**3GPP TSG-RAN WG2 Meeting #129bis [Draft] R2-250xxxx
Wuhan, China, April 7th – 11th, 2025**

Agenda Item: 8.5.4

Source: OPPO

Title: Summary of [122]

Document for: Discussion, Decision

1. Introduction

This is to discuss the offline as follows.

* [POST129b][122][NES] (OPPO)

 **Scope:** Discuss and make conclusions on proposal 1 in R2-2501817.

 **Intended outcome:** Discussion summary.

**Deadline: Long email discussion.**

1. Discussion

In this section, the defined scope of the post email discussion is further expanded to dig into details.

In the current RACH framework, CFRA could be initiated by a PDCCH order, by the MAC entity itself, or by RRC signalling. For different CFRA cases, their CFRA resources may be configured differently, i.e.,

1) CFRA for **additional PCI initiated by PDCCH order**: the CFRA resources are configured by *rach-configGeneric* from *additionalRACH-perPCI-ToAddModList-r18*, which is **mandatory** present.





For this case, there is a single mandatory *rach-configGeneric* to refer to, so if one wants to enable the usage of RACH adaptation for this case, network can simply set *rach-configGeneric* to be the additional RACH resource.

And since it is based on PDCCH order, network can ensure the PDCCH order is sent during the period when the additional RACH is activated, so no need to concern the case when the additional RACH resources are (de)activated.

Q1: For CFRA for **additional PCI initiated by PDCCH order**, what is your preference

1. R2 does not consider the support of RACH adaptation in this case;
2. R2 assume the support of RACH adaptation in this case can be done by network implementation without spec impact;
3. R2 aims at supporting RACH adaptation in this case, and spec impact is foreseen (if this option is selected, please indicate what the spec impact is)

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| --- | --- | --- |
| **Company** | **Option (A/B/C)** | **Comment** |
| OPPO | A or B |  |
| Xiaomi | B |  |
| Samsung | A | Same as legacy behaviour. No new enhancement is needed for CFRA. |
| Nokia | A | The framework with DCI dynamic activation wouldn’t work since the UE does not know non-serving cell status. |
| Lenovo | A or B |  |
| Apple | A or B without inter-node signaling work. | The two TA PDCCH-order RACH supports both intra-cell and inter-cell case. We think inter-cell case may not work unless some inter-node signalling is introduced which should be avoided at this stage. If majority prefer to support inter-cell case, no RAN3/inter-node signaling work should be done (i.e. the coordination between target and source cell about the RACH adaptation activation/deactivation status should be up to network implementation).  |
| vivo | B | The adapted resource in the inter-cell case can be transparent to the UE. No spec impact is foreseen. |
| Huawei, HiSIlicon | A or B |  |
| LGE | A | As Nokia mentioned, we also think that the UE does not know non-serving cell status. Previously it was agreed in RAN1 that Cell DTX/DRX operation is only supported for sTRP. It is not clear to us that NES operation is supported for mTRP. |
| Fujitsu | A or B |  |
| CATT | A or B |  |

2) CFRA for **L3** **HO initiated by RRC signalling (via *RRCReconfiguration* with *ReconfigurationWithSync*)**: the CFRA resources are configured by *rach-configGeneric* from the *rach-ConfigDedicated* (if provided, otherwise from *rach-configCommon*) of target cell.

3) CFRA for **LTM cell switch initiated by LTM Cell Switch Command MAC CE**: the CFRA resources are configured by *rach-configGeneric* from the *rach-ConfigDedicated* (if provided, otherwise from *rach-configCommon*) of each LTM candidate cell.

4) CFRA for **LTM early sync initiated by PDCCH order**: the CFRA resources are configured by *rach-configGeneric* from *EarlyUL-SyncConfig* of each LTM candidate cell, which is **mandatory** present.

For the case 2) and 3), there is a single optional *rach-configGeneric* to refer to, so if one wants to enable the usage of RACH adaptation for this case, network can simply set *rach-configGeneric* to be the additional RACH resource.



While for case 4), the CFRA resources are configured by *rach-configGeneric* from *EarlyUL-SyncConfig* of each LTM candidate cell, which is **mandatory** present. And thus also network can simply set *rach-configGeneric* to be the additional RACH resource.



And for the LTM cases (for both early UL sync and CSC MAC-CE), due to the uncertainty of the RACH timing, inter-node signaling is necessary (and thus R3 impact) in order for source node to indicate the additional RACH resource, when it is available at target node side.

Q2a: For CFRA for **L3** **HO initiated by RRC signalling (via *RRCReconfiguration* with *ReconfigurationWithSync*)**, what is your preference

1. R2 does not consider the support of RACH adaptation in this case;
2. R2 assume the support of RACH adaptation in this case can be done by network implementation without spec impact;
3. R2 aims at supporting RACH adaptation in this case, and spec impact is foreseen (if this option is selected, please indicate what the spec impact is)

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| --- | --- | --- |
| **Company** | **Option (A/B/C)** | **Comment** |
| OPPO | A or B |  |
| Xiaomi | B  |  |
| Samsung | A | Same as legacy behaviour. No new enhancement is needed for CFRA. |
| Nokia | A or B | For HO case, if configured in HO command then it is assumed to be usable for the RA procedure to target cell. Overlapped resource validation defined for normal case CBRA can be applied without further impact.[Rapp] After offline with Nokia, the intention of “Overlapped resource validation” is to say that if a same *rach-ConfigurGeneric* contains configuration for two RACH resources, e.g., legacy and additional RACH, the selection between the two follows the behavior for CBRA case. While Rapp understand there are another assumption that a single *rach-ConfigurGeneric* would contain a single RACH resource, either legacy or the additional one. So there might be different interpretation/view in the two directions.[Rapp2] Sorry for the misunderstanding. After further offline with Nokia, the intention is to allow additional signaling to indicate additional RACH (rather than a same *rach-ConfigurGeneric* contains configuration for two RACH resources, e.g., legacy and additional RACH), considering some associated signaling like SSB-RO mapping is anyway per RACH resource. And thus the selection of option-B is more from the perspective that no change to the UP procedure. |
| Lenovo | A or B | Our interpretation to use *rach-ConfigurGeneric* is like Rapp i.e., the network can include additional resource in *rach-ConfigurGeneric* if it wants to. |
| Apple | A or B  | On the two understanding between Nokia and Rapp, we now tend to agree with Nokia after reviewing RAN1 provided L1 excel: 1. In legacy *rach-ConfigurGeneric, prach-ConfigurationIndex* is mandatory configured.
2. In latest RAN1 excel, it seems that RAN1 assume that if another *prach-ConfigurationIndex* is configured (as legacy one is mandatory, it means that there will be two index), RACH adaptation is configured.

If this is correct understanding, we assume B means: 1. The UE assume additional RACH resource is available during HO.
2. Follow the agreement in RAN2#129:

Will follow legacy mechanism regarding how to select RACH resource. If company think above 1) has spec impact (although it seems straight forward to regard as principle that if CFRA resource is provided in HO command, it is valid during HO), we can go A.  |
| vivo | B | The adapted resource can be transparent to the UE, i.e. agree with comments from [Rapp]. |
| Huawei, HiSilicon | A or B | In RRC triggered HO, our understanding is that, both the *RACH-ConfigDedicated* and *RACH-ConfigCommon* in the *RRCReconfiguration* msg are configured by the target cell, and the HO will be triggered right after *RRCReconfiguration* is sent to the UE (unlike CHO).Therefore, the target cell can include whichever RACH configuration to be used for the UE. If it wants to include “additional RA resources”, it can either include it directly in the *RACH-ConfigGeneric* of the *RACH-ConfigDedicated*, or it can leave *RACH-ConfigGeneric* absent in *RACH-ConfigDedicated* while including the “additional RA resources” in *RACH-ConfigGeneric* of *RACH-ConfigCommon*, either way is already possible in the existing spec. The other network behavior is to include both common RA resources and additional RA resources in *RACH-ConfigCommon* and indicate which resource to use in *RACH-ConfigDedicated*, this is unlike the legacy behavior but we didn’t see much gain of it.Therefore, we think no additional spec impact is necessary for CFRA used in RRC triggered HO, regardless of whether it is categorized in to option A (so that we don’t emphasize the wording “adaptation”) or Option B (so that we mention “adaptation” but it is via implementation). The outcomes of Option A and B are the same to us. |
| LGE | A or B |  |
| Fujitsu | A or B | For L3 HO, we assume there is no additional impact on RAN3, as inter-node signalling will contain adaptive PRACH resources. If there is further impact on RAN3, we should select option-A. |
| CATT | A or B |  |

Q2b: For CFRA for **LTM cell switch initiated by LTM Cell Switch Command MAC CE**, what is your preference

1. R2 does not consider the support of RACH adaptation in this case;
2. R2 assume the support of RACH adaptation in this case can be done by network implementation without spec impact;
3. R2 aims at supporting RACH adaptation in this case, and spec impact is foreseen (if this option is selected, please indicate what the spec impact is)

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| **Company** | **Option (A/B/C)** | **Comment** |
| OPPO | A or B | If companies have a concern on the sync between source and target node regarding the additional RACH (de)activation status, we are surely fine to limit to option-A. |
| Xiaomi | B  | For the A/D sync issue, if additional PRACH is provided as CFRA resource, the target cell should ensure the additional PRACH is activated. Even if the additional PRACH becomes deactivated afterwards, the target cell can update the CFRA resource or release the target cell from the candidate cell for LTM if needed based on the existing procedure.  |
| Samsung | A | Same as legacy behaviour. No new enhancement is needed for CFRA. |
| Nokia | A | Considering the difference from L3 HO and pre-configuration of multiple candidate cells, thus no T304 timer for LTM like for L3 HO with which NW knows for how long it needs assume those resources might be used. |
| Lenovo | A |  |
| Apple | A or B without RAN3 impact | We agree with Nokia comment. If majority prefer B, we think no RAN3 work should be done (i.e. the coordination between target and source cell about the RACH adaptation activation/deactivation status should be up to network implementation). |
| vivo | A or B without RAN3 impact | Understand that for LTM case, if NW can ensure the validity of the additional RACH resource of the candidate cells, B is can work. |
| Huawei, HiSilicon | A or B | Similar to Q2a, since the RA resources are provided via dedicated signaling, the network already has the flexibility of configuring the RA resources it wants. |
| LGE | A | We have similar view with Nokia comment. |
| Fujitsu | A | For LTM, it requires tight coordination between source and target nodes, even if it can be handled by NW implementation. No need to support CFRA in this case without performance improvement. |
| CATT | A | Share the same view with Nokia. |

Q2c: For CFRA for **LTM early sync initiated by PDCCH order**, what is your preference

1. R2 does not consider the support of RACH adaptation in this case;
2. R2 assume the support of RACH adaptation in this case can be done by network implementation without spec impact;
3. R2 aims at supporting RACH adaptation in this case, and spec impact is foreseen (if this option is selected, please indicate what the spec impact is)

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| --- | --- | --- |
| **Company** | **Option (A/B/C)** | **Comment** |
| OPPO | A or B | If companies have a concern on the sync between source and target node regarding the additional RACH (de)activation status, we are surely fine to limit to option-A. |
| Xiaomi | B  | Similar comment as above |
| Samsung | A | Same as legacy behaviour. No new enhancement is needed for CFRA. |
| Nokia | A | Same as above. |
| Lenovo | A |  |
| Apple | A  |  |
| Apple | A or B without RAN3 impact | If majority prefer B, we think no RAN3 work should be done (i.e. the coordination between target and source cell about the RACH adaptation activation/deactivation status should be up to network implementation). |
| vivo | A or B without RAN3 impact |  |
| Huawei, HiSilicon | A or B | Similar to Q2a, since the RA resources are provided via dedicated signaling, the network already has the flexibility of configuring the RA resources it wants. |
| LGE | A |  |
| Fujitsu | A | Same comment in Q2b |
| CATT | A | Same as Q2b. |

5) CFRA for **BFR initiated by MAC entity itself**: the CFRA resources are configured by *rach-configGeneric* from *BeamFailureRecoveryConfig*.





For the case here, there is a single optional *rach-configGeneric* to refer to, so if one wants to enable the usage of RACH adaptation for this case, network can simply set *rach-configGeneric* to be the additional RACH resource.

The concern here yet is since network cannot know when the BFR is initiated, while the *rach-configGeneric* is provided statically, there might be a case where the additional RACH (provided via *rach-configGeneric*) is **deactivated**, yet the UE initiated the BFR procedure. So from some companies perspective, spec impact is foreseen to handle this case. While there is also company(ies) thinking that when additional RACH is configured to BFR, there is no need to be further dependent on the additional RACH (de)activation status as indicated in DCI 1\_0 with P-RNTI.

Q3: For CFRA for **BFR initiated by MAC entity itself**, what is your preference

1. R2 does not consider the support of RACH adaptation in this case;
2. R2 assume the support of RACH adaptation in this case can be done by network implementation without spec impact;
3. R2 aims at supporting RACH adaptation in this case, and spec impact is foreseen (if this option is selected, please indicate what the spec impact is)

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| **Company** | **Option (A/B/C)** | **Comment** |
| OPPO | A or B | For B, our understanding is that when additional RACH is configured to BFR via *rach-configGeneric*, no dependency on the additional RACH (de)activation status as indicated by P-RNTI based DCI, and thus the UE behavior is still the same as in legacy. |
| Xiaomi | B | We think additional PRACH config is configured via SIB1 but should be activated by DCI as agreed by RAN1. It cannot be assumed as always activated after being configured. But we think one NW implementation solution is if NW configures additional PRACH for BFR, NW should always ensure the additional PRACH as activated. Or if the NW can not always ensure the additional PRACH as activated, NW does not configure the additional PRACH for BFR. Generally, we see no spec impact, we can leave this to NW implementation.  |
| Samsung | - | No new enhancement is needed if *rach-configGeneric* is configured in beam failure recovery configuration. If *rach-configGeneric* is not configured in beam failure recovery configuration, UE will apply *rach-configcommon* in active UL BWP. If this *rach-configcommon* includes additional ROs, UE will use or not use them based on whether they are activated or not according to DCI addressed to P-RNTI. This is same as any other CBRA procedure. |
| Nokia | B | Additional resource can be configured as CFRA resource for BFR and only usable if activated as the UE knows the activation status of the additional resource. Activation/deactivation follows current DCI mechanism without additional impact.[Rapp] After offline with Nokia, the intention is to say that if a same *rach-ConfigurGeneric* contains configuration for two RACH resources, e.g., legacy and additional RACH, the UE is to select resource 1. Either from both RACH resources, if DCI indicates that the additional RACH is available
2. Or from legacy RACH resource only, if DCI indicates that the additional RACH is not available

Similar to Q2a, while Rapp understand there are another assumption that a single *rach-ConfigurGeneric* would contain a single RACH resource, either legacy or the additional one. So there might be different interpretation/view in the two directions.[Rapp2] Sorry for the misunderstanding. After further offline with Nokia, the intention is to allow additional signaling to indicate additional RACH (rather than a same *rach-ConfigurGeneric* contains configuration for two RACH resources, e.g., legacy and additional RACH), considering some associated signaling like SSB-RO mapping is anyway per RACH resource. And thus the selection of option-B is more from the perspective that no change to the UP procedure. |
| Lenovo | B | This is the “source” side case and like SS indicated, DCI based activation can be used to control if additional PRACH resources will be used in the source side including in the BFR scenario. |
| Apple | A or B with Xiaomi understanding | On the two understanding between Nokia and Rapp, we now tend to agree with Nokia after reviewing RAN1 provided L1 excel: * In legacy *rach-ConfigurGeneric, prach-ConfigurationIndex* is mandatory configured.
* In latest RAN1 excel, it seems that RAN1 assume that if another *prach-ConfigurationIndex* is configured (as legacy one is mandatory, it means that there will be two index), RACH adaptation is configured.

If this understanding is correct, we think extra spec impact (or clarification) is required if availability of additional RACH resource still depends on DCI with P-RNTI: * It implies that the additional CFRA resource for BFR (i.e. *rach-ConfigurGeneric* under *BeamFailureRecoveryConfig)* is always synchronized with the additional CBRA resource in SIB1 (i.e. either both are activated at the same time or deactivated at the same time).

However, if this assumption is always true, we need to further clarify:* The intention of CFRA is to provide separate (UE dedicated) resource different from CBRA resource. Then, what is the benefit if we need to couple the A/D status of CBRA resource and CFRA resource? Or why not just rely on additional CBRA resource for BFR (i.e. 2nd parapragh of Samsung)?

If we go B, we think it is general principle that if serving cell provides CFRA resource, serving cell is responsible to ensure its validity (i.e. if it is not available anymore, serving cell should de-configure the additional PRACH configuration index via RRC instead of indicated by DCI with P-RNTI). So, if we go B, we prefer Xiaomi’s understanding.  |
| vivo | B |  |
| Huawei, HiSilicon | A or B | BFR case is a bit different from handover in that the RA resources are configured by serving cell, not neighbour cell. Therefore, as Samsung mentioned, if contention-free BFR resource is not configured, UE can still utilize the RACH adaptation designed for CBRA. There is no clear benefit of further enhancing CF BFR, especially considering the network has no idea of when the BFR will be triggered and the additional RA needs to be valid. |
| LGE | A | We have a concern about whether DCI based (de)activation works well in beam failure situation. |
| Fujitsu | B | If PRACH adaptation for BFR is configured and activated, the UE can use adaptive resource as in CBRA case. If PRACH adaptation for BFR is not configured or deactivated, legacy behaviour is applied. No additional impact is foreseen. |
| CATT | A | As Samsung mentioned, if contention-free BFR resource is not configured, UE can still utilize the RACH adaptation designed for CBRA which includes additional resources. No strong motivation to support other options. |

During online/offline, some company(ies) raised the issue to further check the applicability of normal PDCCH order, i.e., CFRA only, or CBRA as well.

**6. RACH Adaptation for CFRA**

R2-2501817 Discussion on adaptation of common signal channel transmission OPPO discussion Rel-19 Netw\_Energy\_NR\_enh-Core

Proposal 1: R2 confirms time-domain RACH adaptation is supported for CFRA initiated by normal PDCCH order, but not for other CFRA cases. Send LS to R1 if any concern.

[Nokia]: Any technical reason not to apply PDCCH order based CFRA RACH adaptation to other use case? [OPPO]: For example, BFR, RACH configuration is presented as mandatory configuration. And if needed, NW can put additional RACH RO into this configuration. [Samsung, Apple]: Agree with OPPO proposal. And note RAN1 decided that additional RO is only applicable to initial BWP. [Huawei]: Understand RAN1 introduced PDCCH order can be applicable to CBRA also. [Apple]: Understand there is no restriction that PDCCH order is applied to CBRA. [Ericsson]: Not sure if new mechanism for additional RO cannot be used for other cases. [Nokia]: Understand the additional RO activation/deactivation still can be applicable e.g. into BFR case. [OPPO]: Understand without additional RO activation/deactivation, if network wants, the network just includes additional RO into BFR configuration, then the UE uses it unless it is reconfigured or released. [Nokia]: Can we try to agree no additional mechanism is needed for BFR case in order to use additional RO. [Samsung]: For any kind of HO mechanisms, RACH generic is optional and if network wants to use additional RACH RO, network can configure the additional RACH RO to RACH generic configuration. Dynamic activation/deactivation is based on the serving cell’s short message. It seems clear no need of dynamic activation/deactivation to the non-serving cell(s). [Spreadtrum]: Wonder how it works if multiple initial BWPs are configured. [OPPO]: Propose to have post email discussion on this issue.

Q4: For the RAN1 agreed 1-bit indication in DCI 1\_0 for C-RNTI, i.e., PDCCH order, what is your view for the applicability?

1. CFRA only
2. CFRA and CBRA.

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| --- | --- | --- |
| **Company** | **Option (A/B/C)** | **Comment** |
| OPPO | B | Based on our internal check with R1 colleagues. |
| Xiaomi | B | Same understanding from our RAN1 |
| Samsung | B |  |
| Nokia | B |  |
| Lenovo | B |  |
| Apple | B |  |
| vivo | B |  |
| Huawei, HiSilicon | B |  |
| LGE | B |  |
| Fujitsu | B |  |
| CATT | B |  |

1. Summary

For Q1/2a/2b/2c, which are all related to availability of additional RACH resources in neighbouring cell, there are some common concern, i.e., UE does not know the availability of neighboring cell, so may not be sure whether the additional RACH resource is available or not when initiate the RACH. If we leave this to network, it relies on the assumption that network has a good knowledge on when the RACH would be initiated. Otherwise, neighboring cell has to update the RACH resource when the availability status changes, so that it may lead to inter-node signaling, i.e., R3 impact.

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|  | Does network have a good knowledge on when the RACH would be initiated | A:B |
| Q1, RACH initiated by PDCCH order for additional RACH | Yes and No. Since PDCCH order is used as soon as UE is out-of-sync for the additional PCI while there is DL/UL data delivery via the TRP of the additional PCI. Yet note that this topic comes from MIMO topic which assumes ideal backhaul rather than standardized inter-node interface | 9:8 (where 3 companies select A only, while 2 companies select B only) |
| Q2a, RACH initiated by L3 HO command | Yes, based on T304 | 9:10 (where 1 company selects A only, while 2 companies select B only) |
| Q2b, RACH initiated by LTM CSC MAC-CE | No, since it is fully up to source DU to decide when to send the LTM CSC command  | 10:5 (where 6 companies select A only, while 1 company selects B only) |
| Q2c, RACH initiated by PDCCH order for early UL sync for LTM | No, since it is fully up to source DU to decide when to send the LTM CSC command | 10:5 (where 7 companies select A only, while 1 company selects B only) |

Yet all companies agree that no spec impact should be caused to enable the usage of additional RACH in this case.

For Q1 and Q2a, the selection of A and B are comparable. The proposal is thus drafted below, in order to avoid spec impact (since no one selected C), but leave the usage of R19 additional RACH for the two scenarios to network implementation.

For whether the *rach-configGeneric* contains a single or two RACH resources, it is up to further discussion on stage-3 details.

**Proposal 1 R2 not pursue spec impact specifically for the usage of R19 additional RACH resources for CFRA initiated by**

1. **PDCCH order for additional RACH;**
2. **L3 HO command.**

For Q2b and Q2c, majority selected A. The proposal is thus drafted below, in order to reflect majority view, i.e., no consideration for the two use cases at all.

**Proposal 2 R2 not consider the support of** **R19 additional RACH resources for CFRA initiated by**

1. **LTM CSC MAC-CE;**
2. **PDCCH order for LTM early UL sync;**

For Q3, which is for serving cell case so no need to concern on R3 impact.

Based on the voting ratio, A:B = 5:8 (where 2 companies select A only, while 5 companies select B only), i.e., seems more support the usage of additional RACH for this use case.

But for this case, clearly network has no information on when the RACH is to be initiated by UE. For this issue, there are different views (within the companies selecting B)

View-1: if NW configures additional PRACH for BFR in *rach-configGeneric*, NW should always ensure the additional PRACH as activated (Xiaomi, Apple, OPPO, Samsung, Huawei?, Fujitsu?)

View-2: if NW configures additional RACH for BFR, UE should check DCI for its availability before making use of it (Lenovo, Nokia)

Combining this with the voting on A Rapp assumes it is more reasonable to go for view-1.

Besides, Rapp assumes that if *rach-configGeneric* is not configured, CBRA resource is to be used, then that is dependent on the DCI indicated availability as for other CBRA cases.

Rapp suggests to discuss this issue, while the following proposal is drafted based on majority view

**Proposal 3 R2 not pursue spec impact specifically for the usage for R19 additional RACH resources for CFRA initiated by BFR (e.g., UE does not based on DCI 1\_0 of P-RNTI to know the availability of RACH resource indicated in *rach-configGeneric* for BFR)**

For Q4, all companies show the same view.

**Proposal 4 R2 confirms the newly introduced 1-bit indication in DCI 1\_0 for C-RNTI, i.e., PDCCH order, applies to both CBRA and CFRA.**

If any comment on the drafted proposals, please be free to share

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| --- | --- |
| **Company** | **Comment** |
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1. Conclusion

Based on the offline, we reached the following WF