Scope of Future FDD HSPA Evolution

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HSPA Evolution – High Level Requirements

- ***"Guiding Principles"* for HSPA Evolution (HSPA+)**
  - **Established at RAN#31 (Sanya)**
    - *Scope of future FDD HSPA Evolution*, RP-060217
  - **HSPA+ Guiding Principles – Summary**
    - 1. Evolve HSPA spectrum efficiency, peak data rate and latency
    - 2. Inter-working with LTE and GSM/EDGE
    - 3. Support PS-only operation on shared channels
    - 4. Be "*backward compatible*" – i.e. legacy terminals (R99-DCH and HSPA) share same carrier with HSPA+ terminals without any performance degradation
    - 5. Should need a simple upgrade to existing infrastructure
  - **HSPA+ should not impact or delay other work – e.g. LTE**
- **RAN WG Primary Tasks**
  - **Define requirements for HSPA+ covering:**
    - Latency, throughput and spectrum efficiency targets for 5MHz operation
    - Constraints on acceptable hardware and software changes to current elements
    - Constraints on acceptable network architecture changes
  - **Determine performance benefits achieved by existing WI's on HSPA**
  - **Identify potential solutions to improve HSPA performance towards the agreed targets within the defined constraints**

Observations on Requirements

- **Observations**
  - **Selected existing Work Items deal with similar goals**
    - Examples:
      a) Delay Optimisation for Procedures Applicable to PS and CS Connections
      b) HSDPA MIMO
      c) Continuous Connectivity for Packet Data Users
      d) Improvement of MBMS
      e) Improved Perf. Req's for Non-HSDPA Channels based on Enh.Type 1 Rx
  - **Work already providing means of assessing performance benefits**
  - **Constraints – e.g. on number of antennas, number of sectors, UE capabilities etc. – can be captured initially in requirements document**
    - "*Backwards compatibility*" and "*simple upgrade*" constraints challenging
- **Requirements Specification**
  - **Similar document to 3GPP TR 25.913 "*Requirements for Evolved UTRA (E-UTRA) and Evolved UTRAN (E-UTRAN)*"**
  - **Provides guidance on key technical issues and method of capturing requirements**

HSPA+ – Key Technical Aspects

- **Key Goals – HSPA Evolutionary Aspects**
  - **HSPA Latency, Capacity & Rate Enhancement**
    - **Goal** : Reduce latency, maximise user and system t-put and coverage in 5MHz channel. Including network and user peak rates, cell edge coverage
  - **PS Domain Operation**
    - **Goal**: Enable and validate full migration to PS-domain, including signalling
  - **VoIP Performance Optimisation**
    - **Goal**: Enhance VoIP performance – support elimination of DCH, exceed CS perf.
  - **Evolved MBMS**
    - **Goal**: Further optimise MBMS service performance
- **Assumptions**
  - **Pragmatic set of constraints required if timely progress to be made**
  - **Key assumptions:**
    - ***Deployment*** – consistent with HSPA; urban deployments, low- to moderate mobility
    - ***Channel bandwidth*** – 5MHz, single carrier, no bandwidth scaling
    - ***Synchronization*** – not mandated but applicable where performance gains justify use
    - ***UE multi-antenna support*** – 2-port assumption used for performance assessment

HSPA+ Technical Opportunities & Scope – L1

- **Layer 1 Issues for Potential Further Study**
  - **MIMO**
    - Including 'uplink MIMO' (single UE Tx antenna)
  - **Higher-Order Modulation**
    - 64-QAM, or alternative
  - **Advanced Receivers**
    - Including other-cell suppression
    - Primarily RAN4 work but also potentially required in RAN1 at Node-B and UE for complete HSPA+ performance impact assessment
  - **VoIP Optimisation**
    - Including signalling optimisation, low power DTX/DRX aspects
  - **Optimised Sectorisation and Beamforming**
  - **HSPA Physical Channel Re-Design & Optimisation**
    - Including DCH removal & logical channel re-mapping
  - **Enhanced MBMS Services**
    - Enhanced spectral efficiency, coverage, higher peak rates
    - Scenarios requiring dedicated carrier for MBMS
  - ***Note: L1/L2/L3 partition arbitrary and for initial consideration only.***

HSPA Technical Opportunities & Scope – L2 & L3

- **Layer 2 & 3 Issues for Potential Further Study**
  - **Protocol Enhancements**
    - RRC state re-assessment for latency enhancement
    - Bearer establishment optimisation for PS domain
    - L2 protocol enhancements
    - Scheduling optimization
  - **Mobility**
    - Optimised serving cell change
    - Optimised HO to LTE, GSM/EDGE
  - **Signalling for Continuous Connectivity**
    - Signalling specification, ConCon state management & performance assessment
  - **SAE Exploitation**
    - Feasibility of any functional re-mapping for HSPA in an SAE network
  - **MIMO**
    - Signalling for optimised control, mode selection