



Federico Tonini

Curriculum Vitae

Education

- Nov. 2019 – **PostDoc**, *Chalmers University of Technology, Sweden*.
present The research focuses on optimal resource allocation strategies for network slices in 5G networks.
- Oct. 2019 **Research fellow**, *University of Bologna, Italy*.
The main research topics were slice resource provisioning techniques for reliable communications and creation of end-to-end network slicing for 5G networks. Optimization algorithms based on integer linear programming has been developed to solve dedicated and shared path protection problems, in the presence of single failure. The goal of this study was to minimize the deployment cost while supporting the functional splitting options defined by 3GPP and multi-access edge computing. In addition, network slice template, generic slice template, network service descriptor, and slice creation/instantiation problems have been investigated. Sample deployments of cloud slices based on open source tools such as Openstack and Open Source Mano have been developed in the framework of the 5G networks deployment project lead by Italian operator Wind3.
- Apr. 2019 **Ph.D. in Electronics, Telecommunications, and Information Technologies Engineering**, *University of Bologna, Italy*.
Research topic: *“Cost-effective provisioning of 5G transport networks: architectures and modelling”*.
The studies conducted throughout the PhD consist in finding cost efficient deployment solutions, based on integer linear programs and heuristics, for the fifth generation of mobile networks (5G). In particular, deployment strategies for small cells and backhaul or fronthaul links based on fiber and free space optics have been developed to provide mobile network coverage for special events. Moreover, the problem of network survivability against baseband hotel failures in centralized radio access networks has been investigated. Resilient solutions have been developed and compared in scenarios exploiting novel software defined network (SDN) and network function virtualization (NFV) principles. Finally, the adoption of Ethernet-based fronthaul and the introduction of hybrid switches is pursued to further decrease network cost by increasing optical resources usage. An event-driven simulator, written in C++, has been developed to resemble the behavior of hybrid switches. Simulations have been performed with reference to Ethernet based fronthaul solutions (CPRI over Ethernet) to evaluate the benefits of multiplexing backhaul and fronthaul traffic over the same optical resources.

*Work Address: Chalmers University of Technology, Department of Electrical Engineering
412 96 Gothenburg, Sweden*

Oct. 2015 **MSc in Telecommunications Engineering**, *University of Bologna*, Italy, 110/110 with honors.

Thesis title: "*Cost Minimization Strategies for Centralized Radio Access Networks*".

The thesis was conducted at the Optical Network Laboratory (ONLab), KTH Royal Institute of Technology, Sweden. This work tackles the problem of providing indoor mobile network coverage and proposes novel optimal hardware deployment strategies, based on integer programming and heuristic, aiming at minimizing costs. Minimization of network equipment as well as reuse of already deployed infrastructure, either based on fiber or copper cables, is investigated and shown to be effective to reduce the overall cost.

Dec. 2012 **BSc in Electronics and Telecommunications Engineering**, *University of Bologna*, Italy.

Thesis title: "*Comunicazioni multi-salto tra veicoli mediante dispositivi IEEE 802.11p*".

The focus of the thesis is on vehicular communications based on IEEE 802.11p protocol. This work consists of a java-based implementation of multi-hopping functionalities on Alix3d3 boards using OpenWRT operating system. A performance analysis of the system has been performed through packet error rate and throughput measurements.

Experience

Nov. 2016 – **Teaching Assistant**, *University of Bologna*, Dept. of Electrical, Electronic, and
Oct. 2019 Information Engineering, Italy.

Tutor of the course "Network Design M". Main topics: traffic and queuing theory, TCP modelling. Main Activities: support to students in theoretical aspects and practical exercises.

Apr. 2017 – **Visiting Researcher**, *Optical Network Laboratory*, KTH Royal Institute of Tech-
Jun. 2017 nology, Sweden.

Main activity: study of novel techniques to transport data over optical networks in relation to the new baseband function splits proposed by 3GPP and CPRI alliance.

Apr. 2016 – **Visiting Researcher**, *Optical Network Laboratory*, KTH Royal Institute of Tech-
Jul. 2016 nology, Sweden.

Main activities: development of mathematical models and implementation of a Java-based tool for 4G/5G mobile networks in dense urban scenarios.

Nov. 2015 – **Master Program Tutor**, *University of Bologna*, Dept. of Electrical, Electronic,
Oct. 2016 and Information Engineering, Italy.

Assistant for the Major in Telecommunication Engineering. Support to prospective and enrolled students with regard to administrative aspects and learning activities of the course (e.g., enrollment, study plan). Assistance to the Degree Program Director and International Students Advisor in promotional activities.

About me

Born on November 5, 1990 in Medicina (Italy), where one of the largest radio telescopes in the world is located, I've always been fascinated by telecommunications. I'm interested in new technologies related to the IT world. I enjoy working in a dynamic environment with people from different culture and background. In my free time, I like running and spend time with friends.

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