[97e-31-IODT-RedCap] - Version 0.0.4
RAN

3GPP TSG RAN#97e draft [RP-222591]

Electronic Meeting, Sept. 12 - 16, 2022

Agenda Item 9.11

Source: RAN Vice-Chair (Deutsche Telekom)

Title: Moderator's summary of discussion for [97e-31-IODT-RedCap]

Document for: Discussion & Decision

Objective:

This NWM thread discusses the content and proposal of:

- **RP-222270** (vivo, Apple, MediaTek Inc., Nordic)
- **RP-222376** (Ericsson, Qualcomm Incorporated, Verizon, Samsung, Nokia, Nokia Shanghai Bell)

RP-222374 & RP-222375 provide draft CRs for RP-222376 which should only be discussed if the proponent's way forward is agreed.

(from 270) According to current RAN1 feature list [1], RedCap UE should mandatorily support NCD-SSB operation. While in RAN2#119e meeting, whether introduce a new capability to indicate the support of NCD-SSB was discussed, and no agreement and no decision was made.

The aim is to decide, if an IODT bit for NCD-SSB for RedCap should be introduced or not.

Timeline:

According to the RAN chair's guidance in max. 3 rounds

1 Initial Round

1.1 Questions on RP-222270

Proposal 1: Keep RAN1 feature list as it is, i.e. no IODT bit will be introduced for NCD-SSB for RedCap FG28-1.

Feedback Form 1: Questions on RP-222270

1 – Nordic Semiconductor ASA Support
2 – VODAFONE Group Plc No support
3 – vivo Communication Technology Support the proposal in **RP-222270**
4 – ZTE Corporation Support
5 – Samsung Electronics Co. We believe that to introduce IODT bit would expedite the early RedCap deployment, while it does not change about its mandatory aspect.
6 – NTT DOCOMO INC. same view with Samsung.
7 – Spreadtrum Communications Support
8 – Ericsson LM We do not support the proposal and we agree with Samsung. The RAN1 feature list can be updated if an IODT bit is decided to be specified for some sub-group of components of the existing FG28-1.
9 – Apple Poland Sp. z.o.o. Support
10 – HuaWei Technologies Co. Support
11 – CATT Support
12 – MediaTek Inc. Support

13 – Guangdong OPPO Mobile Telecom.

support

14 – Classon Consulting

[for FUTUREWEI] support

15 – Verizon UK Ltd

Same view with Samsung. We are actively trying to arrange IODT pairs for RedCap. Introducing IoDT bit expedite RedCap adoption.

16 – Telstra Corporation Limited

Telstra also shares Samsung view and does not support proposal 1.

17 – QUALCOMM JAPAN LLC.

Do not support.

We introduced IOT bits for practical purposes for mandatory features even in the past. While the hope is that all mandatory features are tested, we should consider need of IOT bits to facilate early introductions of 3GPP features.

18 – NEC Corporation

Support

19 – LG Electronics France

do not support. We agree with Samsung and think IODT bit will help avoid deferred deployment of RedCap due to lack of the IODT opportunities.

20 – Nokia Corporation

Do not support. We have similar view as Samsung et al.

21 – China Unicom

Support

22 – China Mobile Com. Corporation

Support.

NCD-SSB based measurement is the basic UE feature for RedCap UEs, so all the RedCap UEs should support the NCD-SSB, no additional IODT bit for NCD-SSB is needed.

We have spent long time in RAN1 to discuss the benefit of separate initial DL BWP and how to make sure it work properly with different RedCap UE capabilities. For basic RedCap UE capability, NCS-SSB is supported to reduce UE complexity when the active BWP does not include CD-SSB. This is important for co-existence deployment when the resources around CD-SSB are crowed.

If a separate IODT bit is introduced, the support of NCD-SSB feature will be delayed due to either network vendor or UE vendor deployment.

Although RedCap can be deployed earlier without support of NCD-SSB as Samsung mentioned, the consequence will be large amount of UEs put in use without support of NCD-SSB. Then gNB has to configure all the active DL BWPs for such RedCap UEs to include CD-SSB, this is not aligned with the RAN1 flexible RedCap design. And it cannot realize offloading of RedCap UEs to other resources other than resources around CORESET#0, as a result, UE experience of both legacy and RedCap UEs is reduced. And such kinds of RedCap Ues without NCD-SSB is possible to exist for a long time, and both the network and UE performance will be affected, which is we don't want see.

23 – Telia Company AB

We don't support proposal 1.

IODT bit is needed for NCD-SSB for RedCap FG28-1. Aligned with Samsung, Ericsson and Qualcomm comments.

24 – Intel Corporation (UK) Ltd

We see the potential benefit in terms of allowing early deployments for RedCap as pointed out by Samsung, without changing the mandatory nature of NCD-SSB for RedCap UEs.

1.2 Questions on RP-222376

Proposal 1: An IODT bit is introduced for RedCap UEs to indicate that operation in DL BWP with NCD-SSB has been successfully tested.

Feedback Form 2: Questions on RP-222376

1 – VODAFONE Group Plc

Support: In our view, one of the factors is the spectrum where RedCAP will be introduced. In lower spectrum, there might be only 20 MHz available and NCD-SSB concept might not be possible to use, therefore we believe IoDT bit is needed not to delay the functionality, but we strongly believe that NCD-SSB is a mandatory feature.

2 – Nordic Semiconductor ASA

Do not support, as this de-facto creates new feature group "Mandatory with capability bit".

Should we then have also IoDT bits for other baseline features of R17 RedCap, like Early indication, or Separate initial DL/UL BWP? With same logic, non of these need to be implemented by gNB if RedCap UE is limited to bands with max 20MHz carrier support!?

And surely NCD-SSB is feasible also in 20MHz BW, thanks to introduced NCD-SSB time offset.

3 – vivo Communication Technology

We cannot accept the proposal in RP-222376, due to following reasons.

1. The existing package of basic RedCap feature group 28-1 was the compromise from an very exhausted discussion in RAN1. The history of the discussion was: network side wanted BWP offloading possbility to avoid UE congestion, UE side could agree to that only when there is CD-SSB/NCD-SSB in the active DL BWP. The proposal in RP-222376 effectively makes NCD-SSB a seperate feature group from FG28-1 which breaks the compromise from RAN1.

2. NCD-SSB is now a component of basic FG28-1, it is problematic to make a component of FG28-1 an IODT bit. We did not have such precedent before.

3. It is unclear to us how difficult from NW perspective to implement NCD-SSB for providing IODT possibility, as the signal generation is the same as CD-SSB just put it in a differnt time or frequency location, although we understand NCD-SSB may not be deployed in certain use cases, e.g. FDD low bands.

4. From comments made by Vodafone, we can understand there could be potential deployment scenaios where NCD-SSB is not useful, e.g. FDD low bands. However, the current proposal in RP-222376 is far beyond that, it enables IODT for TDD mid/high-bands and even FR2, which BWP offloading and NCD-SSB is essential features for efficient wideband operation based on the RAN1 discussion.

5. As Nordic commented, many other features in FG28-1 was included for effcient system operation, but may not be used in the initial deployment (e.g. FDD low bands) when there is no UE congestion issues, including UE early indication, seperate initial DL BWP, sepearte initial UL BWP, etc. Should we discuss these components all together just to be fair?

4 – Samsung Electronics Co.

As indicated above, we believe that to introduce IODT bit would expedite the early RedCap deployment, while it does not change about its mandatory aspect.

Also, unlike other features in FG28-1, the feature in the proposal is only applicable in RRC-CONNECTED, so looks okay with us.

5 – ZTE Corporation

We have strong concerns with this, for the reasons already explained by others (Nordic Semiconductor and vivo) and also for the additional impacts to the network implementation.

Currently, all RedCap UEs are supposed to support NCD-SSB with no need for the network to check this. So the network can deploy RedCap-specific initial BWP to not cover CD-SSB, and NCD-SSB will be configured in Msg4 to facilitate RLM/BFD in RedCap-specific initial BWP.

However, if we introduce an IODT bit for this, it means the network can no longer configure NCD-SSB in Msg4 for all RedCap UEs, because the network needs to obtain the UE's capability first. This also means that when RedCap-specific initial BWP without CD-SSB is configured in SIB1, during initial access, the network is expected to switch the UE to another dedicated BWP containing CD-SSB (using BWP operation option-1), and then decide whether to switch the UE back after getting the UE's capability.

In summary, this requires the network to support different implementations and such situation won't change in the future (it will impact the performance for those NCD-SSB capable UEs).

6 – Spreadtrum Communications

Negative

We share the similar concerns as vivo and ZTE.

7 – Ericsson LM

We are the proponent and support the proposal. We also agree with Vodafone and Samsung comments. There are visions of early deployment for lower bands and supporting 20 MHz carrier BW. In practice, it is not likely that such early development efforts would focus on features (e.g. NCD-SSB) which are not required or beneficial to be used in such deployments. The NCD-SSB feature is mainly targeted for RRC_CONNECTED as commented by Samsung, therefore in our discussion paper and proposal we have taken only components 9 (partly) and 10 into account. However, if there are strong concerns with the current CRs, we can further discuss if it would be beneficial to consider other components as well.

RedCap UEs cannot be IODT tested properly until there is a wide support from both UE and NW side for all of the components included in FG28-1. If there are UEs which are deployed early, without proper testing and support of all of the components, the networks will need to take this into account which would result in multiple different implementations to support all UEs indicating RedCap. In the worst case, if the early UE implementations do not work properly (thus also won't work properly later), there is danger the NWs will not implement and/or configure such components (e.g. depending on NCD-SSB) at all. Therefore, we do not agree that without IODT bit everything will work properly and the system can rely on (one) proper implementation from UE and NW side.

Thus, we strongly support defining an IODT bit as proposed.

However, we are also open to discuss possible alternative solutions which would alleviate the companies' concerns, e.g. for which deployment types IODT bit is useful and whether there are some other components which would benefit from such a bit.

8 – Apple Poland Sp. z.o.o.

Do Not support.

We share the views from Nordic and Vivo.

In addition, except frequency location difference, NCD-SSB is identical as CD-SSB in many aspects e.g., sequence generation, associated functionalities, that's the reason why all mandatory feature of SSB defined in Rel-15 were agreed to be mandatory for Redcap UE with NCD-SSB. Given this commonality between NCD-SSB and CD-SSB, we can not understand the argument/concerns of IoDT testing complexity as many testing of CD-SSB can be largely reused for NCD-SSB. If we follow this IoDT logic, tons of IoDT bits need to be created for many other features, as they even cause more complicated IoDT testing compared to NCD-SSB Case.

9 – T-Mobile USA Inc.

NCD-SSB is a useful feature for MBB CBW's > 20 MHz which needs to be deployed early. As such T-Mobile USA isn't keen on the idea of an IODT bit.

10 – HuaWei Technologies Co.

No. The NCD-SSB was introduced to simplify the implementation of UEs and seen essential for UEs to support REDCAP, which actually added complexity at the network side. As other companies also commented, there are a few components for supporting REDCAP and it is unclear why NCD-SSB is the one requiring IODT bit. NCD-SSB was supported since Rel-15 and there is no big difference when this was introduced to REDCAP for Rel-17.

In this case only when all the UEs are mandatory to support NCD-SSB, it is meaningful to configure NCD-SSB. It is true that this is not necessary for those FDD bands which may only have 20MHz, but at this stage there are also cases that REDCAP could be deployed in TDD bands which has 100MHz. If IODT bit is introduced, this may end up different time to market from different UE vendors, and the commercialization of this feature may become slower and optional in the end.

11 – CATT

No.

We also do not understand why NCD-SSB is a special case that requires IODT bit. Given the commonality between CD-SSB and NCD-SSB, we do not see the difficulty in IODT test. On the contrast, as commented by other companies, the proposal would impact the gNB implementation and may delay the commercialization of the feature.

12 – Guangdong OPPO Mobile Telecom.

No.

we share the view from vivo, ZTE and Apple.

13 – MediaTek Inc.

No. Other components in FG28-1 that depends on NCD-SSB function should be considered if NCD-SSB is removed from the basic feature set. At least, the Redcap specific initial BWP seems not work without NCD-SSB. Also, we would like to clarify the consequnce if UE does not indicate this IODT bit. Does it imply that "the network always include CD-SSB in active DL BWP"?

14 – Panasonic Corporation

For 20 MHz and less carrier BW, to support IODT bit.

For more than 20 MHz carrier BW, not to support IODT bit.

15 – Classon Consulting

[for FUTUREWEI] do not support

16 – Verizon UK Ltd

We are a proponent and support the proposal. We agree with Vodafone and Samsung comments. As one of the earliest RedCap adopters, we usually have the task of finding IoDT partners for our vendors and we find it difficult - having to wait for NCD support (to call it IoDT ready) while most other features are ready to be tested (equally well) on CD-SSB.

17 – Telstra Corporation Limited

In line with our response to 1-1, we support the introduction of IODT bit and share the views of Samsung and Ericsson.

18 – QUALCOMM JAPAN LLC.

Support.

It is very unfortunate if one has to delay the introduction of RedCap into the market, due to the lack of IOT opportunities for NCD-SSB. NCD-SSB was introduced to circumvent the narrow band limitation of RedCap devices with respect to wider system spectrum. There can be scenarios where such limitation is not an issue.

19 – NEC Corporation

Do not support. we share the view from vivo and ZTE.

20 – LG Electronics France

Support. IODT bit would be useful for early RedCap deployment.

21 – Nokia Corporation

Support

22 – China Unicom

Following the comments from some companies,the IODT bit will introduce complexity at the network side. It is no need to introduce an IODT bit. We don't prefer to define two types of RedCap UE for early deployment and the "late" deployment.

23 – Telia Company AB

We support.

24 – China Mobile Com. Corporation

Not support.

If a separate IODT bit is introduced, the support of NCD-SSB feature will be delayed due to either network vendor or UE vendor deployment.

Although RedCap can be deployed earlier without support of NCD-SSB as Samsung mentioned, the consequence will be large amount of UEs put in use without support of NCD-SSB. Then gNB has to configure all the active DL BWPs for such RedCap UEs to include CD-SSB, this is not aligned with the RAN1 flexible RedCap design. And it cannot realize offloading of RedCap UEs to other resources other than resources around CORESET#0, as a result, UE experience of both legacy and RedCap UEs is reduced. And such kinds of RedCap Ues without NCD-SSB is possible to exist for a long time, and both the network and UE performance will be affected, which is we don't want see.

25 – Intel Corporation (UK) Ltd

We see the potential benefit in terms of allowing early deployments for RedCap as pointed out by Samsung, without changing the mandatory nature of NCD-SSB for RedCap UEs.

26 – Intel Corporation (UK) Ltd

[please ignore previous response]

We can accept the proposal for this case as motivated by the proponents. At the same time, we would certainly be wary of using this as a precedent for other features, i.e., using this example to introduce IODT bits for other features associated with FG 28-1.

Regarding capability signalling, we do not see an issue with introducing IODT bit for some component(s) of a feature group. Further, we would like to clarify that by "IODT bit" we still are referring to introduction of UE capability signalling to indicate capability of the NCD-SSB-related components of FG 28-1 that are "conditionally mandatory" for a UE indicating support of FG 28-1.

1.3 Introduction of an IODT bit ?

Please indicate here if you think an IODT bit shall be introduced or not.

Feedback Form 3: Should an IODT bit be introduced (yes/no) ?

1 – VODAFONE Group Plc

No very clear what is the difference to the question 1.2. IoDT bit is to indicate that IoDT are sucsessfully done

2 – Nordic Semiconductor ASA

As argued above , we do not support IoDT bit

3 – vivo Communication Technology

No, given the reasons we provided in section 1.2

4 – Samsung Electronics Co.

Yes, as said above.

5 – ZTE Corporation

No, for the reasons explained above

6 – NTT DOCOMO INC.

Yes, it is acceptable to introduce an IODT bit.

7 – Spreadtrum Communications

No.

8 – Ericsson LM

Yes.

For motivation, please also see our reply to the previous question. (Also it is not clear to us if there is a difference to the previous question?)

9 – Apple Poland Sp. z.o.o.

No. See comments on Q 1.2

10 – T-Mobile USA Inc.

Only if RAN has clear criteria for requiring the IODT bit to be set ”tested”

11 – HuaWei Technologies Co.

No. Not clear why in Rel-17, an IODT bit is emphasized here. Note that since the very beginning of NR for Rel-15, we only have “mandatory without capability signaling” and “mandatory with capability signaling”. As we explained above, such change seems reverting RAN1’s previous agreement and we are not in favor of it.

12 – CATT

No as commented above.

13 – Guangdong OPPO Mobile Telecom.

No

14 – MediaTek Inc.

No.

15 – Panasonic Corporation

For 20 MHz and less carrier BW, to support IODT bit.

For more than 20 MHz carrier BW, not to support IODT bit.

16 – Classon Consulting

[for FUTUREWEI] No

17 – Telstra Corporation Limited

Yes

18 – Verizon UK Ltd

Yes. If other fellow operators are able to set up IODT pairs earlier than us with this NCD feature, it would be great to share the experience :)

19 – QUALCOMM JAPAN LLC. Yes
20 – NEC Corporation No
21 – VODAFONE Group Plc To make our position more clear: Yes, we prefer the IoDT bit
22 – LG Electronics France **Yes, as answered in clauses 1.1 and 1.2.**
23 – Nokia Corporation Yes
24 – China Unicom No
25 – Telia Company AB Yes
26 – China Mobile Com. Corporation No
27 – Intel Corporation (UK) Ltd We can accept the proposal for this case as motivated by the proponents. At the same time, we would certainly be wary of using this as a precedent for other features, i.e., using this example to introduce IODT bits for other features associated with FG 28-1. Regarding capability signalling, we do not see an issue with introducing IODT bit for some component(s) of a feature group. Further, we would like to clarify that by "IODT bit" we still are referring to introduction of UE capability signalling to indicate capability of the NCD-SSB-related components of FG 28-1 that are "conditionally mandatory" for a UE indicating support of FG 28-1, as against an FGI bit as in LTE.
28 – Intel Corporation (UK) Ltd [please ignore previous response] As expressed in previous response, we can accept the proposal.

1.4 Other comments

This form is ONLY for other comments not covered by any other of the forms !

Feedback Form 4: Other comments

1.5 Summary of the Initial Round

Moderator's summary of the initial round of discussion

The initial 2 questions asked by the moderator aimed to understand the two different motivations better – unfortunately the participants partly missed the point and provided already their assessment, if an IODT bit should be introduced or not.

For fairness reasons the moderator only counts the replies in the question 1.3 for the question if an IODT bit should be introduced.

1.3 Introduction of an IODT bit ?

YES:

Vodafone, Samsung, DCM, Ericsson, TMUS (with criteria), Panasonic (for 20MHz or less), Telstra, Verizon, Qualcomm, LGE, Nokia, Telia, INTEL

NO

Nordic, vivo, ZTE, Spreadtrum, Apple, Huawei, CATT, OPPO, MediaTek, Panasonic (for more than 20MHz), Futurewei, NEC, China Unicom, CMCC

Given the feedback of the participants during the initial phase and considering the contributions to RAN#97e there is no easy way to take a binary decision at this point, espcially as the situation is 12 (yes) : 13 (no) companies.

One proposal of the moderator would be that the definition of the IODT bit shall not be carrier bandwidth dependent as this would only create more fragmentation, but still there is room for further discussion in this proposal in the Intermediate Round.

Conclusion: Continue the discussion in the Intermediate round with focus on how to address the different camps concerns....

2 Intermediate Round

Please provide further arguments either way, **which have not been stated already in the initial round** for each of the positions.

Feedback Form 5: Further arguments

1 – T-Mobile USA Inc.

T-Mobile is against creating an IODT bit unless there is clear objective criteria for converting the feature to mandatory for all UE's in the future. This issue isn't addressed by the moderator in the 2nd round.

Perhaps in the final round the moderator could seek comments on the following criteria in the last round:

This feature shall be mandatory for all UE's starting the Plenary meeting following presentation by one chipset and one infrastructure vendor that the UE and infrastructure vendor have passed all of the relevant RAN5 test cases.

2 – Intel Corporation (UK) Ltd

Not a new argument as such, but to ensure we're all on the same page regarding the "introduction of IODT bit", in our understanding, if we agree to introduce IODT bit, the corresponding components in FG6-1a need to introduce separate 'capability signaling' rather than IODT bit.

3 – Deutsche Telekom AG

(as Moderator) @T-Mobile: John, I thought that the concept of "IODT bits in 3GPP" is pretty clear ?

My understanding is that the feature **remains mandatory** independetly how the bit is set and RAN plenary decides from which version of the the spec (i.e. time) all UE shall set the bit to be TRUE (i.e. sucessfully tested). The criteria was always that at least 2 infra vendors provide testing opportunities.

I do not want to discuss the generic IODT concept of 3GPP, but I invite comments in this regard to reconfirm a common understanding how the process works.

4 – QUALCOMM JAPAN LLC.

We agree with Deutsche Telekom that we have the established way of mandating all UEs to set the IOT bit.

Not introducing the IOT bit now invites the risk of having a certain period where some UEs are not tested for NCD-SSB and some other UEs are tested for the same feature, but without our ability to distinguish those different UE types. As a result, we will have to introduce an IOT bit, and all UEs must be treated as "not tested", until UEs start implementing the IOT bit.

5 – Ericsson LM

First: To clarify: The original proposal is not to make anything optional, but as is clearly stated in TS 38.306, a feature which is "mandatory with capability signaling" means that the corresponding capability bit is "set" when the feature has been tested properly. Thus we confirm the moderator's understanding.

Then, to address some of the issues concerns brought up during the first phase:

The implementation timelines of different functionality varies between different vendors and even if the full FG 28-1 is mandatory (for RedCap), in practice it does not mean every company will implement everything at the same time, especially as the usefulness of different features depends on the deployment type (e.g. the examples of low band and <= 20 MHz deployment as discussed). This is particularly true

for features for which there might not be wide existing support yet (i.e. NCD-SSB). Thus, we don't think the situation w.r.t. actual support would be different without an IODT bit. On the contrary, without such bit the danger of having wrong implementations in the field later is greater and the NW needs to take into account the erroneous implementations in any case (thus resulting in the similar concerns from NW side on implementation as discussed during first round)

On the scope of the proposed IODT bit, we are fine to discuss if other components should be included and which deployments (FR1/FR2/FDD/TDD) should be covered, if this resolves concerns of the opposing companies. However, for the other components, we think as NCD-SSB is relevant for connected mode, whereas 3,4,5 are for RRC_IDLE, it is better to specify the (separate) IODT capability signaling only for NCD-SSB functionality.

We are happy to hear other proposal as well!

6 – VODAFONE Group Plc

we feel that IoDT bit is needed. I am not sure how and when the vendors would test NCD-SSB if they decide to start developing redcap UEs for lower bands only. Saying that, the feature is absolutely mandatory in my view and we do not need to re-discuss criteria for that, but we also need to take care about reality.

7 – Ericsson LM

[For reference, as the different components of FG 28-1 have been brought up:

28. NR_redcap

28-1

RedCap UE

1. Maximum FR1 RedCap UE bandwidth is 20 MHz.
2. Maximum FR2 RedCap UE bandwidth is 100 MHz.
3. Early indication of RedCap UE in Msg.1 for 4-step RACH
4. Separate initial UL BWP for RedCap UEs

- It includes the configuration(s) needed for RedCap UE to perform random access
- Enabling/disabling of frequency hopping for common PUCCH resources

5. Separate initial DL BWP for RedCap UE~~e~~s

- It includes CSS/CORESET for random access
- FFS: For separate initial DL BWP used for paging, CD-SSB is included
- For separate initial DL BWP only used for RACH, SSB may or may not be included

6. 1 UE-specific RRC configured DL BWP per carrier
7. 1 UE-specific RRC configured UL BWP per carrier
8. RRC reconfiguration of any parameters related to BWP
9. UE-specific RRC- configured DL BWP with CD-SSB or NCD-SSB
10. NCD-SSB based measurements in RRC-configured DL BWP

FFS whether to add any other basic features for RedCap UE]

8 – Nokia Corporation

We have the same understanding of the IODT bit as moderator and the intention is not to make anything optional with the IODT bit proposal. Furthermore, we have similar concern as expressed by Ericsson if no IODT bit is defined: ”*without such bit the danger of having wrong implementations in the field later is greater and the NW needs to take into account the erroneous implementations in any case* ”

9 – vivo Communication Technology

We will not repeat the arguments made in the first round.

We do not buy the argument made by Ericsson ”*without such bit the danger of having wrong implementations in the field later is greater and the NW needs to take into account the erroneous implementations in any case* ” . Without the IODT bit, every RedCap UE has to be properly tested before entering into the market, this is the safest approach.

However, with the IODT bit, there could be significant amount of devices in the market which are not fully tested with NCD-SSB features, which will make problems if operators wish to enable NCD-SSB feature in the future, especially when the number of such ”unreliable devices” is large.

10 – MediaTek Inc.

If there is no consensus in RP to do something, we should not revert RAN1 agreement (which was discussed for long time and made based on technique reasons)

11 – China Mobile Com. Corporation

Firstly, NCD-SSB is a basic UE feature as comment by vivo that it is a compromise from an very exhausted discussion in RAN1. Then as a basic feature, it should be supported by all UEs before putting into practical use, and we don’t think there will be wrong implementations in the field.

Secondly, the consequence of introducing mandatory with capability will be delayed implementation for NCD-SSB, and make a risk of optional capability for it. One example is CSI-RS based RLM measurement, which has been discussed for several meetings by RAN1/2/3, supposing that it is not supported for R17 still. Then the benefit of offloading will never be realized, since offloading is impossible for those early deployment RedCap UEs (And this type of terminal may exist for a long time).

12 – ZTE Corporation

We first of all repeat we have a strong concern with the introduction of such IODT bit, for the reasons already expressed. We disagree with the comment from Ericsson and we still fail to understand why there should be a specific issue with the testing of the NCD-SSB support (which is deemed to be a key feature for RedCap, which all the networks - besides the UEs - will likely implement) and not with other mandatory features, like ”early indication of RedCap UE in Msg 1”, which many networks/operators might decide not to use.

We can then add that, from our perspective, we think IODT opportunities (for both FDD and TDD) will be available soon, so that the alleged justification for introducing an IODT bit might not be really valid.

13 – HuaWei Technologies Co.

We are not sure whether we are talking the same thing here. Indeed the moderator’s interpretation of IODT bit is what we also understand, but here we have a long story. In LTE we previously have had a FGI bit,

which was exactly reflecting the meaning of IODT bit, but later we dropped this and we always use mandatory with capability signaling since later LTE releases and all NR releases for IOT bit. In our understanding, the major difference between mandatory without capability signaling and mandatory with capability signaling, is whether we allow different timelines for mandatory features. If all the mandatory components need to be separated due to testing purpose, there is no meaning of mandatory without capability signaling anymore. We understand for REDCAP, NCD-SSB is one important component to be supported widely, if as Pananosic proposed that this becomes an IODT bit per band, it would end up no unified support and no unified time to market from vendors, and would further fragment the market.

14 – Classon Consulting

[for FUTUREWEI] regardless of the intent, reverting the agreements on the RedCap basic feature will have a negative impact on the adoption and use of NCD-SSB. C.f. mandatory with capability CSI-RS RLM discussions.

Please provide your view of the IODT bit should be introcuced depending on the carrier bandwiths (i.e. like the Panasoic proposal in the initial round, proposing an IODT bit for 20 MHz and less carrier BW, but not for above 20 MHz

Feedback Form 6: Support of carrier BW dependent IODT bit ?

1 – Nordic Semiconductor ASA

If we have consensus that NCD SSB is of no use in ChBW<=20MHz, then rather than adding IoDT bits, we clarify in RAN1 feature list that NCD-SSB features apply to configured ChBW larger than 20MHz?

2 – Panasonic Corporation

The reasoning of our proposal of 20MHz dependent was this IODT bit could be defined per band.

We are also ok with Nordic proposal to clarify that NCD-SSB features apply to configured ChBW larger than 20MHz

3 – T-Mobile USA Inc.

T-Mobile USA is against this approach given that the vast majority of NR bands support Channel BW's > 20 MHz. It's not clear how this significantly reduces IODT testing.

4 – Intel Corporation (UK) Ltd

We agree with the moderator's initial assessment that defining the IODT bit dependent on channel BW effectively causes more fragmentation, complicates signalling, and potentially impacts eventual adoption of NCD-SSB for all cases as was originally intended by RAN1 design, and all of these are undesirable.

To the comment from Nordic on potential consensus that "NCD SSB is of no use in ChBW <= 20 MHz", we do not share such view. The relevance of NCD-SSB is not only in consideration of the ChBW but also how it relates to an active DL BWP configured to a RedCap UE. In this regard, NCD-SSB would be

relevant also for RedCap UEs supporting NCD-SSB but not supporting FG 28-1a when configured with an active DL BWP that may not include CD-SSB. More importantly, the proposal from Nordic effectively impacts core specs and we do not prefer changing core specs at this stage.

In our view, an IODT bit for early market deployments still remains as the most appropriate option for the issue at hand. We are open to possible clarifications on the criteria that could be considered for making the feature truly mandatory.

5 – QUALCOMM JAPAN LLC.

This is acceptable to us.

But we would like to point out that this may result in the need of additional IOT bits in the future, if the lack of IOT availability is identified for other cases, hence the fragmentations.

6 – Ericsson LM

In general, we the think that the IODT signaling should cover all of the cases to be most useful and convey reliable information on what functionality has been successfully tested.

We are ready to compromise to target the early deployments. One possibility is the Panasonic proposal, but, addressing some of vivo's concerns, we would also like to check whether companies would be OK to specify the bit for FR1 (and FDD) to target the early deployments.

However, as Qualcomm points out, we also think there is a real danger we need to come back to this discussion and add new IODT bits in the future if we identify issues.

7 – Guangdong OPPO Mobile Telecom.

we are not sure whether carrier bandwidth really matters for deployment and test of NCD-SSB. if a vendor can already do it for e.g. >20MHz carrier, why it is difficult for <=20MHz carrier?

As for the dimension of FR range and/or duplex mode, we would like to hear technical view also.

8 – Nokia Corporation

As a compromise we are open to try to find some constraints e.g. related to initial deployments but this should not lead to a situation that additional IODT bits will need to be defined later for the same feature in different deployment scenarios.

9 – VODAFONE Group Plc

I am not sure what is the IoDT bit for early implementations. To me the sense of IoDT bits is to cover early implentations. Do we have IoDT bits for early and late implementations? If we can not agree to restrict the IoDT bits for particular bands or bandwith, in my view we should go with one generic IoDT bit, but again the feature remains mandatory

10 – ZTE Corporation

Similarly to Oppo, we are not sure why the carrier BW really matters here.

In case we could consider what Nordic Semiconductor suggested (NCD-SSB features apply to configured ChBW larger than 20MHz), but we also note that RAN2 already discussed the proposal to prevent deployments of two SSBs within 20MHz in the past meetings, but several companies did not agree to add such restriction.

11 – MediaTek Inc.

We do not support carrier BW dependent IODT bit, it is a strange concept and we do not have this kind of IODT bit design before. Instead, if something is really needed, we can say that - "**From NW perspective, it only configures NCD-SSB and/or separate initial Redcap BWP for carrier BW larger than 20MHz**". Maybe some clarification in 38.300 could be added but no need to update RAN1 feature table.

12 – China Mobile Com. Corporation

We do not support carrier BW dependent IODT bit.

We have discussed whether to report RedCap capability per band or per UE considering low FDD bands with small CBW, and made agreement that FG28-1 is reported Per UE. So support of FG28-1 should be mandatory for all the RedCap UEs regardless of bands. It is a bad idea to open the door to add IODT bit for part of FG28-1 components that we have long discussed as basic feature.

13 – HuaWei Technologies Co.

we share similiar views as CMCC and see no need for IODT bit.

14 – Spreadtrum Communications

We are not supportive for carrier BW dependent IODT bit, and share the similar views as CMCC.

15 – Classon Consulting

[for FUTUREWEI] should not introduce

16 – Classon Consulting

[for FUTUREWEI] should not introduce

17 – Classon Consulting

[for FUTUREWEI] should not introduce

2.1 Summary of Intermediate Round

Moderator's summary of the intermediate round of discussion

The first Question invited for other aspects.

One discussion was on the generic handling IODT bits in 3GPP. This topic was clarified by the moderator and confirmed by multiple companies.

It was also indicated that the per band capability was discussed in RAN1 already and ruled out.

2nd Question asked by the moderator: “Support of carrier BW dependent IODT bit ?”

Yes: Nordic & Panasonic (NCD-SSB only for > 20 MHz), Qualcomm, Ericsson,

No: TMUS, INTEL, OPPO ?, VF, ZTE ?, MediTek, CMCC, Huawei, FUTUREWEI

Proposed conclusion by the moderator: Given this discussion and the quite balanced viewpoints partly more negative on introduction of an IODT bit, I suggest to close the discussion and keep the status quo (no IODT bit introduced).