**3GPP TSG RAN WG2 Meeting #117-e R2-2203976**

Electronic meeting, 21st Feb – 3rd Mar 2022

Agenda Item: 8.4.4

Source: Intel Corporation (Rapporteur)

Title: [AT117-e][022][eIAB] UE capabilities (Intel)

Document for: Discussion and Decision

# Introduction

This document captures the following discussion:

* [AT117-e][022][eIAB] UE capabilities (Intel)

      Scope: Treat R2-2203702. Determine agreeable parts, points for discussion if needed, open issues if needed. Aim for offline agreement, if not possible then pave the way for efficient on-line. Review Updated draft CRs for UE capabilities (pl provide), including agreements from prev. meeting, and all agreeable points from this meeting (e.g. this discussion and the open issues discussion).

      Intended outcome: Report, Draft CRs (38306, 38331) endorsed.

      Deadline: In time for on-line CB W2 Wednesday (Report) if CB is needed or W2 Thursday (CRs) if needed

The discussion consists of two phases, Phase 1 and Phase 2, and the deadline of each phase is given below:

Phase 1: Deadline: Monday W2, 11:00PM UTC.

1) Determine agreeable parts, points for discussion if needed, open issues if needed. Aim for offline agreement, if not possible then pave the way for efficient on-line.

2) Review draft CRs for UE capabilities (38306, 38331) from previous meeting and easy agreements in [AT117-e][022][eIAB] UE capabilities (Intel)

Phase 2: Deadline: Wednesday W2, 11:00AM UTC.

Review updated draft CRs for UE capabilities (38306, 38331) for all remaining agreeable points from this meeting.

**Contact**

To make it easier to find the correct contact delegate in each company for potential follow-up questions, the rapporteur encourages the delegates who provided input to provide their contacts information in this table:

|  |  |
| --- | --- |
| **Company** | **Contact: Name (Email)** |
| Intel (Rapporteur) | Ziyi.li@intel.com |
| Huawei, HiSilicon | Yulong (shiyulong5@huawei.com) |
| LG Electronics | Gyeong-Cheol LEE (gyeongcheol.lee@lge.com) |
| Samsung | Milos Tesanovic (m.tesanovic@samsung.com) |
| Apple | Ralf Rossbach (rrossbach@apple.com) |
| Fujitsu | Sue Yi (yisu@fujitsu.com) |
| Lenovo | Yibin Zhuo(zhuoyb1@lenovo.com) |
| ZTE | Lin Chen(chen.lin23@zte.com.cn) |
| NEC | Sidong Li (lisidong@labs.nec.cn) |
| Nokia | Malgorzata Tomala (malgorzata.tomala@nokia.com) |
| Ericsson | Marco Belleschi (marco.belleschi@ericsson.com) |

# Discussion

## UE capability for BAP header rewriting

As summarized in [1], all companies believe a separate UE capability needs to be defined for BAP header rewriting based local re-routing. This local re-routing includes both inter-donor DU re-routing and inter-donor CU re-routing.

The rapporteur proposes with below proposal for easy agreement:

**Proposal 1 [easy agreement]: Define a new UE capability for BAP header rewriting-based local re-routing (including inter-donor DU re-routing and inter-donor CU re-routing) as optional UE capability for IAB-MT.**

#### **Q1. Do you agree with above proposal for BAP header rewriting-based local re-routing?**

|  |  |  |
| --- | --- | --- |
| Company | Y/N | Comment |
| Huawei, HiSilicon | Y |  |
| LGE | Y |  |
| Samsung | Y but see comment | The question is really whether we need a UE capability for BAP header rewriting. Is it important to specify it’s for local re-routing? Also, why are we emphasising ‘inter-donor CU **re**-routing’? We do not typically refer to this case as local re-routing. |
| Apple | Y |  |
| Fujitsu |  | We have similar concern as Samsung. Is this capability for BAP header rewriting, or BAP header rewriting based local re-routing? We have BAP header rewriting for inter-CU routing as well. Need to clarify. |
| Lenovo | Y |  |
| ZTE | Y |  |
| NEC | Y |  |
| Nokia | Y | The capability definition as such is needed, whether it requires a capability bit or not we are not sure, but it should be at least defined in the eIAB feature list. BAP header re-writing capability should be generic covering all cases |
| Ericsson |  | We are ok to have a separate capability for BAP header rewriting which applies to BAP header rewriting functionalities in general. However, it is not clear from this proposal why local re-routing and the cases in the brackets should be mentioned. |
| Intel | Y | Inter-donor CU re-routing mainly covers the scenarios to allow data re-routed from alternative topology to original donor CU or vice versa, as agreed in RAN2 before:   * Support inter-CU re-routing, i.e. IAB-node re-routes the data to its original donor-CU via the alternative BAP path over the topology in target CU. * For the two scenario of inter-topology routing and intra-to-inter-topology re-routing, there is only one header rewriting for a packet, where the header rewriting entry includes the BAP routing ID of the packet’s ingress topology and the BAP routing ID of the packet’s egress topology. |

Rapporteur’s Summary:

11 companies participated the discussion, 7 companies agree to define a UE capability for BAP header rewriting-based local re-routing, which covers inter-donor DU local re-routing and inter-donor CU re-routing.

2 companies (Samsung, Fujitsu) have comments about why inter-donor CU re-routing is covered under this UE capability. It was agreed in RAN2 #115e meeting and RAN2 #116bis-e meeting:

* Support inter-CU re-routing, i.e. IAB-node re-routes the data to its original donor-CU via the alternative BAP path over the topology in target CU.
* For the two scenario of inter-topology routing and intra-to-inter-topology re-routing, there is only one header rewriting for a packet, where the header rewriting entry includes the BAP routing ID of the packet’s ingress topology and the BAP routing ID of the packet’s egress topology.

Inter-donor CU re-routing mainly covers two scenarios: 1) intra-to-inter-topology re-routing 2) inter-to-intra-topology re-routing. BAP header rewriting is required for both scenarios to re-route packets from one topology to another.

Therefore, the proposed UE capability for BAP header rewriting based local re-routing covers both inter-donor DU local re-routing and inter-donor CU re-routing.

2 companies (Nokia, Ericsson) commented the UE capability for BAP header rewriting should be generic covering all cases. The question is whether above proposed UE capability for inter-donor DU local re-routing and inter-donor CU re-routing should be combined with the UE capability agreed for inter-donor CU routing. Rapporteur understands that a new UE capability for BAP header rewriting based inter-donor CU routing was agreed in RAN2 #116bis-e meeting:

* [051] Define a new UE capability for BAP header rewriting based inter-donor CU routing as optional UE capability for IAB-MT.

Therefore, rapporteur proposed with the following proposal:

**Proposal 1: (7/11) [online] Define a new UE capability for BAP header rewriting-based re-routing (including inter-donor DU local re-routing and inter-donor CU re-routing) as optional UE capability for IAB-MT.** **FFS whether this UE capability is a separate UE capability or it is the same UE capability as BAP header rewriting-based inter-donor CU routing.**

It was also proposed in [Pre117-e][003][eIAB] eIAB Open Issues Input (Qualcomm) [2] to discuss inter-donor-DU re-routing and/or congestion-based local re-routing.

**Proposal 5b: RAN2 to discuss if inter-donor-DU re-routing and/or congestion-based local re-routing be optional with capability signaling.**

It was agreed in RAN2 #116bis-e meeting:

|  |
| --- |
| * [051] The single UE capability is used for all UL local re-routing trigger conditions. |

The rapporteur acknowledges that the above agreement is agreed as “a single UE capability is used for all local re-routing trigger conditions, e.g. type-2/type-3 RLF indication, type-4 RLF indication or congestion”, based on discussion in [AT116bis-e][051][eIAB] UE Caps [3]. With that, a clarification agreement is proposed as below:

**Proposal 2 [easy agreement]: If new UE capability for BAP header rewriting-based local re-routing is defined in Proposal 1, it is used for all local re-routing trigger conditions, e.g. flow control feedback (congestion), type-2/3 RLF indication, etc.**

#### **Q2. Do you agree with above proposal?**

|  |  |  |
| --- | --- | --- |
| Company | Y/N | Comment |
| Huawei, HiSilicon | Y | Minor comment: This is the capability for IAB-MT which means UL traffic re-routing. Then “e.g. flow control feedback (congestion)” seems not needed, since it is DL traffic. |
| LGE | Y |  |
| Samsung | Y | The important thing in our view is not to limit the new capability to UL (as it seems to be the case in the agreement quoted above). Huawei seem to have a different view and we see their point. In any case the congestion-triggered re-routing – which Huawei are right is not strictly speaking an IAB-MT capability – should somehow be captured since the network will need to configure the relevant IAB-MT with reporting threshold. |
| Apple | Y |  |
| Fujitsu | Y, with comment | “flow control feedback (congestion)” should be removed since it is for DL, and there is no BAP header rewriting for that. |
| Lenovo | Y | Agree with Huawei and Fujitsu to remove the “flow control feedback (congestion)”. |
| ZTE | Y |  |
| NEC | Y |  |
| Nokia | Y | As commented in Q1, one generic capability is sufficient, with no need to refer in detail to use cases or conditions |
| Ericsson | Yes, but | Agree with Huawei. No need to mention flow control feedback. |
| Intel | Y |  |

Rapporteur’s Summary:

All companies (11) agree with Proposal 2. 4 companies commented that flow control feedback (congestion) should be removed as it’s for DL traffic, which does not require UE capability for IAB-MT. 1 company commented there’s no need to refer use cases or conditions in detail. Therefore, rapporteur proposes with the updated agreement as below:

**Proposal 2 [easy agreement]: No need to split UE capability further for different local re-routing trigger conditions.**

## UE capability for inter-donor CU partial migration and topology redundancy

As summarized in [1], all contributions believe that there’s no need to differentiate the capability between inter-donor CU partial migration and inter-donor CU routing for topology redundancy, as the BAP procedure for above two scenarios is the same.

On the other hand, [3] considers separate UE capabilities is needed, as the IAB-node may not be required to support two functionalities at the same time. It is considered by [3] that inter-donor CU partial migration is deployed to allow some traffic being migrated to another topology due to traffic offloading, and inter-donor CU topology redundancy is deployed for robustness. However, rapporteur believes, for inter-donor CU partial migration, there’s only one BH link is available, which means all traffics of the boundary IAB-node are routed from the source topology to another. For inter-donor CU topology redundancy, the boundary IAB-node may offload partial traffic to another topology due to load balancing, etc. From BAP processing point of view, both scenarios require BAP header rewriting from previous routing ID in source topology to new routing ID in target topology, which has no difference.

Therefore, the rapporteur proposes with below proposal:

**Proposal 3 [easy agreement]: No need to differentiate “inter-donor CU routing” UE capability between “inter-donor CU partial migration” and “inter-donor CU routing for topology redundancy”.**

#### **Q3. Do you agree with above proposal?**

|  |  |  |
| --- | --- | --- |
| Company | Y/N | Comment |
| Huawei, HiSilicon | Y |  |
| LGE | Y |  |
| Samsung | Y |  |
| Apple | Y |  |
| Fujitsu | Y |  |
| Lenovo | Y |  |
| ZTE | Y |  |
| NEC | Y |  |
| Nokia |  |  |
| Ericsson | Y |  |
| Intel | Y |  |

Rapporteur’s Summary:

All companies agree there’s no need to differentiate “inter-donor CU routing” UE capability between “inter-donor CU partial migration” and “inter-donor CU routing for topology redundancy”. Rapporteur proposes Proposal 3 as it is:

**Proposal 3 [easy agreement]: No need to differentiate “inter-donor CU routing” UE capability between “inter-donor CU partial migration” and “inter-donor CU routing for topology redundancy”.**

## UE capability for intra-donor DU local re-routing

As summarized by [Pre117-e][003][eIAB] eIAB Open Issues Input (Qualcomm) [2], it was summarized by rapporteur that there’s no need for Rel-17 to discuss intra-donor DU re-routing as it is already supported in Rel-16.

**Observation 9: Intra-donor-DU re-routing does not require Rel-17 discussion as it is already supported in Rel-16.**

Based on the contribution submitted to RAN2 #117bis-e meeting, as summarized in [1], there are equal support for defining new UE capability (3 companies) and not defining new UE capability (3 companies) for intra-donor DU local re-routing. Reasons are summarized as below:

Support to define new UE capability for intra-donor DU local re-routing

1) For congestion-based re-routing, the network needs to configure congestion threshold for re-routing

2) similar as inter-donor DU local re-routing, this UE capability should be used to cover all local re-routing trigger conditions, e.g. flow control feedback (congestion), type-2/3 RLF indication

No need to define new UE capability for intra-donor DU local re-routing

1) New triggers agreed in Rel-17 does not have corresponding configurations from IAB-donor CU side

2) Follow the same principle as Rel-16 local re-routing

3) Configuration to congestion triggered local re-routing is performed in downstream at the IAB-DU side

#### **Q4. Companies are invited to provide views on which option is preferred?**

**Option 1**: Define new UE capability for Rel-17 intra-donor DU local re-routing for all local re-routing trigger conditions, e.g. flow control feedback (congestion), type-2/3 RLF indication.

**Option 2**: Not to define new UE capability for Rel-17 intra-donor DU local re-routing.

|  |  |  |  |
| --- | --- | --- | --- |
| Company | Is Option 1 Acceptable | Is Option 2 Acceptable | Comment |
| Huawei, HiSilicon | N | Y | Type2 indciation triggred re-routing is same as legacy except for the new trigger. And, it is somehow up to implementation. CU does not have to know the capabiliy. |
| LGE | No | Yes |  |
| Samsung | Yes | No | The discussion of whether we should have a separate **intra**-donor DU local-rerouting is in our view about whether the IAB node supports header rewriting based local re-routing: for intra-donor DU local re-routing, header rewriting support is not needed. In this sense, we support the intention of separate capability. |
| Apple | No | Yes |  |
| Fujitsu | No | Yes | Agree with observation 8. |
| Lenovo | No | Yes |  |
| ZTE | No | Yes | It is suggested to follow the same principle as Rel-16 local re-routing. |
| NEC | No | Yes |  |
| Nokia | N | Y | Support for Rel-17 BAP re-routing should be implied by BAP header rewriting |
| Ericsson | N | Y | What it matters is whether the IAB-MT supports BAP header rewriting. Otherwise, local routing is already possible in Rel16 to some extent. Additionally, we already have capabilities for the type2/3 RLF. |
| Intel | Y | Y |  |

**Rapporteurs’ Summary:**

11 companies participated the discussion. The preferences of companies are summarized as below:

Option 1 is acceptable: 2/11

Option 2 is acceptable: 10/11

There’s a majority support to not define new UE capability for intra-donor DU local re-routing. Rapporteur proposes with below proposal:

**Proposal 4 [easy agreement]: No UE capability is defined for Rel-17 intra-donor DU local re-routing.**

## Other open issues in eIAB Open issues Input

As summarized in [2], Fujitsu and Lenovo proposed that BH RLF detection indication, BH RFL recovery indication and inter-donor-DU rerouting be optional with capability signaling.

**Proposal 5a: RAN2 to discuss if BH RLF detection indication and/or BH RLF recovery indication to be optional with capability signaling.**

However, it was already agreed in RAN2 #116bis-e meeting:

|  |
| --- |
| * [051] Define a new UE capability (1 bit) for ‘BH RLF detection indication and BH RLF recovery indication’ as optional UE capability for IAB-MT. |

Therefore, there’s no need for discussion of this topic.

#### **Q5. Is there any other open issue for UE capability in Rel-17 eIAB?**

|  |  |
| --- | --- |
| Company | Comment |
|  |  |
|  |  |
|  |  |

Rapporteur’s Summary:

There’s no other open issue proposed by companies.

## Feature Group

As summarized in [1], rapporteur thinks feature group is not a critical issue, companies are invited to check the Annex for TR38.822 in TS38.306 draft CR for eIAB directly.

# Conclusion

Based on the discussion above, the following is proposed:

**Proposal 1: (7/11) [online] Define a new UE capability for BAP header rewriting-based re-routing (including inter-donor DU local re-routing and inter-donor CU re-routing) as optional UE capability for IAB-MT.** **FFS whether this UE capability is a separate UE capability or it is the same UE capability as BAP header rewriting-based inter-donor CU routing.**

**Proposal 2 [easy agreement]: No need to split UE capability further for different local re-routing trigger conditions.**

**Proposal 3 [easy agreement]: No need to differentiate “inter-donor CU routing” UE capability between “inter-donor CU partial migration” and “inter-donor CU routing for topology redundancy”.**

**Proposal 4 [easy agreement]: No UE capability is defined for Rel-17 intra-donor DU local re-routing.**

# References

[1] R2-2203702, AI summary of AI 8.4.4 UE capabilities (Intel)

[2] R2-2202329, [Pre117-e][003][eIAB] eIAB Open Issues Input (Qualcomm)

[3] R2-2201912, Summary of discussion [AT116bis-e][051][eIAB] UE Caps (Intel)