



3GPP TSG RAN #84

Newport Beach, USA, June 3-6, 2019

Agenda Item: 8

# MOTIVATION FOR RAN LEVEL MULTI-SIM SUPPORT

Intel Corporation

# BACKGROUND: MULTI-SIM ACTIVITY IN SA

## SA1

- SA1 TR (S1-191255) and the SA1 WID (S1-191635).
- The SA1 study is estimated to be 95% complete.

## SA2

- Rel-17 SA2 study item ([SP-190248](#)) has been approved with the following scope. Completion date
  - Delivering paging to USIM A while the UE is actively communicating with USIM B.
  - Suspension (or release) and resumption of an ongoing connection in the 3GPP system associated with USIM A to leave to the 3GPP system associated with USIM B, and then return to the 3GPP system in a network-controlled manner.
  - Avoidance of paging collisions occurring in the UE between USIM A and USIM B.
  - Emergency calls and sessions.
  - Handling of service prioritization i.e. the study shall determine whether the UE behaviour upon reception of paging information is driven by USIM configuration or user preferences or both.

# SCENARIOS

## Core Network

- Both USIM in 5GS
- Both USIMs in EPS
- USIM A to 5GS and USIM B to EPS
- Inter-MNO and intra-MNO

## RAN

- LTE + LTE
- LTE + NR
- NR + NR
- [UMTS] : SA doesn't preclude but RAN can try to preclude because 1) hard to have a single item across RAN2 and RAN6, 2) we already have solution in 2G/3G (paging cause).

## UE capability

- Single Rx / single Tx
- Dual Rx / single Tx
- Dual Rx/Dual Tx
  - Not within SA2 SI but it may be more practical if the UE supports CA or DC.

Solutions can be applicable to Dual Registration (Single SIM) between 5GS and EPS but not support interworking between 5GS and EPS.

General assumption is to avoid any coordination between two USIMs (i.e. different operators)

# RAN LEVEL SCENARIOS

Scenario 1: USIM A (connected) and USIM B (idle/inactive mode)

Scenario 2: USIM A (inactive mode) and USIM B (idle/inactive mode)

Scenario 3: USIM A (idle mode) and USIM B (idle/inactive mode)

Scenario 4: USIM A (connected mode) and USIM B (connected mode)

# POTENTIAL RAN IMPACTS (1/2)

## Handling Paging priority

- Paging can be delivered to USIM A while the UE is actively communicating with USIM B.
  - Based on paging cause, the UE decide to keep connection with USIM B if paging cause of USIM A is lower priority. Otherwise, the UE decide to suspend/release the connection with USIM B.
- RAN impacts
  - Provide paging cause to the upper layer.
  - Reception of paging for single Rx: gap/interruption in connection with USIM B is needed.
  - No impact expected from paging cause prioritization and connection suspend/release as these should be specified in NAS

## Paging collision

- Paging occasion can be colliding between USIM A and B because it is a problem for single Rx case.
  - NAS approach:
    - Change of 5G-S-TMSI upon UE request
- RAN impact
  - No impact to support the change of 5G-S-TMSI.
  - RAN level solution can be studied e.g. update of existing or new paging related parameter upon UE request.

# POTENTIAL RAN IMPACTS (2/2)

## Handling of connections when UE receives paging of USIM A, while the UE is actively communicating with USIM B

- Approach 1: maintain one connection only
  - If paging has lower priority, the UE delays paging response in USIM A. On the other hand, if paging has higher priority, the UE should prioritize response for paging.
  - The UE suspend(or release) connection with USIM B and initiate a new service request to the 3GPP system associated with USIM A.
    - The UE at NAS can initiate new service request to send the UE to connected mode in USIM B. After finishing connection in USIM A the UE at NAS can initiate service request to send the UE to connected mode in USIM B.
- Approach 2: operate both connections in parallel.
- RAN impacts
  - Approach1 might be transparent to AS layer.
  - Approach2 can be supportable by Rel-15 NR (R2-1813461) but further enhancements can be considered e.g. power control, TDM operation or UE capability coordination.

# CONSIDERATION ON RAN LEVEL MULTI-SIM

## RAN2 potential starting time: Q2 2020

- It is expected that SA2 may be able to finish WI during 2 meeting cycle.

## RAN2 SI or WI

- Either SI or WI should be ok. In case of WI, study phase can be added.

## Relationship with SA2 work

- SA2 dependent items: need to wait for SA2 outcome and there is no study if it is included SA2 WI.
  - Handling Paging priority, RAN level solution paging collision
- SA2 independent items: RAN can perform study separate from SA2 discussion.
  - Potential enhancements to enable dual connection

## Other RAN WG involvement

- For SA2 dependent items, no need RAN1/RAN4 involvement.
- For SA2 independent items, need RAN1/RAN4 discussion.