



Developing an International Calendar in Java



TME10 Internationalization Team
David Kumhyr

Contents

1. Introduction	1
2. International Calendar Control	2
3. Supported Calendar Styles	3
3.1 Gregorian Calendar	3
3.2 Gregorian Calendar, Wrapped Head to Tail	3
3.3 Japanese Era Calendar	4
3.4 Japanese Era Calendar in Romanji	4
1.1.1 Table of Supported Japanese Eras	5
1.5 Hijri Um Al-Qura calendar, Arabic Numerals	6
1.6 Hijri calendar English Transliteration, Arabic Numerals	7
1.7 Hebrew Calendar	8
1.8 Hebrew, English Transliteration	9
Using UFCalendar Interfaces to Build New Views	9
4. UFCalendar User Interface GUI	10
4.1 Supported Languages	10
4.2 Month Control	10
4.3 Year Control	11
4.4 Day of Week Control	11
4.5 Day Control	11
4.6 Popup Menu	12
4.6.1 (Menu Choice) Go to today	12
4.6.2 (Menu Choice) Set date...	12
4.6.3 (Menu Choice) Calendar preferences...	13
4.7 Calendar Preferences Dialogue	13
4.7.1 Style Panel	13
4.8 Hebrew Style Panel	15
4.8.2 Date Panel	15
4.8.3 Color / Font Panel	15
4.8.4 Holiday Panel	16
4.8.5 Add Holiday Dialogue	17
5. Holidays	18
6. Derived Calendar Controls	19
6.1 UFCalendarButton	19
6.2 UFCalendarField	19
6.3 UFCalendarMultiField	19
7. Translation to Other Languages	20
7.1 Items Not Translated	20
7.1.1 Day and Month Names	20
7.1.2 Japanese Era, Hebrew and Hijri Calendars	20
7.2 Items Translated	20
7.2.1 Menu Items and Dialogue Text	20
7.2.2 Adding New Japanese Eras	20
8. References	21



9. Appendix A	22
9.1 Font.properties file	22
9.2 Unicode fonts	23



1. Introduction

Tivoli Systems, Inc. develops systems management software for client / server computing. Tivoli products are distributed world-wide through a network of domestic and international sales offices as well as international distributors and systems integrators.

Tivoli is implementing new user interface technology using Java. In keeping with the world-wide nature of Tivoli's product set this interface is fully internationalized and translated into many languages. Individual components are created to function in a locale independent manner. This paper describes one of the international controls, the calendar component.

2. International Calendar Control

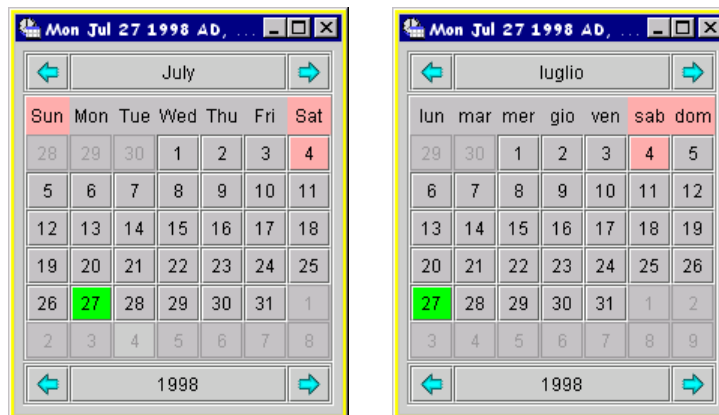
The International Calendar Control is the standard calendar for all Tivoli Java based products. This document describes the construction, operation, features and discusses how to implement and use the calendar component (UFCalendar) of Tivoli's new Java user interface technology.

The calendar is implemented with Sun Java Development Kit (JDK 1.1.6) and the Java Foundation Classes (JFC 1.0.3). It is based upon the Java Calendar abstract base class and uses the Java Gregorian calendar class. The Hijri and Hebrew calendars are implemented with subclasses provided by Taligent Inc., the Julian, Japanese Era and Taiwanese Era calendar classes are all Tivoli developed.

The calendar control provides:

- a calendar that is usable world-wide, presented in a culturally correct format
- year 2000 compliance (and beyond)
- displays text in Unicode fonts for world-wide character set support
- a uniform method of selecting and recording dates
- internationalised for all locales and languages supported by the TME 4.0 platform
- runtime human language and calendar style selection
- support for bi-directional calendars
- support for Tivoli Java AEF customisation
- a user configurable, locale independent holiday listing
- locale sensitive classes for date and time formatting
- a reusable, extensible base calendar component for all Tivoli Java products

The calendar provides a means for selecting single and multiple dates from a graphical representation of a monthly calendar. Multiple calendar styles are supported; Gregorian, Hijri, Hebrew, ISO Commercial, Chinese Lunar, Taiwan Era and Japanese Era



The calendar adapts to the conventions of the locale in which it is being run or the stored preferences of the Tivoli Administrator. In an English language, United States of America locale, weeks start on Sunday and the text for the day of the week and month names are displayed in English. If the locale and language were switched to Italian the first day of the week would be *lundi* (Monday) and all text displays would be in Italian. This behaviour requires no intervention on the part of the programmer or user.

3. Supported Calendar Styles

The calendar is intended to provide support for all significant calendar systems in use in the business world today. A Unicode font is required for displaying Arabic, Chinese, Hebrew, Japanese and Korean characters.

Calendar styles

- Gregorian calendar
- Gregorian calendar, wrapped
- Hijri calendar, Arabic numerals
- Hijri calendar, Arabic numerals, English transliteration
- Hebrew calendar
- Hebrew calendar, English transliteration
- Japanese Era calendar, kanji
- Japanese Era calendar, romanji
- Julian Day Number

3.1 Gregorian Calendar

The Gregorian calendar is the primary calendar in world-wide business use. It is a solar calendar with a 365 day year, with leap year rules adjusting for variations in the Earth's rotational speed. The Gregorian calendar is a derivative of the Julian¹ calendar using expanded leap year rules to compensate for differences between the solar year and the calendar year length.

Gregorian is the default calendar displayed if no calendar style is specified. The UFCalendar Gregorian calendar style supports all dates from 1582 (the year of the Gregorian changeover) forward. Dates prior to 1582 are not allowed. The Gregorian calendar implements the proper leap year rules to be year 2000 compliant.

3.2 Gregorian Calendar, Wrapped Head to Tail

The wrapped Gregorian calendar is a Gregorian calendar display variant used in Asia. It wraps the trailing days of the month back to the start of the calendar, space permitting.

¹ The Julian calendar is the same 365 day per year calendar as the Gregorian calendar however it does not implement a century leap year rule.

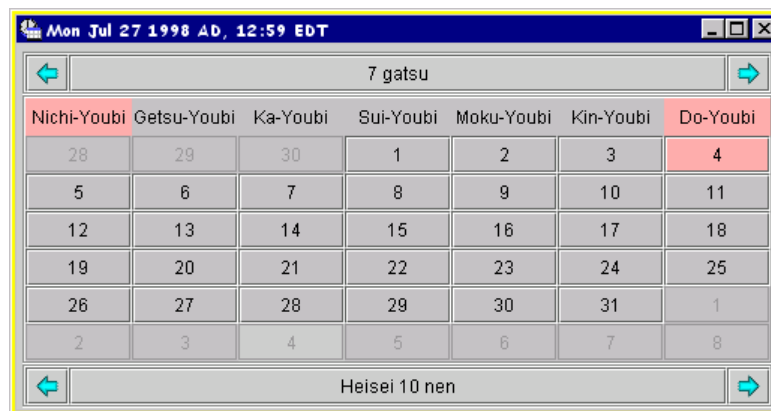
3.3 Japanese Era Calendar

The Japanese Era calendar, also called the Japanese Imperial calendar, is a Gregorian calendar with the years mapped to the Imperial reign. Emperor Akihito who ascended to the throne on January 8th, 1989 names the current era Heisei. The Japanese Era calendar supports the eras Kyowa (beginning January 1, 1801) through the present day Heisei era.



3.4 Japanese Era Calendar in Romanji

The Japanese Era calendar may be displayed in Romanji² to allow persons who do not read Japanese to use the calendar.



² Romanji is a Romanization method for reading Japanese words.

3.4.1 Table of Supported Japanese Eras

The eras and matched begin date for the reign are stored in the resource file `CalendarJapanEras.java`. Eras may be added to this file.

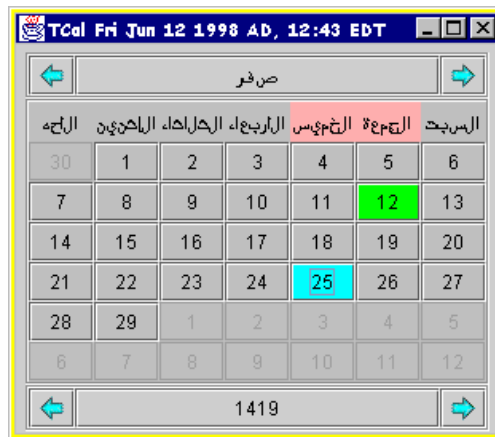
Era	Beginning Date
<input type="checkbox"/> Heisei	01/08/1989
<input type="checkbox"/> Showa	12/25/1926
<input type="checkbox"/> Taisho	07/30/1912
<input type="checkbox"/> Meiji	09/08/1868
<input type="checkbox"/> Keio	04/07/1865
<input type="checkbox"/> Genji	02/20/1864
<input type="checkbox"/> Bunkyu	02/19/1861
<input type="checkbox"/> Manen	03/18/1860
<input type="checkbox"/> Kaei	02/28/1848
<input type="checkbox"/> Ansei	11/27/1854
<input type="checkbox"/> Kouka	12/02/1844
<input type="checkbox"/> Tenpo	12/10/1830
<input type="checkbox"/> Bunsei	04/22/1818
<input type="checkbox"/> Bunka	02/11/1804
<input type="checkbox"/> Kyowa	01/01/1801

3.5 Hijri Um Al-Qura calendar, Arabic Numerals

The Islamic Hijri calendar is a pure lunar calendar with twelve alternating months of 29 and 30 days. Months are counted from lunar conjunction to conjunction. A month starts on the first day following a conjunction if the new moon is visible after sunset. A synodic month does not contain a fixed number of days, containing approximately 29.5305941.

The calendar is generated in the King Saud University in Saudi Arabia based upon astronomical tables. This edition of the Hijri calendar is named the Um Al-Qura calendar. The Hijri calendar is one of the calendars in use in the Arabic world (22 countries). In some countries law mandates its use. In world-wide business operations dates can be mapped to the Gregorian calendar.

Since the Arabic language is bi-directional³ the calendar and its controls are presented in a right to left format. (Shown here laid out right to left)



The months of the Hijri calendar are:

1	المم حرم	Al-Muharram
2	صفر	Safar
3	ربيع الأول	Rabia al-awwal
4	ربيع الآخر	Rabia al-akhar
5	جمادى الآخرة	Jumada al-awwal
6	جمادى الآخرة	Jumada al-akharah
7	رجب	Rajab
8	شعبان	Shaaban
9	رمضان	Ramadan
10	شوال	Shawwal
11	ذو القعدة	Dhu'l-qa'da
12	ذو الحجة	Dhu'l-hijja

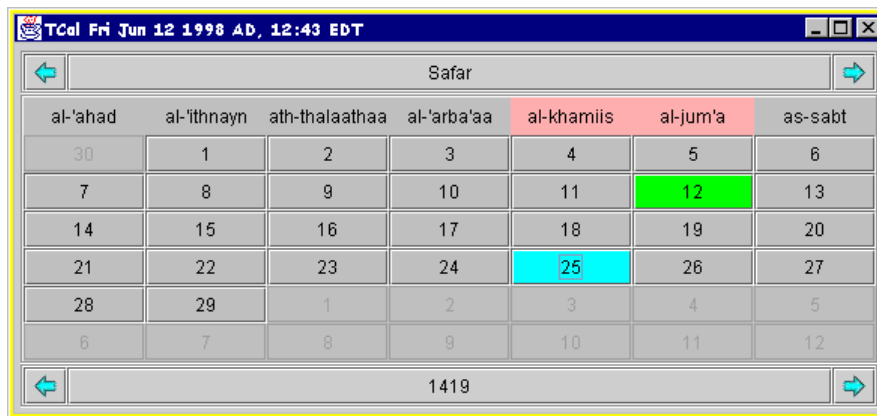
The days of the week for the Hijri calendar are:

³ Hebrew and Arabic are bi-directional languages, that is the text flows from right to left, but numbers and non-Arabic or non-Hebrew proper names flow left to right. Flow of controls in a user interface is right to left, top to bottom.

1	الأحد	al-'ahad	Sunday / the 1st day
2	الاثنين	al-'ithnayn	Monday / the 2nd day
3	الثلاثاء	ath-thalaathaa	Tuesday / the 3rd day
4	الأربعاء	al-'arba'aa	Wednesday / the 4th day
5	الخميس	al-khamiis	Thursday / the 5th day
6	الجمعة	al-jum'a	Friday / the 6th day
7	السبت	as-sabt	Saturday / the Sabbath day

3.6 Hijri calendar English Transliteration, Arabic Numerals

Hijri calendar displayed with English transliteration of months and days for persons who do not read Arabic.



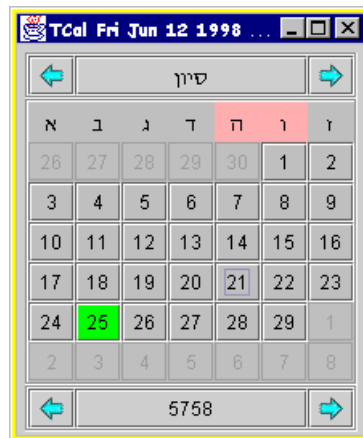
Safar						
al-'ahad	al-'ithnayn	ath-thalaathaa	al-'arba'aa	al-khamiis	al-jum'a	as-sabt
30	1	2	3	4	5	6
7	8	9	10	11	12	13
14	15	16	17	18	19	20
21	22	23	24	25	26	27
28	29	1	2	3	4	5
6	7	8	9	10	11	12

1419

3.7 Hebrew Calendar

The Hebrew calendar is a luni-solar calendar with twelve or thirteen months alternating between 29 and 30 days length. A normal Hebrew year has between 353 and 355 days, a leap year is added to synchronise the lunar year with the solar year for seasonal mapping. Leap years occur on a 3, 6, 8, 11, 14, 17 and 19 year Metonic cycle. Leap years are calculated with the formula $((7 \times \text{year} + 1) \bmod 19) < 7$.

Days begin at sunset. The days of the week for the Hebrew calendar are simply lettered A through G [in Hebrew: א, ב, ג, ד, ה, ו, ש; aleph, bet, gimel, dalet, he, vav, shin].



The months for the Hebrew calendar are:

1	תשרי	Tishrei
2	חשוון	Heshvan
3	כסלו	Kislev
4	טבת	Tevet
5	שבט	Shevat
6	אדר א'	Adar I
7	אדר ב'	Adar II (leap month)
8	ניסן	Nisan
9	אייר	Iyar
10	סיון	Sivan
11	תמוז	Tamuz
12	אב	Av
13	אלול	Elul

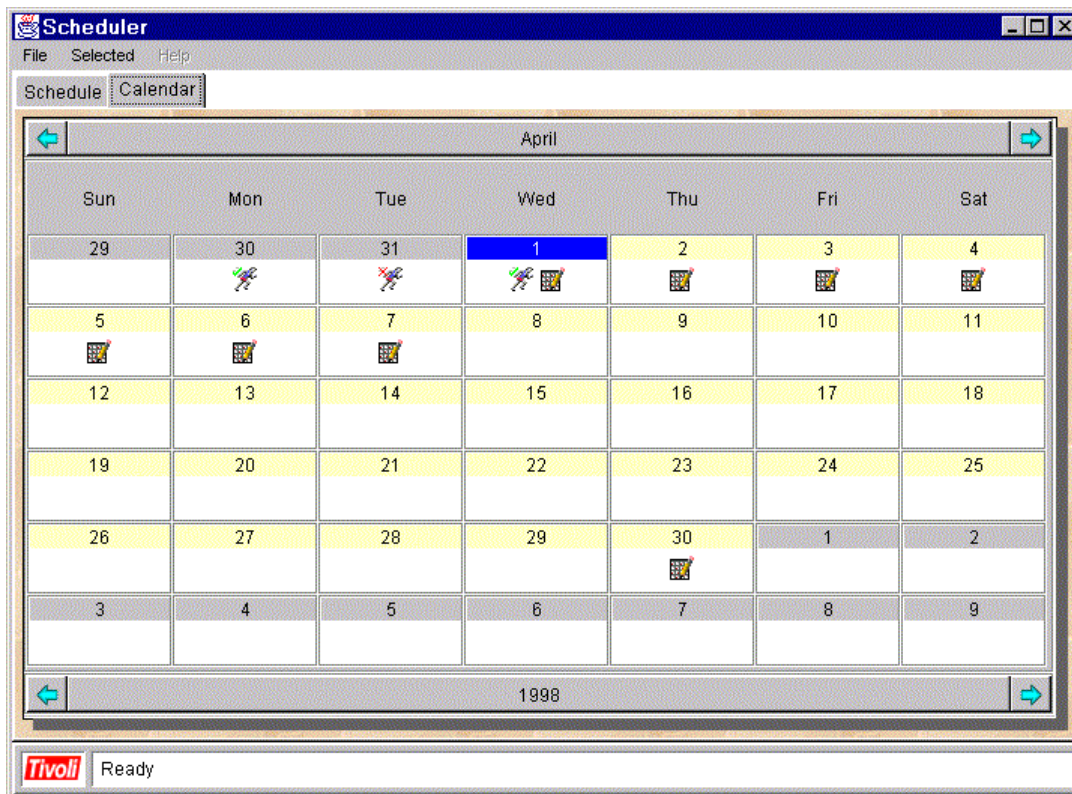
3.8 Hebrew, English Transliteration

Hebrew calendar displayed with English transliteration of months and days for persons who do not read Hebrew.



3.9 Using UFCalendar Interfaces to Build New Views

UFCalendar contains interface methods that allow the construction of alternative views of the calendar for use with individual Tivoli products. The image below depicts the scheduler interface constructed by Brian Price for event scheduling in the Tivoli *IT Director* product.



4. UFCalendar User Interface GUI

The following section provides a description of the user controls of the calendar interface.

4.1 Supported Languages

The month names and day of the week names are loaded from Sun supplied Java resources, the calendar resources do not contain this text. Thus no translation is necessary, all languages and locales supported by Java will display correctly translated weekday and month names. Unicode fonts enable display the display of foreign language text in Arabic, Chinese, Hebrew, Japanese, and Korean.

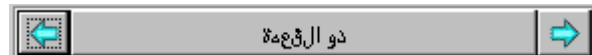
The UFCalendar private text for weekday and month names used in the Japanese Era, Hebrew and Hijri calendar are stored in CalendarSymbols.java. This file is already translated.

4.2 Month Control

The month selector panel allows the user to scroll forward or backward through the months of the year. Crossing a year boundary increments or decrements the year depending upon the boundary crossed. Each click of the selector buttons increments or decrements by one month unit of the currently selected calendar style.

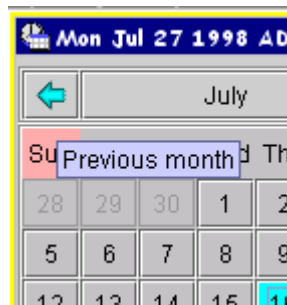
The display of the month selector is optional. A constructor is provided to create a calendar without a month selector (the year selector is removed by default if the month selector is not displayed). In the place of a month selector a bar with the month name is displayed.

Selection of a calendar style that is normally displayed bi-directionally (Hijri, Hebrew) when the calendar is being used on a computer that does not have a bi-directional operating system installed reverses the locations of the next/previous buttons.



Previous month control - Action, rolls the displayed month back. Crossing an annual boundary (e.g. Gregorian calendar December/January) rolls the year back. A ToolTip of “Previous Month”⁴ is displayed if ToolTips are enabled and the cursor is left over the control for the ToolTip activation period.

Month display - Displays the current month name in the context of the current locale.



⁴ In the screen capture the calendar is in an Italian locale, though the text resources have not yet been translated; thus the ToolTip is still in English.

Next month control - Action, rolls the displayed month forward. Crossing an annual boundary (e.g. Gregorian calendar December/January) rolls the year forward. A ToolTip of “Next Month” is displayed if ToolTips are enabled and the cursor is left over the control for the ToolTip activation period.

4.3 Year Control

The year selector panel allows the user to scroll forward or backward through the year. Each click of the control buttons increments or decrements by one year unit of the currently selected calendar style. If display of eras is enabled, the year along with the era designator will be displayed.

The display of the year selector is optional. A constructor is provided to create a calendar without a year control. In the place of a year selector a bar with the year name or numeric is displayed



Previous year control - Action, rolls the displayed year back by one year unit. A ToolTip of “Previous Year” is displayed if ToolTips are enabled and the cursor is left over the control for the ToolTip activation period.

Year display control - Displays the current year and optionally the era name.

Next year control - Action, rolls the displayed year forward by one year unit. A ToolTip of “Next Year” is displayed if ToolTips are enabled and the cursor is left over the control for the ToolTip activation period.

4.4 Day of Week Control

Display the days of the week. The day’s names are loaded from Java supplied resource bundles and are derived from the current locale setting or the stored Tivoli Administrator preferences of locale and language. The beginning day of the week for the set locale is also honoured. Thus in Italy the beginning day of the week is *lundi* (Monday). The days are abbreviated where permitted by language and locale and calendar style.



4.5 Day Control

The day selector panel displays the numeric days of the current month. The trailing days of the previous month are displayed as disabled as are the beginning days of the following month. Selection of a button selects that date. If the calendar is in multiple selection mode, multiple non-contiguous days may be selected. A repeat selection toggles the selection off.

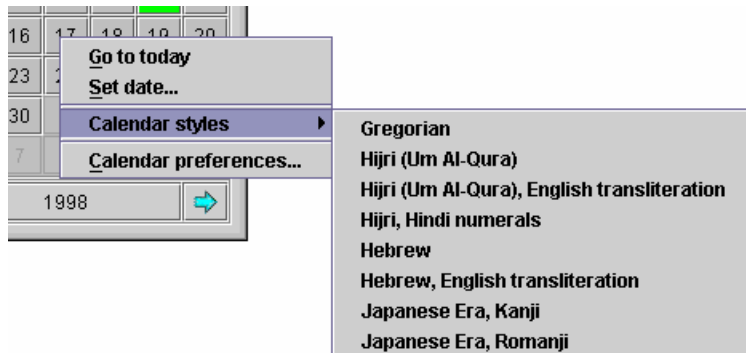
28	29	30	31	1	2	3
4	5	6	7	8	9	10
11	12	13	14	15	16	17
18	19	20	21	22	23	24
25	26	27	28	29	30	31
1	2	3	4	5	6	7

Day control - Displays the day of the month, making the background green (default colour, user selectable preference), highlights the current day. Selecting a day fires a DATE_SELECTED event to inform the registered listeners.

Holiday dates have foreground displayed in red (default colour, which is a user selectable preference).

4.6 *Popup Menu*

The calendar implements a popup menu available via a right mouse button click. This menu may be disabled at instantiation by selecting the appropriate UFCalendar constructor. Another constructor adds the menu, but removes the configuration item (calendar preferences).

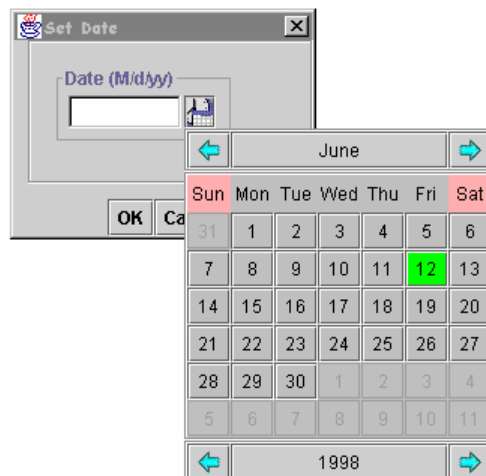


4.6.1 (Menu Choice) Go to today

Sets the calendar display to the current system year, month, and day.

4.6.2 (Menu Choice) Set date...

Select a date implemented using a UFCalendarField control in a dialogue box.



Date field – An entry field for a date. The current short date format (based upon locale or overridden by an Administrator's preference is displayed in the field name. The frame surrounding the date field displays the current short date format. The user may type the date here.



Calendar control – Pressing the button pops up a calendar component with the current date. Selecting a date and then pressing the calendar button dismisses the popup calendar and set the date in the date edit field.

OK – Dismisses the dialogue and sets the calendar date in the text edit field.

Cancel – Dismisses the dialogue with no date selection.

4.6.3 (Menu Choice) Calendar preferences...

Calendar preferences relating to the calendar. See the following discussion of Calendar preferences dialogue for more detail. Selected attributes are stored by Tivoli Administrator.

4.7 Calendar Preferences Dialogue

A tabbed panel dialog for selection of calendar preferences. Panels include all user configurable settings. Three buttons are used to apply or abandon the changes made. All calendar preferences are stored on a per Tivoli Administrator basis in a serialized file.

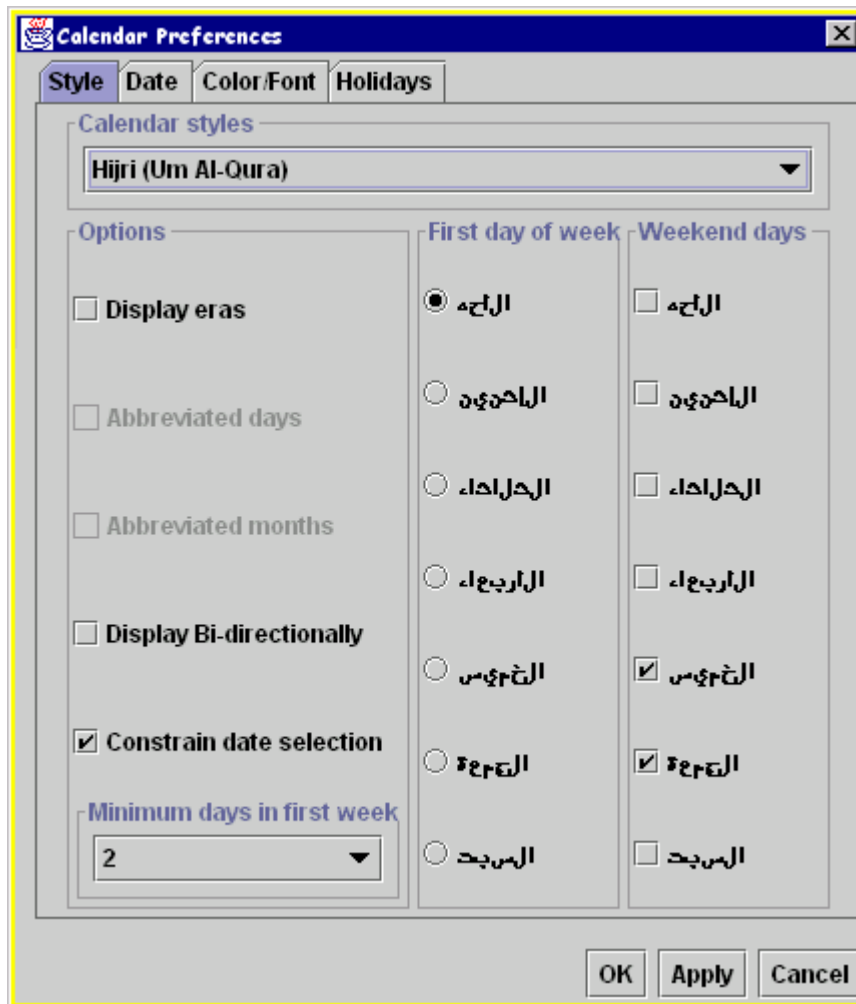
OK – Apply changes made and dismiss the dialogue.

Apply – Apply the changes and do not dismiss the dialogue.

Cancel – Abandon the changes made and dismiss the dialogue.

4.7.1 Style Panel

The Style Panel gathers all configurable elements relating to calendar styles:



Calendar styles group – Select the default calendar style of the calendar. Selecting different styles alters the options available and default first days of the week and weekend days. The calendar styles are listed in the section 3.

Options group – Options that apply to the selected calendar style.

- **Display eras** – Add the era to the year display
- **Abbreviated days** – Show days as abbreviated or in full on the days of the week controls. This option is disabled if the calendar style is Hijri, Hebrew or Japanese Era.
- **Abbreviated months** - Show months as abbreviated or in full on the month control. This option is disabled if the calendar style is Hijri, Hebrew or Japanese Era.
- **Display bi-directionally** – Allows Hijri or Hebrew calendars to be displayed in a left to right form,
- **Constrain date selection** – Allows selection of dates prior to the current date.
- **Minimum days in the first week** – Number of days that compose a complete first week of the month.

First day of week – An array of radio buttons allowing the user to set the first day of the week shown on the calendar. The default setting is the set by the current locale.

Weekend days – Select which days comprise the weekend.

4.7.1.1 Hijri (Um Al-Qura) Style Panel

Selection of the Hijri calendar style changes the options group to reflect choices that apply to the Hijri calendars. Days of the week change to the day names in Arabic and the weekend days change to الجمعة *al-jum'at* and السبت *al-sabt* [al-khamiis and al-jum'a; Friday and Saturday] default. The week begins on الأحد *al-ahad*; [Sunday].

4.7.1.2 Hijri (Um Al-Qura), English Transliteration Style Panel

The same information is available in an English transliteration.

4.8 Hebrew Style Panel

Selection of the Hebrew calendar style changes the options group to reflect choices that apply to the Hebrew calendar. Days of the week change to the day names in Hebrew and the weekend days change to י (vav) and ש (shin) [Friday and Saturday] default. The week begins on א (alef)[Sunday].

4.8.1.1 Hebrew Style Panel

The same information is available in an English transliteration.

4.8.1.2 Japanese Era, Kanji Style Panel

Selection of the Japanese Era calendar style changes the options group to reflect choices that apply to the Japanese Era calendar. Days of the week change to the day names in Kanji.

4.8.1.3 Japanese Era, Romanji Style Panel

The same information in Romanji.

4.8.2 Date Panel

This panel allows the Administrator to select their preferences for the display of time zone, formal and informal date format.

Time Zone – Select the time zone that you wish to use for date calculation. Dates are stored as an offset from UCT.

Formal date format – The display mask that the user wishes to use for formatting the formal (long) date display. The format varies by locale.

- SHORT is completely numeric, such as 12.13.52 or 3:30pm
- MEDIUM is longer, such as Aug 21, 1998
- LONG is longer, such as August 21, 1998 or 3:30:32pm
- FULL is pretty completely specified, such as Friday, August 21, 1998 AD or 3:30:42pm CDT.

Formal date format example – An example of the formal (long) date display.

Informal date format - The display mask that the user wishes to use for formatting the informal (short) date display.

Informal date format example – An example of the informal (short) date display.

4.8.3 Color / Font Panel

This panel allows the Administrator to select their preferences of font, font point size and colour.

Font – Select the font used by the calendar. Selecting a non-Unicode font will prevent the user from being able to view characters in Arabic, Hebrew, Japanese, Ukrainian etc..

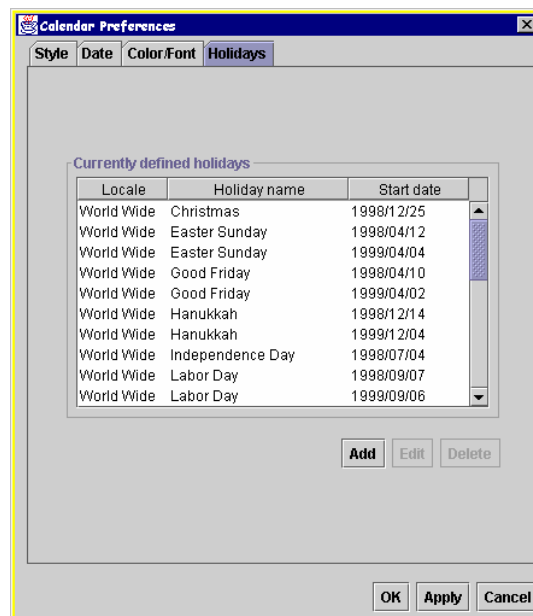
Font points – Select the point size of the font. The size of the font will affect the size of the calendar display.

Color selector - Colour is used to differentiate the current date, holidays, selected days, and weekends. The user may override the default calendar preferences.

```
ivClrForeground = Color.black;           // foreground color
ivClrBackGround = Color.lightGray;       // background color
ivClrCurrentDay = Color.green;           // current day color
ivClrWeekend    = Color.pink;            // weekend day color
ivClrHoliday    = Color.red;             // holiday day color
ivClrSelectedDay = Color.cyan;           // selected day color
```

4.8.4 Holiday Panel

The calendar allows display and creating of holidays on a local inspecific basis. The Holidays panel allows the user to add, edit and delete holidays. For a full discussion of the Holiday class see Holidays.



Currently defined holidays – Lists the current holidays and effective locales, with starting and ending time.

Add – Define and add a new holiday.

Edit – Edit selected holiday. Enabled when a holiday in the *Currently defined holidays* list is selected.

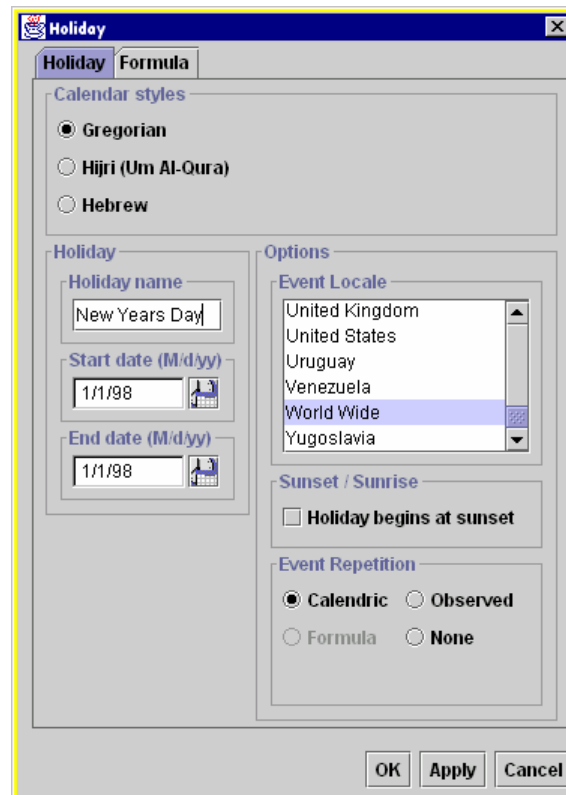
Delete – Remove the selected holiday. Enabled when a holiday in the *Currently defined holidays* list is selected.

4.8.5 Add Holiday Dialogue

A dialog to define a holiday specifies the locales it is observed in and the calendar, which it is mapped to.

4.8.5.1 Holiday Panel

Define the holiday; specify the locales it is observed in and the calendar, which it is mapped to.



OK – Apply changes made and dismiss the dialogue.

Apply – Apply the changes and do not dismiss the dialogue.

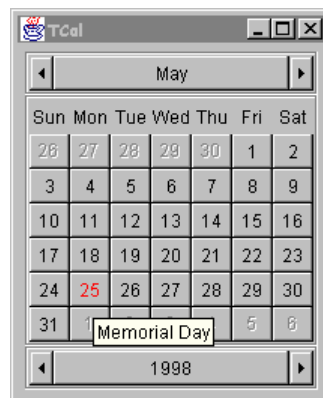
Cancel – Abandon the changes made and dismiss the dialogue.

5. Holidays

Tracking the difference between working days and non-working days is important in enterprise management. UFCalendar tracks holidays using a class to define a holiday.

Holidays may be defined to be effective on a world-wide basis or only in certain locales. Holidays defined on Hebrew and Hijri calendars are stored as offsets to Gregorian dates.

Holidays are denoted on the visible calendar by a (user configurable) colour change from normal days. The calendar will also display the holiday name as a ToolTip.



CalendarHolidays.java is the default file that is loaded as a resource if the calendar is loaded in a locale that is unsupported. This file contains no holidays so the calendar will not have any holidays displayed. This prevents inappropriate displaying of holidays that are not observed in the locale. For example US Independence Day is not displayed if the calendar is invoked on a computer in an Egyptian locale. The users in other locales can create their own list of holidays.

CalendarHolidays_en_US.java contains the basic list of legal holidays for the United States of America. Individual administrators may add other holidays at runtime.

Supported locales add their own list of holidays during translation. Tivoli Administrators may add other holidays later.

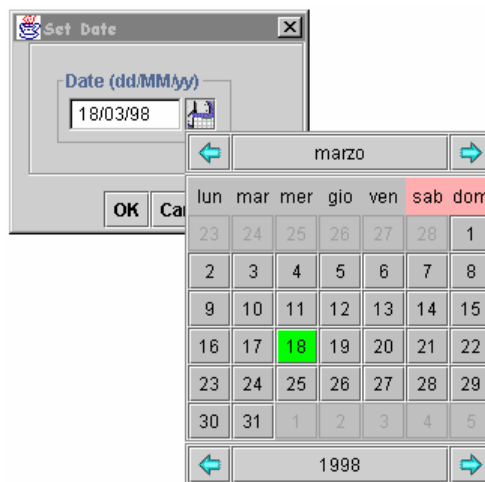
6. Derived Calendar Controls

6.1 UFCalendarButton

The UFCalendarButton is a class that creates a button that pops up a calendar for selecting dates.

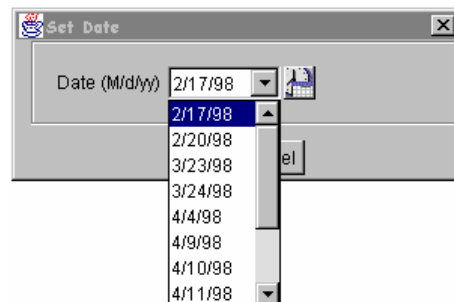
6.2 UFCalendarField

The UFCalendarField is an edit control combined with a UFCalendarButton to create a control for selection of a date. The frame shows the current format for date input based upon the locale. The date may be typed in by the user or entered by selecting a date from the popup calendar. Dates are returned as a Java Gregorian date.



6.3 UFCalendarMultiField

The UFCalendarMultiField is an edit control combined with a UFCalendarButton to create a control for selection of multiple dates. The frame shows the current format for date input based upon the locale. The date may be typed in by the user or entered by selecting multiple dates from the popup calendar. Dates are returned as a Java Gregorian dates.



7. Translation to Other Languages

The calendar component is designed to be as simple as possible from a translation and localization point of view and to contain all text for translation to a small number of files.

7.1 Items Not Translated

7.1.1 Day and Month Names

The month names and day of the week names are loaded from Java resources; the calendar does not contain any of this text. Thus no translation of these items is necessary, all languages and locales supported by Java will display correct weekday and month names without translation.

7.1.2 Japanese Era, Hebrew and Hijri Calendars

The weekday and month names for Japanese Era, Hebrew and Hijri calendar are stored in the resource bundle `CalendarSymbols.java`. This file does not require translation as they are always presented in the original languages.

7.2 Items Translated

7.2.1 Menu Items and Dialogue Text

Human language text that does require translation is isolated in the file `CalendarResources.java`. The text strings are commented to provide contextual guidance for the translator. Some resources are not to be translated and are commented as such.

7.2.2 Adding New Japanese Eras

For Japanese Translators Only

The eras and matched begin date for the reign are stored in the resource file `CalendarJapanEras.java`. New eras or older eras may be added to this file. It must be recompiled to be used by the calendar.

8. References

Um Al-Qura Calendar Algorithm, Technical Disclosure Bulletin, Sherif El-Rafei, IBM Corp.

Calendrical Calculations, Nachum Dershowitz and Edward M. Reingold, Cambridge University Press, 1997

Astronomical Formulæ for Calculators, Jean Meeus, Willmann-Bell, 1979, 1988

Astronomical Algorithms, Jean Meeus, Willmann-Bell, 1991

The Calendrical Systems of Mainland and South East Asia, J.C.Eade, E.J. Brill Publishing, 1995

9. Appendix A

9.1 Font.properties file

The Java font properties file needs to be modified to include a Unicode font for proper display of non-English characters. A problem exists with some ill behaved applications that create their own font.properties file in the Windows directories (\WINNT\SYSTEM32\lib). An interim solution has been to create a read-only copy this file in the Windows directory.

```
# font.properties
#
# AWT Font Properties for Windows
#

dialog.0=Arial,ANSI_CHARSET
dialog.1=WingDings,SYMBOL_CHARSET,NEED_CONVERTED
dialog.2=Symbol,SYMBOL_CHARSET,NEED_CONVERTED
dialog.3=Lucida Sans Unicode,DEFAULT_CHARSET
dialog.4=Bitstream Cyberbit,DEFAULT_CHARSET
dialog.5=Arabic Transparent,DEFAULT_CHARSET

dialoginput.0=Courier New,ANSI_CHARSET
dialoginput.1=WingDings,SYMBOL_CHARSET,NEED_CONVERTED
dialoginput.2=Symbol,SYMBOL_CHARSET,NEED_CONVERTED
dialoginput.3=Bitstream Cyberbit,DEFAULT_CHARSET
dialoginput.4=Lucida Sans Unicode,DEFAULT_CHARSET
dialoginput.5=Traditional Arabic,DEFAULT_CHARSET

serif.0=Times New Roman,ANSI_CHARSET
serif.1=WingDings,SYMBOL_CHARSET,NEED_CONVERTED
serif.2=Symbol,SYMBOL_CHARSET,NEED_CONVERTED
serif.3=Bitstream Cyberbit,DEFAULT_CHARSET
serif.4=Lucida Sans Unicode,DEFAULT_CHARSET
serif.5=Traditional Arabic,DEFAULT_CHARSET

sansserif.0=Arial,ANSI_CHARSET
sansserif.1=WingDings,SYMBOL_CHARSET,NEED_CONVERTED
sansserif.2=Symbol,SYMBOL_CHARSET,NEED_CONVERTED
sansserif.3=Lucida Sans Unicode,DEFAULT_CHARSET
sansserif.4=Bitstream Cyberbit,DEFAULT_CHARSET
sansserif.5=Arabic Transparent,DEFAULT_CHARSET

monospaced.0=Courier New,ANSI_CHARSET
monospaced.1=WingDings,SYMBOL_CHARSET,NEED_CONVERTED
monospaced.2=Symbol,SYMBOL_CHARSET,NEED_CONVERTED
monospaced.3=Bitstream Cyberbit,DEFAULT_CHARSET
monospaced.4=Lucida Sans Unicode,DEFAULT_CHARSET
monospaced.5=Traditional Arabic,DEFAULT_CHARSET

# name aliases
```

```
#
# alias.timesroman=serif
# alias.helvetica=sansserif
# alias.courier=monospaced

# for backward compatibility
timesroman.0=Times New Roman,ANSI_CHARSET
helvetica.0=Arial,ANSI_CHARSET
courier.0=Courier New,ANSI_CHARSET
zapfdingbats.0=WingDings,SYMBOL_CHARSET

# Default font definition
#
default.char=2751

# Static FontCharset info.
#
fontcharset.dialog.1=sun.awt.windows.CharToByteWingDings
fontcharset.dialog.2=sun.awt.CharToByteSymbol

fontcharset.dialoginput.1=sun.awt.windows.CharToByteWingDings
fontcharset.dialoginput.2=sun.awt.CharToByteSymbol

fontcharset.serif.1=sun.awt.windows.CharToByteWingDings
fontcharset.serif.2=sun.awt.CharToByteSymbol

fontcharset.sansserif.1=sun.awt.windows.CharToByteWingDings
fontcharset.sansserif.2=sun.awt.CharToByteSymbol

fontcharset.monospaced.1=sun.awt.windows.CharToByteWingDings
fontcharset.monospaced.2=sun.awt.CharToByteSymbol

# Exclusion Range info.
exclusion.dialog.0=0100-ffff
exclusion.dialoginput.0=0100-ffff
exclusion.serif.0=0100-ffff
exclusion.sansserif.0=0100-ffff
exclusion.monospaced.0=0100-ffff

# charset for text input
#
inputtextcharset=ANSI_CHARSET
```

9.2 Unicode fonts

On Windows NT the best current solution are the Bitstream® Cyberbit Unicode fonts. They are available for download from Bitstream at: <http://www.bitstream.com/>

For UNIX platforms support is spotty at best. IBM AIX platforms include a Unicode font.