S-38.3156 Delay-tolerant Networking Jörg Ott, Teemu Kärkkäinen, Marcin Nagy

Exam 24. October 2013

Please write readably and answer in English.

There are three classes of questions: (**a**) expecting (relatively) short answers, (**b**) expecting more elaborate answers, and (**c**) small design task. The questions are marked accordingly.

Questions:

1. [6p, **a**] List and define the three different types of discovery in opportunistic networks.
2. [6p, **a**] What are the main characteristics that differentiate traditional networks from challenged networks?
3. [6p, **a**] Define the problem of data synchronization in multicasting and list three possible approaches to solving it.
4. [6p, **a**] List the main types of microscopic mobility models and characterize the main feature of each type. For every type, list one example of the mobility model.
5. [6p, **b**] What is an Endpoint Identifier in the Bundle Protocol? What different functions does it have from application and systems design perspective? Explain using an example.
6. [6p, **b**] Sketch how DTN multicast distribution works. Explain subscription maintenance and routing for DTN multicast.
7. [6p, **b**] Discuss the fundamental concept of identity based cryptography. Compare it to the traditional cryptography, and argue what benefits it brings in DTN.
8. [12p, **c**] The combination of the Internet's effortless global connectivity and its hugely popular web- and cloud-based services has blurred the distinction between local and remote applications; at least for those well connected. This in tum has made users blindly dependent on the Internet and centralized third parties. The cloud now stores the users' data and controls the software that executes on that data. To balance this centralization and globalization, localized and distributed *neighborhood networks* could be built, operated and controlled by the users themselves.

   Your task is to design such a neighborhood network using techniques studies in this course.

   a) What are problems and issues caused by centralization and protocols and services designed for "always-on" networks?

   b) What kinds of actors, roles, users and devices would a neighborhood network be composed of? What kinds of applications or protocols would be well suited and ill-suited for a neighborhood network?

   c) Sketch a system design for a neighborhood network. The system should be (as far as possible) independent from the Internet infrastructure and centralized actors. It should be possible for the users themselves to build, operate and control the network.

   d) Sketch a simple application design to run on your neighborhood network.

   e) What type of routing protocol(s) would you choose and why?

   f) What are the limitations of your proposed system and application?

   (Note: there are many possible solutions.)