3GPP TSG-RAN WG3 Meeting #114bis-e R3-221102

Online, 17 – 26 January 2022

**Agenda item: 9.3.5.1**

**Source: Huawei (moderator)**

**Title: Summary of offline: indirect data forwarding for MR-DC**

**Document for: Discussion and Decision**

# 1 Introduction

This paper summarizes the following email discussion:

**CB: # 92\_IndirectDF**

**- Clarify the benefits and the definition of indirect data forwarding**

**- Rewording the semantic description?**

(HW - moderator)

Summary of offline disc [R3-221102](file:///E:\3GPP%20Standardization\RAN3\RAN3%23114bis-e\Drafts\CB%20%23%2092_IndirectDF\Inbox\R3-221102.zip)

# 2 For the Chair’s Notes

Propose to agree:

**Proposal 1: For Handover from ENDC to SA and for SN-terminated bearers, the data forwarding can happen (source SgNB->SGW(PGW)->UPF->target gNB).**

**Proposal 2: For Handover from ENDC to SA and for SN-terminated bearers, the source SgNB does not need to be aware of the S1-U/X2-U/other interface types of the data forwarding destination address;**

**Proposal 3: Agree the X2AP CR R3-221287 (revision of R3-220690) to remove the “X2” in the semantic descriptions.**

# 3 Discussion (Phase 1)

## 3.1 X2AP CR on SGNB RELEASE REQUEST message

Based on the online discussion, it seems there are two options to support the scenario below:

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| --- |
| For the data forwarding for SN-terminated bearers, and for handover from the ENDC to SA,  - the data forwarding can happen from the source SgNB to the target gNB (i.e. source SgNB->SGW(PGW)->UPF->target gNB). |

* **Option 1: Add the DL/UL forwarding GTP Tunnel Endpoint for S1 in SGNB RELEASE REQUEST message as provided in R3-220690 below**

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| >>CHOICE *Resource Configuration* | M |  |  |  |  |  |
| >>>*PDCP present in SN* |  |  |  | This choice tag is used if the *PDCP at SgNB* IE in the *EN-DC Resource Configuration* IE is set to the value "present". |  |  |
| >>>>UL Forwarding GTP Tunnel Endpoint | O |  | GTP Tunnel Endpoint 9.2.1 | Identifies the X2 transport bearer used for forwarding of UL PDUs | – |  |
| >>>>DL Forwarding GTP Tunnel Endpoint | O |  | GTP Tunnel Endpoint 9.2.1 | Identifies the X2 transport bearer used for forwarding of DL PDUs | – |  |
| >>>>UL Forwarding GTP Tunnel Endpoint – S1 | O |  | GTP Tunnel Endpoint 9.2.1 | Identifies the S1 transport bearer used for forwarding of UL PDUs | YES | ignore |
| >>>>DL Forwarding GTP Tunnel Endpoint – S1 | O |  | GTP Tunnel Endpoint 9.2.1 | Identifies the S1 transport bearer used for forwarding of DL PDUs | YES | ignore |

* **Option 2: update the semantic descriptions, e.g, adding “or S1” (see below), or just removing the “X2”.**

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| --- | --- | --- | --- | --- |
| >>>>DL Forwarding GTP Tunnel Endpoint | O |  | GTP Tunnel Endpoint 9.2.1 | Identifies the **X2 or S1** transport bearer used for forwarding of DL PDUs |
| >>>>UL Forwarding GTP Tunnel Endpoint | O |  | GTP Tunnel Endpoint 9.2.1 | Identifies the **X2 or S1** transport bearer used for forwarding of UL PDUs |

Basically we think that the option 1 is the preferred approach. The reason is that during handover, the source node needs to be aware whether the received TNL destination address is for X2-U, or S1-U. Then it can select the proper source X2-U or S1-U address for data forwarding. Otherwise, the data forwarding would be failed.

For example,

* The received TNL **destination** address is allocated for X2-U,
* But the source RAN node misunderstands it as for S1-U,
* Then the source RAN node will use the S1-U **source** address but with X2-U **destination** address to forward packets.

Then the data forwarding transport is failed.

Note that during the ENDC to SA handover, the source MeNB is already aware of this TNL address for X2-U or S1-U. Typically,

* If the “Direct Forwarding Path Availability” is provided in the HANDOVER REQUIRED message, then the source MeNB understands the received TNL address is for the X2-U; it can allocate X2-U
* Otherwise, the MeNB understands the received TNL address is for S1-U.

So the question here is that the source SgNB also should be aware of the TNL address for X2-U or S1-U.

**Question 1: Your views whether the source SgNB should be aware of the data forwarding destination address is for X2-U or S1-U.**

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| --- | --- |
| **Company** | **Comments** |
| Huawei | As analysed above. The source SgNB should be aware of this. |
|  |  |
| Nokia | The question is: does the source TNL address depend on the interface to be used? In our understanding it does not and hence the forwarding node (SN in this case) may pick any address – there are no special “X2-U” or “S1-U” addresses, they are all the same, and actually they may not be related to any specific UP.  If the answer is different though, then we may need to review all the procedures where forwarding may be done over different paths. |
| E/// | The answer is no. MN does not have to know which interface the TNL address is for, but a tunnel to forward the packets. |
| ZTE | From our point of view, the indirect data forwarding can be done via MN. And the mechanism runs normally in LTE in recent years. In addition, Compared with the scheme of forwarding data via MN, forwarding data via CN does not bring more benefits. We do not think the requirement,data forwarding via CN, is necessary. |
| Samsung | No. From the received TNL address e.g. IPv4 or IPv6, the source SN can select corresponding source address to forward data. No need to know S1 or X2. |
| CATT | We think the requirement is for the receiving node of data forwarding not the sending node. |
| Moderator Summary:   * Majority companies think that the source SgNB does not need to be aware that the data forwarding destination address is for X2-U or S1-U or other UP interfaces. We can go with the majority views. * Then see the proposal in 2nd round. | |

On the basis of the question 1, please provide views which option is your preferred one for X2AP.

**Question 2: Which option is preferred option?**

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| --- | --- |
| **Company** | **Comments** |
| Nokia | Considering the answer above, for this problem, correction of semantics is better (BTW, isn’t “X2” also in other semantics where data forwarding happens?).  However, again, I wonder, is X2 and S1 the only option? After all, we talk about direct date forwarding, which is supposed to be done directly between the SgNB and the SA gNB (we’ve discussed how the gNB handles SeqNums, which indicates we assumed it receives data directly from the en-gNB).  If so, perhaps the change should be that “X2” is removed:  “*Identifies the ~~X2~~ transport bearer. used for forwarding of DL PDUs*” |
| E/// | No duplicated info need to be introduced. Share same view as Nokia, remove “X2” in the semantics description is the simplest way. |
| ZTE | Neither |
| Samsung | Removing X2 or adding S1 is ok. |
| CATT | Similar view as Samsung |
| Huawei | Ok, we are fine majority views, to remove “X2” |
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| Moderator Summary:   * Majority companies are fine to go to option 2 (removing “X2”).The moderator proposes to go to majority views. * One company mentions that there may have “X2” in other semantic descriptions. The moderator understands that other cases are mainly used for the ENDC, not for handover. at this meeting we can focus on the EN-DC to SA handover case. * See the proposal in 2nd round. | |

## 3.2 XnAP CR on the Served Cell Information

Over Xn interface, it is ambiguous whether the existing **D*ata Forwarding Info from target NG-RAN node*** IE is indicating the Xn transport bearers, or can also be used for NG transport bearers.

So similarly to X2 interface, below provides two options. .

* **Option 1: add a new *Data Forwarding Info from SMF* in the XN-U ADDRESS INDICATION message provided in R3-220691**

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| >**Xn-U Address Information per PDU Session Resources Item** |  | *1..<maxnoofPDUSessions>* |  |  | – |  |
| >>PDU Session ID | M |  | 9.2.3.18 |  | – |  |
| >>Data Forwarding Info from target NG-RAN node | O |  | Data Forwarding Info from target NG-RAN node 9.2.1.16 |  | – |  |
| >>Secondary Data Forwarding Info from target NG-RAN node List | O |  | 9.2.1.31 | This IE would be present only when the target M-NG-RAN node decide to split a PDU session between MN and SN | YES | ignore |
| >>PDU Session Resource Setup Complete Info – SN terminated | O |  | 9.2.1.30 |  | – |  |
| >>DRB IDs taken into use | O |  | DRB List 9.2.1.29 | Indicating the DRB IDs taken into use by the target NG-RAN node, as specified in TS 37.340 [8]. | YES | reject |
| >>Data Forwarding Info from target E-UTRAN node | O |  | 9.2.1.35 |  | YES | ignore |
| >>Data Forwarding Info from SMF | O |  | Data Forwarding Info from target NG-RAN node 9.2.1.16 | Indicating the NG transport bearers used for forwarding. | YES | ignore |

* **Option 2: Adding semantic descriptions for the *Data Forwarding Info from target NG-RAN node* IE**

#### 9.1.1.11 XN-U ADDRESS INDICATION

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| IE/Group Name | Presence | Range | IE type and reference | Semantics description | Criticality | Assigned Criticality |
| <Skipped> |  |  |  |  |  |  |
| **Xn-U Address Information per PDU Session Resources List** |  | *1* |  |  | YES | reject |
| >**Xn-U Address Information per PDU Session Resources Item** |  | *1..<maxnoofPDUSessions>* |  |  | – |  |
| >>PDU Session ID | M |  | 9.2.3.18 |  | – |  |
| >>Data Forwarding Info from target NG-RAN node | O |  | Data Forwarding Info from target NG-RAN node 9.2.1.16 | Indicating the Xn or NG transport bearers used for forwarding. | – |  |
| >>Secondary Data Forwarding Info from target NG-RAN node List | O |  | 9.2.1.31 | This IE would be present only when the target M-NG-RAN node decide to split a PDU session between MN and SN | YES | ignore |

The moderator understands this may dependent on the discussion of X2AP CR. But it may be beneficial to collect company views first.

**Question 3: Which option is preferred option? Or any other comments?**

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| **Company** | **Comments** |
| Huawei | Option 1.  We may prefer to define a new IE to differentiate Xn-U or NG-U based data forwarding. |
| Nokia | Again, we do not understand why this is even relevant – data forwarding shall be the same, irrespectively from the destination, right? Again, a while ago we discussed if SeqNums are to be removed depending whether forwarding is to the MN or elsewhere and we agreed it does not matter for the SN… So, why does it need to have such indication? |
| E/// | The question is not about which option to be selected, but whether there is any ambiguity. We have doubt that why such clarification is needed. Current spec is clear. |
| ZTE | Current specification is clear enough. |
| Samsung | More clarification is needed. |
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| Moderator Summary:   * Majority companies are not convinced this change. So the XnAP CR is not pursued. | |

# 4 Discussion (Phase 2)

Based on the collected comments, the moderator provides the following proposals.

**Proposal 1: For Handover from ENDC to SA and for SN-terminated bearers, the data forwarding can happen (source SgNB->SGW(PGW)->UPF->target gNB).**

**Proposal 2: For Handover from ENDC to SA and for SN-terminated bearers, the source SgNB does not need to be aware of the S1-U/X2-U/other interface types of the data forwarding destination address;**

**Proposal 3: Agree the X2AP CR R3-221191 (revision of R3-220690) to remove the “X2” in the semantic descriptions.**

**No consensus on the XnAP CR in R3-220691.**

If you have **different** view, please provide comments on this topic below:

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| Company | Comment | |
| ZTE | P1: As we commented in the round 1 discussion, we think the indirect data forwarding can be done via MN instead of “**source SgNB->SGW(PGW)->UPF->target gNB**”.  P2: Same view.  P3: We don't see the need for this change. But we can follow the majority, and if necessary, we prefer to remove "X2" from the description. | |
| E/// | P2 is right, then it means SN does not have to be aware of which interface type the address belongs to. Current spec does not cause any issue, so this is not an essential correction. | |
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| Moderator Summary:   * One company is fine with majority, while one company think it is not an essential correction. * See the final proposals in section 2, trying to be agreeable. | |

# 5 Conclusions, Recommendations

TBD

# References

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| [R3-220690](file:///E:\3GPP%20Standardization\RAN3\RAN3%23114bis-e\Drafts\CB%20%23%2092_IndirectDF\Docs\R3-220690.zip) | Correction of indirect data forwarding for MR-DC (Huawei, China Telecom, China Unicom, Deutsche Telekom) | CR1664r, TS 36.423 v16.8.0, Rel-16, Cat. F  \*\*  ZTE: Whether this correction is critical, it’s optimization  Nok: Beneficial for what?  E///: The indirect data forwarding is defined to be routed by MN  SS, CATT: Only the updated semantic description is needed, no new IE needed  HW: Considered the alternative as description update, it’s still indirect data forwarding between NG-RAN nodes via CN  **CB: # 92\_IndirectDF**  **- Clarify the benefits and the definition of indirect data forwarding**  **- Rewording the semantic description?**  (HW - moderator)  Summary of offline disc [R3-221102](file:///E:\3GPP%20Standardization\RAN3\RAN3%23114bis-e\Drafts\CB%20%23%2092_IndirectDF\Inbox\R3-221102.zip) |
| [R3-220691](file:///E:\3GPP%20Standardization\RAN3\RAN3%23114bis-e\Drafts\CB%20%23%2092_IndirectDF\Docs\R3-220691.zip) | Correction of indirect data forwarding for MR-DC (Huawei, China Telecom, China Unicom, Deutsche Telekom) | CR0737r, TS 38.423 v16.8.0, Rel-16, Cat. F  \*\* |