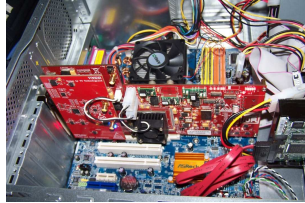# MASTER THESIS TOPICS FOR NETWORKING 2013 - G. Giambene

Realization of an Evolved WiFi Testbed - SORA Kit

- The aim of this thesis is configure the SORA control board to test **different options for the WiFi MAC protocol (use of the SORA SoftWiFi Driver)** and to define/experiment a scheme that is adaptive depending on the traffic conditions in the cell.

- Possible cooperation with the University of Karlstad in Sweden.

SORA presentation: http://srif2012.inc.cuhk.edu.hk/slides/Kun%20Tan.pdf
SORA Kit Manual, available online: http://research.microsoft.com/apps/pubs/?id=144847
SORA SDK 1.6: http://research.microsoft.com/en-us/downloads/ca9a93a1-2a38-4e3d-b87c-b7e8ddc46ea2/

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Open Source Wireless Mesh - cooperation with CREATE-NET

- By mean of the ALIX 3D2 board by PCENGINES (http://pcengines.ch/alix.htm) with WiFi transceiver and the **Openwrt** operating system (open source, https://openwrt.org/) it is requested to implement a routing protocol for a wireless mesh network (**IEEE 801.11s**) utilizing the packages 'olsrd' and 'wing', developed by CREATE-NET. It is also requested to evaluate the performance of different routing metrics in a real test bed, taking the channel conditions into account.

- Use of the **"click" software to develop** routers, switches, and access points (possible development of a load-dependent routing protocol).

http://www.read.cs.ucla.edu/click/click
http://www.wing-project.org/doku.php
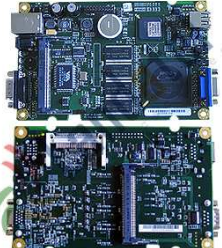
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TCP Support in Satellite Networks (frw/rtn)

- The aim of this thesis is to define, develop (in NS-2 simulator framework), and evaluate **a new protocol based on network coding; we call it PEP-NEC, which will be operating between two PEPs (on the Gateway and Terminal)**.
- The aim of this thesis is **to study the impact of RA + SIC on return link for a forward TCP flow (mice or elephant connections) in a satellite network**. Towards this end, saturation throughput and stability issues will be investigated. **The goal is to show that these RA methods can improve TCP performance with respect to DAMA schemes** (the delay experienced by TCP with RA is not critical).
- A fellowship is possible on this topic paid by CNIT Consortium.

C. T. Ho, M. Medard, R. Koetter, D. R. Karger, M. Effros, J. Shi, and B. Leong, "A Random Linear Network Coding Approach to Multicast," IEEE TRANS. INFORM. THEORY, vol. 52, no. 10, pp. 4413–4430, 2006.
ETSI TR 102 676 ("Satellite Earth Stations and Systems (SES); Broadband Satellite Multimedia (BSM); Performance Enhancing Proxies (PEPs)", 2009.
E. Casini, R. D. Gaudenzi, O. Herrero, "Contention Resolution Diversity Slotted ALOHA (CRDSA): An Enhanced Random Access Scheme for Satellite Access Packet Networks", IEEE Transactions on Wireless Communications, vol 6, no. 4, pp. 1408 –1419, Apr. 2007.
http://www.etsi.org/deliver/etsi_ts/102700_102799/10272103/01.01.01_60/ts_10272103v010101p.pdf
http://www.isi.edu/nsnam/ns/

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Contention-based Access Analysis in IEEE 802.16m

- Future WiMAX air interface will be based on the IEEE 802.16m standard (released in 2011). In this system the access protocol is based on a **5-step CDMA-based bandwidth request scheme**.

- The interest of this thesis is to simulate IEEE 802.16m in ns-2 and to define an approach for the **optimization of this air interface considering Poisson or TCP-elephant traffic types**.

- **A multi-traffic scenario** has to be considered.
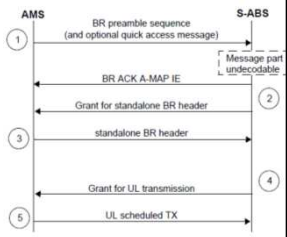
IEEE Std 802.16mTM-2011 (Amendment to IEEE Std 802.16TM-2009), May 2011.
H. Lee, E. Kim, S.Kim, S. Chang, C. Yoon, K.-R. Cho, "Performance Analysis of Random Access in IEEE 802.16m System", in Proc. of ICTC 2010, 17-19 Nov. 2010.
http://www.isi.edu/nsnam/ns/

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Performance of IEEE 802.11p in Cooperative VANETs

- One of the key drawbacks of the IEEE 802.11p is its **low scalability** which lies in the fact that the protocol is unable to provide the required time-probabilistic characteristics in dense road scenarios, i.e. when the number of cars in the same area is high.

- The purpose of this thesis is to propose **a cross-layer optimization of IEEE 802.11p access protocol (PHY – MAC – TCP) and to evaluate the performance of this protocol in a suitable scenario for the exchange of car-to-car safety messages**.

ETSI standard suite TS 102 636 on Intelligent Transport Systems (ITS)

Alexey V. Vinel, Rashid Mehmood, Marion Berbineau, Cristina Rico Garcia, Chung-Ming Huang, Naveen Chilamkurti Communication Technologies for Vehicles - 4th International Workshop, Nets4Cars/Nets4Trains 2012, Vilnius, Lithuania, April 25-27, 2012. Proceedings Springer 2012.

C. Cicconetti, F. Galeassi, R. Mambrini, "IEEE 802.11p: Laboratory Measurements and Analysis", 50th FITCE Congress (FITCE) 2011, Aug. 31 -Sept. 3 2011.

C. Han, M. Dianati, R. Tafazolli, R. Kernchen, X. Shen, "Analytical Study of the IEEE 802.11p MAC Sublayer in Vehicular Networks", IEEE Transactions on Intelligent Transportation Systems, Vol. 13, No. 2, pp. 873 - 886, 2012.

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Cognitive Radio Networks and Interference Management

- By means of the **LTE module** integrated with ns-3 (or the standalone C++ version, called LTE-Sim R3.1), the interest is in working on the scheduler proposing and evaluating a resource allocation / scheduler (eNBs, relays, and HeNBs) **able to manage interference by means of an Inter-Cell Interference Coordination (ICIC) approach**.

- Consideration of both the **underlay** and **overlay** approaches. Consideration of **dynamic channel aggregation** approaches and Call Admission Control (CAC) schemes.

G. Piro, L. A. Grieco, G. Boggia, F. Capozzi, P. Camarda, "Simulating LTE Cellular Systems: An Open-Source Framework," IEEE Transactions on Vehicular Technology, vol.60, no.2, pp.498-513, Feb. 2011.

http://www.nsnam.org/
http://www.nsnam.org/docs/models/html/lte.html
http://telematics.poliba.it/index.php?option=com_content&view=article&id=158&Itemid=&lang=it

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