



SPEED-5G overview

**“Quality of Service Provision and capacity
Expansion through Extended-DSA for 5G”**

*CLEEN2016 Workshop @CROWNCOM 2016
31/05/2016, Grenoble*

Uwe Herzog, EURESCOM

Quick overview

- ▶ Speed-5G is one of the 19 projects in 5G PPP Phase 1
- ▶ Main objective
 - ➔ To achieve a significantly better exploitation of heterogeneous wireless technologies, providing higher capacity together with the ultra-densification of cellular technology, and effectively supporting the new 5G Quality of Experience (QoE) requirements.

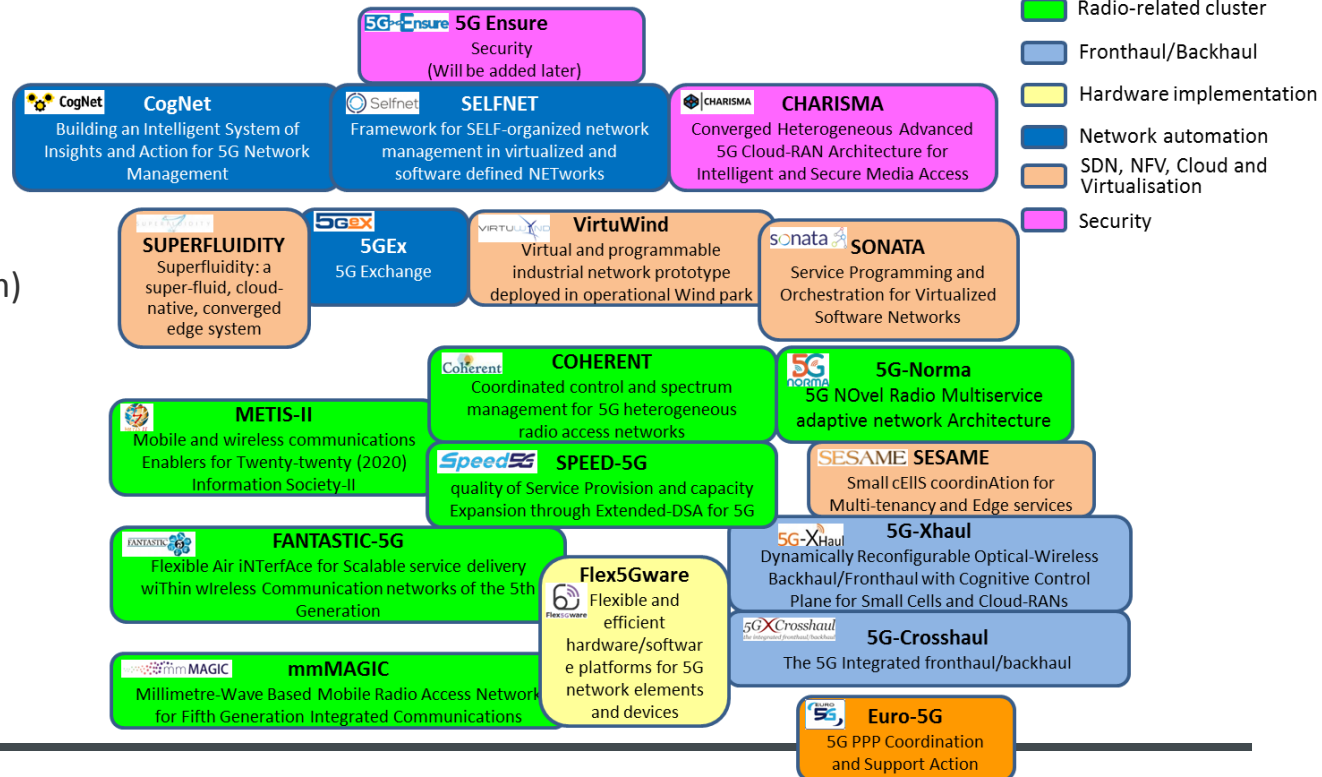
▶ Duration: 1 July 2015 – 31 December 2017

▶ Coordinator:

➔ Oscar Carrasco (Sistel-banda)

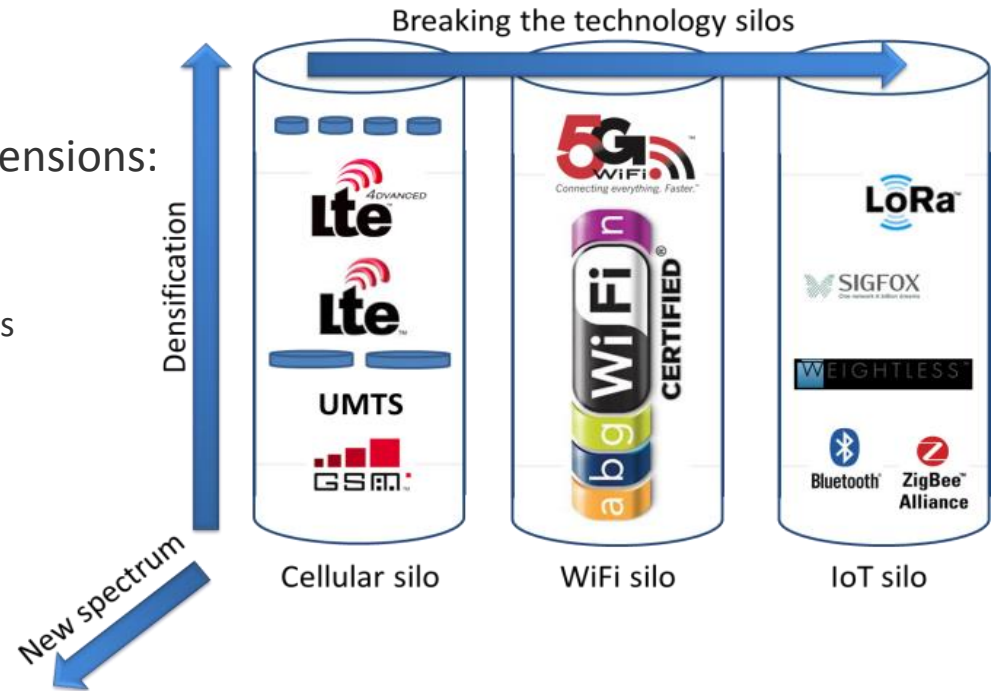
▶ Project Manager:

➔ Uwe Herzog (Eurescom)



Project scope at a glance

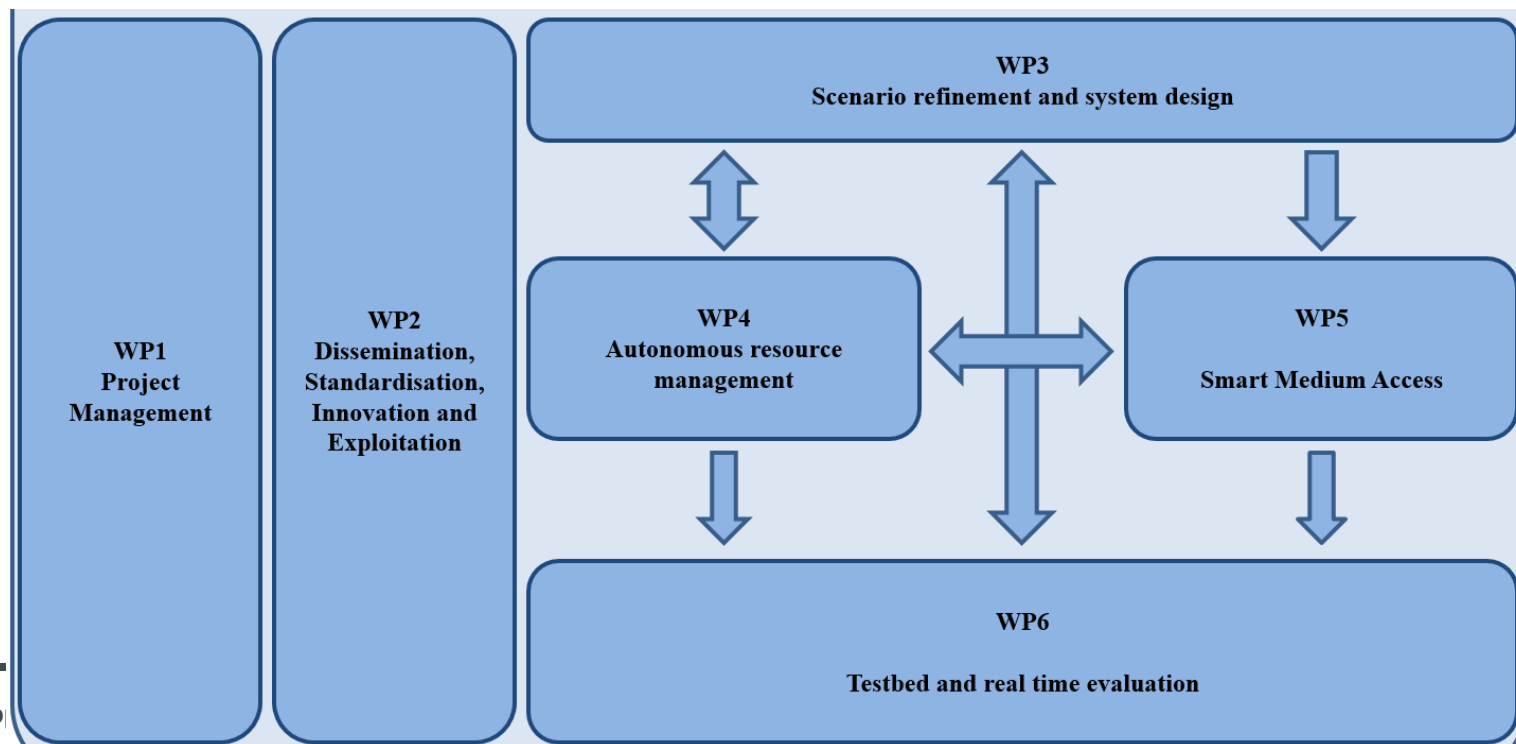
- ▶ In SPEED-5G we will develop new techniques for optimizing spectrum utilization, following three main dimensions:
 - ➔ ultra-densification through small cells,
 - ➔ additional spectrum,
 - ➔ exploitation of available resources across technologies



- ▶ In SPEED-5G this three dimensional model is referred to 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.

Partner list and WP structure

| Participant organisation | Country |
|--|----------------|
| Sistelbanda (SISTEL) | Spain |
| Eurescom (EURES) | Germany |
| British Telecommunications PLC (BT) | United Kingdom |
| Commissariat à l'énergie atomique et aux énergies alternatives (CEA) | France |
| Intel Mobile Communications GmbH (IMC) | Germany |
| Intracom S.A. Telecom Solutions (ICOM) | Greece |
| Instituto de Telecomunicações (IT) | Portugal |
| Rohde & Schwarz (R&S) | Germany |
| University of Surrey (UNIS) | United Kingdom |
| WINGS ICT Solutions (WINGS) | Greece |



Main aspects to be covered by the project

- ▶ Dynamic management of wireless network resources
 - ➔ Enhanced, multi-RAT and context-aware resource management and allocation schemes that will offer capacity and coverage extension, as well as improved resource utilization in ultra-dense small cell and low density environments.
- ▶ Optimised spectrum use and spectral efficiency
 - ➔ 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 below 1GHz (TVWS).
- ▶ How can Speed-5G tackle aforementioned aspects

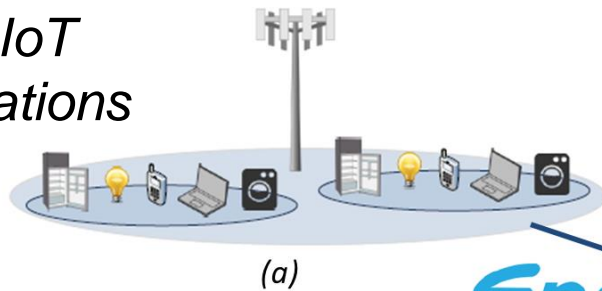


- ▶ SPEED-5G targets providing solutions at Layer 2, Layer 3 and above to enable eDSA with multiple RATs, and especially with FBMC, a non orthogonal multicarrier waveform.
 - ▶ SPEED-5G doesn't work on physical layer design but provides the enablers for using in a coordinated way licensed, lightly-licensed and unlicensed spectrum mostly in dense and ultra-dense small cell networks.
 - ▶ A new MAC for the 5G will be developed and evaluated throughout different use cases and scenarios
 - ▶ New RRM mechanisms will be explored in order to enhance and enable a real Dynamic Spectrum Access using in a well defined set of Use Cases and scenarios mainly from 3GPP and METIS
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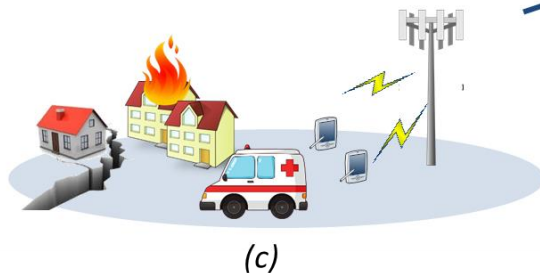
Speed-5G Use cases

- ▶ main scenarios refer to indoor and indoor/ outdoor scenarios (around buildings) where capacity demands are the highest.
- ▶ eDSA can be a very effective approach exploiting co-operation across technologies and bands, resulting in significant performance improvements

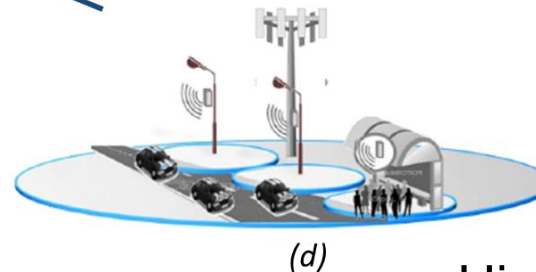
Massive IoT communications



evolved Mobile Broadband (eMBB)



Ultra-Reliable Communications



High-speed mobility

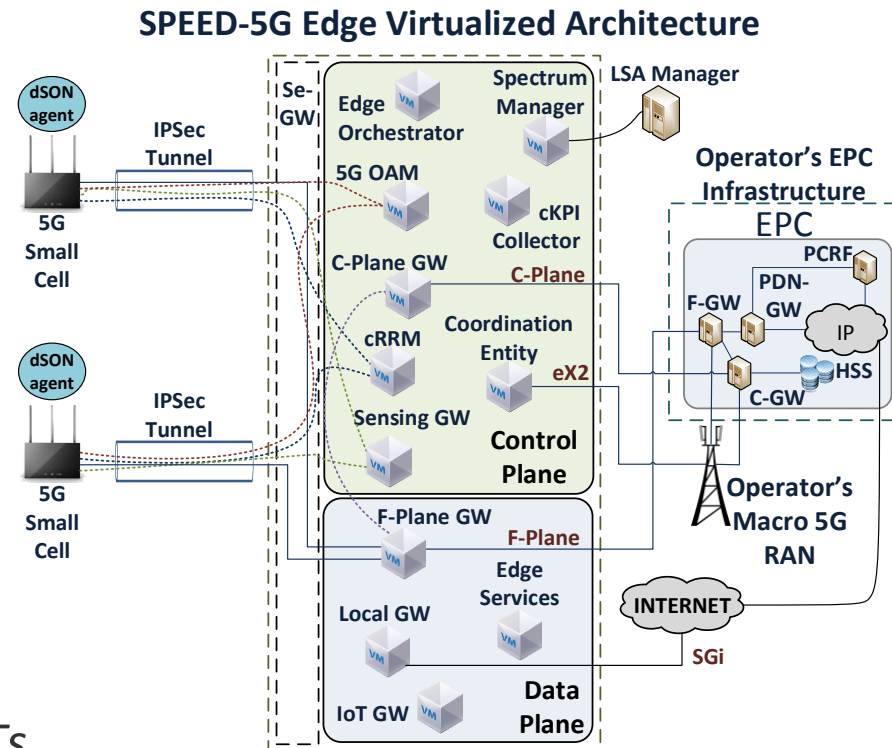
KPIs and requirements of SPEED-5G use cases

- ▶ Collection and analysis of requirements from vertical sectors
 - ➔ Energy, media & entertainment, eHealth, automotive

| KPI | Requirements | | | |
|-----------------------------------|---------------------------------------|--|--|--|
| | Massive IoT communications | evolved Mobile Broadband | Ultra-reliable communications | High-Speed mobility |
| User Experienced Data Rate | From tens to hundreds of Kbps | DL: 300 Mbps UL: 50 Mbps | DL: several kbps upwards UL: several kbps upwards | DL: 50Mbps UL: 25Mbps |
| E2E Latency | Order of seconds or more | 10 ms | 1 ms upwards | 10 ms |
| Mobility | On demand | On demand, 0-100 km/h | Mostly static | On demand (up to 500km/) |
| Connection Density | Up to 200,000 devices/km ² | 200-2500 /km ² | Mostly low, but variable | ~2000/km ² |
| Traffic Density | Not critical | DL: 750 Gbps/km ² UL: 125 Gbps/km ² | Highly variable | DL:100Gbps/km ² UL: 50Gbps/km ² |

Speed-5G Virtualised architecture

- ▶ Small cells are not natively supported in current LTE-based approaches
 - ➔ High number of small cells to be addressed by design
 - ➔ macro cell offloading required
- ▶ Take full advantage of available spectrum by dynamically access licensed / licensed shared / license-exempt bands.
- ▶ Enhanced interference coordination
- *Easy and autonomous management, configuration, and optimization of small cells*
- *Lean and scalable design, limited interfaces, avoiding signalling congestion*
- *Support eDSA, managing several RATs*



Thank you for your attention!

Find us at www.speed-5g.eu

Twitter: [@SPEED_5G](https://twitter.com/SPEED_5G)

Acknowledgment:

The research conducted by Speed-5G receives funding from the European Commission H2020 programme under Grant Agreement N° 671705. The European Commission has no responsibility for the content of this presentation.