

The ccool package*

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Released 2020/04/12

Abstract

ccool stands for Custom COntent Oriented for L^AT_EX, a concept pioneered by cool[1]¹. 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, `$_\text{Nat}<Math>$` 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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¹Whereas cool provided predefined macros, ccool is tool for making macros, hence “custom”.

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Part I

Usage

Convention

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

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

Requirement

1. `ccool.sty` is in the path of the L^AT_EX engine. See [Part III, section 4](#).
2. Declare it in the *preamble*

<code>\Ccool</code>	<code>\Ccool<tl₁></code> <code>[\tl₂]</code> <code>if{code₁}</code> <code>{kv₁}</code> <code>+</code> <code>*</code> <code>s{\tl₃}\tl₃\tl₄\tl₃\tl₄\tl₅}</code> <code>of{code₂}</code> <code>[\tl₆]</code>
---------------------	---

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

`<kv1>`

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

Semantics

2. $\langle key_i \rangle \langle tl_1 \rangle \leftarrow \langle val_i \rangle$ 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 $\{\sim\backslash in\sim\}$

$\langle tl_4 \rangle$

Example $\{,\sim\}$

$\langle tl_5 \rangle$

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

$\langle code_2 \rangle$

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

$\langle tl_6 \rangle$

Semantics $\backslash Ccool<\langle tl_1 \rangle>[<\langle tl_6 \rangle]$

$\backslash CcoolClear$ $\backslash CcoolClear<\langle keyval list \rangle>$

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

$\backslash CcoolHook$ $\backslash CcoolHook$

Example $\backslash AfterEndEnvironment\{theorem\}\{\backslash CcoolHook\}$

$\backslash CcoolLambda$ $\backslash CcoolLambda[<\langle integer \rangle]\{\langle code \rangle\}$

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

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

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

Semantics Set default options for $\backslash Ccool$

Expans

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

Listing 2. Preamble^a

^aThese 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!^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 = {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[1, 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 = { [x_0,x] } }+
% [$n\in\mathbb{N}, \sim\mathcal{O}ffMenge\subseteq\mathbb{R}^n$ eine offene Menge und
% $f\in C^1(\mathcal{O}ffMenge, \mathbb{R})$.
% Dann gibt es auf jeder Strecke $\mathcal{S}\subseteq\mathcal{O}ffMenge$ einen
% Punkt $\xi\in\mathcal{S}$,~]
% { Steig = { \frac{ f(x)-f(x_0) }{ x-x_0 } }, Punkt = { \xi } }+
% [so dass gilt
% \begin{equation*}
% \quad \text{Steig} = \text{Grad } f(\text{Punkt})^{\top}
% \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} , ξ)

Listing 9. Listing 8 read from file.

```
% \CcoolRead \tab $N$ $R$ $\mathcal{O}ffMenge$ $\mathcal{C}i$ $\mathcal{S}trecke$
%
```

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

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: λ, 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^AT_EX community[6]. Specific attributions are made in the implementation and [References](#).

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

Technicality

Not possible to compile-check the expansion of a certain class of macros against predefined 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.

Platform and L^AT_EX engine

1. `ccool v1.8` satisfactory on/with

Linux version 4.15.0-20-generic (buildd@lgw01-amd64-039)
↔ pdfTeX 3.14159265-2.6-1.40.20 (TeX Live 2019)

Other

Check [\[5\]](#) for using `ccool` with `lncs`

²Under Unix, `$tex ccool.dtx`

References

- [1] Nick Setzer *The cool package*, 2005, <https://www.ctan.org/pkg/cool>
- [2] 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>
- [3] Thomas F. Sturm *The tcolorbox package*, 2019, <http://www.texdoc.net/texmf-dist/doc/latex/tcolorbox/tcolorbox.pdf>
- [4] The L^AT_EX3 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] User `erwann` at tex.stackexchange.com, <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] “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

```

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 [7]
85 \cs_new_protected:Npn \__ccool_lambda:nn #1 #2
86 {
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 : <path>

```

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 [9]

```

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       \begin{group}
180       \def \_ccool\_log\_entry { \Ccool<#1>i{#2}{#3} } \expandafter
181       \end{group} \_ccool\_log\_entry
182     }
183   }{\c\_empty\_tl}
184 }

```

(End definition for _ccool_make_ccool_sideeffect:nnn.)

_ccool_make_ccool:nnnn #1 : < token list >
 #2 : < seq₁ >
 #3 : < seq₂ >
 #4 : < prop >

```

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 : < inline code >

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 : {< tl1>}{< tl2>}{< tl3>}

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 : < prop1 >
#2 : < prop2 >

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 : < prop >
#2 : < tl var name >

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 : < tl var name >

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 : $\langle \textit{tl var name} \rangle$

```
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: Expans (for debugging' sake, but...)	14
v1.1	General: Added: Save	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: \OpsRestore	14	Replaced: $\mathfrak{s}\{\langle tl_3 \rangle\}\{\langle tl_4 \rangle\}\{\langle tl_5 \rangle\}$ by $\mathfrak{s}\{\{\langle tl_3 \rangle\} \{\langle tl_3 \rangle\}\{\langle tl_4 \rangle\} \{\langle tl_3 \rangle\}\{\langle tl_4 \rangle\}\{\langle tl_5 \rangle\}\}$	14
	Added: \OpsTest	14		
	Deleted: Listing 1-5 from v1.0 . . .	14	v1.5	General: Added: File
	Fixed: apparent anomaly in v1.0's Listing 4, see Listing 3	14		Deleted: dependence on datetime . .
	Replaced: \OpsOptions by \OpsOption . .	14	v1.6	General: Added: Listing 2 (preamble) .
	Replaced: $\{\langle kvl_2 \rangle\}$ by $\langle kvl_2 \rangle$ given that option type G not recommended[4] .	14		Renamed: \OpsClear to \CcoolClear
	Replaced: GenericObject by Name . . .	14		Renamed: \OpsDebug to \CcoolDebug
	Replaced: Separators by Separ . . .	14		Renamed: \OpsHook to \CcoolHook
	Revamped: much of the implementation	14		Renamed: \OpsOption to \CcoolOption
v1.2	General: Deleted: \OpsTest	14		Renamed: \OpsRead to \CcoolRead
	Deleted: $\langle kvl_2 \rangle$ and $\langle code_2 \rangle$	14		Renamed: \Ops to \Ccool
	Deleted: Listing 2-3 from v1.1. . . .	14		Renamed: oops to ccool (better describes the purpose)
	Replaced: \OpsClear $\{\langle tl_1 \rangle\}$ by \OpsClear $[\langle keyval list \rangle]$	14	v1.7	General: Added: Legends to listings . .
	Replaced: \Restore by \Read	14		Added: Listing 12 (CUSUM)
	Replaced: \Save by \Write	14		Deleted: \CcoolDebug
v1.3	General: Replaced: \OpsNew by \Ops . .	14		Deleted: Listing 5 from v1.6
	Replaced: $\{\langle tl_1 \rangle\}$ and $[\langle tl_1 \rangle]$ by $\langle tl_1 \rangle$	14	v1.8	General: Added: \CcoolLambda
v1.4	General: Added: section 9	14		Added: \CcoolVers
	Added: \OpsDebug	14		Added: Listing 10, Listing 11
	Added: \OpsHook	14		Added: Listing 1

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$\langle code_2 \rangle$ (option)	$\langle tl_5 \rangle$ (option)	5

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