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)
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- 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 GUls
  - 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:**
    - d r é L e
    - This is what users regard as a character.

  - **Code Points:**
    - d r e ́ L e
    - U+0301 Combining Accent Acute
    - This is an Unicode encoding of the string.

  - **Code Units:**
    - d r e i L e
    - 0xC 0x81
    - UTF-8 for U+0301
    - 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
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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
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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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