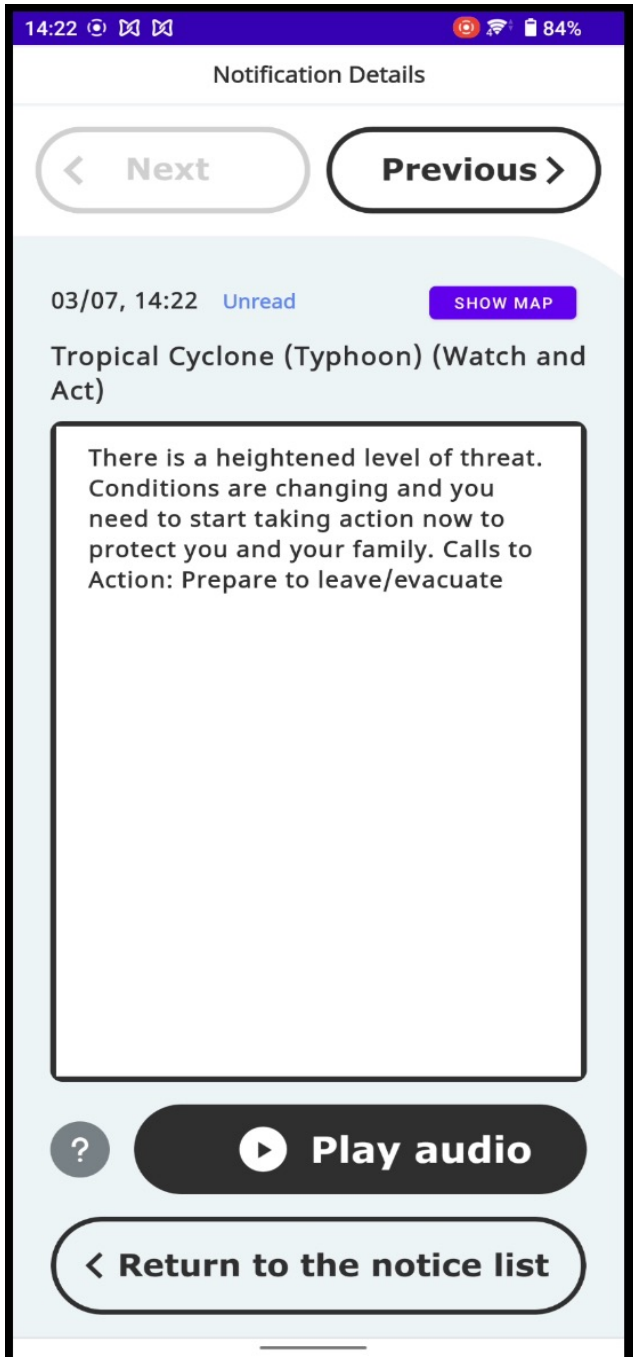


- **Receiver and display integrated model**

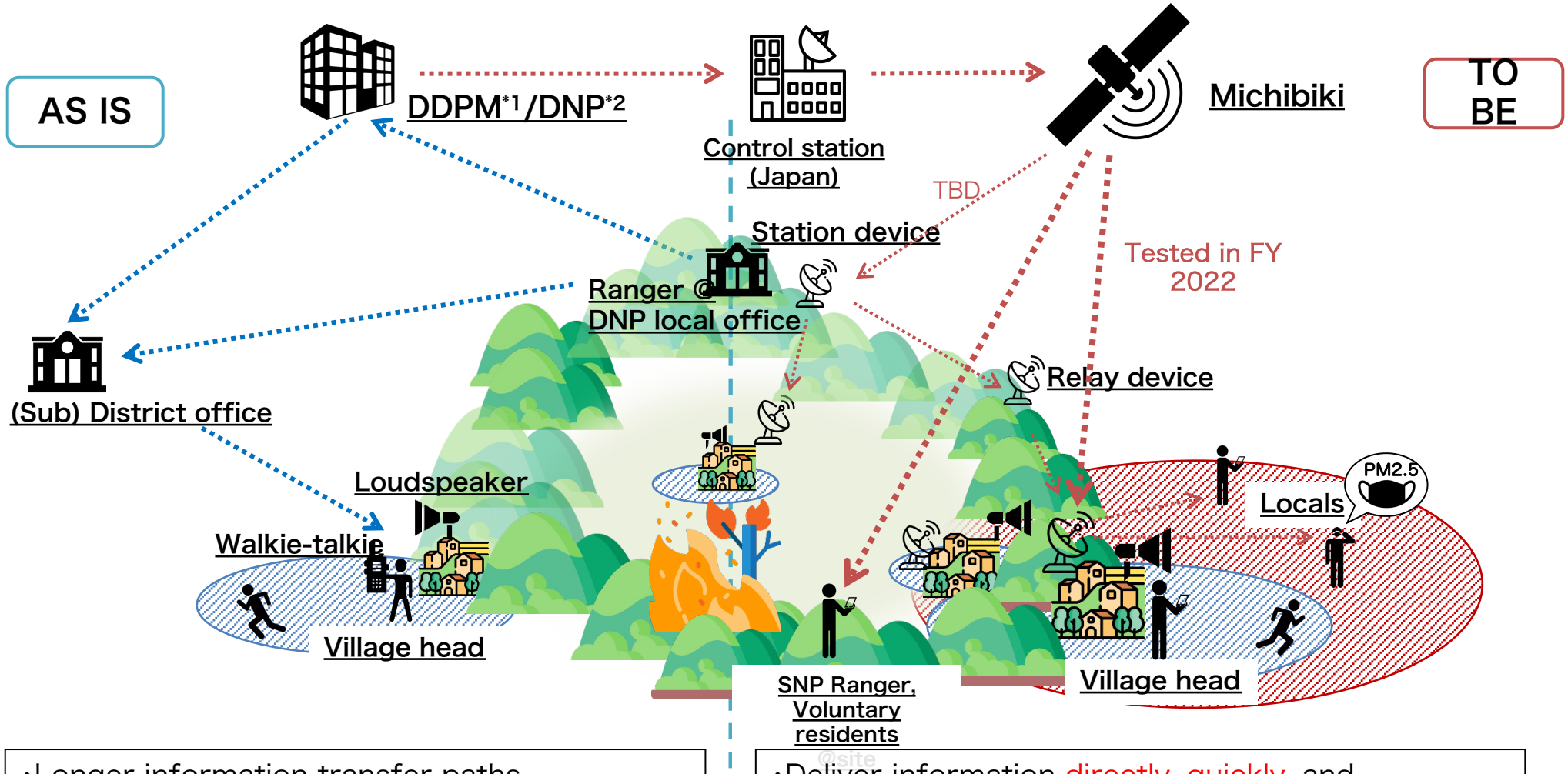
The smartphone receives DC report directly and notify the disaster information using smartphone application.

- **Smartwatch model**

The smartwatch receives DC report directly and notify the disaster information using smartwatch application .



Thailand



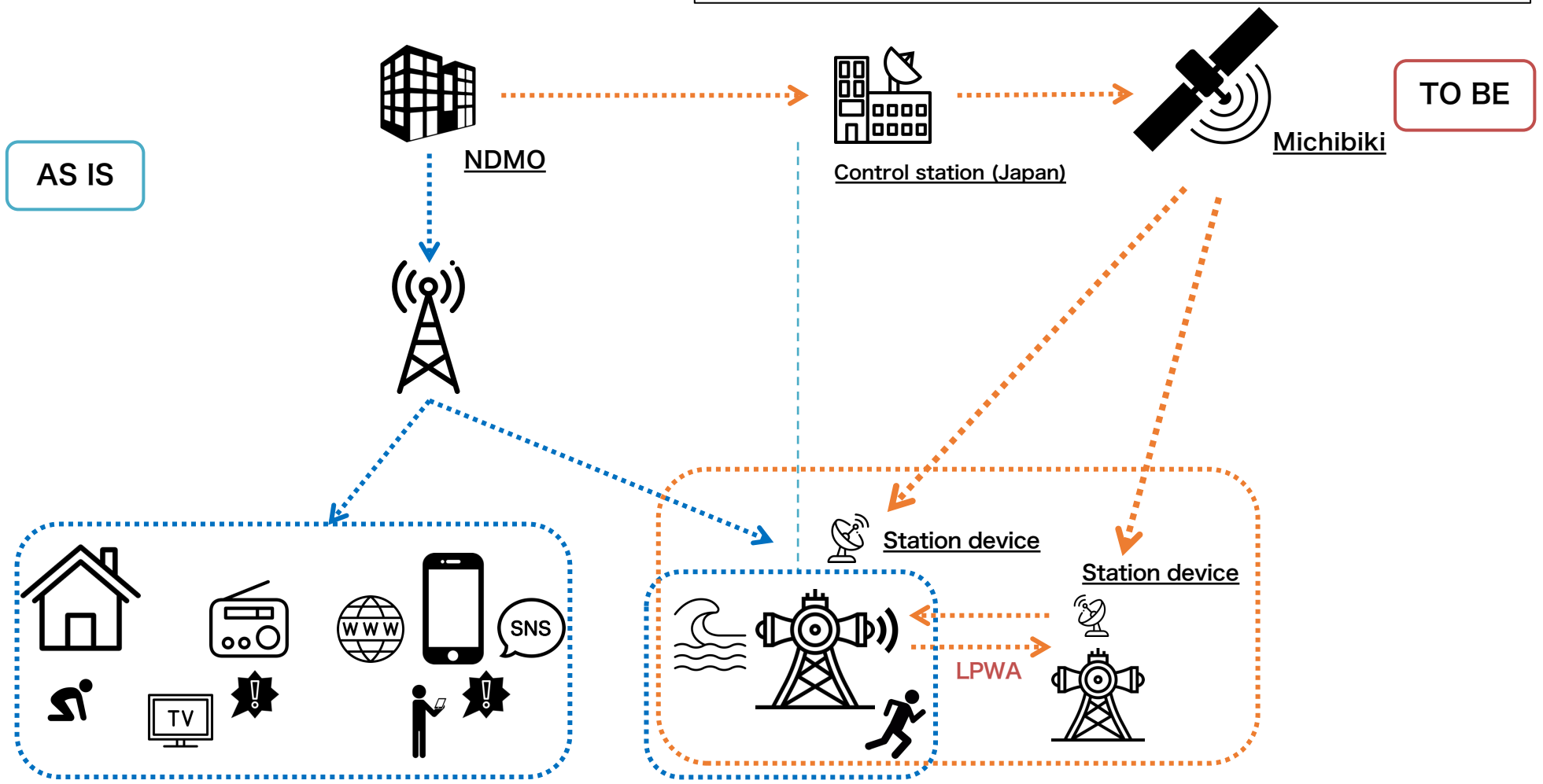
・Longer information transfer paths
・Only to a part of the national park

・Deliver information directly, quickly, and comprehensively to rangers of the national park.
・Receive from QZSS and disseminate the messages to loudspeaker and smartphones to urge residents to evacuate.

*1 Department of Disaster Prevention and Mitigation
*2 Department of National Parks, Wildlife and Plant Conservation

Fiji

・ Proposed a configuration to improve the robustness of the existing system and deliver information more quickly.



Currently, individuals get information through channels that relies only on terrestrial communication infrastructure

・Receive from QZSS by several station devices and transmitted by LPWA

Australia

AS IS

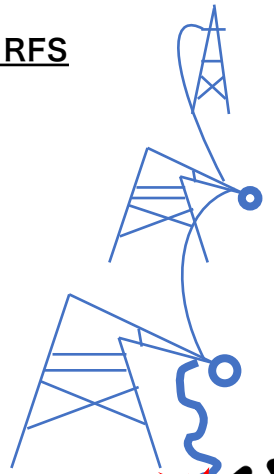
EMA/BOM/NSW RFS

Control station (Japan)

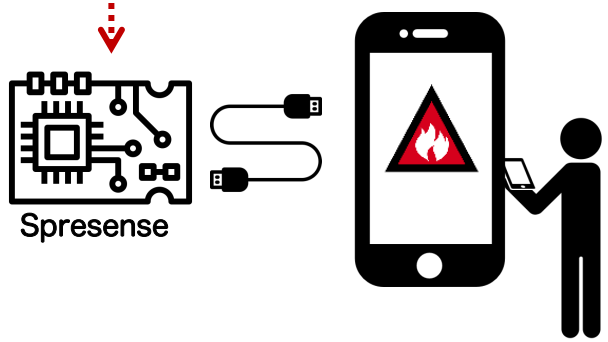
Michibiki

TO BE

Can‘t send warning due to mobile network failure.



Direct Receiving from the Michibiki satellite

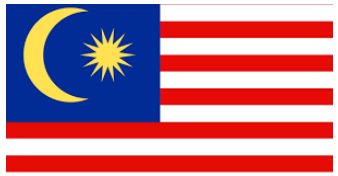


Spresense

There was mobile network failure during the huge bushfire in Australia because of electric towers got damage from the fire

・Receiving from QZSS directly helps in the situation where are out of cellular network and/or there is mobile network failure.

Other DC Report Demonstrations (with ADRC)



Malaysia
21-24 Aug 2023
Flood & Landslide

Nepal
25-28 Nov 2023
Earthquake

Indonesia
2-6 Oct 2023
Floods & Volcanic Eruption

Philippines
11-16 Dec 2023
Typhoon

Bangladesh
1-5 Nov 2023
Cyclone

Cambodia
12-16 Feb 2024
Storm Surge

Potential Contributions of QZSS DC Report in the EW4All

Augment the transmission of early warning information

- **Robustness** -- transmits information even when ground communication system is disrupted
- **Immediacy** -- transmits information immediately, without delay
- **Correctness** -- transmits information only in targeted areas
- **Comprehensiveness** -- transmits information

Value-addition of QZSS DC Report to Existing EWS

- Serves as a backup system when communication infrastructure damaged
- Transmits early warning information to wide area, correctly and immediately

Contact:

https://www.adrc.asia

https://www.afacebook.com/ADRC.KOBE

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