Scientific Report

First name / Family name	Angeliki Sgora
Nationality	Greek
Name of the *Host Organisation*	VTT Technical Research Centre of Finland
First Name / family name of the *Scientific Coordinator*	Jukka-Pekka Laulajainen
Period of the fellowship	01/10/2012 to 30/09/2013

I – SCIENTIFIC ACTIVITY DURING YOUR FELLOWSHIP

During my fellowship at VTT Technical Research Centre of Finland I was member of the VTT‘s “Quality of Service Technologies” research team, headed by Mr. Jukka-Pekka Laulajainen, within the Communication Networks (earlier Network Technologies) knowledge center. My research activity, in line with the ABCDE Research Training Programme, was focused on the development of mechanisms and schemes in order to provide Quality of Service (QoS) or/and Quality of Experience (QoE) in wireless networks.
More specifically, the following research activities took place during my fellowship:

- Attendance of the VTT introductory course
- Participation in Quality of Service Technologies team’s joint research projects.
- Preparation and submission of publications in co-operation with VTT’s staff.
- Participation in internal VTT meetings and events.
- Presentation of my work at VTT‘s personnel meeting.

II – PUBLICATION(S) DURING YOUR FELLOWSHIP

Accepted Papers:

1. Dimitrios J. Vergados, **Aggeliki Sgora**, Angelos Michalas, Dimitrios D. Vergados, J-P. Laulajainen, and Yuming Jiang. "A QoE-Driven Adaptation Scheme for Video Content Delivery in LTE Networks." Tenth International Symposium on Wireless Communication Systems (ISWCS 2013), August 27 – 30, 2013 – Ilmenau, Germany.

Abstract: The Long-Term Evolution (LTE) standard is a promising solution to mobile connectivity. It provides high data rates at a relatively low cost. At the same time, video traffic has so far outpaced other traffic types in growth, making it the dominant traffic type in current wireless networks. In this paper we study the concept of Quality of Experience (QoE) for video traffic in LTE systems. Since video users are more annoyed by unpredictable disruptions than overall reduced video fidelity, we developed an adaptive video coding scheme that aims to improve QoE in LTE networks. In the proposed model users of the same quality class are classified into a number of service levels providing different QoE satisfaction thresholds to their members. The QoE driven adaptation scheme adapts the rate of the transmitted video, so that the QoE experienced by the users remains in satisfactory levels. Two different policies for transmission rate adaptation are studied, namely the adaptive and the coordinated approach. The level of the transmission rate for both policies is regulated by the linear slow start and/or the exponential increase. Simulation results showed that the proposed algorithm for the both transmission rate adaptation policies succeeds in minimizing packet loss and delay in the video transmission, by adjusting the video resolution.

2. M. Zogkou, **A. Sgora**, and D. D. Vergados, “QoE – Based Scheduling in WiMAX Networks”, In the Proceedings of the 10th International Conference on Wireless Information Networks and Systems (WINSYS 2013), Reykjavik, Iceland, 29– 31 July, 2013, pp. 215-220.

Wireless Mesh Networking is a continuous growing technology that can be used used for several application scenarios, such as military tactical operations, etc. in next generation wireless networks. The IEEE 802.11s Standard defines the procedures that wireless nodes follow in order to interconnect and create a Wireless Local Area Network (WLAN) mesh network. It, also, defines the routing protocol and the metric that are used by a IEEE 802.11s mesh network to route data. However, although the energy consumption of mesh nodes is a crucial parameter for the network’s lifetime in specific purpose operations (e.g. military and health) the default metric proposed by the standard doesn ’t take into account the energy of the nodes. In this paper, a new energy - aware routing metric for the IEEE 802.11s mesh networks has been implemented. Simulation results showed that the proposed metric prolongs the lifetime of a WMN in comparison with the default metric used by IEEE 802.11s Standard while causing a little higher total delay

in the network.

3. **A. Sgora**, D. D. Vergados,and P. Chatzimisios, "A survey on security and privacy issues in Wireless Mesh Networks", accepted to Security and Communication Networks Journal

Abstract: Wireless mesh networks (WMNs) are considered a promising solution for offering low-cost access to broadband services. However, the multi-hop nature, the lack of physical protection, the dynamic topology, and ad hoc connectivity among end user nodes are such characteristics of WMNs that pose new challenges in achieving security. Although security in WMNs has attracted many researchers and many intrusion prevention, detection and response mechanisms may be found in the literature, the question about which is the best solution still remains unanswered, because each of them focuses on specific attacks and requirements.

4. Janne Seppänen; Martín Varela; and **Aggeliki Sgora**, "An Autonomous QoE-driven Network Management Framework", accepted to Elsevier Journal of Visual Communication and Image Representation

Abstract: Recently, network researchers have taken a great interest in quality of experience (QoE) and in the new aspects it brings in the study of the link between network conditions and user satisfaction. Also, the realization that the information of users' satisfaction can be directly applied in the network management in a real-time manner has resulted in a fair amount of publications. Although the systems and frameworks presented in these publications tackle the subject of QoE-driven management quite successfully, they often concentrate on certain applications or technologies. We present a generic QoE management framework, which is applicable in a broad scope of systems. We also demonstrate a network access point management system, which shows how this framework can be utilized in the design of a practical QoE system architecture. This system is not only able to positively affect the perceived quality of multimedia, but to reduce over-prioritization and optimize resource usage.

Papers under Review:

1. **Aggeliki Sgora**, Dimitrios J. Vergados, Dimitrios D. Vergados, "A Survey of TDMA Scheduling Schemes in Wireless Multihop Networks", Submitted to ACM Computing Surveys

Abstract: One of the major problems in wireless multihop networks is the scheduling of transmissions in a fair and efficient manner. Time Division Multiple Access (TDMA) seems to be one of the dominant solutions to achieve this goal, since it is a simple scheme and can prolong the devices lifetime, by allowing them to transmit only portion of the time during conversation. For that reasons several TDMA scheduling algorithms may be found in the literature. The scope of this paper is to classify the existing TDMA scheduling algorithms based on several factors, i.e. the entity that is scheduled, the network topology information that is needed in order to produce or maintain the schedule and the entity/entities that perform the computing for producing and maintaining the schedules, and to discuss the advantages and disadvantages of each category.

III – ATTENDED SEMINARS, WORKHOPS, CONFERENCES

10th International Conference on Wireless Information Networks and Systems (WINSYS 2013), Reykjavik, Iceland, 29– 31 July, 2013, pp. 215-220

IV – RESEARCH EXCHANGE PROGRAMME (REP)

1st REP

University of Cyprus (Networks Research Lab -NetRL), 20-26 February 2013, Nicosia, Cyprus. Host: Prof. Andreas Pitsillides

2nd REP

INRIA (Dionysos Team), 01-09 July 2013, Rennes, France, Host: Dr. Gerardo Rubino