Using Location-Based Social Networks for Emergency Response

Presentation for the
United Nations International Meeting on the
Applications of Global Navigation Satellite Systems

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Yuval Ne'eman Workshop for Science, Technology and Security

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Outline

INTRODUCTION

Flickr.com

ASSUMPTIONS

discovery.com

ENABLERS

iphonebuzz.com

CASE STUDIES

standard.net

CHALLENGES

hackingtricks.blogspot.ccm

RECOMMENDATIONS

Esa.int

Basis for the Research

- Based insights from a research for Israel Emergency Authority
- Using infrastructure grids as sensors for situational awareness in crisis
- Analysis of most deployed infrastructure grids (electricity, gas, water, ICT, alarms etc.)
- Key finding: new sensors are needed
- Mobile Crowdsensing for Emergency

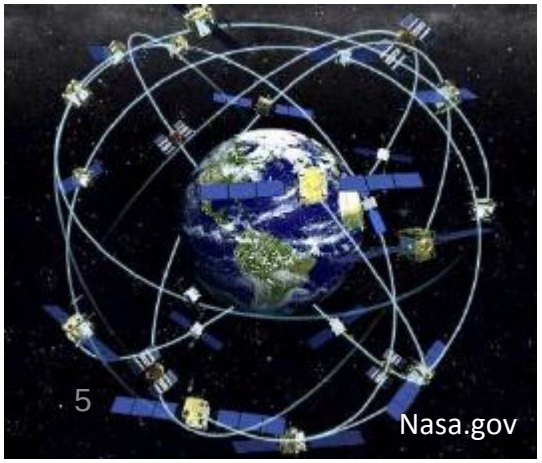
Current Research

- Social networks applications (SNA) are a *new* phenomenon that changes how people communicate
- GNSS based SNA applications are used for various applications: social navigation, geo-social shopping, etc.
- S&R efforts recently show increase use in SNA+GNSS (that is likely to increase)
- Why now?
- How could SNA be utilized in crisis management to better respond in future crises?

Mobile Crowdsensing

"Mobile crowdsensing applications leverage consumer mobile devices (e.g., smart phones, GPS gadgets, and cars) to collect and share information about the user or the environment, either interactively or autonomously, towards a common goal."

Source: IBM



Nasa.gov

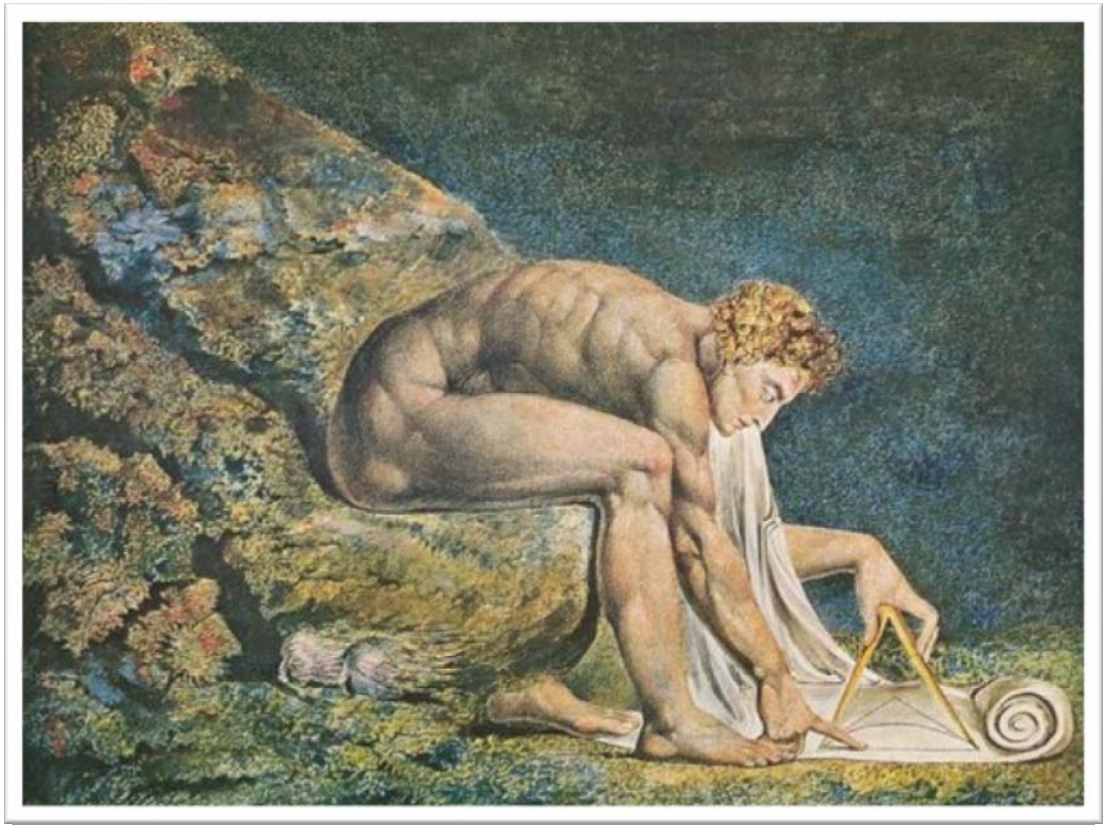
Tal Dekel Ram Levi

talentgenius.co.uk

geek.com/

"If I have seen further
it is by standing on the shoulders of giants"

-Sir Isaac Newton



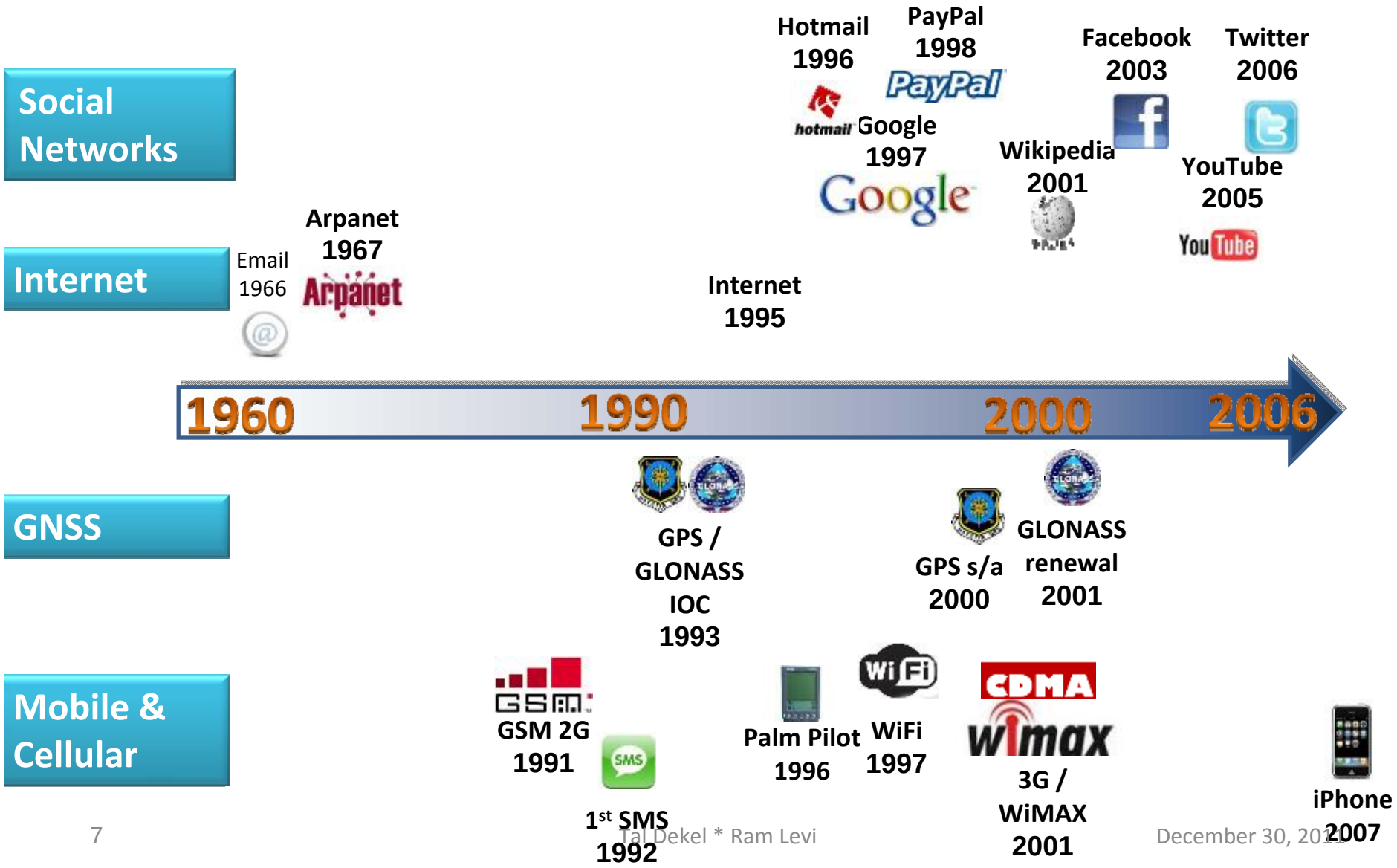
William Blake, Newton, 1795

Source: http://blog.julianlass.com

Augmented Reality in NYC, 2011

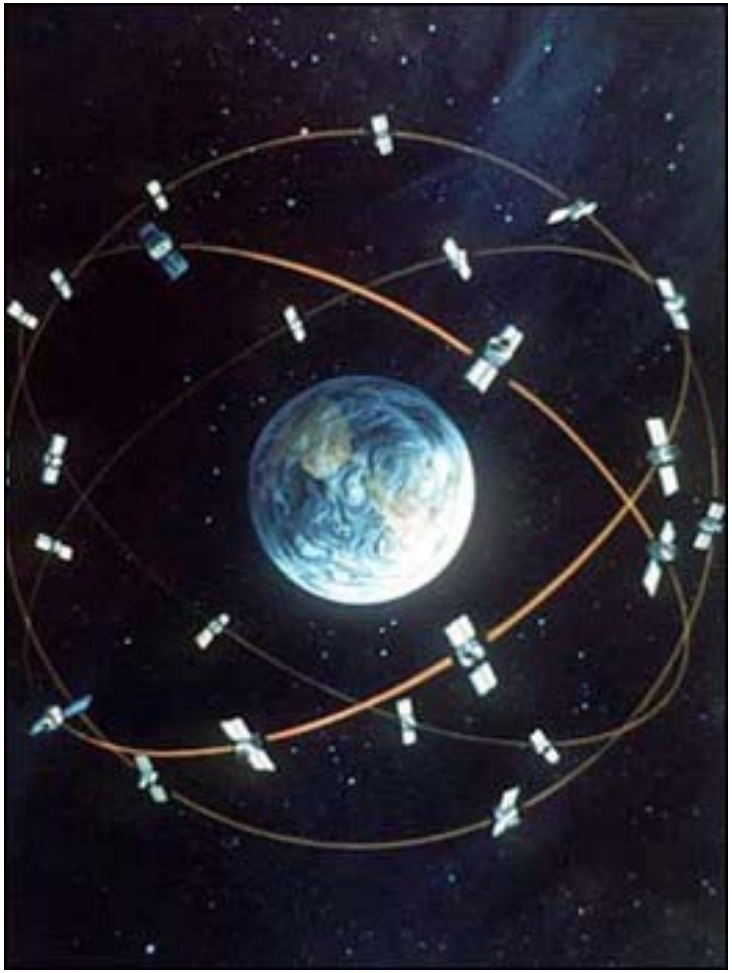
Source: http://www.gizchina.com

Timeline of Major Technology



Trend 1 - GNSS

- GPS IOC in 1993
- Removal of Selective Availability in 2000
- Price, size and power consumption decreasing dramatically
- GNSS infrastructure is provided to everyone for free

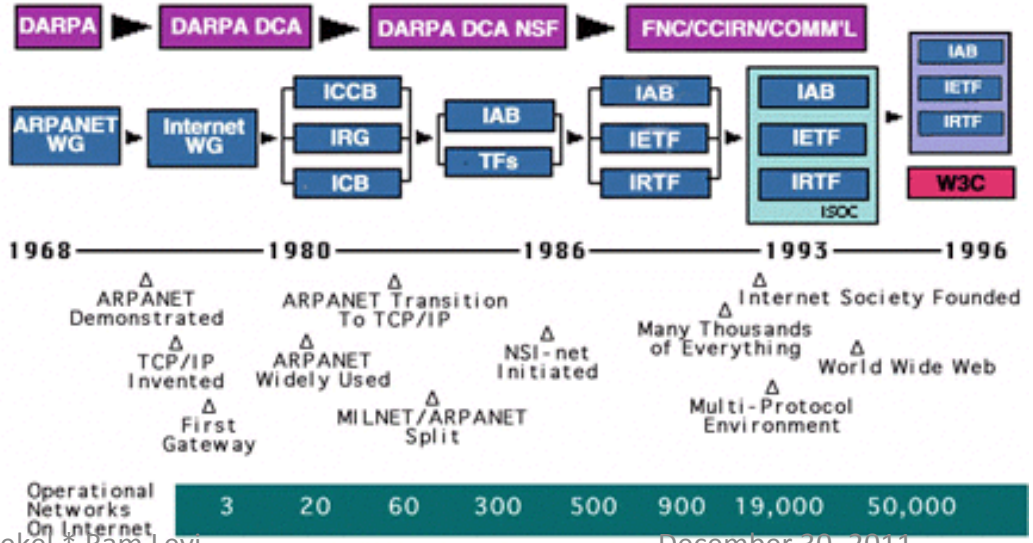


"Global shipments of GNSS-enabled mobile phones are expected to reach 1 billion in 2020. This is driven by increasing attractiveness and affordability of devices …"

(The Space Report 2011)

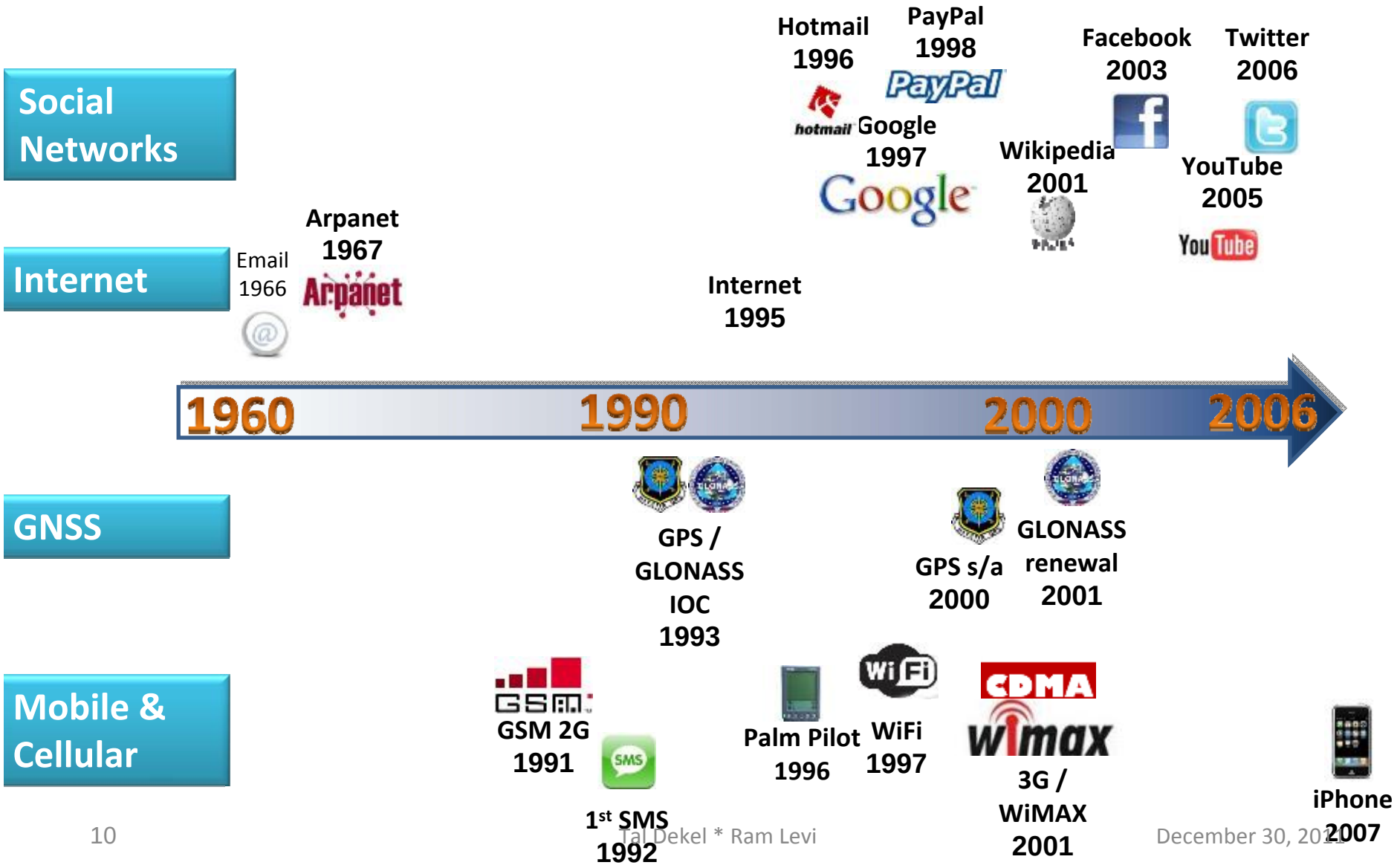
Trend 2 – Internet

- Began in 1960s but rapid commercial acceleration in 1990s
- Services less than “15 years old”: Email, search, wikipedia, social networks, e-payments, blogging and more



Source: isoc.org

Timeline of Major Technology



Trend 3 – Social Networks

Trend 3 – Social Networks

- Increase the speed at which a community can better communicate, coordinate, mobilize and use resources
- User spending more time on social networks

Source: facebook.com

Community resilience and the ability to adapt to change is related to the strength of its social networks

(source: National Research Council)

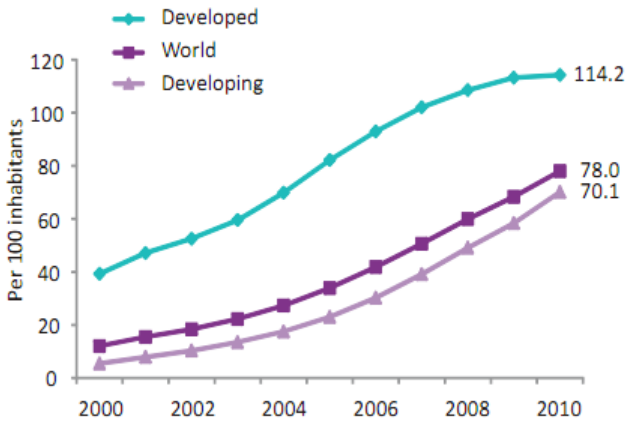
Benefits of Social Networks

- Interactivity – Users can interact and disseminate information in one-to-many and many-to-many forms
- Virallity - messages can be exponentially spread using online services.
- Measurability – online actions of users can be measured
- Documented history – actions online can be stored for past analysis.
- In sociological terms, ongoing contact with people can improve resilience.
- Information intelligence gathering to improve situational awareness in crisis.

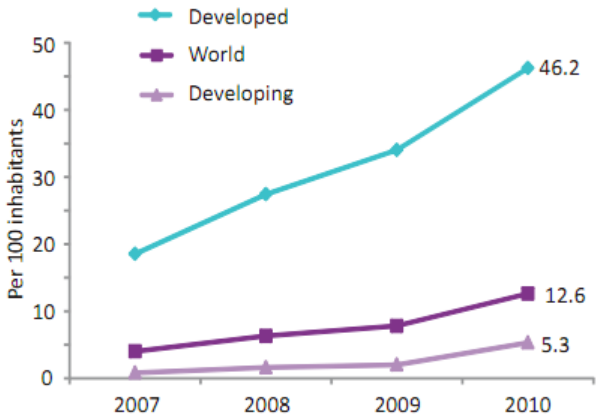
Trend 4 – Cellphones & Smartphones

- *Global increase in mobile-cellular subscription*
- Mobile Apps
- Integrated MULTI GNSS GPS and GLONASS (iPhone 4s)
- High relevance to emergency response

Cellular Subscriptions



Broadband Subscriptions



Source: ITU

Assumptions

- Tools that will be used in the early stages of a crisis are the ones used before the crisis.
- Communication is essential and thus be restored.
- Changing communication ways are forcing governments to integrate solutions in working platforms instead of developing new ones

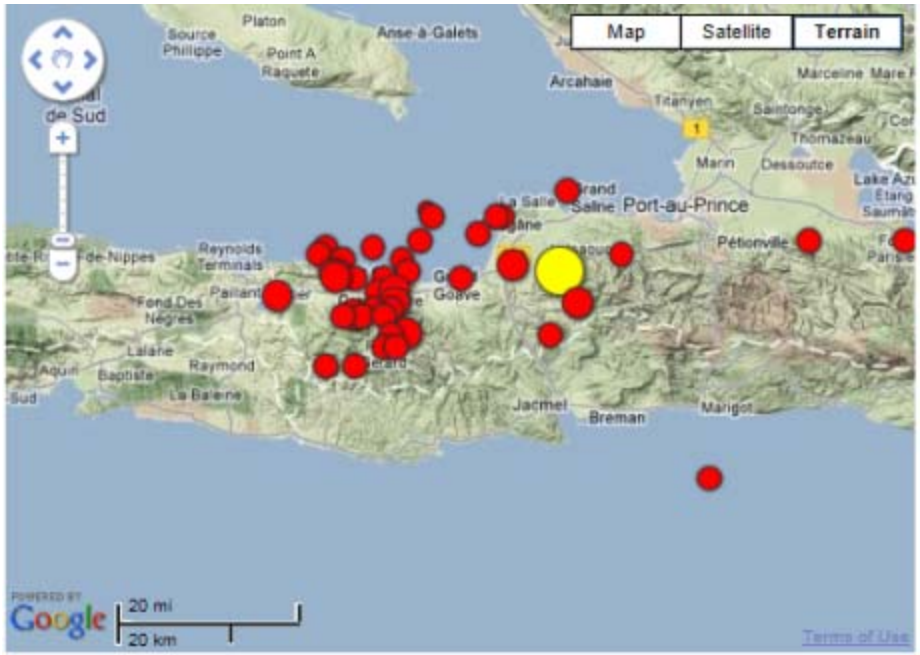
Case Study -1

2010 Haiti earthquake

UN Mission Building Port Au Prance

Source: http://news.bbc.co.uk/2/hi/americas/8458690.stm

Introduction

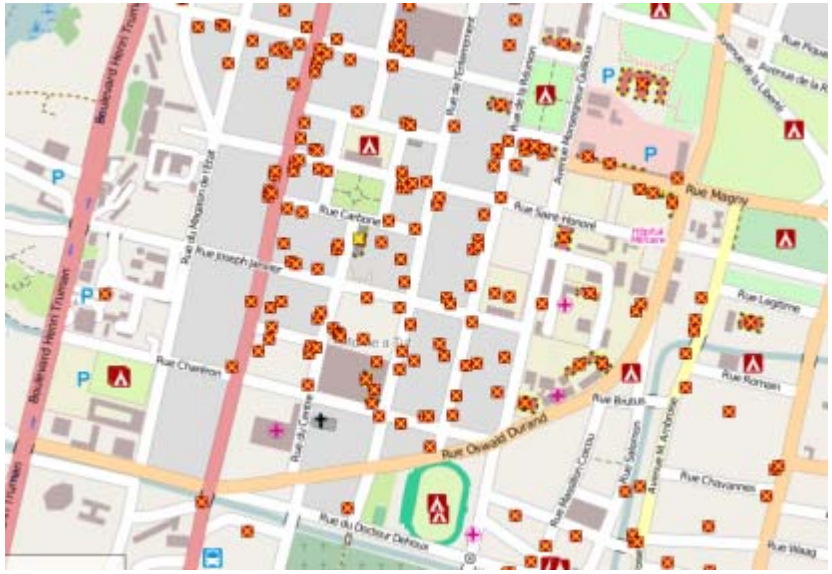


Earthquake and aftershock map

Tent City in Port-au-Prince area

Source: http://www.heartlandalliance.org/international/updates.html

Communication infrastructure

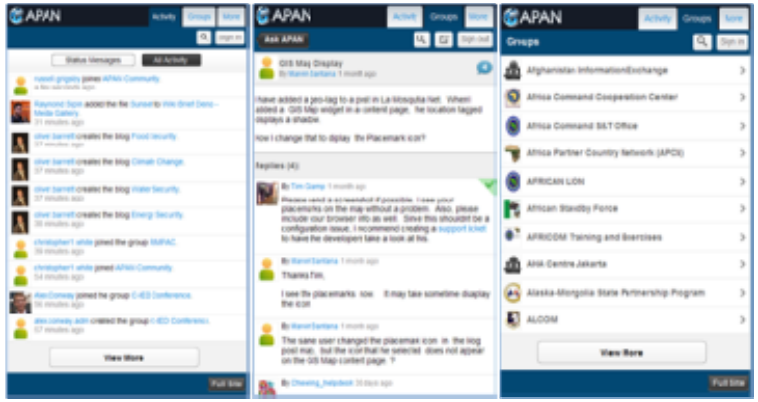


Haiti Earthquake damage map
Source: OpenStreetMap

Damaged communication infrastructures

Source: http://www.itu.int/ITU-D/emergencytelecoms/response/haiti2010.html

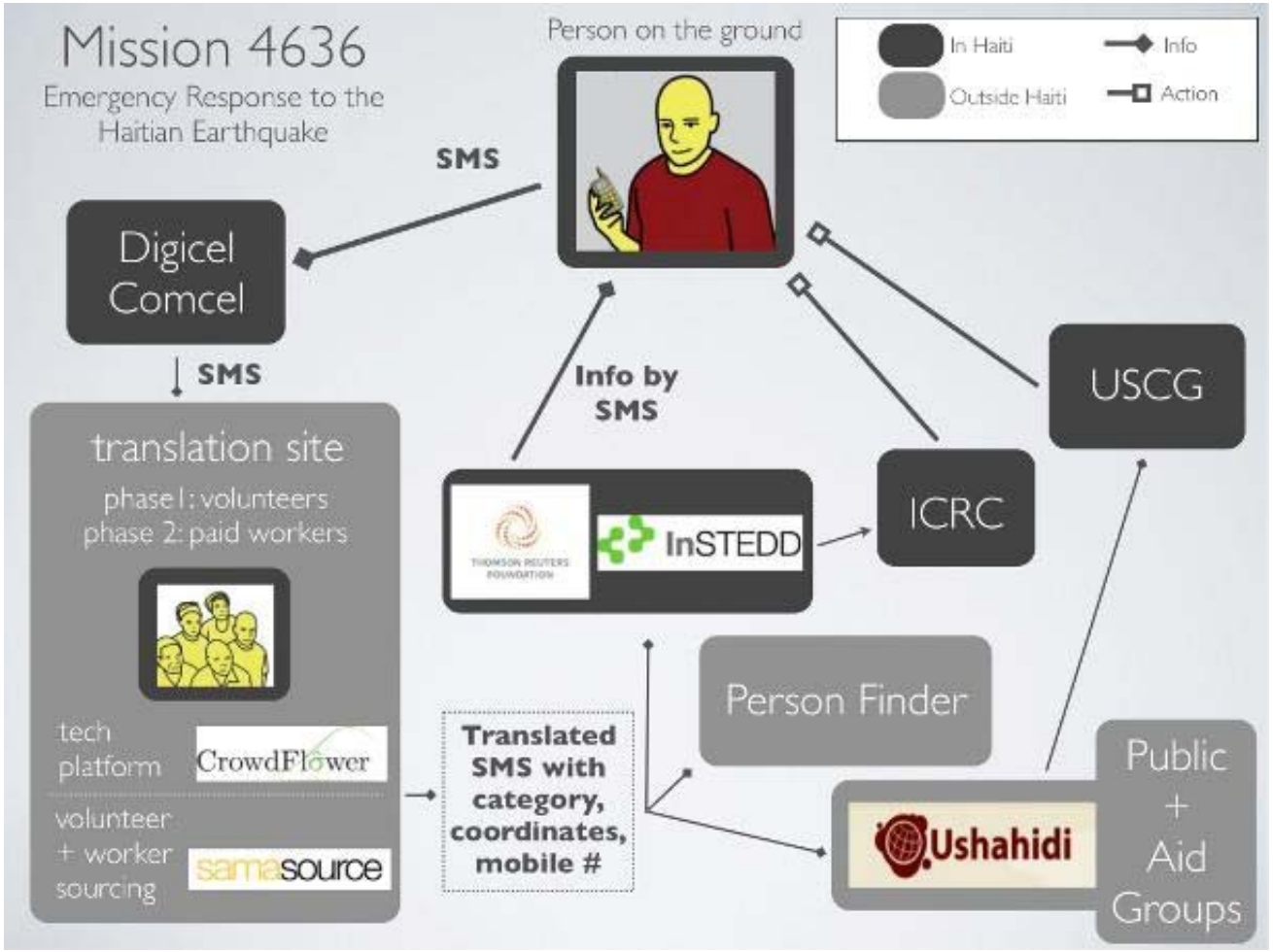
All Partners Access Network (APAN)



APAN mobile app screen shots

Source: APAN.org

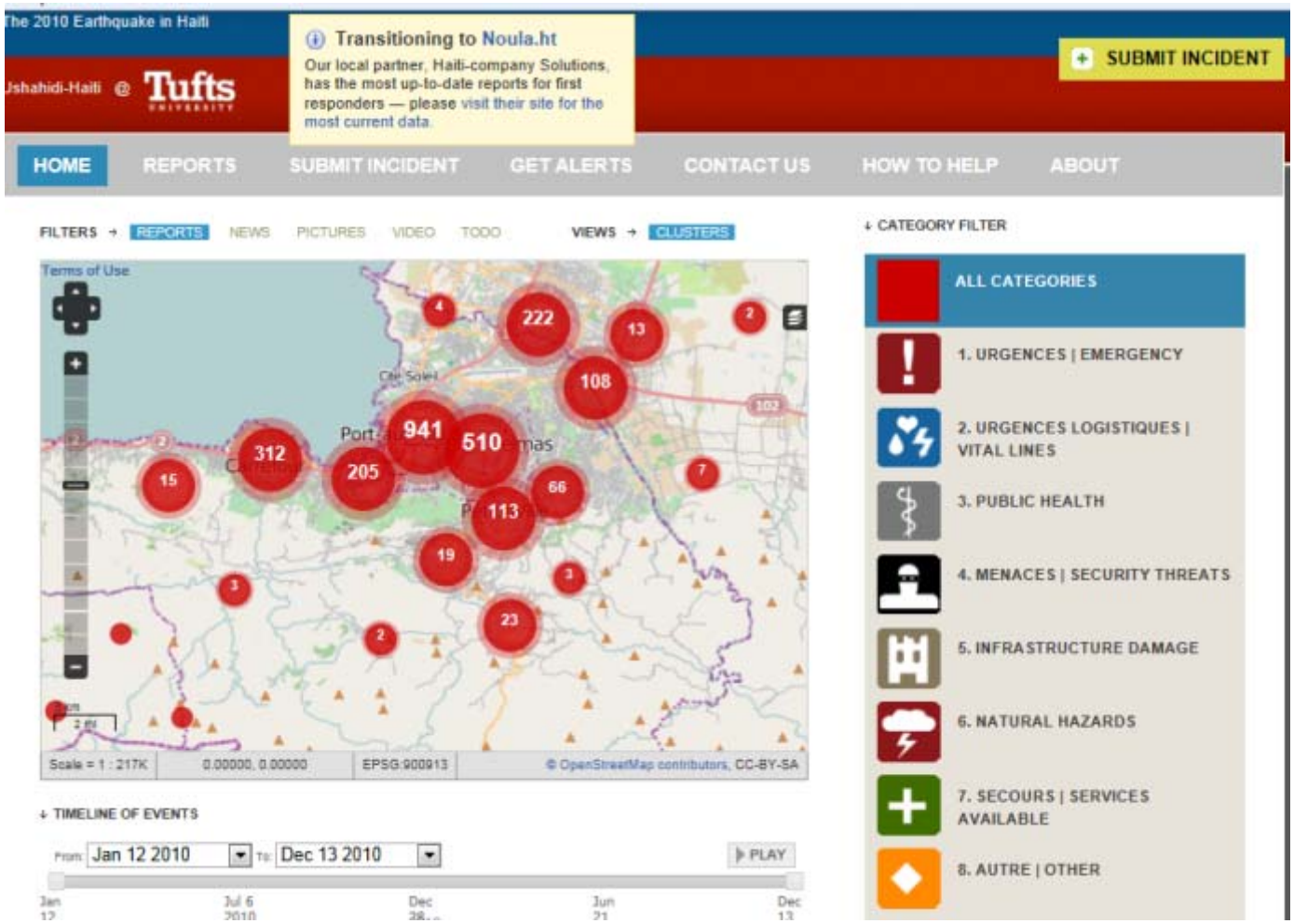
Mission 4636



Mission 4636 architecture

Source: http://www.search-internetmarketing.com/tag/mobile-services/

Disaster management systems



Ushaidi Report Map

Source: http://haiti.ushahidi.com/

Google Crisis Response Team

Google crisis response

Google Map Maker

Google earth

Google person finder

Person Finder: Haiti Earthquake

English | Français | Kreyòl

What is your situation?

I'm looking for someone | I have information about someone

Currently tracking about 34800 records.

PLEASE NOTE: All data entered will be available to the public and viewable and usable by anyone. Google does not review or verify the accuracy of this data.

Embed this tool on your site - Developers - Terms of Service

powered by Google

Terms

Google earth images before and after the earthquake

Source: http://www.pcworld.com/article/186897/google_earth_reveals_the_devastation_in_haiti.html

Success stories

The Israeli hospital – Haiti

Source : http://www.tampabay.com

Health facilities location

Israeli search and rescue team in action

Source : http://www.vosizneias.com

Case Study -2

2011 Japan earthquake and tsunami

People wait to be rescued in Kesennuma, Miyagi Prefecture March 12

Source: http://www.boston.com/bigpicture/2011/03/japan_earthquake_aftermath.html

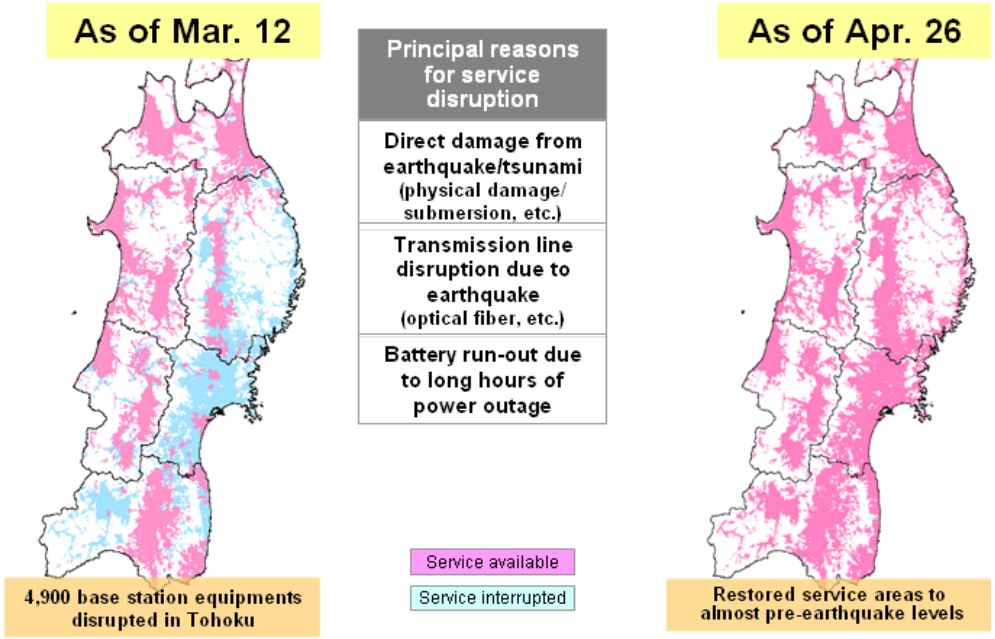
Introduction

The U.S. Indian Ocean Tsunami Warning System (IOTWS)

Source: http://www.boston.com/

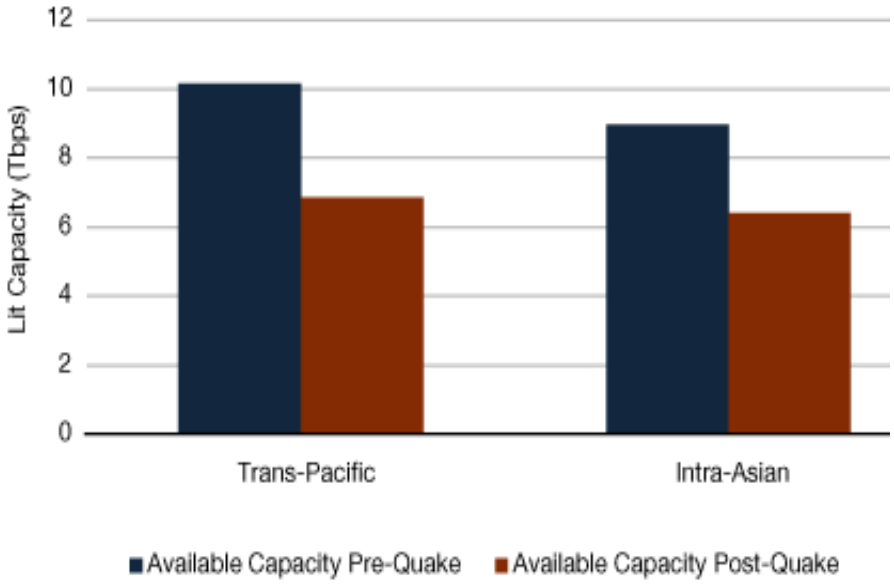
Source: http://www.boston.com/bigpicture/2011/03/japan_earthquake_aftermath.html

Communication infrastructure



NTTDoCoMo disaster recovery scheme

source: http://www.nttdocomo.com/disaster/index.html

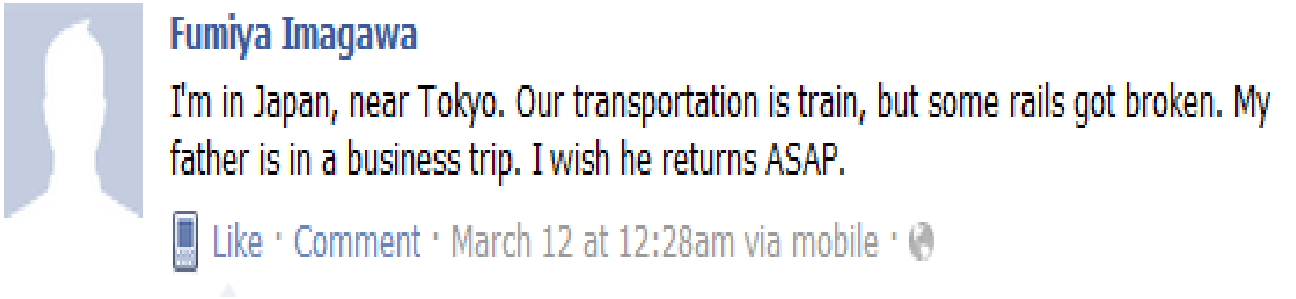


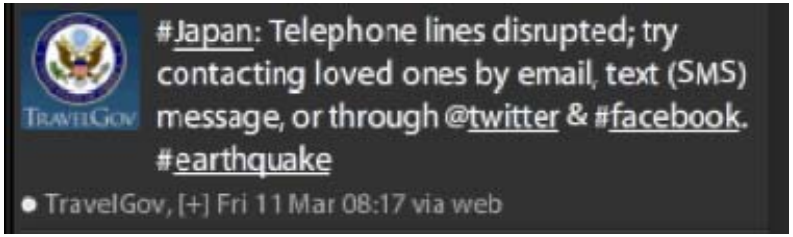
Earthquake's Impact on Japanese International Bandwidth

Source:http://www.telegeography.com/press/press-releases/2011/04/11/earthquakes-and-red-tape-challenge-carriers/index.html

Introduction

"While there are so many technologies at this time that isolate us …social networking tools have shown their ability once again to unify us as human beings"

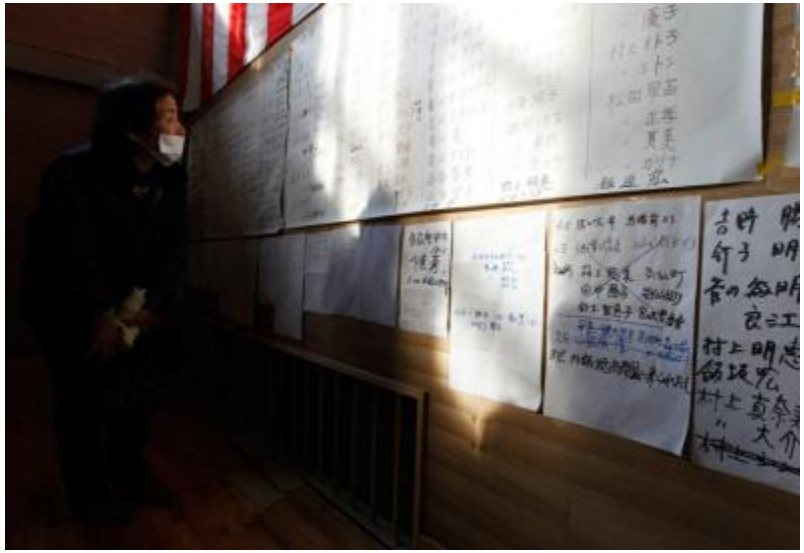




Tweet from US state department

source: http://idisaster.wordpress.com/

Online search and rescue efforts



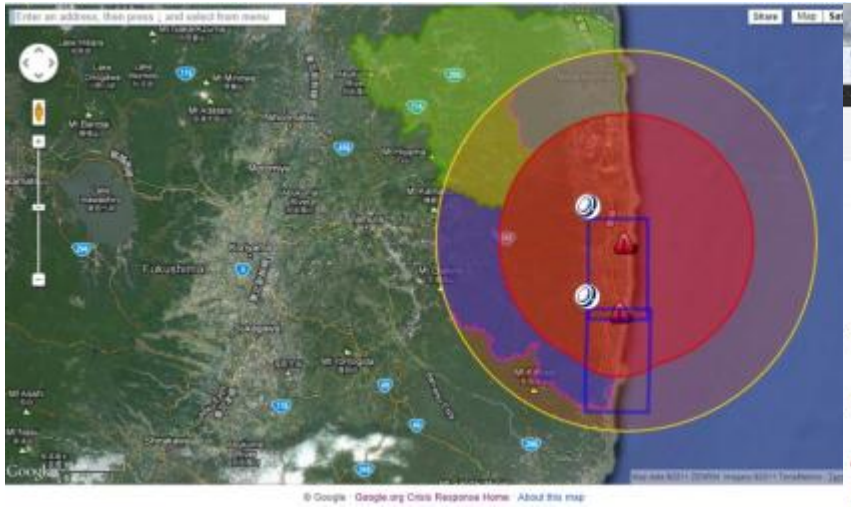
Survivor looking for relative survivors

Source: http://www.boston.com/bigpicture/2011/03/japan_earthquake_aftermath.html

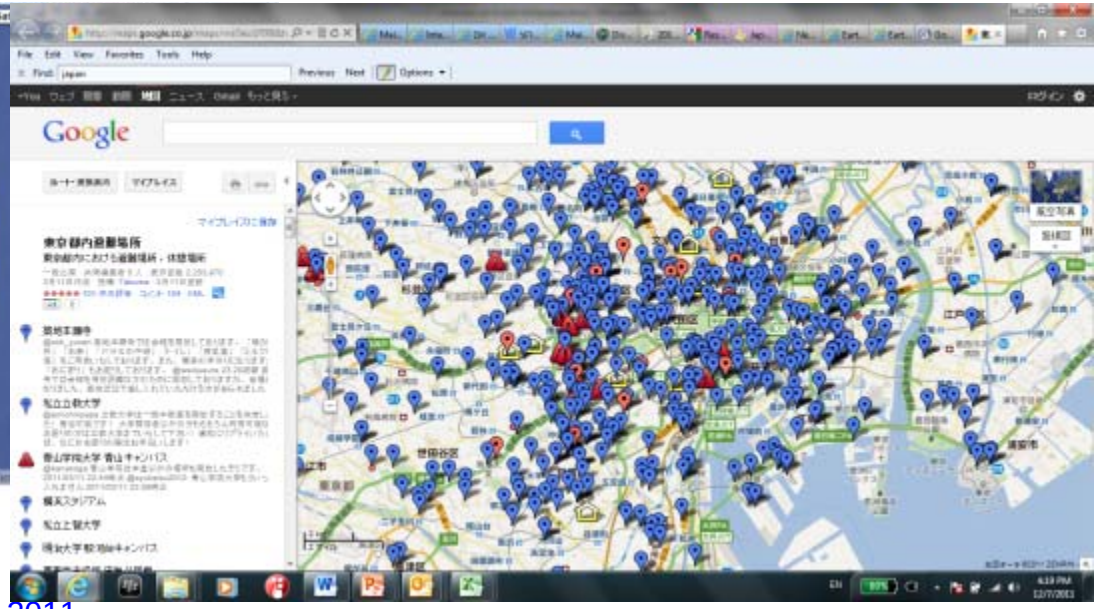
Google person finder received 7000 request in the first few hours

Source: http://www.kochiservnet.com/

Google Crisis Response Team



Goggle maps updates on affected ares source:
http://crisislanding.appspot.com/?crisis=japan_earthquake_2011



Google maps update on Locations of impromptu shelters

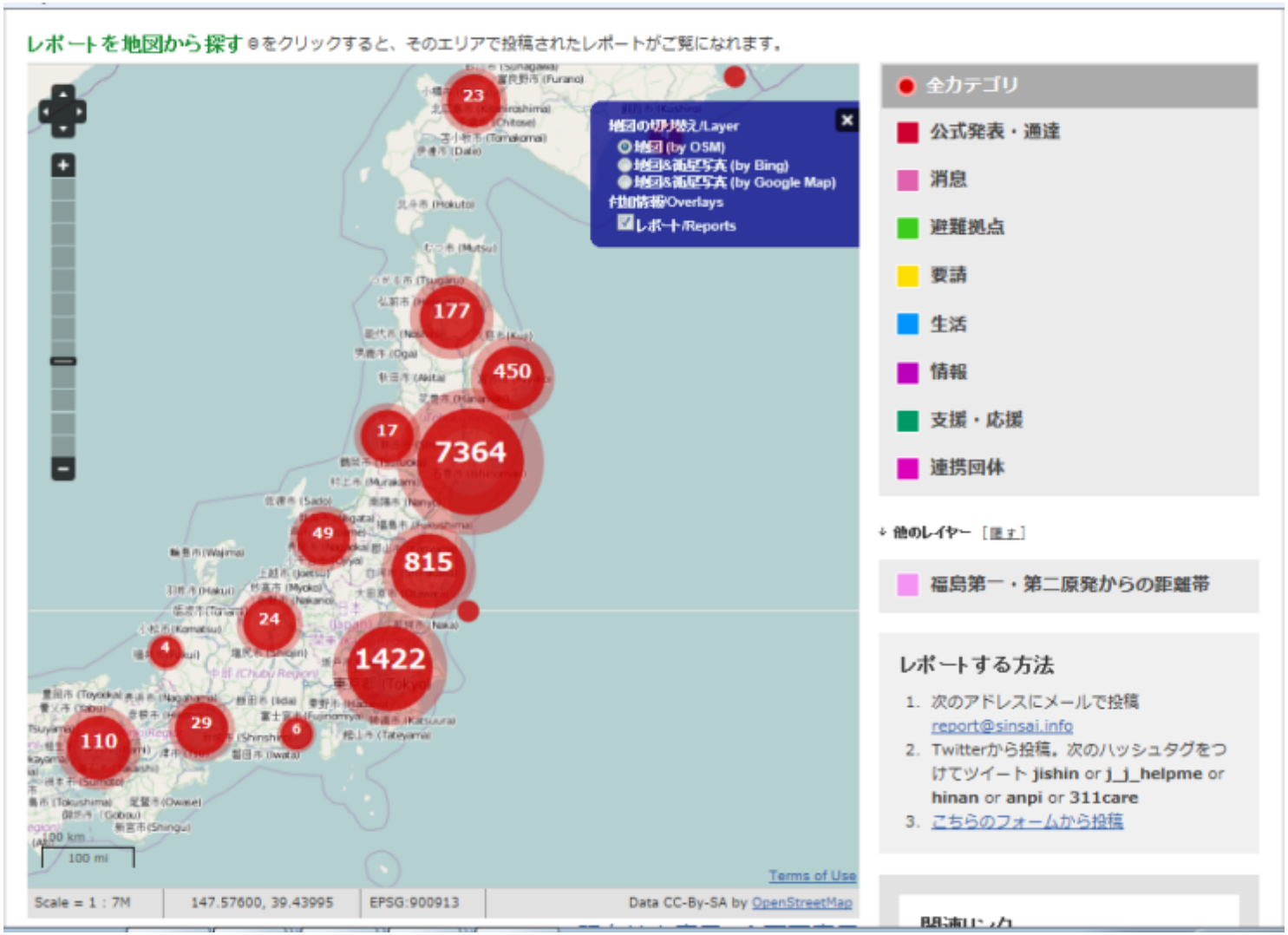
http://maps.google.co.jp/maps

Earthquakes in the last week map
source: http://googlemapsmania.blogspot.com/2011/03/japanese-earthquake-maps.html
http://earthquakes.tafoni.net/?lat=37.23032838760387&lon=146.22802734375&type=map&zoom=6

Youtube Person Finder

Source: http://www.nitro-digital.co.uk/blog/2011/04/12/natural-disasters/

Disaster management systems



Source: http://www.ushahidi.com/

Observations & Conclusions

- In crises people use the same communication methods they use in everyday life with higher intensity
- Unmanaged peak of traffic can cause collapses of the network
- Social networks are lifelines for survivors in the disaster areas
- Translation and location were major efforts for Search and rescue teams in the presented test case
- Social networks served mainly S&R teams in Haiti while in Japan both population and S&R teams used the network

Challenges

- Rapid restoration of communications
- Gapping the digital divide
  - Developed and developing countries
  - Young and elderly
  - Government entities and the public
  - Men and women
  - Urban and rural areas
- Avoid overwhelming of the network
- Avoid spread of misinformation and Dishonesty
- Understanding of the Social Network Applications by local emergency authorities

Recommendations

- Infrastructure Level
  - Act with the mobile network providers to prepare for different crisis scenarios
  - Fast approach to deploy temporary mobile network for the disaster area
  - Examine network redundancy options, including broadband satellite links or microwave
  - affordable IP relays to create an improvised best-effort mesh network
- Traffic Level
  - Prioritize data over traditional telephony
  - Prepare filtering systems for congestion control

Recommendations

- Application level
  - Survey popular social platforms and add "emergency features“
  - Develop tailor made application for emergency automated GNSS based report
  - Prepare “social channels” in popular social networks
  - Develop Data mining tools to increase crisis situational awareness
- Increase Awareness Programs
  - Communicate with citizens regularly through social networks
  - training

Recommendations

- R&D for knowledge gaps
  - Deepen crowdsensing R&D
  - Research Information flow during crisis
- Government Initiatives and International Agreements
  - Constructive and proactive dialog with major social network operators and online services such as Google, Facebook and NGO developing search and rescue software
  - International agreement for assisting in restoration of communication after a disaster
  - Network command and control centers (local, regional, international)
  - Encourage innovation through international organizations

Summary

- Social networks GNSS based applications used in emergency and crisis
- GNSS, mobile networks and the internet are critical enablers
- Governments need to integrate in a changing communication environment
- Encourage innovation and invest R&D
- Possibilities for International cooperation
- Paper under review and will be available shortly

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Thank You!

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