

The ccool package*

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Abstract

ccool stands for Custom COntent Oriented for L^AT_EX, a concept pioneered by cool[2]¹. This is done using a minimalist interface built upon xparse[6]. Specifically, `\Ccool<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{{~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, `$_\text{Nat}<Math>$` encodes “ \mathbb{N} ” (and likewise for `$_\text{Real}`). `Math` being the default for `<name>`, `<Math>` can be dropped. Optionally, the macros can be written to a file, and read, which can be useful for typesetting documents sharing the same notation.

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*This file describes version v1.7, last revised 2020/04/12.

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¹Whereas cool provided predefined macros, ccool is tool for making custom macros.

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Part I

Usage

Convention

1. Loosely, those of [4] and [6], for example as to the meaning of $\langle token\ list \rangle$.
2. If unspecified, the environment in which a macro must be declared is `document`.

| | |
|--------------------------|---------------------------------|
| <code>\usepackage</code> | <code>\usepackage{ccool}</code> |
|--------------------------|---------------------------------|

Environment *preamble*

Requirement `ccool.sty` is in the path of the L^AT_EX engine. See [Part III, section 4](#).

\Ccool $\langle tl_1 \rangle$
 $[\langle tl_2 \rangle]$
 $i\{\langle code_1 \rangle\}$
 $\{\langle kvl_1 \rangle\}$
 $+$
 $*$
 $s\{\{\langle tl_3 \rangle\}|\{\langle tl_3 \rangle\}\{\langle tl_4 \rangle\}|\{\langle tl_3 \rangle\}\{\langle tl_4 \rangle\}\{\langle tl_5 \rangle\}\}$
 $o\{\langle code_2 \rangle\}$
 $[\langle tl_6 \rangle]$

Requirement $\langle kvl_1 \rangle$ is specified (all others optional).

$\langle tl_1 \rangle$

Example Math, ModelA, ModelB

Semantics Identifies a group of macros

$\langle tl_2 \rangle$

Example Let~

Semantics Expands $\langle tl_2 \rangle$

$\langle code_1 \rangle$

Example $\mathbb{\#1}$

Semantics

1. $\langle val_i \rangle \leftarrow \langle code_1 \rangle$ applied to $\langle val_i \rangle$

$\langle kvl_1 \rangle$

Example Elms= $\{\omega_1, \dots, \omega_n\}$, Sample= Ω

Semantics

2. $\backslash\langle key_i \rangle\langle tl_1 \rangle \leftarrow \langle val_i \rangle$ defined in step 1, using **Expans** for expansion.
3. If **Write**, writes the input used by step 2 to **File**

$+$

Other Needed to make **\Ccool**'s side effect within a *local group* persist thereafter

Semantics Appends step 2 and step 3 to **\CcoolHook**

$*$

Semantics

4. Expands $\langle code_2 \rangle$ applied to the list created in step 1, using the separator specified by $\langle tl_3 \rangle$, $\langle tl_4 \rangle$, $\langle tl_5 \rangle$.

$\langle tl_3 \rangle$

Example `{~\in~}`

$\langle tl_4 \rangle$

Example `{,~}`

$\langle tl_5 \rangle$

Example `{~\&~}`

$\langle code_2 \rangle$

Example `$\left\{ \right. \left. \right\} $`

$\langle tl_6 \rangle$

Semantics `\Ccool` $\langle tl_1 \rangle$ \rangle $[\langle tl_6 \rangle]$

`\CcoolClear`

`\CcoolClear` $\langle keyval list \rangle$

Semantics Clears any data created by `\Ccool` $\{\langle tl_1 \rangle\}$, for all $\langle tl_1 \rangle$ in $\langle keyval list \rangle$

`\CcoolHook`

`\CcoolHook`

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

`\CcoolOption`

`\CcoolOption` $\{\langle kv10 \rangle\}$

Semantics Set default options for `\Ccool`

Expans

Default `xo`

Syntax Either of `eo`, `ee`, `ex`, `xe`, `xo`, `xe`, `xx`

File

Default `ccool\pdfcreationdate`

Syntax Expands to a file valid *path*

Inner

Default `####1`

Semantics Default for $\langle code_1 \rangle$

Syntax Use `####1` as the argument to be replaced

Name

Default Math

Semantics Default for $\langle tl_1 \rangle$

Outer

Default `\ensuremath{####1}`

Semantics Default for $\langle code_2 \rangle$

Syntax Use `####1` as the argument to be replaced

Separ

Default `{ {\ }and{\ } } { ,{\ } } { ,{\ }and{\ } }`

Semantics Default for **separators' parameter**

Syntax That of 'separators' in [4, Section 8 of l3seq]

Write

Default `\BooleanFalse`

Syntax *Boolean*

`\CcoolRead` `\CcoolRead[\langle path \rangle]`

Other The default for $\langle path \rangle$ is the last write-file (see $\langle kvl_1 \rangle$)

Semantics

1. Reads the definitions in $\langle path \rangle$.
2. Writes to `ccool.log`: 'read from $\langle path \rangle$ '

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: $\$ \langle key_i \rangle < x \$$.

Do: $\$ \langle key_i \rangle \{ < \} x \$$

3.

Don't: $[a, b]$.

Do: $\{[a, b)\}$

4.

Don't: $F = \text{cal } F$.

Do: $F = \text{cal}\{F\}$ or $F = \text{mathcal}\{F\}$

5. Also see [Part III, section 3](#)

Part II

Listing

Listing 1. Preamble^a

^aCheck the documentation portion of the source file, `ccool.dtx`, for exhaustive settings

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

Listing 2. 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 @ y
x % y @ z
x & y
x & y
x & y & z
x, y & z
x, y & z
```

Listing 3. Hello, world!^a

^aIf 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 = {1} }*[]
% { KeyI = {\%}, KeyJ = {\%}, KeyK = {\%} }[.\{1\}.\{o\}]
% { KeyL = {1}, 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 4. Listing 3 read from file.

```
% \CcoolRead
% \KeyF<Test>\KeyA<Test>\nobreak
% \KeyG<Test>\KeyA<Test>\nobreak
% \KeyH<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 5. 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 6. Listing 5 read from file.

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

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

Listing 7. Mittelwertsatz für n Variable

```
% \CcoolOption{ Write = \BooleanTrue }
% \newtheorem{theorem}{Theorem}
% \AfterEndEnvironment{theorem}{\CcoolHook}
% \Ccool if{\mathbb{#1}}
% { N = { N } , R = { R } }+[]
% { Grad = { \operatorname{grad} } }+
% [\begin{theorem}
%   [Mittelwertsatz f\"ur $n$ Variable]Es~sei~
%   { OffMenge = {D}, Ci = {C^{1}}, Strecke = { [x_0,x] } }+
%   [$n\in\mathbb{N}$,~$OffMenge\subseteq\mathbb{R}^n$ eine offene Menge und
%   $f\in Ci(OffMenge,\mathbb{R})$].
%   Dann gibt es auf jeder Strecke $Strecke\subseteq OffMenge$ 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 $n \in \mathbb{N}$, $D \subseteq \mathbb{R}^n$ 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*

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

(Check: \mathbb{N} , ξ)

Listing 8. Listing 7 read from file.

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

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

Listing 9. CUSUM statistic[7]

```
% \newtheorem{definition}{Definition}
% \AfterEndEnvironment{definition}{\CcoolHook}
% \NewDocumentCommand\EvalAt{m}{\#1}
%
% \Ccool{ SuchThat = { ;~ }, Time = { t }, Process = { \xi }, StopT
% = T }
% [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{ \in \mathcal{R}^+ }$.}
% [~Define the following processes:]
% { LogWald = { u }, CUSUMst = { \StopT_{c} }, CUSUM = { y },
LogWaldInf = { m } }+
% [\begin{enumerate}
% \item{ $\LogWald_{\Time}\EvalAt{ \Scale } =
\Scale\Process_{\Time} - \frac{1}{2}\Scale^2\Time$;
% $\LogWaldInf_{\Time}\EvalAt{ \Scale } = \inf_{0 \leq s \leq \Time} \{ CUSUM_s \} \EvalAt{ \Scale }$.}
% \item{ $\CUSUM_{\Time}\EvalAt{ \Scale } =
\LogWaldInf_{\Time}\EvalAt{ \Scale } - \LogWald_{\Time}\EvalAt{
\Scale } \geq 0$, which is the CUSUM statistic process.}
% \item{ $\CUSUMst \EvalAt{ \Scale, \LogWaldInf } = \inf_{\Time \geq 0} \{ \text{SuchThat } CUSUM_{\Time}\EvalAt{\Scale} \geq \LogWaldInf \}$, which is the CUSUM stopping time.}
\end{enumerate}\end{definition}\par}{
%
% (Check: $\Scale$, $\CUSUM$)
%

```

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)

Part III

Other

1 Acknowledgment

This work has benefited from Q&A's from the L^AT_EX community, see here: <https://tex.stackexchange.com/users/112708/erwann?tab=questions>. Specific references are made in Part IV. Listing 5 and Listing 6 are from [1]. Listing 7 is from tcolbox[5, 17.3].

2 Install

Compiling ccool.dtx² 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

It's not possible to check the expansion of a certain class of macros against predefined values[8]. Instead, one can check that Part II, as generated in section 2 on one's own machine, agrees with bench.pdf available at <https://github.com/rogard/ccool>,

References

- [1] A.N. Shiryaev *Probability* Springer, 1995
- [2] Nick Setzer *The cool package*, 2005, <https://www.ctan.org/pkg/cool>
- [3] Olympia Hadjiliadis *Change-point detection of two-sided alternatives in the Brownian motion model and its connection to the gambler's ruin problem with relative wealth perception*. PhD thesis. Columbia University, 2005
- [4] The L^AT_EX3 Project Team *The L^AT_EX3 interfaces*, 2019, <http://ftp.math.purdue.edu/mirrors/ctan.org/macros/latex/contrib/l3kernel/interface3.pdf>

²Under Unix, `$tex ccool.dtx`

- [5] Thomas F. Sturm *The tcolorbox package*, 2019, <http://www.texdoc.net/texmf-dist/doc/latex/tcolorbox/tcolorbox.pdf>
- [6] The L^AT_EX3 Project Team *The xparse package*, 2020, <http://ftp.math.purdue.edu/mirrors/ctan.org/macros/latex/contrib/l3packages/xparse.pdf>
- [7] Erwann Rogard and Olympia Hadjiliadis *Typesetting a math thesis with ccool*, 2020, <https://github.com/rogard/ccool/blob/master/thesis.pdf>
- [8] <https://tex.stackexchange.com/a/534100/112708>

Change History

| | | | |
|---|----|---|----|
| v1.0 | | Added: <code>\OpsDebug</code> | 13 |
| General: Initial version | 13 | Added: <code>\OpsHook</code> | 13 |
| v1.1 | | Added: <code>Expans</code> (for debugging sake, but...) | 13 |
| General: Added: <code>Save</code> | 13 | Added: Listing 1., 2., and 3. | 13 |
| Added: Listing 1., 2., 3., 4., 6., and 9. | 13 | Deleted: Listing 1., and 2. | 13 |
| Added: <code>\OpsRestore</code> | 13 | Replaced: <code>s{\langle tl_3 \rangle}{\langle tl_4 \rangle}{\langle tl_5 \rangle}</code> by <code>s{\langle tl_3 \rangle}{\langle tl_3 \rangle}{\langle tl_4 \rangle}{\langle tl_3 \rangle}{\langle tl_4 \rangle}{\langle tl_5 \rangle}</code> | 13 |
| Added: <code>\OpsTest</code> | 13 | | |
| Deleted: Listing 1-5 from v1.0 . . . | 13 | | |
| Fixed: apparent anomaly in v1.0's Listing 4, see Listing 2 | 13 | v1.5 | |
| Replaced: <code>\OpsOptions</code> by <code>\OpsOption</code> . . | 13 | General: Added: <code>File</code> | 13 |
| Replaced: <code>{\langle kvl_2 \rangle}</code> by <code><kvl_2></code> given that option type G not recommended[6] . | 13 | Deleted: dependence on <code>datetime</code> . | 13 |
| Replaced: <code>GenericObject</code> by <code>Name</code> . | 13 | v1.6 | |
| Replaced: <code>Separators</code> by <code>Separ</code> . . | 13 | General: Added: Listing 1 (preamble) . | 13 |
| Revamped: much of the implementation | 13 | Renamed: <code>\OpsClear</code> to <code>\CcoolClear</code> | 13 |
| v1.2 | | Renamed: <code>\OpsDebug</code> to <code>\CcoolDebug</code> | 13 |
| General: Deleted: <code>\OpsTest</code> | 13 | Renamed: <code>\OpsHook</code> to <code>\CcoolHook</code> | 13 |
| Deleted: <code>\langle kvl_2 \rangle</code> and <code>\langle code_2 \rangle</code> | 13 | Renamed: <code>\OpsOption</code> to <code>\CcoolOption</code> | 13 |
| Deleted: Listing 2-3 from v1.1. . . . | 13 | Renamed: <code>\OpsRead</code> to <code>\CcoolRead</code> | 13 |
| Replaced: <code>\OpsClear{\langle tl_1 \rangle}</code> by <code>\OpsClear[\langle keyval list \rangle]</code> | 13 | Renamed: <code>\Ops</code> to <code>\Ccool</code> | 13 |
| Replaced: <code>\Restore</code> by <code>\Read</code> | 13 | Renamed: <code>oops</code> to <code>ccool</code> (better describes the purpose) | 13 |
| Replaced: <code>\Save</code> by <code>\Write</code> | 13 | | |
| v1.3 | | v1.7 | |
| General: Replaced: <code>\OpsNew</code> by <code>\Ops</code> . | 13 | General: Added: Co-author | 13 |
| Replaced: <code>{\langle tl_1 \rangle}</code> and <code>[\langle tl_1 \rangle]</code> by <code><\langle tl_1 \rangle></code> | 13 | Added: Legends to listings | 13 |
| v1.4 | | Added: Listing 9 (CUSUM) | 13 |
| General: Added: section 7 | 13 | Removed: <code>\CcoolDebug</code> | 13 |
| | | Removed: Listing 5 from v1.6 | 13 |

Index

The italic numbers denote the pages where the corresponding entry is described, numbers underlined point to the definition, all others indicate the places where it is used.

| Symbols | |
|---|-------------|
| * (option) | <i>4</i> |
| + (option) | <i>4</i> |
| <code>\key_i</code> | <i>4, 6</i> |
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| <code>\tl₁</code> (option) | <i>4</i> |
| <code>\tl₂</code> (option) | <i>4</i> |
| <code>\tl₃</code> (option) | <i>4</i> |
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| <code>\tl₅</code> (option) | <i>5</i> |
| <code>\tl₆</code> (option) | <i>5</i> |
| <code>Expans</code> (option) | <i>5</i> |
| <code>File</code> (option) | <i>5</i> |
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| _ccool_aux_prop:N | 44, 159 | _ccool_seq_from_prop:NNn | 83, 280 |
| _ccool_aux_prop:n | 40, 50 | _ccool_seq_use:Nn | 147, 292 |
| _ccool_aux_prop:nn | 26 | \\CcoolClear | 2, 5, 14, 373 |
| _ccool_aux_prop:w | 32, 42 | \\CcoolDebug | 14 |
| _ccool_aux_separ:n | 76, 296 | \\CcoolHook | 2, 4, 5, 14, 177, 193 |
| _ccool_aux_separ:nn | 53, 78 | \\CcoolOption | 2, 5, 14, 378 |
| _ccool_aux_val:Nn | 80, 142 | \\CcoolRead | 2, 6, 12, 14, 383 |
| \\g_ccool_aux_val_seq | 82, 83, 148 | cs commands: | |
| _ccool_erw_seq_use:Nn | 288 | \\cs_generate_variant:Nn | 7, 31, 75, 105, 120, 130, 135, 253 |
| _ccool_log_close: | 85, 353 | \\cs_gset:Npn | 6, 24, 239 |
| _ccool_log_entry | 172, 173 | \\cs_new:Nn | 53, 76, 219, 267, 271, 292 |
| \\g_ccool_log_file_tl | 93, 96, 305 | \\cs_new:Npn | 275 |
| \\g_ccool_log_iow | 85, 86, 90, 97, 115, 118 | \\cs_new_protected:Nn | 4, 13, 17, 22, 27, 40, 44, 80, 88, 94, 100, 106, 111, 121, 131, 136, 140, 152, 164, 211, 229, 237, 254, 258, 262, 276, 280 |
| _ccool_log_open: | 93, 352 | \\cs_new_protected:Npn | 9, 33, 178, 245 |
| \\g_ccool_log_open_bool | 87, 91, 98, 113, 167 | \\cs_set:Nn | 247 |
| _ccool_log_read: | 106, 388 | | |
| _ccool_log_read:n | 100, 108, 387 | | |
| \\g_ccool_log_log_to_tl | 96, 97, 108, 110 | | |

| | | | |
|--|------------------------|--|---------------|
| <code>\cs_set_protected:Nn</code> | 282 | <code>\msg_new:nnn</code> 205, 206, 207, 208, 209, 210 | |
| | | <code>\msg_warning:nnn</code> | 217, 235, 243 |
| D | | | |
| <code>\DeclareDocumentCommand</code> | 180 | N | |
| <code>\def</code> | 172, 177 | <code>\NeedsTeXFormat</code> | 2 |
| | | <code>\NewDocumentCommand</code> | 373, 378, 383 |
| E | | | |
| <code>\end</code> | 291 | O | |
| <code>\endgroup</code> | 173 | <code>\Ops</code> | 14 |
| <code>\ensuremath</code> | 348, 349 | <code>\OpsClear</code> | 14 |
| exp commands: | | <code>\OpsDebug</code> | 14 |
| <code>\exp_args:Nnf</code> | 146 | <code>\OpsHook</code> | 14 |
| <code>\exp_args:NNx</code> | 123, 180 | <code>\OpsNew</code> | 14 |
| <code>\exp_args:No</code> | 157, 260 | <code>\OpsOption</code> | 14 |
| <code>\exp_args:Nx</code> | 35 | <code>\OpsOptions</code> | 14 |
| <code>\exp_last_unbraced:Nf</code> | | <code>\OpsRead</code> | 14 |
| | 310, 324, 338, 360 | <code>\OpsRestore</code> | 14 |
| <code>\exp_last_unbraced:NNf</code> | 294 | <code>\OpsTest</code> | 14 |
| <code>\exp_not:N</code> | 71, 217, 227, 235, 243 | options: | |
| <code>\exp_not:n</code> | 201, 305 | <code>*</code> | 4 |
| <code>\expandafter</code> | 172 | <code>+</code> | 4 |
| <code>\ExplSyntaxOff</code> | 390 | <code><code₁></code> | 4 |
| <code>\ExplSyntaxOn</code> | 3 | <code><code₂></code> | 5 |
| F | | | |
| file commands: | | <code><kv₁></code> | 4 |
| <code>\file_input:n</code> | 102 | <code><tl₁></code> | 4 |
| G | | | |
| <code>\gappto</code> | 193 | <code><tl₂></code> | 4 |
| I | | | |
| <code>\IfBooleanT</code> | 187 | <code><tl₃></code> | 4 |
| <code>\IfValueT</code> | 185, 199 | <code><tl₄></code> | 5 |
| <code>\IfValueTF</code> | 386 | <code><tl₅></code> | 5 |
| int commands: | | <code><tl₆></code> | 5 |
| <code>\int_case:nnTF</code> | 55 | Expans | 5 |
| iow commands: | | File | 5 |
| <code>\iow_close:N</code> | 86, 90 | Inner | 5 |
| <code>\iow_new:N</code> | 85 | Name | 6 |
| <code>\iow_now:Nn</code> | 115 | Outer | 6 |
| <code>\iow_open:Nn</code> | 97 | Separ | 6 |
| <code>\item</code> | 289, 290 | Write | 6 |
| K | | | |
| keys commands: | | P | |
| <code>\l_keys_choice_tl</code> | 302 | <code>\pdfcreationdate</code> | 306, 307 |
| <code>\keys_define:nn</code> | 298 | prg commands: | |
| <code>\keys_set:nn</code> | 381 | <code>\prg_replicate:nn</code> | 58 |
| M | | | |
| <code>\meta</code> | 289, 290 | prop commands: | |
| msg commands: | | <code>\prop_clear_new:N</code> | 260 |
| <code>\msg_error:nnn</code> | 118, 225 | <code>\prop_gclear_new:N</code> | 46 |
| <code>\msg_error:nnnn</code> | 69 | <code>\prop_gput:Nnn</code> | 29, 249 |
| | | <code>\prop_if_exist:NTF</code> | 269 |
| | | <code>\prop_item:Nn</code> | 249, 273, 284 |
| | | <code>\prop_map_function:NN</code> | 251 |
| | | <code>\prop_new:N</code> | 26, 278 |
| | | <code>\ProvideDocumentCommand</code> | 124 |
| Q | | | |
| | | quark commands: | |
| | | <code>\q_stop</code> | 9, 15, 33, 42 |

(End definition for _ccool_aux_key:n.)

```
\_ccool_aux_key:N #1 : < seq >
17 \cs_new_protected:Nn \_ccool_aux_key:N
18 {
19   \seq_gclear_new:N \g__ccool_aux_key_seq
20   \seq_map_function:NN #1 \_ccool_aux_key:n
21 }
```

(End definition for _ccool_aux_key:N.)

```
\_ccool_aux_outer_set:n #1 : < inline code >
22 \cs_new_protected:Nn \_ccool_aux_outer_set:n
23 {
24   \cs_gset:Npn \_ccool_aux_outer:n ##1 {#1}
25 }
```

(End definition for _ccool_aux_outer_set:n.)

```
\_ccool_aux_prop:nn
26 \prop_new:N \g__ccool_aux_prop
27 \cs_new_protected:Nn \_ccool_aux_prop:nn
28 {
29   \prop_gput:Nnn \g__ccool_aux_prop{#1}{#2}
30 }
31 \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 >
32 \tl_new:N \g__ccool_option_expans_tl
33 \cs_new_protected:Npn \_ccool_aux_prop:w #1 = #2 \q_stop
34 {
35   \exp_args:Nx
36   \use:c{\_ccool_aux_prop:\g__ccool_option_expans_tl}
37   { \tl_trim_spaces:n{#1} }
38   { \_ccool_aux_inner:n{ \tl_trim_spaces:n{#2} } }
39 }
```

(End definition for _ccool_aux_prop:w.)

```
\_ccool_aux_prop:n #1 : < key = value >
40 \cs_new_protected:Nn \_ccool_aux_prop:n
41 {
42   \_ccool_aux_prop:w #1 \q_stop
43 }
```

(End definition for _ccool_aux_prop:n.)

```

\__ccool_aux_prop:N #1 : <keyval list>

44 \cs_new_protected:Nn \__ccool_aux_prop:N
45 {
46   \prop_gclear_new:N \g__ccool_aux_prop
47   \seq_if_empty:NTF #1
48   { \c_empty_tl }
49   {
50     \seq_map_function:NN #1 \__ccool_aux_prop:n
51   }
52 }

(End definition for \__ccool_aux_prop:N.)

\__ccool_aux_separ:nn #1 : <int>
#2 : <tokens>

53 \cs_new:Nn \__ccool_aux_separ:nn
54 {
55   \int_case:nnTF {#1}
56   {
57     {1}
58     { \prg_replicate:nn{ 3 }{#2} }
59     {2}
60     {
61       { \use_i:nn #2 }
62       { \use_ii:nn #2 }
63       { \use_i:nn #2 }
64     }
65     {3}{#2}
66   }
67   { \c_empty_tl }
68   {
69     \msg_error:nnnn { __erw }
70     { separ }
71     { \exp_not:N \__ccool_aux_separ:nn }
72     {#2}
73   }
74 }
75 \cs_generate_variant:Nn \__ccool_aux_separ:nn { e }

(End definition for \__ccool_aux_separ:nn.)

\__ccool_aux_separ:n #1 : <tokens>

76 \cs_new:Nn \__ccool_aux_separ:n
77 {
78   \__ccool_aux_separ:en{ \tl_count:n{#1} }{#1}
79 }

(End definition for \__ccool_aux_separ:n.)

\__ccool_aux_val:Nn #1 : <seq>

```

```

#2 : < tl var name >

80 \cs_new_protected:Nn \__ccool_aux_val:Nn
81 {
82   \seq_gclear_new:N \g__ccool_aux_val_seq
83   \__ccool_seq_from_prop:Nn \g__ccool_aux_val_seq #1 { \__ccool_prop_name:n{#2} }
84 }

(End definition for \__ccool_aux_val:Nn.)

```

2 log

```

\__ccool_log_close:

85 \iow_new:N \g__ccool_log_iow
86 \AtEndDocument{\iow_close:N \g__ccool_log_iow}
87 \bool_set_false:N \g__ccool_log_open_bool
88 \cs_new_protected:Nn \__ccool_log_close:
89 {
90   \iow_close:N \g__ccool_log_iow
91   \bool_gset_false:N \g__ccool_log_open_bool
92 }

(End definition for \__ccool_log_close:.)

\__ccool_log_open:

93 \tl_new:N \g__ccool_log_file_tl
94 \cs_new_protected:Nn \__ccool_log_open:
95 {
96   \tl_gset:Nx \g__ccool_log_to_tl{\g__ccool_log_file_tl}
97   \iow_open:Nn \g__ccool_log_iow {\g__ccool_log_to_tl}
98   \bool_gset_true:N \g__ccool_log_open_bool
99 }

(End definition for \__ccool_log_open:.)

\__ccool_log_read:n #1 : <path>

100 \cs_new_protected:Nn \__ccool_log_read:n
101 {
102   \file_input:n{#1}
103   \tl_log:n{read~from~#1}
104 }
105 \cs_generate_variant:Nn \__ccool_log_read:n { e }

(End definition for \__ccool_log_read:n.)

\__ccool_log_read:

106 \cs_new_protected:Nn \__ccool_log_read:
107 {
108   \__ccool_log_read:e{\g__ccool_log_to_tl}
109 }

(End definition for \__ccool_log_read:.)

```

```

\__ccool_log_write:n
110 \tl_new:N \g__ccool_log_to_tl
111 \cs_new_protected:Nn \__ccool_log_write:n
112 {
113   \bool_if:nTF{ \g__ccool_log_open_bool }
114   {
115     \iow_now:Nn \g__ccool_log_iow {#1}
116     \tl_log:n{ write~to~#1 }
117   }
118   { \msg_error:nnn{ __ccool }{ iow }{ \g__ccool_log_iow } }
119 }
120 \cs_generate_variant:Nn \__ccool_log_write:n { e }

(End definition for \__ccool_log_write:n.)

```

3 make_key

```

\__ccool_make_key:Nn #1 : < token >
#2 : < key >
121 \cs_new_protected:Nn \__ccool_make_key:Nn
122 {
123   \exp_args:NNx
124   \ProvideDocumentCommand{#1}
125   { D<>{ \g__ccool_option_name_tl } }
126   {
127     \__ccool_prop_item:nn{##1}{#2}
128   }
129 }
130 \cs_generate_variant:Nn \__ccool_make_key:Nn { c }

(End definition for \__ccool_make_key:Nn.)

```

```

\__ccool_make_key:n #1 : < key >
131 \cs_new_protected:Nn \__ccool_make_key:n
132 {
133   \__ccool_make_key:cn{#1}{#1}
134 }
135 \cs_generate_variant:Nn \__ccool_make_key:n { e }

(End definition for \__ccool_make_key:n.)

```

```

\__ccool_make_key:N #1 : < seq >
136 \cs_new_protected:Nn \__ccool_make_key:N
137 {
138   \seq_map_function:NN #1 \__ccool_make_key:e
139 }

(End definition for \__ccool_make_key:N.)

```

4 make_ccool

_ccool_make_ccool_exp:nnn

```

140 \cs_new_protected:Nn \_ccool_make_ccool_exp:nnn
141 {
142   \_ccool_aux_val:Nn \g\_ccool_aux_key_seq {#1}
143   \_ccool_aux_outer_set:n{#3}
144   \_ccool_aux_outer:n
145   {
146     \exp_args:Nnf
147     \_ccool_seq_use:Nn
148     \g\_ccool_aux_val_seq
149     {#2}
150   }
151 }
```

(End definition for _ccool_make_ccool_exp:nnn.)

_ccool_make_ccool_key:nnn

```

152 \cs_new_protected:Nn \_ccool_make_ccool_key:nnn
153 {
154   \_ccool_prop_if_exist:nTF{#1}
155   { \c_empty_tl }
156   { \_ccool_prop_new:n{#1} }
157   \exp_args:No \_ccool_aux_inner_set:n{#2}
158   \seq_set_from_clist:Nn \g\_ccool_aux_keyval_seq {#3}
159   \_ccool_aux_prop:N \g\_ccool_aux_keyval_seq
160   \_ccool_prop_append:Nn \g\_ccool_aux_prop {#1}
161   \_ccool_aux_key:N \g\_ccool_aux_keyval_seq
162   \_ccool_make_key:N \g\_ccool_aux_key_seq
163 }
```

(End definition for _ccool_make_ccool_key:nnn.)

_ccool_make_ccool_sideeffect:nnn

```

164 \cs_new_protected:Nn \_ccool_make_ccool_sideeffect:nnn
165 {
166   \_ccool_make_ccool_key:nnn{#1}{#2}{#3}
167   \bool_if:nTF{ \g\_ccool_log_open_bool }
168   {%^A https://tex.stackexchange.com/questions/536597
169     \_ccool_log_write:n
170     {
171       \begingroup
172       \def \_ccool_log_entry { \Ccool<#1>i{#2}{#3} } \expandafter
173       \endgroup \_ccool_log_entry
174     }
175   }{\c_empty_tl}
176 }
```

(End definition for _ccool_make_ccool_sideeffect:nnn.)

_ccool_make_ccool:nnnn #1 : \langle token list \rangle
 #2 : \langle seq₁ \rangle
 #3 : \langle seq₂ \rangle

```

#4 : < prop >

177 \def\CcoolHook{\c_empty_tl}
178 \cs_new_protected:Npn \__ccool_make_ccool:nnnn #1 #2 #3 #4
179 {
180   \exp_args:NNx \DeclareDocumentCommand \Ccool
181     {%^~A      2      3      4 5 6      7 8      9
182     D<>{#1} +o E{ i }{{#2}} m t+ s E{ s o }{{#3}{#4}} +o
183   }
184   {
185     \IfValueT{##2}{##2}
186     \__ccool_make_ccool_sideeffect:nnn{##1}{##3}{##4}
187     \IfBooleanT{##6}
188     {
189       \__ccool_make_ccool_exp:nnn{##1}{##7}{##8}
190     }
191     \bool_if:nTF{##5}
192     {
193       \gappto{\CcoolHook}
194       {
195         \__ccool_make_ccool_sideeffect:nnn{##1}{##3}{##4}
196       }
197     }
198     {\c_empty_tl}
199     \IfValueT{##9}
200     {
201       \exp_not:n{ \Ccool<##1>[##9] }
202     }
203   }
204 }

```

(End definition for __ccool_make_ccool:nnnn.)

5 msg

```

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

```

6 option

```

\__ccool_aux_inner:n #1 : <code>

211 \cs_new_protected:Nn \__ccool_option_inner:n
212 {
213   \tl_gset:Nn \g__ccool_option_inner_tl {#1}
214 }
215 \__ccool_option_inner:n
216 {
217   \msg_warning:nnn{ __ccool }{ unset }{ \exp_not:N \g__ccool_option_inner_tl }
218 }

```

(End definition for _ccool_aux_inner:n.)

```
\_ccool_option_name:n #1 : < token list >
219 \cs_new:Nn \_ccool_option_name:n
220 {
221   \tl_gset:Nn \g_ccool_option_name_tl{#1}
222 }
223 \_ccool_option_name:n
224 {
225   \msg_error:nnx{ __ccool }
226   { generic }
227   { \exp_not:N\g_ccool_option_name_tl~undefined }
228 }
```

(End definition for _ccool_option_name:n.)

```
\_ccool_option_outer:n #1 : < inline code >
229 \cs_new_protected:Nn \_ccool_option_outer:n
230 {
231   \tl_gset:Nn \g_ccool_option_outer_tl {#1}
232 }
233 \_ccool_option_outer:n
234 {
235   \msg_warning:nnn{ __ccool }{ unset }{ \exp_not:N \g_ccool_option_outer_tl }
236 }
```

(End definition for _ccool_option_outer:n.)

```
\_ccool_option_separ:n #1 : {< tl1>}{< tl2>}{< tl3>}
237 \cs_new_protected:Nn \_ccool_option_separ:n
238 {
239   \cs_gset:Npn \g_ccool_option_separ_tl {#1}
240 }
241 \_ccool_option_separ:n
242 {
243   \msg_warning:nnn{ __ccool }{ unset }{ \exp_not:N \g_ccool_option_separ_tl }
244 }
```

(End definition for _ccool_option_separ:n.)

7 prop

```
\_ccool_prop_append:NN #1 : < prop1 >
#2 : < prop2 >
245 \cs_new_protected:Npn \_ccool_prop_append:NN #1 #2
246 {
247   \cs_set:Nn \_ccool_prop_append:nn
248   {
249     \prop_gput:Nnx #1 {##1}{ \prop_item:Nn #2{##1} }
250   }
251   \prop_map_function:NN #2 \_ccool_prop_append:nn
252 }
253 \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 >
254 \cs_new_protected:Nn \_ccool_prop_append:Nn
255 {
256   \_ccool_prop_append:cN{ \_ccool_prop_name:n {#2} } #1
257 }
```

(End definition for _ccool_prop_append:Nn.)

```
\_ccool_prop_clear_new:n #1 : < tl var name >
258 \cs_new_protected:Nn \_ccool_prop_clear_new:n
259 {
260   \exp_args:No \prop_clear_new:c{ \_ccool_prop_name:n {#1} }
261 }
```

(End definition for _ccool_prop_clear_new:n.)

```
\_ccool_prop_clear_new_map:n #1 : < keyval list >
262 \cs_new_protected:Nn \_ccool_prop_clear_new_map:n
263 {
264   \seq_set_from_clist:Nn \g__ccool_aux_key_seq {#1}
265   \seq_map_function:NN \g__ccool_aux_key_seq \_ccool_prop_clear_new:n
266 }
```

(End definition for _ccool_prop_clear_new_map:n.)

```
\_ccool_prop_if_exist:nTF #1 : < tl1 >
#2 : < tl2 >
#3 : < tl3 >
267 \cs_new:Nn \_ccool_prop_if_exist:nTF
268 {
269   \prop_if_exist:ctF{ \_ccool_prop_name:n {#1} }{#2}{#3}
270 }
```

(End definition for _ccool_prop_if_exist:nTF.)

```
\_ccool_prop_item:nn #1 : < tl var name >
#2 : < key >
271 \cs_new:Nn \_ccool_prop_item:nn
272 {
273   \prop_item:cn { \_ccool_prop_name:n {#1} } {#2}
274 }
```

(End definition for _ccool_prop_item:nn.)

```
\_ccool_prop_name:n #1 : < tl var name >
275 \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 >
276 \cs_new_protected:Nn \__ccool_prop_new:n
277 {
278   \prop_new:c{ \__ccool_prop_name:n {#1} }
279 }

(End definition for \__ccool_prop_new:n.)

```

8 seq

```

\__ccool_seq_from_prop:NNn #1: < seq1 >
#2: < seq2 > (keys)
#3: < prop >

280 \cs_new_protected:Nn \__ccool_seq_from_prop:NNn
281 {
282   \cs_set_protected:Nn \__ccool_seq_from_prop:n
283   {
284     \seq_gput_right:No #1 { \prop_item:cn{#3}{##1} }
285   }
286   \seq_map_function:NN #2 \__ccool_seq_from_prop:n
287 }

(End definition for \__ccool_seq_from_prop:NNn.)

```

```

\__ccool_erw_seq_use:Nn
288 % \begin{arguments}
289 % \item \meta{ seq }
290 % \item \meta{ tokens }
291 % \end{arguments}
292 \cs_new:Nn \__ccool_seq_use:Nn
293 {
294   \exp_last_unbraced:NNf
295   \seq_use:Nnnn #1
296   \__ccool_aux_separ:n{#2}
297 }

(End definition for \__ccool_erw_seq_use:Nn.)

```

9 Front-end

```

298 \keys_define:nn { __ccool }
299 {
300   Expans .multichoices:nn =
301   { eo, ee, ex, xo, xe, xx }
302   { \tl_gset_eq:NN \g__ccool_option_expans_tl \l_keys_choice_tl },
303   Expans .default:n = { xo },
304   Expans .initial:n = { xo },
305   File .code:n = { \tl_gset:Nn \g__ccool_log_file_tl{ \exp_not:n{ #1 } } },
306   File .default:n = { ccool\pdfcreationdate },
307   File .initial:n = { ccool\pdfcreationdate },
308   Name .code:n={
309     \__ccool_option_name:n{#1}

```

```

310 \exp_last_unbraced:Nf
311 \__ccool_make_ccool:nnnn
312 {
313   { \g__ccool_option_name_tl }
314   { \g__ccool_option_inner_tl }
315   { \g__ccool_option_separ_tl }
316   { \g__ccool_option_outer_tl }
317 }
318 },
319 Name .value_required:n = false,
320 Name .default:n = { Math },
321 Name .initial:n = { Math },
322 Inner .code:n={
323   \__ccool_option_inner:n{#1}
324   \exp_last_unbraced:Nf
325   \__ccool_make_ccool:nnnn
326   {
327     { \g__ccool_option_name_tl }
328     { \g__ccool_option_inner_tl }
329     { \g__ccool_option_separ_tl }
330     { \g__ccool_option_outer_tl }
331   }
332 },
333 Inner .value_required:n = false,
334 Inner .default:n = {####1},
335 Inner .initial:n = {####1},
336 Outer .code:n={
337   \__ccool_option_outer:n{#1}
338   \exp_last_unbraced:Nf
339   \__ccool_make_ccool:nnnn
340   {
341     { \g__ccool_option_name_tl }
342     { \g__ccool_option_inner_tl }
343     { \g__ccool_option_separ_tl }
344     { \g__ccool_option_outer_tl }
345   }
346 },
347 Outer .value_required:n = false,
348 Outer .default:n = { \ensuremath{####1} },
349 Outer .initial:n = { \ensuremath{####1} },
350 Write .code:n = {
351   \bool_if:nTF{#1}
352   {\__ccool_log_open:}
353   {\__ccool_log_close:}
354 },
355 Write .value_required:n = false,
356 Write .default:n = \BooleanFalse,
357 Write .initial:n = \BooleanFalse,
358 Separ .code:n={
359   \__ccool_option_separ:n{#1}
360   \exp_last_unbraced:Nf
361   \__ccool_make_ccool:nnnn
362   {
363     { \g__ccool_option_name_tl }

```

```

364     { \g__ccool_option_inner_tl }
365     { \g__ccool_option_separ_tl }
366     { \g__ccool_option_outer_tl }
367   }
368 },
369 Separ .value_required:n = false,
370 Separ .default:n = { {\ }and{\ } } { ,{\ } } { ,{\ }and{\ } },
371 Separ .initial:n = { {\ }and{\ } } { ,{\ } } { ,{\ }and{\ } }
372 }

```

\CcoolClear #1 : \langle *tl var name* \rangle

```

373 \NewDocumentCommand{ \CcoolClear }
374 { D<>{\g__ccool_option_name_tl} }
375 {
376   \__ccool_prop_clear_new_map:n{#1}
377 }

```

(End definition for \CcoolClear. This function is documented on page 5.)

\CcoolOption

```

378 \NewDocumentCommand{ \CcoolOption }
379 { m }
380 {
381   \keys_set:nn{ __ccool }{#1}
382 }

```

(End definition for \CcoolOption. This function is documented on page 5.)

\CcoolRead

```

383 \NewDocumentCommand{\CcoolRead}
384 {o}
385 {
386   \IfValueTF{#1}
387   {\__ccool_log_read:e{#1}}
388   {\__ccool_log_read:}
389 }

```

(End definition for \CcoolRead. This function is documented on page 6.)

10 Misc

```

390 \ExplSyntaxOff

```