

Towards Information Services for Disaster Relief based on Mobile Social Networking

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- New Opportunities for Disaster Relief
- Information Needs
- Information Services
- Communication Architecture
- Conclusions and Outlook

- **Responding to large-scale disasters presents a challenge**
 - Local rescue forces also affected by incident
 - Inoperable infrastructure, communication breakdown
- **Authorities not able to provide aid within first few hours**
 - Delay until deployment of (external) rescue forces
 - Uncertainty of number and whereabouts of victims
- **First 72 hours critical for saving human lives**
 - Effective coordination of response operations necessary
- **Situational awareness key to success**
 - Timely and accurate information
 - Problem of delayed reports from official first responders

New Opportunities for Disaster Relief

- **Affected population observes disaster directly**
 - First responders often volunteers among population
 - Provide immediate situation reports
- **Many people carry powerful mobile devices**
 - Internet connection via EDGE/3G/WLAN
 - GPS receiver, high resolution cameras, etc.
- **Growing popularity of Mobile Social Networking services**
 - People sharing user-generated content with mobile devices
 - Location-based services and augmented reality

→ Opportunity for Disaster Relief:

Public Participation based on Mobile Social Networking

Benefits of public participation

- **Empower official rescue forces**
 - Obtain first-hand situation reports
 - Access knowledge from local residents
 - Issue warnings and recommendations
 - Organize evacuations more effectively
- **Support public response efforts**
 - Immediate mutual help among citizens

Contributions

- Overview of information services for public participation
- Communication architecture for these services

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Official Responders

What is the situation?



Affected Population

Victims

Where to get help?

Public Responders

Who needs support?



Official Responders



and

Public Responders



- Whereabouts of victims
- Infrastructural damages
 - Obstructed roads
 - Unsafe buildings
- Potential hazards
 - Hazardous materials
 - Gas leaks, fires etc.
- Available resources
 - Hospitals, airports etc.
 - Machines, personnel
 - Volunteers

Victims



- Official warnings and guidelines
- Call for help / Notify “I’m OK”
- Infrastructural damages
- Potential hazards in surroundings
- Location of useful resources
 - Hospitals, evacuation centers
 - Food, clean water
 - Gas stations, power generators
- Whereabouts of family and friends

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- **Damage Assessment**
- Hazard Monitoring
- Victim Registry
- Resource Inventory
- Need Registry
- Task Monitoring
- Information Dissemination
- Event/Need Reporting
- Expert Consultation
- Navigation
- Request/Pledge Mediation
- Contacting Acquaintances

Damage Assessment

- Overview of infrastructural damages
 - Road obstructions
 - Unsafe buildings

- Damage Assessment
- **Hazard Monitoring**
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Hazard Monitoring

- Overview of potential hazards
- Real-time monitoring (including forecasts)
 - Automatic risk assessment
 - Recommendation of intervention
 - Prioritization of hazards
- Warn about hazards in surrounding area or along a planned route

- Damage Assessment
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- **Victim Registry**
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Victim Registry

- Overview of potential victims
- Provide status information
 - Last known location
 - Missing / In Treatment / Deceased
- Patient tracking
 - Health condition
 - Treatment location
 - Known relatives

- Damage Assessment
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- **Resource Inventory**
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Resource Inventory

- Locate, monitor and track resources
 - Personnel (tasks, assignments)
 - Machines, vehicles
 - Medication, food, water, fuel supply
 - Hospitals (bed capacities)

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Need Registry

- Overview of needs and resource requests
- Prioritization of requests
- Assisted mediation of available resources

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- **Task Monitoring**
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Task Monitoring

- Overview of progress of assigned tasks
- Distributed, automated tracking
 - Volunteers not bound to commands
 - Monitor fulfillment of tasks more closely
 - Reassign tasks if necessary

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Information Dissemination

- Inform affected population
 - Issue warnings and recommendations
- Broadcast / multicast
 - Disseminate to geographic region
 - Address individuals by specific attributes

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Event/Need Reporting

- Report observations and requests
- Supply other services with information
 - Report damages, hazards, victims
 - Request resources
 - Call for help / Notify “I’m OK”

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Expert Consultation

- Locate citizens with specific skills
 - Medical treatment
 - Hazardous materials
- Enable remote analysis of a situation
 - Provide information about situation (e.g. photo or short video)
 - Obtain feedback from expert

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Navigation

- Route planning and guidance
- Consider disaster-related constraints
 - Infrastructural damage
 - Dangerous areas
 - Traffic conditions (prevent congestion)
 - Balance load among relief centers

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- **Request/Pledge Mediation**
- Contacting Acquaintances

Request/Pledge Mediation

- Required by public responders
- Match requests to fulfillment offers
- Support self-organized relief efforts
 - Task planning among volunteers

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- **Contacting Acquaintances**

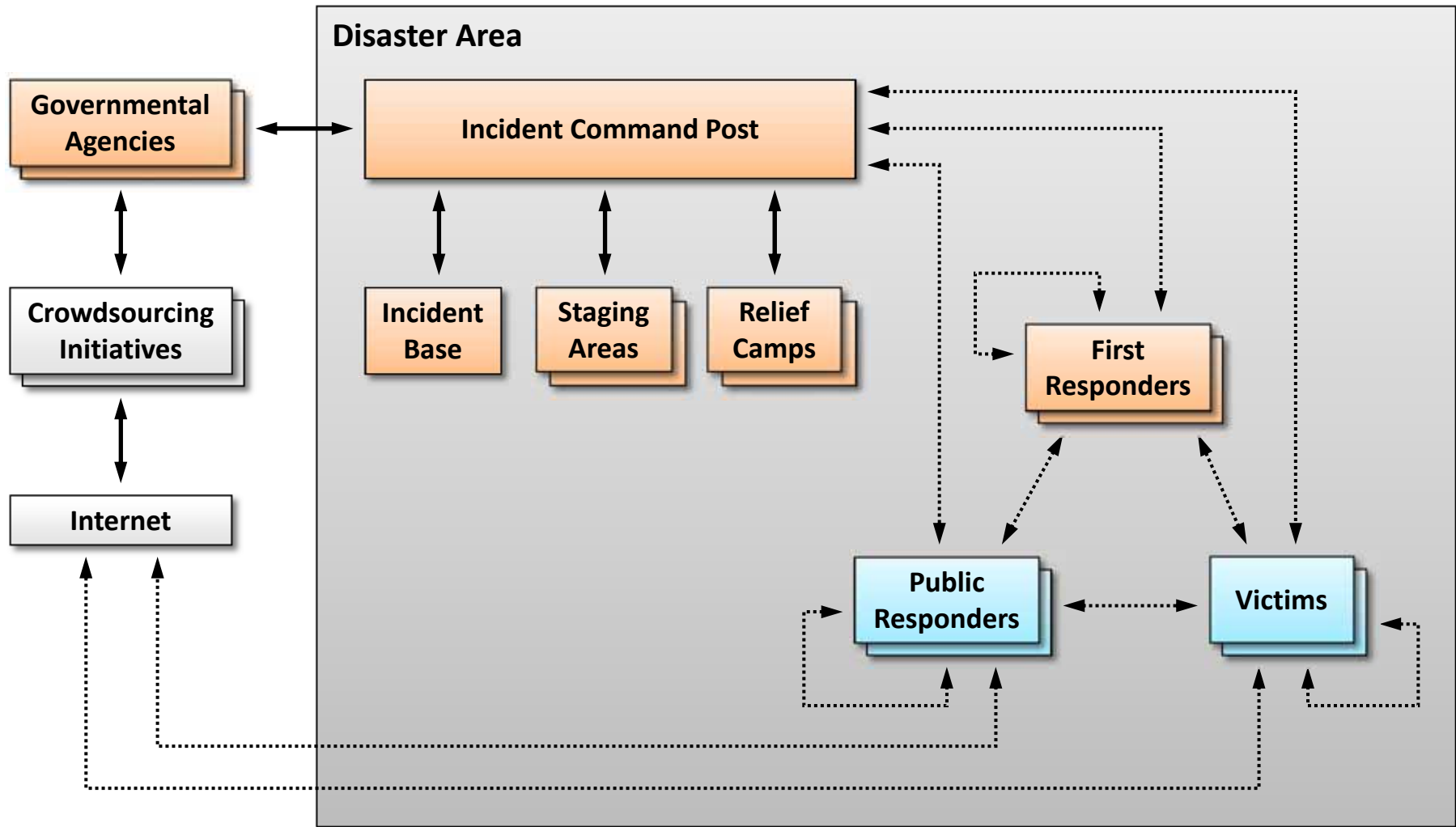
Contacting Acquaintances

- Enable communication among victims
- Contact friends and relatives
 - Report location, health condition
 - Meet at specific relief centers

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- **Existing Disaster Management Information Systems**
 - Virtual OSOCC, Sahana, WebEOC, E-Team, etc.
 - Centralized, web-based platforms
 - Platforms do not consider mobile social networking
- **Existing Mobile Social Networks require infrastructure**
 - Ad hoc communication not supported
 - Distributed, delay-tolerant approaches necessary
 - Need for distributed storage based on mobile devices

Proposed Communication Architecture



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Conclusions

- New opportunity for disaster relief:
Public participation based on mobile social networking
- Systematic overview of information services
- Proposed communication architecture

Outlook

- Applicability of existing delay-tolerant ad hoc communication approaches to mobile social networks in disasters
- Prevention of injection of malicious user-generated content
- Mobility models for mobile social networks in disasters

Thank you very much!

Questions?