**3GPP TSG RAN WG2 Meeting #129bis R2-250xxxx**

Wuhan, China, April 7th– 11th, 2025

Agenda Item: 8.2.4

Source: Xiaomi

Title: Report of [POST129][036][AIoT] AS ID (Xiaomi)

Document for: Discussion and Decision

# Introduction

This report provides a summary for the following post-meeting email discussion:

* [POST129][036][AIoT] AS ID (Xiaomi)

 Intended outcome: Discuss the pros/cons of the related CFRA and CBRA options and validity of AS ID

 Deadline: long

Rapporteurs would suggest to have two phases discussion:

**Phase 1**: Companies are invited to provide comments/inputs on the pros/cons of each option for CFRA/CBRA and validity of AS ID.

Deadline for providing comments for phase 1 is March 14th, 2025, 10:00UTC.

**Phase 2**: Rapporteur will provide summary based on the inputs from companies in Phase 1. Companies are invited to provide comment on the summary and new questions from Rapporteur.

Deadline for providing comments for phase 2 is March 20th, 2025, 10:00UTC.

Companies providing input to this email discussion are requested to leave contact information below.

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| **Company** | **Name** | **Email Address** |
| ZTE | Eswar Vutukuri | eswar.vutukuri@zte.com.cn |
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# Phase 1 Discussion

## AS ID assignment for CFRA

Based on offline discussion “R2-2501510 [AT129][020][AIoT] AS ID (XiaomiHuawei)”, RAN2 discussed the need of AS ID for CFRA and candidate options for AS assignment for CFRA and concluded that:

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| 1. RAN2 assumes, AS ID is needed for CFRA at least for inventory + command procedure
2. For CFRA, if a valid AS ID is not already assigned, continue the discussion on AS-ID assignment based on the following options:
* Option 2: the device includes a random ID in “Msg 1”. And same as CBRA, it is up to Reader to decide whether to reuse the random ID as the AS ID or to assign a new AS ID.
* Option 3: New “Msg 2” for AS ID assignment, complementary option or independent from option 2
* Option 4: “Msg 2” (including the “Command”) for AS ID assignment, complementary option or independent from option 2
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During offline discussion, 4 options were listed as below, but option 1 has been precluded during online discussion.

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| **Option 1**: the reader assigns AS ID via Msg0 Paging**Option 2**: the device includes a random ID in Msg 1. And same as CBRA, it is up to Reader to decide whether to reuse the random ID as the AS ID or to assign a new AS ID.**Option 3**: New Msg 2 for AS ID assignment, complementary option or independent from option 2**Option 4**: Msg 2 (command) for AS ID assignment, complementary option or independent from option 2- Option 1: 4- Option 2: 7- Option 3: 8- Option 4: 11 |

In addition, based on the offline discussion, there was clear consensus that AS ID is needed for data transmission, i.e., Command procedure after inventory procedure. Therefore we may focus on whether AS ID can be used for Command procedure when analyse Option2-4.

As RAN2 concluded that “1. NACK based mechanism is supported for D2R messages to determine re-access for at least msg3.”, the successful Inventory+Command procedure for CFRA could be:



##### Q1-0: Do companies agree with the above AS ID assignment procedure for CFRA which will be used for further analysis?

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| **Company**  | **Yes/No** | **Remark (add your view if any)** |
| ZTE | Yes | Option s may be combined as already hinted above and option 2+4 would be something that would be similar to CBRA for instance.  |
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During online discussion and offline discussion, companies already explained the Pros/Cons of each option. Rapporteur try to summarize them as below:

**Option 2**: the device includes a random ID in Msg 1 (Inventory Response). Same as CBRA, it is up to Reader to decide whether to reuse the random ID as the AS ID or to assign a new AS ID (The assignment can be done via Option 3 or Option 4).

**Pros:**

* The random ID included in Msg1 (Inventory Response) can be used in “New Msg2” or “Msg 2 Command” to associate the resources and identify the device if the ID can be reused;
* If new ID is needed, the RN 16 indicated in Msg1 can be used to identify the device and associate with the resources.

**Cons**:

* Additional signalling overhead in Msg 1 (Inventory Response); But same content as Msg3 for CBRA if RAN2 agrees that AS ID is contained in D2R message if available. FFS on RN 16 collision case

##### Q1-1. Do companies agree the above analysis on Pros/Cons of option 2 (the device includes a random ID in Msg 1 (Inventory Response))?

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| **Company**  | **Yes/No** | **Remark (add your view if any)** |
| ZTE | Yes | The additional overhead I guess is there in MSG1, when compared to the case when there is no RN16 in MSG1 but UE directly includes UE ID. But, then the paging message needs to include ASID in the other option (i.e. option 1). It is worth clarifying hence what the additional signalling overhead is with respect to… |
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Regarding the impact of Msg 1 Inventory Response message, it is related to whether AS ID should be contained in D2R message. Rapporteur would like to check companies’ view on this.

##### Q1-2. Do companies see the need to contain AS-ID in D2R message when it is available?

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| **Company**  | **Yes/No** | **Remark (add your view if any)** |
| ZTE | Yes | Some sort of ID should be included in MSG1. It can be either RN16 or some other ID. So, whatever is the content of MSG1, it can be called ASID for this purpose.  |
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In addition, RAN2 has agreed that

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| For CBRA, it is up to Reader to decide whether to reuse the random ID as the AS ID or to assign a new AS ID. FFS how this is signalled, which message is used and size of AS ID.  |

If RN 16 can be reused as the AS ID, the size of AS ID should be same as RN 16, i.e. 16 bits. RAN2 discussed the issue during online discussion, but no conclusion. Rapporteur assumes to support max around 60000 devices, 16 bits ID is needed at least for CBRA. And it could be good to have common ID size for CFRA and CBRA.

##### Q1-3. Do companies agree that the AS ID size is same as RN 16, i.e. 16 bits for both CFRA and CBRA?

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| **Company**  | **Yes/No** | **Remark (add your view if any)** |
| ZTE | Yes | Having a fixed and uniform length of ID across all options would be simpler.  |
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Note: Q1-2 and Q1-3 are more or less related to RAN1 discussion on whether CRC is not needed. If AS ID is always contained in D2R message, the alternatives listed in option 1 cannot be met, i.e. only option 2 can work.

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| **R1-2501437** Summary #3 for coding aspects of physical channel design Moderator (CMCC)AgreementWhen CRC is attached to a PRDCH or PDRCH transmission, * When the number of information bits is ≤ X bits, CRC-6 is used. Otherwise, when the number of information bits is > X bits, CRC-16 is used. Down-selection by RAN1#120bis from the following for X considering the balance of overhead and probability of undetected error:
	+ Alt. 1: 24
	+ Alt. 2: 56
* FFS impact of segmentation, if any
	+ Note: impact may not be in RAN1

**R1-2501592** Summary #5 for coding aspects of physical channel design Moderator (CMCC)AgreementOne or both of the following options are supported to determine when no CRC is used,* Option 1: A threshold of number of information bits Y. When the number of information bits is ≤ Y bits, no CRC is used. Down-selection from the following for Y:
	+ Alt. 1: 16
	+ Alt. 2: 8
	+ Alt. 3: 6
* Option 2: Specified condition(s), e.g., device transmits PDRCH for Msg 1 upon receiving a PRDCH triggering random access. FFS specified condition(s) and/or how to determine the specified condition(s).
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**Option 3**: “New Msg” for AS ID assignment, work with/without option 2

**Pros**:

* The AS ID assigned in the “new Msg “can be used for “the first Command message, i.e. Msg 2 Comand message, and “subsequent R2D Command messages” to associate the resources and identify the device;
* No impact on Msg 1 (Inventory Response) if option 2 is not supported;

**Cons**:

* Additional delay/overhead/procedure due to the new message;
* Device ID needs to be contained in “new Msg” in order to identify the device, to associate with the newly assigned AS ID in new Msg if option 2 is not supported;

##### Q1-4. Do companies agree the above analysis on Pros/Cons of option 3 (“New Msg” for AS ID assignment)?

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| **Company**  | **Yes/No** | **Remark (add your view if any)** |
| ZTE | Yes, and… | One of the main disadvantages with these approaches is that the device procedure starts to diverge for various RACH options. i.e. the device has to follow different procedure between CBRA and CFRA. This should be captured as a Con.  |
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**Option 4**: Msg 2 (Command message) for AS ID assignment, work with/without option 2

**Pros**:

* The AS ID assigned in the “Msg 2 Command message “can be used for “Msg 4” and subsequent R2D Command message” to associate the resources and identify the device;
* No impact on Msg 1 (Inventory Response) if option 2 is not supported;
* Not need to introduce new procedures;

**Cons**:

* Device ID needs to be contained in “Msg2” in order to identify the device, to associate with the newly assigned AS ID in Msg2 if option 2 is not supported, i.e. AS ID cannot be used for the first Command message;

##### Q1-5. Do companies agree the above analysis on Pros/Cons of option 4 ( Msg 2 (Command message) for AS ID assignment)?

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| **Company**  | **Yes/No** | **Remark (add your view if any)** |
| ZTE | Yes |  |
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## AS ID assignment for CBRA

During the online discussion, RAN2 concluded that

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| **Agreements** 1. For CBRA, it is up to Reader to decide whether to reuse the random ID as the AS ID or to assign a new AS ID. FFS how this is signalled, which message is used and size of AS ID.
2. From device perspective, it is only required to use one AS ID.
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To assign a new AS ID, there were different options, e.g. AS ID is assigned in Msg2 together with RN 16, option 3 or 4 listed for CFRA.

The successful Inventory+Command procedure for CBRA is shown as below:



##### Q2-0: Do companies agree with the above AS ID assignment procedure for CBRA which will be used for further analysis?

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| **Company**  | **Yes/No** | **Remark (add your view if any)** |
| ZTE | Yes |  |
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During online discussion and offline discussion, companies already explained the Pros/Cons of each option. Rapporteur try to summarize them as below:

**Option 1**: Msg 2 for AS ID assignment;

**Pros:**

* The AS ID assigned in the “Msg2 “can be used for “the first Command message i.e. Msg 4 and subsquent Command messages” to associate the resources and identify the device;
* Not need to introduce new procedures

**Cons**:

* Additional signalling overhead in Msg 2, especially when multiplexing is supported;

##### Q2-1. Do companies agree the above analysis on Pros/Cons of option 1 (Msg 2 for AS ID assignment)?

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| **Company**  | **Yes/No** | **Remark (add your view if any)** |
| ZTE | Yes | Additional disadvantage is that assigning ASID in MSG2 unnecessarily impacts inventory procedure and yet for inventory purpose, reader assigned ASID is not useful/necessary.  |
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**Option 3 (reuse the number of CFRA)**: “New Msg” for AS ID assignment

**Pros**:

* The AS ID assigned in the “new Msg “can be used for “the first Command message, i.e. Msg 4 Comand message, and “subsequent R2D Command messages” to associate the resources and identify the device;
* No impact on Msg 2;

**Cons**:

* Additional delay/overhead/procedure due to the new message;
* Device ID or RN16 needs to be contained in “new Msg” in order to identify the device, to associate with the newly assigned AS ID in the new Msg; FFS on RN 16 collision case

##### Q2-2. Do companies agree the above analysis on Pros/Cons of option 3 (“New Msg” for AS ID assignment)?

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| **Company**  | **Yes/No** | **Remark (add your view if any)** |
| ZTE | Yes |  |
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**Option 4 (reuse the number of CFRA)**: Msg 4 (First Command message) for AS ID assignment

**Pros**:

* The AS ID assigned in the “Msg 4 Command message “can be used for “Msg 6” and subsequent R2D Command message” to associate the resources and identify the device;
* No impact on Msg 2;
* Not need to introduce new procedures;

**Cons**:

* Device ID or RN16 needs to be contained in “Msg 4 Command message” in order to identify the device, to associate with the newly assigned AS ID in the new Msg; FFS on RN 16 collision case
* The reader has to reuse RN16 or device ID for the first Command message;

##### Q2-3. Do companies agree the above analysis on Pros/Cons of option 4 ( Msg 4 (First Command message) for AS ID assignment)?

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| **Company**  | **Yes/No** | **Remark (add your view if any)** |
| ZTE | Yes |  |
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## Validity of AS ID

In last RAN2 meeting, validity of AS ID was discussed during offline discussion. But different from the discussion on AS ID assignment, we did not discuss the details of each option. Based on the options mentioned by companies during offline discussion, and proposals from companies in their contributions, Rapporteur listed following options for further discussion.

**Option 1**: The device releases the AS ID upon receiving Paging with new transaction id, i.e. different session/service

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| **Company** | **Arguments** |
| IDC R2-2500495 | Instead, release could be based on reception of a specific D2R message such as the occasion start message or paging message,Once a device has determined/stored its AS ID, it should remember it for a finite period. Specifically, use of the same AS ID indefinitely may pose a security risk. Furthermore, we can expect that the storage of the AS ID may consume some energy at the device, and it should be avoided if unnecessary.  |
| Xiaomi R2-2500253  | • Reception of paging message with a different session ID |
| Lenovo R2-2500387 | Slightly negativeFor opt2, the device may maintain more than one AS ID if re-access is triggered in the same round, which may then cause misalignment between reader and device. |

Considering we did not discuss the details of the option during the meeting, Rapporteur would like to collect companies’ view on the Pros/Cons of the option.

##### Q3-1. Companies are invited to provide Pros/Cons for option 1 (The device releases the AS ID upon receiving Paging with new transaction id).

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| **Company**  | **Pros/Cons** |
| ZTE | If this is the only way to release the ASID, then the problem is for the case where the device misses the paging message. Can the reader then reuse the ASID for a different device without impacting the other devices (across paging cycles) or not? i.e. the protocol seems to rely on all devices correctly receiving the paging messages all the time, which is not preferrable.  |
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**Option 2**: The device releases the AS ID upon timer expiry; The Timer could be configured by the reader, or pre-defined in the specification;

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| **Company** | **Arguments** |
| Vivo R2-2500131 | Furthermore, the AS ID can also be released based on a pre-defined/configured timer expiry. The timer will be restarted upon each R2D/D2R transmission and separate timers can be maintained at both device and reader side. When timer expires, the AS ID is released respectively at device and reader side without explicit release signaling. |
| Lenovo R2-2500387 | NegativeFor opt4, it may be difficult to configure a suitable timer value considering the service time is dynamic. |
| Panasonic R2-2500672  | Negative on timerThere was another proposal in previous meeting to introduce a timer for the validity of AS ID. However, in our view, such scheme is not preferred because it further increases the complexity of AS ID maintenance in device and it is difficult to set the appropriate timer value.Positive on predefined timer?**The device shall keep volatile memory contents including AS ID for the certain duration.** |

Considering we did not discuss the details of the option during the meeting, Rapporteur would like to collect companies’ view on the Pros/Cons of the option.

##### Q3-2. Companies are invited to provide Pros/Cons for option 2 (The device releases the AS ID upon timer expiry, predefined or configured timer).

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| **Company**  | **Pros/Cons** |
| ZTE | The advantage of this is that this doesn’t rely on the devices receiving (or not receiving) certain messages. The disadvantage is that the device needs to maintain a timer. But, we think the device will need to have the means to maintain some (even if coarse) timers for other AS purposes anyway. |
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**Option 3**: The device releases the AS ID upon receiving new assigned AS ID from the Reader

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| **Company** | **Arguments** |
| Lenovo R2-2500387 | **Proposal 12:** From device side, AS ID is valid until reader assigns a new AS ID. From reader side, it’s up to reader implementation to determine the validity of AS ID. |

Considering we did not discuss the details of the option during the meeting, Rapporteur would like to collect companies’ view on the Pros/Cons of the option.

##### Q3-3. Companies are invited to provide Pros/Cons for option 3 (The device releases the AS ID upon receiving new assigned AS ID from the Reader).

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| **Company**  | **Pros/Cons** |
| ZTE | This can work but it is unclear why we need to assign a new ID and release the previous one. The device ID can simply be released (without assigning a new one), otherwise, ASIDs will be occupied unnecessarily.  |
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**Option 4a**: The device releases the AS ID upon reaching the max number of received Command Messages

Collected via offline discussion.

Considering we did not discuss the details of the option during the meeting, Rapporteur would like to collect companies’ view on the Pros/Cons of the option.

##### Q3-4a. Companies are invited to provide Pros/Cons for option 4a (The device releases the AS ID upon reaching the max number of received Command Messages).

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| **Company**  | **Pros/Cons** |
| ZTE | Not sure what the advantage of this is compared to other options.  |
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**Option 4b**: The device releases the AS ID after completion of the command procedure

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| **Company** | **Arguments** |
| IDC R2-2500495 | As a result, the device could release the AS ID after completion of the command procedure. If multiple commands need to be issued to the device, such approach may be cumbersome.  |
| Xiaomi R2-2500253  | * ***Complete the transmission of the D2R response to a “command”***
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| CATT R2-2500272 | Proposal 3b: The device should release the AS ID, if it determines the service is completed.If the device confirms that it had completed the service triggered by the reader, the device should release the AS ID.So this optional feedback indication can be used by the device to determine the successful reception of the last data transmission by the reader, i.e., the service has been completed by the device. |

Considering we did not discuss the details of the option during the meeting, Rapporteur would like to collect companies’ view on the Pros/Cons of the option.

##### Q3-4b. Companies are invited to provide Pros/Cons for option 4b (The device releases the AS ID after completion of the command procedure).

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| **Company**  | **Pros/Cons** |
| ZTE | The advantage is that there is a well defined message to release the ASID and hence the reader and device can be always in syncThe disadvantage is that this message may be missed by the device. In which case, we need to discuss whether we also need a timer or not. i.e. it is unclear whether we can solely rely on a reader based mechanism when the DL message may be missed.  |
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**Option 5**: The device releases the AS ID upon power off

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| **Company** | **Arguments** |
| Xiaomi R2-2500253  | * ***when the device is powered off, all information stored in the register memory needs to be cleared including the AS ID.***
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Considering we did not discuss the details of the option during the meeting, Rapporteur would like to collect companies’ view on the Pros/Cons of the option.

##### Q3-5. Companies are invited to provide Pros/Cons for option 5 (The device releases the AS ID upon power off).

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| **Company**  | **Pros/Cons** |
| ZTE | This is needed anyway. I guess ASID is in volatile memory and whenever the device runs out of power, the ASID is released. So, regardless of pros and cons, we have to discuss how the protocol should actually support this case (i.e. this is something the protocol has to live with).  |
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**Option 6**: The device releases the AS ID upon receiving explicit release indication from the Reader

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| **Company** | **Arguments** |
| Vivo R2-2500131 | Explicit release indication from reader is the most straightforward solution, e.g., upon reader reception of service ending indication from CN. |
| IDC R2-2500495 | we could rely on an explicit indication by the reader (e.g., included with the data transmission scheduling).  |
| Lenovo R2-2500387 | NegativeFor opt5, it may be unnecessary to use an explicit indication (e.g., AS ID release indication). |

Considering we did not discuss the details of the option during the meeting, Rapporteur would like to collect companies’ view on the Pros/Cons of the option.

##### Q3-6. Companies are invited to provide Pros/Cons for option 6 (The device releases the AS ID upon receiving explicit release indication from the Reader).

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| **Company**  | **Pros/Cons** |
| ZTE | Need for an explicit message is unclear (e.g. if implicit release upon completion of certain procedures is sufficient).  |
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##### Q3-7. Companies are invited to add if any options are missing.

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| **Company**  | **New options** |
| ZTE | Combination of some of the options above. e.g. a reader-based release (either implicitly or explicitly) + device releasing it upon expiry of a timer (e.g. like an inactivity timer). Pros: This works for all cases and covers the cases where the R2D message is missed by the device  |
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## Others

Rapporteur would like to check companies’ view on whether any other aspects need to be considered in this email discussion.

##### Q4-1: Any other aspects on AS-ID need to be considered in this email discussion?

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| **Company**  | **Comment**  |
| ZTE | One of the requirements for ASID management is for the reader to have a well-known point when the ASID can be reassigned/reused. There should be no ambiguity at the reader whether the ASID is still in use by some other device or if it is released and hence can be reused for a different UE.  |
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# Phase 2 Discussion

After phase 1 discussion, Rapporteur will provide summary based on the inputs from companies during Phase 1. Companies are invited to provide further comment on the summary and new questions from Rapporteur.

# Conclusion

# Reference

[1] R2-2501510 [AT129][020][AIoT] AS ID (XiaomiHuawei) Xiaomi, Huawei

[2] R2-2500131 AIoT Data Transmission vivo

[3] R2-2500495 Data Transmission and General Aspects for Ambient IOT InterDigital

[4] R2-2500253 Protocol design principle and considerations on Data transmission Xiaomi

[5] R2-2500272 Discussion on the A-IoT Data Transmission and Other General Aspects CATT

[6] R2-2500387 Discussion on A-IoT data transmission and other general aspects Lenovo

[7] R2-2500672 Discussion on AS ID, segmentation and control signaling format Panasonic

# Annex – RAN2 AS ID related agreements

RAN2 #127 meeting

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| **Agreements on AS ID**1. RAN2 assumes that if “AS ID” is defined it is used at least for purpose of D2R scheduling and R2D reception. Up to RAN1 to decide whether a “AS ID” is defined.
2. RAN2 assumes this “AS ID” should be a short AS layer ID, rather than the full upper layer device ID. FFS on the length. FFS if AS ID can be based on partial upper layer device ID.
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RAN2 #129 meeting

**Agreements**

1. NACK based mechanism is supported for D2R messages to determine re-access for at least msg3. FFS details including whether we need a timer or explicit message and when reader sends feedback

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| **Agreements** 1. For CBRA, it is up to Reader to decide whether to reuse the random ID as the AS ID or to assign a new AS ID. FFS how this is signalled, which message is used and size of AS ID.
2. From device perspective, it is only required to use one AS ID.
3. CFRA is not supported for group ID
4. RAN2 assumes, AS ID is needed for CFRA at least for inventory + command procedure
5. For CFRA, if a valid AS ID is not already assigned, continue the discussion on AS-ID assignment based on the following options:
* Option 2: the device includes a random ID in “Msg 1”. And same as CBRA, it is up to Reader to decide whether to reuse the random ID as the AS ID or to assign a new AS ID.
* Option 3: New “Msg 2” for AS ID assignment, complementary option or independent from option 2
* Option 4: “Msg 2” (including the “Command”) for AS ID assignment, complementary option or independent from option 2
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