Developing Unicode-aware Applications in Python

Preparing an application for internationalization (i18n) and localization (l10n)

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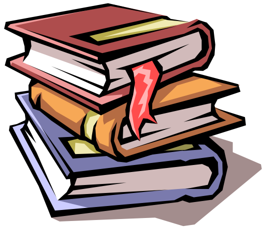
Speaker Introduction: Marc-André Lemburg

- CEO eGenix.com and Consultant
  - More than 20 years software experience
  - Diploma in Mathematics
  - Expert in Python, OOP, Web Technologies and Unicode
  - Python Core Developer
  - Python Software Foundation Board Member (2002-04)
  - Contact: mal@egenix.com
- eGenix.com Software GmbH, Germany
  - Founded in 2000
  - Core business:
    - Consulting: helping companies write successful Python software
    - Product design: professional quality Python/Zope developer tools (mxODBC, mxDateTime, mxTextTools, etc.)
  - International customer base



Agenda

1. Introduction
2. Preparation for Internationalization
3. Adding Translation Support
4. Translation Tools
5. Interoperability
6. Localization
7. Discussion

Introduction

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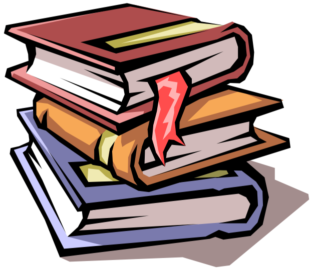
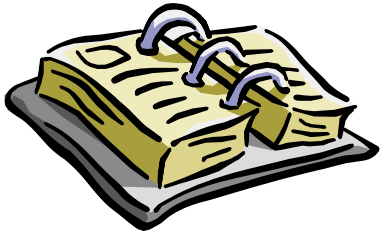
Motivation: Why Unicode ?

- Storing scripts: human readable text data
  - Localization (l10n) and Internationalization (i18n) of software and GUIs
  - Basis for national language and script support
  - Common ground for textual information exchange



The Unicode Consortium Solution



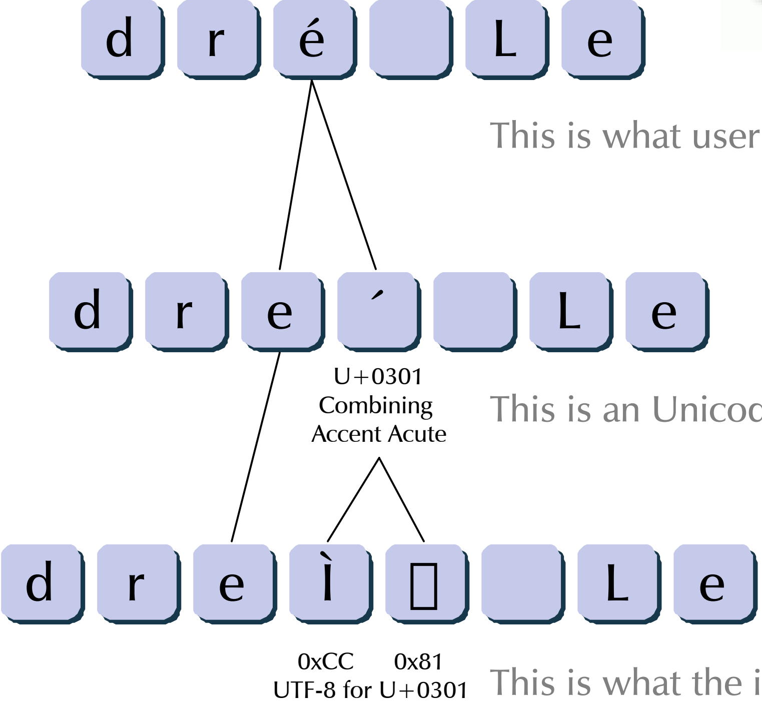
- One encoding for all scripts of the world
- ASCII compatibility (even Latin-1)
- Includes character meta data
  - Case mapping information
  - Numeric conversion
  - Character category information
- Accounts for scripts using different orientations
- Enables sorting and normalization support

Also see the Unicode Consortium web-site at http://www.unicode.org/

Unicode Terminology: What is a Character ?

- Unicode Terminology

  - Graphemes:
  - Code Points:
  - Code Units:



This is what users regard as a character.

This is an Unicode encoding of the string.

This is what the implementation stores (UTF-8).

Unicode Statistics

- Unicode 4.1.0
  - 1,114,112 code points available
  - 97,655 code points assigned
    - 1,273 code point assignments were added in Unicode 4.1.0 compared to Unicode 4.0
  - 70,207 of these are part of a Han subset used for Asian scripts
  - Most assignments in the first 65536 code points (BMP - Basic Multilingual Plane)
- Python supports Unicode version 3.2 (in Python 2.4)

Unicode features included in Python

- Native Unicode Type
  - very efficient
  - performance comparable to strings (sometime even better)
- Large set of built-in codecs
  - to convert between Unicode and various encodings (among other things)
- Unicode code point database
  - information on code point properties
- Partial support for OS based Unicode I/O
  - still in the making

Unicode literals in Python

- Source code encoding
  - Defines the encoding used for the Python source code
  - Must appear in the first two lines of a Python program
  - Format: `# -*- coding: latin-1 -*-`
- Unicode literals
  - String literals prefixed with a small *u*
  - Get converted to a Unicode object
  - Format: `u”this is a latin-1 string (éèàôäöü)”`

Pitfalls in writing Unicode-aware Python applications

- Not all Python modules/extensions expect Unicode
  - UnicodeError (due to ASCII conversion)
  - TypeError (tool expected a string)
  - Work-around: explicit encoding/decoding
- Operating Systems
  - don’t all handle Unicode well
  - Python doesn’t always use their Unicode support
  - Work-around: use ASCII OS-identifiers wherever possible
- Tool-chain:
  - Unicode is still in the process of being adopted – we’re not quite there yet… YMMV

Preparation for Internationalization (i18n)

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General principles in preparation for i18n

1. Use Unicode for all text in the application / presentation data
   - Avoid mixing strings and Unicode
2. Use explicit encoding/decoding in all I/O operations
   - Avoid Python's automatic coercion mechanisms
   - Encodings are usually application and locale dependent

I18n approach in Python: Basics

- Choose a default language
- Always define the source code encoding
  - should be suitable for your default language
  - Example: `# -*- coding: latin-1 -*-`
- Always use Unicode literals for all text
  - written in your default language
  - Example: `u”use your preferred default language”`
  - Important:
    These strings will be used as keys to find their own translation

I18n approach in Python: Prepare for automatic translation

- Enclose all literals in a call to a translation function

  translate(u"Save Document")

  translate(u"Save Document", topic=u"Menu")

  _(u"Save Document") (for those who don't like typing ☺)

- Always inline formatting specifiers into literals

  _(u"this will cause ") + many + _(u"translation problems")

  _(u"this is much %s translation friendly") % (more)

- Try not to break literals unnecessarily

  _(u"complete sentences are usually easier to translate…")

  _(u"…than short snippets without context")

Translation Problems

- Strings can have different translations depending on context
  - Use topics (aka domains, categories)

- A single string in one language can have multiple translations in other languages
  - Try to make the string more descriptive, or
  - Add helper context which the translation function then removes again for the default language

- Missing translation ?
  - Fallback to the default language

Adding Translation Support

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Translation Tools: GNU gettext tool chain

- Python gettext module (Python license)
  - provides translation function
- Many available tools:
  - to extract literals from source code (xgettext)
  - manage translations
  - compile translations for quick lookup
- Problem:
  - limited topic support
  - not context-aware (at least not out of the box)
  - hard to extend

Translation Tools: eGenix approach

- Use a TranslationComponent in the application
  - translations stored in the database
  - provides translation function
  - “knows” what the application is doing: context aware
- String extraction:
  - dynamically at run-time
  - statically, by scanning source code and/or presentation data

Translation Tools: eGenix approach (cont.)

- Managing translations:
  Import/export translations to Excel Unicode CSV files
  - easy to pass to translation studios
  - can include topic information

- Advantages of the approach:
  - context- and topic-aware
  - easily extendable
  - tested and proven in real-life applications

Interoperability

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Application Interoperability

- For best interop, use UTF-8 as Unicode transfer format
  - Best supported transfer format
- Avoid UTF-16, if possible
  - Byte ordering issues can be troublesome
- Avoid lossy encodings such as Latin-1, ASCII, etc.

Common Unicode transfer formats

- Browsers
  - UTF-8 (good support on all platforms)
- Text Editors
  - UTF-8 (Joe, Emacs on Unix)
  - UTF-16-LE (Notepad, Word on Windows)
- Excel
  - CSV files: UTF-16-LE
- Terminals / Shells
  - UTF-8

Detecting character sets / encodings

- Very hard problem (in general)

- Some encodings help
  - UTF-16 uses BOMs (byte order marks)
  - UTF-8 sometimes does too

- The application may have enough knowledge to detect the encoding based on the context …
  - … or it may not ☹

Localization (l10n)

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General things to consider when localizing (l10n)

- Date formats
  - 2005-07-07 vs. 07.07.2005 vs. 07/07/2005
- Number formats
  - 1.234,567 vs. 1,234.567
- Currency formats
  - $12.34 vs. €12,34 vs. 12.34 MUR
- Translations for varying quantities
  - Singular and plural form: u"%i file(s)"
  - Empty set or zero: u"no files"

GUI considerations

- Text direction: Left-to-right vs. Right-to-left
  - Text
  - Menus
  - Buttons
- Varying sizes of glyphs depending on language
  - e.g. English compared to Japanese
- Accelerator Keys
  - will likely have to depend on the language

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Developing Unicode-aware applications in Python

- Questions
  - What is your biggest problem with Unicode ?
  - What tools / features are (still) missing in Python's Unicode support ?

And finally...

Thank you for your time.

Contact

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