The ccool package*

Erwann Rogard†

Released 2020/04/15

Abstract

ccool stands for Custom COntent Oriented for LaTeX, a concept pioneered by cool[?][1]. This is done using a minimalist interface built upon xparse[?]. Specifically, **??**<⟨*name*⟩> begins a series of instructions alternating between 'text' and macro definitions, that themselves optionally expand using predefined or inline rules. For example,

```
\Ccool<Math>[Let~]
i{\mathbb{#1}}{ Nat = N, Real = R }*s{{~\rm{and}~}}
[~denote the natural and real numbers.]{}
```

expands to: "Let $\mathbb{N}$ and $\mathbb{R}$ denote the natural and real numbers." As a side effect, `$\Nat<Math>$` encodes "$\mathbb{N}$" (and likewise for `\Real`). `Math` being the default for ⟨*name*⟩, `<Math>` can be dropped. In conjunction with lamba expressions, this tool allows for encoding the way certain mathematical objects, such as functions, should be formatted. Optionally, the macros can be written to a file, and read, which can be useful for typesetting documents sharing the same notation.

Contents

Part I
Usage

Convention

1. Loosely, those of [**?**] and [**?**], for example as to the meaning of ⟨*token list*⟩.
2. If unspecified, the environment in which a macro must be declared is `document`.

`\usepackage` `\usepackage{ccool}`

Requirement

1. `ccool.sty` is in the path of the LaTeX engine. See **??**, **??**.
2. Declare it in the *preamble*

*This file describes version v2.0, last revised 2020/04/15.

†firstname dot lastname AusTria gmail dot com

[1] Whereas cool provided predefined macros, ccool is tool for making macros, hence "custom".

\Ccool

```
\Ccool<⟨tl1⟩>
[⟨tl2⟩]
i{⟨code1⟩}
{⟨kvl1⟩}
+
*
s{{⟨tl3⟩}|{⟨tl3⟩}{⟨tl4⟩}|{⟨tl3⟩}{⟨tl4⟩}{⟨tl5⟩}}
o{⟨code2⟩}
[⟨tl6⟩]
```

Requirement ⟨kvl_1⟩ is specified (all others optional).

⟨tl_1⟩

Default **??**

Example `Math`, `ModelA`, `ModelB`

Semantics Identifies a group of macros

⟨tl_2⟩

Example `Let~`

Semantics Expands ⟨tl_2⟩

⟨$code_1$⟩

Default **??**

Example `\mathbb{#1}`

⟨kvl_1⟩

Example `Elems={\omega_1, \dots, \omega_n}, Sample=\Omega`

Semantics

1) ⟨val_i⟩ ← ⟨$code_1$⟩ applied to ⟨val_i⟩

2) `\`⟨`key`$_i$⟩`<`⟨tl_1⟩`>` ← ⟨val_i⟩ defined in step **??**, using **??** for expansion.

3) If **??**, writes the input used by step **??** to **??**

`+`

Semantics Repeats step **??**, step **??**, and step **??**, at **??** (useful inside a *local group*)

`*`

Semantics Expands **??** applied to the list created in step **??**, using the separator specified by **??**, **??**, and **??**.

⟨tl_3⟩

Default ??

Example `{~\in~}`

⟨*tl*$_4$⟩

Default ??

Example `{,~}`

⟨*tl*$_5$⟩

Default ??

Example `{~\&~}`

⟨*code*$_2$⟩

Default ??

Example `$\left\{#1\right\}$`

⟨*tl*$_6$⟩

Semantics ??<⟨*tl*$_1$⟩>[⟨*tl*$_6$⟩]

Other

Continued in ??, ??.

Do's and dont's

1.

Don't: `\Ccool{ A = a, B = b }[Hello, world!]`.

Do: `\Ccool{ A = a, B = b }[Hello, world!]{}`, or
`\Ccool{ A = a, B = b } Hello, world!`

2.

Don't: `$\⟨key$_i$⟩<x$`.

Do: `$\⟨key$_i$⟩{<}x$`

3.

Don't: `[a, b)`

Do: `{[}a, b{)}`

4.

Don't: `\Ccool{ F = \cal F }`.

Do: `\Ccool{ F = \cal{F} }` or `\Ccool{ F = \mathcal{F} }`

5.

Don't: `[x_0,x]`

Do: `\left[x_0,x\right]`

6. Also see **??**, **??**

Part II
Listing

Listing 1.

```
%     \CcoolVers
%
```

2020/04/15 v2.0 cool — A tool for encoding mathematical notation

Listing 2. Preamble[a]

[a]These are the settings to replicate the listings. For exhaustivity, check the `documentation` section of `ccool.dtx`.

```
%     \usepackage{amsmath, amsthm, commath}
%     \usepackage[T1]{fontenc}% \char`[
%
```

Listing 3. Separators

```
%     \CcoolOption{
%     ^^A% spaces betw. inner and outer brackets matter!->
%     Separ={{\ \char`@\ }{\ \%\ }{\ \char`@\ }}
%     \Ccool<Test>{ X = x, Y = y }*[\\]
%     { X = x, Y = y, Z = z }*[\\]
%     { X = x, Y = y }*s{{\ \&\ }}[\\]
%     { X = x, Y = y }*s{{\ \&\ }{,\ }}[\\]
%     { X = x, Y = y, Z = z }*s{{\ \&\ }}[\\]
%     { X = x, Y = y, Z = z }*s{{\ \&\ }{,\ }}[\\]
%     { X = x, Y = y, Z = z }*s{{\ \&\ }{,\ }{\ \&\ }}\\
%
```

$x \mathbin{@} y$
$x \mathbin{\%} y \mathbin{@} z$
$x \mathbin{\&} y$
$x \mathbin{\&} y$
$x \mathbin{\&} y \mathbin{\&} z$
$x, y \mathbin{\&} z$
$x, y \mathbin{\&} z$

Listing 4. Hello, world![a]

[a]If this looks arcane, it's for the purpose of testing.

```
%     \CcoolOption{ Separ = {{}{.}{.}}, Outer = { ####1 } }
%     \CcoolOption{ Write = \BooleanTrue }
```

```
%     \Ccool<Test>
%     { KeyA = {.}, KeyB = {!}, KeyC = {\%} }[]
%     { KeyD = {d}, KeyE = {\%} }[]i{\{#1\}}
%     { KeyF = {H}, KeyG = {e}, KeyH = {l} }*[]
%     { KeyI = {\%}, KeyJ = {\%}, KeyK = {\%} }[.\{l\}.\{o\}]
%     { KeyL = {l}, KeyM = {\char`[}, KeyN = {\char`]} }[]
%     { KeyO = {o}, KeyP = {\%}, KeyQ = {\%} }[{,\ }]
%     { KeyR = {w}, KeyS = {o}, KeyT = {r} }*s{{}{}{}}o{{\char`[}#1}[]
%     { KeyU = {\%}, KeyV = {\%}, KeyW = {\%} }[]
%     { KeyX = {\%}, KeyY = {\%}, KeyZ = {\KeyB<Test>} }\nobreak
%     \KeyL<Test>\KeyD<Test>\KeyZ<Test>\KeyN<Test>\\
%     \CcoolOption{ Write = \BooleanFalse }
%
```

{H}.{e}.{l} .{l}.{o}, [world!]

Listing 5. Listing ?? read from file.

```
%     \CcoolRead
%     \KeyF<Test>\KeyA<Test>\nobreak
%     \KeyG<Test>\KeyA<Test>\nobreak
%     \KeyH<Test>\KeyA<Test>\nobreak
%     \KeyH<Test>\KeyA<Test>\nobreak
%     {\{}\nobreak\KeyO<Test>{\}},{\ }\nobreak
%     \KeyM<Test>\KeyR<Test>\nobreak
%     \KeyO<Test>\nobreak
%     \KeyT<Test>\nobreak
%     \KeyL<Test>\nobreak
%     \KeyD<Test>\nobreak
%     \KeyZ<Test>\nobreak
%     \KeyN<Test>\nobreak
%
```

{H}.{e}.{l}.{l}.{o}, [world!]

Listing 6. Probability space

```
%     \CcoolOption{ Write = \BooleanTrue }
%     \Ccool[Let~]
%     { Space = \Omega, Field = \mathcal{F}, Meas = \mathcal{P} }
%     *s{{,}}o{$\{#1\}$}
%     [~denote the probability space, where~]{ PowerSet = { 2^{\Space} } }
%     [$\Field\subset \PowerSet$.]
%     {}
%     \CcoolOption{ Write = \BooleanFalse }
%
```

Let $\{\Omega, \mathcal{F}, \mathcal{P}\}$ denote the probability space, where $\mathcal{F} \subset 2^{\Omega}$.

Listing 7. Listing ?? read from file.

```
%     \CcoolRead \tab $\Omega$ $\Field$ $\Meas$
%
```

$$\Omega\ \mathcal{F}\ \mathcal{P}$$

Listing 8. Mittelwertsatz für n Variable[?, 17.3]

```
%     \CcoolOption{ Write = \BooleanTrue }
%     \newtheorem{theorem}{Theorem}
%     \AfterEndEnvironment{theorem}{\CcoolHook}
%     \Ccool i{\mathbb{#1}}
%     { N = { N } , R = { R } }+[]
%     { Grad = { \operatorname{grad} } }+
%     [\begin{theorem}
%       [Mittelwertsatz f\"ur $n$ Variable]Es~sei~]
%       { OffMenge = {D}, Ci = {C^{1}}, Strecke = { \left[x_0,x\right] } }+
%       [$n\in\N$,~$\OffMenge\subseteq\N^n$ eine offene Menge und
    $f\in\Ci(\OffMenge,\R)$.
%       Dann gibt es auf jeder Strecke $\Strecke\subset\OffMenge$ einen
    Punkt $\xi\in\Strecke$,~]
%       { Steig = { \frac{ f(x)-f(x_0) }{ x-x_0 } }, Punkt = { \xi } }+
%       [so dass gilt
%       \begin{equation*}
%         \Steig = \Grad f(\Punkt)^{\top}
%       \end{equation*}
%     \end{theorem}]
%     {}
%     (Check: $\N$, $\Punkt$)
%     \CcoolOption{ Write = \BooleanFalse }
%
```

Theorem 1 (Mittelwertsatz für n Variable) *Es sei $n \in \mathbb{N}$, $D \subseteq \mathbb{N}^n$ eine offene Menge und $f \in C^1(D, \mathbb{R})$. Dann gibt es auf jeder Strecke $[x_0, x] \subset D$ einen Punkt $\xi \in [x_0, x]$, so dass gilt*

$$\frac{f(x) - f(x_0)}{x - x_0} = \operatorname{grad} f(\xi)^\top$$

(Check: $\mathbb{N}$, ξ)

Listing 9. Listing ?? read from file.

```
%     \CcoolRead \tab $\N$ $\R$ $\OffMenge$ $\Ci$ $\Strecke$
%
```

$$\mathbb{N}\ \mathbb{R}\ D\ C^1\ [x_0, x]$$

Listing 10. Lambda expression.

```
%     \CcoolOption{ Write = \BooleanTrue }
%     \Ccool{ EvalAt = \CcoolLambda{(#1)}, ApplyOp =
    \CcoolLambda[mm]{#1[#2]} }
%     [Supposons une fonction $f\EvalAt{t}$, et \'etudions le probl\`eme
    o\`u la fonctionnelle $\ApplyOp{S}{f}$ est donn\'ee par\dots]{}
%     \CcoolOption{ Write = \BooleanFalse }
%
```

Supposons une fonction $f(t)$, et étudions le problème où la fonctionnelle $S[f]$ est donnée par...

Listing 11. Listing ?? read from file.

```
%     \CcoolRead \tab $f\EvalAt{t}$, $\ApplyOp{S}{f}$
%
```

$f(t)$, $S[f]$

Listing 12. CUSUM statistic[?]

```
%     \newtheorem{definition}{Definition}
%     \AfterEndEnvironment{definition}{\CcoolHook}
%
%     \CcoolOption{ Write = \BooleanTrue }
%     \Ccool{ SuchThat = { ;~ }, Time = { t }, Process = { \xi }, StopT =
    { T }, EvalAt = \CcoolLambda{(#1)}  }
%     [The CUSUM statistic process and the corresponding one-sided CUSUM
    stopping time are defined as follows:
%     \begin{definition}\label{the CUSUM statistic}. Let~]
%       { Scale = { \lambda }, Real = {\mathcal{R}} }+*s{{~\in~}}[~and~]
%       { CUSUMthresh = { \nu } }+*o{$#1\in\Real^{+}$.}
%       [~Define the following processes:]
%       { LogWald = { u },  CUSUMst = { \StopT_{c} }, CUSUM = { y },
    LogWaldInf = { m } }+
%       [\begin{enumerate}
%       \item{$\LogWald_{\Time}\EvalAt{ \Scale } = \Scale\Process_{\Time}
    - \frac{1}{2}\Scale^2\Time$;
%         $\LogWaldInf_{\Time}\EvalAt{ \Scale } = \inf_{ 0\le s \le \Time
    }\CUSUM_{s} \EvalAt{ \Scale }$.}
%       \item{$\CUSUM_{\Time}\EvalAt{ \Scale } =
    \LogWaldInf_{\Time}\EvalAt{ \Scale } - \LogWald_{\Time}\EvalAt{
    \Scale }\ge0$, which is the CUSUM statistic process.}
%       \item{$\CUSUMst \EvalAt{ \Scale, \LogWaldInf } = \inf\left[ \Time
    \ge 0 \SuchThat \CUSUM_{\Time}\EvalAt{\Scale} \ge \LogWaldInf
    \right]$, which is the CUSUM stopping time.}
    \end{enumerate}\end{definition}\par]{}
%
%     (Check: $\Scale$, $\CUSUM$)
%     \CcoolOption{ Write = \BooleanFalse }
```

```
%
```

The CUSUM statistic process and the corresponding one-sided CUSUM stopping time are defined as follows:

Definition 1 . *Let* $\lambda \in \mathcal{R}$ *and* $\nu \in \mathcal{R}^+$. *Define the following processes:*

1. $u_t(\lambda) = \lambda\xi_t - \frac{1}{2}\lambda^2 t$; $m_t(\lambda) = \inf_{0\leq s\leq t} y_s(\lambda)$.
2. $y_t(\lambda) = m_t(\lambda) - u_t(\lambda) \geq 0$, *which is the CUSUM statistic process.*
3. $T_c(\lambda, m) = \inf[t \geq 0;\, y_t(\lambda) \geq m]$, *which is the CUSUM stopping time.*

(Check: λ, y)

Listing 13. Listing ?? read from file.

```
%     \CcoolRead \tab $\Time $ $\Process$ $\Scale$ $\Real$ $\CUSUMthresh$
    $\LogWald$  $\CUSUMst$ $\CUSUM$ $\LogWaldInf$
%
```

$t\ \xi\ \lambda\ \mathcal{R}\ \nu\ u\ T_c\ y\ m$

Part III
Other

1 Acknowledgment

This work has benefited from Q&A's from the LaTeXcommunity[?]. Specific attributions are made throughout this document.

2 Install

Compiling `ccool.dtx`[2] will generate `ccool.sty` and `ccool.pdf`

3 Issue

1. **Don't:** `Inner={\{####1\}}`
   Symptom: `\CcoolRead` fails
   Do: `Inner={\char‘{####1\char‘}}`

4 Support

This package is available from https://www.ctan.org/pkg/ccool and https://github.com/rogard/ccool.

5 Testing

5.1 Technicality

Not possible to compile-check the expansion of a certain class of macros against predefined values[?]. Instead, one can visually check **??**, as generated in **??** on one's own machine, against that of the repository for the same version.

5.2 Platform

i) `Linux laptop 4.15.0-20-generic #21-Ubuntu SMP Tue Apr 24 ↪ 06:16:15 UTC 2018 x86_64 x86_64 x86_64 GNU/Linux`

5.3 Engine

a) `pdfTeX 3.14159265-2.6-1.40.20 (TeX Live 2019)`

b) `pdfTeX 3.14159265-2.6-1.40.21 (TeX Live 2020)`

c) `LuaHBTeX, Version 1.12.0 (TeX Live 2020)`

d) `XeTeX 3.14159265-2.6-0.999992 (TeX Live 2020)`

[2] Under Unix, `$tex ccool.dtx`

5.4 Results

1. ccool v1.8 satisfactory on platform ?? and engine ??
2. ccool v1.8 satisfactory on platform ?? and engine ??
3. ccool v1.9 satisfactory on platform ?? and engines ?? and ??
4. ccool v2.0 satisfactory on platform ?? and engines ??, ??, and ??

5.5 Other

Check [?] for testing ccool with llncs

References

[1] Nick Setzer *The cool package*, 2005, https://www.ctan.org/pkg/cool

[2] The LaTeX3 Project Team *The LaTeX3 interfaces*, 2019, http://ftp.math.purdue.edu/mirrors/ctan.org/macros/latex/contrib/l3kernel/interface3.pdf

[3] Thomas F. Sturm *The tcolorbox package*, 2019, http://www.texdoc.net/texmf-dist/doc/latex/tcolorbox/tcolorbox.pdf

[4] The LaTeX3 Project Team *The xparse package*, 2020, http://ftp.math.purdue.edu/mirrors/ctan.org/macros/latex/contrib/l3packages/xparse.pdf

[5] Erwann Rogard and Olympia Hadjiliadis *Typesetting a math thesis with ccool*, 2020, https://github.com/rogard/ccool/blob/master/thesis.pdf

[6] https://tex.stackexchange.com/users/112708/erwann?tab=questions

[7] @sean-allred's answer to "How to create lambda expressions?", https://tex.stackexchange.com/a/188053/112708

[8] @joseph-wright's answer to "Checking a function's expansion against a string", https://tex.stackexchange.com/a/534100

[9] @frougon's answer to "Journaling calls to a function []", https://tex.stackexchange.com/a/536620

Part IV
Implementation

```
⟨@@=ccool⟩
\ExplSyntaxOn
```

1 aux

`\__ccool_aux_inner_set:n` `#1 :` ⟨*code*⟩

```
\cs_new_protected:Nn \__ccool_aux_inner_set:n
{
  \cs_gset:Npn \__ccool_aux_inner:n ##1 {#1}
  \cs_generate_variant:Nn \__ccool_aux_inner:n { e }
}
```

(*End definition for* `\__ccool_aux_inner_set:n`.)

`\__ccool_aux_key:w` `#1 :` ⟨ *key* ⟩
`#2 :` ⟨ *value* ⟩

```
\cs_new_protected:Npn \__ccool_aux_key:w #1 = #2 \q_stop
{
  \seq_gput_right:Nx \g__ccool_aux_key_seq { \tl_trim_spaces:n{#1} }
}
```

(*End definition for* `\__ccool_aux_key:w`.)

`\__ccool_aux_key:n` `#1 :` ⟨ *key* = *value* ⟩

```
\cs_new_protected:Nn \__ccool_aux_key:n
{
  \__ccool_aux_key:w #1 \q_stop
}
```

(*End definition for* `\__ccool_aux_key:n`.)

`\__ccool_aux_key:N` `#1 :` ⟨ *seq* ⟩

```
\cs_new_protected:Nn \__ccool_aux_key:N
{
  \seq_gclear_new:N \g__ccool_aux_key_seq
  \seq_map_function:NN #1 \__ccool_aux_key:n
}
```

(*End definition for* `\__ccool_aux_key:N`.)

`\__ccool_aux_outer_set:n` `#1 :` ⟨ *inline code* ⟩

```
\cs_new_protected:Nn \__ccool_aux_outer_set:n
{
  \cs_gset:Npn \__ccool_aux_outer:n ##1 {#1}
}
```

(*End definition for* `\__ccool_aux_outer_set:n`.)

__ccool_aux_prop:nn

```
\prop_new:N \g__ccool_aux_prop
\cs_new_protected:Nn \__ccool_aux_prop:nn
{
  \prop_gput:Nnn \g__ccool_aux_prop{#1}{#2}
}
\cs_generate_variant:Nn \__ccool_aux_prop:nn { eo, ee, ex, xo, xe, xx }
```

(*End definition for* `\__ccool_aux_prop:nn`.)

`\__ccool_aux_prop:w` #1 : ⟨ *key* ⟩
#2 : ⟨ *value* ⟩

```
\tl_new:N \g__ccool_option_expans_tl
\cs_new_protected:Npn \__ccool_aux_prop:w #1 = #2 \q_stop
{
  \exp_args:Nx
  \use:c{__ccool_aux_prop:\g__ccool_option_expans_tl}
  { \tl_trim_spaces:n{#1} }
  { \__ccool_aux_inner:n{ \tl_trim_spaces:n{#2} } }
}
```

(*End definition for* `\__ccool_aux_prop:w`.)

`\__ccool_aux_prop:n` #1 : ⟨ *key* = *value* ⟩

```
\cs_new_protected:Nn \__ccool_aux_prop:n
{
  \__ccool_aux_prop:w #1 \q_stop
}
```

(*End definition for* `\__ccool_aux_prop:n`.)

`\__ccool_aux_prop:N` #1 : ⟨*keyval list*⟩

```
\cs_new_protected:Nn \__ccool_aux_prop:N
{
  \prop_gclear_new:N \g__ccool_aux_prop
  \seq_if_empty:NTF #1
  { \c_empty_tl }
  {
    \seq_map_function:NN #1 \__ccool_aux_prop:n
  }
}
```

(*End definition for* `\__ccool_aux_prop:N`.)

`\__ccool_aux_separ:nn` #1 : ⟨ *int* ⟩
#2 : ⟨ *tokens* ⟩

```
\cs_new:Nn \__ccool_aux_separ:nn
{
  \int_case:nnTF {#1}
  {
    {1}
    { \prg_replicate:nn{ 3 }{#2} }
    {2}
    {
```

```
      { \use_i:nn #2 }
      { \use_ii:nn #2 }
      { \use_i:nn #2 }
    }
    {3}{#2}
  }
  { \c_empty_tl }
  {
    \msg_error:nnnn { __ccool }
    { separ }
    { \exp_not:N \__ccool_aux_separ:nn }
    {#2}
  }
}
\cs_generate_variant:Nn \__ccool_aux_separ:nn { e }
```

(*End definition for* `\__ccool_aux_separ:nn`.)

`\__ccool_aux_separ:n` `#1` : ⟨ *tokens* ⟩

```
\cs_new:Nn \__ccool_aux_separ:n
{
  \__ccool_aux_separ:en{ \tl_count:n{#1} }{#1}
}
```

(*End definition for* `\__ccool_aux_separ:n`.)

`\__ccool_aux_val:Nn` `#1` : ⟨ *seq* ⟩
`#2` : ⟨ *tl var name* ⟩

```
\cs_new_protected:Nn \__ccool_aux_val:Nn
{
  \seq_gclear_new:N \g__ccool_aux_val_seq
  \__ccool_seq_from_prop:NNn \g__ccool_aux_val_seq #1 { \__ccool_prop_name:n{#2} }
}
```

(*End definition for* `\__ccool_aux_val:Nn`.)

2 lambda

`\__ccool_lambda:nn` [?]

```
\cs_new_protected:Npn \__ccool_lambda:nn #1 #2
{
  \exp_args:NNx
  \DeclareDocumentCommand \__ccool_lambda_expression
  {#1}
  {#2}
  \__ccool_lambda_expression
}
```

(*End definition for* `\__ccool_lambda:nn`.)

3 log

__ccool_log_close:

```
\iow_new:N \g__ccool_log_iow
\AtEndDocument{\iow_close:N \g__ccool_log_iow}
\bool_set_false:N \g__ccool_log_open_bool
\cs_new_protected:Nn \__ccool_log_close:
{
  \iow_close:N \g__ccool_log_iow
  \bool_gset_false:N \g__ccool_log_open_bool
}
```

(*End definition for* `\__ccool_log_close:`.)

__ccool_log_open:

```
\tl_new:N \g__ccool_log_file_tl
\cs_new_protected:Nn \__ccool_log_open:
{
  \tl_gset:Nx \g__ccool_log_to_tl{\g__ccool_log_file_tl}
  \iow_open:Nn \g__ccool_log_iow {\g__ccool_log_to_tl}
  \bool_gset_true:N \g__ccool_log_open_bool
}
```

(*End definition for* `\__ccool_log_open:`.)

__ccool_log_read:n `#1` : ⟨*path*⟩

```
\cs_new_protected:Nn \__ccool_log_read:n
{
  \file_input:n{#1}
  \tl_log:n{read~from~#1}
}
\cs_generate_variant:Nn \__ccool_log_read:n { e }
```

(*End definition for* `\__ccool_log_read:n`.)

__ccool_log_read:

```
\cs_new_protected:Nn \__ccool_log_read:
{
  \__ccool_log_read:e{\g__ccool_log_to_tl}
}
```

(*End definition for* `\__ccool_log_read:`.)

__ccool_log_write:n

```
\tl_new:N \g__ccool_log_to_tl
\cs_new_protected:Nn \__ccool_log_write:n
{
  \bool_if:nTF{ \g__ccool_log_open_bool }
  {
    \iow_now:Nn \g__ccool_log_iow {#1}
    \tl_log:n{ write~to~#1 }
  }
  { \msg_error:nnn{ __ccool }{ iow }{ \g__ccool_log_iow }  }
}
\cs_generate_variant:Nn \__ccool_log_write:n { e }
```

(*End definition for* `\__ccool_log_write:n`.)

4 make_key

__ccool_make_key:Nn

#1 : ⟨ *token* ⟩
#2 : ⟨ *key* ⟩

```
\cs_new_protected:Nn \__ccool_make_key:Nn
{
  \exp_args:NNx
  \ProvideDocumentCommand{#1}
  { D<>{\g__ccool_option_name_tl} }
  {
    \__ccool_prop_item:nn{##1}{#2}
  }
}
\cs_generate_variant:Nn \__ccool_make_key:Nn {c}
```

(*End definition for* `\__ccool_make_key:Nn`.)

__ccool_make_key:n

#1 : ⟨ *key* ⟩

```
\cs_new_protected:Nn \__ccool_make_key:n
{
  \__ccool_make_key:cn{#1}{#1}
}
\cs_generate_variant:Nn \__ccool_make_key:n { e }
```

(*End definition for* `\__ccool_make_key:n`.)

__ccool_make_key:N

#1 : ⟨ *seq* ⟩

```
\cs_new_protected:Nn \__ccool_make_key:N
{
  \seq_map_function:NN #1 \__ccool_make_key:e
}
```

(*End definition for* `\__ccool_make_key:N`.)

5 make_ccool

__ccool_make_ccool_exp:nnn

```
\cs_new_protected:Nn \__ccool_make_ccool_exp:nnn
{
  \__ccool_aux_val:Nn \g__ccool_aux_key_seq {#1}
  \__ccool_aux_outer_set:n{#3}
  \__ccool_aux_outer:n
  {
    \exp_args:NNf
    \__ccool_seq_use:Nn
    \g__ccool_aux_val_seq
    {#2}
  }
}
```

(*End definition for* `\__ccool_make_ccool_exp:nnn`.)

__ccool_make_ccool_key:nnn

```
\cs_new_protected:Nn \__ccool_make_ccool_key:nnn
{
  \__ccool_prop_if_exist:nTF{#1}
  { \c_empty_tl }
  { \__ccool_prop_new:n{#1} }
  \exp_args:No \__ccool_aux_inner_set:n{#2}
  \seq_set_from_clist:Nn \g__ccool_aux_keyval_seq {#3}
  \__ccool_aux_prop:N \g__ccool_aux_keyval_seq
  \__ccool_prop_append:Nn \g__ccool_aux_prop {#1}
  \__ccool_aux_key:N \g__ccool_aux_keyval_seq
  \__ccool_make_key:N \g__ccool_aux_key_seq
}
```

(*End definition for* `\__ccool_make_ccool_key:nnn`.)

__ccool_make_ccool_sideeffect:nnn [?]

```
\cs_new_protected:Nn \__ccool_make_ccool_sideeffect:nnn
{
  \__ccool_make_ccool_key:nnn{#1}{#2}{#3}
  \bool_if:nTF{ \g__ccool_log_open_bool }
  {
    \__ccool_log_write:n
    {
      \begingroup
      \def \__ccool_log_entry { \Ccool<#1>i{#2}{#3} } \expandafter
      \endgroup \__ccool_log_entry
    }
  }{\c_empty_tl}
}
```

(*End definition for* `\__ccool_make_ccool_sideeffect:nnn`.)

__ccool_make_ccool:nnnn

#1 : ⟨ *token list* ⟩
#2 : ⟨ seq_1 ⟩
#3 : ⟨ seq_2 ⟩
#4 : ⟨ *prop* ⟩

```
\cs_new_protected:Npn \__ccool_make_ccool:nnnn #1 #2 #3 #4
{
  \exp_args:NNx \DeclareDocumentCommand \Ccool
  {%^^A      2    3         4 5  6    7 8              9
    D<>{#1} +o E{ i }{{#2}} m t+ s E{ s o }{{#3}{#4}} +o
  }
  {
    \IfValueT{##2}{##2}
    \__ccool_make_ccool_sideeffect:nnn{##1}{##3}{##4}
    \IfBooleanT{##6}
    {
      \__ccool_make_ccool_exp:nnn{##1}{##7}{##8}
    }
    \bool_if:nTF{##5}
    {
      \gappto{\CcoolHook}
      {
```

```
        \__ccool_make_ccool_sideeffect:nnn{##1}{##3}{##4}
      }
    }
    {\c_empty_tl}
    \IfValueT{##9}
    {
      \exp_not:n{ \Ccool<##1>[##9] }
    }
  }
}
```

(*End definition for* `\__ccool_make_ccool:nnnn`.)

6 msg

```
\msg_new:nnn {__ccool}{ generic }{#1}
\msg_new:nnn {__ccool}{ iow }{#1~is~closed~can't~write}
\msg_new:nnn {__ccool}{ keyonly }{#1~does~not~take~values;~keyval~is~#2}
\msg_new:nnn {__ccool}{ keywrong }{#1~does~not~recognize~key~#2}
\msg_new:nnn {__ccool}{ separ }{#1~expects~1~to~3~items,~#2}
\msg_new:nnn {__ccool}{ unset }{#1~unset}
```

7 option

`\__ccool_aux_inner:n` #1 : ⟨*code*⟩

```
\cs_new_protected:Nn \__ccool_option_inner:n
{
  \tl_gset:Nn \g__ccool_option_inner_tl {#1}
}
\__ccool_option_inner:n
{
  \msg_warning:nnn{ __ccool }{ unset }{ \exp_not:N \g__ccool_option_inner_tl }
}
```

(*End definition for* `\__ccool_aux_inner:n`.)

`\__ccool_option_name:n` #1 : ⟨*token list*⟩

```
\cs_new:Nn \__ccool_option_name:n
{
  \tl_gset:Nn \g__ccool_option_name_tl{#1}
}
\__ccool_option_name:n
{
  \msg_error:nnx{ __ccool }
  { generic }
  { \exp_not:N\g__ccool_option_name_tl~undefined }
}
```

(*End definition for* `\__ccool_option_name:n`.)

`\__ccool_option_outer:n` #1 : ⟨ *inline code* ⟩

```
\cs_new_protected:Nn \__ccool_option_outer:n
{
```

```
  \tl_gset:Nn \g__ccool_option_outer_tl {#1}
}
\__ccool_option_outer:n
{
  \msg_warning:nnn{ __ccool }{ unset }{ \exp_not:N \g__ccool_option_outer_tl }
}
```

(*End definition for* `\__ccool_option_outer:n`.)

`\__ccool_option_separ:n` #1 : {⟨ *tl*$_1$ ⟩}{⟨ *tl*$_2$ ⟩}{⟨ *tl*$_3$ ⟩}

```
\cs_new_protected:Nn \__ccool_option_separ:n
{
  \cs_gset:Npn \g__ccool_option_separ_tl {#1}
}
\__ccool_option_separ:n
{
  \msg_warning:nnn{ __ccool }{ unset }{ \exp_not:N \g__ccool_option_separ_tl }
}
```

(*End definition for* `\__ccool_option_separ:n`.)

8 prop

`\__ccool_prop_append:NN` #1 : ⟨ *prop*$_1$ ⟩
#2 : ⟨ *prop*$_2$ ⟩

```
\cs_new_protected:Npn \__ccool_prop_append:NN #1 #2
{
  \cs_set:Nn \__ccool_prop_append:nn
  {
    \prop_gput:Nnx #1 {##1}{ \prop_item:Nn #2{##1} }
  }
  \prop_map_function:NN #2 \__ccool_prop_append:nn
}
\cs_generate_variant:Nn \__ccool_prop_append:NN { cN }
```

(*End definition for* `\__ccool_prop_append:NN`.)

`\__ccool_prop_append:Nn` #1 : ⟨ *prop* ⟩
#2 : ⟨ *tl var name* ⟩

```
\cs_new_protected:Nn \__ccool_prop_append:Nn
{
  \__ccool_prop_append:cN{ \__ccool_prop_name:n {#2} } #1
}
```

(*End definition for* `\__ccool_prop_append:Nn`.)

`\__ccool_prop_clear_new:n` #1 : ⟨ *tl var name* ⟩

```
\cs_new_protected:Nn \__ccool_prop_clear_new:n
{
  \exp_args:No \prop_clear_new:c{ \__ccool_prop_name:n {#1} }
}
```

(*End definition for* `\__ccool_prop_clear_new:n`.)

__ccool_prop_clear_new_map:n `#1 :` ⟨ *keyval list* ⟩

```
\cs_new_protected:Nn \__ccool_prop_clear_new_map:n
{
  \seq_set_from_clist:Nn \g__ccool_aux_key_seq {#1}
  \seq_map_function:NN \g__ccool_aux_key_seq \__ccool_prop_clear_new:n
}
```

(*End definition for* `\__ccool_prop_clear_new_map:n`.)

__ccool_prop_if_exist:nTF `#1 :` $\langle tl_1 \rangle$
`#2 :` $\langle tl_2 \rangle$
`#3 :` $\langle tl_3 \rangle$

```
\cs_new:Nn \__ccool_prop_if_exist:nTF
{
  \prop_if_exist:cTF{ \__ccool_prop_name:n {#1} }{#2}{#3}
}
```

(*End definition for* `\__ccool_prop_if_exist:nTF`.)

__ccool_prop_item:nn `#1 :` ⟨ *tl var name* ⟩
`#2 :` ⟨ *key* ⟩

```
\cs_new:Nn \__ccool_prop_item:nn
{
  \prop_item:cn { \__ccool_prop_name:n {#1} } {#2}
}
```

(*End definition for* `\__ccool_prop_item:nn`.)

__ccool_prop_name:n `#1 :` ⟨ *tl var name* ⟩

```
\cs_new:Npn \__ccool_prop_name:n #1{ __ccool_#1 }
```

(*End definition for* `\__ccool_prop_name:n`.)

__ccool_prop_new:n `#1 :` ⟨ *tl var name* ⟩

```
\cs_new_protected:Nn \__ccool_prop_new:n
{
  \prop_new:c{ \__ccool_prop_name:n {#1} }
}
```

(*End definition for* `\__ccool_prop_new:n`.)

9 seq

__ccool_seq_from_prop:NNn `#1 :` ⟨ seq_1 ⟩
`#2 :` ⟨ seq_2 ⟩ (keys)
`#3 :` ⟨ *prop* ⟩

```
\cs_new_protected:Nn \__ccool_seq_from_prop:NNn
{
  \cs_set_protected:Nn \__ccool_seq_from_prop:n
  {
    \seq_gput_right:No #1 { \prop_item:cn{#3}{##1} }
  }
  \seq_map_function:NN #2 \__ccool_seq_from_prop:n
}
```

(*End definition for* `\__ccool_seq_from_prop:NNn`.)

`\__ccool_erw_seq_use:Nn`

```
%       \begin{arguments}
%       \item \meta{ seq }
%       \item \meta{ tokens }
%       \end{arguments}
\cs_new:Nn \__ccool_seq_use:Nn
{
  \exp_last_unbraced:NNf
  \seq_use:Nnnn #1
  \__ccool_aux_separ:n{#2}
}
```

(*End definition for* `\__ccool_erw_seq_use:Nn`.)

10 sys

`\__ccool_sys_date:`

```
\cs_new:Nn \__ccool_sys_date:
{
  \int_eval:n
  {
    \c_sys_year_int * 10000
    +\c_sys_month_int * 100
    +\c_sys_day_int *  1
  }
}
```

(*End definition for* `\__ccool_sys_date:`.)

`\__ccool_sys_date_hex:`

```
\cs_new:Nn \__ccool_sys_date_hex:
{\int_to_hex:n{\__ccool_sys_date:}}
```

(*End definition for* `\__ccool_sys_date_hex:`.)

`\__ccool_sys_time:`

```
\cs_new:Nn \__ccool_sys_time:
{
  \int_eval:n
  {
    \c_sys_hour_int * 100
    +\c_sys_minute_int * 1
  }
}
```

(*End definition for* `\__ccool_sys_time:`.)

`\__ccool_sys_time_hex:`

```
\cs_new:Nn\__ccool_sys_time_hex:
{\int_to_hex:n{\__ccool_sys_time:}}
```

(*End definition for* `\__ccool_sys_time_hex:`.)

__ccool_sys_filename:

```
\cs_new:Nn\__ccool_sys_filename:
{
  \c_sys_jobname_str--
  \__ccool_sys_date_hex:--
  \__ccool_sys_time_hex:
}
```

(*End definition for* `\__ccool_sys_filename:`.)

11 Front-end

\CcoolClear

`#1` : ⟨*token list*⟩

Semantics Clears any data created by `??{`⟨*token list*⟩`}`

```
\NewDocumentCommand{ \CcoolClear }
{ D<>{\g__ccool_option_name_tl} }
{
  \__ccool_prop_clear_new_map:n{#1}
}
```

\CcoolHook

Example `\AfterEndEnvironment{theorem}{\CcoolHook}`

```
\NewDocumentCommand{\CcoolHook}{}{\c_empty_tl}
```

\CcoolLambda

`#1` : ⟨*integer*⟩
`#2` : ⟨*code*⟩

Example `\Ccool{ EvalAt = \CcoolLambda{(#1)} }`

Semantics Creates a lambda expression with ⟨*integer*⟩ arguments for ⟨*code*⟩

```
\ProvideDocumentCommand \CcoolLambda { O{m} m }
{
  \__ccool_lambda:nn { #1 } { #2 }
}
```

\CcoolOption `#1` : ⟨*keyval list*⟩

```
\NewDocumentCommand{ \CcoolOption }
{ m }
{
  \keys_set:nn{ __ccool }{#1}
}

\keys_define:nn { __ccool }
{
```

Expans

Value `eo|ee|ex|xo|xe|xx`

```
Expans .multichoices:nn = { eo, ee, ex, xo, xe, xx }
{ \tl_gset_eq:NN \g__ccool_option_expans_tl \l_keys_choice_tl },
Expans .default:n = { xo },
Expans .initial:n = { xo },
```

File

Value ⟨*path*⟩

```
File .code:n = {
  \tl_gset:Nx \g__ccool_log_file_tl{#1}
},
File .default:n = { \__ccool_sys_filename: },
File .initial:n = { \__ccool_sys_filename: },
```

Inner

Value ⟨*code*⟩, with `####1` as the argument to be replaced

```
Inner .code:n={
  \__ccool_option_inner:n{#1}
  \exp_last_unbraced:Nf
  \__ccool_make_ccool:nnnn
  {
    { \g__ccool_option_name_tl }
    { \g__ccool_option_inner_tl }
    { \g__ccool_option_separ_tl }
    { \g__ccool_option_outer_tl }
  }
},
Inner .value_required:n = false,
Inner .default:n = {####1},
Inner .initial:n = {####1},
```

Name

Value ⟨*token list*⟩

```
Name .code:n={
  \__ccool_option_name:n{#1}
  \exp_last_unbraced:Nf
  \__ccool_make_ccool:nnnn
  {
```

```
    { \g__ccool_option_name_tl }
    { \g__ccool_option_inner_tl }
    { \g__ccool_option_separ_tl }
    { \g__ccool_option_outer_tl }
  }
},
Name .value_required:n = false,
Name .default:n = { Math },
Name .initial:n = { Math },
```

`Outer`

Value ⟨*code*⟩, with `####1` as the argument to be replaced

```
Outer .code:n={
  \__ccool_option_outer:n{#1}
  \exp_last_unbraced:Nf
  \__ccool_make_ccool:nnnn
  {
    { \g__ccool_option_name_tl }
    { \g__ccool_option_inner_tl }
    { \g__ccool_option_separ_tl }
    { \g__ccool_option_outer_tl }
  }
},
Outer .value_required:n = false,
Outer .default:n = { \ensuremath{####1} },
Outer .initial:n = { \ensuremath{####1} },
```

`Separ`

Value That of 'separators' in [**?**, Section 8 of l3seq]

```
Separ .code:n={
  \__ccool_option_separ:n{#1}
  \exp_last_unbraced:Nf
  \__ccool_make_ccool:nnnn
  {
    { \g__ccool_option_name_tl }
    { \g__ccool_option_inner_tl }
    { \g__ccool_option_separ_tl }
    { \g__ccool_option_outer_tl }
  }
},
Separ .value_required:n = false,
Separ .default:n = { {\ }and{\ } } { ,{\ } } { ,{\ }and{\ } },
Separ .initial:n = { {\ }and{\ } } { ,{\ } } { ,{\ }and{\ } },
```

`Write`

Value ⟨*boolean*⟩

```
Write .code:n = {
  \bool_if:nTF{#1}
  {\__ccool_log_open:}
  {\__ccool_log_close:}
},
```

```
Write .value_required:n = false,
Write .default:n = \BooleanFalse,
Write .initial:n = \BooleanFalse
}
```

`\CcoolRead` `#1` : ⟨*path*⟩

Semantics

1. Reads the definitions in ⟨*path*⟩.
2. Writes to `ccool.log`: 'read from ⟨*path*⟩'

```
\NewDocumentCommand{\CcoolRead}
{o}
{
  \IfValueTF{#1}
  {\__ccool_log_read:e{#1}}
  {\__ccool_log_read:}
}
```

`\CcoolVers`

Semantics Expands to the package's version

```
\NewDocumentCommand{\CcoolVers}
{}
{\use:c{ver@ccool.sty}}
```

16 Misc

```
\ExplSyntaxOff
```