3GPP TSG-RAN WG2 Meeting #114-e Tdoc R2- 210XXXX

Electronic meeting, May 19th - 27th, 2021

Agenda Item: 9.2.3

Source: Ericsson

Title: [Pre114-e][006][IoT NTN] Summary of 9.2.3 Other Open Issues (Ericsson)

Document for: Discussion, Decision

# 1 Introduction

In this document, we present a summary of the documents submitted under AI 9.2.3 Other Open Issues.

# 2 Discussion

## 2.1 Paging Capacity Evaluation

The following proposals were made in [2], [4], [8] and [9] regarding paging capacity evaluation:

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| --- | --- |
| Tdoc | Proposals |
| R2-2105223 [2] | Proposal 1: Impact of extended coverage on paging capacity should be considered while determining the maximum coverage extension for IoT-NTN cell.  Proposal 2: Tracking area dimensioning of IoT-NTN network shall consider the percentage of mobile IoT devices within system and its impact on paging capacity.  Proposal 3: The text proposal given in Annexure A is considered for inclusion in TR 36.373 |
| R2-2105371 [4] | Proposal 1: RAN2 can discuss and capture the above paging capacity evaluation results in Table 2 and Table 3 into 36.763. |
| R2-2105662 [8] | We propose to capture the calculations and results in the TR. |
| R2-2106169 [9] | Proposal 1 Capture the text proposal on paging capacity in Annex 7.1. |

Rapporteur’s summary:

Further discussion is required to finalize the text to be captured in TR 36.373 on paging capacity evaluation. This could be done offline during and after the electronic meeting, however it would be beneficial if companies have an online discussion on the structure of the evaluation, e.g., adopting one of the proposed text as the baseline, and on aspects such as UE density, arrival session rate, percentage of UEs in the cell expecting network originated traffic etc.

1. Discuss which paging capacity evaluation can be adopted as a baseline considering the aspects such as UE density, arrival session rate, percentage of UEs in the cell expecting network originated traffic.
2. Discuss offline to finalize the text to be captured in the TR on paging capacity evaluation.

## 2.2 Radio Link Failure & RRC Re-establishment

The following proposals were made in [1], [6], [7] and [10] regarding Radio Link Failure & RRC Re-establishment:

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| --- | --- |
| Tdoc | Proposals |
| R2-2104856 [1] | Proposal 1: RAN2 don’t need any new RLF triggers in IOT over NTN.  Proposal 2: RAN2 can consider how to avoid that the IDLE UE connected to the satellite which has insufficient servicing time. |
| R2-2106247 [10] | Proposal 1: it is proposed to introduce the conditional RRC connection re-establishment procedure which configures the procedure triggering condition and target cells to the UE beforehand.  Proposal 2: the conditional RRC connection re-establishment condition setting and execution, can base on the ephemeris information and UE’s location, which can be clarified as the following conditions to trigger the RRC connection re-establishment procedure as for CHO:   * Time, timer or time range based C-Re-establishment triggering event * Location based C-Re-establishment triggering event   Proposal 3: the group Re-establishment mechanism as for group HO is required to study for NB-IoT UEs as well. |
| R2-2105461 [6] | Proposal 1: Network can provide satellite assistance information to indicate the target cell of RRC reestablishment before the RLF occurs, which can include frequency information, PLMN, PCI and so on. |
| R2-2105545 [7] | Proposal 2: A time-based trigger condition for triggering RLF can be considered in IOT over NTN. |

Rapporteur’s summary:

Potential enhancements to RLF and RRC re-establishment mechanisms in IoT NTNs, including conditional triggering, have been discussed with the context of essential functionality, but no consensus has been reached.

1. Discuss whether new triggering events based on time and location are introduced for RLF and RRC re-establishment mechanisms in IoT NTN.
2. Discuss whether RAN2 should study if a mechanism for RRC re-establishment is introduced for a group of UEs.
3. Discuss whether satellite assistance information indicates the target cell for RRC re-establishment prior to RLF.

## 2.3 Discontinuous Coverage

The following proposals were made in [3] regarding discontinuous coverage:

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| --- | --- |
| Tdoc | Proposals |
| R2-2105254 [3] | Proposal 1: Satellite ephemeris orbital is used for long-term prediction of satellite position for UE wake up from idle DRX for next satellite fly-by  Proposal 2: The lowest level of knowledge in network of when a UE will be in coverage of a satellite is the time when the UE last accessed the satellite cell.  Proposal 3: The network should page the UE at the right time when  (a) UE enters active period of idle DRX / PSM;  (b) UE is within coverage. |

Rapporteur’s summary:

Considering that contributions on discontinuous coverage are discussed in AI 9.2.2, rapporteur suggests moving this Tdoc from this AI to AI 9.2.2

1. Discuss the following proposals in R2-2105254 within the context of “Discontinuous Coverage and Power Savings” in AI 9.2.2.

Proposal 1: Satellite ephemeris orbital is used for long-term prediction of satellite position for UE wake up from idle DRX for next satellite fly-by

Proposal 2: The lowest level of knowledge in network of when a UE will be in coverage of a satellite is the time when the UE last accessed the satellite cell.

Proposal 3: The network should page the UE at the right time when

(a) UE enters active period of idle DRX / PSM;

(b) UE is within coverage.

## 2.4 Connection Density Evaluation

The following proposal was made in [9] regarding connection density evaluation:

|  |  |
| --- | --- |
| Tdoc | Proposals |
| R2-2106169 [9] | Proposal 2 Capture the text proposal on connection density in Annex 7.3. |

Rapporteur’s summary:

If there is consensus on capturing the connection density evaluation in TR 36.373, further discussion is required to finalize the text. This could be done offline during and after the electronic meeting,

1. Discuss whether connection density evaluation is captured in TR 36.373.
2. If Proposal 7 is agreed, discuss offline to finalize the text to be captured in the TR on connection density evaluation.

## 2.5 Tracking Area Update

The following proposals were made in [11] regarding tracking area update:

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| --- | --- |
| Tdoc | Proposals |
| R2-2106250 [11] | Proposal 1: it is proposed that the NTN-IoT UEs determine the TA based on the broadcast information (the use of other information is not excluded). And the network may broadcast more than one TAC per PLMN in a cell, which is to up to network implementation.  Proposal 2: it is proposed to prefer the implicit manner to let the UE be aware of the network stops broadcasting a TAC. |

Rapporteur’s summary:

Please see below for an attempt to clarify and reformulate the proposals from [11]:

1. NTN-IoT UEs determine the TA based on the broadcast information (the use of other information is not excluded).
2. More than one TAC per PLMN can be broadcasted in a cell, i.e., this is up to network implementation.
3. No need to send a notification for system information update when it is stopped to broadcast a TAC.

## 2.6 System Information Acquisition

The following proposals were made in [5] system information acquisition:

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| --- | --- |
| Tdoc | Proposals |
| R2-2105430 [5] | Proposal 1 For eMTC and NB-IoT in NTN, existing SIB acquisition procedure of TN is baseline.  Proposal 2 For eMTC and NB-IoT, support area specific SIB acquisition as an option to reduce frequency of SIB acquisitions. |

Rapporteur’s summary:

Considering that system information acquisition is also discussed in AI 9.2.2, rapporteur suggests merging the discussion in AI 9.2.2 or AI 9.2.3 for potential treatment during the meeting.

1. For eMTC and NB-IoT in NTN, existing SIB acquisition procedure of TN is baseline.
2. For eMTC and NB-IoT, support area specific SIB acquisition as an option to reduce frequency of SIB acquisitions.

## 2.7 Connected mode related issues

The following proposals were made in [6] regarding the connected mode related issues:

|  |  |
| --- | --- |
| Tdoc | Proposals |
| R2-2105461 [6] | Proposal 2: Common assistance information can be provided to UE in a broadcast manner.  Proposal 3: Location based measurement event should be considered in eMTC NTN.  Proposal 4: In eMTC NTN, propagation delay differences should be considered while measuring neighbor cells from different satellites.  Proposal 5: The agreements on measurement achieved in NR NTN can be the baseline for measurement enhancement in eMTC NTN. |
|  |  |

Rapporteur’s summary:

The following proposals can be discussed:

1. Common assistance information can be provided to UE in a broadcast manner.
2. Location based measurement event should be considered in eMTC NTN.
3. In eMTC NTN, propagation delay differences should be considered while measuring neighbour cells from different satellites.
4. The agreements on measurement achieved in NR NTN can be the baseline for measurement enhancement in eMTC NTN.

## 2.8 Cell re-selection

The following proposal was made in [7] regarding the connected mode related issues:

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| --- | --- |
| Tdoc | Proposals |
| R2-2105545 [7] | Proposal 1: The existing Qoffset can be reused for cell re-selection between TN and NTN. |

Rapporteur’s summary:

The following proposal can be discussed:

1. The existing Qoffset is used for cell re-selection between TN and NTN.

## 2.9 Random access capacity evaluation

The following proposal was made in [9] regarding the random access capacity evaluation:

|  |  |
| --- | --- |
| Tdoc | Proposals |
| R2-2106169 [9] | Proposal 3 Capture the text proposal on random access capacity in the TR. |

Rapporteur’s summary:

If there is consensus on capturing the random-access capacity evaluation in TR 36.373, further discussion is required to finalize the text. This could be done offline during and after the electronic meeting,

1. Discuss whether random access capacity evaluation is captured in TR 36.373.
2. If Proposal 19 is agreed, discuss offline to finalize the text to be captured in the TR on random access capacity evaluation.

# 3 Conclusion

In this contribution we present a summary of the documents submitted under AI 9.2.3 Other Open Issues.Based on the discussion in the previous sections we propose the following:

[Proposal 1 Discuss which paging capacity evaluation can be adopted as a baseline considering the aspects such as UE density, arrival session rate, percentage of UEs in the cell expecting network originated traffic.](#_Toc72127708)

[Proposal 2 Discuss offline to finalize the text to be captured in the TR on paging capacity evaluation.](#_Toc72127709)

[Proposal 3 Discuss whether new triggering events based on time and location are introduced for RLF and RRC re-establishment mechanisms in IoT NTN.](#_Toc72127710)

[Proposal 4 Discuss whether RAN2 should study if a mechanism for RRC re-establishment is introduced for a group of UEs.](#_Toc72127711)

[Proposal 5 Discuss whether satellite assistance information indicates the target cell for RRC re-establishment prior to RLF.](#_Toc72127712)

[Proposal 6 Discuss the following proposals in R2-2105254 within the context of “Discontinuous Coverage and Power Savings” in AI 9.2.2.](#_Toc72127713)

[Proposal 1: Satellite ephemeris orbital is used for long-term prediction of satellite position for UE wake up from idle DRX for next satellite fly-by](#_Toc72127714)

[Proposal 2: The lowest level of knowledge in network of when a UE will be in coverage of a satellite is the time when the UE last accessed the satellite cell.](#_Toc72127715)

[Proposal 3: The network should page the UE at the right time when](#_Toc72127716)

[(a) UE enters active period of idle DRX / PSM;](#_Toc72127717)

[(b) UE is within coverage.](#_Toc72127718)

[Proposal 7 Discuss whether connection density evaluation is captured in TR 36.373.](#_Toc72127719)

[Proposal 8 If Proposal 7 is agreed, discuss offline to finalize the text to be captured in the TR on connection density evaluation.](#_Toc72127720)

[Proposal 9 NTN-IoT UEs determine the TA based on the broadcast information (the use of other information is not excluded).](#_Toc72127721)

[Proposal 10 More than one TAC per PLMN can be broadcasted in a cell, i.e., this is up to network implementation.](#_Toc72127722)

[Proposal 11 No need to send a notification for system information update when it is stopped to broadcast a TAC.](#_Toc72127723)

[Proposal 12 For eMTC and NB-IoT in NTN, existing SIB acquisition procedure of TN is baseline.](#_Toc72127724)

[Proposal 13 For eMTC and NB-IoT, support area specific SIB acquisition as an option to reduce frequency of SIB acquisitions.](#_Toc72127725)

[Proposal 14 Common assistance information can be provided to UE in a broadcast manner.](#_Toc72127726)

[Proposal 15 Location based measurement event should be considered in eMTC NTN.](#_Toc72127727)

[Proposal 16 In eMTC NTN, propagation delay differences should be considered while measuring neighbour cells from different satellites.](#_Toc72127728)

[Proposal 17 The agreements on measurement achieved in NR NTN can be the baseline for measurement enhancement in eMTC NTN.](#_Toc72127729)

[Proposal 18 The existing Qoffset is used for cell re-selection between TN and NTN.](#_Toc72127730)

[Proposal 19 Discuss whether random access capacity evaluation is captured in TR 36.373.](#_Toc72127731)

[Proposal 20 If Proposal 19 is agreed, discuss offline to finalize the text to be captured in the TR on random access capacity evaluation.](#_Toc72127732)

# References

1. [R2-2104856](http://ftp.3gpp.org/tsg_ran/WG2_RL2/TSGR2_114-e/Docs/R2-2104856.zip) Discussion on RLF mechanism of IOT over NTN CATT Rel-17
2. [R2-2105223](http://ftp.3gpp.org/tsg_ran/WG2_RL2/TSGR2_114-e/Docs/R2-2105223.zip) On Paging Capacity Evaluation for IoT-NTN Nokia, Nokia Shanghai Bells Rel-17
3. [R2-2105254](http://ftp.3gpp.org/tsg_ran/WG2_RL2/TSGR2_114-e/Docs/R2-2105254.zip) On Discontinuous coverage in IoT-NTN MediaTek Inc. Rel-17
4. [R2-2105371](http://ftp.3gpp.org/tsg_ran/WG2_RL2/TSGR2_114-e/Docs/R2-2105371.zip) Paging capacity evaluation for IoT NTN ZTE Corporation, Sanechips Rel-17
5. [R2-2105430](http://ftp.3gpp.org/tsg_ran/WG2_RL2/TSGR2_114-e/Docs/R2-2105430.zip) Enhancement to SIB acquisition Qualcomm Incorporated discussion Rel-17
6. [R2-2105461](http://ftp.3gpp.org/tsg_ran/WG2_RL2/TSGR2_114-e/Docs/R2-2105461.zip) Connected mode related issues in IoT NTN Xiaomi Communications discussion
7. [R2-2105545](http://ftp.3gpp.org/tsg_ran/WG2_RL2/TSGR2_114-e/Docs/R2-2105545.zip) Discussion on the issue of mobility for IoT over NTN Spreadtrum Communications
8. [R2-2105662](http://ftp.3gpp.org/tsg_ran/WG2_RL2/TSGR2_114-e/Docs/R2-2105662.zip) Paging evaluation for NTN IOT Huawei, HiSilicon Rel-17
9. [R2-2106169](http://ftp.3gpp.org/tsg_ran/WG2_RL2/TSGR2_114-e/Docs/R2-2106169.zip) Connection density evaluation for IoT NTN devices Ericsson Rel-17
10. [R2-2106247](http://ftp.3gpp.org/tsg_ran/WG2_RL2/TSGR2_114-e/Docs/R2-2106247.zip) RLF-based NB-IoT mobility in IoT-NTN CMCC Rel-17
11. [R2-2106250](http://ftp.3gpp.org/tsg_ran/WG2_RL2/TSGR2_114-e/Docs/R2-2106250.zip) Discussion on TA Update for IoT-NTN CMCC Rel-17