3GPP TSG-RAN WG2 #106 Tdoc R2-19xxxxx

Reno, Nevada, USA 13th - 17th May 2019

Agenda Item: x.x.x

Source: Ericsson

Title: Email discussion summary [105bis#12][NR/R15] Filters used to generate FeatureSets (Ericsson)

Document for: Discussion, Decision

# 1 Introduction

This document reports the following e-mail discussion:

[105bis#12][NR/R15] Filters used to generate FeatureSets (Ericsson)

To progress both 36.331 and 38.331 CRs to the next meeting

Intended outcome: CRs submitted to the next meeting

Deadline: Thursday 2019-05-02

# 2 Discussion

## 2.1 Consistency of Feature Set IDs according to filtering

In 38.331, 5.6.1.4 clause has the following procedures:

#### 5.6.1.4 Setting band combinations, feature set combinations and feature sets supported by the UE

The UE invokes the procedures in this clause if the NR or E-UTRA network requests UE capabilities for *nr*, *eutra-nr* or *eutra*. This procedure is invoked once per requested *rat-Type* (see clause 5.6.1.3 for capability enquiry by the NR network; see TS 36.331 [10], clause 5.6.3.3 for capability enquiry by the E-UTRA network). The UE shall ensure that the feature set IDs and feature set combination IDs are consistent across feature sets, feature set combinations and band combinations in all three UE capability containers that the network queries with the same *frequencyBandListFilter* and with the same eutra-nr-only flag (where applicable).

It is thus unclear whether consistency of feature set IDs and feature set combination IDs also applies for SRS carrier switching request. An example is given below to explain what it implies whether this consistency is applicable or not to SRS carrier switching request.

1) Consistency of feature set IDs and feature set combination IDs **applies** to SRS carrier switching request.

- Network performs a capability request for ***rat-Type* *eutra-nr*** including *FreqBandList* with bands A, B and C, and including ***srs-SwitchingTimeRequest* field**;

- When performing a subsequent request for ***rat-Type* *nr***, it should use the same *FreqBandList* (i.e. with bands A, B and C) and:

- If it includes *srs-SwitchingTimeRequest* field, it will expect that feature set IDs and feature set combination IDs are consistent between the former and current request;

- If it does not include *srs-SwitchingTimeRequest* field, it will not expect that feature set IDs and feature set combination IDs are consistent between the former and current request. Therefore, the network should either perform both *rat-Type* *eutra-nr* and *nr* requests with *srs-SwitchingTimeRequest* field or both requests without it;

2) Consistency of feature set IDs and feature set combination IDs **does not apply** to SRS carrier switching request.

- Network performs a capability request for ***rat-Type* *eutra-nr*** including *FreqBandList* with bands A, B and C, and including ***srs-SwitchingTimeRequest* field**;

- When performing a subsequent request for ***rat-Type* *nr***, it should use the same *FreqBandList* (i.e. with bands A, B and C) and:

- If it includes *srs-SwitchingTimeRequest* field, it will expect that feature set IDs and feature set combination IDs are consistent between the former and current request;

- If it does not include *srs-SwitchingTimeRequest* field, it will expect that feature set IDs and feature set combination IDs are consistent between the former and current request. Therefore, regardless of the inclusion or not of *srs-SwitchingTimeRequest* field for current request, feature set IDs and feature set combination IDs should be consistent between the former and current request;

**Question 1: Which is companies preferred option?**

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| --- | --- | --- |
| **Company** | **1/2** | **Comments** |
| **Intel** | 1 | One of the main reasons we agreed to adding the field ‘*srs-SwitchingTimeRequest’* was that the UE capability size would increase (from the content in band combinations) due to the elaborate capability information the UE can provide for each band in a band combination. And that, this can be avoided if the NW is not really interested in this configuration.  We can infer from this that even when the featureSets won’t be impacted (it’s the BCs that get impacted), the total size the UE has to report a capability is still limited to 9k, and it’s upto UE implementation on how to compose featureSets if the UE is running out of space. With increase size of CA BCs, the amount of space for featureSets gets reduced, and the UE to ensure the consistency of featureSets (and IDs) across the different capability req/response messages, the UE has to be aware of whether the NW is interested in this srs switching capability in all the capability enquiry requests.  Our view is that ‘all’ the applicable filtering parameters for the entire capability are to be known at the UE to ensure that featureSet consistency is maintained. |
| **Nokia, Nokia Shanghai Bell** | 1 | As Intel pointed out the filter was extended later to include the SRS switching capability for NR and EUTRA-NR RAT types. Technically, from the procedural description it is just appending the switching times to the BC list. However, the difficulty is that the option 2 is more complex than fire-and-forget policy of option 1 and is simpler for implementing. As a result, we do not prefer option 2 and think that if the filter changes across subsequent requests, the underlying capability should not be judged based on a previous version of the filter. Some UEs may work correctly and some other may not and this will result in a lot of handling in procedural text to clarify what is the right behavior. So, we vote for option 1. |
| **Ericsson** | 1 | As a general remark, we think pointing specific filters to be subject to featureSet consistency or not may result in additional complexity, and there could be also a risk that e.g. a given filter is at first considered to not be relevant to featureSet consistency, and later on identified as relevant to featureSet consistency. Therefore it seems safer to adopt option 1. |
| **MediaTek** | 1 (slight) | In principle option 1 looks simpler, but in practice we don’t see that the SRS switching capability should impact the feature sets (as Intel said above, the impact is to the BCs). So we consider that either option is reasonable, but we agree that it needs to be specified clearly.  However, considering forward compatibility towards other filters that might be introduced in the future, we think option 1 has less potential for confusion in the spec, so it would be slightly safer to go this direction. |
| **Huawei** | 1 | Agree that it would be safer to adopt option 1. |
| **Vodafone** | 1 | In our view the SRS carrier switching feature is important and Option 1 has less signalling load on the UE when interrogating UE’s EUTRA and/or NR Capabilities |

To avoid future confusion on whether specific filters may influence UE reported Feature Set IDs, and to clarify it for the current *srs-SwitchingTimeRequest* field, it was discussed in [1] how to make the statement above more generic, as also captured below:

#### 5.6.1.4 Setting band combinations, feature set combinations and feature sets supported by the UE

The UE invokes the procedures in this clause if the NR or E-UTRA network requests UE capabilities for *nr*, *eutra-nr* or *eutra*. This procedure is invoked once per requested *rat-Type* (see clause 5.6.1.3 for capability enquiry by the NR network; see TS 36.331 [10], clause 5.6.3.3 for capability enquiry by the E-UTRA network). The UE shall ensure that the feature set IDs and feature set combination IDs are consistent across feature sets, feature set combinations and band combinations in all three UE capability containers that the network queries with the same filters, i.e. UE-*CapabilityRequestFilterNR* and fields in *UECapabilityEnquiry* message (i.e. *requestedFreqBandsNR-MRDC*, *requestedCapabilityNR* and *eutra-nr-only* flag) as defined in TS 36.331 [x]where applicable.

The change above would also account for option 1 described for Question 1. It should be noted, however, that even if option 2 is preferred in Question 1, this should also be clarified in the same statement above. In general, the change would avoid the need to explicitly state filters and thus also avoid that new filters are included in the future without proper handling in the statement above.

**Question 2: Do companies agree to have the general statement above? Companies are also encouraged to provide comments to improve the statement if needed, or to express why the statement should not be added.**

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| --- | --- | --- |
| **Company** | **Yes/No?** | **Comments** |
| **Intel** | Yes | We agree with this (as also commented above) |
| **Nokia, Nokia Shanghai Bell** | Yes | We agree the intent, but we would prefer to have “identical filter settings” as filters does not really convey anything. |
| **Ericsson** | Yes | Agree, the exact wording can be refined in the CR. |
| **MediaTek** | Yes | Agree also with Nokia’s comment about the wording. |
| **Huawei** | Yes | Agree the statement above in general. |
| **Vodafone** | Yes | We generally agree with the statement above. |

## 2.2 Missing aspects on TS 36.331 for SRS carrier switching request

In [2] it was discussed that SRS carrier switching request handling is missing in 36.331. Two changes are proposed in [2]:

START OF FIRST CHANGE

3> if the UE supports EN-DC and if *requestedFreqBandsNR-MRDC* is included in the request:

4> include into *featureSetsEUTRA* the feature sets that are applicable for the received *requestedFreqBandsNR-MRDC* and *requestedCapabilityNR* (if present) as specified in TS 38.331 [82], clause 5.6.1.4.

END OF FIRST CHANGE

START OF SECOND CHANGE

2> if the *ue-CapabilityRequest* includes *eutra-nr* and if the UE supports EN-DC:

3> include the UE radio access capabilities for EUTRA-NR within a *ue-CapabilityRAT-Container*, with the *rat-Type* set to *eutra-nr*;

3> include band combinations and feature sets as specified in TS 38.331 [82], clause 5.6.1.4, considering the included *requestedFreqBandsNR-MRDC* and *requestedCapabilityNR* (if present)*;*

END OF SECOND CHANGE

In principle, first change would enable *srs-SwitchingTimeRequest* field to be taken into consideration for feature set generation, i.e. it would enable option 1 in question 1 (section 2.1); while option 2 in question 1 would not require any change. After further checking, however, it is identified that first change is not needed, even if option 1 is preferred in question 1. This is motivated by the fact that for *eutra-nr-only* flag, no handling is present in Feature Sets procedural text in 36.331 for *rat-Type* set to *eutra-nr*. But as stated in clause 5.6.1.4 from 38.331, *eutra-nr-only* should be taken into consideration for the report of consistent feature set IDs and feature set combination IDs.

1. No procedure in 36.331 feature set handling is defined for *eutra-nr-only* flag when *rat-Type* is set to *eutra-nr.*
2. 38.331 procedures already account that *eutra-nr-only* should be taken into consideration for the report of consistent feature set IDs and feature set combination IDs.

The mapping of procedural text and handling of *eutra-nr-only* flag is given in the example below:

1) eNB performs a capability request for ***rat-Type* *eutra-nr*** including *FreqBandList* with bands A, B and C, and including ***eutra-nr-only* flag**;

- No procedures are defined in 36.331 on how to handle the flag specifically for *rat-Type* *eutra-nr*.

- Procedures in 38.331 state that *eutra-nr-only* flag should be taken into consideration for the report of consistent feature set IDs and feature set combination IDs.

- No procedures are defined in 38.331 on how to handle the flag specifically for *rat-Type* *eutra-nr*. This should be straightforward since, apart from feature sets, the flag should not further influence on procedures for *rat-Type* *eutra-nr.*

- When performing a subsequent request for ***rat-Type* *nr***, it should use the same *FreqBandList* (i.e. with bands A, B and C) and ***eutra-nr-only* flag**;

- Procedures are defined in 36.331 on how to handle the flag for *rat-Type* *nr*.

- Procedures in 38.331 state that *eutra-nr-only* flag should be taken into consideration for the report of consistent feature set IDs and feature set combination IDs.

- Procedures are defined in 38.331 on how to handle the flag for *rat-Type* *nr*.

Therefore, similar to *eutra-nr-only* flag case, it seems current 38.331 procedures are also sufficient even if option 1 in question 1 (section 2.1) is the preferred one.

1. No further procedure in 36.331 feature set handling is needed for *srs-SwitchingTimeRequest*.

NOTE: Whether this is also applicable to late drop filters should be discussed as part of late drop.

**Question 3: Do companies agree with Observation 3?**

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| **Company** | **Yes/No?** | **Comments** |
| **Intel** | Yes | Agree that no change is needed here. |
| **Nokia, Nokia Shanghai Bell** | Yes |  |
| **Ericsson** | Yes |  |
| **MediaTek** | Yes |  |
| **Huawei** | Yes |  |

While the first change in [2] concerns Feature Set handling, second change in [2] inserts general capability handling for SRS-Switching request for *rat-Type* *eutra-nr*. More specifically, in 38.331, the following procedures apply:

1> else, if the requested *rat-Type* is *eutra-nr*:

2> include into *supportedBandCombinationList* as many E-UTRA-NR band combinations as possible from the list of "candidate band combinations", starting from the first entry;

3> if *srs-SwitchingTimeRequest* is received:

4> if SRS carrier switching is supported;

5> include *srs-SwitchingTimesListNR* and *srs-SwitchingTimesListEUTRA* for each band combination;

4> set *srs-SwitchingTimeRequested* to *true*;

But in 36.331 no handling is defined for SRS-Switching request for *rat-Type* *eutra-nr*, as shown also below:

2> if the *ue-CapabilityRequest* includes *eutra-nr* and if the UE supports EN-DC:

3> include the UE radio access capabilities for EUTRA-NR within a *ue-CapabilityRAT-Container*, with the *rat-Type* set to *eutra-nr*;

3> include band combinations and feature sets as specified in TS 38.331 [82], clause 5.6.1.4, considering the included *requestedFreqBandsNR-MRDC;*

In this manner, second change in [2] would be needed to account for this behaviour. It should also be noted that this would be a change needed regardless of decisions on questions 1-3.

Question 4: Do companies agree that a general handling of *srs-SwitchingTimeRequested* field should be included in 36.331 for *rat-Type eutra-nr*?

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| **Company** | **Yes/No?** | **Comments** |
| **Intel** | Yes | Although the procedure for what to include and how to include is already specified in 5.6.1.4 of 38.331, we are ok to with this change: the second change of [2]. The first change in [2] is not needed, as this only concerns feature sets of EUTRA. |
| **Nokia, Nokia Shanghai Bell** | Yes | Adding clarification for 2nd change is okay for us. |
| **Ericsson** | Yes | We think this is needed since there is also an explicit mentioning of *requestedCapabilityNR* for *rat-Type nr* in 36.331. |
| **MediaTek** | Yes |  |
| **Huawei** | Yes | Second change in [2] is OK. |
| **Vodafone** | Yes | To be consistent, the EUTRA-NR Capability should also be covered |

# 3 Conclusion

**No table of figures entries found.**

# 4 References

1. R2-1905396, Clarification on filters used to generate FeatureSets, Ericsson, 3GPP TSG-RAN WG2#105bis, Xian, China, 8th – 12th April 2019.
2. R2-1905463, Clarification on filters used to generate FeatureSets, Ericsson, 3GPP TSG-RAN WG2#105bis, Xian, China, 8th – 12th April 2019.