3GPP TSG-RAN WG2 Meeting #109bis-e draftR2-200xxxx

Elbonia, Online, 20 – 30 April 2020

**Agenda item: 6.9.3.1**

**Source: Nokia, Nokia Shanghai Bell**

**Title: Report from [AT109bis-e][207][MOB] Open CHO issues**

**WID/SID: LTE\_feMob-Core/NR\_Mob\_enh-Core - Release 16**

**Document for: Discussion and Decision**

# 1 Brief scope of the paper

This document aims at collecting companies’ views regarding the open issues for Conditional Handover (CHO), submitted to 6.9.3.1 for RAN2#109bis-e (held in Elbonia, April 2020). Please beware that TDocs discussing the aspects handled in [3] are not included below, as the e-mail discussion report shall be handled first!

# 2 Discussion

## 2.1 T304 running when CHO condition execution is met

The authors of [1] insist on clarifying that CHO shall not be executed if there is already any other ongoing HO (e.g. legacy HO was initiated while the UE still evaluates CHO conditions and decides to execute CHO when HO is ongoing). Due to this problem, the authors of [1] suggest to associate the CHO execution with the condition which checks if the T304 is already running. This idea was already brought up and discussed briefly during RAN2#109 and not captured in the specification. While this is logical that T304 shall not be running when UE triggers CHO, it is a separate question if this behaviour needs to be explicitly captured in the specification. Thus, please respond to the following question.

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| **Question 1: Should the RRC procedure be extended with a condition checking if T304 is running before UE executes conditional reconfiguration?** | | |
| **Company** | **YES/NO** | **Comment** |
| MediaTek | No | We agreed to have recovery via CHO for mobility failures, which implies that UE may continue evaluating CHO execution conditions during HO/CHO, if possible. In normal cases, when T304 is running, UE does not execute CHO to another candidate, but we may find it useful in later UE implementation, and thus we don’t want to have it explicitly banned in the specifications. |
| OPPO | Yes | We think checking T304 makes sense when initiating CHO execution. |
| Intel | No | It is related to whether the UE can continue the evaluation of execution condition during HO. We do not see the use case for it, and if the UE stops the evaluation of execution condition, then the condition will not be met when T304 is running. |
| Lenovo | Yes | We slightly prefer to make it clear. |
| Panasonic | - | We are either fine with this T304 approach as well as the solution suggested by Ericsson in [3]. However, if no consensus is possible we prefer to not capture anything in the spec and avoid discussing the same thing again and again. |
| Futurewei | Yes | I think the discussion was initially from the last email discussion. The question is when a first CHO execution is triggered, should the UE initiate another CHO execution. The answer from most companies is No. Therefore, After CHO execution is triggered and the T304 like is started, the UE shall **check if T304 like for CHO is running before UE applies or executes conditional reconfiguration, and stop any other execution request or attempt.**  In R2-2002748, we suggest RAN2 to discuss a general principle: when a mobility or failure recovery execution has been initiated, it is normally shall not be stopped – first come first serve, unless a new attempt has higher priority which can be specifically specified if any. Therefore, in stage 3, if the principle applies to a first executed HO:  If a HO execution is initiated first before a CHO execution is triggered, the UE shall check the T304 for this HO execution and stop any other execution attempt.  The principle can be also applied to MCG fast recovery. |
| Qualcomm | No | Once UE process HO command and starts T304, it removes all entries for CHO as follows. There is nothing else to specify.  2> if the *reconfigurationWithSync* was included in *spCellConfig* of an SCG and the CPC was configured  3> remove all the entries within *VarConditionalConfig*, if any; |
| Ericsson | No | This has been discussed N times in previous email discussions and it seems we always conclude to not have anything captured for T304. |
| NEC | No | we also think when the legacy HO is initiated, the CHO evaluation is stopped. Then no CHO is triggered during T304 is running anyway. |
| ZTE | - | If something needs to be captured, we slightly prefer to capture that checking whether the related timer (e.g. T304, T316) is running before executing the CHO, for simplify. Otherwise, we may need to capture that the UE stops the evaluation of execution condition upon triggering the execution of CHO/HO or initiation of fast MCG recovery in the corresponding sections. But if majority prefer not to capture anything, we are also fine for it. |
| BT | Yes | We agree with MediaTek to have recovery via CHO for mobility failures, which implies that UE may continue evaluating CHO execution conditions during HO/CHO, if possible. But at this point, we don’t consider necessary to have the option to trigger a CHO meanwhile a HO is being executed. |
| LG | Yes | We think this is the simplest way to resolve this issue.  To be aligned, we are also fine the proposal by Ericsson in [3] if the solution is updated that the UE stops evaluating the CHO execution not only when the CHO is executed but also the legacy HO is executed. This is because, in the current Ericsson’s proposal, the UE stops evaluating the CHO execution only when the CHO is executed.  Regarding Qualcomm’s comment, it removes all entries for CHO only after HO complete so that the referred statements has nothing to do with this issue. |
| Huawei, HiSilicon | No | Share the same view as Intel. |
| Sharp |  | We agree with Futurewei’s view that an ongoing mobility or failure recovery should not be stopped in normal cases. But the answer may depend on the section 2.6 discussion. If it is agreed that UE stop the evaluation when a condition is met, then such T304 condition checking is not needed. |
| Samsung | No | As already discussed previous email discussion, we think associating the CHO execution to the stage 3 timer operation is not appropriate. Based on stage 2 description is enough. |
| CMCC | No | We have discussed similar questions that if UE continues evaluating the CHO condition during the execution of HO/CHO/fast MCG recovery. Since CHO does not have priority over these ongoing procedures, the basic idea is that these procedures should not be interrupted by a new CHO attempt. The agreement here can be also applied to HO/CHO/fast MCG recovery.  For the RRC spec, we slightly prefer not to associate the restriction with T304 or other timer and share the same view with Intel. |

## 2.2 Corrections to conditional reconfiguration evaluation

The authors of [2] argue the procedure for evaluating the measurement events for triggering conditional reconfiguration (5.3.5.13.4 in TS 38.331) should be extended. It is proposed to add a statement initializing the procedure, to make sure the condition is not fulfilled when the procedure is started. In addition, it is proposed to prevent the UE from checking the leaving condition all the time even if the entry condition was not fulfilled earlier. The authors of [2] have brought the same topic to [Post109bis-e#12], report in [3]. Several companies found those changes unnecessary. However, no proper discussion happened. Thus, companies are now invited to express their opinions.

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| **Question 2: Do you think the RRC procedure in 5.3.5.13.4 should be extended with additional subclauses to make sure the condition is not fulfilled/leaving condition is not checked when unnecessary, as suggested in [2]?** | | |
| **Company** | **YES/NO** | **Comment** |
| MediaTek | Yes/No | We believe that the default state of a triggering event is “not fulfilled”, and we need not to specify explicitly. Otherwise we should do this also for all measurement events?  But we are fine to have “if this event is considered as being fulfilled before, and” in [2]. |
| OPPO | No | We don’t understand why this issue is specific to CHO execution conditions, given that legacy measurement event works well in the same way? |
| Intel | No | Do not see the reason why such changes are needed. |
| Lenovo | No |  |
| Panasonic | Yes | In the measurement framework, when a triggering event is fulfilled, a measurement reporting entry will be added into *VarMeasReportList*. Here the CHO event uses a different approaching by assigning “not fulfilled” and “fulfilled” states. We simply want to avoid the situation where a new variable is declared but no value is assigned to that variable (to avoid some debugging issues).  Also, it is clear in the measurement framework that the UE will not check the leaving condition of a triggering event, if this event is not fulfilled before (not being added into *VarMeasReportList* before). However, according to the current spec the UE has to always check the leaving condition of a CHO triggering event. |
| Futurewei | No | The change can lead to more ping-ponging in a fluctuated measurement scenario. |
| Qualcomm | No | This is called over-specification. No UE will consider an event which did not happen as fulfilled. |
| Ericsson | No | We see the point brought by Panasonic, is just that what they seem to point out is an obvious thing. A sensitive UE implementation will anyways assume that and going beyond that, by adding a requirement feels a bit like over-specification as Qaulcomm has highlighted.  Trying to be a bit constructive, one possible compromise could be a NOTE, or something captured in the minutes “RAN understanding is that initial state is non-fulfilled, blah, blah”. |
| NEC | No | we do not see need for this specifically to CHO case. |
| ZTE | No |  |
| LG | No | Since we think the default state is as being non-fulfilled, we don’t think this is necessary. |
| Huawei, HiSilicon | No |  |
| Sharp | Yes/NO | The second change to add “if this event is considered as being fulfilled before, and” seems reasonable to us. But we also think the first change of “else” part is over-specified |
| Samsung | Yes/No | There could be some confusion on the way the spec is written currently. In current spec, the complement of definition of the fulfilment for one event is not same as the definition of non-fulfilment, which should be normally the case. However, in legacy case, entering condition and leaving condition have different metric to be fulfilled. So, we should think current way is one of extension of that legacy case by introducing the definition of “fulfilment” and “non-fulfilment” of event.  Anyhow, the second part looks valid to add “if this event is considered as being fulfilled before, and” |
| CMCC | Yes/No | Share the same view as MediaTek. |

## 2.3 CHO and MR-DC operation

The authors of [4] describe the possible consequences of allowing CHO in MR-DC and MR-DC after CHO is configured. Such aspects need to be considered as the majority in [3] seem to favour no SCG configuration in Conditional Reconfiguration, so MR-DC needs to be released at certain point during CHO. The authors of [4] propose the UE releases MR-DC upon the execution of CHO (Proposal 1). In addition, it is suggested source MN releases source SN upon reception of Handover Success from the target MN (Proposal 3 and 4). Do companies agree with such approach?

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| **Question 3: Do you agree UE releases MR-DC upon the execution of CHO and MN releases source SN upon reception of Handover Success from the target MN?** | | |
| **Company** | **YES/NO** | **Comment** |
| MediaTek | Yes | This is reasonable UE behaviour if we agree to have no SCG configuration in Conditional Reconfiguration. |
| OPPO | We prefer network-based approach for releasing MR-DC | We would like to understand the proposal a bit further.   1. Does it mean UE autonomously releases MR-DC? or 2. Does CHO configuration include a MR-DC release command?   We don’t want to have UE autonomous MR-DC release and we think it would be enough to have network-based solution, i.e. including MR-DC release explicitly in CHO configuration. |
| Intel | No | It should be released by network. |
| Lenovo | Yes | We have agreed that CHO configuration is allowed to be configured for UE with MR-DC. In addition, CHO including SCG configuration is not supported. Therefore, it is reasonable to autonomously release SCG when UE executes CHO. |
| Panasonic | Yes | We agree that UE can release the MR-DC upon the execution of CHO (if the conditional reconfiguration doesn’t carry the SCG configuration). The source node anyway will release all UE’s configurations (including SCG configuration) upon receiving the Hanover Success indication from target node. |
| Futurewei | No | Agree with Intel. It should be released by the network. The UE behaviour with the source should follow CHO behaviour as specified. |
| Qualcomm | Yes | Even though we don’t see any technical reason to restrict SCG configuration in CHO command (after all CHO is just a delayed HO and HO does allow this), we agree with the arguments in [4] that the target gNB may not be able to release this so it is much simpler to do this on the UE side. |
| Ericsson | Yes | We agree with Qualcomm restricting SCG configuration in CHO was unnecessary. Under this situation, it would be a bit unfortunate to add a requirement in network implementation to handle MR-DC in its CHO functionality but because RAN2 introduced a restriction (in theory something aimed to simplify something). |
| NEC | No | The release by network is our preference. If there is any case where the network cannot do it or difficult to do, the UE autonomous release is fine. |
| ZTE | No | We think it should be explicitly released by the NW. The source node can inform the target node that the UE is being MR-DC via setting sourceSCG-Configured as TRUE in HandoverPreparationInformation. Then the target can include the mrdc-SecondaryCellGroupConfig set to release in the generated RRCReconfiguration. So we see no difficulty for the target to release it. |
| LG | No | The network can release the MR-DC configuration via reconfiguration with sync which is associated with the CHO execution. This is because the target network already know the source configuration.  In addition, since MR-DC configuration can be releases by simply one bit signalling we think there is also no signalling burden to release MR-DC release. |
| Huawei, HiSilicon | No |  |
| Sharp |  | We agree the MR-DC is released in a CHO execution. It seems simper to rely on network indication, in which we does not see any spec impact. |
| Samsung | No | Release should be based on network’s command. |
| CMCC | No | The network should be the one to release the MR-DC. |

The authors of [4] also suggest to suspend CHO when SCG addition is received (Proposal 6). However, that seems to be a sort of enhancement and can be circumvented by cancelling CHO and configuring it again, if necessary. We suggest not to handle this or any other proposals from [4].

## 2.4 Source reconfiguration during CHO

The authors of [5] claim that Stage 2 specification shall be updated with a NOTE, explaining that source gNB is allowed to reconfigure the UE even after CHO configuration for candidate target cells. In addition, the NOTE shall say it is up to network to update the UE stored CHO configurations so that they remain valid. Such NOTE does not seem to be critically needed, but we would like the companies to express their opinion.

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| **Question 4: Do you think TS 38.300, section 9.2.3.4.2 should be updated with a NOTE that source gNB can reconfigure the UE even after providing CHO configuration for candidate target cells and it is NW’s responsibility to ensure those configurations remain valid (as proposed in [5])?** | | |
| **Company** | **YES/NO** | **Comment** |
| MediaTek | Yes | This NOTE is not critically needed, but we’d like to have it as a clarification. |
| OPPO | Yes | We are ok with the NOTE since this reflects earlier RAN2 agreements on NW behaviour. |
| Intel | No | Do not see the strong need to have such NOTE in stage 2. |
| Lenovo | No | As discussed in the email discussion, gNB may release CHO configuration and reconfigure the CHO based on the acknowledge from target cell. We don’t see the necessity to add a note since it is network implementation. |
| Panasonic | Yes | Although we also agree it is not critically needed. |
| Futurewei |  | No strong opinion. If this agreement is already captured in stage 3, it is not critical in stage 2. |
| Qualcomm | Yes | This was agreed after long discussions so good to write it down, which will help implementation people on what to expect. |
| Ericsson | No | We don’t believe this is needed. The source can do many other tings we are not capturing in notes e.g. send a handover command while UE, remove CHO, modify CHO, etc.  While we believe this is not necessary, we don’t find the Samsung proposal in [5] acceptable, in particular the second sentence, which looks like a network requirement.  “NOTE: After sending CHO configuration to the UE, the source gNB is allowed to reconfigure the UE. This may require the stored CHO configurations to be updated, in which case it is up to network to take appropriate actions.” |
| NEC | Yes | we are fine to add a NOTE |
| ZTE | Yes | We slightly prefer to add the note for clarification. |
| BT | Yes | Our preference is to add a note. |
| LG | No strong view | It has been clarified in stage 3 that the source cell provides further addition or modification for CHO. |
| Huawei, HiSilicon | Yes | We see benefits of having the Note. |
| Sharp | Yes | No strong view, but can agree with other views to clarify this. |
| Samsung | Yes | We think that information should be anyway highlighted in the overall procedure point of view. This is the basic difference compared to the legacy HO. |
| CMCC | Yes | We are fine to have the note. |

## 2.5 UE configuration release in RRC Reestablishment

The authors of [6] discuss UE’s behaviour when RRC Reestablishment is performed. It is described that as per legacy, the UE releases its configuration including spCellConfig, MCG SCell and otherconfig (delayBudgetReportingConfig and overheatingAssistanceConfig). In [6] it is proposed to change this behaviour if the UE is configured with *conditionalReconfiguration*. We do not fully understand the motivation behind this proposal and wonder if the intention was perhaps to associate it with the *attemptCondReconfig*, not the *conditionalReconfiguration*? Anyway, do companies share the proposal brought by Sharp in [6]?

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| **Question 5: Do you think the UE shall not release otherconfig including delayBudgetReportingConfig and overheatingAssistanceConfig and MCG SCells if the UE was configured with conditionalReconfiguration and the selected cell is a CHO candidate cell (as proposed in [6])?** | | |
| **Company** | **YES/NO** | **Comment** |
| MediaTek | Yes? | We are not sure if the configuration misalignment described in [6] will happen.  In the endorsed RRC CR (R2-2001767), we already identify that “release spCellConfig” and “suspend all RBs, except SRB0” should not be done in the initiation part if UE is configured with *conditionalReconfiguration*, and they will be done later if the selected cell is not CHO candidate.  If the *delayBudgetReportingConfig*, *overheatingAssistanceConfig* and MCG SCells also have the same problem, we should treat them in the same way as the previous two, i.e., associated with *conditionalReconfiguration* instead of *attemptCondReconfig*, and the text proposal in [6] can be used. |
| OPPO | Yes | Since delta configuration can be used for CHO configuration, then for UE to be able to acquire the entire target configuration upon CHO execution, e.g. in case of recovery via CHO, these source configurations should not be released. |
| Intel | Yes | This is same as PSCell configuration,etc that can be used as baseline for delta signalling in CHO configuration. |
| Lenovo | Yes | In the current running CR, UE release spCellConfig and suspend all RBs during initiating re-establishment only if UE is not configured with conditionalReconfiguration. Similarly, otherconfig(delayBudgetReportingConfig and overheatingAssistanceConfig) is released if UE is not configured with conditionalReconfiguration |
| Panasonic | Neutral | We understand the issue and remedy brought in [6]. However, as *otherconfig* is not as critical as spCellConfig and MCG SCell, we wonder whether such remedy is really necessary. Besides, the misalignment issue could be resolved if the target cell can assume that the UE has released *otherconfig*, upon receiving the RRCReestablishmentRequest. |
| Futurewei | Yes |  |
| Qualcomm | Neutral | It is beneficial to allow delta signalling but not sure if this can cause other problems. But since this *attemptCondReconfig* is an already an optimization, it can be kept simple as it is with PCell only. |
| NEC | Neural | we can understand this may be useful for delta configuration, while these configurations seem not so ciritcal. |
| ZTE | Yes |  |
| BT | Neutral | Even thought, we consider is beneficial |
| LG | Yes except of MCG Scell handling | We see the point from SHARP, for delay budget report and overheating assistance, there might be a mismatch between the network and the UE even though it isn’t critical.  However, for MCG SCells, there would be no problem if RAN2 agree that the target shouldn’t provide SCG configuration with CHO. Thus, for MCG Scell handling, we should wait for the outcome of the discussion whether the target shouldn’t provide SCG configuration with CHO. |
| Huawei, HiSilicon | Yes |  |
| Sharp | Yes | There is no reason that we allow delta configuration for spCellConfig, but not for other parts of UE configuration. |
| Samsung | Neutral | We are not sure if those other information is critical so that they needs to be the same way of spcellConfig. But it is reasonable to handle the MCG Scell at least as the way of spcellconfig |
| CMCC | Yes |  |

## 2.6 Stage 2 Text (TS38.300) on CHO evaluation during execution

In RAN2 #107 meeting, companies reached an agreement on CHO evaluation handling during CHO execution: “*UE is not required to continue evaluating the triggering condition of other candidate cell(s) during CHO execution.*” The agreement is based on the majority views in the email discussion [106#41][NR and LTE CHO] - *CHO execution details*. The statement is not mandatory requirement for UE.

However, in the latest TS38.300 under the clause 9.2.3.4.1, a UE mandatory stage 2 text is suggested. This mandatory requirement goes beyond the RAN2 agreement above. In fact, evaluating the execution condition(s) is a UE internal operation, mandating to stop the UE internal operation is not a directly testable requirement. Therefore, the current stage 2 text in TS38.300 is not aligned with the related RAN2 agreements and is not a suitable requirement. It can cause misleading to the stage 3 text development.

[7] suggests modifying the stage 2 text to align with the RAN2 #107 agreement and RAN2109e agreement on CHO measurement during execution:

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##### 9.2.3.4.1 General

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“The UE starts evaluating the execution condition(s) upon receiving the CHO configuration, and is not required to continue evaluating the execution condition(s) once the execution condition(s) is met.”

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Companies are kindly asked the following question:

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| **Question 6: Do you agree to make stage2 modification in TS38.300 as proposed in [7]?** | | |
| **Company** | **YES/NO** | **Comment** |
| Futurewei | Yes | It is understood that the term “*evaluating the triggering condition*” in the agreement is a high level stage 2 statement of entire process of CHO evaluation which including the detailed operations of quantity measurement, data processing and comparing the final data against the threshold for all the CHO candidates. The RAN2 #107 agreement precisely represents the majority views in the email discussion [106#41] while also respects the minority opinions.  The current stage 2 text in TS38.300 is not aligned with the related RAN2 agreements and is not a suitable requirement. If it is not modified it can cause misleading to current stage 3 text development and in future. |
| Qualcomm | No | This is another example of over-specification. “not required to” already means that the UE can do whatever it wants. |
| Ericsson | No | Agree with Qualcomm, this is over-specifying. We do not specify what the UE is NOT required to do. Could you even imagine if this becomes a trend in RAN2? In follow up meetings we would see “TP for actions UE is not required to do”. |
| NEC | No | this text should not be changed as proposed to avoid any further discussions behind this change. |
| ZTE | No | Agree with QCM and Ericsson. |
| LG | No | We think the current spec is clearer to understand the UE behavior. The problem is how to specify this behavior into stage 3. |
| Huawei, HiSilicon | No |  |
| Sharp | No |  |
| Samsung | No | We prefer to keep the text as it is. |
| CMCC | No |  |

# 3 Summary

# 4 Conclusions

# 5 List of referenced documents

[1] R2-2002900 *T304 running issue when CHO Execution,* LG Electronics, 3GPP TSG-RAN WG2 Meeting #109bis-e Elbonia, Online, 20 – 30 April 2020

[2] R2-2002996 *Corrections to conditional configuration evaluation,* Panasonic, 3GPP TSG-RAN WG2 Meeting #109bis-e Elbonia, Online, 20 – 30 April 2020

[3] R2-2003105 *E-mail discussion report [Post109bis-e#12][MOB] Resolving open issues for CHO* Nokia, Nokia Shanghai Bell, 3GPP TSG-RAN WG2 Meeting #109bis-e Elbonia, Online, 20 – 30 April 2020

[4] R2-2003035 *CHO and MR-DC operation*, Ericsson, 3GPP TSG-RAN WG2 Meeting #109bis-e Elbonia, Online, 20 – 30 April 2020

[5] R2-2003333 *Clarification on source reconfiguration during CHO*, Samsung, 3GPP TSG-RAN WG2 Meeting #109bis-e Elbonia, Online, 20 – 30 April 2020

[6] R2-2003609 *UE configuration release in RRC reestablishment*, Sharp, 3GPP TSG-RAN WG2 Meeting #109bis-e Elbonia, Online, 20 – 30 April 2020

[7] R2-2002748\_On measurement and evaluation during CHO execution, Futurewei, 3GPP TSG-RAN WG2 Meeting #109bis-e Elbonia, Online, 20 – 30 April 2020