**3GPP TSG-RAN WG2 Meeting #110 e R2-200xxxx**

**E-meeting, June 1 – 12, 2020**

**Agenda Item:** 6.1.6 (NR\_IAB-Core)

**Source:** LG Electronics

**Title:** E-mail discusson: [AT110-e][047][IAB] Particular issues III UAC

**Document for:** Discussion and Decision

# Introduction

This is to kick-off an email discussion with the following scope and intended outcome:

**[AT110-e][047][IAB] Particular issues III UAC (LG)**

Scope: Address open issues related to access control bypassing, i.e., address R2-2005992, R2-2005525, R2-2005653

Intended outcome: Report with functional Agreements (potentially also TPs).

Deadline: June 5, 0700 UTC

Specifically, this email discussion aims to resolve the followig issues:

* In section 2.2, whether UAC skipping should be effectively realized by AS or NAS
* In section 2.3, how to set establishmentCause and resumeCause
* In section 2.4, when UAC bypassing shouuld be applied

# Discussion

## RAN2 agreements and Liaison

At the RAN2 #109-e meeting, RAN2 made the following agreement for IAB MTs:

* IAB-MTs are not under UAC control.

The agreement means that IAB-MT, being part of an IAB node which is a network node, does not perform access barring check for its access attempts to a cell. RAN2 sent an LS to SA1/CT1 to inform this decision.

RAN2 has received an reply LS [1] from SA, where the updates of TS 22.261 to reflect the RAN2 decision is informed, and the following NOTE is introduced in TS 22.261 below:

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| NOTE2: IAB-MT is not subject to unified access control |

Given the updates of TS 22.271, RAN2 decision on UAC skipping is confirmed to be valid. Currently 38.331 already introduced the following text in red to support UAC bypassing:

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| 5.3.14 Unified Access Control 5.3.14.1 General  The purpose of this procedure is to perform access barring check for an access attempt associated with a given Access Category and one or more Access Identities upon request from upper layers according to TS 24.501 [23] or the RRC layer. This procedure does not apply to IAB-MT |

## How to realize bypassing Unified Access Control

While it was confirmed that IAB-MT is not subject to UAC, there are actually two possible approaches in principle to realize “not subject to UAC”, because UAC skipping can be *effectively* realized by either AS or NAS.

* **Approach1 (NAS based)**: IAB MT Access Stratum still applies UAC but NAS ensures via proper setting of Access Category (AC) and Access identify (AI) such that access by IAB MT during UAC is considered as “allowed”
* **Approach2 (AS based)**: IAB MT Access Stratum completely skips UAC (irrespective of AC and AI provided by NAS).

UAC is executed for most of UE access attempts including connection establishment and resume, where UAC is associated with Access Category and Access Identity provided by NAS for the access. Exceptions are the access in response to NG-RAN paging and for RNA update, where a certain Access Category is selected by AS, rather than NAS. Given those, we make the following observations for idle and inactive:

* In case of access in response to NG-RAN paging (inactive),
  + AC ‘0’ is selected by UE AS, and hence the access is considered as “allowed” during UAC.
* In case of access for RNA update (inactive),
  + AC ‘2’ or ‘8’ is chosen by AS, and UE performs UAC associated with this AC and AI. Whether the access cess is allowed or not depends on UAC parameters being broadcast.
* In all other cases (idle and inactive)
  + UE AS performs UAC associated with AC and AI provided by NAS. Whether the access is allowed or not depends on UAC parameters being broadcast.

With the approach1, it is rapporteur view that RAN2 do not need to introduce any special handling to support UAC bypassing for the cases where connection is triggered by upper layers. However, we may still need to take a special treatment for RNA update (where AC ‘8’ is selected by UE AS).

With the approach2, RAN2 may need to introduce a special handing to enable IAB-MT access to completely bypass UAC. RAN2 already introduced the text in 38.331 “This procedure does not apply to IAB-MT”, but the contribution [2] claims further changes as shown below to be done if we go for this option (Note that the changes below are not exhaustive but more can be found in [2] and Annex.C of this contribution)

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| 5.3.13 RRC connection resume Upon initiation of the procedure, the UE shall:  1> if the resumption of the RRC connection is triggered by response to NG-RAN paging:  2> if the resumption of the RRC connection is not for IAB-MT;  3> select '0' as the Access Category;  3> perform the unified access control procedure as specified in 5.3.14 using the selected Access Category and one or more Access Identities provided by upper layers;  4> if the access attempt is barred, the procedure ends; |

Even if we take approach1, a special treatment for RNA update may need to be specified to enable effective UAC bypassing in case of RNA update by IAB MT. This implies that approach1 may not work for all cases but requires some approach2 as well. So we can add one additional approach on top of two aforementioned approaches:

* **Approach3 (Mixed)**: To apply approach1 for all possible cases, and to apply approach2 for the rest case including RNA-update.

**Question1a**: Which approach do you think should be adopted to *effectively* enable UAC bypassing by IAB-MTs?

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| **Company** | **Answer (Approach1/2/3)** | **Comment** |
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**Question1b**: (Only if the answer to the question1a is Approach1) Do you agree that we do not need to change any further changes in RAN2 specification. If No, please provide the required changes

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| **Company** | **Answer (Yes/No)** | **Comment**  **(in case answer is NO, please provide the required changes)** |
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In case option2 is adopted, we need to discuss whether and whether we introduce further changes, in addition to what we already have “This procedure does not apply to IAB-MT” in UAC procedure heading section. .

**Question1c**: (Only if the answer to the question1a is Approach2) Do you agree with the direction of changes as proposed in [2]?

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| **Company** | **Answer (Yes/No)** | **Comment**  **(in case answer is NO, please provide the required changes)** |
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**Question1d**: (Only if the answer to the question1a is Approach3) Companies are requested to provide view in which case the approach2 (i.e., enforced UAC bypassing by AS) should be applied?

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| **Company** | **Access case for which approach2 should apply** | **Comment** |
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CT1 is discussing this issue as well, and there are some proposals to enable UAC bypassing by setting a specific AC/AI value for IAB access. CT1 final decision may be pending due to our pending decision on Q1. Hence, it seems good to send an LS to CT1 to inform our decision about this (and with SA1/2 CCed).

**Question2**: Do you agree to send an LS to CT1 to inform RAN2 decision on Question 1?

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| **Company** | **Answer (Yes/No)** | **Comment** |
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## EstablishmentCause and ResumeCause

**Connection Setup**

For connection establishment, a normal UE Access Stratum sets the establishment cause to the value as received from upper layers, as specified in 38.331 s5.3.3.3. The cause value is determined based on the mapping between access identity/class and causes as specified in TS 24.501.

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| 5.3.3.3 Actions related to transmission of *RRCSetupRequest* message The UE shall set the contents of *RRCSetupRequest* message as follows:  1> set the *ue-Identity* as follows:  2> if upper layers provide a 5G-S-TMSI:  3> set the *ue-Identity* to *ng-5G-S-TMSI-Part1*;  2> else:  3> draw a 39-bit random value in the range 0..239-1 and set the *ue-Identity* to this value;  NOTE 1: Upper layers provide the *5G-S-TMSI* if the UE is registered in the TA of the current cell.  1> set the *establishmentCause* in accordance with the information received from upper layers;  The UE shall submit the *RRCSetupRequest* message to lower layers for transmission. |

EstablishmentCause ::= ENUMERATED {

emergency, highPriorityAccess, mt-Access, mo-Signalling,

mo-Data, mo-VoiceCall, mo-VideoCall, mo-SMS, mps-PriorityAccess, mcs-PriorityAccess,

spare6, spare5, spare4, spare3, spare2, spare1}

For access attempt by IAB MT, there are mainly two options how to set the establishment cause during RRC connection establishment:

* **Option1:** To introduce no special handling for IAB MT for *establishmentCause* setting. That is, IAB MT sets the establishment cause value as indicated by upper layers
* **Option2:** To introduce a special handling for IAB MT for *establishmentCause* setting. IAB MT sets the establishment cause to a *specific* value (e.g., *highPriorityAccess*)

The option1 assumes that, for connection setup, NAS always indicates the cause value to be used by AS. With this option, we do not introduce any special handling for setting *establishmentCause* by IAB MTs during RRC connection establishment.

The option2 enforces Access Stratum of IAB MT to set the establishment cause to a specific value. RAN2 needs to discuss which cause value shall be set for which case.

The following in the box is an excerpt from the contribution [2], where it claims that if AS of IAB-MT follows upper layer indication on AI/AC, then the IAB-MT will necessarily set the cause value to highPriorityAccess. From this rapporteur understanding, the approach in the box below [2] is to set the cause value as indicated by upper layer, i.e., to follow option1.

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| IAB-MT does not have other traffic except for OAM traffic, and the purpose of its access is to provide access service to the UE and other IAB-nodes, so IAB-MT can set *highPriorityAccess* as the cause of RRC connection establishment based on the indication from upper layer, |

**Question3a**: Which option do you think should be adopted for IAB MT to set the establishment cause value within RRCSetupRequest?

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| **Company** | **Answer (Option1/option2)** | **Comment** |
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**Question3b** (Only if the answer to the question3a is option1) Do you agree that, we do not need to change any RAN2 specification to address cause value setting within RRCSetupRequest.

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| **Company** | **Answer (Yes/No)** | **Comment**  **(in case answer is NO, please provide the required changes)** |
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**Question3c** (Only if the answer to the question3a is option2) Please provide your view regarding how to set the cause value

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| **Company** | **Comment** |
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**Connection Resume**

UE AS needs to set *resumeCause* during RRC connection resume procedure. In case of resume triggered by upper layers, the *resumeCause* is set in accordance with the information received from upper layers, except for the access in response to RAN-paging, RNA-update, and emergency, and there are *resumeCauses* to be set in those exceptional cases.

ResumeCause ::= ENUMERATED {emergency, highPriorityAccess, mt-Access, mo-Signalling,

mo-Data, mo-VoiceCall, mo-VideoCall, mo-SMS, rna-Update, mps-PriorityAccess,

mcs-PriorityAccess, spare1, spare2, spare3, spare4, spare5 }

For resume cause setting by IAB MT access, we have two options:

* **Option1:** To not introduce a special handling for *resumeCause* setting. That is, for resume triggered by upper layers, IAB MT sets the resumeCause value in accordance with the information received from upper layers, and for resume in response to RAN-paging and for RNA-update, existing respective resumeCause is set.
* **Option2**: To introduce a special handling in AS for *resumeCause* setting. That is, IAB MT sets the establishment cause to a *specific* value.
* **Others**: Please specify your preferred behaviours in the table below as part of your company comments.

**Question4a**: Which option do you think should be adopted for resume cause setting by IAB MT?

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| **Company** | **Answer (Option1/option2)** | **Comment** |
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**Question4b** (Only if the answer to the question4a is option1) Do you agree that, we do not need to change any RAN2 specification to address *resumeCause* value setting within *RRCResumeRequest*.

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| **Company** | **Answer (Yes/No)** | **Comment**  **(in case answer is NO, please provide the required changes)** |
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**Question4c** (Only if the answer to the question4a is option2) Please provide your view regarding how to set the *resumeCause* value

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| **Company** | **Comment** |
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## When UAC bypassing should be applied?

The contribution [3] claims that it is not crystal when IAB-MT should or should not bypass UAC, as different from normal UE. More specifically, the contribution asks:

* Case a) What if a device capable of IAB functionalities goes outside intended IAB network coverage and happens to only identify a cell not supporting IAB operations? Is it possible for the device to access the cell as if it is a normal UEs? If this is possible (e.g. in case the IAB node has normal UE subscription as well), should the device ignore or apply UAC? What about other access control mechanism in such a case?

In addition to the case presented above (case a) and in [3], we can also consider the following case (case b) to ask if IAB node should bypass UAC at the very initial access to the network? That is, should IAB node be allowed to bypass UAC prior to actual IAB operation readiness (i.e. before receiving IAB configuration from CU).

* Casa b) Should the IAB node be able to bypass UAC even before it is ready for IAB operations? Or, Should the IAB node be able to bypass UAC only after it is ready for IAB operation?

Regarding the case b), we note that there is IAB-specific authorization procedure defined in NAS. So, from AS point of view, IAB-MT can determine that it is authorized only after receiving IAB-related RRC configuration.

**Question 5a: (Related to case a) Do you think there is indeed a case where IAB node accesses a cell not *broadcasting iab-Support indication* as if it is a normal UE.**

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| **Company** | **Answer (yes/no)** | **Comment** |
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If there is indeed a case where an IAB node accesses a cell not broadcasting iab-Support indication as if it is a normal UE, RAN2 should decide whether UAC and other access control mechanism should be applied to the IAB node.

* **Alt1**: IAB node accessing a cell not broadcasting *iab-Support* indication shall ignore UAC and other access control mechanisms *as it does on a cell broadcasting iab-Support indication*.
* **Alt2**: IAB node accessing a cell not broadcasting *iab-Support* indication shall apply UAC and other access control mechanisms *as normal UEs do*.
* **Others**: Please specify your preferred behaviours in the table below as part of your company comments.

**Question 5b: If answer to question5a is yes, companies are requested to express views on the preferred alternative.**

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| **Company** | **Preferred alternative** | **Comments** |
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**Question 6: (Related to case b) Do you agree that a device be able to bypass UAC even before it is configured to operate as IAB?**

## Other issue?

**Question 7: Companies are requested to provide view on any other issue related to UAC and cause value handling, which is essential to complete IAB WI.**

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| **Company** | **Issue** | **Suggested changes to RAN2 specs** |
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# Summary

**FFS**

# Reference

**[1] R2-2005992** Reply LS on UAC applicability to IABs (S1-202274; contact: Nokia) SA1 LS in Rel-16 NR\_IAB-Core To:RAN2, CT1 Cc:RAN3, SA2

**[2]** [**R2-2005525**](file:///D:\Documents\3GPP\tsg_ran\WG2\TSGR2_110-e\Docs\R2-2005525.zip) Clarification on the cause value and not supporting UAC for IAB [ToDo RIL H697] Huawei, HiSilicon discussion Rel-16 NR\_IAB-Core

**[3] R2-2005653** Clarification of access control bypasssing LG France discussion Rel-16

# Annex. A

## Definitions in TS 38.300

**IAB-MT**: IAB-node function that terminates the Uu interface to the parent node using the procedures and behaviours specified for UEs unless stated otherwise. IAB-MT function used in 38series of 3GPP Specifications corresponds to IAB-UE function defined in TS 23.501 [3].

**IAB-node**: RAN node that supports NR access links to UEs and NR backhaul links to parent nodes and child nodes. The IAB-node does not support backhauling via LTE.

# Annex. B

## Mapping between RRC causes and Access Identities/Classes

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| Rule # | Access identities | Access categories | RRC establishment cause is set to |
| 1 | 1 | Any category | mps-PriorityAccess |
| 2 | 2 | Any category | mcs-PriorityAccess |
| 3 | 11, 15 | Any category | highPriorityAccess |
| 4 | 12,13,14, | Any category | highPriorityAccess |
| 5 | 0 | 0 (= MT\_acc) | mt-Access |
| 1 (= delay tolerant) | Not applicable (NOTE 1) |
| 2 (= emergency) | emergency |
| 3 (= MO\_sig) | mo-Signalling |
| 4 (= MO MMTel voice) | mo-VoiceCall |
| 5 (= MO MMTel video) | mo-VideoCall |
| 6 (= MO SMS and SMSoIP) | mo-SMS |
| 7 (= MO\_data) | mo-Data |
| 9 (= MO IMS registration related signalling) | mo-Data |
| NOTE 1: A UE using access category 1 for the access barring check will determine a second access category in the range 3 to 7 that is to be used for determination of the RRC establishment cause. See subclause 4.5.2, table 4.5.2.2, NOTE 6.  NOTE 2: See subclause 4.5.2, table 4.5.2.1 for use of the access identities of 0, 1, 2, and 11-15. | | | |

# Annex. C Text Proposal for option 2.

### 5.3.13 RRC connection resume

#### 5.3.13.1 General



Figure 5.3.13.1-1: RRC connection resume, successful



Figure 5.3.13.1-2: RRC connection resume fallback to RRC connection establishment, successful



Figure 5.3.13.1-3: RRC connection resume followed by network release, successful



Figure 5.3.13.1-4: RRC connection resume followed by network suspend, successful



Figure 5.3.13.1-5: RRC connection resume, network reject

The purpose of this procedure is to resume a suspended RRC connection, including resuming SRB(s) and DRB(s) or perform an RNA update.

#### 5.3.13.1a Conditions for resuming RRC Connection for NR sidelink communication

For NR sidelink communication an RRC connection is resumed only in the following cases:

1> if configured by upper layers to transmit NR sidelink communication and related data is available for transmission:

2> if the frequency on which the UE is configured to transmit NR sidelink communication concerns the camped frequency; and if *SIB12* is provided by the cell on which the UE camps; and if the valid version of *SIB12* does not include *sl-TxPoolSelectedNormal* for the frequency; or

2> if the frequency on which the UE is configured to transmit NR sidelink communication is included in *sl-FreqInfoList* within *SIB12* provided by the cell on which the UE camps; and if the valid version of *SIB12* does not include *sl-TxPoolSelectedNormal* for the concerned frequency;

For V2X sidelink communication an RRC connection resume is initiated only when the conditions specified for V2X sidelink communication in subclause 5.3.3.1a of TS 36.331 [10] are met.

NOTE: Upper layers initiate an RRC connection resume. The interaction with NAS is left to UE implementation.

#### 5.3.13.2 Initiation

The UE initiates the procedure when upper layers or AS (when responding to RAN paging or upon triggering RNA updates while the UE is in RRC\_INACTIVE) requests the resume of a suspended RRC connection.

The UE shall ensure having valid and up to date essential system information as specified in clause 5.2.2.2 before initiating this procedure.

Upon initiation of the procedure, the UE shall:

1> if the resumption of the RRC connection is triggered by response to NG-RAN paging:

2> if the resumption of the RRC connection is not for IAB-MT;

3> select '0' as the Access Category;

3> perform the unified access control procedure as specified in 5.3.14 using the selected Access Category and one or more Access Identities provided by upper layers;

4> if the access attempt is barred, the procedure ends;

1> else if the resumption of the RRC connection is triggered by upper layers:

2> if the upper layers provide an Access Category and one or more Access Identities:

3> perform the unified access control procedure as specified in 5.3.14 using the Access Category and Access Identities provided by upper layers;

4> if the access attempt is barred, the procedure ends;

2> set the *resumeCause* in accordance with the information received from upper layers;

1> else if the resumption of the RRC connection is triggered due to an RNA update as specified in 5.3.13.8:

2> if an emergency service is ongoing:

NOTE: How the RRC layer in the UE is aware of an ongoing emergency service is up to UE implementation.

3> select '2' as the Access Category;

3> set the *resumeCause* to *emergency*;

2> else:

3> if the resumption of the RRC connection is not for IAB-MT;

4> select '8' as the Access Category;

2> perform the unified access control procedure as specified in 5.3.14 using the selected Access Category and one or more Access Identities to be applied as specified in TS 24.501 [23];

3> if the access attempt is barred:

4> set the variable *pendingRNA-Update* to *true*;

4> the procedure ends;

1> if the UE is in NE-DC or NR-DC:

2> if the UE does not support maintaining SCG configuration upon connection resumption:

3> release the MR-DC related configurations (i.e., as specified in 5.3.5.10) from the UE Inactive AS context, if stored;

1> if the UE does not support maintaining the MCG SCell configurations upon connection resumption:2> release the MCG SCell(s) from the UE Inactive AS context, if stored;

1> apply the default L1 parameter values as specified in corresponding physical layer specifications, except for the parameters for which values are provided in *SIB1*;

1> apply the default SRB1 configuration as specified in 9.2.1;

1> apply the default MAC Cell Group configuration as specified in 9.2.2;

1> release *delayBudgetReportingConfig* from the UE Inactive AS context, if stored;

1> stop timer T342, if running;

1> release *overheatingAssistanceConfig* from the UE Inactive AS context, if stored;

1> stop timer T345, if running;

1> release *idc-AssistanceConfig* from the UE Inactive AS context, if stored;

1> release *drx-PreferenceConfig* from the UE Inactive AS context, if stored;

1> stop timer T346a, if running;

1> release *maxBW-PreferenceConfig* from the UE Inactive AS context, if stored;

1> stop timer T346b, if running;

1> release *maxCC-PreferenceConfig* from the UE Inactive AS context, if stored;

1> stop timer T346c, if running;

1> release *maxMIMO-LayerPreferenceConfig* from the UE Inactive AS context, if stored;

1> stop timer T346d, if running;

1> release *minSchedulingOffsetPreferenceConfig* from the UE Inactive AS context, if stored;

1> stop timer T346e, if running;

1> release *releasePreferenceConfig* from the UE Inactive AS context, if stored;

1> stop timer T346f, if running;

1> apply the CCCH configuration as specified in 9.1.1.2;

1> apply the *timeAlignmentTimerCommon* included in *SIB1*;

1> start timer T319;

1> set the variable *pendingRNA-Update* to *false*;

1> initiate transmission of the *RRCResumeRequest* message or *RRCResumeRequest1* in accordance with 5.3.13.3.