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3GPP RAN Update & Opportunities for RAS Cluster Projects

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Overview

1. 3GPP in 3 minutes
2. Release 12 Status
3. Future Challanges

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3GPP in 3 Minutes

A quick reminder

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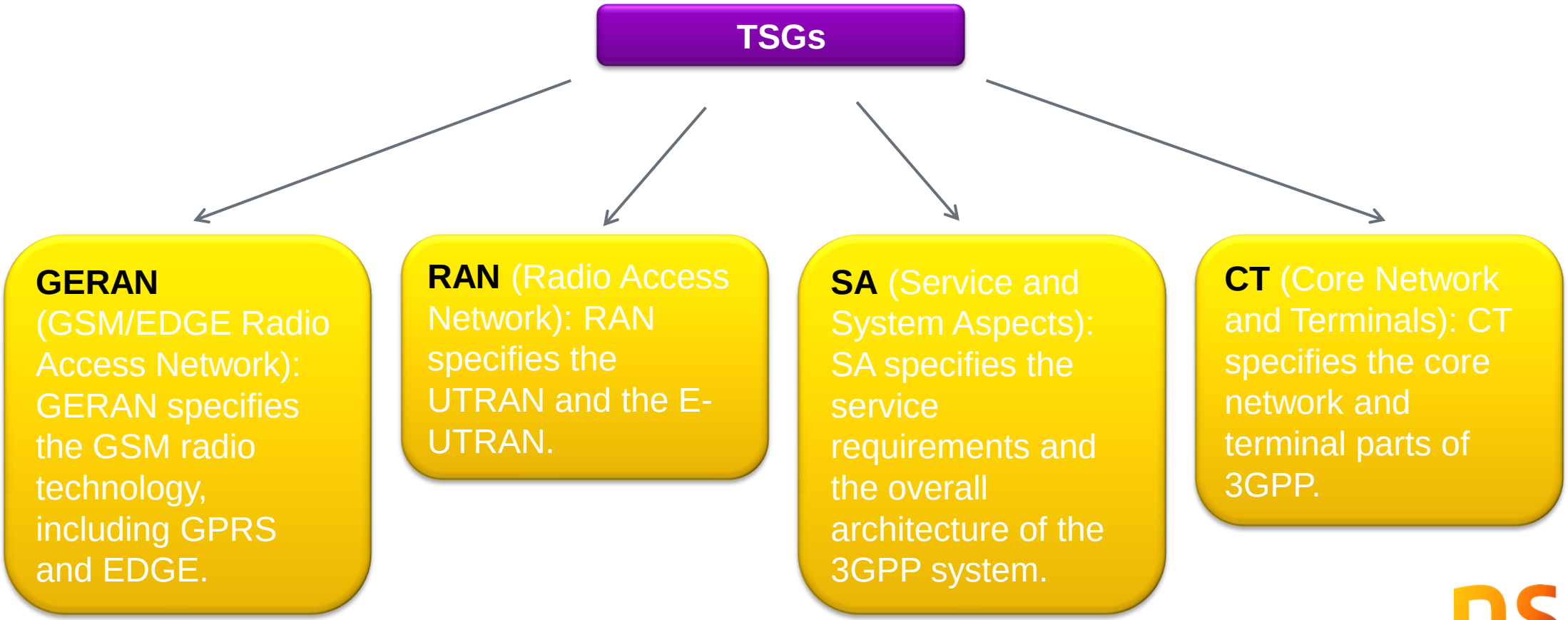
Technical Specification Groups

The 3rd Generation Partnership Project (3GPP) unites [Six] telecommunications standard development organizations (ARIB, ATIS, CCSA, ETSI, TTA, TTC), known as “Organizational Partners” and provides their members with a stable environment to produce the highly successful Reports and Specifications that define 3GPP technologies.



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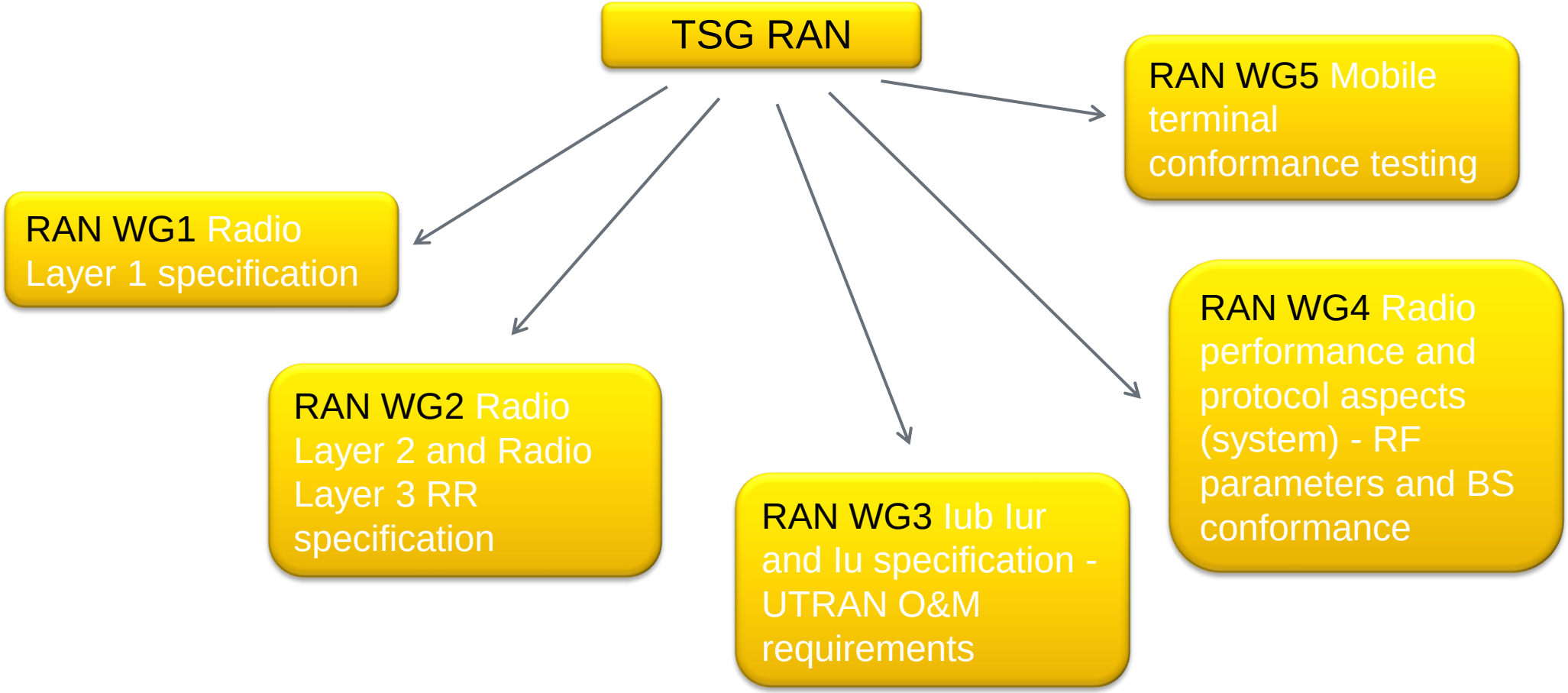
RAN Working Groups



In 2011 over 48,000 delegate days were contributed to 3GPP Meetings

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Standardization Process

- 3GPP standardization work is contribution-driven. Companies ("individual members") participate through their membership to a 3GPP Organizational Partner. 3GPP is composed of more than 400 individual members.
- Specification work is done at WG and at TSG level:
- the 3GPP WGs hold several meetings a year. They prepare and discuss change requests against 3GPP specifications. A change request accepted at WG level is called "agreed".
- the 3GPP TSGs hold plenary meetings quarterly. The TSGs can "approve" the change requests that were agreed at WG level. Some specifications are under the direct responsibility of TSGs and therefore, change requests can also be handled at TSG level. The approved change requests are subsequently incorporated in 3GPP specifications.

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3GPP Standards

3GPP standards are structured as *Releases*. Discussion of 3GPP thus frequently refers to the functionality in one release or another.

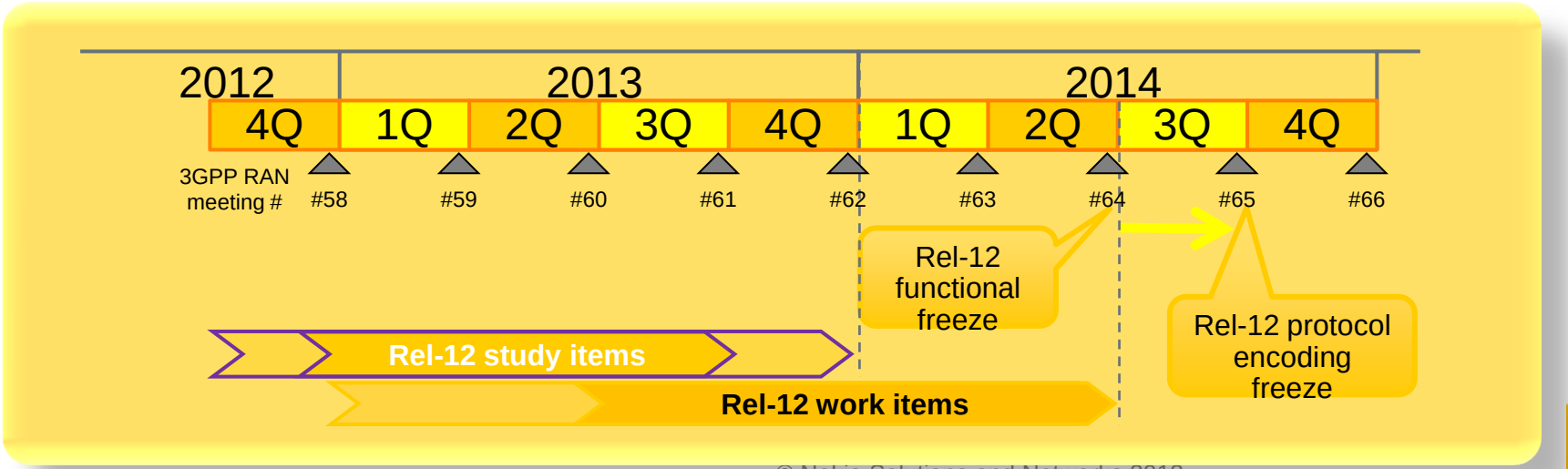
Release 8 (2008 Q4) First **LTE** release. All-IP Network (SAE). New OFDMA, FDE and MIMO based radio interface, not backwards compatible with previous CDMA interfaces.

Release 9 (2009 Q4) SAES Enhancements, WiMAX and LTE/UMTS Interoperability. Dual-Cell HSDPA with MIMO, Dual-Cell HSUPA.

Release 10 (2011 Q1) **LTE Advanced** fulfilling IMT Advanced 4G requirements. Backwards compatible with release 8 (LTE). Multi-Cell HSDPA (4 carriers).

Release 11 (2012 Q3) Advanced IP Interconnection of Services. Service layer interconnection between national operators/carriers as well as third party application providers.

Release 12



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3GPP Release 12

What are we working on now?

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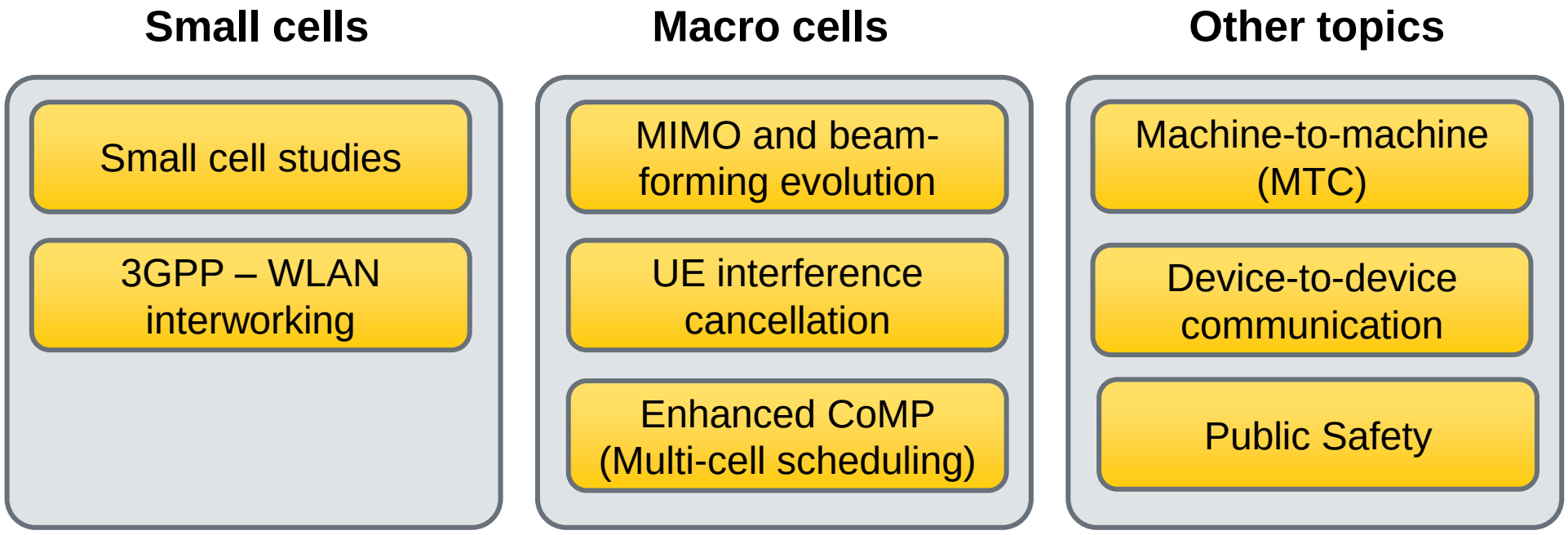
Main Topics in 3GPP Release 12



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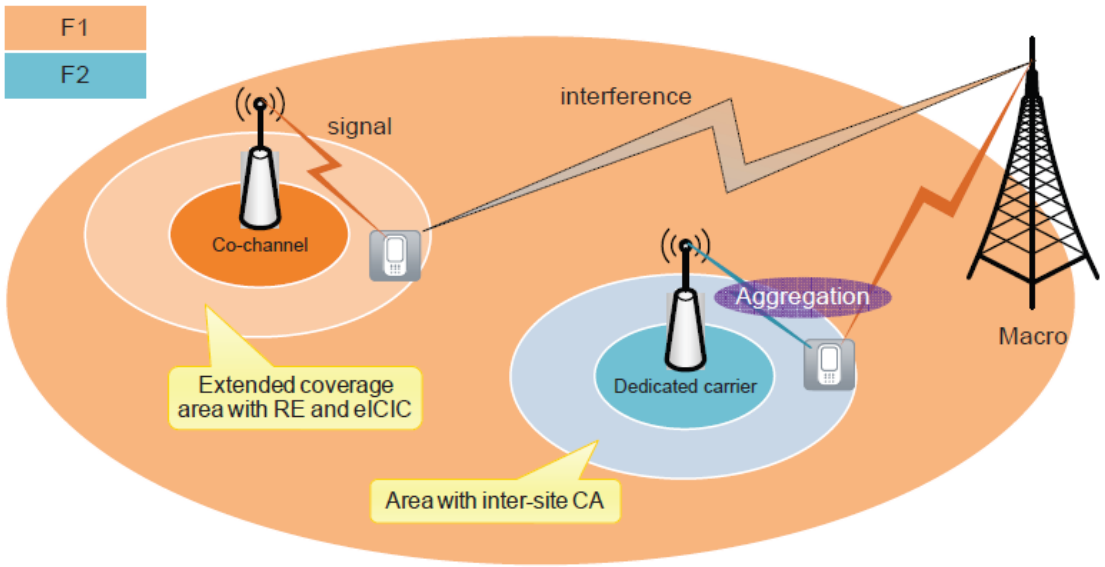
Small cell studies in Release 12

- Covers macro assisted small cells as well as stand alone small cell
  - 3GPP study to be completed Dec13 (then actual WI to be started)
- Dedicated spectrum for small cells at 3.5 GHz
  - Also existing spectrum being considered (including co-channel case)
  - Further items under study include:
    - Dual connectivity
    - 256QAM



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Key Release 12 LTE Topics

LTE Small Cell Enhancements Phy & Higher Layer

New Carrier Type (NCT)

→ People's data consumption has changed; both in DL and UL data rates increased significantly → **more capacity per m², higher user throughputs and better power efficiency** to support continuous connectivity to cloud.
→ Small Cell SI expected to seek enhancements both for CA and non-CA UEs
→ NCT stopped in 3GPP due small gain and resulting non-backwards compatibility

HetNet Mobility Enhancements

→ **Robust Mobility and small cells** for successful introduction of small cells based on the Rel-11 study item work.

3GPP – WLAN Radio Interworking

→ Better **user experience for WLAN offloading or WLAN "integration" to operator's cellular offering**
→ Operators target is to enable **controlled load balancing** between WLAN and 3GPP radios (LTE, UTRA).
→ More predictable user experience and UE behavior with mobility control to both directions -> enable getting UE back from poorly performing WLAN

Seen useful | **Possibly useful** | **Not useful at this time**

Key Release 12 LTE Topics (cont)

Low cost MTC and coverage enhancements

→ Important to facilitate 2G/3G M2M communications to migrate to LTE in the long term (in the short term LTE modem price to high compared to 2G/3G for many low data rate applications (Smart metering etc.)

3D Channel Modeling

3D-beamforming

FD MIMO

→ 3D radio channel model study started with strong industry support (Ready 12/2013)
→ To be followed by 3D elevation beamforming study for enhancing LTE macro network capacity
→ Followed by Full Dimension (Massive) MIMO, but probably in Release 13

LTE FDD-TDD joint operation

→ Carrier Aggregation evolution for further enhancements of combining operator's spectra; FDD-TDD CA

Enhancent CoMP study

→ Support of non-ideal backhaul for the use of scheduler coordination (if benefit high enough in the recently started study)

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LTE Rel-12 Overview after TSG RAN Plenary #61

RAN1

Stopped

- New Carrier Type
- LTE TDD for DL-UL Interference Management and Traffic Adaptation
- Further DL MIMO enhancements
- Enhanced CoMP study
- LTE coverage enhancements
- LTE TDD – FDD Joint Operation including Carrier Aggregation
- Small Cell Studies – L1
- 3D Channel Modeling
- D2D– Discovery & data communication
- Low Cost & coverage improvement MTC UE
- Network-Assisted Interference Cancellation and Suppression for LTE

RAN2

- HetNet Mobility Enhancements
- Support for BeiDou
- 3GPP – WLAN Radio IW
- Small Cell Studies – L2
- Machine-Type and other mobile data applications Communications enhancements (Closed)
- Further MBMS Operations Support for E-UTRAN
- Group Communication for LTE
- Smart Congestion Mitigation in E-UTRAN

RAN3

- Further enhancements for HeNB mobility
- RAN aspects for LIPA Mobility and SIPTO at the Local Network
- PWS Reporting Enhancements Reset/Failure/Restart
- LTE-HRPD inter RAT SON
- Next-generation SON for UTRA and LTE
- RAN Enhancements for UMTS/HSPA and LTE Interworking
- Energy Saving Enhancement
- Mobile Relay for E-UTRA

RAN4

- LTE UE TRP and TRS and UTRA Hand Phantom Requirements
- UE MIMO OTA test method (requirements likely to follow)
- Inter- & intra-band CA band specific WIs, potentially
- Inter-band CA for 2 UL WIs
- Intra-band NC CA 2UL framework
- 3 DL CA WIs
- New LTE Frequency Bands
- Performance Requirements of 8 Rx Antennas for LTE UL
- Base Station (BS) RF requirements for Active Antenna System (AAS)
- BS specification structure
- CRS interference cancellation requirements for UE
- Positioning Enhancements for E-UTRA

Approved WI

Approved SI

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Future Challanges

Opportunities for future RAS projects

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Key requirements for network infrastructure towards 2020

Support up to 1000 times more traffic

Enable Gbps peak speeds

Improve energy efficiency

Deliver safe superior customer experience

Manage up to 10 times more users

Reduce latency to milliseconds

Make networks self-aware, self-adaptable, and intelligent

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Future Challenges I

- 5G Mobile Radio Systems
  - What are the real requirements?
  - Do we need new physical layer (or layers)?
  - Which frequencies should be used?
  - What should the architecture look like?
  - How can we deploy and manage future networks?

- Cloudification/Virtualization of mobile networks
  - How far can we virtualize the RAN?
  - Is fibre the limitation?
  - Use of network edge computing resources

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Future Challenges II

- Spectrum
  - Authorised Shared Access spectrum management
  - Cognitive radio
  - Use of shared access spectrum

- Cognitive Networks
  - The application of big data analytics and Artificial Intelligence technologies will help to create the Cognitive Network that can autonomously handle complex end-to-end network and service management.

- Personalization of the network experience
  - Customer experience management (CEM) In future, the capabilities of CEM can be enhanced substantially when combined with the Cognitive Network approach. In short, cognitive networks can dynamically optimize the experience of selected users in response to a changing environment.

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How FP7 projects can be more effective in 3GPP standardization

- Understand the standardization environment
  - Submission by partners not projects and based on agreed work program
  - Standardization is not a one off event but rather a protracted process involving major time and effort
  - Plan accordingly in project proposal

- Make sure there are experienced standardization experts involved in the project
- Make sure there are strong 3GPP partners in the project consortium (vendor and operator)
- Try to build broad consensus before trying to standardize (contact and disseminate to key players before submission)
- Be realistic!

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