3GPP TSG-RAN WG2 #110e R2-20xxxxx

Online, June 01 – 12, 2020

Agenda Item: 6.8.2.3

Source: Ericsson

Title: [AT110-e][612][POS] TRP-ID continuation (Ericsson)

Document for: Discussion, Decision

# 1 Introduction

This document summarizes the following email discussion:

* [AT110-e][612][POS] TRP-ID continuation (Ericsson)

      Scope: Continue discussion of the open issues from R2-2004704 and converge where possible.  Open issues identified:

* Name of the integer identifier for a TRP
* Unique identification of a DL-PRS resource between the UE and the LMF
* Need for an additional identifier in the measurement information
* Need for a cell identifier in DL-PRS assistance data
* Need for a cell identifier in UE-based assistance data

      Intended outcome: Report of discussion, in R2-2005894

      Deadline:  Thursday 2020-06-04 1800 UTC

Section 2 continues the email discussion on TRP-ID based on the summary and text proposal of [1], where the discussion regarding some questions converged to some agreeable proposals, while the following open issues were identified:

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| **Issue #1: The name of the (0..255) INTEGER identifying the TRP among the TRPs the target device can handle**  Option 1.1 – Use the name TRP-ID  Option 1.2 – Use the name DL-PRS-ID  Option 1.3 – Discuss and determine a new name |
| **Issue #2, Unique identification of a DL-PRS resource**  Option 2.1 – It is sufficient if the DL-PRS resource is uniquely identified between a UE and an LMF within the LPP scope including both unicast and broadcast data exchange  Option 2.2 – The DL-PRS resource needs to be uniquely identified globally, implying that the TRP identifier has to be globally unique, at least optionally |
| The following cases have been identifed:   1. DL-PRS AD is provided via unicast, signal measurement information is provided via unicast. In this case, the TRPs are handled between LMF and UE as part of an LPP session, and the (0..255) identifier is sufficient for LMF to uniquely identify TRPs from the signal measurement information 2. DL-PRS AD and semi-static UEB AD via unicast, dynamic UEB AD via broadcast. In this case, the TRPs are associated to an NCGI of the serving cell via the request assistance data as well as from the system information broadcast, and the baseline of an INTEGER (0..255) is sufficient for LMF to uniquely identify TRPs from the signal measurement information. 3. All assistance data (DL-PRS, UEB-AD) provided via broadcast. In this case, LMF has not an association of the UE to a cell identifier such as a serving cell NCGI, unless the UE provides some more information to LMF. Companies has suggested that NCGI or some other global identifier should be provided, which could mean:    * NCGI of the serving cell    * NCGI associated to each TRP   **Issue #3 Additional identifiers in the signal measurement information (case C and maybe case B)**  Option 3.1 – The serving cell NCGI  Option 3.2 – An NCGI associated to each TRP (which means that this association has to be established via the DL-PRS AD) |
| **Issue #4 The need for a cell identifier within the DL-PRS assistance data**  Option 4.1 – No, the associated serving cell identifier is enough (but the case when no cell identifier is provided in the Request AD needs to be handled)  Option 4.2 – An NCGI associated to each TRP |
| **Issue #5 The need for a cell identifier within the UEB assistance data**  Option 5.1 – No, the associated serving cell identifier is enough (but the case when no cell identifier is provided in the Request AD needs to be handled)  Option 5.2 – An NCGI associated to each TRP |

This email discussion is focused on these open issues.

To enable a discussion that is easy for other companies to follow, please include also technical motivations, not only an indicated preferred option.

# 2 Discussion

## 2.1 Name of INTEGER (0..255) identifying a TRP

It was considered agreeable to identify any TRP among the TRPs the target device can handle by an INTEGER (0..255), and three different names of this identity has been considered:

**Issue #1: The name of the (0..255) INTEGER identifying the TRP among the TRPs the target device can handle**

Option 1.1 – Use the name TRP-ID

Option 1.2 – Use the name DL-PRS-ID

Option 1.3 – Discuss and determine a new name

In Annex 1, there is a text proposal which changed the definition of the TRP-ID, and this IE will then be named according to the outcome of this discussion.

Companies are asked to provide their view regarding the name of the (0..255) INTEGER identifying a TRP among the TRPs a target device can handle, and which option is preferred.

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| Issue #1: The name of the (0..255) INTEGER identifying the TRP among the TRPs the target device can handle | |
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## 2.2 Meaning of RAN1 TRP identifier agreement

There are some different interpretations of the RAN1 agreement and how ‘unique’ is to be interpreted. What is clear is that

* the UE can handle up to 256 TRPs accross all frequency layers
* there is one identifier per TRP
* the TRP identifier together with a DL PRS resource set ID and a DL PRS resource ID will uniquely identify a DL PRS resource

There can be different interpretations of ‘unique’ in the context above. The purpose of the DL PRS is to enable UE-assisted positioning and UE-based positioning, which means that

* **UEA:** the UE shall be able to associate DL PRS assistance data to measurements provided per positioning method to enable LMF to understand which TRP a measurement corresponds to
* **UEB:** the UE shall be able to associate DL assistance data with UEB assistance data such as TRP location, beam and relative time difference information

From the comments from companies, the opinions about ‘unique’ can be grouped into two groups:

**Issue #2, Unique identification of a DL-PRS resource**

Option 2.1 – It is sufficient if the DL-PRS resource is uniquely identified between a UE and an LMF within the LPP scope including both unicast and broadcast data exchange

Option 2.2 – The DL-PRS resource needs to be uniquely identified globally, implying that the TRP identifier has to be globally unique, at least optionally

It was pointed out that a TRP identifier that is locally unique between a UE and an LMF within the LPP scope is also associated to one globally unique cell identifier, either via LPP unicast exchange or via the cell system information broadcast. Therefore, a locally unique TRP identifier with the associated globally unique cell identifier is enough to identify a DL-PRS resource uniquely globally.

Companies are asked to provide their view regarding the meaning of the RAN1 agreement on the unique identification of a DL-PRS resource, in consideration of the options presented above.

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| Issue #2, Unique identification of a DL-PRS resource | |
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## 2.3 TRP identifiers in the DL-TDOA, Multi-RTT and AoD signal measurement information, MeasList

There is a need for a TRP identifier in the \*-MeasList of the signal measurement information that is based on DL-PRS – that is, DL-TDOA, Multi-RTT and AoD. In the email discussion, an integer (0..255) identifier per TRP (name FFS - TRP-ID/DL-PRS-ID/...) is used as baseline. There are different opinions about whether there is a need for additional information to be provided to LMF to identify the TRP:

1. It is sufficient with the (0..255) identifier
2. There is a need for a cell identifier such as PCI or NCGI or some other global identifier
3. There is a need for NRARFCN

Companies have commented that 3 is not needed since NRARFCN is provide in the assistance data per frequency layer. Companies have also argued that 2 is needed in order to handle the situation when some assistance data is provided via unicast and some via broadcast, which other companies have disclosed that the association to one globally unique cell identifier is sufficient to ensure that LMF can identify the TRPs in the measurements, and that the globally unique NCGI is provided in the request assistance data and via system information broadcast, so it is already present.

Trying to analyse the provided comments per different cases:

1. DL-PRS AD is provided via unicast, signal measurement information is provided via unicast. In this case, the TRPs are handled between LMF and UE as part of an LPP session, and the (0..255) identifier is sufficient for LMF to uniquely identify TRPs from the signal measurement information
2. DL-PRS AD and semi-static UEB AD via unicast, dynamic UEB AD via broadcast. In this case, the TRPs are associated to an NCGI of the serving cell via the request assistance data as well as from the system information broadcast, and the baseline of an INTEGER (0..255) is sufficient for LMF to uniquely identify TRPs from the signal measurement information.
3. All assistance data (DL-PRS, UEB-AD) provided via broadcast. In this case, LMF has not an association of the UE to a cell identifier such as a serving cell NCGI, unless the UE provides some more information to LMF. Companies has suggested that NCGI or some other global identifier should be provided, which could mean:
   1. NCGI of the serving cell
   2. NCGI associated to each TRP

Given that a (0..255) INTEGER per TRP and a serving cell NCGI is sufficient in case A and B, a minimalistic approach would be to let the UE provide the serving cell NCGI in the signal measurement information, at least in case assistance data has only been provided via broadcast. Alternatively, an NCGI is provided per TRP in case assistance data has only been provided via broadcast.

**Issue #3 Additional identifiers in the signal measurement information (case C and maybe case B)**

Option 3.1 – The serving cell NCGI

Option 3.2 – An NCGI associated to each TRP (which means that this association has to be established via the DL-PRS AD)

Companies are asked to provide their view regarding the need for additional identifiers in the signal measurement information, in consideration of the options above.

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| Issue #3 Additional identifiers in the signal measurement information (case C and maybe case B) | |
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## 2.4 TRP identifiers within the DL-PRS assistance data

The DL-PRS-IdInfo IE is used by LMF to configure the assistance data reference, as well as by the target device to indicate the reference in the DL-TDOA Signal measurement information. The NR-DL-PRS-AssistanceDataPerTRP IE is used by LMF to provide DL-PRS assistance data per TRP. These cases are also under discussion in the email discussion #948 on LPP ASN.1 issues, whether the reference TRP can be provided as the first element of the DL-PRS assistance data list of TRPs, and whether the reference could be provided as the first measElement of the MeasList.

For LMF to target device signalling of the DL-PRS assistance data reference TRP, there are different views expressed by companies:

1. It is sufficient with the (0..255) identifier
2. There is a need for a cell identifier such as PCI or NCGI or some other global identifier

Given that there is an associated serving cell identifier either via the request assistance data or via the cell identifier of the cell the broadcast was retrieved from, the remaining issues can be expressed as

**Issue #4 The need for a cell identifier within the DL-PRS assistance data**

Option 4.1 – No, the associated serving cell identifier is enough (but the case when no cell identifier is provided in the Request AD needs to be handled)

Option 4.2 – An NCGI associated to each TRP

Companies are asked to provide their view regarding the. need for additional identifiers within the DL-PRS assistance data, in consideration of the options above.

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| Issue #4 The need for a cell identifier within the DL-PRS assistance data | |
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## 2.5 Identifiers in UEB Assistance data

The UEB assistance data is provided using the IEs NR-TRP-LocationInfo, NR-DL-PRS-BeamInfo, ReferenceTRP-RTD-Info and RTD-InfoElement, which needs to be associated to the DL-PRS assistance data on a per TRP basis. Companies have different views and there are different opinions about whether there is a need for additional identifier(s) to be provided by LMF per TRP:

1. It is sufficient with the (0..255) identifier
2. There is a need for a cell identifier such as PCI or NCGI or some other global identifier

Given that there is an associated serving cell identifier either via the request assistance data or via the cell identifier of the cell the broadcast was retrieved from, the remaining issues is essentially the same as Issue #4

**Issue #5 The need for a cell identifier within the UEB assistance data**

Option 5.1 – No, the associated serving cell identifier is enough (but the case when no cell identifier is provided in the Request AD needs to be handled)

Option 5.2 – An NCGI associated to each TRP

Companies are asked to provide their view regarding the need for additional identifiers within the UEB assistance data, in consideration of the options above.

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| Issue #5 The need for a cell identifier within the UEB assistance data | |
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# Conclusion

# References

[1] R2-2004704, Summary and Text Proposal on TRP-ID structure (Email discussion 947) (Ericsson).

# Annex A1, Text proposal to 3GPP TS 37.355 for TRP-ID

6.4.3.1 Common NR assistance data Information Elements

*[…]*

*– TRP-ID*

The IE *TRP-ID* provides the ID to identify the TRP among the TRPs the target device can handle. This field is used along with a DL PRS Resource Set ID and a DL PRS Resources ID to uniquely identify a DL PRS Resource. This ID can be associated with multiple DL PRS Resource Sets associated with a single TRP.

Each TRP can only be associated with one such ID.

-- ASN1START

TRP-ID-r16 ::= INTEGER (0..255)

-- ASN1STOP