

Quek Wei Ping - Project Portfolio

PROJECT: MooLah

Overview

This portfolio aims to document my contributions to MooLah

My team of 4 Computer Science students and I were tasked with enhancing a basic Command Line Interface desktop application AddressBook - Level 3 for our Software Engineering project. Over 6 weeks, we chose to morph it into a finance tracker application called MooLah. This enhanced application allows the typical NUS student to manage past expenses with the use of budgets, reminders for future expenses, helpful statistics and user-friendly input formats. It is written in Java, and has about 23k LoC. My main developer responsibility in the team consists of the statistics features across every component.

Summary of contributions

- **Big feature:** I have added **the ability to generate statistics** in MooLah
 - What it does: This feature consists of a basic summary of expenses, a side-to-side comparison as well as a trend analysis across different periods of time.
 - Justification: This feature improves the product significantly because the lack of analytic tools to make sense of data is a potential reason for the problem of poor spending habits to be snowballed. The inclusion of a statistics feature addresses this directly, with varying levels of depths and visual representation the user can choose from.
 - Highlights: As the feature is closely coupled to the budget features and requires to support other dependencies such as undo/redo, constant coordination with other developers is required.
- **Code contributed:** ([Link to RepoSense](#))
- **Other contributions:**
 - Project management:
 - Initiated the renaming of the product to MooLah
 - Reviewed pull requests of team mates
 - Facilitated meetings every Wednesday and Friday and consolidated discussion minutes,
 - Scheduled milestone tasks and ensure that project deliverables are completed on time in the right format.
 - Wrote additional tests for existing features to increase coverage from 52% to 59% (PR [#254](#))

- Enhancements to existing features:
 - Refactored Tag classes from AddressBook - Level 3 to Category class (PR [#100](#), [#129](#))
 - Populated SampleDataUtil class with various budgets and expenses so that MooLah has sufficient data upon first launch (PR [#254](#))
- Documentation:
 - Documented new statistics features in User Guide
 - Added the implementation of Statistics in Developer's Guide

Contributions to the User Guide

We had to update the original AddressBook - Level 3 with instruction for the enhancement that we have added. The following is an excerpt from our MooLah User Guide, showing additions that I have made for the Statistics features.

Viewing Statistics

Like most of the expense commands, statistics of your expenses can be generated concerning to the primary budget you're residing on. Read further for the rest of the commands covered under the Statistics section.

Notes that apply to all statistics features

- For any input that consists of date and time, only the date information will be considered.
- Expenses to be included in the statistics generated include those on the start dates and end dates itself.
- The period of the budget plays a significant role in determining the output of the statistics features especially those that allow optional parameters. Hence, it may be helpful to be familiar with editing the period of a budget.
- Even though the **Default Budget** can contain expenses and has a valid budget period, it is not recommended to type this command when in that budget. It is after all a placeholder budget that is meant to hold expenses not associated to any budgets when starting out, which also implies it doesn't support editing any of its attributes, especially period. Also, the budget period is set to a large interval by design, so the output might not make sense.
- For commands that use **sd/ ed/** prefixes, **END_DATE** will be checked to be not before **START_DATE**.

Summary Statistics: **statsbasic**

This command allows you to have a basic summary of the money spent from their categorical expenses in a given period of their current budget.

The visual output of the statistics shown is a pie chart, with each piece representing the combined

expenditure of all expenses under the category, taken as a percentage of the total expenditure in the budget the command was called.

Format: `statsbasic [sd/<START_DATE>] [ed/<END_DATE>]`

Note

- The success message for this command is "Pie Chart calculated!"
- When there are no expenses in the current window of the current budget, a successful `statsbasic` can still be called. However, the same success message "Pie Chart calculated!" is still seen on the result display, but now with a blank screen in the StatsPanel.
- Categories where no tracked expenses fall under will not be reflected in the Statistics Panel.

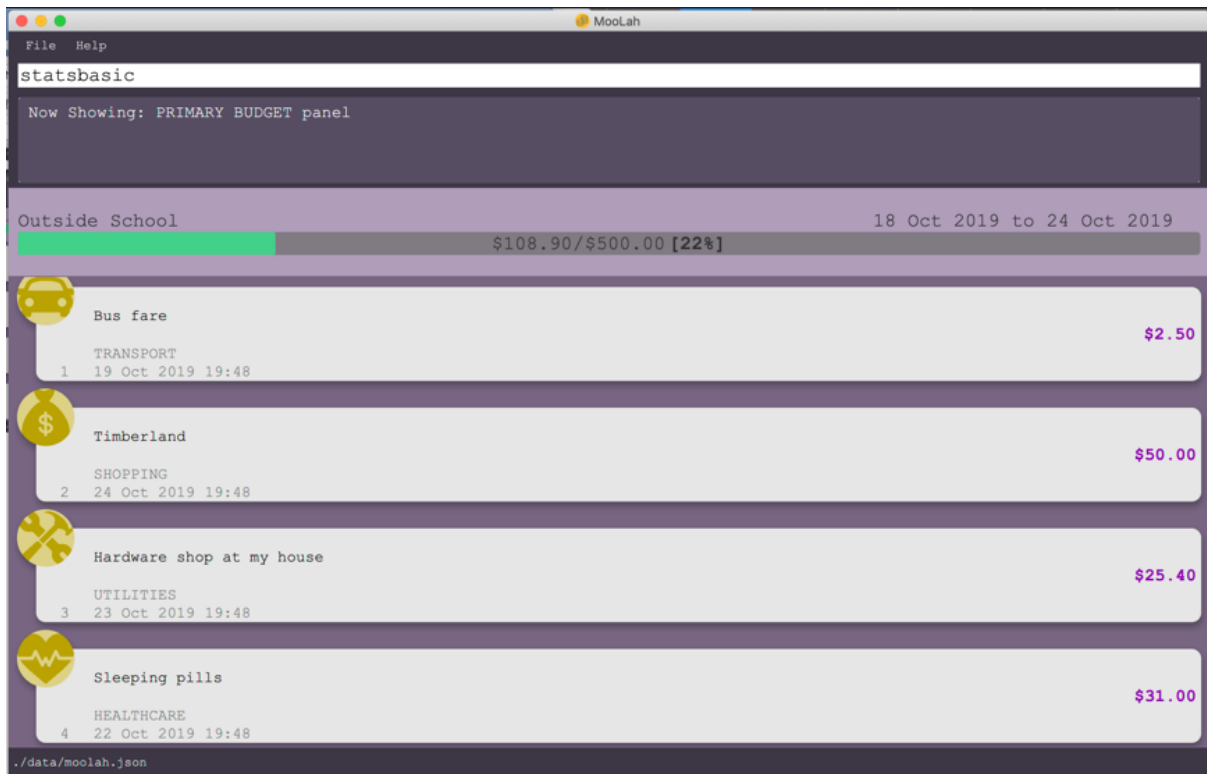
Tips:

- There is no need to specify all the parameters if the outcomes of the example usage scenarios below fit your needs
- If `START_DATE` is specified but `END_DATE` is empty, the period of the current budget will be considered as the unit of time and statistics is calculated till one unit of time after `START_DATE`.
- If `START_DATE` is empty but `END_DATE` is specified, the period of the current budget will be considered as the unit of time and statistics is calculated starting from one unit of time before `END_DATE`.
- If both `START_DATE` and `END_DATE` are empty, statistics will be calculated using the start date and end date of the current window of the budget, seen on the top right of the budget progress bar.

Example of configurations:

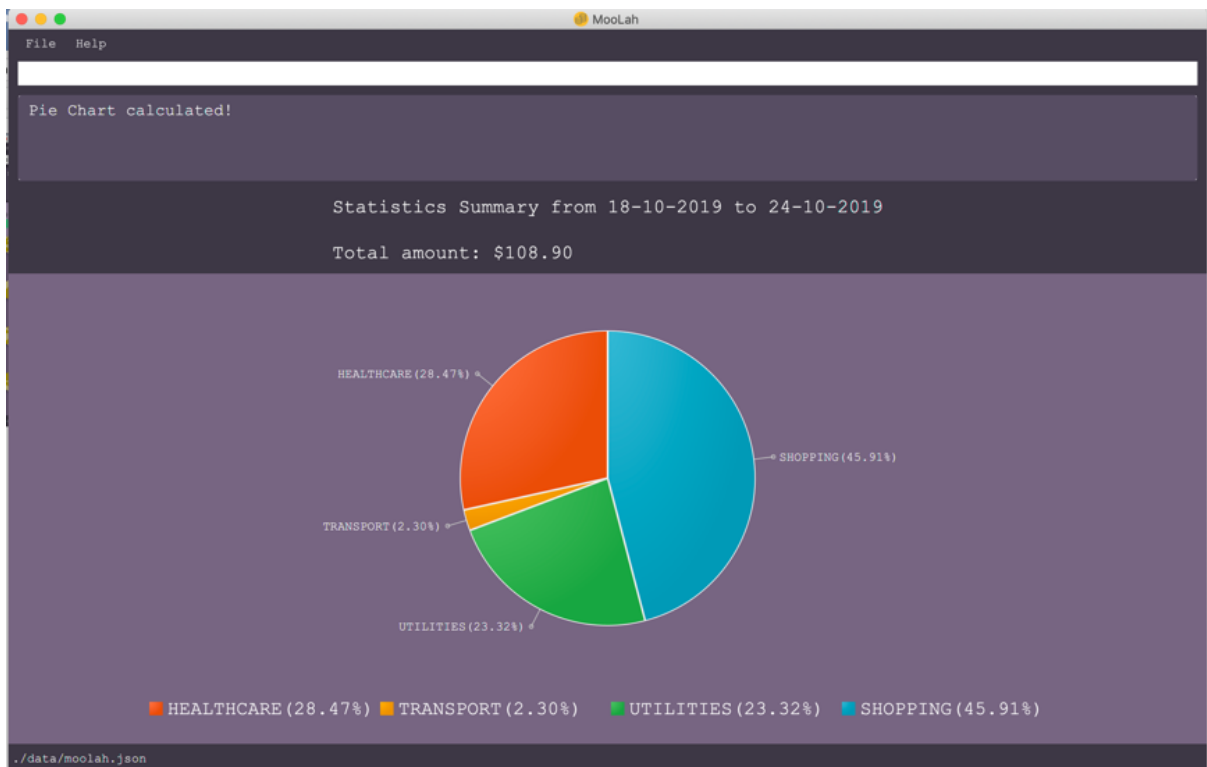
```
statsbasic  
statsbasic sd/tmr  
statsbasic sd/11-11-2018 ed/12-12-2018
```

Step-by-step guide: For example, MooLah is currently at the "Outside School" budget, and shown below is the view of the current window of the Budget from start of 18 Oct to the end of 24 Oct. There are exactly 4 expenses as shown in the example.



To generate the pie chart for the expenses for this window.

1. Type `statsbasic` into the command box and press `Enter` to execute it.
2. The result display will display the message "Pie Chart calculated!".
3. The screen will be switched into the Statistics Panel where the Pie Chart will be generated as shown below.



Comparison Statistics: `statscompare`

This command allows you to have a side-to-side comparison of the money spent from their categorical expenses in 2 periods of their current budget. In this comparison, we provide you with data of both the similarities and differences in these 2 periods.

The visual output of the statistics shown is a table view, with 5 columns, consisting of a category column, and 2 pairs of frequency-total expenditure columns. The cells in the first pair of columns, denoted as "similarity columns" represents the frequency and total expenditure in any existing overlapping interval between the 2 periods, while the cells in the second pair of columns, denoted as the "difference columns" represents the difference in frequency and difference in total expenditure.

Format: `statscompare sd1/<START_DATE_1> sd2/<START_DATE_2>`

Note

- The success message for this command is "Statistics Comparison Calculated!"
- The cells in the "similarity columns" denote only non-negative values. This is because it shows the frequency and total expenditure common to both periods.
- The cells in the "difference columns" may contain negative values. This is because the values for differences in frequency and differences in total expenditure for each category is calculated using the formula `second period - first period`.
- The end dates for both start dates specified by the user are constructed using the period that the current budget is using.

Example of configurations:

```
statscompare sd1/12-12 sd2/ 1 month ago
statscompare sd2/ today sd1/tmr
statscompare sd2/ 23-09-2019 sd1/1 year ago
```

Growth Statistics : `statstrend`

This command allows you to see the growth of the money spent from your categorical expenses in fixed units of time between the interval that you're interested in finding out

The visual output of the statistics shown is in the form of plotted trend lines.

Currently 2 modes of usage can be selected.

The first one is a `category` mode where each individual trend lines represents one categories and every plotted point on a line represents the total expenditure starting from its stated date, till before the stated date of the next point.

The second mode is a `budget` mode where only 2 trend lines can be observed. The first trend line

represents the budget limit where every plotted point represents the budget limit set starting from its stated date, till before the stated date of the next point.

The second trend line represents the total expenditure for all expenses regardless of category, where every plotted point represents the total expenditure starting from its stated date, till before the stated date of the next point.

Format: `statstrend [sd/<START_DATE>] [ed/<END_DATE>] mode/MODE`

Note - `mode/` takes in only "mode" and "category" and is case-insensitive

- The success message for this command is "Statistics Trend Calculated!"
- The categories that do not have any expenses in any of the time intervals will not be reflected as trend lines in the Statistics Panel.
- The first plotted point that would be observed should be the start date of the window of the current budget closest to the start date of analysis. If the two happen to be the same, the start date of the window of the budget should be included as a point in the trend line
- Due to the possible differences in amounts, some points may not be plotted.
- At any time, only a maximum of 32 points starting from the first valid point will be shown

Tips:

- There is no need to specify all the parameters if the outcomes of the example usage scenarios below fit your needs. The analysis comes in the form of interval construction followed by the searching of the nearest possible window to be included. The following describes how the interval is constructed with different configurations
- If `START_DATE` is specified but `END_DATE` is empty, the end date of analysis is constructed till 32 unit of time after `START_DATE`.
- If `START_DATE` is empty but `END_DATE` is specified, the start date of analysis is constructed from 32 unit of time before `END_DATE`.
- If both `START_DATE` and `END_DATE` are empty, the start date of analysis is constructed from 16 units of time before the start date of the current window of the current budget and the end date of analysis is constructed from 16 units after the start date of the current window of the current budget.

Example of configurations:

```
statstrend mode/category
statstrend sd/tmr mode/category
statstrend sd/11-11-2018 ed/12-12-2018 mode/category
```

Contributions to the Developer Guide

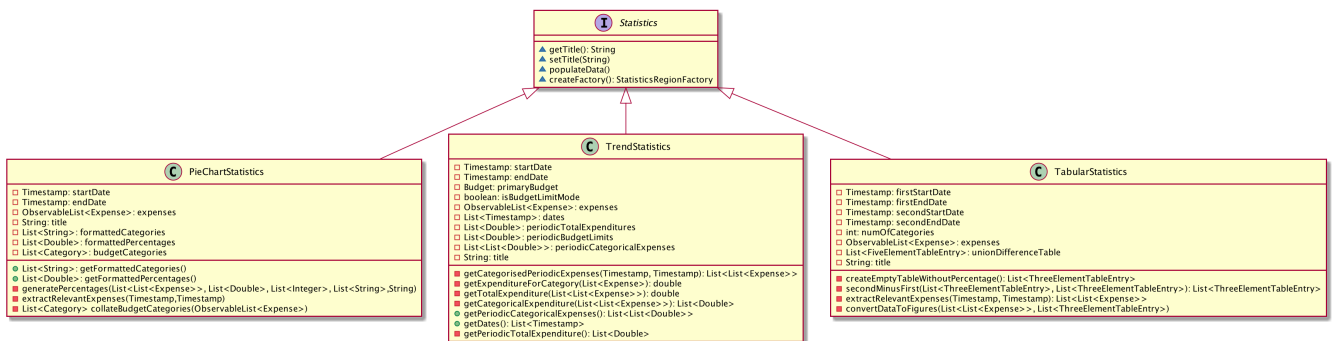
The following section shows my additions to the MooLah Developer Guide for the Statistics features. They showcase my ability to write technical documentation and the technical depth of my contributions to the project.

Statistics Feature

Implementation

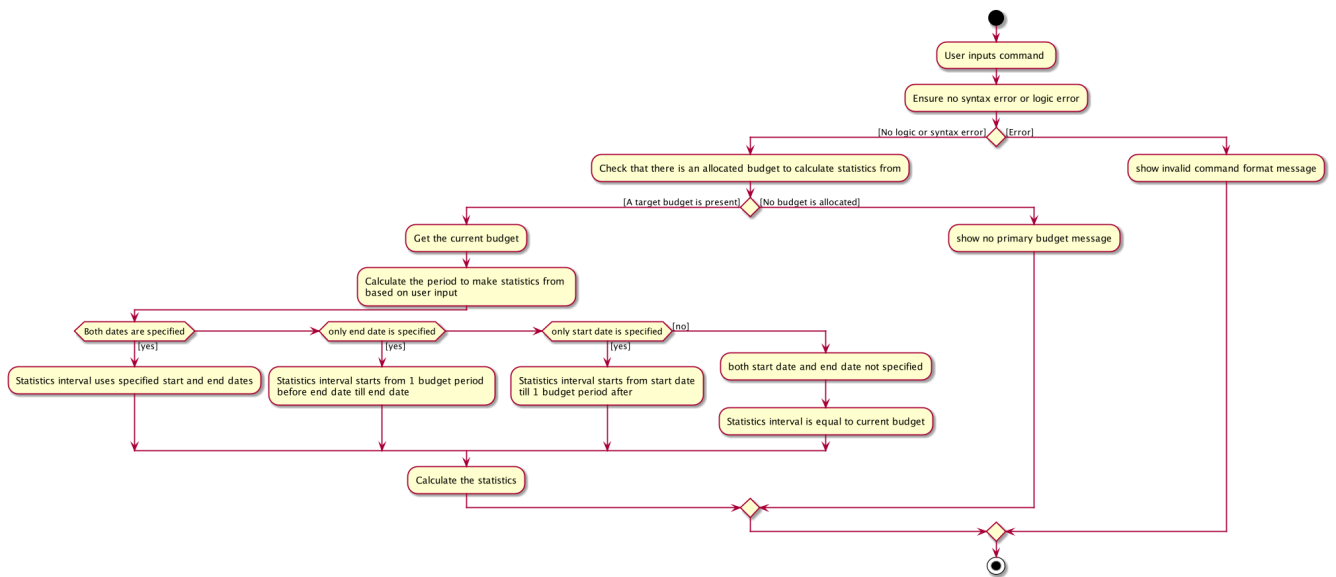
The statistics feature allows users to have an alternative view for the entries in **MooLah**. It is facilitated by the **Statistics** interface, which is part of the **model** package, and is implemented by 3 classes **PieChartStatistics**, **TabularStatistics** and **TrendStatistics**. Each of the implementing classes will be invoked when their respective parsers detect its corresponding command word, which is **statsbasic**, **statscompare** and **statstrend**. The prefix configurations vary greatly between them as well as the visual representation they create.

Given below is a class diagram to summarise the relationship between **Statistics** and its implementing classes.



The main entries that **Statistics** interacts with are **Expense** class and the **Budget** class. The entire statistics features only supports the generating of statistics from only the current budget and responds to the different methods called by the current **Budget** object. Every successful interaction will force a switch to the **Statistics Panel**, where each of their different visual representations will be generated.

The following activity diagram summarizes how statistics are shown from a current budget after possible user inputs to modify the attributes of the budget.



In the following sections, the implementation details of one of the more complicated command words will be discussed, as well as its design considerations.

statsbasic

The purpose of the `statsbasic` command word is to request `MooLah` to visualise the total expenditure across expenses of different categories as a percentage of the total expenditure of all expenses tracked under the budget where the command is called. The visual representation used here will be a PieChart.

Given below is an example usage scenario and how the `statsbasic` command word is handled by `MooLah`.

Step 1. The user enters the command `statsbasic sd/01-10-2019 ed/01-11-2019` to visualise the total percentage of each category as a percentage of total expenditure across all categories, in the primary budget. The command is received by `MooLahParser`, which then creates a `StatsCommandParser` object, to subsequently help to parse the input by the user.

Step 2. The newly created `StatsCommandParser` calls `parse("stats sd/01-10-2019 ed/01-11-2019")`, which in turns calls `ArgumentTokenizer#tokenize("sd/01-10-2019 ed/01-11-2019", PREFIX_START_DATE, PREFIX_END_DATE)` to split the arguments into its preamble(the start date and end date). This returns an `ArgumentMultimap` object, `argMultimap` containing the split input.

Step 3. The `StatsCommandParser` object creates a `StatsDescriptor` object `desc` to hold the start date and end date that was specified by the user. Depending on the presence of start date and end date, `desc` will be filled in differently.

If the start date and end date is both specified by the user, the end date will be checked to not be before the start date. If the end date happens to be before the start date, a `ParseException` will be thrown

Step 4. The filled `desc` will be returned to the `LogicManager` where a new `StatsCommand` object, `statsCommand` will be created with `desc`

Step 5. The `LogicManager` calls `StatsCommand#run()`, where the `StatsCommand` will be validated before

getting executed.

Step 6. During execution, `StatsCommand` calls `ModelManager#getPrimaryBudget()` to retrieve the primary budget to calculate statistics from. After which, `StatsCommand` will call `createPieChartStatistics`, which takes in `desc` and the primary budget.

Step 7. To construct the time interval required for statistics, information from `desc` is being processed. If there are unspecified inputs inside `desc`, the time interval will be constructed with some information from the primary budget.

Step 8. The `PieChartStatistics` object will be created with the constructed interval as well as the expenses the primary budget tracks. After which, `StatsCommand` will call the `PieChartStatistics` implementation of `populateData()` to fill up its other fields

Step 9. `StatsCommand` calls `ModelManager#setStatistics(statistics)` which updates the `Statistics` attribute in `ModelManager`.

Step 10. A `CommandResult` is then created and returned to `LogicManager`, which will then force a switch to the `Statistics Panel` where a Pie Chart will be generated.

The following sequence diagram shows how the `statsbasic` operation works:

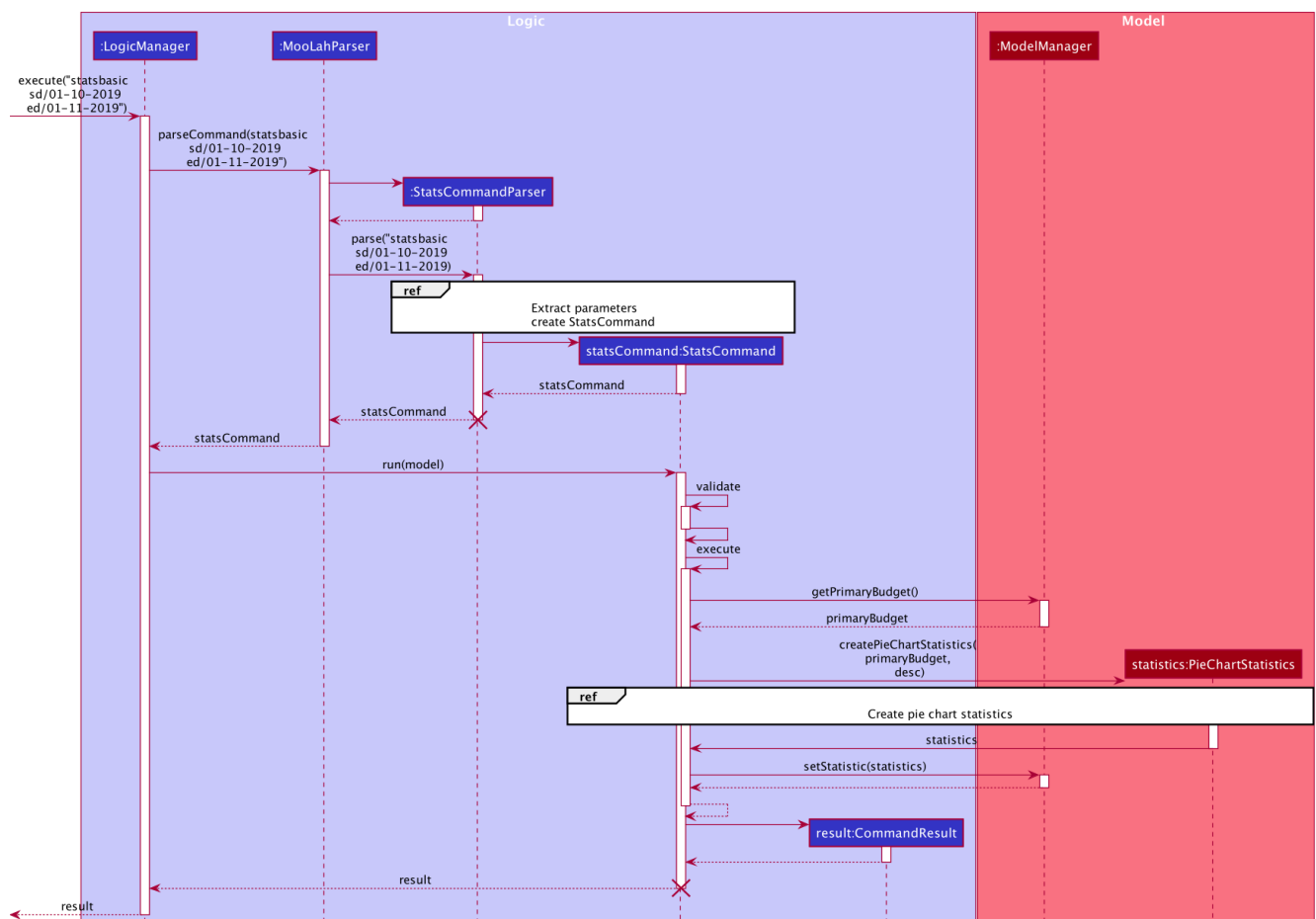


Figure 1. Sequence Diagram for executing a `StatsCommand`

Design Considerations

When designing the interaction of the command word `statsbasic`, decisions have to be made on the most suitable visual representation for `statsbasic` particular use case.

- **Alternative 1:** Table view
 - Pros: Sequential view, can capture number of entries
 - Cons: May be a duplicate of the `ListExpense` command, just grouping expenses via categories
- **Alternative 2:** Pie chart
 - Pros: Offers a visual view of size to represent the expenditure under each category
 - Cons: Loses the elements of number of entries in each category
- **Solution (Current Implementation):** Adopts Alternative 2. It is important that every aspect of the user experience gets covered, and what `Moolah` before the inclusion of `Statistics` is the appreciation of percentage expenditure in each category of expenses. Expenses can already be observed in its chronological order using `ListExpense` while individual view of expenses under a category can be accessed using `FindExpense`. Offering a visual view on expenditure under each category complements with the existing implementation of sequential view in the primary budget.

For more sequence diagrams, you can find them below Figure 1 ([here](#))