Real-time Operating Systems and Systems Programming

Localization

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I18n and L10n

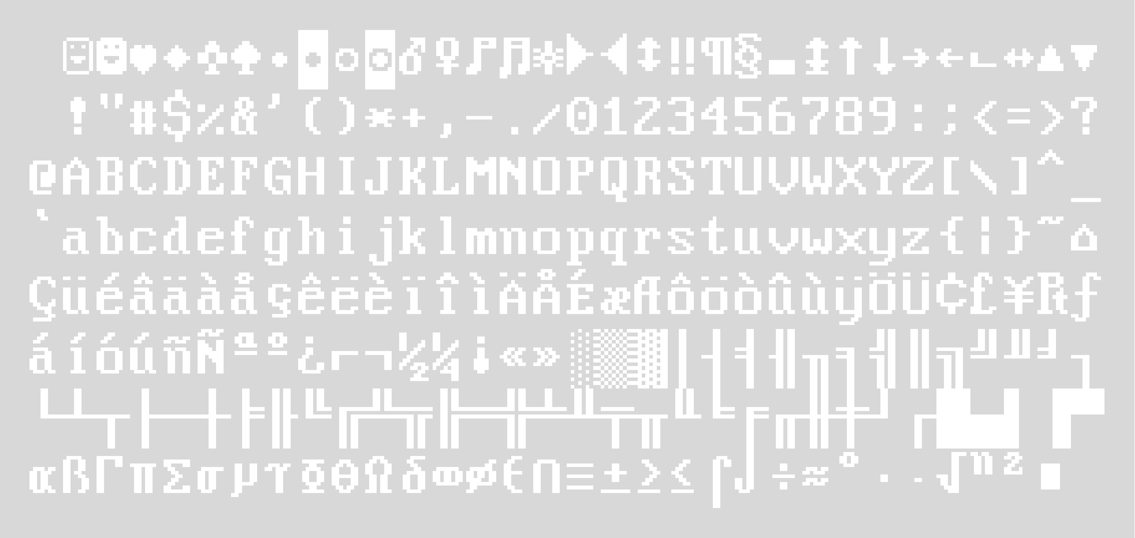
- Internationalization – enabling translation support for a program
- Localization – translation and modifying a program to suit local idioms and customs

ASCII

- Time before ASCII luckily outside of our scope
- ASCII standard: characters with value of less than 32 are non-printable (bell sound or feeding a new paper into the printer)
- Characters above 127 free for anyone to use

IBM PC codepage (437)

- ASCII compatible
- For some European languages é and è letters
- Horizontal and vertical table-drawing characters
- Remember the older cashier screens
  - (For those you can use the curses library)
- What about Hebrew,
  Asian languages,
  Russian?



```
 ☺☻♥♦♣♠•◘○◙♂♀♪♫☼►◄↕‼¶§▬↨↑↓→←∟↔▲▼
 !"#$%&'()*+,-./0123456789:;<=>?
@ABCDEFGHIJKLMNOPQRSTUVWXYZ[\]^_
`abcdefghijklmnopqrstuvwxyz{|}~⌂
ÇüéâäàåçêëèïîìÄÅÉæÆôöòûùÿÖÜ¢£¥₧ƒ
áíóúñÑªº¿⌐¬½¼¡«»░▒▓│┤╡╢╖╕╣║╗╝╜╛┐
└┴┬├─┼╞╟╚╔╩╦╠═╬╧╨╤╥╙╘╒╓╫╪┘┌█▄▌▐▀
αßΓπΣσµτΦΘΩδ∞φε∩≡±≥≤⌠⌡÷≈°∙·√ⁿ²■
```

Illustration: https://en.wikipedia.org/wiki/File:Codepage-437.png

Code pages

- ASCII provides the base, upper characters different
- Support for several languages in parallel

- Asia uses two-byte codepage
- Result: the same computer can not display some languages in parallel (unless you create bitmap fonts for that specific purpose)
- IBM and Microsoft code-tables split after the end of their co-operation around 1990
- ANSI standard comes along too

Unicode to the rescue

- Unicode is a collection of *Code Points*
- Every *Code Point* refers to a symbol which sometimes is a character in some language like A or Õ, or something else like ﬃ (U+FB03)
- They exist in a rather plentiful manner (cat faces etc)
- You can refer to the *Code Points* using some specific encoding

Functionality

- Combining of letters
- ~ and o > õ combinations
- test
- Sign to swap text direction for right-to-left languages

Example

- test
- 74 65 73 74
- 2 byte : 00 74 00 65 00 73 00 74 (UCS-2 / UTF-16)
- Or? : 74 00 65 00 73 00 74 00
- FE FF : byte order mark
  - someone in Microsoft thought that it would be a good idea to put it before files and strings; Avoid in Unix world
- UCS-4 means 4-byte characters

Coding: UTF-8

- A specific coding
- Lower 127 characters are ASCII compatible
- Further bytes represent multibyte characters
- Linux has mostly completed standardization to UTF-8; Use of anything other than this should be considered problematic

Conclusions

- "Plain text" does not exist
- We are always interested in the encoding of the aforementioned "plain text"
    - Our Huffman encoder is also essentially a translation program from one encoding to another

In practice

- GNU library: libiconv
  http://www.gnu.org/software/libiconv/
- fopen("file.txt", "r, ccs=UTF-8");
- wchar_t data-type
- fgetc() >> wint_t fgetwc(FILE * stream)
- EOF >> WEOF

Linux support

- The input from the keyboard (what you get from terminal stdin) is converted to UTF-8 stream (console driver does this work)
- The output to console is decoded using a UTF-8 decoder and is presented using a 16-bit font
- BOM does not exist (the FE FF)

Two approaches

- Keep internal data in UTF-8
- Keep data in its decoded form and convert only upon outputting it
  - A character would be an object in memory in this case

Problems of internal UTF-8

- strlen() does not tell how many positions the cursor would move
- mbstowcs(NULL,s,0) returns the character count according to its coding

Usage

- Define locale in environment:
  LANG=et_EE (for output in ISO 8859-1)
  LANG=et_EE.UTF-8 (for output in UTF-8)
- #include <locale.h>
- setlocale() - LC_CTYPE or LC_ALL arguments
- command:
  locale -a shows the locales installed into system

Gettext

- Solution from Sun Microsystems
- Copied by GNU project
- Quite standard and widely used

Workflow

- Write your program using gettext() function and locale registration
- Use xgettext program to gather your strings into .pot file
- Create translation files for your target language using msginit command
- Translate
- Cinvert translation into binary using msgfmt program
- Put the result into /usr/share/locale/XX/LC_MESSAGES (XX is language; et or de, for example)

Hello.c

```c
#include <libintl.h>
#include <locale.h>
#include <stdio.h>
#include <stdlib.h>
int main(void)
{
  setlocale( LC_ALL, "" );
  bindtextdomain( "hello", "/usr/share/locale" );
  textdomain( "hello" );
   printf( gettext( "Hello, world!\n" ) );
   exit(0);
 }
```

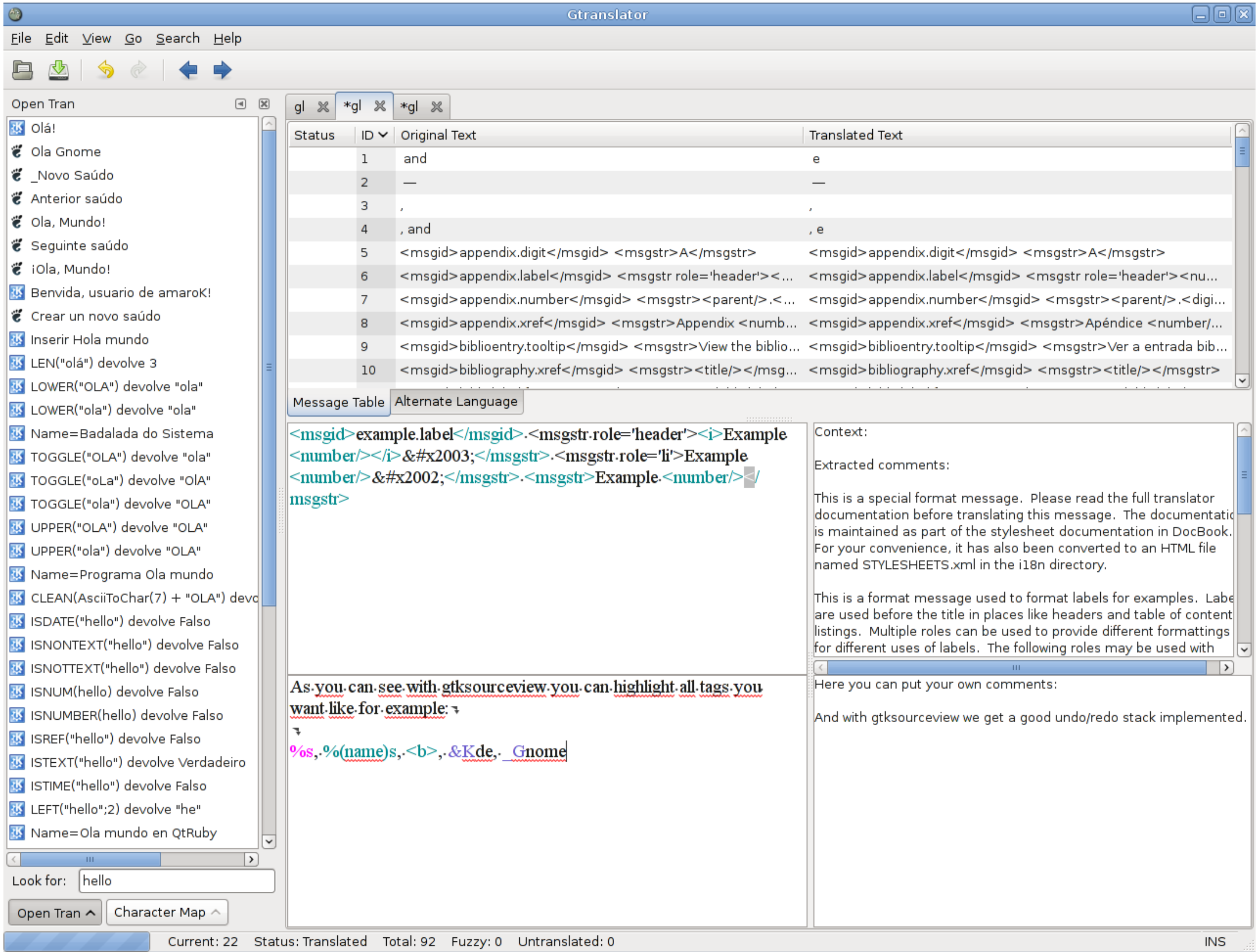
Source: http://oriya.sarovar.org/docs/gettext_single.html

Explanation

- setlocale() gathers the users preferences for language and its customs (date formats, week starting date, currency, etc)
- bindtextdomain() tells that „hello“ program can find its translation under /usr/share/locale (this is the default and could be skipped)
- textdomain() tells that language set is named "hello" in all of the languages
- **gettext()** should wrap all the strings; alias _

Tools

- gtranslator



Olá!
Ola Gnome
_Novo Saúdo
Anterior saúdo
Ola, Mundo!
Seguinte saúdo
¡Ola, Mundo!
Benvida, usuario de amaroK!
Crear un novo saúdo
Inserir Hola mundo
LEN("olá") devolve 3
LOWER("OLA") devolve "ola"
LOWER("ola") devolve "ola"
Name=Badalada do Sistema
TOGGLE("OLA") devolve "ola"
TOGGLE("oLa") devolve "OlA"
TOGGLE("ola") devolve "OLA"
UPPER("OLA") devolve "OLA"
UPPER("ola") devolve "OLA"
Name=Programa Ola mundo
CLEAN(AsciiToChar(7) + "OLA") devo
ISDATE("hello") devolve Falso
ISNONTEXT("hello") devolve Falso
ISNOTTEXT("hello") devolve Falso
ISNUM(hello) devolve Falso
ISNUMBER(hello) devolve Falso
ISREF("hello") devolve Falso
ISTEXT("hello") devolve Verdadeiro
ISTIME("hello") devolve Falso
LEFT("hello";2) devolve "he"
Name=Ola mundo en QtRuby

Look for: hello

Status	ID	Original Text	Translated Text
	1	and	e
	2	—	—
	3	,	,
	4	, and	, e
	5	<msgid>appendix.digit</msgid> <msgstr>A</msgstr>	<msgid>appendix.digit</msgid> <msgstr>A</msgstr>
	6	<msgid>appendix.label</msgid> <msgstr role='header'><...	<msgid>appendix.label</msgid> <msgstr role='header'><nu...
	7	<msgid>appendix.number</msgid> <msgstr><parent/>.<...	<msgid>appendix.number</msgid> <msgstr><parent/>.<digi...
	8	<msgid>appendix.xref</msgid> <msgstr>Appendix <numb...	<msgid>appendix.xref</msgid> <msgstr>Apéndice <number/...
	9	<msgid>biblioentry.tooltip</msgid> <msgstr>View the biblio...	<msgid>biblioentry.tooltip</msgid> <msgstr>Ver a entrada bib...
	10	<msgid>bibliography.xref</msgid> <msgstr><title/></msg...	<msgid>bibliography.xref</msgid> <msgstr><title/></msgstr>

```
<msgid>example.label</msgid> <msgstr role='header'><i>Example
<number/></i>&#x2003;</msgstr> <msgstr role='li'>Example
<number/>&#x2002;</msgstr> <msgstr>Example <number/></
msgstr>
```

Context:

Extracted comments:

This is a special format message. Please read the full translator documentation before translating this message. The documentatio is maintained as part of the stylesheet documentation in DocBook. For your convenience, it has also been converted to an HTML file named STYLESHEETS.xml in the i18n directory.

This is a format message used to format labels for examples. Labe are used before the title in places like headers and table of content listings. Multiple roles can be used to provide different formattings for different uses of labels. The following roles may be used with

As you can see with gtksourceview you can highlight all tags you want like for example:

%s, %(name)s, <b>, &Kde, _Gnome

Here you can put your own comments:

And with gtksourceview we get a good undo/redo stack implemented.

Current: 22 Status: Translated Total: 92 Fuzzy: 0 Untranslated: 0