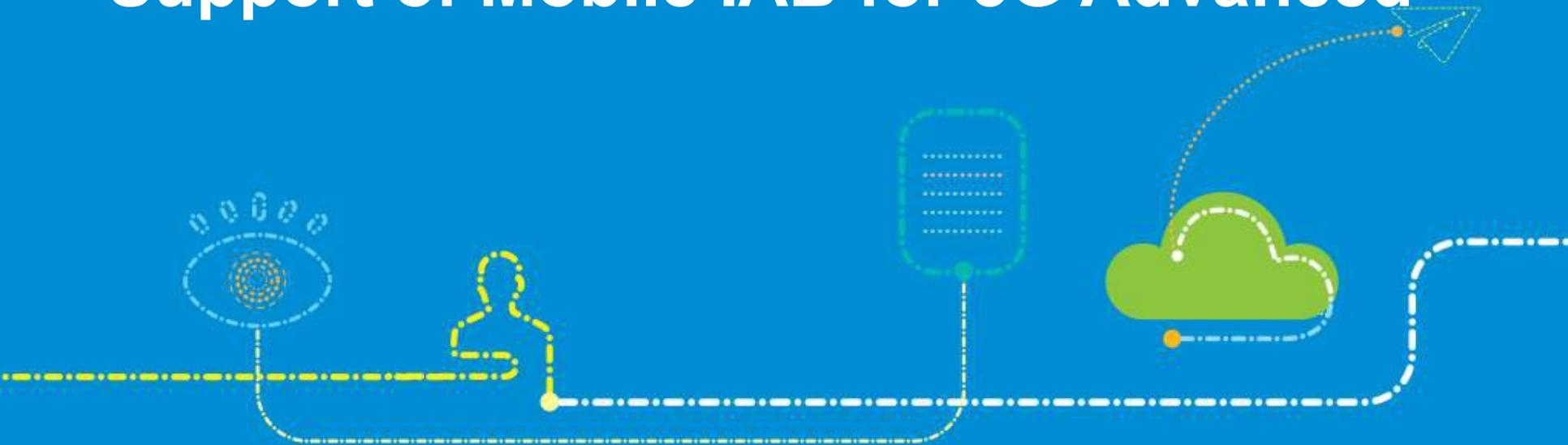


Source: ZTE, Sanechips
Agenda: 9.0.4

Support of Mobile IAB for 5G Advanced

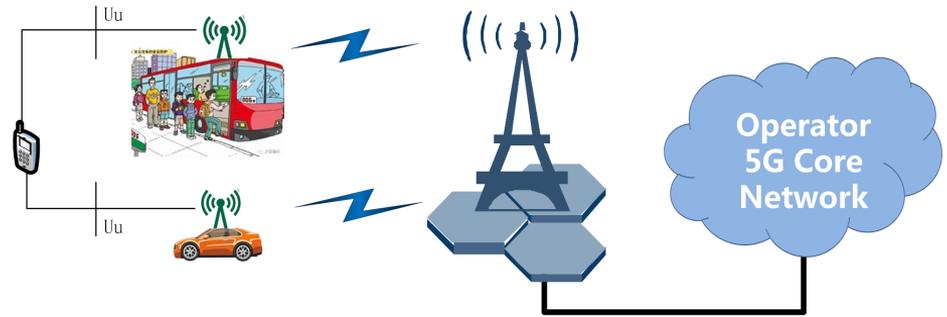


Overview

- Motivations for R18 Mobile IAB
- Key issues
 - Group mobility and service interruption reduction
 - Cell mobility aware UE access/mobility
 - Support of local service
 - SON enhancements
 - Power saving
- Potential WID proposal

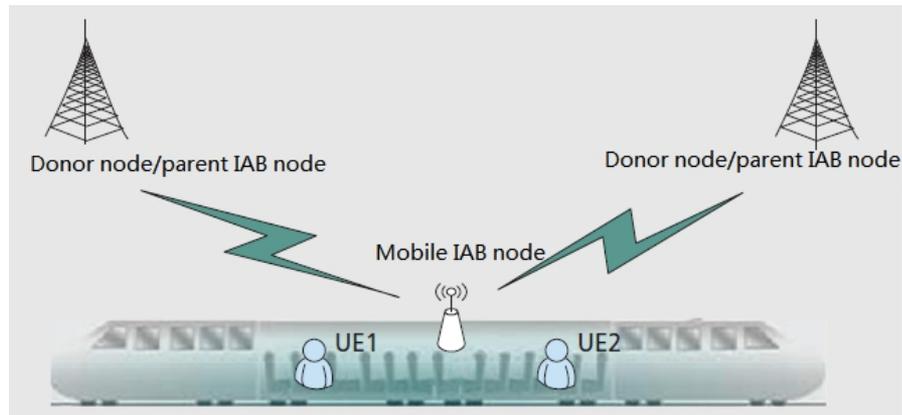
Motivations

- In Rel-16 and Rel-17, static IAB node is assumed. Although intra-donor migration is supported in Rel-16 and inter-donor migration is supported in Rel-17, mobile IAB node is not supported yet.
- The R18 SI “Study on Vehicle-Mounted Relays” is under discussion in SA1. The typical use case is that vehicles are equipped with 5G mobile BS relays for inside/outside users and can provide a better 5G in-vehicle experience to its subscribers (or inbound roamers).
- The following use cases on Service continuity are considered in the SA1 SI “Study on Vehicle-Mounted Relays”
 - Mobility between macro and relay
 - Mobility of relay between macro nodes
 - Mobility between relays
 - Group UEs’ service continuity



New use case for R18 IAB

- New use case in Rel-18 IAB
 - Mobile IAB, i.e. IAB node is installed in a vehicle and move along with the vehicle. The IAB node mounted in the vehicle provides wireless access to UEs and connects to parent IAB node or IAB donor node with backhaul link.



Group mobility and service interruption reduction

- In Rel-17, partial migration and full migration were discussed for inter-donor migration. And partial migration was agreed while there is no consensus yet on the support of full migration.
- Assuming partial migration is used, the mobile IAB node is migrated while the UEs are not migrated and UE context remains at source IAB donor.
- In Rel-17, it was agreed that no other enhancements are required to address potential UL packet loss when inter-donor-DU re-routing is not possible.
- Potential issues to be solved in R18:
 - long path between mobile IAB node and donor if only Partial Migration is supported in R17.
 - handover of UEs may lead to signaling storm if individual UE handover procedure is used.
 - packet loss due to the frequent handover of mobile IAB node if inter-donor-DU re-routing is not available.

Cell mobility aware UE access/mobility

- Motivation
 - mobile IAB node need to provide 5G coverage/capacity enhancement to onboard and/or surrounding UEs
- Potential enhancements
 - Optimized UE access
 - differentiate the in-side and out-side UE
 - optimized UE mobility for RRC_IDLE/RRC_INACTIVE UEs
 - to avoid unnecessary measurement/cell reselection
 - optimized UE mobility for RRC_CONNECTED UEs
 - to avoid unnecessary measurement/handover

Support of local service

- Motivation
 - The data packet does not need to pass through the core network and even IAB donor CU
 - Save the backhaul link radio resources and further reduce the burden of the core network
- During the offline discussion [RAN93e-R18Prep-04] Additional topological improvements, some company has some concern on its complexity. In our view, the complexity and standardisation effort is limited since the following existing mechanisms could be leveraged as the starting point of supporting local service in IAB node:
 - Support of Local Area Data Network:
 - localized UPF co-located in the IAB node
 - the traffic steering from the UPF to the local Data Network
 - support of local switch
 - packet forwarding locally between two UEs via IAB node

SON enhancements

- Motivation
 - Mobile IAB node should only migrate to specific target IAB nodes/donors along the trajectory
 - Handover procedure needs to be performed for UEs to neighbour gNB cells smoothly, e.g., when getting out of the vehicle.
- Potential enhancements:
 - No need to maintain the Neighbour Cell Relation Table (NCRT) at the mobile IAB node during movement.
 - Establish and maintain the NCR of the mobile IAB cells automatically, e.g., when the train enters station
 - based on UE report or directly sent from IAB donor or gNB

Power saving

- Motivation
 - UEs may experience a large number of mobility related burdens, such as unnecessary handovers, selection of a mobile relay to connect, and cell reselection.
 - IAB node/donor node may only need to serve specific mobile IAB nodes.
- Potential enhancements:
 - IAB node/donor can enter dormant mode or switch on/off
 - based on the load information as well as the request from neighboring IAB nodes.

Others

- In the offline discussion [RAN93e-R18Prep-04] Additional topological improvements, the following two of the four objectives for mobile IAB/VMR in Rel-18 proposed by moderator are listed below:
 - Authorization and backhaul security [RAN2, RAN3][Non-controversial]
 - Whether enhancements for PCI collision and RACH conflict avoidance are necessary should be considered [RAN2/3] [Non-controversial]
- For backhaul security, the motivation needs to be further clarified. As we know, there is end to end PDCP security protect between UE and donor CU. And F1/non-F1 traffic between IAB node and donor CU could be protected by IPsec. Moreover, enhancements on authorization and security needs to be discussed in SA3 first. As a result, we suggest to exclude authorization and backhaul security from the scope of R18 IAB RAN WI.
- For PCI collision and RACH conflict, we think the PCI collision and RACH conflict could be avoided by proper configuration or up to implementation, so there is no need to be included in the scope of R18 IAB.

Potential WID proposal

- Justifications
 - Handover of UEs may lead to signaling storm if individual UE handover procedure is used. And the path between mobile IAB node and donor would be rather long if only partial migration is supported in R17.
 - Mobile IAB node need to provide 5G coverage/capacity enhancement to onboard and/or surrounding UEs
 - There would be packet loss due to the frequent handover of mobile IAB node if inter-donor-DU re-routing is not available.
 - Support of local service to save the backhaul link radio resources and reduce the burden of the CN.
 - Support of power saving of mobile IAB node/UE and parent IAB node/IAB donor node.
- A work item with the following objectives can be considered:
 - Specification of functionalities, procedures, signaling, etc. to support the group mobility of mobile relay along with UEs. [RAN3, RAN2]
 - Specification of procedures and enhancements to enable cell mobility aware UE access/mobility [RAN2, RAN3]
 - Specification of enhancements to reduce service interruption due to IAB-node migration. [RAN3, RAN2]
 - Specification of functionalities, procedures, signaling, etc. to support local service. [RAN3, RAN2]
 - Specification of enhancements to neighboring cell management of mobile IAB node. [RAN3, RAN2]
 - Specification of functionalities, procedures, signaling, etc. to support power saving for mobile IAB node/UE and parent IAB node/IAB donor node. [RAN3, RAN2]

Thanks



Tomorrow never waits

