Design and Development of Decision Support System Using Near Cloud for Disaster Management and Risk Reduction

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April Jewel Domingo

Advisers:

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Multi-platform ICT Decision Support System UAVs, Vehicle Hubs, Ubiquitous Computing for Disaster Risk Reduction

Critical Information System for Evacuations, Early Response, and Mission Planning.

Dr. N. Libatique, Dr. G Abrajano, Dr. G Tangonan
C. Favila, D. Solpico, D. Lagazo

ATENEO DE MANILA UNIVERSITY
PHILIPPINES

Overview

Ateneo Innovation Center

Introduction

Research Teams

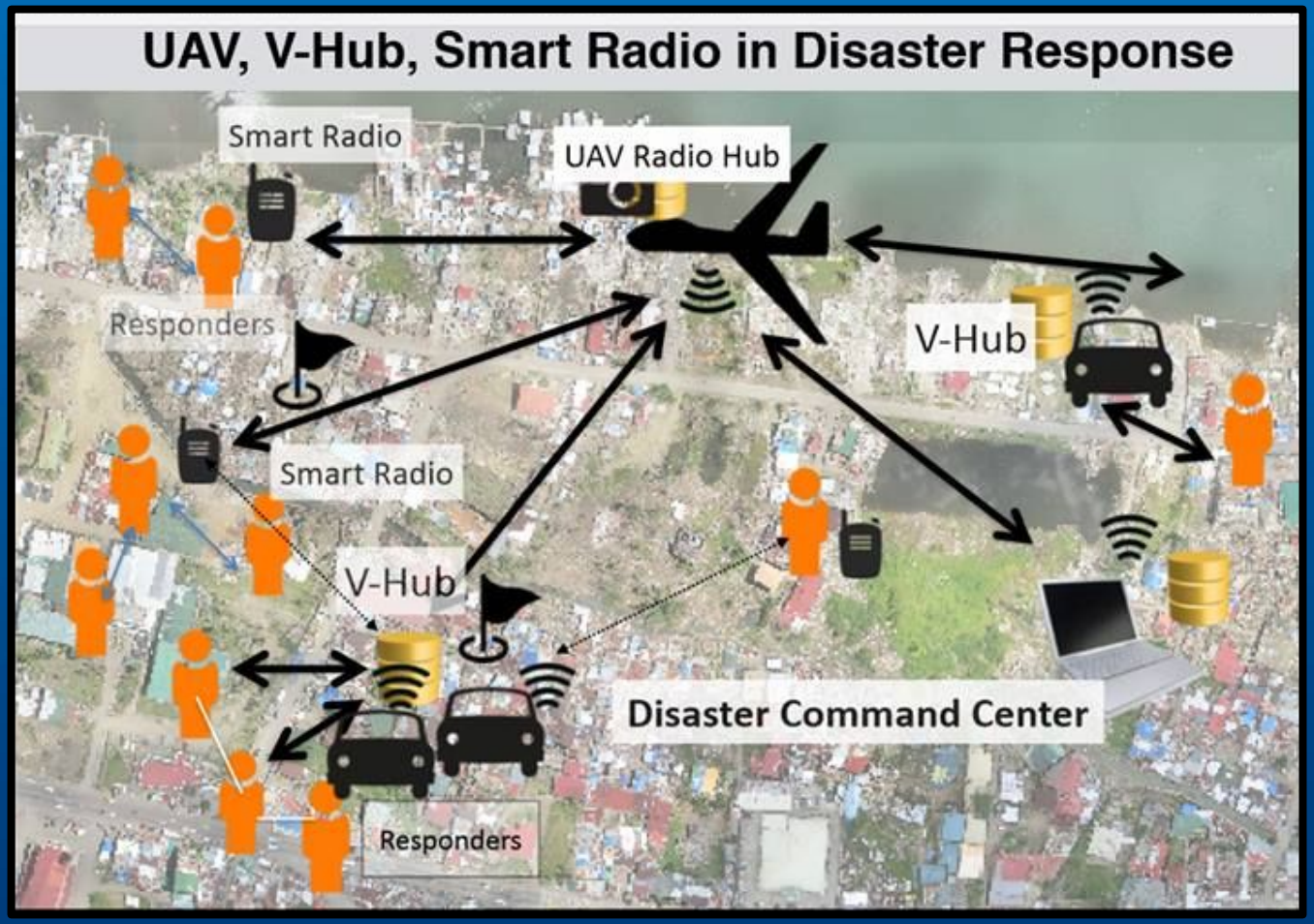
UAV and UGV Team (9:00, Wed)

Modeling and Simulation Team (10:30, Th)

IBR-DTN Team (10:00, Th)

Mission Control

Bigger Picture



Situational Awareness

Objective

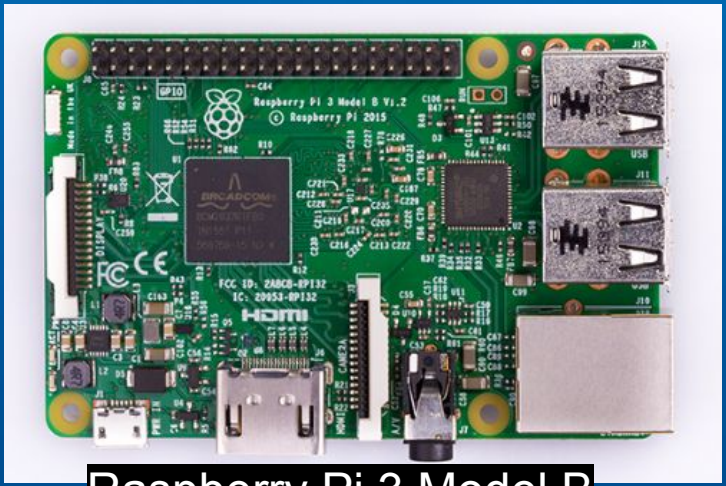
This research aimed to design and develop an information management and visualization system for post disaster situational awareness and decision support.

Accomplishments

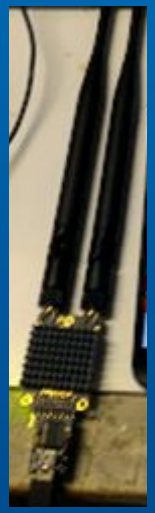
- Design post-disaster information system based on near cloud nodes
- Develop use cases for field-deployable kiosks and command and control post-disaster environments
  - Broadcast Mode
  - Mapping
  - Data Mining-ready
    - Facial Recognition-ready
    - Context Tagging Decision Support
  - Raspberry Pi Near Cloud
    - Live Message Board
    - On Premise File Sharing
- Develop a near cloud-based multi-interfaced enabling platform for future use cases

Technological Approach

Hardware



Raspberry Pi 3 Model B



915 MHz RF Antenna

- **A 1.2GHz 64-bit quad-core ARMv8 CPU**
- **802.11n Wireless LAN**
- Bluetooth 4.1
- Bluetooth Low Energy (BLE)
- **1GB RAM**
- **4 USB ports**
- 40 GPIO pins
- **Full HDMI port**
- **Ethernet port**
- Combined 3.5mm audio jack and composite video
- Camera interface (CSI)
- Display interface (DSI)
- Micro SD card slot (now push-pull rather than push-push)
- VideoCore IV 3D graphics core

LCD SCREENS

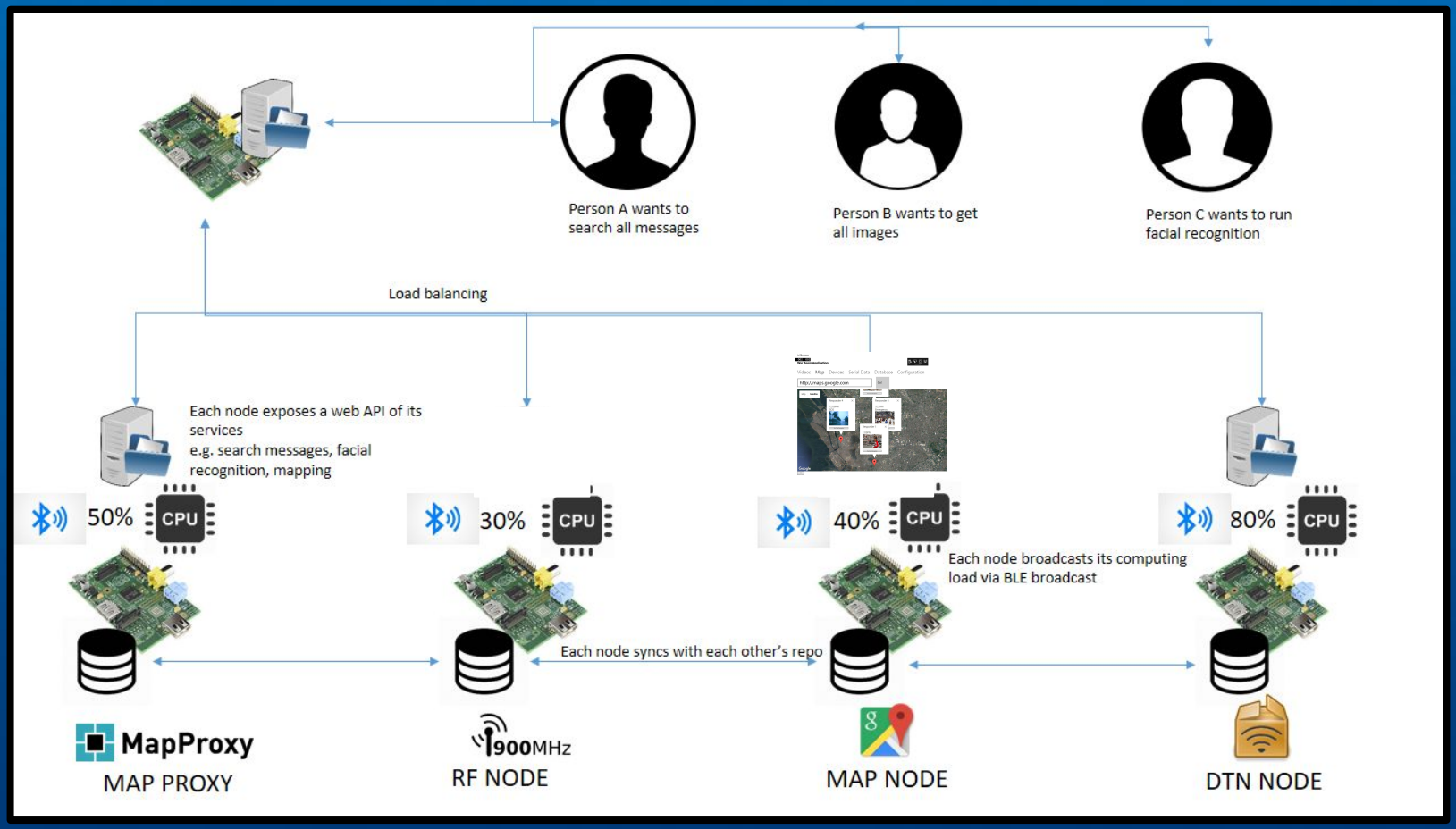
Terabyte Hard Drives

Technological Approach

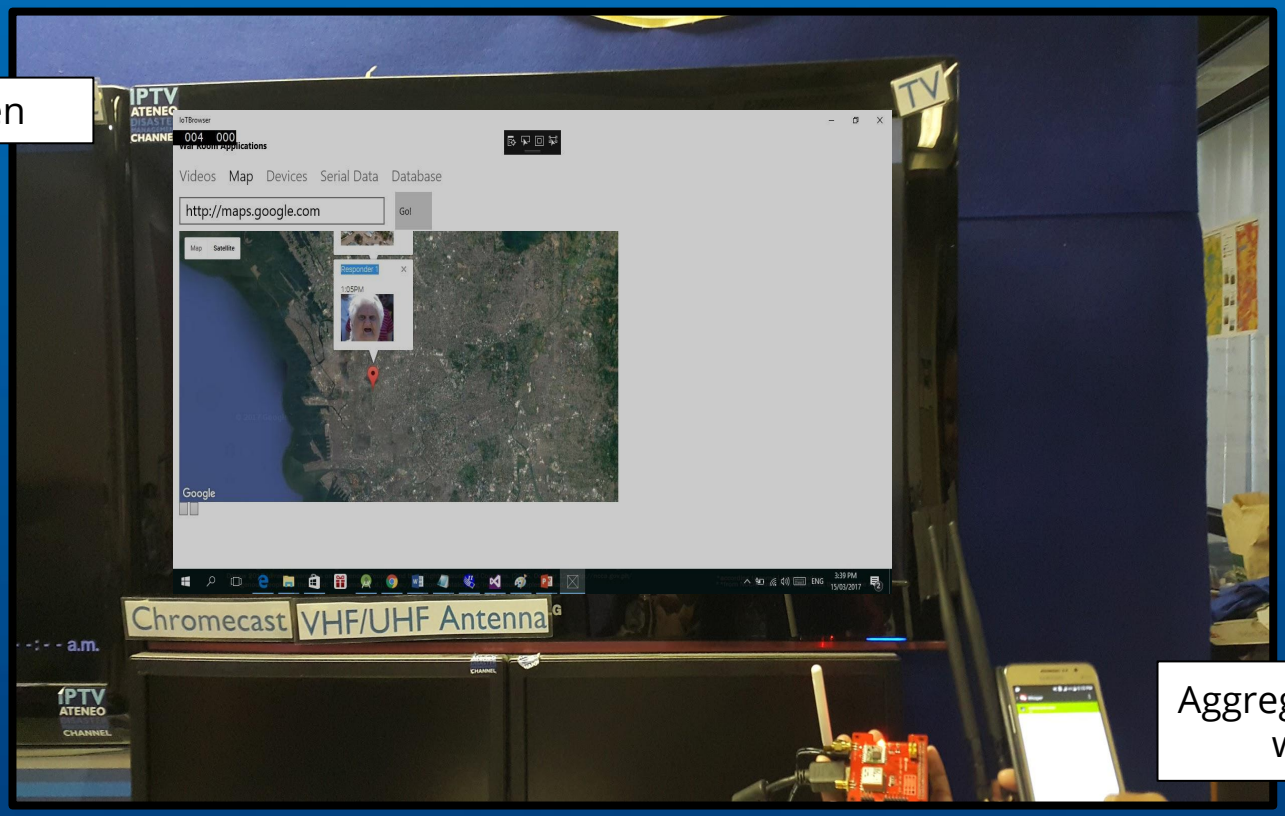
Software

Raspbian and Windows IoT Core

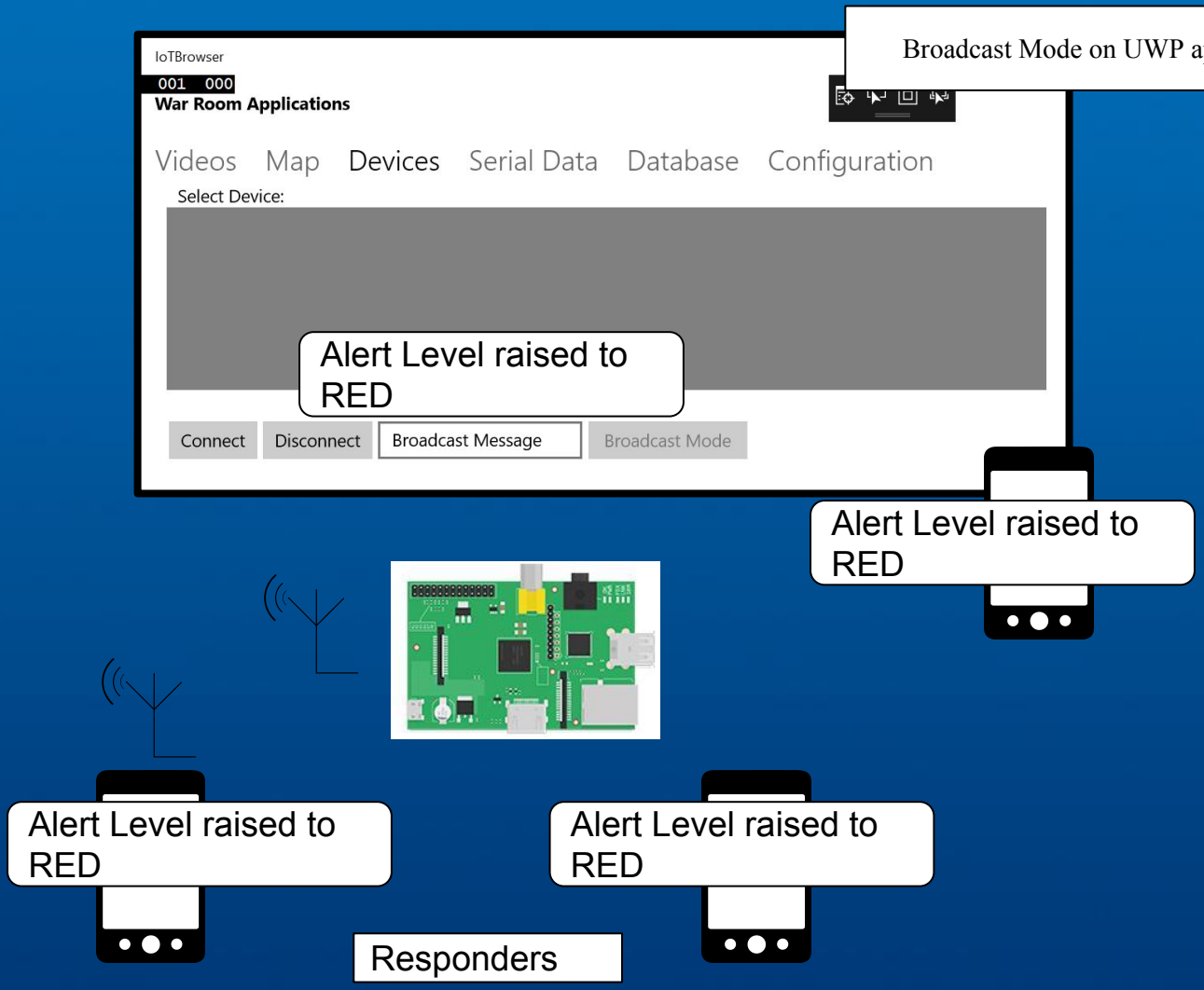
System Architecture



Mobile Command Center



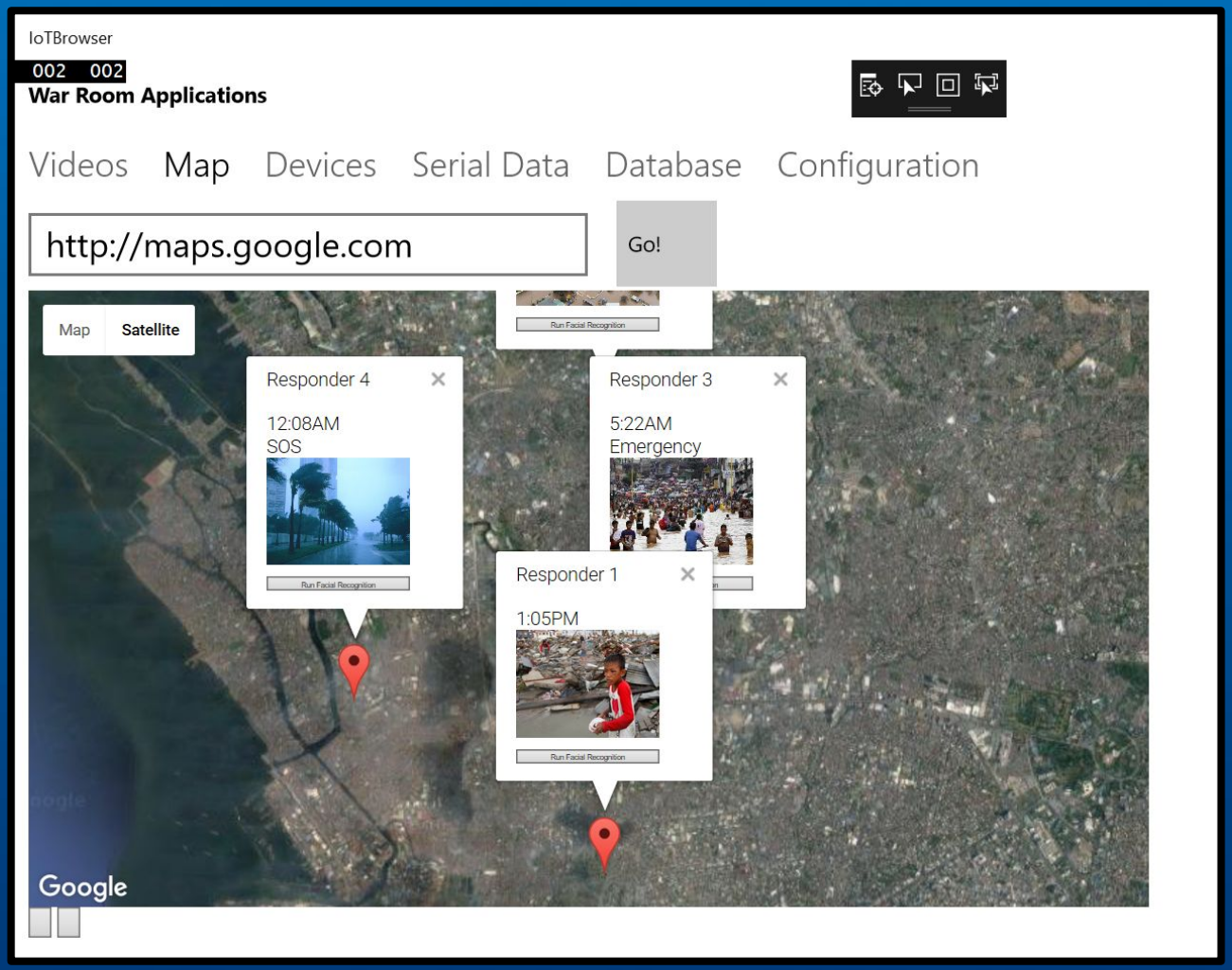
Application 1: Broadcast Mode



Application 1: Broadcast Mode (code)

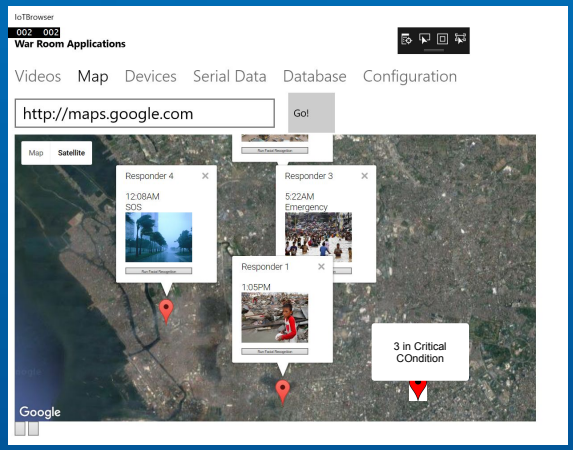
```
private void toggleButton_IsCheckedChanged(object sender, RoutedEventArgs e)
{
    if (broadcastMode.IsChecked == true)
    {
        System.Diagnostics.Debug.WriteLine("Broadcast mode is on");
        timer = new DispatcherTimer();
        timer.Interval = TimeSpan.FromMilliseconds(10000);
        timer.Tick += Timer_Tick;
        timer.Start();

    }

}

private void toggleButton_IsUncheckedChanged(object sender, RoutedEventArgs e)
{
    if (broadcastMode.IsChecked == false)
    {
        System.Diagnostics.Debug.WriteLine("Broadcast mode is off");
        timer.Stop();
    }

}
```

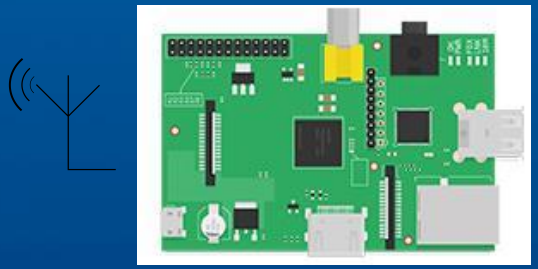

Application 2: Mapping



Application 2: Mapping

Mobile Kiosk



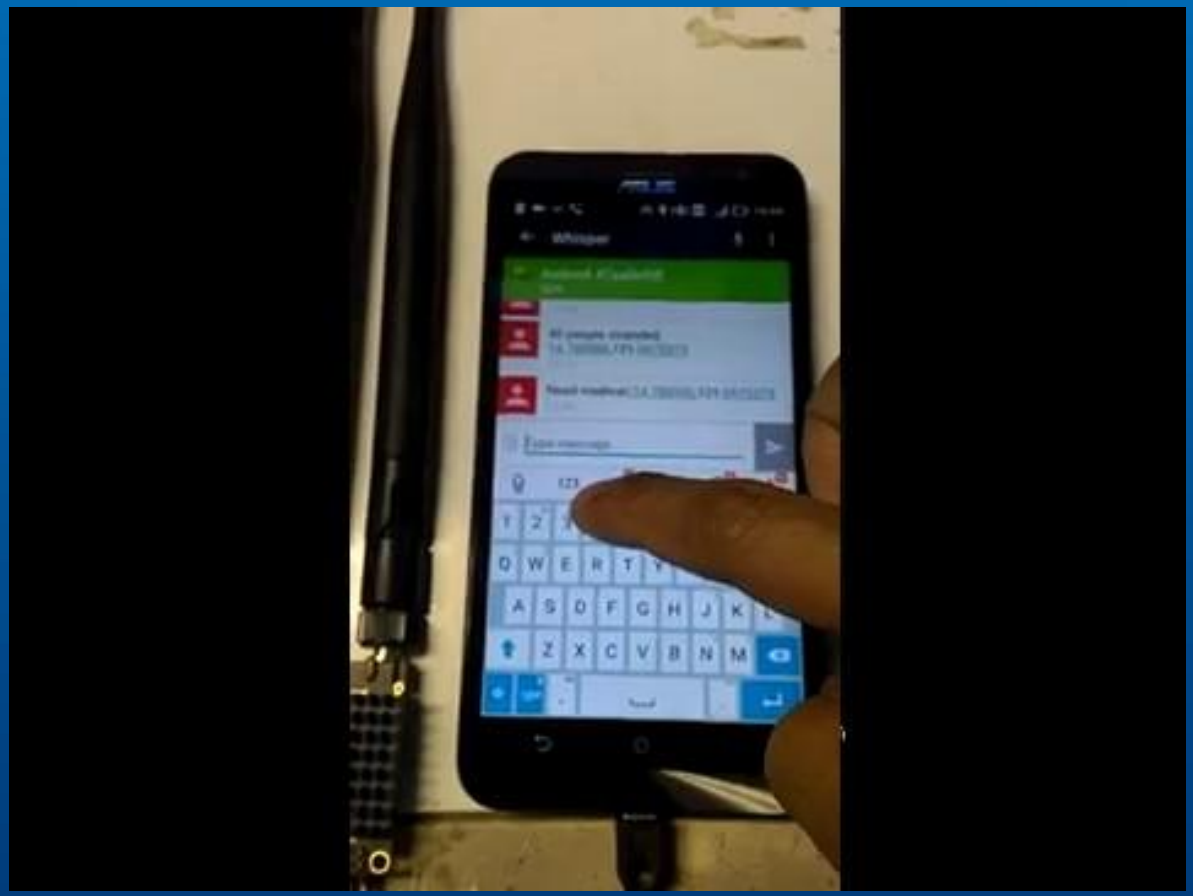


Responders

Application 2: Mapping (code)

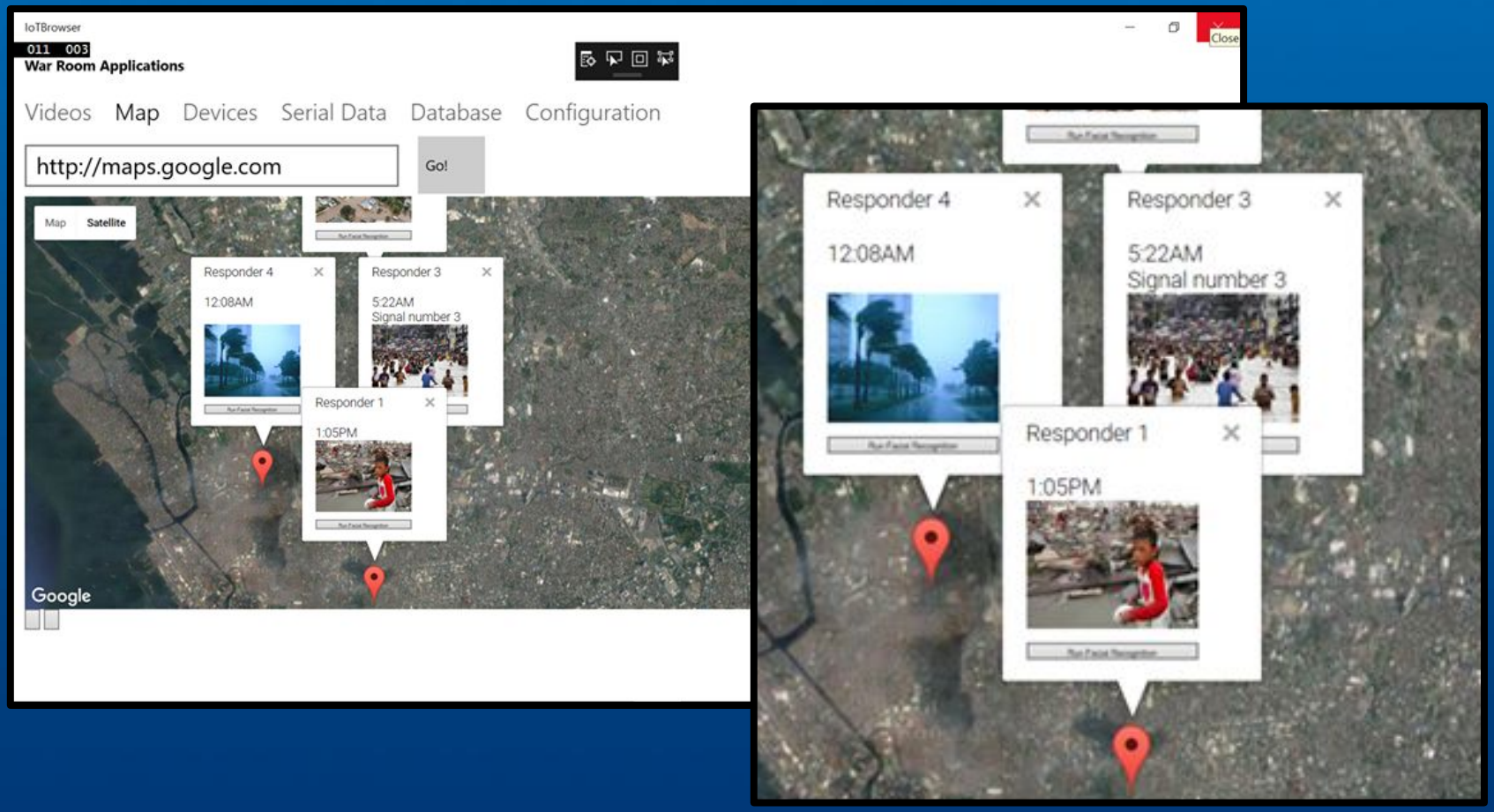
```
var marker = new google.maps.Marker({
    position: myLatLng,
    map: map,
    title: id
});

var infowindow = new google.maps.InfoWindow({
    title: id,
    content: "<b>" + id + "</b><br/><br/>" + stamp + ": " + msg

});
infowindow.open(map, marker);
marker.addListener('click', function () {
    infowindow.open(map, marker);
});
markers.push(marker);
infowindows.push(infowindow);
```


Application 2: Mapping (video)



1. Responder 1 sends a message using IBR-DTN: “Need Medivac”
2. Mobile Command Center receives message and displays it on the map.
3. Responder 2 sends a message using IBR-DTN: “40 people stranded”
4. Mobile Command Center receives message and displays it on the map.

Application 3.1: Data Mining-ready,
Facial Recognition-Ready



Application 3.2: Data Mining-ready,
Context Tagging for Decision Support

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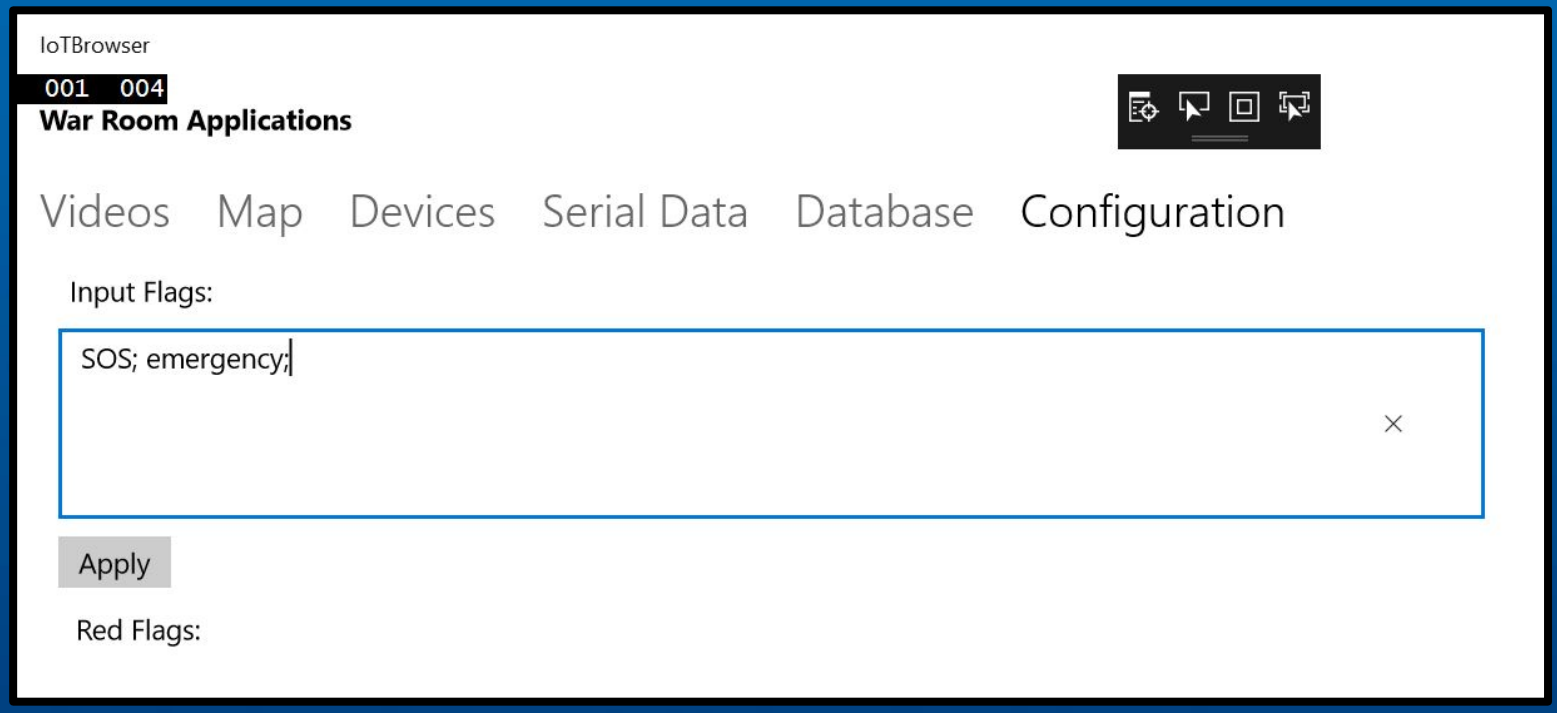
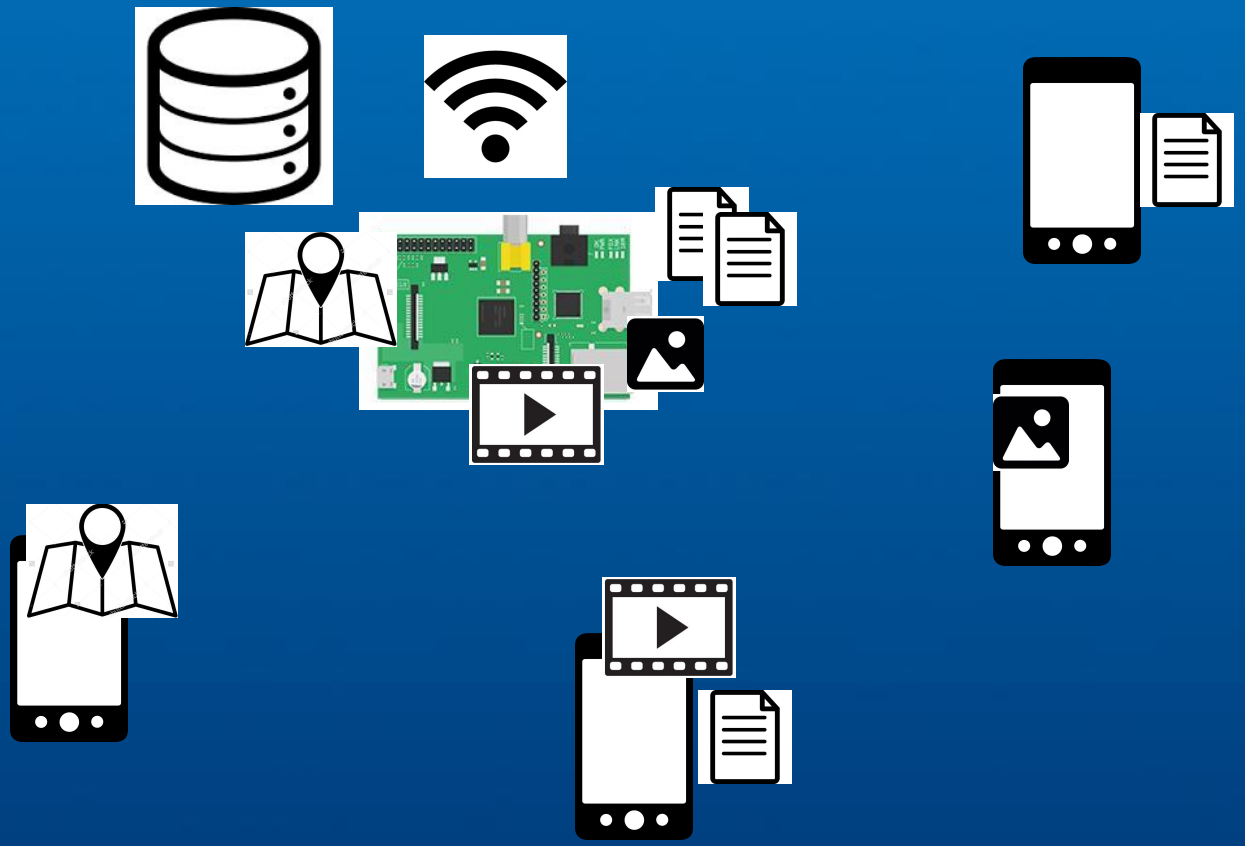


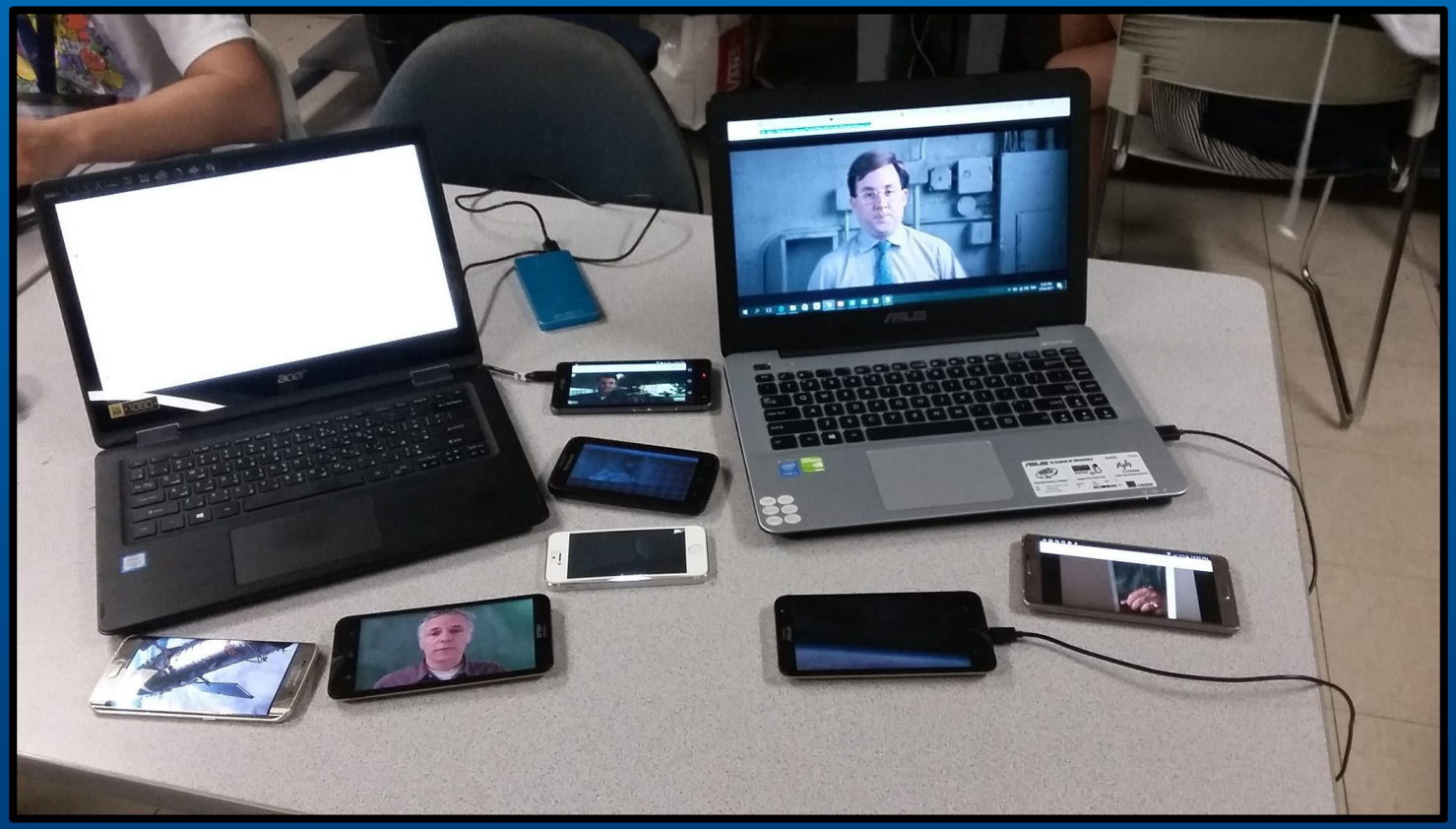
Application 4: Raspberry Pi Near Cloud



Raspberry Pi Near Cloud

with hotspot and attached storage

Scalability Test



Application 4: Raspberry Pi Near Cloud

1. Each phone connects to the wireless network.
2. One phone opens the live message board.
3. Another phone opens the on-premise file sharing app.
4. The last phone streams a video.

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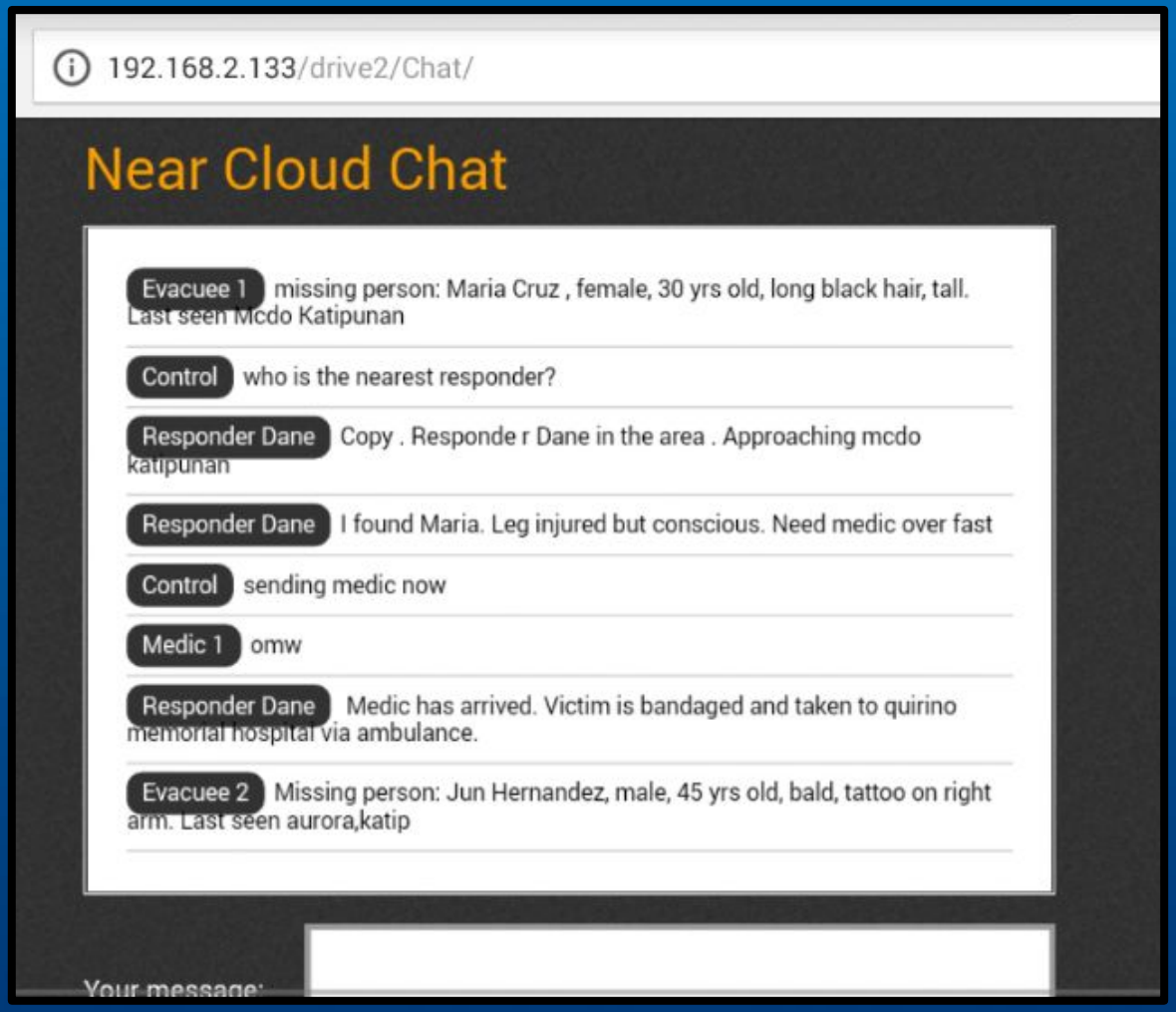
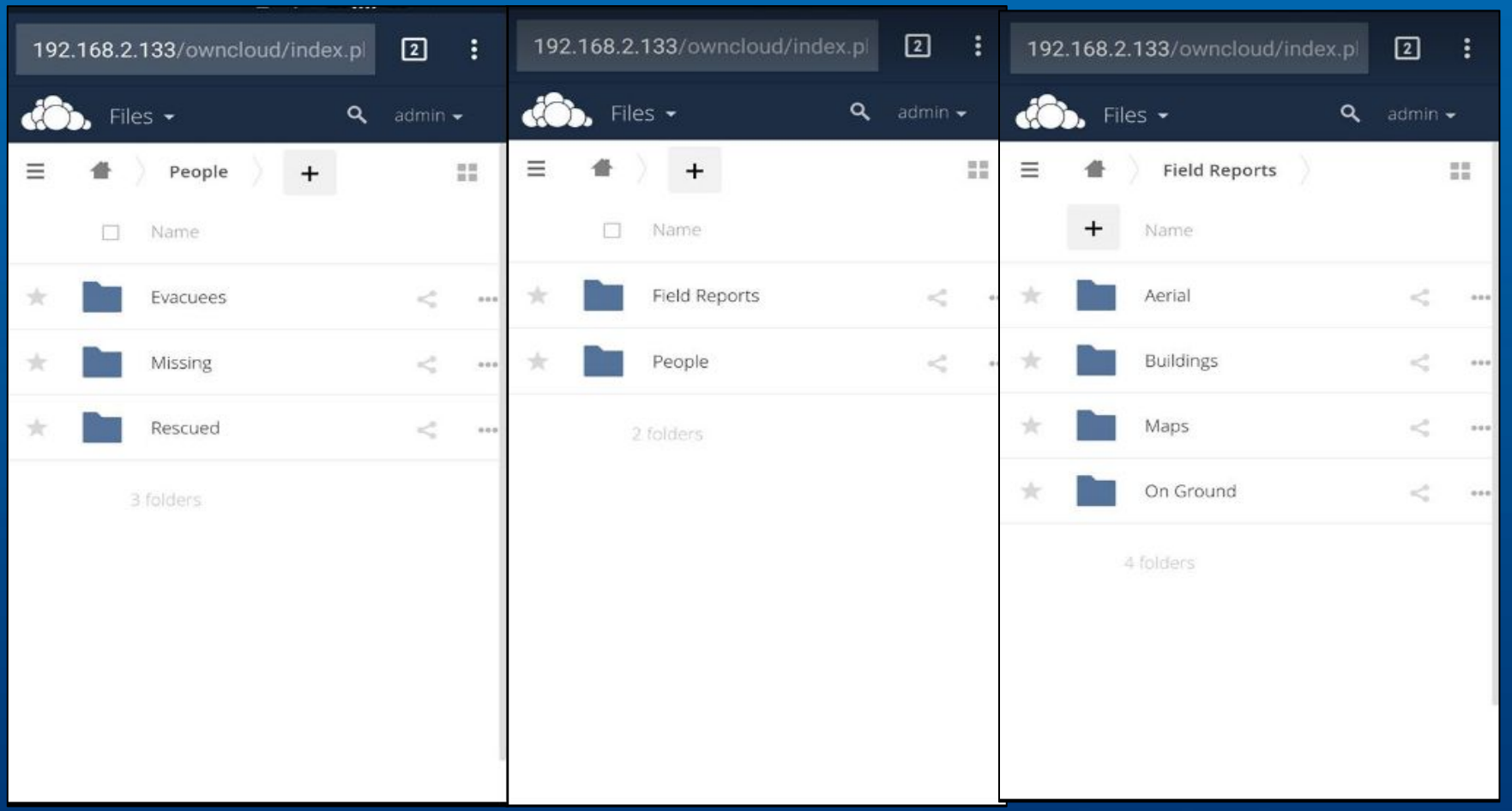
Application 4.1 Live Message Board



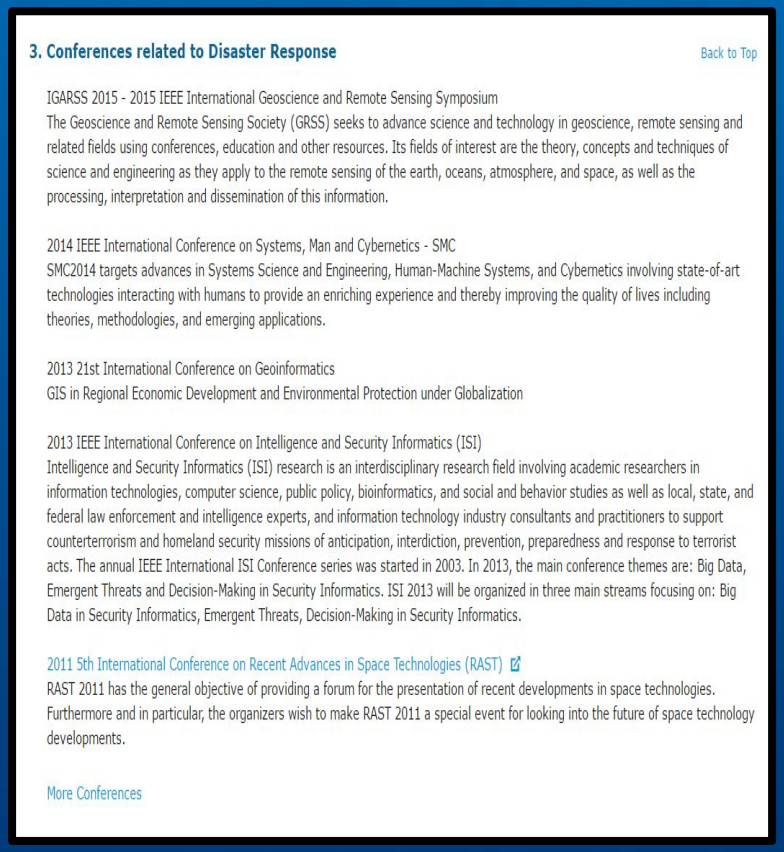
Application 4.1 Live Message Board (video)

1. First user enters the message board and posts a message.
2. The message appears live on the message board.
3. Second user enters the message board and posts a message.
4. The message appears live on the message board.

Application 4.2: On Premise File Sharing



Related Work and Significance of Study



3. Conferences related to Disaster Response Back to Top

IGARSS 2015 - 2015 IEEE International Geoscience and Remote Sensing Symposium
The Geoscience and Remote Sensing Society (GRSS) seeks to advance science and technology in geoscience, remote sensing and related fields using conferences, education and other resources. Its fields of interest are the theory, concepts and techniques of science and engineering as they apply to the remote sensing of the earth, oceans, atmosphere, and space, as well as the processing, interpretation and dissemination of this information.

2014 IEEE International Conference on Systems, Man and Cybernetics - SMC
SMC2014 targets advances in Systems Science and Engineering, Human-Machine Systems, and Cybernetics involving state-of-art technologies interacting with humans to provide an enriching experience and thereby improving the quality of lives including theories, methodologies, and emerging applications.

2013 21st International Conference on Geoinformatics
GIS in Regional Economic Development and Environmental Protection under Globalization

2013 IEEE International Conference on Intelligence and Security Informatics (ISI)
Intelligence and Security Informatics (ISI) research is an interdisciplinary research field involving academic researchers in information technologies, computer science, public policy, bioinformatics, and social and behavior studies as well as local, state, and federal law enforcement and intelligence experts, and information technology industry consultants and practitioners to support counterterrorism and homeland security missions of anticipation, interdiction, prevention, preparedness and response to terrorist acts. The annual IEEE International ISI Conference series was started in 2003. In 2013, the main conference themes are: Big Data, Emergent Threats and Decision-Making in Security Informatics. ISI 2013 will be organized in three main streams focusing on: Big Data in Security Informatics, Emergent Threats, Decision-Making in Security Informatics.

2011 5th International Conference on Recent Advances in Space Technologies (RAST)
RAST 2011 has the general objective of providing a forum for the presentation of recent developments in space technologies. Furthermore and in particular, the organizers wish to make RAST 2011 a special event for looking into the future of space technology developments.

More Conferences

- J.P. Talusan, Design, Development and Demonstration of a Highly Interactive Near Cloud Architecture for Institutions over Wireless Connectivity, Unpublished, Quezon City, pp. 30-90, March 2015
- L. Koa and B. Sevilla, Internet Protocol Television (IPTV) as an Interactive Application for Disaster Management and Education, Unpublished, Quezon City, March 2014 .
- S.K. Cortez, R. De los Reyes and M. G. Gacusan, Developing Interactive Content Deployments and Extending the Near Cloud Capabilities of the Convergent Platforms and Network Media Testbed, Unpublished, Quezon city pp.7-15 March 2015.
- Asia-Pacific Telecommunity Standardization Program, “Requirements of Information and Communication System Using Vehicle During Disaster,” 2016.
- Telecommunication Standardization Sector of ITU, “Requirements for Disaster Relief System” May 2014.
- Mushtaq, N. U. (2016, October 23). Network Attached Storage CCTV Institute CCTV Surveillance Smarthome. Retrieved March 15, 2017, from http://cctvinstitute.co.uk/network-attached-storage/

Accomplishments

- Design post-disaster information system based on near cloud nodes
- Develop use cases for field-deployable kiosks and command and control post-disaster environments
- Develop a near cloud-based multi-interfaced enabling platform for future use cases

Mobile kiosk design by Mr. Eduardo Bellido

Thank You

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1. connect to RPi3 thesis
2. open your browser type 192.168.2.133

References

[1] J.P. Talusan, Design, Development and Demonstration of a Highly Interactive Near Cloud Architecture for Institutions over Wireless Connectivity, Unpublished, Quezon City, pp. 30-90, March 2015

[2] L. Koa and B. Sevilla, Internet Protocol Television (IPTV) as an Interactive Application for Disaster Management and Education, Unpublished, Quezon City, March 2014 .

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[5] Telecommunication Standardization Sector of ITU, "Requirements for Disaster Relief System" May 2014.

[6] Raspberry Pi 3 Model B. (n.d.). Retrieved January 29, 2017, from https://www.raspberrypi.org/products/raspberry-pi-3-model-b/

[7] RFD900 Modem. (n.d.). Retrieved March 15, 2017, from http://store.rfdesign.com.au/rfd-900p-modem/

[8] Download Raspbian for Raspberry Pi. (n.d.). Retrieved March 15, 2017, from https://www.raspberrypi.org/downloads/raspbian/

[9] Learn about Windows 10 IoT Core. (n.d.). Retrieved March 15, 2017, from https://developer.microsoft.com/en-us/windows/iot/Explore/IoTCore

[10] What is PHP? (n.d.). Retrieved March 15, 2017, from http://php.net/manual/en/intro-whatis.php

[11] About MySQL. (n.d.). Retrieved March 15, 2017, from https://www.mysql.com/about/

[12] IBR-DTN (n.d). Retrieved March 15, 2017, from https://github.com/ibrdtn/ibrd/

[13] Mushtaq, N. U. (2016, October 23). Network Attached Storage CCTV Institute CCTV Surveillance Smarthome. Retrieved March 15, 2017, from http://cctvinstitute.co.uk/network-attached-storage/