3GPP TSG RAN Release 18 Workshop

28th June – 2nd July 2021

RWS-210369

Further Enhancements of NR Mobility

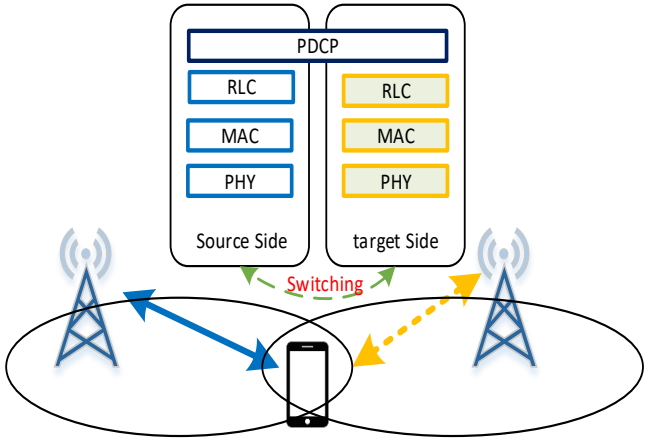
Agenda Item: 4.3

Source: Intel Corporation

Document for: Discussion

Fast cell group switching

- DAPS was introduced in Rel-16 to reduce the latency for PCell change, however:
  - DAPS requires simultaneous operation between source and target cell which is quite challenging in implementation and not feasible for FR2-FR2;
  - No solution to reduce the interruption caused by the switching of SCG, or between MCG and SCG;



- Objectives for fast cell group switching
  - Specify solution for fast cell group switching without the need of simultaneous transmission/reception:
    - Only one cell group activated at a time;
  - Following scenarios are considered:
    - Switching of SCG;
    - Switching between MCG and SCG;
    - Switching between SPCell and Scell;
    - Intra/inter-DC;
    - More than two cell groups, e.g. three;
  - Switching mechanism
    - L1/L2 or RRC based

Further enhancements on DAPS

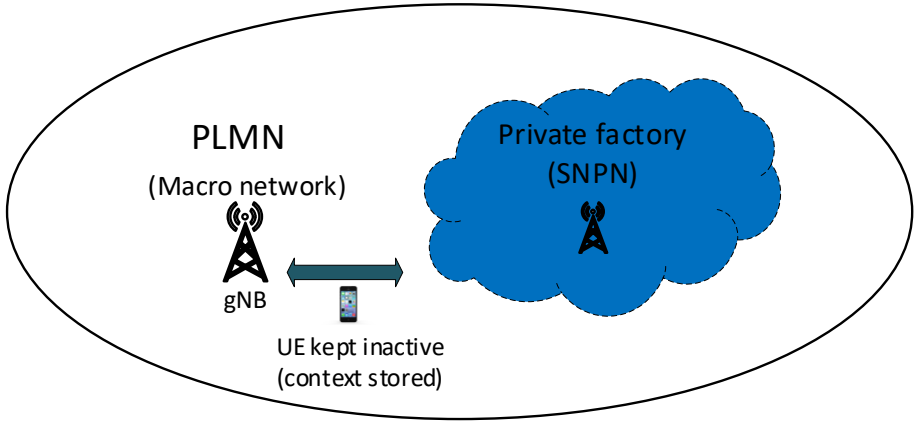
- DAPS was introduced in Rel-16 to reduce the latency for PCell change, however:
  - Cannot support consistent data rate with low interruption (e.g. XR requirement): Data rate is decreased during DAPS handover due to release of CA, DC and without simultaneous UL data transmission;
  - Handover Failure Ratio may be increased since DAPS cannot work together with CA, DC, EHC, UDC, and CHO/CPC and the source has to release the configuration before sending HO command;

- Objectives on further DAPS enhancements
  - Specify solution on the release of configuration during DAPS handover;
  - Specify solution to support simultaneous UL PUSCH transmission for user data;
  - Specify solution to support following combinations:
    - DAPS+EN-DC;
    - DAPS+DC;
    - DAPS+CA;
    - DAPS+CHO;

Mobility enhancements in NPN

- Enterprise/private 5G network is becoming a reality.
- For mobility in private networks with limited coverage:
  - Currently, a UE in INACTIVE needs to enter IDLE if cell selection occurs between private and public network.
  - Beneficial to enable faster transition to RRC_CONNECTED when re-entering the private network after e.g.:
    - UE temporarily enters out-of-coverage or,
    - UE switches to public PLMN not associated with the private network (where possible) .

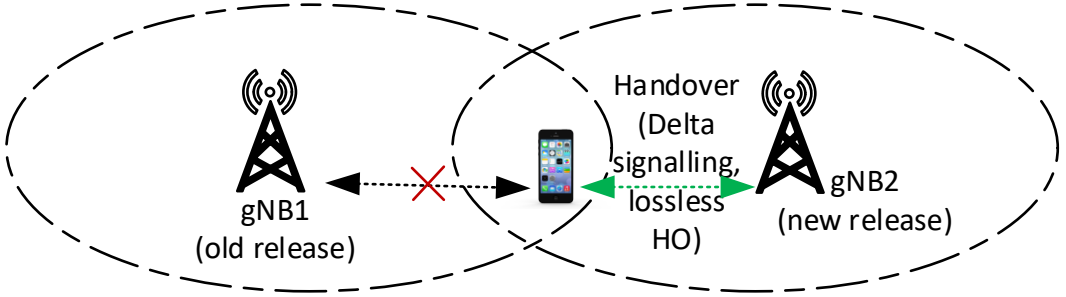
- Objectives on mobility enhancements in NPN
  - Specify the solution to maintain UE in INACTIVE when re-entering the private network after:
    - E.g. UE temporarily enters out of coverage or UE switches to public PLMN not associated with the private network (where possible) ;



Handover enhancement for mixed deployment

- Motivation (use cases and market opportunity):
  - Allow mixed deployments of nodes of different releases for both MN and SN
  - Deployments that cannot be coordinated to ensure all nodes are of same release
  - Private networks, network sharing, makes it quite likely that HO between nodes of different releases will happen
  - We already allow MN and SN to be potentially of different releases
- Today handover between nodes of different releases requires the use of "Full Configuration". Limitations of this approach:
  - During HO/SN change between nodes of different releases
    - Data loss due to PDCP release
    - Large HO command size
      - NR RRC reconfiguration messages can be large
      - Too large to fit in one message – segmentation is not so straightforward for HO
      - Additional delay, increasing chances of HO failure

- Objectives for handover enhancement for mixed deployment
  - Specify the solution to support lossless HO and delta signalling for HO between nodes with different releases;



Mobility enhancements for UAV (Drones)

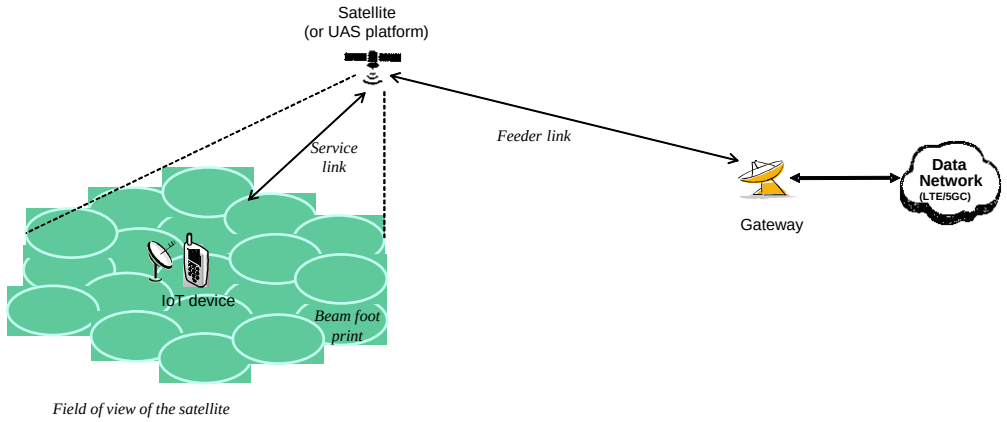
- Mobility enhancements for UAV (Drones) were supported in LTE Rel-15, but it is still missing in NR.
  - As discussed in RAN#85 and RAN#86, it was preferred to address the same use cases, requirements and problems as the Rel-15 LTE UAV WI with small RRM/mobility management enhancements for FR1/FR2; However, it was taken out from Rel-17 finally due to lack of time.
  - Reasonable to consider this in Rel-18 with same scope as Rel-17 in RP-192451;
  - Note: as indicated in RP-192452 “UL power control enhancement” was omitted from the NR WID because this functionality is already present in current NR-specifications.

- Objectives on Mobility enhancements for UAV (Drones) (cited from RP-192451)
- Aerial UE-specific reporting:
  - Height by introducing a UE-triggered measurement report when the UE is above a configured height, or below a configured height, as for LTE measurement events H1 and H2.
    - Inclusion of height, location and speed of UEs in the measurement reports
  - flight path reporting
- Subscription-based identification:
  - Specify NG/Xn signalling to support subscription-based aerial UE identification
- Note: Interaction with SA2 regarding this objective is needed.
- Small RRM or mobility enhancements, for instance controlling the amount of measurement reports;

Low Interruption/high reliability HO for LTE/5GC

- Low interruption, high reliability handover solutions (DAPS/CHO/CPC) were introduced in Rel-16, but are not applied for LTE/5GC;
- NB-IoT/MTC NTN was discussed in Rel-17:
  - IoT NTN connectivity via EPC is supported. LTE CHO is reused;
  - IoT NTN connectivity via 5GC can be supported. CHO is not supported since it is not available for LTE/5GC;

- Objectives on low Interruption/high reliability HO for LTE/5GC
  - Specify solution on CHO based NB-IoT/MTC over NTN via 5GC;



Summary

Priorities for R18 work (listed in priority order)

- Interruption reduction for cell group change
  - Fast cell group switching within SCGs, between MCG and SCG or between Pscell and Scell;
  - Further enhancements on DAPS, e.g. to support EN-DC, DC, CA, CHO and simultaneous UL data transmission;
- Mobility enhancements on NPN
  - Maintain UE in INACTIVE while re-entering the private network after e.g. UE temporarily enters out of coverage or UE switches to public PLMN not associated with the private network (where possible) ;
- Handover enhancement for mixed deployment
  - To avoid existing full configuration which will lead data loss and large handover command size;
- Mobility enhancements for UAV (Drones)
  - Aerial UE-specific reporting (Inclusion of height, location and speed of UEs in the measurement reports and flight path reporting);
  - Subscription-based identification;
  - Small RRM or mobility enhancements, for instance controlling the amount of measurement reports;
- CHO based NBIoT/MTC over NTN via LTE/5GC;

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