Motivation of
Further enhanced Multicast Broadcast services

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Motivation

- 5G enables lots of vertical use cases, whereby one of remarkable functions is the support of multicast and broadcast services (MBS).
  - The market requirements for Rel-19 enhancements are certainly available, e.g., according to 5G-MAG.

- Rel-17 MBS specified the basic functionalities for multicast and broadcast sessions via PTM and/or PTP delivery.
  - For multicast sessions, the reliable delivery mode was introduced with e.g., HARQ feedback and Split MRB.
  - For broadcast sessions, the similar mechanism as LTE eMBMS/SC-PTM was introduced.
- Rel-18 eMBS, some limitations were removed from Rel-17 mechanisms.
  - For multicast sessions, the multicast reception in RRC INACTIVE was supported.
  - For broadcast sessions, the shared processing with unicast reception was introduced.

- Rel-19 FeMBS, all the existing limitations should be considered for removal and the full-support of 5G-integrated media/content services to accelerate the MBS deployments for corresponding verticals should be provided.
  - Coverage and capacity enhancements.
  - Efficiency and flexibility improvements.
  - Commitment to future use cases, e.g., metaverse.

- In Rel-19 RAN workshop, the enhancements of MBS was identified as a potential projects, as in RWS-230488.
  - This paper provides possible areas for Rel-19 MBS enhancements.

Further enhancements of MBS should be discussed in Rel-19, to enable all use cases from verticals

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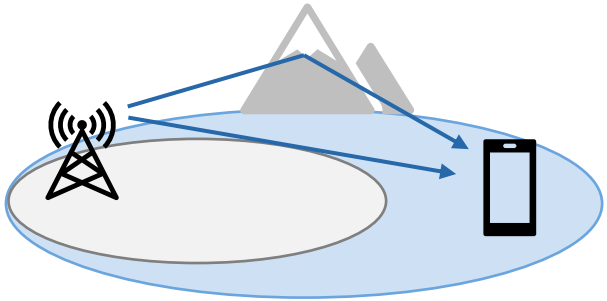
Coverage and efficiency improvements – ECP and SFN

Extended cyclic prefix (ECP) and Single frequency network (SFN) are expected to provide wider coverage and better efficiency with improved service continuity especially for moving UEs and UEs at cell edge.

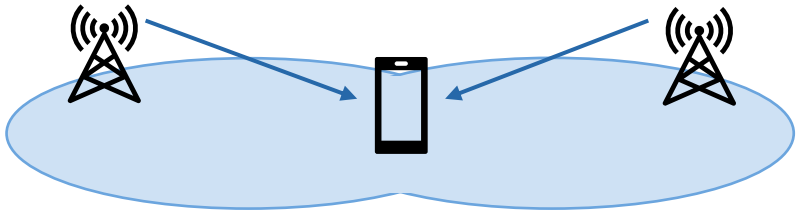
- In LTE eMBMS, both functions were supported from the beginning.
- For NR MBS, these functions were discussed but deprioritized in the previous releases.
- Currently, intra-gNB SFN can be enabled by NW implementation (i.e., no standard support.)

ECP and SFN would be beneficial for migrating legacy eMBMS network to NR MBS.

- ECP is also useful for SFN, i.e., for relaxation of inter-gNB synchronization.



***ECP** accepts larger delay spread*



***SFN** provides uniform reception quality*

Rel-19 MBS should support Enhanced cyclic prefix and Single frequency network

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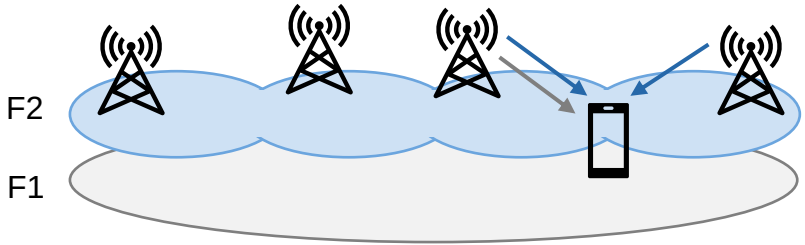
Connectivity topological enhancements – CA/DC and MBS relaying

Aggregation of multiple MBS carriers (i.e., CA) can enable delivery of richer contents, e.g., metaverse.

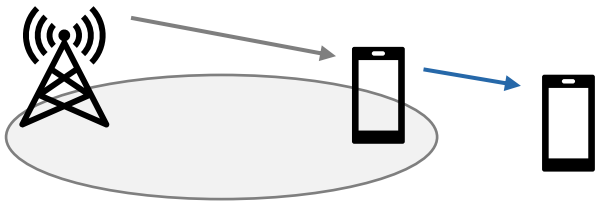
- Same as unicast CA, MBS CA provides higher throughput for high-definition MBS services.
- Same as unicast DC, PCell provides basic service coverage while PSCell may boost user experiences.
- Small cells' SFN will provide stability and high-throughput to moving UEs even at cell edge, while macro cells will provide reliability for basic MBS services.

MBS service for out-of-coverage UEs is critical e.g., for Public Safety group communication.

- Currently, MBS service relayed by IAB-node and NCR is possible.
- On the other hand, Sidelink Relay would be necessary under certain use cases.



***MBS CA/DC** with small cell SFN*



***MBS relaying** with L2 U2N relay*

Rel-19 MBS should support MBS CA/DC and MBS relaying

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Summary

Potential objectives of Rel-19 MBS enhancements are proposed as follows.

- Specify extended CP (ECP) [RAN2, RAN1]
- Specify single frequency network (SFN) [RAN2, RAN3]
- Specify MBS carrier aggregation (MCA) [RAN2, RAN1]
  - Study MBS dual connectivity (MDC) [RAN2, RAN1]
- Specify MBS relaying over L2 Sidelink Relay [RAN2]

Further enhanced Multicast Broadcast Services should be approved in Rel-19

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