3GPP TSG RAN WG2 Meeting #116-e R2-210xxxx

**Electronic meeting, 1st -12th November 2021**

**Agenda item: 8.2.x**

**Source: Intel Corporation**

**Title: Report of email discussion [Post115-e][214][R17 DCCA] Capabilities (Intel)**

**Document for: Discussion and Decision**

# Introduction

This is the email discussion report for following email discussion:

**[Post115-e][214][R17 DCCA] UE capabilities (Intel)**

Scope: Discuss which (RAN2-determined) UE capabilities (for all features in this WI) are needed

Intended outcome: Report

Deadline: Long

Rapporteur would like to split the discussion in two phases:

**Phase 1**: To collect companies’ view on what UE features should be considered for R17 DCCA ; The **deadline for this 1st phase** of email discussion is **Thursday September 30.**

**Phase 2**: To collect companies’ view on identified UE features, and whether they are per UE, BC, FS, etc The **deadline for this 2nd phase** of email discussion is **Wednesday October 20.**

# RAN2 UE Feature list for Rel-17 DCCA-Phase 1

Note: In phase 1, we only collect potential features for R17 DCCA. The prerequisite feature groups, etc will be discussed in phase 2.

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| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Features | Index | Feature group | Components | Prerequisite feature groups | Need for the gNB to know if the feature is supported | **Consequence if the feature is not supported by the UE** | **Type**  **(the ‘type’ definition from UE features should be based on the granularity of 1) Per UE or 2) Per Band or 3) Per BC or 4) Per FS or 5) Per FSPC)** | Need of FDD/TDD differentiation | Need of FR1/FR2 differentiation | Capability interpretation for mixture of FDD/TDD and/or FR1/FR2 | Note | Mandatory/Optional |
| x. Rel-17 DCCA | X-0 | Activation/Deactivation of SCG | 1. Support of activation/deactivation of SCG; 2. RACH-less SCG activation; 3. UE initiated activation; 4. RLF/BFD monitoring on deactived SCG; |  |  |  |  |  |  |  |  |  |
| x-1 | CPAC | 1. CPAC for NR-DC 2. CPAC for (NG)EN-DC 3. A3/A5 based execution condition (if agreed) |  |  |  |  |  |  |  |  |  |

**Question 1: Companies are invited to provide your views on Deactivation of SCG (from RAN2 perspective):**

* **For the feature group listed above, which** **are essential/basic components to the feature group and which should be added as separate features?**
* **whether there are other basic components related to the listed feature group or whether there are further separate features related that need to be added?**

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| --- | --- | --- |
| Company | Essential/basic features, 1, 2, 3, 4, others? | remark |
| Ericsson | 1,2 | 3 is still FFS, so too early to discuss capabilities for this.  4 is a prerequisite for 2, i.e. RACH-less SCG activation does not work without RLF/BFD. |
| vivo | 1,2,4 | For 3), agree with Ericsson. Besides, whether “UE requested SCG deactivation to the MN” should be added and maybe as separate features. |
| CATT | 1,2,4 | Whether UE can intiated SCG activation is still under discussion  Minor eidtorial correction: we think it should be “RLM/BFD monitoring on deactivation SCG”  We also wonder whether the scenarios such as applicability of activation/deactivation of SCG for (NG)EN-DC, NR-DC, handover and RRC resume should be considered as separate features. |
| MediaTek | 1 | We think that SCG activation/dedicatation conttolled by NW and always triggering RACH is baseline of this feature. UE initiated activation or RACH-less opearation is not a must. Those two should be separated features. RLF/BFD is requested for RACH-less operation. |
| Apple | 1,2,3,4 | We do agree that topics related to 3 are FFS. We also have a couple of comments:   * We do not want to link 2 and 4. Obviously, for RACH-less activaiton, UE needs to do additional actions which warrants a capability. And same argument for 4. But we do not see that 4 is needed for 2. In small cell environments, the RACH might not be needed at all, irrespective of the usage/no-usage of 4. ‘4’ deals with beams, while ‘2’ is not limited to beams (TA is the main component). * We also think the support of SCG deactivation feature should be per-band-per-BC. * Also, a differentiation is needed on whether the UE supports SCG deactivation in NR-DC vs NG(EN)-DC. |
| Qualcomm | 1, 2 | 1), 2) are the basic features. 3) is FFS. |
| Nokia | 1,2,3,4 | It seems very difficult to separate some items from the functionality – at least at this point of time. For example – 3) Ue initiated activation – How would feature work without this if there is no reporting to MCG about data arrival? So this needs to be basic feature unless we have some alternative feature. Additionally 3) seems to be already in the MAC specification unless one makes some deliberate measures to change the existing MAC specification. Then 4) as discussed this features seem necessary for feature to work properly. If this would be optional why we even specify it? |
| Huawei, HiSilicon | See comments | We agree with above companies that 3) is still a FFS point, which could be decided later.  For 1) we understand it includes MN/SN/UE requested activation/deactivation and we would like to confirm that it includes activation/deactivation in mobility scenarios e.g. PSCell change/HO/RRC resume as well.  For 2) RACHless SCG activation can bring benefit on activation delay, without which the feature of fast SCG activation has less value, so we prefer to make it always supported if the UE supports 1).  For 4) we think support RLF/BFD on deactivated SCG does not require extra capability compared with RLF/BFD on activated SCG (BF recovery is mandatory for FR2, SCG failure recovery is mandatory). Then we are thinking there is no need to introduce capability component specific to SCG activation/deactivation, the network will understand the same capabilities for legacy/activated SCG also apply to the case of SCG deactivated. |
| Intel | 1,2,4 | We agree 3 is still FFS, and it would be good to wait until we confirm this feature is supported. |
| ZTE | 1,2,3,4 | For 1), we may need to further discuss whether to define separate capabilities for RRCReconfiguration, and RRCResume cases. But prefer not to differentiate normal RRC reconfiguration, HO and PSCell change scenarios, all of them are triggered by RRCReconfiguration.  3) is needed if UE-initiated SCG activation is supported. |
| Futurewei | 1.2.3 | We agree on that 3) is still FFS but it is desirable with clear use case to support. 4) is the matter of whether to maitain RLF/BFD for deactivated SCG. It seems not necessary to be a new UE capability. |

**PH1 summary:**

Regarding Activation/Deactivation of SCG, companies have concern about UE initiated activation and think it is still FFS. So it would be good to exclude it for now in UE capability discussion.

And the following UE capabilities are suggested to go for PH2 discussion:

1. Support of activation/deactivation of SCG;
2. RACH-less SCG activation;
3. RLF/BFD monitoring on deactivated SCG;

**Question 2: Companies are invited to provide your views on CPAC (from RAN2 perspective):**

* **For the feature group listed above, which are essential/basic components to the feature group and which should be added as separate features?**

**whether there are other basic components related to the listed feature group or whether there are further separate features related that need to be added**?

|  |  |  |
| --- | --- | --- |
| Company | Essential/basic features, 1, 2, 3, others? | remark |
| Ericsson | 1, 2 | 3 is not needed as a separate capability since this needs to be supported in order to support MN initiated CPC. Since there is another ongoing email discussion on this it is anyway too early to discuss capabilities for this now. |
| vivo | 1, 2, 3 | Agree with the rapporteur. |
| CATT |  | We wonder whether it is necessary to separate 1) and 2). The UE supporting CPAC could be considered to support both CPAC for NR-DC and (NG) EN-DC as one feature.  Agree with Ericsson that it is too early for 3) as there is another discusion ongoign to discuss the use of A3/A5 based execution condition. |
| MediaTek | See comment | It is unclear to us why we want to combine CPA and CPC (to CPAC) into one capability bit. Those two procedures are different and deserved to have different IOT bit at least.  It is also unclear what would be the different UE behavior for intra-SN CPC and inter-SN CPC (For SN initialized).  In our understanding, we should have 4 different sub features  (1) CPA for NR-DC  (2) CPA for (NG)EN-DC  (3) MN initiated CPC in NR-DC  (4) MN initiated CPC in (NG)EN-DC  A3/A5 based execution condition could be discussed later if it is agreed. |
| Apple | Similar views are Mediatek. |  |
| Qualcomm | 1, 2,  See comment | 1), 2) are the basic features. 3) is FFS. CPA, Inter-SN CPC, and Intra-SN CPC are to be considered as different features. |
| Nokia | 1,2 | We think there is no need to split the capabilities and have separate for NR-DC and EN-DC. Also, no strong motivation behind keeping CPA and CPC separately. Although we agree with MTK these are two different procedures, it is a bit weird if the UE supports Conditional PSCell Addition (CPA), but then it is not possible to change the configured PSCell in a conditional way (via CPC). Do we need to create so many individual capabilities?  Agree that 3 shall not be subject to a separate capability, but any UE supporting MN-initiated CPC shall support also A3/A5-based triggering. |
| Huawei, HiSilicon | See comments | We agree with MediaTek that: - Rel-16 UE capabilities for CPC could cover inter-SN CPC - NR-DC and -(NG)EN-DC can have separate capabilities.  However, for simplicity we are wondering if the CPA and MN intiatied CPC could be merged as one capability, as the only difference from UE perspective maybe the excution condition/event used. |
| Intel | 1,2 | Also ok to have separate UE capabilities for CPA and CPC. |
| ZTE | 1,2 | No strong view for whether to have separate capabilities for CPA and CPC. If the majority wants it, we share the same view with Huawei that CPA and MN initiated CPC could be merged as one capability for simplicity, considering they have similar procedures and signaling. |
| Futurewei |  | We share similar views as MediaTek. It is reasonable to consider the capabilities based on the four sub-features. We also share the similar view as Ericcson that using of A3/A5 need not to be a UE capability. |

**PH1 summary:**

Regarding CPAC, companies think A3/A5 based execution condition is still under discussion in another ongoing email discussion. So it would be good to exclude it for now in UE capability discussion.

And the following UE capabilities are suggested to go for PH2 discussion.

1. CPA for NR-DC
2. CPA for (NG)EN-DC
3. MN initiated CPC in NR-DC
4. MN initiated CPC in (NG)EN-DC

# RAN2 UE Feature list for Rel-17 DCCA-Phase 2

Note: In phase 2, companies are invited to provide input for the following questions about Prerequisite feature groups, Granularities, Need of FDD/TDD differentiation and Need of FR1/FR2 differentiation.

**Question 3: Companies are invited to provide your views on Prerequisite feature groups for the following UE capabilities, e.g. not needed or any:**

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| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Company | Support of activation/deactivation of SCG; | RACH-less SCG activation; | RLF/BFD monitoring on deactivated SCG; | | CPA for NR-DC | | CPA for (NG)EN-DC | | MN initiated CPC in NR-DC | | MN initiated CPC in (NG)EN-DC |
| ZTE | not needed | not needed | not needed.  (The R15 RLF/BFD are expected to be supported first, but seems no need to capture it in spec?) | | Can merge the CPA and MN initiated CPC as one capability, e.g. MN initiated CPAC for NR-DC | | Can merge the CPA and MN initiated CPC as one capability, e.g. MN initiated CPAC for (NG)EN-DC | | Can merge the CPA and MN initiated CPC as one capability, e.g. MN initiated CPAC for NR-DC | | Can merge the CPA and MN initiated CPC as one capability, e.g. MN initiated CPAC for (NG)EN-DC |
| MediaTek | Not needed | RACH-less operation is still not fully defined yet, we suggest to discuss this after RAN2#116. | R15 RLF/BFD | | Not needed  (We disagree to merge CPC and CPA) | | Not needed  (We disagree to merge CPC and CPA) | | Not needed  (We disagree to merge CPC and CPA) | | Not needed  (We disagree to merge CPC and CPA) |
| Futurewei | not needed | not needed | R15 RLF/BFD are supported first. It need not be a new capability. | | not needed | | not needed | | not needed | | not needed |
| Huawei, HiSilicon | not needed | not needed | not needed | | not needed | | not needed | | not needed | | not needed |
| Qualcomm | Support of MR-DC operation with NR SCG. | Support of activation/deactivation of SCG.  Support of RLM/BFD monitoring on deactivated SCG. | | Support of activation/deactivation of SCG. | | Support of NR-DC operation. | | Support of (NG)EN-DC operation. | | Support of NR-DC operation. | Support of (NG)EN-DC operation. |
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**Question 4: Companies are invited to provide your views on Granularities for the following UE capabilities, e.g. 1) Per UE or 2) Per Band or 3) Per BC or 4) Per FS or 5) Per FSPC):**

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| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Company | Support of activation/deactivation of SCG; | RACH-less SCG activation; | | RLF/BFD monitoring on deactivated SCG; | CPA for NR-DC | CPA for (NG)EN-DC | MN initiated CPC in NR-DC | MN initiated CPC in (NG)EN-DC |
| ZTE | 1) Per UE  (May need to differentiate SCG (de)activation via RRCReconfiguration and via RRCResume, and need to differentiate NR-DC and (NG)EN-DC) | 1) Per UE?  (May need to differentiate RRCReconfiguration and RRCResume, it is too complex to use per-band per BC) | | 1) Per band  (same as for R15 capability) | 1) Per UE | 1) Per UE | 1) Per UE | 1) Per UE |
| MediaTek | Per UE and prefer to have separate capability for Resume and Reconfigruation case. | FFS | | Same as R15 is okay | Per UE | Per UE | Per UE | Per UE |
| Futurewei | 1) Per UE |  | | Need not be a new capability  (same as for R15 capability) | 1) Per UE | 1) Per UE | 1) Per UE | 1) Per UE |
| Huawei, HiSilicon | 1) Per UE | 1) Per UE | | Prefer to reuse R15 capability, i.e. no new capability for deactivated SCG | 1) Per UE | 1) Per UE | 1) Per UE | 1) Per UE |
| Qualcomm | 2) Per band.  We would like FR1-FR2 differentiation. | 2) Per band.  We would like FR1-FR2 differentiation. | 2) Per band.  We would like FR1-FR2 differentiation. | | 1) Per Band. | 1) Per Band. | 1) Per Band. | 1) Per Band. |
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**Question 5: Companies are invited to provide your views on Need of FDD/TDD differentiation for the following UE capabilities, e.g. Yes or No or N/A:**

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| --- | --- | --- | --- | --- | --- | --- | --- |
| Company | Support of activation/deactivation of SCG; | RACH-less SCG activation; | RLF/BFD monitoring on deactivated SCG; | CPA for NR-DC | CPA for (NG)EN-DC | MN initiated CPC in NR-DC | MN initiated CPC in (NG)EN-DC |
| ZTE | No  (same as for direct SCell activation) | No or N/A | No or N/A | No | No | No | No |
| MediaTek | No | FFS | No | No | No | No | No |
| Futurewei | No | No | No | No | No | No | No |
| Huawei, HiSilicon | No | No | N/A, prefer to reuse R15 UE capability | No  But following the same way of R16 CPC UE capability reporting, the UE needs to report separate CPAC capabilities for the following cases?   * within FDD-FR1/ TDD-FR1/TDD-FR2, * between FDD and TDD, * between FR1 and FR2 | No | No | No |
| Qualcomm | No. | No. | No. | N/A. | N/A. | N/A. | N/A. |
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**Question 6: Companies are invited to provide your views on Need of FR1/FR2 differentiation for the following UE capabilities, e.g. Yes or No or N/A:**

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| --- | --- | --- | --- | --- | --- | --- | --- |
| Company | Support of activation/deactivation of SCG; | RACH-less SCG activation; | RLF/BFD monitoring on deactivated SCG; | CPA for NR-DC | CPA for (NG)EN-DC | MN initiated CPC in NR-DC | MN initiated CPC in (NG)EN-DC |
| ZTE | Maybe Yes  (same as for direct SCell activation) | Maybe Yes | Maybe Yes | No | No | No | No |
| MediaTek | Prefer Yes | FFS | Prefer Yes | No | No | No | No |
| Futurewei | Prefer No | Yes | Same as R15 RLF/BFD | No | No | No | No |
| Huawei, HiSilicon |  |  | N/A, reuse R15 UE capability | No  But following the same way of R16 CPC UE capability reporting, the UE needs to report separate CPAC capabilities for the following cases?   * within FDD-FR1/ TDD-FR1/TDD-FR2, * between FDD and TDD, * between FR1 and FR2 | No | No | No |
| Qualcomm | Yes. | Yes. | Yes. | N/A. | N/A. | N/A. | N/A. |
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**Question 7: To better understand companies’ views on phase-1, companies are invited to provide your views on Need of separate indication for the following UE capabilities, e.g. Yes (when UE supports the feature group, UE can further choose whether to support this component) or No (when UE supports the feature group this component is supported by default):**

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| --- | --- | --- | --- | --- | --- | --- | --- |
| Company | Support of activation/deactivation of SCG; | RACH-less SCG activation; | RLF/BFD monitoring on deactivated SCG; | CPA for NR-DC | CPA for (NG)EN-DC | MN initiated CPC in NR-DC | MN initiated CPC in (NG)EN-DC |
| ZTE | Yes | Yes | Prefer No  (We prefer to use R15 capabiltiies) | No | No | No | No |
| MediaTek | Yes | Yes | FFS | Yes | Yes | Yes | Yes |
| Futurewei | Yes | Yes | Not a new capability | Yes | Yes | Yes | Yes |
| Huawei, HiSilicon | No  We understand this is the basic capability of the feature group of deactivated SCG, i.e. if the UE supports the feature group the UE needs to support this component. | No  We prefer to make this component always supported if UE support deactivated SCG, otherwise we will lose the benefit of fast SCG activation. | N/A, we prefer to reuse the R15 UE capabilities | No  Depends on if we have one feature group of CPAC or two feature groups of CPA and CPC.  From our side, one feature group of CPAC is enough. Then if UE supports the feature group for NR-DC or (NG)EN-DC, it supports both of CAP and MN-initiated CPC. | No | No | No |
| Qualcomm | Yes. | No.  RACH-less SCG activation has a pre-requisite that RLM/BFD monitoring on deactivated SCG is supported, i.e., this feature is dependent on RLM/BFD monitoring. | Yes. | Yes. | Yes. | Yes. | Yes. |
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# Conclusion

The followings are proposed:

1. **a potential easy agreement**

FFS on the following two UE capabilities:

1. UE initiated SCG activation
2. A3/A5 based execution condition for inter-SN CPC
3. **a candidate for immediate postpone, is contentious such that it is unlikely to converge at e-Meeting.**