Ph.D. in Information Technology: Theses Defenses

January 24th, 2019

Room Seminari - 10.30 am

Omran AYOUB – XXXI Cycle

"Resource Management and Planning in Cloud-Enabled Optical Metro-Area Networks"

Advisor: Prof. **Massimo Tornatore**

Abstract:

To cope with the unprecedented growth the Internet is experiencing, network operators are resorting to enhance nodes at the network edge, taking advantage of Network Function Virtualization and Cloud Computing, with cloud capabilities. This thesis investigates the deployment of cloud-enabled edge nodes and proposes novel strategies for improved network resource management in optical metro-area networks. In particular, the thesis considers Video-on-Demand (VoD) content delivery service for it being responsible for the elephant's share in Internet data. The thesis also focuses on improving network resource occupation due to moving (i.e., migrating) services such as VoD hosted on Virtual Machines between cloud-enabled edge-nodes and data centers.

Douglas OLIVEIRA MORAIS DE AGUIAR – XXXI Cycle

"Reconfigurable Photonic Integrated Circuits for High Capacity Optical Networks"

Advisor: Prof. **Andrea Melloni**

Abstract:

In this thesis, the main advances in control of complex and flexible Photonic Integrated Circuits (PICs) are presented, and a novel control technique applied to a reconfigurable PIC is demonstrated. Targeting the application on high capacity optical networks, the requirements of such networks are analyzed and an evaluation on how they can be fulfilled by integrated photonics technology is held. The required tasks to design, fabricate, test, operate and calibrate optical chips are discussed, and then it is effectively designed, realized, characterized and operated with the fabrication of the optical chips being done in a commercial Silicon Photonics (SiP) foundry run. The automated tuning and locking of a hitless silicon Microring Resonator (MRR) filter, exploiting a novel channel labeling scheme is demonstrated. Hitless tuning with more than 30 dB isolation is achieved. A dynamic and hitless channel reconfiguration making use of the SiP PIC is demonstrated. For the first time in a SiP MRR system, it is shown that the already established channel was

not affected by the newly added channel. Moreover, a technique to measure in-band Optical Signal to Noise Ratio (OSNR) of optical channels also making use of the labeling technique is demonstrated. All the demonstrated techniques, architectures and strategies are key enabling technologies for the applications of PIC in add-drop reconfigurable optical node architectures.

Mohamed SHEHATA – XXXI Cycle

"Energy Efficiency and Survivability in 5G Centralized Access Networks"

Advisor: Prof. **Massimo Tornatore**

Abstract:

The continuous demand for better wireless data services in terms of very high data rates (typically of Gbps order), extremely low latency, and significant improvement in users'perceived Quality-of-Service, has triggered the research on the fifth generation (5G) wireless systems that are expected to be deployed beyond 2020. Centralized Radio Access Network (C-RAN) is a promising mobile network architecture designed to support the requirements of future 5G mobile networks.

In this thesis, we investigate the opportunities enabled by C-RAN. We model the computational savings (what we called multiplexing gain) enabled by C-RAN under four different functional splits. Then, we estimate the power savings -resulting from reduction in the computational resources. Following this centralization savings, we design a survivable C-RAN against BBU pool and link failures. We propose different dedicated and shared approaches for the survivable BBU pool placement problem and traffic routing in C-RAN deployment over a 5G optical aggregation network.

PhD Committee:

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