SHORT TERM SCIENTIFIC MISSION (STSM) – SCIENTIFIC REPORT

The STSM applicant submits this report for approval to the STSM coordinator

Action number: CA15127
STSM title: A framework for evaluation of FC-based Storage Capacity
STSM start and end date: 16/07/2018 to 22/07/2018
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PURPOSE OF THE STSM/

In ad-hoc networks used for disaster response and emergency awareness, an indiscriminate and uncontrolled use of the wireless communication medium can easily result in saturation of the available bandwidth, with a consequent degradation in the quality of the communication service offered by Floating content (FC), and in turn, of the various services relying on FC. At the same time, achieving some form of control and coordination is particularly challenging in a disaster scenario, given that the availability of some form of infrastructure support cannot be guaranteed.

The goal of the STSM is to investigate the performance limitations on anchored information schemes, such as FC, deriving from limitations in available bandwidth and in host memory. The group of Prof Mancuso at IMDEA has strong expertise in performance evaluation of Floating Content and, more generally, of opportunistic communications. In addition, its group is particularly interested in application scenarios in settings where communication infrastructure is not available.

As its goal is to elaborate suitable analytical models of performance of an opportunistic communication scheme which finds important applications in post-disaster emergency networks, the proposed work falls into the category "Emergency Networks for Post-Disaster Recovery", and it aims at advancing the state of the art in that domain.

DESCRIPTION OF WORK CARRIED OUT DURING THE STSMS

The work performed in the STSM has focused on two different aspects.

On one side, the analytical work has focused on defining the system model for the elaboration of a first instance of the analytical model, and on outlining a modeling approach which captures the relationship between the main performance parameters (success probability and content availability), and the mean utilization of system resources (host memory and channel capacity).

A second direction of work has been the definition of the architecture of a simulation tool, for the numerical assessment of the analytical results. The main requirements on the tool are the capability of integrating

measurement-based traces for a realistic estimation of the main performance tradeoffs in contexts of post-disaster.

DESCRIPTION OF THE MAIN RESULTS OBTAINED

For what concerns the analytical part of the work, the joint effort has produced a complete model for the simple case of a single Floating Area in isolation. Moreover, the extension of these results to the multi-content case has been outlined.

As for the numerical work, a first numerical assessment has been performed, which has allowed to outline some aspects of the performance of the FC scheme which will hopefully facilitate the understanding of its behaviour in more complex settings. Finally, a first version of the architecture of the simulator has been defined. A first version of the simulator, capable of simulating both the single content and the multi-content case, has been implemented in the Python programming language. A set of tests have been performed, in order to assess the accuracy of the simulation results, and to evaluate the impact of some of the assumptions at the basis of the analytical model on its accuracy.

FUTURE COLLABORATIONS (if applicable)

(max.500 words)

The discussions and work performed during the STSM will constitute the starting point for further common work on performance evaluation of FC in realistic setups, and in particular, in several contexts of post-disaster. The analytical work performed will help understanding the fundamental tradeoffs involved in dimensioning the main paremetrs of a FC scheme (namely, replication rate, and radii of the replication zone and of the persistence zone). The simulation work performed, and the simulation software developed in the context of the collaboration initiated by the STSM are potentially useful for evaluating the FC behaviour in several contexts of disaster, possibly with the use of measurement-based mobility traces.