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| 3GPP TR 21.802 V0.0.1 (2025-08) |
| Technical Report |
| 3rd Generation Partnership Project;Technical Specification Group Services and System Aspects;Study on modernization of specification format and procedures for 6G(Release 20) |
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| The present document has been developed within the 3rd Generation Partnership Project (3GPP TM) and may be further elaborated for the purposes of 3GPP.The present document has not been subject to any approval process by the 3GPPOrganizational Partners and shall not be implemented.This Specification is provided for future development work within 3GPPonly. The Organizational Partners accept no liability for any use of this Specification.Specifications and Reports for implementation of the 3GPP TM system should be obtained via the 3GPP Organizational Partners' Publications Offices. |

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Contents

Foreword 4

Introduction 5

1 Scope 6

2 References 6

3 Definitions of terms, symbols and abbreviations 6

3.1 Terms 6

3.2 Symbols 7

3.3 Abbreviations 7

4 Assessment of existing specification formats and working methods, and requirements for any improvements 7

4.1 Benefits of current tools 7

4.2 Shortcomings, pain-points and potential benefits 12

4.3 Requirements Identification 30

4.3.1 General requirements 30

4.3.2 Requirements related to specific identified shortcomings/pain-points in clause 4.2 30

5 Proposals for new formats for 3GPP specifications 35

5.X Proposal #X 35

5.X.1 Description 35

5.X.2 Evaluation against requirements of section 4.3 35

6 Proposals for Tools and Ways of Working 35

6.X Proposal #X 36

6.X.1 Description 36

6.X.1.1 Description of tools 36

6.X.1.2 Description of procedures 36

6.X.2 Evaluation against requirements of section 4.3 36

7 Overall evaluation 36

8 Recommendations 36

Annex A: 3GPP Stakeholder Survey on CR Tools 36

A.1 Methodology 36

A.2 Major Findings 37

A.3 Specific Requirements for Rapporteurs and Secretaries 42

Annex B: Survey of specification formats, tools, and CR processes in use by 3GPP WGs in 2025 44

Annex C: Change history 49

# Foreword

This Technical Report has been produced by the 3rd Generation Partnership Project (3GPP).

The contents of the present document are subject to continuing work within the TSG and may change following formal TSG approval. Should the TSG modify the contents of the present document, it will be re-released by the TSG with an identifying change of release date and an increase in version number as follows:

Version x.y.z

where:

x the first digit:

1 presented to TSG for information;

2 presented to TSG for approval;

3 or greater indicates TSG approved document under change control.

y the second digit is incremented for all changes of substance, i.e. technical enhancements, corrections, updates, etc.

z the third digit is incremented when editorial only changes have been incorporated in the document.

In the present document, modal verbs have the following meanings:

**shall** indicates a mandatory requirement to do something

**shall not** indicates an interdiction (prohibition) to do something

The constructions "shall" and "shall not" are confined to the context of normative provisions, and do not appear in Technical Reports.

The constructions "must" and "must not" are not used as substitutes for "shall" and "shall not". Their use is avoided insofar as possible, and they are not used in a normative context except in a direct citation from an external, referenced, non-3GPP document, or so as to maintain continuity of style when extending or modifying the provisions of such a referenced document.

**should** indicates a recommendation to do something

**should not** indicates a recommendation not to do something

**may** indicates permission to do something

**need not** indicates permission not to do something

The construction "may not" is ambiguous and is not used in normative elements. The unambiguous constructions "might not" or "shall not" are used instead, depending upon the meaning intended.

**can** indicates that something is possible

**cannot** indicates that something is impossible

The constructions "can" and "cannot" are not substitutes for "may" and "need not".

**will** indicates that something is certain or expected to happen as a result of action taken by an agency the behaviour of which is outside the scope of the present document

**will not** indicates that something is certain or expected not to happen as a result of action taken by an agency the behaviour of which is outside the scope of the present document

**might** indicates a likelihood that something will happen as a result of action taken by some agency the behaviour of which is outside the scope of the present document

**might not** indicates a likelihood that something will not happen as a result of action taken by some agency the behaviour of which is outside the scope of the present document

In addition:

**is** (or any other verb in the indicative mood) indicates a statement of fact

**is not** (or any other negative verb in the indicative mood) indicates a statement of fact

The constructions "is" and "is not" do not indicate requirements.

# Introduction

Editor's note: To be determined whether this clause needs to be filled.

# 1 Scope

The present document …

# 2 References

The following documents contain provisions which, through reference in this text, constitute provisions of the present document.

- References are either specific (identified by date of publication, edition number, version number, etc.) or non‑specific.

- For a specific reference, subsequent revisions do not apply.

- For a non-specific reference, the latest version applies. In the case of a reference to a 3GPP document (including a GSM document), a non-specific reference implicitly refers to the latest version of that document *in the same Release as the present document*.

[1] 3GPP TR 21.905: "Vocabulary for 3GPP Specifications".

[2] 3GPP TR 21.801: "Specification Drafting rules".

[3] Report on User Requirements for a Next Generation Specification Development Tool, NWM Project Oversight Committee, 08.12.22. <https://www.3gpp.org/ftp/Email_Discussions/3GPP/221208-Report-Requirements-for-NG-Spec-Tool.zip> *(accessed 07.07.2025)*

[4] Supplement to Report on Next Generation Specification Tools Requirements, NWM Project Oversight Committee, 12.01.23.
<https://www.3gpp.org/ftp/Email_Discussions/3GPP/230112-supplemental-report-requirements-for-ng-spec-tool-01.zip> *(accessed 07.07.2025)*

# 3 Definitions of terms, symbols and abbreviations

## 3.1 Terms

For the purposes of the present document, the terms given in TR 21.905 [1] and the following apply. A term defined in the present document takes precedence over the definition of the same term, if any, in TR 21.905 [1].

**Consumer:** A person who reads the specification such as an Original Equipment Manufacturer (OEM), a mobile network operator (MNO), an implementor, government regulatory body, researcher, automated text processing tool, or the general public.

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

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

**source specification:** A version of a 3GPP TR or TS used as the basis for revision, to produce a new version.

**target specification:** A 3GPP TR or TS resulting from a source specification and a set of approved changes.

NOTE: The above definitions for source specification and target specification apply both to specifications under change control and those not yet under change control.

## 3.2 Symbols

For the purposes of the present document, the following symbols apply:

µ Average

σ Standard Deviation

## 3.3 Abbreviations

For the purposes of the present document, the abbreviations given in TR 21.905 [1] and the following apply. An abbreviation defined in the present document takes precedence over the definition of the same abbreviation, if any, in TR 21.905 [1].

WYSIWYG What You See Is What You Get

# 4 Assessment of existing specification formats and working methods, and requirements for any improvements

Editor's note: corresponds to objective 1.

## 4.1 Benefits of current tools

These benefits may in future be achieved by other means than the current tools and file formats used.

1. Familiarity

 The current set of tools are well known to delegates. 3GPP TR 21.801 [2] captures all requirements and recommendations, accumulated since 1999. Further, there is institutional expertise in checking that this is done properly (each secretary, MCC, other delegates, etc.) There are company internal and external tutorials for new delegates to assist coming up to speed.

 There is a complete 'way of working' built around the tools that is well known and stable, including interactions between delegates and group leadership, submission, retrieval during and after meetings, databases to track actions, etc.

NOTE 1: There is a limitation to this benefit as institutional expertise in checking proper use of drafting rules is quite inconsistent amongst those who create and edit CRs. Additionally, features which appear to be simple, such as applying the correct style and verifying the correct style, ensuring the correct style when copying and pasting, and correctly applying changes with track changes turned on, are quite error prone.

2. Integration

 (Nearly) all content for CRs and specifications are integrated into a single file that can be edited, viewed, sent to others, without any concern for capturing all of the content of the document (e.g. each figure.) This makes it extremely easy to work collaboratively to incrementally collect feedback and share proposed changes on a document under discussion and revision.

NOTE 2: There is a limitation to this benefit, as continuing work and discussion of a CR involves multiple copies of the document (e.g. in the INBOX DRAFTS folder with only a manual effort approach to keep them in sync.) Discussions on the basis of such divergent documents is difficult to follow.

 Content can also be directly pasted into the document from external applications. For some formats, the metadata required to edit the figure is also included, e.g., MSC-Generator block diagrams and call flows include the image representation and the source representation when pasted into a document.

 To the extent that there are other files needed, e.g. source code attachment in the form of YAML, JSON, XML, etc., these are collected in the same zip file that is used to store & retrieve, share and review, etc.

NOTE 3: There is a limitation to this benefit as the integration doesn't work well on all platforms. In particular, MSC-Generator diagrams embedded with OLE are not editable on any platform other than MS Windows.

3. WYSIWYG Editing and Ease of Use

 The content of the document appears as it will in the final product. This view is exact when change marks are not shown.

 When change marks are shown, the document is shown with close to final results, though the removed material is also displayed. Changes on changes, if shown at all, are used only for draft documents, removed in the submitted CR, but this is used in on-line work in some groups (see 16 below.)

NOTE 4: Changes on changes are not trivial to remove once introduced.3GPP delegates, leaders and secretaries are familiar with this view and can work with it rapidly to identify what has changed and whether it is acceptable (especially, whether it addresses past comments.) See Change Marking below.

 WYSIWYG editing is easy to use. There is only one tool to learn for most editing tasks, (except for figure and equation editing, which can support use of external tools such as visio.)

 Also, WYSIWYG editing in the current tools allows editing *directly in the document* of content that has been embedded, such as equations, figures, diagrams, tables, etc. which is especially useful. This edited content appears at all times as it will in the final resulting version.

NOTE 5: There is a limitation to this benefit as MS Word is in fact a very complex software and even experienced delegates sometimes struggle with some of its features. Furthermore, when something goes wrong (in a large document with complex styles), it is extremely hard to figure out the source of the problem.

4. Proofing Tools

 For many delegates English is not their primary language. For them, the spelling and grammar checks are quite helpful, as well as the automatic proposals for replacement of words and grammatical correction of phrases.

5. Change Marking

 Change marks show added, removed and moved text. They capture more than one change in a way that makes it immediately visible that changes are distinct. It is possible to view the metadata associated with the change (who did it, when, what the text of the change was, etc.)

 It is possible to adjust the 'source' of the change marks, as this could be the name of the delegate, company, work item code, CR number, etc. in different ways of working scenarios, employed in 3GPP groups.

 Additionally, draft specifications show change marks and a comment indicating from which CR submitted to plenary a change originated.

NOTE 6: There is a limitation to the benefit of change marking when applied to the task of implementing a CR in a specification on the basis of change marking, which has proven very difficult to automate.

NOTE 7: There is a limitation to the benefit of change marking as it does not capture some changes, especially details of changes to figures, tables and other more complex content. Some formatting changes are also not captured as changes. Removing empty lines can also result in unexpected behaviour such as applying the style of the text beneath the empty line to the text above the empty line once the empty line is deleted.

6. Extensive Formatting

 It is possible to format tables, figures, text, text coloring, and other content easily, with integrated help facilities to assist. Some of these operations are complex in principle (e.g. merging or splitting cells, greying parts of cells, etc.) though these are straightforward in terms of usability with the current tools.

NOTE 8: Highlight formatting is not strictly allowed by the drafting rules TR 21.801, but used extensively and found to be highly useful to emphasize certain changes in the drafting phase of a specification and for documents under discussion, etc.

NOTE 9: There is a limitation to this benefit as overly complex text formatting, which a document can end up with (sometimes invertedly), significantly contributes to the slowness of editing and even viewing it.

7. Consistent Output

 The current tools and formats have allowed 3GPP specifications to have a consistent appearance across thousands of publications, new and old.

8. Integrated means for collaboration

 It is possible to embed comments (also known as 'comment bubbles') and replies to comments directly in documents. This is often used by participants in 3GPP to share their views during the revision and off-line discussion of documents. Though this is not used in any formal 3GPP document process, it remains a useful tool for organizations to share individual comments and questions both internally and externally.

 Additionally, online collaboration is possible internally to a company during the drafting phase depending on the docx editing tool and file sharing system in place.

NOTE 10: There are limits to this benefit, as it does not scale up well to allow large numbers of comments or commenters.

NOTE 11: There is a limit to the way of working in which comments are shared in the form of documents with comments using ftp, email, etc. It is very difficult to coordinate this activity and keep track of all comments: either comments are collected in a single document which 'forks' unintentionally, or multiple documents must be collected and read without 'order' in the discussion (making it hard to properly reply to others' comments, be aware of all comments made, etc.)

9. Ability to control the page orientation

 For tables that are very wide, it is very useful to reorient specific pages to landscape. This requires insertion of 'sections' in Microsoft Word.

10. Ability to capture significant common information in templates

 Templates capture common styles, defaults, page width and height, headers, footers, etc. This makes it possible to achieve Consistent Output (see 7 above.)

NOTE 12: There is some limit to this benefit, since it is possible to ignore the template either through improper configuration of MS Word (e.g. the wrong language setting), or unintentionally, through pasting content into a document from a document with different properties and settings, that does not use the template, etc.

11. Product support and licensing

 The current tools have professional support, are licensed and sold at reasonable prices globally and are sufficiently stable to work with. There are even (open source tool) options that are available that are compatible without professional support and licensing fees.

NOTE 13: There is a limit to this benefit, as some versions of tools used to read and write DOCX work slightly differently. In particular, embedded object editing support and Visio is only available on computers running Windows.

NOTE 14: The availability of some tools over time changes, and the affordability and stability of commercial tools depends on the perspective of the organization that participates in 3GPP.

12. Ease of conversion of format

 It is easy to convert a MS Word document to PDF, among other formats.

NOTE 15: There is a limit to this benefit, as conversion to PDF sometimes fails (for reasons unknown).

13. Offline editing

 Current tools and the associated file formats, principally MS Word and DOCX format files can be used off-line. TDocs and CRs can be downloaded in advance and read and edited locally.

14. Document navigation

 Docx supports hierarchical headings which can be used by many docx editors to show an interactive table of contents for quick document navigation.

NOTE 16: There is a limit to this benefit, as large DOCX documents often need to be split into multiple files, which hampers navigation.

15. Simple access to documents

 Specifications and TDocs, including CRs, are easily accessible through a web portal and through an FTP client. Specifications are also available in a structured way, e.g., by series, which also lists all the version numbers per specification.

NOTE 17: For TDocs and CRs, this benefit is limited to the access, and the benefit falls short when searching for a specific document. That is, searching for the TDoc explaining the reason a change was made remains difficult. There is some disagreement about whether ftp use is 'simple' (it may be difficult to find a tdoc on the ftp file tree for past meetings, etc.)

NOTE 18: This benefit concerns the current 'document-centric way of working' in 3GPP and does not specifically relate to any document format, e.g. DOCX.

NOTE 19: The use of FTP is not allowed by some organizations as it is considered insecure.

16. Ease of consensus building during meetings

 During the meetings, both during online and offline sessions a lot of editing of the CRs happens whilst the changes are displayed directly on the screen. This is done by the chairs, rapporteurs and offline moderators to capture comments made on the floor and to display the corresponding changes at the same time on the screen, including figures, equations and tables. This is an important benefit of the current tools that improves meeting efficiency and is enabled by the WYSIWYG nature of the current tools.

NOTE 20: There is a limit to the extent that change marks can be captured on figures, equations, tables, etc. Change marking is not the benefit described above, rather collectively viewing and participating in editing sessions to reach consensus decisions on modified draft documents rather than already submitted documents.

17. Copy and paste content from CRs to other documents is possible. Chair notes, session notes, discussion papers and other documents include content from CRs. It is beneficial to be able to reproduce the content of CRs with the same appearance in other documents easily. It is also beneficial (somehow essential) that the same format is used for CRs as specifications.

NOTE 21: There is a limit to this benefit, as the paste of content into a CR sometimes results in unexpected configuration and styles and other diverse formatting issues: MSWord will sometimes apply the style of the area being pasted into. The different options: keep source formatting; merge formatting; and keep text only are not always sufficient for maintaining the correct style, and are complex so easy to apply incorrectly.

18. The use of git brings benefits: testing of cross referencing across YAML files (text only) before publication. Cross referencing has proven beneficial also for the development of OpenAPIs. Use of 3GPP Forge hosting allows content (including OpenAPIs) to be stored without use of zip files.

NOTE 22: There is a limit to this benefit, as it is only used by a few WGs. Tdocs that use solely DOCX format CRs do not benefit.

19. The use of Excel has proven useful for storage of large tables, which have proven problematic when included in DOCX files. It is also possible to include computation across multiple cells in the table, e.g. for test tolerances, measurement uncertainties and link budget calculations.

NOTE 23: Storage of some content of CRs in a separate file eliminates benefit 2 "Integration."

20. Macros for batch processing are beneficial, e.g. to identify style errors, editorial errors, in ASN.1 review for comment collection. Macros are also used for local document manipulation or concurrent manipulation of differnt documents.

NOTE 24: This benefit is present in MS Office applications, but the actual benefit is not the use of visual basic (which has disadvantages as a scripting language.) Rather, the benefit is that there is a means to use scripts to process 3GPP documents, e.g. CRs, TRs, TSs and drafts thereof. Furthermore, VBA macros are not cross platform (many Word VBA features are not available on platforms other than MS Windows).

21. The ability to visualize different parts of a document (i.e. Split View) at the same time on the same screen is beneficial.

22. The ability to open and visualize several documents at the same time on the same screen is beneficial.

NOTE 25: One caveat to opening several documents at the same time is that with a popular docx editing tool, every window of the application is associated with all the others, so if one crashes, they all crash.

23. For their intended purpose in 3GPP, MS Office tools can be considered both natively secure i.e. robust to manipulation of source code, and systematically available (i.e. usable)

## 4.2 Shortcomings, pain-points and potential benefits

Editor’s note: corresponds to objectives 1a/b

Table 4.2-1: Shortcomings, pain-points and potential benefits of current tools

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| # | Shortcoming / pain-point / potential benefit | Possible improvement approaches with current tools | 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 after the TSG plenaries, sometimes very close to submission deadlines for the next WG meeting. Thus, writing new CRs is delayed or CRs are written based on an old version. There is also limited time for review of the merged spec. | Solution 1 – Increase workforce for CR mergingSolution 2 – Scripting to automatically merge CRs | **Partly feasible** – Solution 1 for decreasing the number of TSes handled by a single MCC officer with the caveat that even a single large specification with many CRs still takes time to handle, while there are drawbacks about redistributing the load from MCC to delegates who would take on some of the work. Solution 2 (maybe feasible) is being developed for ETSI, but its feasibility is unknown. | **WGs**All groups**Users**Consumer, Contributor, Editor |
| 2 | **CR cover page errors**Errors can be present in the cover page details such as specification number and version, date, release, CR revision, affected clauses, and changes are not reflected in database  | Solution 3 – [New tool] CR conformance checkingSolution 4 – [New tool] CR auto-generationSolution 5 – CR cover auto-generation | **Maybe feasible** – Solution 5 is available and can be useful if the cover page is generated and attached to the CR just before submission. Solution 3 and Solution 4 would solve the problem, but the tools do not exist. | **WGs**All Groups**Users**Contributor, Editor |
| 3 | **CR content errors*** Incorrect specification base text, e.g., from the incorrect version
* Errors introduced by copying and pasting content such as additional sections
* Errors introduced by copying a CR for a later release to mirror CRs for prior releases
* Unused references, e.g., references that are used but not defined, or defined which are not used, and references to non-existent clauses
* Incorrect use of styles, including manually applying text formatting to mimic a style
* Use of different settings in the docx editor such as language can lead to inconsistent formatting and styles which diverge from the official template
* Omission of trademarks, commercial references, etc.
 | Solution 3 – [New tool] CR conformance checkingSolution 4 – [New tool] CR auto-generationSolution 6 – Restrict editingSolution 7 – TrainingSolution 8 – Light version of Microsoft WordSolution 9 – EditHelp Consulting from ETSISolution 10 – Exhaustive analysis of docx files against 21.801 | **Not feasible -** Solutions 3, 4, and 8 require new tools, which need to be written. Today they are infeasible since they do not exist.**Not feasible** – Solutions 7, 9, and 10 resolve parts of the issues. Solution 7, 9, and 10 are already done today and we still have the problems.**Maybe feasible** – Solution 6 could be feasible to resolve the style errors as long as everyone uses Microsoft Word.NOTE: It has been noted that some of the errors are due to not following the process. It should be considered which of these errors could be prevented by following rules and whether it is feasible to enforce the following of such rules. | **WGs**All Groups**Users**Contributor, Editor |
| 4 | **CR Merging** * Multiple changes to the same section sometimes remove specification text due to human errors.
* 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.
* Implementation of a CR is a manual process
 | Solution 2 – Scripting to automatically merge CRs | **Maybe feasible** – if the tool would be available for all specification contributors and editors, then it would be possible to check the effect of CRs. | **WGs**All groups**Users**Contributor, Editor |
| 5 | **CR Tracking*** It is difficult to associate a spec change with a CR, e.g., to determine where a change came from between two non-contiguous versions of a specification. For example, something changed between 18.1 and 18.7, but the exact version is unknown.
* CRs which are part of mega CRs or aggregate CRs are not visible individually in the draft spec.
* Changes to CRs to resolve merging conflicts, including those present in tables, ASN.1 definitions, and other text conflicts are not identifiable.
* Checking implementation of CRs is a manual process
* Changes in a new version of a specification are hard to track for implementors. It is particularly difficult to track an individual feature.
* Missing background information on how certain test steps or approaches (pertaining to test parameters or implementation) were adopted for in conf test procedure
 |  |  | **WGs**All groups**Users**Consumer, Contributor, Editor |
| 6 | **Data Structure Styling, Syntax and Representation*** APIs and data structures, e.g., ASN.1, can contain formatting errors such as indentation for readability and colorization of keywords.
* 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.
* 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.
* It isn’t easy to extract code
 | Solution 11 – Externalization of APIs and data structuresSolution 12 – Single representation of APIs and data structuresSolution 13 – Automatic syntax checking | **Feasible –** Solution 11 is already used by some WGs to store certain data structures and APIs separately from the specification, e.g., RAN4, CT4, and SA5. Solution 12 is already used in RAN2 which moved away from tabular ASN.1.**Maybe Feasible** – Solution 11 could be adopted. 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.Solution 13 would require new scripting to extract text from the specification and run the syntax checker. | **WGs**All groups**Users**Consumer, Contributor, Editor |
| 7 | **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)
 | Solution 14 - Include the specification number and clause number in referencesSolution 15 – Use hyperlinks in referencesSolution 16 - Script to create, validate, and automate verification of cross-references between specifications | **Feasible** – Solution 14 at least solves the problem of accurately referencing another specification or the same specification.**Partly feasible** – Solution 15 – while feasible, links would be to zip files hosted on the 3GPP FTP server. These would have to be unzipped, which is inconvenient, and the reference could not be to a specific clause.**Infeasible** – Solution 16 doesn’t exist. | **WGs**All groups**Users**Consumer, Contributor, Editor |
| 8 | **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
 | Solution 17 – Store figure source files | **Maybe feasible** – Solution 17 is feasible in the current tools because figure source files could be attached in the zip files. However, specifications can contain dozens to hundreds of figures, which could lead to error in omission of files and could be unscalable. Additionally, each attached file would have to be individually opened. | **WGs**All groups**Users**Contributor, Editor |
| 9 | **Quality and size of figures*** 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.
* Figures are resized in dimension or compressed, thereby being distorted.
* Microsoft has disallowed usage of equation editor 3.0 due to security issues with equation editor. When opening equations that were originally written using equation editor are stored as rasterized pixel images. Such images have image distortion issues when resizing the scale of the view.
 | Solution 18 – Store images as vector graphics | **Feasible** – Solution 18 is feasible for non-equation graphics. | **WGs**All groups**Users**Contributor, Editor |
| 10 | **Inconsistent use of tools and formats for figures*** e.g., Word, Visio, MSC-Generator, PlantUML, MS paint, PowerPoint, Equation editor, Latex, etc.
* Use of non-cross-platform formats (Visio, objects embedded in documents using Windows OLE are not available on macOS).
 | Solution 19 - Support a limited number of supported formats which work across WGs and platforms | **Feasible** – Solution 19 would consider tools supported by the overall specification format, so they would be compatible.NOTE: This could also solve pain-point 8 depending on what is chosen. | **WGs**All groups**Users**Contributor, Editor |
| 11 | **Large tables are not handled well** - MS word does not handle large tables well and large documents well - can cause MS Word to crash or operate slowly.  | Solution 11 – Externalization of APIs and data structuresSolution 25 – Split large specifications into smaller parts | **Maybe feasible** – Solution 11, depending on the nature of the table’s content, it could be externalized, e.g., as in RAN4**Feasible** – Solution 25 is used today. | **WGs**All groups**Users**Consumer, Contributor, Editor |
| 12 | **Collaboration on CRs*** Limitations of change tracking include: specific changes to figures are impossible to see; change marks not shown for columns deleted from tables; change marks are not shown when merging or unmerging cells; and change marks are shown in different colors, which poses an accessibility issue.
* Collaborative editing relies on downloading a document, providing input, and uploading it. There is a race condition when multiple delegates are working at the same time.
* Commenting bubbles do not scale well and having too many which affect the same clause makes it impossible to read.
* It is difficult to update documents when used to collect input since manual locking does not work and progress becomes slow and error prone
 | Solution 20 - Provide comments on CRs in a separate file instead of using bubble commentsSolution 21 – Use NWM to collect commentsSolution 22 - Extract text under review and use Git to manage reviewsSolution 23 - Use FTP to download latest inputs and upload new inputsSolution 24 - Split the CR for review into multiple files | **Infeasible** – Solution 20 and 21 could become unscalable when commenting on a large CR with a large number of comments and responses. Solution 22 would cause the loss of content most likely and would result in an inaccurate review.**Maybe feasible** – Solution 23 is used today, but many companies may be restricting access to FTP and SFTP.**Feasible** – Solution 24 could also work, but it has problems similar to Solution 23 and could increase confusion. | **WGs**All groups**Users**Contributor, Editor |
| 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.
* The specifications are stored as ZIP files, which add another step to opening the specification.
* There seems to be some issue in the .docx specification template itself, regarding the header that appears on top of each page which checking for every single page how the header should be filled even if there is only one outcome.
 | Solution 6 – Restrict editingSolution 7 - TrainingSolution 8 – Light version of Microsoft WordSolution 11 – Externalization of APIs and data structuresSolution 25 – split large specifications into smaller partsSolution 26 - Open specification and change to draft modeSolution 27 - Produce 3GPP PDF version of the specification after each plenarySolution 28 - Make all specs available in HTML | **Maybe feasible –** Solution 6, Solution 7, Solution 8 could help solve the problem, but so far these have not resulted in faster loading specs. Solution 25 works but has downsides like lack of navigability. Solution 26 works once the document is open, but crashing can occur prior to being able to switch to draft mode. Solution 28 may be infeasible because the conversion of Word to HTML could be lossy.Solution 11 is feasible but has more impact.**Feasible –** Solution 27 is already done by ETSI and other SDOs, but 3GPP could possibly release a version more quickly.NOTE: No solution has been provided for how to deal with ZIP files. | **WGs**All groups**Users**Contributor, Editor |
| 14 | **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.
* In some groups, requirements are not numbered which makes reference to requirements very difficult - it must be done by copying the text of the requirement. This can become misaligned, if the text is corrected in the specification where it is a provision.
 | Solution 29 – Mandate the numbering of requirements (PR and CPR) | **Feasible** – In Solution 29, numbering just needs to be enforced. |  |
| 15 | **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 |  | The docx format 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, Editor |

Table 4.2-2: Possible improvement approaches with current tools

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| # | Possible improvement approaches with current tools | Pros of possible improvement approaches | Cons of possible improvement approaches | Implementation Feasibility Analysis |
| 1 | **Increase workforce for CR merging** – In WGs where all CR merging is done by a single MCC officer today, there is the possibility to:* Increase the MCC staff for CR merging.
* Offload this task to each spec rapporteur. 3GPP could provide regular training courses for delegates that are candidates to become TS rapporteurs.
 | Drastic decrease in the workload for MCC officers, reduces the need to look for automated tools for merging CRs into specs. | Increase in workload for delegates. Need to ensure that all TS rapporteurs complete the task timely and respect all 3GPP drafting rules with proper and regular training. |  |
| 2 | **Scripting to automatically merge CRs** – ETSI is having a tool developed to automatically merge CRs into the specification. | Reduces human error and decreases the time to produce a merged specification. | It is unknown if such a script could be released to delegates and if it would comply with company security policies. For example, if macros are used, many would not be able to run them. |  |
| 3 | [New tool] **CR conformance checking** – write a new tool to check and report the location and nature of errors in a CR. These errors could include style errors, non-contiguous clause numbering, non-conforming figure and table numbering, and mismatches between the CR database and the CR cover page. | By using the tool pre-submission, delegates would not experience delays in submission and less time would be spent during meetings discussing styles and formatting. | It is difficult to write and maintain consistent tools based on docx due to high variability in docx file structures.Ensuring that styles didn’t change between versions and ensuring that the correct approved styles are used could be challenging and encounter corner cases. |  |
| 4 | [New tool] **CR auto-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.
* Style errors would be prevented
* The correct specification base text would be used
 | - 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. |  |
| 5 | CR cover auto-generation | The tool exists online at the time of reserving a TDoc for a CR. | The tool is only available for online use. |  |
| 6 | Restrict editingA screenshot of a computer program  AI-generated content may be incorrect. | The feature is available in current tool used for writing CRs and the specification. | This feature is not available in all docx editors. |  |
| 7 | **Training** – (1) correct use of styles | Easy to implement through reminder by Chairs or MCC with detailed guidance. It is possible for MCC to organize training sessions and to provide tutorial documents. | Some tools other than used for processing docx files may not allow delegates full control of the styles. |  |
| 8 | **Light version of Microsoft Word** - 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 Microsoft Word features should help reduce file sizes, ensure consistent use of styles and formatting, and may make automatic processing of compressed docs files easier. | Microsoft is not likely to create a custom version of Word for 3GPP. |  |
| 9 | **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.This solution relies on accountability by contributors for repeated errors, but this is disrespectful in a professional setting. So this solution is not feasible.[In principle all authors must use official templates and settings. In practice, no one enforces this] |  |
| 10 | **Exhaustive analysis of docx files against 21.801** | 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.  |  |
| 11 | **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.Requires code to be separate from CRs, essentially. This reduces CR specification cohesiveness. |  |
| 12 | **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, e.g., a tabular form of APIs and data structures and would need to devise a new way of capturing the additional information. |  |
| 13 | [New tool] **Automatic syntax checking** - Syntax checkingReference 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. | Many errors cannot be identified without checking across all content associated with the entire target specification, or across multiple specifications. |  |
| 14 | **Include the specification number and clause number in references** – When available, include enough information to find the information referenced. |  |  |  |
| 15 | **Use hyperlinks in references** – manual process | Reader could immediately navigate to a reference without having to search each document. | 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. |  |
| 16 | [New tool] **Script to create, validate, and automate verification of cross-references between 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. |  |
| 17 | **Store figure source files** - For editable figures, store at least the source file, named in accordance with the figure number, alongside the specification. | - 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 needs to be taken to ensure that the figure source file is updated.- Errors could occur in naming of the source files.- This disaggregation of content removes one benefit of the use of MS Word, namely that a single file contains all content in a simple way. |  |
| 18 | **Store images as vector graphics** | Scalable Vector Graphics (SVG) are scalable without distortion and are smaller in file size. |  |  |
| 19 | **Support a limited number of supported formats which work across WGs and platforms** | Limited changes to the current way of working. |  |  |
| 20 | **Provide comments on CRs in a separate file instead of using bubble 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. |  |
| 21 | **Use NWM to collect comments** | 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. |  |
| 22 | [New tool] **Extract text under review and use Git to manage reviews** | 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). |  |
| 23 | **Use FTP to download latest inputs and upload new inputs** | It is based on existing tools. | Simultaneous editing and updating is not possible nor traceable. Coordination is very difficult. |  |
| 24 | **Split the CR for review into multiple files** – this can include splitting the ASN.1 from a spec like 38.331 for review. | 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. |  |
| 25 | **Split large specifications into smaller parts** | Faster opening | Decreased locality of content, more difficult to maintain, read, etc. |  |
| 26 | **Open specification and change to 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. |  |
| 27 | **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, | - Cannot be used for producing CRs.Need to ensure that conversion does not lose any information.Requires additional storage on FTP server. |  |
| 28 | **Make all specs available in HTML** | 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. |  |
| 29 | **Mandate the numbering of requirements (PR and CPR) -** In some WGs, requirement numbering is done already. Maintenance of numbering is done the normal way - through careful alignment of provisions whenever they are introduced or corrected. | It is possible to refer to requirements without copying the text of the requirement. This reduces the risk of misalignment between specifications. |  |  |
| 30 | **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. |  |

## 4.3 Requirements Identification

Editor's note: corresponds to Objective 1c

### 4.3.1 General requirements

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| # | Requirement | Description | Applicable to objective 2 | Applicable to objective 3 |
| x | << Example: International availability >> | << Example: There shall be no geographic limitations on availability and usability of tools >> | <<Example: Y>> | <<Example:: Y>> |
|  |  |  |  |  |
|  |  |  |  |  |
|  |  |  |  |  |

### 4.3.2 Requirements related to specific identified shortcomings/pain-points in clause 4.2

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| # | Requirement | Description | Applicable to objective 2 | Applicable to objective 3 |
| 1 | Global availability | There shall be no geographic limitations on availability and usability of tools and formats. | Yes | Yes |
| 2 | Cost and licensing | Tools shall be available at reasonable cost. Ideally, the use of open source and free tools (under reasonable licensing terms) should be prioritized, if possible. | Yes | Yes |
| 3 | Security and Availability | Tools shall be secure i.e. robust to manipulation of source code and shall be systematically available (i.e. usable) to avoid 3GPP coming to a halt. | Yes | Yes |
| 4 | Cross platform | It shall be possible to view and edit the specifications, including figures, on all major computer platforms (not necessarily including mobile platforms).Ideally, online variants of these tools should be available (a.k.a. web-GUIs ). | Yes | Yes |
| 5 | Simplicity and learning curve | Tools shall be reasonably easy to use and should not cause significant change of the existing working procedures and/or drafting rules.  | Yes | Yes |
| 6 | Limited number of tools and formats. | Specifications shall only require a limited number of approved formats and recommended tools.  | Yes | Yes |
| 7 | One reference | It should be possible to produce representations of the specifications in various formats suitable for different situations.However, at the same time there shall be only one reference. The representation (i.e. reference output) should have consistent appearance to specifications of past generations. | Yes | Yes |
| 8 | Fast opening, navigating and editing | Specifications shall be fast (no longer than 30 seconds on a reasonably modern computer even for large and complex specifications) to open. Furthermore, there shall be no noticeable lag when searching, navigating or editing the specifications. The tool shall be stable (no crashes) and shall not require splitting large documents into multiple files.  | Yes | Yes |
| 9 | CR implementation | It shall be possible to quickly and easily (ideally automatically) implement a CR. This applies to both MCC and delegates (e.g. CR/TR rapporteurs).Furthermore, it should be possible to automatically detect CR conflicts (e.g. detect if multiple CRs propose changes to text in the same clauses, or the same text, or if a definition is changed for a term that is used in other CRs, etc). | Yes | Yes |
| 10 | CR Traceability | Specifications format and tools shall support an easy way for implementors to track introduction of a new feature and corrections to the existing ones. Tools used for handling CRs (submission, revisions, agreement, rejection, etc) should allow that all decisions be traceable along with the reasons for decision. | Yes | Yes |
| 11 | Feature Traceability | The tools shall allow to document features and capabilities in a format that can be automatically parsed. It should be possible (if feasible) to associate a feature with the relevant text in all specifications which are related to the feature.  | Yes | Yes |
| 12 | Cross-referencing functionality to track and point to exact section in the other specification | It shall be possible to cross reference multiple specifications including (sub-)clauses. Such cross referencing shall be easy to navigate.Note: For example, 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) which are critical for implementation of the test however difficult to maintain with manual effort. | Yes | Yes |
| 13 | Tracking of Editor’s notes  | It shall be possible to automatically track Editor’s Notes (EN) addition/removal/resolution, if ENs are used as an issue raising/resolving mechanism. | Yes | Yes |
| 14 | References to discussion papers | It shall be possible to reference discussion papers (for background information) in CR cover page (or its equivalent in the new tool/format).  | Yes | Yes |
| 15 | Automation | Specification format shall enable automation, e.g. to:* Ensure consistent use of styles
* Extract ASN.1 (if in the new format ASN.1 isn’t stored separately)
 | Yes | Yes |
| 16 | Specification browsing | It shall be possible to search and navigate within and across specs. It shall be possible to select the exact release and version of a TR or TS to access. | Yes | Yes |
| 17 | CR drafting during and in between meetings | It shall be possible to handle the process of drafting a CR involving a large number of contributors who provide a large number of comments and propose a large number of changes. CR handling needs to work for normal meetings, where only author can provide revisions, and before and after meetings for collaborative work between source companies preparing input documents.Note: the tool should improve upon the process used today. | Yes | Yes |
| 18 | Collaboration on CR drafting between companies | Sharing of draft CRs within and between the source companies for preparing input documents shall be possible. | Yes | Yes |
| 19 | Consistent access to CRs and specifications | The tools should allow 3GPP delegates to access CRs and specifications in a similar way as today during pre-meeting, post-meeting and online meeting. | Yes | Yes |
| 20 | Visual representation of changes | Tools shall allow visual representation of the changes in a CR and between the original spec and the revision. The author, i.e., at least the source company, of proposed changes should be visible.The effects or changes imposed by a CR should be easily readable and navigable such that all the changes can be viewed in the context of the clause affected.  | Yes | Yes |
| 21 | Supported styles | Tools shall support the following styles:* Headings – Heading 1, Heading 2, up to Heading 6
* Hyperlinks – Internal and external
* Lists (bulleted)
* Lists (hierarchical)
* Lists (numbered)NOTE: Lists can be indented to different levels, e.g. to allow sub-bullets)
* Tables (simple cell contents; allows different justification {left, center, right})
* Table (column header contents)
* Table of contents
* Text bolding (or equivalent highlighting)
* Text italicization (or equivalent highlighting)
* Text subscript
* Text superscript
* code (in the case code is not stored separately in its native format)
* symbols (non-alpha-numeric characters), non-breaking spaces and hyphens
* Notes
* Editor's Notes
* Table footers
* Table headers
* References
* Equations

Ideally, there should be a way to preclude usage of styles not listed above. In particular, complex tables shall be avoided.  | Yes | Yes |
| 22 | Supported objects | Tools shall support:* Figures (e.g. block diagrams, call flow diagrams, images)
* Equations (inline and block).
 | Yes | Yes |
| 23 | Seeing output while editing | The tool shall support the ability to view the content of (part of a specification) in the form in which it will be published (as a specification), including tables and diagrams while and after editing. | No | Yes |
| 24 | Offline work | The tool shall support the ability to read and edit specifications and CRs and to verify CRs offline, in particular to allow private editing before submission. | Yes | Yes |
| 25 | Meeting decisions and reports (meeting minutes) | Tools shall support tracking decisions of the following: CR, draft CR, pCR, TS, TR with Tdoc numbers in meeting reports.  | Yes | Yes |
| 26 | Public access to specifications and CRs | Tools shall allow easy access to CRs and Specifications to the larger community, including those who do not actively participate in 3GPP.The specifications shall be convertible to PDF for publishing. | Yes | Yes |
| 27 | Fault tolerance | Tools and working methods should have reasonable fault tolerance against minor human errors. Corner cases should be manageable. | Yes | No |
| 28 | Consistent appearance | New specifications (for 6G) need to have a consistent appearance and quality, similar to previous generations. | Yes | Yes |
| 29 | Supported style functions | A delegate, MCC rapporteur shall be able to highlight text, to draw attention to it, even though highlighting is not allowed in the drafting rules and cannot be in an approved CR.A delegate, MCC rapporteur shall be able to remove all formatting from text. A delegate, MCC rapporteur shall be able to view non-printing characters (non-breaking spaces, tabs, new lines, page breaks, etc.) if these are added to the content of the CR. | Yes | Yes |
| 30 | Comments | It shall be possible to associate a comment with specific provisions (e.g. a paragraph, single word, figure, etc.) of any CR. This comment includes comment text, the identity of the commenter and the time in which the comment was provided.It shall be possible to remove or 'disassociate' comments with text in a CR. | Yes | Yes |
| 31 | CR format | CRs using the new specification format for 6G should support visual emphasis of modified sections, be compatible with file formats acceptable for submission to 3GPP meetings, and allow for seamless transfer of the proposed changes into discussion papers as Text Proposals | Yes | Yes |
| 32 | CR cover pages  | The tool shall support CR cover page (or its equivalent in the new tool) checking (e.g. no dates in the future, CRs to specifications that don't exist, the other specs affected tick boxes are neither yes nor no, and so on). The tool shall also support automatic generation of CR cover pages (where possible).The tool shall also support reviewing, editing and commenting on CR cover pages during CR review process. | Yes | Yes |
| 33 | Code  | The tool and formats shall support code (e.g. ASN.1).If code is in the same document as the CR/TS, there should be a means to extract the code portions from the technical specification so that the code can be used as input to machine processing (e.g. an interpreter, compiler, etc.)Code that is part of a CR/TS should be able to be checked for syntax errors, and compile time errors.Code that is part of a CR should be able to be checked in combination with other code provided in the specification, to determine if there are redundancies, mismatches, etc. | Yes | Yes |
| 34 | Support review of figures | Every change to a figure shall result in a 'change marking' visible, indicating what changed and who made the change.NOTE: The granularity of the change marking is at least 'the figure has changed.' Greater granularity than that, e.g. highlighting changes in text in a figure, is considered Very Nice To Have. | Yes | Yes |
| 35 | Support consistent common configuration | It shall be possible to enforce simple and consistent configuration for users, so that errors arising while creating, editing and cut-n-pasting due to inconsistencies are rare or impossible. NOTE : This addresses the problem with current use of MS Word where the configuration of the tool is frequently inconsistent and hard to control, leading to poorer CR and specification quality. | Yes | Yes |
| 36 | CRs comprising multiple files | The tools shall support (if needed) CRs comprising multiple files in simple and consistent order (i.e. as separate documents stored in a mandatory way for the associated CR or specification.) | Yes | Yes |
| 37 | CR database | Changes to CR documents (including headers and content) shall be automatically captured in CR databases to ensure the correct correspondence between an approved and implemented CR and the CR database. | Yes | Yes |
| 38 | Support for gathering input on a CR | The tool shall support gathering input on a CR or its content for highly active topics involving many participants, without divergence in the process.Use of tools to collect comments and feedback shall enable orderly capture of responses, so that the order, source and input from each reviewer is captured without ambiguity or loss. This facility shall scale up to 100s of active reviewers posting 1000s of comments a day.NOTE: The comments and related information that are gathered can be removed or are not intrinsically part of the CR or specification. | Yes | Yes |
| 39 | Simplicity to follow drafting rules | The tool shall enable editors not to be concerned with styles, but rather with the technical content and its hierarchy in the document. | Yes | Yes |
| 40 | Support for visualization different parts of a document concurrently on the same screen | The tool shall enable visualizing different (incl. disjoint) parts of the same document concurrently on the same screen similar to Split View in MS Word. | Yes | Yes |
| 41 | Support for visualizing different documents concurrently on the same screen | The tool should enable visualizing different documents concurrently on the same screen. | Yes | Yes |
| 42 | Support for personal scripts | The tool should enable delegate, consumer, MCC/Rapporteur to develop and use their own scripts to manipulate a document locally or together with other documents (similar to MS Office Macros). | Yes | Yes |
| 43 | Language proofing | The format shall allow checking a document for errors in spelling, grammar, and punctuation, and ensuring it adheres to the rules of the English language. | Yes | Yes |

# 5 Proposals for new formats for 3GPP specifications

Editor's note: corresponds to objective 2.

## 5.X Proposal #X

### 5.X.1 Description

### 5.X.2 Evaluation against requirements of section 4.3

# 6 Proposals for Tools and Ways of Working

Editor's note: corresponds to objective 3.

## 6.X Proposal #X

### 6.X.1 Description

#### 6.X.1.1 Description of tools

#### 6.X.1.2 Description of procedures

### 6.X.2 Evaluation against requirements of section 4.3

# 7 Overall evaluation

Editor's note: Overall evaluation of combined proposals from sections 5 and 6, including trials.

# 8 Recommendations

Editor's note: Final recommendations

Annex A:
3GPP Stakeholder Survey on CR Tools

As part of the effort to develop tools ''New Working Methods'' during the years 2015-2022, a 3GPP stakeholder survey was performed in 2022 [3]. The goal of this survey was to provide clear input on requirements and expectations with respect to specification development with CRs. A summary of results of the survey are presented here.

NOTE: For those interested, the reference [3] includes also the data set used for the assessment summarized in the present document. There were also many interesting comments provided by responders to the survey which are omitted in this synopsis.

The interpretation of the survey is merely intended to be well-founded input to the present document.

The terms 'must have' or 'low priority' were used in the analysis of the survey. These terms are informative only.

# A.1 Methodology

3GPP stakeholders were surveyed, with input specifically solicited from delegates, implementers, secretaries, OP delegates, 3GPP leaders (working group and TSG chairs, vice chairs).

Table A.1-1: Survey Response

|  |  |  |
| --- | --- | --- |
| Category | Responses | % of total |
| Delegate | 556 | 91.3 |
| Rapporteur of Specification Editor | 144 | 23.7 |
| Leader (Chair, Vice Chair) | 17 | 2.8 |
| Secretary or MCC | 7 | 1.2 |
| OP transposer | 2 | 0.3 |
| Moderator / Feature Leads | 58 | 9.5 |
| Engineer (who implements specifications in products or services) | 39 | 6.4 |
| Other (please specify) | 17 | 2.8 |

The categories were not exclusive. A single responder could check both 'Delegate' and 'Rapporteur' for example. The categories were useful to select for specific evaluation for analysis and comparison.

All questions were of the form "I need…" and could be answered with results shown below. Only results that were not 'non-applicable' were counted.

0 [non-applicable];

1 [Not useful, **don't do this**];

2 [I don't need this, others might];

3 [Useful, would be helpful];

4 [I need this from time to time];

5 [I need this very often, a **'must have'**]

In order to assess the results for each question, the following was used to categorize the results:

Table A.1-2: Survey Response Interpretation

|  |  |  |  |
| --- | --- | --- | --- |
| Interpretation | Positive Responses (3, 4 or 5) | Must have % rating "5" | µ and σ  |
| Must Have | > 0.82 | > 45% responses | µ + σ > 5.25 |
| High Priority | 0.75 > x > 0.82 | 40 – 45% responses | µ + σ > 4.8 |
| Medium Priority |  |  |  |
| Low priority | < 65% | < 30% responses | µ - σ < 2 |
| Strong indication of low priority | < 55% | < 20% responses | µ + σ < 1.5 |

The range of experience of responders varied, less than 3 years (newcomers) 20.5%, 3-6 years (since 5G) 24.8%, 7-14 years (since 4G) 29.6%, >14 years (since 3G) 25.1%

# A.2 Major Findings

In the tables below, the needs are listed in their relative levels of needs. The survey question numbers (in the # column) remain so these items can be references in the rest of the TR. Please refer to the survey report [3].

Table A.2-1: Must have needs

|  |  |  |
| --- | --- | --- |
| # | Topic | Need |
| 3.1 | General | I need to review, edit and otherwise access CRs off-line, that is, with no access to the Internet. |
| 3.5 | General | I rely on 'recovery features' so that I do not lose work if there is an interruption or failure of some kind (computer, software, network, etc.) while editing or creating CRs. |
| 3.6 | General | I rely on tools to indicate incorrect spelling in documents I edit or compose. |
| 3.8 | General | I use 'advanced search' capabilities for search and replace (match case, find whole words, use wildcards, search 'up' vs. 'down', etc.) |
| 3.9 | General | I rely on 'what you see is what you get' presentation of content on pages as I edit or create content in CRs. |
| 3.14 | General | I need to be able to use the tool to open multiple windows (or to split windows) to different parts of the same document. |
| 3.16 | General | I need the tool to capture every change made in a CR such that the change identifies who made the change and when it was made (similar to Microsoft Word Revision Marks). |
| 3.14 | General | I need to be able to use the tool to open multiple windows (or to split windows) to different parts of the same document. |
| 3.18 | General | I need the tool to capture every change made in a CR such that the change identifies who made the change and when it was made (similar to Microsoft Word Revision Marks). |
| 3.19 | General | I need to be able to add comments to any content in a CR including text, figures, header fields, etc. These comments need to capture my name and the time they were made. |
| 3.20 | General | I need to be able to delete comments from CRs. |
| 3.21 | General | I need to be able to respond to comments so that the response is kept in the context of the comment. |
| 3.22 | General | I need to be able to see comments and responses to comments, so that I see who provided the comment and when. |
| 3.24 | General | I need the tool to enable me to reject any change. [NOTE 1] |
| 8.1 | Tables | I need to adjust the column and row widths, as the automatic width and height settings are insufficient. |
| 8.5 | Tables | I merge cells. |
| 8.6 | Tables | I split cells. |
| 8.7 | Tables | I adjust cell alignment (e.g. upper left, centered, lower right, etc.). |
| 10.1 | Text | I need to identify the appropriate clause number when inserting a new clause into a specification under change control. |
| 10.2 | Text | I highlight text. |
| 10.3 | Text | I enter or modify subscripts and superscripts in text. |
| 10.4 | Text | I insert symbols (non-alphanumeric characters). |
| 10.9 | Text | I create and modify multi-level bulleted lists in CRs. |
| 13.1 | Equations | I need to have a 'what you see is what you get' style of equation editor, such as the Open Math ML editor. |
| 17.3 | Code | I need code to be displayed in a form optimized for readability of the given language, e.g. appropriate indentations, colors, etc.) |
| 17.6 | Code | I need the tool to identify every character that is proposed to be changed by a CR (similar to word revision marks) rather than just identifying entire lines that are proposed to be changed. |
| 23.1 | CR check | I need to check the CR specification information (is the specification number correct, the latest version used for the corresponding release, the CR number correct (assigned to this CR) and that the work item code (WIC) exists in the release corresponding to this CR (or allowed for a mirror CR.) |
| 23.4 | CR check | I need to check whether the source, reason for change, summary of change and consequences if not approved sections are filled in. I need to identify multiple sources and authors in the source field. |
| 23.5 | CR check | I need to check whether the category is filled in and is an allowed value. |
| 23.6 | CR check | I need to check whether the CR header is 'clean' (no revision marks or comments) since these are not allowed in the revision of CRs that can be agreed in WG or approved in TSG. |
| 23.7 | CR check | I need to check whether the sections affected field is filled in and that this corresponds exactly to the sections included in the set of changes that the CR contains. |
| 23.8 | CR check | I need to check whether the 'Other specs affected' tick boxes are checked, and if they are, that they correspond to existing specifications. |
| 23.9 | CR check | I need to check that the CR revision number is correct. |
| 23.11 | CR check | I need to check that a CR is based on the most recent version of the specification, for the specification and release targeted by the CR. |
| 27.1 | CR impl. | I need to be able to identify a set of CRs and a source specification to which the changes will be applied. As a result I need to produce two versions of the target specification - one 'clean' and the other 'revision marked.' |
| NOTE 1: 'Accepting changes' to the source specification in a CR is not allowed since a CR must show all changes to the unmodified specification text. The only way to accept changes in a CR is for TSG to approve the CR and the change to be implemented to create a new version of a specification. |

Table A.2-2: High priority needs

|  |  |  |
| --- | --- | --- |
| # | Topic | Need |
| 3.13 | General | My company / organization needs to create, modify and otherwise develop CRs (and specifications) autonomously, so that the data is only stored and accessible by my company / organization. |
| 3.23 | General | I need to be able to search for comments from specific authors (see all comments by a particular commenter.) |
| 5.1 | Figures | I adjust the formatting of images (png, jpg, etc.) in CRs (e.g. size, centering). |
| 5.3 | Figures | I create editable figures within the tool (using figure drawing mechanisms to drop elements, resize, type text, etc.) |
| 5.4 | Figures | I create (and edit) editable figures externally from the tool and import or paste them in. |
| 8.4 | Tables | I adjust the indentation of cells (above, below, left, right) surrounding the text content of the cells. |
| 8.8 | Tables | I adjust text direction (e.g. to write vertically instead of horizontally.) |
| 8.9 | Tables | I shade rows or columns (e.g. with light gray). |
| 8.10 | Tables | I need to add equations to cells in tables. |
| 8.12 | Tables | I need to add figures to cells in tables. |
| 10.5 | Text | I insert non-printing characters (e.g. non-breaking spaces) in text. |
| 10.6 | Text | I remove all formatting of text. |
| 10.7 | Text | I view non-printing characters (including non-breaking spaces, carriage return, tabs, etc.) |
| 13.3 | Equations | I need the tool to capture every change made in an equation such that the change identifies who made the change and when it was made. [NOTE 1] |
| 17.1 | Code | I need code to be embedded within the same document as the rest of the Technical Specification to which the code is associated. Note: this question asks how important it is, in your opinion, that code is embedded in the specification itself rather than provided some other way, e.g. by reference or as a component in the CR or specification 'zip file', etc. |
| 20.1 | MSC | I need MSC to be embedded within the same document as the rest of the Technical Specification to which the code is associated. [NOTE 2] |
| 20.2 | MSC | I need the machine-readable format of MSCs to be stored in a CR or specification such that it can be modified by others. |
| 23.2 | CR check | I need to check that the CR title does not change after it is assigned. |
| 23.3 | CR check | I need to check whether the date is in the proper format. |
| 25.1 | CR check | I need to check CRs for compliance to TR 21.801 drafting rules, e.g. use of styles, non-breaking spaces, avoiding use of tabs, avoiding 'hanging paragraphs,' etc. |
| 25.2 | CR check | I need to check that CRs use the latest CR Form (template). |
| 25.4 | CR check | I need to identify all abbreviations in a CR that are neither defined in the specification, nor in TR 21.905, nor in the cited 3GPP specifications in the reference section. |
| 25.7 | CR check | I need to check whether a set of CRs clash with each other where the CRs target the same version of the same release of a specification. Note: A CR clash is when more than one CR proposes changes to the same text. |
| 25.8 | CR check | I need to check if a CR includes all changes compared with the previous specification version and against a previous rev of the same CR. Note: This could happen if a change were made without 'track changes' being activated. This question also asks whether it is difficult to identify 'new' changes if all changes are marked the same way. |
| 27.2 | CR impl. | I need to check if there are clashes between the set of CRs applied to the same source specification. If this is the case I need to create a list of all the clashes to resolve in order to create a new version of the specification correctly. |
| 27.3 | CR impl. | I need to determine if there are any 'warnings' or 'errors' present in all the input CRs. If so, I need to list all these warnings and errors. The errors must all be corrected in order to create a new version of the specification correctly. |
| NOTE 1: This requirement would go beyond Revision Marks in Microsoft Word that merely show that an equation has changed and not what in a figure has changed.NOTE 2: This question asks how important it is, in your opinion, that code is embedded in the specification itself as it is (as MSC) as opposed to using an external tool to generate a figure (e.g. PNG file) and including that in the specification. |

Table A.2-3: Medium priority (missing some 'high priority' criteria)

|  |  |  |
| --- | --- | --- |
| # | Topic | Need |
| 3.4 | General | I need a tool that allows importing of documents and content created in Microsoft Word. [NOTE 1] |
| 3.10 | General | I need a way to compare two user-specified versions of the same specification, (e.g. TS 38.331 v17.2.0 vs v17.0.0) to identify the differences. I also need to be able to filter this 'difference' presentation, so that I can select a specific Work Item Code, (e.g. only show changes due to NR\_MBS-Core). [NOTE 1] |
| 3.12 | General | I rely on keyboard shortcuts for efficiency (beyond cut/copy/paste/undo). [NOTE 2] |
| 3.17 | General | I need for the tool to enforce the marking of any change in a CR compared to the latest version of the targeted release of the source specification. [NOTE 2][NOTE 3] |
| 5.5 | Figures | I create and import non-editable images (png, jpg, etc.) instead of editable figures when I cannot create the figure I require. |
| 5.6 | Figures | I need images that are not editable in the tool to be stored as an editable source file in the CR or specification so that the image can be modified by others. |
| 5.7 | Figures | I need the tool to capture every change made in a figure such that the change identifies who made the change and when it was made. |
| 8.2 | Tables | I need to apply formatting to tables beyond those provided in 21.801 styles, and beyond basic text formatting (e.g. bold). Examples of 'going beyond 21.801' are shading of rows. |
| 8.11 | Figures | I need to add figures to cells in tables. |
| 10.8 | Text | I adjust paragraph attributes that are not in the 3GPP template (e.g. alignment, indentation, spacing before and after lines.) [NOTE 2] |
| 13.2 | Equations | I need to have a mark-up language based editor for equations, such as latex. |
| 17.2 | Code | If embedded within the same document as the rest of the technical specification, I need the tool to provide automatic extraction of the code portions in the technical specification. [NOTE 2] |
| 17.4 | Code | I need the tool used for creating and editing code to perform syntax checking. [NOTE 2] |
| 17.5 | Code | I need the tool used for creating and editing code to perform compilation checking of the code. [NOTE 2] |
| 17.7 | Code | I need the tool to identify conflicts (i.e. that would result in syntax or compilation errors) with code in other CRs and the specification that the CR targets. [NOTE 2] |
| 23.10 | CR check | I need to warn me if there are no 'change affects' tick boxes ticked as this is a 'warning': though in some special cases this is intended, lack of tick boxes ticked is generally an error. [NOTE 2] |
| 23.12 | CR check | I need the tool to help create mirror CRs, especially so that the header page is set up properly. [NOTE 2] |
| 25.3 | CR check | I need to check references: does each reference added have text in the specification that refers to it? Do all references added to specification text have corresponding references? [NOTE 2] |
| 25.6 | CR check | I need to search change marked documents for all changes by a specific source 'individual member' (associated with the marked revision.) [NOTE 2] |
| 27.4 | CR impl. | I need to be able to use the CR and specification tool to apply pseudo-CRs as changes to a source specification. [NOTE 4] |
| 27.5 | CR impl. | I need to create a next version of the target specification with as much assistance from automated implementation as possible. [NOTE 5] |
| 27.6 | CR impl. | I need to create an interim version of the target specification that reflects the specification status after the first of more than one working group meeting in a single quarter. [NOTE 6] |
| NOTE 1: Though many were positive about this, there was a high σ, resulting in a strong trailing edge. Skepticism?NOTE 2: There was a large variation in responses.NOTE 3: This is not true today. Change marking is manually controlled by the user. It is thus possible to improperly create an incorrect CR with changes that are not marked.NOTE 4: pseudo-CRs are currently informally structured documents. Please take into account in answering this question that in order to support implementation of pseudo-CRs in a tool, it may be necessary that pseudo-CRs documents become more formal in their structure. For example, it may be necessary to define and fill in a pseudo-CR header page.NOTE 5: This was a 'must have' when rapporteurs and secretariats are selected as the responding group. In general responses, only 72% responded positively. The criteria for unambiguous 'high priority' is 75% or higher response of 3, 4 or 5.NOTE 6: Though interim versions of specifications have no official status since CRs are only sent to TSG for approval at the end of a quarter, some delegates may benefit from the ability to view the cumulative result of all agreed CRs (and even postponed CRs) to a given specification. |

In all rows of Table A.2-3, there was less than 40% 'must have' responses.

Table A.2-4: Low and very low priority

|  |  |  |
| --- | --- | --- |
| # | Topic | Need |
| 3.2 | General | I need a tool which does not require any additional software to be installed on my PC beyond those tools used today. |
| 3.3 | General | I use in-company or other non-3GPP tools which require access to the CR database and/or the full set of CR files. |
| 3.7 | General | I use different layouts of CRs while I work on them, including print layout and 'web' layout (without pages or fixed width). |
| 3.11 | General | I rely on help facilities. |
| 3.15 | General | I need to collect all source files together with the CR, for example, the source file used to create a figure, equation, etc. Note that even though it is not required today in all 3GPP groups to collect all source files for figures, equations, etc. with the CR, in future this could become a requirement. |
| 5.2 | Figures | I embellish the presentation of images in CRs (e.g. adding a border, drop shadow, other 'effects.') |
| 25.5 | CR check | I need to search change marked documents for all changes after a given date, e.g. after CEST yesterday. |

# A.3 Specific Requirements for Rapporteurs and Secretaries

In a follow up study, Q25 and Q27 were reviewed specifically in the responses of secretaries and rapporteurs.

Q25: Do you have any other needs with respect to filling in or checking the header sheets of CRs?

Q27: Do you have any other needs with respect to checking the correctness of CRs?

Table A.3-1: Must Have for Rapporteurs and Secretaries

|  |  |  |
| --- | --- | --- |
| # | Topic | Need |
| 25.1 | CR check | I need to check CRs for compliance to TR 21.801 drafting rules, e.g. use of styles, non-breaking spaces, avoiding use of tabs, avoiding 'hanging paragraphs,' etc. |
| 25.2 | CR check | I need to check that CRs use the latest CR Form (template). |
| 25.3 | CR check | I need to check references: does each reference added have text in the specification that refers to it? Do all references added to specification text have corresponding references? |
| 25.7 | CR check | I need to check whether a set of CRs clash with each other where the CRs target the same version of the same release of a specification. Note: A CR clash is when more than one CR proposes changes to the same text. |
| 25.8 | CR check | I need to check if a CR includes all changes compared with the previous specification version and against a previous rev of the same CR. [NOTE 1] |
| 27.1 | CR impl. | I need to be able to identify a set of CRs and a source specification to which the changes will be applied. As a result I need to produce two versions of the target specification - one 'clean' and the other 'revision marked.' |
| 27.2 | CR check | I need to check if there are clashes between the set of CRs applied to the same source specification. If this is the case, I need to create a list of all the clashes to resolve in order to create a new version of the specification correctly. |
| 27.3 | CR check | I need to determine if there are any 'warnings' or 'errors' present in all the input CRs. If so, I need to list all these warnings and errors. The errors must all be corrected in order to create a new version of the specification correctly. |
| 27.5 | CR impl. | I need to create a next version of the target specification with as much assistance from automated implementation as possible.  |
| NOTE 1: This could happen if a change were made without 'track changes' being activated. This question also asks whether it is difficult to identify 'new' changes if all changes are marked the same way. |

Interestingly, secretaries agreed that the following is very important, but some rapporteurs disagreed:

25.4 I need to identify all abbreviations in a CR that are neither defined in the specification, nor in 21.905, nor in the cited 3GPP specifications in the reference section.

Some secretaries found this useful, but most found the feature unimportant:

25.5 I need to search change marked documents for all changes after a given date, e.g. after CEST yesterday.

While most rapporteurs agreed this was important, there was disagreement with secretaries. One even commented: "don't do this!"

27.6 I need to create an interim version of the target specification that reflects the specification status after the first of more than one working group meeting in a single quarter.

NOTE 1: Though interim versions of specifications have no official status since CRs are only sent to TSG for approval at the end of a quarter, some delegates may benefit from the ability to view the cumulative result of all agreed CRs (and even postponed CRs) to a given specification

While some rapporteurs found this important, there is disagreement. Secretaries do not see this as important.

27.4 I need to be able to use the CR and specification tool to apply pseudo-CRs as changes to a source specification.

NOTE 2: Pseudo-CRs (pCRs) are currently informally structured documents. Please take into account in answering this question that in order support implementation of pseudo-CRs in a tool, it may be necessary that pseudo-CRs documents become more formal in their structure. For example, it may be necessary to define and fill in a pseudo-CR header page.

This topic could have been underdeveloped in the survey. It seems very strange that one would automate CR quality improvement and implementation, but not support pCRs. During the early phase of development of specifications, pCRs are used to incorporate most of the content that will remain forever, before change control begins.

Annex B:
Survey of specification formats, tools, and CR processes in use by 3GPP WGs in 2025

In 2025, 3GPP WGs are using Word for writing specifications and for working on CRs/pCRs in meetings. Additional tools (e.g. Visio, MSC generator, PlantUML) are used for crafting objects that are then embedded in Word. For some WGs, such as RAN1 and RAN2, specifications are published only using Word with embedded objects. In order to address specific needs of certain WGs, some WGs use additional file formats for writing annexes or attachments to the specifications (e.g. YAML file/codec codes).

Table B.1 below summarizes the various tools in use as of 2025 in 3GPP WGs. When only Word is mentioned, it is implied that built-in tools for handling equations, tables, and for drawing figures are also commonly being used. The table indicates when parts of the specifications are also stored on 3GPP Forge (https://forge.3gpp.org), while when not indicated the storage of the specifications is only on 3gpp.org/ftp/Specs also accessible via the 3GPP portal 3GU (https://portal.3gpp.org/).

Table B.1 – Survey of formats and tools in use as of 2025 by 3GPP WGs for specifications and CRs

|  |  |  |
| --- | --- | --- |
|  | **Specification formats/tools** | **Formats/tools/processes used for CRs** |
| CT1 | Word (Visio and MSC-GEN for figures). XML files are included as annex in the Word file of a TS. OpenAPI files are included as .yaml files (Notepad++) in the ZIP file of a TS, and the OpenAPI text is also copied into the Word doc of that TS in annexes. A YAML file is also stored as a fixed branch in Git on 3GPP Forge. These 3 versions must be identical.3GPP Forge for OpenAPI YAML files: OpenAPI descriptions are extracted from the annex of the 3GPP Technical Specifications and made available as stand-alone YAML files, identified by a file name composed of the API name prefixed by the TS number of the specification containing the OpenAPI description. All these files are then stored in a common repository managed by Gitlab on the 3GPP Forge for testing.YAML text parser (Notepad++) to generate YAML file (note that new swagger version does not support saving of YAML file and cross checking).OpenAPI YAML syntax checker (Swagger tool)XML syntax checker/validator.CDDL and JSON syntax checker/validator. | Word + Visioregex101: used to build, test, and debug regex, to check regular expressions online.CRs are submitted in 3GU, stored on 3gpp.org/ftp, and after the meeting agreed CRs are tested using Git in 3GPP forge:1. A company submits a CR for an OpenAPI using Word in 3GU, showing track changes to the YAML text copied from the Word annex of a TS with OpenAPI2. CT1 discusses CRs for that OpenAPI during the meeting. The CRs agreed during the CT1 meeting don’t include a separate .yaml file but just a Word file.3. After the CT1 meeting, the TS rapporteur merges all agreed CRs for that OpenAPI into a .yaml file (using NotePad++), as part of drafting the TS update.4. The TS rapporteur checks for syntax errors in Swagger, and provides the checked .yaml file to 3GPP Forge and on FTP draft folder (and also use Github e.g. to detect issues with APIs referring to each other). If CR implementation errors are found the TS Rapporteur proposes a correction and asks Source companies if they agree and asks for a revision to next meeting/plenary.5. Delegates review the comments from rapporteur, .yaml files and draft TS for correctness and provide feedback on the email reflector.6. For CRs which are agreed by CT1 and need a correction, the source companies provide a company revision to next plenary with an indication corrected due to errors found during pre-implementation and checking. 7. Once the CRs (including Word docs and .yaml files) are approved in plenary, TS rapporteur provide final version of TS and .yaml files. MCC is doing a final check (e.g. running their Macros) and TS is uploaded to ftp/Specs and the Git branch is fixed and cannot be updated anymore by delegates/rapporteurs. MCC is creating a new draft branch for next plenary for testing.Similar is valid for correcting or changing a specification’s text, with the difference that Git is not used for text other than .yaml files. |
| CT3 | See CT1 | See CT1 |
| CT4 | See CT1 | See CT1In deviation to CT1-Step1 as described above, forge is already used when drafting a CR. The author shall check and correct errors early, list the impacted API.In CT4, the use of the field function provided by Word and foreseen in the template is forbidden. |
| CT6 | Word (Visio for figures) | Word + VisioCRs are submitted in 3GU, stored on 3gpp.org/ftp |
| RAN1 | Word, Excel (in some cases for TRs)Excel (included as attachment in a single zip file for some TRs). The formula tool built in Excel is used for calculating e.g. link budgets. | WordCRs are submitted in 3GU, stored on 3gpp.org/ftpIn RAN1 (and some other RAN WGs such as RAN2), TS rapporteurs are tasked at certain stages with providing a CR for their responsible TS which merges together all or many of the changes agreed during a RAN1 meeting relating to a given release, and these editor’s CRs are reviewed by delegates before submission to RAN plenary. TS rapporteurs are not tasked with providing a draft TS merging all approved CRs for their TS. This is done by the MCC officer (RAN1 secretary) after RAN plenary for all TSs under RAN1 responsibility. Draft TSs are provided for review by delegates after which the new version of the TSs is published. |
| RAN2 | Word (Visio and MSC-GEN for figures)ASN.1 syntax checker (not included in spec) | Word (Visio and MSC-GEN for figures)CRs are submitted in 3GU, stored on 3gpp.org/ftp |
| RAN3 | Word (Visio and MSC-GEN for figures)ASN.1 syntax checker (not included in spec) | Word (Visio and MSC-GEN for figures)CRs are submitted in 3GU, stored on 3gpp.org/ftp |
| RAN4 | Word, Excel (in some cases)At least one TR (37.941) includes multiple Excel spreadsheets in separate files in the same zip file | Word, VisioCRs are submitted in 3GU, stored on 3gpp.org/ftpRAN4 use separate tool for the CA/DC band combinations requests (Excel so far; database under construction) |
| RAN5 | Word, Excel, VisioExcel and Visio (included as attachment in a single zip file, and implemented as part of TR 38.903/38.905). The formula tool built-in Excel is used for calculating e.g. uncertainty values.Machine processable files specified in TTCN-3 language (.ttcn) are provided as attachments in the zip file of a TS, and are not embedded in the Word doc of a TS. Several TTCN-3 compilers are used for syntax checking the TTCN-3 files. | WordCRs are submitted in 3GU, stored on 3gpp.org/ftp |
| SA1 | Word | WordCRs are submitted in 3GU, stored on 3gpp.org/ftp |
| SA2 | Word, Visio | Word, VisioCRs are submitted in 3GU, stored on 3gpp.org/ftp |
| SA3 | WordMachine deliverable parts (.asn, .xsd) are provided as attachments in the zip file of a TS, and are not embedded in the Word doc of a TS. | WordCRs are submitted in 3GU, stored on 3gpp.org/ftpSA3-LI SWG:* Word + Visio
* 3GPP Forge for ASN.1, following these instructions: <https://forge.3gpp.org/rep/sa3/li/-/wikis/How-To/Create-a-CR>

A summary of the process used with 3GPP Forge by SA3-LI is provided below:Changes to 3GPP specifications still have to go through the 3GPP change control procedure, even if the changes are held on the Forge. A CR can refer to the Forge for any changes to the machine deliverable parts, rather than writing them out in a change-marked Word document.SA3LI puts each CR and each plenary meeting in its own branch. A CR entered as a branch in 3GPP Forge requires to first obtain a CR number from the 3GPP Portal, and to finally be submitted to a WG meeting with a proper CR form. A CR branch follows the branching convention and a name of the form cr/{deliverable/{CR number}, and it is placed in the branch for the plenary meeting that might eventually approve the CR. Revisions of a CR are possible during a WG meeting, and the corresponding commits must be updated along with increasing the CR revision.One CR branch can include one or more commits, each with a commit hash, which is a unique and durable identifier of the changes in the Forge. This hash (or the URL associated with the commit hash) is to be copied in the "Comments" section of the CR, along with the merge request number.* 3GPP Forge for storing Visio diagrams and their revisions, following these instructions: <https://forge.3gpp.org/rep/sa3/li_diagrams>

Visio diagrams are embedded in the specification Word file. 3GPP Forge is used only as a repository for Visio diagrams that can be downloaded for editing. There is no preview for this type of file within 3GPP Forge. A naming convention is defined allowing for referencing each Visio diagram to its specification and specification release and version. |
| SA4 | Word (Visio and MSC-GEN for figures)3GPP Forge for stage 3 openAPI (YAML file/codec codes maintenance) - cf further details as described for CT1 | WordCRs are submitted in 3GU, stored on 3gpp.org/ftp |
| SA5 | Word (PlantUML for figures)3GPP Forge for stage 3 openAPI - cf further details as described for CT1 | Word (PlantUML for figures)CRs are submitted in 3GU, stored on 3gpp.org/ftp3GPP Forge for stage 3 openAPI, XSD, andYANG data models. SA5 YANG data models and APIs are validated by an automated pipeline that runs for every push or merge-request event. This pipeline is composed of two stages, validation and generation. Generation stage runs an automated Word CR text generation for the corresponding merge-request.The generated Word CR text is a changed marked word document that includes all changes made by the associated merge-request. Each modified file (YANG model, OpenApi or XSD) will be included as a change in the Word CR text. This can be included in the Word Change Request document. The Word CR text can be downloaded from the merge-request webpage or the pipeline-page as described above for the detailed log output files. |
| SA6 | Word | WordCRs are submitted in 3GU, stored on 3gpp.org/ftp |

In addition, MCC provides a number of file templates that are to be used by delegates when drafting CRs, specifications and other document types that are prepared in Word format. These templates are regularly updated and available in meeting-specific folders such as <https://www.3gpp.org/ftp/tsg_ran/TSG_RAN/TSGR_108/Templates>. Some templates are also available at <https://www.3gpp.org/ftp/Information/All_Templates>.

MCC also provides a number of tools (Macros) to help with using 3GPP Styles, available at the same link as above. "Unofficial" macros are also used by some groups for specific purposes e.g. ASN.1 review in RAN2

For specific purposes, such as for the collection of evaluation results in an excel worksheet, other templates may be provided by the rapporteur in the course of a study or work item.

Annex C:
Change history

|  |
| --- |
| Change history |
| Date | Meeting | TDoc | CR | Rev | Cat | Subject/Comment | New version |
| 2025-07 | 6GSM#01 | 6GSM-250008 |  |  |  | Endorsed TR Skeleton | 0.0.0 |
| 2025-08 |  |  |  |  |  | Inclusion of endorsed pCRs 6GSM-250041, 6GSM-250045, 6GSM-250046, 6GSM-250048, 6GSM-250050 | 0.0.1 |