

# The ccool package\*

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## Abstract

ccool stands for Custom COntent Oriented for L<sup>A</sup>T<sub>E</sub>X, a concept pioneered by cool[1]<sup>1</sup>. This is done using a minimalist interface built upon xparse[4]. 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{{~\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 “N” (and likewise for `\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 v1.8, last revised 2020/04/12.

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<sup>1</sup>Whereas cool provided predefined macros, ccool is tool for making custom macros.

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## Part I

# Usage

### Convention

1. Loosely, those of [2] and [4], 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`.

---

`\usepackage` `\usepackage{ccool}`

---

**Environment** *preamble*

**Requirement** `ccool.sty` is in the path of the L<sup>A</sup>T<sub>E</sub>X engine. See [Part III, section 4](#).

---

`\Ccool` `\Ccool<tl1>`  
`[\tl2]`  
`i{<code1>}`  
`{<kv1>}`  
`+`  
`*`  
`s{{<tl3>|{<tl3>}{<tl4>|{<tl3>}{<tl4>}{<tl5>}}`  
`o{<code2>}`  
`[\tl6]`

**Requirement** `<kv1>` is specified (all others optional).

`<tl1>`

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

**Semantics** Identifies a group of macros

`<tl2>`

**Example** `Let~`

**Semantics** Expands `<tl2>`

`<code1>`

**Example** `\mathbb{#1}`

**Semantics**

1. `<vali>`  $\leftarrow$  `<code1>` applied to `<vali>`

`<kv1>`

**Example** `Elms={\omega1, \dots, \omegan}`, `Sample=\Omega`

**Semantics**

2. `\<keyi><tl1>`  $\leftarrow$  `<vali>` 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  $\langle tl_3 \rangle$ ,  $\langle tl_4 \rangle$ ,  $\langle tl_5 \rangle$ .

 $\langle t l_3 \rangle$ 

**Example**  $\{\sim\backslash\text{in}\sim\}$

 $\langle t l_4 \rangle$ 

### Example $\{, \sim\}$

 $\langle t1_5 \rangle$ 

Example  $\{\sim\backslash\&\sim\}$

 $\langle code_2 \rangle$ 

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

 $\langle t l_6 \rangle$ 

**Semantics**  $\backslash \text{Cool} \langle \langle tl_1 \rangle \rangle [\langle tl_6 \rangle]$

```
\CcoolClear    \CcoolClear<<keyval list>>
```

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

---

---

\CcoolHook	\CcoolHook
------------	------------

**Example** \AfterEndEnvironment{theorem}{\CcoolHook}

```
\CcoolLambda \CcoolLambda[integer]{code}
```

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

**Semantics** Creates a lambda expression with  $\langle integer \rangle$  arguments for  $\langle code \rangle$

---

<code>\CcoolOption</code>	<code>\CcoolOption{<math>\langle kv10 \rangle</math>}</code>
---------------------------	--------------------------------------------------------------

**Semantics** Set default options for `\Ccool`

Expans

	<p><b>Default</b> <code>xo</code></p> <p><b>Syntax</b> Either of <code>eo</code>, <code>ee</code>, <code>ex</code>, <code>xe</code>, <code>xo</code>, <code>xe</code>, <code>xx</code></p>
File	<p><b>Default</b> <code>ccool\pdfcreationdate</code></p> <p><b>Syntax</b> Expands to a valid <i>path</i></p>
Inner	<p><b>Default</b> <code>####1</code></p> <p><b>Semantics</b> Default for <math>\langle code_1 \rangle</math></p> <p><b>Syntax</b> Use <code>####1</code> as the argument to be replaced</p>
Name	<p><b>Default</b> <code>Math</code></p> <p><b>Semantics</b> Default for <math>\langle tl_1 \rangle</math></p>
Outer	<p><b>Default</b> <code>\ensuremath{####1}</code></p> <p><b>Semantics</b> Default for <math>\langle code_2 \rangle</math></p> <p><b>Syntax</b> Use <code>####1</code> as the argument to be replaced</p>
Separ	<p><b>Default</b> <code>{ {\ }and{\ } } { ,{\ } } { ,{\ }and{\ } }</code></p> <p><b>Semantics</b> Default for <code>separators'</code> <i>parameter</i></p> <p><b>Syntax</b> That of ‘separators’ in [2, Section 8 of l3seq]</p>
Write	<p><b>Default</b> <code>\BooleanFalse</code></p> <p><b>Syntax</b> <i>Boolean</i></p>
<hr/> <hr/>	<p><b><code>\CcoolRead</code></b> <code>\CcoolRead[\langle path \rangle]</code></p>
	<p><b>Other</b> The default for <math>\langle path \rangle</math> is the last write-file (see <math>\langle kul_1 \rangle</math>)</p> <p><b>Semantics</b></p> <ol style="list-style-type: none"> <li>1. Reads the definitions in <math>\langle path \rangle</math>.</li> <li>2. Writes to <code>ccool.log</code>: ‘read from <math>\langle path \rangle</math>’</li> </ol>
<hr/> <hr/>	<p><b><code>\CcoolVers</code></b> <code>\CcoolVers</code></p>
	<p><b>Semantics</b> Expands to the package’s version</p>

## Do's and don't'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: `\Ccool{ F = \cal F }`.

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

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

## Part II

# Listing

### Listing 1.

```
% \CcoolVers
%
```

---

2020/04/12 v1.8 cool — Custom COnText Oriented for LaTeX

### Listing 2. Preamble<sup>a</sup>

<sup>a</sup>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 @ y
x \% y @ z
x & y
x & y
x & y & z
x, y & z
x, y & z
```

### Listing 4. Hello, world!<sup>a</sup>

<sup>a</sup>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 4 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 6 read from file.

```
% \CcoolRead \tab $\Omega$ $\mathcal{F}$ $\mathcal{P}$
%
```

---


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

Listing 8. Mittelwertsatz für  $n$  Variable

```
% \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 = { [x_0,x] } }+
% [$n\in\mathbb{N}$, $\mathcal{O}\subseteq\mathbb{R}^n$ eine offene Menge und
% $f\in C^1(\mathcal{O},\mathbb{R})$.
% Dann gibt es auf jeder Strecke $[x_0,x]$ einen
% Punkt $\xi\in[x_0,x]$
% { Steig = { \frac{ f(x)-f(x_0) }{ x-x_0 } }, Punkt = { \xi } }+
% [so dass gilt
% \begin{equation*}
% \text{Steig} = \text{grad } f(\xi)
% \end{equation*}
% \end{theorem}]
% {}
% (Check: $n$, $\xi$)
% \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:  $\mathbb{N}$ ,  $\xi$ )

Listing 9. Listing 8 read from file.

```
% \CcoolRead \tab $n$ $R$ $\mathcal{O}$ $Ci$ $Strecke$
%
```

---


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

#### Listing 10. Lambda expression.

```
% \CcoolOption{ Write = \BooleanTrue }
% \Ccool{ EvalAt = \CcoolLambda{(#1)}, ApplyOp =
% \CcoolLambda[2]{#1[#2]} }
% [Supposons une fonction  $f$ \EvalAt{t}$, et \etudions le probl\eme
% o\`u la fonctionnelle  $S$ \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 10 read from file.

```
% \CcoolRead \tab  $f$ \EvalAt{t}$,  $S$ \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{ $\LogWald_{\Time}\EvalAt{ \Scale } = \Scale\Process_{\Time}
% - \frac{1}{2}\Scale^2\Time$ ;
%  $\LogWaldInf_{\Time}\EvalAt{ \Scale } = \inf_{0 \leq s \leq \Time}
% \CUSUM_{s}\EvalAt{ \Scale }$ .}
% \item{ $\CUSUM_{\Time}\EvalAt{ \Scale } =
% \LogWaldInf_{\Time}\EvalAt{ \Scale } - \LogWald_{\Time}\EvalAt{
% \Scale } \geq 0$ , which is the CUSUM statistic process.}
% \item{ $\CUSUMst \EvalAt{ \Scale, \LogWaldInf } = \inf\left[ \Time
% \geq 0 \text{ \textit{SuchThat} } \CUSUM_{\Time}\EvalAt{\Scale} \geq \LogWaldInf
% \right]$ , 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:  $\lambda, y$ )

Listing 13. Listing 12 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 L<sup>A</sup>T<sub>E</sub>Xcommunity[6]. The implementations of `\CcoolLambda` and `Write` are based on answers by sean-allred[7] and frougon[9], respectively. Listing 8 is from tcolorbox[3, 17.3].

### 2 Install

Compiling `ccool.dtx`<sup>2</sup> 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

General Not possible to compile-check the expansion of a certain class of macros against pre-defined values[8]. Instead, one can visually check Part II, as generated in section 2 on one's own machine, against that of the repository for the same version.

Unix `ccool v1.8` satisfactory on

1. Linux version 4.15.0-20-generic (buildd@lgw01-amd64-039)<sup>3</sup>, with
2. pdfTeX 3.14159265-2.6-1.40.20 (TeX Live 2019)

## References

- [1] Nick Setzer *The cool package*, 2005, <https://www.ctan.org/pkg/cool>
- [2] The L<sup>A</sup>T<sub>E</sub>X3 Project Team *The L<sup>A</sup>T<sub>E</sub>X3 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>

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<sup>2</sup>Under Unix, `$tex ccool.dtx`

<sup>3</sup>`$cat /proc/version`

- [4] The L<sup>A</sup>T<sub>E</sub>X3 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] Erwann Rogard’s questions at [tex.stackexchange.com](https://tex.stackexchange.com/users/112708/erwann?tab=questions), <https://tex.stackexchange.com/users/112708/erwann?tab=questions>
- [7] “How to create lambda expressions?”, <https://tex.stackexchange.com/a/188053/112708>
- [8] “You can only carry out a string comparison for expandable material.”, <https://tex.stackexchange.com/a/534100/112708>
- [9] “Checking a function’s expansion against a string”, <https://tex.stackexchange.com/questions/536597>

## Part IV

# Implementation

```

1 <@@=ccool>
2 \NeedsTeXFormat{LaTeX2e}[2019/10/01]
3 \ExplSyntaxOn

```

### 1 aux

```

\__ccool_aux_inner_set:n #1: <code>

4 \cs_new_protected:Nn \__ccool_aux_inner_set:n
5 {
6   \cs_gset:Npn \__ccool_aux_inner:n ##1 {#1}
7   \cs_generate_variant:Nn \__ccool_aux_inner:n { e }
8 }

(End definition for \__ccool_aux_inner_set:n.)

\__ccool_aux_key:w #1: <key>
#2: <value>

9 \cs_new_protected:Npn \__ccool_aux_key:w #1 = #2 \q_stop
10 {
11   \seq_gput_right:Nx \g__ccool_aux_key_seq { \tl_trim_spaces:n{#1} }
12 }

(End definition for \__ccool_aux_key:w.)

\__ccool_aux_key:n #1: <key = value>

13 \cs_new_protected:Nn \__ccool_aux_key:n
14 {
15   \__ccool_aux_key:w #1 \q_stop
16 }

(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:NNn \g__ccool_aux_val_seq #1 { \__ccool_prop_name:n{#2} }
84 }

```

(End definition for \\_\_ccool\_aux\_val:Nn.)

## 2 lambda

```

\__ccool_lambda:nn
85 \cs_new_protected:Npn \__ccool_lambda:nn #1 #2
86 {%^A https://tex.stackexchange.com/a/188053/112708
87   \exp_args:NNx
88   \DeclareDocumentCommand \__ccool_lambda_expression
89   { \prg_replicate:nn { #1 } { m } }
90   {#2}
91   \__ccool_lambda_expression
92 }

```

(End definition for \\_\_ccool\_lambda:nn.)

### 3 log

\\_ccool\_log\_close:

```

93 \iow_new:N \g__ccool_log_iow
94 \AtEndDocument{\iow_close:N \g__ccool_log_iow}
95 \bool_set_false:N \g__ccool_log_open_bool
96 \cs_new_protected:Nn \_ccool_log_close:
97 {
98   \iow_close:N \g__ccool_log_iow
99   \bool_gset_false:N \g__ccool_log_open_bool
100 }

```

(End definition for \\_ccool\_log\_close:.)

\\_ccool\_log\_open:

```

101 \tl_new:N \g__ccool_log_file_tl
102 \cs_new_protected:Nn \_ccool_log_open:
103 {
104   \tl_gset:Nx \g__ccool_log_to_tl{\g__ccool_log_file_tl}
105   \iow_open:Nn \g__ccool_log_iow {\g__ccool_log_to_tl}
106   \bool_gset_true:N \g__ccool_log_open_bool
107 }

```

(End definition for \\_ccool\_log\_open:.)

\\_ccool\_log\_read:n #1 :  $\langle path \rangle$

```

108 \cs_new_protected:Nn \_ccool_log_read:n
109 {
110   \file_input:n{#1}
111   \tl_log:n{read~from~#1}
112 }
113 \cs_generate_variant:Nn \_ccool_log_read:n { e }

```

(End definition for \\_ccool\_log\_read:n.)

\\_ccool\_log\_read:

```

114 \cs_new_protected:Nn \_ccool_log_read:
115 {
116   \_ccool_log_read:e{\g__ccool_log_to_tl}
117 }

```

(End definition for \\_ccool\_log\_read:.)

\\_ccool\_log\_write:n

```

118 \tl_new:N \g__ccool_log_to_tl
119 \cs_new_protected:Nn \_ccool_log_write:n
120 {
121   \bool_if:nTF{ \g__ccool_log_open_bool }
122   {
123     \iow_now:Nn \g__ccool_log_iow {#1}
124     \tl_log:n{ write~to~#1 }
125   }
126   { \msg_error:nnnn{ __ccool }{ iow }{ \g__ccool_log_iow } }
127 }
128 \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 >

129 \cs_new_protected:Nn \__ccool_make_key:Nn
130 {
131   \exp_args:NNx
132   \ProvideDocumentCommand{#1}
133   { D<>{\g__ccool_option_name_tl} }
134   {
135     \__ccool_prop_item:nn{#1}{#2}
136   }
137 }
138 \cs_generate_variant:Nn \__ccool_make_key:Nn {c}

(End definition for \__ccool_make_key:Nn.)

__ccool_make_key:n #1 : < key >

139 \cs_new_protected:Nn \__ccool_make_key:n
140 {
141   \__ccool_make_key:cn{#1}{#1}
142 }
143 \cs_generate_variant:Nn \__ccool_make_key:n { e }

(End definition for \__ccool_make_key:n.)

__ccool_make_key:N #1 : < seq >

144 \cs_new_protected:Nn \__ccool_make_key:N
145 {
146   \seq_map_function:NN #1 \__ccool_make_key:e
147 }

(End definition for \__ccool_make_key:N.)

```

## 5 make\_ccool

```

__ccool_make_ccool_exp:nnn

148 \cs_new_protected:Nn \__ccool_make_ccool_exp:nnn
149 {
150   \__ccool_aux_val:Nn \g__ccool_aux_key_seq {#1}
151   \__ccool_aux_outer_set:n{#3}
152   \__ccool_aux_outer:n
153   {
154     \exp_args:NNf
155     \__ccool_seq_use:Nn
156     \g__ccool_aux_val_seq
157     {#2}
158   }
159 }

(End definition for \__ccool_make_ccool_exp:nnn.)

```

`\_ccool_make_ccool_key:nnn`

```

160 \cs_new_protected:Nn \_ccool_make_ccool_key:nnn
161 {
162   \_ccool_prop_if_exist:nTF{#1}
163   { \c_empty_tl }
164   { \_ccool_prop_new:n{#1} }
165   \exp_args:No \_ccool_aux_inner_set:n{#2}
166   \seq_set_from_clist:Nn \g__ccool_aux_keyval_seq {#3}
167   \_ccool_aux_prop:N \g__ccool_aux_keyval_seq
168   \_ccool_prop_append:Nn \g__ccool_aux_prop {#1}
169   \_ccool_aux_key:N \g__ccool_aux_keyval_seq
170   \_ccool_make_key:N \g__ccool_aux_key_seq
171 }

```

(End definition for `\_ccool_make_ccool_key:nnn`.)

`\_ccool_make_ccool_sideeffect:nnn`

```

172 \cs_new_protected:Nn \_ccool_make_ccool_sideeffect:nnn
173 {
174   \_ccool_make_ccool_key:nnn{#1}{#2}{#3}
175   \bool_if:nTF{ \g__ccool_log_open_bool }
176   {%~A https://tex.stackexchange.com/questions/536597
177     \_ccool_log_write:n
178     {
179       \begingroup
180       \def \_ccool_log_entry { \Ccool<#1>i{#2}{#3} } \expandafter
181       \endgroup \_ccool_log_entry
182     }
183   }\c_empty_tl}
184 }

```

(End definition for `\_ccool_make_ccool_sideeffect:nnn`.)

`\_ccool_make_ccool:nnnn` **#1** :  $\langle$  token list  $\rangle$   
**#2** :  $\langle$  seq<sub>1</sub>  $\rangle$   
**#3** :  $\langle$  seq<sub>2</sub>  $\rangle$   
**#4** :  $\langle$  prop  $\rangle$

```

185 \def\CcoolHook{\c_empty_tl}
186 \cs_new_protected:Npn \_ccool_make_ccool:nnnn #1 #2 #3 #4
187 {
188   \exp_args:NNx \DeclareDocumentCommand \Ccool
189   {%~A      2      3      4 5 6      7 8      9
190     D<>{#1} +o E{ i }{{#2}} m t+ s E{ s o }{{#3}{#4}} +o
191   }
192   {
193     \IfValueT{##2}{##2}
194     \_ccool_make_ccool_sideeffect:nnn{##1}{##3}{##4}
195     \IfBooleanT{##6}
196     {
197       \_ccool_make_ccool_exp:nnn{##1}{##7}{##8}
198     }
199     \bool_if:nTF{##5}
200     {
201       \gappto{\CcoolHook}

```

```

202     {
203       \__ccool_make_ccool_sideeffect:nnn{##1}{##3}{##4}
204     }
205   }
206   {\c_empty_tl}
207   \IfValueT{##9}
208   {
209     \exp_not:n{ \Ccool<##1>[##9] }
210   }
211 }
212 }

```

(End definition for \\_\_ccool\_make\_ccool:nnnn.)

## 6 msg

```

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

```

## 7 option

\\_\_ccool\_aux\_inner:n #1 : *<code>*

```

219 \cs_new_protected:Nn \__ccool_option_inner:n
220 {
221   \tl_gset:Nn \g__ccool_option_inner_tl {#1}
222 }
223 \__ccool_option_inner:n
224 {
225   \msg_warning:nnn{ __ccool }{ unset }{ \exp_not:N \g__ccool_option_inner_tl }
226 }

```

(End definition for \\_\_ccool\_aux\_inner:n.)

\\_\_ccool\_option\_name:n #1 : *<token list>*

```

227 \cs_new:Nn \__ccool_option_name:n
228 {
229   \tl_gset:Nn \g__ccool_option_name_tl{#1}
230 }
231 \__ccool_option_name:n
232 {
233   \msg_error:nnx{ __ccool }
234   { generic }
235   { \exp_not:N\g__ccool_option_name_tl~undefined }
236 }

```

(End definition for \\_\_ccool\_option\_name:n.)

```

\__ccool_option_outer:n #1 :  $\langle inline\ code \rangle$ 
237 \cs_new_protected:Nn \__ccool_option_outer:n
238 {
239   \tl_gset:Nn \g__ccool_option_outer_tl {#1}
240 }
241 \__ccool_option_outer:n
242 {
243   \msg_warning:nnn{__ccool}{unset}{\exp_not:N \g__ccool_option_outer_tl}
244 }

```

(End definition for \\_\_ccool\_option\_outer:n.)

```

\__ccool_option_separ:n #1 : { $\langle tl_1 \rangle$ }{ $\langle tl_2 \rangle$ }{ $\langle tl_3 \rangle$ }
245 \cs_new_protected:Nn \__ccool_option_separ:n
246 {
247   \cs_gset:Npn \g__ccool_option_separ_tl {#1}
248 }
249 \__ccool_option_separ:n
250 {
251   \msg_warning:nnn{__ccool}{unset}{\exp_not:N \g__ccool_option_separ_tl}
252 }

```

(End definition for \\_\_ccool\_option\_separ:n.)

## 8 prop

```

\__ccool_prop_append:NN #1 :  $\langle prop_1 \rangle$ 
#2 :  $\langle prop_2 \rangle$ 
253 \cs_new_protected:Npn \__ccool_prop_append:NN #1 #2
254 {
255   \cs_set:Nn \__ccool_prop_append:nn
256   {
257     \prop_gput:Nnx #1 {##1}{\prop_item:Nn #2{##1}}
258   }
259   \prop_map_function:NN #2 \__ccool_prop_append:nn
260 }
261 \cs_generate_variant:Nn \__ccool_prop_append:NN {cN}

```

(End definition for \\_\_ccool\_prop\_append:NN.)

```

\__ccool_prop_append:Nn #1 :  $\langle prop \rangle$ 
#2 :  $\langle tl\ var\ name \rangle$ 
262 \cs_new_protected:Nn \__ccool_prop_append:Nn
263 {
264   \__ccool_prop_append:cN{ \__ccool_prop_name:n {#2} } #1
265 }

```

(End definition for \\_\_ccool\_prop\_append:Nn.)

```

\__ccool_prop_clear_new:n #1 :  $\langle tl\ var\ name \rangle$ 
266 \cs_new_protected:Nn \__ccool_prop_clear_new:n
267 {
268   \exp_args:No \prop_clear_new:c{ \__ccool_prop_name:n {#1} }
269 }

```

(End definition for \\_ccool\_prop\_clear\_new:n.)

```
\_ccool_prop_clear_new_map:n #1 : < keyval list >
270 \cs_new_protected:Nn \_ccool_prop_clear_new_map:n
271 {
272   \seq_set_from_clist:Nn \g__ccool_aux_key_seq {#1}
273   \seq_map_function:NN \g__ccool_aux_key_seq \_ccool_prop_clear_new:n
274 }
```

(End definition for \\_ccool\_prop\_clear\_new\_map:n.)

```
\_ccool_prop_if_exist:nTF #1 : < tl_1 >
#2 : < tl_2 >
#3 : < tl_3 >
275 \cs_new:Nn \_ccool_prop_if_exist:nTF
276 {
277   \prop_if_exist:cTF{ \_ccool_prop_name:n {#1} }{#2}{#3}
278 }
```

(End definition for \\_ccool\_prop\_if\_exist:nTF.)

```
\_ccool_prop_item:nn #1 : < tl var name >
#2 : < key >
279 \cs_new:Nn \_ccool_prop_item:nn
280 {
281   \prop_item:cn { \_ccool_prop_name:n {#1} } {#2}
282 }
```

(End definition for \\_ccool\_prop\_item:nn.)

```
\_ccool_prop_name:n #1 : < tl var name >
283 \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 >
284 \cs_new_protected:Nn \_ccool_prop_new:n
285 {
286   \prop_new:c{ \_ccool_prop_name:n {#1} }
287 }
```

(End definition for \\_ccool\_prop\_new:n.)

## 9 seq

```

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

288 \cs_new_protected:Nn \__ccool_seq_from_prop:NNn
289 {
290   \cs_set_protected:Nn \__ccool_seq_from_prop:n
291   {
292     \seq_gput_right:No #1 { \prop_item:cn{#3}{##1} }
293   }
294   \seq_map_function:NN #2 \__ccool_seq_from_prop:n
295 }

```

(End definition for \\_\_ccool\_seq\_from\_prop:NNn.)

```

\__ccool_erw_seq_use:Nn

296 % \begin{arguments}
297 % \item \meta{ seq }
298 % \item \meta{ tokens }
299 % \end{arguments}
300 \cs_new:Nn \__ccool_seq_use:Nn
301 {
302   \exp_last_unbraced:NNf
303   \seq_use:Nnnn #1
304   \__ccool_aux_separ:n{#2}
305 }

```

(End definition for \\_\_ccool\_erw\_seq\_use:Nn.)

## 10 Front-end

```

306 \keys_define:nn { __ccool }
307 {
308   Expans .multichoices:nn =
309   { eo, ee, ex, xo, xe, xx }
310   { \tl_gset_eq:NN \g__ccool_option_expans_tl \l_keys_choice_tl },
311   Expans .default:n = { xo },
312   Expans .initial:n = { xo },
313   File .code:n = { \tl_gset:Nn \g__ccool_log_file_tl{ \exp_not:n{ #1 } } },
314   File .default:n = { ccool\pdfcreationdate },
315   File .initial:n = { ccool\pdfcreationdate },
316   Name .code:n={
317     \__ccool_option_name:n{#1}
318     \exp_last_unbraced:Nf
319     \__ccool_make_ccool:nnnn
320     {
321       { \g__ccool_option_name_tl }
322       { \g__ccool_option_inner_tl }
323       { \g__ccool_option_separ_tl }
324       { \g__ccool_option_outer_tl }
325     }
326   },

```



```

327 Name .value_required:n = false,
328 Name .default:n = { Math },
329 Name .initial:n = { Math },
330 Inner .code:n={
331   \__ccool_option_inner:n{#1}
332   \exp_last_unbraced:Nf
333   \__ccool_make_ccool:nnnn
334   {
335     { \g__ccool_option_name_tl }
336     { \g__ccool_option_inner_tl }
337     { \g__ccool_option_separ_tl }
338     { \g__ccool_option_outer_tl }
339   }
340 },
341 Inner .value_required:n = false,
342 Inner .default:n = {####1},
343 Inner .initial:n = {####1},
344 Outer .code:n={
345   \__ccool_option_outer:n{#1}
346   \exp_last_unbraced:Nf
347   \__ccool_make_ccool:nnnn
348   {
349     { \g__ccool_option_name_tl }
350     { \g__ccool_option_inner_tl }
351     { \g__ccool_option_separ_tl }
352     { \g__ccool_option_outer_tl }
353   }
354 },
355 Outer .value_required:n = false,
356 Outer .default:n = { \ensuremath{####1} },
357 Outer .initial:n = { \ensuremath{####1} },
358 Write .code:n = {
359   \bool_if:nTF{#1}
360   {\__ccool_log_open:}
361   {\__ccool_log_close:}
362 },
363 Write .value_required:n = false,
364 Write .default:n = \BooleanFalse,
365 Write .initial:n = \BooleanFalse,
366 Separ .code:n={
367   \__ccool_option_separ:n{#1}
368   \exp_last_unbraced:Nf
369   \__ccool_make_ccool:nnnn
370   {
371     { \g__ccool_option_name_tl }
372     { \g__ccool_option_inner_tl }
373     { \g__ccool_option_separ_tl }
374     { \g__ccool_option_outer_tl }
375   }
376 },
377 Separ .value_required:n = false,
378 Separ .default:n = { {\ }and{\ } } { ,{\ } } { ,{\ }and{\ } },
379 Separ .initial:n = { {\ }and{\ } } { ,{\ } } { ,{\ }and{\ } }
380 }

```

**\CcoolClear** #1 :  $\langle \text{tl var name} \rangle$

```

381 \NewDocumentCommand{ \CcoolClear }
382 { D<>{\g__ccool_option_name_tl} }
383 {
384   \__ccool_prop_clear_new_map:n{#1}
385 }

```

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

**\CcoolLambda**

```

386 \ProvideDocumentCommand \CcoolLambda { 0{1} m }
387 {
388   \__ccool_lambda:nn { #1 } { #2 }
389 }

```

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

**\CcoolOption**

```

390 \NewDocumentCommand{ \CcoolOption }
391 { m }
392 {
393   \keys_set:nn{ __ccool }{#1}
394 }

```

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

**\CcoolRead**

```

395 \NewDocumentCommand{\CcoolRead}
396 {o}
397 {
398   \IfValueTF{#1}
399   {\__ccool_log_read:e{#1}}
400   {\__ccool_log_read:}
401 }

```

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

**\CcoolVers**

```

402 \NewDocumentCommand{\CcoolVers}
403 {}
404 {\use:c{ver@ccool.sty}}

```

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

## 11 Misc

```

405 \ExplSyntaxOff

```

# Change History

v1.0	General: Initial version . . . . .	14	Added: <b>Expans</b> (for debugging' sake, but...) . . . . .	14
v1.1	General: Added: <b>Save</b> . . . . .	14	Added: Listing 1., 2., and 3. . . . .	14
	Added: Listing 1., 2., 3., 4., 6., and 9. . . . .	14	Deleted: Listing 1., and 2. . . . .	14
	Added: <b>\OpsRestore</b> . . . . .	14	Replaced: $s\{\langle tl_3 \rangle\}\{\langle tl_4 \rangle\}\{\langle tl_5 \rangle\}$ by $s\{\{\langle tl_3 \rangle\} \{\langle tl_3 \rangle\}\{\langle tl_4 \rangle\} \{\langle tl_3 \rangle\}\{\langle tl_4 \rangle\}\{\langle tl_5 \rangle\}\}$ . . . . .	14
	Added: <b>\OpsTest</b> . . . . .	14		
	Deleted: Listing 1-5 from v1.0 . . .	14	v1.5	General: Added: <b>File</b> . . . . .
	Fixed: apparent anomaly in v1.0's Listing 4, see Listing 3 . . . . .	14		Deleted: dependence on <b>datetime</b> . .
	Replaced: <b>\OpsOptions</b> by <b>\OpsOption</b> . .	14	v1.6	General: Added: Listing 2 (preamble) .
	Replaced: $\{\langle kvl_2 \rangle\}$ by $\langle kvl\_2 \rangle$ given that option type <b>G</b> not recommended[4] .	14		Renamed: <b>\OpsClear</b> to <b>\CcoolClear</b> . . . . .
	Replaced: <b>GenericObject</b> by <b>Name</b> . . .	14		Renamed: <b>\OpsDebug</b> to <b>\CcoolDebug</b> . . . . .
	Replaced: <b>Separators</b> by <b>Separ</b> . . .	14		Renamed: <b>\OpsHook</b> to <b>\CcoolHook</b> . . . . .
	Revamped: much of the implementation . . . . .	14		Renamed: <b>\OpsOption</b> to <b>\CcoolOption</b> . . . . .
v1.2	General: Deleted: <b>\OpsTest</b> . . . . .	14		Renamed: <b>\OpsRead</b> to <b>\CcoolRead</b> . . . . .
	Deleted: $\langle kvl_2 \rangle$ and $\langle code_2 \rangle$ . . . . .	14		Renamed: <b>\Ops</b> to <b>\Ccool</b> . . . . .
	Deleted: Listing 2-3 from v1.1. . . .	14		Renamed: <b>oops</b> to <b>ccool</b> (better describes the purpose) . . . . .
	Replaced: <b>\OpsClear</b> $\{\langle tl_1 \rangle\}$ by <b>\OpsClear</b> $[\langle keyval list \rangle]$ . . . . .	14	v1.7	General: Added: Co-author . . . . .
	Replaced: <b>\Restore</b> by <b>\Read</b> . . . .	14		Added: Legends to listings . . . . .
	Replaced: <b>\Save</b> by <b>\Write</b> . . . . .	14		Added: Listing 12 (CUSUM) . . . . .
v1.3	General: Replaced: <b>\OpsNew</b> by <b>\Ops</b> . .	14		Deleted: <b>\CcoolDebug</b> . . . . .
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	Added: <b>\OpsDebug</b> . . . . .	14		Added: <b>\CcoolVers</b> . . . . .
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