3GPP TSG-RAN WG3 #117bis-e R3-225906

10th – 18th Oct 2022

Online

Agenda Item: 9.2.8

Source: ZTE (moderator)

Title: Summary of Offline Discussion on CB: # 13\_DAPS

Document for: Approval

# Introduction

**CB: # 13\_DAPS**

**- Which node decides powerCoordinationDAPS infor, source CU or source DU?**

**- Whether the restriction information includes the feature set?**

**- Capture agreements and provide CR**

(ZTE - moderator)

Summary of offline disc [R3-225906](Inbox%5CR3-225906.zip)

The 1st round of discussion is set to deadline on **12th Oct (Wednesday) 11:59 UTC.**

# For the Chairman’s Notes

<TBD>

# Discussion- Second round

<TBD>

# Discussion-First round

## PowerCoordination over F1 during SN addition procedure

In [1], after analysis, the cosigned discussion paper provides two observations for DC deployment, as below.

|  |
| --- |
| **Observation 1: According to current specs, during SN addition procedure, powerCoordination is transmitted from MN-CU to SN-CU then from SN-CU to SN-DU.****Observation 2: According to current specs, during SN addition procedure, it is the MN-CU to generate powerCoordination.** |

**Question 1: Do you agree with above observations?**

|  |  |  |
| --- | --- | --- |
| **Company** | **O1, O2****Yes/No** | **Comment** |
| ZTE | Yes for both | They have been captured into the current TS 38.473. |
|  |  |  |
|  |  |  |
|  |  |  |
|  |  |  |
|  |  |  |
|  |  |  |

In [1], it also gives the reason why the MN-CU to generate powerCoordination during SN addition procedure, is that

**Reason 1：**During SN addition procedure, powerCoordination is to coordinate (i.e., to split) the current power into two parts (one split power for MN and another split power for SN). So that, MU-CU is the suitable node to handle the coordination.

**Reason 2：**During SN addition procedure, if MN-DU generates the powerCoordination, before it initiates SN addition procedure, it has to firstly initiate F1AP procedure to request source DU to generate powerCoordination, which will introduce unnecessary latency.

**Question 2: Do you also agree with above reasons for MN-CU to generate powerCoordination during SN addition procedure? Or, other reason?**

|  |  |  |
| --- | --- | --- |
| **Company** | **R1, R2****Yes/No** | **Comment** |
| ZTE | Yes for both | More, CU has more information about both Source/MN node and Target/SN node than DU, so that CU is the suitable node to handle coordination between two nodes (source node and targe node, MN and SN). |
|  |  |  |
|  |  |  |
|  |  |  |
|  |  |  |
|  |  |  |
|  |  |  |

* 1. PowerCoordination over F1 during DAPS procedure

In [1], it observes that according to current specs, during DAPS HO procedure, powerCoordination is transmitted from source CU to target CU then from target CU to target DU.

Meanwhile, in all papers on the table, they agree that power coordination transmission between source CU and source DU is needed but is missing for Inter frequency DAPS HO.

|  |
| --- |
| **Observation 3: According to current specs, during DAPS procedure, powerCoordination is transmitted from source CU to target CU then from target CU to target DU.****Observation 4: During DAPS procedure, power coordination transmission between source CU and source DU is needed but is missing in F1AP specs.** |

**Question 3: Do you agree with the above observations?**

|  |  |  |
| --- | --- | --- |
| **Company** | **O3, O4****Yes/No** | **Comment** |
| ZTE | Yes for both |  |
|  |  |  |
|  |  |  |
|  |  |  |
|  |  |  |
|  |  |  |
|  |  |  |

## Which node decides powerCoordinationDAPS information, source CU or source DU?

According the papers ([1], [2]… [7]), there are two solutions to decide powerCoordinationDAPS.

**Solution 1: Source CU decides it**

**8** companies support Solution 1: ZTE, Ericsson, CATT, Google, Samsung, Intel Corporation, Lenovo, and NEC.

**Solution 2: Source DU decides it**

**2** companies support Solution 2: QC and HW

In [1]. It gives the reason for Solution 1 as below.

|  |
| --- |
| For powerCoordination, its generation and transmission are very similar between both SN addition procedure and DAPS HO procedure.During SN addition procedure, since we have already agreed that MN-CU is the suitable node to generate the powerCoordination and which is already captured in the current TS38.473, we shall propose source CU to generate the powerCoordination during DAPS HO procedure.On the contrary, if MN CU generates powerCoordination for SN addition, but source DU (other than source CU) generates powerCoordination for DAPS, then both CU and DU are involved to generate powerCoordination, which introduces extra complexity. And if source DU generates the powerCoordination, before it initiates DAPS HO procedure, the source CU has to firstly initiate F1AP procedure to request source DU to generate powerCoordination, which will introduce extra handover latency, seen as figure.Figure : Extra F1AP procedure (power coordination) before DAPS HO procedure**Observation: During DAPS HO procedure, it will introduce extra complexity and latency when source DU to generate the powerCoordination.** |

In [5] and [6], they give the reason for Solution 2 as below.

|  |
| --- |
| [5] Currently source CU sends the source and target Pmax for DAPS HO to target CU. Target CU sends the target Pmax to target DU. However Pmax is a gNB-DU parameter. Hence the Pmax needed for DAPS Handover for source and target should be provided by source gNB-DU to source gNB-CU in DU to CU RRC Container IE in F1 UE Context Modification Response when the latest UE configuration is queried by gNB-CU before sending XN Handover Request for DAPS handover. For inter frequency DAPS HO, the source CU should request the source DU to provide the source and target Pmax.[6] - The power coordination defines the maximum total transmit power to be used by the UE in the source and target, which is much related to the physical /L1 parameters. Hence it should be decided for the MN DU discretion. - For MR-DC case at the SN side, the SN-DU will provide the Requested P-MaxFR1/ Requested P-MaxFR2/ FeatureSetEntryIndex etc to the SN CU, indicating the maximum value for FR1/FR2 and feature set entry index to be used at the SN side. This proves that the DU decide the DAPS lower layer parameters, for the DAPS handover. |

**Question 4: Do you agree with the following view? If not agreed, please provide your reason.**

**The mechanism on generating powerCoordination shall be the same between both SN addition procedure and DAPS HO procedure**

|  |  |  |
| --- | --- | --- |
| **Company** | **Same/Different** | **Comment** |
| ZTE | Same | The union mechanism is helpful to decrease normative work and product design complexity. |
|  |  |  |
|  |  |  |
|  |  |  |
|  |  |  |
|  |  |  |
|  |  |  |

For Solution 2, there is no discussion paper to analyse the detail, however, moderator finds some different between both Solution 1 and Solution 2.

**Issue 1：Power & powerCoordination**

* Understanding 1: Power is physical layer parameter, but powerCoordination is high layer parameter.
* Understanding 2: Both power and powerCoordination are physical parameter
* Understanding 3: If any.

**Issue 2：Usage of powerCoordination**

* Understanding 1: The powerCoordination is **NOT** to generate current maximum total power to be used by UE, but to coordinate (i.e., to split) the current maximum total power into two parts (one split power for MN/source and another split power for SN/target).
* Understanding 2: The power coordination defines the maximum total transmit power to be used by the UE in the source and target.
* Understanding 3: If any.

**Issue 3：powerCoordination used for SN addition vs DAPS HO**

* Understanding 1: Same, i.e., it is generated at MN/source CU for both SN addition and DAPS HO
* Understanding 2: Different, i.e, it is generated at MN CU for SN addition, but at source DU for DAPS HO
* Understanding 3: If any.

**Issue 4：For MR-DC case at the SN side, the SN-DU will provide the Requested P-MaxFR1/ Requested P-MaxFR2 to the SN CU, indicating the maximum value for FR1/FR2 to be used at the SN side.**

* Understanding 1: For DC, it is used at SN side other than MN side. For DAPS HO, it is the same mechanism, i.e., it is used at target side other than source side.
* Understanding 2: For DC, it is used at SN side other than MN side. For DAPS HO, it is used at both source side and target side.
* Understanding 3: If any.

**Issue 5：Before source CU initiates DAPS HO procedure, does it need to firstly initiate F1AP procedure to request source DU to generate powerCoordination?**

* Understanding 1: For both DC and DAPS HO, it is not needed.
* Understanding 2: For DC it is not needed, but for DAPS HO, it is needed.
* Understanding 3: If any.

**Issue 6: Other issue, if any. Please input.**

**Question 5: Companies are kindly invited to input your understanding for above issues?**

|  |  |  |
| --- | --- | --- |
| **Company** | **Issue1… Issue 5** | **Comment** |
| ZTE | All issues: understanding 1 |  |
|  |  |  |
|  |  |  |
|  |  |  |
|  |  |  |
|  |  |  |
|  |  |  |

## Whether the restriction information includes the feature set?

In [6], it indicates the following information from TS38.331

ConfigRestrictInfoDAPS-r16 ::= SEQUENCE {

 powerCoordination-r16 SEQUENCE {

 p-DAPS-Source-r16 P-Max,

 p-DAPS-Target-r16 P-Max,

 uplinkPowerSharingDAPS-Mode-r16 ENUMERATED {semi-static-mode1, semi-static-mode2, dynamic }

 } OPTIONAL

}

ConfigRestrictInfoDAPS-v1640 ::= SEQUENCE {

 sourceFeatureSetPerDownlinkCC-r16 FeatureSetDownlinkPerCC-Id,

 sourceFeatureSetPerUplinkCC-r16 FeatureSetUplinkPerCC-Id

}

|  |
| --- |
| * The feature set information indicates the index selected by the source for DL and UL, which includes a set of features that the UE supports on one band entry with detailed physical parameters. Hence it is up to the MN DU decision.

In order for the DU to provide the accurate information, the **target cell ID related information** is also provided to the source DU so that the source DU can select the more proper restriction information. Note that this can be sent together with the *GNB-DU Configuration Query* IE in the UE CONTEXT MODIFICATION REQUEST message, when the gNB-CU requests the latest lower layer information before the handover. |

Then in [6], it proposes that:

|  |
| --- |
| - Add the ConfigRestrictInfoDAPS1 IE and ConfigRestrictInfoDAPS2 IE in the DU to CU RRC Information. - Add the Target Cell Information DAPS IE in the UE CONTEXT MODIFICATION REQUEST message. |

There are two kinds of methods and three kinds of IEs to transfer powerCoordination between source CU and source DU.

**Method 1: ConfigRestrictInfoDAPS-r16 (seen in CR [5])**

ConfigRestrictInfoDAPS-r16 ::= SEQUENCE {

 powerCoordination-r16 SEQUENCE {

 p-DAPS-Source-r16 P-Max,

 p-DAPS-Target-r16 P-Max,

 uplinkPowerSharingDAPS-Mode-r16 ENUMERATED {semi-static-mode1, semi-static-mode2, dynamic }

 } OPTIONAL

}

**IE 1: used for method 1:**

|  |  |  |
| --- | --- | --- |
| Config Restrict Info DAPS | OCTET STRING | ConfigRestrictInfoDAPS-r16, as defined in TS 38.331 [8].This IE is used by gNB-DU to inform gNB-CU the power parameters required for DAPS Handover Preparation |

**Method 2: ConfigRestrictInfoDAPS-r16 and ConfigRestrictInfoDAPS-v1640 (seen in CR [2] and CR [6])**

ConfigRestrictInfoDAPS-r16 ::= SEQUENCE {

 powerCoordination-r16 SEQUENCE {

 p-DAPS-Source-r16 P-Max,

 p-DAPS-Target-r16 P-Max,

 uplinkPowerSharingDAPS-Mode-r16 ENUMERATED {semi-static-mode1, semi-static-mode2, dynamic }

 } OPTIONAL

}

ConfigRestrictInfoDAPS-v1640 ::= SEQUENCE {

 sourceFeatureSetPerDownlinkCC-r16 FeatureSetDownlinkPerCC-Id,

 sourceFeatureSetPerUplinkCC-r16 FeatureSetUplinkPerCC-Id

**IE2: used for method 2, including all rel-16 ConfigRestrictInfoDAPS IEs defined in TS38.331**

|  |  |  |
| --- | --- | --- |
| ConfigRestrictInfoDAPS | OCTET STRING | ConfigRestrictInfoDAPS as defined in TS 38.331 [8]. This IE is used at the source node if DAPS HO is configured. |

**IE3: used for method 2, two separate IEs, one for rel-16, another for rel-1640 ConfigRestrictInfoDAPS IE**

|  |  |  |
| --- | --- | --- |
| ConfigRestrictInfoDAPS1 | OCTET STRING | ConfigRestrictInfoDAPS-r16, as specifed in TS 38.331 [8]. |
| ConfigRestrictInfoDAPS2 | OCTET STRING | ConfigRestrictInfoDAPS-v1640, as specifed in TS 38.331 [8]. |

**Question 6: Which method and which kind of IE as above do you prefer for DAPS HO procedure?**

|  |  |  |
| --- | --- | --- |
| **Company** | **Method 1 vs Method 2****IE1 vs IE2 vs IE3** | **Comment** |
| ZTE | Method 2, IE 2 | In current RAN3 specs, suffix (e.g., “-r16” or “-r17”) is not used in OCTET STRING type of RAN3 IE for the RRC reference. IE2 (i.e., a union RAN3 IE without release/version suffix) can include all releases and versions of RRC reference (i.e., rel16 and v1640…). For future proof, the IE2 is suitable. |
|  |  |  |
|  |  |  |
|  |  |  |
|  |  |  |
|  |  |  |
|  |  |  |

If it is agreed to transfer powerCoordination from source DU to source CU, there are two options to request powerCoordination via UE CONTEXT MODIFICATION REQUEST message.

**Option 1: Add a new code point in the existing IE *GNB-DU Configuration Query* (seen in CR [5])**

**Option 2: Add a new IE “Target Cell Information DAPS” (seen in CR [6])**

**Question 7: If it is agreed to transfer powerCoordination from source DU to source CU, which option as above do you prefer for DAPS HO procedure?**

|  |  |  |
| --- | --- | --- |
| **Company** | **Option1 vs Option2** | **Comment** |
| ZTE |  | If source CU generates powerCoordination, it is not needed. |
|  |  |  |
|  |  |  |
|  |  |  |
|  |  |  |
|  |  |  |
|  |  |  |

## Which set of CRs do you support?

There are three set of CR on the table.

**Set 1 ([2] and [3]): Source CU generates powerCoordination for DAPS HO, including IE2 as above**

Companies: ZTE, Ericsson, CATT, Google, Samsung, Intel Corporation, Lenovo, NEC

**Set 2 ([4] and [5]): Source DU generates powerCoordination for DAPS HO, including IE1 as above**

Companies: QC

**Set 3 ([6] and [7]): Source DU generates powerCoordination for DAPS HO, including IE3 as above**

Companies: HW, QC

**Question 8: Which set of CRs do you support?**

|  |  |  |
| --- | --- | --- |
| **Company** | **Set 1 vs Set 2 vs Set 3** | **Comment** |
| ZTE | Set 1 | Source CU is the suitable node to coordinate power during DAPS HO procedure. |
|  |  |  |
|  |  |  |
|  |  |  |
|  |  |  |
|  |  |  |
|  |  |  |

# Conclusion, Recommendations [if needed]

# References

1. R3-225363 Discussion on DAPS over F1 (ZTE, Ericsson, CATT, Google, Samsung, Intel Corporation, Lenovo, NEC) discussion
2. [R3-225364](file:///D%3A%5C%E4%BC%9A%E8%AE%AE%E7%A1%AC%E7%9B%98%5CTSGR3_117bis-e%5CDocs%5CR3-225364.zip) R16CR for DAPS over F1 to TS38.473 (ZTE, Ericsson, CATT, Google, Samsung, Intel Corporation, Lenovo, NEC) CR0974r2, TS 38.473 v16.11.0, Rel-16, Cat. F
3. [R3-225365](file:///D%3A%5C%E4%BC%9A%E8%AE%AE%E7%A1%AC%E7%9B%98%5CTSGR3_117bis-e%5CDocs%5CR3-225365.zip) R17CR for DAPS over F1 to TS38.473 (ZTE, Ericsson, CATT, Google, Samsung, Intel Corporation, Lenovo, NEC) CR0975r2, TS 38.473 v17.2.0, Rel-17, Cat. A
4. [R3-225402](file:///D%3A%5C%E4%BC%9A%E8%AE%AE%E7%A1%AC%E7%9B%98%5CTSGR3_117bis-e%5CDocs%5CR3-225402.zip) Power Co-ordination for DAPS HO over F1 for R17 (Qualcomm India Pvt Ltd) CR1040r, TS 38.473 v17.2.0, Rel-17, Cat. A
5. [R3-225403](file:///D%3A%5C%E4%BC%9A%E8%AE%AE%E7%A1%AC%E7%9B%98%5CTSGR3_117bis-e%5CDocs%5CR3-225403.zip) Power Co-ordination for DAPS HO over F1 for R16 (Qualcomm India Pvt Ltd) CR1041r, TS 38.473 v16.11.0, Rel-16, Cat. F
6. [R3-225737](file:///D%3A%5C%E4%BC%9A%E8%AE%AE%E7%A1%AC%E7%9B%98%5CTSGR3_117bis-e%5CDocs%5CR3-225737.zip) Configuration Restriction Info for DAPS handover (Huawei, Qualcomm Incorporate) CR1064r, TS 38.473 v16.11.0, Rel-16, Cat. F
7. [R3-225738](file:///D%3A%5C%E4%BC%9A%E8%AE%AE%E7%A1%AC%E7%9B%98%5CTSGR3_117bis-e%5CDocs%5CR3-225738.zip) Configuration Restriction Info for DAPS handover (Huawei, Qualcomm Incorporate) CR1065r, TS 38.473 v17.2.0, Rel-17, Cat. A