3GPP TSG-RAN WG2 Meeting #112e R2-2010739

Online, 2-13 November 2020

**Agenda item: 8.3.3**

**Source: vivo**

**Title: [AT112-e][241][Multi-SIM] Network switching scenarios(vivo)**

**WID: LTE\_NR\_MUSIM-Core**

**Document for: Discussion and Decision**

# 1 Introduction

This document aims to collect views from companies for the following email discussion agreed during RAN2#112e:

* [AT112-e][241][Multi-SIM] Network switching scenarios (vivo)

Scope:

* + - Discuss validity of scenario 3 and scenario 4 from the previous email discussion

Intended outcome:

* + - Discussion summary in R2-2010739 (by email rapporteur).

Deadlines:

* + - Deadline for email discussion report: 2nd week Thu, UTC 1000

# 2 Discussion

## 2.1 Background

One of the objectives of MUSIM WID [1] is:

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| 1. Specify mechanism for UE to notify Network A of its switch from Network A (for MUSIM purpose) [RAN2]:  * RAT Concurrency: Network A is NR. Network B can either be LTE or NR. * Applicable UE architecture: Single-Rx/Single-Tx, Dual-Rx/Single-Tx   NOTE 1: Single Rx allows MUSIM UE to receive traffic from only one network at one time, Dual Rx allows MUSIM UE to simultaneously receive traffic from two networks. Single Tx allows MUSIM UE to transmit traffic to one network at one time, dual Tx allows MUSIM UE to simultaneously Transmit traffic to two networks. (The terms Single Rx/Tx and Dual Rx/Tx do not refer to a device type. A single UE may, as an example, uses Dual Tx in some cases but Single Tx in other cases). |

In the post email discussion [2], UE switching scenarios were classified as follows:

* Single-Rx or Dual-Rx/Single-Tx:
  + **Scenario 1**: Short-time switching, such as paging reception, measurements, TAU, RNAU, MO SMS
  + **Scenario 2**: Long-time switching, such as VoLTE/VoNR voice call
* Dual-Rx /Single-Tx:
  + **Scenario 3**: UE in RRC CONNECTED state in network A and needs to switch to network B and hence change its RX capability in NW A
* Dual-Rx /Dual-Tx:
  + **Scenario 4**: UE in RRC CONNECTED state in network A and needs to switch (part capability) to network B and hence change its Tx capability in NW A, such as dual connectivity

Companies are invited to express their view on the validity of scenario 3 and scenario 4 from the previous email discussion[2].

For the WI objective (Network switching), WI does not specify RRC states or procedures. According to WI use case discussion in the email discussion[2], companies expressed their view from different perspectives. In order to facilitate the discussion, we would give more detailed use case categories for scenario 3 and scenario 4 based on the contributions[3-9].

## 2.2 Scenario 3: Rx capability switching

Scenario 3 is relevant to Rx capability switching for Dual-Rx /Single-Tx UEs. According to different UE state and activities in NW B, we would like to discuss the following sub-cases：

**Sub-Case 3-1: UE stays in RRC\_CONNECTED mode in NW A and only reception in NW B (in RRC\_IDLE/RRC\_INACTIVE)**

In this sub-case, UE is in RRC CONNECTED state in network A, needs to perform data reception in the NW A and Paging reception in NW B, e.g. some idle procedure in NW B. UE could change its Rx capability in NW A to support simultaneous reception in the two networks.

Companies are invited to express their view on the following questions.

**Question 1: Do we support this sub-case 3-1?**

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| **Company** | **Yes/No** | **Comments** |
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Summary: TBD

**Sub-Case 3-2: UE stays in RRC\_CONNECTED mode in NW A and both reception and transmission in NW B (in RRC\_ CONNECTED or during RRC setup/resume period )**

In this sub-case, UE is in RRC CONNECTED state in network A, needs to perform reception in the NW A, and both reception and transmission in NW B. UE in NW B could be in RRC\_ CONNECTED or performing RRC setup/resume procedures. UE may change its Rx capability in NW A to perform data reception in NWA and data reception in NW B. Because the UE is a single-Tx UE, the UE could coordinate its transmission in NW A and NW B via TDM transmission. Here, we focus on Rx capability switching behavior.

Companies are invited to express their view on the following questions.

**Question 2: Do we support this sub-case 3-2?**

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| **Company** | **Yes/No** | **Comments** |
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Summary: TBD

Some companies discussed Rx capability coordination in their contributions. In [8], it’s pointed out that a single USIM device compliant to carrier aggregation, Dual Connectivity, and/or diversity/MIMO requirements has already several RX and TX chains. [3] discussed that UE with shared Rx chains between two USIMs may tune away partial Rx chains to monitor the paging or perform measurements in USIM B when USIM A is in connected mode. Regarding Rx capability coordination, [7] mentioned the question “Which kinds of capabilities shall be reported to the network A?”

Based on the contributions, the possible Rx capabilities to be coordinated could include supported bands, band combinations, DC capabilities, number of antennas, DL MIMO layers, etc.

**Question 3: Which kinds of capabilities shall be coordinated from network A, if Rx capability coordination is allowed?**

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Summary: TBD

## 2.3 Scenario 4: Tx capability switching

Scenario 4 is relevant to Tx capability switching for Dual-Rx /Dual-Tx UEs. According to different activities in NW B, we would like to discuss the following sub-cases：

**Sub-Case 4-1: UE stays in RRC\_CONNECTED mode in NW A and both reception and transmission in NW B, however, without changing into RRC\_CONNECTED state(e.g., RNAU in RRC\_INACTIVE state and go back RRC\_INACTIVE)**

In this sub-case, UE stays in RRC\_CONNECTED mode in NW A. UE needs to perform both reception and transmission in NW B. UE will not change into RRC connected state in case of short-time signaling procedures, such as RNAU in RRC\_INACTIVE state. UE may change its Tx capability in NW A to support simultaneous transmission in the two networks.

Companies are invited to express their view on the following questions.

**Question 4: Do we support this sub-case 4-1?**

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Summary: TBD

**Sub-Case 4-2: UE stays in RRC\_CONNECTED mode in NW A and both reception and transmission in NW B and RRC\_ CONNECTED in NW B**

In this sub-case, UE stays in RRC\_CONNECTED mode in NW A. UE needs to perform both reception and transmission in RRC\_CONNECTED in NW B. For example, UE could perform voice service in NW B in parallel with the data service in NW A.

Companies are invited to express their view on the following questions.

**Question 5: Do we support this sub-case 4-2?**

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Summary: TBD

Some companies discussed Tx capability coordination in their contributions. [4] thinks that, Multi-USIM UE may spare one transmission chain for another USIM when two USIMs need to communicate with two networks at the same time. [3] discussed that the UE may reduce its Tx capabilities or DC (dual connection) capabilities with one network when it has to communicate with the other network.

[8] discussed the switching notification for dual connectivity scenario. The signaling procedure should support the configuration of single connectivity with control to release any of the cell group.  The UE capable of dual connectivity is expected to have Dual TX/RX as a minimum requirement. When the UE attempts to establish RRC connection in the idle mode network which may be NR or LTE network, the dual connectivity at the NTWK-A may need to be downgraded to single connectivity.

Companies are invited to express their view on the following questions.

**Question 6: Which kinds of capabilities shall be coordinated from NW A, if Tx capability coordination is allowed?**

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Summary: TBD

## 2.4 Other comments

Companies are invited to express their view if any other comments or sussgestions on scenario 3 or scenario 4.

**Question 7: Any other comments or suggestions on scenario 3 or scenario 4?**

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| **Company** | **Comments** |
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Summary: TBD

# 3 Conclusions

TBD

# 4 Contact Information

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# 5 References

1. RP-201309 Support for Multi-SIM devices for LTE/NR
2. R2-2009325 Summary of [Post111-e][917][Multi-SIM] Multi-Sim vivo discussion
3. [R2-2008831](file:///C:\Users\terhentt\Documents\Tdocs\RAN2\RAN2_112-e\R2-2008831.zip)  Discussion on various scenarios of UE switching from network for activities on another network    China Telecommunications discussion     Rel-17
4. [R2-2008832](file:///C:\Users\terhentt\Documents\Tdocs\RAN2\RAN2_112-e\R2-2008832.zip)   Support of UE capabilities coordination for Dual Tx/Dual Rx Multi-USIM UEs China Telecommunications discussion
5. [R2-2010246](file:///C:\Users\terhentt\Documents\Tdocs\RAN2\RAN2_112-e\R2-2010246.zip)   On coordinated switch from NW for MUSIM device  Huawei, HiSilicon  discussion Rel-17    LTE\_NR\_MUSIM-Core
6. [R2-2008956](file:///C:\Users\terhentt\Documents\Tdocs\RAN2\RAN2_112-e\R2-2008956.zip)   Discussion on UE Notification on Network Switching CATT     discussion     Rel-17   LTE\_NR\_MUSIM-Core
7. [R2-2009623](file:///C:\Users\terhentt\Documents\Tdocs\RAN2\RAN2_112-e\R2-2009623.zip)   Consideration on the Switching Notification Procedure    ZTE Corporation, Sanechips     discussion     Rel-17    LTE\_NR\_MUSIM-Core
8. [R2-2009265](file:///C:\Users\terhentt\Documents\Tdocs\RAN2\RAN2_112-e\R2-2009265.zip)   Scenarios and Impact analysis for Switching Notification Nokia, Nokia Shanghai Bell discussion     Rel-17
9. R2-2009557   Switching between two links for Multi-SIM Qualcomm Incorporated discussion