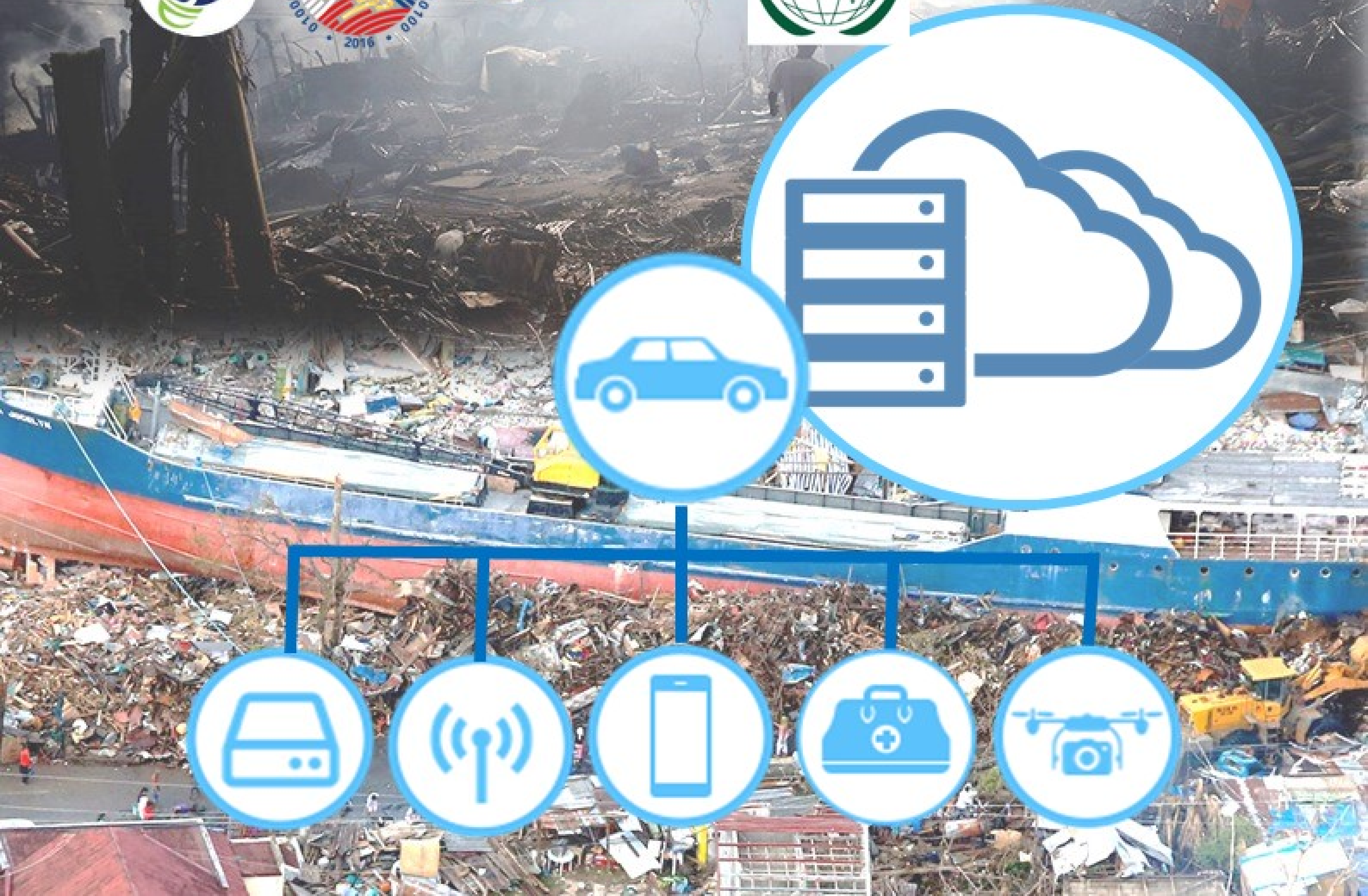
INTERNATIONAL COLLABORATIVE RESEARCH OF DISASTER RESPONSE MODEL USING VEHICLE COMMUNICATION



APT International Collaborative Research 2016

Report
on
International Collaborative Research of
Disaster Response Model
using Vehicle Communication

March 9, 2018

Submitted to:	The Asia-Pacific Telecommunity
Project Leader:	Dr. Gregory Tangonan Ateneo Innovation Center, Ateneo de Manila University, Philippines

Preface

Eliseo Rio, Jr.
Undersecretary
Department of Information and Communications Technology
Philippines

Distinguished delegates, colleagues, ladies and gentlemen, good morning!

It is my distinct honor and pleasure to welcome you all to this Asia-Pacific Telecommunity workshop on “International Collaborative Research on Disaster Response Model Using Vehicle Communication.”

The English social thinker John Ruskin once said, “When brilliant minds, attitudes, and talents come together to form one goal – expect a masterpiece.”

In the next few days, the masterpiece we’ll be working towards creating is a matter of massive importance. The presence or absence of it could mean a life saved or a life lost.

Communication. The be-all and end-all during and after disaster. Its availability can be the difference between life and death.

And the question we’ll find answer to, When the world goes silent, how do we communicate?

According to the 2015 Asia-Pacific Disaster Report, Asia-Pacific remains to be the world’s most disaster-prone region, which bore the brunt of 1600 natural disasters in just the past decade, 40 percent of the global total.

And the Philippines, the fourth most disaster-prone country in the world, endured a total of 274 natural calamities, covering the period between 1995 and 2015, according to a study conducted by UN Office for Disaster Risk Reduction.

When Typhoon Haiyan, the strongest storm on record that struck the Philippines in November

2013, major issues on communications capabilities arose. There were reports that communications gap immobilized relief efforts. Connection was cut between first responders on the ground and the headquarters in Manila. This is a situation that highlights the value of emergency communications systems in disaster relief efforts. The faster the response is, the more lives are saved.

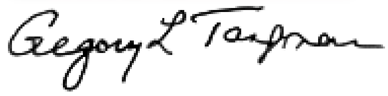
More than 7,000 were killed by the super-storm and estimated economic losses amounting to US$10 billion, and we do not intend to lose more from worse disasters in the future. We can only hope for the best and prepare for the worst by leveraging technology in disaster management.

The Philippines, through the Department of Information and Communications Technology (DICT), would like to express our gratitude to the Ministry of Internal Affairs and Communications of the Government of Japan for our ongoing ICT cooperation. Last June 30, we held our first conference meeting with them and we are looking forward to promoting our cooperation for enhancing the capability of disaster management in the Philippines using ICT systems.

And thank you to the Asia-Pacific Telecommunity for having us on board this International Collaborative Research on telecommunications. Let's take this three-day opportunity to learn from each other's expertise and unique experiences. Through this learning process, we hope to convert our shared knowledge into actionable strategies and develop a harmonized set of utilization standards for vehicle communications networks during disasters.
Our regional cooperation is our sure-fire way to make Asia-Pacific truly disaster-resilient!
As we say it here, MABUHAY, everyone!

(quoted from Welcome Address for the Workshop on International Collaborative Research of Disaster Response Model Using Vehicle Communication at Mabini, Batangas, Philippines, on 12 July 2017)

Message from the Project Leader



Professor Gregory Tangonan
Ateneo Innovation Center
Ateneo de Manila University, Philippines

Welcome to the Asia-Pacific Telecommunity (APT)-sponsored workshop on the standard specifications of information and communications systems using vehicles during a disaster on the V-Hub. The APT, with the able assistance of the Telecommunications Technology Committee of Japan (TTC), deserves our sincerest thanks for sponsoring the activities related to "Bridging the Standardization Gap" with Asia Pacific countries. This effort is culminating with the convergence of Industry, Government and Academe contributors in the Philippines to complete the V-Hub standards specification this year.

Over the last five years researchers from throughout ASEAN and Japan have developed vehicle communications and information systems for disaster risk reduction and early responders. All the participants have experienced how society can be crippled by natural disasters and submitted use cases for the V-Hub technology platform. The Philippines is hit with over twenty strong typhoons every year-to this end we have contributed development of V2X communications for disaster operations, where X can be another vehicle, an UAV, the sensor infrastructure, and individuals interacting with the environment. To this end much work has been done to investigate the role of sub-GHz frequencies in this context, since the propagation characteristics match well with models of search-and-rescue operations over multiple platforms. From this work we see the emergence of mobile cloud technology and ad-hoc WiFi for situations with limited instantaneous bandwidth that will have many applications in future, well beyond disaster response. The V-Hub Standard being developed here is truly a powerful new platform for vehicular communications and information systems.

On behalf of the local organizers, the Ateneo Innovation Center and the DICT, we welcome you to the Philippines. We hope you get to play hard and work hard during your stay.

(quoted from A MESSAGE FROM THE PROJECT LEADER, The WORKSHOP GUIDE)

Table of Contents

Executive Summary

The International Collaborative Research of Disaster Response Model Using Vehicle Communication (VHUB) is a project submitted under the APT International Collaborative Research 2016. This project is headed by Dr. Gregory Tangonan of the Ateneo Innovation Center, Ateneo de Manila University. Main collaborators are the Department of Information and Communications Technology of the Philippines, Telecommunications Technology Committee of Japan, and Toyota InfoTechnology Center Co., Ltd.

The project's aim is to develop a set of utilization standards for vehicles as a resilient communication network and information hub during disasters. Experts on intelligent transport systems and disaster response from different Asian countries are the main participants in this research. This expected output is a Draft Specification document that is submitted to APT for further consideration.

The academe, industry, and government from Japan, Philippines, Thailand, Malaysia, and Papua New Guinea participated in the International Workshop held in Batangas, Philippines, last July 12-15, 2017. This is a major activity of the project where experts from different countries come together to discuss and share knowledge regarding disaster response and risk management. This is also the venue where the draft specification document was discussed and a final draft was crafted for presentation in ASTAP-29.

To date, the APT through ASTAP is consolidating the vote forms from member countries and will be subjected for assessment whether the standard will finally be adopted and later be implemented. The Project Team will monitor the progress of the status of the adoption of the draft recommendation and closely coordinate with APT for any feedback.

Chapter 1 Introduction of the Project

1.1 Purpose

Disaster response is an important topic that should be continuously discussed in international meetings, with stakeholders from different countries sharing knowledge and experiences with each other. The recent years have seen countries in Asia go through numerous disasters like earthquakes, typhoons, flooding, landslides, and volcanic eruptions. When these events happen in populated areas, it results to loss of lives and properties. Disaster response is crucial to provide immediate aid and minimize losses in communities.

A common problem encountered during disaster response is the lack of means of communication, with the usual approaches like internet connectivity and cellular networks not functioning properly. This communication problem affects almost everyone involved in the disaster, whether survivor-to-survivor, survivor-to-rescuer, or rescuer-to-rescuer. With the development of vehicle-to-vehicle communication for automated driving, it is relevant to explore other uses of the technology for applications that would involve the use of vehicles. As such, this project was proposed to accelerate the international collaborative research on the ASTAP Standardization theme of “Information and Communication System using Vehicle During Disaster”. The project’s aim is to develop a set of utilization standards for vehicles as a resilient communication network and information hub during disasters.

The project involves international consultations that culminated in an international workshop where experts were able to share their experiences, harness/harmonize ideas, and formulate a draft specification standard as the best practice for vehicle communications used in disaster response. This draft recommendation was presented in ASTAP-29, after which the experts can make follow-up actions and build a roadmap from the proof-of-concept to the business practices based on the responses.

1.2 Participants

The success of this international project is critically dependent on the cooperation of many partners from academe, government, and industry from both the Philippines and Japan, with invited experts from Malaysia, Thailand, and Papua New Guinea. The project is headed by Dr. Gregory Tangonan of the Ateneo Innovation Center, Ateneo de Manila University, Philippines, with close collaboration and support from the Department of Information and Communications Technology of the Philippines, headed by Ms. Arlene Romasanta. The Japanese counterpart for the implementation of the project is handled by the Telecommunication Technology Committee, with Mr. Masatoshi Mano as the Project Manager.

The main activity of the project, the International Workshop, was held in Mabini, Batangas, Philippines on July 11-15, 2017. A total of 33 participants from five (5) countries attended the presentations and demonstrations during the 3-day event.

The workshop participants came from the following affiliations:

Philippines
- Ateneo Innovation Center (AIC) - Ateneo de Manila University
- Department of Information and Communications Technology (DICT)
    - National Telecommunications Commission (NTC)
- Philippine Communications Satellite Corporation (Philcomsat)

Japan
- Telecommunication Technology Committee (TTC)
- Toyota InfoTechnology Center Co., Ltd. (Toyota-ITC)
- Oki Electric Industry Co., Ltd.
- Honda Motor Co., Ltd.
- SKY Perfect JSAT Corporation

Malaysia
- Universiti Putra Malaysia

Thailand
- Internet Education and Research Laboratory (intERLab) - Asian Institute of Technology
- CAT Telecom Public Company Limited

Papua New Guinea
- National Information & Communication Technology Authority (NICTA)

Table 1. List of Participants and Their Affiliations for the International Workshop

No.	Name	Firm	Country
1	Eliseo M. Rio, Jr. Undersecretary for Special Concerns eliseo.riojr@dict.gov.ph	Department of Information and Communications Technology	PHL
2	Alan A. Silor Assistant Secretary alan.silor@dict.gov.ph	Department of Information and Communications Technology	PHL
3	Arlene Romasanta Chief, Strategic R&D Services Division arlene.romasanta@dict.gov.ph	Department of Information and Communications Technology	PHL
4	Marcelo Aberion Information Technology Officer I marcelo.aberion@dict.gov.ph	Department of Information and Communications Technology	PHL
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8	Nathaniel J.C. Libatique Associate Professor nlibatique@ateneoinnovation.org	Ateneo de Manila University	PHL
9	Gemalyn D. Abrajano Assistant Professor gabrajano@ateneo.edu	Ateneo de Manila University	PHL
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11	Dominic Solpico Researcher, Ateneo Innovation Center db.solpico@gmail.com	Ateneo de Manila University	PHL
12	Jane Arleth Dela Cruz Ateneo Innovation Center	Ateneo de Manila University	PHL
13	Joshua Benedict Yu Ateneo Innovation Center	Ateneo de Manila University	PHL
14	Carlex Randolph Jose II Ateneo Innovation Center	Ateneo de Manila University	PHL
15	Jherrielloyd Lourrenz Yao Ateneo Innovation Center	Ateneo de Manila University	PHL
16	Aduwati Sali Associate Professor IR. DR. aduwati@upm.edu.my	Universiti Putra Malaysia (UPM)	MYS

17	Gibson Kemoi Senior Engineer ICT Policy gkemoi@nicta.gov.pg	National Information & Communication Technology Authority	PNG
18	Nisarat Tansakul Manager nisarat@ait.asia	intERLab Asian Institute of Technology	THA
19	Arunsak Nit-in Engineer arunsak.n@cattelecom.com	CAT Telecom	THA
20	Hiroshi Masuyama Manager hiroshi_masuyama@hm.honda.co.jp	HONDA Motor Co., Ltd.	JPN
21	Akira Iihoshi Chief Engineer akira_iihoshi@hm.honda.co.jp	HONDA Motor Co., Ltd.	JPN
22	Yasuo Oishi Chief Engineer yasuo_oishi@hm.honda.co.jp	HONDA Motor Co., Ltd.	JPN
23	Yasubumi Chimura Chairman of EG DRMRS ASTAP chimura730@oki.com	Oki Electric Industry Co., Ltd.	JPN
24	Tomoki Isaac Saso Assistant Manager saso-tomoki-isaac@sptvjsat.com	Skyperfect JSAT Corporation	JPN
25	Sunao Toya Assistant Manager s-toya@sptvjsat.com	Skyperfect JSAT Corporation	JPN
26	Christopher Francisco chrisfrancisco@philcomsat.com.ph	Philcomsat	PHL
27	Junny Mark Panuela	Philcomsat	PHL
28	Nizer Comia Rosales	Philcomsat	PHL
29	Kazuma Sato General Manager ksato@jp.toyota-itc.com	Toyota InfoTechnology Center	JPN
30	Yoshiharu Doi Group Leader, ITS Wireless yo-doi@jp.toyota-itc.com	Toyota InfoTechnology Center	JPN
31	Ryokichi Onishi Group Leader onishi@jp.toyota-itc.com	Toyota InfoTechnology Center	JPN
32	Yoichi Maeda S.V.P. & CEO Chairman of ASTAP maeda@s.ttc.or.jp	The Telecommunication Technology Committee (TTC)	JPN
33	Masatoshi Mano Director, Project Management mano@ttc.or.jp	The Telecommunication Technology Committee (TTC)	JPN

1.3 Schedule

The project duration is 11 months, from January 25, 2017 to December 24, 2017. The following gives the schedule of the project:

January 6, 2017	Notification of selection of the project for the International Collaborative Research Program of the APT
January 25, 2017	Notification of Acceptance of the Philippines through DICT
March 8, 2017	Kick-off meeting of the Philippine-Japan team in Bangkok during ASTAP-28
April 2017	Writing of the initial Draft Specification v.0.1
May 2017	Circulation and review of the Draft Specification v.0.1 to member countries
June 2017	Update Draft Specification to v.0.8, using initial comments
July 11-15, 2017	Conduct of the International Workshop in the Philippines; updating of Draft Specification to v.0.9, plus workshop talks and demonstrations
August 2017	Update Draft Specification to v.1.0 for presentation in ASTAP-29
September 2017	Present to ASTAP-29 and agree to Draft Specification v.1.0
November 2017	Meeting of the Steering Committee in Tokyo, Japan
December 2017	Editing of Final Report and Financial Report

1.4 Expected Output

The project is proposed to formulate a specification standard for using vehicular communication as a communication hub during disaster. There are various relevant and isolated projects among the Asia-Pacific nations that deal with the project theme, and the international collaboration will enable those players to understand others' experiences and harness/harmonize relevant efforts into a solid and integrative specification standard.

The Asia-Pacific Telecommunity (APT) organized the 5th APT Workshop on Disaster Management/Communications (WDMC-5) in 2014 in Tokyo, Japan. In the workshop, many requirements and use cases of resilient networks and reconfigurable information systems for use during disasters were discussed. The workshop led to the idea of developing a set of specification standards of vehicle communications networks as resilient information hub-networks during disasters. Thus, it is high time to step into the standardization effort on disaster resilient communications. The purpose of the collaboration is to bring local perspectives of Asia-Pacific nations on use cases, technologies, and regulations into a standard. To do this, use cases from member countries were solicited, a draft specification standard was written and circulated, and an international workshop was conducted to produce the expected output of the project, which is the draft specification standard on the utilization of vehicles as information and communication hubs during disasters.

Chapter 2 Activities

2.1 Kick-off Meeting

The kick-off meeting for the project was held on March 8, 2017 at the Hilton Hotel in Bangkok, Thailand. The meeting was facilitated by Mr. Yasubumi Chimura of Oki Electric Industry Co., Ltd. Mr. Masatoshi Mano, the Project Manager, initiated to introduce the participants in the meeting: the Philippine Project team headed by Dr. Gregory Tangonan of Ateneo Innovation Center (AIC) as the Project Lead, OIC Director Arlene Romasanta of the Department of Information and Communications Technology (DICT) as the Project Co-Lead, and Mr. Ryokichi Onishi of Toyota InfoTechnology Center, Japan.

Mr. Onishi did a presentation about the Vehicle Hub (V-HUB) as a communication system and the importance of vehicle as the hub for communication during disasters. Communication protocols such as TV whitespace, WiFi modules, and cellular communication are used to send messages to and from the victims and survivors in a disaster. For a successful implementation, the protocol should be standardized in the application interface (messaging, tracking, streaming and alerting) and network interface (WLAN, GNSS, DSRC (beacon), white space, satellite, cellular).

Also discussed in the kick-off meeting were the next steps for the project. The AIC together with the DICT counterpart are tasked to oversee the implementation of the workshop in the Philippines. Target participants are the APT member countries while target place is Cebu, Philippines in July. The venue was later changed to Batangas, a province to the south of Manila.

The draft standard specification will be circulated to the identified experts in member countries prior to the workshop to be conducted in the Philippines. The standards would serve as the working document for review and suggestions. The same document will then be presented to the workshop for a more participative discussion and inputs from other invited participants.

Figure 1. Kick-off meeting, March 8, 2017, Bangkok, Thailand.

2.2 Workshop Preparation

Circulation of Draft Specification and Invitation Letters to Stakeholders

The draft specification document, which is the expected output of the project, was circulated to APT member countries starting May 2017, specifically to those countries who responded to the "Questionnaire on the Use-Cases for the Disaster Information and Communication System Using Vehicle as a Communication Hub" in ASTAP-26. This was done to get initial comments to the draft and in preparation for the international workshop to be held in Batangas, Philippines on July 2017. Invitation letters for participation to the said workshop was sent to the same stakeholders and other interested parties. Researchers doing similar projects in Asian countries, their government representatives, and industry partners in car manufacturing and satellite communications were invited to join.

Pre-meeting

Several pre-meetings were done to prepare for the workshop. After the kick-off meeting in Bangkok, the PHL-JPN Steering Committee including Mr. Mano of TTC, Mr. Chimura of OKI, Mr. Onishi of Toyota ITC, and the AIC and DICT working group had four teleconferences to talk about the preparations being done for the workshop. These teleconferences happened on March 30, April 10, May 10, and May 31. Details on the logistics of the date and venue of the workshop, invitation letters, workshop program, list of participants, and other logistical matters were discussed in these meetings.

Logistics and Participants

The International workshop was held at the Eagle Point Beach Resort in Anilao, Batangas, Philippines last July 11-15, 2017. A total of 33 participants from government, industry, and academe joined the workshop. Notably, two officials from the DICT of the Philippines participated in the workshop as speakers, Undersecretary Eliseo Rio and Assistant Secretary Alan Silor. There were also participants from the National Telecommunications Commission (NTC), the regulating body for telecommunications companies in the Philippines, and CAT Telecom, the public telecommunications company of Thailand. Academic experts from Papua New Guinea, Malaysia, and Philippines gave presentations. Most of the participants stayed in the resort for the duration of the workshop. The workshop logistics were handled by the researchers of the Ateneo Innovation Center.

Chapter 3 International Workshop in the Philippines

3.1 Workshop Program

The APT International Collaborative Research 2016 Workshop on International Collaborative Research of Disaster Response Model using Vehicle Communication (VHUB) featured a comprehensive presentation from the participants on efforts relating to the use of vehicle for disaster response, as well as best practices in ICT strategies for disaster risk reduction and management. There was a total of six sessions over the 3-day workshop. The schedule of the workshop is given in Table 2.

Table 2 Workshop Program

DATE	AGENDA		
DAY 1: July 12			
10:00-12:00	Session-1: Opening Session		
	Moderator: Arlene Romasanta, DICT, Philippines		
	1. Welcome address:	Eliseo Rio, Undersecretary, DICT, Philippines	
	2. Message:	Nathaniel J.C. Libatique, Ateneo Innovation Center, Ateneo de Manila University, Philippines	
	3. Message:	Yoichi Maeda, ASTAP Chair, The Telecommunication Technology Committee, Japan	
14:00-17:00	Session-2: VHUB Seminar		
	Moderator: Yasubumi Chimura, TTC, Japan		
	1. V-HUB: Vehicles as Information Hubs during Disaster		Kevin Sato, Toyota ITC, Japan
	2. Restoration Support by Satellite Communications -- Tohoku-Pacific Ocean Earthquake --		Tomoki Isaac Saso, SKY Perfect JSAT, Japan
	3. Approach for disaster prevention and reduction using Honda telematics		Yasuo Oishi, HONDA, Japan
	4. Resilient Post-Disaster Information Systems Using Delay Tolerant Networks and UAVs as Data Ferries		Nathaniel Joseph Libatique, Ateneo Innovation Center, Ateneo de Manila University, Philippines
18:00-20:00	Welcome Reception		

DAY 2: July 13 10:00-12:00	Session-3: Review of draft of VHUB Specification Moderator: Ryokichi Onishi, Toyota ITC, Japan 1. Presentation of VHUB Specification Draft — Ryokichi Onishi, Toyota ITC, Japan 2. Discussion
14:00-17:00	Session-4: Use-case Presentation and Demonstration Moderator: Yasubumi Chimura, TTC, Japan 1. SKY Perfect JSAT (Demo) 2. Ateneo de Manila University (Demo) 3. WiFi on Vehicle cells: Inter-operation of Satellite, Drone and Vehicle cells — Mr. Arunsak Nit-in, CAT Telecom, Thailand 4. Research on Disaster Response — Dr. Aduwati Sali, Universiti Putra Malaysia, Malaysia 5. The Design and Operational Guidelines for DUMBONET Emergency Networks — Ms. Nisarat Tansakul, Asian Institute of Technology, Thailand 6. ICT Strategy for DRRM (The Philippine Setting) — Asec. Alan Silor, DICT, Philippines 7. V2X Applications by using VHUB — Dr. Yoshiharu Doi Toyota ITC, Japan
DAY 3: July 14 10:00-12:00	Session-5: Closing Session Moderator: Yasubumi Chimura, TTC, Japan - Agreement on VHUB Specification or its way forward which will be contribute to ASTAP-29
14:00-17:00	Session-6: (Reserved）
18:00-20:00	Farewell Dinner

(a)

(b)

Figure 2 Participants of the International Workshop held in Batangas, Philippines.

Workshop Program in Pictures: Presentations and Demonstrations

Session-1: Opening Moderator: Arlene Romasanta, DICT, Philippines

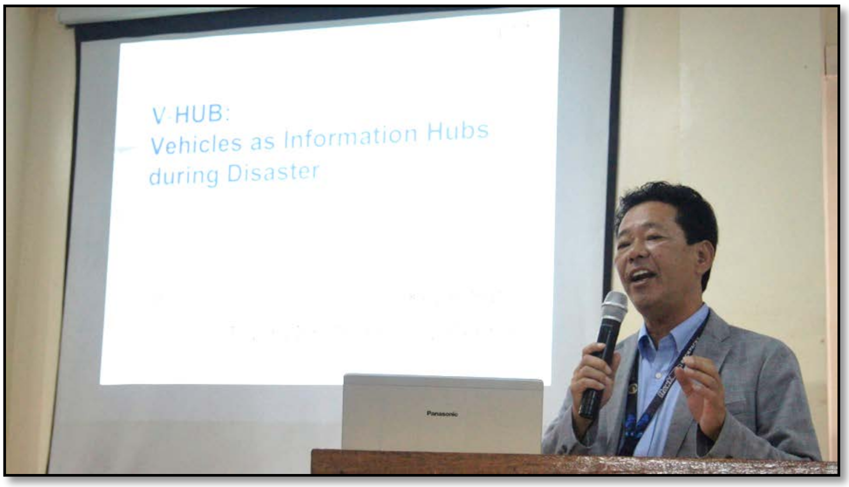
Eliseo Rio, Undersecretary, DICT, Philippines

Nathaniel J.C. Libatique
Ateneo Innovation Center, Ateneo de Manila University, Philippines

Yoichi Maeda, ASTAP Chair,
The Telecommunication Technology Committee, Japan

Session-2: VHUB Seminar

Moderator: Yasubumi Chimura, Oki Electric Industry, Japan



"V-HUB: Vehicles as Information Hubs during Disaster"
Kevin Sato, Toyota InfoTechnology Center, Japan

"Restoration Support by Satellite Communications - Tohoku-Pacific Ocean Earthquake –"
Tomoki Isaac Saso, SKY Perfect JSAT, Japan

"Approach for disaster prevention and reduction using Honda telematics"
Yasuo Oishi, HONDA Motor, Japan

“Resilient Post-Disaster Information Systems
Using Delay Tolerant Networks and UAVs as Data Ferries”
Nathaniel Libatique, Ateneo Innovation Center, Ateneo de Manila University, Philippines

7. V2X Applications by using VHUB
Dr. Yoshiharu Doi, Toyota InfoTechnology Center, Japan

Session-3: Review of draft of VHUB Specification
Moderator: Ryokichi Onishi, Toyota InfoTechnology Center, Japan

Presentation of VHUB Specification Draft
Ryokichi Onishi, Toyota InfoTechnology Center, Japan

Discussion

Session-4: Use-case Presentation
Moderator: Yasubumi Chimura, TTC, Japan

WiFi on Vehicle cells: Inter-operation of Satellite, Drone and Vehicle cells
Mr. Arunsak Nit-in, CAT Telecom, Thailand

Research on Disaster Response
Dr. Aduwati Sali, Universiti Putra Malaysia, Malaysia

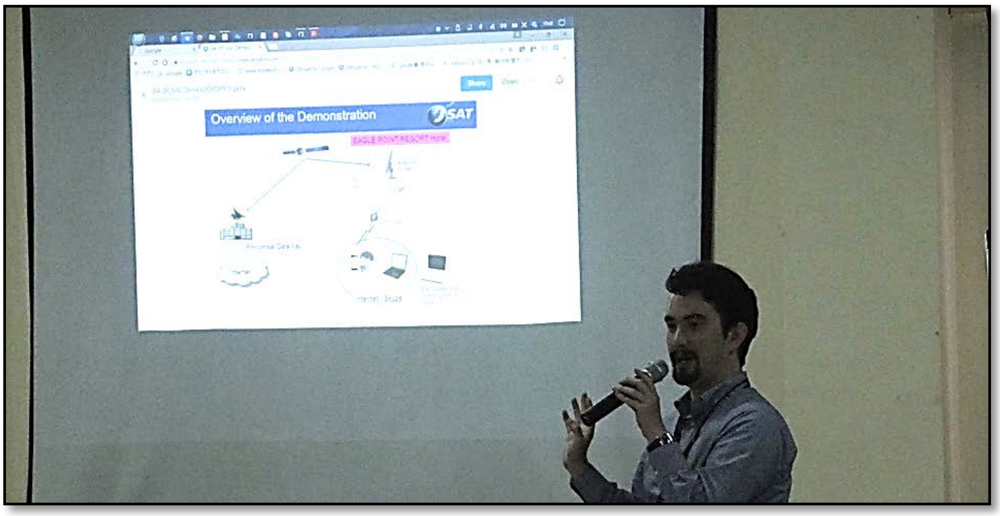
The Design and Operational Guidelines for DUMBONET Emergency Networks
Ms. Nisarat Tansakul, Asian Institute of Technology, Thailand

ICT Strategy for DRRM (The Philippine Setting)
Asec. Alan Silor, DICT, Philippines

Session-4: Demonstration

Ateneo de Manila University (Demo)

SKY Perfect JSAT (Demo)



Session-5: Closing Session
Moderator: Yasubumi Chimura, Oki Electric Industry, Japan

Agreement on VHUB Specification
or its way forward which will be contributed to ASTAP-29

Chapter 4 Overview of Standard Specification for VHUB System

V-HUB system is the entire information and communication system using vehicles*1 during disaster. Note that it is not limited to vehicle unit. The V-HUB*2 system has two types of interface; network interface for devices and application interface for applications. The specification covers scenarios using vehicles to replace destroyed/broken communication infrastructure during disaster beyond V2V communications.

Note *1; The vehicle of V-HUB has engine or motor and battery, communication unit.
Note *2; The HUB of V-HUB means information and communications infrastructure.

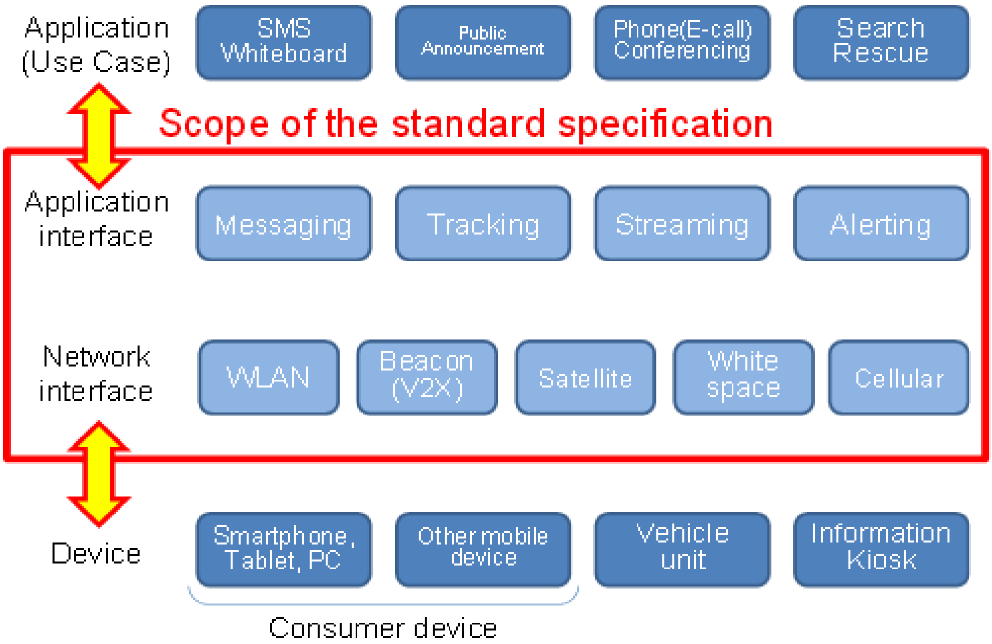


Figure 3. The VHUB system

4.1. Device

Device is defined as a hardware that serves as a communication network node and may include consumer device, vehicle unit, and information kiosk. The consumer device is off-the-shelf such as smartphone, PC, tablet, and other mobile devices.

A) Smartphone, Tablet, PC	The computer device used for consumer.
B) Other mobile devices	The mobile computer device not included in A.
C) Vehicle unit	The vehicle unit can be factory-installed by manufacturer and also carried-on by user.
D) Information Kiosk	The information kiosk may include a stationary server at

the evacuation site with internet access. The information kiosk is usually maintained by designated operators.

4.2. Network interface

Network interface is defined as a communication interface among devices and may include WLAN, beacon (V2X), satellite, white space and cellular.

1) WLAN

WLAN has two major connection methods; infrastructure mode and ad-hoc mode. The V-HUB system must support the infrastructure mode because most of consumer off-the-shelf devices such as smartphones only support the infrastructure mode and the V-HUB system must offer the service to such popular devices. Alternatively, the V-HUB system may additionally support ad-hoc mode for communications between vehicle units. Since this is also achieved by infrastructure mode as mentioned below, the ad-hoc mode specification has been postponed. It does not mean the ad-hoc mode remains declined. This option can also be developed in the future.

The infrastructure mode has two functions; AP and STA. One WLAN AP serves multiple connections to WLAN STAs. It is not supported to establish connection between APs or between STAs. Since the consumer devices usually operate WLAN STA as a standard setup, the vehicle unit must operate WLAN AP to connect to user devices without any operation on the user side. In addition, the inter-vehicle communication also requires the AP-STA linkage. This means that the vehicle unit must operate WLAN STA for relaying. This also benefits the vehicle unit to connect to the internet access point and information kiosk at the evacuation site. As a consequence, the vehicle unit must operate both WLAN AP and STA. There are three potential options for this as follows: (1) dual interfaces, (2) concurrent mode, and (3) Wi-Fi Direct. With dual interfaces or concurrent mode, the vehicle unit may operate both AP and STA at the same time. The concurrent mode is to switch AP and STA periodically on the single interface to emulate (pretend) the dual interfaces. This is a kind of proprietary technology provided by many major WLAN chipset manufacturers. Though it looks the simplest setup, it is not true actually. If there are several vehicles in the same communication vicinity, multiple APs are appeared. Since there is no linkage among APs, communication network is divided among APs even in the same communication vicinity. This also induces a complication for users to choose one AP to connect. The third option Wi-Fi Direct enables the interface to be AP or STA and not both at the same time. If there is no AP, the interface gets AP. If there is AP, the interface gets STA and connects to the existing AP. If existing APs are met, one random AP gets STA and connects to the other AP. This mechanism virtually ensures a single AP in the same communication vicinity and keeps the V-HUB system away from network complication due to multiple APs that occurs in case of dual interface and concurrent mode.

In addition, it is quite opportunistic to practice inter-vehicle communication on the street. In order to increase that opportunity, it will be highly recommended that the V-HUB system support IEEE802.11ai of Fast Initial Link Setup (FILS) capability.

Note that this specification does not cover multi-hop ad-hoc routing, that is known as VANET (Vehicular Ad-hoc Network), and DTN (Delay/Disruption Tolerant Network). Both capabilities can be developed in the future.

2) Beacon (V2X)

The consumer device (pedestrian device) broadcasts a rescue message using wireless beacon(s). The vehicle unit (including drone) relays the message to the information kiosk. After receiving the message at the information kiosk, the massage will be used to make rescue map in the information kiosk. The rescue map shows position and priority of people who needs support. Typical wireless media for the beacon are 1) ARIB STD T109 (V2X) and 2) IoT using sub-giga band (IoT), because communication distance and stability is better than higher band. Field trial to confirm communication distance is carried out in the Philippines and it is reported to ASTAP. The report shows that the vehicle unit can work to find victims and the information kiosk can gather the victim information.

This system has three types of beacons. First beacon is an alert delivery beacon that will be sent by authorized organization. This beacon defines mode of this system and area. If the alert delivery beacon shows disaster mode and certain area, consumer devices that are in the certain area shift to disaster mode automatically. Before shifting disaster mode, the consumer devices stay in normal mode, so the pedestrian units can use the beacon system for normal V2X communication and so on.

Second beacon is a rescue request beacon, and this rescue request beacon can be sent only after shifting disaster mode. We can assume that the beacon can be sent by four cases. First case is that the consumer device sends the beacon automatically. Second case is victim sends the beacon by him/herself. Third case is other person sends the beacon in order to call rescue team for rescuing victims. Fourth case is a rescue team uses this beacon to share the information within another rescue team. The rescue request beacon includes requirement information, personal information that is needed, vital information, and METHANE information. METHANE is defined in NATO. M means Major incident happens. E means Exact location. T means Types of incident, H means kind of Hazard, A means Accessibility to the location. N means Number of casualties. E means Emergency services to rescue the casualties.

Third beacon is a rescue response beacon from rescue team to victim. This rescue response beacon includes accepting time, estimated arrival time, and so on.

3) Satellite

Satellite Network Interface is used for providing robust communication line to other networks outside the V-HUB system.

In a typical regulatory environment, high power satellite communication requires a trained and licensed person to operate the terminal. However, in a case of disaster obtaining such personal at the right site will be extremely difficult. Therefore, the V-HUB system must deploy a VSAT system, which is a system that uses low power satellite communication equipment that does not require trained and licensed personal to operate the terminal.

The VSAT system is constructed by terminals with satellite antenna, satellites and satellite gateways. The terminal will be deployed on to the vehicle unit and the information kiosk. The satellite gateway is an entity that will control the remote terminal and become the gateway to connect to the internet. In order to secure robust communication a backup the satellite gateway is needed.

4) White space

The VHUB system may use the government specified frequency such as VHF. The VHUB system dynamically finds/utilizes the available white space typically for long-range (10-17 km) communications for isolated disaster areas. The use case may follow technical requirement of VSAT and the specification can be developed in the future.

5) Cellular

The VHUB system may use mobile BTS (base transceiver station) for isolated areas. The specification can be developed in the future.

4.3. Application interface

Application interface is defined as a communication interface among applications and may include messaging, tracking, streaming and alerting.

1) Messaging

The messaging application is a general service platform. It may be used by citizens, responders and volunteers. Note that the application is neither intended to be time sensitive nor mission critical. The messaging interface is for asynchronous transfer of data such as binary, text, voice, image and video. This interface is widely used for application such as SMS, SOS signaling, white board, public announcement, phone (E-call), conferencing and search/rescue. The V-HUB system delivers messages among users. There are following four options in which users put their messages into the vehicle unit:

a) Web service

The web service is the simplest fashion that does not require users to install any application -just available at the pre-installed web browser. In order to host the service, the vehicle unit must have a web server and a database. In addition, the vehicle unit must show the default web page whichever URLs users indicate.

b) Dedicated applications

The dedicated application is mainly for professional use. Though it requires an additional installation, it may offer optimized user interface for professional users and also for challenged users. Since the dedicated application does not limit protocol options, the vehicle unit may also use the web server for it.

c) Commercial applications

The commercial application should be user friendly. Users may use any social media applications. For that service, the vehicle unit must emulate these commercial services and this requires individual collaborations.

d) Email service

The last option of email service seems easy and friendly to users, but the fact is the opposite. It requires users to modify email client settings and that information is obtained from the web service.

The last two options are not suitable as standard specifications.

The vehicle units share messages among each other. Since there remains limited time to inter-vehicle communication, it is important to share messages efficiently using dedicated messaging daemon. The information kiosk shall have the same requirements and therefore have the same functions with the vehicle unit because the vehicle unit also acts as the information kiosk at the evacuation site in some situation.

In order to protect messages from fraud acts, the vehicle unit uses encryption or digital signature in the messages. Note that important is not concealment of information but proof of identity of message originators. Messaging interface is mainly supported by WLAN interface.

2) Tracking

The V-HUB system tracks victims, responders and vehicle units to locate and coordinate the rescue team. The specification can be developed in the future.

3) Streaming

The streaming interface is for distributing video contents to users as live streaming and also sending of recorded videos. Considering it is difficult for consumer devices to deploy satellite antennas, an IP streaming method is required.

A video playout system at the satellite gateway will uplink the video content to the information kiosks and the vehicle units with satellite interface. Information kiosks and vehicle units will receive the RF signals and encode it through an IP encoder that will multicast it to the vehicle units and the web client on consumer devices and vehicle units.

Note that it has not covered the use case of phone call and video chat yet. Here it assumes the use case of the command center streams down to victims and responders. If an interactive streaming capability gets available, the command center, responders and victims can talk among each other interactively according to appropriate designated policy. Even drones can do streaming. The requirement may involve ISDB-T and DTN. This can be developed in the future.

4) Alerting

The alerting interface is for delivering critical information that requires robust and immediate delivery. Here the information assumes Earthquake Early Warning Alert. The Earthquake Early Warning Alert is an alert to provide awareness to humans and machines in minutes or seconds prior to the earthquake wave hits the location. A typical massive earthquake accompanies large aftershock for few days or more. Hence, it is necessary to deploy a robust communication line that can deliver the Earthquake Early Warning Alert even when the terrestrial line has been damaged after the first shock. The alert will be distributed to alert software servers from an alert management server which is located in the satellite gateway. The alert software server, which is a software deployed in certain vehicle units or information kiosks will be responsible to distribute the alert to other vehicle units or consumer devices. Of course, the alerting application should cover not only earthquake but also other natural disasters and even man-made ones. The application should also use another network such as beacon (V2X). This can be developed in the future.

4.4. Application

Application is a software enabling use cases. APT Report on Requirements of Information and Communication System Using Vehicle during Disaster (APT/ASTAP/REPT-21) has a list of suggested use cases of V-HUB. Use cases can be classified by nature into four categories below:

a)	SMS/Whiteboard	Non-real-time text communication ex. Short Message Service and Whiteboard for information sharing during disaster. etc.
b)	Public announcement	Non-real-time/Real-time text distribution ex. Delivering information by Web news. etc.
c)	Phone(E-call)/Conferencing	Interactive voice/video communication ex. Emergency Call etc.
d)	Search/Rescue	Non-real-time beacon communication ex. Person Search Service. etc.

Chapter 5 ASTAP-29 DRMRS SESSION

Event Title: Asia-Pacific Telecommunity Standardization Program-29 (ASTAP29) – Expert Group on Disaster Risk Management Relief System (EG DRMRS)
Project Title: International Collaborative Research on Disaster Response Model Using Vehicle Communications (APT-Funded Project)
Duration: 11 months (25 January to 24 December 2017)
Date: 22-25 August 2017
Venue: Amari Waterpark, Bangkok, Thailand
Participants:
- APT-Member countries EG DRMRS
- Representatives from Project Team:

Arlene Romasanta	DICT, Philippines – Co-Project Lead of AIC
Yasubumi Chimura	Chair of TTC Working Group on Connected car Oki Electric Industry Co., Ltd. – Industry Collaborator
Masatoshi Mano	TTC, Japan – Account Coordinator

Highlights:

1. There was a discussion on V-HUB Draft Specification where Philippines was one of the major players. The version presented was an output of the workshop conducted in Batangas, Philippines through the APT-funded project “International Collaborative Research on Disaster Response Model on Vehicle Communications during Disasters”; The Telecommunication Technology Committee (TTC) Japan, Department of Information and Communications Technology (DICT) Philippines and Ateneo Innovation Center (AIC) conducted the workshop last July 12-14, 2017.

2. Mr. Mano (TTC) proposed the Draft Recommendation on “Standard Specification of Information and Communication System using Vehicle during Disaster” (INP-06 (Rev.1)) based on discussion by corresponding group.

3. There were comments to change the format into the Recommendation Document Style. Chairman Maeda (TTC) proposed the APT Recommendation Style Information (TMP-02) to be used as reference. EG DRMRS editing group changed the style of documents, confirmed new Draft (TMP-02 (Rev.3). EG DRMRS agreed, adopted and forwarded to the WG NS the Draft Recommendation on Standard Specification of Information and Communication System using Vehicle during Disaster (TMP-02 Rev.3).

4. APT will begin the recommendation process after approval at plenary of ASTAP-29. During the plenary, the proposed Draft Recommendation on Standard Specification of Information and Communication System using Vehicle during Disaster was APPROVED. It will then be forwarded to APT-Member Countries for their “YES” votes on the standard.

Chapter 6 Conclusion and Next Steps

The project, through its eleven months of implementation, was able to bring together experts and industry practitioners from different APT-member countries to discuss and share experiences regarding disaster response and communications using vehicles. The academe, government, and industry from Japan, Philippines, Thailand, Malaysia, and Papua New Guinea came together to produce a draft standard specification document on the use of vehicles as an information and communication system (VHUB) during disaster.

During the ASTAP29 last 22-25 August held in Bangkok, Thailand, the Draft Recommendation on Standard Specification of Information and Communication System using Vehicle during Disaster was APPROVED in the plenary. It was then circulated by the APT-member countries for their "YES" votes to adopt the standard and be implemented in the Asia Pacific region.

To date, the APT through ASTAP is consolidating the vote forms from member countries and will be subjected for assessment whether the standard will finally be adopted and later be implemented. The Project Team will monitor the progress of the status of the adoption of the draft recommendation and closely coordinate with APT for any feedback. The Project Team is looking at the possibility of pushing for another collaborative project for APT funding based on the Call for Proposal that will be released. The proposal should be responsive on the priorities identified in the Call and on the current pressing national problems commonly experienced by APT-member countries.

Standard Specification

Information and Communication System using Vehicle during Disaster

23 August 2017

CONTENTS

1. Scope

This document defines the specification of information and communication system using vehicle during disaster in order to support the system requirements. The specification covers technical requirements and functional architectures. The specification does not cover protocol details (message format, message sequence, and etc.), conformance/interoperability testing, and operational guideline. They can be developed in the future.

2. References

[APT/ASTAP/REPT-21] Report APT/REPT-21(2016), "Requirements of Information and Communication System using Vehicle during Disaster"

3. Terms and definition

This document defines the following terms.

3.1. V-HUB system

V-HUB system is the entire information and communication system using vehicles*1 during disaster. Note that it is not limited to vehicle unit. The V-HUB*2 system has two types of interface; network interface for devices and application interface for applications. The specification covers scenarios using vehicles to replace destroyed / broken communication infrastructure during disaster beyond V2V communications.

Note *1; The vehicle of V-HUB has engine or motor and battery, communication unit.
Note *2; The HUB of V-HUB means information and communications infrastructure.

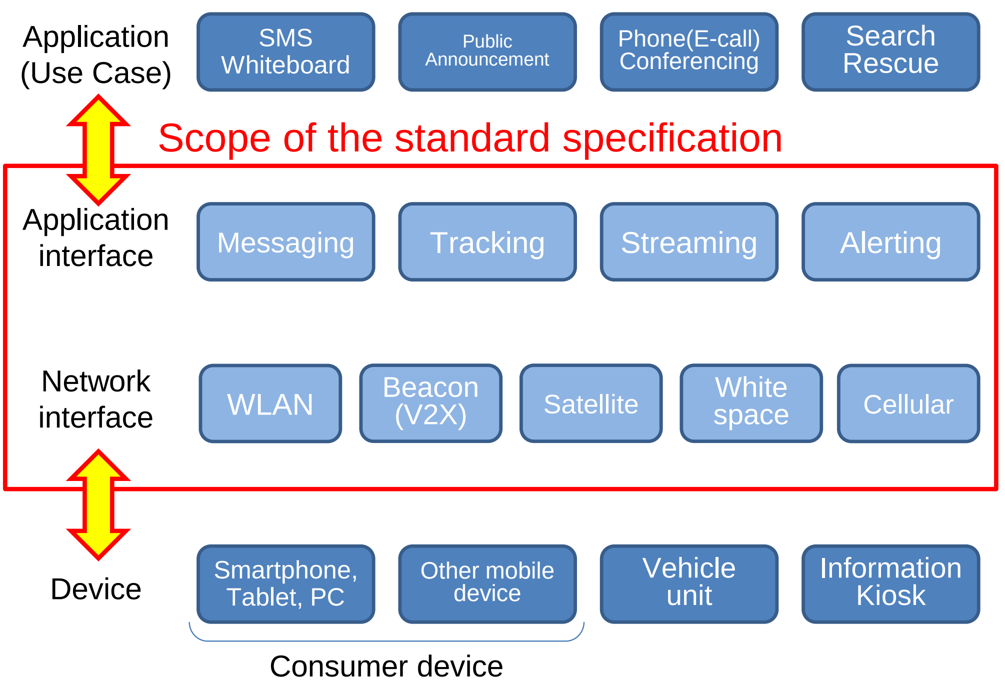


Fig. 1 The V-HUB system

3.2. Device

Device is defined as a hardware that serves as a communication network node and may include consumer device, vehicle unit, and information kiosk. The consumer device is off-the-shelf such as smartphone, PC, tablet and other mobile device.

A) Smartphone, Tablet, PC	The computer device used for consumer.
B) Other mobile device	The mobile computer device out of A).
C) Vehicle unit	The vehicle unit can be factory-installed by manufacturer and also carried-on by user.
D) Information Kiosk	The information kiosk may include a stationary server at the evacuation site with internet access. The information kiosk is usually maintained by designated operators.

3.3. Network interface

Network interface is defined as a communication interface among devices and may include WLAN, beacon (V2X), satellite, white space and cellular.

3.4. Application interface

Application interface is defined as a communication interface among applications and may include messaging, tracking, streaming and alerting.

3.5. Application

Application is a software enabling use cases. APT Report on Requirements of Information and Communication System Using Vehicle during Disaster (APT/ASTAP/REPT-21) has a list of suggested use cases of V-HUB. Use cases can be classified by nature into four categories below:

A) SMS/Whiteboard Non-real-time text communication
ex. Short Message Service and Whiteboard for information sharing during disaster. etc.

B) Public announcement Non-real-time/Real-time text distribution
ex. Delivering information by Web news. etc.

C) Phone(E-call)/Conferencing Interactive voice/video communication
ex. Emergency Call etc.

D) Search/Rescue Non-real-time beacon communication
ex. Person Search Service. etc.

4. Abbreviations

AP	Access Point
CRUD	Create, Read, Update and Delete
SSID	Service Set Identifier
STA	Station terminal
WLAN	Wireless LAN
VSAT system	Very Small Aperture Terminal system

5. Conventions

None

6. Network interfaces

6.1. WLAN

6.1.1. Description

WLAN has two major connection methods; infrastructure mode and ad-hoc mode. The V-HUB system must support the infrastructure mode, because most of consumer off-the-shelf devices such as smartphones only support the infrastructure mode and the V-HUB system must offer the service to such popular devices. Alternatively the V-HUB system may additionally support ad-hoc mode for communications between vehicle units. Since this is also achieved by infrastructure mode as mentioned below, the ad-hoc mode specification has been postponed. It does not mean the ad-hoc mode remains declined. This option can also be developed in the future.

The infrastructure mode has two functions; AP and STA. One WLAN AP serves multiple connections to WLAN STAs. It is not supported to establish connection between APs or between STAs. Since the consumer devices usually operate WLAN STA as a standard setup, the vehicle unit must operate WLAN AP to connect to user devices without any operation on the user side. In addition, the inter-vehicle communication also requires the AP-STA linkage. This means that the vehicle unit must operate WLAN STA for relaying. This also benefits the vehicle unit to connect to the internet access point and information kiosk at the evacuation site. As a consequence, the vehicle unit must operate both WLAN AP and STA. There are three potential options for this as follows:

- Dual interfaces
- Concurrent mode
- Wi-Fi Direct

With dual interfaces or concurrent mode, the vehicle unit may operate both AP and STA at the same time. The concurrent mode is to switch AP and STA periodically on the single interface to emulate (pretend) the dual interfaces. This is a kind of proprietary technology provided by many major WLAN chipset manufacturers. Though it looks the simplest setup, it is not true actually. If there are several vehicles in the same communication vicinity, multiple APs are appeared. Since there is no linkage among APs, communication network is divided among APs even in the same communication vicinity. This also induces a complication for users to choose one AP to connect. The third option Wi-Fi Direct enables the interface to be AP or STA and not both at the same time. If there is no AP, the interface gets AP. If there is AP, the interface gets STA and connects to the existing AP. If existing APs are met, one random AP gets STA and connects to the other AP. This mechanism virtually ensures a single AP in the same communication vicinity and keeps the V-HUB system away from network complication due to multiple APs that occurs in case of dual interface and concurrent mode.

In addition, it is quite opportunistic to practice inter-vehicle communication on the street. In order to increase that opportunity, it will be highly recommended that the V-HUB system support IEEE802.11ai of Fast Initial Link Setup (FILS) capability.

Note that this specification does not cover multi-hop ad-hoc routing, that is known as VANET (Vehicular Ad-hoc Network), and DTN (Delay/Disruption Tolerant Network). Both capabilities can be developed in the future.

6.1.2. Technical requirement

ID	Technical requirement	Use case

N001	The V-HUB system shall enable the vehicle unit to have both WLAN AP and WLAN STA.	A, B, D
N002	The V-HUB system shall enable the vehicle unit to deactivate WLAN AP after a random time wait, while the vehicle unit identifies the presence of WLAN AP of the other vehicle unit. Note: Wi-Fi Direct can be a solution for this.	A, B, D
N003	The V-HUB system shall enable the vehicle unit to use a pre-defined SSID at WLAN AP.	A, B, D
N004	The V-HUB system shall enable the vehicle unit to operate WLAN STA to automatically connect to the pre-defined SSID of WLAN AP of another vehicle unit. Note: IEEE802.11ai may apply for fast link setup.	A, B, D
N005	The V-HUB system shall enable the vehicle unit to operate WLAN STA not to connect to its own WLAN AP while the same vehicle unit activate WLAN AP.	A, B, D
N006	The V-HUB system shall enable the consumer device have WLAN STA.	A, B, D
N007	The V-HUB system shall enable the consumer device to operate WLAN STA to manually connect to the pre-defined SSID of WLAN AP of the vehicle unit. Note: IEEE802.11ai may apply for fast link setup.	A, B, D
N008	The V-HUB system shall enable the information kiosk to have WLAN AP.	A, B, D
N009	The V-HUB system shall enable the information kiosk to use a pre-defined SSID at WLAN AP.	A, B, D
N010	The V-HUB system shall enable the vehicle unit that operates WLAN AP to operate WLAN STA to automatically connect to the pre-defined SSID of WLAN AP of the information kiosk. Note: IEEE802.11ai may apply for fast link setup.	A, B, D

6.1.3. Functional architecture specification

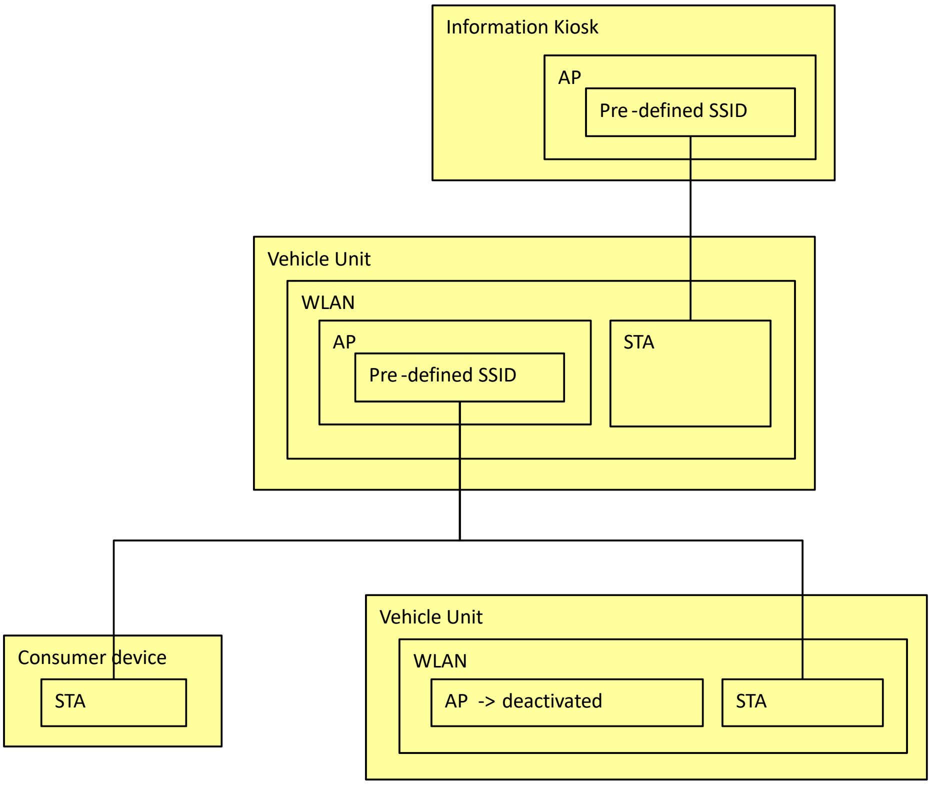


Fig. 2 Functional architecture of wireless LAN interface

6.2. Beacon (V2X)

6.2.1. Description

The consumer device (pedestrian device) broadcasts a rescue message using wireless beacon(s). The vehicle unit (including drone) relays the message to the information kiosk. After receiving the message at the information kiosk, the massage will be used to make rescue map in the information kiosk. The rescue map shows position and priority of people who needs support. Typical wireless media for the beacon are 1) ARIB STD T109 (V2X) and 2) IoT using sub-giga band (IoT), because communication distance and stability is better than higher band. Field trial to confirm communication distance is carried out in the Philippines and it is reported to ASTAP. The report shows that the vehicle unit can work to find victims and the information kiosk can gather the victim information.

This system has three types of beacons. First beacon is an alert delivery beacon that will be sent by authorized organization. This beacon defines mode of this system and area. If the alert delivery beacon shows disaster mode and certain area, consumer devices that are in the certain area shift to disaster mode automatically. Before shifting disaster mode, the consumer devices stay in normal mode, so the pedestrian units can use the beacon system for normal V2X communication and so on.

Second beacon is a rescue request beacon, and this rescue request beacon can be sent only after shifting disaster mode. We can assume that the beacon can be sent by four cases. First case is that the consumer device sends the beacon automatically. Second case is victim sends the beacon by him/herself. Third case is other person sends the beacon in order to call rescue team for rescuing victims. Fourth case is a rescue team uses this beacon to share the information within other rescue team. The rescue request beacon includes requirement information, personal information that is needed, vital information, and METHANE information. METHANE is defined in NATO. M means Major incident happens. E means Exact location. T means Types of incident, H means kind of Hazard, A means Accessibility to the location. N means Number of casualties. E means Emergency services to rescue the casualties.

Third beacon is a rescue response beacon from rescue team to victim. This rescue response beacon includes accepting time, estimated arrival time, and so on.

6.2.2. Technical requirement

ID	Technical requirement	Use case
N011	The V-HUB system shall enable the rescue message to have three types of beacon; alert delivery beacon, rescue request beacon, and rescue response beacon.	B, D
N012	The V-HUB system shall use ARIB STD T109 (V2X) and/or sub-giga band wireless IoT system (IoT) that carries the rescue messages. Note: ARIB STD T109 can be referred at [URL]http://www.arib.or.jp/english/html/overview/doc/5-STD-T109v1_2-E1.pdf	B, D
N013	The V-HUB system shall enable the consumer device to broadcast and to receive the rescue message.	B, D
N014	The V-HUB system shall enable the vehicle unit to relay (receive and re-broadcast) the rescue message.	B, D
N015	The V-HUB system shall enable the information kiosk to broadcast and to receive the rescue message.	B, D

6.2.3. Functional architecture specification

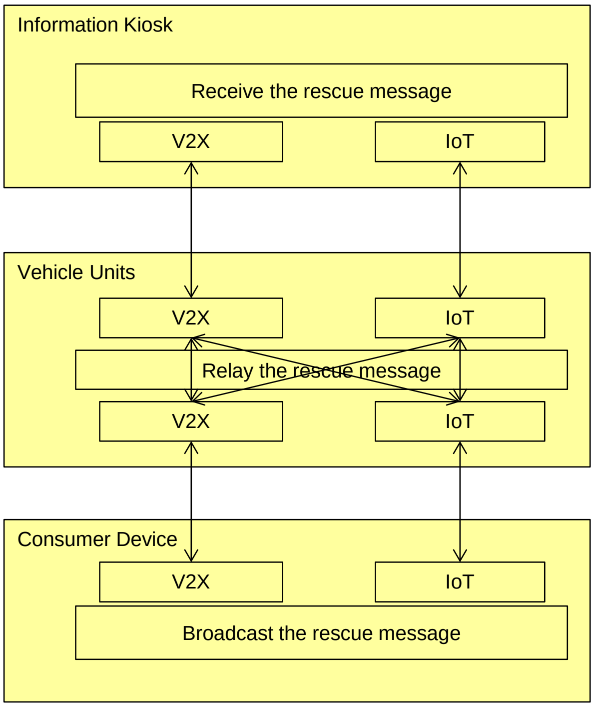


Fig. 3 Functional architecture of beacon interface

6.3. Satellite

6.3.1. Description

Satellite Network Interface is used for providing robust communication line to other networks outside the V-HUB system.

In a typical regulatory environment, high power satellite communication requires a trained and licensed person to operate the terminal. However, in a case of disaster obtaining such personal at the right site will be extremely difficult. Therefore the V-HUB system must deploy a VSAT system, which is a system that uses low power satellite communication equipment that does not require trained and licensed personal to operate the terminal.

The VSAT system is constructed by terminals with satellite antenna, satellites and satellite gateways. The terminal will be deployed on to the vehicle unit and the information kiosk. The satellite gateway is an entity that will control the remote terminal and become the gateway to connect to the internet. In order to secure robust communication a backup the satellite gateway is needed.

6.3.2. Technical requirement

ID	Technical requirement	Use case
N016	The V-HUB system shall have the V-SAT system that consists of the information kiosks/the vehicle units, satellites, satellite gateways and the internet.	A, B, C, D
N017	The V-HUB system shall have the satellite in the sky.	A, B, C, D
N018	The V-HUB system shall have the satellite gateway outside the disaster area that connects to the internet.	A, B, C, D

N019	The V-HUB system shall enable the satellite gateway to have back up equipment including site diversity to avoid service down time.	A, B, C, D
N020	The V-HUB system shall enable the information kiosk, the vehicle unit and the satellite gateway to have a terminal with satellite antenna in order to connect to the satellite.	A, B, C, D
N021	The V-HUB system shall enable the terminal to use the pre-assigned IP address.	A, B, C, D
N022	The V-HUB system shall enable the VSAT system to deliver the data between the information kiosk/the vehicle unit and the internet.	A, B, C, D
N023	The V-HUB system shall enable the VSAT system to maintain designated capacity.	A, B, C, D

6.3.3. Functional architecture specification

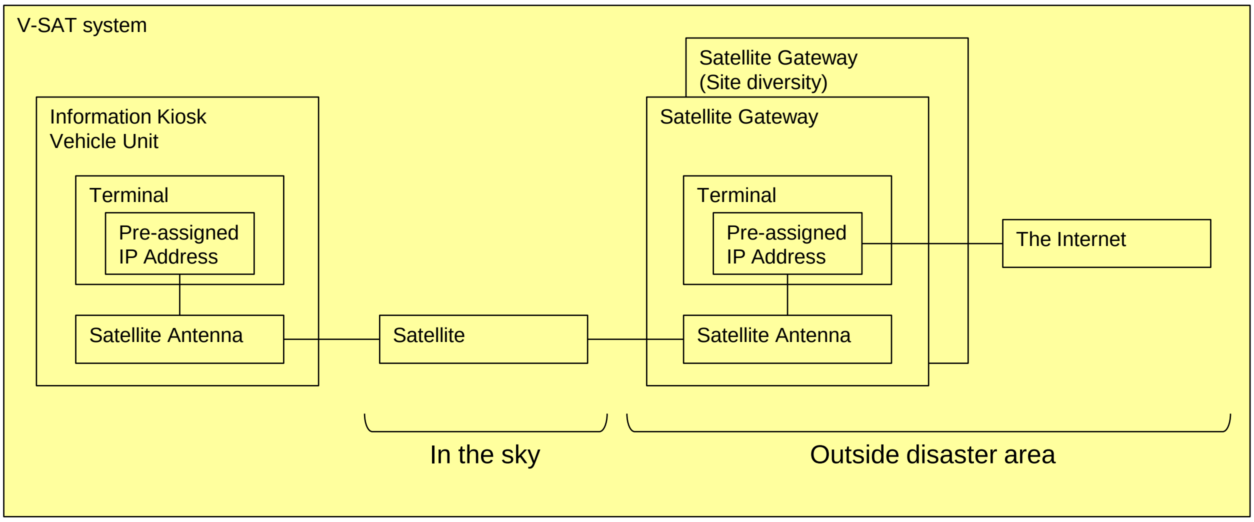


Fig. 4 Functional architecture of satellite interface

6.4. White space

6.4.1. Description

The VHUB system may use the government specified frequency such as VHF. The VHUB system dynamically finds/utilizes the available white space typically for long-range (10-17 km) communications for isolated disaster areas. The use case may follow technical requirement of VSAT and the specification can be developed in the future.

6.4.2. Technical requirement

To be developed.

6.4.3. Functional architecture specification

To be developed.

6.5. Cellular

6.5.1. Description

The VHUB system may use mobile BTS (base transceiver station) for isolated areas. The specification can be developed in the future.

6.5.2. Technical requirement

To be developed.

6.5.3. Functional architecture specification

To be developed. It will include the utilization of DTH (Direct to Home) satellite band.

7. Application interfaces

7.1. Messaging

7.1.1. Description

The messaging application is a general service platform. It may be used by citizens, responders and volunteers. Note that the application is neither intended to be time sensitive nor mission critical. The messaging interface is for asynchronous transfer of data such as binary, text, voice, image and video. This interface is widely used for application such as SMS, SOS signaling, white board, public announcement, phone (E-call), conferencing and search/rescue. The V-HUB system delivers messages among users. There are following four options in which users put their messages into the vehicle unit:

Web service
The web service is the simplest fashion that does not require users to install any application - just available at the pre-installed web browser. In order to host the service, the vehicle unit must have a web server and a database. In addition, the vehicle unit must show the default web page whichever URLs users indicate.

Dedicated applications
The dedicated application is mainly for professional use. Though it requires an additional installation, it may offer optimized user interface for professional users and also for challenged users. Since the dedicated application does not limit protocol options, the vehicle unit may also use the web server for it.

Commercial applications
The commercial application should be user friendly. Users may use any social media applications. For that service, the vehicle unit must emulate these commercial services and this requires individual collaborations.

Email service
The last option of email service seems easy and friendly to users, but the fact is the opposite. It requires users to modify email client settings and that information is obtained from the web service.

The last two options are not suitable as standard specifications.

The vehicle units share messages among each other. Since there remains limited time to inter-vehicle communication, it is important to share messages efficiently using dedicated messaging daemon. The information kiosk shall have the same requirements and therefore have the same functions with the vehicle unit because the vehicle unit also acts as the information kiosk at the evacuation site in some situation.

In order to protect messages from fraud acts, the vehicle unit uses encryption or digital signature in the messages. Note that important is not concealment of information but proof of identity of message originators. Messaging interface is mainly supported by WLAN interface.

7.1.2. Technical requirement

ID	Technical Requirement	Use case
A001	The V-HUB system shall enable the vehicle unit to have both web server and database.	A,B,D
A002	The V-HUB system shall enable the consumer device to have web client accessible by users.	A,B,D
A003	The V-HUB system shall enable the vehicle unit to have DNS server to let the web server respond to any host name request from the web client of the consumer device.	A,B,D

A004	The V-HUB system shall enable the web server of the vehicle to have web page to receive message and message query from the web client and show message to the web client.	A,B,D
A005	The V-HUB system shall enable the web page to use encryption or digital signature in the message based on information from the web client.	B
A006	The V-HUB system shall enable the web page of the vehicle unit to have CRUD (create, read, update and delete) function of the message at the database.	A,B,D
A007	The V-HUB system shall enable the vehicle unit to have messaging daemons CRUD function of the message at the database.	A,B,D
A008	The V-HUB system shall enable the messaging daemon of the vehicle unit to have CRUD function of the message at the database.	A,B,D
A009	The V-HUB system shall enable the messaging daemon of the vehicle unit to communicate with the messaging daemon of the other vehicle unit connected at the network interface.	A,B,D
A010	The V-HUB system shall enable the messaging daemon of the vehicle unit to send summary of messages to messaging daemons.	A,B,D
A012	The V-HUB system shall enable the information kiosk has the same requirements as the vehicle unit.	A,B,D

7.1.3. Functional architecture specification

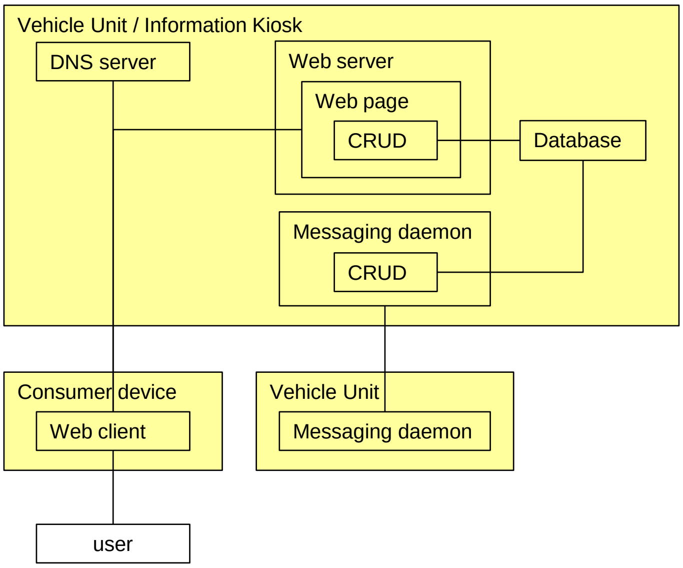


Fig. 5 Functional architecture of messaging interface

7.2. Tracking

7.2.1. Description

The V-HUB system tracks victims, responders and vehicle units to locate and coordinate the rescue team. The specification can be developed in the future.

7.2.2. Technical requirement

To be developed.

The VHUB system shall enable the vehicle unit to track responders, vehicle units, existing sensors (fitness trackers) for rescuers, health information/ body status (activity tracker, body sensor data). Smartphone acts as intermediary. The VHUB system shall involve GIS map format, GPS (responders should have GPS), and data analytics.

7.2.3. Functional architecture specification

To be developed.

7.3. Streaming

7.3.1. Description

The streaming interface is for distributing video contents to users as live streaming and also sending of recorded videos. Considering it is difficult for consumer devices to deploy satellite antennas, an IP streaming method is required.

A video playout system at the satellite gateway will uplink the video content to the information kiosks and the vehicle units with satellite interface. Information kiosks and vehicle units will receive the RF signals and encode it through an IP encoder that will multicast it to the vehicle units and the web client on consumer devices and vehicle units.

Note that it has not covered the use case of phone call and video chat yet. Here it assumes the use case of the command center streams down to victims and responders. If an interactive streaming capability gets available, the command center, responders and victims can talk among each other interactively according to appropriate designated policy. Even drones can do streaming. The requirement may involve ISDB-T and DTN. This can be developed in the future.

7.3.2. Technical requirement

ID	Technical requirement	Use case
A013	The V-HUB system shall enable the satellite gateway to have a video playout system.	C
A014	The V-HUB system shall enable the vehicle unit and the information kiosk to have a decoder, an IP encoder, a database and a web server.	C
A015	The V-HUB system shall enable the video playout system to encode video signals into RF signals and transmit them to the decoder.	C
A016	The V-HUB system shall enable the decoder to receive the RF signals, decode them into video signals hand them to the IP encoder.	C

A017	The V-HUB system shall enable the IP encoder to receive the video signals, encode them to IP video stream and store them into the database.	C
A018	The V-HUB system shall enable the consumer device and the vehicle unit to have a web Client to connect to the web server.	C
A019	The V-HUB system shall enable the web server to retrieve the IP video stream from the database and send it to the connected web client on demand.	C

7.3.3. Functional architecture specification

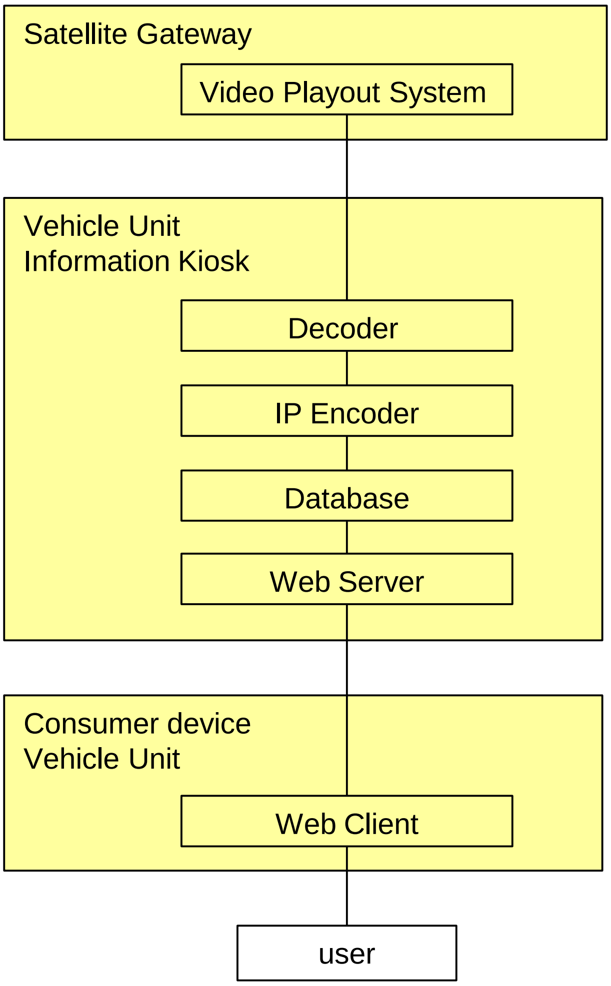


Fig. 6 Functional architecture of streaming interface

7.4. Alerting

7.4.1. Description

The alerting interface is for delivering critical information that requires robust and immediate delivery. Here the information assumes Earthquake Early Warning Alert.

The Earthquake Early Warning Alert is an alert to provide awareness to humans and machines in minutes or seconds prior to the earthquake wave hits the location.

A typical massive earthquake accompanies large aftershock for few days or more. Hence, it is necessary to deploy a robust communication line that can deliver the Earthquake Early Warning Alert even when the terrestrial line has been damaged after the first shock.

The alert will be distributed to alert software servers from an alert management server which is located in the satellite gateway.

The alert software server, which is a software deployed in certain vehicle units or information kiosks will be responsible to distribute the alert to other vehicle units or consumer devices.

Of course, the alerting application should cover not only earthquake but also other natural disasters and even man-made ones. The application should also use other network such as Beacon (V2X). This can be developed in the future.

7.4.2. Technical requirement

ID	Technical requirement	Use case
A019	The V-HUB system shall enable the satellite gateway to have an alert management server.	B
A020	The V-HUB system shall enable the vehicle unit and the information kiosk to have an alert software server.	B
A021	The V-HUB system shall enable the consumer device and the vehicle device to have an alert software client.	B
A022	The V-HUB system shall enable the alert management server to distribute Earthquake Early Warning Alert to the alert software servers.	B
A023	The V-HUB system shall enable the alert software server to distribute Earthquake Early Warning Alert to the alert software client.	B

7.4.3. Functional architecture specification

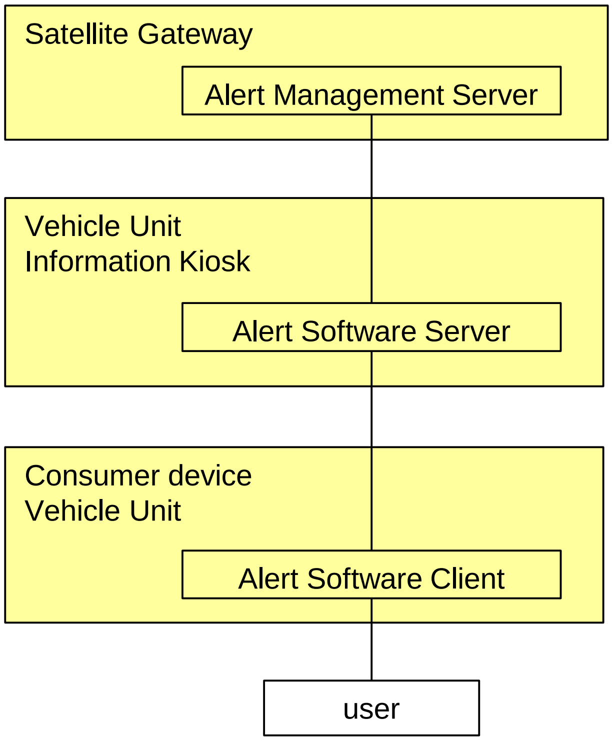


Fig. 7 Functional architecture of alerting interface

BIBLIOGRAPHY（Informative）

[IEEE 802.11ai] Draft IEEE802.11ai (2016), “Fast Initial Link Setup (FILS)”

[DOD GPS] DOD Standard Global Position System (2001), “Global Position System Standard Positioning Service Performance Standard”

[RTCM GNSS] RTCM Standard SC104-STD (1998), “RTCM Recommended Standard for GNSS (Global Navigation Satellite System)”

[NATO MIMMS] NATO Standard MIMMS (2010), “The Major Incident Medical Management and Support System”

[ARIB STD-T109] ARIB Standard STD-T109 Version1.0 (2012), “700 MHz BAND INTELLIGENT TRANSPORT SYSTEMS”

[ARIB ISDB-T] ARIB Standard STD-B24 (2009), “Data Coding and Transmission Specification for Digital Broadcasting”

APPENDIX (Informative)

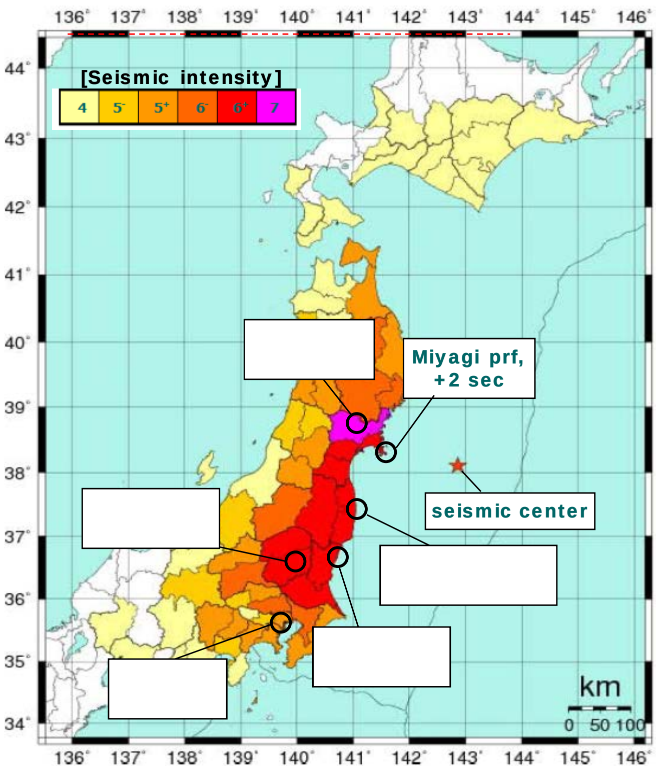
APPENDIX-A. Example of VSAT terminal on vehicle unit

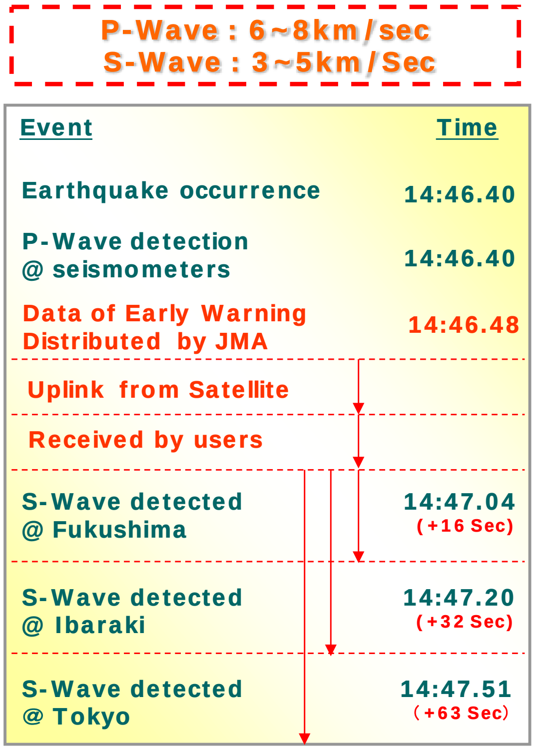
VSAT Terminals for information kiosk can be a typical off the shelf product. However, it is advised that VSAT terminal for vehicle unit implements certain specification such as

・Small antenna space factor
・Quick satellite acquisition process including auto track satellite antenna
・Low Electric power consumption

APPENDIX-B. Example of alerting application

Figure below shows arrival time of destructive quakes in the case of Tohoku-Pacific Ocean Earthquake.





APPENDIX-C. Proactive V-HUB system

The V-HUB system can be more proactive for forecasting next action and moves, maybe using big data infrastructure. This can be developed in the future.

APPENDIX-D. Example of the pre-defined SSID of WLAN AP for disaster in japan

The pre-defined SSID of WLAN AP for disaster is assigned by government or disaster organization. The Japanese government assigned “00000JAPAN” to the pre-defined SSID of WLAN AP for disaster .

ANNEX-2

APT INTERNATIONAL COLLABORATIVE RESEARCH (CATEGORY I) 2016

INTERNATIONAL COLLABORATIVE RESEARCH OF DISASTER RESPONSE MODEL USING VEHICLE COMMUNICATION

WORKSHOP GUIDE

Organized by

ATENEO INNOVATION CENTER

July 11 to 15, 2017

EAGLE POINT BEACH RESORT
BRGY. BAGALANGIT, ANILAO, MABINI
BATANGAS, PHILIPPINES 4202

TTC Telecommunication Technology Committee

APT

JULY 4, 2017

A MESSAGE FROM THE PROJECT LEADER

Welcome to the Asia Pacific Telecommunity (APT)-sponsored workshop on the standard specifications of information and communications systems using vehicles during a disaster on the V-Hub. The APT, with the able assistance of the Telecommunications Technology Committee of Japan (TTC), deserves our sincerest thanks for sponsoring the activities related to "Bridging the Standards Gap" with ASEAN countries. This effort is culminating with the convergence of Industry, Government and Academe contributors in the Philippines to complete the V-Hub standards specification this year.

Over the last five years researchers from throughout ASEAN and Japan have developed vehicle communications and information systems for disaster risk reduction and early responders. All the participants have experienced how society can be crippled by natural disasters and submitted use cases for the V-Hub technology platform. The Philippines is hit with over twenty strong typhoons every year—to this end we have contributed development of V2X communications for disaster operations, where X can be another vehicle, an UAV, the sensor infrastructure, and individuals interacting with the environment. To this end much work has been done to investigate the role of sub-GHz frequencies in this context, since the propagation characteristics match well with models of search-and-rescue operations over multiple platforms. From this work we see the emergence of mobile cloud technology and ad-hoc WiFi for situations with limited instantaneous bandwidth that will have many applications in future, well beyond disaster response. The V-Hub Standard being developed here is truly a powerful new platform for vehicular communications and information systems.

On behalf of the local organizers, the Ateneo Innovation Center and the DICT, we welcome you to the Philippines. We hope you get to play hard and work hard during your stay.

Professor Gregory Tangonan
Ateneo Innovation Center
Ateneo de Manila University, Philippines

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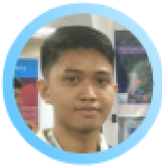

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SCHEDULE OF ACTIVITIES

DATE	AGENDA
Day 1: JULY 12	
10:00 - 12:00	Session 1: Opening session Moderator: **Arlene Romasanta**, Dept. of Information and Communications Technology (DICT), Philippines 1. Welcome address: **Eliseo M. Rio**, Undersecretary, DICT, Philippines 2. Message: **Nathaniel Joseph C. Libatique**, Ateneo Innovation Center (AIC), Ateneo de Manila University (ADMU), Philippines 3. Message: **Yoichi Maeda**, ASTAP Chairperson, The Telecommunication Technology Committee (TTC), Japan
14:00 - 17:00	Session 2: V-HUB Seminar Moderator: **Yasubumi Chimura**, TTC, Japan 1. V-HUB: Vehicles as Information Hubs during Disaster • by **Kevin Sato**, Toyota InfoTechnology Center (Toyota ITC), Japan 2. Restoration Support by Satellite Communications • by **Tomoki Isaac Saso**, SKY Perfect JSAT, Japan 3. Approach for Disaster Prevention and Reduction using Honda Telematics • by **Yasuo Oishi**, HONDA, Japan 4. Resilient Post-Disaster Information Systems using Delay Tolerant Networks and UAVs as Data Ferries • by **Nathaniel Joseph Libatique**, AIC, ADMU, Philippines
18:00 - 20:00	Welcome Reception
Day 2: JULY 13	
10:00 - 12:00	Session 3: Review of Draft of V-Hub Specification Moderator: **Ryokichi Onishi**, Toyota ITC, Japan 1. Presentation of V-Hub Specification Draft • by **Ryokichi Onishi**, Toyota ITC, Japan 2. Discussion

SCHEDULE OF ACTIVITIES

DATE	AGENDA
14:00 - 17:00	Session 4: Use-case Presentation and Demonstration Moderator: **Yasubumi Chimura**, TTC, Japan 1. SKY Perfect JSAT (Demo) 2. Ateneo Innovation Center/Ateneo de Manila University (Demo) 3. WiFi on Vehicle Cells: Inter-operation of Satellite, Drone, and Vehicle Cells • by **Arunsak Nit-in**, CAT Telecom, Thailand 4. Research on Disaster Response • by **Dr. Aduwati Sali**, Universiti Putra Malaysia, Malaysia 5. The Design and Operational Guidelines for DUMBONET Emergency Networks • by **Ms. Nisarat Tansakul**, Asian Institute of Technology, Thailand 6. (TBA) • by **Alan Silor**, Assistant Secretary, DICT, Philippines 7. V2X Applications using VHUB • by **Dr. Yoshiharu Doi**, Toyota ITC, Japan
Day 3: JULY 14	
10:00 - 12:00	Session 5: Closing Session Moderator: **Yasubumi Chimura**, TTC, Japan 1. Agreement on V-Hub Specification • or its way forward which will be contributed to **ASTAP-29**
14:00 - 17:00	Session 6: Reserved
18:00 - 20:00	Farewell Dinner

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Fax: **(+63 2) 811 3468**

RESORT INFORMATION

Eagle Point Resort is a seaside haven located at the tip of the Calumpang Peninsula in Anilao, Batangas. Owned and operated by Atty. Ramon J. Quisumbing and family, it is now the largest and most popular diving destination for locals and foreigners. It is also the premier company outing venue in Batangas, as it offers exclusive access to private and secluded beaches and a plethora of water activities.

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EMAIL ADDRESS
frontdesk@eaglepointresort.com.ph

WEBSITE
http://eaglepointresort.com.ph

-Page 7-

List of Invited Presenters of the Workshop

Session 2 – 1 "V-HUB: Vehicles as Information Hubs during Disaster"
Kevin Sato
Toyota InfoTechnology Center, Japan

Entry Number: Session 2 - 1
Presenter Name: Kevin Sato, Toyota InfoTechnology Center, Japan
Title: V-HUB: Vehicles as Information Hubs during Disaster

Motivation

2

- Asia-Pacific maritime nations and Japan
  - Massive earthquakes
  - Devastating tsunamis
  - Destructive typhoons

Japan (2011)

Philippines (2013)

Motivation

1

- Asia-Pacific maritime nations and Japan
  - Massive earthquakes
  - Devastating tsunamis
  - Destructive typhoons

Philippines (2013)

Motivation

3

- Asia-Pacific maritime nations and Japan
  - Massive earthquakes
  - Devastating tsunamis
  - Destructive ty

Japan (2011)

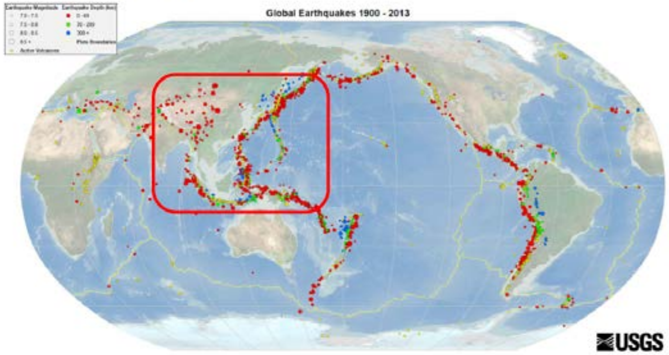
Philippines (2013)

Thailand (2004)

Annex 3

Shared Experience

- Earthquakes

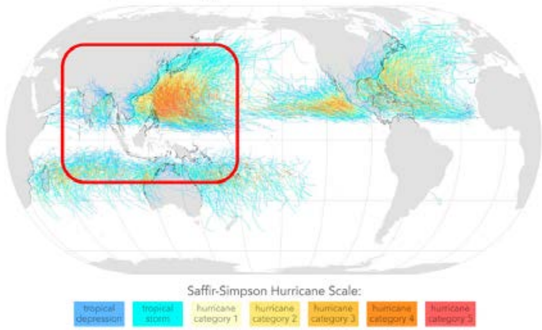


http://earthquake.usgs.gov/earthquakes/world/seismicity_maps/world.pdf
https://en.wikipedia.org/wiki/Tropical_cyclone#/media/File:Tropical_cyclones_1945_2006_wikicolor.png

Shared Experience

- Typhoons

Tropical Cyclones, 1945–2006



http://earthquake.usgs.gov/earthquakes/world/seismicity_maps/world.pdf
https://en.wikipedia.org/wiki/Tropical_cyclone#/media/File:Tropical_cyclones_1945_2006_wikicolor.png

Issues

- No power supply on sockets
  - due to disruption of power line network.
- ZERO connectivity on phone and internet
  - due to disruption of communication network or power loss.

Issues

- Handwritten messages crowded
  - the whiteboards at every evacuation site

Thailand 2004

Issues

8

- Handwritten messages crowded
  - the whiteboards at every evacuation site

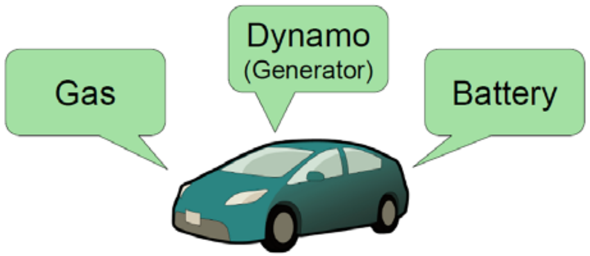
Japan 2011

Thailand 2004

Communication is Vital

9

- Communication was literally vital
  - in a matter of life and death
- Electric power drove that communication
- There I have paid attention to vehicles.



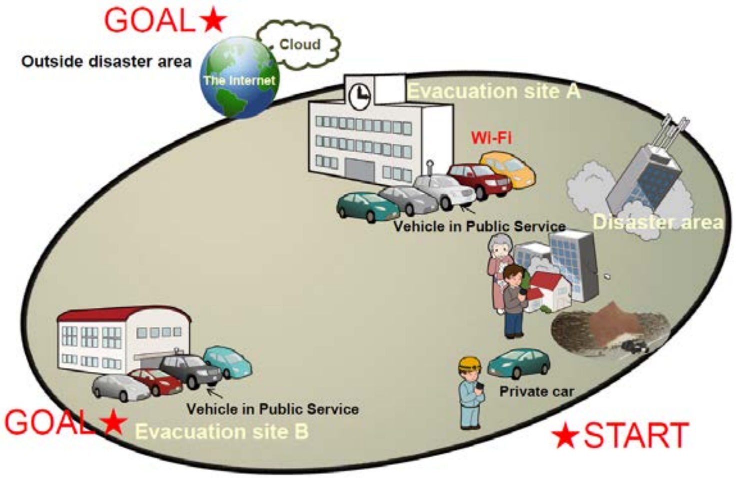
Communication is Vital

10

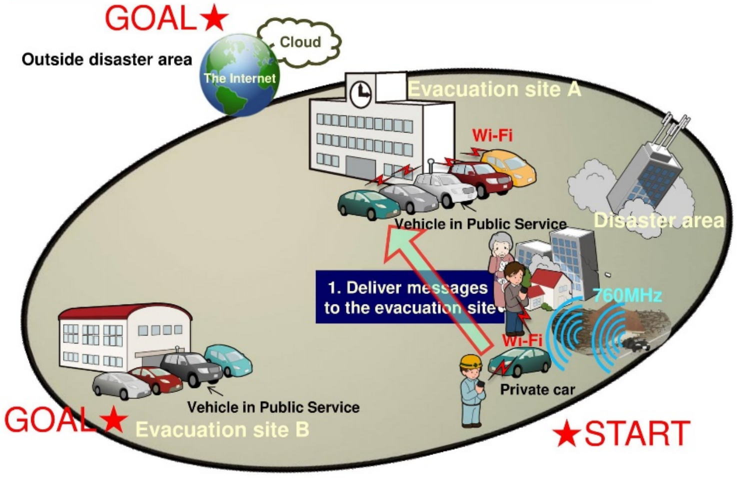
- There are emerging activities to introduce radio communication modules into vehicles

Big Picture

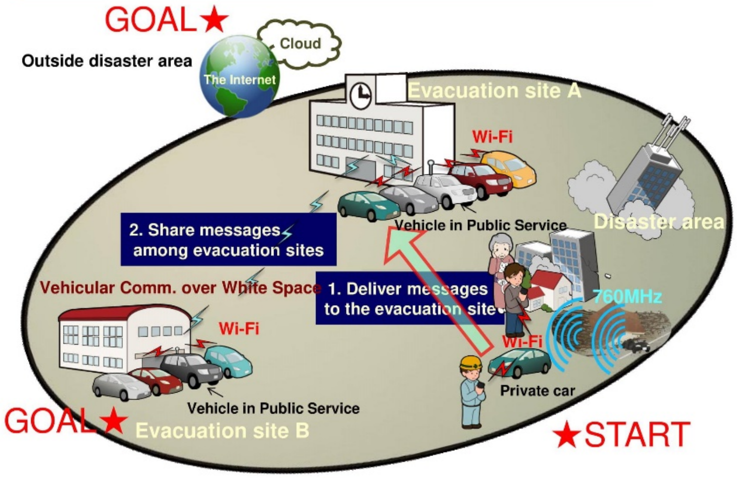
11



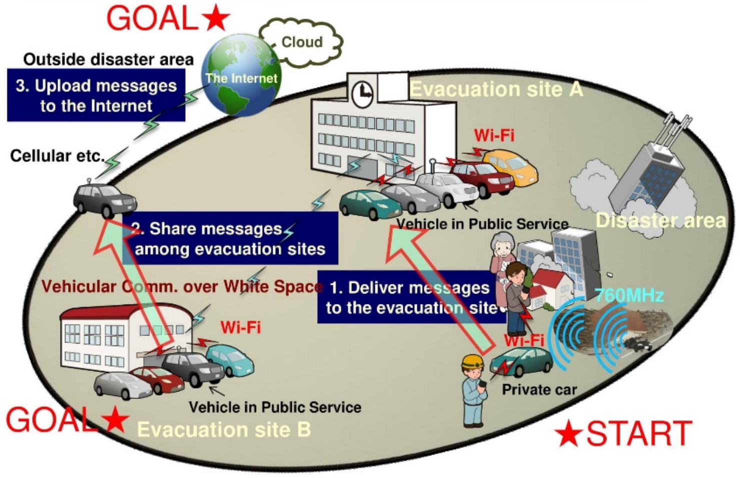
Big Picture



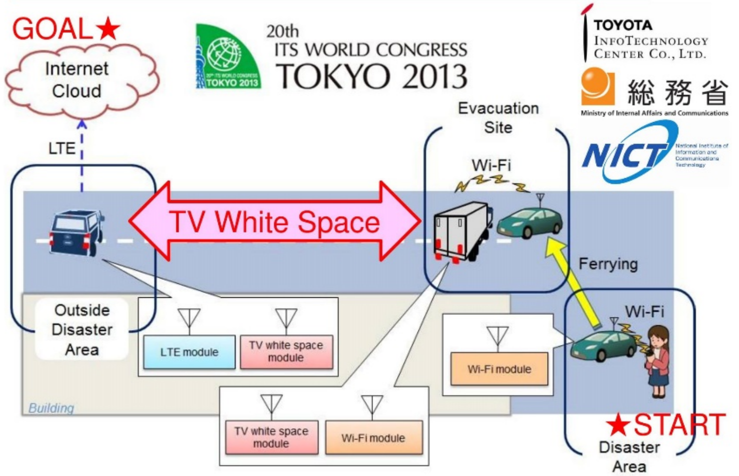
Big Picture



Big picture

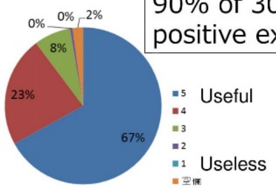


Conceptual Demonstration



Demo Experience at a Glance

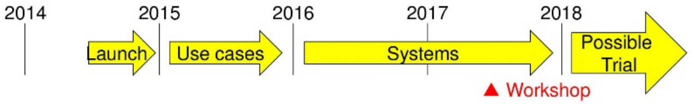
90% of 300+ had positive experience



The Daily Industrial News on 11th Oct. 2013

Standardization Activity

- Active in ASTAP
  - Asia-Pacific Telecommunity Standardization Program



ASIA-PACIFIC TELECOMMUNITY
The 24th APT Standardization Program Forum (ASTAP-24)
27 – 29 August 2014, Bangkok, Thailand

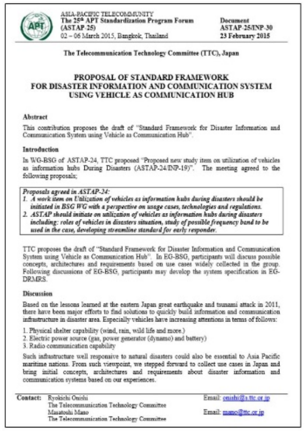
Document: ASTAP-24/INP-19
18 August 2014

Telecommunication Technology Committee (TTC), Japan

PROPOSED NEW STUDY ITEM ON UTILIZATION OF VEHICLES AS INFORMATION HUBS DURING DISASTERS

Call for Use Case Suggestions

Questionnaire



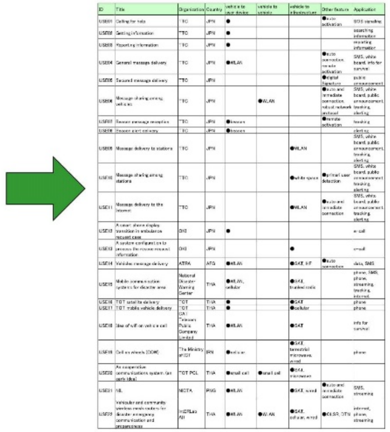
ASIA-PACIFIC TELECOMMUNITY
The 25th APT Standardization Program Forum (ASTAP-25)
02 – 06 March 2015, Bangkok, Thailand

Document ASTAP-25/INP-30
23 February 2015

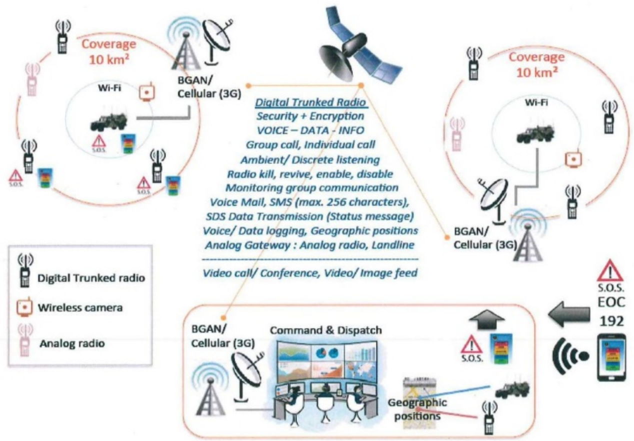
The Telecommunication Technology Committee (TTC), Japan

PROPOSAL OF STANDARD FRAMEWORK FOR DISASTER INFORMATION AND COMMUNICATION SYSTEM USING VEHICLE AS COMMUNICATION HUB

Suggestions



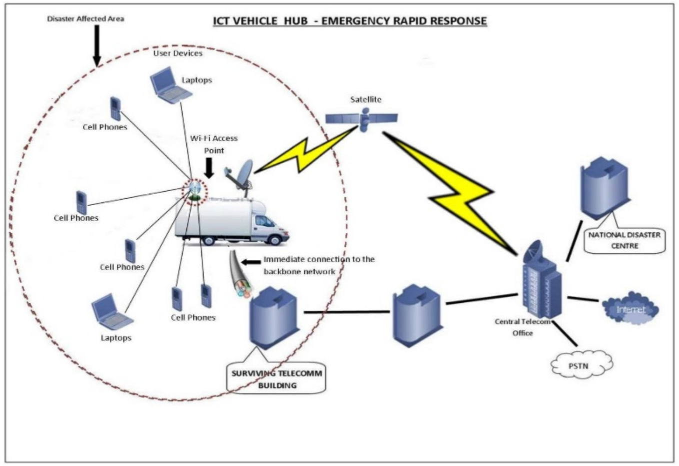
Suggestion (Thailand)



Suggestion (Papua New Guinea)

TOYOTA InfoTechnology Center Co., Ltd.

20



Suggestion (Thailand)

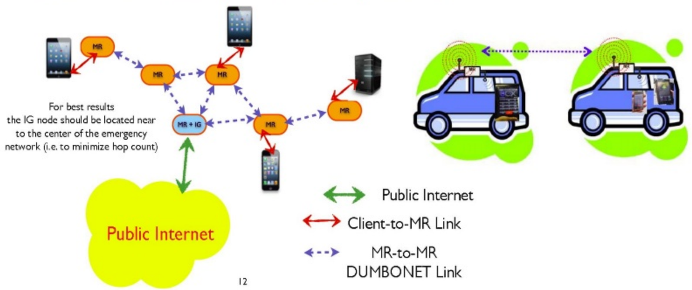
TOYOTA InfoTechnology Center Co., Ltd.

21

Internet Gateway (IG) in DUMBONET

One DUMBONET node can be specially configured to connect to the public Internet (e.g. via Ethernet cable or 3G/4G cellular).

Add the IG node and then every client can access the public Internet.



Suggestion (Thailand)

TOYOTA InfoTechnology Center Co., Ltd.

22

From Disaster Emergency Communication Networks To Rural Community Wireless Mesh Networks for Education and Disaster Preparedness
http://isif.asia/theme/default/files/interlab_dumbonet_is4cwn2013.pdf

Suggestion (Thailand)

TOYOTA InfoTechnology Center Co., Ltd.

23

From Disaster Emergency Communication Networks To Rural Community Wireless Mesh Networks for Education and Disaster Preparedness
http://isif.asia/theme/default/files/interlab_dumbonet_is4cwn2013.pdf

Suggestion (Philippines)

TOYOTA InfoTechnology Center Co., Ltd.

24

HOPE in the Car

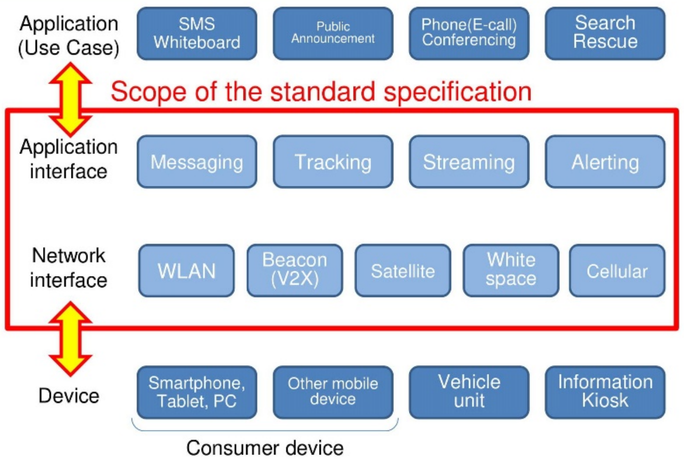
TOYOTA InfoTechnology Center Co., Ltd.

26

Coming-up: System Standards

TOYOTA InfoTechnology Center Co., Ltd.

25



TOYOTA InfoTechnology Center Co., Ltd.

Showcase Pictures

Demo scene

28

Demo scene

29

Demo scene

30

User terminal (tablet) and interface

31

Display in the trunk room

TOYOTA InfoTechnology Center Co., Ltd.

32

Demo scene

TOYOTA InfoTechnology Center Co., Ltd.

33

Displays in the truck*

TOYOTA InfoTechnology Center Co., Ltd.

34

* The truck is emulating an evacuation center

Antennas for TV white space

TOYOTA InfoTechnology Center Co., Ltd.

35

Messages sent to the Internet

TOYOTA InfoTechnology Center Co., Ltd.

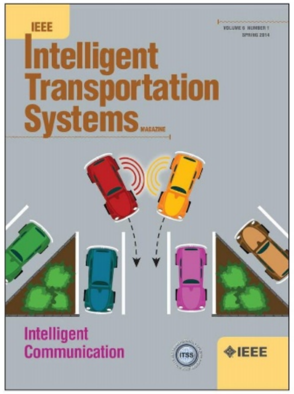
36

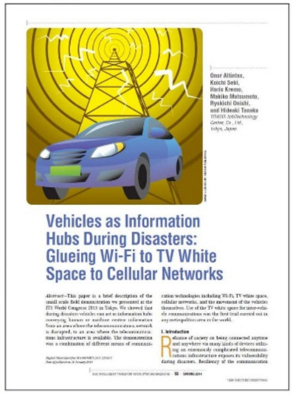
For more information

TOYOTA InfoTechnology Center Co., Ltd.

37

- IEEE Intelligent Transportation Systems Magazine, Vol.6, Issue 1, pp.68-71, Jan. 2014.





Vehicles as Information Hubs During Disasters: Glueing Wi-Fi to TV White Space to Cellular Networks

Annex 4

List of Invited Presenters of the Workshop

Presentation by invited Researchers

Session 2 - 4	"Resilient Post-Disaster Information Systems Using Delay Tolerant Networks and UAVs as Data Ferries" Nathaniel Libatique Ateneo Innovation Center, Ateneo de Manila University, Philippines
Session 4 - 2	"AIC Demo on Resilient Post-Disaster Communication Using UAV and DTN" Daniel Lagazo Ateneo Innovation Center, Ateneo de Manila University, Philippines
Session 4 - 3	"WiFi on Vehicle Cells: Inter-operation of Satellite, Drone and Vehicles" Arunsak Nit-in CAT Telecom Public Co., Ltd, Thailand
Session 4 - 4	"UNIVERSITI PUTRA MALAYSIA (UPM) in Collaboration with Malaysian Technical Standards Forum Bhd. (MTSFB) Project on Disaster Response and Vehicle Communication" Aduwati Sali Universiti Putra Malaysia, Malaysia
Session 4 - 5	"The Design and Operational Guidelines for DUMBONET Emergency Networks" Nisarat Tansakul Internet Education and Research Laboratory (intERLab), Asian Institute of Technology, Thailand
Session 4 - 6	"ICT Strategy for DRRM (The Philippine Setting)" Alan Silor Department of Information and Communications Technology, Philippines
Session 4 - 7	"V2X Applications by using VHUB" Yoshiharu Doi Toyota InfoTechnology Center, Japan

Entry Number: Session 2 - 4

Presenter Name: Nathaniel Libatique, Ateneo Innovation Center, Philippines

Title: Resilient Post-Disaster Information Systems Using Delay Tolerant Networks and UAVs as Data Ferries

Ateneo Innovation Center

Resilient Post-Disaster Information Systems Using Delay Tolerant Networks and UAVs as Data Ferries

N. J. C. Libatique, G. D. Abrajano, G. L. Tangonan
Ateneo Innovation Center
Ateneo de Manila University

International Collaborative Research of Disaster Response Model using Vehicle Communication (VHUB)
Eagle Point, Batangas, Philippines
July 12, 2017

Ateneo Innovation Center

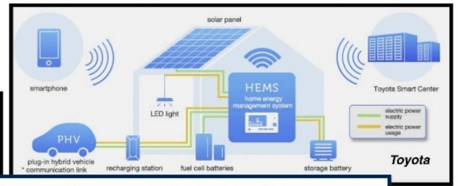
Update on the Philippine V-Hub Standard Use Case
Multi-Platform Information Gathering System design based on 'Ready at Hand' Communications' Technology in All Phases of Disaster Operations
Delay Tolerant Networking for Responders Plus Caching
Key Applications - Facial Recognition, Medical Assistance and Mapping
Several Demonstrations of the Philippine Use Case for V-Hub
PTT Image Transmission, End-to-End DTN Data Sharing, Processing Applications, Multiple UAV Victim Finding / Mapping, UAV / V-Hub Victim Finding with 760 MHz ITS (ARIB STD-T109) devices

Acknowledgments: We acknowledge the assistance of TTC-Japan, Asia Pacific Telecommunity, Toyota InfoTech Center - Japan, Oki Electronics, Inc., Internet Society of the Philippines, SkyEye, Inc., APNIC ISIF Asia, and numerous research students of AIC.

1. ASTAP-28 INDUSTRY WORKSHOP, Bangkok, Thailand, March 6, 2017.
2. 17th Science Council of Asia, Manila, June 15, 2017.
3. IEEE Global Humanitarian Technology Conference, October 19-22, 2017.

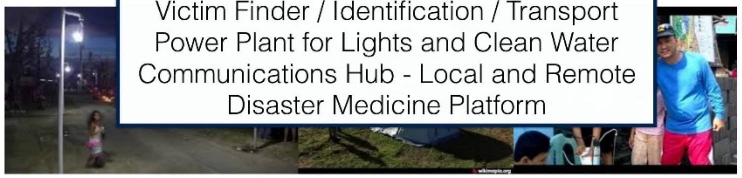
Hybrid Vehicles provide Power to Homes in Disasters

Vehicle with 30 liters fuel can with inverter package generate 1.5 kW for two days. Prius battery - 4kWh



In a D… …wer

Vehicles Play a Crucial Role in Disasters
Evacuation Phase
Debris Clearing / Survivor Transport
Victim Finder / Identification / Transport
Power Plant for Lights and Clean Water
Communications Hub - Local and Remote
Disaster Medicine Platform



The 24th APT Standardization Program Forum (ASTAP-24)
27-29 August 2014, Bangkok, Thailand

Philippine V-Hub Use-Case for Disaster Risk Reduction and Resilience

V-Hub and V-X Technology will play in Disasters such as survivor transport, victim finder, power plant, communications hub, and information kiosk.

Personal Transponders in Sub-GHz Band can be viable for Practiced Evacuation and Finding of Survivors because of penetration of debris.

Cooperative Operations of UAVs and UGVs for Practiced Evacuations, Situational Awareness and Mission Planning

Delay Tolerant Networks plus Near Cloud Caching for Information Gathering with Always Ready Radio and Ad-Hoc Wifi.

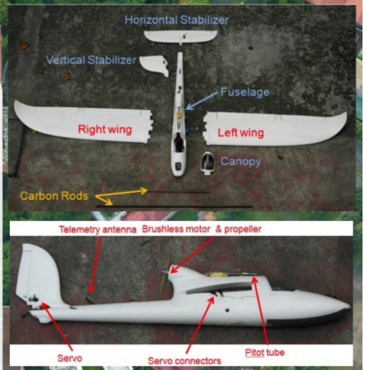
Crucial Applications Implemented in the Field - Facial Recognition, Damage Assessment by Aerial Imaging and Sensor Networks, Rapid Kiosks for Evacuation Center / Disaster Medicine

Practiced Evacuation *V2V and V2I Comm for Safety* *V2X for Search and Rescue*

UAV FLEET DEVELOMENT

SkySurfer "Local"
Fixed Wing UAV - Year 1.5 ~ Year 3

Powertrain	2 4,500mAH LiPo Battery
Characteristics	Shallow Glider Type made of Foam .
Payload	Go Pro HD 3 Canon EoS M2 Canon S100
AutoPilot	3DR ArduPilot HK ArduPilot
Skill level	Medium
Price	< 700,000 each set
Operation	Co-Developed with SkyEye Inc. (providing technical knowledge,



UAV FLEET DEVELOMENT

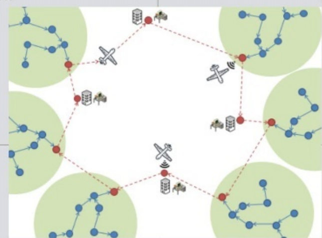
MicroPilot MPVision
Fixed Wing UAV - Year 0 ~ Year 1

Powertrain	4 3100mAH LiPo Battery 15mins flight time
Characteristics	Hand-Tossed Fixed Wing made of Balsa Wood
Payload	Go Pro HD2 Lumix LX3 Pentax VS20
AutoPilot	MP-2128 (MicroPilot)
Skill level	High
Price	1,500,000 per unit
Operation	Purchased Pre-Project with spare batteries, motors and repairs on

Philippine ICT Use-Case Applications for Disaster RR&R

V-Hub & V-X Technology
Personal Transponders
Dynamic Info Distribution
'Every Day' Technology
Commercial Base

Sub-GHz Digital Radios
PTT Radio - Image Nets
Long Range Connections
Debris Penetration
LoRa Beacons



Multiple UAV Operations
Aerial Damage Assessment
Airborne Data Ferries
Mission Control
Cooperative UAV & UGV Ops

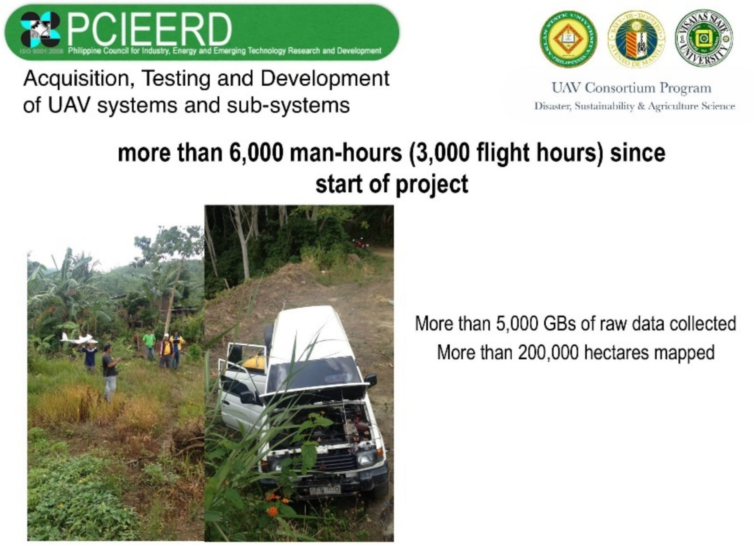
Ad-Hoc WiFi Network
Near Cloud Caching
GPS +Time+DATA Protocol
'Native ICT ' Technology
Delay Tolerant Nets + Caching

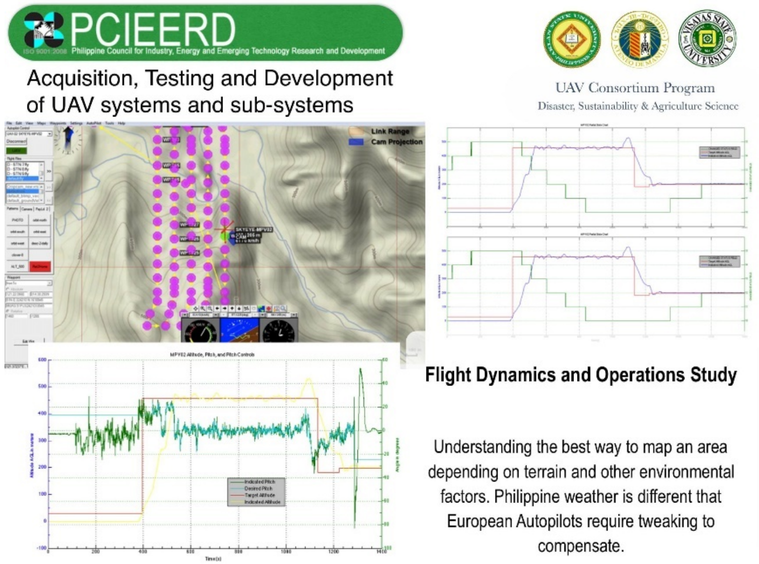
Technical Stack of the Demonstrated Capabilities

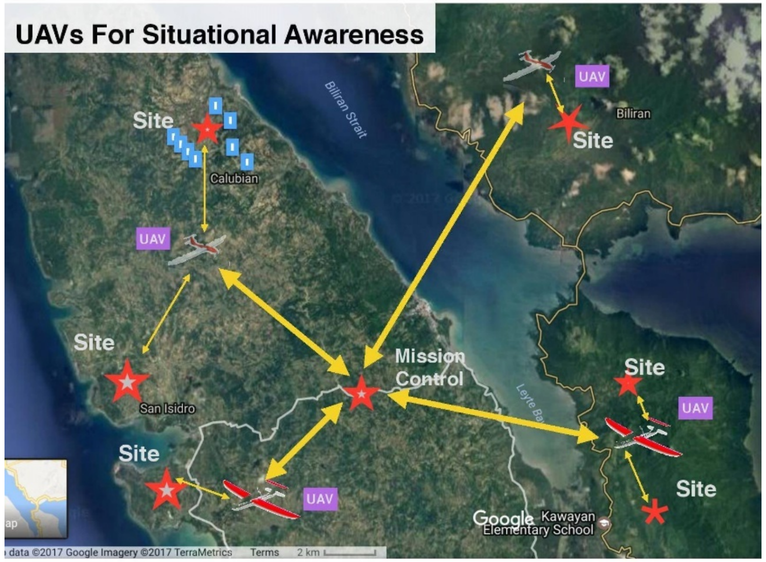
3

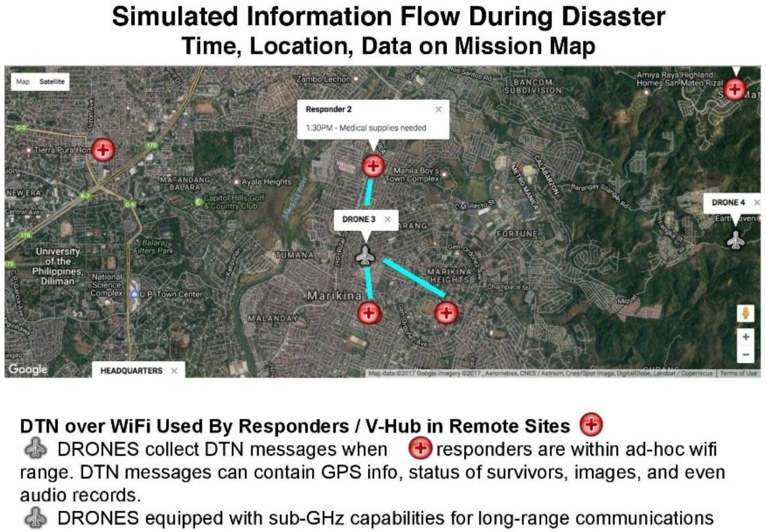
Annex 4

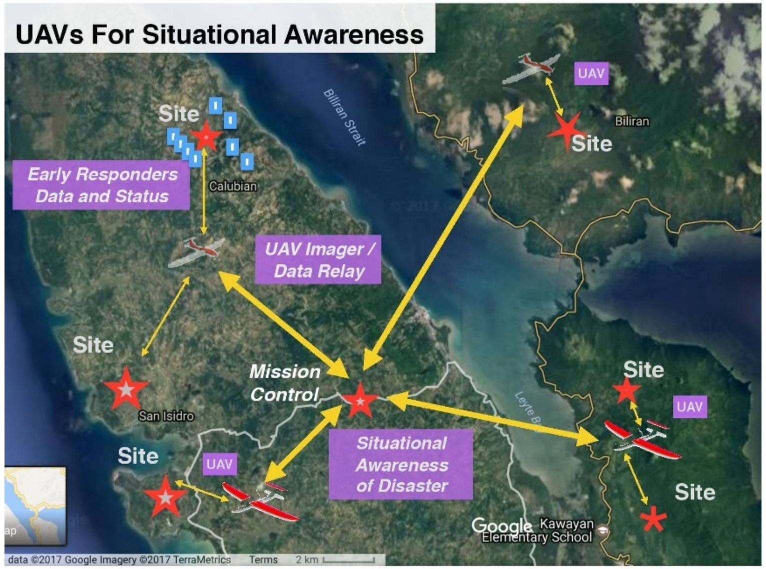
Powertrain	up to 4 5,000mAH LiPo 120 minutes max
Characteristics	Catapult Launched Fixed Wing Foam Drone \
Payload	Canon EoS M2 Canon S100 x2
AutoPilot	3DR ArduPilot HK ArduPilot
Skill level	Easy-Medium
Price	950,000 each
Operation	Co-Developed with SkyEye Inc . Operated with Dual Cam Set-up for

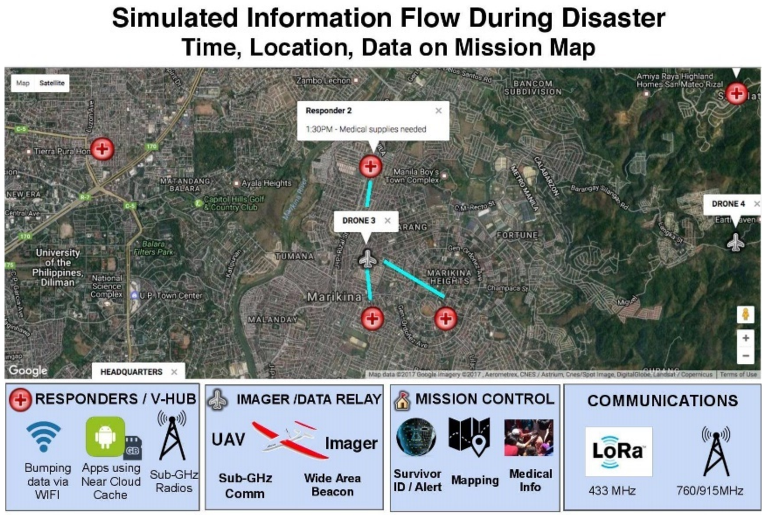


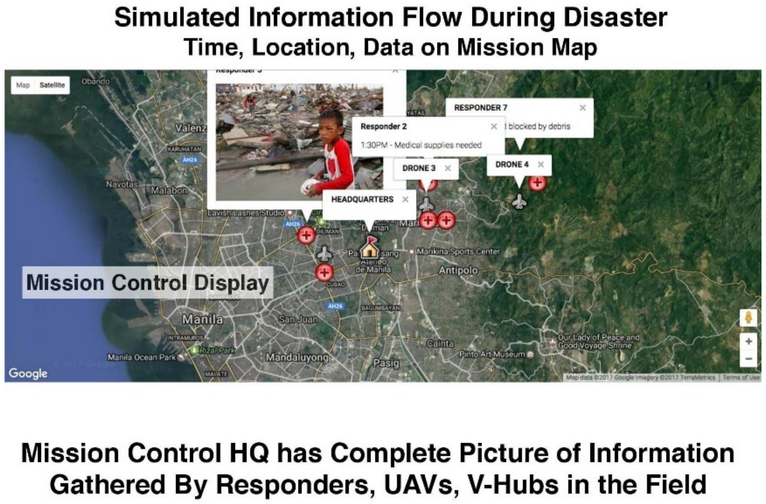


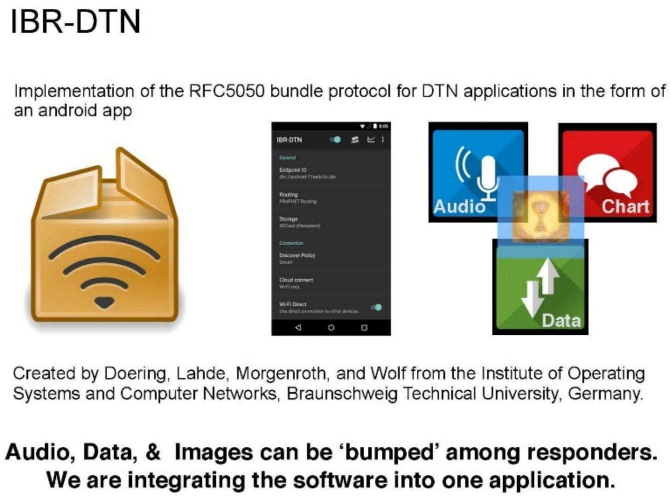

UAVs For Situational Awareness
Site
Calubian
UAV
Site
San Isidro
Site
UAV
Mission Control
Billiran Strait
UAV
Billiran
Site
Site
UAV
Site
Google Kawayan Elementary School
data ©2017 Google Imagery ©2017 TerraMetrics Terms 2 km

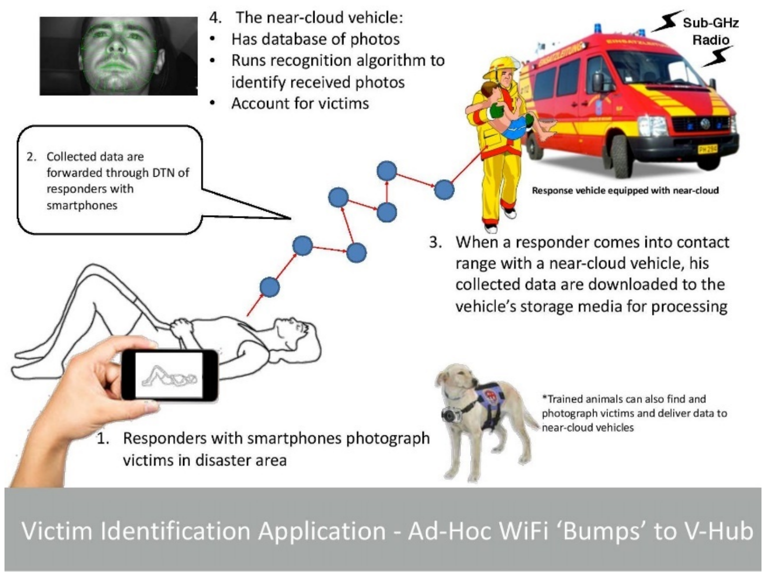

Simulated Information Flow During Disaster
Time, Location, Data on Mission Map
Responder 2
1:30PM - Medical supplies needed
DRONE 3
DRONE 4
Marikina
HEADQUARTERS
Google
DTN over WiFi Used By Responders / V-Hub in Remote Sites
DRONES collect DTN messages when responders are within ad-hoc wifi range. DTN messages can contain GPS info, status of survivors, images, and even audio records.
DRONES equipped with sub-GHz capabilities for long-range communications

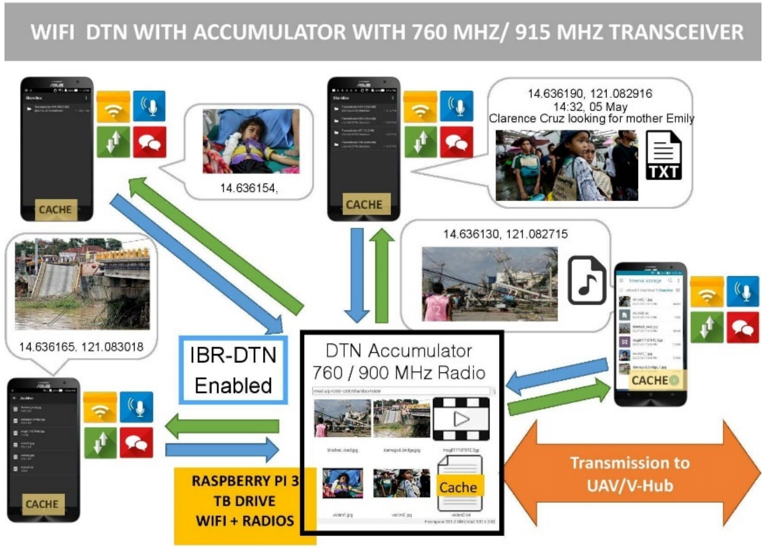

UAVs For Situational Awareness
Site
Early Responders Data and Status
Calubian
UAV Imager / Data Relay
Site
San Isidro
Mission Control
Site
UAV
Situational Awareness of Disaster
UAV
Site
Billiran Strait
Billiran
Site
Site
UAV
Site
Google Kawayan Elementary School
data ©2017 Google Imagery ©2017 TerraMetrics Terms 2 km


Simulated Information Flow During Disaster
Time, Location, Data on Mission Map
Responder 2
1:30PM - Medical supplies needed
DRONE 3
DRONE 4
Marikina
HEADQUARTERS
Google
RESPONDERS / V-HUB
Bumping data via WIFI
Apps using Near Cloud Cache
Sub-GHz Radios
IMAGER /DATA RELAY
UAV
Imager
Sub-GHz Comm
Wide Area Beacon
MISSION CONTROL
Survivor ID / Alert
Mapping
Medical Info
COMMUNICATIONS
LoRa
433 MHz
760/915MHz

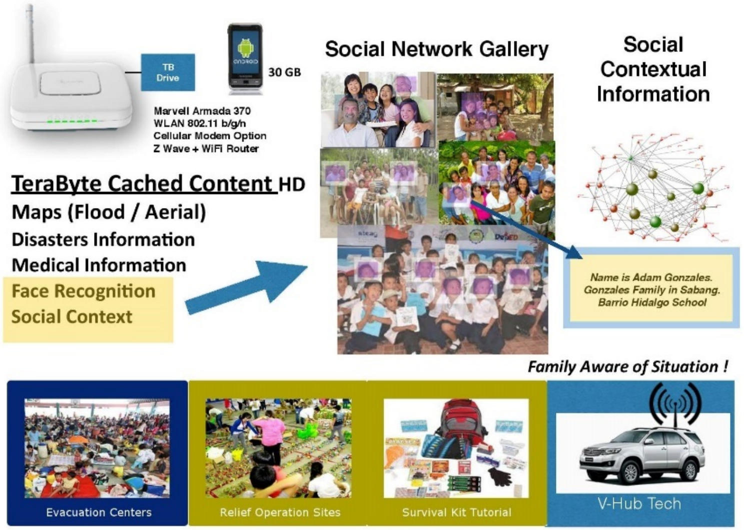

Simulated Information Flow During Disaster
Time, Location, Data on Mission Map
Mission Control Display
Responder 2
1:30PM - Medical supplies needed
RESPONDER 7
DRONE 3
DRONE 4
HEADQUARTERS
Manila
Mandaluyong
Pasig
Antipolo
Google
Mission Control HQ has Complete Picture of Information
Gathered By Responders, UAVs, V-Hubs in the Field


IBR-DTN
Implementation of the RFC5050 bundle protocol for DTN applications in the form of an android app
Audio
Chart
Data
Created by Doering, Lahde, Morgenroth, and Wolf from the Institute of Operating Systems and Computer Networks, Braunschweig Technical University, Germany.
Audio, Data, & Images can be 'bumped' among responders.
We are integrating the software into one application.

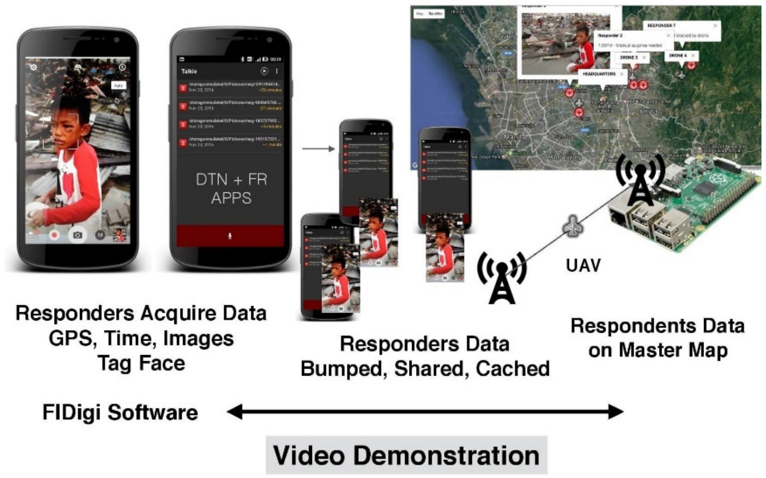

4. The near-cloud vehicle:
• Has database of photos
• Runs recognition algorithm to identify received photos
• Account for victims
Sub-GHz Radio
2. Collected data are forwarded through DTN of responders with smartphones
Response vehicle equipped with near-cloud
3. When a responder comes into contact range with a near-cloud vehicle, his collected data are downloaded to the vehicle's storage media for processing
*Trained animals can also find and photograph victims and deliver data to near-cloud vehicles
1. Responders with smartphones photograph victims in disaster area
Victim Identification Application - Ad-Hoc WiFi 'Bumps' to V-Hub


WIFI DTN WITH ACCUMULATOR WITH 760 MHZ/ 915 MHZ TRANSCEIVER
CACHE
14.636154,
14.636190, 121.082916
14:32, 05 May
Clarence Cruz looking for mother Emily
TXT
CACHE
14.636130, 121.082715
14.636165, 121.083018
IBR-DTN Enabled
DTN Accumulator
760 / 900 MHz Radio
CACHE
CACHE
Cache
RASPBERRY PI 3
TB DRIVE
WIFI + RADIOS
Transmission to UAV/V-Hub

Caching in Mobile Cloud and Smart Phones is Critical



DATA GATHERING - ACCUMULATION - MISSION DISPLAY OVER MULTI-PLATFORM V-HUB NETWORK



FACIAL RECOGNITION ON RESPONDERS' SMARTPHONE

DATA GATHERING - ACCUMULATION - MISSION DISPLAY OVER MULTI-PLATFORM V-HUB NETWORK

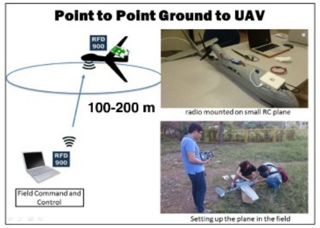
ATENEO EMERGENCY RESPONSE TEAM
NBEMS IMAGE TRANSMISSION, 25 FEBRUARY 2017

450 MHz PTT Radio - Security Guard Radio
Android Smartphone with Fldigi Software
New Capability for Response Teams
New Tool in Practiced Evacuations
Preprocessing with Cached Content √

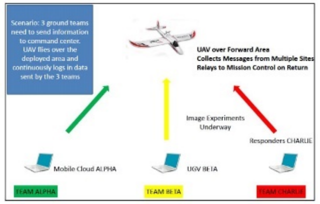
EMERGENCY TEAM TRANSMIT TO HOSPITAL NAME. VITAL SIGNS, IMAGES OF INJURIES, TEXT TIME, GPS LOCATION, ETA AT HOSPITAL

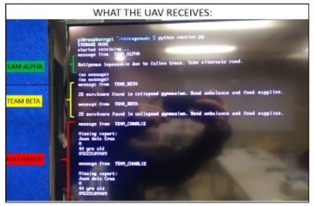
Narrow Band Emergency Messaging Software (NBEMS)

UAV Communications using 915 MHz



- A point-to-point ground to UAV connection using 915 MHz was done using fixed wing RC planes.
- Receiving multiple messages from different ground teams in a store and forward manner was demonstrated.



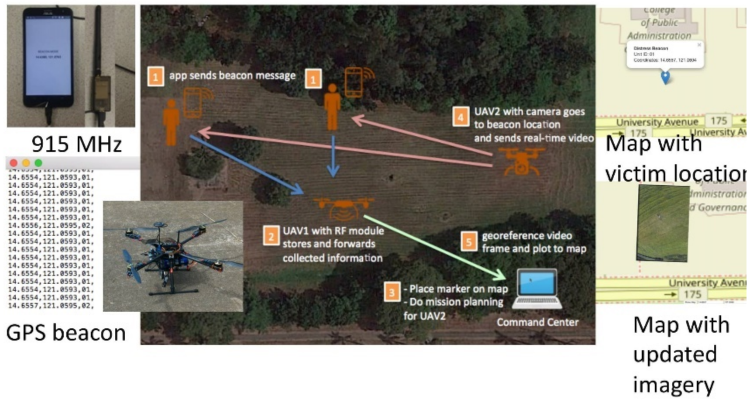


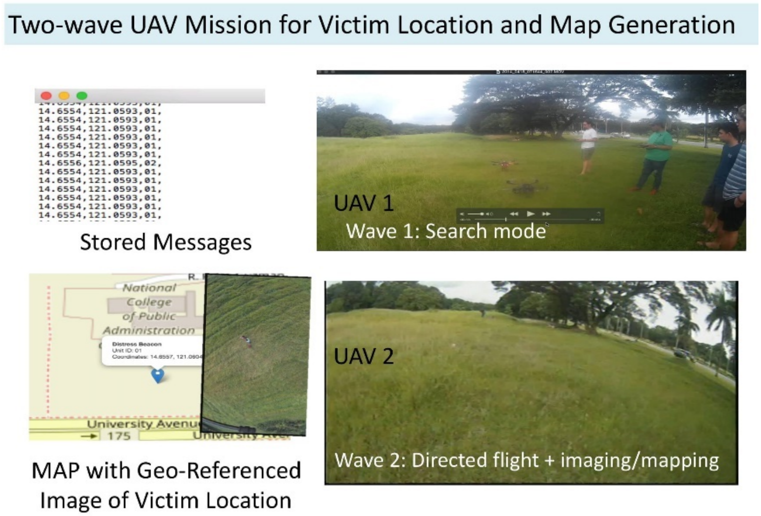
ATENEO EMERGENCY RESPONSE TEAM
PTT RADIO IMAGE TRANSMISSION, 25 FEBRUARY 2017

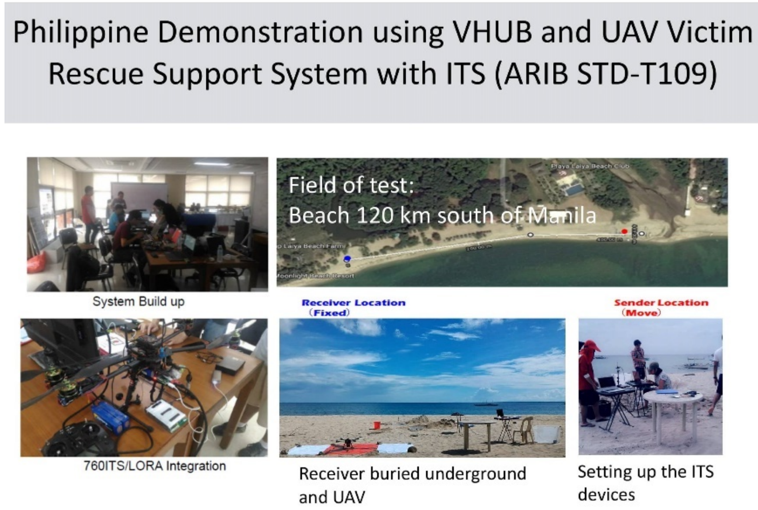
EMERGENCY TEAM TRANSMIT TO HOSPITAL NAME. VITAL SIGNS, IMAGES OF INJURIES, TEXT TIME, GPS LOCATION, ETA AT HOSPITAL

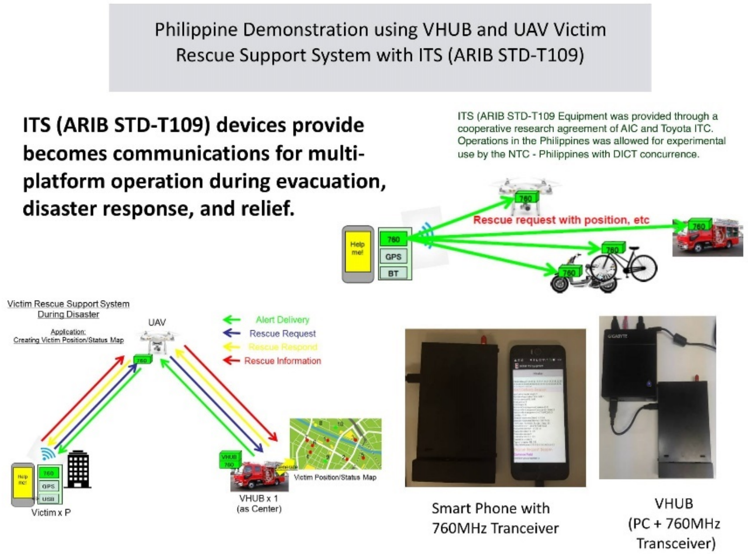
RESPONDERS CAN PROCESS INFORMATION USING CACHED CONTENT WITH APPS √

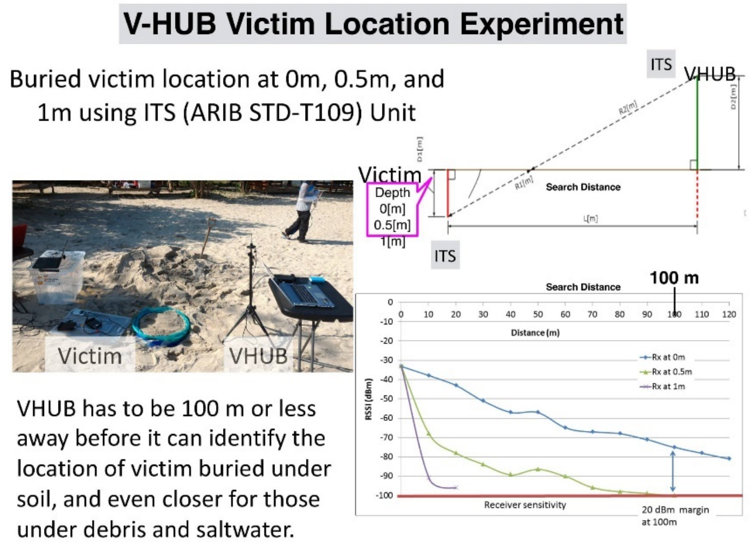
Two-wave UAV Mission for Victim Location and Map Generation

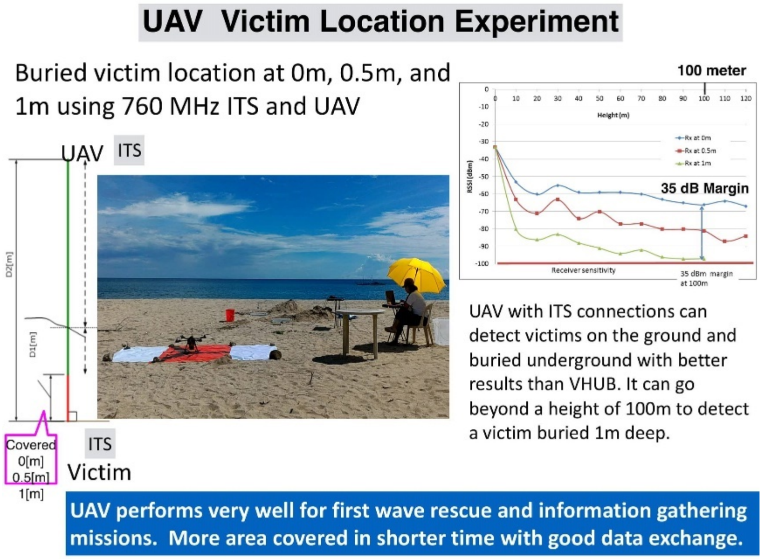


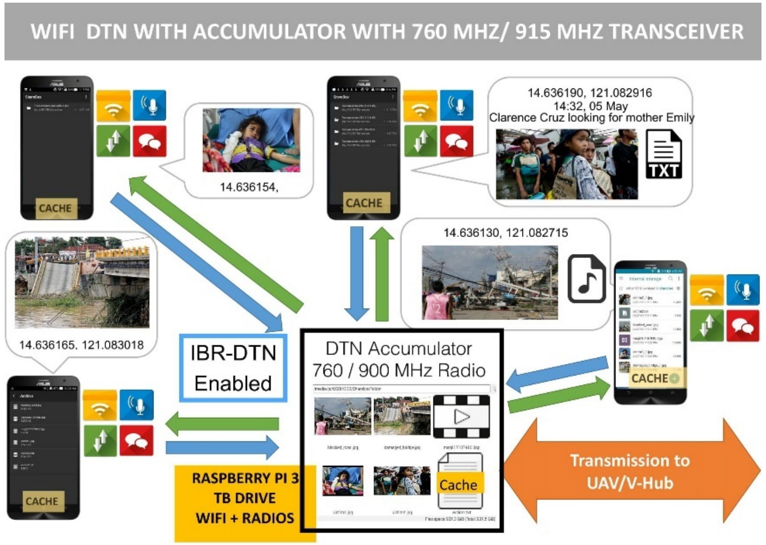

Two-wave UAV Mission for Victim Location and Map Generation
Stored Messages
UAV 1
Wave 1: Search mode
National College of Public Administration
University Avenue
MAP with Geo-Referenced Image of Victim Location
UAV 2
Wave 2: Directed flight + imaging/mapping

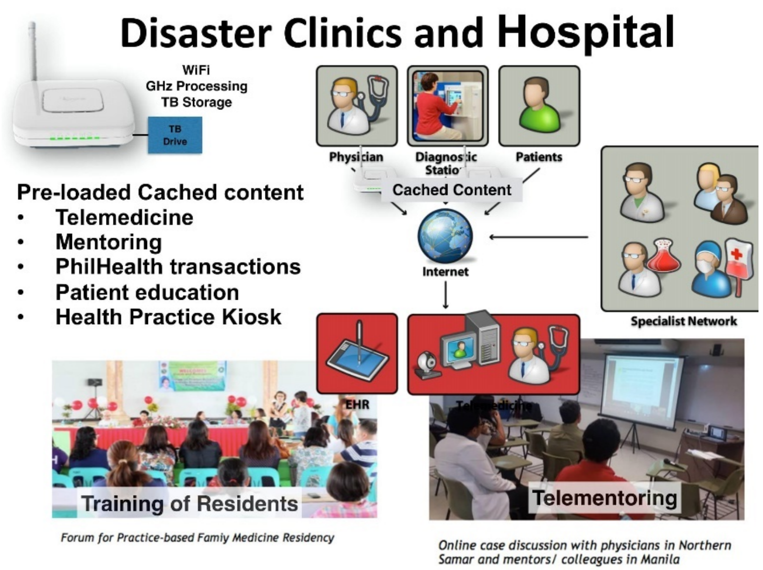

Philippine Demonstration using VHUB and UAV Victim Rescue Support System with ITS (ARIB STD-T109)
System Build up
Field of test:
Beach 120 km south of Manila
Receiver Location (Fixed)
Sender Location (Move)
760ITS/LORA Integration
Receiver buried underground and UAV
Setting up the ITS devices


Philippine Demonstration using VHUB and UAV Victim Rescue Support System with ITS (ARIB STD-T109)
ITS (ARIB STD-T109) devices provide becomes communications for multi-platform operation during evacuation, disaster response, and relief.
ITS (ARIB STD-T109 Equipment was provided through a cooperative research agreement of AIC and Toyota ITC. Operations in the Philippines was allowed for experimental use by the NTC - Philippines with DICT concurrence.
Rescue request with position, etc
Victim Rescue Support System During Disaster
Application: Creating Victim Position/Status Map
UAV
Alert Delivery
Rescue Request
Rescue Respond
Rescue Information
Victim Position/Status Map
Victim x P
VHUB x 1 (as Center)
Smart Phone with 760MHz Tranceiver
VHUB (PC + 760MHz Transceiver)


V-HUB Victim Location Experiment
Buried victim location at 0m, 0.5m, and 1m using ITS (ARIB STD-T109) Unit
ITS
VHUB
Victim
Depth
0[m]
0.5[m]
1[m]
ITS
Search Distance
Victim
VHUB
100 m
Distance (m)
Rx at 0m
Rx at 0.5m
Rx at 1m
RSSI (dBm)
Receiver sensitivity
20 dBm margin at 100m
VHUB has to be 100 m or less away before it can identify the location of victim buried under soil, and even closer for those under debris and saltwater.



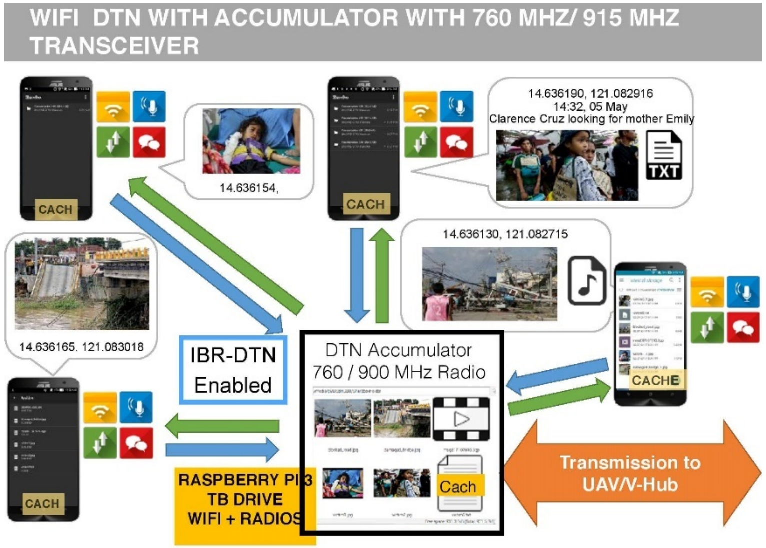


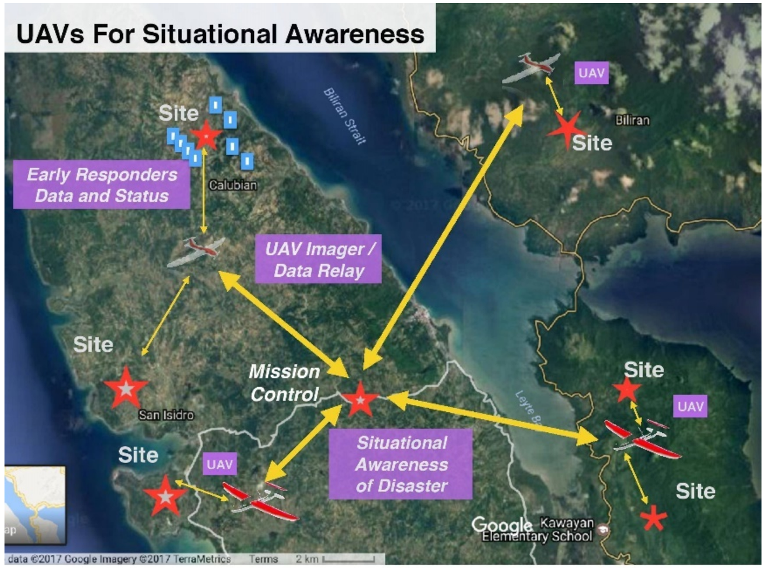


Rich Area for Discussion and Standardization

- Interface definitions
  - between Ad-Hoc “bump communications” portion of network and Infrastructure Mode
  - between readily available yet low bandwidth technologies such as PTT radio and Infrastructure mode
- Signalling to and from UAVs
  - Low bandwidth beacon mode
  - High bandwidth close-in mode (e.g. such as video for emergency on-site surgery with UAV in close-in loiter mode), communications mode impacts flight dynamics
- Security and Reliability
  - Scrambling by hostile elements
  - Priority classes: messages from command and control
- Content and System Standards
  - System QoR: System Quality of Readiness *Checklist* and *Measures (degree of implementation, procedures for auditing readiness) and Protocol for Measurement*
    - Prepositioned Information (provisions made for, data models)
    - Disaster readiness drills and protocols (usability for)
  - Displays and Man-Machine Interfaces (Command and Control)
  - Data containers, bundled data, metadata

Entry Number: Session 4 - 2
Presenter Name: Daniel Lagazo, Ateneo Innovation Center, Philippines
Title: AIC Demo on Resilient Post-Disaster Communication Using UAV and DTN





CAT

WiFi on Vehicle Cells: Inter-operation of Satellite, Drone and Vehicles

ARUNSAK NIT-IN

Planning and Engineering Department

CAT Telecom Public Co., Ltd (Thailand)

CAT TELECOM PUBLIC COMPANY LIMITED

CAT

CAT Telecom Network

- **Satellite Telecommunication System**

CAT Telecom is capable of providing satellite telecommunication services either domestically or internationally, such as THAICOM, ABS, ASIASAT, MEASAT, VIANASAT, PALAPA, AGILA, INTELSAT, and NSS

- **Communication System via Land Signal Transmission System**

CAT has the land optical fiber signal transmission network for connecting domestic signal transmission networks and for data transmission service. The entire optical fiber cable distance is approximately 32,000 kilometers covering whole country. Land transmission system equipped with Dense Wavelength Division Multiplexing (DWDM) technology, which can now transmit signal with the speed of over 100 Gbps, and ASON technology

- **Communication System via Submarine Optical Fiber Cable**

CAT has invested in constructing different submarine optical fiber cable systems both domestically and internationally for serving the overall telecommunication services

- Domestic Submarine Optical Fiber System: DSCN and CSN
- International Submarine Optical Fiber Cable System: APG, AAG, SMW4, TIS, SMW3, FLAG

CAT TELECOM PUBLIC COMPANY LIMITED

CAT

CAT Corporate info.

- Previously known as "Communications Authority of Thailand"
- Register on 14 August 2003 as CAT Telecom Public Company Limited
- Head quarter: Bangkok, 6 branch offices: North, Northeast, East, Central, West, South and 77 local offices in every provinces

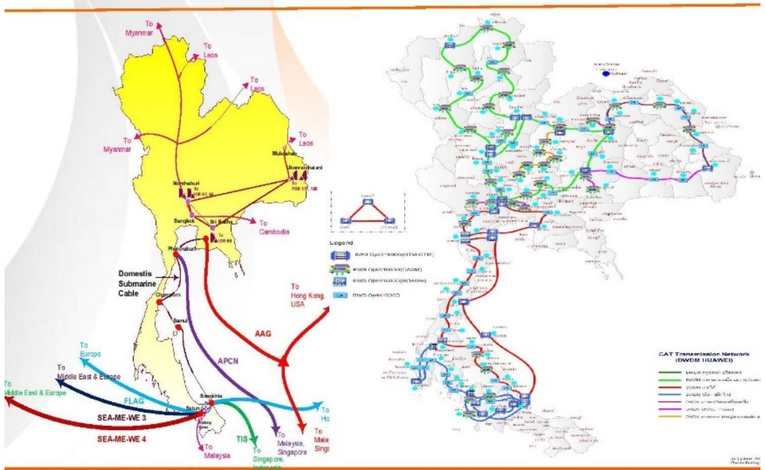
CAT Telecom Services

- Datacenter (IRIS Cloud, Co-location), NIX (National Internet Exchange , IIG (International Internet Gateway)
- Internet (broadband, FttX, corporate)
- Data communication (CAT private line, CAT ethernet, CAT MPLS, CAT IPstar, CAT GlobSAT)
- 3G/4G mobile (My by CAT)

CAT TELECOM PUBLIC COMPANY LIMITED

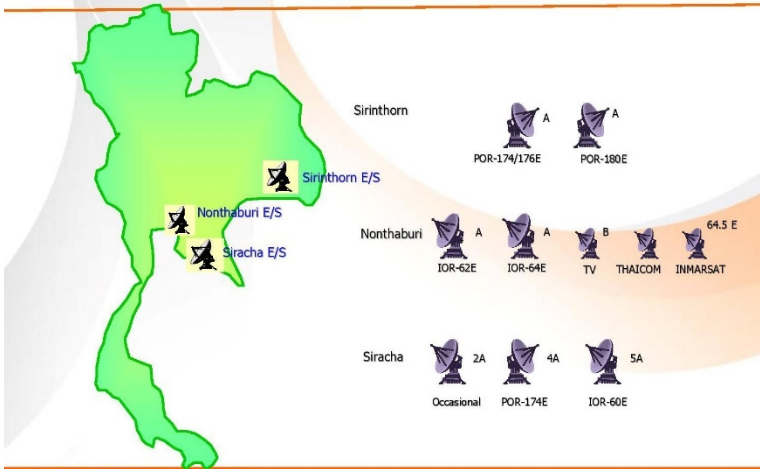
CAT

CAT Telecom Network

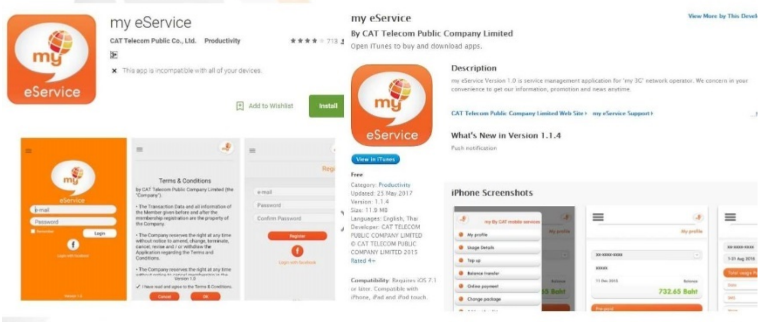


CAT TELECOM PUBLIC COMPANY LIMITED

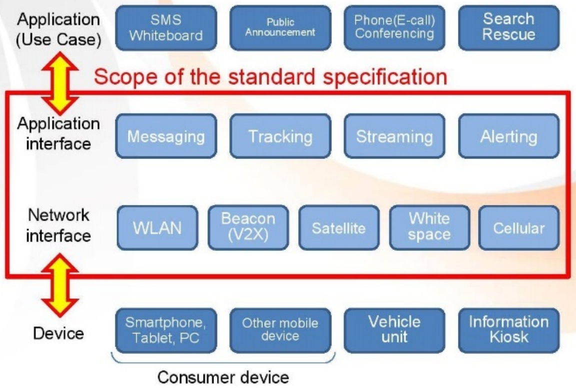
CAT Telecom Network



CAT Telecom Proposed Solution



V-Hub System



CAT Telecom Proposed Solution

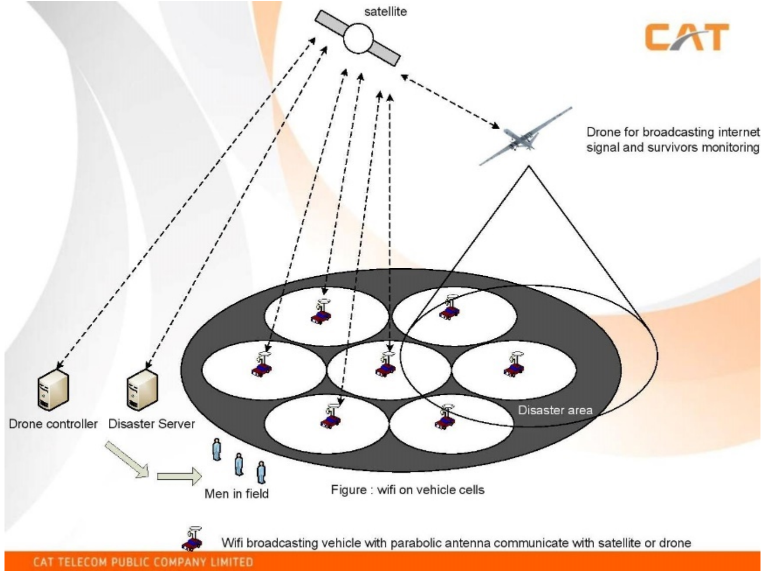
Assumptions:

I. Vehicle, Drone, necessary equipment and network shall be prepared

II. Mobile application available in iOS/Android/Windows OS shall be installed in user device

Expectation:

1. Survivors shall be able to access Wi-Fi to communicate with outside disaster area
2. Government and involving parties shall be able to monitor, locate, aid and rescue people in disaster area



CAT

Thank you

Entry Number: Session 4 - 4

Presenter Name: Aduwati Sali, Universiti Putra Malaysia, Malaysia

Title: UNIVERSITI PUTRA MALAYSIA (UPM) in Collaboration with Malaysian Technical Standards Forum Bhd. (MTSFB)Project on Disaster Response and Vehicle Communication

UPM UNIVERSITI PUTRA MALAYSIA BERILMU BERBAKTI

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UNIVERSITI PUTRA MALAYSIA (UPM)
In Collaboration with
Malaysian Technical Standards Forum Bhd. (MTSFB)

MTSFB MALAYSIAN TECHNICAL STANDARDS FORUM BHD MCMC

Project on Disaster Response and Vehicle Communication
12-14 July 2017, Batangas, Philippines

Presented by
Assoc. Prof. Ir. Dr. Aduwati Sali
Deputy Director, Research Management Centre (RMC), UPM

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Project #1: ECOSAN - Emergency Communication over Satellite-Assisted Network

- Objectives:
- To analyse past record on seismic activities in Malaysia, particularly in Ranau, Sabah
- To conduct site visits to remote seismology stations
- To analyse propagation model at C-band for satellite transmission
- Dec 2013 - Dec 2015 (24 months)

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Presentation Outline

- *Completed* Research on Disaster Response
- *Ongoing and Future* Research on Disaster Response

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Project #1: ECOSAN - Emergency Communication over Satellite-Assisted Network

- Collaboration with
- Department of Meteorological Malaysia (MetMalaysia),
- Department of Minerals and Geoscience (JMG)
- National Space Agency (ANGKASA)
- Leading to development of Shakemap with USGS

METMalaysia JMG ANGKASA MALAYSIA USGS science for a changing world

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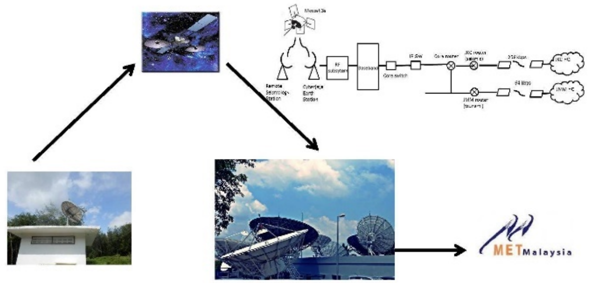
Seismic data training

- Felt earthquake data (1/1/2013 – 1/4/2014) from MetMalaysia
- Reports from JMG:
- Assessment of the Seismic Threats to Malaysia from Major Earthquakes in Southeast Asian Region
- Geological Terrain Mapping of Ranau Area, Sabah
- Report on the Monitoring of Active Faults in Kundasang-Ranau Area, Sabah

Site Visit - Seismology Station

Setup and Configuration - SAN

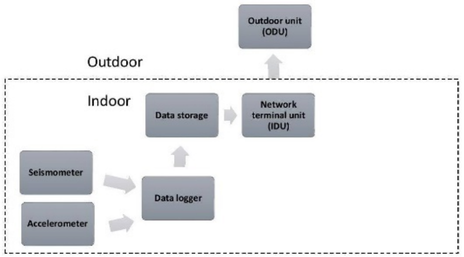


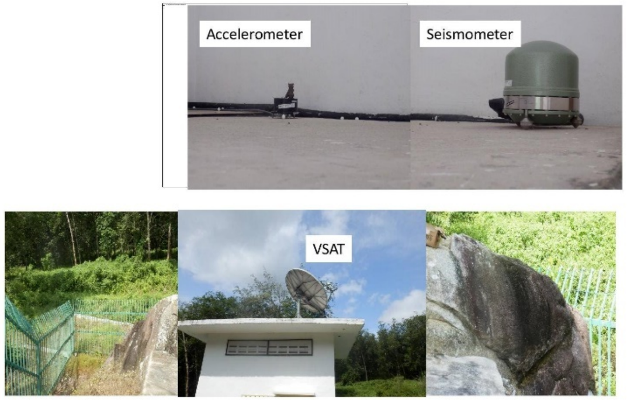
Seismology station with satellite network

Satellite network operating centre, Cyberjaya

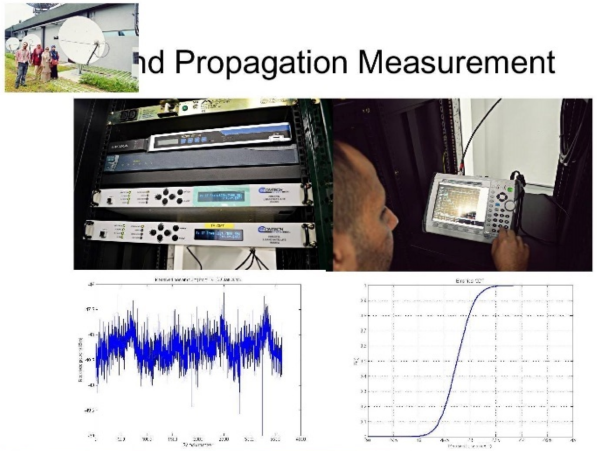
MetMalaysia, PJ

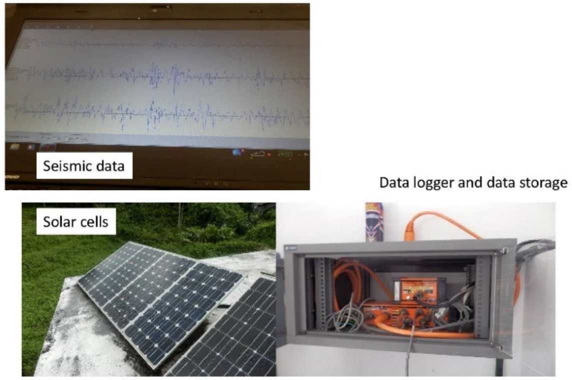
Setup and Configuration – Seismology Station





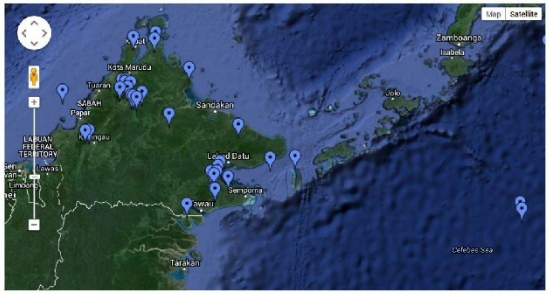
nd Propagation Measurement





Data logger and data storage

Record of Felt Earthquake Events in Sabah (2004 – July 2014)



Location	Date	Time	mb	ml	Intensity
Ranau	01-02-2014	11:35:10	4.40	4.60	IV
	23-12-2013	11:44:14	-	3.00	III
	09-04-2013	03:2755	-	4.20	III
	23-06-2011	14:39:43	2.24	2.19	II
	06-02-2010	18:07:52	3.09	2.54	II
	12-01-2008	16:35:00	2.80	-	II
Kudat	23 07 2013	04:07:34	-	3.95	IV
	23-07-2013	01:14:00	-	3.18	II
	21-10-2012	12:46:37	-	2.84	IV
Keningau	03-12-2012	12:45:17	-	2.90	III
	03-12-2012	03:16:33	-	3.10	IV
Kunak	04-06-2012	06:36:02	3.70	3.71	II
	28-05-2012	16:44:15	4.46	4.14	II
Kundasang	04-10-2011	11:59:17	3.10	2.80	III
	29-09-2011	07:00:50	3.32	2.94	II
	23-07-2009	10:23:54	N/A	2.99	I
Tawau	24-05-2011	08:32:10	2.89	2.49	II
	17-10-2010	20:37:06	3.77	3.36	III
	10-02-2011	14:42:00	6.49	6.97	II
	10-02-2011	14:39:28	6.31	N/A	II
	13 07 2008	12:55:00	2.30	N/A	II
	18-05-2008	15:52:05	3.60	N/A	IV
	18-05-2008	06:26:42	4.70	N/A	IV
	16-11-2008	17:02:32	6.50	N/A	II
Lahad Datu	02 05 2012	12:32:03	4.47	3.94	II
	07-01-2009	14:03:00	3.80	N/A	II
	09-04-2008	00:51:40	4.30	N/A	IV
	14-03-2006	06:58:00	6.80	N/A	II
	06-02-2006	14:54:00	3.60	N/A	II
	27-01-2006	16:58:00	7.40	N/A	III
	23-05-2005	19:58:00	5.30	N/A	IV

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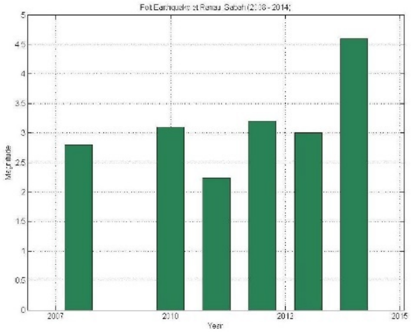
Record of Felt Earthquake Events in Ranau : Magnitude



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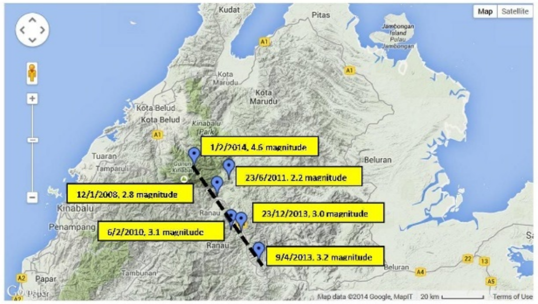
Record of Felt Earthquake Events in Ranau (2008 – July 2014)



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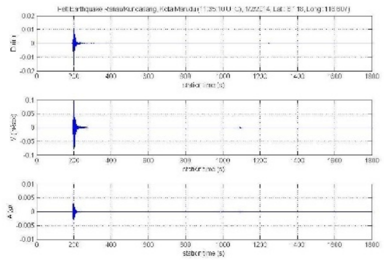
Record of Felt Earthquake Events in Ranau : Displacement, Velocity, Acceleration



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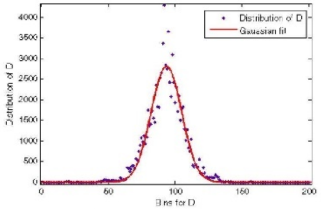
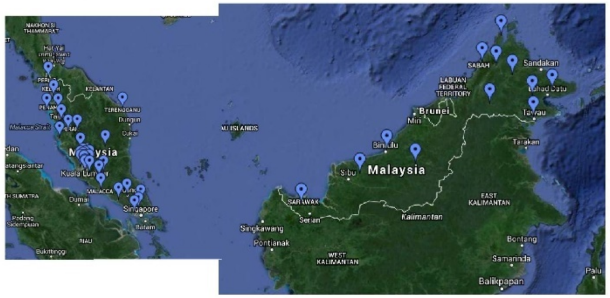
Record of Felt Earthquake Events in Ranau : Gaussian fit

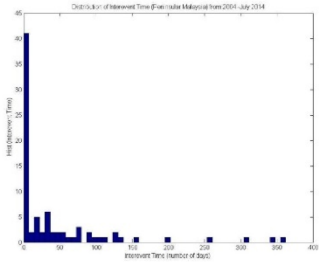


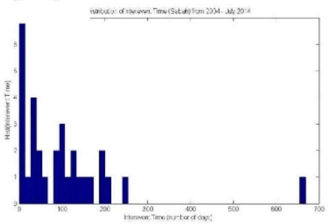
Parameter	Dimension	Gaussian parameters			RMSE
		a	b	c	
Displacement	Vertical (Z)	3.128e+005	99.02	0.5997	172.5
	E-W (E)	6.387e+004	125.7	0.7518	194.6
	N-S (N)	2807	93.51	16.09	194.2
Velocity	Vertical (Z)	3.556e+005	91.9	0.4795	113.1
	E-W (E)	7.978e+004	97.19	0.6055	149.7
	N-S (N)	2.904e+004	107.3	1.487	212.3
Acceleration	Vertical (Z)	3.555e+005	95.05	0.4351	70.61
	E-W (E)	478.3	100.2	2.332e+004	0.4596
	N-S (N)	7.253e+004	98.12	0.5997	57.01

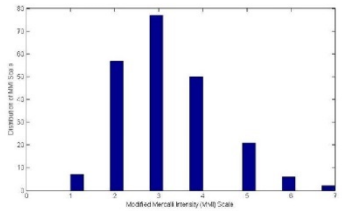
Record of Felt Earthquake Events in Malaysia



Ranau – Site visit







Distribution of Modified Mercalli Intensity (MMI) Scale for Felt Earthquake Events in Malaysia from 2004 – July 2014

Table x Recorded MMI and its frequency of events (2004 – July 2014)

Recorded MMI	Number of events
1	8
2	58
3	78
4	50
5	22
6	8
7	1

Conclusion for Project #1

- Using Satellite-Assisted Network (SAN), real-time earthquake monitoring and early warning system can be developed
- Area of interest: Ranau, Sabah
- Earthquake modeling can be developed using current and past seismic data

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Project Output

- Recommendation to MetMalaysia
- Felt earthquake event model
- Satellite transmission at C-band (delay, signal strength)
- Publications
- A. Sali, D. Zainal. N. H. T. Ahmad, F. Omar, S. Mohammad, 'Remote Earthquake Monitoring over GEO Satellite Network', 7th International Conference on Recent Advances in Satellite Technologies (submitted Jan 2015)
- A. Sali, D. Zainal. N. H. T. Ahmad, F. Omar, 'Analysis of Felt Earthquake Event in Malaysia from 2004 - 2014', Elsevier Soil Dynamics and Earthquake Engineering (to submit March 2015)
- Copyrights
- Copyright '10-Step Procedure to Identify Seismic Stations in Sabah that can Detect Aftershock Earthquake Events (I-SHOCK) – LY2017001439
- Hakcipta '10-Langkah bagi Prosedur Mengenalpasti Stesen-stesen Seismik yang akan Mengesan Kejadian Gegar Penghujung Gempa Bumi (I-SHOCK) – LY2017001440

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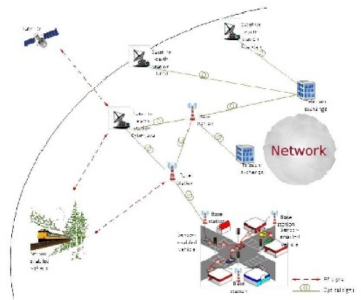
Ongoing Project#21: I-Seam Integrated Networks for Seamless Radio Vehicle Communications for Disaster Management

- Intelligent Secured Routing Protocol in Wireless Sensor Network for Radio Vehicle Communication
- Seamless Radio-over-Fibre Transmission System for Radio Vehicle Communication
- SeamSat: Seamless Satellite Communications for Radio Vehicle Communications



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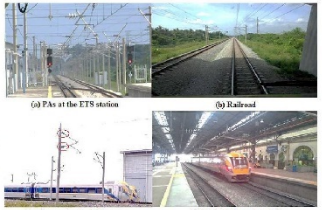
I-Seam Integrated Networks for Seamless Radio Vehicle Communications for Disaster Management

- Collaboration with Toyota Auto Body Malaysia Sdn Bhd (TABM)
- Electrified Train System (ETS), Keretapi Tanah Melayu (KTM)



(a) PAs at the ETS station (b) Railroad
(c) PAs nearing the ETS station (d) Main ETS station at KL

Summary

- Potential research collaboration
- International research grants
- Publications and innovations
- Input to policy making process

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Expected Output

- Duration: 1/7/2017 – 30/6/2019 (24 months)
- Emergency communications over train and cars during disaster
- Recommendations as policy to Malaysia National Security Council (NSC)
- Testing during Disaster Relief Exercise (DiREx)

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Thank you

aduwati@upm.edu.my

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Entry Number: Session 4 - 5

Presenter Name: Nisarat Tansakul, Internet Education and Research Laboratory (intERLab)Asian Institute of Technology, Thailand

Title: The Design and Operational Guidelines for DUMBONET Emergency Networks

The Design and Operational Guidelines for DUMBONET Emergency Networks

Nisarat Tansakul
Internet Education and Research Laboratory (intERLab)
Asian Institute of Technology (AIT)

July 2017

What is DUMBONET ?

Digital Ubiquitous Mobile Broadband OLSR Network

DUMBONET is an emergency network which aims to

- provide a collection of post-disaster emergency communication tools
  - which can be quickly and reasonably deployed for rescuer activities.
- enable multimedia communications
  - Photos, videos, texts, audios

2

Commodity Devices

The type of devices used in our MANET as technology are becoming available

2006: Large Notebooks

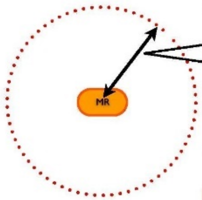
2008: Netbooks, and Bluetooth-enabled mobile phones

2011: Tablets, Smartphones and Embedded systems

2013 - present: Mobile routers

3

Mobile Routers (MR)



- Approximately 80 - 100 meters of coverage radius.
- Shorter distance means a more stable and reliable link
- Built-in battery allows ~ 4 hours operation.
- We have replaced the factory firmware and specially customized the configuration parameters for emergency network operations

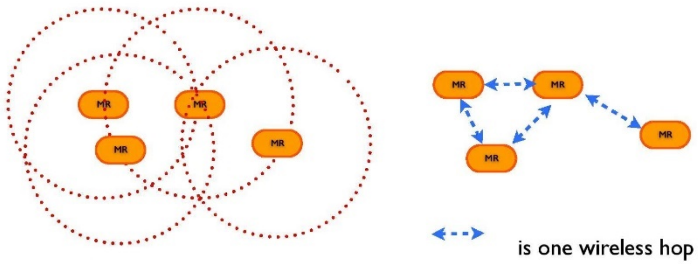
4

Rules of Thumb

- Each router has a range of approximately 80 - 100 meters.
- Each router can be thought of as a circle whose center is located at the installation location.
- Plan the coverage area by overlapping these circles, and making sure that some of their centers are within range of each others.
- Maximum distance should be limited to 3 or 4 wireless DUMBONET "hops"

Coverage vs. Link Views

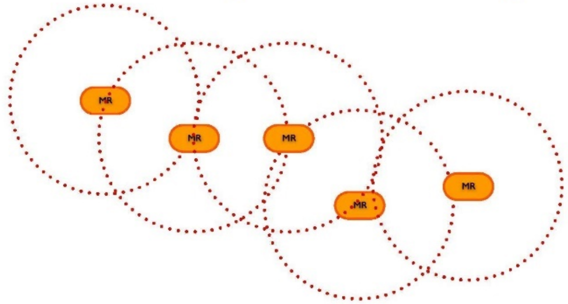
Coverage View = Connectivity (Link) View



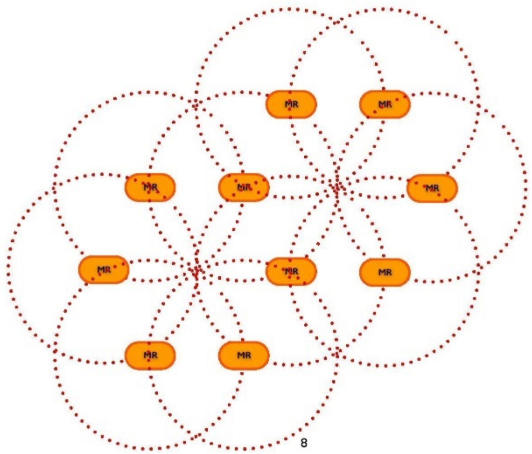
Important: maximum distance between any two farthest routers should not exceed 3 or 4 wireless hops.

Example of "Sparse" Topology :

The Sparse topology offers a reasonably wider or farer coverage in a specific direction. But if they spread too far, the network might break into several segments

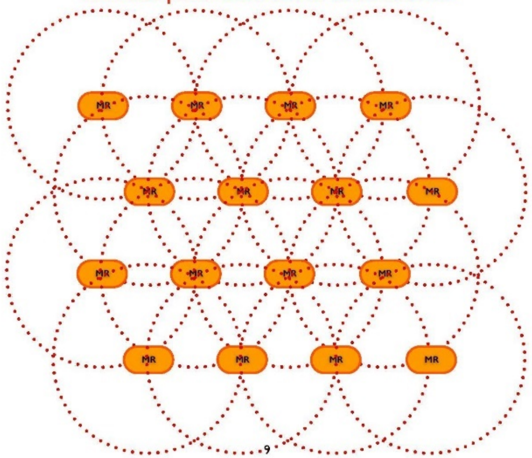


Example of "Honeycomb" Topology : Better robustness



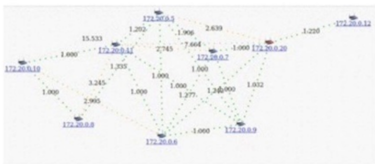
Example of "Dense Grid" Topology :

An N x N dense grid offers the best robustness and shortest paths between farthest routers



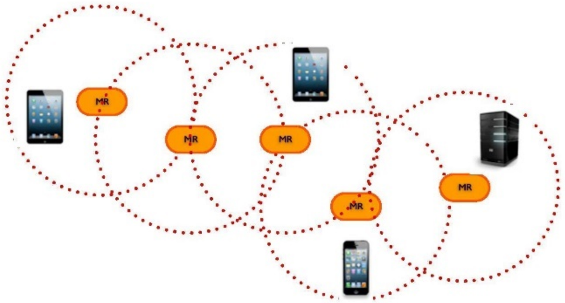
How to operate DUMBONET

- Install the mobile routers in their designated places
- Connect to the power source, or install a fully charged battery
- Switch on the routers and wait
- When the indicator lights start to blink, it's done. The DUMBONET emergency network is formed.



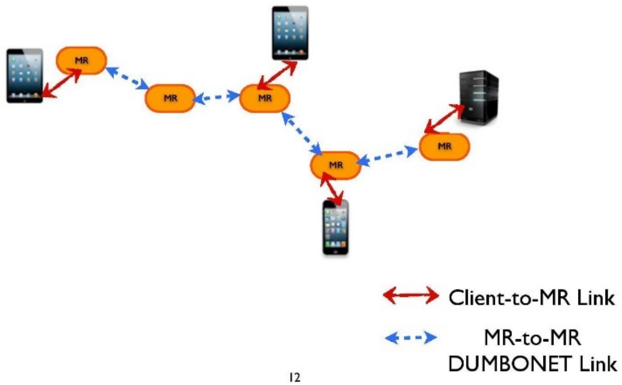
How to connect the clients :

Put the clients in the covered area and connect to the nearest DUMBONET MR as normal Wi-Fi clients



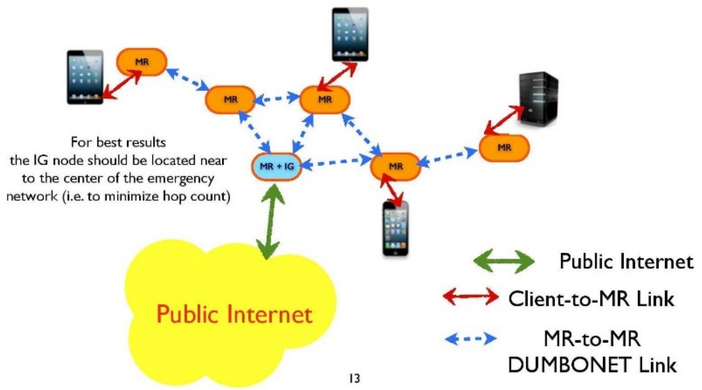
The Link View :

Standard IP communications are possible between any connected clients and computers.
Think of this as our own "intranet"



Internet Gateway (IG) in DUMBONET

One DUMBONET node can be specially configured to connect to the public Internet (e.g. via Ethernet cable or 3G/4G cellular).
Add the IG node and then every client can access the public Internet.



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Design Checklist

- Map of the targeted area
- Topology (Sparse vs. Honey Comb vs. Dense vs. Mixed)
  - Everything is portable and can be moved all together. You can mix or change the topology whenever you need and hence might require fewer resources than expected.
- Max distance of 4 wireless hops
  - typically achievable with 20 or fewer routers per site
- Power and re-charging requirements
  - How many hours of operation?
  - Logistics of power, recharging, or router replacements
- Apps (intranet/internet) are your responsibility.
- Need an Internet Gateway?
  - How to connect the gateway: Ethernet, Fiber, or 3G/4G
  - Extra costs of 3G/4G airtime and Internet access are your responsibility.

14

Pre-disaster deployments

TakNet: Community Network (CWMN)

- DUMBONET as Community Wireless Mesh Network since 2013
- Help people in villages to became familiar with the technology and utilize the available on a daily basis.

intERLab Internet Education and Research Laboratory

isif asia

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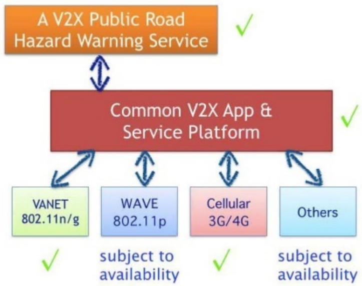
TakNet: Community Network (CWMN)

http://interlab.ait.ac.th/cwmn/

17

V2X Web Application & Service platform

- DUMBONET as V2X Communication (2015)
- Web Application as a Service Platform for V2X Communication (CarTalkWaas)



18

V2X Web Application & Service platform

Common V2X App & Service Platform

Hybrid Routing Decision :
VANET, VDTN 3G/4G, or WAVE (if available)

Web App & Service APIs for :
web services, messaging, bulk data transfer, etc.

Simple Vehicular Cloud -features :
Data store, Data retrieval, Data exchange

19

V2X Web Application & Service platform

https://interlab.ait.ac.th/CarTalkWaaS/

20

Post-disaster deployments

Nepal Earthquake (April 2015)

http://dumbo-isif.interlab.ait.ac.th/nepal

Nepal Earthquake (April 2015)

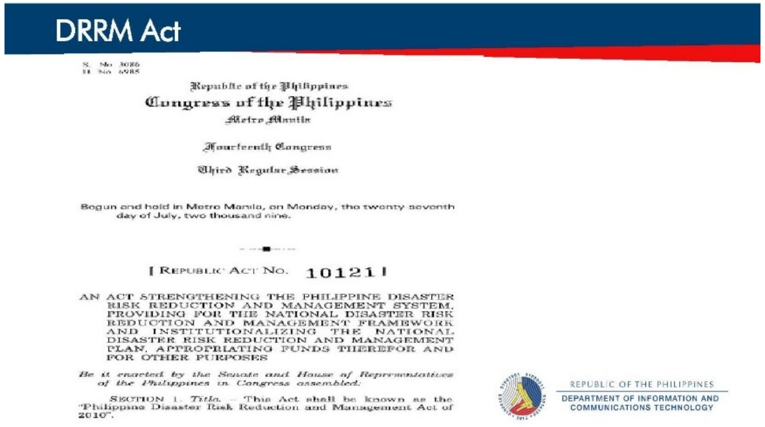
- DUMBONET routers shipped to Nepal after earthquake disaster in 2015.
- Deployed in 4 hospitals:
  - Kirtipur Hospital of Kathmandu
  - Nepal Army Hospital of Kathmandu
  - Dhulikhel hospital of Kavrepalanchowk
  - Gaurishankar General Hospital of Dolakha districts.
- For medical and patient communications in hospitals.
- Users of all the deployment sites in Nepal uses these devices much for making VOIP call through 'Zoiper'.

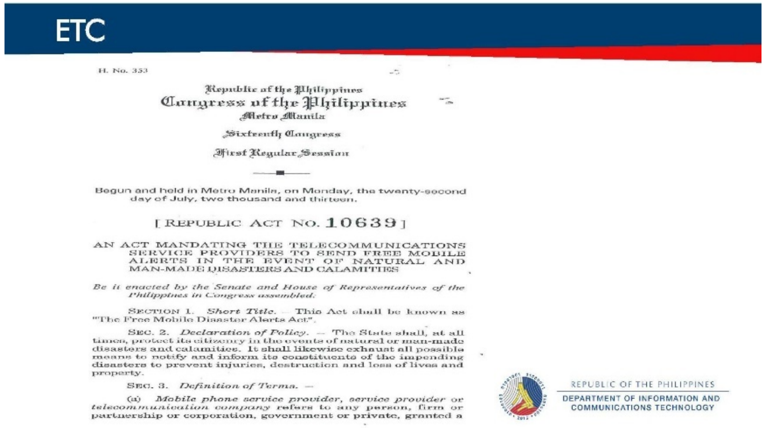
Thank you

Contact us: nisarat@ait.asia

http://dumbo-technology.interlab.ait.ac.th/

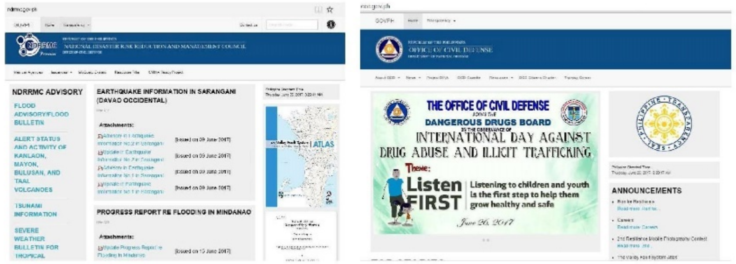
Entry Number: Session 4 - 6
Presenter Name: Alan Silor
Department of Information and Communications Technology, Philippines
Title: ICT Strategy for DRRM





ETC

websites



DINA

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DEPARTMENT OF INFORMATION AND COMMUNICATIONS TECHNOLOGY

apps

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apps

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Wishlist - GECS

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Wishlist - GECS

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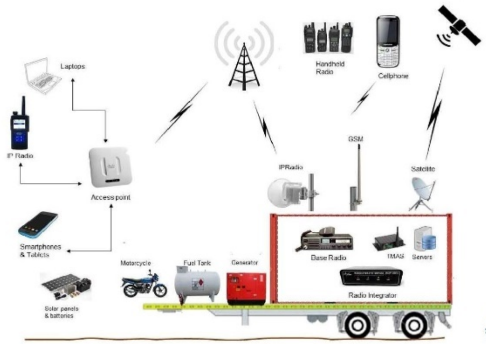
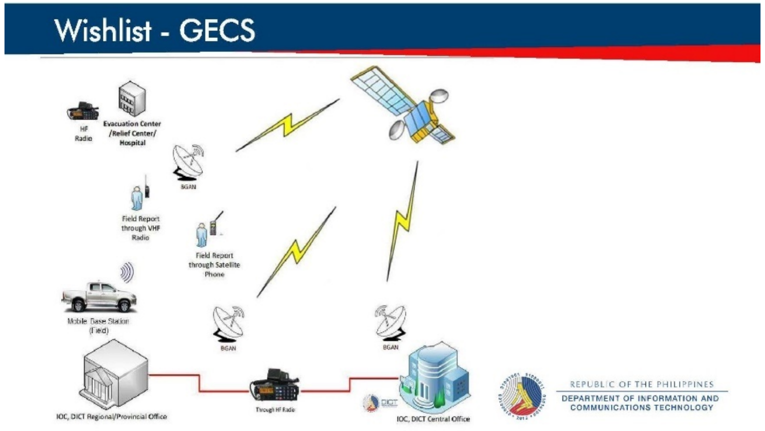
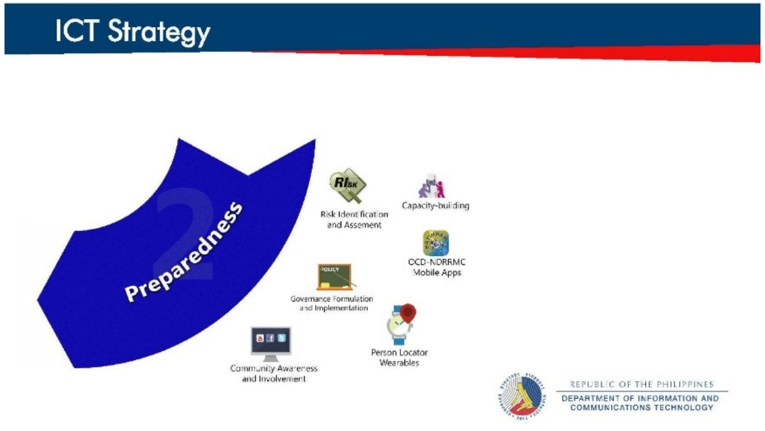
Wishlist - GECS



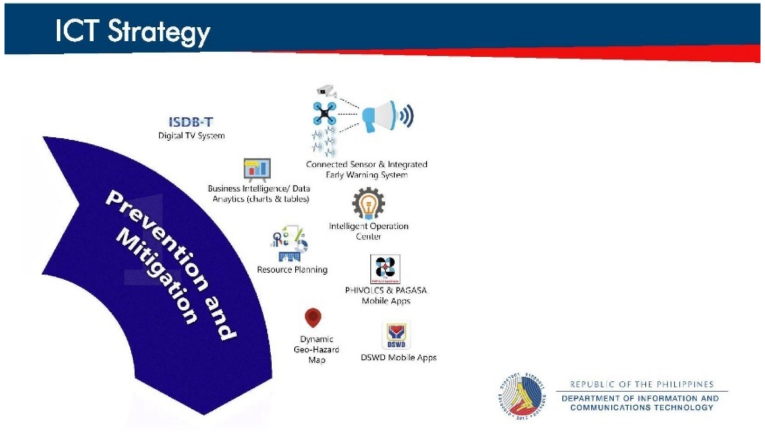
REPUBLIC OF THE PHILIPPINES
DEPARTMENT OF INFORMATION AND COMMUNICATIONS TECHNOLOGY



Wishlist - GECS
HF Radio
Evacuation Center /Relief Center/ Hospital
BGAN
Field Report through VHF Radio
Field Report through Satellite Phone
Mobile Base Station (Field)
BGAN
BGAN
IOC, DICT Regional/Provincial Office
Through HF Radio
IOC, DICT Central Office
REPUBLIC OF THE PHILIPPINES
DEPARTMENT OF INFORMATION AND COMMUNICATIONS TECHNOLOGY



ICT Strategy
Preparedness
Risk Identification and Assement
Capacity-building
OCD-NDRRMC Mobile Apps
Governance Formulation and Implementation
Person Locator Wearables
Community Awareness and Involvement
REPUBLIC OF THE PHILIPPINES
DEPARTMENT OF INFORMATION AND COMMUNICATIONS TECHNOLOGY



ICT Strategy
Prevention and Mitigation
ISDB-T
Digital TV System
Connected Sensor & Integrated Early Warning System
Business Intelligence/ Data Analytics (charts & tables)
Intelligent Operation Center
Resource Planning
PHIVOLCS & PAGASA Mobile Apps
Dynamic Geo-Hazard Map
DSWD Mobile Apps
REPUBLIC OF THE PHILIPPINES
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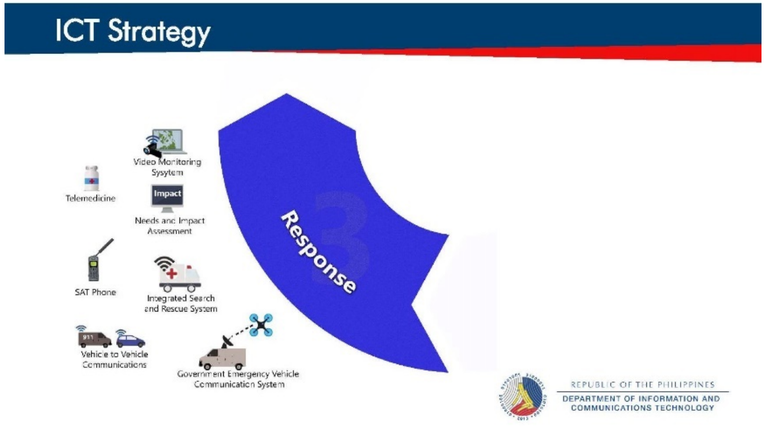
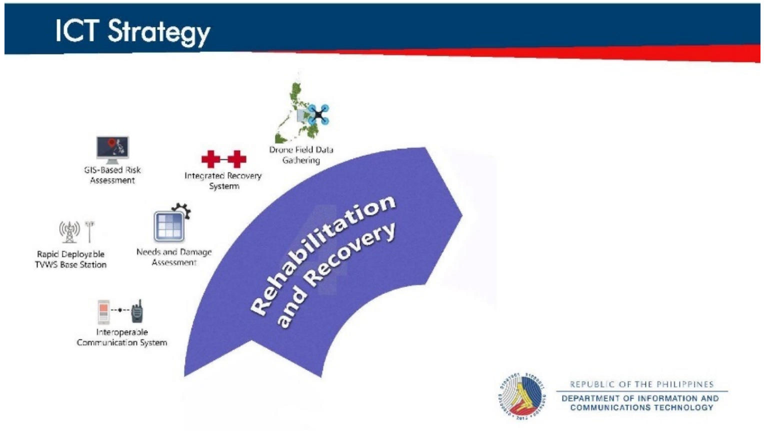


ICT Strategy
Video Monitoring Sysytem
Telemedicine
Needs and Impact Assessment
Response
SAT Phone
Integrated Search and Rescue System
Vehicle to Vehicle Communications
Government Emergency Vehicle Communication System
REPUBLIC OF THE PHILIPPINES
DEPARTMENT OF INFORMATION AND COMMUNICATIONS TECHNOLOGY

Annex 4


ICT Strategy
Drone Field Data Gathering
GIS-Based Risk Assessment
Integrated Recovery System
Rapid Deployable TVWS Base Station
Needs and Damage Assessment
Interoperable Communication System
Rehabilitation and Recovery
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DEPARTMENT OF INFORMATION AND COMMUNICATIONS TECHNOLOGY
National ICT Summit
Maraming Salamat Po...


Holistic Strategy
Rehabilitation and Recovery
Prevention and Mitigation
Preparedness
Response
Disaster Resilient Philippines for Every Juan & Juana
ISDB-T

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Annex 4

Entry Number: Session 4 - 7
Presenter Name: Yoshiharu Doi. Toyota Infotechnology Center, Japan
Title: V2X Applications by using VHUB

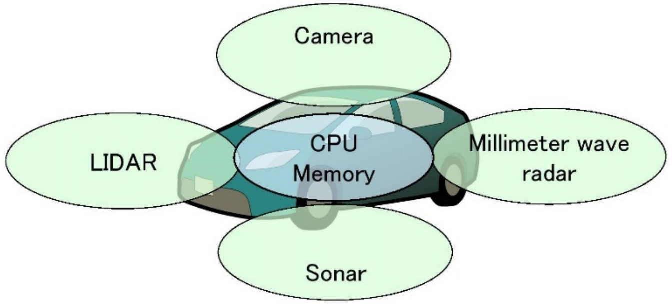
V2X Applications by using VHUB

June 13th 2017
TOYOTA InfoTechnology Center Co., Ltd.
ITS Wireless Group Leader
Yoshiharu Doi (yo-doi@jp.toyota-itc.com)

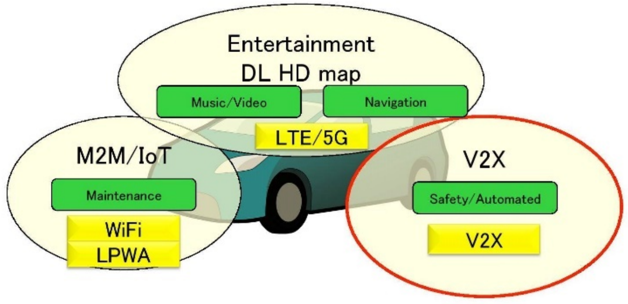
1 VHUB concept and What is V2X

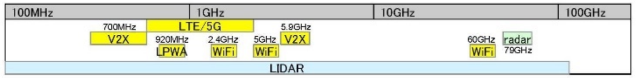
Contents

Censors and calculation resource in vehicle

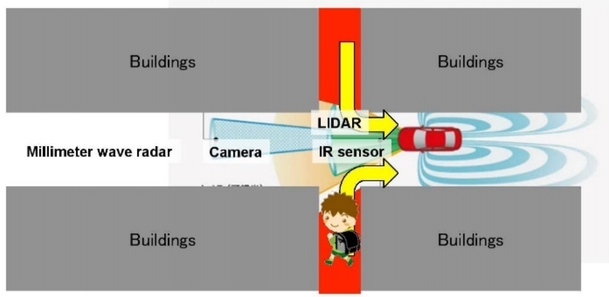


Wireless equipment in vehicle





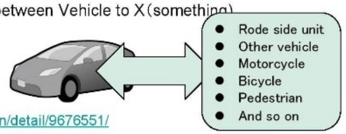
V2X is a kind of sensor for vehicle!

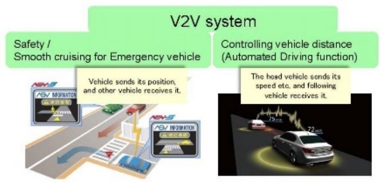


V2X is a kind of sensor to watch situation behind buildings (Non-Line Of Sight).

What is V2X in VHUB

- Protocol
  - ARIB STD T109 (760MHz V2X9
  - IEEE802.11p (5.9GHz DSRC)
- ITS Connect is a communication system between Vehicle to X (something)
  - V2I Vehicle to Infrastructure
  - V2V Vehicle to Vehicle
  - V2P Vehicle to Pedestrian
- Major application
  - Traffic safety : http://newsroom.toyota.co.jp/en/detail/9676551/





V2X Applications

V2X has a potential to solve social issues

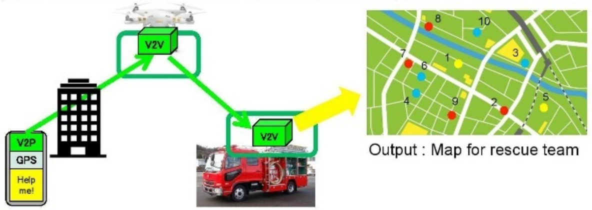
- Disaster timing
  - Rescue support system
    - V2X system tell position and situation of victims.
- Normal times
  - Safety : Reducing traffic accident
    - V2X system is kind of sensor to detect other X on blind spots.
  - Economy & Environment : Reducing traffic congestion
    - V2X system can be a kind of traffic counter
  - Economy & Efficiency : Mobility efficiency
    - V2X system can reduce travel time of Police/Fire fighting/Ambulance/VIP vehicle.
    - V2X system can realize platooning of Track/Trailer. (A kind of Automated Driving System)
  - Safety : Social security
    - V2X system can watch other X (Vehicle, Motorcycle, Pedestrian, etc).

Rescue support system

Motivations

V2P is a sensor to find victims

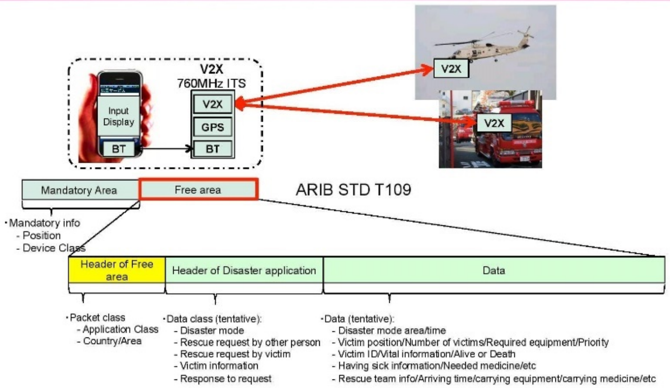
Many east and south Asian countries needs victim rescue system



Output : Map for rescue team

V2X Applications @ Big disaster timing

Rescue message set using V2P



Wireless equipment (from Japan)

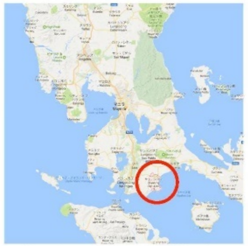
TOYOTA InfoTechnology Center Co., Ltd.

760MHz ITS

Permission from Philippine Gov.

Location and seen of FoT

TOYOTA InfoTechnology Center Co., Ltd.



San Juan, Batangas, Philippines

Victim

Rescue

Creating test equipment in Pilippines

TOYOTA InfoTechnology Center Co., Ltd.

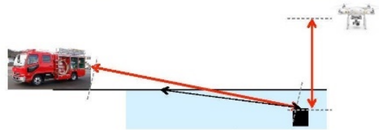
- Ateneo Univ. created the test equipment.

Drone provided by Ateneo Univ.

760MHzITS From Japan

Result of the Propagation distance

TOYOTA InfoTechnology Center Co., Ltd.



Depth underground	Ground Search				Sky Search			
	Soil	Concrete	FreshW	SaltW	Soil	Concrete	FreshW	SaltW
0m	470m				>120m(-75dbm)			
0.25m	80m	80m	22m	15m	>120m	>120m	>120m	50m
0.5m	80m	40m	20m	14m	>120m	>120m	70m	30m
1m	20m	20m	19m	10m	100m	>120m	70m	20m

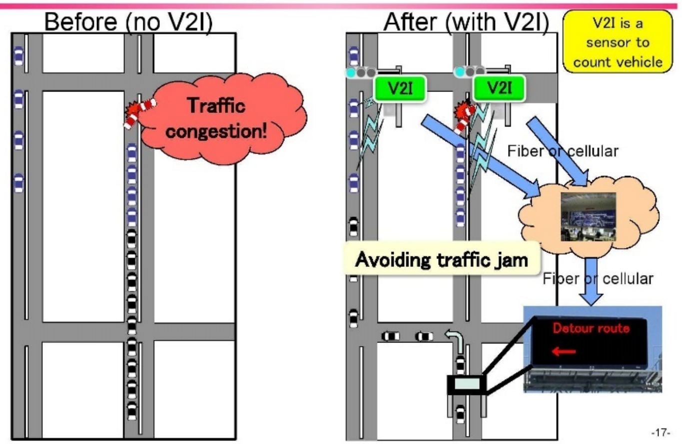
Sky search is effective.
It have potential to find the victim who is covered by obstacle of 1m.

TOYOTA InfoTechnology Center Co., Ltd.

V2X Applications @ Normal times
Another use case

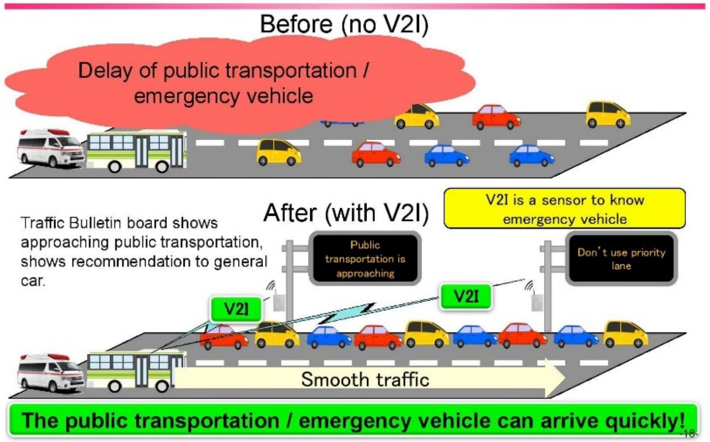
-16-

Reducing traffic congestion



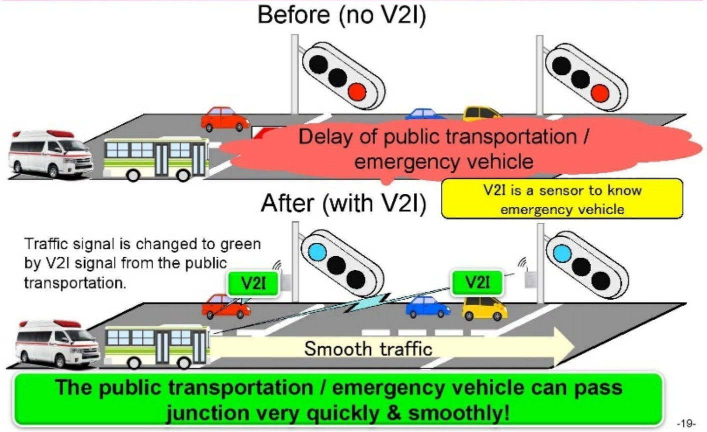
-17-

Mobility efficiency



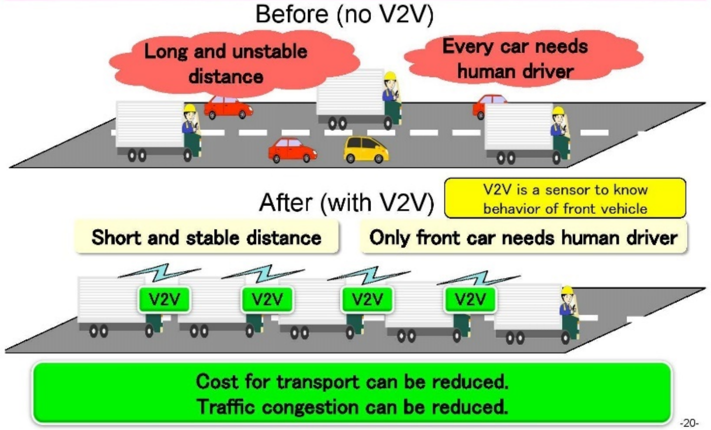
-18-

Mobility efficiency

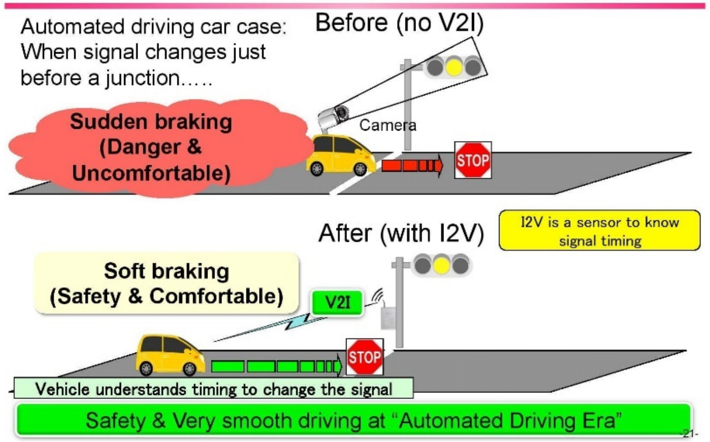


-19-

Track platooning

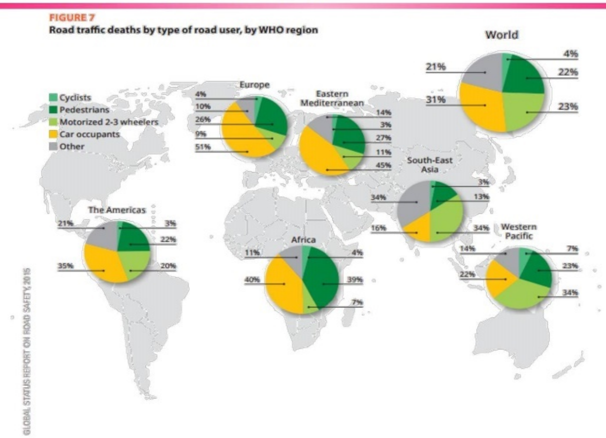


Support for Automated Driving

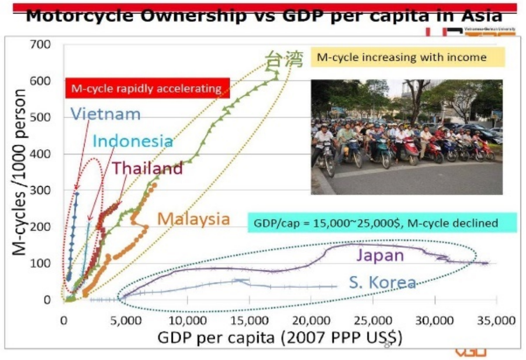


3 For motorcycle safety
Biggest traffic issue in south east Asia

Fatalities by traffic accident



GDP versus Motorcycle ownership



Source: Dr.-Eng. Vu Anh Tuan, Director of VGTRC, Motorcycle Accidents in Vietnam,
A Roundtable on safety of two-wheeled vehicles, Geneva, 23-26 March 2015

-24-

V2X motorcycle (TW&JP collaboration)

A Motorcycle was a marketing car base.

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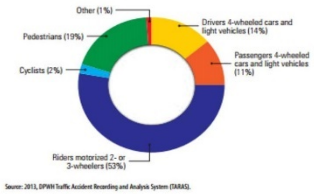
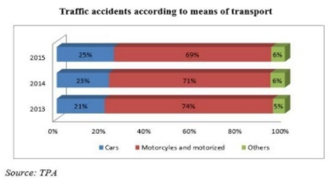
Traffic Accident in Philippines and Vietnam



Fatal Accident in Philippines



Source: TPA

Road Accident in Vietnam

Motorcycle Safety (TW&JP collaboration)

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Annex 4

Motorcycle Safety (TW&JP collaboration)

Conclusions

1. **VHUB including V2X has a big potential to solve social issues (Disaster & Normal times)**

2. **We hope to help to solve Asian issues using VHUB.**
   - ✓ **We made V2P message set for victim rescue support system. Ateneo Univ. in Philippines supported to evaluate its propagation performance.**
   - ✓ **We can support to make an Asian V2M message set for motorcycle safety.**

3. **Let's start discussion of a collaboration!**

Appendix

India - Mobility efficiency (Plan)

End of file

Annex 5

List of Invited Presenters of the Workshop

Presentation by Guests

Session 2 - 2	"Restoration Support by Satellite Communications" Tomoki Isaac Saso SKY Perfect JSAT, Japan
Session 2 - 3	"HONDA, Origin of HONDA TECHNOLOGY for I-Trip" Yasuo Oishi Honda Motor, Japan
Session 2 - 3 - 2	"Approach for disaster prevention and reduction using Honda telematics" Akira Iihoshi Honda Motor, Japan
Session 4 - 1	"JSAT Demo" Tomoki Isaac Saso SKY Perfect JSAT, Japan

Entry Number: Session 2 - 2
Presenter Name: Tomoki Isaac Saso, SKY Perfect JSAT
Title: Restoration Support by Satellite Communications

Restoration Support by Satellite Communications

-- Tohoku-Pacific Ocean Earthquake --

July 12th, 2017

SKY Perfect JSAT Corporation

◆**SKY Perfect JSAT Corporation**

◆Summary of the Tohoku-Pacific Ocean Earthquake

◆Role of Satellite Communication in disaster

◆Desired Satellite System in Disaster Situation

Contents

Who am I

Space & Satellite Business

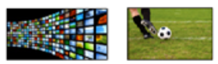
- First satellite launched in 1989
  - ✓ Know-how over 25 years of satellite operation
- Satellite capacity leasing and managed services
- Solid and diverse customer base
  - ✓ Government sector
  - ✓ Public Service Companies
  - ✓ Telcos, Enterprises
  - ✓ Broadcasters
  - ✓ In Japan and other countries

Largest Satellite Operator in Asia

SKY Perfect JSAT Corporation

Japan's Largest Multichannel Pay TV Service SKY PerfecTV!

- Operation started in 1996
- Pay-TV services through
  - ✓ 3 satellites
  - ✓ Optical Fiber
  - ✓ Over-the-Top VOD
- 3.5 million subscribers
- 200+ Channels (HD/SD/Audio)



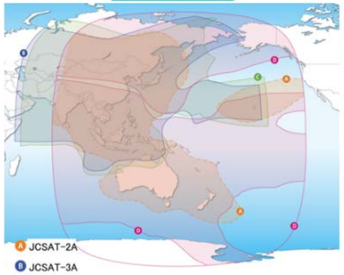
Multichannel Pay TV Business

(As of March, 2016 / US$1 = JPY110)

Revenue	: JPY162.9 Billion (US$1.48 Billion)
Total Equity	: JPY200.5 Billion (US$1.82 Billion)
Major Shareholders (voting rights)	: Itochu Fuji Partners (25.8%), NTT Communications (8.8%), Nippon Television Network Corp (7.0%), TBS Holdings (6.2%), Mitsui & Co. (4.5%), and Sumitomo Corp (3.7%)

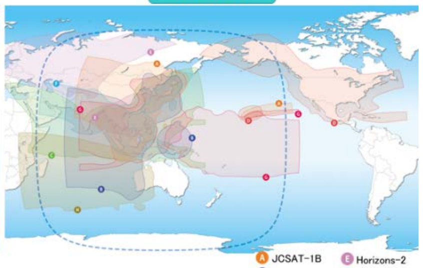
Coverage

C-band



- A JCSAT-2A
- B JCSAT-3A
- C JCSAT-5A
- D JCSAT-2B

Ku-band



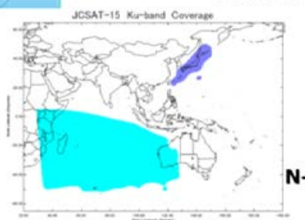
- A JCSAT-1B
- B Superbird-C2
- C JCSAT-85
- D Horizons-1
- E Horizons-2
- F JCSAT-4B
- G JCSAT-2B
- H JCSAT-110A

- ◆SKY Perfect JSAT Corporation
- **◆Summary of the Tohoku-Pacific Ocean Earthquake**
- ◆Role of Satellite Communication in disaster
- ◆Desired Satellite System in Disaster Situation

New satellite

Horizons 3e

JCSAT-18



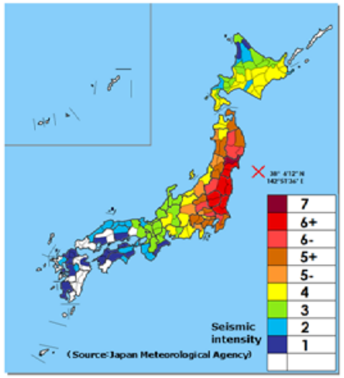
N-SAT-110A

Summary of the Tohoku-Pacific Ocean Earthquake

At 14:46 Friday, March 11, 2011, a magnitude 9.0 earthquake stroked Japan, its hypocenter was approx. 130km east of Sendai, the capital of Miyagi prefecture. The tremor triggers a massive tsunami and seriously damages the Tohoku districts. It was the most powerful known earthquake to have hit Japan, and one of the five most powerful earthquakes in the world.

As of May 1st, 2011

Date	2011-03-11 14:46 JST 2011-03-11 05:46 UTC
Duration	6 minutes
Magnitude	9.0 M_W
Depth	32km
Tsunami	Maximum 38.9m flooded 807km² area
Death	15,873 people (2012.11.14)
Missing	2,744 people (2012.11.14)
Destroyed Buildings	350,000+



3

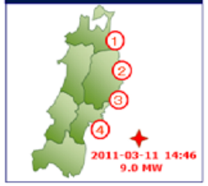
Annex 5

Summary of Tsunami

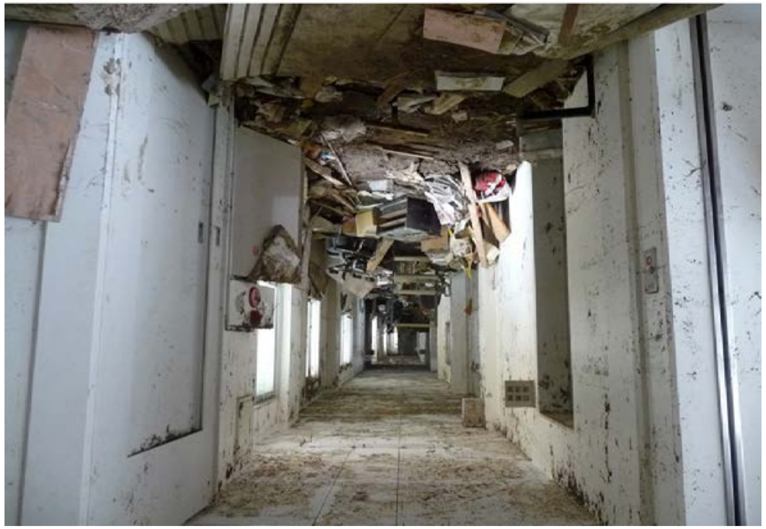
Source: Geospatial Information Authority of Japan

The earthquake which was caused by 5 to 8 meters upthrust on 180km wide seabed at 60km offshore from the east coast of Tohoku resulted in a major tsunami which brought destruction along the Pacific coastline of Japan's northern islands and resulted in the loss of thousands of lives and devastated entire towns. The tsunami was reached max. 12km from the offshore and inundated a total area of approximately 807 km² in Japan.

Tohoku Region



	City	Height	Arrival Time (JST)
①	Hachinohe	~9.3m	2011-03-11 16:51
②	Miyako	~38.9m	2011-03-11 15:21
③	Ofunato	~30.1m	2011-03-11 15:15
④	Ayukawa	~20m	2011-03-11 15:20



Damages of Telecommunications (1)

Damages of Fixed Lines

The number of Unavailable Fixed Lines

Company	Quantity	Description
NTT EAST	898,100	Fixed Telephone Lines
	108,100	ISDN
	512,700	Optical Fibers
NTT Communications	17,384	Dedicated Terrestrial Lines
KDDI	390,000	Fixed Lines
Softbank	31,000	Fixed Lines (Telephone & ISDN)
	1,200	Dedicated Terrestrial Lines

Damages of Submarine Cables

More than 2,000,000 fixed lines were unavailable.

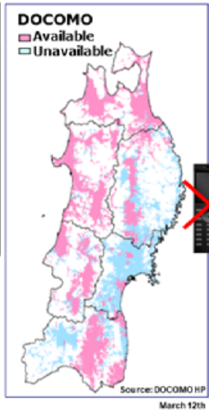
Damages of Telecommunications (2)

Damages of Mobile Backhaul

The number of Deactivated Mobile-Backhaul

Company	Quantity
DOCOMO	6,720
KDDI (au)	3,680
Softbank	3,786
EMOBILE	704
WILLCOM	13,760

Approx. 29,000 mobile base stations were deactivated.



◆SKY Perfect JSAT Corporation

◆Summary of the Tohoku-Pacific Ocean Earthquake

◆Role of Satellite Communication in disaster

◆Desired Satellite System in Disaster Situation

[Occurrence Phase]
[Rescue and Life-Saving Phase]
[Restoration Support Phase]


NTT
docomo
災害
復旧
docomo

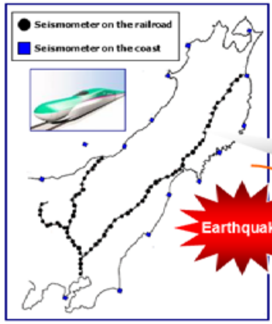

NTT


スカパーJSAT

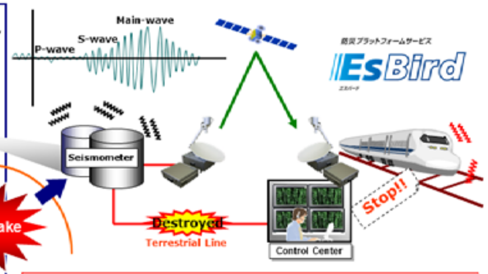
Railway Company

Occurrence Phase | Rescue and Life-Saving Phase | Restoration Support Phase

Early Warning Alert System for Shinkansen



There are approx. 60 seismometers in the east side of Japan. If any of seismometer senses intensity of an earthquake, the emergency brake will be activated to all trains (SHINKANSEN).



At the time of Tohoku-Pacific Ocean Earthquake , this early warning alert system was activated 9 seconds prior to the initial tremor and the emergency brake was activated 70 seconds prior to the most destructive quake. None of the trains (27 SHINKANSENs) running at the Earthquake were derailed.

Summary of Telecommunications

Earthquake Early Warning

Earthquake Early Warning (EEW) data was successfully distributed and received via terrestrial line and satellite. However, after the most destructive quake occurred, the terrestrial line was destroyed. The EEW data of afterquake was distributed only by the satellite.

SafetyBird

Fixed-Line and Mobile Communications

After the Tohoku-Pacific Ocean Earthquake, fixed-line and mobile communication services were unavailable, particularly in the Tohoku region, impacting more than 2 million fixed lines and approx. 29,000 mobile base stations and others. For the restoration purpose, Fixed VSATs and vehicle-mounted satellite systems (approx. 40 vehicles) were deployed immediately and most of the mobile communication services were restored within a month.

Evacuation Centers & Temporally Houses

In the Tohoku region, afflicted people were only able to utilize temporary phones set up at the evacuation centers. In order to gather the information of rescue, food aid, etc., the Internet was imperative. SKY Perfect JSAT has provided the satellite broadband systems to the evacuation centers and also provided the systems to temporally houses (Over 200 VSAT systems).

Government

Most of rescues teams from Military, Police, Coastguard etc. carried Flyaway type of VSATs for voice and video transmissions at the stricken areas.

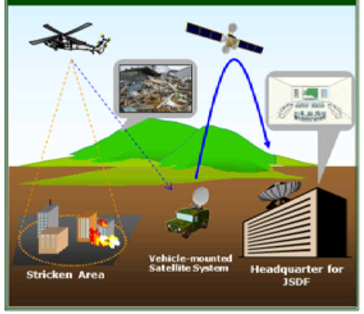
防災プラットフォームサービス EsBird

Military

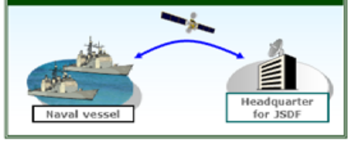
Occurrence Phase | Rescue and Life-Saving Phase | Restoration Support Phase

- The Japan Self Defense Force(JSDF) sent approximately 100,000 SDF members to the stricken areas immediately after the earthquake occurrence.

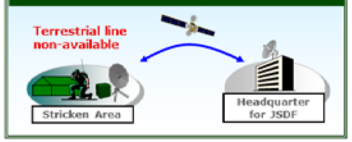
Video transmission



Satellite communication for Naval vessel

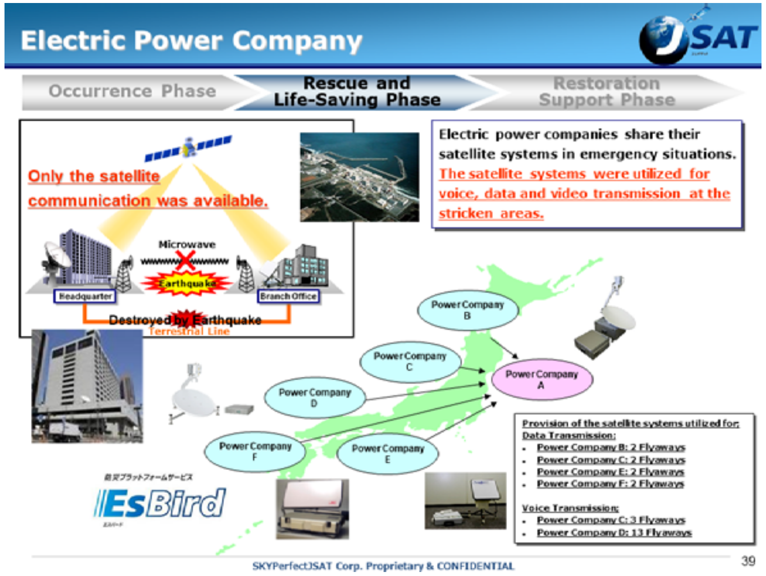


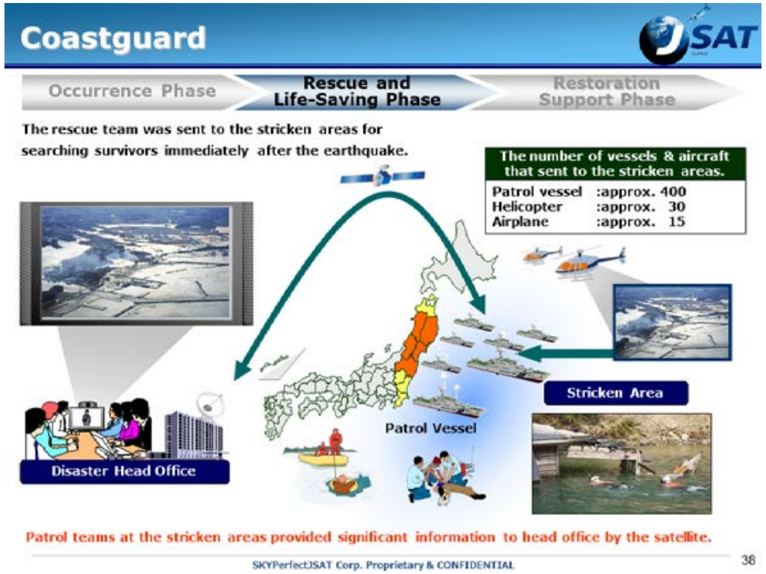
Satellite communication for the stricken areas



Satellite communication contributed for the rescue operation at the stricken areas.


Police
SAT
Occurrence Phase
Rescue and Life-Saving Phase
Restoration Support Phase
Prefectural police agencies sent approximately 6,500 police officers to the stricken areas immediately after the earthquake occurrence for the purpose of searching disaster survivors and dead bodies.
Allocated bandwidth
Existing assignment
Existing assignment
Temporary assignment
66% up
Assigned occasional use bandwidth for police agency has been fully utilized during the time of rescue.
Prefectural Police Headquarter
Stricken Area
Satellite communication played an important role in searching disaster victims and dead bodies.
SKYPerfectJSAT Corp. Proprietary & CONFIDENTIAL
37


Electric Power Company
SAT
Occurrence Phase
Rescue and Life-Saving Phase
Restoration Support Phase
Only the satellite communication was available.
Microwave
Earthquake
Headquarter
Branch Office
Destroyed by Earthquake
Terrestrial Line
Electric power companies share their satellite systems in emergency situations.
The satellite systems were utilized for voice, data and video transmission at the stricken areas.
Power Company B
Power Company C
Power Company A
Power Company D
Power Company F
Power Company E
Provision of the satellite systems utilized for:
Data Transmission:
Power Company B: 2 Flyaways
Power Company C: 2 Flyaways
Power Company E: 2 Flyaways
Power Company F: 2 Flyaways
Voice Transmission:
Power Company C: 3 Flyaways
Power Company D: 13 Flyaways
EsBird
SKYPerfectJSAT Corp. Proprietary & CONFIDENTIAL
39


Coastguard
SAT
Occurrence Phase
Rescue and Life-Saving Phase
Restoration Support Phase
The rescue team was sent to the stricken areas for searching survivors immediately after the earthquake.
The number of vessels & aircraft that sent to the stricken areas.
Patrol vessel :approx. 400
Helicopter :approx. 30
Airplane :approx. 15
Stricken Area
Patrol Vessel
Disaster Head Office
Patrol teams at the stricken areas provided significant information to head office by the satellite.
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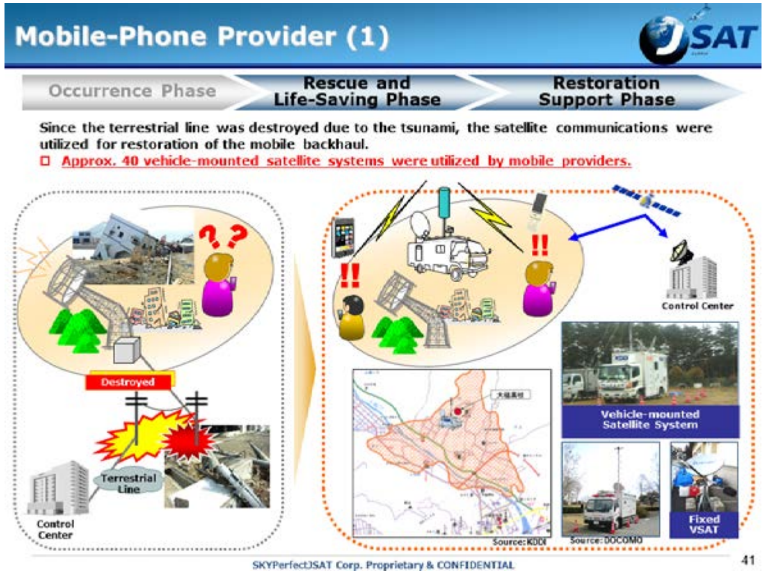
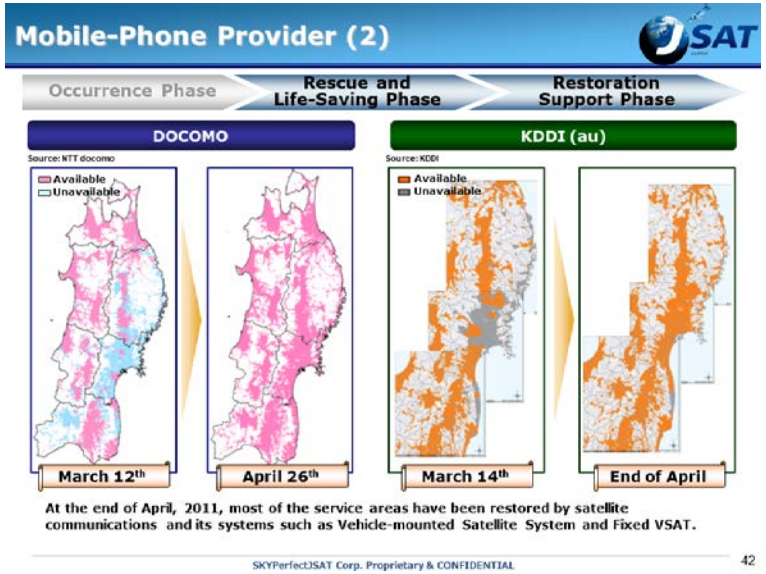
Broadcaster
SAT
Occurrence Phase
Rescue and Life-Saving Phase
Restoration Support Phase
Provision of satellite bandwidth for broadcasters immediately after the earthquake.
Allocated bandwidth
Existing assignment
Existing assignment
Additional assignment
56% up
The total amount of additional allocated bandwidth was 56 percent increase.
Broadcasting for Stricken Areas
Flyaway was utilized for the stricken areas (where SNG cannot enter).
EsBird
Emergency News
Teleport Center (Broadcaster)
SNG (Satellite news Gathering)
SKYPerfectJSAT Corp. Proprietary & CONFIDENTIAL
40


Mobile-Phone Provider (1)
SAT
Occurrence Phase
Rescue and Life-Saving Phase
Restoration Support Phase
Since the terrestrial line was destroyed due to the tsunami, the satellite communications were utilized for restoration of the mobile backhaul.
Approx. 40 vehicle-mounted satellite systems were utilized by mobile providers.
Destroyed
Terrestrial Line
Control Center
Control Center
Vehicle-mounted Satellite System
Fixed VSAT
Source: KDDI
Source: DOCOMO
SKYPerfectJSAT Corp. Proprietary & CONFIDENTIAL
41


Mobile-Phone Provider (2)
SAT
Occurrence Phase
Rescue and Life-Saving Phase
Restoration Support Phase
DOCOMO
KDDI (au)
Source: NTT docomo
Available
Unavailable
Source: KDDI
Available
Unavailable
March 12th
April 26th
March 14th
End of April
At the end of April, 2011, most of the service areas have been restored by satellite communications and its systems such as Vehicle-mounted Satellite System and Fixed VSAT.
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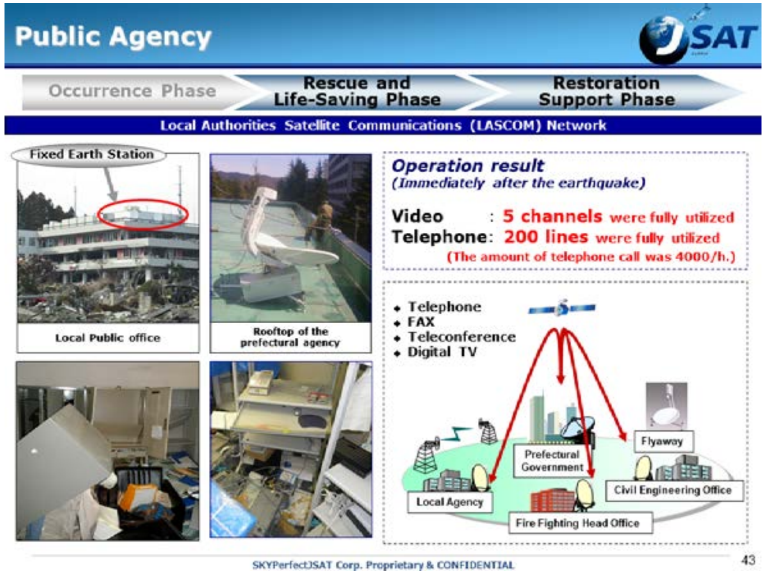
Public Agency
SAT
Occurrence Phase
Rescue and Life-Saving Phase
Restoration Support Phase
Local Authorities Satellite Communications (LASCOM) Network
Fixed Earth Station
Local Public office
Rooftop of the prefectural agency
Operation result
(Immediately after the earthquake)
Video : 5 channels were fully utilized
Telephone: 200 lines were fully utilized
(The amount of telephone call was 4000/h.)
Telephone
FAX
Teleconference
Digital TV
Flyaway
Prefectural Government
Local Agency
Civil Engineering Office
Fire Fighting Head Office
SKYPerfectJSAT Corp. Proprietary & CONFIDENTIAL
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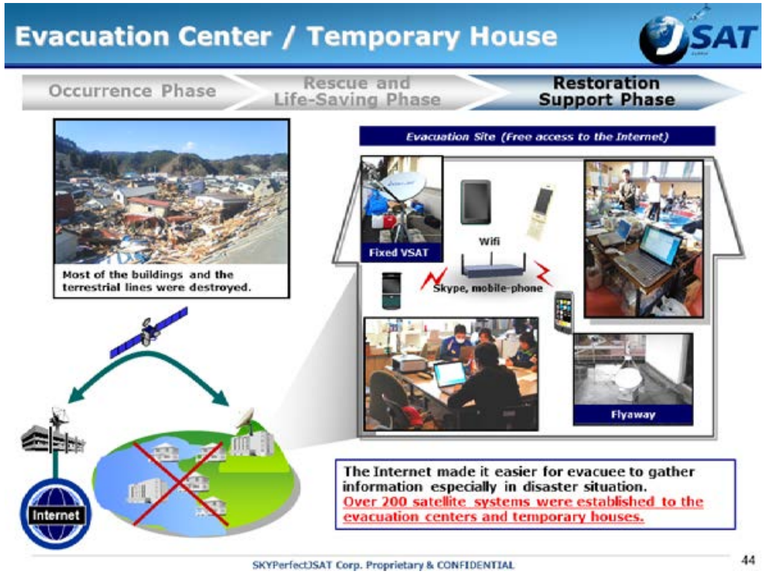
Evacuation Center / Temporary House
SAT
Occurrence Phase
Rescue and Life-Saving Phase
Restoration Support Phase
Most of the buildings and the terrestrial lines were destroyed.
Evacuation Site (Free access to the Internet)
Fixed VSAT
Wifi
Skype, mobile-phone
Flyaway
Internet
The Internet made it easier for evacuee to gather information especially in disaster situation.
Over 200 satellite systems were established to the evacuation centers and temporary houses.
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Evacuation Center / Temporary House
JSAT
Total 184 VSATs installed. (Supplementary Budget for FY2011 of Ministry of Internal Affairs and Communications.)
Installation
Antenna1
Antenna2
(Out door)
(In door)
Line pass
Source; Natori City Temporary House blog.
http://natorishikasetsu.blog.fc2.com/blog-category-1.html
PC & Wireless LAN router
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Satellite & Network Control Center
JSAT
Although our main control center at Ibaraki has kept controlling the service during the earthquake, the sub-station was also ready for switching the service operation at any time.
The operators of main control center have been sent to the sub control center to support its operation.
Switchable
Sub Control Center (Yamaguchi)
Main Control Center (Ibaraki)
EsBird
SKYPerfectJSAT Corp. Proprietary & CONFIDENTIAL
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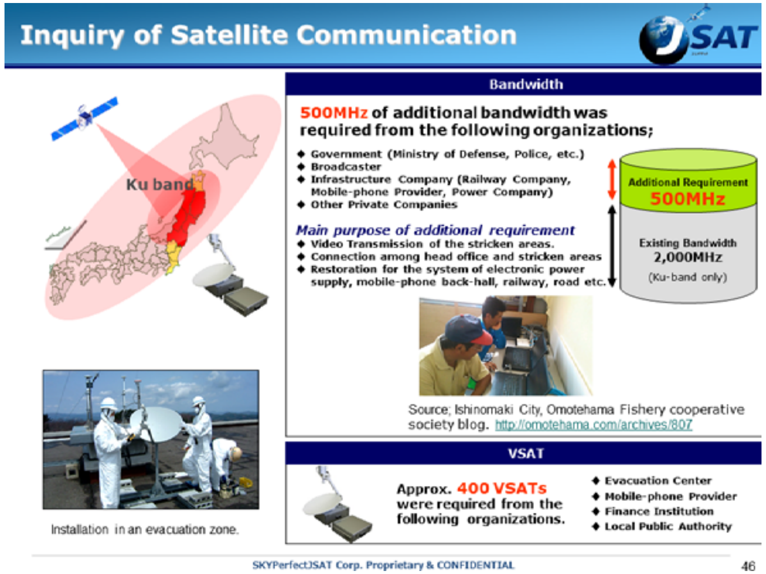
Inquiry of Satellite Communication
JSAT
Ku band
Installation in an evacuation zone.
Bandwidth
500MHz of additional bandwidth was required from the following organizations;
Government (Ministry of Defense, Police, etc.)
Broadcaster
Infrastructure Company (Railway Company, Mobile-phone Provider, Power Company)
Other Private Companies
Main purpose of additional requirement
Video Transmission of the stricken areas.
Connection among head office and stricken areas
Restoration for the system of electronic power supply, mobile-phone back-hall, railway, road etc.
Additional Requirement
500MHz
Existing Bandwidth
2,000MHz
(Ku-band only)
Source; Ishinomaki City, Omotehama Fishery cooperative society blog. http://omotehama.com/archives/807
VSAT
Approx. 400 VSATs were required from the following organizations.
Evacuation Center
Mobile-phone Provider
Finance Institution
Local Public Authority
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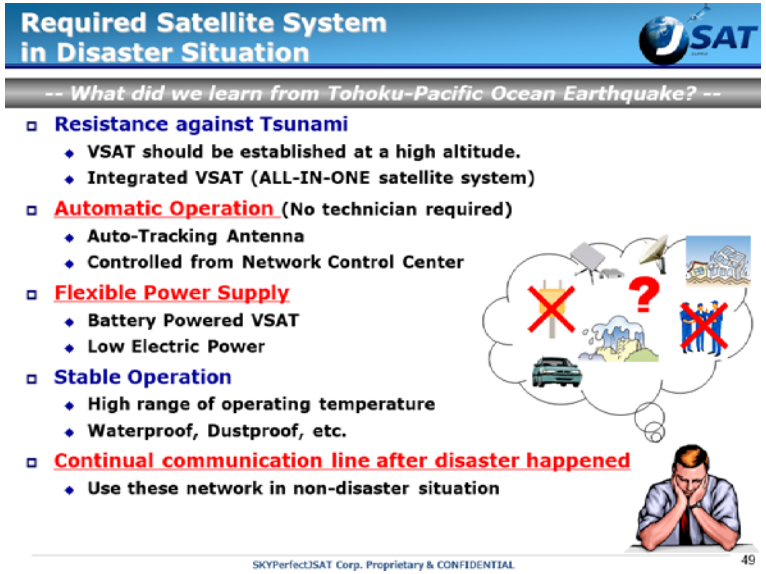
Required Satellite System in Disaster Situation
JSAT
-- What did we learn from Tohoku-Pacific Ocean Earthquake? --
Resistance against Tsunami
VSAT should be established at a high altitude.
Integrated VSAT (ALL-IN-ONE satellite system)
Automatic Operation (No technician required)
Auto-Tracking Antenna
Controlled from Network Control Center
Flexible Power Supply
Battery Powered VSAT
Low Electric Power
Stable Operation
High range of operating temperature
Waterproof, Dustproof, etc.
Continual communication line after disaster happened
Use these network in non-disaster situation
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Required Satellite System in Disaster Situation

-- What did we learn from Tohoku-Pacific Ocean Earthquake? --

- **Resistance against Tsunami**
  - VSAT should be established at a high altitude.
  - Integrated VSAT (ALL-IN-ONE satellite system)
- **Automatic Operation** (No technician required)
  - Auto-Tracking Antenna
  - Controlled from Network Control Center
- **Flexible Power Supply**
  - Battery Powered VSAT
  - Low Electric Power
- **Stable Operation**
  - High range of operating temperature
  - Waterproof, Dustproof, etc.
- **Continual communication line after disaster happened**
  - Use these network in non-disaster situation

New VSAT terminal

JSAT developed in 2012

1. **Fully auto-acquisition system**
   No need assembling
   Automatic satellite access test
2. **Single button push for setup**
   Approx. 2 minutes
3. **Automatic vocal guidance**
   Beginner can understand what's happened.

No Technical Skill Required!!

Low power antenna

JSAT has invested in 2017.

Kymeta Antenna

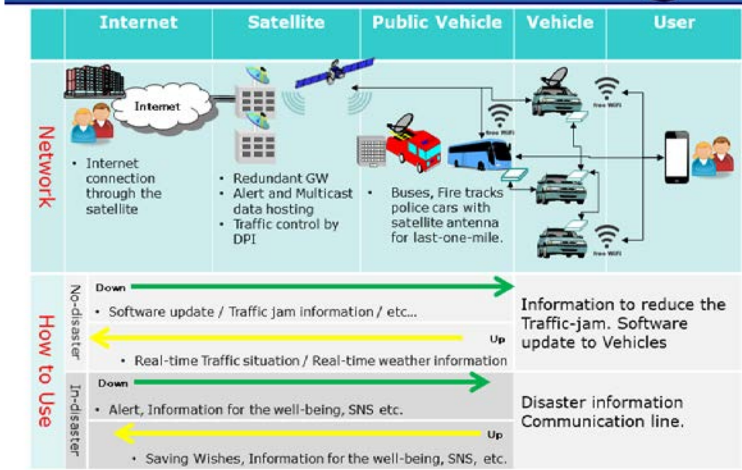
✓ Flat antenna

✓ Acquisition satellite by Software control

✓ Lower power than phased array system for acquisition satellite using liquid crystal

✓ Low cost using liquid crystal

Sample of VHUB Network via satellite




Thank you .
JSAT
SKY Perfect JSAT Corporation
SKY Perfect JSAT Corporation
Global Sales Division
Tomoki Isaac Saso
Assistant Manager
TEL: +81-3-5571-7861
FAX: +81-3-5571-1703
E-mail: saso-tomoki-isaac@sptvjsat.com
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Entry Number: Session 2 - 3
Presenter Name: Yasuo Oishi, Honda Motor, Japan
Title: HONDA, Origin of HONDA TECHNOLOGY for I-Trip

HONDAの中で受け継いだ思い(技術)

ORIGIN OF HONDA TECHNOLOGY FOR i-TRIP

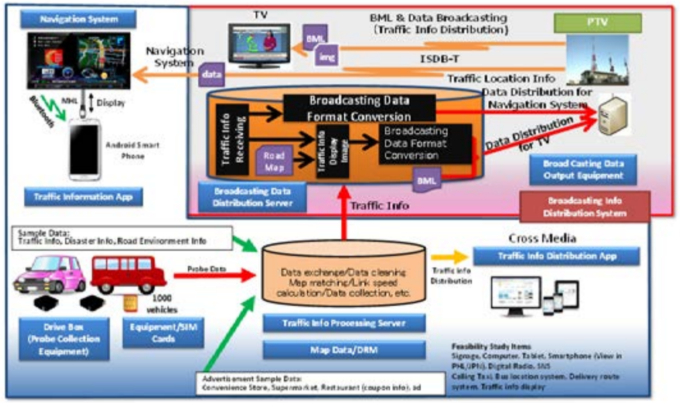
i-TRIP:
For Traffic condition information system by DTV, Japan MIC researched project in Philippines .

HONDA
The Power of Dreams

2015 Project started･･･

Telematics — START OF 2015

I. System Model Analysis



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Telematics — START OF 2015

II. Business Model Analysis

<Traffic Information Distribution Business>
- Advertisement, Shop/Restaurant/Company
- Information and data selling for marketing, etc.

Existing Traffic Service

Source: Metro Manila Traffic Navigator

Proposed Information Service

Source: VICS Center

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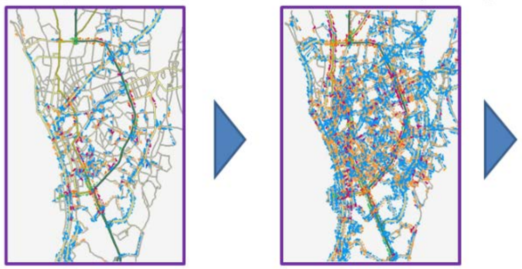
Annex 5

Telematics — Probe car data can be processed into traffic jam information

DATA QUALITY:
Probe data collection frequency and collected data type are equivalent to

Japanese InterNavi service(Honda)

Real time probe information | Real time + statistical processing | Display Navi application



Statistics:
Extracted from a database
by conditions such as day of the week, time

5

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Concept of Internavi

In order to realize a comfortable car life of the driver, Drive information service / network that is more safe and environment friendly

BUT
Information technology should be DTV
why is not it Telecommunication・・・・
why did HONDA join???

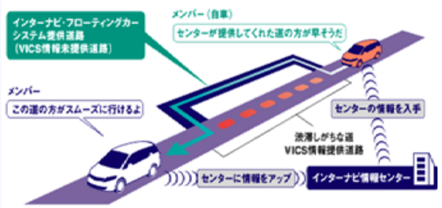
ホンダの中で受け継がれた技術 それは開発者の思い

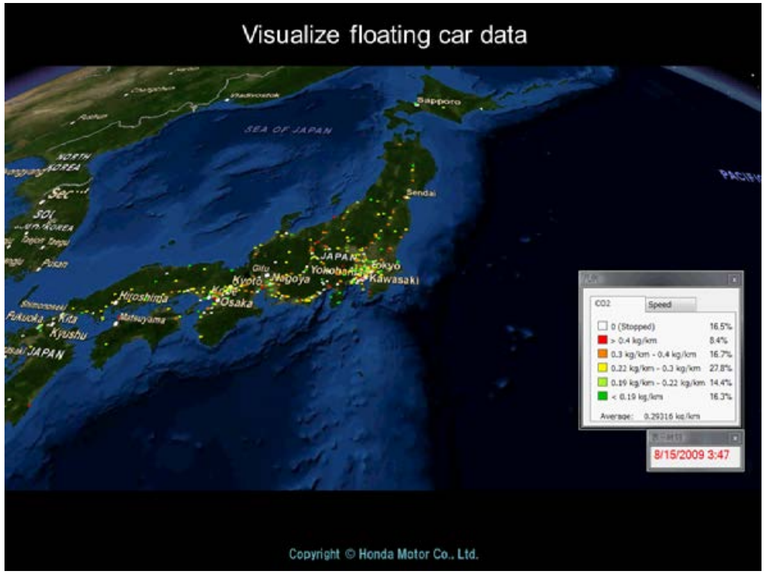
Technology inherited in Honda It is a developer's thought

Floating car (probe) traffic information system

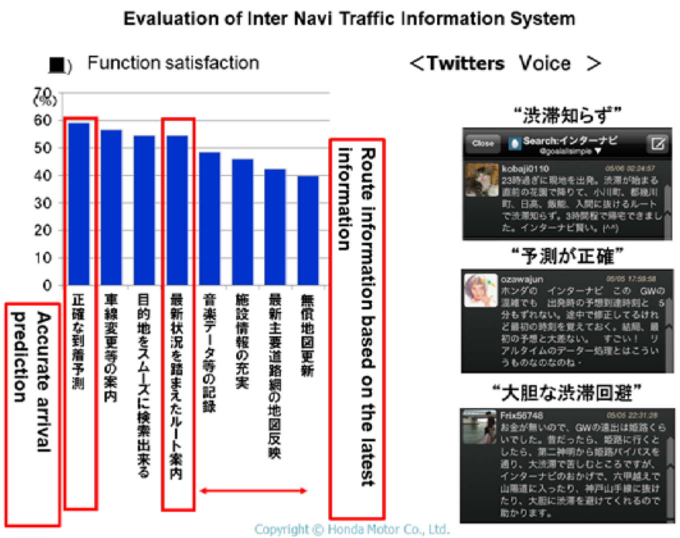
Everyone shares traffic information gathered among members
Avoid traffic jams and guide earlier routes to your destination

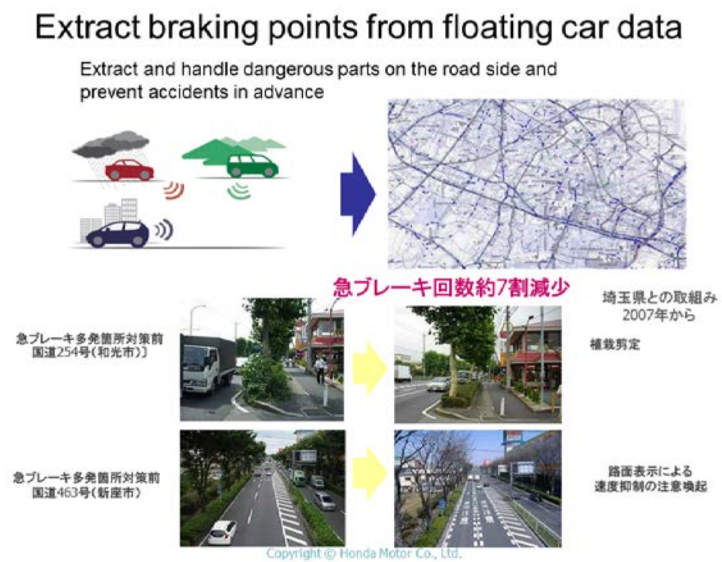
2003年10月開始
世界初
自動車メーカとして
world's first



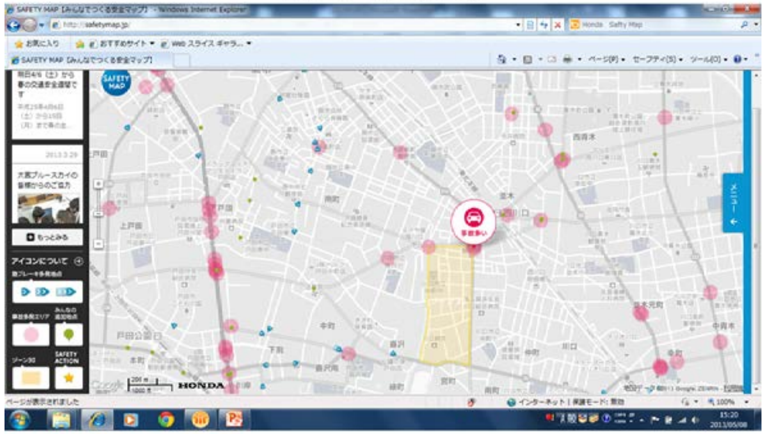

Visualize floating car data
Sapporo
SEA OF JAPAN
Sendai
JAPAN
Tokyo
Yokohama
Kawasaki
Kyoto
Nagoya
Osaka
Hiroshima
Matsuyama
Kyushu
CO2
Speed
0 (Stopped) 16.5%
> 0.4 kg/km 8.4%
0.3 kg/km - 0.4 kg/km 16.7%
0.22 kg/km - 0.3 kg/km 27.8%
0.19 kg/km - 0.22 kg/km 14.4%
< 0.19 kg/km 16.3%
Average: 0.29316 kg/km
8/15/2009 3:47
Copyright © Honda Motor Co., Ltd.


Efforts to reduce disasters
Provide car navigation system with weather and disaster information affecting drive
雨情報
豪雨地点予測情報
雪情報
凍結情報
地震情報
ナビのルートを
サーバへアップ
気象情報
ルート上に
災害発生！
発生地域
Premium Club
Copyright © Honda Motor Co., Ltd.


Evaluation of Inter Navi Traffic Information System
Function satisfaction
<Twitters Voice >
70
60
50
40
30
20
10
0
正確な到着予測
車線変更等の案内
目的地をスムーズに検索出来る
最新状況を踏まえたルート案内
音楽データ等の記録
施設情報の充実
最新主要道路網の地図反映
無償地図更新
Accurate arrival prediction
Route information based on the latest information
"渋滞知らず"
"予測が正確"
"大胆な渋滞回避"
Copyright © Honda Motor Co., Ltd.


Extract braking points from floating car data
Extract and handle dangerous parts on the road side and prevent accidents in advance
急ブレーキ回数約7割減少
埼玉県との取組み
2007年から
急ブレーキ多発箇所対策前
国道254号(和光市)
植栽剪定
急ブレーキ多発箇所対策前
国道463号(新座市)
路面表示による
速度抑制の注意喚起
Copyright © Honda Motor Co., Ltd.

Honda Safety Map



http://safetymap.jp/

Utilization of Big Data

大規模災害時、車両データを公開し、被災地の移動支援に役立てる

In case of a large-scale disaster, release vehicle data and use it for mobility support of disaster area

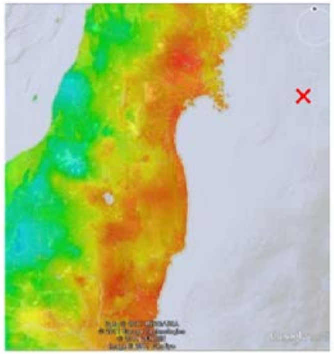
GRAND AWARD
2011グッドデザイン大賞受賞
（応募分野：社会のデザイン）

Experience the Great Earthquake

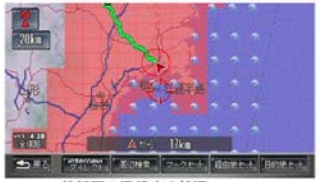
牡鹿群女川町

Efforts of the Great East Japan Earthquake

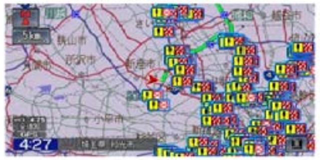
2011年3月11日14時46分 東日本大震災発生



津波警報と地震震度を表示



首都圏の通行止め状況



Efforts of the Great East Japan Earthquake

3月12日(朝)

3月16日(新潟、茨城を追加)

For next

～次に震災が発生した時に、救える命を救う取り組み～

Efforts to save lives that can be saved the next time the earthquake occurs

石巻市松原地区、11kmの渋滞　200人以上が車内で死亡

Ishinomaki-shi Matsubara district, more than 200 traffic jams of 11 km died in the car

14万台ものクルマが津波で流された

As many as 140 thousand cars were drifted by the tsunami

亡くなった方の6%がクルマの中

6% of the deceased people are in the car

Experience the Great Earthquake

牡鹿群女川町

Analysis of probe

3.11発災時の石巻渋滞状況

from now on

世の中とオープンに、いつでもどこでもつながることで
さらに役だつ情報を提供する

Open to the world, to connect anytime, anywhere　Provide further useful information

◆発災時でもスムーズに
避難できる道路インフラ整備

◆何時でも何処でもタイムリーに
情報が伝わるインフラ整備

Timely anytime anywhere information is transmitted　Infrastructure development that

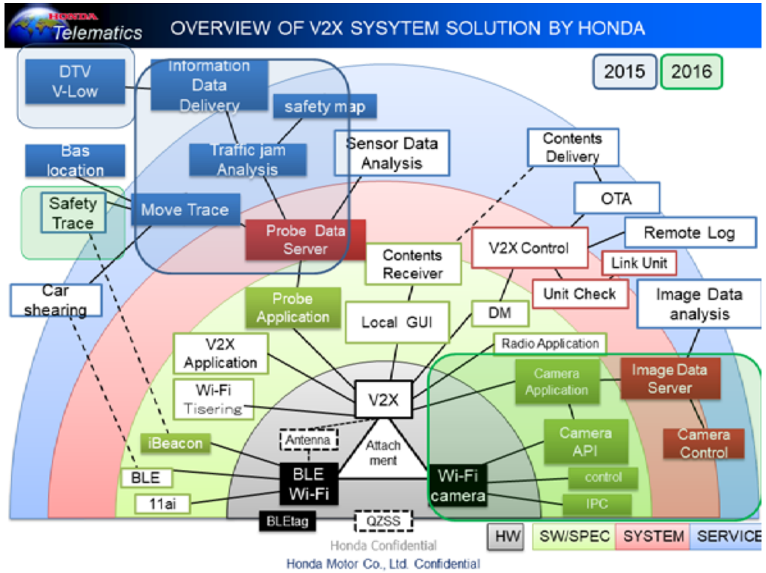
◆Big Data連携

道路状況投稿情報

プローブ・マイクロメディア

HONDAが日本で必要だとわかったものは？・・・・・・・その1つがDTV

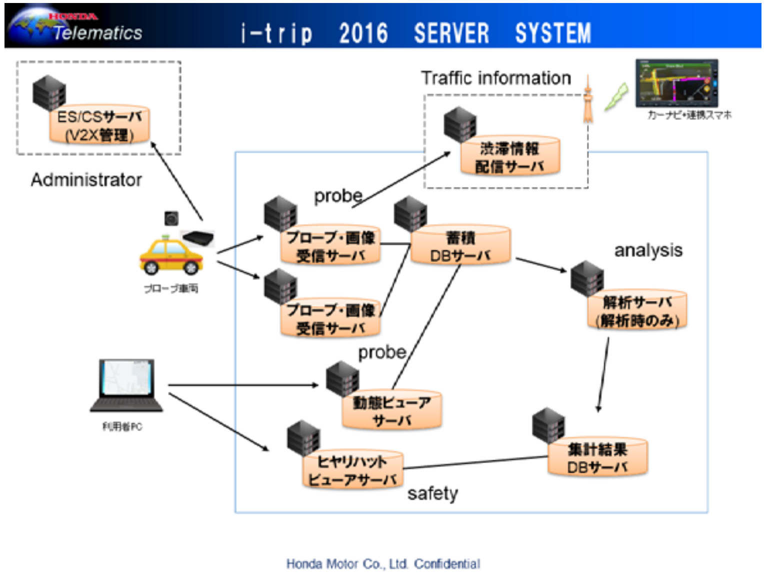
----The same in the Philippines----



i－Trip 2016

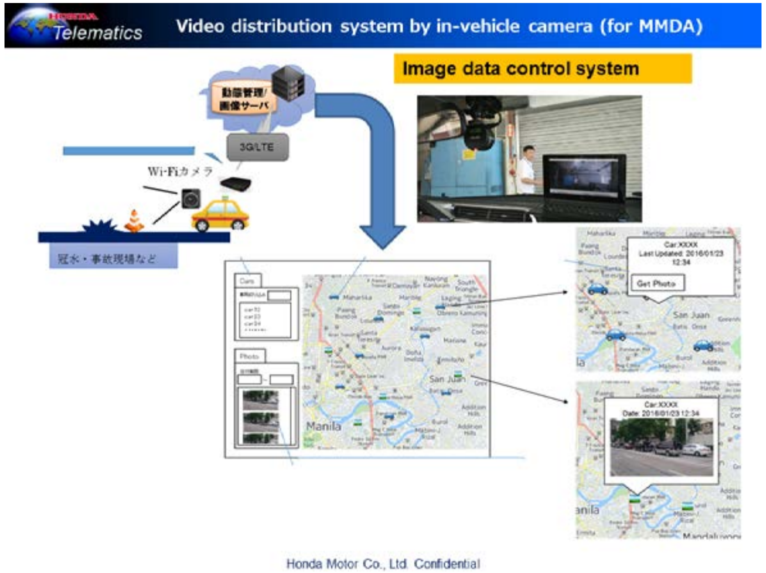
今、HONDAが日本で同時に参画しているPROJECT技術をフィリピンにも同時に

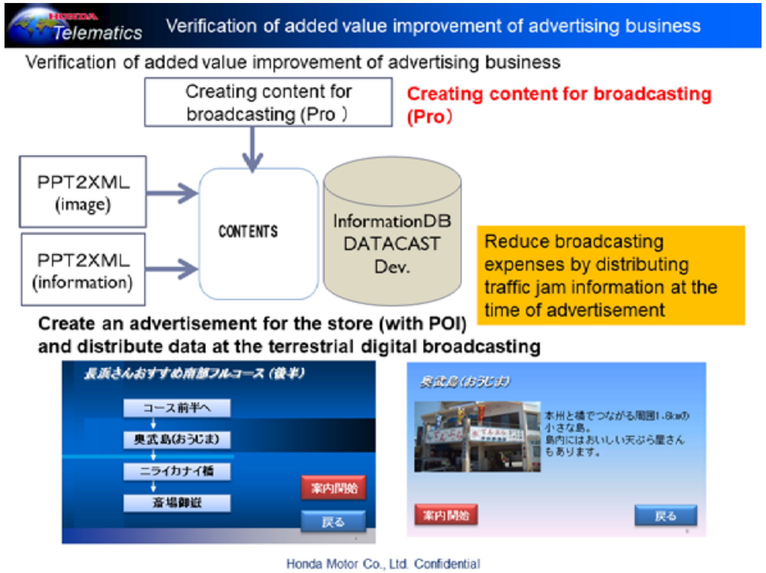
At the same time, we also have PROJECT technology which HONDA is simultaneously participating in Japan to the Philippines




Telematics
Navigation system for Demonstration experiment
PILOT NAVI(VXM-174VFi改)
After washing out the necessary parts, about the commercial flow, also about the logistics
Driving on Gen. Araneta
Honda Motor Co., Ltd. Confidential

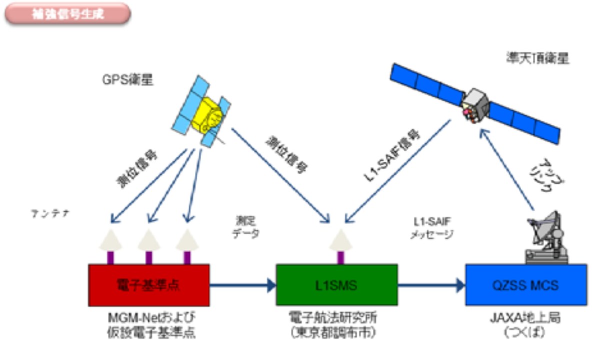

Telematics
Map data distribution technology in digital broadcasting system
Shinshu TV narrowcast indoor test environment use
Narrowcast BOX
Wi-Fi
USB connection update
Map update verification with data communication function in terrestrial digital broadcasting
Honda Motor Co., Ltd. Confidential


Telematics
Video distribution system by in-vehicle camera (for MMDA)
Image data control system
動画管理/画像サーバ
3G/LTE
Wi-Fiカメラ
冠水・事故現場など
Manila
Honda Motor Co., Ltd. Confidential


Telematics
Verification of added value improvement of advertising business
Verification of added value improvement of advertising business
Creating content for broadcasting (Pro)
Creating content for broadcasting (Pro)
PPT2XML (image)
PPT2XML (information)
CONTENTS
InformationDB DATACAST Dev.
Reduce broadcasting expenses by distributing traffic jam information at the time of advertisement
Create an advertisement for the store (with POI) and distribute data at the terrestrial digital broadcasting
コース前半へ
奥武島(おうじま)
ニライカナイ橋
斎場御嶽
案内開始
戻る
Honda Motor Co., Ltd. Confidential

Improvement of GPS position information by QZSS (quasi-zenith satellite) parent reinforcement signal

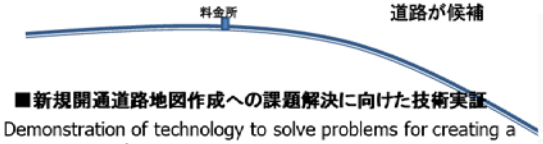
For example ...
Make the bus routing system simpler and direct guide to the shop without errors



High accuracy positioning experiment

■通行課金への課題解決に向けた技術実証
Demonstration of technology to solve problems for toll charging

高速道路の本線と側道の分離性能検証



または、上が高速道路、下が一般道の道路が候補

■新規開通道路地図作成への課題解決に向けた技術実証
Demonstration of technology to solve problems for creating a new open road map

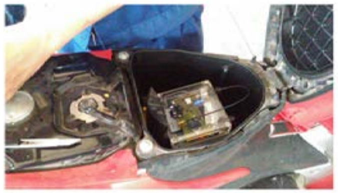
車線識別位置精度検証
走行軌跡の位置精度、バラツキの検証
道路路面状況を並行して測定

最低2車線の道路を走行して車線識別能力をGPS単独と比較する

Mounting on a two-wheeled vehicle

Honda Wave α

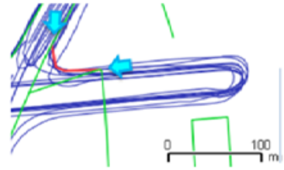
WDB+GNSS



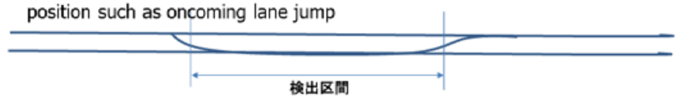
antenna

■住宅位置識別への課題解決に向けた技術実証
Demonstration of technology to solve problems for housing location identification

建物が密集している家の
前に車を止めて位置を計測し、GPS単独精度と比較する。



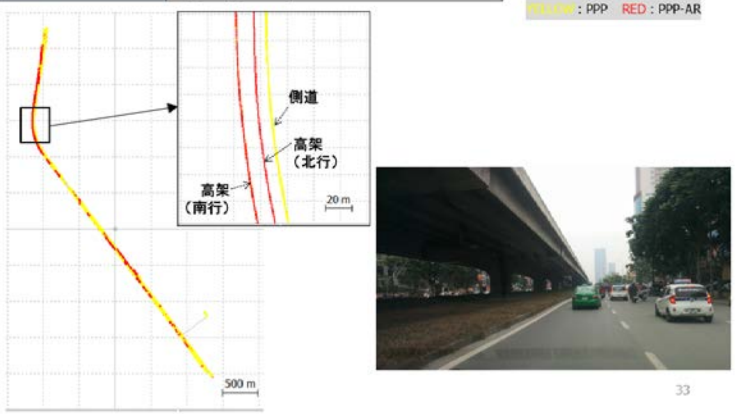
■対向車線飛出しなどのレーンチェンジ位置検出への課題解決に向けた技術実証
Demonstration of technology to solve problems for detection of lane change position such as oncoming lane jump



Telematics Elevated Road / Side Road Driving GPS+QZSS+GLONASS

Positioning Software	rtkrcv_rtcm 0.7.3 (MALIB)
Augmentation	MADOCA via QZSS + Local Ionosphere at HUST
Satellite Systems	GPS + QZSS + GLONASS
Route	Highway / Frontage road

YELLOW : PPP RED : PPP-AR



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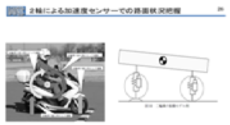
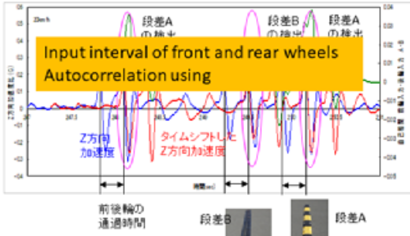
High precision position · New value service proposal by utilizing probe of G sensor? (Road surface condition detection in driving, automatic creation of road network map)

■ Road surface condition detection

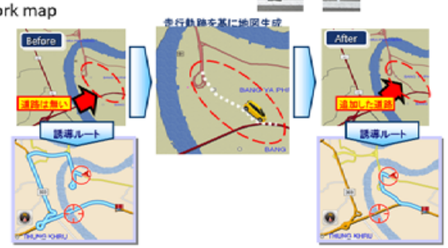
Road surface of emerging countries is in poor condition Understand the situation and need an effective repair plan





■ Automatic creation of road network map

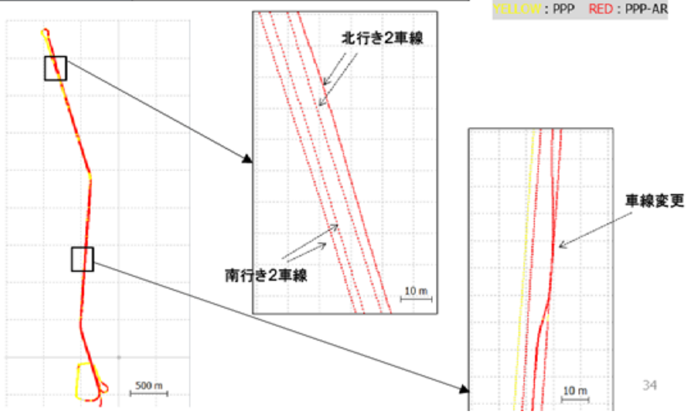
There are many newly constructed roads in emerging countries,? Open roads are hardly reflected



Telematics New road (bridge) positioning GPS+QZSS+GLONASS

Positioning Software	rtkrcv_rtcm 0.7.3 (MALIB)
Augmentation	MADOCA via QZSS + Local Ionosphere at HUST
Satellite Systems	GPS + QZSS + GLONASS
Route	Bridge

YELLOW : PPP RED : PPP-AR

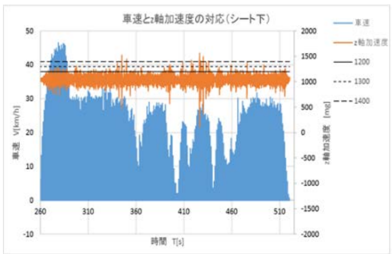


34

2輪車走行による道路段差自動計測実験

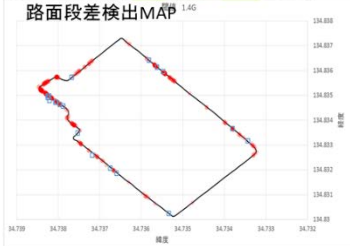
Automatic road level difference measurement experiment by motorcycle driving

V2Xユニットでの計測波形



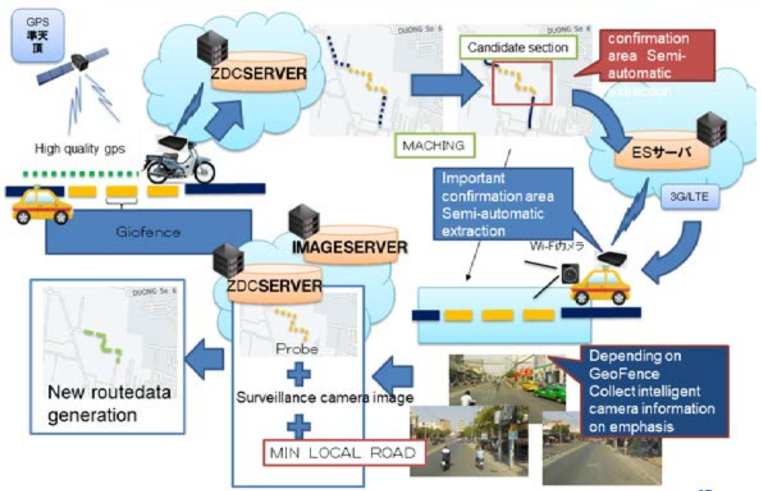
走行テストコース

路面段差検出MAP



Annex 5

MAP AUTO MAKING SYSTEM IMAGE



PROBE DATA LEVEL UP

TIMING	Ver.	OUTLINE
2015/08	新常磐Bus location	3 seconds measurement · 15 seconds transmission · HTTP version DEMO
2015/10	DANGO-P	3 seconds measurement · 15 seconds transmission · TCP version Reduce data volume
2015/12	333V Bus LOCATION	1 second measurement · 3 minutes transmission · With acceleration · TCP version Acceleration response
2016/2	神戸市BUS LOCATION	1 second measurement · 15 seconds transmission · With acceleration · UDP version data reduction
2016/10	DANGO-P2 神戸・加古川	1 second measurement · 15 seconds transmission · With acceleration · UDP version pseudo push cooperation (camera)

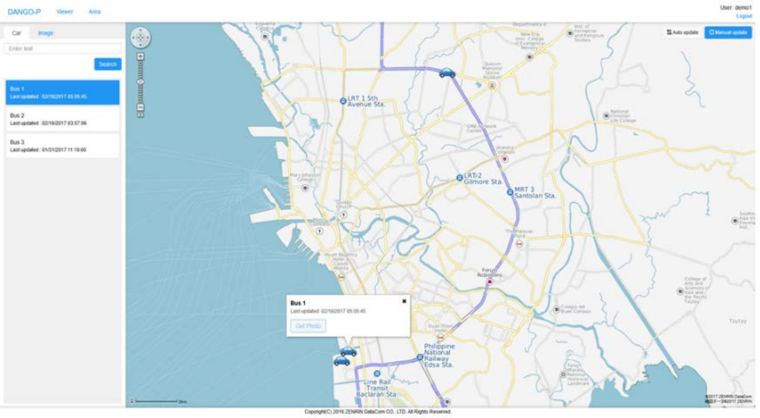
Evolution of probe data

プローブ収集の質をＵＰ　（データ記録３秒⇒１秒　１５秒間隔通信）

UP of probe collection quality (data recording 3 seconds ⇒ 1 second 15 seconds interval communication)

BUS LOCATION SYSTEM

Telematics — BUS LOCATION SYSTEM



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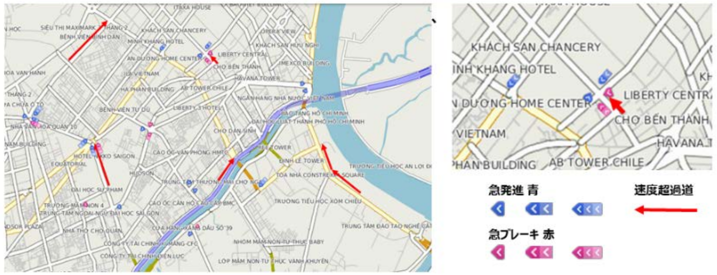
Approach for Next Disaster Prevention and Reduction

Telematics — PROBE DATA LEVEL UP･･･NEW BIz.

Grasp incident and hazardous driving conditions as seen from high quality probe data collection

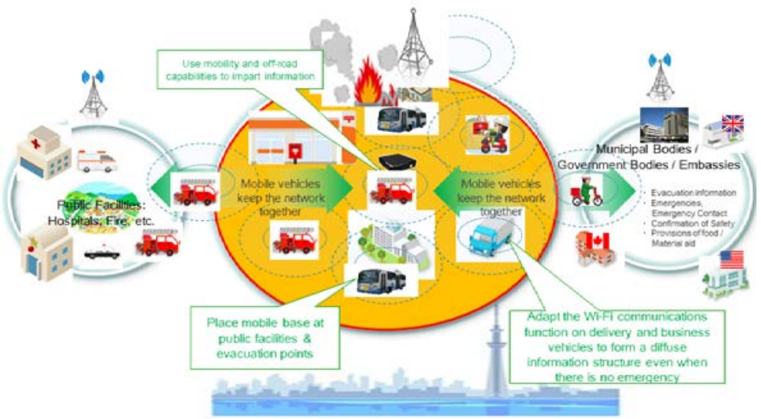
Receive acceleration / deceleration of vehicle from highly precise 3G sensor of V2X unit (received once per second)



For each individual vehicle, you can see the driving situation for each driver
It is used for activities to encourage safe driving of drivers (enlightenment, education,etc.)

Telematics — Emergency-time ad hoc network using V2X unit

Area of Network Disruptions



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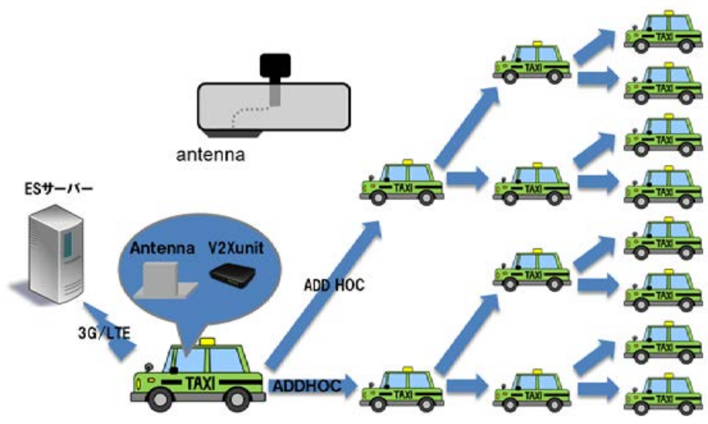
Telematics — Distributed transfer



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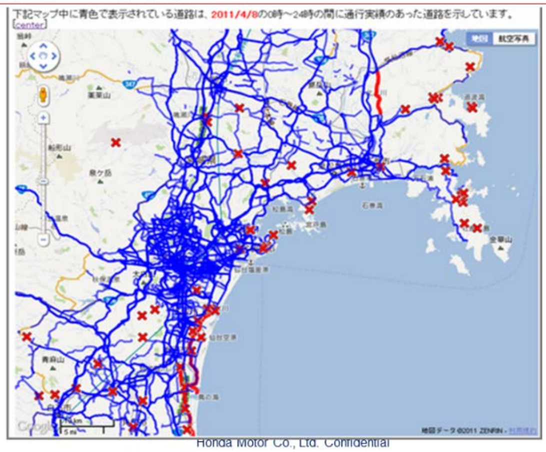
Telematics — Making IMAGE DATA

Practical example: Latest disaster area about 300 K Traffic results MAP emergency ad hoc propagation



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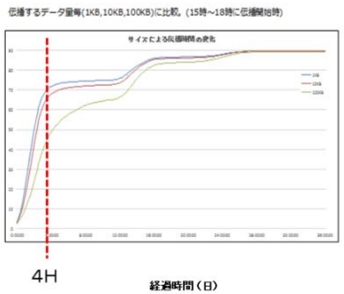
Telematics — V2X ADD HOC Demonstration experiment

Mirai-shi taxi operating in Osaka carries out interaction with 90 cars

(A) Taxi service (90 cars for 2 days)



(B) Data summation result of propagation experiment

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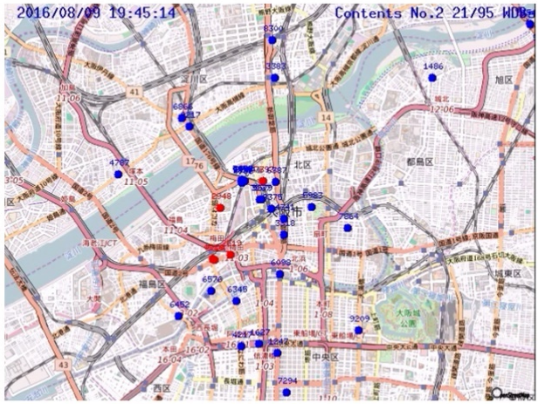
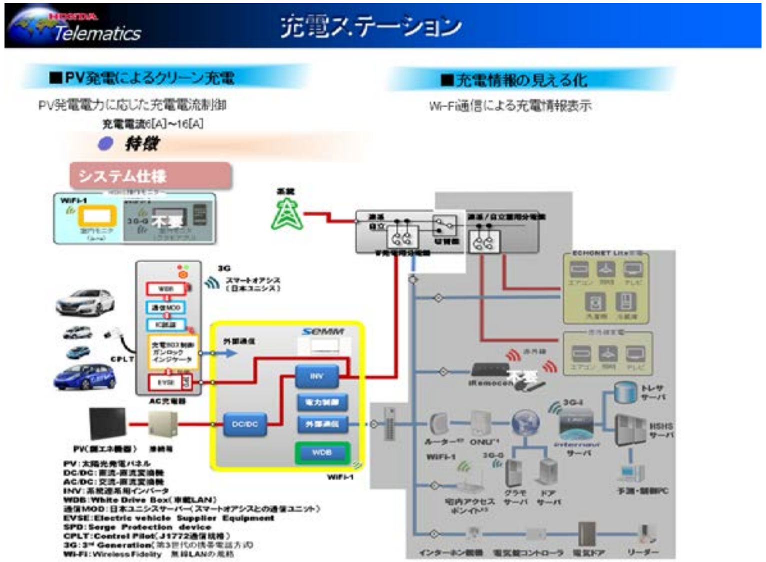
HONDA
The Power of Dreams



DTN,É,æ,é2ndƒRƒ“ƒeƒ“ƒc

HONDA
The Power of Dreams

But where does energy come from?



Toward expansion of the connected world
~ strong even when a disaster occurs ~

Expand the world leading from "telling" to "communicating"
at any time in preparation for the future

HONDA
The Power of Dreams

HONDA Telematics

The Origins of HONDA

1947 Release Honda A Type

I want to be of some use to people, and
to provide something that's useful and fun to use

HONDA
The Power of Dreams
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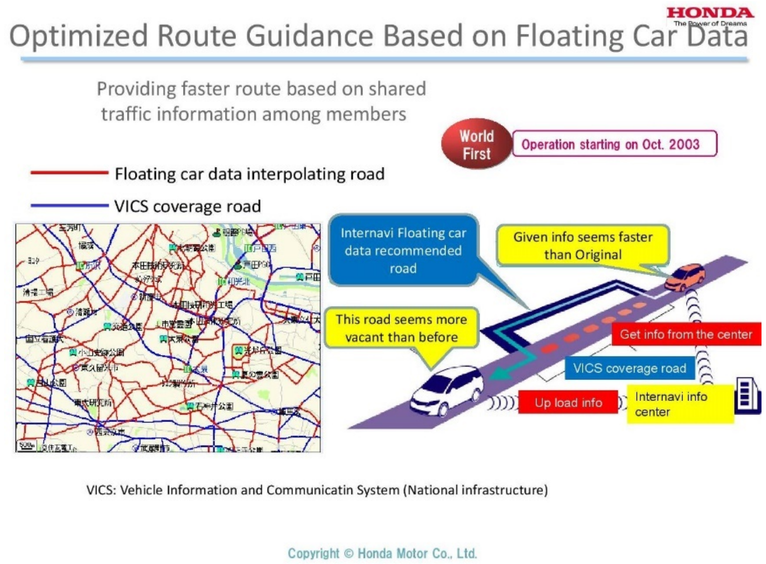
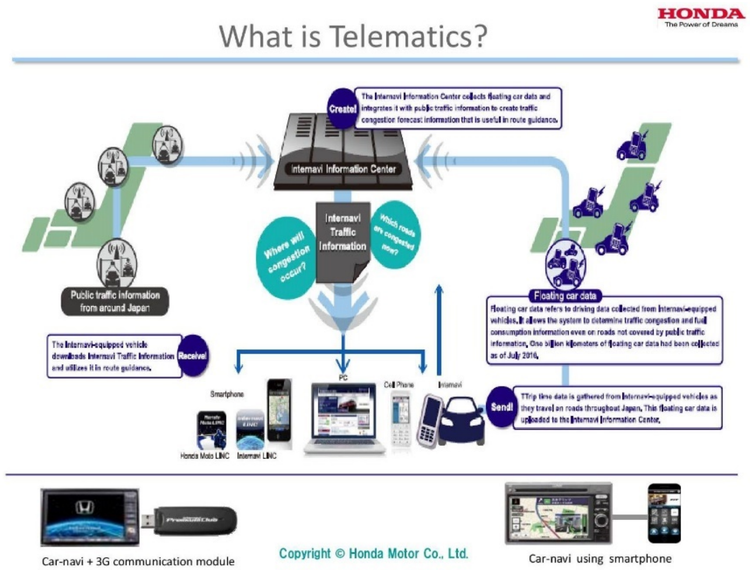
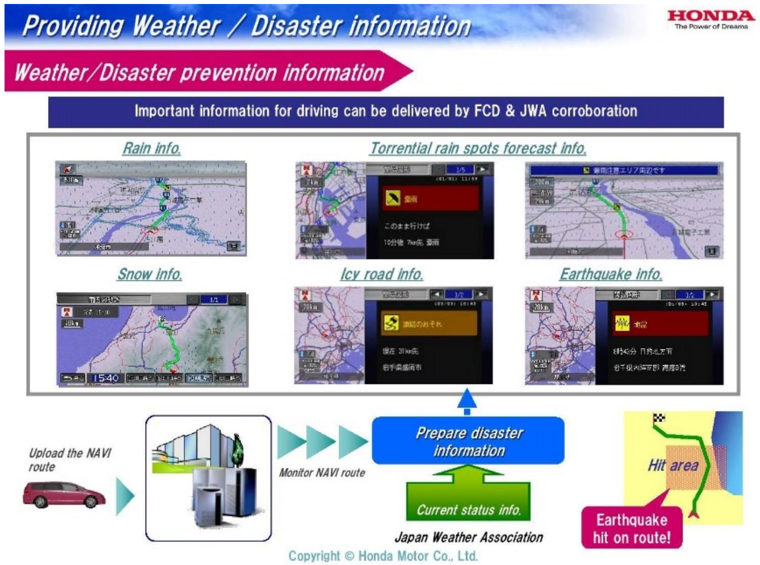
Entry Number: Session 2 - 3 - 2
Presenter Name: Akira Iihoshi, Honda Motor Co., Ltd., Japan
Title: Approach for disaster preventionand reduction using Honda telematics



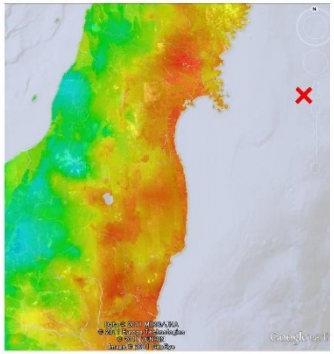




Providing Weather / Disaster information

East Japan area earthquake (Mar. 11, 2011)

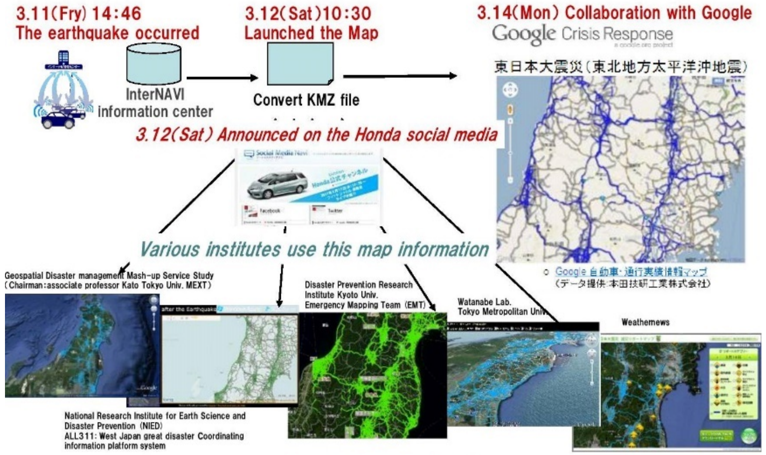
Internavi delivered information to subscriber on Mar.11.2011



Display tsunami and earthquake area

Display closed road information around the TOKYO

Great Japan Earthquake "Passable road information" sharing



Automatic message send with car location in big earthquake

クルマが震度5弱以上のエリアで地震に遭遇した場合に作動
When seismic intensity is over 5, automatically the system send email to family with car position.

Lessons learned by the huge earthquake

140,000 cars have been attacked by the tsunami.
People who died in the car, is 6% of all deaths.

People who could not recognize the tsunami warning are about 30 % of the people that were in driving.

Even if the ground communication facilities have been destroyed, we need a way to send the disaster information.

8

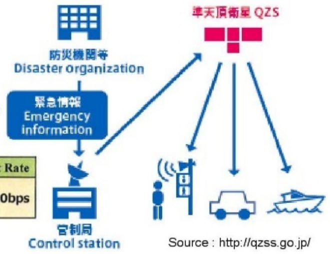
Further to disaster damage mitigation in future

Satellite Report for Disaster and Crisis Management using QZSS* in Japan

This is a service to transmit disaster-related information, such as heavy rain, earthquakes and tsunamis; crisis management information, such as terrorism; and official announcements, such as evacuation advisories. QZSS transmits overseas earthquakes and Northwest Pacific tsunamis because signals can also be received in the Asia and Oceanic regions.

*QZSS:Quasi-Zenith Satellite System launched by Japan 2018 April in available.

信号名称	配信サービス	中心周波数	変調方式	Bit Rate
L1S	サブメータ級測位補強サービス 災害・危機管理通報サービス	1575.42MHz	BPSK	250bps



Source : http://qzss.go.jp/

It's effective, when the ground communication facilities have been destroyed by huge earthquake. We can receive this information at the GPS receiver.

Further to disaster damage mitigation in future

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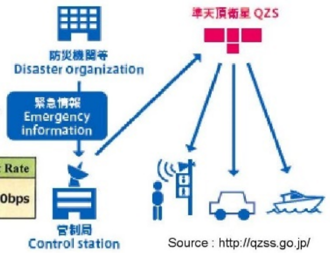
9



Thank you for your attention.

Entry Number: Session 4 – 1
Presenter Name: Tomoki Isaac Saso, SKYPerfect JSAT, Japan
Title: JSAT Demo