PDF++ - Developer Guide

By: `Team T12-4` Since: `Feb 2019` Licence: `MIT`

1. Setting up

1.1. Prerequisites

1. **JDK** `9` or later

WARNING	JDK `10` on Windows will fail to run tests in headless mode due to a JavaFX bug. Windows developers are highly recommended to use JDK `9`.

2. **IntelliJ** IDE

NOTE	IntelliJ by default has Gradle and JavaFx plugins installed. Do not disable them. If you have disabled them, go to `File` > `Settings` > `Plugins` to re-enable them.

1.2. Setting up the project in your computer

1. Fork this repo, and clone the fork to your computer
2. Open IntelliJ (if you are not in the welcome screen, click `File` > `Close Project` to close the existing project dialog first)
3. Set up the correct JDK version for Gradle
   a. Click `Configure` > `Project Defaults` > `Project Structure`
   b. Click `New…` and find the directory of the JDK
4. Click `Import Project`
5. Locate the `build.gradle` file and select it. Click `OK`
6. Click `Open as Project`
7. Click `OK` to accept the default settings
8. Open a console and run the command `gradlew processResources` (Mac/Linux: `./gradlew processResources`). It should finish with the `BUILD SUCCESSFUL` message.
   This will generate all resources required by the application and tests.
9. Open `MainWindow.java` and check for any code errors
   a. Due to an ongoing issue with some of the newer versions of IntelliJ, code errors may be detected even if the project can be built and run successfully
   b. To resolve this, place your cursor over any of the code section highlighted in red. Press kbd:[ALT + ENTER], and select `Add '--add-modules=…' to module compiler options` for each error
10. Repeat this for the test folder as well (e.g. check `HelpWindowTest.java` for code errors, and if so, resolve it the same way)

1.3. Verifying the setup

1. Run the `seedu.pdf.MainApp` and try a few commands.
2. Run the tests to ensure they all pass.

1.4. Configurations to do before writing code

1.4.1. Configuring the coding style

This project follows oss-generic coding standards. IntelliJ's default style is mostly compliant with ours but it uses a different import order from ours. To rectify,

1. Go to `File` > `Settings…` (Windows/Linux), or `IntelliJ IDEA` > `Preferences…` (macOS)
2. Select `Editor` > `Code Style` > `Java`
3. Click on the `Imports` tab to set the order
    - For `Class count to use import with '*'` and `Names count to use static import with '*'`: Set to `999` to prevent IntelliJ from contracting the import statements
    - For `Import Layout`: The order is `import static all other imports`, `import java.*`, `import javax.*`, `import org.*`, `import com.*`, `import all other imports`. Add a `<blank line>` between each `import`

Optionally, you can follow the UsingCheckstyle.adoc document to configure Intellij to check style-compliance as you write code.

1.4.2. Updating documentation to match your fork

After forking the repo, the documentation will still have the SE-EDU branding and refer to the `se-edu/addressbook-level4` repo.

If you plan to develop this fork as a separate product (i.e. instead of contributing to `se-edu/addressbook-level4`), you should do the following:

1. Configure the site-wide documentation settings in `build.gradle`, such as the `site-name`, to suit your own project.
2. Replace the URL in the attribute `repoURL` in `DeveloperGuide.adoc` and `UserGuide.adoc` with the URL of your fork.

1.4.3. Setting up CI

Set up Travis to perform Continuous Integration (CI) for your fork. See UsingTravis.adoc to learn how to set it up.

After setting up Travis, you can optionally set up coverage reporting for your team fork (see UsingCoveralls.adoc).

NOTE	Coverage reporting could be useful for a team repository that hosts the final version but it is not that useful for your personal fork.

Optionally, you can set up AppVeyor as a second CI (see UsingAppVeyor.adoc).

NOTE	Having both Travis and AppVeyor ensures your App works on both Unix-based platforms and Windows-based platforms (Travis is Unix-based and AppVeyor is Windows-based)

1.4.4. Getting started with coding

When you are ready to start coding,

1. Get some sense of the overall design by reading Section 2.1, "Architecture".
2. Take a look at Appendix A, *Suggested Programming Tasks to Get Started*.

2. Design

2.1. Architecture

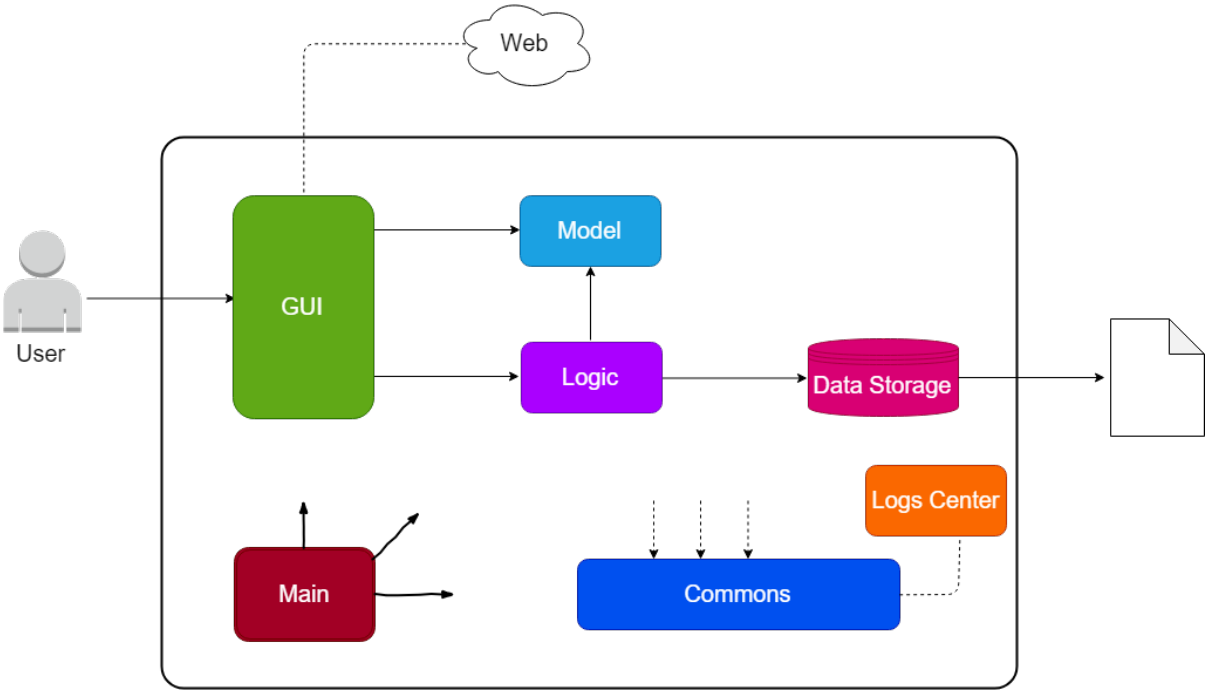


Figure 1. Architecture Diagram

The ***Architecture Diagram*** given above explains the high-level design of the App. Given below is a quick overview of each component.

TIP	The `.pptx` or `.xml` files used to create diagrams in this document can be found in the diagrams folder. To update a diagram, modify the diagram in the pptx or xml file, select the objects of the diagram, and choose `Save as picture`.

`Main` has only one class called `MainApp`. It is responsible for,

- At app launch: Initializes the components in the correct sequence, and connects them up with each other.
- At shut down: Shuts down the components and invokes cleanup method where necessary.

`Commons` represents a collection of classes used by multiple other components. The following class plays an important role at the architecture level:

- `LogsCenter` : Used by many classes to write log messages to the App's log file.

The rest of the App consists of four components.

- `UI`: The UI of the App.
- `Logic`: The command executor.
- `Model`: Holds the data of the App in-memory.
- `Storage`: Reads data from, and writes data to, the hard disk.

Each of the four components

- Defines its *API* in an `interface` with the same name as the Component.
- Exposes its functionality using a `{Component Name}Manager` class.

For example, the `Logic` component (see the class diagram given below) defines it's API in the `Logic.java` interface and exposes its functionality using the `LogicManager.java` class.

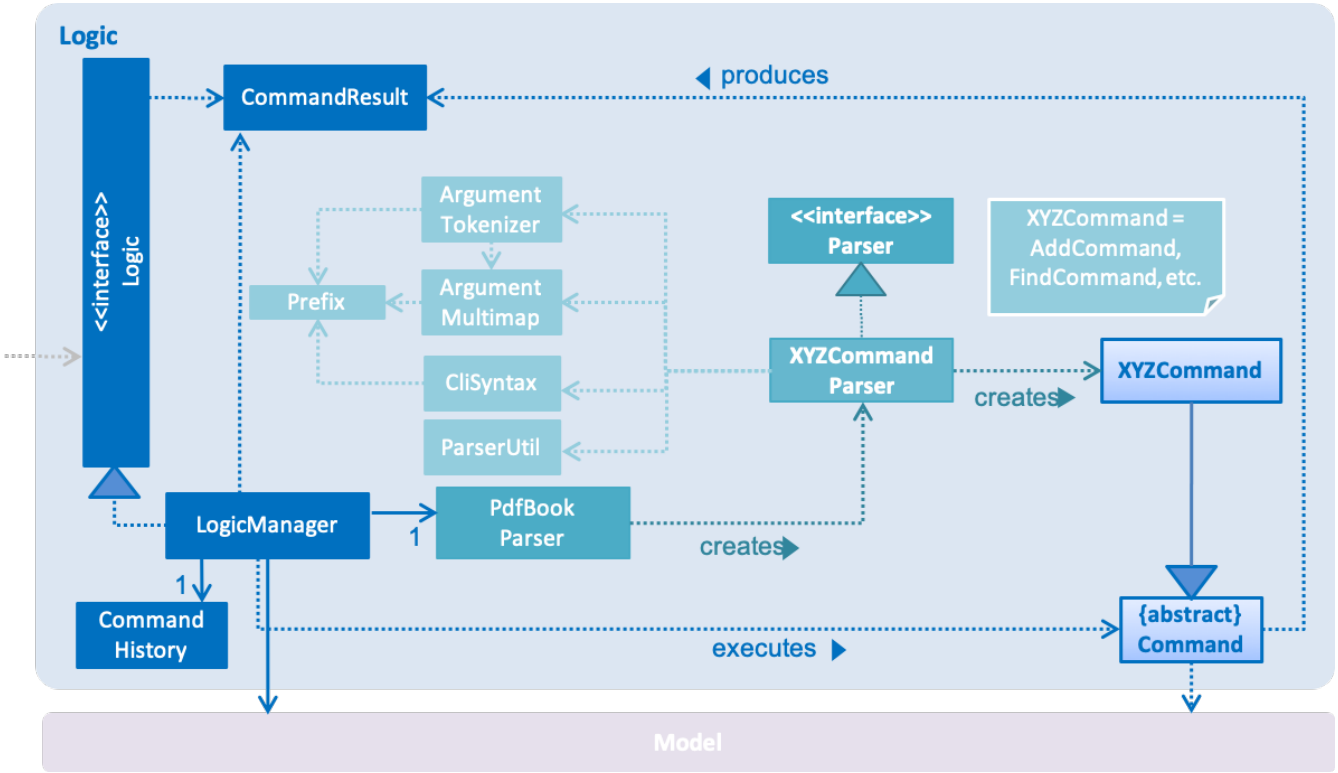


Figure 2. Class Diagram of the Logic Component

How the architecture components interact with each other

The *Sequence Diagram* below shows how the components interact with each other for the scenario where the user issues the command `delete 1`.

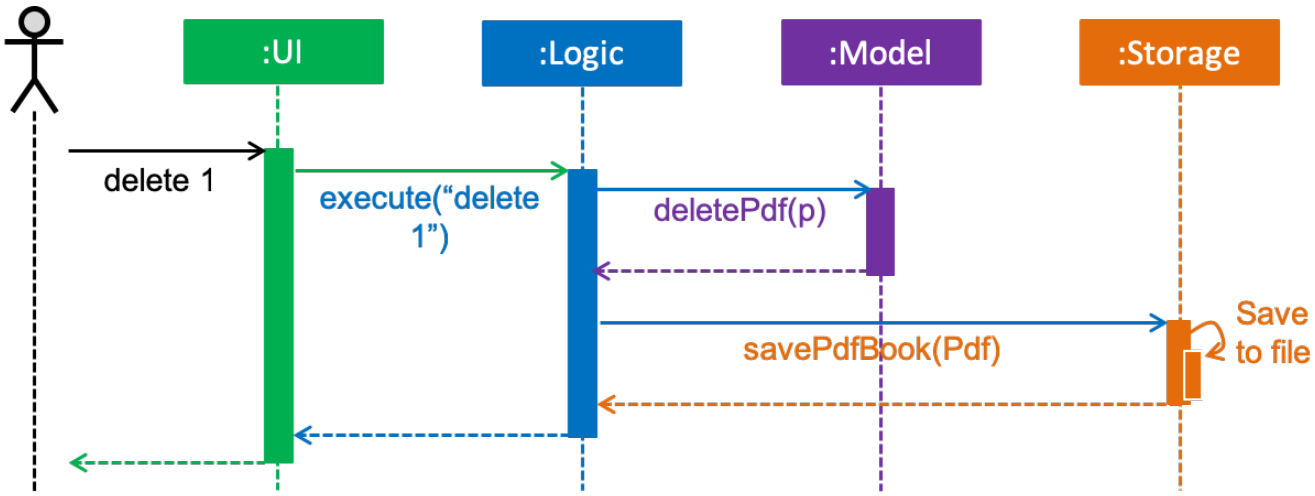


Figure 3. Component interactions for `delete 1` command

The sections below give more details of each component.

2.2. UI component

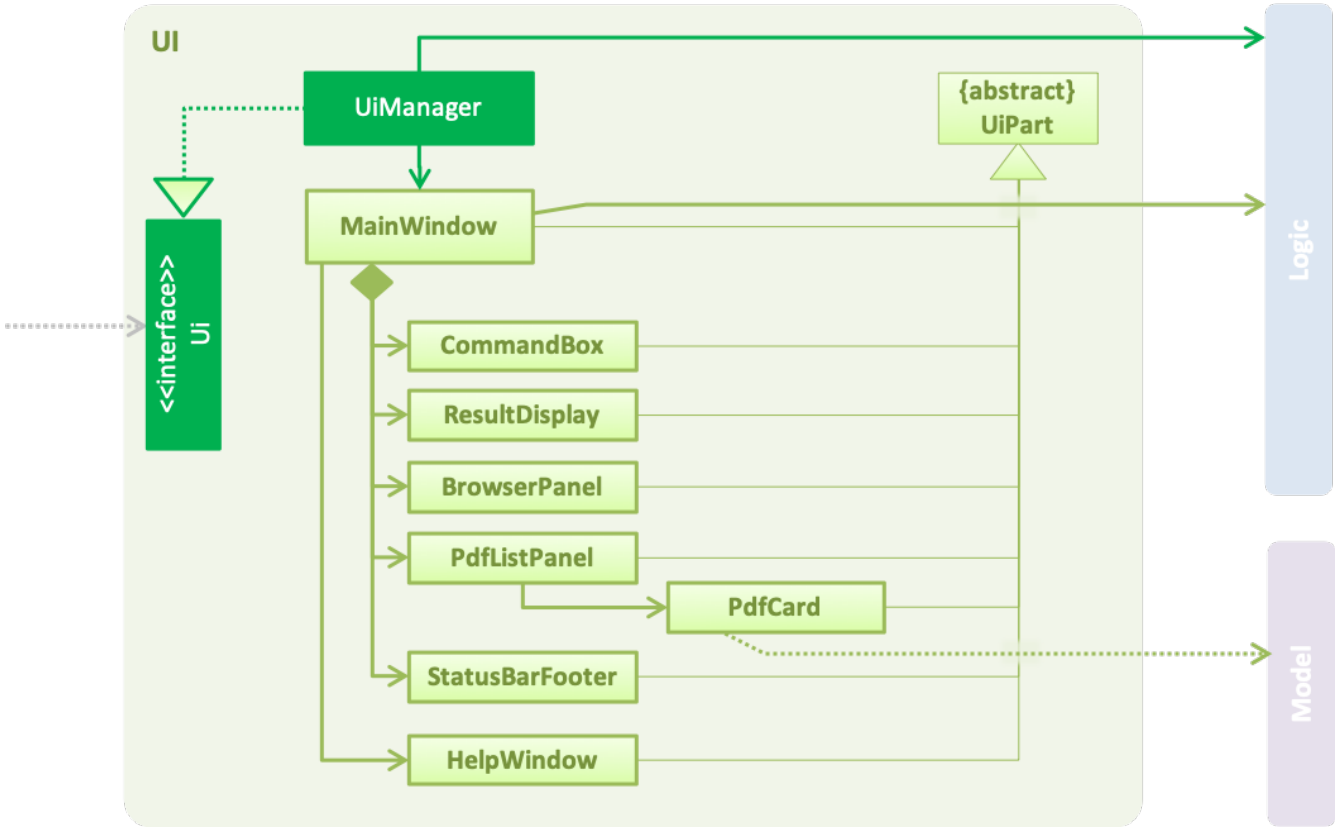


Figure 4. Structure of the UI Component

API : `Ui.java`

The UI consists of a `MainWindow` that is made up of parts e.g.`CommandBox`, `ResultDisplay`, `PdfListPanel`, `StatusBarFooter`, `BrowserPanel` etc. All these, including the `MainWindow`, inherit from the abstract `UiPart` class.

The `UI` component uses JavaFx UI framework. The layout of these UI parts are defined in matching `.fxml` files that are in the `src/main/resources/view` folder. For example, the layout of the `MainWindow` is specified in `MainWindow.fxml`

The `UI` component,

- Executes user commands using the `Logic` component.
- Listens for changes to `Model` data so that the UI can be updated with the modified data.

2.3. Logic component

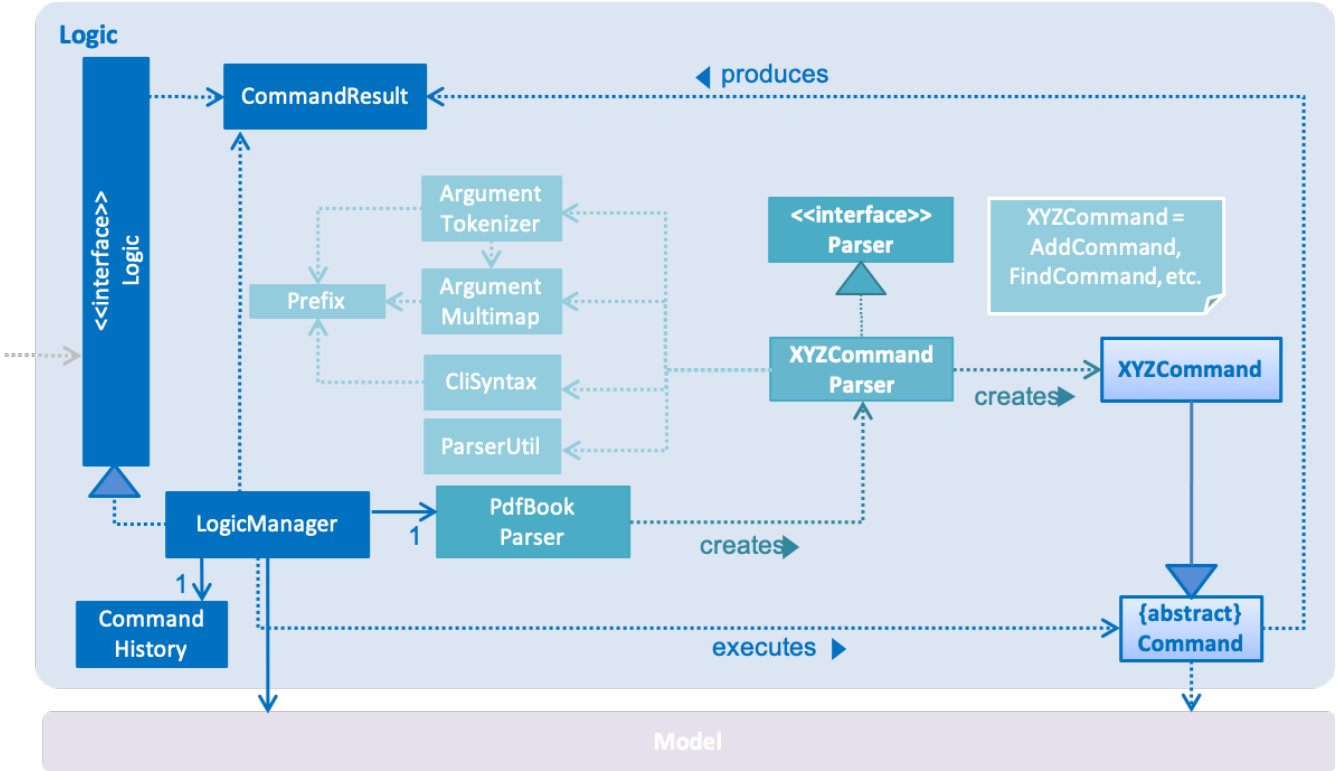


Figure 5. Structure of the Logic Component

API : `Logic.java`

1. `Logic` uses the `PdfBookParser` class to parse the user command.
2. This results in a `Command` object which is executed by the `LogicManager`.
3. The command execution can affect the `Model` (e.g. adding a pdf).
4. The result of the command execution is encapsulated as a `CommandResult` object which is passed back to the `Ui`.
5. In addition, the `CommandResult` object can also instruct the `Ui` to perform certain actions, such as displaying help to the user.

Given below is the Sequence Diagram for interactions within the `Logic` component for the `execute("delete 1")` API call.

[DeletePdfSdForLogic] | *DeletePdfSdForLogic.png*

Figure 6. Interactions Inside the Logic Component for the `delete 1` Command

2.4. Model component

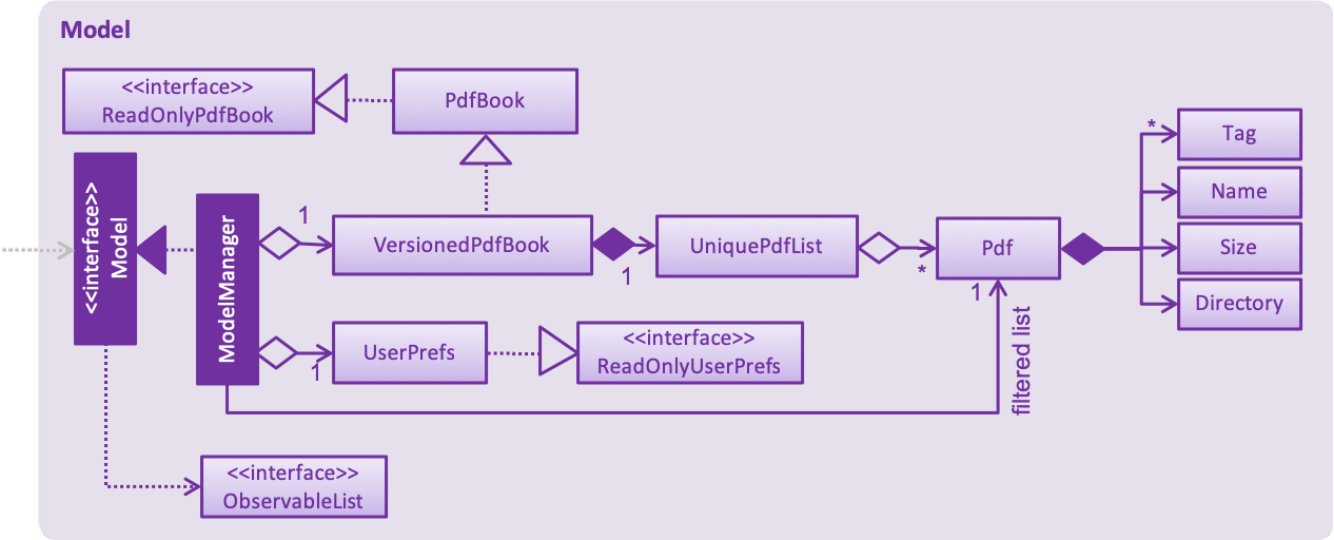


Figure 7. Structure of the Model Component

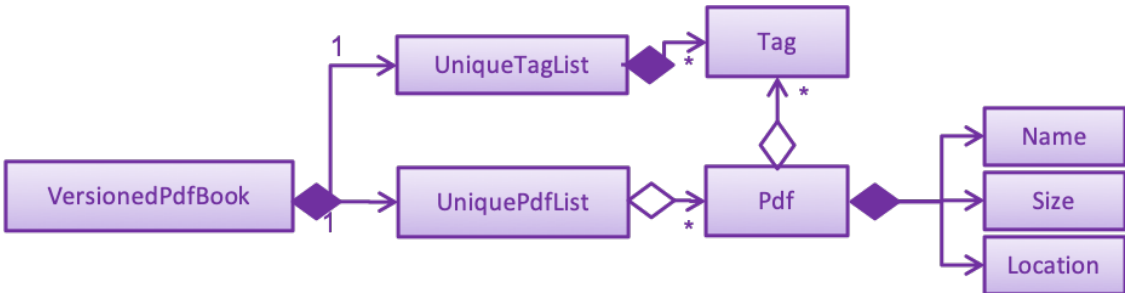
API : `Model.java`

The `Model`,

- stores a `UserPref` object that represents the user's preferences.
- stores the Pdf Book data.
- exposes an unmodifiable `ObservableList<Pdf>` that can be 'observed' e.g. the UI can be bound to this list so that the UI automatically updates when the data in the list change.
- does not depend on any of the other three components.

NOTE

As a more OOP model, we can store a `Tag` list in `Pdf Book`, which `Pdf` can reference. This would allow `Pdf Book` to only require one `Tag` object per unique `Tag`, instead of each `Pdf` needing their own `Tag` object. An example of how such a model may look like is given below.



2.5. Storage component

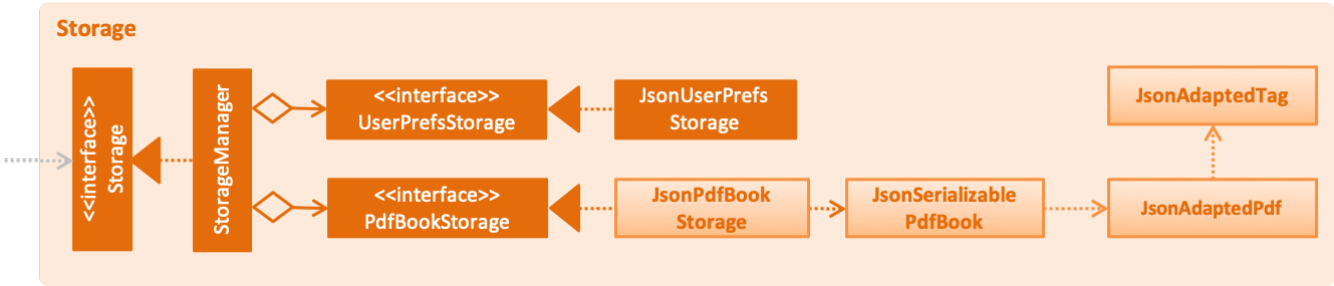


Figure 8. Structure of the Storage Component

API : `Storage.java`

The `Storage` component,

- can save `UserPref` objects in json format and read it back.
- can save the Pdf Book data in json format and read it back.

2.6. Common classes

Classes used by multiple components are in the `seedu.pdfbook.commons` package.

3. Implementation

This section describes some noteworthy details on how certain features are implemented.

- Items with `…` after them can be used multiple times including zero times e.g. `TAG…` can be used as (i.e. 0 times), `MyTag`, `TagA TagB TagC` etc.

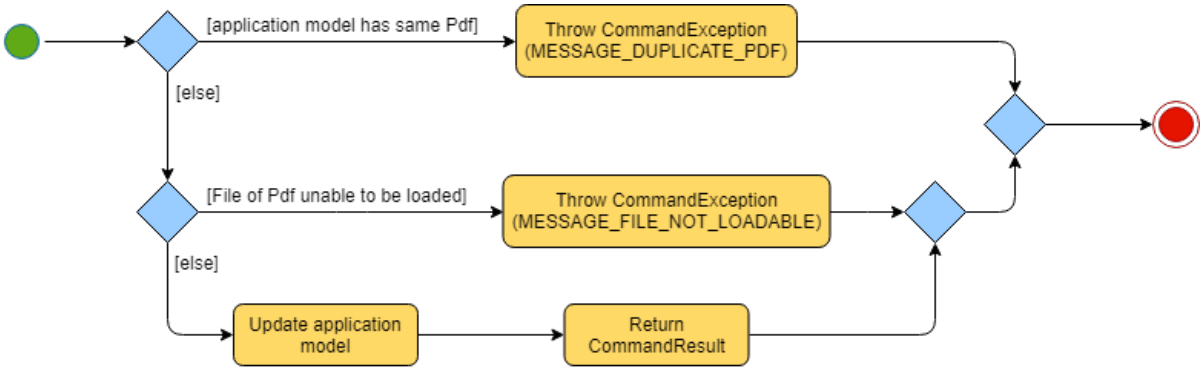
3.1. Adding of files to application

3.1.1. Current Implementation

This feature is facilitated by both the **AddCommandParser** and **AddCommand**. This feature adds the PDF file to the app using the path specified by your users. Other features such as the Section 3.3, “Edit feature” and Section 3.2, “Open feature” can only be performed on files that are added to the application.

The **AddCommandParser** uses the prefixes defined in **CliSyntax** to identify the different types of arguments that are entered along with the `add` command. These arguments will then be used to construct a new Pdf which will represent the Pdf to be added.

The implementation of the **AddCommand** execution can be summarised in the following activity diagram:



1. The current PdfBook Model is checked to determine if identical Pdf has already been added.
    a. If such a Pdf already exists, a **CommandException** will be thrown and the execution will be ended.
2. The Pdf to be added is loaded as to check for errors.
    a. Pdf will be loaded as **PDDocument**, which is an indicator if the application can perform other operations on the Pdf that need it to be handled as a `.pdf` file.
    b. Created PDDocument will be closed after loading as it is unused.
    c. Errors in accessing Pdf would throw **IOException**. Errors would most likely be due to:
        i. File not found at location
        ii. Lack of user permissions to open file
        iii. File has encryption
        iv. File corruption
    d. Thrown **IOException** is intercepted, a **CommandException** will be thrown and the execution will be ended.
3. The Pdf is recorded in the Model and the changes are committed.
4. **CommandResult** is returned upon successful execution.

3.1.2. Considerations

The implementation design of this feature was built upon the original implementation used by the addressbook. As the application is primarily meant to be operated through the CLI, it was decided to continue using the same prefix for the command input to keep its consistency.

Due to handling of files, additional checks have to be added such as the use of *PDDocument* to ascertain that it is a `.pdf` file and that it can be used with *Apache PDFBox® library* API.

3.1.3. Future Implementation

Currently PDF++ only supports PDF files, any other types of files will not be accepted. As the goal of the application is to be the sole manager of files, the application will be upgraded to work with all files in v2.0.

3.2. Open feature

3.2.1. Current Implementation

The `open` feature is facilitated by both the **OpenCommandParser** and **OpenCommand**. Essentially upon opening a Pdf that is tracked by the application, the user will be able to execute the PDF with the operating system's default PDF reader application.

The Open feature has the following syntax:

`open <INDEX>`

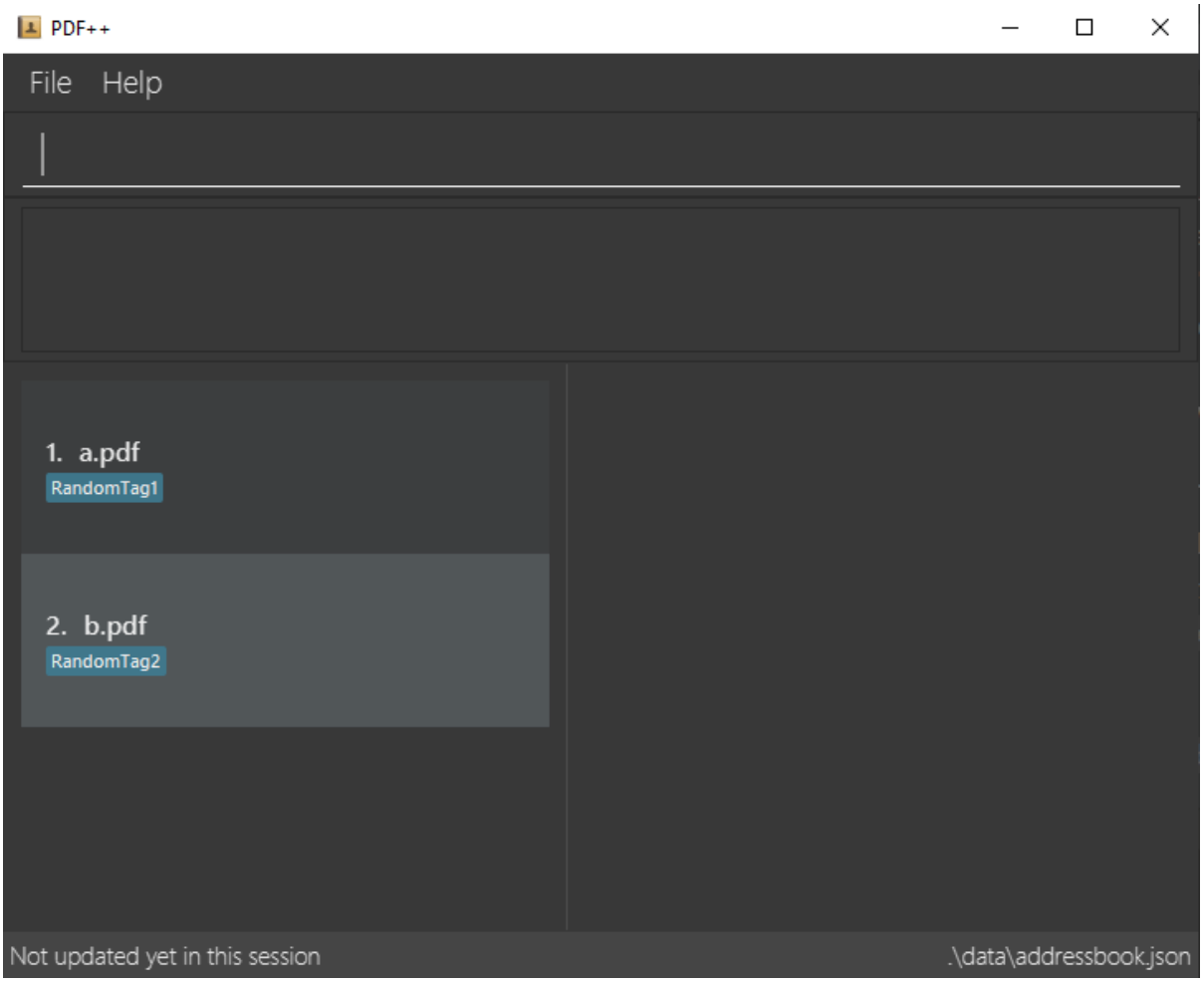
- `<INDEX>` refers to the index of the `Pdf` that you wish to edit.

NOTE	The index value can be referenced from the list in the main application, or from the result of the `Filter`, `Find` or `List` feature.

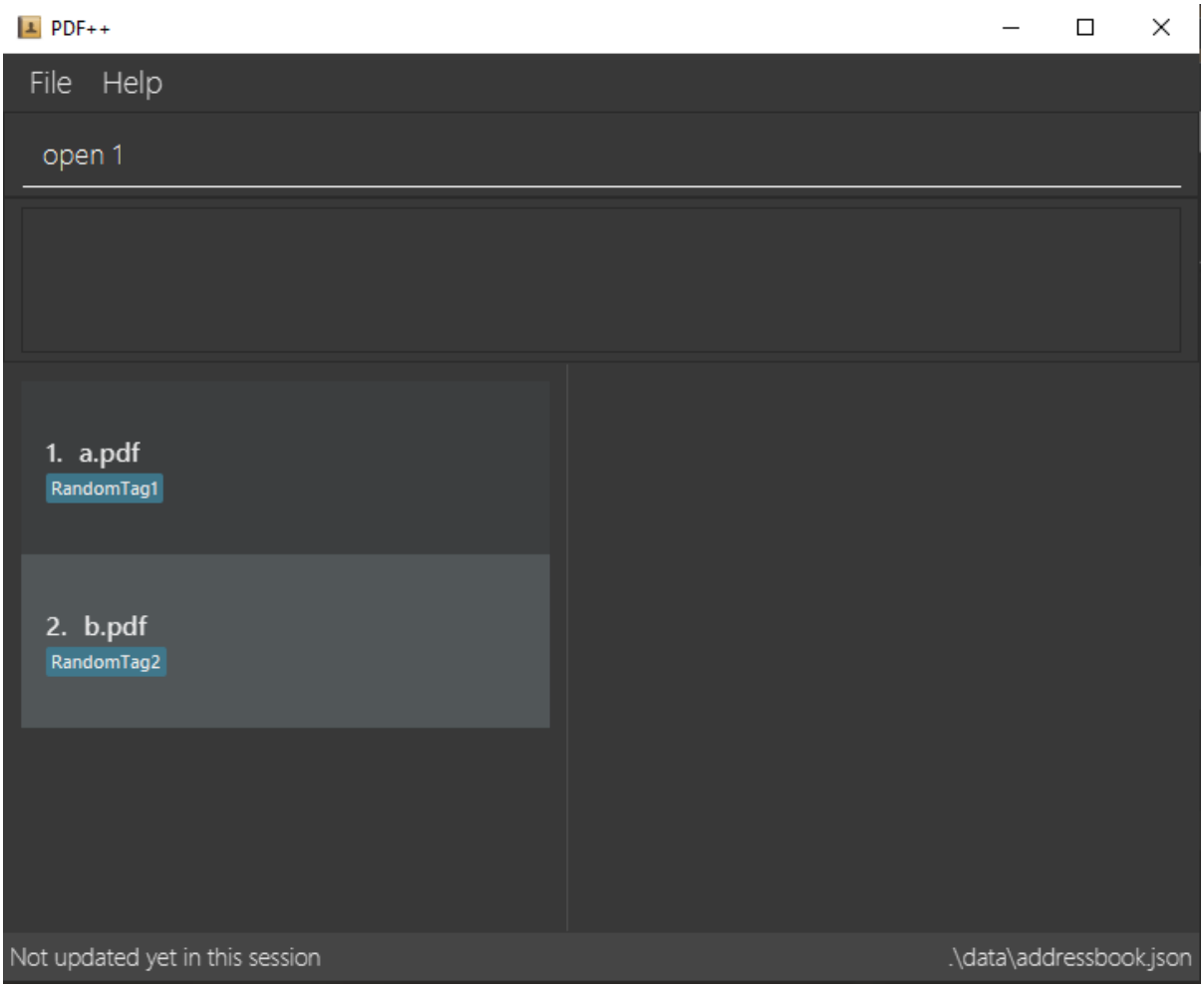
3.2.2. Feature Breakdown

Illustrated below is a sample usage scenario that provides a clear view to the inner workings of the Open feature.

Step 1: The user launches an application with either an existing set of `Pdf` or a new sample set of `Pdf` stored within as shown below.

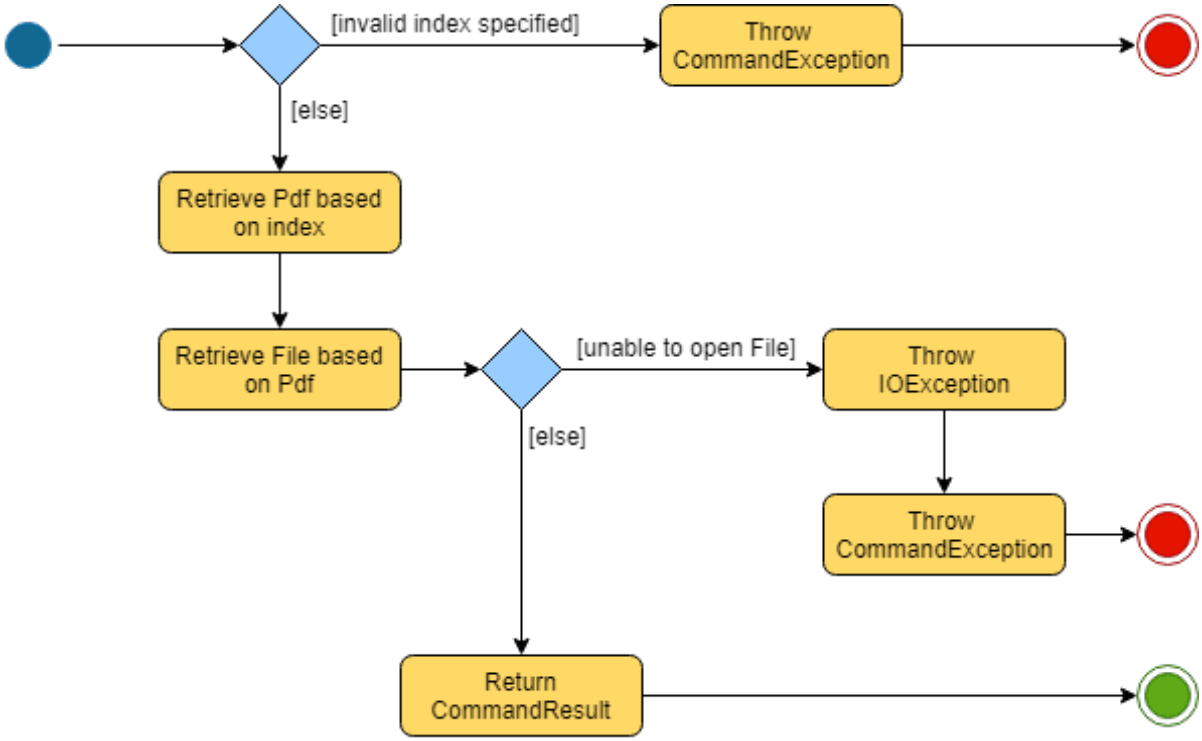


Step 2: The user chooses a `Pdf` that they wish to open, in this case `a.pdf`, and enters the `open` command into the CLI Interface, following the outlined Syntax as illustrated below.



Step 3: Upon hitting enter to execute the command, the **OpenCommandParser** parses the input into relevant objects that are required to be executed by the **OpenCommand** object. Upon parsing, the parser then creates a new **OpenCommand** that will execute the user's input.

Step 4: Upon receiving the necessary information from the parser, the **OpenCommand** retrieves the directory of the Pdf listed in the Pdf Book. It then launches the Pdf with the user-default Pdf reader.

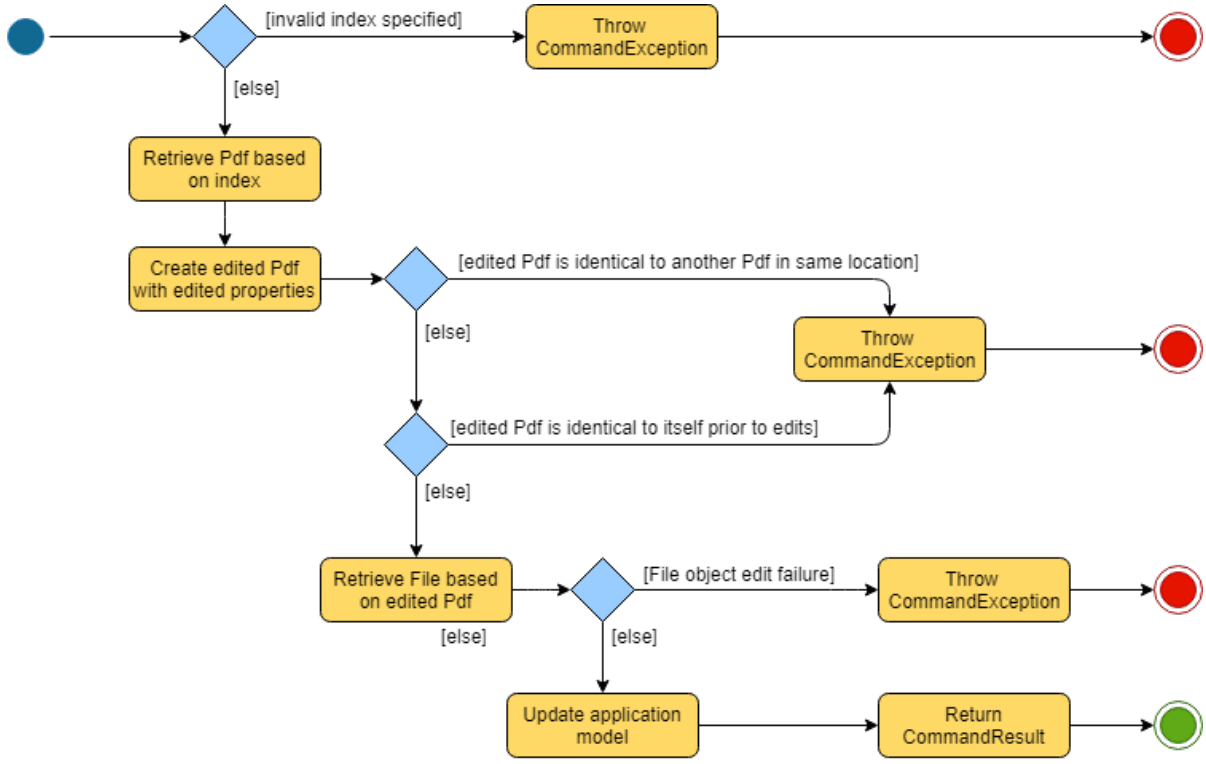


NOTE For more information about the behavior of launching the Pdf, please refer to Java SE 9 class Desktop.

3.3. Edit feature

3.3.1. Current Implementation

The `edit` feature is facilitated by both the **EditCommandParser** and **EditCommand**. Essentially upon adding a Pdf to be tracked by the application, the user will be able to change certain attributes tied to the PDF such as the `Name` and `Tag` tied to a particular Pdf.



3.4. Move feature

3.4.1. Current Implementation

The `move` feature is facilitated by both **MoveCommand** and **MoveCommandParser**. This feature functions as a simplified version of Section 3.3, “Edit feature”, as in nature it is making an edit to the directory of the file. However, in addition to making changes to the directory in the application storage, it also ensures that the directory changes are reflected in the local filesystem.

The design consideration into separating move as a new command from edit factored in the purpose of the application; as a document manager, the term "edit" is synonymous with making content or characteristic changes when it is applied in the context of documents.

The Move feature has the following syntax:

```
move
```

```
move <INDEX> <NEWDIRECTORY>
```

- `<INDEX>` refers to the index of the file that you wish to move.
- `<NEWDIRECTORY>` refers to the address of the new location the file is to be moved.
- Entering `move` without `<INDEX>` or `<NEWDIRECTORY>` will open the default file selection GUI for the user to select the file directly.

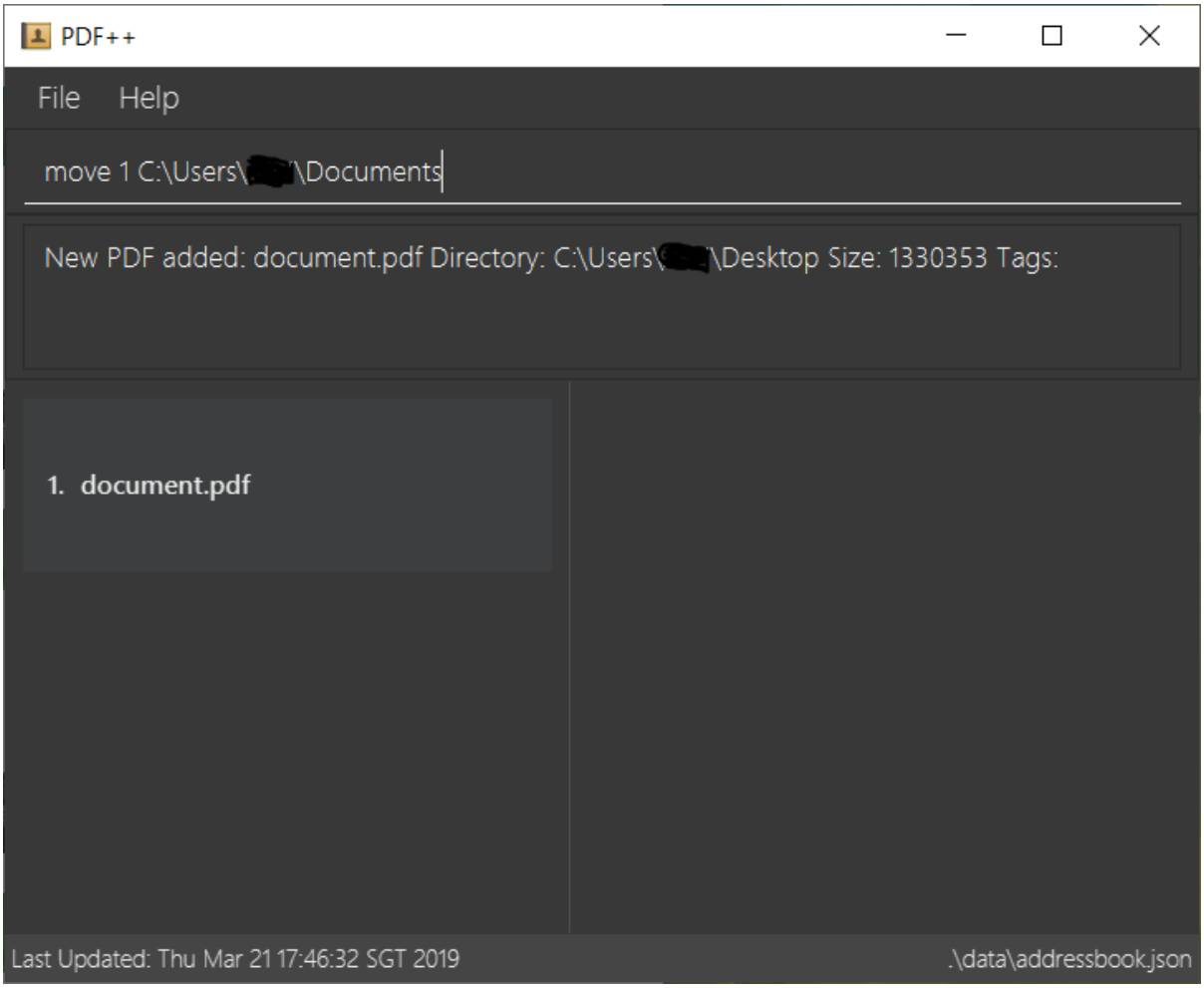
NOTE	The index value can be referenced from the list in the main application, or from the result of the `Filter`, `Find` or `List` feature.

All parts of the syntax are required.

3.4.2. Feature breakdown

Illustrated below is a sample usage scenario that provides a clear view to the inner workings of the `move` feature.

Step 1: From the main interface of the application, the user chooses a `Pdf` that they wish to move, and enters the `move` command into the CLI Interface, following the outlined Syntax as illustrated below.



In this scenario, there is a file **document.pdf** in the windows *Desktop* directory, and the `move` command entered is intended for the file to be moved to the windows *Documents* directory.

Step 2: After executing the command, the `MoveCommandParser` parses the input into relevant objects that are required to be executed by the `MoveCommand` object. In particular, it ensures that there are correctly two arguments passed as described in the above Syntax. Upon parsing, the parser then creates a new `MoveCommand` that will execute the user's input.

Step 3: The `MoveCommand` is then executed. Successful execution of the command would return a **CommandResult** object, while unsuccessful execution due to validation failure will throw a **CommandException**.

[MoveCommandActivityDiagram] | *MoveCommandActivityDiagram.png*

3.5. Merge feature

3.5.1. Current Implementation

The `merge` feature is facilitated by both **MergeCommand** and **MergeCommandParser**. This feature utilises the *Apache PDFBox® library*, specifically the *PDFMergerUtility* API to append two or more PDFs and create a new file with the merged content. As there will be one additional file added to the application, this feature also implicitly performs an `Add` feature to add the new PDF to the application.

The Merge feature has the following syntax:

```
merge <INDEX1> <INDEX2> …
```

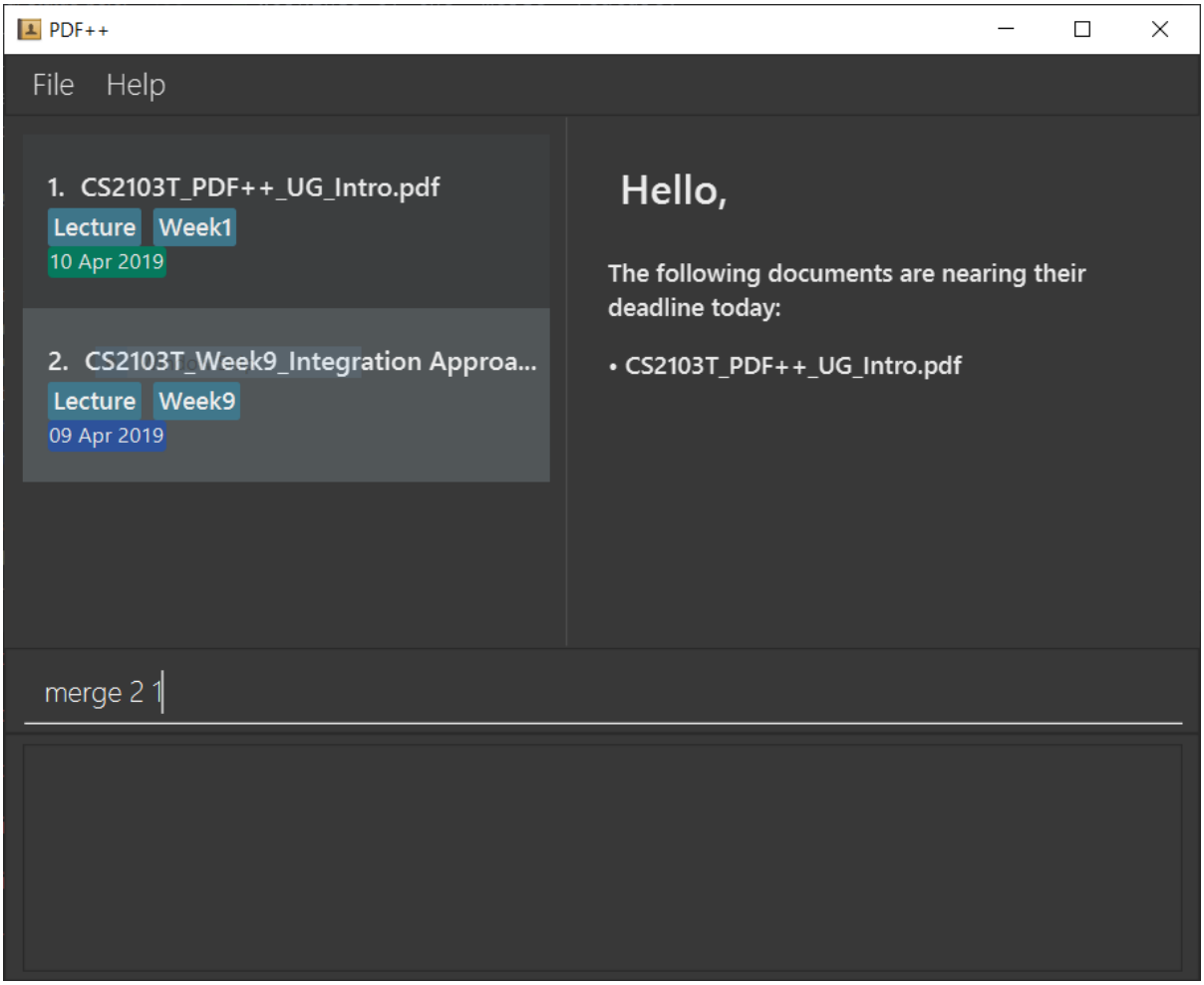
- `<INDEX>` refers to the index of the `Pdf` that you wish to merge.
- Minimum of two indices have to be provided for the merge to be performed, up to as many indices as desired.
- It is possible to repeat an index; the PDF would simply merge with a copy of itself.

NOTE	The index value can be referenced from the list in the main application, or from the result of the `Filter`, `Find` or `List` feature.

3.5.2. Feature breakdown

Illustrated below is a sample usage scenario that provides a clear view to the inner workings of the `merge` feature.

Step 1: From the main interface of the application, the user chooses the file(s) that they wish to merge, and enters the `merge` command into the CLI Interface, following the outlined Syntax as illustrated below.



Step 2: After executing the command, the **MergeCommandParser** parses the input into relevant objects that are required to be executed by the **MergeCommand** object. In particular, it ensures that there are two or more arguments passed as described in the above Syntax. Upon parsing, the parser then creates a new **MergeCommand** that will execute the user's input.

In this case, the above two files will be merged, with the *"CS2103T_PDF++_UG_Intro.pdf"* file appended behind the other file.

Step 3: The **MergeCommand** is then executed. During the execution, there are several levels of validation that, failing which would stop the execution and throw an exception. Here are the different cases:

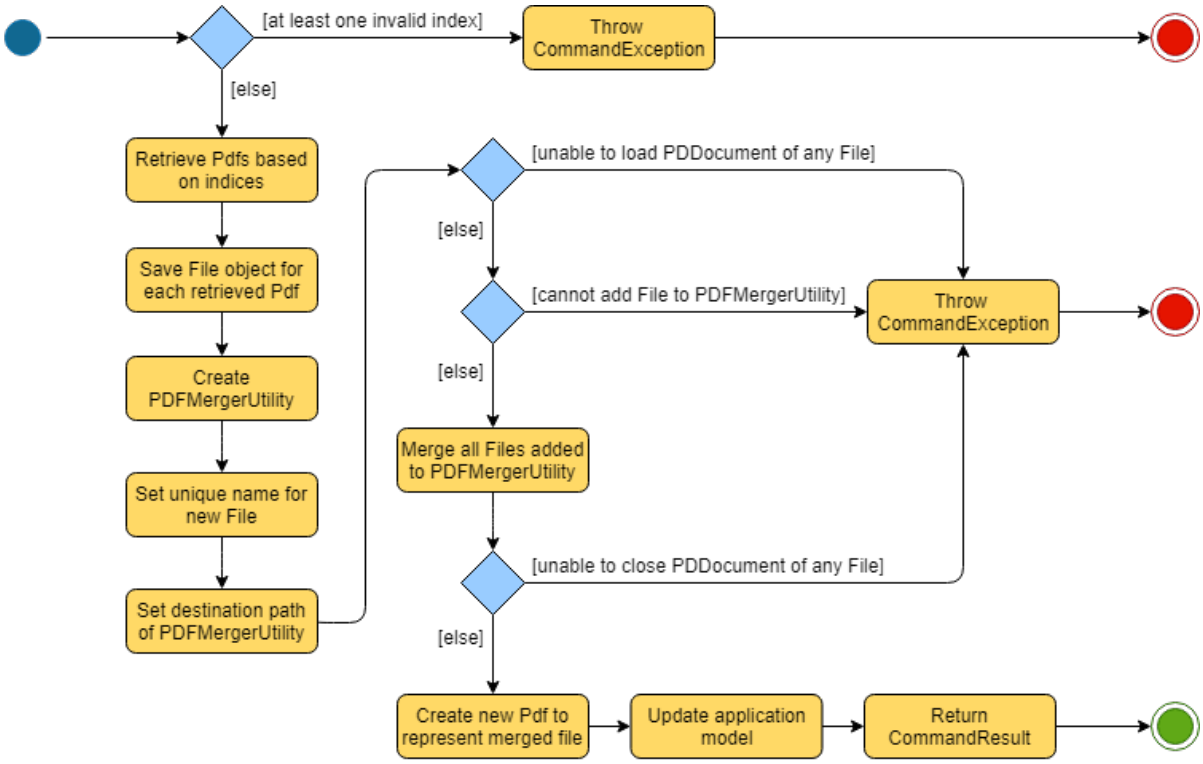
NOTE	In these cases, all exceptions encountered will be handled as a **CommandException**. This design consideration was made to add convenience to error handling.

- One or more of the indices provided are invalid i.e. the index is negative or does not reference any of the Pdfs listed. A **ParseException** is thrown.
- When loading the PDDocument of the file, the file cannot be accessed for various reasons:-
  - If the document cannot be found, a **FileNotFoundException** is thrown.
  - If the document is encrypted, an **InvalidPasswordException** is thrown.
  - If the document cannot be opened for any other reason, an **IOException** is thrown.

- When any of the files to the fail to be added to the PDFMergerUtility, an **IOException** is thrown.
- After merging the files, if any of the PDDocuments are unable to be closed, an **IOException** is thrown.

Step 4: Successful execution of the command would return a **CommandResult** object and create the a new file with the merged content. The new name of the merged file follows the format: "merged[hashcode].pdf". This is to ensure unique file name. The hashcode in the name will be modified if name already exists.

The following Activity Diagram is a summary of the entire execution process.



3.6. Delete feature

3.6.1. Current Implementation

The `delete` feature is facilitated by both **DeleteCommand** and **DeleteCommandParser**. This feature performs either a *soft* or *hard* remove operation on a file in the application based on the index provided.

- *Soft* delete is defined as removing a file from the application but not from the local filesystem; the physical file is left intact within the user's operating system, but the user will not be able to access or use the features of the application on said file - unless it is added back to the application.
- *Hard* delete is defined as removing a file both from the application and the local filesystem; the physical file will be deleted and the user will not be able to access or perform any operations on the file, either through the application or through the user's operating system.

WARNING	As of v1.4 there is no way to completely undo the *hard* delete operation. When the file is deleted from the filesystem, it is permanently erased. Even the Section 3.18, “Undo/Redo feature” cannot help with this…

The `delete` feature has the following syntax:

`delete <INDEX>`

`delete <INDEX> hard`

- `<INDEX>` refers to the index of the file in the list that you wish to perform the `action` on.
- If the keyword `hard` is not specified, the *soft* delete operation will be performed. Otherwise, the *hard* delete operation will be performed.

NOTE	The index value can be referenced from the list in the main application, or from the result of the `Filter`, `Find` or `List` feature.

3.6.2. Feature breakdown

Illustrated below is a sample usage scenario that provides a clear view to the inner workings of the `delete` feature.

Step 1: From the main interface, the user chooses a file that they wish to delete, and enters the `delete` command into the CLI Interface, following the outlined Syntax mentioned.

Step 2: Upon hitting enter to execute the command, the **DeleteCommandParser** parses the input into relevant objects that are required to be executed by the **DeleteCommand** object. Upon parsing, the parser then creates a new **DeleteCommand** that will execute the user’s input.

Step 3: The **DeleteCommand** is then executed. Successful execution will return a **CommandResult** indicating that the deadline has been set.

[DeleteCommandActivityDiagram] | *DeleteCommandActivityDiagram.png*

3.7. Clear feature

3.7.1. Current Implementation

The `clear` feature is facilitated by both **ClearCommand** and **ClearCommandParser**. This features removes all the PDF files that were previously stored in PDF++. It is similar to the Section 3.6, “Delete feature” in that it removes files from the application, with multiple files instead of one at a time. However, it differs that it does not have the option to delete the file from the local filesystem.

The `Clear` feature has to following syntax:

`clear`

- The `clear` command will be executed regardless if there is any invalid text that comes after the command

- All files will be removed from the application, but not from the local filesystem.

NOTE	Since the `clear` feature is very easily executed, if you have accidentally entered the `clear` command and wish to revert the action, please refer to Section 3.18, "Undo/Redo feature" for more information.

3.8. Deadline feature

3.8.1. Current Implementation

The `deadline` feature is facilitated by both **DeadlineCommand** and **DeadlineCommandParser** This feature allows you to set or remove deadlines of the file specified by you from PDF++. The deadlines will be recorded and displayed both in the list of files as well as in the information panel for each individual file.

The `deadline` feature has the following syntax:

```
deadline <INDEX> <ACTION>
```

- `<INDEX>` refers to the index of the file in the list that you wish to perform the `action` on.
- `<ACTION>` refers to the type of action that you wish to perform. There are 3 actions that you can perform
  - `date/<DATE>`
    - `date/` refers to command immediately following after this prefix is a date
    - `<DATE>` must be of `dd-mm-yyyy` format (E.g. 15-03-2019)
  - `done` assigns the file a ***DONE*** status
  - `remove` assigns the file a ***REMOVE*** status

NOTE	The index value can be referenced from the list in the main application, or from the result of the `Filter`, `Find` or `List` feature.

3.8.2. Feature Breakdown

Illustrated below is a sample usage scenario that provides a clear view to the inner workings of the `deadline` feature.

Step 1: From the main interface, the user chooses a file that they wish to set a deadline, enters the `deadline` command into the CLI Interface, following the outlined Syntax mentioned.

Step 2: Upon hitting enter to execute the command, the **DeadlineCommandParser** parses the input into relevant objects that are required to be executed by the **DeadlineCommand** object. Upon parsing, the parser then creates a new **DeadlineCommand** that will execute the user's input.

Step 3: The **DeadlineCommand** is then executed. Successful execution will return a **CommandResult** indicating that the deadline has been set.

[DeadlineCommandActivityDiagram] | *DeadlineCommandActivityDiagram.png*

TIP	After a deadline has been added to the PDF file specified, the date will be color coded according to days remaining from the current day until the deadline date.

3.9. Help feature

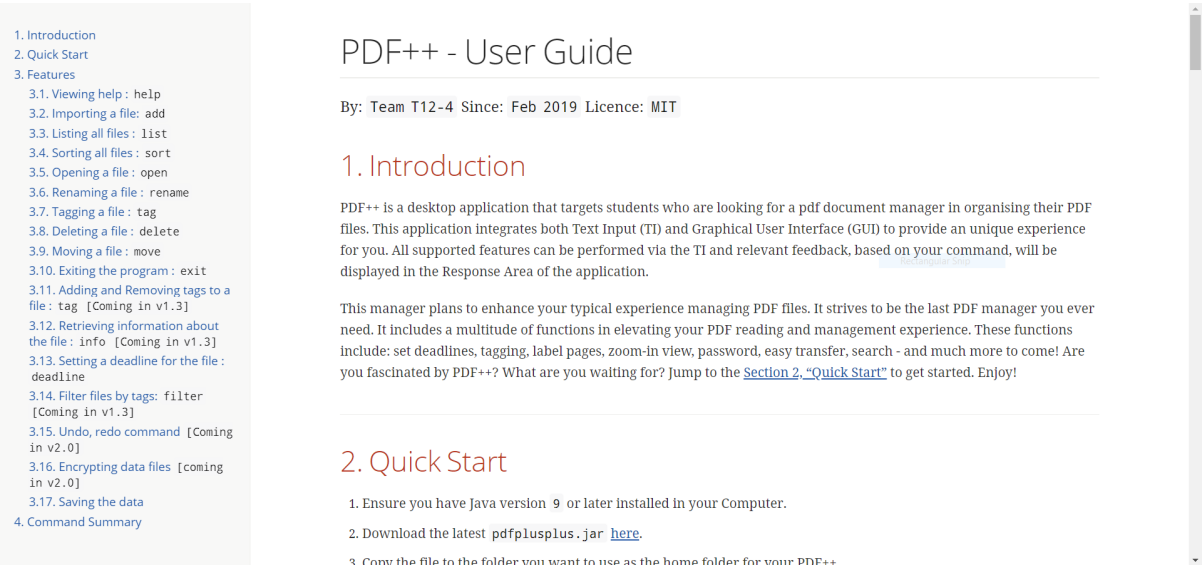
3.9.1. Current Implementation

The `help` feature brings up the UserGuide in a browser window as a html file. Following other features, the command is parsed and a **HelpCommand** object is created to be executed.

The `help` feature has to following syntax:

`help`

After execution, the user will be directed to the start of the *UserGuide.adoc* as shown. Users can reference from the UserGuide directly on how to navigate the guide.



3.10. Exit feature

3.10.1. Current Implementation

The `exit` feature is facilitated by **ExitCommand**. This feature allows you to exit from *PDF++*.

The `exit` feature has to following syntax:

`exit`...

- The `exit` command will be executed regardless if there is any invalid text that comes after the command

NOTE	Your files and commands are immediately stored after execution, and can be retrieved on reopening the application.

3.11. List feature

3.11.1. Current Implementation

The list feature is facilitated by **ListCommand**. This feature will display all of the files currently stored within the application at the main interface. By default, all of the files will be displayed when the application is started. However, the display of the interface can be changed to reflect the results of Section 3.12, “Find feature” or Section 3.13, “Filter feature”.

NOTE	Certain features such as Section 3.5, “Merge feature” rely on the index of the file(s) displayed on the main interface. Since the `find` or `filter` feature would list a sample of all the files at the main interface, no commands can be executed on the files not included in the results. Hence, the `list` feature is added to allow for a "reset" of the view of the files.

The `List` feature has to following syntax:

```
list
```

3.12. Find feature

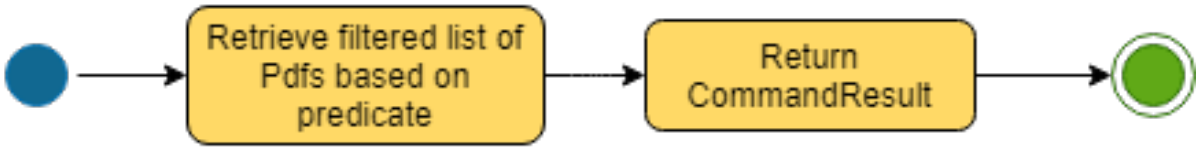
3.12.1. Current Implementation

The `find` feature is facilitated by **FindCommand** and **FindCommandParser**. This feature lists a subset of all the files in the application based on the keyword(s) provided. Using the keyword(s), the application will check the names of all files, as well as the content of the text within the files.

The `find` feature has to following syntax:

```
find <KEYWORD> …
```

- `<KEYWORD>` refers to the word that the application will use as reference to find files. There must be at least one provided.



3.13. Filter feature

3.13.1. Current Implementation

The `filter` feature is facilitated by **FilterCommand** and **FilterCommandParser**. This feature is

similar to Section 3.12, “Find feature” in that it lists a subset of all the files in the application, except that it will list the files based on the tag of the file.

The `filter` feature has to following syntax:

`filter t/<TAG> …`

- `<TAG>` refers to a tag that is valid, i.e. a tag that was previously set on a file.
- All tags need to have the prefix /t to differentiate between each tag.

[FilterCommandActivityDiagram] | *FilterCommandActivityDiagram.png*

3.14. Select feature

3.14.1. Current Implementation

The select feature is facilitated by `SelectCommand`. `Enter functionality here`

The `Select` feature has to following syntax: `select`

- Enter here

NOTE	Enter note here

3.15. Sort feature

3.15.1. Current Implementation

The sort feature is facilitated by `SortCommand`. `Enter functionality here`

The `Sort` feature has to following syntax: `sort`

- Enter here

NOTE	Enter note here

3.16. Tag feature

3.16.1. Current Implementation

The tag feature is facilitated by `TagCommand`. `Enter functionality here`

The `Tag` feature has to following syntax: `tag t/`

- Enter here

NOTE	Enter note here

3.17. History feature

3.17.1. Current Implementation

The history feature is facilitated by `HistoryCommand`. This feature displays the previous commands entered since the start of the current session of the application; each time the application is closed, the command history will be erased.

The `history` feature has to following syntax:

`history`

- When there is no command history, a message will be shown to notify the user.

3.18. Undo/Redo feature

3.18.1. Current Implementation

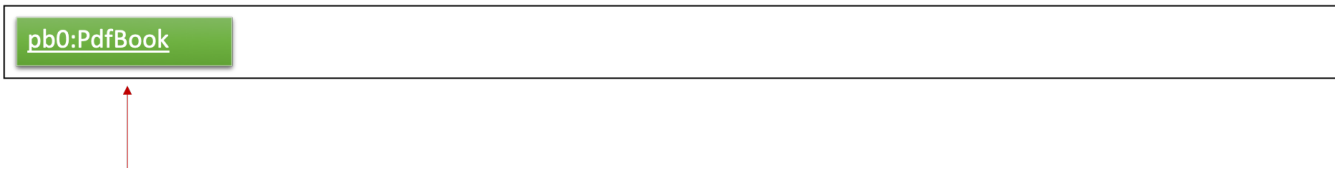
The undo/redo mechanism is facilitated by `VersionedPdfBook`. It extends `PdfBook` with an undo/redo history, stored internally as an `pdfBookStateList` and `currentStatePointer`. Additionally, it implements the following operations:

- `VersionedPdfBook#commit()` — Saves the current pdf book state in its history.
- `VersionedPdfBook#undo()` — Restores the previous pdf book state from its history.
- `VersionedPdfBook#redo()` — Restores a previously undone pdf book state from its history.

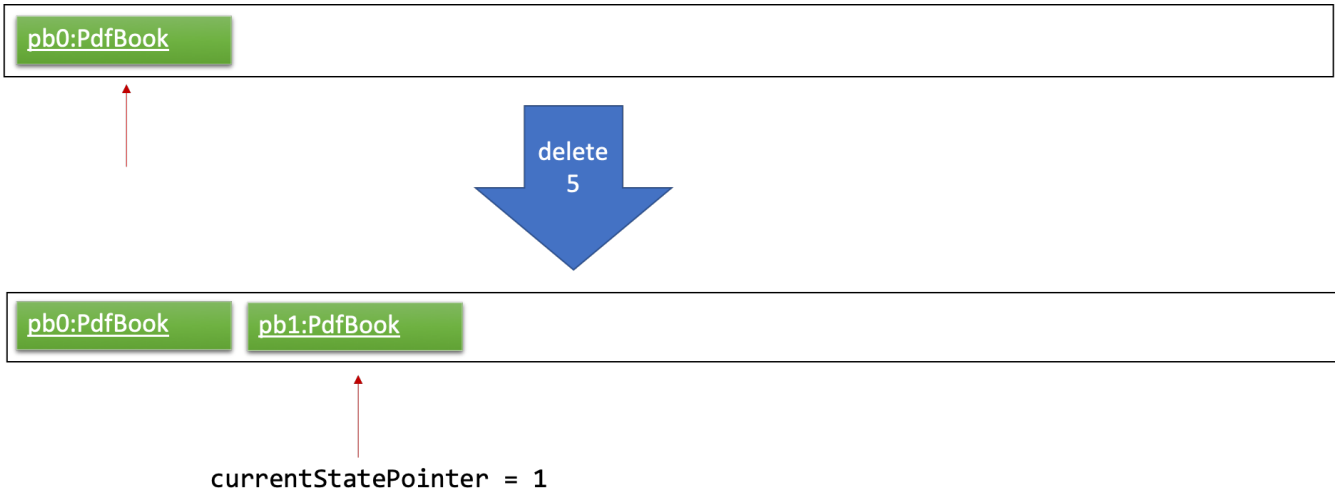
These operations are exposed in the `Model` interface as `Model#commitPdfBook()`, `Model#undoPdfBook()` and `Model#redoPdfBook()` respectively.

Given below is an example usage scenario and how the undo/redo mechanism behaves at each step.

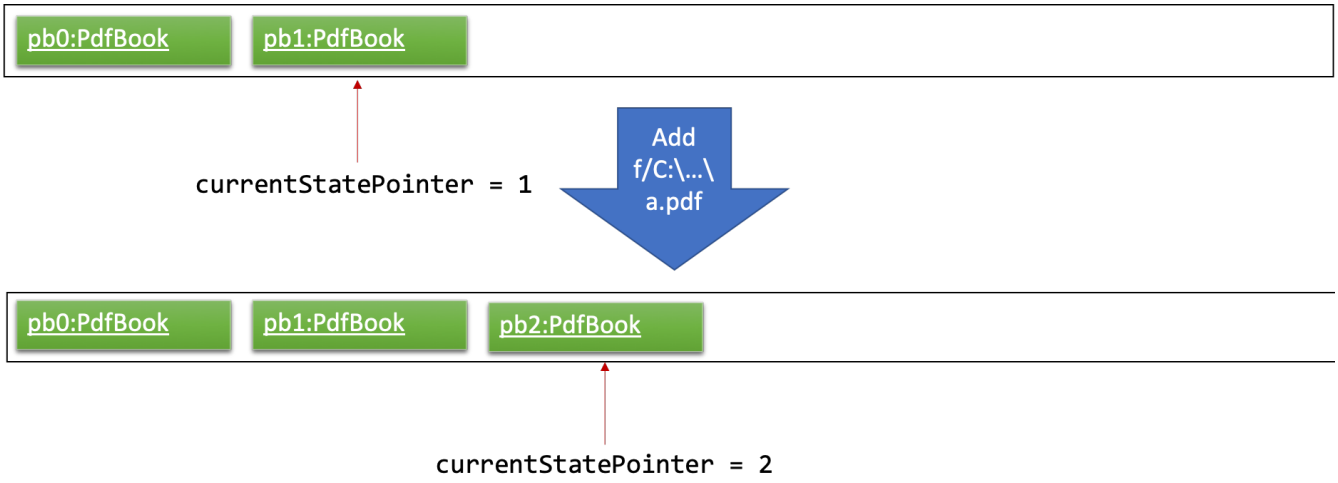
Step 1. The user launches the application for the first time. The `VersionedPdfBook` will be initialized with the initial pdf book state, and the `currentStatePointer` pointing to that single pdf book state.



Step 2. The user executes `delete 5` command to delete the 5th pdf in the pdf book. The `delete` command calls `Model#commitPdfBook()`, causing the modified state of the pdf book after the `delete 5` command executes to be saved in the `pdfBookStateList`, and the `currentStatePointer` is shifted to the newly inserted pdf book state.

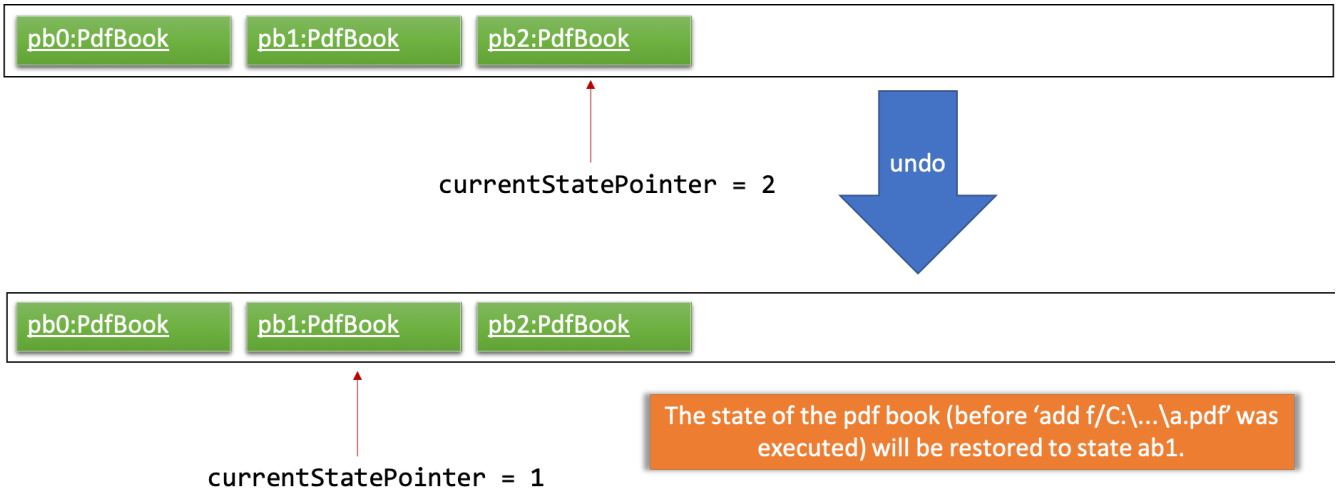


Step 3. The user executes `add n/David …` to add a new pdf. The `add` command also calls `Model#commitPdfBook()`, causing another modified pdf book state to be saved into the `pdfBookStateList`.



NOTE If a command fails its execution, it will not call `Model#commitPdfBook()`, so the pdf book state will not be saved into the `pdfBookStateList`.

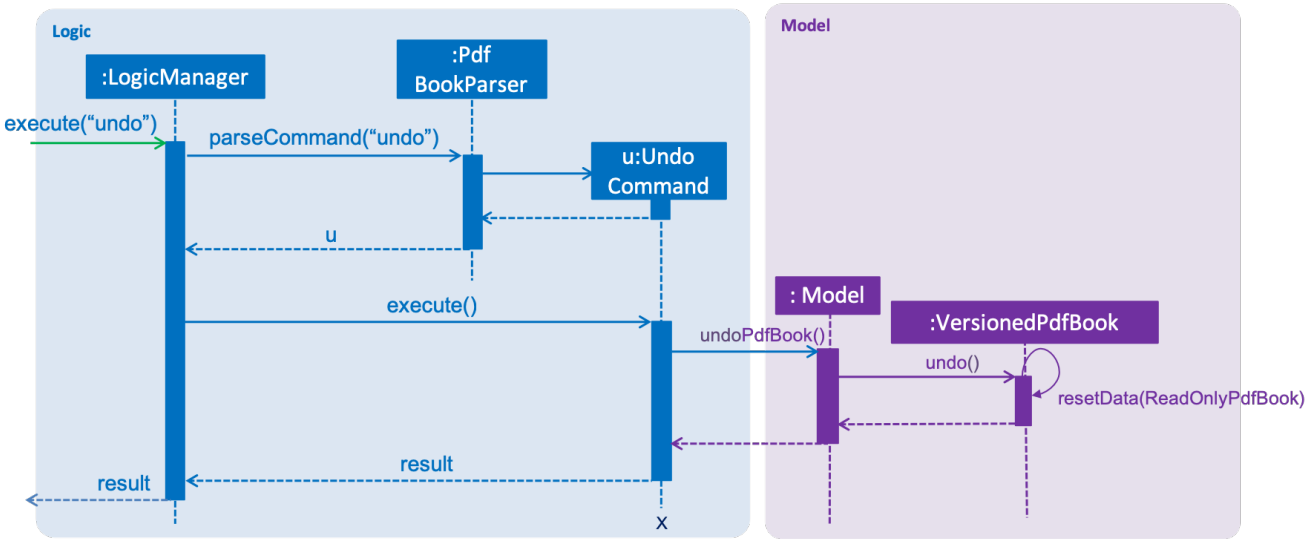
Step 4. The user now decides that adding the pdf was a mistake, and decides to undo that action by executing the `undo` command. The `undo` command will call `Model#undoPdfBook()`, which will shift the `currentStatePointer` once to the left, pointing it to the previous pdf book state, and restores the pdf book to that state.



NOTE

If the `currentStatePointer` is at index 0, pointing to the initial pdf book state, then there are no previous pdf book states to restore. The `undo` command uses `Model#canUndoPdfBook()` to check if this is the case. If so, it will return an error to the user rather than attempting to perform the undo.

The following sequence diagram shows how the undo operation works:

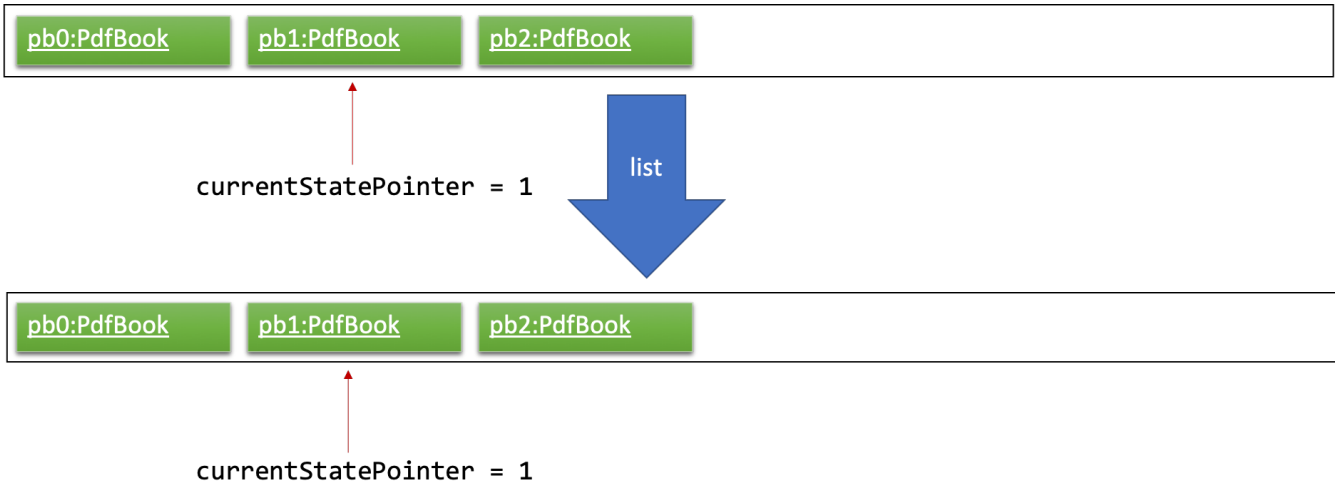


The `redo` command does the opposite — it calls `Model#redoPdfBook()`, which shifts the `currentStatePointer` once to the right, pointing to the previously undone state, and restores the pdf book to that state.

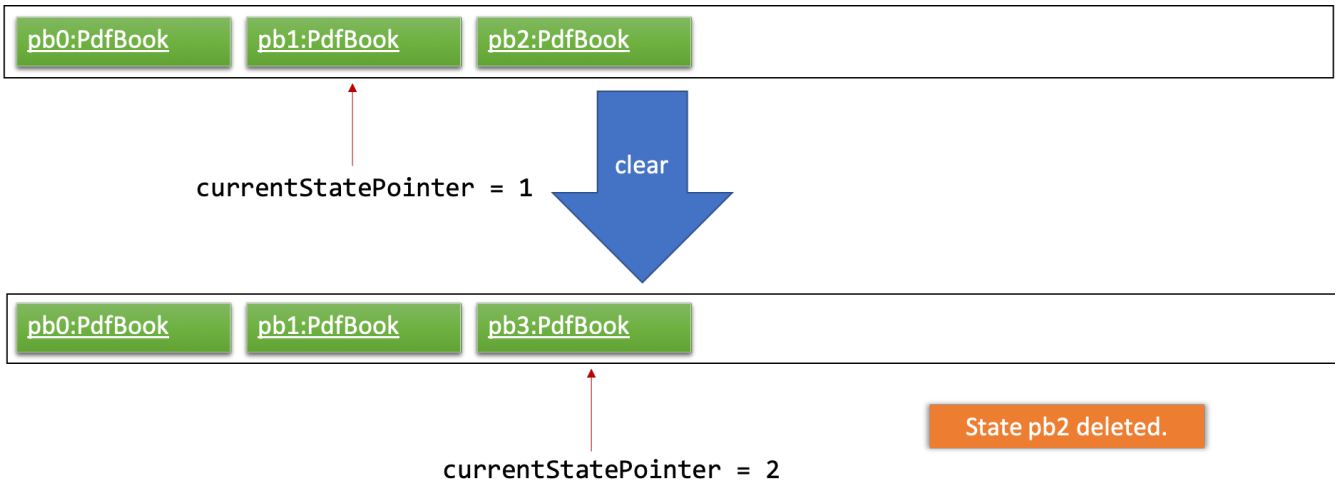
NOTE

If the `currentStatePointer` is at index `pdfBookStateList.size() - 1`, pointing to the latest pdf book state, then there are no undone pdf book states to restore. The `redo` command uses `Model#canRedoPdfBook()` to check if this is the case. If so, it will return an error to the user rather than attempting to perform the redo.

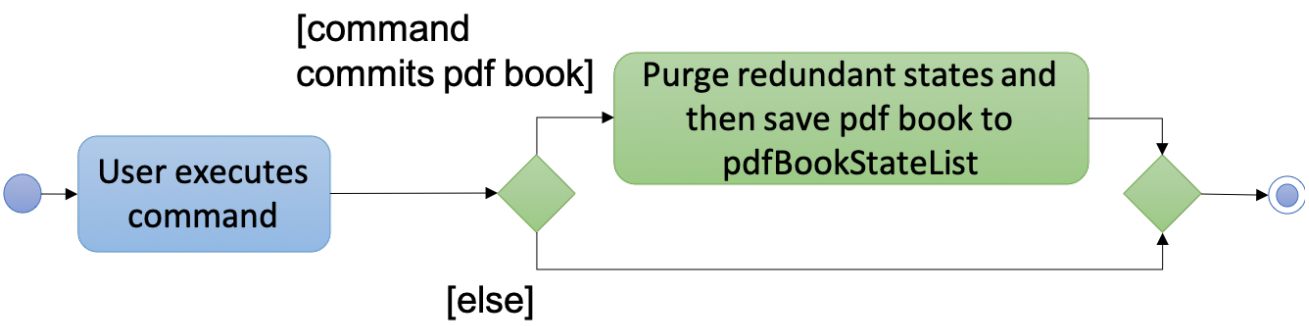
Step 5. The user then decides to execute the command `list`. Commands that do not modify the pdf book, such as `list`, will usually not call `Model#commitPdfBook()`, `Model#undoPdfBook()` or `Model#redoPdfBook()`. Thus, the `pdfBookStateList` remains unchanged.



Step 6. The user executes `clear`, which calls `Model#commitPdfBook()`. Since the `currentStatePointer` is not pointing at the end of the `pdfBookStateList`, all pdf book states after the `currentStatePointer` will be purged. We designed it this way because it no longer makes sense to redo the `add n/David …` command. This is the behavior that most modern desktop applications follow.



The following activity diagram summarizes what happens when a user executes a new command:



3.18.2. Design Considerations

Aspect: How undo & redo executes

- **Alternative 1 (current choice):** Saves the entire pdf book.
  - Pros: Easy to implement.

    - Cons: May have performance issues in terms of memory usage.
- **Alternative 2:** Individual command knows how to undo/redo by itself.
    - Pros: Will use less memory (e.g. for `delete`, just save the pdf being deleted).
    - Cons: We must ensure that the implementation of each individual command are correct.

Aspect: Data structure to support the undo/redo commands

- **Alternative 1 (current choice):** Use a list to store the history of pdf book states.
    - Pros: Easy for new Computer Science student undergraduates to understand, who are likely to be the new incoming developers of our project.
    - Cons: Logic is duplicated twice. For example, when a new command is executed, we must remember to update both `HistoryManager` and `VersionedPdfBook`.
- **Alternative 2:** Use `HistoryManager` for undo/redo
    - Pros: We do not need to maintain a separate list, and just reuse what is already in the codebase.
    - Cons: Requires dealing with commands that have already been undone: We must remember to skip these commands. Violates Single Responsibility Principle and Separation of Concerns as `HistoryManager` now needs to do two different things.

3.19. File Protection

PDF++ has a robust in-built file protection system which allows you to encrypt or decrypt any PDF files you want. Both encrypt and decrypt feature are facilitated by both `EncryptCommand / DecryptCommand` and `EncryptCommandParser / DecryptCommandParser`.

For encryption, you can select the file on the list that you wish to encrypt with a password you specified. Likewise, for decryption, you have to enter the password of the encrypted file that you wish to decrypt.

The Encrypt and Decrypt feature has the following syntax:

Encryption: `encrypt INDEX password/PASSWORD`

Decryption: `decrypt INDEX password/PASSWORD`

- `INDEX` refers to the index of the file on the list that you wish to encrypt/decrypt
- `password/` refers to the command immediately following after this prefix is the password of the file
- `PASSWORD` refers to the password you wish to encrypt your file with / of the encrypted file you want to decrypt.

NOTE	Please ensure that you have entered the correct password as undo & redo functions do not work with encrypt & decrypt.

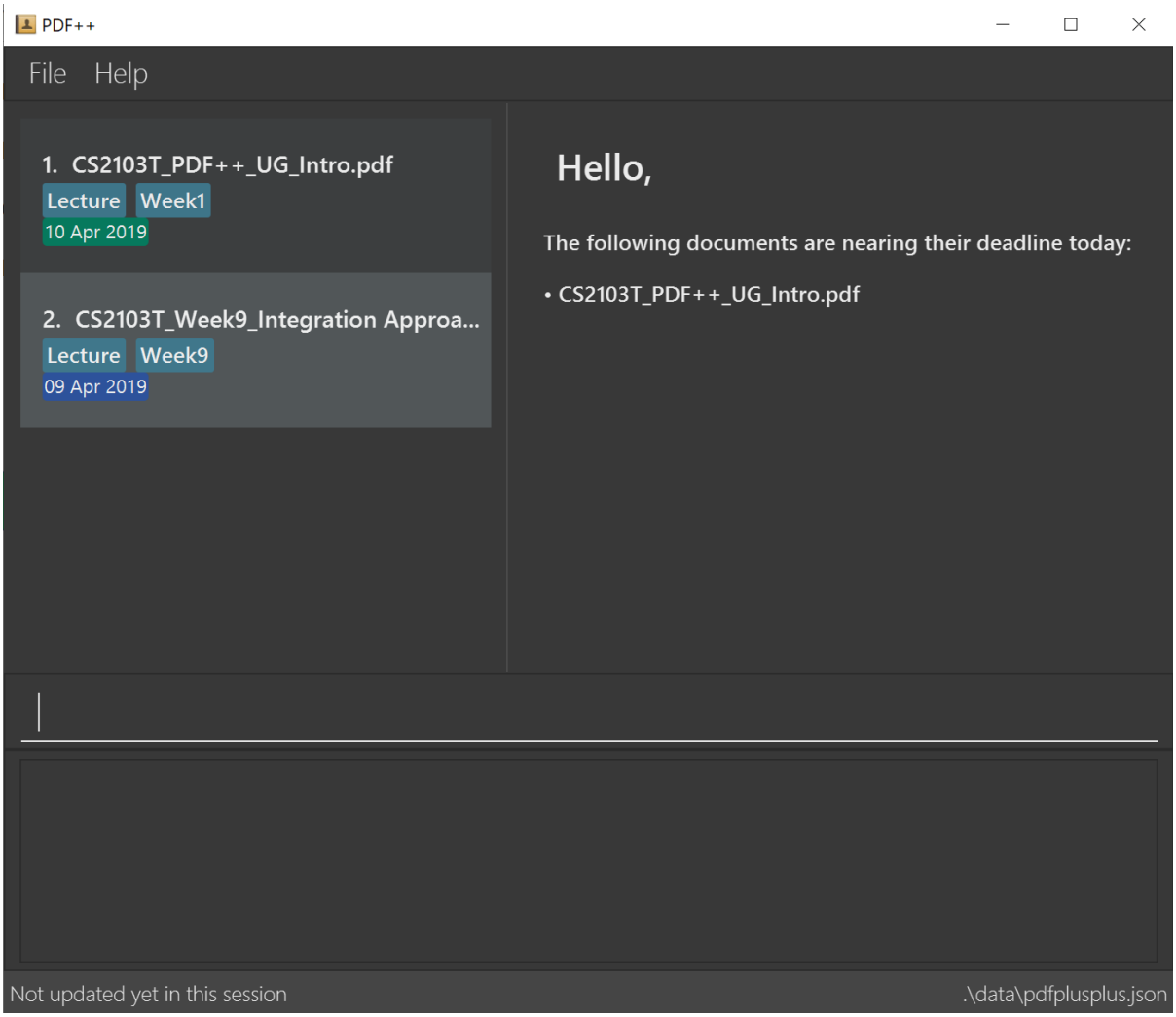
Please refer to `Step-by-Step Guide — encrypt` for encryption guide and `Step-by-Step Guide — decrypt`

for decryption guide.

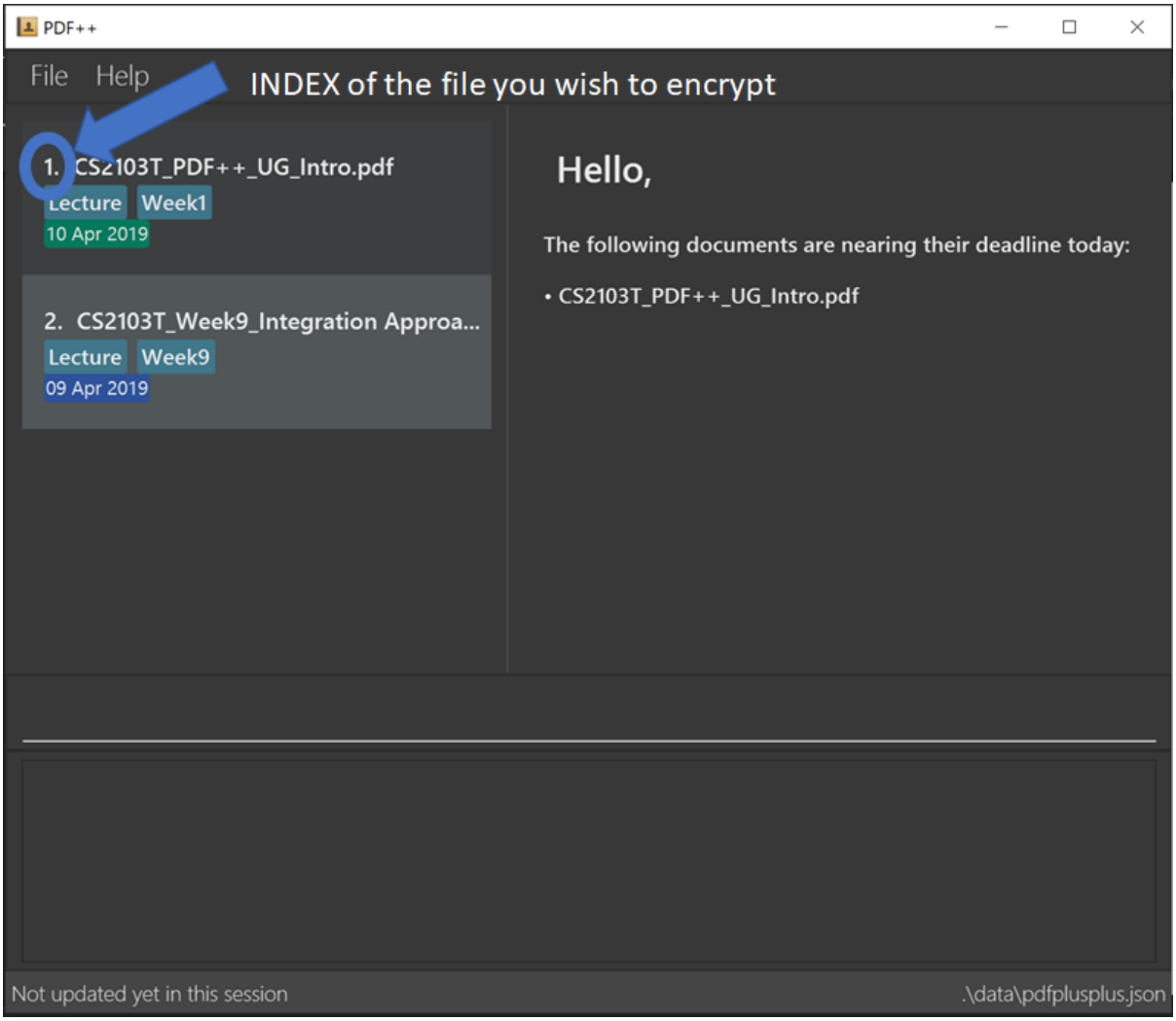
3.19.1. Step-by-Step Guide — encrypt

Illustrate below is a sample usage scenario that provides a clear view to the inner workings of the Encrypt feature.

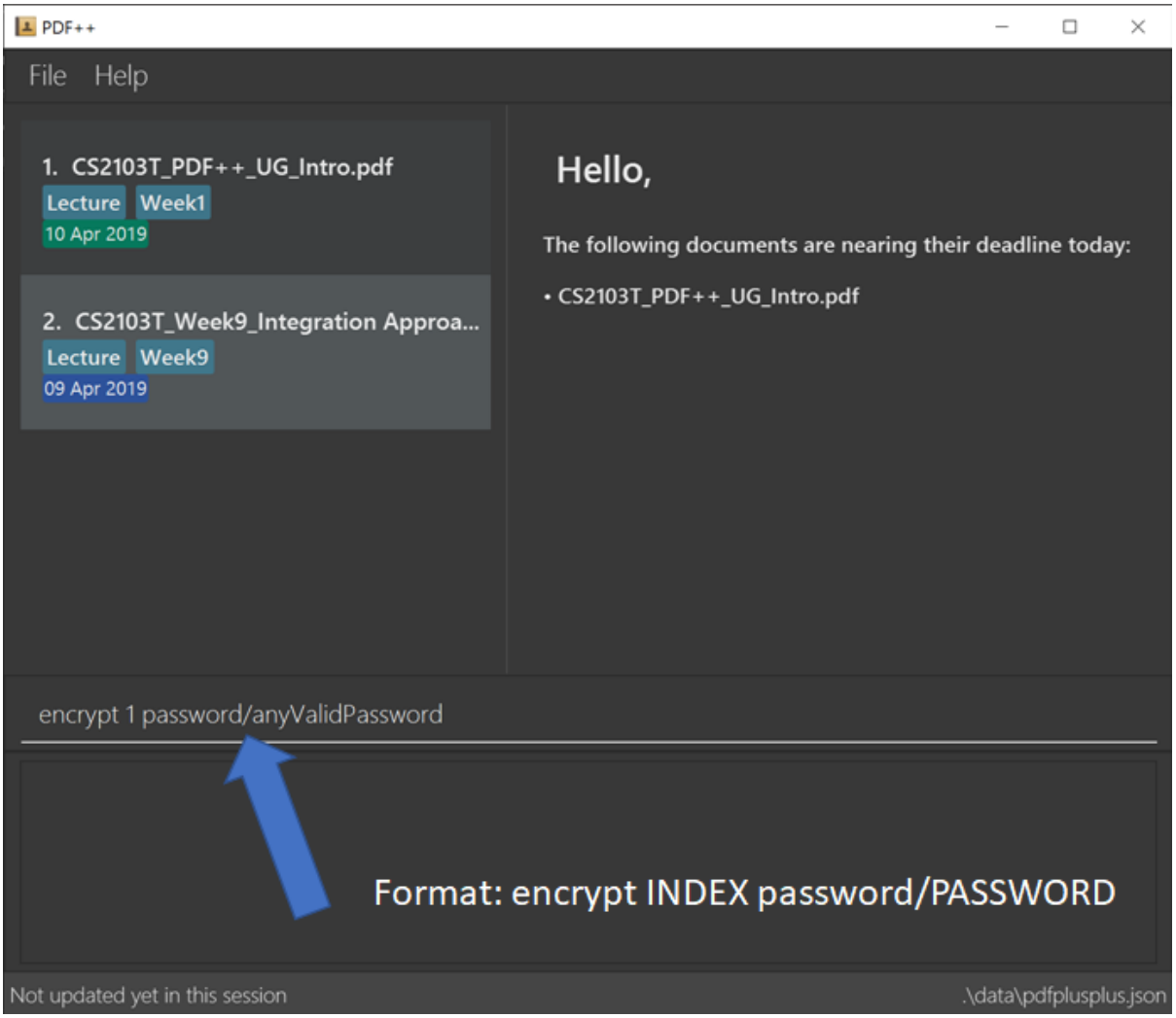
Step 1: The user launches the application with either an existing set of `Pdf` or a new sample set of `Pdf` stored within as shown below. Please refer to [Add feature] for guide in how you can add your files into PDF++.



Step 2: You select the file that you wish to encrypt via the INDEX on the list.



Step 3: Enter the `encrypt` command into the CLI interface, following the outlined syntax as illustrated below.



Step 4: Upon hitting enter to execute the command, the `EncryptCommandParser` parses the input into several components that are required to be executed by the `EncryptCommand`.

Upon parsing, the parser then creates a new `EncryptCommand` that will be executed according to your input.

Step 5: Upon receiving the necessary information from the parser, which includes the INDEX and PASSWORD, the `EncryptCommand` first checks if the INDEX is valid.

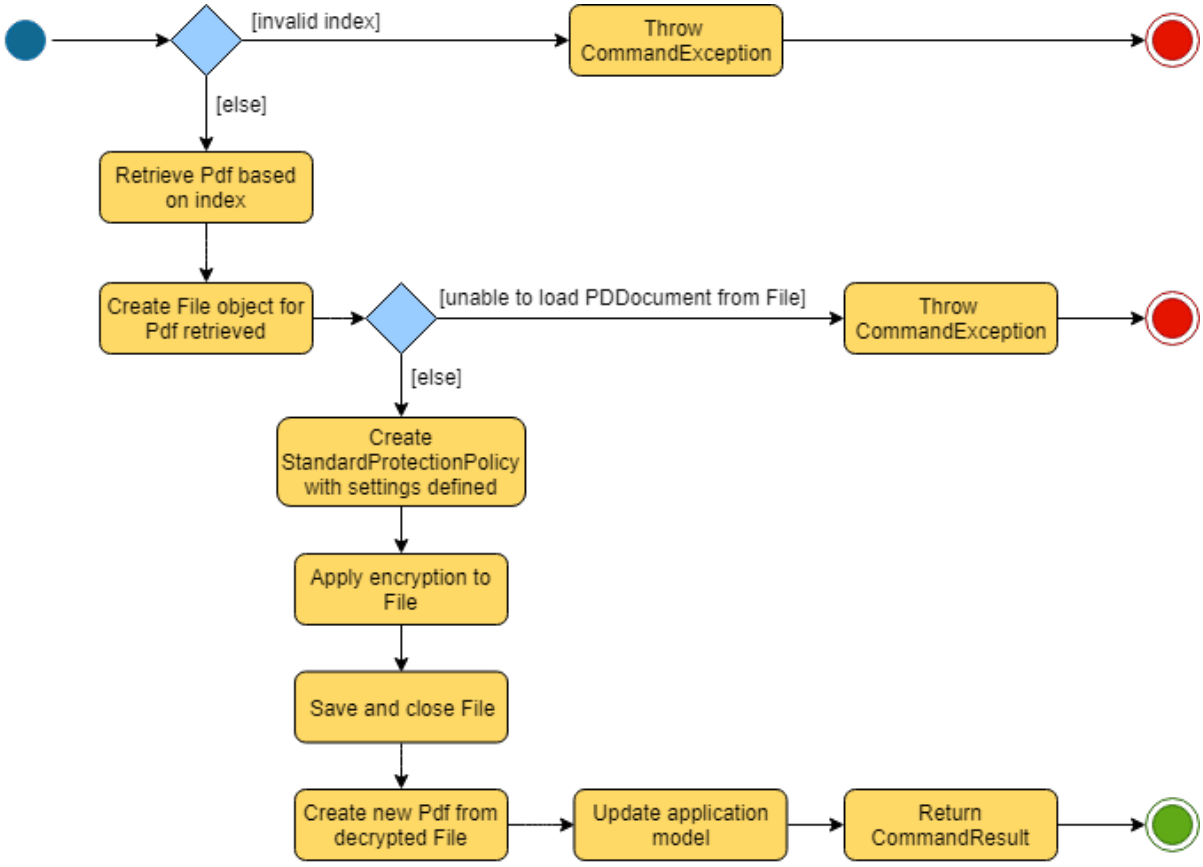
- `INDEX` is invalid or out of bound.

[EncryptFeatureStep5InvalidIndex] | *EncryptFeatureStep5InvalidIndex.png*

- `INDEX` and `PASSWORD` are both valid. The file you selected will be encrypted with the password you specified.

[EncryptFeatureStep5Sucess] | *EncryptFeatureStep5Sucess.png*

Step 6: If the command passes the validity check, the file you have selected is encrypted. You can open your file to see the result. Please refer to Section 3.2, “Open feature” for the `open` feature.

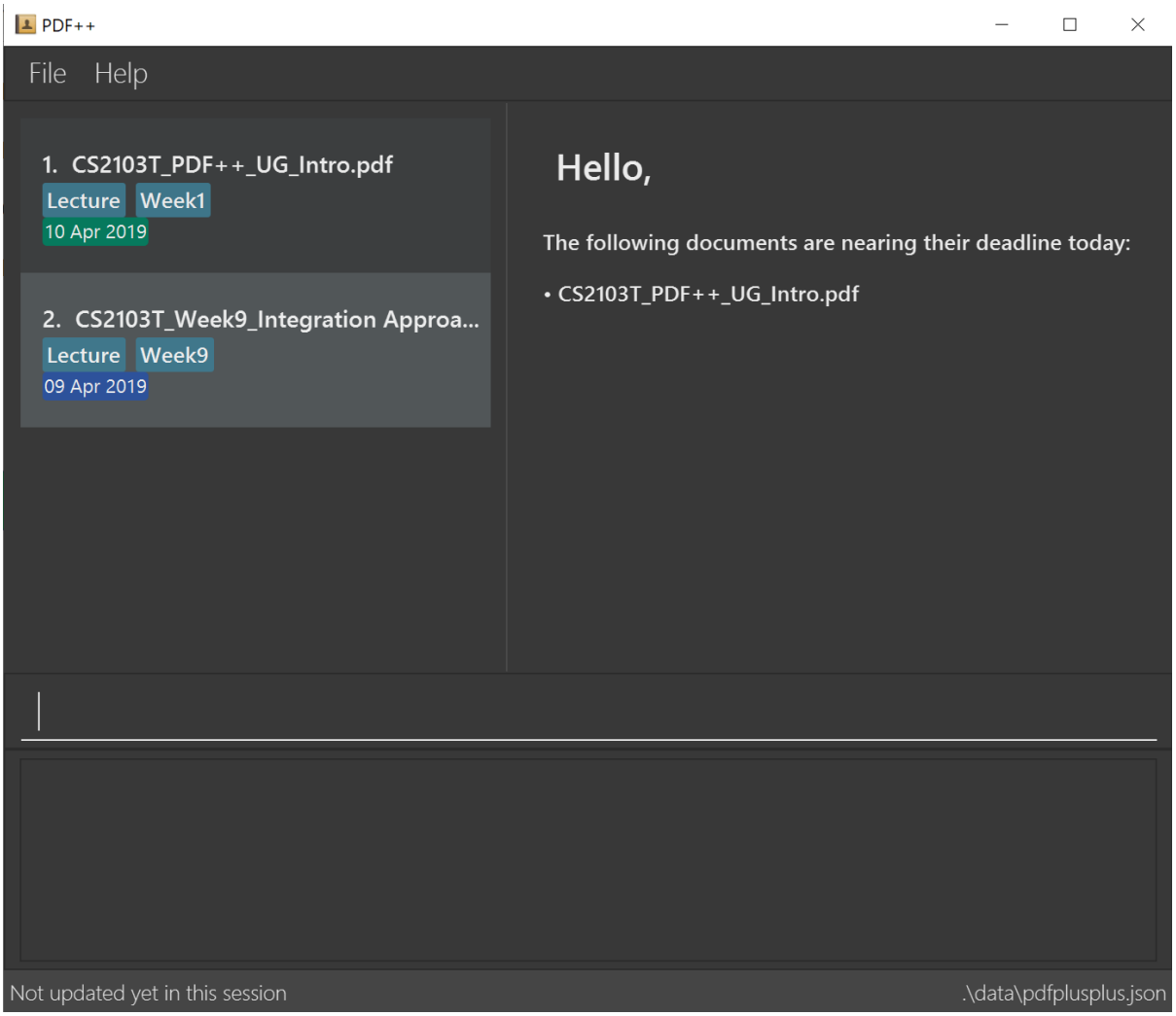


3.19.2. Step-by-Step Guide — decrypt

Illustrate below is a sample usage scenario that provides a clear view to the inner workings of the Decrypt feature.

> **TIP** `decrypt` feature is very similar to `encrypt` feature.

Step 1: The user launches the application with either an existing set of `Pdf` or a new sample set of `Pdf` stored within as shown below. Please refer to [Add feature] for guide in how you can add your files into PDF++.



Step 2: You select the file that you wish to decrypt via the INDEX on the list.

[DecryptFeatureStep2Index] | *DecryptFeatureStep2Index.png*

Step 3: Enter the `decrypt` command into the CLI interface, following the outlined syntax as illustrate below.

[DecryptFeatureStep3UserInput] | *DecryptFeatureStep3UserInput.png*

Step 4: Upon hitting enter to execute the command, the `DecryptCommandParser` parses the input into several components that are required to be executed by the `DecryptCommand`.

Upon parsing, the parser then creates a new `DecryptCommand` that will be executed according to your input.

Step 5: Upon receiving the necessary information from the parser, which includes the INDEX and PASSWORD, the `DecryptCommand` first checks if the INDEX is valid.

- `INDEX` is invalid or out of bound.

[DecryptFeatureStep5InvalidIndex] | *DecryptFeatureStep5InvalidIndex.png*

- `PASSWORD` is invalid

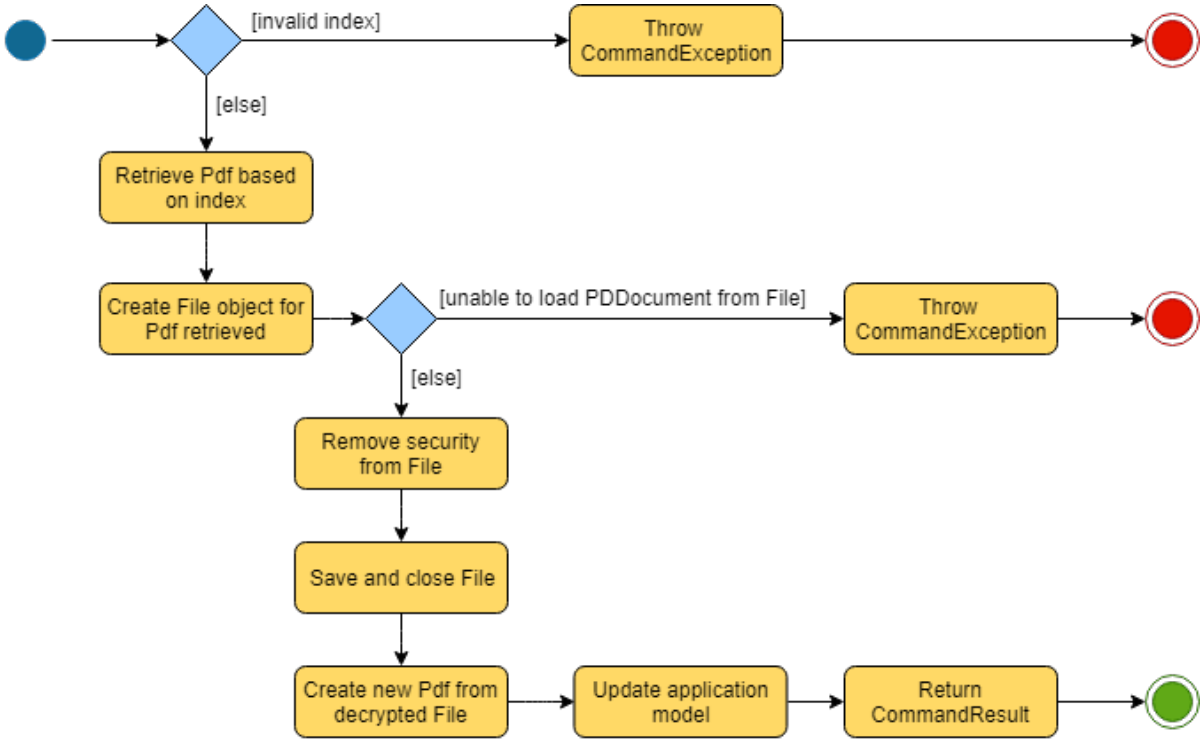
NOTE	Please enter the password of the encrypted file. You will not be able to decrypt the file without the password.

[DecryptFeatureStep5InvalidPassword] | *DecryptFeatureStep5InvalidPassword.png*

- `INDEX` and `PASSWORD` are both valid. The file you selected will be decrypted with the password you specified.

[DecryptFeatureStep5Sucess] | *DecryptFeatureStep5Sucess.png*

Step 6: If the command passes the validity check, the file you have selected is decrypted. You can open your file to see the result. Please refer to Section 3.2, "Open feature" for the `open` feature.



3.20. Logging

We are using `java.util.logging` package for logging. The `LogsCenter` class is used to manage the logging levels and logging destinations.

- The logging level can be controlled using the `logLevel` setting in the configuration file (See Section 3.21, "Configuration")
- The `Logger` for a class can be obtained using `LogsCenter.getLogger(Class)` which will log messages according to the specified logging level
- Currently log messages are output through: `Console` and to a `.log` file.

Logging Levels

- `SEVERE` : Critical problem detected which may possibly cause the termination of the application
- `WARNING` : Can continue, but with caution

- `INFO` : Information showing the noteworthy actions by the App
- `FINE` : Details that is not usually noteworthy but may be useful in debugging e.g. print the actual list instead of just its size

3.21. Configuration

Certain properties of the application can be controlled (e.g user prefs file directory, logging level) through the configuration file (default: `config.json`).

4. Documentation

We use asciidoc for writing documentation.

NOTE	We chose asciidoc over Markdown because asciidoc, although a bit more complex than Markdown, provides more flexibility in formatting.

4.1. Editing Documentation

See UsingGradle.adoc to learn how to render `.adoc` files locally to preview the end result of your edits. Alternatively, you can download the AsciiDoc plugin for IntelliJ, which allows you to preview the changes you have made to your `.adoc` files in real-time.

4.2. Publishing Documentation

See UsingTravis.adoc to learn how to deploy GitHub Pages using Travis.

4.3. Converting Documentation to PDF format

We use Google Chrome for converting documentation to PDF format, as Chrome's PDF engine preserves hyperlinks used in webpages.

Here are the steps to convert the project documentation files to PDF format.

1. Follow the instructions in UsingGradle.adoc to convert the AsciiDoc files in the `docs/` directory to HTML format.
2. Go to your generated HTML files in the `build/docs` folder, right click on them and select `Open with` → `Google Chrome`.
3. Within Chrome, click on the `Print` option in Chrome's menu.
4. Set the destination to `Save as PDF`, then click `Save` to save a copy of the file in PDF format. For best results, use the settings indicated in the screenshot below.

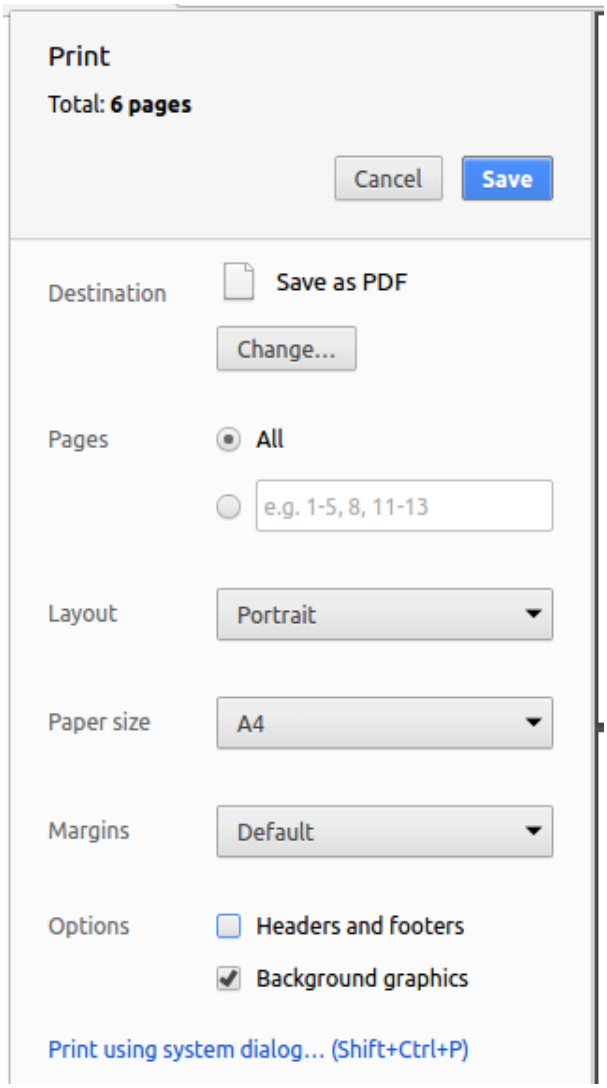


Figure 9. Saving documentation as PDF files in Chrome

4.4. Site-wide Documentation Settings

The `build.gradle` file specifies some project-specific asciidoc attributes which affects how all documentation files within this project are rendered.

TIP Attributes left unset in the `build.gradle` file will use their **default value**, if any.

Table 1. List of site-wide attributes

Attribute name	Description	Default value
`site-name`	The name of the website. If set, the name will be displayed near the top of the page.	*not set*
`site-githuburl`	URL to the site's repository on GitHub. Setting this will add a "View on GitHub" link in the navigation bar.	*not set*

Attribute name	Description	Default value
`site-seedu`	Define this attribute if the project is an official SE-EDU project. This will render the SE-EDU navigation bar at the top of the page, and add some SE-EDU-specific navigation items.	*not set*

4.5. Per-file Documentation Settings

Each `.adoc` file may also specify some file-specific asciidoc attributes which affects how the file is rendered.

Asciidoctor's built-in attributes may be specified and used as well.

> **TIP** Attributes left unset in `.adoc` files will use their **default value**, if any.

Table 2. List of per-file attributes, excluding Asciidoctor's built-in attributes

Attribute name	Description	Default value
`site-section`	Site section that the document belongs to. This will cause the associated item in the navigation bar to be highlighted. One of: `UserGuide`, `DeveloperGuide`, `LearningOutcomes`*, `AboutUs`, `ContactUs` * *Official SE-EDU projects only*	*not set*
`no-site-header`	Set this attribute to remove the site navigation bar.	*not set*

4.6. Site Template

The files in `docs/stylesheets` are the CSS stylesheets of the site. You can modify them to change some properties of the site's design.

The files in `docs/templates` controls the rendering of `.adoc` files into HTML5. These template files are written in a mixture of Ruby and Slim.

> **WARNING** Modifying the template files in `docs/templates` requires some knowledge and experience with Ruby and Asciidoctor's API. You should only modify them if you need greater control over the site's layout than what stylesheets can provide. The SE-EDU team does not provide support for modified template files.

5. Testing

5.1. Running Tests

There are three ways to run tests.

TIP	The most reliable way to run tests is the 3rd one. The first two methods might fail some GUI tests due to platform/resolution-specific idiosyncrasies.

Method 1: Using IntelliJ JUnit test runner

- To run all tests, right-click on the `src/test/java` folder and choose `Run 'All Tests'`
- To run a subset of tests, you can right-click on a test package, test class, or a test and choose `Run 'ABC'`

Method 2: Using Gradle

- Open a console and run the command `gradlew clean allTests` (Mac/Linux: `./gradlew clean allTests`)

NOTE	See UsingGradle.adoc for more info on how to run tests using Gradle.

Method 3: Using Gradle (headless)

Thanks to the TestFX library we use, our GUI tests can be run in the *headless* mode. In the headless mode, GUI tests do not show up on the screen. That means the developer can do other things on the Computer while the tests are running.

To run tests in headless mode, open a console and run the command `gradlew clean headless allTests` (Mac/Linux: `./gradlew clean headless allTests`)

5.2. Types of tests

We have two types of tests:

1. **GUI Tests** - These are tests involving the GUI. They include,
   a. *System Tests* that test the entire App by simulating user actions on the GUI. These are in the `systemtests` package.
   b. *Unit tests* that test the individual components. These are in `seedu.pdf.ui` package.
2. **Non-GUI Tests** - These are tests not involving the GUI. They include,
   a. *Unit tests* targeting the lowest level methods/classes.
   e.g. `seedu.pdf.commons.StringUtilTest`
   b. *Integration tests* that are checking the integration of multiple code units (those code units are assumed to be working).
   e.g. `seedu.pdf.storage.StorageManagerTest`

c. Hybrids of unit and integration tests. These test are checking multiple code units as well as how the are connected together.
e.g. `seedu.pdf.logic.LogicManagerTest`

5.3. Troubleshooting Testing

Problem: `HelpWindowTest` fails with a `NullPointerException`.

- Reason: One of its dependencies, `HelpWindow.html` in `src/main/resources/docs` is missing.
- Solution: Execute Gradle task `processResources`.

6. Dev Ops

6.1. Build Automation

See UsingGradle.adoc to learn how to use Gradle for build automation.

6.2. Continuous Integration

We use Travis CI and AppVeyor to perform *Continuous Integration* on our projects. See UsingTravis.adoc and UsingAppVeyor.adoc for more details.

6.3. Coverage Reporting

We use Coveralls to track the code coverage of our projects. See UsingCoveralls.adoc for more details.

6.4. Documentation Previews

When a pull request has changes to asciidoc files, you can use Netlify to see a preview of how the HTML version of those asciidoc files will look like when the pull request is merged. See UsingNetlify.adoc for more details.

6.5. Making a Release

Here are the steps to create a new release.

1. Update the version number in `MainApp.java`.
2. Generate a JAR file using Gradle.
3. Tag the repo with the version number. e.g. `v0.1`
4. Create a new release using GitHub and upload the JAR file you created.

6.6. Managing Dependencies

A project often depends on third-party libraries. For example, Pdf Book depends on the Jackson library for JSON parsing. Managing these *dependencies* can be automated using Gradle. For example, Gradle can download the dependencies automatically, which is better than these alternatives:

a. Include those libraries in the repo (this bloats the repo size)

b. Require developers to download those libraries manually (this creates extra work for developers)

Appendix A: Suggested Programming Tasks to Get Started

Suggested path for new programmers:

1. First, add small local-impact (i.e. the impact of the change does not go beyond the component) enhancements to one component at a time. Some suggestions are given in Section A.1, "Improving each component".
2. Next, add a feature that touches multiple components to learn how to implement an end-to-end feature across all components. Section A.2, "Creating a new command: `remark`" explains how to go about adding such a feature.

A.1. Improving each component

Each individual exercise in this section is component-based (i.e. you would not need to modify the other components to get it to work).

`Logic` component

Scenario: You are in charge of `logic`. During dog-fooding, your team realize that it is troublesome for the user to type the whole command in order to execute a command. Your team devise some strategies to help cut down the amount of typing necessary, and one of the suggestions was to implement aliases for the command words. Your job is to implement such aliases.

> **TIP** Do take a look at Section 2.3, "Logic component" before attempting to modify the `Logic` component.

1. Add a shorthand equivalent alias for each of the individual commands. For example, besides typing `clear`, the user can also type `c` to remove all pdfs in the list.

- Hints
  - Just like we store each individual command word constant `COMMAND_WORD` inside `*Command.java` (e.g. `FindCommand#COMMAND_WORD`, `DeleteCommand#COMMAND_WORD`), you need a new constant for aliases as well (e.g. `FindCommand#COMMAND_ALIAS`).
  - `PdfBookParser` is responsible for analyzing command words.
- Solution
  - Modify the switch statement in `PdfBookParser#parseCommand(String)` such that both the proper command word and alias can be used to execute the same intended command.
  - Add new tests for each of the aliases that you have added.
  - Update the user guide to document the new aliases.
  - See this PR for the full solution.

`Model` component

Scenario: You are in charge of `model`. One day, the `logic`-in-charge approaches you for help. He wants to implement a command such that the user is able to remove a particular tag from everyone in the pdf book, but the model API does not support such a functionality at the moment. Your job is to implement an API method, so that your teammate can use your API to implement his command.

TIP Do take a look at Section 2.4, "Model component" before attempting to modify the `Model` component.

1. Add a `removeTag(Tag)` method. The specified tag will be removed from everyone in the pdf book.

- Hints
  - The `Model` and the `PdfBook` API need to be updated.
  - Think about how you can use SLAP to design the method. Where should we place the main logic of deleting tags?
  - Find out which of the existing API methods in `PdfBook` and `Pdf` classes can be used to implement the tag removal logic. `PdfBook` allows you to update a pdf, and `Pdf` allows you to update the tags.
- Solution
  - Implement a `removeTag(Tag)` method in `PdfBook`. Loop through each pdf, and remove the `tag` from each pdf.
  - Add a new API method `deleteTag(Tag)` in `ModelManager`. Your `ModelManager` should call `PdfBook#removeTag(Tag)`.
  - Add new tests for each of the new public methods that you have added.
  - See this PR for the full solution.

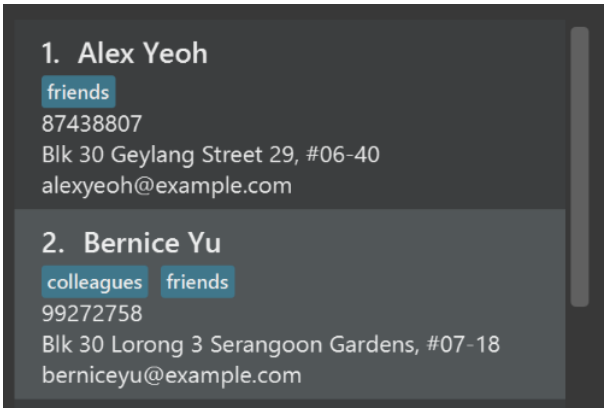
`Ui` component

Scenario: You are in charge of `ui`. During a beta testing session, your team is observing how the users use your pdf book application. You realize that one of the users occasionally tries to delete non-existent tags from a contact, because the tags all look the same visually, and the user got confused. Another user made a typing mistake in his command, but did not realize he had done so because the error message wasn't prominent enough. A third user keeps scrolling down the list, because he keeps forgetting the index of the last pdf in the list. Your job is to implement improvements to the UI to solve all these problems.

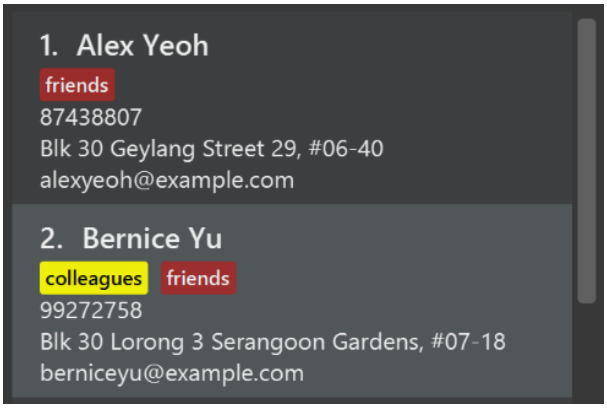
TIP	Do take a look at Section 2.2, "UI component" before attempting to modify the `UI` component.

1. Use different colors for different tags inside pdf cards. For example, `friends` tags can be all in brown, and `colleagues` tags can be all in yellow.

   Before

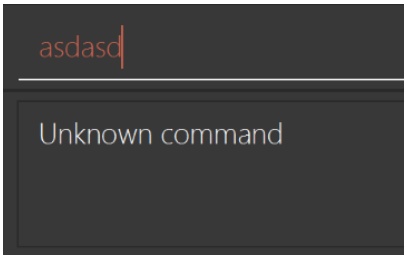
   After

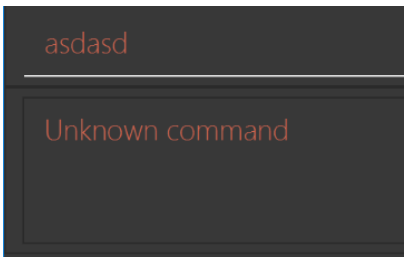
- Hints
  - The tag labels are created inside the `PdfCard` constructor (`new Label(tag.tagName)`). JavaFX's `Label` class allows you to modify the style of each Label, such as changing its color.
  - Use the .css attribute `-fx-background-color` to add a color.
  - You may wish to modify `DarkTheme.css` to include some pre-defined colors using css, especially if you have experience with web-based css.
- Solution
  - You can modify the existing test methods for `PdfCard` 's to include testing the tag's color as well.
  - See this PR for the full solution.
    - The PR uses the hash code of the tag names to generate a color. This is deliberately designed to ensure consistent colors each time the application runs. You may wish to expand on this design to include additional features, such as allowing users to set their own tag colors, and directly saving the colors to storage, so that tags retain their colors even if the hash code algorithm changes.

2. Modify `NewResultAvailableEvent` such that `ResultDisplay` can show a different style on error (currently it shows the same regardless of errors).

   Before

   After

- Hints
  - `NewResultAvailableEvent` is raised by `CommandBox` which also knows whether the result is a success or failure, and is caught by `ResultDisplay` which is where we want to change the style to.
  - Refer to `CommandBox` for an example on how to display an error.
- Solution
  - Modify `NewResultAvailableEvent` 's constructor so that users of the event can indicate whether an error has occurred.
  - Modify `ResultDisplay#handleNewResultAvailableEvent(NewResultAvailableEvent)` to react to this event appropriately.
  - You can write two different kinds of tests to ensure that the functionality works:
    - The unit tests for `ResultDisplay` can be modified to include verification of the color.
    - The system tests `PdfBookSystemTest#assertCommandBoxShowsDefaultStyle()` and `PdfBookSystemTest#assertCommandBoxShowsErrorStyle()` to include verification for `ResultDisplay` as well.
  - See this PR for the full solution.
    - Do read the commits one at a time if you feel overwhelmed.

3. Modify the `StatusBarFooter` to show the total number of people in the pdf book.

Before

After

- Hints
  - `StatusBarFooter.fxml` will need a new `StatusBar`. Be sure to set the `GridPane.columnIndex` properly for each `StatusBar` to avoid misalignment!
  - `StatusBarFooter` needs to initialize the status bar on application start, and to update it accordingly whenever the pdf book is updated.
- Solution
  - Modify the constructor of `StatusBarFooter` to take in the number of pdfs when the application just started.
  - Use `StatusBarFooter#handlePdfBookChangedEvent(PdfBookChangedEvent)` to update the number of pdfs whenever there are new changes to the pdfbook.
  - For tests, modify `StatusBarFooterHandle` by adding a state-saving functionality for the total number of people status, just like what we did for save directory and sync status.
  - For system tests, modify `PdfBookSystemTest` to also verify the new total number of pdfs status bar.
  - See this PR for the full solution.

`Storage` component

Scenario: You are in charge of `storage`. For your next project milestone, your team plans to implement a new feature of saving the pdf book to the cloud. However, the current implementation of the application constantly saves the pdf book after the execution of each command, which is not ideal if the user is working on limited internet connection. Your team decided that the application should instead save the changes to a temporary local backup file first, and only upload to the cloud after the user closes the application. Your job is to implement a backup API for the pdf book storage.

TIP Do take a look at Section 2.5, “Storage component” before attempting to modify the `Storage` component.

1. Add a new method `backupPdfBook(ReadOnlyPdfBook)`, so that the pdf book can be saved in a fixed temporary directory.

- Hint
  - Add the API method in `PdfBookStorage` interface.
  - Implement the logic in `StorageManager` and `JsonPdfBookStorage` class.
- Solution
  - See this PR for the full solution.

A.2. Creating a new command: `remark`

By creating this command, you will get a chance to learn how to implement a feature end-to-end, touching all major components of the app.

Scenario: You are a software maintainer for `pdfbook`, as the former developer team has moved on to new projects. The current users of your application have a list of new feature requests that they hope the software will eventually have. The most popular request is to allow adding additional comments/notes about a particular contact, by providing a flexible `remark` field for each contact, rather than relying on tags alone. After designing the specification for the `remark` command, you are convinced that this feature is worth implementing. Your job is to implement the `remark` command.

A.2.1. Description

Edits the remark for a pdf specified in the `INDEX`.
Format: `remark INDEX r/[REMARK]`

Examples:

- `remark 1 r/Likes to drink coffee.`
  Edits the remark for the first pdf to `Likes to drink coffee.`
- `remark 1 r/`
  Removes the remark for the first pdf.

A.2.2. Step-by-step Instructions

[Step 1] Logic: Teach the app to accept 'remark' which does nothing

Let's start by teaching the application how to parse a `remark` command. We will add the logic of `remark` later.

Main:

1. Add a `RemarkCommand` that extends `Command`. Upon execution, it should just throw an `Exception`.
2. Modify `PdfBookParser` to accept a `RemarkCommand`.

Tests:

1. Add `RemarkCommandTest` that tests that `execute()` throws an Exception.
2. Add new test method to `PdfBookParserTest`, which tests that typing "remark" returns an instance of `RemarkCommand`.

[Step 2] Logic: Teach the app to accept 'remark' arguments

Let's teach the application to parse arguments that our `remark` command will accept. E.g. `1 r/Likes to drink coffee.`

Main:

1. Modify `RemarkCommand` to take in an `Index` and `String` and print those two parameters as the error message.
2. Add `RemarkCommandParser` that knows how to parse two arguments, one index and one with prefix 'r/'.
3. Modify `PdfBookParser` to use the newly implemented `RemarkCommandParser`.

Tests:

1. Modify `RemarkCommandTest` to test the `RemarkCommand#equals()` method.
2. Add `RemarkCommandParserTest` that tests different boundary values for `RemarkCommandParser`.
3. Modify `PdfBookParserTest` to test that the correct command is generated according to the user input.

[Step 3] Ui: Add a placeholder for remark in `PdfCard`

Let's add a placeholder on all our `PdfCard` s to display a remark for each pdf later.

Main:

1. Add a `Label` with any random text inside `PdfListCard.fxml`.
2. Add FXML annotation in `PdfCard` to tie the variable to the actual label.

Tests:

1. Modify `PdfCardHandle` so that future tests can read the contents of the remark label.

[Step 4] Model: Add `Remark` class

We have to properly encapsulate the remark in our `Pdf` class. Instead of just using a `String`, let's follow the conventional class structure that the codebase already uses by adding a `Remark` class.

Main:

1. Add `Remark` to model component (you can copy from `Directory`, remove the regex and change the names accordingly).
2. Modify `RemarkCommand` to now take in a `Remark` instead of a `String`.

Tests:

1. Add test for `Remark`, to test the `Remark#equals()` method.

[Step 5] Model: Modify `Pdf` to support a `Remark` field

Now we have the `Remark` class, we need to actually use it inside `Pdf`.

Main:

1. Add `getRemark()` in `Pdf`.
2. You may assume that the user will not be able to use the `add` and `edit` commands to modify the

remarks field (i.e. the pdf will be created without a remark).

3. Modify `SampleDataUtil` to add remarks for the sample data (delete your `data/pdfbook.json` so that the application will load the sample data when you launch it.)

[Step 6] Storage: Add `Remark` field to `JsonAdaptedPdf` class

We now have `Remark` s for `Pdf` s, but they will be gone when we exit the application. Let's modify `JsonAdaptedPdf` to include a `Remark` field so that it will be saved.

Main:

1. Add a new JSON field for `Remark`.

Tests:

1. Fix `invalidAndValidPdfPdfBook.json`, `typicalPdfsPdfBook.json`, `validPdfBook.json` etc., such that the JSON tests will not fail due to a missing `remark` field.

[Step 6b] Test: Add withRemark() for `PdfBuilder`

Since `Pdf` can now have a `Remark`, we should add a helper method to `PdfBuilder`, so that users are able to create remarks when building a `Pdf`.

Tests:

1. Add a new method `withRemark()` for `PdfBuilder`. This method will create a new `Remark` for the pdf that it is currently building.
2. Try and use the method on any sample `Pdf` in `TypicalPdfs`.

[Step 7] Ui: Connect `Remark` field to `PdfCard`

Our remark label in `PdfCard` is still a placeholder. Let's bring it to life by binding it with the actual `remark` field.

Main:

1. Modify `PdfCard`'s constructor to bind the `Remark` field to the `Pdf` 's remark.

Tests:

1. Modify `GuiTestAssert#assertCardDisplaysPdf(…)` so that it will compare the now-functioning remark label.

[Step 8] Logic: Implement `RemarkCommand#execute()` logic

We now have everything set up… but we still can't modify the remarks. Let's finish it up by adding in actual logic for our `remark` command.

Main:

1. Replace the logic in `RemarkCommand#execute()` (that currently just throws an `Exception`), with the

actual logic to modify the remarks of a pdf.

Tests:

1. Update `RemarkCommandTest` to test that the `execute()` logic works.

A.2.3. Full Solution

See this PR for the step-by-step solution.

Appendix B: Product Scope

Target user profile:

- has a need to manage a significant number of contacts
- prefers desktop app over other types
- can type fast
- prefers typing over mouse input
- is reasonably comfortable using CLI apps

Value proposition: manage contacts faster than a typical mouse/GUI driven app

Appendix C: User Stories

Priorities: High (must have) - * * *, Medium (nice to have) - * *, Low (unlikely to have) - *

Priority	As a ...	I want to ...	So that I can...
* * *	new user	see usage instructions	refer to instructions when I forget how to use the App
* * *	organized student	rename the PDFs to any valid name supported by the operating system	keep my PDFs organized
* * *	lazy user	filter my PDFs based on the tags	so that I can see all the files with the same tag in the app
* * *	user	delete a pdf	remove entries that I no longer need

Priority	As a …	I want to …	So that I can…
* * *	user	find a pdf by name	locate details of PDFs without having to go through the entire list
* * *	user with different tasks and deadlines	set due dates for my PDFs	be notified of upcoming deadlines and know the files required for that task
* *	student	view my productivity analysis and estimate time to get work done	allocate sufficient time to finish my homework & assignments before deadlines
*	user	view clashing tasks/appointments	be notified and make changes
*	class tutor	obtain the statistics of the exam	evaluate the performance of the exam
*	teacher	create new exam paper	create formatted online exam paper easily
*	NUS student	submit my files to LumiNUS with command lines	submit files without using an internet browsers

Appendix D: Use Cases

(For all use cases below, the **System** is the `PDF++` and the **Actor** is the `user`, unless specified otherwise)

Use case: Add new PDF file

MSS

1. User clicks on `Import PDF` button [top-left corner of the UI].
2. User navigates to directory of the PDF file to be added.

3. User clicks desired PDF file followed by `Add` button.
4. PDF++ makes a record of the relevant attributes of the selected PDF.

   Use case ends.

Use case: Sort files within PDF++

MSS

1. User clicks on `Sort` dropdown box.
2. User clicks on sorting criteria based on dropdown box options.
3. User clicks on `Sort` button.
4. PDF++ sorts the list of files and displays sorted list to user.

   Use case ends.

Use case: Delete pdf

MSS

1. User requests to list pdfs
2. PdfBook shows a list of pdfs
3. User requests to delete a specific pdf in the list
4. PdfBook deletes the pdf

   Use case ends.

Extensions

2a. The list is empty.

Use case ends.

3a. The given index is invalid.

3a1. PdfBook shows an error message.

Use case resumes at step 2.

{More to be added}

Appendix E: Non Functional Requirements

- **Technical requirements**

  The software should work on both 32-bit and 64-bit environments.

- **Platform compatibility**

  The software should work on Windows, Linux and OS-X platforms.

- **Response time**

  The software should respond within two seconds.

- **Cost**

  The software is free of charge. However, we do appreciate any contributions to our coffee fund.

- **Privacy**

  The software should work entirely offline and should not collect user personal data for any purposes.

- **Licensing**

  The software is free, open-source does not require installation.

- **Portability**

  The software should not require any installer; it should be able to run without installing any additional software.

- **Extensibility**

  The software should take future growth into consideration e.g. adding features, carry-forward of customizations at next major version upgrade.

- **Testability**

  The software should not have features that are hard to test both manual and automated testing.

- **Data requirements**

  The data that is stored locally should be editable by user. In other words, expert users can open the file without using the application and edit it for his or her liking.

Appendix F: Glossary

Mainstream OS

Windows, Linux, Unix, OS-X

Private contact detail

A contact detail that is not meant to be shared with others

Appendix G: Instructions for Manual Testing

Given below are instructions to test the app manually.

NOTE	These instructions only provide a starting point for testers to work on; testers are expected to do more *exploratory* testing.

G.1. Launch and Shutdown

1. Initial launch
   a. Download the jar file and copy into an empty folder
   b. Double-click the jar file
      Expected: Shows the GUI with a set of sample contacts. The window size may not be optimum.
2. Saving window preferences
   a. Resize the window to an optimum size. Move the window to a different directory. Close the window.
   b. Re-launch the app by double-clicking the jar file.
      Expected: The most recent window size and directory is retained.

G.2. Deleting a pdf

1. Deleting a pdf while all pdfs are listed
   a. Prerequisites: List all pdfs using the `list` command. Multiple pdfs in the list.
   b. Test case: `delete 1`
      Expected: First contact is deleted from the list. Details of the deleted contact shown in the status message. Timestamp in the status bar is updated.
   c. Test case: `delete 0`
      Expected: No pdf is deleted. Error details shown in the status message. Status bar remains the same.
   d. Other incorrect delete commands to try: `delete`, `delete x` (where x is larger than the list size) *{give more}*
      Expected: Similar to previous.

G.3. Saving data

1. Dealing with missing/corrupted data files
   a. *{explain how to simulate a missing/corrupted file and the expected behavior}*