MuLan-String library manual

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October 9, 2020

Contents

1 Introduction

MuLan-String (or MultiLanguage String) is an internationalization and localization library made to aid translators whose native language nature forbids simple strings substitution eg. because it uses case system. The other goal of MuLan-String is to make working with such languages simple for programmers writing programs with i18n in mind.

The general idea of using MuLan-String is based on *template strings*. The program using the library uses them for building strings from elements. The translators formulate template strings which can include rules of how to generate text based on language's case system, genders or pluralization rules.

This manual shows how to use MuLan-String from the view point of programmer and translator. One can read only the part made for one point of view and skip the other.

2 The programmer's POV

MuLan-String was made to be easy to use in source code in different projects. Its main parts are the template system and the backend. Both parts are made with customization in mind. To use the library one have to "install" it in a project. This is done by making 2 files:

A *.hpp file is meant to be included into every module which needs to be internationalized. It contains some `#define`-s and `#include<mulanstring/main.hpp>`.

A *.cpp file build once for the project. It also contains `#define`-s and at the end `#include`-s the `mulanstring/main.cpp` file. The purpose of this file is to add the implementation part of the MuLan-String library into the project.

2.1 The `mulanstr.hpp` file

In this file we decide which of backends we want to use[1]:

```
//to use GNU Gettext backend
#define MULANSTR_USE_GETTEXT
```

The other option is to tell the library if we want to use 4 helper functions which all start with an underscore. These are meant to speed up writing programs. They are short name replacements for functions retrieving template strings from the backend. If one doesn't want them he has to write:

```
#define MULANSTR_DONT_USE_UNDERSCORE
```

These functions (and their replacements) are:

1. `_(message)` or `mls::translate(message)`: the basic template retriever. Gets template in the default language set during initialization.
2. `_c(catalog, message)` or `mls::translate(catalog, message)`: Gets template from a different catalog. The term 'catalog' can mean different things for different backends. In the GNU Gettext it is the name of '`.mo`' file.
3. `_l(message, locale)` or `mls::translateWithLocale(message, locale)`: Gets template in the language given as the second parameter.
4. `_cl(catalog, message, locale)` or `mls::translateWithLocale(catalog, message, locale)`: like 2. but allows to choose a different language.

And at the end of our header file we include the MuLan-String main header file:

```
#include <mulanstring/main.hpp>
```

Now, in every source file in our project that needs to use MuLan-String's elements, we include our file:

```
#include "mulanstr.hpp"
```

[1] for now (version 1.0) MuLan-String offers only GNU Gettext backend

2.2 The `mulanstr.cpp` file

This file properly installs MuLan-String into our project. Just like in the previous subsection, it does by `#define`-ing macros, which affect the library's `main.cpp` file.

Again we first have to decide which backend to use:

```
//to use GNU Gettext backend
#define MULANSTR_USE_GETTEXT
```

Then we can make a decision on what delimiters we use in template strings. By default in MuLan-String templates are made using `%{` and `}%`. For example in:

> %{parent}% has %{num}% kids

template the `%{parent}%` and `%{num}%` are substitution commands. If for some reason we want to use `[[` and `]]` as delimiters, we have to write:

```
#define MULANSTR_TAG_START "[["
#define MULANSTR_TAG_END "]]"
```

in our `mulanstr.cpp` file.

Some template inserts needs parameters. For example in:

> There is %{num}% file%{num!P one={} other={s}}%

template the P function returns text based of the quantity given in `num` variable. It then produces output based on whenever `num` is 1 or >1 (for English language). So, the above example will result in "There is 1 file" or "There is 8 files" (for `num` being 1 and 8 respectively). For this it needs to know what text to output. And these texts are given between `{` and `}` delimiters.

If one wants to change those internal delimiters to `<` and `>`, he has to write:

```
#define MULANSTR_INNER_TAG_START "<"
#define MULANSTR_INNER_TAG_END ">"
```

And finally our `mulanstr.cpp` file has to end with:

```
#include <mulanstring/main.cpp>
```

2.3 Using MLS templates in code

OK, once we have set those two files properly, we can use MuLan-String's capabilities. To do it we have to find in our project's source code every use of strings which needs to be translated. Then we have to replace these strings with MuLan-String's call to templates. It consist of three parts:

2.3.1 Getting the template

First we need a template. We get it by using special template retrieval functions discussed in the 2.1 subsection. We can do it as in the example:

```
auto filesFound = _("%{num}% file%{num!P:,s}% have been found");
```

2.3.2 Applying variables

Some templates require additional information to produce a result string. In the above example, the template needs `num` to be set for the number of files found. We give that information by invoking `apply(<var name>, <value>)` method on the template:

```
filesFound.apply("num",3);
```

Some templates have got more than one variable. To set them we call `apply(...)` for each of the variables. You can do it by separate calls or chain them:

```
auto parentHasKids = _("%{parent}% has got %{num}% %{num!P:kid,kids}%");

//1st method
parentHasKids.apply("parent", "Alice");
parentHasKids.apply("num", 3);
//2nd method
parentHasKids.apply("parent", "Alice").apply("num", 3);
```

2.3.3 Producing output

After getting and applying variables (if necessary) we can get the result by calling `get()` method on the template. This method produces a `std::string` which can be used elsewhere in the program.

```
std::cout << parentHasKids.get() << std::endl;
```

2.3.4 All three in one line

All that was said above can be written in one line:

```
std::cout << _("%{parent}% has got %{num}% %{num!P:kid,kids}%")
.apply("parent", "Bob").apply("num", 2)
.get() << std::endl; //produces "Bob has got 2 kids"
```

2.4 Working with backends

MuLan-String's templates are taken from the backend. Different backends require different method to extract translatable strings from your project's code. Another fact is some backends require an initialization process before they can retrieve strings. How to do it is explained below.

2.4.1 GNU Gettext

To initialize Gettext we need to call `mls::backend::init(...)` function. This function requires a name of the main catalog used by our program. Usually it is project name set by `#define PACKAGE ...` in the `config.h` header (if we use Autoconf). Other parameters are: the locale name and localization of `.mo` files. These are optional and, if not provides, are set to the default values (which for the locale is the system locale and for the localization is `/usr/local/share/locale`). The initialization should be done as earlier as possible, preferably in the `main()` function:

```
int main() {
// ...
mls::backend::init(PACKAGE);
//or if we want to set locale:
mls::backend::init(PACKAGE, "en_US");
//or if we want to set localization:
mls::backend::init(PACKAGE, nullptr, "./locales");
//or all three:
mls::backend::init(PACKAGE, "en_US", "./locales");
// ...
}
```

To extract template strings we need to run `xgettext` with these parameters:

`xgettext -C -k_ -k_c:2 -k_l:1 -k_cl:2 -o` <**name of .pot file**> <*list of .hpp and .cpp files*>

or, if we set `MULANSTR_DONT_USE_UNDERSCORE` we need to write longer list:

`xgettext -C -kmls::translate -kmls::translate:2 \`
`-kmls::translateWithLocale:1 -kmls::translateWithLocale:2 \`
`-o` <**name of .pot file**> <*list of .hpp and .cpp files*>

For information on how to work with `.pot`, `.po` and `.mo` files refer to the GNU Gettext manual[2].

2.5 A quick overview of the template string syntax

So far now I showed how to get and work with templates, but nothing about *what to put in them*. This is the job of this subsection. However, I won't show all the possibles of the MuLan-String library. The reason is you as the programmer are using English in the source code and as the default language for communicating with a user. So, you only need to know those elements of MuLan-String's template system which are enough to work in English. If you want to know more, read the Translators' POV section of this manual.

OK, so what MuLan-String's templates are made of? The templates are strings with tags which may be identified by `%{` and `}%` delimiters[3]. Everything inside them tells the MuLan-String to do its magic.

There are two main types of tags: a substitution tag and a function tag:

The substitutions are tags in the form `%{`*variable_name*`}%`. They work by putting a text (or a number) from a variable named the same as it is written between the delimiters. The content of that variable are given by the `apply(...)` method of the template.

The functions are tags in the form `%{`*variable_name*`!FUNCTION` *arguments...*`}%`. They work in the similar way to the above, but uses one of MuLan-String functions to process the content of the *variable_name* in some way and produce the output based on the result. For the English users the only function you must know about is the `P` function, which stands for *(P)luralize*. The function gets two parameters and a variable name. The parameters tells the function what to output if the variable is equal to 1 or not.

The arguments may be given in two possible ways:

- **As a table**: `%{`*variable_name*`!P:`*singular form*`,`*plural form*`}%`
- **As a hash**: `%{`*variable_name*`!P one={`*singular form*`} other={`*plural form*`}}%`[4]

Example:

```
%{num}% %{num!P:page,pages}% %{num!P one={has} other={have}}% been printed.
```

Suppose we set *num* to be equal 1. The first tag in the above template will put the string "`1`" in its place. The second tag will check the *num* and, because it is equal 1, it will put the "`page`" string in its place. The third tag works the same way, but its argument list was given in a more verbose form. The tag in this case will get the string given in the `one` parameter and put the "`has`" string in its place.

As a result the output will be: `"1 page has been printed."`.

Now, let's suppose the *num* is equal to 4. The first tag will produce "`4`", the second: "`pages`" and the third: "`have`" which results in a output: `"4 pages have been printed."`.

Take note that the above example may be written also in this way:

```
%{num}% page%{num!P:,s}% ha%{num!P one={s} other={ve}}% been printed.
```

The produced result will be the same. It's up to you which form you think is more readable and maintainable.

[2] Available at https://www.gnu.org/software/gettext/manual/index.html
[3] Remember, you can change the delimiters
[4] Remember you can change internal { and } characters to anything else

Comments The last thing to know about MuLan-String templates is you can put comments inside them. They are made in this way:

Text `%{#`*comment*`#}%` around.

What MuLan-String does with them is it treats them as if they wasn't there. So, the result of above example will be:

`Text␣␣around.`

(mind the double spaces between words!)

What comments are useful for? Well, sometimes to translate the sentence translators need some external information. However the process of extracting templates from a source code removes that information. Let's suppose we want translators to translate "Sam is beautiful." In some languages the word "beautiful" will be different, depending on whenever Sam is a man or a woman. But all that a translator sees is just that simple text. It would be good, if we had some way to inform our translators about the Sam's gender, thus solving the ambiguity.

And that's is why comments may be useful. You can write the above example as: "Sam`%{#a woman#}%` is beautiful."

3 The translators' POV

As a translator the only thing you must to learn is the MuLan-String's template syntax. The syntax is based on a system of tags inserted inside template string. They are recognized by being surrounded by delimiters. These delimiters are, by default, `%{` and `}%`. So, for example the below sentence:

You have selected `%{num}%` `%{num!P:object,objects}%` for deletion.

contains two tags: `%{num}%` and `%{num!P:object,objects}%`. The first tag is called *the substitution tag* and the second: *the function tag*. Everything that is surrounded by these delimiters is subject to MuLan-String "magic."

Warning! The programmer has the ability to change those delimiters to anything else! Make sure you consult the programmers' team in case you would suspect they have done it.

3.1 Types of tags

OK, so what types of tags content you may encounter/use? Well, at first let me tell you about general types of tags:

3.1.1 Substitution tags

That type is the simplest of all and also the most restricted in how it may behave. They are recognized by one word put between delimiters:

`%{`*variable*`}%`

All that it does is put the *variable* content (given by a programmer) in its place. You, as the translator, must make sure that content will be put in the right place. You do it by moving such a tag into a place where it is the most logical for a sentence in your language.

So, if given a template:

There were `%{num}%` changes in the `%{document_type}%`

If your language for some reason requires that *document_type* should be to put before *num*, you can switch those two tags like that:

In `%{document_type}%` there is `%{num}%` changes.

The order of them doesn't matter as long as all of them are in place.

3.1.2 Function tags

Ah, there is where MuLan-String gets its power! That tag type returns the result of call to one of predefined functions. These functions works by getting the variable name (or not) and some parameters and, based on that information, produces an output.

A function can take one parameter, a table, or a hash (also called a map). Also some functions needs a variable name to work, others doesn't need it. If that sounds complicated, don't worry: I explain all of it in parts.

The first thing is whenever the function needs a variable or not:

Requred: functions of this type are written in this form:

`%{`*variable_name*`!FUNCTION_NAME`*argument(s)*`}%`

(mind the `!` character that separates the variable name from function name)

Not needed: this type of functions are written in this form:

`%{+FUNCTION_NAME`*argument(s)*`}%`

(remember about the plus sign at the beginning of the function name)

The second thing is how a function gets its arguments. An argument list goes right after the function name, and can take one of these forms:

Form	Description	Example
`=`*value*	gives *one* parameter	`%{item!C=gen}%`
`:`*first*`,`*second*`,...`	gives *a table*	`%{num!P:mouse,mice}%`
␣`par1=`*value1*␣`par2=`*value2*`...`	gives *a map*	`%{person!G m={his} f={hers}}%`

I hope all of it will be clear once you read the subsection about functions.

3.1.3 Comment tags

And the last are tags which serve as an aid for translators given by programmers. Sometimes you may find such that tag:

`%{#`*a commentary*`#}%`

In a translation you can do anything to that tag, even remove it completely.

What is their purpose? Well, sometimes you may find a template which is hard to translate without some external information. For example a text:

A kid just ran away.

may be hard or even impossible to translate, if in your language "ran away" requires the knowledge about the kid's sex. You then may ask a programmer to clarify it by putting a comment like this:

A `%{#male#}%`kid just ran away.

Another reason is some backends like GNU Gettext may remove duplicate templates which, for some cases, can make a problem for a translator. Let's imagine we got this template:

Open

and an information that it is used in both "File" and "Print" menus. For some languages the translation of "Open" may differ depending on if it relates to a file or a printer. Unfortunately, your backend may treat the second "Open" as redundant, leaving you with a problem how to write a translation which fits both cases.

The solution again lies in the possibility for programmer to add comments. For example:

```
%{#File menu#}%Open
%{#Print menu#}%Open
```

will not be reduced to one item and gives a translator a way to translate them differently.

3.2 List of functions

OK, so after we learned how to write function tags, now I can tell you what possibilities MuLan-String gives to you. I divided the list into 3 parts by the topic. Each topic tells about problems you may encounter during a translation.

3.2.1 Gender

Gender tells about a class a word belongs to. it is a peculiarity of each noun and a language, which have got this feature, may require other words to adapt to the other word.

MuLan-String gives two functions to work with genders:

(S)et (G)ender ⇒ `%{+SG=`*gender_to_set*`}%`

Each template has got a gender assigned to them. Normally it is an empty string, but using the SG function we can change that.

This function produces nothing in place where it was put, so alone it is not useful. But becomes one when used with the next function.

(G)ender writer ⇒ `%{noun!G:`*a list*`}%` **or** `%{noun!G` *a map*`}%`

Produces output based of gender set to the *noun*. To work right the value of *noun* variable must be another template where SG function was used.

Example: Let's say we have a template (written in Latin):

`%{noun}%` magn`%{noun!G m={us} f={a} n={um}}%` est

and three other templates:

`%{+SG=m}%`Puteus
`%{+SG=f}%`Officina
`%{+SG=n}%`Forum

If now a program sets *noun* variable to one of those three templates, the results will be:

`Puteus magnus est` (for *noun* set to the first template)
`Officina magna est` (for the second template)
`Forum magnum est` (and for the third template)

Short and long version In the example above the G function was written in the long (verbose) form. When executed it tries to match each of the given parameters names (`m`, `f` and `n`) to those set by the SG function in the sub-template. Sometimes however you don't want to write it *that* long and want some shorter and quicker form to write. As you can see in the function header in this manual, the G function has a shorter form: `%{noun!G:`*a list*`}%`. To use it in our Latin example we need to replace it with:

`%{noun}%` magn`%{noun!G:us,a,um}%` est

Now the *-us*, *-a* and *-um* endings are assigned to the `m=`, `f=` and `n=` parameters in order. The order of that parameters depends on the language. The MuLan-String has an embedded list of languages it supports. Each of entry in that list contains, among others, a specific order set to the Gender writer function, which dictates how a list is converted into a map. You can read what is that order in the Supported languages section.

3.2.2 Case

Some languages employ a case system. A form of a noun depends of what a function it has in a sentence. If for example a noun is used as sentence's subject it has different form than when used as an object.

For this feature MuLan-String has got two functions:

(C)ase chooser ⇒ `%{noun!C=`*required_case_name*`}%`

Outputs the *noun* variable, first informing it it should inflect by *required_case_name*.

(C)ase writer ⇒ `%{+C case1={`*case1_output*`} case2={`*case2_output*`}}%` **or** `%{+C:`*list of outputs*`}%`

If a template containing this function was informed by the Case chooser to inflect, this function outputs a `case`*n*`_output` associated with `case`*n*.

Example: Again a Latin example. There is a template for word *domus* (house):

dom`%{+C nom={us} gen={us} dat={ui} acc={um} abl={o} voc={us} loc={i}}%`

and a template:

De `%{from!C=abl}%` in `%{to!C=acc}%`

which means "From *from* to *to*".

If now the program assigns both variables to the same "domus" template, the output will be:

De **domo** in **domum**

correctly inflected.

Short and long version just like in the Gender section, the Case writer also has got a long and a short form. The short form of the "domus" template may be like:

dom`%{+C:us,us,ui,um,o,us,i}%`

And just like for Gender functions, the order of assigning elements of that list to a map is given in the Supported languages section.

3.2.3 Plural forms

Pluralization rules tells how a noun should change its form based of some numerical quantity. Languages vary *a lot* in this matter.

There is only one function for this feature in MuLan-String.

(P)luralizer ⇒ `%{num!P one={`*output_for_1*`} other={`*output_for_the_rest*`}}%` **or** `%{num!P:`*list of outputs*`}%`

The function gets a number from the variable and gives an output depending of the value and pluralization rules in the template's language.

The Supported languages section contains the rules, list of classes of numbers and how short form of the function is mapped to the long form.

Example: In the English language nouns has got singular and plural forms. Singular forms are applied to quantities equal 1 and plural forms for the rest. Therefore one can write a template like:

`%{num}%` file`%{num!P one={} other={s}}%` deleted

Now if a program sets *num* variable to 1 the output will be:

1 file deleted

and with $num = 3$ it will be:

3 files deleted

3.3 Supported languages

This section contains the list of languages the MuLan-String has a builtin support. Take note that, if a language is not on the list, it doesn't stop the library from retrieving templates from a backend. However it means that template functions *will* output wrong texts.

British English

Locale name: `en_GB`

Cases list: *None*

Genders list: *None*

Plurals list: one($= 1$), other($\neq 1$)

Pluralization rule: #1

American English

Locale name: `en_US`

Cases list: *None*

Genders list: *None*

Plurals list: one($= 1$), other($\neq 1$)

Pluralization rule: #1

Polish

Locale name: `pl_PL`

Cases list: nom, gen, dat, acc, ins, loc, voc

Genders list: m, f, n

Plurals list: one($= 1$), few($ending = [2, 3, 4]$ except $ending = [12, 13, 14]$), other

Pluralization rule: #9

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