unCoordinated netwOrk StrategieS for enhanced interFerence, mobility, radio Resource, and Energy saving management in LTE-Advanced networks

CROSSFIRE is a Multi-Partner Initial Training Network (MITN) Marie Curie project that is focused on providing forward-looking solutions for Long Term Evolution-Advanced (LTE-A) networks. It has created a multi-disciplinary network of 12 Early Stage Researchers (ESRs) working in 8 first-class institutions. This Network offers ESRs a cross-sectorial environment to shape their long-term research view and get methodological tools on various research fields such as network virtualization, self-organization, cognitive radio, energy saving, QoE, and small cell networks.

CROSSFIRE at a glance

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**Partners:**
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King’s College London (UK)
Open University of Catalonia (ES)
CNRS (FR)
NEC Europe (DE)
Iquadrat (ES)
Steinwurf (DK)
Vodafone Group R&D (UK)

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**Motivation**

The aim of CROSSFIRE is to provide forward-looking solutions for LTE-A network co-existence including aspects ranging from the physical layer such as co-channel interference and cognition to the user perception of the service, i.e., Quality of Experience (QoE). The project analyzes and proposes network virtualization solutions for LTE-A networks, a technology which is envisioned to transform operation of cellular networks in the years to come. Our goal is to provide a holistic understanding on issues such as co-channel interference from randomly located small cells, efficient utilization of the scarce spectrum, self-organization (SONs) and QoE at the end users, under the assumption that LTE-A networks share a common physical infrastructure.

The CROSSFIRE network has recruited talented ESRs to conduct world leading research and offers them advanced training, mentoring and personalized career planning. ESRs are being also trained in aspects such as project management, understanding of IPR, scientific writing, presentation and communication skills and creating spin-offs. The intention is to create well-rounded, out-of-the-box thinking engineers to tackle the significant challenges of next generation cellular networks that will not only be an integral part of every day life but they will also significantly shape it.
Research objectives

The key technical challenges of the CROSSFIRE project can be summarized as follows:

- Architectural aspects for enabling dynamic LTE-A network sharing via network virtualization (infrastructure sharing of the wireless access networks).
- Protocols and advanced algorithms for dynamic network virtualization in LTE-A wireless access networks.
- Near optimal utilization of the available spectrum by considering cognition as a building block for self-organization – developing and proposing a set of algorithms towards this direction.
- Advanced techniques for network interference mitigation and avoidance in conjunction with QoS consideration and opportunistic use of the available spectrum.
- Bridging the gap between the overall perceived quality of an offered service (QoE) and the technical dimensions as encapsulated within the QoS parameters.

The CROSSFIRE approach

The project is organized into 7 Work Packages:


WP2: Network Virtualization in LTE-A Networks. Development of techniques for allowing multiple network operators to share the same physical infrastructure and to optimize network operation utilizing network virtualization specific to LTE-A.


WP4: Quality of Experience (QoE) in LTE-A. Move beyond QoS by developing a deeper understanding of the perceived experience by the end users.

WP5: Training. Preparation and organization of the training tools and events of the Network.


WP7: Dissemination & Outreach Activities. Provision of a framework for disseminating the project achievements and promoting its key results.

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