

The sTeX3 Package *

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Abstract

sTeX is a collection of L^AT_EX package that allow to markup documents semantically without leaving the document format, essentially turning L^AT_EX into a document format for mathematical knowledge management (MKM).

sTeX augments L^AT_EX with

- *Semantic macros* that denote and distinguish between mathematical concepts, operators, etc. independent of their notational presentation,
- A powerful *module system* that allows for authoring and importing individual fragments containing document text and/or semantic macros, independent of – and without hard coding – directory paths relative to the current document,
- A mechanism for exporting sTeX documents to (modular) XHTML, preserving all the semantic information for semantically informed knowledge management services.

This is the full documentation of sTeX. It consists of four parts:

- **Part I** is a general manual for the sTeX package and associated software. It is primarily directed at end-users who want to use sTeX to author semantically enriched documents.
- **Part II** documents the macros provided by the sTeX package. It is primarily directed at package authors who want to build on sTeX, but can also serve as a reference manual for end-users.
- **Part III** documents additional packages that build on sTeX, primarily its module system. These are not part of the sTeX package itself, but useful additions enabled by sTeX package functionality.
- **Part IV** is the detailed documentation of the sTeX package implementation.

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Part I

Manual



Boxes like this one contain implementation details that are mostly relevant for more advanced use cases, might be useful to know when debugging, or might be good to know to better understand how something works. They can easiyl be skipped on a first read.



Boxes like this one explain how some $\text{\texttt{STEX}}$ concept relates to the MMT/OMDoc system, philosophy or language.

Chapter 1

What is sTeX?

Formal systems for mathematics (such as interactive theorem provers) have the potential to significantly increase both the accessibility of published knowledge, as well as the confidence in its veracity, by rendering the precise semantics of statements machine actionable. This allows for a plurality of added-value services, from semantic search up to verification and automated theorem proving. Unfortunately, their usefulness is hidden behind severe barriers to accessibility; primarily related to their surface languages reminiscent of programming languages and very unlike informal standards of presentation.

sTeX minimizes this gap between informal and formal mathematics by integrating formal methods into established and widespread authoring workflows, primarily L^AT_EX, via non-intrusive semantic annotations of arbitrary informal document fragments. That way formal knowledge management services become available for informal documents, accessible via an IDE for authors and via generated *active* documents for readers, while remaining fully compatible with existing authoring workflows and publishing systems.

Additionally, an extensible library of reusable document fragments is being developed, that serve as reference targets for global disambiguation, intermediaries for content exchange between systems and other services.

Every component of the system is designed modularly and extensibly, and thus lay the groundwork for a potential full integration of interactive theorem proving systems into established informal document authoring workflows.

The general sTeX workflow combines functionalities provided by several pieces of software:

- The sTeX package to use semantic annotations in L^AT_EX documents,
- RuSTeX to convert `tex` sources to (semantically enriched) `xhtml`,
- The MMT software, that extracts semantic information from the thus generated `xhtml` and provides semantically informed added value services.

Chapter 2

Quickstart

2.1 Setup

2.1.1 The sTeX IDE

TODO: VSCode Plugin

2.1.2 Manual Setup

Foregoing on the sTeX IDE, we will need several pieces of software; namely:

- **The sTeX-Package** available [here](#).
sTeX is also available on CTAN and in TeXLive.
- To make sure that sTeX too knows where to find its archives, we need to set a global system variable `MATHHUB`, that points to your local `MathHub`-directory (see [section 3.2](#)).

- **The Mmt System** available [here](#)¹. We recommend following the setup routine documented [here](#).

Following the setup routine (Step 3) will entail designating a `MathHub`-directory on your local file system, where the MMT system will look for sTeX/MMT content archives.

- **sTeX Archives** If we only care about L^ATeX and generating pdfs, we do not technically need MMT at all; however, we still need the `MATHHUB` system variable to be set. Furthermore, MMT can make downloading content archives we might want to use significantly easier, since it makes sure that all dependencies of (often highly interrelated) sTeX archives are cloned as well.

Once set up, we can run `mmt` in a shell and download an archive along with all of its dependencies like this: `lmh install <name-of-repository>`, or a whole *group* of archives; for example, `lmh install smglom` will download all `smglom` archives.

- **RuSTeX** The MMT system will also set up RuSTeX for you, which is used to generate (semantically annotated) `xhtml` from tex sources. In lieu of using MMT, you can also download and use RuSTeX directly [here](#).

¹EdNOTE: For now, we require the sTeX-branch, requiring manually compiling the MMT sources

2.2 A First \LaTeX Document

Having set everything up, we can write a first \LaTeX document. As an example, we will use the `smglom/calculus` and `smglom/arithmetics` archives, which should be present in the designated MathHub-folder, and write a small fragment defining the *geometric series*:

TODO: use some sTeX -archive instead of `smglom`, use a convergence-notion that includes the limit, mark-up the theorem properly

```

1 \documentclass{article}
2 \usepackage{stex,xcolor,stexthm}
3
4 \begin{document}
5 \begin{smodule}{GeometricSeries}
6   \importmodule[smglom/calculus]{series}
7   \importmodule[smglom/arithmetics]{realarith}
8
9   \symdef{geometricSeries}[name=geometric-series]{\comp{S}}
10
11   \begin{sdefinition}[for=geometricSeries]
12     The \definame{geometricSeries} is the \symname{?series}
13     \[\defeq{\geometricSeries}{\definiens{
14       \infinitesum{\svar{n}}{1}{
15         \realdivide[frac]{1}{
16           \realpower{2}{\svar{n}}
17         }
18       }}
19     \].\]
20   \end{sdefinition}
21
22   \begin{sassertion}[name=geometricSeriesConverges,type=theorem]
23     The \symname{geometricSeries} \symname{converges} towards $1$.
24   \end{sassertion}
25 \end{smodule}
26 \end{document}

```

Compiling this document with `pdflatex` should yield the output

Definition 0.1. The **geometric series** is the **series**

$$S := \sum_{n=1}^{\infty} \frac{1}{2^n}.$$

Theorem 0.2. The **geometric series converges** towards 1.

Feel free to move your cursor over the various highlighted parts of the document – depending on your pdf viewer, this should yield some interesting (but possibly for now cryptic) information.

Remark 2.2.1:

Note that all of the highlighting, tooltips, coloring and the environment headers come from `stexthm` – by default, the amount of additional packages loaded is kept to a minimum and all the presentations can be customized, see [chapter 6](#).

Let’s investigate this document in detail now:

```
\begin{smodule}{GeometricSeries}
...
\end{smodule}
```

smodule First, we open a new *module* called `GeometricSeries`. This module is assigned a *globally unique* identifier (URI), which (depending on your pdf viewer) should pop up in a tooltip if you hover over the word **geometric series**.

```
\importmodule[smglom/calculus]{series}
\importmodule[smglom/arithmetics]{realarith}
```

\importmodule Next, we *import* two modules – `series` in the `smglom/calculus`-archive, and `realarith` in the `smglom/arithmetics`-archive. If we investigate these archives, we find the files `series.en.tex` and `realarith.en.tex` (respectively) in their respective **source**-folders, which contain the statements `\begin{smodule}{series}` and `\begin{smodule}{realarith}` (respectively).

The `\importmodule`-statements make all \TeX symbols and associated semantic macros (e.g. `\infinitesum`, `\realdive`, `\realpower`) in the desired module available. Additionally, they “export” these symbols to all further modules which include the *current* module – i.e. if in some future module we would put `\importmodule{GeometricSeries}`, we would also have `\infinitesum` etc. at our disposal.

\usemodule If we only want to *use* the content of some module `Foo`, e.g. in remarks or examples, but none of the symbols in our current module actually *depend* on the content of `Foo`, we can use `\usemodule` instead – like `\importmodule`, this will make the module content available, but will *not* export it to other modules.

```
\symdef{GeometricSeries}[name=geometric-series]{\comp{S}}
```

\symdef Next, we introduce a new *symbol* with name `geometric-series` and assign it the semantic macro `\geometricSeries`. `\symdef` also immediately assigns this symbol a *notation*, namely `S`.

\comp The macro `\comp` marks the `S` in the notation as a *notational component*, as opposed to e.g. arguments to `\geometricSeries`. It is the notational components that get highlighted and associated with the corresponding symbol (i.e. in this case `geometricSeries`). Since `\geometricSeries` takes no arguments, we can wrap the whole notation in a `\comp`.

```
\begin{sdefinition}[for=geometricSeries]
...
\end{sdefinition}
\begin{sassertion}[name=geometricSeriesConverges,type=theorem]
...
\end{sassertion}
```

What follows are two \LaTeX -statements (e.g. definitions, theorems, examples, proofs, ...). These are semantically marked-up variants of the usual environments, which take additional optional arguments (e.g. `for=`, `type=`, `name=`). Since many \LaTeX templates predefine environments like `definition` or `theorem` with different syntax, we use `sdefinition`, `sassertion`, `sexample` etc. instead. You can customize these environments to e.g. simply wrap around some predefined `theorem`-environment. That way, we can still use `sassertion` to provide semantic information, while being fully compatible with (and using the document presentation of) predefined environments.

In our case, the `stexthm`-package patches e.g. `\begin{sassertion}[type=theorem]` to use a `theorem`-environment defined (as usual) using `amsthm`.

The `\define{geometricSeries}` is the `\symname{?series}`

<u><code>\symname</code></u>	The <code>\symname</code> -command prints the name of a symbol, highlights it (based on customizable settings) and associates the text printed with the corresponding symbol. If you hover over the word <code>series</code> in the pdf output, you should see a tooltip showing the full URI of the symbol used.
<u><code>\symref</code></u>	The <code>\symname</code> -command is a special case of the more general <code>\symref</code> -command, which allows customizing the precise text associated with a symbol.
<u><code>\define</code></u> <u><code>\definiendum</code></u>	<p>The <code>sdefinition</code>-environment provides two additional macros, <code>\define</code> and <code>\definiendum</code> which behave similar to <code>\symname</code> and <code>\symref</code>, but explicitly mark the symbols as <i>being defined</i> in this environment, to allow for special highlighting.</p> <pre> \[\defeq{\geometricSeries}{\definiens{ \infinitesum{svar{n}}{1}{ \realdivide[frac]{1}{ \realpower{2}{svar{n}} } }} }\].\]</pre> <p>The next snippet – set in a math environment – uses several semantic macros imported from (or recursively via) <code>series</code> and <code>realarithmetics</code>, such as <code>\defeq</code>, <code>\infinitesum</code>, etc. In math mode, using a semantic macro inserts its (default) definition. A semantic macro can have several notations – in that case, we can explicitly choose a specific notation by providing its identifier as an optional argument; e.g. <code>\realdivide[frac]{a}{b}</code> will use the explicit notation named <code>frac</code> of the semantic macro <code>\realdivide</code>, which yields $\frac{a}{b}$ instead of a/b.</p>
<u><code>\svar</code></u>	The <code>\svar{n}</code> command marks up the <code>n</code> as a variable with name <code>n</code> and notation <code>n</code> .
<u><code>\definiens</code></u>	The <code>sdefinition</code> -environment additionally provides the <code>\definiens</code> -command, which allows for explicitly marking up its argument as the <i>definiens</i> of the symbol currently being defined.

2.2.1 OMDoc/xhtml Conversion

So, if we run `pdflatex` on our document, then \LaTeX yields pretty colors and tooltips¹. But \LaTeX becomes a lot more powerful if we additionally convert our document to `xhtml`.

TODO VSCode Plugin

Using `RuSTeX`, we can convert the document to `xhtml` using the command `rustex -i /path/to/file.tex -o /path/to/outfile.xhtml`. Investigating the resulting file, we notice additional semantic information resulting from our usage of semantic macros, `\symref` etc. Below is the (abbreviated) snippet inside our `\definiens` block:

```
<mrow resource="" property="stex:definiens">
  <mrow resource="...?series?infinitesum" property="stex:OMBIND">
    <munderover displaystyle="true">
      <mo resource="...?series?infinitesum" property="stex:comp"> $\Sigma$ </mo>
      <mrow>
        <mrow resource="1" property="stex:arg">
          <mi resource="var://n" property="stex:OMV">n</mi>
        </mrow>
        <mo resource="...?series?infinitesum" property="stex:comp">=</mo>
        <mi resource="2" property="stex:arg">1</mi>
      </mrow>
      <mi resource="...?series?infinitesum" property="stex:comp"> $\infty$ </mi>
    </munderover>
    <mrow resource="3" property="stex:arg">
      <mfrac resource="...?realarith?division#frac#" property="stex:OMA">
        <mi resource="1" property="stex:arg">1</mi>
        <mrow resource="2" property="stex:arg">
          <msup resource="...realarith?exponentiation" property="stex:OMA">
            <mi resource="1" property="stex:arg">2</mi>
            <mrow resource="2" property="stex:arg">
              <mi resource="var://n" property="stex:OMV">n</mi>
            </mrow>
          </msup>
        </mrow>
      </mfrac>
    </mrow>
  </mrow>
</mrow>
```

...containing all the semantic information. The MMT system can extract from this the following OPENMATH snippet:

```
<OMBIND>
  <OMID name="...?series?infinitesum"/>
  <OMV name="n"/>
  <OMLIT name="1"/>
  <OMA>
    <OMS name="...?realarith?division"/>
    <OMLIT name="1"/>
    <OMA>
      <OMS name="...realarith?exponentiation"/>
      <OMLIT name="2"/>
      <OMV name="n"/>
    </OMA>
  </OMA>
</OMBIND>
```

¹...and hyperlinks for symbols, and indices, and allows reusing document fragments modularly, and...

...giving us the full semantics of the snippet, allowing for a plurality of knowledge management services – in particular when serving the `xhtml`.

Remark 2.2.2:

Note that the `html` when opened in a browser will look slightly different than the `pdf` when it comes to highlighting semantic content – that is because naturally `html` allows for much more powerful features than `pdf` does. Consequently, the `html` is intended to be served by a system like MMT, which can pick up on the semantic information and offer much more powerful highlighting, linking and similar features, and being customizable by *readers* rather than being prescribed by an author.

Additionally, not all browsers (most notably Chrome) support MATHML natively, and might require additional external JavaScript libraries such as MathJax to render mathematical formulas properly.

Chapter 3

Creating sTeX Content

We can use sTeX by simply including the package with `\usepackage{stex}`, or – primarily for individual fragments to be included in other documents – by using the sTeX document class with `\documentclass{stex}` which combines the `standalone` document class with the `stex` package.

Both the `stex` package and document class offer the following options:

lang ($\langle\textit{language}\rangle*$) Languages to load with the `babel` package.

mathhub ($\langle\textit{directory}\rangle$) MathHub folder to search for repositories – this is not necessary if the `MATHHUB` system variable is set.

sms ($\langle\textit{boolean}\rangle$) use *persisted* mode (not yet implemented).

image ($\langle\textit{boolean}\rangle$) passed on to `tikzinput`.

debug ($\langle\textit{log-prefix}\rangle*$) Logs debugging information with the given prefixes to the terminal, or all if `all` is given. Largely irrelevant for the majority of users.

3.1 How Knowledge is Organized in sTeX

sTeX content is organized on multiple levels:

- sTeX **archives** (see [section 3.2](#)) contain individual `.tex`-files.
- These may contain sTeX **modules**, introduced via `\begin{smodule}{ModuleName}`.
- Modules contain sTeX **symbol declarations**, introduced via `\symdecl{symbolname}`, `\symdef{symbolname}` and some other constructions. Most symbols have a *notation* that can be used via a *semantic macro* `\symbolname` generated by symbol declarations.
- sTeX **expressions** finally are built up from usages of semantic macros.

$\hookrightarrow M \rightarrow$

$\hookrightarrow M \rightarrow$

$\hookrightarrow T \rightarrow$

• sTeX archives are simultaneously MMT archives, and the same directory structure is consequently used.

• sTeX modules correspond to OMDoc/MMT *theories*. `\importmodules` (and



similar constructions) induce MMT `includes` and other *theory morphisms*, thus giving rise to a *theory graph* in the OMDOC sense.

- Symbol declarations induce OMDOC/MMT *constants*, with optional (formal) *type* and *definiens* components.
- Finally, $\text{\texttt{\textit{STeX}}}$ expressions are converted to OMDOC/MMT terms, which use the syntax of `OPENMATH`.

3.2 $\text{\texttt{\textit{STeX}}}$ Archives

3.2.1 The Local MathHub-Directory

`\usemodule`, `\importmodule`, `\inputref` etc. allow for including content modularly without having to specify absolute paths, which would differ between users and machines. Instead, $\text{\texttt{\textit{STeX}}}$ uses *archives* that determine the global namespaces for symbols and statements and make it possible for $\text{\texttt{\textit{STeX}}}$ to find content referenced via such URIs.

All $\text{\texttt{\textit{STeX}}}$ archives need to exist in the local **MathHub**-directory. $\text{\texttt{\textit{STeX}}}$ knows where this folder is via one of three means:

1. If the $\text{\texttt{\textit{STeX}}}$ package is loaded with the option `mathhub=/path/to/mathhub`, then $\text{\texttt{\textit{STeX}}}$ will consider `/path/to/mathhub` as the local **MathHub**-directory.
2. If the `mathhub` package option is *not* set, but the macro `\mathhub` exists when the $\text{\texttt{\textit{STeX}}}$ -package is loaded, then this macro is assumed to point to the local **MathHub**-directory; i.e. `\def\mathhub{/path/to/mathhub}\usepackage{stex}` will set the **MathHub**-directory as `path/to/mathhub`.
3. Otherwise, $\text{\texttt{\textit{STeX}}}$ will attempt to retrieve the system variable `MATHHUB`, assuming it will point to the local **MathHub**-directory. Since this variant needs setting up only *once* and is machine-specific (rather than defined in tex code), it is compatible with collaborating and sharing tex content, and hence recommended.
4. Finally, if all else fails, $\text{\texttt{\textit{STeX}}}$ will look for a file `~/.stex/mathhub.path`. If this file exists, $\text{\texttt{\textit{STeX}}}$ will assume that it contains the path to the local **MathHub**-directory.

3.2.2 The Structure of $\text{\texttt{\textit{STeX}}}$ Archives

An $\text{\texttt{\textit{STeX}}}$ archive `group/name` needs to be stored in the directory `/path/to/mathhub/group/name`; e.g. assuming your local **MathHub**-directory is set as `/user/foo/MathHub`, then in order for the `smglom/calculus`-archive to be found by the $\text{\texttt{\textit{STeX}}}$ system, it needs to be in `/user/foo/MathHub/smgom/calculus`.

Each such archive needs two subdirectories:

- `/source` – this is where all your tex files go.
- `/META-INF` – a directory containing a single file `MANIFEST.MF`, the content of which we will consider shortly

An additional `lib`-directory is optional, and is where `TeX` will look for files included via `\libinput`.

Additionally a *group* of archives `group/name` may have an additional archive `group/meta-inf`. If this `meta-inf`-archive has a `/lib`-subdirectory, it too will be searched by `\libinput` from all tex files in any archive in the `group/*-group`.

We recommend this additional directory structure in the `source`-folder of an `TeX` archive:

- `/source/mod/` – individual `TeX` modules, containing symbol declarations, notations, and `\begin{paragraph}[type=symdoc,for=...]` environments for “encyclopedic” symbol documentations
- `/source/def/` – definitions
- `/source/ex/` – examples
- `/source/thm/` – theorems, lemmata and proofs; preferably proofs in separate files to allow for multiple proofs for the same statement
- `/source/snip/` – individual text snippets such as remarks, explanations etc.
- `/source/frag/` – individual document fragments, ideally only `\inputref`ing snippets, definitions, examples etc. in some desirable order
- `/source/tikz/` – tikz images, as individual `.tex`-files
- `/source/pic/` – image files.

3.2.3 MANIFEST.MF-Files

The `MANIFEST.MF` in the `META-INF`-directory consists of key-value-pairs, instructing `TeX` (and associated software) of various properties of an archive. For example, the `MANIFEST.MF` of the `smglom/calculus`-archive looks like this:

```
id: smglom/calculus
source-base: http://mathhub.info/smglob/calculus
narration-base: http://mathhub.info/smglob/calculus
dependencies: smglom/arithmetics,smglom/sets,smglom/topology,
              smglom/mv,smglom/linear-algebra,smglom/algebra
responsible: Michael.Kohlhase@FAU.de
title: Elementary Calculus
teaser: Terminology for the mathematical study of change.
description: desc.html
```

Many of these are in fact ignored by `TeX`, but some are important:

id: The name of the archive, including its group (e.g. `smglom/calculus`),

source-base or

ns: The namespace from which all symbol and module URIs in this repository are formed, see (**TODO**),

narration-base: The namespace from which all document URIs in this repository are formed, see (TODO),

url-base: The URL that is formed as a basis for *external references*, see (TODO),

dependencies: All archives that this archive depends on. \TeX ignores this field, but MMT can pick up on them to resolve dependencies, e.g. for `lmh install`.

3.2.4 Using Files in \TeX Archives Directly

Several macros provided by \TeX allow for directly including files in repositories. These are:

`\mhinput` `\mhinput`[Some/Archive]{some/file} directly inputs the file `some/file` in the source-folder of `Some/Archive`.

`\inputref` `\inputref`[Some/Archive]{some/file} behaves like `\mhinput`, but wraps the input in a `\begingroup ... \endgroup`. When converting to `xhtml`, the file is not input at all, and instead an `html`-annotation is inserted that references the file.

In the majority of cases `\inputref` is likely to be preferred over `\mhinput`.

`\ifinput` Both `\mhinput` and `\inputref` set `\ifinput` to “true” during input. This allows for selectively including e.g. bibliographies only if the current file is not being currently included in a larger document.

`\addmhbibresource` `\addmhbibresource`[Some/Archive]{some/file} searches for a file like `\mhinput` does, but calls `\addbibresource` to the result and looks for the file in the archive root directory directly, rather than the `source` directory.

`\libinput` `\libinput`{some/file} searches for a file `some/file` in

- the `lib`-directory of the current archive, and
- the `lib`-directory of a `meta-inf`-archive in (any of) the archive groups containing the current archive

and include all found files in reverse order; e.g. `\libinput{preamble}` in a `.tex`-file in `smglom/calculus` will *first* input `.../smglom/meta-inf/lib/preamble.tex` and then `.../smglom/calculus/lib/preamble.tex`.

Will throw an error if *no* candidate for `some/file` is found.

`\libusepackage` `\libusepackage`[package-options]{some/file} searches for a file `some/file.sty` in the same way that `\libinput` does, but will call `\usepackage`[package-options]{path/to/some/file} instead of `\input`.

Will throw an error if not *exactly one* candidate for `some/file` is found.

Remark 3.2.1:

A good practice is to have individual \TeX fragments follow basically this document frame:

```
1 \documentclass{stex}
2 \libinput{preamble}
3 \begin{document}
4   ...
5   \ifinputref \else \libinput{postamble} \fi
6 \end{document}
```

Then the `preamble.tex` files can take care of loading the generally required packages, setting presentation customizations etc. (per archive or archive group or both), and `postamble.tex` can e.g. print the bibliography, index etc.

3.3 Module, Symbol and Notation Declarations

3.3.1 The `smodule`-Environment

`smodule` A new module is declared using the basic syntax

```
\begin{smodule}[options]{ModuleName}...\end{smodule}.
```

A module is required to declare any new formal content such as symbols or notations (but not variables, which may be introduced anywhere).

The `smodule`-environment takes several optional arguments, all of which are optional:

`title` ($\langle token list \rangle$) to display in customizations.

`type` ($\langle string \rangle *$) for use in customizations.

`deprecate` ($\langle module \rangle$) if set, will throw a warning when loaded, urging to use $\langle module \rangle$ instead.

`id` ($\langle string \rangle$) for cross-referencing.

`ns` ($\langle URI \rangle$) the namespace to use. *Should not be used, unless you know precisely what you're doing.* If not explicitly set, is computed using `\stex_modules_current_namespace:`.

`lang` ($\langle language \rangle$) if not set, computed from the current file name (e.g. `foo.en.tex`).

`sig` ($\langle language \rangle$) if the current file is a translation of a file with the same base name but a different language suffix, setting `sig=<lang>` will preload the module from that language file. This helps ensuring that the (formal) content of both modules is (almost) identical across languages and avoids duplication.

`creators` ($\langle string \rangle *$) names of the creators.

`contributors` ($\langle string \rangle *$) names of contributors.

`srccite` ($\langle string \rangle$) a source citation for the content of this module.

\hookrightarrow An \TeX module corresponds to an MMT/OMDOC *theory*. As such it
 \hookrightarrow gets assigned a module URI (*universal resource identifier*) of the form
 \hookrightarrow `<namespace>?<module-name>`.

By default, opening a module will produce no output whatsoever, e.g.:

Example 1

Input:

```

1 \begin{smodule}[title={This is Some Module}]{SomeModule}
2   Hello World
3 \end{smodule}

```

Output:

Hello World

\stexpatchmodule

We can customize this behavior either for all modules or only for modules with a specific type using the command `\stexpatchmodule[optional-type]{begin-code}{end-code}`. Some optional parameters are then available in `\smodule*`-macros, specifically `\smodulename`, `\smoduletype` and `\smoduleid`.

For example:

Example 2

Input:

```

1 \stexpatchmodule[display]
2   {\textbf{Module (\smodulename)}}\par
3   {\par\noindent\textbf{End of Module (\smodulename)}}
4
5 \begin{smodule}[type=display,title={Some New Module}]{SomeModule2}
6   Hello World
7 \end{smodule}

```

Output:

Module (Some New Module)
 Hello World
End of Module (Some New Module)

3.3.2 Declaring New Symbols and Notations

Inside an `smodule` environment, we can declare new \TeX symbols.

`\symdecl`

The most basic command for doing so is using `\symdecl{symbolname}`. This introduces a new symbol with name `symbolname`, arity 0 and semantic macro `\symbolname`.

The starred variant `\symdecl*{symbolname}` will declare a symbol, but not introduce a semantic macro. If we don't want to supply a notation (for example to introduce concepts like “abelian”, which is not something that has a notation), the starred variant is likely to be what we want.

\hookrightarrow `\symdecl` introduces a new OMDoc/MMT constant in the current module (=OMDoc/MMT theory). Correspondingly, they get assigned the URI `<module-URI>?<constant-name>`.

Without a semantic macro or a notation, the only meaningful way to reference a symbol is via `\symref`, `\symname` etc.

Example 3

Input:

```
1 \symdecl*{foo}
2 Given a \symname{foo}, we can...
```

Output:

Given a `foo`, we can...

Obviously, most semantic macros should take actual *arguments*, implying that the symbol we introduce is an *operator* or *function*. We can let `\symdecl` know the *arity* (i.e. number of arguments) of a symbol like this:

Example 4

Input:

```
1 \symdecl{binarysymbol}[args=2]
2 \symref{binarysymbol}{this} is a symbol taking two arguments.
```

Output:

`this` is a symbol taking two arguments.

`\notation`

In that case, we probably want to supply a notation as well, in which case we can finally actually use the semantic macro in math mode. We can do so using the `\notation` command, like this:

Example 5

Input:

```
1 \notation{binarysymbol}{\text{First: }#1\text{; Second: }#2}  
2 $\binarysymbol{a}{b}$
```

Output:

First: a ; Second: b

↪M↪ Applications of semantic macros, such as `\binarysymbol{a}{b}` are translated to
↪M↪ MMT/OMDOC as OMA-terms with head `<OMS name="...?binarysymbol"/>`.
↪T↪ Semantic macros with no arguments correspond to OMS directly.

`\comp`

Unfortunately, we have no highlighting whatsoever now. That is because we need to tell \TeX explicitly which parts of the notation are *notation components* which *should* be highlighted. We can do so with the `\comp` command.

We can introduce a new notation `highlight` for `\binarysymbol` that fixes this flaw, which we can subsequently use with `\binarysymbol[highlight]`:

Example 6

Input:

```
1 \notation{binarysymbol}[highlight]  
2 {\comp{\text{First: }}#1\comp{\text{; Second: }}#2}  
3 $\binarysymbol[highlight]{a}{b}$
```

Output:

First: a ; Second: b



Ideally, `\comp` would not be necessary: Everything in a notation that is *not* an argument should be a notation component. Unfortunately, it is computationally expensive to determine where an argument begins and ends, and the argument markers `#n` may themselves be nested in other macro applications or \TeX groups, making it ultimately almost impossible to determine them automatically while also remaining compatible with arbitrary highlighting customizations (such as tooltips, hyperlinks, colors) that users might employ, and that are ultimately invoked by `\comp`.

Note that it is required that

1. the argument markers `#n` never occur inside a `\comp`, and
2. no semantic arguments may ever occur inside a notation.

Both criteria are not just required for technical reasons, but conceptionally meaningful:

The underlying principle is that the arguments to a semantic macro represent *arguments to the mathematical operation* represented by a symbol. For example, a semantic macro `\addition{a}{b}` taking two arguments would represent *the actual addition of (mathematical objects) a and b*. It should therefore be impossible for *a* or *b* to be part of a notation component of `\addition`.



Similarly, a semantic macro can not conceptually be part of the notation of `\addition`, since a semantic macro represents a *distinct mathematical concept* with *its own semantics*, whereas notations are syntactic representations of the very symbol to which the notation belongs.

If you want an argument to a semantic macro to be a purely syntactic parameter, then you are likely somewhat confused with respect to the distinction between the precise *syntax* and *semantics* of the symbol you are trying to declare (which happens quite often even to experienced \LaTeX users), and might want to give those another thought - quite likely, the macro you aim to implement does not actually represent a semantically meaningful mathematical concept, and you will want to use `\def` and similar native \LaTeX macro definitions rather than semantic macros.

`\symdef`

In the vast majority of cases where a symbol declaration should come with a semantic macro, we will want to supply a notation immediately. For that reason, the `\symdef` command combines the functionality of both `\symdecl` and `\notation` with the optional arguments of both:

Example 7

Input:

```
1 \symdef{newbinarysymbol}[h1,args=2]
2   {\comp{\text{1.: }}#1\comp{\text{; 2.: }}#2}
3 $\newbinarysymbol{a}{b}$
```

Output:

1.: *a*; 2.: *b*

We just declared a new symbol `newbinarysymbol` with `args=2` and immediately provided it with a notation with identifier `h1`. Since `h1` is the *first* (and so far, only) notation supplied for `newbinarysymbol`, using `\newbinarysymbol` without optional argument defaults to this notation.

`\setnotation`

The first notation provided will stay the default notation unless explicitly changed – this is enabled by the `\setnotation` command: `\setnotation{symbolname}{notation-id}` sets the default notation of `\symbolname` to `notation-id`, i.e. henceforth, `\symbolname` behaves like `\symbolname[notation-id]` from now on.

Often, a default notation is set right after the corresponding notation is introduced – the starred version `\notation*` for that reason introduces a new notation and immediately sets it to be the new default notation. So expressed differently, the *first* `\notation` for a symbol behaves exactly like `\notation*`, and `\notation*{foo}[bar]{...}` behaves exactly like `\notation{foo}[bar]{...}\setnotation{foo}{bar}`.

Operator Notations

Once we have a semantic macro with arguments, such as `\newbinarysymbol`, the semantic macro represents the *application* of the symbol to a list of arguments. What if we want to refer to the operator *itself*, though?

We can do so by supplying the `\notation` (or `\symdef`) with an *operator notation*, indicated with the optional argument `op=`. We can then invoke the operator notation using `\symbolname![notation-identifier]`. Since operator notations never take arguments, we do not need to use `\comp` in it, the whole notation is wrapped in a `\comp` automatically:

Example 8

Input:

```
1 \notation{newbinarysymbol}[ab,
2 op={\text{a:}\cdot\text{; b:}\cdot}]
3 {\comp{\text{a:}}#1\comp{\text{; b:}}#2}
4 \symname{newbinarysymbol} is also occasionally written
5 $\newbinarysymbol![ab]$
```

Output:

`newbinarysymbol` is also occasionally written `a: · ; b: ·`

\hookrightarrow `\symbolname!` is translated to OMDoc/MMT as `<OMS name="...?symbolname"/>`
 \rightarrow directly.
 \rightsquigarrow `T`

3.3.3 Argument Types

The notations so far used *simple* arguments which we call *i-type* arguments. Declaring a new symbol with `\symdecl{foo}[args=3]` is equivalent to writing `\symdecl{foo}[args=iii]`, indicating that the semantic macro takes three *i-type* arguments. However, there are three more argument types which we will investigate now, namely *b-type*, *a-type* and *B-type* arguments.

b-Type Arguments

A **b**-type argument represents a *variable* that is *bound* by the symbol in its application, making the symbol a *binding operator*. Typical examples of binding operators are e.g. sums \sum , products \prod , integrals \int , quantifiers like \forall and \exists , that λ -operator, etc.

\hookrightarrow **M** \rightarrow **b**-type arguments behave exactly like **i**-type arguments within \TeX , but applications of binding operators, i.e. symbols with **b**-type arguments, are translated to \rightsquigarrow **T** \rightsquigarrow OMBIND-terms in OMDoc/MMT, rather than OMA.

For example, we can implement a summation operator binding an index variable and taking lower and upper index bounds and the expression to sum over like this:

Example 9

Input:

```
1 \symdef{summation}[args=bihi]
2 {\mathop{\comp{sum}}_{\#1\comp{=}\#2}^{\#3}\#4}
3 $\summation{\svar{x}}{\#1}\{\svar{n}\}\{\svar{x}\}^2$
```

Output:

$$\sum_{x=1}^n x^2$$

where the variable x is now *bound* by the `\summation`-symbol in the expression.

a-Type Arguments

a-type arguments represent a *flexary argument sequence*, i.e. a sequence of arguments of arbitrary length. Formally, operators that take arbitrarily many arguments don't "exist", but in informal mathematics, they are ubiquitous. **a**-type arguments allow us to write e.g. `\addition{a,b,c,d,e}` rather than having to write something like `\addition{a}{\addition{b}{\addition{c}{\addition{d}{e}}}}`!

`\notation` (and consequently `\symdef`, too) take one additional argument for each **a**-type argument that indicates how to "accumulate" a comma-separated sequence of arguments. This is best demonstrated on an example.

Let's say we want an operator representing quantification over an ascending chain of elements in some set, i.e. `\ascendingchain{S}{a,b,c,d,e}{t}` should yield $\forall a <_S b <_S c <_S d <_S e. t$. The "base"-notation for this operator is simply `{\comp{forall} \#2\comp{.},\#3}`, where `\#2` represents the full notation fragment *accumulated* from `{a,b,c,d,e}`.

The *additional* argument to `\notation` (or `\symdef`) takes the same arguments as the base notation and two *additional* arguments `\#1` and `\#2` representing successive pairs in the **a**-type argument, and accumulates them into `\#2`, i.e. to produce $a <_S b <_S c <_S d <_S e$, we do `{\#1 \comp{<}}_{\#1} \#2`:

Example 10

Input:

```

1 \symdef{ascendingchain}[args=iai]
2 {\comp{\forall} #2\comp{.\,}#3}
3 {##1 \comp{<}_{#1} ##2}
4
5 Tadaa: $\ascendingchain{S}{a,b,c,d,e}{t}$

```

Output:

Tadaa: $\forall a <_S b <_S c <_S d <_S e. t$

If this seems overkill, keep in mind that you will rarely need the single-hash arguments #1,#2 etc. in the a-notation-argument. For a much more representative and simpler example, we can introduce flexary addition via:

Example 11

Input:

```

1 \symdef{addition}[args=a]{#1}{##1 \comp{+} ##2}
2
3 Tadaa: $\addition{a,b,c,d,e}$

```

Output:

Tadaa: $a+b+c+d+e$

The assoc-key We mentioned earlier that “formally”, flexary arguments don’t really “exist”. Indeed, formally, addition is usually defined as a binary operation, quantifiers bind a single variable etc.

Consequently, we can tell \LaTeX (or, rather, MMT/OMDOC) how to “resolve” flexary arguments by providing `\symdecl` or `\symdef` with an optional `assoc`-argument, as in `\symdecl{addition}[args=a,assoc=bin]`. The possible values for the `assoc`-key are:

bin: A binary, associative argument, e.g. as in `\addition`

binl: A binary, left-associative argument, e.g. $a^{b^{c^d}}$, which stands for $((a^b)^c)^d$

binr: A binary, right-associative argument, e.g. as in $A \rightarrow B \rightarrow C \rightarrow D$, which stands for $A \rightarrow (B \rightarrow (C \rightarrow D))$

pre: Successively prefixed, e.g. as in $\forall x, y, z. P$, which stands for $\forall x. \forall y. \forall z. P$

conj: Conjunctive, e.g. as in $a = b = c = d$ or $a, b, c, d \in A$, which stand for $a = d \wedge b = d \wedge c = d$ and $a \in A \wedge b \in A \wedge c \in A \wedge d \in A$, respectively

pwconj: Pairwise conjunctive, e.g. as in $a \neq b \neq c \neq d$, which stands for $a \neq b \wedge a \neq c \wedge a \neq d \wedge b \neq c \wedge b \neq d \wedge c \neq d$

B-Type Arguments

Finally, B-type arguments simply combine the functionality of both `a` and `b` - i.e. they represent an arbitrarily long sequence of variables to be bound, e.g. for implementing quantifiers:

Example 12

Input:

```
1 \symdef{quantforall}[args=Bi]
2 {\comp{\forall}#1\comp{.}#2}
3 {##1\comp,##2}
4
5 $\quantforall{\svar{x},\svar{y},\svar{z}}{P}$
```

Output:

$\forall x,y,z.P$

3.3.4 Type and Definiens Components

`\symdecl` and `\symdef` take two more optional arguments. \TeX largely ignores them (except for special situations we will talk about later), but MMT can pick up on them for additional services. These are the `type` and `def` keys, which expect expressions in math-mode (ideally using semantic macros, of course!)

The `type` and `def` keys correspond to the `type` and `definiens` components of

- \hookrightarrow OMDoc/MMT constants.
- \rightarrow Correspondingly, the name “type” should be taken with a grain of salt, since
- \rightarrow OMDoc/MMT – being foundation-independent – does not a priori implement a fixed typing system.

The `type`-key allows us to provide additional information (given the necessary \TeX symbols), e.g. for addition on natural numbers:

Example 13

Input:

```
1 \symdef{Nat}[type=\set]{\comp{\mathbb N}}
2 \symdef{addition}[
3   type=\funtype{\Nat,\Nat}{\Nat},
4   op=+,
5   args=a
6 ]{\#1}{\#1 \comp+ \#2}
7
8 \symname{addition} is an operation $\funtype{\Nat,\Nat}{\Nat}$
```

Output:

`addition` is an operation $\mathbb{N} \times \mathbb{N} \rightarrow \mathbb{N}$

The `def`-key allows for declaring symbols as abbreviations:

Example 14

Input:

```
1 \symdef{successor}[
2   type=\funtype{\Nat}{\Nat},
3   def=\fun{\svar{x}}{\addition{\svar{x},1}},
4   op=\mathtt{succ},
5   args=1
6 ]{\comp{\mathtt{succ}(\#1\comp{)}}}
7
8 The \symname{successor} operation $\funtype{\Nat}{\Nat}$
9 is defined as $\fun{\svar{x}}{\addition{\svar{x},1}}$
```

Output:

The `successor` operation $\mathbb{N} \rightarrow \mathbb{N}$ is defined as $x \mapsto x+1$

3.3.5 Precedences and Automated Bracketing

Having done `\addition`, the obvious next thing to implement is `\multiplication`. This is in theory straight-forward:

Example 15

Input:

```
1 \symdef{multiplication}[
2   type=\funtype{\Nat,\Nat}{\Nat},
3   op=\cdot,
4   args=a
5 ]{\#1}{\#1 \comp\cdot \#2}
6
7 \symname{multiplication} is an operation $\funtype{\Nat,\Nat}{\Nat}$
```

Output:

`multiplication` is an operation $\mathbb{N} \times \mathbb{N} \rightarrow \mathbb{N}$

However, if we *combine* `\addition` and `\multiplication`, we notice a problem:

Example 16

Input:

```
1 $\addition{a,\multiplication{b,\addition{c,\multiplication{d,e}}}}$
```

Output:

$a+b \cdot c+d \cdot e$

We all know that \cdot binds stronger than $+$, so the output $a+b\cdot c+d\cdot e$ does not actually reflect the term we wrote. We can of course insert parentheses manually

Example 17

Input:

```
1 $ \addition{a, \multiplication{b, (\addition{c, \multiplication{d, e}})}}$
```

Output:

$$a+b\cdot(c+d\cdot e)$$

but we can also do better by supplying *precedences* and have \TeX insert parentheses automatically.

For that purpose, `\notation` (and hence `\symdef`) take an optional argument `prec=<opprec>;<argprec1>x...x<argprec n>`.

We will investigate the precise meaning of `<opprec>` and the `<argprec>`s shortly – in the vast majority of cases, it is perfectly sufficient to think of `prec=` taking a single number and having that be *the* precedence of the notation, where lower precedences (somewhat counterintuitively) bind stronger than higher precedences. So fixing our notations for `\addition` and `\multiplication`, we get:

Example 18

Input:

```
1 \notation{multiplication}[
2   op=\cdot,
3   prec=50
4 ]{#1}{##1 \comp\cdot ##2}
5 \notation{addition}[
6   op=+,
7   prec=100
8 ]{#1}{##1 \comp+ ##2}
9
10 $ \addition{a, \multiplication{b, \addition{c, \multiplication{d, e}}}}$
```

Output:

$$a+b\cdot(c+d\cdot e)$$

Note that the precise numbers used for precedences are pretty arbitrary – what matters is which precedences are higher than which other precedences when used in conjunction.

`\infprec`
`\neginfprec`

It is occasionally useful to have “infinitely” high or low precedences to enforce or forbid automated bracketing entirely – for those purposes, `\infprec` and `\neginfprec` exist (which are implemented as the maximal and minimal integer values accordingly).



More precisely, each notation takes

1. One *operator precedence* and

2. one *argument precedence* for each argument.

By default, all precedences are 0, unless the symbol takes no argument, in which case the operator precedence is `\neginfprec` (negative infinity). If we only provide a single number, this is taken as both the operator precedence and all argument precedences.

$\text{\texttt{gT\TeX}}$ decides whether to insert parentheses by comparing operator precedences to a *downward precedence* p_d with initial value `\infprec`. When encountering a semantic macro, $\text{\texttt{gT\TeX}}$ takes the operator precedence p_{op} of the notation used and checks whether $p_{op} > p_d$. If so, $\text{\texttt{gT\TeX}}$ insert parentheses.

When $\text{\texttt{gT\TeX}}$ steps into an argument of a semantic macro, it sets p_d to the respective argument precedence of the notation used.

In the example above:



1. $\text{\texttt{gT\TeX}}$ starts out with $p_d = \text{\texttt{\neginfprec}}$.
2. $\text{\texttt{gT\TeX}}$ encounters `\addition` with $p_{op} = 100$. Since $100 \not> \text{\texttt{\neginfprec}}$, it inserts no parentheses.
3. Next, $\text{\texttt{gT\TeX}}$ encounters the two arguments for `\addition`. Both have no specifically provided argument precedence, so $\text{\texttt{gT\TeX}}$ uses $p_d = p_{op} = 100$ for both and recurses.
4. Next, $\text{\texttt{gT\TeX}}$ encounters `\multiplication{b,...}`, whose notation has $p_{op} = 50$.
5. We compare to the current downward precedence p_d set by `\addition`, arriving at $p_{op} = 50 \not> 100 = p_d$, so $\text{\texttt{gT\TeX}}$ again inserts no parentheses.
6. Since the notation of `\multiplication` has no explicitly set argument precedences, $\text{\texttt{gT\TeX}}$ uses the operator precedence for all arguments of `\multiplication`, hence sets $p_d = p_{op} = 50$ and recurses.
7. Next, $\text{\texttt{gT\TeX}}$ encounters the inner `\addition{c,...}` whose notation has $p_{op} = 100$.
8. We compare to the current downward precedence p_d set by `\multiplication`, arriving at $p_{op} = 100 > 50 = p_d$ – which finally prompts $\text{\texttt{gT\TeX}}$ to insert parentheses, and we proceed as before.

3.3.6 Variables

All symbol and notation declarations require a module with which they are associated, hence the commands `\symdecl`, `\notation`, `\symdef` etc. are disabled outside of `smodule`-environments.

Variables are different – variables are allowed everywhere, are not exported when the current module (if one exists) is imported (via `\importmodule` or `\usemodule`) and (also unlike symbol declarations) “disappear” at the end of the current $\text{\texttt{T\TeX}}$ group.

`\svar`

So far, we have always used variables using `\svar{n}`, which marks-up n as a variable with name n . More generally, `\svar[foo]{<texcode>}` marks-up the arbitrary `<texcode>` as representing a variable with name `foo`.

Of course, this makes it difficult to reuse variables, or introduce “functional” variables with arities > 0 , or provide them with a type or definiens.

`\vardef`

For that, we can use the `\vardef` command. Its syntax is largely the same as that of `\symdef`, but unlike symbols, variables have only one notation (TODO: so far?), hence there is only `\vardef` and no `\vardecl`.

Example 19

Input:

```
1 \vardef{varf}[
2   name=f,
3   type=\funtype{\Nat}{\Nat},
4   op=f,
5   args=1,
6   prec=0;\neginfp
7 ]{\comp{f}#1}
8 \vardef{varn}[name=n,type=\Nat]{\comp{n}}
9 \vardef{varx}[name=x,type=\Nat]{\comp{x}}
10
11 Given a function $\varf!:\funtype{\Nat}{\Nat}$,
12 by $\addition{\varf!,\varn}$ we mean the function
13 $\fun{\varx}{\varf{\addition{\varx,\varn}}}$
```

Output:

Given a function $f : \mathbb{N} \rightarrow \mathbb{N}$, by $f+n$ we mean the function $x \mapsto f(x+n)$

(of course, “lifting” addition in the way described in the previous example is an operation that deserves its own symbol rather than abusing `\addition`, but... well.)

TODO: bind=forall/exists

3.3.7 Variable Sequences

Variable *sequences* occur quite frequently in informal mathematics, hence they deserve special support. Variable sequences behave like variables in that they disappear at the end of the current $\text{T}_\text{E}\text{X}$ group and are not exported from modules, but their declaration is quite different.

`\varseq`

A variable sequence is introduced via the command `\varseq`, which takes the usual optional arguments `name` and `type`. It then takes a starting index, an end index and a *notation* for the individual elements of the sequence parametric in an index.

This is best shown by example:

Example 20

Input:

```
1 \vardef{varn}[name=n,type=\Nat]{\comp{n}}
2 \varseq{seqa}[name=a,type=\Nat]{1}{\varn}{\comp{a}_{#1}}
3
4 The $i$th index of $\seqa!$ is $\seqa{i}$.
```

Output:

The i th index of a_1, \dots, a_n is a_i .

Note that the syntax `\seqa!` now automatically generates a presentation based on the starting and ending index.

TODO: more notations for invoking sequences.

Notably, variable sequences are nicely compatible with **a**-type arguments, so we can do the following:

Example 21

Input:

```
1 \addition{\seqa}
```

Output:

$$a_1 + \dots + a_n$$

Sequences can be *multidimensional* using the **args**-key, in which case the notation's arity increases and starting and ending indices have to be provided as a comma-separated list:

Example 22

Input:

```
1 \vardef{varm}[name=m,type=\Nat]{\comp{m}}
2 \varseq{seqa}[
3   name=a,
4   args=2,
5   type=\Nat,
6 ]{1,1}{\varn,\varm}{\comp{a}_{#1}^{#2}}
7
8 \seqa! and \addition{\seqa}
```

Output:

$$a_1^1, \dots, a_n^m \text{ and } a_1^1 + \dots + a_n^m$$

We can also explicitly provide a “middle” segment to be used, like such:

Example 23

Input:

```
1 \varseq{seqa}[
2   name=a,
3   type=\Nat,
4   args=2,
5   mid={\comp{a}_{\varn}^1,\comp{a}_1^2,\ellipses,\comp{a}_1^{\varm}}
6 ]{1,1}{\varn,\varm}{\comp{a}_{#1}^{#2}}
7
8 \seqa! and \addition{\seqa}
```

Output:

$$a_1^1, \dots, a_n^1, a_1^2, \dots, a_1^m, \dots, a_n^m \text{ and } a_1^1 + \dots + a_n^1 + a_1^2 + \dots + a_1^m + \dots + a_n^m$$

3.4 Module Inheritance and Structures

3.4.1 Multilinguality and Translations

If we load the \TeX document class or package with the option `lang=<lang>`, \TeX will load the appropriate `babel` language for you – e.g. `lang=de` will load the `babel` language `ngerman`. Additionally, it makes \TeX aware of the current document being set in (in this example) *german*. This matters for reasons other than mere `babel`-purposes, though:

Every *module* is assigned a language. If no \TeX package option is set that allows for inferring a language, \TeX will check whether the current file name ends in e.g. `.en.tex` (or `.de.tex` or `.fr.tex`, or...) and set the language accordingly. Alternatively, a language can be explicitly assigned via `\begin{smodule}[lang=<language>]{Foo}`.

Technically, each `smodule`-environment induces *two* OMDoc/MMT theories:
 $\begin{array}{ll} \text{---M---} & \text{\begin{smodule}[lang=<lang>]{Foo} generates a theory some/namespace?Foo} \\ \text{---M---} & \text{that only contains the “formal” part of the module – i.e. exactly the content} \\ \text{---T---} & \text{that is exported when using \importmodule.} \\ \text{---T---} & \text{Additionally, MMT generates a language theory some/namespace/Foo?<lang> that} \\ & \text{includes some/namespace?Foo and contains all the other document content – vari-} \\ & \text{able declarations, includes for each \usemodule, etc.} \end{array}$

Notably, the language suffix in a filename is ignored for `\usemodule`, `\importmodule` and in generating/computing URIs for modules. This however allows for providing *translations* for modules between languages without needing to duplicate content:

If a module `Foo` exists in e.g. *english* in a file `Foo.en.tex`, we can provide a file `Foo.de.tex` right next to it, and write `\begin{smodule}[sig=en]{Foo}`. The `sig`-key then signifies, that the “signature” of the module is contained in the *english* version of the module, which is immediately imported from there, just like `\importmodule` would.

Additionally to translating the informal content of a module file to different languages, it also allows for customizing notations between languages. For example, the *least common multiple* of two numbers is often denoted as `lcm(a,b)` in *english*, but is called *kleinstes gemeinsames Vielfaches* in *german* and consequently denoted as `kgV(a,b)` there.

We can therefore imagine a *german* version of an `lcm`-module looking something like this:

```
1 \begin{smodule}[sig=en]{lcm}
2   \notation*{lcm}[de]{\comp{\mathtt{kgV}}}{\#1,\#2}
3
4   Das \symref{lcm}{kleinste gemeinsame Vielfache}
5   $\lcm{a,b}$ von zwei Zahlen $a,b$ ist...
6 \end{smodule}
```

If we now do `\importmodule{lcm}` (or `\usemodule{lcm}`) within a *german* document, it will also load the content of the *german* translation, including the `de`-notation for `\lcm`.

3.4.2 Simple Inheritance and Namespaces

`\importmodule`
`\usemodule`

`\importmodule`[Some/Archive]{path?ModuleName} is only allowed within an `smodule`-environment and makes the symbols declared therein available. Additionally the content of ModuleName will be exported if the current module is imported somewhere else via `\importmodule`.

`\usemodule` behaves the same way, but without exporting the content of the used module.

It is worth going into some detail how exactly `\importmodule` and `\usemodule` resolve their arguments to find the desired module – which is closely related to the *namespace* generated for a module, that is used to generate its URI.



Ideally, \TeX would use arbitrary URIs for modules, with no forced relationships between the *logical* namespace of a module and the *physical* location of the file declaring the module – like MMT does things.

Unfortunately, \TeX only provides very restricted access to the file system, so we are forced to generate namespaces systematically in such a way that they reflect the physical location of the associated files, so that \TeX can resolve them accordingly. Largely, users need not concern themselves with namespaces at all, but for completeness sake, we describe how they are constructed:

- If `\begin{smodule}{Foo}` occurs in a file `/path/to/file/Foo[.<lang>].tex` which does not belong to an archive, the namespace is `file://path/to/file`.
- If the same statement occurs in a file `/path/to/file/bar[.<lang>].tex`, the namespace is `file://path/to/file/bar`.

In other words: outside of archives, the namespace corresponds to the file URI with the filename dropped iff it is equal to the module name, and ignoring the (optional) language suffix.

If the current file is in an archive, the procedure is the same except that the initial segment of the file path up to the archive's `source`-folder is replaced by the archive's namespace URI.



Conversely, here is how namespaces/URIs and file paths are computed in import statements, exemplary `\importmodule`:

- `\importmodule{Foo}` outside of an archive refers to module `Foo` in the current namespace. Consequently, `Foo` must have been declared earlier in the same document or, if not, in a file `Foo[.<lang>].tex` in the same directory.
- The same statement *within* an archive refers to either the module `Foo` declared earlier in the same document, or otherwise to the module `Foo` in the archive's top-level namespace. In the latter case, it has to be declared in a file `Foo[.<lang>].tex` directly in the archive's `source`-folder.
- Similarly, in `\importmodule{some/path?Foo}` the path `some/path` refers to either the sub-directory and relative namespace path of the current directory and namespace outside of an archive, or relative to the current archive's top-level namespace and `source`-folder, respectively.

The module `Foo` must either be declared in the



file $\langle top-directory \rangle / some/path/Foo[. \langle lang \rangle].tex$, or in $\langle top-directory \rangle / some/path[. \langle lang \rangle].tex$ (which are checked in that order).

- Similarly, `\importmodule[Some/Archive]{some/path?Foo}` is resolved like the previous cases, but relative to the archive `Some/Archive` in the mathhub-directory.
- Finally, `\importmodule{full://uri?Foo}` naturally refers to the module `Foo` in the namespace `full://uri`. Since the file this module is declared in can not be determined directly from the URI, the module must be in memory already, e.g. by being referenced earlier in the same document. Since this is less compatible with a modular development, using full URIs directly is strongly discouraged, unless the module is declared in the current file directly.

`\STEXexport`

`\importmodule` and `\usemodule` import all symbols, notations, semantic macros and (recursively) `\importmodules`. If you want to additionally export e.g. convenience macros and other code from a module, you can use the command `\STEXexport{<code>}` in your module. Then `<code>` is executed (both immediately and) every time the current module is opened via `\importmodule` or `\usemodule`.



Note, that `\newcommand` defines macros *globally* and throws an error if the macro already exists, potentially leading to low-level L^AT_EX errors if we put a `\newcommand` in an `\STEXexport` and the `<code>` is executed more than once in a document – which can happen easily.

A safer alternative is to use macro definition principles, that are safe to use even if the macro being defined already exists, and ideally are local to the current T_EX group, such as `\def` or `\let`.

3.4.3 The `mathstructure` Environment

A common occurrence in mathematics is bundling several interrelated “declarations” together into *structures*. For example:

- A *monoid* is a structure $\langle M, \circ, e \rangle$ with $\circ : M \times M \rightarrow M$ and $e \in M$ such that...
- A *topological space* is a structure $\langle X, \mathcal{T} \rangle$ where X is a set and \mathcal{T} is a topology on X
- A *partial order* is a structure $\langle S, \leq \rangle$ where \leq is a binary relation on S such that...

This phenomenon is important and common enough to warrant special support, in particular because it requires being able to *instantiate* such structures (or, ratherer, structure *signatures*) in order to talk about (concrete or variable) *particular* monoids, topological spaces, partial orders etc.

`mathstructure` The `mathstructure` environment allows us to do exactly that. It behaves exactly like the `smodule` environment, but is itself only allowed inside an `smodule` environment, and allows for instantiation later on.

How this works is again best demonstrated by example:

Example 24

Input:

```

1 \begin{mathstructure}{monoid}
2   \symdef{universe}[type=\set]{\comp{U}}
3   \symdef{op}[
4     args=2,
5     type=\funtype{\universe,\universe}{\universe},
6     op=\circ
7   ]{##1 \comp{\circ} ##2}
8   \symdef{unit}[type=\universe]{\comp{e}}
9 \end{mathstructure}
10
11 A \symname{monoid} is...
```

Output:

A **monoid** is...

Note that the `\symname{monoid}` is appropriately highlighted and (depending on your pdf viewer) shows a URI on hovering – implying that the `mathstructure` environment has generated a *symbol* monoid for us. It has not generated a semantic macro though, since we can not use the monoid-symbol *directly*. Instead, we can instantiate it, for example for integers:

Example 25

Input:

```

1 \symdef{Int}[type=\set]{\comp{\mathbb Z}}
2 \symdef{addition}[
3   type=\funtype{\Int,\Int}{\Int},
4   args=2,
5   op=+
6 ]{##1 \comp{+} ##2}
7 \symdef{zero}[type=\Int]{\comp{0}}
8
9 $\mathstruct{\Int,\addition!,\zero}$ is a \symname{monoid}.
```

Output:

$\langle \mathbb{Z}, +, 0 \rangle$ is a **monoid**.

So far, we have not actually instantiated monoid, but now that we have all the symbols to do so, we can:

Example 26

Input:

```

1 \instantiate{intmonoid}{
2   universe = Int ,
3   op = addition ,
4   unit = zero
5 }{monoid}{\mathbb{Z}_{+,0}}
6
7 $\intmonoid{universe}$, $\intmonoid{unit}$ and $\intmonoid{op}{a}{b}$.
8
9 Also: $\intmonoid!$

```

Output:

\mathbb{Z} , 0 and $a+b$.
Also: $\mathbb{Z}_{+,0}$

\instantiate

So summarizing: `\instantiate` takes four arguments: The (macro-)name of the instance, a key-value pair assigning declarations in the corresponding `mathstructure` to symbols currently in scope, the name of the `mathstructure` to instantiate, and lastly a notation for the instance itself.

It then generates a semantic macro that takes as argument the name of a declaration in the instantiated `mathstructure` and resolves it to the corresponding instance of that particular declaration.

`\instantiate` and `mathstructure` make use of the *Theories-as-Types* paradigm: `mathstructure{<name>}` does in fact simply create a nested theory with name `<name>-structure`. The *constant* `<name>` is defined as `Mod(<name>-structure)` – a *dependent record type with manifest fields*, the fields of which are generated from (and correspond to) the constants in `<name>-structure`.
 $\hookrightarrow M$ `\instantiate` appropriately generates a constant whose definiens is a record term of type `Mod(<name>-structure)`, with the fields assigned appropriately based on the key-value-list.

Notably, `\instantiate` throws an error if not *every* declaration in the instantiated `mathstructure` is being assigned.

You might consequently ask what the usefulness of `mathstructure` even is.

\varinstantiate

The answer is that we can also instantiate a `mathstructure` with a *variable*. The syntax of `\varinstantiate` is equivalent to that of `\instantiate`, but all of the key-value-pairs are optional, and if not explicitly assigned (to a symbol *or* a variable declared with `\vardef`) inherit their notation from the one in the `mathstructure` environment.

This allows us to do things like:

Example 27

Input:

```

1 \varinstantiate{varM}{\monoid}{M}
2
3 A \symname{monoid} is a structure
4 $\varM!:=\mathstrut{\varM{universe},\varM{op}!,\varM{unit}}$
5 such that
6 $\varM{op}!:\funtype{\varM{universe},\varM{universe}}{\varM{universe}}$
7 and...
8
9 \varinstantiate{varMb}{universe = Int}{monoid}{M_2}
10
11 \noindent Let $\varMb!:=\mathstrut{\varMb{universe},\varMb{op}!,\varMb{unit}}$
12 a \symname{monoid} on $\Int$...

```

Output:

A monoid is a structure $M := \langle U, \circ, e \rangle$ such that $\circ : U \times U \rightarrow U$ and...
 Let $M_2 := \langle \mathbb{Z}, \circ, e \rangle$ a monoid on \mathbb{Z} ...

We will return to this example later, when we also know how to handle the *axioms* of a monoid.

3.4.4 The copymodule Environment

TODO: explain

Given modules:

Example 28

Input:

```

1 \begin{smodule}{magma}
2   \symdef{universe}{\comp{\mathcal U}}
3   \symdef{operation}[args=2,op=\circ]{\#1 \comp\circ \#2}
4 \end{smodule}
5 \begin{smodule}{monoid}
6   \importmodule{magma}
7   \symdef{unit}{\comp e}
8 \end{smodule}
9 \begin{smodule}{group}
10  \importmodule{monoid}
11  \symdef{inverse}[args=1]{\#1\comp{-1}}
12 \end{smodule}

```

Output:

We can form a module for *rings* by “cloning” an instance of **group** (for addition) and **monoid** (for multiplication), respectively, and “glueing them together” to ensure they share the same universe:

Example 29

Input:

```

1 \begin{smodule}{ring}
2   \begin{copymodule}{group}{addition}
3     \renamedecl[name=universe]{universe}{runiverse}
4     \renamedecl[name=plus]{operation}{rplus}
5     \renamedecl[name=zero]{unit}{rzero}
6     \renamedecl[name=uminus]{inverse}{ruminus}
7   \end{copymodule}
8   \notation*{rplus}[plus,op=+,prec=60]{#1 \comp+ #2}
9   \notation*{rzero}[zero]{\comp0}
10  \notation*{ruminus}[uminus,op=-]{\comp- #1}
11  \begin{copymodule}{monoid}{multiplication}
12    \assign{universe}{\runiverse}
13    \renamedecl[name=times]{operation}{rtimes}
14    \renamedecl[name=one]{unit}{rone}
15  \end{copymodule}
16  \notation*{rtimes}[cdot,op=\cdot,prec=50]{#1 \comp\cdot #2}
17  \notation*{rone}[one]{\comp1}
18  Test: $\rtimes a\{rplus c\{rtimes de\}}$
19 \end{smodule}

```

Output:

Test: $a \cdot (c + d \cdot e)$

TODO: explain donotclone

3.4.5 The interpretmodule Environment

TODO: explain

Example 30

Input:

```

1 \begin{smodule}{int}
2   \symdef{Integers}{\comp{\mathbb Z}}
3   \symdef{plus}[args=2,op=+]{#1 \comp+ #2}
4   \symdef{zero}{\comp0}
5   \symdef{uminus}[args=1,op=-]{\comp-#1}
6
7   \begin{interpretmodule}{group}{intisgroup}
8     \assign{universe}{\Integers}
9     \assign{operation}{\plus!}
10    \assign{unit}{\zero}
11    \assign{inverse}{\uminus!}
12  \end{interpretmodule}
13 \end{smodule}

```

Output:

3.5 Primitive Symbols (The $\text{\texttt{sTeX}}$ Metatheory)

TODO: metatheory documentation

Chapter 4

Using \TeX Symbols

Given a symbol declaration `\symdecl{symbolname}`, we obtain a semantic macro `\symbolname`. We can use this semantic macro in math mode to use its notation(s), and we can use `\symbolname!` in math mode to use its operator notation(s). What else can we do?

4.1 `\symref` and its variants

`\symref`
`\symname`

We have already seen `\symname` and `\symref`, the latter being the more general.

`\symref{<symbolname>}{<code>}` marks-up `<code>` as referencing `<symbolname>`. Since quite often, the `<code>` should be (a variant of) the name of the symbol anyway, we also have `\symname{<symbolname>}`.

Note that `\symname` uses the *name* of a symbol, not its macroname. More precisely, `\symname` will insert the name of the symbol with “-” replaced by spaces. If a symbol does not have an explicit `name=` given, the two are equal – but for `\symname` it often makes sense to make the two explicitly distinct. For example:

Example 31

Input:

```
1 \symdef{Nat}[
2   name=natural-number,
3   type=\set
4 ]{\comp{\mathbb{N}}}
5
6 A \symname{Nat} is...
```

Output:

A natural number is...

`\symname` takes two additional optional arguments, `pre=` and `post=` that get prepended or appended respectively to the symbol name.

`\Symname`

Additionally, `\Symname` behaves exactly like `\symname`, but will capitalize the first letter of the name:

Example 32

Input:

```
1 \Symname[post=s]{Nat} are...
```

Output:

Natural numbers are...



This is as good a place as any other to explain how \TeX resolves a string `symbolname` to an actual symbol.

If `\symbolname` is a semantic macro, then \TeX has no trouble resolving `symbolname` to the full URI of the symbol that is being invoked.

However, especially in `\symname` (or if a symbol was introduced using `\symdecl*` without generating a semantic macro), we might prefer to use the *name* of a symbol directly for readability – e.g. we would want to write `A \symname{natural-number} is...` rather than `A \symname{Nat} is...`. \TeX attempts to handle this case thusly:

If `string` does *not* correspond to a semantic macro `\string`, then \TeX checks all symbols currently in scope until it finds one, whose full URI ends with `string`. This allows for disambiguating more precisely, e.g. by saying `\symname{Integers?addition}` or `\symname{RealNumbers?addition}` in the case where several `additions` are in scope.

However, this also means that if we have symbols `foo` and e.g. `miraculous-foo`, then \TeX might resolve `\symname{foo}` to `miraculous-foo` if it finds this symbol first. It is therefore a good idea to prefix symbol names with a `?`, thus ensuring that \TeX will find the symbol `...?foo` rather than `...?miraculous-foo`.

4.2 Marking Up Text and On-the-Fly Notations

We can also use semantic macros outside of text mode though, which allows us to annotate arbitrary text fragments.

Let us assume again, that we have `\symdef{addition}[args=2]{#1 \comp+ #2}`. Then we can do

Example 33

Input:

```
1 \addition{\comp{The sum of} \arg{${\svar{n}}$} \comp{ and } \arg{${\svar{m}}$}}
2 is...
```

Output:

The sum of n and m is...

...which marks up the text fragment as representing an *application* of the `addition`-symbol to two argument n and m .

\hookrightarrow As expected, the above example is translated to OMDOC/MMT as an
 \rightarrow OMA with `<OMS name="...?addition"/>` as head and `<OMV name="n"/>` and
 \rightsquigarrow `<OMV name="m"/>` as arguments.

\arg

In text mode, every semantic macro takes exactly one argument, namely the text-fragment to be annotated. The `\arg` command is only valid within the argument to a semantic macro and marks up the *individual arguments* for the symbol.

We can also use semantic macros in text mode to invoke an operator itself instead of its application, with the usual syntax using `!`:

Example 34

Input:

```
1 \addition!{Addition} is...
```

Output:

Addition is...

In deed, `\symbolname!{<code>}` is exactly equivalent to `\symref{symbolname}{<code>}` (the latter is in fact implemented in terms of the former).

`\arg` also allows us to switch the order of arguments around and “hide” arguments: For example, `\arg[3]{<code>}` signifies that `<code>` represents the *third* argument to the current operator, and `\arg*[i]{<code>}` signifies that `<code>` represents the *i*th argument, but it should not produce any output (it is exported in the `xhtml` however, so that MMT and other systems can pick up on it)

Example 35

Input:

```
1 \addition{\comp{adding}
2 \arg[2]{\svar{k}}
3 \arg*{\svar{n}}{\svar{m}}} yields...
```

Output:

adding k yields...

Note that since the second `\arg` has no explicit argument number, it automatically represents the first not-yet-given argument – i.e. in this case the first one.

The same syntax can be used in math mode, too, which allows us to spontaneously introduce new notations on the fly. We can activate it using the starred variants of semantic macros:

Example 36

Input:

```
1 Given $\text{\addition{\svar{n}}{\svar{m}}}$, then
2 $\text{\addition*}{
3   \arg*{\text{\addition{\svar{n}}{\svar{m}}}}
4   \comp{+}
5   \arg{\svar{k}}}
6 }$ yields...
```

Output:

Given $n+m$, then $+k$ yields...

4.3 Referencing Symbols and Statements

TODO: references documentation

Chapter 5

sTEX Statements

5.1 Definitions, Theorems, Examples, Paragraphs

As mentioned earlier, we can semantically mark-up *statements* such as definitions, theorems, lemmata, examples, etc.

The corresponding environments for that are:

- `sdefinition` for definitions,
- `sassertion` for assertions, i.e. propositions that are declared to be *true*, such as theorems, lemmata, axioms,
- `sexample` for examples, and
- `sparagraph` for other semantic paragraphs, such as comments, remarks, conjectures, etc.

The *presentation* of these environments can be customized to use e.g. predefined theorem-environments, see [chapter 6](#) for details.

All of these environments take optional arguments in the form of `key=value`-pairs. Common to all of them are the keys `id=` (for cross-referencing, see [section 4.3](#)), `type=` for customization (see [chapter 6](#)) and additional information (e.g. definition principles, “difficulty” etc), `title=`, and `for=`.

The `for=` key expects a comma-separated list of existing symbols, allowing for e.g. things like

Example 37

Input:

```
1 \begin{sexample}[
2   id=additionandmultiplication.ex,
3   for={addition,multiplication},
4   type={trivial,boring},
5   title={An Example}
6 ]
7   $\addition{2,3}$ is $5$, $\multiplication{2,3}$ is $6$.
8 \end{sexample}
```




Output:

Example 5.1.1 (An Example). $2+3$ is 5, $2\cdot 3$ is 6.

`\definiendum`
`\definame`
`\definiens`
`\Definame`

`sdefinition` (and `sparagraph` with `type=symdoc`) introduce three new macros: `definiendum` behaves like `symref` (and `definame/Definame` like `symname/Symname`, respectively), but highlights the referenced symbol as *being defined* in the current definition.

`\definiens`[<optional symbolname>]{<code>} marks up <code> as being the explicit *definiens* of <optional symbolname> (in case `for=` has multiple symbols).

-  `M` → The special `type=symdoc` for `sparagraph` is intended to be used for “informal definitions”, or encyclopedia-style descriptions for symbols.
-  `M` → The MMT-system can use those (in lieu of an actual `sdefinition` in scope) to present to users, e.g. when hovering over symbols.
-  `T` →

All four environments also take an optional parameter `name=` – if this one is given a value, the environment will generate a *symbol* by that name (but with no semantic macro). Not only does this allow for `\symref` et al, it allows us to resume our earlier example for monoids much more nicely:

Example 38

Input:

```

1 \begin{mathstructure}{monoid}
2   \symdef{universe}[type=\set]{\comp{U}}
3   \symdef{op}[
4     args=2,
5     type=\funtype{\universe,\universe}{\universe},
6     op=\circ
7   ]{#1 \comp{\circ} #2}
8   \symdef{unit}[type=\universe]{\comp{e}}
9
10  \begin{sparagraph}[type=symdoc,for=monoid]
11    A \definame{monoid} is a structure
12    $\mathstruct{\universe,\op!,\unit}$
13    where $\op!: \funtype{\universe}{\universe}$ and
14    $\inset{\unit}{\universe}$ such that
15
16    \begin{sassertion}[name=associative,
17      type=axiom,
18      title=Associativity]
19      $\op!$ is associative
20    \end{sassertion}
21    \begin{sassertion}[name=isunit,
22      type=axiom,
23      title=Unit]
24      $\equal{\op{\svar{x}}{\unit}}{\svar{x}}$
25      for all $\inset{\svar{x}}{\universe}$
26    \end{sassertion}
27  \end{sparagraph}
28 \end{mathstructure}
29
30 An example for a \symname{monoid} is...
```

Output:

A **monoid** is a structure $\langle U, \circ, e \rangle$ where $\circ : U \rightarrow U$ and $e \in U$ such that

Axiom 5.1.2 (Associativity). \circ is associative

Axiom 5.1.3 (Unit). $x \circ e = x$ for all $x \in U$

An example for a **monoid** is...

Now the **mathstructure monoid** contains two additional symbols, namely the axioms for associativity and that e is a unit. Note that both symbols do not represent the mere *propositions* that e.g. \circ is associative, but *the assertion that it is actually true* that \circ is associative.

If we now want to instantiate **monoid** (unless with a variable, of course), we also need to assign **associative** and **neutral** to analogous assertions. So the earlier example

```
1 \instantiate{intmonoid}{  
2   universe = Int ,  
3   op = addition ,  
4   unit = zero  
5 }{monoid}{\mathbb{Z}_{+,0}}
```

...will not work anymore. We now need to give assertions that **addition** is associative and that **zero** is a unit with respect to addition.²

5.2 Proofs

TODO

²Of course, $\text{\texttt{S}\text{\textsf{T}\text{\textsf{E}\text{\textsf{X}}}}$ can not check that the assertions are the “correct” ones – but if the assertions (both in **monoid** as well as those for addition and zero) are properly marked up, MMT can. **TODO: should**

Chapter 6

Highlighting and Presentation Customizations

The environments starting with `s` (i.e. `smodule`, `sassertion`, `sexample`, `sdefinition`, `sparagraph` and `sproof`) by default produce no additional output whatsoever (except for the environment content of course). Instead, the document that uses them (whether directly or e.g. via `inputref`) can decide how these environments are supposed to look like.

The `stexthm` defines some default customizations that can be used, but of course many existing L^AT_EX templates come with their own `definition`, `theorem` and similar environments that authors are supposed (or even required) to use. Their concrete syntax however is usually not compatible with all the additional arguments that `gTEX` allows for semantic information.

Therefore we introduced the separate environments `sdefinition` etc. instead of using `definition` directly, and allow authors to specify how these environments should be styled via the commands `stexpatch*`.

```
\stexpatchmodule
\stexpatchdefinition
\stexpatchassertion
\stexpatchexample
\stexpatchparagraph
\stexpatchproof
```

All of these commands take one optional and two proper arguments, i.e.

```
\stexpatch*{<type>}{<begin-code>}{<end-code>}.
```

After `gTEX` reads and processes the optional arguments for these environments, (some of) their values are stored in the macros `\s*<field>` (i.e. `sexampleid`, `\sassertionname`, etc.). It then checks for all the values `<type>` in the `type=`-list, whether an `\stexpatch*{<type>}` for the current environment has been called. If it finds one, it uses that patches `<begin-code>` and `<end-code>` to mark up the current environment. If no patch for (any of) the type(s) is found, it checks whether and `\stexpatch*` was called without optional argument.

For example, if we want to use a predefined `theorem` environment for `sassertions` with `type=theorem`, we can do

```
1 \stexpatchassertion[theorem]{\begin{theorem}}{\end{theorem}}
```

...or, rather, since e.g. `theorem`-environments defined using `amsthm` take an optional title as argument, we can do:

```
1 \stexpatchassertion[theorem]
2   {\ifx\sassertiontitle\@empty
3     \begin{theorem}}
```

```

4   \else
5     \begin{theorem}[\sassertiontitle]
6   \fi}
7   {\end{theorem}}

```

Or, if we want all `sdefinitions` to use a predefined `definition`-environment, we can do

```

1 \stexpatchdefinition
2   {\ifx\sdefinitiontitle\@empty
3     \begin{definition}
4   \else
5     \begin{definition}[\sdefinitiontitle]
6   \fi}
7   {\end{definition}}

```

`\compemph`
`\varemp`
`\symrefemph`
`\defemph`

Apart from the environments, we can control how `STEX` highlights variables, notation components, `\symrefs` and `\definiendums`, respectively.

To do so, we simply redefine these four macros. For example, to highlight notation components (i.e. everything in a `\comp`) in blue, as in this document, we can do `\def\compemph#1{\textcolor{blue}{#1}}`. By default, `\compemph` et al do nothing.

`\compemph@uri`
`\varemp@uri`
`\symrefemph@uri`
`\defemph@uri`

For each of the four macros, there exists an additional macro that takes the full URI of the relevant symbol currently being highlighted as a second argument. That allows us to e.g. use pdf tooltips and links. For example, this document uses

```

1 \protected\def\symrefemph@uri#1#2{
2   \pdftooltip{
3     \srefsymuri{#2}{\symrefemph{#1}}
4   }{
5     URI:~\detokenize{#2}
6   }
7 }

```

By default, `\compemph@uri` is simply defined as `\compemph{#1}` (analogously for the other three commands).

Chapter 7

Additional Packages

TODO: tikzinput documentation

7.1 Modular Document Structuring

TODO: document-structure documentation

7.2 Slides and Course Notes

TODO: notesslides documentation

7.3 Homework, Problems and Exams

TODO: problem documentation

TODO: hwexam documentation

Part II

Documentation

Chapter 8

sTeX-Basics

This sub package provides general set up code, auxiliary methods and abstractions for xhtml annotations.

8.1 Macros and Environments

<code>\sTeX</code>	Both print this sTeX logo.
<code>\stex</code>	

<code>\stex_debug:nn</code>	<code>\stex_debug:nn {<log-prefix>} {<message>}</code>
-----------------------------	--

Logs *<message>*, if the package option `debug` contains *<log-prefix>*.

8.1.1 HTML Annotations

<code>\if@latexml</code>	L ^A T _E X2e conditional for L ^A T _E XML
--------------------------	---

<code>\latexml_if_p: *</code>	L ^A T _E X3 conditionals for L ^A T _E XML.
<code>\latexml_if:TF *</code>	

<code>\stex_if_do_html_p: *</code>	Whether to currently produce any HTML annotations (can be false in some advanced structuring environments, for example)
<code>\stex_if_do_html:TF *</code>	

<code>\stex_suppress_html:n</code>	Temporarily disables HTML annotations in its argument code
------------------------------------	--

We have four macros for annotating generated HTML (via L^AT_EXML or R_US_TE_X) with attributes:

<code>\stex_annotate:nnn</code>	<code>\stex_annotate:nnn {⟨property⟩} {⟨resource⟩} {⟨content⟩}</code>
<code>\stex_annotate_invisible:nnn</code>	
<code>\stex_annotate_invisible:n</code>	

Annotates the HTML generated by $\langle content \rangle$ with

`property="stex:⟨property⟩", resource="⟨resource⟩".`

`\stex_annotate_invisible:n` adds the attributes

`stex:visible="false", style="display:none".`

`\stex_annotate_invisible:nnn` combines the functionality of both.

<code>stex_annotate_env</code>	<code>\begin{stex_annotate_env}{⟨property⟩}{⟨resource⟩}</code> $\langle content \rangle$ <code>\end{stex_annotate_env}</code> behaves like <code>\stex_annotate:nnn {⟨property⟩} {⟨resource⟩} {⟨content⟩}</code> .
--------------------------------	---

8.1.2 Babel Languages

<code>\c_stex_languages_prop</code>
<code>\c_stex_language_abbrevs_prop</code>

Map language abbreviations to their full babel names and vice versa. e.g. `\c_stex_languages_prop{en}` yields `english`, and `\c_stex_language_abbrevs_prop{english}` yields `en`.

8.1.3 Auxiliary Methods

<code>\stex_deactivate_macro:Nn</code>	<code>\stex_deactivate_macro:Nn⟨cs⟩{⟨environments⟩}</code>
<code>\stex_reactivate_macro:N</code>	

Makes the macro $\langle cs \rangle$ throw an error, indicating that it is only allowed in the context of $\langle environments \rangle$.

`\stex_reactivate_macro:N⟨cs⟩` reactivates it again, i.e. this happens ideally in the $\langle begin \rangle$ -code of the associated environments.

<code>\ignorespacesandpars</code>	ignores white space characters and <code>\par</code> control sequences. Expands tokens in the process.
-----------------------------------	--

Chapter 9

STEX-MathHub

This sub package provides code for handling ST_EX archives, files, file paths and related methods.

9.1 Macros and Environments

<code>\stex_kpsewhich:n</code>	<code>\stex_kpsewhich:n</code> executes <code>kpsewhich</code> and stores the return in <code>\l_stex_kpsewhich_return_str</code> . This does not require shell escaping.
--------------------------------	---

9.1.1 Files, Paths, URIs

<code>\stex_path_from_string:Nn</code>	<code>\stex_path_from_string:Nn</code> $\langle path-variable \rangle$ $\{\langle string \rangle\}$ turns the $\langle string \rangle$ into a path by splitting it at <code>/</code> -characters and stores the result in $\langle path-variable \rangle$. Also applies <code>\stex_path_canonicalize:N</code> .
--	--

<code>\stex_path_to_string:NN</code> <code>\stex_path_to_string:N</code>	The inverse; turns a path into a string and stores it in the second argument variable, or leaves it in the input stream.
---	--

<code>\stex_path_canonicalize:N</code>	Canonicalizes the path provided; in particular, resolves <code>.</code> and <code>..</code> path segments.
--	--

<code>\stex_path_if_absolute_p:N</code> \star <code>\stex_path_if_absolute:N\underline{T}</code> \star	Checks whether the path provided is <i>absolute</i> , i.e. starts with an empty segment
--	---

<code>\c_stex_pwd_seq</code> <code>\c_stex_pwd_str</code> <code>\c_stex_mainfile_seq</code> <code>\c_stex_mainfile_str</code>	Store the current working directory as path-sequence and string, respectively, and the (heuristically guessed) full path to the main file, based on the PWD and <code>\jobname</code> .
--	---

<code>\g_stex_currentfile_seq</code>	The file being currently processed (respecting <code>\input</code> etc.)
--------------------------------------	--

<code>\stex_filestack_push:n</code> <code>\stex_filestack_pop:</code>	Push and pop (repectively) a file path to the file stack, to keep track of the current file. Are called in hooks <code>file/before</code> and <code>file/after</code> , respectively.
--	---

9.1.2 MathHub Archives

<code>\mathhub</code> <code>\c_stex_mathhub_seq</code> <code>\c_stex_mathhub_str</code>	We determine the path to the local MathHub folder via one of four means, in order of precedence:
---	--

1. The `mathhub` package option, or
2. the `\mathhub-macro`, if it has been defined before the `\usepackage{stex}`-statement, or
3. the `MATHHUB` system variable, or
4. a path specified in `~/.stex/mathhub.path`.

In all four cases, `\c_stex_mathhub_seq` and `\c_stex_mathhub_str` are set accordingly.

<code>\l_stex_current_repository_prop</code>	
--	--

Always points to the *current* MathHub repository (if we currently are in one). Has the following fields corresponding to the entries in the `MANIFEST.MF`-file:

- `id`: The name of the archive, including its group (e.g. `smglom/calculus`),
- `ns`: The content namespace (for modules and symbols),
- `narr`: the narration namespace (for document references),
- `docurl`: The URL that is used as a basis for *external references*,
- `deps`: All archives that this archive depends on (currently not in use).

<code>\stex_set_current_repository:n</code>	
---	--

Sets the current repository to the one with the provided ID. calls `__stex_mathhub_do_manifest:n`, so works whether this repository's `MANIFEST.MF`-file has already been read or not.

<code>\stex_require_repository:n</code>	Calls <code>__stex_mathhub_do_manifest:n</code> iff the corresponding archive property list does not already exist, and adds a corresponding definition to the <code>.sms</code> -file.
---	--

<code>\stex_in_repository:nn</code>	<code>\stex_in_repository:nn{<repository-name>}{<code>}</code> Change the current repository to <code>{<repository-name>}</code> (or not, if <code>{<repository-name>}</code> is empty), and passes its ID on to <code>{<code>}</code> as <code>#1</code> . Switches back to the previous repository after executing <code>{<code>}</code> .
-------------------------------------	---

9.1.3 Using Content in Archives

<hr/> <hr/> <code>\mhp</code> <hr/>	<code>\mhp{<i>archive-ID</i>}{<i>filename</i>}</code>
	Expands to the full path of file <i>filename</i> in repository <i>archive-ID</i> . Does not check whether the file or the repository exist.
<hr/> <hr/> <code>\inputref</code> <hr/> <code>\mhinput</code> <hr/>	<code>\inputref[<i>archive-ID</i>]{<i>filename</i>}</code> Both <code>\input</code> the file <i>filename</i> in archive <i>archive-ID</i> (relative to the <code>source-</code> subdirectory). <code>\mhinput</code> does so directly. <code>\inputref</code> does so within an <code>\begingroup... \endgroup-</code> block, and skips it in <code>html</code> -mode, inserting a <i>reference</i> to the file instead. Both also set <code>\ifinputref</code> to true.
<hr/> <hr/> <code>\addmhbibresource</code> <hr/>	<code>\inputref[<i>archive-ID</i>]{<i>filename</i>}</code> Adds a <code>.bib</code> -file <i>filename</i> in archive <i>archive-ID</i> (relative to the top-directory of the archive!).
<hr/> <hr/> <code>\libinput</code> <hr/>	<code>\libinput{<i>filename</i>}</code> Inputs <i>filename.tex</i> from the <code>lib</code> folders in the current archive and the <code>meta-inf-</code> archive of the current archive group(s) (if existent) in descending order. Throws an error if no file by that name exists in any of the relevant <code>lib</code> -folders.
<hr/> <hr/> <code>\libusepackage</code> <hr/>	<code>\libusepackage[<i>args</i>]{<i>filename</i>}</code> Like <code>\libinput</code> , but looks for <code>.sty</code> -files and calls <code>\usepackage[<i>meta</i>{<i>args</i>}]<i>Arg</i>{<i>filename</i>}</code> instead of <code>\input</code> . Throws an error, if none or more than one suitable package file is found.
<hr/> <hr/> <code>\mhgraphics</code> <hr/> <code>\cmhgraphics</code> <hr/>	<i>If</i> the <code>graphicx</code> package is loaded, these macros are defined at <code>\begin{document}</code> . <code>\mhgraphics</code> takes the same arguments as <code>\includegraphics</code> , with the additional optional key <code>mhrepos</code> . It then resolves the file path in <code>\mhgraphics[mhrepos=Foo/Bar]{foo/bar.png}</code> relative to the <code>source</code> -folder of the <code>Foo/Bar</code> -archive. <code>\cmhgraphics</code> additional wraps the image in a <code>center</code> -environment.
<hr/> <hr/> <code>\lstinputmhlisting</code> <hr/> <code>\clstinputmhlisting</code> <hr/>	Like <code>\mhgraphics</code> , but only defined if the <code>listings</code> -package is loaded, and with <code>\lstinputlisting</code> instead of <code>\includegraphics</code> .

Chapter 10

STEX-References

This sub package contains code related to links and cross-references

10.1 Macros and Environments

\STEXreftitle**\STEXreftitle{<some title>}**

Sets the title of the current document to *<some title>*. A reference to the current document from *some other* document will then be displayed accordingly. e.g. if **\STEXreftitle{foo book}** is called, then referencing Definition 3.5 in this document in another document will display **Definition 3.5 in foo book**.

\stex_get_document_uri:

Computes the current document uri from the current archive's **narr**-field and its location relative to the archive's **source**-directory. Reference targets are computed from this URI and the reference-id.

\l_stex_current_docns_str

Stores its result in **\l_stex_current_docns_str**

\stex_get_document_url:

Computes the current URL from the current archive's **docurl**-field and its location relative to the archive's **source**-directory. Reference targets are computed from this URL and the reference-id, if this document is only included in SMS mode.

\l_stex_current_docurl_str

Stores its result in **\l_stex_current_docurl_str**

10.1.1 Setting Reference Targets

\stex_ref_new_doc_target:n**\stex_ref_new_doc_target:n{<id>}**

Sets a new reference target with id *<id>*.

\stex_ref_new_sym_target:n**\stex_ref_new_sym_target:n{<uri>}**

Sets a new reference target for the symbol *<uri>*.

10.1.2 Using References

`\sref` `\sref[<opt-args>]{<id>}`

References the label with if *<id>*. Optional arguments: TODO

`\srefsym` `\srefsym[<opt-args>]{<symbol>}`

Like `\sref`, but references the *canonical label* for the provided symbol. The canonical target is the last of the following occurring in the document:

- A `\definiendum` or `\definame` for *<symbol>*,
- The `sassertion`, `sexample` or `sparagraph` with `for=<symbol>` that generated *<symbol>* in the first place, or
- A `\sparagraph` with `type=symdoc` and `for=<symbol>`.

`\srefsymuri` `\srefsymuri{<URI>}{<text>}`

A convenient short-hand for `\srefsym[linktext={<text>}]<URI>`, but requires the first argument to be a full URI already. Intended to be used in e.g. `\compemph@uri`, `\defemph@uri`, etc.

Chapter 11

STEX-Modules

This sub package contains code related to Modules

11.1 Macros and Environments

The content of a module with uri $\langle URI \rangle$ is stored in four macros. All modifications of these macros are global:

 $\backslash\text{c_stex_module_}\langle URI \rangle_prop$

A property list with the following fields:

name The *name* of the module,

ns the *namespace* in field **ns**,

file the *file* containing the module, as a sequence of path fragments

lang the module's *language*,

sig the language of the signature module, if the current file is a translation from some other language,

deprecate if this module is deprecated, the module that replaces it,

meta the metatheory of the module.

 $\backslash\text{c_stex_module_}\langle URI \rangle_code$

The code to execute when this module is activated (i.e. imported), e.g. to set all the semantic macros, notations, etc.

 $\backslash\text{c_stex_module_}\langle URI \rangle_constants$

The names of all constants declared in the module

 $\backslash\text{c_stex_module_}\langle URI \rangle_constants$

The full URIs of all modules imported in this module

<hr/> <hr/> <code>\l_stex_current_module_str</code>	<code>\l_stex_current_module_str</code> always contains the URI of the current module (if existent).
<hr/> <hr/> <code>\l_stex_all_modules_seq</code>	Stores full URIs for all modules currently in scope.
<hr/> <hr/> <code>\stex_if_in_module_p: *</code> <code>\stex_if_in_module:TF *</code>	Conditional for whether we are currently in a module
<hr/> <hr/> <code>\stex_if_module_exists_p:n *</code> <code>\stex_if_module_exists:nTF *</code>	Conditional for whether a module with the provided URI is already known.
<hr/> <hr/> <code>\stex_add_to_current_module:n</code> <code>\STEXexport</code>	Adds the provided tokens to the <code>_code</code> control sequence of the current module. <code>\stex_add_to_current_module:n</code> is used internally, <code>\STEXexport</code> is intended for users and additionally executes the provided code immediately.
<hr/> <hr/> <code>\stex_add_constant_to_current_module:n</code>	Adds the declaration with the provided name to the <code>_constants</code> control sequence of the current module.
<hr/> <hr/> <code>\stex_add_import_to_current_module:n</code>	Adds the module with the provided full URI to the <code>_imports</code> control sequence of the current module.
<hr/> <hr/> <code>\stex_collect_imports:n</code>	Iterates over all imports of the provided (full URI of a) module and stores them as a topologically sorted list – including the provided module as the last element – in <code>\l_stex_collect_imports_seq</code>
<hr/> <hr/> <code>\stex_do_up_to_module:n</code>	Code that is <i>exported</i> from module (such as symbol declarations) should be local <i>to the current module</i> . For that reason, ideally all symbol declarations and similar commands should be called directly in the module environment, however, that is not always feasible, e.g. in structural features or <code>sparapraphs</code> . <code>\stex_do_up_to_module</code> therefore executes the provided code repeatedly in an <code>\aftergroup</code> up until the group level is equal to that of the innermost smodule environment.

\stex_modules_current_namespace:

Computes the current namespace as follows:

If the current file is `.../source/sub/file.tex` in some archive with namespace `http://some.namespace/foo`, then the namespace of is `http://some.namespace/foo/sub/file`. Otherwise, the namespace is the absolute file path of the current file (i.e. starting with `file:///`).

The result is stored in `\l_stex_module_ns_str`. Additionally, the sub path relative to the current repository is stored in `\l_stex_module_subpath_str`.

11.1.1 The smodule environment

module `\begin{module}[\langle options \rangle]{\langle name \rangle}`

Opens a new module with name `\langle name \rangle`. Options are:

title `(\langle token list \rangle)` to display in customizations.

type `(\langle string \rangle*)` for use in customizations.

deprecate `(\langle module \rangle)` if set, will throw a warning when loaded, urging to use `\langle module \rangle` instead.

id `(\langle string \rangle)` for cross-referencing.

ns `(\langle URI \rangle)` the namespace to use. *Should not be used, unless you know precisely what you're doing.* If not explicitly set, is computed using `\stex_modules_current_namespace:`.

lang `(\langle language \rangle)` if not set, computed from the current file name (e.g. `foo.en.tex`).

sig `(\langle language \rangle)` if the current file is a translation of a file with the same base name but a different language suffix, setting `sig=<lang>` will preload the module from that language file. This helps ensuring that the (formal) content of both modules is (almost) identical across languages and avoids duplication.

creators `(\langle string \rangle*)` names of the creators.

contributors `(\langle string \rangle*)` names of contributors.

srccite `(\langle string \rangle)` a source citation for the content of this module.

\stex_module_setup:nn `\stex_module_setup:nn{\langle params \rangle}{\langle name \rangle}`

Sets up a new module with name `\langle name \rangle` and optional parameters `\langle params \rangle`. In particular, sets `\l_stex_current_module_str` appropriately.

\stexpatchmodule `\stexpatchmodule [\langle type \rangle] {\langle begincode \rangle} {\langle endcode \rangle}`

Customizes the presentation for those `smodule`-environments with `type=\langle type \rangle`, or all others if no `\langle type \rangle` is given.

\STEXModule `\STEXModule {\langle fragment \rangle}`

Attempts to find a module whose URI ends with `\langle fragment \rangle` in the current scope and passes the full URI on to `\stex_invoke_module:n`.

\stex_invoke_module:n `\stex_invoke_module:n`

Invoked by `\STEXModule`. Needs to be followed either by `!\macro` or `?{\langle symbolname \rangle}`. In the first case, it stores the full URI in `\macro`; in the second case, it invokes the symbol `\langle symbolname \rangle` in the selected module.

`\stex_activate_module:n`

Activate the module with the provided URI; i.e. executes all macro code of the module's `_code`-macro (does nothing if the module is already activated in the current context) and adds the module to `\l_stex_all_modules_seq`.

Chapter 12

STEX-Module Inheritance

Code related to Module Inheritance, in particular *sms mode*.

12.1 Macros and Environments

12.1.1 SMS Mode

“SMS Mode” is used when loading modules from external tex files. It deactivates any output and ignores all T_EX commands not explicitly allowed via the following lists – all of which either declare module content or are needed in order to declare module content:

`\g_stex_smsmode_allowedmacros_tl`

Macros that are executed as is; i.e. sms mode continues immediately after. These macros may not take any arguments or otherwise gobble tokens.

Initially: `\makeatletter`, `\makeatother`, `\ExplSyntaxOn`, `\ExplSyntaxOff`.

`\g_stex_smsmode_allowedmacros_escape_tl`

Macros that are executed and potentially gobble up further tokens. These macros need to make sure, that the very last token they ultimately expand to is `\stex_smsmode_do:`.

Initially: `\symdecl`, `\notation`, `\symdef`, `\importmodule`, `\STEXexport`, `\inlineass`, `\inlinedef`, `\inlineex`, `\endinput`, `\setnotation`, `\copynotation`.

`\g_stex_smsmode_allowedenvs_seq`

The names of environments that should be allowed in SMS mode. The corresponding `\begin`-statements are treated like the macros in `\g_stex_smsmode_allowedmacros_escape_tl`, so `\stex_smsmode_do:` needs to be the last token in the `\begin`-code. Since `\end`-statements take no arguments anyway, those are called directly and sms mode continues afterwards.

Initially: `smodule`, `copymodule`, `interpretmodule`, `sdefinition`, `sexample`, `sassertion`, `sparagraph`.

`\stex_if_smsmode_p: *`
`\stex_if_smsmode: TF *`

Tests whether SMS mode is currently active.

<code>\stex_file_in_smsmode:nn</code>	<code>\stex_in_smsmode:nn {<filename>} {<code>}</code>
---------------------------------------	--

Executes `<code>` in SMS mode, followed by the content of `<filename>`. `<code>` can be used e.g. to set the current repository, and is executed within a new tex group, and the same group as the file content.

<code>\stex_smsmode_do:</code>	Starts gobbling tokens until one is encountered that is allowed in SMS mode.
--------------------------------	--

12.1.2 Imports and Inheritance

<code>\importmodule</code>	<code>\importmodule[<archive-ID>]{<module-path>}</code>
----------------------------	---

Imports a module by reading it from a file and “activating” it. `\STEX` determines the module and its containing file by passing its arguments on to `\stex_import_module_path:nn`.

<code>\usemodule</code>	<code>\importmodule[<archive-ID>]{<module-path>}</code>
-------------------------	---

Like `\importmodule`, but does not export its contents; i.e. including the current module will not activate the used module

\stex_import_module_uri:nn

\stex_import_module_uri:nn $\{\langle archive-ID \rangle\}$ $\{\langle module-path \rangle\}$

Determines the URI of a module by splitting $\langle module-path \rangle$ into $\langle path \rangle ? \langle name \rangle$. If $\langle module-path \rangle$ does *not* contain a ?-character, we consider it to be the $\langle name \rangle$, and $\langle path \rangle$ to be empty.

If $\langle archive-ID \rangle$ is empty, it is automatically set to the ID of the current archive (if one exists).

1. If $\langle archive-ID \rangle$ is empty:

- (a) If $\langle path \rangle$ is empty, then $\langle name \rangle$ must have been declared earlier in the same file and retrievable from `\g_stex_modules_in_file_seq`, or a file with name $\langle name \rangle . \langle lang \rangle . \text{tex}$ must exist in the same folder, containing a module $\langle name \rangle$.

That module should have the same namespace as the current one.

- (b) If $\langle path \rangle$ is not empty, it must point to the relative path of the containing file as well as the namespace.

2. Otherwise:

- (a) If $\langle path \rangle$ is empty, then $\langle name \rangle$ must have been declared earlier in the same file and retrievable from `\g_stex_modules_in_file_seq`, or a file with name $\langle name \rangle . \langle lang \rangle . \text{tex}$ must exist in the top `source` folder of the archive, containing a module $\langle name \rangle$.

That module should lie directly in the namespace of the archive.

- (b) If $\langle path \rangle$ is not empty, it must point to the path of the containing file as well as the namespace, relative to the namespace of the archive.

If a module by that namespace exists, it is returned. Otherwise, we call `\stex_require_module:nn` on the `source` directory of the archive to find the file.

\l_stex_import_name_str
\l_stex_import_archive_str
\l_stex_import_path_str
\l_stex_import_ns_str

stores the result in these four variables.

\stex_import_require_module:nnnn $\{\langle ns \rangle\}$ $\{\langle archive-ID \rangle\}$ $\{\langle path \rangle\}$ $\{\langle name \rangle\}$

Checks whether a module with URI $\langle ns \rangle ? \langle name \rangle$ already exists. If not, it looks for a plausible file that declares a module with that URI.

Finally, activates that module by executing its `_code`-macro.

Chapter 13

STEX-Symbols

Code related to symbol declarations and notations

13.1 Macros and Environments

$\backslash\text{symdecl}$	$\backslash\text{symdecl}\{\langle\text{macroname}\rangle\}[\langle\text{args}\rangle]$
----------------------------	---

Declares a new symbol with semantic macro $\backslash\text{macroname}$. Optional arguments are:

- **name**: An (OMDOC) name. By default equal to $\langle\text{macroname}\rangle$.
- **type**: An (ideally semantic) term, representing a *type*. Not used by STEX, but passed on to MMT for semantic services.
- **def**: An (ideally semantic) term, representing a *definiens*. Not used by STEX, but passed on to MMT for semantic services.
- **local**: A boolean (by default false). If set, this declaration will not be added to the module content, i.e. importing the current module will not make this declaration available.
- **args**: Specifies the “signature” of the semantic macro. Can be either an integer $0 \leq n \leq 9$, or a (more precise) sequence of the following characters:
 - i** a “normal” argument, e.g. $\backslash\text{symdecl}\{\text{plus}\}[\text{args}=\text{ii}]$ allows for $\backslash\text{plus}\{2\}\{2\}$.
 - a** an *associative* argument; i.e. a sequence of arbitrarily many arguments provided as a comma-separated list, e.g. $\backslash\text{symdecl}\{\text{plus}\}[\text{args}=\text{a}]$ allows for $\backslash\text{plus}\{2,2,2\}$.
 - b** a *variable* argument. Is treated by STEX like an *i*-argument, but an application is turned into an **OMBind** in OMDOC, binding the provided variable in the subsequent arguments of the operator; e.g. $\backslash\text{symdecl}\{\text{forall}\}[\text{args}=\text{bi}]$ allows for $\backslash\text{forall}\{x\in\text{Nat}\}\{x\geq 0\}$.

<hr/> <hr/> <code>\stex_symdecl_do:n</code>	<p>Implements the core functionality of <code>\symdecl</code>, and is called by <code>\symdecl</code> and <code>\symdef</code>.</p> <p>Ultimately stores the symbol $\langle URI \rangle$ in the property list <code>\l_stex_symdecl_<URI>_prop</code> with fields:</p> <ul style="list-style-type: none"> • <code>name</code> (string), • <code>module</code> (string), • <code>notations</code> (sequence of strings; initially empty), • <code>local</code> (boolean), • <code>type</code> (token list), • <code>args</code> (string of <code>is</code>, <code>as</code> and <code>bs</code>), • <code>arity</code> (integer string), • <code>assoc</code> (integer string; number of associative arguments),
<hr/> <hr/> <code>\stex_all_symbols:n</code>	<p>Iterates over all currently available symbols. Requires two <code>\seq_map_break:</code> to break fully.</p>
<hr/> <hr/> <code>\stex_get_symbol:n</code>	<p>Computes the full URI of a symbol from a macro argument, e.g. the macro name, the macro itself, the full URI...</p>
<hr/> <code>\notation</code> <hr/>	<p><code>\notation[<args>]{<symbol>}{<notations⁺>}</code></p> <p>Introduces a new notation for $\langle symbol \rangle$, see <code>\stex_notation_do:nn</code></p>
<hr/> <hr/> <code>\stex_notation_do:nn</code>	<p><code>\stex_notation_do:nn{<URI>}{<notations⁺>}</code></p> <p>Implements the core functionality of <code>\notation</code>, and is called by <code>\notation</code> and <code>\symdef</code>.</p> <p>Ultimately stores the notation in the property list <code>\g_stex_notation_<URI>#<variant>#<lang>_prop</code> with fields:</p> <ul style="list-style-type: none"> • <code>symbol</code> (URI string), • <code>language</code> (string), • <code>variant</code> (string), • <code>opprec</code> (integer string), • <code>argprec</code> (sequence of integer strings)
<hr/> <hr/> <code>\symdef</code> <hr/>	<p><code>\symdef[<args>]{<symbol>}{<notations⁺>}</code></p> <p>Combines <code>\symdecl</code> and <code>\notation</code> by introducing a new symbol and assigning a new notation for it.</p>

Chapter 14

STEX-Terms

Code related to symbolic expressions, typesetting notations, notation components, etc.

14.1 Macros and Environments

<hr/> <hr/> <code>\STEXsymbol</code>	Uses <code>\stex_get_symbol:n</code> to find the symbol denoted by the first argument and passes the result on to <code>\stex_invoke_symbol:n</code>
<hr/> <hr/> <code>\symref</code>	<code>\symref{<symbol>}{<text>}</code> shortcut for <code>\STEXsymbol{<symbol>}! [<text>]</code>
<hr/> <hr/> <code>\stex_invoke_symbol:n</code>	Executes a semantic macro. Outside of math mode or if followed by <code>*</code> , it continues to <code>\stex_term_custom:nn</code> . In math mode, it uses the default or optionally provided notation of the associated symbol. If followed by <code>!</code> , it will invoke the symbol <i>itself</i> rather than its application (and continue to <code>\stex_term_custom:nn</code>), i.e. it allows to refer to <code>\plus!</code> [addition] as an operation, rather than <code>\plus[addition of]{some}{terms}</code> .
<hr/> <hr/> <code>_stex_term_math_oms:nnnn</code> <code>_stex_term_math_oma:nnnn</code> <code>_stex_term_math_omb:nnnn</code>	<code><URI><fragment><precedence><body></code> Annotates <code><body></code> as an OMDOC-term (OMID, OMA or OMBIND, respectively) with head symbol <code><URI></code> , generated by the specific notation <code><fragment></code> with (upwards) operator precedence <code><precedence></code> . Inserts parentheses according to the current downwards precedence and operator precedence.
<hr/> <hr/> <code>_stex_term_math_arg:nnn</code>	<code>\stex_term_arg:nnn<int><prec><body></code> Annotates <code><body></code> as the <code><int></code> th argument of the current OMA or OMBIND, with (downwards) argument precedence <code><prec></code> .
<hr/> <hr/> <code>_stex_term_math_assoc_arg:nnnn</code>	<code>\stex_term_arg:nnn<int><prec><notation><body></code> Annotates <code><body></code> as the <code><int></code> th (associative) <i>sequence</i> argument (as comma-separated list of terms) of the current OMA or OMBIND, with (downwards) argument precedence <code><prec></code> and associative notation <code><notation></code> .

<hr/> <code>\infprec</code> <hr/> <code>\neginfprec</code> <hr/>	Maximal and minimal notation precedences.
<hr/> <code>\dobrackets</code> <hr/>	<code>\dobrackets {⟨body⟩}</code> Puts <i>⟨body⟩</i> in parentheses; scaled if in display mode unscaled otherwise. Uses the current \SIX brackets (by default (and)), which can be changed temporarily using <code>\withbrackets</code> .
<hr/> <code>\withbrackets</code> <hr/>	<code>\withbrackets ⟨left⟩ ⟨right⟩ {⟨body⟩}</code> Temporarily (i.e. within <i>⟨body⟩</i>) sets the brackets used by \SIX for automated bracketing (by default (and)) to <i>⟨left⟩</i> and <i>⟨right⟩</i> . Note that <i>⟨left⟩</i> and <i>⟨right⟩</i> need to be allowed after <code>\left</code> and <code>\right</code> in display-mode.
<hr/> <code>\stex_term_custom:nn</code> <hr/>	<code>\stex_term_custom:nn{⟨URI⟩}{⟨args⟩}</code> Implements custom one-time notation. Invoked by <code>\stex_invoke_symbol:n</code> in text mode, or if followed by <code>*</code> in math mode, or whenever followed by <code>!</code> .
<hr/> <code>\comp</code> <code>\compemph</code> <code>\compemph@uri</code> <code>\defemph</code> <code>\defemph@uri</code> <code>\symrefemph</code> <code>\symrefemph@uri</code> <code>\varemp</code> <code>\varemp@uri</code> <hr/>	<code>\comp{⟨args⟩}</code> Marks <i>⟨args⟩</i> as a notation component of the current symbol for highlighting, linking, etc. The precise behavior is governed by <code>\@comp</code> , which takes as additional argument the URI of the current symbol. By default, <code>\@comp</code> adds the URI as a PDF tooltip and colors the highlighted part in blue. <code>\@defemph</code> behaves like <code>\@comp</code> , and can be similarly redefined, but marks an expression as <i>definiendum</i> (used by <code>\definiendum</code>)
<hr/> <code>\STEXinvisible</code> <hr/>	Exports its argument as OMDoc (invisible), but does not produce PDF output. Useful e.g. for semantic macros that take arguments that are not part of the symbolic notation.
<hr/> <code>\ellipses</code> <hr/>	TODO

Chapter 15

TeX-Structural Features

Code related to structural features

15.1 Macros and Environments

15.1.1 Structures

`mathstructure` TODO

Chapter 16

sTeX-Statements

Code related to statements, e.g. definitions, theorems

16.1 Macros and Environments

`symboldoc` `\begin{<symboldoc>}{<symbols>} <text> \end{<symboldoc>}`

Declares *<text>* to be a (natural language, encyclopaedic) description of $\{<symbols>\}$ (a comma separated list of symbol identifiers).

Chapter 17

sTeX-Proofs: Structural Markup for Proofs

The `sproof` package is part of the sTeX collection, a version of T_EX/L^AT_EX that allows to markup T_EX/L^AT_EX documents semantically without leaving the document format, essentially turning T_EX/L^AT_EX into a document format for mathematical knowledge management (MKM).

This package supplies macros and environment that allow to annotate the structure of mathematical proofs in sTeX files. This structure can be used by MKM systems for added-value services, either directly from the sTeX sources, or after translation.

Contents

17.1 Introduction

The `sproof` (semantic proofs) package supplies macros and environment that allow to annotate the structure of mathematical proofs in \LaTeX files. This structure can be used by MKM systems for added-value services, either directly from the \LaTeX sources, or after translation. Even though it is part of the \LaTeX collection, it can be used independently, like its sister package `statements`.

\LaTeX is a version of $\text{\TeX}/\text{\LaTeX}$ that allows to markup $\text{\TeX}/\text{\LaTeX}$ documents semantically without leaving the document format, essentially turning $\text{\TeX}/\text{\LaTeX}$ into a document format for mathematical knowledge management (MKM).

```
\begin{sproof}[id=simple-proof]
  {We prove that  $\sum_{i=1}^n (2i-1) = n^2$  by induction over  $n$ }
  \begin{spfcases}{For the induction we have to consider the following cases:}
    \begin{spfcase}{ $n=1$ }
      \begin{spfstep}[type=inline] then we compute  $1=1^2$ \end{spfstep}
    \end{spfcase}
    \begin{spfcase}{ $n=2$ }
      \begin{sproofcomment}[type=inline]
        This case is not really necessary, but we do it for the
        fun of it (and to get more intuition).
      \end{sproofcomment}
      \begin{spfstep}[type=inline] We compute  $1+3=2^2=4$ .\end{spfstep}
    \end{spfcase}
    \begin{spfcase}{ $n>1$ }
      \begin{spfstep}[type=assumption,id=ind-hyp]
        Now, we assume that the assertion is true for a certain  $k \geq 1$ ,
        i.e.  $\sum_{i=1}^k (2i-1) = k^2$ .
      \end{spfstep}
      \begin{sproofcomment}
        We have to show that we can derive the assertion for  $n=k+1$  from
        this assumption, i.e.  $\sum_{i=1}^{k+1} (2i-1) = (k+1)^2$ .
      \end{sproofcomment}
      \begin{spfstep}
        We obtain  $\sum_{i=1}^{k+1} (2i-1) = \sum_{i=1}^k (2i-1) + 2(k+1) - 1$ 
        \begin{justification}[method=arith:split-sum]
          by splitting the sum.
        \end{justification}
      \end{spfstep}
      \begin{spfstep}
        Thus we have  $\sum_{i=1}^{k+1} (2i-1) = k^2 + 2k + 1$ 
        \begin{justification}[method=fertilize]
          by inductive hypothesis.
        \end{justification}
      \end{spfstep}
      \begin{spfstep}[type=conclusion]
        We can \begin{justification}[method=simplify]simplify\end{justification}
        the right-hand side to  $(k+1)^2$ , which proves the assertion.
      \end{spfstep}
    \end{spfcase}
  \end{spfcases}
  \begin{spfstep}[type=conclusion]
    We have considered all the cases, so we have proven the assertion.
  \end{spfstep}
\end{sproof}
```

Example 1: A very explicit proof, marked up semantically

We will go over the general intuition by way of our running example (see Figure 1 for the source and Figure 2 for the formatted result).²

²EdNOTE: talk a bit more about proofs and their structure,... maybe copy from OMDoc spec.

17.2 The User Interface

17.2.1 Package Options

`showmeta` The `sproof` package takes a single option: `showmeta`. If this is set, then the metadata keys are shown (see [Kohlhase:metakeys] for details and customization options).

17.2.2 Proofs and Proof steps

`sproof` The `proof` environment is the main container for proofs. It takes an optional `KeyVal` argument that allows to specify the `id` (identifier) and `for` (for which assertion is this a proof) keys. The regular argument of the `proof` environment contains an introductory comment, that may be used to announce the proof style. The `proof` environment contains a sequence of `\step`, `proofcomment`, and `pfcases` environments that are used to markup the proof steps. The `proof` environment has a variant `Proof`, which does not use the proof end marker. This is convenient, if a proof ends in a case distinction, which brings it's own proof end marker with it. The `Proof` environment is a variant of `proof` that does not mark the end of a proof with a little box; presumably, since one of the subproofs already has one and then a box supplied by the outer proof would generate an otherwise empty line. The `\spfidea` macro allows to give a one-paragraph description of the proof idea.

`spfsketch` For one-line proof sketches, we use the `\spfsketch` macro, which takes the `KeyVal` argument as `sproof` and another one: a natural language text that sketches the proof.

`spfstep` Regular proof steps are marked up with the `step` environment, which takes an optional `KeyVal` argument for annotations. A proof step usually contains a local assertion (the text of the step) together with some kind of evidence that this can be derived from already established assertions.

Note that both `\premise` and `\justarg` can be used with an empty second argument to mark up premises and arguments that are not explicitly mentioned in the text.

17.2.3 Justifications

`justification` This evidence is marked up with the `justification` environment in the `sproof` package. This environment totally invisible to the formatted result; it wraps the text in the proof step that corresponds to the evidence. The environment takes an optional `KeyVal` argument, which can have the `method` key, whose value is the name of a proof method (this will only need to mean something to the application that consumes the semantic annotations). Furthermore, the justification can contain “premises” (specifications to assertions that were used justify the step) and “arguments” (other information taken into account by the proof method).

`\premise` The `\premise` macro allows to mark up part of the text as reference to an assertion that is used in the argumentation. In the example in Figure 1 we have used the `\premise` macro to identify the inductive hypothesis.

`\justarg` The `\justarg` macro is very similar to `\premise` with the difference that it is used to mark up arguments to the proof method. Therefore the content of the first argument is interpreted as a mathematical object rather than as an identifier as in the case of `\premise`. In our example, we specified that the simplification should take place on the right hand side of the equation. Other examples include proof methods that instantiate. Here we would indicate the substituted object in a `\justarg` macro.

Proof: We prove that $\sum_{i=1}^n 2i - 1 = n^2$ by induction over n

1. For the induction we have to consider the following cases:
 - 1.1. $n = 1$: then we compute $1 = 1^2$ □
 - 1.2. $n = 2$: This case is not really necessary, but we do it for the fun of it (and to get more intuition). We compute $1 + 3 = 2^2 = 4$ □
 - 1.3. $n > 1$:
 - 1.3.1. Now, we assume that the assertion is true for a certain $k \geq 1$, i.e. $\sum_{i=1}^k (2i - 1) = k^2$.
 - 1.3.2. We have to show that we can derive the assertion for $n = k + 1$ from this assumption, i.e. $\sum_{i=1}^{k+1} (2i - 1) = (k + 1)^2$.
 - 1.3.3. We obtain $\sum_{i=1}^{k+1} (2i - 1) = \sum_{i=1}^k (2i - 1) + 2(k + 1) - 1$ by splitting the sum
 - 1.3.4. Thus we have $\sum_{i=1}^{k+1} (2i - 1) = k^2 + 2k + 1$ by inductive hypothesis.
 - 1.3.5. We can simplify the right-hand side to $(k + 1)^2$, which proves the assertion. □
 - 1.4. We have considered all the cases, so we have proven the assertion. □

Example 2: The formatted result of the proof in Figure 1

17.2.4 Proof Structure

subproof	The <code>pfcases</code> environment is used to mark up a subproof. This environment takes an optional <code>KeyVal</code> argument for semantic annotations and a second argument that allows
method	to specify an introductory comment (just like in the <code>proof</code> environment). The <code>method</code> key can be used to give the name of the proof method executed to make this subproof.
spfcases	The <code>pfcases</code> environment is used to mark up a proof by cases. Technically it is a variant of the <code>subproof</code> where the <code>method</code> is <code>by-cases</code> . Its contents are <code>spfcase</code> environments that mark up the cases one by one.
spfcase	The content of a <code>pfcases</code> environment are a sequence of case proofs marked up in the <code>pfcase</code> environment, which takes an optional <code>KeyVal</code> argument for semantic annotations. The second argument is used to specify the the description of the case under consideration. The content of a <code>pfcase</code> environment is the same as that of a <code>proof</code> , i.e.
\spfcasesketch	<code>steps</code> , <code>proofcomments</code> , and <code>pfcases</code> environments. <code>\spfcasesketch</code> is a variant of the <code>spfcase</code> environment that takes the same arguments, but instead of the <code>spfsteps</code> in the body uses a third argument for a proof sketch.
sproofcomment	The <code>sproofcomment</code> environment is much like a <code>step</code> , only that it does not have an object-level assertion of its own. Rather than asserting some fact that is relevant for the proof, it is used to explain where the proof is going, what we are attempting to to, or what we have achieved so far. As such, it cannot be the target of a <code>\premise</code> .

17.2.5 Proof End Markers

Traditionally, the end of a mathematical proof is marked with a little box at the end of the last line of the proof (if there is space and on the end of the next line if there isn't), like so:

\sproofend	The <code>sproof</code> package provides the <code>\sproofend</code> macro for this. If a different symbol for the proof end is to be used (e.g. <i>q.e.d</i>), then this can be obtained by specifying it using the
\sProofEndSymbol	<code>\sProofEndSymbol</code> configuration macro (e.g. by specifying <code>\sProofEndSymbol{q.e.d}</code>). Some of the proof structuring macros above will insert proof end symbols for subproofs, in most cases, this is desirable to make the proof structure explicit, but sometimes this wastes space (especially, if a proof ends in a case analysis which will supply its own proof end marker). To suppress it locally, just set <code>proofend={}</code> in them or use use <code>\sProofEndSymbol{}</code> .

17.2.6 Configuration of the Presentation

Finally, we provide configuration hooks in Figure 1 for the keywords in proofs. These are mainly intended for package authors building on `statements`, e.g. for multi-language support.³. The proof step labels can be customized via the `\pstlabelstyle` macro:

Environment	configuration macro	value
<code>sproof</code>	<code>\spf@proof@kw</code>	Proof
<code>sketchproof</code>	<code>\spf@sketchproof@kw</code>	Proof Sketch

Figure 1: Configuration Hooks for Semantic Proof Markup

\pstlabelstyle	<code>\pstlabelstyle{<style>}</code> sets the style; see Figure ?? for an overview of styles. Package writers can add additional styles by adding a macro <code>\pst@make@label@<style></code> that takes
----------------	---

³EdNOTE: we might want to develop an extension `sproof-babel` in the future.

two arguments: a comma-separated list of ordinals that make up the prefix and the current ordinal. Note that comma-separated lists can be conveniently iterated over by the \LaTeX `\@for...:=...\do{...}` macro; see Figure ?? for examples.

17.3 Limitations

In this section we document known limitations. If you want to help alleviate them, please feel free to contact the package author. Some of them are currently discussed in the \TeX issue tracker at [\[sTeX\]](#).

1. The numbering scheme of proofs cannot be changed. It is more geared for teaching proof structures (the author's main use case) and not for writing papers. reported by Tobias Pfeiffer (fixed)
2. currently proof steps are formatted by the \LaTeX `description` environment. We would like to configure this, e.g. to use the `inparaenum` environment for more condensed proofs. I am just not sure what the best user interface would be I can imagine redefining an internal environment `spf@proofstep@list` or adding a key `prooflistenv` to the `proof` environment that allows to specify the environment directly. Maybe we should do both.

Chapter 18

sTeX-Metatheory

The default meta theory for an sTeX module. Contains symbols so ubiquitous, that it is virtually impossible to describe any flexiformal content without them, or that are required to annotate even the most primitive symbols with meaningful (foundation-independent) “type”-annotations, or required for basic structuring principles (theorems, definitions).

Foundations should ideally instantiate these symbols with their formal counterparts, e.g. `isa` corresponds to a typing operation in typed setting, or the \in -operator in set-theoretic contexts; `bind` corresponds to a universal quantifier in (n th-order) logic, or a Π in dependent type theories.

18.1 Symbols

Part III
Extensions

Chapter 19

Tikzinput

19.1 Macros and Environments

LocalWords: bibfolder jobname.dtx tikzinput.dtx usetikzlibrary Gin@ewidth Gin@eheight
LocalWords: resizebox ctikzinput mhtikzinput Gin@mhrepos mhpath

Chapter 20

document-structure: Semantic Markup for Open Mathematical Documents in L^AT_EX

The `document-structure` package is part of the \S TeX collection, a version of T_EX/L^AT_EX that allows to markup T_EX/L^AT_EX documents semantically without leaving the document format, essentially turning T_EX/L^AT_EX into a document format for mathematical knowledge management (MKM).

This package supplies an infrastructure for writing OMDOC documents in L^AT_EX. This includes a simple structure sharing mechanism for \S TeX that allows to move from a copy-and-paste document development model to a copy-and-reference model, which conserves space and simplifies document management. The augmented structure can be used by MKM systems for added-value services, either directly from the \S TeX sources, or after translation.

20.1 Introduction

\S TeX is a version of T_EX/L^AT_EX that allows to markup T_EX/L^AT_EX documents semantically without leaving the document format, essentially turning T_EX/L^AT_EX into a document format for mathematical knowledge management (MKM). The package supports direct translation to the OMDOC format [Koh06]

The `document-structure` package supplies macros and environments that allow to label document fragments and to reference them later in the same document or in other documents. In essence, this enhances the document-as-trees model to documents-as-directed-acyclic-graphs (DAG) model. This structure can be used by MKM systems for added-value services, either directly from the \S TeX sources, or after translation. Currently, trans-document referencing provided by this package can only be used in the \S TeX collection.

DAG models of documents allow to replace the “Copy and Paste” in the source document with a label-and-reference model where document are shared in the document

source and the formatter does the copying during document formatting/presentation.⁴

20.2 The User Interface

The `document-structure` package generates two files: `document-structure.cls`, and `document-structure.sty`. The OMDoc class is a minimally changed variant of the standard `article` class that includes the functionality provided by `document-structure.sty`. The rest of the documentation pertains to the functionality introduced by `document-structure.sty`.

20.2.1 Package and Class Options

The `document-structure` class accept the following options:

<code>class=<name></code>	load <code><name>.cls</code> instead of <code>article.cls</code>
<code>topsect=<sect></code>	The top-level sectioning level; the default for <code><sect></code> is <code>section</code>
<code>showignores</code>	show the the contents of the <code>ignore</code> environment after all
<code>showmeta</code>	show the metadata; see <code>metakeys.sty</code>
<code>showmods</code>	show modules; see <code>modules.sty</code>
<code>extrefs</code>	allow external references; see <code>sref.sty</code>
<code>defindex</code>	index definienda; see <code>statements.sty</code>
<code>minimal</code>	for testing; do not load any \TeX packages

The `document-structure` package accepts the same except the first two.

20.2.2 Document Structure

<code>document</code>	The top-level <code>document</code> environment can be given key/value information by the
<code>\documentkeys</code>	<code>\documentkeys</code> macro in the preamble ³ . This can be used to give metadata about the
<code>id</code>	document. For the moment only the <code>id</code> key is used to give an identifier to the <code>omdoc</code>
<code>sfragment</code>	element resulting from the L ^A T _E XML transformation.
	The structure of the document is given by the <code>omgroup</code> environment just like in OM-
	DOC. In the L ^A T _E X route, the <code>omgroup</code> environment is flexibly mapped to sectioning com-
	mands, inducing the proper sectioning level from the nesting of <code>omgroup</code> environments.
	Correspondingly, the <code>omgroup</code> environment takes an optional key/value argument for
	metadata followed by a regular argument for the (section) title of the <code>omgroup</code> . The op-
<code>id</code>	tional metadata argument has the keys <code>id</code> for an identifier, <code>creators</code> and <code>contributors</code>
<code>creators</code>	for the Dublin Core metadata [DCM03]; see [Koh20a] for details of the format. The
<code>contributors</code>	<code>short</code> allows to give a short title for the generated section. If the title contains semantic
<code>short</code>	macros, they need to be protected by <code>\protect</code> , and we need to give the <code>loadmodules</code>
<code>loadmodules</code>	key it needs no value. For instance we would have

```

\begin{smodule}{foo}
\symdef{bar}{B^a_r}
...
\begin{sfragment}[id=sec.bardriv,loadmodules]{Introducing $\protect\bar$ Derivation

```

⁴EdNOTE: integrate with latexml's XMRef in the Math mode.

³We cannot patch the document environment to accept an optional argument, since other packages we load already do; pity.

`blindfragment`

\TeX automatically computes the sectioning level, from the nesting of `omgroup` environments. But sometimes, we want to skip levels (e.g. to use a `subsection*` as an introduction for a chapter). Therefore the `document-structure` package provides a variant `blindomgroup` that does not produce markup, but increments the sectioning level and logically groups document parts that belong together, but where traditional document markup relies on convention rather than explicit markup. The `blindomgroup` environment is useful e.g. for creating frontmatter at the correct level. Example 3 shows a typical setup for the outer document structure of a book with parts and chapters. We use two levels of `blindomgroup`:

- The outer one groups the introductory parts of the book (which we assume to have a sectioning hierarchy topping at the part level). This `blindomgroup` makes sure that the introductory remarks become a “chapter” instead of a “part”.
- The inner one groups the frontmatter⁴ and makes the preface of the book a section-level construct. Note that here the `display=flow` on the `omgroup` environment prevents numbering as is traditional for prefaces.

```
\begin{document}
\begin{blindfragment}
\begin{blindfragment}
\begin{frontmatter}
\maketitle\newpage
\begin{sfragment}[display=flow]{Preface}
... <<preface>> ...
\end{sfragment}
\clearpage\setcounter{tocdepth}{4}\tableofcontents\clearpage
\end{frontmatter}
\end{blindfragment}
... <<introductory remarks>> ...
\end{blindfragment}
\begin{sfragment}{Introduction}
... <<intro>> ...
\end{sfragment}
... <<more chapters>> ...
\bibliographystyle{alpha}\bibliography{kwarc}
\end{document}
```

Example 3: A typical Document Structure of a Book

`\skipomgroup`

The `\skipomgroup` “skips an `omgroup`”, i.e. it just steps the respective sectioning counter. This macro is useful, when we want to keep two documents in sync structurally, so that section numbers match up: Any section that is left out in one becomes a `\skipomgroup`.

`\currentsectionlevel`
`\CurrentSectionLevel`

The `\currentsectionlevel` macro supplies the name of the current sectioning level, e.g. “chapter”, or “subsection”. `\CurrentSectionLevel` is the capitalized variant. They are useful to write something like “In this `\currentsectionlevel`, we will...” in an `omgroup` environment, where we do not know which sectioning level we will end up.

⁴We shied away from redefining the `frontmatter` to induce a `blindomgroup`, but this may be the “right” way to go in the future.

20.2.3 Ignoring Inputs

`ignore` The `ignore` environment can be used for hiding text parts from the document structure.
`showignores` The body of the environment is not PDF or DVI output unless the `showignores` option is given to the `document-structure` class or `package`. But in the generated OMDoc result, the body is marked up with a `ignore` element. This is useful in two situations. For

editing One may want to hide unfinished or obsolete parts of a document

narrative/content markup In \TeX we mark up narrative-structured documents. In the generated OMDoc documents we want to be able to cache content objects that are not directly visible. For instance in the `statements` package [Koh20d] we use the `\inlinedef` macro to mark up phrase-level definitions, which verbalize more formal definitions. The latter can be hidden by an `ignore` and referenced by the `verbalizes` key in `\inlinedef`.

`\prematurestop` For prematurely stopping the formatting of a document, \TeX provides the `\prematurestop` macro. It can be used everywhere in a document and ignores all input after that – backing out of the `omgroup` environment as needed. After that – and before the implicit `\end{document}` it calls the internal `\afterprematurestop`, which can be customized to do additional cleanup or e.g. print the bibliography.

`\afterprematurestop` `\prematurestop` is useful when one has a driver file, e.g. for a course taught multiple years and wants to generate course notes up to the current point in the lecture. Instead of commenting out the remaining parts, one can just move the `\prematurestop` macro. This is especially useful, if we need the rest of the file for processing, e.g. to generate a theory graph of the whole course with the already-covered parts marked up as an overview over the progress; see `import_graph.py` from the `lmhtools` utilities [LMH].

20.2.4 Structure Sharing

`\STRlabel` The `\STRlabel` macro takes two arguments: a label and the content and stores the content for later use by `\STRcopy[⟨URL⟩]{⟨label⟩}`, which expands to the previously stored content. If the `\STRlabel` macro was in a different file, then we can give a URL `⟨URL⟩` that lets L^AT_EXML generate the correct reference.

`\STRsemantics` The `\STRlabel` macro has a variant `\STRsemantics`, where the label argument is optional, and which takes a third argument, which is ignored in L^AT_EX. This allows to specify the meaning of the content (whatever that may mean) in cases, where the source document is not formatted for presentation, but is transformed into some content markup format.⁵

20.2.5 Global Variables

Text fragments and modules can be made more re-usable by the use of global variables. For instance, the admin section of a course can be made course-independent (and therefore re-usable) by using variables (actually token registers) `courseAcronym` and `courseTitle` instead of the text itself. The variables can then be set in the \TeX preamble of the course notes file. `\setSGvar{⟨vname⟩}{⟨text⟩}` to set the global variable `⟨vname⟩` to `⟨text⟩` and `\useSGvar{⟨vname⟩}` to reference it.

`\setSGvar`
`\useSGvar`
`\ifSGvar`

With `\ifSGvar` we can test for the contents of a global variable: the macro call

⁵EdNOTE: document LMID und LMXRef here if we decide to keep them.

`\ifSGvar{⟨vname⟩}{⟨val⟩}{⟨ctext⟩}` tests the content of the global variable `⟨vname⟩`, only if (after expansion) it is equal to `⟨val⟩`, the conditional text `⟨ctext⟩` is formatted.

20.2.6 Colors

For convenience, the `document-structure` package defines a couple of color macros for the `color` package: For instance `\blue` abbreviates `\textcolor{blue}`, so that `\blue{⟨something⟩}` writes `⟨something⟩` in blue. The macros `\red`, `\green`, `\cyan`, `\magenta`, `\brown`, `\yellow`, `\orange`, `\gray`, and finally `\black` are analogous.

20.3 Limitations

In this section we document known limitations. If you want to help alleviate them, please feel free to contact the package author. Some of them are currently discussed in the `TeX` GitHub repository [\[sTeX\]](#).

1. when option `book` which uses `\pagestyle{headings}` is given and semantic macros are given in the `omgroup` titles, then they sometimes are not defined by the time the heading is formatted. Need to look into how the headings are made.

Chapter 21

NotesSlides – Slides and Course Notes

We present a document class from which we can generate both course slides and course notes in a transparent way.

21.1 Introduction

The `notesslides` document class is derived from `beamer.cls` [Tana], it adds a “notes version” for course notes derived from the `omdoc` class [Kohlhase:smomdl] that is more suited to printing than the one supplied by `beamer.cls`.

21.2 The User Interface

The `notesslides` class takes the notion of a slide frame from Till Tantau’s excellent `beamer` class and adapts its notion of frames for use in the \LaTeX and OMDoc. To support semantic course notes, it extends the notion of mixing frames and explanatory text, but rather than treating the frames as images (or integrating their contents into the flowing text), the `notesslides` package displays the slides as such in the course notes to give students a visual anchor into the slide presentation in the course (and to distinguish the different writing styles in slides and course notes).

In practice we want to generate two documents from the same source: the slides for presentation in the lecture and the course notes as a narrative document for home study. To achieve this, the `notesslides` class has two modes: *slides mode* and *notes mode* which are determined by the package option.

21.2.1 Package Options

The `notesslides` class takes a variety of class options:⁶

- | | |
|---------------------|---|
| <code>slides</code> | • The options <code>slides</code> and <code>notes</code> switch between slides mode and notes mode (see |
| <code>notes</code> | Section 21.2.2). |

<code>sectocframes</code>	<ul style="list-style-type: none"> If the option <code>sectocframes</code> is given, then for the <code>omgroups</code>, special frames with the <code>omgroup</code> title (and number) are generated.
<code>showmeta</code>	<ul style="list-style-type: none"> <code>showmeta</code>. If this is set, then the metadata keys are shown (see [Koh20b] for details and customization options).
<code>frameimages</code> <code>fiboxed</code>	<ul style="list-style-type: none"> If the option <code>frameimages</code> is set, then slide mode also shows the <code>\frameimage</code>-generated frames (see section 21.2.4). If also the <code>fiboxed</code> option is given, the slides are surrounded by a box.
<code>topsect</code>	<ul style="list-style-type: none"> <code>topsect=<sect></code> can be used to specify the top-level sectioning level; the default for <code><sect></code> is <code>section</code>.

21.2.2 Notes and Slides

`frame` Slides are represented with the `frame` just like in the `beamer` class, see [Tanb] for details.
`note` The `notesslides` class adds the `note` environment for encapsulating the course note fragments.⁵

⚠ Note that it is essential to start and end the `notes` environment at the start of the line – in particular, there may not be leading blanks – else L^AT_EX becomes confused and throws error messages that are difficult to decipher.

```
\ifnotes\maketitle\else
\frame[noframenumbering]\maketitle\fi

\begin{note}
  We start this course with ...
\end{note}

\begin{frame}
  \frametitle{The first slide}
  ...
\end{frame}
\begin{note}
  ... and more explanatory text
\end{note}

\begin{frame}
  \frametitle{The second slide}
  ...
\end{frame}
...
```

Example 4: A typical Course Notes File

By interleaving the `frame` and `note` environments, we can build course notes as shown in Figure 4.

`\ifnotes` Note the use of the `\ifnotes` conditional, which allows different treatment between

⁶EDNOTE: leaving out `noproblems` for the moment until we decide what to do with it.

⁵MK: it would be very nice, if we did not need this environment, and this should be possible in principle, but not without intensive L^AT_EX trickery. Hints to the author are welcome.

`notes` and `slides` mode – manually setting `\notesttrue` or `\notesfalse` is strongly discouraged however.

⚠: We need to give the title frame the `noframenumbering` option so that the frame numbering is kept in sync between the slides and the course notes.

⚠: The `beamer` class recommends not to use the `allowframebreaks` option on frames (even though it is very convenient). This holds even more in the `notesslides` case: At least in conjunction with `\newpage`, frame numbering behaves funnily (we have tried to fix this, but who knows).

If we want to transclude a the contents of a file as a note, we can use a new variant `\inputref*` of the `\inputref` macro from [KGA20]: `\inputref*{foo}` is equivalent to `\begin{note}\inputref{foo}\end{note}`.

There are some environments that tend to occur at the top-level of `note` environments. We make convenience versions of these: e.g. the `nparagraph` environment is just an `sparagraph` inside a `note` environment (but looks nicer in the source, since it avoids one level of source indenting). Similarly, we have the `nomgroup`, `ndefinition`, `nexample`, `nsproof`, and `nassertion` environments.

`\inputref*`
`nparagraph`
`nfragment`
`ndefinition`
`nexample`
`nsproof`
`nassertion`

21.2.3 Header and Footer Lines of the Slides

The default logo provided by the `notesslides` package is the \TeX logo it can be customized using `\setslidelogo{<logo name>}`.

The default footer line of the `notesslides` package mentions copyright and licensing. In the `beamer` class, `\source` stores the author's name as the copyright holder . By default it is *Michael Kohlhase* in the `notesslides` package since he is the main user and designer of this package. `\setsource{<name>}` can change the writer's name. For licensing, we use the Creative Commons Attribution-ShareAlike license by default to strengthen the public domain. If package `hyperref` is loaded, then we can attach a hyperlink to the license logo. `\setlicensing[<url>]{<logo name>}` is used for customization, where `<url>` is optional.

`\setslidelogo`
`\setsource`
`\setlicensing`

21.2.4 Frame Images

Sometimes, we want to integrate slides as images after all – e.g. because we already have a PowerPoint presentation, to which we want to add \TeX notes. In this case we can use `\frameimage[<opt>]{<path>}`, where `<opt>` are the options of `\includegraphics` from the `graphicx` package [CR99] and `<path>` is the file path (extension can be left off like in `\includegraphics`). We have added the `label` key that allows to give a frame label that can be referenced like a regular `beamer` frame.⁷

`\frameimage`
`\mhframeimage`

The `\mhframeimage` macro is a variant of `\frameimage` with repository support. Instead of writing

```
\frameimage{\MathHub{fooMH/bar/source/baz/foobar}}
```

we can simply write (assuming that `\MathHub` is defined as above)

```
\mhframeimage[fooMH/bar]{baz/foobar}
```

⁷EdNOTE: MK: the `hyperref` link does not seem to work yet. I wonder why but do not have the time to fix it.

Note that the `\mhframeimage` form is more semantic, which allows more advanced document management features in MathHub.

If `baz/foobar` is the “current module”, i.e. if we are on the MathHub path `...MathHub/fooMH/bar...`, then stating the repository in the first optional argument is redundant, so we can just use

```
\mhframeimage{baz/foobar}
```

21.2.5 Colors and Highlighting

`\textwarning` The `\textwarning` macro generates a warning sign: 

21.2.6 Front Matter, Titles, etc.

21.2.7 Excursions

In course notes, we sometimes want to point to an “excursion” – material that is either presupposed or tangential to the course at the moment – e.g. in an appendix. The typical setup is the following:

```
\excursion{founif}{../ex/founif}{We will cover first-order unification in}
...
\begin{appendix}\printexcursions\end{appendix}
```

```
\excursion      The \excursion{<ref>}{<path>}{<text>} is syntactic sugar for
\activateexcursion
\begin{nparagraph}[title=Excursion]
  \activateexcursion{founif}{../ex/founif}
  We will cover first-order unification in \sref{founif}.
\end{nparagraph}
```

```
\activateexcursion      where \activateexcursion{<path>} augments the \printexcursions macro by a
\printexcursions        call \inputref{<path>}. In this way, the3 \printexcursions macro (usually in the
                        appendix) will collect up all excursions that are specified in the main text.
```

Sometimes, we want to reference – in an excursion – part of another. We can use

```
\excursionref \excursionref{<label>} for that.
```

Finally, we usually want to put the excursions into an `omgroup` environment and add an introduction, therefore we provide the a variant of the `\printexcursions` macro:

```
\excursiongroup \excursiongroup[id=<id>,intro=<path>] is equivalent to
```

```
\begin{note}
\begin{sfragment}[id=<id>]{Excursions}
  \inputref{<path>}
  \printexcursions
\end{sfragment}
\end{note}
```

21.2.8 Miscellaneous

21.3 Limitations

In this section we document known limitations. If you want to help alleviate them, please feel free to contact the package author. Some of them are currently discussed in the \TeX GitHub repository [[sTeX](#)].

1. when option `book` which uses `\pagestyle{headings}` is given and semantic macros are given in the `omgroup` titles, then they sometimes are not defined by the time the heading is formatted. Need to look into how the headings are made. This is a problem of the underlying `omdoc` package.

Chapter 22

problem.sty: An Infrastructure for formatting Problems

The `problem` package supplies an infrastructure that allows specify problems and to reuse them efficiently in multiple environments.

22.1 Introduction

The `problem` package supplies an infrastructure that allows specify problem. Problems are text fragments that come with auxiliary functions: hints, notes, and solutions⁶. Furthermore, we can specify how long the solution to a given problem is estimated to take and how many points will be awarded for a perfect solution.

Finally, the `problem` package facilitates the management of problems in small files, so that problems can be re-used in multiple environment.

22.2 The User Interface

22.2.1 Package Options

<code>solutions</code>	The <code>problem</code> package takes the options <code>solutions</code> (should solutions be output?), <code>notes</code>
<code>notes</code>	(should the problem notes be presented?), <code>hints</code> (do we give the hints?), <code>gnotes</code> (do we
<code>hints</code>	show grading notes?), <code>pts</code> (do we display the points awarded for solving the problem?),
<code>gnotes</code>	<code>min</code> (do we display the estimated minutes for problem soling). If theses are specified, then
<code>pts</code>	the corresponding auxiliary parts of the problems are output, otherwise, they remain
<code>min</code>	invisible.
<code>boxed</code>	The <code>boxed</code> option specifies that problems should be formatted in framed boxes so
<code>test</code>	that they are more visible in the text. Finally, the <code>test</code> option signifies that we are in
	a test situation, so this option does not show the solutions (of course), but leaves space
	for the students to solve them.
<code>mh</code>	The <code>mh</code> option turns on MathHub support; see [<code>Kohlhase:mss</code>].
<code>showmeta</code>	Finally, if the <code>showmeta</code> is set, then the metadata keys are shown (see [<code>Kohlhase:metakeys</code>]
	for details and customization options).

⁶for the moment multiple choice problems are not supported, but may well be in a future version

22.2.2 Problems and Solutions

problem The main environment provided by the **problem** package is (surprise surprise) the **problem** environment. It is used to mark up problems and exercises. The environment takes an optional KeyVal argument with the keys **id** as an identifier that can be reference later, **pts** for the points to be gained from this exercise in homework or quiz situations, **min** for the estimated minutes needed to solve the problem, and finally **title** for an informative title of the problem. For an example of a marked up problem see Figure 5 and the resulting markup see Figure 6.

```
\usepackage[solutions,hints,pts,min]{problem}
\begin{document}
  \begin{sproblem}[id=elefants,pts=10,min=2,title=Fitting Elefants,name=elefants]
    How many Elefants can you fit into a Volkswagen beetle?
  \begin{hint}
    Think positively, this is simple!
  \end{hint}
  \begin{exnote}
    Justify your answer
  \end{exnote}
  \begin{solution}[for=elefants,height=3cm]
    Four, two in the front seats, and two in the back.
  \begin{gnote}
    if they do not give the justification deduct 5 pts
  \end{gnote}
  \end{solution}
  \end{sproblem}
\end{document}
```

Example 5: A marked up Problem

solution The **solution** environment can be to specify a solution to a problem. If the **solutions** option is set or **\solutionstrue** is set in the text, then the solution will be presented in the output. The **solution** environment takes an optional KeyVal argument with the keys **id** for an identifier that can be reference **for** to specify which problem this is a solution for, and **height** that allows to specify the amount of space to be left in test situations (i.e. if the **test** option is set in the **\usepackage** statement).

```
Problem 22.2.1 (Fitting Elefants)
How many Elefants can you fit into a Volkswagen beetle?


---


Hint: Think positively, this is simple!


---


Note:Justify your answer


---


Solution: Four, two in the front seats, and two in the back.


---


```

Example 6: The Formatted Problem from Figure 5

hint The **hint** and **exnote** environments can be used in a **problem** environment to give hints and to make notes that elaborate certain aspects of the problem.

exnote

gnote The **gnote** (grading notes) environment can be used to document situations that

may arise in grading.

Sometimes we would like to locally override the `solutions` option we have given to the package. To turn on solutions we use the `\startsolutions`, to turn them off, `\stopsolutions`. These two can be used at any point in the documents.

Also, sometimes, we want content (e.g. in an exam with master solutions) conditional on whether solutions are shown. This can be done with the `\ifsolutions` conditional.

22.2.3 Multiple Choice Blocks

Multiple choice blocks can be formatted using the `mcb` environment, in which single choices are marked up with `\mcc[⟨keyvals⟩]{⟨text⟩}` macro, which takes an optional key/value argument `⟨keyvals⟩` for choice metadata and a required argument `⟨text⟩` for the proposed answer text. The following keys are supported

- `T` • `T` for true answers, `F` for false ones,
- `F` • `Ttext` the verdict for true answers, `Ftext` for false ones, and
- `Ttext` • `feedback` for a short feedback text given to the student.
- `Ftext`
- `feedback`

See Figure ?? for an example

22.2.4 Including Problems

The `\includeproblem` macro can be used to include a problem from another file. It takes an optional `KeyVal` argument and a second argument which is a path to the file containing the problem (the macro assumes that there is only one problem in the include file). The keys `title`, `min`, and `pts` specify the problem title, the estimated minutes for solving the problem and the points to be gained, and their values (if given) overwrite the ones specified in the `problem` environment in the included file.

22.2.5 Reporting Metadata

The sum of the points and estimated minutes (that we specified in the `pts` and `min` keys to the `problem` environment or the `\includeproblem` macro) to the log file and the screen after each run. This is useful in preparing exams, where we want to make sure that the students can indeed solve the problems in an allotted time period.

The `\min` and `\pts` macros allow to specify (i.e. to print to the margin) the distribution of time and reward to parts of a problem, if the `pts` and `pts` package options are set. This allows to give students hints about the estimated time and the points to be awarded.

22.3 Limitations

In this section we document known limitations. If you want to help alleviate them, please feel free to contact the package author. Some of them are currently discussed in the [sTeXGitHub repository](#) [[sTeX](#)].

1. none reported yet

```

\begin{sproblem}[title=Functions,name=functions1]
  What is the keyword to introduce a function definition in python?
  \begin{mcb}
    \mcc[T]{def}
    \mcc[F,feedback=that is for C and C++){function}
    \mcc[F,feedback=that is for Standard ML]{fun}
    \mcc[F,Ftext=Noooooooooooo,feedback=that is for Java]{public static void}
  \end{mcb}
\end{sproblem}

```

Problem 22.2.2 (Functions)

What is the keyword to introduce a function definition in python?

- ☐ def
- ☐ function
- ☐ fun
- ☐ public static void

Problem 22.2.3 (Functions)

What is the keyword to introduce a function definition in python?

- ☐ def
(**true**)
- ☐ function
(**false**) (*that is for C and C++*)
- ☐ fun
(**false**) (*that is for Standard ML*)
- ☐ public static void
(**false**) (*that is for Java*)

Example 7: A Problem with a multiple choice block

Chapter 23

`hwexam.sty/cls`: An Infrastructure for formatting Assignments and Exams

The `hwexam` package and class allows individual course assignment sheets and compound assignment documents using problem files marked up with the `problem` package.

Contents

23.1 Introduction

The `hwexam` package and class supplies an infrastructure that allows to format nice-looking assignment sheets by simply including problems from problem files marked up with the `problem` package [Kohlhase:problem]. It is designed to be compatible with `problems.sty`, and inherits some of the functionality.

23.2 The User Interface

23.2.1 Package and Class Options

The `hwexam` package and class take the options `solutions`, `notes`, `hints`, `gnotes`, `pts`, `min`, and `boxed` that are just passed on to the `problems` package (cf. its documentation for a description of the intended behavior).

`showmeta` If the `showmeta` option is set, then the metadata keys are shown (see [Kohlhase:metakeys] for details and customization options).

The `hwexam` class additionally accepts the options `report`, `book`, `chapter`, `part`, and `showignores`, of the `omdoc` package [Kohlhase:smomdl] on which it is based and passes them on to that. For the `extrefs` option see [Kohlhase:sref].

23.2.2 Assignments

`assignment` This package supplies the `assignment` environment that groups problems into assignment sheets. It takes an optional KeyVal argument with the keys `number` (for the assignment number; if none is given, 1 is assumed as the default or — in multi-assignment documents
`number` — the ordinal of the `assignment` environment), `title` (for the assignment title; this is referenced in the title of the assignment sheet), `type` (for the assignment type; e.g. “quiz”, or “homework”), `given` (for the date the assignment was given), and `due` (for the date the assignment is due).

23.2.3 Typesetting Exams

`multiple` Furthermore, the `hwexam` package takes the option `multiple` that allows to combine multiple assignment sheets into a compound document (the assignment sheets are treated as section, there is a table of contents, etc.).

`test` Finally, there is the option `test` that modifies the behavior to facilitate formatting tests. Only in `test` mode, the macros `\testspace`, `\testnewpage`, and `\testemptypage` have an effect: they generate space for the students to solve the given problems. Thus they can be left in the L^AT_EX source.

`\testspace` `\testspace` takes an argument that expands to a dimension, and leaves vertical space accordingly. `\testnewpage` makes a new page in `test` mode, and `\testemptypage` generates an empty page with the cautionary message that this page was intentionally left empty.

`testheading` Finally, the `\testheading` takes an optional keyword argument where the keys
`duration` `duration` specifies a string that specifies the duration of the test, `min` specifies the equivalent in number of minutes, and `reqpts` the points that are required for a perfect grade.
`min`
`reqpts`

23.2.4 Including Assignments

`\inputassignment` The `\inputassignment` macro can be used to input an assignment from another file. It takes an optional `KeyVal` argument and a second argument which is a path to the file containing the problem (the macro assumes that there is only one `assignment` environment in the included file). The keys `number`, `title`, `type`, `given`, and `due` are just as for the `assignment` environment and (if given) overwrite the ones specified in the `assignment` environment in the included file.

23.3 Limitations

In this section we document known limitations. If you want to help alleviate them, please feel free to contact the package author. Some of them are currently discussed in the `STEX`GitHub repository [[sTeX](#)].

1. none reported yet.

Name: _____ Matriculation Number: _____

2022-04-19

Write the solutions to the sheet.

You can reach 30 points if you solve all problems. You will only need 27 points for a perfect score, i.e. 3 points are bonus points.

Different problems test different skills and knowledge, so do not get stuck on one problem.

[illegible]

Example 8: A generated test heading.

Part IV

Implementation

Chapter 24

\TeX -Basics Implementation

24.1 The \TeX Document Class

The `stex` document class is pretty straight-forward: It largely extends the `standalone` package and loads the `stex` package, passing all provided options on to the package.

```
1 <*cls>
2
3 %%%%%%%%% basics.dtx %%%%%%%%%
4
5 \RequirePackage{expl3,l3keys2e}
6 \ProvidesExplClass{stex}{2022/03/03}{3.1.0}{sTeX document class}
7
8 \DeclareOption*{\PassOptionsToPackage{\CurrentOption}{stex}}
9 \ProcessOptions
10
11 \bool_set_true:N \c_stex_document_class_bool
12
13 \RequirePackage{stex}
14
15 \stex_html_backend:TF {
16   \LoadClass{article}
17 }{
18   \LoadClass[border=1px,varwidth,crop=false]{standalone}
19   \setlength\textwidth{15cm}
20 }
21 \RequirePackage{standalone}
22 </cls>
```

24.2 Preliminaries

```
23 <*package>
24
25 %%%%%%%%% basics.dtx %%%%%%%%%
26
```

```

27 \RequirePackage{expl3,l3keys2e,ltxcmds}
28 \ProvidesExplPackage{stex}{2022/03/03}{3.1.0}{sTeX package}
29
30 \bool_if_exist:NF \c_stex_document_class_bool {
31   \bool_set_false:N \c_stex_document_class_bool
32   \RequirePackage{standalone}
33 }
34
35 \message{^^J
36   *****^^J
37   *~This~is~sTeX~version~3.1.0~*^^J
38   *****^^J
39 ^^J}
40
41 %\RequirePackage{morewrites}
42 %\RequirePackage{amsmath}
43
44 Package options:
45 \keys_define:nn { stex } {
46   debug      .clist_set:N = \c_stex_debug_clist ,
47   lang       .clist_set:N = \c_stex_languages_clist ,
48   mathhub    .tl_set_x:N = \mathhub ,
49   usesms     .bool_set:N = \c_stex_persist_mode_bool ,
50   writesms   .bool_set:N = \c_stex_persist_write_mode_bool ,
51   image      .bool_set:N = \c_tikzinput_image_bool ,
52   unknown    .code:n      = {}
53 }
54 \ProcessKeysOptions { stex }

```

\stex The sTeXlogo:

\sTeX

```

54 \RequirePackage{xspace}
55 \protected\def\stex{
56   \@ifundefined{texorpdfstring}{\let\texorpdfstring\@firstoftwo}{}
57   \texorpdfstring{\raisebox{-.5ex}{S\kern-.5ex\TeX}}{sTeX}\xspace
58 }
59 \let\sTeX\stex

```

(End definition for \stex and \sTeX. These functions are documented on page 46.)

24.3 Messages and logging

```

60 <@@=stex_log>

```

Warnings and error messages

```

61 \msg_new:nnn{stex}{error/unknownlanguage}{
62   Unknown~language:~#1
63 }
64 \msg_new:nnn{stex}{warning/nomathhub}{
65   MATHHUB~system~variable~not~found~and~no~
66   \detokenize{\mathhub}-value~set!
67 }
68 \msg_new:nnn{stex}{error/deactivated-macro}{
69   The~\detokenize{#1}~command~is~only~allowed~in~#2!
70 }

```

\stex_debug:nn A simple macro issuing package messages with subpath.

```

71 \cs_new_protected:Nn \stex_debug:nn {
72   \clist_if_in:NnTF \c_stex_debug_clist { all } {
73     \msg_set:nnn{stex}{debug / #1}{
74       \\Debug~#1:~#2\\
75     }
76     \msg_none:nn{stex}{debug / #1}
77   }{
78     \clist_if_in:NnT \c_stex_debug_clist { #1 } {
79       \msg_set:nnn{stex}{debug / #1}{
80         \\Debug~#1:~#2\\
81       }
82       \msg_none:nn{stex}{debug / #1}
83     }
84   }
85 }

```

(End definition for \stex_debug:nn. This function is documented on page 46.)

Redirecting messages:

```

86 \clist_if_in:NnTF \c_stex_debug_clist {all} {
87   \msg_redirect_module:nnn{ stex }{ none }{ term }
88 }{
89   \clist_map_inline:Nn \c_stex_debug_clist {
90     \msg_redirect_name:nnn{ stex }{ debug / ##1 }{ term }
91   }
92 }
93
94 \stex_debug:nn{log}{debug~mode~on}

```

24.4 HTML Annotations

95 <@@=stex_annotate>

\l_stex_html_arg_tl Used by annotation macros to ensure that the HTML output to annotate is not empty.
\c_stex_html_emptyarg_tl

96 \tl_new:N \l_stex_html_arg_tl

(End definition for \l_stex_html_arg_tl and \c_stex_html_emptyarg_tl. These variables are documented on page ??.)

_stex_html_checkempty:n

```

97 \cs_new_protected:Nn \_stex_html_checkempty:n {
98   \tl_set:Nn \l_stex_html_arg_tl { #1 }
99   \tl_if_empty:NT \l_stex_html_arg_tl {
100     \tl_set_eq:NN \l_stex_html_arg_tl \c_stex_html_emptyarg_tl
101   }
102 }

```

(End definition for _stex_html_checkempty:n. This function is documented on page ??.)

\stex_if_do_html_p: Whether to (locally) produce HTML output

\stex_if_do_html:TF

```

103 \bool_new:N \_stex_html_do_output_bool
104 \bool_set_true:N \_stex_html_do_output_bool
105

```



```

106 \prg_new_conditional:Nnn \stex_if_do_html: {p,T,F,TF} {
107   \bool_if:nTF \_stex_html_do_output_bool
108     \prg_return_true: \prg_return_false:
109 }

```

(End definition for `\stex_if_do_html:TF`. This function is documented on page 46.)

`\stex_suppress_html:n` Whether to (locally) produce HTML output

```

110 \cs_new_protected:Nn \stex_suppress_html:n {
111   \exp_args:Nne \use:nn {
112     \bool_set_false:N \_stex_html_do_output_bool
113     #1
114   }{
115     \stex_if_do_html:T {
116       \bool_set_true:N \_stex_html_do_output_bool
117     }
118   }
119 }

```

(End definition for `\stex_suppress_html:n`. This function is documented on page 46.)

`\stex_annotate:enw`

`\stex_annotate_invisible:n`

`\stex_annotate_invisible:nnn`

We define four macros for introducing attributes in the HTML output. The definitions depend on the “backend” used (L^AT_EX_ML, R_US_TE_X, p_DF_LA_TE_X).

The p_DF_LA_TE_X-macros largely do nothing; the R_US_TE_X-implementations are pretty clear in what they do, the L^AT_EX_ML-implementations resort to perl bindings.

```

120 \tl_if_exist:NF\stex@backend{
121   \ifcsname if@rustex\endcsname
122     \def\stex@backend{rustex}
123   \else
124     \ifcsname if@latexml\endcsname
125       \def\stex@backend{latexml}
126     \else
127       \def\stex@backend{pdflatex}
128     \fi
129   \fi
130 }
131 \input{stex-backend-\stex@backend.cfg}

```

(End definition for `\stex_annotate:nnn`, `\stex_annotate_invisible:n`, and `\stex_annotate_invisible:nnn`. These functions are documented on page 47.)

24.5 Babel Languages

```

132 <@@=stex_language>

```

`\c_stex_languages_prop`

`\c_stex_language_abbrevs_prop`

We store language abbreviations in two (mutually inverse) property lists:

```

133 \prop_const_from_keyval:Nn \c_stex_languages_prop {
134   en = english ,
135   de = ngerman ,
136   ar = arabic ,
137   bg = bulgarian ,
138   ru = russian ,
139   fi = finnish ,
140   ro = romanian ,

```

```

141   tr = turkish ,
142   fr = french
143 }
144
145 \prop_const_from_keyval:Nn \c_stex_language_abbrevs_prop {
146   english   = en ,
147   ngerman   = de ,
148   arabic    = ar ,
149   bulgarian = bg ,
150   russian   = ru ,
151   finnish   = fi ,
152   romanian  = ro ,
153   turkish   = tr ,
154   french    = fr
155 }
156 % todo: chinese simplified (zhs)
157 %       chinese traditional (zht)

```

(End definition for `\c_stex_languages_prop` and `\c_stex_language_abbrevs_prop`. These variables are documented on page 47.)

we use the `lang`-package option to load the corresponding babel languages:

```

158 \clist_if_empty:NF \c_stex_languages_clist {
159   \clist_clear:N \l_tmpa_clist
160   \clist_map_inline:Nn \c_stex_languages_clist {
161     \prop_get:NnNTF \c_stex_languages_prop { #1 } \l_tmpa_str {
162       \clist_put_right:No \l_tmpa_clist \l_tmpa_str
163     } {
164       \msg_error:nnx{stex}{error/unknownlanguage}{\l_tmpa_str}
165     }
166   }
167   \stex_debug:nn{lang} {Languages:~\clist_use:Nn \l_tmpa_clist {,~} }
168   \RequirePackage[\clist_use:Nn \l_tmpa_clist,]{babel}
169 }
170
171 \AtBeginDocument{
172   \stex_html_backend:T {
173     \seq_get_right:NN \g_stex_currentfile_seq \l_tmpa_str
174     \seq_set_split:NnV \l_tmpa_seq . \l_tmpa_str
175     \seq_pop_right:NN \l_tmpa_seq \l_tmpa_str % .tex
176     \seq_pop_left:NN \l_tmpa_seq \l_tmpa_str % <filename>
177     \seq_if_empty:NF \l_tmpa_seq { %remaining element should be language
178       \seq_pop_right:NN \l_tmpa_seq \l_tmpa_str
179       \stex_debug:nn{basics} {Language~\l_tmpa_str~
180         inferred~from~file~name}
181       \stex_annotate_invisible:nnn{language}{ \l_tmpa_str }{}
182     }
183   }
184 }

```

24.6 Persistence

```

185 <@@=stex_persist>
186 \bool_if:NTF \c_stex_persist_mode_bool {

```

```

187 \def \stex_persist:n #1 {}
188 \def \stex_persist:x #1 {}
189 }{
190 \bool_if:NTF \c_stex_persist_write_mode_bool {
191 \iow_new:N \c__stex_persist_iow
192 \iow_open:Nn \c__stex_persist_iow{\jobname.sms}
193 \AtEndDocument{
194 \iow_close:N \c__stex_persist_iow
195 }
196 \cs_new_protected:Nn \stex_persist:n {
197 \tl_set:Nn \l_tmpa_tl { #1 }
198 \regex_replace_all:nnN { \cP\# } { \cO\# } \l_tmpa_tl
199 \exp_args:NNo \iow_now:Nn \c__stex_persist_iow \l_tmpa_tl
200 }
201 \cs_generate_variant:Nn \stex_persist:n {x}
202 }{
203 \def \stex_persist:n #1 {}
204 \def \stex_persist:x #1 {}
205 }
206 }

```

24.7 Auxiliary Methods

\stex_deactivate_macro:Nn

```

207 \cs_new_protected:Nn \stex_deactivate_macro:Nn {
208 \exp_after:wN\let\csname \detokenize{#1} - orig\endcsname#1
209 \def#1{
210 \msg_error:nnnn{stex}{error/deactivated-macro}{\detokenize{#1}}{#2}
211 }
212 }

```

(End definition for \stex_deactivate_macro:Nn. This function is documented on page 47.)

\stex_reactivate_macro:N

```

213 \cs_new_protected:Nn \stex_reactivate_macro:N {
214 \exp_after:wN\let\exp_after:wN#1\csname \detokenize{#1} - orig\endcsname
215 }

```

(End definition for \stex_reactivate_macro:N. This function is documented on page 47.)

\ignorespacesandpars

```

216 \protected\def\ignorespacesandpars{
217 \begingroup\catcode13=10\relax
218 \@ifnextchar\par{
219 \endgroup\expandafter\ignorespacesandpars\@gobble
220 }{
221 \endgroup
222 }
223 }
224
225 \cs_new_protected:Nn \stex_copy_control_sequence:NNN {
226 \tl_set:Nx \_tmp_args_tl {\cs_argument_spec:N #2}
227 \exp_args:NNo \tl_remove_all:Nn \_tmp_args_tl \c_hash_str
228 \int_set:Nn \l_tmpa_int {\tl_count:N \_tmp_args_tl}

```

```

229
230 \tl_clear:N \_tmp_args_tl
231 \int_step_inline:nn \l_tmpa_int {
232   \tl_put_right:Nx \_tmp_args_tl {{\exp_not:n{####}\exp_not:n{##1}}}
233 }
234
235 \tl_set:Nn #3 {\cs_generate_from_arg_count:NNnn #1 \cs_set:Npn}
236 \tl_put_right:Nx #3 { {\int_use:N \l_tmpa_int}{
237   \exp_after:wN\exp_after:wN\exp_after:wN \exp_not:n
238   \exp_after:wN\exp_after:wN\exp_after:wN {
239     \exp_after:wN #2 \_tmp_args_tl
240   }
241 }}
242 }
243 \cs_generate_variant:Nn \stex_copy_control_sequence:NNN {cNN}
244 \cs_generate_variant:Nn \stex_copy_control_sequence:NNN {NcN}
245 \cs_generate_variant:Nn \stex_copy_control_sequence:NNN {ccN}

```

(End definition for `\ignorespacesandpars`. This function is documented on page 47.)

`\MMTrule`

```

246 \NewDocumentCommand \MMTrule {m m}{
247   \seq_set_split:Nnn \l_tmpa_seq , {#2}
248   \int_zero:N \l_tmpa_int
249   \stex_annotate_invisible:nnn{mmtrule}{scala://#1}{
250     $\seq_map_inline:Nn \l_tmpa_seq {
251       \int_incr:N \l_tmpa_int
252       \stex_annotate:nnn{arg}{i\int_use:N \l_tmpa_int}{##1}
253     }$
254   }
255 }
256
257 \NewDocumentCommand \MMTinclude {m}{
258   \stex_annotate_invisible:nnn{import}{#1}{-}
259 }
260 \endpackage

```

(End definition for `\MMTrule`. This function is documented on page ??.)

Chapter 25

STEX -MathHub Implementation

```
261 <*package>
262
263 %%%%%%%%%% mathhub.dtx %%%%%%%%%%
264
265 <@@=stex_path>
266
267 Warnings and error messages
268 \msg_new:nnn{stex}{error/norepository}{
269   No~archive~#1~found~in~#2
270 }
271 \msg_new:nnn{stex}{error/notinarchive}{
272   Not~currently~in~an~archive,~but~\detokenize{#1}~
273   needs~one!
274 }
275 \msg_new:nnn{stex}{error/nofile}{
276   \detokenize{#1}~could~not~find~file~#2
277 }
278 \msg_new:nnn{stex}{error/twofiles}{
279   \detokenize{#1}~found~two~candidates~for~#2
280 }
```

25.1 Generic Path Handling

We treat paths as L^AT_EX3-sequences (of the individual path segments, i.e. separated by a /-character) unix-style; i.e. a path is absolute if the sequence starts with an empty entry.

`\stex_path_from_string:Nn`

```
279 \cs_new_protected:Nn \stex_path_from_string:Nn {
280   \str_set:Nx \l_tmpa_str { #2 }
281   \str_if_empty:NTF \l_tmpa_str {
282     \seq_clear:N #1
283   }{
284     \exp_args:NNNo \seq_set_split:Nnn #1 / { \l_tmpa_str }
285     \sys_if_platform_windows:T{
286       \seq_clear:N \l_tmpa_tl
```

```

287 \seq_map_inline:Nn #1 {
288   \seq_set_split:Nnn \l_tmpb_tl \c_backslash_str { ##1 }
289   \seq_concat:NNN \l_tmpa_tl \l_tmpa_tl \l_tmpb_tl
290 }
291 \seq_set_eq:NN #1 \l_tmpa_tl
292 }
293 \stex_path_canonicalize:N #1
294 }
295 }
296

```

(End definition for `\stex_path_from_string:Nn`. This function is documented on page 48.)

`\stex_path_to_string:NN`
`\stex_path_to_string:N`

```

297 \cs_new_protected:Nn \stex_path_to_string:NN {
298   \exp_args:Nne \str_set:Nn #2 { \seq_use:Nn #1 / }
299 }
300
301 \cs_new:Nn \stex_path_to_string:N {
302   \seq_use:Nn #1 /
303 }

```

(End definition for `\stex_path_to_string:NN` and `\stex_path_to_string:N`. These functions are documented on page 48.)

`\c__stex_path_dot_str` . and .., respectively.
`\c__stex_path_up_str`

```

304 \str_const:Nn \c__stex_path_dot_str {.}
305 \str_const:Nn \c__stex_path_up_str {...}

```

(End definition for `\c__stex_path_dot_str` and `\c__stex_path_up_str`.)

`\stex_path_canonicalize:N` Canonicalizes the path provided; in particular, resolves . and .. path segments.

```

306 \cs_new_protected:Nn \stex_path_canonicalize:N {
307   \seq_if_empty:NF #1 {
308     \seq_clear:N \l_tmpa_seq
309     \seq_get_left:NN #1 \l_tmpa_tl
310     \str_if_empty:NT \l_tmpa_tl {
311       \seq_put_right:Nn \l_tmpa_seq {}
312     }
313     \seq_map_inline:Nn #1 {
314       \str_set:Nn \l_tmpa_tl { ##1 }
315       \str_if_eq:NNF \l_tmpa_tl \c__stex_path_dot_str {
316         \str_if_eq:NNTF \l_tmpa_tl \c__stex_path_up_str {
317           \seq_if_empty:NNTF \l_tmpa_seq {
318             \exp_args:NNo \seq_put_right:Nn \l_tmpa_seq {
319               \c__stex_path_up_str
320             }
321           }{
322             \seq_get_right:NN \l_tmpa_seq \l_tmpa_tl
323             \str_if_eq:NNTF \l_tmpa_tl \c__stex_path_up_str {
324               \exp_args:NNo \seq_put_right:Nn \l_tmpa_seq {
325                 \c__stex_path_up_str
326               }
327             }{

```

```

328         \seq_pop_right:NN \l_tmpa_seq \l_tmpb_tl
329     }
330 }
331 }{
332     \str_if_empty:NF \l_tmpa_tl {
333         \exp_args:NNo \seq_put_right:Nn \l_tmpa_seq { \l_tmpa_tl }
334     }
335 }
336 }
337 }
338 \seq_gset_eq:NN #1 \l_tmpa_seq
339 }
340 }

```

(End definition for `\stex_path_canonicalize:N`. This function is documented on page 48.)

`\stex_path_if_absolute_p:N`
`\stex_path_if_absolute:N \underline{TF}`

```

341 \prg_new_conditional:Nnn \stex_path_if_absolute:N {p, T, F, TF} {
342     \seq_if_empty:NTF #1 {
343         \prg_return_false:
344     }{
345         \seq_get_left:NN #1 \l_tmpa_tl
346         \sys_if_platform_windows:TF{
347             \str_if_in:NnTF \l_tmpa_tl {:}{
348                 \prg_return_true:
349             }{
350                 \prg_return_false:
351             }
352         }{
353             \str_if_empty:NTF \l_tmpa_tl {
354                 \prg_return_true:
355             }{
356                 \prg_return_false:
357             }
358         }
359     }
360 }

```

(End definition for `\stex_path_if_absolute:N \underline{TF}` . This function is documented on page 48.)

25.2 PWD and kpsewhich

`\stex_kpsewhich:n`

```

361 \str_new:N\l_stex_kpsewhich_return_str
362 \cs_new_protected:Nn \stex_kpsewhich:n {
363     \sys_get_shell:nnN { kpsewhich ~ #1 } { } \l_tmpa_tl
364     \exp_args:NNo\str_set:Nn\l_stex_kpsewhich_return_str{\l_tmpa_tl}
365     \tl_trim_spaces:N \l_stex_kpsewhich_return_str
366 }

```

(End definition for `\stex_kpsewhich:n`. This function is documented on page 48.)

We determine the PWD

`\c_stex_pwd_seq`
`\c_stex_pwd_str`

```

367 \sys_if_platform_windows:TF{
368   \begingroup\escapechar=-1\catcode'\=12
369   \exp_args:Nx\stex_kpsewhich:n{-expand-var~\c_percent_str CD\c_percent_str}
370   \exp_args:NNx\str_replace_all:Nnn\l_stex_kpsewhich_return_str{\c_backslash_str}/
371   \exp_args:Nnx\use:nn{\endgroup}{\str_set:Nn\exp_not:N\l_stex_kpsewhich_return_str{\l_stex_
372   }}{
373   \stex_kpsewhich:n{-var-value~PWD}
374   }
375
376 \stex_path_from_string:Nn\c_stex_pwd_seq\l_stex_kpsewhich_return_str
377 \stex_path_to_string:NN\c_stex_pwd_seq\c_stex_pwd_str
378 \stex_debug:nn {mathhub} {PWD:~\str_use:N\c_stex_pwd_str}

```

(End definition for `\c_stex_pwd_seq` and `\c_stex_pwd_str`. These variables are documented on page 48.)

25.3 File Hooks and Tracking

```

379 <@@=stex_files>

```

We introduce hooks for file inputs that keep track of the absolute paths of files used. This will be useful to keep track of modules, their archives, namespaces etc.

Note that the absolute paths are only accurate in `\input`-statements for paths relative to the PWD, so they shouldn't be relied upon in any other setting than for \TeX -purposes.

`\g__stex_files_stack` keeps track of file changes

```

380 \seq_gclear_new:N\g__stex_files_stack

```

(End definition for `\g__stex_files_stack`.)

`\c_stex_mainfile_seq`
`\c_stex_mainfile_str`

```

381 \str_set:Nx \c_stex_mainfile_str {\c_stex_pwd_str/\jobname.tex}
382 \stex_path_from_string:Nn \c_stex_mainfile_seq
383   \c_stex_mainfile_str

```

(End definition for `\c_stex_mainfile_seq` and `\c_stex_mainfile_str`. These variables are documented on page 48.)

`\g_stex_currentfile_seq`

```

384 \seq_gclear_new:N\g_stex_currentfile_seq

```

(End definition for `\g_stex_currentfile_seq`. This variable is documented on page 49.)

`\stex_filestack_push:n`

```

385 \cs_new_protected:Nn \stex_filestack_push:n {
386   \stex_path_from_string:Nn\g_stex_currentfile_seq{#1}
387   \stex_path_if_absolute:NF\g_stex_currentfile_seq{
388     \stex_path_from_string:Nn\g_stex_currentfile_seq{
389       \c_stex_pwd_str/#1
390     }
391   }
392   \seq_gset_eq:NN\g_stex_currentfile_seq\g_stex_currentfile_seq
393   \exp_args:NNo\seq_gpush:Nn\g__stex_files_stack\g_stex_currentfile_seq
394 }

```


(End definition for `\stex_filestack_push:n`. This function is documented on page 49.)

`\stex_filestack_pop:`

```

395 \cs_new_protected:Nn \stex_filestack_pop: {
396   \seq_if_empty:NF\g__stex_files_stack{
397     \seq_gpop:NN\g__stex_files_stack\l_tmpa_seq
398   }
399   \seq_if_empty:NTF\g__stex_files_stack{
400     \seq_gset_eq:NN\g_stex_currentfile_seq\c_stex_mainfile_seq
401   }{
402     \seq_get:NN\g__stex_files_stack\l_tmpa_seq
403     \seq_gset_eq:NN\g_stex_currentfile_seq\l_tmpa_seq
404   }
405 }
```

(End definition for `\stex_filestack_pop:`. This function is documented on page 49.)

Hooks for the current file:

```

406 \AddToHook{file/before}{
407   \stex_filestack_push:n{\CurrentFilePath/\CurrentFile}
408 }
409 \AddToHook{file/after}{
410   \stex_filestack_pop:
411 }
```

25.4 MathHub Repositories

412 `<@@=stex_mathhub>`

`\mathhub` The path to the mathhub directory. If the `\mathhub`-macro is not set, we query `\c_stex_mathhub_seq` `\c_stex_mathhub_str` `kpsewhich` for the MATHHUB system variable.

```

413 \str_if_empty:NTF\mathhub{
414   \sys_if_platform_windows:TF{
415     \begingroup\escapechar=-1\catcode'\=12
416     \exp_args:Nx\stex_kpsewhich:n{-expand-var~\c_percent_str MATHHUB\c_percent_str}
417     \exp_args:NNx\str_replace_all:Nnn\l_stex_kpsewhich_return_str{\c_backslash_str}/
418     \exp_args:Nnx\use:nn{\endgroup}{\str_set:Nn\exp_not:N\l_stex_kpsewhich_return_str{\l_stex_kpsewhich_return_str}}
419   }{
420     \stex_kpsewhich:n{-var-value-MATHHUB}
421   }
422   \str_set_eq:NN\c_stex_mathhub_str\l_stex_kpsewhich_return_str
423 }
424 \str_if_empty:NT \c_stex_mathhub_str {
425   \sys_if_platform_windows:TF{
426     \begingroup\escapechar=-1\catcode'\=12
427     \exp_args:Nx\stex_kpsewhich:n{-var-value-HOME}
428     \exp_args:NNx\str_replace_all:Nnn\l_stex_kpsewhich_return_str{\c_backslash_str}/
429     \exp_args:Nnx\use:nn{\endgroup}{\str_set:Nn\exp_not:N\l_stex_kpsewhich_return_str{\l_stex_kpsewhich_return_str}}
430   }{
431     \stex_kpsewhich:n{-var-value-HOME}
432   }
433   \ior_open:NnT \l_tmpa_ior{\l_stex_kpsewhich_return_str / .stex / mathhub.path}{
434     \begingroup\escapechar=-1\catcode'\=12
435     \ior_str_get:NN \l_tmpa_ior \l_tmpa_str
```

```

436     \sys_if_platform_windows:T{
437         \exp_args:NNx\str_replace_all:Nnn\l_tmpa_str{\c_backslash_str}/
438     }
439     \str_gset_eq:NN \c_stex_mathhub_str\l_tmpa_str
440     \endgroup
441     \ior_close:N \l_tmpa_ior
442 }
443 }
444 \str_if_empty:NTF\c_stex_mathhub_str{
445     \msg_warning:nn{stex}{warning/nomathhub}
446 }{
447     \stex_debug:nn{mathhub}{MathHub:~\str_use:N\c_stex_mathhub_str}
448     \exp_args:NNo \stex_path_from_string:Nn\c_stex_mathhub_seq\c_stex_mathhub_str
449 }
450 }{
451     \stex_path_from_string:Nn \c_stex_mathhub_seq \mathhub
452     \stex_path_if_absolute:NF \c_stex_mathhub_seq {
453         \exp_args:NNx \stex_path_from_string:Nn \c_stex_mathhub_seq {
454             \c_stex_pwd_str/\mathhub
455         }
456     }
457     \stex_path_to_string:NN\c_stex_mathhub_seq\c_stex_mathhub_str
458     \stex_debug:nn{mathhub} {MathHub:~\str_use:N\c_stex_mathhub_str}
459 }

```

(End definition for `\mathhub`, `\c_stex_mathhub_seq`, and `\c_stex_mathhub_str`. These variables are documented on page 49.)

`_stex_mathhub_do_manifest:n` Checks whether the manifest for archive #1 already exists, and if not, finds and parses the corresponding manifest file

```

460 \cs_new_protected:Nn \_stex_mathhub_do_manifest:n {
461     \prop_if_exist:cF {c_stex_mathhub_#1_manifest_prop} {
462         \str_set:Nx \l_tmpa_str { #1 }
463         \prop_new:c { c_stex_mathhub_#1_manifest_prop }
464         \seq_set_split:NnV \l_tmpa_seq / \l_tmpa_str
465         \seq_concat:NNN \l_tmpa_seq \c_stex_mathhub_seq \l_tmpa_seq
466         \_stex_mathhub_find_manifest:N \l_tmpa_seq
467         \seq_if_empty:NTF \l_stex_mathhub_manifest_file_seq {
468             \msg_error:nnxx{stex}{error/norepository}{#1}{
469                 \stex_path_to_string:N \c_stex_mathhub_str
470             }
471         } {
472             \exp_args:No \_stex_mathhub_parse_manifest:n { \l_tmpa_str }
473         }
474     }
475 }

```

(End definition for `_stex_mathhub_do_manifest:n`.)

`\l_stex_mathhub_manifest_file_seq`

```

476 \seq_new:N\l_stex_mathhub_manifest_file_seq

```

(End definition for `\l_stex_mathhub_manifest_file_seq`.)

`_stex_mathhub_find_manifest:N` Attempts to find the MANIFEST.MF in some file path and stores its path in `\l__stex_mathhub_manifest_file_seq`:

```

477 \cs_new_protected:Nn \_stex_mathhub_find_manifest:N {
478   \seq_set_eq:NN \l_tmpa_seq #1
479   \bool_set_true:N \l_tmpa_bool
480   \bool_while_do:Nn \l_tmpa_bool {
481     \seq_if_empty:NTF \l_tmpa_seq {
482       \bool_set_false:N \l_tmpa_bool
483     }{
484       \file_if_exist:nTF{
485         \stex_path_to_string:N \l_tmpa_seq/MANIFEST.MF
486       }{
487         \seq_put_right:Nn \l_tmpa_seq{MANIFEST.MF}
488         \bool_set_false:N \l_tmpa_bool
489       }{
490         \file_if_exist:nTF{
491           \stex_path_to_string:N \l_tmpa_seq/META-INF/MANIFEST.MF
492         }{
493           \seq_put_right:Nn \l_tmpa_seq{META-INF}
494           \seq_put_right:Nn \l_tmpa_seq{MANIFEST.MF}
495           \bool_set_false:N \l_tmpa_bool
496         }{
497           \file_if_exist:nTF{
498             \stex_path_to_string:N \l_tmpa_seq/meta-inf/MANIFEST.MF
499           }{
500             \seq_put_right:Nn \l_tmpa_seq{meta-inf}
501             \seq_put_right:Nn \l_tmpa_seq{MANIFEST.MF}
502             \bool_set_false:N \l_tmpa_bool
503           }{
504             \seq_pop_right:NN \l_tmpa_seq \l_tmpa_tl
505           }
506         }
507       }
508     }
509   }
510   \seq_set_eq:NN \l__stex_mathhub_manifest_file_seq \l_tmpa_seq
511 }

```

(End definition for `_stex_mathhub_find_manifest:N`.)

`\c_stex_mathhub_manifest_ior` File variable used for MANIFEST-files

```

512 \ior_new:N \c_stex_mathhub_manifest_ior

```

(End definition for `\c_stex_mathhub_manifest_ior`.)

`_stex_mathhub_parse_manifest:n` Stores the entries in manifest file in the corresponding property list:

```

513 \cs_new_protected:Nn \_stex_mathhub_parse_manifest:n {
514   \seq_set_eq:NN \l_tmpa_seq \l__stex_mathhub_manifest_file_seq
515   \ior_open:Nn \c_stex_mathhub_manifest_ior {\stex_path_to_string:N \l_tmpa_seq}
516   \ior_map_inline:Nn \c_stex_mathhub_manifest_ior {
517     \str_set:Nn \l_tmpa_str {##1}
518     \exp_args:NNoo \seq_set_split:Nnn
519       \l_tmpb_seq \c_colon_str \l_tmpa_str
520     \seq_pop_left:NNTF \l_tmpb_seq \l_tmpa_tl {

```

```

521 \exp_args:NNe \str_set:Nn \l_tmpb_tl {
522 \exp_args:NNo \seq_use:Nn \l_tmpb_seq \c_colon_str
523 }
524 \exp_args:No \str_case:nnTF \l_tmpa_tl {
525 {id} {
526 \prop_gput:cno { c_stex_mathhub_#1_manifest_prop }
527 { id } \l_tmpb_tl
528 }
529 {narration-base} {
530 \prop_gput:cno { c_stex_mathhub_#1_manifest_prop }
531 { narr } \l_tmpb_tl
532 }
533 {url-base} {
534 \prop_gput:cno { c_stex_mathhub_#1_manifest_prop }
535 { docurl } \l_tmpb_tl
536 }
537 {source-base} {
538 \prop_gput:cno { c_stex_mathhub_#1_manifest_prop }
539 { ns } \l_tmpb_tl
540 }
541 {ns} {
542 \prop_gput:cno { c_stex_mathhub_#1_manifest_prop }
543 { ns } \l_tmpb_tl
544 }
545 {dependencies} {
546 \prop_gput:cno { c_stex_mathhub_#1_manifest_prop }
547 { deps } \l_tmpb_tl
548 }
549 }{}{}
550 }{}
551 }
552 \ior_close:N \c__stex_mathhub_manifest_ior
553 \stex_persist:x {
554 \prop_set_from_keyval:cn{ c_stex_mathhub_#1_manifest_prop }{
555 \exp_after:wN \prop_to_keyval:N \csname c_stex_mathhub_#1_manifest_prop\endcsname
556 }
557 }
558 }

```

(End definition for `__stex_mathhub_parse_manifest:n`.)

`\stex_set_current_repository:n`

```

559 \cs_new_protected:Nn \stex_set_current_repository:n {
560 \stex_require_repository:n { #1 }
561 \prop_set_eq:Nc \l_stex_current_repository_prop {
562 c_stex_mathhub_#1_manifest_prop
563 }
564 }

```

(End definition for `\stex_set_current_repository:n`. This function is documented on page 49.)

`\stex_require_repository:n`

```

565 \cs_new_protected:Nn \stex_require_repository:n {
566 \prop_if_exist:cF { c_stex_mathhub_#1_manifest_prop } {
567 \stex_debug:nn{mathhub}{Opening~archive:~#1}

```

```

568     \__stex_mathhub_do_manifest:n { #1 }
569   }
570 }

```

(End definition for `\stex_require_repository:n`. This function is documented on page 49.)

`\l_stex_current_repository_prop` Current MathHub repository

```

571 %\prop_new:N \l_stex_current_repository_prop
572 \bool_if:NF \c_stex_persist_mode_bool {
573   \__stex_mathhub_find_manifest:N \c_stex_pwd_seq
574   \seq_if_empty:NTF \l__stex_mathhub_manifest_file_seq {
575     \stex_debug:nn{mathhub}{Not~currently~in~a~MathHub~repository}
576   } {
577     \__stex_mathhub_parse_manifest:n { main }
578     \prop_get:NnN \c_stex_mathhub_main_manifest_prop {id}
579     \l_tmpa_str
580     \prop_set_eq:cN { c_stex_mathhub\_l_tmpa_str_manifest_prop }
581     \c_stex_mathhub_main_manifest_prop
582     \exp_args:Nx \stex_set_current_repository:n { \l_tmpa_str }
583     \stex_debug:nn{mathhub}{Current~repository:~
584     \prop_item:Nn \l_stex_current_repository_prop {id}
585   }
586 }
587 }

```

(End definition for `\l_stex_current_repository_prop`. This variable is documented on page 49.)

`\stex_in_repository:nn` Executes the code in the second argument in the context of the repository whose ID is provided as the first argument.

```

588 \cs_new_protected:Nn \stex_in_repository:nn {
589   \str_set:Nx \l_tmpa_str { #1 }
590   \cs_set:Npn \l_tmpa_cs ##1 { #2 }
591   \str_if_empty:NTF \l_tmpa_str {
592     \prop_if_exist:NTF \l_stex_current_repository_prop {
593       \stex_debug:nn{mathhub}{do~in~current~repository:~\prop_item:Nn \l_stex_current_reposi
594       \exp_args:Ne \l_tmpa_cs{
595         \prop_item:Nn \l_stex_current_repository_prop { id }
596       }
597     }{
598       \l_tmpa_cs{}
599     }
600   }{
601     \stex_debug:nn{mathhub}{in~repository:~\l_tmpa_str}
602     \stex_require_repository:n \l_tmpa_str
603     \str_set:Nx \l_tmpa_str { #1 }
604     \exp_args:Nne \use:nn {
605       \stex_set_current_repository:n \l_tmpa_str
606       \exp_args:Nx \l_tmpa_cs{\l_tmpa_str}
607     }{
608       \stex_debug:nn{mathhub}{switching~back~to:~
609       \prop_if_exist:NTF \l_stex_current_repository_prop {
610         \prop_item:Nn \l_stex_current_repository_prop { id }::~
611       \meaning\l_stex_current_repository_prop
612     }{

```

```

613         no~repository
614     }
615 }
616 \prop_if_exist:NTF \l_stex_current_repository_prop {
617     \stex_set_current_repository:n {
618         \prop_item:Nn \l_stex_current_repository_prop { id }
619     }
620 }{
621     \let\exp_not:N\l_stex_current_repository_prop\exp_not:N\undefined
622 }
623 }
624 }
625 }

```

(End definition for `\stex_in_repository:nn`. This function is documented on page [49](#).)

25.5 Using Content in Archives

`\mhpath`

```

626 \def \mhpath #1 #2 {
627     \exp_args:Ne \tl_if_empty:nTF{#1}{
628         \c_stex_mathhub_str /
629         \prop_item:Nn \l_stex_current_repository_prop { id }
630         / source / #2
631     }{
632         \c_stex_mathhub_str / #1 / source / #2
633     }
634 }

```

(End definition for `\mhpath`. This function is documented on page [50](#).)

`\inputref`

`\mhinput`

```

635 \newif \ifinputref \inputreffalse
636
637 \cs_new_protected:Nn \__stex_mathhub_mhinput:nn {
638     \stex_in_repository:nn {#1} {
639         \ifinputref
640             \input{ \c_stex_mathhub_str / ##1 / source / #2 }
641         \else
642             \inputreftrue
643             \input{ \c_stex_mathhub_str / ##1 / source / #2 }
644             \inputreffalse
645         \fi
646     }
647 }
648 \NewDocumentCommand \mhinput { 0{} m }{
649     \__stex_mathhub_mhinput:nn{ #1 }{ #2 }
650 }
651
652 \cs_new_protected:Nn \__stex_mathhub_inputref:nn {
653     \stex_in_repository:nn {#1} {
654         \stex_html_backend:TF {
655             \str_clear:N \l_tmpa_str

```

```

656     \prop_get:NnNF \l_stex_current_repository_prop { narr } \l_tmpa_str {
657       \prop_get:NnNF \l_stex_current_repository_prop { ns } \l_tmpa_str {}
658     }
659     \stex_annotate_invisible:nnn{inputref}{
660       \l_tmpa_str / #2
661     }{}
662   }{
663     \begingroup
664     \inputreftrue
665     \tl_if_empty:nTF{ ##1 }{
666       \input{#2}
667     }{
668       \input{ \c_stex_mathhub_str / ##1 / source / #2 }
669     }
670     \endgroup
671   }
672 }
673 }
674 \NewDocumentCommand \inputref { 0{ } m }{
675   \__stex_mathhub_inputref:nn{ #1 }{ #2 }
676 }

```

(End definition for `\inputref` and `\mhinput`. These functions are documented on page 50.)

`\addmhbibresource`

```

677 \cs_new_protected:Nn \__stex_mathhub_mhbibresource:nn {
678   \stex_in_repository:nn {#1} {
679     \addbibresource{ \c_stex_mathhub_str / ##1 / #2 }
680   }
681 }
682 \newcommand\addmhbibresource[2][]{
683   \__stex_mathhub_mhbibresource:nn{ #1 }{ #2 }
684 }

```

(End definition for `\addmhbibresource`. This function is documented on page 50.)

`\libinput`

```

685 \cs_new_protected:Npn \libinput #1 {
686   \prop_if_exist:NF \l_stex_current_repository_prop {
687     \msg_error:nnn{stex}{error/notinarchive}\libinput
688   }
689   \prop_get:NnNF \l_stex_current_repository_prop {id} \l_tmpa_str {
690     \msg_error:nnn{stex}{error/notinarchive}\libinput
691   }
692   \seq_clear:N \l__stex_mathhub_libinput_files_seq
693   \seq_set_eq:NN \l_tmpa_seq \c_stex_mathhub_seq
694   \seq_set_split:NnV \l_tmpb_seq / \l_tmpa_str
695
696   \bool_while_do:nn { ! \seq_if_empty_p:N \l_tmpb_seq }{
697     \str_set:Nx \l_tmpa_str {\stex_path_to_string:N \l_tmpa_seq / meta-inf / lib / #1.tex}
698     \IfFileExists{ \l_tmpa_str }{
699       \seq_put_right:No \l__stex_mathhub_libinput_files_seq \l_tmpa_str
700     }{}
701     \seq_pop_left:NN \l_tmpb_seq \l_tmpa_str
702     \seq_put_right:No \l_tmpa_seq \l_tmpa_str

```

```

703 }
704
705 \str_set:Nx \l_tmpa_str {\stex_path_to_string:N \l_tmpa_seq / lib / #1.tex}
706 \IfFileExists{ \l_tmpa_str }{
707   \seq_put_right:No \l__stex_mathhub_libinput_files_seq \l_tmpa_str
708 }{}
709
710 \seq_if_empty:NTF \l__stex_mathhub_libinput_files_seq {
711   \msg_error:nnxx{stex}{error/nofile}{\exp_not:N\libinput}{#1.tex}
712 }{
713   \seq_map_inline:Nn \l__stex_mathhub_libinput_files_seq {
714     \input{ ##1 }
715   }
716 }
717 }

```

(End definition for `\libinput`. This function is documented on page 50.)

`\libusepackage`

```

718 \NewDocumentCommand \libusepackage {0{ } m} {
719   \prop_if_exist:NF \l_stex_current_repository_prop {
720     \msg_error:nnn{stex}{error/notinarchive}\libusepackage
721   }
722   \prop_get:NnNF \l_stex_current_repository_prop {id} \l_tmpa_str {
723     \msg_error:nnn{stex}{error/notinarchive}\libusepackage
724   }
725   \seq_clear:N \l__stex_mathhub_libinput_files_seq
726   \seq_set_eq:NN \l_tmpa_seq \c_stex_mathhub_seq
727   \seq_set_split:NnV \l_tmpb_seq / \l_tmpa_str
728
729   \bool_while_do:nn { ! \seq_if_empty_p:N \l_tmpb_seq }{
730     \str_set:Nx \l_tmpa_str {\stex_path_to_string:N \l_tmpa_seq / meta-inf / lib / #2}
731     \IfFileExists{ \l_tmpa_str.sty }{
732       \seq_put_right:No \l__stex_mathhub_libinput_files_seq \l_tmpa_str
733     }{}
734     \seq_pop_left:NN \l_tmpb_seq \l_tmpa_str
735     \seq_put_right:No \l_tmpa_seq \l_tmpa_str
736   }
737
738   \str_set:Nx \l_tmpa_str {\stex_path_to_string:N \l_tmpa_seq / lib / #2}
739   \IfFileExists{ \l_tmpa_str.sty }{
740     \seq_put_right:No \l__stex_mathhub_libinput_files_seq \l_tmpa_str
741   }{}
742
743   \seq_if_empty:NTF \l__stex_mathhub_libinput_files_seq {
744     \msg_error:nnxx{stex}{error/nofile}{\exp_not:N\libusepackage}{#2.sty}
745   }{
746     \int_compare:nNnTF {\seq_count:N \l__stex_mathhub_libinput_files_seq} = 1 {
747       \seq_map_inline:Nn \l__stex_mathhub_libinput_files_seq {
748         \usepackage[##1]{ ##1 }
749       }
750     }{
751       \msg_error:nnxx{stex}{error/twofiles}{\exp_not:N\libusepackage}{#2.sty}
752     }

```



```

753 }
754 }

```

(End definition for `\libusepackage`. This function is documented on page 50.)

```

\mhgraphics
\cmhgraphics

```

```

755
756 \AddToHook{begindocument}{
757 \ltx@ifpackageloaded{graphicx}{
758   \define@key{Gin}{mhrepos}{\def\Gin@mhrepos{#1}}
759   \newcommand\mhgraphics[2][]{\%
760     \def\Gin@mhrepos{}\setkeys{Gin}{#1}%
761     \includegraphics[#1]{\mhp@th\Gin@mhrepos{#2}}}
762   \newcommand\cmhgraphics[2][]{\begin{center}\mhgraphics[#1]{#2}\end{center}}
763 }{}

```

(End definition for `\mhgraphics` and `\cmhgraphics`. These functions are documented on page 50.)

```

\lstinputmhlisting
\clstinputmhlisting

```

```

764 \ltx@ifpackageloaded{listings}{
765   \define@key{lst}{mhrepos}{\def\lst@mhrepos{#1}}
766   \newcommand\lstinputmhlisting[2][]{\%
767     \def\lst@mhrepos{}\setkeys{lst}{#1}%
768     \lstinputlisting[#1]{\mhp@th\lst@mhrepos{#2}}}
769   \newcommand\clstinputmhlisting[2][]{\begin{center}\lstinputmhlisting[#1]{#2}\end{center}}
770 }{}
771 }
772
773 \</package>

```

(End definition for `\lstinputmhlisting` and `\clstinputmhlisting`. These functions are documented on page 50.)

Chapter 26

STEX -References Implementation

```
774 <*package>
775
776 %%%%%%%%%%% references.dtx %%%%%%%%%%%
777
778 <@@=stex_refs>
779
780 Warnings and error messages
```

References are stored in the file `\jobname.sref`, to enable cross-referencing external documents.

```
780 %\iow_new:N \c__stex_refs_refs_iow
781 \AtBeginDocument{
782 % \iow_open:Nn \c__stex_refs_refs_iow {\jobname.sref}
783 }
784 \AtEndDocument{
785 % \iow_close:N \c__stex_refs_refs_iow
786 }
```

`\STEXreftitle`

```
787 \str_set:Nn \g__stex_refs_title_tl {Unnamed~Document}
788
789 \NewDocumentCommand \STEXreftitle { m } {
790 \tl_gset:Nx \g__stex_refs_title_tl { #1 }
791 }
```

(End definition for `\STEXreftitle`. This function is documented on page 51.)

26.1 Document URIs and URLs

`\l_stex_current_docns_str`

```
792 \str_new:N \l_stex_current_docns_str
```

(End definition for `\l_stex_current_docns_str`. This variable is documented on page 51.)

`\stex_get_document_uri:`

```
793 \cs_new_protected:Nn \stex_get_document_uri: {  
794   \seq_set_eq:NN \l_tmpa_seq \g_stex_currentfile_seq  
795   \seq_pop_right:NN \l_tmpa_seq \l_tmpb_str  
796   \exp_args:NNno \seq_set_split:Nnn \l_tmpb_seq . \l_tmpb_str  
797   \seq_get_left:NN \l_tmpb_seq \l_tmpb_str  
798   \seq_put_right:No \l_tmpa_seq \l_tmpb_str  
799  
800   \str_clear:N \l_tmpa_str  
801   \prop_if_exist:NT \l_stex_current_repository_prop {  
802     \prop_get:NnNF \l_stex_current_repository_prop { narr } \l_tmpa_str {  
803       \prop_get:NnNF \l_stex_current_repository_prop { ns } \l_tmpa_str {}  
804     }  
805   }  
806  
807   \str_if_empty:NTF \l_tmpa_str {  
808     \str_set:Nx \l_stex_current_docns_str {  
809       file:/\stex_path_to_string:N \l_tmpa_seq  
810     }  
811   }{  
812     \bool_set_true:N \l_tmpa_bool  
813     \bool_while_do:Nn \l_tmpa_bool {  
814       \seq_pop_left:NN \l_tmpa_seq \l_tmpb_str  
815       \exp_args:No \str_case:nnTF { \l_tmpb_str } {  
816         {source} { \bool_set_false:N \l_tmpa_bool }  
817       }{}{  
818         \seq_if_empty:NT \l_tmpa_seq {  
819           \bool_set_false:N \l_tmpa_bool  
820         }  
821       }  
822     }  
823  
824     \seq_if_empty:NTF \l_tmpa_seq {  
825       \str_set_eq:NN \l_stex_current_docns_str \l_tmpa_str  
826     }{  
827       \str_set:Nx \l_stex_current_docns_str {  
828         \l_tmpa_str/\stex_path_to_string:N \l_tmpa_seq  
829       }  
830     }  
831   }  
832 }
```

(End definition for `\stex_get_document_uri`:. This function is documented on page 51.)

`\l_stex_current_docurl_str`

```
833 \str_new:N \l_stex_current_docurl_str
```

(End definition for `\l_stex_current_docurl_str`. This variable is documented on page 51.)

`\stex_get_document_url:`

```
834 \cs_new_protected:Nn \stex_get_document_url: {  
835   \seq_set_eq:NN \l_tmpa_seq \g_stex_currentfile_seq  
836   \seq_pop_right:NN \l_tmpa_seq \l_tmpb_str  
837   \exp_args:NNno \seq_set_split:Nnn \l_tmpb_seq . \l_tmpb_str
```

```

838 \seq_get_left:NN \l_tmpb_seq \l_tmpb_str
839 \seq_put_right:No \l_tmpa_seq \l_tmpb_str
840
841 \str_clear:N \l_tmpa_str
842 \prop_if_exist:NT \l_stex_current_repository_prop {
843   \prop_get:NnNF \l_stex_current_repository_prop { docurl } \l_tmpa_str {
844     \prop_get:NnNF \l_stex_current_repository_prop { narr } \l_tmpa_str {
845       \prop_get:NnNF \l_stex_current_repository_prop { ns } \l_tmpa_str {}
846     }
847   }
848 }
849
850 \str_if_empty:NTF \l_tmpa_str {
851   \str_set:Nx \l_stex_current_docurl_str {
852     file:/\stex_path_to_string:N \l_tmpa_seq
853   }
854 }{
855   \bool_set_true:N \l_tmpa_bool
856   \bool_while_do:Nn \l_tmpa_bool {
857     \seq_pop_left:NN \l_tmpa_seq \l_tmpb_str
858     \exp_args:No \str_case:nnTF { \l_tmpb_str } {
859       {source} { \bool_set_false:N \l_tmpa_bool }
860     }{}{
861       \seq_if_empty:NT \l_tmpa_seq {
862         \bool_set_false:N \l_tmpa_bool
863       }
864     }
865   }
866
867   \seq_if_empty:NTF \l_tmpa_seq {
868     \str_set_eq:NN \l_stex_current_docurl_str \l_tmpa_str
869   }{
870     \str_set:Nx \l_stex_current_docurl_str {
871       \l_tmpa_str/\stex_path_to_string:N \l_tmpa_seq
872     }
873   }
874 }
875 }

```

(End definition for `\stex_get_document_url`:. This function is documented on page 51.)

26.2 Setting Reference Targets

```

876 \str_const:Nn \c__stex_refs_url_str{URL}
877 \str_const:Nn \c__stex_refs_ref_str{REF}
878 \str_new:N \l__stex_refs_curr_label_str
879 % @currentlabel -> number
880 % @currentlabelname -> title
881 % @currentHref -> name.number <- id of some kind
882 % \theH# -> \arabic{section}
883 % \the# -> number
884 % \hyper@makecurrent{#}
885 \int_new:N \l__stex_refs_unnamed_counter_int

```

`\stex_ref_new_doc_target:n`

```

886 \cs_new_protected:Nn \stex_ref_new_doc_target:n {
887   \stex_get_document_uri:
888   \str_clear:N \l__stex_refs_curr_label_str
889   \str_set:Nx \l_tmpa_str { #1 }
890   \str_if_empty:NT \l_tmpa_str {
891     \int_incr:N \l__stex_refs_unnamed_counter_int
892     \str_set:Nx \l_tmpa_str {REF\int_use:N \l__stex_refs_unnamed_counter_int}
893   }
894   \str_set:Nx \l__stex_refs_curr_label_str {
895     \l_stex_current_docns_str?\l_tmpa_str
896   }
897   \seq_if_exist:cF{g__stex_refs_labels_\l_tmpa_str_seq}{
898     \seq_new:c {g__stex_refs_labels_\l_tmpa_str_seq}
899   }
900   \seq_if_in:coF{g__stex_refs_labels_\l_tmpa_str_seq}\l__stex_refs_curr_label_str {
901     \seq_gput_right:co{g__stex_refs_labels_\l_tmpa_str_seq}\l__stex_refs_curr_label_str
902   }
903   \stex_if_smsmode:TF {
904     \stex_get_document_url:
905     \str_gset_eq:cN {sref_url_\l__stex_refs_curr_label_str_str}\l_stex_current_docurl_str
906     \str_gset_eq:cN {sref_\l__stex_refs_curr_label_str_type}\c__stex_refs_url_str
907   }{
908     %\iow_now:Nx \c__stex_refs_refs_iow { \l_tmpa_str~=\expandafter\unexpanded\expandafter{
909     \exp_args:Nx\label{sref_\l__stex_refs_curr_label_str}
910     \immediate\write\@auxout{\stexauxadddocref{\l_stex_current_docns_str}{\l_tmpa_str}}
911     \str_gset:cx {sref_\l__stex_refs_curr_label_str_type}\c__stex_refs_ref_str
912   }
913 }

```

(End definition for `\stex_ref_new_doc_target:n`. This function is documented on page 51.)

The following is used to set the necessary macros in the .aux-file.

```

914 \cs_new_protected:Npn \stexauxadddocref #1 #2 {
915   \str_set:Nn \l_tmpa_str {#1?#2}
916   \str_gset_eq:cN{sref_#1?#2_type}\c__stex_refs_ref_str
917   \seq_if_exist:cF{g__stex_refs_labels_#2_seq}{
918     \seq_new:c {g__stex_refs_labels_#2_seq}
919   }
920   \seq_if_in:coF{g__stex_refs_labels_#2_seq}\l_tmpa_str {
921     \seq_gput_right:co{g__stex_refs_labels_#2_seq}\l_tmpa_str
922   }
923 }

```

To avoid resetting the same macros when the .aux-file is read at the end of the document:

```

924 \AtEndDocument{
925   \def\stexauxadddocref#1 #2 {}{}
926 }

```

`\stex_ref_new_sym_target:n`

```

927 \cs_new_protected:Nn \stex_ref_new_sym_target:n {
928   \stex_if_smsmode:TF {
929     \str_if_exist:cF{sref_sym_#1_type}{
930       \stex_get_document_url:
931       \str_gset_eq:cN {sref_sym_url_#1_str}\l_stex_current_docurl_str

```

```

932     \str_gset_eq:cN {sref_sym_#1_type}\c__stex_refs_url_str
933   }
934 }{
935   \str_if_empty:NF \l__stex_refs_curr_label_str {
936     \str_gset_eq:cN {sref_sym_#1_label_str}\l__stex_refs_curr_label_str
937     \immediate\write\@auxout{
938       \exp_not:N\expandafter\def\exp_not:N\csname \exp_not:N\detokenize{sref_sym_#1_label_
939         \l__stex_refs_curr_label_str
940       }
941     }
942   }
943 }
944 }

```

(End definition for `\stex_ref_new_sym_target:n`. This function is documented on page 51.)

26.3 Using References

```

945 \str_new:N \l__stex_refs_indocument_str

```

\sref Optional arguments:

```

946
947 \keys_define:nn { stex / sref } {
948   linktext      .tl_set:N = \l__stex_refs_linktext_tl ,
949   fallback      .tl_set:N = \l__stex_refs_fallback_tl ,
950   pre           .tl_set:N = \l__stex_refs_pre_tl ,
951   post          .tl_set:N = \l__stex_refs_post_tl ,
952 }
953 \cs_new_protected:Nn \__stex_refs_args:n {
954   \tl_clear:N \l__stex_refs_linktext_tl
955   \tl_clear:N \l__stex_refs_fallback_tl
956   \tl_clear:N \l__stex_refs_pre_tl
957   \tl_clear:N \l__stex_refs_post_tl
958   \str_clear:N \l__stex_refs_repo_str
959   \keys_set:nn { stex / sref } { #1 }
960 }

```

The actual macro:

```

961 \NewDocumentCommand \sref { 0{} m}{
962   \__stex_refs_args:n { #1 }
963   \str_if_empty:NTF \l__stex_refs_indocument_str {
964     \str_set:Nx \l_tmpa_str { #2 }
965     \exp_args:NNno \seq_set_split:Nnn \l_tmpa_seq ? \l_tmpa_str
966     \int_compare:nNnTF {\seq_count:N \l_tmpa_seq} = 1 {
967       \seq_if_exist:cTF{g__stex_refs_labels_\l_tmpa_str _seq}{
968         \seq_get_left:cNF {g__stex_refs_labels_\l_tmpa_str _seq} \l_tmpa_str {
969           \str_clear:N \l_tmpa_str
970         }
971       }{
972         \str_clear:N \l_tmpa_str
973       }
974     }{
975       \seq_pop_left:NN \l_tmpa_seq \l_tmpb_str
976       \seq_pop_right:NN \l_tmpa_seq \l_tmpa_str

```

```

977 \int_set:Nn \l_tmpa_int { \exp_args:Ne \str_count:n {\l_tmpb_str?\l_tmpa_str} }
978 \seq_if_exist:cTF{g__stex_refs_labels_\l_tmpa_str_seq}{
979   \str_set_eq:NN \l_tmpc_str \l_tmpa_str
980   \str_clear:N \l_tmpa_str
981   \seq_map_inline:cn {g__stex_refs_labels_\l_tmpc_str_seq} {
982     \str_if_eq:eeT { \l_tmpb_str?\l_tmpc_str }{
983       \str_range:nnn { ##1 }{-\l_tmpa_int}{ -1 }
984     }{
985       \seq_map_break:n {
986         \str_set:Nn \l_tmpa_str { ##1 }
987       }
988     }
989   }
990 }{
991   \str_clear:N \l_tmpa_str
992 }
993 }
994 \str_if_empty:NTF \l_tmpa_str {
995   \tl_if_empty:NTF \l__stex_refs_linktext_tl \l__stex_refs_fallback_tl \l__stex_refs_lin
996 }{
997   \str_if_eq:cNTF {sref_\l_tmpa_str_type} \c__stex_refs_ref_str {
998     \tl_if_empty:NTF \l__stex_refs_linktext_tl {
999       \cs_if_exist:cTF{autoref}{
1000         \l__stex_refs_pre_tl\exp_args:Nx\autoref{sref_\l_tmpa_str}\l__stex_refs_post_tl
1001       }{
1002         \l__stex_refs_pre_tl\exp_args:Nx\ref{sref_\l_tmpa_str}\l__stex_refs_post_tl
1003       }
1004     }{
1005       \ltx@ifpackageloaded{hyperref}{
1006         \hyperref[sref_\l_tmpa_str]\l__stex_refs_linktext_tl
1007       }{
1008         \l__stex_refs_linktext_tl
1009       }
1010     }
1011   }{
1012     \ltx@ifpackageloaded{hyperref}{
1013       \href{\use:c{sref_url_\l_tmpa_str_str}}{\tl_if_empty:NTF \l__stex_refs_linktext_t
1014     }{
1015       \tl_if_empty:NTF \l__stex_refs_linktext_tl \l__stex_refs_fallback_tl \l__stex_refs
1016     }
1017   }
1018 }
1019 }{
1020   % TODO
1021 }
1022 }

```

(End definition for `\sref`. This function is documented on page 52.)

`\srefsym`

```

1023 \NewDocumentCommand \srefsym { 0{} m }{
1024   \stex_get_symbol:n { #2 }
1025   \__stex_refs_sym_aux:nn{##1}{\l_stex_get_symbol_uri_str}
1026 }

```

```

1027
1028 \cs_new_protected:Nn \__stex_refs_sym_aux:nn {
1029   \str_if_exist:cTF {sref_sym_#2 _label_str }{
1030     \sref[#1]{\use:c{sref_sym_#2 _label_str}}
1031   }{
1032     \__stex_refs_args:n { #1 }
1033     \str_if_empty:NTF \l__stex_refs_indocument_str {
1034       \tl_if_exist:cTF{sref_sym_#2 _type}{
1035         % doc uri in \l_tmpb_str
1036         \str_set:Nx \l_tmpa_str {\use:c{sref_sym_#2 _type}}
1037         \str_if_eq:NNTF \l_tmpa_str \c__stex_refs_ref_str {
1038           % reference
1039           \tl_if_empty:NTF \l__stex_refs_linktext_tl {
1040             \cs_if_exist:cTF{autoref}{
1041               \l__stex_refs_pre_tl\autoref{sref_sym_#2}\l__stex_refs_post_tl
1042             }{
1043               \l__stex_refs_pre_tl\ref{sref_sym_#2}\l__stex_refs_post_tl
1044             }
1045           }{
1046             \ltx@ifpackageloaded{hyperref}{
1047               \hyperref[sref_sym_#2]\l__stex_refs_linktext_tl
1048             }{
1049               \l__stex_refs_linktext_tl
1050             }
1051           }
1052         }{
1053           % URL
1054           \ltx@ifpackageloaded{hyperref}{
1055             \href{\use:c{sref_sym_url_#2 _str}}{\tl_if_empty:NTF \l__stex_refs_linktext_tl \
1056           }{
1057             \tl_if_empty:NTF \l__stex_refs_linktext_tl \l__stex_refs_fallback_tl \l__stex_re
1058           }
1059         }
1060       }{
1061         \tl_if_empty:NTF \l__stex_refs_linktext_tl \l__stex_refs_fallback_tl \l__stex_refs_l
1062       }
1063     }{
1064       % TODO
1065     }
1066   }
1067 }

```

(End definition for \srefsym. This function is documented on page 52.)

\srefsymuri

```

1068 \cs_new_protected:Npn \srefsymuri #1 #2 {
1069   \__stex_refs_sym_aux:nn{linktext={#2}}{#1}
1070 }

```

(End definition for \srefsymuri. This function is documented on page 52.)

```

1071 </package>

```


Chapter 27

STEX -Modules Implementation

```
1072 <*package>
1073
1074 %%%%%%%%%%% modules.dtx %%%%%%%%%%%
1075
1076 <@@=stex_modules>
1077
1078   Warnings and error messages
1079   \msg_new:nnn{stex}{error/unknownmodule}{
1080     No~module~#1~found
1081   }
1082   \msg_new:nnn{stex}{error/syntax}{
1083     Syntax~error:~#1
1084   }
1085   \msg_new:nnn{stex}{error/siglanguage}{
1086     Module~#1~declares~signature~#2,~but~does~not~
1087     declare~its~language
1088   }
1089   \msg_new:nnn{stex}{warning/deprecated}{
1090     #1~is~deprecated;~please~use~#2~instead!
1091   }
1092   \msg_new:nnn{stex}{error/conflictingmodules}{
1093     Conflicting~imports~for~module~#1
1094   }
1095
1096 \l_stex_current_module_str The current module:
1097 \str_new:N \l_stex_current_module_str
1098
1099 (End definition for \l_stex_current_module_str. This variable is documented on page 54.)
1100
1101 \l_stex_all_modules_seq Stores all available modules
1102 \seq_new:N \l_stex_all_modules_seq
1103
1104 (End definition for \l_stex_all_modules_seq. This variable is documented on page 54.)
```

```

\stex_if_in_module_p:
\stex_if_in_module:TF
1096 \prg_new_conditional:Nnn \stex_if_in_module: {p, T, F, TF} {
1097   \str_if_empty:NTF \l_stex_current_module_str
1098   \prg_return_false: \prg_return_true:
1099 }

```

(End definition for `\stex_if_in_module:TF`. This function is documented on page 54.)

```

\stex_if_module_exists_p:n
\stex_if_module_exists:nTF
1100 \prg_new_conditional:Nnn \stex_if_module_exists:n {p, T, F, TF} {
1101   \prop_if_exist:cTF { c_stex_module_#1_prop }
1102   \prg_return_true: \prg_return_false:
1103 }

```

(End definition for `\stex_if_module_exists:nTF`. This function is documented on page 54.)

`\stex_add_to_current_module:n` Only allowed within modules:

```

\STEXexport
1104 \cs_new_protected:Nn \stex_execute_in_module:n { \stex_if_in_module:T {
1105   \stex_add_to_current_module:n { #1 }
1106   \stex_do_up_to_module:n { #1 }
1107 }}
1108 \cs_generate_variant:Nn \stex_execute_in_module:n {x}
1109
1110 \cs_new_protected:Nn \stex_add_to_current_module:n {
1111   \tl_gput_right:cn {c_stex_module_\l_stex_current_module_str _code} { #1 }
1112 }
1113 \cs_generate_variant:Nn \stex_add_to_current_module:n {x}
1114 \cs_new_protected:Npn \STEXexport {
1115   \beginngroup
1116   \newlinechar=-1\relax
1117   \endlinechar=-1\relax
1118   %\catcode'\ = 9\relax
1119   \expandafter\endgroup\__stex_modules_export:n
1120 }
1121 \cs_new_protected:Nn \__stex_modules_export:n {
1122   \ignorespaces #1
1123   \stex_add_to_current_module:n { \ignorespaces #1 }
1124   \stex_smsmode_do:
1125 }
1126 \stex_deactivate_macro:Nn \STEXexport {module~environments}

```

(End definition for `\stex_add_to_current_module:n` and `\STEXexport`. These functions are documented on page 54.)

`\stex_add_constant_to_current_module:n`

```

1127 \cs_new_protected:Nn \stex_add_constant_to_current_module:n {
1128   \str_set:Nx \l_tmpa_str { #1 }
1129   \seq_gput_right:co {c_stex_module_\l_stex_current_module_str _constants} { \l_tmpa_str }
1130 }

```

(End definition for `\stex_add_constant_to_current_module:n`. This function is documented on page 54.)

`\stex_add_import_to_current_module:n`

```

1131 \cs_new_protected:Nn \stex_add_import_to_current_module:n {
1132   \str_set:Nx \l_tmpa_str { #1 }
1133   \exp_args:Nno
1134   \seq_if_in:cnF{c_stex_module_\l_stex_current_module_str _imports}\l_tmpa_str{
1135     \seq_gput_right:co{c_stex_module_\l_stex_current_module_str _imports}\l_tmpa_str
1136   }
1137 }

```

(End definition for `\stex_add_import_to_current_module:n`. This function is documented on page 54.)

`\stex_collect_imports:n`

```

1138 \cs_new_protected:Nn \stex_collect_imports:n {
1139   \seq_clear:N \l_stex_collect_imports_seq
1140   \__stex_modules_collect_imports:n {#1}
1141 }
1142 \cs_new_protected:Nn \__stex_modules_collect_imports:n {
1143   \seq_map_inline:cn {c_stex_module_#1_imports} {
1144     \seq_if_in:NnF \l_stex_collect_imports_seq { ##1 } {
1145       \__stex_modules_collect_imports:n { ##1 }
1146     }
1147   }
1148   \seq_if_in:NnF \l_stex_collect_imports_seq { #1 } {
1149     \seq_put_right:Nx \l_stex_collect_imports_seq { #1 }
1150   }
1151 }

```

(End definition for `\stex_collect_imports:n`. This function is documented on page 54.)

`\stex_do_up_to_module:n`

```

1152 \int_new:N \l__stex_modules_group_depth_int
1153 \cs_new_protected:Nn \stex_do_up_to_module:n {
1154   \int_compare:nNnTF \l__stex_modules_group_depth_int = \currentgrouplevel {
1155     #1
1156   }{
1157     #1
1158     \expandafter \tl_gset:Nn
1159     \csname l__stex_modules_aftergroup_\l_stex_current_module_str _tl
1160     \expandafter\expandafter\expandafter\endcsname
1161     \expandafter\expandafter\expandafter { \csname
1162       l__stex_modules_aftergroup_\l_stex_current_module_str _tl\endcsname #1 }
1163     \aftergroup\__stex_modules_aftergroup_do:
1164   }
1165 }
1166 \cs_generate_variant:Nn \stex_do_up_to_module:n {x}
1167 \cs_new_protected:Nn \__stex_modules_aftergroup_do: {
1168   \stex_debug:nn{aftergroup}{\cs_meaning:c{
1169     l__stex_modules_aftergroup_\l_stex_current_module_str _tl
1170   }}
1171   \int_compare:nNnTF \l__stex_modules_group_depth_int = \currentgrouplevel {
1172     \use:c{l__stex_modules_aftergroup_\l_stex_current_module_str _tl}
1173     \tl_gclear:c{l__stex_modules_aftergroup_\l_stex_current_module_str _tl}
1174   }{
1175     \use:c{l__stex_modules_aftergroup_\l_stex_current_module_str _tl}

```

```

1176     \aftergroup\__stex_modules_aftergroup_do:
1177   }
1178 }
1179 \cs_new_protected:Nn \stex_reset_up_to_module:n {
1180   \expandafter\let\csname l__stex_modules_aftergroup_#1_tl\endcsname\undefined
1181 }

```

(End definition for `\stex_do_up_to_module:n`. This function is documented on page 54.)

`\stex_modules_compute_namespace:nN` Computes the appropriate namespace from the top-level namespace of a repository (#1) and a file path (#2).

```

1182

```

(End definition for `\stex_modules_compute_namespace:nN`. This function is documented on page ??.)

`\stex_modules_current_namespace:` Computes the current namespace based on the current MathHub repository (if existent) and the current file.

```

1183 \str_new:N \l_stex_module_ns_str
1184 \str_new:N \l_stex_module_subpath_str
1185 \cs_new_protected:Nn \__stex_modules_compute_namespace:nN {
1186   \seq_set_eq:NN \l_tmpa_seq #2
1187   % split off file extension
1188   \seq_pop_right:NN \l_tmpa_seq \l_tmpb_str % <- filename
1189   \exp_args:NNno \seq_set_split:Nnn \l_tmpb_seq . \l_tmpb_str
1190   \seq_get_left:NN \l_tmpb_seq \l_tmpb_str % <- filename without suffixes
1191   \seq_put_right:No \l_tmpa_seq \l_tmpb_str % <- file path including name without suffixes
1192
1193   \bool_set_true:N \l_tmpa_bool
1194   \bool_while_do:Nn \l_tmpa_bool {
1195     \seq_pop_left:NN \l_tmpa_seq \l_tmpb_str
1196     \exp_args:No \str_case:nnTF { \l_tmpb_str } {
1197       {source} { \bool_set_false:N \l_tmpa_bool }
1198     }{}{
1199       \seq_if_empty:NT \l_tmpa_seq {
1200         \bool_set_false:N \l_tmpa_bool
1201       }
1202     }
1203   }
1204
1205   \stex_path_to_string:NN \l_tmpa_seq \l_stex_module_subpath_str
1206   % \l_tmpa_seq <- sub-path relative to archive
1207   \str_if_empty:NTF \l_stex_module_subpath_str {
1208     \str_set:Nx \l_stex_module_ns_str {#1}
1209   }{
1210     \str_set:Nx \l_stex_module_ns_str {
1211       #1/\l_stex_module_subpath_str
1212     }
1213   }
1214 }
1215
1216 \cs_new_protected:Nn \stex_modules_current_namespace: {
1217   \str_clear:N \l_stex_module_subpath_str
1218   \prop_if_exist:NTF \l_stex_current_repository_prop {
1219     \prop_get:NnN \l_stex_current_repository_prop { ns } \l_tmpa_str

```

```

1220     \__stex_modules_compute_namespace:nN \l_tmpa_str \g_stex_currentfile_seq
1221   }{
1222     % split off file extension
1223     \seq_set_eq:NN \l_tmpa_seq \g_stex_currentfile_seq
1224     \seq_pop_right:NN \l_tmpa_seq \l_tmpb_str
1225     \exp_args:NNno \seq_set_split:Nnn \l_tmpb_seq . \l_tmpb_str
1226     \seq_get_left:NN \l_tmpb_seq \l_tmpb_str
1227     \seq_put_right:No \l_tmpa_seq \l_tmpb_str
1228     \str_set:Nx \l_stex_module_ns_str {
1229       file:/\stex_path_to_string:N \l_tmpa_seq
1230     }
1231   }
1232 }

```

(End definition for `\stex_modules_current_namespace:.` This function is documented on page 55.)

27.1 The smodule environment

smodule arguments:

```

1233 \keys_define:nn { stex / module } {
1234   title      .tl_set:N      = \smodulename ,
1235   type       .str_set_x:N   = \smodulename ,
1236   id         .str_set_x:N   = \smoduleid ,
1237   deprecate  .str_set_x:N   = \l_stex_module_deprecate_str ,
1238   ns         .str_set_x:N   = \l_stex_module_ns_str ,
1239   lang       .str_set_x:N   = \l_stex_module_lang_str ,
1240   sig        .str_set_x:N   = \l_stex_module_sig_str ,
1241   creators   .str_set_x:N   = \l_stex_module_creators_str ,
1242   contributors .str_set_x:N = \l_stex_module_contributors_str ,
1243   meta       .str_set_x:N   = \l_stex_module_meta_str ,
1244   srccite    .str_set_x:N   = \l_stex_module_srccite_str
1245 }
1246
1247 \cs_new_protected:Nn \__stex_modules_args:n {
1248   \str_clear:N \smodulename
1249   \str_clear:N \smodulename
1250   \str_clear:N \smoduleid
1251   \str_clear:N \l_stex_module_ns_str
1252   \str_clear:N \l_stex_module_deprecate_str
1253   \str_clear:N \l_stex_module_lang_str
1254   \str_clear:N \l_stex_module_sig_str
1255   \str_clear:N \l_stex_module_creators_str
1256   \str_clear:N \l_stex_module_contributors_str
1257   \str_clear:N \l_stex_module_meta_str
1258   \str_clear:N \l_stex_module_srccite_str
1259   \keys_set:nn { stex / module } { #1 }
1260 }
1261
1262 % module parameters here? In the body?
1263

```

`\stex_module_setup:nn` Sets up a new module property list:

```

1264 \cs_new_protected:Nn \stex_module_setup:nn {

```

```

1265 \int_set:Nn \l__stex_modules_group_depth_int {\currentgrouplevel}
1266 \str_set:Nx \l_stex_module_name_str { #2 }
1267 \__stex_modules_args:n { #1 }

```

First, we set up the name and namespace of the module.
Are we in a nested module?

```

1268 \stex_if_in_module:TF {
1269   % Nested module
1270   \prop_get:cnN {c_stex_module\l_stex_current_module_str _prop}
1271   { ns } \l_stex_module_ns_str
1272   \str_set:Nx \l_stex_module_name_str {
1273     \prop_item:cn {c_stex_module\l_stex_current_module_str _prop}
1274     { name } / \l_stex_module_name_str
1275   }
1276   \str_if_empty:NT \l_stex_module_lang_str {
1277     \str_set:Nx \l_stex_module_lang_str {
1278       \prop_item:cn {c_stex_module\l_stex_current_module_str _prop}
1279       { lang }
1280     }
1281   }
1282 }{
1283   % not nested:
1284   \str_if_empty:NT \l_stex_module_ns_str {
1285     \stex_modules_current_namespace:
1286     \exp_args:NNNo \seq_set_split:Nnn \l_tmpa_seq
1287       / {\l_stex_module_ns_str}
1288     \seq_pop_right:NN \l_tmpa_seq \l_tmpa_str
1289     \str_if_eq:NNT \l_tmpa_str \l_stex_module_name_str {
1290       \str_set:Nx \l_stex_module_ns_str {
1291         \stex_path_to_string:N \l_tmpa_seq
1292       }
1293     }
1294   }
1295 }

```

Next, we determine the language of the module:

```

1296 \str_if_empty:NT \l_stex_module_lang_str {
1297   \seq_get_right:NN \g_stex_currentfile_seq \l_tmpa_str
1298   \seq_set_split:NnV \l_tmpa_seq . \l_tmpa_str
1299   \seq_pop_right:NN \l_tmpa_seq \l_tmpa_str % .tex
1300   \exp_args:No \str_if_eq:nnF \l_tmpa_str {tex} {
1301     \exp_args:No \str_if_eq:nnF \l_tmpa_str {dtx} {
1302       \exp_args:NNNo \seq_put_right:Nn \l_tmpa_seq \l_tmpa_str
1303     }
1304   }
1305   \seq_pop_left:NN \l_tmpa_seq \l_tmpa_str % <filename>
1306   \seq_if_empty:NF \l_tmpa_seq { %remaining element should be [<something>.]language
1307     \seq_pop_right:NN \l_tmpa_seq \l_stex_module_lang_str
1308     \stex_debug:nn{modules} {Language~\l_stex_module_lang_str~
1309       inferred~from~file~name}
1310   }
1311 }
1312
1313 \stex_if_smsmode:F { \str_if_empty:NF \l_stex_module_lang_str {

```

```

1314 \prop_get:NVNTF \c_stex_languages_prop \l_stex_module_lang_str
1315 \l_tmpa_str {
1316 \ltx@ifpackageloaded{babel}{
1317 \exp_args:Nx \selectlanguage { \l_tmpa_str }
1318 }{}
1319 } {
1320 \msg_error:nnx{stex}{error/unknownlanguage}{\l_tmpa_str}
1321 }
1322 }}

```

We check if we need to extend a signature module, and set `\l_stex_current_module_prop` accordingly:

```

1323 \str_if_empty:NTF \l_stex_module_sig_str {
1324 \exp_args:Nnx \prop_gset_from_keyval:cn {
1325 c_stex_module_\l_stex_module_ns_str?\l_stex_module_name_str _prop
1326 } {
1327 name = \l_stex_module_name_str ,
1328 ns = \l_stex_module_ns_str ,
1329 file = \exp_not:o { \g_stex_currentfile_seq } ,
1330 lang = \l_stex_module_lang_str ,
1331 sig = \l_stex_module_sig_str ,
1332 deprecate = \l_stex_module_deprecate_str ,
1333 meta = \l_stex_module_meta_str
1334 }
1335 \seq_clear:c {c_stex_module_\l_stex_module_ns_str?\l_stex_module_name_str _imports}
1336 \seq_clear:c {c_stex_module_\l_stex_module_ns_str?\l_stex_module_name_str _constants}
1337 \seq_clear:c {c_stex_module_\l_stex_module_ns_str?\l_stex_module_name_str _copymodules}
1338 \tl_clear:c {c_stex_module_\l_stex_module_ns_str?\l_stex_module_name_str _code}
1339 \str_set:Nx\l_stex_current_module_str{\l_stex_module_ns_str?\l_stex_module_name_str}

```

We load the metatheory:

```

1340 \str_if_empty:NT \l_stex_module_meta_str {
1341 \str_set:Nx \l_stex_module_meta_str {
1342 \c_stex_metatheory_ns_str ? Metatheory
1343 }
1344 }
1345 \str_if_eq:VnF \l_stex_module_meta_str {NONE} {
1346 \bool_set_true:N \l_stex_in_meta_bool
1347 \exp_args:Nx \stex_add_to_current_module:n {
1348 \bool_set_true:N \l_stex_in_meta_bool
1349 \stex_activate_module:n {\l_stex_module_meta_str}
1350 \bool_set_false:N \l_stex_in_meta_bool
1351 }
1352 \stex_activate_module:n {\l_stex_module_meta_str}
1353 \bool_set_false:N \l_stex_in_meta_bool
1354 }
1355 }{
1356 \str_if_empty:NT \l_stex_module_lang_str {
1357 \msg_error:nnxx{stex}{error/siglanguage}{
1358 \l_stex_module_ns_str?\l_stex_module_name_str
1359 }\l_stex_module_sig_str}
1360 }
1361 \stex_debug:nn{modules}{Signature~\l_stex_module_sig_str~for~\l_stex_module_ns_str?\l_st
1362 \stex_if_module_exists:nTF{\l_stex_module_ns_str?\l_stex_module_name_str}{

```

```

1363     \stex_debug:nn{modules}{(already exists)}
1364   }{
1365     \stex_debug:nn{modules}{(needs loading)}
1366     \seq_set_eq:NN \l_tmpa_seq \g_stex_currentfile_seq
1367     \seq_pop_right:NN \l_tmpa_seq \l_tmpa_str
1368     \seq_set_split:NnV \l_tmpb_seq . \l_tmpa_str
1369     \seq_pop_right:NN \l_tmpb_seq \l_tmpa_str % .tex
1370     \seq_pop_left:NN \l_tmpb_seq \l_tmpa_str % <filename>
1371     \str_set:Nx \l_tmpa_str {
1372       \stex_path_to_string:N \l_tmpa_seq /
1373       \l_tmpa_str . \l_stex_module_sig_str .tex
1374     }
1375     \IfFileExists \l_tmpa_str {
1376       \exp_args:No \stex_file_in_smsmode:nn { \l_tmpa_str } {
1377         \str_clear:N \l_stex_current_module_str
1378         \seq_clear:N \l_stex_all_modules_seq
1379         \stex_debug:nn{modules}{Loading~signature}
1380       }
1381     }{
1382       \msg_error:nnx{stex}{error/unknownmodule}{for~signature~\l_tmpa_str}
1383     }
1384   }
1385   \stex_if_smsmode:F {
1386     \stex_activate_module:n {
1387       \l_stex_module_ns_str ? \l_stex_module_name_str
1388     }
1389   }
1390   \str_set:Nx\l_stex_current_module_str{\l_stex_module_ns_str?\l_stex_module_name_str}
1391 }
1392 \str_if_empty:NF \l_stex_module_deprecate_str {
1393   \msg_warning:nnxx{stex}{warning/deprecated}{
1394     Module~\l_stex_current_module_str
1395   }{
1396     \l_stex_module_deprecate_str
1397   }
1398 }
1399 \seq_put_right:Nx \l_stex_all_modules_seq {
1400   \l_stex_module_ns_str ? \l_stex_module_name_str
1401 }
1402 \tl_clear:c{l__stex_modules_aftergroup\l_stex_module_ns_str ? \l_stex_module_name_str _tl}
1403 }

```

(End definition for `\stex_module_setup:nn`. This function is documented on page 55.)

smodule The module environment.

`_stex_modules_begin_module:` implements `\begin{smodule}`

```

1404 \cs_new_protected:Nn \_stex_modules_begin_module: {
1405   \stex_reactivate_macro:N \STEXexport
1406   \stex_reactivate_macro:N \importmodule
1407   \stex_reactivate_macro:N \symdecl
1408   \stex_reactivate_macro:N \notation
1409   \stex_reactivate_macro:N \symdef
1410 }

```



```

1411 \stex_debug:nn{modules}{
1412   New~module:\
1413   Namespace:~\l_stex_module_ns_str\
1414   Name:~\l_stex_module_name_str\
1415   Language:~\l_stex_module_lang_str\
1416   Signature:~\l_stex_module_sig_str\
1417   Metatheory:~\l_stex_module_meta_str\
1418   File:~\stex_path_to_string:N \g_stex_currentfile_seq
1419 }
1420
1421 \stex_if_do_html:T{
1422   \begin{stex_annotate_env} {theory} {
1423     \l_stex_module_ns_str ? \l_stex_module_name_str
1424   }
1425
1426   \stex_annotate_invisible:nnn{header}{} {
1427     \stex_annotate:nnn{language}{ \l_stex_module_lang_str }{}
1428     \stex_annotate:nnn{signature}{ \l_stex_module_sig_str }{}
1429     \str_if_eq:VnF \l_stex_module_meta_str {NONE} {
1430       \stex_annotate:nnn{metatheory}{ \l_stex_module_meta_str }{}
1431     }
1432     \str_if_empty:NF \smodulotype {
1433       \stex_annotate:nnn{type}{\smodulotype}{}
1434     }
1435   }
1436 }
1437 % TODO: Inherit metatheory for nested modules?
1438 }
1439 \iffalse \end{stex_annotate_env} \fi %^^A make syntax highlighting work again

```

(End definition for _stex_modules_begin_module:.)

_stex_modules_end_module: implements \end{module}

```

1440 \cs_new_protected:Nn \_stex_modules_end_module: {
1441   \stex_debug:nn{modules}{Closing~module~\prop_item:cn {c_stex_module\_l_stex_current_module}
1442   \_stex_reset_up_to_module:n \l_stex_current_module_str
1443   \stex_if_smsmode:T {
1444     \stex_persist:x {
1445       \prop_set_from_keyval:cn{c_stex_module\_l_stex_current_module_str _prop}{
1446         \exp_after:wN \prop_to_keyval:N \csname c_stex_module\_l_stex_current_module_str _pr
1447       }
1448       \seq_set_from_clist:cn{c_stex_module\_l_stex_current_module_str _constants}{
1449         \seq_use:cn{c_stex_module\_l_stex_current_module_str _constants},
1450       }
1451       \seq_set_from_clist:cn{c_stex_module\_l_stex_current_module_str _imports}{
1452         \seq_use:cn{c_stex_module\_l_stex_current_module_str _imports},
1453       }
1454       \tl_set:cn {c_stex_module\_l_stex_current_module_str _code}
1455     }
1456     \exp_after:wN \let \exp_after:wN \l_tmpa_tl \csname c_stex_module\_l_stex_current_module
1457     \exp_after:wN \stex_persist:n \exp_after:wN { \exp_after:wN { \l_tmpa_tl } }
1458   }
1459 }

```

(End definition for `_stex_modules_end_module:.`)

The core environment

```

1460 \iffalse \begin{stex_annotate_env} \fi %^A make syntax highlighting work again
1461 \NewDocumentEnvironment { smodule } { 0{} m } {
1462   \stex_module_setup:nn{#1}{#2}
1463   \par
1464   \stex_if_smsmode:F{
1465     \tl_clear:N \l_tmpa_tl
1466     \clist_map_inline:Nn \smodulotype {
1467       \tl_if_exist:cT {__stex_modules_smodule_##1_start:}{
1468         \tl_set:Nn \l_tmpa_tl {\use:c{__stex_modules_smodule_##1_start:}}
1469       }
1470     }
1471     \tl_if_empty:NTF \l_tmpa_tl {
1472       \__stex_modules_smodule_start:
1473     }{
1474       \l_tmpa_tl
1475     }
1476   }
1477   \__stex_modules_begin_module:
1478   \str_if_empty:NF \smoduleid {
1479     \stex_ref_new_doc_target:n \smoduleid
1480   }
1481   \stex_smsmode_do:
1482 } {
1483   \__stex_modules_end_module:
1484   \stex_if_smsmode:F {
1485     \end{stex_annotate_env}
1486     \clist_set:Nn \l_tmpa_clist \smodulotype
1487     \tl_clear:N \l_tmpa_tl
1488     \clist_map_inline:Nn \l_tmpa_clist {
1489       \tl_if_exist:cT {__stex_modules_smodule_##1_end:}{
1490         \tl_set:Nn \l_tmpa_tl {\use:c{__stex_modules_smodule_##1_end:}}
1491       }
1492     }
1493     \tl_if_empty:NTF \l_tmpa_tl {
1494       \__stex_modules_smodule_end:
1495     }{
1496       \l_tmpa_tl
1497     }
1498   }
1499 }

```

`\stexpatchmodule`

```

1500 \cs_new_protected:Nn \__stex_modules_smodule_start: {}
1501 \cs_new_protected:Nn \__stex_modules_smodule_end: {}
1502
1503 \newcommand\stexpatchmodule[3] [] {
1504   \str_set:Nx \l_tmpa_str{ #1 }
1505   \str_if_empty:NTF \l_tmpa_str {
1506     \tl_set:Nn \__stex_modules_smodule_start: { #2 }
1507     \tl_set:Nn \__stex_modules_smodule_end: { #3 }
1508   }{

```

```

1509     \exp_after:wN \tl_set:Nn \csname __stex_modules_smodule_#1_start:\endcsname{ #2 }
1510     \exp_after:wN \tl_set:Nn \csname __stex_modules_smodule_#1_end:\endcsname{ #3 }
1511   }
1512 }

```

(End definition for `\stexpatchmodule`. This function is documented on page 55.)

27.2 Invoking modules

```

\STEXModule
\stex_invoke_module:n
1513 \NewDocumentCommand \STEXModule { m } {
1514   \exp_args:NNx \str_set:Nn \l_tmpa_str { #1 }
1515   \int_set:Nn \l_tmpa_int { \str_count:N \l_tmpa_str }
1516   \tl_set:Nn \l_tmpa_tl {
1517     \msg_error:nnx{stex}{error/unknownmodule}{#1}
1518   }
1519   \seq_map_inline:Nn \l_stex_all_modules_seq {
1520     \str_set:Nn \l_tmpb_str { ##1 }
1521     \str_if_eq:eeT { \l_tmpa_str } {
1522       \str_range:Nnn \l_tmpb_str { -\l_tmpa_int } { -1 }
1523     } {
1524       \seq_map_break:n {
1525         \tl_set:Nn \l_tmpa_tl {
1526           \stex_invoke_module:n { ##1 }
1527         }
1528       }
1529     }
1530   }
1531   \l_tmpa_tl
1532 }
1533
1534 \cs_new_protected:Nn \stex_invoke_module:n {
1535   \stex_debug:nn{modules}{Invoking~module~#1}
1536   \peek_charcode_remove:NTF ! {
1537     \__stex_modules_invoke_uri:nN { #1 }
1538   } {
1539     \peek_charcode_remove:NTF ? {
1540       \__stex_modules_invoke_symbol:nn { #1 }
1541     } {
1542       \msg_error:nnx{stex}{error/syntax}{
1543         ?~or~!~expected~after~
1544         \c_backslash_str STEXModule{#1}
1545       }
1546     }
1547   }
1548 }
1549
1550 \cs_new_protected:Nn \__stex_modules_invoke_uri:nN {
1551   \str_set:Nn #2 { #1 }
1552 }
1553
1554 \cs_new_protected:Nn \__stex_modules_invoke_symbol:nn {
1555   \stex_invoke_symbol:n{#1?#2}

```

```
1556 }
```

(End definition for \STEXModule and \stex_invoke_module:n. These functions are documented on page 55.)

\stex_activate_module:n

```
1557 \bool_new:N \l_stex_in_meta_bool
1558 \bool_set_false:N \l_stex_in_meta_bool
1559 \cs_new_protected:Nn \stex_activate_module:n {
1560   \stex_debug:nn{modules}{Activating~module~#1}
1561   \exp_args:NNx \seq_if_in:NnF \l_stex_all_modules_seq { #1 } {
1562     \seq_put_right:Nx \l_stex_all_modules_seq { #1 }
1563     \use:c{ c_stex_module_#1_code }
1564   }
1565 }
```

(End definition for \stex_activate_module:n. This function is documented on page 56.)

```
1566 \</package>
```

Chapter 28

STEX -Module Inheritance Implementation

```
1567 <*package>
1568
1569 %%%%%%%%%% inheritance.dtx %%%%%%%%%%
1570
```

28.1 SMS Mode

```
1571 <@@=stex_smsmode>

\g_stex_smsmode_allowedmacros_tl
\g_stex_smsmode_allowedmacros_escape_tl
\g_stex_smsmode_allowedenvs_seq

1572 \tl_new:N \g_stex_smsmode_allowedmacros_tl
1573 \tl_new:N \g_stex_smsmode_allowedmacros_escape_tl
1574 \seq_new:N \g_stex_smsmode_allowedenvs_seq
1575
1576 \tl_set:Nn \g_stex_smsmode_allowedmacros_tl {
1577   \makeatletter
1578   \makeatother
1579   \ExplSyntaxOn
1580   \ExplSyntaxOff
1581   \rustexBREAK
1582 }
1583
1584 \tl_set:Nn \g_stex_smsmode_allowedmacros_escape_tl {
1585   \symdef
1586   \importmodule
1587   \notation
1588   \symdecl
1589   \STEXexport
1590   \inlineass
1591   \inlinedef
1592   \inlineex
1593   \endinput
1594   \setnotation
```

```

1595 \copynotation
1596 \assign
1597 \renamedekl
1598 \donotcopy
1599 \instantiate
1600 }
1601
1602 \exp_args:NNx \seq_set_from_clist:Nn \g_stex_smsmode_allowedenvs_seq {
1603   \tl_to_str:n {
1604     smodule,
1605     copymodule,
1606     interpretmodule,
1607     sdefinition,
1608     sexample,
1609     sassertion,
1610     sparagraph,
1611     mathstructure
1612   }
1613 }

```

(End definition for `\g_stex_smsmode_allowedmacros_tl`, `\g_stex_smsmode_allowedmacros_escape_tl`, and `\g_stex_smsmode_allowedenvs_seq`. These variables are documented on page 57.)

`\stex_if_smsmode_p:`
`\stex_if_smsmode:TF`

```

1614 \bool_new:N \g__stex_smsmode_bool
1615 \bool_set_false:N \g__stex_smsmode_bool
1616 \prg_new_conditional:Nnn \stex_if_smsmode: { p, T, F, TF } {
1617   \bool_if:NTF \g__stex_smsmode_bool \prg_return_true: \prg_return_false:
1618 }

```

(End definition for `\stex_if_smsmode:TF`. This function is documented on page 57.)

`_stex_smsmode_in_smsmode:nn`

```

1619 \cs_new_protected:Nn \_stex_smsmode_in_smsmode:nn { \stex_suppress_html:n {
1620   \vbox_set:Nn \l_tmpa_box {
1621     \bool_set_eq:cN { l__stex_smsmode_#1_bool } \g__stex_smsmode_bool
1622     \bool_gset_true:N \g__stex_smsmode_bool
1623     #2
1624     \bool_gset_eq:Nc \g__stex_smsmode_bool { l__stex_smsmode_#1_bool }
1625   }
1626   \box_clear:N \l_tmpa_box
1627 } }

```

(End definition for `_stex_smsmode_in_smsmode:nn`.)

`\stex_file_in_smsmode:nn`

```

1628 \quark_new:N \q__stex_smsmode_break
1629
1630 \NewDocumentCommand \_stex_smsmode_importmodule: { 0{} m } {
1631   \seq_gput_right:Nn \l__stex_smsmode_importmodules_seq {{#1}{#2}}
1632   \stex_smsmode_do:
1633 }
1634
1635 \cs_new_protected:Nn \_stex_smsmode_module:nn {
1636   \_stex_modules_args:n{#1}

```

```

1637 \stex_if_in_module:F {
1638   \str_if_empty:NF \l_stex_module_sig_str {
1639     \stex_modules_current_namespace:
1640     \str_set:Nx \l_stex_module_name_str { #2 }
1641     \stex_if_module_exists:nF{\l_stex_module_ns_str?\l_stex_module_name_str}{
1642       \seq_set_eq:NN \l_tmpa_seq \g_stex_currentfile_seq
1643       \seq_pop_right:NN \l_tmpa_seq \l_tmpa_str
1644       \seq_set_split:NnV \l_tmpb_seq . \l_tmpa_str
1645       \seq_pop_right:NN \l_tmpb_seq \l_tmpa_str % .tex
1646       \seq_pop_left:NN \l_tmpb_seq \l_tmpa_str % <filename>
1647       \str_set:Nx \l_tmpa_str {
1648         \stex_path_to_string:N \l_tmpa_seq /
1649         \l_tmpa_str . \l_stex_module_sig_str .tex
1650       }
1651       \IfFileExists \l_tmpa_str {
1652         \exp_args:NNx \seq_gput_right:Nn \l__stex_smsmode_sigmodules_seq \l_tmpa_str
1653       }{
1654         \msg_error:nnx{stex}{error/unknownmodule}{for~signature~\l_tmpa_str}
1655       }
1656     }
1657   }
1658 }
1659 }
1660
1661 \cs_new_protected:Nn \stex_file_in_smsmode:nn {
1662   \stex_filestack_push:n{#1}
1663   \seq_gclear:N \l__stex_smsmode_importmodules_seq
1664   \seq_gclear:N \l__stex_smsmode_sigmodules_seq
1665   % ----- new -----
1666   \__stex_smsmode_in_smsmode:nn{#1}{
1667     \let\importmodule\__stex_smsmode_importmodule:
1668     \let\stex_module_setup:nn\__stex_smsmode_module:nn
1669     \let\__stex_modules_begin_module:\relax
1670     \let\__stex_modules_end_module:\relax
1671     \seq_clear:N \g_stex_smsmode_allowedenvs_seq
1672     \exp_args:NNx \seq_put_right:Nn \g_stex_smsmode_allowedenvs_seq {\tl_to_str:n{module}}
1673     \tl_clear:N \g_stex_smsmode_allowedmacros_tl
1674     \tl_clear:N \g_stex_smsmode_allowedmacros_escape_tl
1675     \tl_put_right:Nn \g_stex_smsmode_allowedmacros_escape_tl {\importmodule}
1676     \everyeof{\q__stex_smsmode_break\noexpand}
1677     \expandafter\expandafter\expandafter
1678     \stex_smsmode_do:
1679     \csname @ @ input\endcsname "#1"\relax
1680
1681     \seq_map_inline:Nn \l__stex_smsmode_sigmodules_seq {
1682       \stex_filestack_push:n{##1}
1683       \expandafter\expandafter\expandafter
1684       \stex_smsmode_do:
1685       \csname @ @ input\endcsname "##1"\relax
1686       \stex_filestack_pop:
1687     }
1688   }
1689   % ----- new -----
1690   \__stex_smsmode_in_smsmode:nn{#1} {

```

```

1691 #2
1692 % ----- new -----
1693 \begingroup
1694 %\stex_debug:nn{smsmode}{Here:~\seq_use:Nn\l__stex_smsmode_importmodules_seq, }
1695 \seq_map_inline:Nn \l__stex_smsmode_importmodules_seq {
1696   \stex_import_module_uri:nn ##1
1697   \stex_import_require_module:nnnn
1698   \l_stex_import_ns_str
1699   \l_stex_import_archive_str
1700   \l_stex_import_path_str
1701   \l_stex_import_name_str
1702 }
1703 \endgroup
1704 \stex_debug:nn{smsmode}{Actually~loading~file~#1}
1705 % ----- new -----
1706 \everyeof{\q__stex_smsmode_break\noexpand}
1707 \expandafter\expandafter\expandafter
1708 \stex_smsmode_do:
1709 \csname @ @ input\endcsname "#1"\relax
1710 }
1711 \stex_filestack_pop:
1712 }

```

(End definition for `\stex_file_in_smsmode:nn`. This function is documented on page 58.)

`\stex_smsmode_do:` is executed on encountering `\` in smsmode. It checks whether the corresponding command is allowed and executes or ignores it accordingly:

```

1713 \cs_new_protected:Npn \stex_smsmode_do: {
1714   \stex_if_smsmode:T {
1715     \__stex_smsmode_do:w
1716   }
1717 }
1718 \cs_new_protected:Npn \__stex_smsmode_do:w #1 {
1719   \exp_args:Nx \tl_if_empty:nTF { \tl_tail:n{ #1 } }{
1720     \expandafter\if\expandafter\relax\noexpand#1
1721     \expandafter\__stex_smsmode_do_aux:N\expandafter#1
1722     \else\expandafter\__stex_smsmode_do:w\fi
1723   }{
1724     \__stex_smsmode_do:w %#1
1725   }
1726 }
1727 \cs_new_protected:Nn \__stex_smsmode_do_aux:N {
1728   \cs_if_eq:NnF #1 \q__stex_smsmode_break {
1729     \tl_if_in:NnTF \g_stex_smsmode_allowedmacros_tl {#1} {
1730       #1\__stex_smsmode_do:w
1731     }{
1732       \tl_if_in:NnTF \g_stex_smsmode_allowedmacros_escape_tl {#1} {
1733         #1
1734       }{
1735         \cs_if_eq:NnTF \begin #1 {
1736           \__stex_smsmode_check_begin:n
1737         }{
1738           \cs_if_eq:NnTF \end #1 {
1739             \__stex_smsmode_check_end:n

```



```

1740         }{
1741         \__stex_smsmode_do:w
1742         }
1743     }
1744 }
1745 }
1746 }
1747 }
1748
1749 \cs_new_protected:Nn \__stex_smsmode_check_begin:n {
1750 \seq_if_in:NxTF \g_stex_smsmode_allowedenvs_seq { \detokenize{#1} }{
1751 \begin{#1}
1752 }{
1753 \__stex_smsmode_do:w
1754 }
1755 }
1756 \cs_new_protected:Nn \__stex_smsmode_check_end:n {
1757 \seq_if_in:NxTF \g_stex_smsmode_allowedenvs_seq { \detokenize{#1} }{
1758 \end{#1}\__stex_smsmode_do:w
1759 }{
1760 \str_if_eq:nnTF{#1}{document}{\endinput}{\__stex_smsmode_do:w}
1761 }
1762 }

```

(End definition for `\stex_smsmode_do:.` This function is documented on page 58.)

28.2 Inheritance

```

1763 <@@=stex_importmodule>

\stex_import_module_uri:nn

1764 \cs_new_protected:Nn \stex_import_module_uri:nn {
1765 \str_set:Nx \l_stex_import_archive_str { #1 }
1766 \str_set:Nn \l_stex_import_path_str { #2 }
1767
1768 \exp_args:NNNo \seq_set_split:Nnn \l_tmpb_seq ? { \l_stex_import_path_str }
1769 \seq_pop_right:NN \l_tmpb_seq \l_stex_import_name_str
1770 \str_set:Nx \l_stex_import_path_str { \seq_use:Nn \l_tmpb_seq ? }
1771
1772 \stex_modules_current_namespace:
1773 \bool_lazy_all:nTF {
1774 {\str_if_empty_p:N \l_stex_import_archive_str}
1775 {\str_if_empty_p:N \l_stex_import_path_str}
1776 {\stex_if_module_exists_p:n { \l_stex_module_ns_str ? \l_stex_import_name_str } }
1777 }{
1778 \str_set_eq:NN \l_stex_import_path_str \l_stex_module_subpath_str
1779 \str_set_eq:NN \l_stex_import_ns_str \l_stex_module_ns_str
1780 }{
1781 \str_if_empty:NT \l_stex_import_archive_str {
1782 \prop_if_exist:NT \l_stex_current_repository_prop {
1783 \prop_get:NnN \l_stex_current_repository_prop { id } \l_stex_import_archive_str
1784 }
1785 }
1786 \str_if_empty:NTF \l_stex_import_archive_str {

```

```

1787     \str_if_empty:NF \l_stex_import_path_str {
1788         \str_set:Nx \l_stex_import_ns_str {
1789             \l_stex_module_ns_str / \l_stex_import_path_str
1790         }
1791     }
1792 }{
1793     \stex_require_repository:n \l_stex_import_archive_str
1794     \prop_get:cnN { c_stex_mathhub_\l_stex_import_archive_str _manifest_prop } { ns }
1795     \l_stex_import_ns_str
1796     \str_if_empty:NF \l_stex_import_path_str {
1797         \str_set:Nx \l_stex_import_ns_str {
1798             \l_stex_import_ns_str / \l_stex_import_path_str
1799         }
1800     }
1801 }
1802 }
1803 }

```

(End definition for \stex_import_module_uri:nn. This function is documented on page 59.)

```

\l_stex_import_name_str Store the return values of \stex_import_module_uri:nn.
\l_stex_import_archive_str
\l_stex_import_path_str
\l_stex_import_ns_str

```

(End definition for \l_stex_import_name_str and others. These variables are documented on page 59.)

```

\stex_import_require_module:nnnn {<ns>} {<archive-ID>} {<path>} {<name>}
1808 \cs_new_protected:Nn \stex_import_require_module:nnnn {
1809     \exp_args:Nx \stex_if_module_exists:nF { #1 ? #4 } {
1810
1811         %\stex_debug:nn{requiremodule}{Here:\\~1::~~2::~~3::~~4}
1812
1813         \exp_args:NNxx \seq_set_split:Nnn \l_tmpa_seq {\tl_to_str:n{/}} {#4}
1814         \seq_get_left:NN \l_tmpa_seq \l_tmpc_str
1815
1816         %\stex_debug:nn{requiremodule}{Top~module:\l_tmpc_str}
1817
1818         % archive
1819         \str_set:Nx \l_tmpa_str { #2 }
1820         \str_if_empty:NTF \l_tmpa_str {
1821             \seq_set_eq:NN \l_tmpa_seq \g_stex_currentfile_seq
1822         } {
1823             \stex_path_from_string:Nn \l_tmpb_seq { \l_tmpa_str }
1824             \seq_concat:NNN \l_tmpa_seq \c_stex_mathhub_seq \l_tmpb_seq
1825             \seq_put_right:Nn \l_tmpa_seq { source }
1826         }
1827
1828         % path
1829         \str_set:Nx \l_tmpb_str { #3 }
1830         \str_if_empty:NTF \l_tmpb_str {
1831             \str_set:Nx \l_tmpa_str { \stex_path_to_string:N \l_tmpa_seq / \l_tmpc_str }
1832

```

```

1833 \ltx@ifpackageloaded{babel} {
1834   \exp_args:NnX \prop_get:NnNF \c_stex_language_abbrevs_prop
1835     { \language } \l_tmpb_str {
1836       \msg_error:nnx{stex}{error/unknownlanguage}{\language}
1837     }
1838   } {
1839     \str_clear:N \l_tmpb_str
1840   }
1841
1842   %\stex_debug:nn{modules}{Checking~\l_tmpa_str.\l_tmpb_str.tex}
1843   \IfFileExists{ \l_tmpa_str.\l_tmpb_str.tex }{
1844     \str_gset:Nx \g__stex_importmodule_file_str { \l_tmpa_str.\l_tmpb_str.tex }
1845   }{
1846     %\stex_debug:nn{modules}{Checking~\l_tmpa_str.tex}
1847     \IfFileExists{ \l_tmpa_str.tex }{
1848       \str_gset:Nx \g__stex_importmodule_file_str { \l_tmpa_str.tex }
1849     }{
1850       % try english as default
1851       %\stex_debug:nn{modules}{Checking~\l_tmpa_str.en.tex}
1852       \IfFileExists{ \l_tmpa_str.en.tex }{
1853         \str_gset:Nx \g__stex_importmodule_file_str { \l_tmpa_str.en.tex }
1854       }{
1855         \msg_error:nnx{stex}{error/unknownmodule}{#1?#4}
1856       }
1857     }
1858   }
1859
1860 } {
1861   \seq_set_split:NnV \l_tmpb_seq / \l_tmpb_str
1862   \seq_concat:NNN \l_tmpa_seq \l_tmpa_seq \l_tmpb_seq
1863
1864   \ltx@ifpackageloaded{babel} {
1865     \exp_args:NnX \prop_get:NnNF \c_stex_language_abbrevs_prop
1866       { \language } \l_tmpb_str {
1867       \msg_error:nnx{stex}{error/unknownlanguage}{\language}
1868     }
1869   } {
1870     \str_clear:N \l_tmpb_str
1871   }
1872
1873   \stex_path_to_string:NN \l_tmpa_seq \l_tmpa_str
1874
1875   %\stex_debug:nn{modules}{Checking~\l_tmpa_str/\l_tmpc_str.\l_tmpb_str.tex}
1876   \IfFileExists{ \l_tmpa_str/\l_tmpc_str.\l_tmpb_str.tex }{
1877     \str_gset:Nx \g__stex_importmodule_file_str { \l_tmpa_str/\l_tmpc_str.\l_tmpb_str.tex }
1878   }{
1879     %\stex_debug:nn{modules}{Checking~\l_tmpa_str/\l_tmpc_str.tex}
1880     \IfFileExists{ \l_tmpa_str/\l_tmpc_str.tex }{
1881       \str_gset:Nx \g__stex_importmodule_file_str { \l_tmpa_str/\l_tmpc_str.tex }
1882     }{
1883       % try english as default
1884       %\stex_debug:nn{modules}{Checking~\l_tmpa_str/\l_tmpc_str.en.tex}
1885       \IfFileExists{ \l_tmpa_str/\l_tmpc_str.en.tex }{
1886         \str_gset:Nx \g__stex_importmodule_file_str { \l_tmpa_str/\l_tmpc_str.en.tex }

```

```

1887     }{
1888         %\stex_debug:nn{modules}{Checking~\l_tmpa_str.\l_tmpb_str.tex}
1889         \IfFileExists{ \l_tmpa_str.\l_tmpb_str.tex }{
1890             \str_gset:Nx \g__stex_importmodule_file_str { \l_tmpa_str.\l_tmpb_str.tex }
1891         }{
1892             %\stex_debug:nn{modules}{Checking~\l_tmpa_str.tex}
1893             \IfFileExists{ \l_tmpa_str.tex }{
1894                 \str_gset:Nx \g__stex_importmodule_file_str { \l_tmpa_str.tex }
1895             }{
1896                 % try english as default
1897                 %\stex_debug:nn{modules}{Checking~\l_tmpa_str.en.tex}
1898                 \IfFileExists{ \l_tmpa_str.en.tex }{
1899                     \str_gset:Nx \g__stex_importmodule_file_str { \l_tmpa_str.en.tex }
1900                 }{
1901                     \msg_error:nnx{stex}{error/unknownmodule}{#1?#4}
1902                 }
1903             }
1904         }
1905     }
1906 }
1907 }
1908 }
1909
1910 \str_if_eq:eeF{\g__stex_importmodule_file_str}{\seq_use:Nn \g_stex_currentfile_seq /}{
1911     \exp_args:No \stex_file_in_smsmode:nn { \g__stex_importmodule_file_str } {
1912         \seq_clear:N \l_stex_all_modules_seq
1913         \str_clear:N \l_stex_current_module_str
1914         \str_set:Nx \l_tmpb_str { #2 }
1915         \str_if_empty:NF \l_tmpb_str {
1916             \stex_set_current_repository:n { #2 }
1917         }
1918         \stex_debug:nn{modules}{Loading~\g__stex_importmodule_file_str}
1919     }
1920
1921     \stex_if_module_exists:nF { #1 ? #4 } {
1922         \msg_error:nnx{stex}{error/unknownmodule}{
1923             #1?#4~(in~file~\g__stex_importmodule_file_str)
1924         }
1925     }
1926 }
1927
1928 }
1929 \stex_activate_module:n { #1 ? #4 }
1930 }

```

(End definition for `\stex_import_require_module:nnnn`. This function is documented on page 59.)

`\importmodule`

```

1931 \NewDocumentCommand \importmodule { 0{} m } {
1932     \stex_import_module_uri:nn { #1 } { #2 }
1933     \stex_debug:nn{modules}{Importing~module:~
1934         \l_stex_import_ns_str ? \l_stex_import_name_str
1935     }
1936     \stex_import_require_module:nnnn

```

```

1937 { \l_stex_import_ns_str } { \l_stex_import_archive_str }
1938 { \l_stex_import_path_str } { \l_stex_import_name_str }
1939 \stex_if_smsmode:F {
1940   \stex_annotate_invisible:nnn
1941   {import} {\l_stex_import_ns_str ? \l_stex_import_name_str} {}
1942 }
1943 \exp_args:Nx \stex_add_to_current_module:n {
1944   \stex_import_require_module:nnnn
1945   { \l_stex_import_ns_str } { \l_stex_import_archive_str }
1946   { \l_stex_import_path_str } { \l_stex_import_name_str }
1947 }
1948 \exp_args:Nx \stex_add_import_to_current_module:n {
1949   \l_stex_import_ns_str ? \l_stex_import_name_str
1950 }
1951 \stex_smsmode_do:
1952 \ignorespacesandpars
1953 }
1954 \stex_deactivate_macro:Nn \importmodule {module~environments}

```

(End definition for `\importmodule`. This function is documented on page 58.)

`\usemodule`

```

1955 \NewDocumentCommand \usemodule { 0{} m } {
1956   \stex_if_smsmode:F {
1957     \stex_import_module_uri:nn { #1 } { #2 }
1958     \stex_import_require_module:nnnn
1959     { \l_stex_import_ns_str } { \l_stex_import_archive_str }
1960     { \l_stex_import_path_str } { \l_stex_import_name_str }
1961     \stex_annotate_invisible:nnn
1962     {usemodule} {\l_stex_import_ns_str ? \l_stex_import_name_str} {}
1963   }
1964   \stex_smsmode_do:
1965   \ignorespacesandpars
1966 }

```

(End definition for `\usemodule`. This function is documented on page 58.)

```

1967 \cs_new_protected:Nn \stex_csl_to_imports:Nn {
1968   \tl_if_empty:nF{#2}{
1969     \clist_set:Nn \l_tmpa_clist {#2}
1970     \clist_map_inline:Nn \l_tmpa_clist {
1971       \tl_if_head_eq_charcode:nNTF {##1}[{
1972         #1 ##1
1973       }{
1974         #1{##1}
1975       }
1976     }
1977   }
1978 }
1979 \cs_generate_variant:Nn \stex_csl_to_imports:Nn {No}
1980
1981
1982 </package>

```

Chapter 29

STEX -Symbols Implementation

```
1983 <*package>
1984
1985 %%%%%%%%%% symbols.dtx %%%%%%%%%%
1986
    Warnings and error messages
1987 \msg_new:nnn{stex}{error/wrongargs}{
1988   args~value~in~symbol~declaration~for~#1~
1989   needs~to~be~i,~a,~b~or~B,~but~#2~given
1990 }
1991 \msg_new:nnn{stex}{error/unknownsymbol}{
1992   No~symbol~#1~found!
1993 }
1994 \msg_new:nnn{stex}{error/seqlength}{
1995   Expected~#1~arguments;~got~#2!
1996 }
1997 \msg_new:nnn{stex}{error/unknownnotation}{
1998   Unknown~notation~#1~for~#2!
1999 }
```

29.1 Symbol Declarations

```
2000 <@@=stex_symdecl>
\stex_all_symbols:n Map over all available symbols
2001 \cs_new_protected:Nn \stex_all_symbols:n {
2002   \def \__stex_symdecl_all_symbols_cs ##1 {#1}
2003   \seq_map_inline:Nn \l_stex_all_modules_seq {
2004     \seq_map_inline:cn{c_stex_module_##1_constants}{
2005       \__stex_symdecl_all_symbols_cs{##1?####1}
2006     }
2007   }
2008 }
```

(End definition for `\stex_all_symbols:n`. This function is documented on page 61.)

\STEXsymbol

```
2009 \NewDocumentCommand \STEXsymbol { m } {
2010   \stex_get_symbol:n { #1 }
2011   \exp_args:No
2012   \stex_invoke_symbol:n { \l_stex_get_symbol_uri_str }
2013 }
```

(End definition for \STEXsymbol. This function is documented on page 62.)

symdecl arguments:

```
2014 \keys_define:nn { stex / symdecl } {
2015   name      .str_set_x:N = \l_stex_symdecl_name_str ,
2016   local     .bool_set:N = \l_stex_symdecl_local_bool ,
2017   args      .str_set_x:N = \l_stex_symdecl_args_str ,
2018   type      .tl_set:N = \l_stex_symdecl_type_tl ,
2019   deprecate .str_set_x:N = \l_stex_symdecl_deprecate_str ,
2020   align     .str_set:N = \l_stex_symdecl_align_str , % TODO(?)
2021   gfc       .str_set:N = \l_stex_symdecl_gfc_str , % TODO(?)
2022   specializes .str_set:N = \l_stex_symdecl_specializes_str , % TODO(?)
2023   def       .tl_set:N = \l_stex_symdecl_definiens_tl ,
2024   reorder   .str_set_x:N = \l_stex_symdecl_reorder_str ,
2025   assoc     .choices:nn =
2026             {bin,binl,binr,pre,conj,pwconj}
2027             {\str_set:Nx \l_stex_symdecl_assoctype_str {\l_keys_choice_tl}}
2028 }
2029
2030 \bool_new:N \l_stex_symdecl_make_macro_bool
2031
2032 \cs_new_protected:Nn \__stex_symdecl_args:n {
2033   \str_clear:N \l_stex_symdecl_name_str
2034   \str_clear:N \l_stex_symdecl_args_str
2035   \str_clear:N \l_stex_symdecl_deprecate_str
2036   \str_clear:N \l_stex_symdecl_reorder_str
2037   \str_clear:N \l_stex_symdecl_assoctype_str
2038   \bool_set_false:N \l_stex_symdecl_local_bool
2039   \tl_clear:N \l_stex_symdecl_type_tl
2040   \tl_clear:N \l_stex_symdecl_definiens_tl
2041
2042   \keys_set:nn { stex / symdecl } { #1 }
2043 }
```

\symdecl Parses the optional arguments and passes them on to \stex_symdecl_do: (so that \symdef can do the same)

```
2044
2045 \NewDocumentCommand \symdecl { s m O{} } {
2046   \__stex_symdecl_args:n { #3 }
2047   \IfBooleanTF #1 {
2048     \bool_set_false:N \l_stex_symdecl_make_macro_bool
2049   } {
2050     \bool_set_true:N \l_stex_symdecl_make_macro_bool
2051   }
2052   \stex_symdecl_do:n { #2 }
2053   \stex_smsmode_do:
2054 }
```

```

2055
2056 \cs_new_protected:Nn \stex_symdecl_do:nn {
2057   \__stex_symdecl_args:n{#1}
2058   \bool_set_false:N \l_stex_symdecl_make_macro_bool
2059   \stex_symdecl_do:n{#2}
2060 }
2061
2062 \stex_deactivate_macro:Nn \symdecl {module-environments}

```

(End definition for \symdecl. This function is documented on page 60.)

\stex_symdecl_do:n

```

2063 \cs_new_protected:Nn \stex_symdecl_do:n {
2064   \stex_if_in_module:F {
2065     % TODO throw error? some default namespace?
2066   }
2067
2068   \str_if_empty:NT \l_stex_symdecl_name_str {
2069     \str_set:Nx \l_stex_symdecl_name_str { #1 }
2070   }
2071
2072   \prop_if_exist:cT { l_stex_symdecl_
2073     \l_stex_current_module_str ?
2074     \l_stex_symdecl_name_str
2075     _prop
2076   }{
2077     % TODO throw error (beware of circular dependencies)
2078   }
2079
2080   \prop_clear:N \l_tmpa_prop
2081   \prop_put:Nnx \l_tmpa_prop { module } { \l_stex_current_module_str }
2082   \seq_clear:N \l_tmpa_seq
2083   \prop_put:Nno \l_tmpa_prop { name } \l_stex_symdecl_name_str
2084   \prop_put:Nno \l_tmpa_prop { type } \l_stex_symdecl_type_tl
2085
2086   \str_if_empty:NT \l_stex_symdecl_deprecate_str {
2087     \str_if_empty:NF \l_stex_module_deprecate_str {
2088       \str_set_eq:NN \l_stex_symdecl_deprecate_str \l_stex_module_deprecate_str
2089     }
2090   }
2091   \prop_put:Nno \l_tmpa_prop { deprecate } \l_stex_symdecl_deprecate_str
2092
2093   \exp_args:No \stex_add_constant_to_current_module:n {
2094     \l_stex_symdecl_name_str
2095   }
2096
2097   % arity/args
2098   \int_zero:N \l_tmpb_int
2099
2100   \bool_set_true:N \l_tmpa_bool
2101   \str_map_inline:Nn \l_stex_symdecl_args_str {
2102     \token_case_meaning:NnF ##1 {
2103       0 {} 1 {} 2 {} 3 {} 4 {} 5 {} 6 {} 7 {} 8 {} 9 {}
2104       {\tl_to_str:n i} { \bool_set_false:N \l_tmpa_bool }

```



```

2105     {\tl_to_str:n b} { \bool_set_false:N \l_tmpa_bool }
2106     {\tl_to_str:n a} {
2107         \bool_set_false:N \l_tmpa_bool
2108         \int_incr:N \l_tmpb_int
2109     }
2110     {\tl_to_str:n B} {
2111         \bool_set_false:N \l_tmpa_bool
2112         \int_incr:N \l_tmpb_int
2113     }
2114 }{
2115     \msg_error:nnxx{stex}{error/wrongargs}{
2116         \l_stex_current_module_str ?
2117         \l_stex_symdecl_name_str
2118     }{##1}
2119 }
2120 }
2121 \bool_if:NTF \l_tmpa_bool {
2122     % possibly numeric
2123     \str_if_empty:NTF \l_stex_symdecl_args_str {
2124         \prop_put:Nnn \l_tmpa_prop { args } {}
2125         \prop_put:Nnn \l_tmpa_prop { arity } { 0 }
2126     }{
2127         \int_set:Nn \l_tmpa_int { \l_stex_symdecl_args_str }
2128         \prop_put:Nnx \l_tmpa_prop { arity } { \int_use:N \l_tmpa_int }
2129         \str_clear:N \l_tmpa_str
2130         \int_step_inline:nn \l_tmpa_int {
2131             \str_put_right:Nn \l_tmpa_str i
2132         }
2133         \prop_put:Nnx \l_tmpa_prop { args } { \l_tmpa_str }
2134     }
2135 } {
2136     \prop_put:Nnx \l_tmpa_prop { args } { \l_stex_symdecl_args_str }
2137     \prop_put:Nnx \l_tmpa_prop { arity }
2138     { \str_count:N \l_stex_symdecl_args_str }
2139 }
2140 \prop_put:Nnx \l_tmpa_prop { assocs } { \int_use:N \l_tmpb_int }
2141
2142 \tl_if_empty:NTF \l_stex_symdecl_definiens_tl {
2143     \prop_put:Nnx \l_tmpa_prop { defined }{ false }
2144 }{
2145     \prop_put:Nnx \l_tmpa_prop { defined }{ true }
2146 }
2147
2148 % semantic macro
2149
2150 \bool_if:NT \l_stex_symdecl_make_macro_bool {
2151     \exp_args:Nx \stex_do_up_to_module:n {
2152         \tl_set:cn { #1 } { \stex_invoke_symbol:n {
2153             \l_stex_current_module_str ? \l_stex_symdecl_name_str
2154         }}
2155     }
2156 }
2157
2158 \stex_debug:nn{symbols}{New~symbol:~

```

```

2159 \l_stex_current_module_str ? \l_stex_symdecl_name_str^^J
2160 Type:~\exp_not:o { \l_stex_symdecl_type_tl }^^J
2161 Args:~\prop_item:Nn \l_tmpa_prop { args }^^J
2162 Definiens:~\exp_not:o {\l_stex_symdecl_definiens_tl}
2163 }
2164
2165 % circular dependencies require this:
2166 \stex_if_do_html:T {
2167   \stex_annotate_invisible:nnn {symdecl} {
2168     \l_stex_current_module_str ? \l_stex_symdecl_name_str
2169   } {
2170     \tl_if_empty:NF \l_stex_symdecl_type_tl {
2171       \stex_annotate_invisible:nnn{type}{\l_stex_symdecl_type_tl$}
2172     }
2173     \stex_annotate_invisible:nnn{args}{\l_stex_symdecl_type_tl$}
2174     \prop_item:Nn \l_tmpa_prop { args }
2175   }
2176   \stex_annotate_invisible:nnn{macroname}{#1}{}
2177   \tl_if_empty:NF \l_stex_symdecl_definiens_tl {
2178     \stex_annotate_invisible:nnn{definiens}{\l_stex_symdecl_definiens_tl$}
2179   }
2180   \str_if_empty:NF \l_stex_symdecl_assoc_type_str {
2181     \stex_annotate_invisible:nnn{assoc_type}{\l_stex_symdecl_assoc_type_str}{}
2182   }
2183   \str_if_empty:NF \l_stex_symdecl_reorder_str {
2184     \stex_annotate_invisible:nnn{reorder_args}{\l_stex_symdecl_reorder_str}{}
2185   }
2186 }
2187 }
2188 }
2189 \prop_if_exist:cF {
2190   \l_stex_symdecl_
2191   \l_stex_current_module_str ? \l_stex_symdecl_name_str
2192   _prop
2193 } {
2194   \bool_if:NTF \l_stex_symdecl_local_bool \stex_do_up_to_module:x \stex_execute_in_module:
2195     \__stex_symdecl_restore_symbol:nnnnnnn
2196       {\l_stex_symdecl_name_str}
2197       { \prop_item:Nn \l_tmpa_prop {args} }
2198       { \prop_item:Nn \l_tmpa_prop {arity} }
2199       { \prop_item:Nn \l_tmpa_prop {assoc} }
2200       { \prop_item:Nn \l_tmpa_prop {defined} }
2201       {\bool_if:NT \l_stex_symdecl_make_macro_bool {#1} }
2202       {\l_stex_current_module_str}
2203 }
2204 }
2205 }
2206 \cs_new_protected:Nn \__stex_symdecl_restore_symbol:nnnnnnn {
2207   \prop_clear:N \l_tmpa_prop
2208   \prop_put:Nnn \l_tmpa_prop { module } { #7 }
2209   \prop_put:Nnn \l_tmpa_prop { name } { #1 }
2210   \prop_put:Nnn \l_tmpa_prop { args } { #2 }
2211   \prop_put:Nnn \l_tmpa_prop { arity } { #3 }
2212   \prop_put:Nnn \l_tmpa_prop { assoc } { #4 }

```

```

2213 \prop_put:Nnn \l_tmpa_prop { defined } { #5 }
2214 \tl_if_empty:nF{#6}{
2215   \tl_set:cx{#6}{\stex_invoke_symbol:n{\detokenize{#7 ? #1}}}
2216 }
2217 \prop_set_eq:cN{l_stex_symdecl_ \detokenize{#7 ? #1} _prop}\l_tmpa_prop
2218 \seq_clear:c{l_stex_symdecl_ \detokenize{#7 ? #1} _notations}
2219 }

```

(End definition for `\stex_symdecl_do:n`. This function is documented on page 61.)

`\stex_get_symbol:n`

```

2220 \str_new:N \l_stex_get_symbol_uri_str
2221
2222 \cs_new_protected:Nn \stex_get_symbol:n {
2223   \tl_if_head_eq_catcode:nNTF { #1 } \relax {
2224     \tl_set:Nn \l_tmpa_tl { #1 }
2225     \__stex_symdecl_get_symbol_from_cs:
2226   }{
2227     % argument is a string
2228     % is it a command name?
2229     \cs_if_exist:cTF { #1 }{
2230       \cs_set_eq:Nc \l_tmpa_tl { #1 }
2231       \str_set:Nx \l_tmpa_str { \cs_argument_spec:N \l_tmpa_tl }
2232       \str_if_empty:NTF \l_tmpa_str {
2233         \exp_args:Nx \cs_if_eq:NNTF {
2234           \tl_head:N \l_tmpa_tl
2235         } \stex_invoke_symbol:n {
2236           \__stex_symdecl_get_symbol_from_cs:
2237         }{
2238           \__stex_symdecl_get_symbol_from_string:n { #1 }
2239         }
2240       } {
2241         \__stex_symdecl_get_symbol_from_string:n { #1 }
2242       }
2243     }{
2244       % argument is not a command name
2245       \__stex_symdecl_get_symbol_from_string:n { #1 }
2246       % \l_stex_all_symbols_seq
2247     }
2248   }
2249   \str_if_eq:eeF {
2250     \prop_item:cn {
2251       l_stex_symdecl_\l_stex_get_symbol_uri_str _prop
2252     }{ deprecate }
2253   }{
2254     \msg_warning:nxxx{stex}{warning/deprecated}{
2255       Symbol~\l_stex_get_symbol_uri_str
2256     }{
2257       \prop_item:cn {l_stex_symdecl_\l_stex_get_symbol_uri_str _prop}{ deprecate }
2258     }
2259   }
2260 }
2261
2262 \cs_new_protected:Nn \__stex_symdecl_get_symbol_from_string:n {

```

```

2263 \tl_set:Nn \l_tmpa_tl {
2264   \msg_error:nnn{stex}{error/unknownsymbol}{#1}
2265 }
2266 \str_set:Nn \l_tmpa_str { #1 }
2267 \int_set:Nn \l_tmpa_int { \str_count:N \l_tmpa_str }
2268
2269 \stex_all_symbols:n {
2270   \str_if_eq:eeT { \l_tmpa_str }{ \str_range:nnn {##1}{-\l_tmpa_int}{-1}}{
2271     \seq_map_break:n{\seq_map_break:n{
2272       \tl_set:Nn \l_tmpa_tl {
2273         \str_set:Nn \l_stex_get_symbol_uri_str { ##1 }
2274       }
2275     }}
2276   }
2277 }
2278
2279 \l_tmpa_tl
2280 }
2281
2282 \cs_new_protected:Nn \__stex_symdecl_get_symbol_from_cs: {
2283   \exp_args:NNx \tl_set:Nn \l_tmpa_tl
2284     { \tl_tail:N \l_tmpa_tl }
2285   \tl_if_single:NTF \l_tmpa_tl {
2286     \exp_args:No \tl_if_head_is_group:nTF \l_tmpa_tl {
2287       \exp_after:wN \str_set:Nn \exp_after:wN
2288         \l_stex_get_symbol_uri_str \l_tmpa_tl
2289     }{
2290       % TODO
2291       % tail is not a single group
2292     }
2293   }{
2294     % TODO
2295     % tail is not a single group
2296   }
2297 }

```

(End definition for `\stex_get_symbol:n`. This function is documented on page [61](#).)

29.2 Notations

```

2298 <@@=stex_notation>
2299 notation arguments:
2299 \keys_define:nn { stex / notation } {
2300 % lang      .tl_set_x:N = \l__stex_notation_lang_str ,
2301 variant .tl_set_x:N = \l__stex_notation_variant_str ,
2302 prec     .str_set_x:N = \l__stex_notation_prec_str ,
2303 op       .tl_set:N = \l__stex_notation_op_tl ,
2304 primary .bool_set:N = \l__stex_notation_primary_bool ,
2305 primary .default:n = {true} ,
2306 unknown .code:n = \str_set:Nx
2307   \l__stex_notation_variant_str \l_keys_key_str
2308 }
2309

```

```

2310 \cs_new_protected:Nn \_stex_notation_args:n {
2311 % \str_clear:N \l__stex_notation_lang_str
2312 \str_clear:N \l__stex_notation_variant_str
2313 \str_clear:N \l__stex_notation_prec_str
2314 \tl_clear:N \l__stex_notation_op_tl
2315 \bool_set_false:N \l__stex_notation_primary_bool
2316
2317 \keys_set:nn { stex / notation } { #1 }
2318 }

```

\notation

```

2319 \NewDocumentCommand \notation { s m O{}} {
2320 \_stex_notation_args:n { #3 }
2321 \tl_clear:N \l_stex_symdecl_definiens_tl
2322 \stex_get_symbol:n { #2 }
2323 \tl_set:Nn \l_stex_notation_after_do_tl {
2324 \_stex_notation_final:
2325 \IfBooleanTF#1{
2326 \stex_setnotation:n {\l_stex_get_symbol_uri_str}
2327 }{}
2328 \stex_smsmode_do:\ignorespacesandpars
2329 }
2330 \stex_notation_do:nnnnn
2331 { \prop_item:cn {l_stex_symdecl\_l_stex_get_symbol_uri_str _prop } { args } }
2332 { \prop_item:cn { l_stex_symdecl\_l_stex_get_symbol_uri_str _prop } { arity } }
2333 { \l__stex_notation_variant_str }
2334 { \l__stex_notation_prec_str }
2335 }
2336 \stex_deactivate_macro:Nn \notation {module~environments}

```

(End definition for \notation. This function is documented on page 61.)

\stex_notation_do:nnnnn

```

2337 \seq_new:N \l__stex_notation_precedences_seq
2338 \tl_new:N \l__stex_notation_opprec_tl
2339 \int_new:N \l__stex_notation_currarg_int
2340 \tl_new:N \stex_symbol_after_invokation_tl
2341
2342 \cs_new_protected:Nn \stex_notation_do:nnnnn {
2343 \let\l_stex_current_symbol_str\relax
2344 \seq_clear:N \l__stex_notation_precedences_seq
2345 \tl_clear:N \l__stex_notation_opprec_tl
2346 \str_set:Nx \l__stex_notation_args_str { #1 }
2347 \str_set:Nx \l__stex_notation_arity_str { #2 }
2348 \str_set:Nx \l__stex_notation_suffix_str { #3 }
2349 \str_set:Nx \l__stex_notation_prec_str { #4 }
2350
2351 % precedences
2352 \str_if_empty:NTF \l__stex_notation_prec_str {
2353 \int_compare:nNnTF \l__stex_notation_arity_str = 0 {
2354 \tl_set:No \l__stex_notation_opprec_tl { \neginfprec }
2355 }{
2356 \tl_set:Nn \l__stex_notation_opprec_tl { 0 }
2357 }
2358 } {

```

```

2359 \str_if_eq:onTF \l__stex_notation_prec_str {nobrackets}{
2360 \tl_set:No \l__stex_notation_opprec_tl { \neginfprec }
2361 \int_step_inline:nn { \l__stex_notation_arity_str } {
2362 \exp_args:NNo
2363 \seq_put_right:Nn \l__stex_notation_precedences_seq { \infprec }
2364 }
2365 }{
2366 \seq_set_split:NnV \l_tmpa_seq ; \l__stex_notation_prec_str
2367 \seq_pop_left:NNTF \l_tmpa_seq \l_tmpa_str {
2368 \tl_set:No \l__stex_notation_opprec_tl { \l_tmpa_str }
2369 \seq_pop_left:NNT \l_tmpa_seq \l_tmpa_str {
2370 \exp_args:NNNo \exp_args:NNno \seq_set_split:Nnn
2371 \l_tmpa_seq {\tl_to_str:n{x}} { \l_tmpa_str }
2372 \seq_map_inline:Nn \l_tmpa_seq {
2373 \seq_put_right:Nn \l_tmpb_seq { ##1 }
2374 }
2375 }
2376 }{
2377 \int_compare:nNnTF \l__stex_notation_arity_str = 0 {
2378 \tl_set:No \l__stex_notation_opprec_tl { \infprec }
2379 }{
2380 \tl_set:No \l__stex_notation_opprec_tl { 0 }
2381 }
2382 }
2383 }
2384 }
2385
2386 \seq_set_eq:NN \l_tmpa_seq \l__stex_notation_precedences_seq
2387 \int_step_inline:nn { \l__stex_notation_arity_str } {
2388 \seq_pop_left:NNF \l_tmpa_seq \l_tmpb_str {
2389 \exp_args:NNo
2390 \seq_put_right:No \l__stex_notation_precedences_seq {
2391 \l__stex_notation_opprec_tl
2392 }
2393 }
2394 }
2395 \tl_clear:N \l_stex_notation_dummyargs_tl
2396
2397 \int_compare:nNnTF \l__stex_notation_arity_str = 0 {
2398 \exp_args:NNe
2399 \cs_set:Npn \l_stex_notation_macrocode_cs {
2400 \_stex_term_math_oms:nxxx { \l_stex_current_symbol_str }
2401 { \l__stex_notation_suffix_str }
2402 { \l__stex_notation_opprec_tl }
2403 { \exp_not:n { #5 } }
2404 }
2405 \l_stex_notation_after_do_tl
2406 }{
2407 \str_if_in:NnTF \l__stex_notation_args_str b {
2408 \exp_args:Nne \use:nn
2409 {
2410 \cs_generate_from_arg_count:NNnn \l_stex_notation_macrocode_cs
2411 \cs_set:Npn \l__stex_notation_arity_str } { {
2412 \_stex_term_math_omb:nxxx { \l_stex_current_symbol_str }

```

```

2413         { \l__stex_notation_suffix_str }
2414         { \l__stex_notation_opprec_tl }
2415         { \exp_not:n { #5 } }
2416     }}
2417 }{
2418     \str_if_in:NnTF \l__stex_notation_args_str B {
2419         \exp_args:Nne \use:nn
2420         {
2421             \cs_generate_from_arg_count:NNnn \l_stex_notation_macrocode_cs
2422             \cs_set:Npn \l__stex_notation_arity_str } { {
2423                 \stex_term_math_omb:nnnn { \l_stex_current_symbol_str }
2424                 { \l__stex_notation_suffix_str }
2425                 { \l__stex_notation_opprec_tl }
2426                 { \exp_not:n { #5 } }
2427             } }
2428     }{
2429         \exp_args:Nne \use:nn
2430         {
2431             \cs_generate_from_arg_count:NNnn \l_stex_notation_macrocode_cs
2432             \cs_set:Npn \l__stex_notation_arity_str } { {
2433                 \stex_term_math_oma:nnnn { \l_stex_current_symbol_str }
2434                 { \l__stex_notation_suffix_str }
2435                 { \l__stex_notation_opprec_tl }
2436                 { \exp_not:n { #5 } }
2437             } }
2438     }
2439 }
2440
2441 \str_set_eq:NN \l__stex_notation_remaining_args_str \l__stex_notation_args_str
2442 \int_zero:N \l__stex_notation_currarg_int
2443 \seq_set_eq:NN \l__stex_notation_remaining_precs_seq \l__stex_notation_precedences_seq
2444 \__stex_notation_arguments:
2445 }
2446 }

```

(End definition for \stex_notation_do:nnnnn. This function is documented on page ??.)

__stex_notation_arguments: Takes care of annotating the arguments in a notation macro

```

2447 \cs_new_protected:Nn \__stex_notation_arguments: {
2448     \int_incr:N \l__stex_notation_currarg_int
2449     \str_if_empty:NTF \l__stex_notation_remaining_args_str {
2450         \l_stex_notation_after_do_tl
2451     }{
2452         \str_set:Nx \l_tmpa_str { \str_head:N \l__stex_notation_remaining_args_str }
2453         \str_set:Nx \l__stex_notation_remaining_args_str { \str_tail:N \l__stex_notation_remaini
2454         \str_if_eq:VnTF \l_tmpa_str a {
2455             \__stex_notation_argument_assoc:nn{a}
2456         }{
2457             \str_if_eq:VnTF \l_tmpa_str B {
2458                 \__stex_notation_argument_assoc:nn{B}
2459             }{
2460                 \seq_pop_left:NN \l__stex_notation_remaining_precs_seq \l_tmpb_str
2461                 \tl_put_right:Nx \l_stex_notation_dummyargs_tl {
2462                     { \stex_term_math_arg:nnn

```

```

2463         { \l_tmpa_str\int_use:N \l__stex_notation_currarg_int }
2464         { \l_tmpb_str }
2465         { ####\int_use:N \l__stex_notation_currarg_int }
2466     }
2467 }
2468 \__stex_notation_arguments:
2469 }
2470 }
2471 }
2472 }

```

(End definition for __stex_notation_arguments:.)

_stex_notation_argument_assoc:nn

```

2473 \cs_new_protected:Nn \__stex_notation_argument_assoc:nn {
2474
2475     \cs_generate_from_arg_count:NNnn \l_tmpa_cs \cs_set:Npn
2476     { \l__stex_notation_arity_str } {
2477         #2
2478     }
2479     \int_zero:N \l_tmpa_int
2480     \tl_clear:N \l_tmpa_tl
2481     \str_map_inline:Nn \l__stex_notation_args_str {
2482         \int_incr:N \l_tmpa_int
2483         \tl_put_right:Nx \l_tmpa_tl {
2484             \str_if_eq:nnTF {##1}{a}{ {} } {}{
2485                 \str_if_eq:nnTF {##1}{B}{ {} } {}{
2486                     { \stex_term_arg:nn{##1}\int_use:N \l_tmpa_int } {##### \int_use:N \l_tmpa_int}
2487                 }
2488             }
2489         }
2490     }
2491     \exp_after:wN\exp_after:wN\exp_after:wN \def
2492     \exp_after:wN\exp_after:wN\exp_after:wN \l_tmpa_cs
2493     \exp_after:wN\exp_after:wN\exp_after:wN ##
2494     \exp_after:wN\exp_after:wN\exp_after:wN 1
2495     \exp_after:wN\exp_after:wN\exp_after:wN ##
2496     \exp_after:wN\exp_after:wN\exp_after:wN 2
2497     \exp_after:wN\exp_after:wN\exp_after:wN {
2498         \exp_after:wN \exp_after:wN \exp_after:wN
2499         \exp_not:n \exp_after:wN \exp_after:wN \exp_after:wN {
2500             \exp_after:wN \l_tmpa_cs \l_tmpa_tl
2501         }
2502     }
2503
2504     \seq_pop_left:NN \l__stex_notation_remaining_precs_seq \l_tmpa_str
2505     \tl_put_right:Nx \l__stex_notation_dummyargs_tl { {
2506         \stex_term_math_assoc_arg:nnnn
2507         { #1\int_use:N \l__stex_notation_currarg_int }
2508         { \l_tmpa_str }
2509         { ####\int_use:N \l__stex_notation_currarg_int }
2510         { \l_tmpa_cs {####1} {####2} }
2511     } }
2512     \__stex_notation_arguments:
2513 }

```


(End definition for _stex_notation_argument_assoc:nn.)

_stex_notation_final: Called after processing all notation arguments

```

2514 \cs_new_protected:Nn \_stex_notation_restore_notation:nnnnn {
2515   \cs_generate_from_arg_count:cNnn{stex_notation_\detokenize{#1} \c_hash_str \detokenize{#2}}
2516   \cs_set_nopar:Npn {#3}{#4}
2517   \tl_if_empty:nF {#5}{
2518     \tl_set:cn{stex_op_notation_\detokenize{#1} \c_hash_str \detokenize{#2}_cs}{ \comp{ #5 }
2519   }
2520   \seq_if_exist:cT { l_stex_symdecl_\detokenize{#1} _notations }{
2521     \seq_put_right:cx { l_stex_symdecl_\detokenize{#1} _notations } { \detokenize{#2} }
2522   }
2523 }
2524
2525 \cs_new_protected:Nn \_stex_notation_final: {
2526
2527   \stex_execute_in_module:x {
2528     \_stex_notation_restore_notation:nnnnn
2529     {\l_stex_get_symbol_uri_str}
2530     {\l_stex_notation_suffix_str}
2531     {\l_stex_notation_arity_str}
2532     {
2533       \exp_after:wN \exp_after:wN \exp_after:wN
2534       \exp_not:n \exp_after:wN \exp_after:wN \exp_after:wN
2535       { \exp_after:wN \l_stex_notation_macrocode_cs \l_stex_notation_dummyargs_tl \stex_sy
2536     }
2537     {\exp_args:No \exp_not:n \l_stex_notation_op_tl }
2538   }
2539
2540   \stex_debug:nn{symbols}{
2541     Notation~\l_stex_notation_suffix_str
2542     ~for~\l_stex_get_symbol_uri_str^^J
2543     Operator~precedence:~\l_stex_notation_opprec_tl^^J
2544     Argument~precedences:~
2545     \seq_use:Nn \l_stex_notation_precedences_seq {,~}^^J
2546     Notation: \cs_meaning:c {
2547       stex_notation_ \l_stex_get_symbol_uri_str \c_hash_str
2548       \l_stex_notation_suffix_str
2549       _cs
2550     }
2551   }
2552   % HTML annotations
2553   \stex_if_do_html:T {
2554     \stex_annotate_invisible:nnn { notation }
2555     { \l_stex_get_symbol_uri_str } {
2556       \stex_annotate_invisible:nnn { notationfragment }
2557       { \l_stex_notation_suffix_str }{}
2558       \stex_annotate_invisible:nnn { precedence }
2559       { \l_stex_notation_prec_str }{}
2560
2561       \int_zero:N \l_tmpa_int
2562       \str_set_eq:NN \l_stex_notation_remaining_args_str \l_stex_notation_args_str
2563       \tl_clear:N \l_tmpa_tl
2564       \int_step_inline:nn { \l_stex_notation_arity_str }{

```

```

2565 \int_incr:N \l_tmpa_int
2566 \str_set:Nx \l_tmpb_str { \str_head:N \l__stex_notation_remaining_args_str }
2567 \str_set:Nx \l__stex_notation_remaining_args_str { \str_tail:N \l__stex_notation_re
2568 \str_if_eq:VnTF \l_tmpb_str a {
2569   \tl_set:Nx \l_tmpa_tl { \l_tmpa_tl {
2570     \stex_annotate:nnn{argmarker}{\int_use:N \l_tmpa_int a}{ } ,
2571     \stex_annotate:nnn{argmarker}{\int_use:N \l_tmpa_int b}{ }
2572   } }
2573 }{
2574   \str_if_eq:VnTF \l_tmpb_str B {
2575     \tl_set:Nx \l_tmpa_tl { \l_tmpa_tl {
2576       \stex_annotate:nnn{argmarker}{\int_use:N \l_tmpa_int a}{ } ,
2577       \stex_annotate:nnn{argmarker}{\int_use:N \l_tmpa_int b}{ }
2578     } }
2579   }{
2580     \tl_set:Nx \l_tmpa_tl { \l_tmpa_tl {
2581       \stex_annotate:nnn{argmarker}{\int_use:N \l_tmpa_int}{ }
2582     } }
2583   }
2584 }
2585 }
2586 \stex_annotate_invisible:nnn { notationcomp }{ }{
2587   \str_set:Nx \l_stex_current_symbol_str { \l_stex_get_symbol_uri_str }
2588   $ \exp_args:Nno \use:nn { \use:c {
2589     stex_notation_ \l_stex_current_symbol_str
2590     \c_hash_str \l__stex_notation_suffix_str_cs
2591   } } { \l_tmpa_tl } $
2592 }
2593 }
2594 }
2595 }

```

(End definition for _stex_notation_final:.)

\setnotation

```

2596 \keys_define:nn { stex / setnotation } {
2597   % lang      .tl_set_x:N = \l__stex_notation_lang_str ,
2598   variant .tl_set_x:N = \l__stex_notation_variant_str ,
2599   unknown .code:n = \str_set:Nx
2600     \l__stex_notation_variant_str \l_keys_key_str
2601 }
2602
2603 \cs_new_protected:Nn \stex_setnotation_args:n {
2604   % \str_clear:N \l__stex_notation_lang_str
2605   \str_clear:N \l__stex_notation_variant_str
2606   \keys_set:nn { stex / setnotation } { #1 }
2607 }
2608
2609 \cs_new_protected:Nn \__stex_notation_setnotation:nn {
2610   \seq_if_exist:CT{l_stex_symdecl_#1_notations}{
2611     \seq_remove_all:cn { l_stex_symdecl_#1_notations }{ #2 }
2612     \seq_put_left:cn { l_stex_symdecl_#1_notations }{ #2 }
2613   }
2614 }

```

```

2615
2616 \cs_new_protected:Nn \stex_setnotation:n {
2617   \exp_args:Nnx \seq_if_in:cnTF { l_stex_symdecl_#1 _notations }
2618   { \l__stex_notation_variant_str }{
2619     \stex_execute_in_module:x{ \__stex_notation_setnotation:nn {#1}{\l__stex_notation_vari
2620     \stex_debug:nn {notations}}{
2621       Setting~default~notation~
2622       {\l__stex_notation_variant_str }~for~
2623       #1 \\
2624       \expandafter\meaning\csname
2625       l_stex_symdecl_#1 _notations\endcsname
2626     }
2627   }{
2628     \msg_error:nnxx{stex}{unknownnotation}{\l__stex_notation_variant_str}{#1}
2629   }
2630 }
2631
2632 \NewDocumentCommand \setnotation {m m} {
2633   \stex_get_symbol:n { #1 }
2634   \stex_setnotation_args:n { #2 }
2635   \stex_setnotation:n{\l_stex_get_symbol_uri_str}
2636   \stex_smsmode_do:\ignorespacesandpars
2637 }
2638
2639 \cs_new_protected:Nn \stex_copy_notations:nn {
2640   \stex_debug:nn {notations}{
2641     Copying~notations~from~#2~to~#1\\
2642     \seq_use:cn{l_stex_symdecl_#2_notations}{,~}
2643   }
2644   \tl_clear:N \l_tmpa_tl
2645   \int_step_inline:nn { \prop_item:cn {l_stex_symdecl_#2_prop}{ arity } } {
2646     \tl_put_right:Nn \l_tmpa_tl { {## #1} }
2647   }
2648   \seq_map_inline:cn {l_stex_symdecl_#2_notations}{
2649     \cs_set_eq:Nc \l_tmpa_cs { stex_notation_ #2 \c_hash_str ##1 _cs }
2650     \edef \l_tmpa_tl {
2651       \exp_after:wN\exp_after:wN\exp_after:wN \exp_not:n
2652       \exp_after:wN\exp_after:wN\exp_after:wN \exp_after:wN {
2653         \exp_after:wN \l_tmpa_cs \l_tmpa_tl
2654       }
2655     }
2656
2657     \stex_execute_in_module:x {
2658       \__stex_notation_restore_notation:nnnnn
2659       {#1}{##1}
2660       { \prop_item:cn {l_stex_symdecl_#2_prop}{ arity } }
2661       { \exp_after:wN\exp_not:n\exp_after:wN{\l_tmpa_tl} }
2662       {
2663         \cs_if_exist:cT{stex_op_notation_ #2\c_hash_str ##1 _cs}{
2664           \exp_args:NNo\exp_args:No\exp_not:n{\csname stex_op_notation_ #2\c_hash_str ##1
2665         }
2666       }
2667     }
2668   }

```

```

2669 }
2670
2671 \NewDocumentCommand \copynotation {m m} {
2672   \stex_get_symbol:n { #1 }
2673   \str_set_eq:NN \l_tmpa_str \l_stex_get_symbol_uri_str
2674   \stex_get_symbol:n { #2 }
2675   \exp_args:Noo
2676   \stex_copy_notations:nn \l_tmpa_str \l_stex_get_symbol_uri_str
2677   \stex_smsmode_do:\ignorespacesandpars
2678 }
2679

```

(End definition for \setnotation. This function is documented on page 18.)

\symdef

```

2680 \keys_define:nn { stex / symdef } {
2681   name .str_set_x:N = \l_stex_symdecl_name_str ,
2682   local .bool_set:N = \l_stex_symdecl_local_bool ,
2683   args .str_set_x:N = \l_stex_symdecl_args_str ,
2684   type .tl_set:N = \l_stex_symdecl_type_tl ,
2685   def .tl_set:N = \l_stex_symdecl_definiens_tl ,
2686   reorder .str_set_x:N = \l_stex_symdecl_reorder_str ,
2687   op .tl_set:N = \l__stex_notation_op_tl ,
2688   % lang .str_set_x:N = \l__stex_notation_lang_str ,
2689   variant .str_set_x:N = \l__stex_notation_variant_str ,
2690   prec .str_set_x:N = \l__stex_notation_prec_str ,
2691   assoc .choices:nn =
2692     {bin,binl,binr,pre,conj,pwconj}
2693     {\str_set:Nx \l_stex_symdecl_assoctype_str {\l_keys_choice_tl}},
2694   unknown .code:n = \str_set:Nx
2695     \l__stex_notation_variant_str \l_keys_key_str
2696 }
2697
2698 \cs_new_protected:Nn \__stex_notation_symdef_args:n {
2699   \str_clear:N \l_stex_symdecl_name_str
2700   \str_clear:N \l_stex_symdecl_args_str
2701   \str_clear:N \l_stex_symdecl_assoctype_str
2702   \str_clear:N \l_stex_symdecl_reorder_str
2703   \bool_set_false:N \l_stex_symdecl_local_bool
2704   \tl_clear:N \l_stex_symdecl_type_tl
2705   \tl_clear:N \l_stex_symdecl_definiens_tl
2706   % \str_clear:N \l__stex_notation_lang_str
2707   \str_clear:N \l__stex_notation_variant_str
2708   \str_clear:N \l__stex_notation_prec_str
2709   \tl_clear:N \l__stex_notation_op_tl
2710
2711   \keys_set:nn { stex / symdef } { #1 }
2712 }
2713
2714 \NewDocumentCommand \symdef { m O{} } {
2715   \__stex_notation_symdef_args:n { #2 }
2716   \bool_set_true:N \l_stex_symdecl_make_macro_bool
2717   \stex_symdecl_do:n { #1 }
2718   \tl_set:Nn \l_stex_notation_after_do_tl {

```

```

2719   \__stex_notation_final:
2720   \stex_smsmode_do:\ignorespacesandpars
2721 }
2722 \str_set:Nx \l_stex_get_symbol_uri_str {
2723   \l_stex_current_module_str ? \l_stex_symdecl_name_str
2724 }
2725 \exp_args:Nx \stex_notation_do:nnnnn
2726   { \prop_item:cn {l_stex_symdecl\l_stex_get_symbol_uri_str_prop} { args } }
2727   { \prop_item:cn { l_stex_symdecl\l_stex_get_symbol_uri_str_prop } { arity } }
2728   { \l__stex_notation_variant_str }
2729   { \l__stex_notation_prec_str}
2730 }
2731 \stex_deactivate_macro:Nn \symdef {module~environments}

```

(End definition for `\symdef`. This function is documented on page [61](#).)

29.3 Variables

```

2732 <@@=stex_variables>
2733
2734 \keys_define:nn { stex / vardef } {
2735   name      .str_set:N = \l__stex_variables_name_str ,
2736   args      .str_set:N = \l__stex_variables_args_str ,
2737   type      .tl_set:N  = \l__stex_variables_type_tl ,
2738   def       .tl_set:N  = \l__stex_variables_def_tl ,
2739   op        .tl_set:N  = \l__stex_variables_op_tl ,
2740   prec      .str_set:N = \l__stex_variables_prec_str ,
2741   assoc     .choices:nn =
2742     {bin,binl,binr,pre,conj,pwconj}
2743     {\str_set:Nx \l__stex_variables_assoctype_str {\l_keys_choice_tl}},
2744   bind      .choices:nn =
2745     {forall,exists}
2746     {\str_set:Nx \l__stex_variables_bind_str {\l_keys_choice_tl}}
2747 }
2748
2749 \cs_new_protected:Nn \__stex_variables_args:n {
2750   \str_clear:N \l__stex_variables_name_str
2751   \str_clear:N \l__stex_variables_args_str
2752   \str_clear:N \l__stex_variables_prec_str
2753   \str_clear:N \l__stex_variables_assoctype_str
2754   \str_clear:N \l__stex_variables_bind_str
2755   \tl_clear:N \l__stex_variables_type_tl
2756   \tl_clear:N \l__stex_variables_def_tl
2757   \tl_clear:N \l__stex_variables_op_tl
2758
2759   \keys_set:nn { stex / vardef } { #1 }
2760 }
2761
2762 \NewDocumentCommand \__stex_variables_do_simple:nnn { m O{} } {
2763   \__stex_variables_args:n {#2}
2764   \str_if_empty:NT \l__stex_variables_name_str {
2765     \str_set:Nx \l__stex_variables_name_str { #1 }
2766   }
2767   \prop_clear:N \l_tmpa_prop

```

```

2768 \prop_put:Nno \l_tmpa_prop { name } \l__stex_variables_name_str
2769
2770 \int_zero:N \l_tmpb_int
2771 \bool_set_true:N \l_tmpa_bool
2772 \str_map_inline:Nn \l__stex_variables_args_str {
2773   \token_case_meaning:NnF ##1 {
2774     0 {} 1 {} 2 {} 3 {} 4 {} 5 {} 6 {} 7 {} 8 {} 9 {}
2775     {\tl_to_str:n i} { \bool_set_false:N \l_tmpa_bool }
2776     {\tl_to_str:n b} { \bool_set_false:N \l_tmpa_bool }
2777     {\tl_to_str:n a} {
2778       \bool_set_false:N \l_tmpa_bool
2779       \int_incr:N \l_tmpb_int
2780     }
2781     {\tl_to_str:n B} {
2782       \bool_set_false:N \l_tmpa_bool
2783       \int_incr:N \l_tmpb_int
2784     }
2785   }{
2786     \msg_error:nnxx{stex}{error/wrongargs}{
2787       variable~\l__stex_variables_name_str
2788     }{##1}
2789   }
2790 }
2791 \bool_if:NTF \l_tmpa_bool {
2792   % possibly numeric
2793   \str_if_empty:NTF \l__stex_variables_args_str {
2794     \prop_put:Nnn \l_tmpa_prop { args } {}
2795     \prop_put:Nnn \l_tmpa_prop { arity } { 0 }
2796   }{
2797     \int_set:Nn \l_tmpa_int { \l__stex_variables_args_str }
2798     \prop_put:Nnx \l_tmpa_prop { arity } { \int_use:N \l_tmpa_int }
2799     \str_clear:N \l_tmpa_str
2800     \int_step_inline:nn \l_tmpa_int {
2801       \str_put_right:Nn \l_tmpa_str i
2802     }
2803     \str_set_eq:NN \l__stex_variables_args_str \l_tmpa_str
2804     \prop_put:Nnx \l_tmpa_prop { args } { \l__stex_variables_args_str }
2805   }
2806 } {
2807   \prop_put:Nnx \l_tmpa_prop { args } { \l__stex_variables_args_str }
2808   \prop_put:Nnx \l_tmpa_prop { arity }
2809   { \str_count:N \l__stex_variables_args_str }
2810 }
2811 \prop_put:Nnx \l_tmpa_prop { assocs } { \int_use:N \l_tmpb_int }
2812 \tl_set:cx { #1 }{ \stex_invoke_variable:n { \l__stex_variables_name_str } }
2813
2814 \prop_set_eq:cN { l_stex_variable_\l__stex_variables_name_str _prop} \l_tmpa_prop
2815
2816 \tl_if_empty:NF \l__stex_variables_op_tl {
2817   \cs_set:cpx {
2818     stex_var_op_notation_ \l__stex_variables_name_str _cs
2819   } { \exp_not:N\comp{ \exp_args:No \exp_not:n { \l__stex_variables_op_tl } } }
2820 }
2821

```

```

2822 \tl_set:Nn \l_stex_notation_after_do_tl {
2823   \exp_args:Nne \use:nn {
2824     \cs_generate_from_arg_count:cNnn { stex_var_notation_\l__stex_variables_name_str_cs }
2825     \cs_set:Npn { \prop_item:Nn \l_tmpa_prop { arity } }
2826   } {{
2827     \exp_after:wN \exp_after:wN \exp_after:wN
2828     \exp_not:n \exp_after:wN \exp_after:wN \exp_after:wN
2829     { \exp_after:wN \l_stex_notation_macrocode_cs \l_stex_notation_dummyargs_tl \stex_symbol
2830   }}
2831   \stex_if_do_html:T {
2832     \stex_annotate_invisible:nnn {vardecl}{\l__stex_variables_name_str}{
2833       \stex_annotate_invisible:nnn { precedence }
2834       { \l__stex_variables_prec_str }}{
2835       \tl_if_empty:NF \l__stex_variables_type_tl {\stex_annotate_invisible:nnn{type}{\l__stex_variables_type_str}{
2836         \stex_annotate_invisible:nnn{args}{\l__stex_variables_args_str }
2837         \stex_annotate_invisible:nnn{macroname}{\l__stex_variables_macroname_str }
2838         \tl_if_empty:NF \l__stex_variables_def_tl {
2839           \stex_annotate_invisible:nnn{definiens}{
2840             {\l__stex_variables_def_tl$}
2841         }
2842         \str_if_empty:NF \l__stex_variables_assoc_type_str {
2843           \stex_annotate_invisible:nnn{assoc_type}{\l__stex_variables_assoc_type_str}{
2844         }
2845         \str_if_empty:NF \l__stex_variables_bind_str {
2846           \stex_annotate:nnn {bindtype}{\l__stex_variables_bind_str}{
2847         }
2848         \int_zero:N \l_tmpa_int
2849         \str_set_eq:NN \l__stex_variables_remaining_args_str \l__stex_variables_args_str
2850         \tl_clear:N \l_tmpa_tl
2851         \int_step_inline:nn { \prop_item:Nn \l_tmpa_prop { arity } } {{
2852           \int_incr:N \l_tmpa_int
2853           \str_set:Nx \l_tmpb_str { \str_head:N \l__stex_variables_remaining_args_str }
2854           \str_set:Nx \l__stex_variables_remaining_args_str { \str_tail:N \l__stex_variables_remaining_args_str }
2855           \str_if_eq:VnTF \l_tmpb_str a {
2856             \tl_set:Nx \l_tmpa_tl { \l_tmpa_tl {
2857               \stex_annotate:nnn{argmarker}{\int_use:N \l_tmpa_int a}{
2858               \stex_annotate:nnn{argmarker}{\int_use:N \l_tmpa_int b}{
2859             } }
2860           }}
2861           \str_if_eq:VnTF \l_tmpb_str B {
2862             \tl_set:Nx \l_tmpa_tl { \l_tmpa_tl {
2863               \stex_annotate:nnn{argmarker}{\int_use:N \l_tmpa_int a}{
2864               \stex_annotate:nnn{argmarker}{\int_use:N \l_tmpa_int b}{
2865             } }
2866           }}
2867           \tl_set:Nx \l_tmpa_tl { \l_tmpa_tl {
2868             \stex_annotate:nnn{argmarker}{\int_use:N \l_tmpa_int}{
2869           } }
2870         }
2871       }
2872     }
2873     \stex_annotate_invisible:nnn { notationcomp }{{
2874       \str_set:Nx \l_stex_current_symbol_str {var://\l__stex_variables_name_str }
2875       $ \exp_args:Nno \use:nn { \use:c {

```

```

2876         stex_var_notation_\l__stex_variables_name_str _cs
2877     } } { \l_tmpa_tl } $
2878     }
2879 }
2880 }\ignorespacesandpars
2881 }
2882
2883 \stex_notation_do:nnnnn { \l__stex_variables_args_str } { \prop_item:Nn \l_tmpa_prop { ari
2884 }
2885
2886 \cs_new:Nn \_stex_reset:N {
2887     \tl_if_exist:NTF #1 {
2888         \def \exp_not:N #1 { \exp_args:No \exp_not:n #1 }
2889     }{
2890         \let \exp_not:N #1 \exp_not:N \undefined
2891     }
2892 }
2893
2894 \NewDocumentCommand \__stex_variables_do_complex:nn { m m }{
2895     \clist_set:Nx \l__stex_variables_names { \tl_to_str:n {#1} }
2896     \exp_args:Nnx \use:nn {
2897         % TODO
2898         \stex_annotate_invisible:nnn {vardecl}{\clist_use:Nn\l__stex_variables_names,}{
2899             #2
2900         }
2901     }{
2902         \_stex_reset:N \varnot
2903         \_stex_reset:N \vartype
2904         \_stex_reset:N \vardefi
2905     }
2906 }
2907
2908 \NewDocumentCommand \vardef { s } {
2909     \IfBooleanTF#1 {
2910         \__stex_variables_do_complex:nn
2911     }{
2912         \__stex_variables_do_simple:nnn
2913     }
2914 }
2915
2916 \NewDocumentCommand \svar { 0{} m }{
2917     \tl_if_empty:nTF {#1}{
2918         \str_set:Nn \l_tmpa_str { #2 }
2919     }{
2920         \str_set:Nn \l_tmpa_str { #1 }
2921     }
2922     \_stex_term_omv:nn {
2923         var://\l_tmpa_str
2924     }{
2925         \exp_args:Nnx \use:nn {
2926             \def\comp{\_varcomp}
2927             \str_set:Nx \l_stex_current_symbol_str { var://\l_tmpa_str }
2928             \comp{ #2 }
2929         }{

```



```

2930     \stex_reset:N \comp
2931     \stex_reset:N \l_stex_current_symbol_str
2932   }
2933 }
2934 }
2935
2936
2937
2938 \keys_define:nn { stex / varseq } {
2939   name      .str_set_x:N = \l__stex_variables_name_str ,
2940   args      .int_set:N   = \l__stex_variables_args_int ,
2941   type      .tl_set:N    = \l__stex_variables_type_tl ,
2942   mid       .tl_set:N    = \l__stex_variables_mid_tl ,
2943   bind      .choices:nn =
2944     {forall,exists}
2945     {\str_set:Nx \l__stex_variables_bind_str {\l_keys_choice_tl}}
2946 }
2947
2948 \cs_new_protected:Nn \__stex_variables_seq_args:n {
2949   \str_clear:N \l__stex_variables_name_str
2950   \int_set:Nn \l__stex_variables_args_int 1
2951   \tl_clear:N \l__stex_variables_type_tl
2952   \str_clear:N \l__stex_variables_bind_str
2953
2954   \keys_set:nn { stex / varseq } { #1 }
2955 }
2956
2957 \NewDocumentCommand \varseq {m O{} m m m}{
2958   \__stex_variables_seq_args:n { #2 }
2959   \str_if_empty:NT \l__stex_variables_name_str {
2960     \str_set:Nx \l__stex_variables_name_str { #1 }
2961   }
2962   \prop_clear:N \l_tmpa_prop
2963   \prop_put:Nnx \l_tmpa_prop { arity }{\int_use:N \l__stex_variables_args_int}
2964
2965   \seq_set_from_clist:Nn \l_tmpa_seq {#3}
2966   \int_compare:nNnF {\seq_count:N \l_tmpa_seq} = \l__stex_variables_args_int {
2967     \msg_error:nnxx{stex}{error/seqlength}
2968     {\int_use:N \l__stex_variables_args_int}
2969     {\seq_count:N \l_tmpa_seq}
2970   }
2971   \seq_set_from_clist:Nn \l_tmpb_seq {#4}
2972   \int_compare:nNnF {\seq_count:N \l_tmpb_seq} = \l__stex_variables_args_int {
2973     \msg_error:nnxx{stex}{error/seqlength}
2974     {\int_use:N \l__stex_variables_args_int}
2975     {\seq_count:N \l_tmpb_seq}
2976   }
2977   \prop_put:Nnn \l_tmpa_prop {starts} {#3}
2978   \prop_put:Nnn \l_tmpa_prop {ends} {#4}
2979
2980   \cs_generate_from_arg_count:cNnn {stex_varseq\l__stex_variables_name_str _cs}
2981     \cs_set:Npn {\int_use:N \l__stex_variables_args_int} { #5 }
2982
2983   \exp_args:NNo \tl_set:No \l_tmpa_tl {\use:c{stex_varseq\l__stex_variables_name_str _cs}}

```

```

2984 \int_step_inline:nn \l__stex_variables_args_int {
2985   \tl_put_right:Nx \l_tmpa_tl { {\seq_item:Nn \l_tmpa_seq {##1}} }
2986 }
2987 \tl_set:Nx \l_tmpa_tl {\exp_args:NNo \exp_args:No \exp_not:n{\l_tmpa_tl}}
2988 \tl_put_right:Nn \l_tmpa_tl {,\ellipses,}
2989 \tl_if_empty:NF \l__stex_variables_mid_tl {
2990   \tl_put_right:No \l_tmpa_tl \l__stex_variables_mid_tl
2991   \tl_put_right:Nn \l_tmpa_tl {,\ellipses,}
2992 }
2993 \exp_args:NNo \tl_set:No \l_tmpb_tl {\use:c{stex_varseq_\l__stex_variables_name_str _cs}}
2994 \int_step_inline:nn \l__stex_variables_args_int {
2995   \tl_put_right:Nx \l_tmpb_tl { {\seq_item:Nn \l_tmpb_seq {##1}} }
2996 }
2997 \tl_set:Nx \l_tmpb_tl {\exp_args:NNo \exp_args:No \exp_not:n{\l_tmpb_tl}}
2998 \tl_put_right:No \l_tmpa_tl \l_tmpb_tl
2999
3000
3001 \prop_put:Nno \l_tmpa_prop { notation }\l_tmpa_tl
3002
3003 \tl_set:cx {#1} {\stex_invoke_sequence:n {\l__stex_variables_name_str}}
3004
3005 \exp_args:NNo \tl_set:No \l_tmpa_tl {\use:c{stex_varseq_\l__stex_variables_name_str _cs}}
3006
3007 \int_step_inline:nn \l__stex_variables_args_int {
3008   \tl_set:Nx \l_tmpa_tl {\exp_args:No \exp_not:n \l_tmpa_tl {
3009     \stex_term_math_arg:nnn{i##1}{0}{\exp_not:n{####}##1}
3010   }}
3011 }
3012
3013 \tl_set:Nx \l_tmpa_tl {
3014   \stex_term_math_oma:nnnn { varseq://\l__stex_variables_name_str}{0}{
3015     \exp_args:NNo \exp_args:No \exp_not:n {\l_tmpa_tl}
3016   }
3017 }
3018
3019 \tl_set:No \l_tmpa_tl { \exp_after:wN { \l_tmpa_tl \stex_symbol_after_invokation_tl} }
3020
3021 \exp_args:Nno \use:nn {
3022   \cs_generate_from_arg_count:cNnn {stex_varseq_\l__stex_variables_name_str _cs}
3023   \cs_set:Npn {\int_use:N \l__stex_variables_args_int}{\l_tmpa_tl}
3024
3025   \stex_debug:nn{sequences}{New~Sequence:~
3026     \expandafter\meaning\csname stex_varseq_\l__stex_variables_name_str _cs\endcsname\\~\\
3027     \prop_to_keyval:N \l_tmpa_prop
3028   }
3029   \stex_if_do_html:T{\stex_annotate_invisible:nnn{varseq}{\l__stex_variables_name_str}{
3030     \tl_if_empty:NF \l__stex_variables_type_tl {
3031       \stex_annotate:nnn {type}{}{\seqtype\l__stex_variables_type_tl$}
3032     }
3033     \stex_annotate:nnn {args}{\int_use:N \l__stex_variables_args_int}{}
3034     \str_if_empty:NF \l__stex_variables_bind_str {
3035       \stex_annotate:nnn {bindtype}{\l__stex_variables_bind_str}{}
3036     }
3037   }}

```

```
3038
3039 \prop_set_eq:cN {stex_varseq_\l__stex_variables_name_str _prop}\l_tmpa_prop
3040 \ignorespacesandpars
3041 }
3042
3043 </package>
```

Chapter 30

STEX -Terms Implementation

```
3044 <*package>
3045
3046 %%%%%%%%%%% terms.dtx %%%%%%%%%%%
3047
3048 <@@=stex_terms>
3049
3050 Warnings and error messages
3051 \msg_new:nnn{stex}{error/nonotation}{
3052   Symbol~#1~invoked,~but~has~no~notation#2!
3053 }
3054 \msg_new:nnn{stex}{error/notationarg}{
3055   Error~in~parsing~notation~#1
3056 }
3057 \msg_new:nnn{stex}{error/noop}{
3058   Symbol~#1~has~no~operator~notation~for~notation~#2
3059 }
3060 \msg_new:nnn{stex}{error/notallowed}{
3061   Symbol~invocation~#1~not~allowed~in~notation~component~of~#2
3062 }
3063 \msg_new:nnn{stex}{error/doubleargument}{
3064   Argument~#1~of~symbol~#2~already~assigned
3065 }
3066 \msg_new:nnn{stex}{error/overarity}{
3067   Argument~#1~invalid~for~symbol~#2~with~arity~#3
3068 }
```

30.1 Symbol Invocations

`\stex_invoke_symbol:n` Invokes a semantic macro

```
3068
3069
3070 \bool_new:N \l_stex_allow_semantic_bool
3071 \bool_set_true:N \l_stex_allow_semantic_bool
3072
```

```

3073 \cs_new_protected:Nn \stex_invoke_symbol:n {
3074   \bool_if:NTF \l_stex_allow_semantic_bool {
3075     \str_if_eq:eeF {
3076       \prop_item:cn {
3077         l_stex_symdecl_#1_prop
3078       }{ deprecate }
3079     }{}{
3080       \msg_warning:nxxx{stex}{warning/deprecated}{
3081         Symbol~#1
3082       }{
3083         \prop_item:cn {l_stex_symdecl_#1_prop}{ deprecate }
3084       }
3085     }
3086     \if_mode_math:
3087       \exp_after:wN \__stex_terms_invoke_math:n
3088     \else:
3089       \exp_after:wN \__stex_terms_invoke_text:n
3090     \fi: { #1 }
3091   }{
3092     \msg_error:nxxx{stex}{error/notallowed}{#1}{\l_stex_current_symbol_str}
3093   }
3094 }
3095
3096 \cs_new_protected:Nn \__stex_terms_invoke_text:n {
3097   \peek_charcode_remove:NTF ! {
3098     \__stex_terms_invoke_op_custom:nn {#1}
3099   }{
3100     \__stex_terms_invoke_custom:nn {#1}
3101   }
3102 }
3103
3104 \cs_new_protected:Nn \__stex_terms_invoke_math:n {
3105   \peek_charcode_remove:NTF ! {
3106     % operator
3107     \peek_charcode_remove:NTF * {
3108       % custom op
3109       \__stex_terms_invoke_op_custom:nn {#1}
3110     }{
3111       % op notation
3112       \peek_charcode:NTF [ {
3113         \__stex_terms_invoke_op_notation:nw {#1}
3114       }{
3115         \__stex_terms_invoke_op_notation:nw {#1}[]
3116       }
3117     }
3118   }{
3119     \peek_charcode_remove:NTF * {
3120       \__stex_terms_invoke_custom:nn {#1}
3121       % custom
3122     }{
3123       % normal
3124       \peek_charcode:NTF [ {
3125         \__stex_terms_invoke_notation:nw {#1}
3126       }{

```

```

3127     \__stex_terms_invoke_notation:nw {#1}[]
3128   }
3129 }
3130 }
3131 }
3132
3133
3134 \cs_new_protected:Nn \__stex_terms_invoke_op_custom:nn {
3135   \exp_args:Nnx \use:nn {
3136     \def\comp{\_comp}
3137     \str_set:Nn \l_stex_current_symbol_str { #1 }
3138     \bool_set_false:N \l_stex_allow_semantic_bool
3139     \stex_term_oms:nnn {#1}{#1 \c_hash_str CUSTOM-}{
3140       \comp{ #2 }
3141     }
3142   }{
3143     \stex_reset:N \comp
3144     \stex_reset:N \l_stex_current_symbol_str
3145     \bool_set_true:N \l_stex_allow_semantic_bool
3146   }
3147 }
3148
3149 \keys_define:nn { stex / terms } {
3150   % lang .tl_set_x:N = \l_stex_notation_lang_str ,
3151   variant .tl_set_x:N = \l_stex_notation_variant_str ,
3152   unknown .code:n = \str_set:Nx
3153     \l_stex_notation_variant_str \l_keys_key_str
3154 }
3155
3156 \cs_new_protected:Nn \__stex_terms_args:n {
3157   % \str_clear:N \l_stex_notation_lang_str
3158   \str_clear:N \l_stex_notation_variant_str
3159
3160   \keys_set:nn { stex / terms } { #1 }
3161 }
3162
3163 \cs_new_protected:Nn \stex_find_notation:nn {
3164   \__stex_terms_args:n { #2 }
3165   \seq_if_empty:cTF {
3166     l_stex_symdecl_ #1 _notations
3167   } {
3168     \msg_error:nxxx{stex}{error/nonotation}{#1}{s}
3169   } {
3170     \str_if_empty:NTF \l_stex_notation_variant_str {
3171       \seq_get_left:cN {l_stex_symdecl_#1_notations}\l_stex_notation_variant_str
3172     }{
3173       \seq_if_in:cxTF {l_stex_symdecl_#1_notations}{
3174         \l_stex_notation_variant_str
3175       }{
3176         % \str_set:Nx \l_stex_notation_variant_str { \l_stex_notation_variant_str \c_hash_str
3177       }{
3178         \msg_error:nxxx{stex}{error/nonotation}{#1}{
3179           ~\l_stex_notation_variant_str
3180         }
3181       }

```

```

3181     }
3182   }
3183 }
3184 }
3185
3186 \cs_new_protected:Npn \__stex_terms_invoke_op_notation:nw #1 [#2] {
3187   \exp_args:Nnx \use:nn {
3188     \def\comp{\_comp}
3189     \str_set:Nn \l_stex_current_symbol_str { #1 }
3190     \stex_find_notation:nn { #1 }{ #2 }
3191     \bool_set_false:N \l_stex_allow_semantic_bool
3192     \cs_if_exist:cTF {
3193       stex_op_notation_ #1 \c_hash_str \l_stex_notation_variant_str _cs
3194     }{
3195       \_stex_term_oms:nnn { #1 }{
3196         #1 \c_hash_str \l_stex_notation_variant_str
3197       }{
3198         \use:c{stex_op_notation_ #1 \c_hash_str \l_stex_notation_variant_str _cs}
3199       }
3200     }{
3201       \int_compare:nNnTF {\prop_item:cn {\l_stex_symdecl_#1_prop}{arity}} = 0{
3202         \cs_if_exist:cTF {
3203           stex_notation_ #1 \c_hash_str \l_stex_notation_variant_str _cs
3204         }{
3205           \tl_set:Nx \stex_symbol_after_invokation_tl {
3206             \_stex_reset:N \comp
3207             \_stex_reset:N \stex_symbol_after_invokation_tl
3208             \_stex_reset:N \l_stex_current_symbol_str
3209             \bool_set_true:N \l_stex_allow_semantic_bool
3210           }
3211           \def\comp{\_comp}
3212           \str_set:Nn \l_stex_current_symbol_str { #1 }
3213           \bool_set_false:N \l_stex_allow_semantic_bool
3214           \use:c{stex_notation_ #1 \c_hash_str \l_stex_notation_variant_str _cs}
3215         }{
3216           \msg_error:nnxx{stex}{error/nonotation}{#1}{
3217             ~\l_stex_notation_variant_str
3218           }
3219         }
3220       }{
3221         \msg_error:nnxx{stex}{error/noop}{#1}{\l_stex_notation_variant_str}
3222       }
3223     }
3224   }{
3225     \_stex_reset:N \comp
3226     \_stex_reset:N \l_stex_current_symbol_str
3227     \bool_set_true:N \l_stex_allow_semantic_bool
3228   }
3229 }
3230
3231 \cs_new_protected:Npn \__stex_terms_invoke_notation:nw #1 [#2] {
3232   \stex_find_notation:nn { #1 }{ #2 }
3233   \cs_if_exist:cTF {
3234     stex_notation_ #1 \c_hash_str \l_stex_notation_variant_str _cs

```

```

3235 }{
3236   \tl_set:Nx \stex_symbol_after_invokation_tl {
3237     \_stex_reset:N \comp
3238     \_stex_reset:N \stex_symbol_after_invokation_tl
3239     \_stex_reset:N \l_stex_current_symbol_str
3240     \bool_set_true:N \l_stex_allow_semantic_bool
3241   }
3242   \def\comp{\_comp}
3243   \str_set:Nn \l_stex_current_symbol_str { #1 }
3244   \bool_set_false:N \l_stex_allow_semantic_bool
3245   \use:c{stex_notation_ #1 \c_hash_str \l_stex_notation_variant_str _cs}
3246 }{
3247   \msg_error:nnxx{stex}{error/nonotation}{#1}{
3248     ~\l_stex_notation_variant_str
3249   }
3250 }
3251 }
3252
3253 \prop_new:N \l__stex_terms_custom_args_prop
3254
3255 \cs_new_protected:Nn \__stex_terms_invoke_custom:nn {
3256   \exp_args:Nnx \use:nn {
3257     \bool_set_false:N \l_stex_allow_semantic_bool
3258     \def\comp{\_comp}
3259     \str_set:Nn \l_stex_current_symbol_str { #1 }
3260     \prop_clear:N \l__stex_terms_custom_args_prop
3261     \prop_put:Nnn \l__stex_terms_custom_args_prop {currnum} {1}
3262     \prop_get:cnN {
3263       l_stex_symdecl_#1 _prop
3264     }{ args } \l_tmpa_str
3265     \prop_put:Nno \l__stex_terms_custom_args_prop {args} \l_tmpa_str
3266     \tl_set:Nn \arg { \__stex_terms_arg: }
3267     \str_if_empty:NTF \l_tmpa_str {
3268       \_stex_term_oms:nnn {#1}{#1\c_hash_str CUSTOM-}{#2}
3269     }{
3270       \str_if_in:NnTF \l_tmpa_str b {
3271         \_stex_term_ombind:nnn {#1}{#1\c_hash_str CUSTOM-\l_tmpa_str}{#2}
3272       }{
3273         \str_if_in:NnTF \l_tmpa_str B {
3274           \_stex_term_ombind:nnn {#1}{#1\c_hash_str CUSTOM-\l_tmpa_str}{#2}
3275         }{
3276           \_stex_term_oma:nnn {#1}{#1\c_hash_str CUSTOM-\l_tmpa_str}{#2}
3277         }
3278       }
3279     }
3280     % TODO check that all arguments exist
3281   }{
3282     \_stex_reset:N \l_stex_current_symbol_str
3283     \_stex_reset:N \arg
3284     \_stex_reset:N \comp
3285     \_stex_reset:N \l__stex_terms_custom_args_prop
3286     \bool_set_true:N \l_stex_allow_semantic_bool
3287   }
3288 }

```



```

3289
3290 \NewDocumentCommand \__stex_terms_arg: { s O{} m}{
3291   \tl_if_empty:nTF {#2}{
3292     \int_set:Nn \l_tmpa_int {\prop_item:Nn \l__stex_terms_custom_args_prop {currnum}}
3293     \bool_set_true:N \l_tmpa_bool
3294     \bool_do_while:Nn \l_tmpa_bool {
3295       \exp_args:NNx \prop_if_in:NnTF \l__stex_terms_custom_args_prop {\int_use:N \l_tmpa_int
3296         \int_incr:N \l_tmpa_int
3297       }{
3298         \bool_set_false:N \l_tmpa_bool
3299       }
3300     }
3301   }{
3302     \int_set:Nn \l_tmpa_int { #2 }
3303   }
3304   \str_set:Nx \l_tmpa_str {\prop_item:Nn \l__stex_terms_custom_args_prop {args} }
3305   \int_compare:nNnT \l_tmpa_int > {\str_count:N \l_tmpa_str} {
3306     \msg_error:nnxxx{stex}{error/overarity}
3307     {\int_use:N \l_tmpa_int}
3308     {\l_stex_current_symbol_str}
3309     {\str_count:N \l_tmpa_str}
3310   }
3311   \str_set:Nx \l_tmpa_str {\str_item:Nn \l_tmpa_str \l_tmpa_int}
3312   \exp_args:NNx \prop_if_in:NnT \l__stex_terms_custom_args_prop {\int_use:N \l_tmpa_int} {
3313     \bool_lazy_any:nF {
3314       {\str_if_eq_p:Vn \l_tmpa_str {a}}
3315       {\str_if_eq_p:Vn \l_tmpa_str {B}}
3316     }{
3317       \msg_error:nnxx{stex}{error/doubleargument}
3318       {\int_use:N \l_tmpa_int}
3319       {\l_stex_current_symbol_str}
3320     }
3321   }
3322   \exp_args:NNx \prop_put:Nnn \l__stex_terms_custom_args_prop {\int_use:N \l_tmpa_int} {#3}
3323   \bool_set_true:N \l_stex_allow_semantic_bool
3324   \IfBooleanTF#1{
3325     \stex_annotate_invisible:n { %TODO
3326       \exp_args:No \_stex_term_arg:nn {\l_tmpa_str\int_use:N \l_tmpa_int}{#3}
3327     }
3328   }{ %TODO
3329     \exp_args:No \_stex_term_arg:nn {\l_tmpa_str\int_use:N \l_tmpa_int}{#3}
3330   }
3331   \bool_set_false:N \l_stex_allow_semantic_bool
3332 }
3333
3334
3335 \cs_new_protected:Nn \_stex_term_arg:nn {
3336   \bool_set_true:N \l_stex_allow_semantic_bool
3337   \stex_annotate:nnn{ arg }{ #1 }{ #2 }
3338   \bool_set_false:N \l_stex_allow_semantic_bool
3339 }
3340
3341 \cs_new_protected:Nn \_stex_term_math_arg:nnn {
3342   \exp_args:Nnx \use:nn

```

```

3343 { \int_set:Nn \l__stex_terms_downprec { #2 }
3344   \stex_term_arg:nn { #1 }{ #3 }
3345 }
3346 { \int_set:Nn \exp_not:N \l__stex_terms_downprec { \int_use:N \l__stex_terms_downprec }
3347 }

```

(End definition for `\stex_invoke_symbol:n`. This function is documented on page 62.)

`\stex_term_math_assoc_arg:nnnn`

```

3348 \cs_new_protected:Nn \stex_term_math_assoc_arg:nnnn {
3349   \cs_set:Npn \l_tmpa_cs ##1 ##2 { #4 }
3350   \tl_set:Nn \l_tmpb_tl {\stex_term_math_arg:nnn{#1}{#2}}
3351   \exp_args:Nx \tl_if_empty:nTF { \tl_tail:n{ #3 } }{
3352     \expandafter\if\expandafter\relax\noexpand#3
3353     \expandafter\__stex_terms_math_assoc_arg_maybe_sequence:N\expandafter#3
3354     \else\expandafter\__stex_terms_math_assoc_arg_simple:nn
3355     \expandafter{\expandafter}\expandafter#3\fi
3356   }{
3357     \__stex_terms_math_assoc_arg_simple:nn{#1}{#3}
3358   }
3359 }
3360
3361 \cs_new_protected:Nn \__stex_terms_math_assoc_arg_maybe_sequence:N {
3362   \str_set:Nx \l_tmpa_str { \cs_argument_spec:N #1 }
3363   \str_if_empty:NTF \l_tmpa_str {
3364     \exp_args:Nx \cs_if_eq:NNTF {
3365       \tl_head:N #1
3366     } \stex_invoke_sequence:n {
3367       \tl_set:Nx \l_tmpa_tl {\tl_tail:N #1}
3368       \str_set:Nx \l_tmpa_str {\exp_after:wN \use:n \l_tmpa_tl}
3369       \tl_set:Nx \l_tmpa_tl {\prop_item:cn {stex_varseq\l_tmpa_str _prop}{notation}}
3370       \exp_args:NNo \seq_set_from_clist:Nn \l_tmpa_seq \l_tmpa_tl
3371       \tl_set:Nx \l_tmpa_tl {\exp_not:N \exp_not:n{
3372         \exp_not:n{\exp_args:Nnx \use:nn} {
3373           \exp_not:n {
3374             \def\comp{\_varcomp}
3375             \str_set:Nn \l_stex_current_symbol_str
3376             } {varseq://\l_tmpa_str}
3377             \exp_not:n{ ##1 }
3378           }{
3379             \exp_not:n {
3380               \stex_reset:N \comp
3381               \stex_reset:N \l_stex_current_symbol_str
3382             }
3383           }
3384         }}}
3385       \exp_args:Nno \use:nn {\seq_set_map:NNn \l_tmpa_seq \l_tmpa_seq} \l_tmpa_tl
3386       \seq_reverse:N \l_tmpa_seq
3387       \seq_pop:NN \l_tmpa_seq \l_tmpa_tl
3388       \seq_map_inline:Nn \l_tmpa_seq {
3389         \exp_args:NNo \exp_args:NNo \tl_set:N \l_tmpa_tl {
3390           \exp_args:Nno
3391           \l_tmpa_cs { ##1 } \l_tmpa_tl
3392         }

```

```

3393     }
3394     \tl_set:Nx \l_tmpa_tl {
3395         \stex_term_omv:nn {varseq://\l_tmpa_str}{
3396             \exp_args:No \exp_not:n \l_tmpa_tl
3397         }
3398     }
3399     \exp_args:No\l_tmpb_tl\l_tmpa_tl
3400 }{
3401     \__stex_terms_math_assoc_arg_simple:nn{} { #1 }
3402 }
3403 } {
3404     \__stex_terms_math_assoc_arg_simple:nn{} { #1 }
3405 }
3406
3407 }
3408
3409 \cs_new_protected:Nn \__stex_terms_math_assoc_arg_simple:nn {
3410     \clist_set:Nn \l_tmpa_clist{ #2 }
3411     \int_compare:nNnTF { \clist_count:N \l_tmpa_clist } < 2 {
3412         \tl_set:Nn \l_tmpa_tl { #2 }
3413     }{
3414         \clist_reverse:N \l_tmpa_clist
3415         \clist_pop:NN \l_tmpa_clist \l_tmpa_tl
3416         \tl_set:Nx \l_tmpa_tl { \stex_term_arg:nn{A#1}{
3417             \exp_args:No \exp_not:n \l_tmpa_tl
3418         }}
3419         \clist_map_inline:Nn \l_tmpa_clist {
3420             \exp_args:NNNo \exp_args:NNo \tl_set:No \l_tmpa_tl {
3421                 \exp_args:Nno
3422                 \l_tmpa_cs { \stex_term_arg:nn{A#1}{##1} } \l_tmpa_tl
3423             }
3424         }
3425     }
3426     \exp_args:No\l_tmpb_tl\l_tmpa_tl
3427 }

```

(End definition for `\stex_term_math_assoc_arg:nnnn`. This function is documented on page 62.)

30.2 Terms

Precedences:

```

\infprec
\neginfprec
\l__stex_terms_downprec
3428 \tl_const:Nx \infprec {\int_use:N \c_max_int}
3429 \tl_const:Nx \neginfprec {-\int_use:N \c_max_int}
3430 \int_new:N \l__stex_terms_downprec
3431 \int_set_eq:NN \l__stex_terms_downprec \infprec

```

(End definition for `\infprec`, `\neginfprec`, and `\l__stex_terms_downprec`. These variables are documented on page 63.)

Bracketing:

```

\l__stex_terms_left_bracket_str
\l__stex_terms_right_bracket_str
3432 \tl_set:Nn \l__stex_terms_left_bracket_str (
3433 \tl_set:Nn \l__stex_terms_right_bracket_str )

```

(End definition for `\l__stex_terms_left_bracket_str` and `\l__stex_terms_right_bracket_str`.)

`__stex_terms_maybe_brackets:nn` Compares precedences and insert brackets accordingly

```

3434 \cs_new_protected:Nn \__stex_terms_maybe_brackets:nn {
3435   \bool_if:NTF \l__stex_terms_brackets_done_bool {
3436     \bool_set_false:N \l__stex_terms_brackets_done_bool
3437     #2
3438   } {
3439     \int_compare:nNnTF { #1 } > \l__stex_terms_downprec {
3440       \bool_if:NTF \l__stex_inarray_bool { #2 }{
3441         \stex_debug:nn{dobrackets}{\number#1 > \number\l__stex_terms_downprec; \detokenize{#
3442         \dobrackets { #2 }
3443       }
3444     }{ #2 }
3445   }
3446 }
```

(End definition for `__stex_terms_maybe_brackets:nn`.)

`\dobrackets`

```

3447 \bool_new:N \l__stex_terms_brackets_done_bool
3448 %\RequirePackage{scalerel}
3449 \cs_new_protected:Npn \dobrackets #1 {
3450   %\ThisStyle{\if D\m@switch
3451   %   \exp_args:Nnx \use:nn
3452   %   { \exp_after:wN \left\l__stex_terms_left_bracket_str #1 }
3453   %   { \exp_not:N\right\l__stex_terms_right_bracket_str }
3454   % \else
3455   \exp_args:Nnx \use:nn
3456   {
3457     \bool_set_true:N \l__stex_terms_brackets_done_bool
3458     \int_set:Nn \l__stex_terms_downprec \infpref
3459     \l__stex_terms_left_bracket_str
3460     #1
3461   }
3462   {
3463     \bool_set_false:N \l__stex_terms_brackets_done_bool
3464     \l__stex_terms_right_bracket_str
3465     \int_set:Nn \l__stex_terms_downprec { \int_use:N \l__stex_terms_downprec }
3466   }
3467   %\fi}
3468 }
```

(End definition for `\dobrackets`. This function is documented on page 63.)

`\withbrackets`

```

3469 \cs_new_protected:Npn \withbrackets #1 #2 #3 {
3470   \exp_args:Nnx \use:nn
3471   {
3472     \tl_set:Nx \l__stex_terms_left_bracket_str { #1 }
3473     \tl_set:Nx \l__stex_terms_right_bracket_str { #2 }
3474     #3
3475   }
3476   {
```

```

3477 \tl_set:Nn \exp_not:N \l__stex_terms_left_bracket_str
3478 {\l__stex_terms_left_bracket_str}
3479 \tl_set:Nn \exp_not:N \l__stex_terms_right_bracket_str
3480 {\l__stex_terms_right_bracket_str}
3481 }
3482 }

```

(End definition for `\withbrackets`. This function is documented on page 63.)

`\STEXinvisible`

```

3483 \cs_new_protected:Npn \STEXinvisible #1 {
3484 \stex_annotate_invisible:n { #1 }
3485 }

```

(End definition for `\STEXinvisible`. This function is documented on page 63.)

OMDoc terms:

`_stex_term_math_oms:nnnn`

```

3486 \cs_new_protected:Nn \_stex_term_oms:nnn {
3487 \stex_annotate:nnn{ OMID }{ #2 }{
3488 #3
3489 }
3490 }
3491
3492 \cs_new_protected:Nn \_stex_term_math_oms:nnnn {
3493 \__stex_terms_maybe_brackets:nn { #3 }{
3494 \_stex_term_oms:nnn { #1 } { #1\c_hash_str#2 } { #4 }
3495 }
3496 }

```

(End definition for `_stex_term_math_oms:nnnn`. This function is documented on page 62.)

`_stex_term_math_omv:nn`

```

3497 \cs_new_protected:Nn \_stex_term_omv:nn {
3498 \stex_annotate:nnn{ OMV }{ #1 }{
3499 #2
3500 }
3501 }

```

(End definition for `_stex_term_math_omv:nn`. This function is documented on page ??.)

`_stex_term_math_oma:nnnn`

```

3502 \cs_new_protected:Nn \_stex_term_oma:nnn {
3503 \stex_annotate:nnn{ OMA }{ #2 }{
3504 #3
3505 }
3506 }
3507
3508 \cs_new_protected:Nn \_stex_term_math_oma:nnnn {
3509 \__stex_terms_maybe_brackets:nn { #3 }{
3510 \_stex_term_oma:nnn { #1 } { #1\c_hash_str#2 } { #4 }
3511 }
3512 }

```

(End definition for `_stex_term_math_oma:nnnn`. This function is documented on page 62.)

`_stex_term_math_omb:nnnn`

```
3513 \cs_new_protected:Nn \_stex_term_ombind:nnn {
3514   \stex_annotate:nnn{ OMBIND }{ #2 }{
3515     #3
3516   }
3517 }
3518
3519 \cs_new_protected:Nn \_stex_term_math_omb:nnnn {
3520   \__stex_terms_maybe_brackets:nn { #3 }{
3521     \_stex_term_ombind:nnn { #1 } { #1\c_hash_str#2 } { #4 }
3522   }
3523 }
```

(End definition for `_stex_term_math_omb:nnnn`. This function is documented on page 62.)

`\symref`

`\symname`

```
3524 \cs_new:Nn \stex_capitalize:n { \uppercase{#1} }
3525
3526 \keys_define:nn { stex / symname } {
3527   pre      .tl_set_x:N    = \l__stex_terms_pre_tl ,
3528   post     .tl_set_x:N    = \l__stex_terms_post_tl ,
3529   root     .tl_set_x:N    = \l__stex_terms_root_tl
3530 }
3531
3532 \cs_new_protected:Nn \stex_symname_args:n {
3533   \tl_clear:N \l__stex_terms_post_tl
3534   \tl_clear:N \l__stex_terms_pre_tl
3535   \tl_clear:N \l__stex_terms_root_str
3536   \keys_set:nn { stex / symname } { #1 }
3537 }
3538
3539 \NewDocumentCommand \symref { m m }{
3540   \let\compemph_uri_prev:\compemph@uri
3541   \let\compemph@uri\symrefemph@uri
3542   \STEXsymbol{#1}!{ #2 }
3543   \let\compemph@uri\compemph_uri_prev:
3544 }
3545
3546 \NewDocumentCommand \synonym { 0{ } m m }{
3547   \stex_symname_args:n { #1 }
3548   \let\compemph_uri_prev:\compemph@uri
3549   \let\compemph@uri\symrefemph@uri
3550   % TODO
3551   \STEXsymbol{#2}!\l__stex_terms_pre_tl #3 \l__stex_terms_post_tl}
3552   \let\compemph@uri\compemph_uri_prev:
3553 }
3554
3555 \NewDocumentCommand \symname { 0{ } m }{
3556   \stex_symname_args:n { #1 }
3557   \stex_get_symbol:n { #2 }
3558   \str_set:Nx \l_tmpa_str {
3559     \prop_item:cn { l_stex_symdecl_ \l_stex_get_symbol_uri_str _prop } { name }
3560   }
3561   \exp_args:NNno \str_replace_all:Nnn \l_tmpa_str {-} {~}
```

```

3562
3563 \let\compemph_uri_prev:\compemph@uri
3564 \let\compemph@uri\symrefemph@uri
3565 \exp_args:NNx \use:nn
3566 \stex_invoke_symbol:n { { \l_stex_get_symbol_uri_str }!{
3567   \l__stex_terms_pre_tl \l_tmpa_str \l__stex_terms_post_tl
3568 } }
3569 \let\compemph@uri\compemph_uri_prev:
3570 }
3571
3572 \NewDocumentCommand \Symname { 0{ } m }{
3573   \stex_symname_args:n { #1 }
3574   \stex_get_symbol:n { #2 }
3575   \str_set:Nx \l_tmpa_str {
3576     \prop_item:cn { l_stex_symdecl_ \l_stex_get_symbol_uri_str _prop } { name }
3577   }
3578   \exp_args:NNno \str_replace_all:Nnn \l_tmpa_str {-} {~}
3579   \let\compemph_uri_prev:\compemph@uri
3580   \let\compemph@uri\symrefemph@uri
3581   \exp_args:NNx \use:nn
3582   \stex_invoke_symbol:n { { \l_stex_get_symbol_uri_str }!{
3583     \exp_after:wN \stex_capitalize:n \l_tmpa_str
3584     \l__stex_terms_post_tl
3585   } }
3586   \let\compemph@uri\compemph_uri_prev:
3587 }

```

(End definition for `\symref` and `\symname`. These functions are documented on page 62.)

30.3 Notation Components

```

3588 <@@=stex_notationcomps>

\comp
\compemph@uri
\compemph
\defemph
\defemph@uri
\symrefemph
\symrefemph@uri
\varemp
\varemp@uri

3589 \cs_new_protected:Npn \_comp #1 {
3590   \str_if_empty:NF \l_stex_current_symbol_str {
3591     \stex_html_backend:TF {
3592       \stex_annotate:nnn { comp }{ \l_stex_current_symbol_str }{ #1 }
3593     }{
3594       \exp_args:Nnx \compemph@uri { #1 } { \l_stex_current_symbol_str }
3595     }
3596   }
3597 }
3598
3599 \cs_new_protected:Npn \_varcomp #1 {
3600   \str_if_empty:NF \l_stex_current_symbol_str {
3601     \stex_html_backend:TF {
3602       \stex_annotate:nnn { varcomp }{ \l_stex_current_symbol_str }{ #1 }
3603     }{
3604       \exp_args:Nnx \varemp@uri { #1 } { \l_stex_current_symbol_str }
3605     }
3606   }
3607 }
3608

```

```

3609 \def\comp{\_comp}
3610
3611 \cs_new_protected:Npn \compemph@uri #1 #2 {
3612     \compemph{ #1 }
3613 }
3614
3615
3616 \cs_new_protected:Npn \compemph #1 {
3617     #1
3618 }
3619
3620 \cs_new_protected:Npn \defemph@uri #1 #2 {
3621     \defemph{#1}
3622 }
3623
3624 \cs_new_protected:Npn \defemph #1 {
3625     \textbf{#1}
3626 }
3627
3628 \cs_new_protected:Npn \symrefemph@uri #1 #2 {
3629     \symrefemph{#1}
3630 }
3631
3632 \cs_new_protected:Npn \symrefemph #1 {
3633     \textbf{#1}
3634 }
3635
3636 \cs_new_protected:Npn \varempemph@uri #1 #2 {
3637     \varempemph{#1}
3638 }
3639
3640 \cs_new_protected:Npn \varempemph #1 {
3641     #1
3642 }

```

(End definition for `\comp` and others. These functions are documented on page 63.)

`\ellipses`

```

3643 \NewDocumentCommand \ellipses {} { \ldots }

```

(End definition for `\ellipses`. This function is documented on page 63.)

```

\parray
\prmatrix 3644 \bool_new:N \l_stex_inarray_bool
\parrayline 3645 \bool_set_false:N \l_stex_inarray_bool
\parraylineh 3646 \NewDocumentCommand \parray { m m } {
\parraycell 3647     \begingroup
3648     \bool_set_true:N \l_stex_inarray_bool
3649     \begin{array}{#1}
3650         #2
3651     \end{array}
3652     \endgroup
3653 }
3654
3655 \NewDocumentCommand \prmatrix { m } {

```



```

3656 \begingroup
3657 \bool_set_true:N \l_stex_inarray_bool
3658 \begin{matrix}
3659   #1
3660 \end{matrix}
3661 \endgroup
3662 }
3663
3664 \def \maybepline {
3665   \bool_if:NT \l_stex_inarray_bool {\hline}
3666 }
3667
3668 \def \parrayline #1 #2 {
3669   #1 #2 \bool_if:NT \l_stex_inarray_bool {\\\}
3670 }
3671
3672 \def \pmrow #1 { \parrayline{}{ #1 } }
3673
3674 \def \parraylineh #1 #2 {
3675   #1 #2 \bool_if:NT \l_stex_inarray_bool {\\\hline}
3676 }
3677
3678 \def \parraycell #1 {
3679   #1 \bool_if:NT \l_stex_inarray_bool {&}
3680 }

```

(End definition for `\parray` and others. These functions are documented on page ??.)

30.4 Variables

```

3681 <@@=stex_variables>

```

`\stex_invoke_variable:n` Invokes a variable

```

3682 \cs_new_protected:Nn \stex_invoke_variable:n {
3683   \if_mode_math:
3684     \exp_after:wN \__stex_variables_invoke_math:n
3685   \else:
3686     \exp_after:wN \__stex_variables_invoke_text:n
3687   \fi: {#1}
3688 }
3689
3690 \cs_new_protected:Nn \__stex_variables_invoke_text:n {
3691   %TODO
3692 }
3693
3694
3695 \cs_new_protected:Nn \__stex_variables_invoke_math:n {
3696   \peek_charcode_remove:NTF ! {
3697     \peek_charcode_remove:NTF ! {
3698       \peek_charcode:NTF [ {
3699         \__stex_variables_invoke_op_custom:nw
3700       }{
3701         % TODO throw error
3702       }

```

```

3703     }{
3704       \__stex_variables_invoke_op:n { #1 }
3705     }
3706   }{
3707     \peek_charcode_remove:NTF * {
3708       \__stex_variables_invoke_text:n { #1 }
3709     }{
3710       \__stex_variables_invoke_math_ii:n { #1 }
3711     }
3712   }
3713 }
3714
3715 \cs_new_protected:Nn \__stex_variables_invoke_op:n {
3716   \cs_if_exist:cTF {
3717     stex_var_op_notation_ #1 _cs
3718   }{
3719     \exp_args:Nnx \use:nn {
3720       \def\comp{\_varcomp}
3721       \str_set:Nn \l_stex_current_symbol_str { var://#1 }
3722       \_stex_term_omv:nn { var://#1 }{
3723         \use:c{stex_var_op_notation_ #1 _cs }
3724       }
3725     }{
3726       \_stex_reset:N \comp
3727       \_stex_reset:N \l_stex_current_symbol_str
3728     }
3729   }{
3730     \int_compare:nNnTF {\prop_item:cn {l_stex_variable_#1_prop}{arity}} = 0{
3731       \__stex_variables_invoke_math_ii:n {#1}
3732     }{
3733       \msg_error:nxxx{stex}{error/noop}{variable~#1}{}
3734     }
3735   }
3736 }
3737
3738 \cs_new_protected:Npn \__stex_variables_invoke_math_ii:n #1 {
3739   \cs_if_exist:cTF {
3740     stex_var_notation_#1_cs
3741   }{
3742     \tl_set:Nx \stex_symbol_after_invokation_tl {
3743       \_stex_reset:N \comp
3744       \_stex_reset:N \stex_symbol_after_invokation_tl
3745       \_stex_reset:N \l_stex_current_symbol_str
3746       \bool_set_true:N \l_stex_allow_semantic_bool
3747     }
3748     \def\comp{\_varcomp}
3749     \str_set:Nn \l_stex_current_symbol_str { var://#1 }
3750     \bool_set_false:N \l_stex_allow_semantic_bool
3751     \use:c{stex_var_notation_#1_cs}
3752   }{
3753     \msg_error:nxxx{stex}{error/nonotation}{variable~#1}{s}
3754   }
3755 }

```

(End definition for `\stex_invoke_variable:n`. This function is documented on page ??.)

30.5 Sequences

```

3756 <@@=stex_sequences>
3757
3758 \cs_new_protected:Nn \stex_invoke_sequence:n {
3759   \peek_charcode_remove:NTF ! {
3760     \_stex_term_omv:nn {varseq://#1}{
3761       \exp_args:Nnx \use:nn {
3762         \def\comp{\_varcomp}
3763         \str_set:Nn \l_stex_current_symbol_str {varseq://#1}
3764         \prop_item:cn{stex_varseq_#1_prop}{notation}
3765       }{
3766         \_stex_reset:N \comp
3767         \_stex_reset:N \l_stex_current_symbol_str
3768       }
3769     }
3770   }{
3771     \bool_set_false:N \l_stex_allow_semantic_bool
3772     \def\comp{\_varcomp}
3773     \str_set:Nn \l_stex_current_symbol_str {varseq://#1}
3774     \tl_set:Nx \stex_symbol_after_invokation_tl {
3775       \_stex_reset:N \comp
3776       \_stex_reset:N \stex_symbol_after_invokation_tl
3777       \_stex_reset:N \l_stex_current_symbol_str
3778       \bool_set_true:N \l_stex_allow_semantic_bool
3779     }
3780     \use:c { stex_varseq_#1_cs }
3781   }
3782 }
3783 </package>

```

Chapter 31

STEX -Structural Features Implementation

```
3784 <*package>
3785
3786 %%%%%%%%%%% features.dtx %%%%%%%%%%%
3787
    Warnings and error messages
3788 \msg_new:nnn{stex}{error/copymodule/notallowed}{
3789     Symbol~#1~can~not~be~assigned~in~copymodule~#2
3790 }
3791 \msg_new:nnn{stex}{error/interpretmodule/nodfiniens}{
3792     Symbol~#1~not~assigned~in~interpretmodule~#2
3793 }
3794
3795 \msg_new:nnn{stex}{error/unknownstructure}{
3796     No~structure~#1~found!
3797 }
3798
3799 \msg_new:nnn{stex}{error/unknownfield}{
3800     No~field~#1~in~instance~#2~found!\#3
3801 }
3802
3803 \msg_new:nnn{stex}{error/keyval}{
3804     Invalid~key=value~pair~#1
3805 }
3806 \msg_new:nnn{stex}{error/instantiate/missing}{
3807     Assignments~missing~in~instantiate:~#1
3808 }
3809 \msg_new:nnn{stex}{error/incompatible}{
3810     Incompatible~signature:~#1~(#2)~and~#3~(#4)
3811 }
3812
```

31.1 Imports with modification

```

3813 <@@=stex_copymodule>
3814 \cs_new_protected:Nn \stex_get_symbol_in_seq:nn {
3815   \tl_if_head_eq_catcode:nNTF { #1 } \relax {
3816     \tl_set:Nn \l_tmpa_tl { #1 }
3817     \__stex_copymodule_get_symbol_from_cs:
3818   }{
3819     % argument is a string
3820     % is it a command name?
3821     \cs_if_exist:cTF { #1 }{
3822       \cs_set_eq:Nc \l_tmpa_tl { #1 }
3823       \str_set:Nx \l_tmpa_str { \cs_argument_spec:N \l_tmpa_tl }
3824       \str_if_empty:NTF \l_tmpa_str {
3825         \exp_args:Nx \cs_if_eq:NNTF {
3826           \tl_head:N \l_tmpa_tl
3827         } \stex_invoke_symbol:n {
3828           \__stex_copymodule_get_symbol_from_cs:n{ #2 }
3829         }{
3830           \__stex_copymodule_get_symbol_from_string:nn { #1 }{ #2 }
3831         }
3832       } {
3833         \__stex_copymodule_get_symbol_from_string:nn { #1 }{ #2 }
3834       }
3835     }{
3836       % argument is not a command name
3837       \__stex_copymodule_get_symbol_from_string:nn { #1 }{ #2 }
3838       % \l_stex_all_symbols_seq
3839     }
3840   }
3841 }
3842
3843 \cs_new_protected:Nn \__stex_copymodule_get_symbol_from_string:nn {
3844   \str_set:Nn \l_tmpa_str { #1 }
3845   \bool_set_false:N \l_tmpa_bool
3846   \bool_if:NF \l_tmpa_bool {
3847     \tl_set:Nn \l_tmpa_tl {
3848       \msg_error:nnn{stex}{error/unknownsymbol}{#1}
3849     }
3850     \str_set:Nn \l_tmpa_str { #1 }
3851     \int_set:Nn \l_tmpa_int { \str_count:N \l_tmpa_str }
3852     \seq_map_inline:Nn #2 {
3853       \str_set:Nn \l_tmpb_str { ##1 }
3854       \str_if_eq:eeT { \l_tmpa_str } {
3855         \str_range:Nnn \l_tmpb_str { -\l_tmpa_int } { -1 }
3856       } {
3857         \seq_map_break:n {
3858           \tl_set:Nn \l_tmpa_tl {
3859             \str_set:Nn \l_stex_get_symbol_uri_str {
3860               ##1
3861             }
3862           }
3863         }
3864       }

```

```

3865     }
3866     \l_tmpa_tl
3867   }
3868 }
3869
3870 \cs_new_protected:Nn \__stex_copymodule_get_symbol_from_cs:n {
3871   \exp_args:NNx \tl_set:Nn \l_tmpa_tl
3872     { \tl_tail:N \l_tmpa_tl }
3873   \tl_if_single:NTF \l_tmpa_tl {
3874     \exp_args:No \tl_if_head_is_group:nTF \l_tmpa_tl {
3875       \exp_after:wN \str_set:Nn \exp_after:wN
3876         \l_stex_get_symbol_uri_str \l_tmpa_tl
3877       \__stex_copymodule_get_symbol_check:n { #1 }
3878     }{
3879       % TODO
3880       % tail is not a single group
3881     }
3882   }{
3883     % TODO
3884     % tail is not a single group
3885   }
3886 }
3887
3888 \cs_new_protected:Nn \__stex_copymodule_get_symbol_check:n {
3889   \exp_args:NNx \seq_if_in:NnF #1 \l_stex_get_symbol_uri_str {
3890     \msg_error:nxxx{stex}{error/copymodule/notallowed}{\l_stex_get_symbol_uri_str}{
3891       :~\seq_use:Nn #1 {,~}
3892     }
3893   }
3894 }
3895
3896 \cs_new_protected:Nn \stex_copymodule_start:nnnn {
3897   % import module
3898   \stex_import_module_uri:nn { #1 } { #2 }
3899   \str_set:Nx \l_stex_current_copymodule_name_str {#3}
3900   \stex_import_require_module:nnnn
3901     { \l_stex_import_ns_str } { \l_stex_import_archive_str }
3902     { \l_stex_import_path_str } { \l_stex_import_name_str }
3903
3904   \stex_collect_imports:n {\l_stex_import_ns_str ?\l_stex_import_name_str }
3905   \seq_set_eq:NN \l__stex_copymodule_copymodule_modules_seq \l_stex_collect_imports_seq
3906
3907   % fields
3908   \seq_clear:N \l__stex_copymodule_copymodule_fields_seq
3909   \seq_map_inline:Nn \l__stex_copymodule_copymodule_modules_seq {
3910     \seq_map_inline:cn {c_stex_module_##1_constants}{
3911       \exp_args:NNx \seq_put_right:Nn \l__stex_copymodule_copymodule_fields_seq {
3912         ##1 ? ####1
3913       }
3914     }
3915   }
3916
3917   % setup prop
3918   \seq_clear:N \l_tmpa_seq

```

```

3919 \exp_args:Nn \prop_set_from_keyval:Nn \l_stex_current_copymodule_prop {
3920   name      = \l_stex_current_copymodule_name_str ,
3921   module    = \l_stex_current_module_str ,
3922   from      = \l_stex_import_ns_str ?\l_stex_import_name_str ,
3923   includes  = \l_tmpa_seq %,
3924 % fields    = \l_tmpa_seq
3925 }
3926 \stex_debug:nn{copymodule}{#4~for~module~{\l_stex_import_ns_str ?\l_stex_import_name_str}
3927   as~\l_stex_current_module_str?\l_stex_current_copymodule_name_str}
3928 \stex_debug:nn{copymodule}{modules:\seq_use:Nn \l__stex_copymodule_copymodule_modules_seq {,
3929 \stex_debug:nn{copymodule}{fields:\seq_use:Nn \l__stex_copymodule_copymodule_fields_seq {,
3930
3931 \stex_if_do_html:T {
3932   \begin{stex_annotate_env} {#4} {
3933     \l_stex_current_module_str?\l_stex_current_copymodule_name_str
3934   }
3935   \stex_annotate_invisible:nnn{domain}{\l_stex_import_ns_str ?\l_stex_import_name_str}{}
3936 }
3937 }
3938
3939 \cs_new_protected:Nn \stex_copymodule_end:n {
3940   % apply to every field
3941   \def \l_tmpa_cs ##1 ##2 {#1}
3942
3943   \tl_clear:N \__stex_copymodule_module_tl
3944   \tl_clear:N \__stex_copymodule_exec_tl
3945
3946   %\prop_get:NnN \l_stex_current_copymodule_prop {fields} \l_tmpa_seq
3947   \seq_clear:N \__stex_copymodule_fields_seq
3948
3949   \seq_map_inline:Nn \l__stex_copymodule_copymodule_modules_seq {
3950     \seq_map_inline:cn {c_stex_module_##1_constants}{
3951
3952       \tl_clear:N \__stex_copymodule_curr_symbol_tl % <- wrap in current symbol html
3953       \l_tmpa_cs{##1}{####1}
3954
3955       \str_if_exist:cTF {l__stex_copymodule_copymodule_##1?####1_name_str} {
3956         \str_set_eq:Nc \__stex_copymodule_curr_name_str {l__stex_copymodule_copymodule_##1?####1_name_str}
3957         \stex_if_do_html:T {
3958           \tl_put_right:Nx \__stex_copymodule_curr_symbol_tl {
3959             \stex_annotate_invisible:nnn{alias}{\use:c{l__stex_copymodule_copymodule_##1?####1_name_str}}
3960           }
3961         }
3962       }{
3963         \str_set:Nx \__stex_copymodule_curr_name_str { \l_stex_current_copymodule_name_str /
3964       }
3965
3966       \prop_set_eq:Nc \l_tmpa_prop {l_stex_symdecl_ ##1?####1_prop}
3967       \prop_put:Nnx \l_tmpa_prop { name } \__stex_copymodule_curr_name_str
3968       \prop_put:Nnx \l_tmpa_prop { module } \l_stex_current_module_str
3969
3970       \tl_if_exist:cT {l__stex_copymodule_copymodule_##1?####1_def_tl}{
3971         \stex_if_do_html:T {
3972           \tl_put_right:Nx \__stex_copymodule_curr_symbol_tl {

```

```

3973         $\stex_annotate_invisible:nnn{definiens}{\exp_after:wN \exp_not:N\csname l__st
3974     }
3975 }
3976 \prop_put:Nnn \l_tmpa_prop { defined } { true }
3977 }
3978
3979 \stex_add_constant_to_current_module:n \__stex_copymodule_curr_name_str
3980 \tl_put_right:Nx \__stex_copymodule_module_tl {
3981     \seq_clear:c {l_stex_symdecl_ \l_stex_current_module_str ? \__stex_copymodule_curr_n
3982     \prop_set_from_keyval:cn {
3983         l_stex_symdecl_ \l_stex_current_module_str ? \__stex_copymodule_curr_name_str _prop
3984     }{
3985         \prop_to_keyval:N \l_tmpa_prop
3986     }
3987 }
3988
3989 \str_if_exist:cT {l__stex_copymodule_copymodule_##1?####1_macroname_str} {
3990     \stex_if_do_html:T {
3991         \tl_put_right:Nx \__stex_copymodule_curr_symbol_tl {
3992             \stex_annotate_invisible:nnn{macroname}{\use:c{l__stex_copymodule_copymodule_##1
3993         }
3994     }
3995     \tl_put_right:Nx \__stex_copymodule_module_tl {
3996         \tl_set:cx {\use:c{l__stex_copymodule_copymodule_##1?####1_macroname_str}}{
3997             \stex_invoke_symbol:n {
3998                 \l_stex_current_module_str ? \__stex_copymodule_curr_name_str
3999             }
4000         }
4001     }
4002 }
4003
4004 \seq_put_right:Nx \__stex_copymodule_fields_seq {\l_stex_current_module_str ? \__stex_
4005
4006 \tl_put_right:Nx \__stex_copymodule_exec_tl {
4007     \stex_copy_notations:nn {\l_stex_current_module_str ? \__stex_copymodule_curr_name_s
4008 }
4009
4010 \tl_put_right:Nx \__stex_copymodule_exec_tl {
4011     \stex_if_do_html:TF{
4012         \stex_annotate_invisible:nnn{assignment} {##1?####1} { \exp_after:wN \exp_not:n \e
4013     }{
4014         \exp_after:wN \exp_not:n \exp_after:wN {\__stex_copymodule_curr_symbol_tl}
4015     }
4016 }
4017 }
4018 }
4019
4020
4021 \prop_put:Nno \l_stex_current_copymodule_prop {fields} \__stex_copymodule_fields_seq
4022 \tl_put_left:Nx \__stex_copymodule_module_tl {
4023     \prop_set_from_keyval:cn {
4024         l_stex_copymodule_ \l_stex_current_module_str?\l_stex_current_copymodule_name_str _pro
4025     }{
4026         \prop_to_keyval:N \l_stex_current_copymodule_prop

```



```

4027   }
4028 }
4029
4030 \seq_gput_right:cx{c_stex_module_\l_stex_current_module_str _copymodules}{
4031   \l_stex_current_module_str?\l_stex_current_copymodule_name_str
4032 }
4033
4034 \exp_args:No \stex_execute_in_module:n \__stex_copymodule_module_tl
4035 \stex_debug:nn{copymodule}{result:\meaning \__stex_copymodule_module_tl}
4036 \stex_debug:nn{copymodule}{output:\meaning \__stex_copymodule_exec_tl}
4037
4038 \__stex_copymodule_exec_tl
4039 \stex_if_do_html:T {
4040   \end{stex_annotate_env}
4041 }
4042 }
4043
4044 \NewDocumentEnvironment {copymodule} { 0{} m m}{
4045   \stex_copymodule_start:nnnn { #1 }{ #2 }{ #3 }{ copymodule }
4046   \stex_deactivate_macro:Nn \symdecl {module~environments}
4047   \stex_deactivate_macro:Nn \symdef {module~environments}
4048   \stex_deactivate_macro:Nn \notation {module~environments}
4049   \stex_reactivate_macro:N \assign
4050   \stex_reactivate_macro:N \renamedekl
4051   \stex_reactivate_macro:N \donotcopy
4052   \stex_smsmode_do:
4053 }{
4054   \stex_copymodule_end:n {}
4055 }
4056
4057 \NewDocumentEnvironment {interpretmodule} { 0{} m m}{
4058   \stex_copymodule_start:nnnn { #1 }{ #2 }{ #3 }{ interpretmodule }
4059   \stex_deactivate_macro:Nn \symdecl {module~environments}
4060   \stex_deactivate_macro:Nn \symdef {module~environments}
4061   \stex_deactivate_macro:Nn \notation {module~environments}
4062   \stex_reactivate_macro:N \assign
4063   \stex_reactivate_macro:N \renamedekl
4064   \stex_reactivate_macro:N \donotcopy
4065   \stex_smsmode_do:
4066 }{
4067   \stex_copymodule_end:n {
4068     \tl_if_exist:cF {
4069       l__stex_copymodule_copymodule_##1?##2_def_tl
4070     }{
4071       \str_if_eq:eeF {
4072         \prop_item:cn{
4073           l_stex_symdecl_ ##1 ? ##2 _prop }{ defined }
4074         }{ true }{
4075           \msg_error:nxxx{stex}{error/interpretmodule/nodéfiniens}{
4076             ##1?##2
4077           }{\l_stex_current_copymodule_name_str}
4078         }
4079       }
4080     }

```

```

4081 }
4082
4083 \iffalse \begin{stex_annotate_env} \fi
4084 \NewDocumentEnvironment {realization} { 0 } { m } {
4085   \stex_copymodule_start:nnnn { #1 } { #2 } { #2 } { realize }
4086   \stex_deactivate_macro:Nn \symdecl {module~environments}
4087   \stex_deactivate_macro:Nn \symdef {module~environments}
4088   \stex_deactivate_macro:Nn \notation {module~environments}
4089   \stex_reactivate_macro:N \donotcopy
4090   \stex_reactivate_macro:N \assign
4091   \stex_smsmode_do:
4092 } {
4093   \stex_import_module_uri:nn { #1 } { #2 }
4094   \tl_clear:N \__stex_copymodule_exec_tl
4095   \tl_set:Nx \__stex_copymodule_module_tl {
4096     \stex_import_require_module:nnnn
4097     { \l_stex_import_ns_str } { \l_stex_import_archive_str }
4098     { \l_stex_import_path_str } { \l_stex_import_name_str }
4099   }
4100
4101   \seq_map_inline:Nn \l__stex_copymodule_copymodule_modules_seq {
4102     \seq_map_inline:cn {c_stex_module_##1_constants}{
4103       \str_set:Nx \__stex_copymodule_curr_name_str { \l_stex_current_copymodule_name_str / #1 }
4104       \tl_if_exist:cT {l__stex_copymodule_copymodule_##1?###1_def_tl}{
4105         \stex_if_do_html:T {
4106           \tl_put_right:Nx \__stex_copymodule_exec_tl {
4107             \stex_annotate_invisible:nnn{assignment} {##1?###1} {
4108               $\stex_annotate_invisible:nnn{definien}{}{\exp_after:wN \exp_not:N\csname l__
4109             }
4110           }
4111         }
4112         \tl_put_right:Nx \__stex_copymodule_module_tl {
4113           \prop_put:cnn {l_stex_symdecl_##1?###1_prop}{ defined }{ true }
4114         }
4115       }
4116     }
4117
4118   \exp_args:No \stex_execute_in_module:n \__stex_copymodule_module_tl
4119
4120   \__stex_copymodule_exec_tl
4121   \stex_if_do_html:T {\end{stex_annotate_env}}
4122 }
4123
4124 \NewDocumentCommand \donotcopy { m } {
4125   \str_clear:N \l_stex_import_name_str
4126   \str_set:Nn \l_tmpa_str { #1 }
4127   \int_set:Nn \l_tmpa_int { \str_count:N \l_tmpa_str }
4128   \seq_map_inline:Nn \l_stex_all_modules_seq {
4129     \str_set:Nn \l_tmpb_str { ##1 }
4130     \str_if_eq:eeT { \l_tmpa_str } {
4131       \str_range:Nnn \l_tmpb_str { -\l_tmpa_int } { -1 }
4132     } {
4133       \seq_map_break:n {
4134         \stex_if_do_html:T {

```

```

4135         \stex_if_smsmode:F {
4136             \stex_annotate_invisible:nnn{donotcopy}{##1}{
4137                 \stex_annotate:nnn{domain}{##1}{}}
4138         }
4139     }
4140 }
4141 \str_set_eq:NN \l_stex_import_name_str \l_tmpb_str
4142 }
4143 }
4144 \seq_map_inline:cn {c_stex_module_###1_copymodules}{
4145     \str_set:Nn \l_tmpb_str { #####1 }
4146     \str_if_eq:eeT { \l_tmpa_str } {
4147         \str_range:Nnn \l_tmpb_str { -\l_tmpa_int } { -1 }
4148     } {
4149         \seq_map_break:n {\seq_map_break:n {
4150             \stex_if_do_html:T {
4151                 \stex_if_smsmode:F {
4152                     \stex_annotate_invisible:nnn{donotcopy}{#####1}{
4153                         \stex_annotate:nnn{domain}{
4154                             \prop_item:cn {l_stex_copymodule_ #####1 _prop}{module}
4155                         }{}
4156                     }
4157                 }
4158             }
4159             \str_set:Nx \l_stex_import_name_str {
4160                 \prop_item:cn {l_stex_copymodule_ #####1 _prop}{module}
4161             }
4162         }}
4163     }
4164 }
4165 }
4166 \str_if_empty:NTF \l_stex_import_name_str {
4167     % TODO throw error
4168 }{
4169     \stex_collect_imports:n {\l_stex_import_name_str }
4170     \seq_map_inline:Nn \l_stex_collect_imports_seq {
4171         \seq_remove_all:Nn \l__stex_copymodule_copymodule_modules_seq { ##1 }
4172         \seq_map_inline:cn {c_stex_module_###1_constants}{
4173             \seq_remove_all:Nn \l__stex_copymodule_copymodule_fields_seq { ##1 ? #####1 }
4174             \bool_lazy_any:nT {
4175                 { \cs_if_exist_p:c {l__stex_copymodule_copymodule_###1?#####1_name_str}}
4176                 { \cs_if_exist_p:c {l__stex_copymodule_copymodule_###1?#####1_macroname_str}}
4177                 { \cs_if_exist_p:c {l__stex_copymodule_copymodule_###1?#####1_def_tl}}
4178             }{
4179                 % TODO throw error
4180             }
4181         }
4182     }
4183     \prop_get:NnN \l_stex_current_copymodule_prop { includes } \l_tmpa_seq
4184     \seq_put_right:Nx \l_tmpa_seq {\l_stex_import_name_str }
4185     \prop_put:Nno \l_stex_current_copymodule_prop {includes} \l_tmpa_seq
4186 }
4187 \stex_smsmode_do:
4188 }

```

```

4189
4190 \NewDocumentCommand \assign { m m }{
4191   \stex_get_symbol_in_seq:nn {#1} \l__stex_copymodule_copymodule_fields_seq
4192   \stex_debug:nn{assign}{defining~{\l_stex_get_symbol_uri_str}~as~\detokenize{#2}}
4193   \tl_set:cn {l__stex_copymodule_copymodule_\l_stex_get_symbol_uri_str_def_tl}{#2}
4194   \stex_smsmode_do:
4195 }
4196
4197 \keys_define:nn { stex / renamedecl } {
4198   name          .str_set_x:N = \l_stex_renamedecl_name_str
4199 }
4200 \cs_new_protected:Nn \__stex_copymodule_renamedecl_args:n {
4201   \str_clear:N \l_stex_renamedecl_name_str
4202   \keys_set:nn { stex / renamedecl } { #1 }
4203 }
4204
4205 \NewDocumentCommand \renamedecl { O{} m m }{
4206   \__stex_copymodule_renamedecl_args:n { #1 }
4207   \stex_get_symbol_in_seq:nn {#2} \l__stex_copymodule_copymodule_fields_seq
4208   \stex_debug:nn{renamedecl}{renaming~{\l_stex_get_symbol_uri_str}~to~#3}
4209   \str_set:cx {l__stex_copymodule_copymodule_\l_stex_get_symbol_uri_str_macroname_str}{#3}
4210   \str_if_empty:NTF \l_stex_renamedecl_name_str {
4211     \tl_set:cx { #3 }{ \stex_invoke_symbol:n {
4212       \l_stex_get_symbol_uri_str
4213     } }
4214   } {
4215     \str_set:cx {l__stex_copymodule_copymodule_\l_stex_get_symbol_uri_str_name_str}{\l_stex
4216       \stex_debug:nn{renamedecl}{@~\l_stex_current_module_str ? \l_stex_renamedecl_name_str}
4217       \prop_set_eq:cc {l_stex_symdecl_
4218         \l_stex_current_module_str ? \l_stex_renamedecl_name_str
4219         _prop
4220       }{l_stex_symdecl_ \l_stex_get_symbol_uri_str_prop}
4221       \seq_set_eq:cc {l_stex_symdecl_
4222         \l_stex_current_module_str ? \l_stex_renamedecl_name_str
4223         _notations
4224       }{l_stex_symdecl_ \l_stex_get_symbol_uri_str_notations}
4225       \prop_put:cnx {l_stex_symdecl_
4226         \l_stex_current_module_str ? \l_stex_renamedecl_name_str
4227         _prop
4228       }{ name }{ \l_stex_renamedecl_name_str }
4229       \prop_put:cnx {l_stex_symdecl_
4230         \l_stex_current_module_str ? \l_stex_renamedecl_name_str
4231         _prop
4232       }{ module }{ \l_stex_current_module_str }
4233       \exp_args:NNx \seq_put_left:Nn \l__stex_copymodule_copymodule_fields_seq {
4234         \l_stex_current_module_str ? \l_stex_renamedecl_name_str
4235       }
4236       \tl_set:cx { #3 }{ \stex_invoke_symbol:n {
4237         \l_stex_current_module_str ? \l_stex_renamedecl_name_str
4238       } }
4239     }
4240   \stex_smsmode_do:
4241 }
4242

```

```

4243 \stex_deactivate_macro:Nn \assign {copymodules}
4244 \stex_deactivate_macro:Nn \renamedekl {copymodules}
4245 \stex_deactivate_macro:Nn \donotcopy {copymodules}
4246
4247

```

31.2 The feature environment

structural@feature

```

4248 <@@=stex_features>
4249
4250 \NewDocumentEnvironment{structural_feature_module}{ m m m }{
4251   \stex_if_in_module:F {
4252     \msg_set:nnn{stex}{error/nomodule}{
4253       Structural~Feature~has~to~occur~in~a~module:\\
4254       Feature~#2~of~type~#1\\
4255       In~File:~\stex_path_to_string:N \g_stex_currentfile_seq
4256     }
4257     \msg_error:nn{stex}{error/nomodule}
4258   }
4259
4260   \str_set_eq:NN \l_stex_feature_parent_str \l_stex_current_module_str
4261
4262   \stex_module_setup:nn{meta=NONE}{#2 - #1}
4263
4264   \stex_if_do_html:T {
4265     \begin{stex_annotate_env}{ feature:#1 }{\l_stex_feature_parent_str ? #2 - #1}
4266     \stex_annotate_invisible:nnn{header}{}{ #3 }
4267   }
4268   ){
4269     \str_gset_eq:NN \l_stex_last_feature_str \l_stex_current_module_str
4270     \prop_gput:cnn {c_stex_module_ \l_stex_current_module_str _prop}{feature}{#1}
4271     \stex_debug:nn{features}{
4272       Feature: \l_stex_last_feature_str
4273     }
4274     \stex_if_do_html:T {
4275       \end{stex_annotate_env}
4276     }
4277   }

```

31.3 Structure

structure

```

4278 <@@=stex_structures>
4279 \cs_new_protected:Nn \stex_add_structure_to_current_module:nn {
4280   \prop_if_exist:cF {c_stex_module_ \l_stex_current_module_str _structures}{
4281     \prop_new:c {c_stex_module_ \l_stex_current_module_str _structures}
4282   }
4283   \prop_gput:cxn{c_stex_module_ \l_stex_current_module_str _structures}
4284   {#1}{#2}
4285 }
4286

```

```

4287 \keys_define:nn { stex / features / structure } {
4288   name          .str_set_x:N = \l__stex_structures_name_str ,
4289 }
4290
4291 \cs_new_protected:Nn \__stex_structures_structure_args:n {
4292   \str_clear:N \l__stex_structures_name_str
4293   \keys_set:nn { stex / features / structure } { #1 }
4294 }
4295
4296 \NewDocumentEnvironment{mathstructure}{m O{}}{
4297   \__stex_structures_structure_args:n { #2 }
4298   \str_if_empty:NT \l__stex_structures_name_str {
4299     \str_set:Nx \l__stex_structures_name_str { #1 }
4300   }
4301   \stex_suppress_html:n {
4302     \exp_args:Nx \stex_symdecl_do:nn {
4303       name = \l__stex_structures_name_str ,
4304       def = {\STEXsymbol{module-type}}{
4305         \stex_term_math_oms:nnnn {
4306           \prop_item:cn {c_stex_module_\l_stex_current_module_str _prop}
4307             { ns } ?
4308           \prop_item:cn {c_stex_module_\l_stex_current_module_str _prop}
4309             { name } / \l__stex_structures_name_str - structure
4310         }{}{0}{}
4311       }}
4312     }{ #1 }
4313   }
4314   \exp_args:Nnnx
4315   \begin{structural_feature_module}{ structure }
4316     { \l__stex_structures_name_str }{}
4317   \stex_smsmode_do:
4318 }{
4319   \end{structural_feature_module}
4320   \stex_reset_up_to_module:n \l_stex_last_feature_str
4321   \exp_args:No \stex_collect_imports:n \l_stex_last_feature_str
4322   \seq_clear:N \l_tmpa_seq
4323   \seq_map_inline:Nn \l_stex_collect_imports_seq {
4324     \seq_map_inline:cn{c_stex_module_##1_constants}{
4325       \seq_put_right:Nn \l_tmpa_seq { ##1 ? ###1 }
4326     }
4327   }
4328   \exp_args:Nnno
4329   \prop_gput:cnn {c_stex_module_\l_stex_last_feature_str _prop}{fields}\l_tmpa_seq
4330   \stex_debug:nn{structure}{Fields:~\seq_use:Nn \l_tmpa_seq ,}
4331   \stex_add_structure_to_current_module:nn
4332     \l__stex_structures_name_str
4333     \l_stex_last_feature_str
4334
4335   \stex_execute_in_module:x {
4336     \tl_set:cn { #1 }{
4337       \exp_not:N \stex_invoke_structure:nn {\l_stex_current_module_str }{ \l__stex_structures
4338     }
4339   }
4340 }

```

```

4341
4342 \cs_new:Nn \stex_invoke_structure:nn {
4343   \stex_invoke_symbol:n { #1?#2 }
4344 }
4345
4346 \cs_new_protected:Nn \stex_get_structure:n {
4347   \tl_if_head_eq_catcode:nNTF { #1 } \relax {
4348     \tl_set:Nn \l_tmpa_tl { #1 }
4349     \__stex_structures_get_from_cs:
4350   }{
4351     \cs_if_exist:cTF { #1 }{
4352       \cs_set_eq:Nc \l_tmpa_cs { #1 }
4353       \str_set:Nx \l_tmpa_str {\cs_argument_spec:N \l_tmpa_cs }
4354       \str_if_empty:NNTF \l_tmpa_str {
4355         \cs_if_eq:NNTF { \tl_head:N \l_tmpa_cs } \stex_invoke_structure:nn {
4356           \__stex_structures_get_from_cs:
4357         }{
4358           \__stex_structures_get_from_string:n { #1 }
4359         }
4360       }{
4361         \__stex_structures_get_from_string:n { #1 }
4362       }
4363     }{
4364       \__stex_structures_get_from_string:n { #1 }
4365     }
4366   }
4367 }
4368
4369 \cs_new_protected:Nn \__stex_structures_get_from_cs: {
4370   \exp_args:NNx \tl_set:Nn \l_tmpa_tl
4371     { \tl_tail:N \l_tmpa_tl }
4372   \str_set:Nx \l_tmpa_str {
4373     \exp_after:wN \use_i:nn \l_tmpa_tl
4374   }
4375   \str_set:Nx \l_tmpb_str {
4376     \exp_after:wN \use_ii:nn \l_tmpa_tl
4377   }
4378   \str_set:Nx \l_stex_get_structure_str {
4379     \l_tmpa_str ? \l_tmpb_str
4380   }
4381   \str_set:Nx \l_stex_get_structure_module_str {
4382     \exp_args:Nno \prop_item:cn {c_stex_module_\l_tmpa_str _structures}{\l_tmpb_str}
4383   }
4384 }
4385
4386 \cs_new_protected:Nn \__stex_structures_get_from_string:n {
4387   \tl_set:Nn \l_tmpa_tl {
4388     \msg_error:nnn{stex}{error/unknownstructure}{#1}
4389   }
4390   \str_set:Nn \l_tmpa_str { #1 }
4391   \int_set:Nn \l_tmpa_int { \str_count:N \l_tmpa_str }
4392
4393   \seq_map_inline:Nn \l_stex_all_modules_seq {
4394     \prop_if_exist:cT {c_stex_module_##1_structures} {

```

```

4395 \prop_map_inline:cn {c_stex_module_##1_structures} {
4396   \str_if_eq:eeT { \l_tmpa_str }{ \str_range:nnn {##1?####1}{-\l_tmpa_int}{-1}}{
4397     \prop_map_break:n{\seq_map_break:n{
4398       \tl_set:Nn \l_tmpa_tl {
4399         \str_set:Nn \l_stex_get_structure_str {##1?####1}
4400         \str_set:Nn \l_stex_get_structure_module_str {####2}
4401       }
4402     }}
4403   }
4404 }
4405 }
4406 }
4407 \l_tmpa_tl
4408 }

```

\instantiate

```

4409
4410 \keys_define:nn { stex / instantiate } {
4411   name          .str_set_x:N = \l__stex_structures_name_str
4412 }
4413 \cs_new_protected:Nn \__stex_structures_instantiate_args:n {
4414   \str_clear:N \l__stex_structures_name_str
4415   \keys_set:nn { stex / instantiate } { #1 }
4416 }
4417
4418 \NewDocumentCommand \instantiate {m O{} m m m}{
4419   \begingroup
4420     \stex_get_structure:n {#4}
4421     \__stex_structures_instantiate_args:n { #2 }
4422     \str_if_empty:NT \l__stex_structures_name_str {
4423       \str_set:Nn \l__stex_structures_name_str { #1 }
4424     }
4425     \exp_args:No \stex_activate_module:n \l_stex_get_structure_module_str
4426     \seq_clear:N \l__stex_structures_fields_seq
4427     \exp_args:Nx \stex_collect_imports:n \l_stex_get_structure_module_str
4428     \seq_map_inline:Nn \l_stex_collect_imports_seq {
4429       \seq_map_inline:cn {c_stex_module_##1_constants}{
4430         \seq_put_right:Nx \l__stex_structures_fields_seq { ##1 ? ####1 }
4431       }
4432     }
4433
4434     \tl_if_empty:nF{#3}{
4435       \seq_set_split:Nnn \l_tmpa_seq , {#3}
4436       \prop_clear:N \l_tmpa_prop
4437       \seq_map_inline:Nn \l_tmpa_seq {
4438         \seq_set_split:Nnn \l_tmpb_seq = { ##1 }
4439         \int_compare:nNnF { \seq_count:N \l_tmpb_seq } = 2 {
4440           \msg_error:nnn{stex}{error/keyval}{##1}
4441         }
4442         \exp_args:Nx \stex_get_symbol_in_seq:nn {\seq_item:Nn \l_tmpb_seq 1} \l__stex_struct
4443         \str_set_eq:NN \l__stex_structures_dom_str \l_stex_get_symbol_uri_str
4444         \exp_args:NNx \seq_remove_all:Nn \l__stex_structures_fields_seq \l_stex_get_symbol_u
4445         \exp_args:Nx \stex_get_symbol:n {\seq_item:Nn \l_tmpb_seq 2}
4446         \exp_args:Nxx \str_if_eq:nnF

```



```

4447         {\prop_item:cn{l_stex_symdecl\_l\_stex_structures_dom_str\_prop}{args}}
4448         {\prop_item:cn{l_stex_symdecl\_l\_stex_get_symbol_uri_str\_prop}{args}}{
4449         \msg_error:nnxxxx{stex}{error/incompatible}
4450         {l\_stex_structures_dom_str}
4451         {\prop_item:cn{l_stex_symdecl\_l\_stex_structures_dom_str\_prop}{args}}
4452         {\l_stex_get_symbol_uri_str}
4453         {\prop_item:cn{l_stex_symdecl\_l\_stex_get_symbol_uri_str\_prop}{args}}
4454     }
4455     \prop_put:Nxx \l_tmpa_prop {\seq_item:Nn \l_tmpb_seq 1} \l_stex_get_symbol_uri_str
4456 }
4457 }
4458
4459 \seq_map_inline:Nn \l\_stex_structures_fields_seq {
4460     \str_set:Nx \l_tmpa_str {field:\l\_stex_structures_name_str . \prop_item:cn {l_stex_sy
4461     \stex_debug:nn{instantiate}{Field~\l_tmpa_str :~##1}
4462
4463     \stex_add_constant_to_current_module:n {\l_tmpa_str}
4464     \stex_execute_in_module:x {
4465         \prop_set_from_keyval:cn { l_stex_symdecl\_l\_stex_current_module_str?\l_tmpa_str_p
4466         name = \l_tmpa_str ,
4467         args = \prop_item:cn {l_stex_symdecl_##1_prop}{args} ,
4468         arity = \prop_item:cn {l_stex_symdecl_##1_prop}{arity} ,
4469         assocs = \prop_item:cn {l_stex_symdecl_##1_prop}{assocs}
4470     }
4471     \seq_clear:c {l_stex_symdecl\_l\_stex_current_module_str?\l_tmpa_str\_notations}
4472 }
4473
4474 \seq_if_empty:cF{l_stex_symdecl_##1_notations}{
4475     \stex_find_notation:nn{##1}{}
4476     \stex_execute_in_module:x {
4477         \seq_put_right:cn {l_stex_symdecl\_l\_stex_current_module_str?\l_tmpa_str\_notation
4478     }
4479
4480     \stex_copy_control_sequence:ccN
4481     {stex_notation\_l\_stex_current_module_str?\l_tmpa_str\c_hash_str \l_stex_notation_
4482     {stex_notation_##1\c_hash_str \l_stex_notation_variant_str_cs}
4483     \l_tmpa_tl
4484     \exp_args:No \stex_execute_in_module:n \l_tmpa_tl
4485
4486
4487     \cs_if_exist:cT{stex_op_notation_##1\c_hash_str \l_stex_notation_variant_str_cs}{
4488         \tl_set_eq:Nc \l_tmpa_cs {stex_op_notation_##1\c_hash_str \l_stex_notation_variant
4489         \stex_execute_in_module:x {
4490             \tl_set:cn
4491             {stex_op_notation\_l\_stex_current_module_str?\l_tmpa_str\c_hash_str \l_stex_nota
4492             { \exp_args:No \exp_not:n \l_tmpa_cs}
4493         }
4494     }
4495
4496 }
4497
4498 \prop_put:Nxx \l_tmpa_prop {\prop_item:cn {l_stex_symdecl_##1_prop}{name}}{\l_stex_cur
4499 }
4500

```

```

4501 \stex_execute_in_module:x {
4502   \prop_set_from_keyval:cn {l_stex_instance_\l_stex_current_module_str?\l__stex_structur
4503   domain = \l_stex_get_structure_module_str ,
4504   \prop_to_keyval:N \l_tmpa_prop
4505 }
4506 \tl_set:cn{ #1 }{\stex_invoke_instance:n{ \l_stex_current_module_str?\l__stex_structur
4507 }
4508 \stex_debug:nn{instantiate}{
4509   Instance~\l_stex_current_module_str?\l__stex_structures_name_str \
4510   \prop_to_keyval:N \l_tmpa_prop
4511 }
4512 \exp_args:Nxx \stex_symdecl_do:nn {
4513   type={\STEXsymbol{module-type}}{
4514     \stex_term_math_oms:nnnn {
4515       \l_stex_get_structure_module_str
4516     }{}{0}{}
4517   }}
4518 }{\l__stex_structures_name_str}
4519 % {
4520   \str_set:Nx \l_stex_get_symbol_uri_str {\l_stex_current_module_str?\l__stex_structures
4521   \tl_set:Nn \l_stex_notation_after_do_tl {\__stex_notation_final:}
4522   \stex_notation_do:nnnnn{}{}{}{}{\comp{#5}}
4523 % }
4524 %\exp_args:Nx \notation{\l__stex_structures_name_str}{\comp{#5}}
4525 \endgroup
4526 \stex_smsmode_do:\ignorespacesandpars
4527 }
4528
4529 \cs_new_protected:Nn \stex_symbol_or_var:n {
4530   \cs_if_exist:cTF{#1}{
4531     \cs_set_eq:Nc \l_tmpa_tl { #1 }
4532     \str_set:Nx \l_tmpa_str { \cs_argument_spec:N \l_tmpa_tl }
4533     \str_if_empty:NTF \l_tmpa_str {
4534       \exp_args:Nx \cs_if_eq:NNTF { \tl_head:N \l_tmpa_tl }
4535       \stex_invoke_variable:n {
4536         \bool_set_true:N \l_stex_symbol_or_var_bool
4537         \tl_set:Nx \l_tmpa_tl {\tl_tail:N \l_tmpa_tl}
4538         \str_set:Nx \l_stex_get_symbol_uri_str {
4539           \exp_after:wN \use:n \l_tmpa_tl
4540         }
4541       }{
4542         \bool_set_false:N \l_stex_symbol_or_var_bool
4543         \stex_get_symbol:n{#1}
4544       }
4545     }{
4546       \__stex_structures_symbolorvar_from_string:n{ #1 }
4547     }
4548   }{
4549     \__stex_structures_symbolorvar_from_string:n{ #1 }
4550   }
4551 }
4552
4553 \cs_new_protected:Nn \__stex_structures_symbolorvar_from_string:n {
4554   \prop_if_exist:cTF {l_stex_variable_#1 _prop}{

```

```

4555     \bool_set_true:N \l_stex_symbol_or_var_bool
4556     \str_set:Nn \l_stex_get_symbol_uri_str { #1 }
4557   }{
4558     \bool_set_false:N \l_stex_symbol_or_var_bool
4559     \stex_get_symbol:n{#1}
4560   }
4561 }
4562
4563 \keys_define:nn { stex / varinstantiate } {
4564   name      .str_set_x:N = \l__stex_structures_name_str,
4565   bind      .choices:nn =
4566     {forall,exists}
4567     {\str_set:Nx \l__stex_structures_bind_str {\l_keys_choice_tl}}
4568 }
4569
4570 \cs_new_protected:Nn \__stex_structures_varinstantiate_args:n {
4571   \str_clear:N \l__stex_structures_name_str
4572   \str_clear:N \l__stex_structures_bind_str
4573   \keys_set:nn { stex / varinstantiate } { #1 }
4574 }
4575
4576 \NewDocumentCommand \varinstantiate {m O{} m m m}{
4577   \begin{group}
4578     \stex_get_structure:n {#4}
4579     \__stex_structures_varinstantiate_args:n { #2 }
4580     \str_if_empty:NT \l__stex_structures_name_str {
4581       \str_set:Nn \l__stex_structures_name_str { #1 }
4582     }
4583     \stex_if_do_html:TF{
4584       \stex_annotate:nnn{varinstance}{\l__stex_structures_name_str}
4585     }{\use:n}
4586     {
4587       \stex_if_do_html:T{
4588         \stex_annotate_invisible:nnn{domain}{\l_stex_get_structure_module_str}{}}
4589     }
4590     \seq_clear:N \l__stex_structures_fields_seq
4591     \exp_args:Nx \stex_collect_imports:n \l_stex_get_structure_module_str
4592     \seq_map_inline:Nn \l_stex_collect_imports_seq {
4593       \seq_map_inline:cn {c_stex_module_##1_constants}{
4594         \seq_put_right:Nx \l__stex_structures_fields_seq { ##1 ? ####1 }
4595       }
4596     }
4597     \exp_args:No \stex_activate_module:n \l_stex_get_structure_module_str
4598     \prop_clear:N \l_tmpa_prop
4599     \tl_if_empty:nF {#3} {
4600       \seq_set_split:Nnn \l_tmpa_seq , {#3}
4601       \seq_map_inline:Nn \l_tmpa_seq {
4602         \seq_set_split:Nnn \l_tmpb_seq = { ##1 }
4603         \int_compare:nNnF { \seq_count:N \l_tmpb_seq } = 2 {
4604           \msg_error:nnn{stex}{error/keyval}{##1}
4605         }
4606         \exp_args:Nx \stex_get_symbol_in_seq:nn {\seq_item:Nn \l_tmpb_seq 1} \l__stex_stru
4607         \str_set_eq:NN \l__stex_structures_dom_str \l_stex_get_symbol_uri_str
4608         \exp_args:NNx \seq_remove_all:Nn \l__stex_structures_fields_seq \l_stex_get_symbol

```

```

4609 \exp_args:Nx \stex_symbol_or_var:n {\seq_item:Nn \l_tmpb_seq 2}
4610 \stex_if_do_html:T{
4611   \stex_annotate:nnn{assign}{\l__stex_structures_dom_str,\l_stex_get_symbol_uri_str}
4612 }
4613 \bool_if:NTF \l_stex_symbol_or_var_bool {
4614   \exp_args:Nxx \str_if_eq:nnF
4615     {\prop_item:cn{l_stex_symdecl_\l__stex_structures_dom_str _prop}{args}}
4616     {\prop_item:cn{l_stex_variable_\l_stex_get_symbol_uri_str _prop}{args}}{
4617     \msg_error:nnxxx{stex}{error/incompatible}
4618     {\l__stex_structures_dom_str
4619     {\prop_item:cn{l_stex_symdecl_\l__stex_structures_dom_str _prop}{args}}
4620     {\l_stex_get_symbol_uri_str
4621     {\prop_item:cn{l_stex_variable_\l_stex_get_symbol_uri_str _prop}{args}}
4622   }
4623   \prop_put:Nxx \l_tmpa_prop {\seq_item:Nn \l_tmpb_seq 1} {\stex_invoke_variable:n}
4624 }{
4625   \exp_args:Nxx \str_if_eq:nnF
4626     {\prop_item:cn{l_stex_symdecl_\l__stex_structures_dom_str _prop}{args}}
4627     {\prop_item:cn{l_stex_symdecl_\l_stex_get_symbol_uri_str _prop}{args}}{
4628     \msg_error:nnxxx{stex}{error/incompatible}
4629     {\l__stex_structures_dom_str
4630     {\prop_item:cn{l_stex_symdecl_\l__stex_structures_dom_str _prop}{args}}
4631     {\l_stex_get_symbol_uri_str
4632     {\prop_item:cn{l_stex_symdecl_\l_stex_get_symbol_uri_str _prop}{args}}
4633   }
4634   \prop_put:Nxx \l_tmpa_prop {\seq_item:Nn \l_tmpb_seq 1} {\stex_invoke_symbol:n}
4635 }
4636 }
4637 }
4638 \tl_gclear:N \g__stex_structures_aftergroup_tl
4639 \seq_map_inline:Nn \l__stex_structures_fields_seq {
4640   \str_set:Nx \l_tmpa_str {\l__stex_structures_name_str . \prop_item:cn {l_stex_symdecl_\l__stex_structures_name_str}{args}}
4641   \stex_debug:nn{varinstantiate}{Field~\l_tmpa_str :~##1}
4642   \seq_if_empty:cF{l_stex_symdecl_##1_notations}{
4643     \stex_find_notation:nn{##1}{
4644       \cs_gset_eq:cc{g__stex_structures_tmpa_\l_tmpa_str_cs}
4645         {stex_notation_##1\c_hash_str \l_stex_notation_variant_str_cs}
4646       \stex_debug:nn{varinstantiate}{Notation:~\cs_meaning:c{g__stex_structures_tmpa_\l_tmpa_str_cs}}
4647       \cs_if_exist:cT{stex_op_notation_##1\c_hash_str \l_stex_notation_variant_str_cs}{
4648         \cs_gset_eq:cc {g__stex_structures_tmpa_op_\l_tmpa_str_cs}
4649           {stex_op_notation_##1\c_hash_str \l_stex_notation_variant_str_cs}
4650         \stex_debug:nn{varinstantiate}{Operator~Notation:~\cs_meaning:c{g__stex_structures_tmpa_op_\l_tmpa_str_cs}}
4651       }
4652     }
4653   }
4654   \exp_args:NNx \tl_gput_right:Nn \g__stex_structures_aftergroup_tl {
4655     \prop_set_from_keyval:cn { l_stex_variable_ \l_tmpa_str _prop}{
4656       name = \l_tmpa_str ,
4657       args = \prop_item:cn {l_stex_symdecl_##1_prop}{args} ,
4658       arity = \prop_item:cn {l_stex_symdecl_##1_prop}{arity} ,
4659       assocs = \prop_item:cn {l_stex_symdecl_##1_prop}{assocs}
4660     }
4661     \cs_set_eq:cc {stex_var_notation_\l_tmpa_str_cs}
4662     {g__stex_structures_tmpa_\l_tmpa_str_cs}

```

```

4663         \cs_set_eq:cc {stex_var_op_notation_\l_tmpa_str_cs}
4664         {g__stex_structures_tmpa_op_\l_tmpa_str_cs}
4665     }
4666     \prop_put:Nxx \l_tmpa_prop {\prop_item:cn {l_stex_symdecl_##1_prop}{name}}{\stex_inv
4667 }
4668 \exp_args:NNx \tl_gput_right:Nn \g__stex_structures_aftergroup_tl {
4669     \prop_set_from_keyval:cn {l_stex_varinstance_\l__stex_structures_name_str_prop }{
4670         domain = \l_stex_get_structure_module_str ,
4671         \prop_to_keyval:N \l_tmpa_prop
4672     }
4673     \tl_set:cn { #1 }{\stex_invoke_varinstance:n {\l__stex_structures_name_str}}
4674     \tl_set:cn {l_stex_varinstance_\l__stex_structures_name_str_op_tl}{
4675         \exp_args:Nnx \exp_not:N \use:nn {
4676             \str_set:Nn \exp_not:N \l_stex_current_symbol_str {var://\l__stex_structures_nam
4677             \stex_term_omv:nn {var://\l__stex_structures_name_str}{
4678                 \exp_not:n{
4679                     \_varcomp{#5}
4680                 }
4681             }
4682         }{
4683             \exp_not:n{\stex_reset:N \l_stex_current_symbol_str}
4684         }
4685     }
4686 }
4687 }
4688 \stex_debug:nn{varinstantiate}{\expandafter\detokenize\expandafter{\g__stex_structures_a
4689 \aftergroup\g__stex_structures_aftergroup_tl
4690 \endgroup
4691 \stex_smsmode_do:\ignorespacesandpars
4692 }
4693
4694 \cs_new_protected:Nn \stex_invoke_instance:n {
4695     \peek_charcode_remove:NTF ! {
4696         \stex_invoke_symbol:n{#1}
4697     }{
4698         \stex_invoke_instance:nn {#1}
4699     }
4700 }
4701
4702
4703 \cs_new_protected:Nn \stex_invoke_varinstance:n {
4704     \peek_charcode_remove:NTF ! {
4705         \exp_args:Nnx \use:nn {
4706             \def\comp{\_varcomp}
4707             \use:c{l_stex_varinstance_#1_op_tl}
4708         }{
4709             \stex_reset:N \comp
4710         }
4711     }{
4712         \stex_invoke_varinstance:nn {#1}
4713     }
4714 }
4715
4716 \cs_new_protected:Nn \stex_invoke_instance:nn {

```

```

4717 \prop_if_in:cnTF {l_stex_instance_ #1 _prop}{#2}{
4718   \exp_args:Nx \stex_invoke_symbol:n {\prop_item:cn{l_stex_instance_ #1 _prop}{#2}}
4719 }{
4720   \prop_set_eq:Nc \l_tmpa_prop{l_stex_instance_ #1 _prop}
4721   \msg_error:nnxxx{stex}{error/unknownfield}{#2}{#1}{
4722     \prop_to_keyval:N \l_tmpa_prop
4723   }
4724 }
4725 }
4726
4727 \cs_new_protected:Nn \stex_invoke_varinstance:nn {
4728   \prop_if_in:cnTF {l_stex_varinstance_ #1 _prop}{#2}{
4729     \prop_get:cnN{l_stex_varinstance_ #1 _prop}{#2}\l_tmpa_tl
4730     \l_tmpa_tl
4731   }{
4732     \msg_error:nnnnn{stex}{error/unknownfield}{#2}{#1}{}
4733   }
4734 }

```

(End definition for `\instantiate`. This function is documented on page 31.)

`\stex_invoke_structure:nnn`

```

4735 % #1: URI of the instance
4736 % #2: URI of the instantiated module
4737 \cs_new_protected:Nn \stex_invoke_structure:nnn {
4738   \tl_if_empty:nTF{ #3 }{
4739     \prop_set_eq:Nc \l__stex_structures_structure_prop {
4740       c_stex_feature_ #2 _prop
4741     }
4742     \tl_clear:N \l_tmpa_tl
4743     \prop_get:NnN \l__stex_structures_structure_prop { fields } \l_tmpa_seq
4744     \seq_map_inline:Nn \l_tmpa_seq {
4745       \seq_set_split:Nnn \l_tmpb_seq ? { ##1 }
4746       \seq_get_right:NN \l_tmpb_seq \l_tmpa_str
4747       \cs_if_exist:cT {
4748         stex_notation_ #1/\l_tmpa_str \c_hash_str\c_hash_str _cs
4749       }{
4750         \tl_if_empty:NF \l_tmpa_tl {
4751           \tl_put_right:Nn \l_tmpa_tl {,}
4752         }
4753         \tl_put_right:Nx \l_tmpa_tl {
4754           \stex_invoke_symbol:n {#1/\l_tmpa_str}!
4755         }
4756       }
4757     }
4758     \exp_args:No \mathstruct \l_tmpa_tl
4759   }{
4760     \stex_invoke_symbol:n{#1/#3}
4761   }
4762 }

```

(End definition for `\stex_invoke_structure:nnn`. This function is documented on page ??.)

```

4763 \</package>

```

Chapter 32

STEX -Statements Implementation

```
4764 <*package>
4765
4766 %%%%%%%%%%% features.dtx %%%%%%%%%%%
4767
4768 <@@=stex_statements>
    Warnings and error messages
4769

\titleemph
4770 \def\titleemph#1{\textbf{#1}}

(End definition for \titleemph. This function is documented on page ??.)
```

32.1 Definitions

definiendum

```
4771 \keys_define:nn {stex / definiendum }{
4772   pre      .tl_set:N      = \l__stex_statements_definiendum_pre_tl,
4773   post     .tl_set:N      = \l__stex_statements_definiendum_post_tl,
4774   root     .str_set_x:N    = \l__stex_statements_definiendum_root_str,
4775   gfa      .str_set_x:N    = \l__stex_statements_definiendum_gfa_str
4776 }
4777 \cs_new_protected:Nn \__stex_statements_definiendum_args:n {
4778   \str_clear:N \l__stex_statements_definiendum_root_str
4779   \tl_clear:N \l__stex_statements_definiendum_post_tl
4780   \str_clear:N \l__stex_statements_definiendum_gfa_str
4781   \keys_set:nn { stex / definiendum }{ #1 }
4782 }
4783 \NewDocumentCommand \definiendum { O{} m m } {
4784   \__stex_statements_definiendum_args:n { #1 }
4785   \stex_get_symbol:n { #2 }
4786   \stex_ref_new_sym_target:n \l_stex_get_symbol_uri_str
4787   \str_if_empty:NTF \l__stex_statements_definiendum_root_str {
4788     \tl_if_empty:NTF \l__stex_statements_definiendum_post_tl {
```

```

4789     \tl_set:Nn \l_tmpa_tl { #3 }
4790   } {
4791     \str_set:Nx \l__stex_statements_definiendum_root_str { #3 }
4792     \tl_set:Nn \l_tmpa_tl {
4793       \l__stex_statements_definiendum_pre_tl\l__stex_statements_definiendum_root_str\l__st
4794     }
4795   }
4796 } {
4797   \tl_set:Nn \l_tmpa_tl { #3 }
4798 }
4799
4800 % TODO root
4801 \stex_html_backend:TF {
4802   \stex_annotate:nnn { definiendum } { \l_stex_get_symbol_uri_str } { \l_tmpa_tl }
4803 } {
4804   \exp_args:Nnx \defemph@uri { \l_tmpa_tl } { \l_stex_get_symbol_uri_str }
4805 }
4806 }
4807 \stex_deactivate_macro:Nn \definiendum {definition~environments}

```

(End definition for definiendum. This function is documented on page 40.)

definame

```

4808
4809 \NewDocumentCommand \definame { 0{ } m } {
4810   \__stex_statements_definiendum_args:n { #1 }
4811   % TODO: root
4812   \stex_get_symbol:n { #2 }
4813   \stex_ref_new_sym_target:n \l_stex_get_symbol_uri_str
4814   \str_set:Nx \l_tmpa_str {
4815     \prop_item:cn { l_stex_symdecl_ \l_stex_get_symbol_uri_str _prop } { name }
4816   }
4817   \str_replace_all:Nnn \l_tmpa_str {-} {~}
4818   \stex_html_backend:TF {
4819     \stex_if_do_html:T {
4820       \stex_annotate:nnn { definiendum } { \l_stex_get_symbol_uri_str } {
4821         \l_tmpa_str\l__stex_statements_definiendum_post_tl
4822       }
4823     }
4824   } {
4825     \exp_args:Nnx \defemph@uri {
4826       \l_tmpa_str\l__stex_statements_definiendum_post_tl
4827     } { \l_stex_get_symbol_uri_str }
4828   }
4829 }
4830 \stex_deactivate_macro:Nn \definame {definition~environments}
4831
4832 \NewDocumentCommand \Definame { 0{ } m } {
4833   \__stex_statements_definiendum_args:n { #1 }
4834   \stex_get_symbol:n { #2 }
4835   \str_set:Nx \l_tmpa_str {
4836     \prop_item:cn { l_stex_symdecl_ \l_stex_get_symbol_uri_str _prop } { name }
4837   }
4838   \exp_args:NNno \str_replace_all:Nnn \l_tmpa_str {-} {~}

```



```

4839 \stex_ref_new_sym_target:n \l_stex_get_symbol_uri_str
4840 \stex_html_backend:TF {
4841   \stex_if_do_html:T {
4842     \stex_annotate:nnn { definiendum } { \l_stex_get_symbol_uri_str } {
4843       \exp_after:wN \stex_capitalize:n \l_tmpa_str\l__stex_statements_definiendum_post_tl
4844     }
4845   }
4846 } {
4847   \exp_args:Nnx \defemph@uri {
4848     \exp_after:wN \stex_capitalize:n \l_tmpa_str\l__stex_statements_definiendum_post_tl
4849   } { \l_stex_get_symbol_uri_str }
4850 }
4851 }
4852 \stex_deactivate_macro:Nn \Definame {definition-environments}
4853
4854 \NewDocumentCommand \premise { m }{
4855   \stex_annotate:nnn{ premise }{}{ #1 }
4856 }
4857 \NewDocumentCommand \conclusion { m }{
4858   \stex_annotate:nnn{ conclusion }{}{ #1 }
4859 }
4860 \NewDocumentCommand \definiens { 0{} m }{
4861   \str_clear:N \l_stex_get_symbol_uri_str
4862   \tl_if_empty:nF {#1} {
4863     \stex_get_symbol:n { #1 }
4864   }
4865   \str_if_empty:NT \l_stex_get_symbol_uri_str {
4866     \int_compare:nNnTF {\clist_count:N \l__stex_statements_sdefinition_for_clist} = 1 {
4867       \str_set:Nx \l_stex_get_symbol_uri_str {\clist_item:Nn \l__stex_statements_sdefinition
4868     }{
4869       % TODO throw error
4870     }
4871   }
4872   \str_if_eq:eeT {\prop_item:cn {l_stex_symdecl_ \l_stex_get_symbol_uri_str _prop}{module}}
4873   {\l_stex_current_module_str}{
4874     \str_if_eq:eeF {\prop_item:cn {l_stex_symdecl_ \l_stex_get_symbol_uri_str _prop}{defin
4875   }{true}{
4876     \prop_put:cnn{l_stex_symdecl_ \l_stex_get_symbol_uri_str _prop}{defined}{true}
4877     \exp_args:Nx \stex_add_to_current_module:n {
4878       \prop_put:cnn{l_stex_symdecl_ \l_stex_get_symbol_uri_str _prop}{defined}{true}
4879     }
4880   }
4881 }
4882 \stex_annotate:nnn{ definiens }{\l_stex_get_symbol_uri_str}{ #2 }
4883 }
4884
4885 \stex_deactivate_macro:Nn \premise {definition,~example~or~assertion~environments}
4886 \stex_deactivate_macro:Nn \conclusion {example~or~assertion~environments}
4887 \stex_deactivate_macro:Nn \definiens {definition~environments}
4888

```

(End definition for `definame`. This function is documented on page 40.)

`sdefinition`

```

4889
4890 \keys_define:nn {stex / sdefinition }{
4891   type      .str_set_x:N = \sdefinitiontype,
4892   id        .str_set_x:N = \sdefinitionid,
4893   name      .str_set_x:N = \sdefinitionname,
4894   for       .clist_set:N = \l__stex_statements_sdefinition_for_clist ,
4895   title     .tl_set:N     = \sdefinitiontitle
4896 }
4897 \cs_new_protected:Nn \__stex_statements_sdefinition_args:n {
4898   \str_clear:N \sdefinitiontype
4899   \str_clear:N \sdefinitionid
4900   \str_clear:N \sdefinitionname
4901   \clist_clear:N \l__stex_statements_sdefinition_for_clist
4902   \tl_clear:N \sdefinitiontitle
4903   \keys_set:nn { stex / sdefinition }{ #1 }
4904 }
4905
4906 \NewDocumentEnvironment{sdefinition}{O{}}{
4907   \__stex_statements_sdefinition_args:n{ #1 }
4908   \stex_reactivate_macro:N \definiendum
4909   \stex_reactivate_macro:N \definame
4910   \stex_reactivate_macro:N \Definame
4911   \stex_reactivate_macro:N \premise
4912   \stex_reactivate_macro:N \definiens
4913   \stex_if_smsmode:F{
4914     \seq_clear:N \l_tmpa_seq
4915     \clist_map_inline:Nn \l__stex_statements_sdefinition_for_clist {
4916       \tl_if_empty:NF{ ##1 }{
4917         \stex_get_symbol:n { ##1 }
4918         \exp_args:NNo \seq_put_right:Nn \l_tmpa_seq {
4919           \l_stex_get_symbol_uri_str
4920         }
4921       }
4922     }
4923     \clist_set_from_seq:NN \l__stex_statements_sdefinition_for_clist \l_tmpa_seq
4924     \exp_args:Nnnx
4925     \begin{stex_annotate_env}{definition}{\seq_use:Nn \l_tmpa_seq {},}}
4926     \str_if_empty:NF \sdefinitiontype {
4927       \stex_annotate_invisible:nnn{typestrings}{\sdefinitiontype}{}
4928     }
4929     \str_if_empty:NF \sdefinitionname {
4930       \stex_annotate_invisible:nnn{statementname}{\sdefinitionname}{}
4931     }
4932     \clist_set:Nn \l_tmpa_clist \sdefinitiontype
4933     \tl_clear:N \l_tmpa_tl
4934     \clist_map_inline:Nn \l_tmpa_clist {
4935       \tl_if_exist:cT {__stex_statements_sdefinition_##1_start:}{
4936         \tl_set:Nn \l_tmpa_tl {\use:c{__stex_statements_sdefinition_##1_start:}}
4937       }
4938     }
4939     \tl_if_empty:NTF \l_tmpa_tl {
4940       \__stex_statements_sdefinition_start:
4941     }{
4942       \l_tmpa_tl

```

```

4943     }
4944   }
4945   \stex_ref_new_doc_target:n \sdefinitionid
4946   \stex_smsmode_do:
4947 }{
4948   \stex_suppress_html:n {
4949     \str_if_empty:NF \sdefinitionname { \stex_symdecl_do:nn{}{\sdefinitionname} }
4950   }
4951   \stex_if_smsmode:F {
4952     \clist_set:No \l_tmpa_clist \sdefinitiontype
4953     \tl_clear:N \l_tmpa_tl
4954     \clist_map_inline:Nn \l_tmpa_clist {
4955       \tl_if_exist:cT {__stex_statements_sdefinition_##1_end:}{
4956         \tl_set:Nn \l_tmpa_tl {\use:c{__stex_statements_sdefinition_##1_end:}}
4957       }
4958     }
4959     \tl_if_empty:NTF \l_tmpa_tl {
4960       \__stex_statements_sdefinition_end:
4961     }{
4962       \l_tmpa_tl
4963     }
4964     \end{stex_annotate_env}
4965   }
4966 }

```

\stexpatchdefinition

```

4967 \cs_new_protected:Nn \__stex_statements_sdefinition_start: {
4968   \par\noindent\titleemph{Definition\tl_if_empty:NF \sdefinitiontitle {
4969     ~(\sdefinitiontitle)
4970   }~}
4971 }
4972 \cs_new_protected:Nn \__stex_statements_sdefinition_end: {\par\medskip}
4973
4974 \newcommand\stexpatchdefinition[3]{} {
4975   \str_set:Nx \l_tmpa_str{ #1 }
4976   \str_if_empty:NTF \l_tmpa_str {
4977     \tl_set:Nn \__stex_statements_sdefinition_start: { #2 }
4978     \tl_set:Nn \__stex_statements_sdefinition_end: { #3 }
4979   }{
4980     \exp_after:wN \tl_set:Nn \csname __stex_statements_sdefinition_#1_start:\endcsname{ #2 }
4981     \exp_after:wN \tl_set:Nn \csname __stex_statements_sdefinition_#1_end:\endcsname{ #3 }
4982   }
4983 }

```

(End definition for \stexpatchdefinition. This function is documented on page 42.)

\inlinedef inline:

```

4984 \keys_define:nn {stex / inlinedef }{
4985   type      .str_set_x:N = \sdefinitiontype,
4986   id        .str_set_x:N = \sdefinitionid,
4987   for       .clist_set:N = \l__stex_statements_sdefinition_for_clist ,
4988   name      .str_set_x:N = \sdefinitionname
4989 }
4990 \cs_new_protected:Nn \__stex_statements_inlinedef_args:n {

```

```

4991 \str_clear:N \sdefinitiontype
4992 \str_clear:N \sdefinitionid
4993 \str_clear:N \sdefinitionname
4994 \clist_clear:N \l__stex_statements_sdefinition_for_clist
4995 \keys_set:nn { stex / inlinedef }{ #1 }
4996 }
4997 \NewDocumentCommand \inlinedef { 0{} m } {
4998 \begingroup
4999 \__stex_statements_inlinedef_args:n{ #1 }
5000 \stex_reactivate_macro:N \definiendum
5001 \stex_reactivate_macro:N \definame
5002 \stex_reactivate_macro:N \Definame
5003 \stex_reactivate_macro:N \premise
5004 \stex_reactivate_macro:N \definiens
5005 \stex_ref_new_doc_target:n \sdefinitionid
5006 \stex_if_smsmode:TF{\stex_suppress_html:n {
5007   \str_if_empty:NF \sdefinitionname { \stex_symdecl_do:nn{}{\sdefinitionname} }
5008 }}{
5009   \seq_clear:N \l_tmpa_seq
5010   \clist_map_inline:Nn \l__stex_statements_sdefinition_for_clist {
5011     \tl_if_empty:nF{ ##1 }{
5012       \stex_get_symbol:n { ##1 }
5013       \exp_args:NNo \seq_put_right:Nn \l_tmpa_seq {
5014         \l_stex_get_symbol_uri_str
5015       }
5016     }
5017   }
5018   \clist_set_from_seq:NN \l__stex_statements_sdefinition_for_clist \l_tmpa_seq
5019   \exp_args:Nnx
5020   \stex_annotate:nnn{definition}{\seq_use:Nn \l_tmpa_seq {,}}{
5021     \str_if_empty:NF \sdefinitiontype {
5022       \stex_annotate_invisible:nnn{typestrings}{\sdefinitiontype}{}
5023     }
5024     #2
5025     \str_if_empty:NF \sdefinitionname {
5026       \stex_suppress_html:n{\stex_symdecl_do:nn{}{\sdefinitionname}}
5027       \stex_annotate_invisible:nnn{statementname}{\sdefinitionname}{}
5028     }
5029   }
5030 }
5031 \endgroup
5032 \stex_smsmode_do:
5033 }

```

(End definition for `\inlinedef`. This function is documented on page ??.)

32.2 Assertions

sassertion

```

5034
5035 \keys_define:nn {stex / sassertion }{
5036   type      .str_set_x:N = \sassertiontype,
5037   id        .str_set_x:N = \sassertionid,

```

```

5038 title .tl_set:N = \sassertiontitle ,
5039 for .clist_set:N = \l__stex_statements_sassertion_for_clist ,
5040 name .str_set_x:N = \sassertionname
5041 }
5042 \cs_new_protected:Nn \__stex_statements_sassertion_args:n {
5043 \str_clear:N \sassertiontype
5044 \str_clear:N \sassertionid
5045 \str_clear:N \sassertionname
5046 \clist_clear:N \l__stex_statements_sassertion_for_clist
5047 \tl_clear:N \sassertiontitle
5048 \keys_set:nn { stex / sassertion }{ #1 }
5049 }
5050
5051 %\tl_new:N \g__stex_statements_aftergroup_tl
5052
5053 \NewDocumentEnvironment{sassertion}{0{}}{
5054 \__stex_statements_sassertion_args:n{ #1 }
5055 \stex_reactivate_macro:N \premise
5056 \stex_reactivate_macro:N \conclusion
5057 \stex_if_smsmode:F {
5058 \seq_clear:N \l_tmpa_seq
5059 \clist_map_inline:Nn \l__stex_statements_sassertion_for_clist {
5060 \tl_if_empty:nF{ ##1 }{
5061 \stex_get_symbol:n { ##1 }
5062 \exp_args:NNo \seq_put_right:Nn \l_tmpa_seq {
5063 \l_stex_get_symbol_uri_str
5064 }
5065 }
5066 }
5067 \exp_args:Nnnx
5068 \begin{stex_annotate_env}{assertion}{\seq_use:Nn \l_tmpa_seq {,}}
5069 \str_if_empty:NF \sassertiontype {
5070 \stex_annotate_invisible:nnn{type}{\sassertiontype}{ }
5071 }
5072 \str_if_empty:NF \sassertionname {
5073 \stex_annotate_invisible:nnn{statementname}{\sassertionname}{ }
5074 }
5075 \clist_set:Nn \l_tmpa_clist \sassertiontype
5076 \tl_clear:N \l_tmpa_tl
5077 \clist_map_inline:Nn \l_tmpa_clist {
5078 \tl_if_exist:cT {__stex_statements_sassertion_##1_start:}{
5079 \tl_set:Nn \l_tmpa_tl {\use:c{__stex_statements_sassertion_##1_start:}}
5080 }
5081 }
5082 \tl_if_empty:NTF \l_tmpa_tl {
5083 \__stex_statements_sassertion_start:
5084 }{
5085 \l_tmpa_tl
5086 }
5087 }
5088 \str_if_empty:NTF \sassertionid {
5089 \str_if_empty:NF \sassertionname {
5090 \stex_ref_new_doc_target:n { }
5091 }

```

```

5092 } {
5093   \stex_ref_new_doc_target:n \sassertionid
5094 }
5095 \stex_smsmode_do:
5096 ){
5097   \str_if_empty:NF \sassertionname {
5098     \stex_suppress_html:n{\stex_symdecl_do:nn}{\sassertionname}}
5099     \stex_ref_new_sym_target:n {\l_stex_current_module_str ? \sassertionname}
5100   }
5101   \stex_if_smsmode:F {
5102     \clist_set:Nn \l_tmpa_clist \sassertiontype
5103     \tl_clear:N \l_tmpa_tl
5104     \clist_map_inline:Nn \l_tmpa_clist {
5105       \tl_if_exist:cT {__stex_statements_sassertion_##1_end:}{
5106         \tl_set:Nn \l_tmpa_tl {\use:c{__stex_statements_sassertion_##1_end:}}
5107       }
5108     }
5109     \tl_if_empty:NTF \l_tmpa_tl {
5110       __stex_statements_sassertion_end:
5111     }{
5112       \l_tmpa_tl
5113     }
5114     \end{stex_annotate_env}
5115   }
5116 }

```

\stexpatchassertion

```

5117
5118 \cs_new_protected:Nn \__stex_statements_sassertion_start: {
5119   \par\noindent\titleemph{Assertion~\tl_if_empty:NF \sassertiontitle {
5120     (\sassertiontitle)
5121   }~}
5122 }
5123 \cs_new_protected:Nn \__stex_statements_sassertion_end: {\par\medskip}
5124
5125 \newcommand\stexpatchassertion[3] [] {
5126   \str_set:Nx \l_tmpa_str{ #1 }
5127   \str_if_empty:NTF \l_tmpa_str {
5128     \tl_set:Nn \__stex_statements_sassertion_start: { #2 }
5129     \tl_set:Nn \__stex_statements_sassertion_end: { #3 }
5130   }{
5131     \exp_after:wN \tl_set:Nn \csname __stex_statements_sassertion_#1_start:\endcsname{ #2 }
5132     \exp_after:wN \tl_set:Nn \csname __stex_statements_sassertion_#1_end:\endcsname{ #3 }
5133   }
5134 }

```

(End definition for \stexpatchassertion. This function is documented on page 42.)

\inlineass inline:

```

5135 \keys_define:nn {stex / inlineass }{
5136   type      .str_set_x:N = \sassertiontype,
5137   id        .str_set_x:N = \sassertionid,
5138   for       .clist_set:N = \l__stex_statements_sassertion_for_clist ,
5139   name      .str_set_x:N = \sassertionname

```

```

5140 }
5141 \cs_new_protected:Nn \__stex_statements_inlineass_args:n {
5142   \str_clear:N \sassertiontype
5143   \str_clear:N \sassertionid
5144   \str_clear:N \sassertionname
5145   \clist_clear:N \l__stex_statements_sassertion_for_clist
5146   \keys_set:nn { stex / inlineass }{ #1 }
5147 }
5148 \NewDocumentCommand \inlineass { 0{} m } {
5149   \begingroup
5150   \stex_reactivate_macro:N \premise
5151   \stex_reactivate_macro:N \conclusion
5152   \__stex_statements_inlineass_args:n{ #1 }
5153   \str_if_empty:NTF \sassertionid {
5154     \str_if_empty:NF \sassertionname {
5155       \stex_ref_new_doc_target:n {}
5156     }
5157   } {
5158     \stex_ref_new_doc_target:n \sassertionid
5159   }
5160
5161   \stex_if_smsmode:TF{
5162     \str_if_empty:NF \sassertionname {
5163       \stex_suppress_html:n{\stex_symdecl_do:nn{}{\sassertionname}}
5164       \stex_ref_new_sym_target:n {\l_stex_current_module_str ? \sassertionname}
5165     }
5166   }{
5167     \seq_clear:N \l_tmpa_seq
5168     \clist_map_inline:Nn \l__stex_statements_sassertion_for_clist {
5169       \tl_if_empty:nF{ ##1 }{
5170         \stex_get_symbol:n { ##1 }
5171         \exp_args:NNo \seq_put_right:Nn \l_tmpa_seq {
5172           \l_stex_get_symbol_uri_str
5173         }
5174       }
5175     }
5176     \exp_args:Nnx
5177     \stex_annotate:nnn{assertion}{\seq_use:Nn \l_tmpa_seq {,}}{
5178       \str_if_empty:NF \sassertiontype {
5179         \stex_annotate_invisible:nnn{typestrings}{\sassertiontype}{}
5180       }
5181       #2
5182       \str_if_empty:NF \sassertionname {
5183         \stex_suppress_html:n{\stex_symdecl_do:nn{}{\sassertionname}}
5184         \stex_ref_new_sym_target:n {\l_stex_current_module_str ? \sassertionname}
5185         \stex_annotate_invisible:nnn{statementname}{\sassertionname}{}
5186       }
5187     }
5188   }
5189   \endgroup
5190   \stex_smsmode_do:
5191 }

```

(End definition for \inlineass. This function is documented on page ??.)

32.3 Examples

sexample

```

5192 \keys_define:nn {stex / sexample }{
5193   type      .str_set_x:N = \exampletype,
5194   id        .str_set_x:N = \sexampleid,
5195   title     .tl_set:N     = \sexampletitle,
5196   name      .str_set_x:N = \sexamplename ,
5197   for       .clist_set:N = \l__stex_statements_sexample_for_clist,
5198 }
5199
5200 \cs_new_protected:Nn \__stex_statements_sexample_args:n {
5201   \str_clear:N \sexampletype
5202   \str_clear:N \sexampleid
5203   \str_clear:N \sexamplename
5204   \tl_clear:N \sexampletitle
5205   \clist_clear:N \l__stex_statements_sexample_for_clist
5206   \keys_set:nn { stex / sexample }{ #1 }
5207 }
5208
5209 \NewDocumentEnvironment{sexample}{0{}}{
5210   \__stex_statements_sexample_args:n{ #1 }
5211   \stex_reactivate_macro:N \premise
5212   \stex_reactivate_macro:N \conclusion
5213   \stex_if_smsmode:F {
5214     \seq_clear:N \l_tmpa_seq
5215     \clist_map_inline:Nn \l__stex_statements_sexample_for_clist {
5216       \tl_if_empty:nF{ ##1 }{
5217         \stex_get_symbol:n { ##1 }
5218         \exp_args:NNo \seq_put_right:Nn \l_tmpa_seq {
5219           \l_stex_get_symbol_uri_str
5220         }
5221       }
5222     }
5223     \exp_args:Nnnx
5224     \begin{stex_annotate_env}{example}{\seq_use:Nn \l_tmpa_seq {,}}
5225     \str_if_empty:NF \sexampletype {
5226       \stex_annotate_invisible:nnn{typestrings}{\sexampletype}{}
5227     }
5228     \str_if_empty:NF \sexamplename {
5229       \stex_annotate_invisible:nnn{statementname}{\sexamplename}{}
5230     }
5231     \clist_set:Nn \l_tmpa_clist \sexampletype
5232     \tl_clear:N \l_tmpa_tl
5233     \clist_map_inline:Nn \l_tmpa_clist {
5234       \tl_if_exist:cT {__stex_statements_sexample_##1_start:}{
5235         \tl_set:Nn \l_tmpa_tl {\use:c{__stex_statements_sexample_##1_start:}}
5236       }
5237     }
5238     \tl_if_empty:NTF \l_tmpa_tl {
5239       \__stex_statements_sexample_start:
5240     }{
5241       \l_tmpa_tl
5242     }

```



```

5243 }
5244 \str_if_empty:NF \sexampleid {
5245   \stex_ref_new_doc_target:n \sexampleid
5246 }
5247 \stex_smsmode_do:
5248 ){
5249   \str_if_empty:NF \sexamplename {
5250     \stex_suppress_html:n{\stex_symdecl_do:nn}{\sexamplename}}
5251   }
5252   \stex_if_smsmode:F {
5253     \clist_set:Nn \l_tmpa_clist \sexamplotype
5254     \tl_clear:N \l_tmpa_tl
5255     \clist_map_inline:Nn \l_tmpa_clist {
5256       \tl_if_exist:cT {__stex_statements_sexample_##1_end:}{
5257         \tl_set:Nn \l_tmpa_tl {\use:c{__stex_statements_sexample_##1_end:}}
5258       }
5259     }
5260     \tl_if_empty:NTF \l_tmpa_tl {
5261       \__stex_statements_sexample_end:
5262     }{
5263       \l_tmpa_tl
5264     }
5265     \end{stex_annotate_env}
5266   }
5267 }

```

\stexpatchexample

```

5268
5269 \cs_new_protected:Nn \__stex_statements_sexample_start: {
5270   \par\noindent\titllemph{Example~\tl_if_empty:NF \sexamplotype {
5271     (\sexamplotype)
5272   }~}
5273 }
5274 \cs_new_protected:Nn \__stex_statements_sexample_end: { \par\medskip}
5275
5276 \newcommand\stexpatchexample[3] [] {
5277   \str_set:Nx \l_tmpa_str{ #1 }
5278   \str_if_empty:NTF \l_tmpa_str {
5279     \tl_set:Nn \__stex_statements_sexample_start: { #2 }
5280     \tl_set:Nn \__stex_statements_sexample_end: { #3 }
5281   }{
5282     \exp_after:wN \tl_set:Nn \csname __stex_statements_sexample_#1_start:\endcsname{ #2 }
5283     \exp_after:wN \tl_set:Nn \csname __stex_statements_sexample_#1_end:\endcsname{ #3 }
5284   }
5285 }

```

(End definition for \stexpatchexample. This function is documented on page 42.)

\inlineex inline:

```

5286 \keys_define:nn {stex / inlineex }{
5287   type .str_set_x:N = \sexamplotype,
5288   id .str_set_x:N = \sexampleid,
5289   for .clist_set:N = \l__stex_statements_sexample_for_clist ,
5290   name .str_set_x:N = \sexamplename

```

```

5291 }
5292 \cs_new_protected:Nn \__stex_statements_inlineex_args:n {
5293   \str_clear:N \sexamplotype
5294   \str_clear:N \sexampleid
5295   \str_clear:N \sexamplename
5296   \clist_clear:N \l__stex_statements_sexample_for_clist
5297   \keys_set:nn { stex / inlineex }{ #1 }
5298 }
5299 \NewDocumentCommand \inlineex { 0{ } m } {
5300   \beginngroup
5301     \stex_reactivate_macro:N \premise
5302     \stex_reactivate_macro:N \conclusion
5303     \__stex_statements_inlineex_args:n{ #1 }
5304     \str_if_empty:NF \sexampleid {
5305       \stex_ref_new_doc_target:n \sexampleid
5306     }
5307     \stex_if_smsmode:TF{
5308       \str_if_empty:NF \sexamplename {
5309         \stex_suppress_html:n{\stex_symdecl_do:nn{}{\sexamplename}}
5310       }
5311     }{
5312       \seq_clear:N \l_tmpa_seq
5313       \clist_map_inline:Nn \l__stex_statements_sexample_for_clist {
5314         \tl_if_empty:nF{ ##1 }{
5315           \stex_get_symbol:n { ##1 }
5316           \exp_args:NNo \seq_put_right:Nn \l_tmpa_seq {
5317             \l_stex_get_symbol_uri_str
5318           }
5319         }
5320       }
5321       \exp_args:Nnx
5322       \stex_annotate:nnn{example}{\seq_use:Nn \l_tmpa_seq {,}}{
5323         \str_if_empty:NF \sexamplotype {
5324           \stex_annotate_invisible:nnn{typestrings}{\sexamplotype}{ }
5325         }
5326         #2
5327         \str_if_empty:NF \sexamplename {
5328           \stex_suppress_html:n{\stex_symdecl_do:nn{}{\sexamplename}}
5329           \stex_annotate_invisible:nnn{statementname}{\sexamplename}{ }
5330         }
5331       }
5332     }
5333   \endgroup
5334   \stex_smsmode_do:
5335 }

```

(End definition for \inlineex. This function is documented on page ??.)

32.4 Logical Paragraphs

sparagraph

```

5336 \keys_define:nn { stex / sparagraph } {
5337   id          .str_set_x:N    = \sparagraphid ,

```

```

5338 title .tl_set:N = \l_stex_sparagraph_title_tl ,
5339 type .str_set_x:N = \sparagraphtype ,
5340 for .clist_set:N = \l__stex_statements_sparagraph_for_clist ,
5341 from .tl_set:N = \sparagraphfrom ,
5342 to .tl_set:N = \sparagraphto ,
5343 start .tl_set:N = \l_stex_sparagraph_start_tl ,
5344 name .str_set:N = \sparagraphname ,
5345 imports .tl_set:N = \l__stex_statements_sparagraph_imports_tl
5346 }
5347
5348 \cs_new_protected:Nn \stex_sparagraph_args:n {
5349 \tl_clear:N \l_stex_sparagraph_title_tl
5350 \tl_clear:N \sparagraphfrom
5351 \tl_clear:N \sparagraphto
5352 \tl_clear:N \l_stex_sparagraph_start_tl
5353 \tl_clear:N \l__stex_statements_sparagraph_imports_tl
5354 \str_clear:N \sparagraphid
5355 \str_clear:N \sparagraphtype
5356 \clist_clear:N \l__stex_statements_sparagraph_for_clist
5357 \str_clear:N \sparagraphname
5358 \keys_set:nn { stex / sparagraph }{ #1 }
5359 }
5360 \newif\if@in@omtext\@in@omtextfalse
5361
5362 \NewDocumentEnvironment {sparagraph} { 0{} } {
5363 \stex_sparagraph_args:n { #1 }
5364 \tl_if_empty:NTF \l_stex_sparagraph_start_tl {
5365 \tl_set_eq:NN \sparagraphtitle \l_stex_sparagraph_title_tl
5366 }{
5367 \tl_set_eq:NN \sparagraphtitle \l_stex_sparagraph_start_tl
5368 }
5369 \@in@omtexttrue
5370 \stex_if_smsmode:F {
5371 \seq_clear:N \l_tmpa_seq
5372 \clist_map_inline:Nn \l__stex_statements_sparagraph_for_clist {
5373 \tl_if_empty:NF{ ##1 }{
5374 \stex_get_symbol:n { ##1 }
5375 \exp_args:NNo \seq_put_right:Nn \l_tmpa_seq {
5376 \l_stex_get_symbol_uri_str
5377 }
5378 }
5379 }
5380 \exp_args:Nnnx
5381 \begin{stex_annotate_env}{paragraph}{\seq_use:Nn \l_tmpa_seq {,}}
5382 \str_if_empty:NF \sparagraphtype {
5383 \stex_annotate_invisible:nnn{typestrings}{\sparagraphtype}{ }
5384 }
5385 \str_if_empty:NF \sparagraphfrom {
5386 \stex_annotate_invisible:nnn{from}{\sparagraphfrom}{ }
5387 }
5388 \str_if_empty:NF \sparagraphto {
5389 \stex_annotate_invisible:nnn{to}{\sparagraphto}{ }
5390 }
5391 \str_if_empty:NF \sparagraphname {

```

```

5392     \stex_annotate_invisible:nnn{statementname}{\sparagraphname}{\}
5393   }
5394   \clist_set:No \l_tmpa_clist \sparagraphtype
5395   \tl_clear:N \l_tmpa_tl
5396   \clist_map_inline:Nn \sparagraphtype {
5397     \tl_if_exist:cT {__stex_statements_sparagraph_##1_start:}{
5398       \tl_set:Nn \l_tmpa_tl {\use:c{__stex_statements_sparagraph_##1_start:}}
5399     }
5400   }
5401   \stex_csl_to_imports:No \usemodule \l__stex_statements_sparagraph_imports_tl
5402   \tl_if_empty:NTF \l_tmpa_tl {
5403     \__stex_statements_sparagraph_start:
5404   }{
5405     \l_tmpa_tl
5406   }
5407 }
5408 \clist_set:No \l_tmpa_clist \sparagraphtype
5409 \exp_args:NNx \clist_if_in:NnT \l_tmpa_clist {\tl_to_str:n{symdoc}}{
5410 {
5411   \stex_reactivate_macro:N \definiendum
5412   \stex_reactivate_macro:N \definame
5413   \stex_reactivate_macro:N \Definame
5414   \stex_reactivate_macro:N \premise
5415   \stex_reactivate_macro:N \definiens
5416 }
5417 \str_if_empty:NTF \sparagraphid {
5418   \str_if_empty:NTF \sparagraphname {
5419     \exp_args:NNx \clist_if_in:NnT \l_tmpa_clist {\tl_to_str:n{symdoc}}{
5420       \stex_ref_new_doc_target:n {}
5421     }
5422   } {
5423     \stex_ref_new_doc_target:n {}
5424   }
5425 } {
5426   \stex_ref_new_doc_target:n \sparagraphid
5427 }
5428 \exp_args:NNx
5429 \clist_if_in:NnT \l_tmpa_clist {\tl_to_str:n{symdoc}}{
5430   \clist_map_inline:Nn \l__stex_statements_sparagraph_for_clist {
5431     \tl_if_empty:nF{ ##1 }{
5432       \stex_get_symbol:n { ##1 }
5433       \stex_ref_new_sym_target:n \l_stex_get_symbol_uri_str
5434     }
5435   }
5436 }
5437 \stex_smsmode_do:
5438 \ignorespacesandpars
5439 }{
5440   \str_if_empty:NF \sparagraphname {
5441     \stex_suppress_html:n{\stex_symdecl_do:nn{}{\sparagraphname}}
5442     \stex_ref_new_sym_target:n {\l_stex_current_module_str ? \sparagraphname}
5443   }
5444   \stex_if_smsmode:F {
5445     \clist_set:No \l_tmpa_clist \sparagraphtype

```

```

5446 \tl_clear:N \l_tmpa_tl
5447 \clist_map_inline:Nn \l_tmpa_clist {
5448   \tl_if_exist:cT {__stex_statements_sparagraph_##1_end:}{
5449     \tl_set:Nn \l_tmpa_tl {\use:c{__stex_statements_sparagraph_##1_end:}}
5450   }
5451 }
5452 \tl_if_empty:NTF \l_tmpa_tl {
5453   \__stex_statements_sparagraph_end:
5454 }{
5455   \l_tmpa_tl
5456 }
5457 \end{stex_annotate_env}
5458 }
5459 }

```

\stexpatchparagraph

```

5460
5461 \cs_new_protected:Nn \__stex_statements_sparagraph_start: {
5462   \par\noindent\tl_if_empty:NTF \l_stex_sparagraph_start_tl {
5463     \tl_if_empty:NF \l_stex_sparagraph_title_tl {
5464       \titleemph{\l_stex_sparagraph_title_tl}:~
5465     }
5466   }{
5467     \titleemph{\l_stex_sparagraph_start_tl}~
5468   }
5469 }
5470 \cs_new_protected:Nn \__stex_statements_sparagraph_end: {\par\medskip}
5471
5472 \newcommand\stexpatchparagraph[3] [] {
5473   \str_set:Nx \l_tmpa_str{ #1 }
5474   \str_if_empty:NTF \l_tmpa_str {
5475     \tl_set:Nn \__stex_statements_sparagraph_start: { #2 }
5476     \tl_set:Nn \__stex_statements_sparagraph_end: { #3 }
5477   }{
5478     \exp_after:wN \tl_set:Nn \csname __stex_statements_sparagraph_#1_start:\endcsname{ #2
5479     \exp_after:wN \tl_set:Nn \csname __stex_statements_sparagraph_#1_end:\endcsname{ #3 }
5480   }
5481 }
5482
5483 \keys_define:nn { stex / inlinepara } {
5484   id      .str_set_x:N = \sparagraphid ,
5485   type    .str_set_x:N = \sparagraphtype ,
5486   for     .clist_set:N = \l__stex_statements_sparagraph_for_clist ,
5487   from    .tl_set:N    = \sparagraphfrom ,
5488   to      .tl_set:N    = \sparagraphto ,
5489   name    .str_set:N   = \sparagraphname
5490 }
5491 \cs_new_protected:Nn \__stex_statements_inlinepara_args:n {
5492   \tl_clear:N \sparagraphfrom
5493   \tl_clear:N \sparagraphto
5494   \str_clear:N \sparagraphid
5495   \str_clear:N \sparagraphtype
5496   \clist_clear:N \l__stex_statements_sparagraph_for_clist
5497   \str_clear:N \sparagraphname

```

```

5498 \keys_set:nn { stex / inlinepara }{ #1 }
5499 }
5500 \NewDocumentCommand \inlinepara { 0{} m } {
5501   \beginingroup
5502   \__stex_statements_inlinepara_args:n{ #1 }
5503   \clist_set:No \l_tmpa_clist \sparagraphtype
5504   \str_if_empty:NTF \sparagraphid {
5505     \str_if_empty:NTF \sparagraphname {
5506       \exp_args:NNx \clist_if_in:NnT \l_tmpa_clist {\tl_to_str:n{syndoc}}{
5507         \stex_ref_new_doc_target:n {}
5508       }
5509     } {
5510       \stex_ref_new_doc_target:n {}
5511     }
5512   } {
5513     \stex_ref_new_doc_target:n \sparagraphid
5514   }
5515   \stex_if_smsmode:TF{
5516     \str_if_empty:NF \sparagraphname {
5517       \stex_suppress_html:n{\stex_symdecl_do:nn{}}{\sparagraphname}}
5518     \stex_ref_new_sym_target:n {\l_stex_current_module_str ? \sparagraphname}
5519   }
5520 }{
5521   \seq_clear:N \l_tmpa_seq
5522   \clist_map_inline:Nn \l__stex_statements_sparagraph_for_clist {
5523     \tl_if_empty:nF{ ##1 }{
5524       \stex_get_symbol:n { ##1 }
5525       \exp_args:NNo \seq_put_right:Nn \l_tmpa_seq {
5526         \l_stex_get_symbol_uri_str
5527       }
5528     }
5529   }
5530   \exp_args:NNx
5531   \stex_annotate:nnn{paragraph}{\seq_use:Nn \l_tmpa_seq {,}}{
5532     \str_if_empty:NF \sparagraphtype {
5533       \stex_annotate_invisible:nnn{typestrings}{\sparagraphtype}{}
5534     }
5535     \str_if_empty:NF \sparagraphfrom {
5536       \stex_annotate_invisible:nnn{from}{\sparagraphfrom}{}
5537     }
5538     \str_if_empty:NF \sparagraphto {
5539       \stex_annotate_invisible:nnn{to}{\sparagraphto}{}
5540     }
5541     \str_if_empty:NF \sparagraphname {
5542       \stex_suppress_html:n{\stex_symdecl_do:nn{}}{\sparagraphname}}
5543     \stex_annotate_invisible:nnn{statementname}{\sparagraphname}{}
5544     \stex_ref_new_sym_target:n {\l_stex_current_module_str ? \sparagraphname}
5545   }
5546   \exp_args:NNx \clist_if_in:NnT \l_tmpa_clist {\tl_to_str:n{syndoc}}{
5547     \clist_map_inline:Nn \l_tmpa_seq {
5548       \stex_ref_new_sym_target:n {##1}
5549     }
5550   }
5551   #2

```

```

5552     }
5553   }
5554   \endgroup
5555   \stex_smsmode_do:
5556 }
5557
(End definition for \stexpatchparagraph. This function is documented on page 42.)
5558 \endpackage

```

Chapter 33

The Implementation

33.1 Package Options

We declare some switches which will modify the behavior according to the package options. Generally, an option `xxx` will just set the appropriate switches to true (otherwise they stay false).⁸

```
5559 <*package>
5560 <@@=stex_sproof>
5561
5562 %%%%%%%%%%% sproof.dtx %%%%%%%%%%%
5563
```

33.2 Proofs

We first define some keys for the proof environment.

```
5564 \keys_define:nn { stex / spf } {
5565   id          .str_set_x:N = \spfid,
5566   for         .clist_set:N = \l__stex_sproof_spf_for_clist ,
5567   from        .tl_set:N    = \l__stex_sproof_spf_from_tl ,
5568   proofend    .tl_set:N    = \l__stex_sproof_spf_proofend_tl,
5569   type        .str_set_x:N = \spftype,
5570   title       .tl_set:N    = \spftitle,
5571   continues   .tl_set:N    = \l__stex_sproof_spf_continues_tl,
5572   functions   .tl_set:N    = \l__stex_sproof_spf_functions_tl,
5573   method      .tl_set:N    = \l__stex_sproof_spf_method_tl
5574 }
5575 \cs_new_protected:Nn \__stex_sproof_spf_args:n {
5576   \str_clear:N \spfid
5577   \tl_clear:N \l__stex_sproof_spf_for_tl
5578   \tl_clear:N \l__stex_sproof_spf_from_tl
5579   \tl_set:Nn \l__stex_sproof_spf_proofend_tl {\sproof@box}
5580   \str_clear:N \spftype
5581   \tl_clear:N \spftitle
5582   \tl_clear:N \l__stex_sproof_spf_continues_tl
5583   \tl_clear:N \l__stex_sproof_spf_functions_tl
```

⁸EdNOTE: need an implementation for L^AT_EX_ML


```

5584 \tl_clear:N \l__stex_sproof_spf_method_tl
5585 \bool_set_false:N \l__stex_sproof_inc_counter_bool
5586 \keys_set:nn { stex / spf }{ #1 }
5587 }

```

`\c__stex_sproof_flow_str` We define this macro, so that we can test whether the `display` key has the value `flow`

```

5588 \str_set:Nn\c__stex_sproof_flow_str{inline}

```

(End definition for `\c__stex_sproof_flow_str`.)

For proofs, we will have to have deeply nested structures of enumerated list-like environments. However, L^AT_EX only allows `enumerate` environments up to nesting depth 4 and general list environments up to listing depth 6. This is not enough for us. Therefore we have decided to go along the route proposed by Leslie Lamport to use a single top-level list with dotted sequences of numbers to identify the position in the proof tree. Unfortunately, we could not use his `pf.sty` package directly, since it does not do automatic numbering, and we have to add keyword arguments all over the place, to accomodate semantic information.

`pst@with@label` This environment manages⁷ the path labeling of the proof steps in the description environment of the outermost `proof` environment. The argument is the label prefix up to now; which we cache in `\pst@label` (we need evaluate it first, since are in the right place now!). Then we increment the proof depth which is stored in `\count10` (lower counters are used by T_EX for page numbering) and initialize the next level counter `\count\count10` with 1. In the end call for this environment, we just decrease the proof depth counter by 1 again.

```

5589 \intarray_new:Nn\l__stex_sproof_counter_intarray{50}
5590 \cs_new_protected:Npn \sproofnumber {
5591   \int_set:Nn \l_tmpa_int {1}
5592   \bool_while_do:nn {
5593     \int_compare_p:nNn {
5594       \intarray_item:Nn \l__stex_sproof_counter_intarray \l_tmpa_int
5595     } > 0
5596   }{
5597     \intarray_item:Nn \l__stex_sproof_counter_intarray \l_tmpa_int .
5598     \int_incr:N \l_tmpa_int
5599   }
5600 }
5601 \cs_new_protected:Npn \__stex_sproof_inc_counter: {
5602   \int_set:Nn \l_tmpa_int {1}
5603   \bool_while_do:nn {
5604     \int_compare_p:nNn {
5605       \intarray_item:Nn \l__stex_sproof_counter_intarray \l_tmpa_int
5606     } > 0
5607   }{
5608     \int_incr:N \l_tmpa_int
5609   }
5610   \int_compare:nNnF \l_tmpa_int = 1 {
5611     \int_decr:N \l_tmpa_int
5612   }
5613   \intarray_gset:Nnn \l__stex_sproof_counter_intarray \l_tmpa_int {
5614     \intarray_item:Nn \l__stex_sproof_counter_intarray \l_tmpa_int + 1

```

⁷This gets the labeling right but only works 8 levels deep

```

5615 }
5616 }
5617
5618 \cs_new_protected:Npn \__stex_sproof_add_counter: {
5619   \int_set:Nn \l_tmpa_int {1}
5620   \bool_while_do:nn {
5621     \int_compare_p:nNn {
5622       \intarray_item:Nn \l__stex_sproof_counter_intarray \l_tmpa_int
5623     } > 0
5624   }{
5625     \int_incr:N \l_tmpa_int
5626   }
5627   \intarray_gset:Nnn \l__stex_sproof_counter_intarray \l_tmpa_int { 1 }
5628 }
5629
5630 \cs_new_protected:Npn \__stex_sproof_remove_counter: {
5631   \int_set:Nn \l_tmpa_int {1}
5632   \bool_while_do:nn {
5633     \int_compare_p:nNn {
5634       \intarray_item:Nn \l__stex_sproof_counter_intarray \l_tmpa_int
5635     } > 0
5636   }{
5637     \int_incr:N \l_tmpa_int
5638   }
5639   \int_decr:N \l_tmpa_int
5640   \intarray_gset:Nnn \l__stex_sproof_counter_intarray \l_tmpa_int { 0 }
5641 }

```

\sproofend This macro places a little box at the end of the line if there is space, or at the end of the next line if there isn't

```

5642 \def\sproof@box{
5643   \hbox{\vrule\vbox{\hrule width 6 pt\vskip 6pt\hrule}\vrule}
5644 }
5645 \def\sproofend{
5646   \tl_if_empty:NF \l__stex_sproof_spf_proofend_tl {
5647     \hfil\hfil\hfil\hfil\l__stex_sproof_spf_proofend_tl\par\smallskip
5648   }
5649 }

```

(End definition for \sproofend. This function is documented on page ??.)

spf@*@kw

```

5650 \def\spf@proofsketch@kw{Proof-Sketch}
5651 \def\spf@proof@kw{Proof}
5652 \def\spf@step@kw{Step}

```

(End definition for spf@*@kw. This function is documented on page ??.)

For the other languages, we set up triggers

```

5653 \AddToHook{begindocument}{
5654   \ltx@ifpackageloaded{babel}{
5655     \makeatletter
5656     \clist_set:Nx \l_tmpa_clist {\bbl@loaded}
5657     \clist_if_in:NnT \l_tmpa_clist {ngerman}{
5658       \input{sproof-ngerman.ldf}

```

```

5659   }
5660   \clist_if_in:NnT \l_tmpa_clist {finnish}{
5661     \input{sproof-finnish.ldf}
5662   }
5663   \clist_if_in:NnT \l_tmpa_clist {french}{
5664     \input{sproof-french.ldf}
5665   }
5666   \clist_if_in:NnT \l_tmpa_clist {russian}{
5667     \input{sproof-russian.ldf}
5668   }
5669   \makeatother
5670 }{}
5671 }

```

spfsketch

```

5672 \newcommand\spfsketch[2] [] {
5673   \beginingroup
5674   \let \premise \stex_proof_premise:
5675   \__stex_sproof_spf_args:n{#1}
5676   \stex_if_smsmode:TF {
5677     \str_if_empty:NF \spfid {
5678       \stex_ref_new_doc_target:n \spfid
5679     }
5680   }{
5681     \seq_clear:N \l_tmpa_seq
5682     \clist_map_inline:Nn \l__stex_sproof_spf_for_clist {
5683       \tl_if_empty:nF{ ##1 }{
5684         \stex_get_symbol:n { ##1 }
5685         \exp_args:NNo \seq_put_right:Nn \l_tmpa_seq {
5686           \l_stex_get_symbol_uri_str
5687         }
5688       }
5689     }
5690     \exp_args:Nnx
5691     \stex_annotate:nnn{proofsketch}{\seq_use:Nn \l_tmpa_seq {,}}{
5692       \str_if_empty:NF \spftype {
5693         \stex_annotate_invisible:nnn{type}{\spftype}{-}
5694       }
5695       \clist_set:No \l_tmpa_clist \spftype
5696       \tl_set:Nn \l_tmpa_tl {
5697         \titleemph{
5698           \tl_if_empty:NTF \spftitle {
5699             \spf@proofsketch@kw
5700           }{
5701             \spftitle
5702           }
5703         }::~
5704       }
5705       \clist_map_inline:Nn \l_tmpa_clist {
5706         \exp_args:No \str_if_eq:nnT \c__stex_sproof_flow_str {##1} {
5707           \tl_clear:N \l_tmpa_tl
5708         }
5709       }
5710       \str_if_empty:NF \spfid {

```

```

5711         \stex_ref_new_doc_target:n \spfid
5712     }
5713     \l_tmpa_tl #2 \sproofend
5714 }
5715 }
5716 \endgroup
5717 \stex_smsmode_do:
5718 }
5719

```

(End definition for spfsketch. This function is documented on page ??.)

spfeq This is very similar to \spfsketch, but uses a computation array⁹¹⁰

```

5720 \newenvironment{spfeq}[2][]{
5721   \__stex_sproof_spf_args:n{#1}
5722   \let \premise \stex_proof_premise:
5723   \stex_if_smsmode:TF {
5724     \str_if_empty:NF \spfid {
5725       \stex_ref_new_doc_target:n \spfid
5726     }
5727   }{
5728     \seq_clear:N \l_tmpa_seq
5729     \clist_map_inline:Nn \l__stex_sproof_spf_for_clist {
5730       \tl_if_empty:NF{ ##1 }{
5731         \stex_get_symbol:n { ##1 }
5732         \exp_args:NNo \seq_put_right:Nn \l_tmpa_seq {
5733           \l_stex_get_symbol_uri_str
5734         }
5735       }
5736     }
5737     \exp_args:Nnnx
5738     \begin{stex_annotate_env}{spfeq}{\seq_use:Nn \l_tmpa_seq {,}}
5739     \str_if_empty:NF \spftype {
5740       \stex_annotate_invisible:nnn{type}{\spftype}{ }
5741     }
5742
5743     \clist_set:No \l_tmpa_clist \spftype
5744     \tl_clear:N \l_tmpa_tl
5745     \clist_map_inline:Nn \l_tmpa_clist {
5746       \tl_if_exist:cT {__stex_sproof_spfeq_##1_start:}{
5747         \tl_set:Nn \l_tmpa_tl {\use:c{__stex_sproof_spfeq_##1_start:}}
5748       }
5749       \exp_args:No \str_if_eq:nnT \c__stex_sproof_flow_str {##1} {
5750         \tl_set:Nn \l_tmpa_tl {\use:n{ }}
5751       }
5752     }
5753     \tl_if_empty:NTF \l_tmpa_tl {
5754       \__stex_sproof_spfeq_start:
5755     }{
5756       \l_tmpa_tl
5757     }{-#2}

```

⁹EDNOTE: This should really be more like a tabular with an ensuremath in it. or invoke text on the last column

¹⁰EDNOTE: document above

```

5758 \str_if_empty:NF \spfid {
5759 \stex_ref_new_doc_target:n \spfid
5760 }
5761 \begin{displaymath}\begin{array}{rc1l}
5762 }
5763 \stex_smsmode_do:
5764 }{
5765 \stex_if_smsmode:F {
5766 \end{array}\end{displaymath}
5767 \clist_set:No \l_tmpa_clist \spftype
5768 \tl_clear:N \l_tmpa_tl
5769 \clist_map_inline:Nn \l_tmpa_clist {
5770 \tl_if_exist:cT {__stex_sproof_spfeq_##1_end:}{
5771 \tl_set:Nn \l_tmpa_tl {\use:c{__stex_sproof_spfeq_##1_end:}}
5772 }
5773 }
5774 \tl_if_empty:NTF \l_tmpa_tl {
5775 \__stex_sproof_spfeq_end:
5776 }{
5777 \l_tmpa_tl
5778 }
5779 \end{stex_annotate_env}
5780 }
5781 }
5782
5783 \cs_new_protected:Nn \__stex_sproof_spfeq_start: {
5784 \titleemph{
5785 \tl_if_empty:NTF \spftitle {
5786 \spf@proof@kw
5787 }{
5788 \spftitle
5789 }
5790 }:
5791 }
5792 \cs_new_protected:Nn \__stex_sproof_spfeq_end: {\sproofend}
5793
5794 \newcommand\stexpatchspfeq[3] [] {
5795 \str_set:Nx \l_tmpa_str{ #1 }
5796 \str_if_empty:NTF \l_tmpa_str {
5797 \tl_set:Nn \__stex_sproof_spfeq_start: { #2 }
5798 \tl_set:Nn \__stex_sproof_spfeq_end: { #3 }
5799 }{
5800 \exp_after:wN \tl_set:Nn \csname __stex_sproof_spfeq_#1_start:\endcsname{ #2 }
5801 \exp_after:wN \tl_set:Nn \csname __stex_sproof_spfeq_#1_end:\endcsname{ #3 }
5802 }
5803 }
5804

```

(End definition for *spfeq*. This function is documented on page ??.)

sproof In this environment, we initialize the proof depth counter `\count10` to 10, and set up the description environment that will take the proof steps. At the end of the proof, we position the proof end into the last line.

```

5805 \newenvironment{sproof}[2] []{

```

```

5806 \let \premise \stex_proof_premise:
5807 \intarray_gzero:N \l__stex_sproof_counter_intarray
5808 \intarray_gset:Nnn \l__stex_sproof_counter_intarray 1 1
5809 \__stex_sproof_spf_args:n{#1}
5810 \stex_if_smsmode:TF {
5811   \str_if_empty:NF \spfid {
5812     \stex_ref_new_doc_target:n \spfid
5813   }
5814 }{
5815   \seq_clear:N \l_tmpa_seq
5816   \clist_map_inline:Nn \l__stex_sproof_spf_for_clist {
5817     \tl_if_empty:NF{ ##1 }{
5818       \stex_get_symbol:n { ##1 }
5819       \exp_args:NNo \seq_put_right:Nn \l_tmpa_seq {
5820         \l_stex_get_symbol_uri_str
5821       }
5822     }
5823   }
5824   \exp_args:Nnnx
5825   \begin{stex_annotate_env}{sproof}{\seq_use:Nn \l_tmpa_seq {},}}
5826   \str_if_empty:NF \spftype {
5827     \stex_annotate_invisible:nnn{type}{\spftype}{}
5828   }
5829
5830   \clist_set:No \l_tmpa_clist \spftype
5831   \tl_clear:N \l_tmpa_tl
5832   \clist_map_inline:Nn \l_tmpa_clist {
5833     \tl_if_exist:cT {__stex_sproof_sproof_##1_start:}{
5834       \tl_set:Nn \l_tmpa_tl {\use:c{__stex_sproof_sproof_##1_start:}}
5835     }
5836     \exp_args:No \str_if_eq:nnT \c__stex_sproof_flow_str {##1} {
5837       \tl_set:Nn \l_tmpa_tl {\use:n{}}
5838     }
5839   }
5840   \tl_if_empty:NTF \l_tmpa_tl {
5841     \__stex_sproof_sproof_start:
5842   }{
5843     \l_tmpa_tl
5844   }{~#2}
5845   \str_if_empty:NF \spfid {
5846     \stex_ref_new_doc_target:n \spfid
5847   }
5848   \begin{description}
5849 }
5850 \stex_smsmode_do:
5851 }{
5852 \stex_if_smsmode:F{
5853   \end{description}
5854   \clist_set:No \l_tmpa_clist \spftype
5855   \tl_clear:N \l_tmpa_tl
5856   \clist_map_inline:Nn \l_tmpa_clist {
5857     \tl_if_exist:cT {__stex_sproof_sproof_##1_end:}{
5858       \tl_set:Nn \l_tmpa_tl {\use:c{__stex_sproof_sproof_##1_end:}}
5859     }

```

```

5860     }
5861     \tl_if_empty:NTF \l_tmpa_tl {
5862       \__stex_sproof_sproof_end:
5863     }{
5864       \l_tmpa_tl
5865     }
5866     \end{stex_annotate_env}
5867   }
5868 }
5869
5870 \cs_new_protected:Nn \__stex_sproof_sproof_start: {
5871   \par\noindent\titleemph{
5872     \tl_if_empty:NTF \spftype {
5873       \spf@proof@kw
5874     }{
5875       \spftype
5876     }
5877   }:
5878 }
5879 \cs_new_protected:Nn \__stex_sproof_sproof_end: {\sproofend}
5880
5881 \newcommand\stexpatchproof[3] [] {
5882   \str_set:Nx \l_tmpa_str{ #1 }
5883   \str_if_empty:NTF \l_tmpa_str {
5884     \tl_set:Nn \__stex_sproof_sproof_start: { #2 }
5885     \tl_set:Nn \__stex_sproof_sproof_end: { #3 }
5886   }{
5887     \exp_after:wN \tl_set:Nn \csname __stex_sproof_sproof_#1_start:\endcsname{ #2 }
5888     \exp_after:wN \tl_set:Nn \csname __stex_sproof_sproof_#1_end:\endcsname{ #3 }
5889   }
5890 }

```

\spfidea

```

5891 \newcommand\spfidea[2] []{
5892   \__stex_sproof_spf_args:n{#1}
5893   \titleemph{
5894     \tl_if_empty:NTF \spftype {Proof~Idea}{
5895       \spftype
5896     }:
5897   }~#2
5898   \sproofend
5899 }

```

(End definition for \spfidea. This function is documented on page ??.)

The next two environments (proof steps) and comments, are mostly semantical, they take `KeyVal` arguments that specify their semantic role. In draft mode, they read these values and show them. If the surrounding proof had `display=flow`, then no new `\item` is generated, otherwise it is. In any case, the proof step number (at the current level) is incremented.

spfstep

```

5900 \newenvironment{spfstep}[1] []{
5901   \__stex_sproof_spf_args:n{#1}
5902   \stex_if_smsmode:TF {

```

```

5903 \str_if_empty:NF \spfid {
5904   \stex_ref_new_doc_target:n \spfid
5905 }
5906 }{
5907   \@in@omtexttrue
5908   \seq_clear:N \l_tmpa_seq
5909   \clist_map_inline:Nn \l__stex_sproof_spf_for_clist {
5910     \tl_if_empty:nF{ ##1 }{
5911       \stex_get_symbol:n { ##1 }
5912       \exp_args:NNo \seq_put_right:Nn \l_tmpa_seq {
5913         \l_stex_get_symbol_uri_str
5914       }
5915     }
5916   }
5917   \exp_args:Nnnx
5918   \begin{stex_annotate_env}{spfstep}{\seq_use:Nn \l_tmpa_seq {,}}
5919   \str_if_empty:NF \spftype {
5920     \stex_annotate_invisible:nnn{type}{\spftype}{}
5921   }
5922   \clist_set:No \l_tmpa_clist \spftype
5923   \tl_set:Nn \l_tmpa_tl {
5924     \item[\sproofnumber]
5925     \bool_set_true:N \l__stex_sproof_inc_counter_bool
5926   }
5927   \clist_map_inline:Nn \l_tmpa_clist {
5928     \exp_args:No \str_if_eq:nnT \c__stex_sproof_flow_str {##1} {
5929       \tl_clear:N \l_tmpa_tl
5930     }
5931   }
5932   \l_tmpa_tl
5933   \tl_if_empty:NF \spftitle {
5934     {(\titleemph{\spftitle})\enspace}
5935   }
5936   \str_if_empty:NF \spfid {
5937     \stex_ref_new_doc_target:n \spfid
5938   }
5939 }
5940 \stex_smsmode_do:
5941 \ignorespacesandpars
5942 }{
5943   \bool_if:NT \l__stex_sproof_inc_counter_bool {
5944     \__stex_sproof_inc_counter:
5945   }
5946   \stex_if_smsmode:F {
5947     \end{stex_annotate_env}
5948   }
5949 }

```

sproofcomment

```

5950 \newenvironment{sproofcomment}[1][]{
5951   \__stex_sproof_spf_args:n{#1}
5952   \clist_set:No \l_tmpa_clist \spftype
5953   \tl_set:Nn \l_tmpa_tl {
5954     \item[\sproofnumber]

```



```

5955 \bool_set_true:N \l__stex_sproof_inc_counter_bool
5956 }
5957 \clist_map_inline:Nn \l_tmpa_clist {
5958 \exp_args:No \str_if_eq:nnT \c__stex_sproof_flow_str {##1} {
5959 \tl_clear:N \l_tmpa_tl
5960 }
5961 }
5962 \l_tmpa_tl
5963 }{
5964 \bool_if:NT \l__stex_sproof_inc_counter_bool {
5965 \__stex_sproof_inc_counter:
5966 }
5967 }

```

The next two environments also take a `KeyVal` argument, but also a regular one, which contains a start text. Both environments start a new numbered proof level.

subproof In the `subproof` environment, a new (lower-level) `proproof` environment is started.

```

5968 \newenvironment{subproof}[2][]{
5969 \__stex_sproof_spf_args:n{#1}
5970 \stex_if_smsmode:TF{
5971 \str_if_empty:NF \spfid {
5972 \stex_ref_new_doc_target:n \spfid
5973 }
5974 }{
5975 \seq_clear:N \l_tmpa_seq
5976 \clist_map_inline:Nn \l__stex_sproof_spf_for_clist {
5977 \tl_if_empty:nF{ ##1 }{
5978 \stex_get_symbol:n { ##1 }
5979 \exp_args:NNo \seq_put_right:Nn \l_tmpa_seq {
5980 \l_stex_get_symbol_uri_str
5981 }
5982 }
5983 }
5984 \exp_args:Nnnx
5985 \begin{stex_annotate_env}{subproof}{\seq_use:Nn \l_tmpa_seq {,}}
5986 \str_if_empty:NF \spftype {
5987 \stex_annotate_invisible:nnn{type}{\spftype}{}}
5988 }
5989
5990 \clist_set:No \l_tmpa_clist \spftype
5991 \tl_set:Nn \l_tmpa_tl {
5992 \item[\sproofnumber]
5993 \bool_set_true:N \l__stex_sproof_inc_counter_bool
5994 }
5995 \clist_map_inline:Nn \l_tmpa_clist {
5996 \exp_args:No \str_if_eq:nnT \c__stex_sproof_flow_str {##1} {
5997 \tl_clear:N \l_tmpa_tl
5998 }
5999 }
6000 \l_tmpa_tl
6001 \tl_if_empty:NF \spftitle {
6002 {(\titleemph{\spftitle})\enspace}
6003 }

```

```

6004     {~#2}
6005     \str_if_empty:NF \spfid {
6006         \stex_ref_new_doc_target:n \spfid
6007     }
6008 }
6009 \__stex_sproof_add_counter:
6010 \stex_smsmode_do:
6011 }{
6012     \__stex_sproof_remove_counter:
6013     \bool_if:NT \l__stex_sproof_inc_counter_bool {
6014         \__stex_sproof_inc_counter:
6015     }
6016     \stex_if_smsmode:F{
6017         \end{stex_annotate_env}
6018     }
6019 }

```

spfcases In the **pfcases** environment, the start text is displayed as the first comment of the proof.

```

6020 \newenvironment{spfcases}[2][]{
6021     \tl_if_empty:nTF{#1}{
6022         \begin{subproof}[method=by-cases]{#2}
6023     }{
6024         \begin{subproof}[#1,method=by-cases]{#2}
6025     }
6026 }{
6027     \end{subproof}
6028 }

```

spfcase In the **pfcase** environment, the start text is displayed specification of the case after the **\item**

```

6029 \newenvironment{spfcase}[2][]{
6030     \__stex_sproof_spf_args:n{#1}
6031     \stex_if_smsmode:TF {
6032         \str_if_empty:NF \spfid {
6033             \stex_ref_new_doc_target:n \spfid
6034         }
6035     }{
6036         \seq_clear:N \l_tmpa_seq
6037         \clist_map_inline:Nn \l__stex_sproof_spf_for_clist {
6038             \tl_if_empty:nF{ ##1 }{
6039                 \stex_get_symbol:n { ##1 }
6040                 \exp_args:NNo \seq_put_right:Nn \l_tmpa_seq {
6041                     \l_stex_get_symbol_uri_str
6042                 }
6043             }
6044         }
6045         \exp_args:Nnnx
6046         \begin{stex_annotate_env}{spfcase}{\seq_use:Nn \l_tmpa_seq {,}}
6047         \str_if_empty:NF \spftype {
6048             \stex_annotate_invisible:nnn{type}{\spftype}{}}
6049     }
6050     \clist_set:Nn \l_tmpa_clist \spftype
6051     \tl_set:Nn \l_tmpa_tl {
6052         \item[\sproofnumber]

```

```

6053     \bool_set_true:N \l__stex_sproof_inc_counter_bool
6054   }
6055   \clist_map_inline:Nn \l_tmpa_clist {
6056     \exp_args:No \str_if_eq:nnT \c__stex_sproof_flow_str {##1} {
6057       \tl_clear:N \l_tmpa_tl
6058     }
6059   }
6060   \l_tmpa_tl
6061   \tl_if_empty:nF{#2}{
6062     \titleemph{#2}:~
6063   }
6064 }
6065 \__stex_sproof_add_counter:
6066 \stex_smsmode_do:
6067 }{
6068   \__stex_sproof_remove_counter:
6069   \bool_if:NT \l__stex_sproof_inc_counter_bool {
6070     \__stex_sproof_inc_counter:
6071   }
6072   \stex_if_smsmode:F{
6073     \clist_set:No \l_tmpa_clist \spftype
6074     \tl_set:Nn \l_tmpa_tl{\sproofend}
6075     \clist_map_inline:Nn \l_tmpa_clist {
6076       \exp_args:No \str_if_eq:nnT \c__stex_sproof_flow_str {##1} {
6077         \tl_clear:N \l_tmpa_tl
6078       }
6079     }
6080     \l_tmpa_tl
6081     \end{stex_annotate_env}
6082   }
6083 }

```

spfcase similar to **spfcase**, takes a third argument.

```

6084 \newcommand\spfcasesketch[3][]{
6085   \begin{spfcase}[#1]{#2}#3\end{spfcase}
6086 }

```

33.3 Justifications

We define the actions that are undertaken, when the keys for justifications are encountered. Here this is very simple, we just define an internal macro with the value, so that we can use it later.

```

6087 \keys_define:nn { stex / just }{
6088   id      .str_set:x:N = \l__stex_sproof_just_id_str,
6089   method  .tl_set:N    = \l__stex_sproof_just_method_tl,
6090   premises .tl_set:N    = \l__stex_sproof_just_premises_tl,
6091   args     .tl_set:N    = \l__stex_sproof_just_args_tl
6092 }

```

The next three environments and macros are purely semantic, so we ignore the keyval arguments for now and only display the content.¹¹

¹¹EDNOTE: need to do something about the premise in draft mode.

justification

```
6093 \newenvironment{justification}[1] [] {}{}
```

\premise

```
6094 \newcommand\stex_proof_promise:[2] [] {#2}
```

(End definition for \premise. This function is documented on page ??.)

\justarg the **\justarg** macro is purely semantic, so we ignore the keyval arguments for now and only display the content.

```
6095 \newcommand\justarg[2] [] {#2}
```

```
6096 \end{package}
```

(End definition for \justarg. This function is documented on page ??.)

Some auxiliary code, and clean up to be executed at the end of the package.

Chapter 34

STEX -Others Implementation

```
6097 <*package>
6098
6099 %%%%%%%%%% others.dtx %%%%%%%%%%
6100
6101 <@@=stex_others>
        Warnings and error messages
6102 % None

\MSC Math subject classifier

6103 \NewDocumentCommand \MSC {m} {
6104 % TODO
6105 }

(End definition for \MSC. This function is documented on page ??.)
        Patching tikzinput, if loaded

6106 \@ifpackageloaded{tikzinput}{
6107 \RequirePackage{stex-tikzinput}
6108 }{}
6109
6110 \bool_if:NT \c_stex_persist_mode_bool {
6111 \input{\jobname.sms}
6112 \prop_if_exist:NT\c_stex_mathhub_main_manifest_prop{
6113 \prop_get:NnN \c_stex_mathhub_main_manifest_prop {id}
6114 \l_tmpa_str
6115 \prop_set_eq:cN { c_stex_mathhub\_l_tmpa_str_manifest_prop }
6116 \c_stex_mathhub_main_manifest_prop
6117 \exp_args:Nx \stex_set_current_repository:n { \l_tmpa_str }
6118 }
6119 }

6120 </package>
```

Chapter 35

STEX -Metatheory Implementation

```
6121 <*package>
6122 <@@=stex_modules>
6123
6124 %%%%%%%%%%% metatheory.dtx %%%%%%%%%%%
6125
6126 \str_const:Nn \c_stex_metatheory_ns_str {http://mathhub.info/sTeX/meta}
6127 \begingroup
6128 \stex_module_setup:nn{
6129   ns=\c_stex_metatheory_ns_str,
6130   meta=NONE
6131 }{Metatheory}
6132 \stex_reactivate_macro:N \symdecl
6133 \stex_reactivate_macro:N \notation
6134 \stex_reactivate_macro:N \symdef
6135 \ExplSyntaxOff
6136 \csname stex_suppress_html:n\endcsname{
6137   % is-a (a:A, a \in A, a is an A, etc.)
6138   \symdecl{isa}[args=ai]
6139   \notation{isa}[typed,op=:]{#1 \comp{:} #2}{##1 \comp, ##2}
6140   \notation{isa}[in]{#1 \comp\in #2}{##1 \comp, ##2}
6141   \notation{isa}[pred]{#2\comp(#1 \comp)}{##1 \comp, ##2}
6142
6143   % bind (\forall, \Pi, \lambda etc.)
6144   \symdecl{bind}[args=Bi]
6145   \notation{bind}[forall]{\comp\forall #1.;#2}{##1 \comp, ##2}
6146   \notation{bind}[Pi]{\comp\prod_{#1}#2}{##1 \comp, ##2}
6147   \notation{bind}[depfun]{\comp( #1 \comp{}\;\to\;} #2}{##1 \comp, ##2}
6148
6149   % implicit bind
6150   \symdef{implicitbind}[args=Bi]{\comp\prod_{#1}#2}{##1 \comp, ##2}
6151
6152   % dummy variable
6153   \symdecl{dummyvar}
6154   \notation{dummyvar}[underscore]{\comp\_}
6155   \notation{dummyvar}[dot]{\comp\cdot}
```

```

6156 \notation{dummyvar}[dash]{\comp{\rm --}}
6157
6158 %fromto (function space, Hom-set, implication etc.)
6159 \symdecl{fromto}[args=ai]
6160 \notation{fromto}[xarrow]{#1 \comp\to #2}{##1 \comp\times ##2}
6161 \notation{fromto}[arrow]{#1 \comp\to #2}{##1 \comp\to ##2}
6162
6163 % mapto (lambda etc.)
6164 \symdecl{mapto}[args=Bi]
6165 %\notation{mapto}[mapsto]{#1 \comp\mapsto #2}{#1 \comp, #2}
6166 %\notation{mapto}[lambda]{\comp\lambda #1 \comp.; #2}{#1 \comp, #2}
6167 %\notation{mapto}[lambdau]{\comp\lambda_{#1} \comp.; #2}{#1 \comp, #2}
6168
6169 % function/operator application
6170 \symdecl{apply}[args=ia]
6171 \notation{apply}[prec=0;0x\infprec,parens]{#1 \comp( #2 \comp)}{##1 \comp, ##2}
6172 \notation{apply}[prec=0;0x\infprec,lambda]{#1 \; #2 }{##1 \; ; ##2}
6173
6174 % collection of propositions/booleans/truth values
6175 \symdecl{prop}[name=proposition]
6176 \notation{prop}[prop]{\comp{\rm prop}}
6177 \notation{prop}[BOOL]{\comp{\rm BOOL}}
6178
6179 \symdecl{judgmentholds}[args=1]
6180 \notation{judgmentholds}[vdash,op=\vdash]{\comp\vdash\; ; #1}
6181
6182 % sequences
6183 \symdecl{seqtype}[args=1]
6184 \notation{seqtype}[kleene]{#1^{\comp\ast}}
6185
6186 \symdecl{seqexpr}[args=a]
6187 \notation{seqexpr}[angle,prec=nobrackets]{\comp\angle #1\comp\rangle}{##1\comp,##2}
6188
6189 \symdef{sequence-index}[args=2,li,prec=nobrackets]{#{#1}_{#2}}
6190 \notation{sequence-index}[ui,prec=nobrackets]{#{#1}^{#2}}
6191
6192 \symdef{aseqdots}[args=a,prec=nobrackets]{#1\comp{,\ellipses}}{##1\comp,##2}
6193 \symdef{aseqfromto}[args=ai,prec=nobrackets]{#1\comp{,\ellipses,}#2}{##1\comp,##2}
6194 \symdef{aseqfromtovia}[args=aii,prec=nobrackets]{#1\comp{,\ellipses,}#2\comp{,\ellipses,}#3}
6195
6196 % letin (''let'', local definitions, variable substitution)
6197 \symdecl{letin}[args=bii]
6198 \notation{letin}[let]{\comp{\rm let}}\;#1\comp{=}\;#2\; \comp{\rm in}}\;#3}
6199 \notation{letin}[subst]{#3 \comp[ #1 \comp/ #2 \comp]}
6200 \notation{letin}[frac]{#3 \comp[ \frac{#2}{#1} \comp]}
6201
6202 % structures
6203 \symdecl*{module-type}[args=1]
6204 \notation{module-type}{\comp{\mathtt{MOD}}} #1}
6205 \symdecl{mathstruct}[name=mathematical-structure,args=a] % TODO
6206 \notation{mathstruct}[angle,prec=nobrackets]{\comp\angle #1 \comp\rangle}{##1 \comp, ##2}
6207
6208 % objects
6209 \symdecl{object}

```

```

6210 \notation{object}{\comp{\mathtt{OBJECT}}}
6211
6212 }
6213 \ExplSyntaxOn
6214 \stex_add_to_current_module:n{
6215   \let\nappa\apply
6216   \def\nappli#1#2#3#4{\apply{#1}{\naseqli{#2}{#3}{#4}}}
6217   \def\nappui#1#2#3#4{\apply{#1}{\nasequi{#2}{#3}{#4}}}
6218   \def\livar{\csname sequence-index\endcsname[li]}
6219   \def\uivar{\csname sequence-index\endcsname[ui]}
6220   \def\naseqli#1#2#3{\aseqfromto{\livar{#1}{#2}}{\livar{#1}{#3}}}
6221   \def\nasequi#1#2#3{\aseqfromto{\uivar{#1}{#2}}{\uivar{#1}{#3}}}
6222   \def\nappe#1#2#3{\apply{#1}{\aseqfromto{#2}{#3}}}
6223 }
6224 \__stex_modules_end_module:
6225 \endgroup
6226 \</package>

```


Chapter 36

Tikzinput Implementation

```
6227 <@@=tikzinput>
6228 <*package>
6229
6230 %%%%%%%%%% tikzinput.dtx %%%%%%%%%%
6231
6232 \ProvidesExplPackage{tikzinput}{2022/02/26}{3.0.1}{tikzinput package}
6233 \RequirePackage{l3keys2e}
6234
6235 \keys_define:nn { tikzinput } {
6236   image .bool_set:N = \c_tikzinput_image_bool,
6237   image .default:n = false ,
6238   unknown .code:n = {}
6239 }
6240
6241 \ProcessKeysOptions { tikzinput }
6242
6243 \bool_if:NTF \c_tikzinput_image_bool {
6244   \RequirePackage{graphicx}
6245
6246   \providecommand\usetikzlibrary[]{}
6247   \newcommand\tikzinput[2] [] {\includegraphics[#1]{#2}}
6248 }{
6249   \RequirePackage{tikz}
6250   \RequirePackage{standalone}
6251
6252   \newcommand \tikzinput [2] [] {
6253     \setkeys{Gin}{#1}
6254     \ifx \Gin@ewidth \Gin@exclamation
6255       \ifx \Gin@eheight \Gin@exclamation
6256         \input { #2 }
6257       \else
6258         \resizebox{!}{ \Gin@eheight }{
6259           \input { #2 }
6260         }
6261       \fi
6262     \else
6263       \ifx \Gin@eheight \Gin@exclamation
6264         \resizebox{ \Gin@ewidth }{!}{
```

```

6265         \input { #2 }
6266     }
6267     \else
6268         \resizebox{ \Gin@ewidth }{ \Gin@eheight }{
6269             \input { #2 }
6270         }
6271     \fi
6272 \fi
6273 }
6274 }
6275
6276 \newcommand \ctikzinput [2] [] {
6277     \begin{center}
6278         \tikzinput [#1] {#2}
6279     \end{center}
6280 }
6281
6282 \@ifpackageloaded{stex}{
6283     \RequirePackage{stex-tikzinput}
6284 }{}
6285
6286 </package>
6287 <*stex>
6288 \ProvidesExplPackage{stex-tikzinput}{2022/02/26}{3.0.1}{stex-tikzinput}
6289 \RequirePackage{stex}
6290 \RequirePackage{tikzinput}
6291
6292 \newcommand\mhtikzinput[2] []{%
6293     \def\Gin@mhrepos{ }\setkeys{Gin}{#1}%
6294     \stex_in_repository:nn\Gin@mhrepos{
6295         \tikzinput[#1]{\mhp@hpath{##1}{#2}}
6296     }
6297 }
6298 \newcommand\cmhtikzinput[2] []{\begin{center}\mhtikzinput[#1]{#2}\end{center}}
6299
6300 \cs_new_protected:Nn \__tikzinput_usetikzlibrary:nn {
6301     \pgfkeys@spdef\pgf@temp{#1}
6302     \expandafter\ifx\csname tikz@library@\pgf@temp @loaded\endcsname\relax%
6303     \expandafter\global\expandafter\let\csname tikz@library@\pgf@temp @loaded\endcsname=\pgf@temp
6304     \expandafter\edef\csname tikz@library@#1@atcode\endcsname{\the\catcode'\@}
6305     \expandafter\edef\csname tikz@library@#1@barcode\endcsname{\the\catcode'\|}
6306     \expandafter\edef\csname tikz@library@#1@dollarcode\endcsname{\the\catcode'\$}
6307     \catcode'\@=11
6308     \catcode'\|=12
6309     \catcode'\$=3
6310     \pgfutil@InputIfFileExists{#2}{-}{-}
6311     \catcode'\@=\csname tikz@library@#1@atcode\endcsname
6312     \catcode'\|=\csname tikz@library@#1@barcode\endcsname
6313     \catcode'\$=\csname tikz@library@#1@dollarcode\endcsname
6314 }
6315
6316
6317 \newcommand\libusetikzlibrary[1]{

```

```

6318 \prop_if_exist:NF \l_stex_current_repository_prop {
6319   \msg_error:nnn{stex}{error/notinarchive}\libusetikzlibrary
6320 }
6321 \prop_get:NnNF \l_stex_current_repository_prop {id} \l_tmpa_str {
6322   \msg_error:nnn{stex}{error/notinarchive}\libusetikzlibrary
6323 }
6324 \seq_clear:N \l__tikzinput_libinput_files_seq
6325 \seq_set_eq:NN \l_tmpa_seq \c_stex_mathhub_seq
6326 \seq_set_split:NnV \l_tmpb_seq / \l_tmpa_str
6327
6328 \bool_while_do:nn { ! \seq_if_empty_p:N \l_tmpb_seq }{
6329   \str_set:Nx \l_tmpa_str {\stex_path_to_string:N \l_tmpa_seq / meta-inf / lib / tikzlibrary
6330   \IfFileExists{ \l_tmpa_str }{
6331     \seq_put_right:No \l__tikzinput_libinput_files_seq \l_tmpa_str
6332   }{
6333     \seq_pop_left:NN \l_tmpb_seq \l_tmpa_str
6334     \seq_put_right:No \l_tmpa_seq \l_tmpa_str
6335   }
6336
6337   \str_set:Nx \l_tmpa_str {\stex_path_to_string:N \l_tmpa_seq / lib / tikzlibrary #1 .code.t
6338   \IfFileExists{ \l_tmpa_str }{
6339     \seq_put_right:No \l__tikzinput_libinput_files_seq \l_tmpa_str
6340   }{
6341
6342     \seq_if_empty:NTF \l__tikzinput_libinput_files_seq {
6343       \msg_error:nnxx{stex}{error/nofile}{\exp_not:N\libusetikzlibrary}{tikzlibrary #1 .code.t
6344     }{
6345       \int_compare:nNnTF {\seq_count:N \l__tikzinput_libinput_files_seq} = 1 {
6346         \seq_map_inline:Nn \l__tikzinput_libinput_files_seq {
6347           \__tikzinput_usetikzlibrary:nn{#1}{ ##1 }
6348         }
6349       }{
6350         \msg_error:nnxx{stex}{error/twofiles}{\exp_not:N\libusetikzlibrary}{tikzlibrary #1 .co
6351       }
6352     }
6353   }
6354 }

```

LocalWords: bibfolder jobname.dtx tikzinput.dtx usetikzlibrary Gin@ewidth Gin@eheight
 LocalWords: resizebox ctikzinput mhtikzinput Gin@mhrepos mhpah

Chapter 37

document-structure.sty Implementation

```
6355 <*package>
6356 <@@=document_structure>
6357 \ProvidesExplPackage{document-structure}{2022/02/26}{3.0.1}{Modular Document Structure}
6358 \RequirePackage{13keys2e}
```

37.1 Package Options

We declare some switches which will modify the behavior according to the package options. Generally, an option xxx will just set the appropriate switches to true (otherwise they stay false).

```
6359
6360 \keys_define:nn{ document-structure }{
6361   class      .str_set_x:N = \c_document_structure_class_str,
6362   topsect    .str_set_x:N = \c_document_structure_topsect_str,,
6363   unknown    .code:n      = {
6364     \PassOptionsToClass{\CurrentOption}{stex}
6365     \PassOptionsToClass{\CurrentOption}{tikzinput}
6366   }
6367   % showignores .bool_set:N = \c_document_structure_showignores_bool,
6368 }
6369 \ProcessKeysOptions{ document-structure }
6370 \str_if_empty:NT \c_document_structure_class_str {
6371   \str_set:Nn \c_document_structure_class_str {article}
6372 }
6373 \str_if_empty:NT \c_document_structure_topsect_str {
6374   \str_set:Nn \c_document_structure_topsect_str {section}
6375 }
```

Then we need to set up the packages by requiring the `sref` package to be loaded, and set up triggers for other languages

```
6376 \RequirePackage{xspace}
6377 \RequirePackage{comment}
6378 \RequirePackage{stex}
6379 \AddToHook{begindocument}{}
```

```

6380 \ltx@ifpackageloaded{babel}{
6381   \clist_set:Nx \l_tmpa_clist {\bbl@loaded}
6382   \clist_if_in:NnT \l_tmpa_clist {ngerman}{
6383     \makeatletter\input{document-structure-ngerman.ldf}\makeatother
6384   }
6385 }{}
6386 }

```

`\section@level` Finally, we set the `\section@level` macro that governs sectioning. The default is two (corresponding to the `article` class), then we set the defaults for the standard classes `book` and `report` and then we take care of the levels passed in via the `topsect` option.

```

6387 \int_new:N \l_document_structure_section_level_int
6388 \str_case:NnF \c_document_structure_topsect_str {
6389   {part}}{
6390     \int_set:Nn \l_document_structure_section_level_int {0}
6391   }
6392   {chapter}{
6393     \int_set:Nn \l_document_structure_section_level_int {1}
6394   }
6395 }{
6396   \str_case:NnF \c_document_structure_class_str {
6397     {book}{
6398       \int_set:Nn \l_document_structure_section_level_int {0}
6399     }
6400     {report}{
6401       \int_set:Nn \l_document_structure_section_level_int {0}
6402     }
6403   }{
6404     \int_set:Nn \l_document_structure_section_level_int {2}
6405   }
6406 }

```

37.2 Document Structure

The structure of the document is given by the `omgroup` environment just like in OMDoc. The hierarchy is adjusted automatically according to the L^AT_EX class in effect.

`\currentsectionlevel` For the `\currentsectionlevel` and `\Currentsectionlevel` macros we use an internal macro `\current@section@level` that only contains the keyword (no markup). We initialize it with “document” as a default. In the generated OMDoc, we only generate a text element of class `omdoc_currentsectionlevel`, which will be instantiated by CSS later.¹²

```

6407 \def\current@section@level{document}%
6408 \newcommand\currentsectionlevel{\lowercase\expandafter\current@section@level\xspace}%
6409 \newcommand\Currentsectionlevel{\expandafter\MakeUppercase\current@section@level\xspace}%

```

(End definition for `\currentsectionlevel`. This function is documented on page ??.)

`\skipomgroup`

```

6410 \cs_new_protected:Npn \skipomgroup {

```

¹²EdNOTE: MK: we may have to experiment with the more powerful uppercasing macro from `mfirstuc.sty` once we internationalize.

```

6411 \ifcase\l_document_structure_section_level_int
6412 \or\stepcounter{part}
6413 \or\stepcounter{chapter}
6414 \or\stepcounter{section}
6415 \or\stepcounter{subsection}
6416 \or\stepcounter{subsubsection}
6417 \or\stepcounter{paragraph}
6418 \or\stepcounter{subparagraph}
6419 \fi
6420 }

```

(End definition for \skipomgroup. This function is documented on page ??.)

blindfragment

```

6421 \newcommand\at@begin@blindomgroup[1]{
6422 \newenvironment{blindfragment}
6423 {
6424 \int_incr:N\l_document_structure_section_level_int
6425 \at@begin@blindomgroup\l_document_structure_section_level_int
6426 }{}

```

\omgroup@nonum convenience macro: `\omgroup@nonum{<level>}{<title>}` makes an unnumbered sectioning with title `<title>` at level `<level>`.

```

6427 \newcommand\omgroup@nonum[2]{
6428 \ifx\hyper@anchor\@undefined\else\phantomsection\fi
6429 \addcontentsline{toc}{#1}{#2}\@nameuse{#1}*{#2}
6430 }

```

(End definition for \omgroup@nonum. This function is documented on page ??.)

\omgroup@num convenience macro: `\omgroup@num{<level>}{<title>}` makes numbered sectioning with title `<title>` at level `<level>`. We have to check the `short` key was given in the `omgroup` environment and – if it is use it. But how to do that depends on whether the `rdmeta` package has been loaded. In the end we call `\sref@label@id` to enable crossreferencing.

```

6431 \newcommand\omgroup@num[2]{
6432 \tl_if_empty:NTF \l__document_structure_omgroup_short_tl {
6433 \@nameuse{#1}{#2}
6434 }{
6435 \cs_if_exist:NTF\rdmeta@sectioning{
6436 \@nameuse{rdmeta@#1@old}[\l__document_structure_omgroup_short_tl]{#2}
6437 }{
6438 \@nameuse{#1}[\l__document_structure_omgroup_short_tl]{#2}
6439 }
6440 }
6441 %\sref@label@id@arg{\omdoc@sect@name~\@nameuse{the#1}}\omgroup@id
6442 }

```

(End definition for \omgroup@num. This function is documented on page ??.)

sfragment

```

6443 \keys_define:nn { document-structure / omgroupp }{
6444 id .str_set_x:N = \l__document_structure_omgroup_id_str,
6445 date .str_set_x:N = \l__document_structure_omgroup_date_str,
6446 creators .clist_set:N = \l__document_structure_omgroup_creators_clist,

```

```

6447 contributors .clist_set:N = \l__document_structure_omgroup_contributors_clist,
6448 srccite .tl_set:N = \l__document_structure_omgroup_srccite_tl,
6449 type .tl_set:N = \l__document_structure_omgroup_type_tl,
6450 short .tl_set:N = \l__document_structure_omgroup_short_tl,
6451 display .tl_set:N = \l__document_structure_omgroup_display_tl,
6452 intro .tl_set:N = \l__document_structure_omgroup_intro_tl,
6453 imports .tl_set:N = \l__document_structure_omgroup_imports_tl,
6454 loadmodules .bool_set:N = \l__document_structure_omgroup_loadmodules_bool
6455 }
6456 \cs_new_protected:Nn \__document_structure_omgroup_args:n {
6457 \str_clear:N \l__document_structure_omgroup_id_str
6458 \str_clear:N \l__document_structure_omgroup_date_str
6459 \clist_clear:N \l__document_structure_omgroup_creators_clist
6460 \clist_clear:N \l__document_structure_omgroup_contributors_clist
6461 \tl_clear:N \l__document_structure_omgroup_srccite_tl
6462 \tl_clear:N \l__document_structure_omgroup_type_tl
6463 \tl_clear:N \l__document_structure_omgroup_short_tl
6464 \tl_clear:N \l__document_structure_omgroup_display_tl
6465 \tl_clear:N \l__document_structure_omgroup_imports_tl
6466 \tl_clear:N \l__document_structure_omgroup_intro_tl
6467 \bool_set_false:N \l__document_structure_omgroup_loadmodules_bool
6468 \keys_set:nn { document-structure / omgrou } { #1 }
6469 }

```

we define a switch for numbering lines and a hook for the beginning of groups: The `\at@begin@omgroup` macro allows customization. It is run at the beginning of the `omgroup`, i.e. after the section heading.

```

6470 \newif\if@mainmatter\@mainmattertrue
6471 \newcommand\at@begin@omgroup[3][]{ }

```

Then we define a helper macro that takes care of the sectioning magic. It comes with its own key/value interface for customization.

```

6472 \keys_define:nn { document-structure / sectioning }{
6473   name .str_set_x:N = \l__document_structure_sect_name_str ,
6474   ref .str_set_x:N = \l__document_structure_sect_ref_str ,
6475   clear .bool_set:N = \l__document_structure_sect_clear_bool ,
6476   clear .default:n = {true} ,
6477   num .bool_set:N = \l__document_structure_sect_num_bool ,
6478   num .default:n = {true}
6479 }
6480 \cs_new_protected:Nn \__document_structure_sect_args:n {
6481 \str_clear:N \l__document_structure_sect_name_str
6482 \str_clear:N \l__document_structure_sect_ref_str
6483 \bool_set_false:N \l__document_structure_sect_clear_bool
6484 \bool_set_false:N \l__document_structure_sect_num_bool
6485 \keys_set:nn { document-structure / sectioning } { #1 }
6486 }
6487 \newcommand\omdoc@sectioning[3][]{
6488 \__document_structure_sect_args:n {#1 }
6489 \let\omdoc@sect@name\l__document_structure_sect_name_str
6490 \bool_if:NT \l__document_structure_sect_clear_bool { \cleardoublepage }
6491 \if@mainmatter% numbering not overridden by frontmatter, etc.
6492 \bool_if:NTF \l__document_structure_sect_num_bool {
6493 \omgroup@num{#2}{#3}

```

```

6494     }{
6495       \omgroup@nonum{#2}{#3}
6496     }
6497     \def\current@section@level{\omdoc@sect@name}
6498   \else
6499     \omgroup@nonum{#2}{#3}
6500   \fi
6501 }% if@mainmatter

```

and another one, if redefines the `\addtocontentsline` macro of L^AT_EX to import the respective macros. It takes as an argument a list of module names.

```

6502 \newcommand\omgroup@redefine@addtocontents[1]{%
6503   %\edef\__document_structureimport{#1}%
6504   %\@for\@I:=\__document_structureimport\do{%
6505     %\edef\@path{\csname module@\@I @path\endcsname}%
6506     %\@ifundefined{tf@toc}\relax%
6507     %    {\protected@write\tf@toc}{\string\@requiremodules{\@path}}}%
6508   %\ifx\hyper@anchor\@undefined% hyperref.sty loaded?
6509   %\def\addcontentsline##1##2##3{%
6510     %\addtocontents{##1}{\protect\contentsline{##2}{\string\withusedmodules{##1}{##3}}{\thepage}}%
6511   %\else% hyperref.sty not loaded
6512   %\def\addcontentsline##1##2##3{%
6513     %\addtocontents{##1}{\protect\contentsline{##2}{\string\withusedmodules{##1}{##3}}{\thepage}}%
6514   %\fi
6515 }% hypreref.sty loaded?

```

now the `omgroup` environment itself. This takes care of the table of contents via the helper macro above and then selects the appropriate sectioning command from `article.cls`. It also registers the current level of `omgroups` in the `\omgroup@level` counter.

```

6516 \newenvironment{sfragment}[2][ ]% keys, title
6517 {
6518   \__document_structure_omgroup_args:n { #1 }%\sref@target%

```

If the `loadmodules` key is set on `\begin{sfragment}`, we redefine the `\addcontetsline` macro that determines how the sectioning commands below construct the entries for the table of contents.

```

6519   \stex_csl_to_imports:No \usemodule \l__document_structure_omgroup_imports_tl
6520
6521   \bool_if:NT \l__document_structure_omgroup_loadmodules_bool {
6522     \omgroup@redefine@addtocontents{
6523       %\@ifundefined{module@id}\used@modules%
6524       %{\@ifundefined{module@\module@id @path}{\used@modules}\module@id}
6525     }
6526   }

```

now we only need to construct the right sectioning depending on the value of `\section@level`.

```

6527   \int_incr:N\l__document_structure_section_level_int
6528   \ifcase\l__document_structure_section_level_int
6529     \or\omdoc@sectioning[name=\omdoc@part@kw,clear,num]{part}{#2}
6530     \or\omdoc@sectioning[name=\omdoc@chapter@kw,clear,num]{chapter}{#2}
6531     \or\omdoc@sectioning[name=\omdoc@section@kw,num]{section}{#2}
6532     \or\omdoc@sectioning[name=\omdoc@subsection@kw,num]{subsection}{#2}
6533     \or\omdoc@sectioning[name=\omdoc@subsubsection@kw,num]{subsubsection}{#2}
6534     \or\omdoc@sectioning[name=\omdoc@paragraph@kw,ref=this \omdoc@paragraph@kw]{paragraph}{#2}
6535     \or\omdoc@sectioning[name=\omdoc@subparagraph@kw,ref=this \omdoc@subparagraph@kw]{paragr

```



```

6536 \fi
6537 \at@begin@omgroup[#1]\l_document_structure_section_level_int{#2}
6538 \str_if_empty:NF \l__document_structure_omgroup_id_str {
6539   \stex_ref_new_doc_target:n\l__document_structure_omgroup_id_str
6540 }
6541 }% for customization
6542 {}

```

and finally, we localize the sections

```

6543 \newcommand\omdoc@part@kw{Part}
6544 \newcommand\omdoc@chapter@kw{Chapter}
6545 \newcommand\omdoc@section@kw{Section}
6546 \newcommand\omdoc@subsection@kw{Subsection}
6547 \newcommand\omdoc@subsubsection@kw{Subsubsection}
6548 \newcommand\omdoc@paragraph@kw{paragraph}
6549 \newcommand\omdoc@subparagraph@kw{subparagraph}

```

37.3 Front and Backmatter

Index markup is provided by the `omtext` package [Koh20c], so in the `document-structure` package we only need to supply the corresponding `\printindex` command, if it is not already defined

`\printindex`

```

6550 \providecommand\printindex{\IfFileExists{\jobname.ind}{\input{\jobname.ind}}{}}

```

(End definition for `\printindex`. This function is documented on page ??.)

some classes (e.g. `book.cls`) already have `\frontmatter`, `\mainmatter`, and `\backmatter` macros. As we want to define `frontmatter` and `backmatter` environments, we save their behavior (possibly defining it) in `orig@*matter` macros and make them undefined (so that we can define the environments).

```

6551 \cs_if_exist:NTF\frontmatter{
6552   \let\__document_structure_orig_frontmatter\frontmatter
6553   \let\frontmatter\relax
6554 }{
6555   \tl_set:Nn\__document_structure_orig_frontmatter{
6556     \clearpage
6557     \@mainmatterfalse
6558     \pagenumbering{roman}
6559   }
6560 }
6561 \cs_if_exist:NTF\backmatter{
6562   \let\__document_structure_orig_backmatter\backmatter
6563   \let\backmatter\relax
6564 }{
6565   \tl_set:Nn\__document_structure_orig_backmatter{
6566     \clearpage
6567     \@mainmatterfalse
6568     \pagenumbering{roman}
6569   }
6570 }

```

Using these, we can now define the `frontmatter` and `backmatter` environments

frontmatter we use the `\orig@frontmatter` macro defined above and `\mainmatter` if it exists, otherwise we define it.

```

6571 \newenvironment{frontmatter}{
6572   \_document_structure_orig_frontmatter
6573 }{
6574   \cs_if_exist:NTF\mainmatter{
6575     \mainmatter
6576   }{
6577     \clearpage
6578     \@mainmattertrue
6579     \pagenumbering{arabic}
6580   }
6581 }

```

backmatter As backmatter is at the end of the document, we do nothing for `\endbackmatter`.

```

6582 \newenvironment{backmatter}{
6583   \_document_structure_orig_backmatter
6584 }{
6585   \cs_if_exist:NTF\mainmatter{
6586     \mainmatter
6587   }{
6588     \clearpage
6589     \@mainmattertrue
6590     \pagenumbering{arabic}
6591   }
6592 }

```

finally, we make sure that page numbering is arabic and we have main matter as the default

```

6593 \@mainmattertrue\pagenumbering{arabic}

```

\prematurestop We initialize `\afterprematurestop`, and provide `\prematurestop@endomgroup` which looks up `\omgroup@level` and recursively ends enough `{sfragment}`s.

```

6594 \def \c__document_structure_document_str{document}
6595 \newcommand\afterprematurestop{}
6596 \def\prematurestop@endomgroup{
6597   \unless\ifx\@currenvir\c__document_structure_document_str
6598     \expandafter\expandafter\expandafter\end\expandafter\expandafter\expandafter{\expandafter
6599     \expandafter\prematurestop@endomgroup
6600   \fi
6601 }
6602 \providecommand\prematurestop{
6603   \message{Stopping~sTeX~processing~prematurely}
6604   \prematurestop@endomgroup
6605   \afterprematurestop
6606   \end{document}
6607 }

```

(End definition for `\prematurestop`. This function is documented on page ??.)

37.4 Global Variables

`\setSGvar` set a global variable

```
6608 \RequirePackage{etoolbox}
6609 \newcommand\setSGvar[1]{\@namedef{sTeX@Gvar@#1}}
```

(End definition for \setSGvar. This function is documented on page ??.)

`\useSGvar` use a global variable

```
6610 \newrobustcmd\useSGvar[1]{%
6611   \@ifundefined{sTeX@Gvar@#1}
6612   {\PackageError{document-structure}
6613    {The sTeX Global variable #1 is undefined}
6614    {set it with \protect\setSGvar}}
6615   \@nameuse{sTeX@Gvar@#1}}
```

(End definition for \useSGvar. This function is documented on page ??.)

`\ifSGvar` execute something conditionally based on the state of the global variable.

```
6616 \newrobustcmd\ifSGvar[3]{\def\@test{#2}%
6617   \@ifundefined{sTeX@Gvar@#1}
6618   {\PackageError{document-structure}
6619    {The sTeX Global variable #1 is undefined}
6620    {set it with \protect\setSGvar}}
6621   {\expandafter\ifx\csname sTeX@Gvar@#1\endcsname\@test #3\fi}}
```

(End definition for \ifSGvar. This function is documented on page ??.)

Chapter 38

NotesSlides – Implementation

38.1 Class and Package Options

We define some Package Options and switches for the `notesslides` class and activate them by passing them on to `beamer.cls` and `omdoc.cls` and the `notesslides` package. We pass the `nontheorem` option to the `statements` package when we are not in notes mode, since the `beamer` package has its own (overlay-aware) theorem environments.

```
6622 \*cls)
6623 \@@=notesslides}
6624 \ProvidesExplClass{notesslides}{2022/02/28}{3.1.0}{notesslides Class}
6625 \RequirePackage{13keys2e}
6626
6627 \keys_define:nn{notesslides / cls}{
6628   class .str_set_x:N = \c__notesslides_class_str,
6629   notes .bool_set:N = \c__notesslides_notes_bool ,
6630   slides .code:n = { \bool_set_false:N \c__notesslides_notes_bool },
6631   docopt .str_set_x:N = \c__notesslides_docopt_str,
6632   unknown .code:n = {
6633     \PassOptionsToPackage{\CurrentOption}{document-structure}
6634     \PassOptionsToClass{\CurrentOption}{beamer}
6635     \PassOptionsToPackage{\CurrentOption}{notesslides}
6636     \PassOptionsToPackage{\CurrentOption}{stex}
6637   }
6638 }
6639 \ProcessKeysOptions{ notesslides / cls }
6640
6641 \str_if_empty:NF \c__notesslides_class_str {
6642   \PassOptionsToPackage{class=\c__notesslides_class_str}{document-structure}
6643 }
6644
6645 \exp_args:No \str_if_eq:nnT\c__notesslides_class_str{book}{
6646   \PassOptionsToPackage{defaultttopsect=part}{notesslides}
6647 }
6648 \exp_args:No \str_if_eq:nnT\c__notesslides_class_str{report}{
6649   \PassOptionsToPackage{defaultttopsect=part}{notesslides}
6650 }
6651
6652 \RequirePackage{stex}
```

```

6653 \stex_html_backend:T {
6654   \bool_set_true:N\c__notesslides_notes_bool
6655 }
6656
6657 \bool_if:NTF \c__notesslides_notes_bool {
6658   \PassOptionsToPackage{notes=true}{notesslides}
6659 }{
6660   \PassOptionsToPackage{notes=false}{notesslides}
6661 }
6662 \</cls>

```

now we do the same for the notesslides package.

```

6663 \*package>
6664 \ProvidesExplPackage{notesslides}{2022/02/28}{3.1.0}{notesslides Package}
6665 \RequirePackage{13keys2e}
6666
6667 \keys_define:nn{notesslides / pkg}{
6668   topsect          .str_set_x:N = \c__notesslides_topsect_str,
6669   defaulttopsect   .str_set_x:N = \c__notesslides_defaulttopsec_str,
6670   notes            .bool_set:N = \c__notesslides_notes_bool ,
6671   slides           .code:n      = { \bool_set_false:N \c__notesslides_notes_bool },
6672   sectocframes     .bool_set:N = \c__notesslides_sectocframes_bool ,
6673   frameimages      .bool_set:N = \c__notesslides_frameimages_bool ,
6674   fiboxed          .bool_set:N = \c__notesslides_fiboxed_bool ,
6675   noproblems       .bool_set:N = \c__notesslides_noproblems_bool,
6676   unknown          .code:n      = {
6677     \PassOptionsToClass{\CurrentOption}{stex}
6678     \PassOptionsToClass{\CurrentOption}{tikzinput}
6679   }
6680 }
6681 \ProcessKeysOptions{ notesslides / pkg }
6682
6683 \RequirePackage{stex}
6684 \stex_html_backend:T {
6685   \bool_set_true:N\c__notesslides_notes_bool
6686 }
6687
6688 \newif\ifnotes
6689 \bool_if:NTF \c__notesslides_notes_bool {
6690   \notesttrue
6691 }{
6692   \notesfalse
6693 }
6694

```

we give ourselves a macro \@@topsect that needs only be evaluated once, so that the \ifdefstring conditionals work below.

```

6695 \str_if_empty:NTF \c__notesslides_topsect_str {
6696   \str_set_eq:NN \__notesslidestopsect \c__notesslides_defaulttopsec_str
6697 }{
6698   \str_set_eq:NN \__notesslidestopsect \c__notesslides_topsect_str
6699 }
6700 \PassOptionsToPackage{topsect=\__notesslidestopsect}{document-structure}
6701 \</package>

```

Depending on the options, we either load the `article`-based document-structure or the `beamer` class (and set some counters).

```

6702 <*cls>
6703 \bool_if:NTF \c__notesslides_notes_bool {
6704   \str_if_empty:NT \c__notesslides_class_str {
6705     \str_set:Nn \c__notesslides_class_str {article}
6706   }
6707   \exp_after:wN\LoadClass\exp_after:wN[\c__notesslides_docostr]
6708     {\c__notesslides_class_str}
6709 }{
6710   \LoadClass[10pt,notheorems,xcolor={dvipsnames,svgnames}]{beamer}
6711   \newcounter{Item}
6712   \newcounter{paragraph}
6713   \newcounter{subparagraph}
6714   \newcounter{Hfootnote}
6715 }
6716 \RequirePackage{document-structure}

```

now it only remains to load the `notesslides` package that does all the rest.

```

6717 \RequirePackage{notesslides}
6718 </cls>

```

In `notes` mode, we also have to make the `beamer`-specific things available to `article` via the `beamerarticle` package. We use options to avoid loading theorem-like environments, since we want to use our own from the `TeX` packages. The first batch of packages we want are loaded on `notesslides.sty`. These are the general ones, we will load the `TeX`-specific ones after we have done some work (e.g. defined the counters `m*`). Only the `stex`-logo package is already needed now for the default theme.

```

6719 <*package>
6720 \bool_if:NT \c__notesslides_notes_bool {
6721   \RequirePackage{a4wide}
6722   \RequirePackage{marginnote}
6723   \PassOptionsToPackage{usenames,dvipsnames,svgnames}{xcolor}
6724   \RequirePackage{mdframed}
6725   \RequirePackage[noxcolor,noamsthm]{beamerarticle}
6726   \RequirePackage[bookmarks,bookmarksopen,bookmarksnumbered,breaklinks,hidelinks]{hyperref}
6727 }
6728 \RequirePackage{stex-tikzinput}
6729 \RequirePackage{etoolbox}
6730 \RequirePackage{amssymb}
6731 \RequirePackage{amsmath}
6732 \RequirePackage{comment}
6733 \RequirePackage{textcomp}
6734 \RequirePackage{url}
6735 \RequirePackage{graphicx}
6736 \RequirePackage{pgf}

```

38.2 Notes and Slides

For the lecture notes cases, we also provide the `\usetheme` macro that would otherwise come from the `beamer` class. While the latter loads `beamertheme<theme>.sty`, the

notes version loads `beamernotestheme(theme).sty`.¹³

```

6737 \bool_if:NT \c__notesslides_notes_bool {
6738   \renewcommand\usetheme[2] [] {\usepackage[#1]{beamernotestheme#2}}
6739 }
6740
6741
6742 \NewDocumentCommand \libusetheme {0{} m} {
6743   \bool_if:NTF \c__notesslides_notes_bool {
6744     \libusepackage[#1]{beamernotestheme#2}
6745   }{
6746     \libusepackage[#1]{beamertheme#2}
6747   }
6748 }

```

We define the sizes of slides in the notes. Somehow, we cannot get by with the same here.

```

6749 \newcounter{slide}
6750 \newlength{\slidewidth}\setlength{\slidewidth}{13.5cm}
6751 \newlength{\slideheight}\setlength{\slideheight}{9cm}

```

note The `note` environment is used to leave out text in the `slides` mode. It does not have a counterpart in OMDoc. So for course notes, we define the `note` environment to be a no-operation otherwise we declare the `note` environment as a comment via the `comment` package.

```

6752 \bool_if:NTF \c__notesslides_notes_bool {
6753   \renewenvironment{note}{\ignorespaces}{}
6754 }{
6755   \excludecomment{note}
6756 }

```

We first set up the slide boxes in `article` mode. We set up sizes and provide a box register for the frames and a counter for the slides.

```

6757 \bool_if:NT \c__notesslides_notes_bool {
6758   \newlength{\slideframewidth}
6759   \setlength{\slideframewidth}{1.5pt}

```

frame We first define the keys.

```

6760 \cs_new_protected:Nn \__notesslides_do_yes_param:Nn {
6761   \exp_args:Nx \str_if_eq:nnTF { \str_uppercase:n{ #2 } }{ yes }{
6762     \bool_set_true:N #1
6763   }{
6764     \bool_set_false:N #1
6765   }
6766 }
6767 \keys_define:nn{notesslides / frame}{
6768   label .str_set_x:N = \l__notesslides_frame_label_str,
6769   allowframebreaks .code:n = {
6770     \__notesslides_do_yes_param:Nn \l__notesslides_frame_allowframebreaks_bool { #1 }
6771   },
6772   allowdisplaybreaks .code:n = {

```

¹³EDNOTE: MK: This is not ideal, but I am not sure that I want to be able to provide the full theme functionality there.

```

6773     \_notesslides\_do\_yes\_param:Nn \l\_notesslides\_frame\_allowdisplaybreaks\_bool { #1 }
6774 },
6775 fragile .code:n = {
6776     \_notesslides\_do\_yes\_param:Nn \l\_notesslides\_frame\_fragile\_bool { #1 }
6777 },
6778 shrink .code:n = {
6779     \_notesslides\_do\_yes\_param:Nn \l\_notesslides\_frame\_shrink\_bool { #1 }
6780 },
6781 squeeze .code:n = {
6782     \_notesslides\_do\_yes\_param:Nn \l\_notesslides\_frame\_squeeze\_bool { #1 }
6783 },
6784 t .code:n = {
6785     \_notesslides\_do\_yes\_param:Nn \l\_notesslides\_frame\_t\_bool { #1 }
6786 },
6787 }
6788 \cs\_new\_protected:Nn \_notesslides\_frame\_args:n {
6789     \str\_clear:N \l\_notesslides\_frame\_label\_str
6790     \bool\_set\_true:N \l\_notesslides\_frame\_allowframebreaks\_bool
6791     \bool\_set\_true:N \l\_notesslides\_frame\_allowdisplaybreaks\_bool
6792     \bool\_set\_true:N \l\_notesslides\_frame\_fragile\_bool
6793     \bool\_set\_true:N \l\_notesslides\_frame\_shrink\_bool
6794     \bool\_set\_true:N \l\_notesslides\_frame\_squeeze\_bool
6795     \bool\_set\_true:N \l\_notesslides\_frame\_t\_bool
6796     \keys\_set:nn { notesslides / frame }{ #1 }
6797 }

```

We define the environment, read them, and construct the slide number and label.

```

6798 \renewenvironment{frame}[1][]{
6799     \_notesslides\_frame\_args:n{#1}
6800     \sffamily
6801     \stepcounter{slide}
6802     \def\@currentlabel{\theslide}
6803     \str\_if\_empty:NF \l\_notesslides\_frame\_label\_str {
6804         \label{\l\_notesslides\_frame\_label\_str}
6805     }

```

We redefine the `itemize` environment so that it looks more like the one in `beamer`.

```

6806     \def\itemize@level{outer}
6807     \def\itemize@outer{outer}
6808     \def\itemize@inner{inner}
6809     \renewcommand\newpage{\addtocounter{framenum}{1}}
6810     \newcommand\metakeys@show@keys[2]{\marginnote{\scriptsize ##2}}
6811     \renewenvironment{itemize}{
6812         \ifx\itemize@level\itemize@outer
6813             \def\itemize@label{\$ \rhd \$}
6814         \fi
6815         \ifx\itemize@level\itemize@inner
6816             \def\itemize@label{\$ \scriptstyle \rhd \$}
6817         \fi
6818         \begin{list}
6819             {\itemize@label}
6820             {\setlength{\labelsep}{.3em}
6821              \setlength{\labelwidth}{.5em}
6822              \setlength{\leftmargin}{1.5em}
6823             }

```



```

6824     \edef\itemize@level{\itemize@inner}
6825   }{
6826     \end{list}
6827   }

```

We create the box with the `mdframed` environment from the `equinymous` package.

```

6828     \stex_html_backend:TF {
6829       \begin{stex_annotate_env}{frame}{}\vbox\bgroup
6830     }{
6831       \begin{mdframed}[linewidth=\slideframewidth,skipabove=1ex,skipbelow=1ex,userdefinedwid
6832     ]
6833   }{
6834     \stex_html_backend:TF {
6835       \miko@slidelabel\egroup\end{stex_annotate_env}
6836     }\medskip\miko@slidelabel\end{mdframed}}
6837   }

```

Now, we need to redefine the `frametitle` (we are still in course notes mode).

```

\frametitle
6838   \renewcommand{\frametitle}[1]{\Large\bf\sffcolor{blue}{#1}}\medskip
6839 }

```

(End definition for `\frametitle`. This function is documented on page ??.)

EdN:14

```

\pause 14
6840 \bool_if:NT \c__notesslides_notes_bool {
6841   \newcommand\pause{}
6842 }

```

(End definition for `\pause`. This function is documented on page ??.)

```

nparagraph
6843 \bool_if:NTF \c__notesslides_notes_bool {
6844   \newenvironment{nparagraph}[1][\begin{sparagraph}[#1]]{\end{sparagraph}}
6845 }{
6846   \excludecomment{nparagraph}
6847 }

```

```

nfragment
6848 \bool_if:NTF \c__notesslides_notes_bool {
6849   \newenvironment{nfragment}[2][\begin{sfragment}[#1][#2]]{\end{sfragment}}
6850 }{
6851   \excludecomment{nfragment}
6852 }

```

```

ndefinition
6853 \bool_if:NTF \c__notesslides_notes_bool {
6854   \newenvironment{ndefinition}[1][\begin{sdefinition}[#1]]{\end{sdefinition}}
6855 }{
6856   \excludecomment{ndefinition}
6857 }

```

¹⁴EDNOTE: MK: fake it in notes mode for now

nassertion

```

6858 \bool_if:NTF \c_notesslides_notes_bool {
6859   \newenvironment{nassertion}[1][\begin{sassertion}[#1]]{\end{sassertion}}
6860 }{
6861   \excludecomment{nassertion}
6862 }

```

nsproof

```

6863 \bool_if:NTF \c_notesslides_notes_bool {
6864   \newenvironment{nproof}[2][\begin{sproof}[#1][#2]]{\end{sproof}}
6865 }{
6866   \excludecomment{nproof}
6867 }

```

nexample

```

6868 \bool_if:NTF \c_notesslides_notes_bool {
6869   \newenvironment{nexample}[1][\begin{sexample}[#1]]{\end{sexample}}
6870 }{
6871   \excludecomment{nexample}
6872 }

```

\inputref@*skip We customize the hooks for in \inputref.

```

6873 \def\inputref@preskip{\smallskip}
6874 \def\inputref@postskip{\medskip}

```

(End definition for \inputref@*skip. This function is documented on page ??.)

\inputref*

```

6875 \let\orig@inputref\inputref
6876 \def\inputref{\@ifstar\ninputref\orig@inputref}
6877 \newcommand\ninputref[2][\{
6878   \bool_if:NT \c_notesslides_notes_bool {
6879     \orig@inputref[#1][#2]
6880   }
6881 }

```

(End definition for \inputref*. This function is documented on page ??.)

38.3 Header and Footer Lines

Now, we set up the infrastructure for the footer line of the slides, we use boxes for the logos, so that they are only loaded once, that considerably speeds up processing.

\setslidelogo The default logo is the \TeX logo. Customization can be done by \setslidelogo{<logo name>}.

```

6882 \newlength{\slidelogoheight}
6883
6884 \bool_if:NTF \c_notesslides_notes_bool {
6885   \setlength{\slidelogoheight}{.4cm}
6886 }{
6887   \setlength{\slidelogoheight}{1cm}
6888 }
6889 \newsavebox{\slidelogo}

```

```

6890 \sbox{\slidelogo}{\TeX}
6891 \newrobustcmd{\setslidelogo}[1]{
6892   \sbox{\slidelogo}{\includegraphics[height=\slidelogoheight]{#1}}
6893 }

```

(End definition for `\setslidelogo`. This function is documented on page ??.)

\setsource `\source` stores the writer's name. By default it is *Michael Kohlhase* since he is the main user and designer of this package. `\setsource{<name>}` can change the writer's name.

```

6894 \def\source{Michael Kohlhase}% customize locally
6895 \newrobustcmd{\setsource}[1]{\def\source{#1}}

```

(End definition for `\setsource`. This function is documented on page ??.)

\setlicensing Now, we set up the copyright and licensing. By default we use the Creative Commons Attribution-ShareAlike license to strengthen the public domain. If package `hyperref` is loaded, then we can attach a hyperlink to the license logo. `\setlicensing[<url>]{<logo name>}` is used for customization, where `<url>` is optional.

```

6896 \def\copyrightnotice{\footnotesize\copyright : \hspace{.3ex}{\source}}
6897 \newsavebox{\cclogo}
6898 \sbox{\cclogo}{\includegraphics[height=\slidelogoheight]{stex-cc_somerights}}
6899 \newif\ifcchref\cchreffalse
6900 \AtBeginDocument{
6901   \ifpackageloaded{hyperref}{\cchreftrue}{\cchreffalse}
6902 }
6903 \def\licensing{
6904   \ifcchref
6905     \href{http://creativecommons.org/licenses/by-sa/2.5/}{\usebox{\cclogo}}
6906   \else
6907     {\usebox{\cclogo}}
6908   \fi
6909 }
6910 \newrobustcmd{\setlicensing}[2][]{
6911   \def\@url{#1}
6912   \sbox{\cclogo}{\includegraphics[height=\slidelogoheight]{#2}}
6913   \ifx\@url\@empty
6914     \def\licensing{{\usebox{\cclogo}}}
6915   \else
6916     \def\licensing{
6917       \ifcchref
6918         \href{#1}{\usebox{\cclogo}}
6919       \else
6920         {\usebox{\cclogo}}
6921       \fi
6922     }
6923   \fi
6924 }

```

(End definition for `\setlicensing`. This function is documented on page ??.)

EdN:15 **\slidelabel** Now, we set up the slide label for the article mode.¹⁵

```

6925 \newrobustcmd\miko@slidelabel{
6926   \vbox to \slidelogoheight{

```

¹⁵EdNOTE: see that we can use the themes for the slides some day. This is all fake.

```

6927 \vss\hbox to \slidewidth
6928 {\licensing\hfill\copyrightnotice\hfill\arabic{slide}\hfill\usebox{\slide\logo}}
6929 }
6930 }

```

(End definition for \slide\label. This function is documented on page ??.)

38.4 Frame Images

`\frameimage` We have to make sure that the width is overwritten, for that we check the `\Gin@ewidth` macro from the `graphicx` package. We also add the `label` key.

```

6931 \def\Gin@mhrepos{}
6932 \define@key{Gin}{mhrepos}{\def\Gin@mhrepos{#1}}
6933 \define@key{Gin}{label}{\def\currentlabel{\arabic{slide}}\label{#1}}
6934 \newrobustcmd\frameimage[2][]{
6935   \stepcounter{slide}
6936   \bool_if:NT \c__notesslides_frameimages_bool {
6937     \def\Gin@ewidth{} \setkeys{Gin}{#1}
6938     \bool_if:NF \c__notesslides_notes_bool { \vfill }
6939     \begin{center}
6940       \bool_if:NTF \c__notesslides_fiboxed_bool {
6941         \fbox{
6942           \ifx\Gin@ewidth\@empty
6943             \ifx\Gin@mhrepos\@empty
6944               \mhgraphics[width=\slidewidth,#1]{#2}
6945             \else
6946               \mhgraphics[width=\slidewidth,#1,mhrepos=\Gin@mhrepos]{#2}
6947             \fi
6948           \else% Gin@ewidth empty
6949             \ifx\Gin@mhrepos\@empty
6950               \mhgraphics[#1]{#2}
6951             \else
6952               \mhgraphics[#1,mhrepos=\Gin@mhrepos]{#2}
6953             \fi
6954           \fi% Gin@ewidth empty
6955         }
6956       }{
6957         \ifx\Gin@ewidth\@empty
6958           \ifx\Gin@mhrepos\@empty
6959             \mhgraphics[width=\slidewidth,#1]{#2}
6960           \else
6961             \mhgraphics[width=\slidewidth,#1,mhrepos=\Gin@mhrepos]{#2}
6962           \fi
6963         \ifx\Gin@mhrepos\@empty
6964           \mhgraphics[#1]{#2}
6965         \else
6966           \mhgraphics[#1,mhrepos=\Gin@mhrepos]{#2}
6967         \fi
6968       \fi% Gin@ewidth empty
6969     }
6970   \end{center}
6971   \par\strut\hfill{\footnotesize Slide \arabic{slide}}}%
6972   \bool_if:NF \c__notesslides_notes_bool { \vfill }

```

```

6973 }
6974 } % ifmks@sty@frameimages

```

(End definition for \frameimage. This function is documented on page ??.)

38.5 Colors and Highlighting

We first specify sans serif fonts as the default.

```

6975 \sffamily

```

Now, we set up an infrastructure for highlighting phrases in slides. Note that we use content-oriented macros for highlighting rather than directly using color markup. The first thing to do is to adapt the green so that it is dark enough for most beamers

```

6976 \AddToHook{begindocument}{
6977   \definecolor{green}{rgb}{0,.5,0}
6978   \definecolor{purple}{cmk}{.3,1,0,.17}
6979 }

```

We customize the \defemph, \symrefemph, \compemph, and \titleemph macros with colors. Furthermore we customize the __omtextlec macro for the appearance of line end comments in \lec.

```

6980 % \def\STpresent#1{\textcolor{blue}{#1}}
6981 \def\defemph#1{\textcolor{magenta}{#1}}
6982 \def\symrefemph#1{\textcolor{cyan}{#1}}
6983 \def\compemph#1{\textcolor{blue}{#1}}
6984 \def\titleemph#1{\textcolor{blue}{#1}}
6985 \def\__omtext_lec#1{(\textcolor{green}{#1})}

```

I like to use the dangerous bend symbol for warnings, so we provide it here.

`\textwarning` as the macro can be used quite often we put it into a box register, so that it is only loaded once.

```

6986 \pgfdeclareimage[width=.8em]{miko@small@dbend}{stex-dangerous-bend}
6987 \def\smalltextwarning{
6988   \pgfuseimage{miko@small@dbend}
6989   \xspace
6990 }
6991 \pgfdeclareimage[width=1.2em]{miko@dbend}{stex-dangerous-bend}
6992 \newrobustcmd\textwarning{
6993   \raisebox{-.05cm}{\pgfuseimage{miko@dbend}}
6994   \xspace
6995 }
6996 \pgfdeclareimage[width=2.5em]{miko@big@dbend}{stex-dangerous-bend}
6997 \newrobustcmd\bigtextwarning{
6998   \raisebox{-.05cm}{\pgfuseimage{miko@big@dbend}}
6999   \xspace
7000 }

```

(End definition for \textwarning. This function is documented on page ??.)

```

7001 \newrobustcmd\putgraphicsat[3]{
7002   \begin{picture}(0,0)\put(#1){\includegraphics[#2]{#3}}\end{picture}
7003 }
7004 \newrobustcmd\putat[2]{
7005   \begin{picture}(0,0)\put(#1){#2}\end{picture}
7006 }

```

38.6 Sectioning

If the `sectocframes` option is set, then we make section frames. We first define counters for `part` and `chapter`, which `beamer.cls` does not have and we make the `section` counter which it does dependent on `chapter`.

```

7007 \bool_if:NT \c__notesslides_sectocframes_bool {
7008   \str_if_eq:VnTF \__notesslidestopsect{part}{
7009     \newcounter{chapter}\counterwithin*{section}{chapter}
7010   }{
7011     \str_if_eq:VnT\__notesslidestopsect{chapter}{
7012       \newcounter{chapter}\counterwithin*{section}{chapter}
7013     }
7014   }
7015 }

```

`\section@level` We set the `\section@level` counter that governs sectioning according to the class options. We also introduce the sectioning counters accordingly.

```

\section@level
7016 \def\part@prefix{}
7017 \@ifpackageloaded{document-structure}{}{
7018   \str_case:VnF \__notesslidestopsect {
7019     {part}{
7020       \int_set:Nn \l_document_structure_section_level_int {0}
7021       \def\thesection{\arabic{chapter}.\arabic{section}}
7022       \def\part@prefix{\arabic{chapter}.}
7023     }
7024     {chapter}{
7025       \int_set:Nn \l_document_structure_section_level_int {1}
7026       \def\thesection{\arabic{chapter}.\arabic{section}}
7027       \def\part@prefix{\arabic{chapter}.}
7028     }
7029   }{
7030     \int_set:Nn \l_document_structure_section_level_int {2}
7031     \def\part@prefix{}
7032   }
7033 }
7034
7035 \bool_if:NF \c__notesslides_notes_bool { % only in slides

```

(End definition for `\section@level`. This function is documented on page ??.)

The new counters are used in the `omgroup` environment that chooses the L^AT_EX sectioning macros according to `\section@level`.

sfragment

```

7036 \renewenvironment{sfragment}[2][]{
7037   \__document_structure_omgroup_args:n { #1 }
7038   \int_incr:N \l_document_structure_section_level_int
7039   \bool_if:NT \c__notesslides_sectocframes_bool {
7040     \stepcounter{slide}
7041     \begin{frame}[noframenumbering]
7042       \vfill\Large\centering
7043     \red{
7044       \ifcase\l_document_structure_section_level_int\or

```

```

7045         \stepcounter{part}
7046         \def\__notesslideslabel{\o{omdoc@part@kw}~\Roman{part}}
7047         \def\currentsectionlevel{\o{omdoc@part@kw}}
7048     \or
7049         \stepcounter{chapter}
7050         \def\__notesslideslabel{\o{omdoc@chapter@kw}~\arabic{chapter}}
7051         \def\currentsectionlevel{\o{omdoc@chapter@kw}}
7052     \or
7053         \stepcounter{section}
7054         \def\__notesslideslabel{\part@prefix\arabic{section}}
7055         \def\currentsectionlevel{\o{omdoc@section@kw}}
7056     \or
7057         \stepcounter{subsection}
7058         \def\__notesslideslabel{\part@prefix\arabic{section}.\arabic{subsection}}
7059         \def\currentsectionlevel{\o{omdoc@subsection@kw}}
7060     \or
7061         \stepcounter{subsubsection}
7062         \def\__notesslideslabel{\part@prefix\arabic{section}.\arabic{subsection}.\arabic{s
7063         \def\currentsectionlevel{\o{omdoc@subsubsection@kw}}
7064     \or
7065         \stepcounter{paragraph}
7066         \def\__notesslideslabel{\part@prefix\arabic{section}.\arabic{subsection}.\arabic{s
7067         \def\currentsectionlevel{\o{omdoc@paragraph@kw}}
7068     \else
7069         \def\__notesslideslabel{}
7070         \def\currentsectionlevel{\o{omdoc@paragraph@kw}}
7071     \fi% end ifcase
7072     \__notesslideslabel%\sref@label@id\__notesslideslabel
7073     \quad #2%
7074 }%
7075 \vfill%
7076 \end{frame}%
7077 }
7078 \str_if_empty:NF \l__document_structure_omgroup_id_str {
7079     \stex_ref_new_doc_target:n\l__document_structure_omgroup_id_str
7080 }
7081 }{}
7082 }

```

We set up a beamer template for theorems like ams style, but without a block environment.

```

7083 \def\inserttheorembodyfont{\normalfont}
7084 %\bool_if:NF \c__notesslides_notes_bool {
7085 % \defbeamertemplate{theorem begin}{miko}
7086 % {\inserttheoremheadfont\inserttheoremname\inserttheoremnumber
7087 % \ifx\inserttheoremaddition\@empty\else\ (\inserttheoremaddition)\fi%
7088 % \inserttheorempunctuation\inserttheorembodyfont\xspace}
7089 % \defbeamertemplate{theorem end}{miko}{\}

```

and we set it as the default one.

```

7090 % \setbeamertemplate{theorems}[miko]

```

The following fixes an error I do not understand, this has something to do with beamer compatibility, which has similar definitions but only up to 1.

```

7091 % \expandafter\def\csname Parent2\endcsname{}

```

```

7092 %}
7093
7094 \AddToHook{begindocument}{% this does not work for some reason
7095   \setbeamertemplate{theorems}[ams style]
7096 }
7097 \bool_if:NT \c__notesslides_notes_bool {
7098   \renewenvironment{columns}[1][]{%
7099     \par\noindent%
7100     \begin{minipage}%
7101       \slidewidth\centering\leavevmode%
7102   }{%
7103     \end{minipage}\par\noindent%
7104   }%
7105   \newsavebox\columnbox%
7106   \renewenvironment<>{column}[2][]{%
7107     \begin{lrbox}{\columnbox}\begin{minipage}{#2}%
7108   }{%
7109     \end{minipage}\end{lrbox}\usebox\columnbox%
7110   }%
7111 }
7112 \bool_if:NTF \c__notesslides_noproblems_bool {
7113   \newenvironment{problems}{}{}
7114 }{
7115   \excludcomment{problems}
7116 }

```

38.7 Excursions

\excursion The excursion macros are very simple, we define a new internal macro `\excursionref` and use it in `\excursion`, which is just an `\inputref` that checks if the new macro is defined before formatting the file in the argument.

```

7117 \gdef\printexcursions{}
7118 \newcommand\excursionref[2]{% label, text
7119   \bool_if:NT \c__notesslides_notes_bool {
7120     \begin{sparagraph}[title=Excursion]
7121       #2 \sref[fallback=the appendix]{#1}.
7122     \end{sparagraph}
7123   }
7124 }
7125 \newcommand\activate@excursion[2][{}{
7126   \gappto\printexcursions{\inputref[#1]{#2}}
7127 }
7128 \newcommand\excursion[4][{}{repos, label, path, text
7129   \bool_if:NT \c__notesslides_notes_bool {
7130     \activate@excursion[#1]{#3}\excursionref{#2}{#4}
7131   }
7132 }

```

(End definition for `\excursion`. This function is documented on page ??.)

\excursiongroup

```

7133 \keys_define:nn{notesslides / excursiongroup }{

```



```

7134 id      .str_set_x:N = \l__notesslides_excursion_id_str,
7135 intro    .tl_set:N    = \l__notesslides_excursion_intro_tl,
7136 mhrepos   .str_set_x:N = \l__notesslides_excursion_mhrepos_str
7137 }
7138 \cs_new_protected:Nn \l__notesslides_excursion_args:n {
7139   \tl_clear:N \l__notesslides_excursion_intro_tl
7140   \str_clear:N \l__notesslides_excursion_id_str
7141   \str_clear:N \l__notesslides_excursion_mhrepos_str
7142   \keys_set:nn {notesslides / excursiongroup} { #1 }
7143 }
7144 \newcommand\excursiongroup[1][ ]{
7145   \l__notesslides_excursion_args:n{ #1 }
7146   \ifdefempty\printexcursions{}% only if there are excursions
7147   {\begin{note}
7148     \begin{sfragment}[#1]{Excursions}%
7149     \ifdefempty\l__notesslides_excursion_intro_tl}{
7150       \inputref[\l__notesslides_excursion_mhrepos_str]{
7151         \l__notesslides_excursion_intro_tl
7152       }
7153     }
7154     \printexcursions%
7155   \end{sfragment}
7156   \end{note}}
7157 }
7158 \ifcsname beameritemnestingprefix\endcsname\else\def\beameritemnestingprefix{\fi
7159 \</package>

```

(End definition for \excursiongroup. This function is documented on page ??.)

Chapter 39

The Implementation

39.1 Package Options

The first step is to declare (a few) package options that handle whether certain information is printed or not. They all come with their own conditionals that are set by the options.

```
7160 <*package>
7161 <@@=problems>
7162 \ProvidesExplPackage{problem}{2022/02/26}{3.0.1}{Semantic Markup for Problems}
7163 \RequirePackage{l3keys2e,stex}
7164
7165 \keys_define:nn { problem / pkg }{
7166   notes      .default:n    = { true },
7167   notes      .bool_set:N   = \c__problems_notes_bool,
7168   gnotes     .default:n    = { true },
7169   gnotes     .bool_set:N   = \c__problems_gnotes_bool,
7170   hints      .default:n    = { true },
7171   hints      .bool_set:N   = \c__problems_hints_bool,
7172   solutions  .default:n    = { true },
7173   solutions  .bool_set:N   = \c__problems_solutions_bool,
7174   pts        .default:n    = { true },
7175   pts        .bool_set:N   = \c__problems_pts_bool,
7176   min        .default:n    = { true },
7177   min        .bool_set:N   = \c__problems_min_bool,
7178   boxed      .default:n    = { true },
7179   boxed      .bool_set:N   = \c__problems_boxed_bool,
7180   unknown    .code:n       = {}
7181 }
7182 \newif\ifsolutions
7183
7184 \ProcessKeysOptions{ problem / pkg }
7185 \bool_if:NTF \c__problems_solutions_bool {
7186   \solutionstrue
7187 }{
7188   \solutionsfalse
7189 }
```

Then we make sure that the necessary packages are loaded (in the right versions).

```
7190 \RequirePackage{comment}
```

The next package relies on the L^AT_EX3 kernel, which L^AT_EXML only partially supports. As it is purely presentational, we only load it when the boxed option is given and we run L^AT_EXML.

```
7191 \bool_if:NT \c__problems_boxed_bool { \RequirePackage{mdframed} }
```

\prob@*@kw For multilinguality, we define internal macros for keywords that can be specialized in *.ldf files.

```
7192 \def\prob@problem@kw{Problem}
7193 \def\prob@solution@kw{Solution}
7194 \def\prob@hint@kw{Hint}
7195 \def\prob@note@kw{Note}
7196 \def\prob@gnote@kw{Grading}
7197 \def\prob@pt@kw{pt}
7198 \def\prob@min@kw{min}
```

(End definition for \prob@*@kw. This function is documented on page ??.)

For the other languages, we set up triggers

```
7199 \AddToHook{begindocument}{
7200   \ltx@ifpackageloaded{babel}{
7201     \makeatletter
7202     \clist_set:Nx \l_tmpa_clist {\bbl@loaded}
7203     \clist_if_in:NnT \l_tmpa_clist {ngerman}{
7204       \input{problem-ngerman.ldf}
7205     }
7206     \clist_if_in:NnT \l_tmpa_clist {finnish}{
7207       \input{problem-finnish.ldf}
7208     }
7209     \clist_if_in:NnT \l_tmpa_clist {french}{
7210       \input{problem-french.ldf}
7211     }
7212     \clist_if_in:NnT \l_tmpa_clist {russian}{
7213       \input{problem-russian.ldf}
7214     }
7215     \makeatother
7216   }{}
7217 }
```

39.2 Problems and Solutions

We now prepare the KeyVal support for problems. The key macros just set appropriate internal macros.

```
7218 \keys_define:nn{ problem / problem }{
7219   id      .str_set_x:N = \l__problems_prob_id_str,
7220   pts     .tl_set:N    = \l__problems_prob_pts_tl,
7221   min     .tl_set:N    = \l__problems_prob_min_tl,
7222   title   .tl_set:N    = \l__problems_prob_title_tl,
7223   type    .tl_set:N    = \l__problems_prob_type_tl,
7224   imports .tl_set:N    = \l__problems_prob_imports_tl,
7225   name    .str_set_x:N = \l__problems_prob_name_str,
7226   refnum  .int_set:N   = \l__problems_prob_refnum_int
```

```

7227 }
7228 \cs_new_protected:Nn \__problems_prob_args:n {
7229   \str_clear:N \l__problems_prob_id_str
7230   \str_clear:N \l__problems_prob_name_str
7231   \tl_clear:N \l__problems_prob_pts_tl
7232   \tl_clear:N \l__problems_prob_min_tl
7233   \tl_clear:N \l__problems_prob_title_tl
7234   \tl_clear:N \l__problems_prob_type_tl
7235   \tl_clear:N \l__problems_prob_imports_tl
7236   \int_zero_new:N \l__problems_prob_refnum_int
7237   \keys_set:nn { problem / problem }{ #1 }
7238   \int_compare:nNnT \l__problems_prob_refnum_int = 0 {
7239     \let\l__problems_prob_refnum_int\undefined
7240   }
7241 }

```

Then we set up a counter for problems.

`\numberproblemsin`

```

7242 \newcounter{problem}[section]
7243 \newcommand\numberproblemsin[1]{\@addtoreset{problem}{#1}}

```

(End definition for `\numberproblemsin`. This function is documented on page ??.)

`\prob@label` We provide the macro `\prob@label` to redefine later to get context involved.

```

7244 \newcommand\prob@label[1]{\thesection.#1}

```

(End definition for `\prob@label`. This function is documented on page ??.)

`\prob@number` We consolidate the problem number into a reusable internal macro

```

7245 \newcommand\prob@number{
7246   \int_if_exist:NTF \l__problems_inclprob_refnum_int {
7247     \prob@label{\int_use:N \l__problems_inclprob_refnum_int }
7248   }{
7249     \int_if_exist:NTF \l__problems_prob_refnum_int {
7250       \prob@label{\int_use:N \l__problems_prob_refnum_int }
7251     }{
7252       \prob@label\theproblem
7253     }
7254   }
7255 }

```

(End definition for `\prob@number`. This function is documented on page ??.)

`\prob@title` We consolidate the problem title into a reusable internal macro as well. `\prob@title` takes three arguments the first is the fallback when no title is given at all, the second and third go around the title, if one is given.

```

7256 \newcommand\prob@title[3]{%
7257   \tl_if_exist:NTF \l__problems_inclprob_title_tl {
7258     #2 \l__problems_inclprob_title_tl #3
7259   }{
7260     \tl_if_exist:NTF \l__problems_prob_title_tl {
7261       #2 \l__problems_prob_title_tl #3
7262     }{
7263       #1

```

```

7264     }
7265   }
7266 }

```

(End definition for `\prob@title`. This function is documented on page ??.)

With these the problem header is a one-liner

`\prob@heading` We consolidate the problem header line into a separate internal macro that can be reused in various settings.

```

7267 \def\prob@heading{
7268   {\prob@problem@kw}\ \prob@number\prob@title{~}{~}{~}\strut}
7269   %\sref@label@id{\prob@problem@kw~\prob@number}{~}
7270 }

```

(End definition for `\prob@heading`. This function is documented on page ??.)

With this in place, we can now define the `problem` environment. It comes in two shapes, depending on whether we are in boxed mode or not. In both cases we increment the problem number and output the points and minutes (depending) on whether the respective options are set.

`sproblem`

```

7271 \newenvironment{sproblem}[1][{}]{
7272   \__problems_prob_args:n{#1}%\sref@target%
7273   \@in@omtexttrue% we are in a statement (for inline definitions)
7274   \stepcounter{problem}\record@problem
7275   \def\current@section@level{\prob@problem@kw}
7276
7277   \str_if_empty:NT \l__problems_prob_name_str {
7278     \seq_get_right:NN \g_stex_currentfile_seq \l_tmpa_str
7279     \seq_set_split:NnV \l_tmpa_seq . \l_tmpa_str
7280     \seq_get_left:NN \l_tmpa_seq \l__problems_prob_name_str
7281   }
7282   \exp_args:Nno\stex_module_setup:nn{type=problem}\l__problems_prob_name_str
7283
7284   \stex_reactivate_macro:N \STEXexport
7285   \stex_reactivate_macro:N \importmodule
7286   \stex_reactivate_macro:N \symdecl
7287   \stex_reactivate_macro:N \notation
7288   \stex_reactivate_macro:N \symdef
7289
7290   \stex_if_do_html:T{
7291     \begin{stex_annotate_env} {problem} {
7292       \l_stex_module_ns_str ? \l_stex_module_name_str
7293     }
7294
7295     \stex_annotate_invisible:nnn{header}{~}{~} {
7296       \stex_annotate:nnn{language}{~} \l_stex_module_lang_str }{~}
7297       \stex_annotate:nnn{signature}{~} \l_stex_module_sig_str }{~}
7298       \str_if_eq:VnF \l_stex_module_meta_str {NONE} {
7299         \stex_annotate:nnn{metatheory}{~} \l_stex_module_meta_str }{~}
7300     }
7301   }
7302 }
7303

```

```

7304 \stex_csl_to_imports:No \importmodule \l__problems_prob_imports_tl
7305
7306
7307 \tl_if_exist:NTF \l__problems_inclprob_type_tl {
7308   \tl_set_eq:NN \sproblemtype \l__problems_inclprob_type_tl
7309 }{
7310   \tl_set_eq:NN \sproblemtype \l__problems_prob_type_tl
7311 }
7312 \str_if_exist:NTF \l__problems_inclprob_id_str {
7313   \str_set_eq:NN \sproblemid \l__problems_inclprob_id_str
7314 }{
7315   \str_set_eq:NN \sproblemid \l__problems_prob_id_str
7316 }
7317
7318
7319 \stex_if_smsmode:F {
7320   \clist_set:No \l_tmpa_clist \sproblemtype
7321   \tl_clear:N \l_tmpa_tl
7322   \clist_map_inline:Nn \l_tmpa_clist {
7323     \tl_if_exist:cT {__problems_sproblem_##1_start:}{
7324       \tl_set:Nn \l_tmpa_tl {\use:c{__problems_sproblem_##1_start:}}
7325     }
7326   }
7327   \tl_if_empty:NTF \l_tmpa_tl {
7328     \__problems_sproblem_start:
7329   }{
7330     \l_tmpa_tl
7331   }
7332 }
7333 \stex_ref_new_doc_target:n \sproblemid
7334 \stex_smsmode_do:
7335 }{
7336   \__stex_modules_end_module:
7337   \stex_if_smsmode:F{
7338     \clist_set:No \l_tmpa_clist \sproblemtype
7339     \tl_clear:N \l_tmpa_tl
7340     \clist_map_inline:Nn \l_tmpa_clist {
7341       \tl_if_exist:cT {__problems_sproblem_##1_end:}{
7342         \tl_set:Nn \l_tmpa_tl {\use:c{__problems_sproblem_##1_end:}}
7343       }
7344     }
7345     \tl_if_empty:NTF \l_tmpa_tl {
7346       \__problems_sproblem_end:
7347     }{
7348       \l_tmpa_tl
7349     }
7350   }
7351   \stex_if_do_html:T{
7352     \end{stex_annotate_env}
7353   }
7354
7355   \smallskip
7356 }
7357

```

```

7358 \seq_put_right:Nx\g_stex_smsmode_allowedenvs_seq{\tl_to_str:n{sproblem}}
7359
7360
7361
7362 \cs_new_protected:Nn \__problems_sproblem_start: {
7363   \par\noindent\textbf{\prob@heading\show@pts\show@min\\ignorespacesandpars
7364 }
7365 \cs_new_protected:Nn \__problems_sproblem_end: {\par\smallskip}
7366
7367 \newcommand\stexpatchproblem[3][] {
7368   \str_set:Nx \l_tmpa_str{ #1 }
7369   \str_if_empty:NTF \l_tmpa_str {
7370     \tl_set:Nn \__problems_sproblem_start: { #2 }
7371     \tl_set:Nn \__problems_sproblem_end: { #3 }
7372   }{
7373     \exp_after:wN \tl_set:Nn \csname __problems_sproblem_#1_start:\endcsname{ #2 }
7374     \exp_after:wN \tl_set:Nn \csname __problems_sproblem_#1_end:\endcsname{ #3 }
7375   }
7376 }
7377
7378
7379 \bool_if:NT \c__problems_boxed_bool {
7380   \surroundwithmdframed{problem}
7381 }

```

\record@problem This macro records information about the problems in the *.aux file.

```

7382 \def\record@problem{
7383   \protected@write\@auxout{}
7384   {
7385     \string\@problem{\prob@number}
7386     {
7387       \tl_if_exist:NTF \l__problems_inclprob_pts_tl {
7388         \l__problems_inclprob_pts_tl
7389       }{
7390         \l__problems_prob_pts_tl
7391       }
7392     }%
7393     {
7394       \tl_if_exist:NTF \l__problems_inclprob_min_tl {
7395         \l__problems_inclprob_min_tl
7396       }{
7397         \l__problems_prob_min_tl
7398       }
7399     }
7400   }
7401 }

```

(End definition for \record@problem. This function is documented on page ??.)

\@problem This macro acts on a problem's record in the *.aux file. It does not have any functionality here, but can be redefined elsewhere (e.g. in the **assignment** package).

```

7402 \def\@problem#1#2#3{}

```

(End definition for \@problem. This function is documented on page ??.)

solution The `solution` environment is similar to the `problem` environment, only that it is independent of the boxed mode. It also has its own keys that we need to define first.

```

7403 \keys_define:nn { problem / solution }{
7404   id          .str_set_x:N = \l__problems_solution_id_str ,
7405   for         .tl_set:N    = \l__problems_solution_for_tl ,
7406   height      .dim_set:N   = \l__problems_solution_height_dim ,
7407   creators    .clist_set:N = \l__problems_solution_creators_clist ,
7408   contributors .clist_set:N = \l__problems_solution_contributors_clist ,
7409   srccite     .tl_set:N    = \l__problems_solution_srccite_tl
7410 }
7411 \cs_new_protected:Nn \__problems_solution_args:n {
7412   \str_clear:N \l__problems_solution_id_str
7413   \tl_clear:N \l__problems_solution_for_tl
7414   \tl_clear:N \l__problems_solution_srccite_tl
7415   \clist_clear:N \l__problems_solution_creators_clist
7416   \clist_clear:N \l__problems_solution_contributors_clist
7417   \dim_zero:N \l__problems_solution_height_dim
7418   \keys_set:nn { problem / solution }{ #1 }
7419 }

```

the next step is to define a helper macro that does what is needed to start a solution.

```

7420 \newcommand\@startsolution[1][]{
7421   \__problems_solution_args:n { #1 }
7422   \@in@omtexttrue% we are in a statement.
7423   \bool_if:NF \c__problems_boxed_bool { \hrule }
7424   \smallskip\noindent
7425   {\textbf\prob@solution@kw : \enspace}
7426   \begin{small}
7427   \def\current@section@level{\prob@solution@kw}
7428   \ignorespacesandpars
7429 }

```

\startsolutions for the `\startsolutions` macro we use the `\specialcomment` macro from the `comment` package. Note that we use the `\@startsolution` macro in the start codes, that parses the optional argument.

```

7430 \box_new:N \l__problems_solution_box
7431 \newenvironment{solution}{
7432   \stex_html_backend:TF{
7433     \stex_if_do_html:T{
7434       \begin{stex_annotate_env}{solution}{ }
7435     }
7436   }{
7437     \setbox\l__problems_solution_box\vbox\bgroup
7438     \par\smallskip\hrule\smallskip
7439     \noindent\textbf{Solution:}~
7440   }
7441 }{
7442   \stex_html_backend:TF{
7443     \stex_if_do_html:T{
7444       \end{stex_annotate_env}
7445     }
7446   }{

```



```

7447 \smallskip\hrule
7448 \egroup
7449 \bool_if:NT \c__problems_solutions_bool {
7450 \box\l__problems_solution_box
7451 }
7452 }
7453 }
7454
7455 \newcommand\startsolutions{
7456 \bool_set_true:N \c__problems_solutions_bool
7457 % \specialcomment{solution}{\@startsolution}{
7458 % \bool_if:NF \c__problems_boxed_bool {
7459 % \hrule\medskip
7460 % }
7461 % \end{small}%
7462 % }
7463 % \bool_if:NT \c__problems_boxed_bool {
7464 % \surroundwithmdframed{solution}
7465 % }
7466 }

```

(End definition for \startsolutions. This function is documented on page ??.)

\stopsolutions

```

7467 \newcommand\stopsolutions{\bool_set_false:N \c__problems_solutions_bool}%\excludecomment{sol

```

(End definition for \stopsolutions. This function is documented on page ??.)

so it only remains to start/stop solutions depending on what option was specified.

```

7468 \ifsolutions
7469 \startsolutions
7470 \else
7471 \stopsolutions
7472 \fi

```

exnote

```

7473 \bool_if:NTF \c__problems_notes_bool {
7474 \newenvironment{exnote}[1][]{
7475 \par\smallskip\hrule\smallskip
7476 \noindent\textbf{\prob@note@kw : }\small
7477 }{
7478 \smallskip\hrule
7479 }
7480 }{
7481 \excludecomment{exnote}
7482 }

```

hint

```

7483 \bool_if:NTF \c__problems_notes_bool {
7484 \newenvironment{hint}[1][]{
7485 \par\smallskip\hrule\smallskip
7486 \noindent\textbf{\prob@hint@kw :~ }\small
7487 }{
7488 \smallskip\hrule
7489 }

```

```

7490 \newenvironment{exhint}[1][]{
7491   \par\smallskip\hrule\smallskip
7492   \noindent\textbf{\prob@hint@kw :~ }\small
7493 }{
7494   \smallskip\hrule
7495 }
7496 }{
7497   \excludecomment{hint}
7498   \excludecomment{exhint}
7499 }

```

gnote

```

7500 \bool_if:NTF \c__problems_notes_bool {
7501   \newenvironment{gnote}[1][]{
7502     \par\smallskip\hrule\smallskip
7503     \noindent\textbf{\prob@gnote@kw : }\small
7504   }{
7505     \smallskip\hrule
7506   }
7507   }{
7508     \excludecomment{gnote}
7509   }

```

39.3 Multiple Choice Blocks

EdN:16

mcb 16

```

7510 \newenvironment{mcb}{
7511   \begin{enumerate}
7512 }{
7513   \end{enumerate}
7514 }

```

we define the keys for the mcb macro

```

7515 \cs_new_protected:Nn \__problems_do_yes_param:Nn {
7516   \exp_args:Nx \str_if_eq:nnTF { \str_lowercase:n{ #2 } }{ yes }{
7517     \bool_set_true:N #1
7518   }{
7519     \bool_set_false:N #1
7520   }
7521 }
7522 \keys_define:nn { problem / mcb }{
7523   id .str_set:N = \l__problems_mcc_id_str ,
7524   feedback .tl_set:N = \l__problems_mcc_feedback_tl ,
7525   T .default:n = { false } ,
7526   T .bool_set:N = \l__problems_mcc_t_bool ,
7527   F .default:n = { false } ,
7528   F .bool_set:N = \l__problems_mcc_f_bool ,
7529   Ttext .tl_set:N = \l__problems_mcc_Ttext_str ,
7530   Ftext .tl_set:N = \l__problems_mcc_Ftext_str
7531 }
7532 \cs_new_protected:Nn \l__problems_mcc_args:n {

```

¹⁶EdNOTE: MK: maybe import something better here from a dedicated MC package

```

7533 \str_clear:N \l__problems_mcc_id_str
7534 \tl_clear:N \l__problems_mcc_feedback_tl
7535 \bool_set_false:N \l__problems_mcc_t_bool
7536 \bool_set_false:N \l__problems_mcc_f_bool
7537 \tl_clear:N \l__problems_mcc_Ttext_tl
7538 \tl_clear:N \l__problems_mcc_Ftext_tl
7539 \str_clear:N \l__problems_mcc_id_str
7540 \keys_set:nn { problem / mcc }{ #1 }
7541 }

```

`\mcc`

```

7542 \def\mccTrueText{\textbf{(true)~}}
7543 \def\mccFalseText{\textbf{(false)~}}
7544 \newcommand\mcc[2][] {
7545   \l__problems_mcc_args:n{ #1 }
7546   \item[{$\Box$}] #2
7547   \ifsolutions
7548     \l
7549     \bool_if:NT \l__problems_mcc_t_bool {
7550       \tl_if_empty:NTF\l__problems_mcc_Ttext_tl\mccTrueText\l__problems_mcc_Ttext_tl
7551     }
7552     \bool_if:NT \l__problems_mcc_f_bool {
7553       \tl_if_empty:NTF\l__problems_mcc_Ttext_tl\mccFalseText\l__problems_mcc_Ftext_tl
7554     }
7555     \tl_if_empty:NF \l__problems_mcc_feedback_tl {
7556       \emph{(\l__problems_mcc_feedback_tl)}
7557     }
7558   \fi
7559 } %solutions

```

(End definition for `\mcc`. This function is documented on page ??.)

39.4 Including Problems

`\includeproblem` The `\includeproblem` command is essentially a glorified `\input` statement, it sets some internal macros first that overwrite the local points. Importantly, it resets the `inclprob` keys after the input.

```

7560
7561 \keys_define:nn{ problem / inclproblem }{
7562   id      .str_set_x:N = \l__problems_inclprob_id_str,
7563   pts     .tl_set:N    = \l__problems_inclprob_pts_tl,
7564   min     .tl_set:N    = \l__problems_inclprob_min_tl,
7565   title   .tl_set:N    = \l__problems_inclprob_title_tl,
7566   refnum  .int_set:N   = \l__problems_inclprob_refnum_int,
7567   type    .tl_set:N    = \l__problems_inclprob_type_tl,
7568   mhrepos .str_set_x:N = \l__problems_inclprob_mhrepos_str
7569 }
7570 \cs_new_protected:Nn \l__problems_inclprob_args:n {
7571   \str_clear:N \l__problems_prob_id_str
7572   \tl_clear:N \l__problems_inclprob_pts_tl
7573   \tl_clear:N \l__problems_inclprob_min_tl
7574   \tl_clear:N \l__problems_inclprob_title_tl
7575   \tl_clear:N \l__problems_inclprob_type_tl

```

```

7576 \int_zero_new:N \l__problems_inclprob_refnum_int
7577 \str_clear:N \l__problems_inclprob_mhrepos_str
7578 \keys_set:nn { problem / inclproblem }{ #1 }
7579 \tl_if_empty:NT \l__problems_inclprob_pts_tl {
7580   \let\l__problems_inclprob_pts_tl\undefined
7581 }
7582 \tl_if_empty:NT \l__problems_inclprob_min_tl {
7583   \let\l__problems_inclprob_min_tl\undefined
7584 }
7585 \tl_if_empty:NT \l__problems_inclprob_title_tl {
7586   \let\l__problems_inclprob_title_tl\undefined
7587 }
7588 \tl_if_empty:NT \l__problems_inclprob_type_tl {
7589   \let\l__problems_inclprob_type_tl\undefined
7590 }
7591 \int_compare:nNnT \l__problems_inclprob_refnum_int = 0 {
7592   \let\l__problems_inclprob_refnum_int\undefined
7593 }
7594 }
7595
7596 \cs_new_protected:Nn \__problems_inclprob_clear: {
7597   \let\l__problems_inclprob_id_str\undefined
7598   \let\l__problems_inclprob_pts_tl\undefined
7599   \let\l__problems_inclprob_min_tl\undefined
7600   \let\l__problems_inclprob_title_tl\undefined
7601   \let\l__problems_inclprob_type_tl\undefined
7602   \let\l__problems_inclprob_refnum_int\undefined
7603   \let\l__problems_inclprob_mhrepos_str\undefined
7604 }
7605 \__problems_inclprob_clear:
7606
7607 \newcommand\includeproblem[2][ ]{
7608   \__problems_inclprob_args:n{ #1 }
7609   \exp_args:No \stex_in_repository:nn\l__problems_inclprob_mhrepos_str{
7610     \stex_html_backend:TF {
7611       \str_clear:N \l_tmpa_str
7612       \prop_get:NnNF \l_stex_current_repository_prop { narr } \l_tmpa_str {
7613         \prop_get:NnNF \l_stex_current_repository_prop { ns } \l_tmpa_str {}
7614       }
7615       \stex_annotate_invisible:nnn{includeproblem}{
7616         \l_tmpa_str / #2
7617       }{}
7618     }{
7619       \begingroup
7620         \inputreftrue
7621         \tl_if_empty:nTF{ ##1 }{
7622           \input{#2}
7623         }{
7624           \input{ \c_stex_mathhub_str / ##1 / source / #2 }
7625         }
7626       \endgroup
7627     }
7628   }
7629   \__problems_inclprob_clear:

```

```
7630 }
```

(End definition for `\includeproblem`. This function is documented on page ??.)

39.5 Reporting Metadata

For messages it is OK to have them in English as the whole documentation is, and we can therefore assume authors can deal with it.

```
7631 \AddToHook{enddocument}{
7632   \bool_if:NT \c__problems_pts_bool {
7633     \message{Total:~\arabic{pts}~points}
7634   }
7635   \bool_if:NT \c__problems_min_bool {
7636     \message{Total:~\arabic{min}~minutes}
7637   }
7638 }
```

The margin pars are reader-visible, so we need to translate

```
7639 \def\pts#1{
7640   \bool_if:NT \c__problems_pts_bool {
7641     \marginpar{#1~\prob@pt@kw}
7642   }
7643 }
7644 \def\min#1{
7645   \bool_if:NT \c__problems_min_bool {
7646     \marginpar{#1~\prob@min@kw}
7647   }
7648 }
```

`\show@pts` The `\show@pts` shows the points: if no points are given from the outside and also no points are given locally do nothing, else show and add. If there are outside points then we show them in the margin.

```
7649 \newcounter{pts}
7650 \def\show@pts{
7651   \tl_if_exist:NTF \l__problems_inclprob_pts_tl {
7652     \bool_if:NT \c__problems_pts_bool {
7653       \marginpar{\l__problems_inclprob_pts_tl\ \prob@pt@kw\smallskip}
7654       \addtocounter{pts}{\l__problems_inclprob_pts_tl}
7655     }
7656   }{
7657     \tl_if_exist:NT \l__problems_prob_pts_tl {
7658       \bool_if:NT \c__problems_pts_bool {
7659         \tl_if_empty:NTF \l__problems_prob_pts_tl{
7660           \tl_set:Nn \l__problems_prob_pts_tl {0}
7661         }
7662         \marginpar{\l__problems_prob_pts_tl\ \prob@pt@kw\smallskip}
7663         \addtocounter{pts}{\l__problems_prob_pts_tl}
7664       }
7665     }
7666   }
7667 }
```

(End definition for \show@pts. This function is documented on page ??.)
and now the same for the minutes

\show@min

```

7668 \newcounter{min}
7669 \def\show@min{
7670   \tl_if_exist:NTF \l__problems_inclprob_min_tl {
7671     \bool_if:NT \c__problems_min_bool {
7672       \marginpar{\l__problems_inclprob_pts_tl\ min}
7673       \addtocounter{min}{\l__problems_inclprob_min_tl}
7674     }
7675   }{
7676     \tl_if_exist:NT \l__problems_prob_min_tl {
7677       \bool_if:NT \c__problems_min_bool {
7678         \tl_if_empty:NT\l__problems_prob_min_tl{
7679           \tl_set:Nn \l__problems_prob_min_tl {0}
7680         }
7681         \marginpar{\l__problems_prob_min_tl\ min}
7682         \addtocounter{min}{\l__problems_prob_min_tl}
7683       }
7684     }
7685   }
7686 }
7687 \</package>

```

(End definition for \show@min. This function is documented on page ??.)

Chapter 40

Implementation: The hwexam Package

40.1 Package Options

The first step is to declare (a few) package options that handle whether certain information is printed or not. Some come with their own conditionals that are set by the options, the rest is just passed on to the `problems` package.

```
7688 \*package>
7689 \ProvidesExplPackage{hwexam}{2022/02/26}{3.0.1}{homework assignments and exams}
7690 \RequirePackage{13keys2e}
7691
7692 \newif\iftest\testfalse
7693 \DeclareOption{test}{\testtrue}
7694 \newif\ifmultiple\multiplefalse
7695 \DeclareOption{multiple}{\multipletrue}
7696 \DeclareOption*{\PassOptionsToPackage{\CurrentOption}{problem}}
7697 \ProcessOptions
```

Then we make sure that the necessary packages are loaded (in the right versions).

```
7698 \RequirePackage{keyval}[1997/11/10]
7699 \RequirePackage{problem}
```

`\hwexam@*@kw` For multilinguality, we define internal macros for keywords that can be specialized in `*.ldf` files.

```
7700 \newcommand\hwexam@assignment@kw{Assignment}
7701 \newcommand\hwexam@given@kw{Given}
7702 \newcommand\hwexam@due@kw{Due}
7703 \newcommand\hwexam@testemptypage@kw{This~page~was~intentionally~left~
7704 blank~for~extra~space}
7705 \def\hwexam@minutes@kw{minutes}
7706 \newcommand\correction@probs@kw{prob.}
7707 \newcommand\correction@pts@kw{total}
7708 \newcommand\correction@reached@kw{reached}
7709 \newcommand\correction@sum@kw{Sum}
7710 \newcommand\correction@grade@kw{grade}
7711 \newcommand\correction@forgrading@kw{To~be~used~for~grading,~do~not~write~here}
```

(End definition for `\hwexam@*kw`. This function is documented on page ??.)

For the other languages, we set up triggers

```

7712 \AddToHook{begindocument}{
7713 \ltx@ifpackageloaded{babel}{
7714 \makeatletter
7715 \clist_set:Nx \l_tmpa_clist {\bbl@loaded}
7716 \clist_if_in:NnT \l_tmpa_clist {ngerman}{
7717 \input{hwexam-ngerman.ldf}
7718 }
7719 \clist_if_in:NnT \l_tmpa_clist {finnish}{
7720 \input{hwexam-finnish.ldf}
7721 }
7722 \clist_if_in:NnT \l_tmpa_clist {french}{
7723 \input{hwexam-french.ldf}
7724 }
7725 \clist_if_in:NnT \l_tmpa_clist {russian}{
7726 \input{hwexam-russian.ldf}
7727 }
7728 \makeatother
7729 }{}
7730 }
7731

```

40.2 Assignments

Then we set up a counter for problems and make the problem counter inherited from `problem.sty` depend on it. Furthermore, we specialize the `\prob@label` macro to take the assignment counter into account.

```

7732 \newcounter{assignment}
7733 %\numberproblemsin{assignment}

We will prepare the keyval support for the assignment environment.

7734 \keys_define:nn { hwexam / assignment } {
7735 id .str_set:N = \l_@@_assign_id_str,
7736 number .int_set:N = \l_@@_assign_number_int,
7737 title .tl_set:N = \l_@@_assign_title_tl,
7738 type .tl_set:N = \l_@@_assign_type_tl,
7739 given .tl_set:N = \l_@@_assign_given_tl,
7740 due .tl_set:N = \l_@@_assign_due_tl,
7741 loadmodules .code:n = {
7742 \bool_set_true:N \l_@@_assign_loadmodules_bool
7743 }
7744 }
7745 \cs_new_protected:Nn \_@@_assignment_args:n {
7746 \str_clear:N \l_@@_assign_id_str
7747 \int_set:Nn \l_@@_assign_number_int {-1}
7748 \tl_clear:N \l_@@_assign_title_tl
7749 \tl_clear:N \l_@@_assign_type_tl
7750 \tl_clear:N \l_@@_assign_given_tl
7751 \tl_clear:N \l_@@_assign_due_tl
7752 \bool_set_false:N \l_@@_assign_loadmodules_bool
7753 \keys_set:nn { hwexam / assignment }{ #1 }
7754 }

```


The next three macros are intermediate functions that handle the case gracefully, where the respective token registers are undefined.

The `\given@due` macro prints information about the given and due status of the assignment. Its arguments specify the brackets.

```

7755 \newcommand\given@due[2]{
7756 \bool_lazy_all:nF {
7757 { \tl_if_empty_p:V \l_@@_inclasssign_given_tl }
7758 { \tl_if_empty_p:V \l_@@_assign_given_tl }
7759 { \tl_if_empty_p:V \l_@@_inclasssign_due_tl }
7760 { \tl_if_empty_p:V \l_@@_assign_due_tl }
7761 }{ #1 }
7762
7763 \tl_if_empty:NTF \l_@@_inclasssign_given_tl {
7764 \tl_if_empty:NF \l_@@_assign_given_tl {
7765 \hwexam@given@kw\xspace\l_@@_assign_given_tl
7766 }
7767 }{
7768 \hwexam@given@kw\xspace\l_@@_inclasssign_given_tl
7769 }
7770
7771 \bool_lazy_or:nnF {
7772 \bool_lazy_and_p:nn {
7773 \tl_if_empty_p:V \l_@@_inclasssign_due_tl
7774 }{
7775 \tl_if_empty_p:V \l_@@_assign_due_tl
7776 }
7777 }{
7778 \bool_lazy_and_p:nn {
7779 \tl_if_empty_p:V \l_@@_inclasssign_due_tl
7780 }{
7781 \tl_if_empty_p:V \l_@@_assign_due_tl
7782 }
7783 }{ ,~ }
7784
7785 \tl_if_empty:NTF \l_@@_inclasssign_due_tl {
7786 \tl_if_empty:NF \l_@@_assign_due_tl {
7787 \hwexam@due@kw\xspace \l_@@_assign_due_tl
7788 }
7789 }{
7790 \hwexam@due@kw\xspace \l_@@_inclasssign_due_tl
7791 }
7792
7793 \bool_lazy_all:nF {
7794 { \tl_if_empty_p:V \l_@@_inclasssign_given_tl }
7795 { \tl_if_empty_p:V \l_@@_assign_given_tl }
7796 { \tl_if_empty_p:V \l_@@_inclasssign_due_tl }
7797 { \tl_if_empty_p:V \l_@@_assign_due_tl }
7798 }{ #2 }
7799 }

```

`\assignment@title` This macro prints the title of an assignment, the local title is overwritten, if there is one from the `\inputassignment`. `\assignment@title` takes three arguments the first is the

fallback when no title is given at all, the second and third go around the title, if one is given.

```

7800 \newcommand\assignment@title[3]{
7801 \tl_if_empty:NTF \l_@@_inclasssign_title_tl {
7802 \tl_if_empty:NTF \l_@@_assign_title_tl {
7803 #1
7804 }{
7805 #2\l_@@_assign_title_tl#3
7806 }
7807 }{
7808 #2\l_@@_inclasssign_title_tl#3
7809 }
7810 }

```

(End definition for \assignment@title. This function is documented on page ??.)

\assignment@number Like \assignment@title only for the number, and no around part.

```

7811 \newcommand\assignment@number{
7812 \int_compare:nNnTF \l_@@_inclasssign_number_int = {-1} {
7813 \int_compare:nNnTF \l_@@_assign_number_int = {-1} {
7814 \arabic{assignment}
7815 } {
7816 \int_use:N \l_@@_assign_number_int
7817 }
7818 }{
7819 \int_use:N \l_@@_inclasssign_number_int
7820 }
7821 }

```

(End definition for \assignment@number. This function is documented on page ??.)

With them, we can define the central **assignment** environment. This has two forms (separated by \ifmultiple) in one we make a title block for an assignment sheet, and in the other we make a section heading and add it to the table of contents. We first define an assignment counter

assignment For the assignment environment we delegate the work to the @assignment environment that depends on whether multiple option is given.

```

7822 \newenvironment{assignment}[1][ ]{
7823 \_@@_assignment_args:n { #1 }
7824 %\sref@target
7825 \int_compare:nNnTF \l_@@_assign_number_int = {-1} {
7826 \global\stepcounter{assignment}
7827 }{
7828 \global\setcounter{assignment}{\int_use:N\l_@@_assign_number_int}
7829 }
7830 \setcounter{problem}{0}
7831 \renewcommand\prob@label[1]{\assignment@number.##1}
7832 \def\current@section@level{\document@hwexamtype}
7833 %\sref@label{id}{\document@hwexamtype \thesection}
7834 \begin{@assignment}
7835 }{
7836 \end{@assignment}
7837 }

```

In the multi-assignment case we just use the omdoc environment for suitable sectioning.

```

7838 \def\ass@title{
7839 {\protect\document@hwexamtype}\arabic{assignment}
7840 \assignment@title{\;(\;)\;}\; -- \given@due{\;}
7841 }
7842 \ifmultiple
7843 \newenvironment{@assignment}{
7844 \bool_if:NTF \l_@@_assign_loadmodules_bool {
7845 \begin{sfragment}[loadmodules]{\ass@title}
7846 }{
7847 \begin{sfragment}{\ass@title}
7848 }
7849 }{
7850 \end{sfragment}
7851 }

```

for the single-page case we make a title block from the same components.

```

7852 \else
7853 \newenvironment{@assignment}{
7854 \begin{center}\bf
7855 \Large@title\strut\
7856 \document@hwexamtype\arabic{assignment}\assignment@title{\;(\;)\;}\;
7857 \large\given@due{--\;}\;{--}\
7858 \end{center}
7859 }{}
7860 \fi% multiple

```

40.3 Including Assignments

\in*assignment This macro is essentially a glorified `\include` statement, it just sets some internal macros first that overwrite the local points. Importantly, it resets the `inclassig` keys after the input.

```

7861 \keys_define:nn { hwexam / inclassignment } {
7862 %id .str_set_x:N = \l_@@_assign_id_str,
7863 number .int_set:N = \l_@@_inclassign_number_int,
7864 title .tl_set:N = \l_@@_inclassign_title_tl,
7865 type .tl_set:N = \l_@@_inclassign_type_tl,
7866 given .tl_set:N = \l_@@_inclassign_given_tl,
7867 due .tl_set:N = \l_@@_inclassign_due_tl,
7868 mhrepos .str_set_x:N = \l_@@_inclassign_mhrepos_str
7869 }
7870 \cs_new_protected:Nn \l_@@_inclassignment_args:n {
7871 \int_set:Nn \l_@@_inclassign_number_int {-1}
7872 \tl_clear:N \l_@@_inclassign_title_tl
7873 \tl_clear:N \l_@@_inclassign_type_tl
7874 \tl_clear:N \l_@@_inclassign_given_tl
7875 \tl_clear:N \l_@@_inclassign_due_tl
7876 \str_clear:N \l_@@_inclassign_mhrepos_str
7877 \keys_set:nn { hwexam / inclassignment }{ #1 }
7878 }
7879 \l_@@_inclassignment_args:n {}
7880
7881 \newcommand\inputassignment[2][{}]{

```

```

7882 \_@@_inclassassignment_args:n { #1 }
7883 \str_if_empty:NTF \l_@@_inclasssign_mhrepos_str {
7884 \input{#2}
7885 }{
7886 \stex_in_repository:nn{\l_@@_inclasssign_mhrepos_str}{
7887 \input{\mhpath{\l_@@_inclasssign_mhrepos_str}{#2}}
7888 }
7889 }
7890 \_@@_inclassassignment_args:n {}
7891 }
7892 \newcommand\includeassignment[2][]{
7893 \newpage
7894 \inputassignment[#1]{#2}
7895 }

```

(End definition for \in*assignment. This function is documented on page ??.)

40.4 Typesetting Exams

\quizheading

```

7896 \ExplSyntaxOff
7897 \newcommand\quizheading[1]{%
7898 \def\@tas{#1}%
7899 \large\noindent NAME: \hspace{8cm} MAILBOX:\[2ex]%
7900 \ifx\@tas\@empty\else%
7901 \noindent TA:~\@for\@I:=\@tas\do{\Large$\Box$}\@I\hspace*{1em}}\[2ex]%
7902 \fi%
7903 }
7904 \ExplSyntaxOn

```

(End definition for \quizheading. This function is documented on page ??.)

\testheading

```

7905
7906 \def\hwexamheader{\input{hwexam-default.header}}
7907
7908 \def\hwexamminutes{
7909 \tl_if_empty:NTF \testheading@duration {
7910 {\testheading@min}~\hwexam@minutes@kw
7911 }{
7912 \testheading@duration
7913 }
7914 }
7915
7916 \keys_define:nn { hwexam / testheading } {
7917 min .tl_set:N = \testheading@min,
7918 duration .tl_set:N = \testheading@duration,
7919 reqpts .tl_set:N = \testheading@reqpts,
7920 tools .tl_set:N = \testheading@tools
7921 }
7922 \cs_new_protected:Nn \_@@_testheading_args:n {
7923 \tl_clear:N \testheading@min
7924 \tl_clear:N \testheading@duration

```

```

7925 \tl_clear:N \testheading@reqpts
7926 \tl_clear:N \testheading@tools
7927 \keys_set:nn { hwexam / testheading }{ #1 }
7928 }
7929 \newenvironment{testheading}[1][]{
7930 \_@@_testheading_args:n{ #1 }
7931 \newcount\check@time\check@time=\testheading@min
7932 \advance\check@time by -\theassignment@totalmin
7933 \newif\if@bonuspoints
7934 \tl_if_empty:NTF \testheading@reqpts {
7935 \@bonuspointsfalse
7936 }{
7937 \newcount\bonus@pts
7938 \bonus@pts=\theassignment@totalpts
7939 \advance\bonus@pts by -\testheading@reqpts
7940 \edef\bonus@pts{\the\bonus@pts}
7941 \@bonuspointstrue
7942 }
7943 \edef\check@time{\the\check@time}
7944
7945 \makeatletter\hwexamheader\makeatother
7946 }{
7947 \newpage
7948 }

```

(End definition for \testheading. This function is documented on page ??.)

\testspace

```

7949 \newcommand\testspace[1]{\iftest\vspace*{#1}\fi}

```

(End definition for \testspace. This function is documented on page ??.)

\testnewpage

```

7950 \newcommand\testnewpage{\iftest\newpage\fi}

```

(End definition for \testnewpage. This function is documented on page ??.)

\testemptypage

```

7951 \newcommand\testemptypage[1][]{\iftest\begin{center}\hwexam@testemptypage@kw\end{center}\vfi}

```

(End definition for \testemptypage. This function is documented on page ??.)

\@problem This macro acts on a problem's record in the *.aux file. Here we redefine it (it was defined to do nothing in problem.sty) to generate the correction table.

```

7952 <@@=problems>
7953 \renewcommand\@problem[3]{
7954 \stepcounter{assignment@probs}
7955 \def\__problemspts{#2}
7956 \ifx\__problemspts\@empty\else
7957 \addtocounter{assignment@totalpts}{#2}
7958 \fi
7959 \def\__problemsmin{#3}\ifx\__problemsmin\@empty\else\addtocounter{assignment@totalmin}{#3}\fi
7960 \xdef\correction@probs{\correction@probs & #1}%
7961 \xdef\correction@pts{\correction@pts & #2}
7962 \xdef\correction@reached{\correction@reached &}

```

```

7963 }
7964 <@@=hwexam>

```

(End definition for \@problem. This function is documented on page ??.)

`\correction@table` This macro generates the correction table

```

7965 \newcounter{assignment@probs}
7966 \newcounter{assignment@totalpts}
7967 \newcounter{assignment@totalmin}
7968 \def\correction@probs{\correction@probs@kw}
7969 \def\correction@pts{\correction@pts@kw}
7970 \def\correction@reached{\correction@reached@kw}
7971 \stepcounter{assignment@probs}
7972 \newcommand\correction@table{
7973 \resizebox{\textwidth}{!}{%
7974 \begin{tabular}{|l|*{\theassignment@probs}{c|}|l|}\hline%
7975 &\multicolumn{\theassignment@probs}{c|}||%|
7976 {\footnotesize\correction@forgrading@kw} &\\\hline
7977 \correction@probs & \correction@sum@kw & \correction@grade@kw\\\hline
7978 \correction@pts & \theassignment@totalpts & \\\hline
7979 \correction@reached & & \[.7cm]\hline
7980 \end{tabular}}
7981 </package>

```

(End definition for \correction@table. This function is documented on page ??.)

40.5 Leftovers

at some point, we may want to reactivate the logos font, then we use

here we define the logos that characterize the assignment

```

\font\bierfont=../assignments/bierglas
\font\denkerfont=../assignments/denker
\font\uhrfont=../assignments/uhr
\font\warnschildfont=../assignments/achtung

\newcommand\bierglas{{\bierfont\char65}}
\newcommand\denker{{\denkerfont\char65}}
\newcommand\uhr{{\uhrfont\char65}}
\newcommand\warnschild{{\warnschildfont\char 65}}
\newcommand\hardA{\warnschild}
\newcommand\longA{\uhr}
\newcommand\thinkA{\denker}
\newcommand\discussA{\bierglas}

```