

# The subcaption package\*

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## Abstract

This tiny package demonstrates the sub-caption feature of the caption package.

- ▲ At the end of each section, text marked with the mountain symbol will contain background knowledge on how the particular command or environment is actually implemented. If you just want to use this package as it is, you don't have to read or understand them.
- ▲ This package demonstrates the usage of `\DeclareCaptionSubType`, `\captionsetup{sub-type}`, and the internal hook `\caption@subtypehook` (offered by the caption package).

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# 1 The user interface

Just load this package after the caption package, e.g.:

```
\usepackage[options]{caption}
\usepackage[options]{subcaption}
```

The options for the subcaption package are the same ones as for the caption package, but specify settings which are used for sub-captions *additionally*. In fact

```
\usepackage[options]{subcaption}
```

is identical to

```
\usepackage{subcaption}
\captionsetup[sub]{options}
```

The default settings for subcaptions are:

```
margin=0pt, font+=small, labelformat=parens, labelsep=space,
skip=6pt, list=false, hypcap=false1
```

Options specified with `\usepackage[...]{subcaption}` and `\captionsetup[sub]{...}` will override the ones specified by `\captionsetup{...}` and `\captionsetup[figure]{...}`, but are again overwritten by `\captionsetup[subfigure]{...}` (same for ‘table’).

So finally we have the following order how settings for sub-captions are applied:

1. global settings (`\usepackage[...]{caption}` and `\captionsetup{...}`)
2. environmental settings (`\captionsetup[figure -or- table]{...}`)
3. local settings (`\captionsetup{...}` inside figure or table environment)
4. default ‘sub’ settings (`margin=0pt, font+=small, ...`, see above)
5. custom ‘sub’ settings (`\usepackage[...]{subcaption}` and `\captionsetup[sub]{...}`)
6. environmental ‘sub’ settings (`\captionsetup[subfigure -or- subtable]{...}`)
7. local ‘sub’ settings (`\captionsetup{...}` inside subfigure or subtable)

An example:

```
\usepackage[labelsep=quad, indentation=10pt]{caption}
\usepackage[labelfont=bf, list=true]{subcaption}
\captionsetup[table]{textfont=it, position=top}
\captionsetup[subtable]{textfont=sf}
```

causes the captions inside subtable environments to be typeset with the settings

```
indentation=10pt, position=top, margin=0pt, font=small,
labelformat=parens, labelsep=space, skip=6pt, hypcap=false,
labelfont=bf, list=true, textfont=sf .
```

---

<sup>1</sup>This means that sub-captions are not listed in the List of Figures or Tables by default, but (of course) you can enable that by specifying the option `list=true`.

## 1.1 The `\subcaption` command

`\subcaption` The easiest and most flexible method to apply a sub-caption is by using the `\subcaption` command. Its syntax is analogous to the one of the `\caption` command and shares its features:

```
\subcaption[{list entry}]{{heading}}
\subcaption*{{heading}}
```

Please note that the `\subcaption` command *must* be applied inside its own box or environment.

An example:

```
\begin{figure}
  \begin{minipage}[b]{.5\linewidth}
    \centering\large A
    \subcaption{A subfigure}\label{fig:1a}
  \end{minipage}%
  \begin{minipage}[b]{.5\linewidth}
    \centering\large B
    \subcaption{Another subfigure}\label{fig:1b}
  \end{minipage}
  \caption{A figure}\label{fig:1}
\end{figure}
```

gives the result:

<b>A</b>	<b>B</b>
(a) A subfigure	(b) Another subfigure

Figure 1: A figure

- ▲ Prepared with either `\DeclareCaptionSubType` (offered by the `caption` package) or `\newsubfloat` (offered by the `subfig` package), the `caption` package option `subtype` becomes available. Analogous to the `type` option of the `caption` package, the `subtype` option sets the sub-type of the box or environment (so `\caption` will typeset a sub-caption instead of an ordinary one), places a proper hyperlink anchor (non-starred variant only), executes options associated with the sub-type etc.

The `\subcaption` command is just a simple combination of `\captionsetup{subtype*}` and `\caption`.

## 1.2 The subfigure & subtable environments

`subfigure`    After loading the subcaption package the new environments `subfigure` and `subtable`  
`subtable`    are available, which have the same (optional & mandatory) arguments as the `minipage` environment. Inside these environments you use the ordinary `\caption` command for typesetting captions. So this example is identical to the last one, but uses the `subfigure` environment:

```
\begin{figure}
  \begin{subfigure}[b]{.5\linewidth}
    \centering\large A
    \caption{A subfigure}\label{fig:1a}
  \end{subfigure}%
  \begin{subfigure}[b]{.5\linewidth}
    \centering\large B
    \caption{Another subfigure}\label{fig:1b}
  \end{subfigure}
  \caption{A figure}\label{fig:1}
\end{figure}
```

Using the `subfigure` or `subtable` environment instead of `\subcaption` has two (little) advantages:

- You can override the settings for a specific subcaption with a `\captionsetup` inside the `subfigure` or `subtable` environment, e.g.:

```
...
\begin{subfigure}[b]{.5\linewidth}
  \centering\large A
  \captionsetup{skip=3pt}
  \caption{A subfigure}\label{fig:1a}
\end{subfigure}
...
```

- Hyperlinks pointing to this subfigure will jump to the beginning of the subfigure, and not to the caption of the subfigure (if `hypcap=true` is set for sub-captions). (See [section 1.6: Where do hyperlinks jump?](#))

▲ The `subfigure` & `subtable` environments are just simple `minipage` environments with `\captionsetup{subtype}` as first contents line. These environments are defined with the help of `\caption@For{subtypelist}`, which executes code for every sub-type declared with `\DeclareCaptionSubType`.

### 1.3 The `\subcaptionbox` command

`\subcaptionbox` A more powerful (but less flexible) way of setting sub-figures is offered by the `\subcaptionbox` command. Its syntax is:

```
\subcaptionbox[<list entry>]{<heading>}[<width>][<inner-pos>]{<contents>}  
\subcaptionbox*{<heading>}[<width>][<inner-pos>]{<contents>}
```

The arguments *<list entry>* & *<heading>* will be used for typesetting the `\caption`.

*<width>* is the width of the resulting `\parbox`; the default value is the width of the contents.

*<inner-pos>* specifies how the contents will be justified inside the resulting `\parbox`; it can be either 'c' (for `\centering`), 'l' (for `\raggedright`), 'r' (for `\raggedleft`), or 's' (for no special justification). The default is 'c'. (But you can use any justification defined with `\DeclareCaptionJustification` as well, e.g. 'centerlast'.)

Using `\subcaptionbox`, the baseline of the resulting box will be placed right between contents and heading, so usually you don't have to care about the vertical alignment of the sub-figures for yourself. Also the hyperlink anchor is placed properly with respect to the `hypcap=` setting.

One example:

```
\begin{figure}  
  \centering  
  \subcaptionbox{A cat\label{cat}}  
    {\includegraphics{cat}}  
  \subcaptionbox{An elephant\label{elephant}}  
    {\includegraphics{elephant}}  
  \caption{Two animals}\label{animals}  
\end{figure}
```

gives the result:

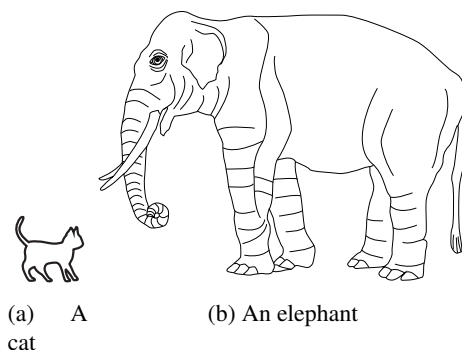


Figure 2: Two animals<sup>2</sup>

As you see the result is not satisfying; the caption below the cat looks ugly because of the small width of the graphic. This can be solved by using the optional arguments of `\captionbox`, increasing the width of the resulting box:

<sup>2</sup>The pictures were taken with permission from the `LATEX Companion`[1] examples.

```

...
\subcaptionbox{A cat\label{cat}}
  [2.5cm]{\includegraphics{cat}}
...

```

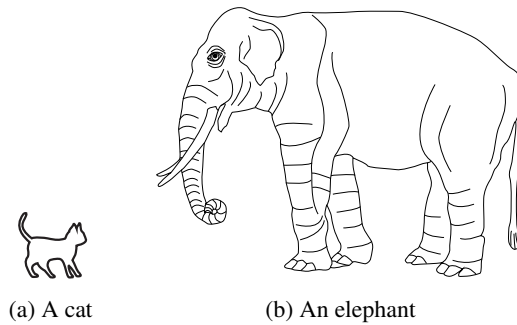


Figure 3: Two animals

Furthermore the main caption, which is centered with respect to the `\textwidth`, looks mis-aligned with respect to the sub-captions. This can (again) be solved by using the optional arguments of `\captionbox`, giving both boxes the same width, for example:

```

...
\subcaptionbox{A cat\label{cat}}
  [.4\linewidth]{\includegraphics{cat}}%
\subcaptionbox{An elephant\label{elephant}}
  [.4\linewidth]{\includegraphics{elephant}}
...

```

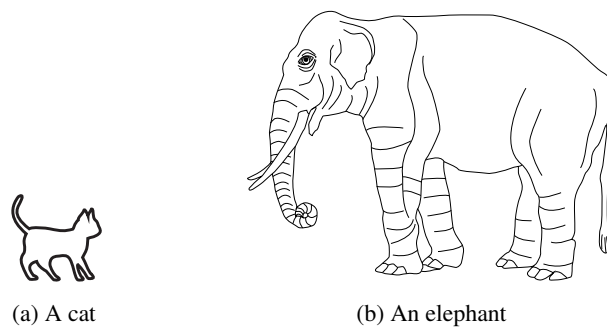


Figure 4: Two animals

▲ The `\subcaptionbox` is a `\parbox` with `\captionsetup{subtype}` as first contents line.

## 1.4 The `\subref` command

While `\ref{<key>}` (and `\ref*{<key>}`, if the `hyperref` package is used) usually gives a combined result representing the main caption counter and the sub-caption one, it is sometimes useful to have a reference to the sub-caption only. For this purpose you can use

```
\subref{<key>}
\subref*{<key>}3 .
```

So for example `\ref{cat}` gives the result ‘2a’ but `\subref{cat}` gives ‘a’.

*Note:* If the sub-caption was defined with the starred variant `\DeclareCaptionSubType*`, both `\ref` and `\subref` gives the same result.

- ▲ The `\subref` command demonstrates the usage of `\caption@subtyphook` which will be called during `\captionsetup{subtype}`.

## 1.5 The `\DeclareCaptionSubType` command

`\DeclareCaptionSubType` For using the sub-caption feature of the caption package some commands and counters must be prepared. This is done with<sup>4</sup>

```
\DeclareCaptionSubType[<numbering scheme>]{<type>}
\DeclareCaptionSubType*[<numbering scheme>]{<type>}
```

For the environments `figure` & `table` (and all the ones defined with `\DeclareCaptionType`) this will be done automatically by this package, but for others (e.g. defined with `\newfloat` offered by the `float` package or `\DeclareNewFloatType` offered by the `floatrow` package) this has to be done manually.

The starred variant provides the sub-caption numbering format `<type>.<subtype>` (e.g. ‘1.2’) while the non-starred variant simply uses `<subtype>` (e.g. ‘a’).

Own numbering formats can be created by redefining `\thesub<type>`, e.g.

```
\DeclareCaptionSubType*{figure}
\renewcommand\thesubfigure{\thefigure\alph{subfigure}}
```

would give you sub-caption numbers like ‘1b’.

The default numbering scheme is `alph`, but you can use any  $\LaTeX$  command name here which converts a counter to a text value, e.g. `arabic`, `roman`, `Roman`, `alph`, `Alph`, `fnsymbol`, ...

But `\DeclareCaptionSubType` is not for defining new sub-caption types only, you can use this command for re-definitions as well, e.g.

```
\DeclareCaptionSubType*[arabic]{table}
\captionsetup[subtable]{labelformat=simple,labelsep=colon}
```

---

<sup>3</sup>Like `\ref*`, `\subref*` is only available if the `hyperref` package<sup>[3]</sup> is used.

<sup>4</sup>`\newsfloat` offered by the `subfig` package<sup>[5]</sup> could be used for this purpose as well.

will give you sub-captions in tables like these ones:

Table 1: Two tables

1.1: Table one	1.2: Table two
A B	E F
C D	G H

▲ `\DeclareCaptionSubType` is an integral part of the caption package kernel.

## 1.6 Where do hyperlinks jump?

For the `subfigure` & `subtable` environments and `\subcaptionbox` boxes (and own constructs which use `\captionsetup{subtype}`) the hyperlink anchors will be placed in respect to the `hycap=` setting. While usage of this option is straight-forward ordinary captions, the usage for sub-captions depends on the setting for the main captions. This table gives you an overview where the hyperlinks will jump:

caption subcaption	hycap=false	hycap=true
hycap=false	sub-caption	figure or table <i>(default setting)</i>
hycap=true	sub-figure or sub-table	sub-figure or sub-table

But if `\subcaption` is used and `hycap=true` is set for sub-captions, the `subcaption` package does not know where the sub-figure or sub-table actually begins, so it will jump to the sub-caption instead.

*Remember:* If you use the `hycap` package[4], it controls the placement of the hyperlink anchors, making the rules above invalid.

(See also the documentation of the caption package, sections about `hyperref` & `hycap`.)

## 1.7 Beyond this package

For a more advanced usage of the sub-caption feature of the caption package, please take a look at the `floatrow` package[2] which provides the powerful `subfloatrow` environment for typesetting sub-figures.

## 2 Thanks

I would like to thank Stephen Dalton who helped to make this package a better one.



## 3 The implementation

### 3.1 Identification

```
1 \NeedsTeXFormat{LaTeX2e}[1994/12/01]
2 \ProvidesPackage{subcaption}[2008/08/31 v1.0b Adding subcaptions (AR)]
```

### 3.2 Initial code

We need the caption package, so we issue an error here if it's not loaded yet.

```
3 \@ifundefined{caption@subtypehook}{% we need caption v3.1f or newer
4   \PackageError{subcaption}{`caption' package not loaded\MessageBreak
5     (which is needed by this package)\@gobble}{%
6     If you do not understand this error, please take a closer look\MessageBreak
7     at the documentation of the `subcaption' package.\MessageBreak
8     \@ehc}%
9   \endinput}{}
```

### 3.3 Execution of options

We map `\caption@setkeys` to `\captionsetup[sub]` so `\caption@ExecuteOptions` & `\caption@ProcessOptions` adds the options to the 'sub' option list instead of executing them immediately.

```
10 \let\caption@setkeys@ORI\caption@setkeys
11 \renewcommand\caption@setkeys[2]{\captionsetup[sub]{#2}}
12 \caption@ExecuteOptions{subcaption}{%
13   font+=small,labelformat=parens,labelsep=space,skip=6pt,list=0,hypcap=0}
14 \caption@ProcessOptions*{subcaption}
15 \let\caption@setkeys\caption@setkeys@ORI
16 \let\caption@setkeys@ORI\@undefined
```

### 3.4 Main code

We call `\DeclareCaptionSubType` for figure, table, and every caption type declared with `\DeclareCaptionType` here.

```
17 \@ifundefined{c@figure}{}{\DeclareCaptionSubType{figure}}
18 \@ifundefined{c@table}{}{\DeclareCaptionSubType{table}}
19 \caption@For{typelist}{\DeclareCaptionSubType{#1}}
```

#### 3.4.1 The `\subcaption` command

`\subcaption` Without a prefacing `\captionsetup{subtype}`, `\subcaption` is some kind of `\captionof{sub\@caption}`.

*Note:* Like `\captionof`, this command is designed to be used inside an own group!

```
20 \newcommand*\subcaption{\captionsetup{subtype*}\caption}
```

But with a prefacing `\captionsetup{subtype}`, `\subcaption` is simply `\caption`.

```
21 \g@addto@macro\caption@subtypehook{\let\subcaption\caption}
```

### 3.4.2 The subfigure & subtable environments

subfigure This is just an ordinary minipage environment with `\captionsetup{subtype}`  
subtable as first contents line. It will be defined using the helper macro `\caption@For{sub-`  
`typelist}` offered by the caption kernel, so for every caption type declared with  
`\DeclareCaptionType` a corresponding ‘sub’ environment will be defined automat-

```
22 \caption@For{subtypelist}{%  
23   \newenvironment{sub#1}%  
24     {\caption@withoptargs\subcaption@minipage}%  
25     {\endminipage}}%  
  
26 \newcommand*\subcaption@minipage[2]{%  
27   \minipage#1{#2}%  
28   \captionsetup{subtype}}
```

### 3.4.3 The \subcaptionbox command

```
\subcaptionbox A \parbox with contents and sub-caption, separated by an invisible \hrule.  
29 \newcommand*\subcaptionbox{\caption@withoptargs\subcaption@box}  
30 \newcommand\subcaption@box[2]{%  
31   \@testopt{\subcaption@ibox{#1}{#2}}{\wd\@tempboxa}}  
32 \long\def\subcaption@ibox#1#2[#3]{%  
33   \@testopt{\subcaption@iibox{#1}{#2}{#3}}\subcaptionbox@hj@default}  
34 \long\def\subcaption@iibox#1#2#3[#4]#5{%  
35   \setbox\@tempboxa\hbox{#5}%  
36   \begingroup  
37     \captionsetup{subtype*}% set \caption@position  
38     \caption@iftop{%  
39       \endgroup  
40       \parbox[t]{#3}{%  
41         \captionsetup{subtype,position=t}%  
42         \vbox{\caption#1{#2}}%  
43         \subcaption@hrule  
44         \csname caption@hj@#4\endcsname  
45         \unhbox\@tempboxa}%  
46       }{%  
47         \endgroup  
48         \parbox[b]{#3}{%  
49           \captionsetup{subtype,position=b}%  
50           \csname caption@hj@#4\endcsname  
51           \unhbox\@tempboxa  
52           \subcaption@hrule  
53           \vtop{\caption#1{#2}}}%  
54       }}  
  
55 \providecommand*\caption@hj@c{\centering}  
56 \providecommand*\caption@hj@l{\raggedright}  
57 \providecommand*\caption@hj@r{\raggedleft}  
58 \providecommand*\caption@hj@s{}  
59 \newcommand*\subcaptionbox@hj@default{c}  
60 \newcommand*\subcaption@hrule{\hrule\@height\z@}
```

### 3.4.4 The `\subfloat` command

```
\subfloat <list_entry> [<sub-caption>] {<body>}
\subfloat* {<body>}
```

If `<sub-caption>` is given, we simply map this to `\subcaptionbox`. If not, we do the same as `\subcaptionbox`, but increment the sub-caption counter instead of typesetting a sub-caption. (The star variant is neither incrementing the sub-caption counter nor setting an hyperref anchor.)

```
61 \newcommand*\subfloat{%
62   \@ifnextchar[\@subfloat\subfloat@}
63 \long\def\@subfloat[#1]{%
64   \@ifnextchar[{\@subfloat{#1}}{\subcaptionbox{#1}}]
65 \long\def\@subfloat#1[#2]{\subcaptionbox[{}]{#1}[{}]{#2}}
66 \newcommand*\subfloat@{%
67   \caption@teststar\subfloat@@\@firstoftwo\@secondoftwo}
68 \newcommand\subfloat@@[2]{%
69   \setbox\@tempboxa\hbox{#2}%
70   \begingroup
71   \captionsetup{subtype*}% set \caption@position
72   \caption@iftop{\subfloat@@@ t}{\subfloat@@@ b}%
73   {#1}\subcaptionbox@hj@default}
74 \newcommand\subfloat@@@[3]{%
75   \endgroup
76   \parbox[#1]{\wd\@tempboxa}{%
77     #2% \@firstoftwo in star form, \@secondoftwo otherwise
78     {\captionsetup{subtype*,position=#1}}%
79     {\captionsetup{subtype,position=#1}}%
80     \caption@refstepcounter\@subcaptiontype
81     \caption@prepareanchor\@subcaptiontype{}%
82     \caption@makeanchor{}}%
83   \caption@iftop\subcaption@hrule\@empty
84   \csname caption@hj@#3\endcsname
85   \unhbox\@tempboxa
86   \caption@iftop\@empty\subcaption@hrule}}%
```

### 3.4.5 The `\subref` command

At `\captionsetup{subtype}`, we redefine `\label`.

```
87 \g@addto@macro\caption@subtypetoolhook{%
88   \ifx\label\subcaption@label \else
89     \let\subcaption@ORI@label\label
90     \let\label\subcaption@label
91   \fi}
```

`\subcaption@label` When a label will be placed for a sub-caption, we automatically place a second one for `\subref`, too. This second label will contain the sub-type counter only.

```
92 \newcommand*\subcaption@label[1]{%
93   \@bsphack\begingroup
94   \subcaption@ORI@label{#1}%
95   \protected@edef\@currentlabel{\csname thesub\@captiontype\endcsname}}%
```

```
96 \subcaption@ORI@label{sub@#1}%  
97 \endgroup\@esphack}
```

`\subref` This simply calls `\ref` with the second label. (see `\subcaption@label`)

```
98 \DeclareRobustCommand*\subref{\caption@withoptargs\subcaption@ref}  
99 \newcommand*\subcaption@ref[2]{\ref#1{sub@#2}}
```

## References

- [1] Frank Mittelbach and Michel Goossens:  
*The L<sup>A</sup>T<sub>E</sub>X Companion (2nd. Ed.)*, Addison-Wesley, 2004.
- [2] Olga Lapko:  
*The floatrow package documentation*, 2007/12/24
- [3] Sebastian Rahtz & Heiko Oberdiek:  
*Hypertext marks in L<sup>A</sup>T<sub>E</sub>X*, November 12, 2007
- [4] Heiko Oberdiek:  
*The hypcap package – Adjusting anchors of captions*, 2007/04/09
- [5] Steven D. Cochran:  
*The subfig package*, 2005/07/05