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## **Handling Long Lines in Inclusions in Internet-Drafts and RFCs draft-ietf-netmod-artwork-folding-08**

### Abstract

This document defines two strategies for handling long lines in width-bounded text content. One strategy is based on the historic use of a single backslash ('\') character to indicate where line-folding has occurred, with the continuation occurring with the first non-space (' ') character on the next line. The second strategy extends the first strategy by adding a second backslash character to identify where the continuation begins and thereby able to handle cases not supported by the first strategy. Both strategies use a self-describing header enabling automated reconstitution of the original content.

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## [1.](#) Introduction

[RFC7994] sets out the requirements for plain-text RFCs and states that each line of an RFC (and hence of an Internet-Draft) must be limited to 72 characters followed by the character sequence that denotes an end-of-line (EOL).

Internet-Drafts and RFCs often include example text or code fragments. Many times the example text or code exceeds the 72 character line-length limit. The ``xml2rfc`` utility does not attempt to wrap the content of such inclusions, simply issuing a warning whenever lines exceed 69 characters. According to the RFC Editor, there is currently no convention in place for how to handle long lines in such inclusions, other than advising authors to clearly indicate what manipulation has occurred.

This document defines two strategies for handling long lines in width-bounded text content. One strategy is based on the historic use of a single backslash ('\\') character to indicate where line-folding has occurred, with the continuation occurring with the first non-space (' ') character on the next line. The second strategy extends the first strategy by adding a second backslash character to identify where the continuation begins and thereby able to handle cases not supported by the first strategy. Both strategies use a self-describing header enabling automated reconstitution of the original content.

The strategies defined in this document work on any text content, but are primarily intended for a structured sequence of lines, such as would be referenced by the `<sourcecode>` element defined in [Section 2.48 of \[RFC7991\]](#), rather than for two-dimensional imagery, such as would be referenced by the `<artwork>` element defined in [Section 2.5 of \[RFC7991\]](#).

Note that text files are represented as lines having their first character in column 1, and a line length of N where the last



character is in the Nth column and is immediately followed by an end of line character sequence.

## **2. Applicability Statement**

The formats and algorithms defined in this document may be used in any context, whether for IETF documents or in other situations where structured folding is desired.

Within the IETF, this work primarily targets the xml2rfc v3 `<sourcecode>` element ([Section 2.48 of \[RFC7991\]](#)) and the xml2rfc v2 `<artwork>` element ([Section 2.5 of \[RFC7749\]](#)) that, for lack of a better option, is currently used for both source code and artwork. This work may also be used for the xml2rfc v3 `<artwork>` element ([Section 2.5 of \[RFC7991\]](#)) but, as described in [Section 5.1](#), it is generally not recommended.

## **3. Requirements Language**

The key words "MUST", "MUST NOT", "REQUIRED", "SHALL", "SHALL NOT", "SHOULD", "SHOULD NOT", "RECOMMENDED", "NOT RECOMMENDED", "MAY", and "OPTIONAL" in this document are to be interpreted as described in [BCP 14 \[RFC2119\]](#) [\[RFC8174\]](#) when, and only when, they appear in all capitals, as shown here.

## **4. Goals**

### **4.1. Automated Folding of Long Lines in Text Content**

Automated folding of long lines is needed in order to support draft compilations that entail a) validation of source input files (e.g., XML, JSON, ABNF, ASN.1) and/or b) dynamic generation of output, using a tool that doesn't observe line lengths, that is stitched into the final document to be submitted.

Generally, in order for tooling to be able to process input files, the files must be in their original/natural state, which may entail them having some long lines. Thus, these source files need to be modified before inclusion in the document in order to satisfy the line length limits. This modification SHOULD be automated to reduce effort and errors resulting from manual processing.

Similarly, dynamically generated output (e.g., tree diagrams) must also be modified, if necessary, in order for the resulting document to satisfy the line length limits. When needed, this effort again SHOULD be automated to reduce effort and errors resulting from manual processing.



## **4.2. Automated Reconstitution of the Original Text Content**

Automated reconstitution of the exact original text content is needed to support validation of text-based content extracted from documents.

For instance, already YANG [RFC7950] modules are extracted from Internet-Drafts and validated as part of the [draft-submission](#) process. Additionally, the desire to validate instance examples (i.e., XML/JSON documents) contained within Internet-Drafts has been discussed ([[yang-doctors-thread](#)]).

## **5. Limitations**

### **5.1. Not Recommended for Graphical Artwork**

While the solution presented in this document works on any kind of text-based content, it is most useful on content that represents source code (XML, JSON, etc.) or, more generally, on content that has not been laid out in two dimensions (e.g., diagrams).

Fundamentally, the issue is whether the text content remains readable once folded. Text content that is unpredictable is especially susceptible to looking bad when folded; falling into this category are most UML diagrams, YANG tree diagrams, and ASCII art in general.

It is NOT RECOMMENDED to use the solution presented in this document on graphical artwork.

### **5.2. Doesn't Work as Well as Format-Specific Options**

The solution presented in this document works generically for all text-based content, as it only views content as plain text. However, various formats sometimes have built-in mechanisms that are better suited to prevent long lines.

For instance, both the ``pyang`` and ``yanglint`` utilities have the command line option `"--tree-line-length"` that can be used to indicate a desired maximum line length for when generating tree diagrams [[RFC8340](#)].

In another example, some source formats (e.g., YANG [RFC7950]) allow any quoted string to be broken up into substrings separated by a concatenation character (e.g., `'+'`), any of which can be on a different line.

It is RECOMMENDED that authors do as much as possible within the selected format to avoid long lines.





## **6. Two Folding Strategies**

This document defines two nearly identical strategies for folding text-based content.

The Single Backslash Strategy ('\\'): Uses a backslash ('\\') character at the end of the line where folding occurs, and assumes that the continuation begins at the character that is not a space character (' ') on the following line.

The Double Backslash Strategy ('\\'): Uses a backslash ('\\') character at the end of the line where folding occurs, and assumes that the continuation begins after a second backslash ('\\') character on the following line.

### **6.1. Comparison**

The first strategy produces more readable output, however it is significantly more likely to encounter unfoldable input (e.g., there exists a line anywhere in the input ending with a backslash character, or there exists a long line containing only space characters) and, for long lines that can be folded, automation implementations may encounter scenarios that will produce errors without special care.

The second strategy produces less readable output, but is unlikely to encounter unfoldable input, there are no long lines that cannot be folded, and no special care is required for when folding a long line.

### **6.2. Recommendation**

It is RECOMMENDED for implementations to first attempt to fold content using the single backslash strategy and, only in the unlikely event that it cannot fold the input or the folding logic is unable to cope with a contingency occurring on the desired folding column, then fallback to the double backslash strategy.

## **7. The Single Backslash Strategy ('\\')**

### **7.1. Folded Structure**

Text content that has been folded as specified by this strategy MUST adhere to the following structure.



#### **7.1.1. Header**

The header is two lines long.

The first line is the following 45-character string that MAY be surrounded by any number of printable characters. This first line cannot itself be folded.

NOTE: '\' line wrapping per BCP XX (RFC XXXX)

[Note to RFC Editor: Please replace XX and XXXX with the numbers assigned to this document and delete this note. Please make this change in multiple places in this document.]

The second line is a blank line. This line provides visual separation for readability.

#### **7.1.2. Body**

The character encoding is the same as described in [Section 2 of \[RFC7994\]](#), except that, per [\[RFC7991\]](#), tab characters are prohibited.

Lines that have a backslash ('\') occurring as the last character in a line are considered "folded".

Really long lines may be folded multiple times.

### **7.2. Algorithm**

This section describes a process for folding and unfolding long lines when they are encountered in text content.

The steps are complete, but implementations MAY achieve the same result in other ways.

When a larger document contains multiple instances of text content that may need to be folded or unfolded, another process must insert/extract the individual text content instances to/from the larger document prior to utilizing the algorithms described in this section. For example, the `xiac` utility [\[xiac\]](#) does this.

#### **7.2.1. Folding**

Determine the desired maximum line length from input to the line-wrapping process, such as from a command line parameter. If no value is explicitly specified, the value "69" SHOULD be used.



Ensure that the desired maximum line length is not less than the minimum header, which is 45 characters. If the desired maximum line length is less than this minimum, exit (this text-based content cannot be folded).

Scan the text content for horizontal tab characters. If any horizontal tab characters appear, either resolve them to space characters or exit, forcing the input provider to convert them to space characters themselves first.

Scan the text content to ensure at least one line exceeds the desired maximum. If no line exceeds the desired maximum, exit (this text content does not need to be folded).

Scan the text content to ensure no existing lines already end with a backslash ('\') character, as this would lead to an ambiguous result. If such a line is found, and its width is less than the desired maximum, then it SHOULD be flagged for forced folding (folding even though unnecessary). If the folding implementation doesn't support forced foldings, it MUST exit.

If this text content needs to and can be folded, insert the header described in [Section 7.1.1](#), ensuring that any additional printable characters surrounding the header does not result in a line exceeding the desired maximum.

For each line in the text content, from top-to-bottom, if the line exceeds the desired maximum, or requires a forced folding, then fold the line by:

1. Determine where the fold will occur. This location MUST be before or at the desired maximum column, and MUST NOT be chosen such that the character immediately after the fold is a space (' ') character. If no such location can be found, then exit (this text content cannot be folded).
2. At the location where the fold is to occur, insert a backslash ('\') character followed by the end of line character sequence.
3. On the following line, insert any number of space (' ') characters.

The result of the previous operation is that the next line starts with an arbitrary number of space (' ') characters, followed by the character that was previously occupying the position where the fold occurred.



Continue in this manner until reaching the end of the text content. Note that this algorithm naturally addresses the case where the remainder of a folded line is still longer than the desired maximum, and hence needs to be folded again, ad infinitum.

The process described in this section is illustrated by the "fold\_it\_1()" function in [Appendix A](#).

### **[7.2.2.](#) Unfolding**

Scan the beginning of the text content for the header described in [Section 7.1.1](#). If the header is not present, starting on the first line of the text content, exit (this text contents does not need to be unfolded).

Remove the 2-line header from the text content.

For each line in the text content, from top-to-bottom, if the line has a backslash ('\') character immediately followed by the end of line character sequence, then the line can be unfolded. Remove the backslash ('\') character, the end of line character sequence, and any leading space (' ') characters, which will bring up the next line. Then continue to scan each line in the text content starting with the current line (in case it was multiply folded).

Continue in this manner until reaching the end of the text content.

The process described in this section is illustrated by the "unfold\_it\_1()" function in [Appendix A](#).

## **[8.](#) The Double Backslash Strategy ('\')**

### **[8.1.](#) Folded Structure**

Text content that has been folded as specified by this strategy MUST adhere to the following structure.

#### **[8.1.1.](#) Header**

The header is two lines long.

The first line is the following 46-character string that MAY be surrounded by any number of printable characters. This first line cannot itself be folded.





NOTE: '\\' line wrapping per BCP XX (RFC XXXX)

[Note to RFC Editor: Please replace XX and XXXX with the numbers assigned to this document and delete this note. Please make this change in multiple places in this document.]

The second line is a blank line. This line provides visual separation for readability.

### **8.1.2. Body**

The character encoding is the same as described in [Section 2 of \[RFC7994\]](#), except that, per [\[RFC7991\]](#), tab characters are prohibited.

Lines that have a backslash ('\') occurring as the last character in a line immediately followed by the end of line character sequence, when the subsequent line starts with a backslash ('\') as the first non-space (' ') character, are considered "folded".

Really long lines may be folded multiple times.

## **8.2. Algorithm**

This section describes a process for folding and unfolding long lines when they are encountered in text content.

The steps are complete, but implementations MAY achieve the same result in other ways.

When a larger document contains multiple instances of text content that may need to be folded or unfolded, another process must insert/extract the individual text content instances to/from the larger document prior to utilizing the algorithms described in this section. For example, the `xiac` utility [\[xiaz\]](#) does this.

### **8.2.1. Folding**

Determine the desired maximum line length from input to the line-wrapping process, such as from a command line parameter. If no value is explicitly specified, the value "69" SHOULD be used.

Ensure that the desired maximum line length is not less than the minimum header, which is 46 characters. If the desired maximum line length is less than this minimum, exit (this text-based content cannot be folded).

Scan the text content for horizontal tab characters. If any horizontal tab characters appear, either resolve them to space



characters or exit, forcing the input provider to convert them to space characters themselves first.

Scan the text content to see if any line exceeds the desired maximum. If no line exceeds the desired maximum, exit (this text content does not need to be folded).

Scan the text content to ensure no existing lines already end with a backslash ('\') character while the subsequent line starts with a backslash ('\') character as the first non-space (' ') character, as this could lead to an ambiguous result. If such a line is found, and its width is less than the desired maximum, then it SHOULD be flagged for forced folding (folding even though unnecessary). If the folding implementation doesn't support forced foldings, it MUST exit.

If this text content needs to and can be folded, insert the header described in [Section 8.1.1](#), ensuring that any additional printable characters surrounding the header does not result in a line exceeding the desired maximum.

For each line in the text content, from top-to-bottom, if the line exceeds the desired maximum, or requires a forced folding, then fold the line by:

1. Determine where the fold will occur. This location MUST be before or at the desired maximum column.
2. At the location where the fold is to occur, insert a first backslash ('\') character followed by the end of line character sequence.
3. On the following line, insert any number of space (' ') characters followed by a second backslash ('\') character.

The result of the previous operation is that the next line starts with an arbitrary number of space (' ') characters, followed by a backslash ('\') character, immediately followed by the character that was previously occupying the position where the fold occurred.

Continue in this manner until reaching the end of the text content. Note that this algorithm naturally addresses the case where the remainder of a folded line is still longer than the desired maximum, and hence needs to be folded again, ad infinitum.

The process described in this section is illustrated by the "fold\_it\_2()" function in [Appendix A](#).



### **8.2.2. Unfolding**

Scan the beginning of the text content for the header described in [Section 8.1.1](#). If the header is not present, starting on the first line of the text content, exit (this text content does not need to be unfolded).

Remove the 2-line header from the text content.

For each line in the text content, from top-to-bottom, if the line has a backslash ('\') character immediately followed by the end of line character sequence, and if the next line has a backslash ('\') character as the first non-space (' ') character, then the lines can be unfolded. Remove the first backslash ('\') character, the end of line character sequence, any leading space (' ') characters, and the second backslash ('\') character, which will bring up the next line. Then continue to scan each line in the text content starting with the current line (in case it was multiply folded).

Continue in this manner until reaching the end of the text content.

The process described in this section is illustrated by the "unfold\_it\_2()" function in [Appendix A](#).

## **9. Examples**

The following self-documenting examples illustrate folded text-based content.

The source text content cannot be presented here, as it would again be folded. Alas, only the results can be provided.

### **9.1. Example Showing Boundary Conditions**

This example illustrates boundary condition. The input contains seven lines, each line one character longer than the previous line. Numbers for counting purposes. The default desired maximum column value "69" is used.

#### **9.1.1. Using '\'**



===== NOTE: '\' line wrapping per BCP XX (RFC XXXX) =====

```
12345678901234567890123456789012345678901234567890123456
123456789012345678901234567890123456789012345678901234567
1234567890123456789012345678901234567890123456789012345678
12345678901234567890123456789012345678901234567890123456789
1234567890123456789012345678901234567890123456789012345678\
90
1234567890123456789012345678901234567890123456789012345678\
901
1234567890123456789012345678901234567890123456789012345678\
9012
```

#### [9.1.2.](#) Using '\'

===== NOTE: '\\' line wrapping per BCP XX (RFC XXXX) =====

```
12345678901234567890123456789012345678901234567890123456
123456789012345678901234567890123456789012345678901234567
1234567890123456789012345678901234567890123456789012345678
12345678901234567890123456789012345678901234567890123456789
1234567890123456789012345678901234567890123456789012345678\
\90
1234567890123456789012345678901234567890123456789012345678\
\901
1234567890123456789012345678901234567890123456789012345678\
\9012
```

### [9.2.](#) Example Showing Multiple Wraps of a Single Line

This example illustrates what happens when very long line needs to be folded multiple times. The input contains one line containing 280 characters. Numbers for counting purposes. The default desired maximum column value "69" is used.

#### [9.2.1.](#) Using '\'

===== NOTE: '\' line wrapping per BCP XX (RFC XXXX) =====

```
1234567890123456789012345678901234567890123456789012345678\
9012345678901234567890123456789012345678901234567890123456\
7890123456789012345678901234567890123456789012345678901234\
5678901234567890123456789012345678901234567890123456789012\
34567890
```





### [9.2.2.](#) Using '\\'

===== NOTE: '\\ line wrapping per BCP XX (RFC XXXX) =====

```
1234567890123456789012345678901234567890123456789012345678\
\901234567890123456789012345678901234567890123456789012345\
\678901234567890123456789012345678901234567890123456789012\
\345678901234567890123456789012345678901234567890123456789\
\01234567890
```

### [9.3.](#) Example Showing "Smart" Folding

This example illustrates how readability can be improved via "smart" folding, whereby folding occurs at format-specific locations and format-specific indentations are used.

The text content was manually folded, since the script in the appendix does not implement smart folding.

Note that the headers are surrounded by different printable characters than shown in the script-generated examples.

#### [9.3.1.](#) Using '\\'

[NOTE: '\\ line wrapping per BCP XX (RFC XXXX)]

```
<yang-library
  xmlns="urn:ietf:params:xml:ns:yang:ietf-yang-library"
  xmlns:ds="urn:ietf:params:xml:ns:yang:ietf-datastores">

  <module-set>
    <name>config-modules</name>
    <module>
      <name>ietf-interfaces</name>
      <revision>2018-02-20</revision>
      <namespace>\
        urn:ietf:params:xml:ns:yang:ietf-interfaces\
      </namespace>
    </module>
    ...
  </module-set>
  ...
</yang-library>
```

Below is the equivalent to the above, but it was folded using the script in the appendix.



===== NOTE: '\\' line wrapping per BCP XX (RFC XXXX) =====

```
<yang-library
  xmlns="urn:ietf:params:xml:ns:yang:ietf-yang-library"
  xmlns:ds="urn:ietf:params:xml:ns:yang:ietf-datastores">

  <module-set>
    <name>config-modules</name>
    <module>
      <name>ietf-interfaces</name>
      <revision>2018-02-20</revision>
      <namespace>urn:ietf:params:xml:ns:yang:ietf-interfaces</namesp\
ace>
    </module>
    ...
  </module-set>
  ...
</yang-library>
```

#### [9.3.2.](#) Using '\\'

[NOTE: '\\ ' line wrapping per BCP XX (RFC XXXX)]

```
<yang-library
  xmlns="urn:ietf:params:xml:ns:yang:ietf-yang-library"
  xmlns:ds="urn:ietf:params:xml:ns:yang:ietf-datastores">

  <module-set>
    <name>config-modules</name>
    <module>
      <name>ietf-interfaces</name>
      <revision>2018-02-20</revision>
      <namespace>\
        \urn:ietf:params:xml:ns:yang:ietf-interfaces\
      </namespace>
    </module>
    ...
  </module-set>
  ...
</yang-library>
```

Below is the equivalent to the above, but it was folded using the script in the appendix.



===== NOTE: '\\' line wrapping per BCP XX (RFC XXXX) =====

```
<yang-library
  xmlns="urn:ietf:params:xml:ns:yang:ietf-yang-library"
  xmlns:ds="urn:ietf:params:xml:ns:yang:ietf-datastores">

  <module-set>
    <name>config-modules</name>
    <module>
      <name>ietf-interfaces</name>
      <revision>2018-02-20</revision>
      <namespace>urn:ietf:params:xml:ns:yang:ietf-interfaces</namesp\
\ace>
      </module>
      ...
    </module-set>
    ...
  </yang-library>
```

#### 9.4. Example Showing "Forced" Folding

This example illustrates how invalid sequences in lines that do not have to be folded can be handled via forced folding, whereby the folding occurs even though unnecessary.

The following line exceeds a 68-char max, thus demands folding  
 123456789012345678901234567890123456789012345678901234567890123456789

This line ends with a backslash \

This line ends with a backslash \  
 \ This line begins with a backslash

Following is an indented 3x3 block of backslashes:

```
  \\\
  \\\
  \\\
```

The samples below were manually folded, since the script in the appendix does not implement forced folding.

Note that the headers are prefixed by a pound ('#') character, rather than surrounded by equal ('=') characters as shown in the script-generated examples.



#### [9.4.1.](#) Using '\'

# NOTE: '\' line wrapping per BCP XX (RFC XXXX)

The following line exceeds a 68-char max, thus demands folding  
123456789012345678901234567890123456789012345678901234567\  
89

This line ends with a backslash \

This line ends with a backslash \

\ This line begins with a backslash

Following is an indented 3x3 block of backslashes:

\\\

\\\

\\

#### [9.4.2.](#) Using '\\'

# NOTE: '\\' line wrapping per BCP XX (RFC XXXX)

The following line exceeds a 68-char max, thus demands folding  
123456789012345678901234567890123456789012345678901234567\  
\89

This line ends with a backslash \

This line ends with a backslash \

\

\ This line begins with a backslash

Following is an indented 3x3 block of backslashes:

\\\

\

\\\

\

\\

## [10.](#) Security Considerations

This BCP has no Security Considerations.





## **11. IANA Considerations**

This BCP has no IANA Considerations.

## **12. References**

### **12.1. Normative References**

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### **12.2. Informative References**

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## [Appendix A](#). **POSIX Shell Script: rfcfold**

This non-normative appendix section includes a shell script that can both fold and unfold text content using both the single and double backslash strategies described in [Section 7](#) and [Section 8](#) respectively.

This script is intended to be applied to a single text content instance. If it is desired to fold or unfold text content instances within a larger document (e.g., an Internet draft or RFC), then another tool must be used to extract the content from the larger document before utilizing this script.

For readability purposes, this script forces the minimally supported line length to be eight characters longer than the raw header text defined in [Section 7.1.1](#) and [Section 8.1.1](#) so as to ensure that the header can be wrapped by a space (' ') character and three equal ('=') characters on each side of the raw header text.

This script does not implement the whitespace-avoidance logic described in [Section 7.2.1](#). In such case, the script will exit with one of the following message:

```
Error: infile has a space character occuring on the
      folding column. This file cannot be folded using the
      '\' strategy.
```

This script does not implement the "forced folding" logic described in [Section 7.2.1](#) or [Section 8.2.1](#). In such cases the script will exit with one of the following message:

```
Error: infile has a line ending with a '\' character
      This file cannot be folded using the '\' strategy.
```

```
Error: infile has a line ending with a '\' character
      followed by a '\' character as the first non-space
      character on the next line. This script cannot fold
      this file using '\\' strategy without there being
      false positives produced in the unfolding (i.e., this
      script does not attempt to proactively force-fold such
      lines, as described in RFC XXXX).
```

Shell-level end-of-line backslash ('\') characters have been purposely added to the script so as to ensure that the script is itself not folded in this document, thus simplify the ability to copy/paste the script for local use. As should be evident by the lack of the mandatory header described in [Section 7.1.1](#), these



backslashes do not designate a folded line, such as described in [Section 7](#).

<CODE BEGINS>

```
#!/bin/bash --posix

# This script may need some adjustments to work on a given system.
# For instance, the utilities `pcgrep` and `gsed` may need to
# be installed. Also, please be advised that `bash` (not `sh`)
# must be used.

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# ADVISED OF THE POSSIBILITY OF SUCH DAMAGE.

print_usage() {
    printf "\n"
    printf "Folds or unfolds the input text file according to BCP XX"
```



```

    printf " (RFC XXXX).\n"
    printf "\n"
    printf "Usage: rfcfold [-s <strategy>] [-c <col>] [-r] -i <infile>"
    printf " -o <outfile>\n"
    printf "\n"
    printf "  -s: strategy to use, '1' or '2' (default: try 1,"
    printf " else 2)\n"
    printf "  -c: column to fold on (default: 69)\n"
    printf "  -r: reverses the operation\n"
    printf "  -i: the input filename\n"
    printf "  -o: the output filename\n"
    printf "  -d: show debug messages\n"
    printf "  -q: quiet (suppress error messages)\n"
    printf "  -h: show this message\n"
    printf "\n"
    printf "Exit status code: 1 on error, 0 on success, -1 on no-op.\n"
    printf "\n"
}

# global vars, do not edit
strategy=0 # auto
debug=0
quiet=0
reversed=0
infile=""
outfile=""
maxcol=69 # default, may be overridden by param
hdr_txt_1="NOTE: '\\\'' line wrapping per BCP XX (RFC XXXX)"
hdr_txt_2="NOTE: '\\\\\'\' line wrapping per BCP XX (RFC XXXX)"
equal_chars="===== "
space_chars=" "
temp_dir=""

# determine name of [g]sed binary
type gsed > /dev/null 2>&1 && SED=gsed || SED=sed

# warn if a non-GNU sed utility is used
"$SED" --version < /dev/null 2> /dev/null \
| grep GNU >/dev/null 2>&1 || echo 'Warning: not using GNU `sed`.'

# verify the availability of pcregrep
type pcregrep > /dev/null 2>&1 || {
    echo 'Error: missing utility `pcregrep`'
    exit 1
}

cleanup() {
    rm -rf "$temp_dir"

```





```

}
trap 'cleanup' EXIT

fold_it_1() {
    # ensure input file doesn't contain the fold-sequence already
    pcregrep -M "\\n" $infile >> /dev/null 2>&1
    if [[ $? -eq 0 ]]; then
        if [[ $quiet -eq 0 ]]; then
            echo
            echo "Error: infile $infile has a line ending with a '\\'"
            echo "character. This file cannot be folded using the '\\'"
            echo "strategy."
            echo
        fi
        return 1
    fi

    # where to fold
    foldcol=`expr "$maxcol" - 1` # for the inserted '\\' char

    # ensure input file doesn't contain whitespace on the fold column
    grep "^.\{$foldcol\} " $infile >> /dev/null 2>&1
    if [[ $? -eq 0 ]]; then
        if [[ $quiet -eq 0 ]]; then
            echo
            echo "Error: infile has a space character occurring on the"
            echo "folding column. This file cannot be folded using the"
            echo "'\\' strategy."
            echo
        fi
        return 1
    fi

    # center header text
    length=`expr ${#hdr_txt_1} + 2`
    left_sp=`expr \( "$maxcol" - "$length" \) / 2`
    right_sp=`expr "$maxcol" - "$length" - "$left_sp"`
    header=`printf "%.s %s %.s" "$left_sp" "$equal_chars" \
        "$hdr_txt_1" "$right_sp" "$equal_chars"`

    # generate outfile
    echo "$header" > $outfile
    echo "" >> $outfile
    "$SED" 's/\(.\{"$foldcol"\}\)\(..\)/\1\\n\2/;t M;b;;M;P;D;' \
        < $infile >> $outfile 2>/dev/null
    if [[ $? -ne 0 ]]; then
        return 1
    fi
}

```



```
    return 0
}

fold_it_2() {
    # where to fold
    foldcol=`expr "$maxcol" - 1` # for the inserted '\\' char

    # ensure input file doesn't contain the fold-sequence already
    pcregrep -M "\\n[\ ]*\\n" $infile >> /dev/null 2>&1
    if [[ $? -eq 0 ]]; then
        if [[ $quiet -eq 0 ]]; then
            echo
            echo "Error: infile has a line ending with a '\\' character"
            echo "followed by a '\\' character as the first non-space"
            echo "character on the next line. This script cannot fold"
            echo "this file using '\\n' strategy without there being"
            echo "false positives produced in the unfolding (i.e., this"
            echo "script does not attempt to proactively force-fold such"
            echo "lines, as described in RFC XXXX)."
            echo
        fi
        return 1
    fi

    # center header text
    length=`expr ${#hdr_txt_2} + 2`
    left_sp=`expr \( "$maxcol" - "$length" \) / 2`
    right_sp=`expr "$maxcol" - "$length" - "$left_sp"`
    header=`printf "%.s %s %.s" "$left_sp" "$equal_chars" \
        "$hdr_txt_2" "$right_sp" "$equal_chars"`

    # generate outfile
    echo "$header" > $outfile
    echo "" >> $outfile
    "$SED" 's/\(.\{"$foldcol"\}\)\(..\)/\1\\n\\2/;t M;b;:M;P;D;' \
        < $infile >> $outfile 2>/dev/null
    if [[ $? -ne 0 ]]; then
        return 1
    fi
    return 0
}

fold_it() {
    # ensure input file doesn't contain a TAB
    grep $'\t' $infile >> /dev/null 2>&1
    if [[ $? -eq 0 ]]; then
        if [[ $quiet -eq 0 ]]; then
            echo
        fi
    fi
}
```



```
        echo "Error: infile contains a TAB character, which is"
        echo "not allowed."
        echo
    fi
    return 1
fi

# check if file needs folding
testcol=`expr "$maxcol" + 1`
grep ".\{$testcol\}" $infile >> /dev/null 2>&1
if [ $? -ne 0 ]; then
    if [[ $debug -eq 1 ]]; then
        echo "nothing to do"
    fi
    cp $infile $outfile
    return -1
fi

if [[ $strategy -eq 1 ]]; then
    fold_it_1
    return $?
fi
if [[ $strategy -eq 2 ]]; then
    fold_it_2
    return $?
fi
quiet_sav=$quiet
quiet=1
fold_it_1
result=$?
quiet=$quiet_sav
if [[ $result -ne 0 ]]; then
    if [[ $debug -eq 1 ]]; then
        echo "Folding strategy 1 didn't succeed, trying strategy 2..."
    fi
    fold_it_2
    return $?
fi
return 0
}

unfold_it_1() {
    temp_dir=`mktemp -d`

    # output all but the first two lines (the header) to wip file
    awk "NR>2" $infile > $temp_dir/wip

    # unfold wip file
```



```
"$SED" '{H;$!d};x;s/^\\n//;s/\\\\\\n *\\/g' $temp_dir/wip > $outfile

return 0
}

unfold_it_2() {
    temp_dir=`mktemp -d`

    # output all but the first two lines (the header) to wip file
    awk "NR>2" $infile > $temp_dir/wip

    # unfold wip file
    "$SED" '{H;$!d};x;s/^\\n//;s/\\\\\\n *\\/g' $temp_dir/wip > $outfile

    return 0
}

unfold_it() {
    # check if file needs unfolding
    line=`head -n 1 $infile`
    result=`echo $line | fgrep "$hdr_txt_1"`
    if [ $? -eq 0 ]; then
        unfold_it_1
        return $?
    fi
    result=`echo $line | fgrep "$hdr_txt_2"`
    if [ $? -eq 0 ]; then
        unfold_it_2
        return $?
    fi
    if [[ $debug -eq 1 ]]; then
        echo "nothing to do"
    fi
    cp $infile $outfile
    return -1
}

process_input() {
    while [ "$1" != "" ]; do
        if [ "$1" == "-h" -o "$1" == "--help" ]; then
            print_usage
            exit 1
        fi
        if [ "$1" == "-d" ]; then
            debug=1
        fi
        if [ "$1" == "-q" ]; then
            quiet=1
        fi
    done
}
```





```
fi
if [ "$1" == "-s" ]; then
    strategy="$2"
    shift
fi
if [ "$1" == "-c" ]; then
    maxcol="$2"
    shift
fi
if [ "$1" == "-r" ]; then
    reversed=1
fi
if [ "$1" == "-i" ]; then
    infile="$2"
    shift
fi
if [ "$1" == "-o" ]; then
    outfile="$2"
    shift
fi
shift
done

if [[ -z "$infile" ]]; then
    if [[ $quiet -eq 0 ]]; then
        echo
        echo "Error: infile parameter missing (use -h for help)"
        echo
    fi
    exit 1
fi

if [[ -z "$outfile" ]]; then
    if [[ $quiet -eq 0 ]]; then
        echo
        echo "Error: outfile parameter missing (use -h for help)"
        echo
    fi
    exit 1
fi

if [[ ! -f "$infile" ]]; then
    if [[ $quiet -eq 0 ]]; then
        echo
        echo "Error: specified file \"$infile\" is does not exist."
        echo
    fi
    exit 1
fi
```



```
fi

if [[ $strategy -eq 2 ]]; then
    min_supported=`expr ${#hdr_txt_2} + 8`
else
    min_supported=`expr ${#hdr_txt_1} + 8`
fi
if [[ $maxcol -lt $min_supported ]]; then
    if [[ $quiet -eq 0 ]]; then
        echo
        echo "Error: the folding column cannot be less than"
        echo "$min_supported."
        echo
    fi
    exit 1
fi

# this is only because the code otherwise runs out of equal_chars
max_supported=`expr ${#equal_chars} + 1 + ${#hdr_txt_1} + 1\`
    + ${#equal_chars}`
if [[ $maxcol -gt $max_supported ]]; then
    if [[ $quiet -eq 0 ]]; then
        echo
        echo "Error: the folding column cannot be more than"
        echo "$max_supported."
        echo
    fi
    exit 1
fi
}

main() {
    if [ "$#" == "0" ]; then
        print_usage
        exit 1
    fi

    process_input $@

    if [[ $reversed -eq 0 ]]; then
        fold_it
        code=$?
    else
        unfold_it
        code=$?
    fi
    exit $code
}
```



```
main "$@"
```

```
<CODE ENDS>
```

#### Acknowledgements

The authors thank the RFC Editor for confirming that there was previously no set convention for handling long lines in sourcecode inclusions, thus instigating this work.

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