3GPP TSG-RAN WG2 #109-e Tdoc R2-200xxxx

Electronic meeting, 24th February – 6th March, 2020

**Title: [DRAFT]** Reply LS on Handling of Fallbacks for combined contiguous and non-contiguous CA or DC configurations in FR2

**Response to:** LS on Handling of Fallbacks for combined contiguous and non-contiguous CA or DC configurations in FR2 (R4-1910239)

**Release:** Rel-15

**Work Item:** NR\_newRAT-Core

**Source:** MediaTek Inc. [To be RAN WG2]

**To:** RAN WG4, RAN

**Cc:** -

**Contact Person:**

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**Send any reply LS to: 3GPP Liaisons Coordinator,** **mailto:3GPPLiaison@etsi.org**

**Attachments:** -

**1. Overall Description:**

RAN2 would like to thank RAN4 for their LS on handling of fallbacks for combined contiguous and non-contiguous CA or DC configurations in FR2 [R4-1910238]. Below is an excerpt from the minutes from RAN2#109-e:

* Chair’s decided way forward

 **R2 assume to follow R4 decision to not support all fall-backs.**

 **Send an LS to R4 with questions to understand more detailed requirements for a solution, and understand better what R4 actually means with not supporting all fallbacks.**

 **Next Q expect to agree on the solution (solution could cover impact in R4 and R2).**

Based on discussions during RAN2#108 and RAN2 #109e, RAN2 did also not reach a common understanding about the main justification for the change requested by RAN4 and the trade-off between benefits in RAN4 and cost from a RAN2 protocol perspective. Therefore, RAN2 would like to understand more detailed requirements for a solution, and understand better what R4 actually means with not supporting all fallbacks.

RAN2 would like to remind that the principle of implicitly supported fallback BCs was introduced to avoid the unbearable increase of UE capability containers with increasing number of carriers. Even with this principle, some UEs already advertise MRDC capability containers with more than 8 kByte.

Besides the signalling overhead, some companies raised concerns that support of UEs not supporting all fallback combinations would require significant changes to existing network implementations, would restrict configuration options and would further increase the computational complexity of the capability evaluation on the NW side.

Q1: What is RAN4’s motivation/benefit for the suggested change and its impact to the RAN2 specifications?

Q2: In the LS, RAN4 states that “Deactivating carriers within the CA or DC combination is still possible”, which seems also a way of “supporting fallback” from R2 point of view. Please explain the difference of “not supporting all fallback” through of CA/DC deactivation and RRC reconfiguration.

[Nokia] The intention from RAN4 was to not support the fallbacks as a standalone band combination and hence the statement on the carriers. Do we really need to ask this? [Ericsson] We are ok with the above question but we would also be fine remove it.

Q3: On the request to “not supporting all fallbacks for FR2”, which of below options is R4’s expectation:

[Nokia] We did not understand the relevance of a) and b). Will you please explain this more clearly? :-)

1. fallback support of a FR2 BC is defined in TS38.101-2 and other undefined fallback is not supported. In this case, fallback support is not only based on R2 specifications and capability report but also R4 specification.
2. Fallback support of a BC is completely based on R2 specifications and capability report regardless of R4 specification. In this case, R2 specifications and capability report needs to provide complete information on supported fallbacks.

For three meetings, RAN2 has analysed a set of solutions to accommodate the suggested change the RAN4 agreement. First an email discussion in RAN2#107-bis (R2-1915507), another offline discussion in RAN2#108 (with multiple solution options described in RAN2 in R2-1916498, see Annex 2). Furthermore in RAN#109e, multiple companies support the solution (see Annex 3 and R2-2000600) to introduce a new separate list for *exceptional* band combinations (i.e. with fallback exceptions) upon NW enabling. The high level concept of the solution is described below.

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| * Step 1: NW side indicates with 1-bit in the *UECapabilityEnquiry* message asking UE to report the band combinations with fallback exceptions.
* Step 2: UE reports the band combinations with fallback exceptions in a separate band combination container *supportedBandCombinationList-FR2CAFallbackException* together with one bit indication.
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Q3: What is the criteria to consider a band combination “exceptional” e.g. due to practical issues? Will those band combination(s) be captured in the RAN4 specifications?

Q4: If an “exceptional” band combination is captured in the RAN4 specifications, does RAN4 foresee an “exceptional” band combination to become normal band combination in the future?

**2. Actions:**

**To RAN4:** RAN2 respectfully asks RAN4 to answer to the above questions.

**3. Date of Next TSG-RAN WG2 Meetings:**

TSG-RAN WG2 Meeting #109bis 2020-04-20 to 2020-04-24 e-meeting, JP

TSG-RAN WG2 Meeting #110 2019-05-25 to 2019-05-29 Athens, GR

**4.**

**Annex 1:**

RAN2 would like to highlight one aspect in the definition of fallback band combinations as excerpted from TS 38.306 below:

“An intra-band non-contiguous band combination is not considered to be a fallback band combination of an intra-band contiguous band combination”.

For the fallbacks from the intra-band contiguous CA, all of the fallback combinations result in intra-band contiguous CA, i.e. by removing the lowest CC or highest CC from a contiguous block of carriers. As given by the definition, an intra-band non-contiguous CA is not a fallback of a contiguous block, and hence not implicitly supported by the UE.

**Annex 2: Discussion during RAN2#108**

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| [R2-1916498](file:///D%3A%5C%5CDocuments%5C%5C3GPP%5C%5Ctsg_ran%5C%5CWG2%5C%5CRAN2%5C%5CDocs%5C%5CR2-1916498.zip%22%20%5Co%20%22D%3ADocuments3GPPtsg_ranWG2RAN2DocsR2-1916498.zip) Report for [107bis#36] [NR R15] FR2 CA Fallbacks (Nokia) Nokia, Nokia Shanghai Bell discussion Rel-15 NR\_newRAT-Core- Ericsson don’t agree, and think the increase in signalling will be huge. Ericsson think we should send an LS to express concern. Docomo has same concern. - Docomo think the R4 LS is not based on good reasons. - Intel think capability size is indeed a side effect, but we should not let signalling drive deployments. Samsung agrees fully. - Apple think the overhead is not increased, and think that if UE support part of superset, the UE would indicate BC one by one. Apple think the solution on the table works well and is backwards compatible. Oppo agrees. Google agrees that LS is not needed- MTK think R4 didn’t think about Signalling, but still think that R4 can in that case indicate restrictions in their TS, rather than R2 change. - Samsung think we need to resolve this, and think we should consider cross-group solutions. - CMCC cannot accept any solution in Rel-15. - Nokia think the solution on the table doesn’t increase the size at all. - TMO think this can be rel-16. Apple think this can be rel-15 as no FR2 deployments are there yet. - Verizon think this is problematic but think it is ok to postponeChair: A significant group of companies want this kind of solution, and a solution has been found which is acceptable to this group. However there is no consensus. postpone |

**Annex 3: Salient features of way forward solution in RAN2**

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| Based on the discussions on the email reflector and clarifications provided by the companies (Nokia, Nokia Shanghai Bell, Qualcomm, Intel, MTK, Apple, Docomo, Ericsson, Huawei, HiSilicon, CATT, Spreadtrum, Lenovo, CMCC, APTG, China Mobile) following is proposed as summary:The proposed solution direction is based on what is described in 1, 4 and 5. The salient features of the way forward solution is as follows:

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| * Step 1: The network indicates using a 1-bit filter in the Capability Enquiry message asking the UE to report problematic band combinations (containing a band with FR2 intra-band CA with multiple-sublock part of the band combination may only fallback directly to bandwidth class A).
* Step 2: A 1-bit indication is added by the UE to flag a problematic band combination in the Capability Information message.
* Step 3: All the problematic band combinations in Step 2 are reported in a separate list of band combinations to avoid the issue that legacy network does not interpret the 1-bit in the band combination and neither understands the 1-bit in the filter.
* Step 4: A legacy gNB will never know anything about problematic band combinations but a gNB that implements this behavior will be able to configure the problematic band combination with the restriction agreed in RAN4.
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Tabular 4-1: Proposed solution direction (offline with 17 companies’ participation)The principal advantages and disadvantages are:

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| The solution has the main **advantage** that the legacy gNB is completely spared of getting into a problem by accidentally configuring a non-tested fallback. In addition, the principle of RAN2 that UE does not report fallbacks is fully preserved (if the UE will report the superset band combination EXACTLY ONCE i.e. in the normal band combination list or the problematic list i.e. the UE does not report the fallback combinations of the problematic band combinations which are normal).The solution has a **disadvantage** that the legacy gNB misses out on the problematic band combination completely (i.e. there is an inherent performance impact as at least the top-level band combination cannot be configured to the UE. |

**Tabular 4-2: Advantages and Disadvantages of the proposed solution direction** |