



European Conference on Networks and Communications | Paris, France

WO#08: Optical back/front-hauling technologies for future 5G networks

Room#6- Monday, June 29

- **Organisers**

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- **Technical program committee**

Dr. Gemma Vall-Ilosera, Prof. Ernesto Ciaramella, Prof. Ioannis Tomkos.

- **Abstract**

5G is not just an evolution of 4G as previous generations of wireless communications have been. 5G defines a new world where high capacity mobile broadband is a reality. In this world, architecture, technology, management have to work together to deliver a networked society in which every person and every industry is empowered to reach their full potential. Technology wise we are speaking of at least 5 times more backhaul capacity than networks being deployed with LTE and LTE-advanced. This might force us to look for different back/front-haul solutions because current ones will not scale up. What are these solutions? The best answer is at guess. In the workshop we will try to give an insight into 5G and how could we build up future solutions for the new digital era where internet is no longer reserved to the sight but it also reaches the touch.

This proposed workshop is under the COCONUT FP7 project that is developing low cost coherent transceivers to enable a 6.25GHz grid. The project has now entered the third year with very good marks from the EU office. Specifically the reviewers were impressed by the amount of technical publications (25) in leading conferences and journals. We will hear how photonics can enable radio beamforming, the need for fronthaul for enabling MIMO and distributed radioheads, for example. Also champions of the optical fonthaul studies in standardization bodies will tell us about their views regarding optical back/front-haul of 5G networks and evolution from 4G. We do not pretend to solve the 5G paradigm, we just want to add our grain of sand and perhaps to agree on the further steps to enable a 5G networked society.

- **Speakers**

Antonio D'Errico, Ericsson AB; Paolo Monti, Kungliga Tekniska Högskolan; Stephane Gosselin, Orange Labs; Thomas Pfeiffer, Alcatel-Lucent; Ernesto Ciaramella, Scuola Superiore Sant'Anna ; Frank Effenberger, Huawei.

- **Agenda**

14.00 Welcome and introduction

14.05 Antonio D’Errico, Ericsson AB. *Optical beamforming: enabler for high bandwidth demanding 5G services.*

The 5G mobile-broadband user will experience radio access with “unlimited” performance. This will lead to a wide range of new requirements on fronthaul, backhaul and radio providing high potential in terms of data rates, latency, reliability, device energy consumption and cost. To address the challenge arrayed antennas using the beamforming techniques must be introduced. Today’s microwave components suffer from limited bandwidth, poor flexibility and high noise at increasing carrier frequencies limiting beamforming performances. In the present work, we report how photonics enables, ultra-wide band high quality signals and accurate beam steering, allowing the generation of extremely stable multiple radio-frequency (RF) transmission up to the millimeter waves.

14.30 Thomas Pfeiffer, Alcatel-Lucent. *Trends in optical x-haul for 4G and 5G mobile networks.*

With the introduction of advanced multi-antenna and multi-site processing in wireless networks as well as with the anticipated trend towards large C-RAN deployments, and even more with the expected introduction of new service types in future 5G mobile networks, the existing back-and front-haul solutions will have to be revisited, in order to accommodate – or mitigate - the massive bandwidth requirements and tight latency constraints.

In the presentation, we will critically review existing solutions, highlight new recent directions and point to specific challenges in x-haul solutions for some new service types in 5G networks.

15.00 Frank Effenberger, Huawei.

The advent of wireless front haul as a service has opened many new investigations on optical access technology, due to the potentially huge bandwidth dimensions that it has. This presentation will review some of the factors that determine the front haul demand, and some of the architectures that can be used to address these demands.

15.30 Coffee break

16.00 Stephane Gosselin, Orange Labs. *Unified network architecture integrating back/front-hauling with fixed access.*

Tight integration of fixed and mobile architectures at network level will fully leverage future 5G technologies. Intermediate results of COMBO European project on design and dimensioning of a unified access network integrating back/front-hauling together with fixed access are presented and analyzed.

16.30 Paolo Monti, Kungliga Tekniska Högskolan. *Flexible and cost efficient optical 5G transport.*

The 5th generation of mobile networks (5G) will enable access to information anywhere and anytime to anyone and anything, i.e., the so called Networked Society. The details of 5G are the subject of ongoing research and debate, mostly focused on understanding how radio technologies can enable the 5G vision.

So far, less work has been dedicated to address the challenges that 5G will pose to the transport network. These challenges include the capability of supporting very high aggregated traffic volumes, ensuring extremely small latency, providing flexibility and programmability for efficient adaptation to the traffic conditions as well as for service differentiation.

This talk will first highlight some of these challenges and then it will elaborate on a number of data plane architectures able to provide a flexible and cost efficient optical transport solution for 5G.

17.00 Ernesto Ciaramella, Scuola Superiore Sant'Anna. *COCONUT Optical coherent solutions for back/front hauling*

Results obtained in the framework of COCONUT project indicate that coherent detection based on simplified transmitter and receiver schemes are feasible and have high potential for seamless upgrade of existing PON network infrastructures. The developed technology can enable high-speed transport solution for 5G, since it is compatible with cost and performance requirements of future optical back/front-hauling, while keeping backward compatibility with other optical solutions already in place.

We will first summarize most recent achievements of COCONUT and then comment on its feasible extension to 5G network architectures.

17.25 Recap