[94e-29-R18-gNB-CU] - Version 0.0.8
RAN

1 Introduction

At the GTW on Monday Week 1, RAN agreed to have a email thread for gNB-CU resiliency, using RP-212723 as a starting point.

It is understood that the discussion needs to cover the necessity of the project, the detailed scopes/justification and how to carry out if found necessary.

It is also understood that the discussion may result in a small project led by RAN3 (including the possibility of a TEI), or no approved project at all.

1.1 Time plan

As per Chair's guidance, moderator would like to try to stick to the same deadline as other email discussions with the understanding that some companies may need more time (if so, these comments can be reflected in the subsequent rounds).

1.2 References

Draft SID (as a starting point)

RP□212723 New SI: Study on enhancement for resiliency of gNB-CU RAN3 vice-chair (Ericsson)

Company contributions

RP□213172 Comments on Rel-18 inter-gNB coordination draft WID Huawei, HiSilicon

RP□213192 Views on enhancement for resiliency of gNB-CU NTT DOCOMO, INC.

2 Initial Phase, Week 1

According to Chair's guidance, this thread is to cover the following:

- the necessity of the project
- the detailed scopes/justification
- how to carry out if found necessary

2.1 Necessity of the project

Companies are invited to provide comments on the necessity of the project to study enhancements for resiliency of gNB-CU, e.g. commercial interest. The justification part of the draft SID (RP□212723), and

both company contributions can be a reference.

Feedback Form 1: Comments on the necessity of the project

1 – Nokia

The necessity of gNB-CU resiliency seemed clear from the October email discussion, which resulted in the draft SID in RP-212723 produced by the moderator (RAN3 VC). The scope of the study should include:

- evaluate failure scenarios and their associated problems,
- identify potential solutions which adhere to existing RAN architecture framework (e.g. no new interfaces, etc.)
- assess solutions according to agreed criteria (e.g. service downtime, signaling load towards UE and/or neighbors, etc.)

2 – NTT DOCOMO INC.

We agree with Nokia's view that the necessity is already clear from the October email discussion. As we mentioned in our contribution, it is important to discuss solutions that require coordination between nodes, targeting e.g. geo-redundancy with CU-DU interoperability.

3 – KDDI Corporation

We share the view with Nokia and docomo.

4 – Qualcomm Technologies Int

We share a similar understanding - we seem to be going back to the discussion in October.

5 – NEC Corporation

The gNB-CU resiliency for any risk of gNB-CU single point failure have been raised, and as drafted in the Justification of draft SID in RP-212723. We think it is at least worth to have a study to see how the serious of the problem and evaluate to see valuable standard solution. In that sense, it would be good to have the project as a study item.

6 – Samsung Electronics Nordic AB

We are fine to have this study from the a study item.

7 – CATT

We are fine to study the resiliency of gNB-CU

8 – Ericsson LM

We have already provided technical comments on why we believe that the current NG-RAN architecture already supports CU resiliency mechanisms through virtualized implementations; for this reason, this topic might be considered as lower priority for inclusion in Rel-18, also considering the high workload. Having said that, and looking at the status of the discussions, the current scope seems to be the minimum acceptable subset for most companies.

9 – Huawei Tech.(UK) Co.. Ltd

We do not denied the importance of the resilience of CU. This was specified in rel-15!

What are the standard gaps identified between re-15 and now, which justify the necessity of the project? It is not obvious to us particularly on necessity of Standard impact. We do believe that majority of failure cases are cover today either by implementation, either by existing standard. If something is missing, it must clarify. We cannot afford a SI covering all CU-CP single point of failures…

See also RP□213172

10 – ZTE Corporation

According to the email discussion in Oct, gNB-CU resiliency needs to be considered but the RP-212723 does not mean a new SID is necessary in Rel-18. The objective part of the "SID" is based on October discussion can be seen as following :

· Solutions for gNB-CU-CP failure recovery should minimise signalling towards the UE and signalling load towards the network

· Solutions for gNB-CU-CP failure recovery should minimise UP interruptions, namely they should minimize the service downtime from the end-user perspective.

· Solutions for minimisation of control plane interruptions should also be targeted

It can be seen the only remain issue of this topic is "gNB-CU-CP failure recovery". The issue is not new in 3GPP, where the Core network has developed entirely CN recovery procedural and defined these procedures in TS23.501. The CN recovery feature introduce AMF Addition/Update,planned removal procedure and Procedure for AMF Auto-recovery. In addition, Core network also provides Network Reliability support with Sets to improve Reliability of the Network Functions. These legacy mechanism can be reused for resiliency of gNB-CU, however the impact to the current RAN architecture are not easy to be accepted. For example if we define CU-Set similar like AMF SET which requires more complex network deployment. In order to minimize signalling /service downtime/control plane interruptions, the backup gNB-CU-CP needs to reserve backup NG-U tunnel, F1-U tunnel for the served UE which will introduce the interaction between gNB-CU-CPs.

Alternatively, Active/Standby or Pool is a matured implementation solution to ensure reliability robust of network entity. AMF recovery provides system-level stability. Active/Standby provides equipment-level stability, from our point of view, the equipment-level stability is sufficient for gNB-CU-CP.

If Active/Standby or Pool can be accepted for resiliency of gNB-CU in Rel-18, then the left main issue is how to support one DU connects to multiple CU. Take the current TS38.401 into account , it states "For resiliency, a gNB-DU and/or a gNB-CU-UP may be connected to multiple gNB-CU-CPs by appropriate implementation."Therefore, it is not an essential feature on the top of current spec to be supported in R18.

11 – Deutsche Telekom AG

We share the views of Nokia and Docomo initially listed and therefore support the SI in Rel-18.

12 – TELECOM ITALIA S.p.A.

Same view as DOCOMO and KDDI

13 – China Mobile International Ltd

We acknowledge the importance of gNB-CU resilience, but it does not justify the necessity of a study item. Considering a large scale of 5G network have been deployed worldwide, some operators have deployed CU-DU architecture, if we really found some resilience issues in multi-vendor deployment and there is a

gap with Rel-15 specification, we should address it as soon as possible by describing the scenarios and proposing some solutions via CRs.

14 – China Unicom

The requirements maybe reasonable from the operator, but the deployment scenarios need to be further clarified as the gNB-CU and gNB-DU are split logical nodes in NG-RAN. But operators have no experience to occur and identify similar issue in their 5G commercial network or even in 4G network. If such issues are acknowledged in RAN, the potential specification impacts are involved with F1 and E1 interface if needed. One way to solve this issue is to find a way to resolved it by identify the specification impact first.

15 – Verizon UK Ltd

We support the SI in Rel-18. We agree with Nokia that the necessity of gNB-CU resiliency was clear from the October email discussion. Resiliency mechanisms for virtualized gNB-CU today are mostly left to implementation and deployment. However the issue is there and cannot be brushed aside. Sometimes operators need to deploy physical units as backup for resiliency issues in virtualized implementations resulting in increased costs. Standard solutions to the issue would certainly relieve this pain point.

2.2 Detailed justifications

Companies are invited to provide comments on the draft SID.

Table 1: Justification in the draft SID

The split NG-RAN architecture is characterised by the presence of a single gNB-CU-CP connected to multiple gNB-DUs and gNB-CU-UPs, for each split gNB. Such architecture is affected by a single point of failure at the gNB-CU-CP. Failures at the gNB-CU-CP may cause interruption of UP traffic and disconnection of UEs. For these reasons, solutions should be studied that allow to recover from such failures ideally without any UP interruptions or UE disconnections/interruptions at CP level. The solutions should be based on the current NG-RAN architecture and they should require minimum signalling towards the UE and towards different parts of the 5G network.

Feedback Form 2: Essential comments on the Justification part

1 – NTT DOCOMO INC.

The last paragraph should be updated or removed to reflect potential change of the similar sentences in the objectives.

2 – NEC Corporation

The last sentence “The solution should be based on current .....and towards different parts of 5G network” can be removed as the same wording is already in the Objective.

3 – Samsung Electronics Nordic AB

The justification part looks good to us

4 – CATT

We are OK with this

5 – Ericsson LM

The current formulation is not entirely correct: any logical node in RAN architecture is pictured as a single "box" on a page, but this does not mean that it has to be realized as a "single physical box" with a single point of failure. We propose the following slight change to the first paragraph: "The split NG-RAN architecture is characterized by the presence of one logical gNB-CU-CP connected to multiple logical gNB-DUs and logical gNB-CU-UPs, for each split gNB. Failures at the gNB-CU-CP may cause interruption of UP traffic and disconnection of UEs."

We also believe that there should be some initial discussions on agreeable failure scenarios prior to studying potential solutions. We propose to update the second paragraph accordingly, e.g. "For these reasons, failure scenarios should be discussed and defined, and for agreed failure scenarios solutions should be ..."

6 – Huawei Tech.(UK) Co.. Ltd

The justification cover a large scope of resilience aspects… As example, the recovery of a failure of "Failures at the gNB-CU-CP may cause interruption of UP traffic and disconnection of UEs", in case of card justification, it could be handle by swapping the card, or moving the processing, the storage, etc to other card. This is pure implementation.

The standard aspects of the problem that proponents would like to tackle must be clarified.

We would like also to second the RAN2 chair comment online about "minimise signalling towards the UE". This is too vague … It should be "no new signalling towards the UE", only existing procedure should be re-used as they are.

7 – ZTE Corporation

See above. The above justification is not clear enough to identify the issue to be solved, at least, the issue can not be solved by implementation should be clarified. It is not an essential feature on the top of current spec to be supported in R18.

8 – TELECOM ITALIA S.p.A.

the justification is ok (plus the comment from DOCOMO on the last sentence)

9 – Deutsche Telekom AG

The justification is generally ok, but the last sentence is already covered in the objective section and can be deleted.

We are fine with E///'s proposal to add "logical" to listed nodes even if this should be clear from existing RAN architecture descriptions.

Failure scenarios can be described and discussed in the objective section. No need to have that in the justification.

10 – Verizon UK Ltd

We are generally fine with the justification.

2.3 Detailed objectives

If really necessary, companies are invited to provide comments on the draft SID.

Table 2: Objectives in the draft SID

The study should be based on the current architecture framework for the NG-RAN. The detailed objectives of the WI are listed as follows: – Solutions for gNB-CU-CP failure recovery should minimise signalling towards the UE and signalling load towards the network – Solutions for gNB-CU-CP failure recovery should minimise UP interruptions, namely they should minimize the service downtime from the end-user perspective. – Solutions for minimisation of control plane interruptions should also be targeted

2.3.1 Proposals on architecture impact

RP-213192 has the following proposal:

Proposal 1: The SID should address specific concerns on the architecture, in order not to be too restrictive to accommodate proposals while ensuring there is no critical impact. As a starting point, RAN to consider the following wording:

– The study should be based on the current architecture framework for the NG-RAN, **(i.e. no new interfaces should be defined)**.

RP-213172 has the following statements that seem to be related to the above:

1) As explained, the CU pooling is already supported in specification since rel-15 in TS 38.410, any study should take account existing specifications.

3) As claimed several times any 5G advanced feature should take the existing architecture as baseline.

Feedback Form 3: Do you agree with Proposal 1 above? If not, what kind of guidance on the architecture is essential if any?

1 – Nokia We are fine with Proposal 1 and open to discuss other wording (if needed) to further clarify the meaning of "current architecture framework". Regarding "CU pooling" mentioned in RP-213172, our understanding is that such a solution is not intended to be in-scope of this study since it does not adhere to interface cardinality rules (since DU connects to multiple active CUs which distribute the UE load), so if this is a common understanding then it may be useful to clarify this in the draft SID.
2 – NTT DOCOMO INC. We are the proponent of Proposal 1. We are also fine to mention "CU pooling" with some clear text e.g. "multiple CUs actively serving the same DU". We are also open to discuss other necessary restrictions as long as it can be formulated clearly enough.

3 – KDDI Corporation

We are fine with Proposal1.

4 – Qualcomm Technologies Int

We are fine with Proposal 1.

Regarding CU pooling, it probably needs a better definition, but we see it in scope a least to the extent that one obvious option is to divert access to a back-up CU (for example). Either way we should not move forward without clarification of whether this is in scope or not.

Also to be clear in our view ”CU pooling” does not break the architecture because as 38.401 states ”For resiliency, a gNB-DU may be connected to multiple gNB-CUs by appropriate implementation”. It would be reasonable to study whether standardization could be useful / applicable for this use case.

We are open to discussing narrower definitions if companies are concerned with general pooling (e.g. general F1 flex).

5 – NEC Corporation

The proposal 1 is fine for us. For the “current architecture framework”, if need to clarify then can just refer the gNB internal architecture that is specified in 38.401.

6 – Samsung Electronics Nordic AB

In our understanding, the essential part in P1 is “The study should be based on the current architecture framework for the NG-RAN, **(i.e. no new interfaces should be defined)**”, which is fine to us. Meanwhile, we suggest to change the P1 to this sentence only for simplicity.

7 – Ericsson LM

The word “framework” should be removed (including other similar instances) – the concept of architecture should be clear enough. Furthermore, in our view the term “CU pooling” is not defined; the note in TS 38.401 (this is the correct reference, by the way) refers to a suitable implementation. For this reason, we should not mention CU pooling in the SID.

8 – Huawei Tech.(UK) Co.. Ltd

We do agree that if any study, it must take account existing architecture and existing specification. The SI should if possible avoid to address problem already discuss even it was decided to be let to implementation.

Note: should it be TS 38.401?

9 – ZTE Corporation

Fine with this principle for the study.

10 – TELECOM ITALIA S.p.A.

suport the proposal

11 – Deutsche Telekom AG

We are fine with the proposal. No need to explicitly mention ”CU pooling”.

12 – China Unicom

One gNB-DU connects to multiple gNB-CU seems like a redundant deployment solution. The DU have only one control plane connects for specific UE to one gNB-CU. If one DU have multiple control plane connects to different gNB-CU for different UE, the complexity of network can't be negligible.

2.3.2 Proposals on work structure

RP-213192 has the following proposal:

Table 3: Proposal 2 in RP-213192

•Proposal 2: Update the list of objectives as follows:

- **Evaluate the problems associated with gNB-CU-CP failure**
- **Identify and study solutions for recovery of failures and enhanced resiliency at the gNB-CU-CP**
- **NOTE 1**: Solutions for gNB-CU-CP failure recovery should minimise signalling towards the UE and signalling load towards the network
- **NOTE 2**: Solutions for gNB-CU-CP failure recovery should minimise UP interruptions, namely they should minimize the service downtime from the end-user perspective
- **NOTE 3**: Solutions for minimisation of control plane interruptions should also be targeted

Feedback Form 4: Do you agree to the proposal above?

1 – Nokia

We are fine with the proposal. One suggestion is to reword the first bullet to "Evaluate gNB-CU-CP failure scenarios and their associated problems", since a failure in a virtualized scenario likely has different problems than a failure in a geo-redundant scenario.

2 – NTT DOCOMO INC.

We prefer Nokia's version over our original proposal. It is a valid argument heard also from Huawei at the GTW that the scenario should be clear, and we believe it should be evaluated in the study phase.

3 – KDDI Corporation

We are fine with the proposed objectives with Nokia's modification.

4 – Qualcomm Technologies Int

We are also fine with the proposed objectives plus Nokia's suggestion.

5 – NEC Corporation

This is fine for us. Nokia's proposed wording "Evaluate gNB-CU-CP failure scenarios and their associated problems" is also fine.

6 – Samsung Electronics Nordic AB

P2 is fine to us with the rewording as "Evaluate the scenarios and problems associated with gNB-CU-CP failure".

7 – CATT

We are fine with the rewording from Nokia.

8 – Ericsson LM

The first bullet should be reworded as "Identify and study solutions for recovery of failures at the gNB-CU-CP, for enhanced resiliency". Furthermore, instead of evaluating the problems associated with gNB-CU-CP failure (namely the loss of connections), it seems better to study the failure scenarios; the first bullet should be reworded as: "Define and study failure scenarios associated with…".

9 – Huawei Tech.(UK) Co.. Ltd

No, the scope of the study is too large, we could not investigate all gNB-CU-CP failure cases.

Then lot of them are not related to the standard see previous example on card. Other could be solved by standard, like moving the UE context to other CU if time allow. etc.. These solutions already existing today!!

Then we do encourage the proponents to identify clearly the scenario, or set of scenarios, of gNB-CU-CP failure where they identify a possible standard gap …

If not possible, may be more time is needed to proponents, to provide such "set of scenarios" ….

10 – TELECOM ITALIA S.p.A.

ok with the modified version by Nokia

11 – ZTE Corporation

The gNB-CU-CP failure cases needs further clarification and specified, the failure in the scope need not including anything.

The CU-DU split is the main feature normatived since R15, and has been deployed on a large scale globally with the evolution of R15/R16. It is necessary to determine whether a disaster-level failure occurs on the basis of the existing architecture and mechanism and needs to be solved in Rel-18.

12 – Deutsche Telekom AG

Ok with the proposal inclusive of considering Nokia's modification.

13 – China Unicom

Before go to work structure, the issue related with the problems associated with gNB-CU should be identified first. After that, the potential enhancements for F1 and E1 interface, if needed, could be studied in a later phase.

14 – China Mobile International Ltd

Same view as ZTE

2.3.3 Other comments on objectives

Feedback Form 5: Essential comments on the detailed objective

1 – Ericsson LM

As mentioned above in the justification section, a bullet should be included to discuss and agree failure scenarios "- discuss and agree upon failure scenarios". Furthermore, instead of evaluating the problems associated with gNB-CU-CP failure (namely the loss of connections), it seems better to study the failure scenarios; the first bullet should be reworded as: "Define and study failure scenarios associated with…".

2.4 How to carry out if found necessary

Companies are invited to comment how the project should be carried out, if found necessary. It is moderator's understanding that there are two options on the table: SI or TEI.

Please note that as per Chair's guidance it is to be a small project if found necessary.

Feedback Form 6: SI or TEI if found necessary? And why?

1 – Nokia

In our understanding, TEI is not an option since this "project" involves evaluation of scenarios and their associated problems, identifying potential solutions which adhere to certain constraints (e.g. current architecture framework), assessing performance versus complexity of the solutions, etc. These are the steps of a study.

2 – NTT DOCOMO INC.

Agree with Nokia's view.

3 – KDDI Corporation

Agree with Nokia and docomo.

4 – Qualcomm Technologies Int

Fully agree with Nokia. TEI would assume we have a fairly good definition of the problem, and maybe even a likely solution or narrow solution space.

5 – NEC Corporation

To carry out by a Study Item for this case is more appropriate than TEI since we need to evaluate first its scenario and problem

6 – Samsung Electronics Nordic AB

We don't think TEI is an option since it is normally for an WI. Moreover, the above objectives are more likely for a study item. Thus, this should be a study item.

7 – CATT

We are OK with either of the options.

8 – Ericsson LM

It's very unclear to us how a study could be performed as a TEI activity: how to e.g. document the study activities without a formal TR? This should be discussed as a SI; if this SID is agreed it should result in a proper RAN3 TR.

9 – Huawei Tech.(UK) Co.. Ltd

If a clear scenario, with associated gap is identified then it is acknowledged, we do not have any issue to proceed via TEI, we guess TEI-18.

10 – ZTE Corporation

We propose that this topic be discussed in the TEI. As we explained in 2.1, the resiliency of gNB-CU shall not introduce big impact on current split architecture. Active/Standby or Pool can be regarded as the starting point. Similar like what we discussed in TEI15 for network sharing support with CU-DU split architecture, the discussion triggered by companies' contributions, after the issue has been identified, then the enhancements can be solved naturally.

11 – Deutsche Telekom AG

Activity should be performed as SI with describing the failure scenarios identified and suitable solutions in a TR.

12 – China Mobile International Ltd

What we are thinking is how to handle the operators reuqirement on gNB-CU resilience more effieciently and timely. TEI and SI are two ways to fulfil operator reuqirement, we would not say it is a study item, how it would be handled via TEI. If the requirement can be fulfilled via TEI, why a study is needed. Discussions could be triggerred by contributions which contains the scenarios/issues and potential solutions, if the scenarios/issues are identified, solutions can be worked out.

13 – China Unicom

If necessary, this topic can be treated in TEI as the limited impact on F1 and E1 interface. While first of all, it need to be clarify whether it is a clear deployment scenario.

2.5 Other

Feedback Form 7: Any other essential aspects to discuss?

1 – Huawei Tech.(UK) Co.. Ltd

We would like to understand how to handle in this discussion the balance between cost and robustness of resiliency. Indeed any inventive solution could be found, but a basic robust solution is the duplication of the equipment, which is not cost effective…

2.6 Summary of the initial phase

Necessity

Vast majority (Nokia, Docomo, KDDI, QC, DT, TIM, Verizon, NEC, Samsung, CATT, Ericsson) thinks the study should be started.

The following two vendors are not convinced, thinking that implementation-based solution is enough.

- Huawei: Implementation-based solution is available from Rel-15, Study on all CU-CP failure cases is not affordable

- ZTE: Cannot re-use CN recovery. Suggest implementation-based solution (Active/Standby or Pool), thinking that equipment-level stability is enough and system-level stability is not needed for gNB-CU-CP.

CMCC and China Unicom thinks that CR should be directly created without the study phase. CMCC thinks ~~they actually see some resilience issues in multi-vendor deployment~~ **that if some resilience issues are found in multi-vendor deployment, solutions can be proposed as CRs directly**.

Since this topic is related to other topics, moderator's way forward is provided in a later section.

Justification details

Docomo, NEC, and DT mentioned that the last paragraph is a duplicate of the content of objective section, and it is suggested to remove the paragraph. As this seems editorial, the moderator would like to remove the last paragraph.

Ericsson suggests to add "logical" to the mentioned nodes. DT agrees. => Moderator: this is technically correct and would like to adopt it.

Ericsson suggests to have text on discussing and defining failure scenarios, while DT thinks that it can be described in the objectives section. => Moderator: no update as DT suggests

Huawei and ZTE thinks that the standard aspect of the problem to be tackled must be clarified, with Huawei mentioning that implementation-based solution like card swapping falls into the scope with the current justification text. => Moderator: same topic as the necessity section. discuss further.

Huawei suggests "**no new** ~~minimize~~ signalling towards the UE". => Moderator: thinks that the intention of "no new signalling towards the UE" is clear from non-inclusion of RAN2 as the secondary group, and proposes to add "no new signalling" in the objective section. Moderator's understanding is that the existing "minimise" refers to the amount of the signalling, and would like to keep it.

Architecture Impact

The text proposal part of P1 is supported by the vast majority. => Moderator would like to adopt it

It is also suggested to mention ”CU Pooling”, but the companies had diverging views. Moderator suggests not to mention ”CU Pooling”, with the understanding from this discussion that ”CU pooling”-like solutions might be controversy also in the study phase.

Work structure

Nokia suggests “Evaluate gNB-CU-CP failure scenarios and their associated problems” and vast majority agrees. Ericsson do not want ”problems” and suggests ”Define and study failure scenarios associated with…”.

Huawei, ZTE and CMCC the (set of) failure scenario must be already identified in the SID, which is summarized in the later section.

Moderator would like to proceed for now with the common ground, i.e. Ericsson suggestion (without ”problems”), with the understanding that the problems associated with the failure can also be discussed by companies along with failure scenarios.

Objectives - other

Ericsson suggests the rewording ”Identify and study solutions for recovery of failures at the gNB-CU-CP, for enhanced resiliency”. Moderator thinks this is for clarity and would like to adopt it.

SI or TEI

Majority prefers SI as study phase is needed.

Huawei, ZTE, CMCC, and China Unicom prefers TEI. They think study phase is not needed and the activitiy should be based on company contributions.

Moderator’s way forward is provided in a later section.

Other

Huawei mentioned on the balance between cost and robustness of resiliency. Moderator thinks this is technically valid point if we are in a later phase, but too early to discuss it as this is the KPI itself.

Implementation vs Standardized Solution

Some companies are not convinced on the need for a study phase, thinking that implementation-based solution is enough. As they made the same argument in various questions (necessity, justification, objective, SI or TEI), the moderator thinks that this is the main gap between camps.

As the moderator thinks that the topic has not discussed as a separate question, the moderator would like to discuss for what failure scenario or what direction of solutions standardized solution is preferred over implementation in the intermediate phase.

3 Intermediate phase, Week 1

3.1 Implementation vs standardized solution

In the initial round, the most fundamental gap is on the need for the standardized solution. Some companies have doubt on this and some open issues, e.g. necessity of the project and SI or TEI (=not to have study phase), seem to be based on the doubt.

There was also a comment in the initial phase that the current SID scope could include implementation-specific solutions, e.g. swapping the card, or moving the processing, the storage, etc to other card, which they think leads to an unaffordable scope.

While some companies have mentioned this aspect in previous discussions, the moderator thinks that the topic has not discussed as a separate question, and would like to discuss for what failure scenario or what direction of solutions standardized approach is preferred over implementation.

After this discussion, we can update the draft SID taking this discussion into account, and resume the discussion on SI/TEI.

Feedback Form 8: For what failure scenario or what direction of solutions standardized solution is preferred over implementation?

1 – NTT DOCOMO INC.

Single node-based solutions (e.g. active/standby redundancy, card handling) are important in a local failure scenarios, e.g. card failure. We agree with observations of some companies that for this scenario (e.g. card failure), implementation-based solution is enough (or even preferred). However, there often exist and we cannot completely eliminate common components/facilities that are common to e.g. the active unit and stand-by unit. We observe in the field such failure of common components, which is not very rare. We think geographical redundancy is another example that tries to address failures of common facility/site. Coordination between independent nodes would be beneficial to tackle the problem. We could think of e.g. minimizing call loss, or shortening the cell downtime (accepting some call loss), with the aid of inter-node coordination or preparative information exchange etc. These are examples from Docomo perspective and we would also like to invite companies to study the solutions. Inter-operability should be pursued to the extent possible, which is the motivation of standardized solutions.
We are fine to mention these aspects, i.e. common component/facility/site and interoperability, in the SID.

2 – KDDI Corporation

We think implementation solution vs standardized solution it depends on failure scenarios. As docomo mentioned above, to address card failure, implementation maybe preferable, but to achieve geographical redundancy, standardized solution seems to be preferable. We feel it's difficult to list up all failure scenarios through RAN plenary level discussion, so we prefer to have the objective "Define and study failure scenarios associated with gNB-CU-CP" in the SID, so that we can discuss the matter in the SI.

3 – Samsung Electronics Nordic AB

This question seems to be tackling the discussions we expect during the study item. We think the reason of having a study item first is that companies need discussions to figure out the exact failure scenarios and the corresponding solutions. The solutions may be implementation-based or standardized-based. If this

question can be answered now, the study in Rel-18 becomes meaningless.

If some examples are needed, card failure may be one possible case, and some other cases are also possible, which needs further disucssion during study item.

4 – ZTE Corporation

We share the same view that implementation-based solution is enough for many failure scenarios and has already been applied in business deployments. We are still not convinced by the clarification from the moderator, which does not clearly indicate the failure issue unable to be solved by implementation.

If DU/CU-UP is enabled to be connected to multiple CU-CP, the common component/facility/site resiliency can still be improved. For example, one DU can be connected to multiple CU-CPs (e.g., CU-CP1, CU-CP2, CU-CP3, CU-CP4) which has already been supported in current specs, each CU-CP can serve some of the UEs served by DU. When CU-CP1 fails, the other UEs which not served by CU-CP1 connected with the DU can still work normally. Such flexibility deployment can meet all the prerequisites that we reached at the meeting in October, and we understand it can be discussed in R18 for solving resiliency of common component/facility/site in addition to active/stand implementation way. Probably only some stage2 clarification text is needed for such deployment solution, it is suitable to be handled in R18 TEI.

5 – ZTE Corporation

By the way, if there is no common understanding on the scenario and issue to be solved, the necessity of this SI is unconvincing.

6 – NEC Corporation

The question itself is the scope of the study item i.e. to study failure scenarios associated with the gNB-CU-CP. Once we identify the failure scenarios, then can try to see possible solutions including those that can be handled by implementation.

7 – CATT

We share the view that the discussion is more like WG group level than RAN plenary meeting.We have some doubt on whether we could reach a common understanding during this discussion.My understanding is that the controversity is whether it should be discussed via a SI or via TEI.To address the concern from both camps,we think maybe we could consider **have a dedicated agenda** for gNB-CU resiliency in TEI which guanrantee the discussion of this topic even without a dedicated SI.

8 – Nokia

One example of a failure scenario where a standardized resiliency solution may be preferred is “entire node failure” (i.e. gNB-CU-CP failure) due to e.g., natural disasters, man-made disasters or HW failure, where the stand-by node is expected to be non-collocated and in a different IP network. Then, solutions can be discussed (without starting the SI here and now!) which attempt to e.g. minimize or eliminate the service downtime for all or certain users.

9 – Ericsson LM

There seems to be a very fundamental misunderstanding here. This e-mail discussion started aiming to clarify remaining doubts about a possible SID, but now we seem to be discussing normative work/need for standardized solutions etc.. If this is the intention, we cannot agree. As we already stated, at this stage we can only accept a SI on a minimum acceptable set of topics. We shall not discuss solutions now.

10 – China Mobile International Ltd

First, we would like to correct the moderator summary for CMCC views. We didn't say we see some resilience issues in multi-vendor deployment. We were saying if some resilience issues are found in multi-vendor deployment, solutions can be proposed as CRs directly.

11 – Deutsche Telekom AG

It is fully clear that some failure cases can be handled based on implementation assuming single vendor implementation. For others like in geo-redundant deployments standardized multi-vendor solutions are more appropriate. As stated also by other companies we should not go into details of failure scenarios and solutions during this RAN plenary discussion as this should be part of the study according to the bullet point "Define and study failure scenarios associated with gNB-CU-CP".

12 – China Mobile International Ltd

For the scenarios and solutions, based on the discussion, it seems one of the prominent scenarios is common facility failure or the entire node failure, which in our view is a critical issue should be seriously considered from day one deployment. We believe there should be solutions for this issue in field. e.g., when a data center encounters disaster, migration can be quickly implemented to gurantte the service continuity. So the issues with the current solution is not clear to us.

So targeting for this scenario, a study item is not needed, if some issues with the current solution are found and the gap with the current specification is really identified, it is obvious the solutions can be more efficiently handled in TEI.

13 – Huawei Tech.(UK) Co.. Ltd

We do understand from online solution that this item is targeting to be "small". We then share the view that the focus must be on standard scenario with standard improvement considering existing specification (e.g. TS 38.401). On top of ZTE, and make the explanation short, we also would like to clarify that the current logical architecture is enough flexible to respond via a good deployment according to the topology (logical architecture design) to the geo-redundancy e.g. for disaster. Here the resiliency is ensure by deployment matter not implementation. It also seems obvious to us that equipment geo redundancy, cost effective, will solve many problem. Then we are still looking for the scenario set which clearly identify a standard gap.

14 – China Unicom

For the failure scenarios, the implementation solution is good enough for operator as the first choice to solve the issue. If discussing gNB-CU-CP, the split architecture is referring to high layer split. Here comes the issue, before we discuss about what is the potential impacts on the existing solution for NR specs. We have to concerns the bandwidth of the fronthaul/middlehaul to supporting the redundancy connections.

As we have comments in first round, the potential impacts on the F1 and E1 interface, if needed, to support some new or enhance the existing interface failure management procedures could be treated in TEI. So, a single study item is not very clear as companies haven't identified the standard gap to solve the failure issue, which is more related with network implementation.

15 – Qualcomm Technologies Int

We understand that the moderator has opened this particular discussion to address some comments that standardized solutions are not needed. To the extent that we can analyze the question in this framework,

it does seem that the answer is that there is enough concern to justify further study of the failure scenarios (i.e. it certainly is NOT clear that proprietary solutions are optimal in all scenarios).

16 – Verizon UK Ltd

Agree with DocoMo and KDDI. Detailed failure scenarios and solutions can be discussed in the SI. There is enough justification to study the failure scenarios.

3.2 Draft SID

Companies are invited to provide comments on the draft SID. Please concentrate on the essentials, and provide comments **which is not related to the question in 3.1**. Otherwise provide your comments in 3.1.

Feedback Form 9: Comments on the justification

1 – KDDI Corporation

We are fine with the current version v01 in the draft folder.

2 – Samsung Electronics Nordic AB

Fine to current version v01

3 – NEC Corporation

we are fine with the justification in version v01

4 – Nokia

The justification looks fine.

5 – Ericsson LM

We propose: 1) remove the sentence "Such architecture is affected by a single point of failure at the gNB-CU-CP": the single point of failure is not due to the architecture but due to one of many supported implementations (namely the one where the gNB-CU-CP is implemented as a single physical node) [PS this part was missed in the 1st round]; 2) reword the 2nd paragraph as follows: "For these reasons, failure scenarios which cannot be solved by currently specified means and corresponding potential solutions should be studied…": as already stated, we should study the failure scenarios first, not the solutions, and focus on what cannot be addressed with current specifications; 3) Further tighten the last sentence on basing the study on the current architecture; it's probably easier to replace the 3rd paragraph with "Any potential solution studied should be based on the current NG-RAN architecture."

6 – Deutsche Telekom AG

We are fine with the justification text.

7 – Huawei Tech.(UK) Co.. Ltd

If we procced with the Study:

- We prefer to make it clear in justification that a solution is existing and we are working on top of it.
- Then we have strong preference to talk of "scenario" not solution

"For these reasons, **on top of rel-15 TS 38.401 specification**, **scenario** ~~solutions~~ should be studied **and defined** that allow to recover from such failures ideally without any UP interruptions or UE disconnections/interruptions at CP level.

Further comment may follow.

8 – Huawei Tech.(UK) Co.. Ltd

If we procced with the Study,

- Due to the broad scope, large dependency of implementation in many resilience scenario, dependency on deployment design and none clear set of scenarios to focus on, we need to make clear in objective that we should define failure scenario with standard impacts then agreed it before discussing on solutions:

· Define ~~and~~ study and **agreed** failure scenarios associated with gNB-CU-CP **with clear standard impact**

· Identify and study solutions for recovery of failures at the gNB-CU-CP, for enhanced resiliency **for agreed scenario**

Further comment may follow.

9 – Huawei Tech.(UK) Co.. Ltd

(previous comment is for next section :))

10 – Qualcomm Technologies Int

We are fine with the justification text.

Feedback Form 10: Comments on the objectives

1 – KDDI Corporation

We are fine with the current version v01 in the draft folder.

2 – Samsung Electronics Nordic AB

Fine to current version v01

3 – NEC Corporation

we are fine with the objective in version v01

4 – Nokia

The objectives look fine.

5 – Ericsson LM

As already stated, we should remove the word "framework" (unclear what an "architecture framework" is) and be clear that no new interfaces are to be defined and the current cardinality should be kept. We should add bullets at the beginning "define and study failure scenarios associated with the gNB-CU-CP", and "identify and study solutions for recovery of failures at the gNB-CU-CP for enhanced resiliency". A note also needs to be added: "NOTE - No new signaling between the UE and the network should be required".

6 – Deutsche Telekom AG

We are fine with the objectives.

Just a minor editorial comment: In the sentence ”The detailed objectives of the WI are listed as follows:” the term ”WI” should be replaced by ”SI”.

7 – Huawei Tech.(UK) Co.. Ltd

If we procced with the Study,

- Due to the broad scope, large dependency of implementation in many resilience scenario, dependency on deployment design and none clear set of scenarios to focus on, we need to make clear in objective that we should define failure scenario with standard impacts then agreed it before discussing on solutions:

· Define ~~and~~ study and **agreed** failure scenarios associated with gNB-CU-CP **with clear standard impact**

· Identify and study solutions for recovery of failures at the gNB-CU-CP, for enhanced resiliency **for agreed scenario**

Further comment may follow.

8 – Qualcomm Technologies Int

Fine in general with v01. However the notes seem to be out of order from a significance point of view: notes 2 and 3 are probably the main ones regarding solution identification (in fact they are suggesting a kind of definition of ”enhanced resiliency”). Note 4 is an important constraint (which by the way was already captured in RAN#93, then somehow lost, as with other items, in the October discussion). With that, we would suggest moving note 1 down since this is more of a criteria (to become note 4), or even remove it or phrase it more simply like e.g. ”Note 4: Additional signalling load should preferably be minimized”.

Feedback Form 11: Comments on the other parts

1 – KDDI Corporation

We are fine with the current version v01 in the draft folder.

2 – Samsung Electronics Nordic AB

Fine to current version v01

3 – Ericsson LM

In general, we think that we should concentrate on refining the actual draft SID instead of continuing the discussion on the summary.

4 – Huawei Tech.(UK) Co.. Ltd

Due to the broad scope, which allow too much discussion on too much scenario, we encourage the proponent to focus e.g.

- It should be clarify if we allow scenario where the CU which failed is able to take action or not in order to reduce the scope.

- It should be clarify if the CU-UP functionality will be impacted or not, e.g. if the intention is to enable functional change for UP.

- Further comment may follow.

3.3 Summary of the intermediate phase

Potential benefits of standardization solution

Potential benefits of standardized solutions have been discussed to tackle the gap between camps which affects questions like necessity of the project and SI or TEI.

The proponent mentioned two examples of failure scenarios:

(a) local (e.g. card) failure; and

(b) failure to common components (or facilities/sites).

For scenario (a), the majority thinks implementation-based solutions is enough or preferable, while some companies see benefit to study also this scenario.

For scenario (b), Docomo claims that the latter would be improved by the aid of standardization and needs interoperability. Nokia also mentions similar example as (b) above, "entire node failure" (i.e. gNB-CU-CP failure) due to e.g., natural disasters, man-made disasters or HW failure, where the stand-by node is expected to be non-collocated and in a different IP network. DT agrees.

ZTE mentions a particular implementation solution (multiple CUs connected to a DU with each CU serving some part of UEs in the DU) and thinks it can already improve the resiliency to common-part failures. CMCC, China Unicom, and Huawei also think an implementation- or deployment-based solution is preferable also for scenario (b). Qualcomm thinks ~~the concern is not enough and thinks proprietary solutions are optimal in all scenarios~~ **there is sufficient concern from operators that existing proprietary solutions may not be optimal for all scenarios, and therefore there is reasonable justification to study such scenarios and what improvements may be made**.

Majority of companies (including some of those expressed their view as summarized above) were reluctant to discuss the question from the moderator which relates to potential solutions, and think it should be discussed in the study itself. Ericsson disagrees to discuss the solution details in the plenary level discussion.

CATT suggests considering a compromise to have a dedicated agenda for gNB-CU resiliency in TEI which guarantees the discussion of this topic even without a dedicated SI.

Moderator's way forward:

- Limiting the scope to the scenario of "entire node failure", if any study is justified, does not seem controversial. Clarity "Focus on scenarios involving an entire node failure of the gNB-CU-CP." in the objective and check wording in the next phase.
- Many companies are reluctant (or even disagrees) to discuss potential solutions now in the plenary level. This discussion is not continued as an explicit question in the next phase, but companies can still make new (i.e. non-repeated) point if they think it helps to the gap between camps.
- Discuss to see how and if the CATT's suggested compromise (TEI with a dedicated agenda item) works.

Justifications

Ericsson suggests rewording the 2nd paragraph as follows: “For these reasons, failure scenarios which cannot be solved by currently specified means and corresponding potential solutions should be studied…”. Moderator would like to adopt it to align with the moderator’s way forward in the previous topic.

Moderator would like to discuss other comments in the next phase.

Objectives

Moderator would like to adopt editorial comments (**the** gNB-CU-CP, WI=>SI), and discuss other comments in the next phase.

Other

Huawei would like to clarify if we allow scenario where the CU which failed is able to take action or not in order to reduce the scope. They would also like to clarify if the CU-UP functionality will be impacted or not, e.g. if the intention is to enable functional change for UP. These can be discussed in the next phase in the objective section.

4 Final phase, Week 1

Companies are invited to provide comment on the draft SID **v03**, which can be found in:

https://www.3gpp.org/ftp/tsg_ran/TSG_RAN/TSGR_94e/Inbox/Drafts/%5B94e-29-R18-gNB-CU%5D/Final%20Round/Draft%20New%20SID%20on%20enhancement%20for%20resiliency%20of%20gNB-CU_v03.docx

4.1 Justifications

Proposals in the previous round:

(1) remove the sentence “Such architecture is affected by a single point of failure at the gNB-CU-CP” [this part was missed in the previous rounds]

(2) Add “Any potential solution studied should be based on the current NG-RAN architecture.”

(3) For these reasons, **on top of rel-15 TS 38.401 specification**, **scenario** ~~solutions~~ should be studied **and defined** that allow to recover...

Feedback Form 12: Do companies agree with the proposals?

1 – Nokia

We are fine with proposals (1) and (2).

However, we disagree with (3). TS 38.401 contains only a note indicating that resiliency is left to implementation (i.e. resiliency is unspecified), and it is unclear what ”on top of” means. Also, RAN3 defines solutions (not scenarios).

2 – Verizon UK Ltd

Agree with proposals 1 and 2.

For proposal 3, we prefer the original wording for the sentence as it is much simpler and clearer:

”For these reasons, solutions should be studied that allow to recover from such failures...”

Current sentence and this new proposal seem to indicate something is specified to recover from such failures which is clearly not the case.

3 – NTT DOCOMO INC.

(1) OK
(2) We do not think this is needed. ”Current NG-RAN architecture” is not clear enough for companies to be on the same page, e.g. does it allow what is allowed for implementations? This ambiguity is what we wanted to resolve in our contribution, and was already discussed in the initial phase.
(3) Agree with Nokia.

4 – Deutsche Telekom AG

We are fine with proposals 1 and 2.

But we don’t agree with proposal 3. Here, we share Nokia’s and Verizon’s views.

5 – Samsung Electronics Nordic AB

Fine to (1) and (2). For (3), share Nok’s view

6 – Qualcomm Technologies Int

(1) ok

(2) No need, since it is already stated more clearly in the objectives

(3) No need - it actually adds nothing, and as pointed out by Nokia, could even create confusion (do scenarios allow recovery?...) Current paragraph looks pretty good.

7 – ZTE Corporation

1□ OK

2□ Would like to change to “Current NG-RAN architecture”.

Without these descriptions, it is likely to assuming that the RAN split architecture from Rel-15 has not considered the resiliency feature from the very beginning. The impact caused by the gNB-CU-CP when failure appears is not much different from that of a gNB under the non split architecture or that of one eNB . From the perspective of other gNB or eNB, gNB-CU-CP and its’ connected DU and CU-UP are actually one NG-RAN node. If the architecture change needs to be considered in order to enhance the resiliency of gNB-CU-CP, the gNB of non-split and the architecture of eNB can also be changed.

3□ This change is important and necessary. Because the TS 38.401 has already considered resiliency feature of split architecture. Then new study should focus on the additional benefit based on legacy solutions, else what’s the motivation of this SI?

8 – NEC Corporation

ok with (1) and (2). But if (2) is already in the objective, then no need to duplicate.

For (3), share view with Nokia and Qualcomm.

9 – Huawei Tech.(UK) Co.. Ltd

We agreed all these proposals and we believe that justification of the Study must be reword:

- Starting from the fact that the single point of failure of the CU-CP was identified early, it was discussed, including solution in rel-15 (TS 38.401, via implementation).

- Then clarifying that the aim of the study is to identify gap in some resiliency scenario, not already possible to cover, with expectation of a standard solution.

If the statement above is not captured in the justification, we do not have common understanding of the current situation.

There is no requirements neither in 5G definition TR 38.913, neither in SA1 on RAN or RAN node resiliency. It is then not acceptable to have in 5G-Advanced to a Study covering all the aspects of the resiliency for a RAN node (CU-CP).

We do understood that this study should be a short item i.e. the scope must be focus.

We can provide a text which match with the 2 bullets above

10 – Ericsson LM

OK with 1) and 2); 3) is redundant because it's already captured by 2).

11 – KDDI Corporation

We are fine with proposals 1 and 2. But we don't agree with proposal 3. We share Nokia's and others' views.

12 – CATT

We are OK with 1 and 2.

For the third bullet,it seems a littlte bit difficult to be understood.Maybe it coudlbe rephrase as **"For these reasons, on top of rel-15 TS 38.401 specification, scenarios on gNB-CU-CP failure should be defined and solution should be defined that allow to recover..."**

13 – LG Uplus

We are aligned with Nokia's suggestion.

14 – China Unicom

Proposal 1 and proposal 2 are OK, for proposal 3, it is no need to mention TS38.401, it is only a note in 38.401, it will rely on the implementation. It should not be the objective of the SI.

Feedback Form 13: Other essential comments to the justification

1 – Nokia

Regarding the newly added text in the Justification ("failure scenarios which cannot be solved by currently specified means and corresponding solutions"), it is unclear what is meant by "currently specified means" since resiliency is currently unspecified (there is only a note indicating that it is left to implementation). We propose to modify this text to state "failure scenarios and corresponding inter-operable solutions" since I recall that the original comment was to exclude implementation-based solutions from the SI scope.

2 – Verizon UK Ltd

Agree with Nokia comment above. The newly added text is too confusing.

Consider: ”For these reasons, such failure scenarios and corresponding interoperable recovery solutions should be studied. The recovery solutions should ideally recover from failure scenarios without any UP interruptions or UE disconnections/interruptions at CP level”

3 – NTT DOCOMO INC.

On “failure scenarios which cannot be solved by currently specified means and corresponding solutions”, we tend to agree with Nokia’s observation and suggest to remove it. The intention of the inclusion of the sentence in the moderator summary was ”to align with the moderator’s way forward in the previous topic”, i.e. ”Limiting the scope to the scenario of ”entire node failure”. We think this is already resolved in the objective section, so not essential.
We support Nokia’s suggestion on interoperability. As we commented in the previous section, this is an important motivation from our perspective.

4 – Deutsche Telekom AG

We share the views raised already by Nokia, Verizon, and Docomo on this topic; no need to repeat the arguments. In addition, Verizon’s proposal on text change is supported.

5 – Qualcomm Technologies Int

We fully subscribe to the comments from Nokia, Verizon and Docomo, and further support the proposal from Verizon on rewrite of the second paragraph.

6 – Huawei Tech.(UK) Co.. Ltd

See above

About the Nokia proposal on ““failure scenarios and corresponding inter-operable solutions”, this does not restricted the scope. It also introduce confusion because the “and” may be interpreted as none “corresponding inter-operable solutions” is possible … May be some rewording ….

In principle we also do not agree on fact that the “currently unspecified (there is only a note indicating that it is left to implementation)”, because this was discuss and decided on purpose, the resiliency is wide area where for example the flexibility of logical architecture could solve some issue i.e. nothing preclude the definition of multiple logical node in a physical node …

7 – KDDI Corporation

We share the views raised already by Nokia, Verizon, and Docomo.

8 – Ericsson LM

For better clarity, we should reword “…failure scenarios which cannot be solved by currently specified means and corresponding solutions…” to “…failure scenarios which are not **covered** by current specifications should be studied. Whether it is possible to recover from such failures without any UP interruptions or UE disconnections/interruptions at CP level, may be part of the study.”.

9 – LG Uplus

We are fine with Nokia’s suggestion.

4.2 Objective

Proposals in the previous round (including potential clarifications according to company comments on scope):

(1) The study should be based on the current architecture ~~**framework**~~ for the NG-RAN (i.e. no new interfaces should be defined).

(2) We should add bullets at the beginning "define and study failure scenarios associated with the gNB-CU-CP", and "identify and study solutions for recovery of failures at the gNB-CU-CP for enhanced resiliency". (Moderator: is these already available in the draft? May need clarification of the intention)

(3) A note also needs to be added: "NOTE - No new signaling between the UE and the network should be required". (Moderator: is this already available in the draft? May need clarification of the intention)

(4) - Define ~~and~~ study and **agreed** failure scenarios associated with gNB-CU-CP **with clear standard impact**;
- Identify and study solutions for recovery of failures at the gNB-CU-CP, for enhanced resiliency **for agreed scenario**

(5) move NOTE1 to the last item (i.e. to be NOTE 4), and reword to: "Additional signalling load should preferably be minimized"

(7) Add "NOTE: assume the scenario where the gNB-CU-CP which failed is not able to take action" (or "is able to take action") below the "study failure scenarios" item. This comes from Huawei proposal in the "other" section.

(8) Add "NOTE 5: CU-UP functionality should not be impacted" (this comes from Huawei proposal in the "other" section)

Feedback Form 14: Do companies agree with the proposals?

1 – Nokia We are fine with proposals (1) and (2). Regarding (3), is the intention that RRC specification should not be impacted? If so, then perhaps it could be rephrased to be more clear. The other proposals seem unnecessary (e.g. resolved by other changes) and/or motivation is unclear.
2 – Verizon UK Ltd Proposals 1 and 2 are fine. 2 Seems to be already captured in the draft SID v03. Proposal 3 can be slightly rephrased as per Nokia comment above to provide better clarity of the intention. Proposal 4 is not needed as it is redundant and is also more confusing. Proposal 5 part related to signaling towards UE might be acceptable if intention is to avoid impact to RRC spec. This can be clarified explicitly. Proposals 7 and 8 are not needed as they add to confusion.
3 – NTT DOCOMO INC. (1) Fine (2) Not sure, clarification needed

(3) Fine
(4) Disagree. Standard impact depends on the solutions, and it would be impossible to affirm ”clear standard impact” before studying the potential solutions.
(5) No strong view
(7)(8) Not sure for now. Open to discussion if some company think these can significantly reduce the workload.

4 – Deutsche Telekom AG

(1) Fine

(2) Fine, but those issues are already captured in the latest version of Draft SID.

(3) Not needed as already sufficiently captured by Note 4 in the latest version of Draft SID.

(4) - (7): Not needed

(8) Unclear what is meant by ”CU-UP functionality” in this context; clarification is needed. From our perspective, it cannot be excluded at present time that there might be an extension of signaling over E1 needed to support CU-CP resiliency. If this is excluded by the proposed note, we cannot agree to it.

5 – Samsung Electronics Nordic AB

(1) fine to the revision

(2)&(3) already available

(4) “agreed failure scenario” is misleading, we are intending to define scenarios, how could we have agreed scenarios now? Suggest not to have such revision.

“with clear standard impact” is not needed. This should be discussed during SI.

“for agreed scenario”, it is fine to us. One typo “for agreed scenario**s**”

(5) fine to the rewording. Do not understand the intention or benefit to change the order.

(7) “not able to take action” (or ”is able to take action”)” which part is added? Putting this two parts here is misleading. Suggest to remove this Note unless this sentence is clear.

(8) fine to us

6 – Qualcomm Technologies Int

Proposal 1 and 5 are ok

Proposals 2 and 3 are ok also, but seem already covered by the current version

Proposal 4, 7 and 8 are not needed. The changes they propose are either redundant or making the text less clear.

7 – NEC Corporation

OK for (1) and (2) and (3).

Regarding (4), not understand well the wording “Define study and agreed failure....” so cannot for the moment to say ok or not.

Regarding (5), not sure about the meaning of the question. But if refer to the draft SID v3 in the draft folder, understand the “NOTE 1: Solutions for gNB-CU-CP failure recovery should minimise signalling towards the UE and signalling load towards the network” is talking about should minimise the signaling load while “NOTE 4: No new signalling between the UE and the network should be defined” is talking about “No new signalling”, so they don’t have the same meaning, then the (5) is unnecessary.

Regarding (7), it seems that the original intention (from the comment in intermediate phase) is to reduce the scope, but not sure how the wording will reduce the scope.

Regarding (8), it seems that the original intention (from the comment in intermediate phase) is asking whether will have the CU-UP functionality change, this is not sure if this is try to restrict the functionality change in CU-UP. But feel that the draft SID v3 has already "NOTE 2: Solutions for gNB-CU-CP failure recovery should minimise UP interruptions..." think that is enough.

8 – ZTE Corporation

1)OK

2)OK

3)OK

4) We support this proposal.

5) OK

7) OK. We support this proposal. Because it is not clear whether DU/CU-UP detects the failure of gNB-CU-CP by itself (e.g. by monitor SCTP status) or by indication from a gNB-CU-CP when failure happens.

8) OK, see comments in 7)

9 – Huawei Tech.(UK) Co.. Ltd

All these proposal are acceptable for us.

Any additional proposal which help to better understand which exact scenario we would like to tackle e.g. fast F1 setup, fast Context retrieval etc … is welcome…

10 – KDDI Corporation

Proposal 1: Fine

Proposal 2: Fine

Proposal 3: Fine

Proposal 4: Disagree

Proposal 5: No strong view

Proposal 7: We share the view with NEC, wondering it can reduce the scope.

Proposal 8: Not sure, so at this moment, we are reluctant to have the proposed sentence.

11 – Ericsson LM

1) and 2) are OK. On 3), our proposal was to change "defined" to "required" (rationale: a SI does not define signaling). On 4): the text proposed by the Moderator seems to require editing; in any case, the discussion should not be restricted to only solutions which have a standards impact (i.e. if a solution can be adopted by pure implementation, it should be allowed to be discussed and captured if agreeable). On 5): NOTE 1 should stay as it is (the proposed change makes it less clear). On 7): unclear what the text means; it seems obvious that in a failure case the failed node cannot take action – this is probably best left to WG discussion. On 8): we agree to add this note.

12 – CATT

OK with 1□ 2□ 3□

For 4),we understand the intention but it seems the current text has some confusion.Some rewording is needed.

For 5,maybe we could remove the word ”preferably” and stated as below:

Additional signalling load should be minimized

13 – China Unicom

(1) (2) and (3) is OK

For (4), “agreed failure scenario” is not clear, and it need to be further studied for the failure scenario in the network.

For (5) and (7), the failure scenario and issues should be studied first, and standard gap to solve the failure issue also should be studied, “Additional signalling load should preferably be minimized” it not clear, it need to be further discussed if there are specification impact, and whether signaling load need to be introduced could be discussed in the WG.

Feedback Form 15: Other essential comments to the objectives

1 – Huawei Tech.(UK) Co.. Ltd

We suggest additional update:

1) remove ”WI” in favor of “SI” in “objectives of the **SI** are listed as follows:”

2) Add “Identify, if any “: **Identify, if any, the** failure scenario(s) associated with the gNB-CU-CP3) Add “If…” : “**If failure scenario(s) is identified, assess whether standardized solution is required for** recovery of failures at the gNB-CU-CP, for enhanced resiliency.”

4) Add “Potential standardized solutions” in the notes

- NOTE 1: **Potential standardized solutions** for gNB-CU-CP failure recovery should minimise signalling towards the UE and signalling load towards the network

- NOTE 2: **Potential standardized solutions** for gNB-CU-CP failure recovery should minimise UP interruptions, namely they should minimize the service downtime from the end-user perspective.

- NOTE 3: **Potential standardized solutions** for minimisation of control plane interruptions should also be targeted

- NOTE 4: No new signalling between the UE and the network should be defined

2 – Ericsson LM

We prefer not to add the bullet that says “Focus on scenarios involving an entire node failure of the gNB-CU-CP”. For the same reason we should not discuss solutions at this stage, we should also not restrict or prescribe discussions on failure classes at this stage.

4.3 Other

Feedback Form 16: Essential comments on the other parts of the draft SID

1 – ZTE Corporation Considering that the failure scenarios have not been clearly clarified during the ongoing RAN plenary email discussion, addition, we would like clarify one more question, what is the different of gNB-CU-CP resiliency between gNB resiliency or eNB resiliency?
2 – Huawei Tech.(UK) Co.. Ltd We do understand this Study should be short in TU, then focus. We tried to help the discussion for better understanding by "cutting" some scenarios, unfortunately this is not accepted by proponents. all thoughts, the clear definition of a set of scenario would have been easier to understand….It was not provided… The current status of the SID remains too large, then unclear …. There is no requirements for such large Study at this stage.
3 – Ericsson LM As we already stated, we propose that the SI outcome is captured in a RAN3 TR – this needs to be mentioned in Sec. 5 of the SID.
4 – China Mobile International Ltd We still think the study item is not sufficiently justified. It seems the only justification is the "failure scenarios which cannot be solved by currently specified means.....". However, what's the issue of the current solution is not clear. And the scope is too large, we don't know how many scenarios we need to study, and therefore cannot evaluate how many TUs are needed for this study item
5 – Qualcomm Technologies Int We would like to correct our view as presented in the intermediate phase summary i.e. "Qualcomm thinks the concern is not enough and thinks proprietary solutions are optimal in all scenarios." In fact it is the opposite, as stated we think there is sufficient concern from operators that existing proprietary solutions may not be optimal for all scenarios, and therefore there is reasonable justification to study such scenarios and what improvements may be made.

4.4 TEI with a dedicated agenda item?

In the previous round, CATT suggested considering a compromise to have a dedicated agenda for gNB-CU resiliency in TEI which guarantees the discussion of this topic even without a dedicated SI.

Moderator would like to companies to provide views on how the proposal could work in case the potential SI is not approved.

Feedback Form 17: Feedback to "TEI with a dedicated agenda item" proposal

1 – Nokia

We don't see how TEI is an option. The value of a study is that there is structured discussion based on a SID scope, guidance from SI rapporteur, documentation of scenarios & associated solutions in a TR, etc.

2 – Verizon UK Ltd

Agree with Nokia view above. Given the importance of the dealing with failure scenarios for operators like us, this needs a structured discussion with proper documentation of scenarios and potential solutions in a TR.

3 – NTT DOCOMO INC.

Agree with Nokia's and Verizon's views.

4 – Deutsche Telekom AG

We agree with the arguments raised by companies before. We should go for a study, not for TEI.

5 – Qualcomm Technologies Int

We agree with Nokia's view. Doing this study as a TEI would be a highly inappropriate outcome at many levels. Regardless of the topic or company's views on it, RAN3 should minimize defining extra topics (mini work items), as this makes a mockery of release and workload planning. Plus it seems completely unsuitable for the type of study proposed here.

6 – NEC Corporation

TEI for this case is not a good way for project management. We will use the study item to have a TR to record the study.

7 – ZTE Corporation

TEI can be used to discuss those issues detected from business deployments and driven by contributions. If the topic got enough attention, then a dedicated agenda item can be allocated.

8 – Huawei Tech.(UK) Co.. Ltd

We have sympathy for a TEI approach if a clear scenario of resiliency which highlights the standard impact could be acknowledge.

9 – KDDI Corporation

Agree with Nokia's and Verizon's views

10 – Ericsson LM

As already stated, a proper SI with a proper TR would be the correct way to handle this topic. However, given the persisting status of this discussion we fully understand the intention to minimize the time spent on this topic if there is no consensus on a SID. We would also be supportive of not having a SID on this topic, as we still believe TSG and WG time should be better spent on more meaningful topics.

11 – CATT Considering it is controversial to have a SID on this topic,we think allocating a dedicated agenda item in TEI would be another possible way to guarantee the discussion on this issue in Rel-18.
12 – China Unicom Since the potential impacts on the F1 and E1 interface is not clear, if needed, to support some new or enhance the existing interface failure management procedures could be treated in TEI.
13 – China Mobile International Ltd If a clear scenario is identified and inter-operable solution with standard impact can be found, why not go with TEI directly.
14 – LG Uplus We agree with Nokia.

4.5 Summary of the final phase

Justifications

On (1) remove the sentence “Such architecture is affected by a single point of failure at the gNB-CU-CP”:

Well supported. Moderator would like adopt this.

On (2) Add “Any potential solution studied should be based on the current NG-RAN architecture.”:

Opposing comments from Docomo (ambiguous) and Qualcomm (already have clearer text in the objectives) does not seem so critical considering the support from the vast majority. Moderator would like to adopt this change.

On ”(3) For these reasons, **on top of rel-15 TS 38.401 specification**, **scenario** ~~solutions~~ should be studied **and defined** that allow to recover...”:

The comments were mostly against the change. The examples of main point from opponents were that we only have a note that states ”up to implementation”, and the change creates confusion what ”on top of” means. Moderator would like to go without this change.

There was also a discussion on the sentence ”failure scenarios which cannot be solved by currently specified means and corresponding solutions” which was added by the moderator in the previous phase. The moderator’s intention was to align with the moderator’s way forward in the previous topic, i.e. limiting the scope to the scenario of ”entire node failure”.

Despite support from a couple of to keep it, many companies commented that the new text is confusing, as “currently specified means” is unclear.

Moderator would like to remove this part (”which cannot be solved by currently specified means ”) to avoid confusion and side-effect.

There was a suggestion that we mention ”inter-operable solutions” in the same sentence, which was supported by the vast majority of the comments and received no opposition. Moderator understands that this is a part of the motivation of the project, and would like to adopt it.

Objective

On moderator proposals:

There was clear support in (1) and Moderator would like to adopt this.

(2) seems to be already available in the draft SID.

The proponent of (3) clarified the intention was to change ”defined” to ”required”. Moderator wonders that it might change the meaning from ”no RRC impact” to ”not send anything to/from UE”, and for now would like to stay as it is.

There was not enough support for (4) to (8).

Huawei made a number of new proposals. Moderator thinks:

(1) already available, (2)(3) can be discussed, (4) not needed if we have (2)(3).

Ericsson suggests removing “Focus on scenarios involving an entire node failure of the gNB-CU-CP” not to discuss solutions at this stage. Moderator have some sympathy but would like to stick to current text for now, as it was to resolve one of the main concern in the first round from some companies.

Other

SI outcome (TR) is added.

QC comments mistakenly summarized by the moderator is corrected.

Other general comments can be discussed in the GTW.

TEI with a dedicated agenda item?

No consensus on this for now.

Companies promoting TEI thinks this could work by first identifying the standard impact by proponents (not WG). Out of them some companies can have a dedicated AI if enough attention.

Other companies think the study cannot be managed without structured discussion based on a SID scope, guidance from SI rapporteur, documentation of scenarios & associated solutions in a TR etc.

5 Initial phase, Week 2

5.1 Work scope

In the Thursday GTW, RAN Chair’s guidance was to further refine the scope to fit in 0.5TUs x 2-3 quarters. In this round the moderator would like to concentrate on the scope aspect.

Regarding how to limit the scope, we could think of qualifying the scenario more strictly. The idea could be to agree some allow/exclude-list or focus area of the scenarios. However, looking back at previous discussions, the discussion on the additional focus in addition to already captured ”entire node failure” clearly requires detailed technical discussions, and it seems very unlikely from the moderator’s viewpoint that we can converge on it. Please note that in the previous discussions many companies opposed to discuss in this way, including some specific proposals from Huawei. Moderator would like thank for the constructiveness, but thinks that it would be difficult to have a common understanding on how much scope the proposals can reduce without WG-level discussions.

Rather than the above, the moderator suggests that we limit the work scope by discussing potential work plan for the project and considering some restrictions in the plan. Following Chair’s guidance, let us assume 0.5TUs x 3-4 meetings, and **the moderator suggests capturing, in the SID objective, the potential plan for limiting the scope is as follows**:

- Split the project into 3 **sequential** phases:
  - Phase 1: Identify failure scenarios, and **agree to study** corresponding solutions **for up to [5] scenarios**
  - Phase 2: Identify and evaluate candidate solutions
  - Phase 3: Conclude the study
  - NOTE: Evaluation criteria for candidate solutions should be discussed in Phase 1, and can be adjusted in Phase 2

The idea is to upper-limit the number of scenarios whose solution should be studied. Companies are invited to check if there is any critical concern on the tentative work plan (if the item is approved).

Feedback Form 18: Strong concerns on the work plan restrictions above (if the item is approved)

1 – Nokia The work plan looks reasonable. Although we don’t foresee very many failure scenarios being proposed in “Phase 1”, putting a limit on the maximum number that can proceed to the solution phase seems like a good way to restrict how big the SI scope can (theoretically) become. Failure scenarios are likely driven by real operator concerns and the need for standardized / inter-operable solutions.
2 – Verizon UK Ltd The plan looks reasonable. Entire node failure for gNB-CU-CP has already been identified as a failure scenario. This could occur due to natural disasters or other man-made reasons. Further this could be in single/multi-vendor scenarios. Other scenarios and refinements could be studied in the SID phase with a limit to capture only the most important ones to operators.
3 – KDDI Corporation The plan looks reasonable. We also believe we can manage the workload by putting the maximum number of the solution. We don’t have strong opinion whether we decide the max number now but we guess 3 to 5 seems acceptable.

4 – ZTE Corporation

Work plan seems fine to us, it is a traditional way to handle a SID.

5 – CATT

Generally,the work plan seems OK to us.We also think that it is better to restrict scenarios that would be considerred in the SI.What's more,we think work on the solutions should aim to have common solution for all scenatios not one solution per scenario.

6 – Ericsson LM

In general, we are still of the opinion that ideally there shouldn't be a SI of this sort this late in the 5G cycle; but if there is, it shall have as wide a consensus as possible and it shall not modify the current NG-RAN architecture. With that in mind the phasing proposed by the Moderator might work, although 5 scenarios are too many: a number of companies believe (and rightfully so) that most scenarios can be addressed by implementation. As a compromise, we propose that the focus should be on max. 1-2 scenarios, that cannot be addressed by current specifications.

7 – NTT DOCOMO INC.

The proposal looks fine.
We think we do not need CATT's suggested restriction (common solution only) before looking at companies' suggestions on scenarios and solutions.

8 – NTT DOCOMO INC.

To comment on Ericsson's view, we think 1-2 scenarios are too few. Please note that what Verizon's example already consumes two scenarios. 3-5 scenarios should be reasonable to balance the SI outcome and work scope.

9 – Samsung Electronics Nordic AB

In general, we are fine with the work plan above. Setting a limitation to the number of scenarios can be a reasonable point to limit the scope. The number, e.g., 5, can be discussed when SI is started.

10 – Deutsche Telekom AG

To split the SI into 3 phases as proposed by the moderator is fine with us. To limit the number of failure scenarios is reasonable but we shouldn't initially restrict it too much, i.e., 3-5 scenarios seem to be feasible.

To get a common solution for different scenarios would be certainly nice to have, but the outcome is strongly dependent on the failure cases identified. Therefore, there is no need to have any restriction to common solutions at present state.

11 – TELECOM ITALIA S.p.A.

support the moderator's proposal

12 – China Mobile International Ltd

Before approving any study item, we should make it clear the scenarios and the issues first. The current specification has allowed a gNB-DU can be connected to multiple gNB-CUs for resiliency, the issue caused by the failure of gNB-CU-CP should be identified and understood by the groups first. Base station failure is a critical issue in our view should come from the field rather than a study.

13 – China Unicom

We share the same view with Ericsson, "there shouldn't be a SI of this sort this late in the 5G cycle;". The scenario is not clearly enough to convince all companies for the benefits by now. We share the view with other companies that the majority of failure cases are cover by implementation, or by the existing specifications of F1 and E1 interface. If we don't have the consensus on whether to treat in TEI or a SI , it is no need to further discuss on workplan, the detailed objective and time budget.

14 – Huawei Tech.(UK) Co.. Ltd

We tried to be constructive by cutting some aspects of the gNB-CU resiliency e.g. not impacting rel-15 agreement, not impacting CU-UP etc…. The proponents rejected this proposal without proposing any clarification of down scoping…

The current proposal to limit to 5 acknowledged scenarios for a solution is difficult to understand, because one "thousand scenarios", could be proposed and discuss before making a down selection to 5… The scope reduction is indeed on solution to study agreed scenarios but not wide area of possible scenario to submit …. We are thinking that the main discussion will be on acknowledgement of the scenario with regards to the standard impact e.g. if a scenario is already solved via implementation or existing standard there is no matter to pursue the discussion on solutions for this scenario, it won't be acknowledged.

After the one-line there is a clear request to provide reduced scope. We were expecting some clarification on family set of scenario e.g. interface impacted, node to considered only etc..

15 – BT plc

We are fine with the work plan, the proposal of splitting the SI into 3 phases and to limit the scenarios to 3 - 5 seems a reasonable way forward.

5.2 Draft SID

Companies are invited to provide remaining comments on remaining critical concerns in the draft SID, if any. Please provide comments on the scope to the previous section, not to this section. With little time left, please focus on the essentials.

Draft SID v5 can be found in:

https://www.3gpp.org/ftp/tsg_ran/TSG_RAN/TSGR_94e/Inbox/Drafts/%5B94e-29-R18-gNB-CU%5D/First%20Round%20(Week%202)/Draft%20New%20SID%20on%20enhancement%20for%20resiliency%20of%2
CU_v05.docx

Feedback Form 19: Essential comments of the SID, if any

1 – Nokia

Based on the work plan in section 5.1, companies are allowed to propose failure scenarios during "Phase 1" of the study. Therefore, in the Objectives section, perhaps the sub-bullet "*Focus on scenarios involving an entire node failure of the gNB-CU-CP*" should be deleted (or moved to the Justification section as an example failure scenario). The rest of the SID was extensively discussed in Week 1 and seems stable.

2 – Verizon UK Ltd

The SID looks fine. Entire gNB-CU-CP failure scenario should be definitely considered in the SI for single/multi-vendor use cases. Other scenarios or sub-scenarios could be defined in the first phase of the SID. Any prioritization/down-scoping of use cases should also be done in this phase. The solution/recovery phase should focus only on the most relevant use cases.

3 – KDDI Corporation

We are fine with the current SID. We are also fine with changes Nokia proposed above, since entire gNB-CU-CP failure scenario will be considered anyway.

4 – ZTE Corporation

For justification part, it is still not clear that the study should be enforced based on Rel-15 specification for RAN spit in TS38.401. Furthermore, we'd like to hear the feedback from the proponents on the question raised in the last week: What is the different of gNB-CU-CP resiliency between gNB resiliency or eNB resiliency?

The updates on the justification with change **in Bold** are shown as below:

1:Justification:

The split NG-RAN architecture is characterised by the presence of a single logical gNB-CU-CP connected to multiple logical gNB-DUs and logical gNB-CU-UPs, for each split gNB. Failures at the gNB-CU-CP may cause interruption of UP traffic and disconnection of UEs. **As stated in TS38.401, a gNB-DU may be connected to multiple gNB-CUs by appropriate implementation for resiliency, the issue caused by the failure of gNB-CU-CP based on geographical redundancy requirement needs to be further discussed and identified.**

For these reasons, failure scenarios and corresponding interoperable recovery solutions **are to be** studied that allow to recover from such failures ideally without any UP interruptions or UE disconnections/interruptions at CP level. Any potential solution studied should be based on the current NG-RAN architecture.

2: For the objective part.

The updates on the objectives with change **in Bold** are shown as below:

· Define and study failure scenarios associated with the gNB-CU-CP

o Focus on scenarios involving an entire node failure of the gNB-CU-**CP with geographical redundancy requirement.[RAN3]**

· Study solutions for recovery of failures at the gNB-CU-CP,for enhanced resiliency, **if the issue is identified.[RAN3]**

o NOTE 1: Solutions for gNB-CU-CP failure recovery should minimise signalling towards the UE and signalling load towards the network

o NOTE 2: Solutions for gNB-CU-CP failure recovery should minimise UP interruptions, namely they should minimize the service downtime from the end-user perspective.

o NOTE 3: Solutions for minimisation of control plane interruptions should also be targeted

o NOTE 4: No new signalling between the UE and the network should be defined

5 – Ericsson LM

1) In the Justification, the sentence "For these reasons, failure scenarios and corresponding interoperable recovery solutions should be studied that allow to recover..." should be slightly reworded. E.g. to: "For these reasons, failure scenarios and corresponding interoperable recovery solutions should be studied. Potential solutions should allow to recover…" (editorial). 2) "Interoperable recovery solutions" don't seem to belong in a 3GPP SID (which obviously should focus on interoperability); we propose to remove the words "interoperable recovery". 3) Since we shall identify scenarios during the course of the SI, we should also not restrict the type of scenarios at this stage, so we propose to remove the statement "Focus on scenarios involving an entire node failure of the gNB-CU-CP." 4) One further thought on NOTE4: it seems to contradict the other notes. E.g. we could envisage solutions with Uu impact which would benefit the whole system resiliency. So, NOTE4 should not be included.

6 – NTT DOCOMO INC.

We agree with KDDI's view.
We think we do not need the modifications proposed by ZTE as the scenarios can be limited by the moderator proposal in 5.1.

7 – CATT

1)For the first bullet in the objective part,since only one sub-bullet is included,we could directly promote the sub-bullet to a high level.Together to comments from ZTE,maybe the first bullet could just be ***Define and study failure scenarios involving an entire node failure of the gNB-CU-CP with geographical redundancy requirement*** without any sub-bullet.

2)We think there is redundancy between note 1 and note 4.In current stage,it is safer to say minimize the siganlling towards UE than stating no singalling impact between UE and network.Note 4 could be removed.

8 – Samsung Electronics Nordic AB

We are fine with the current SID content.

9 – TELECOM ITALIA S.p.A.

we are fine with the current proposal

10 – NEC Corporation

in the objective, one idea is to add "e.g." so it is like "Focus on scenarios **e.g.** involving an entire node failure of the gNB-CU-CP"

11 – Deutsche Telekom AG

We are generally fine with the proposed SID, but have following comments:

- W.r.t. sub-bullet "*Focus on scenarios involving an entire node failure of the gNB-CU-CP*" in the Objective section, we share the same view of some companies that it should be removed. Nevertheless, it can be listed as one exemplary failure scenario in the Justification part.
- We further support to mention "*interoperable recovery solutions*" to distinguish against implementation-based solutions noted by some companies.

12 – Huawei Tech.(UK) Co.. Ltd - The SID still needs some improvement as already suggested to ensure "agreed failure scenario with standard interoperability"… - Some aspects are not clear like: "Focus on scenarios involving an entire node failure of the gNB-CU-CP," does it mean that the gNB-CU-CP, will be able to at least send a failure message to the CU-UP or DU? Will it be able to transfer some context? - There is no [5] restriction in the SID - etc … - etc …
13 – BT plc We are fine with the current SID.

5.3 Time budget request

Companies are invited to comment on the potential time budget request below:

- 3Q 2022
  - R3 #117: 0.5TU
- 4Q 2022
  - R3 #117bis: 0.5TU
  - R3 #118: 0.5TU
- 1Q 2023
  - R3 #119: 0.5TU

Feedback Form 20: Feedback on the time budget request

1 – Nokia The time budget looks reasonable.
2 – Verizon UK Ltd Looks a reasonable plan
3 – KDDI Corporation Looks a reasonable plan.
4 – ZTE Corporation If the SID is approved, 2 quarters with 0.5TU/per RAN3 meeting starts from Q3' 2022 seems fine.

5 – Ericsson LM The proposed time budget seems appropriate.
6 – NTT DOCOMO INC. The time budget looks fine.
7 – CATT OK to us
8 – Samsung Electronics Nordic AB We are fine with the TU budget.
9 – TELECOM ITALIA S.p.A. ok
10 – NEC Corporation the proposed time budget is fine.
11 – China Mobile International Ltd We should not allocate TU just for imagination of the scenarios, we encourage companies to do some consolidated homework to identify the problem and bring it to 3GPP for discussion. Anyway, the proponents think it is only a small item which can be done easily in a short time frame, in this sense, we do not see it urgent, we are open to discuss in later stage as long as we can verify the cases.
12 – Deutsche Telekom AG The proposed TU allocation is fine with us.
13 – Huawei Tech.(UK) Co.. Ltd The TU looks appropriated, however, which item will suffer of these additional TU? We understand some TU needs to be remove somewhere….

5.4 Summary of the initial phase, Week 2

Work scope

Vast majority think that the moderator's proposal is reasonable. The moderator's proposal will be incorporated in the next version of the draft SID.

Some companies suggested not to have study, but in the NWM discussions, the moderator would like to focus on refining the SID. The decision of "approve or not" can be discussed in the GTW at the later stage.

There are some notable suggestions:

A company suggest to have down-scoping not only between phase 1 and 2, but also in scenarios. The

moderator understands that their concern is that ”thousands of scenarios” could be proposed. As described in moderator’s question in 5.1, it was very difficult in Week 1 to have a discussion on the details itself on e.g. interface impacted, node to be considered, as this requires WG-level discussion. The moderator thinks we should not repeat the same. However, the suggestion in 5.2 on focusing on ”geo-redundancy” scenario could help this aspect, on which the moderator would like to try to converge.

There were some comments on [5] scenarios, e.g. 1-2 is enough, need 3-5, decide in SI, limit to those with clear standard impact. Moderator would like to further discuss on the number of scenarios.

Other aspects of Draft SID

There were a discussion on the ”focus on entire node failure” part. 5 companies suggest to remove the part because it can be discussed in Phase 1 of the SI. On the other hand, two companies suggests to further restrict the scenario to ”geographical redundancy”. Moderator would like to try to converge on this part.

Some comments were about NOTE 1 (minimise the signalling) and NOTE 4 (no new Uu signalling). The moderator’s understanding is that NOTE 1 is about the amount of signalling load, and NOTE 4 is about the Uu spec impact. The moderator would like clarify the difference in the next version. A company suggested removing NOTE 4, but the moderator would like to stick to what we have discussed before, i.e. no Uu spec impact, for stability and reducing the scope.

For the comment on “agreed failure scenario with standard interoperability”, the moderator would like to discuss it along with the failure scenario discussion (limit to those with clear standard impact) in the next phase.

Other comments seems non-essential (e.g. already addressed by ”current NG-RAN architecture”, editorial), or seems to have little chance to converge on them from the moderator perspective due to e.g. already expressed oppositions (e.g. remove ”interoperable”, detailed CU-CP capability assumption after failure). For these comments, moderator would like to the current state for the sake of stability.

Time budget

Vast majority thinks the proposed TU request is fine. Moderator would like to adopt this in the next version.

Some companies suggested not to have the study, but in the NWM discussions, the moderator would like to focus on refining the SID. The decision of ”approve or not” can be discussed in the GTW at the later stage.

6 Intermediate phase, Week 2

Companies are invited to provide feedback on the following questions about the draft SID v6 in:

https://www.3gpp.org/ftp/tsg_ran/TSG_RAN/TSGR_94e/Inbox/Drafts/%5B94e-29-R18-gNB-CU%5D/Intermediate%20Round%20(Week%202)

6.1 How to limit scenarios after phase 1

Phase 1 of the potential study is formulated as follows with the number of scenarios in brackets.

> (1) Define and study failure scenarios associated with the gNB-CU-CP, and agree to study corresponding

solutions for up to [5] scenarios

There were various comments on this part in the initial round. Companies are invited to provide feedback on the following aspects, targeting to fit in the time budget.

1: number of scenarios in the square bracket

2: limit to scenarios that cannot be addressed by current specifications

Feedback Form 21: How to limit scenarios after phase 1

1 – Nokia

We are fine with the limits that are already captured in the current draft SID (i.e. "study corresponding solutions for up to [5] scenarios"). If there are strong concerns that the scope may still be too large, then reducing "5" to "3" could be a way forward. There is no need to add any other limits.

2 – Verizon UK Ltd

Current SID draft limit of 5 seems reasonable to start with. No further limit needed at this time. Further prioritization can be done in Phase 3. .

3 – Ericsson LM

Both approaches are beneficial (and 2 seems common sense: it's hard to understand why one should spend time on scenarios which are already covered by current specifications). One important thing to keep in mind on 1 is that the more scenarios are allowed to be discussed and evaluated, the less probability there is that the SI will actually progress. This is especially true given the planned time allocation of 3x0.5 TUs. For this reason, we propose to limit the number of scenarios to max. 1-2. Trying to pre-select the scenarios at TSG level is not going to work either, given the current status of discussions.

4 – Deutsche Telekom AG

To (1): To limit the number of relevant failure scenarios to 5 is fine for us. Going down to 3 is feasible from our perspective as a compromise.

To (2): No need to set that limit in the SID. We have to distinguish between implementation-specific single-vendor solutions and interoperable, multi-vendor suitable solutions to cover potential failure scenarios.

5 – Samsung Electronics Nordic AB

We are fine to have a limited number of scenarios to down-scope. 5 can be a reasonable number. For the second bullet, we think the final selected scenarios should be the ones with specification impact. We may not need to mention it as a down-scoping.

6 – KDDI Corporation

1. We are fine either 5 or 3.
2. We are reluctant to have the statement. We fell that implementation solutions with the current specification can address almost everything, so the statements seems confusing at least to us.

7 – Qualcomm Technologies Int

1. We also think as pointed out by others that ”3” could be a reasonable compromise, given # of TUs etc

2. This seems not a helpful addition. Because the current specifications refer to ”implementation”, they could be said to cover every scenario that one could care to imagine, as long as a solution (any solution) can be implemented regardless of standards. Maybe there is some other related meaning that makes sense, but not this one.

8 – NEC Corporation

The essential is to identify scenarios and that solution(s) can be enhanced in the standardization. At the same time, share the opinion to avoid too many scenarios. The 2. Does not seem to have an effect that can have limitation as “scenarios cannot be addressed by current specification” can still be as many as possible. Therefore, it would be good to indicate the number to e.g. 3 if 5 is still seen too many.

9 – ZTE Corporation

1: We are fine to limited to 3.

2: Limited to specific scenarios is necessary. Currently, the scenarios that the SID is expected to focus are very unclear. This indicates that there is no consensus on the study content. In order that the study can be carried out smoothly, it is highly recommended that we need make it clear at most three specific study scenarios before approve the SID.

10 – Huawei Tech.(UK) Co.. Ltd

How do you select these [n] scenarios????

As we explained in the previous discussion, limiting the number of scenarios subject to solution, in bracket to [n], does not preclude that lot of proposals will be submitted including against the rel-15 specification, indeed the point 2. does not cover the implementation. …

The point 2. seems to be an obvious way of filtering one a scenario to pursuit the discussion on solutions… but they are other criteria to be discuss… Here we see that each “scenario proposal” will be subject to discussion…

At the end the proposals do not reduce the scope of the study item.

11 – LG Electronics Polska

For 1, because many scenarios should be avoided, 3 can be a reasonable number rather than 5.

For 2, this addition is not helpful to limit scenarios.

12 – NTT DOCOMO INC.

(1) We prefer 5 scenarios, but 3 could be a compromise.
(2) We disagree to have this constraint in the SID. It is very difficult to affirm that the scenario is ”not addressed by current specifications” before studying solutions.

13 – BT plc

(1) Limiting to 5 failure scenarios is fine for us, but acceptable to reduce to 3 if there is strong opposition.

(2) We believe this statement is not needed in the SID

14 – CATT

Considering the limited TU for this SI,we think it is good to limit the number to 3

15 – China Mobile International Ltd

The status of the current discussion clearly shows the scenarios are totally not clear. How would the restriction on number of sceanrios could limite the scope. We even don't know what kind of the sceanrios will be proposed if we do not clarify it before approving any study. And how to select the scenarios for study is also not clear.

6.2 Entire node failure scenario

The objective part of the current draft SID have a sentence:

> Focus on scenarios involving an entire node failure of the gNB-CU-CP.

There were a discussion on the "focus on entire node failure" part in the initial phase. 5 companies suggest to remove the part because it can be discussed in Phase 1 of the SI.

On the other hand, two companies suggests to further restrict the scenario to "geographical redundancy". Moderator would like to try to converge on this part. There was also a concern from a company in 5.1 that the current draft SID could allow companies to propose thousands of scenarios that lead to vast amount of discussions for filtering into [5] scenarios. Though discussing detailed scenario restrictions in plenary level is not accepted by many companies, further restricting the scenario by this "geographical redundancy" might help reduce the concern.

Companies are invited to provide feedback on the following alternatives, **targeting to fit in the time budget.**

Alt 1: remove "Focus on scenarios involving an entire node failure of the gNB-CU-CP."

Alt 2: change phase 1 to "Define and study failure scenarios involving an entire node failure of the gNB-CU-CP with geographical redundancy requirement, and agree ...". With this change, remove the "Focus on ..." sub-bullet.

Alt 3: Keep "Focus on scenarios involving an entire node failure of the gNB-CU-CP." as it is.

Feedback Form 22: Feedback on "entire node failure" scenario

1 – Nokia

We prefer Alt 1 since "entire node failure" is just one scenario, and therefore seems inconsistent with the higher-level bullet that states "study corresponding solutions for up to **5 scenarios**". However, we can live with Alt 3 (keep text in draft SID as-is) as long as it is a common understanding that other scenarios are not precluded (this could be clarified by adding "Other scenarios are not precluded" as a second sentence in the same sub-bullet).

2 – Verizon UK Ltd

Prefer Alt1, Alt3 is acceptable but not Alt 2. Geographic redundancy requirement is a specific implementation solution and may not be possible in different operator deployment scenarios. So we would not want

to impose such a limitation on the SI.

3 – Ericsson LM

As previously explained, we strongly favor Alt. 1. The actual discussion of scenarios should take place in Phase 1.

4 – Deutsche Telekom AG

We prefer Alt 1.

As compromise Alt 3 is feasible, if as proposed by Nokia "*Other scenarios are not precluded*" is added as further sub-bullet.

Geo-redundancy is a special case and can be seen as one scenario to be covered in Phase 1 if prioritized, but there is no need to list it in the SID.

5 – Samsung Electronics Nordic AB

We are fine with Alt. 1 since we already decide to limit the number of scenarios, and "entire node failure" is just one scenario.

6 – KDDI Corporation

We are fine either Alt1 or Alt3, but Alt2 is not acceptable.

7 – NEC Corporation

either to take the Alt.1 i.e. remove the sentence, or take the Alt.3by saying this is only an example and other scenarios are not precluded, i.e. "Focus on scenarios **e.g.** involving an entire node failure of the gNB-CU-CP, **other scenarios are not precluded.**"

8 – Qualcomm Technologies Int

We think Alt 1 is the one that makes more sense. Alt 2 is not preferred, and Alt 3 could be acceptable.

9 – ZTE Corporation

We prefer Alt 2. Alt 1 actually expands the scope of the SID and make the study no long focused.

10 – NTT DOCOMO INC.

We prefer Alt 1 and agree with Verizon.

11 – Huawei Tech.(UK) Co.. Ltd

None of the alternatives above match with the request to reduce the scope:

- Alt1: is not acceptable, because this allow as example to discuss the rel-15 agreement
- Alt2: the "geographical redundancy", is already possible either via implementation and redundant equipment, either via well definition of the logical architecture
- Alt3: please check our previous response, it is not clear whether the failing node is able to send message move context etc before failed …

In general the proposal as good will, we have sympathy for it, but it deserved further clarification, to avoid the confusion we already see …

12 – LG Electronics Polska

We prefer Alt 1. As NEC's proposal i.e., "Focus on scenarios **e.g.** involving an entire node failure of the gNB-CU-CP, **other scenarios are not precluded**." is acceptable, we are fine with Alt 3 as a compromise.

13 – CATT

Perfer Alt2 which somehow reflect the discussion in this RAN pleanry meeting.

6.3 Other

Companies are invited to provide remaining comments on remaining critical concerns in the draft SID, if any. With little time left, please focus on the essentials and please do not repeat something that was previously discussed.

Feedback Form 23: Essential concerns on the draft SID

1 – Nokia

The draft SID looks good.

2 – Verizon UK Ltd

We are fine with the draft SID.

3 – Ericsson LM

On not considering editorial comments for the sake of stability, we respectfully disagree with the Moderator: the editorial correction we proposed (item 1 of feedback form 19), by breaking up a run-on sentence into 2 more concise ones, does not affect "stability" but increases readability of a SID which still causes continued discussion (including on how to interpret an "interoperable recovery solution"). Also on NOTE4 (now called NOTE2), we respectfully disagree with the Moderator: by keeping this note, we may be artificially excluding some perfectly workable solutions without a technical discussion. As an example, if UP interruptions are caused by sub-optimal UE behaviors the study should be able to analyze such use cases and investigate any viable solution. We also disagree with how NOTES1-3, which put quite reasonable constraints on candidate solutions, are now gone and have been "watered down" into evaluation criteria for solutions, "to be discussed during the study". For us this is not acceptable. The conditions for the SID to be acceptable are:

- Agree to editorial changes proposed;
- Remove Note 4 or indeed turn Note 4it into "minimize new signalling, if at all needed, between UE and network"
- Maintain Note 1-3
- The notes shall be pre-requisites for the solutions.

4 – Samsung Electronics Nordic AB

We are fine with draft SID (v06)

5 – KDDI Corporation

We are fine with the current version.

6 – Deutsche Telekom AG

We would prefer to keep Notes 1-3 instead of the newly proposed Note 1. As addition, it could be stated in a note that "*Further evaluation criteria for candidate solutions, if required, could be discussed in Phase 1.*"

With respect to Note 2 (former Note 4) we would prefer Ericsson's proposal to change it to "*Minimize new signalling, if at all needed, between UE and network*".

7 – Qualcomm Technologies Int

The SID's current version is ok for us.

With respect to possible changes:

- We cannot agree with any change or removal of note 4. Note that this has already a "should". If someone comes up with an amazing solution that requires some changes, I am sure they can use such semantics to justify. But removal or further dilution is simply not acceptable.
- Regarding notes 1-3. Indeed they are budding evaluation criteria only (how do you measure if a solution minimises UP interruptions?? clearly this is only possible by comparing to a different solution, or status quo). Perhaps something like the below might be acceptable to all:
- *Note 1: Solutions should minimise signalling towards the UE and the network, service downtime and control plane interruptions. Specific evaluation criteria can be refined in phase 1.*

8 – ZTE Corporation

Before we judge the necessity of this new SID , we hope all companies stand on the same page to focus on the scenarios/issues that have not been covered by the current specification/implementation. Else it is difficulty to progress this SID even it is approved. Furthermore, if the proponents think the critical issue can be done easily in a short time frame, we are open to discuss in later stage when we identify the issues or treated it in TEI.

9 – NTT DOCOMO INC.

For Ericsson's point,

- We are fine with the editorial proposal from Ericsson
- On NOTE 4, Uu spec impact should be avoided. Ericsson's proposal adds confusion and larger scope.
- On maintaining NOTE 1-3, we prefer current version, but can accept to revert to the previous formulation, including QC's or DT's formulation.
- On the "prerequisite" suggestion, we disagree with it. It adds confusion, e.g. not clear the prerequisite criteria are "AND" conditions or "OR" conditions.

10 – Huawei Tech.(UK) Co.. Ltd

To our understanding the draft SID v6 extends the scope by removing some restrictions…

The proposal to down select the scenario which will pursuit for solutions does not restrict the number of initial solutions discussed…

There is no focus on that version … even less

Again we would appreciate to focus the SID on a set of operators clear scenarios, based on their experience or analysis, not on a "regulatory like" 5G requirement study for RAN resiliency single point of failure.

11 – China Mobile International Ltd

We would like to reiterate our comments that the scenarios and issues should be clarified first. The current specification has allowed a gNB-DU can be connected to multiple gNB-CUs for resiliency, the issue caused by the failure of gNB-CU-CP should be identified and understood by the groups first. Base station failure is a critical issue in our view should come from the field rather than a study.

6.4 Summary of the intermediate phase, Week 2

How to limit scenarios after phase 1

On **1: number of scenarios in the square bracket**, there were various comments (5, 3, 1-2). 3 would be a good middle ground from moderator's perspective.

No consensus on having **2: limit to scenarios that cannot be addressed by current specifications**. The proponent think this is a "common sense", but some other companies opposes because, e.g. see no need, distinguishment between implementation and interoperable solutions, implementation can do anything.

Entire node failure scenario

Both support and objection to both changes.

Concerns to Alt 1: expands the scope, "allow as example to discuss the rel-15 agreement", etc.

Concerns to Alt 2: is a specific solution, already possible by implementation, etc.

There were some support to a compromised suggestion "Focus on scenarios **e.g.** involving an entire node failure of the gNB-CU-CP, **other scenarios are not precluded**.". However, it seems to the moderator as a soft equivalent of Alt 1, which would not be acceptable for opponents of Alt 1.

With the above situation in mind, the moderator would like to keep the current formulation.

Other

Some proposals from Ericsson.

- "For these reasons, failure scenarios and corresponding interoperable recovery solutions should be studied. Potential solutions should allow to recover…": got support and no objection. Moderator would like to adopt this.

- Remove Note 4 or turn Note 4 into “minimize new signalling, if at all needed, between UE and network”: got a support, but also some objections including strong one. With ”should” (not ”shall”) in the current version, the moderator would like to keep it as it is.
- There were support to revert the reformulation of Notes 1-3. Moderator would like to restore the former Notes 1-3, also considering wording improvements from DT and Qualcomm.

It is the moderator’s understanding that the main remaining concern from the opponents is that target scenario is not clear, leading to e.g. large scope. This aspect can further be discussed in the GTW.