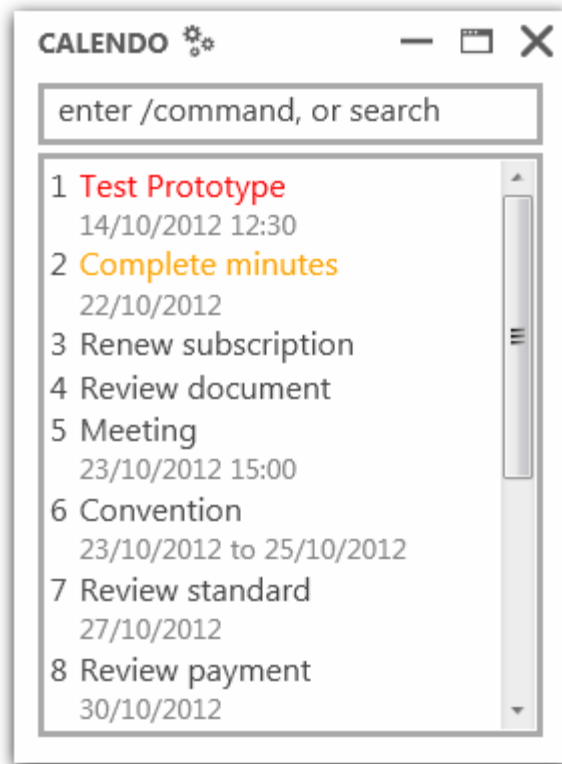






Calendo



			
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User Guide

1. Introduction

1.1. About Calendo

Calendo is a task planner that allows you to manage tasks efficiently in an easy way. It integrates with Google Calendar so that tasks could be retrieved online from any computer. Its offline mode ensures that you can stay in check even without access to the Internet.

1.2. System requirements

Calendo is compatible with Windows XP, Windows Vista, Windows 7 and Windows 8. Some features such as Google Calendar Integration may require Internet access and a Google account.

2. Features

2.1. User Interface

Calendo's user interface is designed to be easy to use. All commands can be performed by entering them into the command or search box. A command is of the form `/command [parameters]`.

Tasks are displayed in the task list panel, and are sorted by importance. The importance of the task is determined by its time and date.

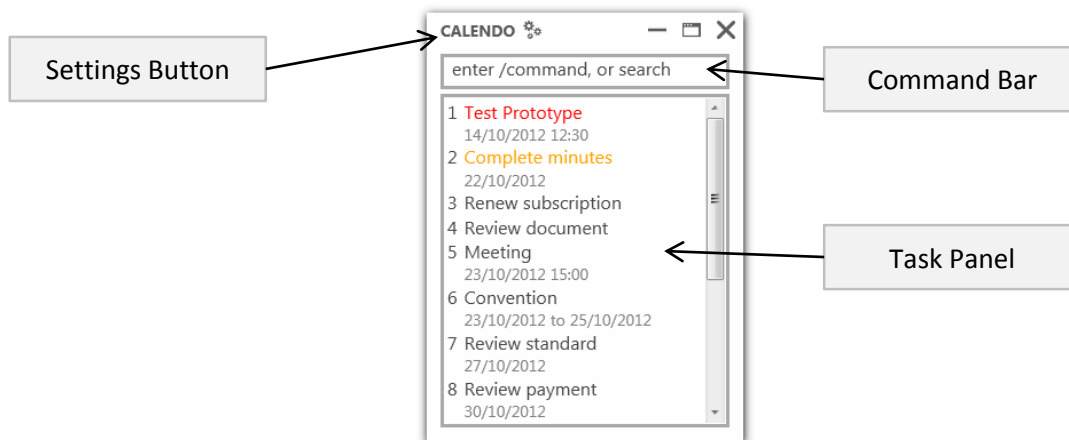


Figure 2.1: User Interface

2.2. Task Notification

There are 3 types of tasks: Floating, Deadline, and Timed. Calendo treats each task differently.

2.2.1. Floating Tasks

Floating tasks are tasks without any due date or time interval specified. Calendo will not provide any special notifications for floating tasks.

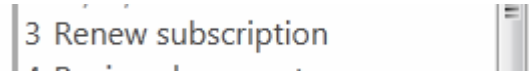


Figure 2.2: Floating Task

2.2.2. Deadline Tasks

Deadline tasks are tasks that have a specific due date or time.

Deadline tasks would be notified 24 hours before it is due. When this occurs, the task is highlighted in orange in the task list. When the task is overdue, the task would be highlighted in red, and Calendo would display a prompt to the user.

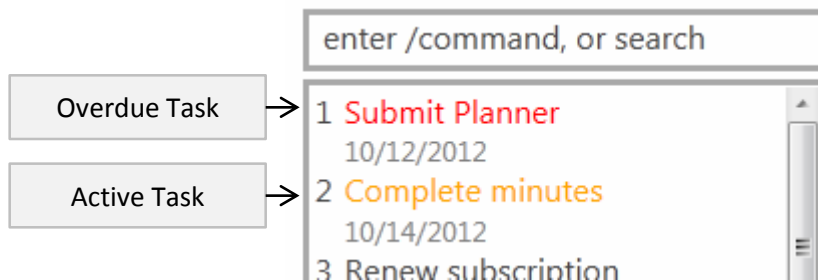


Figure 2.3: Task notification for Deadline Tasks

2.2.3. Timed Tasks

Timed tasks are tasks spanning over a period of time.

Timed tasks are similar to deadline tasks in that Calendo will provide a notification 24 hours before the timed task begins. When the time interval of the timed task has lapsed, the task will be marked as overdue.



Figure 2.4: Timed Task

2.3. Google Calendar Integration

Google Calendar integration allows you to modify tasks online via Google Calendar, and have them synchronized with Calendo so that you can access the tasks from within the application.

2.4. Auto-Suggest

The Auto-Suggest feature is designed to give immediate feedback as to what each command does. Typing a “/” immediately activates the feature, displaying a list of available commands along with their description.

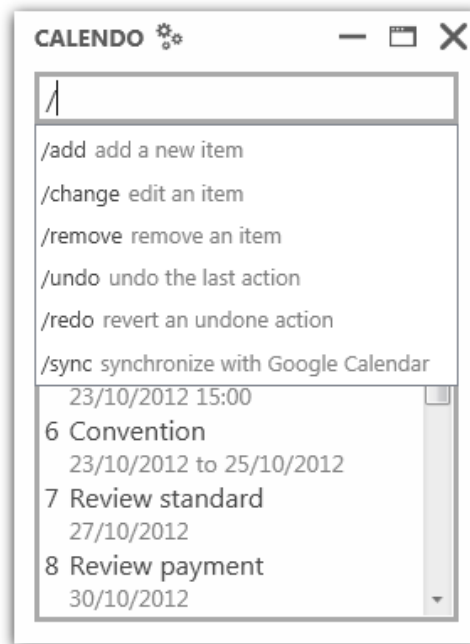


Figure 2.4: Auto suggest

3. Quick start

3.1. Setting up Calendo

Calendo does not require installation. Simply run the executable at where it is. If it Calendo is run for the first time, it would create several new files in the same folder.

3.2. Adding tasks

Tasks can be added by entering **/add** command into the search box, followed by the description of the task. Tasks can be assigned a date and time to the task using the **/date** and **/time** parameters respectively.

/add [Description] **/date** [Day/Month/Year] **/time** [Hour:Minutes]

The date and time parameters are optional.

Example: To create a floating task

`/add Prepare chicken`

This adds “Prepare chicken” to the list of tasks. As no date and time is specified, it is treated as a floating task and would remain on the list of tasks until it is removed.

Example: To create a deadline task at a certain date

`/add Meeting /date 18/10`

This adds “Meeting” to the list of tasks, and will notify the user of the task nearing the 18th of October. For more information on task notifications, refer to 2.2 Task Notification.

The date is in the form of Day/Month/Year. Specifying the year is optional, and if it is omitted Calendo will assume that the event occurs on the closest matching date in the future.

Example: To create a deadline task at a certain time

`/add Meeting /time 11:00 AM`

Calendo will notify the user of the task at 11:00 AM on the same day. If the current time is past 11:00 AM, Calendo will assume it is for the following day.

If AM/PM is not specified, it is assumed that the time follows the 24-hour clock.

Example: To create a deadline task on a certain date and time

`/add Meeting /date 18/9 /time 11:00 AM`

Calendo will notify the user of the task on 18th September at 11:00 AM.

Example: To create a timed task on a certain time range

`/add Exhibition /date 19/9-21/9`

Calendo will notify the user of the task near the 19th to 21st of September.

3.3. Removing tasks

To remove the task, use the `/remove` command and specify the task number that appears to the left of the task. Calendo does not automatically remove tasks; users should remove them when they are completed.

`/remove [Task number]`

Example: To remove the first task

`/remove 1`

3.4. Modifying tasks

To modify a task, use the **/change** command and specify the task number. Immediately following the command, type the new description, the time and date and press enter.

/change [Task Number] [Description] **/date** [Day/Month/Year] **/time** [Hour:Minutes]

The description, date, and time parameters are optional. If a parameter is omitted, it will remain unchanged.

Example: To change the description of the first task on the list

/change 1 Flight to Hong Kong

Example: To change the time of the first task on the list

/change 1 **/time** 11:00 AM

If the task is originally a floating task, it would be converted to a deadline task.

Example: To convert a task from a deadline task to a floating task

/change 1 **/date** **/time**

The date and time parameter is provided but their parameter values are omitted.

Example: To change the date of the first task

/change 1 **/date** 19/11

Example: To change multiple parameters

/change 1 Flight to Hong Kong **/date** 19/11 **/time** 11:00 AM

3.5. Searching for tasks

To search for a particular task, simply type the search query into the Command Bar. The results should appear immediately. Tasks can be searched either by description or by due date.

Search queries must not begin with a **"/**. In the event you wish to search with the **"/** included, add a space to the front of the query.

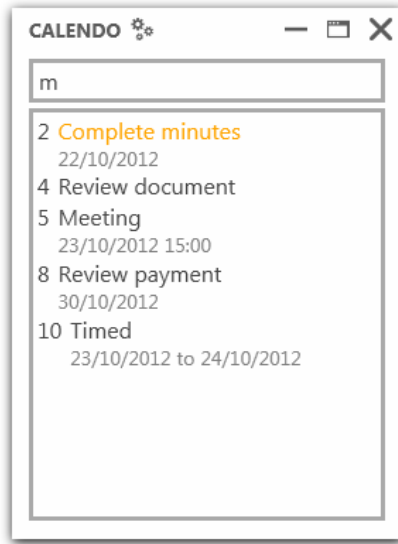


Figure 3.1: Searching for tasks

3.6. Undo an operation

To undo an operation performed by a command, use the `/undo` command. To undo an operation performed by the undo command, use the `/redo` command. Both commands do not have any parameters.

Example: To undo an operation
`/undo`

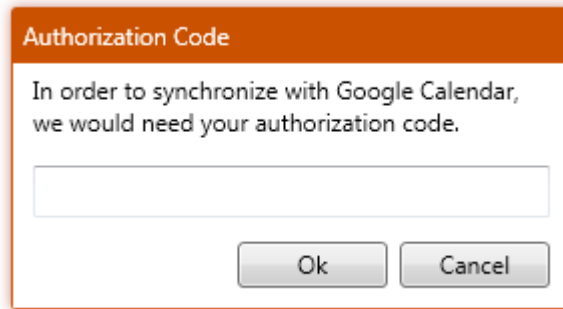
Example: To undo the undo operation
`/redo`

3.7. Synchronize with Google Calendar

To synchronize with the Google Calendar, use the `/sync` command to synchronize changes done in Calendo to Google Calendar and vice versa. The `/sync` command does not have any parameters.

Example: To synchronize with Google Calendar
`/sync`

When the command is used, you may be prompted for an authorization code. Simply sign in using your Google Account and paste the authorization code into the form shown.



A dialog box titled "Authorization Code" with an orange header bar. The text inside reads: "In order to synchronize with Google Calendar, we would need your authorization code." Below the text is a single-line text input field. At the bottom right are two buttons: "Ok" and "Cancel".

Figure 3.2: Authorization form

Developer Manual

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1. Introduction

Calendo is a task management application designed to help users manage their tasks efficiently. This developer guide aims to introduce you to the inner workings of Calendo, and assumes you have experience working with C#. **User Interface** developers should also have some knowledge of XAML and the Windows Presentation Foundation.

1.1. Component Overview

Calendo is broken up into several components, as shown in figure 1.1.

- **User Interface** (Section 2, page 11): The **User Interface** component consists of the Graphical User Interface (GUI) and handles user interaction. The component is simply referred to as “Calendo” in code.
- **Logic** (Section 3, page 14): The **Logic** component handles commands that the user provides through the **User Interface**. This component decides what actions are to be performed based on the supplied command. This component acts as a wrapper between **User Interface** and other components such as **Google Calendar** and **Data**.
- **Data** (Section 4, page 18): The **Data** component handles data storage. The component stores data and allows for the retrieval of information to be used at runtime.
- **Google Calendar** (Section 5, page 23): The **Google Calendar** component handles synchronization with the Google Calendar web service, including authentication.

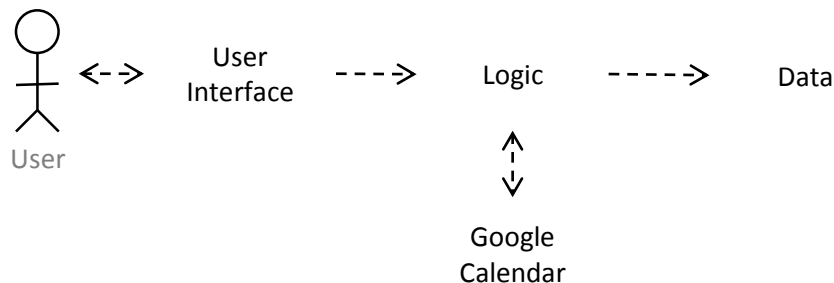


Figure 1.1: Architecture Overview

2. User Interface

The **User Interface** component is responsible for handling all user interactions, providing a means for users to input commands as well as displaying a list of all the tasks Calendo is handling. The main window and its behavior is defined in the `MainWindow` class, as well as the corresponding XAML document containing the markup for the interface.

The `UiViewModel` class is used as a façade for the `MainWindow` class to perform its functions: this class acts as a source task data and auto suggest information, and a sink for user input to be routed to the **Command Processing** component. Data from `UiViewModel` is displayed in `MainWindow` through the use of data bindings.

This component also contains several converter classes, found in the `Calendo.Converters` namespace. These classes are `EntryToBrushConverter`, `EntryToDateTimeStringConverter`, `EntryToDateTimeVisibilityConverter`, and `StringArrayToStringConverter`. Each of these converter classes implements the `IValueConverter` interface, and is used with a data-binding that passes it an `Entry` object with the exception of `StringArrayToStringConverter`, which takes in an array of strings.

Auto Suggest logic is found in the `AutoSuggest` class, with an accompanying `AutoSuggestEntry` class used to model entries that appear in the suggestion list.

Finally, the `UiTaskHelper` class contains several methods used to assist in comparing `Entry` objects in order to sort them.

2.1. MainWindow

This class contains methods used as event handlers for user interaction, as well as an instance of the `UiViewModel` class.

Unlike other components in Calendo, `MainWindow` has no publicly accessible properties or methods, and is not designed to be instantiated or used by other modules. This portion of the document hence assumes the reader will be extending or modifying its functionality.

2.1.1. MainWindow Properties

Property Name	Description
ViewModel: <code>UiViewModel</code>	<code>UiViewModel</code> instance. Used to display task and auto suggest data and handle commands.

2.1.2. MainWindow Methods

Method Name	Description
<code>MainWindow()</code>	Constructor. Creates and initializes the component.
<code>DateFilter(object o)</code>	Predicate used in <code>FilterListContents</code> . Used to filter the task list for items within a certain date range.
<code>DeleteSelectedTask()</code>	Method used to delete a task when a user clicks the Delete button on it in the Task List.
<code>FocusOnTaskList()</code>	Method used to set keyboard focus away from the Command Bar.

Method Name	Description
FilterListContents()	Method used to filter the Task List.
SearchFilter(object o)	Predicate used in FilterListContents. Used to filter the task list for items matching the user's search term.
SetCommandFromSuggestion()	Method used to fill in the appropriate command when the user selects an item from the Auto Suggest list.
AutoSuggestListKeyDown(object sender, KeyEventArgs e)	Event handler triggered after a keystroke has been detected in the Auto Suggest list. Used to move keyboard focus between the list and the Command Bar, and select a suggestion from the list.
AutoSuggestListMouseUp(object sender, MouseButtonEventArgs e)	Event handler triggered after a mouse click occurs in the Auto Suggest list. Used to select a suggestion from the list.
BtnSettingsClick(object sender, RoutedEventArgs e)	Event handler triggered when the Settings button is clicked.
CommandBarLostFocus(object sender, RoutedEventArgs e)	Event handlers triggered when the Command Bar has lost or gained focus. Used to show or hide the "Enter Command" prompt appropriately.
CommandBarGotFocus(object sender, RoutedEventArgs e)	
CommandBarKeyUp(object sender, KeyEventArgs e)	Event handler triggered after a keystroke has been detected in the Command Bar. Used to send user input to UiViewModel as well as filter the task list.
CloseWindow(object sender, RoutedEventArgs e)	Event handlers triggered when the Close, Minimize, or Maximize buttons are clicked.
MinimiseWindow(object sender, RoutedEventArgs e)	
MaximiseWindow(object sender, RoutedEventArgs e)	
DeleteHandler(object sender, ExecutedRoutedEventArgs e)	Event handler triggered when the Delete key is pressed on the keyboard. Used to delete the selected item from the list.
DragWindow(object sender, MouseButtonEventArgs e)	Event handler triggered when a mouse click occurs on the title bar area. Used to toggle the maximize state of the window and allow it to be moved around the screen.
GridMouseDown(object sender, MouseButtonEventArgs e)	Event handler triggered when a mouse click occurs in the main Grid control. Used to set keyboard focus away from the Command Bar.
UndoHandler(object sender, ExecutedRoutedEventArgs e)	Event handlers triggered when the key combinations Ctrl+Z or Ctrl+Y are pressed. Used to Undo or Redo the last action.
RedoHandler(object sender, ExecutedRoutedEventArgs e)	
WindowStateChange(object sender, EventArgs e)	Event handler triggered when the window shifts between states (maximized, normal, or minimized). Used to adjust the window borders.

2.2. EntryToBrushConverter

This class is used in the MainWindow.xaml control to color tasks in the task list according to their current status (ongoing, overdue, or normal).

2.2.1. EntryToBrushConverter Methods

Method Name	Description
Convert(object value, Type targetType, object parameter, CultureInfo culture)	Takes in an Entry, processes it, and returns a Brush with a colour appropriate for the entry's status.

Method Name	Description
IsTaskOverdue(Entry currentEntry)	Takes in an Entry, returns true if it is overdue, false otherwise.
IsTaskOngoing(Entry currentEntry)	Takes in an Entry, returns true if it is ongoing, false otherwise.
ConvertBack(object value, Type targetType, object parameter, CultureInfo culture)	Unimplemented Interface member. Will throw a NotImplementedException if called.

2.3. EntryToDateTimeStringConverter

This class is used in the MainWindow.xaml control to format and display the start and end dates of tasks in a human-readable format.

The data-binding used with this class must also pass it a string parameter of either “StartDate” or “EndDate” depending on which date is to be used.

2.3.1. EntryToDateTimeStringConverter Methods

Method Name	Description
Convert(object value, Type targetType, object parameter, CultureInfo culture)	Takes in an Entry and a string parameter, returns a string of the specified date (start/end) in a human-readable format.
ConvertBack(object value, Type targetType, object parameter, CultureInfo culture)	Unimplemented Interface member. Will throw a NotImplementedException if called.

2.4. EntryToDateTimeVisibilityConverter

This class is used in the MainWindow.xaml control to properly display tasks with or without start/end dates. If a task has no start or end date, it is displayed as a single-line entry consisting of only its description; if it does, the start (and end date, if applicable) are displayed underneath the description text. This converter is used to determine if the second line should be hidden or displayed, and if so, whether or not separator text is needed between start and end date.

The data-binding used with this class must also pass it a string parameter of either “StackPanel” or “RangeText”, depending on if the converter is being used to show/hide the second line as a whole, or the separator text alone.

2.4.1. EntryToDateTimeStringConverter Methods

Method Name	Description
Convert(object value, Type targetType, object parameter, CultureInfo culture)	Takes in an Entry and a string parameter, returns Visibility.Visible or Visibility.Collapsed depending on whether the Entry has a start/end time.
ConvertBack(object value, Type targetType, object parameter, CultureInfo culture)	Unimplemented Interface member. Will throw a NotImplementedException if called.

2.5. StringArrayToStringConverter

This class is used in the `MainWindow.xaml` control to format the list of aliases that appear under each suggestion in the Auto Suggest list.

2.5.1. StringArrayToStringConverter Methods

Method Name	Description
<code>Convert(object value, Type targetType, object parameter, CultureInfo culture)</code>	Takes in a string array, returns a string consisting of each of the elements in the array separated with commas (or “none” if the array is empty.)
<code>ConvertBack(object value, Type targetType, object parameter, CultureInfo culture)</code>	Unimplemented Interface member. Will throw a <code>NotImplementedException</code> if called.

2.6. AutoSuggest

This class is used to display a list of suggested commands based on the user’s input. It maintains a basic dictionary of the various commands accepted by Calendo, as well as an accompanying description for each.

2.6.1. AutoSuggest Properties

Property Name	Description
<code>COMMAND_INDICATOR: char</code>	Constant, set to the command prefix used by Calendo (“/” at the time of this writing.)
<code>SuggestionList: List<AutoSuggestEntry></code>	The list of suggestions to be displayed in the User Interface.

2.6.2. AutoSuggest Methods

Method Name	Description
<code>AutoSuggest(Dictionary<string, string[]> aliasDictionary)</code>	Constructor. Initializes this module, and prepares the Master List of entries. Takes in a dictionary containing command types and the corresponding aliases.
<code>AddEntryFromString(Dictionary<string, string[]> aliasDictionary, string currentCommand)</code>	Method used to populate the list of suggestions. Takes in the dictionary of aliases and the current command to be added to the list.
<code>SetSuggestions(string input)</code>	Method used to trigger the generation of suggestions. Takes in the input for which suggestions should be provided.
<code>GenerateSuggestionsFromInput(string input)</code>	Method used to determine if Auto Suggest should be providing command suggestions, or displaying help instructions for a specific command. Called from <code>SetSuggestions</code> .
<code>MatchInputToInstruction(string inputCommand)</code>	Method used if Auto Suggest is to display help instructions for a specific command. Takes in the command to display instructions for.
<code>MatchInputToCommandSuggestion(string inputCommand)</code>	Method used if Auto Suggest is to display command suggestions. Takes in the input for which suggestions should be provided.

Method Name	Description
CheckAliasesForCommand(<code>string</code> inputCommand, <code>AutoSuggestEntry</code> entry)	Method used to determine if an <code>AutoSuggestEntry</code> contains an alias entered by the user. Takes in the entered alias and an entry, returns <code>true</code> if the alias is found in the entry and <code>false</code> otherwise.

2.7. AutoSuggestEntry

This class is used to model the entries that appear in the Auto Suggest list. There are two types of entries: Master and Detail.

Master entries appear when the user starts to enter a command in the Command Bar, and consist of the accepted command, an accompanying description, and the various aliases (alternate commands that have the same action) that can be entered instead.

Detail entries appear when the user has entered a command, and consist of the command and a parameter guide (showing the various parameters that command is used with.)

2.7.1. AutoSuggestEntry Properties

Property Name	Description
Command: <code>string</code>	The command keyword.
Description: <code>string</code>	The description of the command (for Master entries), or the parameter guide (for Detail entries).
Type: <code>EntryType</code>	The type of this entry: Master or Detail.
Aliases: <code>string[]</code>	Any aliases that can be used as a replacement for this command.
IsMaster: <code>bool</code>	Whether or not this entry is a Master entry: <code>true</code> if so, <code>false</code> otherwise.
HasAliases: <code>bool</code>	Whether or not this entry has any aliases: <code>true</code> if so, <code>false</code> otherwise.

3. Logic

The **logic** component performs commands issued by the user. The component is located in the `Calendo.Logic` namespace. The component classes are illustrated in figure 3.1.

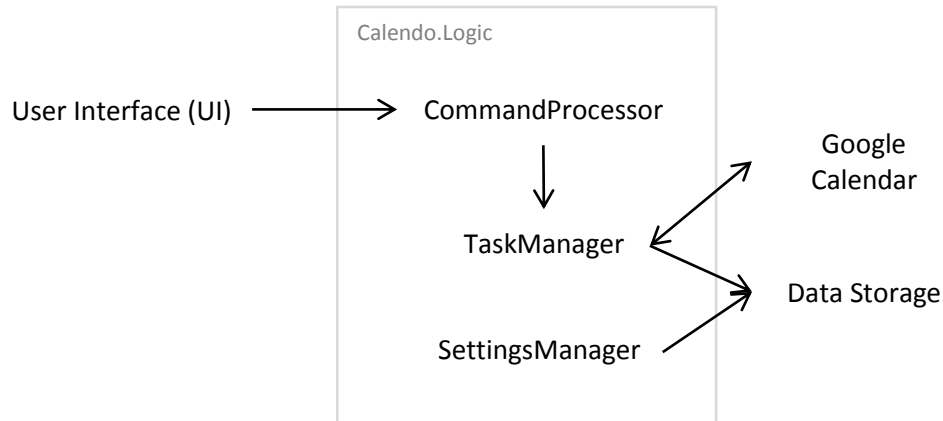


Figure 3.1: Task Manager Component Overview

A sequence of events when a command is invoked is illustrated by figure 3.2. When a user enters a command into the command box in the **User Interface**, the command gets passed into **CommandProcessor** as a string. **CommandProcessor** decides which action to take, and calls the corresponding method in **TaskManager**. **TaskManager** manipulates the information in **Storage**. After the procedure, the **User Interface** component would request the list of tasks and display it to the user.

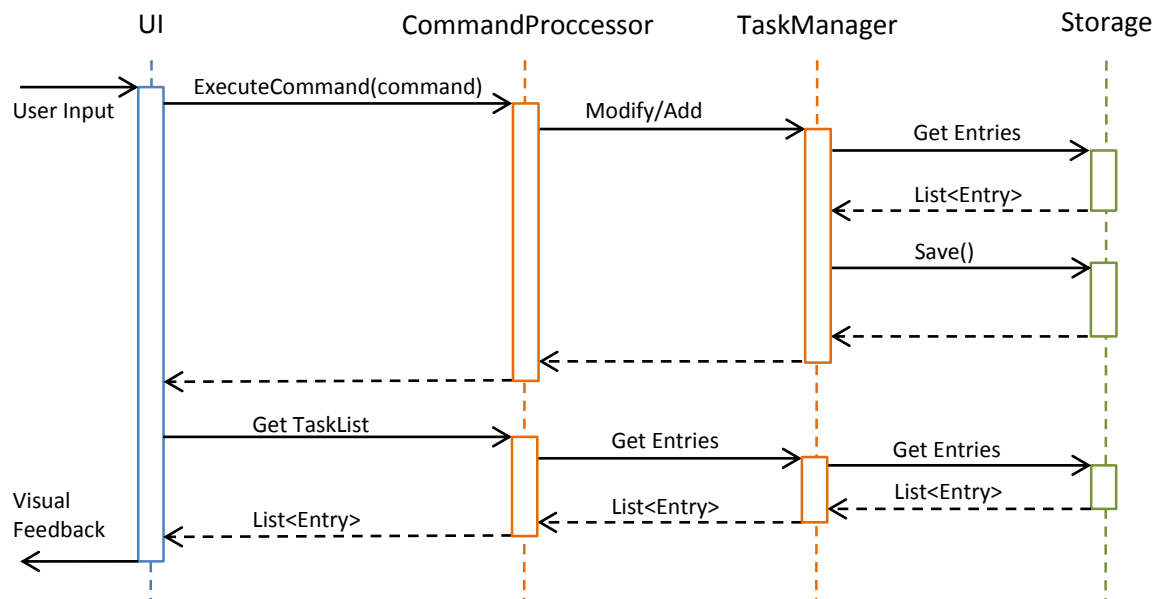


Figure 3.2: General processing of user input

3.1. CommandProcessor

The CommandProcessor class is used for processing user input, and determines which actions performed based on the provided input. The command entered by the user is passed into the ExecuteCommand method by the **User Interface** component. The TaskList property is updated after the method is called.

Example: Command Execution

```
CommandProcessor commandProcessor = new CommandProcessor();
string inputString = "/add Task Description";
commandProcessor.ExecuteCommand(inputString);
```

Example: Accessing the current task list

```
CommandProcessor commandProcessor = new CommandProcessor();
List<Entry> result = CommandProcessor.TaskList;
```

3.1.1. CommandProcessor Properties

Property Name	Description
TaskList: <code>List<Entry></code>	Gets the list of tasks returned by the last executed command.

3.1.2. CommandProcessor Methods

Method Name	Description
CommandProcessor()	Constructor. Creates a CommandProcessor "module".
ExecuteCommand(<code>string</code> userInput)	Executes the command and stores the result in TaskList.

3.2. TaskManager

The TaskManager class performs the actions requested by the CommandProcessor class. Some of these actions are passed directly to other components (i.e. a pass-through), such as the Import() method to the **Google Calendar** component.

Note: The TaskManager class is a *singleton*, which means there can only be one instance of TaskManager. This instance can be accessed from the Instance static property.

TaskManager has a subscriber functionality that allows other components to be notified when an operation has made modifications to the information stored.

Example: Adding a subscription

```
TaskManager.Instance.AddSubscriber(new TaskManager.UpdateHandler(this.UpdateMethod));
```

3.2.1. TaskManager Properties

Property Name	Description
Entries: <code>List<Entry></code>	Gets the list of entries.
Instance: <code>TaskManager</code>	Static property. Gets a TaskManager instance.

3.2.2. TaskManager Methods

Method Name	Description
<code>TaskManager()</code>	Private constructor. Load entries from archive file. To obtain an instance of TaskManager, use the Instance property.
<code>Add(string description, string startDate, string startTime, string endDate, string endTime): void</code>	Adds a task.
<code>AddSubscriber(Delegate handler): void</code>	Adds a handler to the list of subscribers.
<code>Change(int id, string description, string startDate, string startTime, string endDate, string endTime): void</code>	Change parameters of a task. Parameters that are empty would be ignored.
<code>Get(int id): Entry</code>	Get the task by ID.
<code>Redo(): void</code>	Revert changes performed by undo
<code>Remove(int id): void</code>	Remove a task by ID.
<code>Import(): void</code>	Import tasks from Google Calendar.
<code>Export(): void</code>	Export tasks from Google Calendar.
<code>Undo(): void</code>	Undo the last operation (excluding itself).

3.2.3. TaskManager Dependencies

The TaskManager class is dependent on StateStorage (from Calendo.Data). The StateStorage class is used for storing entries into a file for later retrieval. The TaskManager class also depends on the TaskTime class, but only as a temporary data representation for date and time. The TimeConverter class is used to convert strings into a suitable time format.

The TaskManager can have multiple instances of the GoogleCalendar class, as each invocation of the import and export methods create an instance of the class on a separate thread. GoogleCalendar runs on a separate thread since operations in the GoogleCalendar class may require significant resource usage depending on the number of tasks involved.

There can only be one instance of TaskManager. This is to allow for concurrent modification of information shared between different components.

The dependencies for TaskManager are shown in figure 3.3.

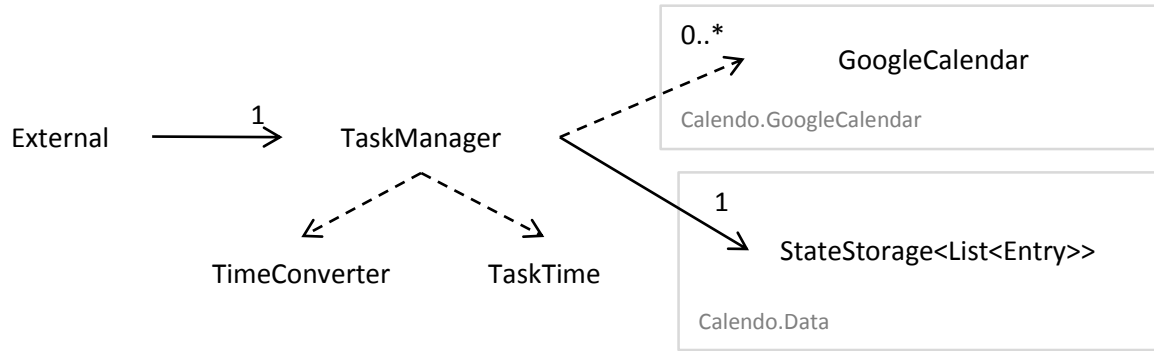


Figure 3.3: TaskManager Dependencies

3.3. SettingsManager

The SettingsManager class provides a means to access and modify settings. All settings are in string format. Objects can be converted into string format using serialization formats such as XML or JSON.

3.3.1. SettingsManager Properties

There are no properties for SettingsManager. Settings are retrieved and modified via methods.

3.3.2. SettingsManager Methods

Method Name	Description
SettingsManager()	Constructor. Load settings from settings file.
GetSetting(string settingName): string	Retrieves the value of the setting for the specified setting.
SetSetting(string settingName, string settingValue): void	Sets the value of the setting for the specified setting. If the setting exists, its value would be overwritten.

3.3.3. SettingsManager Dependencies

The SettingsManager class is dependent on the Storage (from Calendo.Data) and KeyPair classes. The Storage class is used for storing settings into a file for later retrieval. The KeyPair class is a serializable class used for storing Key-Value pairs and is only used when loading and saving settings. The dependencies of SettingsManager are shown in figure 3.4.

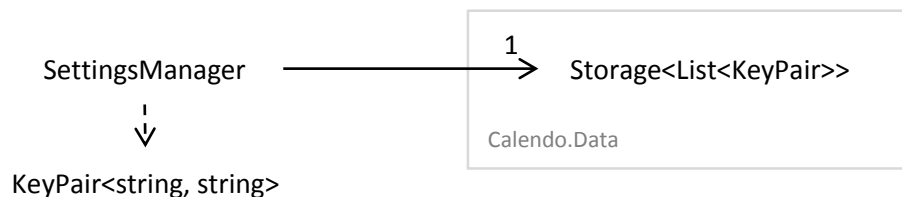


Figure 3.4: SettingsManager Dependencies

4. Data Storage

The **Data Storage** component is used to store information used by Calendo for later retrieval. There are two main classes in this component, `Storage` and `StateStorage`. These classes are part of the `Calendo.Data` namespace. External classes such as `SettingsManager` and `TaskManager` depend on the `Storage` and `StateStorage` classes respectively. The component is illustrated in figure 4.1.

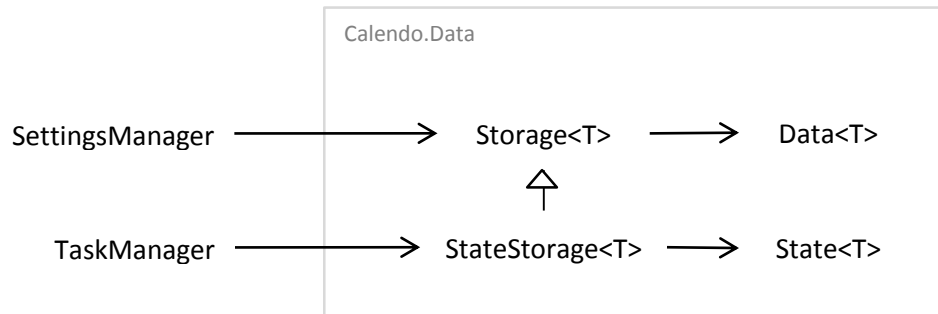


Figure 4.1: Data Storage component overview

4.1. Storage<T>

The `Storage` class is used as a general purpose data storage system. As it is a generic class (hence the “<T>”), runtime objects can be saved as they are, and returned back to their original state upon retrieval. The `Storage` class saves the object into an XML file, which is a human-readable format.

The `Storage` class saves to “data.txt” by default.

Note: Only *publicly accessible* properties that can be modified are saved. The class must also be publicly accessible in order to be supported by the `Storage` class. Interfaces and non-serializable classes are not supported by the `Storage` class.

Example: Saving

```
Storage<Entry> myStorage = new Storage<Entry>();
myStorage.Entries = new Entry();
myStorage.Save();
```

Example: Loading

```
Storage<Entry> myStorage = new Storage<Entry>();
myStorage.Load();
Entry current = myStorage.Entries;
```

4.1.1. Storage<T> Properties

Property Name	Description
Entries: <code>T</code>	Gets or sets the object stored by Storage.

4.1.2. Storage<T> Methods

Method Name	Description
<code>Storage()</code>	Constructor. Use the default “data.txt” as file path.
<code>Storage(string filePath)</code>	Constructor. Sets the file path used by Storage class.
<code>Load(): bool</code>	Loads the current object from the file. Returns true on success, false if an error occurred.
<code>Save(): bool</code>	Saves the current object to the file. Returns true on success, false if an error occurred.

4.1.3. Storage<T> Dependencies

The Storage class is dependent on the Data class. The Data class serves as a wrapper to for the data to be stored, and is mainly used for controlling the resulting XML format. The Storage class uses the XMLSerializer class (part of the .NET framework) to serialize and deserialize objects to and from XML. The Storage class dependencies is shown in figure 4.2.

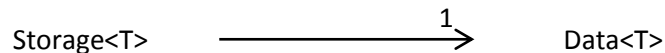


Figure 4.2: Storage<T> Dependencies

4.2. StateStorage<T>

The StateStorage class has almost the same functionality as the Storage class. Unlike the Storage class, StateStorage supports the undo and redo feature, allowing you to revert changes made to your object.

The StateStorage class can be used in the same way as the Storage class.

Note: The file produced by StateStorage is usually not compatible with Storage. However, the Storage class can be used to read files produced by StateStorage by using the State class to wrap the original class which was saved.

```
Storage<State<Entry>> compatibleStorage = new Storage<State<Entry>>();
```

Note: The generic type T to be used with StateStorage must be *serializable*. In order to tag a class as serializable, add the [Serializable] tag to the beginning of the class.

```
[Serializable]
public class Entry {
...
}
```

4.2.1. StateStorage<T> Properties

Property Name	Description
Entries: <code>T</code>	Gets or sets the object stored by StateStorage.
HasRedo: <code>bool</code>	Returns true if there are available redo states, false otherwise.
HasUndo: <code>bool</code>	Returns true if there are available undo states, false otherwise.

4.2.2. StateStorage<T> Methods

Method Name	Description
StateStorage()	Constructor. Use the default "data.txt" as file path.
StateStorage(<code>string</code> filePath)	Constructor. Sets the filePath used by StateStorage class.
Load(): <code>bool</code>	Loads the current object from the file. Returns true on success, false if an error occurred.
Redo(): <code>bool</code>	Reverses changes done by the Undo() method. Returns true if the current state has changed, false if no changes were made.
Save(): <code>bool</code>	Saves the current object to the file. Saving adds a state to the storage. Returns true on success, false if an error occurred.
Undo(): <code>bool</code>	Reverts the current state to the previous state. Returns true if the current state has changed, false if no changes were made.

4.2.3. StateStorage<T> Dependencies

The StateStorage class inherits from the Storage and depends on the State class. The State class is used to maintain the current state of the object, and stores copies of past revisions of the object. The Storage class is used to save the State class into a file. The dependencies are illustrated in figure 4.3.



Figure 4.3: StateStorage<T> Dependencies

4.3. Data<T>

The Data class is a wrapper that is used by the Storage class. The wrapper class controls the formatting produced by the serializer.

Note: The generic type T must have the default constructor.

4.3.1. Data<T> Properties

Property Name	Description
Value: T	Gets or sets the object represented by Data. Used for serialization.

4.3.2. Data<T> Methods

Method Name	Description
Data()	Constructor. Uses the default constructor for T.

4.3.3. Data<T> Dependencies

The Data class has no dependencies with other classes in Calendo, and is only used to contain a value of the generic type. The dependencies are shown in figure 4.4.

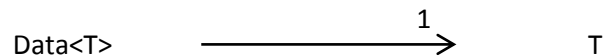


Figure 4.4: State<T> Dependencies

4.4. State<T>

The State class maintains the current and past states of an object. The AddState() method is used to add a state to the list of states. This class supports the Undo() and Redo() methods, which are used for going back and forward in the list of states respectively.

Note: The generic type T must have the default constructor and must be serializable. Refer to section 4.2. StateStorage<T> for an example of how to tag a class as serializable.

4.4.1. State<T> Properties

Property Name	Description
Value: T	Gets or sets the object represented by the current state.
States: List<Data<T>>	Gets or sets the list of states. Used for serialization.
HasRedo: bool	Returns true if there are available redo states, false otherwise.
HasUndo: bool	Returns true if there are available undo states, false otherwise.

4.4.2. State<T> Methods

Method Name	Description
State()	Constructor. Creates an empty state if there is none.
AddState(): void	Adds a state.
Redo(): bool	Revert to a state in the redo stack. Returns true if the current state has changed, false otherwise.
Undo(): bool	Revert to the state before the current state. Returns true if the current state has changed, false otherwise.

4.4.3. State<T> Dependencies

The State class has no dependencies with other classes in Calendo. However, there must be at least one copy of the generic type T in the list of states. If all copies are removed, the State class would create one using the default value of the generic type. The dependencies are shown in figure 4.5.

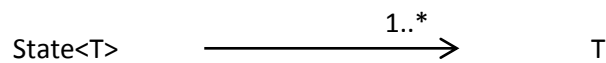


Figure 4.5: State<T> Dependencies

5. Google Calendar

The **Google Calendar** component is responsible for synchronizing the user's tasks with their Google Account. The component layout is shown in figure 5.1.

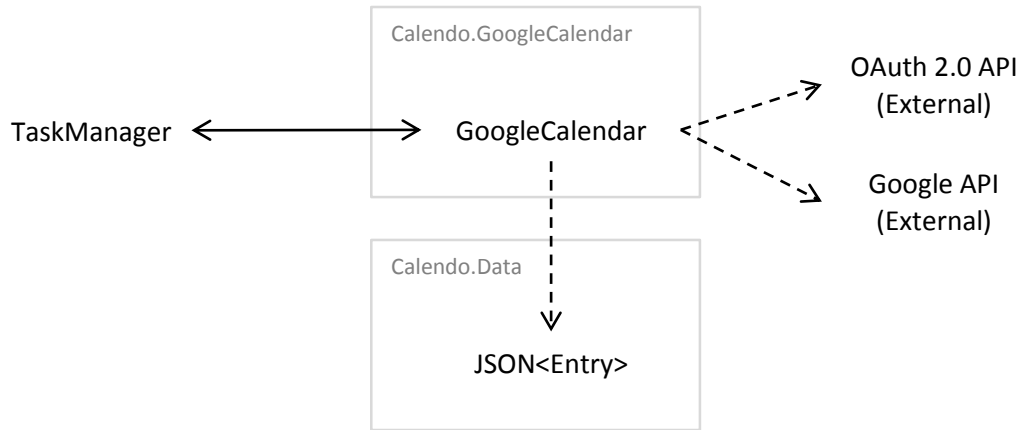


Figure 5.1: Google Calendar Component Overview

5.1. GoogleCalendar

5.1.1. GoogleCalendar Methods

Method Name	Description
Sync(List<Entry> entries): bool	Gets list of tasks and adds it to Google Calendar.
Authorize(): void	Authorizes user's Google Account.
GetAuthentication(NativeApplicationClient provider): string	Returns access token for authentication.
PostTasks(Entry entry, string access_token): bool	Posts a task.
Import(string access_token): string	Imports tasks from Google Calendar.

5.1.2. GoogleCalendar Dependencies

The GoogleCalendar class is dependent on the TaskManager class, which is used to obtain entries to be added to Google Calendar (through the Sync() method). The TaskManager class also calls the Import() method of GoogleCalendar.

The GoogleCalendar component uses several libraries from the Google Calendar API [1]. Authentication is performed using the OAuth 2.0 authorization protocol [2]. Google's API libraries are part of the Google.Apis namespace, while the OAuth 2.0 library is part of the DotNetOpenAuth namespace.

The **Google Calendar** component depends on the JSON class in the Data component to serialize and deserialize objects. The JSON (JavaScript Object Notation) format is used by the Google API to represent runtime objects in a format suitable for web requests or responses.

7. Testing

Automated testing is performed via a separate project solution, which is located in CalendoUnitTests. Visual Studio 2010 Professional or Visual Studio 2012 Express is required for unit testing.

Note: The solution file for unit testing is separate from that of the main Calendo project solution.

Unit testing is currently supported by the Data Storage and Logic components.

7.1. Data Storage

The following tests are supported by the Data Storage component. The Data Storage component consists of the Storage and StateStorage classes.

Test Name	Description
DataEntry	Tests if entries can be modified.
DataIncompatible	Tests situations where the data file is corrupted.
DataLoad	Tests if entries can be loaded from file.
DataSave	Tests if entries persist after saving.
DataState	Tests State class functionality.
DataStateStorage	Tests StateStorage class functionality.
DataUnwritable	Tests situations where the data file is unreadable/locked.
DataJSON	Tests the JSON serialization and deserialization methods.
DataJSONTime	Tests JSON time conversion.

7.2. Logic

The following tests are supported by the SettingsManager class.

Test Name	Description
SMAAdd	Tests if settings can be added.
SMLoad	Tests if settings can be loaded from file.
SMMModify	Tests if settings can be modified and persist after saving.

The following tests are supported by the TaskManager class.

Test Name	Description
TMAdd	Tests if entries can be added.
TMAddInvalid	Tests if malformed entries can be handled properly.
TMChange	Tests if entries can be modified.
TMRemove	Tests if entries can be removed.
TMCreate	Tests if TaskManager can be initialized.
TMUndoRedo	Tests the undo and redo functionality.

The following tests are supported by the CommandProcessor class.

Test Name	Description
CPAdd	Tests the add command.
CPChange	Tests the change command.
CPDelete	Tests the remove command.

8. Change log

8.1. Current

Version 0.4 is a maintenance build. Major changes to its feature set are not expected.

- Refactoring has been performed on several components used by the application.
- In-line task editing has been added.
- Task sorting behavior has been updated to sort by type, followed by time, followed by description.
- **Google Calendar** import and export functionality has been refined. Both import and export operations will override existing tasks.

8.2. Version 0.3

Version 0.3 had several changes to its feature set since version 0.2.

- TaskManager and DebugTool have a notification functionality based on the subscriber pattern.
- TaskManager is now a singleton class to allow for concurrent data modification.
- StateStorage is a subclass of Storage.
- **Google Calendar** export and import functionality has been implemented.
- **Google Calendar** is multi-threaded to allow asynchronous operations for faster performance
- **User Interface** has been changed to increase usability and user appeal.
- Main feature has been changed to **User Interface**.
- Changes to code to improve readability.
- Part of UI functionality has been moved to UiViewModel, loosely based upon the MVVM (Model-View-ViewModel) pattern.

8.3. Version 0.2

Version 0.2 had several architecture changes since version 0.1, some of which are influenced by external feedback.

- Both TaskManager and SettingsManager classes have been moved to the **Logic** namespace.
- CommandProcessor class has been moved to the **Logic** namespace.
- The early stages of the AutoSuggest feature have been implemented.
- Several unit tests have been added, particularly those concerning the **Logic** namespace.
- Portions of the **Google Calendar** component, particularly those concerning authentication, has been integrated to the main application.
- Redundant dependencies in **Data** namespace have been reduced.
- JSON parser has been added to the **Data** namespace.

- TimeConverter class has been added to **Logic** namespace, and subsumes time conversion function of TaskManager class.
- **User Interface** has been changed to increase usability and user appeal.

8.4. Version 0.1

Version 0.1 is the initial build.

- Early progress has been made on the **Data** component.
- A prototype has been made for the **User Interface** component.
- Basic command processing has been implemented.

9. References

[1] Google. (2012 Sep). *Google Apps Calendar API: Downloads*. Retrieved 12 October, 2012 from the World Wide Web: <https://developers.google.com/google-apps/calendar/downloads>

[2] Internet Engineering Task Force. (2012 March). *The OAuth 2.0 Authorization Protocol*. Retrieved 13 October, 2012 from the World Wide Web: <http://tools.ietf.org/html/draft-ietf-oauth-v2-22/>