3GPP Conference Call on 3GPP Spec Modernization #1 6GSM-250xxx

Electronic, 6 August 2025, 13:00-15:00 UTC

**Agenda item: 5.2**

**Source: Nokia (Rapporteur)**

**Title: Email discussion on pCR to Section 4.2 – Shortcomings, pain-points and potential benefits**

**WID/SID: FS\_6Gspecs - Release 20**

**Document for: Discussion and Decision**

# 1 Introduction

This document is the report of an email discussion on the contents of a pCR to TR 21.802, Section 4.2 on Shortcomings, pain-points and potential benefits. The results of this email discussion will be used to produce a new pCR based on [6GSM-250019](https://www.3gpp.org/ftp/workshop/2025-03-10_3GPP_6G_WS/Docs/6GWS-250019.zip), aggregating inputs from [6GSM-250015](https://www.3gpp.org/ftp/workshop/FS_6GSpecs/6GSM_Meeting_01/Docs/6GSM-250015.zip) (Huawei), [6GSM-250026](https://www.3gpp.org/ftp/workshop/FS_6GSpecs/6GSM_Meeting_01/Docs/6GSM-250026.zip) (Apple), [6GSM-250028](https://www.3gpp.org/ftp/workshop/FS_6GSpecs/6GSM_Meeting_01/Docs/6GSM-250028.zip) (Samsung, ZTE), [6GSM-250032](https://www.3gpp.org/ftp/workshop/FS_6GSpecs/6GSM_Meeting_01/Docs/6GSM-250032.zip) (Ericsson), [6GSM-250035](https://www.3gpp.org/ftp/workshop/FS_6GSpecs/6GSM_Meeting_01/Docs/6GSM-250035.zip) (NTT DOCOMO INC.), and [6GSM-250038](https://www.3gpp.org/ftp/workshop/FS_6GSpecs/6GSM_Meeting_01/Docs/6GSM-250038.zip) (Xiaomi). The resulting pCR will have the TDoc number 6GSM-250043.

# 2 Contact Points

Respondents to the email discussion are kindly asked to fill in the following table.

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| Company | Name | Email Address |
| Nokia (Rapporteur) | Jerediah Fevold | jerediah.fevold@nokia.com |
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# 3 Discussion

In this email discussion, pain-points, shortcomings, and potential benefits related to current tools and procedures will be discussed. The first question will address the terminology used for various roles and the questions which follow will address one pain-point and all related solutions, including their pros and cons.

The question description will be the name of the pain-point and the details of the pain-point will be provided above the question. For pain-points which were proposed by more than one company, their content will be merged with the pain-point description and with the solutions, whether they are modifications or unique solutions and identified by contribution number and company. The base list of pain-points will be sourced from 6GSM-250019 and all unique ones will be added to the end of the list. **Note:** For simplicity, the merging has been removed from the tables since it is obvious to which pain-point each solution applies since they are handled individually. Solutions will be numbered in brackets, related to the pain-point number, e.g., solution 1 for pain-point 1 would be numbered as [1.1].

In the discussion tables, please note whether you generally agree or disagree with the pain-point itself and comment on the pain-point and its description and on the solutions and their pros and cons. Please do not add any new pain-points or solutions during the email discussion, but contribute them to the next conference call, CC#2. Feel free to also comment on whether certain pain-points should be merged or split. The last question will request comments on the organization of the table.

## 3.0 Q0 - Role Descriptions

The following roles and descriptions were provided in 6GSM-250019 to categorize pain-points, shortcomings, and benefits: contributor; editor; and reader.

**Contributor:** A person who contributes to the specification, e.g., a delegate, by submitting change requests (CRs).

**Editor:** A person who merges changes into the specification, e.g., a rapporteur or MCC.

**Reader:** A person who reads the specification such as a chipset, radio access network (RAN), or core network (CN) vendor, a mobile network operator (MNO), government regulatory body, researcher, automated text processing tool, or the general public.

Please comment on whether these definitions are sufficient or if they should be modified or clarified, removed, and whether any additional roles should be added.

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| Answers to Question 0 |
| Company | Comments |
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**Summary 0**: TBD

**Proposal 0**: TBD

## 3.1 Q1 – Delays in specification availability

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| # | Shortcoming / pain-point / potential benefit | Possible improvement approaches with current tools | Pros of possible improvement approaches | Cons of possible improvement approaches | Summary of feasibility of addressing the shortcoming / pain-point / potential benefit with current tools | Applicable WGs and users of the specification |
| 1 | **Delays in specification availability**: Specifications are not available until sometime after the TSG plenaries, sometimes very close to or even after submission deadlines for the next WG meeting, resulting in: * Inefficient working
* CRs cannot be created until the new specification is available.
* Last minute changes to CRs & pCRs

Insufficient time to review merged specification prior to the end-of-release specification review due to merging delay. |  |  |  | (not easily feasible) We do not see a way to resolve the issue of merging docx-based CRs into the specification without significant effort to create a version control tool on top of a docx editing tool. | WGsAll groupsUsersContributor, Editor, Reader |
|  |  | [1.1] In WGs where all merging is done by a single MCC officer today, there is the possibility to offload this task to each spec rapporteur. 3GPP could provide regular training courses for delegates that are candidates for becoming TS rapporteurs. | Drastic decrease in the workload for MCC officers, reduces the need to look for automated tools for merging CRs into specs. | Need to ensure that all TS rapporteurs complete the task timely and respect all 3GPP drafting rules with proper and regular training. | Current practices in some WGs handling large numbers of CRs show that it is feasible to mitigate this shortcoming, by adopting a better distribution of tasks for offloading MCC officers. | WGsAll groupsUsersEditor |

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| Answers to Question 1 |
| Company | Yes / No | Comment on Shortcoming/Pain-Point/Benefit | Comment on Solution (s) |
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**Summary 1**: TBD

**Proposal 1**: TBD

## 3.2 Q2 – CR based on incorrect specification version

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| # | Shortcoming / pain-point / potential benefit | Possible improvement approaches with current tools | Pros of possible improvement approaches | Cons of possible improvement approaches | Summary of feasibility of addressing the shortcoming / pain-point / potential benefit with current tools | Applicable WGs and users of the specification |
| 2 | **CR based on incorrect specification version**: This can be due to late specification availability as noted in pain-point #1, or due to delegate error.CRs based on the wrong version should be rejected by MCC and they could be impossible to implement in the specification.Can delay the implementation of critical fixes to the specification. | **[2.1] CR Conformance Checking**: Write a tool, e.g., an application-native script, Python script, or other programming language-based tool to check and report the location and nature of style errors and inconsistencies, including:Heading style errorsNon-contiguous clause numberingNon-conforming figure and table numbering, including the location of the caption, above or belowMismatch between CR database and the CR cover pageAdditionally, the macro would need to be available for local use such that delegates could check their CRs prior to submission. | - By using the tool pre-submission, delegates would not experience delays in submission.- Less time would be spent during meetings discussing styles and formatting. |  - Difficult to write and maintain consistent tools based on docx due to high variability in docx file structures | **(feasible)** Search for an exact match of the text in a CR without changes applied to the latest version of the specification.  | **WGs**All Groups**Users**Contributor, Editor |

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| Answers to Question 2 |
| Company | Yes / No | Comment on Shortcoming/Pain-Point/Benefit | Comment on Solution (s) |
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**Summary 2**: TBD

**Proposal 2**: TBD

## 3.3 Q3 – CR cover page errors

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| # | Shortcoming / pain-point / potential benefit | Possible improvement approaches with current tools | Pros of possible improvement approaches | Cons of possible improvement approaches | Summary of feasibility of addressing the shortcoming / pain-point / potential benefit with current tools | Applicable WGs and users of the specification |
| 3 | **CR cover page errors:*** Incomplete list of affected clauses
* Incorrect specification references
* Incorrectly identified mirror CRs
* Changes to the CR cover page are not reflected in the CR database
 | **[3.1] Automatic CR Generation:** Write a tool, e.g., an application-native script, Python script or other programming language-based tool to automatically create a CR from a modified version of a specification, including the following:* Auto-filled cover page including the specification number, specification version, and affected clauses
* Automatic inclusion of affected clauses in the body of the CR, including change marks

Additionally, the macro would need to be available for local use such that delegates could check their CRs prior to submission. | - Many error-prone fields of the CR cover page would be guaranteed to be correct. | - Modifying additional clauses or removing affected clauses requires a regeneration of the CR- Difficult to write and maintain consistent tools based on docx due to high variability in docx file structures- Some companies do not allow the use of macros.- This solution only works for the initial version of the CR. | **(feasible)** A cover page generated from a modified version of the specification with change tracking would guarantee the correct cover page information, including specification number, release, and affected clauses. | **WGs**All Groups**Users**Contributor, Editor |
|  |  | **[3.2] CR Conformance Checking (see above)** |  |  | **(feasible)** The version in the cover page would be checked. If the version is greater than the latest version, then the text could be checked for consistency with the latest version. | **WGs**All Groups**Users**Contributor, Editor |
|  |  | **[3.3]** Potentially.Best if **automatically generated headers are mandatory**.[Tools already exist to check this to some extent from MCC. Further tools are under development. It is also already supported to automatically generate correct headers.][ETSI has a project to provide such a tool for use in 3GPP work. The tool is currently under development.] | Limited changes to ways of working (force use of automatically generated headers,) improved quality. | Forcing use of automatically generated headers may be difficult. It is not clear how to automatically update headers (e.g. rev #, changes in list of supporting companies, date, etc. | This would improve CR quality and is feasible to implement. It would have some impact on our current way of working. |  |

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| Answers to Question 3 |
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**Summary 3**: TBD

**Proposal 3**: TBD

## 3.4 Q4 – CR content errors

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| # | Shortcoming / pain-point / potential benefit | Possible improvement approaches with current tools | Pros of possible improvement approaches | Cons of possible improvement approaches | Summary of feasibility of addressing the shortcoming / pain-point / potential benefit with current tools | Applicable WGs and users of the specification |
| 4 | **CR content errors**: CRs are created by editing the specification with “Track Changes” enabled, copying and pasting one or more sections with changes from the specification into a CR template and filling in the CR cover page with the affected clauses, affected specification number, description of the problem and description of the change.* Copying and pasting from external tools can lead to the document editor tool to crash.
* Errors can be introduced when additional sections are pasted into the CR template.
* Use of incorrect base text, e.g., from the wrong version of the specification. This can especially happen while waiting for the next release of a specification.
* A variety of tools are used by different companies to create docx files, resulting in inconsistent file formats.
* Creation of mirror CRs is a manual process.
* Unused references, references which are undefined, references to clauses which do not exist

Coloured font used instead of change-tracking | **[4.1] Automatic CR Generation (see above)** |  |  | **(feasible)** A CR generated automatically from a modified version of the specification would be guaranteed to have the correct base text, styles, complete sections, etc. | **WGs**All Groups**Users**Contributor |
|  |  | **[4.2] CR Conformance Checking (see above)** |  |  | **(possibly feasible)** Checking for the correct base specification is feasible but could result in false negatives if additional sections were copied into the CR at a later stage, e.g., if an extra new line was introduced by accident. | **WGs**All Groups**Users**Contributor |

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| Answers to Question 4 |
| Company | Yes / No | Comment on Shortcoming/Pain-Point/Benefit | Comment on Solution (s) |
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**Summary 4**: TBD

**Proposal 4**: TBD

## 3.5 Q5 – CR style errors

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| # | Shortcoming / pain-point / potential benefit | Possible improvement approaches with current tools | Pros of possible improvement approaches | Cons of possible improvement approaches | Summary of feasibility of addressing the shortcoming / pain-point / potential benefit with current tools | Applicable WGs and users of the specification |
| 5 | **CR style errors:*** Inconsistent or incorrect styles such as incorrect header style, caption style, bullet style, etc.
* Can be caused by copying and pasting from other documents into a CR

Table styles can be inconsistent for tables with the same type of content. | **[5.1] Automatic CR Generation (see above)** |  |  | **(feasible)** Using auto generation of the CR would significantly reduce the introduction of new errors and help to ensure that the approved styles are ones which are used. | **WGs**All Groups**Users**Contributor, Editor |
|  |  | **[5.2] CR Conformance Checking (see above)** | Delegates just need to run the macro on their CR before submission. | Is such macro feasible?There could be feasibility issues due to some companies not being allowed to run macros as a consequence of company-specific IT rules/policy | (**feasible**) Simple checks such as ensuring that only approved styles, fonts, font sizes, etc., are used is feasible. (**not feasible**) Ensuring that styles didn’t change between versions and ensuring that the correct approved styles are used could be challenging and encounter corner cases. | **WGs**All Groups**Users**Contributor, Editor |
|  |  | **[5.3]** **Training of delegates and rapporteurs to apply consistent styles in CRs and TRs/TSs**. | Easy reminder by Chairs or MCC with detailed guidance. Possibility for MCC to organize training sessions and to provide tutorial documents. | Some tools other than MS WORD used for processing docx files may not allow delegates full control of the styles | Delegates are potentially capable of applying consistent styles with proper training and the right tools. | **WGs**All Groups**Users**Contributor, Editor |
|  |  | **[5.4]** **Use of a light version of MS WORD** may facilitate the development of automatic processing on docx files. Such light version would include only features used in 3GPP without any additional feature, e.g. removing the possibility of adding new styles, and many other functions. | Removing most of MS WORD features should help reduce file sizes, ensure consistent use of styles and formatting, and may make automatic processing of compressed docs files easier.  | Such light version of MS WORD may need to be outsourced to Microsoft, with concerns on feasibility and cost. This would require a clear set of requirements from 3GPP, which need to be future-proof. It should be targeted for 3GPP to make it available to Individual Members without incurring additional cost. | Feasibility remains to be evaluated, in addition to the possible difficulties of requesting the creation of such light version of MS WORD to Microsoft. Unclear if this would still work with other editors. | **WGs**All Groups**Users**Contributor, Editor |
|  |  | **[5.5] EditHelp consulting from ETSI.** This is done before entering change control. After change control secretary review is possible but does not scale well. | Current rules require this[In principle all authors must use official templates and settings. In practice, no one enforces this] | Forcing adherence to rules leads to slower progress. Those who did so were called CR police - respected, not loved.[In principle all authors must use official templates and settings. In practice, no one enforces this] | Training of authors? Forcing authors by means of tools to comply with drafting rules? | **WGs**All Groups**Users**Contributor, Editor |
|  |  | **[5.6] Only very invasively: DOCX files could be analyzed for *anything* that is not in TR 21.801 and complain.** [In principle all authors must use official templates and settings. In practice, no one enforces this] | Issues would be discovered that are currently hidden. | This would have a very large impact on ways of working since authors would need to strictly use MS Word according to rules.  | Some success for some errors are feasible to identify.It may not be possible to enforce this because some tools used by delegates (see (s) below) differ from MS Word. It may be impossible to prevent these from diverging from expectations. |  |

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| Answers to Question 5 |
| Company | Yes / No | Comment on Shortcoming/Pain-Point/Benefit | Comment on Solution (s) |
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**Summary 5**: TBD

**Proposal 5**: TBD

## 3.6 Q6 – CR content checking

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| # | Shortcoming / pain-point / potential benefit | Possible improvement approaches with current tools | Pros of possible improvement approaches | Cons of possible improvement approaches | Summary of feasibility of addressing the shortcoming / pain-point / potential benefit with current tools | Applicable WGs and users of the specification |
| 6 | **CR content checking:** Subject to manual or best-effort contributions. Errors in the content include:* Drafting rules violations
* Commercial references
* Intellectual property violations for images
* Inclusion of trademarks

Typos, spelling and grammar mistakes | **[6.1] CR Conformance Checking (see above)** |  |  | (**feasible**) If the conformance checking tool is made available to delegates, then errors can be discovered and fixed well before the contribution deadline. | **WGs**All Groups**Users**Contributor, Editor |

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| Answers to Question 6 |
| Company | Yes / No | Comment on Shortcoming/Pain-Point/Benefit | Comment on Solution (s) |
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**Summary 6**: TBD

**Proposal 6**: TBD

## 3.7 Q7 – CR conflicts

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| # | Shortcoming / pain-point / potential benefit | Possible improvement approaches with current tools | Pros of possible improvement approaches | Cons of possible improvement approaches | Summary of feasibility of addressing the shortcoming / pain-point / potential benefit with current tools | Applicable WGs and users of the specification |
| 7 | **CR conflicts**: Merging CRs into the specification* Multiple changes to the same section sometimes remove specification text due to human errors. For example, when multiple work items are modifying the same section, some of the changes may be removed or not implemented.
* It is not possible to easily check the effect of the implementation of more than one CR or pCR simultaneously to check for side-effects.

It isn’t trivial to identify conflicting CRs such that the relevant experts, e.g., CR editors or WI rapporteurs, could discuss the appropriate resolution. |  |  |  | **(infeasible)** While a diff is possible inside of Word, CRs cannot be directly compared to the full specification since the CR can have discontinuities between sections and includes the cover page. Additionally, such a diff would not be possible when considering multiple CRs simultaneously, e.g., applying all the CRs of a WI to the specification to check for conflicts. | **WGs**All Groups**Users**Contributor, Editor |
|  |  | **[7.1]** **careful review by delegates to detect CR implementation errors.** | Review by delegates is a proven method. Undetected critical errors are fixed with another CR. | Delay in proper implementation of a CR by one quarter may occur, unless such review is completed in-between WG meeting and TSG meeting (as already done by certain WGs). | Current practices in some WGs handling large numbers of CRs show that it is feasible to address this shortcoming. | **WGs**All Groups**Users**Contributor, Editor |
|  |  | **[7.2] Tools can be provided by MCC to automate CR implementation of DOCX format CRs.** [ETSI has a project to provide such a tool for use in 3GPP work. The tool is currently under development] | Multiple issues could be addressed with this approach. Allowing the various roles (delegates, rapporteurs and MCCs) to work efficiently. | Not readily available tool. Implementation and maintenance of such a tool is a challenge considering the amount of development / testing effort needed. It is only possible to review the target specification after implementation by MCC (after TSG approval.) | This could greatly improve the current process of implementing CRs. It is too early to tell how well this tool will function in real conditions. | **WGs**All Groups**Users**Contributor, Editor |

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**Summary 7**: TBD

**Proposal 7**: TBD

## 3.8 Q8 – Cross-specification reference and navigation

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| # | Shortcoming / pain-point / potential benefit | Possible improvement approaches with current tools | Pros of possible improvement approaches | Cons of possible improvement approaches | Summary of feasibility of addressing the shortcoming / pain-point / potential benefit with current tools | Applicable WGs and users of the specification |
| 8 | **Cross-specification reference and navigation**: References to other specification documents are made using numbered references in square brackets and are sometimes accompanied by a section or clause number. Navigating across a work item over multiple specifications and working groups can be time consuming. For example, a RAN2 procedure could be triggered by RAN3 procedure, triggered by an SA2 procedure.Conformance Test specifications use heavy cross-referencing between the test spec (e.g. 38.521-1) and associated details in test point analysis (TR 38.905), MU/TT (TR 38.903), UE/UE connection diagrams (TS 38.508-1) | **[8.1] Include the specification number and clause when available.** |  |  | **(feasible)** This is a matter of following a procedure. Since clause numbers are never reused, such references should be available. | **WGs**All Groups**Users**Contributor, Reader |
|  |  | **[8.2] Use hyperlinks in the references** |  |  | **(infeasible)** The specifications are stored as zip files on the 3GPP server and in the 3GPP portal. If links were provided in the specifications, they would be to zip files, which would have to be downloaded, extracted and opened. | **WGs**All Groups**Users**Contributor, Reader |
|  |  | **[8.3]** Perhaps **scripts can be developed to create, validate and automate verification of cross-references between test specifications** | Completeness and accuracy of references can be improved (if a solution is feasible). | If a solution is feasible, it will require extensive parsing of many specifications which may take time and may turn out to be prone to errors. Validation will be complex. | Complex and may be hard to manage. Feasibility is not certain. | **WGs**RAN5**Users**Contributor, Editor |

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| Answers to Question 8 |
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**Summary 8**: TBD

**Proposal 8**: TBD

## 3.9 Q9 – Data structure and API styling

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| # | Shortcoming / pain-point / potential benefit | Possible improvement approaches with current tools | Pros of possible improvement approaches | Cons of possible improvement approaches | Summary of feasibility of addressing the shortcoming / pain-point / potential benefit with current tools | Applicable WGs and users of the specification |
| 9 | **Data structure and API styling:** APIs and data structures, e.g., ASN.1, can contain formatting errors such as indentation for readability and colorization of keywords. | **[9.1] Externalization of APIs and data structures:** APIs and data structures could be stored externally to the specification. | - Standard text editors would take on the role of enhancing readability of APIs and data structures by providing colorization, indentation, and syntax highlighting. | - The specifications would be more difficult to search. - Field descriptions and procedures related to the APIs and data structures would be stored separately, requiring more careful checking. | **(feasible)** Some WGs already store certain data structures and APIs separately from the specification, e.g., RAN4, CT4, and SA5.(**feasible with caveats**) Groups such as RAN2 and RAN3 include field definitions and descriptions of conditionals in field tables. A solution for storing the field descriptions, which contain normative text, needs to be devised. Additionally, many find it convenient to have the procedures and protocol definitions in the same document. | **WGs**RAN2, RAN5**Users**Contributor,Editor, Reader |

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| Answers to Question 9 |
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**Summary 9**: TBD

**Proposal 9**: TBD

## 3.10 Q10 – Data structure and multiple representations

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| # | Shortcoming / pain-point / potential benefit | Possible improvement approaches with current tools | Pros of possible improvement approaches | Cons of possible improvement approaches | Summary of feasibility of addressing the shortcoming / pain-point / potential benefit with current tools | Applicable WGs and users of the specification |
| 10 | **Data structure and API multiple representations:*** Code-like and data model or table representations coexist and can be inconsistent, e.g., ASN.1, OpenAPI and XML in tabular form can be inconsistent and don’t match the code representations.

OpenAPI: Different WGs (e.g. CT4 and SA5) often use the same datatypes but they are defined slightly differently. | **[10.1] Single representation of APIs and data structures:** APIs and data structures could be limited to a single representation. | - The need for specifying which version of an API or data structure is authoritative would be eliminated. | - Some WGs include additional information in, e.g., a tabular form of APIs and data structures and would need to devise a new way of capturing the additional information. | (**feasible with caveats**) Many times the second representation is used as a way to describe the more technical protocol definitions. A new way to describe the protocol message fields would need to be devised. | **WGs**RAN3, SA5, CT1, CT3, CT4**Users**Contributor, Editor, Reader |

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| Answers to Question 10 |
| Company | Yes / No | Comment on Shortcoming/Pain-Point/Benefit | Comment on Solution (s) |
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**Summary 10**: TBD

**Proposal 10**: TBD

## 3.11 Q11 – Data structure and API syntax errors

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| # | Shortcoming / pain-point / potential benefit | Possible improvement approaches with current tools | Pros of possible improvement approaches | Cons of possible improvement approaches | Summary of feasibility of addressing the shortcoming / pain-point / potential benefit with current tools | Applicable WGs and users of the specification |
| 11 | **Data structure and API syntax errors*** In some groups, when modifications are made during a meeting, syntax errors can be introduced due to lack of verification.
* In some groups, the contributions to the meeting can include syntax errors.
 | **[11.1] Automatic syntax and consistency checking for APIs and data structures:** Write or provide a tool to check for the following:* Syntax checking

Reference checking, e.g., checking that a datatype of a parameter exists as an intrinsic to the language or as defined elsewhere in the API or data structure specifications | - The volume of CRs with syntax and consistency errors would be reduced. |  | **(feasible)** While there would be some growing pains to require syntax checking, if the syntax tool were made available to all for local use, people would get used to it. | **WGs**RAN2, RAN3, CT1, CT3, CT4**Users**Contributor, Editor, Reader |
|  |  | **[11.2]** If **code is moved to external files or storage in the FORGE it is in principle possible.** | CR quality would improve if tools were available to check code quality. | Requires code to be separate from CRs, essentially. This reduces CR specification cohesiveness.[NOTE Y] | This is feasible, though might not be trivial.  | **WGs**RAN Groups, CT Groups, SA4, SA5**Users**Contributor, Editor, Reader |

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| Answers to Question 11 |
| Company | Yes / No | Comment on Shortcoming/Pain-Point/Benefit | Comment on Solution (s) |
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**Summary 11**: TBD

**Proposal 11**: TBD

## 3.12 Q12 – Associating a spec change with a CR

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| # | Shortcoming / pain-point / potential benefit | Possible improvement approaches with current tools | Pros of possible improvement approaches | Cons of possible improvement approaches | Summary of feasibility of addressing the shortcoming / pain-point / potential benefit with current tools | Applicable WGs and users of the specification |
| 12 | **Associating a spec change with a CR**: It is difficult to determine where a change came from between two non-contiguous versions of a specification, e.g., between 18.1 and 18.7. * The draft version of the specification with change tracking enabled only shows change marks based on changes between the previous version of the specification and the new version of the specification.
* Draft CRs which are aggregated into larger CRs, e.g., mega CRs, are not distinguished even in the draft version of the specification. This can make it difficult to identify the reason for each change.

Not always straightforward to track which WID/SID introduced a certain change.  |  |  |  | **(infeasible)** There are different strategies to associated changes in a specification to a CR, but this can become time consuming, the older the CR is. | **WGs**All groups**Users**Contributor, Editor, Reader |

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| Answers to Question 12 |
| Company | Yes / No | Comment on Shortcoming/Pain-Point/Benefit | Comment on Solution (s) |
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**Summary 12**: TBD

**Proposal 12**: TBD

## 3.13 Q13 – Specification opening and navigation delay

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| # | Shortcoming / pain-point / potential benefit | Possible improvement approaches with current tools | Pros of possible improvement approaches | Cons of possible improvement approaches | Summary of feasibility of addressing the shortcoming / pain-point / potential benefit with current tools | Applicable WGs and users of the specification |
| 13 | **Specification opening and navigation delay** * Opening a TR or TS of 100s or 1000s of pages can take many minutes or even be impossible due to crashing.
* Searching with keywords can be slow.

From a smartphone and even on laptops, the navigation of such large documents is not reasonably possible from mobile applications which support the docx format. | **[13.1] Edit specification in draft mode** | - Loading and editing times could be reduced.- Change marks are still visible in draft mode | - It is more difficult to check bubble comments in draft mode- Some document editing tools have been known to crash prior to being able to enter draft mode.- Need to ensure correct insertion of figures in WORD so that they are still visible in draft view. | **(feasible with caveats)** Most editors should support editing docx in draft mode. There are instances where the editor crashes while loading, before draft mode can be entered, however. | **WGs**All groups**Users**Contributor, Editor, Reader |
|  |  | **[13.2] Produce 3GPP PDF version of the specification after each plenary** | - Quicker access to a version of the specification which isn’t impacted by the slowness of some WYSIWYG editors.- Processing for converting all WORD docs into PDF is done only once for each spec version, presumably by MCC. | - Cannot be used for producing CRs.Need to ensure that conversion does not lose any information.Requires additional storage on FTP server. | (**feasible**) There are docx editors which can export docx to PDF. Editing would not be possible in the PDF version. | **WGs**All groups**Users**Reader |
|  |  | **[13.3] Split into multiple smaller docx files included in the same zip file**, with Table of Contents (ToC) in one of the separate files. | Faster opening of each individual file. | Cannot search across the multiple docx files.First need to check ToC file before navigating other files. | Partial solution (stability) but drawbacks remain (speed of navigation and search). | **WGs**All groups**Users**Contributor, Editor, Reader |
|  |  | **[13.4]** **Move large contents into separate database**, e.g. as with CA band combinations or as with ASN.1 code.Such content extracted from today’s specs could be made easy to identify with a proper file naming, or as new specs. | Faster opening of the separate parts of the spec without impact to ease of navigation and search | Does not help with large specs that do not include database-appropriate content | Potential solution for some specs but not for all large specs | At least RAN4 (for CA band combinations) and RAN2 (for ASN.1 clause)All users identified above |
|  |  | **[13.5] Use a more powerful computer** | Faster opening, faster navigation and search | This solution can be costly | Potential solution, but may not be available for all users (due to cost) | **WGs**All groups**Users**Contributor, Editor, Reader |
|  |  | **[13.6]** **Make all specs available in HTML** on 3gpp.org after each TSG meeting, in addition to publication of specs in WORD | Faster opening, faster search.Processing for converting all WORD docs into HTML is done only once for each spec version, presumably by MCC. | Cannot be used for producing CRs.No navigation panel in html.Need to ensure that conversion does not lose any information.Requires additional storage on FTP server. | Potential solution at least for users of the specifications that do not need to produce CRs and updates TSs. | **WGs**All groups**Users**Reader |
|  |  | **[13.7]** Many of the performance problems stem from incorrect use (or perhaps abuse) of Word features.It may be possible to **optimize the documents, e.g. by: reducing the number of styles used, only using named styles, simplifying tables, optimizing embedded objects, reducing figures resolution, etc.** | Limited changes to the current way of working. | It may not be possible to enforce proper usage of Word and over time we may end up with the same issues.  | Not sure. | **WGs**All groups**Users**Contributor, Editor, Reader |

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| Answers to Question 13 |
| Company | Yes / No | Comment on Shortcoming/Pain-Point/Benefit | Comment on Solution (s) |
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**Summary 13**: TBD

**Proposal 13**: TBD

## 3.14 Q14 – Zip file format

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| # | Shortcoming / pain-point / potential benefit | Possible improvement approaches with current tools | Pros of possible improvement approaches | Cons of possible improvement approaches | Summary of feasibility of addressing the shortcoming / pain-point / potential benefit with current tools | Applicable WGs and users of the specification |
| 14 | **Zip file format**: * While compression slightly reduces the download time and allows for grouping specification-related files, it prevents easy handling, e.g., on mobile phones without a proper application, which may be prohibited by company policy.
* Complicates cross-specification linking.
* Prevents searching in files via some operating systems.

Docx is a form of zip file already, which means that zipping it does not provide additional compression. |  |  |  | **(infeasible)** The only way we have to group files together with the specification is with a container format like zip. Otherwise, files would need to be manually downloaded from the FTP server, one-by-one. | **WGs**All groups**Users**Contributor, Reader |

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| Answers to Question 14 |
| Company | Yes / No | Comment on Shortcoming/Pain-Point/Benefit | Comment on Solution (s) |
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**Summary 14**: TBD

**Proposal 14**: TBD

## 3.15 Q15 – Numbering of PRs and CPRs

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| # | Shortcoming / pain-point / potential benefit | Possible improvement approaches with current tools | Pros of possible improvement approaches | Cons of possible improvement approaches | Summary of feasibility of addressing the shortcoming / pain-point / potential benefit with current tools | Applicable WGs and users of the specification |
| 15 | **Numbering of PRs and CPRs**:Potential Requirements (PR), Consolidated Potential Requirements (CPR), requirements are numbered manually and inconsistently within TR/TS, making it error prone for tracking or later reference |  |  |  |  | **WGs**SA1, CT3**Users**Contributor, Editor |

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| Answers to Question 15 |
| Company | Yes / No | Comment on Shortcoming/Pain-Point/Benefit | Comment on Solution (s) |
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**Summary 15**: TBD

**Proposal 15**: TBD

## 3.16 Q16 – Tracking editor’s notes

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| # | Shortcoming / pain-point / potential benefit | Possible improvement approaches with current tools | Pros of possible improvement approaches | Cons of possible improvement approaches | Summary of feasibility of addressing the shortcoming / pain-point / potential benefit with current tools | Applicable WGs and users of the specification |
| 16 | **Tracking editor’s notes**: The list of Editor’s notes to be addressed need to be compiled and their source need to be tracked manually.* It is not easy to extract a list of editor’s notes.
* There is no way to track the author of an editor’s note

There is no way to identify to which WI an editor’s note belongs or during which meeting the note was added. | **[16.1] Include WI and meeting number with editor’s notes.****-** For example, Editor’s Note: [FS\_AIML-air\_core, RAN2#129] | **-** It would be easier to find the delegate(s) responsible for the editor’s note**-** It would be easier to identify stale topics to resolve. | - Slightly more work and introduces meeting-related details into the specification, which isn’t ideal. An alternative would be to find the CR which introduced the Editor’s note. | **(feasible)** This is a matter of following a rule. The WI and meeting numbers are known. | **WGs**RAN2, RAN4, SA1, SA2, SA3, CT1, CT3, SA3**Users**Contributor, Editor |
|  |  | **[16.2]** Perhaps **scripts can be developed to automate cross-checks each time a test case has Editor’s Notes updated or removed.** | Provides a way to accurately record open items tracked via Editor’s notes within incomplete test cases (if a solution is feasible).  | If a solution is feasible, it will require extensive parsing of many specifications which may take time and may turned out to be prone to errors. Validation will be complex. | Tracking test case specific updates to Editor’s notes and open items in specifications is still going to be challenging without more advanced tools. |  |

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| Answers to Question 16 |
| Company | Yes / No | Comment on Shortcoming/Pain-Point/Benefit | Comment on Solution (s) |
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**Summary 16**: TBD

**Proposal 16**: TBD

## 3.17 Q17 – Automatic processing of specifications

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| # | Shortcoming / pain-point / potential benefit | Possible improvement approaches with current tools | Pros of possible improvement approaches | Cons of possible improvement approaches | Summary of feasibility of addressing the shortcoming / pain-point / potential benefit with current tools | Applicable WGs and users of the specification |
| 17 | **Automatic processing of specifications**:Access from automated text processing tools, e.g., Automata, to CRs and TSs/TRs is very cumbersome, requiring a lot of preprocessing and manual intervention |  |  |  | **(infeasible)** The docx format does is not easily processed. The file format is a mix of text and binary (to store images and objects). Conversions, e.g., docx to markdown, do not produce perfect representations of the original docx. | **WGs**All Groups**Users**Contributor |

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| Answers to Question 17 |
| Company | Yes / No | Comment on Shortcoming/Pain-Point/Benefit | Comment on Solution (s) |
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**Summary 17**: TBD

**Proposal 17**: TBD

## 3.18 Q18 – Figures can become impossible to edit

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| # | Shortcoming / pain-point / potential benefit | Possible improvement approaches with current tools | Pros of possible improvement approaches | Cons of possible improvement approaches | Summary of feasibility of addressing the shortcoming / pain-point / potential benefit with current tools | Applicable WGs and users of the specification |
| 18 | **Figures can become impossible to edit:*** Occasionally, CRs convert Visio figures to a format which cannot be edited. Sometimes Visio figures are drawn in an older format.

MSC-Generator diagrams can become corrupt | **[18.1] Store figure source files:** For editable figures, store at least the source file, named in accordance with the figure number, alongside the specification.* In conjunction with the option to download a 3GPP PDF of the specification, the downside of having larger zip files is mitigated and limited to those who are editing the specification.

Alternatively, two versions of the editable specification could be produced. One version would include only the embedded figures and another would include the figure source files as well. | - Standalone editors could be used to modify figures- The figure source would never be lost.- Because captions and headings are never reused, file naming consistency should be feasible. | - Any time a figure is edited, an extra step would need to be taken to ensure that the figure source file is updated.- Errors could occur in naming of the source files. | **(feasible with caveats)** Currently, images are stored as part of the docx file format, so they are conveniently collocated. Storing separate figures requires a way to associate the files with one another, e.g., a directory structure. | **WGs**RAN2, SA2, SA3, SA5, SA6, CT1, CT3**Users**Contributor, Editor |

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| Answers to Question 18 |
| Company | Yes / No | Comment on Shortcoming/Pain-Point/Benefit | Comment on Solution (s) |
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**Summary 18**: TBD

**Proposal 18**: TBD

## 3.19 Q19 – File sizes of embedded images

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| # | Shortcoming / pain-point / potential benefit | Possible improvement approaches with current tools | Pros of possible improvement approaches | Cons of possible improvement approaches | Summary of feasibility of addressing the shortcoming / pain-point / potential benefit with current tools | Applicable WGs and users of the specification |
| 19 | **File sizes of embedded images**: Some specifications and TRs include many images or a large body of text which can contribute significantly to the size of a docx file, leading to high upload and download times. | **[19.1] Store images as vector graphics:** Store images in Scalable Vector Graphic (SVG) format* Vector graphics are scalable and are not distorted through resizing.

Vector graphics are more efficient in storage, especially for graphics which have many straight lines and basic shapes, which is the typical nature of the figures in our specifications. | - All figures would be in the same format- Document sizes would decrease- Figures could be resized without distortion. | - Tools used to create figures would need to support SVG. | **-** In some docx editors, certain types of figures can be edited by double clicking them to launch an editor. Editing SVGs directly is not likely supported. | **WGs**RAN2, SA1, SA4, SA5, CT3**Users**Contributor, Editor, Reader |

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| Answers to Question 19 |
| Company | Yes / No | Comment on Shortcoming/Pain-Point/Benefit | Comment on Solution (s) |
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**Summary 19**: TBD

**Proposal 19**: TBD

## 3.20 Q20 – Quality of figures

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| # | Shortcoming / pain-point / potential benefit | Possible improvement approaches with current tools | Pros of possible improvement approaches | Cons of possible improvement approaches | Summary of feasibility of addressing the shortcoming / pain-point / potential benefit with current tools | Applicable WGs and users of the specification |
| 20 | **Quality of figures:** Figures are resized in dimension or compressed, thereby being distorted. | **[20.1] Store images as vector graphics (see above)** |  |  | **(feasible)** SVG files are inherently scalable. | **WGs**All Groups**Users**Contributor, Editor, Reader |

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| Answers to Question 20 |
| Company | Yes / No | Comment on Shortcoming/Pain-Point/Benefit | Comment on Solution (s) |
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**Summary 20**: TBD

**Proposal 20**: TBD

## 3.21 Q21 – Limitations of change tracking

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| # | Shortcoming / pain-point / potential benefit | Possible improvement approaches with current tools | Pros of possible improvement approaches | Cons of possible improvement approaches | Summary of feasibility of addressing the shortcoming / pain-point / potential benefit with current tools | Applicable WGs and users of the specification |
| 21 | **Limitations of change tracking:*** It is only shown whether a figure changed, but the changes in the figure need to be found manually by each reader.
* Change marks are not shown for columns and rows deleted in tables.
* removing a change from a previous revision is invisible.

Change marks are not shown when merging and unmerging cells in tables. |  |  |  | **(infeasible)** It is up to the implementation of docx editing tools which are not controlled by 3GPP. | **WGs**All Groups**Users**Contributor, Editor |
|  |  | **[21.1] Changes on changes can be used** |  | Changes on changes are strongly discouraged. |  | **WGs**All Groups**Users**Contributor, Editor |

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| Answers to Question 21 |
| Company | Yes / No | Comment on Shortcoming/Pain-Point/Benefit | Comment on Solution (s) |
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**Summary 21**: TBD

**Proposal 21**: TBD

## 3.22 Q22 – One document crashing crashes all documents

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| # | Shortcoming / pain-point / potential benefit | Possible improvement approaches with current tools | Pros of possible improvement approaches | Cons of possible improvement approaches | Summary of feasibility of addressing the shortcoming / pain-point / potential benefit with current tools | Applicable WGs and users of the specification |
| 22 | **One document crashing crashes all documents:**In some tools, when one document crashes, it is common for all other open documents to crash at the same time. |  |  |  | **(infeasible)** It is up to the implementation of docx editing tools which are not controlled by 3GPP. | **WGs**All Groups**Users**Contributor, Editor, Reader |

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| Answers to Question 22 |
| Company | Yes / No | Comment on Shortcoming/Pain-Point/Benefit | Comment on Solution (s) |
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**Summary 22**: TBD

**Proposal 22**: TBD

## 3.23 Q23 – Lack of collaborative editing

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| # | Shortcoming / pain-point / potential benefit | Possible improvement approaches with current tools | Pros of possible improvement approaches | Cons of possible improvement approaches | Summary of feasibility of addressing the shortcoming / pain-point / potential benefit with current tools | Applicable WGs and users of the specification |
| 23 | **Lack of collaborative editing:** We currently upload and download files to an FTP server to facilitate discussion or we walk around with a laptop during a meeting to find people to discuss with.* There are no notifications when a new document has been uploaded to the FTP server.

There is a race condition when two delegates try to provide input at the same time. |  |  |  | **(infeasible)** The main option for collaborative editing of docx is not scalable to the number of collaborators in 3GPP. | **WGs**All groups**Users**Contributor |

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| Answers to Question 23 |
| Company | Yes / No | Comment on Shortcoming/Pain-Point/Benefit | Comment on Solution (s) |
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**Summary 23**: TBD

**Proposal 23**: TBD

## 3.24 Q24 – Changes made during the merging of a CR into the specification are not visible

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| # | Shortcoming / pain-point / potential benefit | Possible improvement approaches with current tools | Pros of possible improvement approaches | Cons of possible improvement approaches | Summary of feasibility of addressing the shortcoming / pain-point / potential benefit with current tools | Applicable WGs and users of the specification |
| 24 | **Changes made during the merging of a CR into the specification are not visible:**Changes to CRs to resolve merge conflicts, including those present in tables, ASN.1 definitions, and other text conflicts are not identifiable. |  |  |  | **(infeasible)** It is not feasible to reference every CR in the draft specification. Normally, many CRs are merged into one. To determine the nature and reason of a specific change, it is necessary to find the aggregate CR, and then find the individual CR merged into it. | **WGs**All groups**Users**Contributor, Editor, Reader |

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| Answers to Question 24 |
| Company | Yes / No | Comment on Shortcoming/Pain-Point/Benefit | Comment on Solution (s) |
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**Summary 24**: TBD

**Proposal 24**: TBD

## 3.25 Q25 – Commenting does not scale well

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| # | Shortcoming / pain-point / potential benefit | Possible improvement approaches with current tools | Pros of possible improvement approaches | Cons of possible improvement approaches | Summary of feasibility of addressing the shortcoming / pain-point / potential benefit with current tools | Applicable WGs and users of the specification |
| 25 | **Commenting does not scale well to a large number of embedded comments** related to the same sentence or different sentences in the same page. |  |  |  |  | **WGs**All groups**Users**Contributor, Editor |
|  |  | **[25.1]** Avoid using embedded comments within the docx of the draft TS under review. Instead **use a separate WORD document only for collecting comments**. | Using a separate WORD document for collecting comments is a widely used technique in WGs, and allows responding to comments efficiently | When using a draft FTP folder, comments from multiple delegates may collide in time and separate branches of the same file are created, which are then cumbersome to merge. Delegates have to carefully provide the reference to the clause and line of the spec they are commenting on. | While many WGs operate this way, it can become impractical when scaled to a large spec and a large number of comments and responses | **WGs**All groups**Users**Contributor, Editor |
|  |  | **[25.2]** Avoid using embedded comments within the docx of the draft TS under review. **Instead use NWM** | Using NWM for collecting comments is a technique used by some TSGs/WGs. | Using NWM avoids collision of comments, but NWM is not convenient for commenting on equations or figures. Delegates have to carefully provide the reference to the clause and line of the spec they are commenting on. | NWM has not been tested for commenting on large specs where a large number of comments are expected.  | **WGs**All groups**Users**Contributor, Editor |
|  |  | **[25.3]** Avoid using embedded comments within the docx of the draft TS under review. **Instead extract the text under review and use a platform such as Gitlab for managing reviews and updates on a text-based file format**. | This would help reviewing text-based large parts of specs where typically a large number of comments are received during the review of a draft TS. Delegates would be able to see spec text and provide a comment directly over that spec text without using another file. | This requires separating (during review time) some parts of the specs which are only text-based for separate commenting, since text-based file formats may not be suitable to parts of specs that contains other types of objects (equations, figures, etc).  | This may be a good solution for large parts of a spec that are text-based only, if those parts are handled as a separate docx file within the zip file of the spec, or extracted as a completely separate spec where only text and simple tables is allowed. | **WGs****RAN2**: in RRC spec TS38.331, clause 6 spans over 1000 pages (about 60% of the entire spec). It contains the ASN.1 and includes only text (tabulated text for ASN.1) and simple tables.Potentially other WGs were text-only large parts of specs could be extracted.**Users**Contributor, Editor |

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| Answers to Question 25 |
| Company | Yes / No | Comment on Shortcoming/Pain-Point/Benefit | Comment on Solution (s) |
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**Summary 25**: TBD

**Proposal 25**: TBD

## 3.26 Q26 – Inability to search within or for equations and symbols

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| # | Shortcoming / pain-point / potential benefit | Possible improvement approaches with current tools | Pros of possible improvement approaches | Cons of possible improvement approaches | Summary of feasibility of addressing the shortcoming / pain-point / potential benefit with current tools | Applicable WGs and users of the specification |
| 26 | **Inability to search within or for equations and symbols**, whether using the older or newer equation editors | **[26.1]** No known solution to this problem within MS WORD |  |  |  | **WGs**All groups**Users**Contributor, Editor, Reader |

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| Answers to Question 26 |
| Company | Yes / No | Comment on Shortcoming/Pain-Point/Benefit | Comment on Solution (s) |
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**Summary 26**: TBD

**Proposal 26**: TBD

## 3.27 Q27 – Inconsistent use of tools and formats for figures

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| # | Shortcoming / pain-point / potential benefit | Possible improvement approaches with current tools | Pros of possible improvement approaches | Cons of possible improvement approaches | Summary of feasibility of addressing the shortcoming / pain-point / potential benefit with current tools | Applicable WGs and users of the specification |
| 27 | **Inconsistent use of tools and formats for figures** (e.g. Word, Visio, mscgen, PlantUML, etc). | **[27.1]** **Agree on one (or limited number, doesn’t have to be exactly 1) tool and format for figures, ideally across all WGs.** | Limited changes to the current way of working. | None | Appear to be feasible, but we need to figure out a way to enforce this decision.  | **WGs**All groups**Users**Contributor, Editor, Reader |

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| Answers to Question 27 |
| Company | Yes / No | Comment on Shortcoming/Pain-Point/Benefit | Comment on Solution (s) |
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**Summary 27**: TBD

**Proposal 27**: TBD

## 3.28 Q28 – Usage of non-cross platform formats

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| # | Shortcoming / pain-point / potential benefit | Possible improvement approaches with current tools | Pros of possible improvement approaches | Cons of possible improvement approaches | Summary of feasibility of addressing the shortcoming / pain-point / potential benefit with current tools | Applicable WGs and users of the specification |
| 28 | Usage of non-cross platform formats (Visio, objects embedded in documents using Windows OLE are not available on macOS). | **[28.1]** Agree that all tools and formats used in 3GPP specifications should be available on all major commercial platforms, exclude tools and formats which aren’t (e.g. Visio, objects embedded in documents using Windows OLE). | Limited changes to the current way of working. | None | Appear to be feasible, but we need to figure out a way to enforce this decision. | **WGs**All groups**Users**Contributor, Editor, Reader |

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| Answers to Question 28 |
| Company | Yes / No | Comment on Shortcoming/Pain-Point/Benefit | Comment on Solution (s) |
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**Summary 28**: TBD

**Proposal 28**: TBD

## 3.29 Q29 – Implementing CRs is a manual process

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| # | Shortcoming / pain-point / potential benefit | Possible improvement approaches with current tools | Pros of possible improvement approaches | Cons of possible improvement approaches | Summary of feasibility of addressing the shortcoming / pain-point / potential benefit with current tools | Applicable WGs and users of the specification |
| 29 | Implementing CRs is a manual process. | **[29.1]** **Tools can be provided by MCC to automate CR implementation of DOCX format CRs.** [ETSI has a project to provide such a tool for use in 3GPP work. The tool is currently under development.] | There would be no additional changes to 3GPP ways of working, nor retraining needed. | It is unlikely that this will be able to fully automate the process as DOCX based CRs are messy (see n, o, s below). | This could greatly improve the current process of implementing CRs. It is too early to tell how well this tool will function in real conditions. | **WGs**All groups**Users**Editor |

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| Answers to Question 29 |
| Company | Yes / No | Comment on Shortcoming/Pain-Point/Benefit | Comment on Solution (s) |
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**Summary 29**: TBD

**Proposal 29**: TBD

## 3.30 Q30 – Checking implementation of CRs is a manual process

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| # | Shortcoming / pain-point / potential benefit | Possible improvement approaches with current tools | Pros of possible improvement approaches | Cons of possible improvement approaches | Summary of feasibility of addressing the shortcoming / pain-point / potential benefit with current tools | Applicable WGs and users of the specification |
| 30 | Checking implementation of CRs is a manual process | [NOTE X] | This would be very helpful! | There is no disadvantage. | This is feasible: compare the approved CR vs. the target specification to find differences. | **WGs**All groups**Users**Editor |

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| Answers to Question 30 |
| Company | Yes / No | Comment on Shortcoming/Pain-Point/Benefit | Comment on Solution (s) |
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**Summary 30**: TBD

**Proposal 30**: TBD

## 3.31 Q31 – Large tables are not handled well

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| # | Shortcoming / pain-point / potential benefit | Possible improvement approaches with current tools | Pros of possible improvement approaches | Cons of possible improvement approaches | Summary of feasibility of addressing the shortcoming / pain-point / potential benefit with current tools | Applicable WGs and users of the specification |
| 31 | MS word does not handle large tables well and large documents well - can cause MS Word to crash or operate slowly. | **[31.1]** Already under development. **Move large tables to external files.** [NOTE Y] | This works well. | The approach reduces cohesiveness of CRs.[NOTE Y] | This is a potential solution only for some specifications (with large tables.) | **WGs**RAN4, RAN5**Users**Contributors, Editors, Readers |
|  |  | **[31.2] Break apart large specifications to smaller files.** | Faster opening. | Decreased locality of content, more difficult to maintain, read, etc. | Partial solution with significant drawbacks. | **WGs**Many groups**Users**Contributors, Editors |
|  |  | [**31.3] Move some large content to external databases**, e.g. RAN4 for CA band compatibility. | Faster opening of specifications that have their large content removed. | Does not help with specifications without content that can be put in a database. | This is a potential solution only for some specifications. | **WGs**RAN4, RAN5**Users**Contributors, Editors, Readers  |

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| Answers to Question 31 |
| Company | Yes / No | Comment on Shortcoming/Pain-Point/Benefit | Comment on Solution (s) |
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**Summary 31**: TBD

**Proposal 31**: TBD

## 3.32 Q32 – Current tools cannot extract code well

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| # | Shortcoming / pain-point / potential benefit | Possible improvement approaches with current tools | Pros of possible improvement approaches | Cons of possible improvement approaches | Summary of feasibility of addressing the shortcoming / pain-point / potential benefit with current tools | Applicable WGs and users of the specification |
| 32 | Current tools cannot extract code well | **[32.1] Move code to external files or storage in the FORGE.**[Eliminates the advantage of aggregation of all CR content in one file.] | CR usability (to implement products based on specifications) would improve if tools were available to check code quality | Requires code to be separate from CRs, essentially. This reduces CR specification cohesiveness.[Eliminates the advantage of aggregation of all CR content in one file.] | This is feasible. Some WGs already do this (SA5.) | **WGs**CT groups, SA4, SA5, RAN groups**Users**Reader |

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| Answers to Question 32 |
| Company | Yes / No | Comment on Shortcoming/Pain-Point/Benefit | Comment on Solution (s) |
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**Summary 32**: TBD

**Proposal 32**: TBD

## 3.33 Q33 – Hard to update documents when used to collect input

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| # | Shortcoming / pain-point / potential benefit | Possible improvement approaches with current tools | Pros of possible improvement approaches | Cons of possible improvement approaches | Summary of feasibility of addressing the shortcoming / pain-point / potential benefit with current tools | Applicable WGs and users of the specification |
| 33 | **It is hard to update MS Word documents when used to collect input from companies** e.g. in a single file as manual locking does not work, progress becomes slow and error prone. | **[33.1] Use ftp server to edit / update based on the latest version.** | It is based on existing tools. | Simultaneous editing and updating is not possible nor traceable. | Coordination is possible for small topics & number of participants, but not for large topics/#s (e.g. ASN.1 review in RAN2.) [NOTE D] | **WGs**All groups**Users**Contributor, Editor, Reader |
|  |  | **[33.2] Splitting a for review and comment into multiple separate files to reduce contention.** | It is based on existing tools and does help speed up work and reduces some contention. | Other problems are created, as changes to different parts of the spec can diverge. This approach does not scale to large files. | This approach is only incrementally useful. | **WGs**All groups**Users**Contributor, Editor, Reader |
|  |  | **[33.3]** Separate ASN.1 part of the file and use git and other such tools on the ASN.1 code part of the specification for collaborative working. | There will no longer be errors due to contention or misuse of manual locking, etc. Work can be done in parallel. | Problems for collaborative working still exist for other parts of the spec that are not in code format. This problem however exists for all CRs affecting different sections of specifications where collaboration is needed. | It is possible to achieve large scale coordinated review of ASN.1 that is not error prone and avoids delays. | **WGs**RAN2**Users**Contributor, Editor, Reader |

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| Answers to Question 33 |
| Company | Yes / No | Comment on Shortcoming/Pain-Point/Benefit | Comment on Solution (s) |
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**Summary 33**: TBD

**Proposal 33**: TBD

## 3.34 Q34 – Changes in a new version of a specification are hard to track for implementors

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| # | Shortcoming / pain-point / potential benefit | Possible improvement approaches with current tools | Pros of possible improvement approaches | Cons of possible improvement approaches | Summary of feasibility of addressing the shortcoming / pain-point / potential benefit with current tools | Applicable WGs and users of the specification |
| 34 | Changes in a new version of a specification are hard to track for implementors | Not sure, but do we consider RAN4 JSON exercise (which might help) as a “current tool”? |  |  |  | **WGs**All groups**Users**Reader |

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| Answers to Question 34 |
| Company | Yes / No | Comment on Shortcoming/Pain-Point/Benefit | Comment on Solution (s) |
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**Summary 34**: TBD

**Proposal 34**: TBD

## 3.35 Q35 – Organization of pain-points and solutions

Please provide comments on suggestions on how to organize solutions and pain-points. For example, separating solutions from pain-points would allow us to reference to one solution which may solve several pain-points and grouping pain-points such as by CR-creation related, CR-implementation related, specification navigation related, etc.

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| Answers to Question 35 |
| Company | Comments on Organization |
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**Summary 35**: TBD

**Proposal 35**: TBD

# 4 Conclusion

TBD