Defining Common Standards for Calendar Systems and Holiday Data

John Layt
Introduction - Me

• From New Zealand
• Work on KDE
• Co-Maintainer of kdelibs Localization
• Maintainer of kdelibs Calendar Systems
• Co-Maintainer of KDE PIM KHolidays
If I lived 3000 Years Ago...

- The Berlin Gold Hat
- Neues Museum
- 1000 BC
- 0.75 m tall
- 57 month calendar
Purpose

- Explain why we need support
- Examine what support currently exists
- Explain the problems with current solutions
- Propose a new collaborative project
Calendar Systems
Today

<table>
<thead>
<tr>
<th>Calendar</th>
<th>Date Description</th>
<th>Unix Time</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gregorian</td>
<td>Monday 8 August 2011 AD/BCE</td>
<td>2011-08-08</td>
</tr>
<tr>
<td>Julian</td>
<td>Monday 26 July 2011 AD</td>
<td>2011-07-02</td>
</tr>
<tr>
<td>Hebrew</td>
<td>8 Av 5771 AM</td>
<td>5771-11-08</td>
</tr>
<tr>
<td>Islamic Civil</td>
<td>Yaum al-Ithnain 8 Ramadan 1432 AH</td>
<td>1432-09-08</td>
</tr>
<tr>
<td>Jalali / Persian</td>
<td>Do shanbe 18 Mordad 1390 AP</td>
<td>1390-05-18</td>
</tr>
<tr>
<td>Coptic</td>
<td>Pesnau 2 Mesore 1727 AM</td>
<td>1727-12-02</td>
</tr>
<tr>
<td>Ethiopian</td>
<td>Segno 2 Nehase 2003 AM</td>
<td>2003-12-02</td>
</tr>
<tr>
<td>Indian National</td>
<td>Somavāra 18 Shrāvana 1933 SE</td>
<td>1933-05-18</td>
</tr>
<tr>
<td>Chinese</td>
<td>9 Yi-Wei 4709</td>
<td>4709-07-09</td>
</tr>
<tr>
<td>Japanese</td>
<td>8 August Heisei 23</td>
<td>平成23-08-08</td>
</tr>
<tr>
<td>Taiwanese / Mingao / RoC</td>
<td>8 August 0100</td>
<td>0100-08-08</td>
</tr>
<tr>
<td>North Korean / Juche</td>
<td>8 August 0100</td>
<td>0100-08-08</td>
</tr>
<tr>
<td>Thai / Buddhist</td>
<td>8 August 2554</td>
<td>2554-08-08</td>
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</tbody>
</table>
Why do we need alternative Calendar Systems?
Can't everyone just use the Gregorian?
No!

- Several countries only official Calendar System
- Many countries have multiple official Calendars
- Many religions use for daily life
- Official and unofficial holidays defined by them
- Standard feature in Windows, Mac, and CLDR
At least 4,000,000,000 people of the world's population is 60%.
Daily Life
## Current Support (1)

<table>
<thead>
<tr>
<th>Calendar</th>
<th>Win</th>
<th>OSX</th>
<th>CLDR</th>
<th>KDE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gregorian</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>Hebrew</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>Islamic / Hijri Civil</td>
<td>X</td>
<td>X</td>
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<td>Jalali / Persian</td>
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<td>Japanese Era</td>
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<td>Taiwanese / Minguo / RoC</td>
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<tr>
<td>Thai / Buddhist Era</td>
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<td>Coptic</td>
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<tr>
<td>Indian National</td>
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<tr>
<td>Chinese Lunisolar</td>
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<tr>
<td>Islamic Lunar</td>
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<td>X</td>
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</tbody>
</table>
## Current Support (2)

<table>
<thead>
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<th>CLDR</th>
<th>KDE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Islamic Um Al Qura</td>
<td>X</td>
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<tr>
<td>Korean / Tangun</td>
<td>X</td>
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<tr>
<td>East Asian Lunisolar</td>
<td>X</td>
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<tr>
<td>Japanese Lunisolar</td>
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<tr>
<td>Taiwanese Lunisolar</td>
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<tr>
<td>Julian</td>
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<td>X</td>
<td></td>
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<tr>
<td>ISO 8601</td>
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<tr>
<td>Hindu Lunar</td>
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<tr>
<td>North Korean / Juche</td>
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</table>
Current Support (3)

- No support in POSIX, glibc, Gtk
- No support in iCalendar (CALSCALE)
- So not supported in Kontakt / Evolution, etc
- Supported in Outlook / Exchange but not exported
- “Supported” in OSX Calendar but not correctly
KDE Support
The Problem

- No standards defined
- No standard names
- No standard formulas
- No standard test suite
- Can cause interoperability problems
- Unicode CLDR defines names not formulas
- The 'definitive' academic resource is closed license (and wrong!)
A Technical Digression

• Converting between all calendars doesn't scale
• Needs a common conversion medium
• Julian Day number
• Day 0 = 1 January 4713 BC
• 8 August 2011 = Day 2,455,782
• Store the JD and convert into required calendar
• Astronomical / Observational calendars a problem
Proposed Collaboration (1)

- Formal definitions of each Calendar System
- Standard Formulas
- Standard Translations
- Standard Test Suite
- Initial work under FreeDesktop.org based on KDE
- Approach Unicode and/or IETF for merging
Proposed Collaboration (2)

- KDE code going into Qt5
- Find someone for glibc support
- Work with ICU to implement
- Work with IETF to get into iCalendar standard
- Once in iCalendar… Profit!
- Interim solution using current iCalendar
Holiday Data
KHolidays

- Part of kdepimlibs
- Database of national holidays in PLAN format
- API available throughout KDE and Plasma
- Used in Calendar apps and Financial apps
K Holidays in use
NIH?

• Why a separate library and file format?
• Why not use iCalendar?
• If it's good enough for Mozilla and Evolution...

Calendar - Holiday Files

You can also find calendars to subscribe to at iCalShare.com.

We've got some calendar holiday files available for download. You can either download and then import them into Sunbird or Lightning or you can just subscribe to these calendars by copying their URL and then adding them as new remote calendar files. More information on installing a holiday calendar can be found in the Adding a holiday calendar article.

| Albania Holidays thanks to Besnik Bleta | 2011 |
| Algeria Holidays thanks to Imad Tbahriti | 2007-2020 |
| Argentina Holidays thanks to Hernan Belloni | 2011-2013 |
But...

- iCalendar is just not flexible enough
- Doesn't support alternative calendar systems
- Doesn't support complex recurrence rules
- Doesn't support different observance day
- Poor category support
- Doesn't support day-off type
- Doesn't directly support regional variations
- etc...
Easter

QDate HolidayParserDriverPlan::easter( int year )
{
    if ( m_parseCalendar->calendarType() != "gregorian" ) {
        return QDate();
    }

    // Algorithm taken from Tondering
    // http://www.tondering.dk/claus/cal/node3.html#SECTION003137000000000000000

    int g = year % 19;
    int c = year / 100;
    int h = ( c - ( c / 4 ) - ( ( ( 8 * c ) + 13 ) / 25 ) + ( 19 * g ) + 15 ) % 30;
    int i = h - ( ( h / 28 ) * ( 1 - ( ( 29 / ( h + 1 ) ) * ( ( 21 - g ) / 11 ) ) ) )
        + ( year + ( year / 4 ) + i + 2 - c + ( c / 4 ) ) % 7;
    int l = i - j;
    int month = 3 + ( ( l + 40 ) / 44 );
    int day = l + 28 - ( 31 * ( month / 4 ) );

    return QDate::fromJulianDay( julianDay( year, month, day ) );
}
San Pedro y San Pablo

- 29 August
- Chile: Move to the nearest Monday
More Examples

- Chinese New Year
- Ramadan
- UK: Christmas Day extra day off if falls on weekend
- NZ: Wellington Anniversary Day in Wellington only
With iCalendar you must manually calculate and enter the date for every year

= Maintenance Nightmare
What's good about KHolidays

• Does support alternative calendar systems
• Does support complex recurrence rules
• Does support different observance day
• Good category support in next release
• Does support day-off type, better in next release
• Does directly support regional variations
• etc...
What's bad about KHolidays

- PLAN format not originally designed for this use
- Custom extensions
- Ugly syntax, hard to express complex rules
- Makes maintenance harder than necessary
- No translations
- Restricted to KDE
PLAN Example

"San Pedro y San Pablo"

holiday on ([6/29] == [tuesday after ([6/28])] ||
            [6/29] == [wednesday after ([6/28])] ||
            [6/29] == [thursday after ([6/28])] ) ?

            [monday before ([6/29])] :

            ( ([6/29] == [friday after ([6/28])])?

            [monday after ([6/29])]:[6/29]))
A Proposed Collaboration

- A shared database would benefit all
- A new common standard file format
- A common set of data files
- Initially hosted by FreeDesktop.org
- Later propose to IETF as RFC
- A common shared library like libical?
- Clean slate: a true collaboration?
Thank you...

- http://community.kde.org/KDE_Core/KCalendarSystem
- http://community.kde.org/KDE_PIM/KHolidays
- jlayt@kde.org