Thesis topic: Information-centric Networking for disaster scenarios

Background
With the predominant usage of the Internet having shifted toward the distribution of content. New Internet architecture designs are underway to rethink how content should be distributed and stored in the Internet. One promising approach is Information Centric Networking (ICN), a candidate of next generation Internet architecture. The main idea of ICN is to supports content-based data dissemination through in-network caching and request-based content retrieval. Data objects can be cached in ICN routers, so that the requests can also from caches, not only from the original source. This architecture design is different from traditional host-based end-to-end communication. It is more scalable and efficient in the distribution of data objects.

Description
ICN decouples data from the source and allows data objects to be stored anywhere. This in-network caching property can reduce network traffic load and data delay. ICN disseminate information in a store and forward fashion, which gives it inherent support for delay tolerant networking (DTN). In a disaster scenario where all existing networking infrastructure can be assumed to be out of order a communication paradigm, like ICN, that works well in a DTN style ad-hoc networks should have significant advantages. This thesis work is about evaluating and substantiating these expected advantages.

Topics that are of interest includes:
- Information model for and naming of resources that should be accessed
- Dissemination strategies for Interest messages
- Resource discovery and zero-conf
- Models for resource sharing
- Access control to information objects
- Stay alive (both devices & people)

Objectives:
- Design and implement an app that can be used to request and publish information objects (App should be uploaded to an Appstore)
- The app should be able to communicate using device-to-device communication, e.g. Bluetooth, Direct WiFi.
- The app should also be able to communicate directly with IoT devices that use CCN/NDN natively over e.g. 802.15.4.

In ICN each node has a cache where it can store information objects. This means that objects can be made available to other users at a later time, even if the original source is no longer available or offline. In a disaster scenario where no infrastructure is available this makes all nodes capable to function as “data mules”. To be able to find data that might be stored
on some nearby node. There are several challenges that needs to be overcome.

- How to find out which nearby nodes do exist?
- Which node has what in its cache?
- Which interfaces should be used for which communication at which time?
- On which interfaces should Interest messages be sent?
- When should a node allow for transit traffic?
- Which objects should be stored in the cache and which should be removed?
- ...

The main goal of this thesis work is create an app that can be used in disaster scenarios to find and spread information using ICN technology. It will also evaluate and substantiate the expected advantages of using ICN compared to existing networking technologies. The work will be carried in a number of phases.

1. Perform a literature study to find out the state of the art for use of ICN in disaster scenarios.
2. Select/create a concrete disaster scenario to be used in this thesis work.
3. Create an information model to be used in ICN.
4. Develop the app.
5. Set up a lab environment where the app can be tested. This environment will include ICN enabled sensor devices, ad-hoc infrastructure ICN-WiFi base stations (e.g. based on Raspberry Pies) and possibly some resource servers.
6. Evaluate the advantages of using ICN compared to existing networking technologies.

**Description of the work**
- Preparations and reading: information centric networking (ICN), disaster scenario work done for ICN
- Implement disaster app in an ICN environment, probably CCN Lite, http://www.ccn-lite.net
- Evaluate the advantages of using ICN compared to existing networking technologies.
- Report writing
- Code documentation and packaging

**Qualifications**
You should be self-motivated and used to working with others in project teams. The positions also require you to be fluent in English, both written and spoken. In return, you will get to perform you thesis work with cutting-edge technology in a stimulating learning environment with a friendly atmosphere.

You should have good programming skills. Likely programming environment include Linux, C, Android and Java.
The Thesis is for a Master of Science Degree in Electrical Engineering, Computer Science or equivalent.

Contact Information

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Number of Openings  2

Company Description:

Ericsson is shaping the future of mobile communications and broadband Internet, providing innovative solutions in over 140 countries. More than half of Ericsson’s employees worldwide are university graduates and over a quarter of our research staff have technology PhDs.

Ericsson Research provides Ericsson with system concepts, technology and methodology, to secure long term competitive product provisioning. World-class innovation is achieved through cooperation within Ericsson and with partners, customers, universities and research institutes.

Our research branch is working with the latest technology in network caching, network features, security and advanced multimedia delivery. We are regularly offering interesting master or diploma thesis and internships. Together with our research staff, you will have the opportunity to work on the exciting future of computer systems and communications technologies.