3GPP RAN #75
Dubrovnik, Croatia, March 6-9, 2017
Agenda item: 9.1

RP-170449

Discussion on the evolution of MBMS

QUALCOMM®

A premise on eMBMS

- "eMBMS" for LTE/EPS refers to (at least) two variants of the technology that are worth spelling out clearly

- (1) eMBMS as a "radio-centric" multicast mechanism for a more efficient delivery of data over the radio interface, i.e. enabler for a mixed mode between multicast & unicast
  - From technical point of view, it does NOT require usage of the BMSC-based system architecture, nor of any specific service layer
  - Primary use case is constituted by "unicast operators" that also want to be able to do multicast

- (2) eMBMS as a "standalone" cellular-based broadcasting solution
  - This one may or may NOT require a specific broadcasting-based / BMSC-based system architecture & it may benefit (but does not require) the usage of specific service layer
  - Primary use case is constituted by operators mainly focused on broadcasting

A premise on eMBMS (cont.)

- We propose to distinguish two use cases with the correct terminology from now on
- “Mixed mode” → radio-based multicast, to be designed in a way such that it can efficiently share resources with unicast
- “Standalone MBMS” → cellular-based broadcasting solution, to be designed keeping in mind the end-to-end system architecture

Our proposal on the evolution of MBMS in 5G era

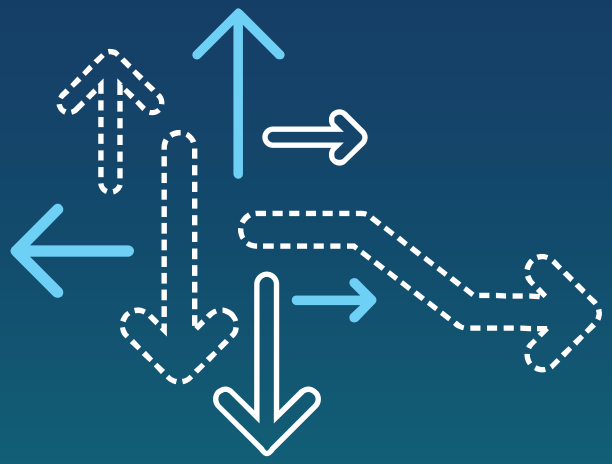
- The evolution of MBMS needs to take into account this fundamental distinction
- Thus, we propose the following

- "Mixed mode" → eventually, this should be studied as part of NR evolution
  - It does not necessarily need to be called "eMBMS" as it really is efficient about having an efficient RAN multicast to coexist with unicast
  - Annex includes some initial observations

- "Standalone MBMS" → the starting point for this should be the Release 14 LTE EnTV work
  - Are there 5G RAN or system requirements for broadcasting that are not met by LTE EnTV?
  - If so, which ones?
  - Maybe this will result in an evolution of LTE EnTV to be called "5G". Note that this approach is the same one we are following for NB-IoT/eMTC with respect to 5G mMTC

Conclusions

- We propose to consider separate evolution path for standalone and mixed carriers
- 5G standalone MBMS should be based on Rel-14 EnTV
  - The starting point is a careful gap analysis to identify enhancements necessary
- 5G NR mixed mode multicast/unicast should be based on NR numerology and frame formats
  - E.g. should remove inefficiencies of eMBMS resource allocation & should provide a unified framework for MBMS, SC-PTM/Public safety, IoT, V2X
  - System architecture needs to be studied in SA2 but 5G System “unicast“ architecture can be considered the basis



Annex

General description of eMBMS in LTE RAN through Rel-14

- The following operating modes are supported
  - Standalone eMBMS carrier with almost 100% broadcast (Rel-14) => Standalone
  - Mixed unicast/eMBMS carrier with up to 80% broadcast (Rel-14) => Mixed mode
  - Mixed unicast/eMBMS carrier with up to 60% broadcast (Rel-9) => Mixed mode
- The following subframe formats are supported
  - 1.25 kHz subcarrier spacing, 200 µs CP
  - 7.5 kHz subcarrier spacing, 16.6 µs CP;
  - 15 kHz subcarrier spacing, 16.6 µs CP
- System architecture described in 3GPP TS 23.246, including a set of major enhancements introduced in Rel-14 e.g.
  - “Receive Only Mode”
  - Open XMB2 interface (which decouples transport & service layers)
  - and many others

Standalone MBMS - why should LTE EnTV be the starting point?

- The new subframe formats for LTE EnTV has been recently defined
- The introduction of NR doesn't create an obvious reason to change the standalone MBMS format
- It is not immediately obvious what major enhancements are needed
  - → Careful gap analysis is needed in the standalone case
- We should not destabilize possible market adoption of LTE EnTV (same reasoning as for NB-IoT); to the contrary, we should explore how LTE EnTV can be augmented to meet 5G standalone eMBMS requirements

Mixed mode - inefficiencies of eMBMS in LTE

- In the mixed unicast/multicast carrier case, the resource allocation granularity is one subframe, which is relatively coarse, especially in ≥10 MHz CC BW
- The MBSFN subframes are semi-statically allocated
  - The subframes that are allocated but not used for MBMS due to traffic fluctuation can only be allocated to TM9/10 unicast
    - Many UEs are not TM9/10 capable
    - TM9/10 has reduced efficiency in non-MBSFN subframes (40% of subframes in Rel-9, 20% in Rel-14) due to presence of both CRS and DM-RS

Mixed mode - possible motivation for study in NR

- Mixed unicast/eMBMS carrier
  - The broadcast waveform should be adapted to NR numerology and frame formats
  - Better resource allocation granularity should be supported
    - FDM-ing of MBMS and other services should be supported
  - Coexistence and dynamic resource sharing between MBMS and other services should be supported
    - Resources not used for MBMS should be efficiently reusable to other services
    - Resources allocated for MBMS should not degrade QoS for high priority unicast services (e.g. URLLC)
      - Pre-emption and/or error correction of MBMS data should be supported

Thank you

Follow us on:

For more information on Qualcomm, visit us at:
www.qualcomm.com & www.qualcomm.com/blog