3GPP TSG-RAN WG2 Meeting #122 R2-2xxxxxx

Incheon, Korea, May 22-26, 2023

Agenda: 8.8

Source: Session Chair (Intel)

Title: Report from IDC breakout session

Document for: Approval

**Organizational:**

* [AT122][650][IDC] Organizational Yi – IDC (Intel)

Scope:

* Share plans for the e-meetings and list/status of ongoing email discussions for the sessions.
* Share meeting notes and agreements for review and endorsement.

## 7.10 IDC enhancements for NR and MR-DC

(NR\_IDC\_enh-Core; leading WG: RAN2; REL-18; WID: RP-221281)

Time budget: 1 TU

Tdoc Limitation: 3 tdocs

### 7.10.1 Organizational

LS in. Rapporteur Input, e.g. running CRs;

Including the outcome of email discussion [Post121][655][IDC] Discussion on Leftover issues for IDC (xiaomi).

* WI can be closed from RAN2 perspective.

R2-2305580 Summary of [Post121][655][IDC] Discussion on Leftover issues for IDC Xiaomi discussion Rel-18 NR\_IDC\_enh-Core

Discussion:

Proposal 1 (8/10): No extra UE behaviors need to be clarified on the starting slot for autonomousDenialValidity.

* Agreed

Proposal 2 (8/10): The LTE autonomous denial configuration is only for the LTE frequency in EN-DC, and no extra specification change is needed.

* Agreed

Proposal 3: RAN2 is kindly requested to select one option from the followings:

 Option 1 (5/10): The UE sums up the denied UL slots together across all CC(s) in the CG. RAN2 is requested to discuss whether this is captured in the Chair’s minutes or in a NOTE in the specification.

 Option 2 (2/10): The dropped UL slots across CCs at the same time are counted as a single slot. RAN2 is requested to discuss whether the “single slot” refers to PCell.

 Option 3 (1/10): The autonomous denial configuration is per CC.

Discussion:

* Xiaomi, we already agreed it is per CG.We should go for option 1. QC, different numerology is supported for each CC. Then option 3 is simple. It is still configured per CG, only count per CC. Samsung, it will impact network performance. Option 1 is ok to them.
* Ericsson, option 1 and 2 are better than option 3. We may combine option 1 and 2, i.e. count dropped UL slots per CC, but for the overlapping part, only count once. Xiaomi is ok.
* ZTE would like to go for simple solution ,i.e. option 1. They can also accept option 2.
* Xiaomi, what validity timer period should be used. They think UE should sums up the slots across all CCs as validity timer period.
* Samsung wonder how to handle the case if all CCs are not sync? Xiaomi think it is per CG configuration, all CCs in the same CG should be sync. Vivo think insync is possible. But they do not see the issue to count, i.e. only consider the overlapping part. At least, slot boundary should be aligned.
* Xiaomi think Samsung’s scenario should be for different TAG scenario. Nokia think we do not need to consider this for CA.
* Xiaomi, we can leave it to UE implementation on how to handle different TAG scenario.
* Huawei agree with Xiaomi, and think we do not need to capture in specification.
* Samsung agree with xiaomi to capture these two into specification as Note. Huawei would like to capture “The details are up to UE implementation. “ also in the note.
* Xiaomi would like to agree “The UE sums up the UL slots together across all CC(s) in the CG as validity time period. “
* The UE sums up the denied UL slots together across all CC(s) in the CG.
* The dropped UL slots across CCs at the same time are counted as a single slot (based on longest slot). The details are up to UE implementation.
* The UE sums up the UL slots together across all CC(s) in the CG as validity time period.
* Capture above agreements as note in TS38.331;

Inter-node coordination:

Proposal 4 (5(No)/4(Yes)): RAN2 is kindly requested to discuss whether the inter-node coordination is needed for the IDC report from UE.

Proposal 5 (5(No)/4(Yes)): RAN2 is kindly requested to discuss whether additional coordination between MN and SN is needed when network configures IDC assistance information reporting or autonomous denial for the UE.

Discussion:

* Huawei think coordination is needed for IMD issue across MCG and SCG.
* Ericsson and xiaomi, the discussion is only for NR DC.
* Samsung think the only thing missing is from MN to SN side. SN to MN should be sufficient since we introduce R18 IE in UE assistance information. Vivo what is missing for MN to SN. Samsung clarify so far for MN to SN only r16 IDC is contained. We need to add R18 IDC for it.
* Ericsson think EN-DC approach is fine, and do not see the need to have further enhancements. Ericsson think we do not have time to enhance anything in the last meeting. Nokia agree with Ericsson, and think it is not critical.
* Huawei think we have EN-DC like coordination. It should be easy to introduce it for NR-DC. Ericsson can compromise to accept EN-DC like coordination.
* QC support to introduce some coordinations.
* Xiaomi think that we may comeback on Friday if companies can have consensus.
* Introduce EN-DC like coordination for NR-DC case;

Others:

Proposal 6 (7/10): The FDM configuration/reporting and the TDM configuration/reporting can be provided independently. No extra specification change is needed.

* Huawei think network can still configure the FDM to the UE for NTN scenario.
* QC think we already agreed to introduce separate capabilities, and it is also captured as separately in the spec. Therefore we would like to agree this.
* Nokia think anyway no additional specification change is needed, we do not need to do anything for it.
* Huawei if network does not configure FDM, does that mean the UE can report TDM assistance info for any detected frequency? QC, from UE implementation, they will report the useful information.
* Xiaomi, the UE still needs frequency configuration from network,e.g. for measurement, but not FDM candidate freq.
* Ericsson think we did not discuss/study NTN issue. We need more time to study.
* ZTE think network can know UE capability, and if network did not configure FDM, that means network allows UE to report TDM in any freq.
* Huawei and Ericsson think network must configure FDM configuration when configure TDM configuration.
* The network always provides either R16 FDM configuration or R18 FDM configuration based on UE capability when provides the TDM configuration to a UE.
* The UE always provides FDM reporting when provides the TDM reporting to the network .

Proposal 7 (10/10): The CG used for reporting the TDM assistance information is used as the timing reference. RAN2 is requested to discuss whether this is captured in a NOTE in the specification.

* The CG used for reporting the TDM assistance information is used as the timing reference.( only captured in Chair notes)

Proposal 8 (10/10): maxFreqIDC-r16 is reused.

* Agreed.

Proposal 9 (9/10): interferenceDirection-r18 reuses the values of interferenceDirection-r16.

* Agreed.

Proposal 10 (5/10): A unified solution is adopted for harmonic interference and IMD interference that interferenceDirection or victimSystemType is always reported with the affected frequency.

* Xiaomi think to save signalling overhead, affected freq is optional for victimSystemType. But it is incorrect. QC would like to keep it optional.
* Huawei think for IMD, victimSystemType is mandatory, but interferenceDirection is not needed. For harmonic interference case, victimSystemType is not reported, but interferenceDirection is needed. So the question is for harmonic interference case, whether victimSystemType should be reported.
* ZTE do not have strong view. But for harmonic interference case, victimSystemType is not necessary since it is used to narrow down the frequency range. But we already introduce the finer granularity of frequency range.
* Vivo think from Ue perspective it is good to have. Xiaomi think UE already has these information. The simple way is that the UE always report what it has, i.e. not distinguish the cases.
* Huawei can follow majority view.
* ZTE how to distinguish harmonic and IMD from network side. Xiaomi think so far there are separate IEs.
* A unified solution is adopted for harmonic interference and IMD interference that interferenceDirection and victimSystemType could be reported with the affected frequency.

Propoal 11 (6/10): Value “whole” is removed for affectedBandwidth-r18 and candidateBandwidth-r18.

* Huawei, optional, the UE has no idea about real bandwidth. Xiaomi for R16, affected freq is the central freq. Ericsson think optional is easy for future extension. Nokia think no impact to UE behavior. Xiaomi think reported bandwidth should be within the allowed bandwidth. But seems Nokia wants to allow the UE to report freq for any bandwidth.
* Value “whole” is removed for affectedBandwidth-r18 and candidateBandwidth-r18.
* candidateBandwidth-r18 are optional. The UE is allowed to report freq range for any bandwidth within FR1/FR2 limitation if the network does not provide the candidateBandwidth-r18.

Proposal 12 (9/10): candidateBandwidth-r18 is always included for the Rel-18 IDC FDM configuration from the network.

* Not pursued

Proposal 13 (8/10): affectedBandwidth-r18 is always included for the Rel-18 FDM assistance information reported from the UE.

* Agreed
* [AT122][655][IDC] discussion on inter-node coordination solution (Huawei)

Scope: to provide TP based on EN-DC like cooridnation

Intended outcome: Agreeable TP in R2-2306595 (to be merged into TS38.331 CR)

Deadline: Thursday 2023-05-25 2000 KST

R2-2306595 Discussion on inter-node coordination solution Huawei, HiSilicon discussion Rel-18 NR\_IDC\_enh-Core

* Huawei clarify that the procedure text should be updated for the support of MR-DC, but it can be handled in RRC rapporteur CR discussion.
* QC has concern on procedure text, and would like to avoid the change of UE behavior.
* Huawei think current text is for UL CA and only for the same node. It cannot support cross node scenario.
* Merge the text proposal on inter-node RRC message (clause 11.2) into RRC CR;

R2-2305579 Draft LS on autonomous denial Xiaomi LS out Rel-18 NR\_IDC\_enh-Core To:RAN4

* [AT122][654][IDC] LS to RAN4 on autonomous denial (xiaomi)

Scope: to send agreements related to autonomous denial to RAN4

Intended outcome: agreeable LS in R2-2306594

Deadline: Thursday 2023-05-25 2000 KST

R2-2306594 LS on autonomous denial Xiaomi LS out Rel-18 NR\_IDC\_enh-Core To:RAN4

* Approved

R2-2305578 38.331 running CR for introduction of IDC Xiaomi draftCR Rel-18 38.331 17.4.0 NR\_IDC\_enh-Core

R2-2305995 Introduction of In-Device Co-existence (IDC) enhancements for NR Huawei, HiSilicon CR Rel-18 38.300 17.4.0 0680 - B NR\_IDC\_enh-Core

R2-2306304 37.340 Running CR for Introduction of IDC ZTE Corporation, Sanechips draftCR Rel-18 37.340 17.4.0 B NR\_IDC\_enh-Core R2-2303884

R2-2305446 Introduction of Rel-18 IDC UE capabilities Intel Corporation CR Rel-18 38.306 17.4.0 0915 - B NR\_IDC\_enh-Core R2-2302979

* Agreed in principle

R2-2305447 Introcution of Rel-18 IDC UE capabilities Intel Corporation CR Rel-18 38.331 17.4.0 4106 - B NR\_IDC\_enh-Core R2-2302980

* Agreed in principle
* [AT122][651][IDC] Update of TS 38.331 CR (Xiaomi)

Scope: To update the CR based on agreements and comments received in the meeting;

Take into account of the P1 in R2-2305034, P3/4 in R2-2305452 and P4 in R2-2305125

Intended outcome: Agreeable CR in R2-2306591;

Deadline: Thursday 2023-05-25 2000 KST

R2-2306591 38.331 running CR for introduction of IDC Xiaomi CR Rel-18 38.331 17.4.0 4164 - B NR\_IDC\_enh-Core

* Xiaomi suggest to have postmeeting email discussion, and leave time to companies for checking.
* Chair, Annex on agreements shall be removed
* [AT122][652][IDC] Update of TS 38.300 CR (Huawei)

Scope: To update the CR based on agreements and comments received in the meeting;

Intended outcome: Agreeable CR in R2-2306592;

Deadline: Thursday 2023-05-25 2000 KST

R2-2306592 Introduction of In-Device Co-existence (IDC) enhancements for NR Huawei, HiSilicon CR Rel-18 38.300 17.4.0 0680 1 B NR\_IDC\_enh-Core

* Nokia identified some issues, and would like to have postmeeting email discussion for double check.
* [AT122][653][IDC] Update of TS 37.340 CR (ZTE)

Scope: To update the CR based on agreements and comments received in the meeting;

Intended outcome: Agreeable CR in R2-2306593;

Deadline: Thursday 2023-05-25 2000 KST

R2-2306593 37.340 Running CR for Introduction of IDC ZTE Corporation, Sanechips CR Rel-18 37.340 17.4.0 0367 - B NR\_IDC\_enh-Core

* To add “or NR frequency ranges” for the sentence “For the FDM solution, the list of NR carriers or NR frequency ranges”
* Regarding the EN, xiaomi think we do not need to capture it in the stage 2 since it is stage 3 details.
* Remove EN;
* Remove agreements.
* To add “and TS 38.300 [3]” for the sentence “In-Device Coexistence (IDC) solution as described in TS 36.300 [2] and TS 38.300 [3] is extended to address EN-DC/NR-DC operation.”
* To change “IDC indication” to “IDC report” for the sentence “For the TDM solution, a periodic pattern can be signalled per-CG in IDC indication”
* [Post122][650][IDC] TS 38.331 CR for IDC (xiaomi)

Scope: Merge the text proposal on inter-node message, and review the RRC CR;

Intended outcome: Agreeable CR

Deadline: Short

* [Post122][651][IDC] TS 38.300 CR for IDC (Huawei)

Scope: Review the TS38.300 CR;

Intended outcome: Agreeable CR

Deadline: Short

* [Post122][652][IDC] TS 37.340 CR for IDC (ZTE)

Scope: Review the TS37.340 CR;

Intended outcome: Agreeable CR

Deadline: Short

### 7.10.2 FDM solution enhancements

Leftover issues and issues identified for running CRs on FDM solutions.

R2-2305978 Discussion on the handling IDC issue during the SDT procedure Huawei, HiSilicon discussion Rel-18 NR\_IDC\_enh-Core

Proposal 1- FDM solution enhancements introduced in Rel 18 should be applied to the SDT procedure to address IDC issue that happens during SDT and to avoid degradation of the overall system performance .

Proposal 2a- For the UE configured with R18 IDC Configuration during RRC\_CONNECTED State, the gNB can simply provide an indication for the UE to keep using the same IDC Config during SDT procedure in RRCRelease message when moving the UE to RRC\_INACTIVE state.

Proposal 2b- If the UE detects IDC issue during SDT, it reports the affected frequency range in the UE Assistance Information message during SDT procedure as usual. No changes are required for SDT.

Proposal 2c- On receiving IDC report, gNB applies scheduling restrictions to not schedule the UE in the affected frequency range during the SDT procedure.

Discussion:

* Huawei think we can reuse the IDC configuration for UE in RRC\_INACTIVE. Samsung think it is beneficial to support this. It can reduce the retransmission, and save UE power.
* Ericsson are not sure the benefit since it is the short period. QC share the same view as Ericsson. Intel agree. Nokia agree. Vivo also agree. LG also agree. Xiaomi also agree the SDT period is really short.
* IDC for SDT is not supported in Rel-18.

R2-2305124 FDM Solutions in IDC Qualcomm Incorporated discussion Rel-18

Proposal 2: “uwb” is added as a field value in victimSystemType.

Discussion:

* Huawei wonder for which cellular freq will have impact with uwb. QC is not sure.
* QC would like to discuss this in postmeeting email discussion for RRC. Xiaomi think it is ok to introduce. Nokia would like to have time to check.
* Samsung ask whether RAN4 should do the evaluation on uwb? Nokia, xiaomi think we do not need to do the evaluation in RAN4.
* Samsung think uwb was there for LTE, why we do not introduce uwb for LTE.
* Will not introduce uwb unless the real problem is identified.

R2-2305034 More granular FDM indications Ericsson discussion Rel-18 NR\_IDC\_enh-Core

Proposal 1 Adopt at least 2 MHz as the smallest BW value for both candidateBandwidth-r18 and affectedBandwidth-r18.

* To be discussed in [651]

R2-2305452 Open issues of FDM solution for IDC Intel Corporation discussion Rel-18 NR\_IDC\_enh-Core

Proposal 3: The granularity of affected bandwidth should not be smaller than 180 kHz.

Proposal 4: The affected bandwidth takes the following values {kzh200, khz400, khz600, khz800, mhz1, mhz2, mhz3, mhz4, mhz5, mhz6, mhz8, mhz10, mhz20, mhz30, mhz40, mhz50, mhz60, mhz80, mhz100, mhz200, mhz300, mhz400, spare…}.

* To be discussed in [651]

Following contributions are not treated

R2-2305009 Discussion on inter-node coordination for IDC Samsung discussion Rel-18 NR\_IDC\_enh-Core

R2-2305035 IDC configuration and report in MR-DC Ericsson discussion Rel-18 NR\_IDC\_enh-Core

R2-2305581 Remaining issues for FDM Xiaomi discussion Rel-18 NR\_IDC\_enh-Core

R2-2305976 Discussion on inter-node coordination issue for NR IDC Huawei, HiSilicon discussion Rel-18 NR\_IDC\_enh-Core

R2-2305977 Leftover issues for FDM solution enhancement for NR IDC Huawei, HiSilicon discussion Rel-18 NR\_IDC\_enh-Core

R2-2306210 Discussion on the leftover issue for IDC FDM Solution vivo discussion Rel-18 NR\_IDC\_enh-Core

R2-2306305 Remaining Issues on the FDM solution enhancement ZTE Corporation, Sanechips discussion Rel-18 NR\_IDC\_enh-Core

R2-2306307 Further Consideration on the NR-DC IMD Interference Reporting ZTE Corporation, Sanechips discussion Rel-18 NR\_IDC\_enh-Core

R2-2306364 Common FDM and TDM aspects Nokia, Nokia Shanghai Bell discussion Rel-18 NR\_IDC\_enh-Core

R2-2306366 Autonomous Denial Aspects Nokia, Nokia Shanghai Bell discussion Rel-18 NR\_IDC\_enh-Core

### 7.10.3 TDM solution

Leftover issues and issues identified for running CRs on TDM solutions.

Note, common issues for FDM and TDM (e.g. inter-node coordination, independent configuration of FDM and TDM, etc) should be submitted under agenda item 7.10.2.

R2-2305125 TDM Solutions in IDC Qualcomm Incorporated discussion Rel-18

Proposal 4: Values 100ms and 96ms are added to the possible cycleLength-r18 in IDC-TDM-Assistance-r18 to cover WLAN and UWB, respectively.

* To be discussed in [651]

Following contributions are not treated

R2-2305453 Open issues of TDM solution for IDC Intel Corporation discussion Rel-18 NR\_IDC\_enh-Core Withdrawn

R2-2305582 Remaining issues for TDM solutions Xiaomi discussion Rel-18 NR\_IDC\_enh-Core

R2-2306173 Leftover autonomous denial operation issues in IDC Apple discussion Rel-18 NR\_IDC\_enh-Core

R2-2306211 Discussion on the leftover issue for IDC TDM Solution vivo discussion Rel-18 NR\_IDC\_enh-Core

R2-2306306 Remaining Issues on the TDM solution enhancement ZTE Corporation, Sanechips discussion Rel-18 NR\_IDC\_enh-Core

R2-2306365 Interference direction for TDM Assistance Information for IDC Nokia, Nokia Shanghai Bell discussion Rel-18 NR\_IDC\_enh-Core

### 7.10.4 UE capabilities

Including impact to TS 38.306 and TS 38.331.

Following contributions are not treated

R2-2305126 IDC UE Capabilities Qualcomm Incorporated discussion Rel-18

R2-2306212 Discussion on IDC UE Capabilities vivo discussion Rel-18 NR\_IDC\_enh-Core