

RP-181981

# Way forward on 2-step RACH



3GPP TSG RAN #81

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Agenda Item: 9.3.4

**ZTE Corporation**



# Progress of 2-step RACH

## RAN1:

Companies proposed to enhance 4-step RACH [1][2][3][4][5][6][7]

- It seems 4-step RACH could be baseline for NR-U

The same companies also believe 2-step RACH is beneficial for NR-U, but without any agreement

- To reduce delay and improve reliability for initial access due to necessary LBT operation

Not many details of 2-step RACH were discussed

- Msg1 may contain preamble and data (e.g. the Msg3 contents) and this is all that was put on the table
- Details of how to resolve collisions and ensure good quality of detection/decoding at the receiver are essential , but not yet discussed under this agenda item
  - Note that these aspects are highly related to the NOMA SID

## RAN2 :

Is also working on 4-step RACH enhancement

The assumption is that a generic 2-step RACH (not NR-U specific) will be studied further

- One email discussion is arranged till next meeting
- And discussion on how to proceed with such generic 2-step RACH is invited for the RAN plenary meeting

[1] R1-1809480, Qualcomm

[2] R1-1808769, Samsung

[3] R1-1808336, Sony

[4] R1-1808508, LGE

[5] R1-1808686, Intel

[6] R1-1808062, Huawei

[7] R1-1809205, Ericsson

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# How to proceed with 2-step RACH

- The main building block for the 2-Step RACH will be the transmission scheme and channel being currently studied under NOMA SID in RAN1
  - Specifically, enabling transmission of payload in Msg1 using NOMA based schemes
  - For both synchronous and asynchronous operations
- So, given the above dependence in the scope, it makes sense to specify the details of 2-Step RACH as part of NOMA WID to avoid duplication of work in different work items
- Hence, we propose the following work split:
  - **Study aspects of 2-Step RACH – until December (Rel-15):**
    - RAN2 issues can be progressed as part of NR-U (Rel-15 SID)
    - RAN1 issues can be progressed as part of NOMA (Rel-15 SID)
  - **Normative work (i.e. specification of 2-step RACH in Rel-16) – all under NOMA (WID)**
    - RAN1 will specify the payload and L1 aspects of spreading etc depending on the NOMA scheme selected as part of the NOMA WID (Rel-16)
    - RAN2 will specify the higher layer aspects as part of the RAN2 objectives for NOMA WID (Rel-16)
    - The specified frame work for 2-step RACH under NOMA WID would also be reused for NR-U WID in Rel-16

# Potential Scope of NOMA WID [8]

## ▪ Symbol level spreading [RAN1]

- Spreading sequence harmonization to facilitate the scalable design and support diverse spectral efficiency per user, overloading capability, sequence pool size, PAPR requirement, performance robustness
- Bit-level scrambling/interleaving as a subset of the design with limited specification impact

## ▪ 2-step RACH [RAN1, RAN2]

- Preamble enhancements and channel structure
- 2-step RACH procedure in both PHY and MAC layer

## ▪ Data transmission [RAN1, RAN2]

- In both RRC-CONNECTED and RRC-INACTIVE state
- Both grant-based and grant-free transmission

# Thank you



Tomorrow never waits

