3GPP TSG RAN WG1 Meeting #101-e R1-200xxx

25th May– 5th June 2020

Agenda Item: 7.2.3

Source: Moderator (Qualcomm Incorporated)

Title: Draft FL summary for [101-e-NR-IAB-05] - Updates to TS38.300

Document for: Discussion and decision

## Introduction

This contribution provides a summary for RAN1 related IAB updates to TS 38.300. The starting point is based on the TPs from the Rapporteur [1]. Each subsection in the Discussion section is now updated based on the comments received and comments were provided in response. The Recommendations section includes the proposed FL agreements.

## Recommendations

**FL proposed agreement:**

**Adopt the following TPs for TS38.300:**

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| **<**Unchanged text is omitted> 4.7.4 Signalling procedures4.7.4.x OTA timing synchronization An IAB-DU is subject to the same downlink timing alignment of a gNB. The IAB-DU may use the received downlink signal from a parent as a reference to control its downlink timing using TA in conjunction with an additional Tdelta parameter signalled via MAC-CE. 4.7.4.x+1 Inter node discovery Inter node discovery is supported via SSB-based and/or CSI-RS-based measurements. An IAB-node can be configured to transmit and receive off synchronization raster SSB signals to discover neighboring IAB-nodes. The configuration is not expected to create a conflict between IAB-DU SSB transmission and IAB-MT SSB measurement windows.  **<**Unchanged text is omitted> |

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| **<**Unchanged text is omitted> 5.2.3 Physical downlink control channels The Physical Downlink Control Channel (PDCCH) can be used to schedule DL transmissions on PDSCH and UL transmissions on PUSCH, where the Downlink Control Information (DCI) on PDCCH includes:  - Downlink assignments containing at least modulation and coding format, resource allocation, and hybrid-ARQ information related to DL-SCH;  - Uplink scheduling grants containing at least modulation and coding format, resource allocation, and hybrid-ARQ information related to UL-SCH.  In addition to scheduling, PDCCH can be used to for  - Activation and deactivation of configured PUSCH transmission with configured grant;  - Activation and deactivation of PDSCH semi-persistent transmission;  - Notifying one or more UEs of the slot format;  - Notifying one or more UEs of the PRB(s) and OFDM symbol(s) where the UE may assume no transmission is intended for the UE;  - Transmission of TPC commands for PUCCH and PUSCH;  - Transmission of one or more TPC commands for SRS transmissions by one or more UEs;  - Switching a UE's active bandwidth part;  - Initiating a random access procedure;  - Indicating the UE(s) to monitor the PDCCH during the next occurrence of the DRX on-duration~~.~~;  - In IAB context, indicating the availability for soft symbols of an IAB-DU.  **<**Unchanged text is omitted> |

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| **<**Unchanged text is omitted> 5.3.4 Random access Random access preamble sequences, of four different lengths are supported. Sequence length 839 is applied with subcarrier spacings of 1.25 and 5 kHz, sequence length 139 is applied with subcarrier spacings of 15, 30, 60 and 120 kHz, and sequence lengths of 571 and 1151 are applied with subcarrier spacings of 30 kHz and 15 kHz respectively.. Sequence length 839 supports unrestricted sets and restricted sets of Type A and Type B, while sequence lengths 139, 571, and 1151 support unrestricted sets only. Sequence length 839 is only used for operation with licensed channel access while sequence length 139 can be used for operation with either licensed or shared spectrum channel access. Sequence lengths of 571 and 1151 can be used only for operation with shared spectrum channel access.  Multiple PRACH preamble formats are defined with one or more PRACH OFDM symbols, and different cyclic prefix and guard time. The PRACH preamble configuration to use is provided to the UE in the system information.  For IAB additional random access configurations are defined. These configurations are obtained by extending the random access configurations defined for UEs via scaling the periodicity and/or offsetting the time domain position of the RACH occasions.  IAB-MTs can be provided with random access configurations (as defined for UEs or after applying the aforementioned scaling/offsetting) different from random access configurations provided to UEs.  **<**Unchanged text is omitted> |
| **<**Unchanged text is omitted> 8.1 UE Identities In this clause, the identities used by NR connected to 5GC are listed. For scheduling at cell level, the following identities are used:  - C-RNTI: unique UE identification used as an identifier of the RRC Connection and for scheduling;  - CI-RNTI: identification of cancellation in the uplink;  - CS-RNTI: unique UE identification used for Semi-Persistent Scheduling in the downlink or configured grant in the uplink;  - INT-RNTI: identification of pre-emption in the downlink;  - MCS-C-RNTI: unique UE identification used for indicating an alternative MCS table for PDSCH and PUSCH;  - P-RNTI: identification of Paging and System Information change notification in the downlink;  - SI-RNTI: identification of Broadcast and System Information in the downlink;  - SP-CSI-RNTI: unique UE identification used for semi-persistent CSI reporting on PUSCH.  For power and slot format control, the following identities are used:  - SFI-RNTI: identification of slot format;  - TPC-PUCCH-RNTI: unique UE identification to control the power of PUCCH;  - TPC-PUSCH-RNTI: unique UE identification to control the power of PUSCH;  - TPC-SRS-RNTI: unique UE identification to control the power of SRS.  During the random access procedure, the following identities are also used:  - RA-RNTI: identification of the Random Access Response in the downlink;  - Temporary C-RNTI: UE identification temporarily used for scheduling during the random access procedure;  - Random value for contention resolution: UE identification temporarily used for contention resolution purposes during the random access procedure.  For NR connected to 5GC, the following UE identities are used at NG-RAN level:  - I-RNTI: used to identify the UE context in RRC\_INACTIVE.  For UE power saving purpose during DRX, the following identity is used:  - PS-RNTI: used to determine if the UE needs to monitor PDCCH on the next occurrence of the connected mode DRX on-duration.  For IAB the following identity is used:  - AI-RNTI: identification of the DCI carrying availability indication for soft symbols of an IAB-DU.  **<**Unchanged text is omitted> |

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| **<**Unchanged text is omitted> 10 Scheduling10.x IAB Resource Multiplexing and Scheduling In general the IAB-DU and the IAB-MT of an IAB-node are subject to a half-duplex constraint, as correct transmission/reception by one cannot be guaranteed during transmission/reception by the other and vice versa, e.g. when collocated and operating in the same frequency. An IAB-node can report its duplexing constraints between the IAB-MT and the IAB-DU via F1AP.  The scheduler on an IAB-DU or IAB-donor-DU complies with the gNB-DU resource configuration received via F1AP, which defines the usage of scheduling resources to account for the aforementioned duplexing constraint.  The resource configuration assigns an attribute of hard, soft or unavailable to each symbol of each DU cell. Transmission/reception can occur for symbols configured as hard, whereas scheduling cannot occur, except for some special cases, for symbols configured as unavailable. For symbols configured as soft, scheduling can occur conditionally on an explicit indication of availability by the parent node via DCI format 2\_5, or on an implicit determination of availability by the IAB-node. The implicit determination of availability is determined by the IAB-node depending on whether or not the operation of the IAB-DU would have an impact on the collocated IAB-MT.  **<**Unchanged text is omitted> |

## Discussion

### Updates to section 4

**FL Proposal 1:**

**Adopt the following TP for 38.300:**

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| **<**Unchanged text is omitted> 4.7.4 Signalling procedures4.7.4.x OTA timing synchronization An IAB-DU is subject to the same downlink timing alignment of a gNB. The IAB-DU may use the received downlink signal from a parent as a reference to control its downlink timing using TA in conjunction with an additional Tdelta parameter signalled via MAC-CE. 4.7.4.x+1 Inter node discovery An IAB-node can be configured to transmit and receive off synchronization raster SSB signals to discover neighboring IAB-nodes. The configuration is expected to not create a conflict between IAB-DU SSB transmission and IAB-MT SSB measurement windows.  **<**Unchanged text is omitted> |

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| **Company** | **Support FL Proposal 1?** | **Comments** |
| ZTE, Sanechips | Not sure about “off sync raster”. | The ssbFrequecy of SMTC/STC is ARFCN-ValueNR, which does not necessarily limit to off-raster. |
| AT&T | Yes | Suggest that section 4.7.4.x+1 should also mention that:   1. Both SSB-based and CSI-RS-based measurements can be used for IAB node discovery. 2. Up to 4 independent SMTCs can be configured for IAB-MTs and up to 4 independent STCs can be configured for IAB-DUs to support multi-hop topologies with IAB-specific SSB transmission periodicities |

### Updates to section 5

**FL Proposal 2:**

**Adopt the following TP for 38.300:**

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| **<**Unchanged text is omitted> 5.2.3 Physical downlink control channels The Physical Downlink Control Channel (PDCCH) can be used to schedule DL transmissions on PDSCH and UL transmissions on PUSCH, where the Downlink Control Information (DCI) on PDCCH includes:  - Downlink assignments containing at least modulation and coding format, resource allocation, and hybrid-ARQ information related to DL-SCH;  - Uplink scheduling grants containing at least modulation and coding format, resource allocation, and hybrid-ARQ information related to UL-SCH.  In addition to scheduling, PDCCH can be used to for  - Activation and deactivation of configured PUSCH transmission with configured grant;  - Activation and deactivation of PDSCH semi-persistent transmission;  - Notifying one or more UEs of the slot format;  - Notifying one or more UEs of the PRB(s) and OFDM symbol(s) where the UE may assume no transmission is intended for the UE;  - Transmission of TPC commands for PUCCH and PUSCH;  - Transmission of one or more TPC commands for SRS transmissions by one or more UEs;  - Switching a UE's active bandwidth part;  - Initiating a random access procedure;  - Indicating the UE(s) to monitor the PDCCH during the next occurrence of the DRX on-duration~~.~~;  - In IAB context, indicating the availability for soft symbols of an IAB-DU.  **<**Unchanged text is omitted> |

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| **Company** | **Support FL Proposal 2?** | **Comments** |
| ZTE, Sanechips | Yes with editorial improvement | The document seems to make “child node” and “IAB node” inter-changeable. |

**FL Proposal 3:**

**Adopt the following TP for 38.300:**

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| **<**Unchanged text is omitted> 5.3.4 Random access Random access preamble sequences, of four different lengths are supported. Sequence length 839 is applied with subcarrier spacings of 1.25 and 5 kHz, sequence length 139 is applied with subcarrier spacings of 15, 30, 60 and 120 kHz, and sequence lengths of 571 and 1151 are applied with subcarrier spacings of 30 kHz and 15 kHz respectively.. Sequence length 839 supports unrestricted sets and restricted sets of Type A and Type B, while sequence lengths 139, 571, and 1151 support unrestricted sets only. Sequence length 839 is only used for operation with licensed channel access while sequence length 139 can be used for operation with either licensed or shared spectrum channel access. Sequence lengths of 571 and 1151 can be used only for operation with shared spectrum channel access.  Multiple PRACH preamble formats are defined with one or more PRACH OFDM symbols, and different cyclic prefix and guard time. The PRACH preamble configuration to use is provided to the UE in the system information.  For IAB additional random access configurations are defined. These configurations are obtained by extending the random access configurations defined for UEs via scaling the periodicity and/or offsetting the time domain position of the RACH occasions.  IAB-MTs can be provided with random access configurations (as defined for UEs or after applying the aforementioned scaling/offsetting) different from random access configurations provided to UEs.  **<**Unchanged text is omitted> |

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| **Company** | **Support FL Proposal 3?** | **Comments** |
| ZTE, Sanechips | Yes with editorial improvement | Per RAN1 spec (38.211, 5.3.2), the PRACH occasion refers to both time domain and frequency domain. |

### Updates to section 8

**FL Proposal 4:**

**Adopt the following TP for 38.300:**

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| **<**Unchanged text is omitted> 8.1 UE Identities In this clause, the identities used by NR connected to 5GC are listed. For scheduling at cell level, the following identities are used:  - C-RNTI: unique UE identification used as an identifier of the RRC Connection and for scheduling;  - CI-RNTI: identification of cancellation in the uplink;  - CS-RNTI: unique UE identification used for Semi-Persistent Scheduling in the downlink or configured grant in the uplink;  - INT-RNTI: identification of pre-emption in the downlink;  - MCS-C-RNTI: unique UE identification used for indicating an alternative MCS table for PDSCH and PUSCH;  - P-RNTI: identification of Paging and System Information change notification in the downlink;  - SI-RNTI: identification of Broadcast and System Information in the downlink;  - SP-CSI-RNTI: unique UE identification used for semi-persistent CSI reporting on PUSCH.  For power and slot format control, the following identities are used:  - SFI-RNTI: identification of slot format;  - TPC-PUCCH-RNTI: unique UE identification to control the power of PUCCH;  - TPC-PUSCH-RNTI: unique UE identification to control the power of PUSCH;  - TPC-SRS-RNTI: unique UE identification to control the power of SRS.  During the random access procedure, the following identities are also used:  - RA-RNTI: identification of the Random Access Response in the downlink;  - Temporary C-RNTI: UE identification temporarily used for scheduling during the random access procedure;  - Random value for contention resolution: UE identification temporarily used for contention resolution purposes during the random access procedure.  For NR connected to 5GC, the following UE identities are used at NG-RAN level:  - I-RNTI: used to identify the UE context in RRC\_INACTIVE.  For UE power saving purpose during DRX, the following identity is used:  - PS-RNTI: used to determine if the UE needs to monitor PDCCH on the next occurrence of the connected mode DRX on-duration.  For IAB the following identity is used:  - AI-RNTI: identification of the DCI carrying availability indication for soft symbols of an IAB-DU.  **<**Unchanged text is omitted> |

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| **Company** | **Support FL Proposal 4?** | **Comments** |
| ZTE, Sanechips | Yes with editorial improvement |  |

### Updates to section 10

**FL Proposal 5:**

**Adopt the following TP for 38.300:**

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| **<**Unchanged text is omitted> 10 Scheduling10.x IAB Resource Multiplexing and Scheduling In general the IAB-DU and the IAB-MT of an IAB-node are subject to a half-duplex constraint, as correct transmission/reception by one cannot be guaranteed during transmission/reception by the other and vice versa, e.g. when collocated and operating in the same frequency. An IAB-node can report its duplexing constraints between the IAB-MT and the IAB-DU via F1AP.  The scheduler on an IAB-DU or IAB-donor-DU complies with the gNB-DU resource configuration received via F1AP, which defines the usage of scheduling resources to account for the aforementioned duplexing constraint.  The resource configuration assigns an attribute of hard, soft or unavailable to each symbol of each DU cell. Scheduling can occur for symbols configured as hard, whereas scheduling cannot occur, except for some special cases, for symbols configured as unavailable. For symbols configured as soft, scheduling can occur conditionally on an explicit indication of availability by the parent node via DCI format 2\_5, or on an implicit determination of availability by the IAB-node. The implicit determination of availability is determined by the IAB-node depending on whether or not the operation of the IAB-DU would have an impact on the collocated IAB-MT.  **<**Unchanged text is omitted> |

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| **Company** | **Support FL Proposal 5?** | **Comments** |
| ZTE, Sanechips | Yes with editorial improvement | We wonder whether the wording “scheduling” in the last paragraph should be replaced with “transmission/reception” |

### Any additional updates to other sections?

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| **Company** | **Comments** |
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### References

[1] R1-2004448 – Proposed IAB updates for 38.300 – Qualcomm