Research Directions for Using ICN in disaster scenarios

draft-irtf-icnrg-disaster-02

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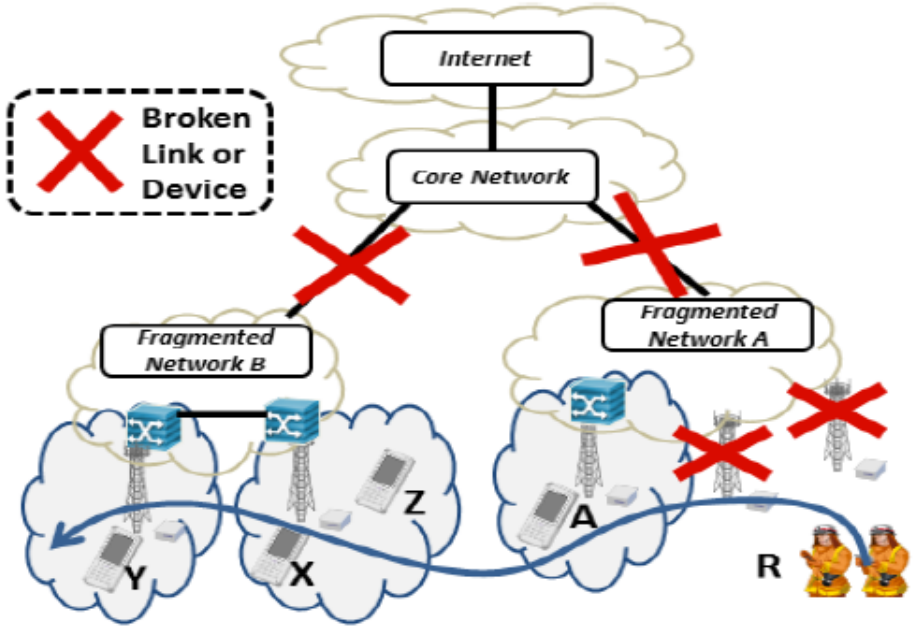
Scope of the Document: Scenario and Use Cases

Disaster Scenario

- The aftermath of a disaster, e.g. hurricane, earthquake, tsunami, or a human-generated network breakdown
- E.g. the enormous earthquake which hit Northeastern Japan on March 11, 2011 (causing extensive damages including blackouts, fires, tsunamis and a nuclear crisis)



Key Use Cases (High-Level)

- Authorities would like to inform the citizens of possible shelters, food, or even of impending danger
- Relatives would like to communicate with each other and be informed about their wellbeing
- Affected citizens would like to make enquiries of food distribution centres, shelters or report trapped, missing people to the authorities

History / Status Quo

History

- Multiple initial versions (2013-2016), output of the GreenICN project
- Various feedback incorporated
  - How ICN relates to existing DTN work (for the scenarios considered)
  - Adding work outside the GreenICN project
  - Addressing various comments
- Adopted as RG item in February 2016

Status Quo

- IETF98:
  - Chairs: reviewers from the WG needed
  - **Detailed Review from Akbar Rahman**
    - **Multiple comments and suggestions (posted on mailing list)**
  - **Comments addressed in latest version: -02**

Changes / Updates

Suggestion: New Title

Research Directions for Using ICN in ~~disaster scenarios~~
~~draft-irtf-icnrg-disaster-01~~ **Disaster Scenarios**
draft-irtf-icnrg-disaster-02

Changes / Updates

Comment: Mention existing disaster services in mobile networks

That earthquake in Japan also showed that the current network is vulnerable against ~~disasters and that mobile~~ **disasters. Mobile** phones have become th
lifelines for communication including safety ~~confirmation.~~ **confirmation: Besides (emergency) phone calls, services in mobile networks commonly being used after a disaster include network disaster SMS notifications (or SMS 'Cell Broadcast' [cellbroadcast]), available in most cellular networks.** The aftermath of a disaster puts a high strain on available resources due to the need for communication by everyone.

Changes / Updates

Comment: Mention that in existing mobile networks some services work without authentication

Decentralised authentication and trust: In mobile networks, users are authenticated via central entities. **While special services important in a disaster scenario exist and may work without authentication (such as SMS 'Cell Broadcast' [cellbroadcast] or emergency calls), user-to-user (or user-to-authorities) communication is normally not possible without being authenticated via a central entity in the network.** In order to communicate in

Changes / Updates

Comment: List of ICN benefits is not exhaustive

~~The list above is most likely incomplete; future revisions of this document intend to add more considerations to the list and to argue in more detail why ICN is suitable for addressing the aforementioned research challenges.~~

Changes / Updates

Comment: What about voice calls after a disaster?

5. Solution Design

This ~~Section~~ **section** outlines some ICN-based approaches that aim at fulfilling the previously mentioned use cases and requirements. **Overall, the focus is on delivery of messages and not real-time communication. While most probably users would like to conduct real-time voice/video calls after a disaster, in the extreme scenario we consider (with users being scattered over different fragmented networks, see Section 2), somewhat delayed message delivery appears to be inevitable, and full-duplex real-time communication seems infeasible to achieve. Thus, the assumption is that - for a certain amount of time at least (i.e. the initial period until the regular communication infrastructure has been repaired) - users would need to live with message delivery and publish/subscribe services but without real-time communication. Note, however, that a) in principle ICN can support VoIP calls, and b) message delivery includes voice messages (e.g. whatsapp voice messages).**

Changes / Updates

Comment: Is there existing work for ICN data mules?

assigned specifically to do so) or a completely random path (doctors moving from one camp to another). **An example of a many-to-many communication service for fragmented networks based on ICN data mules has been proposed in [Tagami2016].**

Changes / Updates

Comment: Is further work needed or are all problems solved?

Finally, the document ~~provides~~ **provided** an overview of examples ~~for conc~~
ICN-based solutions that address the previously outlined research challenges. **These concrete solutions demonstrate that indeed the communication challenges in the aftermath of a disaster can be addressed with techniques that have ICN paradigms at their base, validating our overall reasoning. However, further, more detailed challenges exist and more research is necessary in all areas we discussed: efficient content distribution and routing in fragmented networks, traffic prioritization, security, and energy-efficiency.**

Changes / Updates

Comment: How does this all relate to IETF standardisation?

In order to deploy ICN-based solutions for disaster-aftermath communication in actual mobile networks, standardized ICN baseline protocols are a must: It is unlikely to expect all user equipment in a large-scale mobile network to be from the same vendor. In this respect, the work being done in the IRTF ICNRG is very useful as it works towards standards for concrete ICN protocols that enable interopability among solutions from different vendors. These protocols - currently being standardized in the IRTF INCRG - provide a good foundation for deploying ICN-based disaster-aftermath communication and thereby addressing key use cases that arise in such situations (as outlined in this document).

Next Steps

Objectives (Informational RFC)

- Explain why ICN is a good starting point for addressing communication challenges after a disaster
- Provide concrete examples of existing work in the ICN research community

The authors believe that the documents is quite mature with respect to these objectives

Comments/Suggestions/Opinions?