beamer named overlay specifications with beanoves

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Abstract

This package allows the management of multiple named overlay specifications in beamer documents. Named overlay specifications are very handy both during edition and to manage complex and variable beamer overlay specifications. In particular, they allow to replace raw numbers in beamer `<...>` overlay specifications by logical identifiers. Demonstration files are available for download as part of the development repository. This is a solution to this `latex.org` forum query.

Contents

1 Installation

1.1 Package manager

When not already available, beanoves package may be installed using a TEX distribution's package manager, either from the graphical user interface, or with the relevant command (`tlmgr` for TEX Live and `mpm` for MiKTEX). This should install files beanoves.sty and its debug version beanoves-debug.sty as well as beanoves-doc.pdf documentation.

1.2 Manual installation

The beanoves source files are available from the source repository. They can also be fetched from the CTAN repository.

1.3 Usage

The beanoves package is imported by putting `\RequirePackage{beanoves}` in the preamble of a LaTeX document that uses the beamer class. Should the package cause problems, its features can be temporarily deactivated with simple commands `\BeanovesOff` and `\BeanovesOn`.

2 Minimal example

The LaTeX document below is a contrived example to show how the `beamer` overlay specifications have been extended. More demonstration files are available from the beanoves source repository.

```
1  \documentclass{beamer}
2  \RequirePackage{beanoves}
3  \begin{document}
4  \Beanoves {
5  A = 1:4,
6  B = A.last::3,
7  C = B.next,
8  }
9  \begin{frame}
10 {\Large Frame \insertframenumber}
11 {\Large Slide \insertslidenumber}
12 - \visible<?(A.1)> {Only on slide 1}\\
13 - \visible<?(B.range)> {Only on slides 4 to 6}\\
14 - \visible<?(C.1)> {Only on slide 7}\\
15 - \visible<?(A.2)> {Only on slide 2}\\
16 - \visible<?(B.2:B.last)> {Only on slides 5 to 6}\\
17 - \visible<?(C.2)> {Only on slide 8}\\
18 - \visible<?(A.next)-> {From slide 5}\\
19 - \visible<?(B.3:B.last)> {Only on slide 6}\\
20 - \visible<?(C.3)> {Only on slide 9}\\
21 \end{frame}
22 \end{document}
```

On line 4, we use the `\Beanoves` command to declare *named overlay sets*. On line 5, we declare an overlay set named 'A', which is a range starting at slide 1 and ending at slide 4. On line 12, the extended *named overlay specification* `?(A.1)` stands for 1 because 1 is the first index of the overlay set named A. On line 15, `?(A.2)` stands for 2 whereas on line 18, `?(A.next)` stands for 5. On line 6, we declare a second overlay set named 'B', starting after the 3 slides of 'A' namely 4. Its length is 3 meaning that its last slide number is 6, thus each `?(B.last)` is replaced by 6. The next slide number after slide range 'B' is 7 which is also the start of the third slide range due to line 7.

3 Named overlay sets

3.1 Presentation

Within a beamer frame, there are different slides that appear in turn according to overlay specifications. The main overlay set is a range of integers covering all the slide numbers, from one to the total amount of slides. In general, an overlay set is a range of positive integers identified by a unique name. The main practical interest is that such sets may be defined relative to one another, we can even have lists of overlay sets. Finally, we can use these lists to build and organize beamer overlay specifications logically.

3.2 Named overlay reference

`A.1`, `C.2` are *named overlay references*, as well as `A` and `Y/C.2`. More precisely, they are string identifiers, each one referencing a well defined static integer or range to be used in beamer overlay specifications. They can take one of the next forms.

⟨***short name***⟩ : like `A` and `C`,

⟨***frame id***⟩`!`⟨***short name***⟩ : denoted by *qualified names*, like `X/A` and `Y/C`.

⟨***short name***⟩⟨***dotted path***⟩ : denoted by *dotted names* like `A.1` and `B.C.2`,

⟨***frame id***⟩`!`⟨***short name***⟩⟨***dotted path***⟩ : denoted by *qualified dotted names* like `X!A.1` and `Y!B.C.2`.

The *short names* and *frame ids* are alphanumerical case sensitive identifiers, with possible underscores but with no space nor leading digit. Unicode symbols above `U+00A0` are allowed if the underlying TEX engine supports it. Only the *frame id* is allowed to be empty, in which case it may apply to any frame.

The *dotted path* is a string `.`⟨c_1⟩`.`⟨c_2⟩`....`⟨c_j⟩. Each component ⟨c_i⟩ denotes a ⟨***short name***⟩ or a decimal integer. The *dotted path* can be empty for which j is 0.

Identifiers consisting only of lowercase letters may have special meaning as detailed below. This includes components ⟨*c*⟩s, unless explicitly documented like for "`n`".

The mapping from *named overlay references* to integers is defined at the global TEX level to allow its use in `\begin{frame}<...>` and to share the same overlay sets between different frames. Hence the *frame id* due to the need to possibly target a particular frame.

3.3 Defining named overlay sets

In order to define *named overlay sets*, we can either execute the next `\Beanoves` command before a beamer frame environment, or use the new `beanoves` option of this environment.

`\Beanoves`
`\Beanoves*`

`\Beanoves{`⟨ref_1⟩`[=`⟨$spec_1$⟩`], `⟨ref_2⟩`[=`⟨$spec_2$⟩`],..., [`⟨ref_j⟩`=`⟨$spec_j$⟩`]}`

`beanoves`

`beanoves = {`⟨ref_1⟩`[=`⟨$spec_1$⟩`], `⟨ref_2⟩`[=`⟨$spec_2$⟩`],..., `⟨ref_j⟩`[=`⟨$spec_j$⟩`]}`

Each ⟨ref_i⟩ key is a *named overlay reference* whereas each ⟨***spec***⟩ value is an *overlay set specifier*. When the same ⟨*a*⟩ key is used multiple times, only the last one is taken into account.

Notice that ⟨*ref*$_i$⟩`=1` can be shortened to ⟨*ref*$_i$⟩. The `\Beanoves` arguments take precedence over both the `\Beanoves*` arguments and the `beanoves` options. This allows to provide an overlay name only when not already defined, which is helpfull when the very same frame source is included multiple times in different contexts.

3.3.1 Basic specifiers

In the possible values for ⟨*spec*⟩ hereafter, ⟨*value*⟩, ⟨*first*⟩, ⟨*length*⟩ and ⟨*last*⟩ are numerical expression (with algebraic operators +, −, ...) possibly involving any *named overlay reference* defined above.

⟨*value*⟩**,** the simple *value specifiers* for the whole signed integers set. If only the ⟨*key*⟩ is provided, the ⟨*value*⟩ defaults to 1.

⟨*first*⟩`:` **and** ⟨*first*⟩`::`**,** for the infinite range of signed integers starting at and including ⟨*first*⟩.

⟨*first*⟩`:`⟨*last*⟩**,** ⟨*first*⟩`::`⟨*length*⟩**,** `:`⟨*last*⟩`::`⟨*length*⟩**,** `::`⟨*length*⟩`:`⟨*last*⟩**,** are variants for the finite range of signed integers starting at and including ⟨*first*⟩, ending at and including ⟨*last*⟩. At least one of ⟨*first*⟩ or ⟨*last*⟩ must be provided. We always have ⟨*first*⟩ + ⟨*length*⟩ = ⟨*last*⟩ + 1.

`:`⟨*last*⟩**,** a shortcut for `1:`⟨*last*⟩.

When performed at the document level, the `\Beanoves` command starts by cleaning what was set by previous calls. When performed inside LaTeX environments, each new call cumulates with the previous one. Notice that the argument of this function can contain macros: they will be exhaustively expanded at resolution time[1].

3.3.2 List specifiers

Also possible values are *list specifiers* which are comma separated lists of ⟨*path*⟩`=`⟨*spec*⟩ definitions. They come in three different flavours.

The definition

⟨*a*⟩`={`⟨*path*$_1$⟩`=`⟨*spec*$_1$⟩`,` ⟨*path*$_2$⟩`=`⟨*spec*$_2$⟩`,...,` ⟨*path*$_j$⟩`=`⟨*spec*$_j$⟩`}`

removes previous ⟨*a*⟩ index definitions, and executes

⟨*a*⟩`.`⟨*path*$_1$⟩`=`⟨*spec*$_1$⟩`,`
⟨*a*⟩`.`⟨*path*$_2$⟩`=`⟨*spec*$_2$⟩`,`
`...,`
⟨*a*⟩`.`⟨*path*$_j$⟩`=`⟨*spec*$_j$⟩`.`

The rules above can apply individually to each line. The ⟨*a*⟩ counter defined below is left unmodified. If `=`⟨*spec*$_j$⟩ is omitted, it defaults to `=1`.

The definition

⟨*a*⟩`=[`⟨*path*$_1$⟩`=`⟨*spec*$_1$⟩`,` ⟨*path*$_2$⟩`=`⟨*spec*$_2$⟩`,...,` ⟨*path*$_j$⟩`=`⟨*spec*$_j$⟩`]`

is similar to the previous list, except that what can be omitted is ⟨*path*$_j$⟩`=`, which defaults to ⟨*i*⟩`=` where ⟨*i*⟩ is the smallest positive integer such that ⟨*a*⟩`.`⟨*i*⟩ is not already defined.

Finally, the definition

⟨*a*⟩`={{`⟨*spec*$_1$⟩`,` ⟨*spec*$_2$⟩`,...,` ⟨*spec*$_j$⟩`}}`

corresponds to beamer range specifier.

[1] Precision is needed for the exact time when the expansion occurs.

4 Resolution of `?(...)` query expressions

This is the key feature of the beanoves package, extending beamer *overlay specifications* normally included between pointed brackets. Before the *overlay specifications* are processed by the beamer class, the beanoves package scans them for any occurrence of '`?(`⟨*queries*⟩`)`'. Each one is then evaluated and replaced by its resolved static counterpart. The overall result is finally forwarded to the beamer class.

The ⟨*queries*⟩ argument is a comma separated list of individual ⟨*query*⟩'s processed from left to right as explained below. Notice that nesting a `?(...)` query expressions inside another query expression is not supported.

The named overlay sets defined above are queried for integer numerical values that will be passed to beamer. Turning an *overlay query* into the static expression it represents, as when above `?(A.1)` was replaced by `1`, is denoted by *overlay query resolution* or simply *resolution*. The process starts by replacing any *query reference* by its value as explained below until obtaining numerical expressions that are evaluated and finally rounded to the nearest integer to feed beamer with either a range or a number. When the *query reference* is a previously declared ⟨*a*⟩, like `X` after `X=1`, it is simply replaced by the corresponding declared ⟨*value*⟩, here `1`. Otherwise, we use *implicit overlay queries* and their *resolution rules* depending on the definition of the named overlay set. Hereafter ⟨*i*⟩ denotes a signed integer whereas ⟨*value*⟩, ⟨*first*⟩, ⟨*last*⟩ and ⟨*length*⟩ stand for raw integers or more general numerical expressions. We assume that ⟨*first*⟩ ≤ ⟨*last*⟩ and ⟨*length*⟩ ≥ 0.

Resolution occurs only when required and the result is cached for performance reason.

4.1 Number and range overlay queries

⟨`a`⟩ `=` ⟨*value*⟩ For an unlimited range

overlay query	resolution
⟨`a`⟩`.1`	⟨*value*⟩
⟨`a`⟩`.2`	⟨*value*⟩ + 1
⟨`a`⟩`.`⟨*i*⟩	⟨*value*⟩ + ⟨*i*⟩ − 1

⟨`a`⟩ `=` ⟨*first*⟩`:` as well as ⟨*first*⟩`::`. For a range limited from below:

overlay query	resolution
⟨`a`⟩`.1`	⟨*first*⟩
⟨`a`⟩`.2`	⟨*first*⟩ + 1
⟨`a`⟩`.`⟨*i*⟩	⟨*first*⟩ + ⟨*i*⟩ − 1
⟨`a`⟩`.previous`	⟨*first*⟩ − 1
⟨`a`⟩`.first`	⟨*first*⟩

Notice that ⟨*a*⟩`.previous` and ⟨*a*⟩`.0` are most of the time synonyms.

⟨`a`⟩ `=` `:`⟨*last*⟩ For a range limited from above:

overlay query	resolution
⟨`a`⟩`.1`	⟨*last*⟩
⟨`a`⟩`.0`	⟨*last*⟩ − 1
⟨`a`⟩`.`⟨*i*⟩	⟨*last*⟩ + ⟨*i*⟩ − 1
⟨`a`⟩`.last`	⟨*last*⟩
⟨`a`⟩`.next`	⟨*last*⟩ + 1

⟨a⟩ = ⟨first⟩:⟨last⟩ as well as variants ⟨first⟩::⟨length⟩, ::⟨length⟩:⟨last⟩ or :⟨last⟩::⟨length⟩, which are equivalent provided ⟨first⟩+⟨length⟩ = ⟨last⟩+1.

For a range limited from both above and below:

overlay query	resolution
⟨a⟩.1	⟨first⟩
⟨a⟩.2	⟨first⟩ + 1
⟨a⟩.⟨i⟩	⟨first⟩ + ⟨i⟩ − 1
⟨a⟩.previous	⟨first⟩ − 1
⟨a⟩.first	⟨first⟩
⟨a⟩.last	⟨last⟩
⟨a⟩.next	⟨last⟩ + 1
⟨a⟩.length	⟨length⟩
⟨a⟩.range	max(0, ⟨first⟩) ''-'' max(0, ⟨last⟩)

Notice that the resolution of ⟨a⟩.range is not an algebraic difference, and negative integers do not make sense there while in beamer context.

In the frame example below, we use the \BeanovesResolve command for the demonstration. It is mainly used for debugging and testing purposes.

```
\Beanoves {
A = 3:8, % or similarly A = 3::6, A = ::6:8 and A = :8::6
}
\begin{frame} {Frame \insertframenumber} {Slide \insertslidenumber}
\ttfamily
\BeanovesResolve[show](A.1)        == 3,
\BeanovesResolve[show](A.-1)       == 1,
\BeanovesResolve[show](A.previous) == 2,
\BeanovesResolve[show](A.first)    == 3,
\BeanovesResolve[show](A.last)     == 8,
\BeanovesResolve[show](A.next)     == 9,
\BeanovesResolve[show](A.length)   == 6,
\BeanovesResolve[show](A.range)    == 3-8,
\end{frame}
```

For example both ?(A.next), ?(A.last+1), ?(A.1+A.length) give the same result as soon as the slide range named 'A' has been properly defined with a starting value and a length, and not overriden by some rule below.

4.2 Counters

Each named overlay set defined has a dedicated value counter which is some kind of integer variable that can be used and incremented. A standalone ⟨name⟩ *overlay query* is resolved into the position of this value counter. For each frame, this variable is initialized to the first available resolution amongst ⟨value⟩, ⟨name⟩.first, ⟨name⟩.1 or ⟨name⟩.last. If none is available, the counter is initialized to 1.

Additionnaly, resolution rules are provided for dedicated *overlay queries*:

⟨*name*⟩=⟨*integer expression*⟩, resolve ⟨*integer expression*⟩ into ⟨*integer*⟩, set the value counter to ⟨*integer*⟩ and use the new position. Here ⟨*integer expression*⟩ is the longest character sequence with no space[2].

⟨*name*⟩+=⟨*integer expression*⟩, resolve ⟨*integer expression*⟩ into ⟨*integer*⟩, advance the value counter by ⟨*integer*⟩ and use the new position.

++⟨*name*⟩, advance the value counter for ⟨*name*⟩ by 1 and use the new position.

⟨*name*⟩++, use the actual position and advance the value counter for ⟨*name*⟩ by 1.

For each named overlay set defined, we also have an implicit index counter always starting at 1, its actual value is an integer denoted ⟨*n*⟩ in the sequel. The ⟨*name*⟩.n *named index reference* is resolved into ⟨*name*⟩.⟨*n*⟩, which in turn is resolved according to the preceding rules.

We have resolution rules as well for the *named index references*:

⟨*name*⟩.n=⟨*integer expression*⟩, resolve ⟨*integer expression*⟩ into ⟨*integer*⟩, set the implicit index counter associate to ⟨*name*⟩ to ⟨*integer*⟩ and use the resolution of ⟨*name*⟩.n.

Here again, ⟨*integer expression*⟩ denotes the longest character sequence with no space.

⟨*name*⟩.n+=⟨*integer expression*⟩, resolve ⟨*integer expression*⟩ into ⟨*integer*⟩, advance the implicit index counter associate to ⟨*name*⟩ by ⟨*integer*⟩ and use the resolution of ⟨*name*⟩.n.

⟨*name*⟩.++n, ++⟨*name*⟩.n, advance the implicit index counter associate to ⟨*key*⟩ by 1 and use the resolution of ⟨*name*⟩.n,

⟨*name*⟩.n++, use the resolution of ⟨*name*⟩.n and increment the implicit index counter associate to ⟨*name*⟩ by 1.

In order to decrement a counter, one can increment with a negative value, no dedicated syntax is provided yet.

These counters are reset to their default value for each new frame, which is 1 for the ⟨*name*⟩.n counter, and whichever ⟨*name*⟩ first or last value is defined for the ⟨*name*⟩ counter. Sometimes, resetting the counter manually is necessary, for example when managing tikz overlay material.

\BeanovesReset `\BeanovesReset [⟨options⟩] {⟨ref$_1$⟩[=⟨spec$_1$⟩], ⟨ref$_2$⟩[=⟨spec$_2$⟩],..., ⟨ref$_j$⟩[=⟨spec$_j$⟩]}`

This command is very similar to \Beanoves, except that a standalone ⟨*ref*$_i$⟩ resets the counter to its default value and that it is meant to be used inside a `frame` environment. When the `all` option is provided, some internals that were cached for performance reasons are cleared.

[2]The parser for algebraic expression is very rudimentary.

4.3 Dotted paths

In previous overlay queries, ⟨*name*⟩ can be formally replaced by ⟨*name*⟩.⟨c_1⟩.⟨c_2⟩...⟨c_j⟩. If the whole does not correspond to a definition or an assignment, the longest included qualified dotted name ⟨*name*⟩.⟨c_1⟩.⟨c_2⟩...⟨c_k⟩ where 0≤k≤j is first replaced by its definition ⟨*name'*⟩.⟨c'_1⟩...⟨c'_l⟩ if any and then the modified overlay query is resolved with preceding rules as well as this one. For example, with `\Beanoves{A.B=D, D.C=E}`, `A.B.C` is resolved like `E`.

4.4 The beamer counters

While inside a `frame` environment, it is possible to save the current value of the `beamerpauses` counter that controls whether elements should appear on the current slide. For that, we can execute one of `\Beanoves{`⟨*a*⟩`=pauses}` or in a query `?(...(`⟨*a*⟩`=pauses)...)`. Then later on, we can use `?(...`⟨*a*⟩`...)` to refer to this saved value in the same frame[3]. Next frame source is an example of usage.

```
1 \begin{frame}
2 \visible<+->{A}\\
3 \visible<+->{B\Beanoves{afterB=pauses}}\\
4 \visible<+->{C}\\
5 \visible<?(afterB)>{other C}\\
6 \visible<?(afterB.previous)>{other B}\\
7 \end{frame}
```

"A" first appears on slide 1, "B" on slide 2 and "C" on slide 3. On line 2, `afterB` takes the value of the `beamerpauses` counter once updated, *id est* 3. "B" and "other B" as well as "C" and "other C" appear at the same time. If the `beamerpauses` counter is not suitable, we can execute instead one of `\Beanoves{`⟨*a*⟩`=slideinframe}` or in a query `?(...(`⟨*a*⟩`=slideinframe)...)`. It uses the numerical value of `\insertslideinframe`.

4.5 Multiple queries

It is possible to replace the comma separated list `?(`⟨$query_1$⟩`),...?(`⟨$query_j$⟩`)` with the shorter `?(`⟨$query_1$⟩`,...`⟨$query_j$⟩`)`.

4.6 Frame id

Except for very special situations, the *frame ids* can be left unspecified. When no *frame id* was explicitly provided, beanoves uses the *last frame id*. At the beginning of each frame, the *last frame id* is set to the *frame id* of the current frame, which is denoted *current frame id* and is empty by default. Then it gets updated after each named reference resolution. For example, the first time `A.1` reference is resolved within a given frame, it is first translated to ⟨*current frame id*⟩`!A.1`, but when used just after `Y!C.2`, for example, it becomes a shortcut to `Y!A.1` because the *last frame id* is then `Y`.

In order to set the *frame id* of the current frame to ⟨*frame id*⟩, use the new `beanoves id` option of the beamer frame environment.

`beanoves id` `beanoves id=`⟨*frame id*⟩`,`

[3] See stackexchange for an alternative that needs at least two passes.

We can use the same ⟨*frame id*⟩ for different frames to share named overlay sets. When a query contains an undefined *qualified dotted name* with an explicit ⟨*frame id*⟩, the resolution uses instead the *qualified dotted name* with an empty ⟨*frame id*⟩ instead, if possible. For example, if `X!A` is not defined, `!A` is used instead.

4.7 Resolution command

`\BeanovesResolve` `\BeanovesResolve [⟨setup⟩] {⟨overlay queries⟩}`

This function resolves the ⟨*overlay queries*⟩, which are like the argument of `?(...)` instructions: a comma separated list of single ⟨*overlay query*⟩'s. The optional ⟨*setup*⟩ is a key–value:

`show` the result is left into the input stream

`in:N=`⟨*command*⟩ the result is stored into ⟨*command*⟩.

5 Support

See the source repository. One can report issues there.

6 Implementation

Identify the internal prefix (LaTeX3 DocStrip convention, unused).

```
1 ⟨MY=bnvs⟩
```

Reserved namespace: identifiers containing the case insensitive string `beanoves` or containing the case insensitive string `bnvs` delimited by two non characters.

6.1 Package declarations

```
2 \NeedsTeXFormat{LaTeX2e}[2020/01/01]
3 \ProvidesExplPackage
4   {beanoves}
5   {2024/01/11}
6   {1.0}
7   {Named overlay specifications for beamer}
```

6.2 Facility layer: definitions and naming

In order to make the code shorter and easier to read during development, we add a layer over LaTeX3. The `c` and `v` argument specifiers take a slightly different meaning when used in a function which name contains with `bnvs` or `BNVS`. Where LaTeX3 would transform `l__bnvs_ref_tl` into `\l__bnvs_ref_tl`, `bnvs` will directly transform `ref` into `\l__bnvs_ref_tl`. The type of the local variable used depends on the context and may be `seq` or `int` for example. There are however a pair of exceptions mentionned below. For a better reading experience, '`ref`' will generally stand for `\l__bnvs_ref_tl`, whereas '`path` sequence' will generally stand for `\l__bnvs_path_seq`. Other similar shortcuts are used as well.

Functions with BNVS in their names are management functions. They belong to a deeper layer and do not contain any logic specific to the beanoves package.

\BNVS:c	\BNVS:c {⟨*cs core name*⟩}
\BNVS_l:cn	\BNVS_l:cn {⟨*local variable core name*⟩} {⟨ *type* ⟩}
\BNVS_g:cn	\BNVS_g:cn {⟨*global variable core name*⟩} {⟨ *type* ⟩}

These are naming functions.

```
\cs_new:Npn \BNVS:c    #1    { __bnvs_#1     }
\cs_new:Npn \BNVS_l:cn #1 #2 { l__bnvs_#1_#2 }
\cs_new:Npn \BNVS_g:cn #1 #2 { g__bnvs_#1_#2 }
```

\BNVS_use_raw:c	\BNVS_use_raw:c {⟨*cs name*⟩}
\BNVS_use_raw:Nc	\BNVS_use_raw:Nc ⟨*function*⟩ {⟨*cs name*⟩}
\BNVS_use_raw:nc	\BNVS_use_raw:nc {⟨*tokens*⟩} {⟨*cs name*⟩}
\BNVS_use:c	\BNVS_use:c {⟨*cs core*⟩}
\BNVS_use:Nc	\BNVS_use:Nc ⟨*function*⟩ {⟨*cs core*⟩}
\BNVS_use:nc	\BNVS_use:nc {⟨*tokens*⟩} {⟨*cs core*⟩}

\BNVS_use_raw:c is a wrapper over \use:c. possibly prepended with some code. It needs 3 expansion steps just like \BNVS_use:c. The other are used to expand \use:c enough before usage by ⟨*function*⟩ or ⟨*tokens*⟩. The first argument of ⟨*function*⟩ has type N. The next token after ⟨*tokens*⟩ will have type N too. ⟨*cs name*⟩ is a full cs name whereas ⟨*cs core*⟩ will be prepended with the appropriate prefix.

```
\cs_new:Npn \BNVS_use_raw:N #1 { #1 }
\cs_new:Npn \BNVS_use_raw:c #1 {
  \exp_last_unbraced:No
  \BNVS_use_raw:N { \cs:w #1 \cs_end: }
}
\cs_new:Npn \BNVS_use:c #1 {
  \BNVS_use_raw:c { \BNVS:c { #1 } }
}

\cs_new:Npn \BNVS_use_raw:NN #1 #2 {
  #1 #2
}
\cs_new:Npn \BNVS_use_raw:nN #1 #2 {
  #1 #2
}
\cs_new:Npn \BNVS_use_raw:Nc #1 #2 {
  \exp_last_unbraced:NNo
  \BNVS_use_raw:NN #1 { \cs:w #2 \cs_end: }
}
\cs_new:Npn \BNVS_use_raw:nc #1 #2 {
  \exp_last_unbraced:Nno
  \BNVS_use_raw:nN { #1 } { \cs:w #2 \cs_end: }
}
\cs_new:Npn \BNVS_use:Nc #1 #2 {
  \BNVS_use_raw:Nc #1 { \BNVS:c { #2 } }
}
```

```
\cs_new:Npn \BNVS_use:nc #1 #2 {
  \BNVS_use_raw:nc { #1 } { \BNVS:c { #2 } }
}
\cs_new:Npn \BNVS_tl_use:nvv #1 #2 {
  \BNVS_tl_use:nv { \BNVS_tl_use:nv { #1 } { #2 } }
}
\cs_new:Npn \BNVS_tl_use:nvvv #1 #2 {
  \BNVS_tl_use:nvv { \BNVS_tl_use:nv { #1 } { #2 } }
}

\cs_new:Npn \BNVS_log:n #1 { }
\cs_generate_variant:Nn \BNVS_log:n { x }
```

`\BNVS_DEBUG_on:n` `\BNVS_DEBUG_on:n {⟨type⟩}`
`\BNVS_DEBUG_off:n` `\BNVS_DEBUG_off:n {⟨type⟩}`
`\BNVS_DEBUG_push:n` `\BNVS_DEBUG_push:n {⟨types⟩}`
`\BNVS_DEBUG_pop:` `\BNVS_DEBUG_pop:`

These functions are only available in debug mode. Manage debug messaging for one given ⟨*type*⟩ or ⟨*types*⟩. The implementation is not publicly exposed.

```
\cs_new:Npn \BNVS_DEBUG:c #1 {
  BNVS_DEBUG~#1~
}
\cs_new:Npn \BNVS_DEBUG_on:n #1 {
  \tl_if_empty:nT { #1 } {
    \typein { Empty~argument~not~allowed }
  }
  \cs_set:cpn { \BNVS_DEBUG:c { #1 } log:n } { \BNVS_log:n }
  \cs_generate_variant:cn { \BNVS_DEBUG:c { #1 } log:n } { x }
}

\cs_new:Npn \BNVS_DEBUG_off:n #1 {
  \cs_set:cpn { \BNVS_DEBUG:c { #1 } log:n } { \use_none:n }
}
\seq_new:N \l_BNVS_DEBUG_push_n_seq
\cs_new:Npn \BNVS_DEBUG_push:n #1 {
  \tl_if_empty:nT { #1 } {
    \typein { Empty~argument~not~allowed }
  }
  \tl_map_inline:nn { #1 } {
    \BNVS_DEBUG_on:n { ##1 }
  }
  \seq_put_left:Nn \l_BNVS_DEBUG_push_n_seq {
    \tl_map_inline:nn { #1 } {
      \BNVS_DEBUG_off:n { ##1 }
    }
  }
}
\tl_new:N \l_BNVS_DEBUG_push_n_tl
\cs_new:Npn \BNVS_DEBUG_pop: {
  \seq_pop_left:NNTF \l_BNVS_DEBUG_push_n_seq \l_BNVS_DEBUG_push_n_tl {
    \l_BNVS_DEBUG_push_n_tl
  } {
    \BNVS_error:n { Unbalanced~\BNVS_DEBUG_pop: }
```

```
  }
}
\AddToHookNext { env/BNVS.test/begin } {
  \BNVS_DEBUG_push:n {CDBGpfarsRomqi}
  \BNVS_DEBUG_pop:
}
\cs_new:Npn \BNVS_DEBUG_log:nn #1 {
  \cs_if_exist_use:cF { \BNVS_DEBUG:c { #1 } log:n } {
    \BNVS_warning:n { Undeclared~DEBUG~type:~#1 }
    \cs_new:cpn { \BNVS_DEBUG:c { #1 } log:n } { \use_none:n }
    \use_none:n
  }
}
\cs_new:Npn \BNVS_DEBUG_on: {
  \BNVS_DEBUG_on:n {C}
}

\cs_new:Npn \BNVS_DEBUG_off: {
  \BNVS_DEBUG_off:n {C}
}
```

`\BNVS_new:cpn`
`\BNVS_set:cpn`

`\BNVS_new:cpn` is like `\cs_new:cpn` except that the name argument is tagged for beanoves package. Similarly for `\BNVS_set:cpn`.

```
\cs_new:Npn \BNVS_new:cpn #1 {
  \cs_new:cpn { \BNVS:c { #1 } }
}

\cs_new:Npn \BNVS_set:cpn #1 {
  \cs_set:cpn { \BNVS:c { #1 } }
}

\cs_generate_variant:Nn \cs_generate_variant:Nn { c }
\cs_new:Npn \BNVS_generate_variant:cn #1 {
  \cs_generate_variant:cn { \BNVS:c { #1 } }
}
```

6.3 logging

Utility messaging.

```
\msg_new:nnn { beanoves } { :n } { #1 }
\msg_new:nnn { beanoves } { :nn } { #1~(#2) }

\cs_new:Npn \BNVS_warning:n {
  \msg_warning:nnn { beanoves } { :n }
}
\cs_new:Npn \BNVS_warning:x {
  \msg_warning:nnx { beanoves } { :n }
}
```

```
\cs_new:Npn \BNVS_error:n {
  \msg_error:nnn { beanoves } { :n }
}
\cs_new:Npn \BNVS_error:x {
  \msg_error:nnx { beanoves } { :n }
}

\cs_new:Npn \BNVS_fatal:n {
  \msg_fatal:nnn { beanoves } { :n }
}
\cs_new:Npn \BNVS_fatal:x {
  \msg_fatal:nnx { beanoves } { :n }
}
```

6.4 Facility layer: Variables

\BNVS_N_new:c
\BNVS_v_new:c

\BNVS_N_new:n {⟨*type*⟩}

Creates typed utility functions, see usage below. Undefined when no longer used. ⟨*type*⟩ is one of `tl`, `seq`...

```
\cs_new:Npn \BNVS_N_new:c #1 {
  \cs_new:cpn { BNVS_#1:c } ##1 {
    l \BNVS:c{ ##1 } \tl_if_empty:nF { ##1 } { _ } #1
  }
  \cs_new:cpn { BNVS_#1_new:c } ##1 {
    \use:c { #1_new:c } { \use:c { BNVS_#1:c } { ##1 } }
  }
  \cs_new:cpn { BNVS_#1_use:c } ##1 {
    \use:c { \cs:w BNVS_#1:c \cs_end: { ##1 } }
  }
  \cs_new:cpn { BNVS_#1_use:Nc } ##1 ##2 {
    \BNVS_use_raw:Nc
      ##1 { \cs:w BNVS_#1:c \cs_end: { ##2 } }
  }
  \cs_new:cpn { BNVS_#1_use:nc } ##1 ##2 {
    \BNVS_use_raw:nc
      { ##1 } { \cs:w BNVS_#1:c \cs_end: { ##2 } }
  }
}

\cs_new:Npn \BNVS_v_new:c #1 {
  \cs_new:cpn { BNVS_#1_use:Nv } ##1 ##2 {
    \BNVS_use_raw:nc
      { \exp_args:NV ##1 }
      { \BNVS_use_raw:c { BNVS_#1:c } { ##2 } }
  }
  \cs_new:cpn { BNVS_#1_use:cv } ##1 ##2 {
    \BNVS_use_raw:nc
      { \exp_args:NnV \BNVS_use:c { ##1 } }
      { \BNVS_use_raw:c { BNVS_#1:c } { ##2 } }
  }
  \cs_new:cpn { BNVS_#1_use:nv } ##1 ##2 {
```

```
    \BNVS_use_raw:nc
      { \exp_args:NnV \use:n { ##1 } }
      { \BNVS_use_raw:c { BNVS_#1:c } { ##2 } }
  }
}
\BNVS_N_new:c { bool }
\BNVS_N_new:c { int }
\BNVS_v_new:c { int }
\BNVS_N_new:c { tl }
\BNVS_v_new:c { tl }
\cs_new:Npn \BNVS_tl_use:Nvv #1 {
  \BNVS_exp_args:Nvv #1
}
\BNVS_N_new:c { str }
\BNVS_v_new:c { str }
\BNVS_N_new:c { seq }
\BNVS_v_new:c { seq }
\cs_undefine:N \BNVS_N_new:c
```

\BNVS_use:Ncn `\BNVS_use:Ncn` ⟨*function*⟩ {⟨*core name*⟩} {⟨*type*⟩}

```
\cs_new:Npn \BNVS_use:Ncn #1 #2 #3 {
  \BNVS_use_raw:c { BNVS_#3_use:Nc }   #1   { #2 }
}
\cs_new:Npn \BNVS_use:ncn #1 #2 #3 {
  \BNVS_use_raw:c { BNVS_#3_use:nc } { #1 } { #2 }
}
\cs_new:Npn \BNVS_use:Nvn #1 #2 #3 {
  \BNVS_use_raw:c { BNVS_#3_use:Nv }   #1   { #2 }
}
\cs_new:Npn \BNVS_use:nvn #1 #2 #3 {
  \BNVS_use_raw:c { BNVS_#3_use:nv } { #1 } { #2 }
}
\cs_new:Npn \BNVS_use:Ncncn #1 #2 #3 {
  \BNVS_use:ncn {
    \BNVS_use:Ncn   #1   { #2 } { #3 }
  }
}
\cs_new:Npn \BNVS_use:ncncn #1 #2 #3 {
  \BNVS_use:ncn {
    \BNVS_use:ncn { #1 } { #2 } { #3 }
  }
}
\cs_new:Npn \BNVS_use:Nvncn #1 #2 #3 {
  \BNVS_use:ncn {
    \BNVS_use:Nvn   #1   { #2 } { #3 }
  }
}
```

```
\cs_new:Npn \BNVS_use:nvncn #1 #2 #3 {
  \BNVS_use:ncn {
    \BNVS_use:nvn { #1 } { #2 } { #3 }
  }
}
\cs_new:Npn \BNVS_use:Ncncncn #1 #2 #3 #4 #5 {
  \BNVS_use:ncn {
    \BNVS_use:Ncncn   #1   { #2 } { #3 } { #4 } { #5 }
  }
}
\cs_new:Npn \BNVS_use:ncncncn #1 #2 #3 #4 #5 {
  \BNVS_use:ncn {
    \BNVS_use:ncncn { #1 } { #2 } { #3 } { #4 } { #5 }
  }
}
```

\BNVS_new_c:cn \BNVS_new_c:nc {⟨*type*⟩} {⟨*core name*⟩}

```
\cs_new:Npn \BNVS_new_c:nc #1 #2 {
  \BNVS_new:cpn { #1_#2:c } {
    \BNVS_use_raw:c { BNVS_#1_use:nc } { \BNVS_use_raw:c { #1_#2:N } }
  }
}
\cs_new:Npn \BNVS_new_cn:nc #1 #2 {
  \BNVS_new:cpn { #1_#2:cn } ##1 {
    \BNVS_use:ncn { \BNVS_use_raw:c { #1_#2:Nn } } { ##1 } { #1 }
  }
}
\cs_new:Npn \BNVS_new_cnn:ncN #1 #2 #3 {
  \BNVS_new:cpn { #2:cnn } ##1 {
    \BNVS_use:Ncn { #3 } { ##1 } { #1 }
  }
}
\cs_new:Npn \BNVS_new_cnn:nc #1 #2 {
  \BNVS_use_raw:nc {
    \BNVS_new_cnn:ncN { #1 } { #1_#2 }
  } { #1_#2:Nnn }
}
\cs_new:Npn \BNVS_new_cnv:ncN #1 #2 #3 {
  \BNVS_new:cpn { #2:cnv } ##1 ##2 {
    \BNVS_tl_use:nv {
      \BNVS_use:Ncn #3 { ##1 } { #1 } {  ##2 }
    }
  }
}
\cs_new:Npn \BNVS_new_cnv:nc #1 #2 {
  \BNVS_use_raw:nc {
    \BNVS_new_cnv:ncN { #1 } { #1_#2 }
  } { #1_#2:Nnn }
}
```

```
\cs_new:Npn \BNVS_new_cnx:ncN #1 #2 #3 {
  \BNVS_new:cpn { #2:cnx } ##1 ##2 {
    \exp_args:Nnx \use:n {
      \BNVS_use:Ncn #3 { ##1 } { #1 } {  ##2 }
    }
  }
}
\cs_new:Npn \BNVS_new_cnx:nc #1 #2 {
  \BNVS_use_raw:nc {
    \BNVS_new_cnx:ncN { #1 } { #1_#2 }
  } { #1_#2:Nnn }
}
\cs_new:Npn \BNVS_new_cc:ncNn #1 #2 #3 #4 {
  \BNVS_new:cpn { #2:cc } ##1 ##2 {
    \BNVS_use:Ncncn #3 { ##1 } { #1 } { ##2 } { #4 }
  }
}
\cs_new:Npn \BNVS_new_cc:ncn #1 #2 {
  \BNVS_use_raw:nc {
    \BNVS_new_cc:ncNn { #1 } { #1_#2 }
  } { #1_#2:NN }
}
\cs_new:Npn \BNVS_new_cc:nc #1 #2 {
  \BNVS_new_cc:ncn { #1 } { #2 } { #1 }
}
\cs_new:Npn \BNVS_new_cn:ncNn #1 #2 #3 #4 {
  \BNVS_new:cpn { #2:cn } ##1 {
    \BNVS_use:Ncn #3 { ##1 } { #1 }
  }
}
\cs_new:Npn \BNVS_new_cn:ncn #1 #2 {
  \BNVS_use_raw:nc {
    \BNVS_new_cn:ncNn { #1 } { #1_#2 }
  } { #1_#2:Nn }
}
\cs_new:Npn \BNVS_new_cv:ncNn #1 #2 #3 #4 {
  \BNVS_new:cpn { #2:cv } ##1 ##2 {
    \BNVS_use:nvn {
      \BNVS_use:Ncn #3 { ##1 } { #1 }
    } { ##2 } { #4 }
  }
}
\cs_new:Npn \BNVS_new_cv:ncn #1 #2 {
  \BNVS_use_raw:nc {
    \BNVS_new_cv:ncNn { #1 } { #1_#2 }
  } { #1_#2:Nn }
}
```

```
\cs_new:Npn \BNVS_new_cv:nc #1 #2 {
  \BNVS_new_cv:ncn { #1 } { #2 } { #1 }
}
\cs_new:Npn \BNVS_l_use:Ncn #1 #2 #3 {
  \BNVS_use_raw:Nc   #1   { \BNVS_l:cn { #2 } { #3 } }
}
\cs_new:Npn \BNVS_l_use:ncn #1 #2 #3 {
  \BNVS_use_raw:nc { #1 } { \BNVS_l:cn { #2 } { #3 } }
}
\cs_new:Npn \BNVS_g_use:Ncn #1 #2 #3 {
  \BNVS_use_raw:Nc   #1   { \BNVS_g:cn { #2 } { #3 } }
}
\cs_new:Npn \BNVS_g_use:ncn #1 #2 #3 {
  \BNVS_use_raw:nc { #1 } { \BNVS_g:cn { #2 } { #3 } }
}
\cs_new:Npn \BNVS_exp_args:Nvv #1 #2 #3 {
  \BNVS_use:ncncn { \exp_args:NVV #1 }
    { #2 } { tl } { #3 } { tl }
}
\cs_new:Npn \BNVS_exp_args:Nvvv #1 #2 #3 #4 {
  \BNVS_use:ncncncn { \exp_args:NVVV #1 }
    { #2 } { tl } { #3 } { tl } { #4 } { tl }
}
\cs_new:Npn \BNVS_exp_args:Nvvvv #1 #2 #3 #4 #5 {
  \BNVS_tl_use:nc {
  \exp_args:NnV \use:n {
    \BNVS_exp_args:Nvvv #1 { #2 } { #3 } { #4 }
  }
  } { #5 }
}
```

\BNVS_new_conditional:cpnn `\BNVS_new_conditional:cpnn {⟨core name⟩} ⟨parameter⟩ {⟨conditions⟩} {⟨code⟩}`

```
\cs_generate_variant:Nn \prg_new_conditional:Npnn { c }
\cs_new:Npn \BNVS_new_conditional:cpnn #1 {
  \prg_new_conditional:cpnn { \BNVS:c { #1 } }
}
\cs_generate_variant:Nn \prg_generate_conditional_variant:Nnn { c }
\cs_new:Npn \BNVS_generate_conditional_variant:cnn #1 {
  \prg_generate_conditional_variant:cnn { \BNVS:c { #1 } }
}
\cs_new:Npn \BNVS_new_conditional_vn:cNnn #1 #2 #3 #4 {
  \BNVS_new_conditional:cpnn { #1:vn } ##1 ##2 { #4 } {
    \BNVS_use:Nvn #2 { ##1 } { #3 } { ##2 } {
      \prg_return_true:
    } {
      \prg_return_false:
    }
  }
}
```

```
\cs_new:Npn \BNVS_new_conditional_vn:cnn #1 #2 {
  \BNVS_use:nc {
    \BNVS_new_conditional_vn:cNnn { #1 }
  } { #1:nn TF } { #2 }
}
\cs_new:Npn \BNVS_new_conditional_vc:cNnn #1 #2 #3 #4 {
  \BNVS_new_conditional:cpnn { #1:vc } ##1 ##2 { #4 } {
    \BNVS_use:Nvn #2 { ##1 } { #3 } { ##2 } {
      \prg_return_true:
    } {
      \prg_return_false:
    }
  }
}
\cs_new:Npn \BNVS_new_conditional_vc:cnn #1 {
  \BNVS_use:nc {
    \BNVS_new_conditional_vc:cNnn { #1 }
  } { #1:ncTF }
}
\cs_new:Npn \BNVS_new_conditional_vvc:cNnnn #1 #2 #3 #4 #5 {
  \BNVS_new_conditional:cpnn { #1:vvc } ##1 ##2 ##3 { #5 } {
    \BNVS_use:nvn {
      \BNVS_use:Nvn #2 { ##1 } { #3 }
    } { ##2 } { #4 } { ##3 } {
      \prg_return_true:
    } {
      \prg_return_false:
    }
  }
}
\cs_new:Npn \BNVS_new_conditional_vvc:cnnn #1 {
  \BNVS_use:nc {
    \BNVS_new_conditional_vvc:cNnnn { #1 }
  } { #1:nncTF }
}
\cs_new:Npn \BNVS_new_conditional_vc:cNn #1 #2 #3 {
  \BNVS_new_conditional:cpnn { #1:vc } ##1 ##2 { #3 } {
    \BNVS_tl_use:Nv #2 { ##1 } { ##2 } {
      \prg_return_true:
    } {
      \prg_return_false:
    }
  }
}
\cs_new:Npn \BNVS_new_conditional_vc:cn #1 {
  \BNVS_use:nc {
    \BNVS_new_conditional_vc:cNn { #1 }
  } { #1:ncTF }
}
```

```
\cs_new:Npn \BNVS_new_conditional_vvc:cNn #1 #2 #3 {
  \BNVS_new_conditional:cpnn { #1:vvc } ##1 ##2 ##3 { #3 } {
    \BNVS_tl_use:nv {
      \BNVS_tl_use:Nv #2 { ##1 }
    } { ##2 } { ##3 } {
      \prg_return_true:
    } {
      \prg_return_false:
    }
  }
}
\cs_new:Npn \BNVS_new_conditional_vvc:cn #1 {
  \BNVS_use:nc {
    \BNVS_new_conditional_vvc:cNn { #1 }
  } { #1:nncTF }
}
```

6.4.1 Regex

```
\cs_new:Npn \BNVS_regex_use:Nc #1 #2 {
  \BNVS_use_raw:Nc #1 { c \BNVS:c { #2 } _regex }
}
```

__bnvs_match_if_once:NnTF __bnvs_match_if_once:NnTF ⟨*regex variable*⟩ {⟨*expression*⟩} {⟨*yes code*⟩} {⟨*no code*⟩}
__bnvs_match_if_once:NvTF
__bnvs_match_if_once:nnTF __bnvs_match_if_once:nnTF {⟨*regex*⟩} {⟨*expression*⟩} {⟨*yes code*⟩} {⟨*no code*⟩}
__bnvs_if_regex_split:cnTF __bnvs_if_regex_split:cncTF {⟨*regex core*⟩} {⟨*expression*⟩} ⟨*seq core*⟩ {⟨*yes code*⟩} {⟨*no code*⟩}
__bnvs_if_regex_split:cnTF {⟨*regex core*⟩} {⟨*expression*⟩} {⟨*yes code*⟩} {⟨*no code*⟩}

These are shortcuts to

- `\regex_match_if_once:NnNTF` with the `match` sequence as N argument
- `\regex_match_if_once:nnNTF` with the `match` sequence as N argument
- `\regex_split:NnNTF` with the `split` sequence as last N argument

```
\BNVS_new_conditional:cpnn { if_extract_once:Ncn } #1 #2 #3 { T, F, TF } {
  \BNVS_use:ncn {
    \regex_extract_once:NnNTF #1 { #3 }
  } { #2 } { seq } {
    \prg_return_true:
  } {
    \prg_return_false:
  }
}
```

```
\BNVS_new_conditional:cpnn { match_if_once:Nn } #1 #2 { T, F, TF } {
  \BNVS_use:ncn {
    \regex_extract_once:NnNTF #1 { #2 }
  } { match } { seq } {
    \prg_return_true:
  } {
    \prg_return_false:
  }
}
\BNVS_new_conditional:cpnn { if_extract_once:Ncv } #1 #2 #3 { T, F, TF } {
  \BNVS_seq_use:nc {
    \BNVS_tl_use:nv {
      \regex_extract_once:NnNTF #1
    } { #3 }
  } { #2 } {
    \prg_return_true:
  } {
    \prg_return_false:
  }
}
\BNVS_new_conditional:cpnn { match_if_once:Nv } #1 #2 { T, F, TF } {
  \BNVS_seq_use:nc {
    \BNVS_tl_use:nv {
      \regex_extract_once:NnNTF #1
    } { #2 }
  } { match } {
    \prg_return_true:
  } {
    \prg_return_false:
  }
}
\BNVS_new_conditional:cpnn { match_if_once:nn } #1 #2 { T, F, TF } {
  \BNVS_seq_use:nc {
    \regex_extract_once:nnNTF { #1 } { #2 }
  } { match } {
    \prg_return_true:
  } {
    \prg_return_false:
  }
}
\BNVS_new_conditional:cpnn { if_regex_split:cnc } #1 #2 #3 { T, F, TF } {
  \BNVS_seq_use:nc {
    \BNVS_regex_use:Nc \regex_split:NnNTF { #1 } { #2 }
  } { #3 } {
    \prg_return_true:
  } {
    \prg_return_false:
  }
}
```

```
\BNVS_new_conditional:cpnn { if_regex_split:cn } #1 #2 { T, F, TF } {
  \BNVS_seq_use:nc {
    \BNVS_regex_use:Nc \regex_split:NnNTF { #1 } { #2 }
  } { split } {
    \prg_return_true:
  } {
    \prg_return_false:
  }
}
```

6.4.2 Token lists

__bnvs_tl_clear:c
__bnvs_tl_use:c
__bnvs_tl_set_eq:cc
__bnvs_tl_set:cn
__bnvs_tl_set:(cv|cx)
__bnvs_tl_put_left:cn
__bnvs_tl_put_right:cn
__bnvs_tl_put_right:(cx|cv)

__bnvs_tl_clear:c {⟨*core key tl*⟩}
__bnvs_tl_use:c {⟨*core*⟩}
__bnvs_tl_count:c {⟨*core*⟩}
__bnvs_tl_set_eq:cc {⟨*lhs core name*⟩} {⟨*rhs core name*⟩}
__bnvs_tl_set:cn {⟨*core*⟩} {⟨*tl*⟩}
__bnvs_tl_set:cv {⟨*core*⟩} {⟨*value core name*⟩}
__bnvs_tl_put_left:cn {⟨*core*⟩} {⟨*tl*⟩}
__bnvs_tl_put_right:cn {⟨*core*⟩} {⟨*tl*⟩}
__bnvs_tl_put_right:cv {⟨*core*⟩} {⟨*value core name*⟩}

These are shortcuts to

- \tl_clear:c {l__bnvs_⟨*core*⟩_tl}
- \tl_use:c {l__bnvs_⟨*core*⟩_tl}
- \tl_set_eq:cc {l__bnvs_⟨*lhs core*⟩_tl}{l__bnvs_⟨*rhs core*⟩_tl}
- \tl_set:cv {l__bnvs_⟨*core*⟩_tl}{l__bnvs_⟨*value core*⟩_tl}
- \tl_set:cx {l__bnvs_⟨*core*⟩_tl}{⟨*tl*⟩}
- \tl_put_left:cn {l__bnvs_⟨*core*⟩_tl}{⟨*tl*⟩}
- \tl_put_right:cn {l__bnvs_⟨*core*⟩_tl}{⟨*tl*⟩}
- \tl_put_right:cv {l__bnvs_⟨*core*⟩_tl}{l__bnvs_⟨*value core*⟩_tl}

\BNVS_new_conditional_vnc:cn \BNVS_new_conditional_vnc:cn {⟨*core*⟩} {⟨*conditions*⟩}

⟨*function*⟩ is the test function with signature ...:nncTF. ⟨*core*⟩:nncTF is used for testing.

```
\cs_new:Npn \BNVS_new_conditional_vnc:cNn #1 #2 #3 {
  \BNVS_new_conditional:cpnn { #1:vnc } ##1 ##2 ##3 { #3 } {
    \BNVS_tl_use:Nv #2 { ##1 } { ##2 } { ##3 } {
      \prg_return_true:
    } {
      \prg_return_false:
    }
  }
}
```

```
\cs_new:Npn \BNVS_new_conditional_vnc:cn #1 {
  \BNVS_use:nc {
    \BNVS_new_conditional_vnc:cNn { #1 }
  } { #1:nncTF }
}
```

`\BNVS_new_conditional_vnc:cn` `\BNVS_new_conditional_vnc:cn {⟨core⟩} {⟨conditions⟩}`

Forwards to `\BNVS_new_conditional_vnc:cNn` with `\⟨core⟩:nncTF` as function argument. Used for testing.

```
\cs_new:Npn \BNVS_new_conditional_vvnc:cNn #1 #2 #3 {
  \BNVS_new_conditional:cpnn { #1:vvnc } ##1 ##2 ##3 ##4 { #3 } {
    \BNVS_tl_use:nv {
      \BNVS_tl_use:Nv #2 { ##1 }
    } { ##2 } { ##3 } { ##4 } {
      \prg_return_true:
    } {
      \prg_return_false:
    }
  }
}
\cs_new:Npn \BNVS_new_conditional_vvnc:cn #1 {
  \BNVS_use:nc {
    \BNVS_new_conditional_vvnc:cNn { #1 }
  } { #1:nnncTF }
}
\cs_new:Npn \BNVS_new_conditional_vvvc:cNn #1 #2 #3 {
  \BNVS_new_conditional:cpnn { #1:vvvc } ##1 ##2 ##3 ##4 { #3 } {
    \BNVS_tl_use:nvv {
      \BNVS_tl_use:Nv #2 { ##1 }
    } { ##2 } { ##3 } { ##4 } {
      \prg_return_true:
    } {
      \prg_return_false:
    }
  }
}
\cs_new:Npn \BNVS_new_conditional_vvvc:cn #1 {
  \BNVS_use:nc {
    \BNVS_new_conditional_vvvc:cNn { #1 }
  } { #1:nnncTF }
}
\cs_new:Npn \BNVS_new_tl_c:c {
  \BNVS_new_c:nc { tl }
}
\BNVS_new_tl_c:c { clear }
\BNVS_new_tl_c:c { use }
\BNVS_new_tl_c:c { count }
```

```
\BNVS_new:cpn { tl_set_eq:cc } #1 #2 {
  \BNVS_use:ncncn { \tl_set_eq:NN } { #1 } { tl } { #2 } { tl }
}
\cs_new:Npn \BNVS_new_tl_cn:c {
  \BNVS_new_cn:nc { tl }
}
\cs_new:Npn \BNVS_new_tl_cv:c #1 {
  \BNVS_new_cv:ncn { tl } { #1 } { tl }
}
\BNVS_new_tl_cn:c { set }
\BNVS_new_tl_cv:c { set }
\BNVS_new:cpn { tl_set:cx } {
  \exp_args:Nnx \__bnvs_tl_set:cn
}
\BNVS_new_tl_cn:c { put_right }
\BNVS_new_tl_cv:c { put_right }
% \BNVS_generate_variant:cn { tl_put_right:cn } { cx }
\BNVS_new:cpn { tl_put_right:cx } {
  \exp_args:Nnnx \BNVS_use:c { tl_put_right:cn }
}
\BNVS_new_tl_cn:c { put_left }
\BNVS_new_tl_cv:c { put_left }
% \BNVS_generate_variant:cn { tl_put_left:cn } { cx }
\BNVS_new:cpn { tl_put_left:cx } {
  \exp_args:Nnnx \BNVS_use:c { tl_put_left:cn }
}
```

`\__bnvs_tl_if_empty:c`*TF* `\__bnvs_tl_if_empty:cTF` {⟨*core*⟩} {⟨*yes code*⟩} {⟨*no code*⟩}
`\__bnvs_tl_if_blank:v`*TF* `\__bnvs_tl_if_blank:vTF` {⟨*core*⟩} {⟨*yes code*⟩} {⟨*no code*⟩}
`\__bnvs_tl_if_eq:cn`*TF* `\__bnvs_tl_if_eq:cnTF` {⟨*core*⟩} {⟨*tl*⟩} {⟨*yes code*⟩} {⟨*no code*⟩}

These are shortcuts to

- `\tl_if_empty:cTF` {l__bnvs_⟨*core*⟩_tl} {⟨*yes code*⟩} {⟨*no code*⟩}
- `\tl_if_eq:cnTF` {l__bnvs_⟨*core*⟩_tl}{⟨*tl*⟩} {⟨*yes code*⟩} {⟨*no code*⟩}

```
\cs_new:Npn \BNVS_new_conditional_c:ncNn #1 #2 #3 #4 {
  \BNVS_new_conditional:cpnn { #2 } ##1 { #4 } {
    \BNVS_use:Ncn #3 { ##1 } { #1 } {
      \prg_return_true:
    } {
      \prg_return_false:
    }
  }
}
```

```
\cs_new:Npn \BNVS_new_conditional_c:ncn #1 #2 {
  \BNVS_use_raw:nc {
    \BNVS_new_conditional_c:ncNn { #1 } { #1_#2:c }
  } { #1_#2:NTF }
}
\BNVS_new_conditional_c:ncn { tl } { if_empty } { p, T, F, TF }

\BNVS_new_conditional:cpnn { tl_if_blank:v } #1 { T, F, TF } {
  \BNVS_tl_use:Nv \tl_if_blank:nTF { #1 } {
    \prg_return_true:
  } {
    \prg_return_false:
  }
}

\cs_new:Npn \BNVS_new_conditional_cn:ncNn #1 #2 #3 #4 {
  \BNVS_new_conditional:cpnn { #2:cn } ##1 ##2 { #4 } {
    \BNVS_use:Ncn #3 { ##1 } { #1 } { ##2 } {
      \prg_return_true:
    } {
      \prg_return_false:
    }
  }
}

\cs_new:Npn \BNVS_new_conditional_cn:ncn #1 #2 {
  \BNVS_use_raw:nc {
    \BNVS_new_conditional_cn:ncNn { #1 } { #1_#2 }
  } { #1_#2:NnTF }
}
\BNVS_new_conditional_cn:ncn { tl } { if_eq } { T, F, TF }

\cs_new:Npn \BNVS_new_conditional_cv:ncNn #1 #2 #3 #4 {
  \BNVS_new_conditional:cpnn { #2:cv } ##1 ##2 { #4 } {
    \BNVS_use:nvn {
      \BNVS_use:Ncn #3 { ##1 } { #1 }
    } { ##2 } { #1 } {
      \prg_return_true:
    } {
      \prg_return_false:
    }
  }
}

\cs_new:Npn \BNVS_new_conditional_cv:ncn #1 #2 {
  \BNVS_use_raw:nc {
    \BNVS_new_conditional_cv:ncNn { #1 } { #1_#2 }
  } { #1_#2:NnTF }
}
\BNVS_new_conditional_cv:ncn { tl } { if_eq } { T, F, TF }
```

6.4.3 Strings

__bnvs_str_if_eq:vn*TF* __bnvs_str_if_eq:vnTF {⟨*core*⟩} {⟨*tl*⟩} {⟨*yes code*⟩} {⟨*no code*⟩}

These are shortcuts to

- \str_if_eq:ccTF {l__bnvs_⟨*core*⟩_tl}{⟨*yes code*⟩} {⟨*no code*⟩}

```
\cs_new:Npn \BNVS_new_conditional_vv:cNn #1 #2 #3 {
  \BNVS_new_conditional:cpnn { #1:vv } ##1 ##2 { #3 } {
    \BNVS_tl_use:nv {
      \BNVS_tl_use:Nv #2 { ##1 }
    } { ##2 } {
      \prg_return_true:
    } {
      \prg_return_false:
    }
  }
}
\cs_new:Npn \BNVS_new_conditional_vv:cn #1 {
  \BNVS_use:nc {
    \BNVS_new_conditional_vvnc:cNn { #1 }
  } { #1:nnTF }
}
\cs_new:Npn \BNVS_new_conditional_vn:ncNn #1 #2 #3 #4 {
  \BNVS_new_conditional:cpnn { #2:vn } ##1 ##2 { #4 } {
    \BNVS_use:Nvn #3 { ##1 } { #1 } { ##2 } {
      \prg_return_true:
    } {
      \prg_return_false:
    }
  }
}
\cs_new:Npn \BNVS_new_conditional_vn:ncn #1 #2 {
  \BNVS_use_raw:nc {
    \BNVS_new_conditional_vn:ncNn { #1 } { #1_#2 }
  } { #1_#2:nnTF }
}
\BNVS_new_conditional_vn:ncn { str } { if_eq } { T, F, TF }
\cs_new:Npn \BNVS_new_conditional_vv:ncNn #1 #2 #3 #4 {
  \BNVS_new_conditional:cpnn { #2:vv } ##1 ##2 { #4 } {
    \BNVS_use:nvn {
      \BNVS_use:Nvn #3 { ##1 } { #1 }
    }  { ##2 } { #1 } {
      \prg_return_true:
    } {
      \prg_return_false:
    }
  }
}
```

```
\cs_new:Npn \BNVS_new_conditional_vv:ncn #1 #2 {
  \BNVS_use_raw:nc {
    \BNVS_new_conditional_vv:ncNn { #1 } { #1_#2 }
  } { #1_#2:nnTF }
}
\BNVS_new_conditional_vv:ncn { str } { if_eq } { T, F, TF }
```

6.4.4 Sequences

__bnvs_seq_count:c	__bnvs_seq_new:c {⟨*core*⟩}
__bnvs_seq_clear:c	__bnvs_seq_count:c {⟨*core*⟩}
__bnvs_seq_set_eq:cc	__bnvs_seq_clear:c {⟨*core*⟩}
__bnvs_seq_gset_eq:cc	__bnvs_seq_set_eq:cc {⟨$core_1$⟩} {⟨$core_2$⟩}
__bnvs_seq_use:cn	__bnvs_seq_use:cn {⟨*core*⟩} {⟨*separator*⟩}
__bnvs_seq_item:cn	__bnvs_seq_item:cn {⟨*core*⟩} {⟨*integer expression*⟩}
__bnvs_seq_remove_all:cn	__bnvs_seq_remove_all:cn {⟨*core*⟩} {⟨*tl*⟩}
__bnvs_seq_put_left:cv	__bnvs_seq_put_right:cn {⟨*seq core*⟩} {⟨*tl*⟩}
__bnvs_seq_put_right:cn	__bnvs_seq_put_right:cv {⟨*seq core*⟩} {⟨*tl core*⟩}
__bnvs_seq_put_right:cv	__bnvs_seq_set_split:cnn {⟨*seq core*⟩} {⟨*tl*⟩} {⟨*separator*⟩}
__bnvs_seq_set_split:cnn	__bnvs_seq_pop_left:cc {⟨$core_1$⟩} {⟨$core_2$⟩}
__bnvs_seq_set_split:(cnv|cnx)	
__bnvs_seq_pop_left:cc	

These are shortcuts to

- \seq_set_eq:cc {l__bnvs_⟨$core_1$⟩_seq} {l__bnvs_⟨$core_2$⟩_seq}
- \seq_count:c {l__bnvs_⟨*core*⟩_seq}
- \seq_use:cn {l__bnvs_⟨*core*⟩_seq}{⟨*separator*⟩}
- \seq_item:cn {l__bnvs_⟨*core*⟩_seq}{⟨*integer expression*⟩}
- \seq_remove_all:cn {l__bnvs_⟨*core*⟩_seq}{⟨*tl*⟩}
- __bnvs_seq_clear:c {l__bnvs_⟨*core*⟩_seq}
- \seq_put_right:cv {l__bnvs_⟨*seq core*⟩_seq} {l__bnvs_⟨*tl core*⟩_tl}
- \seq_set_split:cnn{l__bnvs_⟨*seq core*⟩_seq}{l__bnvs_⟨*tl core*⟩_tl}{⟨*tl*⟩}

```
\BNVS_new_c:nc   { seq } { count }
\BNVS_new_c:nc   { seq } { clear }
\BNVS_new_cn:nc  { seq } { use }
\BNVS_new_cn:nc  { seq } { item }
\BNVS_new_cn:nc  { seq } { remove_all }
\BNVS_new_cn:nc  { seq } { map_inline }
\BNVS_new_cc:nc  { seq } { set_eq }
\BNVS_new_cc:nc  { seq } { gset_eq }
\BNVS_new_cv:ncn { seq } { put_left  } { tl }
\BNVS_new_cn:ncn { seq } { put_right } { tl }
\BNVS_new_cv:ncn { seq } { put_right } { tl }
\BNVS_new_cnn:nc { seq } { set_split }
```

```
\BNVS_new_cnv:nc { seq } { set_split }
\BNVS_new_cnx:nc { seq } { set_split }
\BNVS_new_cc:ncn { seq } { pop_left  } { tl }
\BNVS_new_cc:ncn { seq } { pop_right } { tl }
```

__bnvs_seq_if_empty:c*TF* __bnvs_seq_get_right:cc*TF* __bnvs_seq_pop_left:cc*TF* __bnvs_seq_pop_right:cc*TF*

__bnvs_seq_if_empty:cTF {⟨*seq core*⟩} {⟨*yes code*⟩} {⟨*no code*⟩}
__bnvs_seq_get_right:ccTF {⟨*seq core*⟩} {⟨*tl core*⟩} {⟨*yes code*⟩} {⟨*no code*⟩}

```
\cs_new:Npn \BNVS_new_conditional_cc:ncnn #1 #2 #3 #4 {
  \BNVS_new_conditional:cpnn { #1_#2:cc } ##1 ##2 { #4 } {
    \BNVS_use:ncncn {
      \BNVS_use_raw:c { #1_#2:NNTF }
    } { ##1 } { #1 } { ##2 } { #3 } {
      \prg_return_true:
    } {
      \prg_return_false:
    }
  }
}
\BNVS_new_conditional_c:ncn { seq } { if_empty } { T, F, TF }
\BNVS_new_conditional_cc:ncnn
  { seq } { get_right } { tl } { T, F, TF }
\BNVS_new_conditional_cc:ncnn
  { seq } { pop_left  } { tl } { T, F, TF }
\BNVS_new_conditional_cc:ncnn
  { seq } { pop_right } { tl } { T, F, TF }
```

6.4.5 Integers

__bnvs_int_new:c __bnvs_int_use:c __bnvs_int_zero:c __bnvs_int_inc:c __bnvs_int_decr:c __bnvs_int_set:cn __bnvs_int_set:cv

__bnvs_int_new:c {⟨*core*⟩}
__bnvs_int_use:c {⟨*core*⟩}
__bnvs_int_incr:c {⟨*core*⟩}
__bnvs_int_decr:c {⟨*core*⟩}
__bnvs_int_set:cn {⟨*core*⟩} {⟨*value*⟩}

These are shortcuts to

- \int_new:c {l__bnvs_⟨*core*⟩_int}
- \int_use:c {l__bnvs_⟨*core*⟩_int}
- \int_incr:c {l__bnvs_⟨*core*⟩_int}
- \int_idecr:c {l__bnvs_⟨*core*⟩_int}
- \int_set:cn {l__bnvs_⟨*core*⟩_int} ⟨*value*⟩

```
\BNVS_new_c:nc  { int } { new  }
\BNVS_new_c:nc  { int } { use  }
\BNVS_new_c:nc  { int } { zero }
\BNVS_new_c:nc  { int } { incr }
```

```
\BNVS_new_c:nc   { int } { decr }
\BNVS_new_cn:nc  { int } { set  }
\BNVS_new_cv:ncn { int } { set  } { int }
```

6.5 Debug facilities

Typesetting file `beanoves.dtx` creates both beanoves and beanoves-debug style files. The former is intended for everyday use whereas the latter contains supplemental debugging and testing facilities which are intentionally left undocumented. In particular, we have aliases for `\group_begin:` and `\group_end:` to allow the display of supplemental informations while debugging.

6.6 Debug messages

6.7 Testing facilities

6.8 Local variables

We make heavy use of local variables and function scopes. Many functions are executed within a TEX group, which ensures no name collision with the caller stack. The number of variables used has not been optimized, nor the TEX groups used. Optimization often goes against readability.

```
\tl_new:N \l__bnvs_id_last_tl
\tl_new:N \l__bnvs_id_tl
\tl_new:N \l__bnvs_kri_tl
\tl_new:N \l__bnvs_short_tl
\tl_new:N \l__bnvs_path_tl
\tl_new:N \l__bnvs_n_tl
\tl_new:N \l__bnvs_ref_tl
\tl_new:N \l__bnvs_tag_tl
\tl_new:N \l__bnvs_a_tl
\tl_new:N \l__bnvs_b_tl
\tl_new:N \l__bnvs_c_tl
\tl_new:N \l__bnvs_V_tl
\tl_new:N \l__bnvs_A_tl
\tl_new:N \l__bnvs_L_tl
\tl_new:N \l__bnvs_Z_tl
\tl_new:N \l__bnvs_ans_tl
\tl_new:N \l__bnvs_QD_name_tl
\tl_new:N \l__bnvs_base_tl
\tl_new:N \l__bnvs_group_tl
\tl_new:N \l__bnvs_scan_tl
\tl_new:N \l__bnvs_query_tl
\tl_new:N \l__bnvs_token_tl
\tl_new:N \l__bnvs_root_tl
\tl_new:N \l__bnvs_n_incr_tl
\tl_new:N \l__bnvs_incr_tl
\tl_new:N \l__bnvs_plus_tl
\tl_new:N \l__bnvs_rhs_tl
\tl_new:N \l__bnvs_post_tl
\tl_new:N \l__bnvs_suffix_tl
\tl_new:N \l__bnvs_index_tl
\int_new:N \g__bnvs_call_int
```

```
\int_new:N \l__bnvs_int
\int_new:N \l__bnvs_i_int
\seq_new:N \g__bnvs_def_seq
\seq_new:N \l__bnvs_a_seq
\seq_new:N \l__bnvs_b_seq
\seq_new:N \l__bnvs_ans_seq
\seq_new:N \l__bnvs_match_seq
\seq_new:N \l__bnvs_split_seq
\seq_new:N \l__bnvs_path_seq
\seq_new:N \l__bnvs_path_head_seq
\seq_new:N \l__bnvs_path_tail_seq
\seq_new:N \l__bnvs_query_seq
\seq_new:N \l__bnvs_token_seq
\bool_new:N \l__bnvs_in_frame_bool
\bool_set_false:N \l__bnvs_in_frame_bool
\bool_new:N \l__bnvs_parse_bool
\bool_set_false:N \l__bnvs_parse_bool
\bool_new:N \l__bnvs_deep_bool
\bool_set_false:N \l__bnvs_deep_bool

\cs_new:Npn \BNVS_error_ans:x {
  \__bnvs_tl_put_right:cn { ans } { 0 }
  \BNVS_error:x
}
```

In order to implement the provide feature, we add getters and setters

```
\bool_new:N \l__bnvs_provide_bool

\BNVS_new:cpn { set_true:c } #1 {
  \exp_args:Nc \bool_set_true:N { l__bnvs_#1_bool }
}

\BNVS_new:cpn { set_false:c } #1 {
  \exp_args:Nc \bool_set_false:N { l__bnvs_#1_bool }
}

\BNVS_new:cpn { provide_on: } {
  \__bnvs_set_true:c { provide }
}

\BNVS_new:cpn { provide_off: } {
  \__bnvs_set_false:c { provide }
}
\__bnvs_provide_off:
```

6.9 Infinite loop management

Unending recursivity is managed here.

`\g__bnvs_call_int` Some functions calls, as well as some loop bodies, decrement this counter. When this counter reaches 0, an error is raised or a computation is aborted.

(*End of definition for* `\g__bnvs_call_int`.)

```
\int_const:Nn \c__bnvs_max_call_int { 8192 }
```

__bnvs_greset_call: __bnvs_greset_call:

Reset globally the call stack counter to its maximum value.

```
\BNVS_new:cpn  { greset_call: } {
  \int_gset:Nn \g__bnvs_call_int { \c__bnvs_max_call_int }
}
```

__bnvs_if_call:*TF* __bnvs_call_do:TF {⟨*yes code*⟩} {⟨*no code*⟩}

Decrement the \g__bnvs_call_int counter globally and execute ⟨*yes code*⟩ if we have not reached 0, ⟨*no code*⟩ otherwise.

```
\BNVS_new_conditional:cpnn { if_call: } { T, F, TF } {
  \int_gdecr:N \g__bnvs_call_int
  \int_compare:nNnTF \g__bnvs_call_int > 0 {
    \prg_return_true:
  } {
    \prg_return_false:
  }
}
```

6.10 Overlay specification

6.10.1 Registration

We keep track of the ⟨*id*⟩ ⟨*a*⟩ combinations and provide looping mechanisms.

__bnvs_name:nnn __bnvs_name:nnn {⟨*subkey*⟩} {⟨*id*⟩} {⟨*a*⟩}
__bnvs_name:nn __bnvs_id_seq:n __bnvs_name:nn {⟨*id*⟩} {⟨*a*⟩}
__bnvs_id_seq:nn {⟨*id*⟩}

Create a unique name from the arguments.

```
\BNVS_new:cpn { name:nnn } #1 #2 #3 { __bnvs_#2!#3/#1: }
\BNVS_new:cpn { name:nn } #1 #2 { __bnvs_#1!#2: }
\BNVS_new:cpn { id_seq:n } #1 { g__bnvs_#1!_seq }
```

\g__bnvs_I_seq List of registered identifiers.

(*End of definition for* \g__bnvs_I_seq.)

```
\seq_new:N \g__bnvs_I_seq
```

__bnvs_register:nn __bnvs_register:nn {⟨*id*⟩} {⟨*a*⟩}
__bnvs_unregister:nn __bnvs_unregister:nn {⟨*id*⟩} {⟨*a*⟩}
__bnvs_unregister:n __bnvs_unregister:n {⟨*id*⟩}
__bnvs_unregister: __bnvs_unregister:

Register and unregister according to the arguments.

```
\seq_new:N \l__bnvs_register_NNnn_seq
\BNVS_new:cpn { register:NNnn } #1 #2 #3 #4 {
  \cs_if_exist:NF #1 {
```

```
    \cs_gset:Npn #1 { }
    \seq_if_exist:NTF #2 {
      \__bnvs_seq_clear:c { register_NNnn }
      \cs_set:Npn \BNVS_register_NNnn: {
        \__bnvs_seq_put_right:cn { register_NNnn } { #4 }
        \cs_set:Npn \BNVS_register_NNnn: { }
      }
      \cs_set:Npn \BNVS_register_NNnn:w ##1 ##2 {
        \str_compare:nNnTF { ##2 } < { #4 } {
          \__bnvs_seq_put_right:cn { register_NNnn } { ##2 }
        } {
          \BNVS_register_NNnn:
          \__bnvs_seq_put_right:cn { register_NNnn } { ##2 }
          \cs_set:Npn \BNVS_register_NNnn:w ####1 ####2 {
            \__bnvs_seq_put_right:cn { register_NNnn } { ####2 }
          }
        }
      }
      \__bnvs_foreach_T:nNTF { #3 } \BNVS_register_NNnn:w {
        \BNVS_register_NNnn:
        \seq_gset_eq:NN #2 \l__bnvs_register_NNnn_seq
      } {
        \BNVS_error:n { Unreachable/register:NNnn~id~#3 }
      }
    } {
      \seq_new:N #2
      \seq_gput_right:Nn #2 { #4 }
      \__bnvs_seq_clear:c { register_NNnn }
      \cs_set:Npn \BNVS_register_NNnn: {
        \__bnvs_seq_put_right:cn { register_NNnn } { #3 }
        \cs_set:Npn \BNVS_register_NNnn: {}
      }
      \cs_set:Npn \BNVS_register_NNnn:w ##1 {
        \str_compare:nNnTF { ##1 } < { #3 } {
          \__bnvs_seq_put_right:cn { register_NNnn } { ##1 }
        } {
          \BNVS_register_NNnn:
          \__bnvs_seq_put_right:cn { register_NNnn } { ##1 }
          \cs_set:Npn \BNVS_register_NNnn:w ####1 {
            \__bnvs_seq_put_right:cn { register_NNnn } { ####1 }
          }
        }
      }
      \__bnvs_foreach_I:N \BNVS_register_NNnn:w
      \BNVS_register_NNnn:
      \seq_gset_eq:NN \g__bnvs_I_seq \l__bnvs_register_NNnn_seq
    }
  }
}
\BNVS_new:cpn { register:nn } #1 #2 {
  \exp_args:Ncc \__bnvs_register:NNnn
    { \__bnvs_name:nn { #1 } { #2 } } { \__bnvs_id_seq:n { #1 } }
    { #1 } { #2 }
}
```

__bnvs_unregister:NNnn `\__bnvs_unregister:NNnn ⟨cs⟩ ⟨seq⟩ {⟨id⟩} {⟨a⟩}`

Unregistering a ⟨*id*⟩ ⟨*a*⟩ combination is not straightforward. ⟨*cs*⟩ and ⟨*seq*⟩ are respectively is the command and the sequence uniquely associated to this combination.

```
\seq_new:N \l__bnvs_unregister_NNnn_seq
\BNVS_new:cpn { unregister:NNnn } #1 #2 #3 #4 {
  \cs_if_exist:NT #1 {
    \cs_undefine:N #1
    \__bnvs_seq_clear:c { unregister_NNnn }
    \cs_set:Npn \BNVS_unregister_NNnn:n ##1 { ##1 }
    \cs_set:Npn \BNVS_unregister_NNnn:w ##1 ##2 {
      \str_compare:nNnTF { ##2 } < { #4 } {
        \__bnvs_seq_put_right:cn { unregister_NNnn } { ##2 }
        \cs_set:Npn \BNVS_unregister_NNnn:n ####1 { }
      } {
        \cs_set:Npn \BNVS_unregister_NNnn:w ####1 ####2 {
          \__bnvs_seq_put_right:cn { unregister_NNnn } { ####2 }
          \cs_set:Npn \BNVS_unregister_NNnn:n ########1 { }
        }
      }
    }
    \__bnvs_foreach_T:nNTF { #3 } \BNVS_unregister_NNnn:w {
      \seq_gset_eq:NN #2 \l__bnvs_unregister_NNnn_seq
    } {
      \BNVS_error:n { Unreachable / unregister:NNnn~#3!#4 }
    }
    \BNVS_unregister_NNnn:n {
      \__bnvs_seq_clear:c { unregister_NNnn }
      \cs_set:Npn \BNVS_unregister_NNnn:w ##1 {
        \str_compare:nNnTF { ##1 } < { #3 } {
          \__bnvs_seq_put_right:cn { unregister_NNnn } { ##1 }
        } {
          \cs_set:Npn \BNVS_unregister_NNnn:n ####1 {
            \__bnvs_seq_put_right:cn { unregister_NNnn } { ####1 }
          }
        }
      }
      \__bnvs_foreach_I:N \BNVS_unregister_NNnn:w
      \seq_gset_eq:NN \g__bnvs_I_seq \l__bnvs_unregister_NNnn_seq
      \cs_undefine:N #2
    }
  }
}
\BNVS_new:cpn { unregister:nn } #1 #2 {
  \exp_args:Ncc \__bnvs_unregister:NNnn
    { \__bnvs_name:nn { #1 } { #2 } } { \__bnvs_id_seq:n { #1 } }
    { #1 } { #2 }
}
```

__bnvs_foreach_I:N `\__bnvs_foreach_I:N ⟨function:n⟩`
__bnvs_foreach_I:n `\__bnvs_foreach_I:n {⟨code⟩}`

Execute the ⟨*function:n*⟩ or the ⟨*code*⟩ for each declared identifier.

```
\BNVS_new:cpn { foreach_I:N } {
  \seq_map_function:NN \g__bnvs_I_seq
}
\BNVS_new:cpn { foreach_I:n } {
  \seq_map_inline:Nn \g__bnvs_I_seq
}
```

`\__bnvs_foreach_T:nNTF` `\__bnvs_foreach_T:nNTF {⟨id⟩} ⟨function:nn⟩ {⟨yes code⟩} {⟨no code⟩}`
`\__bnvs_foreach_T:nnTF` `\__bnvs_foreach_T:nnTF {⟨id⟩} {⟨code⟩} {⟨yes code⟩} {⟨no code⟩}`

If ⟨*id*⟩ is a declared identifier, execute ⟨*function:nn*⟩ or ⟨*code*⟩ for each combination of ⟨*id*⟩ and its associate ⟨*a*⟩s.

```
\BNVS_new_conditional:cpnn { foreach_T:nN } #1 #2 { T, F, TF } {
  \seq_if_exist:cTF { g__bnvs_#1!_seq } {
    \seq_map_inline:cn { g__bnvs_#1!_seq } { #2 { #1 } { ##1 } }
    \prg_return_true:
  } { \prg_return_false: }
}
\BNVS_new_conditional:cpnn { foreach_T:nn } #1 #2 { T, F, TF } {
  \seq_if_exist:cTF { g__bnvs_#1!_seq } {
    \cs_set:Npn \BNVS_foreach_T_nn:nn ##1 ##2 { #2 }
    \seq_map_inline:cn { g__bnvs_#1!_seq }
      { \BNVS_foreach_T_nn:nn { #1 } { ##1 } }
    \prg_return_true:
  } { \prg_return_false: }
}
```

`\__bnvs_foreach_IT:N` `\__bnvs_foreach_IT:N ⟨function:nn⟩`
`\__bnvs_foreach_IT:n` `\__bnvs_foreach_IT:n {⟨code⟩}`

Execute the ⟨*function:nn*⟩ or the ⟨*code*⟩ for each combination of ⟨*id*⟩ and ⟨*a*⟩.

```
\BNVS_new:cpn { foreach_IT:N } #1 {
  \__bnvs_foreach_I:n {
    \__bnvs_foreach_T:nNT { ##1 } #1 { }
  }
}
\BNVS_new:cpn { foreach_IT:n } #1 {
  \cs_set:Npn \BNVS_foreach_IT_n:nn ##1 ##2 { #1 }
  \__bnvs_foreach_I:n {
    \__bnvs_foreach_T:nNT { ##1 } \BNVS_foreach_IT_n:nn { }
  }
}
```

`\__bnvs_foreach_I:N` `\__bnvs_foreach_key:N ⟨function:n⟩`
`\__bnvs_foreach_I:n` `\__bnvs_foreach_key:n {⟨code⟩}`
`\__bnvs_foreach_key_main:N ⟨function:n⟩`
`\__bnvs_foreach_key_main:n {⟨code⟩}`
`\__bnvs_foreach_key_sub:N ⟨function:n⟩`
`\__bnvs_foreach_key_sub:n {⟨code⟩}`
`\__bnvs_foreach_key_cache:N ⟨function:n⟩`
`\__bnvs_foreach_key_cache:n {⟨code⟩}`

Execute the ⟨*function:n*⟩ or the ⟨*code*⟩ for each concerned key.

```
\BNVS_new:cpn { foreach_key_main:N } {
  \tl_map_function:nN { VWAZL }
}
\BNVS_new:cpn { foreach_key_main:n } {
  \tl_map_inline:nn { VWAZL }
}
\BNVS_new:cpn { foreach_key_sub:N } {
  \tl_map_function:nN { PNvn }
}
\BNVS_new:cpn { foreach_key_sub:n } {
  \tl_map_inline:nn { PNvn }
}
\BNVS_new:cpn { foreach_key:n } #1 {
  \__bnvs_foreach_key_main:n { #1 }
  \__bnvs_foreach_key_sub:n  { #1 }
}
\BNVS_new:cpn { foreach_key:N } #1 {
  \__bnvs_foreach_key_main:N #1
  \__bnvs_foreach_key_sub:N  #1
}
\BNVS_new:cpn { foreach_key_cache:N } {
  \tl_map_function:nN { {V*}{A*}{Z*}{L*}{P*}{N*} }
}
\BNVS_new:cpn { foreach_key_cache:n } {
  \tl_map_inline:nn { {V*}{A*}{Z*}{L*}{P*}{N*} }
}
```

6.10.2 Basic functions

__bnvs_gset:nnnn
__bnvs_gset:(nnnv|nvvn|nvvv)

__bnvs_gset:nnnn {⟨*key*⟩} {⟨*id*⟩} {⟨*a*⟩} {⟨*spec*⟩}

Convenient shortcuts to manage the storage, it makes the code more concise and readable.

```
\BNVS_new:cpn { gset:nnnn } #1 #2 #3 {
  \regex_match:nnTF { ^[a-z_]+$ } { #3 } {
    \use_none:n
  } {
    \__bnvs_register:nn { #2 } { #3 }
    \cs_gset:cpn { \__bnvs_name:nnn { #1 } { #2 } { #3 } }
  }
}
\BNVS_new:cpn { gset:nvvn } #1 {
  \BNVS_tl_use:nvv { \__bnvs_gset:nnnn { #1 } }
}
```

```
\BNVS_new:cpn { gset:nnnv } #1 #2 #3 {
  \BNVS_tl_use:nv {
    \__bnvs_gset:nnnn { #1 } { #2 } { #3 }
  }
}
\BNVS_new:cpn { gset:nvvv } #1 {
  \BNVS_tl_use:nvvv { \__bnvs_gset:nnnn { #1 } }
}
```

`\__bnvs_gunset:nnn`	`\__bnvs_gunset:nnn {`⟨*key*⟩`} {`⟨*id*⟩`} {`⟨*tag*⟩`}`
`\__bnvs_gunset:nn`	`\__bnvs_gunset:nn {`⟨*id*⟩`} {`⟨*tag*⟩`}`
`\__bnvs_gunset:n`	`\__bnvs_gunset:n {`⟨*id*⟩`}`
`\__bnvs_gunset:`	`\__bnvs_gunset:`

Removes the specifications for the ⟨*key*⟩, ⟨*id*⟩, ⟨*tag*⟩ combination. In the variant, all possible ⟨*key*⟩s and ⟨*tag*⟩s are used.

```
\BNVS_new:cpn { gunset:nnn } #1 #2 #3 {
  \cs_undefine:c { \__bnvs_name:nnn { #1 } { #2 } { #3 } }
}
\BNVS_new:cpn { gunset:nvv } #1 {
  \BNVS_tl_use:nvv { \__bnvs_gunset:nnn { #1 } }
}
\BNVS_new:cpn { gunset:nn } #1 #2 {
  \tl_map_inline:nn {
    \__bnvs_foreach_key_main:n
    \__bnvs_foreach_key_sub:n
    \__bnvs_foreach_key_cache:n
  } {
    ##1 {
      \__bnvs_gunset:nnn { ####1 } { #1 } { #2 }
    }
  }
}
\BNVS_new:cpn { gunset_deep:nn } #1 #2 {
  \__bnvs_foreach_IT:n {
    \tl_if_eq:nnT { #1 } { ##1 } {
  \tl_if_in:nnT { .. ##2 } { .. #2 . } {
    \__bnvs_gunset:nn { #1 } { ##2 }
  }
    }
  }
}
\BNVS_new:cpn { gunset:vv } {
  \BNVS_tl_use:Nvv \__bnvs_gunset:nn
}
\BNVS_new:cpn { gunset_deep:vv } {
  \BNVS_tl_use:Nvv \__bnvs_gunset_deep:nn
}
```

```
\seq_new:N \l__bnvs_gunset_n_seq
\BNVS_new:cpn { gunset:n } #1 {
  \__bnvs_seq_clear:c { gunset_n }
  \__bnvs_foreach_I:n {
    \tl_if_eq:nnTF { ##1 } { #1 } {
      \__bnvs_foreach_T:nn { #1 } {
        \__bnvs_gunset:nn { #1  } { ####1 }
      }
    } {
      \__bnvs_seq_put_right:cn { gunset_n } { ##1 }
    }
  }
  \seq_gset_eq:NN \g__bnvs_I_seq \l__bnvs_gunset_n_seq
}

\BNVS_new:cpn { gunset: } {
  \__bnvs_foreach_IT:N \__bnvs_gunset:nn
}
```

`\__bnvs_is_gset:nnn`*TF* `\__bnvs_is_gset:nnnTF {`⟨*key*⟩`} {`⟨*id*⟩`} {`⟨*tag*⟩`} {`⟨*yes code*⟩`} {`⟨*no code*⟩`}`
`\__bnvs_is_gset:nn`*TF* `\__bnvs_is_gset:nnTF {`⟨*id*⟩`} {`⟨*tag*⟩`} {`⟨*yes code*⟩`} {`⟨*no code*⟩`}`
`\__bnvs_if_spec:nnn`*TF* `\__bnvs_if_spec:nnnTF {`⟨*key*⟩`} {`⟨*id*⟩`} {`⟨*tag*⟩`} {`⟨*yes code*⟩`} {`⟨*no code*⟩`}`
`\__bnvs_if_spec:nn`*TF* `\__bnvs_if_spec:nnTF {`⟨*id*⟩`} {`⟨*tag*⟩`} {`⟨*yes code*⟩`} {`⟨*no code*⟩`}`

Convenient shortcuts to test for the existence of a ⟨*spec*⟩ for that ⟨*key*⟩ metaid, metatag combination. The version with no ⟨*key*⟩ is the or combination for keys `V`, `A` and `Z`.

The `_spec:...` variant is similar except that it uses ⟨*key*⟩ metaid, metaref or ⟨*key*⟩ empty metaid, metatag combinations.

```
\BNVS_new_conditional:cpnn { is_gset:nnn } #1 #2 #3 { T, F, TF } {
  \cs_if_exist:cTF { \__bnvs_name:nnn { #1 } { #2 } { #3 } } {
    \prg_return_true:
  } {
    \prg_return_false:
  }
}

\BNVS_new_conditional:cpnn { is_gset:nvv } #1 #2 #3 { T, F, TF } {
  \BNVS_tl_use:nvv {
    \__bnvs_is_gset:nnnTF { #1 }
  } { #2 } { #3 } {
    \prg_return_true:
  } {
    \prg_return_false:
  }
}

\BNVS_new_conditional:cpnn { is_gset:nn } #1 #2 { T, F, TF } {
  \__bnvs_is_gset:nnnTF V { #1 } { #2 } {
    \prg_return_true:
  } {
    \__bnvs_is_gset:nnnTF A { #1 } { #2 } {
      \prg_return_true:
    } {
      \__bnvs_is_gset:nnnTF Z { #1 } { #2 } {
```

```
        \prg_return_true:
      } {
        \prg_return_false:
      }
    }
  }
}
\BNVS_new_conditional:cpnn { if_spec:nnn } #1 #2 #3 { T, F, TF } {
  \__bnvs_is_gset:nnnTF { #1 } { #2 } { #3 } {
    \prg_return_true:
  } {
    \tl_if_empty:nTF { #2 } {
      \prg_return_false:
    } {
      \__bnvs_is_gset:nnnTF { #1 } { } { #3 } {
        \prg_return_true:
      } {
        \prg_return_false:
      }
    }
  }
}
\BNVS_new_conditional:cpnn { if_spec:nn } #1 #2 { T, F, TF } {
  \__bnvs_is_gset:nnTF { #1 } { #2 } {
    \prg_return_true:
  } {
    \tl_if_empty:nTF { #1 } {
      \prg_return_false:
    } {
      \__bnvs_is_gset:nnTF { } { #2 } {
        \prg_return_true:
      } {
        \prg_return_false:
      }
    }
  }
}
```

`\__bnvs_if_get:nnnc`*TF*
`\__bnvs_spec:nnnc`*TF*

`\__bnvs_if_get:nnncTF {`⟨*key*⟩`} {`⟨*id*⟩`} {`⟨*a*⟩`} {`⟨*ans*⟩`} {`⟨*yes code*⟩`} {`⟨*no code*⟩`}`
`\__bnvs_spec:nnncTF {`⟨*key*⟩`} {`⟨*id*⟩`} {`⟨*a*⟩`} {`⟨*ans*⟩`} {`⟨*yes code*⟩`} {`⟨*no code*⟩`}`

The `\__bnvs_if_get:nnnc...` variant puts what was stored for ⟨*key*⟩, ⟨*id*⟩ and ⟨*a*⟩ into the ⟨*ans*⟩ variable, if any, then executes the ⟨*yes code*⟩. Otherwise executes the ⟨*no code*⟩ without changing the contents of the ⟨*ans*⟩ `tl` variable.

The `\__bnvs_spec:nnnc...` is similar except that is uses what was stored for ⟨*key*⟩, ⟨*id*⟩ and ⟨*a*⟩ or ⟨*key*⟩, an empty ⟨*id*⟩ and ⟨*a*⟩.

```
\BNVS_new_conditional:cpnn { if_get:nnnc } #1 #2 #3 #4 { T, F, TF } {
  \__bnvs_is_gset:nnnTF { #1 } { #2 } { #3 } {
```

```
    \exp_args:Nnc \use:n { \exp_args:Nno \cs_set:cpn { \BNVS_l:cn { #4 } { tl } } } { \__bnv
    \prg_return_true:
  } {
    \prg_return_false:
  }
}
\BNVS_new_conditional:cpnn { if_get:nvvc } #1 #2 #3 #4 { T, F, TF } {
  \BNVS_tl_use:nvv {
    \__bnvs_if_get:nnncTF { #1 }
  } { #2 } { #3 } { #4 } {
    \prg_return_true:
  } {
    \prg_return_false:
  }
}
\BNVS_new_conditional:cpnn { if_spec:nnnc } #1 #2 #3 #4 { T, F, TF } {
  \__bnvs_if_get:nnncTF { #1 } { #2 } { #3 } { #4 } {
    \prg_return_true:
  } {
    \tl_if_empty:nTF { #2 } {
      \prg_return_false:
    } {
      \__bnvs_if_get:nnncTF { #1 } { } { #3 } { #4 } {
        \prg_return_true:
      } {
        \prg_return_false:
      }
    }
  }
}
```

__bnvs_gprovide:TnnnnF
__bnvs_gprovide:TnvvnF

__bnvs_gprovide:TnnnnF {⟨*yes code*⟩} {⟨*key*⟩} {⟨*id*⟩} {⟨*tag*⟩} {⟨*value*⟩} {⟨*no code*⟩}

Execute {⟨*no code*⟩} exclusively when not in provide mode. Does nothing when something was set for the ⟨*key*⟩, ⟨*id*⟩!⟨*tag*⟩ combination. Execute ⟨*yes code*⟩ before providing.

```
\BNVS_new:cpn { gprovide:TnnnnF } #1 #2 #3 #4 #5 {
  \__bnvs_if:cTF { provide } {
    \__bnvs_is_gset:nnnF { #2 } { #3 } { #4 } {
      #1
      \__bnvs_gset:nnnn { #2 } { #3 } { #4 } { #5 }
    }
  }
}
\BNVS_new:cpn { gprovide:TnvvnF } #1 #2 {
  \BNVS_tl_use:nvv { \__bnvs_gprovide:TnnnnF { #1 } { #2 } }
}
```

6.10.3 Functions with cache

__bnvs_gset_cache:nnnn
__bnvs_gset_cache:(nnnv|nvvn)
__bnvs_gset_cache:nnnn {⟨*key*⟩} {⟨*id*⟩} {⟨*a*⟩} {⟨*value*⟩}

Wrapper over the functions above for ⟨*key*⟩* instead of ⟨*key*⟩.

```
\BNVS_new:cpn { gset_cache:nnnn } #1 {
  \__bnvs_gset:nnnn { #1 * }
}
\BNVS_new:cpn { gset_cache:nvvn } #1 #2 {
  \BNVS_tl_use:nv {
    \BNVS_tl_use:nv {
      \__bnvs_gset_cache:nnnn { #1 }
    } { #2 }
  }
}
\BNVS_new:cpn { gset_cache:nnnv } #1 #2 #3 {
  \BNVS_tl_use:nv {
    \__bnvs_gset_cache:nnnn { #1 } { #2 } { #3 }
  }
}
```

__bnvs_if_get_cache:nnnc*TF*
__bnvs_if_get_cache:nnncTF {⟨*key*⟩} {⟨*id*⟩} {⟨*a*⟩} {⟨*ans*⟩} {⟨*yes code*⟩} {⟨*false code*⟩}

Wrapper over the functions above for ⟨*key*⟩* instead of ⟨*key*⟩.

```
\BNVS_new_conditional:cpnn { if_get_cache:nnnc } #1 #2 #3 #4 { T, F, TF } {
  \__bnvs_if_get:nnncTF { #1 * } { #2 } { #3 } { #4 } {
    \prg_return_true:
  } {
    \prg_return_false:
  }
}
```

__bnvs_gunset_cache:nnn
__bnvs_gunset_cache:nvv
__bnvs_gunset_cache:nn
__bnvs_gunset_cache:n
__bnvs_gunset_cache:nnn {⟨*key*⟩} {⟨*id*⟩} {⟨*a*⟩}
__bnvs_gunset_cache:nn {⟨*id*⟩} {⟨*a*⟩}
__bnvs_gunset_cache:n {⟨*id*⟩}
__bnvs_gunset_cache: __bnvs_gunset_cache:

Wrapper over the functions above for ⟨*key*⟩* instead of ⟨*key*⟩.

```
\BNVS_new:cpn { gunset_cache:nnn } #1 {
  \__bnvs_gunset:nnn { #1 * }
}
\BNVS_new:cpn { gunset_cache:nvv } #1 {
  \__bnvs_gunset:nvv { #1 * }
}
```

```
\BNVS_new:cpn { gunset_cache:nn } #1 #2 {
  \__bnvs_foreach_key_cache:n {
    \__bnvs_gunset:nnn { ##1 } { #1 } { #2 }
  }
}
\BNVS_new:cpn { gunset_cache:n } #1 {
  \__bnvs_foreach_IT:n {
    \tl_if_eq:nnT { #1 } { ##1 } {
      \__bnvs_gunset_cache:nn { ##1 } { ##2 }
    }
  }
}
\BNVS_new:cpn { gunset_cache: } {
  \__bnvs_foreach_IT:n {
    \__bnvs_gunset_cache:nn { ##1 } { ##2 }
  }
}
```

6.11 Implicit value counter

The implicit value counter is local to the current frame. It is defined at the global level because changes made at any depth must be made at the frame depth. If the frame were a closure, this counter would belong to that closure. When used for the first time, it either defaults to the first index or last index.

`\g__bnvs_v_prop` ⟨*key*⟩–⟨*value*⟩ property list to store the contents or the named value counters. The keys are qualified dotted names ⟨*frame id*⟩/⟨*name*⟩.⟨c_1⟩...⟨c_j⟩ denoted as ⟨*a*⟩.

```
\prop_new:N \g__bnvs_v_prop
```

(*End of definition for* `\g__bnvs_v_prop`.)

`\__bnvs_v_gunset:nn` `\__bnvs_v_gunset:n {⟨id⟩} {⟨a⟩}`
`\__bnvs_v_gunset:n` `\__bnvs_v_gunset:n {⟨id⟩}`
`\__bnvs_v_gunset:` `\__bnvs_v_gunset:`

Convenient shortcuts to manage the storage, it makes the code more concise and readable. This is a wrapper over LaTeX3 eponym functions.

```
\BNVS_new:cpn { v_gunset: } {
  \__bnvs_foreach_IT:n {
    \__bnvs_gunset:nnn   v { ##1 } { ##2 }
    \__bnvs_gunset_cache:nnn v { ##1 } { ##2 }
  }
}
```

`\__bnvs_n_if_greset:nnnTF` `\__bnvs_n_if_greset:nnnTF {⟨id⟩} {⟨tag⟩} {⟨initial value⟩} {⟨yes code⟩} {⟨no code⟩}`
`\__bnvs_n_if_greset:(nnv|vvn|vvv)TF`
`\__bnvs_if_greset_all:nnnTF` `\__bnvs_if_greset_all:nnnTF {⟨id⟩} {⟨tag⟩} {⟨initial value⟩} {⟨yes code⟩} {⟨no code⟩}`
`\__bnvs_if_greset_all:vvnTF`

If the ⟨*id*⟩!⟨*tag*⟩ combination is known, reset the value counter or the `n` counter to the given ⟨*initial value*⟩ and execute ⟨*yes code*⟩ otherwise ⟨*no code*⟩ is executed. The `..._all` variant also cleans the cached values and all the subvalues.

```
\BNVS_new_conditional:cpnn { if_greset:nnnn } #1 #2 #3 #4 { T, F, TF } {
  \__bnvs_is_gset:nnnTF { #1 } { #2 } { #3 } {
    \__bnvs_gunset_deep:nn { #2 } { #3 }
    \tl_if_empty:nTF { #4 } {
      \__bnvs_gunset:nnn { #1 } { #2 } { #3 }
    } {
      \__bnvs_gset:nnnn { #1 } { #2 } { #3 } { #4 }
    }
    \prg_return_true:
  } {
    \prg_return_false:
  }
}

\BNVS_new_conditional:cpnn { if_greset:nnnv } #1 #2 #3 #4 { T, F, TF } {
  \BNVS_tl_use:nv {
    \__bnvs_if_greset:nnTF { #1 } { #2 } { #3 }
  } { #4 } { \prg_return_true: } { \prg_return_false: }
}

\BNVS_new_conditional:cpnn { if_greset:nnvn } #1 #2 #3 #4 { T, F, TF } {
  \BNVS_tl_use:nv {
    \__bnvs_if_greset:nnnnTF { #1 } { #2 }
  } { #3 } { #4 }
    { \prg_return_true: } { \prg_return_false: }
}

\BNVS_new_conditional:cpnn { if_greset:nvvn } #1 #2 #3 #4 { T, F, TF } {
  \BNVS_tl_use:nvv {
    \__bnvs_if_greset:nnnnTF { #1 }
  } { #2 } { #3 } { #4 }
    { \prg_return_true: } { \prg_return_false: }
}

\BNVS_new_conditional:cpnn { n_if_greset:nnn } #1 #2 #3 { T, F, TF } {
  \__bnvs_is_gset:nnnTF n { #1 } { #2 } {
    \__bnvs_gunset:nnn n { #1 } { #2 }
    \tl_if_empty:nF { #3 } {
      \__bnvs_gset:nnnn n { #1 } { #2 } { #3 }
    }
    \prg_return_true:
  } {
    \prg_return_false:
  }
}

\BNVS_new_conditional:cpnn { n_if_greset:nnv } #1 #2 #3 { T, F, TF } {
  \BNVS_tl_use:nv { \__bnvs_n_if_greset:nnnTF { #1 } { #2 } } { #3 }
    { \prg_return_true: } { \prg_return_false: }
}

\BNVS_new_conditional:cpnn { n_if_greset:vvn } #1 #2 #3 { T, F, TF } {
  \BNVS_tl_use:nv {
    \BNVS_tl_use:Nv \__bnvs_n_if_greset:nnnTF { #1 }
  } { #2 } { #3 } { \prg_return_true: } { \prg_return_false: }
}
```

```
\BNVS_new_conditional:cpnn { n_if_greset:vvv } #1 #2 #3 { T, F, TF } {
  \BNVS_tl_use:nvv {
    \BNVS_tl_use:Nv \__bnvs_n_if_greset:nnnTF { #1 }
  } { #2 } { #3 } { \prg_return_true: } { \prg_return_false: }
}

\BNVS_new_conditional:cpnn { v_if_greset:nnn } #1 #2 #3 { T, F, TF } {
  \__bnvs_is_gset:nnnTF v { #1 } { #2 } {
    \__bnvs_gunset:nnn v { #1 } { #2 }
    \tl_if_empty:nF { #3 } {
      \__bnvs_gset:nnnn v { #1 } { #2 } { #3 }
    }
    \prg_return_true:
  } {
    \prg_return_false:
  }
}

\BNVS_new_conditional:cpnn { v_if_greset:nnv } #1 #2 #3 { T, F, TF } {
  \BNVS_tl_use:nv { \__bnvs_v_if_greset:nnnTF { #1 } { #2 } } { #3 }
    { \prg_return_true: } { \prg_return_false: }
}

\BNVS_new_conditional:cpnn { v_if_greset:vvn } #1 #2 #3 { T, F, TF } {
  \BNVS_tl_use:nv {
    \BNVS_tl_use:Nv \__bnvs_v_if_greset:nnnTF { #1 }
  } { #2 } { #3 } { \prg_return_true: } { \prg_return_false: }
}

\BNVS_new_conditional:cpnn { v_if_greset:vvv } #1 #2 #3 { T, F, TF } {
  \BNVS_tl_use:nvv {
    \BNVS_tl_use:Nv \__bnvs_v_if_greset:nnnTF { #1 }
  } { #2 } { #3 } { \prg_return_true: } { \prg_return_false: }
}

\BNVS_new_conditional:cpnn { quark_if_nil:c } #1 { T, F, TF } {
  \BNVS_tl_use:nc { \exp_args:No \quark_if_nil:nTF } { #1 } {
    \prg_return_true:
  } {
    \prg_return_false:
  }
}

\BNVS_new_conditional:cpnn { quark_if_no_value:c } #1 { T, F, TF } {
  \BNVS_tl_use:nc { \exp_args:No \quark_if_no_value:nTF } { #1 } {
    \prg_return_true:
  } {
    \prg_return_false:
  }
}

\BNVS_new_conditional:cpnn { if_greset_all:nnn } #1 #2 #3 { T, F, TF } {
  \__bnvs_is_gset:nnTF { #1 } { #2 } {
    \BNVS_begin:
```

```
    \__bnvs_foreach_key_main:n {
      \__bnvs_if_get:nnncT { ##1 } { #1 } { #2 } { a } {
        \__bnvs_quark_if_nil:cT { a } {
          \__bnvs_if_get_cache:nnncTF { ##1 } { #1 } { #2 } { a } {
            \__bnvs_gset:nnnv { ##1 } { #1 } { #2 } { a }
          } {
            \__bnvs_gset:nnnn { ##1 } { #1 } { #2 } { 1 }
          }
        }
      }
    }
    \BNVS_end:
    \__bnvs_gunset_cache:nn { #1 } { #2 }
    \__bnvs_foreach_key_sub:n {
      \__bnvs_gunset:nnn { ##1 } { #1 } { #2 }
    }
    \prg_return_true:
  } {
    \prg_return_false:
  }
}
\BNVS_new_conditional:cpnn { if_greset_all:vvn } #1 #2 #3 { T, F, TF } {
  \BNVS_tl_use:nv {
    \BNVS_tl_use:Nv \__bnvs_if_greset_all:nnnTF { #1 }
  } { #2 } { #3 } { \prg_return_true: } { \prg_return_false: }
}
```

6.12 Implicit index counter

The implicit index counter is also local to the current frame. It is defined at the global level because changes made at any depth must be made at the frame depth. When used for the first time, it defaults to 1.

__bnvs_n_gunset: __bnvs_n_gunset:

Convenient shortcuts to manage the storage, it makes the code more concise and readable. This is a wrapper over LaTeX3 eponym functions.

```
\BNVS_new:cpn { n_gunset: } {
  \__bnvs_foreach_IT:n {
    \__bnvs_gunset:nnn   n { ##1 } { ##2 }
    \__bnvs_gunset_cache:nnn n { ##1 } { ##2 }
  }
}
```

6.13 Regular expressions

\c__bnvs_short_regex This regular expressioin is used for both short names and dot path components. The short name of an overlay set consists of a non void list of alphanumerical characters and underscore, but with no leading digit.

```
\regex_const:Nn \c__bnvs_short_regex {
  [[:alpha:]_][[:alnum:]_]*
}
```

(*End of definition for* `\c__bnvs_short_regex`.)

`\c__bnvs_path_regex` A sequence of .⟨*positive integer*⟩ or .⟨*short name*⟩ items representing a path.

```
\regex_const:Nn \c__bnvs_path_regex {
  (?: \. \ur{c__bnvs_short_regex} | \. [-+]? \d+ )*
}
```

(*End of definition for* `\c__bnvs_path_regex`.)

`\c__bnvs_A_index_Z_regex`

(*End of definition for* `\c__bnvs_A_index_Z_regex`.)

```
\regex_const:Nn \c__bnvs_A_index_Z_regex { \A[-+]?\d+\Z }
```

`\c__bnvs_A_reserved_Z_regex`

(*End of definition for* `\c__bnvs_A_reserved_Z_regex`.)

```
\regex_const:Nn \c__bnvs_A_reserved_Z_regex {
  \A_*[a-z][_a-z0-9]*\Z
}
```

`\c__bnvs_A_ref_Z_regex` A qualified dotted name is the qualified name of an overlay set possibly followed by a dotted path. Matches the whole string.

(*End of definition for* `\c__bnvs_A_ref_Z_regex`.)

```
\regex_const:Nn \c__bnvs_A_ref_Z_regex {
```

1: the ⟨*frame id*⟩

```
  \A (?: ( \ur{c__bnvs_short_regex} )? ! )?
```

2: The short name.

```
  ( \ur{c__bnvs_short_regex} )
```

3: the path, if any.

```
  ( \ur{c__bnvs_path_regex} ) \Z
}
```

`\c__bnvs_A_ISPn_Z_regex` Matches the whole string. Catch the ending `.n`.

(*End of definition for* `\c__bnvs_A_ISPn_Z_regex`.)

```
\regex_const:Nn \c__bnvs_A_ISPn_Z_regex {
```

1: The full match,

2: the frame ⟨*id*⟩

```
        \A (?: ( \ur{c__bnvs_short_regex} )? (!) )?
```

3: The short name

```
1314          ( \ur{c__bnvs_short_regex} )
```

4: The dotted path excluding the trailing `.n`.

```
1315          ( (?: \. \ur{c__bnvs_short_regex} | \. [-+]? \d+ )*? )
```

5: the last `.n` component if any.

```
1316          ( \. n )? \Z
1317        }
```

`\c__bnvs_A_SPn_Z_regex` Matches the whole string. Catch the ending `.n`.

(*End of definition for* `\c__bnvs_A_SPn_Z_regex`.)

```
1318 \regex_const:Nn \c__bnvs_A_SPn_Z_regex {
```

1: The full match,

2: the frame ⟨*id*⟩

```
1319          \A ( \ur{c__bnvs_short_regex} | [-+]? \d+ )
```

3: The dotted path excluding the trailing `.n`.

```
1320          ( (?: \. \ur{c__bnvs_short_regex} | \. [-+]? \d+ )*? )
```

4: the last `.n` component if any.

```
1321          ( \. n )? \Z
1322        }
```

`\c__bnvs_colons_regex` For ranges defined by a colon syntax. One catching group for more than one colon.

```
1323 \regex_const:Nn \c__bnvs_colons_regex { :(:+)? }
```

(*End of definition for* `\c__bnvs_colons_regex`.)

`\c__bnvs_split_regex` Used to parse slide list overlay specifications in queries. Next are the 12 capture groups. Group numbers are 1 based because the regex is used in splitting contexts where only capture groups are considered and not the whole match.

```
1324 \regex_const:Nn \c__bnvs_split_regex {
1325   \s* ( ? :
```

We start with '++' instrussions[4].

1 incrementation prefix

```
1326          \+\+
```

1.1: optional identifier: optional ⟨*frame id*⟩ followed by `!`

```
      (?: ( \ur{c__bnvs_short_regex} )? (!) )?
```

1.2: ⟨*short name*⟩

```
    ( \ur{c__bnvs_short_regex} )
```

1.3: optionally followed by a dotted path with a heading dot

```
    ( \ur{c__bnvs_path_regex} )
```

2: without incement prefix

2.1: optional ⟨*frame id*⟩

```
    | (?: ( \ur{c__bnvs_short_regex} )? (!) )?
```

2.2: ⟨*short name*⟩

```
      ( \ur{c__bnvs_short_regex} )
```

2.3: optionally followed by a dotted path

```
      ( \ur{c__bnvs_path_regex} )
```

We continue with other expressions

2.4: the ⟨*++n*⟩ attribute

```
      (?: \.(\+)\+n
```

2.5: the '+' in '+=' versus standalone '='.

2.6: the poor man integer expression after '+?=', which is the longest sequence of black characters, which ends just before a space or at the very last character. This tricky definition allows quite any algebraic expression, even those involving parenthesis.

```
      |  \s* (\+?)= \s* ( \S+ )
```

2.7: the post increment

```
      | (\+)\+

    )?
  ) \s*
}
```

"

(*End of definition for* `\c__bnvs_split_regex`.)

[4] At the same time an instruction and an expression... this is a synonym of exprection

6.14 beamer.cls interface

Work in progress.

```
\RequirePackage{keyval}

\define@key{beamerframe}{beanoves~id}[]{
  \tl_set:Nx \l__bnvs_id_last_tl { #1 }
}

\AddToHook{env/beamer@frameslide/before}{
  \__bnvs_greset_call:
  \__bnvs_n_gunset:
  \__bnvs_v_gunset:
  \__bnvs_set_true:c { in_frame }
}

\AddToHook{env/beamer@frameslide/after}{
  \__bnvs_set_false:c { in_frame }
}
```

6.15 Defining named slide ranges

`\__bnvs_range_if_set:cccn`*TF* `\__bnvs_range_if_set:cccnTF {`⟨*core first*⟩`} {`⟨*core end*⟩`} {`⟨*core length*⟩`} {`⟨*tl*⟩`} {`⟨*yes code*⟩`} {`⟨*no code*⟩`}`

Parse ⟨*tl*⟩ as a range according to `\c__bnvs_colons_regex` and set the variables accordingly. ⟨*tl*⟩ is expected to only contain colons and integers.

```
\BNVS_new_conditional:cpnn { split_if_pop_left:c } #1 { T, F, TF } {
  \__bnvs_seq_pop_left:ccTF { split } { #1 } {
    \prg_return_true:
  } {
    \prg_return_false:
  }
}

\BNVS_new:cpn { split_if_pop_left:cTn } #1 #2 #3 {
  \__bnvs_split_if_pop_left:cTF { #1 } { #2 } { \BNVS_split_F:n { #3 } }
}

\BNVS_new:cpn { split_if_pop_left_or:cT } #1 #2 {
  \__bnvs_split_if_pop_left:cTF { #1 } { #2 } { \BNVS_split_F:n { #1 } }
}
\exp_args_generate:n { VVV }

\BNVS_new_conditional:cpnn { range_if_set:cccn } #1 #2 #3 #4 { T, F, TF } {
  \BNVS_begin:
  \__bnvs_tl_clear:c { a }
  \__bnvs_tl_clear:c { b }
  \__bnvs_tl_clear:c { c }
  \__bnvs_if_regex_split:cnTF { colons } { #4 } {
    \__bnvs_seq_pop_left:ccT { split } { a } {
```

`a` may contain the ⟨*start*⟩.

```
      \__bnvs_seq_pop_left:ccT { split } { b } {
        \__bnvs_tl_if_empty:cTF { b } {
```

This is a one colon range.

```
          \__bnvs_split_if_pop_left:cTF { b } {
```

`b` may contain the ⟨*end*⟩.

```
            \__bnvs_seq_pop_left:ccT { split } { c } {
              \__bnvs_tl_if_empty:cTF { c } {
```

A `::` was expected:

```
                \BNVS_error:n { Invalid~range~expression(1):~#4 }
              } {
                \int_compare:nNnT { \__bnvs_tl_count:c { c } } > { 1 } {
                  \BNVS_error:n { Invalid~range~expression(2):~#4 }
                }
                \__bnvs_split_if_pop_left:cTF { c } {
```

`\l__bnvs_c_tl` may contain the ⟨*length*⟩.

```
                  \__bnvs_seq_if_empty:cF { split } {
                    \BNVS_error:n { Invalid~range~expression(3):~#4 }
                  }
                } {
                  \BNVS_error:n { Internal~error }
                }
              }
            }
          } {
          }
        } {
```

This is a two colon range component.

```
          \int_compare:nNnT { \__bnvs_tl_count:c { b } } > { 1 } {
            \BNVS_error:n { Invalid~range~expression(4):~#4 }
          }
          \__bnvs_seq_pop_left:ccT { split } { c } {
```

`c` contains the ⟨*length*⟩.

```
            \__bnvs_split_if_pop_left:cTF { b } {
              \__bnvs_tl_if_empty:cTF { b } {
                \__bnvs_seq_pop_left:cc { split } { b }
```

`b` may contain the ⟨*end*⟩.

```
                \__bnvs_seq_if_empty:cF { split } {
                  \BNVS_error:n { Invalid~range~expression(5):~#4 }
                }
              } {
                \BNVS_error:n { Invalid~range~expression(6):~#4 }
              }
            } {
              \__bnvs_tl_clear:c { b }
            }
          }
        }
      }
    }
```

Providing both the ⟨*start*⟩, ⟨*length*⟩ and ⟨*end*⟩ of a range is not allowed, even if they happen to be consistent.

```
    \cs_set:Npn \BNVS_range_if_set_cccnTF:w { }
    \__bnvs_tl_if_empty:cT { a } {
      \__bnvs_tl_if_empty:cT { b } {
        \__bnvs_tl_if_empty:cT { c } {
          \cs_set:Npn \BNVS_range_if_set_cccnTF:w {
            \BNVS_error:n { Invalid~range~expression(7):~#3 }
          }
        }
      }
    }
    \BNVS_range_if_set_cccnTF:w
    \cs_set:Npn \BNVS_range_if_set_cccnTF:w ##1 ##2 ##3 {
      \BNVS_end:
      \__bnvs_tl_set:cn { #1 } { ##1 }
      \__bnvs_tl_set:cn { #2 } { ##2 }
      \__bnvs_tl_set:cn { #3 } { ##3 }
    }
    \BNVS_exp_args:Nvvv \BNVS_range_if_set_cccnTF:w { a } { b } { c }
    \prg_return_true:
  } {
    \BNVS_end:
    \prg_return_false:
  }
}
```

__bnvs_parse_IT: `\__bnvs_parse_IT:`

Auxiliary function for `\__bnvs_parse:n` and `\__bnvs_parse:nn` below. The `id`, `short` and `path` variables are expected to be set. These are bottlenecks.

```
\BNVS_new:cpn { parse_IT: } {
  \__bnvs_gprovide:TnvvnF {
    \__bnvs_gunset_cache:vv { id } { tag }
  } V { id } { tag } { 1 } {
    \__bnvs_if:cTF { reset } {
      \__bnvs_if:cT { reset_all } {
        \__bnvs_if_greset_all:vvnT { id } { tag } {} {}
      }
      \__bnvs_if:cF { only } {
        \__bnvs_foreach_IT:n {
          \__bnvs_tl_if_eq:cnT { id } { ##1 } {
            \exp_args:Ne \tl_if_in:nnT {
              .. \__bnvs_tl_use:c { tag } . }  { .. ##2
            } {
              \__bnvs_gunset_cache:nn { ##1 } { ##2 }
            }
          }
        }
      }
      \__bnvs_gunset:nvv v { id } { tag }
    } {
      \__bnvs_gunset:vv { id } { tag }
      \__bnvs_gset:nvvn V { id } { tag } { 1 }
```

```
    }
  }
}
```

__bnvs_parse_IT:n __bnvs_parse_IT:n {⟨*value*⟩}
__bnvs_n_parse_IT:n __bnvs_n_parse_IT:n {⟨*value*⟩}

Auxiliary function for __bnvs_parse:n and __bnvs_parse:nn below. If ⟨*value*⟩ does not correspond to a range, the V key is used. The _n variant concerns the index counter. These are bottlenecks.

__bnvs_range:nnnnn __bnvs_range:nnnnn {⟨*id*⟩} {⟨*a*⟩} {⟨*start*⟩} {⟨*end*⟩} {⟨*length*⟩}
__bnvs_range:nnvvv

Auxiliary function called within a group. Setup the model to define a range.

```
\BNVS_new:cpn { range:nnnnn } #1 #2 {
  \__bnvs_if:cTF { provide } {
    \__bnvs_is_gset:nnnTF A { #1 } { #2 } {
      \use_none:nnn
    } {
      \__bnvs_is_gset:nnnTF Z { #1 } { #2 } {
        \use_none:nnn
      } {
        \__bnvs_is_gset:nnnTF L { #1 } { #2 } {
          \use_none:nnn
        } {
          \__bnvs_do_range:nnnnn { #1 } { #2 }
        }
      }
    }
  } {
    \__bnvs_do_range:nnnnn { #1 } { #2 }
  }
}
\BNVS_new:cpn { range:nnvvv } #1 #2 {
  \BNVS_tl_use:nvvv {
     \__bnvs_range:nnnnn { #1 } { #2 }
  }
}
\BNVS_new:cpn { do_range:nnnnn } #1 #2 #3 #4 #5 {
  \__bnvs_gunset:nn { #1 } { #2 }
  \tl_if_empty:nTF { #5 } {
    \tl_if_empty:nTF { #3 } {
      \tl_if_empty:nTF { #4 } {
        \BNVS_error:n { Not~a~range:~:~#1!#2 }
      } {
        \__bnvs_gset:nnnn Z { #1 } { #2 } { #4 }
        \__bnvs_gset:nnnn A { #1 } { #2 } {  1 }
        \__bnvs_gset:nnnn V { #1 } { #2 } { \q_nil }
      }
    } {
      \__bnvs_gset:nnnn A { #1 } { #2 } { #3 }
      \__bnvs_gset:nnnn V { #1 } { #2 } { \q_nil }
```

```
      \tl_if_empty:nF { #4 } {
        \__bnvs_gset:nnnn Z { #1 } { #2 } { #4 }
        \__bnvs_gset:nnnn L { #1 } { #2 } { \q_nil }
      }
    }
  } {
    \tl_if_empty:nTF { #3 } {
      \__bnvs_gset:nnnn L { #1 } { #2 } { #5 }
      \tl_if_empty:nF { #4 } {
        \__bnvs_gset:nnnn Z { #1 } { #2 } { #4 }
        \__bnvs_gset:nnnn A { #1 } { #2 } { \q_nil }
        \__bnvs_gset:nnnn V { #1 } { #2 } { \q_nil }
      }
    } {
      \__bnvs_gset:nnnn A { #1 } { #2 } { #3 }
      \__bnvs_gset:nnnn L { #1 } { #2 } { #5 }
      \__bnvs_gset:nnnn Z { #1 } { #2 } { \q_nil }
      \__bnvs_gset:nnnn V { #1 } { #2 } { \q_nil }
    }
  }
}
\BNVS_new:cpn { range_IT:vvv } {
  \BNVS_tl_use:nvvv {
    \BNVS_tl_use:nv {
      \BNVS_tl_use:Nv \__bnvs_range:nnnnn { id }
    } { tag }
  }
}
\BNVS_new:cpn { parse_IT:n } #1 {
  \__bnvs_range_if_set:cccnTF { a } { b } { c } { #1 } {
    \__bnvs_range_IT:vvv { a } { b } { c }
  } {
    \__bnvs_gprovide:TnvvnF {
      \__bnvs_gunset:vv { id } { tag }
    } V { id } { tag } { #1 } {
      \__bnvs_if:cTF { reset } {
        \__bnvs_if:cT { reset_all } {
          \__bnvs_if_greset_all:vvnT { id } { tag } { #1 } { }
        }
        \__bnvs_if_greset:nvvnT v { id } { tag } { #1 } { }
      } {
        \__bnvs_gunset:vv { id } { tag }
        \__bnvs_gset:nvvn V { id } { tag } { #1 }
      }
    }
  }
}
\BNVS_new:cpn { n_parse_IT:n } #1 {
  \__bnvs_range_if_set:cccnTF { a } { b } { c } { #1 } {
    \BNVS_error:n { Unexpected~range:~#1 }
  } {
    \__bnvs_gprovide:TnvvnF {} n { id } { tag } { #1 } {
```

```
      \__bnvs_gset:nvvn        n { id } { tag } { #1 }
    }
  }
}
```

`\__bnvs_if_ref:nTF`	`\__bnvs_if_ref:nTF {⟨name⟩} {⟨yes code⟩} {⟨no code⟩}`
`\__bnvs_if_ref:nnTF`	`\__bnvs_if_ref:nnTF {⟨root⟩} {⟨relative⟩} {⟨yes code⟩} {⟨no code⟩}`
`\__bnvs_if_ref:vnTF`	`\__bnvs_if_ref_relative:nnTF {⟨root⟩} {⟨relative⟩} {⟨yes code⟩} {⟨no code⟩}`
`\__bnvs_if_ref_relative:nnTF`	

If ⟨*name*⟩ is a reference, put the frame id it defines into `id` the short name into `short`, the dotted path into `path`, without an eventual trailing `.n`, an eventual trailing `.n` into `n`, then execute ⟨*yes code*⟩. The `n tl` variable is empty except when ⟨*a*⟩ ends with `.n`. Otherwise execute ⟨*no code*⟩.

The second version calls the first one with ⟨*name*⟩ equals ⟨*relative*⟩ prepended with ⟨*root*⟩.

The third version accepts integers as ⟨*relative*⟩ argument. It assumes that ⟨*id*⟩, ⟨*short*⟩ and ⟨*path*⟩ are already set. The ⟨*path*⟩ and ⟨*tag*⟩ are updated accordingly

```
\BNVS_new_conditional:cpnn { if_ref:n } #1 { T, F, TF } {
  \BNVS_begin:
  \__bnvs_match_if_once:NnTF \c__bnvs_A_ISPn_Z_regex { #1 } {
    \__bnvs_if_match_pop_left:cTF { n } {
      \__bnvs_if_match_pop_left:cTF { id } {
        \__bnvs_if_match_pop_left:cTF { kri } {
          \__bnvs_if_match_pop_left:cTF { short } {
            \__bnvs_if_match_pop_left:cTF { path } {
              \__bnvs_if_match_pop_left:cTF { n } {
                \cs_set:Npn \BNVS_aux_if_ref_nTF:nnnn ##1 ##2 ##3 ##4 {
                  \BNVS_end:
                  \__bnvs_tl_set:cn { id } { ##1 }
                  \__bnvs_tl_set:cn { short } { ##2 }
                  \__bnvs_tl_set:cn { path } { ##3 }
                  \__bnvs_tl_set:cn { n } { ##4 }
                }
                \__bnvs_tl_if_empty:cTF { kri } {
                  \BNVS_exp_args:Nvvvv
                  \BNVS_aux_if_ref_nTF:nnnn
                    { id_last }
                } {
                  \BNVS_exp_args:Nvvvv
                  \BNVS_aux_if_ref_nTF:nnnn
                    { id }
                } { short } { path } { n }
                \__bnvs_tl_if_empty:cTF n {
                  \__bnvs_set_false:c
                } {
                  \__bnvs_set_true:c
                } n
                \__bnvs_tl_set:cv { tag } { path }
                \__bnvs_tl_put_left:cv { tag } { short }
                \__bnvs_tl_set:cv { id_last } { id }
```

```
                \prg_return_true:
              } {
                \BNVS_end_unreachable_return_false:n { A_ISPn_Z/n }
              }
            } {
              \BNVS_end_unreachable_return_false:n { A_ISPn_Z/path }
            }
          } {
            \BNVS_end_unreachable_return_false:n  { A_ISPn_Z/short }
          }
        } {
          \BNVS_end_unreachable_return_false:n  { A_ISPn_Z/kri }
        }
      } {
        \BNVS_end_unreachable_return_false:n  { A_ISPn_Z/id }
      }
    } {
      \BNVS_end_unreachable_return_false:n  { A_ISPn_Z/full_match }
    }
  } {
    \BNVS_end:
    \prg_return_false:
  }
}
\BNVS_new_conditional:cpnn { if_ref_relative:nn } #1 #2 { T, F, TF } {
  \BNVS_begin:
  \__bnvs_match_if_once:NnTF \c__bnvs_A_SPn_Z_regex { #2 } {
    \__bnvs_if_match_pop_left:cTF { n } {
      \__bnvs_if_match_pop_left:cTF { short } {
        \__bnvs_if_match_pop_left:cTF { path } {
          \__bnvs_if_match_pop_left:cTF { n } {
            \cs_set:Npn \BNVS_aux_if_ref_nTF:nnn ##1 ##2 ##3 {
              \BNVS_end:
              \__bnvs_tl_put_right:cn { path } { . ##1 ##2 }
              \__bnvs_tl_set:cn { n } { ##3 }
            }
            \BNVS_exp_args:Nvvv
            \BNVS_aux_if_ref_nTF:nnn { short } { path } { n }
            \__bnvs_tl_if_empty:cTF n {
              \__bnvs_set_false:c
            } {
              \__bnvs_set_true:c
            } n
            \__bnvs_tl_set:cv { tag } { path }
            \__bnvs_tl_put_left:cv { tag } { short }
            \prg_return_true:
          } {
            \BNVS_end_unreachable_return_false:n { A_SPn_Z/n }
          }
        } {
          \BNVS_end_unreachable_return_false:n { A_SPn_Z/path }
        }
      } {
        \BNVS_end_unreachable_return_false:n  { A_SPn_Z/short }
```

```
      }
    } {
      \BNVS_end_unreachable_return_false:n  { A_SPn_Z/full_match }
    }
  } {
    \BNVS_end:
    \prg_return_false:
  }
}

\BNVS_new_conditional:cpnn { if_ref:nn } #1 #2 { T, F, TF } {
  \tl_if_empty:nTF { #1 } {
    \__bnvs_if_ref:nTF { #2 } {
      \prg_return_true:
    } {
      \prg_return_false:
    }
  } {
    \__bnvs_if_ref_relative:nnTF { #1 } { #2 } {
      \prg_return_true:
    } {
      \prg_return_false:
    }
  }
}

\BNVS_new_conditional:cpnn { if_ref:vn } #1 #2 { T, F, TF } {
  \BNVS_tl_use:Nv \__bnvs_if_ref:nnTF { #1 } { #2 } {
    \prg_return_true:
  } {
    \prg_return_false:
  }
}
```

`\__bnvs_keyval_parse:Nn` `\__bnvs_keyval_named:n` `\__bnvs_keyval_defined:n`

`\__bnvs_keyval_parse:Nn` ⟨*function*⟩ {⟨*definition*⟩}
`\__bnvs_keyval_defined:n` {⟨*definition*⟩}
`\__bnvs_keyval_named:n` {⟨*name*⟩}

Wrapper over `\keyval_parse:nnn`.

```
\BNVS_new:cpn { keyval_parse:Nn } #1 {
  \keyval_parse:nnn { #1 } { \__bnvs_parse:nn }
}

\BNVS_new:cpn { keyval_named:n } {
  \keyval_parse:nnn { \__bnvs_parse_named:n } { \__bnvs_parse:nn }
}

\BNVS_new:cpn { keyval_defined:n } {
  \keyval_parse:nnn { \__bnvs_parse_defined:n } { \__bnvs_parse:nn }
}
```

__bnvs_parse:nn __bnvs_parse_named:n __bnvs_parse_defined:n

__bnvs_parse:nn {⟨*name*⟩} {⟨*definition*⟩}
__bnvs_parse_named:n {⟨*name*⟩}
__bnvs_parse_defined:n {⟨*definition*⟩}

Auxiliary functions called within a group by `\keyval:nnn`. ⟨*name*⟩ is the overlay set name, including eventually a dotted path or a frame identifier, ⟨*definition*⟩ is the corresponding definition. `\__bnvs_parse_named:n` is `\__bnvs_parse:nn` with the definition `1`. It is used when parsing a `{{}}` `\__bnvs_parse_defined:n` is `\__bnvs_parse:nn` with the first available index as n. `\__bnvs_parse:n` is just `\__bnvs_parse_defined:n` when in list mode and `\__bnvs_parse_named:n` otherwise.

\l__bnvs_match_seq Local storage for the match result.

(*End of definition for* `\l__bnvs_match_seq`.)

```
\exp_args_generate:n { nne }
\exp_args_generate:n { nnne }
\BNVS_new:cpn { parse_named:n } #1 {
  \__bnvs_set_true:c { deep }
  \__bnvs_parse:nn { #1 } { 1 }
}
\BNVS_new:cpn { parse_defined:n } #1 {
  \__bnvs_tl_if_empty:cTF { root } {
    \BNVS_error:n { Unexpected~list~at~top~level. }
  } {
    \BNVS_begin:
    \cs_set:Npn \BNVS_aux_parse_defined_n: {
      \__bnvs_int_incr:c { i }
      \__bnvs_tl_set_eq:cc { a } { root }
      \__bnvs_tl_put_right:cn { a } { . }
      \BNVS_int_use:nc { \exp_args:NnV \__bnvs_tl_put_right:cn { a } } { i }
      \__bnvs_is_gset:nvvT V { id } { a } { \BNVS_aux_parse_defined_n: }
    }
    \BNVS_aux_parse_defined_n:
    \BNVS_int_use:nv { \__bnvs_parse:nn } { i } { #1 }
    \BNVS_end:
  }
}

\cs_new:Npn \BNVS_exp_args:NNcv #1 #2 #3 #4 {
  \BNVS_tl_use:nc { \exp_args:NNnV #1 #2 { #3 } }
    { #4 }
}
\cs_new:Npn \BNVS_end_tl_set:cv #1 {
  \BNVS_tl_use:nv {
    \BNVS_end: \__bnvs_tl_set:cn { #1 }
  }
}
```

Helper for `\keyval_parse:nnn` used in `\Beanoves` command. We have three requirements:

- raw beamer lists `X=A` or `X={A}`,
- key–value lists `X={{A,B}}`,

- integer–value lists `X=[A,B]`.

```
\regex_const:Nn \c__bnvs_one_suffix_regex { \A(.*)\.(?:1|first)\Z }
\BNVS_new:cpn { parse:nn } #1 #2 {
  \BNVS_begin:
```

We prepend the argument with `root`, in case we are recursive.

```
  \__bnvs_if_ref:vnTF { root } { #1 } {
    \regex_match:nnTF { \S } { #2 } {
```

This is not a `X=`.

```
      \peek_meaning:NTF \BNVS_square_brackets:w {
```

This is a `X=[...]` list, for an indexed list of range specification.

```
        \BNVS_begin:
```

We prepend the argument with `root`, in case we are recursive.

```
        \cs_set:Npn \BNVS_square_brackets:w ##1 \s_stop {
          \__bnvs_tl_put_right:cn { root } { #1 }
          \__bnvs_keyval_defined:n { ##1 }
          \BNVS_end:
        }
      } {
```

Not a `X=[...]`.

```
        \peek_catcode:NTF \c_group_begin_token {
          \__bnvs_if:cT n {
\BNVS_warning:n { Ignoring~unexpected~suffix~.n:~#1 }
          }
          \cs_set:Npn \BNVS_aux_parse_nn:w ##1 ##2 \s_stop {
            \regex_match:nnT { \S } { ##2 } {
              \BNVS_warning:n { Ignoring~##2 }
            }
            \BNVS_use:c { X={{...}}:n } { ##1 }
          }
          \BNVS_aux_parse_nn:w
        } {
```

This is not a raw list, not a `X={{...}}`.

```
          \__bnvs_if:cTF n {
            \cs_set:Npn \BNVS_aux_parse_nn:n ##1 {
              \__bnvs_n_parse_IT:n { ##1 }
              \cs_set:Npn \BNVS_aux_parse_nn:n ####1 {
                \BNVS_warning:n { Ignored:~##1 }
              }
            }
            \cs_set:Npn \BNVS_aux_parse_nn:nn ##1 ##2 {
              \BNVS_warning:n { Ignored:~##1=##2 }
            }
            \keyval_parse:nnn
              { \BNVS_aux_parse_nn:n } { \BNVS_aux_parse_nn:nn } { #2 }
          } {
            \BNVS_use:c { X=...:n } { #2 }
          }
```

This is a not a compound definition. Next character is not a group begin token.

```
          \use_none_delimit_by_s_stop:w
        }
      }
      #2 \s_stop
    } {
```

Empty value given: completely remove the reference.

```
      \__bnvs_if:cTF n {
        \__bnvs_gunset:nvv       n { id } { tag }
        \__bnvs_gunset_cache:nvv n
      } {
        \__bnvs_if:cT { deep } {
          \__bnvs_gunset_deep:vv { id } { tag }
        }
        \__bnvs_gunset:vv
      } { id } { tag }
    }
  } {
    \BNVS_error:n { Invalid~name:~#2 }
  }
```

We export `\l__bnvs_id_last_tl`:

```
  \__bnvs_match_if_once:NvT \c__bnvs_one_suffix_regex { tag } {
    \__bnvs_if_match_pop_left:cTF { a } {
      \__bnvs_if_match_pop_left:cTF { a } {
        \cs_set:Npn \BNVS_aux_parse_nn: {
          \__bnvs_gset:nvvn V { id } { a } { #2 }
        }
        \__bnvs_if_get:nvvcT V { id } { a } { b } {
          \__bnvs_quark_if_nil:cF { b } {
            \cs_set:Npn \BNVS_aux_parse_nn: { }
          }
        }
        \BNVS_aux_parse_nn:
      } {
        \BNVS_error:n { Unreachable~2 }
      }
    } {
      \BNVS_error:n { Unreachable~1 }
    }
  }
```

We export `\l__bnvs_id_last_tl`:

```
  \BNVS_end_tl_set:cv { id_last } { id_last }
}

\BNVS_new:cpn { X={{...}}:n } #1 {
  \__bnvs_gunset_deep:vv { id } { tag }
```

s

A `X={{...}}` list, for a ⟨*name*⟩–⟨*definition*⟩ dictionary.

```
  \BNVS_begin:
```

Remove the elements that contain a `=`.

```
  \__bnvs_tl_put_right:cv { root } { tag }
  \__bnvs_tl_put_right:cn { root } { . }
  \__bnvs_keyval_named:n { #1 }
  \BNVS_end:
}
\BNVS_new:cpn { X=...:n } #1 {
  \BNVS_begin:
  \__bnvs_tl_clear:c  { a }
  \__bnvs_seq_clear:c { a }
  \cs_set:Npn \BNVS_aux_parse_nn:n ##1 {
    \__bnvs_tl_set:cn { a } { ##1 }
    \cs_set:Npn \BNVS_aux_parse_nn:n ####1 {
      \__bnvs_seq_put_right:cn { a } { ####1 }
    }
  }
  \cs_set:Npn \BNVS_aux_parse_nn:nn ##1 ##2 {
    \BNVS_warning:n { Ignored:~##1=##2 }
  }
  \keyval_parse:nnn
    { \BNVS_aux_parse_nn:n } { \BNVS_aux_parse_nn:nn } { #1 }
  \__bnvs_tl_if_empty:cTF { a } {
```

Clean everything, whether in provide mode or not, including the `.n` counter.

```
   \__bnvs_gunset_deep:vv { id } { tag }
   \__bnvs_gunset:vv { id } { tag }
  } {
```

The first definition.

```
    \BNVS_tl_use:Nv \__bnvs_parse_IT:n { a }
    \__bnvs_seq_if_empty:cTF { a } {
      \__bnvs_gunset:nvv       W { id } { tag }
      \__bnvs_gunset_cache:nvv W { id } { tag }
    } {
      \exp_args:Nnx \use:n {
        \__bnvs_gset:nvvn W { id } { tag }
      } { \seq_use:Nn \l__bnvs_a_seq { \q__bnvs } }
    }
  }
  \BNVS_end:
}
```

`\__bnvs_parse_IT[=...]:n` `\__bnvs_parse_n_IT[=...]:n` `\__bnvs_parse_IT[=...]:n {⟨definitions⟩}` `\__bnvs_parse_n_IT[=...]:n {⟨definitions⟩}`

Used by `\__bnvs_parse:nn` . ⟨*id*⟩ and ⟨*tag*⟩ are set. Store the associate values. ⟨*definitions*⟩ is a comma separated list of ⟨*definition*⟩'s, either for ranges or values. The first ⟨*definition*⟩ is for the `VWAZL` keys, the other ones are for the `W` key.

```
\BNVS_new:cpn { parse_IT[=...]:n } #1 {
  \BNVS_begin:
```

```
  \__bnvs_tl_clear:c  { a }
  \__bnvs_seq_clear:c { a }
  \cs_set:Npn \BNVS_aux_parse_nn:n ##1 {
    \__bnvs_tl_set:cn { a } { ##1 }
    \cs_set:Npn \BNVS_aux_parse_nn:n ##1 {
      \__bnvs_seq_put_right:cn { a } { ##1 }
    }
  }
  \cs_set:Npn \BNVS_aux_parse_nn:nn ##1 ##2 {
    \BNVS_warning:n { Ignored:~##1=##2 }
  }
  \keyval_parse:nnn
    { \BNVS_aux_parse_nn:n } { \BNVS_aux_parse_nn:nn } { #1 }
  \__bnvs_tl_if_empty:cTF { a } {
```

Clean everything, whether in provide mode or not, including the `.n` counter.

```
   \__bnvs_gunset:vv { id } { tag }
  } {
```

The first definition.

```
    \BNVS_tl_use:Nv \__bnvs_parse_IT:n { a }
    \__bnvs_seq_if_empty:cTF { a } {
      \__bnvs_gunset:nvv       W { id } { tag }
      \__bnvs_gunset_cache:nvv W { id } { tag }
    } {
      \__bnvs_seq_use:cn {
        \__bnvs_set:nvvn W { id } { tag }
      } { a } { \q__bnvs }
    }
  }
  \BNVS_end:
}
\BNVS_new:cpn { parse_IT[.n=...]:n } #1 {
  \BNVS_begin:
  \__bnvs_tl_clear:c  { a }
  \cs_set:Npn \BNVS_aux_parse_nn:n ##1 {
    \__bnvs_tl_set:cn { a } { ##1 }
    \cs_set:Npn \BNVS_aux_parse_nn:n ##1 {
      \BNVS_warning:n { Ignored:~##1 }
    }
  }
  \cs_set:Npn \BNVS_aux_parse_nn:nn ##1 ##2 {
    \BNVS_warning:n { Ignored:~##1=##2 }
  }
  \keyval_parse:nnn
    { \BNVS_aux_parse_nn:n } { \BNVS_aux_parse_nn:nn } { #1 }
  \__bnvs_tl_if_empty:cTF { a } {
```

Clean everything, whether in provide mode or not, including the `.n` counter.

```
   \__bnvs_gunset:nvv       n { id } { tag }
   \__bnvs_gunset_cache:nvv n { id } { tag }
  } {
```

The first definition.

```
    \BNVS_tl_use:Nv \__bnvs_n_parse_IT:n { a }
  }
  \BNVS_end:
}

\BNVS_new:cpn { parse_prepare:N } #1 {
  \tl_set:Nx #1 #1
  \__bnvs_set_false:c { parse }
  \bool_do_until:Nn \l__bnvs_parse_bool {
    \tl_if_in:NnTF #1 {%---[
    ]} {
      \regex_replace_all:nnNF { \[ ([^\]%---)
      ]*%---[(
      ) \] } { \c{BNVS_square_brackets:w} { \1 } } #1 {
        \__bnvs_set_true:c { parse }
      }
    } {
      \__bnvs_set_true:c { parse }
    }
  }
  \tl_if_in:NnTF #1 {%---[
  ]} {
    \BNVS_error:n { Unbalanced~%---[
    ]}
  } {
    \tl_if_in:NnT #1 { [%---]
    } {
      \BNVS_error:n { Unbalanced~[ %---]
      }
    }
  }
}
```

\Beanoves `\Beanoves {⟨key-value list⟩}`

The keys are the slide overlay references. When no value is provided, it defaults to `1`. On the contrary, ⟨*key-value*⟩ items are parsed by `\__bnvs_parse:nn`.

```
\cs_new:Npn \BNVS_end_tl_put_right:cv #1 #2 {
  \BNVS_tl_use:nv {
    \BNVS_end:
    \__bnvs_tl_put_right:cn { #1 }
  } { #2 }
}
\cs_new:Npn \BNVS_end_gset:nnnv #1 #2 #3 {
  \BNVS_tl_use:nv {
    \BNVS_end:
    \__bnvs_gset:nnnn { #1 } { #2 } { #3 }
  }
}

\NewDocumentCommand \Beanoves { sm } {
  \__bnvs_set_false:c { reset }
  \__bnvs_set_false:c { reset_all }
  \__bnvs_set_false:c { only }
```

```
  \tl_if_empty:NTF \@currenvir {
```

We are most certainly in the preamble, record the definitions globally for later use.

```
    \seq_gput_right:Nn \g__bnvs_def_seq { #2 }
  } {
    \tl_if_eq:NnT \@currenvir { document } {
```

At the top level, clear everything.

```
      \__bnvs_gunset:
    }
    \BNVS_begin:
    \__bnvs_tl_clear:c { root }
    \__bnvs_int_zero:c { i }
    \__bnvs_tl_set:cn { a } { #2 }
    \tl_if_eq:NnT \@currenvir { document } {
```

At the top level, use the global definitions.

```
      \seq_if_empty:NF \g__bnvs_def_seq {
        \__bnvs_tl_put_left:cx { a } {
          \seq_use:Nn \g__bnvs_def_seq , ,
        }
      }
    }
    \__bnvs_parse_prepare:N \l__bnvs_a_tl
    \IfBooleanTF {#1} {
      \__bnvs_provide_on:
    } {
      \__bnvs_provide_off:
    }
    \BNVS_tl_use:Nv \__bnvs_keyval_named:n { a }
    \BNVS_end_tl_set:cv { id_last } { id_last }
    \ignorespaces
  }
}
```

If we use the frame `beanoves` option, we can provide default values to the various name ranges.

```
\define@key{beamerframe}{beanoves}{\Beanoves*{#1}}
```

6.16 Scanning named overlay specifications

Patch some beamer commands to support `?(...)` instructions in overlay specifications.

`\__bnvs@frame` `\__bnvs@frame {`⟨*overlay specification*⟩`}`
`\__bnvs@masterdecode` `\__bnvs@masterdecode {`⟨*overlay specification*⟩`}`

Preprocess ⟨*overlay specification*⟩ before beamer reads it.

`\l__bnvs_ans_tl` Storage for the translated overlay specification, where `?(...)` instructions are replaced by their static counterparts.

(*End of definition for* `\l__bnvs_ans_tl`.)

Save the original macros `\beamer@frame` and `\beamer@masterdecode` then override them to properly preprocess the argument. We start by defining the overloads.

```
\makeatletter
\cs_set:Npn \__bnvs@frame < #1 > {
  \BNVS_begin:
  \__bnvs_tl_clear:c { ans }
  \__bnvs_scan:nNc { #1 } \__bnvs_if_resolve:ncTF { ans }
  \BNVS_set:cpn { :n } ##1 { \BNVS_end: \BNVS_saved@frame < ##1 > }
  \BNVS_tl_use:cv { :n } { ans }
}
\cs_set:Npn \__bnvs@masterdecode #1 {
  \BNVS_begin:
  \__bnvs_tl_clear:c { ans }
  \__bnvs_scan:nNc { #1 } \__bnvs_if_resolve_queries:ncTF { ans }
  \BNVS_tl_use:nv {
    \BNVS_end:
    \BNVS_saved@masterdecode
  } { ans }
}
\cs_new:Npn \BeanovesOff {
  \cs_set_eq:NN \beamer@frame \BNVS_saved@frame
  \cs_set_eq:NN \beamer@masterdecode \BNVS_saved@masterdecode
}
\cs_new:Npn \BeanovesOn {
  \cs_set_eq:NN \beamer@frame \__bnvs@frame
  \cs_set_eq:NN \beamer@masterdecode \__bnvs@masterdecode
}
\AddToHook{begindocument/before}{
  \cs_if_exist:NTF \beamer@frame {
    \cs_set_eq:NN \BNVS_saved@frame \beamer@frame
    \cs_set_eq:NN \BNVS_saved@masterdecode \beamer@masterdecode
  } {
    \cs_set:Npn \BNVS_saved@frame < #1 > {
      \BNVS_error:n {Missing~package~beamer}
    }
    \cs_set:Npn \BNVS_saved@masterdecode < #1 > {
      \BNVS_error:n {Missing~package~beamer}
    }
  }
  \BeanovesOn
}
\makeatother
```

__bnvs_scan:nNc `\__bnvs_scan:nNc {⟨overlay query⟩} ⟨resolve⟩ {⟨ans⟩}`

Scan the ⟨*overlay query*⟩ argument and feed the ⟨*ans*⟩ `tl` variable replacing `?(...)` instructions by their static counterpart with help from the ⟨*resolve*⟩ function, which is `\__bnvs_if_resolve:ncTF`. A group is created to use local variables:

\l__bnvs_ans_tl The token list that will be appended to ⟨*tl variable*⟩ on return.

(*End of definition for* `\l__bnvs_ans_tl`.)

\l__bnvs_int Store the depth level in parenthesis grouping used when finding the proper closing parenthesis balancing the opening parenthesis that follows immediately a question mark in a `?(...)` instruction.

(*End of definition for* `\l__bnvs_int`.)

\l__bnvs_query_tl Storage for the overlay query expression to be evaluated.

(*End of definition for* `\l__bnvs_query_tl`.)

\l__bnvs_token_seq The ⟨*overlay expression*⟩ is split into the sequence of its tokens.

(*End of definition for* `\l__bnvs_token_seq`.)

\l__bnvs_token_tl Storage for just one token.

(*End of definition for* `\l__bnvs_token_tl`.)

__bnvs_scan:nNc*TF* `\__bnvs_scan:nNcTF {⟨overlay query⟩} ⟨resolve⟩ {⟨ans⟩} {⟨yes code⟩} {⟨no code⟩}`

Next are helpers.

`\__bnvs_scan_for_query_then_end_return:` `\__bnvs_scan_for_query_then_end_return:`

At top level state, scan the tokens of the ⟨*named overlay expression*⟩ looking for a '`?`' character. If a '`?(...)`' is found, then the ⟨*code*⟩ is executed.

```
\BNVS_new:cpn { scan_for_query_then_end_return: } {
  \__bnvs_seq_pop_left:ccTF { token } { token } {
    \__bnvs_tl_if_eq:cnTF { token } { ? } {
      \__bnvs_scan_require_open_end_return:
    } {
      \__bnvs_tl_put_right:cv { ans } { token }
      \__bnvs_scan_for_query_then_end_return:
    }
  } {
    \__bnvs_scan_end_return_true:
  }
}
```

`\__bnvs_scan_require_open_end_return:` `\__bnvs_scan_require_open_end_return:`

We just found a '`?`', we first gobble tokens until the next '`(`', whatever they may be. In general, no tokens should be silently ignored.

```
\BNVS_new:cpn { scan_require_open_end_return: } {
```

Get next token.

```
  \__bnvs_seq_pop_left:ccTF { token } { token } {
    \str_if_eq:VnTF \l__bnvs_token_tl { ( %)
    } {
```

We found the '`(`' after the '`?`'. Set the parenthesis depth to 1 (on first passage).

```
      \__bnvs_int_set:cn { } { 1 }
```

Record the forthcomming content in the `\l__bnvs_query_tl` variable, up to the next balancing '`)`'.

```
      \__bnvs_tl_clear:c { query }
      \__bnvs_scan_require_close_and_return:
    } {
```

Ignore this token and loop.

```
      \__bnvs_scan_require_open_end_return:
    }
  } {
```

Get next token.

End reached but no opening parenthesis found, raise. As this is a standalone raising `?`, this is not a fatal error.

```
    \BNVS_error:x {Missing~'('%---)
      ~after~a~? }
    \__bnvs_scan_end_return_true:
  }
}
```

`\__bnvs_scan_require_close_and_return:` `\__bnvs_scan_require_close_and_return:`

We found a '`?(`', we record the forthcomming content in the `query` variable, up to the next balancing '`)`'.

```
\BNVS_new:cpn { scan_require_close_and_return: } {
```

Get next token.

```
  \__bnvs_seq_pop_left:ccTF { token } { token } {
    \str_case:VnF \l__bnvs_token_tl {
      { ( %---)
      } {
```

We found a '`(`', increment the depth and append the token to `query`, then scan for a '`)`'.

```
        \__bnvs_int_incr:c { }
        \__bnvs_tl_put_right:cv { query } { token }
        \__bnvs_scan_require_close_and_return:
      }
      { %(---
        )
      } {
```

We found a balancing '`)`', we decrement and test the depth.

```
        \__bnvs_int_decr:c { }
        \int_compare:nNnTF { \__bnvs_int_use:c { } } = 0 {
```

The depth level has reached 0: we found our balancing parenthesis of the `?(...)` instruction. We can append the evaluated slide ranges token list to `ans` and look for the next '`?`'.

```
          \__bnvs_scan_handle_query_then_end_return:
        } {
```

The depth has not yet reached level 0. We append the '`)`' to `query` because it is not yet the end of sequence marker.

```
          \__bnvs_tl_put_right:cv { query } { token }
          \__bnvs_scan_require_close_and_return:
        }
      }
    } {
```

The scanned token is not a '`(`' nor a '`)`', we append it as is to `query` and look for a balancing`)`.

```
        \__bnvs_tl_put_right:cv { query } { token }
      \__bnvs_scan_require_close_and_return:
    }
  } {
```

Above ends the code for Not a '`(`'. We reached the end of the sequence and the token list with no closing '`)`'. We raise and terminate. As recovery we feed `query` with the missing '`)`'.

```
    \BNVS_error:x { Missing~%(---
      `)' }
    \__bnvs_tl_put_right:cx { query } {
      \prg_replicate:nn { \l__bnvs_int } {%(---
      )}
    }
    \__bnvs_scan_end_return_true:
  }
}

\BNVS_new_conditional:cpnn { scan:nNc } #1 #2 #3 { T, F, TF } {
  \BNVS_begin:
  \BNVS_set:cpn { error:x } ##1 {
    \msg_error:nnx { beanoves } { :n }
      { \tl_to_str:n { #1 }:~##1}
  }
  \__bnvs_tl_set:cn { scan } { #1 }
  \__bnvs_tl_clear:c { ans }
  \__bnvs_seq_clear:c { token }
```

Explode the ⟨*named overlay expression*⟩ into a list of individual tokens:

```
  \regex_split:nnN { } { #1 } \l__bnvs_token_seq
```

Run the top level loop to scan for a '`?`' character: Error recovery is missing.

```
  \BNVS_set:cpn { scan_handle_query_then_end_return: } {
    \BNVS_tl_use:Nv #2 { query } { ans } {
      \__bnvs_scan_for_query_then_end_return:
    } {
      \BNVS_end_tl_put_right:cv { #3 } { ans }
```

Stop on the first error.

```
      \prg_return_false:
    }
  }
  \BNVS_set:cpn { scan_end_return_true: } {
    \BNVS_end_tl_put_right:cv { #3 } { ans }
    \prg_return_true:
  }
  \BNVS_set:cpn { scan_end_return_false: } {
    \BNVS_end_tl_put_right:cv { #3 } { ans }
    \prg_return_false:
  }
  \__bnvs_scan_for_query_then_end_return:
}
\BNVS_new:cpn { scan:nNc } #1 #2 #3 {
  \BNVS_use:c { scan:nNcTF } { #1 } #2 { #3 } {} {}
}
```

6.17 Resolution

Given a name, a frame id and a dotted path, we resolve any intermediate standalone reference. For example, with `A=B` and `B=C`, `A` is resolved in `C`. But with `A=B+1` and `B=C`, `A` is not resolved in `C+1`. With `A=B:D` and `B=C`, `A` is not resolved in `C:D` neither.

`\__bnvs_if_TIP:ccc`*TF* `\__bnvs_if_TIP:cccTF {`⟨*name*⟩`} {`⟨*id*⟩`} {`⟨*path*⟩`} {`⟨*yes code*⟩`} {`⟨*no code*⟩`}`

Auxiliary function. On input, the ⟨*name*⟩ tl variable contains a set name whereas the ⟨*id*⟩ tl variable contains a frame id. If ⟨*name*⟩ tl variable contents is a recorded set, on return, ⟨*a*⟩ tl variable contains the resolved name, ⟨*id*⟩ tl variable contains the used frame id, ⟨*path*⟩ seq variable is prepended with new dotted path components, ⟨*n*⟩ tl variable is empty on return iff there is a trailing `.n`, ⟨*yes code*⟩ is executed, otherwise variables are left untouched and ⟨*no code*⟩ is executed.

```
\BNVS_new_conditional:cpnn { if_TIP:ccc } #1 #2 #3 { T, F, TF } {
  \BNVS_begin:
  \__bnvs_match_if_once:NvTF \c__bnvs_A_ref_Z_regex { #1 }  {
```

This is a correct ⟨*a*⟩, update the path sequence accordingly.

```
    \__bnvs_if_match_pop_TIP:cccTF { #1 } { #2 } { #3 } {
      \__bnvs_export_TIP:cccN { #1 } { #2 } { #3 }
        \BNVS_end:
      \prg_return_true:
    } {
      \BNVS_end:
      \prg_return_false:
    }
  } {
    \BNVS_end:
    \prg_return_false:
  }
}
\quark_new:N \q__bnvs
```

```
\tl_new:N \l__bnvs_export_TIP_cccN_tl
\BNVS_new:cpn { export_TIP:cccN } #1 #2 #3 #4 {
  \cs_set:Npn \BNVS_export_TIP_cccN:w ##1 ##2 ##3 {
    #4
    \__bnvs_tl_set:cn { #1 } { ##1 }
    \__bnvs_tl_set:cn { #2 } { ##2 }
    \__bnvs_tl_set:cn { export_TIP_cccN } { ##3 }
  }
  \__bnvs_tl_set:cx { export_TIP_cccN }
    { \__bnvs_seq_use:cn { #1 } { \q__bnvs } }
  \BNVS_tl_use:nvv {
    \BNVS_tl_use:Nv \BNVS_export_TIP_cccN:w { #1 }
  } { #2 } { export_TIP_cccN }
  \BNVS_tl_use:nv {
    \__bnvs_seq_set_split:cnn { #3 } { \q__bnvs }
  } { export_TIP_cccN }
  \__bnvs_seq_remove_all:cn { #3 } { }
}

\tl_new:N \l__bnvs_if_match_export_ISPn_cccc_tl
\BNVS_new:cpn { if_match_export_ISPn:ccccN } #1 #2 #3 #4 #5 {
  \cs_set:Npn \BNVS_if_match_export_ISPn_ccccN:w ##1 ##2 ##3 ##4 {
    #5
    \__bnvs_tl_set:cn { #1 } { ##1 }
    \__bnvs_tl_set:cn { #2 } { ##2 }
    \__bnvs_tl_set:cn { #3 } { ##3 }
    \__bnvs_tl_set:cn { #4 } { ##4 }
  }
  \__bnvs_tl_set:cx { if_match_export_ISPn_cccc }
    { \__bnvs_seq_use:cn { #1 } { \q__bnvs } }
  \BNVS_tl_use:nvvv {
    \BNVS_tl_use:Nv \BNVS_if_match_export_ISPn_ccccN:w { #1 }
  } { #2 } { if_match_export_ISPn_cccc } { #4 }
  \BNVS_tl_use:nv {
    \__bnvs_seq_set_split:cnn { #3 } { \q__bnvs }
  } { if_match_export_ISPn_cccc }
  \__bnvs_seq_remove_all:cn { #3 } { }
}

\BNVS_new_conditional:cpnn { if_match_pop_ISPn:cccc } #1 #2 #3 #4 { TF } {
  \BNVS_begin:
  \__bnvs_if_match_pop_left:cTF { #1 } {
    \__bnvs_if_match_pop_left:cTF { #1 } {
      \__bnvs_if_match_pop_left:cTF { #2 } {
        \__bnvs_if_match_pop_left:cTF { #3 } {
          \__bnvs_seq_set_split:cnv { #3 } { . } { #3 }
          \__bnvs_seq_remove_all:cn { #3 } { }
          \__bnvs_if_match_pop_left:cTF { #4 } {
            \__bnvs_if_match_export_ISPn:ccccN { #1 } { #2 } { #3 } { #4 }
              \BNVS_end:
            \prg_return_true:
          } {
            \BNVS_end_return_false:
          }
```

```
        } {
         \BNVS_end_return_false:
        }
      } {
        \BNVS_end_return_false:
      }
    } {
      \BNVS_end_return_false:
    }
  } {
    \BNVS_end_return_false:
  }
}
```

Local variables:

- `\l__bnvs_a_tl` contains the name with a partial index path currently resolved.
- `\l__bnvs_path_head_seq` contains the index path components currently resolved.
- `\l__bnvs_b_tl` contains the resolution.
- `\l__bnvs_path_tail_seq` contains the index path components to be resolved.

```
\BNVS_new:cpn { seq_merge:cc } #1 #2 {
  \__bnvs_seq_if_empty:cF { #2 } {
    \__bnvs_seq_set_split:cnx { #1 } { \q__bnvs } {
      \__bnvs_seq_use:cn { #1 } { \q__bnvs }
      \exp_not:n { \q__bnvs }
      \__bnvs_seq_use:cn { #2 } { \q__bnvs }
    }
    \__bnvs_seq_remove_all:cn { #1 } { }
  }
}
```

6.18 Evaluation bricks

We start by helpers.

`\__bnvs_round:N` `\__bnvs_round:N` ⟨*tl variable*⟩
`\__bnvs_round:c` `\__bnvs_round:c` {⟨*tl core name*⟩}

Replaces the variable content with its rounded floating point evaluation.

```
\BNVS_new:cpn { round:N } #1 {
  \tl_if_empty:NTF #1 {
    \tl_set:Nn #1 { 0 }
  } {
    \tl_set:Nx #1 { \fp_eval:n { round(#1) } }
  }
}

\BNVS_new:cpn { round:c } {
  \BNVS_tl_use:Nc \__bnvs_round:N
}
```

__bnvs_if_assign_value:nnn*TF* __bnvs_if_assign_value:nnnTF {⟨*id*⟩} {⟨*a*⟩} ⟨*value*⟩ {⟨*yes code*⟩} {⟨*no code*⟩}
__bnvs_if_assign_value:(nnv|vvv)*TF*

```
\BNVS_new_conditional:cpnn { if_assign_value:nnn } #1 #2 #3 { T, F, TF } {
  \BNVS_begin:
  \__bnvs_if_resolve:ncTF { #3 } { a } {
    \__bnvs_gunset:nn { #1 } { #2 }
    \tl_map_inline:nn { V { V * } v } {
      \__bnvs_gset:nnnv { ##1 } { #1 } { #2 } { a }
    }
    \BNVS_end:
    \prg_return_true:
  } {
    \BNVS_end:
    \prg_return_false:
  }
}
\BNVS_new_conditional:cpnn { if_assign_value:nnv } #1 #2 #3 { T, F, TF } {
  \BNVS_tl_use:nv {
    \__bnvs_if_assign_value:nnnTF { #1 } { #2 }
  } { #3 } {
    \prg_return_true:
  } {
    \prg_return_false:
  }
}
\BNVS_new_conditional:cpnn { if_assign_value:vvv } #1 #2 #3 { T, F, TF } {
  \BNVS_tl_use:nvv {
    \BNVS_tl_use:Nv \_bnvs_if_assign_value:nnnTF { #1 }
  } { #2 } { #3 } { \prg_return_true: } { \prg_return_false: }
}
```

__bnvs_if_resolve_V:nnc*TF* __bnvs_if_resolve_V:nncTF {⟨*id*⟩} {⟨*a*⟩} ⟨*ans*⟩ {⟨*yes code*⟩} {⟨*no code*⟩}
__bnvs_if_resolve_V:nvc*TF* __bnvs_if_append_V:nncTF {⟨*id*⟩} {⟨*a*⟩} ⟨*ans*⟩ {⟨*yes code*⟩} {⟨*no code*⟩}
__bnvs_if_append_V:nnc*TF*
__bnvs_if_append_V:(nxc|nvc)*TF*

Resolve the content of the ⟨*id*⟩, ⟨*a*⟩ value counter into the ⟨*ans*⟩ `tl` variable or append this value to the right of this variable. Execute ⟨*yes code*⟩ when there is a ⟨*value*⟩, ⟨*no code*⟩ otherwise. Inside the ⟨*no code*⟩ branch, the content of the ⟨*ans*⟩ `tl` variable is undefined. Implementation detail: in ⟨*ans*⟩ we return the first in the cache for subkey V and in the general prop for subkey V (once resolved). Once we have found a value, we feed the previous items such that the next search stops at the first item. The cache contains an integer which is the computed value from the general prop. A local group is created while appending but not while resolving.

```
\BNVS_new:cpn { if_resolve_V_return:nnncT } #1 #2 #3 #4 #5 {
  \__bnvs_tl_if_empty:cTF { #4 } {
    \prg_return_false:
  } {
    \__bnvs_gset_cache:nnnv V { #2 } { #3 } { #4 }
    #5
```

```
    \prg_return_true:
  }
}
\makeatletter
\BNVS_new_conditional:cpnn { if_resolve_V:nnc } #1 #2 #3 { T, F, TF } {
  \__bnvs_if_get_cache:nnncTF V { #1 } { #2 } { #3 } {
    \prg_return_true:
  } {
    \__bnvs_if_get:nnncTF V { #1 } { #2 } { #3 } {
      \__bnvs_quark_if_nil:cTF { #3 } {
```

We can retrieve the value from either the first or last index.

```
        \__bnvs_gset:nnnn V { #1 } { #2 } { \q_no_value }
        \__bnvs_if_resolve_A:nncTF { #1 } { #2 } { #3 } {
          \__bnvs_if_resolve_V_return:nnncT A { #1 } { #2 } { #3 } {
            \__bnvs_gset:nnnn V { #1 } { #2 } { \q_nil }
          }
        } {
          \__bnvs_if_resolve_Z:nncTF { #1 } { #2 } { #3 } {
            \__bnvs_if_resolve_V_return:nnncT Z { #1 } { #2 } { #3 } {
              \__bnvs_gset:nnnn V { #1 } { #2 } { \q_nil }
            }
          } {
            \__bnvs_gset:nnnn V { #1 } { #2 } { \q_nil }
            \prg_return_false:
          }
        }
      } {
```

Possible recursive call.

```
        \__bnvs_quark_if_no_value:cTF { #3 } {
          \BNVS_error:n {Circular~definition:~#1!#2 (Error~recovery~1)}
          \__bnvs_gset:nnnn V { #1 } { #2 } { 1 }
          \__bnvs_tl_set:cn { #3 } { 1 }
          \prg_return_true:
        } {
          \__bnvs_if_resolve:vcTF { #3 } { #3 } {
            \__bnvs_if_resolve_V_return:nnncT V { #1 } { #2 } { #3 } {
              \__bnvs_gset:nnnn V { #1 } { #2 } { \q_nil }
            }
          } {
            \__bnvs_gset:nnnn V { #1 } { #2 } { \q_nil }
            \prg_return_false:
          }
        }
      }
    } {
      \tl_if_eq:nnTF { #2 } { pauses } {
        \cs_if_exist:NTF \c@beamerpauses {
          \exp_args:Nnx \__bnvs_tl_set:cn { #3 } { \the\c@beamerpauses }
          \__bnvs_gunset:nn { #1 } { #2 }
          \prg_return_true:
        } {
```

```
          \prg_return_false:
        }
      } {
        \tl_if_eq:nnTF { #2 } { slideinframe } {
          \cs_if_exist:NTF \beamer@slideinframe {
            \exp_args:Nnx \__bnvs_tl_set:cn { #3 } { \beamer@slideinframe }
          \__bnvs_gunset:nn { #1 } { #2 }
            \prg_return_true:
          } {
            \prg_return_false:
          }
        } {
          \prg_return_false:
        }
      }
    }
  }
}
\makeatother
\BNVS_new_conditional_vvc:cn { if_resolve_V } { T, F, TF }

\BNVS_new:cpn { end_put_right:vc } #1 #2 {
  \BNVS_tl_use:nv {
    \BNVS_end:
    \__bnvs_tl_put_right:cn { #2 }
  } { #1 }
}

\BNVS_new_conditional:cpnn { if_append_V:nnc } #1 #2 #3 { T, F, TF } {
  \BNVS_begin:
  \__bnvs_if_resolve_V:nncTF { #1 } { #2 } { #3 } {
    \BNVS_end_tl_put_right:cv { #3 } { #3 }
    \prg_return_true:
  } {
    \BNVS_end:
    \prg_return_false:
  }
}
\BNVS_new_conditional_vvc:cn { if_append_V } { T, F, TF }
```

`\__bnvs_if_resolve_A:nnc`*TF* `\__bnvs_if_resolve_A:nncTF {`⟨*id*⟩`} {`⟨*a*⟩`} {`⟨*ans*⟩`} {`⟨*yes code*⟩`} {`⟨*no code*⟩`}`
`\__bnvs_if_append_A:nnc`*TF* `\__bnvs_if_append_A:nncTF {`⟨*id*⟩`} {`⟨*a*⟩`} {`⟨*ans*⟩`} {`⟨*yes code*⟩`} {`⟨*no code*⟩`}`

Resolve the first index of the ⟨*a*⟩ slide range into the ⟨*ans*⟩ `tl` variable or append the first index of the ⟨*a*⟩ slide range to the ⟨*ans*⟩ `tl` variable. If no resolution occurs the content of the ⟨*ans*⟩ `tl` variable is undefined in the first case and unmodified in the second. Cache the result. Execute ⟨*yes code*⟩ when there is a ⟨*first*⟩, ⟨*no code*⟩ otherwise.

```
\BNVS_new_conditional:cpnn { if_resolve_A:nnc } #1 #2 #3 { T, F, TF } {
  \__bnvs_if_get_cache:nnncTF A { #1 } { #2 } { #3 } {
    \prg_return_true:
  } {
    \__bnvs_if_get:nnncTF A { #1 } { #2 } { #3 } {
      \__bnvs_quark_if_nil:cTF { #3 } {
        \__bnvs_gset:nnnn A { #1 } { #2 } { \q_no_value }
```

The first index must be computed separately from the length and the last index.

```
        \__bnvs_if_resolve_Z:nncTF { #1 } { #2 } { #3 } {
          \__bnvs_tl_put_right:cn { #3 } { - }
          \__bnvs_if_append_L:nncTF { #1 } { #2 } { #3 } {
            \__bnvs_tl_put_right:cn { #3 } { + 1 }
            \__bnvs_round:c { #3 }
            \__bnvs_tl_if_empty:cTF { #3 } {
              \__bnvs_gset:nnnn A { #1 } { #2 } { \q_nil }
              \prg_return_false:
            } {
              \__bnvs_gset:nnnn   A { #1 } { #2 } { \q_nil }
              \__bnvs_gset_cache:nnnv A { #1 } { #2 } { #3 }
              \prg_return_true:
            }
          } {
            \BNVS_error:n {
Unavailable~length~for~#1~(\token_to_str:N\__bnvs_if_resolve_A:nncTF/2) }
            \__bnvs_gset:nnnn A { #1 } { #2 } { \q_nil }
            \prg_return_false:
          }
        } {
          \BNVS_error:n {
Unavailable~last~for~#1~(\token_to_str:N\__bnvs_if_resolve_A:nncTF/1) }
          \__bnvs_gset:nnnn A { #1 } { #2 } { \q_nil }
          \prg_return_false:
        }
      } {
        \__bnvs_quark_if_no_value:cTF { a } {
          \BNVS_error:n {Circular~definition:~#1!#2 (Error~recovery~1)}
          \__bnvs_gset:nnnn A { #1 } { #2 } { 1 }
          \__bnvs_tl_set:cn { #3 } { 1 }
          \prg_return_true:
        } {
          \__bnvs_if_resolve:vcTF { #3 } { #3 } {
            \__bnvs_gset:nnnv A { #1 } { #2 } { #3 }
            \prg_return_true:
          } {
            \prg_return_false:
          }
        }
      }
    } {
      \prg_return_false:
    }
  }
}
\BNVS_new_conditional:cpnn { if_append_A:nnc } #1 #2 #3 { T, F, TF } {
  \BNVS_begin:
  \__bnvs_if_resolve_A:nncTF { #1 } { #2 } { #3 } {
    \BNVS_end_tl_put_right:cv { #3 } { #3 }
    \prg_return_true:
  } {
```

```
    \BNVS_end:
    \prg_return_false:
  }
}
```

`\__bnvs_if_resolve_Z:nncTF` `\__bnvs_if_append_Z:nncTF`

`\__bnvs_if_resolve_Z:nncTF` {⟨*id*⟩} {⟨*a*⟩} {⟨*ans*⟩} {⟨*yes code*⟩} {⟨*no code*⟩}
`\__bnvs_if_append_Z:nncTF` {⟨*id*⟩} {⟨*a*⟩} {⟨*ans*⟩} {⟨*yes code*⟩} {⟨*no code*⟩}

Resolve the last index of the ⟨*id*⟩!⟨*a*⟩ range into or to the right of the ⟨*ans*⟩ `tl` variable, when possible. Execute ⟨*yes code*⟩ when a last index was given, ⟨*no code*⟩ otherwise.

```
\BNVS_new_conditional:cpnn { if_resolve_Z:nnc } #1 #2 #3 { T, F, TF } {
  \__bnvs_if_get_cache:nnncTF Z { #1 } { #2 } { #3 } {
    \prg_return_true:
  }  {
    \__bnvs_if_get:nnncTF Z { #1 } { #2 } { #3 } {
      \__bnvs_quark_if_nil:cTF { #3 } {
        \__bnvs_gset:nnnn Z { #1 } { #2 } { \q_no_value }
```

The last index must be computed separately from the start and the length.

```
        \__bnvs_if_resolve_A:nncTF { #1 } { #2 } { #3 } {
          \__bnvs_tl_put_right:cn { #3 } { + }
          \__bnvs_if_append_L:nncTF { #1 } { #2 } { #3 } {
            \__bnvs_tl_put_right:cn { #3 } { - 1 }
            \__bnvs_round:c { #3 }
            \__bnvs_gset_cache:nnnv Z { #1 } { #2 } { #3 }
            \__bnvs_gset:nnnn   Z { #1 } { #2 } { \q_nil }
            \prg_return_true:
          } {
            \BNVS_error:x {
 Unavailable~last~for~#1~(\token_to_str:N \__bnvs_if_resolve_Z:ncTF/1) }
            \__bnvs_gset:nnnn Z { #1 } { #2 } { \q_nil }
            \prg_return_false:
          }
        } {
          \BNVS_error:x {
Unavailable~first~for~#1~(\token_to_str:N \__bnvs_if_resolve_Z:ncTF/1) }
          \__bnvs_gset:nnnn Z { #1 } { #2 } { \q_nil }
          \prg_return_false:
        }
      } {
        \__bnvs_quark_if_no_value:cTF { #3 } {
          \BNVS_error:n {Circular~definition:~#1!#2 (Error~recovery~1)}
          \__bnvs_tl_set:cn { #3 } { 1 }
          \__bnvs_gset_cache:nnnv Z { #1 } { #2 } { #3 }
          \prg_return_true:
        } {
          \__bnvs_if_resolve:vcTF { #3 } { #3 } {
            \__bnvs_gset_cache:nnnv Z { #1 } { #2 } { #3 }
            \prg_return_true:
          } {
            \prg_return_false:
          }
        }
```

```
      }
    } {
      \prg_return_false:
    }
  }
}
\BNVS_new_conditional_vvc:cn { if_resolve_Z } { T, F, TF }

\BNVS_new_conditional:cpnn { if_append_Z:nnc } #1 #2 #3 { T, F, TF } {
  \BNVS_begin:
  \__bnvs_if_resolve_Z:nncTF { #1 } { #2 } { #3 } {
    \BNVS_end_tl_put_right:cv { #3 } { #3 }
    \prg_return_true:
  } {
    \BNVS_end:
    \prg_return_false:
  }
}
\BNVS_new_conditional_vvc:cn { if_append_Z } { T, F, TF }
```

__bnvs_if_resolve_L:nnc*TF* __bnvs_if_resolve_L:nncTF {⟨*id*⟩} {⟨*a*⟩} {⟨*ans*⟩} {⟨*yes code*⟩} {⟨*no code*⟩}
__bnvs_if_append_L:nnc*TF* __bnvs_if_append_L:nncTF {⟨*id*⟩} {⟨*a*⟩} {⟨*ans*⟩} {⟨*yes code*⟩} {⟨*no code*⟩}

Resolve the length of the ⟨*id*⟩!⟨*a*⟩ slide range into ⟨*ans*⟩ `tl` variable, or append the length of the ⟨*key*⟩ slide range to this variable. Execute ⟨*yes code*⟩ when there is a ⟨*length*⟩, ⟨*no code*⟩ otherwise.

```
\BNVS_new_conditional:cpnn { if_resolve_L:nnc } #1 #2 #3 { T, F, TF } {
  \__bnvs_if_get_cache:nnncTF L { #1 } { #2 } { #3 } {
    \prg_return_true:
  } {
    \__bnvs_if_get:nnncTF L { #1 } { #2 } { #3 } {
      \__bnvs_quark_if_nil:cTF { #3 } {
        \__bnvs_gset:nnnn L { #1 } { #2 } { \q_no_value }
```

The length must be computed separately from the start and the last index.

```
        \__bnvs_if_resolve_Z:nncTF { #1 } { #2 } { #3 } {
          \__bnvs_tl_put_right:cn { #3 } { - }
          \__bnvs_if_append_A:nncTF { #1 } { #2 } { #3 } {
            \__bnvs_tl_put_right:cn { #3 } { + 1 }
            \__bnvs_round:c { #3 }
            \__bnvs_gset:nnnn   L { #1 } { #2 } { \q_nil }
            \__bnvs_gset_cache:nnnv L { #1 } { #2 } { #3 }
            \prg_return_true:
          } {
            \BNVS_error:n {
Unavailable~first~for~#1~(\__bnvs_if_resolve_L:nncTF/2) }
            \prg_return_false:
          }
        } {
          \BNVS_error:n {
Unavailable~last~for~#1~(\__bnvs_if_resolve_L:nncTF/1) }
          \prg_return_false:
        }
      } {
```

```
        \__bnvs_quark_if_no_value:cTF { #3 } {
          \BNVS_error:n {Circular~definition:~#1!#2 (Error~recovery~1)}
          \__bnvs_gset_cache:nnnn L { #1 } { #2 } { 1 }
          \__bnvs_tl_set:cn { #3 } { 1 }
          \prg_return_true:
        } {
          \__bnvs_if_resolve:vcTF { #3 } { #3 } {
            \__bnvs_gset_cache:nnnv L { #1 } { #2 } { #3 }
            \prg_return_true:
          } {
            \prg_return_false:
          }
        }
      }
    } {
      \prg_return_false:
    }
  }
}
\BNVS_new_conditional_vvc:cn { if_resolve_L } { T, F, TF }

\BNVS_new_conditional:cpnn { if_append_L:nnc } #1 #2 #3 { T, F, TF } {
  \BNVS_begin:
  \__bnvs_if_resolve_L:nncTF { #1 } { #2 } { #3 } {
    \BNVS_end_tl_put_right:cv { #3 } { #3 }
    \prg_return_true:
  } {
    \BNVS_end:
    \prg_return_false:
  }
}
\BNVS_new_conditional_vvc:cn { if_append_L } { T, F, TF }
```

__bnvs_if_resolve_previous:nnc*TF* __bnvs_if_append_previous:ncTF {⟨*id*⟩} {⟨*a*⟩} {⟨*ans*⟩} {⟨*yes code*⟩} {⟨*no*
__bnvs_if_append_previous:nnc*TF* *code*⟩}

Resolve the index after the ⟨*id*⟩!⟨*key*⟩ slide range into the ⟨*ans*⟩ `tl` variable, or append this index to that variable. Execute ⟨*yes code*⟩ when there is a ⟨*next*⟩ index, ⟨*no code*⟩ otherwise. In the latter case, the ⟨*ans*⟩ `tl` is undefined on resolution only.

__bnvs_if_resolve_first:nnc*TF* __bnvs_if_resolve_first:nncTF {⟨*id*⟩} {⟨*tag*⟩} ⟨*ans*⟩ {⟨*yes code*⟩} {⟨*no*
__bnvs_if_resolve_first:vvc*TF* *code*⟩}
__bnvs_if_append_first:nnc*TF* __bnvs_if_append_first:nncTF {⟨*id*⟩} {⟨*tag*⟩} ⟨*ans*⟩ {⟨*yes code*⟩} {⟨*no*
__bnvs_if_append_first:vvc*TF* *code*⟩}

Resolve the first index starting the ⟨*id*⟩!⟨*tag*⟩ slide range into the ⟨*ans*⟩ `tl` variable, or append this index to that variable. Execute ⟨*yes code*⟩ when there is a ⟨*first*⟩ index, ⟨*no code*⟩ otherwise. In the latter case, on resolution only, the content of the ⟨*ans*⟩ `tl` variable is undefined.

```
\BNVS_new_conditional:cpnn { if_resolve_first:nnc } #1 #2 #3 { T, F, TF } {
```

```
  \__bnvs_if_resolve_V:nncTF { #1 } { #2.first } { #3 }
    { \prg_return_true: }
    { \__bnvs_if_resolve_A:nncTF { #1 } { #2 } { #3 }
        { \prg_return_true: }
        { \__bnvs_if_resolve_v:nncTF { #1 } { #2.1 } { #3 }
            { \prg_return_true: } { \prg_return_false: }
        }
    }
}
\BNVS_new_conditional_vvc:cn { if_resolve_first } { T, F, TF }

\BNVS_new_conditional:cpnn { if_append_first:nnc } #1 #2 #3 { T, F, TF } {
  \__bnvs_if_append_index:nnncTF { #1 } { #2 } { 1 } { #3 } { \prg_return_true: } {
    \__bnvs_if_append_A:nncTF { #1 } { #2 } { #3 }
      { \prg_return_true: } { \prg_return_false: }
  }
}
\BNVS_new_conditional_vvc:cn { if_append_first } { T, F, TF }
```

__bnvs_if_resolve_last:nnc*TF* __bnvs_if_resolve_last:nncTF {⟨*id*⟩} {⟨*a*⟩} {⟨*ans*⟩} {⟨*yes code*⟩} {⟨*no*
__bnvs_if_resolve_last:vvc*TF* *code*⟩}
__bnvs_if_append_last:nnc*TF* __bnvs_if_append_last:nncTF {⟨*id*⟩} {⟨*a*⟩} {⟨*ans*⟩} {⟨*yes code*⟩} {⟨*no*
__bnvs_if_append_last:vvc*TF* *code*⟩}

Resolve the last index of the ⟨*id*⟩!⟨*a*⟩ slide range into the ⟨*ans*⟩ `tl` variable, or append this index to that variable. Execute ⟨*yes code*⟩ when there is a ⟨*last*⟩ index, ⟨*no code*⟩ otherwise. In the latter case, the content of the ⟨*ans*⟩ `tl` variable is undefined, on resolution only.

```
\BNVS_new_conditional:cpnn { if_resolve_last:nnc } #1 #2 #3 { T, F, TF } {
  \__bnvs_if_resolve_Z:nncTF { #1 } { #2 } { #3 }
    { \prg_return_true: } { \prg_return_false: }
}
\BNVS_new_conditional_vvc:cn { if_resolve_last } { T, F, TF }

\BNVS_new_conditional:cpnn { if_append_last:nnc } #1 #2 #3 { T, F, TF } {
  \__bnvs_if_append_Z:nncTF { #1 } { #2 } { #3 }
    { \prg_return_true: } {\prg_return_false: }
}

\BNVS_new_conditional_vvc:cn { if_append_last } { T, F, TF }
```

__bnvs_if_resolve_length:nnc*TF* __bnvs_if_resolve_length:nncTF {⟨*id*⟩} {⟨*a*⟩} {⟨*ans*⟩} {⟨*yes code*⟩} {⟨*no*
__bnvs_if_append_length:nnc*TF* *code*⟩}
__bnvs_if_append_length:vvc*TF* __bnvs_if_append_length:nncTF {⟨*id*⟩} {⟨*a*⟩} {⟨*ans*⟩} {⟨*yes code*⟩} {⟨*no*
code⟩}

Resolve the length of the ⟨*id*⟩!⟨*a*⟩ slide range into the ⟨*ans*⟩ `tl` variable, or append this number to that variable. Execute ⟨*yes code*⟩ when there is a ⟨*last*⟩ index, ⟨*no code*⟩ otherwise. In the latter case, the content of the ⟨*ans*⟩ `tl` variable is undefined, on resolution only.

```
\BNVS_new_conditional:cpnn { if_resolve_length:nnc } #1 #2 #3 { T, F, TF } {
```

```
  \__bnvs_if_resolve_L:nncTF { #1 } { #2 } { #3 }
    { \prg_return_true: } { \prg_return_false: }
}
\BNVS_new_conditional_vvc:cn { if_resolve_length } { T, F, TF }

\BNVS_new_conditional:cpnn { if_append_length:nnc } #1 #2 #3 { T, F, TF } {
  \__bnvs_if_append_L:nncTF { #1 } { #2 } { #3 }
    { \prg_return_true: } {\prg_return_false: }
}
\BNVS_new_conditional_vvc:cn { if_append_length } { T, F, TF }
```

`\__bnvs_if_resolve_range:nncTF` `\__bnvs_if_append_range:nncTF`

`\__bnvs_if_resolve_range:nncTF {⟨id⟩} {⟨a⟩} {⟨ans⟩} {⟨yes code⟩} {⟨no code⟩}`
`\__bnvs_if_append_range:nncTF {⟨id⟩} {⟨a⟩} {⟨ans⟩} {⟨yes code⟩} {⟨no code⟩}`

Resolve the range of the ⟨*id*⟩!⟨*key*⟩ slide range into the ⟨*ans*⟩ `tl` variable or append this range to that variable. Execute ⟨*yes code*⟩ when there is a ⟨*range*⟩, ⟨*no code*⟩ otherwise, in that latter case the content the ⟨*ans*⟩ `tl` variable is undefined on resolution only.

```
\BNVS_new_conditional:cpnn { if_append_range:nnc } #1 #2 #3 { T, F, TF } {
  \BNVS_begin:
  \__bnvs_if_resolve_A:nncTF { #1 } { #2 } { a } {
    \BNVS_tl_use:Nv \int_compare:nNnT { a } < 0 {
      \__bnvs_tl_set:cn { a } { 0 }
    }
    \__bnvs_if_resolve_Z:nncTF { #1 } { #2 } { b } {
```

Limited from above and below.

```
      \BNVS_tl_use:Nv \int_compare:nNnT { b } < 0 {
        \__bnvs_tl_set:cn { b } { 0 }
      }
      \__bnvs_tl_put_right:cn { a } { - }
      \__bnvs_tl_put_right:cv { a } { b }
      \BNVS_end_tl_put_right:cv { #3 } { a }
      \prg_return_true:
    } {
```

Limited from below.

```
      \BNVS_end_tl_put_right:cv { #3 } { a }
      \__bnvs_tl_put_right:cn { #3 } { - }
      \prg_return_true:
    }
  } {
    \__bnvs_if_resolve_Z:nncTF { #1 } { #2 } { b } {
```

Limited from above.

```
      \BNVS_tl_use:Nv \int_compare:nNnT { b } < 0 {
        \__bnvs_tl_set:cn { b } { 0 }
      }
      \__bnvs_tl_put_left:cn { b } { - }
      \BNVS_end_tl_put_right:cv { #3 } { b }
```

```
      \prg_return_true:
    } {
      \__bnvs_if_resolve_V:nncTF { #1 } { #2 } { b } {
      \BNVS_tl_use:Nv \int_compare:nNnT { b } < 0 {
        \__bnvs_tl_set:cn { b } { 0 }
      }
```

Unlimited range.

```
        \BNVS_end_tl_put_right:cv { #3 } { b }
        \__bnvs_tl_put_right:cn { #3 } { - }
        \prg_return_true:
      } {
        \BNVS_end:
        \prg_return_false:
      }
    }
  }
}
\BNVS_new_conditional_vvc:cn { if_append_range } { T, F, TF }

\BNVS_new_conditional:cpnn { if_resolve_range:nnc } #1 #2 #3 { T, F, TF } {
  \__bnvs_tl_clear:c { #3 }
  \__bnvs_if_append_range:ncTF { #1 } { #2 } { #3 } {
    \prg_return_true:
  } {
    \prg_return_false:
  }
}
\BNVS_new_conditional_vvc:cn { if_resolve_range } { T, F, TF }
```

`\__bnvs_if_resolve_previous:nnc`*TF*
`\__bnvs_if_append_previous:nnc`*TF*

`\__bnvs_if_resolve_previous:nncTF` {⟨*id*⟩} {⟨*tag*⟩} {⟨*ans*⟩} {⟨*yes code*⟩} {⟨*no code*⟩}
`\__bnvs_if_append_previous:nncTF` {⟨*id*⟩} {⟨*tag*⟩} {⟨*ans*⟩} {⟨*yes code*⟩} {⟨*no code*⟩}

Resolve the index after the ⟨*key*⟩ slide range into the ⟨*ans*⟩ `tl` variable, or append this index to that variable. Execute ⟨*yes code*⟩ when there is a ⟨*next*⟩ index, ⟨*no code*⟩ otherwise. In the latter case, the ⟨*tl variable*⟩ is undefined on resolution only.

```
\BNVS_new_conditional:cpnn { if_resolve_previous:nnc } #1 #2 #3 { T, F, TF } {
  \__bnvs_if_get_cache:nnncTF P { #1 } { #2 } { #3 } {
    \prg_return_true:
  } {
    \__bnvs_if_resolve_A:nncTF { #1 } { #2 } { #3 } {
      \__bnvs_tl_put_right:cn { #3 } { -1 }
      \__bnvs_round:c { #3 }
      \__bnvs_gset_cache:nnnv P { #1 } { #2 } { #3 }
      \prg_return_true:
    } {
      \prg_return_false:
    }
  }
}
\BNVS_new_conditional_vvc:cn { if_resolve_previous } { T, F, TF }
```

```
\BNVS_new_conditional:cpnn { if_append_previous:nnc } #1 #2 #3 { T, F, TF } {
  \BNVS_begin:
  \__bnvs_if_resolve_previous:nncTF { #1 } { #2 } { #3 } {
    \BNVS_end_tl_put_right:cv { #3 } { #3 }
    \prg_return_true:
  } {
    \BNVS_end:
    \prg_return_false:
  }
}
\BNVS_new_conditional_vvc:cn { if_append_previous } { T, F, TF }
```

__bnvs_if_resolve_next:nnc*TF*
__bnvs_if_append_next:nnc*TF*

```
\__bnvs_if_resolve_next:nncTF {⟨id⟩} {⟨tag⟩} {⟨ans⟩} {⟨yes code⟩} {⟨no code⟩}
\__bnvs_if_append_next:nncTF  {⟨id⟩} {⟨tag⟩} {⟨ans⟩} {⟨yes code⟩} {⟨no code⟩}
```

Resolve the index after the ⟨*id*⟩! slide range into the ⟨*ans*⟩ `tl` variable, or append this index to that variable. Execute ⟨*yes code*⟩ when there is a ⟨*next*⟩ index, ⟨*no code*⟩ otherwise. In the latter case, the content of the ⟨*tl variable*⟩ is undefined, on resolution only.

```
\BNVS_new_conditional:cpnn { if_resolve_next:nnc } #1 #2 #3 { T, F, TF } {
  \__bnvs_if_get_cache:nnncTF N { #1 } { #2 } { #3 } {
    \prg_return_true:
  } {
    \__bnvs_if_resolve_Z:nncTF { #1 } { #2 } { #3 } {
      \__bnvs_tl_put_right:cn { #3 } { +1 }
      \__bnvs_round:c { #3 }
      \__bnvs_gset_cache:nnnv N { #1 } { #2 } { #3 }
      \prg_return_true:
    } {
      \prg_return_false:
    }
  }
}
\BNVS_new_conditional_vvc:cn { if_resolve_next } { T, F, TF }

\BNVS_new_conditional:cpnn { if_append_next:nnc } #1 #2 #3 { T, F, TF } {
  \BNVS_begin:
  \__bnvs_if_resolve_next:nncTF { #1 } { #2 } { #3 } {
    \BNVS_end_tl_put_right:cv { #3 } { #3 }
    \prg_return_true:
  } {
    \BNVS_end:
    \prg_return_true:
  }
}
\BNVS_new_conditional_vvc:cn { if_append_next } { T, F, TF }
```

__bnvs_if_resolve_v:nncTF	__bnvs_if_resolve_v:nncTF {⟨*id*⟩} {⟨*a*⟩} ⟨*ans*⟩ {⟨*yes code*⟩} {⟨*no code*⟩}
__bnvs_if_resolve_v:vvcTF	
__bnvs_if_append_v:nnc __bnvs_if_append_v:vvcTF	__bnvs_if_append_v:nncTF {⟨*id*⟩} {⟨*a*⟩} ⟨*ans*⟩ {⟨*yes code*⟩} {⟨*no code*⟩}

Resolve the value of the ⟨*id*⟩!⟨*a*⟩ overlay set into the ⟨*ans*⟩ `tl` variable or append this value to the right of this variable. Execute ⟨*yes code*⟩ when there is a ⟨*value*⟩, ⟨*no code*⟩ otherwise. In the latter case, the content of the ⟨*ans*⟩ `tl` variable is undefined, on resolution only. Calls `\__bnvs_if_resolve_V:nncTF`.

```
\BNVS_new_conditional:cpnn { if_resolve_v:nnc } #1 #2 #3 { T, F, TF } {
  \__bnvs_if_get:nnncTF v { #1 } { #2 } { #3 } {
    \__bnvs_quark_if_no_value:cTF { #3 } {
          \BNVS_error:n {Circular~definition:~#1!#2 (Error~recovery~1)}
          \__bnvs_gset:nnnn V { #1 } { #2 } { 1 }
          \__bnvs_tl_set:cn { #3 } { 1 }
          \prg_return_true:
        } {
      \prg_return_true:
    }
  } {
    \__bnvs_gset:nnnn v { #1 } { #2 } { \q_no_value }
    \__bnvs_if_resolve_V:nncTF { #1 } { #2 } { #3 } {
      \__bnvs_gset:nnnv v { #1 } { #2 } { #3 }
      \prg_return_true:
    } {
      \__bnvs_if_resolve_A:nncTF { #1 } { #2 } { #3 } {
        \__bnvs_gset:nnnv v { #1 } { #2 } { #3 }
        \prg_return_true:
      } {
        \__bnvs_if_resolve_Z:nncTF { #1 } { #2 } { #3 } {
        \__bnvs_gset:nnnv v { #1 } { #2 } { #3 }
          \prg_return_true:
        } {
          \__bnvs_gunset:nnn v { #1 } { #2 }
          \prg_return_false:
        }
      }
    }
  }
}
\BNVS_new_conditional_vvc:cn { if_resolve_v } { T, F, TF }

\BNVS_new_conditional:cpnn { if_append_v:nnc } #1 #2 #3 { T, F, TF } {
  \BNVS_begin:
  \__bnvs_if_resolve_v:nncTF { #1 } { #2 } { #3 } {
    \BNVS_end_tl_put_right:cv { #3 } { #3 }
    \prg_return_true:
  } {
    \BNVS_end:
    \prg_return_false:
  }
}

\BNVS_new_conditional_vvc:cn { if_append_v } { T, F, TF }
```

__bnvs_index_can:nn*TF* __bnvs_index_can:nnTF {⟨*id*⟩} {⟨*a*⟩} {⟨*yes code*⟩} {⟨*no code*⟩}
__bnvs_index_can:vv*TF* __bnvs_if_resolve_index:nnncTF {⟨*id*⟩} {⟨*a*⟩} {⟨*integer*⟩} {⟨*ans*⟩} {⟨*yes code*⟩} {⟨*no code*⟩}
__bnvs_if_resolve_index:nnnc*TF* __bnvs_if_append_index:nnncTF {⟨*id*⟩} {⟨*a*⟩} {⟨*integer*⟩} {⟨*ans*⟩} {⟨*yes code*⟩} {⟨*no code*⟩}
__bnvs_if_resolve_index:vvvc*TF*
__bnvs_if_append_index:nnnc*TF*
__bnvs_if_append_index:vvvc*TF*

Resolve the index associated to the ⟨*id*⟩!⟨*a*⟩ set and ⟨*integer*⟩ slide range into the ⟨*ans*⟩ `tl` variable or append this index to the right of that variable. When ⟨*integer*⟩ is 1, this is the first index, when ⟨*integer*⟩ is 2, this is the second index, and so on. When ⟨*integer*⟩ is 0, this is the index, before the first one, and so on. If the computation is possible, ⟨*yes code*⟩ is executed, otherwise ⟨*no code*⟩ is executed. In the latter case, the content of the ⟨*ans*⟩ `tl` variable is undefined, on resolution only. The computation may fail when too many recursion calls are required.

```
\BNVS_new_conditional:cpnn { index_can:nn } #1 #2 { T, F, TF } {
  \__bnvs_is_gset:nnnTF V { #1 } { #2 } {
    \prg_return_true:
  } {
    \__bnvs_is_gset:nnnTF A { #1 } { #2 } {
      \prg_return_true:
    } {
      \__bnvs_is_gset:nnnTF Z { #1 } { #2 } {
        \prg_return_true:
      } {
        \prg_return_false:
      }
    }
  }
}
\BNVS_new_conditional:cpnn { index_can:vv } #1 #2 { T, F, TF } {
  \BNVS_tl_use:nv {
    \BNVS_tl_use:Nv \__bnvs_index_can:nTF { #1 }
  } { #2 } { \prg_return_true: } { \prg_return_false: }
}
\BNVS_new_conditional:cpnn { if_resolve_index:nnnc } #1 #2 #3 #4 { T, F, TF } {
  \exp_args:Ne \__bnvs_if_resolve_V:nncTF { #1 } { #2.#3 } { #4 } {
      \prg_return_true:
  } {
    \__bnvs_if_resolve_first:nncTF { #1 } { #2 } { #4 } {
      \__bnvs_tl_put_right:cn { #4 } { + #3 - 1 }
      \__bnvs_round:c { #4 }
      \prg_return_true:
```

Limited overlay set.

```
    } {
      \__bnvs_if_resolve_Z:nncTF { #1 } { #2 } { #4 } {
        \__bnvs_tl_put_right:cn { #4 } { + #3 - 1 }
        \__bnvs_round:c { #4 }
        \prg_return_true:
      } {
        \__bnvs_if_resolve_V:nncTF { #1 } { #2 } { #4 } {
          \__bnvs_tl_put_right:cn { #4 } { + #3 - 1 }
          \__bnvs_round:c { #4 }
```

```
          \prg_return_true:
        } {
          \__bnvs_if_resolve_v:nncTF { #1 } { #2 } { #4 } {
            \__bnvs_tl_put_right:cn { #4 } { + #3 - 1 }
            \__bnvs_round:c { #4 }
            \prg_return_true:
          } {
            \prg_return_false:
          }
        }
      }
    }
  }
}
\BNVS_new_conditional:cpnn { if_resolve_index:nnvc } #1 #2 #3 #4 { T, F, TF } {
  \BNVS_tl_use:nv {
    \__bnvs_if_resolve_index:nnncTF { #1 } { #2 }
  } { #3 } { #4 } {
    \prg_return_true:
  } {
    \prg_return_false:
  }
}
\BNVS_new_conditional:cpnn { if_resolve_index:vvvc } #1 #2 #3 #4 { T, F, TF } {
  \BNVS_tl_use:nvv {
    \BNVS_tl_use:Nv \__bnvs_if_resolve_index:nnncTF { #1 }
  } { #2 } { #3 } { #4 } {
    \prg_return_true:
  } {
    \prg_return_false:
  }
}
\BNVS_new_conditional:cpnn { if_append_index:nnnc } #1 #2 #3 #4 { T, F, TF } {
  \BNVS_begin:
  \__bnvs_if_resolve_index:nnncTF { #1 } { #2 } { #3 } { #4 } {
    \BNVS_end_tl_put_right:cv { #4 } { #4 }
    \prg_return_true:
  } {
    \BNVS_end:
    \prg_return_false:
  }
}
\BNVS_new_conditional:cpnn { if_append_index:vvvc } #1 #2 #3 #4 { T, F, TF } {
  \BNVS_tl_use:nvv {
    \BNVS_tl_use:Nv \__bnvs_if_append_index:nnncTF { #1 }
  } { #2 } { #3 } { #4 } {
    \prg_return_true:
  } {
    \prg_return_false:
  }
}
```

6.19 Index counter

__bnvs_n_assign:nnn
__bnvs_n_assign:vvv

__bnvs_n_assign:nnn {⟨*id*⟩} {⟨*a*⟩} {⟨*value*⟩}

Assigns the resolved ⟨*value*⟩ to n counter ⟨*id*⟩!⟨*a*⟩. Execute ⟨*yes code*⟩ when resolution succeeds, ⟨*no code*⟩ otherwise.

```
\BNVS_new:cpn { n_assign:nnn } #1 #2 #3 {
  \__bnvs_if_get:nnncF V { #1 } { #2 } { a } {
    \BNVS_warning:n { Unknwown~ #1!#2,~defaults~to~0 }
    \__bnvs_gset:nnnn V { #1 } { #2 } { 0 }
  }
  \__bnvs_if_resolve:ncTF { #3 } { a } {
    \__bnvs_gset:nnnv v { #1 } { #2 } { a }
  } {
    \BNVS_error:n { NO~resolution~of~#3,~defaults~to~0 }
    \__bnvs_gset:nnnn v { #1 } { #2 } { 0 }
  }
}
\BNVS_new:cpn { n_assign:vvv } #1 {
  \BNVS_tl_use:nvv {
    \BNVS_tl_use:cv { n_assign:nn } { #1 }
  }
}
```

__bnvs_if_resolve_n:nc*TF*
__bnvs_if_append_n:nc*TF*
__bnvs_if_append_n:vc*TF*

__bnvs_if_resolve_n:nncTF {⟨*id*⟩} {⟨*a*⟩} {⟨*ans*⟩} {⟨*yes code*⟩} {⟨*no code*⟩}

Evaluate the n counter associated to the {⟨*id*⟩}!{⟨*a*⟩} overlay set into ⟨*ans*⟩ tl variable. Initialize this counter to 1 on the first use. ⟨*no code*⟩ is never executed.

```
\BNVS_new_conditional:cpnn { if_resolve_n:nnc } #1 #2 #3 { T, F, TF } {
  \__bnvs_if_get:nnncTF n { #1 } { #2 } { #3 } {
    \__bnvs_if_resolve:vcTF { #3 } { #3 } {
      \prg_return_true:
    } {
      \prg_return_false:
    }
  } {
    \__bnvs_tl_set:cn { #3 } { 1 }
    \__bnvs_gset:nnnn n { #1 } { #2 } { 1 }
    \prg_return_true:
  }
}
\BNVS_new_conditional_vvc:cn { if_resolve_n } { T, F, TF }
\BNVS_new_conditional:cpnn { if_append_n:nnc } #1 #2 #3 { T, F, TF } {
  \BNVS_begin:
  \__bnvs_if_resolve_n:nncTF { #1 } { #2 } { #3 } {
    \BNVS_end_tl_put_right:cv { #3 } { #3 }
    \prg_return_true:
  } {
    \BNVS_end:
```

```
    \prg_return_false:
  }
}
\BNVS_new_conditional_vvc:cn { if_append_n } { T, F, TF }
```

`\__bnvs_if_resolve_n_index:nncTF` `\__bnvs_if_append_n_index:nncTF`

`\__bnvs_if_resolve_n_index:nncTF {⟨id⟩} {⟨tag⟩} ⟨ans⟩ {⟨yes code⟩} {⟨no code⟩}`
`\__bnvs_if_append_n_index:nncTF {⟨id⟩} {⟨tag⟩} ⟨ans⟩ {⟨yes code⟩} {⟨no code⟩}`

Resolve the index for the value of the n counter associated to the {⟨*a*⟩} overlay set into the ⟨*ans*⟩ `tl` variable or append this value the right of that variable. Initialize this counter to 1 on the first use. If the computation is possible, ⟨*yes code*⟩ is executed, otherwise ⟨*no code*⟩ is executed. In the latter case, the content of the ⟨*ans*⟩ tl variable is undefined on resolution only.

```
\BNVS_new_conditional:cpnn { if_resolve_n_index:nnc } #1 #2 #3 { T, F, TF } {
  \__bnvs_if_resolve_n:nncTF { #1 } { #2 } { #3 } {
    \__bnvs_tl_put_left:cn { #3 } { #1!#2. }
    \__bnvs_if_resolve:vcTF { #3 } { #3 } {
      \prg_return_true:
    } {
      \prg_return_false:
    }
  } {
    \prg_return_false:
  }
}
\BNVS_new_conditional:cpnn { if_append_n_index:nnc } #1 #2 #3 { T, F, TF } {
  \BNVS_begin:
  \__bnvs_if_resolve_n_index:nncTF { #1 } { #2 } { #3 } {
    \BNVS_end_tl_put_right:cv { #3 } { #3 }
    \prg_return_true:
  } {
    \BNVS_end:
    \prg_return_false:
  }
}
\BNVS_new_conditional_vvc:cn { if_append_n_index } { T, F, TF }
```

6.20 Value counter

`\__bnvs_if_resolve_v_incr:nnncTF` `\__bnvs_if_append_v_incr:nnncTF` `\__bnvs_if_append_v_incr:vvncTF`

`\__bnvs_if_resolve_v_incr:nnnTF {⟨id⟩} {⟨a⟩} {⟨offset⟩} ⟨ans⟩ {⟨yes code⟩} {⟨no code⟩}`
`\__bnvs_if_append_v_incr:nnncTF {⟨id⟩} {⟨a⟩} {⟨offset⟩} ⟨ans⟩ {⟨yes code⟩} {⟨no code⟩}`

Increment the value counter position accordingly. Put the result in the ⟨*ans*⟩ `tl` variable.

```
\BNVS_new_conditional:cpnn { if_resolve_v_incr:nnnc } #1 #2 #3 #4 { T, F, TF } {
```

```
  \__bnvs_if_resolve:ncTF { #3 } { #4 } {
    \BNVS_tl_use:Nv \int_compare:nNnTF { #4 } = 0 {
      \__bnvs_if_resolve_v:nncTF { #1 } { #2 } { #4 } {
        \prg_return_true:
      } {
        \prg_return_false:
      }
    } {
      \__bnvs_tl_put_right:cn { #4 } { + }
      \__bnvs_if_append_v:nncTF { #1 } { #2 } { #4 } {
        \__bnvs_round:c { #4 }
        \__bnvs_gset:nnnv v { #1 } { #2 } { #4 }
        \prg_return_true:
      } {
        \prg_return_false:
      }
    }
  } {
    \prg_return_false:
  }
}
\BNVS_new_conditional:cpnn { if_append_v_incr:nnnc } #1 #2 #3 #4 { T, F, TF } {
  \BNVS_begin:
  \__bnvs_if_resolve_v_incr:nnncTF { #1 } { #2 } { #3 } { #4 } {
    \BNVS_end_tl_put_right:cv { #4 } { #4 }
    \prg_return_true:
  } {
    \BNVS_end:
    \prg_return_false:
  }
}
\BNVS_new_conditional_vvnc:cn { if_append_v_incr } { T, F, TF }
\BNVS_new_conditional:cpnn { if_resolve_v_post:nnnc } #1 #2 #3 #4 { T, F, TF } {
  \__bnvs_if_resolve_v:nncTF { #1 } { #2 } { #4 } {
    \BNVS_begin:
    \__bnvs_if_resolve:ncTF { #3 } { a } {
      \BNVS_tl_use:Nv \int_compare:nNnTF { a } = 0 {
        \BNVS_end:
        \prg_return_true:
      } {
        \__bnvs_tl_put_right:cn { a } { + }
        \__bnvs_tl_put_right:cv { a } { #4 }
        \__bnvs_round:c { a }
        \BNVS_end_gset:nnnv v { #1 } { #2 } { a }
        \prg_return_true:
      }
    } {
      \BNVS_end:
      \prg_return_false:
    }
  } {
```

```
      \prg_return_false:
    }
}
\BNVS_new_conditional_vvvc:cn { if_resolve_v_post } { T, F, TF }
\BNVS_new_conditional:cpnn { if_append_v_post:nnnc } #1 #2 #3 #4 { T, F, TF } {
  \BNVS_begin:
  \__bnvs_if_resolve_v_post:nnncTF { #1 } { #2 } { #3 } { #4 } {
    \BNVS_end_tl_put_right:cv { #4 } { #4 }
    \prg_return_true:
  } {
    \prg_return_false:
  }
}
\BNVS_new_conditional_vvnc:cn { if_append_v_post } { T, F, TF }
\BNVS_new_conditional_vvvc:cn { if_append_v_post } { T, F, TF }
```

__bnvs_if_resolve_n_incr:nnnncTF __bnvs_if_resolve_n_incr:nnnncTF {⟨*id*⟩} {⟨*a*⟩} {⟨*base*⟩} {⟨*offset*⟩} {⟨*ans*⟩} {⟨*yes code*⟩} {⟨*no code*⟩}
__bnvs_if_resolve_n_incr:nnncTF __bnvs_if_resolve_n_incr:nnncTF {⟨*id*⟩} {⟨*a*⟩} {⟨*offset*⟩} {⟨*ans*⟩} {⟨*yes code*⟩} {⟨*no code*⟩}
__bnvs_if_append_n_incr:nnnncTF __bnvs_if_append_n_incr:nnnncTF {⟨*id*⟩} {⟨*a*⟩} {⟨*base*⟩} {⟨*offset*⟩} {⟨*ans*⟩} {⟨*yes code*⟩} {⟨*no code*⟩}
__bnvs_if_append_n_incr:nnncTF __bnvs_if_append_n_incr:nnncTF {⟨*id*⟩} {⟨*a*⟩} {⟨*offset*⟩} {⟨*ans*⟩} {⟨*yes code*⟩} {⟨*no code*⟩}
__bnvs_if_append_n_incr:vvncTF
__bnvs_if_resolve_n_post:nnncTF
__bnvs_if_append_n_post:nnncTF
__bnvs_if_append_n_post:vvncTF

Increment the implicit `n` counter accordingly. When requested, put the resulting index in the ⟨*ans*⟩ tl variable or append to its right. This is not run in a group.

```
\BNVS_new_conditional:cpnn { if_resolve_n_incr:nnnc } #1 #2 #3 #4 { T, TF } {
```

Resolve the ⟨*offset*⟩ into the ⟨*ans*⟩ variable.

```
  \__bnvs_if_resolve:ncTF { #3 } { #4 } {
    \BNVS_tl_use:Nv \int_compare:nNnTF { #4 } = 0 {
```

The offset is resolved to 0, we just have to resolve the `...n`

```
      \__bnvs_if_resolve_n:nncTF { #1 } { #2 } { #4 } {
        \__bnvs_if_resolve_index:nnvcTF { #1 } { #2 } { #4 } { #4 } {
          \prg_return_true:
        } {
          \prg_return_false:
        }
      } {
        \prg_return_false:
      }
    } {
```

The ⟨*offset*⟩ does not resolve to 0.

```
      \__bnvs_tl_put_right:cn { #4 } { + }
      \__bnvs_if_append_n:nncTF { #1 } { #2 } { #4 } {
        \__bnvs_round:c { #4 }
        \__bnvs_gset:nnnv n { #1 } { #2 } { #4 }
        \__bnvs_if_resolve_index:nnvcTF { #1 } { #2 } { #4 } { #4 } {
          \prg_return_true:
        } {
```

```
          \prg_return_false:
        }
      } {
        \prg_return_false:
      }
    }
  } {
    \prg_return_false:
  }
}

\BNVS_new_conditional:cpnn
  { if_append_n_incr:nnnc } #1 #2 #3 #4 { T, F, TF } {
  \BNVS_begin:
  \__bnvs_if_resolve_n_incr:nnncTF { #1 } { #2 } { #3 } { #4 } {
    \BNVS_end_tl_put_right:cv { #4 } { #4 }
    \prg_return_true:
  } {
    \BNVS_end:
    \prg_return_false:
  }
}
\BNVS_new_conditional_vvnc:cn { if_append_n_incr } { T, F, TF }
```

__bnvs_if_resolve_v_post:nnncTF
__bnvs_if_append_v_post:nnncTF
__bnvs_if_append_v_post:vvncTF

__bnvs_if_resolve_v_post:nnncTF {⟨*id*⟩} {⟨*a*⟩} {⟨*offset*⟩} ⟨*ans*⟩ {⟨*yes code*⟩} {⟨*no code*⟩}
__bnvs_if_append_v_post:nnncTF {⟨*id*⟩} {⟨*a*⟩} {⟨*offset*⟩} ⟨*ans*⟩ {⟨*yes code*⟩} {⟨*no code*⟩}

Resolve the value of the free counter for the given ⟨*a*⟩ into the ⟨*ans*⟩ `tl` variable then increment this free counter position accordingly. The append version, appends the value to the right of the ⟨*ans*⟩ `tl` variable. The content of ⟨*ans*⟩ is undefined while in the {⟨*no code*⟩} branch and on resolution only.

```
\BNVS_new_conditional:cpnn { if_resolve_n_post:nnnc } #1 #2 #3 #4 { T, F, TF } {
  \__bnvs_if_resolve_n:nncTF { #1 } { #2 } { #4 } {
    \BNVS_begin:
    \__bnvs_if_resolve:ncTF { #3 } { #4 } {
      \BNVS_tl_use:Nv \int_compare:nNnTF { #4 } = 0 {
        \BNVS_end:
        \__bnvs_if_resolve_index:nnvcTF { #1 } { #2 } { #4 } { #4 } {
          \prg_return_true:
        } {
          \prg_return_false:
        }
      } {
        \__bnvs_tl_put_right:cn { #4 } { + }
        \__bnvs_if_append_n:nncTF { #1 } { #2 } { #4 } {

          \__bnvs_round:c { #4 }
          \__bnvs_gset:nnnv n { #1 } { #2 } { #4 }
          \BNVS_end:
          \__bnvs_if_resolve_index:nnvcTF { #1 } { #2 } { #4 } { #4 } {
```

```
            \prg_return_true:
          } {
            \prg_return_false:
          }
        } {
          \BNVS_end:
          \prg_return_false:
        }
      }
    } {
      \BNVS_end:
      \prg_return_false:
    }
  } {
    \prg_return_false:
  }
}
\BNVS_new_conditional:cpnn { if_append_n_post:nnnc } #1 #2 #3 #4{ T, F, TF } {
  \BNVS_begin:
  \__bnvs_if_resolve_n_post:nnncTF { #1 } { #2 } { #3 } { #4 } {
    \BNVS_end_tl_put_right:cv { #4 } { #4 }
    \prg_return_true:
  } {
    \BNVS_end:
    \prg_return_false:
  }
}
\BNVS_new_conditional_vvnc:cn { if_append_n_post } { T, F, TF }
```

6.21 Functions for the resolution

They manily start with `\__bnvs_if_resolve_` or `\__bnvs_split_`

`\__bnvs_split_pop_iksp:TFF`	`\__bnvs_split_pop_iksp:TFF {`⟨*black code*⟩`} {`⟨*blank code*⟩`}`
`\__bnvs_split_end_return_or_pop_complete:T`	`{`⟨*end code*⟩`}`
`\__bnvs_split_end_return_or_pop_void:T`	`\__bnvs_split_end_return_or_pop_complete:T {`⟨*blank code*⟩`}`
	`\__bnvs_split_end_return_or_pop_void:T {`⟨*black code*⟩`}`

For `\__bnvs_split_pop_iksp:TFF`. If the `split` sequence is empty, execute ⟨*end code*⟩. Otherwise pops the 4 heading items of the `split` sequence into the four `tl` variables `id`, `kri`, `short`, `path`. If `short` is blank then execute ⟨*blank code*⟩, otherwise execute ⟨*black code*⟩.

For `\__bnvs_split_end_return_or_pop_complete:T`: pops the four heading items of the `split` sequence into the four variables `n_incr`, `plus`, `rhs`, `post`. Then execute ⟨*black code*⟩.

For `\__bnvs_split_end_return_or_pop_void:T`: pops the eight heading items of the `split` sequence then execute ⟨*blank code*⟩.

This is called each time a `ref`, `id`, `path` has been parsed.

```
\BNVS_new:cpn { split_pop_iksp:TFF } #1 #2 #3 {
```

```
  \__bnvs_split_if_pop_left:cTF { id } {
    \__bnvs_split_if_pop_left:cTF { kri } {
      \__bnvs_split_if_pop_left:cTF { short } {
        \__bnvs_split_if_pop_left:cTF { path } {
          \__bnvs_tl_if_blank:vTF { short } {
```

The first 4 capture groups are empty, and the 4 next ones are expected to contain the expected information.

```
            #2
          } {
            \BNVS_tl_use:nv {
              \regex_match:NnT \c__bnvs_A_reserved_Z_regex
            } { short } {
              \__bnvs_tl_if_eq:cnF { short } { pauses } {
                \__bnvs_tl_if_eq:cnF { short } { slideinframe } {
\BNVS_error:x { Use~of~reserved~``\BNVS_tl_use:c { tag }'' }
                }
              }
            }
            \__bnvs_tl_if_blank:vTF { kri } {
              \__bnvs_tl_set:cv { id } { id_last }
            } {
              \__bnvs_tl_set:cv { id_last } { id }
            }
```

Build the `path` sequence and lowercase components conditionals.

```
            \__bnvs_seq_set_split:cnv { path } { . } { path }
            #1
          }
        } {
          \BNVS_fatal:n { split_pop_iksp:TFF/path }
        }
      } {
        \BNVS_fatal:n { split_pop_iksp:TFF/short }
      }
    } {
      \BNVS_fatal:n { split_pop_iksp:TFF/kri }
    }
  } {
    #3
  }
}
```

conditional variants.

```
\BNVS_new:cpn { split_end_return_or_pop_complete:T } #1 {
  \cs_set:Npn \BNVS_split_F:n ##1 {
    \BNVS_end_unreachable_return_false:n {
      split_end_return_or_pop_complete: ##1
    }
  }
  \__bnvs_split_if_pop_left_or:cT { n_incr } {
    \__bnvs_split_if_pop_left_or:cT { plus } {
      \__bnvs_split_if_pop_left_or:cT { rhs } {
        \__bnvs_split_if_pop_left_or:cT { post } {
```

```
          #1
        }
      }
    }
  }
}
\BNVS_new:cpn { split_end_return_or_pop_void:T } #1 {
  \cs_set:Npn \BNVS_split_F:n ##1 {
    \BNVS_end_unreachable_return_false:n {
      split_end_return_or_pop_void: ##1
    }
  }
  \__bnvs_split_if_pop_left:cTn { a } {
    \__bnvs_split_if_pop_left:cTn { a } {
      \__bnvs_split_if_pop_left:cTn { a } {
        \__bnvs_split_if_pop_left:cTn { a } {
          \__bnvs_split_if_pop_left:cTn { a } {
            \__bnvs_split_if_pop_left:cTn { a } {
              \__bnvs_split_if_pop_left:cTn { a } {
                \__bnvs_split_if_pop_left:cTn { a } {
                  #1
                } { T/8 }
              } { T/7 }
            } { T/6 }
          } { T/5 }
        } { T/4 }
      } { T/3 }
    } { T/2 }
  } { T/1 }
}
```

__bnvs_if_resolve:nc*TF*
__bnvs_if_resolve:vc*TF*
__bnvs_if_append:nc*TF*
__bnvs_if_append:vc*TF*

__bnvs_if_resolve:ncTF {⟨*expression*⟩} {⟨*ans*⟩} {⟨*yes code*⟩} {⟨*no code*⟩}
__bnvs_if_append:ncTF {⟨*expression*⟩} {⟨*ans*⟩} {⟨*yes code*⟩} {⟨*no code*⟩}

Resolves the ⟨*expression*⟩, replacing all the named overlay specifications by their static counterpart then put the rounded result in ⟨*ans*⟩ `tl` variable when resolving or to the right of this variable when appending.

Implementation details. Executed within a group. Heavily used by `\..._if_resolve_query:ncTF`, where ⟨*expression*⟩ was initially enclosed inside '`?(...)`'. Local variables:

\l__bnvs_ans_tl

To feed ⟨*tl variable*⟩ with.

(*End of definition for* `\l__bnvs_ans_tl`.)

\l__bnvs_split_seq

The sequence of catched query groups and non queries.

(*End of definition for* `\l__bnvs_split_seq`.)

\l__bnvs_split_int

Is the index of the non queries, before all the catched groups.

(*End of definition for* `\l__bnvs_split_int`.)

```
\BNVS_int_new:c { split }
```

\l__bnvs_tag_tl

Storage for `split` sequence items that represent names.

(*End of definition for* `\l__bnvs_tag_tl`.)

\l__bnvs_path_tl

Storage for `split` sequence items that represent integer paths.

(*End of definition for* `\l__bnvs_path_tl`.)

Catch circular definitions. Open a main TEX group to define local functions and variables, sometimes another grouping level is used. The main TEX group is closed in the various `\...end_return...` functions.

```
\BNVS_new_conditional:cpnn { if_append:nc } #1 #2 { TF } {
  \BNVS_begin:
  \__bnvs_if_resolve:ncTF { #1 } { #2 } {
    \BNVS_end_tl_put_right:cv { #2 } { #2 }
    \prg_return_true:
  } {
    \BNVS_end:
    \prg_return_false:
  }
}
\BNVS_new_conditional_vc:cn { if_append } { T, F, TF }
```

Heavily used.

```
\cs_new:Npn \BNVS_end_unreachable_return_false:n #1 {
  \BNVS_error:n { UNREACHABLE/#1 }
  \BNVS_end:
  \prg_return_false:
}
\cs_new:Npn \BNVS_end_unreachable_return_false:x #1 {
  \BNVS_error:x { UNREACHABLE/#1 }
  \BNVS_end:
  \prg_return_false:
```

```
}
\BNVS_new_conditional:cpnn { if_resolve:nc } #1 #2 { TF } {
  \__bnvs_if_call:TF {
    \BNVS_begin:
```

This TEX group will be closed just before returning. Implementation:

```
  \__bnvs_if_regex_split:cnTF { split } { #1 } {
```

The leftmost item is not a special item: we start feeding `\l__bnvs_ans_tl` with it.

```
      \BNVS_set:cpn { if_resolve_end_return_true: } {
```

Normal and unique end of the loop.

```
        \__bnvs_if_resolve_round_ans:
        \BNVS_end_tl_set:cv { #2 } { ans }
        \prg_return_true:
      }
```

Ranges are not rounded: for them `\...if_resolve_round_ans:` is a noop.

```
      \BNVS_set:cpn { if_resolve_round_ans: } { \__bnvs_round:c { ans } }
      \__bnvs_tl_clear:c { ans }
      \__bnvs_split_loop_or_end_return:
    } {
```

There is not reference.

```
      \__bnvs_tl_set:cn { ans } { #1 }
      \__bnvs_round:c { ans }
      \BNVS_end_tl_set:cv { #2 } { ans }
      \prg_return_true:
    }
  } {
    \BNVS_error:n { TOO_MANY_NESTED_CALLS/Resolution }
    \BNVS_end:
    \prg_return_false:
  }
}
\BNVS_new_conditional_vc:cn { if_resolve } { T, F, TF }
\BNVS_new:cpn { build_tag: } {
  \__bnvs_tl_set_eq:cc { tag } { short }
  \__bnvs_seq_map_inline:cn { path } {
    \__bnvs_tl_put_right:cn { tag} { . ##1 }
  }
}
\BNVS_new:cpn { build_tag_head: } {
  \__bnvs_tl_set_eq:cc { tag } { short }
  \__bnvs_seq_map_inline:cn { path_head } {
    \__bnvs_tl_put_right:cn { tag } { . ##1 }
  }
}
```

`\__bnvs_split_loop_or_end_return:` `\__bnvs_split_loop_or_end_return:`

Manages the `split` sequence created by the `...if_resolve_query:...` conditional. Entry point. May call itself at the end. The first step is to collect the various information into variables. Then we separate the trailing lowercase components of the path and act accordingly.

```
\clist_map_inline:nn {
  n, reset, reset_all, v, first, last, length,
  previous, next, range, assign, only
} {
  \bool_new:c { l__bnvs_#1_bool }
}
\BNVS_new_conditional:cpnn { if:c } #1 { p, T, F, TF } {
  \bool_if:cTF { l__bnvs_#1_bool } {
    \prg_return_true:
  } {
    \prg_return_false:
  }
}
\BNVS_new_conditional:cpnn { bool_if_exist:c } #1 { p, T, F, TF } {
  \bool_if_exist:cTF { l__bnvs_#1_bool } {
    \prg_return_true:
  } {
    \prg_return_false:
  }
}
\BNVS_new:cpn { prepare_context:N } #1 {
  \clist_map_inline:nn {
    n, v, reset, reset_all, first, last, length,
    previous, next, range, assign, only
  } {
    \__bnvs_set_false:c { ##1 }
  }
  \__bnvs_seq_clear:c { path_head }
  \__bnvs_seq_clear:c { path_tail }
  \__bnvs_tl_clear:c { index }
  \__bnvs_tl_clear:c { suffix }
  \BNVS_set:cpn { :n } ##1 {
    \tl_if_blank:nF { ##1 } {
      \__bnvs_tl_if_empty:cF { index } {
         \__bnvs_seq_put_right:cv { path_head } { index }
        \__bnvs_tl_clear:c { index }
      }
      \__bnvs_seq_put_right:cn { path_head } { ##1 }
    }
  }
  \__bnvs_seq_map_inline:cn { path } {
    \__bnvs_bool_if_exist:cTF { ##1 } {
      \__bnvs_set_true:c { ##1 }
      \clist_if_in:nnF { n, v, reset, reset_all } { ##1 } {
        \bool_if:NT #1 {
          \BNVS_error:n {Unexpected~##1~in~assignment }
        }
        \__bnvs_tl_set:cn { suffix } { ##1 }
      }
      \BNVS_set:cpn { :n } ####1 {
        \tl_if_blank:nF { ####1 } {
          \BNVS_error:n {Unexpected~####1 }
```

```
        }
      }
    } {
      \regex_match:NnTF \c__bnvs_A_index_Z_regex { ##1 } {
        \__bnvs_tl_if_empty:cF { index } {
         \__bnvs_seq_put_right:cv { path_head } { index }
        }
        \__bnvs_tl_set:cn { index } { ##1 }
      } {
        \regex_match:NnTF \c__bnvs_A_reserved_Z_regex { ##1 } {
          \BNVS_error:n { Unsupported~##1 }
        } {
          \__bnvs_:n { ##1 }
        }
      }
    }
  }
  \__bnvs_seq_set_eq:cc { path } { path_head }
}
\BNVS_new:cpn { split_loop_or_end_return: } {
  \__bnvs_split_if_pop_left:cTF { a } {
    \__bnvs_tl_put_right:cv { ans } { a }
    \__bnvs_split_pop_iksp:TFF {
      \__bnvs_split_end_return_or_pop_void:T {
        \__bnvs_prepare_context:N \c_true_bool
        \__bnvs_build_tag:
        \__bnvs_split_loop_or_end_return_iadd:n { 1 }
      }
    } {
      \__bnvs_split_pop_iksp:TFF {
        \__bnvs_split_end_return_or_pop_complete:T {
          \__bnvs_tl_if_blank:vTF { n_incr } {
            \__bnvs_tl_if_blank:vTF { plus } {
              \__bnvs_tl_if_blank:vTF { rhs } {
                \__bnvs_tl_if_blank:vTF { post } {
                  \__bnvs_prepare_context:N \c_false_bool
                  \__bnvs_build_tag:
```

Only the dotted path, branch according to the last component, if any.

```
                  \__bnvs_tl_if_empty:cTF { index } {
                    \__bnvs_tl_if_empty:cTF { suffix } {
                      \__bnvs_split_loop_or_end_return_v:
                    } {
                      \__bnvs_split_loop_or_end_return_suffix:
                    }
                  } {
                    \__bnvs_split_loop_or_end_return_index:
                  }
                } {
                  \__bnvs_prepare_context:N \c_true_bool
                  \__bnvs_build_tag:
                  \BNVS_use:c { split_loop_or_end_return[...++]: }
                }
              } {
```

```
                \__bnvs_prepare_context:N \c_true_bool
                \__bnvs_build_tag:
                \__bnvs_split_loop_or_end_return_assign:
              }
            } {
              \__bnvs_if_resolve:vcTF { rhs } { rhs } {
                \__bnvs_prepare_context:N \c_true_bool
                \__bnvs_build_tag:
                \BNVS_tl_use:Nv
                  \__bnvs_split_loop_or_end_return_iadd:n { rhs }
              } {
                \BNVS_error_ans:x { Error~in~\BNVS_tl_use:c { rhs }}
                \__bnvs_split_loop_or_end_return:
              }
            }
          } {
            \__bnvs_prepare_context:N \c_true_bool
            \__bnvs_build_tag:
            \__bnvs_set_true:c { n }
            \__bnvs_split_loop_or_end_return_iadd:n { 1 }
          }
        }
      } {
\BNVS_end_unreachable_return_false:n { split_loop_or_end_return:/3 }
      } {
\BNVS_end_unreachable_return_false:n { split_loop_or_end_return:/2 }
      }
    } {
```

The `split` sequence is empty.

```
      \__bnvs_if_resolve_end_return_true:
    }
  } {
\BNVS_end_unreachable_return_false:n { split_loop_or_end_return:/1 }
  }
}

\BNVS_new_conditional:cpnn { if_suffix: } { T, F, TF } {
  \__bnvs_tl_if_empty:cTF { suffix } {
    \__bnvs_seq_pop_right:ccTF { path } { suffix } {
      \prg_return_true:
    } {
      \prg_return_false:
    }
  } {
    \prg_return_true:
  }
}
```

Implementation detail: `tl` variable `a` is used.

```
\BNVS_set:cpn { if_resolve_V_loop_or_end_return_true:F } #1 {
  \__bnvs_if:cTF n {
    #1
  } {
    \__bnvs_build_tag:
```

```
    \__bnvs_tl_set:cx { a } {
      \BNVS_tl_use:c { tag } . \BNVS_tl_use:c { suffix }
    }
    \__bnvs_if_resolve_v:vvcTF { id } { a } { a } {
      \__bnvs_tl_put_right:cv { ans } { a }
      \__bnvs_split_loop_or_end_return:
    } {
      \__bnvs_if_resolve_V:vvcTF { id } { a } { a } {
        \__bnvs_tl_put_right:cv { ans } { a }
        \__bnvs_split_loop_or_end_return:
      } {
        #1
      }
    }
  }
}

\BNVS_new:cpn { error_end_return_false:n } #1 {
      \BNVS_error:n { #1 }
      \BNVS_end:
      \prg_return_false:
}

\BNVS_new:cpn { path_branch_loop_or_end_return: } {
  \__bnvs_if_call:TF {
    \__bnvs_if_path_branch:TF {
      \__bnvs_path_branch_end_return:
    } {
      \__bnvs_if_get:nvvcTF V { id } { tag } { a } {
        \__bnvs_if_TIP:cccTF { id } { a } { path } {
          \__bnvs_tl_set_eq:cc { tag } { a }
          \__bnvs_seq_merge:cc { path } { path_tail }
          \__bnvs_seq_clear:c { path_tail }
          \__bnvs_seq_set_eq:cc { path_head } { path }
          \__bnvs_path_branch_TIPn_loop_or_end_return:
        } {
          \__bnvs_path_branch_head_to_tail_end_return:
        }
      } {
        \__bnvs_path_branch_head_to_tail_end_return:
      }
    }
  } {
    \__bnvs_path_branch_end_return_false:n {
      Too~many~calls.
    }
  }
}

\BNVS_new:cpn { path_branch_end_return: } {
  \__bnvs_split_loop_or_end_return:
}

\BNVS_new:cpn { set_if_path_branch:n } {
  \prg_set_conditional:Npnn \__bnvs_if_path_branch: { TF }
}
```

```
\BNVS_new:cpn { path_branch_head_to_tail_end_return: } {
  \__bnvs_seq_pop_right:ccTF { path_head } { a } {
    \__bnvs_seq_put_left:cv { path_tail } { a }
    \__bnvs_build_tag_head:
    \__bnvs_path_branch_TIPn_loop_or_end_return:
  } {
    \__bnvs_build_tag:
    \__bnvs_seq_set_eq:cc { path_head } { path_tail }
    \__bnvs_seq_clear:c { path_tail }
    \__bnvs_gset:nvvn       V { id } { tag } { 0 }
    \__bnvs_gset_cache:nvvn V { id } { tag } { 0 }
    \__bnvs_path_branch_TIPn_loop_or_end_return:
  }
}
```

The `a tl` variable is used locally. Update the `QD` variable based on `ref` and `path`, then try to resolve it

```
\BNVS_new:cpn { path_branch_TIPn_loop_or_end_return: } {
  \__bnvs_build_tag_head:
  \__bnvs_if_resolve_v:vvcTF { id } { tag } { a } {
    \__bnvs_tl_put_right:cv { ans } { a }
    \__bnvs_split_loop_or_end_return:
  } {
    \__bnvs_if_resolve_V:vvcTF { id } { tag } { a } {
      \__bnvs_tl_put_right:cv { ans } { a }
      \__bnvs_split_loop_or_end_return:
    } {
      \__bnvs_path_branch_loop_or_end_return:
    }
  }
}
```

- Case `....`$\langle$*index*$\rangle$.

```
\BNVS_new:cpn { split_loop_or_end_return_index: } {
  % known, id, tag, path, suffix
  \__bnvs_set_if_path_branch:n {
    \__bnvs_if_append_index:vvvcTF { id } { tag } { index } { ans } {
      \prg_return_true:
    } {
      \prg_return_false:
    }
  }
  \__bnvs_path_branch_loop_or_end_return:
}

\BNVS_new:cpn { split_loop_reset: } {
  \__bnvs_if:cT { reset_all } {
    \__bnvs_set_false:c { reset }
    \__bnvs_if_greset_all:vvnT { id } { tag } {} {}
  }
  \__bnvs_if:cT { reset } {
    \BNVS_use:c {
      \__bnvs_if:cTF nnv _if_greset:vvnT
```

```
    } { id } { tag } {} {}
  }
}
```

- Case `....`

```
\BNVS_new:cpn { split_loop_or_end_return_v: } {
  \__bnvs_split_loop_reset:
  \__bnvs_if:cTF n {
    \__bnvs_tl_set_eq:cc { base } { tag }
    \__bnvs_set_if_path_branch:n {
      \__bnvs_if_resolve_n:vvcTF { id } { tag } { index } {
        \__bnvs_if_append_index:vvvcTF { id } { base } { index } { ans } {
          \prg_return_true:
        } {
          \prg_return_false:
        }
      } {
        \prg_return_false:
      }
    }
  } {
    \__bnvs_set_if_path_branch:n {
      \__bnvs_if_append_v:vvcTF { id } { tag } { ans } {
        \prg_return_true:
      } {
        \__bnvs_if_append_V:vvcTF { id } { tag } { ans } {
          \prg_return_true:
        } {
          \prg_return_false:
        }
      }
    }
  }
  \__bnvs_path_branch_loop_or_end_return:
}
```

- Case `....<suffix>`.

```
\BNVS_new:cpn { split_loop_or_end_return_suffix: } {
  \__bnvs_if_resolve_V_loop_or_end_return_true:F {
    \__bnvs_if:cTF n {
      \__bnvs_tl_set_eq:cc { base } { tag }
      \__bnvs_set_if_path_branch:n {
        \__bnvs_if_resolve_n:vvcTF { id } { tag } { index } {
          \__bnvs_if_append_index:vvvcTF { id } { base } { index } { ans } {
            \prg_return_true:
          } {
            \prg_return_false:
          }
        } {
          \prg_return_false:
        }
      }
    } {
```

```
      \__bnvs_set_if_path_branch:n {
        \BNVS_use:c {
          if_append_ \__bnvs_tl_use:c { suffix } :vvcTF
        } { id } { tag } { ans } {
          \__bnvs_if:cT { range } {
            \BNVS_set:cpn { if_resolve_round_ans: } { }
          }
          \prg_return_true:
        } {
          \prg_return_false:
        }
      }
    }
    \__bnvs_path_branch_loop_or_end_return:
  }
}
```

- Case `...++`.

```
\BNVS_new:cpn { split_loop_or_end_return[...++]: } {
  \__bnvs_if:cTF n {
    \__bnvs_if:cTF { reset } {
      \cs_set:Npn \BNVS_split_loop: {
        \BNVS_error_ans:x { NO~....reset.n++~for~\BNVS_tl_use:c { tag } }
      }
    } {
      \__bnvs_if:cTF { reset_all } {
```

- Case `....reset_all.n++`.

```
        \cs_set:Npn \BNVS_split_loop: {
          \BNVS_error_ans:x {
            NO~....reset_all.n++~for
              ~\BNVS_tl_use:c { id }!\BNVS_tl_use:c { tag }
          }
        }
      } {
```

- Case `....n++`.

```
        \cs_set:Npn \BNVS_split_loop: {
          NO~....n++~for
            ~\BNVS_tl_use:c { id }!\BNVS_tl_use:c { tag }
        }
      }
    }
  } {
    \__bnvs_if:cTF { reset } {
```

- Case `....reset++`.

```
      \cs_set:Npn \BNVS_split_loop: {
        NO~....reset++~for
          ~\BNVS_tl_use:c { id }!\BNVS_tl_use:c { tag }
      }
    } {
      \__bnvs_if:cTF n {
```

- Case `....reset_all.n++`.

```
        \cs_set:Npn \BNVS_split_loop: {
          NO~....n(.reset_all)++~for
            ~\BNVS_tl_use:c { id }!\BNVS_tl_use:c { tag }
        }
      } {
```

- Case `...(.reset_all)++`.

```
        \cs_set:Npn \BNVS_split_loop: {
          \BNVS_error_ans:x {
            NO~...(.reset_all)++~for
              ~\BNVS_tl_use:c { id }!\BNVS_tl_use:c { tag }
          }
        }
      }
    }
  }
  \__bnvs_build_tag:
  \__bnvs_split_loop_reset:
  \BNVS_use:c {
    if_append_\__bnvs_if:cTF nnv _post:vvncTF
  } { id } { tag } { 1 } { ans } {
  } {
    \BNVS_error_ans:x {
      Problem~with~\BNVS_tl_use:c { id }!\BNVS_tl_use:c { tag }~use.
    }
  }
  \__bnvs_split_loop_or_end_return:
}

\BNVS_new:cpn { split_loop_or_end_return_assign: } {
```

- Case `...=....` Resolve the `rhs`, on success make the assignment and put the result to the right of the `ans` variable.

```
  \__bnvs_if_resolve:vcTF { rhs } { rhs } {
    \__bnvs_if:cTF n {
      \__bnvs_gset:nvvv n { id } { tag } { rhs }
      \__bnvs_if_append_index:vvvcTF { id } { tag } { rhs } { ans } {
      } {
        \BNVS_error_ans:x { No~....n=... }
      }
    } {
      \__bnvs_gset:nvvv v { id } { tag } { rhs }
      \__bnvs_if_append_v:vvcTF { id } { tag } { ans } {
      } {
        \BNVS_error_ans:n { No~...=... }
      }
    }
  } {
    \BNVS_error_ans:x { Error~in~\__bnvs_tl_use:c { rhs }. }
  }
  \__bnvs_split_loop_or_end_return:
}
```

- Case `...+=...`.

```
\BNVS_new:cpn { split_loop_or_end_return_iadd:n } #1 {
  \__bnvs_if_resolve:ncTF { #1 } { rhs } {
    \__bnvs_split_loop_reset:
    \BNVS_use:c {
      if_append_ \__bnvs_if:cTF nnv _incr:vvncTF
    } { id } { tag } { #1 } { ans } {
    } {
      \BNVS_error_ans:n { No~...+=... }
    }
  } {
    \BNVS_error_ans:x { Error~in~\BNVS_tl_use:c { rhs } }
  }
  \__bnvs_split_loop_or_end_return:
}
```

__bnvs_if_resolve_query:ncTF __bnvs_if_resolve_query:ncTF {⟨*overlay query*⟩} {⟨*ans*⟩} {⟨*yes code*⟩} {⟨*no code*⟩}

Evaluates the single ⟨*overlay query*⟩, which is expected to contain no comma. Extract a range specification from the argument, replaces all the *named overlay specifications* by their static counterparts, make the computation then append the result to the right of te ⟨*ans*⟩ `tl` variable. Ranges are supported with the colon syntax. This is executed within a local TEX group managed by the caller. Below are local variables and constants.

\l__bnvs_V_tl Storage for a single value out of a range.

(*End of definition for* `\l__bnvs_V_tl`.)

\l__bnvs_A_tl Storage for the first component of a range.

(*End of definition for* `\l__bnvs_A_tl`.)

\l__bnvs_Z_tl Storage for the last component of a range.

(*End of definition for* `\l__bnvs_Z_tl`.)

\l__bnvs_L_tl Storage for the length component of a range.

(*End of definition for* `\l__bnvs_L_tl`.)

\c__bnvs_A_cln_Z_regex Used to parse named overlay specifications. V, A:Z, A::L on one side, :Z, :Z::L and ::L:Z on the other sides. Next are the capture groups. The first one is for the whole match.

(*End of definition for* `\c__bnvs_A_cln_Z_regex`.)

```
\regex_const:Nn \c__bnvs_A_cln_Z_regex {
  \A \s* (?:
```

- 2 → V

```
    ( [^:]+? )
```

- 3, 4, 5 → A : Z? or A :: L?

```
    | (?: ( [^:]+? ) \s* : (?: \s* ( [^:]*? ) | : \s* ( [^:]*? ) ) )
```

- 6, 7 → ::(L:Z)?

```
    | (?: :: \s* (?: ( [^:]+? ) \s* : \s* ( [^:]+? ) )? )
```

- 8, 9 → :(Z::L)?

```
    | (?: : \s* (?: ( [^:]+? ) \s* :: \s* ( [^:]*? ) )? )
  )
  \s* \Z
}

\BNVS_new:cpn { resolve_query_end_return_true: } {
  \BNVS_end:
  \prg_return_true:
}
\BNVS_new:cpn { resolve_query_end_return_false: } {
```

```
  \BNVS_end:
  \prg_return_false:
}

\BNVS_new:cpn { resolve_query_end_return_false:n } #1 {
  \BNVS_end:
  \prg_return_false:
}

\BNVS_new:cpn { if_resolve_query_return_false:n } #1 {
  \prg_return_false:
}

\BNVS_new:cpn { resolve_query_error_return_false:n } #1 {
  \BNVS_error:n { #1 }
  \__bnvs_if_resolve_query_return_false:
}
\BNVS_generate_variant:cn { resolve_query_error_return_false:n } { x }

\BNVS_new:cpn { if_resolve_query_return_unreachable: } {
  \__bnvs_resolve_query_error_return_false:n { UNREACHABLE }
}

\BNVS_new:cpn { if_blank:cTF } #1 {
  \BNVS_tl_use:Nc \tl_if_blank:VTF { #1 }
}

\BNVS_new_conditional:cpnn { if_match_pop_left:c } #1 { T, F, TF } {
  \BNVS_tl_use:nc {
    \BNVS_seq_use:Nc \seq_pop_left:NNTF { match }
  } { #1 } {
    \prg_return_true:
  } {
    \prg_return_false:
  }
}
```

`\__bnvs_if_resolve_query_branch:`*TF* `\__bnvs_if_resolve_query_branch:TF {`⟨*yes code*⟩`} {`⟨*no code*⟩`}`

Called by `\__bnvs_if_resolve_query:ncTF` that just filled `\l__bnvs_match_seq` after the `c__bnvs_A_cln_Z_regex`. Puts the proper items of `\l__bnvs_match_seq` into the variables `\l__bnvs_V_tl`, `\l__bnvs_A_tl`, `\l__bnvs_Z_tl`, `\l__bnvs_L_tl` then branches accordingly on one of the returning
`\__bnvs_if_resolve_query_return[`⟨*description*⟩`]:`
functions. All these functions properly set the `\l__bnvs_ans_tl` variable and they end with either `\prg_return_true:` or `\prg_return_false:`. This is used only once but is not inlined for readability.

```
\BNVS_new_conditional:cpnn { if_resolve_query_branch: } { T, F, TF } {
```

At start, we ignore the whole match.

```
  \__bnvs_if_match_pop_left:cT V {
    \__bnvs_if_match_pop_left:cT V {
      \__bnvs_if_blank:cTF V {
        \__bnvs_if_match_pop_left:cT A {
          \__bnvs_if_match_pop_left:cT Z {
            \__bnvs_if_match_pop_left:cT L {
```

```
              \__bnvs_if_blank:cTF A {
                \__bnvs_if_match_pop_left:cT L {
                  \__bnvs_if_match_pop_left:cT Z {
                    \__bnvs_if_blank:cTF L {
                      \__bnvs_if_match_pop_left:cT Z {
                        \__bnvs_if_match_pop_left:cT L {
                          \__bnvs_if_blank:cTF L {
                            \BNVS_use:c { if_resolve_query_return[:Z]: }
                          } {
                            \BNVS_use:c { if_resolve_query_return[:Z::L]: }
                          }
                        }
                      }
                    } {
                      \__bnvs_if_blank:cTF Z {
\__bnvs_resolve_query_error_return_false:n { Missing~first~or~last }
                      } {
                        \BNVS_use:c { if_resolve_query_return[:Z::L]: }
                      }
                    }
                  }
                } {
                  \__bnvs_if_blank:cTF Z {
                    \__bnvs_if_blank:cTF L {
                      \BNVS_use:c { if_resolve_query_return[A:]: }
                    } {
                      \BNVS_use:c { if_resolve_query_return[A::L]: }
                    }
                  } {
                    \__bnvs_if_blank:cTF L {
                      \BNVS_use:c { if_resolve_query_return[A:Z]: }
                    } {
```

Logically unreachable code, the regular expression does not match this.

```
                      \__bnvs_if_resolve_query_return_unreachable:
                    }
                  }
                }
              }
            }
          }
        } {
          \BNVS_use:c { if_resolve_query_return[V]: }
        }
      }
    }
  }
```

Single value

```
\BNVS_new:cpn { if_resolve_query_return[V]: } {
  \__bnvs_if_resolve:vcTF { V } { ans } {
    \prg_return_true:
  } {
```

```
    \prg_return_false:
  }
}
```

⟨*first*⟩:⟨*last*⟩ range

```
\BNVS_new:cpn { if_resolve_query_return[A:Z]: } {
  \__bnvs_if_resolve:vcTF { A } { ans } {
    \__bnvs_tl_put_right:cn { ans } { - }
    \__bnvs_if_append:vcTF { Z } { ans } {
      \prg_return_true:
    } {
      \prg_return_false:
    }
  } {
    \prg_return_false:
  }
}
```

⟨*first*⟩::⟨*length*⟩ range

```
\BNVS_new:cpn { if_resolve_query_return[A::L]: } {
  \__bnvs_if_resolve:vcTF { A } { A } {
    \__bnvs_if_resolve:vcTF { L } { ans } {
      \__bnvs_tl_put_right:cn { ans } { + }
      \__bnvs_tl_put_right:cv { ans } { A }
      \__bnvs_tl_put_right:cn { ans } { -1 }
      \__bnvs_round:c { ans }
      \__bnvs_tl_put_left:cn { ans } { - }
      \__bnvs_tl_put_left:cv { ans } { A }
      \prg_return_true:
    } {
      \prg_return_false:
    }
  } {
    \prg_return_false:
  }
}
```

⟨*first*⟩: and ⟨*first*⟩:: range

```
\BNVS_new:cpn { if_resolve_query_return[A:]: } {
  \__bnvs_if_resolve:vcTF { A } { ans } {
    \__bnvs_tl_put_right:cn { ans } { - }
    \prg_return_true:
  } {
    \prg_return_false:
  }
}
```

:⟨*last*⟩::⟨*length*⟩ or ::⟨*length*⟩:⟨*last*⟩ range

```
\BNVS_new:cpn { if_resolve_query_return[:Z::L]: } {
  \__bnvs_if_resolve:vcTF { Z } { Z } {
    \__bnvs_if_resolve:vcTF { L } { ans } {
      \__bnvs_tl_put_left:cn  { ans } { 1-}
      \__bnvs_tl_put_right:cn { ans } { + }
      \__bnvs_tl_put_right:cv { ans } { Z }
      \__bnvs_round:c { ans }
```

```
      \__bnvs_tl_put_right:cn { ans } { - }
      \__bnvs_tl_put_right:cv { ans } { Z }
      \prg_return_true:
    } {
      \prg_return_false:
    }
  } {
    \prg_return_false:
  }
}
```

: or :: range

```
\BNVS_new:cpn { if_resolve_query_return[:]: } {
  \__bnvs_tl_set:cn { ans } { - }
  \prg_return_true:
}
```

:⟨*last*⟩ range

```
\BNVS_new:cpn { if_resolve_query_return[:Z]: } {
  \__bnvs_tl_set:cn { ans } { - }
  \__bnvs_if_append:vcTF { Z } { ans } {
    \prg_return_true:
  } {
    \prg_return_false:
  }
}
```

__bnvs_if_resolve_query:nc*TF* __bnvs_if_resolve_query:ncTF {⟨*query*⟩} {⟨*tl core*⟩} {⟨*yes code*⟩} {⟨*no code*⟩}

Evaluate only one query.

```
\BNVS_new_conditional:cpnn { if_resolve_query:nc } #1 #2 { T, F, TF } {
  \__bnvs_greset_call:
  \__bnvs_match_if_once:NnTF \c__bnvs_A_cln_Z_regex { #1 } {
    \BNVS_begin:
    \__bnvs_if_resolve_query_branch:TF {
      \BNVS_end_tl_set:cv { #2 } { ans }
      \prg_return_true:
    } {
      \BNVS_end:
      \prg_return_false:
    }
  } {
    \BNVS_error:n { Syntax~error:~#1 }
    \BNVS_end:
    \prg_return_false:
  }
}
```

__bnvs_if_resolve_queries:nc*TF* __bnvs_if_resolve_queries:ncTF {⟨*overlay query list*⟩} {⟨*ans*⟩} {⟨*yes code*⟩} {⟨*no code*⟩}

This is called by the *named overlay specifications* scanner. Evaluates the comma separated ⟨*overlay query list*⟩, replacing all the individual named overlay specifications and integer expressions by their static counterparts by calling __bnvs_if_resolve_query:ncTF, then append the result to the right of the ⟨*ans*⟩ tl variable . This is executed within a local group. Below are local variables and constants used throughout the body of this function.

\l__bnvs_query_seq Storage for a sequence of ⟨*query*⟩'s obtained by splitting a comma separated list.

(*End of definition for* \l__bnvs_query_seq.)

\l__bnvs_ans_seq Storage for the evaluated result.

(*End of definition for* \l__bnvs_ans_seq.)

\c__bnvs_comma_regex Used to parse slide range overlay specifications.

```
\regex_const:Nn \c__bnvs_comma_regex { \s* , \s* }
```

(*End of definition for* \c__bnvs_comma_regex.)

No other variable is used.

```
\BNVS_new_conditional:cpnn { if_resolve_queries:nc } #1 #2 { TF } {
  \BNVS_begin:
```

Local variables cleared

```
  \__bnvs_seq_clear:c { ans }
```

In this main evaluation step, we evaluate the integer expression and put the result in a variable which content will be copied after the group is closed. We authorize comma separated expressions and ⟨*first*⟩::⟨*last*⟩ range expressions as well. We first split the expression around commas, into \l_query_seq.

```
  \regex_split:NnN \c__bnvs_comma_regex { #1 } \l__bnvs_query_seq
```

Then each component is evaluated and the result is stored in \l__bnvs_ans_seq that we justed cleared above.

```
  \BNVS_set:cpn { end_return: } {
    \__bnvs_seq_if_empty:cTF { ans } {
      \BNVS_end:
    } {
      \exp_args:Nnx
      \use:n {
        \BNVS_end:
        \__bnvs_tl_put_right:cn { #2 }
      } { \__bnvs_seq_use:cn { ans } , }
    }
    \prg_return_true:
  }
  \__bnvs_seq_map_inline:cn { query } {
    \__bnvs_tl_clear:c { ans }
    \__bnvs_if_resolve_query:ncTF { ##1 } { ans } {
      \__bnvs_tl_if_empty:cF { ans } {
        \__bnvs_seq_put_right:cv { ans } { ans }
      }
```

```
    } {
      \seq_map_break:n {
        \BNVS_set:cpn { end_return: } {
          \BNVS_error:n { Circular/Undefined~dependency~in~#1}
          \exp_args:Nnx
          \use:n {
            \BNVS_end:
            \__bnvs_tl_put_right:cn { #2 }
          } { \__bnvs_seq_use:cn { ans } , }
          \prg_return_false:
        }
      }
    }
  }
  \__bnvs_end_return:
```

We have managed all the comma separated components, we collect them back and append them to the tl variable.

```
}

\NewDocumentCommand \BeanovesResolve { O{} m } {
  \BNVS_begin:
  \keys_define:nn { BeanovesResolve } {
    in:N .tl_set:N = \l__bnvs_resolve_in_tl,
    in:N .initial:n = { },
    show .bool_set:N = \l__bnvs_resolve_show_bool,
    show .default:n = true,
    show .initial:n = false,
  }
  \keys_set:nn { BeanovesResolve } { #1 }
  \__bnvs_tl_clear:c { ans }
  \__bnvs_if_resolve_queries:ncTF { #2 } { ans } {
    \__bnvs_tl_if_empty:cTF { resolve_in } {
      \bool_if:nTF { \l__bnvs_resolve_show_bool } {
        \BNVS_tl_use:Nv \BNVS_end: { ans }
      } {
        \BNVS_end:
      }
    } {
      \bool_if:nTF { \l__bnvs_resolve_show_bool } {
        \cs_set:Npn \BNVS_end:Nn ##1 ##2 {
          \BNVS_end:
          \tl_set:Nn ##1 { ##2 }
          ##2
        }
        \BNVS_tl_use:nv {
          \exp_last_unbraced:NV \BNVS_end:Nn \l__bnvs_resolve_in_tl
        } { ans }
      } {
        \cs_set:Npn \BNVS_end:Nn ##1 ##2 {
          \BNVS_end:
          \tl_set:Nn ##1 { ##2 }
        }
        \BNVS_tl_use:nv {
```

```
          \exp_last_unbraced:NV \BNVS_end:Nn \l__bnvs_resolve_in_tl
        } { ans }
      }
    }
  } {}
}
```

6.22 Reseting counters and values

```
\BNVS_new:cpn { reset:n } #1 {
  \BNVS_begin:
  \__bnvs_set_true:c { reset }
  \__bnvs_set_false:c { provide }
  \__bnvs_tl_clear:c { root }
  \__bnvs_int_zero:c { i }
  \__bnvs_tl_set:cn { a } { #1 }
  \__bnvs_provide_off:
  \BNVS_tl_use:Nv \__bnvs_keyval_named:n { a }
  \BNVS_end_tl_set:cv { id_last } { id_last }
}

\BNVS_new:cpn { reset:v } {
  \BNVS_tl_use:Nv \__bnvs_reset:n
}

\makeatletter
\NewDocumentCommand \BeanovesReset { O{} m } {
  \tl_if_empty:NTF \@currenvir {
```

We are most certainly in the preamble, record the definitions globally for later use.

```
    \BNVS_error:x {No~\token_to_str:N \BeanovesReset{}~in~the~preamble.}
  } {
    \tl_if_eq:NnT \@currenvir { document } {
```

At the top level, clear everything.

```
      \BNVS_error:x {No~\token_to_str:N \BeanovesReset{}~at~the~top~level.}
    }
    \BNVS_begin:
    \__bnvs_set_true:c { reset }
    \__bnvs_set_false:c { provide }
    \keys_define:nn { BeanovesReset } {
      all .bool_set:N = \l__bnvs_reset_all_bool,
      all .default:n = true,
      all .initial:n = false,
      only .bool_set:N = \l__bnvs_only_bool,
      only .default:n = true,
      only .initial:n = false,
    }
    \keys_set:nn { BeanovesReset } { #1 }
    \__bnvs_tl_clear:c { root }
    \__bnvs_int_zero:c { i }
    \__bnvs_tl_set:cn { a } { #2 }
```

```
    \__bnvs_provide_off:
    \BNVS_tl_use:Nv \__bnvs_keyval_named:n { a }
    \BNVS_end_tl_set:cv { id_last } { id_last }
    \ignorespaces
  }
}
\makeatother

\ExplSyntaxOff
```