



Technologies for Early Disease Detection and Rapid Disaster Response

**InSTEDD Global Platform for Early
Detection, Response, and Evaluation**

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InSTEDD Proprietary Level I

Larry Brilliant's **TED**PRIZE Wish:

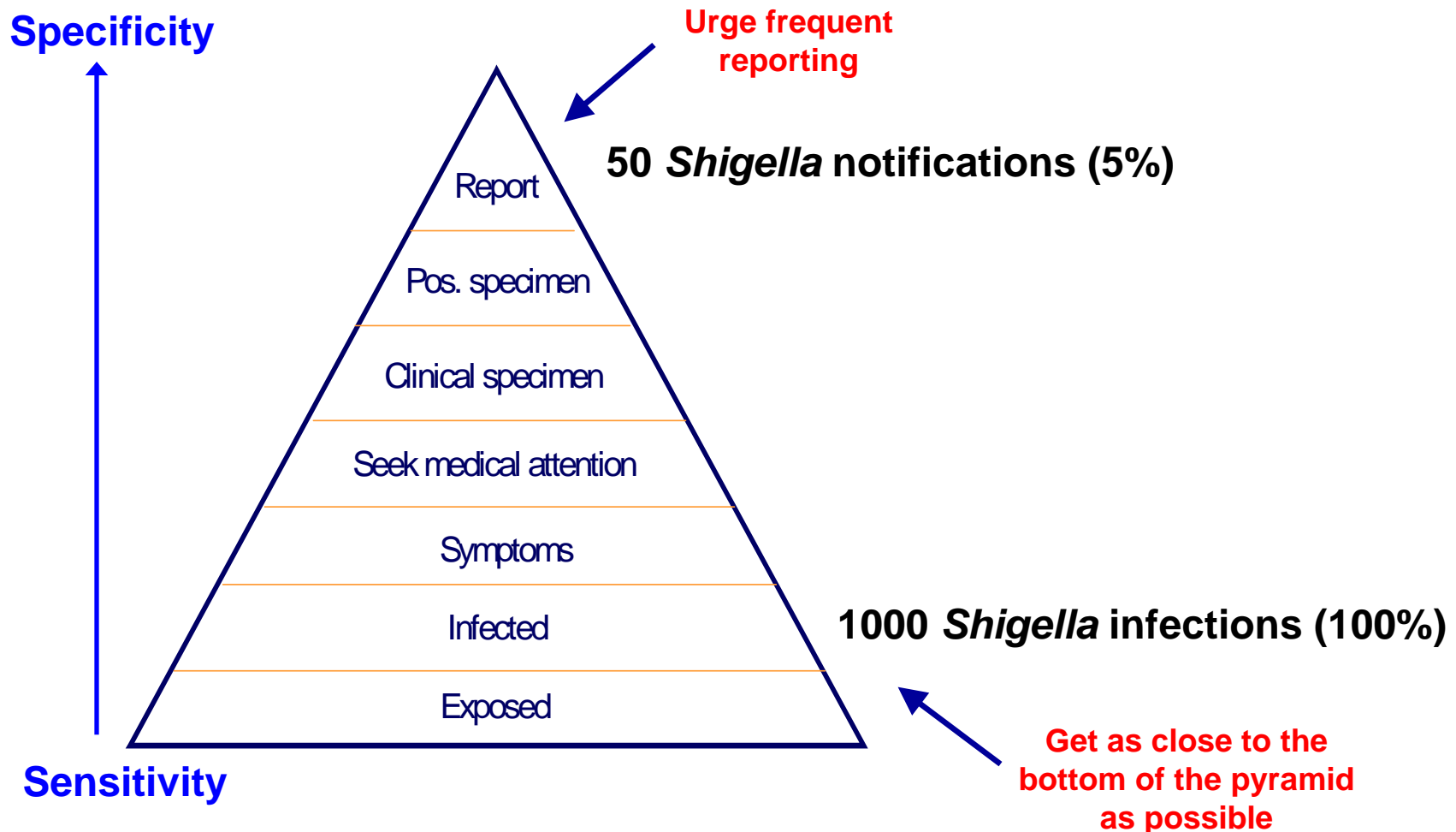
...that you will help build a global system to detect each new disease or disaster as quickly as it emerges...



InSTEDD

Innovative Support to Emergencies
Diseases and Disasters


From Infection to Detection: Proportion of Infections Detected



Our Objective

To address these challenges by adopting a social network and cognitive model approach in order to **facilitate**

- **early identification** of potential health threats
- their **verification, assessment** and **investigation**
- in order to recommend **measures (public health and others)** to control them.



Prototyped for MDBS
Generalized to other regions and conditions

A Hybrid Surveillance Approach

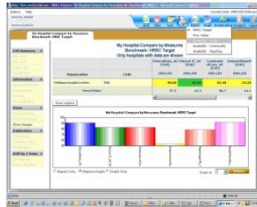
- Indicator-based surveillance
 - computation of indicators upon which unusual disease patterns to investigate are detected (number of cases, rates, proportion of strains...)
- Event-based surveillance
 - the detection of public health events based on the capture of ad-hoc unstructured reports issued by formal or informal sources.

InSTEDD Platform Overview

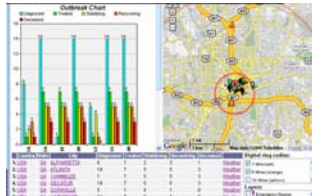
Multiple data streams (structured and unstructured)

- Moderated Lists, News Feeds, Articles, Blogs, Emails, wikis (e.g., fluwiki), Videos, Audios
- Human health, animal health, plant health, water quality, Internet traffic, utilities, intelligence. etc.
- SMS, SMS Geo-Chat

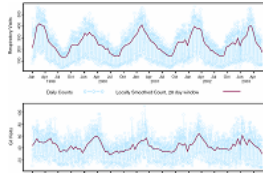
Alert and Health Events Board



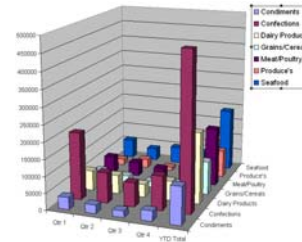
Asset Status and Readiness



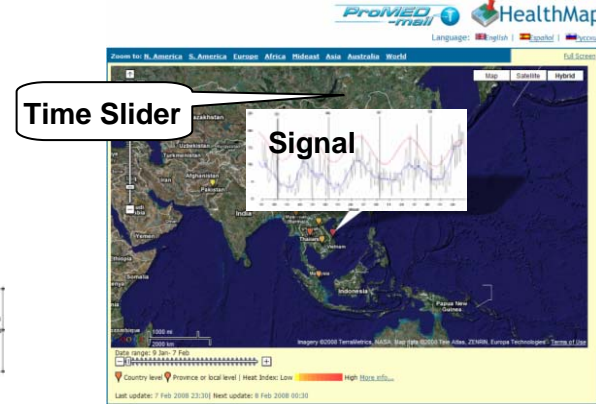
Time Series Visualization



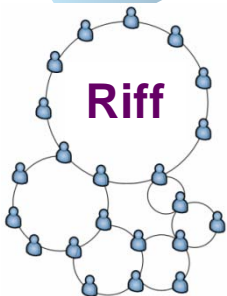
Data Visualization



Spatio-Temporal Analysis




Contact Tracing and Network Modeling



2/29/2008

User Alerts



John Doe
First Name: John
Last Name: Doe

Download Card
Live profiles: LinkedIn - Facebook - Ning

Active in following spaces

- GDACS Maps 3 days ago
- Biosurveillance indicators 5 days ago

Favorites

- GDACS Maps items
- Kenya Map
- Humanitarian Aid Presence in Bangladesh

Biosurveillance indicators items

- TB in Africa
- H5N1

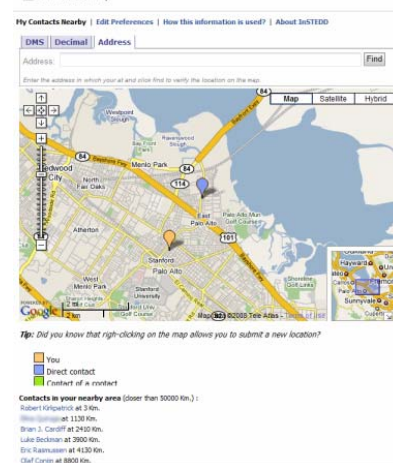
Tags Recently Used

- Africa Asia Bangladesh Bird Flu H5N1 Tuberculosis Zimbabwe

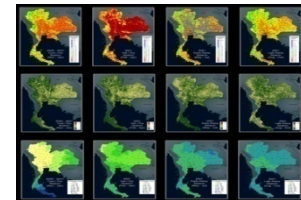
Biosurveillance Tags

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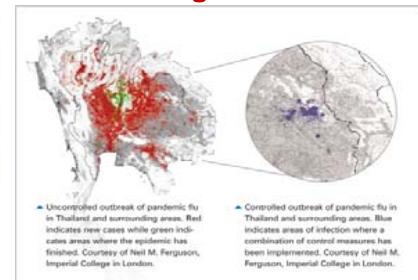
Response



Remote Sensing



Risk Visualization, Simulation and Modeling



InSTEDD Platform

Open source applications, services, and frameworks

Collaboration

Directory

Social Networking

Virtual Teaming

Messaging

Social Metadata

Decision Support

Geospatial
Visualization

Autonomous
Agents

Predictive
Modeling

Distributed
Workflow

Alerting

Reporting

Search

Analysis

Data Fusion

Anomaly
Detection

Complex
Systems

Network
Analysis

Text Mining

GigaPop
Computing

Sensor
integration

Data Collection

Forms Design

Shared Ontologies

Schema Evolution

SMS and Mobile
Reporting

Geocoding

Mesh Synchronization

Storage
Abstraction

Offline Work

Conflict
Resolution

SMS
Integration

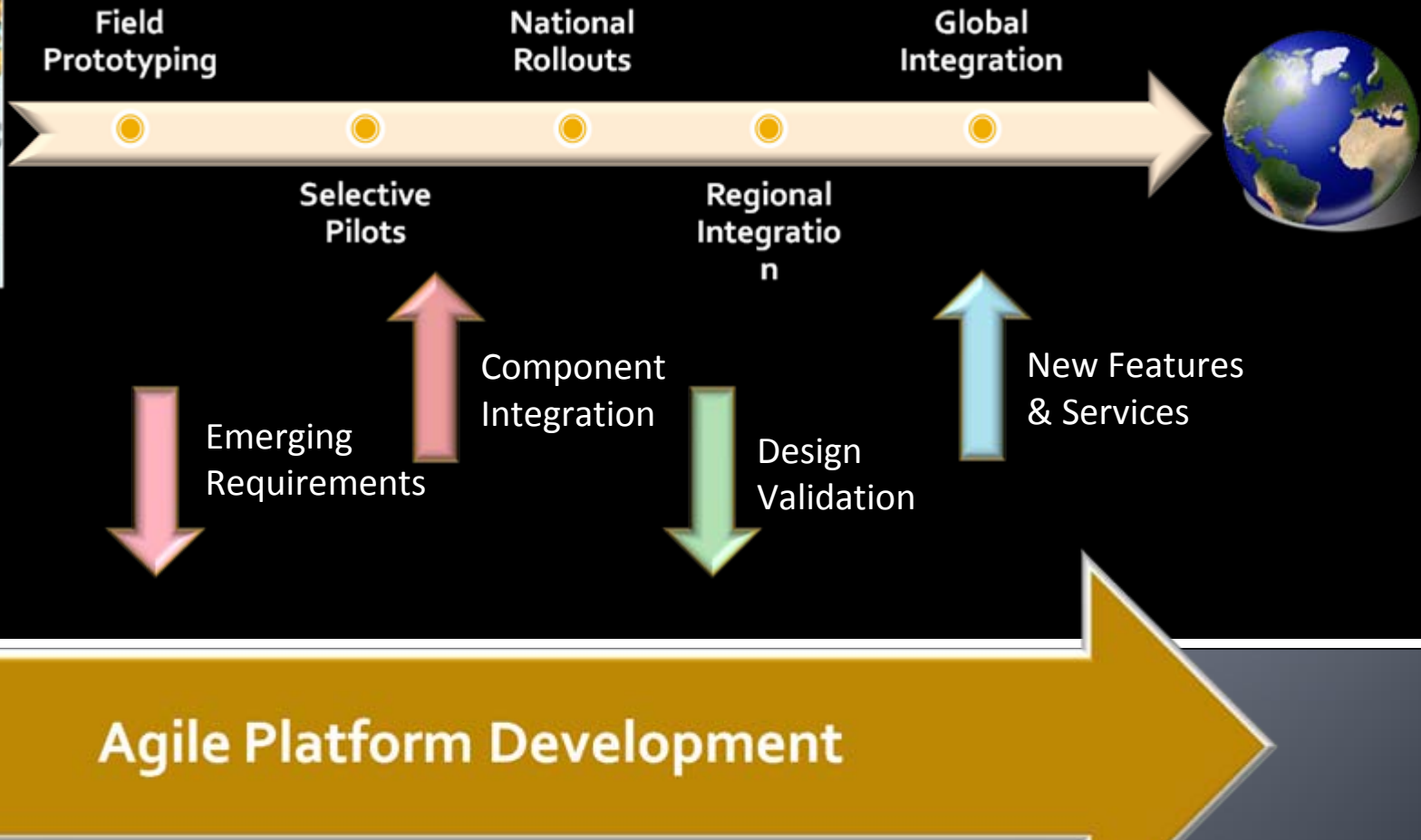
Security

Identity

Adapters &
Transformers

Field Lab and Platform Synergy

Learning at the edge, building for the future



Mekong Collaboration Program



Serious
infectious
disease
hotspot.

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InSTEDD Platform – SMS Text Using Twitter Bot

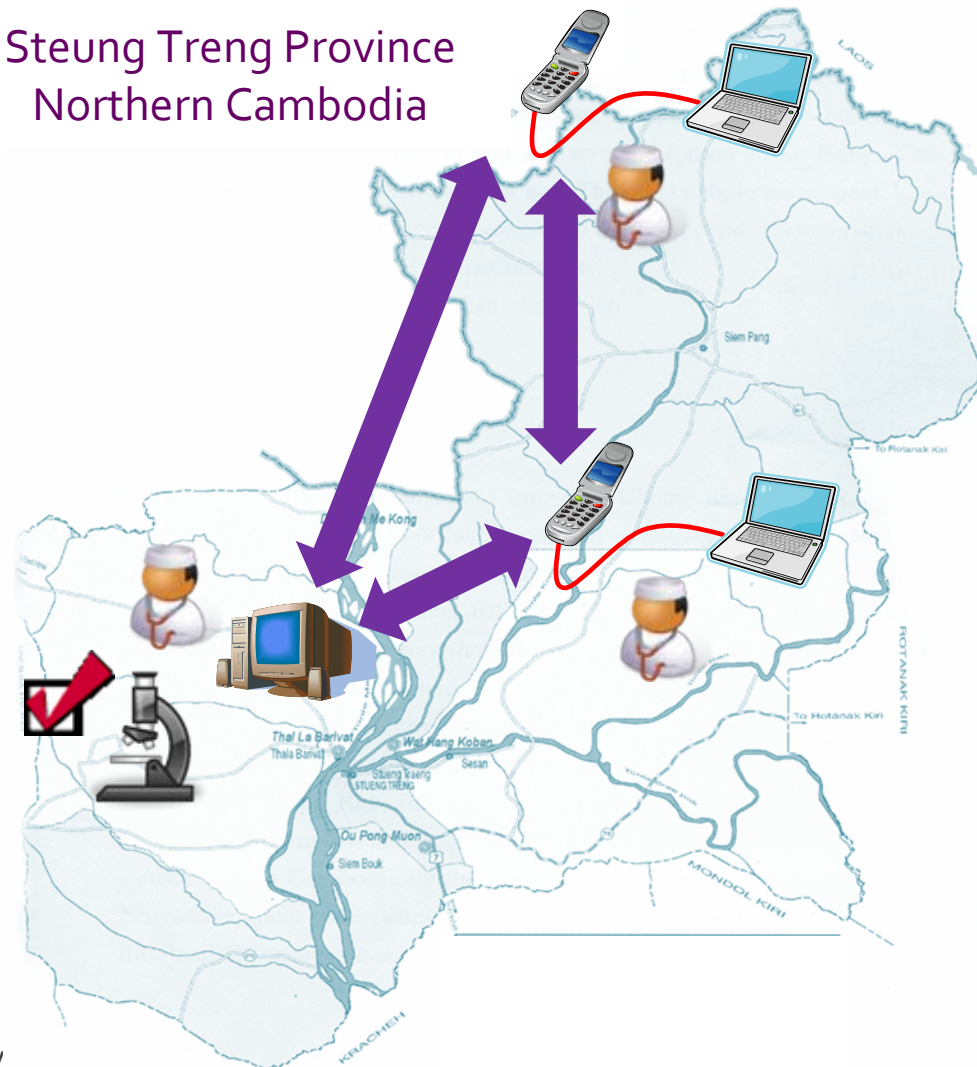


Steung Treng Province, Cambodia

District EWARN Sites, Diagnostics Lab in Provincial Capital

- EWARN database SYNCHRONIZES via SMS. Cell phones to laptops.
- The outbreak, the lab confirmation, and the contact tracking, can all be done over SMS.

Steung Treng Province
Northern Cambodia

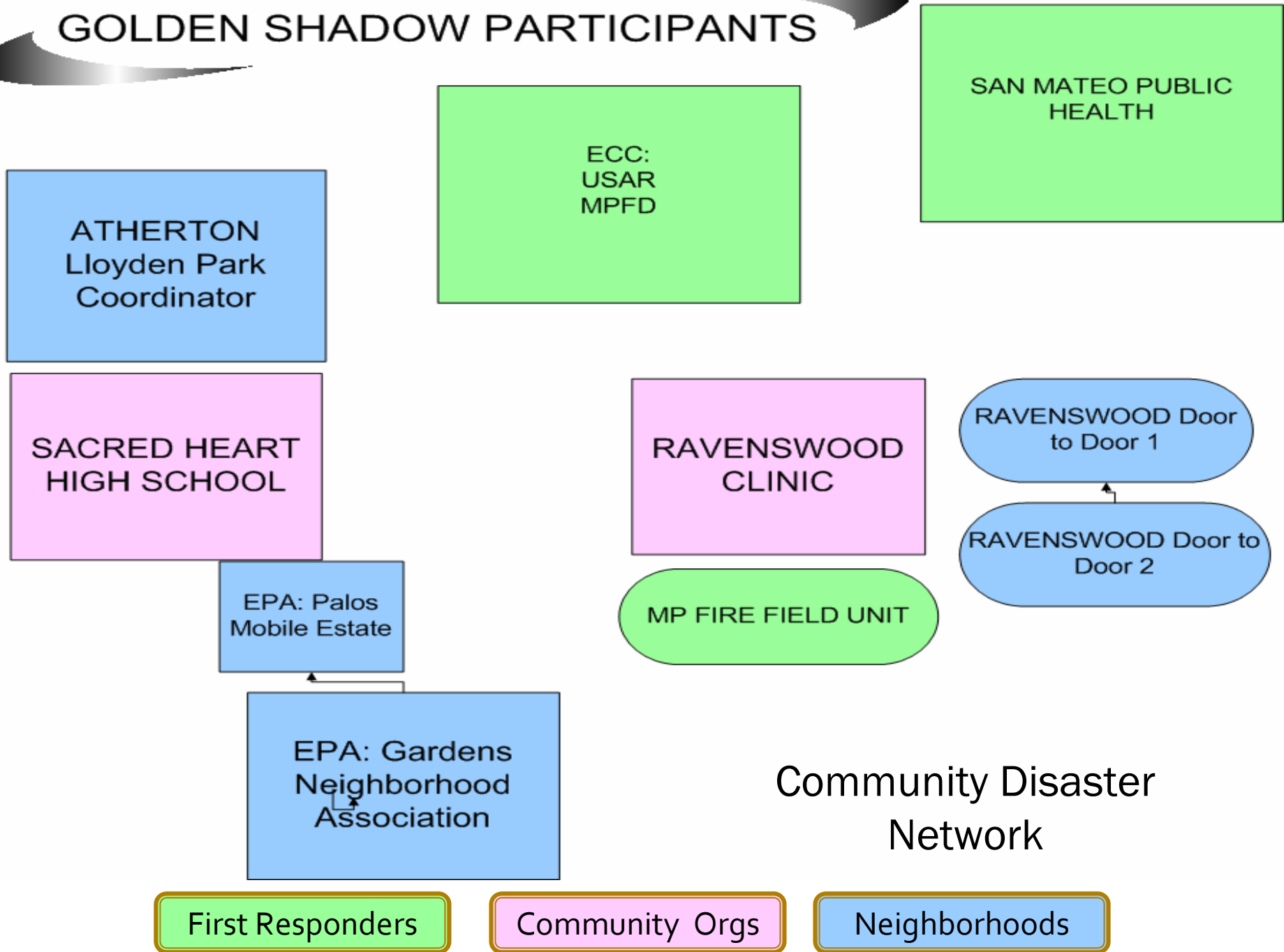


SMS in a Public Health Emergency: Collaboration Testing in the Field

The Golden Shadow Demonstration



GOLDEN SHADOW PARTICIPANTS



Communication but not collaboration...

Using agile design and early validation for linking people to help



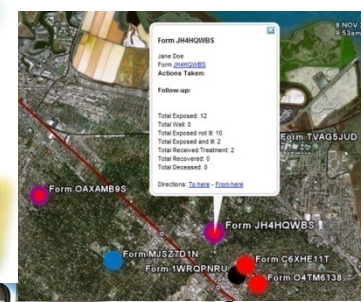
Emergency
Command Center



GeoChat



GeoBlogging

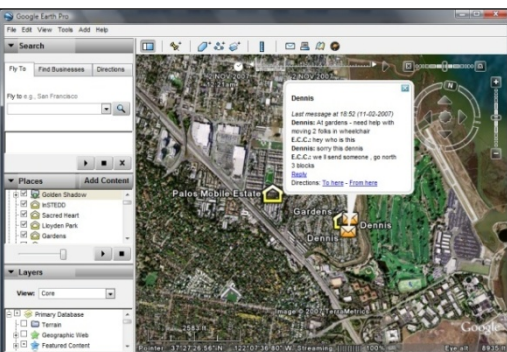


GeoForms

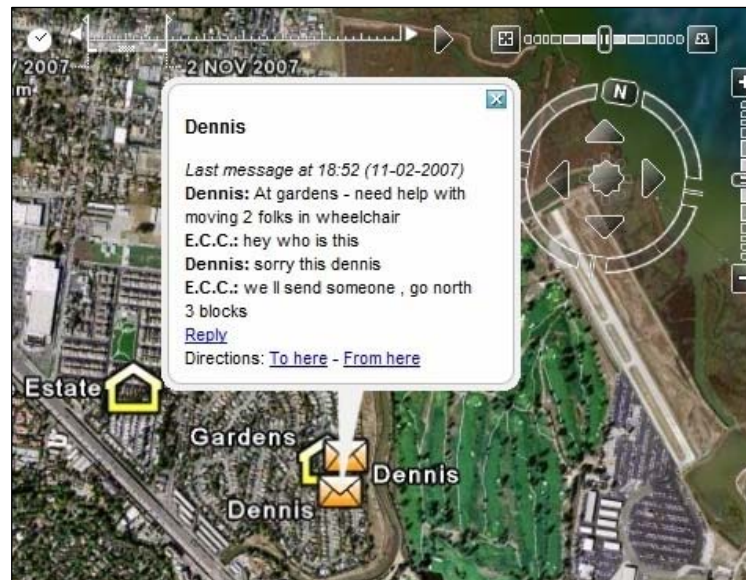


SMS Microblogging (cell phone + Google Earth): GeoChat

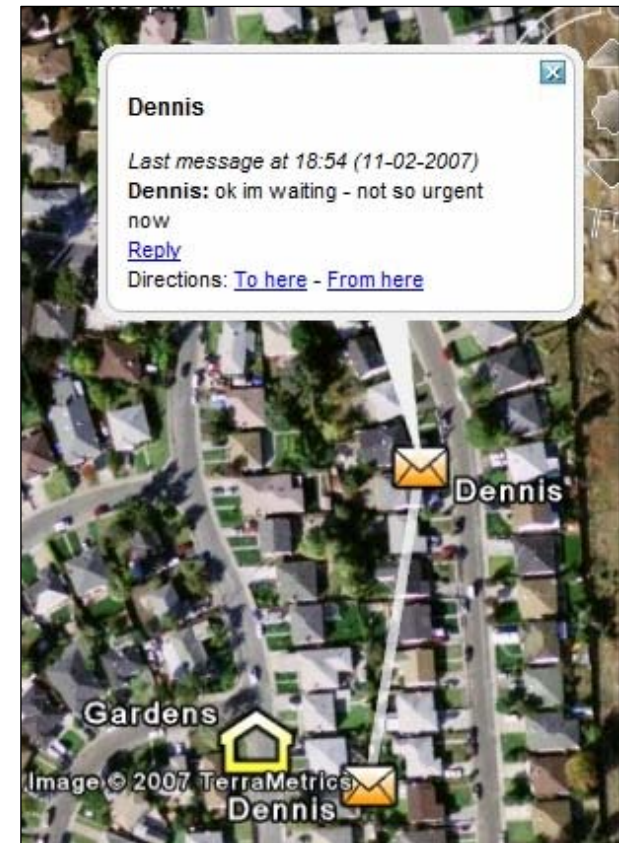
- Cell phone SMS messages show up on Google Earth
- Time, date, person, location, text
- Reply directly from Google Earth
- See movements as paths over time
- The status display ages (colors...)



2/29/2008

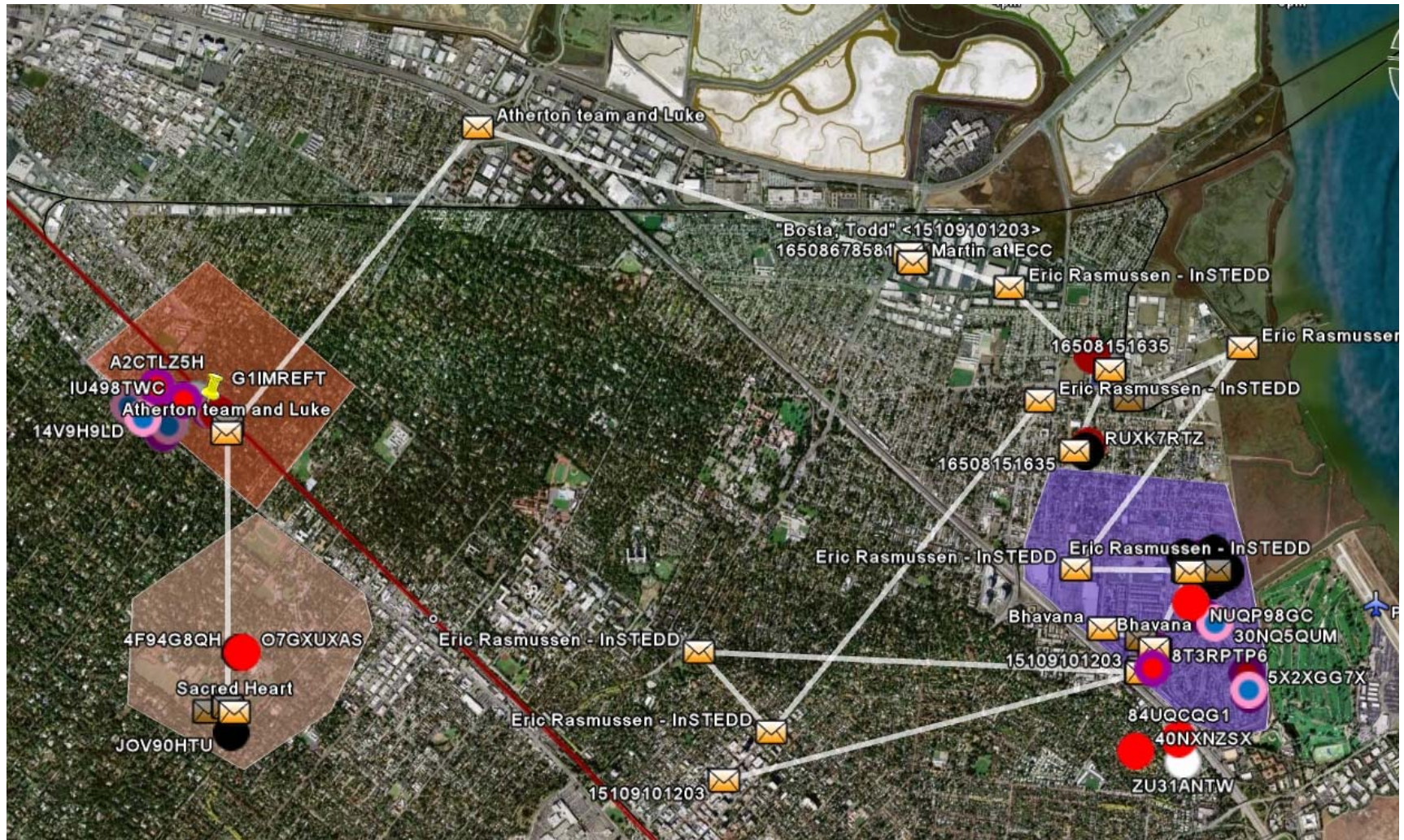


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Emergency Response and Disease Outbreak Tracking using SMS



What we discovered



Moving Forward

- Creating a collaborative environment where human epidemiologists decision makers and responders interact with automated systems, using their existing tools and services when possible
- Application of Social Network Model approach and Collaborative decision making technology into the process

Thank you!

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The Need

- The likelihood of disasters and disease outbreaks is growing
 - According to a recent Oxfam report, there has been a four-fold increase in the annual number of natural disasters
http://www.oxfam.org/en/policy/briefingpapers/bp108_climate_change_alarm_0711
 - 30 infectious diseases identified since 1973
- Potential impact is getting greater
 - Impact on health, economies & security
 - Capable of spreading faster than ever before

The Problem Space

- Current systems design, analysis and evaluation has been geared towards specific data sources and detection algorithms – not humans
 - Much less has been towards interaction with responders and domain experts across agencies and at multiple levels
 - Often provide contradictory interpretations of ongoing events
- We have systems in place for those threats we have been faced with before
 - We are more vulnerable to those we know about, but have not faced on a major scale
 - Even more vulnerable to those that we don't know about

Current Partners

- Research Triangle International
- Harvard MIT – Healthmap
- NASA Goddard Space Flight Center
- IBM: Public Health Information Affinity Domain (PHIAD)
- ProMed



GODDARD SPACE FLIGHT CENTER



Public Health Information Affinity Domain (PHIAD)

A scalable, standards-based, hierarchical network for the exchange of public health information.



Lessons Learned

- Those who had not used text messaging before the demonstration (mainly seniors) reverted to their preferred methods (FRS radio) during the emergency. It is hard to say what would have happened if they only had text messaging as an option
- Those who were experienced with text messaging loved using it for reporting

Lessons Learned

- Those who had failures in all other forms of communication (their FRS radios failed) reverted to SMS text messaging and used it for their internal communication
- The lack of responses to text messaging (and all forms of comm.) was very difficult
- All of the other things we learned around how info needs to be meaningful...triaging at the field level...