SPEED-5G Vision on 5G enablers for Spectrum Management in Sub 6GHz Wireless Networks

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Spectrum Crunch below 6GHz? Panel
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The main objective of SPEED-5G is to achieve a significantly better exploitation of heterogeneous networks and radio access technologies, providing higher capacity together with the ultra-densification of cellular technology, and effectively supporting the new 5G Quality of Experience (QoE) requirements through disruptive spectrum management techniques.

SPEED-5G is developing new techniques for optimizing spectrum utilization, following a three-dimensional model:

- ultra-densification through small cells,
- additional spectrum,
- exploitation of available wireless resources (spectrum, RATs)
SPEED-5G Concepts

- SPEED-5G has specified a three dimensional model defined as extended-Dynamic Spectrum Allocation (eDSA), where several spectrum bands, cells and technologies are jointly managed in order to offer improved QoE and a tremendous capacity increase in a cost-efficient manner.
Research Areas of the project

- Optimised spectrum use and spectral efficiency (L2)
  - Developing and implementing efficient management and MAC mechanisms for the sharing of lightly-licensed spectrum bands at 2.3GHz and 3.5GHz exploiting LSA techniques, as well as of the available unlicensed spectrum at 5GHz and below 1GHz (TVWS)

- Dynamic management of wireless network resources (L3 and above)
  - Enhanced, multi-RAT and context-aware, service oriented radio resource management, and allocation schemes that will offer capacity and coverage extension, as well as improved spectrum utilization in Dense and Ultra-Dense Networks for supporting Ultra-Broadband Wireless and Massive IoT applications
Main aspects of the project

- SPEED-5G is focused in Dynamic Spectrum Access in dense and ultra-dense small cell networks in both indoor, outdoor and mixed indoor / outdoor scenarios using licensed, unlicensed and lightly-licensed spectrum using both non-contention and grant-free contention based Random Access (RA) mechanisms through the development of a new MAC layer and new RRM mechanisms to cope with the eDSA concept.
SPEED-5G vision on the 5G evolution

- In our vision 5G will have a first phase, 5G technologies will be introduced to co-exist in a backwards-compatible way with widely deployed legacy technologies.
- There will be also a second phase, where a new radio-access technology (RAT) without backwards-compatibility requirements will emerge, and in the long-term this new air interface will be migrated into existing spectrum.
- SPEED-5G envisions a new air interface using FBMC waveforms with eDSA enabled L2 and L3 layers, addressing as well the co-existence amongst multiple RATs for 5G’s first phase.

The overall 5G wireless-access solution. Source: Ericsson
SPEED-5G’s Air Interface

SPEED-5G Radio Resource Management
- SON Algorithms
- Radio Bearer Control
- Mobility Control
- Call Admission Control
- KPIs
- Dynamic Resource Allocation

OAM

SPEED-5G Layer 3 (L3)

SPEED-5G MAC (L2)

FBMC PHY layer

FBMC
SPEED-5G’s Air Interface options

- SPEED-5G Radio Resource Management
  - SON Algorithms
  - Radio Bearer Control
  - Mobility Control
  - Call Admission Control
  - KPIs
  - Dynamic Resource Allocation

- OAM
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  - SPEED-5G MAC (L2)

- SPEED-5G MAC (L2)
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- SPEED-5G Layer 3 (L3)
  - FBMC PHY layer
  - FBMC

- FBMC
SPEED-5G’s new MAC layer

- SPEED-5G new MAC will enable a Multi-RAT eDSA solution for the first phase of 5G, introducing 5G capabilities into existing technologies in a backwards-compatibility way.

- SPEED-5G will provide a new eDSA enabled MAC layer for a new FBMC based air interface for 5G small cells with re-configuration capabilities based in the spectrum utilization scheme.

- The unlicensed or lightly licensed carriers can deliver both DL and DL+UL traffic.

- Both Contention-Free Random Access (RA) and Contention based Random Access procedures are considered, using always Contention-Free RA for the licensed carrier.

- Massive IoT is addressed using special FBMC configurations and contention-based access mechanisms that allows using short packets.

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SPEED-5G’s L3 enhancements

- New RRM mechanisms including cross-carrier scheduling will be explored in order to enhance and enable a real Dynamic Spectrum Access
- Context-aware, service oriented radio resource management, with dynamic allocation schemes for enabling the eDSA technology
- Control Plane and Data Plane split for spectrum access coordination, virtual cell and distributed MIMO technologies
- Spectrum-aware hybrid SON algorithmics for eDSA operation
- Support of new SPEED-5G new MAC layer
SPEED-5G Consortium

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Thank you for your attention!

Find us at www.speed-5g.eu

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