Babel

Localization and internationalization

Unicode

\TeX
pdf\TeX
Lua\TeX
Xe\TeX
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Part I
User guide

What is this document about? This user guide focuses on internationalization and localization with \LaTeX and \pdftex, xetex and luatex with the babel package. There are also some notes on its use with e-Plain and pdf-Plain \TeX. Part II describes the code, and usually it can be ignored.

What if I'm interested only in the latest changes? Changes and new features with relation to version 3.8 are highlighted with New X.XX, and there are some notes for the latest versions in the babel site. The most recent features can be still unstable.

Can I help? Sure! If you are interested in the \TeX multilingual support, please join the kadingira mail list. You can follow the development of babel in GitHub and make suggestions; feel free to fork it and make pull requests. If you are the author of a package, send to me a few test files which I’ll add to mine, so that possible issues can be caught in the development phase.

It doesn’t work for me! You can ask for help in some forums like tex.stackexchange, but if you have found a bug, I strongly beg you to report it in GitHub, which is much better than just complaining on an e-mail list or a web forum. Remember warnings are not errors by themselves, they just warn about possible problems or incompatibilities.

How can I contribute a new language? See section 3.1 for contributing a language.

I only need learn the most basic features. The first subsections (1.1-1.3) describe the traditional way of loading a language (with .ldf files), which is usually all you need. The alternative way based on .ini files, which complements the previous one (it does not replace it, although it is still necessary in some languages), is described below; go to 1.13.

I don’t like manuals. I prefer sample files. This manual contains lots of examples and tips, but in GitHub there are many sample files.

1 The user interface

1.1 Monolingual documents

In most cases, a single language is required, and then all you need in \LaTeX is to load the package using its standard mechanism for this purpose, namely, passing that language as an optional argument. In addition, you may want to set the font and input encodings. Another approach is making the language a global option in order to let other packages detect and use it. This is the standard way in \LaTeX for an option – in this case a language – to be recognized by several packages.

Many languages are compatible with xetex and luatex. With them you can use babel to localize the documents. When these engines are used, the Latin script is covered by default in current \LaTeX (provided the document encoding is UTF-8), because the font loader is preloaded and the font is switched to \texttt{lmroman}. Other scripts require loading fontspec. You may want to set the font attributes with fontspec, too.

EXAMPLE Here is a simple full example for “traditional” \TeX engines (see below for xetex and luatex). The packages fontenc and inputenc do not belong to babel, but they are included in the example because typically you will need them. It assumes UTF-8, the default encoding:

\documentclass{article}
\usepackage[T1]{fontenc}
\usepackage{french}{babel}
\begin{document}
Plus ça change, plus c'est la même chose!
\end{document}

Now consider something like:

\documentclass{article}
\usepackage{babel}
\usepackage{varioref}

With this setting, the package \texttt{varioref} will also see the option \texttt{french} and will be able to use it.

\textbf{EXAMPLE} And now a simple monolingual document in Russian (text from the Wikipedia) with \texttt{xeTeX} or \texttt{luatex}. Note neither \texttt{fontenc} nor \texttt{inputenc} are necessary, but the document should be encoded in UTF-8 and a so-called Unicode font must be loaded (in this example \texttt{\babelfont} is used, described below).

\begin{verbatim}
\documentclass{article}
\usepackage{babel}
\babelfont{rm}{DejaVu Serif}
\begin{document}
Россия, находящаяся на пересечении множества культур, а также с учётом многонационального характера её населения, — отличается высокой степенью этнокультурного многообразия и способностью к межкультурному диалогу.
\end{document}
\end{verbatim}

\textbf{TROUBLESHOOTING} A common source of trouble is a wrong setting of the input encoding. Depending on the \LaTeX{} version you can get the following somewhat cryptic error:

\begin{verbatim}
! Paragraph ended before \UTFviii@three@octets was complete.
\end{verbatim}

Or the more explanatory:

\begin{verbatim}
! Package inputenc Error: Invalid UTF-8 byte ...
\end{verbatim}

Make sure you set the encoding actually used by your editor.

\textbf{NOTE} Because of the way \texttt{babel} has evolved, “language” can refer to (1) a set of hyphenation patterns as preloaded into the format, (2) a package option, (3) an \texttt{.ltx} file, and (4) a name used in the document to select a language or dialect. So, a package option refers to a language in a generic way – sometimes it is the actual language name used to select it, sometimes it is a file name loading a language with a different name, sometimes it is a file name loading several languages. Please, read the documentation for specific languages for further info.

\textbf{TROUBLESHOOTING} The following warning is about hyphenation patterns, which are not under the direct control of \texttt{babel}:
Package babel Warning: No hyphenation patterns were preloaded for
the language `LANG' into the format.
Please, configure your TeX system to add them and
rebuild the format. Now I will use the patterns
preloaded for \language=0 instead on input line 57.

The document will be typeset, but very likely the text will not be correctly hyphenated. Some
languages may be raising this warning wrongly (because they are not hyphenated); it is a bug to
be fixed – just ignore it. See the manual of your distribution (Mac\TeX, Mik\TeX, \TeX\Live, etc.) for
further info about how to configure it.

**NOTE** With hyperref you may want to set the document language with something like:

\usepackage[pdflang=es-MX]{hyperref}

This is not currently done by babel and you must set it by hand.

**NOTE** Although it has been customary to recommend placing \title, \author and other elements
printed by \maketitle after \begin{document}, mainly because of shorthands, it is advisable to
keep them in the preamble. Currently there is no real need to use shorthands in those macros.

### 1.2 Multilingual documents

In multilingual documents, just use a list of the required languages as package or class
options. The last language is considered the main one, activated by default. Sometimes, the
main language changes the document layout (eg, spanish and french).

**EXAMPLE** In \LaTeX, the preamble of the document:

\documentclass{article}
\usepackage[dutch,english]{babel}

would tell \LaTeX that the document would be written in two languages, Dutch and English, and
that English would be the first language in use, and the main one.

You can also set the main language explicitly, but it is discouraged except if there is a real
reason to do so:

\documentclass{article}
\usepackage[main=english,dutch]{babel}

Examples of cases where main is useful are the following.

**EXAMPLE** Some classes load babel with a hardcoded language option. Sometimes, the main language
can be overridden with something like that before \documentclass:

\PassOptionsToPackage{main=english}{babel}

**NOTE** Languages may be set as global and as package option at the same time, but in such a case you
should set explicitly the main language with the package option main:

\documentclass[italian]{book}
\usepackage[ngerman,main=italian]{babel}

**WARNING** In the preamble the main language has not been selected, except hyphenation patterns
and the name assigned to \languagename (in particular, shorthands, captions and date are not
activated). If you need to define boxes and the like in the preamble, you might want to use some
of the language selectors described below.
To switch the language there are two basic macros, described below in detail: 
\selectlanguage is used for blocks of text, while \foreignlanguage is for chunks of text inside paragraphs.

**EXAMPLE** A full bilingual document with pdftex follows. The main language is french, which is activated when the document begins. It assumes UTF-8:

```tex
\documentclass{article}
\usepackage[T1]{fontenc}
\usepackage[english,french]{babel}
\begin{document}
Plus ça change, plus c'est la même chose!
\selectlanguage{english}
And an English paragraph, with a short text in \foreignlanguage{french}{français}.
\end{document}
```

**EXAMPLE** With xetex and luatex, the following bilingual, single script document in UTF-8 encoding just prints a couple of ‘captions’ and \today in Danish and Vietnamese. No additional packages are required, because the default fonts supports both languages.

```tex
\documentclass{article}
\usepackage[vietnamese,danish]{babel}
\begin{document}
\prefacename, \alsoname, \today.
\selectlanguage{vietnamese}
\prefacename, \alsoname, \today.
\end{document}
```

**NOTE** Once loaded a language, you can select it with the corresponding BCP47 tag. See section 1.22 for further details.

### 1.3 Mostly monolingual documents

**New 3.39** Very often, multilingual documents consist of a main language with small pieces of text in another languages (words, idioms, short sentences). Typically, all you need is to set the line breaking rules and, perhaps, the font. In such a case, babel now does not require declaring these secondary languages explicitly, because the basic settings are loaded on the fly when the language is selected (and also when provided in the optional argument of \babelfont, if used.) This is particularly useful, too, when there are short texts of this kind coming from an external source whose contents are not known on beforehand (for example, titles in a bibliography). At this regard, it is worth remembering that \babelfont does not load any font until required, so that it can be used just in case.

**EXAMPLE** A trivial document with the default font in English and Spanish, and FreeSerif in Russian is:
\documentclass[english]{article}
\usepackage{babel}
\babelfont[russian]{rm}{FreeSerif}
\begin{document}

English. \foreignlanguage{russian}{Русский}.
\foreignlanguage{spanish}{Español}.

\end{document}

NOTE Instead of its name, you may prefer to select the language with the corresponding BCP47 tag. This alternative, however, must be activated explicitly, because a two- or three-letter word is a valid name for a language (e.g., lu can be the locale name with tag khb or the tag for lubakatanga). See section 1.22 for further details.

1.4 Modifiers

New 3.9c The basic behavior of some languages can be modified when loading babel by means of modifiers. They are set after the language name, and are prefixed with a dot (only when the language is set as package option – neither global options nor the main key accepts them). An example is (spaces are not significant and they can be added or removed):\footnote{No predefined “axis” for modifiers are provided because languages and their scripts have quite different needs.}

\usepackage[latin.medieval, spanish.notilde.lcroman, danish]{babel}

Attributes (described below) are considered modifiers, ie, you can set an attribute by including it in the list of modifiers. However, modifiers are a more general mechanism.

1.5 Troubleshooting

• Loading directly sty files in \TeX (ie, \usepackage{⟨language⟩}) is deprecated and you will get the error:\footnote{In old versions the error read “You have used an old interface to call babel”, not very helpful.}

! Package babel Error: You are loading directly a language style. (babel) This syntax is deprecated and you must use \usepackage[language]{babel}.

• Another typical error when using babel is the following:\footnote{In old versions the error read “You haven’t loaded the language LANG yet”}

! Package babel Error: Unknown language ‘#1’. Either you have (babel) misspelled its name, it has not been installed, (babel) or you requested it in a previous run. Fix its name, (babel) install it or just rerun the file, respectively. In some cases, you may need to remove the aux file.

The most frequent reason is, by far, the latest (for example, you included spanish, but you realized this language is not used after all, and therefore you removed it from the option list). In most cases, the error vanishes when the document is typeset again, but in more severe ones you will need to remove the aux file.
1.6 Plain

In e-Plain and pdf-Plain, load languages styles with \input and then use \begindocument (the latter is defined by babel):

\input estonian.sty
\begindocument

**WARNING** Not all languages provide a sty file and some of them are not compatible with those formats. Please, refer to Using babel with Plain for further details.

1.7 Basic language selectors

This section describes the commands to be used in the document to switch the language in multilingual documents. In most cases, only the two basic macros \selectlanguage and \foreignlanguage are necessary. The environments otherlanguage, otherlanguage* and hyphenrules are auxiliary, and described in the next section.

The main language is selected automatically when the document environment begins.

\selectlanguage{⟨language⟩}

When a user wants to switch from one language to another he can do so using the macro \selectlanguage. This macro takes the language, defined previously by a language definition file, as its argument. It calls several macros that should be defined in the language definition files to activate the special definitions for the language chosen:

\selectlanguage{german}

This command can be used as environment, too.

**NOTE** For "historical reasons", a macro name is converted to a language name without the leading \; in other words, \selectlanguage{\german} is equivalent to \selectlanguage{german}. Using a macro instead of a "real" name is deprecated. However, if the macro name does not match any language, it will get expanded as expected.

**NOTE** Bear in mind \selectlanguage can be automatically executed, in some cases, in the auxiliary files, at heads and foots, and after the environment otherlanguage*.

**WARNING** If used inside braces there might be some non-local changes, as this would be roughly equivalent to:

\selectlanguage{⟨inner-language⟩} ...\selectlanguage{⟨outer-language⟩}

If you want a change which is really local, you must enclose this code with an additional grouping level.

**WARNING** There are a couple of issues related to the way the language information is written to the auxiliary files:

- \selectlanguage should not be used inside some boxed environments (like floats or minipage) to switch the language if you need the information written to the aux be correctly synchronized. This rarely happens, but if it were the case, you must use otherlanguage instead.
- In addition, this macro inserts a \write in vertical mode, which may break the vertical spacing in some cases (for example, between lists). The behavior can be adjusted with \babeladjust{select.write=⟨mode⟩}, where ⟨mode⟩ is shift (which shifts the skips down and adds a \penalty); keep (the default – with it the \write and the skips are kept in the order they are written), and omit (which may seem a too drastic solution, because nothing is written, but more often than not this command is applied to more or less short texts with no sectioning or similar commands and therefore no language synchronization is necessary).
The command \foreignlanguage takes two arguments; the second argument is a phrase
to be typeset according to the rules of the language named in its first one.
This command (1) only switches the extra definitions and the hyphenation rules for the
language, not the names and dates, (2) does not send information about the language to
auxiliary files (i.e., the surrounding language is still in force), and (3) it works even if the
language has not been set as package option (but in such a case it only sets the
hyphenation patterns and a warning is shown). With the bidi option, it also enters in
horizontal mode (this is not done always for backwards compatibility), and since it is
meant for phrases only the text direction (and not the paragraph one) is set.

New 3.44 As already said, captions and dates are not switched. However, with the
optional argument you can switch them, too. So, you can write:

\foreignlanguage[date]{polish}{\today}

In addition, captions can be switched with captions (or both, of course, with date,
captions). Until 3.43 you had to write something like {\selectlanguage{..} ..}, which
was not always the most convenient way.

1.8 Auxiliary language selectors

The environment otherlanguage does basically the same as \selectlanguage, except that
language change is (mostly) local to the environment. Actually, there might be some non-local changes, as this environment is roughly equivalent to:

\begingroup
\selectlanguage{<inner-language>}
... 
\selectlanguage{<outer-language>}
\endgroup

If you want a change which is really local, you must enclose this environment with an
additional grouping, like braces {}. Spaces after the environment are ignored.

Same as \foreignlanguage but as environment. Spaces after the environment are not ignored.
This environment was originally intended for intermixing left-to-right typesetting with
right-to-left typesetting in engines not supporting a change in the writing direction inside a
line. However, by default it never complied with the documented behavior and it is just a
version as environment of \foreignlanguage, except when the option bidi is set – in this
case, \foreignlanguage emits a \leavevmode, while otherlanguage* does not.

1.9 More on selection

New 3.9i In multilingual documents with many language-switches the commands above
can be cumbersome. With this tool shorter names can be defined. It adds nothing really new – it is just syntactical sugar.
It defines \text{⟨tag1⟩}{⟨text⟩} to be \foreignlanguage{⟨language1⟩}{⟨text⟩}, and \begin{⟨tag1⟩} to be \begin{otherlanguage*}{⟨language1⟩}, and so on. Note \langle tag1 \rangle is also allowed, but remember to set it locally inside a group.

**WARNING** There is a clear drawback to this feature, namely, the ‘prefix’ \text{...} is heavily overloaded in \TeX{} and conflicts with existing macros may arise (\textlatin, \textbar{}, \textit, \textcolor and many others). The same applies to environments, because arabic conflicts with \arabic. Furthermore, and because of this overloading, detecting the language of a chunk of text by external tools can become unfeasible. Except if there is a reason for this ‘syntactical sugar’, the best option is to stick to the default selectors or to define your own alternatives.

**EXAMPLE** With

\babeltags{de = german}

you can write

\begin{verbatim}
\text{\textde}{German text} text
\end{verbatim}

and

\begin{verbatim}
\text{\begin{de}German text\end{de}} text
\end{verbatim}

**NOTE** Something like \babeltags{finnish = finnish} is legitimate – it defines \text{finnish} and \finnish (and, of course, \begin{finnish}).

**NOTE** Actually, there may be another advantage in the ‘short’ syntax \text{⟨tag⟩}, namely, it is not affected by \MakeUppercase (while \foreignlanguage is).

\bableness[include=⟨commands⟩, exclude=⟨commands⟩, fontenc=⟨encoding⟩]{⟨language⟩}

**New 3.9i** Except in a few languages, like russian, captions and dates are just strings, and do not switch the language. That means you should set it explicitly if you want to use them, or hyphenation (and in some cases the text itself) will be wrong. For example:

\begin{verbatim}
\foreignlanguage{russian}{text} \foreignlanguage{polish}{\seename} text
\end{verbatim}

Of course, \TeX{} can do it for you. To avoid switching the language all the while, \bableness redefines the captions for a given language to wrap them with a selector:

\bableness{polish}

By default only the basic captions and \today{} are redefined, but you can add further macros with the key include in the optional argument (without commas). Macros not to be modified are listed in exclude. You can also enforce a font encoding with the option fontenc.\footnote{With it, encoded strings may not work as expected.}

A couple of examples:

\begin{verbatim}
\bableness[include=\today]{spanish}
\bableness[fontenc=T5]{vietnamese}
\end{verbatim}

They are activated when the language is selected (at the afterextras event), and it makes some assumptions which could not be fulfilled in some languages. Note also you should include only macros defined by the language, not global macros (eg. \TeX{} of \dag). With ini files (see below), captions are ensured by default.
1.10 Shorthands

A shorthand is a sequence of one or two characters that expands to arbitrary TeX code. Shorthands can be used for different kinds of things; for example: (1) in some languages shorthands such as “a” are defined to be able to hyphenate the word if the encoding is OT1; (2) in some languages shorthands such as ‘_’ are used to insert the right amount of white space; (3) several kinds of discretionary and breaks can be inserted easily with “-, ”=, etc. The package inputenc as well as xetex and luatex have alleviated entering non-ASCII characters, but minority languages and some kinds of text can still require characters not directly available on the keyboards (and sometimes not even as separated or precomposed Unicode characters). As to the point 2, now pdfTeX provides \knbccode, and luatex can manipulate the glyph list. Tools for point 3 can be still very useful in general.

There are four levels of shorthands: user, language, system, and language user (by order of precedence). In most cases, you will use only shorthands provided by languages.

NOTE Keep in mind the following:

1. Activated chars used for two-char shorthands cannot be followed by a closing brace } and the spaces following are gobbled. With one-char shorthands (eg., ’ ‘), they are preserved.
2. If on a certain level (system, language, user, language user) there is a one-char shorthand, two-char ones starting with that char and on the same level are ignored.
3. Since they are active, a shorthand cannot contain the same character in its definition (except if deactivated with, eg, \string).

TROUBLESHOOTING A typical error when using shorthands is the following:

! Argument of \language@active@arg" has an extra }.

It means there is a closing brace just after a shorthand, which is not allowed (eg, ”}). Just add {} after (eg, "{}).

\shorthandon\{\shorthandlist\}
\shorthandoff*\{\shorthandlist\}

It is sometimes necessary to switch a shorthand character off temporarily, because it must be used in an entirely different way. For this purpose, the user commands \shorthandoff and \shorthandon are provided. They each take a list of characters as their arguments. The command \shorthandoff sets the \catcode for each of the characters in its argument to other (12); the command \shorthandon sets the \catcode to active (13). Both commands only work on ‘known’ shorthand characters.

New 3.9a However, \shorthandoff does not behave as you would expect with characters like ~ or ^, because they usually are not "other". For them \shorthandoff* is provided, so that with

\shorthandoff*{-^}

~ is still active, very likely with the meaning of a non-breaking space, and ^ is the superscript character. The catcodes used are those when the shorthands are defined, usually when language files are loaded.

If you do not need shorthands, or prefer an alternative approach of your own, you may want to switch them off with the package option shorthands=off, as described below.

WARNING It is worth emphasizing these macros are meant for temporary changes. Whenever possible and if there are not conflicts with other packages, shorthands must be always enabled (or disabled).
\texttt{\useshorthands \{\texttt{char}\}}

The command \texttt{\useshorthands} initiates the definition of user-defined shorthand sequences. It has one argument, the character that starts these personal shorthands.

\textbf{New 3.9a} User shorthands are not always alive, as they may be deactivated by languages (for example, if you use \texttt{"} for your user shorthands and switch from \texttt{german} to \texttt{french}, they stop working). Therefore, a starred version \texttt{\useshorthands*\{\texttt{char}\}} is provided, which makes sure shorthands are always activated.

Currently, if the package option \texttt{shorthands} is used, you must include any character to be activated with \texttt{\useshorthands*}. This restriction will be lifted in a future release.

\texttt{\defineshorthand \{\langle language\rangle, \langle language\rangle, \ldots\}\{\langle shorthand\rangle\}\{\langle code\rangle\}}

The command \texttt{\defineshorthand} takes two arguments: the first is a one- or two-character shorthand sequence, and the second is the code the shorthand should expand to.

\textbf{New 3.9a} An optional argument allows to (re)define language and system shorthands (some languages do not activate shorthands, so you may want to add \texttt{\languageshorthands\{\langle lang\rangle\}} to the corresponding \texttt{\extras\{\langle lang\rangle\}}, as explained below).

By default, user shorthands are (re)defined.

User shorthands override language ones, which in turn override system shorthands.

Language-dependent user shorthands (new in 3.9) take precedence over “normal” user shorthands.

\textbf{EXAMPLE} Let's assume you want a unified set of shorthand for discretionaries (languages do not define shorthands consistently, and \texttt{" -, \-, \- =} have different meanings). You can start with, say:

\begin{verbatim}
\useshorthands*{"
\defineshorthand{"*}{\babelhyphen{soft}}
\defineshorthand{"-}{\babelhyphen{hard}}
\end{verbatim}

However, the behavior of hyphens is language-dependent. For example, in languages like Polish and Portuguese, a hard hyphen inside compound words are repeated at the beginning of the next line. You can then set:

\begin{verbatim}
\defineshorthand{\{polish, portuguese\}"-}{\babelhyphen{repeat}}
\end{verbatim}

Here, options with \texttt{*} set a language-dependent user shorthand, which means the generic one above only applies for the rest of languages; without \texttt{*} they would (re)define the language shorthands instead, which are overridden by user ones.

Now, you have a single unified shorthand \texttt{"-}, with a content-based meaning (‘compound word hyphen’) whose visual behavior is that expected in each context.

\texttt{\languageshorthands \{\langle language\rangle\}}

The command \texttt{\languageshorthands} can be used to switch the shorthands on the language level. It takes one argument, the name of a language or none (the latter does what its name suggests).\footnote{\texttt{\languageshorthands} actually does the same as \texttt{\useshorthands} in that case.} Note that for this to work the language should have been specified as an option when loading the babel package. For example, you can use in English the shorthands defined by \texttt{ngerman} with

\begin{verbatim}
\addto\extraenglish{\languageshorthands{ngerman}}
\end{verbatim}

(You may also need to activate them as user shorthands in the preamble with, for example, \texttt{\useshorthands} or \texttt{\useshorthands*}.)

\footnote{Actually, any name not corresponding to a language group does the same as \texttt{\useshorthands}. However, follow this convention because it might be enforced in future releases of babel to catch possible errors.}
Very often, this is a more convenient way to de-activate shorthands than \shorthandoff, for example if you want to define a macro to easy typing phonetic characters with tipa:

\newcommand{\myipa}[1]{{\languageshorthands{none}\tipaencoding#1}}

with this command you can use a shorthand even if (1) not activated in shorthands (in this case only shorthands for the current language are taken into account, ie, not user shorthands), (2) turned off with \shorthandoff or (3) deactivated with the internal \bbl@deactivate; for example, \babelshorthand{u} or \babelshorthand{:}. (You can conveniently define your own macros, or even your own user shorthands provided they do not overlap.)

Since by default shorthands are not activated until \begin{document}, you may use this macro when defining the \title in the preamble:

\title{Documento científico\babelshorthand{"-} técnico}

For your records, here is a list of shorthands, but you must double check them, as they may change:

Languages with no shorthands  Croatian, English (any variety), Indonesian, Hebrew, Interlingua, Irish, Lower Sorbian, Malaysian, North Sami, Romanian, Scottish, Welsh

Languages with only " as defined shorthand character  Albanian, Bulgarian, Danish, Dutch, Finnish, German (old and new orthography, also Austrian), Icelandic, Italian, Norwegian, Polish, Portuguese (also Brazilian), Russian, Serbian (with Latin script), Slovene, Swedish, Ukrainian, Upper Sorbian

Basque  
Breton  
Catalan  
Czech  
Esperanto  
Estonian  
French (all varieties)  
Galician  
Greek  
Hungarian  
Kurmanji  
Latin  
Slovak  
Spanish  
Turkish

In addition, the babel core declares ~ as a one-char shorthand which is let, like the standard ~, to a non breaking space.

\ifbabelshorthand{(character)}{(true)}{(false)}

New 3.23 Tests if a character has been made a shorthand.

\aliasshorthand{(original)}{(alias)}

The command \aliasshorthand can be used to let another character perform the same functions as the default shorthand character. If one prefers for example to use the

---

6 Thanks to Enrico Gregorio
7 This declaration serves to nothing, but it is preserved for backward compatibility.
character / over " in typing Polish texts, this can be achieved by entering \aliashorthand{"}/. For the reasons in the warning below, usage of this macro is not recommended.

NOTE The substitute character must not have been declared before as shorthand (in such a case, \aliashorthands is ignored).

EXAMPLE The following example shows how to replace a shorthand by another

\aliashorthand{-}{^}
\AtBeginDocument{\shorthandoff{-}}

WARNING Shorthands remember somehow the original character, and the fallback value is that of the latter. So, in this example, if no shorthand if found, ^ expands to a non-breaking space, because this is the value of ~ (internally, ^ still calls \active@char~ or \normal@char~). Furthermore, if you change the system value of ^ with \defineshorthand nothing happens.

1.11 Package options

New 3.9a These package options are processed before language options, so that they are taken into account irrespective of its order. The first three options have been available in previous versions.

KeepShorthandsActive Tells babel not to deactivate shorthands after loading a language file, so that they are also available in the preamble.

activeacute For some languages babel supports this options to set ' as a shorthand in case it is not done by default.

activegrave Same for `. 

shorthands= \(char\langle char\)\... | off
The only language shorthands activated are those given, like, eg:

\usepackage[esperanto,french,shorthands=;!?]{babel}

If ' is included, activeacute is set; if ` is included, activegrave is set. Active characters (like ~) should be preceded by \texttt{string} otherwise they will be expanded by \LaTeX{} before they are passed to the package and therefore they will not be recognized; however, t is provided for the common case of ~ (as well as c for not so common case of the comma). With shorthands=off no language shorthands are defined. As some languages use this mechanism for tools not available otherwise, a macro \protect\texttt{\babelshorthand} is defined, which allows using them; see above.

safe= none | ref | bib
Some \LaTeX{} macros are redefined so that using shorthands is safe. With safe=bib only \nocite, \bibcite and \bibitem are redefined. With safe=ref only \newlabel, \ref and \pageref are redefined (as well as a few macros from varioref and ifthen).

With safe=none no macro is redefined. This option is strongly recommended, because a good deal of incompatibilities and errors are related to these redefinitions. As of New 3.34 , in \LaTeX{} based engines (ie, almost every engine except the oldest ones) shorthands can be used in these macros (formerly you could not).

math= active | normal
Shorthands are mainly intended for text, not for math. By setting this option with the value normal they are deactivated in math mode (default is active) and things like \$\{a\}'\$ (a closing brace after a shorthand) are not a source of trouble anymore.
config= \( \langle \text{file} \rangle \)

Load \( \langle \text{file} \rangle . \text{cfg} \) instead of the default config file \( \text{bblopts} . \text{cfg} \) (the file is loaded even with \texttt{noconfigs}).

main= \( \langle \text{language} \rangle \)

Sets the main language, as explained above, ie, this language is always loaded last. If it is not given as package or global option, it is added to the list of requested languages.

headfoot= \( \langle \text{language} \rangle \)

By default, headlines and footlines are not touched (only marks), and if they contain language-dependent macros (which is not usual) there may be unexpected results. With this option you may set the language in heads and foots.

noconfigs

Global and language default config files are not loaded, so you can make sure your document is not spoilt by an unexpected \( . \text{cfg} \) file. However, if the key \texttt{config} is set, this file is loaded.

showlanguages

Prints to the log the list of languages loaded when the format was created: number (remember dialects can share it), name, hyphenation file and exceptions file.

nocase

\textit{New 3.9l} Language settings for uppercase and lowercase mapping (as set by \texttt{\SetCase}) are ignored. Use only if there are incompatibilities with other packages.

silent

\textit{New 3.9l} No warnings and \textit{no infos} are written to the log file.\(^8\)

strings= generic | unicode | encoded | \( \langle \text{label} \rangle \) | \( \langle \text{font encoding} \rangle \)

Selects the encoding of strings in languages supporting this feature. Predefined labels are \texttt{generic} (for traditional \TeX, \LICR and ASCII strings), \texttt{unicode} (for engines like \texttt{xetex} and \texttt{luatex}) and encoded (for special cases requiring mixed encodings). Other allowed values are font encoding codes (T1, T2A, LGR, L7X...), but only in languages supporting them. Be aware with encoded captions are protected, but they work in \texttt{\MakeUppercase} and the like (this feature misuses some internal \TeX tools, so use it only as a last resort).

hyphenmap= off | first | select | other | other*

\textit{New 3.9g} Sets the behavior of case mapping for hyphenation, provided the language defines it.\(^9\) It can take the following values:

\texttt{off} deactivates this feature and no case mapping is applied;
\texttt{first} sets it at the first switching commands in the current or parent scope (typically, when the aux file is first read and at \texttt{\begin{document}}, but also the first \texttt{\selectlanguage} in the preamble), and it's the default if a single language option has been stated;\(^10\)
\texttt{select} sets it only at \texttt{\selectlanguage};
\texttt{other} also sets it at other language;
\texttt{other*} also sets it at other language* as well as in heads and foots (if the option headfoot is used) and in auxiliary files (ie, at \texttt{\select@language}), and it's the default if several language options have been stated. The option \texttt{first} can be regarded as an optimized version of \texttt{other*} for monolingual documents.\(^11\)

\(^8\)You can use alternatively the package \texttt{silence}.
\(^9\)Turned off in plain.
\(^10\)Duplicated options count as several ones.
\(^11\)Providing \texttt{foreign} is pointless, because the case mapping applied is that at the end of the paragraph, but if either \texttt{xetex} or \texttt{luatex} change this behavior it might be added. On the other hand, \texttt{other} is provided even if I \cite{JBL} think it isn't really useful, but who knows.
bidi= default | basic | basic-r | bidi-l | bidi-r

New 3.14  Selects the bidi algorithm to be used in luatex and xetex. See sec. 1.24.

layout=

New 3.16  Selects which layout elements are adapted in bidi documents. See sec. 1.24.

provide= *

New 3.49  An alternative to \babelprovide for languages passed as options. See section 1.13, which describes also the variants provide++ and provide*=.

1.12 The base option

With this package option babel just loads some basic macros (those in switch.def), defines \AfterBabelLanguage and exits. It also selects the hyphenation patterns for the last language passed as option (by its name in language.dat). There are two main uses: classes and packages, and as a last resort in case there are, for some reason, incompatible languages. It can be used if you just want to select the hyphenation patterns of a single language, too.

\AfterBabelLanguage \{\{option-name\}\}{\{code\}\}

This command is currently the only provided by base. Executes \{code\} when the file loaded by the corresponding package option is finished (at \ldf@finish). The setting is global. So \AfterBabelLanguage{french}{...} does ... at the end of french.ldf. It can be used in ldf files, too, but in such a case the code is executed only if \{option-name\} is the same as \CurrentOption (which could not be the same as the option name as set in \usepackage!).

EXAMPLE  Consider two languages foo and bar defining the same \macro with \newcommand. An error is raised if you attempt to load both. Here is a way to overcome this problem:

\usepackage{base}{babel}
\AfterBabelLanguage{foo}{\%
 \let\macroFoo\macro
 \let\macroRelax\relax
 \usepackage{foo,bar}{babel}

NOTE  With a recent version of \TeX, an alternative method to execute some code just after an ldf file is loaded is with \AddToHook and the hook file/<language>.ldf/after. Babel does not predeclare it, and you have to do it yourself with \ActivateGenericHook.

WARNING  Currently this option is not compatible with languages loaded on the fly.

1.13 ini files

An alternative approach to define a language (or, more precisely, a locale) is by means of an ini file. Currently babel provides about 250 of these files containing the basic data required for a locale, plus basic templates for 500 about locales.

ini files are not meant only for babel, and they has been devised as a resource for other packages. To easy interoperability between \TeX and other systems, they are identified with the BCP 47 codes as preferred by the Unicode Common Locale Data Repository, which was used as source for most of the data provided by these files, too (the main exception being the \...name strings).

Most of them set the date, and many also the captions (Unicode and LICR). They will be evolving with the time to add more features (something to keep in mind if backward
compatibility is important). The following section shows how to make use of them by means of \babelprovide. In other words, \babelprovide is mainly meant for auxiliary tasks, and as alternative when the ldf, for some reason, does work as expected.

**EXAMPLE** Although Georgian has its own ldf file, here is how to declare this language with an ini file in Unicode engines.

```latex
\documentclass{book}
\usepackage{babel}
\babelprovide[import, main]{georgian}
\babelfont{rm}[Renderer=Harfbuzz]{DejaVu Sans}
\begin{document}
\tableofcontents
\chapter{სამზარეულო და სუფრის ტრადიციები}
ქართული ტრადიციული სამზარეულო ერთ-ერთი უმდიდრესია მთელ მსოფლიოში.
\end{document}
```

**New 3.49** Alternatively, you can tell babel to load all or some languages passed as options with \babelprovide and not from the ldf file in a few few typical cases. Thus, provide=* means 'load the main language with the \babelprovide mechanism instead of the ldf file' applying the basic features, which in this case means import, main. There are (currently) three options:

- provide=* is the option just explained, for the main language;
- provide+=* is the same for additional languages (the main language is still the ldf file);
- provide*+* is the same for all languages, ie, main and additional.

**EXAMPLE** The preamble in the previous example can be more compactly written as:

```latex
\documentclass{book}
\usepackage[georgian, provide=*]{babel}
\babelfont{rm}[Renderer=Harfbuzz]{DejaVu Sans}
```

Or also:

```latex
\documentclass[georgian]{book}
\usepackage[provide=*,main=*,]{babel}
\babelfont{rm}[Renderer=Harfbuzz]{DejaVu Sans}
```

**NOTE** The ini files just define and sets some parameters, but the corresponding behavior is not always implemented. Also, there are some limitations in the engines. A few remarks follow (which could no longer be valid when you read this manual, if the packages involved han been updated). The Harfbuzz renderer has still some issues, so as a rule of thumb prefer the default renderer, and resort to Harfbuzz only if the former does not work for you. Fortunately, fonts can be loaded twice with different renderers; for example:

```latex
\babelfont[spanish]{rm}{FreeSerif}
\babelfont[hindi]{rm}[Renderer=Harfbuzz]{FreeSerif}
```
Arabic  Monolingual documents mostly work in luatex, but it must be fine tuned, particularly math and graphical elements like picture. In xetex babel resorts to the bidi package, which seems to work.

Hebrew  Nqqud marks seem to work in both engines, but depending on the font cantillation marks might be misplaced (xetex or luatex with Harfbuzz seems better).

Devanagari  In luatex and the the default renderer many fonts work, but some others do not, the main issue being the 'ra'. You may need to set explicitly the script to either deva or dev2, eg:

```latex
\newfontscript{Devanagari}{deva}
```

Other Indic scripts are still under development in the default luatex renderer, but should work with `Renderer=Harfbuzz`. They also work with xetex, although unlike with luatex fine tuning the font behavior is not always possible.

Southeast scripts  Thai works in both luatex and xetex, but line breaking differs (rules are hard-coded in xetex, but they can be modified in luatex). Lao seems to work, too, but there are no patterns for the latter in luatex. Khmer clusters are rendered wrongly with the default renderer. The comment about Indic scripts and lualatex also applies here. Some quick patterns can help, with something similar to:

```latex
\babelprovide[import, hyphenrules=+]{lao}
\babelpatterns[lao]{1ດ 1ມ 1ອ 1ງ 1ກ 1າ} % Random
```

East Asia scripts  Settings for either Simplified of Traditional should work out of the box, with basic line breaking with any renderer. Although for a few words and short texts the ini files should be fine. CJK texts are best set with a dedicated framework (CJK, luatexja, kotex, CTeX, etc.). This is what the class ltjbook does with luatex, which can be used in conjunction with the 1df for japanese, because the following piece of code loads luatexja:

```latex
\documentclass[japanese]{ltjbook}
\usepackage{babel}
```

Latin, Greek, Cyrillic  Combining chars with the default luatex font renderer might be wrong; on then other hand, with the Harfbuzz renderer diacritics are stacked correctly, but many hyphenations points are discarded (this bug is related to kerning, so it depends on the font). With xetex both combining characters and hyphenation work as expected (not quite, but in most cases it works; the problem here are font clusters).

**NOTE**  Wikipedia defines a locale as follows: "In computing, a locale is a set of parameters that defines the user's language, region and any special variant preferences that the user wants to see in their user interface. Usually a locale identifier consists of at least a language code and a country/region code." Babel is moving gradually from the old and fuzzy concept of language to the more modern of locale. Note each locale is by itself a separate “language”, which explains why there are so many files. This is on purpose, so that possible variants can be created and/or redefined easily.

Here is the list (u means Unicode captions, and 1 means LIGR captions):

<table>
<thead>
<tr>
<th>Code</th>
<th>Name</th>
<th>Code</th>
<th>Name</th>
<th>Code</th>
<th>Name</th>
</tr>
</thead>
<tbody>
<tr>
<td>af</td>
<td>Afrikaans</td>
<td>asa</td>
<td>Asu</td>
<td>agq</td>
<td>Asturian</td>
</tr>
<tr>
<td>ak</td>
<td>Akan</td>
<td>az-Cyril</td>
<td>Azerbaijani</td>
<td></td>
<td></td>
</tr>
<tr>
<td>am</td>
<td>Amharic</td>
<td>az-Latn</td>
<td>Azerbaijani</td>
<td></td>
<td></td>
</tr>
<tr>
<td>ar</td>
<td>Arabic</td>
<td>az</td>
<td>Azerbaijani</td>
<td></td>
<td></td>
</tr>
<tr>
<td>ar-DZ</td>
<td>Arabic</td>
<td>bas</td>
<td>Basaa</td>
<td></td>
<td></td>
</tr>
<tr>
<td>ar-EG</td>
<td>Arabic</td>
<td>be</td>
<td>Belarusian</td>
<td></td>
<td></td>
</tr>
<tr>
<td>ar-IQ</td>
<td>Arabic</td>
<td>bem</td>
<td>Bemba</td>
<td></td>
<td></td>
</tr>
<tr>
<td>ar-JO</td>
<td>Arabic</td>
<td>bez</td>
<td>Bena</td>
<td></td>
<td></td>
</tr>
<tr>
<td>ar-LB</td>
<td>Arabic</td>
<td>bg</td>
<td>Bulgarian</td>
<td></td>
<td></td>
</tr>
<tr>
<td>ar-MA</td>
<td>Arabic</td>
<td>bm</td>
<td>Bambara</td>
<td></td>
<td></td>
</tr>
<tr>
<td>ar-PS</td>
<td>Arabic</td>
<td>bn</td>
<td>Bangla</td>
<td></td>
<td></td>
</tr>
<tr>
<td>ar-SA</td>
<td>Arabic</td>
<td>bo</td>
<td>Tibetan</td>
<td></td>
<td></td>
</tr>
<tr>
<td>ar-SY</td>
<td>Arabic</td>
<td>brx</td>
<td>Bodo</td>
<td></td>
<td></td>
</tr>
<tr>
<td>ar-TN</td>
<td>Arabic</td>
<td>bs-Cyril</td>
<td>Bosnian</td>
<td></td>
<td></td>
</tr>
<tr>
<td>as</td>
<td>Assamese</td>
<td>bs-Latn</td>
<td>Bosnian</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Code</td>
<td>Language</td>
<td>Code</td>
<td>Language</td>
<td></td>
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<td>----------------</td>
<td>------</td>
<td>----------------</td>
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<td></td>
</tr>
<tr>
<td>bs</td>
<td>Bosnian</td>
<td>ha-GH</td>
<td>Hausa</td>
<td></td>
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<tr>
<td>ca</td>
<td>Catalan</td>
<td>ha-NE</td>
<td>Hausa</td>
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<td>ha</td>
<td>Hausa</td>
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<td>Chiga</td>
<td>haw</td>
<td>Hawaiian</td>
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<td>he</td>
<td>Hebrew</td>
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<td>Central Kurdish</td>
<td>hi</td>
<td>Hindi</td>
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<td>Coptic</td>
<td>hr</td>
<td>Croatian</td>
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<td>Czech</td>
<td>hsb</td>
<td>Upper Sorbian</td>
<td></td>
<td></td>
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<tr>
<td>cu</td>
<td>Church Slavic</td>
<td>hu</td>
<td>Hungarian</td>
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</tr>
<tr>
<td>cu-Cyrs</td>
<td>Church Slavic</td>
<td>hy</td>
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<td>Church Slavic</td>
<td>ia</td>
<td>Interlingua</td>
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<td>cy</td>
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<td>id</td>
<td>Indonesian</td>
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<td>Danish</td>
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<td>Igbo</td>
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<tr>
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<td>Taita</td>
<td>ii</td>
<td>Sichuan Yi</td>
<td></td>
<td></td>
</tr>
<tr>
<td>de-AT</td>
<td>German</td>
<td>is</td>
<td>Icelandic</td>
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<tr>
<td>de-CH</td>
<td>Swiss High German</td>
<td>it</td>
<td>Italian</td>
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<td>jgo</td>
<td>Ngomba</td>
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<td>jmc</td>
<td>Machame</td>
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<td>kab</td>
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<td>Dzongkha</td>
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<td>Kamba</td>
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<td>kea</td>
<td>Kabuverdianu</td>
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<td>el</td>
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<td>khq</td>
<td>Koyra Chiini</td>
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<td>Polytonic Greek</td>
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<td>Kikuyu</td>
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In some contexts (currently `\babelfont`) an ini file may be loaded by its name. Here is the list of the names currently supported. With these languages, `\babelfont` loads (if not done before) the language and script names (even if the language is defined as a package option with an ldf file). These are also the names recognized by `\babelprovide` with a valueless import.

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<td>churchslavic-glagolitic</td>
</tr>
<tr>
<td>centralatlastamazight</td>
<td>ewondo</td>
<td>churchslavic</td>
<td>churchslavic-glagolitic</td>
</tr>
<tr>
<td>centralkurdish</td>
<td>faroese</td>
<td>churchslavic</td>
<td>churchslavic-glagolitic</td>
</tr>
</tbody>
</table>

12The name in the CLDR is Old Church Slavonic Cyrillic, but it has been shortened for practical reasons.
<table>
<thead>
<tr>
<th>Language</th>
<th>Language</th>
</tr>
</thead>
<tbody>
<tr>
<td>polish</td>
<td>sinhala</td>
</tr>
<tr>
<td>polytonicgreek</td>
<td>slovak</td>
</tr>
<tr>
<td>portuguese-br</td>
<td>slovene</td>
</tr>
<tr>
<td>portuguese-brazil</td>
<td>slovenian</td>
</tr>
<tr>
<td>portuguese-portugal</td>
<td>soga</td>
</tr>
<tr>
<td>portuguese-pt</td>
<td>somali</td>
</tr>
<tr>
<td>portuguese</td>
<td>spanish-mexico</td>
</tr>
<tr>
<td>punjabi-arab</td>
<td>spanish-mx</td>
</tr>
<tr>
<td>punjabi-arabic</td>
<td>spanish</td>
</tr>
<tr>
<td>punjabi-gurmukhi</td>
<td>标准摩洛哥塔米纳芝尔特语</td>
</tr>
<tr>
<td>punjabi-guru</td>
<td>swahili</td>
</tr>
<tr>
<td>punjabi</td>
<td>swedish</td>
</tr>
<tr>
<td>quechua</td>
<td>swissgerman</td>
</tr>
<tr>
<td>romanian</td>
<td>tachelhit-latin</td>
</tr>
<tr>
<td>romansh</td>
<td>tachelhit-latin</td>
</tr>
<tr>
<td>rombo</td>
<td>tachelhit-tfng</td>
</tr>
<tr>
<td>rundi</td>
<td>tachelhit-tifinagh</td>
</tr>
<tr>
<td>russian</td>
<td>tachelhit</td>
</tr>
<tr>
<td>rwa</td>
<td>taita</td>
</tr>
<tr>
<td>sakha</td>
<td>tamil</td>
</tr>
<tr>
<td>samburu</td>
<td>tasawaq</td>
</tr>
<tr>
<td>samin</td>
<td>telugu</td>
</tr>
<tr>
<td>sango</td>
<td>teso</td>
</tr>
<tr>
<td>sangu</td>
<td>thai</td>
</tr>
<tr>
<td>sanskrit-beng</td>
<td>tibetan</td>
</tr>
<tr>
<td>sanskrit-bengali</td>
<td>tigrinya</td>
</tr>
<tr>
<td>sanskrit-deva</td>
<td>tongan</td>
</tr>
<tr>
<td>sanskrit-devanagari</td>
<td>turkish</td>
</tr>
<tr>
<td>sanskrit-gujarati</td>
<td>turkmen</td>
</tr>
<tr>
<td>sanskrit-gujr</td>
<td>ukenglish</td>
</tr>
<tr>
<td>sanskrit-kannada</td>
<td>ukrainian</td>
</tr>
<tr>
<td>sanskrit-knda</td>
<td>uppersorbian</td>
</tr>
<tr>
<td>sanskrit-malayalam</td>
<td>urdu</td>
</tr>
<tr>
<td>sanskrit-mlym</td>
<td>usenglish</td>
</tr>
<tr>
<td>sanskrit-telu</td>
<td>usorbian</td>
</tr>
<tr>
<td>sanskrit-telugu</td>
<td>uyghur</td>
</tr>
<tr>
<td>sanskrit</td>
<td>uzbek-arab</td>
</tr>
<tr>
<td>scottishgaelic</td>
<td>uzbek-arabic</td>
</tr>
<tr>
<td>sena</td>
<td>uzbek-cyrillic</td>
</tr>
<tr>
<td>serbian-cyrillic-bosniaherzegovina</td>
<td>uzbek-cyril</td>
</tr>
<tr>
<td>serbian-cyrillic-kosovo</td>
<td>uzbek-latin</td>
</tr>
<tr>
<td>serbian-cyrillic-montenegro</td>
<td>uzbek-latn</td>
</tr>
<tr>
<td>serbian-cyrillic</td>
<td>uzbek</td>
</tr>
<tr>
<td>serbian-cyril-ba</td>
<td>vai-latin</td>
</tr>
<tr>
<td>serbian-cyril-me</td>
<td>vai-latin</td>
</tr>
<tr>
<td>serbian-cyril-xk</td>
<td>vai-vai</td>
</tr>
<tr>
<td>serbian-cyril</td>
<td>vai-vaii</td>
</tr>
<tr>
<td>serbian-latin-bosniaherzegovina</td>
<td>vaj</td>
</tr>
<tr>
<td>serbian-latin-kosovo</td>
<td>vietnam</td>
</tr>
<tr>
<td>serbian-latin-montenegro</td>
<td>vietnamesese</td>
</tr>
<tr>
<td>serbian-latin</td>
<td>vunjo</td>
</tr>
<tr>
<td>serbian-latin-ba</td>
<td>walser</td>
</tr>
<tr>
<td>serbian-latin-me</td>
<td>welsh</td>
</tr>
<tr>
<td>serbian-latin-xk</td>
<td>westernfrisian</td>
</tr>
<tr>
<td>serbian-latin</td>
<td>yangben</td>
</tr>
<tr>
<td>serbian</td>
<td>yiddish</td>
</tr>
<tr>
<td>shambala</td>
<td>yoruba</td>
</tr>
<tr>
<td>shona</td>
<td>zarma</td>
</tr>
<tr>
<td>sichuanyi</td>
<td>zulu afrikaans</td>
</tr>
</tbody>
</table>
Modifying and adding values to ini files

There is a way to modify the values of ini files when they get loaded with \babelprovide and import. To set, say, digits.native in the numbers section, use something like numbers/digits.native=abcdefghij. Keys may be added, too. Without import you may modify the identification keys. This can be used to create private variants easily. All you need is to import the same ini file with a different locale name and different parameters.

1.14 Selecting fonts

Babel provides a high level interface on top of fontspec to select fonts. There is no need to load fontspec explicitly – babel does it for you with the first \babelfont.\footnote{See also the package combofont for a complementary approach.}

\babelfont\[\langle language-list\rangle\]{\langle font-family\rangle}[\langle font-options\rangle]{\langle font-name\rangle}

**NOTE**  See the note in the previous section about some issues in specific languages.

The main purpose of \babelfont is to define at once in a multilingual document the fonts required by the different languages, with their corresponding language systems (script and language). So, if you load, say, 4 languages, \babelfont{rm}{FreeSerif} defines 4 fonts (with their variants, of course), which are switched with the language by babel. It is a tool to make things easier and transparent to the user.

Here \texttt{font-family} is \texttt{rm, sf} or \texttt{tt} (or newly defined ones, as explained below), and \texttt{font-name} is the same as in fontspec and the like.

If no language is given, then it is considered the default font for the family, activated when a language is selected.

On the other hand, if there is one or more languages in the optional argument, the font will be assigned to them, overriding the default one. Alternatively, you may set a font for a script – just precede its name (lowercase) with a star (eg, *devanagari*). With this optional argument, the font is not yet defined, but just predeclared. This means you may define as many fonts as you want ‘just in case’, because if the language is never selected, the corresponding \babelfont declaration is just ignored.

Babel takes care of the font language and the font script when languages are selected (as well as the writing direction); see the recognized languages above. In most cases, you will not need \texttt{font-options}, which is the same as in fontspec, but you may add further key/value pairs if necessary.

**EXAMPLE**  Usage in most cases is very simple. Let us assume you are setting up a document in Swedish, with some words in Hebrew, with a font suited for both languages.

\documentclass{article}
\usepackage[swedish, bidi=default]{babel}
\babelfont{import}{hebrew}
\babelfont{rm}{FreeSerif}
\begin{document}

Svenska \foreignlanguage{hebrew}{{{עברית}}} svenska.

\end{document}

If on the other hand you have to resort to different fonts, you can replace the red line above with, say:
\babelfont\{rm\}\{Iwona\}
\babelfont[hebrew]\{rm\}\{FreeSerif\}

\babelfont can be used to implicitly define a new font family. Just write its name instead of \texttt{rm}, \texttt{sf} or \texttt{tt}. This is the preferred way to select fonts in addition to the three basic families.

**EXAMPLE** Here is how to do it:

\babelfont\{kai\}\{FandolKai\}

Now, \texttt{kai}family and \texttt{kaidefault}, as well as \texttt{textkai} are at your disposal.

**NOTE** You may load fontspec explicitly. For example:

\usepackage\{fontspec\}
\newfontscript\{Devanagari\}\{deva\}
\babelfont[hindi]\{rm\}\{Shobhika\}

This makes sure the OpenType script for Devanagari is deva and not dev2, in case it is not detected correctly. You may also pass some options to fontspec: with \texttt{silent}, the warnings about unavailable scripts or languages are not shown (they are only really useful when the document format is being set up).

**NOTE** Directionality is a property affecting margins, indentation, column order, etc., not just text. Therefore, it is under the direct control of the language, which applies both the script and the direction to the text. As a consequence, there is no need to set \texttt{Script} when declaring a font with \babelfont (nor Language). In fact, it is even discouraged.

**NOTE** \texttt{fontspec} is not touched at all, only the preset font families (\texttt{rm}, \texttt{sf}, \texttt{tt}, and the like). If a language is switched when an \texttt{adhoc} font is active, or you select the font with this command, neither the script nor the language is passed. You must add them by hand. This is by design, for several reasons—for example, each font has its own set of features and a generic setting for several of them can be problematic, and also preserving a “lower-level” font selection is useful.

**NOTE** The keys \texttt{Language} and \texttt{Script} just pass these values to the \texttt{font}, and do not set the script for the \texttt{language} (and therefore the writing direction). In other words, the ini file or \babelfont provide provides default values for \babelfont if omitted, but the opposite is not true. See the note above for the reasons of this behavior.

**WARNING** Using \texttt{set	extbackslash xxxxfont} and \babelfont at the same time is discouraged, but very often works as expected. However, be aware with \texttt{set	extbackslash xxxxfont} the language system will not be set by babel and should be set with \texttt{fontspec} if necessary.

**TROUBLESHOOTING** Package fontspec Warning: 'Language 'LANG' not available for font 'FONT' with script 'SCRIPT' 'Default' language used instead'.

*This is not an error.* This warning is shown by fontspec, not by babel. It can be irrelevant for English, but not for many other languages, including Urdu and Turkish. This is a useful and harmless warning, and if everything is fine with your document the best thing you can do is just to ignore it altogether.

**TROUBLESHOOTING** Package babel Info: The following fonts are not babel standard families.

*This is not an error.* babel assumes that if you are using \babelfont for a family, very likely you want to define the rest of them. If you don’t, you can find some inconsistencies between families. This checking is done at the beginning of the document, at a point where we cannot know which families will be used.

Actually, there is no real need to use \babelfont in a monolingual document, if you set the language system in \texttt{setmainfont} (or not, depending on what you want).

As the message explains, *there is nothing intrinsically wrong* with not defining all the families. In fact, there is nothing intrinsically wrong with not using \babelfont at all. But you must be aware that this may lead to some problems.
\NOTE \\babelfont is a high level interface to fontspec, and therefore in \texttt{xetex} you can apply mappings. For example, there is a set of \texttt{transliterations for Brahmic scripts} by Davis M. Jones. After installing them in your distribution, just set the map as you would do with fontspec.

1.15 Modifying a language

Modifying the behavior of a language (say, the chapter “caption”), is sometimes necessary, but not always trivial. In the case of caption names a specific macro is provided, because this is perhaps the most frequent change:

\setlocalecaption \{⟨language-name⟩\} \{⟨caption-name⟩\} \{⟨string⟩\}

New 3.51 Here \texttt{caption-name} is the name as string without the trailing \texttt{name}. An example, which also shows caption names are often a stylistic choice, is:

\setlocalecaption{english}{contents}{Table of Contents}

This works not only with existing caption names, because it also serves to define new ones by setting the \texttt{caption-name} to the name of your choice (name will be postpended). Captions so defined or redefined behave with the ‘new way’ described in the following note.

\NOTE There are a few alternative methods:

- With data import’ed from ini files, you can modify the values of specific keys, like:

\\babelprovide\[import, captions/listtable = Lista de tablas\]{spanish}

(In this particular case, instead of the captions group you may need to modify the captions.licr one.)

- The ‘old way’, still valid for many languages, to redefine a caption is the following:

\addto\captionsenglish{%
\renewcommand\contentsname{Foo}%
}

As of 3.15, there is no need to hide spaces with % (\babel removes them), but it is advisable to do so. This redefinition is not activated until the language is selected.

- The ‘new way’, which is found in bulgarian, azerbaijani, spanish, french, turkish, icelandic, vietnamese and a few more, as well as in languages created with \babelprovide and its key import, is:

\renewcommand\spanishchaptername{Foo}

This redefinition is immediate.

\NOTE Do not redefine a caption in the following way:

\begin{verbatim}
\AtBeginDocument{\renewcommand\contentsname{Foo}}
\end{verbatim}

The changes may be discarded with a language selector, and the original value restored.

Macros to be run when a language is selected can be add to \texttt{\extras{lang}}:

\addto\extrasrussian\{mymacro\}

There is a counterpart for code to be run when a language is unselected: \texttt{\noextras{lang}}.

\NOTE These macros \texttt{\captions{lang}}, \texttt{\extras{lang}} may be redefined, but must not be used as such – they just pass information to babel, which executes them in the proper context.
Another way to modify a language loaded as a package or class option is by means of \babelprovide, described below in depth. So, something like:

\usepackage[danish]{babel}
\babelprovide[captions=da, hyphenrules=nohyphenation]{danish}

first loads danish.ldf, and then redefines the captions for danish (as provided by the ini file) and prevents hyphenation. The rest of the language definitions are not touched. Without the optional argument it just loads some aditional tools if provided by the ini file, like extra counters.

1.16 Creating a language

New 3.10 And what if there is no style for your language or none fits your needs? You may then define quickly a language with the help of the following macro in the preamble (which may be used to modify an existing language, too, as explained in the previous subsection).

\babelprovide \{ \langle options \rangle \}\{ \langle language-name \rangle \}

If the language \langle language-name \rangle has not been loaded as class or package option and there are no \langle options \rangle, it creates an “empty” one with some defaults in its internal structure: the hyphen rules, if not available, are set to the current ones, left and right hyphen mins are set to 2 and 3. In either case, caption, date and language system are not defined. If no ini file is imported with import, \langle language-name \rangle is still relevant because in such a case the hyphenation and like breaking rules (including those for South East Asian and CJK) are based on it as provided in the ini file corresponding to that name; the same applies to OpenType language and script. Conveniently, some options allow to fill the language, and babel warns you about what to do if there is a missing string. Very likely you will find alerts like that in the log file:

Package babel Warning: \chaptername not set for 'mylang'. Please, (babel) define it after the language has been loaded
(babel) (typically in the preamble) with:
(babel) \setlocalecaption{mylang}{chapter}{..}
(babel) Reported on input line 26.

In most cases, you will only need to define a few macros. Note languages loaded on the fly are not yet available in the preamble.

**EXAMPLE** If you need a language named arhinish:

\usepackage[danish]{babel}
\babelprovide{arhinish}
\setlocalecaption{arhinish}{chapter}{Chapitula}
\setlocalecaption{arhinish}{refname}{Refirenke}
\renewcommand\arhinishhyphenmins{22}

**EXAMPLE** Locales with names based on BCP 47 codes can be created with something like:

\babelprovide[import=en-US]{enUS}

Note, however, mixing ways to identify locales can lead to problems. For example, is yi the name of the language spoken by the Yi people or is it the code for Yiddish?

The main language is not changed (danish in this example). So, you must add \selectlanguage{arhinish} or other selectors where necessary. If the language has been loaded as an argument in \documentclass or \usepackage, then \babelprovide redefines the requested data.
**import=** *(language-tag)*

New 3.13 Imports data from an ini file, including captions and date (also line breaking rules in newly defined languages). For example:

\begin{verbatim}
\babelprovide[import=hu]{hungarian}
\end{verbatim}

Unicode engines load the UTF-8 variants, while 8-bit engines load the LICR (ie, with macros like \ or \ss) ones.

New 3.23 It may be used without a value. In such a case, the ini file set in the corresponding babel-<language>.tex (where <language> is the last argument in \babelprovide) is imported. See the list of recognized languages above. So, the previous example can be written:

\begin{verbatim}
\babelprovide[import]{hungarian}
\end{verbatim}

There are about 250 ini files, with data taken from the ldf files and the CLDR provided by Unicode. Not all languages in the latter are complete, and therefore neither are the ini files. A few languages may show a warning about the current lack of suitability of some features.

Besides \today, this option defines an additional command for dates: \<language>date, which takes three arguments, namely, year, month and day numbers. In fact, \today calls \<language>today, which in turn calls \<language>date{\the\year}{\the\month}{\the\day}. New 3.44 More convenient is usually \localedate, with prints the date for the current locale.

**captions=** *(language-tag)*

Loads only the strings. For example:

\begin{verbatim}
\babelprovide[captions=hu]{hungarian}
\end{verbatim}

**hyphenrules=** *(language-list)*

With this option, with a space-separated list of hyphenation rules, babel assigns to the language the first valid hyphenation rules in the list. For example:

\begin{verbatim}
\babelprovide[hyphenrules=chavacano spanish italian]{chavacano}
\end{verbatim}

If none of the listed hyphenation rules exist, the default behavior applies. Note in this example we set chavacano as first option – without it, it would select spanish even if chavacano exists.

A special value is +, which allocates a new language (in the \TeX sense). It only makes sense as the last value (or the only one; the subsequent ones are silently ignored). It is mostly useful with luatex, because you can add some patterns with \belpatterns, as for example:

\begin{verbatim}
\babelprovide[hyphenrules=+]{neo}
\belpatterns[neo]{a1 e1 i1 o1 u1}
\end{verbatim}

In other engines it just suppresses hyphenation (because the pattern list is empty).

New 3.58 Another special value is unhyphenated, which activates a line breaking mode that allows spaces to be stretched to arbitrary amounts.
**main** This valueless option makes the language the main one (thus overriding that set when babel is loaded). Only in newly defined languages.

**EXAMPLE** Let’s assume your document (xetex or luatex) is mainly in Polytonic Greek with but with some sections in Italian. Then, the first attempt should be:

\usepackage[italian, greek,polutonic]{babel}

But if, say, accents in Greek are not shown correctly, you can try

\usepackage[italian, polytonicgreek, provide=\*]{babel}

Remember there is an alternative syntax for the latter:

\usepackage[italian]{babel}
\babelprovide[import, main]{polytonicgreek}

Finally, also remember you might not need to load italian at all if there are only a few word in this language (see 1.3).

**script=** *(script-name)*

New 3.15 Sets the script name to be used by fontspec (eg, Devanagari). Overrides the value in the ini file. If fontspec does not define it, then babel sets its tag to that provided by the ini file. This value is particularly important because it sets the writing direction, so you must use it if for some reason the default value is wrong.

**language=** *(language-name)*

New 3.15 Sets the language name to be used by fontspec (eg, Hindi). Overrides the value in the ini file. If fontspec does not define it, then babel sets its tag to that provided by the ini file. Not so important, but sometimes still relevant.

**alph=** *(counter-name)*

Assigns to \alph that counter. See the next section.

**Alph=** *(counter-name)*

Same for \Alph.

A few options (only luatex) set some properties of the writing system used by the language. These properties are always applied to the script, no matter which language is active. Although somewhat inconsistent, this makes setting a language up easier in most typical cases.

**onchar=** ids | fonts

New 3.38 This option is much like an ‘event’ called when a character belonging to the script of this locale is found (as its name implies, it acts on characters, not on spaces). There are currently two ‘actions’, which can be used at the same time (separated by a space): with ids the \language and the \localeid are set to the values of this locale; with fonts, the fonts are changed to those of this locale (as set with \bafont). This option is not compatible with mapfont. Characters can be added or modified with \babelcharproperty.

**NOTE** An alternative approach with luatex and Harfbuzz is the font option

RawFeature={multiscript=auto}. It does not switch the babel language and therefore the line breaking rules, but in many cases it can be enough.
\texttt{intraspace= (base) (shrink) (stretch)}

Sets the interword space for the writing system of the language, in em units (so, 0 .1 0 is 0em plus .1em). Like \texttt{\spaceskip}, the em unit applied is that of the current text (more precisely, the previous glyph). Currently used only in Southeast Asian scripts, like Thai, and CJK.

\texttt{intrapenalty= (penalty)}

Sets the interword penalty for the writing system of this language. Currently used only in Southeast Asian scripts, like Thai. Ignored if 0 (which is the default value).

\texttt{transforms= (transform-list)}

See section \texttt{1.21}.

\texttt{justification= kashida | elongated | unhyphenated} \texttt{New 3.59} There are currently three options, mainly for the Arabic script. It sets the linebreaking and justification method, which can be based on the the ARABIC TATWEEL character or in the 'justification alternatives' OpenType table (jalt). For an explanation see the babel site.

\texttt{linebreaking= \texttt{New 3.59} Just a synonymous for justification.}

\texttt{mapfont= direction} \texttt{New 3.59} Assigns the font for the writing direction of this language (only with \texttt{bidi=basic}). Whenever possible, instead of this option use onchar, based on the script, which usually makes more sense. More precisely, what \texttt{mapfont=direction} means is, 'when a character has the same direction as the script for the “provided” language, then change its font to that set for this language'. There are 3 directions, following the bidi Unicode algorithm, namely, Arabic-like, Hebrew-like and left to right. So, there should be at most 3 directives of this kind.

\texttt{NOTE} (1) If you need shorthands, you can define them with \texttt{\useshorthands} and \texttt{\defineshorthand} as described above. (2) Captions and \texttt{\today} are “ensured” with \texttt{\babelensure} (this is the default in ini-based languages).

\texttt{1.17 Digits and counters} \texttt{New 3.20} About thirty ini files define a field named \texttt{digits\_native}. When it is present, two macros are created: \texttt{\langlelanguage\rangle digits} and \texttt{\langlelanguage\rangle counter} (only xetex and luatex). With the first, a string of ‘Latin’ digits are converted to the native digits of that language; the second takes a counter name as argument. With the option \texttt{maparabic} in \texttt{\babelprovide}, \texttt{\arabic} is redefined to produce the native digits (this is done globally, to avoid inconsistencies in, for example, page numbering, and note as well dates do not rely on \texttt{\arabic}).

For example:

\begin{verbatim}
\babelprovide[import]{telugu}
% Or also, if you want:
% \babelprovide[import, maparabic]{telugu}
\babelfont{rm}{Gautami} \% With luatex, better with Harfbuzz
\begin{document}
\telugudigits{1234}
\telugucounter{section}
\end{document}
\end{verbatim}

Languages providing native digits in all or some variants are:
New 3.30 With luatex there is an alternative approach for mapping digits, namely, mapdigits. Conversion is based on the language and it is applied to the typeset text (not math, PDF bookmarks, etc.) before bidi and fonts are processed (i.e., to the node list as generated by the \TeX code). This means the local digits have the correct bidirectional behavior (unlike Numbers=Arabic in fontspec, which is not recommended).

NOTE With xetex you can use the option Mapping when defining a font.

\localenumeral{⟨style}⟨number⟩
\localecounter{⟨style}⟨counter⟩

New 3.41 Many ‘ini’ locale files has been extended with information about non-positional numerical systems, based on those predefined in CSS. They only work with xetex and luatex and are fully expendable (even inside an unprotected \edef). Currently, they are limited to numbers below 10000.
There are several ways to use them (for the available styles in each language, see the list below):

- \localenumeral{⟨style}⟨number⟩, like \localenumeral{abjad}15
- \localecounter{⟨style}⟨counter⟩, like \localecounter{lower}section
- In \babelprovide, as an argument to the keys alph and Alph, which redefine what \alph and \Alph print. For example:

\babelprovide[alph=alphabetic]{thai}

The styles are:

**Ancient Greek** lower.ancient, upper.ancient
**Amharic** afar, agaw, ari, blin, dizi, geodeo, gumuz, hadiyya, harari, kaffa, kebena, kembata, konso, kunama, meen, oromo, saho, sidama, silti, tigre, wolaita, yemsa
**Arabic** abjad, maghrebi.abjad
**Armenian** lower.letter, upper.letter
**Belarusian, Bulgarian, Church Slavic, Macedonian, Serbian** lower, upper
**Bangla** alphabetic
**Central Kurdish** alphabetic
**Chinese** cjk-earthly-branch, cjk-heavenly-stem, circled.ideograph, parenthesized.ideograph, fullwidth.lower.alpha, fullwidth.upper.alpha
**Church Slavic (Glagolitic)** letters
**Coptic** epact, lower.letters
**French** date.day (mainly for internal use).
**Georgian** letters
**Greek** lower.modern, upper.modern, lower.ancient, upper.ancient (all with keraia)
**Hebrew** letters (neither gersh nor gershayim yet)
**Hindi** alphabetic
**Italian** lower.legal, upper.legal
**Japanese** hiragana, hiragana.iroha, katakana, katakana.iroha, circled.katakana, informal, formal, cjk-earthly-branch, cjk-heavenly-stem, circled.ideograph, parenthesized.ideograph, fullwidth.lower.alpha, fullwidth.upper.alpha
Khmer  consonant
Korean  consonant, syllable, hanja.informal, hanja.formal, hangul.formal,
        cjk-earthly-branch, cjk-heavenly-stem, circled.ideograph,
        parenthesized.ideograph, fullwidth.lower.alpha, fullwidth.upper.alpha
Marathi  alphabetic
Persian  abjad, alphabetic
Russian  lower, lower.full, upper, upper.full
Syriac  letters
Tamil  ancient
Thai  alphabetic
Ukrainian  lower, lower.full, upper, upper.full

New 3.45 In addition, native digits (in languages defining them) may be printed with the
        numeral style digits.

1.18 Dates

New 3.45 When the data is taken from an ini file, you may print the date corresponding
to the Gregorian calendar and other lunisolar systems with the following command.

\localdate  \{ calendar=.., variant=.., convert \} \{ year \} \{ month \} \{ day \}

By default the calendar is the Gregorian, but an ini file may define strings for other
calendars (currently ar, ar.*, he, fa, hi). In the latter case, the three arguments are the
year, the month, and the day in those in the corresponding calendar. They are not the
Gregorian data to be converted (which means, say, 13 is a valid month number with
calendar=hebrew and calendar=coptic). However, with the option convert it's
converted (using internally the following command).

Even with a certain calendar there may be variants. In Kurmanji the default variant prints
something like 30 Çileya Pêşîn 2019, but with variant=izafa it prints 31'ê Çileya Pêşînê
2019.

\babelcalendar  \{ date \} \{ calendar \} \{ year-macro \} \{ month-macro \} \{ day-macro \}

New 3.76 Although calendars aren’t the primary concern of babel, the package should be
able to, at least, generate correctly the current date in the way users would expect in their
own culture. Currently, \localdate can print dates in a few calendars (provided the ini
locale file has been imported), but year, month and day had to be entered by hand, which
is very inconvenient. With this macro, the current date is converted and stored in the
three last arguments, which must be macros: allowed calendars are buddhist, coptic,
hebrew, islamic-civil, islamic-umalqura, persian. The optional argument converts the
given date, in the form ‘(year)-(month)-(day)’. Please, refer to the page on the news for
3.76 in the babel site for further details.

1.19 Accessing language info

\languagename  The control sequence \languagename contains the name of the current language.

WARNING  Due to some internal inconsistencies in catcodes, it should not be used to test its value.
Use \iflang, by Heiko Oberdiek.

\iflanguage  \{ language \} \{ true \} \{ false \}

If more than one language is used, it might be necessary to know which language is active
at a specific time. This can be checked by a call to \iflanguage, but note here “language” is
used in the \TeX sense, as a set of hyphenation patterns, and not as its babel name. This
macro takes three arguments. The first argument is the name of a language; the second and
third arguments are the actions to take if the result of the test is true or false respectively.
\localeinfo *(\{field\})*

**New 3.38** If an ini file has been loaded for the current language, you may access the information stored in it. This macro is fully expandable, and the available fields are:

- **name.english** as provided by the Unicode CLDR.
- **tag.ini** is the tag of the ini file (the way this file is identified in its name).
- **tag.bcp47** is the full BCP 47 tag (see the warning below). This is the value to be used for the ‘real’ provided tag (babel may fill other fields if they are considered necessary).
- **language.tag.bcp47** is the BCP 47 language tag.
- **tag.opentype** is the tag used by OpenType (usually, but not always, the same as BCP 47).
- **script.name**, as provided by the Unicode CLDR.
- **script.tag.bcp47** is the BCP 47 tag of the script used by this locale. This is a required field for the fonts to be correctly set up, and therefore it should be always defined.
- **script.tag.opentype** is the tag used by OpenType (usually, but not always, the same as BCP 47).
- **region.tag.bcp47** is the BCP 47 tag of the region or territory. Defined only if the locale loaded actually contains it (eg, es-MX does, but es doesn’t), which is how locales behave in the CLDR. **New 3.75**
- **variant.tag.bcp47** is the BCP 47 tag of the variant (in the BCP 47 sense, like 1901 for German). **New 3.75**
- **extension.(s).tag.bcp47** is the BCP 47 value of the extension whose singleton is (s) (currently the recognized singletons are x, t and u). The internal syntax can be somewhat complex, and this feature is still somewhat tentative. An example is classiclatin which sets extension.x.tag.bcp47 to classic. **New 3.75**

**WARNING** **New 3.46** As of version 3.46 tag.bcp47 returns the full BCP 47 tag. Formerly it returned just the language subtag, which was clearly counterintuitive. **New 3.75** Sometimes, it comes in handy to be able to use \localeinfo in an expandable way even if something went wrong (for example, the locale currently active is undefined). For these cases, \localeinfo* just returns an empty string instead of raising an error. Bear in mind that babel, following the CLDR, may leave the region unset, which means \getlocaleproperty*, described below, is the preferred command, so that the existence of a field can be checked before. This also means building a string with the language and the region with \localeinfo*{language.tag.bcp47}-\localeinfo*{region.tag.bcp47} is not usually a good idea (because of the hyphen).

\getlocaleproperty *(\{macro\})*(\{locale\})*(\{property\})*

**New 3.42** The value of any locale property as set by the ini files (or added/modified with \babelprovide) can be retrieved and stored in a macro with this command. For example, after:

\getlocaleproperty*{hechap}{hebrew}{captions/chapter}

the macro \hechap will contain the string קרפ.
If the key does not exist, the macro is set to \relax and an error is raised. **New 3.47** With the starred version no error is raised, so that you can take your own actions with undefined properties.

\localeid

Each language in the babel sense has its own unique numeric identifier, which can be retrieved with \localeid.

The \localeid is not the same as the \language identifier, which refers to a set of hyphenation patterns (which, in turn, is just a component of the line breaking algorithm described in the next section). The data about preloaded patterns are store in an internal macro named \bbl@languages (see the code for further details), but note several locales may share a single \language, so they are separated concepts. In \tex, the \localeid is saved in each node (when it makes sense) as an attribute, too.
\LocaleForEach \{\code\}

Babel remembers which ini files have been loaded. There is a loop named \LocaleForEach to traverse the list, where \#1 is the name of the current item, so that \LocaleForEach\{\message{ **\#1** }\} just shows the loaded ini's.

\ensureinfo=off

New 3.75 Previously, ini files were loaded only with \babelprovide and also when languages are selected if there is a \babelfont or they have not been explicitly declared. Now the ini files are loaded (and therefore the corresponding data) even if these two conditions are not met (in previous versions you had to enable it with \BabelEnsureInfo in the preamble). Because of the way this feature works, problems are very unlikely, but there is switch as a package option to turn the new behavior off (\ensureinfo=off).

1.20 Hyphenation and line breaking

Babel deals with three kinds of line breaking rules: Western, typically the LGC group, South East Asian, like Thai, and CJK, but support depends on the engine: pdftex only deals with the former; xetex also with the second one (although in a limited way), while luatex provides basic rules for the latter, too. With luatex there are also tools for non-standard hyphenation rules, explained in the next section.

\babelhyphen \{\code\}
\babelhyphen* \{\code\}

New 3.9a It is customary to classify hyphens in two types: (1) explicit or hard hyphens, which in \TeX{} are entered as -, and (2) optional or soft hyphens, which are entered as \textbackslash{}-. Strictly, a soft hyphen is not a hyphen, but just a breaking opportunity or, in \TeX{} terms, a “discretionary”; a hard hyphen is a hyphen with a breaking opportunity after it. A further type is a non-breaking hyphen, a hyphen without a breaking opportunity. In \TeX{}, - and \textbackslash{}- forbid further breaking opportunities in the word. This is the desired behavior very often, but not always, and therefore many languages provide shorthands for these cases. Unfortunately, this has not been done consistently: for example, "- in Dutch, Portuguese, Catalan or Danish is a hard hyphen, while in German, Spanish, Norwegian, Slovak or Russian is a soft hyphen. Furthermore, some of them even redefine \textbackslash{}-, so that you cannot insert a soft hyphen without breaking opportunities in the rest of the word. Therefore, some macros are provided with a set of basic “hyphens” which can be used by themselves, to define a user shorthand, or even in language files.

- \babelhyphen\{soft\} and \babelhyphen\{hard\} are self explanatory.
- \babelhyphen\{repeat\} inserts a hard hyphen which is repeated at the beginning of the next line, as done in languages like Polish, Portuguese and Spanish.
- \babelhyphen\{nobreak\} inserts a hard hyphen without a break after it (even if a space follows).
- \babelhyphen\{empty\} inserts a break opportunity without a hyphen at all.
- \babelhyphen\{\text\} is a hard “hyphen” using \{\text\} instead. A typical case is \babelhyphen{/}.

With all of them, hyphenation in the rest of the word is enabled. If you don't want to enable it, there is a starred counterpart: \babelhyphen*\{soft\} (which in most cases is equivalent to the original \textbackslash{}-), \babelhyphen*\{hard\}, etc. Note hard is also good for isolated prefixes (eg, \textit{anti}) and nobreak for isolated suffixes (eg, \textit{-ism}), but in both cases \babelhyphen*\{nobreak\} is usually better. There are also some differences with \LaTeX{}: (1) the character used is that set for the current font, while in \LaTeX{} it is hardwired to - (a typical value); (2) the hyphen to be used in fonts with a negative \hyphenchar is -, like in \LaTeX{}, but it can be changed to another value by redefining \texttt{\babelnullhyphen}; (3) a break after the hyphen is forbidden if preceded by a glue >0 pt (at the beginning of a word, provided it is not immediately preceded by, say, a parenthesis).
\babelhyphenation \{ \langle language \rangle, \langle language \rangle, ... \}\{\langle exceptions \rangle\}

**New 3.9a**  Sets hyphenation exceptions for the languages given or, without the optional argument, for all languages (eg, proper nouns or common loan words, and of course monolingual documents). Multiple declarations work much like \hyphenation (last wins), but language exceptions take precedence over global ones.

It can be used only in the preamble, and exceptions are set when the language is first selected, thus taking into account changes of \lcodes's done in \extras{\langle lang \rangle} as well as the language-specific encoding (not set in the preamble by default). Multiple \babelhyphenation's are allowed. For example:

\babelhyphenation{Wal-hal-la Dar-bhan-ga}

Listed words are saved expanded and therefore it relies on the LICR. Of course, it also works without the LICR if the input and the font encodings are the same, like in Unicode based engines.

**NOTE** Using \babelhyphenation with Southeast Asian scripts is mostly pointless. But with \babelpatterns (below) you may fine-tune line breaking (only luatex). Even if there are no patterns for the language, you can add at least some typical cases.

**NOTE** Use \babelhyphenation instead of \hyphenation to set hyphenation exceptions in the preamble before any language is explicitly set with a selector. In the preamble the hyphenation rules are not always fully set up and an error can be raised.

\begin{hyphenrules} \{ \langle language \rangle \} ... \end{hyphenrules}

The environment \hyphenrules can be used to select only the hyphenation rules to be used (it can be used as command, too). This can for instance be used to select 'nohyphenation', provided that in \language.dat, the 'language' nohyphenation is defined by loading zeroiph\ .\ tex. It deactivates language shorthands, too (but not user shorthands). Except for these simple uses, \hyphenrules is deprecated and other \language* (the starred version) is preferred, because the former does not take into account possible changes in encodings of characters like, say, ' done by some languages (eg, italian, french, ukraineb).

\babelpatterns \{ \langle language \rangle, \langle language \rangle, ... \}\{\langle patterns \rangle\}

**New 3.9m**  \textit{In \texttt{luatex} only.\textsuperscript{14}} adds or replaces patterns for the languages given or, without the optional argument, for all languages. If a pattern for a certain combination already exists, it gets replaced by the new one.

It can be used only in the preamble, and patterns are added when the language is first selected, thus taking into account changes of \lcodes's done in \extras{\langle lang \rangle} as well as the language-specific encoding (not set in the preamble by default). Multiple \babelpatterns's are allowed.

Listed patterns are saved expanded and therefore it relies on the LICR. Of course, it also works without the LICR if the input and the font encodings are the same, like in Unicode based engines.

**New 3.31**  (Only \texttt{luatex}. With \babelprovide and imported CJK languages, a simple generic line breaking algorithm (push-out-first) is applied, based on a selection of the Unicode rules (\textit{New 3.32} it is disabled in verbatim mode, or more precisely when the \hyphenrules are set to nohyphenation). It can be activated alternatively by setting explicitly the \texttt{intraspace}.

**New 3.27**  Interword spacing for Thai, Lao and Khmer is activated automatically if a language with one of those scripts are loaded with \babelprovide. See the sample on the babel repository. With both Unicode engines, spacing is based on the "current" em unit (the size of the previous char in \texttt{luatex}, and the font size set by the last \\selectfont in xetex).

\textsuperscript{14}With \texttt{luatex} exceptions and patterns can be modified almost freely. However, this is very likely a task for a separate package and \texttt{babel} only provides the most basic tools.
1.21 Transforms

Transforms (only lualatex) provide a way to process the text on the typesetting level in several language-dependent ways, like non-standard hyphenation, special line breaking rules, script to script conversion, spacing conventions and so on.\footnote{They are similar in concept, but not the same, as those in Unicode. The main inspiration for this feature is the Omega transformation processes.}

It currently embraces \texttt{babelprehyphenation} and \texttt{babelposthyphenation}.

**New 3.57** Several ini files predefine some transforms. They are activated with the key \texttt{transforms} in \texttt{babelprovide}, either if the locale is being defined with this macro or the languages has been previously loaded as a class or package option, as the following example illustrates:

```latex
\usepackage{babel}
\babelprovide[transforms = digraphs.hyphen]{magyar}
```

**New 3.67** Transforms predefined in the ini locale files can be made attribute-dependent, too. When an attribute between parenthesis is inserted subsequent transforms will be assigned to it (up to the list end or another attribute). For example, and provided an attribute called \texttt{withsigmafinal} has been declared:

```
transforms = transliteration.omega (\withsigmafinal) sigma.final
```

This applies \texttt{transliteration.omega} always, but \texttt{sigma.final} only when \texttt{withsigmafinal} is set.

Here are the transforms currently predefined. (A few may still require some fine-tuning. More to follow in future releases.)

<table>
<thead>
<tr>
<th>Language</th>
<th>Transform</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Arabic</td>
<td>transliteration.dad</td>
<td>Applies the transliteration system devised by Yannis Haralambous for dad (simple and \TeX-friendly). Not yet complete, but sufficient for most texts.</td>
</tr>
<tr>
<td>Croatian</td>
<td>digraphs.ligatures</td>
<td>Ligatures DŽ, Dž, dž, LJ, Lj, lj, Nj, Nj, nj. It assumes they exist. This is not the recommended way to make these transformations (the best way is with OTF features), but it can get you out of a hurry.</td>
</tr>
<tr>
<td>Czech, Polish, Portuguese, Slovak, Spanish</td>
<td>hyphen.repeat</td>
<td>Explicit hyphens behave like \texttt{\textbackslash babel\textbackslash hyphen {repeat}}.</td>
</tr>
<tr>
<td>Czech, Polish, Slovak</td>
<td>oneletter.nobreak</td>
<td>Converts a space after a non-syllabic preposition or conjunction into a non-breaking space.</td>
</tr>
<tr>
<td>Finnish</td>
<td>prehyphen.nobreak</td>
<td>Line breaks just after hyphens prepended to words are prevented, like in “pakastekaapit ja -arkut”.</td>
</tr>
<tr>
<td>Greek</td>
<td>diaeresis.hyphen</td>
<td>Removes the diaeresis above iota and upsilon if hyphenated just before. It works with the three variants.</td>
</tr>
<tr>
<td>Greek</td>
<td>transliteration.omega</td>
<td>Although the provided combinations are not the full set, this transform follows the syntax of Omega: = for the circumflex, v for digamma, and so on. For better compatibility with Levy’s system, ~ (as ‘string’) is an alternative to =. ’ is tonos in Monotonic Greek, but oxia in Polytonic and Ancient Greek.</td>
</tr>
</tbody>
</table>
Greek sigma.final The transliteration system above does not convert the sigma at the end of a word (on purpose). This transforms does it. To prevent the conversion (an abbreviation, for example), write "s.

Hindi, Sanskrit transliteration.hk The Harvard-Kyoto system to romanize Devanagari.

Hindi, Sanskrit punctuation.space Inserts a space before the following four characters: !?:;.

Hungarian digraphs.hyphen Hyphenates the long digraphs ccs, ddz, ggy, lly, nny, ssz, tty and zzs as cs-cs, dz-dz, etc.

Indic scripts danda.nobreak Prevents a line break before a danda or double danda if there is a space. For Assamese, Bengali, Gujarati, Hindi, Kannada, Malayalam, Marathi, Oriya, Tamil, Telugu.

Latin digraphs.ligatures Replaces the groups ae, AE, oe, OE with ae, AE, oe, OE.

Latin letters.noj Replaces j, J with i, I.

Latin letters.uv Replaces v, U with u, V.

Sanskrit transliteration.iast The IAST system to romanize Devanagari.\[16\]

Serbian transliteration.gajica (Note serbian with ini files refers to the Cyrillic script, which is here the target.) The standard system devised by Ljudevit Gaj.

Arabic, Persian kashida.plain Experimental. A very simple and basic transform for 'plain' Arabic fonts, which attempts to distribute the tatwil as evenly as possible (starting at the end of the line). See the news for version 3.59.

\babelposthyphenation \[options\]\{\langle hyphenrules-name\rangle\}\{\langle lua-pattern\rangle\}\{\langle replacement\rangle\}\babelposthyphenation{german}{\langle fmtrp\rangle} | \{1\}\{ \{ no = \{1\}, pre = \{1\}\{1\} \- \}, % Replace first char with disc remove, % Remove automatic disc (2nd node) \{ \} % Keep last char, untouched \}\}

In the replacements, a captured char may be mapped to another, too. For example, if the first capture reads \{1|1\}, the replacement could be \{1|1\}, which maps \c{n} to \c{n}, and \c{v} to \c{v}, so that the diaeresis is removed.

This feature is activated with the first \b babelposthyphenation or \b babelprehyphenation.\[New 3.67\] With the optional argument you can associate a user defined transform to an attribute, so that it's active only when it's set (currently its attribute value is ignored). With this mechanism transforms can be set or unset even in the middle of paragraphs, and applied to single words. To define, set and unset the attribute, the \LaTeX kernel provides the macros \verb|\newattribute|, \verb|\setattribute| and \verb|\unsetattribute|. The following example shows how to use it, provided an attribute named \verb|latinnoj| has been declared:
\babelprehyphenation\{attribute=\latinnoj\}\{latin\}\{ J \}\{ string = I \}

See the babel site for a more detailed description and some examples. It also describes a few additional replacement types (string, penalty).
Although the main purpose of this command is non-standard hyphenation, it may actually be used for other transformations (after hyphenation is applied, so you must take discretionaries into account).
You are limited to substitutions as done by lua, although a future implementation may alternatively accept lpeg.

\babelprehyphenation \{\langle options\rangle\}\{\langle locale-name\rangle\}\{\langle lua-pattern\rangle\}\{\langle replacement\rangle\}

New 3.44-3-52 It is similar to the latter, but (as its name implies) applied before hyphenation, which is particularly useful in transliterations. There are other differences:
(1) the first argument is the locale instead of the name of the hyphenation patterns; (2) in the search patterns = has no special meaning, while | stands for an ordinary space; (3) in the replacement, discretionaries are not accepted.
See the description above for the optional argument.
This feature is activated with the first \babelposthyphenation or \babelprehyphenation.

EXAMPLE You can replace a character (or series of them) by another character (or series of them).
Thus, to enter ź as zh and š as sh in a newly created locale for transliterated Russian:

\babelprovide\{hyphenrules=+\}\{russian-latin\} % Create locale
\babelprehyphenation\{russian-latin\}\{\[(sz)\]h\} % Create rule
\{ string = \{1|sz|šž\}, remove \}

EXAMPLE The following rule prevent the word “a” from being at the end of a line:

\babelprehyphenation\{english\}\{|a|\}
\{, \}, % Keep first space and a
\{ insert, penalty = 10000 \}, % Insert penalty
\{ % Keep last space
\}

NOTE With luatex there is another approach to make text transformations, with the function fonts\_handlers\_otf\_addfeature, which adds new features to an OTF font (substitution and positioning). These features can be made language-dependent, and babel by default recognizes this setting if the font has been declared with \babelfont. The \texttt{transforms} mechanism supplements rather than replaces OTF features.

With xetex, where \texttt{transforms} are not available, there is still another approach, with font mappings, mainly meant to perform encoding conversions and transliterations. Mappings, however, are linked to fonts, not to languages.

1.22 Selection based on BCP 47 tags

New 3.43 The recommended way to select languages is that described at the beginning of this document. However, BCP 47 tags are becoming customary, particularly in documents (or parts of documents) generated by external sources, and therefore babel will provide a set of tools to select the locales in different situations, adapted to the particular needs of each case. Currently, babel provides autoloading of locales as described in this section. In these contexts autoloading is particularly important because we may not know on beforehand which languages will be requested.
It must be activated explicitly, because it is primarily meant for special tasks. Mapping from BCP 47 codes to locale names are not hardcoded in babel. Instead the data is taken
from the ini files, which means currently about 250 tags are already recognized. Babel performs a simple lookup in the following way: fr-Latn-FR → fr-Latn → fr-FR → fr. Languages with the same resolved name are considered the same. Case is normalized before, so that fr-latn-fr → fr-Latn-FR. If a tag and a name overlap, the tag takes precedence.

Here is a minimal example:

\documentclass{article}
\usepackage[danish]{babel}
\babeladjust{
    autoload.bcp47 = on,
    autoload.bcp47.options = import
}
\begin{document}

Chapter in Danish: \chaptername.

\selectlanguage{de-AT}
\localedate{2020}{1}{30}
\end{document}

Currently the locales loaded are based on the ini files and decoupled from the main ldf files. This is by design, to ensure code generated externally produces the same result regardless of the languages requested in the document, but an option to use the ldf instead will be added in a future release, because both options make sense depending on the particular needs of each document (there will be some restrictions, however). The behaviour is adjusted with \babeladjust with the following parameters:

autoload.bcp47 with values on and off.

autoload.bcp47.options, which are passed to \babelprovide; empty by default, but you may add import (features defined in the corresponding babel-...tex file might not be available).

autoload.bcp47.prefix. Although the public name used in selectors is the tag, the internal name will be different and generated by prepending a prefix, which by default is bcp47-. You may change it with this key.

New 3.46 If an ldf file has been loaded, you can enable the corresponding language tags as selector names with:

\babeladjust{ bcp47.toname = on }

(You can deactivate it with off.) So, if dutch is one of the package (or class) options, you can write \selectlanguage{nl1}. Note the language name does not change (in this example is still dutch), but you can get it with \localeinfo or \getlanguageproperty. It must be turned on explicitly for similar reasons to those explained above.

1.23 Selecting scripts

Currently babel provides no standard interface to select scripts, because they are best selected with either \fontencoding (low-level) or a language name (high-level). Even the
Latin script may require different encodings (i.e., sets of glyphs) depending on the language, and therefore such a switch would be in a sense incomplete.\footnote{The so-called Unicode fonts do not improve the situation either. So, a font suited for Vietnamese is not necessarily suited for, say, the romanization of Indic languages, and the fact it contains glyphs for Modern Greek does not mean it includes them for Classic Greek.}

Some languages sharing the same script define macros to switch it (e.g., \textcyrillic), but be aware they may also set the language to a certain default. Even the babel core defined \textlatin, but is was somewhat buggy because in some cases it messed up encodings and fonts (for example, if the main Latin encoding was LY1), and therefore it has been deprecated.\footnote{But still defined for backwards compatibility.}

\ensureascii \langle \text \rangle \ensureascii

\ensureascii\{\langle \text \rangle\}\ensureascii

New 3.9i This macro makes sure \langle \text \rangle is typeset with a LICR-savvy encoding in the ASCII range. It is used to redefine \LaTeX and \TeX so that they are correctly typeset even with LGR or X2 (the complete list is stored in \BabelNonASCII, which by default is LGR, X2, OT2, OT3, OT6, LHE, LWL, LMA, LMC, LMS, LMU, but you can modify it). So, in some sense it fixes the bug described in the previous paragraph. If non-ASCII encodings are not loaded (or no encoding at all), it is no-op (also \LaTeX and \TeX are not redefined); otherwise, \ensureascii switches to the encoding at the beginning of the document if ASCII-savvy, or else the last ASCII-savvy encoding loaded. For example, if you load LY1, LGR, then it is set to LY1, but if you load LY1, T2A it is set to T2A. The symbol encodings TS1, T3, and T53 are not taken into account, since they are not used for “ordinary” text (they are stored in \BabelNonText, used in some special cases when no Latin encoding is explicitly set).

The foregoing rules (which are applied “at begin document”) cover most of the cases. No assumption is made on characters above 127, which may not follow the LICR conventions – the goal is just to ensure most of the ASCII letters and symbols are the right ones.

1.24 Selecting directions

No macros to select the writing direction are provided, either – writing direction is intrinsic to each script and therefore it is best set by the language (which can be a dummy one). Furthermore, there are in fact two right-to-left modes, depending on the language, which differ in the way ‘weak’ numeric characters are ordered (e.g., Arabic %123 vs Hebrew 123%).

\textbf{WARNING} The current code for text in luatex should be considered essentially stable, but, of course, it is not bug-free and there can be improvements in the future, because setting bidi text has many subtleties (see for example <https://www.w3.org/TR/html-bidi/>). A basic stable version for other engines must wait. This applies to text; there is a basic support for graphical elements, including the picture environment (with pict2e) and pfg/tikz. Also, indexes and the like are under study, as well as math (there are progresses in the latter, including amsmath and mathtools too, but for example gathered may fail).

An effort is being made to avoid incompatibilities in the future (this one of the reason currently bidi must be explicitly requested as a package option, with a certain bidi model, and also the layout options described below).

\textbf{WARNING} If characters to be mirrored are shown without changes with luatex, try with the following line:

\begin{verbatim}
\babeladjust{bidi.mirroring=off}
\end{verbatim}

There are some package options controlling bidi writing.

\begin{verbatim}
bidi= default | basic | basic-r | bidi-l | bidi-r
\end{verbatim}
New 3.14 Selects the bidi algorithm to be used. With default the bidi mechanism is just activated (by default it is not), but every change must be marked up. In xetex and pdftex this is the only option.
In luatex, basic-r provides a simple and fast method for R text, which handles numbers and unmarked L text within an R context many in typical cases.  New 3.19 Finally, basic supports both L and R text, and it is the preferred method (support for basic-r is currently limited). (They are named basic mainly because they only consider the intrinsic direction of scripts and weak directionality.)

New 3.29 In xetex, bidi-r and bidi-l resort to the package bidi (by Vafa Khalighi). Integration is still somewhat tentative, but it mostly works. For RL documents use the former, and for LR ones use the latter.
There are samples on GitHub, under /required/babel/samples. See particularly lua-bidibasic.tex and lua-secenum.tex.

EXAMPLE The following text comes from the Arabic Wikipedia (article about Arabia). Copy-pasting some text from the Wikipedia is a good way to test this feature. Remember basic is available in luatex only.

```latex
\documentclass{article}
\usepackage[bidi=basic]{babel}
\babelprovide[import, main]{arabic}
\babelfont{rm}{FreeSerif}
\begin{document}
ـﺑ(ﻲﻘﻳﺮﻏﻻا)ﻲﻨﻴﻠﻴﻬﻟاﺮﺼﻌﻟاﺔﻠﻴﻃبﺮﻌﻟاةﺮﻳﺰﺟﻪﺒﺷﺖﻓﺮﻋﺪﻗو
Arabia
وأ
Aravia )

\end{document}
```

EXAMPLE With bidi=basic both L and R text can be mixed without explicit markup (the latter will be only necessary in some special cases where the Unicode algorithm fails). It is used much like bidi=basic-r, but with R text inside L text you may want to map the font so that the correct features are in force. This is accomplished with an option in \babelprovide, as illustrated:

```latex
\documentclass{book}
\usepackage[english, bidi=basic]{babel}
\babelprovide[onchar=ids fonts]{arabic}
\babelfont{rm}{Crimson}
\babelfont*[arabic]{rm}{FreeSerif}
\begin{document}
Most Arabic speakers consider the two varieties to be two registers of one language, although the two registers can be referred to in Arabic as \textit{fuṣḥā l-ʻaṣr} (MSA) and \textit{fuṣḥā t-turāth} (CA).
\end{document}
```

In this example, and thanks to onchar=ids fonts, any Arabic letter (because the language is arabic) changes its font to that set for this language (here defined via *arabic, because Crimson does not provide Arabic letters).
Boxes are “black boxes”. Numbers inside an \hbox (for example in a \ref) do not know anything about the surrounding chars. So, \ref{A}-\ref{B} are not rendered in the visual order A-B, but in the wrong one B-A (because the hyphen does not “see” the digits inside the \hbox'es). If you need \ref ranges, the best option is to define a dedicated macro like this (to avoid explicit direction changes in the body; here \textthe must be defined to select the main language):

\newcommand\refrange[2]{\textthe\ref{#1}\textthe\ref{#2}}

In the future a more complete method, reading recursively boxed text, may be added.

layout= sectioning | counters | lists | contents | footnotes | captions | columns | graphics | extras

New 3.16 To be expanded. Selects which layout elements are adapted in bidi documents, including some text elements (except with options loading the bidi package, which provides its own mechanism to control these elements). You may use several options with a dot-separated list (eg. layout=counters.contents.sectioning). This list will be expanded in future releases. Note not all options are required by all engines.

sectioning makes sure the sectioning macros are typeset in the main language, but with the title text in the current language (see below \BabelPatchSection for further details).

counters required in all engines (except \luatex with bidi=basic) to reorder section numbers and the like (eg. \section); required in \text{exetex} and pdftex for counters in general, as well as in \text{luatex} with bidi=default; required in \text{luatex} for numeric footnote marks >9 with bidi=basic -r (but not with bidi=basic); note, however, it can depend on the counter format.

With counters, \arabic is not only considered \text{L} text always (with \babelsublr, see below), but also an “isolated” block which does not interact with the surrounding chars. So, while 1.2 in \text{R} text is rendered in that order with bidi=basic (as a decimal number), in \arabic{c1}..\arabic{c2} the visual order is c2.c1. Of course, you may always adjust the order by changing the language, if necessary.\footnote{Next on the roadmap are counters and numeral systems in general. Expect some minor readjustments.}

lists required in \text{exetex} and pdftex, but only in bidirectional (with both \text{R} and \text{L} paragraphs) documents in \text{latex}.

WARNING As of April 2019 there is a bug with \parshape in \text{latex} (a \TeX primitive) which makes lists to be horizontally misplaced if they are inside a \vbox (like \text{minipage}) and the current direction is different from the main one. A workaround is to restore the main language before the box and then set the local one inside.

contents required in \text{exetex} and pdftex; in \text{latex} toc entries are \text{R} by default if the main language is \text{R}.

columns required in \text{exetex} and pdftex to reverse the column order (currently only the standard two-column mode); in \text{luatex} they are \text{R} by default if the main language is \text{R} (including \text{multicol}).

footnotes not required in monolingual documents, but it may be useful in bidirectional documents (with both \text{R} and \text{L} paragraphs) in all engines; you may use alternatively \BabelFootnote described below (what this option does exactly is also explained there).

captions is similar to sectioning, but for \caption; not required in monolingual documents with \text{latex}, but may be required in \text{exetex} and pdftex in some styles (support for the latter two engines is still experimental) \footnote{New 3.18}.

tabular required in \text{latex} for \text{R} \text{tabular}, so that the first column is the right one (it has been tested only with simple tables, so expect some readjustments in the future); ignored in pdftex or \text{exetex} (which will not support a similar option in the short term). It patches an internal command, so it might be ignored by some packages and classes (or even raise an error). \footnote{New 3.18}.
graphics modifies the picture environment so that the whole figure is L but the text is R. It does not work with the standard picture, and pict2e is required. It attempts to do the same for pgf/tikz. Somewhat experimental. New 3.32.

extras is used for miscellaneous readjustments which do not fit into the previous groups. Currently redefines in luatex \underline{and} \LaTeX{} New 3.19.

EXAMPLE Typically, in an Arabic document you would need:

```
\usepackage[bidi=basic,
    layout=counters.tabular]{babel}
```

\babelsublr \(\langle lr\text{-text} \rangle\)

Digits in pdftex must be marked up explicitly (unlike luatex with bidi=basic or bidi=basic-r and, usually, \xetex). This command is provided to set \(\langle lr\text{-text} \rangle\) in L mode if necessary. It's intended for what Unicode calls weak characters, because words are best set with the corresponding language. For this reason, there is no \text{r} counterpart. Any \babelsublr in explicit L mode is ignored. However, with bidi=basic and implicit L, it first returns to R and then switches to explicit L. To clarify this point, consider, in an R context:

RTL A ltr text \thechapter{} and still ltr RTL B

There are three R blocks and two L blocks, and the order is RTL B and still ltr 1 ltr text RTL A. This is by design to provide the proper behavior in the most usual cases—but if you need to use \texttt{\ref} in an L text inside R, the L text must be marked up explicitly; for example:

RTL A \foreignlanguage{english}{ltr text \thechapter{} and still ltr} RTL B

\BabelPatchSection \(\langle section-name \rangle\)

Mainly for bidi text, but it can be useful in other cases. \BabelPatchSection and the corresponding option layout=sectioning takes a more logical approach (at least in many cases) because it applies the global language to the section format (including the \texttt{\chaptername} in \texttt{\chapter}), while the section text is still the current language. The latter is passed to tocs and marks, too, and with sectioning in layout they both reset the “global” language to the main one, while the text uses the “local” language.

With layout=sectioning all the standard sectioning commands are redefined (it also “isolates” the page number in heads, for a proper bidi behavior), but with this command you can set them individually if necessary (but note then tocs and marks are not touched).

\BabelFootnote \(\langle cmd \rangle\}\{\langle local-language \rangle\}\{\langle before \rangle\}\{\langle after \rangle\}

New 3.17 Something like:

```
\BabelFootnote{\parsfootnote}{\languagename}{{}}{{}}
```

defines \texttt{\parsfootnote} so that \texttt{\parsfootnote{note}} is equivalent to:

```
\footnote{\foreignlanguage{\languagename}{note}}
```

but the footnote itself is typeset in the main language (to unify its direction). In addition, \texttt{\parsfootnotetext} is defined. The option footnotes just does the following:
(which also redefine \footnotetext and define \localfootnotetext and \mainfootnotetext). If the language argument is empty, then no language is selected inside the argument of the footnote. Note this command is available always in bidi documents, even without layout=footnotes.

**EXAMPLE** If you want to preserve directionality in footnotes and there are many footnotes entirely in English, you can define:

\BabelFootnote\enfootnote{english}{.}

It adds a period outside the English part, so that it is placed at the left in the last line. This means the dot at the end of the footnote text should be omitted.

### 1.25 Language attributes

\languageattribute

This is a user-level command, to be used in the preamble of a document (after \usepackage{...}{babel}), that declares which attributes are to be used for a given language. It takes two parameters: the first is the name of the language; the second, a (list of) attribute(s) to be used. Attributes must be set in the preamble and only once – they cannot be turned on and off. The command checks whether the language is known in this document and whether the attribute(s) are known for this language.

Very often, using a modifier in a package option is better. Several language definition files use their own methods to set options. For example, french uses \frenchsetup, magyar (1.5) uses \magyarOptions; modifiers provided by spanish have no attribute counterparts. Macros setting options are also used (eg, \ProsodicMarksOn in latin).

### 1.26 Hooks

New 3.9a A hook is a piece of code to be executed at certain events. Some hooks are predefined when luatex and xetex are used.

New 3.64 This is not the only way to inject code at those points. The events listed below can be used as a hook name in \AddToHook in the form babel1/(language-name)=event-name (with * it’s applied to all languages), but there is a limitation, because the parameters passed with the babel mechanism are not allowed. The \AddToHook mechanism does *not* replace the current one in ‘babel’. Its main advantage is you can reconfigure ‘babel’ even before loading it. See the example below.

\AddBabelHook

{lang}{name}{event}{code}

The same name can be applied to several events. Hooks with a certain {name} may be enabled and disabled for all defined events with \EnableBabelHook{(name)}, \DisableBabelHook{(name)}. Names containing the string babel1 are reserved (for example, by \usepackage{babel} to add a hook for the event afterextras).

New 3.33 They may be also applied to a specific language with the optional argument; language-specific settings are executed after global ones. Current events are the following; in some of them you can use one to three \TeX parameters (#1, #2, #3), with the meaning given:

**addialect** (language name, dialect name) Used by luababel. def to load the patterns if not preloaded.
patterns (language name, language with encoding) Executed just after the \language has been set. The second argument has the patterns name actually selected (in the form of either lang:ENC or lang).

hyphenation (language name, language with encoding) Executed locally just before exceptions given in \babelhyphenation are actually set.

defaultcommands Used (locally) in \StartBabelCommands.

encodedcommands (input, font encodings) Used (locally) in \StartBabelCommands. Both xetex and luatex make sure the encoded text is read correctly.

stopcommands Used to reset the above, if necessary.

write This event comes just after the switching commands are written to the aux file.

beforeextras Just before executing \extras{language}. This event and the next one should not contain language-dependent code (for that, add it to \extras{language}).

afterextras Just after executing \extras{language}. For example, the following deactivates shorthands in all languages:

```
\AddBabelHook{noshort}{afterextras}{\languageshorthands{none}}
```

stringprocess Instead of a parameter, you can manipulate the macro \BabelString containing the string to be defined with \SetString. For example, to use an expanded version of the string in the definition, write:

```
\AddBabelHook{myhook}{stringprocess}{% \protected@edef\BabelString{\BabelString}}
```

initiateactive (char as active, char as other, original char) New 3.9i Executed just after a shorthand has been ‘initiated’. The three parameters are the same character with different catcodes: active, other (\string’ed) and the original one.

afterreset New 3.9i Executed when selecting a language just after \originalTeX is run and reset to its base value, before executing \captions{language} and \date{language}.

Four events are used in hyphen.cfg, which are handled in a quite different way for efficiency reasons – unlike the precedent ones, they only have a single hook and replace a default definition.

everylanguage (language) Executed before every language patterns are loaded.

loadkernel (file) By default just defines a few basic commands. It can be used to define different versions of them or to load a file.

loadpatterns (patterns file) Loads the patterns file. Used by luababel.def.

loadexceptions (exceptions file) Loads the exceptions file. Used by luababel.def.

EXAMPLE The generic unlocalized \LaTeX hooks are predefined, so that you can write:

```
\AddToHook{babel/*/afterextras}{\frenchspacing}
```

which is executed always after the extras for the language being selected (and just before the non-localized hooks defined with \AddBabelHook).

In addition, locale-specific hooks in the form babel/\language-name/\event-name are recognized (executed just before the localized babel hooks), but they are not predefined. You have to do it yourself. For example, to set \frenchspacing only in bengali:

```
\ActivateGenericHook{babel/bengali/afterextras}
\AddToHook{babel/bengali/afterextras}{\frenchspacing}
```
This macro contains a list of “toc” types requiring a command to switch the language. Its default value is toc, lof, lot, but you may redefine it with \renewcommand (it’s up to you to make sure no toc type is duplicated).

1.27 Languages supported by babel with .ldf files

In the following table most of the languages supported by babel with and .ldf file are listed, together with the names of the option which you can load babel with for each language. Note this list is open and the current options may be different. It does not include .ini files.

Afrikaans afrikaans
Azerbaijani azerbaijani
Basque basque
Breton breton
Bulgarian bulgarian
Catalan catalan
Croatian croatian
Czech czech
Danish danish
Dutch dutch
English english, USenglish, american, UKenglish, british, canadian, australian, newzealand
Esperanto esperanto
Estonian estonian
Finnish finnish
French french, francais, canadien, acadian
Galician galician
German austrian, german, germanb, ngerman, naustrian
Greek greek, polutonikogreek
Hebrew hebrew
Icelandic icelandic
Indonesian indonesian (bahasa, indon, bahasai)
Interlingua interlingua
Irish Gaelic irish
Italian italian
Latin latin
Lower Sorbian lowersorbian
Malay malay, melayu (bahasam)
North Sami samin
Norwegian norsk, nynorsk
Polish polish
Portuguese portuguese, brazilian (portuges, brazil)
Romanian romanian
Russian russian
Scottish Gaelic scottish
Spanish spanish
Slovakian slovak
Slovenian slovene
Swedish swedish
Serbian serbian
Turkish turkish
Ukrainian ukrainian
Upper Sorbian uppersorbian
Welsh welsh

There are more languages not listed above, including hindi, thai, thaijk, latvian, turkmen, magyar, mongolian, romansh, lithuanian, spanglish, vietnamese, japanese, pinyin, arabic, farsi, ibygreek, bgreek, serbianc, frienchle, ethiop and friulan.

\footnote{The two last name comes from the times when they had to be shortened to 8 characters}
Most of them work out of the box, but some may require extra fonts, encoding files, a preprocessor or even a complete framework (like \CJK or \luatexja). For example, if you have got the velthuis/devnag package, you can create a file with extension `.dn:

\documentclass{article}
\usepackage[hindi]{babel}
\begin{document}
\dn devaa.na.m priya.h
\end{document}

Then you preprocess it with devnag ⟨file⟩, which creates ⟨file⟩.tex; you can then typeset the latter with \LaTeX.

1.28 Unicode character properties in luatex

New 3.32 Part of the babel job is to apply Unicode rules to some script-specific features based on some properties. Currently, they are 3, namely, direction (ie, bidi class), mirroring glyphs, and line breaking for CJK scripts. These properties are stored in lua tables, which you can modify with the following macro (for example, to set them for glyphs in the PUA).

\begin{verbatim}
\babelcharproperty {\langle char-code\rangle}{{\langle to-char-code\rangle}}{{\langle property\rangle}}{{\langle value\rangle}}
\end{verbatim}

New 3.32 Here, \langle char-code\rangle is a number (with \TeX\ syntax). With the optional argument, you can set a range of values. There are three properties (with a short name, taken from Unicode): direction (bc), mirror (bm), linebreak (lb). The settings are global, and this command is allowed only in vertical mode (the preamble or between paragraphs). For example:

\begin{verbatim}
\babelcharproperty {'?}{mirror}{?}
\babelcharproperty {'-}{direction}{l} % or al, r, en, an, on, et, cs
\babelcharproperty {'}{}{linebreak}{cl} % or id, op, cl, ns, ex, in, hy
\end{verbatim}

New 3.39 Another property is locale, which adds characters to the list used by onchar in \babelprovide, or, if the last argument is empty, removes them. The last argument is the locale name:

\begin{verbatim}
\babelcharproperty {'',}{locale}{english}
\end{verbatim}

1.29 Tweaking some features

\begin{verbatim}
\babeladjust {\langle key-value-list\rangle}
\end{verbatim}

New 3.36 Sometimes you might need to disable some babel features. Currently this macro understands the following keywords (and only for luatex), with values on or off: bidi.text, bidi.mirroring, bidi.mapdigits, layout.lists, layout.tabular, linebreak.see, linebreak.cjk, justify.arabic. For example, you can set \babeladjust{bidi.text=off} if you are using an alternative algorithm or with large sections not requiring it. Use with care, because these options do not deactivate other related options (like paragraph direction with bidi.text).

1.30 Tips, workarounds, known issues and notes

• If you use the document class book and you use \ref inside the argument of \chapter (or just use \ref inside \MakeUppercase), \LaTeX\ will keep complaining about an undefined label. To prevent such problems, you can revert to using uppercase labels, you can use \lowercase{\ref{foo}} inside the argument of \chapter, or, if you will not use shorthands in labels, set the safe option to none or bib.
Both \texttt{ltxdoc} and babel use \texttt{\AtBeginDocument} to change some catcodes, and babel reloads \texttt{hhline} to make sure it has the right one, so if you want to change the catcode of | it has to be done using the same method at the proper place, with

\begin{verbatim}
\AtBeginDocument{\DeleteShortVerb{|}}
\end{verbatim}

before loading babel. This way, when the document begins the sequence is (1) make | active (ltxdoc); (2) make it unactive (your settings); (3) make babel shorthands active (babel); (4) reload \texttt{hhline} (babel, now with the correct catcodes for | and :).

Documents with several input encodings are not frequent, but sometimes are useful. You can set different encodings for different languages as the following example shows:

\begin{verbatim}
\addto\extrasfrench{\inputencoding{latin1}}
\addto\extrasrussian{\inputencoding{koi8-r}}
\end{verbatim}

- For the hyphenation to work correctly, lccodes cannot change, because \TeX{} only takes into account the values when the paragraph is hyphenated, i.e., when it has been finished.\textsuperscript{21} So, if you write a chunk of French text with \texttt{\foreignlanguage}, the apostrophes might not be taken into account. This is a limitation of \TeX{}, not of babel. Alternatively, you may use \texttt{\useshorthands} to activate ‘ and \texttt{\defineshorthand}, or redefine \texttt{\textquoteright} (the latter is called by the non-ASCII right quote).

- \texttt{\bibitem} is out of sync with \texttt{\selectlanguage} in the .aux file. The reason is \texttt{\bibitem} uses \texttt{\immediate} (and others, in fact), while \texttt{\selectlanguage} doesn’t. There is a similar issue with floats, too. There is no known workaround.

- Babel does not take into account \texttt{\normalsf} codes and (non-)French spacing is not always properly (un)set by languages. However, problems are unlikely to happen and therefore this part remains untouched in version 3.9 (but it is in the ‘to do’ list).

- Using a character mathematically active (i.e., with math code "8000) as a shorthand can make \TeX{} enter in an infinite loop in some rare cases. (Another issue in the ‘to do’ list, although there is a partial solution.)

The following packages can be useful, too (the list is still far from complete):

- \texttt{csquotes} Logical markup for quotes.
- \texttt{iflang} Tests correctly the current language.
- \texttt{hyphsubst} Selects a different set of patterns for a language.
- \texttt{translator} An open platform for packages that need to be localized.
- \texttt{siunitx} Typesetting of numbers and physical quantities.
- \texttt{biblatex} Programmable bibliographies and citations.
- \texttt{bicon} Bilingual captions.
- \texttt{babelbib} Multilingual bibliographies.
- \texttt{microtype} Adjusts the typesetting according to some languages (kerning and spacing).
  - Ligatures can be disabled.
- \texttt{substitutefont} Combines fonts in several encodings.
- \texttt{mkpattern} Generates hyphenation patterns.
- \texttt{tracklang} Tracks which languages have been requested.
- \texttt{ucharclasses} (xetex) Switches classes when you switch from one Unicode block to another.
- \texttt{zhspacing} Spacing for CJK documents in xetex.

\textsuperscript{21} This explains why \TeX{} assumes the lowercase mapping of T1 and does not provide a tool for multiple mappings. Unfortunately, \texttt{\savinghyphcodes} is not a solution either, because lccodes for hyphenation are frozen in the format and cannot be changed.
1.31 Current and future work

The current work is focused on the so-called complex scripts in \luatex. In 8-bit engines, babel provided a basic support for bidi text as part of the style for Hebrew, but it is somewhat unsatisfactory and internally replaces some hardwired commands by other hardwired commands (generic changes would be much better).

Useful additions would be, for example, time, currency, addresses and personal names. But that is the easy part, because they don’t require modifying the \LuX internals.

Calendars (Arabic, Persian, Indic, etc.) are under study. Also interesting are differences in the sentence structure or related to it. For example, in Basque the number precedes the name (including chapters), in Hungarian “from (1)” is “(1)-ből”, but “from (3)” is “(3)-ből”, in Spanish an item labelled “3.º” may be referred to as either “item 3.º” or “3.º item”, and so on.

An option to manage bidirectional document layout in \luatex (lists, footnotes, etc.) is almost finished, but \xetex required more work. Unfortunately, proper support for \xetex requires patching somehow lots of macros and packages (and some issues related to \specials remain, like color and hyperlinks), so babel resorts to the bidi package (by Vafa Khalighi). See the babel repository for a small example (xe-bidi).

1.32 Tentative and experimental code

See the code section for \foreignlanguage* (a new starred version of \foreignlanguage). For old an deprecated functions, see the babel site.

Options for locales loaded on the fly

New 3.51 \babelsetup{ autoload.options = ... } sets the options when a language is loaded on the fly (by default, no options). A typical value would be important, which defines captions, date, numerals, etc., but ignores the code in the \tex file (for example, extended numerals in Greek).

Labels

New 3.48 There is some work in progress for babel to deal with labels, both with the relation to captions (chapters, part), and how counters are used to define them. It is still somewhat tentative because it is far from trivial – see the babel site for further details.

2 Loading languages with language.dat

\TeX and most engines based on it (pdf\TeX, \xetex, \etex, the main exception being \luatex) require hyphenation patterns to be preloaded when a format is created (eg, \TeX, \Xe\TeX, pdf\TeX). babel provides a tool which has become standard in many distributions and based on a “configuration file” named language.dat. The exact way this file is used depends on the distribution, so please, read the documentation for the latter (note also some distributions generate the file with some tool).

New 3.9q With \luatex, however, patterns are loaded on the fly when requested by the language (except the “0th” language, typically english, which is preloaded always). Until 3.9n, this task was delegated to the package \luatex-hyphen, by Khaled Hosny, Élie Roux, and Manuel Pégourié-Gonnard, and required an extra file named language.dat.1ua, but now a new mechanism has been devised based solely on language.dat. You must rebuild the formats if upgrading from a previous version. You may want to have a local language.dat for a particular project (for example, a book on Chemistry).\footnote{24}

---

\footnote{22See for example POSIX, ISO 14652 and the Unicode Common Locale Data Repository (CLDR). Those systems, however, have limited application to \TeX because their aim is just to display information and not fine typesetting.}

\footnote{23This feature was added to 3.9o, but it was buggy. Both 3.9o and 3.9p are deprecated.}

\footnote{24The loader for \luatex is slightly different as it’s not based on babel but on \etex.src. Until 3.9p it just didn’t work, but thanks to the new code it works by reloading the data in the babel way, i.e., with language.dat.}
2.1 Format

In that file the person who maintains a TeX environment has to record for which languages he has hyphenation patterns and in which files these are stored. When hyphenation exceptions are stored in a separate file this can be indicated by naming that file after the file with the hyphenation patterns.

The file can contain empty lines and comments, as well as lines which start with an equals (=) sign. Such a line will instruct \TeX that the hyphenation patterns just processed have to be known under an alternative name. Here is an example:

| % File   | : language.dat         |
| % Purpose| tell \ini\TeX what files with patterns to load. |
| english  | english.hyphenations   |
| =british |                      |
| dutch    | hyphen.dutch exceptions.dutch % Nederlands |
| german   | hyphen.ger            |

You may also set the font encoding the patterns are intended for by following the language name by a colon and the encoding code. For example:

```
german:T1 hyphenT1.ger
    german hyphen.ger
```

With the previous settings, if the encoding when the language is selected is T1 then the patterns in `hyphenT1.ger` are used, but otherwise use those in `hyphen.ger` (note the encoding can be set in `\extras⟨lang⟩`).

A typical error when using babel is the following:

```
No hyphenation patterns were preloaded for
the language '⟨lang⟩' into the format.
Please, configure your \TeX system to add them and
rebuild the format. Now I will use the patterns
preloaded for english instead}
```

It simply means you must reconfigure `language.dat`, either by hand or with the tools provided by your distribution.

3 The interface between the core of babel and the language definition files

The language definition files (ldf) must conform to a number of conventions, because these files have to fill in the gaps left by the common code in `babel.def`, i.e., the definitions of the macros that produce texts. Also the language-switching possibility which has been built into the babel system has its implications.

The following assumptions are made:

- Some of the language-specific definitions might be used by plain \TeX users, so the files have to be coded so that they can be read by both \LaTeX and plain \TeX. The current format can be checked by looking at the value of the macro `\fmtname`.

- The common part of the babel system redefines a number of macros and environments (defined previously in the document style) to put in the names of macros that replace the previously hard-wired texts. These macros have to be defined in the language definition files.

\footnote{This is because different operating systems sometimes use very different file-naming conventions.}

\footnote{This is not a new feature, but in former versions it didn't work correctly.}
The language definition files must define five macros, used to activate and deactivate the language-specific definitions. These macros are \langle lang\rangle hyphenmins, \captions{lang}, \date{lang}, \extras{lang} and \noextras{lang} (the last two may be left empty); where \langle lang\rangle is either the name of the language definition file or the name of the \LaTeX option that is to be used. These macros and their functions are discussed below. You must define all or none for a language (or a dialect); defining, say, \date{lang} but not \captions{lang} does not raise an error but can lead to unexpected results.

When a language definition file is loaded, it can define \l@{lang} to be a dialect of \language0 when \l@{lang} is undefined.

Language names must be all lowercase. If an unknown language is selected, babel will attempt setting it after lowercasing its name.

The semantics of modifiers is not defined (on purpose). In most cases, they will just be simple separated options (eg, spanish), but a language might require, say, a set of options organized as a tree with suboptions (in such a case, the recommended separator is /).

Some recommendations:

- The preferred shorthand is ", which is not used in \LaTeX (quotes are entered as ` and '). Other good choices are characters which are not used in a certain context (eg, = in an ancient language). Note however =, <, >, ; and the like can be dangerous, because they may be used as part of the syntax of some elements (numeric expressions, key/value pairs, etc.).

- Captions should not contain shorthands or encoding-dependent commands (the latter is not always possible, but should be clearly documented). They should be defined using the LICR. You may also use the new tools for encoded strings, described below.

- Avoid adding things to \noextras{lang} except for umlauthigh and friends, \deactivate, \nonfrenchspacing, and language-specific macros. Use always, if possible, \save and \savevariable (except if you still want to have access to the previous value). Do not reset a macro or a setting to a hardcoded value. Never. Instead save its value in \extras{lang}.

- Do not switch scripts. If you want to make sure a set of glyphs is used, switch either the font encoding (low-level) or the language (high-level, which in turn may switch the font encoding). Usage of things like \latintext is deprecated.

- Please, for "private" internal macros do not use the \bbi@ prefix. It is used by babel and it can lead to incompatibilities.

There are no special requirements for documenting your language files. Now they are not included in the base babel manual, so provide a standalone document suited for your needs, as well as other files you think can be useful. A PDF and a "readme" are strongly recommended.

### 3.1 Guidelines for contributed languages

Currently, the easiest way to contribute a new language is by taking one the the 500 or so ini templates available on GitHub as a basis. Just make a pull request to download it and then, after filling the fields, sent it to me. Fell free to ask for help or to make feature requests.

As to ldf files, now language files are "outsourced" and are located in a separate directory (/macros/latex/contrib/babel-contrib), so that they are contributed directly to CTAN (please, do not send to me language styles just to upload them to CTAN).

Of course, placing your style files in this directory is not mandatory, but if you want to do it, here are a few guidelines.

---

27But not removed, for backward compatibility.
• Do not hesitate stating on the file heads you are the author and the maintainer, if you actually are. There is no need to state the babel maintainer(s) as authors if they have not contributed significantly to your language files.

• Fonts are not strictly part of a language, so they are best placed in the corresponding \TeX{} tree. This includes not only ttf, vdf, ps1, otf, mf files and the like, but also fd ones.

• Font and input encodings are usually best placed in the corresponding tree, too, but sometimes they belong more naturally to the babel style. Note you may also need to define a LICR.

• Babel ldf files may just interface a framework, as it happens often with Oriental languages/scripts. This framework is best placed in its own directory.

The following page provides a starting point for ldf files:
http://www.texnia.com/incubator.html. See also

If you need further assistance and technical advice in the development of language styles, I am willing to help you. And of course, you can make any suggestion you like.

### 3.2 Basic macros

In the core of the babel system, several macros are defined for use in language definition files. Their purpose is to make a new language known. The first two are related to hyphenation patterns.

\language\addlanguage\adddialect

The macro \addlanguage\adddialect is a non-outerversion of the macro \newlanguage, defined in \plain\text{} version 3.x. Here “language” is used in the \TeX{} sense of set of hyphenation patterns.

\language\language\language

The macro \adddialect can be used when two languages can (or must) use the same hyphenation patterns. This can also be useful for languages for which no patterns are preloaded in the format. In such cases the default behavior of the babel system is to define this language as a ‘dialect’ of the language for which the patterns were loaded as \language0. Here “language” is used in the \TeX{} sense of set of hyphenation patterns.

\langle lang \rangle hyphenmins

The macro \langle lang \rangle hyphenmins is used to store the values of the \lefthyphenmin and \righthyphenmin. Redefine this macro to set your own values, with two numbers corresponding to these two parameters. For example:

\renewcommand\spanishhyphenmins{34}

(Assigning \lefthyphenmin and \righthyphenmin directly in \extras<lang> has no effect.)

\providehyphenmins

The macro \providehyphenmins should be used in the language definition files to set \lefthyphenmin and \righthyphenmin. This macro will check whether these parameters were provided by the hyphenation file before it takes any action. If these values have been already set, this command is ignored (currently, default pattern files do not set them).

\captions<lang>

The macro \captions<lang> defines the macros that hold the texts to replace the original hard-wired texts.

\date<lang>

The macro \date<lang> defines \today. This macro, like the following, is a hook – you can add things to it, but it must not be used directly.

\extras<lang>

The macro \extras<lang> contains all the extra definitions needed for a specific language. This macro, like the following, is a hook – you can add things to it, but it must not be used directly.

\noextras<lang>

Because we want to let the user switch between languages, but we do not know what state \TeX{} might be in after the execution of \extras<lang>, a macro that brings \TeX{} into a predefined state is needed. It will be no surprise that the name of this macro is \noextras<lang>.

\bbl@declare@tribute

This is a command to be used in the language definition files for declaring a language attribute. It takes three arguments: the name of the language, the attribute to be defined, and the code to be executed when the attribute is to be used.

\main@language

To postpone the activation of the definitions needed for a language until the beginning of a
document, all language definition files should use $\texttt{main@language}$ instead of $\texttt{selectlanguage}$. This will just store the name of the language, and the proper language will be activated at the start of the document.

$\texttt{\ProvidesLanguage}$  The macro $\texttt{\ProvidesLanguage}$ should be used to identify the language definition files. Its syntax is similar to the syntax of the \LaTeX{} command $\texttt{\ProvidesPackage}$.

$\texttt{\LdfInit}$  The macro $\texttt{\LdfInit}$ performs a couple of standard checks that must be made at the beginning of a language definition file, such as checking the category code of the $\@$-sign, preventing the .ldf file from being processed twice, etc.

$\texttt{\LdfQuit}$  The macro $\texttt{\LdfQuit}$ does work needed if a .ldf file was processed earlier. This includes resetting the category code of the $\@$-sign, preparing the language to be activated at $\texttt{\begin{document}}$ time, and ending the input stream.

$\texttt{\LdfFinish}$  The macro $\texttt{\LdfFinish}$ does work needed at the end of each .ldf file. This includes resetting the category code of the $\@$-sign, loading a local configuration file, and preparing the language to be activated at $\texttt{\begin{document}}$ time.

$\texttt{\LoadLocalCfg}$  After processing a language definition file, \LaTeX{} can be instructed to load a local configuration file. This file can, for instance, be used to add strings to $\texttt{\captions<language>}$ to support local document classes. The user will be informed that this configuration file has been loaded. This macro is called by $\LdfFinish$.

$\texttt{\SubstituteFontFamily}$ (Deprecated.) This command takes three arguments, a font encoding and two font family names. It creates a font description file for the first font in the given encoding. This .fd file will instruct \LaTeX{} to use a font from the second family when a font from the first family in the given encoding seems to be needed.

### 3.3 Skeleton

Here is the basic structure of an .ldf file, with a language, a dialect and an attribute. Strings are best defined using the method explained in sec. 3.8 (babel 3.9 and later).

```tex
\ProvidesLanguage{<language>}
\LdfInit{<language>}{captions<language>}
\ifx\undefined\l@<language>
  \@nopatterns{<Language>}
\fi
\addialect\l@<language>0
\bbl@declare@ttribute{<language>}{<attrib>}{%
  \expandafter\addto\expandafter\extras<language>
  \expandafter{\extras<attrib><language>}%
  \let\captions<language>\captions<attrib><language>}
\providehyphenmins{<language>}{\tw@\thr@@}
\StartBabelCommands*{<language>}{captions}
\SetString\chaptername{<chapter name>}
% More strings
\StartBabelCommands*{<language>}{date}
\SetString\monthiname{<name of first month>}
% More strings
\StartBabelCommands*{<dialect>}{captions}
\SetString\chaptername{<chapter name>}
% More strings
\StartBabelCommands*{<dialect>}{date}
\SetString\monthiname{<name of first month>}
```

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NOTE If for some reason you want to load a package in your style, you should be aware it cannot be done directly in the \ldf file, but it can be delayed with \AtEndOfPackage. Macros from external packages can be used inside definitions in the \ldf itself (for example, \extras<language>), but if executed directly, the code must be placed inside \AtEndOfPackage. A trivial example illustrating these points is:

\AtEndOfPackage{% \RequirePackage{dingbat}% Delay package \savebox{\myeye}{\eye}% And direct usage \newsavebox{\myeye} \newcommand\myanchor{\anchor}% But OK inside command}

3.4 Support for active characters

In quite a number of language definition files, active characters are introduced. To facilitate this, some support macros are provided.

\initiate@active@char

The internal macro \initiate@active@char is used in language definition files to instruct \LaTeX{} to give a character the category code `active'. When a character has been made active it will remain that way until the end of the document. Its definition may vary.

\bbl@activate \bbl@deactivate

The command \bbl@activate is used to change the way an active character expands. \bbl@activate `switches on' the active behavior of the character; \bbl@deactivate lets the active character expand to its former (mostly) non-active self.

\declare@shorthand

The macro \declare@shorthand is used to define the various shorthands. It takes three arguments: the name for the collection of shorthands this definition belongs to; the character (sequence) that makes up the shorthand, i.e. ~ or `a'; and the code to be executed when the shorthand is encountered. (It does not raise an error if the shorthand character has not been “initiated”.)

\bbl@add@special \bbl@remove@special

The \TeX{}book states: “Plain \TeX{} includes a macro called \texttt{@dospecial} that is essentially a set macro, representing the set of all characters that have a special category code.” [4, p. 380] It is used to set text `verbatim'. To make this work if more characters get a special category code, you have to add this character to the macro \texttt{@dospecial}. \LaTeX{} adds another macro called \texttt{@sanitize} representing the same character set, but without the curly braces. The macros \bbl@add@special\texttt{(char)} and \bbl@remove@special\texttt{(char)} add and remove the character \texttt{(char)} to these two sets.

3.5 Support for saving macro definitions

Language definition files may want to redefine macros that already exist. Therefore a mechanism for saving (and restoring) the original definition of those macros is provided. We provide two macros for this\textsuperscript{28}.

\babel@save

To save the current meaning of any control sequence, the macro \babel@save is provided. It takes one argument, \texttt{\cslname}, the control sequence for which the meaning has to be saved.

\babel@savevariable

A second macro is provided to save the current value of a variable. In this context,

\textsuperscript{28}This mechanism was introduced by Bernd Raichle.
3.6 Support for extending macros

\addto{\langle control sequence\rangle}{\langle TeX code\rangle} can be used to extend the definition of a macro. The macro need not be defined (i.e., it can be undefined or \relax). This macro can, for instance, be used in adding instructions to a macro like \extrasenglish.

Be careful when using this macro, because depending on the case the assignment can be either global (usually) or local (sometimes). That does not seem very consistent, but this behavior is preserved for backward compatibility. If you are using etoolbox, by Philipp Lehman, consider using the tools provided by this package instead of \addto.

3.7 Macros common to a number of languages

\bbl@allowhyphens
In several languages compound words are used. This means that when \TeX{} has to hyphenate such a compound word, it only does so at the '-' that is used in such words. To allow hyphenation in the rest of such a compound word, the macro \bbl@allowhyphens can be used.

\allowhyphens
Same as \bbl@allowhyphens, but does nothing if the encoding is T1. It is intended mainly for characters provided as real glyphs by this encoding but constructed with \accent in OT1.

Note the previous command (\bbl@allowhyphens) has different applications (hyphens and discretionaries) than this one (composite chars). Note also prior to version 3.7, \allowhyphens had the behavior of \bbl@allowhyphens.

\set@low@box
For some languages, quotes need to be lowered to the baseline. For this purpose the macro \set@low@box is available. It takes one argument and puts that argument in an \hbox, at the baseline. The result is available in \box0 for further processing.

\save@sf@q
Sometimes it is necessary to preserve the \spacefactor. For this purpose the macro \save@sf@q is available. It takes one argument, saves the current spacefactor, executes the argument, and restores the spacefactor.

\bbl@frenchspacing
\bbl@nonfrenchspacing
The commands \bbl@frenchspacing and \bbl@nonfrenchspacing can be used to properly switch French spacing on and off.

3.8 Encoding-dependent strings

New 3.9a Babel 3.9 provides a way of defining strings in several encodings, intended mainly for luatex and xetex. This is the only new feature requiring changes in language files if you want to make use of it.

Furthermore, it must be activated explicitly, with the package option strings. If there is no strings, these blocks are ignored, except \SetCases (and except if forced as described below). In other words, the old way of defining/switching strings still works and it's used by default.

It consists of blocks started with \StartBabelCommands. The last block is closed with \EndBabelCommands. Each block is a single group (i.e., local declarations apply until the next \StartBabelCommands or \EndBabelCommands). An ldf may contain several series of this kind.

Thanks to this new feature, string values and string language switching are not mixed any more. No need of \addto. If the language is french, just redefine \frenchchaptername.

\StartBabelCommands
\{(language-list)|\{(category)|\{selector\}\}}

The \langle language-list\rangle specifies which languages the block is intended for. A block is taken into account only if the \CurrentOption is listed here. Alternatively, you can define \BabelLanguages to a comma-separated list of languages to be defined (if undefined,
\StartBabelCommands sets it to \CurrentOption. You may write \CurrentOption as the language, but this is discouraged – a explicit name (or names) is much better and clearer. A “selector” is a name to be used as value in package option strings, optionally followed by extra info about the encodings to be used. The name unicode must be used for xetex and luatex (the key strings has also other two special values: generic and encoded). If a string is set several times (because several blocks are read), the first one takes precedence (ie, it works much like \providecommand). Encoding info is charset= followed by a charset, which if given sets how the strings should be translated to the internal representation used by the engine, typically utf8, which is the only value supported currently (default is no translations). Note charset is applied by luatex and xetex when reading the file, not when the macro or string is used in the document.

A list of font encodings which the strings are expected to work with can be given after fontenc= (separated with spaces, if two or more) – recommended, but not mandatory, although blocks without this key are not taken into account if you have requested strings=encoded.

Blocks without a selector are read always if the key strings has been used. They provide fallback values, and therefore must be the last blocks; they should be provided always if possible and all strings should be defined somehow inside it; they can be the only blocks (mainly LGC scripts using the LICR). Blocks without a selector can be activated explicitly with strings=generic (no block is taken into account except those). With strings=encoded, strings in those blocks are set as default (internally, ?). With strings=encoded strings are protected, but they are correctly expanded in \MakeUppercase and the like. If there is no key strings, string definitions are ignored, but \SetCases are still honored (in a encoded way). The \texttt{category} is either captions, date or extras. You must stick to these three categories, even if no error is raised when using other name.\footnote{it may be empty, too, but in such a case using \SetString is an error (but not \SetCase).}

\StartBabelCommands{language}{captions}
  [unicode, fontenc=TU EU1 EU2, charset=utf8]
  \SetString{\chaptername}{utf8-string}
\EndBabelCommands

\StartBabelCommands{language}{captions}
  \SetString{\chaptername}{ascii-maybe-LICR-string}
\EndBabelCommands

A real example is:

\StartBabelCommands{austrian}{date}
  [unicode, fontenc=TU EU1 EU2, charset=utf8]
  \SetString{\monthiname}{Jänner}
\StartBabelCommands{german,austrian}{date}
  [unicode, fontenc=TU EU1 EU2, charset=utf8]
  \SetString{\monthiiiname}{März}
\StartBabelCommands{austrian}{date}
  \SetString{\monthiname}{J\"änner}
\StartBabelCommands{german}{date}
  \SetString{\monthiname}{Januar}
\StartBabelCommands{german,austrian}{date}
  \SetString{\monthiiiname}{Februar}
  \SetString{\monthiiiname}{M\"arz}

\footnote{In future releases further categories may be added.}
When used in ldf files, previous values of \( \langle \text{category} \rangle \langle \text{language} \rangle \) are overridden, which means the old way to define strings still works and used by default (to be precise, is first set to undefined and then strings are added). However, when used in the preamble or in a package, new settings are added to the previous ones, if the language exists (in the babel sense, i.e., if \( \text{\texttt{\textbackslash date}} \langle \text{language} \rangle \) exists).

\[\text{\texttt{\textbackslash StartBabelCommands}} \langle \text{language-list} \rangle \langle \text{\texttt{\textbackslash category}}} \langle \text{\texttt{\textbackslash selector}} \rangle \]

The starred version just forces strings to take a value – if not set as package option, then the default for the engine is used. This is not done by default to prevent backward incompatibilities, but if you are creating a new language this version is better. It’s up to the maintainers of the current languages to decide if using it is appropriate.\(^{30}\)

\[\text{\texttt{\textbackslash EndBabelCommands}}\]

Marks the end of the series of blocks.

\[\text{\texttt{\textbackslash AfterBabelCommands}} \langle \text{\texttt{\textbackslash code}} \rangle\]

The code is delayed and executed at the global scope just after \( \text{\texttt{\textbackslash EndBabelCommands}} \).

\[\text{\texttt{\textbackslash SetString}} \langle \text{\texttt{\textbackslash macro-name}} \rangle \langle \text{\texttt{\textbackslash string}} \rangle \]

Adds \( \langle \text{\texttt{\textbackslash macro-name}} \rangle \) to the current category, and defines globally \( \langle \text{\texttt{\textbackslash lang-macro-name}} \rangle \) to \( \langle \text{\texttt{\textbackslash code}} \rangle \) (after applying the transformation corresponding to the current charset or defined with the hook \( \text{\texttt{\textbackslash stringprocess}} \)).

Use this command to define strings, without including any “logic” if possible, which should be a separated macro. See the example above for the date.

\[\text{\texttt{\textbackslash SetStringLoop}} \langle \text{\texttt{\textbackslash macro-name}} \rangle \langle \text{\texttt{\textbackslash string-list}} \rangle \]

A convenient way to define several ordered names at once. For example, to define \( \text{\texttt{\textbackslash abmoniname}}, \text{\texttt{\textbackslash abmoniiname}}, \text{etc.} \) (and similarly with \( \text{\texttt{\textbackslash abday}} \)):

\[\text{\texttt{\textbackslash SetStringLoop}} \langle \text{\texttt{\textbackslash abmon#1name}} \rangle \langle \text{\texttt{\textbackslash en,fb,mr,ab,my,jn,jl,ag,sp,oc,nv,dc}} \rangle \]

\[\text{\texttt{\textbackslash SetStringLoop}} \langle \text{\texttt{\textbackslash abday#1name}} \rangle \langle \text{\texttt{\textbackslash lu,ma,mi,ju,vi,sa,do}} \rangle \]

\#1 is replaced by the roman numeral.

\[\text{\texttt{\textbackslash SetCase}} \langle \text{\texttt{\textbackslash map-list}} \rangle \langle \text{\texttt{\textbackslash toupper-code}} \rangle \langle \text{\texttt{\textbackslash tolower-code}} \rangle \]

\(^{30}\)This replaces in 3.9g a short-lived \( \text{\texttt{\textbackslash UseStrings}} \) which has been removed because it did not work.
Sets globally code to be executed at \MakeUpperCase and \MakeLowerCase. The code would typically be things like \let \BB \bb and \uccode or \lccode (although for the reasons explained above, changes in lc/uc codes may not work). A ⟨map-list⟩ is a series of macros using the internal format of \ucilclist (eg, \bb \BB \cc \CC). The mandatory arguments take precedence over the optional one. This command, unlike \SetString, is executed always (even without strings), and it is intended for minor readjustments only. For example, as T1 is the default case mapping in \TeX, we can set for Turkish:

\StartBabelCommands{turkish}{\ot1enc, fontenc=OT1}
\SetCase
{\uccode "10='I\relax}
{\lccode 'I='10\relax}
\EndBabelCommands
\StartBabelCommands{turkish}{\unicode, fontenc=TUEU1 EU2, charset=utf8}
\SetCase
{\uccode 'i='İ\relax}
{\lccode 'I='ı\relax}
\StartBabelCommands{turkish}{}
\SetCase
{\uccode '9D='ı\relax}
{\lccode 'I='ı\relax}
\EndBabelCommands
(Note the mapping for OT1 is not complete.)

\SetHyphenMap {}{(to-lower-macros)}

Case mapping serves in \TeX for two unrelated purposes: case transforms (upper/lower) and hyphenation. \SetCase handles the former, while hyphenation is handled by \SetHyphenMap and controlled with the package option hyphenmap. So, even if internally they are based on the same \TeX primitive (\lccode), babel sets them separately. There are three helper macros to be used inside \SetHyphenMap:

- \BabelLower{⟨uccode⟩}{⟨lccode⟩} is similar to \lccode but it's ignored if the char has been set and saves the original lccode to restore it when switching the language (except with hyphenmap=first).
- \BabelLowerMM{⟨uccode-from⟩}{⟨uccode-to⟩}{⟨step⟩}{⟨lccode-from⟩} loops though the given uppercase codes, using the step, and assigns them the lccode, which is also increased (MM stands for many-to-many).
- \BabelLowerMO{⟨uccode-from⟩}{⟨uccode-to⟩}{⟨step⟩}{⟨lccode⟩} loops though the given uppercase codes, using the step, and assigns them the lccode, which is fixed (MO stands for many-to-one).

An example is (which is redundant, because these assignments are done by both lualatex and xetex):

\SetHyphenMap{\BabelLowerMM{"100}{{"11F}}{{2}}{"101}}

This macro is not intended to fix wrong mappings done by Unicode (which are the default in both xetex and lualatex) – if an assignment is wrong, fix it directly.

### 3.9 Executing code based on the selector
Sometimes a different setup is desired depending on the selector used. Values allowed in \{selectors\} are select, other, foreign, other* (and also foreign* for the tentative starred version), and it can consist of a comma-separated list. For example:

```latex
{other, other*}{A}{B}
```

is true with these two environment selectors. Its natural place of use is in hooks or in \extras\{language\}.

## Part II

### Source code

babel is being developed incrementally, which means parts of the code are under development and therefore incomplete. Only documented features are considered complete. In other words, use babel only as documented (except, of course, if you want to explore and test them – you can post suggestions about multilingual issues to kadingira@tug.org on http://tug.org/mailman/listinfo/kadingira).

### 4 Identification and loading of required files

*Code documentation is still under revision.*

The following description is no longer valid, because switch and plain have been merged into babel.def.

The babel package after unpacking consists of the following files:

- `switch.def`: defines macros to set and switch languages.
- `babel.def`: defines the rest of macros. It has tow parts: a generic one and a second one only for LaTeX.
- `babel.sty`: is the \LaTeX\ package, which set options and load language styles.
- `plain.def`: defines some \LaTeX\ macros required by babel.def and provides a few tools for Plain.
- `hyphen.cfg`: is the file to be used when generating the formats to load hyphenation patterns.

The babel installer extends docstrip with a few “pseudo-guards” to set “variables” used at installation time. They are used with `<@name@>` at the appropriated places in the source code and shown below with ⟨⟨name⟩⟩. That brings a little bit of literate programming.

### 5 locale directory

A required component of babel is a set of ini files with basic definitions for about 200 languages. They are distributed as a separate zip file, not packed as dtx. With them, babel will fully support Unicode engines.

Most of them are essentially finished (except bugs and mistakes, of course). Some of them are still incomplete (but they will be usable), and there are some omissions (eg, Latin and polytonic Greek, and there are no geographic areas in Spanish). Hindi, French, Occitan and Breton will show a warning related to dates. Not all include LICR variants.

This is a preliminary documentation.

Ini files contain the actual data; tex files are currently just proxies to the corresponding ini files. Most keys are self-explanatory.

- `charset`: the encoding used in the ini file.
- `version`: of the ini file.
- `level`: “version” of the ini specification. Which keys are available (they may grow in a compatible way) and how they should be read.
- `encodings`: a descriptive list of font encodings.
- `[captions]`: section of captions in the file charset
- `[captions.licr]`: same, but in pure ASCII using the LICR.
**date.long** fields are as in the CLDR, but the syntax is different. Anything inside brackets is a date field (eg, **MMMM** for the month name) and anything outside is text. In addition, [ ] is a nonbreakable space and [.] is an abbreviation dot.

Keys may be further qualified in a particular language with a suffix starting with a uppercase letter. It can be just a letter (eg, babel.name.A, babel.name.B) or a name (eg, date.long.Nominative, date.long.Formal, but no language is currently using the latter). Multi-letter qualifiers are forward compatible in the sense they won't conflict with new "global" keys (which start always with a lowercase case). There is an exception, however: the section counters has been devised to have arbitrary keys, so you can add lowercased keys if you want.

## 6 Tools

Do not use the following macros in **\ldf** files. They may change in the future. This applies mainly to those recently added for replacing, trimming and looping. The older ones, like `\bbl@afterfi`, will not change.

We define some basic macros which just make the code cleaner. `\bbl@add` is now used internally instead of `\addto` because of the unpredictable behavior of the latter. Used in babel.def and in babel.sty, which means in E\TeX{} is executed twice, but we need them when defining options and babel.def cannot be load until options have been defined. This does not hurt, but should be fixed somehow.

```
\bbl@add@list
This internal macro adds its second argument to a comma separated list in its first argument. When
the list is not defined yet (or empty), it will be initiated. It presumes expandable character strings.
```

```
\bbl@afterelse
\bbl@afterfi
Because the code that is used in the handling of active characters may need to look ahead, we take
extra care to 'throw' it over the `\else` and `\fi` parts of an `\if`-statement\footnote{This code is based on code presented in TUGboat vol. 12, no2, June 1991 in “An expansion Power Lemma” by Sonja Maus.}. These macros will break if another `\if\ldots\fi` statement appears in one of the arguments and it is not enclosed in braces.
```

```
\bbl@exp
Now, just syntactical sugar, but it makes partial expansion of some code a lot more simple and
readable. Here `\` stands for `\noexpand`, `<..>` for `\expandafter` applied to a built macro name (which
does not define the macro if undefined to `\relax`, because it is created locally), and `[..]` for
```
one-level expansion (where . is the macro name without the backslash). The result may be followed by extra arguments, if necessary.

\def\bb@exp#1{% 
\begingroup \let\\noexpand\let\<\bbl@exp@en \let\[]\bbl@exp@ue \edef\bbl@exp@aux{\endgroup#1}% 
\bbl@exp@aux}%

\bbl@exp@en#1>{\expandafter\noexpand\csname#1\endcsname}%
\bbl@exp@ue#1\{\unexpanded\expandafter\expandafter\expandafter{\csname#1\endcsname}}%

\bb@trim The following piece of code is stolen (with some changes) from keyval, by David Carlisle. It defines two macros: \bb@trim and \bb@trim@def. The first one strips the leading and trailing spaces from the second argument and then applies the first argument (a macro, \toks@ and the like). The second one, as its name suggests, defines the first argument as the stripped second argument.

\def\bb@tempa#1{% 
\long\def\bbl@trim##1##2{\futurelet\bbl@trim@a\bbl@trim@c##2\@nil\@nil#1\@nil\relax{##1}}%
\def\bbl@trim@c{\ifx\bbl@trim@a\@sptoken \expandafter\bbl@trim@b \else \expandafter\bbl@trim@b\expandafter#1\fi}%
\long\def\bbl@trim@b#1##1\@nil\@nil\relax#2\relax#3{#3{#1}}%
\long\def\bbl@trim@def#1{\bbl@trim{\def#1}}%

\bb@ifunset To check if a macro is defined, we create a new macro, which does the same as \@ifundefined. However, in an \epsilon-tex engine, it is based on \ifcsname, which is more efficient, and does not waste memory:

\begingroup \gdef\bb@ifunset#1{% \expandafter\ifx\csname#1\endcsname\relax \expandafter\@firstoftwo \else \bb@ifset#1\@nil\bb@afterelse\bb@afterfi \fi \else \bb@afterelse\bb@afterfi \fi}% \endgroup

\bb@ifblank A tool from url, by Donald Arseneau, which tests if a string is empty or space. The companion macros tests if a macro is defined with some ‘real’ value, ie, not \relax and not empty;

\begingroup \def\bb@ifblank#1{% \bb@ifblank@i#1\@nil\@nil\bb@afterelse\bb@afterfi\bb@ifset#1\@nil\bb@afterelse\bb@afterfi}

\bb@ifset To test for a real value, we use the following:

\begingroup \def\bb@ifset#1#2#3{% \bb@ifset@i#1\@nil#2\@nil#3\bb@afterelse\bb@afterfi\bb@ifnull#1\@nil#2\@nil#3\bb@afterelse\bb@afterfi\bb@ifnull#1\@nil#2\@nil#3\bb@afterelse\bb@afterfi\bb@ifnull#1\@nil#2\@nil#3\bb@afterelse\bb@afterfi\bb@ifnull#1\@nil#2\@nil#3\bb@afterelse\bb@afterfi\bb@ifnull#1\@nil#2\@nil#3\bb@afterelse\bb@afterfi\bb@ifnull#1\@nil#2\@nil#3\bb@afterelse\bb@afterfi\bb@ifnull#1\@nil#2\@nil#3\bb@afterelse\bb@afterfi\bb@ifnull#1\@nil#2\@nil#3\bb@afterelse\bb@afterfi\bb@ifnull#1\@nil#2\@nil#3\bb@afterelse\bb@afterfi\bb@ifnull#1\@nil#2\@nil#3\bb@afterelse\bb@afterfi\bb@ifnull#1\@nil#2\@nil#3\bb@afterelse\bb@afterfi}
For each element in the comma separated `<key>=<value>` list, execute `<code>` with #1 and #2 as the key and the value of current item (trimmed). In addition, the item is passed verbatim as #3. With the `<key>` alone, it passes `\empty` (ie, the macro thus named, not an empty argument, which is what you get with `<key>=` and no value).

```
77 \def\bbl@forkv#1#2{%  
78 \def\bbl@kvcmd##1##2##3{#2}%  
79 \bbl@kvnext#1,\@nil,}%  
80 \ifx\@nil#1\relax\else  
81 \bbl@ifblank{#1}{}{\bbl@forkv@eq#1=\@empty=\@nil{#1}}%  
82 \expandafter\bbl@kvnext  
83 \fi}%  
84 \def\bbl@forkv@eq#1=#2=#3\@nil#4{%  
85 \bbl@trim@def\bbl@forkv@a{#1}  
86 \bbl@trim\expandafter\bbl@kvcmd\expandafter{\bbl@forkv@a}#2}{#4}%
```

A `for` loop. Each item (trimmed), is #1. It cannot be nested (it's doable, but we don't need it).

```
88 \def\bbl@vforeach#1#2{%  
89 \def\bbl@forcmd##1{#2}%  
90 \bbl@fornext#1,\@nil,}%  
91 \def\bbl@fornext#1,{%  
92 \ifx\@nil#1\relax\else  
93 \bbl@ifblank{#1}{}{\bbl@trim\bbl@forcmd{#1}}%  
94 \expandafter\bbl@fornext  
95 \fi}%  
96 \def\bbl@foreach#1{\expandafter\bbl@vforeach\expandafter{#1}}%  
```

\bbl@replace Returns implicitly \toks@ with the modified string.

```
97 \def\bbl@replace#1#2#3{% in #1 -> repl #2 by #3  
98 \toks@{%  
99 \def\bbl@replace@aux##1#2##2#2{%  
100 \ifx\bbl@nil##2%  
101 \toks@\expandafter{\the\toks@##1}{}  
102 \else  
103 \toks@\expandafter{\the\toks@##1#3}  
104 \bbl@afterfi  
105 \bbl@replace@aux{##2#2}%  
106 \fi}%  
107 \expandafter\bbl@replace@aux{##1#2}{\bbl@nil#2}%  
108 \edef#1{\the\toks@{}{}%}
```

An extension to the previous macro. It takes into account the parameters, and it is string based (ie, if you replace `relax` by `ho`, then `re*ax` becomes `rho`). No checking is done at all, because it is not a general purpose macro, and it is used by babel only when it works (an example where it does not work is in `\bbl@TG@@date`, and also fails if there are macros with spaces, because they are retokenized). It may change! (or even merged with \bbl@replace; I'm not sure checking the replacement is really necessary or just paranoia).

```
109 \ifx\detokenize\@undefined\else % Unused macros if old Plain TeX  
110 \bbl@exp{\def{\\bbl@parsedef##1\detokenize{macro:}}#2->#3}{#4}{%  
111 \def\bbl@tempa{#1}  
112 \def\bbl@tempb{#2}  
113 \def\bbl@tempc{#3}}  
114 \def\bbl@replace#1#2#3{%  
115 \begingroup  
116 \expandafter\bbl@parsedef\meaning#1\relax  
117 \def\bbl@tempa{%  
118 \edef\bbl@tempc{% in \bbl@tempa, do nothing  
119 \edef\bbl@tempd{% in \bbl@tempd, do nothing  
120 \edef\bbl@tempc{%  
121 \edef\bbl@tempd{% in \bbl@tempd, do nothing  
122 \edef\bbl@tempc{% in \bbl@tempc, do nothing  
123 \edef\bbl@tempc{% in \bbl@tempc, do nothing  
124 \edef\bbl@tempc{% Expanding an executed below as 'uplevel'
```

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Two further tools. \bbl@ifsamestring first expands its arguments and then compare their expansion (sanitized, so that the catcodes do not matter). \bbl@engine takes the following values: 0 is pdfTeX, 1 is luatex, and 2 is xetex. You may use the latter in your language style if you want.

A somewhat hackish tool (hence its name) to avoid spurious spaces in some contexts.

Another hackish tool, to apply case changes inside a protected macros. It's based on the internal \let's made by \MakeUpperCase and \MakeLowercase between things like \oe and \OE.

An alternative to \IfFormatAtLeastTF for old versions. Temporary.
The following adds some code to \extras... both before and after, while avoiding doing it twice. It's somewhat convoluted, to deal with \#'s. Used to deal with alph, Alph and french spacing when there are already changes (with \bbl@save).

\def\bbl@extras@wrap#1#2#3{% 1:in-test, 2:before, 3:after
\toks@\expandafter\expandafter\expandafter{\csname extras\languagename\endcsname}\bbl@exp{\\in@{#1}{\the\toks@}}\ifin@\else\@temptokena{#2}\edef\bbl@tempc{\the\@temptokena\the\toks@}\toks@\expandafter{\bbl@tempc#3}\expandafter\edef\csname extras\languagename\endcsname{\the\toks@}\fi}

\let\bbl@ifformatlater\IfFormatAtLeastTF
\def\bbl@ifformatlater{\@ifl@t@r\fmtversion}

Some files identify themselves with a \LaTeX\ macro. The following code is placed before them to define (and then undefine) if not in \LaTeX..

\def\bbl@extras@wrap#1#2#3{% 1:in-test, 2:before, 3:after
\toks@\expandafter\expandafter\expandafter{\csname extras\languagename\endcsname}\bbl@exp{\\in@{#1}{\the\toks@}}\ifin@\else\@temptokena{#2}\edef\bbl@tempc{\the\@temptokena\the\toks@}\toks@\expandafter{\bbl@tempc#3}\expandafter\edef\csname extras\languagename\endcsname{\the\toks@}\fi}

6.1 Multiple languages

\language Plain \TeX\ version 3.0 provides the primitive \language that is used to store the current language. When used with a pre-3.0 version this function has to be implemented by allocating a counter. The following block is used in switch.def and hyphen.cfg; the latter may seem redundant, but remember babel doesn't requires loading switch.def in the format.

\countdef\last@language=19
\def\addlanguage{\csname newlanguage\endcsname}

Now we make sure all required files are loaded. When the command \AtBeginDocument doesn't exist we assume that we are dealing with a plain-based format. In that case the file plain.def is needed (which also defines \AtBeginDocument, and therefore it is not loaded twice). We need the first part when the format is created, and \orig@dump is used as a flag. Otherwise, we need to use the second part, so \orig@dump is not defined (plain.def undefines it).

Check if the current version of switch.def has been previously loaded (mainly, hyphen.cfg). If not, load it now. We cannot load babel\_.def here because we first need to declare and process the package options.
6.2 The Package File (\LaTeX, babel.sty)

Start with some “private” debugging tool, and then define macros for errors.

\@ifpackagewith{babel}{debug}{
\providecommand\bbl@trace[1]{\message{\[ #1 \]}}% 
\let\bbl@debug\@firstofone
\ifx\directlua\@undefined\else
\directlua{ Babel = Babel or {}
Babel.debug = true }%
\input{babel-debug.tex}%
\fi}
\@ifpackagewith{babel}{silent}{
\let\bbl@info\@gobble
\let\bbl@infowarn\@gobble
\let\bbl@warning\@gobble}
\def\AfterBabelLanguage#1{\global\expandafter\bbl@add\csname#1.ldf-h@@k\endcsname}

If the format created a list of loaded languages (in \bbl@languages), get the name of the 0-th to show the actual language used. Also available with base, because it just shows info.

\ifx\bbl@languages\@undefined\else
\catcode\^^I=12
\@ifpackagewith{babel}{showlanguages}{%
\global\expandafter\bbl@add\csname#1.ldf-h@@k\endcsname}%
\@ifpackagewith{babel}{showlanguages}{%
\@ifpackagewith{babel}{showlanguages}{%
6.3 base

The first ‘real’ option to be processed is base, which sets the hyphenation patterns and then resets \texttt{ver@babel.sty} so that \LaTeX will forget about the first loading. After a subset of babel.def has been loaded (the old switch.def) and \texttt{\AfterBabelLanguage} defined, it exits.

Now the base option. With it we can define (and load, with \texttt{luatex}) hyphenation patterns, even if we are not interested in the rest of babel.

6.4 key=value options and other general option

The following macros extract language modifiers, and only real package options are kept in the option list. Modifiers are saved and assigned to \texttt{\BabelModifiers} at \texttt{\bbl@load@language}; when no modifiers have been given, the former is \texttt{\relax}. How modifiers are handled are left to language styles; they can use \texttt{\in@}, loop them with \texttt{\@for} or load keyval, for example.
The next option tells babel to leave shorthand characters active at the end of processing the package. This is not the default as it can cause problems with other packages, but for those who want to use the shorthand characters in the preamble of their documents this can help.

Handling of package options is done in three passes. (I am not very happy with the idea, anyway.) The first one processes options which has been declared above or follow the syntax `<key>=<value>`, the second one loads the requested languages, except the main one if set with the key `main`, and the third one loads the latter. First, we “flag” valid keys with a nil value.

The following tool is defined temporarily to store the values of options.

Now the option list is processed, taking into account only currently declared options (including those declared with `=`), and `<key>=<value>` options (the former take precedence). Unrecognized options are saved in `\bbl@language@opts`, because they are language options.
Now we finish the first pass (and start over).

\ProcessOptions*
\ifx\bbl@opt@provide\@nnil
\let\bbl@opt@provide\@empty % %%% MOVE above
\else
\chardef\bbl@iniflag\@ne
\bbl@exp{\bbl@forkv{\@nameuse{@raw@opt@babel.sty}}}{{%
\in@{,provide,}{,#1,}%
\ifin@
\def\bbl@opt@provide{#2}%
\bbl@replace\bbl@opt@provide{;}{,}%
\fi}
\fi
% 6.5 Conditional loading of shorthands
If there is no shorthands=<chars>, the original babel macros are left untouched, but if there is, these macros are wrapped (in babel.def) to define only those given. A bit of optimization: if there is no shorthands=, then \bbl@ifshorthand is always true, and it is always false if shorthands is empty. Also, some code makes sense only with shorthands=...\bbl@trace{Conditional loading of shorthands}
\def\bbl@sh@string#1{%
\ifx#1\@empty\else
\ifx#1t\string~%
\else\ifx#1c\string,%
\else\string#1%
\fi\fi
\expandafter\bbl@sh@string
\fi}
\ifx\bbl@opt@shorthands\@nnil
\def\bbl@ifshorthand#1#2#3{#2}%
\else\ifx\bbl@opt@shorthands\@empty
\def\bbl@ifshorthand#1#2#3{#3}%
\else
The following macro tests if a shorthand is one of the allowed ones.
\def\bbl@ifshorthand{%
\bbl@xin@\string#1\string}{\bbl@opt@shorthands}%
\ifin@
\expandafter@firstoftwo
\else
\expandafter@secondoftwo
\fi}
\edef\bbl@opt@shorthands{%
\expandafter\bbl@sh@string\bbl@opt@shorthands\@empty}%
\else
The following is ignored with shorthands=off, since it is intended to take some aditional actions for certain chars.
\bbl@ifshorthand{'}% {(\PassOptionsToPackage{activeacute}{babel})}%
\bbl@ifshorthand{% (\PassOptionsToPackage{activegrave}{babel})}%
\fi
With `headfoot=lang` we can set the language used in heads/foots. For example, in babel/3796 just adds `headfoot=english` but it misuses `\resetactivechars` but seems to work.

```latex
\ifx\bbl@opt@headfoot\@nnil\else
  \g@addto@macro\@resetactivechars{%
    \set@typeset@protect
    \expandafter\select@language@x\expandafter{\bbl@opt@headfoot}%
    \let\protect\noexpand
  }\fi
```

For the option `safe` we use a different approach – `\bbl@opt@safe` says which macros are redefined (B for bibs and R for refs). By default, both are currently set, but in a future release it will be set to `none`.

```latex
\ifx\bbl@opt@safe\@undefined
  \def\bbl@opt@safe{BR}
  % \let\bbl@opt@safe\@empty % Pending of \cite
\fi
```

For layout an auxiliary macro is provided, available for packages and language styles. Optimization: if there is no layout, just do nothing.

```latex
\bbl@trace{Defining IfBabelLayout}
\ifx\bbl@opt@layout\@nnil
  \newcommand\IfBabelLayout[3]{#3}%
\else
  \newcommand\IfBabelLayout[1]{%\input{.#1.}{\bbl@opt@layout.}%
  \ifin@
    \expandafter\@firstoftwo
  \else
    \expandafter\@secondoftwo
  \fi}
\fi
```

```latex
\langle\text{/package}\rangle
\langle\ast\text{core}\rangle
```

### 6.6 Interlude for Plain

Because of the way docstrip works, we need to insert some code for Plain here. However, the tools provided by the babel installer for literate programming makes this section a short interlude, because the actual code is below, tagged as `Emulate\LaTeX`.

```latex
\ifa\ldf@quit\@undefined\else
  \endinput\fi \langle\text{/package}\rangle
```

```latex
\langle\ast\text{package | core}\rangle
```

## 7 Multiple languages

This is not a separate file (switch.def) anymore.

Plain \TeX{} version 3.0 provides the primitive `\language` that is used to store the current language. When used with a pre-3.0 version this function has to be implemented by allocating a counter.

```latex
\def\bbl@version{\langle\text{version}\rangle}
\def\bbl@date{\langle\text{date}\rangle}
\langle\text{Define core switching macros}\rangle
```
\addialect The macro \addialect can be used to add the name of a dialect or variant language, for which an already defined hyphenation table can be used.

\begin{verbatim}
def\addialect#1#2{% 
global\chardef#1#2\relax 
\bbl@usehooks{addialect}{{#1}{#2}}% 
\begingroup 
 \count@#1\relax 
 \def\bbl@elt##1##2##3##4{% 
 \ifnum\count@=##2\relax 
 \edef\bbl@tempa{\expandafter\@gobbletwo\string#1} 
 \bbl@info{Hyphen rules for \expandafter{\string\csname l@##1\endcsname} 
% (\string\language\the\count@). Reported} 
 \def\bbl@elt####1####2####3####4{\relax} 
 \fi} 
 \bbl@cs{languages} 
 \endgroup}
\end{verbatim}

\\bbl@iflanguage\ executes code only if the language \l@ exists. Otherwise raises an error.
The argument of \bbl@fixname has to be a macro name, as it may get “fixed” if casing (lc/uc) is
wrong. It's an attempt to fix a long-standing bug when \foreignlanguage and the like appear in a
\MakeXXXcase. However, a lowercase form is not imposed to improve backward compatibility
(perhaps you defined a language named \MYLANG, but unfortunately mixed case names cannot be
trapped). Note \l@ is encapsulated, so that its case does not change.

\begin{verbatim}
def\bbl@fixname#1{% 
\begingroup 
 \def\bbl@tempe{l@} 
 \edef\bbl@tempd{\noexpand\@ifundefined{\noexpand\bbl@tempe#1}} 
 \bbl@tempd 
 \{\lowercase\expandafter{\bbl@tempd} 
 \{\uppercase\expandafter{\bbl@tempd} 
 \@empty 
 \{\edef\bbl@tempd{\def\noexpand#1{#1}} 
 \uppercase\expandafter{\bbl@tempd} \relax 
 \} 
 \@empty 
 \{\edef\bbl@tempd{\endgroup\def\noexpand#1{#1}} 
 \bbl@tempd 
 \bbl@exp{\\bbl@usehooks{languages}{\\language}{\#1}}} 
 \def\bbl@iflanguage#1{% 
 \@ifundefined{l@#1}{\@nolanerr{#1}\@gobble}\@firstofone
\endgroup 
\end{verbatim}

After a name has been ‘fixed’, the selectors will try to load the language. If even the fixed name is not
defined, will load it on the fly, either based on its name, or if activated, its BCP47 code.
We first need a couple of macros for a simple BCP 47 look up. It also makes sure, with \bbl@bcpcase,
casing is the correct one, so that sr-latn-ba becomes fr-Latn-BA. Note #4 may contain some \@empty's,
but they are eventually removed. \bbl@bcplookup either returns the found ini or it is \relax.

\begin{verbatim}
def\bbl@bcpcase#1#2#3#4\@@#5{% 
 \ifx\@empty#3\% 
 \uppercase{\def#5{#1#2}} 
 \else 
 \uppercase{\def#5{#1}} 
 \lowercase{\edef#5{#5#2#3#4}} 
 \fi} 
\def\bbl@bcplookup#1-#2-#3-#4\@@{ 
 \let\bbl@bcpl=relax 
 \lowercase{\def\bbl@tempa{#1}} 
 \ifx\@empty#2\% 
 \ifFileExists{babel-l\bbl@tempa.ini}{\let\bbl@bcpl=bbl@bcpl} 
 \else\ifx\@empty#3\% 
 \bbl@bcpcase#2\empty\@empty@#bbl@tempb 
 \ifFileExists{babel-l\bbl@tempa-#bbl@tempb.ini} 
\end{verbatim}

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Users might want to test (in a private package for instance) which language is currently active. For this we provide a test macro, \iflanguage, that has three arguments. It checks whether the first argument is a known language. If so, it compares the first argument with the value of \language.
Then, depending on the result of the comparison, it executes either the second or the third argument.

```latex
\def\iflanguage#1{\bbl@iflanguage{#1}{\ifnum\csname l@#1\endcsname=\language\expandafter\@firstoftwo\else\expandafter\@secondoftwo\fi}}
```

7.1 Selecting the language

The macro `\selectlanguage` checks whether the language is already defined before it performs its actual task, which is to update `\language` and activate language-specific definitions.

```latex
\let\bbl@select@type\z@ \edef\selectlanguage{\noexpand\protect\csname selectlanguage \endcsname}
```

Because the command `\selectlanguage` could be used in a moving argument it expands to `\protect\selectlanguage␣`. Therefore, we have to make sure that a macro `\protect` exists. If it doesn’t it is `\let` to `\relax`.

```latex
\ifx\@undefined\protect\let\protect\relax\fi
```

The following definition is preserved for backwards compatibility (e.g., arabic, koma). It is related to a trick for 2.09, now discarded.

```latex
\let\xstring\string
```

Since version 3.5 babel writes entries to the auxiliary files in order to typeset table of contents etc. in the correct language environment.

```latex
\bbl@pop@language
```

But when the language change happens inside a group the end of the group doesn’t write anything to the auxiliary files. Therefore we need TeX’s `\aftergroup` mechanism to help us. The command `\aftergroup` stores the token immediately following it to be executed when the current group is closed. So we define a temporary control sequence `\bbl@pop@language` to be executed at the end of the group. It calls `\bbl@set@language` with the name of the current language as its argument.

```latex
\bbl@language@stack
```

The previous solution works for one level of nesting groups, but as soon as more levels are used it is no longer adequate. For that case we need to keep track of the nested languages using a stack mechanism. This stack is called `\bbl@language@stack` and initially empty.

```latex
\def\bbl@language@stack{}
```

When using a stack we need a mechanism to push an element on the stack and to retrieve the information afterwards.

```latex
\bbl@push@language \bbl@pop@language
```

The stack is simply a list of language names, separated with a ‘+’ sign; the push function can be simple:

```latex
\def\bbl@push@language{% \ifeq\languagename\undefined\else \ifeq\currentgrouplevel\undefined \xdef\bbl@language@stack{\languagename+\bbl@language@stack}\else \ifeq\currentgrouplevel\z@ \xdef\bbl@language@stack{\languagename+}\else \xdef\bbl@language@stack{\languagename+\bbl@language@stack}\fi\fi\fi\fi\fi
```

Retrieving information from the stack is a little bit less simple, as we need to remove the element from the stack while storing it in the macro `\languagename`. For this we first define a helper function.

73
\bbl@pop@lang  This macro stores its first element (which is delimited by the ‘+’-sign) in \languagename and stores the rest of the string in \bbl@language@stack.

573 \def\bbl@pop@lang#1+#2\@@{%  
574 \edef\languagename{#1}  
575 \xdef\bbl@language@stack{#2}  
}

The reason for the somewhat weird arrangement of arguments to the helper function is the fact it is called in the following way. This means that before \bbl@pop@lang is executed \TeX first expands the stack, stored in \bbl@language@stack. The result of that is that the argument string of \bbl@pop@lang contains one or more language names, each followed by a ‘+’-sign (zero language names won’t occur as this macro will only be called after something has been pushed on the stack).

576 \let\bbl@ifrestoring\@secondoftwo  
577 \def\bbl@pop@language{%  
578 \expandafter\bbl@pop@lang\bbl@language@stack\@@  
579 \let\bbl@ifrestoring\@firstoftwo  
580 \expandafter\bbl@set@language\expandafter{\languagename}%  
581 \let\bbl@ifrestoring\@secondoftwo%

Once the name of the previous language is retrieved from the stack, it is fed to \bbl@set@language to do the actual work of switching everything that needs switching.

An alternative way to identify languages (in the babel sense) with a numerical value is introduced in 3.30. This is one of the first steps for a new interface based on the concept of locale, which explains the name of \localeid. This means \l@... will be reserved for hyphenation patterns (so that two locales can share the same rules).

582 \chardef\localeid\z@  
583 \def\bbl@id@last{0} % No real need for a new counter  
584 \def\bbl@id@assign{%  
585 \iffalse Babel or {}  
586 \edef\bbl@id@assign{%  
587 \bbl@ifunset{bbl@id\@\languagename}{}  
588 \bbl@csarg\chardef{id\@\languagename}\count@  
589 \edef\bbl@id@last{\the\count@}  
590 \ifcase\bbl@engine\or  
591 \directlua{  
592 Babel = Babel or {}  
593 Babel.locale_props = Babel.locale_props or {}  
594 Babel.locale_props[\bbl@id@last] = {}  
595 Babel.locale_props[\bbl@id@last].name = '\languagename'  
596 }%  
597 \fi}%  
598 }%  
599 \chardef\localeid\bbl@cl{id@}}

The unprotected part of \selectlanguage.

600 \expandafter\def\csname selectlanguage \endcsname#1{%  
601 \ifnum\bbl@hymapsel=\@cclv\let\bbl@hymapsel=\tw@\fi  
602 \bbl@push@language  
603 \aftergroup\bbl@pop@language  
604 \bbl@set@language{#1}  
}

\bbl@set@language  The macro \bbl@set@language takes care of switching the language environment and of writing entries on the auxiliary files. For historical reasons, language names can be either language of \language. To catch either form a trick is used, but unfortunately as a side effect the catcodes of letters in \languagename are messed up. This is a bug, but preserved for backwards compatibility. The list of auxiliary files can be extended by redefining \BabelContentsFiles, but make sure they are loaded inside a group (as aux, toc, lof, and lot do) or the last language of the document will remain active afterwards.

We also write a command to change the current language in the auxiliary files. \bbl@savelastskip is used to deal with skips before the write whatsit (as suggested by U Fischer). Adapted from hyperref, but it might fail, so I’ll consider it a temporary hack, while I study other options (the ideal, but very likely unfeasible except perhaps in luatex, is to avoid the \write altogether when not needed).
\def\BabelContentsFiles{toc,lof,lot}
\def\bbl@set@language#1{% from selectlanguage, pop@
% The old buggy way. Preserved for compatibility.
\edef\languagename{%
\ifnum\escapechar=\expandafter`\string#1\@empty
\else\string#1\@empty\fi%
\ifcat\relax\noexpand#1%
\edef\languagename{\ifnum\escapechar=\expandafter`\string#1\@empty
\else\string#1\@empty\fi}%
\if\scantokens\@undefined
\def\localename{??}%
\else
\scantokens\expandafter{\expandafter
\def\expandafter\localename\expandafter{\languagename}}%
\fi
\else
\def\localename{#1}% This one has the correct catcodes
\fi
\select@language{\languagename}%
% write to auxs
\expandafter\ifx\csname date\languagename\endcsname\relax\else
\bbl@savelastskip
\protected@write\@auxout{}{\string\babel@aux{\bbl@auxname}{}}%
\bbl@restorelastskip
\fi
\bbl@usehooks{write}{}
\fi
\fi
\def\localename{#1}% This one has the correct catcodes
\fi
\select@language{\languagename}%
% write to auxs
\expandafter\ifx\csname date\languagename\endcsname\relax\else
\bbl@savelastskip
\protected@write\@auxout{}{\string\babel@aux{\bbl@auxname}{}}%
\bbl@restorelastskip
\fi
\bbl@usehooks{write}{}
\fi
\fi
\newif\iffbbl@bcpallowed
\bbl@bcpallowedfalse
\def\select@language#1{% from set@, babel@aux
\if\scantokens\@undefined
\def\localename{select}%
% set hymap
\fi
\else
\bb@bcpallowedfalse
\def\select@language#1{% from set@, babel@aux
\if\scantokens\@undefined
\def\localename{select}%
% set hymap
\fi
\else
\bb@bcpallowedfalse
\def\select@language#1{% from set@, babel@aux
\if\scantokens\@undefined
\def\localename{select}%
% set hymap
\fi
\else
\bb@bcpallowedfalse
\def\select@language#1{% from set@, babel@aux
\if\scantokens\@undefined
\def\localename{select}%
% set hymap
\fi
\else
\bb@bcpallowedfalse
\def\select@language#1{% from set@, babel@aux
\if\scantokens\@undefined
\def\localename{select}%
% set hymap
\fi
\else
\bb@bcpallowedfalse
\def\select@language#1{% from set@, babel@aux
\if\scantokens\@undefined
\def\localename{select}%
% set hymap
\fi
\else
\bb@bcpallowedfalse
\def\select@language#1{% from set@, babel@aux
\if\scantokens\@undefined
\def\localename{select}%
% set hymap
\fi
\else
\bb@bcpallowedfalse
\def\select@language#1{% from set@, babel@aux
\if\scantokens\@undefined
\def\localename{select}%
% set hymap
\fi
\else
\bb@bcpallowedfalse
\def\select@language#1{% from set@, babel@aux
\if\scantokens\@undefined
\def\localename{select}%
% set hymap
\fi
\else
\bb@bcpallowedfalse
\def\select@language#1{% from set@, babel@aux
\if\scantokens\@undefined
\def\localename{select}%
% set hymap
\fi
\else
\bb@bcpallowedfalse
\def\select@language#1{% from set@, babel@aux
\if\scantokens\@undefined
\def\localename{select}%
% set hymap
\fi
\else
\bb@bcpallowedfalse
\def\select@language#1{% from set@, babel@aux
\if\scantokens\@undefined
\def\localename{select}%
% set hymap
\fi
\else
\bb@bcpallowedfalse
\def\select@language#1{% from set@, babel@aux
\if\scantokens\@undefined
\def\localename{select}%
% set hymap
\fi
\else
\bb@bcpallowedfalse
\def\select@language#1{% from set@, babel@aux
\if\scantokens\@undefined
\def\localename{select}%
% set hymap
\fi
\else
\bb@bcpallowedfalse
\def\select@language#1{% from set@, babel@aux
\if\scantokens\@undefined
\def\localename{select}%
% set hymap
\fi
\else
\bb@bcpallowedfalse
\} (Unknown language '\languagename'. Either you have\%
misspelled its name, it has not been installed,\%
or you requested it in a previous run. Fix its name,\%
install it or just rerun the file, respectively. In\%
some cases, you may need to remove the aux file)%
First, check if the user asks for a known language. If so, update the value of \language and call \originalTeX to bring \TeX in a certain pre-defined state.

The name of the language is stored in the control sequence \languagename.

Then we have to redefine \originalTeX to compensate for the things that have been activated. To save memory space for the macro definition of \originalTeX, we construct the control sequence name for the \csname noextras\langle lang\rangle\endcsname command at definition time by expanding the \languagename primitive.

Now activate the language-specific definitions. This is done by constructing the names of three macros by concatenating three words with the argument of \selectlanguage, and calling these macros.

The switching of the values of \lefthyphenmin and \righthyphenmin is somewhat different. First we save their current values, then we check if \langle lang\rangle\hyphenmins is defined. If it is not, we set default values (2 and 3), otherwise the values in \langle lang\rangle\hyphenmins will be used.
otherlanguage (env.)  The otherlanguage environment can be used as an alternative to using the \selectlanguage declarative command. When you are typesetting a document which mixes left-to-right and right-to-left typesetting you have to use this environment in order to let things work as you expect them to. The \ignorespaces command is necessary to hide the environment when it is entered in horizontal mode.

otherlanguage{%}

\long\def\otherlanguage#1{%
  \def\bbl@selectorname{other}%
  \ifnum\bbl@hymapsel=\@cclv\let\bbl@hymapsel=\thr@@\fi
  \csname selectlanguage \endcsname{#1}%
%}

\long\def\endotherlanguage{%
  \ignorespaces}

The \endotherlanguage part of the environment tries to hide itself when it is called in horizontal mode.
The \otherlanguage environment is meant to be used when a large part of text from a different language needs to be typeset, but without changing the translation of words such as 'figure'. This environment makes use of \foreign@language.

\beginotherlanguage The \otherlanguage* environment is another substitute for the \selectlanguage command. This command takes two arguments, the first argument is the name of the language to use for typesetting the text specified in the second argument. Unlike \selectlanguage this command doesn’t switch everything; it only switches the hyphenation rules and the extra definitions for the language specified. It does this within a group and assumes the \extras⟨lang⟩ command doesn’t make any global changes. The coding is very similar to part of \selectlanguage.

\begin foreignlanguage* is a temporary, experimental macro for a few lines with a different script direction, while preserving the paragraph format (thank the braces around \par, things like \hangindent are not reset). Do not use it in production, because its semantics and its syntax may change (and very likely will, or even it could be removed altogether). Currently it enters in vmode and then selects the language (which in turn sets the paragraph direction).

(3.11) Also experimental are the hook foreign and foreign*. With them you can redefine \BabelText which by default does nothing. Its behavior is not well defined yet. So, use it in horizontal mode only if you do not want surprises.

In other words, at the beginning of a paragraph \foreignlanguage enters into hmode with the surrounding lang, and with \foreignlanguage* with the new lang.

\end foreignlanguage*
\textbf{\texttt{foreign@language}} This macro does the work for \texttt{\texttt{foreign@language}} and the other \texttt{\texttt{language*}} environment. First we need to store the name of the language and check that it is a known language. Then it just calls \texttt{\texttt{bbl@switch}}.

\begin{verbatim}
\def\textbf{foreign@language#1}{%
  % set name
  \edef\languagename{#1}%
  \ifbbl@usedategroup
    \bbl@add\bbl@select@opts{,date,}%
  \fi
  \bbl@fixname\languagename
  % TODO. name@map here?
  \bbl@provide@locale
  \bbl@iflanguage\languagename{%  
    % TODO - why a warning, not an error?
    \expandafter\ifx\csname date\languagename\endcsname\relax
      \bbl@warning
        {Unknown language '#1'. Either you have\%
         misspelled its name, it has not been installed,\%
         or you requested it in a previous run. Fix its name,\%
         install it or just rerun the file, respectively. In\%
         some cases, you may need to remove the aux file.\%
         I'll proceed, but expect wrong results.\%
         Reported}%
    \fi
    % set type
    \let\bbl@select@type\@ne
    \expandafter\bbl@switch\expandafter{\languagename}}%
}
\end{verbatim}

The following macro executes conditionally some code based on the selector being used.

\begin{verbatim}
\def\textbf{IfBabelSelectorTF#1}{%
  \bbl@xin{,\bbl@selectorname,}{,\zap@space#1 \@empty,}%
  \ifin@
    \expandafter\@firstoftwo
  \else
    \expandafter\@secondoftwo
  \fi
  \expandafter\@secondoftwo
  \expandafter\@firstoftwo
}\end{verbatim}

\textbf{\texttt{bbl@patterns}} This macro selects the hyphenation patterns by changing the \texttt{\texttt{language}} register. If special hyphenation patterns are available specifically for the current font encoding, use them instead of the default. It also sets hyphenation exceptions, but only once, because they are global (here language \texttt{lccode}s has been set, too). \texttt{\texttt{bbl@hyphenation}} is set to relax until the very first \texttt{\texttt{babelhyphenation}}, so do nothing with this value. If the exceptions for a language (by its number, not its name, so that :ENC is taken into account) has been set, then use \texttt{\texttt{hyphenation}} with both global and language exceptions and empty the latter to mark they must not be set again.
\begin{verbatim}
% > luatex \ifundefined{bbl@hyphenation@}{% Can be \relax!
  \begingroup
  \bbl@xin@{,\number\language,@}{,\bbl@hyphlist}%
  \ifin@
    \@expandtwoargs\bbl@usehooks{hyphenation}{{#1}{\bbl@tempa}}%
  \hyphenation{%
    \bbl@hyphenation@
    \@ifundefined{bbl@hyphenation@#1}%
      \@empty
    {\csname bbl@hyphenation@#1\endcsname}}%
  \xdef\bbl@hyphlist{\bbl@hyphlist\number\language,}%
  \fi
  \endgroup}%

\hyphenrules (env.) The environment \texttt{hyphenrules} can be used to select \emph{just} the hyphenation rules. This environment does not change \texttt{\language} and when the hyphenation rules specified were not loaded it has no effect. Note however, \texttt{\lccode}s and font encodings are not set at all, so in most cases you should use \texttt{otherlanguage*}.

\begin{verbatim}
\def\hyphenrules#1{%
  \edef\bbl@tempf{#1}%
  \bbl@fixname\bbl@tempf
  \bbl@iflanguage\bbl@tempf{%\expandafter\bbl@patterns\expandafter{\bbl@tempf}%
    \ifx\languageshorthands\@undefined\else
      \languageshorthands{none}%
    \fi
    \expandafter\ifx\csname\bbl@tempf hyphenmins\endcsname\relax
      \set@hyphenmins\tw@\thr@@\relax
    \else
      \expandafter\expandafter\expandafter\set@hyphenmins
        \csname\bbl@tempf hyphenmins\endcsname\relax
    \fi
  }\endgroup

\let\endhyphenrules\@empty
\providehyphenmins The macro \texttt{\providehyphenmins} should be used in the language definition files to provide a \emph{default} setting for the hyphenation parameters \texttt{\left\hyphenmin} and \texttt{\right\hyphenmin}. If the macro \texttt{\langle lang\rangle\hyphenmins} is already defined this command has no effect.

\begin{verbatim}
\def\providehyphenmins#1#2{%
  \expandafter\ifx\csname#1\hyphenmins\endcsname\@undefined\else
    \@namedef{#1\hyphenmins}{#2}%
  \fi
}
\set@hyphenmins This macro sets the values of \texttt{\left\hyphenmin} and \texttt{\right\hyphenmin}. It expects two values as its argument.

\begin{verbatim}
\def\set@hyphenmins#1#2{%
  \left\hyphenmin#1\relax
  \right\hyphenmin#2\relax}
\ProvidesLanguage The identification code for each file is something that was introduced in \LaTeX2ε. When the command \texttt{\ProvidesFile} does not exist, a dummy definition is provided temporarily. For use in the language definition file the command \texttt{\ProvidesLanguage} is defined by babel.

\begin{verbatim}
\ifx\ProvidesFile\@undefined
  \\wlog{Language: \#1 [\#2 \#3 \#4]}%
  \\log{Language: \#1 \#4 \#3 <\#2>}%
\else
  \def\ProvidesLanguage#1{%
    \begingroup
    \catcode\ 10 %
    \def\ProvidesLanguage##1[##2 ##3 ##4]{%}
    \\@makeother\/%
\end{verbatim}

\end{verbatim}
\end{verbatim}
\end{verbatim}

80
The macro \originalTeX should be known to \TeX at this moment. As it has to be expandable we let it to \@empty instead of \relax.

Because this part of the code can be included in a format, we make sure that the macro which initializes the save mechanism, \@bbl@beginsave, is not considered to be undefined.

A few macro names are reserved for future releases of babel, which will use the concept of ‘locale’:

7.2 Errors

\@nolanerr The babel package will signal an error when a document tries to select a language that hasn’t been defined earlier. When a user selects a language for which no hyphenation patterns were loaded into the format he will be given a warning about that fact. We revert to the patterns for \language=0 in that case. In most formats that will be (US)english, but it might also be empty.

\@nopatterns When the package was loaded without options not everything will work as expected. An error message is issued in that case.

When the format knows about \PackageError it must be \LaTeX, so we can safely use its error handling interface. Otherwise we’ll have to ‘keep it simple’.

Infos are not written to the console, but on the other hand many people think warnings are errors, so a further message type is defined: an important info which is sent to the console.
\bbl@error
{You haven't defined the language '#1' yet.\%
Perhaps you misspelled it or your installation\%
is not complete}%
{Your command will be ignored, type <return> to proceed}%
\def\@nopatterns#1{%
\bbl@warning
{No hyphenation patterns were preloaded for\%
the language '#1' into the format.\%
Please, configure your TeX system to add them and\%
rebuild the format. Now I will use the patterns\%
preloaded for \bbl@nulllanguage\space instead}}
\let\bbl@usehooks\@gobbletwo
\ifx\bbl@onlyswitch\@empty\endinput\fi
% Here ended switch.def
Here ended the now discarded switch.def. Here also (currently) ends the base option.
\ifx\directlua\@undefined\else
\ifx\bbl@luapatterns\@undefined
\input luababel.def
\fi
\fi
⟨⟨Basic macros⟩⟩
\bbl@trace{Compatibility with language.def}
\ifx\bbl@languages\@undefined
\ifx\directlua\@undefined
\openin1 = language.def % TODO. Remove hardcoded number
\ifeof1
\closein1
\message{I couldn't find the file language.def}
\else
\closein1
\begingroup
\def\addlanguage#1#2#3#4#5{%
\expandafter\ifx\csname lang@#1\endcsname\relax\else
\global\expandafter\let\csname l@#1\expandafter\endcsname
\csname lang@#1\endcsname
\fi}%
\def\uselanguage#1{}%
\input language.def
\endgroup
\fi
\fi
\chardef\l@english\z@
\fi
\addto It takes two arguments, a ⟨control sequence⟩ and \TeX-code to be added to the ⟨control sequence⟩. If the ⟨control sequence⟩ has not been defined before it is defined now. The control sequence could also expand to \relax, in which case a circular definition results. The net result is a stack overflow. Note there is an inconsistency, because the assignment in the last branch is global.
\def\addto#1#2{%
\ifx#1\@undefined
\def#1{#2}%
\else
\ifx#1\relax
\def#1{#2}%
\else
\toks@\expandafter{#1#2}%
\edef#1{\the\toks@}}%
\fi
\fi
\chardef\l@english\z@
\fi
\addto

The macro \initiate@active@char below takes all the necessary actions to make its argument a
shorthand character. The real work is performed once for each character. But first we define a little tool. TODO. Always used with additional expansions. Move them here? Move the macro to basic?

\def\bbl@withactive#1{%
  \begingroup
  \lccode`~=#2\relax
  \lowercase{\endgroup#1~}}

\bbl@redefine To redefine a command, we save the old meaning of the macro. Then we redefine it to call the original macro with the ‘sanitized’ argument. The reason why we do it this way is that we don’t want to redefine the \TeX{} macros completely in case their definitions change (they have changed in the past). A macro named \texttt{macro} will be saved new control sequences named \texttt{org\textbackslash macro}.

\def\bbl@redefine#1{%
  \edef\bbl@tempa{\bbl@stripslash#1}%
  \expandafter\let\csname org\bbl@tempa\endcsname#1%
  \expandafter\def\csname\bbl@tempa\endcsname}

\bbl@redefine@long This version of \texttt{bbl\textbackslash redefine} can be used to redefine \texttt{\long} commands such as \texttt{\ifthenelse}.

\def\bbl@redefine@long#1{%
  \edef\bbl@tempa{\bbl@stripslash#1}%
  \expandafter\let\csname org\bbl@tempa\endcsname#1%
  \expandafter\long\expandafter\def\csname\bbl@tempa\endcsname}

\bbl@redefinerobust For commands that are redefined, but which \textit{might} be robust we need a slightly more intelligent macro. A robust command \texttt{foo} is defined to expand to \texttt{\protect\foo} \texttt{\ldots}. So it is necessary to check whether \texttt{\foo} exists. The result is that the command that is being redefined is always robust afterwards. Therefore all we need to do now is define \texttt{\foo}.

\def\bbl@redefinerobust#1{%
  \edef\bbl@tempa{\bbl@stripslash#1}%
  \bbl@ifunset{\bbl@tempa\space}{}
  {\expandafter\let\csname org\bbl@tempa\endcsname#1%}
  {\bbl@exp{\def\#1{\protect<\bbl@tempa\space}}}
  {\bbl@exp{\let<org\bbl@tempa<\bbl@tempa\space}}
  \@namedef{\bbl@tempa\space}

\bbl@usehooks is the commands used by babel to execute hooks defined for an event.

\def\bbl@usehooks#1#2{\ifx\UseHook\@undefined\else\UseHook{babel/*/#1}\fi}
\def\bbl@elth##1{\bbl@cs{hk@##1}{\bbl@cs{ev@##1@#1}#2}}
\bbl@cs{ev@#1@}\
\ifx\languagename\@undefined\else % Test required for Plain (?)
  \ifx\UseHook\@undefined\else\UseHook{babel/\languagename/#1}\fi
\def\bbl@elth##1{\bbl@cs{hk@##1}{\bbl@cl{ev@##1@#1}#2}}
\bbl@cs{cs@#1@}}

7.3 Hooks

Admittedly, the current implementation is a somewhat simplistic and does very little to catch errors, but it is meant for developers, after all. \texttt{\bbl\textbackslash usehooks} is the commands used by babel to execute hooks defined for an event.
To ensure forward compatibility, arguments in hooks are set implicitly. So, if a further argument is added in the future, there is no need to change the existing code. Note events intended for hyphen.cfg are also loaded (just in case you need them for some reason).

\begin{verbatim}
def \bbl@evargs{,% <- don't delete this comma
  everylanguage=1,loadkernel=1,loadpatterns=1,loadexceptions=1,%
  adddialect=2,patterns=2,defaultcommands=0,encodedcommands=2,write=0,%
  beforeextras=0,afterextras=0,stopcommands=0,stringprocess=0,%
  hyphenation=2,initiateactive=3,afterreset=0,foreign=0,foreign*=0,%
  beforestart=0,languagename=2}
\ifx\NewHook\@undefined\else
  \def\bbl@tempa#1=#2\@@{\NewHook{babel/#1}}
\bbl@foreach\bbl@evargs{\bbl@tempa#1\@@}
\fi
\babelensure
\end{verbatim}

The user command just parses the optional argument and creates a new macro named\bbl@@⟨language⟩. We register a hook at the afterextras event which just executes this macro in a "complete" selection (which, if undefined, is \relax and does nothing). This part is somewhat involved because we have to make sure things are expanded the correct number of times. The macro \bbl@@⟨language⟩ contains \bbl@ensure{⟨include⟩}{⟨exclude⟩}{⟨fontenc⟩}, which in in turn loops over the macros names in \bbl@captionslist, excluding (with the help of \in@) those in the exclude list. If the fontenc is given (and not \relax), the \fontencoding is also added. Then we loop over the include list, but if the macro already contains \foreignlanguage, nothing is done. Note this macro (1) is not restricted to the preamble, and (2) changes are local.
7.4 Setting up language files

\LdfInit macro takes two arguments. The first argument is the name of the language that will be defined in the language definition file; the second argument is either a control sequence or a string from which a control sequence should be constructed. The existence of the control sequence indicates that the file has been processed before.

At the start of processing a language definition file we always check the category code of the at-sign. We make sure that it is a ‘letter’ during the processing of the file. We also save its name as the last called option, even if not loaded.

Another character that needs to have the correct category code during processing of language definition files is the equals sign, ‘=‘, because it is sometimes used in constructions with the \let primitive. Therefore we store its current catcode and restore it later on.

Now we check whether we should perhaps stop the processing of this file. To do this we first need to check whether the second argument that is passed to \LdfInit is a control sequence. We do that by looking at the first token after passing #2 through \string. When it is equal to \@backslashchar we are dealing with a control sequence which we can compare with \@undefined.

If so, we call \ldf@quit to set the main language, restore the category code of the @-sign and call \endinput.

When #2 was not a control sequence we construct one and compare it with \relax.

Finally we check \originalTeX.

\LdfInit \LdfInit%Macro for setting language files up}
\ldf@quit This macro interrupts the processing of a language definition file.
\def\ldf@quit#1{\expandafter\main@language\expandafter{#1}%%
\catcode`@=\atcatcode \let\atcatcode\relax
\catcode`==\eqcatcode \let\eqcatcode\relax
@endinput}

\ldf@finish This macro takes one argument. It is the name of the language that was defined in the language definition file. We load the local configuration file if one is present, we set the main language (taking into account that the argument might be a control sequence that needs to be expanded) and reset the category code of the @-sign.
\def\bbl@afterldf#1{%% TODO. Merge into the next macro? Unused elsewhere
\def\bbl@afterldf{#1}%%
\main@language
\bbl@main@language
This command should be used in the various language definition files. It stores its argument in \bbl@main@language; to be used to switch to the correct language at the beginning of the document.
\def\main@language#1{\def\bbl@main@language{#1}%%
\let\languagename\bbl@main@language % TODO. Set localename
\bbl@id@assign
\bbl@patterns{\languagename}}

After the preamble of the document the commands \LdfInit, \ldf@quit and \ldf@finish are no longer needed. Therefore they are turned into warning messages in \LaTeX. %
\AtBeginDocument{% Group!
\if@filesw
\def\bbl@beforerestart{\def\@nolanerr##1{\bbl@warning{Undefined language '##1' in aux.\Reported}}}%
\bbl@afterldf{%
\expandafter\main@language\expandafter{#1}%%
\catcode`@=\atcatcode \let\atcatcode\relax
\catcode`==\eqcatcode \let\eqcatcode\relax}}
\AtBeginDocument{%
A bit of optimization. Select in head/foot the language only if necessary.

7.5 Shorthands

\bbl@add@special The macro \bbl@add@special is used to add a new character (or single character control sequence) to the macro \dospecials (and \@sanitize if \@EFX is used). It is used only at one place, namely when \initiate@active@char is called (which is ignored if the char has been made active before). Because \@sanitize can be undefined, we put the definition inside a conditional.

Items are added to the lists without checking its existence or the original catcode. It does not hurt, but should be fixed. It's already done with \nfss@catcodes, added in 3.10.

\bbl@remove@special The companion of the former macro is \bbl@remove@special. It removes a character from the set macros \dospecials and @sanitize, but it is not used at all in the babel core.

\initiate@active@char A language definition file can call this macro to make a character active. This macro takes one argument, the character that is to be made active. When the character was already active this macro
does nothing. Otherwise, this macro defines the control sequence \normal@char{char} to expand to the character in its "normal state" and it defines the active character to expand to \normal@char{char} by default (\char being the character to be made active). Later its definition can be changed to expand to \active@char{char} by calling \bbl@activate{\char}. For example, to make the double quote character active one could have \initiate@active@char{"} in a language definition file. This defines " as \active@prefix\ active@char{} (where the first " is the character with its original catcode, when the shorthand is created, and \active@char{} is a single token). In protected contexts, it expands to \protect" or \noexpand" (ie, with the original "); otherwise \active@char{} is executed. This macro in turn expands to \normal@char{} in "safe" contexts (eg, label), but \user@active\ in normal "unsafe" ones. The latter search a definition in the user, language and system levels, in this order, but if none is found, \normal@char{} is used. However, a deactivated shorthand (with \bbl@deactivate\ is defined as \active@prefix\ "normal@char". The following macro is used to define shorthands in the three levels. It takes 4 arguments: the (string'ed) character, \langle level\rangle@group, \langle level\rangle@active and \langle next-level\rangle@active (except in system).

\def\bbl@active@def#1#2#3#4{% 
  \@namedef{#3#1}{% 
    \expandafter\ifx\csname#2@sh@#1@endcsname\relax 
    \bbl@afterelse\bbl@sh@select#2#1{#3@arg#1}{#4#1}% 
    \else \bbl@afterfi\csname#2@sh@#1@endcsname \fi}% 
  \expandafter\long\@namedef{#3@arg#1}##1{% 
    \expandafter\ifx\csname#2@sh@#1@string##1\endcsname\relax 
    \bbl@afterelse\csname#4#1\string##1\endcsname% 
    \else \bbl@afterfi\csname#2@sh@#1@string##1\string##1\endcsname \fi}%) 

\initiate@active@char calls \@initiate@active@char with 3 arguments. All of them are the same character with different catcodes: active, other (\string'ed) and the original one. This trick simplifies the code a lot.

\def\@initiate@active@char#1{% 
  \bbl@ifunset{active@char\string#1}{}% 
  \bbl@withactive{% 
    \expandafter\@initiate@active@char\expandafter}#1\string#1#1} 

The very first thing to do is saving the original catcode and the original definition, even if not active, which is possible (undefined characters require a special treatment to avoid making them \relax and preserving some degree of protection).

\def\@initiate@active@char#1{% 
  \bbl@csarg\edef{oricat@#2}{\catcode`#2=\the\catcode`#2\relax}% 
  \ifx#1\@undefined \bbl@csarg\def{oridef@#2}{\def#1{\active@prefix#1\@undefined}}% 
  \else \bbl@csarg\let{oridef@@#2}#1% 
    \bbl@csarg\edef{oridef@#2}{% 
      \let\noexpand#1% 
      \expandafter\noexpand\csname bbl@oridef@@#2\endcsname}% 
  \fi} 

If the character is already active we provide the default expansion under this shorthand mechanism. Otherwise we write a message in the transcript file, and define \normal@char{char} to expand to the character in its default state. If the character is mathematically active when babel is loaded (for example ') the normal expansion is somewhat different to avoid an infinite loop (but it does not prevent the loop if the mathcode is set to *8000 a posteriori).
\else
  \bbl@info{Making #2 an active character}\
  \ifnum\mathcode`#2=\ifodd\bbl@engine"100000 \else"8000 \fi
  \@namedef{normal@char#2}{\textormath{#3}{\csname bbl@oridef@@#2@endcsname}}}\
  \else
  \@namedef{normal@char#2}{#3}\
  \fi
\fi

To prevent problems with the loading of other packages after babel we reset the catcode of the character to the original one at the end of the package and of each language file (except with KeepShorthandsActive). It is re-activate again at \begin{document}. We also need to make sure that the shorthands are active during the processing of the .aux file. Otherwise some citations may give unexpected results in the printout when a shorthand was used in the optional argument of \bibitem for example. Then we make it active (not strictly necessary, but done for backward compatibility).

\bbl@restoreactive{#2}\
\AtBeginDocument{%\catcode`#2\active\if@filesw\immediate\write\@mainaux{\catcode\string#2\active}\fi}%\expandafter\bbl@add@special\csname#2@endcsname\catcode`#2\active\fi

Now we have set \normal@char{⟨char⟩}, we must define \active@char{⟨char⟩}, to be executed when the character is activated. We define the first level expansion of \active@char{⟨char⟩} to check the status of the @safe@actives flag. If it is set to true we expand to the ‘normal’ version of this character; otherwise we call \user@active{⟨char⟩} to start the search of a definition in the user, language and system levels (or eventually normal@char{⟨char⟩}).

\let\bbl@tempa@firstoftwo\if\string^#2%\def\bbl@tempa@firstoftwo\noexpand\textormath\else\ifx\bbl@mathnormal\@undefined\else\let\bbl@tempa@firstoftwo\bbl@mathnormal\fi\fi\expandafter\edef\csname active@char#2@endcsname{\bbl@tempa@firstoftwo{\if@safe@actives\expandafter\expandafter\expandafter\expandafter\expandafter\expandafter\expandafter\expandafter\expandafter\expandafter\expandafter\expandafter\expandafter\expandafter\expandafter\expandafter\expandafter\expandafter\expandafter\expandafter\expandafter\expandafter\expandafter\expandafter\expandafter\expandafter\expandafter\expandafter\expandafter\expandafter\expandafter\expandafter\expandafter\expandafter\expandafter\expandafter\expandafter\expandafter\expandafter\expandafter\expandafter\expandafter\expandafter\expandafter\expandafter\expandafter\expandafter\expandafter\expandafter\expandafter\expandafter\expandafter\expandafter\expandafter\expandafter\expandafter\expandafter\expandafter\expandafter\expandafter\expandafter\expandafter\expandafter\expandafter\expandafter\expandafter\expandafter\expandafter\expandafter\expandafter\expandafter\expandafter\expandafter\expandafter\expandafter\expandafter\expandafter\expandafter\expandafter\expandafter\expandafter\expandafter\expandafter\expandafter\expandafter\expandafter\expandafter\expandafter\expandafter\expandafter\expandafter\expandafter\expandafter\expandafter\expandafter\expandafter\expandafter\expandafter\expandafter\expandafter\expandafter\expandafter\expandafter\expandafter\expandafter\expandafter\expandafter\expandafter\expandafter\expandafter\expandafter\expandafter\expandafter\expandafter\expandafter\expandafter\expandafter\expandafter\expandafter\expandafter\expandafter\expandafter\expandafter\expandafter\expandafter\expandafter\expandafter\expandafter\expandafter\expandafter\expandafter\expandafter\expandafter\expandafter\expandafter\expandafter\expandafter\expandafter\expandafter\expandafter\expandafter\expandafter\expandafter\expandafter\expandafter\expandafter\expandafter\expandafter\expandafter\expandafter\expandaafter\noexpand\textormath{#1}{\expandafter\noexpand\csname normal@char#2@endcsname}}\bbl@csarg\edef{doactive#2}{\expandafter\noexpand\csname user@active#2@endcsname}}\

We now define the default values which the shorthand is set to when activated or deactivated. It is set to the deactivated form (globally), so that the character expands to

\active@prefix{⟨char⟩} \normal@char{⟨char⟩}

(where \active@char{⟨char⟩} is one control sequence!).
The next level of the code checks whether a user has defined a shorthand for himself with this character. First we check for a single character shorthand. If that doesn’t exist we check for a shorthand with an argument.

\bbl@active@def#2\user@group{user@active}\language@active%
\bbl@active@def#2\language@group{language@active}\system@active%
\bbl@active@def#2\system@group{system@active}\normal@char%

In order to do the right thing when a shorthand with an argument is used by itself at the end of the line we provide a definition for the case of an empty argument. For that case we let the shorthand character expand to its non-active self. Also, When a shorthand combination such as ’’ ends up in a heading \TeX would see \protect ‘\protect’. To prevent this from happening a couple of shorthand needs to be defined at user level.

\expandafter\edef\csname\user@group @sh@#2@@endcsname
{\expandafter\noexpand\csname\normal@char#2\endcsname}\
\expandafter\edef\csname\user@group @sh@#2@\string\protect@endcsname
{\expandafter\noexpand\csname\user@active#2\endcsname}\

Finally, a couple of special cases are taken care of. (1) If we are making the right quote (‘) active we need to change \pr@m@s as well. Also, make sure that a single ‘ in math mode ‘does the right thing’. (2) If we are using the caret (^) as a shorthand character special care should be taken to make sure math still works. Therefore an extra level of expansion is introduced with a check for math mode on the upper level.

\if\string'#2%
\let\prim@s\bbl@prim@s
\let\active@math@prime#1%
\fi
\bbl@usehooks{initiateactive}{#1}{#2}{#3}}

The following package options control the behavior of shorthands in math mode.

//More package options≡
\DeclareOption{math=active}{}
\DeclareOption{math=normal}{\def\bbl@mathnormal{\noexpand\textormath}}

//More package options

Initiating a shorthand makes active the char. That is not strictly necessary but it is still done for backward compatibility. So we need to restore the original catcode at the end of package and and the end of the ldf.

\@ifpackagewith{babel}{KeepShorthandsActive}%
{\let\bbl@restoreactive\@gobble}%
{\def\bbl@restoreactive#1{\bbl@exp{\\AfterBabelLanguage\\CurrentOption
{\catcode`#1=\the\catcode`#1\relax}\\AtEndOfPackage
{\catcode`#1=\the\catcode`#1\relax}}}\\AtEndOfPackage{\let\bbl@restoreactive\@gobble}}

\bbl@sh@select
This command helps the shorthand supporting macros to select how to proceed. Note that this macro needs to be expandable as do all the shorthand macros in order for them to work in expansion-only environments such as the argument of \hyphenation.

This macro expects the name of a group of shorthands in its first argument and a shorthand character in its second argument. It will expand to either \bbl@firstcs or \bbl@scndcs. Hence two more arguments need to follow it.

\def\bbl@sh@select#1#2{%\expandafter\ifx\csname#1\sh@#2\endcsname\relax
\bbl@afterelse\bbl@scndcs
\else
\bbl@afterfi\csname#1\sh@#2\endcsname
\fi

\active@prefix
The command \active@prefix which is used in the expansion of active characters has a function similar to \OT1-cmd in that \protect the active character whenever \protect is not \@typeset@protect. The \@gobble is needed to remove a token such as \activechar: (when the
double colon was the active character to be dealt with). There are two definitions, depending of \ifincsname is available. If there is, the expansion will be more robust.

\begin{group}
\iffalse\ifincsname\% TODO. Ugly. Correct? Only Plain?
\else
\iffalse\protect\@typeset@protect
\else
\iffalse\protect\@unexpandable@protect
\noexpand#1%
\else
\protect#1%
\fi
\expandafter\@gobble
\fi
\fi\fi\fi\fi\fi
\end{group}

In some circumstances it is necessary to be able to change the expansion of an active character on the fly. For this purpose the switch \safe@actives is available. The setting of this switch should be checked in the first level expansion of \active@char\langle char\rangle.

\newif\if\safe@actives
\safe@activesfalse

When the output routine kicks in while the active characters were made "safe" this must be undone in the headers to prevent unexpected typeset results. For this situation we define a command to make them "unsafe" again.

\def\bbl@restore@actives{\if\safe@actives\safe@activesfalse\fi}

Both macros take one argument, like \initiate@active@char. The macro is used to change the definition of an active character to expand to \active@char\langle char\rangle in the case of \bbl@activate, or \normal@char\langle char\rangle in the case of \bbl@deactivate.

\chardef\bbl@activated@z@
\def\bbl@activate#1{\chardef\bbl@activated@one}
\chardef\bbl@activated@tw@
\bbl@withactive{\expandafter\let\expandafter}#1%
\csname bbl@active@string@\endcsname
\def\bbl@deactivate@tw@
\chardef\bbl@activated@tw@
\bbl@withactive{\expandafter\let\expandafter}#1%
\csname bbl@normal@string@\endcsname

These macros are used only as a trick when declaring shorthands.

\def\bbl@firstcs@#2\csname#1\endcsname
\def\bbl@scndcs@#1\csname#2\endcsname

The command \declare@shorthand is used to declare a shorthand on a certain level. It takes three arguments:

1. a name for the collection of shorthands, i.e. ‘system’, or ‘dutch’;
2. The character (sequence) that makes up the shorthand, i.e. – or "a;
3. The code to be executed when the shorthand is encountered.

The auxiliary macro \bbl@texpdf improves the interoperativity with hyperref and takes 4 arguments: (1) The \TeX code in text mode, (2) the string for hyperref, (3) the \TeX code in math mode, and (4), which is currently ignored, but it's meant for a string in math mode, like a minus sign instead of an hyphen (currently hyperref doesn't discriminate the mode). This macro may be used in \ldf files.

\textormath

Some of the shorthands that will be declared by the language definition files have to be usable in both text and math mode. To achieve this the helper macro \textormath is provided.

\textormath

The current concept of 'shorthands' supports three levels or groups of shorthands. For each level the name of the level or group is stored in a macro. The default is to have a user group; use language group 'english' and have a system group called 'system'.

\useshorthands

This is the user level macro. It initializes and activates the character for use as a shorthand character (ie, it's active in the preamble). Languages can deactivate shorthands, so a starred version is also provided which activates them always after the language has been switched.
\defineshorthand
Currently we only support two groups of user level shorthands, named internally user and user@<lang> (language-dependent user shorthands). By default, only the first one is taken into account, but if the former is also used (in the optional argument of \defineshorthand) a new level is inserted for it (user@generic, done by \bbl@set@user@generic); we make also sure {} and \protect are taken into account in this new top level.

\languageshorthands
A user level command to change the language from which shorthands are used. Unfortunately, babel currently does not keep track of defined groups, and therefore there is no way to catch a possible change in casing to fix it in the same way languages names are fixed. [TODO].

\aliasshorthand
First the new shorthand needs to be initialized. Then, we define the new shorthand in terms of the original one, but note with \aliasshorthand("{}/ is \active@prefix \active@char/, so we still need to let the latest to \active@char". 
1454 \fi}
1455 {\bbl@error
1456 {Cannot declare a shorthand turned off (\string#2)}
1457 {Sorry, but you cannot use shorthands which have been \%
1458 turned off in the package options}}

\@notshorthand
1459 \def\@notshorthand#1{%
1460 \bbl@error{%
1461 The character '\string #1' should be made a shorthand character; \%
1462 add the command \string\useshorthand{#1\string} to \%
1463 the preamble. \%
1464 I will ignore your instruction}%
1465 {You may proceed, but expect unexpected results}}

\shorthandon
The first level definition of these macros just passes the argument on to \bbl@switch@sh, adding \nil at the end to denote the end of the list of characters.
1466 \newcommand\shorthandon[1]{\bbl@switch@sh\@ne#1\@nnil}
1467 \DeclareRobustCommand\shorthandoff{%
1468 \@ifstar{\bbl@shorthandoff\tw@}{\bbl@shorthandoff\z@}}
1469 \def\bbl@shorthandoff#1#2{\bbl@switch@sh#1#2\@nnil}

\bbl@switch@sh
The macro \bbl@switch@sh takes the list of characters apart one by one and subsequently switches the category code of the shorthand character according to the first argument of \bbl@switch@sh.
But before any of this switching takes place we make sure that the character we are dealing with is known as a shorthand character. If it is, a macro such as `active' should exist.
Switching off and on is easy – we just set the category code to ‘other’ (12) and `active'. With the starred version, the original catcode and the original definition, saved in \@initiate\active\char, are restored.
1470 \def\bbl@switch@sh#1#2{%#1#2\nil}
1471 \ifx#2\nil\else
1472 \bbl@ifunset{bbl@active\string#2}%
1473 {\bbl@error
1474 {I can't switch '\string#2' on or off--not a shorthand}%
1475 {This character is not a shorthand. Maybe you made \%
1476 a typing mistake? I will ignore your instruction.}}%
1477 {\iffalse#1% off, on, off*
1478 {\catcode`#212\relax
1479 \catcode`#2\active
1480 \bbl@ifunset{bbl@shdef@\string#2}%
1481 {}}%
1482 {\bbl@withactive{\expandafter\let\expandafter}#2%
1483 \csname bbl@shdef@\string#2\endcsname
1484 \bbl@csarg\let{shdef@\string#2}\relax%
1485 \ifcase\bbl@activated\or
1486 \bbl@activate{#2}%
1487 \bbl@deactivate{#2}%
1488 \else
1489 \bbl@deactivate{#2}%
1490 \fi
1491 \or
1492 \bbl@ifunset{bbl@shdef@\string#2}%
1493 {\bbl@withactive{\bbl@csarg\let{shdef@\string#2}}#2}%
1494 {}}%
1495 \csname bbl@oricat@\string#2\endcsname
1496 \csname bbl@oridef@\string#2\endcsname
1497 \fi}%
1498 \bbl@afterfi\bbl@switch@sh#1%
1499 \fi}

Note the value is that at the expansion time; eg, in the preamble shorthands are usually deactivated.
1500 \def\babelshorthand{\active@prefix\babelshorthand\bbl@putsh}
1501 \def\bbl@putsh#1{%
You may want to test if a character is a shorthand. Note it does not test whether the shorthand is on or off.

\ifbabelshorthand{#1}{#2}{#3}

One of the internal macros that are involved in substituting \prime for each right quote in mathmode is \bbl@pr@m@s. This checks if the next character is a right quote. When the right quote is active, the definition of this macro needs to be adapted to look also for an active right quote; the hat could be active, too.

\def\bbl@pr@m@s{\futurelet\@let@token\bbl@pr@m@s}

\def\bbl@if@primes#1#2{\ifx#1\@let@token\expandafter\@firstoftwo\else\ifx#2\@let@token\bbl@afterelse\expandafter\@firstoftwo\else\bbl@afterfi\expandafter\@secondoftwo\fi\fi}

Usually the ~ is active and expands to \penalty@M. When it is written to the .aux file it is written expanded. To prevent that and to be able to use the character ~ as a start character for a shorthand, it is redefined here as a one character shorthand on system level. The system declaration is in most cases redundant (when ~ is still a non-break space), and in some cases is inconvenient (if ~ has been redefined); however, for backward compatibility it is maintained (some existing documents may rely on the babel value).

\initiate@active@char{~}
\declare@shorthand{system}{~}{\leavevmode
\nobreak\ }
\bbl@activate{~}

\endgroup

\catcode`\^=7 \catcode`\*=\active \lccode`\^=`\^\lccode`\*=`\^\lowercase{\def\bbl@if@primes{\if\penalty@M
\pr@@t\egroup}}\edef\bbl@pr@m@s{\bbl@if@primes{~}^{\pr@@t}}

\begin{egroup}

\end{egroup}

\leavevmode\nobreak\}
\bbl@activate{~}
The position of the double quote character is different for the OT1 and T1 encodings. It will later be selected using the \@encoding macro. Therefore we define two macros here to store the position of the character in these encodings.

\begin{Verbatim}
\expandafter\def\csname OT1dqpos\endcsname{127}
\expandafter\def\csname T1dqpos\endcsname{4}
\end{Verbatim}

When the macro \@encoding is undefined (as it is in plain \TeX) we define it here to expand to OT1.

\begin{Verbatim}
\ifx\@encoding\undefined
\def\@encoding{OT1}
\fi
\end{Verbatim}

### 7.6 Language attributes

Language attributes provide a means to give the user control over which features of the language definition files he wants to enable.

\begin{Verbatim}
\languageattribute
\end{Verbatim}

The macro \languageattribute checks whether its arguments are valid and then activates the selected language attribute. First check whether the language is known, and then process each attribute in the list.

\begin{Verbatim}
\bbl@trace{Language attributes}
\newcommand\languageattribute[2]{%
\def\bbl@tempc{#1}%
\bbl@fixname\bbl@tempc
\bbl@iflanguage\bbl@tempc{%
\bbl@vforeach{#2}{%
We want to make sure that each attribute is selected only once: therefore we store the already selected attributes in \bbl@known@attribs. When that control sequence is not yet defined this attribute is certainly not selected before.

\begin{Verbatim}
\ifx\bbl@known@attribs\undefined
\in@false
\else
\bbl@xin{,#2,}{,\bbl@known@attribs,}%
\fi
\ifin@
\bbl@warning{%
You have more than once selected the attribute '##1'
for language #1. Reported}%
\else
When we end up here the attribute is not selected before. So, we add it to the list of selected attributes and execute the associated \TeX-code.

\begin{Verbatim}
\bbl@exp{%
\bbl@add@list\bbl@known@attribs{\bbl@tempc-##1}}%
\edef\bbl@tempa{\bbl@tempc-##1}%
\expandafter\bbl@ifknown@trib\expandafter{\bbl@tempa}{
\csname\bbl@tempc @attr@##1\endcsname}%
\@attrerr{\bbl@tempc}{##1}%
\fi}}
\end{Verbatim}

\end{Verbatim}

The error text to be issued when an unknown attribute is selected.

\begin{Verbatim}
\newcommand*{\@attrerr}[2]{%
\bbl@error{The attribute #2 is unknown for language #1.}%
\{Your command will be ignored, type <return> to proceed}\
\end{Verbatim}

\bbl@declare@tribute

This command adds the new language/attribute combination to the list of known attributes. Then it defines a control sequence to be executed when the attribute is used in a document. The result of this should be that the macro \extras... for the current language is extended, otherwise the attribute will not work as its code is removed from memory at \begin{document}.

\begin{Verbatim}
\def\bbl@declare@tribute{\#2}\#3{%
\bbl@xin{,#2,}{,\BabelModifiers,}%
\end{Verbatim}
This internal macro has 4 arguments. It can be used to interpret \TeX code based on whether a certain attribute was set. This command should appear inside the argument to \AtBeginDocument because the attributes are set in the document preamble, after babel is loaded. The first argument is the language, the second argument the attribute being checked, and the third and fourth arguments are the true and false clauses.

\bbl@ifattributeset This internal macro has 4 arguments. It can be used to interpret \TeX code based on whether a certain attribute was set. This command should appear inside the argument to \AtBeginDocument because the attributes are set in the document preamble, after babel is loaded. The first argument is the language, the second argument the attribute being checked, and the third and fourth arguments are the true and false clauses.

\bbl@ifknown@attrib An internal macro to check whether a given language/attribute is known. The macro takes 4 arguments, the language/attribute, the attribute list, the \TeX-code to be executed when the attribute is known and the \TeX-code to be executed otherwise. We first assume the attribute is unknown. Then we loop over the list of known attributes, trying to find a match.

\bbl@clear@ttribs This macro removes all the attribute code from \TeX's memory at \begin{document} time (if any is present).

7.7 Support for saving macro definitions

To save the meaning of control sequences using \babel@save, we use temporary control sequences. To save hash table entries for these control sequences, we don't use the name of the control sequence to be saved to construct the temporary name. Instead we simply use the value of a counter, which is reset to zero each time we begin to save new values. This works well because we release the saved meanings before we begin to save a new set of control sequence meanings (see \selectlanguage and \original\TeX). Note undefined macros are not undefined any more when saved – they are \relax'ed.

\babel@savecnt The initialization of a new save cycle: reset the counter to zero.
\babel@beginsave
Before it's forgotten, allocate the counter and initialize all.

\newcount\babel@savecnt
\def\babel@beginsave{\babel@savecnt\z@}

\edef\bbl@exp{\def\noexpand\originalTeX{\noexpand\the\toks@<babel@\number\babel@savecnt>\relax}}

\def\babel@save#1{\expandafter\let\csname babel@\number\babel@savecnt\endcsname#1\relax
\toks@\expandafter{\originalTeX\let#1=}\bbl@exp{\def\noexpand\originalTeX{\noexpand\the\toks@<babel@\number\babel@savecnt>\relax}}\adc{\advance\babel@savecnt\@ne}}

\def\babel@savevariable#1{\toks@\expandafter{\originalTeX#1=}\bbl@exp{\def\noexpand\originalTeX{\noexpand\the\toks@\the#1\relax}}}

Some languages need to have \frenchspacing in effect. Others don't want that. The command \bbl@frenchspacing switches it on when it isn't already in effect and \bbl@nonfrenchspacing switches it off if necessary. A more refined way to switch the catcodes is done with ini files. Here an auxiliary macro is defined, but the main part is in \babelprovide. This new method should be ideally the default one.

\def\bbl@frenchspacing{%
\edef\bbl@fs@chars{\bbl@elt{.}\@m{3000}\bbl@elt{?}\@m{3000}\bbl@elt{!}\@m{3000}\bbl@elt{;}\@m{1500}\bbl@elt{,}\@m{1250}}%\def\bbl@pre@fs{%\def\bbl@elt##1##2##3{\sfcode`##1=##2\relax}\bbl@fs@chars}}%\def\bbl@post@fs{%\bbl@fs@chars\edef\bbl@tempa{\bbl@cl{frspc}}\edef\bbl@tempa{\expandafter\@car\bbl@tempa\@nil}\if u\bbl@tempa % do nothing\else\if n\bbl@tempa % non french\def\bbl@elt##1##2##3{%\ifnum\sfcode`##1=##2\relax\babel@savevariable{\sfcode`##1}\sfcode`##1=##3\relax\fi}\bbl@fs@chars\else\if y\bbl@tempa % french\def\bbl@elt##1##2##3{%\ifnum\sfcode`##1=##3\relax\babel@savevariable{\sfcode`##1}\sfcode`##1=##2\relax\fi}\bbl@fs@chars\fi}\fi}}
7.8 Short tags
\babeltags
This macro is straightforward. After zapping spaces, we loop over the list and define the macros \text{⟨tag⟩} and ⟨\text{tag}⟩. Definitions are first expanded so that they don’t contain \csname but the actual macro.
\def\babeltags#1{%
  \edef\bbl@tempa{\zap@space#1 \@empty}%
  \def\bbl@tempb##1=##2\@@{%%
    \edef\bbl@tempc{%
      \noexpand\newcommand\expandafter\noexpand\csname ##1\endcsname{%%
        \noexpand\protect\expandafter\noexpand\csname otherlanguage*\endcsname{##2}}%%
      \noexpand\newcommand\expandafter\noexpand\csname text##1\endcsname{%
        \noexpand\foreignlanguage{##2}}}
    \bbl@tempc}%
  \bbl@for\bbl@tempa\bbl@tempa{%%
    \expandafter\bbl@tempb\bbl@tempa\@@}%
}

7.9 Hyphens
\babelhyphenation
This macro saves hyphenation exceptions. Two macros are used to store them: \bbl@hyphenation@ for the global ones and \bbl@hyphenation<lang> for language ones. See \bbl@patterns above for further details. We make sure there is a space between words when multiple commands are used.
\def\babelhyphenation[#2][#1]{%
  \ifx\bbl@hyphenation@\relax%
    \let\bbl@hyphenation@\@empty%
  \fi%
  \ifx\bbl@hyphenation@\@empty\else%
    \bbl@warning{You must not intermingle \string\selectlanguage\space and\%%
    \string\babelhyphenation\space or some exceptions will not\%%
    be taken into account. Reported\%}
  \fi%
  \ifx\@empty#1%
    \protected@edef\bbl@hyphenation@{\bbl@hyphenation@\space#2}%
  \else%
    \bbl@vforeach{#1}{%
      \def\bbl@tempa{##1}%
      \bbl@fixname\bbl@tempa%
      \bbl@iflanguage\bbl@tempa{%
        \bbl@csarg\protected@edef\bbl@hyphenation@{\bbl@hyphenation@\space#2}{%
      \bbl@vforeach{#1}{%
        \def\bbl@tempa{##1}%
        \bbl@fixname\bbl@tempa%
        \bbl@iflanguage\bbl@tempa{%%
          \bbl@csarg\protected@edef\bbl@hyphenation@{\bbl@tempa}{%
            \bbl@funset{\bbl@hyphenation@\bbl@tempa}%
            {}%
            {\csname bbl@hyphenation@\bbl@tempa\space#2}}%
          \bbl@csarg\protected@edef\bbl@hyphenation@{\bbl@tempa}%
          {\bbl@funset{\bbl@hyphenation@\bbl@tempa}%
            {}%
            {\csname bbl@hyphenation@\bbl@tempa\space#2}}}%
      \bbl@t@one{T1}%
      \def\allowhyphens{\ifx\cf@encoding\bbl@t@one\else\bbl@allowhyphens\fi}%
      \def\bbl@allowhyphens{%
        \ifvmode\else
        \nobreak\hskip \z@skip
        \fi
      }%
      \def\bbl@t@one{T1}%
      \def\allowhyphens{\ifx\cf@encoding\bbl@t@one\else\bbl@allowhyphens\fi}%
      \def\bbl@allowhyphens{%
        \ifvmode\else
        \nobreak\hskip \z@skip
        \fi
      }%
Macros to insert common hyphens. Note the space before \@ in \babelhyphen. Instead of protecting it with \DeclareRobustCommand, which could insert a \relax, we use the same procedure as shorthands, with \active@prefix.

\newcommand\babelnullhyphen{\char\hyphenchar\font}
\def\babelhyphen{\active@prefix\babelhyphen\bbl@hyphen}
\def\bbl@hyphen{\ifstar{\bbl@hyphen@i \@}{\bbl@hyphen@i\@empty}}
\def\bbl@hyphen@i#1#2{\ifunset{\bbl@hy@#1#2\@empty}{\csname bbl@usehyphen\endcsname{\discretionary{#2}{}{#2}}}{{\csname bbl@hy@#1#2\@empty\endcsname}}}

The following two commands are used to wrap the “hyphen” and set the behavior of the rest of the word – the version with a single @ is used when further hyphenation is allowed, while that with @@ if no more hyphens are allowed. In both cases, if the hyphen is preceded by a positive space, breaking after the hyphen is disallowed.

There should not be a discretionary after a hyphen at the beginning of a word, so it is prevented if preceded by a skip. Unfortunately, this does handle cases like “(-suffix)”. \nobreak is always preceded by \leavevmode, in case the shorthand starts a paragraph.

\def\bbl@usehyphen#1{\leavevmode\ifdim\lastskip\z@ \mbox{#1}\else \nobreak#1\fi}
\def\bbl@@usehyphen#1{\leavevmode\ifdim\lastskip\z@ \mbox{#1}\else #1\fi}

The following macro inserts the hyphen char:
\def\bbl@hy@soft{\bbl@usehyphen{\discretionary{\bbl@hyphenchar}{}{}}}\def\bbl@hy@@soft{\bbl@@usehyphen{\discretionary{\bbl@hyphenchar}{}{}}}
\def\bbl@hy@hard{\bbl@usehyphen{\bbl@hyphenchar}}\def\bbl@hy@@hard{\bbl@@usehyphen{\bbl@hyphenchar}}
\def\bbl@hy@nobreak{\bbl@usehyphen{\mbox{\bbl@hyphenchar}}}\def\bbl@hy@@nobreak{\mbox{\bbl@hyphenchar}}
\def\bbl@hy@repeat{\bbl@usehyphen{\discretionary{\bbl@hyphenchar}{\bbl@hyphenchar}{\bbl@hyphenchar}}}\def\bbl@hy@@repeat{\bbl@@usehyphen{\discretionary{\bbl@hyphenchar}{\bbl@hyphenchar}{\bbl@hyphenchar}}}
\def\bbl@hy@empty{\hskip\z@skip}\def\bbl@hy@@empty{\discretionary{}{}{}}

\bbl@disc For some languages the macro \bbl@disc is used to ease the insertion of discretionaries for letters that behave ‘abnormally’ at a breakpoint.

\def\bbl@disc#1#2{\nobreak\discretionary{#2}{\bbl@allowhyphens}{#1}}

7.10 Multiencoding strings

The aim following commands is to provide a common interface for strings in several encodings. They also contains several hooks which can be used by luatex and xetex. The code is organized here with pseudo-guards, so we start with the basic commands.
Tools  But first, a couple of tools. The first one makes global a local variable. This is not the best solution, but it works.

\begin{verbatim}
\def\bbl@trace{Multiencoding strings}
\def\bbl@toglobal#1{\global\let#1#1}
\def\bbl@recatcode#1{% TODO. Used only once?
  \@tempcnta="7F
  \def\bbl@tempa{%
    \ifnum\@tempcnta>"FF\else
      \catcode\@tempcnta=#1\relax
      \advance\@tempcnta\@ne
      \expandafter\bbl@tempa
    \fi%
  \bbl@tempa}
\end{verbatim}

The second one. We need to patch \@uclclist, but it is done once and only if \SetCase is used or if strings are encoded. The code is far from satisfactory for several reasons, including the fact \@uclclist is not a list any more. Therefore a package option is added to ignore it. Instead of gobbling the macro getting the next two elements (usually \reserved@a), we pass it as argument to \bbl@uclc. The parser is restarted inside ⟨⟨lang⟩⟩\bbl@uclc because we do not know how many expansions are necessary (depends on whether strings are encoded). The last part is tricky – when uppercasing, we have:

\begin{verbatim}
\let\bbl@tolower\@empty\bbl@toupper\@empty
\end{verbatim}

and starts over (and similarly when lowering).

\begin{verbatim}
\ifpackagewith{babel}{nocase}%
  \let\bbl@patchuclc\relax%
  \def\bbl@patchuclc{%
    \global\let\bbl@patchuclc\relax
    \g@addto@macro\@uclclist{\reserved@b{\reserved@b{\bbl@uclc}}}
    \def\bbl@uclc##1{%
      \let\bbl@encoded\bbl@encoded@uclc
      \bbl@ifunset{\languagename @bbl@uclc}% and resumes it
        {##1}%
      \else
        \let\bbl@tempa##1\relax % Used by LANG@bbl@uclc
        \csname\languagename @bbl@uc\endcsname
      \fi
    \let\bbl@tolower\csname\languagename @bbl@lc\endcsname
    \let\bbl@toupper\csname\languagename @bbl@uc\endcsname}}
\fi
\end{verbatim}

A temporary hack:

\begin{verbatim}
\ifx\BabelCaseHack\@undefined
  \AtBeginDocument{%
    \bbl@exp{\in@{\string\@uclclist}{}%\expandafter\meaning\csname MakeUppercase \endcsname}}%\let\bbl@newuc\csname MakeUppercase \endcsname
  \let\bbl@newlc\csname MakeLowercase \endcsname
\fi
\end{verbatim}

\begin{verbatim}
\if\AtBeginDocument{%
  \bbl@exp{\in@{\string\@uclclist}{}%\expandafter\meaning\csname MakeUppercase \endcsname}}%\let\bbl@newuc\csname MakeUppercase \endcsname
  \let\bbl@newlc\csname MakeLowercase \endcsname
\fi
\end{verbatim}
The following package options control the behavior of \SetString.

1793 \langle\langle More package options \rangle\rangle \equiv
1794 \let\bbl@opt@strings\@nnil % accept strings=value
1795 \DeclareOption{strings}{\def\bbl@opt@strings{\BabelStringsDefault}}
1796 \DeclareOption{strings=encoded}{\let\bbl@opt@strings\relax}
1797 \def\BabelStringsDefault{generic}

1799 \langle\langle More package options \rangle\rangle

Main command  This is the main command. With the first use it is redefined to omit the basic setup in subsequent blocks. We make sure strings contain actual letters in the range 128-255, not active characters.

1799 \@onlypreamble\StartBabelCommands
1800 \def\StartBabelCommands{%
1801 \begingroup
1802 \bbl@recatcode{11}%
1803 \langle\langle Macros local to BabelCommands \rangle\rangle
1804 \def\bbl@provstring##1##2{%
1805 \providecommand##1{##2}%
1806 \bbl@toglobal##1}
1807 \global\let\bbl@scafter\@empty
1808 \let\StartBabelCommands\bbl@startcmds
1809 \if\BabelLanguages\relax
1810 \let\BabelLanguages\CurrentOption
1811 \fi
1812 \begingroup
1813 \let\bbl@screset\@nnil % local flag - disable 1st stopcommands
1814 \StartBabelCommands%
1815 \def\bbl@startcmds{%
1816 \if\bbl@screset\@nnil
1817 \bbl@startcmds@i}
1818 \bbl@startcmds@i}
1819 \def\bbl@startcmds@ii[1][\@empty]{%
1820 \let\SetString\@gobbletwo
1821 \let\bbl@stringdef\@gobbletwo
1822 \let\AfterBabelCommands\@gobble
1823 \if\@empty#1%
1824 \def\bbl@encstring##1##2{%
1825 \ProvideTextCommandDefault##1{##2}
1826 \set\@noop{128-255}{\bbl@stringdef}
There are two versions of \bbl@scswitch. The first version is used when ldfs are read, and it makes
sure \langle group \rangle \langle language \rangle is reset, but only once (\bbl@screset is used to keep track of this). The
second version is used in the preamble and packages loaded after babel and does nothing.

The macro \bbl@forlang loops \bbl@L but its body is executed only if the value is in
\BabelLanguages (inside babel) or \date \langle language \rangle is defined (after babel has been loaded). There are
also two version of \bbl@forlang. The first one skips the current iteration if the language is not in \BabelLanguages (used in ldfs), and the second one skips undefined languages (after babel has
been loaded).

\def\bbl@forlang#1#2{%
  \bbl@for#1\bbl@L{%}
  \let\bbl@usehooks{defaultcommands}{}%
  \else\%}
  \@expandtwoargs
  \bbl@usehooks{encodedcommands}{{\bbl@sc@charset}{\bbl@sc@fontenc}}%
\fi}
Strings  The following macro is the actual definition of \SetString when it is “active”
First save the “switcher”. Create it if undefined. Strings are defined only if undefined (i.e., like
\providecommand). With the event stringprocess you can preprocess the string by manipulating
the value of \BabelString. If there are several hooks assigned to this event, preprocessing is done in
the same order as defined. Finally, the string is set.
\def\bbl@setstring#1#2{% eg, \prefacename{<string>}
  \bbl@forlang\bbl@tempa{% 1917
    \edef\bbl@LC{\bbl@tempa\bbl@stripslash#1}% 1918
    \bbl@ifunset{\bbl@LC}% eg, \germanchaptername 1919
      \{\bbl@exp{% 1920
         \global\bbl@add\\bbl@G\bbl@tempa{\\bbl@scset\#1\\bbl@LC>{}}}% 1921
      }% 1922
      \bbl@exp{% 1923
        \global\bbl@add\\bbl@G\bbl@tempa{\\bbl@scset\#1\\bbl@LC>}{}}}% 1924
    % 1925
    \bbl@exp{% 1926
      \expandafter\bbl@stringdef
      \csname\bbl@LC\endcsname{\bbl@encoded\bbl@LC>}}% 1927
    \expandafter\bbl@stringdef
    \csname\bbl@LC\endcsname{\bbl@encoded\bbl@LC>}% 1928
  }% 1929
\endgroup
\bbl@scafter
\let\bbl@endcommands\EndBabelCommands
Now we define commands to be used inside \StartBabelCommands.

Now, some additional stuff to be used when encoded strings are used. Captions then include
\bbl@encoded for string to be expanded in case transformations. It is \relax by default, but in
\MakeUppercase and \MakeLowercase its value is a modified expandable \@changed@cmd.
\ifx\bbl@opt@strings\relax
  \savecmd\@inmathwarn\bbl@opt@strings\relax
  \let\bbl@encoded\relax
  \bbl@exp{% 1930
    \expandafter\ifx\csname\cf@encoding\string#1\endcsname\relax
      \global\TextSymbolUnavailable\string#1\endcsname\relax
    \else
      \csname\cf@encoding\string#1\endcsname\relax
    \fi
  }% 1931
  \csname\cf@encoding\string#1\endcsname\relax
  \bbl@encoded\@inmathwarn\@changed@cmd
\else
  \savecmd\@inmathwarn\bbl@opt@strings\relax
  \bbl@encoded\@inmathwarn\@changed@cmd
\fi
\begin{Verbatim}
\end{Verbatim}
Define \texttt{\SetStringLoop}, which is actually set inside \texttt{\StartBabelCommands}. The current definition is somewhat complicated because we need a count, but \texttt{\count@} is not under our control (remember \texttt{\SetString} may call hooks). Instead of defining a dedicated count, we just “pre-expand” its value.

\begin{verbatim}
\newcommand{\SetStringLoop}{%  
  \def{\bbl@templ}{\expandafter\noexpand\csname##1\endcsname}  
  \count@\z@  
  \bbl@loop{\bbl@tempa}{#2}{% empty items and spaces are ok  
    \advance\count@$\z@ne$  
    \toks@{\bbl@tempa}  
    \bbl@exp{  
      \SetString{\romannumeral\count@}{\the\toks@}  
      \count@\the\count@\relax}}%}
\end{verbatim}

\textbf{Delaying code} Now the definition of \texttt{\AfterBabelCommands} when it is activated.

\begin{verbatim}
\newcommand{\AfterBabelCommands}{%  
  \toks@{\expandafter{\bbl@scafter}}  
  \xdef{\bbl@scafter}{\the\toks@}}
\end{verbatim}

\textbf{Case mapping} The command \texttt{\SetCase} provides a way to change the behavior of \texttt{\MakeUppercase} and \texttt{\MakeLowercase}. \texttt{\bbl@tempa} is set by the patched \texttt{\ucilclist} to the parsing command.

\begin{verbatim}
\newcommand{\SetCase}[3]{%  
  \bbl@patchuclc  
  \bbl@forlang{\bbl@tempa}{%  
    \expandafter{\csname\bbl@tempa@bbl@uc\endcsname}{##1}  
    \expandafter{\csname\bbl@tempa@bbl@uc\endcsname}{##2}  
    \expandafter{\csname\bbl@tempa@bbl@uc\endcsname}{##3}}}}%
\end{verbatim}

Macros to deal with case mapping for hyphenation. To decide if the document is monolingual or multilingual, we make a rough guess – just see if there is a comma in the languages list, built in the first pass of the package options.

\begin{verbatim}
\newcommand{\BabelLower}[2]{% one to one.  
  \ifnum\lccode#1=#2\else  
    \babel@savevariable{\lccode#1}  
    \lccode#1=#2\relax  
  \fi}
\newcommand{\BabelLowerMM}[4]{% many-to-many  
  \@tempcnta=#1\relax  
  \@tempcntb=#4\relax  
  \def{\bbl@tempa}{%  
    \ifnum\@tempcnta>#2\else  
      \@expandtwoargs{\BabelLower}{\the\@tempcnta}{\the\@tempcntb}  
      \advance\@tempcnta#3\relax  
      \advance\@tempcntb#3\relax  
      \expandafter{\bbl@tempa}  
    \fi}  
  \bbl@tempa}
\end{verbatim}

There are 3 helper macros which do most of the work for you.

\newcommand{\BabelLowerMM}[4]{% many-to-many  
  \@tempcnta=#1\relax  
  \@tempcntb=#4\relax  
  \def{\bbl@tempa}{%  
    \ifnum\@tempcnta>#2\else  
      \@expandtwoargs{\BabelLower}{\the\@tempcnta}{\the\@tempcntb}  
      \advance\@tempcnta#3\relax  
      \advance\@tempcntb#3\relax  
      \expandafter{\bbl@tempa}  
    \fi}  
  \bbl@tempa}
The following package options control the behavior of hyphenation mapping.

Initial setup to provide a default behavior if hyphenmap is not set.

This section ends with a general tool for resetting the caption names with a unique interface. With the old way, which mixes the switcher and the string, we convert it to the new one, which separates these two steps.
7.11 Macros common to a number of languages

\set@low@box

The following macro is used to lower quotes to the same level as the comma. It prepares its argument in box register 0.

\def\set@low@box#1\{\setbox@tw@\hbox{,}\setbox@z@\hbox{#1}\%
\dimen@z@\ht@z@ \advance\dimen@z@ -\ht@tw@\%
\setbox@z@\hbox{\lower\dimen@z@ \box@z@}\ht@z@\ht@tw@ \dp@z@\dp@tw@
\}

\save@sf@q

The macro \save@sf@q is used to save and reset the current space factor.

{\defs@f@q\{\leavevmode
{\begingroup
{\edef\@SF{\spacefactor\the\spacefactor}\#1}\@SF
\endgroup}

7.12 Making glyphs available

This section makes a number of glyphs available that either do not exist in the OT1 encoding and have to be 'faked', or that are not accessible through T1enc.def.

7.12.1 Quotation marks

\quotedblbase

In the T1 encoding the opening double quote at the baseline is available as a separate character, accessible via \quotedblbase. In the OT1 encoding it is not available, therefore we make it available by lowering the normal open quote character to the baseline.

{\ProvideTextCommand{\quotedblbase}{OT1}\%
{\save@sf@q\{\set@low@box{\textquotedblright }\%
{\box@z@\kern-.04em\bb@allowhyphens}\}}

Make sure that when an encoding other than OT1 or T1 is used this glyph can still be typeset.

{\ProvideTextCommandDefault{\quotedblbase}{%}
{\UseTextSymbol{OT1}{\quotedblbase}}

\quotesinglbase

We also need the single quote character at the baseline.

{\ProvideTextCommand{\quotesinglbase}{OT1}\%
{\save@sf@q\{\set@low@box{\textquoteright }\%
{\box@z@\kern-.04em\bb@allowhyphens}\}}

Make sure that when an encoding other than OT1 or T1 is used this glyph can still be typeset.

{\ProvideTextCommandDefault{\quotesinglbase}{%}
{\UseTextSymbol{OT1}{\quotesinglbase}}
The guillemet characters are not available in OT1 encoding. They are faked. (Wrong names with o preserved for compatibility.)

\ProvideTextCommand{\guillemetleft}{OT1}{
  \ifmmode
  \ll
  \else
  \save@sf@q{\nobreak
    \raise.2ex\hbox{$\scriptscriptstyle\ll$}\bbl@allowhyphens}
  \fi}
\ProvideTextCommand{\guillemetright}{OT1}{
  \ifmmode
  \gg
  \else
  \save@sf@q{\nobreak
    \raise.2ex\hbox{$\scriptscriptstyle\gg$}\bbl@allowhyphens}
  \fi}
\ProvideTextCommandDefault{\guillemetleft}{
  \UseTextSymbol{OT1}{\guillemetleft}}
\ProvideTextCommandDefault{\guillemetright}{
  \UseTextSymbol{OT1}{\guillemetright}}

Make sure that when an encoding other than OT1 or T1 is used these glyphs can still be typeset.

\ProvideTextCommandDefault{\guillemetleft}{
  \UseTextSymbol{OT1}{\guillemetleft}}
\ProvideTextCommandDefault{\guillemetright}{
  \UseTextSymbol{OT1}{\guillemetright}}

The single guillemets are not available in OT1 encoding. They are faked.

\ProvideTextCommand{\guilsinglleft}{OT1}{
  \ifmmode
  <
  \else
  \save@sf@q{\nobreak
    \raise.2ex\hbox{$\scriptscriptstyle<$}\bbl@allowhyphens}
  \fi}
\ProvideTextCommand{\guilsinglright}{OT1}{
  \ifmmode
  >
  \else
  \save@sf@q{\nobreak
    \raise.2ex\hbox{$\scriptscriptstyle>$}\bbl@allowhyphens}
  \fi}
\ProvideTextCommandDefault{\guilsinglleft}{
  \UseTextSymbol{OT1}{\guilsinglleft}}
\ProvideTextCommandDefault{\guilsinglright}{
  \UseTextSymbol{OT1}{\guilsinglright}}

Make sure that when an encoding other than OT1 or T1 is used these glyphs can still be typeset.
7.12.2 Letters
\ij The Dutch language uses the letter 'ij'. It is available in T1 encoded fonts, but not in the OT1 encoded fonts. Therefore we fake it for the OT1 encoding.
\IJ
\DeclareTextCommand{\ij}{OT1}{i\kern-0.02em\textbf{bbl@allowhyphens} j}
\DeclareTextCommand{\IJ}{OT1}{I\kern-0.02em\textbf{bbl@allowhyphens} J}
\DeclareTextCommand{\ij}{T1}{\char188}
\DeclareTextCommand{\IJ}{T1}{\char156}

Make sure that when an encoding other than OT1 or T1 is used these glyphs can still be typeset.
\ProvideTextCommandDefault{\ij}{\UseTextSymbol{OT1}{\ij}}
\ProvideTextCommandDefault{\IJ}{\UseTextSymbol{OT1}{\IJ}}

\dj The Croatian language needs the letters \dj and \DJ; they are available in the T1 encoding, but not in the OT1 encoding by default.

Some code to construct these glyphs for the OT1 encoding was made available to me by Stipčević Mario, (stipcevic@olimp.irb.hr).
\def\crrtic@{\hrule height0.1ex width0.3em}
\def\crttic@{\hrule height0.1ex width0.33em}
\def\ddj@{% 
\setbox0\hbox{d}\dimen@=.ht0 
\advance\dimen@1ex 
\dimen@.45\dimen@ 
\dimen@ii\expandafter\rem@pt\the\fontdimen@one\font\dimen@ 
\advance\dimen@ii.5ex % correction for the dash position 
\advance\dimen@ii-.15\fontdimen7\font % correction for cmtt font 
\dimen\thr@@\expandafter\rem@pt\the\fontdimen7\font\dimen@ 
\leavevmode\rlap{\raise\dimen@\hbox{\kern\dimen@ii\vbox{\crrtic@}}}}
\def\DDJ@{% 
\setbox0\hbox{D}\dimen@=.55\ht0 
\dimen@ii\expandafter\rem@pt\the\fontdimen@one\font\dimen@ 
\advance\dimen@ii.15ex % correction for the dash position 
\advance\dimen@ii-.15\fontdimen7\font % correction for cmtt font 
\dimen\thr@@\expandafter\rem@pt\the\fontdimen7\font\dimen@ 
\leavevmode\rlap{\raise\dimen@\hbox{\kern\dimen@ii\vbox{\crttic@}}}}
\DeclareTextCommand{\dj}{OT1}{\ddj@ d}
\DeclareTextCommand{\DJ}{OT1}{\DDJ@ D}

Make sure that when an encoding other than OT1 or T1 is used these glyphs can still be typeset.
\ProvideTextCommandDefault{\dj}{\UseTextSymbol{OT1}{\dj}}
\ProvideTextCommandDefault{\DJ}{\UseTextSymbol{OT1}{\DJ}}

\SS For the T1 encoding \SS is defined and selects a specific glyph from the font, but for other encodings it is not available. Therefore we make it available here.
\DeclareTextCommand{\SS}{OT1}{SS}
\ProvideTextCommandDefault{\SS}{\UseTextSymbol{OT1}{\SS}}

7.12.3 Shorthands for quotation marks
Shorthands are provided for a number of different quotation marks, which make them usable both outside and inside mathmode. They are defined with \ProvideTextCommandDefault, but this is very likely not required because their definitions are based on encoding-dependent macros.
\glq The 'german' single quotes.
\grq
\ProvideTextCommandDefault{\glq}{% 
\textormath{\quotesinglbase}{\mbox{\quotesinglbase}}}
The definition of `\textquoteleft` depends on the font encoding. With T1 encoding no extra kerning is needed.

\begin{verbatim}
\textquoteleft\textquoteleft
\end{verbatim}

The ‘german’ double quotes.

\begin{verbatim}
\textquotedblleft\textquotedblleft
\end{verbatim}

The ‘french’ double guillemets.

\begin{verbatim}
\guillemetleft\guillemetright
\end{verbatim}

The ‘french’ single guillemets.

The command ‘\textquoteright’ needs to have a different effect for different languages. For German for instance, the ‘umlaut’ should be positioned lower than the default position for placing it over the letters a, o, u, A, O and U. When placed over an e, i, E or I it can retain its normal position. For Dutch the same glyph is always placed in the lower position.

\begin{verbatim}
\umlauthigh\umlautlow
\end{verbatim}

7.12.4 Umlauts and tremas

The command ‘\textquoteright’ needs to have a different effect for different languages. For German for instance, the ‘umlaut’ should be positioned lower than the default position for placing it over the letters a, o, u, A, O and U. When placed over an e, i, E or I it can retain its normal position. For Dutch the same glyph is always placed in the lower position.

\begin{verbatim}
\umlauthigh\umlautlow
\end{verbatim}

To be able to provide both positions of ‘\textquoteright’ we provide two commands to switch the positioning, the default will be ‘\umlauthigh’ (the normal positioning).

\begin{verbatim}
\umlauthigh\umlautlow
\end{verbatim}

The command ‘\textquoteright’ is used to position the ‘\textquoteright’ closer to the letter.

We want the umlaut character lowered, nearer to the letter. To do this we need an extra \texttt{dimen} register.

\begin{verbatim}
\umdim\umlauthigh\umlautlow
\end{verbatim}
The following code fools \TeX's make_accent procedure about the current x-height of the font to force another placement of the umlaut character. First we have to save the current x-height of the font, because we'll change this font dimension and this is always done globally. Then we compute the new x-height in such a way that the umlaut character is lowered to the base character. The value of \texttt{.45ex} depends on the METAFONT parameters with which the fonts were built. (Just try out, which value will look best.) If the new x-height is too low, it is not changed. Finally we call the \texttt{\accent} primitive, reset the old x-height and insert the base character in the argument.

\begin{verbatim}
\def\lower@umlaut#1{% \\
  \leavevmode\bgroup \U@D 1ex% \\
  \setbox\z@\hbox{\expandafter\char\csname f@encoding dqpos \endcsname}% \\
  \dimen@ -.45ex\advance\dimen@\ht\z@ \\
  \ifdim 1ex<\dimen@ \fontdimen5\font\dimen@ \fi}\
  \expandafter\accent\csname f@encoding dqpos \endcsname \\
  \fontdimen5\font\U@D #1% \egroup}
\end{verbatim}

For all vowels we declare \texttt{"} to be a composite command which uses \texttt{\bbl@umlauta} or \texttt{\bbl@umlaute} to position the umlaut character. We need to be sure that these definitions override the ones that are provided when the package fontenc with option OT1 is used. Therefore these declarations are postponed until the beginning of the document. Note these definitions only apply to some languages, but babel sets them for all languages – you may want to redefine \texttt{\bbl@umlauta} and/or \texttt{\bbl@umlaute} for a language in the corresponding \texttt{ldf} (using the babel switching mechanism, of course).

\begin{verbatim}
\AtBeginDocument{% \\
  \DeclareTextCompositeCommand{"}{OT1}{a}{\bbl@umlauta{a}}% \\
  \DeclareTextCompositeCommand{"}{OT1}{e}{\bbl@umlaute{e}}% \\
  \DeclareTextCompositeCommand{"}{OT1}{i}{\bbl@umlaute{\i}}% \\
  \DeclareTextCompositeCommand{"}{OT1}{\i}{\bbl@umlaute{\i}}% \\
  \DeclareTextCompositeCommand{"}{OT1}{o}{\bbl@umlauta{o}}% \\
  \DeclareTextCompositeCommand{"}{OT1}{u}{\bbl@umlauta{u}}% \\
  \DeclareTextCompositeCommand{"}{OT1}{A}{\bbl@umlauta{A}}% \\
  \DeclareTextCompositeCommand{"}{OT1}{E}{\bbl@umlaute{E}}% \\
  \DeclareTextCompositeCommand{"}{OT1}{I}{\bbl@umlaute{I}}% \\
  \DeclareTextCompositeCommand{"}{OT1}{O}{\bbl@umlauta{O}}% \\
  \DeclareTextCompositeCommand{"}{OT1}{U}{\bbl@umlauta{U}}%}
\end{verbatim}

Finally, make sure the default hyphen rules are defined (even if empty). For internal use, another empty \texttt{language} is defined. Currently used in Amharic.

\begin{verbatim}
\ifx\l@english\@undefined \chardef\l@english\z@ \fi \\
% The following is used to cancel rules in ini files (see Amharic). \\
\ifx\l@unhyphenated\@undefined \newlanguage\l@unhyphenated \fi \\
\end{verbatim}

\subsection{Layout}

Layout is mainly intended to set bidi documents, but there is at least a tool useful in general.
7.14 Load engine specific macros

Some macros are not defined in all engines, so, after loading the files define them if necessary to raise an error.

\bbl@trace{Input engine specific macros}
\iffalse\bbl@engine
  \input txtbabel.def
\or
  \input luababel.def
\or
  \input xebabel.def
\fi
\providecommand\b babelfont{%
  \bbl@error
  {This macro is available only in LuaLaTeX and XeLaTeX.}
  {Consider switching to these engines.}}
\providecommand\babelprehyphenation{%
  \bbl@error
  {This macro is available only in LuaLaTeX.}
  {Consider switching to that engine.}}
\ifx\babelposthyphenation\@undefined
  \let\babelposthyphenation\babelprehyphenation
  \let\babelpatterns\babelprehyphenation
  \let\babelcharproperty\babelprehyphenation
\fi

7.15 Creating and modifying languages

\bbl@trace{Creating languages and reading ini files}
\let\bbl@extend@ini\@gobble
\newcommand\babelprovide[2][]{
  \let\bbl@savelangname\languagename
  \edef\bbl@savelocaleid{\the\localeid}
  % Set name and locale id
  \edef\bbl@language@x{\bbl@savelangname\bbl@savelocaleid}}
\let\bbl@trace\@gobble
\bbl@trace{Creating languages and reading ini files}
\let\bbl@extend@ini\@gobble
\newcommand\babelprovide[2][]{
  \let\bbl@savelangname\languagename
  \edef\bbl@savelocaleid{\the\localeid}
  % Set name and locale id
  \edef\bbl@language@x{\bbl@savelangname\bbl@savelocaleid}}
\let\bbl@trace\@gobble
\bbl@trace{Creating languages and reading ini files}
% Load ini ==
\ifcase\bbl@howloaded
\bbl@provide@new{#2}%
\else
\bbl@ifblank{#1}% With \bbl@load@basic below
\bbl@provide@renew{#2}%
\fi
% Post tasks
% ----------
% == subsequent calls after the first provide for a locale ==
\ifx\bbl@inidata@empty\else
\bbl@extend@ini{#2}%
\fi
% == ensure captions ==
\ifx\bbl@KVP@captions@nil\else
\bbl@ifunset{bbl@extracaps@#2}\
\bbl@exp{\abelensure[exclude=\today]{#2}}%
\bbl@ifunset{bbl@ensure@\languagename}\
\bbl@exp{\hfill\\\DeclareRobustCommand<\bbl@ensure@\languagename>[1]{%\\foreignlanguage{\languagename}{####1}}}
\bbl@exp{\bbl@toglobal<\bbl@ensure@\languagename>\bbl@toglobal<\bbl@ensure@\languagename\space>}%
\fi
% == script, language ==
\ifx\bbl@KVP@script@nil\else
\bbl@csarg\edef{sname@#2}{\bbl@KVP@script}%
\fi
\ifx\bbl@KVP@language@nil\else
\bbl@csarg\edef{lname@#2}{\bbl@KVP@language}%
\fi
\ifcase\bbl@engine\or
\bbl@ifunset{bbl@chrng@\languagename}{}
\directlua{
Babel.set_chranges_b(\bbl@cl{sbcp}, \bbl@cl{chrng})}
\fi
% == onchar ==
\ifx\bbl@KVP@onchar@nil\else
\bbl@luahyphenate\bbl@exp{\\AddToHook{env/document/before}{{\\select@language{#2}}}%}
\directlua{
if Babel.locale_mapped == nil then
Babel.locale_mapped = true
Babel.linebreaking.add_before(Babel.locale_map)
Babel.loc_to_scr = {}
}
Babel.chr_to_loc = Babel.chr_to_loc or {}  
end}%  
\bbl@xin@{ ids }{ \bbl@KVP@onchar\space}%  \ifx\bbl@starthyphens\undefined % Needed if no explicit selection  \AddBabelHook{babel-onchar}{beforestart}{\bbl@starthyphens}%  \fi  \bbl@exp{\bbl@add\bbl@starthyphens  {\bbl@patterns@lua{\languagename}}}%  \ifin@  \ifx\bbl@starthyphens\undefined % Needed if no explicit selection  \AddBabelHook{babel-onchar}{beforestart}{\bbl@starthyphens}%  \fi  \bbl@exp{\bbl@add  {\bbl@patterns@lua{\languagename}}}%  \directlua{    if Babel.script_blocks[\'\bbl@cl{sbcp}\'] then  Babel.loc_to_scr[\the\localeid] =  Babel.script_blocks[\'\bbl@cl{sbcp}\']  end}  \fi  \bbl@xin@{ fonts }{ \bbl@KVP@onchar\space}%  \ifin@  \bbl@ifunset{bbl@lsys@\languagename}{\bbl@provide@lsys{\languagename}}{}%  \bbl@ifunset{bbl@wdir@\languagename}{\bbl@provide@dirs{\languagename}}{}%  \directlua{    if Babel.script_blocks[\'\bbl@cl{sbcp}\'] then  Babel.loc_to_scr[\the\localeid] =  Babel.script_blocks[\'\bbl@cl{sbcp}\']  end}%  \ifx\bbl@mapselect\undefined % TODO. almost the same as mapfont  \AtBeginDocument{%  \bbl@patchfont{\bbl@mapselect{\bbl@mapdir{\languagename}}}%  \bbl@ifset{\bbl@mapselect}{\bbl@mapdir{\languagename}}{}%  \def\bbl@mapselect{%    \let\bbl@mapselect\relax    \edef\bbl@prefontid{\fontid\font}%    \def\bbl@mapdir##1{%        \let\bbl@mapdir\relax%        \edef\bbl@prefontid{\fontid\font}%        \def\languagename{##1}%        \let\bbl@ifrestoring\@firstoftwo % To avoid font warning        \bbl@switchfont%        \def\bbl@prefontid{\fontid\font}%        \fi}%    \fi}%  \fi  \bbl@exp{\bbl@add\bbl@mapselect{\bbl@mapdir{\languagename}}}%  \fi  \if\bbl@mapselect\undefined % TODO. almost the same as mapfont  \AtBeginDocument{%  \bbl@patchfont{\bbl@mapselect{\bbl@mapdir{\languagename}}}%  \bbl@ifset{\bbl@mapselect}{\bbl@mapdir{\languagename}}{}%  \def\bbl@mapselect{%    \let\bbl@mapselect\relax%    \edef\bbl@prefontid{\fontid\font}%    \def\bbl@mapdir##1{%        \let\bbl@mapdir\relax%        \edef\bbl@prefontid{\fontid\font}%        \def\languagename{##1}%        \let\bbl@ifrestoring\@firstoftwo % To avoid font warning        \bbl@switchfont%        \def\bbl@prefontid{\fontid\font}%        \fi}%    \fi}%  \fi  \% TODO - catch non-valid values  \ifx\bbl@mapselect\undefined % TODO. almost the same as mapfont  \AtBeginDocument{%  \bbl@patchfont{\bbl@mapselect{\bbl@mapdir{\languagename}}}%  \bbl@ifset{\bbl@mapselect}{\bbl@mapdir{\languagename}}{}%  \def\bbl@mapselect{%    \let\bbl@mapselect\relax%    \edef\bbl@prefontid{\fontid\font}%    \def\bbl@mapdir##1{%        \let\bbl@mapdir\relax%        \edef\bbl@prefontid{\fontid\font}%        \def\languagename{##1}%        \let\bbl@ifrestoring\@firstoftwo % To avoid font warning        \bbl@switchfont%        \def\bbl@prefontid{\fontid\font}%        \fi}%    \fi}%  \fi  \% == mapfont ==  \ifx\bbl@mapselect\undefined % TODO. almost the same as mapfont  \AtBeginDocument{%  \bbl@patchfont{\bbl@mapselect{\bbl@mapdir{\languagename}}}%  \bbl@ifset{\bbl@mapselect}{\bbl@mapdir{\languagename}}{}%  \def\bbl@mapselect{%    \let\bbl@mapselect\relax%    \edef\bbl@prefontid{\fontid\font}%    \def\bbl@mapdir##1{%        \let\bbl@mapdir\relax%        \edef\bbl@prefontid{\fontid\font}%        \def\languagename{##1}%        \let\bbl@ifrestoring\@firstoftwo % To avoid font warning        \bbl@switchfont%        \def\bbl@prefontid{\fontid\font}%        \fi}%    \fi}%  \fi  \% For bidi texts, to switch the font based on direction  \ifx\bbl@KVP@mapfont\nullifelse  \bbl@ifsamestring{\bbl@KVP@mapfont}{\bbl@KVP@mapfont}{\bbl@KVP@mapfont}{\bbl@KVP@mapfont}{\bbl@KVP@mapfont}{\bbl@KVP@mapfont}{\bbl@KVP@mapfont}{\bbl@KVP@mapfont}{\bbl@KVP@mapfont}{\bbl@KVP@mapfont}{\bbl@KVP@mapfont}{\bbl@KVP@mapfont}{\bbl@KVP@mapfont}{\bbl@KVP@mapfont}{\bbl@KVP@mapfont}{\bbl@KVP@mapfont}{\bbl@KVP@mapfont}{\bbl@KVP@mapfont}{\bbl@KVP@mapfont}{\bbl@KVP@mapfont}{\bbl@KVP@mapfont}{\bbl@KVP@mapfont}{\bbl@KVP@mapfont}{\bbl@KVP@mapfont}{\bbl@KVP@mapfont}{\bbl@KVP@mapfont}{\bbl@KVP@mapfont}{\bbl@KVP@mapfont}{\bbl@KVP@mapfont}{\bbl@KVP@mapfont}{\bbl@KVP@mapfont}{\bbl@KVP@mapfont}{\bbl@KVP@mapfont}{\bbl@KVP@mapfont}{\bbl@KVP@mapfont}{\bbl@KVP@mapfont}{\bbl@KVP@mapfont}{\bbl@KVP@mapfont}{\bbl@KVP@mapfont}{\bbl@KVP@mapfont}{\bbl@KVP@mapfont}{\bbl@KVP@mapfont}{\bbl@KVP@mapfont}{\bbl@KVP@mapfont}{\bbl@KVP@mapfont}{\bbl@KVP@mapfont}{\bbl@KVP@mapfont}{\bbl@KVP@mapfont}{\bbl@KVP@mapfont}{\bbl@KVP@mapfont}{\bbl@KVP@mapfont}{\bbl@KVP@mapfont}{\bbl@KVP@mapfont}{\bbl@KVP@mapfont}{\bbl@KVP@mapfont}{\bbl@KVP@mapfont}{\bbl@KVP@mapfont}{\bbl@KVP@mapfont}{\bbl@KVP@mapfont}{\bbl@KVP@mapfont}{\bbl@KVP@mapfont}{\bbl@KVP@mapfont}{\bbl@KVP@mapfont}{\bbl@KVP@mapfont}{\bbl@KVP@mapfont}{\bbl@KVP@mapfont}{\bbl@KVP@mapfont}{\bbl@KVP@mapfont}{\bbl@KVP@mapfont}{\bbl@KVP@mapfont}{\bbl@KVP@mapfont}{\bbl@KVP@mapfont}{\bbl@KVP@mapfont}{\bbl@KVP@mapfont}{\bbl@KVP@mapfont}{\bbl@KVP@mapfont}{\bbl@KVP@mapfont}{\bbl@KVP@mapfont}{\bbl@KVP@mapfont}{\bbl@KVP@mapfont}{\bbl@KVP@mapfont}{\bbl@KVP@mapfont}{\bbl@KVP@mapfont}{\bbl@KVP@mapfont}{\bbl@KVP@mapfont}{\bbl@KVP@mapfont}{\bbl@KVP@mapfont}{\bbl@KVP@mapfont}{\bbl@KVP@mapfont}{\bbl@KVP@mapfont}{\bbl@KVP@mapfont}{\bbl@KVP@mapfont}{\bbl@KVP@mapfont}{\bbl@KVP@mapfont}{\bbl@KVP@mapfont}{\bbl@KVP@mapfont}{\bbl@KVP@mapfont}{\bbl@KVP@mapfont}{\bbl@KVP@mapfont}{\bbl@KVP@mapfont}{\bbl@KVP@mapfont}{\bbl@KVP@mapfont}{\bbl@KVP@mapfont}{\bbl@KVP@mapfont}{\bbl@KVP@mapfont}{\bbl@KVP@mapfont}{\bbl@KVP@mapfont}{\bbl@KVP@mapfont}{\bbl@KVP@mapfont}{\bbl@KVP@mapfont}{\bbl@KVP@mapfont}{\bbl@KVP@mapfont}{\bbl@KVP@mapfont}{\bbl@KVP@mapfont}{\bbl@KVP@mapfont}{\bbl@KVP@mapfont}{\bbl@KVP@mapfont}{\bbl@KVP@mapfont}{\bbl@KVP@mapfont}{\bbl@KVP@mapfont}{\bbl@KVP@mapfont}{\bbl@KVP@mapfont}{\bbl@KVP@mapfont}{\bbl@KVP@mapfont}{\bbl@KVP@mapfont}{\bbl@KVP@mapfont}{\bbl@KVP@mapfont}{\bbl@KVP@mapfont}{\bbl@KVP@mapfont}{\bbl@KVP@mapfont}{\bbl@KVP@mapfont}{\bbl@KVP@mapfont}{\bbl@KVP@mapfont}{\bbl@KVP@mapfont}{\bbl@KVP@mapfont}{\bbl@KVP@mapfont}{\bbl@KVP@mapfont}{\bbl@KVP@mapfont}{\bbl@KVP@mapfont}{\bbl@KVP@mapfont}{\bbl@KVP@mapfont}{\bbl@KVP@mapfo
\let\bbl@mapselect\relax
\edef\bbl@prefontid{\fontid\font}{}
\let\bbl@ifrestoring@firstoftwo % avoid font warning
\bbl@switchfont
\directlua{Babel.fontmap
\[\the\csname bbl@wdir@\languagename\endcsname\] %
\[\bbl@prefontid\] = \fontid\font}}%
\fi
\bbl@exp{\\bbl@add\\bbl@mapselect{\\bbl@mapdir{\\languagename}}}%
\fi
% == Line breaking: intraspace, intrapenalty ==
% For CJK, East Asian, Southeast Asian, if interspace in ini
\ife\bbl@KVP@intraspace\else % We can override the ini or set
\bbl@csarg\edef{intsp@#2}{\bbl@KVP@intraspace}%
\fi
\bbl@provide@intraspace
% == Line breaking: CJK quotes ==
\ifcase\bbl@engine\or
\bbl@xin{/c}{/bbl@cl{lnbrk}}%
\ifin@
\bbl@ifunset{bbl@quote@\languagename}{}%
{\directlua{
Babel.locale_props[\the\localeid].cjk_quotes = {}
for c in string.utfvalues(%
[[\csname bbl@quote@\languagename\endcsname]]) do
if Babel.cjk_characters[c].c == 'qu' then
    Babel.locale_props[\the\localeid].cjk_quotes[c] = cs
end
end
}
\fi
\fi
\bbl@provide@intraspace
% == Line breaking: justification ==
\ife\bbl@KVP@justification\mnilelse
\let\bbl@KVP@linebreaking\bbl@KVP@justification
\fi
\ife\bbl@KVP@linebreaking\mnilelse
\bbl@xin@{/c}{/bbl@cl{lnbrk}}%
\ifin@
\bbl@csarg\edef{lnbrk@\languagename}{{\expandafter@\car\bbl@KVP@linebreaking}@nil}%
\fi
\fi
\bbl@xin@{/c}{/bbl@cl{lnbrk}}%
\ifin@\else\bbl@xin@{/k}{/bbl@cl{lnbrk}}\fi
\ifin@\bbl@arabicjust\fi
% == Line breaking: hyphenate.other.(locale|script) ==
\ife\bbl@KVP@linebreaking@empty
\bbl@ifunset{bbl@hyotl@\languagename}{%}
\bbl@csarg\bbl@replace{hyotl@\languagename}{}{,%}
\bbl@startcommands*{\languagename}{%}
\bbl@csarg\bbl@foreach{hyotl@\languagename}{%}
\bbl@KVP@linebreaking@nil\fi
\fi
\ife\bbl@KVP@linebreaking\mnilelse
\bbl@xin@{},elongated,kashida,cjk,unhyphenated,}%
\fi
\ife\bbl@KVP@linebreaking@empty
\bbl@ifunset{bbl@hyotl@\languagename}{%}
\bbl@csarg\bbl@replace{hyotl@\languagename}{}{,%}
\bbl@startcommands*{\languagename}{%}
\bbl@csarg\bbl@foreach{hyotl@\languagename}{%}
\bbl@KVP@linebreaking@nil\fi
\fi
\end{document}

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\endcommands
\ifunset{\hyots@\languagename}{}
\ifcase\bb\engine
\ifnum\##1<257
\global\lccode\##1=\##1\relax
\fi
\else
\global\lccode\##1=\##1\relax
\fi
\fi
%
% == Counters: maparabic ==
% Native digits, if provided in ini (TeX level, xe and lua)
\ifcase\bb\engine\else
\ifunset{\dgnat@\languagename}{}
{\expandafter\ifx\csname \dgnat@\languagename\endcsname\@empty\else
\expandafter\expandafter\expandafter
\setdigits\csname \dgnat@\languagename\endcsname
\ifx\counter@\languagename\@undefined
\expandafter\let\expandafter\@arabic\csname \counter@\languagename\endcsname
\else % ie, if layout=counters, which redefines \@arabic
\expandafter\let\expandafter\latinarabic\csname \counter@\languagename\endcsname
\csname \counter@\languagename\endcsname \@arabic
\fi
\fi}
\fi
%
% == Counters: mapdigits ==
% Native digits (lua level).
\ifodd\bb\engine
\ifunset{\dgnat@\languagename}{}
{\RequirePackage{luatexbase}
\activate@preotf
\directlua{
Babel = Babel or {}
Babel.digits_mapped = true
Babel.digits = Babel.digits or {}
Babel.digits[\localeid] =
table.pack(string.utfvalue(\\cl{dgnat}))
if not Babel.numbers then
function Babel.numbers(head)
local LOCALE = Babel.attr_locale
local GLYPH = node.id'glyph'
local inmath = false
for item in node.traverse(head) do
if not inmath and item.id == GLYPH then
local temp = node.get_attribute(item, LOCALE)
if Babel.digits[temp] then
local chr = item.char
if chr > 47 and chr < 58 then
item.char = Babel.digits[temp][chr-47]
end
end
else % ie, if layout=counters, which redefines \@arabic
\expandafter\let\expandafter\latinarabic\csname \counter@\languagename\endcsname
\csname \counter@\languagename\endcsname \@arabic
\fi
\fi
\fi
\endlua
\end{verbatim}

% == Counters: alph, Alph ==
% What if extras<lang> contains a \bbl@save@alph? It won't be
% restored correctly when exiting the language, so we ignore
% this change with the \bbl@alph@saved trick.
\ifx\bbl@KVP@alph\@nnil
  \bbl@extras@wrap{\bbl@alph@saved}{\let\bbl@alph@saved\@alph}{\bbl@save@alph}{\let\@alph\bbl@alph\bl@exp{\bbl@add<extras\languagename>{\bbl@cntr\bbl@KVP@alph @\languagename}}}%
\fi
\ifx\bbl@KVP@Alph\@nnil
  \bbl@extras@wrap{\bbl@Alph@saved}{\let\bbl@Alph@saved\@Alph}{\bbl@save@Alph}{\let\@Alph\bbl@Alph\bl@exp{\bbl@add<extras\languagename>{\bbl@cntr\bbl@KVP@Alph @\languagename}}}%
\fi
% == Calendars ==
\ifx\bbl@KVP@calendar\@nnil
  \edef\bbl@KVP@calendar{calpr}\fi
\def\bbl@tempe##1.##2.##3\@@{\def\bbl@tempa{##1}\def\bbl@tempc{##1}\def\bbl@tempb{##2}}\expandafter\bbl@tempe\bbl@tempa..\@@
\bbl@csarg\edef{calpr@\languagename}{\ifx\bbl@tempc\@empty\else calendar=\bbl@tempc\fi\ifx\bbl@tempb\@empty\else ,variant=\bbl@tempb\fi}%
% == require.babel in ini ==
% To load or reaload the babel-*.tex, if require.babel in ini
\bbl@foreach\bbl@calendars{\let\BabelBeforeIni\@gobbletwo\let\@atcatcode\@=11\InputIfFileExists{babel-ca-##1.tex}{\global\bbl@csarg\let{rqtex@\languagename}\relax}{\def{rqtex@\languagename}{\chardef\atcatcode=\catcode`@\expandafter\input\csname bbl@rqtex@\languagename@endcsname\atcatcode\relax}}}}
% \bbl@ifunset{bbl@rqtex@\languagename}{\bbl@foreach\bbl@calendars{\let\BabelBeforeIni\@gobbletwo\let\@atcatcode\@=11\InputIfFileExists{babel-ca-##1.tex}{\global\bbl@csarg\let{rqtex@\languagename}\relax}{\def{rqtex@\languagename}{\chardef\atcatcode=\catcode`@\expandafter\input\csname bbl@rqtex@\languagename@endcsname\atcatcode\relax}}}}
% But not in doc aux or body
\bbl@foreach\bbl@calendars{\let\BabelBeforeIni\@gobbletwo\let\@atcatcode\@=11\InputIfFileExists{babel-ca-##1.tex}{\global\bbl@csarg\let{rqtex@\languagename}\relax}{\def{rqtex@\languagename}{\chardef\atcatcode=\catcode`@\expandafter\input\csname bbl@rqtex@\languagename@endcsname\atcatcode\relax}}}%
Depending on whether or not the language exists (based on \date<language>), we define two macros. Remember \bbl@startcommands opens a group.

\def\bbl@provide@new#1{% 
  \@namedef{date#1}{}% marks lang exists - required by \StartBabelCommands 
  \@namedef{extras#1}{}% 
  \@namedef{noextras#1}{}% 
  \bbl@startcommands*{#1}{captions}%
  \ifx\bbl@KVP@captions\@nnil % and also if import, implicit 
    \def\bbl@tempb##1{% elt for \bbl@captionslist 
      \ifx##1\@empty\else 
        \\SetString\##1{\bbl@nocaption{\bbl@stripslash##1}{#1\bbl@stripslash##1}}%
      \fi}%
    \expandafter\bbl@tempb\bbl@captionslist\@empty
  \else 
    \ifx\bbl@initoload\relax
      \bbl@read@ini{\bbl@KVP@captions}2% % Here letters cat = 11
    \else
      \bbl@read@ini{\bbl@initoload}2% % Same
    \fi
    \expandafter\\bbl@endcommands
  \fi
  \StartBabelCommands*{#1}{date}% 
  \ifx\bbl@KVP@date\@nnil
    \\SetString\today{\bbl@nocaption{today}{#1today}}%
  \else
    \bbl@savetoday
    \bbl@savedate
  \fi
  \bbl@endcommands
  \bbl@load@basic*{#1}%
  \ifx\bbl@KVP@main\@nnil %
    \ \def\<#1hyphenmins>{% 
      \bbl@ifunset{bbl@lfthm@#1}{2}{\bbl@cs{lfthm@#1}}}%
      \bbl@ifunset{bbl@rgthm@#1}{3}{\bbl@cs{rgthm@#1}}%
    \fi
  \fi
\end{BabelCommands}%
\endinput
Load the basic parameters (ids, typography, counters, and a few more), while captions and dates are left out. But it may happen some data has been loaded before automatically, so we first discard the saved values. (TODO. But preserving previous values would be useful.)

The hyphenrules option is handled with an auxiliary macro.
The reader of babel-...tex files. We reset temporarily some catcodes.

The following macros read and store ini files (but don't process them). For each line, there are three possible actions: ignore if starts with ;, switch section if starts with [, and store otherwise. There are used in the first step of \bbl@read@ini.

Now, the 'main loop', which **must be executed inside a group**. At this point, \bbl@inidata may contain data declared in \babelprovide, with 'slashed' keys. There are three steps: first read the ini file and store it; then traverse the stored values, and process some groups if required (date, captions, labels, counters); finally, 'export' some values by defining global macros (identification, typography, characters, numbers). The second argument is 0 when called to read the minimal data for fonts; with \babelprovide it's either 1 or 2.

Now, the 'main loop', which **must be executed inside a group**. At this point, \bbl@inidata may contain data declared in \babelprovide, with 'slashed' keys. There are three steps: first read the ini file and store it; then traverse the stored values, and process some groups if required (date, captions, labels, counters); finally, 'export' some values by defining global macros (identification, typography, characters, numbers). The second argument is 0 when called to read the minimal data for fonts; with \babelprovide it's either 1 or 2.
A variant to be used when the ini file has been already loaded, because it's not the first \babelprovide for this language.
\def\bbl@extend@ini@aux#1{\bbl@startcommands*{#1}{captions}\
% Activate captions/... and modify exports
\bbl@csarg\def\inivk@captions.licr{#1}{#2}\%
\setlocalecaption{#1}{#1}{#2}\%
\def\bbl@stringdef{}\%
\bbl@exportkey{#1}{#2}{#3}\%
\bbl@inidata}

As some hackish tool to handle calendar sections. TODO. To be improved.
\def\bbl@ini@calendar#1{\lowercase{\def\bbl@tempa{=#1=}}}\bbl@replace\bbl@tempa{=date.gregorian}{}\bbl@replace\bbl@tempa{=date.}{}\in@{.licr=}{#1=}\ifin@
\ifcase\bbl@engine\bbl@replace\bbl@tempa{}.licr=}{}\else\let\bbl@tempa\relax\fi\fi\ifx\bbl@tempa\relax\else\xdef\bbl@calendars{\bbl@calendars,\bbl@tempa}\bbl@exp{\
\def\bbl@inikv@#1##1##2{\bbl@inidate##1...\relax{##2}{\bbl@tempa}}}\fi

A key with a slash in \babelprovide replaces the value in the ini file (which is ignored altogether). The mechanism is simple (but suboptimal): add the data to the ini one (at this point the ini file has
not yet been read), and define a dummy macro. When the ini file is read, just skip the corresponding key and reset the macro (in `\bbl@inisestore` above).

```
2978 \def\bbl@renewinikey\#1/#2\@@@@\#3{%
2979 \edef\bbl@tempa{\zap@space \#1 \@empty}% section
2980 \edef\bbl@tempb{\zap@space \#2 \@empty}% key
2981 \bbl@trim\toks@{\#3}% value
2982 \bbl@exp{%
2983 \edef\bbl@key@list{\bbl@key@list \bbl@tempa/\bbl@tempb;}%
2984 \g@addto@macro\bbl@iniidata{%
2985 \bbl@elt{\bbl@tempa}{\bbl@tempb}{\the\toks@}}}}%
```

The previous assignments are local, so we need to export them. If the value is empty, we can provide a default value.

```
2986 \def\bbl@exportkey\#1\#2\#3{%
2987 \bbl@ifunset{bbl@@kv@\#2}{%
2988 {\bbl@csarg\gdef{\#1@\languagename}{\#3}}%
2989 {\expandafter\ifx\csname bbl@@kv@\#2\endcsname\@empty
2990 {\bbl@csarg\gdef{\#1@\languagename}{\#3}}%
2991 \else
2992 \bbl@exp{\global\let\langle\bbl@\#1\@\languagename\rangle\bbl@@kv@\#2}%
2993 \fi}}%
```

Key-value pairs are treated differently depending on the section in the ini file. The following macros are the readers for identification and typography. Note `\bbl@ini@exports` is called always (via `\bbl@inisec`), while `\bbl@after@ini` must be called explicitly after `\bbl@read@ini` if necessary.

```
2994 \def\bbl@iniwarning\#1{%
2995 \bbl@ifunset{bbl@@kv@identification.warning\#1}{%
2996 \bbl@warning{%
2997 From babel-\bbl@cs{lini@\languagename}.ini:\%
2998 \bbl@cs{@kv@identification.warning\#1}\%
2999 Reported }}}%
3000 %}
3001 \let\bbl@release@transforms\@empty

BCP 47 extensions are separated by a single letter (eg. latin-x-medieval. The following macro handles this special case to create correctly the corresponding info.

```
3002 \def\bbl@ini@extension\#1{%
3003 \def\bbl@tempa{\#1}%
3004 \bbl@replace{\bbl@tempa}{extension.}{%}
3005 \bbl@replace{\bbl@tempa}{.tag.bcp47}{%}
3006 \bbl@ifunset{\bbl@info@\#1}{%
3007 {\bbl@csarg\gdef{\#1@\languagename}{.#1}}%
3008 \bbl@exp{%
3009 {\g@addtomacro\bbl@moreinfo{%
3010 \bbl@exportkey{ext/\bbl@tempa}{identification.#1}{%}}}
3011 {}}}
3012 \let\bbl@moreinfo\@empty
3013 %}
3014 \def\bbl@ini@exports\#1{%
3015 % Identification always exported
3016 \bbl@iniwarning{}%
3017 \ifcase\bbl@engine
3018 \bbl@iniwarning{.pdflatex}%
3019 \or
3020 \bbl@iniwarning{.lualatex}%
3021 \or
3022 \bbl@iniwarning{.xelatex}%
3023 \fi%
3024 \bbl@exportkey{\#1@}{identification.load.level}{%}
3025 \bbl@exportkey{\#1@}{identification.name.english}{%}
3026 \bbl@exp{\langle\langle\bbl@\#1@\languagename\rangle\rangle\rangle}
3027 \csname bbl@elname@\languagename@endcsname%
3028 \bbl@exportkey{\#1@}{identification.tag.bcp47}{%}
```
A shared handler for key=val lines to be stored in `\bbl@inikv<section>..<key>.

\def\bbl@inikv#1#2{% key=value
  \toks@{#2}% This hides #'s from ini values
  \bbl@csarg\edef{@kv@\bbl@section.#1}{\the\toks@}
}

By default, the following sections are just read. Actions are taken later.

Additive numerals require an additional definition. When .1 is found, two macros are defined – the basic one, without .1 called by \localenumeral, and another one preserving the trailing .1 for the ‘units’.

\def\bbl@inikv@counters#1#2{%
  \ifnum#1<\tw@
    \bbl@error{The counter name 'digits' is reserved for mapping\%
    decimal digits}%
    {Use another name.}%
  \fi
}
\def\bbl@inikv@counters#1#2{%
  \ifnum#1<\tw@
    \bbl@error{The counter name 'digits' is reserved for mapping\%
    decimal digits}%
    {Use another name.}%
  \fi

% Additive numerals
\def\bbl@addnum{\the\bbl@inikv@counters\textbullet\the\bbl@inikv@counters}

% Local enumeral
\def\localenumeral#1{\bbl@localenumeral{#1}}

% Additional commands
\def\bbl@localenumeral#1{\bbl@addnum@#1\textbullet\bbl@addnum@#1\textbullet}
Now captions and captions.licr, depending on the engine. And below also for dates. They rely on a few auxiliary macros. It is expected the ini file provides the complete set in Unicode and LICR, in that order.

The auxiliary macro for captions define \caption{name}.

The auxiliary macro for captions define \caption{name}.
Labels. Captions must contain just strings, no format at all, so there is new group in ini files.

```latex
\def\bbl@list@the{%
  part, chapter, section, subsection, subsubsection, paragraph, %
  subparagraph, enumi, enumii, enumiii, enumiv, equation, figure, %
  table, page, footnote, mpfootnote, mpfn)
\def\bbl@map@cnt#1{%
  \@nameuse{bbl@map@#1@\languagename}%
  \@nameuse{bbl@map@#1@\languagename}}
\def\bbl@initkv@labels#1#2{%
  \in@{.map}{#1}%
  \ifin@
    \bbl@ifunset{bbl@KVP@labels}\@nnil% 
    \else
      \bbl@xin@{ map }{ \bbl@KVP@labels\space}%
      \ifin@
        \def\bbl@tempc{#1}%
        \bbl@replace\bbl@tempc{.map}{}%
        \in@{,#2,}{,arabic,roman,Roman,alph,Alph,fnsymbol,}%
        \bbl@exp{%
          \gdef\bbl@map@\bbl@tempc@\languagename{}
          \localecounter{#2}
          \bbl@exp{%
            \bbl@foreach\bbl@list@the{%
              \bbl@ifunset{the##1}{}%
              \bbl@exp{\
                \bbl@sreplace\bbl@tempc{\bbl@map@cnt{\bbl@tempc}{##1}}{\
                  \bbl@sreplace\bbl@tempc{\bbl@map@cnt{\bbl@tempc}{##1}}{\bbl@map@cnt{\bbl@tempc}{##1}}}%
            }%}
            % The following code is still under study. You can test it and make
            % suggestions. Eg, enumerate.2 = ([enumi]).([enumii]). It's
            % language dependent.
            \\bbl@exp{\let\bbl@tempd{the##1}%
              \bbl@tempc{the##1}}%
            \expandafter\ifx\expandafter\csname the##1\endcsname\bbl@tempd
            \else
              \toks@={\bbl@tempd}%
            \fi}%
          }%
        }%
        % TODO. Execute only once:
        \\bbl@exp{%
          \bbl@add{\extras@\languagename}{\csname labelenum\romannumeral\bbl@tempc\endcsname{\the\toks@}}%
          \bbl@toglobal{\extras@\languagename}%
        }%
  }%
  \bbl@ifunset{the##1}{}%
}%
\def\bbl@tempa{#1}%
\bbl@replace\bbl@tempa{enumerate.}{}%
\def\bbl@toreplace{#2}%
\bbl@replace\bbl@toreplace{[ ]}{\csname \bbl@map@cnt{\bbl@tempc}{##1}\endcsname{}%}
\expandafter\ifx\expandafter\csname the##1\endcsname\bbl@tempd
\else
  \toks@={\csname the\endcsname{\the\toks@}}%
\fi}
\def\bbl@tempc{#1}%
\bbl@replace\bbl@tempc{enumerate.}{#1}%
\in@{enumerate.}{#1}%
\ifin@
  \def\bbl@tempa{#1}%
  \bbl@replace\bbl@tempa{enumerate.}{}%
  \def\bbl@toreplace{#2}%
  \bbl@replace\bbl@toreplace{[ ]}{\csname #1\endcsname{}%}
  \expandafter\ifx\expandafter\csname \bbl@map@cnt{\bbl@tempc}{##1}\endcsname\bbl@tempd
  \else
    \toks@={\csname \bbl@map@cnt{\bbl@tempc}{##1}\endcsname{}%}
  \expandafter\expandafter\expandafter{\bbl@tempd}%
  \expandafter\expandafter\expandafter{\csname the\endcsname{\the\toks@}}%
\fi%
\else
  %
\else
  % The following code is still under study. You can test it and make
  % suggestions. Eg, enumerate.2 = ([enumi]).([enumii]). It's
  % language dependent.
  \in@{enumerate.}{#1}%
  \ifin@
    \def\bbl@tempa{#1}%
    \bbl@replace\bbl@tempa{enumerate.}{#1}%
    \def\bbl@toreplace{#2}%
    \bbl@replace\bbl@toreplace{[ ]}{\csname the\endcsname{\the\toks@}}%
  % TODO. Execute only once:
  \bbl@exp{%
    \bbl@add{\extras@\languagename}{\csname labelenum\romannumeral\bbl@tempc\endcsname{\the\toks@}}%
    \bbl@toglobal{\extras@\languagename}%
  }%
\fi
```

To show correctly some captions in a few languages, we need to patch some internal macros, because
the order is hardcoded. For example, in Japanese the chapter number is surrounded by two string,
while in Hungarian is placed after. These replacement works in many classes, but not all. Actually,
the following lines are somewhat tentative.

```
\def\bbl@chaptype{chapter}
\ifx\@makechapterhead\@undefined
  \let\bbl@patchchapter\relax
\else\ifx\thechapter\@undefined
  \let\bbl@patchchapter\relax
\else\ifx\ps@headings\@undefined
  \let\bbl@patchchapter\relax
\else
  \def\bbl@patchchapter{%
    \global\let\bbl@patchchapter\relax
    \gdef\bbl@chfmt{%
      \bbl@ifunset{bbl@\bbl@chaptype fmt@\languagename}%
        \{\chapapp\space\thechapter\}
      \else
        \nameuse{bbl@\bbl@chaptype fmt@\languagename}\}
    \bbl@add\appendix{\def\bbl@chaptype{appendix}}% Not harmful, I hope
    \bbl@sreplace\ps@headings{\chapapp\ \thechapter}{\bbl@chfmt}%
    \bbl@sreplace\chaptermark{\chapapp\ \thechapter}{\bbl@chfmt}%
    \bbl@sreplace\@makechapterhead{\chapapp\space\thechapter}{\bbl@chfmt}%
    \bbl@toglobal\appendix
    \bbl@toglobal\ps@headings
    \bbl@toglobal\chaptermark
    \bbl@toglobal\@makechapterhead
  }%
  \let\bbl@patchappendix\bbl@patchchapter
\fi\fi\fi
\ifx\@part\@undefined
  \let\bbl@patchpart\relax
\else
  \def\bbl@patchpart{%
    \global\let\bbl@patchpart\relax
    \gdef\bbl@partformat{%
      \bbl@ifunset{bbl@partfmt@\languagename}%
        \partname\nobreakspace\thepart
      \else
        \nameuse{bbl@partfmt@\languagename}\}
    \bbl@sreplace\@part{\partname\nobreakspace\thepart}{\bbl@partformat}%
    \bbl@toglobal\@part
  }%
\fi
```

\textbf{Date.} Arguments (year, month, day) are not protected, on purpose. In \today, arguments are always gregorian, and therefore always converted with other calendars. TODO Document

```
\let\bbl@calendar\@empty
\DeclareRobustCommand\localedate[1][1]{\bbl@localedate{#1}}
\def\bbl@localedate#1#2#3#4{%
  \begingroup
    \edef\bbl@they{#2}%
    \edef\bbl@them{#3}%
    \edef\bbl@thed{#4}%
    \edef\bbl@tempe{%
      \bbl@ifunset{bbl@calpr@\languagename}{}\{
        \bbl@cl{calpr},
        \nameuse{bbl@calpr@\languagename}\}
      \}{\bbl@them\bbl@them\bbl@thed}
    \bbl@replace\bbl@tempe{ }{}%
    \bbl@replace\bbl@tempe{CONVERT}{convert=} Hackish
    \bbl@replace\bbl@tempe{convert=}{}%
    \let\bbl@ld@calendar\@empty
    \ifx\bbl@ld@calendar\@empty
      \ifx\bbl@ld@convert\relax
        \babelcalendar[gregorian]{\bbl@them\bbl@them\bbl@thed}%
      \else
        \babelcalendar[gregorian]{\bbl@them\bbl@them\bbl@thed}%
      \fi
    \else
      \babelcalendar[gregorian]{\bbl@them\bbl@them\bbl@thed }%
    \fi
  \endgroup
}
```
\def\bbl@calendar{% Used in \month..., too
  \bbl@ld@calendar
  \ifx\bbl@ld@variant\@empty\else
    .\bbl@ld@variant
  \fi}%
\bbl@cased
\{\@nameuse{bbl@date@\languagename \@bbl@calendar}%
  \bbl@they\bbl@them\bbl@thed}%
\endgroup}

Dates will require some macros for the basic formatting. They may be redefined by language, so
“semi-public” names (camel case) are used. Oddly enough, the CLDR places particles like “de”
inconsistently in either in the date or in the month name. Note after \bbl@replace \toks@
contains the resulting string, which is used by \bbl@replace@finish@iii (this implicit behavior doesn’t seem
a good idea, but it’s efficient).

\let\bbl@calendar\@empty
\newcommand\babelcalendar[2][\the\year-\the\month-\the\day]{%
  \@nameuse{bbl@cal@#2}#1\@@}%
\newcommand\BabelDateSpace{\nobreakspace}%
\newcommand\BabelDateDot{.\@} % TODO. \let instead of repeating
\newcommand\BabelDate[1]{\ifnum#1<10 0\fi\number#1}%
\newcommand\BabelDateM[1]{\ifnum#1<10 0\fi\number#1}%
\newcommand\BabelDateMM[1]{%\csname month\romannumeral#1\bbl@calendar name\endcsname}%
\newcommand\BabelDatey[1]{\number#1}%
\newcommand\BabelDateyy[1]{%\ifnum#1<10 0\fi\ifnum#1<100 0\fi\number#1}%
Currently two-digit years are restricted to the range 0-9999. There is little you can do. Sorry.

\newcommand\BabelDateyyyy[1]{\number#1} % TODO - add leading 0
\def\bbl@TG@date{%
  \bbl@replace@finish@iii{\[}{\BabelDateSpace{}}%
  \bbl@replace@finish@iii{\[.}{\BabelDateDot{}}%
  \bbl@replace@finish@iii{\[d]{\BabelDated{####3}}%
  \bbl@replace@finish@iii{\[dd}{\BabelDatedd{####3}}%
  \bbl@replace@finish@iii{\[M}{\BabelDateM{####2}}%
  \bbl@replace@finish@iii{\[MM}{\BabelDateMM{####2}}%
  \bbl@replace@finish@iii{\[MMMM}{\BabelDateMMMM{####2}}%
  \bbl@replace@finish@iii{\[y}{\BabelDatey{####1}}%
  \bbl@replace@finish@iii{\[yy}{\BabelDateyy{####1}}%
  \bbl@replace@finish@iii{\[yyyy}{\BabelDateyyyy{####1}}%
  \bbl@replace@finish@iii{\[m|}{\bbl@datecntr[####2|}%
  \bbl@replace@finish@iii{\[d|}{\bbl@datecntr[####3|}%
  \bbl@replace@finish@iii{\[y|}{\bbl@datecntr[####1|}%
  \bbl@release@transforms}
%
\let\bbl@release@transforms=\@empty
\@namedef{bbl@inikv@transforms.prehyphenation}{\bbl@transforms\babelprehyphenation}
\@namedef{bbl@inikv@transforms.posthyphenation}{\bbl@transforms\babelposthyphenation}
\def\bbl@transforms@aux#1#2#3#4,#5\relax{#1[#2]{#3}{#4}{#5}}%
\begingroup % A hack. TODO. Don't require an specific order
  \catcode`%=12
  \catcode`&=14
  \gdef\bbl@transforms#1#2#3{&%
    \ifx\bbl@KVP@transforms\@nnil%
      \directlua{local str = \[[==\[#2==\]
        str = str:gsub('%.%d+%.%d+$', '')
        tex.print(\[[\def\string\babeltempa{\]
          .. str .. \[\]
        ])}&%
    \else
      \bbl@xin@{,\babeltempa,}{,\bbl@KVP@transforms,}&%
      \ifin@
        \in@(.0)$\{#2$}&%
        \ifin@
          \directlua{
            local str = string.match(\[[\bbl@KVP@transforms\],
              '%([^%-%]-%[^-%])\-\babeltempa')
            if str == nil then
              tex.print(\[[\def\string\babeltempb{}\]
            else
              tex.print(\[[\def\string\babeltempb{,attribute=}\]
          \}
        end}
      \endgroup
    \endgroup
    \toks@(#3)&%
    \bbl@exp&(%
      \g@addto@macro\bbl@release@transforms&%
Language and Script values to be used when defining a font or setting the direction are set with the following macros.

The following ini reader ignores everything but the identification section. It is called when a font is defined (ie, when the language is first selected) to know which script/language must be enabled. This means we must make sure a few characters are not active. The ini is not read directly, but with a proxy text file named as the language (which means any code in it must be skipped, too).
A tool to define the macros for native digits from the list provided in the ini file. Somewhat convoluted because there are 10 digits, but only 9 arguments in \TeX. Non-digits characters are kept. The first macro is the generic “localized” command.

\def\bbl@setdigits#1#2#3#4#5{\let\languagename digits=\bbl@digits@languagename\let\languagename counter=\bbl@counter@languagename\def\bbl@counter@languagename####1{\expandafter\bbl@digits@languagename\number####1\@nil}}

Alphabetic counters must be converted from a space separated list to an \ifcase structure.

\newcommand\localenumeral[2]{\bbl@cs{cntr#1@languagename}{#2}}
\def\bbl@localecntr#1#2{\localenumeral{#2}{#1}}
\newcommand\localecounter[2]{\bbl@localecntr\number\csname c@#2\endcsname}{#1}
\def\bbl@alphnumeral#1#2{\bbl@alphnumeral@i
umber#276543210@@{#1}}
\def\bbl@alphnumeral@i#1#2#3#4#5#6#7#8#9{\ifcase#9\else\fi\fi\fi\fi\fi\fi\fi\fi\fi\fi\fi

The code for additive counters is somewhat tricky and it's based on the fact the arguments just before \@@ collects digits which have been left ‘unused’ in previous arguments, the first of them being the number of digits in the number to be converted. This explains the reverse set 76543210. Digits above 10000 are not handled yet. When the key contains the subkey .F., the number after is treated as an special case, for a fixed form (see babel-he.ini, for example).

\def\bbl@buildifcase#1 {% Returns \bbl@tempa, requires \toks@={}
\ifx#1\@nil % ie, \bbl@digits@lang
\else
  \ifx0#1\@nil % ie, \bbl@digits@lang
  \else
    \toks@={\the	oks@or #1}
  \fi
\fi}
The information in the identification section can be useful, so the following macro just exposes it with a user command.

\newcommand\localeinfo[1]{\ifx*#1\@empty % TODO. A bit hackish to make it expandable.
\bbl@afterelse\bbl@localeinfo{}\else
\bbl@localeinfo{\bbl@error{I've found no info for the current locale.\%}
The corresponding ini file has not been loaded\%
Perhaps it doesn't exist}\%
{See the manual for details.}}#1\fi}

Extensions are dealt with in a special way
% Now, an internal \LaTeX{} macro:
\providecommand\BCPdata[1]{\localeinfo*{#1.tag.bcp47}}

With version 3.75 \BabelEnsureInfo is executed always, but there is an option to disable it.
\ DeclareOption{ensureinfo=off}{
\let\bbl@ensureinfo@\@gobble
\newcommand\BabelEnsureInfo{\if\InputIfFileExists\@undefined\else
\fi}
\providecommand\BabelEnsureInfo*{#1.tag.bcp47}}
More general, but non-expandable, is `\getlocaleproperty`. To inspect every possible loaded ini, we define `\LocaleForEach`, where `\bbl@ini@loaded` is a comma-separated list of locales, built by `\bbl@read@ini`.

```latex
\newcommand{\getlocaleproperty}{% \
  \@ifstar{\bbl@getproperty@s}{\bbl@getproperty@x}
\def{\bbl@getproperty@s}{#1#2#3}{% 
  \let{#1}{\relax}
  \def{\bbl@elt}{##1##2##3}{% 
    \bbl@ifsamestring{##1/##2}{#3}{% 
      \providecommand{#1}{##3}
      \def{\bbl@elt}{#1}}%
  }{}}%
\bbl@cs{inidata@#2}}%
\def{\bbl@getproperty@x}{#1#2#3}{% 
  \bbl@getproperty@s{#1}{#2}{#3}%
  \ifx{#1}{\relax}
    \bbl@error{Unknown key for locale '#2':\%#3\%\string#1 will be set to \relax}%
  \fi}
\let{\bbl@ini@loaded}{\@empty}
\newcommand{\LocaleForEach}{\bbl@foreach{\bbl@ini@loaded}}
```

8 Adjusting the Babel behavior

A generic high level interface is provided to adjust some global and general settings.

```latex
\newcommand{\babeladjust}[1]{% TODO. Error handling.
  \bbl@forkv{#1}{% 
    \bbl@ifunset{bbl@ADJ@##1@##2}{% 
      \bbl@cs{ADJ@##1@##2}}% 
    \bbl@adjust@lua{#1}{#2}{#3}{% 
      {\ifvmode
        \ifnum{\currentgrouplevel=\z@}
          \directlua{ Babel.#2 }%
          \expandafter{\expandafter{\expandafter{\@gobble}}}
        \fi
      }% 
      \bbl@error{Currently, #1 related features can be adjusted only\%in the main vertical list.}% 
      \bbl@adjust@lua{#1}{#2}{#3}{% 
        {\let{\bbl@ini@loaded}{\@empty}}% 
        \newcommand{\LocaleForEach}{\bbl@foreach{\bbl@ini@loaded}}% 
```
\bbl@adjust@lua{bidi}{bidi_enabled=false}}
\@namedef{bbl@ADJ@bidi.mapdigits@on}{%}
\bbl@adjust@lua{bidi}{digits_mapped=true}}
\@namedef{bbl@ADJ@bidi.mapdigits@off}{%}
\bbl@adjust@lua{bidi}{digits_mapped=false}}
\%
\@namedef{bbl@ADJ@linebreak.sea@on}{%}
\bbl@adjust@lua{linebreak}{sea_enabled=true}}
\@namedef{bbl@ADJ@linebreak.sea@off}{%}
\@namedef{bbl@ADJ@linebreak.cjk@on}{%}
\bbl@adjust@lua{linebreak}{cjk_enabled=true}}
\@namedef{bbl@ADJ@linebreak.cjk@off}{%}
\@namedef{bbl@ADJ@justify.arabic@on}{%}
\bbl@adjust@lua{linebreak}{arabic.justify_enabled=true}}
\@namedef{bbl@ADJ@justify.arabic@off}{%}
\%
\def\bbl@adjust@layout#1{\ifvmode#1\expandafter\@gobble\fi}{%}
\@namedef{bbl@ADJ@layout.tabular@on}{%}
\bbl@adjust@layout{\let\@tabular\bbl@NL@@tabular}}
\@namedef{bbl@ADJ@layout.tabular@off}{%}
\bbl@adjust@layout{\let\@tabular\bbl@OL@@tabular}}
\@namedef{bbl@ADJ@layout.lists@on}{%}
\bbl@adjust@layout{\let\list\bbl@NL@list}}
\@namedef{bbl@ADJ@layout.lists@off}{%}
\bbl@adjust@layout{\let\list\bbl@OL@list}}
\@namedef{bbl@ADJ@hyphenation.extra@on}{%}
\bbl@activateposthyphen}}
\@namedef{bbl@ADJ@autoload.bcp47@on}{%}
\bbl@bcpallowedtrue}}
\@namedef{bbl@ADJ@autoload.bcp47@off}{%}
\bbl@bcpallowedfalse}}
\@namedef{bbl@ADJ@bcp47.toname@on}{%}
\bbl@bcpnamestrue\BabelEnsureInfo}}
\@namedef{bbl@ADJ@bcp47.toname@off}{%}
\bbl@bcptonamefalse}}
\@namedef{bbl@ADJ@prehyphenation.disable@nohyphenation}{%}
\directlua{Babel.ignore_pre_char = function(node)
return (node.lang == \the\csname l@nohyphenation\endcsname)
end}}
\@namedef{bbl@ADJ@prehyphenation.disable@off}{%}
\directlua{Babel.ignore_pre_char = function(node)
\let\bbl@restorelastskip\relax
\def\bbl@savelastskip{\let\bbl@restorelastskip\relax}
\ifvmode
\ifdim\lastskip=\z@
\let\bbl@restorelastskip\nobreak
\else
\bbl@exp{\def\bbl@savelastskip##1\bbl@restorelastskip{}\nobreak\vskip-\skip@ \vskip\skip@}}%
\fi
\fi
\@namedef{bbl@ADJ@select.write@shift}{%}
\@namedef{bbl@ADJ@select.write@keep}{%}
\@namedef{bbl@ADJ@select.write@omit}{%}
As the final task, load the code for lua. TODO: use babel name, override
\ifx\directlua\@undefined\else
\input luababel.def
\fi
Continue with \LaTeXX.}
\ medicines}
\medicines}
\medicines}
\medicines}

\section{Cross referencing macros}

The \LaTeXX book states:

The key argument is any sequence of letters, digits, and punctuation symbols; upper- and lower-case letters are regarded as different.

When the above quote should still be true when a document is typeset in a language that has active characters, special care has to be taken of the category codes of these characters when they appear in an argument of the cross referencing macros.

When a cross referencing command processes its argument, all tokens in this argument should be character tokens with category ‘letter’ or ‘other’.

The following package options control which macros are to be redefined.

\DeclareOption{safe=none}{\let\bbl@opt@safe\@empty}
\DeclareOption{safe=bib}{\def\bbl@opt@safe{B}}
\DeclareOption{safe=ref}{\def\bbl@opt@safe{R}}
\DeclareOption{safe=refbib}{\def\bbl@opt@safe{BR}}
\DeclareOption{safe=bibref}{\def\bbl@opt@safe{BR}}
\@newl@bel
First we open a new group to keep the changed setting of \protect local and then we set the \@safe@actives switch to true to make sure that any shorthand that appears in any of the arguments immediately expands to its non-active self.

\bbl@trace{Cross referencing macros}
\ifx\bbl@opt@safe\@empty\else % ie, if 'ref' and/or 'bib'
\let\bbl@opt@safe\empty\else % ie, if 'ref' and/or 'bib'
\def\@newl@bel{\relax
\@safe@actives=true
\bbl@ifunset{\l@bel@name}{}%
An internal \LaTeX\ macro used to test if the labels that have been written on the \verb|.aux\ file have changed. It is called by the \verb|\enddocument| macro.

Now that we made sure that \verb|\@testdef| still has the same definition we can rewrite it. First we make the shorthands ‘safe’. Then we use \verb|\bbl@tempa| as an ‘alias’ for the macro that contains the label which is being checked. Then we define \verb|\bbl@tempb| just as \verb|\@newlabel| does it. When the label is defined we replace the definition of \verb|\bbl@tempa| by its meaning. If the label didn’t change, \verb|\bbl@tempa| and \verb|\bbl@tempb| should be identical macros.

\ref\ The same holds for the macro \verb|\ref| that references a label and \verb|\pageref| to reference a page. We make them robust as well (if they weren’t already) to prevent problems if they should become expanded at the wrong moment.
\@citex  The macro used to cite from a bibliography, \cite, uses an internal macro, \@citex. It is this internal macro that picks up the argument(s), so we redefine this internal macro and leave \cite alone. The first argument is used for typesetting, so the shorthands need only be deactivated in the second argument.

\bbl@xin@{B}\bbl@opt@safe
\ifin@
\bbl@redefine\@citex[#1]{%\@safe@activestrue\edef\@tempa{#1}\@safe@activesfalse\org@@citex[#1]{\@tempa}}%
\else
\bbl@redefine\@citex[#1]{%\@safe@activestrue\edef\@tempa{#1}\@safe@activesfalse\org@@citex[#1]{\@tempa}}%
\fi

Unfortunately, the packages natbib and cite need a different definition of \@citex... To begin with, natbib has a definition for \@citex with three arguments... We only know that a package is loaded when \begin{document} is executed, so we need to postpone the different redefinition.

\AtBeginDocument{%
\@ifpackageloaded{natbib}{\def\@citex[#1]#2{\@safe@activestrue\edef\@tempa{#2}\@safe@activesfalse\org@@citex[#1]{\@tempa}}}{}
\AtBeginDocument{%
\@ifpackageloaded{cite}{\def\@citex[#1]#2{\@safe@activestrue\org@@citex[#1]{#2}\@safe@activesfalse}}{}

\nocite  The macro \nocite which is used to instruct BiBTeX to extract uncited references from the database.

\bbl@redefine\nocite{\@safe@activestrue\org@nocite{\@safe@activesfalse}}

\bibcite  The macro that is used in the .aux file to define citation labels. When packages such as natbib or cite are not loaded its second argument is used to typeset the citation label. In that case, this second argument can contain active characters but is used in an environment where \@safe@activestrue is in effect. This switch needs to be reset inside the \hbox which contains the citation label. In order to determine during .aux file processing which definition of \bibcite is needed we define \bibcite in such a way that it redefines itself with the proper definition. We call \bbl@cite@choice to select the proper definition for \bibcite. This new definition is then activated.

\bbl@bibcite  The macro \bbl@bibcite holds the definition of \bibcite needed when neither natbib nor cite is loaded.

\bbl@cite@choice  The macro \bbl@cite@choice determines which definition of \bibcite is needed. First we give \bibcite its default definition.

\global\let\bibcite\bbl@bibcite
\@ifpackageloaded{natbib}{\global\let\bibcite\org@bibcite}{\global\let\bibcite\org@bibcite}
\@ifpackageloaded{cite}{\global\let\bibcite\org@bibcite}{\global\let\bibcite\org@bibcite}
\global\let\bbl@cite@choice\relax

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When a document is run for the first time, no .aux file is available, and \bibcite will not yet be properly defined. In this case, this has to happen before the document starts.

\AtBeginDocument{\bbl@cite@choice}

\bibitem One of the two internal \LaTeX macros called by \bibitem that write the citation label on the .aux file.

\begin{verbatim}
3780 \AtBeginDocument{\bbl@cite@choice}
\bibitem
3781 \bbl@redefine{\bibitem}{%  
3782 \at@activestrue\org@@bibitem{#1}\at@activesfalse}  
3783 \else
3784 \let\org@nocite\nocite
3785 \let\org@@citex\@citex
3786 \let\org@bibcite\bibcite
3787 \let\org@@bibitem\@bibitem
3788 \fi
\end{verbatim}

8.2 Marks

\markright Because the output routine is asynchronous, we must pass the current language attribute to the head lines. To achieve this we need to adapt the definition of \markright and \markboth somewhat. However, headlines and footlines can contain text outside marks; for that we must take some actions in the output routine if the 'headfoot' options is used. We need to make some redefinitions to the output routine to avoid an endless loop and to correctly handle the page number in bidi documents.

\begin{verbatim}
3789 \bbl@trace{Marks}
3790 \IfBabelLayout{sectioning}  
3791 \{\ifx\bbl@opt@headfoot\@nnil  
3792 \g@addto@macro\resetactivechars{%  
3793 \expandafter{\selectlanguage{\bbl@main@language}}%  
3794 \let\protect\noexpand  
3795 \ifcase\bbl@bidimode\else % Only with bidi. See also above  
3796 \edef\thepage{%  
3797 \noexpand\babelsublr{\unexpanded\expandafter{\thepage}}}%  
3798 \fi}%  
3799 \fi}  
3800 \fi}  
3801 \{\if\bbl@single\else  
3802 \bbl@ifunset{markright }\bbl@redefine\bbl@redefinerobust  
3803 \markright#1{%  
3804 \bbl@ifblank{#1}{\org@markright{}}%  
3805 \toks@{#1}  
3806 \bbl@exp{%  
3807 \\org@markright{\protect\\foreignlanguage{\languagename}{\protect\bbl@restore@actives\the\toks@}}}}%  
3808 \markboth The definition of \markboth is equivalent to that of \markright, except that we need two token registers. The documentclasses report and book define and set the headings for the page. While doing so they also store a copy of \markboth in \@mkboth. Therefore we need to check whether \@mkboth has already been set. If so we need to do that again with the new definition of \markboth. (As of Oct 2019, \LaTeX stores the definition in an intermediate macro, so it's not necessary anymore, but it's preserved for older versions.)  
3810 \ifx\@mkboth\markboth
3811 \\def\bbl@tempc{\let\@mkboth\markboth}
3812 \else
3813 \\def\bbl@tempc{}
3814 \fi
3815 \bbl@ifunset{markboth }\bbl@redefine\bbl@redefinerobust
3816 \markboth#1#{%  
3817 \\protect\\foreignlanguage{\languagename}{\protect\@mkboth{#1}}%  
3818 \\toks@{}}%  
3819 \\toks@{}%  
3820 \\iffalse#1{%
3821 \end{verbatim}

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8.3 Preventing clashes with other packages

8.3.1 \ifthen

\ifthenelse

Sometimes a document writer wants to create a special effect depending on the page a certain fragment of text appears on. This can be achieved by the following piece of code:

\ifthenelse{\isodd{\pageref{some:label}}}{\{code for odd pages\}}{\{code for even pages\}}

In order for this to work the argument of \isodd needs to be fully expandable. With the above redefinition of \pageref it is not in the case of this example. To overcome that, we add some code to the definition of \ifthenelse to make things work.

We want to revert the definition of \pageref and \ref to their original definition for the first argument of \ifthenelse, so we first need to store their current meanings.

Then we can set the \@safe@active switch and call the original \ifthenelse. In order to be able to use shorthands in the second and third arguments of \ifthenelse the resetting of the switch and the definition of \pageref happens inside those arguments.

8.3.2 varioref

\@@vpageref
\vrefpagenum
\Ref

When the package varioref is in use we need to modify its internal command \@@vpageref in order to prevent problems when an active character ends up in the argument of \vref. The same needs to happen for \vrefpagenum. 
The package \texttt{varioref} defines $\texttt{Ref}$ to be a robust command which uppercases the first character of the reference text. In order to be able to do that it needs to access the expandable form of $\texttt{ref}$. So we employ a little trick here. We redefine the (internal) command $\texttt{\textbackslash vrefpagenum}$, to call $\texttt{\textbackslash varpgeref}$ instead of $\texttt{\textbackslash ref}$. The disadvantage of this solution is that whenever the definition of $\texttt{\textbackslash Ref}$ changes, this definition needs to be updated as well.

\begin{verbatim}
\expandafter\def\csname Ref \endcsname#1{\protect\edef\@tempa{\org@ref{#1}}\expandafter\MakeUppercase\@tempa}
\end{verbatim}

\subsection{hhline}
\texttt{\textbackslash hhline}

Delaying the activation of the shorthand characters has introduced a problem with the \texttt{hhline} package. The reason is that it uses the `:` character which is made active by the french support in babel. Therefore we need to \texttt{reload} the package when the `:` is an active character. Note that this happens \texttt{after} the category code of the @-sign has been changed to other, so we need to temporarily change it to letter again.

\begin{verbatim}
\AtEndOfPackage{\AtBeginDocument{\@ifpackageloaded{hhline}{\expandafter\ifx\csname normal@char\string:\endcsname\relax\else\makeatletter\def\@currname{hhline}\input{hhline.sty}\makeatother\fi}}}
\end{verbatim}

\texttt{\textbackslash substitutefontfamily}

Deprecated. Use the tools provided by \TeX. The command \texttt{\textbackslash substitutefontfamily} creates an .fd file on the fly. The first argument is an encoding mnemonic, the second and third arguments are font family names.

\begin{verbatim}
\def\substitutefontfamily#1#2#3{\lowercase{\immediate\openout15=#1#2.fd\relax}\immediate\write15{\string\ProvidesFile{#1#2.fd}[\the\year/\twodigits{\the\month}/\twodigits{\the\day}\space generated font description file]\^^J\string\DeclareFontFamily{#1}{#2}{}\^^J\string\DeclareFontShape{#1}{#2}{m}{n}{<->ssub * #3/m/n}\{{}\^^J\string\DeclareFontShape{#1}{#2}{m}{it}{<->ssub * #3/m/it}\{{}\^^J\string\DeclareFontShape{#1}{#2}{m}{sl}{<->ssub * #3/m/sl}\{{}\^^J\string\DeclareFontShape{#1}{#2}{m}{sc}{<->ssub * #3/m/sc}\{{}\^^J\string\DeclareFontShape{#1}{#2}{b}{n}{<->ssub * #3/bx/n}\{{}\^^J\string\DeclareFontShape{#1}{#2}{b}{it}{<->ssub * #3/bx/it}\{{}\^^J\string\DeclareFontShape{#1}{#2}{b}{sl}{<->ssub * #3/bx/sl}\{{}\^^J\string\DeclareFontShape{#1}{#2}{b}{sc}{<->ssub * #3/bx/sc}\{{}\^^J}}%\closeout15\@onlypreamble\substitutefontfamily
\end{verbatim}

\section{Encoding and fonts}

Because documents may use non-ASCII font encodings, we make sure that the logos of \TeX and \LaTeX always come out in the right encoding. There is a list of non-ASCII encodings. Requested encodings are currently stored in \texttt{\@fontenc\load@list}. If a non-ASCII has been loaded, we define versions of
\TeX and \LaTeX for them using \ensureascii. The default ASCII encoding is set, too (in reverse order): the “main” encoding (when the document begins), the last loaded, or OT1.

\ensureascii

\texttt{\bbl@trace{Encoding and fonts}}
\texttt{\newcommand\BabelNonASCII{LGR,OT2,OT3,OT6,LHE,LwN,LMA,LMC,LMS,LMU}}
\texttt{\let\org@TeX\TeX}
\texttt{\let\org@LaTeX\LaTeX}
\texttt{\let\ensureascii\@firstofone}
\texttt{\AtBeginDocument{}}
\texttt{\def\@elt#1{,#1,}}
\texttt{\edef\bbl@tempa{\expandafter\@gobbletwo\@fontenc@load@list}}
\texttt{\let\@elt\relax}
\texttt{\let\bbl@tempb\@empty}
\texttt{\def\bbl@tempc{OT1}}
\texttt{\bbl@foreach\BabelNonASCII{% LGR loaded in a non-standard way}}
\texttt{\bbl@ifunset{T@#1}{}{\def\bbl@tempb{#1}}}%
\texttt{\bbl@foreach\bbl@tempa{}}
\texttt{\bbl@xin@{#1}{\BabelNonASCII}}
\texttt{\ifin@}
\texttt{\def\bbl@tempb{#1}% Store last non-ascii}
\texttt{\else\bbl@xin@{#1}{\BabelNonText}% Pass}
\texttt{\ifin@\else}
\texttt{\def\bbl@tempc{#1}% Store last ascii}
\texttt{\fi}
\texttt{\if\bbl@tempb\empty\else}
\texttt{\bbl@xin@{,\cf@encoding,}{,\BabelNonASCII,\BabelNonText,}}
\texttt{\ifin@\else}
\texttt{\edef\bbl@tempc{\cf@encoding}% The default if ascii wins}
\texttt{\fi}
\texttt{\fi}
\texttt{\bbl@foreach\bbl@tempc{\cf@encoding} The default if ascii wins}
\texttt{\fi}
\texttt{\fi}
\texttt{\edef\ensureascii{\cf@encoding}{%}
\texttt{\DeclareTextCommandDefault{\TeX}{\ensureascii{\org@TeX}}}
\texttt{\DeclareTextCommandDefault{\LaTeX}{\ensureascii{\org@LaTeX}}}
\texttt{\fi}

Now comes the old deprecated stuff (with a little change in 3.9l for fontspec). The first thing we need to do is to determine, at \begin{document}, which latin fontenc coding to use.

\latinencoding

When text is being typeset in an encoding other than ‘latin’ (OT1 or T1), it would be nice to still have Roman numerals come out in the Latin encoding. So we first assume that the current encoding at the end of processing the package is the Latin encoding.

\texttt{\AtEndOfPackage{}}
\texttt{\edef\latinencoding{\cf@encoding}}

But this might be overruled with a later loading of the package fontenc. Therefore we check at the execution of \begin{document} whether it was loaded with the T1 option. The normal way to do this (using \ifpackageloaded) is disabled for this package. Now we have to revert to parsing the \texttt{\@filelist} which contains all the filenames loaded.

\texttt{\AtBeginDocument{}}
\texttt{\ifpackageloaded(fontspec)\%}
\texttt{\{\edef\latinencoding{\%}}
\texttt{\ifx\UTFencname\undefined}
\texttt{\EU\ifcase\bbl@engine\or2\or1\fi}
\texttt{\else}
\texttt{\UTFencname}
\texttt{\fi\}}%
\texttt{\{\edef\latinencoding{OT1}\%}
\texttt{\ifx\cf@encoding\bbl@t@one}
\texttt{\edef\latinencoding{\bbl@t@one}}
\texttt{\else}
\texttt{\edef\@elt#1{,#1,}}}
\edef\bbl@tempa{\expandafter\@gobbletwo\@fontenc@load@list}%
\let\@elt\relax
\bbl@xin{,T1,}\bbl@tempa
\ifin@
\xdef\latinencoding{\bbl@t@one}%
\fi
}}

\latintext Then we can define the command \latintext which is a declarative switch to a latin font-encoding. Usage of this macro is deprecated.

\textlatin This command takes an argument which is then typeset using the requested font encoding. In order to avoid many encoding switches it operates in a local scope.

For several functions, we need to execute some code with \selectfont. With \TeX 2021-06-01, there is a hook for this purpose, but in older versions the \TeX command is patched (the latter solution will be eventually removed).

\textlatin

8.5 Basic bidi support

Work in progress. This code is currently placed here for practical reasons. It will be moved to the correct place soon, I hope. It is loosely based on rlbabel.def, but most of it has been developed from scratch. This babel module (by Johannes Braams and Boris Lavva) has served the purpose of typesetting R documents for two decades, and despite its flaws I think it is still a good starting point (some parts have been copied here almost verbatim), partly thanks to its simplicity. I've also looked at \texttt{arabi} (by Yousef Jabri), which is compatible with babel. There are two ways of modifying macros to make them "bidi", namely, by patching the internal low-level macros (which is what I have done with lists, columns, counters, tocs, much like rlbabel did), and by introducing a "middle layer" just below the user interface (sectioning, footnotes).

- pdftex provides a minimal support for bidi text, and it must be done by hand. Vertical typesetting is not possible.
- xetex is somewhat better, thanks to its font engine (even if not always reliable) and a few additional tools. However, very little is done at the paragraph level. Another challenging problem is text direction does not honour \TeX grouping.
- luatex can provide the most complete solution, as we can manipulate almost freely the node list, the generated lines, and so on, but bidi text does not work out of the box and some development is necessary. It also provides tools to properly set left-to-right and right-to-left page layouts. As Lua\TeX-ja shows, vertical typesetting is possible, too.

\bbl@trace{Loading basic (internal) bidi support}
\ifodd\bbl@engine
\else % TODO. Move to txtbabel
\ifnum\bbl@bidimode>100 \ifnum\bbl@bidimode<200
\bbl@error
\xdef\latinencoding{\bbl@t@one}%
\let\bbl@beforeforeign\leavevmode
\AtEndOfPackage{\EnableBabelHook{babel-bidi}}%
Now come the macros used to set the direction when a language is switched. First the (mostly) common macros.

\def\bbl@alscripts{,Arabic,Syriac,Thai,}
\def\bbl@rscripts{% TODO. Base on codes ??,,Imperial Aramaic,Avestan,Cypriot,Matran,Hebrew,\%
Old Hungarian,Old Hungarian,LYdian,Mandaean,Mnichaean,\%
Manichean,Meroitic Cursive,Meroitic,Old North Arabian,\%
Nabataean,N'Ko,Orkhon,Palmyrene,Inscriptional Pahlavi,\%
Psalter Pahlavi,Phoenician,Inscriptional Parthian,Samaritan,\%
Old South Arabian,\%
\def\bbl@provide@dirs#1{%}
\def\bbl@trace{Macros to switch the text direction}
\def\bbl@alscripts{,Arabic,Syriac,Thai,}
\def\bbl@switchdir{% TODO - math
    \bbl@ifunset{bbl@lsys@\languagename}{\bbl@provide@lsys{\languagename}}{}%
    \bbl@ifunset{bbl@wdir@\languagename}{\bbl@provide@dirs{\languagename}}{}%
    \def\bbl@setdirs{1}% TODO - math
    \bbl@exp{\\bbl@setdirs@bbl@cl{wdir}}
}\def\bbl@setdirs#1{% TODO - math
    \ifcase\bbl@select@type % TODO - strictly, not the right test
        \bbl@bodydir{#1}%
        \bbl@pardir{#1}%
    \else
        \chardef\bbl@thetextdir\z@
        \bbl@textdir@i\beginL\endL
    \fi
}\def\bbl@textdir@i#1#2{%
    \ifhmode
        \ifnum\currentgrouplevel>\z@
            \ifnum\currentgrouplevel=\bbl@dirlevel
                \bbl@error{Multiple bidi settings inside a group}%
                \bgroup\aftergroup#2\aftergroup\egroup
            \else
                \ifcase\currentgrouptype% 0 bottom
                    \bgroup\aftergroup\egroup% 2 hbox
                \or
                    \bgroup\aftergroup\egroup% 3 adj hbox
                \or
                    \bgroup\aftergroup\egroup% 7 noalign
                \or
                    \bgroup\aftergroup\egroup% output math disc insert vcent mathchoice
                \or
                    \bgroup\aftergroup\egroup% 14 \begingroup
                \else
                    \bgroup\aftergroup\egroup% 15 adj
                \fi
            \fi
        \fi
    \fi
    \bbl@dirlevel\currentgrouplevel
    #1%
}\def\bbl@pardir#1{\chardef\bbl@thepardir#1\relax}
\let\bbl@bodydir\@gobble
\let\bbl@pagedir\@gobble

Now the engine-dependent macros. TODO. Must be moved to the engine files.
\ifodd\bbl@engine % luatex=1
    \else % pdftex=0, xetex=2
        \newcount\bbl@dirlevel
        \chardef\bbl@thetextdir\z@
        \chardef\bbl@thepardir\z@
        \def\bbl@textdir#1{%
            \ifcase#1\relax
                \bbl@textdir@i\beginL\endL
            \else
                \bbl@textdir@i\beginR\endR
            \fi
        }
        \def\bbl@textdir@i#1#2{%
            \ifhmode
                \ifnum\currentgrouplevel>\z@
                    \ifnum\currentgrouplevel=\bbl@dirlevel
                        \bbl@error{Multiple bidi settings inside a group}%
                        \bgroup\aftergroup#2\aftergroup\egroup
                    \else
                        \ifcase\currentgrouptype% 0 bottom
                            \bgroup\aftergroup\egroup% 2 hbox
                        \or
                            \bgroup\aftergroup\egroup% 3 adj hbox
                        \or
                            \bgroup\aftergroup\egroup% 7 noalign
                        \or
                            \bgroup\aftergroup\egroup% output math disc insert vcent mathchoice
                        \or
                            \bgroup\aftergroup\egroup% 14 \begingroup
                        \else
                            \bgroup\aftergroup\egroup% 15 adj
                        \fi
                    \fi
                \fi
            \fi
            \bbl@dirlevel\currentgrouplevel
            #1%
        }% #12%
\fi
\ifmode
    \ifnum\currentgrouplevel>\z@
        \ifnum\currentgrouplevel=\bbl@dirlevel
            \bbl@error{Multiple bidi settings inside a group}%
            \bgroup\aftergroup\egroup
        \else
            \ifcase\currentgrouptype% 0 bottom
                \bgroup\aftergroup\egroup% 2 simple {}
            \or
                \bgroup\aftergroup\egroup% 2 hbox
            \or
                \bgroup\aftergroup\egroup% 3 adj hbox
            \or
                \bgroup\aftergroup\egroup% output math disc insert vcent mathchoice
            \or
                \bgroup\aftergroup\egroup% 14 \begingroup
            \else
                \bgroup\aftergroup\egroup% 15 adj
            \fi
        \fi
    \fi
\bbl@dirlevel\currentgrouplevel
\fi
The following command is executed only if there is a right-to-left script (once). It activates the \everypar hack for xetex, to properly handle the par direction. Note text and par dirs are decoupled to some extent (although not completely).

A tool for weak L (mainly digits). We also disable warnings with hyperref.

\DeclareRobustCommand\babelsublr[1]{\leavevmode{\bbl@textdir\z@#1}}
\AtBeginDocument{\ifx\pdfstringdefDisableCommands\@undefined\else\ifx\pdfstringdefDisableCommands\relax\else\pdfstringdefDisableCommands{\let\babelsublr\@firstofone}\fi\fi}
\bbl@trace{Local Language Configuration}
\ifx\loadlocalcfg\@undefined\else\ifpackagewith{babel}{noconfigs}\let\loadlocalcfg\@gobble\fi\fi

\loadlocalcfg At some sites it may be necessary to add site-specific actions to a language definition file. This can be done by creating a file with the same name as the language definition file, but with the extension .cfg. For instance the file norsk.cfg will be loaded when the language definition file norsk.ldf is loaded.

For plain-based formats we don't want to override the definition of \loadlocalcfg from plain.def.
the ldf file and does some additional checks (\input works, too, but possible errors are not catched).

\bbl@trace{Language options}
\let\bbl@afterlang\relax
\let\BabelModifiers\relax
\let\bbl@loaded\@empty
\def\bbl@load@language#1{%
  \InputIfFileExists{#1.ldf}%
  \edef\bbl@loaded{\CurrentOption
    \ifx\bbl@loaded\@empty\else,\bbl@loaded\fi}%
  \expandafter\let\expandafter\bbl@afterlang
  \csname\CurrentOption.ldf-h@@k\endcsname
  \expandafter\let\expandafter\BabelModifiers
  \csname bbl@mod@\CurrentOption\endcsname}%
  \bbl@error{%
    Unknown option \CurrentOption'. Either you misspelled it\%
    or the language definition file \CurrentOption.ldf was not found}{%}
    Valid options are, among others: shorthands=, KeepShorthandsActive,\%
    activeacute, activegrave, noconfigs, safe=, main=, math=\%
    headfoot=, strings=, config=, hyphenmap=, or a language name.}}}

Now, we set a few language options whose names are different from ldf files. These declarations are
preserved for backwards compatibility, but they must be eventually removed. Use proxy files instead.

\def\bbl@try@load@lang#1#2#3{%
  \IfFileExists{\CurrentOption.ldf}%
    {\bbl@load@language{\CurrentOption}}%
  {#1\bbl@load@language{#2}#3}}%

\DeclareOption{hebrew}{%
  \input{rlbabel.def}%
  \bbl@load@language{hebrew}}%
\DeclareOption{hungarian}{\bbl@try@load@lang{}{magyar}{}}
\DeclareOption{lowersorbian}{\bbl@try@load@lang{}{lsorbian}{}}
\DeclareOption{nynorsk}{\bbl@try@load@lang{}{norsk}{}}
\DeclareOption{polutonikogreek}{%
  \bbl@try@load@lang{}{greek}{\languageattribute{greek}{polutoniko}}}%
\DeclareOption{russian}{\bbl@try@load@lang{}{russianb}{}}
\DeclareOption{ukrainian}{\bbl@try@load@lang{}{ukraineb}{}}
\DeclareOption{uppersorbian}{\bbl@try@load@lang{}{usorbian}{}}

Another way to extend the list of 'known' options for babel was to create the file bblopts.cfg in
which one can add option declarations. However, this mechanism is deprecated – if you want an
alternative name for a language, just create a new .ldf file loading the actual one. You can also set
the name of the file with the package option config=<name>, which will load <name>.cfg instead.

\ifx\bbl@opt@config\@nnil
  \@ifpackagewith{babel}{noconfigs}{%}
  \InputIfFileExists{bblopts.cfg}%
  \{\typeout{********************************************\%
    * Local config file bblopts.cfg used^^J\%
  *)}%
  \}
  \else
    \InputIfFileExists{\bbl@opt@config.cfg}%
    \{\typeout{********************************************\%
      * Local config file \bbl@opt@config.cfg used^^J\%
    *)}%
    \{\bbl@error{%
      Local config file '\bbl@opt@config.cfg' not found}{%}
      \Perhaps you misspelled it.}%
    \fi

Recognizing global options in packages not having a closed set of them is not trivial, as for them to be
processed they must be defined explicitly. So, package options not yet taken into account and stored
in bbl@language@opts are assumed to be languages. If not declared above, the names of the option
and the file are the same. We first pre-process the class and package options to determine the main language, which is processed in the third 'main' pass, except if all files are ldf and there is no main key. In the latter case (\bbl@opt@main is still \@nnil), the traditional way to set the main language is kept — the last loaded is the main language.

```
1489 \ifx\bbl@opt@main\@nnil
1490  \ifnum\bbl@iniflag>\@@ % if all ldf's: set implicitly, no main pass
1491   \let\bbl@temp\@empty
1492   \edef\bbl@temp{\@classoptionslist,\bbl@language@opts}%
1493   \bbl@foreach\bbl@temp{\edef\bbl@temp{\@empty,\bbl@temp}}%
1494   \bbl@foreach\bbl@temp{% \bbl@temp is a reversed list
1495     \ifeq\bbl@opt@main\@nnil % ie, if not yet assigned
1496       \ifodd\bbl@iniflag % *=
1497         \IfFileExists{babel-\bbl@temp.tex}{\def\bbl@opt@main{\bbl@temp}}{}
1498       \else  % +=
1499         \IfFileExists{\bbl@temp.ldf}{\def\bbl@opt@main{\bbl@temp}}{}
1500     \fi
1501   }%
1502   \fi
1503 \else
1504 \bbl@info{Main language set with 'main='. Except if you have\%
1505 problems, prefer the default mechanism for setting\%
1506 the main language. Reported}
1507 \fi

A few languages are still defined explicitly. They are stored in case they are needed in the 'main' pass (the value can be \relax).

```
1490 \bbl@csarg\let{loadmain\expandafter}\csname ds@\bbl@opt@main\endcsname
1491 \expandafter\let\csname ds@\bbl@opt@main\endcsname\relax
1492 \bbl@foreach\@classoptionslist{%
1493 \def\bbl@temp{#1}%
1494 \ifeq\bbl@temp\bbl@opt@main\else
1495 \ifnum\bbl@iniflag<\tw@ % 0 ø (other = ldf)
1496 \bbl@ifunset{ds@#1}{%\DeclareOption{#1}{\bbl@load@language{#1}}}%
1497 \}%
1498 \else    % + * (other = ini)
1499 \DeclareOption{#1}{%
1500 \bbl@ldfinit
1501 \babelprovide[import]{#1}%
1502 \bbl@afterldf{}}%
1503 \fi}
1494 \fi}
1495 \bbl@foreach@\classoptionslist{%
1496 \def\bbl@temp{#1}%
1497 \ifeq\bbl@temp\bbl@opt@main\else
1498 \ifnum\bbl@iniflag<\tw@ % 0 ø (other = ldf)
1499 \bbl@ifunset{ds@#1}{%\DeclareOption{#1}{\bbl@load@language{#1}}}%
1500 \}%
1501 \else    % + * (other = ini)
1502 \IfFileExists{babel-\bbl@temp.tex}{%\DeclareOption{#1}{%
1503 \bbl@ldfinit
1504 \babelprovide[import]{#1}%
1505 \bbl@afterldf{}}}%
1506 \}%
And we are done, because all options for this pass have been declared. Those already processed in the first pass are just ignored. The options have to be processed in the order in which the user specified them (but remember class options are processes before):

\def\AfterBabelLanguage{%
\bbl@ifsamestring\CurrentOption{#1}{\global\bbl@add\bbl@afterlang}{}
\DeclareOption*{}
\ProcessOptions*

This finished the second pass. Now the third one begins, which loads the main language set with the key main. A warning is raised if the main language is not the same as the last named one, or if the value of the key main is not a language. With some options in provide, the package luatexbase is loaded (and immediately used), and therefore \bbl@provide can’t go inside a \DeclareOption; this explains why it’s executed directly, with a dummy declaration. Then all languages have been loaded, so we deactivate \AfterBabelLanguage.

In order to catch the case where the user didn’t specify a language we check whether \bbl@main@language, has become defined. If not, the nil language is loaded.

\def\AfterBabelLanguage{%
\bbl@info{%
9 The kernel of Babel (babel.def, common)

The kernel of the babel system is currently stored in babel.def. The file babel.def contains most of the code. The file hyphen.cfg is a file that can be loaded into the format, which is necessary when you want to be able to switch hyphenation patterns.

Because plain \TeX users might want to use some of the features of the babel system too, care has to be taken that plain \TeX can process the files. For this reason the current format will have to be checked in a number of places. Some of the code below is common to plain \TeX and \LaTeX, some of it is for the \LaTeX case only.

Plain formats based on etex (etex, xetex, luatex) don't load hyphen.cfg but etex.src, which follows a different naming convention, so we need to define the babel names. It presumes language.def exists and it is the same file used when formats were created.

A proxy file for switch.def

\let\bbl@onlyswitch\@empty
\input babel.def
\let\bbl@onlyswitch\@undefined

10 Loading hyphenation patterns

The following code is meant to be read by init\TeX because it should instruct \TeX to read hyphenation patterns. To this end the docstrip option patterns is used to include this code in the file hyphen.cfg. Code is written with lower level macros.

\ProvidesFile{hyphen.cfg}[]{date}[]{version} Babel hyphens
\xdef\bbl@format{\jobname}
\def\bbl@version{\langle\langle version\rangle\rangle}
\def\bbl@date{\langle\langle date\rangle\rangle}
\ifx\AtBeginDocument\@undefined\def\@empty{}\fi

\process@line

Each line in the file language.dat is processed by \process@line after it is read. The first thing this macro does is to check whether the line starts with \=. When the first token of a line is an \=, the macro \process@synonym is called; otherwise the macro \process@language will continue.

\def\process@line#1#2 #3 #4 {%
  \ifx=#1%
    \process@synonym{#2}%
  \else
    \process@language{#1#2}{#3}{#4}%
  \fi
  \ignorespaces}

\process@synonym

This macro takes care of the lines which start with an \=. It needs an empty token register to begin with. \bbl@languages is also set to empty.

\toks@{}
\def\bbl@languages{ }

When no languages have been loaded yet, the name following the \= will be a synonym for hyphenation register 0. So, it is stored in a token register and executed when the first pattern file has been processed. (The \relax just helps to the \if below catching synonyms without a language.) Otherwise the name will be a synonym for the language loaded last.
We also need to copy the hyphenation parameters for the synonym.

\def\process@synonym#1{%  
\ifnum\last@language=\m@ne  
\toks@expandafter{\the\toks@relax\process@synonym(#1)}%  
\else  
\expandafter\chardef\csname l@#1\endcsname\last@language  
\wlog{\string\l@#1=\string\language\the\last@language}%  
\expandafter\let\csname #1hyphenmins\expandafter\endcsname  
\csname\languagename hyphenmins\endcsname  
\let\bbl@elt\relax  
\edef\bbl@languages{\bbl@languages\bbl@elt(#1){\the\last@language}{}{}}%  
\fi}

\process@language

The macro \process@language is used to process a non-empty line from the ‘configuration file’. It has three arguments, each delimited by white space. The first argument is the ‘name’ of a language; the second is the name of the file that contains the patterns. The optional third argument is the name of a file containing hyphenation exceptions.

The first thing to do is call \addlanguage to allocate a pattern register and to make that register ‘active’. Then the pattern file is read.

For some hyphenation patterns it is needed to load them with a specific font encoding selected. This can be specified in the file language.dat by adding for instance ‘:\T{T1}’ to the name of the language. The macro \bbl@get@enc extracts the font encoding from the language name and stores it in \bbl@hyph@enc. The latter can be used in hyphenation files if you need to set a behavior depending on the given encoding (it is set to empty if no encoding is given).

Pattern files may contain assignments to \lefthyphenmin and \righthyphenmin. TeX does not keep track of these assignments. Therefore we try to detect such assignments and store them in the ⟨lang⟩hyphenmins macro. When no assignments were made we provide a default setting.

Some pattern files contain changes to the \lccode en \uccode arrays. Such changes should remain local to the language; therefore we process the pattern file in a group; the \patterns command acts globally so its effect will be remembered.

Then we globally store the settings of \lefthyphenmin and \righthyphenmin and close the group. When the hyphenation patterns have been processed we need to see if a file with hyphenation exceptions needs to be read. This is the case when the third argument is not empty and when it does not contain a space token. (Note however there is no need to save hyphenation exceptions into the format)

\bbl@languages saves a snapshot of the loaded languages in the form
\bbl@elt{⟨language-name⟩}{⟨number⟩}{⟨patterns-file⟩}{⟨exceptions-file⟩}. Note the last 2 arguments are empty in ‘dialects’ defined in language.dat with =. Note also the language name can have encoding info.

Finally, if the counter \language is equal to zero we execute the synonyms stored.

\begingroup
\lefthyphenmin\m@ne  
\bbl@hook@everylanguage\lccode en \uccode % > luatex  
\bbl@get@enc\lccode en \uccode % > luatex  
\begingroup  
\let\bbl@elt\relax  
\def\process@language#1#2#3{%  
\expandafter\addlanguage\csname l@#1\endcsname  
\expandafter\language\csname l@#1\endcsname  
\edef\languagename{#1}%  
\bbl@hook@everylanguage\lccode en \uccode % > luatex  
\ifnum\lefthyphenmin=\m@ne  
\else  
\expandafter\def\csname #1hyphenmins\endcsname{%  
\the\lefthyphenmin\the\righthyphenmin}  
\fi
\endgroup
\def\bbl@tema{#3}%  
\ifx\bbl@tema\@empty\else  
\bbl@hook@loadexceptions\lccode en \uccode % > luatex  
\fi
\let\bbl@elt\relax
\edef\bbl@languages{%
  \bbl@languages\bbl@elt{#1}{\the\language}{#2}{\bbl@tempa}}%
\ifnum\the\language=\z@
  \expandafter\ifx\csname #1hyphenmins\endcsname\relax
  \set@hyphenmins\tw@\thr@@\relax
  \else
    \expandafter\expandafter\expandafter\set@hyphenmins
    \csname #1hyphenmins\endcsname
  \fi
  \thetoks@
  \toks@{}
\fi}
\bbl@get@enc
\bbl@hyph@enc

The macro \bbl@get@enc extracts the font encoding from the language name and stores it in \bbl@hyph@enc. It uses delimited arguments to achieve this.
\def\bbl@get@enc#1:#2:#3@@@{
  \def\bbl@hyph@enc{#2}}

Now, hooks are defined. For efficiency reasons, they are dealt here in a special way. Besides luatex, format-specific configuration files are taken into account. loadkernel currently loads nothing, but define some basic macros instead.
\def\bbl@hook@everylanguage#1{}
\def\bbl@hook@loadpatterns#1{\input #1\relax}
\let\bbl@hook@loadexceptions\bbl@hook@loadpatterns
\def\bbl@hook@loadkernel#1{%
  \def\addlanguage{\csname newlanguage\endcsname}
  \def\adddialect##1##2{\global\chardef##1##2\relax
    \wlog{\string##1 = a dialect from \string\language##2}}
  \def\iflanguage##1{\expandafter\ifx\csname l@##1\endcsname\relax
    \@nolanerr{##1} \else
    \ifnum\csname l@##1\endcsname=\language
      \expandafter\expandafter\expandafter\@firstoftwo
    \else
      \expandafter\expandafter\expandafter\@secondoftwo
    \fi
  \fi}
  \def\providehyphenmins##1##2{\expandafter\ifx\csname ##1hyphenmins\endcsname\relax
    \@namedef{##1hyphenmins}{##2} \fi}
  \def\set@hyphenmins##1##2{\lefthyphenmin##1\relax
    \righthyphenmin##2\relax}
  \def\selectlanguage{\errhelp{Selecting a language requires a package supporting it}\errmessage{Not loaded}}
  \let\foreignlanguage\selectlanguage
  \let\otherlanguage\selectlanguage
  \let\otherlanguage\selectlanguage
  \errhelp{Find an armchair, sit down and wait}\errmessage{Not yet available}%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%}
\begingroup
\begin{verbatim}
\def\AddBabelHook#1#2{%  
\expandafter\ifx\csname bbl@hook@#2\endcsname\relax
\def\next{\toks1}%
\else
\def\next{\expandafter\gdef\csname bbl@hook@#2\endcsname####1}%
\fi
\next}
\ifx\directlua\@undefined
\ifx\XeTeXinputencoding\@undefined\else
\input xebabel.def
\fi
\else
\input luababel.def
\fi
\openin1 = babel-\bbl@format.cfg
\ifeof1
\else
\input babel-\bbl@format.cfg\relax
\fi
\closein1
\endgroup
\bbl@hook@loadkernel{switch.def}
\readconfigfile
The configuration file can now be opened for reading.
\openin1 = language.dat
See if the file exists, if not, use the default hyphenation file hyphen.tex. The user will be informed about this.
\def\languagename{english}%
\ifeof1
\message{I couldn't find the file language.dat, \space}
\message{I will try the file hyphen.tex}\relax
\input hyphen.tex\relax
\chardef\l@english\z@
\else
Pattern registers are allocated using count register \last@language. Its initial value is 0. The definition of the macro \newlanguage is such that it first increments the count register and then defines the language. In order to have the first patterns loaded in pattern register number 0 we initialize \last@language with the value \texttt{-1}.
\last@language\m@ne
We now read lines from the file until the end is found. While reading from the input, it is useful to switch off recognition of the end-of-line character. This saves us stripping off spaces from the contents of the control sequence.
\loop
\endlinechar\m@ne
\read1 to \bbl@line
\endlinechar`\^^M
If the file has reached its end, exit from the loop here. If not, empty lines are skipped. Add 3 space characters to the end of \bbl@line. This is needed to be able to recognize the arguments of \process@line later on. The default language should be the very first one.
\if T\ifeof1\fi \relax
\ifx\bbl@line@empty\else
\edef\bbl@line{\bbl@line\space \space \space}\relax
\fi
\repeat
Check for the end of the file. We must reverse the test for \ifeof without \else. Then reactivate the default patterns, and close the configuration file.
\begingroup
\def\bbl@elt#1#2#3#4{%
\end{verbatim}
We add a message about the fact that babel is loaded in the format and with which language patterns to the \everyjob register:

\ifx/\the\toks@/\else
  \errhelp{language.dat loads no language, only synonyms}
  \errmessage{Orphan language synonym}
\fi

Also remove some macros from memory and raise an error if \toks@ is not empty. Finally load switch.def, but the latter is not required and the line inputting it may be commented out.

\let\bbl@line\@undefined
\let\process@line\@undefined
\let\process@synonym\@undefined
\let\process@language\@undefined
\let\bbl@get@enc\@undefined
\let\bbl@hyph@enc\@undefined
\let\bbl@tempa\@undefined
\let\bbl@hook@loadkernel\@undefined
\let\bbl@hook@everylanguage\@undefined
\let\bbl@hook@loadpatterns\@undefined
\let\bbl@hook@loadexceptions\@undefined

Here the code for init\TeX{} ends.

### 11 Font handling with fontspec

Add the bidi handler just before luaoftload, which is loaded by default by \LaTeX{}\nobreakdash{}\TeX. Just in case, consider the possibility it has not been loaded. First, a couple of definitions related to bidi [misplaced].

\let\bbl@bidimode\@undefined
\def\bbl@bidimode{0}\DeclareOption{bidi=default}{\let\bbl@bidimode=1}\DeclareOption{bidi=basic}{\let\bbl@bidimode=101}\DeclareOption{bidi=basic-r}{\let\bbl@bidimode=102}\DeclareOption{bidi=bidi}{\let\bbl@bidimode=201}\DeclareOption{bidi=bidi-r}{\let\bbl@bidimode=202}\DeclareOption{bidi=bidi-l}{\let\bbl@bidimode=203}\DeclareOption{bidi=bidi-l}{\let\bbl@bidimode=203}

With explicit languages, we could define the font at once, but we don't. Just wait and see if the language is actually activated. \bbl@font replaces hardcoded font names inside \..family by the corresponding macro \..default.

At the time of this writing, fontspec shows a warning about there are languages not available, which some people think refers to babel, even if there is nothing wrong. Here is hack to patch fontspec to avoid the misleading message, which is replaced by a more explanatory one.
That's usually fine, because many languages require no specific features, but if the output is not as expected, consider selecting another font.

\[\texttt{Font 'l_fontspec_fontname_tl' is using the default features for script '#2'.\% That's not always wrong, but if the output is not as expected, consider selecting another font.}\]

\ExplSyntaxOff

\@onlypreamble\babelfont

\newcommand\babelfont[2][]{ 1=langs/scripts 2=fam

\bbl@foreach{#1}{\expandafter\ifx\csname date##1\endcsname\relax

\IfFileExists{babel-##1.tex}{\babelp provide{##1}}{}

}\
\edef\bbl@tempa{#1}\
\def\bbl@tempb{#2}% Used by \bbl@bblfont

\ifx\fontspec\@undefined\bbl@loadfontspec\fi

\EnableBabelHook{babel-fontspec}% Just calls \bbl@switchfont\bbl@bblfont}

\newcommand\bbl@bblfont[2][]{ 1=features 2=fontname, @font=rm|sf|tt

\bbl@ifunset{\bbl@tempb family}\
\bbl@providefam{\bbl@tempb}\
{}\
% For the default font, just in case:
\bbl@ifunset{bbl@lsys@languagename}{\bbl@provide@lsys{\languagename}}{}\n
\expandafter\bbl@ifblank\expandafter{\bbl@tempa}{% ie bbl@rmdflt@lang / *scrt
\bbl@foreach\bbl@tempa{% \bbl@csarg\def{\bbl@tempb dflt@##1}{<>{#1}{#2}}}}%

If the family in the previous command does not exist, it must be defined. Here is how:

\def\bbl@providefam#1{\n
\bbl@exp{\newcommand{\bbl@tempb default}{}}% Just define it
\bbl@add@list\bbl@font@fams{#1}\
\DeclareRobustCommand{\text#1}{\bbl@tempb default}}}

The following macro is activated when the hook babel-fontspec is enabled. But before, we define a macro for a warning, which sets a flag to avoid duplicate them.

\def\bbl@nostdfont#1{\\bbl@ifunset{bbl@WFF@f@family}{}% Flag, to avoid duplicable warns
\bbl@ifwarn{The current font is not a babel standard family:\% #1}%
\fontname\font
\bbl@infowarn{There is nothing intrinsically wrong with this warning, and you can ignore it altogether if you do not need these}
families. But if they are used in the document, you should be\%
aware 'babel' will not set Script and Language for them, so\%
you may consider defining a new family with \string\babelfont.\%
See the manual for further details about \string\babelfont.\%
\Reported}}
}}%
\gdef\bbl@switchfont{%
\bbl@ifunset{bbl@lsys\languagename}{\bbl@provide@lsys\languagename}{}}%
\lowercase{\edef\bbl@tempa{\bbl@cl{sname}}}}%
\bbl@foreach\bbl@font@fams{% eg Arabic -> arabic
\bbl@ifunset{bbl@##1dflt@\languagename}{ (1) language?
\bbl@ifunset{bbl@##1dflt@*\bbl@tempa}{ (2) from script?
\bbl@ifunset{bbl@##1dflt@}{ 2=F - (3) from generic?
{} 123=F - nothing!
\} 3=T - from generic
\} 2=T - from script
\} 1=T - language, already defined
\def\bbl@tempa{\bbl@nostdfont{}}}%
\bbl@foreach\bbl@font@fams{% don't gather with prev for
\bbl@ifunset{bbl@##1dflt@\languagename}{\bbl@cs{famrst@##1}%
\global\let\bbl@csarg\bbl@tempa}{}
\bbl@foreach\bbl@font@fams{%
\bbl@ifunset{bbl@##1dflt@}{\@nameuse{##1family}%
\bbl@csarg\gdef{WFF@\f@family}{}% Flag
\bbl@exp{\bbl@add\bbl@tempa{* \fontname\font}}%}
\bbl@csarg\xdef{##1dflt@}{\f@family}%
\expandafter\xdef\csname ##1default\endcsname{\f@family}}}%
\bbl@ifrestoring{}{\bbl@tempa}}%
The following is executed at the beginning of the aux file or the document to warn about fonts not
defined with \babelfont.
\ifx\f@family\@undefined\else % if latex
\ifcase\bbl@engine % if pdftex
\let\bbl@ckeckstfodt\relax
\else
\edef\bbl@ckeckstfodt{%
\begingroup
\bbl@foreach\bbl@font@fams{%
\global\let\bbl@font@rst\relax
\bbl@exp{\bbl@font@set\bbl@##1dflt@\languagename}% the main part!
\end\bbl@font@rst}{##1default=##1family}{##1}}%
\expandafter\xdef\csname \string##1default\endcsname{\f@family}}%
\bbl@ifrestoring{}{\bbl@tempa}}%
\bbl@ifwarn{The following font families will use the default\%
settings for all or some languages:\%
\bbl@tempa
There is nothing intrinsically wrong with it, but\%
'babel' will not set Script and Language, which could\%
be relevant in some languages. If your document uses\%
these families, consider redefining them with \string\babelfont.\%
\Reported}%
Now the macros defining the font with fontspec. When there are repeated keys in fontspec, the last value wins. So, we just place the ini settings at the beginning, and user settings will take precedence. We must deactivate temporarily \bbl@mapselect because \selectfont is called internally when a font is defined.

\def\bbl@font@set#1#2#3{% eg \bbl@rmdflt@lang \rmdefault \rmfamily
\bbl@xin{<>}{#1}%
\ifin@
\bbl@exp{\bbl@fontspec@set\#1\expandafter\@gobbletwo#1\#3}%
\let\text\bbl@tempa\relax}%
\bbl@exp{% 'Unprotected' macros return prev values
\def\#2{#1}% eg, \rmdefault{\bbl@rmdflt@lang}
\bbl@ifsamestring{#2}{\f@family}%
\bbl@ifsamestring{\f@series}{\bfseries}{}%
\let\text\bbl@tempa\relax}%
\let\text\bbl@tempa\relax
\let\bbl@mapselect\relax
\let\bbl@temp@fam#4% eg, '\rmfamily', to be restored below
\let#4\@empty % Make sure \renewfontfamily is valid
\bbl@exp{%
\let\text\bbl@tempa\relax
\keys_if_exist:nnF}{fontspec-opentype}{Script/\bbl@cl{sname}}%
\newfontscript{\bbl@cl{sname}}{\bbl@cl{otf}}%
\keys_if_exist:nnF}{fontspec-opentype}{Language/\bbl@cl{lname}}%
\newfontlanguage{\bbl@cl{lname}}{\bbl@cl{otf}}%
\renewfontfamily\#4%
}\let#4\@empty % Make sure \renewfontfamily is valid
\bbl@exp{%
\def#1{\f@family} % eg, \bbl@rmdflt@lang{FreeSerif(0)}
\endgroup
}%
\endgroup
\let\text\bbl@tempa\relax
\let\bbl@mapselect\relax
\let\bbl@temp@fam\bbl@tempa
\let\bbl@mapselect\bbl@tempe}%
\let\text\bbl@tempa\relax
\let\bbl@mapselect\bbl@tempe}%
\font@rstandfamrstareonlyusedwhenthereisnoglobalsettings,tosaveandrestoredeprevious families. Not really necessary, but done for optimization.

\def\bbl@font@rst#1#2#3#4{%
\bbl@csarg\def{famrst@#4}{\bbl@font@set{#1}#2#3}}

The default font families. They are eurocentric, but the list can be expanded easily with \babelfont.

\def\bbl@fams{rm, sf, tt}

12 Hooks for XeTeX and LuaTeX

12.1 XeTeX

Unfortunately, the current encoding cannot be retrieved and therefore it is reset always to utf8, which seems a sensible default.

\begin{Verbatim}
\end{Verbatim}
Now, the code.

\def\BabelFootnote#1#2#3#4{\ifx\bbl@fn@footnote\@undefined\let\bbl@fn@footnote\footnote\fi\bbl@ifblank{#2}{\def#1{\bbl@footnote{\@firstofone}{#3}{#4}}{\bbl@exp{\\bbl@footnote{\\foreignlanguage{#2}}}{#3}{#4}}\@namedef{\bbl@stripslash#1text}{\bbl@footnotetext{\\foreignlanguage{#2}}}{#3}{#4}}}\fi\langle\langle\text{Footnote changes}\rangle\rangle
\begin{verbatim}
def\BabelStringsDefault{unicode}
def\BabelFootnote#1#2#3#4{
  {\if\texttt{xetex}\edef\bbl@fn@footnote\undefined
    \let\bbl@fn@footnote\footnote
  \fi
  {\if\texttt{xetex}\edef\bbl@fn@footnotetext\undefined
    \let\bbl@fn@footnotetext\footnotetext
  \fi
  {\if\texttt{xetex}\edef\bbl@fn@footnotetext{\\foreignlanguage{#2}}{#3}{#4}}
\end{verbatim}
\def\bbl@intrapenalty#1\@@{%  
\bbl@csarg\def{xepn@\languagename}{\XeTeXlinebreakpenalty #1\relax}}
\def\bbl@provide@intraspace{%  \bbl@xin@{/s}{/\bbl@cl{lnbrk}}  
\ifin@\else\bbl@xin@{/c}{/\bbl@cl{lnbrk}}\fi
\ifin@  
\bbl@ifunset{bbl@intsp@\languagename}{}  
{\expandafter\ifx\csname bbl@intsp@\languagename\endcsname\@empty\else
  \ifx\bbl@KVP@intraspace\@nnil
    \bbl@exp{\bbl@intraspace\bbl@cl{intsp}\@@}
  \fi
  \ifx\bbl@KVP@intrapenalty\@nnil
    \bbl@intrapenalty0\@@
  \fi
\fi  
\fi
\iffalse
\bbl@exp{%  
% TODO. Execute only once (but redundant):
  \bbl@startskip\@@
\bbl@exp{\everyhbox{\bbl@textdir\bbl@cs{wdir@\bbl@main@language}}}
\bbl@endskip\@@
}  
\fi
\fi
\fi
\fi
\ifx\bbl@KVP@intrapenalty\@nnil\else
  \expandafter\bbl@intrapenalty\bbl@KVP@intrapenalty\@@
\fi
\bbl@exp{%  
% TODO. Execute only once (but redundant):
  \bbl@startskip\@@
\bbl@exp{\everyhbox{\bbl@textdir\bbl@cs{wdir@\bbl@main@language}}}
\bbl@endskip\@@
}
Implicitly reverses sectioning labels in bidi=basic, because the full stop is not in contact with L numbers any more. I think there must be a better way.

4837 \IfBabelLayout{counters}\
4838 \{\let\bbl@latinarabic=\@arabic\n\def\@arabic#1{\babelsublr{\bbl@latinarabic#1}}\n\let\bbl@asciiroman=\@roman\n\def\@roman#1{\babelsublr{\ensureascii{\bbl@asciiroman#1}}}\n\let\bbl@asciiRoman=\@Roman\n\def\@Roman#1{\babelsublr{\ensureascii{\bbl@asciiRoman#1}}}\}\n
4844 ⟨/texxet⟩

12.3 LuaTeX

The loader for \texttt{luatex} is based solely on \texttt{language.dat}, which is read on the fly. The code shouldn't be executed when the format is build, so we check if \texttt{\textbackslash AddBabelHook} is defined. Then comes a modified version of the loader in \texttt{hyphen.cfg} (without the hyphenmins stuff, which is under the direct control of babel).

The names \texttt{\textbackslash <language>} are defined and take some value from the beginning because all \texttt{ldf} files assume this for the corresponding language to be considered valid, but patterns are not loaded (except the first one). This is done later, when the language is first selected (which usually means when the \texttt{ldf} finishes). If a language has been loaded, \texttt{\textbackslash bbl@hyphendata@<num>} exists (with the names of the files read).

The default setup preloads the first language into the format. This is intended mainly for ‘english’, so that it's available without further intervention from the user. To avoid duplicating it, the following rule applies: if the “0th” language and the first language in \texttt{language.dat} have the same name then just ignore the latter. If there are new synonymous, the are added, but note if the language patterns have not been preloaded they won't at run time.

Other preloaded languages could be read twice, if they have been preloaded into the format. This is not optimal, but it shouldn't happen very often – with \texttt{luatex} patterns are best loaded when the document is typeset, and the “0th” language is preloaded just for backwards compatibility.

As of 1.1b, \texttt{luatex} is taken into account. Formerly, loading of patterns on the fly didn't work in this format, but with the new loader it does. Unfortunately, the format is not based on babel, and data could be duplicated, because languages are reassigned above those in the format (nothing serious, anyway). Note even with this format \texttt{language.dat} is used (under the principle of a single source), instead of \texttt{language.def}.

Of course, there is room for improvements, like tools to read and reassign languages, which would require modifying the language list, and better error handling.

We need catcode tables, but no format (targeted by babel) provide a command to allocate them (although there are packages like \texttt{cetablestack}). FIX - This isn't true anymore. For the moment, a dangerous approach is used - just allocate a high random number and cross the fingers. To complicate things, \texttt{etex.def} changes the way languages are allocated.

This files is read at three places: (1) when \texttt{plain.def}, \texttt{babel.sty} starts, to read the list of available languages from \texttt{language.dat} (for the base option); (2) at \texttt{hyphen.cfg}, to modify some macros; (3) in the middle of \texttt{plain.def} and \texttt{babel.sty}, by \texttt{babel.def}, with the commands and other definitions for \texttt{luatex} (eg, \texttt{\bbl@patterns}).

4845 ⟨luatex⟩
4846 \ifx\textbackslash AddBabelHook\undefined % when plain.def, babel.sty starts
4847 \texttt{\textbackslash bbl@trace(Read language.dat)}
4848 \ifx\texttt{\textbackslash bbl@readstream}\undefined
4849 \csname newread\textbackslash endcsname\textbackslash bbl@readstream
4850 \fi
4851 \begingroup
4852 \texttt{\textbackslash toks@{}}
4853 \texttt{\textbackslash count[@] % 0=start, 1=0th, 2=normal}
4854 \texttt{\textbackslash def\texttt{\textbackslash bbl@process@line#1#2 #3 \#4 {}}}
4855 \texttt{\textbackslash ifx=\#1%}
4856 \texttt{\textbackslash bbl@process@synonym(2)%}
4857 \texttt{\else}
4858 \texttt{\textbackslash bbl@process@language(\#1\#2)(\#3)(\#4)}%
4859 \texttt{\fi}
4860 \texttt{\textbackslash ignorespaces}
4861 \texttt{\textbackslash def\texttt{\textbackslash bbl@manylang{%}

161
\ifnum\bbl@last>\one
\bbl@info{Non-standard hyphenation setup}\
\fi
\let\bbl@manylang\relax
\def\bbl@process@language#1#2#3{%
  \ifcase\count@
    \ifeundefined{zth@#1}{\count@\tw@}{\count@\one}%
    \else
      \count@\tw@
  \fi
  \fi
  \ifnum\count@=\tw@
    \expandafter\addlanguage\csname l@#1\endcsname
    \language\allocationnumber
    \bbl@manylang
    \let\bbl@elt\relax
    \let\bbl@manylang\relax
    \let\bbl@last\allocationnumber
    \bbl@languages
    \let\bbl@last\relax
    \bbl@manylang
    \let\bbl@elt\relax
    \xdef\bbl@languages{\bbl@languages\bbl@elt{#1}{\the\language}{#2}{#3}}%
    \the\toks@
  \fi
  \fi
  \the\toks@
}
\def\bbl@process@syntax@aux#1#2{%
  \global\expandafter\chardef\csname l@#1\endcsname#2
  \let\bbl@elt\relax
  \xdef\bbl@languages{\bbl@languages\bbl@elt{#1}{#2}{}{}}}%
\def\bbl@process@syntax#1{%
  \ifcase\count@
    \toks@{\the\toks@\relax\bbl@process@syntax{#1}}%
    \else
      \@ifundefined{zth@#1}{\bbl@process@syntax@aux{#1}{0}}{}
    \fi
  \fi
  \the\toks@
\}
\def\bbl@process@language#1#2#3{%
  \ifx\bbl@languages\@undefined % Just a (sensible?) guess
    \chardef\l@english\z@
    \chardef\l@USenglish\z@
    \chardef\bbl@last\z@
    \global\namedef{bbl@hyphendata@0}{{hyphen.tex}{}}
    \gdef\bbl@languages{%
      \bbl@elt{english}{0}{hyphen.tex}{}%
      \bbl@elt{USenglish}{0}{}{}
    }%
  \else
    \global\let\bbl@languages@format\bbl@languages
    \def\bbl@elt#1#2#3#4{% Remove all except language 0
      \fi
    }
    \xdef\bbl@languages{\bbl@languages}
  \fi
  \def\bbl@process@syntax{#1}{%
    \def\bbl@elt#1#2#3#4{\@namedef{zth@#1}{}} % Define flags
    \bbl@languages
    \openin\bbl@readstream=language.dat
    \ifeof\bbl@readstream
      \bbl@warning{I couldn't find language.dat. No additional\%
        patterns loaded. Reported}%
    \else
      \loop
        \endlinechar\m@ne
        \read\bbl@readstream to \bbl@line
        \endlinechar``\^^M
        \if T\ifeof\bbl@readstream F\fi T\relax
          \ifx\bbl@line\empty\else
            \ifnum\bbl@last>\one
              \bbl@info{Non-standard hyphenation setup}\
            \fi
            \let\bbl@manylang\relax
            \def\bbl@process@language#1#2#3{%
            \fi
          \fi
        \fi
      \endloop
    \fi
  \fi
  \def\bbl@process@syntax{#1}{%
... p ... [[}}]
  pats = pats .. ' ' .. p
else
  tex.sprint(
    [[\string\csname\space bbl@info\endcsname{Renew pattern: \]
      .. p .. [[}}]])
end
end
lang.patterns(lg, pats)
end
Babel.characters = Babel.characters or {}  
Babel.ranges = Babel.ranges or {}  
function Babel.hlist_has_bidi(head)  
  local has_bidi = false
  local ranges = Babel.ranges
  for item in node.traverse(head) do
    if item.id == node.id'glyph' then
      local itemchar = item.char
      local chardata = Babel.characters[itemchar]
      local dir = chardata and chardata.d or nil
      if not dir then
        for nn, et in ipairs(ranges) do
          if itemchar < et[1] then
            break
          elseif itemchar <= et[2] then
            dir = et[3]
            break
          end
        end
        if dir and (dir == 'al' or dir == 'r') then
          has_bidi = true
        end
      end
    end
  end
  return has_bidi
end
function Babel.set_chranges_b (script, chrng)
  if chrng == '' then return end
  texio.write('Replacing ' .. script .. ' script ranges')
  Babel.script_blocks[script] = {}
  for s, e in string.gmatch(chrng..' ', '(.-)%.%.(.-)%s') do
    table.insert(Babel.script_blocks[script], {tonumber(s,16), tonumber(e,16)})
  end
end
\endgroup
\ifx\newattribute@undefined\else
  \newattribute\bbl@attr@locale
  \directlua{ Babel.attr_locale = luatexbase.registernumber'\bbl@attr@locale' }
  \AddBabelHook{luatex}{beforeextras}{%
    \setattribute\bbl@attr@locale\localeid}
\fi
\def\BabelStringsDefault{unicode}
\let\luabbl@stop\relax
\AddBabelHook{luatex}{encodedcommands}{%
  \def\bbl@tempa{utf8}\def\bbl@tempb{#1}%
  \ifx\bbl@tempa\bbl@tempb\else
    \directlua{Babel.begin_process_input()}%
    \def\luabbl@stop{%
      \directlua{Babel.end_process_input()}}%
  \fi}%
\AddBabelHook{luatex}{stopcommands}{\AddBabelHook{luatex}{stopcommands}\luabbl{stop}\let\luabbl{stop}\relax}
\AddBabelHook{luatex}{patterns}{\ifundefined{bbl@hyphendata@the\language}{\def\bbl@elt##1##2##3##4{\ifnum##2=\csname l@#2\endcsname % #2=spanish, dutch:OT1...\def\bbl@tempc{##3}{##4}\bbl@csarg\xdef{hyphendata@##2}{\bbl@tempc}\fi}}{\bbl@languages}\@ifundefined{bbl@hyphendata@the\language}{\@ifundefined{bbl@patterns@}{\bbl@info{No hyphenation patterns were set for language '#2'. Reported}}{}\expandafter\expandafter\expandafter\bbl@luapatterns\csname bbl@hyphendata@the\language\endcsname}{}\@ifundefined{bbl@patterns@}{}{\begingroup\bbl@xin@{,\number\language,}{,\bbl@pttnlist}\ifin@\else\ifx\bbl@patterns@\@empty\directlua{ Babel.addpatterns([\bbl@patterns@], \number\language) }\fi\@ifundefined{bbl@patterns@#1}{\@empty}{\directlua{ Babel.addpatterns([\space\csname bbl@patterns@#1\endcsname], \number\language) }}\xdef\bbl@pttnlist{\bbl@pttnlist\number\language,}\fi\endgroup}\bbl@exp{\bbl@ifunset{bbl@prehc@languagename}{}\@ifblank{\bbl@cs{prehc@languagename}}{}{\prehyphenchar=\bbl@cl{prehc}\relax}}}

\ babelpatterns This macro adds patterns. Two macros are used to store them: \bbl@patterns@ for the global ones and \bbl@patterns@<lang> for language ones. We make sure there is a space between words when multiple commands are used.
12.4 Southeast Asian scripts

First, some general code for line breaking, used by \baposthyphenation. Replace regular (ie, implicit) discretionaries by spaceskips, based on the previous glyph (which I think makes sense, because the hyphen and the previous char go always together). Other discretionaries are not touched. See Unicode UAX 14.

% TODO - to a lua file
\directlua{
Babel = Babel or {}
Babel.linebreaking = Babel.linebreaking or {}
Babel.linebreaking.before = {}
Babel.linebreaking.after = {}
function Babel.linebreaking.add_before(func)
tex.print([\[
\noexpand\csname bbl@luahyphenate\endcsname
])
table.insert(Babel.linebreaking.before, func)
end
function Babel.linebreaking.add_after(func)
tex.print([\[
\noexpand\csname bbl@luahyphenate\endcsname
])
table.insert(Babel.linebreaking.after, func)
end
}
\def\bbl@intraspace#1 #2 #3\@@{\directlua{
Babel = Babel or {}
Babel.intraspaces = Babel.intraspaces or {}
Babel.intraspaces[\csname bbl@sbcp@\languagename\endcsname] = \%
{b = #1, p = #2, m = #3}
Babel.locale_props[\the\localeid].intraspace = \%
{b = #1, p = #2, m = #3}
}}
\def\bbl@intrapenalty#1\@@{\directlua{
Babel = Babel or {}
Babel.intrapenalties = Babel.intrapenalties or {}
Babel.intrapenalties[\csname bbl@sbcp@\languagename\endcsname] = #1
Babel.locale_props[\the\localeid].intrapenalty = #1
}}
\begingroup
\catcode`%=12
\catcode`^=14
\catcode`\'=12
\catcode`\-=12
\gdef\bbl@seaintraspace{^}
\let\bbl@seaintraspace\relax
\directlua{
Babel = Babel or {}
Babel.sea_enabled = true
Babel.sea_ranges = Babel.sea_ranges or {}
function Babel.set_chranges (script, chrng)
local c = 0
for s, e in string.gmatch(chrng..' ', '(.-)%.%.(.-)%s') do
  Babel.sea_ranges[script..c]={tonumber(s,16), tonumber(e,16)}
c = c + 1
end
function Babel.sea_disc_to_space (head)
12.5 CJK line breaking

Minimal line breaking for CJK scripts, mainly intended for simple documents and short texts as a secondary language. Only line breaking, with a little stretching for justification, without any attempt to adjust the spacing. It is based on (but does not strictly follow) the Unicode algorithm.

We first need a little table with the corresponding line breaking properties. A few characters have an additional key for the width (fullwidth vs. halfwidth), not yet used. There is a separate file, defined below.

```latex
\catcode`%=14
\edef\bbl@cjkinspace{\relax
\directlua{
Babel = Babel or {}
require('babel-data-cjk.lua')
Babel.cjk_enabled = true
function Babel.cjk_linebreak(head)
  local GLYPH = node.id'glyph'
  local last_char = nil
  local quad = 655360  % 10 pt = 655360 = 10 * 65536
  for item in node.traverse(head) do
    local i = item.id
    if i == node.id'glyph' then
      last_char = item
    elseif i == 7 and item.subtype == 3 and last_char
      and last_char.char > 0xC99 then
      quad = font.getfont(last_char.font).size
    for lg, rg in pairs(sea_ranges) do
      if last_char.char > rg[1] and last_char.char < rg[2] then
        lg = lg:sub(1, 4)  % Remove trailing number of, eg, Cyril
        local intraspace = Babel.intraspaces[lg]
        local intrapenalty = Babel.intrapenalties[lg]
        local n
        if intrapenalty ~= 0 then
          n = node.new(14, 0)  % penalty
          n.penalty = intrapenalty
          node.insert_before(head, item, n)
        end
        n = node.new(12, 13)  % (glue, spaceskip)
        node.setglue(n, intraspace.b * quad,
                      intraspace.p * quad,
                      intraspace.m * quad)
        node.insert_before(head, item, n)
        node.remove(head, item)
      end
    end
  end
end}
\let\bbl@cjkinspace\relax
\bbl@luahyphenate}
```
local props = babel.locale_props[locale]
local class = babel.cjk_class[item.char].c
if props.cjk_quotes and props.cjk_quotes[item.char] then
    class = props.cjk_quotes[item.char]
end
if class == 'cp' then class = 'cl' end
if class == 'id' then class = 'I' end
local br = 0
if class and last_class and babel.cjk_breaks[last_class][class] then
    br = babel.cjk_breaks[last_class][class]
end
if br == 1 and props.linebreak == 'c' and
    lang ~= \the\l@nohyphenation\space and
    last_lang ~= \the\l@nohyphenation then
    local intrapenalty = props.intrapenalty
    if intrapenalty ~= 0 then
        local n = node.new(14, 0) % penalty
        n.penalty = intrapenalty
        node.insert_before(head, item, n)
    end
    local intraspace = props.intraspace
    local n = node.new(12, 13) % (glue, spaceskip)
    node.setglue(n, intraspace.b * quad,
                 intraspace.p * quad,
                 intraspace.m * quad)
    node.insert_before(head, item, n)
end
if font.getfont(item.font) then
    quad = font.getfont(item.font).size
end
last_class = class
last_lang = lang
else % if penalty, glue or anything else
    last_class = nil
end
lang.hyphenate(head)
func(head)
end
if Babel.sea_enabled then
  Babel.sea_disc_to_space(head)
end
\bbl@provide@intraspace{\bbl@ifunset{bbl@intsp@\languagename}{}%\{\expandafter{\csname bbl@intsp@\languagename\endcsname\empty}else \bbl@in%(/c}{/\bbl@cl{lnbrk}}%\ifin@ % cjk \bbl@cjkintraspace \\bbl@exp{\bbl@intraspace\bbl@cl{intsp}\@@}%\ifx\bbl@KVP@intrapenalty\@nnil \bbl@intrapenalty0\@@ \fi \else % sea \bbl@seaintraspace \\bbl@exp{}{\bbl@intraspace\bbl@cl{intsp}\@@}%\directlua{ Babel = Babel or {} Babel.locale_props = Babel.locale_props or {} Babel.locale_props[the\localeid].linebreak = 'c' %}
\ift\bbl@exp{}\bbl@cl{intsp}\@@%\directlua{ Babel = Babel or {} Babel.sea_ranges = Babel.sea_ranges or {} Babel.set_chranges('\\bbl@cl{sbcp}', '\\bbl@cl{chrng}')}
}%\ift\bbl@KVP@intrapenalty\@nnil \bbl@intrapenalty0\@@ \fi \fi \ift\bbl@KVP@intrapenalty\@nnil\else \expandafter\bbl@intrapenalty\bbl@KVP@intrapenalty\@@ \fi}
\begingroup\catcode`_=11 \catcode`:=11 \gdef\bblar@nofswarn{\gdef\msg\warning:nnx##1##2##3{} }
\endgroup
\gdef\bbl@arabicjust{\let\bbl@arabicjust\relax
\\newattribute{bblar@kashida}
\directlua{ Babel.attr_kashida = luatexbase.registernumber‘bblar@kashida’ }%
12.6 Arabic justification
\def\bbl@bidimode>100 \ifnum\bbl@bidimode<200 \def\bblar@chars{0628,0629,062A,062B,062C,062D,062E,062F,0630,0631,0632,0633,0634,0635,0636,0637,0638,0639,063A,063B,063C,063D,063E,063F,0640,0641,0642,0643,0644,0645,0646,0647,0649}\def\bblar@elongated{0626,0628,062A,062B,0633,0634,0635,0636,0637,0638,0639,063A,063B,063C,063D,063E,063F,0641,0642,0643,0644,0645,0646,0647,0649}\def\bblar@elongated{0626,0628,062A,062B,062C,062D,062E,062F,0630,0631,0632,0633,0634,0635,0636,0637,0638,0639,063A,063B,063C,063D,063E,063F,0640,0641,0642,0643,0644,0645,0646,0647,0649}\def\bblar@elongated{0626,0628,062A,062B,062C,062D,062E,062F,0630,0631,0632,0633,0634,0635,0636,0637,0638,0639,063A,063B,063C,063D,063E,063F,0640,0641,0642,0643,0644,0645,0646,0647,0649} \catcode`\^=11 \catcode`\_=11 \gdef\bblar@nofswarn{\gdef\msg\warning:nnx##1##2##3{} }
\endgroup
\gdef\bbl@arabicjust{\let\bbl@arabicjust\relax
\\newattribute{bblar@kashida}
\directlua{ Babel.attr_kashida = luatexbase.registernumber‘bblar@kashida’ }%
\directlua{Babel.arabic.elong_map = Babel.arabic.elong_map or {}}
\directlua{Babel.arabic.elong_map[\the\localeid] = {}}
luatexbase.add_to_callback('post_linebreak_filter',
Babel.arabic.justify, 'Babel.arabic.justify')
luatexbase.add_to_callback('hpack_filter',
Babel.arabic.justify_hbox, 'Babel.arabic.justify_hbox')

% Save both node lists to make replacement. TODO. Save also widths to
% make computations
\def\bblar@fetchjalt#1#2#3#4{%
\bbl@exp{\bbl@foreach{#1}}{%
\bbl@ifunset{bblar@JE@##1}{%\setbox\z@=\hbox{\string200d\char"##1#2}}%\setbox\z@=\hbox{\string200d\char"\@nameuse{bblar@JE@##1}#2}}%
directlua{local last = nil
for item in node.traverse(tex.box[0].head) do
  if item.id == node.id'glyph' and item.char > 0x600 and
    not (item.char == 0x200D) then
    last = item
  end
end
Babel.arabic.#3['##1#4'] = last.char
}}%
% Brute force. No rules at all, yet. The ideal: look at jalt table. And
% perhaps other tables (falt?, cswh?). What about kaf? And diacritic
% positioning?
\def\bbl@parsejalt{%
\ifx\addfontfeature\@undefined\else
\bbl@xin{/e}{/\bbl@cl{lnbrk}}%
\ifin@
\directlua{
if Babel.arabic.elong_map[\the\localeid][\fontid\font] == nil then
  Babel.arabic.elong_map[\the\localeid][\fontid\font] = {}
tex.print({[\string\csname\space bbl@parsejalti\endcsname\]})
end
}
\fi
\fi}
\def\bbl@parsejalti{%
\begingroup
\let\bbl@parsejalt\relax % To avoid infinite loop
\def\bbl@tempf{\fontid\font}%
\bblar@nofswarn
\bblar@fetchjalt{\bblar@elongated}{\from}{%\Alef maksura
\bblar@fetchjalt{\bblar@chars}{\^^^064a}{\from}{a}%
\addfontfeature{RawFeature=jalt}%
% \@namedef{bblar@JE@0643}{06AA}% todo: catch medial kaf
\bblar@fetchjalt{\bblar@chars}{\^^^0649}{\from}{y}%
\directlua{
for k, v in pairs(Babel.arabic.from) do
  if Babel.arabic.dest[k] and
    not (Babel.arabic.from[k] == Babel.arabic.dest[k]) then
    Babel.arabic.elong_map[\the\localeid][\bbl@tempf] =
    [Babel.arabic.from[k]] = Babel.arabic.dest[k]
  end
end
}
\begin{itemize}
  \item \texttt{%}
  \item \texttt{\endgroup}
  \item \texttt{\begingroup}
  \item \texttt{\catcode`\#=11}
  \item \texttt{\catcode`\~-=11}
  \item \texttt{\directlua{}}
  \item \texttt{Babel.arabic = Babel.arabic or {}}
  \item \texttt{Babel.arabic.from = {}}
  \item \texttt{Babel.arabic.dest = {}}
  \item \texttt{Babel.arabic.justify_factor = 0.95}
  \item \texttt{Babel.arabic.justify_enabled = true}
  \item \texttt{function Babel.arabic.justify(head)}
  \item \texttt{if not Babel.arabic.justify_enabled then return head end}
  \item \texttt{for line in node.traverse_id(node.id'hlist', head) do}
  \item \texttt{Babel.arabic.justify_hlist(head, line)}
  \item \texttt{end}
  \item \texttt{return head}
  \item \texttt{end}
  \item \texttt{function Babel.arabic.justify_hbox(head, gc, size, pack)}
  \item \texttt{local has_inf = false}
  \item \texttt{if Babel.arabic.justify_enabled and pack == 'exactly' then}
  \item \texttt{for n in node.traverse_id(12, head) do}
  \item \texttt{if n.stretch_order > 0 then has_inf = true end}
  \item \texttt{end}
  \item \texttt{if not has_inf then}
  \item \texttt{Babel.arabic.justify_hlist(head, nil, gc, size, pack)}
  \item \texttt{end}
  \item \texttt{return head}
  \item \texttt{end}
  \item \texttt{function Babel.arabic.justify_hlist(head, line, gc, size, pack)}
  \item \texttt{local d, new}
  \item \texttt{local k_list, k_item, pos_inline}
  \item \texttt{local width, width_new, full, k_curr, wt_pos, goal, shift}
  \item \texttt{local subst_done = false}
  \item \texttt{local elong_map = Babel.arabic.elong_map}
  \item \texttt{local last_line}
  \item \texttt{local GLYPH = node.id'glyph'}
  \item \texttt{local KASHIDA = Babel.attr_kashida}
  \item \texttt{local LOCALE = Babel.attr_locale}
  \item \texttt{if line == nil then}
  \item \texttt{line = {}}
  \item \texttt{line.glue_sign = 1}
  \item \texttt{line.glue_order = 0}
  \item \texttt{line.head = head}
  \item \texttt{line.shift = 0}
  \item \texttt{line.width = size}
  \item \texttt{end}
  \item \texttt{% Exclude last line. todo. But-- it discards one-word lines, too!}
  \item \texttt{% ? Look for glue = 12:15}
  \item \texttt{if (line.glue_sign == 1 and line.glue_order == 0) then}
  \item \texttt{elongs = {}}
  \item \texttt{k_list = {}}
  \item \texttt{pos_inline = 0}
  \item \texttt{for n in node.traverse_id(GLYPH, line.head) do}
\end{itemize}
pos_inline = pos_inline + 1 % To find where it is. Not used.

% Elongated glyphs
if elong_map then
  local locale = node.get_attribute(n, LOCALE)
  if elong_map[locale] and elong_map[locale][n.font] and
    elong_map[locale][n.font][n.char] then
    table.insert(elongs, {node = n, locale = locale})
    node.set_attribute(n.prev, KASHIDA, 0)
  end
end

% Tatwil
if Babel.kashida_wts then
  local k_wt = node.get_attribute(n, KASHIDA)
  if k_wt > 0 then % todo. parameter for multi inserts
    table.insert(k_list, {node = n, weight = k_wt, pos = pos_inline})
  end
end

end % of node.traverse_id

if #elongs == 0 and #k_list == 0 then goto next_line end
full = line.width
shift = line.shift
goal = full * Babel.arabic.justify_factor % A bit crude
width = node.dimensions(line.head) % The 'natural' width

% == Elongated ==
% Original idea taken from 'chikenize'
while (#elongs > 0 and width < goal) do
  subst_done = true
  local x = #elongs
  local curr = elongs[x].node
  local oldchar = curr.char
  curr.char = elong_map[elongs[x].locale][curr.font][curr.char]
  width = node.dimensions(line.head) % Check if the line is too wide
  if width > goal then
    curr.char = oldchar
    break
  end
  table.remove(elongs, x)
end

% == Tatwil ==
if #k_list == 0 then goto next_line end
width = node.dimensions(line.head) % The 'natural' width
k_curr = #k_list
wt_pos = 1

while width < goal do
  subst_done = true
  k_item = k_list[k_curr].node
  if k_list[k_curr].weight == Babel.kashida_wts[wt_pos] then
    d = node.copy(k_item)
    d.char = 0x0640
    line.head, new = node.insert_after(line.head, k_item, d)
    width_new = node.dimensions(line.head)
    if width_new == width_new then
      node.remove(line.head, new) % Better compute before
break
end

width = width_new
end

if k_curr == 1 then
  k_curr = #k_list
  wt_pos = (wt_pos >= table.getn(Babel.kashida_wts)) and 1 or wt_pos+1
else
  k_curr = k_curr - 1
end

::next_line::

% Must take into account marks and ins, see luatex manual.
% Have to be executed only if there are changes. Investigate
% what's going on exactly.
if subst_done and not gc then
d = node.hpack(line.head, full, 'exactly')
d.shift = shift
node.insert_before(head, line, d)
node.remove(head, line)
end end % if process line
end % if process line
end
endgroup
\fi % Arabic just block

12.7 Common stuff

\AddBabelHook{babel-fontspec}{afterextras}{\bbl@switchfont}
\AddBabelHook{babel-fontspec}{beforestart}{\bbl@ckeckstdfonts}
\DisableBabelHook{babel-fontspec}
⟨⟨Fontselection⟩⟩

12.8 Automatic fonts and ids switching

After defining the blocks for a number of scripts (must be extended and very likely fine tuned), we define a short function which just traverse the node list to carry out the replacements. The table loc_to_scr gets the locale form as script range (note the locale is the key, and that there is an intermediate table built on the fly for optimization). This locale is then used to get the \language and the \localeid as stored in locale_props, as well as the font (as requested). In the latter table a key starting with / maps the font from the global one (the key) to the local one (the value). Maths are skipped and discretionaries are handled in a special way.

% TODO - to a lua file
\directlua{
Babel.script_blocks = { ['dflt'] = {}, ['Arab'] = {{0x0600, 0x06FF}, {0x08A0, 0x08FF}, {0x0750, 0x077F}, {0xFE70, 0xFEFF}, {0xFB50, 0xFDFF}, {0x1EE00, 0x1EEFF}}, ['Armc'] = {{0x0530, 0x058F}}, ['Beng'] = {{0x0980, 0x09FF}}, ['Cher'] = {{0x13A0, 0x13FF}, {0x1380, 0x139F}, {0x2D80, 0x2DFF}, {0xAB00, 0xAB2F}}, ['Copt'] = {{0x03E2, 0x03EF}, {0x02C80, 0x02CFF}, {0x1EE00, 0x1EEFF}}, ['Cyril'] = {{0x0400, 0x04FF}, {0x0500, 0x052F}, {0x1C80, 0x1C8F}, {0x2D00, 0x2DFF}, {0xA640, 0xA69F}}, ['Devan'] = {{0x0900, 0x09FF}, {0xA8E0, 0xA8FF}}, ['Ethi'] = {{0x1200, 0x137F}, {0x1380, 0x139F}, {0x2D00, 0x2DFF}, {0xA800, 0xA82F}}, ['Geor'] = {{0x10A0, 0x10FF}, {0x2D00, 0x2DFF}}, ['Grek'] = {{0x0370, 0x03E1}, {0x03F0, 0x03FF}, {0x1F00, 0x1FFF}},

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['Hans'] = {{0x2E80, 0x2EFF}, {0x3000, 0x303F}, {0x31C0, 0x31EF},
            {0x3300, 0x33FF}, {0x3400, 0x4DBF}, {0x4E00, 0x9FFF},
            {0xF900, 0xFAFF}, {0xFE30, 0xFE4F}, {0xFF00, 0xFFEF},
            {0x20000, 0x2A6DF}, {0x2A700, 0x2B73F},
            {0x2B740, 0x2B81F}, {0x2B820, 0x2CEAF},
            {0x2CEB0, 0x2EBEF}, {0x2F800, 0x2FA1F}},
['Hebr'] = {{0x0590, 0x05FF}},
['Jpan'] = {{0x3000, 0x303F}, {0x3040, 0x309F}, {0x30A0, 0x30FF},
            {0x4E00, 0x9FAF}, {0xFF00, 0xFFEF}},
['Khmr'] = {{0x1780, 0x17FF}, {0x19E0, 0x19FF}},
['Knda'] = {{0x0C80, 0x0CFF}},
['Kore'] = {{0x1100, 0x11FF}, {0x3000, 0x303F}, {0x3130, 0x318F},
            {0x4E00, 0x9FAF}, {0xA960, 0xA97F}, {0xAC00, 0xD7AF},
            {0xD7B0, 0xD7FF}, {0xFF00, 0xFFEF}},
['Laoo'] = {{0x0E80, 0x0EFF}},
['Latn'] = {{0x0000, 0x007F}, {0x0080, 0x00FF}, {0x0100, 0x017F},
            {0x1E00, 0x1EFF}, {0x2C60, 0x2C7F}, {0x2CEB0, 0x2EBEF},
            {0x2F800, 0x2FA1F}},
['Mahj'] = {{0x0B00, 0x0B7F}},
['Mlym'] = {{0x0D00, 0x0D7F}},
['Mymr'] = {{0x1000, 0x109F}, {0xAA60, 0xAA7F}, {0xA9E0, 0xA9FF}},
['Orya'] = {{0x0B00, 0x0B7F}},
['Sinh'] = {{0x0D80, 0x0DFF}, {0x111E0, 0x111FF}},
['Syrc'] = {{0x0700, 0x074F}, {0x0860, 0x086F}},
['Tamil'] = {{0x0B00, 0x0B7F}},
['Telu'] = {{0x0C00, 0x0C7F}},
['Tfng'] = {{0x2D30, 0x2D7F}},
['Thai'] = {{0x0E00, 0x0E7F}},
['Tibt'] = {{0x0F00, 0x0FFF}},
['Vaii'] = {{0xA500, 0xA63F}},
['Yiii'] = {{0xA000, 0xA48F}, {0xAA90, 0xA4CF}}
}

Babel.script_blocks.Cyrs = Babel.script_blocks.Cyr1

function Babel.locale_map(head)
  if not Babel.locale_mapped then return head end
  local LOCALE = Babel.attr_locale
  local GLYPH = node.id('glyph')
  local inmath = false
  local toloc_save
  for item in node.traverse(head) do
    local toloc
    if not inmath and item.id == GLYPH then
      -- Optimization: build a table with the chars found
      if Babel.chr_to_loc[item.char] then
        toloc = Babel.chr_to_loc[item.char]
      else
        for lc, maps in pairs(Babel.loc_to_scr) do
          for _, rg in pairs(maps) do
            if item.char >= rg[1] and item.char <= rg[2] then
              Babel.chr_to_loc[item.char] = lc
              toloc = lc
              break
            end
          end
        end
      end
    end
    if not inmath and item.id == GLYPH then
      -- Now, take action, but treat composite chars in a different
      -- fashion, because they 'inherit' the previous locale. Not yet

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5709  % optimized.
5710  if not toloc and
5711    (item.char >= 0x0300 and item.char <= 0x036F) or
5712    (item.char >= 0x1AB0 and item.char <= 0x1AFF) or
5713    (item.char >= 0x1DC0 and item.char <= 0x1DFF) then
5714    toloc = toloc_save
5715  end
5716  if toloc and toloc > -1 then
5717    if Babel.locale_props[toloc].lg then
5718      item.lang = Babel.locale_props[toloc].lg
5719      node.set_attribute(item, LOCALE, toloc)
5720    end
5721    if Babel.locale_props[toloc]["/'"..item.font] then
5722      item.font = Babel.locale_props[toloc]["/'"..item.font]
5723    end
5724    toloc_save = toloc
5725  end
5726  elseif not inmath and item.id == 7 then
5727    item.replace = item.replace and Babel.locale_map(item.replace)
5728    item.pre = item.pre and Babel.locale_map(item.pre)
5729    item.post = item.post and Babel.locale_map(item.post)
5730  elseif item.id == node.id'math' then
5731    inmath = (item.subtype == 0)
5732  end
5733  end
5734  return head
5735 end
5736}

The code for \babelcharproperty is straightforward. Just note the modified lua table can be different.

\newcommand\babelcharproperty[1]{%\count@=#1\relax\ifvmode\expandafter\bbl@chprop\else\bbl@error{\string\babelcharproperty space can be used only in vertical mode (preamble or between paragraphs)}\fi}
\newcommand\bbl@chprop[3][the\count@]{%\@tempcnta=#1\relax\bbl@ifunset{bbl@chprop@#2}{\bbl@error{No property named ' #2 '. Allowed values are\% direction (bc), mirror (bmg), and linebreak (lb)}\{See the manual for further info\}}%\ifnum\count@<\@tempcnta\advance\count@\@ne\repeat}edef\bbl@chprop@direction#1{%\directlua{Babel.characters[the\count@] = Babel.characters[the\count@] or {}Babel.characters[the\count@]['d'] = '#1'}}\let\bbl@chprop@bc\bbl@chprop@direction\def\bbl@chprop@mirror#1{%\directlua{Babel.characters[the\count@] = Babel.characters[the\count@] or {}Babel.characters[the\count@]['m'] = '\number#1'}}
Post-handling hyphenation patterns for non-standard rules, like ff to ff-f. There are still some issues with speed (not very slow, but still slow). The Lua code is below.

Now the \TeX{} high level interface, which requires the function defined above for converting strings to functions returning a string. These functions handle the \{\textit{n}\} syntax. For example, \texttt{pre=(\{1\} {1} -} becomes \texttt{function(m) return m[1]..m[1]..'-' end} where \texttt{m} are the matches returned after applying the pattern. With a mapped capture the functions are similar to \texttt{function(m) return Babel.capt_map(m[1],1) end}, where the last argument identifies the mapping to be applied to \texttt{m[1]}. The way it is carried out is somewhat tricky, but the effect in not dissimilar to \texttt{lua load} – save the code as string in a \TeX{} macro, and expand this macro at the appropriate place. As \directlua{} does not take into account the current catcode of \&, we just avoid this character in macro names (which explains the internal group, too).

```latex
\begingroup
  \catcode`\-=12
  \catcode`\%=12
  \catcode`\&=14
  \catcode`\|=12
  \gdef\babelprehyphenation{
  \@ifnextchar[{bl@settransform{0}}{bl@settransform{0}[}]
}
\edef\babelposthyphenation{&%\@ifnextchar[{bl@settransform{1}}{bl@settransform{1}[]}%}
\gdef\bbl@settransform#1[#2]#3#4#5{&%\ifcase#1
  \bbl@activateprehyphen
  \else
  \bbl@activateposthyphen
  \fi
  \begingroup
    \def\babeltempa{\bbl@add@list\babeltempb}&%
    \let\babeltempb\@empty
    \def\bbl@tempa{#5}&% TODO. Ugly trick to preserve {}
    \expandafter\bbl@foreach\expandafter{\bbl@tempa}{&%
      \bbl@ifsamestring{##1}{remove}&%
        {\bbl@add@list\babeltempb{nil}}&%
        {\directlua{
            \local rep = [=[[#1]=]
            rep = rep:gsub('^%s*(remove)%s*%s*$', 'remove = true')
            rep = rep:gsub('^%s*(insert)%s*%s*$', 'insert = true, ')
            rep = rep:gsub('[string]%s*%s*([%s,]%s*)', Babel.capture_func)
            if #1 == 0 then
              rep = rep:gsub('[space]%s*%s*([%d%.]+)%s*([%d%.]+)%s*([%d%.]+)%s*', Babel.capture_func)
              'space = {'.%2, %3, %4' ..'}'
            else
              rep = rep:gsub('[kashida]%s*%s*([%s,]%s*)', Babel.capture_kashida)
            end
        }\directlua{ %}
      }
    \bbl@ifsamestring{##1}{insert}&%
        {\bbl@add@list\babeltempb{insert = true, '}
        }
    \bbl@ifsamestring{##1}{remove}&%
        {\bbl@add@list\babeltempb{nil}}&%
    \bbl@ifsamestring{##1}{space}&%
        {\bbl@add@list\babeltempb{space = {' .. '%2, %3, %4' ..'}'}}
    \bbl@ifsamestring{##1}{spacefactor}&%
        {\bbl@add@list\babeltempb{spacefactor = {' .. '%2, %3, %4' ..'}}'
    \bbl@ifsamestring{##1}{kashida}&%
        {\bbl@add@list\babeltempb{\ }'}
  \else
    \bbl@activateposthyphen
  \fi
\endgroup
```
```
rep = rep:gsub( '(no)%s*=%s*(\[^s,\]*)', Babel.capture_func)
rep = rep:gsub( '(pre)%s*=%s*(\[^s,\]*)', Babel.capture_func)
rep = rep:gsub( '(post)%s*=%s*(\[^s,\]*)', Babel.capture_func)
end
tex.print([[\string\babeltempa{{\]\] .. rep .. \[[}}]
}})&%
\let\bbl@kv@attribute\relax
\let\bbl@kv@label\relax
\bbl@forkv(#2){\bbl@csarg\edef{kv@##1}{##2}}&%
\ift\bbl@kv@attribute\relax\else
\edef{\bbl@kv@attribute}{\expandafter\bbl@stripslash{\bbl@kv@attribute}}&%
\fi
\directlua{
local lbkr = Babel.linebreaking.replacements[#1]
local u = unicode.utf8
local id, attr, label
if #1 == 0 then
  id = \the\csname bbl@id@@#3\endcsname\space
else
  id = \the\csname l@#3\endcsname\space
end
\ifx\bbl@kv@attribute\relax
attr = -1
\else
attr = luatexbase.registernumber'\bbl@kv@attribute'
\fi
\ifx\bbl@kv@label\relax
label = [[==\bbl@kv@label==]]
\fi
&% Convert pattern:
local patt = string.gsub( [[==#4==]], '%s', '' )
if #1 == 0 then
  patt = string.gsub(patt, '|', ' ')
end
if not u.find(patt, '()', nil, true) then
  patt = '()' .. patt .. '()'
end
if #1 == 1 then
  patt = string.gsub(patt, '%(%)%^', '^()')
  patt = string.gsub(patt, '%$%(%)', '()$')
end
patt = u.gsub(patt, '{(.)}', function (n)
  return '%' .. (tonumber(n) and (tonumber(n)+1) or n)
end)
patt = u.gsub(patt, '{(%x%x%x%x+)}', function (n)
  return u.gsub(u.char(tonumber(n, 16)), '(%p)', '%%%1')
end)
lbkr[id] = lbkr[id] or {}
table.insert(lbkr[id],
{ label=label, attr=attr, pattern=patt, replace={\babeltempb} })
}}&%
\endgroup
\endgroup
\def\bbl@activateposthyphen{%
\let\bbl@activateposthyphen\relax
\directlua{
require('babel-transforms.lua')
Babel.linebreaking.add_after(Babel.post_hyphenate_replace)
}}
\def\bbl@activateprehyphen{%
\let\bbl@activateprehyphen\relax
}}
\directlua{
require('babel-transforms.lua')
Babel.linebreaking.add_before(Babel.pre_hyphenate_replace)
}

12.9 \textbf{Bidi}

As a first step, add a handler for bidi and digits (and potentially other processes) just before \texttt{luatofload} is applied, which is loaded by default by \LaTeX{}. Just in case, consider the possibility it has not been loaded.

\def\bbl@activate@preotf{\let\bbl@activate@preotf\relax \onlyonce
\directlua{
Babel = Babel or {}
% function Babel.pre_otfload_v(head)
if Babel.numbers and Babel.digits_mapped then
  head = Babel.numbers(head)
end
if Babel.bidi_enabled then
  head = Babel.bidi(head, false, dir)
end
return head
}
% function Babel.pre_otfload_h(head, gc, sz, pt, dir)
if Babel.numbers and Babel.digits_mapped then
  head = Babel.numbers(head)
end
if Babel.bidi_enabled then
  head = Babel.bidi(head, false, dir)
end
return head
}
% \luatexbase.add_to_callback('pre_linebreak_filter',
Babel.pre_otfload_v,
'\texttt{Babel.pre_otfload_v}',
\luatexbase.priority_in_callback('pre_linebreak_filter',
'\texttt{luaotfload.node_processor}') or \nil)
%
\luatexbase.add_to_callback('hpack_filter',
Babel.pre_otfload_h,
'Babel.pre_otfload_h',
\luatexbase.priority_in_callback('hpack_filter',
'\texttt{luaotfload.node_processor}') or \nil)
}

The basic setup. The output is modified at a very low level to set the \texttt{bodydir} to the \texttt{pagedir}. Sadly, we have to deal with boxes in math with basic, so the \texttt{\bbl@mathboxdir} hack is activated every math with the package option \texttt{bidi=}.

\ifnum\bbl@bidimode>100 \ifnum\bbl@bidimode<200
\let\bbl@beforeforeign\leavevmode
\AtEndOfPackage{\EnableBabelHook{babel-bidi}}
\RequirePackage{luatexbase}
\bbl@activate@preotf
\directlua{
require('babel-data-bidi.lua')
}% case\expandafter\gobbletwo\the\bbl@bidimode\or
require('babel-bidi-basic.lua')
% case\or
require('babel-bidi-basic-r.lua')
\fi}
\newattribute{bbl@attr@dir}
\directlua{ Babel.attr_dir = luatexbase.registernumber'bbl@attr@dir' }
% TODO. I don't like it, hackish:
\bbl@exp{\output{\bodydir\pagedir\the\output}}
\AtEndOfPackage{\EnableBabelHook{babel-bidi}}
\fi\fi
\chardef\bbl@thetextdir\z@
\chardef\bbl@thepardir\z@
\def\bbl@getluadir#1{% 1=text/par.. 2=\textdir.. 3=0 lr/1 rl
\directlua{
  if tex.#1dir == 'TLT' then
    tex.sprint('0')
  elseif tex.#1dir == 'TRT' then
    tex.sprint('1')
  end}}
\def\bbl@setluadir#1#2#3{% 1=text/par.. 2=\textdir.. 3=0 lr/1 rl
  \ifcase#3\relax
    \ifcase\bbl@getluadir{#1}\relax
      #2 TLT\relax
    \else
      #2 TRT\relax
    \fi
  \else
    \ifcase\bbl@getluadir{#1}\relax
      #2 TLT\relax
    \else
      #2 TRT\relax
    \fi
  \fi}
\def\bbl@thedir{0}
\def\bbl@textdir#1{% 1=text/par.. 2=\textdir.. 3=0 lr/1 rl
  \bbl@setluadir{text}
  \textdir{#1}
  \chardef\bbl@thetextdir#1\relax
  \edef\bbl@thedir{\the\numexpr\bbl@thepardir*3+#1}\
  \setattribute{\bbl@attr@dir}{\numexpr\bbl@thepardir*3+#1}}
\def\bbl@pardir#1{% 1=text/par.. 2=\textdir.. 3=0 lr/1 rl
  \bbl@setluadir{par}
  \pardir{#1}
  \chardef\bbl@thepardir#1\relax}
\def\bbl@bodydir{% 1=text/par.. 2=\textdir.. 3=0 lr/1 rl
  \bbl@setluadir{body}
  \bodydir}
\def\bbl@pagedir{% 1=text/par.. 2=\textdir.. 3=0 lr/1 rl
  \bbl@setluadir{page}
  \pagedir}
\def\bbl@dirparastext{% 1=text/par.. 2=\textdir.. 3=0 lr/1 rl
  \parastext\pagedir\the\textdir\relax}% %%%%
\ifnum\bbl@bidimode>\z@
  \def\bbl@insidemath{0}
  \def\bbl@everymath{\def\bbl@insidemath{1}}
  \def\bbl@everydisplay{\def\bbl@insidemath{2}}
  \frozen@everymath\expandafter{\bbl@everymath\the\frozen@everymath}
  \frozen@everydisplay\expandafter{\bbl@everydisplay\the\frozen@everydisplay}
\AtBeginDocument{\directlua{
  function Babel.math_box_dir(head)
    if not (token.get_macro('bbl@insidemath') == '0') then
      if Babel.hlist_has_bidi(head) then
        local d = node.new(node.id'dir')
        d.dir = '+TRT'
        node.insert_before(head, node.has_glyph(head), d)
        for item in node.traverse(head) do
          node.set_attribute(item,
            Babel.attr_dir, token.get_macro('bbl@thedir'))
        end
      end
    end
  return head
end
end
end
end
}}
12.10 Layout

Unlike \texttt{xetex}, \texttt{luatex} requires only minimal changes for right-to-left layouts, particularly in monolingual documents (the engine itself reverses boxes – including column order or headings –, margins, etc.) with \texttt{bidi=basic}, without having to patch almost any macro where text direction is relevant.

\texttt{\@hangfrom} is useful in many contexts and it is redefined always with the layout option. There are, however, a number of issues when the text direction is not the same as the box direction (as set by \texttt{\bodydir}), and when \texttt{\parbox} and \texttt{\hangindent} are involved. Fortunately, latest releases of \texttt{luatex} simplify a lot the solution with \texttt{\shapemode}.

With the issue \#15 I realized commands are best patched, instead of redefined. With a few lines, a modification could be applied to several classes and packages. Now, \texttt{tabular} seems to work (at least in simple cases) with \texttt{array}, \texttt{tabularx}, \texttt{hhline}, \texttt{colortbl}, \texttt{longtable}, \texttt{booktabs}, etc. However, dcolumn still fails.

\begin{verbatim}
\bbl@trace{Redefinitions for bidi layout}
\chardef\bbl@eqnpos\z@
\DeclareOption{leqno}{\chardef\bbl@eqnpos\@ne}
\DeclareOption{fleqn}{\chardef\bbl@eqnpos\tw@}
⟨⟨\texttt{/*More package options}}⟩⟩
\let\bbl@noamsmath\relax
\ifnum\bbl@bidimode>\z@
\ifx\matheqdirmode\@undefined\else
\matheqdirmode\@ne
\fi
\let\bbl@eqnodir\relax
\def\bbl@eqdel{()}
\def\bbl@eqnum{\normalfont\normalcolor
\expandafter\@firstoftwo\bbl@eqdel
\theequation
\expandafter\@secondoftwo\bbl@eqdel}
\def\bbl@puteqno#1{\eqno\hbox{#1}}
\def\bbl@putleqno#1{\leqno\hbox{#1}}
\def\bbl@eqno@flip#1{\ifdim\predisplaysize=-\maxdimen
\eqno
\hb@xt\ht@.01pt\hb@xt\ht@\displaywidth{\hss\hbox{#1}}\hss\%}
\else
\leqno
\hb@xt\ht@.01pt\hb@xt\ht@\displaywidth{\hss\hbox{#1}}\hss\%
\fi}
\def\bbl@leqno@flip#1{\ifdim\predisplaysize=-\maxdimen
\leqno
\hb@xt\ht@.01pt\hb@xt\ht@\displaywidth{\hss\hbox{#1}}\hss\%
\else
\eqno
\hb@xt\ht@.01pt\hb@xt\ht@\displaywidth{\hss\hbox{#1}}\hss\%
\fi}
\AtBeginDocument{%
\ifx\maketag@@@\@undefined % Normal equation, eqnarray
\AddToHook{env/equation/begin}{\ifnum\bbl@thetextdir>\z@
\let\@eqnnum\bbl@eqnum
\edef\bbl@eqnodir{\noexpand\bbl@textdir{\the\bbl@thetextdir}}%
\chardef\bbl@thetextdir\z@
\bbl@add\normalfont{\bbl@eqnodir}}
\fi
\else
\leqno\hbox{#1}\%
\fi}
\AtBeginDocument{%
\ifx\maketag@@@\@undefined % Normal equation, eqnarray
\AddToHook{env/equation/begin}{\ifnum\bbl@thetextdir>\z@
\let\@eqnnum\bbl@eqnum
\edef\bbl@eqnodir{\noexpand\bbl@textdir{\the\bbl@thetextdir}}%
\chardef\bbl@thetextdir\z@
\bbl@add\normalfont{\bbl@eqnodir}}
\fi
\else
\leqno\hbox{#1}\%
\fi}
\end{verbatim}
\@replace@$\tabular$\{
\@nextrule$
\fi$
}}
\IfBabelLayout{lists}
\{\let\bbl@OL@list\list\let\bbl@NL@list\list\def\bbl@listparshape#1#2#3{%}
\parshape #1 #2 #3 %
\ifnum\bbl@getluadir{page}=\bbl@getluadir{par}\else
\shapemode\tw@
\fi}
\IfBabelLayout{graphics}
\{\let\bbl@pictresetdir\relax\def\bbl@pictsetdir#1{%}
\ifcase\bbl@thetextdir
\let\bbl@pictresetdir\relax
\else
\ifcase#1\bodydir TLT % Remember this sets the inner boxes
\or\textdir TLT
\else\bodydir TLT \textdir TLT
\fi
\fi
% \text|par)dir required in pgf:
\def\bbl@pictsetdir{\bodydir TRT \pardir TRT \textdir TRT \relax}%
\fi%
\AddToHook{env/picture/begin}{\bbl@pictsetdir\tw@}%
\directlua{
  Babel.get_picture_dir = true
  Babel.picture_has_bidi = 0
  %
  function Babel.picture_dir (head)
    if not Babel.get_picture_dir then return head end
    if Babel.hlist_has_bidi(head) then
      Babel.picture_has_bidi = 1
    end
    return head
  end
  luatexbase.add_to_callback("hpack_filter", Babel.picture_dir,
    "Babel.picture_dir")
}
\AtBeginDocument{%
  \long\def\put(#1,#2)#3{%
    \@killglue
    % Try:
    \ifx\bbl@pictsetdir\relax
      \def\bbl@tempc(0)%
    \else
      \directlua{
        Babel.get_picture_dir = true
        Babel.picture_has_bidi = 0
      }
      \setbox\z@\hb@xt@\z@{\@defaultunitsset\@tempdimc{#1}\unitlength}
      \kern\@tempdimc
      #3\hss}% TODO: #3 executed twice (below). That's bad.
      \def\bbl@tempc{\directlua{tex.print(Babel.picture_has_bidi)}}%
    \fi
    % Do:
    \@defaultunitsset\@tempdimc{#2}\unitlength
    \raise\@tempdimc\hb@xt@\z@{%
    \@defaultunitsset\@tempdimc{#1}\unitlength
}
Implicitly reverses sectioning labels in bidi=basic-\text{-r}, because the full stop is not in contact with L numbers any more. I think there must be a better way. Assumes bidi=basic, but there are some additional readjustments for bidi=default.

\IfBabelLayout{counters}{\let\bbl@OL@@textsuperscript\@textsuperscript\bbl@sreplace\@textsuperscript{\m@th}{\m@th\mathdir\pagedir}\let\bbl@latinarabic\@arabic\let\bbl@OL@@arabic\@arabic\def\@arabic#1{\babelsublr{\bbl@latinarabic#1}}\@ifpackagewith{babel}{bidi=default}{\let\bbl@asciiroman\@roman\let\bbl@OL@@roman\@roman\def\@roman#1{\babelsublr{\ensureascii{\bbl@asciiroman#1}}}\let\bbl@OL@labelenumii\labelenumii\def\labelenumii{)(\theenumii)}}{}}

\IfBabelLayout{footnotes}{\let\bbl@OL@footnote\footnote\BabelFootnote\footnote\languagename{}{}\BabelFootnote\localfootnote\languagename{}{}\BabelFootnote\mainfootnote{}{}{}}{}

Some \LaTeX{} macros use internally the math mode for text formatting. They have very little in common and are grouped here, as a single option.
12.11 Lua: transforms

After declaring the table containing the patterns with their replacements, we define some auxiliary functions: `str_to_nodes` converts the string returned by a function to a node list, taking the node at base as a model (font, language, etc.); `fetch_word` fetches a series of glyphs and discretionary, which pattern is matched against (if there is a match, it is called again before trying other patterns, and this is very likely the main bottleneck). `post_hyphenate_replace` is the callback applied after `lang.hyphenate`. This means the automatic hyphenation points are known. As empty captures return a byte position (as explained in the luatex manual), we must convert it to a utf8 position. With `first`, the last byte can be the leading byte in a utf8 sequence, so we just remove it and add 1 to the resulting length. With `last` we must take into account the capture position points to the next character. Here `word_head` points to the starting node of the text to be matched.

```lua
Babel.linebreaking.replacements = {}
Babel.linebreaking.replacements[0] = {} -- pre
Babel.linebreaking.replacements[1] = {} -- post

-- Discretionaries contain strings as nodes
function Babel.str_to_nodes(fn, matches, base)
  local n, head, last
  if fn == nil then return nil end
  for s in string.utfvalues(fn(matches)) do
    if base.id == 7 then
      base = base.replace
    end
    n = node.copy(base)
    n.char = s
    if not head then
      head = n
    else
      last.next = n
    end
    last = n
  end
  return head
end

Babel.fetch_subtext = {}
Babel.ignore_pre_char = function(node)
  return (node.lang == Babel.nohyphenation)
end

-- Merging both functions doesn't seem feasible, because there are too many differences.
function Babel.fetch_subtext[0] = function(head)
  local word_string = ''
  local word_nodes = {}
  local lang
  local item = head
  local inmath = false
  return
end
```

while item do
  if item.id == 11 then
    inmath = (item.subtype == 0)
  end
  if inmath then
    -- pass
  else if item.id == 29 then
    local locale = node.get_attribute(item, Babel.attr_locale)
    if lang == locale or lang == nil then
      lang = lang or locale
      if Babel.ignore_pre_char(item) then
        word_string = word_string .. Babel.us_char
      else
        word_string = word_string .. unicode.utf8.char(item.char)
      end
      word_nodes[#word_nodes+1] = item
    else
      break
    end
  elseif item.id == 12 and item.subtype == 13 then
    word_string = word_string .. ' '  
    word_nodes[#word_nodes+1] = item
  elseif word_string ~= '' then
    word_string = word_string .. Babel.us_char
    word_nodes[#word_nodes+1] = item
    -- Will be ignored
  end
  item = item.next
end

-- Here and above we remove some trailing chars but not the
-- corresponding nodes. But they aren't accessed.
if word_string:sub(-1) == '' then
  word_string = word_string:sub(1,-2)
end
word_string = unicode.utf8.gsub(word_string, Babel.us_char .. '+$', '')
return word_string, word_nodes, item, lang
if item.lang == lang or lang == nil then
    if (item.char ~= 124) and (item.char ~= 61) then -- not =, not |
        lang = lang or item.lang
        word_string = word_string .. unicode.utf8.char(item.char)
        word_nodes[#word_nodes+1] = item
    end
else
    break
end

elseif item.id == 7 and item.subtype == 2 then
    word_string = word_string .. '='
    word_nodes[#word_nodes+1] = item
elseif item.id == 7 and item.subtype == 3 then
    word_string = word_string .. '|''
    word_nodes[#word_nodes+1] = item
end

-- (1) Go to next word if nothing was found, and (2) implicitly
-- remove leading USs.
elseif word_string == '' then
    -- pass
else if item.id == 12 and item.subtype == 13) then
    break
else
    word_string = word_string .. Babel.us_char
    word_nodes[#word_nodes+1] = item -- Will be ignored
end
item = item.next

word_string = unicode.utf8.gsub(word_string, Babel.us_char .. '+$', '')
return word_string, word_nodes, item, lang

function Babel.pre_hyphenate_replace(head)
    Babel.hyphenate_replace(head, 0)
end

function Babel.post_hyphenate_replace(head)
    Babel.hyphenate_replace(head, 1)
end

Babel.us_char = string.char(31)

function Babel.hyphenate_replace(head, mode)
    local u = unicode.utf8
    local lbkr = Babel.linebreaking.replacements[mode]
    local word_head = head
    while true do -- for each subtext block
        local w, w_nodes, nw, lang = Babel.fetch_subtext[mode](word_head)
        if Babel.debug then
            print()
            print((mode == 0) and '@@@@<' or '@@@@>', w)
        end
        break
    end
end
if nw == nil and w == '' then break end
if not lang then goto next end
if not lbkr[lang] then goto next end
-- For each saved (pre|post)hyphenation. TODO. Reconsider how
-- loops are nested.
for k=1, #lbkr[lang] do
  local p = lbkr[lang][k].pattern
  local r = lbkr[lang][k].replace
  local attr = lbkr[lang][k].attr or -1
  if Babel.debug then
    print('*****', p, mode)
  end
  -- This variable is set in some cases below to the first *byte*
  -- after the match, either as found by u.match (faster) or the
  -- computed position based on sc if w has changed.
  local last_match = 0
  local step = 0
  -- For every match.
  while true do
    if Babel.debug then
      print('=====
    end
    local new -- used when inserting and removing nodes
    local matches = { u.match(w, p, last_match) }
    if #matches < 2 then break end
    -- Get and remove empty captures (with ()'s, which return a
    -- number with the position), and keep actual captures
    -- (from (...)), if any, in matches.
    local first = table.remove(matches, 1)
    local last = table.remove(matches, #matches)
    -- Non re-fetched substrings may contain \31, which separates
    -- subsubstrings.
    if string.find(w:sub(first, last-1), Babel.us_char) then break end
    local save_last = last -- with A()BC(), points to D
    -- Fix offsets, from bytes to unicode. Explained above.
    first = u.len(w:sub(1, first-1)) + 1
    last = u.len(w:sub(1, last-1)) -- now last points to C
    -- This loop stores in a small table the nodes
    -- corresponding to the pattern. Used by 'data' to provide a
    -- predictable behavior with 'insert' (w_nodes is modified on
    -- the fly), and also access to 'remove'd nodes.
    local sc = first-1 -- Used below, too
    local data_nodes = {}
    local enabled = true
    for q = 1, last-first+1 do
      data_nodes[q] = w_nodes[sc+q]
      if enabled
        and attr > -1
        and not node.has_attribute(data_nodes[q], attr)
      then
enabled = false
end
end

-- This loop traverses the matched substring and takes the
-- corresponding action stored in the replacement list.
-- sc = the position in substr nodes / string
-- rc = the replacement table index
local rc = 0

while rc < last-first+1 do -- for each replacement
    if Babel.debug then
        print('.....', rc + 1)
    end
    sc = sc + 1
    rc = rc + 1
    if Babel.debug then
        Babel.debug_hyph(w, w_nodes, sc, first, last, last_match)
    end
    local ss = ''
    for itt in node.traverse(head) do
        if itt.id == 29 then
            ss = ss .. unicode.utf8.char(itt.char)
        else
            ss = ss .. '{' .. itt.id .. '}'
        end
    end
    print('*****************', ss)
end

local crep = r[rc]
local item = w_nodes[sc]
local item_base = item
local placeholder = Babel.us_char
local d

if crep and crep.data then
    item_base = data_nodes[crep.data]
end

if crep then
    step = crep.step or 0
end

if (not enabled) or (crep and next(crep) == nil) then -- = {}
    last_match = save_last -- Optimization
    goto next
elseif crep == nil or crep.remove then
    node.remove(head, item)
    table.remove(w_nodes, sc)
    w = u.sub(w, 1, sc-1) .. u.sub(w, sc+1)
    sc = sc - 1 -- Nothing has been inserted.
    last_match = utf8.offset(w, sc+1+step)
    goto next
elseif crep and crep.kashida then -- Experimental
    node.set_attribute(item, Babel.attr_kashida, crep.kashida)
    last_match = utf8.offset(w, sc+1+step)
    goto next
end
elseif crep and crep.string then
local str = crep.string(matches)
if str == '' then -- Gather with nil
    node.remove(head, item)
    table.remove(w_nodes, sc)
    w = u.sub(w, 1, sc-1) .. u.sub(w, sc+1)
    sc = sc - 1 -- Nothing has been inserted.
else
    local loop_first = true
    for s in string.utfvalues(str) do
        d = node.copy(item_base)
        d.char = s
        if loop_first then
            loop_first = false
            head, new = node.insert_before(head, item, d)
            if sc == 1 then
                word_head = head
            end
            w_nodes[sc] = d
            w = u.sub(w, 1, sc-1) .. u.char(s) .. u.sub(w, sc+1)
        else
            sc = sc + 1
            head, new = node.insert_before(head, item, d)
            table.insert(w_nodes, sc, new)
            w = u.sub(w, 1, sc-1) .. u.char(s) .. u.sub(w, sc)
        end
        if Babel.debug then
            print('.....', 'str')
            Babel.debug_hyph(w, w_nodes, sc, first, last, last_match)
        end
    end -- for
    node.remove(head, item)
    end -- if ''
last_match = utf8.offset(w, sc+1+step)
goto next
elseif mode == 1 and crep and (crep.pre or crep.no or crep.post) then
    d = node.new(7, 0) -- (disc, discretionary)
    d.pre = Babel.str_to_nodes(crep.pre, matches, item_base)
    d.post = Babel.str_to_nodes(crep.post, matches, item_base)
    d.replace = Babel.str_to_nodes(crep.no, matches, item_base)
    d.attr = item_base.attr
    if crep.pre == nil then -- TeXbook p96
        d.penalty = crep.penalty or tex.hyphenpenalty
    else
        d.penalty = crep.penalty or tex.exhyphenpenalty
    end
    placeholder = '|' 
    head, new = node.insert_before(head, item, d)
elseif mode == 0 and crep and (crep.pre or crep.no or crep.post) then
    -- ERROR
elseif crep and crep.penalty then
    d = node.new(14, 0) -- (penalty, userpenalty)
    d.attr = item_base.attr
    d.penalty = crep.penalty
    head, new = node.insert_before(head, item, d)
elseif crep and crep.space then
    -- 655360 = 10 pt = 10 * 65536 sp
    d = node.new(12, 13) -- (glue, spaceskip)
local quad = font.getfont(item_base.font).size or 655360
node.setglue(d, crep.space[1] * quad,
    crep.space[2] * quad,
    crep.space[3] * quad)
if mode == 0 then
    placeholder = ''
end
head, new = node.insert_before(head, item, d)
elseif crep and crep.spacefactor then
    d = node.new(12, 13) -- (glue, spaceskip)
    local base_font = font.getfont(item_base.font)
    node.setglue(d,
        crep.spacefactor[1] * base_font.parameters['space'],
        crep.spacefactor[2] * base_font.parameters['space_stretch'],
        crep.spacefactor[3] * base_font.parameters['space_shrink'])
    if mode == 0 then
        placeholder = ''
    end
    head, new = node.insert_before(head, item, d)
elseif mode == 0 and crep and crep.space then
    -- ERROR
end -- ie replacement cases
-- Shared by disc, space and penalty.
if sc == 1 then
    word_head = head
end
if crep.insert then
    w = u.sub(w, 1, sc-1) .. placeholder .. u.sub(w, sc)
    table.insert(w_nodes, sc, new)
    last = last + 1
else
    w_nodes[sc] = d
    node.remove(head, item)
    w = u.sub(w, 1, sc-1) .. placeholder .. u.sub(w, sc+1)
end
last_match = utf8.offset(w, sc+1+step)
::next::
end -- for each replacement
if Babel.debug then
    print('.....', '/')
    Babel.debug_hyph(w, w_nodes, sc, first, last, last_match)
end
end -- for match
::next::
word_head = nw
end -- for substring
return head

-- This table stores capture maps, numbered consecutively
Babel.capture_maps = {}
The following functions belong to the next macro

```
function Babel.capture_func(key, cap)
  local ret = "[" .. cap:gsub('([0-9])', '" .. \[m%' .. [[") .. "]")"
  local cnt
  local u = unicode.utf8
  ret, cnt = ret:gsub('([0-9])\([^\]|]+\)(.-)', Babel.capture_func_map)
  if cnt == 0 then
    ret = u.gsub(ret, '{(%x%x%x%x+)}',
        function (n)
          return u.char(tonumber(n, 16))
        end)
  end
  ret = ret:gsub('%[%[%]%]%..', '')
  return key .. \[=function(m) return \[ end\]
end
```

```
function Babel.capture_func_map(capno, from, to)
  local u = unicode.utf8
  from = u.gsub(from, '{(%x%x%x%x+)}',
        function (n)
          return u.char(tonumber(n, 16))
        end)
  to = u.gsub(to, '{(%x%x%x%x+)}',
        function (n)
          return u.char(tonumber(n, 16))
        end)
  local froms = {}
  for s in string.utfcharacters(from) do
    table.insert(froms, s)
  end
  local cnt = 1
  table.insert(Babel.capture_maps, {})
  local mlen = table.getn(Babel.capture_maps)
  for s in string.utfcharacters(to) do
    Babel.capture_maps[mlen][froms[cnt]] = s
    cnt = cnt + 1
  end
  return "]]..Babel.capt_map(m[" .. capno .. "]", ..
    (mlen) .. "]") .. "]["[
end
```

```
-- Handle the {n|abc|ABC} syntax in captures
function Babel.capture_func_map(capno, from, to)
  local u = unicode.utf8
  from = u.gsub(from, '{(%x%x%x%x+)}',
        function (n)
          return u.char(tonumber(n, 16))
        end)
  to = u.gsub(to, '{(%x%x%x%x+)}',
        function (n)
          return u.char(tonumber(n, 16))
        end)
  local froms = {}
  for s in string.utfcharacters(from) do
    table.insert(froms, s)
  end
  local cnt = 1
  table.insert(Babel.capture_maps, {})
  local mlen = table.getn(Babel.capture_maps)
  for s in string.utfcharacters(to) do
    Babel.capture_maps[mlen][froms[cnt]] = s
    cnt = cnt + 1
  end
  return "]].Babel.capt_map(m[" .. capno .. "], ..
    (mlen) .. "]") .. "["[
end
```

```
function Babel.capture_kashida(key, wt)
  wt = tonumber(wt)
  if Babel.kashida_wts then
    for p, q in ipairs(Babel.kashida_wts) do
      if wt == q then
        break
      elseif wt > q then
        table.insert(Babel.kashida_wts, p, wt)
        break
      elseif table.getn(Babel.kashida_wts) == p then
        table.insert(Babel.kashida_wts, wt)
      end
    end
  else
    Babel.kashida_wts = {}
  end
  if Babel.kashida_wts then
    for p, q in ipairs(Babel.kashida_wts) do
      if wt == q then
        break
      elseif wt > q then
        table.insert(Babel.kashida_wts, p, wt)
        break
      elseif table.getn(Babel.kashida_wts) == p then
        table.insert(Babel.kashida_wts, wt)
      end
    end
  end
else
```
12.12 Lua: Auto bidi with basic and basic-r

The file babel-data-bidi.lua currently only contains data. It is a large and boring file and it is not shown here (see the generated file), but here is a sample:

```lua
Babel.kashida_wts = { wt }
Babel = Babel or {}
local characters = Babel.characters
local ranges = Babel.ranges
local DIR = node.id("dir")
local function dir_mark(head, from, to, outer)
    dir = (outer == 'r') and 'TLT' or 'TRT' -- ie, reverse
    local d = node.new(DIR)
    d.dir = '+' .. dir
    node.insert_before(head, from, d)
    d = node.new(DIR)
    d.dir = '-' .. dir
```

For the meaning of these codes, see the Unicode standard.
Now the basic-r bidi mode. One of the aims is to implement a fast and simple bidi algorithm, with a single loop. I managed to do it for R texts, with a second smaller loop for a special case. The code is still somewhat chaotic, but its behavior is essentially correct. I cannot resist copying the following text from Emacs bidi.c (which also attempts to implement the bidi algorithm with a single loop):

Arrrrgh!! The UAX#9 algorithm is too deeply entrenched in the assumption of batch-style processing [...]. May the fleas of a thousand camels infest the armpits of those who design supposedly general-purpose algorithms by looking at their own implementations, and fail to consider other possible implementations!

Well, it took me some time to guess what the batch rules in UAX#9 actually mean (in other word, what they do and why, and not only how), but I think (or I hope) I’ve managed to understand them. In some sense, there are two bidi modes, one for numbers, and the other for text. Furthermore, setting just the direction in R text is not enough, because there are actually two R modes (set explicitly in Unicode with RLM and ALM). In babel the dir is set by a higher protocol based on the language/script, which in turn sets the correct dir (<l>, <r> or <al>).

From UAX#9: “Where available, markup should be used instead of the explicit formatting characters”. So, this simple version just ignores formatting characters. Actually, most of that annex is devoted to how to handle them.

BD14-BD16 are not implemented. Unicode (and the W3C) are making a great effort to deal with some special problematic cases in “streamed” plain text. I don’t think this is the way to go – particular issues should be fixed by a high level interface taking into account the needs of the document. And here is where luatex excels, because everything related to bidi writing is under our control.
node.insert_after(head, to, d)
end

function Babel.bidi(head, ispar)
local first_n, last_n -- first and last char with nums
local last_es -- an auxiliary 'last' used with nums
local first_d, last_d -- first and last char in L/R block
local dir, dir_real

Next also depends on script(lang (<al>]<cr>). To be set by babel. tex.pardir is dangerous, could be
(re)set but it should be changed only in vmode. There are two strong's – strong = l/al/r and
strong_lr = lr (there must be a better way):

local strong = ('TRT' == tex.pardir) and 'r' or 'l'
local strong_lr = (strong == 'l') and 'l' or 'r'
local outer = strong
local new_dir = false
local first_dir = false
local inmath = false
local last_lr
local type_n = ''

for item in node.traverse(head) do
  -- three cases: glyph, dir, otherwise
  if item.id == node.id'glyph'
    or (item.id == 7 and item.subtype == 2) then
    local itemchar
    if item.id == 7 and item.subtype == 2 then
      itemchar = item.char
    else
      itemchar = item.replace.char
    end
    local chardata = characters[itemchar]
    dir = chardata and chardata.d or nil
    if not dir then
      for nn, et in ipairs(ranges) do
        if itemchar < et[1] then
          break
        elseif itemchar <= et[2] then
          dir = et[3]
          break
        end
      end
    end
    dir = dir or 'l'
  end
  end
  if inmath then
dir = dir or 'l'
end

if new_dir then
  attr_dir = 0
  for at in node.traverse(item.attr) do
    if at.number == Babel.attr_dir then
      attr_dir = at.value % 3
    end
  end
  end
if attr_dir == 1 then

Next is based on the assumption babel sets the language AND switches the script with its dir. We
 treat a language block as a separate Unicode sequence. The following piece of code is executed at the
first glyph after a 'dir' node. We don't know the current language until then. This is not exactly true,
as the math mode may insert explicit dirs in the node list, so, for the moment there is a hack by brute
force (just above).
strong = 'r'
elseif attr_dir == 2 then
    strong = 'al'
else
    strong = 'l'
end
strong_lr = (strong == 'l') and 'l' or 'r'
outer = strong_lr
new_dir = false
end
if dir == 'nsm' then dir = strong end -- W1

Numbers. The dual <al>/<r> system for R is somewhat cumbersome.

if dir == 'al' then dir = 'r' end -- W3

By W2, there are no <en> <et> <es> if strong == <al>, only <an>. Therefore, there are not <et en>
nor <en et>, W5 can be ignored, and W6 applied:

if strong == 'al' then
    if dir == 'en' then dir = 'an' end -- W2
    if dir == 'et' or dir == 'es' then dir = 'on' end -- W6
    strong_lr = 'r' -- W3
end

Once finished the basic setup for glyphs, consider the two other cases: dir node and the rest.

elseif item.id == node.id'dir' and not inmath then
    new_dir = true
    dir = nil
elseif item.id == node.id'math' then
    inmath = (item.subtype == 0)
else
    dir = nil -- Not a char
end

Numbers in R mode. A sequence of <en>, <et>, <an>, <es> and <cs> is typeset (with some rules) in L mode. We store the starting and ending points, and only when anything different is found (including nil, ie, a non-char), the textdir is set. This means you cannot insert, say, a whatstis, but this is what I would expect (with luachar you may colorize some digits). Anyway, this behavior could be changed with a switch in the future. Note in the first branch only <an> is relevant if <al>.

if dir == 'en' or dir == 'an' or dir == 'et' then
    if dir == 'et' then
        type_n = dir
    end
    first_n = first_n or item
    last_n = last_es or item
    last_es = nil
    elseif dir == 'es' and last_n then -- W3+W6
        last_es = item
    elseif dir == 'cs' then -- it's right - do nothing
    elseif first_n then -- & if dir = any but en, et, an, es, cs, inc nil
        if strong_lr == 'r' and type_n == '' then
            dir_mark(head, first_n, last_n, 'r')
        elseif strong_lr == 'l' and first_d and type_n == 'an' then
            dir_mark(head, first_n, last_n, 'r')
        elseif strong_lr == 'l' and first_d and type_n == 'an' then
            dir_mark(head, first_d, last_d, outer)
            first_d, last_d = nil, nil
        else if strong_lr == 'l' and type_n == '' then
            last_d = last_n
        end
        type_n = ''
        first_n, last_n = nil, nil
    end

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R text in L, or L text in R. Order of dir_mark's are relevant: d goes outside n, and therefore it's emitted after. See dir_mark to understand why (but is the nesting actually necessary or is a flat dir structure enough?). Only L, R (and AL) chars are taken into account – everything else, including spaces, whatshits, etc., are ignored:

```plaintext
if dir == 'l' or dir == 'r' then
  if dir ~= outer then
    first_d = first_d or item
    last_d = item
  elseif first_d and dir ~= strong_lr then
    dir_mark(head, first_d, last_d, outer)
    first_d, last_d = nil, nil
  end
end
```

**Mirroring.** Each chunk of text in a certain language is considered a “closed” sequence. If <r on r> and <l on l>, it’s clearly <r> and <l>, resp., but with other combinations depends on outer. From all these, we select only those resolving <on> → <r>. At the beginning (when last_hr is nil) of an R text, they are mirrored directly.

TODO - numbers in R mode are processed. It doesn’t hurt, but should not be done.

```plaintext
if dir and not last_lr and dir ~= 'l' and outer == 'r' then
  item.char = characters[item.char] and
  characters[item.char].m or item.char
elseif (dir or new_dir) and last_lr ~= item then
  local mir = outer .. strong_lr .. (dir or outer)
  if mir == 'rrr' or mir == 'lrr' or mir == 'rrl' or mir == 'rlr' then
    for ch in node.traverse(node.next(last_lr)) do
      if ch == item then break end
      if ch.id == node.id'glyph' and characters[ch.char] then
        ch.char = characters[ch.char].m or ch.char
      end
    end
  end
end
```

Save some values for the next iteration. If the current node is ‘dir’, open a new sequence. Since dir could be changed, strong is set with its real value (dir_real).

```plaintext
if dir == 'l' or dir == 'r' then
  last_lr = item
  strong = dir_real -- Don’t search back - best save now
  strong_lr = (strong == 'l') and 'l' or 'r'
elseif new_dir then
  last_lr = nil
end
```

Mirror the last chars if they are not directed. And make sure any open block is closed, too.

```plaintext
if last_lr and outer == 'r' then
  for ch in node.traverse_id(node.id'glyph', node.next(last_lr)) do
    if characters[ch.char] then
      ch.char = characters[ch.char].m or ch.char
    end
  end
end
```

In boxes, the dir node could be added before the original head, so the actual head is the previous node.

```plaintext
return node.prev(head) or head
```
And here the Lua code for bidi=basic:

```lua
Babel = Babel or {}
-- eg, Babel.fontmap[1][<prefontid>]=<dirfontid>
Babel.fontmap = Babel.fontmap or {}
Babel.fontmap[0] = {} -- l
Babel.fontmap[1] = {} -- r
Babel.bidi_enabled = true
Babel.mirroring_enabled = true
require('babel-data-bidi.lua')
local characters = Babel.characters
local ranges = Babel.ranges
local DIR = node.id('dir')
local GLYPH = node.id('glyph')
local function insert_implicit(head, state, outer)
    local new_state = state
    if state.sim and state.eim and state.sim ~= state.eim then
        dir = ((outer == 'r') and 'TLT' or 'TRT') -- ie, reverse
        local d = node.new(DIR)
        d.dir = '+' .. dir
        node.insert_before(head, state.sim, d)
        local d = node.new(DIR)
        d.dir = '-' .. dir
        node.insert_after(head, state.eim, d)
    end
    new_state.sim, new_state.eim = nil, nil
    return head, new_state
end
local function insert_numeric(head, state)
    local new_state = state
    if state.san and state.ean and state.san ~= state.ean then
        local d = node.new(DIR)
        d.dir = '+TLT'
        _, new = node.insert_before(head, state.san, d)
        if state.san == state.sim then state.sim = new end
        local d = node.new(DIR)
        d.dir = '-TLT'
        _, new = node.insert_after(head, state.ean, d)
        if state.ean == state.eim then state.eim = new end
    end
    new_state.san, new_state.ean = nil, nil
    return head, new_state
end
local function insert Implicit(head, state, outer)
    local new_state = state
    if state.sim and state.eim and state.sim ~= state.eim then
        dir = ((outer == 'r') and 'TLT' or 'TRT') -- ie, reverse
        local d = node.new(DIR)
        d.dir = '+' .. dir
        node.insert_before(head, state.sim, d)
        local d = node.new(DIR)
        d.dir = '-' .. dir
        node.insert_after(head, state.eim, d)
    end
    new_state.sim, new_state.eim = nil, nil
    return head, new_state
end
local function insert Numeric(head, state)
    local new_state = state
    if state.san and state.ean and state.san ~= state.ean then
        local d = node.new(DIR)
        d.dir = '+TLT'
        _, new = node.insert_before(head, state.san, d)
        if state.san == state.sim then state.sim = new end
        local d = node.new(DIR)
        d.dir = '-TLT'
        _, new = node.insert_after(head, state.ean, d)
        if state.ean == state.eim then state.eim = new end
    end
    new_state.san, new_state.ean = nil, nil
    return head, new_state
end
-- TODO - \hbox with an explicit dir can lead to wrong results
-- <R \hbox dir TLT{<R>}> and <L \hbox dir TRT{<L>}>. A small attempt
-- was made to improve the situation, but the problem is the 3-dir
-- model in babel/Unicode and the 2-dir model in LuaTeX don't fit
-- well.
```

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function Babel.bidi(head, ispar, hdir)
local d -- d is used mainly for computations in a loop
local prev_d = ''
local new_d = false
local nodes = {}
local outer_first = nil
local inmath = false
local glue_d = nil
local glue_i = nil
local has_en = false
local first_et = nil
local ATDIR = Babel.attr_dir
local save_outer
local temp = node.get_attribute(head, ATDIR)
if temp then
  temp = temp % 3
  save_outer = (temp == 0 and 'l') or
                (temp == 1 and 'r') or
                (temp == 2 and 'al')
elseif ispar then -- Or error? Shouldn't happen
  save_outer = ('TRT' == tex.pardir) and 'r' or 'l'
else -- Or error? Shouldn't happen
  save_outer = ('TRT' == hdir) and 'r' or 'l'
end
-- when the callback is called, we are just _after_ the box,
-- and the textdir is that of the surrounding text
-- if not ispar and hdir ~= tex.textdir then
--   save_outer = ('TRT' == hdir) and 'r' or 'l'
-- end
local outer = save_outer
local last = outer
-- 'al' is only taken into account in the first, current loop
if save_outer == 'al' then save_outer = 'r' end
local fontmap = Babel.fontmap
for item in node.traverse(head) do
  -- In what follows, #node is the last (previous) node, because the
  -- current one is not added until we start processing the neutrals.
  -- three cases: glyph, dir, otherwise
  if item.id == GLYPH
    or (item.id == 7 and item.subtype == 2) then
    local d_font = nil
    local item_r
    if item.id == 7 and item.subtype == 2 then
      item_r = item.replace -- automatic discs have just 1 glyph
    else
      item_r = item
    end
    local chardata = characters[item_r.char]
    d = chardata and chardata.d or nil
    if not d or d == 'nsm' then
      for nn, et in ipairs(ranges) do
        if item_r.char < et[1] then
          break
        end
      end
    else
      ..., continue
elseif item_r.char <= et[2] then
    if not d then d = et[3]
    elseif d == 'nsm' then d_font = et[3]
end
break
end
end
end

-- A short 'pause' in bidi for mapfont
d_font = d_font or d
d_font = (d_font == 'l' and 0) or (d_font == 'nsm' and 0) or (d_font == 'r' and 1) or (d_font == 'al' and 2) or (d_font == 'an' and 2) or nil
if d_font and fontmap and fontmap[d_font][item_r.font] then
    item_r.font = fontmap[d_font][item_r.font]
end

if new_d then
    table.insert(nodes, {nil, (outer == 'l') and 'l' or 'r', nil})
if inmath then
    attr_d = 0
else
    attr_d = node.get_attribute(item, ATDIR)
    attr_d = attr_d % 3
end
if attr_d == 1 then
    outer_first = 'r'
    last = 'r'
else if attr_d == 2 then
    outer_first = 'r'
    last = 'al'
else
    outer_first = 'l'
    last = 'l'
end
outer = last
has_en = false
first_et = nil
new_d = false
end
if glue_d then
    if (d == 'l' and 'l' or 'r') ~= glue_d then
        table.insert(nodes, {glue_i, 'on', nil})
    end
    glue_d = nil
    glue_i = nil
end
elseif item.id == DIR then
    d = nil
    if head ~= item then new_d = true end
elseif item.id == node.id'glue' and item.subtype == 13 then
    glue_d = d
    glue_i = item
    d = nil
elseif item.id == node.id'math' then
inmath = (item.subtype == 0)

else
d = nil
dend

-- AL <= EN/ET/ES -- W2 + W3 + W6
if last == 'al' and d == 'en' then
d = 'an' -- W3
elseif last == 'al' and (d == 'et' or d == 'es') then
d = 'on' -- W6
end

-- EN + CS/ES + EN -- W4
if d == 'en' and #nodes >= 2 then
if (nodes[#nodes][2] == 'es' or nodes[#nodes][2] == 'cs')
and nodes[#nodes-1][2] == 'en' then
nodes[#nodes][2] = 'en'
end
end

-- AN + CS + AN -- W4 too, because uax9 mixes both cases
if d == 'an' and #nodes >= 2 then
if (nodes[#nodes][2] == 'cs')
and nodes[#nodes-1][2] == 'an' then
nodes[#nodes][2] = 'an'
end
end

-- ET/EN -- W5 + W7->l / W6->on
if d == 'et' then
first_et = first_et or (#nodes + 1)
elseif d == 'en' then
has_en = true
first_et = first_et or (#nodes + 1)
elseif first_et then -- d may be nil here!
if has_en then
if last == 'l' then
temp = 'l' -- W7
else
  temp = 'en' -- W5
end
else
  temp = 'on' -- W6
end
for e = first_et, #nodes do
if nodes[e][1].id == GLYPH then nodes[e][2] = temp end
first_et = nil
has_en = false
end

-- Force mathdir in math if ON (currently works as expected only
-- with 'l')
if inmath and d == 'on' then
d = ('TRT' == tex.mathdir) and 'r' or 'l'
end

if d then
if d == 'al' then
d = 'r'
last = 'al'
elseif d == 'l' or d == 'r' then

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last = d
end
prev_d = d

table.insert(nodes, {item, d, outer_first})
end

outer_first = nil

end

-- TODO -- repeated here in case EN/ET is the last node. Find a
-- better way of doing things:
if first_et then -- dir may be nil here!
if has_en then
if last == 'l' then
  temp = 'l' -- W7
else
  temp = 'en' -- W5
end
else
  temp = 'on' -- W6
end
for e = first_et, #nodes do
  if nodes[e][1].id == GLYPH then nodes[e][2] = temp end
end
end

-- dummy node, to close things
table.insert(nodes, {nil, (outer == 'l') and 'l' or 'r', nil})

----------------- NEUTRAL -----------------

outer = save_outer
last = outer

local first_on = nil

for q = 1, #nodes do
  local item
  local outer_first = nodes[q][3]
  outer = outer_first or outer
  last = outer_first or last

  local d = nodes[q][2]
  if d == 'an' or d == 'en' then d = 'r' end
  if d == 'cs' or d == 'et' or d == 'es' then d = 'on' end --- W6
  if d == 'on' then
    first_on = first_on or q
  elseif first_on then
    if last == d then
      temp = d
    else
      temp = outer
    end
    for r = first_on, q - 1 do
      nodes[r][2] = temp
      item = nodes[r][1] -- MIRRORING
      if Babel.mirroring_enabled and item.id == GLYPH
        and temp == 'r' and characters[item.char] then
        local font_mode = ''
        if font.fonts[item.font].properties then
font_mode = font.fonts[item.font].properties.mode
end
if font_mode ~= 'harf' and font_mode ~= 'plug' then
  item.char = characters[item.char].m or item.char
end
end
end

if d == 'r' or d == 'l' then last = d end
end
-------------- IMPLICIT, REORDER ----------------
  outer = save_outer
  last = outer
  local state = {}
  state.has_r = false
  for q = 1, #nodes do
    local item = nodes[q][1]
    outer = nodes[q][3] or outer
    local d = nodes[q][2]
    if d == 'nsm' then d = last end -- W1
    if d == 'en' then d = 'an' end
    local isdir = (d == 'r' or d == 'l')
    if outer == 'l' and d == 'an' then
      state.san = state.san or item
      state.ean = item
    elseif state.san then
      head, state = insert_numeric(head, state)
    end
    if outer == 'l' then
      if d == 'an' or d == 'r' then -- im -> implicit
        if d == 'r' then state.has_r = true end
        state.sim = state.sim or item
        state.eim = item
      elseif d == 'l' and state.sim and state.has_r then
        head, state = insert_implicit(head, state, outer)
      elseif d == 'l' then
        state.sim, state.eim, state.has_r = nil, nil, false
      end
    else
      if d == 'an' or d == 'l' then
        if nodes[q][3] then -- nil except after an explicit dir
          state.sim = item -- so we move sim 'inside' the group
        else
          state.sim = state.sim or item
        end
        state.eim = item
      elseif d == 'r' and state.sim then
        head, state = insert_implicit(head, state, outer)
      elseif d == 'r' then
        state.sim, state.eim = nil, nil
      end
    end
end
if isdir then
  last = d -- Don't search back - best save now
elseif d == 'on' and state.san then
  state.san = state.san or item
  state.ean = item
end
end
return node.prev(head) or head
end

13 Data for CJK

It is a boring file and it is not shown here (see the generated file), but here is a sample:

```
[0x0021]={c='ex'},
[0x0024]={c='pr'},
[0x0025]={c='po'},
[0x0028]={c='op'},
[0x0029]={c='cp'},
[0x002B]={c='pr'},
```

For the meaning of these codes, see the Unicode standard.

14 The ‘nil’ language

This 'language' does nothing, except setting the hyphenation patterns to nohyphenation. For this language currently no special definitions are needed or available. The macro \LdfInit takes care of preventing that this file is loaded more than once, checking the category code of the @ sign, etc.

\ProvidesLanguage{nil}{{\langle date}\{\langle version}\rangle} Nil language\LdfInit{nil}{datenil}

When this file is read as an option, i.e. by the \usepackage command, nil could be an ‘unknown’ language in which case we have to make it known.

\ifx\l@nil\@undefined
  \newlanguage\l@nil
  \@namedef{bbl@hyphendata@\the\l@nil}{{}\{}}% Remove warning
  \let\bbl@elt\relax
  \edef\bbl@languages{% Add it to the list of languages
    \bbl@languages\bbl@elt{nil}{\the\l@nil}\{\{}}
  }
\fi

This macro is used to store the values of the hyphenation parameters \lefthyphenmin and \righthyphenmin.

\providehyphenmins{{\CurrentOption}\{\{one\{one}

The next step consists of defining commands to switch to (and from) the ‘nil’ language.

\captionnil \datenil
\let\captionsnil\@empty
\let\datenil\@empty

There is no locale file for this pseudo-language, so the corresponding fields are defined here.

\def\bbl@inidata@nil{%
  \bbl@elt{identification}{tag.ini}{und}%
`
The macro \ldf@finish takes care of looking for a configuration file, setting the main language to be
switched on at \begin{document} and resetting the category code of @ to its original value.

\section{15 Calendars}

The code for specific calendars are placed in the specific files, loaded when requested by an ini file
in the identification section with require.calendars.

Start with function to compute the Julian day. It's based on the little library calendar.js, by John
Walker, in the public domain.

\begin{Verbatim}
\def\bbl@fpmod#1#2{(#1-#2*floor(#1/#2))}
\def\bbl@cs@gregleap#1{\((\bbl@fpmod{#1}{4} == 0) && (!((\bbl@fpmod{#1}{100} == 0) && (\bbl@fpmod{#1}{400} != 0)))\)}
\def\bbl@cs@jd#1#2#3{% year, month, day\fp_eval:n{ 1721424.5 + (365 * (#1 - 1)) + floor((#1 - 1) / 4) + (-floor((#1 - 1) / 100)) + floor((#1 - 1) / 400) + floor(((367 * #2) - 362) / 12) + ((#2 <= 2) ? 0 : (\bbl@cs@gregleap(#1) ? -1 : -2)) + #3}}
\end{Verbatim}

The Civil calendar.

\begin{Verbatim}
\ExplSyntaxOn
\def\bbl@ca@islamic#1-#2-#3\@@#4#5#6{}
\ExplSyntaxOff
\end{Verbatim}

The Civil calendar.
\[(#1 - 1) \times 354 + \text{floor}((3 + (11 \times #1)) / 30) + 1948439.5) - 1\) \}

\[\@namedef{bbl@ca@islamic-civil++}\{bbl@ca@islamicvl@x{+2}\}
\[\@namedef{bbl@ca@islamic-civil+}\{bbl@ca@islamicvl@x{+1}\}
\[\@namedef{bbl@ca@islamic-civil}\{bbl@ca@islamicvl@x{}\}
\[\@namedef{bbl@ca@islamic-civil-}\{bbl@ca@islamicvl@x{-1}\}
\[\@namedef{bbl@ca@islamic-civil--}\{bbl@ca@islamicvl@x{-2}\}
\[\def\bbl@ca@islamicvl@x#1#2-#3-#4\@@#5#6#7\{}\%
\[\edef\bbl@tempa{\fp_eval:n{\text{floor}((\bbl@cs@jd{#2}{#3}{#4})+0.5 #1}}\%
\[\edef#5{\fp_eval:n{\text{floor}(((30*(\bbl@tempa-1948439.5)) + 10646)/10631) }}%
\[\edef#6{\fp_eval:n{\min(12,\text{ceil}((\bbl@tempa-(29+\bbl@cs@isltojd{#5}{1}{1}))/29.5)+1) }}%
\[\edef#7{\fp_eval:n{\bbl@tempa - \bbl@cs@isltojd{#5}{#6}{1} + 1}}\%

The Umm al-Qura calendar, used mainly in Saudi Arabia, is based on moment-hijri, by Abdullah Alsigar (license MIT).

Since the main aim is to provide a suitable \today, and maybe some close dates, data just covers Hijri ∼1435/∼1460 (Gregorian ∼2014/∼2038).

```latex
\def\bbl@cs@umalqura@data{56660, 56690, 56719, 56749, 56778, 56808,\%
56837, 56867, 56897, 56926, 56956, 56985, 57015, 57044, 57074, 57103,\%
57133, 57162, 57192, 57221, 57251, 57280, 57310, 57340, 57369, 57399,\%
57429, 57458, 57487, 57517, 57546, 57576, 57605, 57634, 57664, 57694,\%
57723, 57753, 57783, 57813, 57842, 57871, 57901, 57930, 57959, 57989,\%
58018, 58048, 58077, 58107, 58137, 58167, 58196, 58226, 58255, 58285,\%
58314, 58343, 58373, 58402, 58432, 58461, 58491, 58521, 58551, 58580,\%
58610, 58639, 58669, 58698, 58727, 58757, 58786, 58816, 58845, 58875,\%
58905, 58934, 58964, 58994, 59023, 59053, 59082, 59111, 59141, 59170,\%
59200, 59229, 59259, 59288, 59318, 59347, 59377, 59407, 59436, 59466,\%
59495, 59525, 59554, 59584, 59613, 59643, 59672, 59702, 59731, 59761,\%
59791, 59820, 59850, 59879, 59909, 59939, 59968, 59997, 60027, 60056,\%
60086, 60115, 60145, 60174, 60204, 60234, 60264, 60293, 60323, 60352,\%
60381, 60411, 60440, 60469, 60499, 60528, 60558, 60588, 60618, 60648,\%
60677, 60707, 60736, 60765, 60795, 60824, 60853, 60883, 60912, 60942,\%
60972, 61002, 61031, 61061, 61090, 61120, 61149, 61179, 61208, 61237,\%
61267, 61296, 61326, 61356, 61385, 61415, 61445, 61474, 61504, 61533,\%
61563, 61592, 61621, 61651, 61680, 61710, 61739, 61769, 61799, 61828,\%
61858, 61888, 61917, 61947, 61976, 62006, 62035, 62064, 62094, 62123,\%
62153, 62182, 62212, 62242, 62271, 62301, 62331, 62360, 62390, 62419,\%
62448, 62478, 62507, 62537, 62566, 62596, 62625, 62655, 62685, 62715,\%
62744, 62774, 62803, 62832, 62862, 62891, 62921, 62950, 62980, 63009,\%
63039, 63069, 63099, 63128, 63157, 63187, 63216, 63246, 63275, 63305,\%
63334, 63363, 63393, 63423, 63453, 63482, 63512, 63541, 63571, 63600,\%
63630, 63659, 63689, 63718, 63747, 63777, 63807, 63836, 63866, 63895,\%
63925, 63955, 63984, 64014, 64043, 64073, 64102, 64131, 64161, 64190,\%
64220, 64249, 64279, 64300, 64330, 64360, 64390, 64420, 64457, 64486,\%
64451, 64484, 64514, 64543, 64573, 64600, 64630, 64657, 64682, 64712,\%
64742, 64782, 64811, 64841, 64870, 64899, 64929, 64958, 64987, 65017,\%
65047, 65076, 65106, 65136, 65166, 65195, 65225, 65254, 65283, 65313,\%
65342, 65371, 65401, 65431, 65460, 65490, 65520)}\%
\@namedef{bbl@ca@islamic-umalqura++}\{bbl@ca@islamicuml@r{+2}\}
\@namedef{bbl@ca@islamic-umalqura+}\{bbl@ca@islamicuml@r{+1}\}
\@namedef{bbl@ca@islamic-umalqura}\{bbl@ca@islamicuml@r{}\}
\@namedef{bbl@ca@islamic-umalqura-}\{bbl@ca@islamicuml@r{-1}\}
\@namedef{bbl@ca@islamic-umalqura--}\{bbl@ca@islamicuml@r{-2}\}
```
16 Hebrew

This is basically the set of macros written by Michail Rozman in 1991, with corrections and adaptations by Rama Porrat, Misha, Dan Haran and Boris Lavva. This must be eventually replaced by computations with l3fp. An explanation of what's going on can be found in hebcal.sty.

\newcount\bbl@cntcommon
\def\bbl@remainder#1#2#3{#3=#1\relax \divide #3 by #2\relax \multiply #3 by -#2\relax \advance #3 by #1\relax}
\newif\ifbbl@divisible
\def\bbl@checkifdivisible#1#2#3{\countdef\tmp=0 \bbl@remainder{#1}{#2}{\tmp} \ifnum \tmp=0 \global\bbl@divisibleture \else \global\bbl@divisiblefalse \fi}
\newif\ifbbl@gregleap
\def\bbl@ifgregleap#1#2#3{\bbl@checkifdivisible{#1}{4}{} \ifnum \tmp=0 \global\bbl@divisibleture \else \global\bbl@divisiblefalse \fi}
\def\bbl@gregdayspriormonths#1#2#3{\bbl@checkifdivisible{#1}{4}{4}\ifbbl@divisible \bbl@checkifdivisible{#1}{100}{4}\ifbbl@divisible \bbl@checkifdivisible{#1}{400}{4}\ifbbl@divisible \bbl@gregleaptrue \else \bbl@gregleapfalse \fi \else \fi \fi \fi \fi \fi \fi \fi \fi \fi

16 Hebrew

This is basically the set of macros written by Michail Rozman in 1991, with corrections and adaptations by Rama Porrat, Misha, Dan Haran and Boris Lavva. This must be eventually replaced by computations with l3fp. An explanation of what's going on can be found in hebcal.sty.
\ifnum #1 > 2
  \advance #3 by 1
\fi
\global\bbl@cntcommon=#3}
#3=\bbl@cntcommon}
\def\bbl@gregdaysprioryears#1#2{%
{\countdef\tmpc=4
\countdef\tmpb=2
\tmpb=#1\relax
\advance \tmpb by -1
\tmpc=\tmpb
\multiply \tmpc by 365
#2=\tmpc
\tmpc=\tmpb
\divide \tmpc by 4
\advance \#2 by \tmpc
\tmpc=\tmpb
\divide \tmpc by 100
\advance #2 by -\tmpc
\tmpc=\tmpb
\divide \tmpc by 400
\global\bbl@cntcommon=#2\relax}%
#2=\bbl@cntcommon}
\def\bbl@absfromgreg#1#2#3#4{%
{\countdef\tmpd=0
#4=#1\relax
\bbl@gregdayspriormonths#2#3\tmpd}%
\advance \#4 by \tmpd
\bbl@gregdaysprioryears#3\tmpd%
\advance \#4 by \tmpd
\global\bbl@cntcommon=#4\relax}%
#4=\bbl@cntcommon}
\newif\ifbbl@hebrleap
\def\bbl@checkleaphebryear#1{%
{\countdef\tmpa=0
\countdef\tmpb=1
\countdef\tmpc=2
\tmpa=#1\relax
\multiply \tmpa by 7
\tmpa=\tmpa+1
\bbl@remainder{\tmpa}{19}{\tmpb)%
\tmpc=\tmpb
\multiply \tmpb by 12
\advance \tmpb by \tmpc
\multiply \tmpc by 7
\tmpc=\tmpc+1
\divide \tmpc by 19
\global\bbl@hebrleaptrue
\else
\global\bbl@hebrleapfalse
\fi})
\def\bbl@hebrelapsedmonths#1#2{%
{\countdef\tmpa=0
\countdef\tmpb=1
\countdef\tmpc=2
\tmpa=#1\relax
\multiply \tmpa by 7
\tmpa=\tmpa+1
\advance \tmpa by -1
#2=\tmpa
\divide \#2 by 19
\multiply \#2 by 235
\bbl@remainder{\#2}{19}{\tmpb)% \tmpb=years%19-years this cycle
\tmpc=\tmpb
\multiply \tmpb by 12
\advance \#2 by \tmpb
\multiply \tmpb by 7
\advance \tmpb by \tmpc
\divide \tmpb by 19
\advance \#2 by \tmpc
\global \bbl@cntcommon=\#2}
\def \bbl@hebrelapseddays{\#1\#2}{
\countdef \tmpa=0
\countdef \tmpb=1
\countdef \tmpc=2
\bbl@hebrelapsedmonths{\#1}\{\#2}
\tmpa=\#2
\multiply \tmpa by 13753
\advance \tmpa by 5604
\bbl@remainder{\tmpa}{25920}\{\tmpc}\tmpc == ConjunctionParts
\divide \tmpa by 25920
\multiply \#2 by 29
\advance \#2 by 1
\advance \#2 by \tmpa
\bbl@remainder{\#2}{7}\{\tmpa}
\ifnum \tmpc < 19440
\ifnum \tmpc < 9924
\else
\ifnum \tmpa=2
\bbl@checkleaphebryear{\#1}\% of a common year
\ifbbl@hebrleap
\else
\advance \#2 by 1
\fi
\fi
\ifnum \tmpc < 16789
\else
\ifnum \tmpa=1
\advance \#1 by -1
\bbl@checkleaphebryear{\#1}\% at the end of leap year
\ifbbl@hebrleap
\advance \#2 by 1
\fi
\fi
\fi
\else
\advance \#2 by 1
\fi
\fi
\else
\advance \#2 by 1
\fi
\bbl@remainder{\#2}{7}\{\tmpa}
\ifnum \tmpa=0
\advance \#2 by 1
\else
\ifnum \tmpa=3
\advance \#2 by 1
\else
\ifnum \tmpa=5
\advance \#2 by 1
\fi
\fi
\fi
\global \bbl@cntcommon=\#2}
\def \bbl@daysinhebryear{\#1\#2}{
\countdef \tmpe=12
\bbl@hebrelapseddays{\#1}\{\tmpe}
\advance \#1 by 1
\bbl@hebrelapseddays{\#1}\{\#2}
\advance \#2 by -\tmpe
\global \bbl@cntcommon=\#2}
17 Persian

There is an algorithm written in TeX by Jabri, Abolhassani, Pournader and Esfahbod, created for the first versions of the FarsiTeX system (no longer available), but the original license is GPL, so its use with LPPL is problematic. The code here follows loosely that by John Walker, which is free and accurate, but sadly very complex, so the relevant data for the years 2013-2050 have been pre-calculated and stored. Actually, all we need is the first day (either March 20 or March 21).
18 Coptic and Ethiopic

Adapted from jquery.calendars.package-1.1.4, written by Keith Wood, 2010. Dual license: GPL and MIT. The only difference is the epoch.

\ExplSyntaxOn
\def\bbl@ca@coptic#1-#2-#3\@@#4#5#6{% 
  \edef\bbl@tempd{\fp_eval:n{floor(\bbl@cs@jd{#1}{#2}{#3}) + 0.5}}% 
  \edef\bbl@tempc{\fp_eval:n{\bbl@tempd - 1825029.5}}% 
  \edef#4{\fp_eval:n{floor((\bbl@tempc - floor((\bbl@tempc+366) / 1461)) / 365) + 1}}% 
  \edef\bbl@tempc{\fp_eval:n{\bbl@tempd - (#4-1) * 365 - floor(#4/4) - 1825029.5}}% 
  \edef#5{\fp_eval:n{floor(\bbl@tempc / 30) + 1}}% 
  \edef#6{\fp_eval:n{\bbl@tempc - (#5 - 1) * 30 + 1}}% 
\ExplSyntaxOff

\ExplSyntaxOn
\def\bbl@ca@ethiopic#1-#2-#3\@@#4#5#6{% 
  \edef\bbl@tempd{\fp_eval:n{floor(\bbl@cs@jd{#1}{#2}{#3}) + 0.5}}% 
  \edef\bbl@tempc{\fp_eval:n{\bbl@tempd - 1724220.5}}% 
  \edef#4{\fp_eval:n{floor((\bbl@tempc - floor((\bbl@tempc+366) / 1461)) / 365) + 1}}% 
  \edef\bbl@tempc{\fp_eval:n{\bbl@tempd - (#4-1) * 365 - floor(#4/4) - 1724220.5}}% 
  \edef#5{\fp_eval:n{floor(\bbl@tempc / 30) + 1}}% 
  \edef#6{\fp_eval:n{\bbl@tempc - (#5 - 1) * 30 + 1}}% 
\ExplSyntaxOff

That's very simple.

\def\bbl@ca@buddhist#1-#2-#3\@@#4#5#6{% 
  \edef#4{\number\numexpr#1+543\relax}% 
  \edef#5{#2}% 
  \edef#6{#3}% 
\ExplSyntaxOn

20 Support for Plain \TeX (plain.def)

20.1 Not renaming hyphen.tex

As Don Knuth has declared that the filename hyphen.tex may only be used to designate his version of the American English hyphenation patterns, a new solution has to be found in order to be able to load hyphenation patterns for other languages in a plain-based \TeX-format. When asked he responded:

That file name is “sacred”, and if anybody changes it they will cause severe upward/downward compatibility headaches.

People can have a file locallyhyphen.tex or whatever they like, but they mustn't diddle with hyphen.tex (or plain.tex except to preload additional fonts).

The files bplain.tex and blplain.tex can be used as replacement wrappers around plain.tex and lplain.tex to achieve the desired effect, based on the babel package. If you load each of them with
\texttt{\LaTeX}, you will get a file called either \texttt{bplain.fmt} or \texttt{blplain.fmt}, which you can use as replacements for \texttt{plain.fmt} and \texttt{lplain.fmt}. As these files are going to be read as the first thing \texttt{\LaTeX} sees, we need to set some category codes just to be able to change the definition of \texttt{\input}.

7799 ⟨\texttt{bplain | blplain}⟩
7800 \texttt{\catcode`\{=1 % left brace is begin-group character}
7801 \texttt{\catcode`\}=2 % right brace is end-group character
7802 \texttt{\catcode`\#=6 % hash mark is macro parameter character}

If a file called \texttt{hyphen.cfg} can be found, we make sure that it will be read instead of the file \texttt{hyphen.tex}. We do this by first saving the original meaning of \texttt{\input} (and I use a one letter control sequence for that so as not to waste multi-letter control sequence on this in the format).

7803 \texttt{\openin 0 hyphen.cfg}
7804 \texttt{\ifeof0}
7805 \texttt{\else}
7806 \texttt{\let\a\input}

Then \texttt{\input} is defined to forget about its argument and load \texttt{hyphen.cfg} instead. Once that's done the original meaning of \texttt{\input} can be restored and the definition of \texttt{\a} can be forgotten.

7807 \texttt{\def\input #1 {}}
7808 \texttt{\let\input\a}
7809 \texttt{\a hyphen.cfg}
7810 \texttt{\let\a\undefined}
7811 ⟩
7812 \texttt{\fi}
7813 ⟨\texttt{bplain | blplain}⟩

Now that we have made sure that \texttt{hyphen.cfg} will be loaded at the right moment it is time to load \texttt{plain.tex}.

7814 ⟨\texttt{bplain}\⟩\texttt{a plain.tex}
7815 ⟨\texttt{blplain}\⟩\texttt{a lplain.tex}

Finally we change the contents of \texttt{\fmtname} to indicate that this is not the plain format, but a format based on plain with the babel package preloaded.

7816 ⟨\texttt{bplain}\⟩\texttt{def\fmtname(babel-plain)}
7817 ⟨\texttt{blplain}\⟩\texttt{def\fmtname(babel-lplain)}

When you are using a different format, based on plain.tex you can make a copy of blplain.tex, rename it and replace \texttt{plain.tex} with the name of your format file.

20.2 Emulating some \LaTeX features

The file \texttt{babel.def} expects some definitions made in the \LaTeX\texttt{2e} style file. So, in Plain we must provide at least some predefined values as well some tools to set them (even if not all options are available). There are no package options, and therefore and alternative mechanism is provided. For the moment, only \texttt{\balsoptionstrings} and \texttt{\balsoptionmath} are provided, which can be defined before loading babel. \texttt{\BabelModifiers} can be set too (but not sure it works).

7818 ⟨\texttt{+/Emulate \LaTeX}⟩
7819 \texttt{\def\@empty{}}
7820 \texttt{\def\loadlocalcfg#1{}}
7821 \texttt{\openin0#1.cfg}
7822 \texttt{\ifeof0}
7823 \texttt{\closein0}
7824 \texttt{\else}
7825 \texttt{\closein0}
7826 \texttt{\immediate\write16{\% Local config file #1.cfg used}}
7827 \texttt{\immediate\write16{\%}}
7828 \texttt{\immediate\write16{\}}
7829 \texttt{\fi}
7830 \texttt{\input #1.cfg\relax}
7831 \texttt{\fi}
7832 \texttt{@endofldf}⟩
20.3 General tools

A number of \LaTeX macro's that are needed later on.

\begin{verbatim}
\long\def\@firstofone#1{#1}
\long\def\@firstoftwo#1#2{#1}
\long\def\@secondoftwo#1#2{#2}
\def\@nnil{\@nil}
\def\@gobbletwo#1#2{ }
\def\@ifstar#1{\@ifnextchar *{\@firstoftwo{#1}}}
\def\@star@or@long#1{\@ifstar{\let\l@ngrel@x\relax#1}{\let\l@ngrel@x\long#1}}
\let\l@ngrel@x\relax
\def\@car#1#2\@nil{#1}
\def\@cdr#1#2\@nil{#2}
\let\@typeset@protect\relax
\let\protected@edef\edef
\long\def\@gobble#1{ }
\edef\@backslashchar{\expandafter\@gobble\string\\}
\def\strip@prefix#1>{ }
\g@addto@macro#1#2{{% 	oks@\expandafter{#1#2}% \xdef#1{\the	oks@}}}
\def\@namedef#1{\expandafter\def\csname #1\endcsname}
\def\@nameuse#1{\csname #1\endcsname}
\def\@ifundefined#1{\expandafter\ifx\csname#1\endcsname\relax \@firstoftwo\else \@secondoftwo\fi}
\def\@expandtwoargs#1#2#3{% \edef\reserved@a{\noexpand#1{#2}{#3}}\reserved@a}
\def\zap@space#1 #2{#1\ifx#2\@empty\else\zap@space\fi #2}
\def\bbl@trace\@gobble
\def\bbl@error#1#2{\begingroup\newlinechar=`\^^J\def\\{\^^J(babel) }\errhelp{#2}\errmessage{\#1}\endgroup}
\def\bbl@warning#1{\begingroup\newlinechar=`\^^J\def\\{\^^J}\message{\#1}\endgroup}
\let\bbl@infowarn\bbl@warning
\def\bbl@info#1{\begingroup\newlinechar=`\^^J\wlog{#1}\endgroup}
\ifx\@preamblecmds\@undefined \def\@preamblecmds{} \fi
\end{verbatim}

\LaTeX has the command \texttt{\onlypreamble} which adds commands to a list of commands that are no longer needed after \texttt{\begin{document}}.
Mimicking \LaTeX{}'s \texttt{AtBeginDocument}; for this to work the user needs to add \texttt{\begindocument} to his file.

We also have to mimick \LaTeX{}'s \texttt{AtEndOfPackage}. Our replacement macro is much simpler; it stores its argument in \texttt{\@endofldf}.

\LaTeX{} needs to be able to switch off writing to its auxiliary files; plain doesn't have them by default. There is a trick to hide some conditional commands from the outer \texttt{\ifx}. The same trick is applied below.

Mimicking \LaTeX{}'s commands to define control sequences.
The following little macro \in@ is taken from latex.ltx; it checks whether its first argument is part of its second argument. It uses the boolean \in@; allocating a new boolean inside conditionally executed code is not possible, hence the construct with the temporary definition of \bbl@tempa.

\def\bbl@tempa{\csname newif\endcsname&ifin@}
\catcode`&=4
\ifx\in@\@undefined
  \def\in@#1#2#3\in@{% 
    \noexpand\protect
    \noexpand#1
    \noexpand\protect
    \noexpand\expandafter\noexpand\csname
    \expandafter\@gobble\string#1 \endsname
  }
\else
  \let\bbl@tempa\@empty
\fi

\catcode`\&=12 % Trick to hide conditionals
\def\@protect#1&fi#2#3{&fi\protect#1}

The \LaTeX macro \@ifl@aded checks whether a file was loaded. This functionality is not needed for plain \TeX but we need the macro to be defined as a no-op.

\def\@ifl@aded#1#2#3#4{}
For the following code we need to make sure that the commands `{\newcommand` and `{\providecommand` exist with some sensible definition. They are not fully equivalent to their `{\LaTeX2e` versions; just enough to make things work in plain `{\TeX} environments.

```
\ifx\@tempcnta\@undefined
  \csname newcount\endcsname\@tempcnta\relax
\fi
\ifx\@tempcntb\@undefined
  \csname newcount\endcsname\@tempcntb\relax
\fi
```

To prevent wasting two counters in `{\LaTeX} (because counters with the same name are allocated later by it) we reset the counter that holds the next free counter (`\count10`).

```
\ifx\bye\@undefined
  \advance\count10 by -2\relax
\fi
\ifx@ifnextchar\@undefined
  \def\@ifnextchar#1#2#3{%
    \let\reserved@d=#1%
    \def\reserved@a{#2}\def\reserved@b{#3}%
    \futurelet\@let@token\@ifnch}
  \def\@ifnch{%
    \ifx\@let@token\@sptoken
      \let\reserved@c\@xifnch
    \else
      \ifx\@let@token\reserved@d
        \let\reserved@c\reserved@a
      \else
        \let\reserved@c\reserved@b
      \fi
    \fi
    \reserved@c}
  \def\:{\let\@sptoken= }\expandafter\def:\{uturelet\@let@token\@ifnch}
\fi
\def\@testopt#1#2{%
  \@ifnextchar\[{#1}{#1[#2]}}
\def\@protected@testopt#1{%
  \ifx\protect\@typeset@protect
    \expandafter\@testopt
  \else
    \@x@protect#1%
  \fi}
\long\def\@whilenum#1\do #2{\ifnum #1\relax #2\relax\@iwhilenum{#1\relax #2\relax}\fi}
\long\def\@iwhilenum#1{\ifnum #1\expandafter\@iwhilenum
  \else\expandafter\@gobble\fi{#1}}
```

## 20.4 Encoding related macros

Code from `ltoutenc.dtx`, adapted for use in the plain `{\TeX} environment.

```
\def\DeclareTextCommand{%
  \@dec@text@cmd\providecommand}
\def\ProvideTextCommand{%
  \@dec@text@cmd\providecommand}
\def\DeclareTextSymbol#1#2#3{%
  \@dec@text@cmd\chardef#1{#2}#3\relax}
\def\@dec@text@cmd#1#2#3{%
  \expandafter\def\expandafter#2%}
```

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\csname#3-cmd\expandafter\endcsname
\expandafter#2%
\csname#3\string#2\endcsname
}%
\let\@ifdefinable\@rc@ifdefinable
\expandafter#1\csname#3\string#2\endcsname
}%
\def\@current@cmd#1{%
\ifx\protect\@typeset@protect\else
\noexpand#1\expandafter\@gobble
\fi
}
\def\@changed@cmd#1#2{%
\ifx\protect\@typeset@protect
\expandafter\ifx\csname\cf@encoding\string#1\endcsname\relax
\expandafter\ifx\csname ?\string#1\endcsname\relax
\expandafter\def\csname ?\string#1\endcsname{%
\@changed@x@err{#1}%
\fi
\global\expandafter\let\csname\cf@encoding\string#1\endcsname
\csname ?\string#1\endcsname
\else
\noexpand#1%
\fi
}
\def\@changed@x@err#1{%
\errhelp{Your command will be ignored, type <return> to proceed}%
\errmessage{Command \protect#1 undefined in encoding \cf@encoding}%
}
\def\DeclareTextCommandDefault#1{%
\DeclareTextCommand#1?%
}
\def\ProvideTextCommandDefault#1{%
\ProvideTextCommand#1?%
}
\expandafter\let\csname OT1-cmd\endcsname\@current@cmd
\expandafter\let\csname?-cmd\endcsname\@changed@cmd
\def\DeclareTextAccent#1#2#3{%
\DeclareTextCommand#1{#2}[1]{\accent#3 ##1}
}
\def\DeclareTextCompositeCommand#1#2#3#4{%
\expandafter\let\expandafter\reserved@a\csname#2\string#1\endcsname
\edef\reserved@b{\string##1}%
\edef\reserved@c{%
\expandafter\@strip@args\meaning\reserved@a:-\@strip@args}%
\ifx\reserved@b\reserved@c
\expandafter\expandafter\expandafter\ifx
\expandafter\@car\reserved@a\relax\relax\@nil
@text@composite
\else
\edef\reserved@b##1{%
\def\expandafter\noexpand\csname#2\string#1\endcsname####1{%
\noexpand@text@composite
\expandafter\noexpand\csname#2\string#1\endcsname
####1\noexpand\@empty\noexpand@text@composite
}{##1}%
}%
}}%
Currently we only use the \text{x2e} method for accents for those that are known to be made active in some language definition file.

The following control sequences are used in babel.def but are not defined for plain \TeX.

For a couple of languages we need the \text{x-control sequence \scriptsize to be available. Because plain \TeX doesn't have such a sophisticated font mechanism as \text{x has, we just \let it to \sevenrm.
And a few more “dummy” definitions.

\def\languagename{english}\
\let\bbl@opt@shorthands@nnil
\def\bbl@ifshorthand#1#2#3{#2}\
\let\bbl@language@opts@empty
\ifx\babeloptionstrings@undefined
\let\bbl@opt@strings@nnil
\else
\let\bbl@opt@strings\babeloptionstrings
\fi
\def\BabelStringsDefault{generic}
\def\bbl@tempa{normal}
\ifx\babeloptionmath\bbl@tempa
\def\bbl@mathnormal{\noexpand\textormath}
\fi
\def\AfterBabelLanguage#1#2{}
\ifx\BabelModifiers@undefined\let\BabelModifiers\relax\fi
\let\bbl@afterlang\relax
\def\bbl@opt@safe{BR}
\ifx\@uclclist@undefined\let\@uclclist\@empty\fi
\ifx\bbl@trace@undefined\def\bbl@trace#1{\relax}\fi
\expandafter\newif\csname ifbbl@single\endcsname
\chardef\bbl@bidimode\z@

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A proxy file:

\input babel.def

References