

Geo-based Content Sharing for Disaster Relief Applications

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disaster

[dih-**zas**-ter, -**zah**-ster]

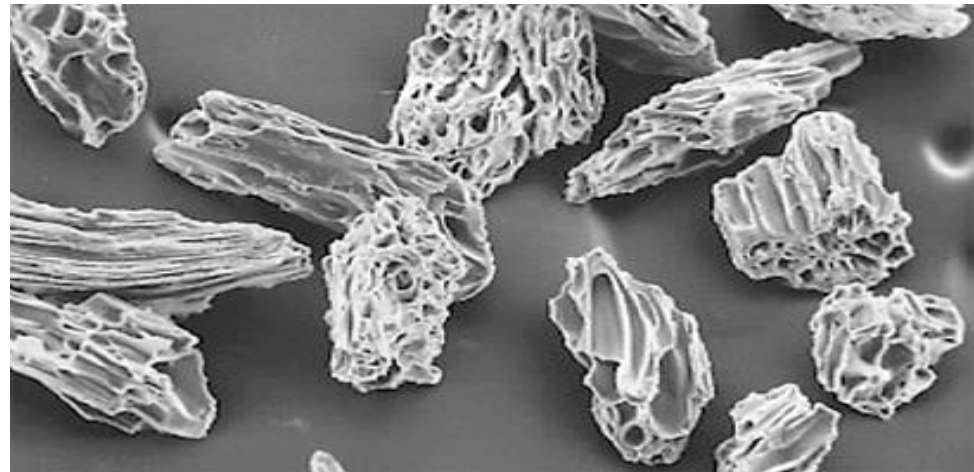
noun

A calamitous event, especially one occurring suddenly and causing great loss of life, damage, or hardship, as a flood, airplane crash, or business failure.

Iceland: A laboratory for (natural) disasters

- Frequent, extreme natural events
- Infrastructure designed for a scarce and sparse population
- Huge touristic presence, even in most remote areas

Iceland: A laboratory for (natural) disasters



Iceland: A laboratory for (natural) disasters



Floods



Brave (naïve?) tourists

Iceland: A laboratory for (natural) disasters

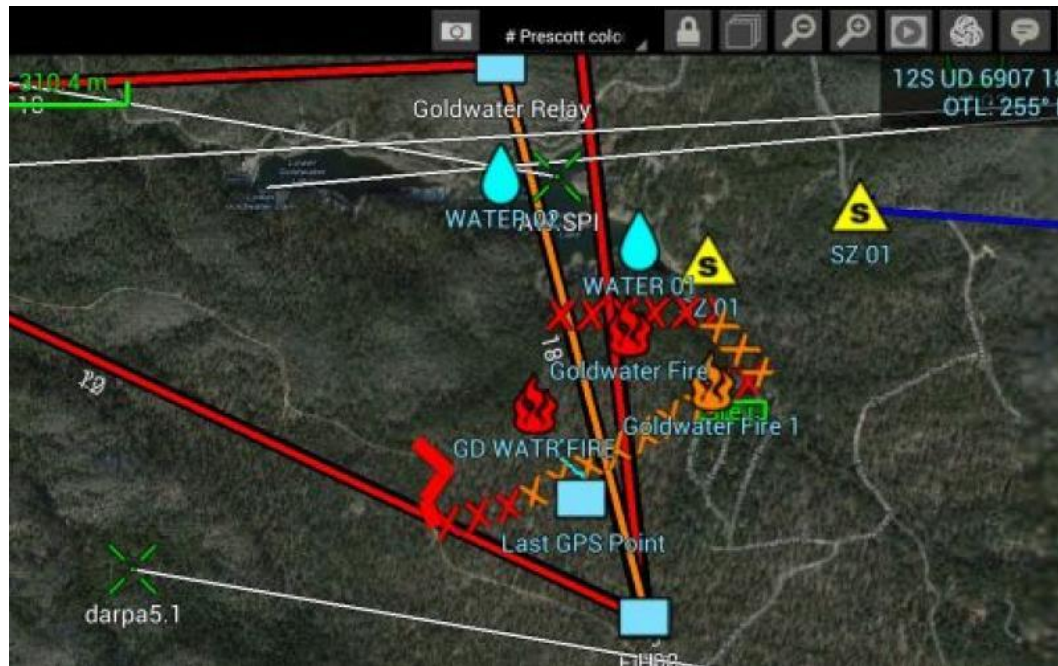
- Storms and/or weight of accumulated icing let power transmission and communication structures collapse.
- Many rural areas/farms only connected by radio: Antennas subject to icing leading to communication failures.



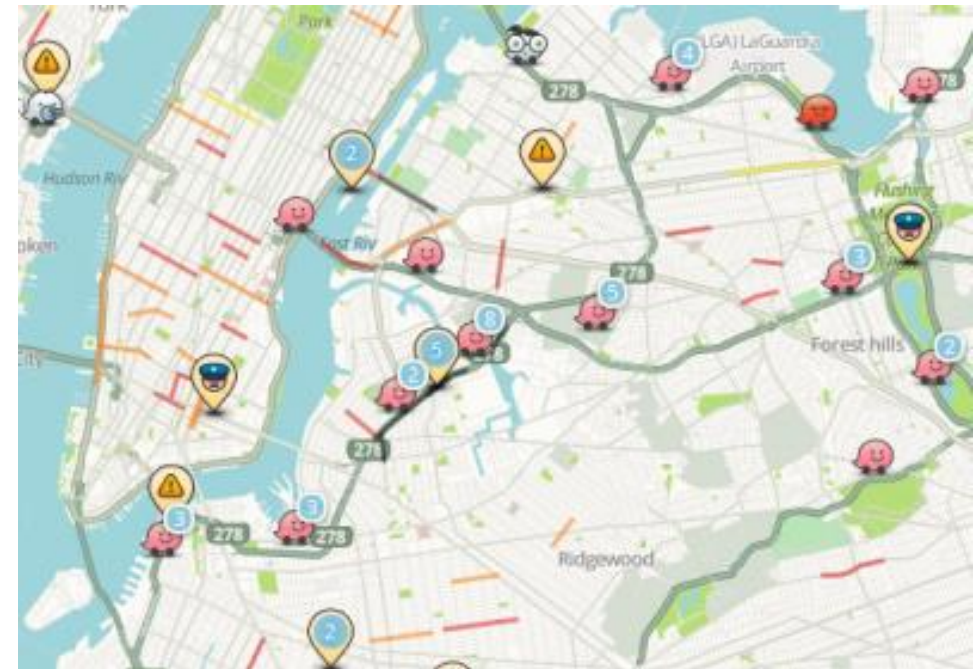


Critical information sharing: Build collaboratively a common view of the status of the emergency

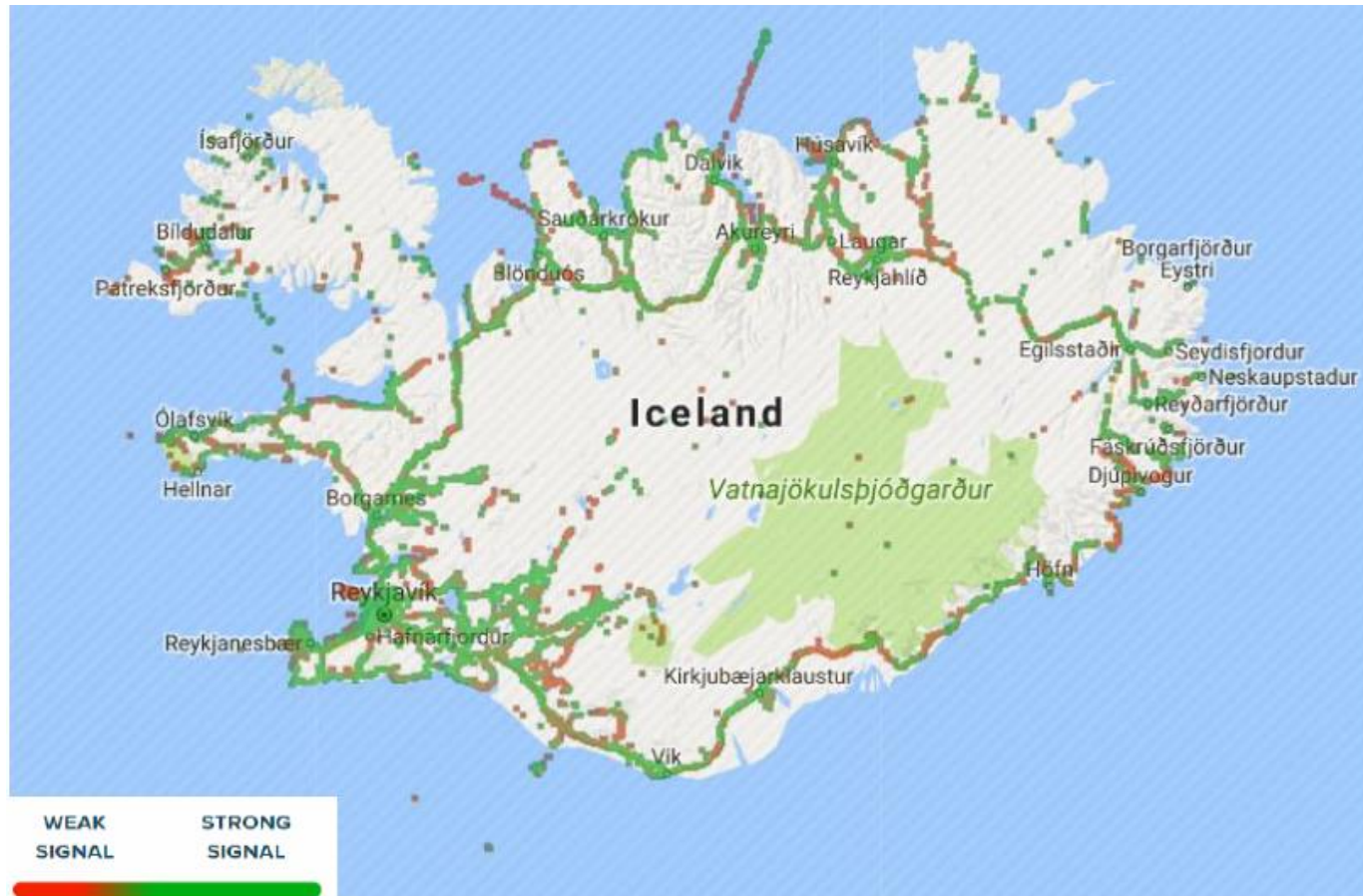
Situation awareness in rescue operations



Live road alerts



Infrastructure for communication is not suitable to satisfy the need for information during a disaster

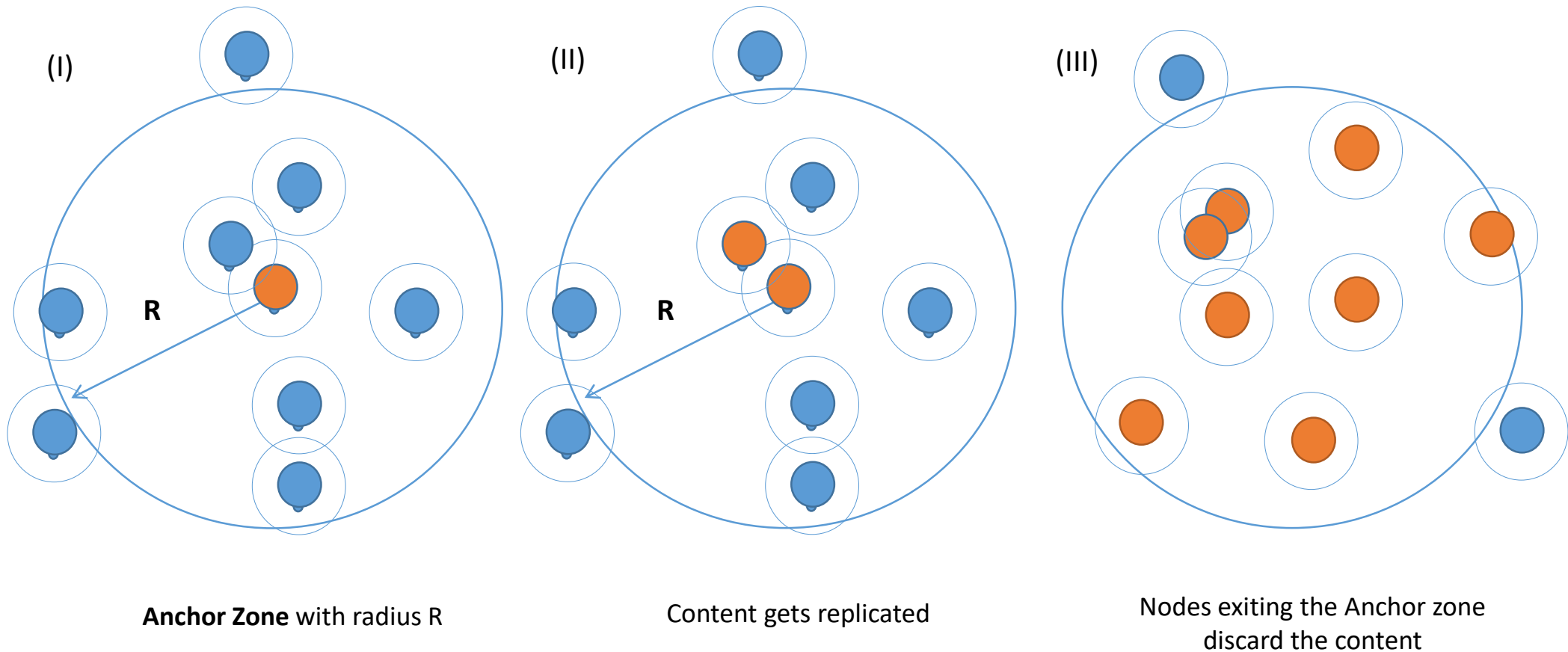


Aggregate coverage map of Iceland, built from crowdsensed data

- Sparsely or non-inhabited areas are not covered (or not reliably) by cellular network.
- However, these areas are populated, in particular by tourists.
- Single point of failures in the optical network

Floating Content enables information storing and sharing without fixed infrastructure

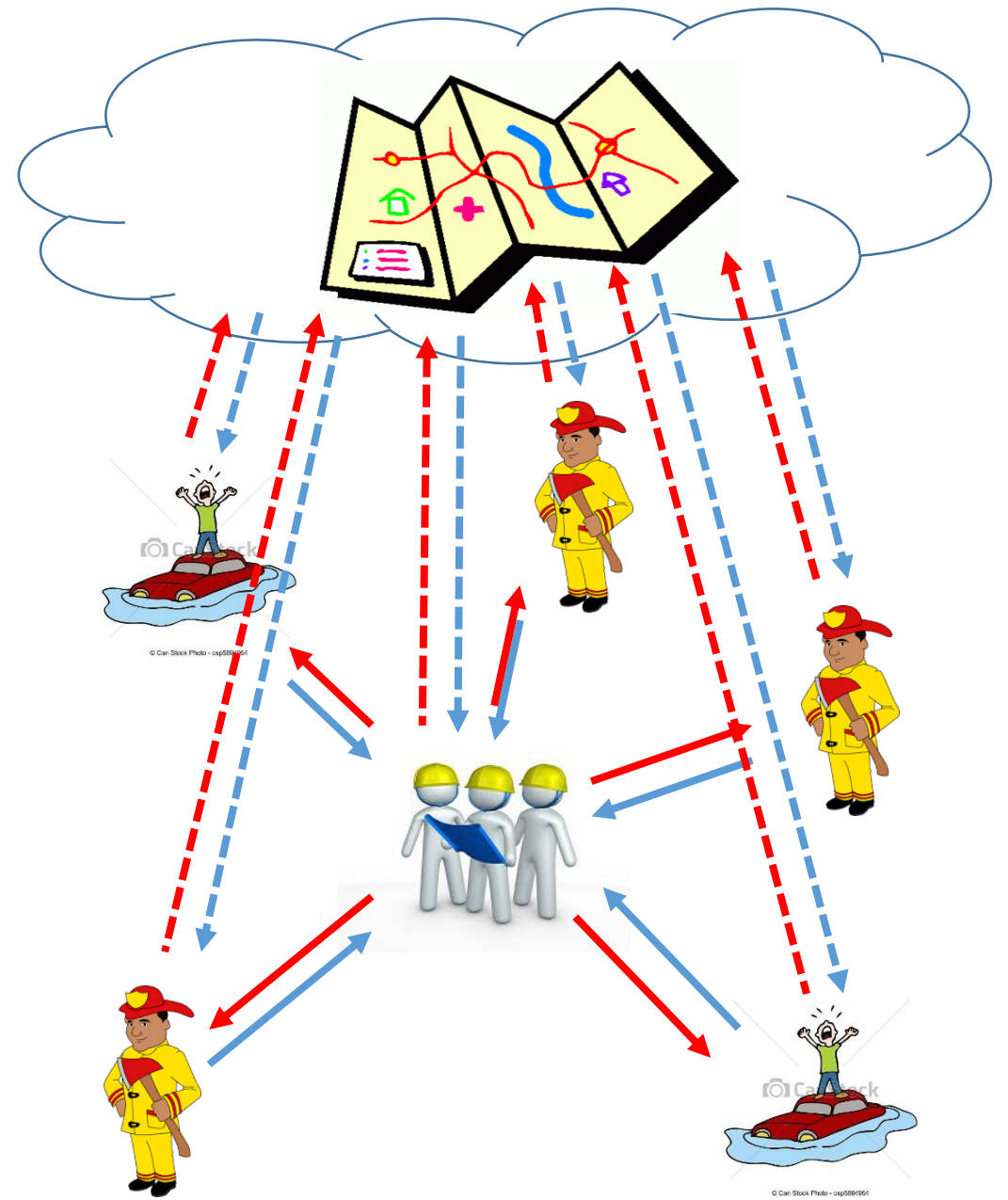
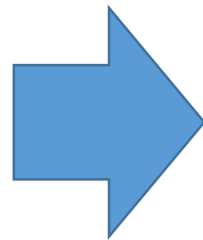
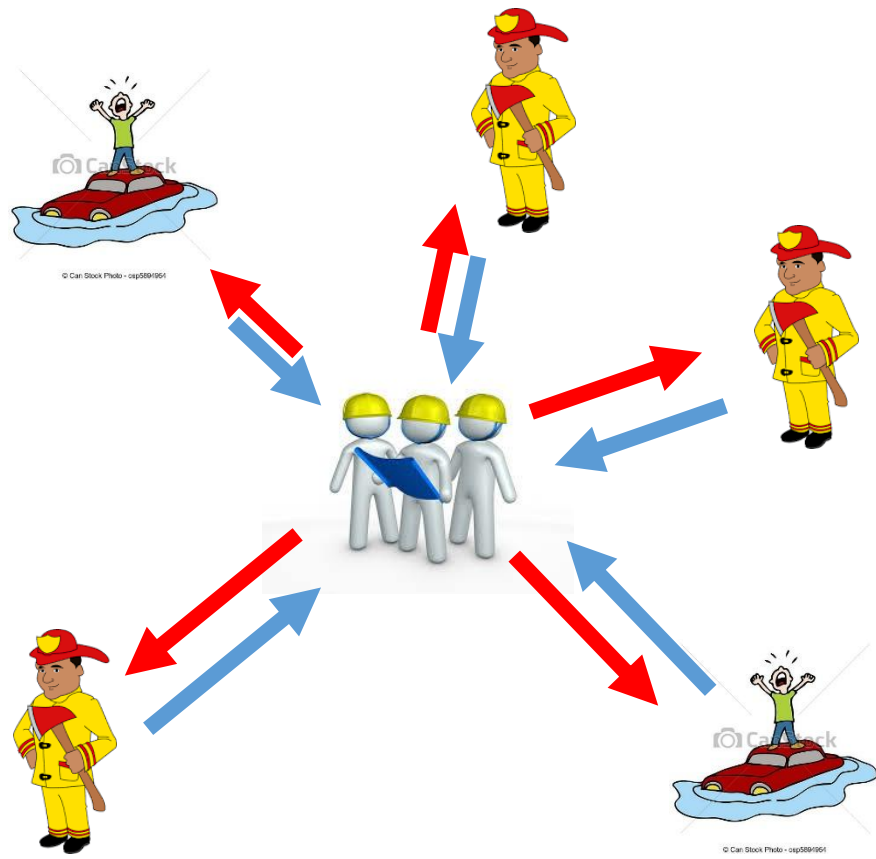
FC: Opportunistic communication scheme for the local dissemination of information to end users through direct terminal-to-terminal connectivity



Situation awareness with FC: Creating a shared vision of the disaster area and of rescue operations

- FC makes information available where and when it is needed
 - “Labeling” of physical location with info (useful for rescue)
- Goal: Build in real time, collaboratively a common view, accessible by everyone in the region who needs it
 - Without infrastructure
 - Many-to-many: no bottleneck
 - Information sources and users often coincide

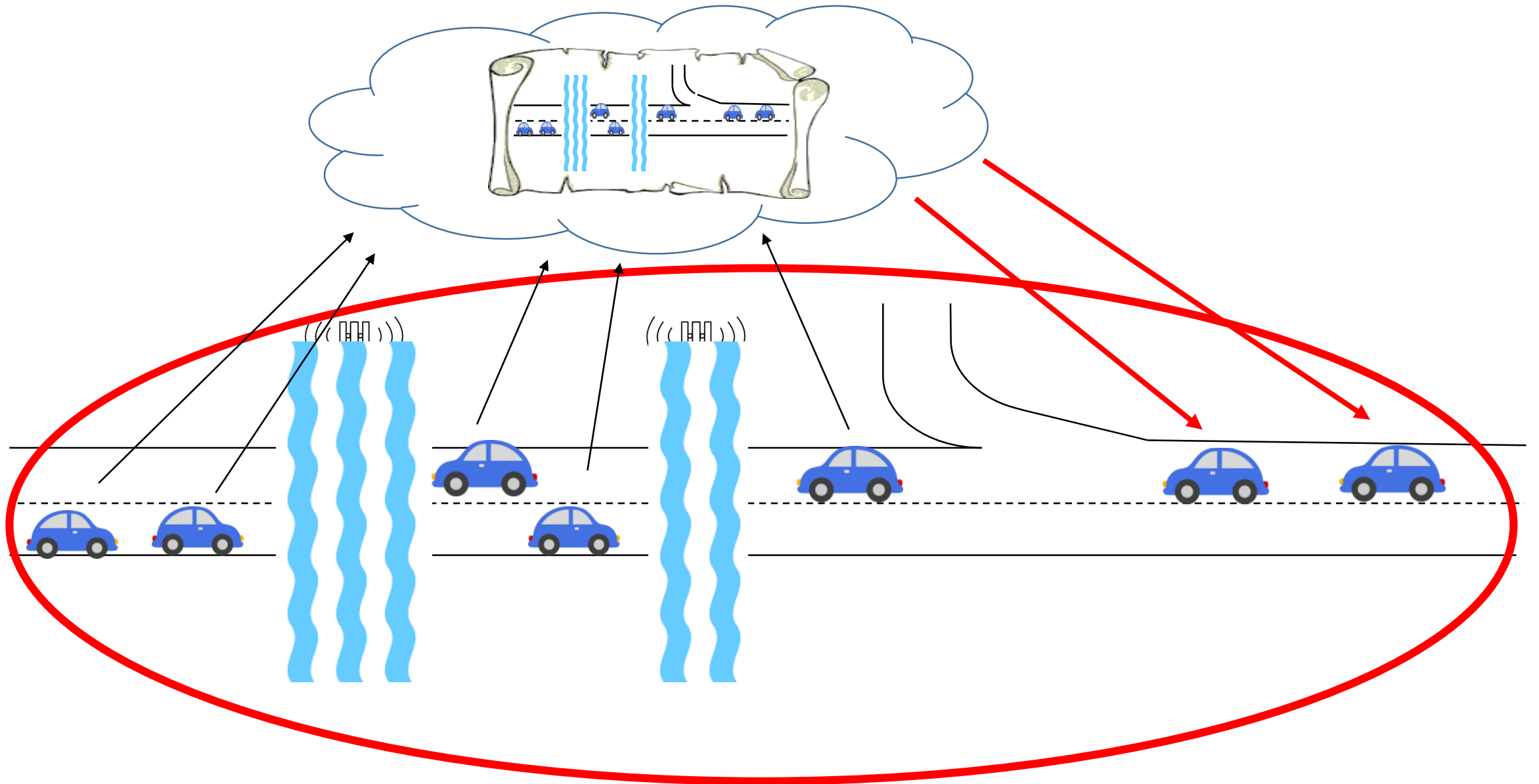




Pros and cons

- Floating content requires a **critical mass** in order not to disappear
 - Typically, people accumulate in the vicinity of a disaster area (search and rescue operators, volunteers, local presence, and affected people)
- Advantages and disadvantages WRT traditional ad-hoc routing:
 - More robust to churn and nodes mobility
 - It requires lower node density
 - BUT: not suitable for real-time interactions

“Ad-hoc Waze” with FC



Conclusions

- Consequences of disasters are amplified by obstacles to information collection and diffusion
 - Delay and decrease in efficiency of rescue operations

We have analyzed the suitability of the Floating Content paradigm for satisfying (at least part of) such demand for data

Future work: devise models for FC performance in such environments, possibly based on realistic mobility patterns

Storyboard

- The problem
 - Iceland as a ideal harsh testing environment
 - Two instances:
 - Situation awareness
 - Vehicular warning
- A help from FC?
 - What is FC?
 - FC for SA:
 - Implementation
 - Challenges and possible approaches
 - FC for VW:
 - Implementation
 - Challenges and possible approaches
 - Conclusions