



ABCDE



Scientific Report

First name / Family name

Fehmi Ben Abdesslem

Nationality

France

Name of the *Host Organisation*

Swedish Institute of Computer Science

First Name / family name
of the *Scientific Coordinator*

Anders Lindgren

Period of the fellowship

05/07/2013 to 05/07/2014



I – SCIENTIFIC ACTIVITY DURING YOUR FELLOWSHIP

Data Traffic Analysis

Mobile traces collected from a national cellular network have been analysed to characterise the data consumption pattern of smartphone users. Different aspects of content consumption have been studied, including video and mobile application download. Using this same dataset, different cache replacement strategies were evaluated. This study led to 3 publications in an international conference and two workshops.

Mobile Opportunistic Social Experience Sharing

An opportunistic system was designed for mobile phones to share experience through media content. The system uses the Information-Centric Networking paradigm to exchange media content opportunistically with other users via Bluetooth. This system has been accepted to 2 demonstration sessions for indoor and outdoor events.

Teaching

A seminar on Big Data was given at Uppsala University and at KTH University, and 3 master students were co-supervised.

Scientific Peer Reviewing

Program chair of a national workshop (SNCNW'14): invitation of the TPC members, organisation of the reviewing process and preparation of the technical program. Member of the TPC in one conference Wireless Days'14, and one workshop (ACM CHANTS'14).

International Research Projects

Participation in 2 EIT ICT Labs projects: Efficient IoT and MOSES, and a EU project MobileCloud.

Participation in writing EU research proposals, and coordinating one of them.

Standardisation

Co-author of an IRTF draft on using Information Centric Networking for the Internet of Things.

II – PUBLICATION(S) DURING YOUR FELLOWSHIP

Accepted:

- “*Large Scale Characterisation of YouTube Requests in a Cellular Network,*” Fehmi Ben Abdesslem and Anders Lindgren, IEEE International Symposium on a World of Wireless, Mobile and Multimedia Networks, June 2014.

Abstract: Traffic from wireless and mobile devices is expected to soon exceed traffic from fixed devices. Understanding the behaviour of users on mobile devices is important in order to improve the offered services and the provision of the underlying network. Globally, more than 60% of consumer Internet traffic is estimated to be video traffic, and the most popular video website, YouTube, estimates that mobile



access makes up nearly 40% of the global watch time. This paper presents the first work to study the characteristics of YouTube user requests on a nationwide cellular network. This study is based on the analysis of a large dataset generated by 3 million users and collected by a major telecom operator. We show for instance that 20% of the users generate 78% of the requests, and that over 80% of the requests target only 20% of the distinct videos accessed during the data collection period. Our results provide a comprehensive insight into the way people use YouTube on mobile devices, and show a very high potential for video cacheability on the cellular network.

- “*The Pursuit of 'Appiness: Exploring Android Market Download Behaviour in a Nationwide Cellular Network,*” Fehmi Ben Abdesslem and Anders Lindgren, 5th International Workshop on TRaffic Analysis and Characterization (TRAC), August 2014.

Abstract: Mobile devices are now part of our everyday lives, and the emergence of online application marketplaces allow a rapid spread of new mobile applications to a large user base. Such user-installed mobile applications constitute a large part of our daily interaction with the devices. With more than one million available applications, Android Market, the online catalog for Android devices allows users to choose and download a large selection of disparate applications. Analysing and characterising the application marketplace download patterns provides a better insight on the needs and behaviour of users. In this paper, we explore a large dataset collected by a major European telecom operator to study the downloads of Android applications on a nationwide scale. Our findings include that more than 43% of the application data downloaded is for games, and that a set of only 10 GB of applications is responsible for 88% of the 45 TB downloaded in total by all the users.

- “*Cacheability of YouTube Videos in Cellular Networks,*” Fehmi Ben Abdesslem and Anders Lindgren, 4th Workshop on All Things Cellular: Operations, Applications and Challenges, August 2014.

Abstract: Video traffic now represents a growing proportion of the traffic on cellular networks, causing capacity problems for operators and increased delays for users. Studies have shown that deploying caches at the network level reduces the delay for the end-user and the overall traffic volume for the telecom operator. In this paper, we analyse a large nation-wide dataset of real-life video requests sent by mobile users to a popular video streaming website. This analysis is the first to rely on such a large dataset, and sheds light on the optimal cacheability of video content with caches distributed in the cellular network, and how efficient some existing cache replacement algorithms are at reducing the number of requests sent to the video provider. We show that depending on the cache size and algorithm parameters, up to 20.33% of the requests can be served by a local cache.

- “*Demo: Opportunistic Experience Sharing with Mobile Phones for Outdoor Environments,*” Fehmi Ben Abdesslem and Anders Lindgren, 6th Extreme Conference on Communication and Computing, August 2014.

Abstract: Information-Centric Networking (ICN) is an alternative architecture for



computer networks, where the communication is focused on the data being transferred instead of the communicating hosts. This paper describes a demo of an experience sharing application for mobile phones built on an ICN platform designed for devices with intermittent connectivity. In particular, we detail how this application will be showcased for a group of users undertaking a trekking expedition.

- “Demo: Mobile Opportunistic System for Experience Sharing (MOSES) in Indoor Exhibitions,” Fehmi Ben Abdesslem and Anders Lindgren, 20th Annual International Conference on Mobile Computing and Networking (ACM Mobicom), September 2014.

Abstract: Information-Centric Networking (ICN) is an alternative architecture for computer networks, where the communication is focused on the data being transferred instead of the communicating hosts. This paper describes a demo of an experience sharing application for mobile phones built on an ICN platform designed for devices with intermittent connectivity. In particular, we detail how this application will be showcased in an indoor exhibition where experience is shared with media content that is geo-tagged using Blue- tooth beacons and spread opportunistically to other users.

Pending:

- “Investigating HTTP Requests Sent to a Large-Scale Cellular Network,” Fehmi Ben Abdesslem, Anders Lindgren and Andrea Hess.
- “Revisiting Inter-contact Times at a Large Scale,” Anders Lindgren and Fehmi Ben Abdesslem.
- “Video Caching for Cellular Networks,” Fehmi Ben Abdesslem and Anders Lindgren.

III – ATTENDED SEMINARS, WORKHOPS, CONFERENCES

EIT ICT Labs Partner Event 2014, Berlin, Germany, April 2014

IEEE International Symposium on a World of Wireless, Mobile and Multimedia Networks, Sydney, Australia, June 2014.

10th Swedish National Computer Networking Workshop, Västerås, Sweden, June 2014.

IV – RESEARCH EXCHANGE PROGRAMME (REP)

REP1 – INRIA Saclay, HIPERCOM Research Team, Palaiseau, France

Scientific Coordinator: Dr Aline Viana

The visit included fruitful discussion about the dataset being used at the host institution (SICS). This led to a collaboration through an internship of a PhD student from INRIA in the host institution.



REP2 – CNR Pisa, IIT, Pisa, Italy

Scientific Coordinator: Dr Andrea Passarella

The visit started with a talk about the work conducted during this ERCIM fellowship, followed by a series of talks by CNR to provide an overview of the research conducted by the team. This workshop led to interesting conversations leading to collaboration on the data analysis of mobile traces, and on the participation of CNR to a EU project proposal coordinated by the ERCIM fellow.