



DWG3: Network Layer - Meeting in Graz

September 12 – 14, Graz, Austria

DWG3 discussions were split in three session, with a total number of twelve TDs. The topics addressed have been Network Optimisation, SON strategies and Spectrum Management.

The first session was addressed to discuss four TDs related with network topology and tuning optimisation tools, as the definition of ring based topologies, new models to predict the spatial user distribution in a cell, the optimization of femtocell self-healing through localization algorithms or the improvement of mmWave radio propagation models for small-cells.

Authors of **TD(17)05033** presented an Angular Model for the Spatial User Distribution inside a Cell, which is interesting to optimize the network topology and tuning. After doing measurements on real environments the Von Mises angular distribution has been suggested as a fairly good model, but the data set obtained are too sparse to draw a firm conclusion. In **TD(17)05053** authors study the availability optimization in a ring-based network topology for a given number of cellular sites and a given size of rings, showing that if each ring includes 3 nodes the problem can be solved in a polynomial time, while for bigger rings approximation methods based on linear programming are proposed to converge to the solution. In **TD(17)05052** authors propose an improvement to Self-healing SON algorithms through the introduction of indoor localization systems, developing a Location-aware Enhanced Self-healing for Femtocell Networks and evaluating the performance through a real testbed environment. Finally authors of **TD(17)05016** analyse how digital geographical data and radio propagation models may be enhanced and tailored to answer new outdoor mmWave links for small-cell RAN and in-street backhauling. Three methods are compared based on free building data base, traditional high-resolution map data, or Lidar point cloud.

The five contributions of the Second session were oriented to the analysis of several SON strategies introducing QoE parameters to improve performance, defining new RRM algorithms for Virtualised Multi-tenant Mobile Het-Nets, or analysing the performance of Cooperative Backhaul for different C-RAN networks.

In **TD(17)05020** the authors study a new QoE-based approach for HO parameter tuning in a real pilot LTE network, focusing on end-user throughput and demonstrating that this technique improves performance compared with the classical Mobility Load Balancing algorithm. **TD(17)05003** introduces the analysis of Load balance performance with a QoE perspective in LTE networks, showing the limitations of the classical cell load balancing algorithm for different services and traffic conditions. Authors of **TD(17)05011** propose a new model of Radio Resource Management and Service Orchestration for Virtualised Multi-tenant Mobile Het-Nets, comprising different access technologies. The model distributes the resources owned by the Infrastructure Providers (InPs) among various Virtual Network Operators (VNOs) in the role of tenants, according

to service priorities and some fairness criteria to satisfy the Service Level Agreements (SLAs). **TD(17)05006** summarises the state of the art for Energy-efficient High-speed Cost Effective Cooperative Backhaul for LTE/LTE-A Small-cells (E-COOP) technologies under four different scenarios: C-RAN, carrier aggregation, C-RAN with control/data plane splitting and SON in LTE-A HetNets with imperfect backhaul. Finally, **TD(17)05043** focuses the research on Cognitive Radio Ad-Hoc networks (CR-MANET) studying the impact of different intelligent or non-intelligent channel assigning methods on the optimal path selection process to deliver the message from source to destination.

Third session was oriented to Spectrum Management with three TDs addressing different technologies and progress in different countries: Dynamic Spectrum Access in South Africa, the coexistence between LTE and P25 and PPDR-LTE in the 850 MHz band, or the co-channel coexistence between LTE-TDD and VSAT DVB-S in C-band in Colombia.

TD(17)05001 author discusses the achievements and trends in the Dynamic Spectrum Access research and development in South Africa. TD(17)05036 explains the experimental campaign on Spectrum sharing between LTE-TDD and VSAT DVB-S in C-band, to test sharing conditions of co-channel and adjacent-channel coexistence in real environments, showing that coexistence may be possible provided that proper separation distances for co-frequency sharing are determined. Authors of TD(17)05048 perform coexistence studies between LTE and narrowband mobile radio technologies (P25 and PPDR-LTE) in the 850MHz band for Colombia, showing the recommendation made to the official regulator.

The topics addressed during the Discussion are:

- Short Term Scientific Missions with DWG3 participants.
- Tutorials organised by DWG3 members
- Training schools (2 for next spring with similar contents and similar dates). The general opinion of DWG3 attendees is that both are interesting, contents will not be completely overlapping for sure, but should be given with a separation of at least 2 months, because they will probably have a similar audience.
- IRACON sessions in conferences
- Deliverable (deadline of Nov 1)
- The possibility of hosting a meeting