3GPP TSG RAN workshop on REL-12 and onwards RWS-120012
Ljubljana, Slovenia, June 11-12, 2012

3GPP RAN Workshop on Release 12 and onwards

Deutsche Telekom Requirements and Candidate Technologies

Han van Bussel, Radio Networks Innovation and Strategy, Deutsche Telekom AG

Overview

- Introduction
- Capacity for mobile broadband
  - Requirements
  - Candidate technologies
- Spectrum and spectrum usage
- Other requirements
- High Speed Packet Access

Introduction

- Deutsche Telekom's mobile networks will remain based on evolving 3GPP standards.
- LTE should continue to evolve to maintain its position as the most competitive mobile broadband technology on the market.
- Clear focus should be on LTE evolution
  - LTE is the current de-facto global mobile broadband standard, and only at the start of its commercial life-cycle.
  - No known killer new technology emerging that would justify a radical rethink.
- Enhancements of HSPA to be considered in selected areas
  - HSPA continues to be used on its current deployment bands for another decade, and should be enhanced where needed to remain competitive and optimized for interworking with LTE.
- There is no current need for a very aggressive timescale for the next Release.
  - 18-24 months for completion could be target.

Capacity for Mobile Broadband Requirements

- Significant capacity increase is needed to meet the fast growing traffic demand.
- Capacity increases are needed for different deployment scenarios: macro-network, heterogeneous networks and hot spot (including (RF) isolated indoor) small cells. It is likely and acceptable that some new features will mainly benefit a subset of scenarios. In case of heterogeneous networks, an improvement of overall capacity density should be targeted by not assuming a much higher traffic density close to deployed small cells.
- Capacity increase needs to be cost competitive and energy efficient.
- Qualitative requirements for capacity enhancements are recommended, as quantitative requirements may drive solutions with excessive complexity and cost, with a negative outlook for practical implementations.

Capacity for Mobile Broadband
Candidate technologies (1/3)

- For all new technologies the achieved gains need to justify the complexity/cost.
- Small cell capacity:
  - Small (indoor) cell deployment will increase over the next years to handle traffic where it is created. Specific capacity and data rate increases are justified for these scenarios which typically could be characterized by higher frequency bands, some RF isolation (high SNR), sometimes line of sight propagation with low/no mobility terminals at lower output powers.
    Candidate physical layer technologies could e.g. be DL HOM (256 QAM), and OFDM in UL.
- Antenna arrays:
  - For the macro-layer the emergence of active antennas offers the possibility to exploit antenna capabilities in the vertical plane, allowing user specific beam-forming as well as vertical sectorization whilst keeping the antenna size. Work may be required on feedback modes and codebooks.
  - As a further step antenna arrays could support 3D beam-forming.
  - The most effective combination of sectorization and MU-MIMO/beam-forming that exploits both dimensions needs further study .

Capacity for Mobile Broadband
Candidate technologies (2/3)

- DL MIMO enhancements:
  - Further enhancements for DL MIMO are achievable with multi-column x-polarized antenna when introducing new feedback methods and new / adaptive codebooks.
    - Evaluations have shown better performance of uplink measurement based BF over purely code-book based BF. The performance difference further increases with multi-cell operation as e.g. CoMP JP.
    - Candidate improvements are foreseen from the exploitation of longer term channel reciprocity in FDD.
      - Further BF gain is expected by introducing measurements of long term channel characteristics as AoA in the UL band also for FDD operation. This will require study on how to make the UL measurements applicable to derive DL antenna weights.
- New or modified carrier types
  - New or modified carrier types (as far as not included in Release 11). It is essential earlier Release UE still get service, but this should not unnecessarily constrain enhancements in new spectrum.

Capacity for Mobile Broadband
Candidate technologies (3/3)

- UE receiver performance enhancements:
  - UE receiver performance enhancements to cancel inter-cell interference, including those needing network support, should be considered as baseband capabilities are expected to continue to evolve. Benefits for both synchronous and non-synchronous NW operation should be evaluated.
- Revision of RAN1 simulation assumptions:
  - The simulation assumptions should be revisited to give more realistic estimates of capacity and specific feature gains:
    - Review down-tilt assumptions and consider introducing some irregularity in the site grid, to create a more representative geometry distribution that can more accurately reflect the gains in actual networks from features improving performance in cell overlap areas.
    - Review the impact of vertical antenna pattern on deployment, as e.g. vertical angular spread may not be correctly modeled..

Spectrum and spectrum usage

- Spectrum:
  - Market demands should drive needs for new Carrier Aggregation combinations
    - For European deployments:
      - Deutsche Telekom's near term requirements on band combinations (e.g. Band 3 and 7) are mostly already being specified.
      - Intra-band contiguous Carrier Aggregation for Band 3 should be extended to cover contiguous as well as the non-contiguous cases already being specified.
    - For US deployments:
      - Intra-band non-contiguous Carrier Aggregation for Band 4
      - Inter-band Carrier Aggregation for Band 2 and Band 4
  - New bands should be specified for new spectrum becoming available for mobile use once it is clear that bands are to be harmonized on a regional/global basis and band plans available
    - One focus on Digital Dividend II (694/8 – 790 MHz) which is on WRC 2015 agenda
  - Wireless backhaul using spectrum capable of NLOS propagation facilitates small cell deployment in some deployments. As an option it should be possible to use part of a 3GPP band for this purpose.
- Spectrum challenge
  - LTE should work on all spectrum (becoming) available for mobile, but the proliferation of global spectrum bands and band combinations increases risk of fragmentation of terminal market for an ecosystem relying on economies of scale and roaming
    - Examples: Initial new iPAD does not support deployed European/Australian LTE bands. Furthermore, several of the high number of LTE CA combinations are operator specific.

Other requirements (1/2)

- The increased availability of MSR BS offers opportunities for enhancements
  - Direct call/session setup in other RAT at least between LTE and UMTS in both directions (no handover).
  - Increased flexibility in dynamic use of RAT over available spectrum to meet traffic needs (without interruption of service).
- SON and MDT should be enhanced where beneficial for the system. For new features SON support should be considered, e.g. for AAS configuration and more dynamic deployment aspects (RAT/spectrum/layer/cell (de-)activation)
- Introduce support for inter-site inter-carrier Carrier Aggregation.
  - This benefits from likely terminal implementation of needed RF to support other features anyway (cf. HSPA multi-flow) and offers improved mobility/traffic steering between layers and enhanced T-put.
- Improved smart phone support. The outcome of the Diverse Data Application Study should be used to decide on enhancement areas, and will likely focus on need to avoid “signaling storms” and control resource shortage.

Other requirements (2/2)

- Introduce and enhance support for new services:
  - Proximity services (D2D) promise an attractive new business field where integration at radio level gives operators an clear advantage over OTT players. To address this at least discovery aspects need to be supported, and this needs to function also for subscribers of multiple operators.
  - Machine to machine. Requirements are being elaborated in SA1.
  - Cloud services will lead to increased data traffic and always on functionality including need for low latency.
- Maintain an optimal architecture with standardized interfaces supporting the increasing degree of inter-site cooperation anticipated in future for radio transmissions and/or resource management
  - Increasing coordination may warrant the standardization of a new centralized node managing inter-site coordination and/or a pooling of processing, if gains are sufficiently high and distributed solutions are not found to be competitive
- Cost and complexity aspects, as well as energy efficiency for network, operations and terminals need to be key criteria when specifying solutions.

High Speed Packet Access

- HSPA still has a number of areas where enhancements are desirable within existing deployments
  - Further improved UE receiver requirements to enhance DL.
  - Improved NodeB receiver requirements to enhance UL.
  - Improved interworking with LTE when required and justified by LTE enhancements
  - Reduction in RNC signaling load caused by smart-phone traffic
    - CN signaling issue has been resolved by fast dormancy introduction.
  - UE battery consumption.
    - Gains as result of CPC introduction are lower than expected.