# 6G Specification Modernization

Matthew Baker
Jerediah Fevold

(with Mattias Bergstrom & Lian Araujo, Ericsson)

NOKIA

# Introduction: 3GPP specifications today

Little change for 4 generations over 30 years:

## Strengths

- WYSIWYG editing
- Change tracking

## Limitations

- Stability and latency
- Inconsistent use of styles
- Inconsistent file formatting
- Large file size

## Presenting challenges for

- CR implementation
- Automation


Some further background is given in RP-250108 and RP-250422.

# **Automation-native** 6G specifications

A once-in-a-decade opportunity for a clean start

## A new vision

## Imagine:

- A single body of spec info, with linking and searching enabled throughout
- Automatic, error-free, instantaneous CR implementation
- New spec versions instantly available after each 3GPP Plenary
- Support for automated processing with consistent formatting full version control

- Git for version control
- Markdown for text foundation
- Appropriate tools per genre (JSON, MSCGen, etc)
- AI for data extraction and processing

# Solution

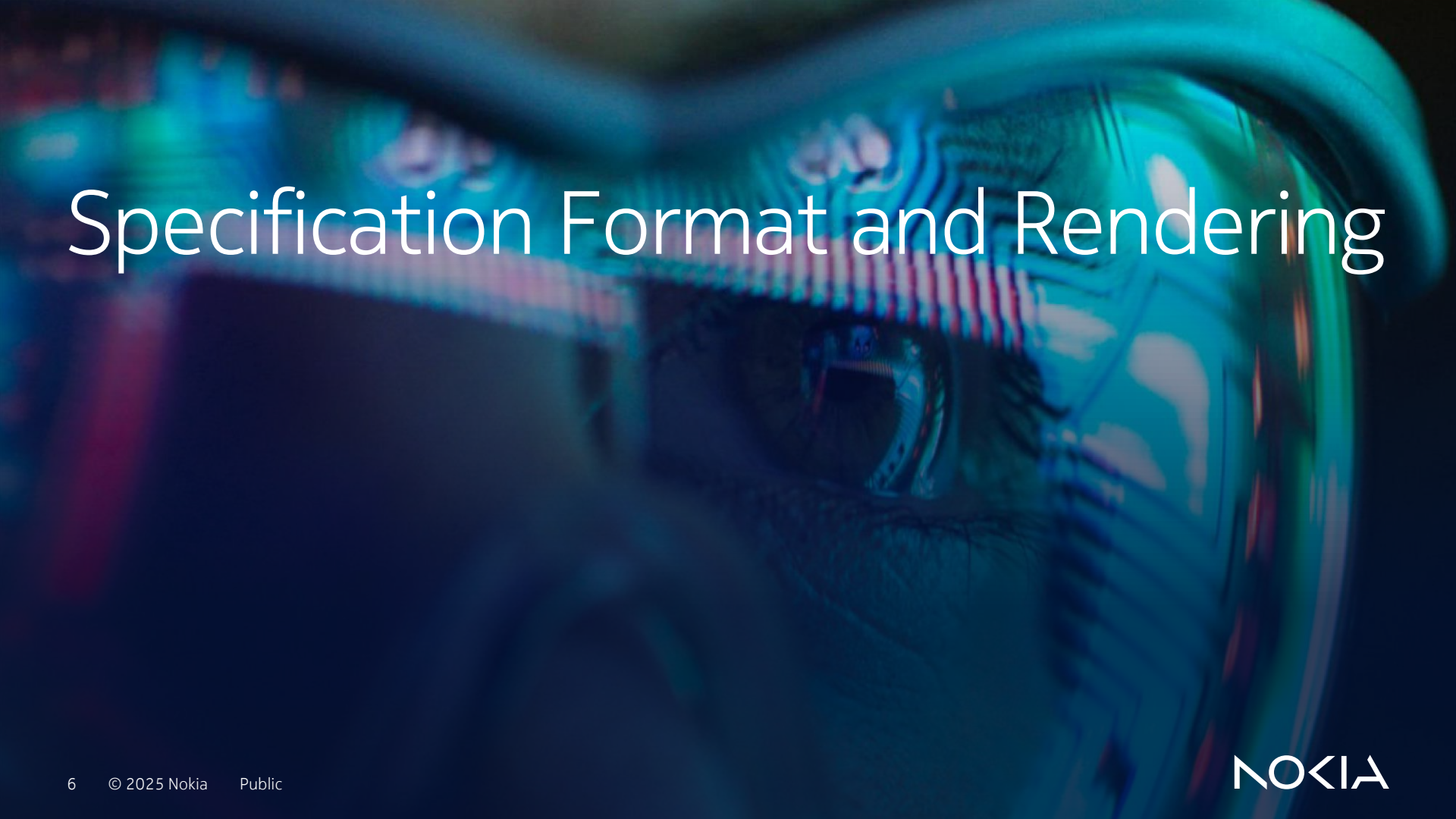
- The solution we suggest is to **write our 6G specifications in Markdown** instead of Microsoft Word.
  - TDocs, email discussions, and Liaison Statements (LSes) could still be written in **Microsoft Word**.
  - The descriptive portions of CRs could be available in Word, and changes would be applied to the spec in Markdown.
- **Enable the use of all currently used specification "objects"** such as signaling diagrams, ASN.1 source, equations, figures and tables.
- Use the **Git version control system** to propose and merge changes into the specification.
- The **technical aspects of the specification become more focused**, while formatting is less of a concern.

# Why Markdown?
## Rationale

**Markdown is the Wikipedia Format**

- **Long history and large userbase –** Created in 2004;  already used for oneM2M specifications.
- **Simpler File Format**
  - Markdown is as a simple plaintext format, which is a format which is human-readable in its raw form.
  - Markdown lacks support for some features of our specs, so additional scripts have been written to support those.
  - Text formatting is left to post-processing, limiting the scope of possible formatting errors, e.g., styles in Word.
  - Styles are implemented using Cascading Style Sheets (CSS) used in styling HTML pages, e.g., websites.
- **Version Control Native**
  - To support version control, a plain-text format is required.
  - Version control systems track the changes between versions of the same file, so changes must be somewhat localized and cannot have side effects throughout the document as in Microsoft Word files.
  - Further details on Git will be provided in the complementary session.
- **Exportable**
  - Markdown is convertible to HTML, which can be further converted to PDF.

# Specification Format and Rendering



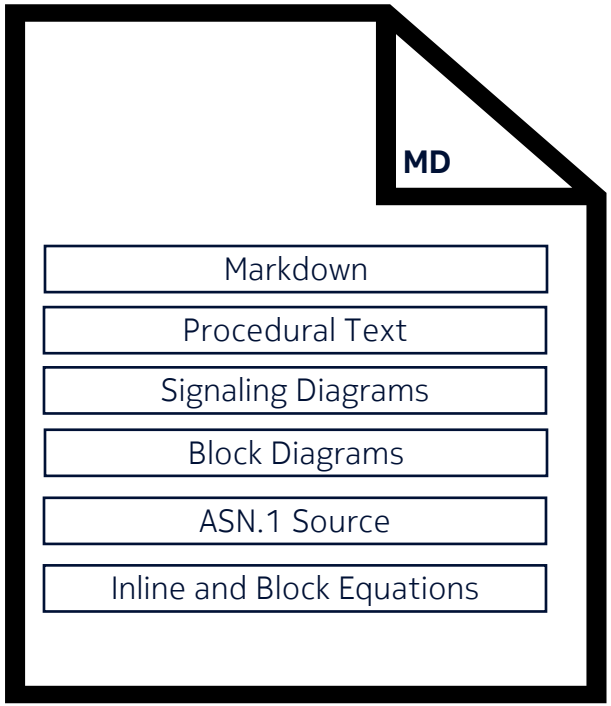
# Markdown

## Features

- Markdown supports the following basic elements
  - Equations (in Latex format)
  - Headings (e.g., H1, H2, H3, etc.)
  - Images
  - Links (internal, e.g., headings, or external)
  - Ordered Lists (e.g., 1., 2.,)
  - Tables (e.g., pipe tables)
  - Text Decoration (e.g., bold, italic)
  - Unordered Lists (e.g., * or -)

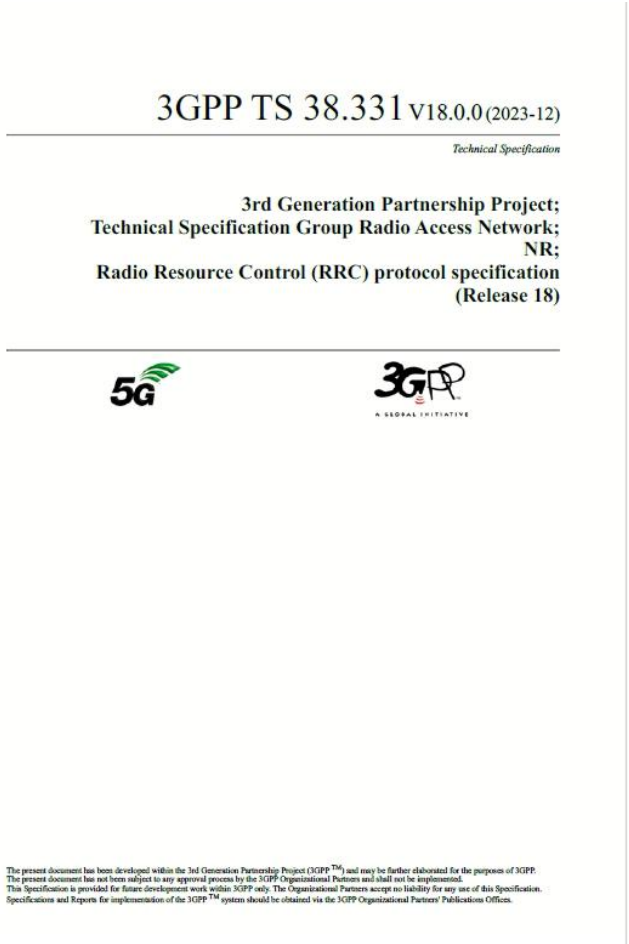
# Markdown Processing

## Conversion to HTML and PDF




**“One Click”**

**PDF**



3GPP TS 38.331 V18.0.0 (2023-12)

*Technical Specification*

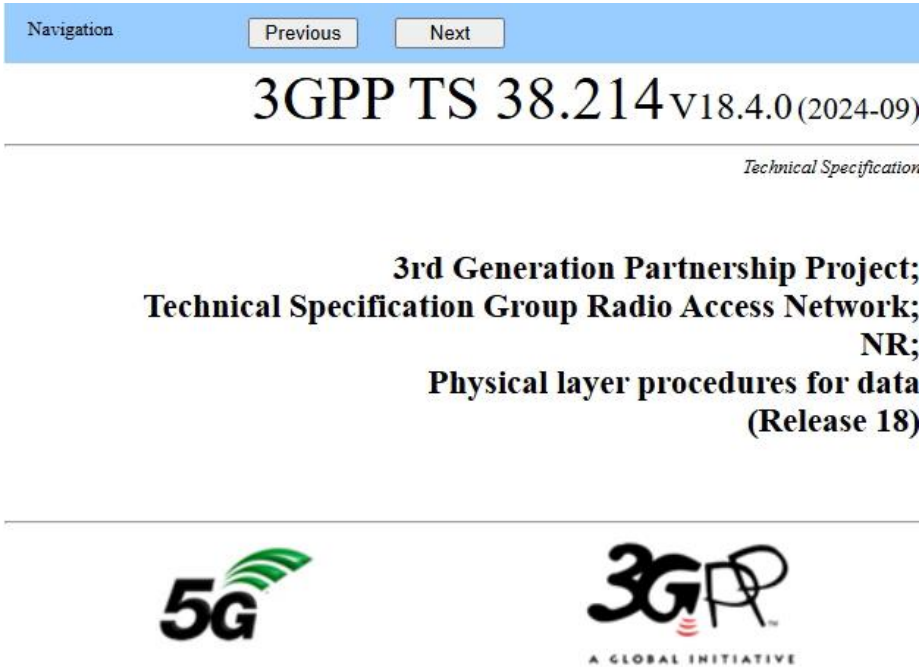
**3rd Generation Partnership Project;**
**Technical Specification Group Radio Access Network;**
**NR;**
**Radio Resource Control (RRC) protocol specification**
**(Release 18)**

The present document has been developed within the 3rd Generation Partnership Project (3GPP™) and may be further elaborated for the purposes of 3GPP.
The present document has not been subject to any approval process by the 3GPP Organizational Partners and shall not be implemented.
This Specification is provided for future development work within 3GPP only. The Organizational Partners accept no liability for any use of this Specification.
Specifications and Reports for implementation of the 3GPP™ system should be obtained via the 3GPP Organizational Partners' Publications Offices.

# Markdown Explorer

## (RAN1) 38.214 Example

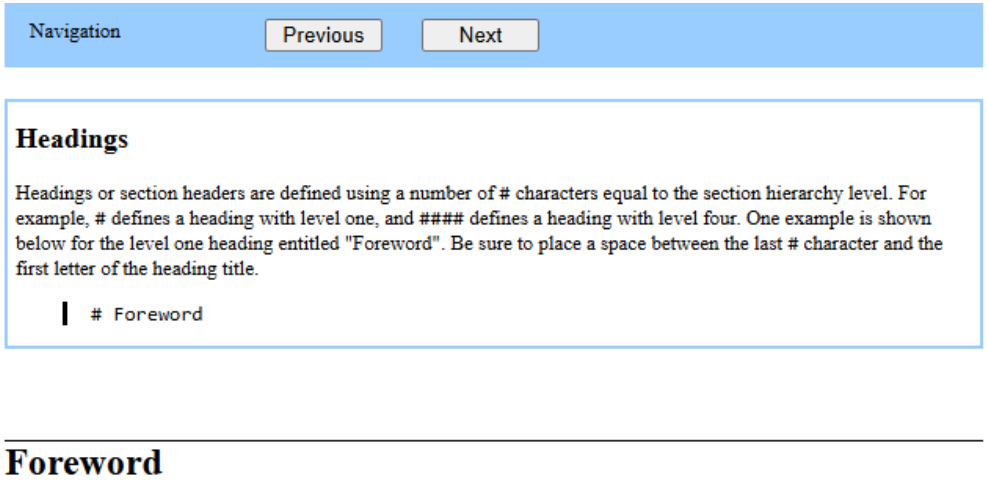
- The video demo to the right briefly browses through an excerpt of TS38.214, showing examples of Markdown syntax inline with the rendered specification.
- These examples include
  - Headings [Level-one]
  - Escaping Special Characters
  - Simple Tables
  - Lists
  - Text Decoration [Italicization]
  - Inline Equations
  - Block Equations
  - Merged Tables
- Each example explains the Markdown element and shows the Markdown source with a thick black line to the left.




HTML

# Markdown Explorer

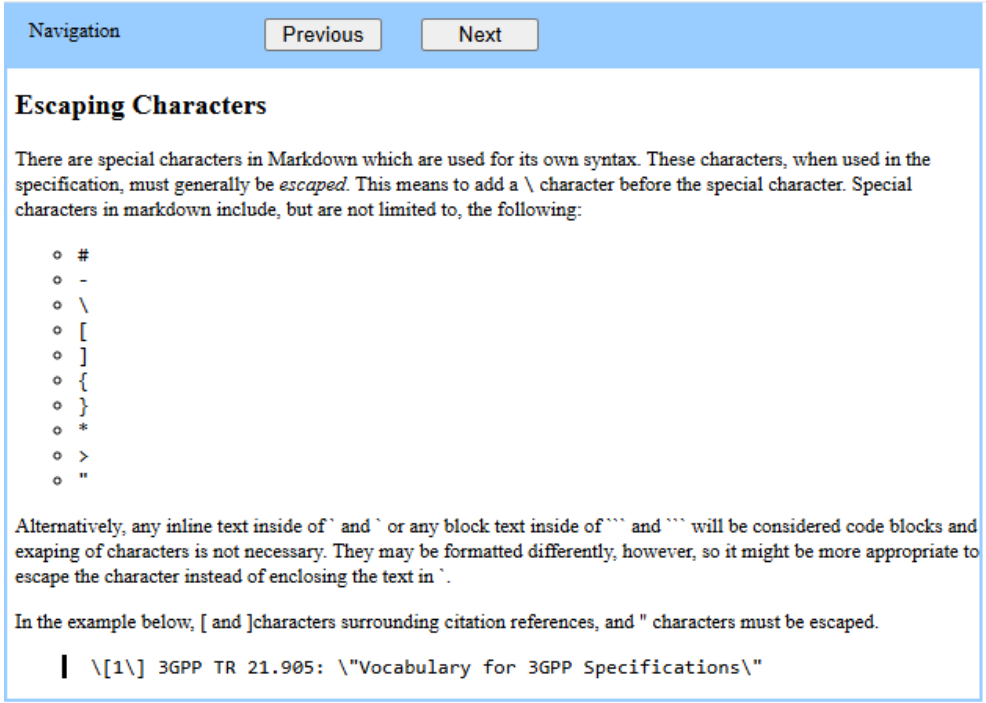
## (RAN1) 38.214 – Headings (Level 1)



# Markdown Explorer

## (RAN1) 38.214 - Escaping Characters



# Markdown Explorer

## (RAN1) 38.214 – Simple Tables

Navigation Previous Next

Table 4.1-2: PT-RS EPRE to PDSCH EPRE per layer per RE ($\rho_{PTRS}$), if *dmrs-TypeEnh* is not configured in *DMRS-DownlinkConfig*

### Simple Tables (Markdown)

Simple tables without merged cells are directly supported by Markdown. In the example below, which is identical except for the lack of merged cells, a three column table is written using *pipe tables*. Alignment is not required between columns, and all columns, even empty ones, must be included.

**Note**: This example and the next one represent the same table in different ways.

The number of dashes, or - characters, indicate the proportion of the page width the column should use in relation to the other columns. For example, `|-|---|` would result in one cell with 25% of the width of the table, and another with 75% of the width of the table. An example of such a table is shown below.

| 25% | 75% |
|---|---|
| Small Column | Long column with more text |

Alignment is possible on a per-column basis using the following options. The alignment syntax is shown in the following table.

| Alignment | Syntax |
|---|---|
| Left | `|:-|` |
| Right | `|-:|` |
| Center | `|:-:|` |

Navigation Previous Next

```
| *epre-Ratio*<br />PDSCH Layers | 1 | 2 | 3 | 4 | 5 | 6 |
|:-:|:-:|:-:|:-:|:-:|:-:|:-:|
| 0 | 0 | 3 | 4.77 | 6 | 7 | 7.78 |
| 1 | 0 | 0 | 0 | 0 | 0 | 0 |
| 2 | R | R | R | R | R | R |
| 3 | R | R | R | R | R | R |
```

| *epre-Ratio*<br>PDSCH Layers | 1 | 2 | 3 | 4 | 5 | 6 |
|---|---|---|---|---|---|---|
| 0 | 0 | 3 | 4.77 | 6 | 7 | 7.78 |
| 1 | 0 | 0 | 0 | 0 | 0 | 0 |
| 2 | R | R | R | R | R | R |
| 3 | R | R | R | R | R | R |

# Markdown Explorer

## (RAN1) 38.214 - Lists

Navigation Previous Next

### Lists

Markdown suports unordered lists, ordered (numbered) lists, and nested lists. Nesting lists is done in the same manner for unordered and ordered lists, i.e., by adding two spaces for each indentation level after the first. Ordered and unordered lists can be mixed, e.g., a numbered list can be written under an unordered bullet.

An example of an unordered list is shown below.

```
The UE:

- is expected to decode PDSCH scheduled with MCCH-RNTI or Multicast MCCH-RNTI, and PBCH in PCell that partially or fully overlaps in time in non-overlapping PRBs in PCell.

- is not expected to decode PDSCH scheduled with G-RNTI for broadcast and PBCH in PCell that partially or fully overlaps in time in non-overlapping PRBs in PCell.

- is not expected to decode PDSCH scheduled with G-RNTI for multicast and PBCH in PCell that partially or fully overlaps in time in non-overlapping PRBs in PCell.
```

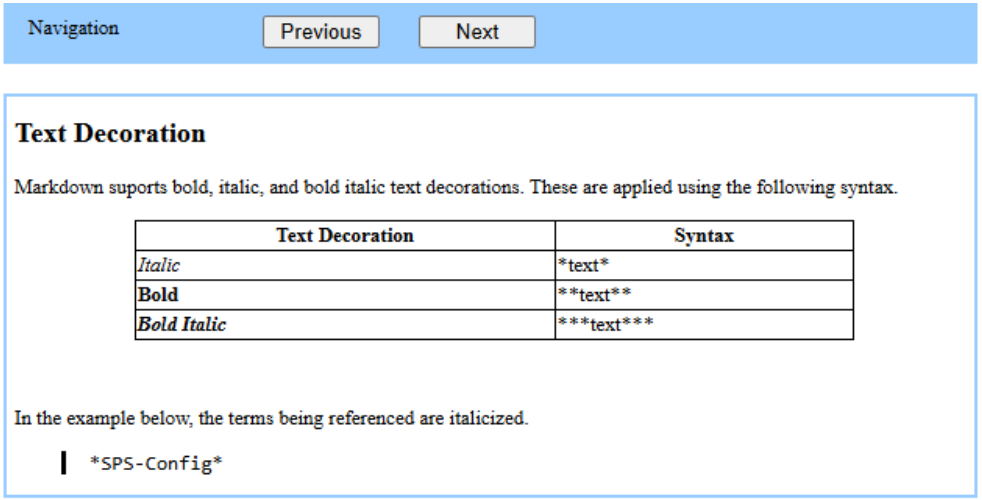
The UE:

- is expected to decode PDSCH scheduled with MCCH-RNTI or Multicast MCCH-RNTI, and PBCH in PCell that partially or fully overlaps in time in non-overlapping PRBs in PCell.
- is not expected to decode PDSCH scheduled with G-RNTI for broadcast and PBCH in PCell that partially or fully overlaps in time in non-overlapping PRBs in PCell.
- is not expected to decode PDSCH scheduled with G-RNTI for multicast and PBCH in PCell that partially or fully overlaps in time in non-overlapping PRBs in PCell.

# Markdown Explorer

## (RAN1) 38.214 - Text Decoration (Italic)



# Markdown Explorer

## (RAN1) 38.214 – Inline Equation

Navigation Previous Next

### Inline Equations

Equations can be entered using the Latex language. A basic overview for Latex math can be found here. Ideally, the equations should use the bare minimum set of required features as to avoid complexity. Inline equations are wrapped with $ and $, and must be defined entirely on a single line.

```
When $\upsilon \leq 2$, where $\upsilon$ is the associated RI value, each PMI
value corresponds to the codebook indices $i_1$ and $i_2$ where
```

When $\upsilon \leq 2$, where $\upsilon$ is the associated RI value, each PMI value corresponds to the codebook indices $i_1$ and $i_2$ where

# Markdown Explorer

## (RAN1) 38.214 – Block Equation

Navigation Previous Next

### Block Equations

Equations can be entered using the Latex language. A basic overview for Latex math can be found here. Ideally, the equations should use the bare minimum set of required features as to avoid complexity. Block equations are wrapped with $$ and $$, and may be split across lines and indented for readability.

```
$$
i_1 = \left \{
    \begin{align*}
        \begin{bmatrix}
            i_{1,1} & i_{1,2} & i_{1,3,1} & i_{1,4,1}
        \end{bmatrix} \upsilon = 1 \\
        \begin{bmatrix}
            i_{1,1} & i_{1,2} & i_{1,3,1} & i_{1,4,1} & i_{1,3,2} & i_{1,4,2}
        \end{bmatrix} \upsilon = 2
    \end{align*}
\right.
$$
```

$$i_1 = \begin{cases} \begin{bmatrix} i_{1,1} & i_{1,2} & i_{1,3,1} & i_{1,4,1} \end{bmatrix} \upsilon = 1 \\ \begin{bmatrix} i_{1,1} & i_{1,2} & i_{1,3,1} & i_{1,4,1} & i_{1,3,2} & i_{1,4,2} \end{bmatrix} \upsilon = 2 \end{cases}$$

# Markdown Explorer

## (RAN1) 38.214 – Merged Tables

Navigation Previous Next

### Merged Tables (HTML)

Tables with merged cells are not supported by most Markdown table formats. Those which support merged cells require manual formatting to align columns, which is too burdensom to be feasible. One alternative to what are called *grid tables* is to use HTML tables, which can be directly included in Markdown source. Note that indentation of the HTML tags and hierarchy is not possible. When possible merged cells should be avoided.

**Note**: In the case of the table of this example, the merged cell could be placed in a separate table underneath the table and then the standard Markdown pipe table could be used.

```
<table>
<tr>
<th>Layers</th>
<th> </th>
</tr>
<tr>
<td>
$\upsilon=1$
</td>
<td>
$W_{q_1,q_2,n_1,n_2,p_{1}^{(1)},p_{1}^{(2)},i_{2,1,1}}^{(1)} =
W_{q_1,q_2,n_1,n_2,p_{1}^{(1)},p_{1}^{(2)},i_{2,1,1}}^{1}$
</td>
</tr>
<tr>
<td>
$\upsilon=2$
</td>
<td>
$W_{q_1,q_2,n_1,n_2,p_{1}^{(1)},p_{1}^{(2)},i_{2,1,2}}^{(2)} = \frac{1}
{\sqrt{2}} \left [ \begin{align*}
W_{q_1,q_2,n_1,n_2,p_{1}^{(1)},p_{1}^{(2)},i_{2,1,1}}^{1} &
```

Navigation Previous Next

```
W_{q_1,q_2,n_1,n_2,p_{2}^{(1)},p_{2}^{(2)},i_{2,1,2}}^{2} \end{align*} \right
]$
</td>
</tr>
<tr>
<td colspan="2">
where $$
W_{q_1,q_2,n_1,n_2,p_{l}^{(1)},p_{l}^{(2)},c_l}^{l} =
    \frac{1}{\sqrt{N_1N_2 \sum_{i=0}^{2L-1}(p_{l,i}^{(1)}p_{l,i}^{(2)})^2}}
    \left [
        \begin{align*}
            \sum_{i=0}^{L-1}
v_{m_{1}^{(i)},m_{2}^{(i)}}p_{l,i}^{(1)}p_{l,i}^{(2)}\varphi_{l,i} \\
            \sum_{i=0}^{L-1}
v_{m_{1}^{(i)},m_{2}^{(i)}}p_{l,i}^{(1)}p_{l,i}^{(2)}\varphi_{l,i+L}
        \end{align*}
    \right ], l=1,2
$$,
<br />and the mappings from $i_1$ to $q_1$, $q_2$, $n_1$, $n_2$, $p_{1}^{(1)}$, $p_{1}^{(2)}$, and from $i_2$ to $i_{2,1,1}$, $i_{2,1,2}$, $p_{1}^{(2)}$ and
$p_{2}^{(2)}$ are as described above, including the ranges of the constituent
indices of $i_1$ and $i_2$.
</td>
</tr>
</table>
```

| Layers | |
|---|---|
| $\upsilon = 1$ | $W^{(1)}_{q_1,q_2,n_1,n_2,p_1^{(1)},p_1^{(2)},i_{2,1,1}} = W^{1}_{q_1,q_2,n_1,n_2,p_1^{(1)},p_1^{(2)},i_{2,1,1}}$ |
| $\upsilon = 2$ | $W^{(2)}_{q_1,q_2,n_1,n_2,p_1^{(1)},p_1^{(2)},i_{2,1,2}} = \frac{1}{\sqrt{2}}\left[ W^{1}_{q_1,q_2,n_1,n_2,p_1^{(1)},p_1^{(2)},i_{2,1,1}} \quad W^{2}_{q_1,q_2,n_1,n_2,p_2^{(1)},p_2^{(2)},i_{2,1,2}} \right]$ |

where

$$W^{l}_{q_1,q_2,n_1,n_2,p_l^{(1)},p_l^{(2)},c_l} = \frac{1}{\sqrt{N_1N_2\sum_{i=0}^{2L-1}\left(p_{l,i}^{(1)}p_{l,i}^{(2)}\right)^2}}\begin{bmatrix}\sum_{i=0}^{L-1} v_{m_1^{(i)},m_2^{(i)}} p_{l,i}^{(1)} p_{l,i}^{(2)} \varphi_{l,i} \\ \sum_{i=0}^{L-1} v_{m_1^{(i)},m_2^{(i)}} p_{l,i}^{(1)} p_{l,i}^{(2)} \varphi_{l,i+L}\end{bmatrix}, l = 1, 2$$

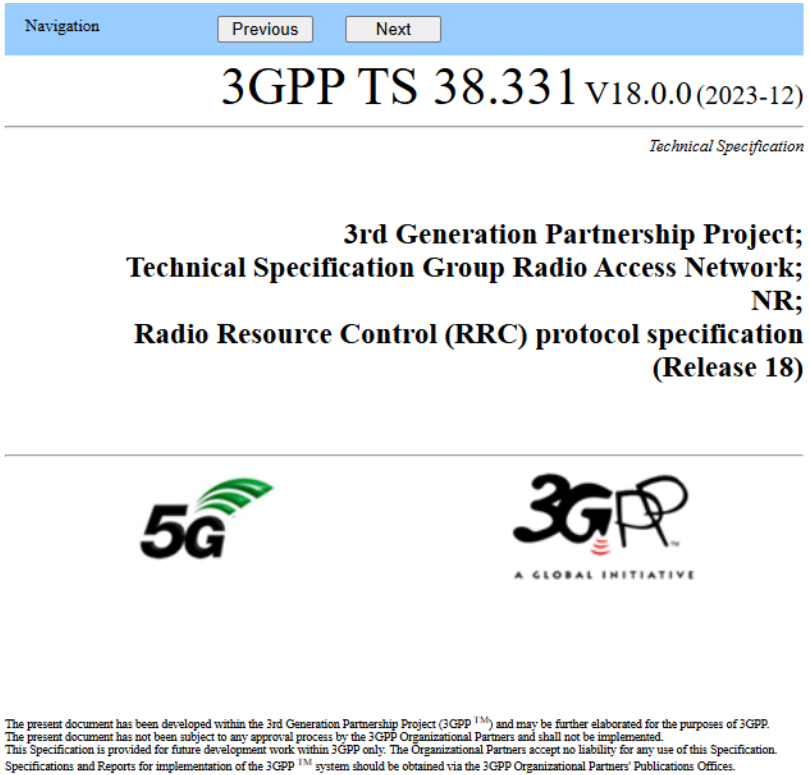
,

and the mappings from $i_1$ to $q_1$, $q_2$, $n_1$, $n_2$, $p_1^{(1)}$, $p_2^{(1)}$, and from $i_2$ to $i_{2,1,1}$, $i_{2,1,2}$, $p_1^{(2)}$ and $p_2^{(2)}$ are as described above, including the ranges of the constituent indices of $i_1$ and $i_2$.

# Markdown Explorer

## (RAN2) 38.331 Example

- Some examples such as text decoration and headers are repeated in this example to show variations.
  - Headings [Level-two]
  - Text Decoration [Bolding]
- TS38.331 requires elements not present in TS38.214.
  - Block Diagram
  - Signaling Diagram
  - Procedural text indentation
  - ASN.1 syntax highlighting



Navigation Previous Next

3GPP TS 38.331 V18.0.0 (2023-12)

*Technical Specification*

**3rd Generation Partnership Project;**
**Technical Specification Group Radio Access Network;**
**NR;**
**Radio Resource Control (RRC) protocol specification**
**(Release 18)**

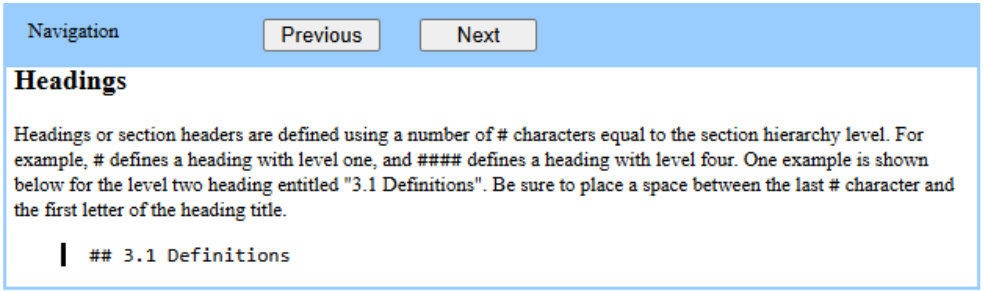
5G

3GPP
A GLOBAL INITIATIVE

The present document has been developed within the 3rd Generation Partnership Project (3GPP ™) and may be further elaborated for the purposes of 3GPP.
The present document has not been subject to any approval process by the 3GPP Organizational Partners and shall not be implemented.
This Specification is provided for future development work within 3GPP only. The Organizational Partners accept no liability for any use of this Specification.
Specifications and Reports for implementation of the 3GPP ™ system should be obtained via the 3GPP Organizational Partners' Publications Offices.

# Markdown Explorer

## (RAN2) 38.331 – Headings (Level 2)



# Markdown Explorer

## (RAN2) 38.331 – Text Decoration (Bold)

Navigation Previous Next

term defined in the present document takes precedence over the definition of the same term, if any, in TR 21.905 [1].

### Text Decoration

Markdown suports bold, italic, and bold italic text decorations. These are applied using the following syntax.

| Text Decoration | Syntax |
|---|---|
| *Italic* | *text* |
| **Bold** | **text** |
| ***Bold Italic*** | ***text*** |

In the example below, the terms being defined are bolded.

```
**A2X communication:** A communication to support A2X services leveraging PC5 reference points, as defined in TS 23.256 \[76\]. A2X services are realized by various types of A2X applications, e.g., BRID or DAA.
```

**A2X communication:** A communication to support A2X services leveraging PC5 reference points, as defined in TS 23.256 [76]. A2X services are realized by various types of A2X applications, e.g., BRID or DAA.

# Markdown Explorer

## (RAN2) 38.331 – Block Diagram

Navigation Previous Next

### Block Diagram Written in MSC Generator

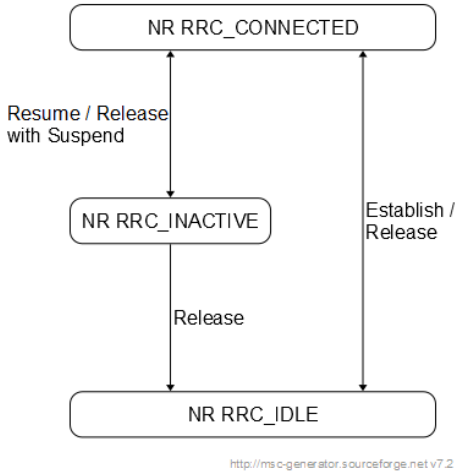
An MSC Generator block diagram can be written in plaintext directly inside the Markdown file. In this example, a block diagram is defined by the source shown below. During conversion from Markdown to HTML, the lua script *msc_to_img.lua* is called, which passes the block diagram to the msc-generator command-line tool and passes the raw bytes of the resulting image file to Pandoc, which creates an image file and inserts it into the resulting HTML file.

```
~~~ mscgenblock
col {
box A: NR RRC_CONNECTED [line.corner=round, width=300];
space 100;
box B: NR RRC_INACTIVE [line.corner=round, mleft=A@mleft];
space 100;
box C: NR RRC_IDLE [line.corner=round, mleft=A@mleft, width=A];
};

A<->B [routing=vertical, text.ident=left, label.align=middle, label.pos=left]:
Resume / Release
 with Suspend;
B->C [routing=vertical, text.ident=left, label.pos=right]: Release;

(A@80%, A@bottom)<->(C@80%, C@top) [label.pos=right, label.align=middle,
text.ident=left]: Establish /
  Release;
~~~
```

Navigation Previous Next



# Markdown Explorer

## (RAN2) 38.331 – Signaling Diagram

Navigation Previous Next

### Signalling Diagram Written in MSC Generator

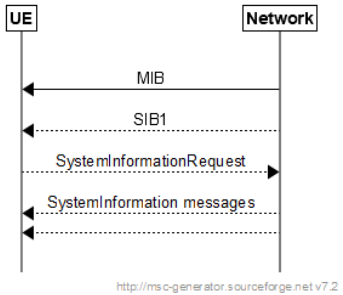
An MSC Generator signalling diagram can be written in plaintext directly inside the Markdown file. In this example, a signallnig diagram is defined by the source shown below. During converstion from Markdown to HTML, the lua script *msc_to_img.lua* is called, which passes the signalling diagram to the msc-generator command-line tool and passes the raw bytes of the resulting image file to Pandoc, which creates an image file and inserts it into the resulting HTML file.

```
~~~ mscgen
hscale="auto";
defstyle hgap [text.gap.left=20, text.gap.right=20];
defstyle entity [text.font.face="Arial", text.size.normal=14, text.wrap=no,
text.bold=yes];
defstyle b2 [text.font.face="Arial", text.size.normal=13, vspacing=7,
text.wrap=no, hgap];
defstyle ac [text.font.face="Times", text.size.normal=15, text.italic=yes,
vspacing=5, arrow.type=sharp, hgap];
defstyle au [text.font.face="Arial", text.size.normal=13, vspacing=5, hgap];
defstyle n1 [text.font.face="Arial", text.size.normal=13, vspacing=5, weak,
text.italic=no, hgap];

U: UE;
N: Network;

|||;
U<-N:MIB [au];
U<N:SIB1 [au];
U>N:SystemInformationRequest [au];
U<N:SystemInformation messages [au];
U<N;
|||;
~~~
```

Navigation Previous Next



# Markdown Explorer

## (RAN2) 38.331 – ASN.1 Formatting

Navigation Previous Next

### ASN.1 Source

ASN.1 source code is typed directly inline with the Markdown text, but is surrounded by ~~~ asn1 and ~~~ on separate lines before and after the source. The lua script *asn_render.lua* adds indentation and colorization of keywords and comments to the resulting HTML file.

```
~~~ asn1
-- ASN1START

-- TAG-BCCH-DL-SCH-MESSAGE-START

BCCH-DL-SCH-Message ::= SEQUENCE {

message BCCH-DL-SCH-MessageType

}

BCCH-DL-SCH-MessageType ::= CHOICE {

c1 CHOICE {

systemInformation SystemInformation,

systemInformationBlockType1 SIB1

},

messageClassExtension SEQUENCE {}

}

-- TAG-BCCH-DL-SCH-MESSAGE-STOP

-- ASN1STOP
~~~
```

Navigation Previous Next

```
-- ASN1START

-- TAG-BCCH-DL-SCH-MESSAGE-START

BCCH-DL-SCH-Message ::= SEQUENCE {

    message BCCH-DL-SCH-MessageType

}

BCCH-DL-SCH-MessageType ::= CHOICE {

    c1 CHOICE {

        systemInformation SystemInformation,

        systemInformationBlockType1 SIB1

    },

    messageClassExtension SEQUENCE {}

}

-- TAG-BCCH-DL-SCH-MESSAGE-STOP

-- ASN1STOP
```

# Markdown Explorer

## (RAN3) 38.423 – ASN.1 Formatting [New]

**ASN.1 Source**

ASN.1 source code is typed directly inline with the Markdown text, but is surrounded by ~~~ asn1 and ~~~ on separate lines before and after the source. The lua script *asn_render.lua* adds indentation and colorization of keywords and comments to the resulting HTML file.

```
InitiatingMessage ::= SEQUENCE {

procedureCode XNAP-ELEMENTARY-PROCEDURE.&procedureCode ({XNAP-ELEMENTARY-
PROCEDURES}),

criticality XNAP-ELEMENTARY-PROCEDURE.&criticality ({XNAP-ELEMENTARY-
PROCEDURES}{@procedureCode}),

value XNAP-ELEMENTARY-PROCEDURE.&InitiatingMessage ({XNAP-ELEMENTARY-
PROCEDURES}{@procedureCode})

}

SuccessfulOutcome ::= SEQUENCE {

procedureCode XNAP-ELEMENTARY-PROCEDURE.&procedureCode ({XNAP-ELEMENTARY-
PROCEDURES}),

criticality XNAP-ELEMENTARY-PROCEDURE.&criticality ({XNAP-ELEMENTARY-
PROCEDI

value
PROCEDI

}
```

```
InitiatingMessage ::= SEQUENCE {

    procedureCode XNAP-ELEMENTARY-PROCEDURE.&procedureCode ({XNAP-ELEMENTARY-PROCEDURES}),

    criticality XNAP-ELEMENTARY-PROCEDURE.&criticality ({XNAP-ELEMENTARY-PROCEDURES}
    {@procedureCode}),

    value XNAP-ELEMENTARY-PROCEDURE.&InitiatingMessage ({XNAP-ELEMENTARY-PROCEDURES}
    {@procedureCode})

}

SuccessfulOutcome ::= SEQUENCE {

    procedureCode XNAP-ELEMENTARY-PROCEDURE.&procedureCode ({XNAP-ELEMENTARY-PROCEDURES}),

    criticality XNAP-ELEMENTARY-PROCEDURE.&criticality ({XNAP-ELEMENTARY-PROCEDURES}
    {@procedureCode}),

    value XNAP-ELEMENTARY-PROCEDURE.&SuccessfulOutcome ({XNAP-ELEMENTARY-PROCEDURES}
    {@procedureCode})

}
```

Navigation Previous Next

3GPP TS 38.423 V18.4.0 (2024-12)

*Technical Specification*

**3rd Generation Partnership Project;**
**Technical Specification Group Radio Access Network;**
**NG-RAN;**
**Xn application protocol (XnAP)**
**(Release 18)**



The present document has been developed within the 3rd Generation Partnership Project (3GPP ™) and may be further elaborated for the purposes of 3GPP.
The present document has not been subject to any approval process by the 3GPP Organizational Partners and shall not be implemented.
This Specification is provided for future development work within 3GPP only. The Organizational Partners accept no liability for any use of this Specification.
Specifications and Reports for implementation of the 3GPP ™ system should be obtained via the 3GPP Organizational Partners' Publications Offices.

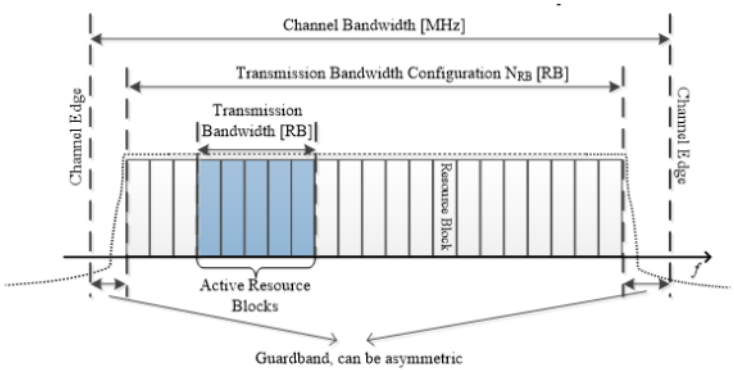
# Markdown Explorer

## (RAN4) 38.101-1 – Images

**Images**

Images can be inserted into a document using the path to the image, that is the location of the image relative to the location of the specification file. Here, images are stored in a folder called media, which is in the same directory as the eventual HTML file. The height and width can also be set.

```
![](media/figure_5_3_1-1.png){width="6.0in" height="3.0in"}
```




Navigation Previous Next

3GPP TS 38.101-1 V18.8.0 (2024-12)

*Technical Specification*

**3rd Generation Partnership Project;**
**Technical Specification Group Radio Access Network;**
**NR;**
**Part 1: Range 1 Standalone**
**(Release 18)**



# Markdown Explorer

## (RAN5) 38.501-1 – Procedural Text

Navigation Previous Next

...

**Procedural Text**

Procedural text indentation is supported in the Markdown source by a pre-processing step which removes all the white space, since Markdown interprets two or more leading spaces as indentation to indicate code blocks. Once the white space is removed by the pre-processing step in *pre_procedural.lua*, the conversion from Markdown to HTML applies formatting to indent the procedural text based on the number indicated by the bullet in *indent_procedural.lua*. The indentation shown in this example is only useful for human-readability and does not affect the final output.

```
1\> else if the *ra-PreambleIndex* has been explicitly provided by
PDCCH; and

1\> if the *ra-PreambleIndex* is not 0b000000:

    2\> set the *PREAMBLE_INDEX* to the signalled *ra-PreambleIndex*;

    2\> select the SSB signalled by PDCCH.

1\> else if the contention-free Random Access Resources associated with
SSBs have been explicitly provided in *rach-ConfigDedicated* and at
least one SSB with SS-RSRP above *rsrp-ThresholdSSB* amongst the
associated SSBs is available:

    2\> select an SSB with SS-RSRP above *rsrp-ThresholdSSB* amongst the
associated SSBs;

    2\> set the *PREAMBLE_INDEX* to a *ra-PreambleIndex* corresponding to
the selected SSB.
```

1> else if the *ra-PreambleIndex* has been explicitly provided by PDCCH; and

1> if the *ra-PreambleIndex* is not 0b000000:

2> set the *PREAMBLE_INDEX* to the signalled *ra-PreambleIndex*;

2> select the SSB signalled by PDCCH.

1> else if the contention-free Random Access Resources associated with SSBs have been explicitly provided in *rach-ConfigDedicated* and at least one SSB with SS-RSRP above *rsrp-ThresholdSSB* amongst the associated SSBs is available:

2> select an SSB with SS-RSRP above *rsrp-ThresholdSSB* amongst the associated SSBs;

2> set the *PREAMBLE_INDEX* to a *ra-PreambleIndex* corresponding to the selected SSB.

Navigation Previous Next

3GPP TS 38.523-1 V18.2.0 (2025-01)

*Technical Specification*

**3rd Generation Partnership Project;**
**Technical Specification Group Radio Access Network;**
**5GS;**
**User Equipment (UE) conformance specification**
**Part 1: Protocol**
**(Release 18)**


# Change Request (CR)

# Thoughts on CR Procedures

- We can compare the typical current procedure to a potential future procedure, relating each current step to the Git equivalent in the new procedure.
  - Steps with solid green border are nearly equivalent steps.
  - Steps with a dashed orange border are modified from the original procedure.
  - Steps with a squiggly black border are unique to each procedure.

**Current Procedure**

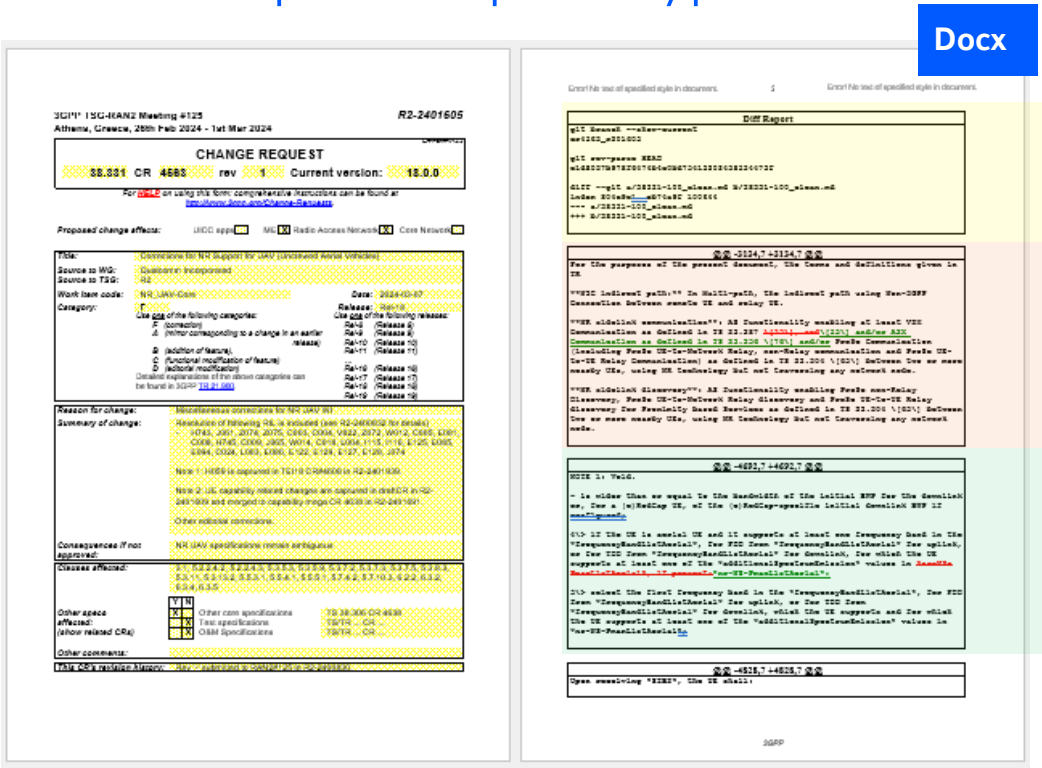

**Potential New Procedure**

# CR approval process

- Automatic verification: colliding CRs can be automatically flagged to enable conflicts to be resolved prior to approval.
  - (Granularity of collision detection FFS)
- Only CRs that have passed verification can be approved.
- A TSG's approval of a CR means that the Git commit, which could be in a branch, identified in the CR is approved.
  - Hence error-prone copy-pasting after approval is eliminated.
- The next version of a TS is produced by "merging" the set of approved Git commits for the spec.

# One example of a prototype CR Format

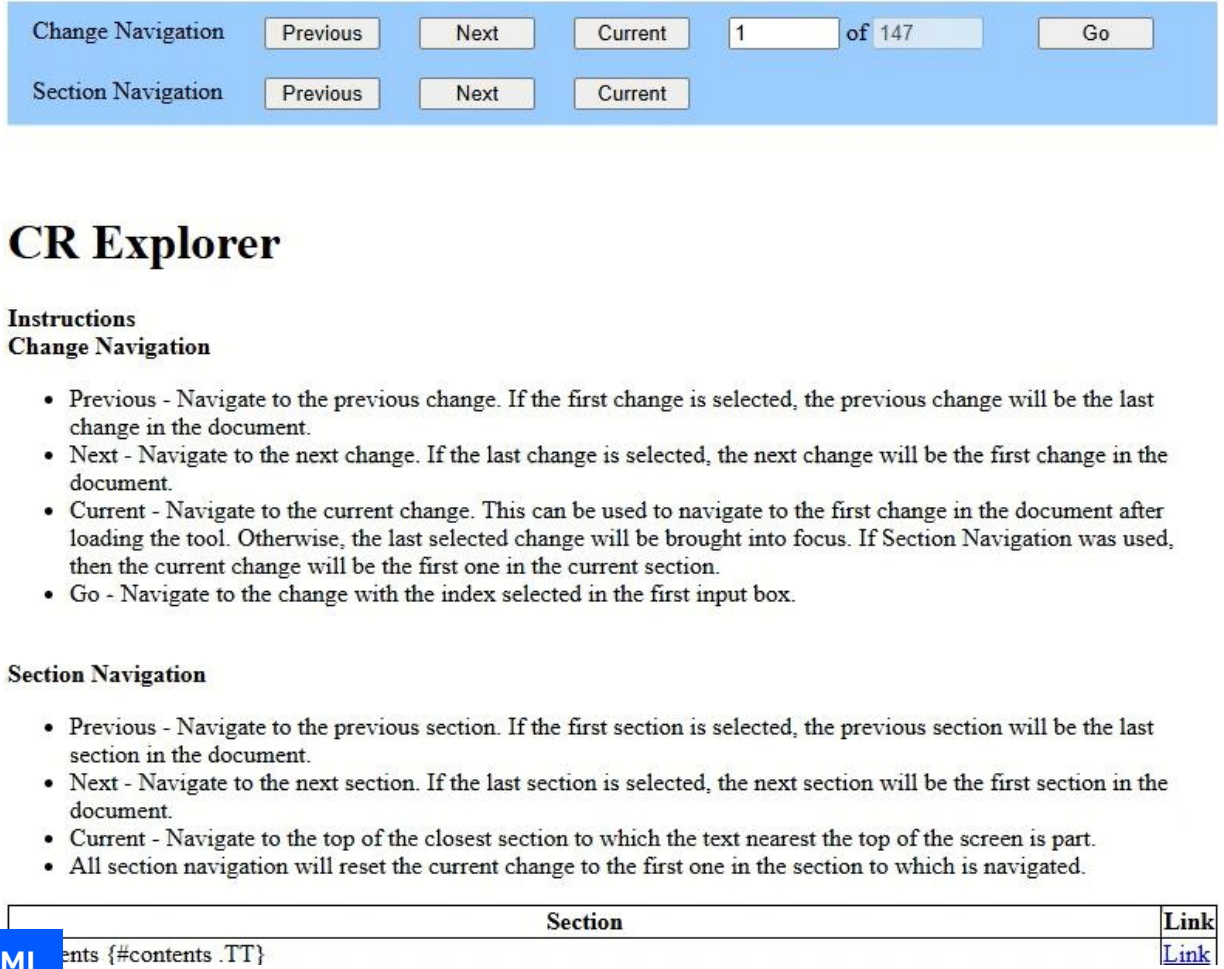



- CR cover page remains the same and **could be automatically generated.**
- The **CR body is automatically generated** from the difference, or diff, between the change and the base specification.
  - The CR body includes the Git Commit ID so that anyone can find the changes.
  - The diff is processed into a familiar format, and each set of changes is contained in a table which includes the entire section as context.
  - Change sets are highlighted in transparent colored boxes.
- Each table indicates the line number of the section containing the changes
  - Additions are marked in green and underlined.
  - Deletions are marked in red and are ~~struck through~~.

# Prototype CR Format

## Demonstration

- The new CR format would not be as functional in Microsoft Word since Microsoft Word would not be able to identify the changes which are simply identified with different font styles.
- Therefore, a new tool to explore the CRs could be provided. A demonstration of such a prototype is shown to the right.
- The example shows changes implemented during the end-of-release review for Release 18 38.331 v18.0.0.

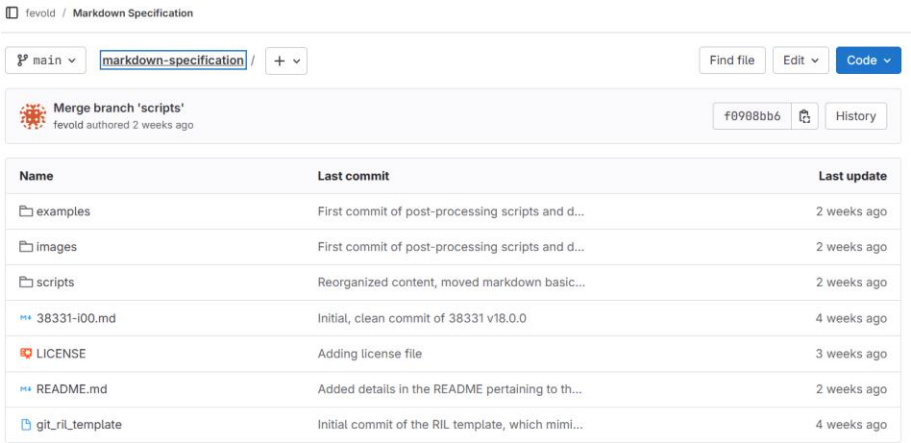


# Example in ETSI Forge

# Markdown-Specification Repository

## End of Release 18 Review Example

- An example repository has been hosted at https://forge.etsi.org/rep/fevold/markdown-specification
  - The example includes more than 25 changes which were merged into the base specification.
  - The README found at the same link explains the contents of the repository.
- The tools are hosted in the same repository at scripts · main · fevold / Markdown Specification · GitLab
  - The README found at the same link explains how to execute the scripts.

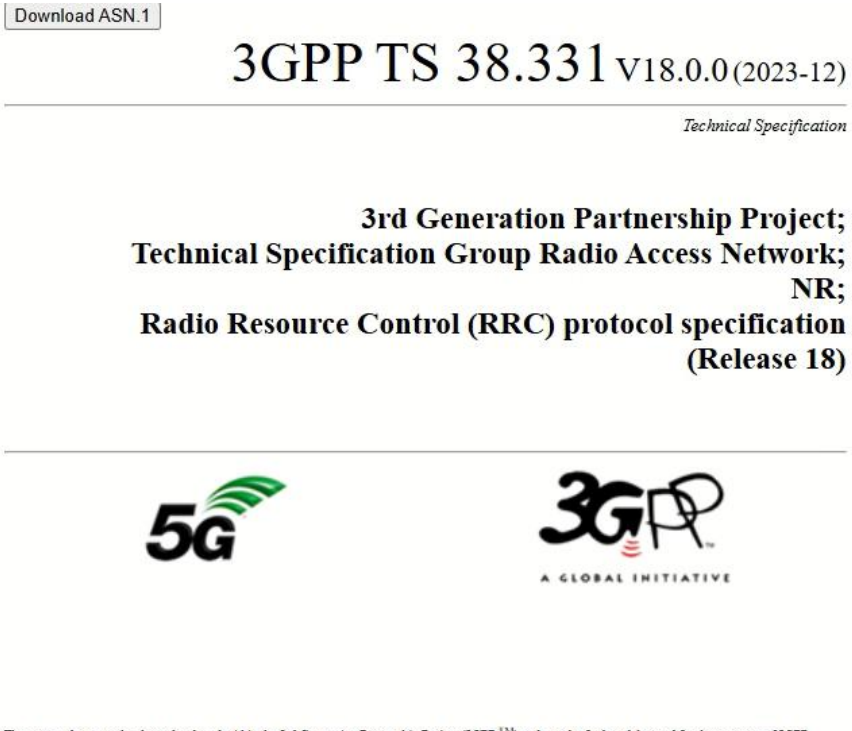


# The Possibilities are Unlimited

## Local ASN.1 Extraction from 38.331



# Summary

# Summary

- In this presentation, we have described
  - Problems with the current tool used to write and update the specifications
  - Way forward with a new specification in Markdown with processing scripts
  - Prototype CR format
  - Prototype CR explorer for change navigation
  - Git repository with TS38.331 fully converted to Markdown for experimentation
- Our next steps as a group are to
  - Collect feedback on the prototypes
  - Identify missing pieces
  - Continue the discussion on how to solve key issues and evaluate feasibility
  - Determine procedures related to version control (Git)

# Resources

- 38.331 Markdown Test Repository
- Pandoc
  - Homepage
  - Documentation
- Git
  - Homepage
  - Documentation
- Latex Equation Cheat Sheet
- MSC Generator
  - Homepage
  - Documentation
- WeasyPrint


NOKIA