

The sTeX3 Package *

Michael Kohlhase, Dennis Müller
FAU Erlangen-Nürnberg
<http://kwarc.info/>

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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 easily be skipped on a first read.



Boxes like this one explain how some $\text{\texttt{S}\TeX}$ 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 \LaTeX 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>
```

...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 (*<language>**) Languages to load with the `babel` package.

mathhub (*<directory>*) MathHub folder to search for repositories – this is not necessary if the `MATHHUB` system variable is set.

sms (*<boolean>*) use *persisted* mode (not yet implemented).

image (*<boolean>*) passed on to `tikzinput`.

debug (*<log-prefix>**) 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.

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- 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.

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/smglom/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 $\text{\texttt{\textit{STeX}}}$ 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:

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

$\backslash\text{inputref}$	$\backslash\text{inputref}$ [Some/Archive]{some/file} behaves like $\backslash\text{mhinput}$, but wraps the input in a $\backslash\text{begingroup} \dots \backslash\text{endgroup}$. 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 $\backslash\text{inputref}$ is likely to be preferred over $\backslash\text{mhinput}$.
-----------------------------	---

$\backslash\text{ifinput}$	Both $\backslash\text{mhinput}$ and $\backslash\text{inputref}$ set $\backslash\text{ifinput}$ 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.
----------------------------	---

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

$\backslash\text{libinput}$	$\backslash\text{libinput}$ {some/file} searches for a file some/file in <ul style="list-style-type: none">• the <code>lib</code>-directory of the current archive, and• the <code>lib</code>-directory of a <code>meta-inf</code>-archive in (any of) the archive groups containing the current archive and include all found files in reverse order; e.g. $\backslash\text{libinput}\{\text{preamble}\}$ in a <code>.tex</code> -file in <code>smglom/calculus</code> will <i>first</i> input <code>../smglom/meta-inf/lib/preamble.tex</code> and then <code>../smglom/calculus/lib/preamble.tex</code> . Will throw an error if <i>no</i> candidate for some/file is found.
-----------------------------	---

$\backslash\text{libusepackage}$	$\backslash\text{libusepackage}$ [package-options]{some/file} searches for a file some/file.sty in the same way that $\backslash\text{libinput}$ does, but will call $\backslash\text{usepackage}$ [package-options]{path/to/some/file} instead of $\backslash\text{input}$. Will throw an error if not <i>exactly one</i> 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 \hookrightarrow `<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` \rightsquigarrow

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 **b-type** arguments behave exactly like **i-type** arguments within $\text{\texttt{TeX}}$, but applications of binding operators, i.e. symbols with **b-type** arguments, are translated to $\text{\texttt{OMBIND}}$ -terms in $\text{\texttt{OMDOC/MTT}}$, rather than $\text{\texttt{OMA}}$.

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=biil]
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 $\text{\texttt{summation}}$ -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. $\text{\texttt{addition}}\{a,b,c,d,e\}$ rather than having to write something like $\text{\texttt{addition}}\{a\}\{\text{\texttt{addition}}\{b\}\{\text{\texttt{addition}}\{c\}\{\text{\texttt{addition}}\{d\}\{e\}\}\}\}$!

$\text{\texttt{notation}}$ (and consequently $\text{\texttt{symdef}}$, 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. $\text{\texttt{ascendingchain}}\{S\}\{a,b,c,d,e\}\{t\}$ should yield $\forall a <_S b <_S c <_S d <_S e. t$. The "base"-notation for this operator is simply $\{\text{\texttt{comp}}\{\text{\texttt{forall}}\} \#2 \text{\texttt{comp}}\{.,\}\#3\}$, where $\#2$ represents the full notation fragment *accumulated* from $\{a,b,c,d,e\}$.

The *additional* argument to $\text{\texttt{notation}}$ (or $\text{\texttt{symdef}}$) 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 $\{\#1 \text{\texttt{comp}}\{<\}_{\#1} \#2\}$:

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.

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

When $\text{\texttt{gTeX}}$ 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. $\text{\texttt{gTeX}}$ starts out with $p_d = \text{\texttt{\neginfprec}}$.
2. $\text{\texttt{gTeX}}$ encounters `\addition` with $p_{op} = 100$. Since $100 \not> \text{\texttt{\neginfprec}}$, it inserts no parentheses.
3. Next, $\text{\texttt{gTeX}}$ encounters the two arguments for `\addition`. Both have no specifically provided argument precedence, so $\text{\texttt{gTeX}}$ uses $p_d = p_{op} = 100$ for both and recurses.
4. Next, $\text{\texttt{gTeX}}$ 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 $\text{\texttt{gTeX}}$ again inserts no parentheses.
6. Since the notation of `\multiplication` has no explicitly set argument precedences, $\text{\texttt{gTeX}}$ uses the operator precedence for all arguments of `\multiplication`, hence sets $p_d = p_{op} = 50$ and recurses.
7. Next, $\text{\texttt{gTeX}}$ 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 $\text{\texttt{gTeX}}$ 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 $\text{\texttt{TeX}}$ 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  $\varf!:\mathbb{N}\rightarrow\mathbb{N}$ ,
12 by  $\mathit{addition}(\varf!,\varn)$  we mean the function
13  $\mathit{fun}(\varx)\{\varf(\mathit{addition}(\varx,\varn))\}$ 
```

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  $\mathit{seqa}!$  is  $\mathit{seqa}\{i\}$ .
```

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{var}[name=m,type=\Nat]{\comp{m}}
2 \varseq{seqa}[
3   name=a,
4   args=2,
5   type=\Nat,
6 ]{1,1}{\varn,\var}{\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^{\varn}}
6 ]{1,1}{\varn,\var}{\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:
 $\begin{array}{ll} \text{---M--}\rightarrow & \text{\code{\begin{smodule}[lang=<lang>]{Foo}} generates a theory \code{some/namespace?Foo} \\ \text{---M--}\rightarrow & \text{that only contains the “formal” part of the module – i.e. exactly the content} \\ \text{---T--}\rightarrow & \text{that is exported when using \code{\importmodule}.} \\ \text{---T--}\rightarrow & \text{Additionally, MMT generates a \i language theory \code{some/namespace/Foo?<lang>} that} \\ & \text{includes \code{some/namespace?Foo} and contains all the other document content – vari-} \\ & \text{able declarations, includes for each \code{\usemodule}, etc.} \end{array}$

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`.
 $\hookrightarrow M$ $\hookrightarrow M$ $\rightsquigarrow T$ `\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 $\varM!:=\mathstrut{\varM{universe},\varM{op}!,\varM{unit}}{\varM{universe}}$
5 such that
6 $\varM{op}!:\mathstrut{\varM{universe},\varM{universe}}{\varM{universe}}$
7 and...
8
9 \varinstantiate{varMb}{universe = Int}{monoid}{M_2}
10
11 \noindent Let $\varMb!:=\mathstrut{\varMb{universe},\varMb{op}!,\varMb{unit}}{\varMb{universe}}$
12 a \symname{monoid} on $\mathbb{Z}$...

```

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: $a \cdot c \cdot c$

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`

`sdefinition` (and `sparagraph` with `type=symdoc`) introduce three new macros: `definiendum` behaves like `symref` (and `definame` like `symname`), but highlights the references 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).

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

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, $\text{\texttt{S}\text{T}\text{E}\text{X}}$ 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 \TeX 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>	Push and pop (repectively) a file path to the file stack, to keep track of the current file.
<code>\stex_filestack_pop:</code>	Are called in hooks <code>file/before</code> and <code>file/after</code> , respectively.

9.1.2 MathHub Archives

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

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.

In all three 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 `{<repository-name>}` (or not, if `{<repository-name>}` is empty), and passes its ID on to `{<code>}` as `#1`. Switches back to the previous repository after executing `{<code>}`.

9.1.3 Using Content in Archives

<hr/> <hr/> <code>\mhpath *</code>	<code>\mhpath{<archive-ID>}{<filename>}</code> Expands to the full path of file <code><filename></code> in repository <code><archive-ID></code> . Does not check whether the file or the repository exist.
<hr/> <hr/> <code>\inputref</code> <code>\mhinput</code>	<code>\inputref[<archive-ID>]{<filename>}</code> Both <code>\input</code> the file <code><filename></code> in archive <code><archive-ID></code> (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-mode</code> , inserting a <i>reference</i> to the file instead. Both also set <code>\ifinputref</code> to true.
<hr/> <hr/> <code>\addmhbibresource</code>	<code>\inputref[<archive-ID>]{<filename>}</code> Adds a <code>.bib</code> -file <code><filename></code> in archive <code><archive-ID></code> (relative to the top-directory of the archive!).
<hr/> <hr/> <code>\libinput</code>	<code>\libinput{<filename>}</code> Inputs <code><filename>.tex</code> 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>	<code>\libusepackage[<args>]{<filename>}</code> Like <code>\libinput</code> , but looks for <code>.sty</code> -files and calls <code>\usepackage[<meta{args}>]{<Arg{filename}>}</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> <code>\cmhgraphics</code>	<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>mhrefpos</code> . It then resolves the file path in <code>\mhgraphics[mhrefpos=Foo/Bar]{foo/bar.png}</code> relative to the <code>source-</code> folder of the <code>Foo/Bar</code> -archive. <code>\cmhgraphics</code> additionally wraps the image in a <code>center</code> -environment.
<hr/> <hr/> <code>\lstinputmhlisting</code> <code>\clstinputmhlisting</code>	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

<hr/> <hr/>	<code>\sref[<i><opt-args></i>]{<i><id></i>}</code> References the label with if <i><id></i> . Optional arguments: TODO
<hr/> <hr/>	<code>\srefsym[<i><opt-args></i>]{<i><symbol></i>}</code> Like <code>\sref</code> , but references the <i>canonical label</i> for the provided symbol. The canonical target is the last of the following occurring in the document: <ul style="list-style-type: none">• A <code>\definiendum</code> or <code>\definame</code> for <i><symbol></i>,• The <code>sassertion</code>, <code>sexample</code> or <code>sparagraph</code> with <code>for=<i><symbol></i></code> that generated <i><symbol></i> in the first place, or• A <code>\sparagraph</code> with <code>type=symdoc</code> and <code>for=<i><symbol></i></code>.
<hr/> <hr/>	<code>\srefsymuri{<i><URI></i>}{<i><text></i>}</code> A convenient short-hand for <code>\srefsym[linktext={<i><text></i>}] {<i><URI></i>}</code> , but requires the first argument to be a full URI already. Intended to be used in e.g. <code>\compemph@uri</code> , <code>\defemph@uri</code> , 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:

`\c_stex_module_<URI>_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.

`\c_stex_module_<URI>_code`

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

`\c_stex_module_<URI>_constants`

The names of all constants declared in the module

`\c_stex_module_<URI>_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_modules_ns_str`. Additionally, the sub path relative to the current repository is stored in `\l_stex_modules_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` 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

 $\backslash\text{stex_import_module_uri:nn}$

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

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

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

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

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

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

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

2. Otherwise:

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

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

- (b) If $\langle \text{path} \rangle$ 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 $\backslash\text{stex_require_module:nn}$ on the **source** directory of the archive to find the file.

 $\backslash\text{l_stex_import_name_str}$
 $\backslash\text{l_stex_import_archive_str}$
 $\backslash\text{l_stex_import_path_str}$
 $\backslash\text{l_stex_import_ns_str}$

stores the result in these four variables.

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

Checks whether a module with URI $\langle \text{ns} \rangle ? \langle \text{name} \rangle$ 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>	Iterates over all currently available symbols. Requires two <code>\seq_map_break:</code> to break fully.
<hr/> <hr/> <code>\stex_get_symbol:n</code>	Computes the full URI of a symbol from a macro argument, e.g. the macro name, the macro itself, the full URI...
<hr/> <hr/> <code>\notation</code>	<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>	<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/> <hr/>	
<code>\infprec</code> <code>\neginfprec</code>	Maximal and minimal notation precedences.
<hr/> <hr/>	
<code>\dobrackets</code>	<code>\dobrackets {⟨body⟩}</code>
	Puts $\langle body \rangle$ 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/> <hr/>	
<code>\withbrackets</code>	<code>\withbrackets ⟨left⟩ ⟨right⟩ {⟨body⟩}</code>
	Temporarily (i.e. within $\langle body \rangle$) sets the brackets used by \SIX for automated bracketing (by default (and)) to $\langle left \rangle$ and $\langle right \rangle$. Note that $\langle left \rangle$ and $\langle right \rangle$ need to be allowed after <code>\left</code> and <code>\right</code> in display-mode.
<hr/> <hr/>	
<code>\stex_term_custom:nn</code>	<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/> <hr/>	
<code>\stex_highlight_term:nn</code>	<code>\stex_highlight_term:nn{⟨URI⟩}{⟨args⟩}</code>
	Establishes a context for <code>\comp</code> . Stores the URI in a variable so that <code>\comp</code> knows which symbol governs the current notation.
<hr/> <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>	<code>\comp{⟨args⟩}</code> Marks $\langle args \rangle$ 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/> <hr/>	
<code>\STEXinvisible</code>	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/> <hr/>	
<code>\ellipses</code>	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.barderv,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=elephants,pts=10,min=2,title=Fitting Elephants]
    How many Elephants 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=elephants,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 0.1 (Fitting Elephants)
How many Elephants 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]
  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 0.2 (Functions)

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

1. def
2. function
3. fun
4. public static void

Problem 0.3 (Functions)

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

1. def
!
2. function
that is for C and C++
3. fun
that is for Standard ML
4. public static void
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 — 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` 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.

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: _____

2022-03-07

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

ST_EX -Basics Implementation

24.1 The ST_EXDocument 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 \LoadClass[border=1px,varwidth]{standalone}
8 \setlength\textwidth{15cm}
9
10 \DeclareOption*{\PassOptionsToPackage{\CurrentOption}{stex}}
11 \ProcessOptions
12
13 \RequirePackage{stex}
14 </cls>
```

24.2 Preliminaries

```
15 <*package>
16
17 %%%%%%%%% basics.dtx %%%%%%%%%
18
19 \RequirePackage{expl3,l3keys2e,ltxcmds}
20 \ProvidesExplPackage{stex}{2022/03/03}{3.1.0}{sTeX package}
21
22 %\RequirePackage{morewrites}
23 %\RequirePackage{amsmath}
24
25 Package options:
26 \keys_define:nn { stex } {
```

```

26 debug      .clist_set:N = \c_stex_debug_clist ,
27 lang       .clist_set:N = \c_stex_languages_clist ,
28 mathhub    .tl_set_x:N   = \mathhub ,
29 sms        .bool_set:N   = \c_stex_persist_mode_bool ,
30 image      .bool_set:N   = \c_tikzinput_image_bool ,
31 unknown    .code:n       = {}
32 }
33 \ProcessKeysOptions { stex }

```

\stex The \TeX logo:

\sTeX

```

34 \protected\def\stex{
35   \texorpdfstring{\raisebox{-.5ex}{S}\kern-.5ex\TeX}{sTeX}\xspace%
36 }
37 \let\sTeX\stex

```

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

24.3 Messages and logging

```

38 <@@=stex_log>
    Warnings and error messages
39 \msg_new:nnn{stex}{error/unknownlanguage}{
40   Unknown~language:~#1
41 }
42 \msg_new:nnn{stex}{warning/nomathhub}{
43   MATHHUB~system~variable~not~found~and~no~
44   \detokenize{\mathhub}~value~set!
45 }
46 \msg_new:nnn{stex}{error/deactivated-macro}{
47   The~\detokenize{#1}~command~is~only~allowed~in~#2!
48 }

```

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

```

49 \cs_new_protected:Nn \stex_debug:nn {
50   \clist_if_in:NnTF \c_stex_debug_clist { all } {
51     \msg_set:nnn{stex}{debug / #1}{
52       \\Debug~#1:~#2\\
53     }
54     \msg_none:nn{stex}{debug / #1}
55   }{
56     \clist_if_in:NnT \c_stex_debug_clist { #1 } {
57       \msg_set:nnn{stex}{debug / #1}{
58         \\Debug~#1:~#2\\
59       }
60       \msg_none:nn{stex}{debug / #1}
61     }
62   }
63 }

```

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

Redirecting messages:

```

64 \clist_if_in:NnTF \c_stex_debug_clist {all} {
65   \msg_redirect_module:nnn{ stex }{ none }{ term }

```

```

66 }{
67   \clist_map_inline:Nn \c_stex_debug_clist {
68     \msg_redirect_name:nnn{ stex }{ debug / ##1 }{ term }
69   }
70 }
71
72 \stex_debug:nn{log}{debug~mode~on}

```

24.4 HTML Annotations

```

73 <@=stex_annotate>
74 \RequirePackage{rustex}

```

We add the namespace abbreviation `ns:stex="http://kwarc.info/ns/sTeX"` to `RUSTEX`:

```

75 \rustex_add_Namespace:nn{stex}{http://kwarc.info/ns/sTeX}

```

Conditionals for L^AT_EXML:

`\if@latexml`

```

76 \ifcsname if@latexml\endcsname\else
77   \expandafter\newif\csname if@latexml\endcsname\@latexmlfalse
78 \fi

```

(End definition for `\if@latexml`. This function is documented on page 46.)

`\latexml_if_p:`

`\latexml_if:TF`

```

79 \prg_new_conditional:Nnn \latexml_if: {p, T, F, TF} {
80   \if@latexml
81     \prg_return_true:
82   \else:
83     \prg_return_false:
84   \fi:
85 }

```

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

`\l__stex_annotate_arg_tl`
`\c__stex_annotate_emptyarg_tl`

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

```

86 \tl_new:N \l__stex_annotate_arg_tl
87 \tl_const:Nx \c__stex_annotate_emptyarg_tl {
88   \rustex_if:TF {
89     \rustex_direct_HTML:n { \c_ampersand_str lrm; }
90   }{-}
91 }

```

(End definition for `\l__stex_annotate_arg_tl` and `\c__stex_annotate_emptyarg_tl`.)

`__stex_annotate_checkempty:n`

```

92 \cs_new_protected:Nn \__stex_annotate_checkempty:n {
93   \tl_set:Nn \l__stex_annotate_arg_tl { #1 }
94   \tl_if_empty:NT \l__stex_annotate_arg_tl {
95     \tl_set_eq:NN \l__stex_annotate_arg_tl \c__stex_annotate_emptyarg_tl
96   }
97 }

```

(End definition for `__stex_annotate_checkempty:n`.)


```

\stex_if_do_html_p: Whether to (locally) produce HTML output
\stex_if_do_html:TF
  98 \bool_new:N \_stex_html_do_output_bool
  99 \bool_set_true:N \_stex_html_do_output_bool
 100
 101 \prg_new_conditional:Nnn \stex_if_do_html: {p,T,F,TF} {
 102   \bool_if:nTF \_stex_html_do_output_bool
 103     \prg_return_true: \prg_return_false:
 104 }

```

(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
 105 \cs_new_protected:Nn \stex_suppress_html:n {
 106   \exp_args:Nne \use:nn {
 107     \bool_set_false:N \_stex_html_do_output_bool
 108     #1
 109   }{
 110     \stex_if_do_html:T {
 111       \bool_set_true:N \_stex_html_do_output_bool
 112     }
 113   }
 114 }

```

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

`\stex_annotate:nnv` 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).

`\stex_annotate_invisible:n` 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.

`\stex_annotate_invisible:nnn`

```

 115 \rustex_if:TF{
 116   \cs_new_protected:Nn \stex_annotate:nnn {
 117     \__stex_annotate_checkempty:n { #3 }
 118     \rustex_annotate_HTML:nn {
 119       property="stex:#1" ~
 120       resource="#2"
 121     } {
 122       \mode_if_vertical:TF{
 123         \tl_use:N \l__stex_annotate_arg_tl\par
 124       }{
 125         \tl_use:N \l__stex_annotate_arg_tl
 126       }
 127     }
 128   }
 129   \cs_new_protected:Nn \stex_annotate_invisible:n {
 130     \__stex_annotate_checkempty:n { #1 }
 131     \rustex_annotate_HTML:nn {
 132       stex:visible="false" ~
 133       style:display="none"
 134     } {
 135       \mode_if_vertical:TF{
 136         \tl_use:N \l__stex_annotate_arg_tl\par
 137       }{
 138         \tl_use:N \l__stex_annotate_arg_tl
 139       }
 140     }
 141   }

```

```

140     }
141   }
142   \cs_new_protected:Nn \stex_annotate_invisible:nnn {
143     \__stex_annotate_checkempty:n { #3 }
144     \rustex_annotate_HTML:nn {
145       property="stex:#1" ~
146       resource="#2" ~
147       stex:visible="false" ~
148       style:display="none"
149     } {
150       \mode_if_vertical:TF{
151         \tl_use:N \l__stex_annotate_arg_tl\par
152       }{
153         \tl_use:N \l__stex_annotate_arg_tl
154       }
155     }
156   }
157   \NewDocumentEnvironment{stex_annotate_env} { m m } {
158     \par
159     \rustex_annotate_HTML_begin:n {
160       property="stex:#1" ~
161       resource="#2"
162     }
163   }{
164     \par\rustex_annotate_HTML_end:
165   }
166 }{
167   \latexml_if:TF {
168     \cs_new_protected:Nn \stex_annotate:nnn {
169       \__stex_annotate_checkempty:n { #3 }
170       \mode_if_math:TF {
171         \cs:w latexml@annotate@math\cs_end:{#1}{#2}{
172           \tl_use:N \l__stex_annotate_arg_tl
173         }
174       }{
175         \cs:w latexml@annotate@text\cs_end:{#1}{#2}{
176           \tl_use:N \l__stex_annotate_arg_tl
177         }
178       }
179     }
180     \cs_new_protected:Nn \stex_annotate_invisible:n {
181       \__stex_annotate_checkempty:n { #1 }
182       \mode_if_math:TF {
183         \cs:w latexml@invisible@math\cs_end:{
184           \tl_use:N \l__stex_annotate_arg_tl
185         }
186       } {
187         \cs:w latexml@invisible@text\cs_end:{
188           \tl_use:N \l__stex_annotate_arg_tl
189         }
190       }
191     }
192     \cs_new_protected:Nn \stex_annotate_invisible:nnn {
193       \__stex_annotate_checkempty:n { #3 }

```

```

194     \cs:w latexml@annotate@invisible\cs_end:{#1}{#2}{
195       \tl_use:N \l__stex_annotate_arg_tl
196     }
197   }
198   \NewDocumentEnvironment{stex_annotate_env} { m m } {
199     \par\begin{latexml@annotateenv}{#1}{#2}
200   }{
201     \par\end{latexml@annotateenv}
202   }
203 }{
204   \cs_new_protected:Nn \stex_annotate:nnn {#3}
205   \cs_new_protected:Nn \stex_annotate_invisible:n {}
206   \cs_new_protected:Nn \stex_annotate_invisible:nnn {}
207   \NewDocumentEnvironment{stex_annotate_env} { m m } {}{}
208 }
209 }

```

(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

```

210 <@@=stex_language>

```

`\c_stex_languages_prop`
`\c_stex_language_abbrevs_prop`

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

```

211 \prop_const_from_keyval:Nn \c_stex_languages_prop {
212   en = english ,
213   de = ngerman ,
214   ar = arabic ,
215   bg = bulgarian ,
216   ru = russian ,
217   fi = finnish ,
218   ro = romanian ,
219   tr = turkish ,
220   fr = french
221 }
222
223 \prop_const_from_keyval:Nn \c_stex_language_abbrevs_prop {
224   english = en ,
225   ngerman = de ,
226   arabic = ar ,
227   bulgarian = bg ,
228   russian = ru ,
229   finnish = fi ,
230   romanian = ro ,
231   turkish = tr ,
232   french = fr
233 }
234 % todo: chinese simplified (zhs)
235 %       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:

```

236 \clist_if_empty:NF \c_stex_languages_clist {
237   \clist_clear:N \l_tmpa_clist
238   \clist_map_inline:Nn \c_stex_languages_clist {
239     \prop_get:NnNTF \c_stex_languages_prop { #1 } \l_tmpa_str {
240       \clist_put_right:No \l_tmpa_clist \l_tmpa_str
241     } {
242       \msg_error:nnx{stex}{error/unknownlanguage}{\l_tmpa_str}
243     }
244   }
245   \stex_debug:nn{lang} {Languages:~\clist_use:Nn \l_tmpa_clist {,~} }
246   \RequirePackage[\clist_use:Nn \l_tmpa_clist,]{babel}
247 }

```

24.6 Auxiliary Methods

\stex_deactivate_macro:Nn

```

248 \cs_new_protected:Nn \stex_deactivate_macro:Nn {
249   \exp_after:wN\let\csname \detokenize{#1} - orig\endcsname#1
250   \def#1{
251     \msg_error:nnnn{stex}{error/deactivated-macro}{#1}{#2}
252   }
253 }

```

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

\stex_reactivate_macro:N

```

254 \cs_new_protected:Nn \stex_reactivate_macro:N {
255   \exp_after:wN\let\exp_after:wN#1\csname \detokenize{#1} - orig\endcsname
256 }

```

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

\ignorespacesandpars

```

257 \protected\def\ignorespacesandpars{
258   \begingroup\catcode13=10\relax
259   \@ifnextchar\par{
260     \endgroup\expandafter\ignorespacesandpars\@gobble
261   }{
262     \endgroup
263   }
264 }
265 \</package>

```

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

Chapter 25

STEX -MathHub Implementation

```
266 <*package>
267
268 %%%%%%%%%% mathhub.dtx %%%%%%%%%%
269
270 <@@=stex_path>
271
272 Warnings and error messages
273 \msg_new:nnn{stex}{error/norepository}{
274   No~archive~#1~found~in~#2
275 }
276 \msg_new:nnn{stex}{error/notinarchive}{
277   Not~currently~in~an~archive,~but~\detokenize{#1}~
278   needs~one!
279 }
280 \msg_new:nnn{stex}{error/nofile}{
281   \detokenize{#1}~could~not~find~file~#2
282 }
283 \msg_new:nnn{stex}{error/twofiles}{
284   \detokenize{#1}~found~two~candidates~for~#2
285 }
```

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`

```
284 \cs_new_protected:Nn \stex_path_from_string:Nn {
285   \str_set:Nx \l_tmpa_str { #2 }
286   \str_if_empty:NTF \l_tmpa_str {
287     \seq_clear:N #1
288   }{
289     \exp_args:NNNo \seq_set_split:Nnn #1 / { \l_tmpa_str }
290     \sys_if_platform_windows:T{
291       \seq_clear:N \l_tmpa_tl
```

```

292 \seq_map_inline:Nn #1 {
293   \seq_set_split:Nnn \l_tmpb_tl \c_backslash_str { ##1 }
294   \seq_concat:NNN \l_tmpa_tl \l_tmpa_tl \l_tmpb_tl
295 }
296 \seq_set_eq:NN #1 \l_tmpa_tl
297 }
298 \stex_path_canonicalize:N #1
299 }
300 }
301

```

(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`

```

302 \cs_new_protected:Nn \stex_path_to_string:NN {
303   \exp_args:Nne \str_set:Nn #2 { \seq_use:Nn #1 / }
304 }
305
306 \cs_new:Nn \stex_path_to_string:N {
307   \seq_use:Nn #1 /
308 }

```

(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`

```

309 \str_const:Nn \c__stex_path_dot_str {.}
310 \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.

```

311 \cs_new_protected:Nn \stex_path_canonicalize:N {
312   \seq_if_empty:NF #1 {
313     \seq_clear:N \l_tmpa_seq
314     \seq_get_left:NN #1 \l_tmpa_tl
315     \str_if_empty:NT \l_tmpa_tl {
316       \seq_put_right:Nn \l_tmpa_seq {}
317     }
318     \seq_map_inline:Nn #1 {
319       \str_set:Nn \l_tmpa_tl { ##1 }
320       \str_if_eq:NNF \l_tmpa_tl \c__stex_path_dot_str {
321         \str_if_eq:NNTF \l_tmpa_tl \c__stex_path_up_str {
322           \seq_if_empty:NNTF \l_tmpa_seq {
323             \exp_args:NNo \seq_put_right:Nn \l_tmpa_seq {
324               \c__stex_path_up_str
325             }
326           }{
327             \seq_get_right:NN \l_tmpa_seq \l_tmpa_tl
328             \str_if_eq:NNTF \l_tmpa_tl \c__stex_path_up_str {
329               \exp_args:NNo \seq_put_right:Nn \l_tmpa_seq {
330                 \c__stex_path_up_str
331               }
332             }{

```

```

333         \seq_pop_right:NN \l_tmpa_seq \l_tmpb_tl
334     }
335 }
336 }{
337     \str_if_empty:NF \l_tmpa_tl {
338         \exp_args:NNo \seq_put_right:Nn \l_tmpa_seq { \l_tmpa_tl }
339     }
340 }
341 }
342 }
343 \seq_gset_eq:NN #1 \l_tmpa_seq
344 }
345 }

```

(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}`

```

346 \prg_new_conditional:Nnn \stex_path_if_absolute:N {p, T, F, TF} {
347     \seq_if_empty:NTF #1 {
348         \prg_return_false:
349     }{
350         \seq_get_left:NN #1 \l_tmpa_tl
351         \sys_if_platform_windows:TF{
352             \str_if_in:NnTF \l_tmpa_tl {:}{
353                 \prg_return_true:
354             }{
355                 \prg_return_false:
356             }
357         }{
358             \str_if_empty:NTF \l_tmpa_tl {
359                 \prg_return_true:
360             }{
361                 \prg_return_false:
362             }
363         }
364     }
365 }

```

(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`

```

366 \str_new:N\l_stex_kpsewhich_return_str
367 \cs_new_protected:Nn \stex_kpsewhich:n {
368     \sys_get_shell:nnN { kpsewhich ~ #1 } { } \l_tmpa_tl
369     \exp_args:NNo\str_set:Nn\l_stex_kpsewhich_return_str{\l_tmpa_tl}
370     \tl_trim_spaces:N \l_stex_kpsewhich_return_str
371 }

```

(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`

```

372 \sys_if_platform_windows:TF{
373   \begingroup\escapechar=-1\catcode'\=12
374   \exp_args:Nx\stex_kpsewhich:n{-expand-var~\c_percent_str CD\c_percent_str}
375   \exp_args:NNx\str_replace_all:Nnn\l_stex_kpsewhich_return_str{\c_backslash_str}/
376   \exp_args:Nnx\use:nn{\endgroup}{\str_set:Nn\exp_not:N\l_stex_kpsewhich_return_str{\l_stex_
377   }}{
378   \stex_kpsewhich:n{-var-value~PWD}
379 }
380
381 \stex_path_from_string:Nn\c_stex_pwd_seq\l_stex_kpsewhich_return_str
382 \stex_path_to_string:NN\c_stex_pwd_seq\c_stex_pwd_str
383 \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

```

384 <@@=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

```

385 \seq_gclear_new:N\g__stex_files_stack

```

(End definition for `\g__stex_files_stack`.)

`\c_stex_mainfile_seq`
`\c_stex_mainfile_str`

```

386 \str_set:Nx \c_stex_mainfile_str {\c_stex_pwd_str/\jobname.tex}
387 \stex_path_from_string:Nn \c_stex_mainfile_seq
388   \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`

```

389 \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`

```

390 \cs_new_protected:Nn \stex_filestack_push:n {
391   \stex_path_from_string:Nn\g_stex_currentfile_seq{#1}
392   \stex_path_if_absolute:NF\g_stex_currentfile_seq{
393     \stex_path_from_string:Nn\g_stex_currentfile_seq{
394       \c_stex_pwd_str/#1
395     }
396   }
397   \seq_gset_eq:NN\g_stex_currentfile_seq\g_stex_currentfile_seq
398   \exp_args:NNo\seq_gpush:Nn\g__stex_files_stack\g_stex_currentfile_seq
399 }

```



```

441 }
442 \stex_path_to_string:NN\c_stex_mathhub_seq\c_stex_mathhub_str
443 \stex_debug:nn{mathhub} {MathHub:~\str_use:N\c_stex_mathhub_str}
444 }

```

(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

```

445 \cs_new_protected:Nn \_stex_mathhub_do_manifest:n {
446   \prop_if_exist:cF {c_stex_mathhub_#1_manifest_prop} {
447     \str_set:Nx \l_tmpa_str { #1 }
448     \prop_new:c { c_stex_mathhub_#1_manifest_prop }
449     \seq_set_split:NnV \l_tmpa_seq / \l_tmpa_str
450     \seq_concat:NNN \l_tmpa_seq \c_stex_mathhub_seq \l_tmpa_seq
451     \_stex_mathhub_find_manifest:N \l_tmpa_seq
452     \seq_if_empty:NTF \l__stex_mathhub_manifest_file_seq {
453       \msg_error:nnxx{stex}{error/norepository}{#1}{
454         \stex_path_to_string:N \c_stex_mathhub_str
455       }
456     } {
457       \exp_args:No \_stex_mathhub_parse_manifest:n { \l_tmpa_str }
458     }
459   }
460 }

```

(End definition for `_stex_mathhub_do_manifest:n`.)

`\l__stex_mathhub_manifest_file_seq`

```

461 \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`:

```

462 \cs_new_protected:Nn \_stex_mathhub_find_manifest:N {
463   \seq_set_eq:NN\l_tmpa_seq #1
464   \bool_set_true:N\l_tmpa_bool
465   \bool_while_do:Nn \l_tmpa_bool {
466     \seq_if_empty:NTF \l_tmpa_seq {
467       \bool_set_false:N\l_tmpa_bool
468     }{
469       \file_if_exist:nTF{
470         \stex_path_to_string:N\l_tmpa_seq/MANIFEST.MF
471       }{
472         \seq_put_right:Nn\l_tmpa_seq{MANIFEST.MF}
473         \bool_set_false:N\l_tmpa_bool
474       }{
475         \file_if_exist:nTF{
476           \stex_path_to_string:N\l_tmpa_seq/META-INF/MANIFEST.MF
477         }{
478           \seq_put_right:Nn\l_tmpa_seq{META-INF}
479           \seq_put_right:Nn\l_tmpa_seq{MANIFEST.MF}

```

```

480         \bool_set_false:N\l_tmpa_bool
481     }{
482         \file_if_exist:nTF{
483             \stex_path_to_string:N\l_tmpa_seq/meta-inf/MANIFEST.MF
484         }{
485             \seq_put_right:Nn\l_tmpa_seq{meta-inf}
486             \seq_put_right:Nn\l_tmpa_seq{MANIFEST.MF}
487             \bool_set_false:N\l_tmpa_bool
488         }{
489             \seq_pop_right:NN\l_tmpa_seq\l_tmpa_tl
490         }
491     }
492 }
493 }
494 }
495 \seq_set_eq:NN\l__stex_mathhub_manifest_file_seq\l_tmpa_seq
496 }

```

(End definition for __stex_mathhub_find_manifest:N.)

\c__stex_mathhub_manifest_ior File variable used for MANIFEST-files

```

497 \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:

```

498 \cs_new_protected:Nn \__stex_mathhub_parse_manifest:n {
499     \seq_set_eq:NN \l_tmpa_seq \l__stex_mathhub_manifest_file_seq
500     \ior_open:Nn \c__stex_mathhub_manifest_ior {\stex_path_to_string:N \l_tmpa_seq}
501     \ior_map_inline:Nn \c__stex_mathhub_manifest_ior {
502         \str_set:Nn \l_tmpa_str {##1}
503         \exp_args:NNoo \seq_set_split:Nnn
504             \l_tmpb_seq \c_colon_str \l_tmpa_str
505         \seq_pop_left:NNTF \l_tmpb_seq \l_tmpa_tl {
506             \exp_args:NNe \str_set:Nn \l_tmpb_tl {
507                 \exp_args:NNo \seq_use:Nn \l_tmpb_seq \c_colon_str
508             }
509             \exp_args:No \str_case:nnTF \l_tmpa_tl {
510                 {id} {
511                     \prop_gput:cno { c_stex_mathhub_#1_manifest_prop }
512                     { id } \l_tmpb_tl
513                 }
514                 {narration-base} {
515                     \prop_gput:cno { c_stex_mathhub_#1_manifest_prop }
516                     { narr } \l_tmpb_tl
517                 }
518                 {url-base} {
519                     \prop_gput:cno { c_stex_mathhub_#1_manifest_prop }
520                     { docurl } \l_tmpb_tl
521                 }
522                 {source-base} {
523                     \prop_gput:cno { c_stex_mathhub_#1_manifest_prop }
524                     { ns } \l_tmpb_tl
525                 }

```

```

526     {ns} {
527         \prop_gput:cno { c_stex_mathhub_#1_manifest_prop }
528         { ns } \l_tmpb_tl
529     }
530     {dependencies} {
531         \prop_gput:cno { c_stex_mathhub_#1_manifest_prop }
532         { deps } \l_tmpb_tl
533     }
534     }{}{}
535 }{}
536 }
537 \ior_close:N \c__stex_mathhub_manifest_ior
538 }

```

(End definition for `_stex_mathhub_parse_manifest:n`.)

`\stex_set_current_repository:n`

```

539 \cs_new_protected:Nn \stex_set_current_repository:n {
540     \stex_require_repository:n { #1 }
541     \prop_set_eq:Nc \l_stex_current_repository_prop {
542         c_stex_mathhub_#1_manifest_prop
543     }
544 }

```

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

`\stex_require_repository:n`

```

545 \cs_new_protected:Nn \stex_require_repository:n {
546     \prop_if_exist:cF { c_stex_mathhub_#1_manifest_prop } {
547         \stex_debug:nn{mathhub}{Opening~archive:~#1}
548         \_stex_mathhub_do_manifest:n { #1 }
549     }
550 }

```

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

`\l_stex_current_repository_prop`

Current MathHub repository

```

551 %\prop_new:N \l_stex_current_repository_prop
552
553 \_stex_mathhub_find_manifest:N \c_stex_pwd_seq
554 \seq_if_empty:NTF \l__stex_mathhub_manifest_file_seq {
555     \stex_debug:nn{mathhub}{Not~currently~in~a~MathHub~repository}
556 } {
557     \_stex_mathhub_parse_manifest:n { main }
558     \prop_get:Nn \c_stex_mathhub_main_manifest_prop {id}
559     \l_tmpa_str
560     \prop_set_eq:cN { c_stex_mathhub\_l_tmpa_str_manifest_prop }
561     \c_stex_mathhub_main_manifest_prop
562     \exp_args:Nx \stex_set_current_repository:n { \l_tmpa_str }
563     \stex_debug:nn{mathhub}{Current~repository:~
564         \prop_item:Nn \l_stex_current_repository_prop {id}
565     }
566 }

```

(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.

```

567 \cs_new_protected:Nn \stex_in_repository:nn {
568   \str_set:Nx \l_tmpa_str { #1 }
569   \cs_set:Npn \l_tmpa_cs ##1 { #2 }
570   \str_if_empty:NTF \l_tmpa_str {
571     \prop_if_exist:NTF \l_stex_current_repository_prop {
572       \stex_debug:nn{mathhub}{do~in~current~repository:~\prop_item:Nn \l_stex_current_reposi
573       \exp_args:Ne \l_tmpa_cs{
574         \prop_item:Nn \l_stex_current_repository_prop { id }
575     }
576   }{
577     \l_tmpa_cs{}
578   }
579 }{
580   \stex_debug:nn{mathhub}{in~repository:~\l_tmpa_str}
581   \stex_require_repository:n \l_tmpa_str
582   \str_set:Nx \l_tmpa_str { #1 }
583   \exp_args:Nne \use:nn {
584     \stex_set_current_repository:n \l_tmpa_str
585     \exp_args:Nx \l_tmpa_cs{\l_tmpa_str}
586   }{
587     \stex_debug:nn{mathhub}{switching~back~to:~
588     \prop_if_exist:NTF \l_stex_current_repository_prop {
589       \prop_item:Nn \l_stex_current_repository_prop { id }::~
590     \meaning\l_stex_current_repository_prop
591   }{
592     no~repository
593   }
594 }
595 \prop_if_exist:NTF \l_stex_current_repository_prop {
596   \stex_set_current_repository:n {
597     \prop_item:Nn \l_stex_current_repository_prop { id }
598   }
599 }{
600   \let\exp_not:N\l_stex_current_repository_prop\exp_not:N\undefined
601 }
602 }
603 }
604 }

```

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

25.5 Using Content in Archives

`\mhpath`

```

605 \def \mhpath #1 #2 {
606   \exp_args:Ne \tl_if_empty:nTF{#1}{
607     \c_stex_mathhub_str /
608     \prop_item:Nn \l_stex_current_repository_prop { id }
609     / source / #2
610 }{
611   \c_stex_mathhub_str / #1 / source / #2

```

```

612 }
613 }

```

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

`\inputref`
`\mhinput`

```

614 \newif \ifinputref \inputreffalse
615
616 \cs_new_protected:Nn \__stex_mathhub_mhinput:nn {
617   \stex_in_repository:nn {#1} {
618     \ifinputref
619       \input{ \c_stex_mathhub_str / ##1 / source / #2 }
620     \else
621       \inputreftrue
622       \input{ \c_stex_mathhub_str / ##1 / source / #2 }
623     \inputreffalse
624   \fi
625 }
626 }
627 \NewDocumentCommand \mhinput { 0{} m}{
628   \stex_mhinput:nn{ #1 }{ #2 }
629 }
630
631 \cs_new_protected:Nn \__stex_mathhub_inputref:nn {
632   \stex_in_repository:nn {#1} {
633     \bool_lazy_any:nTF {
634       {\rustex_if_p:}
635       {\latexml_if_p:}
636     } {
637       \str_clear:N \l_tmpa_str
638       \prop_get:NnNF \l_stex_current_repository_prop { narr } \l_tmpa_str {
639         \prop_get:NnNF \l_stex_current_repository_prop { ns } \l_tmpa_str {}
640       }
641       \stex_annotate_invisible:nnn{inputref}{
642         \l_tmpa_str / #2
643       }{}
644     }{
645       \begingroup
646         \inputreftrue
647         \input{ \c_stex_mathhub_str / ##1 / source / #2 }
648       \endgroup
649     }
650   }
651 }
652 \NewDocumentCommand \inputref { 0{} m}{
653   \__stex_mathhub_inputref:nn{ #1 }{ #2 }
654 }

```

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

`\addmhbibresource`

```

655 \cs_new_protected:Nn \__stex_mathhub_mhbibresource:nn {
656   \stex_in_repository:nn {#1} {
657     \addbibresource{ \c_stex_mathhub_str / ##1 / #2 }
658   }

```

```

659 }
660 \newcommand\addmhbibresource[2][]{
661   \_stex_mathhub_mhbibresource:nn{ #1 }{ #2 }
662 }

```

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

\libinput

```

663 \cs_new_protected:Npn \libinput #1 {
664   \prop_if_exist:NF \l_stex_current_repository_prop {
665     \msg_error:nnn{stex}{error/notinarchive}\libinput
666   }
667   \prop_get:NnNF \l_stex_current_repository_prop {id} \l_tmpa_str {
668     \msg_error:nnn{stex}{error/notinarchive}\libinput
669   }
670   \seq_clear:N \l__stex_mathhub_libinput_files_seq
671   \seq_set_eq:NN \l_tmpa_seq \c_stex_mathhub_seq
672   \seq_set_split:NnV \l_tmpb_seq / \l_tmpa_str
673
674   \bool_while_do:nn { ! \seq_if_empty_p:N \l_tmpb_seq }{
675     \str_set:Nx \l_tmpa_str {\stex_path_to_string:N \l_tmpa_seq / meta-inf / lib / #1.tex}
676     \IfFileExists{ \l_tmpa_str }{
677       \seq_put_right:No \l__stex_mathhub_libinput_files_seq \l_tmpa_str
678     }{}
679     \seq_pop_left:NN \l_tmpb_seq \l_tmpa_str
680     \seq_put_right:No \l_tmpa_seq \l_tmpa_str
681   }
682
683   \str_set:Nx \l_tmpa_str {\stex_path_to_string:N \l_tmpa_seq / lib / #1.tex}
684   \IfFileExists{ \l_tmpa_str }{
685     \seq_put_right:No \l__stex_mathhub_libinput_files_seq \l_tmpa_str
686   }{}
687
688   \seq_if_empty:NTF \l__stex_mathhub_libinput_files_seq {
689     \msg_error:nxxx{stex}{error/nofile}{\exp_not:N\libinput}{#1.tex}
690   }{
691     \seq_map_inline:Nn \l__stex_mathhub_libinput_files_seq {
692       \input{ ##1 }
693     }
694   }
695 }

```

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

\libusepackage

```

696 \NewDocumentCommand \libusepackage {0{} m} {
697   \prop_if_exist:NF \l_stex_current_repository_prop {
698     \msg_error:nnn{stex}{error/notinarchive}\libusepackage
699   }
700   \prop_get:NnNF \l_stex_current_repository_prop {id} \l_tmpa_str {
701     \msg_error:nnn{stex}{error/notinarchive}\libusepackage
702   }
703   \seq_clear:N \l__stex_mathhub_libinput_files_seq
704   \seq_set_eq:NN \l_tmpa_seq \c_stex_mathhub_seq
705   \seq_set_split:NnV \l_tmpb_seq / \l_tmpa_str

```

```

706
707 \bool_while_do:nn { ! \seq_if_empty_p:N \l_tmpb_seq }{
708   \str_set:Nx \l_tmpa_str {\stex_path_to_string:N \l_tmpa_seq / meta-inf / lib / #2}
709   \IfFileExists{ \l_tmpa_str.sty }{
710     \seq_put_right:No \l__stex_mathhub_libinput_files_seq \l_tmpa_str
711   }{}
712   \seq_pop_left:NN \l_tmpb_seq \l_tmpa_str
713   \seq_put_right:No \l_tmpa_seq \l_tmpa_str
714 }
715
716 \str_set:Nx \l_tmpa_str {\stex_path_to_string:N \l_tmpa_seq / lib / #2}
717 \IfFileExists{ \l_tmpa_str.sty }{
718   \seq_put_right:No \l__stex_mathhub_libinput_files_seq \l_tmpa_str
719 }{}
720
721 \seq_if_empty:NTF \l__stex_mathhub_libinput_files_seq {
722   \msg_error:nnxx{stex}{error/nofile}{\exp_not:N\libusepackage}{#2.sty}
723 }{
724   \int_compare:nNnTF {\seq_count:N \l__stex_mathhub_libinput_files_seq} = 1 {
725     \seq_map_inline:Nn \l__stex_mathhub_libinput_files_seq {
726       \usepackage[#1]{ #1 }
727     }
728   }{
729     \msg_error:nnxx{stex}{error/twofiles}{\exp_not:N\libusepackage}{#2.sty}
730   }
731 }
732 }

```

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

`\mhgraphics`
`\cmhgraphics`

```

733
734 \AddToHook{begindocument}{
735   \ltx@ifpackageloaded{graphicx}{
736     \define@key{Gin}{mhrepos}{\def\Gin@mhrepos{#1}}
737     \newcommand\mhgraphics[2][]{%
738       \def\Gin@mhrepos{}\setkeys{Gin}{#1}%
739       \includegraphics[#1]{\mhp\Gin@mhrepos{#2}}}
740     \newcommand\cmhgraphics[2][]{\begin{center}\mhgraphics[#1]{#2}\end{center}}
741   }{}

```

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

`\lstinputmhlisting`
`\clstinputmhlisting`

```

742 \ltx@ifpackageloaded{listings}{
743   \define@key{lst}{mhrepos}{\def\lst@mhrepos{#1}}
744   \newcommand\lstinputmhlisting[2][]{%
745     \def\lst@mhrepos{}\setkeys{lst}{#1}%
746     \lstinputlisting[#1]{\mhp\lst@mhrepos{#2}}}
747   \newcommand\clstinputmhlisting[2][]{\begin{center}\lstinputmhlisting[#1]{#2}\end{center}}
748 }{}
749 }
750
751 </package>

```


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

Chapter 26

STEX -References Implementation

```
752 <*package>
753
754 %%%%%%%%%% references.dtx %%%%%%%%%%
755
756 <@@=stex_refs>
    Warnings and error messages
757
```

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

```
758 %\iow_new:N \c__stex_refs_refs_iow
759 \AddToHook{begindocument}{
760 % \iow_open:Nn \c__stex_refs_refs_iow {\jobname.sref}
761 }
762 \AddToHook{enddocument}{
763 % \iow_close:N \c__stex_refs_refs_iow
764 }
```

`\STEXreftitle`

```
765 \str_set:Nn \g__stex_refs_title_tl {Unnamed~Document}
766
767 \NewDocumentCommand \STEXreftitle { m } {
768 \tl_gset:Nx \g__stex_refs_title_tl { #1 }
769 }
```

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

26.1 Document URIs and URLs

`\l_stex_current_docns_str`

```
770 \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:`

```
771 \cs_new_protected:Nn \stex_get_document_uri: {  
772   \seq_set_eq:NN \l_tmpa_seq \g_stex_currentfile_seq  
773   \seq_pop_right:NN \l_tmpa_seq \l_tmpb_str  
774   \exp_args:NNno \seq_set_split:Nnn \l_tmpb_seq . \l_tmpb_str  
775   \seq_get_left:NN \l_tmpb_seq \l_tmpb_str  
776   \seq_put_right:No \l_tmpa_seq \l_tmpb_str  
777  
778   \str_clear:N \l_tmpa_str  
779   \prop_if_exist:NT \l_stex_current_repository_prop {  
780     \prop_get:NnNF \l_stex_current_repository_prop { narr } \l_tmpa_str {  
781       \prop_get:NnNF \l_stex_current_repository_prop { ns } \l_tmpa_str {}  
782     }  
783   }  
784  
785   \str_if_empty:NTF \l_tmpa_str {  
786     \str_set:Nx \l_stex_current_docns_str {  
787       file:/\stex_path_to_string:N \l_tmpa_seq  
788     }  
789   }{  
790     \bool_set_true:N \l_tmpa_bool  
791     \bool_while_do:Nn \l_tmpa_bool {  
792       \seq_pop_left:NN \l_tmpa_seq \l_tmpb_str  
793       \exp_args:No \str_case:nnTF { \l_tmpb_str } {  
794         {source} { \bool_set_false:N \l_tmpa_bool }  
795       }{}{  
796         \seq_if_empty:NT \l_tmpa_seq {  
797           \bool_set_false:N \l_tmpa_bool  
798         }  
799       }  
800     }  
801  
802     \seq_if_empty:NTF \l_tmpa_seq {  
803       \str_set_eq:NN \l_stex_current_docns_str \l_tmpa_str  
804     }{  
805       \str_set:Nx \l_stex_current_docns_str {  
806         \l_tmpa_str/\stex_path_to_string:N \l_tmpa_seq  
807       }  
808     }  
809   }  
810 }
```

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

`\l_stex_current_docurl_str`

```
811 \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:`

```
812 \cs_new_protected:Nn \stex_get_document_url: {  
813   \seq_set_eq:NN \l_tmpa_seq \g_stex_currentfile_seq  
814   \seq_pop_right:NN \l_tmpa_seq \l_tmpb_str  
815   \exp_args:NNno \seq_set_split:Nnn \l_tmpb_seq . \l_tmpb_str
```

```

816 \seq_get_left:NN \l_tmpb_seq \l_tmpb_str
817 \seq_put_right:No \l_tmpa_seq \l_tmpb_str
818
819 \str_clear:N \l_tmpa_str
820 \prop_if_exist:NT \l_stex_current_repository_prop {
821   \prop_get:NnNF \l_stex_current_repository_prop { docurl } \l_tmpa_str {
822     \prop_get:NnNF \l_stex_current_repository_prop { narr } \l_tmpa_str {
823       \prop_get:NnNF \l_stex_current_repository_prop { ns } \l_tmpa_str {}
824     }
825   }
826 }
827
828 \str_if_empty:NTF \l_tmpa_str {
829   \str_set:Nx \l_stex_current_docurl_str {
830     file:/\stex_path_to_string:N \l_tmpa_seq
831   }
832 }{
833   \bool_set_true:N \l_tmpa_bool
834   \bool_while_do:Nn \l_tmpa_bool {
835     \seq_pop_left:NN \l_tmpa_seq \l_tmpb_str
836     \exp_args:No \str_case:nnTF { \l_tmpb_str } {
837       {source} { \bool_set_false:N \l_tmpa_bool }
838     }{}{
839       \seq_if_empty:NT \l_tmpa_seq {
840         \bool_set_false:N \l_tmpa_bool
841       }
842     }
843   }
844
845   \seq_if_empty:NTF \l_tmpa_seq {
846     \str_set_eq:NN \l_stex_current_docurl_str \l_tmpa_str
847   }{
848     \str_set:Nx \l_stex_current_docurl_str {
849       \l_tmpa_str/\stex_path_to_string:N \l_tmpa_seq
850     }
851   }
852 }
853 }

```

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

26.2 Setting Reference Targets

```

854 \str_const:Nn \c__stex_refs_url_str{URL}
855 \str_const:Nn \c__stex_refs_ref_str{REF}
856 \str_new:N \l__stex_refs_curr_label_str
857 % @currentlabel -> number
858 % @currentlabelname -> title
859 % @currentHref -> name.number <- id of some kind
860 % \theH# -> \arabic{section}
861 % \the# -> number
862 % \hyper@makecurrent{#}
863 \int_new:N \l__stex_refs_unnamed_counter_int

```

`\stex_ref_new_doc_target:n`

```

864 \cs_new_protected:Nn \stex_ref_new_doc_target:n {
865   \stex_get_document_uri:
866   \str_clear:N \l__stex_refs_curr_label_str
867   \str_set:Nx \l_tmpa_str { #1 }
868   \str_if_empty:NT \l_tmpa_str {
869     \int_incr:N \l__stex_refs_unnamed_counter_int
870     \str_set:Nx \l_tmpa_str {REF\int_use:N \l__stex_refs_unnamed_counter_int}
871   }
872   \str_set:Nx \l__stex_refs_curr_label_str {
873     \l_stex_current_docns_str?\l_tmpa_str
874   }
875   \seq_if_exist:cF{g__stex_refs_labels_\l_tmpa_str_seq}{
876     \seq_new:c {g__stex_refs_labels_\l_tmpa_str_seq}
877   }
878   \seq_if_in:coF{g__stex_refs_labels_\l_tmpa_str_seq}\l__stex_refs_curr_label_str {
879     \seq_gput_right:co{g__stex_refs_labels_\l_tmpa_str_seq}\l__stex_refs_curr_label_str
880   }
881   \stex_if_smsmode:TF {
882     \stex_get_document_url:
883     \str_gset_eq:cN {sref_url_\l__stex_refs_curr_label_str_str}\l_stex_current_docurl_str
884     \str_gset_eq:cN {sref_\l__stex_refs_curr_label_str_type}\c__stex_refs_url_str
885   }{
886     %\iow_now:Nx \c__stex_refs_refs_iow { \l_tmpa_str~=\expandafter\unexpanded\expandafter{
887     \exp_args:Nx\label{sref_\l__stex_refs_curr_label_str}
888     \immediate\write\@auxout{\stexauxadddocref{\l_stex_current_docns_str}{\l_tmpa_str}}
889     \str_gset:cx {sref_\l__stex_refs_curr_label_str_type}\c__stex_refs_ref_str
890   }
891 }

```

(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.

```

892 \cs_new_protected:Npn \stexauxadddocref #1 #2 {
893   \str_set:Nn \l_tmpa_str {#1?#2}
894   \str_gset_eq:cN{sref_#1?#2_type}\c__stex_refs_ref_str
895   \seq_if_exist:cF{g__stex_refs_labels_#2_seq}{
896     \seq_new:c {g__stex_refs_labels_#2_seq}
897   }
898   \seq_if_in:coF{g__stex_refs_labels_#2_seq}\l_tmpa_str {
899     \seq_gput_right:co{g__stex_refs_labels_#2_seq}\l_tmpa_str
900   }
901 }

```

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

```

902 \AtEndDocument{
903   \def\stexauxadddocref#1 #2 {}{}
904 }

```

`\stex_ref_new_sym_target:n`

```

905 \cs_new_protected:Nn \stex_ref_new_sym_target:n {
906   \stex_if_smsmode:TF {
907     \str_if_exist:cF{sref_sym_#1_type}{
908       \stex_get_document_url:
909       \str_gset_eq:cN {sref_sym_url_#1_str}\l_stex_current_docurl_str

```

```

910     \str_gset_eq:cN {sref_sym_#1_type}\c__stex_refs_url_str
911   }
912 }{
913   \str_if_empty:NF \l__stex_refs_curr_label_str {
914     \str_gset_eq:cN {sref_sym_#1_label_str}\l__stex_refs_curr_label_str
915     \immediate\write\@auxout{
916       \exp_not:N\expandafter\def\exp_not:N\csname \exp_not:N\detokenize{sref_sym_#1_label_
917         \l__stex_refs_curr_label_str
918       }
919     }
920   }
921 }
922 }

```

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

26.3 Using References

```

923 \str_new:N \l__stex_refs_indocument_str

```

\sref Optional arguments:

```

924
925 \keys_define:nn { stex / sref } {
926   linktext      .tl_set:N = \l__stex_refs_linktext_tl ,
927   fallback      .tl_set:N = \l__stex_refs_fallback_tl ,
928   pre           .tl_set:N = \l__stex_refs_pre_tl ,
929   post          .tl_set:N = \l__stex_refs_post_tl ,
930 }
931 \cs_new_protected:Nn \__stex_refs_args:n {
932   \tl_clear:N \l__stex_refs_linktext_tl
933   \tl_clear:N \l__stex_refs_fallback_tl
934   \tl_clear:N \l__stex_refs_pre_tl
935   \tl_clear:N \l__stex_refs_post_tl
936   \str_clear:N \l__stex_refs_repo_str
937   \keys_set:nn { stex / sref } { #1 }
938 }

```

The actual macro:

```

939 \NewDocumentCommand \sref { 0{} m}{
940   \__stex_refs_args:n { #1 }
941   \str_if_empty:NTF \l__stex_refs_indocument_str {
942     \str_set:Nx \l_tmpa_str { #2 }
943     \exp_args:NNno \seq_set_split:Nnn \l_tmpa_seq ? \l_tmpa_str
944     \int_compare:nNnTF {\seq_count:N \l_tmpa_seq} = 1 {
945       \seq_if_exist:cTF{g__stex_refs_labels_\l_tmpa_str _seq}{
946         \seq_get_left:cNF {g__stex_refs_labels_\l_tmpa_str _seq} \l_tmpa_str {
947           \str_clear:N \l_tmpa_str
948         }
949       }{
950         \str_clear:N \l_tmpa_str
951       }
952     }{
953       \seq_pop_left:NN \l_tmpa_seq \l_tmpb_str
954       \seq_pop_right:NN \l_tmpa_seq \l_tmpa_str

```

```

955 \int_set:Nn \l_tmpa_int { \exp_args:Ne \str_count:n {\l_tmpb_str?\l_tmpa_str} }
956 \seq_if_exist:cTF{g__stex_refs_labels_\l_tmpa_str_seq}{
957   \str_set_eq:NN \l_tmpc_str \l_tmpa_str
958   \str_clear:N \l_tmpa_str
959   \seq_map_inline:cn {g__stex_refs_labels_\l_tmpc_str_seq} {
960     \str_if_eq:eeT { \l_tmpb_str?\l_tmpc_str }{
961       \str_range:nnn { ##1 }{ -\l_tmpa_int}{ -1 }
962     }{
963       \seq_map_break:n {
964         \str_set:Nn \l_tmpa_str { ##1 }
965       }
966     }
967   }
968 }{
969   \str_clear:N \l_tmpa_str
970 }
971 }
972 \str_if_empty:NTF \l_tmpa_str {
973   \tl_if_empty:NTF \l__stex_refs_linktext_tl \l__stex_refs_fallback_tl \l__stex_refs_lin
974 }{
975   \str_if_eq:cNTF {sref_\l_tmpa_str_type} \c__stex_refs_ref_str {
976     \tl_if_empty:NTF \l__stex_refs_linktext_tl {
977       \cs_if_exist:cTF{autoref}{
978         \l__stex_refs_pre_tl\exp_args:Nx\autoref{sref_\l_tmpa_str}\l__stex_refs_post_tl
979       }{
980         \l__stex_refs_pre_tl\exp_args:Nx\ref{sref_\l_tmpa_str}\l__stex_refs_post_tl
981       }
982     }{
983       \ltx@ifpackageloaded{hyperref}{
984         \hyperref[sref_\l_tmpa_str]\l__stex_refs_linktext_tl
985       }{
986         \l__stex_refs_linktext_tl
987       }
988     }
989   }{
990     \ltx@ifpackageloaded{hyperref}{
991       \href{\use:c{sref_url_\l_tmpa_str_str}}{\tl_if_empty:NTF \l__stex_refs_linktext_t
992     }{
993       \tl_if_empty:NTF \l__stex_refs_linktext_tl \l__stex_refs_fallback_tl \l__stex_refs
994     }
995   }
996 }
997 }{
998   % TODO
999 }
1000 }

```

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

\srefsym

```

1001 \NewDocumentCommand \srefsym { 0{} m}{
1002   \stex_get_symbol:n { #2 }
1003   \__stex_refs_sym_aux:nn{##1}{\l_stex_get_symbol_uri_str}
1004 }

```

```

1005
1006 \cs_new_protected:Nn \__stex_refs_sym_aux:nn {
1007   \str_if_exist:cTF {sref_sym_#2 _label_str }{
1008     \sref[#1]{\use:c{sref_sym_#2 _label_str}}
1009   }{
1010     \__stex_refs_args:n { #1 }
1011     \str_if_empty:NTF \l__stex_refs_indocument_str {
1012       \tl_if_exist:cTF{sref_sym_#2 _type}{
1013         % doc uri in \l_tmpb_str
1014         \str_set:Nx \l_tmpa_str {\use:c{sref_sym_#2 _type}}
1015         \str_if_eq:NNTF \l_tmpa_str \c__stex_refs_ref_str {
1016           % reference
1017           \tl_if_empty:NTF \l__stex_refs_linktext_tl {
1018             \cs_if_exist:cTF{autoref}{
1019               \l__stex_refs_pre_tl\autoref{sref_sym_#2}\l__stex_refs_post_tl
1020             }{
1021               \l__stex_refs_pre_tl\ref{sref_sym_#2}\l__stex_refs_post_tl
1022             }
1023           }{
1024             \ltx@ifpackageloaded{hyperref}{
1025               \hyperref[sref_sym_#2]\l__stex_refs_linktext_tl
1026             }{
1027               \l__stex_refs_linktext_tl
1028             }
1029           }
1030         }{
1031           % URL
1032           \ltx@ifpackageloaded{hyperref}{
1033             \href{\use:c{sref_sym_url_#2 _str}}{\tl_if_empty:NTF \l__stex_refs_linktext_tl \
1034           }{
1035             \tl_if_empty:NTF \l__stex_refs_linktext_tl \l__stex_refs_fallback_tl \l__stex_re
1036           }
1037         }
1038       }{
1039         \tl_if_empty:NTF \l__stex_refs_linktext_tl \l__stex_refs_fallback_tl \l__stex_refs_l
1040       }
1041     }{
1042       % TODO
1043     }
1044   }
1045 }

```

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

\srefsymuri

```

1046 \cs_new_protected:Npn \srefsymuri #1 #2 {
1047   \__stex_refs_sym_aux:nn{linktext={#2}}{#1}
1048 }

```

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

```

1049 </package>

```


Chapter 27

STEX -Modules Implementation

```
1050 <*package>
1051
1052 %%%%%%%%%%% modules.dtx %%%%%%%%%%%
1053
1054 <@@=stex_modules>
1055
1056   Warnings and error messages
1057   \msg_new:nnn{stex}{error/unknownmodule}{
1058     No~module~#1~found
1059   }
1060   \msg_new:nnn{stex}{error/syntax}{
1061     Syntax~error:~#1
1062   }
1063   \msg_new:nnn{stex}{error/siglanguage}{
1064     Module~#1~declares~signature~#2,~but~does~not~
1065     declare~its~language
1066   }
1067   \msg_new:nnn{stex}{warning/deprecated}{
1068     #1~is~deprecated;~please~use~#2~instead!
1069   }
1070   \msg_new:nnn{stex}{error/conflictingmodules}{
1071     Conflicting~imports~for~module~#1
1072   }
1073
1074 \l_stex_current_module_str The current module:
1075 \str_new:N \l_stex_current_module_str
1076
1077 (End definition for \l_stex_current_module_str. This variable is documented on page 54.)
1078
1079 \l_stex_all_modules_seq Stores all available modules
1080 \seq_new:N \l_stex_all_modules_seq
1081
1082 (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
1074 \prg_new_conditional:Nnn \stex_if_in_module: {p, T, F, TF} {
1075   \str_if_empty:NTF \l_stex_current_module_str
1076   \prg_return_false: \prg_return_true:
1077 }

```

(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
1078 \prg_new_conditional:Nnn \stex_if_module_exists:n {p, T, F, TF} {
1079   \prop_if_exist:cTF { c_stex_module_#1_prop }
1080   \prg_return_true: \prg_return_false:
1081 }

```

(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
1082 \cs_new_protected:Nn \stex_add_to_current_module:n {
1083   \tl_gput_right:cn {c_stex_module_\l_stex_current_module_str _code} { #1 }
1084 }
1085 \cs_new_protected:Npn \STEXexport {
1086   \begingroup
1087   \newlinechar=-1\relax
1088   \endlinechar=-1\relax
1089   %\catcode'\ = 9\relax
1090   \expandafter\endgroup\__stex_modules_export:n
1091 }
1092 \cs_new_protected:Nn \__stex_modules_export:n {
1093   \ignorespaces #1
1094   \stex_add_to_current_module:n { \ignorespaces #1 }
1095   \stex_smsmode_do:
1096 }
1097 \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
1098 \cs_new_protected:Nn \stex_add_constant_to_current_module:n {
1099   \str_set:Nx \l_tmpa_str { #1 }
1100   \seq_gput_right:co {c_stex_module_\l_stex_current_module_str _constants} { \l_tmpa_str }
1101 }

```

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

```

\stex_add_import_to_current_module:n
1102 \cs_new_protected:Nn \stex_add_import_to_current_module:n {
1103   \str_set:Nx \l_tmpa_str { #1 }
1104   \exp_args:Nno
1105   \seq_if_in:cnF{c_stex_module_\l_stex_current_module_str _imports}\l_tmpa_str{
1106     \seq_gput_right:co{c_stex_module_\l_stex_current_module_str _imports}\l_tmpa_str
1107   }
1108 }

```

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

`\stex_collect_imports:n`

```

1109 \cs_new_protected:Nn \stex_collect_imports:n {
1110   \seq_clear:N \l_stex_collect_imports_seq
1111   \__stex_modules_collect_imports:n {#1}
1112 }
1113 \cs_new_protected:Nn \__stex_modules_collect_imports:n {
1114   \seq_map_inline:cn {c_stex_module_#1_imports} {
1115     \seq_if_in:NnF \l_stex_collect_imports_seq { ##1 } {
1116       \__stex_modules_collect_imports:n { ##1 }
1117     }
1118   }
1119   \seq_if_in:NnF \l_stex_collect_imports_seq { #1 } {
1120     \seq_put_right:Nx \l_stex_collect_imports_seq { #1 }
1121   }
1122 }

```

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

`\stex_do_up_to_module:n`

```

1123 \int_new:N \l__stex_modules_group_depth_int
1124 \tl_new:N \l__stex_modules_aftergroup_tl
1125 \cs_new_protected:Nn \stex_do_up_to_module:n {
1126   \int_compare:nNnTF \l__stex_modules_group_depth_int = \currentgrouplevel {
1127     #1
1128   }{
1129     #1
1130     \expandafter \tl_gset:Nn \expandafter \l__stex_modules_aftergroup_tl \expandafter { \l__
1131       \aftergroup\__stex_modules_aftergroup_do:
1132     }
1133   }
1134   \cs_new_protected:Nn \__stex_modules_aftergroup_do: {
1135     \int_compare:nNnTF \l__stex_modules_group_depth_int = \currentgrouplevel {
1136       \l__stex_modules_aftergroup_tl
1137       \tl_clear:N \l__stex_modules_aftergroup_tl
1138     }{
1139       \l__stex_modules_aftergroup_tl
1140       \aftergroup\__stex_modules_aftergroup_do:
1141     }
1142   }

```

(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).

1143

(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.

```

1144 \str_new:N \l_stex_modules_ns_str
1145 \str_new:N \l_stex_modules_subpath_str

```

```

1146 \cs_new_protected:Nn \__stex_modules_compute_namespace:nN {
1147   \str_set:Nx \l_tmpa_str { #1 }
1148   \seq_set_eq:NN \l_tmpa_seq #2
1149   % split off file extension
1150   \seq_pop_right:NN \l_tmpa_seq \l_tmpb_str
1151   \exp_args:NNno \seq_set_split:Nnn \l_tmpb_seq . \l_tmpb_str
1152   \seq_get_left:NN \l_tmpb_seq \l_tmpb_str
1153   \seq_put_right:No \l_tmpa_seq \l_tmpb_str
1154
1155   \bool_set_true:N \l_tmpa_bool
1156   \bool_while_do:Nn \l_tmpa_bool {
1157     \seq_pop_left:NN \l_tmpa_seq \l_tmpb_str
1158     \exp_args:No \str_case:nnTF { \l_tmpb_str } {
1159       {source} { \bool_set_false:N \l_tmpa_bool }
1160     }{}{
1161       \seq_if_empty:NT \l_tmpa_seq {
1162         \bool_set_false:N \l_tmpa_bool
1163       }
1164     }
1165   }
1166
1167   \stex_path_to_string:NN \l_tmpa_seq \l_stex_modules_subpath_str
1168   \str_if_empty:NTF \l_stex_modules_subpath_str {
1169     \str_set_eq:NN \l_stex_modules_ns_str \l_tmpa_str
1170   }{
1171     \str_set:Nx \l_stex_modules_ns_str {
1172       \l_tmpa_str/\l_stex_modules_subpath_str
1173     }
1174   }
1175 }
1176
1177 \cs_new_protected:Nn \stex_modules_current_namespace: {
1178   \str_clear:N \l_stex_modules_subpath_str
1179   \prop_if_exist:NTF \l_stex_current_repository_prop {
1180     \prop_get:NnN \l_stex_current_repository_prop { ns } \l_tmpa_str
1181     \__stex_modules_compute_namespace:nN \l_tmpa_str \g_stex_currentfile_seq
1182   }{
1183     % split off file extension
1184     \seq_set_eq:NN \l_tmpa_seq \g_stex_currentfile_seq
1185     \seq_pop_right:NN \l_tmpa_seq \l_tmpb_str
1186     \exp_args:NNno \seq_set_split:Nnn \l_tmpb_seq . \l_tmpb_str
1187     \seq_get_left:NN \l_tmpb_seq \l_tmpb_str
1188     \seq_put_right:No \l_tmpa_seq \l_tmpb_str
1189     \str_set:Nx \l_stex_modules_ns_str {
1190       file:/\stex_path_to_string:N \l_tmpa_seq
1191     }
1192   }
1193 }

```

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

27.1 The smodule environment

smodule arguments:

```

1194 \keys_define:nn { stex / module } {
1195   title      .tl_set:N      = \smodulename ,
1196   type       .str_set_x:N    = \smodulename ,
1197   id         .str_set_x:N    = \smoduleid ,
1198   deprecate  .str_set_x:N    = \l_stex_module_deprecate_str ,
1199   ns         .str_set_x:N    = \l_stex_module_ns_str ,
1200   lang       .str_set_x:N    = \l_stex_module_lang_str ,
1201   sig        .str_set_x:N    = \l_stex_module_sig_str ,
1202   creators   .str_set_x:N    = \l_stex_module_creators_str ,
1203   contributors .str_set_x:N  = \l_stex_module_contributors_str ,
1204   meta       .str_set_x:N    = \l_stex_module_meta_str ,
1205   srccite    .str_set_x:N    = \l_stex_module_srccite_str
1206 }
1207
1208 \cs_new_protected:Nn \__stex_modules_args:n {
1209   \str_clear:N \smodulename
1210   \str_clear:N \smodulename
1211   \str_clear:N \smoduleid
1212   \str_clear:N \l_stex_module_ns_str
1213   \str_clear:N \l_stex_module_deprecate_str
1214   \str_clear:N \l_stex_module_lang_str
1215   \str_clear:N \l_stex_module_sig_str
1216   \str_clear:N \l_stex_module_creators_str
1217   \str_clear:N \l_stex_module_contributors_str
1218   \str_clear:N \l_stex_module_meta_str
1219   \str_clear:N \l_stex_module_srccite_str
1220   \keys_set:nn { stex / module } { #1 }
1221 }
1222
1223 % module parameters here? In the body?
1224
```

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

```

1225 \cs_new_protected:Nn \stex_module_setup:nn {
1226   \int_set:Nn \l__stex_modules_group_depth_int {\currentgrouplevel}
1227   \str_set:Nx \l_stex_module_name_str { #2 }
1228   \__stex_modules_args:n { #1 }

```

First, we set up the name and namespace of the module.

Are we in a nested module?

```

1229 \stex_if_in_module:TF {
1230   % Nested module
1231   \prop_get:cnN {c_stex_module\l_stex_current_module_str _prop}
1232     { ns } \l_stex_module_ns_str
1233   \str_set:Nx \l_stex_module_name_str {
1234     \prop_item:cn {c_stex_module\l_stex_current_module_str _prop}
1235       { name } / \l_stex_module_name_str
1236   }
1237 }{
1238   % not nested:
1239   \str_if_empty:NT \l_stex_module_ns_str {

```

```

1240 \stex_modules_current_namespace:
1241 \str_set_eq:NN \l_stex_module_ns_str \l_stex_modules_ns_str
1242 \exp_args:NNNo \seq_set_split:Nnn \l_tmpa_seq
1243 / {\l_stex_module_ns_str}
1244 \seq_pop_right:NN \l_tmpa_seq \l_tmpa_str
1245 \str_if_eq:NNT \l_tmpa_str \l_stex_module_name_str {
1246 \str_set:Nx \l_stex_module_ns_str {
1247 \stex_path_to_string:N \l_tmpa_seq
1248 }
1249 }
1250 }
1251 }

```

Next, we determine the language of the module:

```

1252 \str_if_empty:NT \l_stex_module_lang_str {
1253 \seq_get_right:NN \g_stex_currentfile_seq \l_tmpa_str
1254 \seq_set_split:NnV \l_tmpa_seq . \l_tmpa_str
1255 \seq_pop_right:NN \l_tmpa_seq \l_tmpa_str % .tex
1256 \seq_pop_left:NN \l_tmpa_seq \l_tmpa_str % <filename>
1257 \seq_if_empty:NF \l_tmpa_seq { %remaining element should be language
1258 \stex_debug:nn{modules} {Language~\l_stex_module_lang_str~
1259 inferred~from~file~name}
1260 \seq_pop_left:NN \l_tmpa_seq \l_stex_module_lang_str
1261 }
1262 }
1263
1264 \stex_if_smsmode:F { \str_if_empty:NF \l_stex_module_lang_str {
1265 \prop_get:NVNTF \c_stex_languages_prop \l_stex_module_lang_str
1266 \l_tmpa_str {
1267 \ltx@ifpackageloaded{babel}{
1268 \exp_args:Nx \selectlanguage { \l_tmpa_str }
1269 }{}
1270 } {
1271 \msg_error:nnx{stex}{error/unknownlanguage}{\l_tmpa_str}
1272 }
1273 }}

```

We check if we need to extend a signature module, and set `\l_stex_current_module_prop` accordingly:

```

1274 \str_if_empty:NTF \l_stex_module_sig_str {
1275 \exp_args:Nnx \prop_gset_from_keyval:cn {
1276 c_stex_module_\l_stex_module_ns_str?\l_stex_module_name_str _prop
1277 } {
1278 name = \l_stex_module_name_str ,
1279 ns = \l_stex_module_ns_str ,
1280 file = \exp_not:o { \g_stex_currentfile_seq } ,
1281 lang = \l_stex_module_lang_str ,
1282 sig = \l_stex_module_sig_str ,
1283 deprecate = \l_stex_module_deprecate_str ,
1284 meta = \l_stex_module_meta_str
1285 }
1286 \seq_clear:c {c_stex_module_\l_stex_module_ns_str?\l_stex_module_name_str _imports}
1287 \seq_clear:c {c_stex_module_\l_stex_module_ns_str?\l_stex_module_name_str _constants}
1288 \tl_clear:c {c_stex_module_\l_stex_module_ns_str?\l_stex_module_name_str _code}

```

```

1289 \str_set:Nx\l_stex_current_module_str{\l_stex_module_ns_str?\l_stex_module_name_str}
We load the metatheory:
1290 \str_if_empty:NT \l_stex_module_meta_str {
1291   \str_set:Nx \l_stex_module_meta_str {
1292     \c_stex_metatheory_ns_str ? Metatheory
1293   }
1294 }
1295 \str_if_eq:VnF \l_stex_module_meta_str {NONE} {
1296   \bool_set_true:N \l_stex_in_meta_bool
1297   \exp_args:Nx \stex_add_to_current_module:n {
1298     \bool_set_true:N \l_stex_in_meta_bool
1299     \stex_activate_module:n {\l_stex_module_meta_str}
1300     \bool_set_false:N \l_stex_in_meta_bool
1301   }
1302   \stex_activate_module:n {\l_stex_module_meta_str}
1303   \bool_set_false:N \l_stex_in_meta_bool
1304 }
1305 }{
1306   \str_if_empty:NT \l_stex_module_lang_str {
1307     \msg_error:nnxx{stex}{error/siglanguage}{
1308       \l_stex_module_ns_str?\l_stex_module_name_str
1309     }{\l_stex_module_sig_str}
1310   }
1311
1312   \seq_set_eq:NN \l_tmpa_seq \g_stex_currentfile_seq
1313   \seq_pop_right:NN \l_tmpa_seq \l_tmpa_str
1314   \seq_set_split:NnV \l_tmpb_seq . \l_tmpa_str
1315   \seq_pop_right:NN \l_tmpb_seq \l_tmpa_str % .tex
1316   \seq_pop_left:NN \l_tmpb_seq \l_tmpa_str % <filename>
1317   \str_set:Nx \l_tmpa_str {
1318     \stex_path_to_string:N \l_tmpa_seq /
1319     \l_tmpa_str . \l_stex_module_sig_str .tex
1320   }
1321   \IfFileExists \l_tmpa_str {
1322     \exp_args:No \stex_file_in_smsmode:nn { \l_tmpa_str } {
1323       \str_clear:N \l_stex_current_module_str
1324       \seq_clear:N \l_stex_all_modules_seq
1325       \stex_debug:nn{modules}{Loading~signature~\l_tmpa_str}
1326     }
1327   }{
1328     \msg_error:nnx{stex}{error/unknownmodule}{for~signature~\l_tmpa_str}
1329   }
1330   \stex_if_smsmode:F {
1331     \stex_activate_module:n {
1332       \l_stex_module_ns_str ? \l_stex_module_name_str
1333     }
1334   }
1335   \str_set:Nx\l_stex_current_module_str{\l_stex_module_ns_str?\l_stex_module_name_str}
1336 }
1337 \str_if_empty:NF \l_stex_module_deprecate_str {
1338   \msg_warning:nnxx{stex}{warning/deprecated}{
1339     Module~\l_stex_current_module_str
1340   }{

```

```

1341     \l_stex_module_deprecate_str
1342   }
1343 }
1344 \seq_put_right:Nx \l_stex_all_modules_seq {
1345   \l_stex_module_ns_str ? \l_stex_module_name_str
1346 }
1347 }

```

(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}

1348 \cs_new_protected:Nn \__stex_modules_begin_module: {
1349   \stex_reactivate_macro:N \STEXexport
1350   \stex_reactivate_macro:N \importmodule
1351   \stex_reactivate_macro:N \symdecl
1352   \stex_reactivate_macro:N \notation
1353   \stex_reactivate_macro:N \symdef
1354
1355   \stex_debug:nn{modules}{
1356     New~module:\\
1357     Namespace:~\l_stex_module_ns_str\\
1358     Name:~\l_stex_module_name_str\\
1359     Language:~\l_stex_module_lang_str\\
1360     Signature:~\l_stex_module_sig_str\\
1361     Metatheory:~\l_stex_module_meta_str\\
1362     File:~\stex_path_to_string:N \g_stex_currentfile_seq
1363   }
1364
1365   \stex_if_smsmode:F{
1366     \begin{stex_annotate_env} {theory} {
1367       \l_stex_module_ns_str ? \l_stex_module_name_str
1368     }
1369
1370     \stex_annotate_invisible:nnn{header}{} {
1371       \stex_annotate:nnn{language}{ \l_stex_module_lang_str }{}
1372       \stex_annotate:nnn{signature}{ \l_stex_module_sig_str }{}
1373       \str_if_eq:VnF \l_stex_module_meta_str {NONE} {
1374         \stex_annotate:nnn{metatheory}{ \l_stex_module_meta_str }{}
1375       }
1376       \str_if_empty:NF \smodulotype {
1377         \stex_annotate:nnn{type}{\smodulotype}{}
1378       }
1379     }
1380   }
1381   % TODO: Inherit metatheory for nested modules?
1382 }
1383 \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}

1384 \cs_new_protected:Nn \__stex_modules_end_module: {

```



```

1385 \stex_debug:nn{modules}{Closing-module~\prop_item:cn {c_stex_module_\l_stex_current_module
1386 }

```

(End definition for _stex_modules_end_module:.)

The core environment

```

1387 \iffalse \begin{stex_annotate_env} \fi %%^A make syntax highlighting work again
1388 \NewDocumentEnvironment { smodule } { 0{} m } {
1389   \stex_module_setup:nn{#1}{#2}
1390   \par
1391   \stex_if_smsmode:F{
1392     \tl_clear:N \l_tmpa_tl
1393     \clist_map_inline:Nn \smodulotype {
1394       \tl_if_exist:cT {__stex_modules_smodule_##1_start:}{
1395         \tl_set:Nn \l_tmpa_tl {\use:c{__stex_modules_smodule_##1_start:}}
1396       }
1397     }
1398     \tl_if_empty:NTF \l_tmpa_tl {
1399       \__stex_modules_smodule_start:
1400     }{
1401       \l_tmpa_tl
1402     }
1403   }
1404   \__stex_modules_begin_module:
1405   \str_if_empty:NF \smoduleid {
1406     \stex_ref_new_doc_target:n \smoduleid
1407   }
1408   \stex_smsmode_do:
1409 } {
1410   \__stex_modules_end_module:
1411   \stex_if_smsmode:F {
1412     \end{stex_annotate_env}
1413     \clist_set:Nn \l_tmpa_clist \smodulotype
1414     \tl_clear:N \l_tmpa_tl
1415     \clist_map_inline:Nn \l_tmpa_clist {
1416       \tl_if_exist:cT {__stex_modules_smodule_##1_end:}{
1417         \tl_set:Nn \l_tmpa_tl {\use:c{__stex_modules_smodule_##1_end:}}
1418       }
1419     }
1420     \tl_if_empty:NTF \l_tmpa_tl {
1421       \__stex_modules_smodule_end:
1422     }{
1423       \l_tmpa_tl
1424     }
1425   }
1426 }

```

\stexpatchmodule

```

1427 \cs_new_protected:Nn \__stex_modules_smodule_start: {}
1428 \cs_new_protected:Nn \__stex_modules_smodule_end: {}
1429
1430 \newcommand\stexpatchmodule[3] [] {
1431   \str_set:Nx \l_tmpa_str{ #1 }
1432   \str_if_empty:NTF \l_tmpa_str {
1433     \tl_set:Nn \__stex_modules_smodule_start: { #2 }

```

```

1434     \tl_set:Nn \__stex_modules_smodule_end: { #3 }
1435   }{
1436     \exp_after:wN \tl_set:Nn \csname __stex_modules_smodule_#1_start:\endcsname{ #2 }
1437     \exp_after:wN \tl_set:Nn \csname __stex_modules_smodule_#1_end:\endcsname{ #3 }
1438   }
1439 }

```

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

27.2 Invoking modules

```

\STEXModule
\stex_invoke_module:n
1440 \NewDocumentCommand \STEXModule { m } {
1441   \exp_args:NNx \str_set:Nn \l_tmpa_str { #1 }
1442   \int_set:Nn \l_tmpa_int { \str_count:N \l_tmpa_str }
1443   \tl_set:Nn \l_tmpa_tl {
1444     \msg_error:nnx{stex}{error/unknownmodule}{#1}
1445   }
1446   \seq_map_inline:Nn \l_stex_all_modules_seq {
1447     \str_set:Nn \l_tmpb_str { ##1 }
1448     \str_if_eq:eeT { \l_tmpa_str } {
1449       \str_range:Nnn \l_tmpb_str { -\l_tmpa_int } { -1 }
1450     } {
1451       \seq_map_break:n {
1452         \tl_set:Nn \l_tmpa_tl {
1453           \stex_invoke_module:n { ##1 }
1454         }
1455       }
1456     }
1457   }
1458   \l_tmpa_tl
1459 }
1460
1461 \cs_new_protected:Nn \stex_invoke_module:n {
1462   \stex_debug:nn{modules}{Invoking~module~#1}
1463   \peek_charcode_remove:NTF ! {
1464     \__stex_modules_invoke_uri:nN { #1 }
1465   } {
1466     \peek_charcode_remove:NTF ? {
1467       \__stex_modules_invoke_symbol:nn { #1 }
1468     } {
1469       \msg_error:nnx{stex}{error/syntax}{
1470         ?~or~!~expected~after~
1471         \c_backslash_str STEXModule{#1}
1472       }
1473     }
1474   }
1475 }
1476
1477 \cs_new_protected:Nn \__stex_modules_invoke_uri:nN {
1478   \str_set:Nn #2 { #1 }
1479 }
1480

```

```

1481 \cs_new_protected:Nn \__stex_modules_invoke_symbol:nn {
1482   \stex_invoke_symbol:n{#1?#2}
1483 }

```

(End definition for `\STEXModule` and `\stex_invoke_module:n`. These functions are documented on page 55.)

`\stex_activate_module:n`

```

1484 \bool_new:N \l_stex_in_meta_bool
1485 \bool_set_false:N \l_stex_in_meta_bool
1486 \cs_new_protected:Nn \stex_activate_module:n {
1487   \stex_debug:nn{modules}{Activating~module~#1}
1488   \seq_if_in:NnT \l_stex_implicit_morphisms_seq { #1 }{
1489     \msg_error:nnn{stex}{error/conflictingmodules}{ #1 }
1490   }
1491   \exp_args:NNx \seq_if_in:NnF \l_stex_all_modules_seq { #1 } {
1492     \seq_put_right:Nx \l_stex_all_modules_seq { #1 }
1493     \use:c{ c_stex_module_#1_code }
1494   }
1495 }

```

(End definition for `\stex_activate_module:n`. This function is documented on page 56.)

```

1496 \endpackage

```

Chapter 28

STEX -Module Inheritance Implementation

```
1497 ⟨*package⟩
1498
1499 %%%%%%%%% inheritance.dtx %%%%%%%%%
1500
```

28.1 SMS Mode

```
1501 ⟨@@=stex_smsmode⟩

\g_stex_smsmode_allowedmacros_tl
\g_stex_smsmode_allowedmacros_escape_tl
\g_stex_smsmode_allowedenvs_seq

1502 \tl_new:N \g_stex_smsmode_allowedmacros_tl
1503 \tl_new:N \g_stex_smsmode_allowedmacros_escape_tl
1504 \seq_new:N \g_stex_smsmode_allowedenvs_seq
1505
1506 \tl_set:Nn \g_stex_smsmode_allowedmacros_tl {
1507   \makeatletter
1508   \makeatother
1509   \ExplSyntaxOn
1510   \ExplSyntaxOff
1511   \rustexBREAK
1512 }
1513
1514 \tl_set:Nn \g_stex_smsmode_allowedmacros_escape_tl {
1515   \symdef
1516   \importmodule
1517   \notation
1518   \symdecl
1519   \STEXexport
1520   \inlineass
1521   \inlinedef
1522   \inlineex
1523   \endinput
1524   \setnotation
```

```

1525 \copynotation
1526 }
1527
1528 \exp_args:NNx \seq_set_from_clist:Nn \g_stex_smsmode_allowedenvs_seq {
1529   \tl_to_str:n {
1530     smodule,
1531     copymodule,
1532     interpretmodule,
1533     sdefinition,
1534     sexample,
1535     sassertion,
1536     sparagraph
1537   }
1538 }

```

(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`

```

1539 \bool_new:N \g__stex_smsmode_bool
1540 \bool_set_false:N \g__stex_smsmode_bool
1541 \prg_new_conditional:Nnn \stex_if_smsmode: { p, T, F, TF } {
1542   \bool_if:NTF \g__stex_smsmode_bool \prg_return_true: \prg_return_false:
1543 }

```

(End definition for `\stex_if_smsmode:TF`. This function is documented on page 57.)

`_stex_smsmode_in_smsmode:nn`

```

1544 \cs_new_protected:Nn \_stex_smsmode_in_smsmode:nn {
1545   \vbox_set:Nn \l_tmpa_box {
1546     \bool_set_eq:cN { l__stex_smsmode_#1_bool } \g__stex_smsmode_bool
1547     \bool_gset_true:N \g__stex_smsmode_bool
1548     #2
1549     \bool_gset_eq:Nc \g__stex_smsmode_bool { l__stex_smsmode_#1_bool }
1550   }
1551   \box_clear:N \l_tmpa_box
1552 }

```

(End definition for `_stex_smsmode_in_smsmode:nn`.)

`\stex_file_in_smsmode:nn`

```

1553 \quark_new:N \q__stex_smsmode_break
1554
1555 \cs_new_protected:Nn \stex_file_in_smsmode:nn {
1556   \stex_filestack_push:n{#1}
1557   \_stex_smsmode_in_smsmode:nn{#1} {
1558     #2
1559     \everyeof{\q__stex_smsmode_break\noexpand}
1560     \expandafter\expandafter\expandafter
1561     \stex_smsmode_do:
1562     \csname @ @ input\endcsname "#1"\relax
1563   }
1564   \stex_filestack_pop:
1565 }

```

(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:

```

1566 \cs_new_protected:Npn \stex_smsmode_do: {
1567   \stex_if_smsmode:T {
1568     \__stex_smsmode_do:w
1569   }
1570 }
1571 \cs_new_protected:Npn \__stex_smsmode_do:w #1 {
1572   \exp_args:Nx \tl_if_empty:nTF { \tl_tail:n{ #1 } }{
1573     \expandafter\if\expandafter\relax\noexpand#1
1574     \expandafter\__stex_smsmode_do_aux:N\expandafter#1
1575   } \else\expandafter\__stex_smsmode_do:w\fi
1576 }{
1577   \__stex_smsmode_do:w % #1
1578 }
1579 }
1580 \cs_new_protected:Nn \__stex_smsmode_do_aux:N {
1581   \cs_if_eq:NNTF #1 \q__stex_smsmode_break {
1582     \tl_if_in:NnTF \g_stex_smsmode_allowedmacros_tl {#1} {
1583       #1\__stex_smsmode_do:w
1584     }{
1585       \tl_if_in:NnTF \g_stex_smsmode_allowedmacros_escape_tl {#1} {
1586         #1
1587       }{
1588         \cs_if_eq:NNTF \begin #1 {
1589           \__stex_smsmode_check_begin:n
1590         }{
1591           \cs_if_eq:NNTF \end #1 {
1592             \__stex_smsmode_check_end:n
1593           }{
1594             \__stex_smsmode_do:w
1595           }
1596         }
1597       }
1598     }
1599   }
1600 }
1601
1602 \cs_new_protected:Nn \__stex_smsmode_check_begin:n {
1603   \seq_if_in:NxTF \g_stex_smsmode_allowedenvs_seq { \detokenize{#1} }{
1604     \begin{#1}
1605   }{
1606     \__stex_smsmode_do:w
1607   }
1608 }
1609 \cs_new_protected:Nn \__stex_smsmode_check_end:n {
1610   \seq_if_in:NxTF \g_stex_smsmode_allowedenvs_seq { \detokenize{#1} }{
1611     \end{#1}\__stex_smsmode_do:w
1612   }{
1613     \str_if_eq:nnTF{#1}{document}{\endinput}{\__stex_smsmode_do:w}
1614   }
1615 }

```

(End definition for `\stex_smsmode_do`:. This function is documented on page 58.)

28.2 Inheritance

```

1616 <@@=stex_importmodule>
\stex_import_module_uri:nn
1617 \cs_new_protected:Nn \stex_import_module_uri:nn {
1618   \str_set:Nx \l_stex_import_archive_str { #1 }
1619   \str_set:Nn \l_stex_import_path_str { #2 }
1620
1621   \exp_args:NNNo \seq_set_split:Nnn \l_tmpb_seq ? { \l_stex_import_path_str }
1622   \seq_pop_right:NN \l_tmpb_seq \l_stex_import_name_str
1623   \str_set:Nx \l_stex_import_path_str { \seq_use:Nn \l_tmpb_seq ? }
1624
1625   \stex_modules_current_namespace:
1626   \bool_lazy_all:nTF {
1627     {\str_if_empty_p:N \l_stex_import_archive_str}
1628     {\str_if_empty_p:N \l_stex_import_path_str}
1629     {\stex_if_module_exists_p:n { \l_stex_module_ns_str ? \l_stex_import_name_str } }
1630   }{
1631     \str_set_eq:NN \l_stex_import_path_str \l_stex_modules_subpath_str
1632     \str_set_eq:NN \l_stex_import_ns_str \l_stex_module_ns_str
1633   }{
1634     \str_if_empty:NT \l_stex_import_archive_str {
1635       \prop_if_exist:NT \l_stex_current_repository_prop {
1636         \prop_get:NnN \l_stex_current_repository_prop { id } \l_stex_import_archive_str
1637       }
1638     }
1639     \str_if_empty:NTF \l_stex_import_archive_str {
1640       \str_if_empty:NF \l_stex_import_path_str {
1641         \str_set:Nx \l_stex_import_ns_str {
1642           \l_stex_module_ns_str / \l_stex_import_path_str
1643         }
1644       }
1645     }{
1646       \stex_require_repository:n \l_stex_import_archive_str
1647       \prop_get:cnN { c_stex_mathhub\l_stex_import_archive_str _manifest_prop } { ns }
1648       \l_stex_import_ns_str
1649       \str_if_empty:NF \l_stex_import_path_str {
1650         \str_set:Nx \l_stex_import_ns_str {
1651           \l_stex_import_ns_str / \l_stex_import_path_str
1652         }
1653       }
1654     }
1655   }
1656 }
```

(End definition for `\stex_import_module_uri:nn`. This function is documented on page 59.)

<code>\l_stex_import_name_str</code>	Store the return values of <code>\stex_import_module_uri:nn</code> .
<code>\l_stex_import_archive_str</code>	1657 <code>\str_new:N \l_stex_import_name_str</code>
<code>\l_stex_import_path_str</code>	1658 <code>\str_new:N \l_stex_import_archive_str</code>
<code>\l_stex_import_ns_str</code>	1659 <code>\str_new:N \l_stex_import_path_str</code>

```
1660 \str_new:N \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:nnnnn {{ns}} {{archive-ID}} {{path}} {{name}}

1661 \cs_new_protected:Nn \stex_import_require_module:nnnnn {
1662   \exp_args:Nx \stex_if_module_exists:nF { #1 ? #4 } {
1663
1664     % archive
1665     \str_set:Nx \l_tmpa_str { #2 }
1666     \str_if_empty:NTF \l_tmpa_str {
1667       \seq_set_eq:NN \l_tmpa_seq \g_stex_currentfile_seq
1668     } {
1669       \stex_path_from_string:Nn \l_tmpb_seq { \l_tmpa_str }
1670       \seq_concat:NNN \l_tmpa_seq \c_stex_mathhub_seq \l_tmpb_seq
1671       \seq_put_right:Nn \l_tmpa_seq { source }
1672     }
1673
1674     % path
1675     \str_set:Nx \l_tmpb_str { #3 }
1676     \str_if_empty:NTF \l_tmpb_str {
1677       \str_set:Nx \l_tmpa_str { \stex_path_to_string:N \l_tmpa_seq / #4 }
1678
1679       \ltx@ifpackageloaded{babel} {
1680         \exp_args:NNx \prop_get:NnNF \c_stex_language_abbrevs_prop
1681           { \language } \l_tmpb_str {
1682           \msg_error:nnx{stex}{error/unknownlanguage}{\language}
1683         }
1684       } {
1685         \str_clear:N \l_tmpb_str
1686       }
1687
1688       \stex_debug:nn{modules}{Checking~\l_tmpa_str.\l_tmpb_str.tex}
1689       \IfFileExists{ \l_tmpa_str.\l_tmpb_str.tex }{
1690         \str_gset:Nx \g__stex_importmodule_file_str { \l_tmpa_str.\l_tmpb_str.tex }
1691       }{
1692         \stex_debug:nn{modules}{Checking~\l_tmpa_str.tex}
1693         \IfFileExists{ \l_tmpa_str.tex }{
1694           \str_gset:Nx \g__stex_importmodule_file_str { \l_tmpa_str.tex }
1695         }{
1696           % try english as default
1697           \stex_debug:nn{modules}{Checking~\l_tmpa_str.en.tex}
1698           \IfFileExists{ \l_tmpa_str.en.tex }{
1699             \str_gset:Nx \g__stex_importmodule_file_str { \l_tmpa_str.en.tex }
1700           }{
1701             \msg_error:nnx{stex}{error/unknownmodule}{#1?#4}
1702           }
1703         }
1704       }
1705
1706     } {
1707       \seq_set_split:NnV \l_tmpb_seq / \l_tmpb_str
1708       \seq_concat:NNN \l_tmpa_seq \l_tmpa_seq \l_tmpb_seq
1709
```



```

1710 \ltx@ifpackageloaded{babel} {
1711   \exp_args:NNx \prop_get:NnNF \c_stex_language_abbrevs_prop
1712   { \language } \l_tmpb_str {
1713     \msg_error:nnx{stex}{error/unknownlanguage}{\language}
1714   }
1715 } {
1716   \str_clear:N \l_tmpb_str
1717 }
1718
1719 \stex_path_to_string:NN \l_tmpa_seq \l_tmpa_str
1720
1721 \stex_debug:nn{modules}{Checking~\l_tmpa_str/#4.\l_tmpb_str.tex}
1722 \IfFileExists{ \l_tmpa_str/#4.\l_tmpb_str.tex }{
1723   \str_gset:Nx \g__stex_importmodule_file_str { \l_tmpa_str/#4.\l_tmpb_str.tex }
1724 }{
1725   \stex_debug:nn{modules}{Checking~\l_tmpa_str/#4.tex}
1726   \IfFileExists{ \l_tmpa_str/#4.tex }{
1727     \str_gset:Nx \g__stex_importmodule_file_str { \l_tmpa_str/#4.tex }
1728   }{
1729     % try english as default
1730     \stex_debug:nn{modules}{Checking~\l_tmpa_str/#4.en.tex}
1731     \IfFileExists{ \l_tmpa_str/#4.en.tex }{
1732       \str_gset:Nx \g__stex_importmodule_file_str { \l_tmpa_str/#4.en.tex }
1733     }{
1734       \stex_debug:nn{modules}{Checking~\l_tmpa_str.\l_tmpb_str.tex}
1735       \IfFileExists{ \l_tmpa_str.\l_tmpb_str.tex }{
1736         \str_gset:Nx \g__stex_importmodule_file_str { \l_tmpa_str.\l_tmpb_str.tex }
1737       }{
1738         \stex_debug:nn{modules}{Checking~\l_tmpa_str.tex}
1739         \IfFileExists{ \l_tmpa_str.tex }{
1740           \str_gset:Nx \g__stex_importmodule_file_str { \l_tmpa_str.tex }
1741         }{
1742           % try english as default
1743           \stex_debug:nn{modules}{Checking~\l_tmpa_str.en.tex}
1744           \IfFileExists{ \l_tmpa_str.en.tex }{
1745             \str_gset:Nx \g__stex_importmodule_file_str { \l_tmpa_str.en.tex }
1746           }{
1747             \msg_error:nnx{stex}{error/unknownmodule}{#1?#4}
1748           }
1749         }
1750       }
1751     }
1752   }
1753 }
1754 }
1755
1756 \exp_args:No \stex_file_in_smsmode:nn { \g__stex_importmodule_file_str } {
1757   \seq_clear:N \l_stex_all_modules_seq
1758   \str_clear:N \l_stex_current_module_str
1759   \str_set:Nx \l_tmpb_str { #2 }
1760   \str_if_empty:NF \l_tmpb_str {
1761     \stex_set_current_repository:n { #2 }
1762   }
1763   \stex_debug:nn{modules}{Loading~\g__stex_importmodule_file_str}

```

```

1764     }
1765
1766     \stex_if_module_exists:nF { #1 ? #4 } {
1767         \msg_error:nnx{stex}{error/unknownmodule}{
1768             #1?#4~(in~file~\g__stex_importmodule_file_str)
1769         }
1770     }
1771 }
1772 \stex_activate_module:n { #1 ? #4 }
1773 }

```

(End definition for `\stex_import_require_module:nnnn`. This function is documented on page 59.)

`\importmodule`

```

1774 \NewDocumentCommand \importmodule { 0{ } m } {
1775     \stex_import_module_uri:nn { #1 } { #2 }
1776     \stex_debug:nn{modules}{Importing~module:~
1777         \l_stex_import_ns_str ? \l_stex_import_name_str
1778     }
1779     \stex_if_smsmode:F {
1780         \stex_import_require_module:nnnn
1781         { \l_stex_import_ns_str } { \l_stex_import_archive_str }
1782         { \l_stex_import_path_str } { \l_stex_import_name_str }
1783         \stex_annotate_invisible:nnn
1784         {import} { \l_stex_import_ns_str ? \l_stex_import_name_str } {}
1785     }
1786     \exp_args:Nx \stex_add_to_current_module:n {
1787         \stex_import_require_module:nnnn
1788         { \l_stex_import_ns_str } { \l_stex_import_archive_str }
1789         { \l_stex_import_path_str } { \l_stex_import_name_str }
1790     }
1791     \exp_args:Nx \stex_add_import_to_current_module:n {
1792         \l_stex_import_ns_str ? \l_stex_import_name_str
1793     }
1794     \stex_smsmode_do:
1795     \ignorespacesandpars
1796 }
1797 \stex_deactivate_macro:Nn \importmodule {module-environments}

```

(End definition for `\importmodule`. This function is documented on page 58.)

`\usemodule`

```

1798 \NewDocumentCommand \usemodule { 0{ } m } {
1799     \stex_if_smsmode:F {
1800         \stex_import_module_uri:nn { #1 } { #2 }
1801         \stex_import_require_module:nnnn
1802         { \l_stex_import_ns_str } { \l_stex_import_archive_str }
1803         { \l_stex_import_path_str } { \l_stex_import_name_str }
1804         \stex_annotate_invisible:nnn
1805         {usemodule} { \l_stex_import_ns_str ? \l_stex_import_name_str } {}
1806     }
1807     \stex_smsmode_do:
1808     \ignorespacesandpars
1809 }

```

(End definition for \usemodule. This function is documented on page 58.)

1810 `\endpackage`

Chapter 29

STEX -Symbols Implementation

```
1811 <*package>
1812
1813 %%%%%%%%%% symbols.dtx %%%%%%%%%%
1814
1815 Warnings and error messages
1816 \msg_new:nnn{stex}{error/wrongargs}{
1817   args~value~in~symbol~declaration~for~#1~
1818   needs~to~be~i,~a,~b~or~B,~but~#2~given
1819 }
1820 \msg_new:nnn{stex}{error/unknownsymbol}{
1821   No~symbol~#1~found!
1822 }
1823 \msg_new:nnn{stex}{error/seqlength}{
1824   Expected~#1~arguments;~got~#2!
1825 }
```

29.1 Symbol Declarations

```
1825 <@@=stex_symdecl>
\stex_all_symbols:n Map over all available symbols
1826 \cs_new_protected:Nn \stex_all_symbols:n {
1827   \def \__stex_symdecl_all_symbols_cs ##1 {#1}
1828   \seq_map_inline:Nn \l_stex_all_modules_seq {
1829     \seq_map_inline:cn{c_stex_module_##1_constants}{
1830       \__stex_symdecl_all_symbols_cs{##1?####1}
1831     }
1832   }
1833 }
(End definition for \stex_all_symbols:n. This function is documented on page 61.)
\STEXsymbol
1834 \NewDocumentCommand \STEXsymbol { m } {
1835   \stex_get_symbol:n { #1 }
```

```

1836 \exp_args:No
1837 \stex_invoke_symbol:n { \l_stex_get_symbol_uri_str }
1838 }

```

(End definition for `\STEXsymbol`. This function is documented on page 62.)

`symdecl` arguments:

```

1839 \keys_define:nn { stex / symdecl } {
1840   name      .str_set_x:N = \l_stex_symdecl_name_str ,
1841   local     .bool_set:N = \l_stex_symdecl_local_bool ,
1842   args      .str_set_x:N = \l_stex_symdecl_args_str ,
1843   type      .tl_set:N = \l_stex_symdecl_type_tl ,
1844   deprecate .str_set_x:N = \l_stex_symdecl_deprecate_str ,
1845   align     .str_set:N = \l_stex_symdecl_align_str , % TODO(?)
1846   gfc       .str_set:N = \l_stex_symdecl_gfc_str , % TODO(?)
1847   specializes .str_set:N = \l_stex_symdecl_specializes_str , % TODO(?)
1848   def       .tl_set:N = \l_stex_symdecl_definiens_tl ,
1849   assoc     .choices:nn =
1850     {bin,binl,binr,pre,conj,pwconj}
1851     {\str_set:Nx \l_stex_symdecl_astype_str {\l_keys_choice_tl}}
1852 }
1853
1854 \bool_new:N \l_stex_symdecl_make_macro_bool
1855
1856 \cs_new_protected:Nn \__stex_symdecl_args:n {
1857   \str_clear:N \l_stex_symdecl_name_str
1858   \str_clear:N \l_stex_symdecl_args_str
1859   \str_clear:N \l_stex_symdecl_deprecate_str
1860   \str_clear:N \l_stex_symdecl_astype_str
1861   \bool_set_false:N \l_stex_symdecl_local_bool
1862   \tl_clear:N \l_stex_symdecl_type_tl
1863   \tl_clear:N \l_stex_symdecl_definiens_tl
1864
1865   \keys_set:nn { stex / symdecl } { #1 }
1866 }

```

`\symdecl` Parses the optional arguments and passes them on to `\stex_symdecl_do:` (so that `\symdef` can do the same)

```

1867
1868 \NewDocumentCommand \symdecl { s m O{} } {
1869   \__stex_symdecl_args:n { #3 }
1870   \IfBooleanTF #1 {
1871     \bool_set_false:N \l_stex_symdecl_make_macro_bool
1872   } {
1873     \bool_set_true:N \l_stex_symdecl_make_macro_bool
1874   }
1875   \stex_symdecl_do:n { #2 }
1876   \stex_smsmode_do:
1877 }
1878
1879 \cs_new_protected:Nn \stex_symdecl_do:nn {
1880   \__stex_symdecl_args:n{#1}
1881   \bool_set_false:N \l_stex_symdecl_make_macro_bool
1882   \stex_symdecl_do:n{#2}
1883 }

```

```

1884
1885 \stex_deactivate_macro:Nn \symdecl {module-environments}

```

(End definition for \symdecl. This function is documented on page 60.)

\stex_symdecl_do:n

```

1886 \cs_new_protected:Nn \stex_symdecl_do:n {
1887   \stex_if_in_module:F {
1888     % TODO throw error? some default namespace?
1889   }
1890
1891   \str_if_empty:NT \l_stex_symdecl_name_str {
1892     \str_set:Nx \l_stex_symdecl_name_str { #1 }
1893   }
1894
1895   \prop_if_exist:cT { l_stex_symdecl_
1896     \l_stex_current_module_str ?
1897     \l_stex_symdecl_name_str
1898   }_prop
1899   {
1900     % TODO throw error (beware of circular dependencies)
1901   }
1902
1903   \prop_clear:N \l_tmpa_prop
1904   \prop_put:Nnx \l_tmpa_prop { module } { \l_stex_current_module_str }
1905   \seq_clear:N \l_tmpa_seq
1906   \prop_put:Nno \l_tmpa_prop { name } \l_stex_symdecl_name_str
1907   \prop_put:Nno \l_tmpa_prop { type } \l_stex_symdecl_type_tl
1908
1909   \str_if_empty:NT \l_stex_symdecl_deprecate_str {
1910     \str_if_empty:NF \l_stex_module_deprecate_str {
1911       \str_set_eq:NN \l_stex_symdecl_deprecate_str \l_stex_module_deprecate_str
1912     }
1913   }
1914   \prop_put:Nno \l_tmpa_prop { deprecate } \l_stex_symdecl_deprecate_str
1915
1916   \exp_args:No \stex_add_constant_to_current_module:n {
1917     \l_stex_symdecl_name_str
1918   }
1919
1920   % arity/args
1921   \int_zero:N \l_tmpb_int
1922
1923   \bool_set_true:N \l_tmpa_bool
1924   \str_map_inline:Nn \l_stex_symdecl_args_str {
1925     \token_case_meaning:NnF ##1 {
1926       0 {} 1 {} 2 {} 3 {} 4 {} 5 {} 6 {} 7 {} 8 {} 9 {}
1927       {\tl_to_str:n i} { \bool_set_false:N \l_tmpa_bool }
1928       {\tl_to_str:n b} { \bool_set_false:N \l_tmpa_bool }
1929       {\tl_to_str:n a} {
1930         \bool_set_false:N \l_tmpa_bool
1931         \int_incr:N \l_tmpb_int
1932       }
1933       {\tl_to_str:n B} {

```

```

1934     \bool_set_false:N \l_tmpa_bool
1935     \int_incr:N \l_tmpb_int
1936   }
1937 }{
1938   \msg_error:nnxx{stex}{error/wrongargs}{
1939     \l_stex_current_module_str ?
1940     \l_stex_symdecl_name_str
1941   }{##1}
1942 }
1943 }
1944 \bool_if:NTF \l_tmpa_bool {
1945   % possibly numeric
1946   \str_if_empty:NTF \l_stex_symdecl_args_str {
1947     \prop_put:Nnn \l_tmpa_prop { args } {}
1948     \prop_put:Nnn \l_tmpa_prop { arity } { 0 }
1949   }{
1950     \int_set:Nn \l_tmpa_int { \l_stex_symdecl_args_str }
1951     \prop_put:Nnx \l_tmpa_prop { arity } { \int_use:N \l_tmpa_int }
1952     \str_clear:N \l_tmpa_str
1953     \int_step_inline:nn \l_tmpa_int {
1954       \str_put_right:Nn \l_tmpa_str i
1955     }
1956     \prop_put:Nnx \l_tmpa_prop { args } { \l_tmpa_str }
1957   }
1958 } {
1959   \prop_put:Nnx \l_tmpa_prop { args } { \l_stex_symdecl_args_str }
1960   \prop_put:Nnx \l_tmpa_prop { arity }
1961     { \str_count:N \l_stex_symdecl_args_str }
1962 }
1963 \prop_put:Nnx \l_tmpa_prop { assocs } { \int_use:N \l_tmpb_int }
1964
1965 \tl_if_empty:NTF \l_stex_symdecl_definiens_tl {
1966   \prop_put:Nnx \l_tmpa_prop { defined }{ false }
1967 }{
1968   \prop_put:Nnx \l_tmpa_prop { defined }{ true }
1969 }
1970
1971 % semantic macro
1972
1973 \bool_if:NT \l_stex_symdecl_make_macro_bool {
1974   \exp_args:Nx \stex_do_up_to_module:n {
1975     \tl_set:cn { #1 } { \stex_invoke_symbol:n {
1976       \l_stex_current_module_str ? \l_stex_symdecl_name_str
1977     }}
1978   }
1979
1980   \bool_if:NF \l_stex_symdecl_local_bool {
1981     \exp_args:Nx \stex_add_to_current_module:n {
1982       \tl_set:cn { #1 } { \stex_invoke_symbol:n {
1983         \l_stex_current_module_str ? \l_stex_symdecl_name_str
1984       } }
1985     }
1986   }
1987 }

```

```

1988
1989 \stex_debug:nn{symbols}{New~symbol:~
1990   \l_stex_current_module_str ? \l_stex_symdecl_name_str^^J
1991   Type:~\exp_not:o { \l_stex_symdecl_type_tl }^^J
1992   Args:~\prop_item:Nn \l_tmpa_prop { args }^^J
1993   Definiens:~\exp_not:o { \l_stex_symdecl_definiens_tl }
1994 }
1995
1996 % circular dependencies require this:
1997
1998 \prop_if_exist:cF {
1999   \l_stex_symdecl_
2000   \l_stex_current_module_str ? \l_stex_symdecl_name_str
2001   _prop
2002 } {
2003   \exp_args:Nx \stex_do_up_to_module:n {
2004     \prop_set_from_keyval:cn {
2005       \l_stex_symdecl_
2006       \l_stex_current_module_str ? \l_stex_symdecl_name_str
2007       _prop
2008     } {\prop_to_keyval:N \l_tmpa_prop}
2009     \seq_clear:c {
2010       \l_stex_symdecl_
2011       \l_stex_current_module_str ? \l_stex_symdecl_name_str
2012       _notations
2013     }
2014   }
2015 }
2016
2017
2018
2019 \bool_if:NF \l_stex_symdecl_local_bool {
2020   \exp_args:Nx
2021   \stex_add_to_current_module:n {
2022     \seq_clear:c {
2023       \l_stex_symdecl_
2024       \l_stex_current_module_str ? \l_stex_symdecl_name_str
2025       _notations
2026     }
2027     \prop_set_from_keyval:cn {
2028       \l_stex_symdecl_
2029       \l_stex_current_module_str ? \l_stex_symdecl_name_str
2030       _prop
2031     } {
2032       name      = \prop_item:Nn \l_tmpa_prop { name }      ,
2033       module    = \prop_item:Nn \l_tmpa_prop { module }    ,
2034       type      = \prop_item:Nn \l_tmpa_prop { type }      ,
2035       args      = \prop_item:Nn \l_tmpa_prop { args }      ,
2036       arity     = \prop_item:Nn \l_tmpa_prop { arity }     ,
2037       assocs    = \prop_item:Nn \l_tmpa_prop { assocs }
2038     }
2039   }
2040 }
2041

```



```

2042 \stex_if_smsmode:F {
2043 % \exp_args:Nx \stex_do_up_to_module:n {
2044 % \seq_put_right:Nn \exp_not:N \l_stex_all_symbols_seq {
2045 % \l_stex_current_module_str ? \l_stex_symdecl_name_str
2046 % }
2047 % }
2048 \stex_if_do_html:T {
2049 \stex_annotate_invisible:nnn {symdecl} {
2050 \l_stex_current_module_str ? \l_stex_symdecl_name_str
2051 } {
2052 \tl_if_empty:NF \l_stex_symdecl_type_tl {\stex_annotate_invisible:nnn{type}{}}{ $\l_st
2053 \stex_annotate_invisible:nnn{args}{}{
2054 \prop_item:Nn \l_tmpa_prop { args }
2055 }
2056 \stex_annotate_invisible:nnn{macroname}{#1}{}
2057 \tl_if_empty:NF \l_stex_symdecl_definiens_tl {
2058 \stex_annotate_invisible:nnn{definiens}{}
2059 { $\l_stex_symdecl_definiens_tl$
2060 }
2061 \str_if_empty:NF \l_stex_symdecl_assoc_type_str {
2062 \stex_annotate_invisible:nnn{assoc_type}{\l_stex_symdecl_assoc_type_str}{}
2063 }
2064 }
2065 }
2066 }
2067 }

```

(End definition for `\stex_symdecl_do:n`. This function is documented on page [61](#).)

`\stex_get_symbol:n`

```

2068 \str_new:N \l_stex_get_symbol_uri_str
2069
2070 \cs_new_protected:Nn \stex_get_symbol:n {
2071 \tl_if_head_eq_catcode:nNTF { #1 } \relax {
2072 \tl_set:Nn \l_tmpa_tl { #1 }
2073 \__stex_symdecl_get_symbol_from_cs:
2074 }{
2075 % argument is a string
2076 % is it a command name?
2077 \cs_if_exist:cTF { #1 }{
2078 \cs_set_eq:Nc \l_tmpa_tl { #1 }
2079 \str_set:Nx \l_tmpa_str { \cs_argument_spec:N \l_tmpa_tl }
2080 \str_if_empty:NTF \l_tmpa_str {
2081 \exp_args:Nx \cs_if_eq:NNTF {
2082 \tl_head:N \l_tmpa_tl
2083 } \stex_invoke_symbol:n {
2084 \__stex_symdecl_get_symbol_from_cs:
2085 }{
2086 \__stex_symdecl_get_symbol_from_string:n { #1 }
2087 }
2088 } {
2089 \__stex_symdecl_get_symbol_from_string:n { #1 }
2090 }
2091 }{

```

```

2092     % argument is not a command name
2093     \__stex_symdecl_get_symbol_from_string:n { #1 }
2094     % \l_stex_all_symbols_seq
2095   }
2096 }
2097 \str_if_eq:eeF {
2098   \prop_item:cn {
2099     l_stex_symdecl\l_stex_get_symbol_uri_str _prop
2100   }{ deprecate }
2101 }{}{
2102   \msg_warning:nnxx{stex}{warning/deprecated}{
2103     Symbol~\l_stex_get_symbol_uri_str
2104   }{
2105     \prop_item:cn {l_stex_symdecl\l_stex_get_symbol_uri_str _prop}{ deprecate }
2106   }
2107 }
2108 }
2109
2110 \cs_new_protected:Nn \__stex_symdecl_get_symbol_from_string:n {
2111   \tl_set:Nn \l_tmpa_tl {
2112     \msg_error:nnn{stex}{error/unknownsymbol}{#1}
2113   }
2114   \str_set:Nn \l_tmpa_str { #1 }
2115   \int_set:Nn \l_tmpa_int { \str_count:N \l_tmpa_str }
2116
2117   \stex_all_symbols:n {
2118     \str_if_eq:eeT { \l_tmpa_str }{ \str_range:nnn {##1}{-\l_tmpa_int}{-1}}{
2119       \seq_map_break:n{\seq_map_break:n{
2120         \tl_set:Nn \l_tmpa_tl {
2121           \str_set:Nn \l_stex_get_symbol_uri_str { ##1 }
2122         }
2123       }}
2124     }
2125   }
2126
2127   \l_tmpa_tl
2128 }
2129
2130 \cs_new_protected:Nn \__stex_symdecl_get_symbol_from_cs: {
2131   \exp_args:NNx \tl_set:Nn \l_tmpa_tl
2132     { \tl_tail:N \l_tmpa_tl }
2133   \tl_if_single:NTF \l_tmpa_tl {
2134     \exp_args:No \tl_if_head_is_group:nTF \l_tmpa_tl {
2135       \exp_after:wN \str_set:Nn \exp_after:wN
2136         \l_stex_get_symbol_uri_str \l_tmpa_tl
2137     }{
2138       % TODO
2139       % tail is not a single group
2140     }
2141   }{
2142     % TODO
2143     % tail is not a single group
2144   }
2145 }

```

(End definition for `\stex_get_symbol:n`. This function is documented on page 61.)

29.2 Notations

2146 `<@@=stex_notation>`

notation arguments:

```
2147 \keys_define:nn { stex / notation } {
2148   lang      .tl_set_x:N = \l__stex_notation_lang_str ,
2149   variant   .tl_set_x:N = \l__stex_notation_variant_str ,
2150   prec      .str_set_x:N = \l__stex_notation_prec_str ,
2151   op        .tl_set:N   = \l__stex_notation_op_tl ,
2152   primary   .bool_set:N = \l__stex_notation_primary_bool ,
2153   primary   .default:n  = {true} ,
2154   unknown   .code:n     = \str_set:Nx
2155               \l__stex_notation_variant_str \l_keys_key_str
2156 }
2157
2158 \cs_new_protected:Nn \_stex_notation_args:n {
2159   \str_clear:N \l__stex_notation_lang_str
2160   \str_clear:N \l__stex_notation_variant_str
2161   \str_clear:N \l__stex_notation_prec_str
2162   \tl_clear:N \l__stex_notation_op_tl
2163   \bool_set_false:N \l__stex_notation_primary_bool
2164
2165   \keys_set:nn { stex / notation } { #1 }
2166 }
```

`\notation`

```
2167 \NewDocumentCommand \notation { s m O{}} {
2168   \_stex_notation_args:n { #3 }
2169   \tl_clear:N \l_stex_symdecl_definiens_tl
2170   \stex_get_symbol:n { #2 }
2171   \tl_set:Nn \l_stex_notation_after_do_tl {
2172     \__stex_notation_final:
2173     \IfBooleanTF#1{
2174       \stex_setnotation:n {\l_stex_get_symbol_uri_str}
2175     }{}
2176     \stex_smsmode_do:\ignorespacesandpars
2177   }
2178   \stex_notation_do:nnnnn
2179     { \prop_item:cn {\l_stex_symdecl\_l_stex_get_symbol_uri_str _prop } { args } }
2180     { \prop_item:cn { \l_stex_symdecl\_l_stex_get_symbol_uri_str _prop } { arity } }
2181     { \l__stex_notation_variant_str \c_hash_str \l__stex_notation_lang_str }
2182     { \l__stex_notation_prec_str }
2183   }
2184   \stex_deactivate_macro:Nn \notation {module~environments}
```

(End definition for `\notation`. This function is documented on page 61.)

`\stex_notation_do:nnnnn`

```
2185 \seq_new:N \l__stex_notation_precedences_seq
2186 \tl_new:N \l__stex_notation_opprec_tl
2187 \int_new:N \l__stex_notation_currarg_int
```

```

2188 \tl_new:N \stex_symbol_after_invokation_tl
2189
2190 \cs_new_protected:Nn \stex_notation_do:nnnnn {
2191   \let\l_stex_current_symbol_str\relax
2192   \seq_clear:N \l__stex_notation_precedences_seq
2193   \tl_clear:N \l__stex_notation_opprec_tl
2194   \str_set:Nx \l__stex_notation_args_str { #1 }
2195   \str_set:Nx \l__stex_notation_arity_str { #2 }
2196   \str_set:Nx \l__stex_notation_suffix_str { #3 }
2197   \str_set:Nx \l__stex_notation_prec_str { #4 }
2198
2199   % precedences
2200   \str_if_empty:NTF \l__stex_notation_prec_str {
2201     \int_compare:nNnTF \l__stex_notation_arity_str = 0 {
2202       \tl_set:No \l__stex_notation_opprec_tl { \neginfprec }
2203     }{
2204       \tl_set:Nn \l__stex_notation_opprec_tl { 0 }
2205     }
2206   } {
2207     \str_if_eq:onTF \l__stex_notation_prec_str {nobrackets}{
2208       \tl_set:No \l__stex_notation_opprec_tl { \neginfprec }
2209       \int_step_inline:nn { \l__stex_notation_arity_str } {
2210         \exp_args:NNo
2211         \seq_put_right:Nn \l__stex_notation_precedences_seq { \infprec }
2212       }
2213     }{
2214       \seq_set_split:NnV \l_tmpa_seq ; \l__stex_notation_prec_str
2215       \seq_pop_left:NNTF \l_tmpa_seq \l_tmpa_str {
2216         \tl_set:No \l__stex_notation_opprec_tl { \l_tmpa_str }
2217         \seq_pop_left:NNT \l_tmpa_seq \l_tmpa_str {
2218           \exp_args:NNNo \exp_args:NNno \seq_set_split:Nnn
2219             \l_tmpa_seq {\tl_to_str:n{x}} { \l_tmpa_str }
2220           \seq_map_inline:Nn \l_tmpa_seq {
2221             \seq_put_right:Nn \l_tmpb_seq { ##1 }
2222           }
2223         }
2224       }{
2225         \int_compare:nNnTF \l__stex_notation_arity_str = 0 {
2226           \tl_set:No \l__stex_notation_opprec_tl { \infprec }
2227         }{
2228           \tl_set:No \l__stex_notation_opprec_tl { 0 }
2229         }
2230       }
2231     }
2232   }
2233
2234   \seq_set_eq:NN \l_tmpa_seq \l__stex_notation_precedences_seq
2235   \int_step_inline:nn { \l__stex_notation_arity_str } {
2236     \seq_pop_left:NNTF \l_tmpa_seq \l_tmpb_str {
2237       \exp_args:NNo
2238       \seq_put_right:No \l__stex_notation_precedences_seq {
2239         \l__stex_notation_opprec_tl
2240       }
2241     }
  
```

```

2242 }
2243 \tl_clear:N \l_stex_notation_dummyargs_tl
2244
2245 \int_compare:nNnTF \l__stex_notation_arity_str = 0 {
2246   \exp_args:NNe
2247   \cs_set:Npn \l_stex_notation_macrocode_cs {
2248     \_stex_term_math_oms:nnnn { \l_stex_current_symbol_str }
2249     { \l__stex_notation_suffix_str }
2250     { \l__stex_notation_opprec_tl }
2251     { \exp_not:n { #5 } }
2252   }
2253   \l_stex_notation_after_do_tl
2254 }{
2255   \str_if_in:NnTF \l__stex_notation_args_str b {
2256     \exp_args:Nne \use:nn
2257     {
2258       \cs_generate_from_arg_count:NNnn \l_stex_notation_macrocode_cs
2259       \cs_set:Npn \l__stex_notation_arity_str } { {
2260         \_stex_term_math_omb:nnnn { \l_stex_current_symbol_str }
2261         { \l__stex_notation_suffix_str }
2262         { \l__stex_notation_opprec_tl }
2263         { \exp_not:n { #5 } }
2264       }}
2265   }{
2266     \str_if_in:NnTF \l__stex_notation_args_str B {
2267       \exp_args:Nne \use:nn
2268       {
2269         \cs_generate_from_arg_count:NNnn \l_stex_notation_macrocode_cs
2270         \cs_set:Npn \l__stex_notation_arity_str } { {
2271           \_stex_term_math_omb:nnnn { \l_stex_current_symbol_str }
2272           { \l__stex_notation_suffix_str }
2273           { \l__stex_notation_opprec_tl }
2274           { \exp_not:n { #5 } }
2275         } }
2276     }{
2277       \exp_args:Nne \use:nn
2278       {
2279         \cs_generate_from_arg_count:NNnn \l_stex_notation_macrocode_cs
2280         \cs_set:Npn \l__stex_notation_arity_str } { {
2281           \_stex_term_math_oma:nnnn { \l_stex_current_symbol_str }
2282           { \l__stex_notation_suffix_str }
2283           { \l__stex_notation_opprec_tl }
2284           { \exp_not:n { #5 } }
2285         } }
2286     }
2287   }
2288
2289   \str_set_eq:NN \l__stex_notation_remaining_args_str \l__stex_notation_args_str
2290   \int_zero:N \l__stex_notation_currarg_int
2291   \seq_set_eq:NN \l__stex_notation_remaining_precs_seq \l__stex_notation_precedences_seq
2292   \__stex_notation_arguments:
2293 }
2294 }

```

(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

```

2295 \cs_new_protected:Nn \_stex_notation_arguments: {
2296   \int_incr:N \l__stex_notation_currarg_int
2297   \str_if_empty:NTF \l__stex_notation_remaining_args_str {
2298     \l_stex_notation_after_do_tl
2299   }{
2300     \str_set:Nx \l_tmpa_str { \str_head:N \l__stex_notation_remaining_args_str }
2301     \str_set:Nx \l__stex_notation_remaining_args_str { \str_tail:N \l__stex_notation_remaini
2302     \str_if_eq:VnTF \l_tmpa_str a {
2303       \_stex_notation_argument_assoc:n
2304     }{
2305       \str_if_eq:VnTF \l_tmpa_str B {
2306         \_stex_notation_argument_assoc:n
2307       }{
2308         \seq_pop_left:NN \l__stex_notation_remaining_precs_seq \l_tmpa_str
2309         \tl_put_right:Nx \l_stex_notation_dummyargs_tl {
2310           { \_stex_term_math_arg:nnn
2311             { \int_use:N \l__stex_notation_currarg_int }
2312             { \l_tmpa_str }
2313             { ####\int_use:N \l__stex_notation_currarg_int }
2314           }
2315         }
2316         \_stex_notation_arguments:
2317       }
2318     }
2319   }
2320 }
```

(End definition for `_stex_notation_arguments:.`)

`_stex_notation_argument_assoc:n`

```

2321 \cs_new_protected:Nn \_stex_notation_argument_assoc:n {
2322
2323   \cs_generate_from_arg_count:NNnn \l_tmpa_cs \cs_set:Npn
2324     {\l__stex_notation_arity_str}{
2325     #1
2326   }
2327   \int_zero:N \l_tmpa_int
2328   \tl_clear:N \l_tmpa_tl
2329   \str_map_inline:Nn \l__stex_notation_args_str {
2330     \int_incr:N \l_tmpa_int
2331     \tl_put_right:Nx \l_tmpa_tl {
2332       \str_if_eq:nnTF {##1}{a}{ {} }{
2333         \str_if_eq:nnTF {##1}{B}{ {} }{
2334           {\_stex_term_arg:nn{\int_use:N \l_tmpa_int}{##### \int_use:N \l_tmpa_in
2335         }
2336       }
2337     }
2338   }
2339   \exp_after:wN\exp_after:wN\exp_after:wN \def
2340   \exp_after:wN\exp_after:wN\exp_after:wN \l_tmpa_cs
2341   \exp_after:wN\exp_after:wN\exp_after:wN ##
2342   \exp_after:wN\exp_after:wN\exp_after:wN 1
2343   \exp_after:wN\exp_after:wN\exp_after:wN ##
```

```

2344 \exp_after:wN\exp_after:wN\exp_after:wN 2
2345 \exp_after:wN\exp_after:wN\exp_after:wN {
2346   \exp_after:wN \exp_after:wN \exp_after:wN
2347   \exp_not:n \exp_after:wN \exp_after:wN \exp_after:wN {
2348     \exp_after:wN \l_tmpa_cs \l_tmpa_tl
2349   }
2350 }
2351
2352 \seq_pop_left:NN \l__stex_notation_remaining_precs_seq \l_tmpa_str
2353 \tl_put_right:Nx \l_stex_notation_dummyargs_tl { {
2354   \stex_term_math_assoc_arg:nnnn
2355   { \int_use:N \l__stex_notation_currarg_int }
2356   { \l_tmpa_str }
2357   { ####\int_use:N \l__stex_notation_currarg_int }
2358   { \l_tmpa_cs {####1} {####2} }
2359 } }
2360 \__stex_notation_arguments:
2361 }

```

(End definition for __stex_notation_argument_assoc:n.)

__stex_notation_final: Called after processing all notation arguments

```

2362 \cs_new_protected:Nn \__stex_notation_final: {
2363 % \exp_args:Nne \use:nn
2364 % {
2365 % \cs_generate_from_arg_count:cNnn {
2366 %   stex_notation_ \l_stex_get_symbol_uri_str \c_hash_str
2367 %   \l__stex_notation_suffix_str
2368 %   _cs
2369 % }
2370 % \cs_set:Npn \l__stex_notation_arity_str } { {
2371 %   \exp_after:wN \exp_after:wN \exp_after:wN
2372 %   \exp_not:n \exp_after:wN \exp_after:wN \exp_after:wN
2373 %   { \exp_after:wN \l_stex_notation_macrocode_cs \l_stex_notation_dummyargs_tl \stex_sy
2374 % } }
2375
2376 % \tl_if_empty:NF \l__stex_notation_op_tl {
2377 %   \cs_set:cpx {
2378 %     stex_op_notation_ \l_stex_get_symbol_uri_str \c_hash_str
2379 %     \l__stex_notation_suffix_str
2380 %     _cs
2381 %   } { \exp_not:N \comp{ \exp_args:No \exp_not:n { \l__stex_notation_op_tl } } }
2382 % }
2383
2384 \exp_args:Nx \stex_do_up_to_module:n {
2385   \cs_generate_from_arg_count:cNnn {
2386     stex_notation_ \l_stex_get_symbol_uri_str \c_hash_str
2387     \l__stex_notation_suffix_str
2388     _cs
2389   } \cs_set:Npn { \l__stex_notation_arity_str } {
2390     \exp_after:wN \exp_after:wN \exp_after:wN
2391     \exp_not:n \exp_after:wN \exp_after:wN \exp_after:wN
2392     { \exp_after:wN \l_stex_notation_macrocode_cs \l_stex_notation_dummyargs_tl \stex_sy
2393   }

```

```

2394 \tl_if_empty:NF \l__stex_notation_op_tl {
2395   \cs_set:cpn {
2396     stex_op_notation_\l_stex_get_symbol_uri_str \c_hash_str
2397     \l__stex_notation_suffix_str
2398     _cs
2399   } { \exp_not:N \comp{ \exp_args:No \exp_not:n { \l__stex_notation_op_tl } } }
2400 }
2401 }
2402
2403 \exp_args:Ne
2404 \stex_add_to_current_module:n {
2405   \cs_generate_from_arg_count:cNnn {
2406     stex_notation_ \l_stex_get_symbol_uri_str \c_hash_str
2407     \l__stex_notation_suffix_str
2408     _cs
2409   } \cs_set:Npn {\l__stex_notation_arity_str} {
2410     \exp_after:wN \exp_after:wN \exp_after:wN
2411     \exp_not:n \exp_after:wN \exp_after:wN \exp_after:wN
2412     { \exp_after:wN \l_stex_notation_macrocode_cs \l_stex_notation_dummyargs_tl \stex_sy
2413   }
2414   \tl_if_empty:NF \l__stex_notation_op_tl {
2415     \cs_set:cpn {
2416       stex_op_notation_\l_stex_get_symbol_uri_str \c_hash_str
2417       \l__stex_notation_suffix_str
2418       _cs
2419     } { \exp_not:N \comp{ \exp_args:No \exp_not:n { \l__stex_notation_op_tl } } }
2420   }
2421 }
2422
2423 \stex_debug:nn{symbols}{
2424   Notation~\l__stex_notation_suffix_str
2425   ~for~\l_stex_get_symbol_uri_str^^J
2426   Operator~precedence:~\l__stex_notation_opprec_tl^^J
2427   Argument~precedences:~
2428   \seq_use:Nn \l__stex_notation_precedences_seq {,~}^^J
2429   Notation: \cs_meaning:c {
2430     stex_notation_ \l_stex_get_symbol_uri_str \c_hash_str
2431     \l__stex_notation_suffix_str
2432     _cs
2433   }
2434 }
2435
2436 \exp_args:Nx
2437 \stex_do_up_to_module:n {
2438   \seq_put_right:cx {
2439     l_stex_symdecl_ \l_stex_get_symbol_uri_str
2440     _notations
2441   } {
2442     \l__stex_notation_suffix_str
2443   }
2444 }
2445 \exp_args:Ne
2446 \stex_add_to_current_module:n {
2447   \seq_put_right:cn {

```



```

2448     \l_stex_symdecl \l_stex_get_symbol_uri_str
2449     _notations
2450   } { \l__stex_notation_suffix_str }
2451 }
2452
2453 \stex_if_smsmode:F {
2454
2455   % HTML annotations
2456   \stex_if_do_html:T {
2457     \stex_annotate_invisible:nnn { notation }
2458     { \l_stex_get_symbol_uri_str } {
2459       \stex_annotate_invisible:nnn { notationfragment }
2460       { \l__stex_notation_suffix_str }{}
2461       \stex_annotate_invisible:nnn { precedence }
2462       { \l__stex_notation_prec_str }{}
2463
2464       \int_zero:N \l_tmpa_int
2465       \str_set_eq:NN \l__stex_notation_remaining_args_str \l__stex_notation_args_str
2466       \tl_clear:N \l_tmpa_tl
2467       \int_step_inline:nn { \l__stex_notation_arity_str }{
2468         \int_incr:N \l_tmpa_int
2469         \str_set:Nx \l_tmpb_str { \str_head:N \l__stex_notation_remaining_args_str }
2470         \str_set:Nx \l__stex_notation_remaining_args_str { \str_tail:N \l__stex_notation_r
2471         \str_if_eq:VnTF \l_tmpb_str a {
2472           \tl_set:Nx \l_tmpa_tl { \l_tmpa_tl {
2473             \c_hash_str \c_hash_str \int_use:N \l_tmpa_int a ,
2474             \c_hash_str \c_hash_str \int_use:N \l_tmpa_int b
2475           } }
2476         }{
2477           \str_if_eq:VnTF \l_tmpb_str B {
2478             \tl_set:Nx \l_tmpa_tl { \l_tmpa_tl {
2479               \c_hash_str \c_hash_str \int_use:N \l_tmpa_int a ,
2480               \c_hash_str \c_hash_str \int_use:N \l_tmpa_int b
2481             } }
2482           }{
2483             \tl_set:Nx \l_tmpa_tl { \l_tmpa_tl {
2484               \c_hash_str \c_hash_str \int_use:N \l_tmpa_int
2485             } }
2486           }
2487         }
2488       }
2489       \stex_annotate_invisible:nnn { notationcomp }{}{
2490         \str_set:Nx \l_stex_current_symbol_str {\l_stex_get_symbol_uri_str }
2491         $ \exp_args:Nno \use:nn { \use:c {
2492           stex_notation_ \l_stex_current_symbol_str
2493           \c_hash_str \l__stex_notation_suffix_str _cs
2494         } } { \l_tmpa_tl } $
2495       }
2496     }
2497   }
2498 }
2499 }

```

(End definition for _stex_notation_final:.)

\setnotation

```

2500 \keys_define:nn { stex / setnotation } {
2501   lang .tl_set_x:N = \l__stex_notation_lang_str ,
2502   variant .tl_set_x:N = \l__stex_notation_variant_str ,
2503   unknown .code:n = \str_set:Nx
2504     \l__stex_notation_variant_str \l_keys_key_str
2505 }
2506
2507 \cs_new_protected:Nn \stex_setnotation_args:n {
2508   \str_clear:N \l__stex_notation_lang_str
2509   \str_clear:N \l__stex_notation_variant_str
2510   \keys_set:nn { stex / setnotation } { #1 }
2511 }
2512
2513 \cs_new_protected:Nn \stex_setnotation:n {
2514   \exp_args:Nnx \seq_if_in:cnTF { l_stex_symdecl_#1 _notations }
2515     { \l__stex_notation_variant_str \c_hash_str \l__stex_notation_lang_str }{
2516     \exp_args:Nnx \seq_remove_all:cn { l_stex_symdecl_#1 _notations }
2517       { \l__stex_notation_variant_str \c_hash_str \l__stex_notation_lang_str }
2518     \exp_args:Nnx \seq_remove_all:cn { l_stex_symdecl_#1 _notations }
2519       { \c_hash_str }
2520     \exp_args:Nnx \seq_put_left:cn { l_stex_symdecl_#1 _notations }
2521       { \l__stex_notation_variant_str \c_hash_str \l__stex_notation_lang_str }
2522     \exp_args:Nx \stex_add_to_current_module:n {
2523       \exp_args:Nnx \seq_remove_all:cn { l_stex_symdecl_#1 _notations }
2524         { \l__stex_notation_variant_str \c_hash_str \l__stex_notation_lang_str }
2525       \exp_args:Nnx \seq_put_left:cn { l_stex_symdecl_#1 _notations }
2526         { \l__stex_notation_variant_str \c_hash_str \l__stex_notation_lang_str }
2527       \exp_args:Nnx \seq_remove_all:cn { l_stex_symdecl_#1 _notations }
2528         { \c_hash_str }
2529     }
2530     \stex_debug:nn {notations}{
2531       Setting~default~notation~
2532       {\l__stex_notation_variant_str \c_hash_str \l__stex_notation_lang_str}~for~
2533       #1 \\
2534       \expandafter\meaning\csname
2535         l_stex_symdecl_#1 _notations\endcsname
2536     }
2537   }{
2538     % todo throw error
2539   }
2540 }
2541
2542 \NewDocumentCommand \setnotation {m m} {
2543   \stex_get_symbol:n { #1 }
2544   \stex_setnotation_args:n { #2 }
2545   \stex_setnotation:n{\l_stex_get_symbol_uri_str}
2546   \stex_smsmode_do:\ignorespacesandpars
2547 }
2548
2549 \cs_new_protected:Nn \stex_copy_notations:nn {
2550   \stex_debug:nn {notations}{
2551     Copying~notations~from~#2~to~#1\\
2552     \seq_use:cn{l_stex_symdecl_#2_notations}{,~}

```

```

2553 }
2554 \tl_clear:N \l_tmpa_tl
2555 \int_step_inline:nn { \prop_item:cn {l_stex_symdecl_#2_prop}{ arity } } {
2556   \tl_put_right:Nn \l_tmpa_tl { {## ##1} }
2557 }
2558 \seq_map_inline:cn {l_stex_symdecl_#2_notations}{
2559   \cs_set_eq:Nc \l_tmpa_cs { stex_notation_ #2 \c_hash_str ##1 _cs }
2560   \edef \l_tmpa_tl {
2561     \exp_after:wN\exp_after:wN\exp_after:wN \exp_not:n
2562     \exp_after:wN\exp_after:wN\exp_after:wN {
2563       \exp_after:wN \l_tmpa_cs \l_tmpa_tl
2564     }
2565   }
2566   \exp_args:Nx
2567   \stex_do_up_to_module:n {
2568     \seq_put_right:cn{l_stex_symdecl_#1_notations}{##1}
2569     \cs_generate_from_arg_count:cNnn {
2570       stex_notation_ #1 \c_hash_str ##1 _cs
2571     } \cs_set:Npn { \prop_item:cn {l_stex_symdecl_#2_prop}{ arity } }{
2572       \exp_after:wN\exp_not:n\exp_after:wN{\l_tmpa_tl}
2573     }
2574   }
2575 }
2576 }
2577
2578 \NewDocumentCommand \copynotation {m m} {
2579   \stex_get_symbol:n { #1 }
2580   \str_set_eq:NN \l_tmpa_str \l_stex_get_symbol_uri_str
2581   \stex_get_symbol:n { #2 }
2582   \exp_args:Noo
2583   \stex_copy_notations:nn \l_tmpa_str \l_stex_get_symbol_uri_str
2584   \exp_args:Nx \stex_add_import_to_current_module:n{
2585     \stex_copy_notations:nn {\l_tmpa_str} {\l_stex_get_symbol_uri_str}
2586   }
2587   \stex_smsmode_do:\ignorespacesandpars
2588 }
2589

```

(End definition for \setnotation. This function is documented on page 18.)

\symdef

```

2590 \keys_define:nn { stex / symdef } {
2591   name .str_set_x:N = \l_stex_symdecl_name_str ,
2592   local .bool_set:N = \l_stex_symdecl_local_bool ,
2593   args .str_set_x:N = \l_stex_symdecl_args_str ,
2594   type .tl_set:N = \l_stex_symdecl_type_tl ,
2595   def .tl_set:N = \l_stex_symdecl_definiens_tl ,
2596   op .tl_set:N = \l_stex_notation_op_tl ,
2597   lang .str_set_x:N = \l_stex_notation_lang_str ,
2598   variant .str_set_x:N = \l_stex_notation_variant_str ,
2599   prec .str_set_x:N = \l_stex_notation_prec_str ,
2600   assoc .choices:nn =
2601     {bin,binl,binr,pre,conj,pwconj}
2602     {\str_set:Nx \l_stex_symdecl_assoc_type_str {\l_keys_choice_tl}},

```

```

2603   unknown .code:n      = \str_set:Nx
2604     \l__stex_notation_variant_str \l_keys_key_str
2605 }
2606
2607 \cs_new_protected:Nn \__stex_notation_symdef_args:n {
2608   \str_clear:N \l_stex_symdecl_name_str
2609   \str_clear:N \l_stex_symdecl_args_str
2610   \str_clear:N \l_stex_symdecl_assoctype_str
2611   \bool_set_false:N \l_stex_symdecl_local_bool
2612   \tl_clear:N \l_stex_symdecl_type_tl
2613   \tl_clear:N \l_stex_symdecl_definiens_tl
2614   \str_clear:N \l__stex_notation_lang_str
2615   \str_clear:N \l__stex_notation_variant_str
2616   \str_clear:N \l__stex_notation_prec_str
2617   \tl_clear:N \l__stex_notation_op_tl
2618
2619   \keys_set:nn { stex / symdef } { #1 }
2620 }
2621
2622 \NewDocumentCommand \symdef { m O{} } {
2623   \__stex_notation_symdef_args:n { #2 }
2624   \bool_set_true:N \l_stex_symdecl_make_macro_bool
2625   \stex_symdecl_do:n { #1 }
2626   \tl_set:Nn \l_stex_notation_after_do_tl {
2627     \__stex_notation_final:
2628     \stex_smsmode_do:\ignorespacesandpars
2629   }
2630   \str_set:Nx \l_stex_get_symbol_uri_str {
2631     \l_stex_current_module_str ? \l_stex_symdecl_name_str
2632   }
2633   \exp_args:Nx \stex_notation_do:nnnnn
2634     { \prop_item:cn {l_stex_symdecl\l_stex_get_symbol_uri_str_prop} { args } }
2635     { \prop_item:cn {l_stex_symdecl\l_stex_get_symbol_uri_str_prop} { arity } }
2636     { \l__stex_notation_variant_str \c_hash_str \l__stex_notation_lang_str }
2637     { \l__stex_notation_prec_str }
2638   }
2639   \stex_deactivate_macro:Nn \symdef {module~environments}

```

(End definition for `\symdef`. This function is documented on page [61](#).)

29.3 Variables

```

2640 <@@=stex_variables>
2641
2642 \keys_define:nn { stex / vardef } {
2643   name .str_set_x:N = \l__stex_variables_name_str ,
2644   args .str_set_x:N = \l__stex_variables_args_str ,
2645   type .tl_set:N    = \l__stex_variables_type_tl ,
2646   def  .tl_set:N    = \l__stex_variables_def_tl ,
2647   op   .tl_set:N    = \l__stex_variables_op_tl ,
2648   prec .str_set_x:N = \l__stex_variables_prec_str ,
2649   assoc .choices:nn =
2650     {bin,binl,binr,pre,conj,pwconj}
2651     {\str_set:Nx \l__stex_variables_assoctype_str {\l_keys_choice_tl}},

```

```

2652 bind .choices:nn =
2653 {forall,exists}
2654 {\str_set:Nx \l__stex_variables_bind_str {\l_keys_choice_tl}}
2655 }
2656
2657 \cs_new_protected:Nn \__stex_variables_args:n {
2658 \str_clear:N \l__stex_variables_name_str
2659 \str_clear:N \l__stex_variables_args_str
2660 \str_clear:N \l__stex_variables_prec_str
2661 \str_clear:N \l__stex_variables_assoctype_str
2662 \str_clear:N \l__stex_variables_bind_str
2663 \tl_clear:N \l__stex_variables_type_tl
2664 \tl_clear:N \l__stex_variables_def_tl
2665 \tl_clear:N \l__stex_variables_op_tl
2666
2667 \keys_set:nn { stex / vardef } { #1 }
2668 }
2669
2670 \NewDocumentCommand \__stex_variables_do_simple:nnn { m O{} } {
2671 \__stex_variables_args:n {#2}
2672 \str_if_empty:NT \l__stex_variables_name_str {
2673 \str_set:Nx \l__stex_variables_name_str { #1 }
2674 }
2675 \prop_clear:N \l_tmpa_prop
2676 \prop_put:Nno \l_tmpa_prop { name } \l__stex_variables_name_str
2677
2678 \int_zero:N \l_tmpb_int
2679 \bool_set_true:N \l_tmpa_bool
2680 \str_map_inline:Nn \l__stex_variables_args_str {
2681 \token_case_meaning:NnF ##1 {
2682 0 {} 1 {} 2 {} 3 {} 4 {} 5 {} 6 {} 7 {} 8 {} 9 {}
2683 {\tl_to_str:n i} { \bool_set_false:N \l_tmpa_bool }
2684 {\tl_to_str:n b} { \bool_set_false:N \l_tmpa_bool }
2685 {\tl_to_str:n a} {
2686 \bool_set_false:N \l_tmpa_bool
2687 \int_incr:N \l_tmpb_int
2688 }
2689 {\tl_to_str:n B} {
2690 \bool_set_false:N \l_tmpa_bool
2691 \int_incr:N \l_tmpb_int
2692 }
2693 }{
2694 \msg_error:nnxx{stex}{error/wrongargs}{
2695 variable~\l__stex_variables_name_str
2696 }{##1}
2697 }
2698 }
2699 \bool_if:NTF \l_tmpa_bool {
2700 % possibly numeric
2701 \str_if_empty:NTF \l__stex_variables_args_str {
2702 \prop_put:Nnn \l_tmpa_prop { args } {}
2703 \prop_put:Nnn \l_tmpa_prop { arity } { 0 }
2704 }{
2705 \int_set:Nn \l_tmpa_int { \l__stex_variables_args_str }

```

```

2706     \prop_put:Nnx \l_tmpa_prop { arity } { \int_use:N \l_tmpa_int }
2707     \str_clear:N \l_tmpa_str
2708     \int_step_inline:nn \l_tmpa_int {
2709       \str_put_right:Nn \l_tmpa_str i
2710     }
2711     \str_set_eq:NN \l__stex_variables_args_str \l_tmpa_str
2712     \prop_put:Nnx \l_tmpa_prop { args } { \l__stex_variables_args_str }
2713   }
2714 } {
2715   \prop_put:Nnx \l_tmpa_prop { args } { \l__stex_variables_args_str }
2716   \prop_put:Nnx \l_tmpa_prop { arity }
2717   { \str_count:N \l__stex_variables_args_str }
2718 }
2719 \prop_put:Nnx \l_tmpa_prop { assoc } { \int_use:N \l_tmpb_int }
2720 \tl_set:cx { #1 } { \stex_invoke_variable:n { \l__stex_variables_name_str } }
2721
2722 \prop_set_eq:cN { l_stex_variable_\l__stex_variables_name_str _prop } \l_tmpa_prop
2723
2724 \tl_if_empty:NF \l__stex_variables_op_tl {
2725   \cs_set:cpx {
2726     stex_var_op_notation_\l__stex_variables_name_str_cs
2727   } { \exp_not:N\comp{ \exp_args:No \exp_not:n { \l__stex_variables_op_tl } } }
2728 }
2729
2730 \tl_set:Nn \l_stex_notation_after_do_tl {
2731   \exp_args:Nne \use:nn {
2732     \cs_generate_from_arg_count:cNnn { stex_var_notation_\l__stex_variables_name_str_cs }
2733     \cs_set:Npn { \prop_item:Nn \l_tmpa_prop { arity } }
2734   } {{
2735     \exp_after:wN \exp_after:wN \exp_after:wN
2736     \exp_not:n \exp_after:wN \exp_after:wN \exp_after:wN
2737     { \exp_after:wN \l_stex_notation_macrocode_cs \l_stex_notation_dummyargs_tl \stex_symbol
2738   }}
2739 \stex_if_do_html:T {
2740   \stex_annotate_invisible:nnn {vardecl}{\l__stex_variables_name_str}{
2741     \stex_annotate_invisible:nnn { precedence }
2742     { \l__stex_variables_prec_str }{}
2743     \tl_if_empty:NF \l__stex_variables_type_tl { \stex_annotate_invisible:nnn{type}{ } { $\l
2744     \stex_annotate_invisible:nnn{args}{ } { \l__stex_variables_args_str }
2745     \stex_annotate_invisible:nnn{macroname}{#1}{ }
2746     \tl_if_empty:NF \l__stex_variables_def_tl {
2747       \stex_annotate_invisible:nnn{definiens}{ }
2748       { $\l__stex_variables_def_tl$ }
2749     }
2750     \str_if_empty:NF \l__stex_variables_assoc_type_str {
2751       \stex_annotate_invisible:nnn{assoc_type}{\l__stex_variables_assoc_type_str}{ }
2752     }
2753     \int_zero:N \l_tmpa_int
2754     \str_set_eq:NN \l__stex_variables_remaining_args_str \l__stex_variables_args_str
2755     \tl_clear:N \l_tmpa_tl
2756     \int_step_inline:nn { \prop_item:Nn \l_tmpa_prop { arity } } {{
2757       \int_incr:N \l_tmpa_int
2758       \str_set:Nx \l_tmpb_str { \str_head:N \l__stex_variables_remaining_args_str }
2759       \str_set:Nx \l__stex_variables_remaining_args_str { \str_tail:N \l__stex_variables

```

```

2760 \str_if_eq:VnTF \l_tmpb_str a {
2761 \tl_set:Nx \l_tmpa_tl { \l_tmpa_tl {
2762 \c_hash_str \c_hash_str \int_use:N \l_tmpa_int a ,
2763 \c_hash_str \c_hash_str \int_use:N \l_tmpa_int b
2764 } }
2765 }{
2766 \str_if_eq:VnTF \l_tmpb_str B {
2767 \tl_set:Nx \l_tmpa_tl { \l_tmpa_tl {
2768 \c_hash_str \c_hash_str \int_use:N \l_tmpa_int a ,
2769 \c_hash_str \c_hash_str \int_use:N \l_tmpa_int b
2770 } }
2771 }{
2772 \tl_set:Nx \l_tmpa_tl { \l_tmpa_tl {
2773 \c_hash_str \c_hash_str \int_use:N \l_tmpa_int
2774 } }
2775 }
2776 }
2777 }
2778 \stex_annotate_invisible:nnn { notationcomp }{}{
2779 \str_set:Nx \l_stex_current_symbol_str {var://\l__stex_variables_name_str }
2780 $ \exp_args:Nno \use:nn { \use:c {
2781 stex_var_notation_\l__stex_variables_name_str _cs
2782 } } { \l_tmpa_tl } $
2783 }
2784 }
2785 }\ignorespacesandpars
2786 }
2787
2788 \stex_notation_do:nnnnn { \l__stex_variables_args_str } { \prop_item:Nn \l_tmpa_prop { ari
2789 }
2790
2791 \cs_new:Nn \_stex_reset:N {
2792 \tl_if_exist:NTF #1 {
2793 \def \exp_not:N #1 { \exp_args:No \exp_not:n #1 }
2794 }{
2795 \let \exp_not:N #1 \exp_not:N \undefined
2796 }
2797 }
2798
2799 \NewDocumentCommand \__stex_variables_do_complex:nn { m m }{
2800 \clist_set:Nx \l__stex_variables_names { \tl_to_str:n {#1} }
2801 \exp_args:Nnx \use:nn {
2802 % TODO
2803 \stex_annotate_invisible:nnn {vardecls}{\clist_use:Nn\l__stex_variables_names,}{
2804 #2
2805 }
2806 }{
2807 \_stex_reset:N \varnot
2808 \_stex_reset:N \vartype
2809 \_stex_reset:N \vardefi
2810 }
2811 }
2812
2813 \NewDocumentCommand \vardef { s } {

```

```

2814 \IfBooleanTF#1 {
2815   \__stex_variables_do_complex:nn
2816 }{
2817   \__stex_variables_do_simple:nnn
2818 }
2819 }
2820
2821 \NewDocumentCommand \svar { 0{} m }{
2822   \tl_if_empty:nTF {#1}{
2823     \str_set:Nn \l_tmpa_str { #2 }
2824   }{
2825     \str_set:Nn \l_tmpa_str { #1 }
2826   }
2827   \_stex_term_omv:nn {
2828     var://\l_tmpa_str
2829   }{
2830     \exp_args:Nnx \use:nn {
2831       \def\comp{\_varcomp}
2832       \str_set:Nx \l_stex_current_symbol_str { var://\l_tmpa_str }
2833       \comp{ #2 }
2834     }{
2835       \_stex_reset:N \comp
2836       \_stex_reset:N \l_stex_current_symbol_str
2837     }
2838   }
2839 }
2840
2841
2842
2843 \keys_define:nn { stex / varseq } {
2844   name .str_set_x:N = \l__stex_variables_name_str ,
2845   args .int_set:N   = \l__stex_variables_args_int ,
2846   type .tl_set:N    = \l__stex_variables_type_tl ,
2847   mid .tl_set:N     = \l__stex_variables_mid_tl ,
2848   bind .choices:nn =
2849     {forall,exists}
2850     {\str_set:Nx \l__stex_variables_bind_str {\l_keys_choice_tl}}
2851 }
2852
2853 \cs_new_protected:Nn \__stex_variables_seq_args:n {
2854   \str_clear:N \l__stex_variables_name_str
2855   \int_set:Nn \l__stex_variables_args_int 1
2856   \tl_clear:N \l__stex_variables_type_tl
2857   \str_clear:N \l__stex_variables_bind_str
2858
2859   \keys_set:nn { stex / varseq } { #1 }
2860 }
2861
2862 \NewDocumentCommand \varseq {m 0{} m m m}{
2863   \__stex_variables_seq_args:n { #2 }
2864   \str_if_empty:NT \l__stex_variables_name_str {
2865     \str_set:Nx \l__stex_variables_name_str { #1 }
2866   }
2867   \prop_clear:N \l_tmpa_prop

```



```

2868 \prop_put:Nnx \l_tmpa_prop { arity }{\int_use:N \l__stex_variables_args_int}
2869
2870 \seq_set_from_clist:Nn \l_tmpa_seq {#3}
2871 \int_compare:nNnF {\seq_count:N \l_tmpa_seq} = \l__stex_variables_args_int {
2872   \msg_error:nnxx{stex}{error/seqlength}
2873   {\int_use:N \l__stex_variables_args_int}
2874   {\seq_count:N \l_tmpa_seq}
2875 }
2876 \seq_set_from_clist:Nn \l_tmpb_seq {#4}
2877 \int_compare:nNnF {\seq_count:N \l_tmpb_seq} = \l__stex_variables_args_int {
2878   \msg_error:nnxx{stex}{error/seqlength}
2879   {\int_use:N \l__stex_variables_args_int}
2880   {\seq_count:N \l_tmpb_seq}
2881 }
2882 \prop_put:Nnn \l_tmpa_prop {starts} {#3}
2883 \prop_put:Nnn \l_tmpa_prop {ends} {#4}
2884
2885 \cs_generate_from_arg_count:cNnn {stex_varseq\l__stex_variables_name_str _cs}
2886   \cs_set:Npn {\int_use:N \l__stex_variables_args_int} { #5 }
2887
2888 \exp_args:NNo \tl_set:No \l_tmpa_tl {\use:c{stex_varseq\l__stex_variables_name_str _cs}}
2889 \int_step_inline:nn \l__stex_variables_args_int {
2890   \tl_put_right:Nx \l_tmpa_tl { {\seq_item:Nn \l_tmpa_seq {##1}} }
2891 }
2892 \tl_set:Nx \l_tmpa_tl {\exp_args:NNo \exp_args:No \exp_not:n{\l_tmpa_tl}}
2893 \tl_put_right:Nn \l_tmpa_tl {,\ellipses,}
2894 \tl_if_empty:NF \l__stex_variables_mid_tl {
2895   \tl_put_right:No \l_tmpa_tl \l__stex_variables_mid_tl
2896   \tl_put_right:Nn \l_tmpa_tl {,\ellipses,}
2897 }
2898 \exp_args:NNo \tl_set:No \l_tmpb_tl {\use:c{stex_varseq\l__stex_variables_name_str _cs}}
2899 \int_step_inline:nn \l__stex_variables_args_int {
2900   \tl_put_right:Nx \l_tmpb_tl { {\seq_item:Nn \l_tmpb_seq {##1}} }
2901 }
2902 \tl_set:Nx \l_tmpb_tl {\exp_args:NNo \exp_args:No \exp_not:n{\l_tmpb_tl}}
2903 \tl_put_right:No \l_tmpa_tl \l_tmpb_tl
2904
2905
2906 \prop_put:Nno \l_tmpa_prop { notation }\l_tmpa_tl
2907
2908 \tl_set:cx {#1} {\stex_invoke_sequence:n {\l__stex_variables_name_str}}
2909
2910 \exp_args:NNo \tl_set:No \l_tmpa_tl {\use:c{stex_varseq\l__stex_variables_name_str _cs}}
2911
2912 \int_step_inline:nn \l__stex_variables_args_int {
2913   \tl_set:Nx \l_tmpa_tl {\exp_args:No \exp_not:n \l_tmpa_tl {
2914     \stex_term_math_arg:nnn{##1}{0}{\exp_not:n{####}##1}
2915   }}
2916 }
2917
2918 \tl_set:Nx \l_tmpa_tl {
2919   \stex_term_math_oma:nnnn { varseq://\l__stex_variables_name_str}{\l__stex_variables_name_str}{0}{
2920     \exp_args:NNo \exp_args:No \exp_not:n {\l_tmpa_tl}
2921   }

```

```

2922 }
2923
2924 \tl_set:No \l_tmpa_tl { \exp_after:wN { \l_tmpa_tl \stex_symbol_after_invokation_tl} }
2925
2926 \exp_args:Nno \use:nn {
2927   \cs_generate_from_arg_count:cNnn {stex_varseq_\l__stex_variables_name_str _cs}
2928   \cs_set:Npn {\int_use:N \l__stex_variables_args_int}}{\l_tmpa_tl}
2929
2930 \stex_debug:nn{sequences}{New~Sequence:~
2931   \expandafter\meaning\csname stex_varseq_\l__stex_variables_name_str _cs\endcsname\\~\\
2932   \prop_to_keyval:N \l_tmpa_prop
2933 }
2934
2935 \prop_set_eq:cN {stex_varseq_\l__stex_variables_name_str _prop}\l_tmpa_prop
2936 \ignorespacesandpars
2937 }
2938
2939 \end{package}

```

Chapter 30

STEX -Terms Implementation

```
2940 <*package>
2941
2942 %%%%%%%%%%% terms.dtx %%%%%%%%%%%
2943
2944 <@@=stex_terms>
2945
2946   Warnings and error messages
2947   \msg_new:nnn{stex}{error/nonotation}{
2948     Symbol~#1~invoked,~but~has~no~notation~#2!
2949   }
2950   \msg_new:nnn{stex}{error/notationarg}{
2951     Error~in~parsing~notation~#1
2952   }
2953   \msg_new:nnn{stex}{error/noop}{
2954     Symbol~#1~has~no~operator~notation~for~notation~#2
2955   }
2956   \msg_new:nnn{stex}{error/notallowed}{
2957     Symbol~invocation~#1~not~allowed~in~notation~component~of~#2
2958   }
```

30.1 Symbol Invocations

`\stex_invoke_symbol:n` Invokes a semantic macro

```
2958
2959
2960 \bool_new:N \l_stex_allow_semantic_bool
2961 \bool_set_true:N \l_stex_allow_semantic_bool
2962
2963 \cs_new_protected:Nn \stex_invoke_symbol:n {
2964   \bool_if:NTF \l_stex_allow_semantic_bool {
2965     \str_if_eq:eeF {
2966       \prop_item:cn {
2967         l_stex_symdecl_#1_prop
2968       }{ deprecate }
2969     }
```

```

2969   }{}{
2970     \msg_warning:nxxx{stex}{warning/deprecated}{
2971       Symbol~#1
2972     }{
2973       \prop_item:cn {l_stex_symdecl_#1_prop}{ deprecate }
2974     }
2975   }
2976   \if_mode_math:
2977     \exp_after:wN \__stex_terms_invoke_math:n
2978   \else:
2979     \exp_after:wN \__stex_terms_invoke_text:n
2980   \fi: { #1 }
2981 }{
2982   \msg_error:nxxx{stex}{error/notallowed}{#1}{\l_stex_current_symbol_str}
2983 }
2984 }
2985
2986 \cs_new_protected:Nn \__stex_terms_invoke_text:n {
2987   \peek_charcode_remove:NTF ! {
2988     \__stex_terms_invoke_op_custom:nn {#1}
2989   }{
2990     \__stex_terms_invoke_custom:nn {#1}
2991   }
2992 }
2993
2994 \cs_new_protected:Nn \__stex_terms_invoke_math:n {
2995   \peek_charcode_remove:NTF ! {
2996     % operator
2997     \peek_charcode_remove:NTF * {
2998       % custom op
2999       \__stex_terms_invoke_op_custom:nn {#1}
3000     }{
3001       % op notation
3002       \peek_charcode:NTF [ {
3003         \__stex_terms_invoke_op_notation:nw {#1}
3004       }{
3005         \__stex_terms_invoke_op_notation:nw {#1}[]
3006       }
3007     }
3008   }{
3009     \peek_charcode_remove:NTF * {
3010       \__stex_terms_invoke_custom:nn {#1}
3011       % custom
3012     }{
3013       % normal
3014       \peek_charcode:NTF [ {
3015         \__stex_terms_invoke_notation:nw {#1}
3016       }{
3017         \__stex_terms_invoke_notation:nw {#1}[]
3018       }
3019     }
3020   }
3021 }
3022

```

```

3023
3024 \cs_new_protected:Nn \__stex_terms_invoke_op_custom:nn {
3025   \exp_args:Nnx \use:nn {
3026     \def\comp{\_comp}
3027     \str_set:Nn \l_stex_current_symbol_str { #1 }
3028     \bool_set_false:N \l_stex_allow_semantic_bool
3029     \stex_term_oms:nnn {#1 \c_hash_str\c_hash_str}{#1}{
3030       \comp{ #2 }
3031     }
3032   }{
3033     \stex_reset:N \comp
3034     \stex_reset:N \l_stex_current_symbol_str
3035     \bool_set_true:N \l_stex_allow_semantic_bool
3036   }
3037 }
3038
3039 \keys_define:nn { stex / terms } {
3040   lang .tl_set_x:N = \l_stex_notation_lang_str ,
3041   variant .tl_set_x:N = \l_stex_notation_variant_str ,
3042   unknown .code:n = \str_set:Nx
3043     \l_stex_notation_variant_str \l_keys_key_str
3044 }
3045
3046 \cs_new_protected:Nn \__stex_terms_args:n {
3047   \str_clear:N \l_stex_notation_lang_str
3048   \str_clear:N \l_stex_notation_variant_str
3049
3050   \keys_set:nn { stex / terms } { #1 }
3051 }
3052
3053 \cs_new_protected:Nn \stex_find_notation:nn {
3054   \__stex_terms_args:n { #2 }
3055   \seq_if_empty:cTF {
3056     \l_stex_symdecl_#1_notations
3057   } {
3058     \msg_error:nnxx{stex}{error/nonotation}{#1}{s}
3059   } {
3060     \bool_lazy_all:nTF {
3061       {\str_if_empty_p:N \l_stex_notation_variant_str}
3062       {\str_if_empty_p:N \l_stex_notation_lang_str}
3063     }{
3064       \seq_get_left:cN {\l_stex_symdecl_#1_notations}\l_stex_notation_variant_str
3065     }{
3066       \seq_if_in:cxTF {\l_stex_symdecl_#1_notations}{
3067         \l_stex_notation_variant_str \c_hash_str \l_stex_notation_lang_str
3068       }{
3069         \str_set:Nx \l_stex_notation_variant_str { \l_stex_notation_variant_str \c_hash_str
3070       }{
3071         \msg_error:nnxx{stex}{error/nonotation}{#1}{
3072           ~\l_stex_notation_variant_str \c_hash_str \l_stex_notation_lang_str
3073         }
3074       }
3075     }
3076   }

```

```

3077 }
3078
3079 \cs_new_protected:Npn \__stex_terms_invoke_op_notation:nw #1 [#2] {
3080   \exp_args:Nnx \use:nn {
3081     \def\comp{\_comp}
3082     \str_set:Nn \l_stex_current_symbol_str { #1 }
3083     \stex_find_notation:nn { #1 }{ #2 }
3084     \bool_set_false:N \l_stex_allow_semantic_bool
3085     \cs_if_exist:cTF {
3086       stex_op_notation_ #1 \c_hash_str \l_stex_notation_variant_str _cs
3087     }{
3088       \_stex_term_oms:nnn {
3089         #1 \c_hash_str \l_stex_notation_variant_str
3090       }{ #1 }{
3091         \use:c{stex_op_notation_ #1 \c_hash_str \l_stex_notation_variant_str _cs}
3092       }
3093     }{
3094       \int_compare:nNnTF {\prop_item:cn {l_stex_symdecl_#1_prop}{arity}} = 0{
3095         \cs_if_exist:cTF {
3096           stex_notation_ #1 \c_hash_str \l_stex_notation_variant_str _cs
3097         }{
3098           \tl_set:Nx \stex_symbol_after_invokation_tl {
3099             \_stex_reset:N \comp
3100             \_stex_reset:N \stex_symbol_after_invokation_tl
3101             \_stex_reset:N \l_stex_current_symbol_str
3102             \bool_set_true:N \l_stex_allow_semantic_bool
3103           }
3104           \def\comp{\_comp}
3105           \str_set:Nn \l_stex_current_symbol_str { #1 }
3106           \bool_set_false:N \l_stex_allow_semantic_bool
3107           \use:c{stex_notation_ #1 \c_hash_str \l_stex_notation_variant_str _cs}
3108         }{
3109           \msg_error:nnxx{stex}{error/nonotation}{#1}{
3110             ~\l_stex_notation_variant_str
3111           }
3112         }
3113       }{
3114         \msg_error:nnxx{stex}{error/noop}{#1}{\l_stex_notation_variant_str}
3115       }
3116     }
3117   }{
3118     \_stex_reset:N \comp
3119     \_stex_reset:N \l_stex_current_symbol_str
3120     \bool_set_true:N \l_stex_allow_semantic_bool
3121   }
3122 }
3123
3124 \cs_new_protected:Npn \__stex_terms_invoke_notation:nw #1 [#2] {
3125   \stex_find_notation:nn { #1 }{ #2 }
3126   \cs_if_exist:cTF {
3127     stex_notation_ #1 \c_hash_str \l_stex_notation_variant_str _cs
3128   }{
3129     \tl_set:Nx \stex_symbol_after_invokation_tl {
3130       \_stex_reset:N \comp

```

```

3131     \stex_reset:N \stex_symbol_after_invokation_tl
3132     \stex_reset:N \l_stex_current_symbol_str
3133     \bool_set_true:N \l_stex_allow_semantic_bool
3134   }
3135   \def\comp{\_comp}
3136   \str_set:Nn \l_stex_current_symbol_str { #1 }
3137   \bool_set_false:N \l_stex_allow_semantic_bool
3138   \use:c{stex_notation_ #1 \c_hash_str \l_stex_notation_variant_str _cs}
3139 }{
3140   \msg_error:nnxx{stex}{error/nonotation}{#1}{
3141     ~\l_stex_notation_variant_str
3142   }
3143 }
3144 }
3145
3146 \prop_new:N \l__stex_terms_custom_args_prop
3147
3148 \cs_new_protected:Nn \__stex_terms_invoke_custom:nn {
3149   \exp_args:Nnx \use:nn {
3150     \bool_set_false:N \l_stex_allow_semantic_bool
3151     \def\comp{\_comp}
3152     \str_set:Nn \l_stex_current_symbol_str { #1 }
3153     \prop_clear:N \l__stex_terms_custom_args_prop
3154     \prop_put:Nnn \l__stex_terms_custom_args_prop {currnum} {1}
3155     \prop_get:cnN {
3156       l_stex_symdecl_#1 _prop
3157     }{ args } \l_tmpa_str
3158     \prop_put:Nno \l__stex_terms_custom_args_prop {args} \l_tmpa_str
3159     \tl_set:Nn \arg { \__stex_terms_arg: }
3160     \str_if_empty:NTF \l_tmpa_str {
3161       \stex_term_oms:nnn {#1}{#1}{#2}
3162     }{
3163       \str_if_in:NnTF \l_tmpa_str b {
3164         \stex_term_ombind:nnn {#1}{#1}{#2}
3165       }{
3166         \str_if_in:NnTF \l_tmpa_str B {
3167           \stex_term_ombind:nnn {#1}{#1}{#2}
3168         }{
3169           \stex_term_oma:nnn {#1}{#1}{#2}
3170         }
3171       }
3172     }
3173     % TODO check that all arguments exist
3174   }{
3175     \stex_reset:N \l_stex_current_symbol_str
3176     \stex_reset:N \arg
3177     \stex_reset:N \comp
3178     \stex_reset:N \l__stex_terms_custom_args_prop
3179     \bool_set_true:N \l_stex_allow_semantic_bool
3180   }
3181 }
3182
3183 \NewDocumentCommand \__stex_terms_arg: { s O{} m }{
3184   \tl_if_empty:nTF {#2}{

```

```

3185 \int_set:Nn \l_tmpa_int {\prop_item:Nn \l__stex_terms_custom_args_prop {currnum}}
3186 \bool_set_true:N \l_tmpa_bool
3187 \bool_do_while:Nn \l_tmpa_bool {
3188   \exp_args:NNx \prop_if_in:NnTF \l__stex_terms_custom_args_prop {\int_use:N \l_tmpa_int}
3189   \int_incr:N \l_tmpa_int
3190   }{
3191     \bool_set_false:N \l_tmpa_bool
3192   }
3193 }
3194 ){
3195   \int_set:Nn \l_tmpa_int { #2 }
3196   \exp_args:NNx \prop_if_in:NnT \l__stex_terms_custom_args_prop {\int_use:N \l_tmpa_int} {
3197     % TODO throw error
3198   }
3199 }
3200 \str_set:Nx \l_tmpa_str {\prop_item:Nn \l__stex_terms_custom_args_prop {args} }
3201 \int_compare:nNnT \l_tmpa_int > {\str_count:N \l_tmpa_str} {
3202   % TODO throw error
3203 }
3204 \bool_set_true:N \l_stex_allow_semantic_bool
3205 \IfBooleanTF#1{
3206   \stex_annotate_invisible:n {
3207     \exp_args:No \_stex_term_arg:nn {\l_stex_current_symbol_str}{#3}
3208   }
3209 }{
3210   \exp_args:No \_stex_term_arg:nn {\l_stex_current_symbol_str}{#3}
3211 }
3212 \bool_set_false:N \l_stex_allow_semantic_bool
3213 }
3214
3215
3216 \cs_new_protected:Nn \_stex_term_arg:nn {
3217   \bool_set_true:N \l_stex_allow_semantic_bool
3218   \stex_annotate:nnn{ arg }{ #1 }{ #2 }
3219   \bool_set_false:N \l_stex_allow_semantic_bool
3220 }
3221
3222 \cs_new_protected:Nn \_stex_term_math_arg:nnn {
3223   \exp_args:Nnx \use:nn
3224   { \int_set:Nn \l__stex_terms_downprec { #2 }
3225     \_stex_term_arg:nn { #1 }{ #3 }
3226   }
3227   { \int_set:Nn \exp_not:N \l__stex_terms_downprec { \int_use:N \l__stex_terms_downprec }
3228 }

```

(End definition for `\stex_invoke_symbol:n`. This function is documented on page 62.)

`_stex_term_math_assoc_arg:nnnn`

```

3229 \cs_new_protected:Nn \_stex_term_math_assoc_arg:nnnn {
3230   \cs_set:Npn \l_tmpa_cs ##1 ##2 { #4 }
3231   \tl_set:Nn \l_tmpb_tl {\_stex_term_math_arg:nnn{#1}{#2}}
3232   \exp_args:Nx \tl_if_empty:nTF { \tl_tail:n{ #3 }}{
3233     \expandafter\if\expandafter\relax\noexpand#3
3234     \expandafter\_stex_terms_math_assoc_arg_maybe_sequence:N\expandafter#3

```



```

3235 \else\expandafter\__stex_terms_math_assoc_arg_simple:n\expandafter#3\fi
3236 }{
3237 \__stex_terms_math_assoc_arg_simple:n{#3}
3238 }
3239 }
3240
3241 \cs_new_protected:Nn \__stex_terms_math_assoc_arg_maybe_sequence:N {
3242 \str_set:Nx \l_tmpa_str { \cs_argument_spec:N #1 }
3243 \str_if_empty:NTF \l_tmpa_str {
3244 \exp_args:Nx \cs_if_eq:NNTF {
3245 \tl_head:N #1
3246 } \stex_invoke_sequence:n {
3247 \tl_set:Nx \l_tmpa_tl {\tl_tail:N #1}
3248 \str_set:Nx \l_tmpa_str {\exp_after:wN \use:n \l_tmpa_tl}
3249 \tl_set:Nx \l_tmpa_tl {\prop_item:cn {stex_varseq \l_tmpa_str _prop}{notation}}
3250 \exp_args:NNo \seq_set_from_clist:Nn \l_tmpa_seq \l_tmpa_tl
3251 \tl_set:Nx \l_tmpa_tl {\exp_not:N \exp_not:n{
3252 \exp_not:n{\exp_args:Nnx \use:nn} {
3253 \exp_not:n {
3254 \def\comp{\_varcomp}
3255 \str_set:Nn \l_stex_current_symbol_str
3256 } {varseq://\l_tmpa_str}
3257 \exp_not:n{ ##1 }
3258 }{
3259 \exp_not:n {
3260 \_stex_reset:N \comp
3261 \_stex_reset:N \l_stex_current_symbol_str
3262 }
3263 }
3264 }}}
3265 \exp_args:Nno \use:nn {\seq_set_map:NNn \l_tmpa_seq \l_tmpa_seq} \l_tmpa_tl
3266 \seq_reverse:N \l_tmpa_seq
3267 \seq_pop:NN \l_tmpa_seq \l_tmpa_tl
3268 \seq_map_inline:Nn \l_tmpa_seq {
3269 \exp_args:NNNo \exp_args:NNo \tl_set:No \l_tmpa_tl {
3270 \exp_args:Nno
3271 \l_tmpa_cs { ##1 } \l_tmpa_tl
3272 }
3273 }
3274 \tl_set:Nx \l_tmpa_tl {
3275 \_stex_term_omv:nn {varseq://\l_tmpa_str}{
3276 \exp_args:No \exp_not:n \l_tmpa_tl
3277 }
3278 }
3279 \exp_args:No\l_tmpb_tl\l_tmpa_tl
3280 }{
3281 \__stex_terms_math_assoc_arg_simple:n { #1 }
3282 }
3283 } {
3284 \__stex_terms_math_assoc_arg_simple:n { #1 }
3285 }
3286
3287 }
3288

```

```

3289 \cs_new_protected:Nn \__stex_terms_math_assoc_arg_simple:n {
3290   \clist_set:Nn \l_tmpa_clist{ #1 }
3291   \int_compare:nNnTF { \clist_count:N \l_tmpa_clist } < 2 {
3292     \tl_set:Nn \l_tmpa_tl { #1 }
3293   }{
3294     \clist_reverse:N \l_tmpa_clist
3295     \clist_pop:NN \l_tmpa_clist \l_tmpa_tl
3296
3297     \clist_map_inline:Nn \l_tmpa_clist {
3298       \exp_args:NNNo \exp_args:NNNo \tl_set:No \l_tmpa_tl {
3299         \exp_args:Nno
3300         \l_tmpa_cs { ##1 } \l_tmpa_tl
3301       }
3302     }
3303   }
3304   \exp_args:No\l_tmpb_tl\l_tmpa_tl
3305 }

```

(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
3306 \tl_const:Nx \infprec {\int_use:N \c_max_int}
3307 \tl_const:Nx \neginfprec {-\int_use:N \c_max_int}
3308 \int_new:N \l__stex_terms_downprec
3309 \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
3310 \tl_set:Nn \l__stex_terms_left_bracket_str (
3311 \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

```

3312 \cs_new_protected:Nn \__stex_terms_maybe_brackets:nn {
3313   \bool_if:NTF \l__stex_terms_brackets_done_bool {
3314     \bool_set_false:N \l__stex_terms_brackets_done_bool
3315     #2
3316   } {
3317     \int_compare:nNnTF { #1 } > \l__stex_terms_downprec {
3318       \bool_if:NTF \l_stex_inarray_bool { #2 }{
3319         \stex_debug:nn{dobrackets}{\number#1 > \number\l__stex_terms_downprec; \detokenize{#
3320         \dobrackets { #2 }
3321       }
3322     }{ #2 }
3323   }
3324 }

```

(End definition for `_stex_terms_maybe_brackets:nn`.)

`\dobrackets`

```

3325 \bool_new:N \l__stex_terms_brackets_done_bool
3326 %\RequirePackage{scalerel}
3327 \cs_new_protected:Npn \dobrackets #1 {
3328   %\ThisStyle{\if D\m@switch
3329   %   \exp_args:Nnx \use:nn
3330   %   { \exp_after:wN \left\l__stex_terms_left_bracket_str #1 }
3331   %   { \exp_not:N\right\l__stex_terms_right_bracket_str }
3332   % \else
3333   \exp_args:Nnx \use:nn
3334   {
3335     \bool_set_true:N \l__stex_terms_brackets_done_bool
3336     \int_set:Nn \l__stex_terms_downprec \infpref
3337     \l__stex_terms_left_bracket_str
3338     #1
3339   }
3340   {
3341     \bool_set_false:N \l__stex_terms_brackets_done_bool
3342     \l__stex_terms_right_bracket_str
3343     \int_set:Nn \l__stex_terms_downprec { \int_use:N \l__stex_terms_downprec }
3344   }
3345   %\fi}
3346 }
```

(End definition for `\dobrackets`. This function is documented on page 63.)

`\withbrackets`

```

3347 \cs_new_protected:Npn \withbrackets #1 #2 #3 {
3348   \exp_args:Nnx \use:nn
3349   {
3350     \tl_set:Nx \l__stex_terms_left_bracket_str { #1 }
3351     \tl_set:Nx \l__stex_terms_right_bracket_str { #2 }
3352     #3
3353   }
3354   {
3355     \tl_set:Nn \exp_not:N \l__stex_terms_left_bracket_str
3356     {\l__stex_terms_left_bracket_str}
3357     \tl_set:Nn \exp_not:N \l__stex_terms_right_bracket_str
3358     {\l__stex_terms_right_bracket_str}
3359   }
3360 }
```

(End definition for `\withbrackets`. This function is documented on page 63.)

`\STEXinvisible`

```

3361 \cs_new_protected:Npn \STEXinvisible #1 {
3362   \stex_annotate_invisible:n { #1 }
3363 }
```

(End definition for `\STEXinvisible`. This function is documented on page 63.)

OMDoc terms:

`_stex_term_math_oms:nnnn`

```
3364 \cs_new_protected:Nn \_stex_term_oms:nnn {
3365   \stex_annotate:nnn{ OMID }{ #2 }{
3366     \stex_highlight_term:nn { #1 } { #3 }
3367   }
3368 }
3369
3370 \cs_new_protected:Nn \_stex_term_math_oms:nnnn {
3371   \__stex_terms_maybe_brackets:nn { #3 }{
3372     \_stex_term_oms:nnn { #1 } { #1\c_hash_str#2 } { #4 }
3373   }
3374 }
```

(End definition for `_stex_term_math_oms:nnnn`. This function is documented on page 62.)

`_stex_term_math_omv:nn`

```
3375 \cs_new_protected:Nn \_stex_term_omv:nn {
3376   \stex_annotate:nnn{ OMV }{ #1 }{
3377     \stex_highlight_term:nn { #1 } { #2 }
3378   }
3379 }
```

(End definition for `_stex_term_math_omv:nn`. This function is documented on page ??.)

`_stex_term_math_oma:nnnn`

```
3380 \cs_new_protected:Nn \_stex_term_oma:nnn {
3381   \stex_annotate:nnn{ OMA }{ #2 }{
3382     \stex_highlight_term:nn { #1 } { #3 }
3383   }
3384 }
3385
3386 \cs_new_protected:Nn \_stex_term_math_oma:nnnn {
3387   \__stex_terms_maybe_brackets:nn { #3 }{
3388     \_stex_term_oma:nnn { #1 } { #1\c_hash_str#2 } { #4 }
3389   }
3390 }
```

(End definition for `_stex_term_math_oma:nnnn`. This function is documented on page 62.)

`_stex_term_math_omb:nnnn`

```
3391 \cs_new_protected:Nn \_stex_term_ombind:nnn {
3392   \stex_annotate:nnn{ OMBIND }{ #2 }{
3393     \stex_highlight_term:nn { #1 } { #3 }
3394   }
3395 }
3396
3397 \cs_new_protected:Nn \_stex_term_math_omb:nnnn {
3398   \__stex_terms_maybe_brackets:nn { #3 }{
3399     \_stex_term_ombind:nnn { #1 } { #1\c_hash_str#2 } { #4 }
3400   }
3401 }
```

(End definition for `_stex_term_math_omb:nnnn`. This function is documented on page 62.)

\symref
\symname

```

3402 \cs_new:Nn \stex_capitalize:n { \uppercase{#1} }
3403
3404 \keys_define:nn { stex / symname } {
3405   pre      .tl_set_x:N = \l__stex_terms_pre_tl ,
3406   post     .tl_set_x:N = \l__stex_terms_post_tl ,
3407   root     .tl_set_x:N = \l__stex_terms_root_tl
3408 }
3409
3410 \cs_new_protected:Nn \stex_symname_args:n {
3411   \tl_clear:N \l__stex_terms_post_tl
3412   \tl_clear:N \l__stex_terms_pre_tl
3413   \tl_clear:N \l__stex_terms_root_str
3414   \keys_set:nn { stex / symname } { #1 }
3415 }
3416
3417 \NewDocumentCommand \symref { m m }{
3418   \let\compemph_uri_prev:\compemph@uri
3419   \let\compemph@uri\symrefemph@uri
3420   \STEXsymbol{#1}!\{ #2 }
3421   \let\compemph@uri\compemph_uri_prev:
3422 }
3423
3424 \NewDocumentCommand \synonym { 0{} m m }{
3425   \stex_symname_args:n { #1 }
3426   \let\compemph_uri_prev:\compemph@uri
3427   \let\compemph@uri\symrefemph@uri
3428   % TODO
3429   \STEXsymbol{#2}!\{\l__stex_terms_pre_tl #3 \l__stex_terms_post_tl}
3430   \let\compemph@uri\compemph_uri_prev:
3431 }
3432
3433 \NewDocumentCommand \symname { 0{} m }{
3434   \stex_symname_args:n { #1 }
3435   \stex_get_symbol:n { #2 }
3436   \str_set:Nx \l_tmpa_str {
3437     \prop_item:cn { l_stex_symdecl_ \l_stex_get_symbol_uri_str _prop } { name }
3438   }
3439   \exp_args:NNno \str_replace_all:Nnn \l_tmpa_str {-} {~}
3440
3441   \let\compemph_uri_prev:\compemph@uri
3442   \let\compemph@uri\symrefemph@uri
3443   \exp_args:NNx \use:nn
3444   \stex_invoke_symbol:n { { \l_stex_get_symbol_uri_str }!\{
3445     \l__stex_terms_pre_tl \l_tmpa_str \l__stex_terms_post_tl
3446   } }
3447   \let\compemph@uri\compemph_uri_prev:
3448 }
3449
3450 \NewDocumentCommand \Symname { 0{} m }{
3451   \stex_symname_args:n { #1 }
3452   \stex_get_symbol:n { #2 }
3453   \str_set:Nx \l_tmpa_str {
3454     \prop_item:cn { l_stex_symdecl_ \l_stex_get_symbol_uri_str _prop } { name }

```

```

3455 }
3456 \exp_args:NNno \str_replace_all:Nnn \l_tmpa_str {-} {-}
3457 \let\compemph_uri_prev:\compemph@uri
3458 \let\compemph@uri\symrefemph@uri
3459 \exp_args:NNx \use:nn
3460 \stex_invoke_symbol:n { { \l_stex_get_symbol_uri_str }!{
3461   \exp_after:wN \stex_capitalize:n \l_tmpa_str
3462   \l__stex_terms_post_tl
3463 } }
3464 \let\compemph@uri\compemph_uri_prev:
3465 }

```

(End definition for `\symref` and `\symname`. These functions are documented on page 62.)

30.3 Notation Components

```

3466 <@@=stex_notationcomps>

```

`\stex_highlight_term:nn`

```

3467 \cs_new_protected:Nn \stex_highlight_term:nn {
3468   #2
3469 }
3470
3471 \cs_new_protected:Nn \stex_unhighlight_term:n {
3472   % \latexml_if:TF {
3473   %   #1
3474   % } {
3475   %   \rustex_if:TF {
3476   %     #1
3477   %   } {
3478   %     #1 %\iffalse{{\fi}} #1 {{\iffalse}}\fi
3479   %   }
3480   % }
3481 }

```

(End definition for `\stex_highlight_term:nn`. This function is documented on page 63.)

```

\comp
\compemph@uri
\compemph
\defemph
\defemph@uri
\symrefemph
\symrefemph@uri
\varemp
\varemp@uri

3482 \cs_new_protected:Npn \_comp #1 {
3483   \str_if_empty:NF \l_stex_current_symbol_str {
3484     \rustex_if:TF {
3485       \stex_annotate:nnn { comp }{ \l_stex_current_symbol_str }{ #1 }
3486     }{
3487       \exp_args:Nnx \compemph@uri { #1 } { \l_stex_current_symbol_str }
3488     }
3489   }
3490 }
3491
3492 \cs_new_protected:Npn \_varcomp #1 {
3493   \str_if_empty:NF \l_stex_current_symbol_str {
3494     \rustex_if:TF {
3495       \stex_annotate:nnn { varcomp }{ \l_stex_current_symbol_str }{ #1 }
3496     }{
3497       \exp_args:Nnx \varemp@uri { #1 } { \l_stex_current_symbol_str }

```

```

3498     }
3499   }
3500 }
3501
3502 \def\comp{\_comp}
3503
3504 \cs_new_protected:Npn \compemph@uri #1 #2 {
3505   \compemph{ #1 }
3506 }
3507
3508
3509 \cs_new_protected:Npn \compemph #1 {
3510   #1
3511 }
3512
3513 \cs_new_protected:Npn \defemph@uri #1 #2 {
3514   \defemph{#1}
3515 }
3516
3517 \cs_new_protected:Npn \defemph #1 {
3518   \textbf{#1}
3519 }
3520
3521 \cs_new_protected:Npn \symrefemph@uri #1 #2 {
3522   \symrefemph{#1}
3523 }
3524
3525 \cs_new_protected:Npn \symrefemph #1 {
3526   \textbf{#1}
3527 }
3528
3529 \cs_new_protected:Npn \varempemph@uri #1 #2 {
3530   \varempemph{#1}
3531 }
3532
3533 \cs_new_protected:Npn \varempemph #1 {
3534   #1
3535 }

```

(End definition for `\comp` and others. These functions are documented on page 63.)

\ellipses

```

3536 \NewDocumentCommand \ellipses {} { \ldots }

```

(End definition for `\ellipses`. This function is documented on page 63.)

```

\parray
\prmatrix 3537 \bool_new:N \l_stex_inarray_bool
\parrayline 3538 \bool_set_false:N \l_stex_inarray_bool
\parraylineh 3539 \NewDocumentCommand \parray { m m } {
\parraycell 3540   \begingroup
3541   \bool_set_true:N \l_stex_inarray_bool
3542   \begin{array}{#1}
3543     #2
3544   \end{array}

```

```

3545 \endgroup
3546 }
3547
3548 \NewDocumentCommand \prmatrix { m } {
3549 \begingroup
3550 \bool_set_true:N \l_stex_inarray_bool
3551 \begin{matrix}
3552 #1
3553 \end{matrix}
3554 \endgroup
3555 }
3556
3557 \def \maybepline {
3558 \bool_if:NT \l_stex_inarray_bool {\hline}
3559 }
3560
3561 \def \parrayline #1 #2 {
3562 #1 #2 \bool_if:NT \l_stex_inarray_bool {\}
3563 }
3564
3565 \def \pmrow #1 { \parrayline{}{ #1 } }
3566
3567 \def \parraylineh #1 #2 {
3568 #1 #2 \bool_if:NT \l_stex_inarray_bool {\hline}
3569 }
3570
3571 \def \parraycell #1 {
3572 #1 \bool_if:NT \l_stex_inarray_bool {&}
3573 }

```

(End definition for \parray and others. These functions are documented on page ??.)

30.4 Variables

```

3574 <@@=stex_variables>

```

\stex_invoke_variable:n Invokes a variable

```

3575 \cs_new_protected:Nn \stex_invoke_variable:n {
3576 \if_mode_math:
3577 \exp_after:wN \__stex_variables_invoke_math:n
3578 \else:
3579 \exp_after:wN \__stex_variables_invoke_text:n
3580 \fi: {#1}
3581 }
3582
3583 \cs_new_protected:Nn \__stex_variables_invoke_text:n {
3584 %TODO
3585 }
3586
3587
3588 \cs_new_protected:Nn \__stex_variables_invoke_math:n {
3589 \peek_charcode_remove:NTF ! {
3590 \peek_charcode_remove:NTF ! {
3591 \peek_charcode:NTF [ {

```



```

3592     \__stex_variables_invoke_op_custom:nw
3593   }{
3594     % TODO throw error
3595   }
3596 }{
3597   \__stex_variables_invoke_op:n { #1 }
3598 }
3599 }{
3600   \peek_charcode_remove:NTF * {
3601     \__stex_variables_invoke_text:n { #1 }
3602   }{
3603     \__stex_variables_invoke_math_ii:n { #1 }
3604   }
3605 }
3606 }
3607
3608 \cs_new_protected:Nn \__stex_variables_invoke_op:n {
3609   \cs_if_exist:cTF {
3610     stex_var_op_notation_ #1 _cs
3611   }{
3612     \exp_args:Nnx \use:nn {
3613       \def\comp{\_varcomp}
3614       \str_set:Nn \l_stex_current_symbol_str { var://#1 }
3615       \_stex_term_omv:nn { var://#1 }{
3616         \use:c{stex_var_op_notation_ #1 _cs }
3617       }
3618     }{
3619       \_stex_reset:N \comp
3620       \_stex_reset:N \l_stex_current_symbol_str
3621     }
3622   }{
3623     \int_compare:nNnTF {\prop_item:cn {\l_stex_variable_#1_prop}{arity}} = 0{
3624       \__stex_variables_invoke_math_ii:n {#1}
3625     }{
3626       \msg_error:nnxx{stex}{error/noop}{variable~#1}{-}
3627     }
3628   }
3629 }
3630
3631 \cs_new_protected:Npn \__stex_variables_invoke_math_ii:n #1 {
3632   \cs_if_exist:cTF {
3633     stex_var_notation_#1_cs
3634   }{
3635     \tl_set:Nx \stex_symbol_after_invokation_tl {
3636       \_stex_reset:N \comp
3637       \_stex_reset:N \stex_symbol_after_invokation_tl
3638       \_stex_reset:N \l_stex_current_symbol_str
3639       \bool_set_true:N \l_stex_allow_semantic_bool
3640     }
3641     \def\comp{\_varcomp}
3642     \str_set:Nn \l_stex_current_symbol_str { var://#1 }
3643     \bool_set_false:N \l_stex_allow_semantic_bool
3644     \use:c{stex_var_notation_#1_cs}
3645   }{

```

```

3646 \msg_error:nxx{stex}{error/nonotation}{variable~#1}{s}
3647 }
3648 }

```

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

30.5 Sequences

```

3649 <@@=stex_sequences>
3650
3651 \cs_new_protected:Nn \stex_invoke_sequence:n {
3652   \peek_charcode_remove:NTF ! {
3653     \stex_term_omv:nn {varseq://#1}{
3654       \exp_args:Nnx \use:nn {
3655         \def\comp{\_varcomp}
3656         \str_set:Nn \l_stex_current_symbol_str {varseq://#1}
3657         \prop_item:cn{stex_varseq_#1_prop}{notation}
3658       }{
3659         \stex_reset:N \comp
3660         \stex_reset:N \l_stex_current_symbol_str
3661       }
3662     }
3663   }{
3664     \bool_set_false:N \l_stex_allow_semantic_bool
3665     \def\comp{\_varcomp}
3666     \str_set:Nn \l_stex_current_symbol_str {varseq://#1}
3667     \tl_set:Nx \stex_symbol_after_invokation_tl {
3668       \stex_reset:N \comp
3669       \stex_reset:N \stex_symbol_after_invokation_tl
3670       \stex_reset:N \l_stex_current_symbol_str
3671       \bool_set_true:N \l_stex_allow_semantic_bool
3672     }
3673     \use:c { stex_varseq_#1_cs }
3674   }
3675 }
3676 </package>

```

Chapter 31

STEX -Structural Features Implementation

```
3677 ⟨*package⟩
3678
3679 %%%%%%%%%%% features.dtx %%%%%%%%%%%
3680
3681 Warnings and error messages
3682 \msg_new:nnn{stex}{error/copymodule/notallowed}{
3683   Symbol~#1~can~not~be~assigned~in~copymodule~#2
3684 }
3685 \msg_new:nnn{stex}{error/interpretmodule/nodefiniens}{
3686   Symbol~#1~not~assigned~in~interpretmodule~#2
3687 }
3688 \msg_new:nnn{stex}{error/unknownstructure}{
3689   No~structure~#1~found!
3690 }
3691
3692 \msg_new:nnn{stex}{error/unknownfield}{
3693   No~field~#1~in~instance~#2~found!\#3
3694 }
3695
3696 \msg_new:nnn{stex}{error/keyval}{
3697   Invalid~key=value~pair~#1
3698 }
3699 \msg_new:nnn{stex}{error/instantiate/missing}{
3700   Assignments~missing~in~instantiate:~#1
3701 }
3702 \msg_new:nnn{stex}{error/incompatible}{
3703   Incompatible~signature:~#1~(#2)~and~#3~(#4)
3704 }
3705
```

31.1 Imports with modification

```

3706 <@@=stex_copymodule>
3707 \cs_new_protected:Nn \stex_get_symbol_in_seq:nn {
3708   \tl_if_head_eq_catcode:nNTF { #1 } \relax {
3709     \tl_set:Nn \l_tmpa_tl { #1 }
3710     \__stex_copymodule_get_symbol_from_cs:
3711   }{
3712     % argument is a string
3713     % is it a command name?
3714     \cs_if_exist:cTF { #1 }{
3715       \cs_set_eq:Nc \l_tmpa_tl { #1 }
3716       \str_set:Nx \l_tmpa_str { \cs_argument_spec:N \l_tmpa_tl }
3717       \str_if_empty:NTF \l_tmpa_str {
3718         \exp_args:Nx \cs_if_eq:NNTF {
3719           \tl_head:N \l_tmpa_tl
3720         } \stex_invoke_symbol:n {
3721           \__stex_copymodule_get_symbol_from_cs:n{ #2 }
3722         }{
3723           \__stex_copymodule_get_symbol_from_string:nn { #1 }{ #2 }
3724         }
3725       } {
3726         \__stex_copymodule_get_symbol_from_string:nn { #1 }{ #2 }
3727       }
3728     }{
3729       % argument is not a command name
3730       \__stex_copymodule_get_symbol_from_string:nn { #1 }{ #2 }
3731       % \l_stex_all_symbols_seq
3732     }
3733   }
3734 }
3735
3736 \cs_new_protected:Nn \__stex_copymodule_get_symbol_from_string:nn {
3737   \str_set:Nn \l_tmpa_str { #1 }
3738   \bool_set_false:N \l_tmpa_bool
3739   \bool_if:NF \l_tmpa_bool {
3740     \tl_set:Nn \l_tmpa_tl {
3741       \msg_error:nnn{stex}{error/unknownsymbol}{#1}
3742     }
3743     \str_set:Nn \l_tmpa_str { #1 }
3744     \int_set:Nn \l_tmpa_int { \str_count:N \l_tmpa_str }
3745     \seq_map_inline:Nn #2 {
3746       \str_set:Nn \l_tmpb_str { ##1 }
3747       \str_if_eq:eeT { \l_tmpa_str } {
3748         \str_range:Nnn \l_tmpb_str { -\l_tmpa_int } { -1 }
3749       } {
3750         \seq_map_break:n {
3751           \tl_set:Nn \l_tmpa_tl {
3752             \str_set:Nn \l_stex_get_symbol_uri_str {
3753               ##1
3754             }
3755           }
3756         }
3757       }

```

```

3758     }
3759     \l_tmpa_tl
3760   }
3761 }
3762
3763 \cs_new_protected:Nn \__stex_copymodule_get_symbol_from_cs:n {
3764   \exp_args:NNx \tl_set:Nn \l_tmpa_tl
3765     { \tl_tail:N \l_tmpa_tl }
3766   \tl_if_single:NTF \l_tmpa_tl {
3767     \exp_args:No \tl_if_head_is_group:nTF \l_tmpa_tl {
3768       \exp_after:wN \str_set:Nn \exp_after:wN
3769         \l_stex_get_symbol_uri_str \l_tmpa_tl
3770       \__stex_copymodule_get_symbol_check:n { #1 }
3771     }{
3772       % TODO
3773       % tail is not a single group
3774     }
3775   }{
3776     % TODO
3777     % tail is not a single group
3778   }
3779 }
3780
3781 \cs_new_protected:Nn \__stex_copymodule_get_symbol_check:n {
3782   \exp_args:NNx \seq_if_in:NnF #1 \l_stex_get_symbol_uri_str {
3783     \msg_error:nnxx{stex}{error/copymodule/notallowed}{\l_stex_get_symbol_uri_str}{
3784       :~\seq_use:Nn #1 {,~}
3785     }
3786   }
3787 }
3788
3789 \cs_new_protected:Nn \stex_copymodule_start:nnnn {
3790   \stex_import_module_uri:nn { #1 } { #2 }
3791   \str_set:Nx \l_stex_current_copymodule_name_str {#3}
3792   \stex_import_require_module:nnnn
3793     { \l_stex_import_ns_str } { \l_stex_import_archive_str }
3794     { \l_stex_import_path_str } { \l_stex_import_name_str }
3795   \stex_collect_imports:n {\l_stex_import_ns_str ?\l_stex_import_name_str }
3796   \seq_set_eq:NN \l__stex_copymodule_copymodule_modules_seq \l_stex_collect_imports_seq
3797   \seq_clear:N \l__stex_copymodule_copymodule_fields_seq
3798   \seq_map_inline:Nn \l__stex_copymodule_copymodule_modules_seq {
3799     \seq_map_inline:cn {c_stex_module_###_constants}{
3800       \exp_args:NNx \seq_put_right:Nn \l__stex_copymodule_copymodule_fields_seq {
3801         ##1 ? ####1
3802       }
3803     }
3804   }
3805   \seq_clear:N \l_tmpa_seq
3806   \exp_args:NNx \prop_set_from_keyval:Nn \l_stex_current_copymodule_prop {
3807     name      = \l_stex_current_copymodule_name_str ,
3808     module    = \l_stex_current_module_str ,
3809     from      = \l_stex_import_ns_str ?\l_stex_import_name_str ,
3810     includes  = \l_tmpa_seq ,
3811     fields    = \l_tmpa_seq

```

```

3812 }
3813 \stex_debug:nn{copymodule}{#4~for~module~{\l_stex_import_ns_str ?\l_stex_import_name_str}
3814   as~\l_stex_current_module_str?\l_stex_current_copymodule_name_str}
3815   \stex_debug:nn{copymodule}{modules:\seq_use:Nn \l__stex_copymodule_copymodule_modules_seq {,
3816 \stex_debug:nn{copymodule}{fields:\seq_use:Nn \l__stex_copymodule_copymodule_fields_seq {,
3817 \stex_if_smsmode:F {
3818   \begin{stex_annotate_env} {#4} {
3819     \l_stex_current_module_str?\l_stex_current_copymodule_name_str
3820   }
3821   \stex_annotate_invisible:nnn{from}{\l_stex_import_ns_str ?\l_stex_import_name_str}{}
3822 }
3823 \bool_set_eq:NN \l__stex_copymodule_oldhtml_bool \_stex_html_do_output_bool
3824 \bool_set_false:N \_stex_html_do_output_bool
3825 }
3826 \cs_new_protected:Nn \stex_copymodule_end:n {
3827   \def \l_tmpa_cs ##1 ##2 {#1}
3828   \bool_set_eq:NN \_stex_html_do_output_bool \l__stex_copymodule_oldhtml_bool
3829   \tl_clear:N \l_tmpa_tl
3830   \tl_clear:N \l_tmpb_tl
3831   \prop_get:NnN \l_stex_current_copymodule_prop {fields} \l_tmpa_seq
3832   \seq_map_inline:Nn \l__stex_copymodule_copymodule_modules_seq {
3833     \seq_map_inline:cn {c_stex_module_##1_constants}{
3834       \tl_clear:N \l_tmpc_tl
3835       \l_tmpa_cs{##1}{####1}
3836       \str_if_exist:cTF {l__stex_copymodule_copymodule_##1?####1_name_str} {
3837         \tl_put_right:Nx \l_tmpa_tl {
3838           \prop_set_from_keyval:cn {
3839             l_stex_symdecl_\l_stex_current_module_str ? \use:c{l__stex_copymodule_copymodule_##1?####1_name_str}
3840           }{
3841             \exp_after:wN \prop_to_keyval:N \csname
3842               l_stex_symdecl_\l_stex_current_module_str ? \use:c{l__stex_copymodule_copymodule_##1?####1_name_str}
3843             \endcsname
3844           }
3845           \seq_clear:c {
3846             l_stex_symdecl_
3847             \l_stex_current_module_str ? \use:c{l__stex_copymodule_copymodule_##1?####1_name_str}
3848             _notations
3849           }
3850         }
3851       }
3852       \tl_put_right:Nx \l_tmpc_tl {
3853         \stex_copy_notations:nn {\l_stex_current_module_str ? \use:c{l__stex_copymodule_copymodule_##1?####1_name_str}
3854         \stex_annotate_invisible:nnn{alias}{\use:c{l__stex_copymodule_copymodule_##1?####1_name_str}}
3855       }
3856       \seq_put_right:Nx \l_tmpa_seq {\l_stex_current_module_str ? \use:c{l__stex_copymodule_copymodule_##1?####1_name_str}}
3857       \str_if_exist:cT {l__stex_copymodule_copymodule_##1?####1_macroname_str} {
3858         \tl_put_right:Nx \l_tmpc_tl {
3859           \stex_annotate_invisible:nnn{macroname}{\use:c{l__stex_copymodule_copymodule_##1?####1_name_str}}
3860         }
3861         \tl_put_right:Nx \l_tmpa_tl {
3862           \tl_set:cx {\use:c{l__stex_copymodule_copymodule_##1?####1_macroname_str}}{
3863             \stex_invoke_symbol:n {
3864               \l_stex_current_module_str ? \use:c{l__stex_copymodule_copymodule_##1?####1_name_str}
3865             }
3866           }
3867         }
3868       }
3869     }
3870   }

```

```

3866     }
3867   }
3868 }{
3869   \tl_put_right:Nx \l_tmpc_tl {
3870     \stex_copy_notations:nn {\l_stex_current_module_str ? \l_stex_current_copymodule_name_str}
3871   }
3872   \prop_set_eq:Nc \l_tmpa_prop {l_stex_symdecl_ ##1?####1 _prop}
3873   \prop_put:Nnx \l_tmpa_prop { name }{ \l_stex_current_copymodule_name_str / ####1 }
3874   \prop_put:Nnx \l_tmpa_prop { module }{ \l_stex_current_module_str }
3875   \tl_put_right:Nx \l_tmpa_tl {
3876     \prop_set_from_keyval:cn {
3877       l_stex_symdecl_ \l_stex_current_module_str ? \l_stex_current_copymodule_name_str
3878     }{
3879       \prop_to_keyval:N \l_tmpa_prop
3880     }
3881     \seq_clear:c {
3882       l_stex_symdecl_
3883       \l_stex_current_module_str ? \l_stex_current_copymodule_name_str / ####1
3884       _notations
3885     }
3886   }
3887   \seq_put_right:Nx \l_tmpa_seq {\l_stex_current_module_str ? \l_stex_current_copymodule_name_str}
3888   \str_if_exist:cT {l__stex_copymodule_copymodule_##1?####1_macroname_str} {
3889     \tl_put_right:Nx \l_tmpc_tl {
3890       \stex_annotate_invisible:nnn{macroname}{\use:c{l__stex_copymodule_copymodule_##1?####1_macroname_str}}
3891     }
3892     \tl_put_right:Nx \l_tmpa_tl {
3893       \tl_set:cx {\use:c{l__stex_copymodule_copymodule_##1?####1_macroname_str}}{
3894         \stex_invoke_symbol:n {
3895           \l_stex_current_module_str ? \l_stex_current_copymodule_name_str / ####1
3896         }
3897       }
3898     }
3899   }
3900 }
3901 \tl_if_exist:cT {l__stex_copymodule_copymodule_##1?####1_def_tl}{
3902   \tl_put_right:Nx \l_tmpc_tl {
3903     \stex_annotate_invisible:nnn{definiens}{\use:c{l__stex_copymodule_copymodule_##1?####1_def_tl}}
3904   }
3905 }
3906 \tl_put_right:Nx \l_tmpb_tl {
3907   \stex_annotate:nnn{assignment} {##1?####1} { \l_tmpc_tl }
3908 }
3909 }
3910 }
3911 \prop_put:Nno \l_stex_current_copymodule_prop {fields} \l_tmpa_seq
3912 \tl_put_left:Nx \l_tmpa_tl {
3913   \prop_set_from_keyval:cn {
3914     l_stex_copymodule_ \l_stex_current_module_str? \l_stex_current_copymodule_name_str _prop
3915   }{
3916     \prop_to_keyval:N \l_stex_current_copymodule_prop
3917   }
3918 }
3919 \exp_args:No \stex_add_to_current_module:n \l_tmpa_tl

```

```

3920 \stex_debug:nn{copymodule}{result:\meaning \l_tmpa_tl}
3921 \exp_args:Nx \stex_do_up_to_module:n {
3922   \exp_args:No \exp_not:n \l_tmpa_tl
3923 }
3924 \l_tmpb_tl
3925 \stex_if_smsmode:F {
3926   \end{stex_annotate_env}
3927 }
3928 }
3929
3930 \NewDocumentEnvironment {copymodule} { 0{} m m}{
3931   \stex_copymodule_start:nnnn { #1 }{ #2 }{ #3 }{ structure }
3932   \stex_deactivate_macro:Nn \symdecl {module~environments}
3933   \stex_deactivate_macro:Nn \symdef {module~environments}
3934   \stex_deactivate_macro:Nn \notation {module~environments}
3935   \stex_reactivate_macro:N \assign
3936   \stex_reactivate_macro:N \renamedekl
3937   \stex_reactivate_macro:N \donotcopy
3938   \stex_smsmode_do:
3939 }{
3940   \stex_copymodule_end:n {}
3941 }
3942
3943 \NewDocumentEnvironment {interpretmodule} { 0{} m m}{
3944   \stex_copymodule_start:nnnn { #1 }{ #2 }{ #3 }{ realization }
3945   \stex_deactivate_macro:Nn \symdecl {module~environments}
3946   \stex_deactivate_macro:Nn \symdef {module~environments}
3947   \stex_deactivate_macro:Nn \notation {module~environments}
3948   \stex_reactivate_macro:N \assign
3949   \stex_reactivate_macro:N \renamedekl
3950   \stex_reactivate_macro:N \donotcopy
3951   \stex_smsmode_do:
3952 }{
3953   \stex_copymodule_end:n {
3954     \tl_if_exist:cF {
3955       l__stex_copymodule_copymodule_##1?##2_def_tl
3956     }{
3957       \str_if_eq:eeF {
3958         \prop_item:cn{
3959           l_stex_symdecl_ ##1 ? ##2 _prop }{ defined }
3960         }{ true }{
3961           \msg_error:nnxx{stex}{error/interpretmodule/nodéfiniens}{
3962             ##1?##2
3963           }{\l_stex_current_copymodule_name_str}
3964         }
3965       }
3966     }
3967   }
3968
3969 \NewDocumentCommand \donotcopy { 0{} m}{
3970   \stex_import_module_uri:nn { #1 } { #2 }
3971   \stex_collect_imports:n {\l_stex_import_ns_str ?\l_stex_import_name_str }
3972   \seq_map_inline:Nn \l_stex_collect_imports_seq {
3973     \seq_remove_all:Nn \l__stex_copymodule_copymodule_modules_seq { ##1 }

```



```

3974 \seq_map_inline:cn {c_stex_module_##1_constants}{
3975 \seq_remove_all:Nn \l__stex_copymodule_copymodule_fields_seq { ##1 ? #####1 }
3976 \bool_lazy_any_p:nT {
3977   { \cs_if_exist_p:c {l__stex_copymodule_copymodule_##1?####1_name_str}}
3978   { \cs_if_exist_p:c {l__stex_copymodule_copymodule_##1?####1_macroname_str}}
3979   { \cs_if_exist_p:c {l__stex_copymodule_copymodule_##1?####1_def_tl}}
3980 }{
3981   % TODO throw error
3982 }
3983 }
3984 }
3985
3986 \prop_get:NnN \l_stex_current_copymodule_prop { includes } \l_tmpa_seq
3987 \seq_put_right:Nx \l_tmpa_seq {\l_stex_import_ns_str ?\l_stex_import_name_str }
3988 \prop_put:Nnx \l_stex_current_copymodule_prop {includes} \l_tmpa_seq
3989 }
3990
3991 \NewDocumentCommand \assign { m m }{
3992 \stex_get_symbol_in_seq:nn {#1} \l__stex_copymodule_copymodule_fields_seq
3993 \stex_debug:nn{assign}{defining~{\l_stex_get_symbol_uri_str}~as~\detokenize{#2}}
3994 \tl_set:cn {l__stex_copymodule_copymodule_\l_stex_get_symbol_uri_str _def_tl}{#2}
3995 }
3996
3997 \keys_define:nn { stex / renamedec1 } {
3998   name .str_set_x:N = \l_stex_renamedec1_name_str
3999 }
4000 \cs_new_protected:Nn \__stex_copymodule_renamedec1_args:n {
4001 \str_clear:N \l_stex_renamedec1_name_str
4002 \keys_set:nn { stex / renamedec1 } { #1 }
4003 }
4004
4005 \NewDocumentCommand \renamedec1 { 0{} m m }{
4006 \__stex_copymodule_renamedec1_args:n { #1 }
4007 \stex_get_symbol_in_seq:nn {#2} \l__stex_copymodule_copymodule_fields_seq
4008 \stex_debug:nn{renamedec1}{renaming~{\l_stex_get_symbol_uri_str}~to~#3}
4009 \str_set:cx {l__stex_copymodule_copymodule_\l_stex_get_symbol_uri_str _macroname_str}{#3}
4010 \str_if_empty:NTF \l_stex_renamedec1_name_str {
4011 \tl_set:cx { #3 }{\stex_invoke_symbol:n {
4012 \l_stex_get_symbol_uri_str
4013 } }
4014 } {
4015 \str_set:cx {l__stex_copymodule_copymodule_\l_stex_get_symbol_uri_str _name_str}{\l_stex
4016 \stex_debug:nn{renamedec1}{@~\l_stex_current_module_str ? \l_stex_renamedec1_name_str}
4017 \prop_set_eq:cc {l_stex_symdec1_
4018 \l_stex_current_module_str ? \l_stex_renamedec1_name_str
4019 _prop
4020 }{l_stex_symdec1_ \l_stex_get_symbol_uri_str _prop}
4021 \seq_set_eq:cc {l_stex_symdec1_
4022 \l_stex_current_module_str ? \l_stex_renamedec1_name_str
4023 _notations
4024 }{l_stex_symdec1_ \l_stex_get_symbol_uri_str _notations}
4025 \prop_put:cnx {l_stex_symdec1_
4026 \l_stex_current_module_str ? \l_stex_renamedec1_name_str
4027 _prop

```

```

4028   }{ name }{ \l_stex_renamedecl_name_str }
4029   \prop_put:cnx {l_stex_symdecl_
4030     \l_stex_current_module_str ? \l_stex_renamedecl_name_str
4031     _prop
4032   }{ module }{ \l_stex_current_module_str }
4033   \exp_args:NNx \seq_put_left:Nn \l__stex_copymodule_copymodule_fields_seq {
4034     \l_stex_current_module_str ? \l_stex_renamedecl_name_str
4035   }
4036   \tl_set:cx { #3 }{ \stex_invoke_symbol:n {
4037     \l_stex_current_module_str ? \l_stex_renamedecl_name_str
4038   } }
4039 }
4040 }
4041
4042 \stex_deactivate_macro:Nn \assign {copymodules}
4043 \stex_deactivate_macro:Nn \renamedecl {copymodules}
4044 \stex_deactivate_macro:Nn \donotcopy {copymodules}
4045
4046
4047 \seq_new:N \l_stex_implicit_morphisms_seq
4048 \NewDocumentCommand \implicitmorphism { 0{} m m }{
4049   \stex_import_module_uri:nn { #1 } { #2 }
4050   \stex_debug:nn{implicits}{
4051     Implicit~morphism:~
4052     \l_stex_module_ns_str ? \l__stex_copymodule_name_str
4053   }
4054   \exp_args:NNx \seq_if_in:NnT \l_stex_all_modules_seq {
4055     \l_stex_module_ns_str ? \l__stex_copymodule_name_str
4056   }{
4057     \msg_error:nnn{stex}{error/conflictingmodules}{
4058       \l_stex_module_ns_str ? \l__stex_copymodule_name_str
4059     }
4060   }
4061
4062   % TODO
4063
4064
4065
4066   \seq_put_right:Nx \l_stex_implicit_morphisms_seq {
4067     \l_stex_module_ns_str ? \l__stex_copymodule_name_str
4068   }
4069 }
4070

```

31.2 The feature environment

structural@feature

```

4071 <@@=stex_features>
4072
4073 \NewDocumentEnvironment{structural_feature_module}{ m m m }{
4074   \stex_if_in_module:F {
4075     \msg_set:nnn{stex}{error/nomodule}{
4076       Structural~Feature~has~to~occur~in~a~module:\\

```

```

4077     Feature~#2~of~type~#1\\
4078     In~File:~\stex_path_to_string:N \g_stex_currentfile_seq
4079   }
4080   \msg_error:nn{stex}{error/nomodule}
4081 }
4082
4083 \stex_module_setup:nn{meta=NONE}{#2 - #1}
4084
4085 \stex_if_smsmode:F {
4086   \begin{stex_annotate_env}{ feature:#1 }{}
4087   \stex_annotate_invisible:nnn{header}{}{ #3 }
4088 }
4089 }{
4090   \str_gset_eq:NN \l_stex_last_feature_str \l_stex_current_module_str
4091   \prop_gput:cnn {c_stex_module_ \l_stex_current_module_str _prop}{feature}{#1}
4092   \stex_debug:nn{features}{
4093     Feature: \l_stex_last_feature_str
4094   }
4095   \stex_if_smsmode:F {
4096     \end{stex_annotate_env}
4097   }
4098 }

```

31.3 Structure

structure

```

4099 <@@=stex_structures>
4100 \cs_new_protected:Nn \stex_add_structure_to_current_module:nn {
4101   \prop_if_exist:cF {c_stex_module_ \l_stex_current_module_str _structures}{
4102     \prop_new:c {c_stex_module_ \l_stex_current_module_str _structures}
4103   }
4104   \prop_gput:cxx{c_stex_module_ \l_stex_current_module_str _structures}
4105   {#1}{#2}
4106 }
4107
4108 \keys_define:nn { stex / features / structure } {
4109   name .str_set_x:N = \l__stex_structures_name_str ,
4110 }
4111
4112 \cs_new_protected:Nn \__stex_structures_structure_args:n {
4113   \str_clear:N \l__stex_structures_name_str
4114   \keys_set:nn { stex / features / structure } { #1 }
4115 }
4116
4117 \NewDocumentEnvironment{mathstructure}{m O{}}{
4118   \__stex_structures_structure_args:n { #2 }
4119   \str_if_empty:NT \l__stex_structures_name_str {
4120     \str_set:Nx \l__stex_structures_name_str { #1 }
4121   }
4122   \exp_args:Nx \stex_symdecl_do:nn {
4123     name = \l__stex_structures_name_str ,
4124     type = \metacollection ,
4125     def = {\STEXsymbol{module-type}}{

```

```

4126     \stex_term_math_oms:nmmm {
4127       \prop_get:cnN {c_stex_module_\l_stex_current_module_str _prop}
4128       { ns } \l_stex_module_ns_str ?
4129       \prop_item:cn {c_stex_module_\l_stex_current_module_str _prop}
4130       { name } / \l__stex_structures_name_str - structure
4131     }{}{}{}
4132   }}
4133   }{ #1 }
4134   \exp_args:Nnnx
4135   \begin{structural_feature_module}{ structure }
4136     { \l__stex_structures_name_str }{}
4137   \stex_smsmode_do:
4138 }{
4139   \end{structural_feature_module}
4140   \exp_args:No \stex_collect_imports:n \l_stex_last_feature_str
4141   \seq_clear:N \l_tmpa_seq
4142   \seq_map_inline:Nn \l_stex_collect_imports_seq {
4143     \seq_map_inline:cn{c_stex_module_##1_constants}{
4144       \seq_put_right:Nn \l_tmpa_seq { ##1 ? #####1 }
4145     }
4146   }
4147   \exp_args:Nnno
4148   \prop_gput:cnn {c_stex_module_ \l_stex_last_feature_str _prop}{fields}\l_tmpa_seq
4149   \stex_debug:nn{structure}{Fields:~\seq_use:Nn \l_tmpa_seq ,}
4150   \stex_add_structure_to_current_module:nn
4151     \l_stex_structures_name_str
4152     \l_stex_last_feature_str
4153   \exp_args:Nx
4154   \stex_add_to_current_module:n {
4155     \tl_set:cn { #1 }{
4156       \exp_not:N \stex_invoke_structure:nn {\l_stex_current_module_str }{ \l__stex_structures
4157     }
4158   }
4159   \exp_args:Nx
4160   \stex_do_up_to_module:n {
4161     \tl_set:cn { #1 }{
4162       \exp_not:N \stex_invoke_structure:nn {\l_stex_current_module_str }{ \l__stex_structures
4163     }
4164   }
4165 }
4166 \seq_put_right:Nx \g_stex_smsmode_allowedenvs_seq { \tl_to_str:n {mathstructure}}
4167
4168 \cs_new:Nn \stex_invoke_structure:nn {
4169   \stex_invoke_symbol:n { #1?#2 }
4170 }
4171
4172 \cs_new_protected:Nn \stex_get_structure:n {
4173   \tl_if_head_eq_catcode:nNTF { #1 } \relax {
4174     \tl_set:Nn \l_tmpa_tl { #1 }
4175     \__stex_structures_get_from_cs:
4176   }{
4177     \cs_if_exist:cTF { #1 }{
4178       \cs_set_eq:Nc \l_tmpa_cs { #1 }
4179       \str_set:Nx \l_tmpa_str {\cs_argument_spec:N \l_tmpa_cs }

```

```

4180 \str_if_empty:NTF \l_tmpa_str {
4181 \cs_if_eq:NNTF { \tl_head:N \l_tmpa_cs} \stex_invoke_structure:nn {
4182 \__stex_structures_get_from_cs:
4183 }{
4184 \__stex_structures_get_from_string:n { #1 }
4185 }
4186 }{
4187 \__stex_structures_get_from_string:n { #1 }
4188 }
4189 }{
4190 \__stex_structures_get_from_string:n { #1 }
4191 }
4192 }
4193 }
4194
4195 \cs_new_protected:Nn \__stex_structures_get_from_cs: {
4196 \exp_args:NNx \tl_set:Nn \l_tmpa_tl
4197 { \tl_tail:N \l_tmpa_tl }
4198 \str_set:Nx \l_tmpa_str {
4199 \exp_after:wN \use_i:nn \l_tmpa_tl
4200 }
4201 \str_set:Nx \l_tmpb_str {
4202 \exp_after:wN \use_ii:nn \l_tmpa_tl
4203 }
4204 \str_set:Nx \l_stex_get_structure_str {
4205 \l_tmpa_str ? \l_tmpb_str
4206 }
4207 \str_set:Nx \l_stex_get_structure_module_str {
4208 \exp_args:Nno \prop_item:cn {c_stex_module_\l_tmpa_str _structures}{\l_tmpb_str}
4209 }
4210 }
4211
4212 \cs_new_protected:Nn \__stex_structures_get_from_string:n {
4213 \tl_set:Nn \l_tmpa_tl {
4214 \msg_error:nnn{stex}{error/unknownstructure}{#1}
4215 }
4216 \str_set:Nn \l_tmpa_str { #1 }
4217 \int_set:Nn \l_tmpa_int { \str_count:N \l_tmpa_str }
4218
4219 \seq_map_inline:Nn \l_stex_all_modules_seq {
4220 \prop_if_exist:cT {c_stex_module_##1_structures} {
4221 \prop_map_inline:cn {c_stex_module_##1_structures} {
4222 \str_if_eq:eeT { \l_tmpa_str }{ \str_range:nnn {##1?####1}{-\l_tmpa_int}{-1}}{
4223 \prop_map_break:n{ \seq_map_break:n{
4224 \tl_set:Nn \l_tmpa_tl {
4225 \str_set:Nn \l_stex_get_structure_str {##1?####1}
4226 \str_set:Nn \l_stex_get_structure_module_str {####2}
4227 }
4228 }}
4229 }
4230 }
4231 }
4232 }
4233 \l_tmpa_tl

```

4234 }

\instantiate

4235

4236 \keys_define:nn { stex / instantiate } {

4237 name .str_set_x:N = \l__stex_structures_name_str

4238 }

4239 \cs_new_protected:Nn __stex_structures_instantiate_args:n {

4240 \str_clear:N \l__stex_structures_name_str

4241 \keys_set:nn { stex / instantiate } { #1 }

4242 }

4243

4244 \NewDocumentCommand \instantiate {m O{} m m m}{

4245 \begin{group}

4246 \stex_get_structure:n {#4}

4247 __stex_structures_instantiate_args:n { #2 }

4248 \str_if_empty:NT \l__stex_structures_name_str {

4249 \str_set:Nn \l__stex_structures_name_str { #1 }

4250 }

4251 \seq_clear:N \l__stex_structures_fields_seq

4252 \exp_args:Nx \stex_collect_imports:n \l_stex_get_structure_module_str

4253 \seq_map_inline:Nn \l_stex_collect_imports_seq {

4254 \seq_map_inline:cn {c_stex_module_##1_constants}{

4255 \seq_put_right:Nx \l__stex_structures_fields_seq { ##1 ? #####1 }

4256 }

4257 }

4258 \seq_set_split:Nnn \l_tmpa_seq , {#3}

4259 \exp_args:No \stex_activate_module:n \l_stex_get_structure_module_str

4260 \prop_clear:N \l_tmpa_prop

4261 \seq_map_inline:Nn \l_tmpa_seq {

4262 \seq_set_split:Nnn \l_tmpb_seq = { ##1 }

4263 \int_compare:nNnF { \seq_count:N \l_tmpb_seq } = 2 {

4264 \msg_error:nnn{stex}{error/keyval}{##1}

4265 }

4266 \exp_args:Nx \stex_get_symbol_in_seq:nn {\seq_item:Nn \l_tmpb_seq 1} \l__stex_structures_fields_seq

4267 \str_set_eq:NN \l__stex_structures_dom_str \l_stex_get_symbol_uri_str

4268 \exp_args:NNx \seq_remove_all:Nn \l__stex_structures_fields_seq \l_stex_get_symbol_uri_str

4269 \exp_args:Nx \stex_get_symbol:n {\seq_item:Nn \l_tmpb_seq 2}

4270 \exp_args:Nxx \str_if_eq:nnF

4271 {\prop_item:cn{l_stex_symdecl\l__stex_structures_dom_str _prop}{args}}

4272 {\prop_item:cn{l_stex_symdecl\l_stex_get_symbol_uri_str _prop}{args}}{

4273 \msg_error:nnxxx{stex}{error/incompatible}

4274 {\l__stex_structures_dom_str

4275 {\prop_item:cn{l_stex_symdecl\l__stex_structures_dom_str _prop}{args}}

4276 {\l_stex_get_symbol_uri_str

4277 {\prop_item:cn{l_stex_symdecl\l_stex_get_symbol_uri_str _prop}{args}}}

4278 }

4279 \prop_put:Nxx \l_tmpa_prop {\seq_item:Nn \l_tmpb_seq 1} \l_stex_get_symbol_uri_str

4280 }

4281 \seq_if_empty:NF \l__stex_structures_fields_seq {

4282 \msg_error:nnx{stex}{error/instantiate/missing}{\seq_use:Nn\l__stex_structures_fields_seq}

4283 }

4284 \exp_args:Nx

4285 \stex_add_to_current_module:n {

```

4286     \prop_set_from_keyval:cn {l_stex_instance~\l_stex_current_module_str?\l__stex_structur
4287         domain = \l_stex_get_structure_module_str ,
4288         \prop_to_keyval:N \l_tmpa_prop
4289     }
4290     \tl_set:cn{ #1 }{\stex_invoke_instance:n{ \l_stex_current_module_str?\l__stex_structur
4291 }
4292 \exp_args:Nx
4293 \stex_do_up_to_module:n {
4294     \prop_set_from_keyval:cn {l_stex_instance~\l_stex_current_module_str?\l__stex_structur
4295         domain = \l_stex_get_structure_module_str ,
4296         \prop_to_keyval:N \l_tmpa_prop
4297     }
4298     \tl_set:cn{ #1 }{\stex_invoke_instance:n{\l_stex_current_module_str?\l__stex_structur
4299 }
4300 \stex_debug:nn{instantiate}{
4301     Instance~\l_stex_current_module_str?\l__stex_structures_name_str \
4302     \prop_to_keyval:N \l_tmpa_prop
4303 }
4304 \exp_args:Nxx \stex_symdecl_do:nn {
4305     type={\STEXsymbol{module-type}}{
4306         \_stex_term_math_oms:nnnn {
4307             \l_stex_get_structure_module_str
4308         }{}{0}{}
4309     }}
4310     }{\l__stex_structures_name_str}
4311     \exp_args:Nx \notation{\l__stex_structures_name_str}{\comp{#5}}
4312 \endgroup
4313 \stex_smsmode_do:\ignorespacesandpars
4314 }
4315 \tl_put_right:Nx \g_stex_smsmode_allowedmacros_escape_tl {\instantiate}
4316
4317 \cs_new_protected:Nn \stex_symbol_or_var:n {
4318     \cs_if_exist:cTF{#1}{
4319         \cs_set_eq:Nc \l_tmpa_tl { #1 }
4320         \str_set:Nx \l_tmpa_str { \cs_argument_spec:N \l_tmpa_tl }
4321         \str_if_empty:NTF \l_tmpa_str {
4322             \exp_args:Nx \cs_if_eq:NNTF { \tl_head:N \l_tmpa_tl }
4323                 \stex_invoke_variable:n {
4324                     \bool_set_true:N \l_stex_symbol_or_var_bool
4325                     \tl_set:Nx \l_tmpa_tl {\tl_tail:N \l_tmpa_tl}
4326                     \str_set:Nx \l_stex_get_symbol_uri_str {
4327                         \exp_after:wN \use:n \l_tmpa_tl
4328                     }
4329                 }{
4330                     \bool_set_false:N \l_stex_symbol_or_var_bool
4331                     \stex_get_symbol:n{#1}
4332                 }
4333     }{
4334         \__stex_structures_symbolorvar_from_string:n{ #1 }
4335     }
4336 }{
4337     \__stex_structures_symbolorvar_from_string:n{ #1 }
4338 }
4339 }

```

```

4340
4341 \cs_new_protected:Nn \__stex_structures_symbolorvar_from_string:n {
4342   \prop_if_exist:cTF {l_stex_variable_#1 _prop}{
4343     \bool_set_true:N \l_stex_symbol_or_var_bool
4344     \str_set:Nn \l_stex_get_symbol_uri_str { #1 }
4345   }{
4346     \bool_set_false:N \l_stex_symbol_or_var_bool
4347     \stex_get_symbol:n{#1}
4348   }
4349 }
4350
4351
4352 \NewDocumentCommand \varinstantiate {m O{} m m m}{
4353   \begin_group
4354     \stex_get_structure:n {#4}
4355     \__stex_structures_instantiate_args:n { #2 }
4356     \str_if_empty:NT \l__stex_structures_name_str {
4357       \str_set:Nn \l__stex_structures_name_str { #1 }
4358     }
4359     \seq_clear:N \l__stex_structures_fields_seq
4360     \exp_args:Nx \stex_collect_imports:n \l_stex_get_structure_module_str
4361     \seq_map_inline:Nn \l_stex_collect_imports_seq {
4362       \seq_map_inline:cn {c_stex_module_##1_constants}{
4363         \seq_put_right:Nx \l__stex_structures_fields_seq { ##1 ? #####1 }
4364       }
4365     }
4366     \exp_args:No \stex_activate_module:n \l_stex_get_structure_module_str
4367     \prop_clear:N \l_tmpa_prop
4368     \tl_if_empty:nF {#3} {
4369       \seq_set_split:Nnn \l_tmpa_seq , {#3}
4370       \seq_map_inline:Nn \l_tmpa_seq {
4371         \seq_set_split:Nnn \l_tmpb_seq = { ##1 }
4372         \int_compare:nNnF { \seq_count:N \l_tmpb_seq } = 2 {
4373           \msg_error:nnn{stex}{error/keyval}{##1}
4374         }
4375         \exp_args:Nx \stex_get_symbol_in_seq:nn {\seq_item:Nn \l_tmpb_seq 1} \l__stex_struct
4376         \str_set_eq:NN \l__stex_structures_dom_str \l_stex_get_symbol_uri_str
4377         \exp_args:NNx \seq_remove_all:Nn \l__stex_structures_fields_seq \l_stex_get_symbol_u
4378         \exp_args:Nx \stex_symbol_or_var:n {\seq_item:Nn \l_tmpb_seq 2}
4379         \bool_if:NTF \l_stex_symbol_or_var_bool {
4380           \exp_args:Nxx \str_if_eq:nnF
4381             {\prop_item:cn{l_stex_symdecl_\l__stex_structures_dom_str _prop}{args}}
4382             {\prop_item:cn{l_stex_variable_\l_stex_get_symbol_uri_str _prop}{args}}{
4383             \msg_error:nnxxx{stex}{error/incompatible}
4384             {\l__stex_structures_dom_str}
4385             {\prop_item:cn{l_stex_symdecl_\l__stex_structures_dom_str _prop}{args}}
4386             {\l_stex_get_symbol_uri_str}
4387             {\prop_item:cn{l_stex_variable_\l_stex_get_symbol_uri_str _prop}{args}}
4388           }
4389         \prop_put:Nxx \l_tmpa_prop {\seq_item:Nn \l_tmpb_seq 1} {\stex_invoke_variable:n {
4390       }{
4391         \exp_args:Nxx \str_if_eq:nnF
4392           {\prop_item:cn{l_stex_symdecl_\l__stex_structures_dom_str _prop}{args}}
4393           {\prop_item:cn{l_stex_symdecl_\l_stex_get_symbol_uri_str _prop}{args}}{

```



```

4394         \msg_error:nnxxxx{stex}{error/incompatible}
4395         {\l__stex_structures_dom_str}
4396         {\prop_item:cn{l_stex_symdecl\l__stex_structures_dom_str_prop}{args}}
4397         {\l_stex_get_symbol_uri_str}
4398         {\prop_item:cn{l_stex_symdecl\l_stex_get_symbol_uri_str_prop}{args}}
4399     }
4400     \prop_put:Nxx \l_tmpa_prop {\seq_item:Nn \l_tmpb_seq 1} {\stex_invoke_symbol:n {\l
4401 }
4402 }
4403 }
4404 \tl_gclear:N \g__stex_structures_aftergroup_tl
4405 \seq_map_inline:Nn \l__stex_structures_fields_seq {
4406     \str_set:Nx \l_tmpa_str {\l__stex_structures_name_str . \prop_item:cn {l_stex_symdecl
4407     \stex_find_notation:nn{##1}{}}
4408     \cs_gset_eq:cc{g__stex_structures_tmpa\l_tmpa_str_cs}
4409     {stex_notation_##1\c_hash_str \l_stex_notation_variant_str_cs}
4410     \cs_if_exist:cT{stex_op_notation_##1\c_hash_str \l_stex_notation_variant_str_cs}{
4411     \cs_gset_eq:cc {g__stex_structures_tmpa_op\l_tmpa_str_cs}
4412     {stex_op_notation_##1\c_hash_str \l_stex_notation_variant_str_cs}
4413 }
4414
4415 \exp_args:NNx \tl_gput_right:Nn \g__stex_structures_aftergroup_tl {
4416     \prop_set_from_keyval:cn { l_stex_variable_ \l_tmpa_str_prop}{
4417         name = \l_tmpa_str ,
4418         args = \prop_item:cn {l_stex_symdecl_##1_prop}{args} ,
4419         arity = \prop_item:cn {l_stex_symdecl_##1_prop}{arity} ,
4420         assocs = \prop_item:cn {l_stex_symdecl_##1_prop}{assocs}
4421     }
4422     \cs_set_eq:cc {stex_var_notation\l_tmpa_str_cs}
4423     {g__stex_structures_tmpa\l_tmpa_str_cs}
4424     \cs_set_eq:cc {stex_var_op_notation\l_tmpa_str_cs}
4425     {g__stex_structures_tmpa_op\l_tmpa_str_cs}
4426 }
4427 \prop_put:Nxx \l_tmpa_prop {\prop_item:cn {l_stex_symdecl_##1_prop}{name}}{\stex_invo
4428 }
4429 \exp_args:NNx \tl_gput_right:Nn \g__stex_structures_aftergroup_tl {
4430     \prop_set_from_keyval:cn {l_stex_varinstance\l__stex_structures_name_str_prop }{
4431         domain = \l_stex_get_structure_module_str ,
4432         \prop_to_keyval:N \l_tmpa_prop
4433     }
4434     \tl_set:cn { #1 }{\stex_invoke_varinstance:n {\l__stex_structures_name_str}}
4435     \tl_set:cn {l_stex_varinstance\l__stex_structures_name_str_op_tl}{
4436         \exp_args:Nnx \exp_not:N \use:nn {
4437             \str_set:Nn \exp_not:N \l_stex_current_symbol_str {var://\l__stex_structures_name
4438             \_stex_term_omv:nn {var://\l__stex_structures_name_str}{
4439                 \exp_not:n{
4440                     \_varcomp{#5}
4441                 }
4442             }
4443         }{
4444             \exp_not:n{\_stex_reset:N \l_stex_current_symbol_str}
4445         }
4446     }
4447 }

```

```

4448 \aftergroup\g__stex_structures_aftergroup_tl
4449 \endgroup
4450 \stex_smsmode_do:\ignorespacesandpars
4451 }
4452
4453 \cs_new_protected:Nn \stex_invoke_instance:n {
4454 \peek_charcode_remove:NTF ! {
4455 \stex_invoke_symbol:n{#1}
4456 }{
4457 \stex_invoke_instance:nn {#1}
4458 }
4459 }
4460
4461
4462 \cs_new_protected:Nn \stex_invoke_varinstance:n {
4463 \peek_charcode_remove:NTF ! {
4464 \use:c{l_stex_varinstance_#1_op_tl}
4465 }{
4466 \stex_invoke_varinstance:nn {#1}
4467 }
4468 }
4469
4470 \cs_new_protected:Nn \stex_invoke_instance:nn {
4471 \prop_if_in:cnTF {l_stex_instance_ #1 _prop}{#2}{
4472 \exp_args:Nx \stex_invoke_symbol:n {\prop_item:cn{l_stex_instance_ #1 _prop}{#2}}
4473 }{
4474 \prop_set_eq:Nc \l_tmpa_prop{l_stex_instance_ #1 _prop}
4475 \msg_error:nnnn{stex}{error/unknownfield}{#2}{#1}{
4476 \prop_to_keyval:N \l_tmpa_prop
4477 }
4478 }
4479 }
4480
4481 \cs_new_protected:Nn \stex_invoke_varinstance:nn {
4482 \prop_if_in:cnTF {l_stex_varinstance_ #1 _prop}{#2}{
4483 \prop_get:cnN{l_stex_varinstance_ #1 _prop}{#2}\l_tmpa_tl
4484 \l_tmpa_tl
4485 }{
4486 \msg_error:nnnn{stex}{error/unknownfield}{#2}{#1}{
4487 }
4488 }

```

(End definition for `\instantiate`. This function is documented on page 31.)

`\stex_invoke_structure:nnn`

```

4489 % #1: URI of the instance
4490 % #2: URI of the instantiated module
4491 \cs_new_protected:Nn \stex_invoke_structure:nnn {
4492 \tl_if_empty:nTF{ #3 }{
4493 \prop_set_eq:Nc \l__stex_structures_structure_prop {
4494 c_stex_feature_ #2 _prop
4495 }
4496 \tl_clear:N \l_tmpa_tl
4497 \prop_get:NnN \l__stex_structures_structure_prop { fields } \l_tmpa_seq

```

```

4498 \seq_map_inline:Nn \l_tmpa_seq {
4499   \seq_set_split:Nnn \l_tmpb_seq ? { ##1 }
4500   \seq_get_right:NN \l_tmpb_seq \l_tmpa_str
4501   \cs_if_exist:cT {
4502     stex_notation_ #1/\l_tmpa_str \c_hash_str\c_hash_str _cs
4503   }{
4504     \tl_if_empty:NF \l_tmpa_tl {
4505       \tl_put_right:Nn \l_tmpa_tl {,}
4506     }
4507     \tl_put_right:Nx \l_tmpa_tl {
4508       \stex_invoke_symbol:n {#1/\l_tmpa_str}!
4509     }
4510   }
4511 }
4512 \exp_args:No \mathstruct \l_tmpa_tl
4513 }{
4514   \stex_invoke_symbol:n{#1/#3}
4515 }
4516 }

```

(End definition for \stex_invoke_structure:nnn. This function is documented on page ??.)

```

4517 </package>

```

Chapter 32

STEX -Statements Implementation

```
4518 <*package>
4519
4520 %%%%%%%%%%% features.dtx %%%%%%%%%%%
4521
4522 <@@=stex_statements>
    Warnings and error messages
4523

\titleemph
4524 \def\titleemph#1{\textbf{#1}}

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

32.1 Definitions

definiendum

```
4525 \keys_define:nn {stex / definiendum }{
4526   pre      .tl_set:N      = \l__stex_statements_definiendum_pre_tl,
4527   post     .tl_set:N      = \l__stex_statements_definiendum_post_tl,
4528   root     .str_set_x:N    = \l__stex_statements_definiendum_root_str,
4529   gfa      .str_set_x:N    = \l__stex_statements_definiendum_gfa_str
4530 }
4531 \cs_new_protected:Nn \__stex_statements_definiendum_args:n {
4532   \str_clear:N \l__stex_statements_definiendum_root_str
4533   \tl_clear:N \l__stex_statements_definiendum_post_tl
4534   \str_clear:N \l__stex_statements_definiendum_gfa_str
4535   \keys_set:nn { stex / definiendum }{ #1 }
4536 }
4537 \NewDocumentCommand \definiendum { O{} m m } {
4538   \__stex_statements_definiendum_args:n { #1 }
4539   \stex_get_symbol:n { #2 }
4540   \stex_ref_new_sym_target:n \l_stex_get_symbol_uri_str
4541   \str_if_empty:NTF \l__stex_statements_definiendum_root_str {
4542     \tl_if_empty:NTF \l__stex_statements_definiendum_post_tl {
```

```

4543     \tl_set:Nn \l_tmpa_tl { #3 }
4544   } {
4545     \str_set:Nx \l__stex_statements_definiendum_root_str { #3 }
4546     \tl_set:Nn \l_tmpa_tl {
4547       \l__stex_statements_definiendum_pre_tl\l__stex_statements_definiendum_root_str\l__st
4548     }
4549   }
4550 } {
4551   \tl_set:Nn \l_tmpa_tl { #3 }
4552 }
4553
4554 % TODO root
4555 \rustex_if:TF {
4556   \stex_annotate:nnn { definiendum } { \l_stex_get_symbol_uri_str } { \l_tmpa_tl }
4557 } {
4558   \exp_args:Nnx \defemph@uri { \l_tmpa_tl } { \l_stex_get_symbol_uri_str }
4559 }
4560 }
4561 \stex_deactivate_macro:Nn \definiendum {definition~environments}

```

(End definition for definiendum. This function is documented on page 40.)

definame

```

4562
4563 \NewDocumentCommand \definame { 0{ } m } {
4564   \__stex_statements_definiendum_args:n { #1 }
4565   % TODO: root
4566   \stex_get_symbol:n { #2 }
4567   \stex_ref_new_sym_target:n \l_stex_get_symbol_uri_str
4568   \str_set:Nx \l_tmpa_str {
4569     \prop_item:cn { l_stex_symdecl_ \l_stex_get_symbol_uri_str _prop } { name }
4570   }
4571   \str_replace_all:Nnn \l_tmpa_str {-} {~}
4572   \rustex_if:TF {
4573     \stex_annotate:nnn { definiendum } { \l_stex_get_symbol_uri_str } {
4574       \l_tmpa_str\l__stex_statements_definiendum_post_tl
4575     }
4576   } {
4577     \exp_args:Nnx \defemph@uri {
4578       \l_tmpa_str\l__stex_statements_definiendum_post_tl
4579     } { \l_stex_get_symbol_uri_str }
4580   }
4581 }
4582 \stex_deactivate_macro:Nn \definame {definition~environments}
4583
4584 \NewDocumentCommand \Definame { 0{ } m } {
4585   \__stex_statements_definiendum_args:n { #1 }
4586   \stex_get_symbol:n { #2 }
4587   \str_set:Nx \l_tmpa_str {
4588     \prop_item:cn { l_stex_symdecl_ \l_stex_get_symbol_uri_str _prop } { name }
4589   }
4590   \exp_args:NNno \str_replace_all:Nnn \l_tmpa_str {-} {~}
4591   \stex_ref_new_sym_target:n \l_stex_get_symbol_uri_str
4592   \rustex_if:TF {

```

```

4593 \stex_annotate:nnn { definiendum } { \l_stex_get_symbol_uri_str } {
4594 \l_tmpa_str\l__stex_statements_definiendum_post_tl
4595 }
4596 } {
4597 \exp_args:Nnx \defemph@uri {
4598 \exp_after:wN \stex_capitalize:n \l_tmpa_str\l__stex_statements_definiendum_post_tl
4599 } { \l_stex_get_symbol_uri_str }
4600 }
4601 }
4602 \stex_deactivate_macro:Nn \Definame {definition~environments}
4603
4604 \NewDocumentCommand \premise { m }{
4605 \stex_annotate:nnn{ premise }{}{ #1 }
4606 }
4607 \NewDocumentCommand \conclusion { m }{
4608 \stex_annotate:nnn{ conclusion }{}{ #1 }
4609 }
4610 \NewDocumentCommand \definiens { O{} m }{
4611 \str_clear:N \l_stex_get_symbol_uri_str
4612 \tl_if_empty:nF {#1} {
4613 \stex_get_symbol:n { #1 }
4614 }
4615 \stex_annotate:nnn{ definiens }{\l_stex_get_symbol_uri_str}{ #1 }
4616 }
4617
4618 \stex_deactivate_macro:Nn \premise {definition,~example~or~assertion~environments}
4619 \stex_deactivate_macro:Nn \conclusion {example~or~assertion~environments}
4620 \stex_deactivate_macro:Nn \definiens {definition~environments}
4621

```

(End definition for `definame`. This function is documented on page 40.)

sdefinition

```

4622
4623 \keys_define:nn {stex / sdefinition }{
4624 type .str_set_x:N = \sdefinitiontype,
4625 id .str_set_x:N = \sdefinitionid,
4626 name .str_set_x:N = \sdefinitionname,
4627 for .clist_set:N = \l__stex_statements_sdefinition_for_clist ,
4628 title .tl_set:N = \sdefinitiontitle
4629 }
4630 \cs_new_protected:Nn \__stex_statements_sdefinition_args:n {
4631 \str_clear:N \sdefinitiontype
4632 \str_clear:N \sdefinitionid
4633 \str_clear:N \sdefinitionname
4634 \clist_clear:N \l__stex_statements_sdefinition_for_clist
4635 \tl_clear:N \sdefinitiontitle
4636 \keys_set:nn { stex / sdefinition }{ #1 }
4637 }
4638
4639 \NewDocumentEnvironment{sdefinition}{O{}}{
4640 \__stex_statements_sdefinition_args:n{ #1 }
4641 \stex_reactivate_macro:N \definiendum
4642 \stex_reactivate_macro:N \definame

```

```

4643 \stex_reactivate_macro:N \Definame
4644 \stex_reactivate_macro:N \premise
4645 \stex_reactivate_macro:N \definiens
4646 \stex_if_smsmode:F{
4647   \seq_clear:N \l_tmpa_seq
4648   \clist_map_inline:Nn \l__stex_statements_sdefinition_for_clist {
4649     \tl_if_empty:nF{ ##1 }{
4650       \stex_get_symbol:n { ##1 }
4651       \exp_args:NNo \seq_put_right:Nn \l_tmpa_seq {
4652         \l_stex_get_symbol_uri_str
4653       }
4654     }
4655   }
4656   \exp_args:Nnnx
4657   \begin{stex_annotate_env}{definition}{\seq_use:Nn \l_tmpa_seq {,}}
4658   \str_if_empty:NF \sdefinitiontype {
4659     \stex_annotate_invisible:nnn{type}{\sdefinitiontype}{ }
4660   }
4661   \clist_set:No \l_tmpa_clist \sdefinitiontype
4662   \tl_clear:N \l_tmpa_tl
4663   \clist_map_inline:Nn \l_tmpa_clist {
4664     \tl_if_exist:cT {__stex_statements_sdefinition_##1_start:}{
4665       \tl_set:Nn \l_tmpa_tl {\use:c{__stex_statements_sdefinition_##1_start:}}
4666     }
4667   }
4668   \tl_if_empty:NTF \l_tmpa_tl {
4669     \__stex_statements_sdefinition_start:
4670   }{
4671     \l_tmpa_tl
4672   }
4673 }
4674 \stex_ref_new_doc_target:n \sdefinitionid
4675 \stex_smsmode_do:
4676 ){
4677   \str_if_empty:NF \sdefinitionname { \stex_symdecl_do:nn{}{\sdefinitionname} }
4678   \stex_if_smsmode:F {
4679     \clist_set:No \l_tmpa_clist \sdefinitiontype
4680     \tl_clear:N \l_tmpa_tl
4681     \clist_map_inline:Nn \l_tmpa_clist {
4682       \tl_if_exist:cT {__stex_statements_sdefinition_##1_end:}{
4683         \tl_set:Nn \l_tmpa_tl {\use:c{__stex_statements_sdefinition_##1_end:}}
4684       }
4685     }
4686     \tl_if_empty:NTF \l_tmpa_tl {
4687       \__stex_statements_sdefinition_end:
4688     }{
4689       \l_tmpa_tl
4690     }
4691     \end{stex_annotate_env}
4692   }
4693 }

```

\stexpatchdefinition

```

4694 \cs_new_protected:Nn \__stex_statements_sdefinition_start: {

```

```

4695 \par\noindent\titleemph{Definition\ifempty:NF \sdefinitiontitle {
4696 ~(\sdefinitiontitle)
4697 }~}
4698 }
4699 \cs_new_protected:Nn \__stex_statements_sdefinition_end: {\par\medskip}
4700
4701 \newcommand\stexpatchdefinition[3][] {
4702   \str_set:Nx \l_tmpa_str{ #1 }
4703   \str_if_empty:NTF \l_tmpa_str {
4704     \tl_set:Nn \__stex_statements_sdefinition_start: { #2 }
4705     \tl_set:Nn \__stex_statements_sdefinition_end: { #3 }
4706   }{
4707     \exp_after:wN \tl_set:Nn \csname __stex_statements_sdefinition_#1_start:\endcsname{ #2 }
4708     \exp_after:wN \tl_set:Nn \csname __stex_statements_sdefinition_#1_end:\endcsname{ #3 }
4709   }
4710 }

```

(End definition for \stexpatchdefinition. This function is documented on page 42.)

\inlinedef inline:

```

4711 \keys_define:nn {stex / inlinedef }{
4712   type .str_set_x:N = \sdefinitiontype,
4713   id .str_set_x:N = \sdefinitionid,
4714   for .clist_set:N = \l__stex_statements_sdefinition_for_clist ,
4715   name .str_set_x:N = \sdefinitionname
4716 }
4717 \cs_new_protected:Nn \__stex_statements_inlinedef_args:n {
4718   \str_clear:N \sdefinitiontype
4719   \str_clear:N \sdefinitionid
4720   \str_clear:N \sdefinitionname
4721   \clist_clear:N \l__stex_statements_sdefinition_for_clist
4722   \keys_set:nn { stex / inlinedef }{ #1 }
4723 }
4724 \NewDocumentCommand \inlinedef { 0{} m } {
4725   \begingroup
4726   \__stex_statements_inlinedef_args:n{ #1 }
4727   \stex_reactivate_macro:N \definiendum
4728   \stex_reactivate_macro:N \definame
4729   \stex_reactivate_macro:N \Definame
4730   \stex_reactivate_macro:N \premise
4731   \stex_reactivate_macro:N \definiens
4732   \stex_ref_new_doc_target:n \sdefinitionid
4733   \stex_if_smsmode:TF{
4734     \str_if_empty:NF \sdefinitionname { \stex_symdecl_do:nn{}{\sdefinitionname} }
4735   }{
4736     \seq_clear:N \l_tmpa_seq
4737     \clist_map_inline:Nn \l__stex_statements_sdefinition_for_clist {
4738       \tl_if_empty:nF{ ##1 }{
4739         \stex_get_symbol:n { ##1 }
4740         \exp_args:NNo \seq_put_right:Nn \l_tmpa_seq {
4741           \l_stex_get_symbol_uri_str
4742         }
4743       }
4744     }

```



```

4745 \exp_args:Nnx
4746 \stex_annotate:nnn{definition}{\seq_use:Nn \l_tmpa_seq {,}}{
4747   \str_if_empty:NF \sdefinitiontype {
4748     \stex_annotate_invisible:nnn{type}{\sdefinitiontype}{}
4749   }
4750   #2
4751   \str_if_empty:NF \sdefinitionname { \stex_symdecl_do:nn{}}{\sdefinitionname} }
4752 }
4753 }
4754 \endgroup
4755 \stex_smsmode_do:
4756 }

```

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

32.2 Assertions

sassertion

```

4757
4758 \keys_define:nn {stex / sassertion }{
4759   type      .str_set_x:N = \sassertiontype,
4760   id        .str_set_x:N = \sassertionid,
4761   title     .tl_set:N    = \sassertiontitle ,
4762   for       .clist_set:N = \l__stex_statements_sassertion_for_clist ,
4763   name      .str_set_x:N = \sassertionname
4764 }
4765
4766 \cs_new_protected:Nn \__stex_statements_sassertion_args:n {
4767   \str_clear:N \sassertiontype
4768   \str_clear:N \sassertionid
4769   \str_clear:N \sassertionname
4770   \clist_clear:N \l__stex_statements_sassertion_for_clist
4771   \tl_clear:N \sassertiontitle
4772   \keys_set:nn { stex / sassertion }{ #1 }
4773 }
4774
4775 %\tl_new:N \g__stex_statements_aftergroup_tl
4776
4777 \NewDocumentEnvironment{sassertion}{0{}}{
4778   \__stex_statements_sassertion_args:n{ #1 }
4779   \stex_reactivate_macro:N \premise
4780   \stex_reactivate_macro:N \conclusion
4781   \stex_if_smsmode:F {
4782     \seq_clear:N \l_tmpa_seq
4783     \clist_map_inline:Nn \l__stex_statements_sassertion_for_clist {
4784       \tl_if_empty:nF{ ##1 }{
4785         \stex_get_symbol:n { ##1 }
4786         \exp_args:NNo \seq_put_right:Nn \l_tmpa_seq {
4787           \l_stex_get_symbol_uri_str
4788         }
4789       }
4790     }
4791     \exp_args:Nnnx
4792     \begin{stex_annotate_env}{assertion}{\seq_use:Nn \l_tmpa_seq {,}}

```

```

4792 \str_if_empty:NF \sassertiontype {
4793   \stex_annotate_invisible:nnn{type}{\sassertiontype}{}
4794 }
4795 \clist_set:No \l_tmpa_clist \sassertiontype
4796 \tl_clear:N \l_tmpa_tl
4797 \clist_map_inline:Nn \l_tmpa_clist {
4798   \tl_if_exist:cT {__stex_statements_sassertion_##1_start:}{
4799     \tl_set:Nn \l_tmpa_tl {\use:c{__stex_statements_sassertion_##1_start:}}
4800   }
4801 }
4802 \tl_if_empty:NTF \l_tmpa_tl {
4803   \__stex_statements_sassertion_start:
4804 }{
4805   \l_tmpa_tl
4806 }
4807 }
4808 \str_if_empty:NTF \sassertionid {
4809   \str_if_empty:NF \sassertionname {
4810     \stex_ref_new_doc_target:n {}
4811   }
4812 } {
4813   \stex_ref_new_doc_target:n \sassertionid
4814 }
4815 \stex_smsmode_do:
4816 }{
4817   \str_if_empty:NF \sassertionname {
4818     \stex_symdecl_do:nn{}{\sassertionname}
4819     \stex_ref_new_sym_target:n {\l_stex_current_module_str ? \sassertionname}
4820   }
4821   \stex_if_smsmode:F {
4822     \clist_set:No \l_tmpa_clist \sassertiontype
4823     \tl_clear:N \l_tmpa_tl
4824     \clist_map_inline:Nn \l_tmpa_clist {
4825       \tl_if_exist:cT {__stex_statements_sassertion_##1_end:}{
4826         \tl_set:Nn \l_tmpa_tl {\use:c{__stex_statements_sassertion_##1_end:}}
4827       }
4828     }
4829     \tl_if_empty:NTF \l_tmpa_tl {
4830       \__stex_statements_sassertion_end:
4831     }{
4832       \l_tmpa_tl
4833     }
4834     \end{stex_annotate_env}
4835   }
4836 }

```

\stexpatchassertion

```

4837
4838 \cs_new_protected:Nn \__stex_statements_sassertion_start: {
4839   \par\noindent\titllemph{Assertion~\tl_if_empty:NF \sassertiontitle {
4840     (\sassertiontitle)
4841   }~}
4842 }
4843 \cs_new_protected:Nn \__stex_statements_sassertion_end: {\par\medskip}

```

```

4844
4845 \newcommand\stexpatchassertion[3] [] {
4846   \str_set:Nx \l_tmpa_str{ #1 }
4847   \str_if_empty:NTF \l_tmpa_str {
4848     \tl_set:Nn \__stex_statements_sassertion_start: { #2 }
4849     \tl_set:Nn \__stex_statements_sassertion_end: { #3 }
4850   }{
4851     \exp_after:wN \tl_set:Nn \csname __stex_statements_sassertion_#1_start:\endcsname{ #2
4852     \exp_after:wN \tl_set:Nn \csname __stex_statements_sassertion_#1_end:\endcsname{ #3 }
4853   }
4854 }

```

(End definition for \stexpatchassertion. This function is documented on page 42.)

\inlineass inline:

```

4855 \keys_define:nn {stex / inlineass }{
4856   type      .str_set_x:N = \sassertiontype,
4857   id        .str_set_x:N = \sassertionid,
4858   for       .clist_set:N = \l__stex_statements_sassertion_for_clist ,
4859   name      .str_set_x:N = \sassertionname
4860 }
4861 \cs_new_protected:Nn \__stex_statements_inlineass_args:n {
4862   \str_clear:N \sassertiontype
4863   \str_clear:N \sassertionid
4864   \str_clear:N \sassertionname
4865   \clist_clear:N \l__stex_statements_sassertion_for_clist
4866   \keys_set:nn { stex / inlineass }{ #1 }
4867 }
4868 \NewDocumentCommand \inlineass { 0{} m } {
4869   \begingroup
4870   \stex_reactivate_macro:N \premise
4871   \stex_reactivate_macro:N \conclusion
4872   \__stex_statements_inlineass_args:n{ #1 }
4873   \str_if_empty:NTF \sassertionid {
4874     \str_if_empty:NF \sassertionname {
4875       \stex_ref_new_doc_target:n {}
4876     }
4877   } {
4878     \stex_ref_new_doc_target:n \sassertionid
4879   }
4880
4881   \stex_if_smsmode:TF{
4882     \str_if_empty:NF \sassertionname {
4883       \stex_symdecl_do:nn{}{\sassertionname}
4884       \stex_ref_new_sym_target:n {\l_stex_current_module_str ? \sassertionname}
4885     }
4886   }{
4887     \seq_clear:N \l_tmpa_seq
4888     \clist_map_inline:Nn \l__stex_statements_sassertion_for_clist {
4889       \tl_if_empty:nF{ ##1 }{
4890         \stex_get_symbol:n { ##1 }
4891         \exp_args:NNo \seq_put_right:Nn \l_tmpa_seq {
4892           \l_stex_get_symbol_uri_str
4893         }

```

```

4894     }
4895   }
4896   \exp_args:Nnx
4897   \stex_annotate:nnn{assertion}{\seq_use:Nn \l_tmpa_seq {,}}{
4898     \str_if_empty:NF \sassertiontype {
4899       \stex_annotate_invisible:nnn{type}{\sassertiontype}{}}
4900   }
4901   #2
4902   \str_if_empty:NF \sassertionname {
4903     \stex_symdecl_do:nn{}{\sassertionname}
4904     \stex_ref_new_sym_target:n {\l_stex_current_module_str ? \sassertionname}
4905   }
4906 }
4907 }
4908 \endgroup
4909 \stex_smsmode_do:
4910 }

```

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

32.3 Examples

`sexample`

```

4911
4912 \keys_define:nn {stex / sexample }{
4913   type      .str_set_x:N = \exampletype,
4914   id        .str_set_x:N = \sexampleid,
4915   title     .tl_set:N     = \sexampletitle,
4916   name      .str_set_x:N = \seamplename ,
4917   for       .clist_set:N  = \l__stex_statements_sexample_for_clist,
4918 }
4919 \cs_new_protected:Nn \__stex_statements_sexample_args:n {
4920   \str_clear:N \sexampletype
4921   \str_clear:N \sexampleid
4922   \str_clear:N \sexamplename
4923   \tl_clear:N \sexampletitle
4924   \clist_clear:N \l__stex_statements_sexample_for_clist
4925   \keys_set:nn { stex / sexample }{ #1 }
4926 }
4927
4928 \NewDocumentEnvironment{sexample}{0{}}{
4929   \__stex_statements_sexample_args:n{ #1 }
4930   \stex_reactivate_macro:N \premise
4931   \stex_reactivate_macro:N \conclusion
4932   \stex_if_smsmode:F {
4933     \seq_clear:N \l_tmpa_seq
4934     \clist_map_inline:Nn \l__stex_statements_sexample_for_clist {
4935       \tl_if_empty:nF{ ##1 }{
4936         \stex_get_symbol:n { ##1 }
4937         \exp_args:NNo \seq_put_right:Nn \l_tmpa_seq {
4938           \l_stex_get_symbol_uri_str
4939         }
4940       }

```

```

4941 }
4942 \exp_args:Nnnx
4943 \begin{stex_annotate_env}{example}{\seq_use:Nn \l_tmpa_seq {,}}
4944 \str_if_empty:NF \sexamplotype {
4945   \stex_annotate_invisible:nnn{type}{\sexamplotype}{}
4946 }
4947 \clist_set:No \l_tmpa_clist \sexamplotype
4948 \tl_clear:N \l_tmpa_tl
4949 \clist_map_inline:Nn \l_tmpa_clist {
4950   \tl_if_exist:cT {__stex_statements_sexample_##1_start:}{
4951     \tl_set:Nn \l_tmpa_tl {\use:c{__stex_statements_sexample_##1_start:}}
4952   }
4953 }
4954 \tl_if_empty:NTF \l_tmpa_tl {
4955   \__stex_statements_sexample_start:
4956 }{
4957   \l_tmpa_tl
4958 }
4959 }
4960 \str_if_empty:NF \sexampleid {
4961   \stex_ref_new_doc_target:n \sexampleid
4962 }
4963 \stex_smsmode_do:
4964 }{
4965   \str_if_empty:NF \sexamplename { \stex_symdecl_do:nn{}{\sexamplename} }
4966   \stex_if_smsmode:F {
4967     \clist_set:No \l_tmpa_clist \sexamplotype
4968     \tl_clear:N \l_tmpa_tl
4969     \clist_map_inline:Nn \l_tmpa_clist {
4970       \tl_if_exist:cT {__stex_statements_sexample_##1_end:}{
4971         \tl_set:Nn \l_tmpa_tl {\use:c{__stex_statements_sexample_##1_end:}}
4972       }
4973     }
4974     \tl_if_empty:NTF \l_tmpa_tl {
4975       \__stex_statements_sexample_end:
4976     }{
4977       \l_tmpa_tl
4978     }
4979     \end{stex_annotate_env}
4980   }
4981 }

```

\stexpatchexample

```

4982
4983 \cs_new_protected:Nn \__stex_statements_sexample_start: {
4984   \par\noindent\titleemph{Example~\tl_if_empty:NF \sexamplename {
4985     (\sexamplename)
4986   }}~}
4987 }
4988 \cs_new_protected:Nn \__stex_statements_sexample_end: {\par\medskip}
4989
4990 \newcommand\stexpatchexample[3] [] {
4991   \str_set:Nx \l_tmpa_str{ #1 }
4992   \str_if_empty:NTF \l_tmpa_str {

```

```

4993     \tl_set:Nn \__stex_statements_sexample_start: { #2 }
4994     \tl_set:Nn \__stex_statements_sexample_end: { #3 }
4995   }{
4996     \exp_after:wN \tl_set:Nn \csname __stex_statements_sexample_#1_start:\endcsname{ #2 }
4997     \exp_after:wN \tl_set:Nn \csname __stex_statements_sexample_#1_end:\endcsname{ #3 }
4998   }
4999 }

```

(End definition for `\stexpatchexample`. This function is documented on page 42.)

`\inlineex` inline:

```

5000 \keys_define:nn {stex / inlineex }{
5001   type      .str_set_x:N = \sexamplotype,
5002   id        .str_set_x:N = \sexampleid,
5003   for       .clist_set:N = \l__stex_statements_sexample_for_clist ,
5004   name      .str_set_x:N = \sexamplename
5005 }
5006 \cs_new_protected:Nn \__stex_statements_inlineex_args:n {
5007   \str_clear:N \sexamplotype
5008   \str_clear:N \sexampleid
5009   \str_clear:N \sexamplename
5010   \clist_clear:N \l__stex_statements_sexample_for_clist
5011   \keys_set:nn { stex / inlineex }{ #1 }
5012 }
5013 \NewDocumentCommand \inlineex { 0{} m } {
5014   \begin{group}
5015     \stex_reactivate_macro:N \premise
5016     \stex_reactivate_macro:N \conclusion
5017     \__stex_statements_inlineex_args:n{ #1 }
5018     \str_if_empty:NF \sexampleid {
5019       \stex_ref_new_doc_target:n \sexampleid
5020     }
5021     \stex_if_smsmode:TF{
5022       \str_if_empty:NF \sexamplename { \stex_symdecl_do:nn{}{\sexamplename} }
5023     }{
5024       \seq_clear:N \l_tmpa_seq
5025       \clist_map_inline:Nn \l__stex_statements_sexample_for_clist {
5026         \tl_if_empty:NF{ ##1 }{
5027           \stex_get_symbol:n { ##1 }
5028           \exp_args:NNo \seq_put_right:Nn \l_tmpa_seq {
5029             \l_stex_get_symbol_uri_str
5030           }
5031         }
5032       }
5033       \exp_args:Nnx
5034       \stex_annotate:nnn{example}{\seq_use:Nn \l_tmpa_seq {},}{
5035         \str_if_empty:NF \sexamplotype {
5036           \stex_annotate_invisible:nnn{type}{\sexamplotype}{
5037             }
5038           #2
5039           \str_if_empty:NF \sexamplename { \stex_symdecl_do:nn{}{\sexamplename} }
5040         }
5041       }
5042     }

```

```

5043 \stex_smsmode_do:
5044 }

```

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

32.4 Logical Paragraphs

sparagraph

```

5045 \keys_define:nn { stex / sparagraph } {
5046   id      .str_set_x:N = \sparagraphid ,
5047   title   .tl_set:N   = \l_stex_sparagraph_title_tl ,
5048   type    .str_set_x:N = \sparagraphtype ,
5049   for     .clist_set:N = \l__stex_statements_sparagraph_for_clist ,
5050   from    .tl_set:N   = \sparagraphfrom ,
5051   to      .tl_set:N   = \sparagraphto ,
5052   start   .tl_set:N   = \l_stex_sparagraph_start_tl ,
5053   name    .str_set:N   = \sparagraphname
5054 }
5055
5056 \cs_new_protected:Nn \stex_sparagraph_args:n {
5057   \tl_clear:N \l_stex_sparagraph_title_tl
5058   \tl_clear:N \sparagraphfrom
5059   \tl_clear:N \sparagraphto
5060   \tl_clear:N \l_stex_sparagraph_start_tl
5061   \str_clear:N \sparagraphid
5062   \str_clear:N \sparagraphtype
5063   \clist_clear:N \l__stex_statements_sparagraph_for_clist
5064   \str_clear:N \sparagraphname
5065   \keys_set:nn { stex / sparagraph } { #1 }
5066 }
5067 \newif\if@in@omtext\@in@omtextfalse
5068
5069 \NewDocumentEnvironment {sparagraph} { 0{ } } {
5070   \stex_sparagraph_args:n { #1 }
5071   \tl_if_empty:NTF \l_stex_sparagraph_start_tl {
5072     \tl_set_eq:NN \sparagraphtitle \l_stex_sparagraph_title_tl
5073   }{
5074     \tl_set_eq:NN \sparagraphtitle \l_stex_sparagraph_start_tl
5075   }
5076   \@in@omtexttrue
5077   \stex_if_smsmode:F {
5078     \seq_clear:N \l_tmpa_seq
5079     \clist_map_inline:Nn \l__stex_statements_sparagraph_for_clist {
5080       \tl_if_empty:nF{ ##1 }{
5081         \stex_get_symbol:n { ##1 }
5082         \exp_args:NNo \seq_put_right:Nn \l_tmpa_seq {
5083           \l_stex_get_symbol_uri_str
5084         }
5085       }
5086     }
5087     \exp_args:Nnnx
5088     \begin{stex_annotate_env}{paragraph}{\seq_use:Nn \l_tmpa_seq {,}}
5089     \str_if_empty:NF \sparagraphtype {

```

```

5090     \stex_annotate_invisible:nnn{type}{\sparagraphtype}{}
5091   }
5092   \str_if_empty:NF \sparagraphfrom {
5093     \stex_annotate_invisible:nnn{from}{\sparagraphfrom}{}
5094   }
5095   \str_if_empty:NF \sparagraphto {
5096     \stex_annotate_invisible:nnn{to}{\sparagraphto}{}
5097   }
5098   \clist_set:No \l_tmpa_clist \sparagraphtype
5099   \tl_clear:N \l_tmpa_tl
5100   \clist_map_inline:Nn \sparagraphtype {
5101     \tl_if_exist:cT {__stex_statements_sparagraph_##1_start:}{
5102       \tl_set:Nn \l_tmpa_tl {\use:c{__stex_statements_sparagraph_##1_start:}}
5103     }
5104   }
5105   \tl_if_empty:NTF \l_tmpa_tl {
5106     \__stex_statements_sparagraph_start:
5107   }{
5108     \l_tmpa_tl
5109   }
5110 }
5111 \clist_set:No \l_tmpa_clist \sparagraphtype
5112 \exp_args:NNx \clist_if_in:NnT \l_tmpa_clist {\tl_to_str:n{symdoc}}
5113 {
5114   \stex_reactivate_macro:N \definiendum
5115   \stex_reactivate_macro:N \definame
5116   \stex_reactivate_macro:N \Definame
5117   \stex_reactivate_macro:N \premise
5118   \stex_reactivate_macro:N \definiens
5119 }
5120 \str_if_empty:NTF \sparagraphid {
5121   \str_if_empty:NTF \sparagraphname {
5122     \exp_args:NNx \clist_if_in:NnT \l_tmpa_clist {\tl_to_str:n{symdoc}}{
5123       \stex_ref_new_doc_target:n {}
5124     }
5125   } {
5126     \stex_ref_new_doc_target:n {}
5127   }
5128 } {
5129   \stex_ref_new_doc_target:n \sparagraphid
5130 }
5131 \exp_args:NNx
5132 \clist_if_in:NnT \l_tmpa_clist {\tl_to_str:n{symdoc}}{
5133   \clist_map_inline:Nn \l__stex_statements_sparagraph_for_clist {
5134     \tl_if_empty:nF{ ##1 }{
5135       \stex_get_symbol:n { ##1 }
5136       \stex_ref_new_sym_target:n \l_stex_get_symbol_uri_str
5137     }
5138   }
5139 }
5140 \stex_smsmode_do:
5141 \ignorespacesandpars
5142 }{
5143   \str_if_empty:NF \sparagraphname {

```



```

5144 \stex_symdecl_do:nn{}{\sparagraphname}
5145 \stex_ref_new_sym_target:n {\l_stex_current_module_str ? \sparagraphname}
5146 }
5147 \stex_if_smsmode:F {
5148 \clist_set:N \l_tmpa_clist \sparagraphtype
5149 \tl_clear:N \l_tmpa_tl
5150 \clist_map_inline:Nn \l_tmpa_clist {
5151 \tl_if_exist:cT {__stex_statements_sparagraph_##1_end:}{
5152 \tl_set:Nn \l_tmpa_tl {\use:c{__stex_statements_sparagraph_##1_end:}}
5153 }
5154 }
5155 \tl_if_empty:NTF \l_tmpa_tl {
5156 \__stex_statements_sparagraph_end:
5157 }{
5158 \l_tmpa_tl
5159 }
5160 \end{stex_annotate_env}
5161 }
5162 }

```

\stexpatchparagraph

```

5163
5164 \cs_new_protected:Nn \__stex_statements_sparagraph_start: {
5165 \par\noindent\tl_if_empty:NTF \l_stex_sparagraph_start_tl {
5166 \tl_if_empty:NF \l_stex_sparagraph_title_tl {
5167 \titleemph{\l_stex_sparagraph_title_tl}:~
5168 }
5169 }{
5170 \titleemph{\l_stex_sparagraph_start_tl}~
5171 }
5172 }
5173 \cs_new_protected:Nn \__stex_statements_sparagraph_end: {\par\medskip}
5174
5175 \newcommand\stexpatchparagraph[3] [] {
5176 \str_set:Nx \l_tmpa_str{ #1 }
5177 \str_if_empty:NTF \l_tmpa_str {
5178 \tl_set:Nn \__stex_statements_sparagraph_start: { #2 }
5179 \tl_set:Nn \__stex_statements_sparagraph_end: { #3 }
5180 }{
5181 \exp_after:wN \tl_set:Nn \csname __stex_statements_sparagraph_#1_start:\endcsname{ #2 }
5182 \exp_after:wN \tl_set:Nn \csname __stex_statements_sparagraph_#1_end:\endcsname{ #3 }
5183 }
5184 }
5185
5186 \keys_define:nn { stex / inlinepara} {
5187 id .str_set_x:N = \sparagraphid ,
5188 type .str_set_x:N = \sparagraphtype ,
5189 for .clist_set:N = \l__stex_statements_sparagraph_for_clist ,
5190 from .tl_set:N = \sparagraphfrom ,
5191 to .tl_set:N = \sparagraphto ,
5192 name .str_set:N = \sparagraphname
5193 }
5194 \cs_new_protected:Nn \__stex_statements_inlinepara_args:n {
5195 \tl_clear:N \sparagraphfrom

```

```

5196 \tl_clear:N \sparagraphto
5197 \str_clear:N \sparagraphid
5198 \str_clear:N \sparagraphtype
5199 \clist_clear:N \l__stex_statements_sparagraph_for_clist
5200 \str_clear:N \sparagraphname
5201 \keys_set:nn { stex / inlinepara }{ #1 }
5202 }
5203 \NewDocumentCommand \inlinepara { 0{} m } {
5204   \beginngroup
5205   \__stex_statements_inlinepara_args:n{ #1 }
5206   \clist_set:No \l_tmpa_clist \sparagraphtype
5207   \str_if_empty:NTF \sparagraphid {
5208     \str_if_empty:NTF \sparagraphname {
5209       \exp_args:NNx \clist_if_in:NnT \l_tmpa_clist {\tl_to_str:n{symdoc}}{
5210         \stex_ref_new_doc_target:n {}
5211       }
5212     } {
5213       \stex_ref_new_doc_target:n {}
5214     }
5215   } {
5216     \stex_ref_new_doc_target:n \sparagraphid
5217   }
5218   \stex_if_smsmode:TF{
5219     \str_if_empty:NF \sparagraphname {
5220       \stex_symdecl_do:nn{}{\sparagraphname}
5221       \stex_ref_new_sym_target:n {\l_stex_current_module_str ? \sparagraphname}
5222     }
5223   }{
5224     \seq_clear:N \l_tmpa_seq
5225     \clist_map_inline:Nn \l__stex_statements_sparagraph_for_clist {
5226       \tl_if_empty:nF{ ##1 }{
5227         \stex_get_symbol:n { ##1 }
5228         \exp_args:NNo \seq_put_right:Nn \l_tmpa_seq {
5229           \l_stex_get_symbol_uri_str
5230         }
5231       }
5232     }
5233     \exp_args:NNx
5234     \stex_annotate:nnn{paragraph}{\seq_use:Nn \l_tmpa_seq {,}}{
5235       \str_if_empty:NF \sparagraphtype {
5236         \stex_annotate_invisible:nnn{type}{\sparagraphtype}{}
5237       }
5238       \str_if_empty:NF \sparagraphfrom {
5239         \stex_annotate_invisible:nnn{from}{\sparagraphfrom}{}
5240       }
5241       \str_if_empty:NF \sparagraphto {
5242         \stex_annotate_invisible:nnn{to}{\sparagraphto}{}
5243       }
5244       \str_if_empty:NF \sparagraphname {
5245         \stex_symdecl_do:nn{}{\sparagraphname}
5246         \stex_ref_new_sym_target:n {\l_stex_current_module_str ? \sparagraphname}
5247       }
5248     \exp_args:NNx \clist_if_in:NnT \l_tmpa_clist {\tl_to_str:n{symdoc}}{
5249       \clist_map_inline:Nn \l_tmpa_seq {

```

```

5250         \stex_ref_new_sym_target:n {##1}
5251     }
5252 }
5253 #2
5254 }
5255 }
5256 \endgroup
5257 \stex_smsmode_do:
5258 }
5259

```

(End definition for \stexpatchparagraph. This function is documented on page [42](#).)

```

5260 </package>

```

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

```
5261 <*package>
5262 <@@=stex_sproof>
5263
5264 %%%%%%%%%%% sproof.dtx %%%%%%%%%%%
5265
```

33.2 Proofs

We first define some keys for the proof environment.

```
5266 \keys_define:nn { stex / spf } {
5267   id          .str_set_x:N = \spfid,
5268   for         .clist_set:N = \l__stex_sproof_spf_for_clist ,
5269   from        .tl_set:N    = \l__stex_sproof_spf_from_tl ,
5270   proofend    .tl_set:N    = \l__stex_sproof_spf_proofend_tl,
5271   type        .str_set_x:N = \spftype,
5272   title       .tl_set:N    = \spftitle,
5273   continues   .tl_set:N    = \l__stex_sproof_spf_continues_tl,
5274   functions   .tl_set:N    = \l__stex_sproof_spf_functions_tl,
5275   method      .tl_set:N    = \l__stex_sproof_spf_method_tl
5276 }
5277 \cs_new_protected:Nn \__stex_sproof_spf_args:n {
5278   \str_clear:N \spfid
5279   \tl_clear:N \l__stex_sproof_spf_for_tl
5280   \tl_clear:N \l__stex_sproof_spf_from_tl
5281   \tl_set:Nn \l__stex_sproof_spf_proofend_tl {\sproof@box}
5282   \str_clear:N \spftype
5283   \tl_clear:N \spftitle
5284   \tl_clear:N \l__stex_sproof_spf_continues_tl
5285   \tl_clear:N \l__stex_sproof_spf_functions_tl
```

⁸EdNOTE: need an implementation for L^AT_EXML

```

5286 \tl_clear:N \l__stex_sproof_spf_method_tl
5287 \bool_set_false:N \l__stex_sproof_inc_counter_bool
5288 \keys_set:nn { stex / spf }{ #1 }
5289 }

```

`\c__stex_sproof_flow_str` We define this macro, so that we can test whether the `display` key has the value `flow`

```

5290 \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.

```

5291 \intarray_new:Nn\l__stex_sproof_counter_intarray{50}
5292 \cs_new_protected:Npn \sproofnumber {
5293   \int_set:Nn \l_tmpa_int {1}
5294   \bool_while_do:nn {
5295     \int_compare_p:nNn {
5296       \intarray_item:Nn \l__stex_sproof_counter_intarray \l_tmpa_int
5297     } > 0
5298   }{
5299     \intarray_item:Nn \l__stex_sproof_counter_intarray \l_tmpa_int .
5300     \int_incr:N \l_tmpa_int
5301   }
5302 }
5303 \cs_new_protected:Npn \__stex_sproof_inc_counter: {
5304   \int_set:Nn \l_tmpa_int {1}
5305   \bool_while_do:nn {
5306     \int_compare_p:nNn {
5307       \intarray_item:Nn \l__stex_sproof_counter_intarray \l_tmpa_int
5308     } > 0
5309   }{
5310     \int_incr:N \l_tmpa_int
5311   }
5312   \int_compare:nNnF \l_tmpa_int = 1 {
5313     \int_decr:N \l_tmpa_int
5314   }
5315   \intarray_gset:Nnn \l__stex_sproof_counter_intarray \l_tmpa_int {
5316     \intarray_item:Nn \l__stex_sproof_counter_intarray \l_tmpa_int + 1

```

⁷This gets the labeling right but only works 8 levels deep


```

5361 }
5362 \clist_if_in:NnT \l_tmpa_clist {finnish}{
5363   \input{sproof-finnish.ldf}
5364 }
5365 \clist_if_in:NnT \l_tmpa_clist {french}{
5366   \input{sproof-french.ldf}
5367 }
5368 \clist_if_in:NnT \l_tmpa_clist {russian}{
5369   \input{sproof-russian.ldf}
5370 }
5371 \makeatother
5372 }{}
5373 }

```

spfsketch

```

5374 \newcommand\spfsketch[2] [] {
5375   \beginingroup
5376   \let \premise \stex_proof_premise:
5377   \__stex_sproof_spf_args:n{#1}
5378   \stex_if_smsmode:TF {
5379     \str_if_empty:NF \spfid {
5380       \stex_ref_new_doc_target:n \spfid
5381     }
5382   }{
5383     \seq_clear:N \l_tmpa_seq
5384     \clist_map_inline:Nn \l__stex_sproof_spf_for_clist {
5385       \tl_if_empty:nF{ ##1 }{
5386         \stex_get_symbol:n { ##1 }
5387         \exp_args:NNo \seq_put_right:Nn \l_tmpa_seq {
5388           \l_stex_get_symbol_uri_str
5389         }
5390       }
5391     }
5392     \exp_args:Nnx
5393     \stex_annotate:nnn{proofsketch}{\seq_use:Nn \l_tmpa_seq {,}}{
5394       \str_if_empty:NF \spftype {
5395         \stex_annotate_invisible:nnn{type}{\spftype}{-}
5396       }
5397       \clist_set:No \l_tmpa_clist \spftype
5398       \tl_set:Nn \l_tmpa_tl {
5399         \titleemph{
5400           \tl_if_empty:NTF \spftitle {
5401             \spf@proofsketch@kw
5402           }{
5403             \spftitle
5404           }
5405         }::~
5406       }
5407       \clist_map_inline:Nn \l_tmpa_clist {
5408         \exp_args:No \str_if_eq:nnT \c__stex_sproof_flow_str {##1} {
5409           \tl_clear:N \l_tmpa_tl
5410         }
5411       }
5412       \str_if_empty:NF \spfid {

```

```

5413         \stex_ref_new_doc_target:n \spfid
5414     }
5415     \l_tmpa_tl #2 \sproofend
5416 }
5417 }
5418 \endgroup
5419 \stex_smsmode_do:
5420 }
5421

```

(End definition for spfsketch. This function is documented on page ??.)

spfeq This is very similar to \spfsketch, but uses a computation array⁹¹⁰

```

5422 \newenvironment{spfeq}[2][]{
5423   \__stex_sproof_spf_args:n{#1}
5424   \let \premise \stex_proof_premise:
5425   \stex_if_smsmode:TF {
5426     \str_if_empty:NF \spfid {
5427       \stex_ref_new_doc_target:n \spfid
5428     }
5429   }{
5430     \seq_clear:N \l_tmpa_seq
5431     \clist_map_inline:Nn \l__stex_sproof_spf_for_clist {
5432       \tl_if_empty:NF{ ##1 }{
5433         \stex_get_symbol:n { ##1 }
5434         \exp_args:NNo \seq_put_right:Nn \l_tmpa_seq {
5435           \l_stex_get_symbol_uri_str
5436         }
5437       }
5438     }
5439     \exp_args:Nnnx
5440     \begin{stex_annotate_env}{spfeq}{\seq_use:Nn \l_tmpa_seq {,}}
5441     \str_if_empty:NF \spftype {
5442       \stex_annotate_invisible:nnn{type}{\spftype}{ }
5443     }
5444
5445     \clist_set:No \l_tmpa_clist \spftype
5446     \tl_clear:N \l_tmpa_tl
5447     \clist_map_inline:Nn \l_tmpa_clist {
5448       \tl_if_exist:cT {\__stex_sproof_spfeq_##1_start:}{
5449         \tl_set:Nn \l_tmpa_tl {\use:c{\__stex_sproof_spfeq_##1_start:}}
5450       }
5451       \exp_args:No \str_if_eq:nnT \c__stex_sproof_flow_str {##1} {
5452         \tl_set:Nn \l_tmpa_tl {\use:n{}}
5453       }
5454     }
5455     \tl_if_empty:NTF \l_tmpa_tl {
5456       \__stex_sproof_spfeq_start:
5457     }{
5458       \l_tmpa_tl
5459     }{-#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


```

5460 \str_if_empty:NF \spfid {
5461 \stex_ref_new_doc_target:n \spfid
5462 }
5463 \begin{displaymath}\begin{array}{rcll}
5464 }
5465 \stex_smsmode_do:
5466 }{
5467 \stex_if_smsmode:F {
5468 \end{array}\end{displaymath}
5469 \clist_set:No \l_tmpa_clist \spftype
5470 \tl_clear:N \l_tmpa_tl
5471 \clist_map_inline:Nn \l_tmpa_clist {
5472 \tl_if_exist:cT {__stex_sproof_spfeq_##1_end:}{
5473 \tl_set:Nn \l_tmpa_tl {\use:c{__stex_sproof_spfeq_##1_end:}}
5474 }
5475 }
5476 \tl_if_empty:NTF \l_tmpa_tl {
5477 \__stex_sproof_spfeq_end:
5478 }{
5479 \l_tmpa_tl
5480 }
5481 \end{stex_annotate_env}
5482 }
5483 }
5484
5485 \cs_new_protected:Nn \__stex_sproof_spfeq_start: {
5486 \titleemph{
5487 \tl_if_empty:NTF \spftitle {
5488 \spf@proof@kw
5489 }{
5490 \spftitle
5491 }
5492 }:
5493 }
5494 \cs_new_protected:Nn \__stex_sproof_spfeq_end: {\sproofend}
5495
5496 \newcommand\stexpatchspfeq[3] [] {
5497 \str_set:Nx \l_tmpa_str{ #1 }
5498 \str_if_empty:NTF \l_tmpa_str {
5499 \tl_set:Nn \__stex_sproof_spfeq_start: { #2 }
5500 \tl_set:Nn \__stex_sproof_spfeq_end: { #3 }
5501 }{
5502 \exp_after:wN \tl_set:Nn \csname __stex_sproof_spfeq_#1_start:\endcsname{ #2 }
5503 \exp_after:wN \tl_set:Nn \csname __stex_sproof_spfeq_#1_end:\endcsname{ #3 }
5504 }
5505 }
5506

```

(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.

```

5507 \newenvironment{sproof}[2] []{

```

```

5508 \let \premise \stex_proof_premise:
5509 \intarray_gzero:N \l__stex_sproof_counter_intarray
5510 \intarray_gset:Nnn \l__stex_sproof_counter_intarray 1 1
5511 \__stex_sproof_spf_args:n{#1}
5512 \stex_if_smsmode:TF {
5513   \str_if_empty:NF \spfid {
5514     \stex_ref_new_doc_target:n \spfid
5515   }
5516 }{
5517   \seq_clear:N \l_tmpa_seq
5518   \clist_map_inline:Nn \l__stex_sproof_spf_for_clist {
5519     \tl_if_empty:NF{ ##1 }{
5520       \stex_get_symbol:n { ##1 }
5521       \exp_args:NNo \seq_put_right:Nn \l_tmpa_seq {
5522         \l_stex_get_symbol_uri_str
5523       }
5524     }
5525   }
5526   \exp_args:Nnnx
5527   \begin{stex_annotate_env}{sproof}{\seq_use:Nn \l_tmpa_seq {},}}
5528   \str_if_empty:NF \spftype {
5529     \stex_annotate_invisible:nnn{type}{\spftype}{}}
5530 }
5531
5532 \clist_set:No \l_tmpa_clist \spftype
5533 \tl_clear:N \l_tmpa_tl
5534 \clist_map_inline:Nn \l_tmpa_clist {
5535   \tl_if_exist:cT {__stex_sproof_sproof_##1_start:}{
5536     \tl_set:Nn \l_tmpa_tl {\use:c{__stex_sproof_sproof_##1_start:}}
5537   }
5538   \exp_args:No \str_if_eq:nnT \c__stex_sproof_flow_str {##1} {
5539     \tl_set:Nn \l_tmpa_tl {\use:n{}}
5540   }
5541 }
5542 \tl_if_empty:NTF \l_tmpa_tl {
5543   \__stex_sproof_sproof_start:
5544 }{
5545   \l_tmpa_tl
5546 }{~#2}
5547 \str_if_empty:NF \spfid {
5548   \stex_ref_new_doc_target:n \spfid
5549 }
5550 \begin{description}
5551 }
5552 \stex_smsmode_do:
5553 }{
5554   \stex_if_smsmode:F{
5555     \end{description}
5556     \clist_set:No \l_tmpa_clist \spftype
5557     \tl_clear:N \l_tmpa_tl
5558     \clist_map_inline:Nn \l_tmpa_clist {
5559       \tl_if_exist:cT {__stex_sproof_sproof_##1_end:}{
5560         \tl_set:Nn \l_tmpa_tl {\use:c{__stex_sproof_sproof_##1_end:}}
5561       }

```

```

5562     }
5563     \tl_if_empty:NTF \l_tmpa_tl {
5564       \__stex_sproof_sproof_end:
5565     }{
5566       \l_tmpa_tl
5567     }
5568     \end{stex_annotate_env}
5569   }
5570 }
5571
5572 \cs_new_protected:Nn \__stex_sproof_sproof_start: {
5573   \par\noindent\titleemph{
5574     \tl_if_empty:NTF \spftype {
5575       \spf@proof@kw
5576     }{
5577       \spftype
5578     }
5579   }:
5580 }
5581 \cs_new_protected:Nn \__stex_sproof_sproof_end: {\sproofend}
5582
5583 \newcommand\stexpatchproof[3] [] {
5584   \str_set:Nx \l_tmpa_str{ #1 }
5585   \str_if_empty:NTF \l_tmpa_str {
5586     \tl_set:Nn \__stex_sproof_sproof_start: { #2 }
5587     \tl_set:Nn \__stex_sproof_sproof_end: { #3 }
5588   }{
5589     \exp_after:wN \tl_set:Nn \csname __stex_sproof_sproof_#1_start:\endcsname{ #2 }
5590     \exp_after:wN \tl_set:Nn \csname __stex_sproof_sproof_#1_end:\endcsname{ #3 }
5591   }
5592 }

```

\spfidea

```

5593 \newcommand\spfidea[2] []{
5594   \__stex_sproof_spf_args:n{#1}
5595   \titleemph{
5596     \tl_if_empty:NTF \spftype {Proof~Idea}{
5597       \spftype
5598     }:
5599   }~#2
5600   \sproofend
5601 }

```

(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

```

5602 \newenvironment{spfstep}[1] []{
5603   \__stex_sproof_spf_args:n{#1}
5604   \stex_if_smsmode:TF {

```

```

5605 \str_if_empty:NF \spfid {
5606   \stex_ref_new_doc_target:n \spfid
5607 }
5608 }{
5609   \@in@omtexttrue
5610   \seq_clear:N \l_tmpa_seq
5611   \clist_map_inline:Nn \l__stex_sproof_spf_for_clist {
5612     \tl_if_empty:NF{ ##1 }{
5613       \stex_get_symbol:n { ##1 }
5614       \exp_args:NNo \seq_put_right:Nn \l_tmpa_seq {
5615         \l_stex_get_symbol_uri_str
5616       }
5617     }
5618   }
5619   \exp_args:Nnnx
5620   \begin{stex_annotate_env}{spfstep}{\seq_use:Nn \l_tmpa_seq {,}}
5621   \str_if_empty:NF \spftype {
5622     \stex_annotate_invisible:nnn{type}{\spftype}{}
5623   }
5624   \clist_set:No \l_tmpa_clist \spftype
5625   \tl_set:Nn \l_tmpa_tl {
5626     \item[\sproofnumber]
5627     \bool_set_true:N \l__stex_sproof_inc_counter_bool
5628   }
5629   \clist_map_inline:Nn \l_tmpa_clist {
5630     \exp_args:No \str_if_eq:nnT \c__stex_sproof_flow_str {##1} {
5631       \tl_clear:N \l_tmpa_tl
5632     }
5633   }
5634   \l_tmpa_tl
5635   \tl_if_empty:NF \spftitle {
5636     {(\titleemph{\spftitle})\enspace}
5637   }
5638   \str_if_empty:NF \spfid {
5639     \stex_ref_new_doc_target:n \spfid
5640   }
5641 }
5642 \stex_smsmode_do:
5643 \ignorespacesandpars
5644 }{
5645   \bool_if:NT \l__stex_sproof_inc_counter_bool {
5646     \__stex_sproof_inc_counter:
5647   }
5648   \stex_if_smsmode:F {
5649     \end{stex_annotate_env}
5650   }
5651 }

```

sproofcomment

```

5652 \newenvironment{sproofcomment}[1][]{
5653   \__stex_sproof_spf_args:n{#1}
5654   \clist_set:No \l_tmpa_clist \spftype
5655   \tl_set:Nn \l_tmpa_tl {
5656     \item[\sproofnumber]

```

```

5657 \bool_set_true:N \l__stex_sproof_inc_counter_bool
5658 }
5659 \clist_map_inline:Nn \l_tmpa_clist {
5660 \exp_args:No \str_if_eq:nnT \c__stex_sproof_flow_str {##1} {
5661 \tl_clear:N \l_tmpa_tl
5662 }
5663 }
5664 \l_tmpa_tl
5665 }{
5666 \bool_if:NT \l__stex_sproof_inc_counter_bool {
5667 \__stex_sproof_inc_counter:
5668 }
5669 }

```

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.

```

5670 \newenvironment{subproof}[2][]{
5671 \__stex_sproof_spf_args:n{#1}
5672 \stex_if_smsmode:TF{
5673 \str_if_empty:NF \spfid {
5674 \stex_ref_new_doc_target:n \spfid
5675 }
5676 }{
5677 \seq_clear:N \l_tmpa_seq
5678 \clist_map_inline:Nn \l__stex_sproof_spf_for_clist {
5679 \tl_if_empty:nF{ ##1 }{
5680 \stex_get_symbol:n { ##1 }
5681 \exp_args:NNo \seq_put_right:Nn \l_tmpa_seq {
5682 \l_stex_get_symbol_uri_str
5683 }
5684 }
5685 }
5686 \exp_args:Nnnx
5687 \begin{stex_annotate_env}{subproof}{\seq_use:Nn \l_tmpa_seq {,}}
5688 \str_if_empty:NF \spftype {
5689 \stex_annotate_invisible:nnn{type}{\spftype}{}}
5690 }
5691
5692 \clist_set:No \l_tmpa_clist \spftype
5693 \tl_set:Nn \l_tmpa_tl {
5694 \item[\sproofnumber]
5695 \bool_set_true:N \l__stex_sproof_inc_counter_bool
5696 }
5697 \clist_map_inline:Nn \l_tmpa_clist {
5698 \exp_args:No \str_if_eq:nnT \c__stex_sproof_flow_str {##1} {
5699 \tl_clear:N \l_tmpa_tl
5700 }
5701 }
5702 \l_tmpa_tl
5703 \tl_if_empty:NF \spftitle {
5704 {(\titleemph{\spftitle})\enspace}
5705 }

```

```

5706     {~#2}
5707     \str_if_empty:NF \spfid {
5708         \stex_ref_new_doc_target:n \spfid
5709     }
5710 }
5711 \__stex_sproof_add_counter:
5712 \stex_smsmode_do:
5713 }{
5714     \__stex_sproof_remove_counter:
5715     \bool_if:NT \l__stex_sproof_inc_counter_bool {
5716         \__stex_sproof_inc_counter:
5717     }
5718     \stex_if_smsmode:F{
5719         \end{stex_annotate_env}
5720     }
5721 }

```

spfcases In the **pfcases** environment, the start text is displayed as the first comment of the proof.

```

5722 \newenvironment{spfcases}[2][]{
5723     \tl_if_empty:nTF{#1}{
5724         \begin{subproof}[method=by-cases]{#2}
5725     }{
5726         \begin{subproof}[#1,method=by-cases]{#2}
5727     }
5728 }{
5729     \end{subproof}
5730 }

```

spfcase In the **pfcase** environment, the start text is displayed specification of the case after the **\item**

```

5731 \newenvironment{spfcase}[2][]{
5732     \__stex_sproof_spf_args:n{#1}
5733     \stex_if_smsmode:TF {
5734         \str_if_empty:NF \spfid {
5735             \stex_ref_new_doc_target:n \spfid
5736         }
5737     }{
5738         \seq_clear:N \l_tmpa_seq
5739         \clist_map_inline:Nn \l__stex_sproof_spf_for_clist {
5740             \tl_if_empty:nF{ ##1 }{
5741                 \stex_get_symbol:n { ##1 }
5742                 \exp_args:NNo \seq_put_right:Nn \l_tmpa_seq {
5743                     \l_stex_get_symbol_uri_str
5744                 }
5745             }
5746         }
5747         \exp_args:Nnnx
5748         \begin{stex_annotate_env}{spfcase}{\seq_use:Nn \l_tmpa_seq {,}}
5749         \str_if_empty:NF \spftype {
5750             \stex_annotate_invisible:nnn{type}{\spftype}{}}
5751     }
5752     \clist_set:Nn \l_tmpa_clist \spftype
5753     \tl_set:Nn \l_tmpa_tl {
5754         \item[\sproofnumber]

```

```

5755     \bool_set_true:N \l__stex_sproof_inc_counter_bool
5756   }
5757   \clist_map_inline:Nn \l_tmpa_clist {
5758     \exp_args:No \str_if_eq:nnT \c__stex_sproof_flow_str {##1} {
5759       \tl_clear:N \l_tmpa_tl
5760     }
5761   }
5762   \l_tmpa_tl
5763   \tl_if_empty:nF{#2}{
5764     \titleemph{#2}:~
5765   }
5766 }
5767 \__stex_sproof_add_counter:
5768 \stex_smsmode_do:
5769 }{
5770   \__stex_sproof_remove_counter:
5771   \bool_if:NT \l__stex_sproof_inc_counter_bool {
5772     \__stex_sproof_inc_counter:
5773   }
5774   \stex_if_smsmode:F{
5775     \clist_set:No \l_tmpa_clist \spftype
5776     \tl_set:Nn \l_tmpa_tl{\sproofend}
5777     \clist_map_inline:Nn \l_tmpa_clist {
5778       \exp_args:No \str_if_eq:nnT \c__stex_sproof_flow_str {##1} {
5779         \tl_clear:N \l_tmpa_tl
5780       }
5781     }
5782     \l_tmpa_tl
5783     \end{stex_annotate_env}
5784   }
5785 }

```

spfcase similar to **spfcase**, takes a third argument.

```

5786 \newcommand\spfcasesketch[3][]{
5787   \begin{spfcase}[#1]{#2}#3\end{spfcase}
5788 }

```

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.

```

5789 \keys_define:nn { stex / just }{
5790   id      .str_set:x:N = \l__stex_sproof_just_id_str,
5791   method  .tl_set:N    = \l__stex_sproof_just_method_tl,
5792   premises .tl_set:N    = \l__stex_sproof_just_premises_tl,
5793   args    .tl_set:N    = \l__stex_sproof_just_args_tl
5794 }

```

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

```
5795 \newenvironment{justification}[1] [] {}{}
```

\premise

```
5796 \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.

```
5797 \newcommand\justarg[2] [] {#2}
```

```
5798 \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

```
5799 <*package>
5800
5801 %%%%%%%%%% others.dtx %%%%%%%%%%
5802
5803 <@@=stex_others>
    Warnings and error messages
5804 % None

\MSC Math subject classifier

5805 \NewDocumentCommand \MSC {m} {
5806 % TODO
5807 }

(End definition for \MSC. This function is documented on page ??.)
    Patching tikzinput, if loaded
5808 \@ifpackageloaded{tikzinput}{
5809 \RequirePackage{stex-tikzinput}
5810 }{}
5811 </package>
```

Chapter 35

STEX -Metatheory Implementation

```
5812 <*package>
5813 <@@=stex_modules>
5814
5815 %%%%%%%%%%% metatheory.dtx %%%%%%%%%%%
5816
5817 \str_const:Nn \c_stex_metatheory_ns_str {http://mathhub.info/sTeX}
5818 \begingroup
5819 \stex_module_setup:nn{
5820   ns=\c_stex_metatheory_ns_str,
5821   meta=NONE
5822 }{Metatheory}
5823 \stex_reactivate_macro:N \symdecl
5824 \stex_reactivate_macro:N \notation
5825 \stex_reactivate_macro:N \symdef
5826 \ExplSyntaxOff
5827 \csname stex_suppress_html:n\endcsname{
5828   % is-a (a:A, a \in A, a is an A, etc.)
5829   \symdecl{isa}[args=ai]
5830   \notation{isa}[typed,op=:]{#1 \comp{:} #2}{##1 \comp, ##2}
5831   \notation{isa}[in]{#1 \comp\in #2}{##1 \comp, ##2}
5832   \notation{isa}[pred]{#2\comp(#1 \comp)}{##1 \comp, ##2}
5833
5834   % bind (\forall, \Pi, \lambda etc.)
5835   \symdecl{bind}[args=Bi]
5836   \notation{bind}[forall]{\comp\forall #1.\;#2}{##1 \comp, ##2}
5837   \notation{bind}[Pi]{\comp\prod_{#1}#2}{##1 \comp, ##2}
5838   \notation{bind}[depfun]{\comp( #1 \comp{}\;\to\;)}{##1 \comp, ##2}
5839
5840   % implicit bind
5841   \symdef{implicitbind}[args=Bi]{\comp\prod_{#1}#2}{##1 \comp, ##2}
5842
5843   % dummy variable
5844   \symdecl{dummyvar}
5845   \notation{dummyvar}[underscore]{\comp\_}
5846   \notation{dummyvar}[dot]{\comp\cdot}
```

```

5847 \notation{dummyvar}[dash]{\comp{\rm --}}
5848
5849 %fromto (function space, Hom-set, implication etc.)
5850 \symdecl{fromto}[args=ai]
5851 \notation{fromto}[xarrow]{#1 \comp\to #2}{##1 \comp\times ##2}
5852 \notation{fromto}[arrow]{#1 \comp\to #2}{##1 \comp\to ##2}
5853
5854 % mapto (lambda etc.)
5855 \symdecl{mapto}[args=Bi]
5856 \notation{mapto}[mapsto]{#1 \comp\mapsto #2}{#1 \comp, #2}
5857 \notation{mapto}[lambda]{\comp\lambda #1 \comp.; #2}{#1 \comp, #2}
5858 \notation{mapto}[lambdau]{\comp\lambda_{#1} \comp.; #2}{#1 \comp, #2}
5859
5860 % function/operator application
5861 \symdecl{apply}[args=ia]
5862 \notation{apply}[prec=0;0x\infpres,parens]{#1 \comp( #2 \comp)}{##1 \comp, ##2}
5863 \notation{apply}[prec=0;0x\infpres,lambda]{#1 \; #2 }{##1 \; ; ##2}
5864
5865 % ‘‘type’’ of all collections (sets,classes,types,kinds)
5866 \symdecl{metacollection}
5867 \notation{metacollection}[U]{\comp{\mathcal{U}}}
5868 \notation{metacollection}[set]{\comp{\textsf{Set}}}
5869
5870 % collection of propositions/booleans/truth values
5871 \symdecl{prop}[name=proposition]
5872 \notation{prop}[prop]{\comp{\rm prop}}
5873 \notation{prop}[BOOL]{\comp{\rm BOOL}}
5874
5875 % sequences
5876 \symdecl{seqtype}[args=1]
5877 \notation{seqtype}[kleene]{#1^{\comp\ast}}
5878
5879 \symdef{sequence-index}[args=2,li,prec=nobrackets]{#{1}_{#2}}
5880 \notation{sequence-index}[ui,prec=nobrackets]{#{1}^{\comp\ast}}
5881
5882 \symdef{aseqdots}[args=a,prec=nobrackets]{#1\comp{,\ellipses}}{##1\comp,##2}
5883 \symdef{aseqfromto}[args=ai,prec=nobrackets]{#1\comp{,\ellipses,}#2}{##1\comp,##2}
5884 \symdef{aseqfromtovia}[args=aii,prec=nobrackets]{#1\comp{,\ellipses,}#2\comp{,\ellipses,}#3}
5885
5886 % letin (‘‘let’’, local definitions, variable substitution)
5887 \symdecl{letin}[args=bii]
5888 \notation{letin}[let]{\comp{\rm let}};#1\comp{=}#2\; \comp{\rm in}}\;#3}
5889 \notation{letin}[subst]{#3 \comp[ #1 \comp/ #2 \comp]}
5890 \notation{letin}[frac]{#3 \comp[ \frac{#2}{#1} \comp]}
5891
5892 % structures
5893 \symdecl*{module-type}[args=1]
5894 \notation{module-type}{\mathtt{MOD} #1}
5895 \symdecl{mathstruct}[name=mathematical-structure,args=a] % TODO
5896 \notation{mathstruct}[angle,prec=nobrackets]{\comp\angle #1 \comp\rangle}{##1 \comp, ##2}
5897
5898 }
5899 \ExplSyntaxOn
5900 \stex_add_to_current_module:n{

```

```

5901 \let\nappa\apply
5902 \def\nappli#1#2#3#4{\apply{#1}{\naseqli{#2}{#3}{#4}}}
5903 \def\nappui#1#2#3#4{\apply{#1}{\nasequi{#2}{#3}{#4}}}
5904 \def\livar{\csname sequence-index\endcsname[li]}
5905 \def\uivar{\csname sequence-index\endcsname[ui]}
5906 \def\naseqli#1#2#3{\aseqfromto{\livar{#1}{#2}}{\livar{#1}{#3}}}
5907 \def\nasequi#1#2#3{\aseqfromto{\uivar{#1}{#2}}{\uivar{#1}{#3}}}
5908 \def\nappe#1#2#3{\apply{#1}{\aseqfromto{#2}{#3}}}
5909 }
5910 \__stex_modules_end_module:
5911 \endgroup
5912 </package>

```

Chapter 36

Tikzinput Implementation

```
5913 <*package>
5914
5915 %%%%%%%%%% tikzinput.dtx %%%%%%%%%%
5916
5917 \ProvidesExplPackage{tikzinput}{2022/02/26}{3.0.1}{tikzinput package}
5918 \RequirePackage{l3keys2e}
5919
5920 \keys_define:nn { tikzinput } {
5921   image .bool_set:N = \c_tikzinput_image_bool,
5922   image .default:n = false ,
5923   unknown .code:n = {}
5924 }
5925
5926 \ProcessKeysOptions { tikzinput }
5927
5928 \bool_if:NTF \c_tikzinput_image_bool {
5929   \RequirePackage{graphicx}
5930
5931   \providecommand\usetikzlibrary[]{}
5932   \newcommand\tikzinput[2] [] {\includegraphics[#1]{#2}}
5933 }{
5934   \RequirePackage{tikz}
5935   \RequirePackage{standalone}
5936
5937   \newcommand \tikzinput [2] [] {
5938     \setkeys{Gin}{#1}
5939     \ifx \Gin@ewidth \Gin@exclamation
5940       \ifx \Gin@eheight \Gin@exclamation
5941         \input { #2 }
5942       \else
5943         \resizebox{!}{ \Gin@eheight }{
5944           \input { #2 }
5945         }
5946       \fi
5947     \else
5948       \ifx \Gin@eheight \Gin@exclamation
5949         \resizebox{ \Gin@ewidth }{!}{
5950           \input { #2 }
5951         }
5952       \else
5953         \input { #2 }
5954       \fi
5955     \fi
5956   }
5957 }
```

```

5951     }
5952     \else
5953         \resizebox{ \Gin@ewidth }{ \Gin@eheight }{
5954             \input { #2 }
5955         }
5956     \fi
5957 \fi
5958 }
5959 }
5960
5961 \newcommand \ctikzinput [2] [] {
5962     \begin{center}
5963         \tikzinput [ #1 ] { #2 }
5964     \end{center}
5965 }
5966
5967 \@ifpackageloaded{stex}{
5968     \RequirePackage{stex-tikzinput}
5969 }{}
5970
5971 </package>
5972 <*stex>
5973 \ProvidesExplPackage{stex-tikzinput}{2022/02/26}{3.0.1}{stex-tikzinput}
5974 \RequirePackage{stex}
5975 \RequirePackage{tikzinput}
5976
5977 \newcommand\mhtikzinput [2] [] {%
5978     \def\Gin@mhrepos{}\setkeys{Gin}{#1}%
5979     \stex_in_repository:nn\Gin@mhrepos{
5980         \tikzinput [ #1 ] {\mhp{##1}{#2}}
5981     }
5982 }
5983 \newcommand\cmhtikzinput [2] [] {\begin{center}\mhtikzinput [ #1 ] { #2 }\end{center}}
5984 </stex>

```

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

Chapter 37

document-structure.sty Implementation

37.1 The document-structure Class

The functionality is spread over the `document-structure` class and package. The class provides the `document` environment and the `document-structure` element corresponds to it, whereas the package provides the concrete functionality.

```
5985 \*cls)
5986 \@@=document_structure)
5987 \ProvidesExplClass{document-structure}{2022/02/26}{3.0.1}{Modular Document Structure Class}
5988 \RequirePackage{13keys2e}
```

37.2 Class Options

To initialize the `document-structure` class, we declare and process the necessary options using the `kvoptions` package for key/value options handling. For `omdoc.cls` this is quite simple. We have options `report` and `book`, which set the `\omdoc@cls@class` macro and pass on the macro to `omdoc.sty` for further processing.

`\omdoc@cls@class`

```
5989 \keys_define:nn{ document-structure / pkg }{
5990   class      .str_set_x:N = \c_document_structure_class_str,
5991   minimal    .bool_set:N = \c_document_structure_minimal_bool,
5992   report     .code:n      = {
5993     \ClassWarning{document-structure}{the option 'report' is deprecated, use 'class=report',
5994     \str_set:Nn \c_document_structure_class_str {report}
5995   },
5996   book       .code:n      = {
5997     \ClassWarning{document-structure}{the option 'book' is deprecated, use 'class=book', ins
5998     \str_set:Nn \c_document_structure_class_str {book}
5999   },
6000   bookpart   .code:n      = {
6001     \ClassWarning{document-structure}{the option 'bookpart' is deprecated, use 'class=book,t
6002     \str_set:Nn \c_document_structure_class_str {book}
6003     \str_set:Nn \c_document_structure_topsect_str {chapter}
6004   },
```

```

6005 docopt      .str_set_x:N = \c_document_structure_docopt_str,
6006 unknown    .code:n      = {
6007   \PassOptionsToPackage{ \CurrentOption }{ document-structure }
6008 }
6009 }
6010 \ProcessKeysOptions{ document-structure / pkg }
6011 \str_if_empty:NT \c_document_structure_class_str {
6012   \str_set:Nn \c_document_structure_class_str {article}
6013 }
6014 \exp_after:wN\LoadClass\exp_after:wN[\c_document_structure_docopt_str]
6015   {\c_document_structure_class_str}
6016

```

37.3 Beefing up the document environment

Now, – unless the option `minimal` is defined – we include the `stex` package

```

6017 \RequirePackage{document-structure}
6018 \bool_if:NF \c_document_structure_minimal_bool {

```

And define the environments we need. The top-level one is the `document` environment, which we redefined so that we can provide keyval arguments.

document For the moment we do not use them on the L^AT_EX level, but the document identifier is picked up by L^AT_EXML.¹²

```

6019 \keys_define:nn { document-structure / document }{
6020   id .str_set_x:N = \c_document_structure_document_id_str
6021 }
6022 \let\__document_structure_orig_document=\document
6023 \renewcommand{\document}[1][]{
6024   \keys_set:nn{ document-structure / document }{ #1 }
6025   \stex_ref_new_doc_target:n { \c_document_structure_document_id_str }
6026   \__document_structure_orig_document
6027 }

```

Finally, we end the test for the `minimal` option.

```

6028 }
6029 \</cls>

```

37.4 Implementation: document-structure Package

```

6030 <*package>
6031 \ProvidesExplPackage{document-structure}{2022/02/26}{3.0.1}{Modular Document Structure}
6032 \RequirePackage{l3keys2e}

```

37.5 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).

¹²EDNOTE: faking documentkeys for now. @HANG, please implement


```

6033
6034 \keys_define:nn{ document-structure / pkg }{
6035   class      .str_set_x:N = \c_document_structure_class_str,
6036   topsect     .str_set_x:N = \c_document_structure_topsect_str,
6037   % showignores .bool_set:N = \c_document_structure_showignores_bool,
6038 }
6039 \ProcessKeysOptions{ document-structure / pkg }
6040 \str_if_empty:NT \c_document_structure_class_str {
6041   \str_set:Nn \c_document_structure_class_str {article}
6042 }
6043 \str_if_empty:NT \c_document_structure_topsect_str {
6044   \str_set:Nn \c_document_structure_topsect_str {section}
6045 }

```

Then we need to set up the packages by requiring the `sref` package to be loaded, and set up triggers for other languages

```

6046 \RequirePackage{xspace}
6047 \RequirePackage{comment}
6048 \AddToHook{begindocument}{
6049   \ltx@ifpackageloaded{babel}{
6050     \clist_set:Nx \l_tmpa_clist {\bbl@loaded}
6051     \clist_if_in:NnT \l_tmpa_clist {ngerman}{
6052       \makeatletter\input{document-structure-ngerman.ldf}\makeatother
6053     }
6054   }{}
6055 }

```

`\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.

```

6056 \int_new:N \l_document_structure_section_level_int
6057 \str_case:VnF \c_document_structure_topsect_str {
6058   {part}}{
6059     \int_set:Nn \l_document_structure_section_level_int {0}
6060   }
6061   {chapter}}{
6062     \int_set:Nn \l_document_structure_section_level_int {1}
6063   }
6064 }{
6065   \str_case:VnF \c_document_structure_class_str {
6066     {book}}{
6067       \int_set:Nn \l_document_structure_section_level_int {0}
6068     }
6069     {report}}{
6070       \int_set:Nn \l_document_structure_section_level_int {0}
6071     }
6072   }{
6073     \int_set:Nn \l_document_structure_section_level_int {2}
6074   }
6075 }

```

37.6 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 \LaTeX 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.¹³

EdN:13

```
6076 \def\current@section@level{document}%
6077 \newcommand\currentsectionlevel{\lowercase\expandafter{\current@section@level}\xspace}%
6078 \newcommand\Currentsectionlevel{\expandafter\MakeUppercase\current@section@level\xspace}%
```

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

`\skipomgroup`

```
6079 \cs_new_protected:Npn \skipomgroup {
6080   \ifcase\l_document_structure_section_level_int
6081   \or\stepcounter{part}
6082   \or\stepcounter{chapter}
6083   \or\stepcounter{section}
6084   \or\stepcounter{subsection}
6085   \or\stepcounter{subsubsection}
6086   \or\stepcounter{paragraph}
6087   \or\stepcounter{subparagraph}
6088   \fi
6089 }
```

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

`blindfragment`

```
6090 \newcommand\at@begin@blindomgroup[1]{%
6091 \newenvironment{blindfragment}
6092 {
6093   \int_incr:N\l_document_structure_section_level_int
6094   \at@begin@blindomgroup\l_document_structure_section_level_int
6095 }{}}
```

`\omgroup@nonum` convenience macro: `\omgroup@nonum{<level>}{<title>}` makes an unnumbered sectioning with title `<title>` at level `<level>`.

```
6096 \newcommand\omgroup@nonum[2]{
6097   \ifx\hyper@anchor\@undefined\else\phantomsection\fi
6098   \addcontentsline{toc}{#1}{#2}\@nameuse{#1}*{#2}
6099 }
```

(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 `rdfmata` package has been loaded. In the end we call `\sref@label@id` to enable crossreferencing.

```
6100 \newcommand\omgroup@num[2]{
```

¹³EDNOTE: MK: we may have to experiment with the more powerful uppercasing macro from `mfirstuc.sty` once we internationalize.

```

6101 \tl_if_empty:NTF \l__document_structure_omgroup_short_tl {
6102   \@nameuse{#1}{#2}
6103 }{
6104   \cs_if_exist:NTF\rdfmata@sectioning{
6105     \@nameuse{rdfmata@#1@old}[\l__document_structure_omgroup_short_tl]{#2}
6106   }{
6107     \@nameuse{#1}[\l__document_structure_omgroup_short_tl]{#2}
6108   }
6109 }
6110 %\sref@label@id@arg{\omdoc@ssect@name~\@nameuse{the#1}}\omgroup@id
6111 }

```

(End definition for \omgroup@num. This function is documented on page ??.)

sfragment

```

6112 \keys_define:nn { document-structure / omgroup }{
6113   id          .str_set_x:N = \l__document_structure_omgroup_id_str,
6114   date        .str_set_x:N = \l__document_structure_omgroup_date_str,
6115   creators    .clist_set:N = \l__document_structure_omgroup_creators_clist,
6116   contributors .clist_set:N = \l__document_structure_omgroup_contributors_clist,
6117   srccite     .tl_set:N    = \l__document_structure_omgroup_srccite_tl,
6118   type        .tl_set:N    = \l__document_structure_omgroup_type_tl,
6119   short       .tl_set:N    = \l__document_structure_omgroup_short_tl,
6120   display     .tl_set:N    = \l__document_structure_omgroup_display_tl,
6121   intro       .tl_set:N    = \l__document_structure_omgroup_intro_tl,
6122   loadmodules .bool_set:N  = \l__document_structure_omgroup_loadmodules_bool
6123 }
6124 \cs_new_protected:Nn \__document_structure_omgroup_args:n {
6125   \str_clear:N \l__document_structure_omgroup_id_str
6126   \str_clear:N \l__document_structure_omgroup_date_str
6127   \clist_clear:N \l__document_structure_omgroup_creators_clist
6128   \clist_clear:N \l__document_structure_omgroup_contributors_clist
6129   \tl_clear:N \l__document_structure_omgroup_srccite_tl
6130   \tl_clear:N \l__document_structure_omgroup_type_tl
6131   \tl_clear:N \l__document_structure_omgroup_short_tl
6132   \tl_clear:N \l__document_structure_omgroup_display_tl
6133   \tl_clear:N \l__document_structure_omgroup_intro_tl
6134   \bool_set_false:N \l__document_structure_omgroup_loadmodules_bool
6135   \keys_set:nn { document-structure / omgroup } { #1 }
6136 }

```

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.

```

6137 \newif\if@mainmatter\@mainmattertrue
6138 \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.

```

6139 \keys_define:nn { document-structure / sectioning }{
6140   name .str_set_x:N = \l__document_structure_sect_name_str ,
6141   ref .str_set_x:N = \l__document_structure_sect_ref_str ,
6142   clear .bool_set:N = \l__document_structure_sect_clear_bool ,
6143   clear .default:n = {true} ,
6144   num .bool_set:N = \l__document_structure_sect_num_bool ,

```

```

6145   num      .default:n      = {true}
6146 }
6147 \cs_new_protected:Nn \__document_structure_sect_args:n {
6148   \str_clear:N \l__document_structure_sect_name_str
6149   \str_clear:N \l__document_structure_sect_ref_str
6150   \bool_set_false:N \l__document_structure_sect_clear_bool
6151   \bool_set_false:N \l__document_structure_sect_num_bool
6152   \keys_set:nn { document-structure / sectioning } { #1 }
6153 }
6154 \newcommand\omdoc@sectioning[3][]{
6155   \__document_structure_sect_args:n {#1}
6156   \let\omdoc@sect@name\l__document_structure_sect_name_str
6157   \bool_if:NT \l__document_structure_sect_clear_bool { \cleardoublepage }
6158   \if@mainmatter% numbering not overridden by frontmatter, etc.
6159     \bool_if:NTF \l__document_structure_sect_num_bool {
6160       \omgroup@num{#2}{#3}
6161     }{
6162       \omgroup@nonum{#2}{#3}
6163     }
6164     \def\current@section@level{\omdoc@sect@name}
6165   \else
6166     \omgroup@nonum{#2}{#3}
6167   \fi
6168 }% 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.

```

6169 \newcommand\omgroup@redefine@addtocontents[1]{%
6170 %\edef\__document_structureimport{#1}%
6171 %\@for\@I:=\__document_structureimport\do{%
6172 %\edef\@path{\csname module@\@I @path\endcsname}%
6173 %\@ifundefined{tf@toc}\relax%
6174 %   {\protected@write\tf@toc}{\string\@requiremodules{\@path}}}%
6175 %\ifx\hyper@anchor\undefined% hyperref.sty loaded?
6176 %\def\addcontentsline##1##2##3{%
6177 %\addtocontents{##1}{\protect\contentsline{##2}{\string\withusedmodules{##1}{##3}}{\thepage}}%
6178 %\else% hyperref.sty not loaded
6179 %\def\addcontentsline##1##2##3{%
6180 %\addtocontents{##1}{\protect\contentsline{##2}{\string\withusedmodules{##1}{##3}}{\thepage}}%
6181 %\fi
6182 }% 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.

```

6183 \newenvironment{sfragment}[2][]{% keys, title
6184 {
6185   \__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.

```

6186   \bool_if:NT \l__document_structure_omgroup_loadmodules_bool {
6187     \omgroup@redefine@addtocontents{
6188       \@ifundefined{module@id}\used@modules%

```

```

6189     %{\@ifundefined{module@}\module@id @path}{\used@modules}\module@id}
6190   }
6191 }

```

now we only need to construct the right sectioning depending on the value of `\section@level`.

```

6192 \int_incr:N\l_document_structure_section_level_int
6193 \ifcase\l_document_structure_section_level_int
6194   \or\omdoc@sectioning[name=\omdoc@part@kw,clear,num]{part}{#2}
6195   \or\omdoc@sectioning[name=\omdoc@chapter@kw,clear,num]{chapter}{#2}
6196   \or\omdoc@sectioning[name=\omdoc@section@kw,num]{section}{#2}
6197   \or\omdoc@sectioning[name=\omdoc@subsection@kw,num]{subsection}{#2}
6198   \or\omdoc@sectioning[name=\omdoc@subsubsection@kw,num]{subsubsection}{#2}
6199   \or\omdoc@sectioning[name=\omdoc@paragraph@kw,ref=this \omdoc@paragraph@kw]{paragraph}{#2}
6200   \or\omdoc@sectioning[name=\omdoc@subparagraph@kw,ref=this \omdoc@subparagraph@kw]{subparagraph}{#2}
6201 \fi
6202 \at@begin@omgroup[#1]\l_document_structure_section_level_int{#2}
6203 \str_if_empty:NF \l__document_structure_omgroup_id_str {
6204   \stex_ref_new_doc_target:n\l__document_structure_omgroup_id_str
6205 }
6206 }% for customization
6207 {}

```

and finally, we localize the sections

```

6208 \newcommand\omdoc@part@kw{Part}
6209 \newcommand\omdoc@chapter@kw{Chapter}
6210 \newcommand\omdoc@section@kw{Section}
6211 \newcommand\omdoc@subsection@kw{Subsection}
6212 \newcommand\omdoc@subsubsection@kw{Subsubsection}
6213 \newcommand\omdoc@paragraph@kw{paragraph}
6214 \newcommand\omdoc@subparagraph@kw{subparagraph}

```

37.7 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`

```

6215 \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).

```

6216 \cs_if_exist:NTF\frontmatter{
6217   \let\__document_structure_orig_frontmatter\frontmatter
6218   \let\frontmatter\relax
6219 }{
6220   \tl_set:Nn\__document_structure_orig_frontmatter{
6221     \clearpage
6222     \@mainmatterfalse
6223     \pagenumbering{roman}

```

```

6224 }
6225 }
6226 \cs_if_exist:NTF\backmatter{
6227   \let\__document_structure_orig_backmatter\backmatter
6228   \let\backmatter\relax
6229 }{
6230   \tl_set:Nn\__document_structure_orig_backmatter{
6231     \clearpage
6232     \@mainmatterfalse
6233     \pagenumbering{roman}
6234   }
6235 }

```

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.

```

6236 \newenvironment{frontmatter}{
6237   \__document_structure_orig_frontmatter
6238 }{
6239   \cs_if_exist:NTF\mainmatter{
6240     \mainmatter
6241   }{
6242     \clearpage
6243     \@mainmattertrue
6244     \pagenumbering{arabic}
6245   }
6246 }

```

backmatter As `backmatter` is at the end of the document, we do nothing for `\endbackmatter`.

```

6247 \newenvironment{backmatter}{
6248   \__document_structure_orig_backmatter
6249 }{
6250   \cs_if_exist:NTF\mainmatter{
6251     \mainmatter
6252   }{
6253     \clearpage
6254     \@mainmattertrue
6255     \pagenumbering{arabic}
6256   }
6257 }

```

finally, we make sure that page numbering is arabic and we have main matter as the default

```

6258 \@mainmattertrue\pagenumbering{arabic}

```

\prematurestop We initialize `\afterprematurestop`, and provide `\prematurestop@endomgroup` which looks up `\omgroup@level` and recursively ends enough `{sfragment}`s.

```

6259 \def \c__document_structure_document_str{document}
6260 \newcommand\afterprematurestop{}
6261 \def\prematurestop@endomgroup{
6262   \unless\ifx\@currenvir\c__document_structure_document_str
6263     \expandafter\expandafter\expandafter\end\expandafter\expandafter\expandafter{\expandafter
6264     \expandafter\prematurestop@endomgroup

```

```

6265 \fi
6266 }
6267 \providecommand\prematurestop{
6268   \message{Stopping~sTeX~processing~prematurely}
6269   \prematurestop@endumgroup
6270   \afterprematurestop
6271   \end{document}}
6272 }

```

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

37.8 Global Variables

\setSGvar set a global variable

```

6273 \RequirePackage{etoolbox}
6274 \newcommand\setSGvar[1]{\@namedef{sTeX@Gvar@#1}}

```

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

\useSGvar use a global variable

```

6275 \newrobustcmd\useSGvar[1]{%
6276   \@ifundefined{sTeX@Gvar@#1}
6277   {\PackageError{document-structure}
6278    {The sTeX Global variable #1 is undefined}
6279    {set it with \protect\setSGvar}}
6280   \@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.

```

6281 \newrobustcmd\ifSGvar[3]{\def\@test{#2}%
6282   \@ifundefined{sTeX@Gvar@#1}
6283   {\PackageError{document-structure}
6284    {The sTeX Global variable #1 is undefined}
6285    {set it with \protect\setSGvar}}
6286   {\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.

```
6287 \*cls)
6288 \@@=notesslides)
6289 \ProvidesExplClass{notesslides}{2022/02/28}{3.1.0}{notesslides Class}
6290 \RequirePackage{13keys2e}
6291
6292 \keys_define:nn{notesslides / cls}{
6293   class .code:n = {
6294     \PassOptionsToClass{\CurrentOption}{document-structure}
6295     \str_if_eq:nnT{#1}{book}{
6296       \PassOptionsToPackage{defaulttopsec=part}{notesslides}
6297     }
6298     \str_if_eq:nnT{#1}{report}{
6299       \PassOptionsToPackage{defaulttopsec=part}{notesslides}
6300     }
6301   },
6302   notes .bool_set:N = \c__notesslides_notes_bool ,
6303   slides .code:n = { \bool_set_false:N \c__notesslides_notes_bool },
6304   unknown .code:n = {
6305     \PassOptionsToClass{\CurrentOption}{document-structure}
6306     \PassOptionsToClass{\CurrentOption}{beamer}
6307     \PassOptionsToPackage{\CurrentOption}{notesslides}
6308   }
6309 }
6310 \ProcessKeysOptions{ notesslides / cls }
6311 \bool_if:NTF \c__notesslides_notes_bool {
6312   \PassOptionsToPackage{notes=true}{notesslides}
6313 }{
6314   \PassOptionsToPackage{notes=false}{notesslides}
6315 }
6316 \</cls)
```


now we do the same for the notesslides package.

```

6317 <*package>
6318 \ProvidesExplPackage{notesslides}{2022/02/28}{3.1.0}{notesslides Package}
6319 \RequirePackage{13keys2e}
6320
6321 \keys_define:nn{notesslides / pkg}{
6322   topsect      .str_set_x:N = \c__notesslides_topsect_str,
6323   defaulttopsect .str_set_x:N = \c__notesslides_defaulttopsec_str,
6324   notes        .bool_set:N = \c__notesslides_notes_bool ,
6325   slides       .code:n      = { \bool_set_false:N \c__notesslides_notes_bool },
6326   sectocframes .bool_set:N = \c__notesslides_sectocframes_bool ,
6327   frameimages  .bool_set:N = \c__notesslides_frameimages_bool ,
6328   fiboxed      .bool_set:N = \c__notesslides_fiboxed_bool ,
6329   noproblems   .bool_set:N = \c__notesslides_noproblems_bool,
6330   unknown      .code:n      = {
6331     \PassOptionsToClass{\CurrentOption}{stex}
6332     \PassOptionsToClass{\CurrentOption}{tikzinput}
6333   }
6334 }
6335 \ProcessKeysOptions{ notesslides / pkg }
6336 \newif\ifnotes
6337 \bool_if:NTF \c__notesslides_notes_bool {
6338   \notesttrue
6339 }{
6340   \notesfalse
6341 }
6342

```

we give ourselves a macro `\@@topsect` that needs only be evaluated once, so that the `\ifdefstring` conditionals work below.

```

6343 \str_if_empty:NTF \c__notesslides_topsect_str {
6344   \str_set_eq:NN \__notesslides_topsect \c__notesslides_defaulttopsec_str
6345 }{
6346   \str_set_eq:NN \__notesslides_topsect \c__notesslides_topsect_str
6347 }
6348 </package>

```

Depending on the options, we either load the article-based document-structure or the beamer class (and set some counters).

```

6349 <*cls>
6350 \bool_if:NTF \c__notesslides_notes_bool {
6351   \LoadClass{document-structure}
6352 }{
6353   \LoadClass[10pt,notheorems,xcolor={dvipsnames,svgnames}]{beamer}
6354   \newcounter{Item}
6355   \newcounter{paragraph}
6356   \newcounter{subparagraph}
6357   \newcounter{Hfootnote}
6358   \RequirePackage{document-structure}
6359 }

```

now it only remains to load the notesslides package that does all the rest.

```

6360 \RequirePackage{notesslides}
6361 </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 `STEX` packages. The first batch of packages we want are loaded on `notesslides.sty`. These are the general ones, we will load the `STEX`-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.

```

6362 <*package>
6363 \bool_if:NT \c__notesslides_notes_bool {
6364   \RequirePackage{a4wide}
6365   \RequirePackage{marginnote}
6366   \PassOptionsToPackage{usenames,dvipsnames,svgnames}{xcolor}
6367   \RequirePackage{mdframed}
6368   \RequirePackage[noxcolor,noamsthm]{beamerarticle}
6369   \RequirePackage[bookmarks,bookmarksopen,bookmarksnumbered,breaklinks,hidelinks]{hyperref}
6370 }
6371 \RequirePackage{stex-tikzinput}
6372 \RequirePackage{etoolbox}
6373 \RequirePackage{amssymb}
6374 \RequirePackage{amsmath}
6375 \RequirePackage{comment}
6376 \RequirePackage{textcomp}
6377 \RequirePackage{url}
6378 \RequirePackage{graphicx}
6379 \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`.¹⁴

```

6380 \bool_if:NT \c__notesslides_notes_bool {
6381   \renewcommand\usetheme[2][\usepackage[#1]{beamernotestheme#2}]
6382 }
6383
6384
6385 \NewDocumentCommand \libusetheme {0{} m} {
6386   \bool_if:NTF \c__notesslides_notes_bool {
6387     \libusepackage[#1]{beamernotestheme#2}
6388   }{
6389     \libusepackage[#1]{beamertheme#2}
6390   }
6391 }

```

We define the sizes of slides in the notes. Somehow, we cannot get by with the same here.

```

6392 \newcounter{slide}
6393 \newlength{\slidewidth}\setlength{\slidewidth}{13.5cm}
6394 \newlength{\slideheight}\setlength{\slideheight}{9cm}

```

¹⁴EdNOTE: MK: This is not ideal, but I am not sure that I want to be able to provide the full theme functionality there.

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.

```

6395 \bool_if:NTF \c__notesslides_notes_bool {
6396   \renewenvironment{note}{\ignorespaces}{}
6397 }{
6398   \excludecomment{note}
6399 }

```

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.

```

6400 \bool_if:NT \c__notesslides_notes_bool {
6401   \newlength{\slideframewidth}
6402   \setlength{\slideframewidth}{1.5pt}

```

frame We first define the keys.

```

6403 \cs_new_protected:Nn \__notesslides_do_yes_param:Nn {
6404   \exp_args:Nx \str_if_eq:nnTF { \str_uppercase:n{ #2 } }{ yes }{
6405     \bool_set_true:N #1
6406   }{
6407     \bool_set_false:N #1
6408   }
6409 }
6410 \keys_define:nn{notesslides / frame}{
6411   label .str_set_x:N = \l__notesslides_frame_label_str,
6412   allowframebreaks .code:n = {
6413     \__notesslides_do_yes_param:Nn \l__notesslides_frame_allowframebreaks_bool { #1 }
6414   },
6415   allowdisplaybreaks .code:n = {
6416     \__notesslides_do_yes_param:Nn \l__notesslides_frame_allowdisplaybreaks_bool { #1 }
6417   },
6418   fragile .code:n = {
6419     \__notesslides_do_yes_param:Nn \l__notesslides_frame_fragile_bool { #1 }
6420   },
6421   shrink .code:n = {
6422     \__notesslides_do_yes_param:Nn \l__notesslides_frame_shrink_bool { #1 }
6423   },
6424   squeeze .code:n = {
6425     \__notesslides_do_yes_param:Nn \l__notesslides_frame_squeeze_bool { #1 }
6426   },
6427   t .code:n = {
6428     \__notesslides_do_yes_param:Nn \l__notesslides_frame_t_bool { #1 }
6429   },
6430 }
6431 \cs_new_protected:Nn \__notesslides_frame_args:n {
6432   \str_clear:N \l__notesslides_frame_label_str
6433   \bool_set_true:N \l__notesslides_frame_allowframebreaks_bool
6434   \bool_set_true:N \l__notesslides_frame_allowdisplaybreaks_bool
6435   \bool_set_true:N \l__notesslides_frame_fragile_bool
6436   \bool_set_true:N \l__notesslides_frame_shrink_bool
6437   \bool_set_true:N \l__notesslides_frame_squeeze_bool
6438   \bool_set_true:N \l__notesslides_frame_t_bool

```

```

6439     \keys_set:nn { notesslides / frame }{ #1 }
6440 }

```

We define the environment, read them, and construct the slide number and label.

```

6441 \renewenvironment{frame}[1][]{
6442   \__notesslides_frame_args:n{#1}
6443   \sffamily
6444   \stepcounter{slide}
6445   \def\@currentlabel{\theslide}
6446   \str_if_empty:NF \l__notesslides_frame_label_str {
6447     \label{\l__notesslides_frame_label_str}
6448   }

```

We redefine the `itemize` environment so that it looks more like the one in `beamer`.

```

6449   \def\itemize@level{outer}
6450   \def\itemize@outer{outer}
6451   \def\itemize@inner{inner}
6452   \renewcommand\newpage{\addtocounter{framenumber}{1}}
6453   \newcommand\metakeys@show@keys[2]{\marginnote{\scriptsize ##2}}
6454   \renewenvironment{itemize}{
6455     \ifx\itemize@level\itemize@outer
6456       \def\itemize@label{$\rhd$}
6457     \fi
6458     \ifx\itemize@level\itemize@inner
6459       \def\itemize@label{$\scriptstyle\rhd$}
6460     \fi
6461     \begin{list}
6462       {\itemize@label}
6463       {\setlength{\labelsep}{.3em}
6464        \setlength{\labelwidth}{.5em}
6465        \setlength{\leftmargin}{1.5em}
6466       }
6467     \edef\itemize@level{\itemize@inner}
6468   }{
6469     \end{list}
6470   }

```

We create the box with the `mdframed` environment from the `equinymous` package.

```

6471   \begin{mdframed}[linewidth=\slideframewidth,skipabove=1ex,skipbelow=1ex,userdefinedwidth]
6472   }{
6473     \medskip\miko@slidelabel\end{mdframed}
6474   }

```

Now, we need to redefine the `frametitle` (we are still in course notes mode).

`\frametitle`

```

6475   \renewcommand{\frametitle}[1]{\Large\bf\sf\color{blue}{#1}}\medskip
6476 }

```

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

EdN:15

`\pause`

```

15
6477 \bool_if:NT \c__notesslides_notes_bool {
6478   \newcommand\pause{}
6479 }

```

¹⁵EdNOTE: MK: fake it in notes mode for now

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

nparagraph

```
6480 \bool_if:NTF \c__notesslides_notes_bool {
6481   \newenvironment{nparagraph}[1] [] {\begin{sparagraph}[#1]}\end{sparagraph}}
6482 }{
6483   \excludecomment{nparagraph}
6484 }
```

nfragment

```
6485 \bool_if:NTF \c__notesslides_notes_bool {
6486   \newenvironment{nfragment}[2] [] {\begin{sfragment}[#1]{#2}}\end{sfragment}}
6487 }{
6488   \excludecomment{nfragment}
6489 }
```

ndefinition

```
6490 \bool_if:NTF \c__notesslides_notes_bool {
6491   \newenvironment{ndefinition}[1] [] {\begin{sdefinition}[#1]}\end{sdefinition}}
6492 }{
6493   \excludecomment{ndefinition}
6494 }
```

nassertion

```
6495 \bool_if:NTF \c__notesslides_notes_bool {
6496   \newenvironment{nassertion}[1] [] {\begin{sassertion}[#1]}\end{sassertion}}
6497 }{
6498   \excludecomment{nassertion}
6499 }
```

nsproof

```
6500 \bool_if:NTF \c__notesslides_notes_bool {
6501   \newenvironment{nsproof}[2] [] {\begin{sproof}[#1]{#2}}\end{sproof}}
6502 }{
6503   \excludecomment{nsproof}
6504 }
```

nexample

```
6505 \bool_if:NTF \c__notesslides_notes_bool {
6506   \newenvironment{nexample}[1] [] {\begin{sexample}[#1]}\end{sexample}}
6507 }{
6508   \excludecomment{nexample}
6509 }
```

\inputref@*skip We customize the hooks for in \inputref.

```
6510 \def\inputref@preskip{\smallskip}
6511 \def\inputref@postskip{\medskip}
```

(End definition for \inputref@*skip. This function is documented on page ??.)

`\inputref*`

```
6512 \let\orig@inputref\inputref
6513 \def\inputref{\@ifstar\ninputref\orig@inputref}
6514 \newcommand\ninputref[2][]{
6515   \bool_if:NT \c__notesslides_notes_bool {
6516     \orig@inputref[#1]{#2}
6517   }
6518 }
```

(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>}`.

```
6519 \newlength{\slidelogoheight}
6520
6521 \bool_if:NTF \c__notesslides_notes_bool {
6522   \setlength{\slidelogoheight}{.4cm}
6523 }{
6524   \setlength{\slidelogoheight}{1cm}
6525 }
6526 \newsavebox{\slidelogo}
6527 \sbox{\slidelogo}{\text{\TeX}}
6528 \newrobustcmd{\setslidelogo}[1]{
6529   \sbox{\slidelogo}{\includegraphics[height=\slidelogoheight]{#1}}
6530 }
```

(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.

```
6531 \def\source{Michael Kohlhase}% customize locally
6532 \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.

```
6533 \def\copyrightnotice{\footnotesize\copyright : \hspace{.3ex}{\source}}
6534 \newsavebox{\cclogo}
6535 \sbox{\cclogo}{\includegraphics[height=\slidelogoheight]{stex-cc_somerights}}
6536 \newif\ifcchref\cchreffalse
6537 \AtBeginDocument{
6538   \@ifpackageloaded{hyperref}{\cchreftrue}{\cchreffalse}
6539 }
6540 \def\licensing{
6541   \ifcchref
```

```

6542     \href{http://creativecommons.org/licenses/by-sa/2.5/}{\usebox{\cclogo}}
6543 \else
6544     {\usebox{\cclogo}}
6545 \fi
6546 }
6547 \newrobustcmd{\setlicensing}[2][]{
6548   \def\@url{\#1}
6549   \sbox{\cclogo}{\includegraphics[height=\slidelogoheight]{\#2}}
6550   \ifx\@url\@empty
6551     \def\licensing{\usebox{\cclogo}}
6552   \else
6553     \def\licensing{
6554       \ifcchref
6555         \href{\#1}{\usebox{\cclogo}}
6556       \else
6557         {\usebox{\cclogo}}
6558       \fi
6559     }
6560   \fi
6561 }

```

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

EdN:16

\slidelabel Now, we set up the slide label for the article mode.¹⁶

```

6562 \newrobustcmd\miko@slidelabel{
6563   \vbox to \slidelogoheight{
6564     \vss\hbox to \slidewidth
6565     {\licensing\hfill\copyrightnotice\hfill\arabic{slide}\hfill\usebox{\slidelogo}}
6566   }
6567 }

```

(End definition for \slidelabel. 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.

```

6568 \def\Gin@mhrepos{}
6569 \define@key{Gin}{mhrepos}{\def\Gin@mhrepos{\#1}}
6570 \define@key{Gin}{label}{\def\@currentlabel{\arabic{slide}}\label{\#1}}
6571 \newrobustcmd\frameimage[2][]{
6572   \stepcounter{slide}
6573   \bool_if:NT \c__notesslides_frameimages_bool {
6574     \def\Gin@ewidth{}\setkeys{Gin}{\#1}
6575     \bool_if:NF \c__notesslides_notes_bool { \vfill }
6576     \begin{center}
6577       \bool_if:NTF \c__notesslides_fboxed_bool {
6578         \fbox{
6579           \ifx\Gin@ewidth\@empty
6580             \ifx\Gin@mhrepos\@empty
6581               \mhgraphics[width=\slidewidth,\#1]{\#2}
6582             \else

```

¹⁶EdNOTE: see that we can use the themes for the slides some day. This is all fake.

```

6583         \mhgraphics[width=\slidewidth,#1,mhrepos=\Gin@mhrepos]{#2}
6584     \fi
6585     \else% Gin@ewidth empty
6586         \ifx\Gin@mhrepos\@empty
6587             \mhgraphics[#1]{#2}
6588         \else
6589             \mhgraphics[#1,mhrepos=\Gin@mhrepos]{#2}
6590         \fi
6591     \fi% Gin@ewidth empty
6592 }
6593 }{
6594     \ifx\Gin@ewidth\@empty
6595         \ifx\Gin@mhrepos\@empty
6596             \mhgraphics[width=\slidewidth,#1]{#2}
6597         \else
6598             \mhgraphics[width=\slidewidth,#1,mhrepos=\Gin@mhrepos]{#2}
6599         \fi
6600         \ifx\Gin@mhrepos\@empty
6601             \mhgraphics[#1]{#2}
6602         \else
6603             \mhgraphics[#1,mhrepos=\Gin@mhrepos]{#2}
6604         \fi
6605     \fi% Gin@ewidth empty
6606 }
6607 \end{center}
6608 \par\strut\hfill{\footnotesize Slide \arabic{slide}}}%
6609 \bool_if:NF \c__notesslides_notes_bool { \vfill }
6610 }
6611 } % 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.

```

6612 \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

```

6613 \AddToHook{begindocument}{
6614     \definecolor{green}{rgb}{0,.5,0}
6615     \definecolor{purple}{cmyk}{.3,1,0,.17}
6616 }

```

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`.

```

6617 % \def\STpresent#1{\textcolor{blue}{#1}}
6618 \def\defemph#1{\textcolor{magenta}{#1}}
6619 \def\symrefemph#1{\textcolor{cyan}{#1}}
6620 \def\compemph#1{\textcolor{blue}{#1}}
6621 \def\titleemph#1{\textcolor{blue}{#1}}
6622 \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.

```

6623 \pgfdeclareimage[width=.8em]{miko@small@dbend}{stex-dangerous-bend}
6624 \def\smalltextwarning{
6625   \pgfuseimage{miko@small@dbend}
6626   \xspace
6627 }
6628 \pgfdeclareimage[width=1.2em]{miko@dbend}{stex-dangerous-bend}
6629 \newrobustcmd\textwarning{
6630   \raisebox{-.05cm}{\pgfuseimage{miko@dbend}}
6631   \xspace
6632 }
6633 \pgfdeclareimage[width=2.5em]{miko@big@dbend}{stex-dangerous-bend}
6634 \newrobustcmd\bigtextwarning{
6635   \raisebox{-.05cm}{\pgfuseimage{miko@big@dbend}}
6636   \xspace
6637 }

```

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

```

6638 \newrobustcmd\putgraphicsat[3]{
6639   \begin{picture}(0,0)\put(#1){\includegraphics[#2]{#3}}\end{picture}
6640 }
6641 \newrobustcmd\putat[2]{
6642   \begin{picture}(0,0)\put(#1){#2}\end{picture}
6643 }

```

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`.

```

6644 \bool_if:NT \c__notesslides_sectocframes_bool {
6645   \str_if_eq:VnTF \__notesslidesstopsect{part}{
6646     \newcounter{chapter}\counterwithin*{section}{chapter}
6647   }{
6648     \str_if_eq:VnT \__notesslidesstopsect{chapter}{
6649       \newcounter{chapter}\counterwithin*{section}{chapter}
6650     }
6651   }
6652 }

```

`\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
6653 \def\part@prefix{}
6654 \@ifpackageloaded{document-structure}{}{
6655   \str_case:VnF \__notesslidesstopsect {
6656     {part}{
6657       \int_set:Nn \l_document_structure_section_level_int {0}
6658       \def\thesection{\arabic{chapter}.\arabic{section}}

```

```

6659     \def\part@prefix{\arabic{chapter}.}
6660   }
6661   {chapter}{
6662     \int_set:Nn \l_document_structure_section_level_int {1}
6663     \def\thesection{\arabic{chapter}.\arabic{section}}
6664     \def\part@prefix{\arabic{chapter}.}
6665   }
6666   }{
6667     \int_set:Nn \l_document_structure_section_level_int {2}
6668     \def\part@prefix{}
6669   }
6670 }
6671
6672 \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

```

6673 \renewenvironment{sfragment}[2][]{
6674   \_document_structure_omgroup_args:n { #1 }
6675   \int_incr:N \l_document_structure_section_level_int
6676   \bool_if:NT \c__notesslides_sectocframes_bool {
6677     \stepcounter{slide}
6678     \begin{frame}[noframenumbering]
6679     \vfill\Large\centering
6680     \red{
6681       \ifcase\l_document_structure_section_level_int\or
6682         \stepcounter{part}
6683         \def\_notesslideslabel{\omdoc@part@kw~\Roman{part}}
6684         \def\currentsectionlevel{\omdoc@part@kw}
6685       \or
6686         \stepcounter{chapter}
6687         \def\_notesslideslabel{\omdoc@chapter@kw~\arabic{chapter}}
6688         \def\currentsectionlevel{\omdoc@chapter@kw}
6689       \or
6690         \stepcounter{section}
6691         \def\_notesslideslabel{\part@prefix\arabic{section}}
6692         \def\currentsectionlevel{\omdoc@section@kw}
6693       \or
6694         \stepcounter{subsection}
6695         \def\_notesslideslabel{\part@prefix\arabic{section}.\arabic{subsection}}
6696         \def\currentsectionlevel{\omdoc@subsection@kw}
6697       \or
6698         \stepcounter{subsubsection}
6699         \def\_notesslideslabel{\part@prefix\arabic{section}.\arabic{subsection}.\arabic{s
6700         \def\currentsectionlevel{\omdoc@subsubsection@kw}
6701       \or
6702         \stepcounter{paragraph}
6703         \def\_notesslideslabel{\part@prefix\arabic{section}.\arabic{subsection}.\arabic{s
6704         \def\currentsectionlevel{\omdoc@paragraph@kw}
6705       \else
6706         \def\_notesslideslabel{}

```

```

6707         \def\currentsectionlevel{\omdoc@paragraph@kw}
6708         \fi% end ifcase
6709         \_notesslideslabel%\sref@label@id\_notesslideslabel
6710         \quad #2%
6711     }%
6712     \vfill%
6713     \end{frame}%
6714 }
6715 \str_if_empty:NF \l__document_structure_omgroup_id_str {
6716     \stex_ref_new_doc_target:n\l__document_structure_omgroup_id_str
6717 }
6718 }{}
6719 }

```

We set up a beamer template for theorems like ams style, but without a block environment.

```

6720 \def\inserttheorembodyfont{\normalfont}
6721 %\bool_if:NF \c__notesslides_notes_bool {
6722 % \defbeamertemplate{theorem begin}{miko}
6723 % {\inserttheoremheadfont\inserttheoremname\inserttheoremnumber
6724 % \ifx\inserttheoremaddition\@empty\else\ (\inserttheoremaddition)\fi%
6725 % \inserttheorempunctuation\inserttheorembodyfont\xspace}
6726 % \defbeamertemplate{theorem end}{miko}{}}

```

and we set it as the default one.

```

6727 % \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.

```

6728 % \expandafter\def\csname Parent2\endcsname{}
6729 %}
6730
6731 \AddToHook{begindocument}{% this does not work for some reason
6732     \setbeamertemplate{theorems}[ams style]
6733 }
6734 \bool_if:NT \c__notesslides_notes_bool {
6735     \renewenvironment{columns}[1][ ]{%
6736         \par\noindent%
6737         \begin{minipage}%
6738             \slidewidth\centering\leavevmode%
6739     }{%
6740         \end{minipage}\par\noindent%
6741     }%
6742     \newsavebox\columnbox%
6743     \renewenvironment<>{column}[2][ ]{%
6744         \begin{lrbox}{\columnbox}\begin{minipage}{#2}%
6745     }{%
6746         \end{minipage}\end{lrbox}\usebox\columnbox%
6747     }%
6748 }
6749 \bool_if:NTF \c__notesslides_noproblems_bool {
6750     \newenvironment{problems}{}{}
6751 }{
6752     \excludecomment{problems}
6753 }

```

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.

```

6754 \gdef\printexcursions{}
6755 \newcommand\excursionref[2]{% label, text
6756   \bool_if:NT \c__notesslides_notes_bool {
6757     \begin{sparagraph}[title=Excursion]
6758       #2 \sref[fallback=the appendix]{#1}.
6759     \end{sparagraph}
6760   }
6761 }
6762 \newcommand\activate@excursion[2][]{
6763   \gappto\printexcursions{\inputref{#1}{#2}}
6764 }
6765 \newcommand\excursion[4][]{% repos, label, path, text
6766   \bool_if:NT \c__notesslides_notes_bool {
6767     \activate@excursion[#1]{#3}\excursionref{#2}{#4}
6768   }
6769 }

```

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

`\excursiongroup`

```

6770 \keys_define:nn{notesslides / excursiongroup }{
6771   id          .str_set_x:N = \l__notesslides_excursion_id_str,
6772   intro       .tl_set:N   = \l__notesslides_excursion_intro_tl,
6773   mhrepos     .str_set_x:N = \l__notesslides_excursion_mhrepos_str
6774 }
6775 \cs_new_protected:Nn \__notesslides_excursion_args:n {
6776   \tl_clear:N \l__notesslides_excursion_intro_tl
6777   \str_clear:N \l__notesslides_excursion_id_str
6778   \str_clear:N \l__notesslides_excursion_mhrepos_str
6779   \keys_set:nn {notesslides / excursiongroup }{ #1 }
6780 }
6781 \newcommand\excursiongroup[1][]{
6782   \__notesslides_excursion_args:n{ #1 }
6783   \ifdefempty\printexcursions{}% only if there are excursions
6784     {\begin{note}
6785       \begin{sfragment}[#1]{Excursions}%
6786         \ifdefempty\l__notesslides_excursion_intro_tl{\{
6787           \inputref[\l__notesslides_excursion_mhrepos_str]{
6788             \l__notesslides_excursion_intro_tl
6789           }
6790         }
6791         \printexcursions%
6792       \end{sfragment}
6793     \end{note}}
6794 }
6795 \ifcsname beameritemnestingprefix\endcsname\else\def\beameritemnestingprefix{\fi
6796 \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.

```
6797 <*package>
6798 <@@=problems>
6799 \ProvidesExplPackage{problem}{2022/02/26}{3.0.1}{Semantic Markup for Problems}
6800 \RequirePackage{13keys2e,stex}
6801
6802 \keys_define:nn { problem / pkg }{
6803   notes      .default:n    = { true },
6804   notes      .bool_set:N   = \c__problems_notes_bool,
6805   gnotes     .default:n    = { true },
6806   gnotes     .bool_set:N   = \c__problems_gnotes_bool,
6807   hints      .default:n    = { true },
6808   hints      .bool_set:N   = \c__problems_hints_bool,
6809   solutions  .default:n    = { true },
6810   solutions  .bool_set:N   = \c__problems_solutions_bool,
6811   pts        .default:n    = { true },
6812   pts        .bool_set:N   = \c__problems_pts_bool,
6813   min        .default:n    = { true },
6814   min        .bool_set:N   = \c__problems_min_bool,
6815   boxed      .default:n    = { true },
6816   boxed      .bool_set:N   = \c__problems_boxed_bool,
6817   unknown    .code:n       = {}
6818 }
6819 \newif\ifsolutions
6820
6821 \ProcessKeysOptions{ problem / pkg }
6822 \bool_if:NTF \c__problems_solutions_bool {
6823   \solutionstrue
6824 }{
6825   \solutionsfalse
6826 }
```

Then we make sure that the necessary packages are loaded (in the right versions).

```
6827 \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.

```
6828 \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.

```
6829 \def\prob@problem@kw{Problem}
6830 \def\prob@solution@kw{Solution}
6831 \def\prob@hint@kw{Hint}
6832 \def\prob@note@kw{Note}
6833 \def\prob@gnote@kw{Grading}
6834 \def\prob@pt@kw{pt}
6835 \def\prob@min@kw{min}
```

(End definition for \prob@*@kw. This function is documented on page ??.)

For the other languages, we set up triggers

```
6836 \AddToHook{begindocument}{
6837   \ltx@ifpackageloaded{babel}{
6838     \makeatletter
6839     \clist_set:Nx \l_tmpa_clist {\bbl@loaded}
6840     \clist_if_in:NnT \l_tmpa_clist {ngerman}{
6841       \input{problem-ngerman.ldf}
6842     }
6843     \clist_if_in:NnT \l_tmpa_clist {finnish}{
6844       \input{problem-finnish.ldf}
6845     }
6846     \clist_if_in:NnT \l_tmpa_clist {french}{
6847       \input{problem-french.ldf}
6848     }
6849     \clist_if_in:NnT \l_tmpa_clist {russian}{
6850       \input{problem-russian.ldf}
6851     }
6852     \makeatother
6853   }{ }
6854 }
```

39.2 Problems and Solutions

We now prepare the KeyVal support for problems. The key macros just set appropriate internal macros.

```
6855 \keys_define:nn{ problem / problem }{
6856   id      .str_set:x:N = \l__problems_prob_id_str,
6857   pts     .tl_set:N    = \l__problems_prob_pts_tl,
6858   min     .tl_set:N    = \l__problems_prob_min_tl,
6859   title   .tl_set:N    = \l__problems_prob_title_tl,
6860   type    .tl_set:N    = \l__problems_prob_type_tl,
6861   refnum  .int_set:N    = \l__problems_prob_refnum_int
6862 }
6863 \cs_new_protected:Nn \__problems_prob_args:n {
```

```

6864 \str_clear:N \l__problems_prob_id_str
6865 \tl_clear:N \l__problems_prob_pts_tl
6866 \tl_clear:N \l__problems_prob_min_tl
6867 \tl_clear:N \l__problems_prob_title_tl
6868 \tl_clear:N \l__problems_prob_type_tl
6869 \int_zero_new:N \l__problems_prob_refnum_int
6870 \keys_set:nn { problem / problem }{ #1 }
6871 \int_compare:nNnT \l__problems_prob_refnum_int = 0 {
6872   \let\l__problems_prob_refnum_int\undefined
6873 }
6874 }

```

Then we set up a counter for problems.

`\numberproblemsin`

```

6875 \newcounter{problem}
6876 \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.

```

6877 \newcommand\prob@label[1]{#1}

```

(End definition for `\prob@label`. This function is documented on page ??.)

`\prob@number` We consolidate the problem number into a reusable internal macro

```

6878 \newcommand\prob@number{
6879   \int_if_exist:NTF \l__problems_inclprob_refnum_int {
6880     \prob@label{\int_use:N \l__problems_inclprob_refnum_int }
6881   }{
6882     \int_if_exist:NTF \l__problems_prob_refnum_int {
6883       \prob@label{\int_use:N \l__problems_prob_refnum_int }
6884     }{
6885       \prob@label\theproblem
6886     }
6887   }
6888 }

```

(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.

```

6889 \newcommand\prob@title[3]{%
6890   \tl_if_exist:NTF \l__problems_inclprob_title_tl {
6891     #2 \l__problems_inclprob_title_tl #3
6892   }{
6893     \tl_if_exist:NTF \l__problems_prob_title_tl {
6894       #2 \l__problems_prob_title_tl #3
6895     }{
6896       #1
6897     }
6898   }
6899 }

```

(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.

```

6900 \def\prob@heading{
6901   {\prob@problem@kw}\ \prob@number\prob@title{~}{~}{~}\strut}
6902   %\sref@label{id}\prob@problem@kw~\prob@number}{~}
6903 }

```

(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

```

6904 \newenvironment{sproblem}[1][{}]{
6905   \__problems_prob_args:n{#1}%\sref@target%
6906   \@in@omtexttrue% we are in a statement (for inline definitions)
6907   \stepcounter{problem}\record@problem
6908   \def\current@section@level{\prob@problem@kw}
6909   \tl_if_exist:NTF \l__problems_inclprob_type_tl {
6910     \tl_set_eq:NN \sproblemtype \l__problems_inclprob_type_tl
6911   }{
6912     \tl_set_eq:NN \sproblemtype \l__problems_prob_type_tl
6913   }
6914   \str_if_exist:NTF \l__problems_inclprob_id_str {
6915     \str_set_eq:NN \sproblemid \l__problems_inclprob_id_str
6916   }{
6917     \str_set_eq:NN \sproblemid \l__problems_prob_id_str
6918   }
6919
6920
6921   \clist_set:No \l_tmpa_clist \sproblemtype
6922   \tl_clear:N \l_tmpa_tl
6923   \clist_map_inline:Nn \l_tmpa_clist {
6924     \tl_if_exist:cT {\__problems_sproblem_##1_start:}{
6925       \tl_set:Nn \l_tmpa_tl {\use:c{\__problems_sproblem_##1_start:}}
6926     }
6927   }
6928   \tl_if_empty:NTF \l_tmpa_tl {
6929     \__problems_sproblem_start:
6930   }{
6931     \l_tmpa_tl
6932   }
6933   \stex_ref_new_doc_target:n \sproblemid
6934 }{
6935   \clist_set:No \l_tmpa_clist \sproblemtype
6936   \tl_clear:N \l_tmpa_tl
6937   \clist_map_inline:Nn \l_tmpa_clist {
6938     \tl_if_exist:cT {\__problems_sproblem_##1_end:}{
6939       \tl_set:Nn \l_tmpa_tl {\use:c{\__problems_sproblem_##1_end:}}
6940     }

```



```

6941 }
6942 \tl_if_empty:NTF \l_tmpa_tl {
6943   \__problems_sproblem_end:
6944 }{
6945   \l_tmpa_tl
6946 }
6947
6948
6949 \smallskip
6950 }
6951
6952
6953 \cs_new_protected:Nn \__problems_sproblem_start: {
6954   \par\noindent\textbf{\prob@heading\show@pts\show@min\\ignorespacesandpars
6955 }
6956 \cs_new_protected:Nn \__problems_sproblem_end: {\par\smallskip}
6957
6958 \newcommand\stexpatchproblem[3][] {
6959   \str_set:Nx \l_tmpa_str{ #1 }
6960   \str_if_empty:NTF \l_tmpa_str {
6961     \tl_set:Nn \__problems_sproblem_start: { #2 }
6962     \tl_set:Nn \__problems_sproblem_end: { #3 }
6963   }{
6964     \exp_after:wN \tl_set:Nn \csname __problems_sproblem_#1_start:\endcsname{ #2 }
6965     \exp_after:wN \tl_set:Nn \csname __problems_sproblem_#1_end:\endcsname{ #3 }
6966   }
6967 }
6968
6969
6970 \bool_if:NT \c__problems_boxed_bool {
6971   \surroundwithmdframed{problem}
6972 }

```

\record@problem This macro records information about the problems in the *.aux file.

```

6973 \def\record@problem{
6974   \protected@write\@auxout{}
6975   {
6976     \string\@problem{\prob@number}
6977     {
6978       \tl_if_exist:NTF \l__problems_inclprob_pts_tl {
6979         \l__problems_inclprob_pts_tl
6980       }{
6981         \l__problems_prob_pts_tl
6982       }
6983     }%
6984     {
6985       \tl_if_exist:NTF \l__problems_inclprob_min_tl {
6986         \l__problems_inclprob_min_tl
6987       }{
6988         \l__problems_prob_min_tl
6989       }
6990     }
6991   }
6992 }

```

(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).

```
6993 \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 it's own keys that we need to define first.

```
6994 \keys_define:nn { problem / solution }{
6995   id                .str_set_x:N = \l__problems_solution_id_str ,
6996   for               .tl_set:N    = \l__problems_solution_for_tl ,
6997   height            .dim_set:N   = \l__problems_solution_height_dim ,
6998   creators          .clist_set:N = \l__problems_solution_creators_clist ,
6999   contributors       .clist_set:N = \l__problems_solution_contributors_clist ,
7000   srccite           .tl_set:N    = \l__problems_solution_srccite_tl
7001 }
7002 \cs_new_protected:Nn \__problems_solution_args:n {
7003   \str_clear:N \l__problems_solution_id_str
7004   \tl_clear:N \l__problems_solution_for_tl
7005   \tl_clear:N \l__problems_solution_srccite_tl
7006   \clist_clear:N \l__problems_solution_creators_clist
7007   \clist_clear:N \l__problems_solution_contributors_clist
7008   \dim_zero:N \l__problems_solution_height_dim
7009   \keys_set:nn { problem / solution }{ #1 }
7010 }
```

the next step is to define a helper macro that does what is needed to start a solution.

```
7011 \newcommand\@startsolution[1][{}]{
7012   \__problems_solution_args:n { #1 }
7013   \@in@omtexttrue% we are in a statement.
7014   \bool_if:NF \c__problems_boxed_bool { \hrule }
7015   \smallskip\noindent
7016   {\textbf\prob@solution@kw : \enspace}
7017   \begin{small}
7018   \def\current@section@level{\prob@solution@kw}
7019   \ignorespacesandpars
7020 }
```

\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.

```
7021 \newcommand\startsolutions{
7022   \specialcomment{solution}{\@startsolution}{
7023     \bool_if:NF \c__problems_boxed_bool {
7024       \hrule\medskip
7025     }
7026     \end{small}%
7027   }
7028   \bool_if:NT \c__problems_boxed_bool {
7029     \surroundwithmdframed{solution}
7030   }
7031 }
```

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

\stopsolutions

```
7032 \newcommand\stopsolutions{\excludecomment{solution}}
```

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

so it only remains to start/stop solutions depending on what option was specified.

```
7033 \ifsolutions
7034 \startsolutions
7035 \else
7036 \stopsolutions
7037 \fi
```

exnote

```
7038 \bool_if:NTF \c__problems_notes_bool {
7039 \newenvironment{exnote}[1][]{
7040 \par\smallskip\hrule\smallskip
7041 \noindent\textbf{\prob@note@kw : }\small
7042 }{
7043 \smallskip\hrule
7044 }
7045 }{
7046 \excludecomment{exnote}
7047 }
```

hint

```
7048 \bool_if:NTF \c__problems_notes_bool {
7049 \newenvironment{hint}[1][]{
7050 \par\smallskip\hrule\smallskip
7051 \noindent\textbf{\prob@hint@kw :~ }\small
7052 }{
7053 \smallskip\hrule
7054 }
7055 \newenvironment{exhint}[1][]{
7056 \par\smallskip\hrule\smallskip
7057 \noindent\textbf{\prob@hint@kw :~ }\small
7058 }{
7059 \smallskip\hrule
7060 }
7061 }{
7062 \excludecomment{hint}
7063 \excludecomment{exhint}
7064 }
```

gnote

```
7065 \bool_if:NTF \c__problems_notes_bool {
7066 \newenvironment{gnote}[1][]{
7067 \par\smallskip\hrule\smallskip
7068 \noindent\textbf{\prob@gnote@kw : }\small
7069 }{
7070 \smallskip\hrule
7071 }
7072 }{
7073 \excludecomment{gnote}
7074 }
```

39.3 Multiple Choice Blocks

EdN:17

mcb 17

```

7075 \newenvironment{mcb}{
7076   \begin{enumerate}
7077 }{
7078   \end{enumerate}
7079 }

```

we define the keys for the mcc macro

```

7080 \cs_new_protected:Nn \__problems_do_yes_param:Nn {
7081   \exp_args:Nx \str_if_eq:nnTF { \str_lowercase:n{ #2 } }{ yes }{
7082     \bool_set_true:N #1
7083   }{
7084     \bool_set_false:N #1
7085   }
7086 }
7087 \keys_define:nn { problem / mcc }{
7088   id          .str_set_x:N = \l__problems_mcc_id_str ,
7089   feedback    .tl_set:N    = \l__problems_mcc_feedback_tl ,
7090   T           .default:n    = { true } ,
7091   T           .bool_set:N   = \l__problems_mcc_t_bool ,
7092   F           .default:n    = { true } ,
7093   F           .bool_set:N   = \l__problems_mcc_f_bool ,
7094   Ttext       .code:n       = {
7095     \__problems_do_yes_param:Nn \l__problems_mcc_Ttext_bool { #1 }
7096   } ,
7097   Ftext       .code:n       = {
7098     \__problems_do_yes_param:Nn \l__problems_mcc_Ftext_bool { #1 }
7099   }
7100 }
7101 \cs_new_protected:Nn \l__problems_mcc_args:n {
7102   \str_clear:N \l__problems_mcc_id_str
7103   \tl_clear:N \l__problems_mcc_feedback_tl
7104   \bool_set_true:N \l__problems_mcc_t_bool
7105   \bool_set_true:N \l__problems_mcc_f_bool
7106   \bool_set_true:N \l__problems_mcc_Ttext_bool
7107   \bool_set_false:N \l__problems_mcc_Ftext_bool
7108   \keys_set:nn { problem / mcc }{ #1 }
7109 }

```

\mcc

```

7110 \newcommand\mcc[2][]{
7111   \l__problems_mcc_args:n{ #1 }
7112   \item #2
7113   \ifsolutions
7114     \
7115     \bool_if:NT \l__problems_mcc_t_bool {
7116       % TODO!
7117       % \ifcsstring{mcc@T}{T}{\mcc@Ttext}%
7118     }
7119     \bool_if:NT \l__problems_mcc_f_bool {

```

¹⁷EdNOTE: MK: maybe import something better here from a dedicated MC package

```

7120      % TODO!
7121      % \ifcsstring{mcc@F}{F}{\mcc@Ftext}%
7122    }
7123    \tl_if_empty:NTF \l__problems_mcc_feedback_tl {
7124      !
7125    }{
7126      \l__problems_mcc_feedback_tl
7127    }
7128    \fi
7129  } %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.

```

7130
7131 \keys_define:nn{ problem / inclproblem }{
7132   id      .str_set:N = \l__problems_inclprob_id_str,
7133   pts     .tl_set:N  = \l__problems_inclprob_pts_tl,
7134   min     .tl_set:N  = \l__problems_inclprob_min_tl,
7135   title   .tl_set:N  = \l__problems_inclprob_title_tl,
7136   refnum  .int_set:N  = \l__problems_inclprob_refnum_int,
7137   type    .tl_set:N  = \l__problems_inclprob_type_tl,
7138   mhrepos .str_set:N  = \l__problems_inclprob_mhrepos_str
7139 }
7140 \cs_new_protected:Nn \l__problems_inclprob_args:n {
7141   \str_clear:N \l__problems_prob_id_str
7142   \tl_clear:N \l__problems_inclprob_pts_tl
7143   \tl_clear:N \l__problems_inclprob_min_tl
7144   \tl_clear:N \l__problems_inclprob_title_tl
7145   \tl_clear:N \l__problems_inclprob_type_tl
7146   \int_zero_new:N \l__problems_inclprob_refnum_int
7147   \str_clear:N \l__problems_inclprob_mhrepos_str
7148   \keys_set:nn { problem / inclproblem }{ #1 }
7149   \tl_if_empty:NT \l__problems_inclprob_pts_tl {
7150     \let\l__problems_inclprob_pts_tl\undefined
7151   }
7152   \tl_if_empty:NT \l__problems_inclprob_min_tl {
7153     \let\l__problems_inclprob_min_tl\undefined
7154   }
7155   \tl_if_empty:NT \l__problems_inclprob_title_tl {
7156     \let\l__problems_inclprob_title_tl\undefined
7157   }
7158   \tl_if_empty:NT \l__problems_inclprob_type_tl {
7159     \let\l__problems_inclprob_type_tl\undefined
7160   }
7161   \int_compare:nNnT \l__problems_inclprob_refnum_int = 0 {
7162     \let\l__problems_inclprob_refnum_int\undefined
7163   }
7164 }

```

```

7165
7166 \cs_new_protected:Nn \__problems_inclprob_clear: {
7167   \let\l__problems_inclprob_id_str\undefined
7168   \let\l__problems_inclprob_pts_tl\undefined
7169   \let\l__problems_inclprob_min_tl\undefined
7170   \let\l__problems_inclprob_title_tl\undefined
7171   \let\l__problems_inclprob_type_tl\undefined
7172   \let\l__problems_inclprob_refnum_int\undefined
7173   \let\l__problems_inclprob_mhrepos_str\undefined
7174 }
7175 \__problems_inclprob_clear:
7176
7177 \newcommand\includeproblem[2][ ]{
7178   \__problems_inclprob_args:n{ #1 }
7179   \str_if_empty:NTF \l__problems_inclprob_mhrepos_str {
7180     \input{#2}
7181   }{
7182     \stex_in_repository:nn{\l__problems_inclprob_mhrepos_str}{
7183       \input{\mhpath{\l__problems_inclprob_mhrepos_str}{#2}}
7184     }
7185   }
7186   \__problems_inclprob_clear:
7187 }

```

(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.

```

7188 \AddToHook{enddocument}{
7189   \bool_if:NT \c__problems_pts_bool {
7190     \message{Total:~\arabic{pts}~points}
7191   }
7192   \bool_if:NT \c__problems_min_bool {
7193     \message{Total:~\arabic{min}~minutes}
7194   }
7195 }

```

The margin pars are reader-visible, so we need to translate

```

7196 \def\pts#1{
7197   \bool_if:NT \c__problems_pts_bool {
7198     \marginpar{#1~\prob@pt@kw}
7199   }
7200 }
7201 \def\min#1{
7202   \bool_if:NT \c__problems_min_bool {
7203     \marginpar{#1~\prob@min@kw}
7204   }
7205 }

```

`\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.

```

7206 \newcounter{pts}
7207 \def\show@pts{
7208   \tl_if_exist:NTF \l__problems_inclprob_pts_tl {
7209     \bool_if:NT \c__problems_pts_bool {
7210       \marginpar{\l__problems_inclprob_pts_tl\ \prob@pt@kw\smallskip}
7211       \addtocounter{pts}{\l__problems_inclprob_pts_tl}
7212     }
7213   }{
7214     \tl_if_exist:NT \l__problems_prob_pts_tl {
7215       \bool_if:NT \c__problems_pts_bool {
7216         \marginpar{\l__problems_prob_pts_tl\ \prob@pt@kw\smallskip}
7217         \addtocounter{pts}{\l__problems_prob_pts_tl}
7218       }
7219     }
7220   }
7221 }

```

(End definition for `\show@pts`. This function is documented on page ??.)
and now the same for the minutes

`\show@min`

```

7222 \newcounter{min}
7223 \def\show@min{
7224   \tl_if_exist:NTF \l__problems_inclprob_min_tl {
7225     \bool_if:NT \c__problems_min_bool {
7226       \marginpar{\l__problems_inclprob_min_tl\ min}
7227       \addtocounter{min}{\l__problems_inclprob_min_tl}
7228     }
7229   }{
7230     \tl_if_exist:NT \l__problems_prob_min_tl {
7231       \bool_if:NT \c__problems_min_bool {
7232         \marginpar{\l__problems_prob_min_tl\ min}
7233         \addtocounter{min}{\l__problems_prob_min_tl}
7234       }
7235     }
7236   }
7237 }
7238 </package>

```

(End definition for `\show@min`. This function is documented on page ??.)

Chapter 40

Implementation: The hwexam Class

The functionality is spread over the `hwexam` class and package. The class provides the `document` environment and pre-loads some convenience packages, whereas the package provides the concrete functionality.

40.1 Class Options

To initialize the `hwexam` class, we declare and process the necessary options by passing them to the respective packages and classes they come from.

```
7239 \@@=hwexam>
7240 \*cls>
7241 \ProvidesExplClass{hwexam}{2022/02/26}{3.0.1}{homework assignments and exams}
7242 \RequirePackage{l3keys2e}
7243 \DeclareOption*{
7244   \PassOptionsToClass{\CurrentOption}{document-structure}
7245   \PassOptionsToPackage{\CurrentOption}{stex}
7246   \PassOptionsToPackage{\CurrentOption}{hwexam}
7247   \PassOptionsToPackage{\CurrentOption}{tikzinput}
7248 }
7249 \ProcessOptions
```

We load `omdoc.cls`, and the desired packages. For the L^AT_EXML bindings, we make sure the right packages are loaded.

```
7250 \LoadClass{document-structure}
7251 \RequirePackage{stex}
7252 \RequirePackage{hwexam}
7253 \RequirePackage{tikzinput}
7254 \RequirePackage{graphicx}
7255 \RequirePackage{a4wide}
7256 \RequirePackage{amssymb}
7257 \RequirePackage{amstext}
7258 \RequirePackage{amsmath}
```

Finally, we register another keyword for the `document` environment. We give a default assignment type to prevent errors


```

7259 \newcommand\assig@default@type{\hwexam@assignment@kw}
7260 \def\document@hwexamtype{\assig@default@type}
7261 <@@=document_structure>
7262 \keys_define:nn { document-structure / document }{
7263 id .str_set_x:N = \c_document_structure_document_id_str,
7264 hwexamtype .tl_set:N = \document@hwexamtype
7265 }
7266 <@@=hwexam>
7267 </cls>

```

Chapter 41

Implementation: The hwexam Package

41.1 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.

```
7268 \*package>
7269 \ProvidesExplPackage{hwexam}{2022/02/26}{3.0.1}{homework assignments and exams}
7270 \RequirePackage{13keys2e}
7271
7272 \newif\iftest\testfalse
7273 \DeclareOption{test}{\testtrue}
7274 \newif\ifmultiple\multiplefalse
7275 \DeclareOption{multiple}{\multipletrue}
7276 \DeclareOption*{\PassOptionsToPackage{\CurrentOption}{problem}}
7277 \ProcessOptions
```

Then we make sure that the necessary packages are loaded (in the right versions).

```
7278 \RequirePackage{keyval}[1997/11/10]
7279 \RequirePackage{problem}
```

`\hwexam@*@kw` For multilinguality, we define internal macros for keywords that can be specialized in `*.ldf` files.

```
7280 \newcommand\hwexam@assignment@kw{Assignment}
7281 \newcommand\hwexam@given@kw{Given}
7282 \newcommand\hwexam@due@kw{Due}
7283 \newcommand\hwexam@testemptypage@kw{This~page~was~intentionally~left~
7284 blank~for~extra~space}
7285 \def\hwexam@minutes@kw{minutes}
7286 \newcommand\correction@probs@kw{prob.}
7287 \newcommand\correction@pts@kw{total}
7288 \newcommand\correction@reached@kw{reached}
7289 \newcommand\correction@sum@kw{Sum}
7290 \newcommand\correction@grade@kw{grade}
7291 \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

```

7292 \AddToHook{begindocument}{
7293 \ltx@ifpackageloaded{babel}{
7294 \makeatletter
7295 \clist_set:Nx \l_tmpa_clist {\bbl@loaded}
7296 \clist_if_in:NnT \l_tmpa_clist {ngerman}{
7297 \input{hwexam-ngerman.ldf}
7298 }
7299 \clist_if_in:NnT \l_tmpa_clist {finnish}{
7300 \input{hwexam-finnish.ldf}
7301 }
7302 \clist_if_in:NnT \l_tmpa_clist {french}{
7303 \input{hwexam-french.ldf}
7304 }
7305 \clist_if_in:NnT \l_tmpa_clist {russian}{
7306 \input{hwexam-russian.ldf}
7307 }
7308 \makeatother
7309 }{}
7310 }
7311

```

41.2 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.

```

7312 \newcounter{assignment}
7313 \numberproblemsin{assignment}
7314 \renewcommand\prob@label[1]{\assignment@number.#1}

```

We will prepare the keyval support for the `assignment` environment.

```

7315 \keys_define:nn { hwexam / assignment } {
7316 id .str_set:N = \l__hwexam_assign_id_str,
7317 number .int_set:N = \l__hwexam_assign_number_int,
7318 title .tl_set:N = \l__hwexam_assign_title_tl,
7319 type .tl_set:N = \l__hwexam_assign_type_tl,
7320 given .tl_set:N = \l__hwexam_assign_given_tl,
7321 due .tl_set:N = \l__hwexam_assign_due_tl,
7322 loadmodules .code:n = {
7323 \bool_set_true:N \l__hwexam_assign_loadmodules_bool
7324 }
7325 }
7326 \cs_new_protected:Nn \__hwexam_assignment_args:n {
7327 \str_clear:N \l__hwexam_assign_id_str
7328 \int_set:Nn \l__hwexam_assign_number_int {-1}
7329 \tl_clear:N \l__hwexam_assign_title_tl
7330 \tl_clear:N \l__hwexam_assign_type_tl
7331 \tl_clear:N \l__hwexam_assign_given_tl
7332 \tl_clear:N \l__hwexam_assign_due_tl
7333 \bool_set_false:N \l__hwexam_assign_loadmodules_bool

```

```

7334 \keys_set:nn { hwexam / assignment }{ #1 }
7335 }

```

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.

```

7336 \newcommand\given@due[2]{
7337 \bool_lazy_all:nF {
7338 { \tl_if_empty_p:V \l__hwexam_inclasssign_given_tl }
7339 { \tl_if_empty_p:V \l__hwexam_assign_given_tl }
7340 { \tl_if_empty_p:V \l__hwexam_inclasssign_due_tl }
7341 { \tl_if_empty_p:V \l__hwexam_assign_due_tl }
7342 }{ #1 }
7343
7344 \tl_if_empty:NTF \l__hwexam_inclasssign_given_tl {
7345 \tl_if_empty:NF \l__hwexam_assign_given_tl {
7346 \hwexam@given@kw\xspace\l__hwexam_assign_given_tl
7347 }
7348 }{
7349 \hwexam@given@kw\xspace\l__hwexam_inclasssign_given_tl
7350 }
7351
7352 \bool_lazy_or:nnF {
7353 \bool_lazy_and_p:nn {
7354 \tl_if_empty_p:V \l__hwexam_inclasssign_due_tl
7355 }{
7356 \tl_if_empty_p:V \l__hwexam_assign_due_tl
7357 }
7358 }{
7359 \bool_lazy_and_p:nn {
7360 \tl_if_empty_p:V \l__hwexam_inclasssign_due_tl
7361 }{
7362 \tl_if_empty_p:V \l__hwexam_assign_due_tl
7363 }
7364 }{ ,~ }
7365
7366 \tl_if_empty:NTF \l__hwexam_inclasssign_due_tl {
7367 \tl_if_empty:NF \l__hwexam_assign_due_tl {
7368 \hwexam@due@kw\xspace \l__hwexam_assign_due_tl
7369 }
7370 }{
7371 \hwexam@due@kw\xspace \l__hwexam_inclasssign_due_tl
7372 }
7373
7374 \bool_lazy_all:nF {
7375 { \tl_if_empty_p:V \l__hwexam_inclasssign_given_tl }
7376 { \tl_if_empty_p:V \l__hwexam_assign_given_tl }
7377 { \tl_if_empty_p:V \l__hwexam_inclasssign_due_tl }
7378 { \tl_if_empty_p:V \l__hwexam_assign_due_tl }
7379 }{ #2 }
7380 }

```

`\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.

```

7381 \newcommand\assignment@title[3]{
7382 \tl_if_empty:NTF \l__hwexam_inclasssign_title_tl {
7383 \tl_if_empty:NTF \l__hwexam_assign_title_tl {
7384 #1
7385 }{
7386 #2\l__hwexam_assign_title_tl#3
7387 }
7388 }{
7389 #2\l__hwexam_inclasssign_title_tl#3
7390 }
7391 }

```

(End definition for `\assignment@title`. This function is documented on page ??.)

`\assignment@number` Like `\assignment@title` only for the number, and no around part.

```

7392 \newcommand\assignment@number{
7393 \int_compare:nNnTF \l__hwexam_inclasssign_number_int = {-1} {
7394 \int_compare:nNnTF \l__hwexam_assign_number_int = {-1} {
7395 \arabic{assignment}
7396 } {
7397 \int_use:N \l__hwexam_assign_number_int
7398 }
7399 }{
7400 \int_use:N \l__hwexam_inclasssign_number_int
7401 }
7402 }

```

(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.

```

7403 \newenvironment{assignment}[1][ ]{
7404 \__hwexam_assignment_args:n { #1 }
7405 %\sref@target
7406 \int_compare:nNnTF \l__hwexam_assign_number_int = {-1} {
7407 \global\stepcounter{assignment}
7408 }{
7409 \global\setcounter{assignment}{\int_use:N\l__hwexam_assign_number_int}
7410 }
7411 \setcounter{problem}{0}
7412 \def\current@section@level{\document@hwexamtype}
7413 %\sref@label@id{\document@hwexamtype \thesection}
7414 \begin{@assignment}
7415 }{
7416 \end{@assignment}
7417 }

```

In the multi-assignment case we just use the omdoc environment for suitable sectioning.

```

7418 \def\ass@title{
7419 \protect\document@hwexamtype~\arabic{assignment}
7420 \assignment@title{}\{;\}\{;\} -- \given@due{}\{;\}
7421 }
7422 \ifmultiple
7423 \newenvironment{@assignment}{
7424 \bool_if:NTF \l__hwexam_assign_loadmodules_bool {
7425 \begin{sfragment}[loadmodules]{\ass@title}
7426 }{
7427 \begin{sfragment}{\ass@title}
7428 }
7429 }{
7430 \end{sfragment}
7431 }

```

for the single-page case we make a title block from the same components.

```

7432 \else
7433 \newenvironment{@assignment}{
7434 \begin{center}\bf
7435 \Large@title\strut\
7436 \document@hwexamtype~\arabic{assignment}\assignment@title{}\{;\}\{;\}\{;\}
7437 \large\given@due{--;\}\{;\}--}
7438 \end{center}
7439 }{}
7440 \fi% multiple

```

41.3 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.

```

7441 \keys_define:nn { hwexam / inclassignment } {
7442 %id .str_set_x:N = \l__hwexam_assign_id_str,
7443 number .int_set:N = \l__hwexam_inclassign_number_int,
7444 title .tl_set:N = \l__hwexam_inclassign_title_tl,
7445 type .tl_set:N = \l__hwexam_inclassign_type_tl,
7446 given .tl_set:N = \l__hwexam_inclassign_given_tl,
7447 due .tl_set:N = \l__hwexam_inclassign_due_tl,
7448 mhrepos .str_set_x:N = \l__hwexam_inclassign_mhrepos_str
7449 }
7450 \cs_new_protected:Nn \__hwexam_inclassignment_args:n {
7451 \int_set:Nn \l__hwexam_inclassign_number_int {-1}
7452 \tl_clear:N \l__hwexam_inclassign_title_tl
7453 \tl_clear:N \l__hwexam_inclassign_type_tl
7454 \tl_clear:N \l__hwexam_inclassign_given_tl
7455 \tl_clear:N \l__hwexam_inclassign_due_tl
7456 \str_clear:N \l__hwexam_inclassign_mhrepos_str
7457 \keys_set:nn { hwexam / inclassignment }{ #1 }
7458 }
7459 \__hwexam_inclassignment_args:n {}
7460
7461 \newcommand\inputassignment[2][{}]{

```

```

7462 \_hwexam_inclassnment_args:n { #1 }
7463 \str_if_empty:NTF \l__hwexam_inclassn_mhrepos_str {
7464   \input{#2}
7465 }{
7466   \stex_in_repository:nn{\l__hwexam_inclassn_mhrepos_str}{
7467     \input{\mhp{path}\l__hwexam_inclassn_mhrepos_str}{#2}}
7468   }
7469 }
7470 \_hwexam_inclassnment_args:n {}
7471 }
7472 \newcommand\includeassignment[2][ ]{
7473   \newpage
7474   \inputassignment[#1]{#2}
7475 }

```

(End definition for \in*assignment. This function is documented on page ??.)

41.4 Typesetting Exams

\quizheading

```

7476 \ExplSyntaxOff
7477 \newcommand\quizheading[1]{%
7478   \def\@tas{#1}%
7479   \large\noindent NAME: \hspace{8cm} MAILBOX:\[2ex]%
7480   \ifx\@tas\@empty\else%
7481     \noindent TA:~\@for\@I:=\@tas\do{\Large$\Box$}\@I\hspace*{1em}}\[2ex]%
7482   \fi%
7483 }
7484 \ExplSyntaxOn

```

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

\testheading

```

7485
7486 \def\hwexamheader{\input{hwexam-default.header}}
7487
7488 \def\hwexamminutes{
7489   \tl_if_empty:NTF \testheading@duration {
7490     {\testheading@min}~\hwexam@minutes@kw
7491   }{
7492     \testheading@duration
7493   }
7494 }
7495
7496 \keys_define:nn { hwexam / testheading } {
7497   min .tl_set:N = \testheading@min,
7498   duration .tl_set:N = \testheading@duration,
7499   reqpts .tl_set:N = \testheading@reqpts,
7500   tools .tl_set:N = \testheading@tools
7501 }
7502 \cs_new_protected:Nn \_hwexam_testheading_args:n {
7503   \tl_clear:N \testheading@min
7504   \tl_clear:N \testheading@duration

```

```

7505 \tl_clear:N \testheading@reqpts
7506 \tl_clear:N \testheading@tools
7507 \keys_set:nn { hwexam / testheading }{ #1 }
7508 }
7509 \newenvironment{testheading}[1][]{
7510   \__hwexam_testheading_args:n{ #1 }
7511   \newcount\check@time\check@time=\testheading@min
7512   \advance\check@time by -\theassignment@totalmin
7513   \newif\if@bonuspoints
7514   \tl_if_empty:NTF \testheading@reqpts {
7515     \@bonuspointsfalse
7516   }{
7517     \newcount\bonus@pts
7518     \bonus@pts=\theassignment@totalpts
7519     \advance\bonus@pts by -\testheading@reqpts
7520     \edef\bonus@pts{\the\bonus@pts}
7521     \@bonuspointstrue
7522   }
7523   \edef\check@time{\the\check@time}
7524
7525   \makeatletter\hwexamheader\makeatother
7526 }{
7527   \newpage
7528 }

```

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

\testspace

```

7529 \newcommand\testspace[1]{\iftest\vspace*{#1}\fi}

```

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

\testnewpage

```

7530 \newcommand\testnewpage{\iftest\newpage\fi}

```

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

\testemptypage

```

7531 \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.

```

7532 <@=problems>
7533 \renewcommand\@problem[3]{
7534   \stepcounter{assignment@probs}
7535   \def\__problemspts{#2}
7536   \ifx\__problemspts\@empty\else
7537     \addtocounter{assignment@totalpts}{#2}
7538   \fi
7539   \def\__problemsmin{#3}\ifx\__problemsmin\@empty\else\addtocounter{assignment@totalmin}{#3}\fi
7540   \xdef\correction@probs{\correction@probs & #1}%
7541   \xdef\correction@pts{\correction@pts & #2}
7542   \xdef\correction@reached{\correction@reached &}

```



```

7543 }
7544 <@@=hwexam>

```

(End definition for \@problem. This function is documented on page ??.)

`\correction@table` This macro generates the correction table

```

7545 \newcounter{assignment@probs}
7546 \newcounter{assignment@totalpts}
7547 \newcounter{assignment@totalmin}
7548 \def\correction@probs{\correction@probs@kw}
7549 \def\correction@pts{\correction@pts@kw}
7550 \def\correction@reached{\correction@reached@kw}
7551 \stepcounter{assignment@probs}
7552 \newcommand\correction@table{
7553 \resizebox{\textwidth}{!}{%
7554 \begin{tabular}{|l|*{\theassignment@probs}{c|}|l|}\hline%
7555 &\multicolumn{\theassignment@probs}{c|}|%|
7556 {\footnotesize\correction@forgrading@kw} &\\ \hline
7557 \correction@probs & \correction@sum@kw & \correction@grade@kw\\ \hline
7558 \correction@pts & \theassignment@totalpts & \\ \hline
7559 \correction@reached & & \[.7cm]\hline
7560 \end{tabular}}
7561 \end{package}

```

(End definition for \correction@table. This function is documented on page ??.)

41.5 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}

```