

# Documentation of the L<sup>A</sup>T<sub>E</sub>X packages

## sets and vhistory

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# 1 Introduction

It's clear to me that nobody reads introductions. Nevertheless I recommend not to skip this section, as it tries to explain why I developed the packages sets and vhistory. By reading the following you can see if these packages meet your requirements.

During software projects (hopefully) a lot of documents like specification or design are created. These are normally revised several times. To reconstruct changes, documents should contain a so called *revision history* aka change log. This is a table whose entries contain the following data:

- a version number,
- the date of the change,
- some kind of identification code (e. g. the initials) of the persons that made the changes (the authors),
- a summary of the changes.

Certain data of the revision history shall often be repeated at other parts of the document. Typically the title page shall quote the most recent version number and all authors of the document. The version number should although be repeated on every page, e. g. in a footer. By doing this, it is easy to verify if a page is part of the most recent version or if it is outdated.

Normally the data that is placed on say the title page, is not (automatically) taken from the revision history, but stated at another part of the document. The entries in the revision history are normally always updated. Due to stress and rush updating the data on the title page is often forgotten. This results in inconsistent documents. From my own experience I know that the list of authors is practically never correct, especially when several people edited a document in the course of time.

Therefore it would be nice if the author of a document only had to take care of the revision history. The informations on title page and in footers should be generated from the revision history automatically.

These requirements cannot be implemented without any effort, because the title page for instance is processed by  $\text{\LaTeX}$  before the revision history is even read. All relevant data therefore has to be written to a file and read again before processing the title page. As for some applications even the moment when the aux-file is read is too late, an own file with the extension hst is created. The table containing the revision history needs an own file, too, but this topic will be discussed later.

## *1 Introduction*

Another problem is the list of authors. This list cannot be created by simply concatenating the author entries, because this would result in duplicate entries. At this time the package sets was born allowing to manage simple sets of text. At every entry in the revision history, the set of authors is merged with the set of authors given at this entry. The alphabetically sorted set of authors can then be printed wherever one likes—normally on the tile page.

The following two sections describe the two packages in more detail and explain how to use them. I decided not to repeat anything of source code here. Those who are interested can take a look at the sources. I tried to structure and comment the sources in a way that makes it readable for humans.

## 2 The package vhistory

The purpose of this package was described in detail in section 1. In this section the usage of vhistory is described in detail.

### 2.1 Loading the package

As usual the package is loaded by using the command

```
\usepackage{vhistory}
```

in the preamble. Vhistory requires L<sup>A</sup>T<sub>E</sub>X 2<sub>ε</sub> and the packages sets and ltxtable (which requires longtable and tabularx). If this packages are not already loaded, vhistory will load them.

Vhistory understands several options to control its behaviour. These are listed below. An example for using options would be

```
\usepackage[tocentry, owncaptions]{vhistory}.
```

**nochapter:** If this option is used, the revision history will no be placed in an own chapter—respectively an own section if you use the document classes article or scrartcl.

**tocentry:** With this option you can cause an entry in the table of contents. Normally there won't be such an entry. If the option nochapter is used, tocentry has no effect and you are responsible for toc entries.

**owncaptions:** vhistory supports the languages Croatian, Dutch, English, French, German, Portuguese and Spanish. If you use an unsupported language, all captions (like “Revision history” or “Changes”) will be in English. In this case you might want to change captions yourself. The option owncaptions supports you in this case. More information on this topic can be found in subsection 2.3.

**tablegrid:** Setting this option will display a grid in the table representing the revision history.

**omitable:** In some applications, the output of a table is not wanted. With this option, the output of the revision history and the creation of a chapter or section is suppressed. In this case, the options nochapter, tocentry, owncaptions and tablegrid are ignored. The commands, e. g. to print all authors can still be used.

## 2.2 Usage

The Usage of vhistory is rather easy and is to be described in this subsection. It is important to know that vhistory needs two runs of L<sup>A</sup>T<sub>E</sub>X, because some data is written to external files.

### 2.2.1 Creating the revision history

The revision history is an environment:

```
\begin{versionhistory}
<entries>
\end{versionhistory}
```

An entry generally looks like:

```
\vhEntry{<Version>}{<Date>}{<Authors>}{<Changes>}
```

The authors are written in the set notation of the package sets, i. e. the character | is used as the separator. An example for entry could therefore be:

```
\vhEntry{1.1}{13.05.04}{JW|AK|KL}{Typos corrected.}
```

The \begin...starts a new chapter (or a new section respectively if article is used) if not disabled as described above.

The revision history itself is set in an “ltxtable”. As a result of that, the revision history can consist of more than one page. Lines in the columns “Author(s)” and “Changes” are broken automatically. The package ltxtable requires the table to be in a separate file. This file is generated by vhistory and has the ending “ver”.

### 2.2.2 Getting the current version number

The current version number—i. e.: the version number of the last entry—can be read with the command

```
\vhCurrentVersion.
```

The command is available right after loading the package.

### 2.2.3 Getting the current date

Analogous to the current version number, the date of the last change can be printed. By using the command

```
\vhCurrentDate
```

you will get this data. The command is available right after loading the package, too.

## 2 The package *vh*history

### 2.2.4 Putting a list of all authors

You can get a list of all authors in two ways. Via the command

```
\vhAllAuthorsSet
```

you can get the authors as a set as described in section 3. The more convenient way is using the command

```
\vhListAllAuthors.
```

This command returns an alphabetically sorted list of authors. The items of the list are comma separated. If you want another separator—e.g. & for usage in a table—to be used instead, you can redefine the command

```
\setseparator
```

from the package *sets* (compare section 3.1.2).

Sometimes you want the list to contain full names like “Jochen Wertenaueer” instead of the short form “JW”, which would probably be used in the revision history. By using the command

```
\vhListAllAuthorsLong
```

you can get this behaviour. In this case you still write “JW” in the `\entry` command (note: there is no backslash here!), but also define a macro `\JW` as shown below.

```
\newcommand{\JW}{Jochen Wertenaueer}
```

In the revision history, the text “JW” will be shown in the authors column, but `\vhListAllAuthorsLong` will use the macro `\JW`. If the macro is undefined, the short form will be shown (for this author).

Instead of `\vhListAllAuthorsLong` you can also use

```
\vhListAllAuthorsLongWithAbbrev,
```

which prints the short form in brackets after the complete name, e.g. “Jochen Wertenaueer (JW)”. Name und short form are separated by the command

```
\vhAbbrevSeparator,
```

which defaults to “\\_”. In order to avoid line breaks, you can redefine the command with

```
\renewcommand{\vhAbbrevSeparator}{~}.
```

In order to change the brackets you can redefine the commands

```
\vhAbbrevLeft and
```

```
\vhAbbrevRight
```

as needed.

### 2.2.5 Adjusting the column with in the revision history

If the width of the columns for authors and changes in the revision history does not meet your requirements, you can change the with ratio of the two columns.

## 2 The package *vhhistory*

	<code>\vhhistoryname</code>	<code>\vhversionname</code>	<code>\vhdatename</code>	<code>\vhauthorname</code>	<code>\vhchangenname</code>
Croatian	Povijest verzija	Verzija	Datum	Autor(ica)	Opis Promjena
Dutch	Wijzigingen	Herziening	Datum	Auteur(s)	Beschrijving
English	Revision History	Revision	Date	Author(s)	Description
French	Historique	Version	Date	Auteur(s)	Modifications
German	Versionshistorie	Version	Datum	Autor(en)	Änderungen
Portuguese	Tabela de Revisões	Revisão	Data	Autor(es)	Descrição
Spanish	Historial de Revisiones	Versión	Fecha	Autor(es)	Descripción

Table 1: language dependent captions

The commands

```
\renewcommand \vhAuthorColWidth{.8\hsize}
\renewcommand \vhChangeColWidth{1.2\hsize}
```

change the ratio to 2:3 (default is 1:3). When changing the widths, please take care that the widths add up to `2\hsize`.

### 2.3 Language support

As mentioned in section 2.1, *vhhistory* supports the languages Croatian, Dutch, English, French, German, Portuguese and Spanish. All language dependent captions with their defaults are listed in table 1. If the document is written in a unsupported language, the English version will be used.

By providing the option “owncaptions” you can use custom captions. This option causes *vhhistory* to default the commands in the language that was selected when *vhhistory* is loaded. Therefore it makes sense to load packages like *babel* or *ngerman* before *vhhistory*.

A caption can be changed via the command

```
\renewcommand{<Command>}{<custom text>}
```

If you prefer to use “Improvements” instead of “Description”, you have to write

```
\renewcommand{\vhchangenname}{Improvements}
```

to get the desired result.

### 2.4 Example

## 2 *The package vhistory*

```
1: \documentclass{scrartcl}
2: \usepackage{vhistory, hyperref}
3:
4: \newcommand{\docTitle}{An example for vhistory}
5:
6: \hypersetup{%
7:   pdftitle = {\docTitle},
8:   pdfkeywords = {\docTitle, Version \vhCurrentVersion
9:                 from \vhCurrentDate},
10:  pdfauthor = {\vhAllAuthorsSet}
11: }
12:
13: \usepackage{scrlayer-scrpage}
14: \pagestyle{scrheadings}
15: \ifoot{\docTitle\ -- Version \vhCurrentVersion}
16: \cfoot[]{}
17: \ofoot[\thepage]{\thepage}
18:
19: \begin{document}
20:
21: \title{\docTitle}
22: \author{\vhListAllAuthors}
23: \date{Version \vhCurrentVersion\ from \vhCurrentDate}
24: \maketitle
25:
26: \begin{versionhistory}
27:   \vhEntry{1.0}{22.01.04}{JPW|KW}{created}
28:   \vhEntry{1.1}{23.01.04}{DP|JPW}{correction}
29:   \vhEntry{1.2}{03.02.04}{DP|JPW}{revised after review}
30: \end{versionhistory}
31:
32: \end{document}
```

Figure 1: Example for the usage of vhistory



## 3 The package sets

As described in the introduction, sets was designed to support set operations. The elements of a set are normally simple Text, but you can insert commands in a set, too. These commands will—except when printing the set—not expanded. The usage of braces (`{` and `}`) unfortunately doesn't work. In this case you have to define a shortcut that doesn't need braces. However, Parameters without braces work. `"H"agar` is therefore a valid element of a set. `"\endset"` and `"\empty"` can not be part of a set.

As a document has only a few authors, not much effort was put in improving efficiency. Sets should therefore be relatively small. If you nevertheless try to create a set with hundreds or thousands of items,  $\text{T}_{\text{E}}\text{X}$ 's stack might overflow.

In most cases the sequence of items doesn't matter. This is also the case in most commands here. Exceptions will be marked.

The package sets needs  $\text{L}^{\text{A}}\text{T}_{\text{E}}\text{X} 2_{\epsilon}$ .

### 3.1 Usage

In this subsection the usage of the package sets is described. In the description, some example sets will be used:

$$\begin{aligned} A &= \{Alice, Bob, Charly\} \\ B &= \{Alice, Bob\} \\ C &= \{Bob, Dean\} \\ D &= \{Dean\} \\ L &= \emptyset \end{aligned}$$

#### 3.1.1 Constructors

To create a set, the commands

```
\newset{<set>}{<content>}
```

and

```
\newsetsimple{<set>}{<content>}
```

can be used. `<set>` is a command name to access the set from now on. The items of a set are separated with `|`. The set  $A$  could therefore be defined with:

```
\newset{\sA}{Alice|Bob|Charly}
```

The set  $L$  is defined with:

```
\newset{\sL}{}
```

### 3 The package sets

`\newset` creates a new set. This set will be sorted in alphabetical order and duplicates will be removed. So it would be no matter if in the definition of  $A$  after “Charly” a second “Alice” was inserted.

The effort for sorting and duplicate deleting is unnecessary at this point. If you want to skip these expensive steps, you can create a set with the command `\newsetsimple`, too.

Because they are needed later, we will create all sets mentioned above:

```
\newsetsimple{\sA}{Alice|Bob|Charly}
\newsetsimple{\sD}{Alice|Bob}
\newsetsimple{\sC}{Bob|Dean}
\newsetsimple{\sD}{Dean}
\newsetsimple{\sL}{}
```

#### 3.1.2 Inspectors

Inspectores help you to retrieve informations about sets and to print sets.

**Printing:** A set can be printed using the command

```
\listset.
```

The elements will be put in the sequence they are in the set. A comma is used as separator.

`\listset{\sA}` therefore leads to the following output:

Alice, Bob, Charly

Sometimes you might want to separate the items in a different way, for example with a `&` to put them in a table. In this case a (temporary) redefinition of

```
\setseparator
```

helps you. Normally this command expands to `' , \_ '`.

**Determining the size of a set:** The next inspector has the syntax

```
\sizeofset{S}\is{<counter>},
```

where `<counter>` is the name of a  $\text{\LaTeX}$  counter, which afterwards will contain the number of elements in set  $S$ . The sequence

```
\newcounter{mycounter}
\newset{\sB}{Alice|Bob}
\newset{\sL}{}
\sizeofset{\sB}\is{mycounter}
\arabic{mycounter}
```

leads to the output: “2” If you determine the size of set  $L$ , the result (as you might have expected) is “0”.

**Testing for membership:** By using the command

```
\iselementofset{e}{S}
```

you can check, whether  $e \in S$  is true. The effort is  $O(1)$ , because all work is done by the pattern matching of T<sub>E</sub>X. The sequence

```
\if \iselementofset{Bob}{\sC}Yes\else No\fi
```

would result in the output “Yes”, the same test with set  $D$  in “No”.

#### 3.1.3 Modifiers

**Union of sets:** The operation  $R := S_1 \cup S_2$  is realized in the command

```
\unionsets{S1}{S2}\to{R}.
```

Table 2 contains some examples. The result of the operation is a sorted set without duplicates containing the items of sets  $S_1$  and  $S_2$ .

**Difference of sets:** The operation  $R := S_1 - S_2$  (also written as  $R := S_1 \setminus S_2$ ) can be carried out with

```
\minussets{S1}\minus{S2}\to{R}.
```

If  $S_1$  is a sorted set,  $R$  will be sorted, too. If  $S_1$  contains duplicates,  $R$  might also contains these duplicate elements. Table 2 contains several examples for the usage of this command.

Colloquially you can formulate the operation as follows: Check for every element  $e$  in  $S_1$  if  $e \in S_2$  is true. If not, insert  $e$  into  $R$ . And that’s exactly the way it has been implemented!

**Intersection of sets:** The operation  $R := S_1 \cap S_2$  is made possible with the command

```
\intersectsets{S1}{S2}\to{R}.
```

As above: If  $S_1$  is a sorted set,  $R$  will be sorted, too. If  $S_1$  contains duplicates,  $R$  might also contains these duplicate elements. Table 2 contains several examples for the usage of this command, too.

This operation can colloquially be written down as: Check for every element  $e$  in  $S_1$  if  $e \in S_2$  is true. If yes, insert  $e$  into  $R$ . If you compare this with the formulation above, one can recognize that the only difference is the small word “yes”. In the source code, this expresses in a missing `\else`. Acutally amazingly simple if you remember the formal relation  $S_1 \cap S_2 \equiv S_1 \setminus (S_1 \setminus S_2)$ , which lets one expect a much higher complexity.

**Sorting:** A set  $S$  can be sorted alphabetically by using the command

```
\sortset{S}{R}.
```

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Operation	Result
<code>\unionsets{\sA}{\sC}\to{\sR}</code>	"Alice, Bob, Charly, Dean"
<code>\unionsets{\sB}{\sD}\to{\sR}</code>	"Alice, Bob, Dean"
<code>\unionsets{\sL}{\sC}\to{\sR}</code>	"Bob, Dean"
<code>\unionsets{\sL}{\sL}\to{\sR}</code>	""
<code>\minussets{\sA}\minus{\sC}\to{\sR}</code>	"Alice, Charly"
<code>\minussets{\sD}\minus{\sC}\to{\sR}</code>	""
<code>\minussets{\sD}\minus{\sB}\to{\sR}</code>	"Dean"
<code>\minussets{\sA}\minus{\sL}\to{\sR}</code>	"Alice, Bob, Charly"
<code>\intersectsets{\sA}{\sB}\to{\sR}</code>	"Alice, Bob"
<code>\intersectsets{\sC}{\sB}\to{\sR}</code>	"Bob"
<code>\intersectsets{\sB}{\sD}\to{\sR}</code>	""
<code>\intersectsets{\sA}{\sL}\to{\sR}</code>	""

Table 2: Set operations, examples

After execution of the command,  $R$  contains the sorted set. The sorting is done by the bubblesort algorithm, an algorithm, that can be implemented in  $\text{T}_{\text{E}}\text{X}$  without having to perform many contortions.

At sorting, the elements are compared as they are, i. e. possibly contained macros are not expanded but compared by their name (including the backslash).

**Removing duplicates:** The operations *only* works on sorted sets! You actually will not need it very often, because the creation of a set using `\newset` does the work automatically (by using this macro). However, I decided to make this macro available to public; probably sometimes someone really needs it. Duplicate removal is called with:

```
\deleteduplicates{S}{R},
```

with  $R$  being the result set and  $S$  being the sorted set, whose duplicates shall be removed.

## 3.2 Effort estimations

Table 3 lists the complexity of the operations in  $O$ -notation. The following Assumptions are made:

- Let the length of an element of a set be  $m$ .
- Let the number of elements in a set be  $n$ . If an operation need two sets,  $n_1$  is the cardinality of the first set and  $n_2$  the cardinality of the second one.

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- For simplicity reasons the effort for pattern matching in parameter processing is assumed to be constant.

The given complexity classes can help you to arrange a set of operations in the optimal sequence. For example when using the commands `\intersectsets` or `\minussets` it is better to let the smaller set be the first parameter.

<b>Operation</b>	<b>Operation</b>
Compare elements	$m$
<code>\sizeofset</code>	$n$
<code>\listset</code>	$n$
<code>\iselementofset</code>	1
<code>\sortset</code>	$m \cdot n^2$
<code>\deleteduplicates</code>	$n$
<code>\newset</code>	$m \cdot n^2$
<code>\newsetsimple</code>	1
<code>\unionsets</code>	$m \cdot (n_1 + n_2)^2$
<code>\intersectsets</code>	$n_1$
<code>\minussets</code>	$n_1$

Table 3: Complexity classes of set operations