

## Proposition de sujet de thèse en 2018

**Titre : Optimizing the resource allocation for the multimedia 5G communication systems**

**Laboratoire : XLIM - axe SRI (Systèmes et Réseaux Intelligents) – Smart Networks and Systems**

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**Mots clés :** MIMO, Optimization problem, Resource allocation, Non Orthogonal Multi-Access (NOMA) and Frequency Quadrature Amplitude modulation (FQAM) methods, Multi-users and Multi-services.

**Sujet :**

The challenges of the 5th generation (5G) communication networks, and beyond, consist globally in allowing the cohabitation of various applications while guaranteeing, for each of it, a quality of service (QoS) in spite of an exponential growth of user number. This QoS (robustness/reliability of the communication, latency, energy consumption, etc.) depends on the application, and is strongly related to the transmission medium. To answer these challenges, several concepts are considered: access techniques, modulations, which are the real technological breakthroughs with regard to the standards of 4th generation. At the same time the systematic approaches, allowing to interconnect the characteristics of some of these concepts, are more and more requested because they allow to reach multi-criteria compromises associated to optimal performances of communication.

From then on, this thesis focuses on the transmission strategies of the multimedia content in wireless networks. The advantage of such a strategy is its ability to manage the resources, according to the objectives of the targeted applications. We propose a transmission scheme, which guarantees the quality of service (QoS), depending on the channel state information and on the multimedia content specifications. We would like to take advantage of the radio channel diversities (spatial, frequency, etc.). So, the association of MIMO and a multi access technique appears as an effective solution to increase the system performance, in purpose of 5G, and beyond. For this reason, we want to develop a MIMO-NOMA system related to hierarchical modulation (such like FQAM), which considers cross-layer strategies based on link adaptation schemes to dynamically adjust the system parameters. The student will develop a PHY/MAC/APPL cross-layer strategy, dedicated to a single user and multi users of a MIMO-NOMA system, which transmits an HEVC video. The link adaptation scheme allows to define the optimum parameters, which minimize the multi-points video distortion by using an optimization algorithm under power and robustness metric constraints.



**Ref :**

**Resource allocation based on cross-layer QoS-guaranteed scheduling for multi-service multi-user MIMO-OFDMA systems**, S. Kambou, C. Perrine, M. Afif, Y. Pousset, C. Olivier. Wireless Network - Journal of mobile communication computation and information, Vol 22, N°1, DOI 10.1007/s11276-015-1183-x (2016) 21 pages.

**Low Rank Parity Check Codes and their application in Power Line Communications smart grid networks**, A.K Yazbeck, I. El Quachach, JP Cances, V Meghdadi, International Journal on Communication Systems, DOI: 10.1002/dac.325, janvier 2017.

