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6.170 Project 3.1: Problem Analysis and Design
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Overview

primary author: Sylvan

System Description

- **Split.li**, an app that allows friends to split a bill at a restaurant

Key goals and purpose

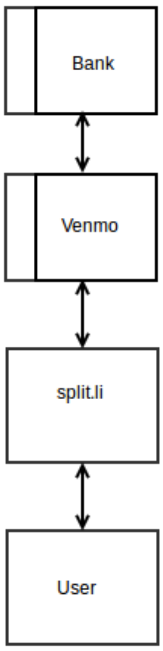
- Facilitates group outings by removing the hassle of calculating who-pays-what and who-owes-who
- Offers a convenient way of reimbursing someone in a timely manner
- Tracks the status of owed payments

Motivations for development

- Provide an avenue for easily splitting a bill at a restaurant without having to do all the math and factoring in tax/tip by yourself. A night shouldn't be ruined by trivial calculations and searching for change.
- Better tracking of who still owes money to whom
- Allows for more reliable repayment - adds social pressure to paying someone back since they can see who has and has not reimbursed them.

Context Diagram

primary author: all



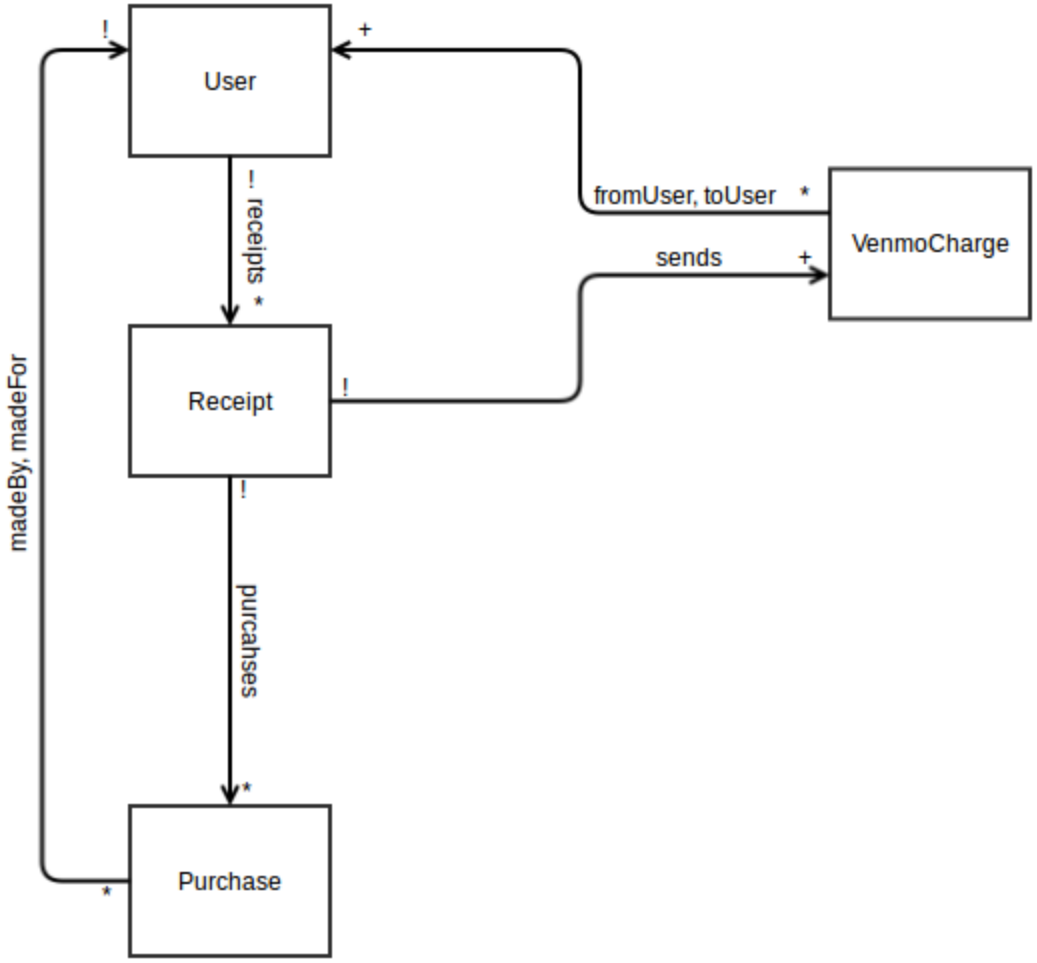
Concepts

primary author: all

Key concepts

- Split.li facilitates peer to peer interaction with Venmo, taking a receipt with purchases and sending the appropriate Venmo charges on behalf of our User.
- Split.li offers two forms of purchase aggregation:
    - itemizing expenses and allocating each purchase to a specific person. Thus, each person pays for what they bought and a proportional amount of tax/tip.
    - split the entire bill, including tax and tip, among a group.

Data Model



- Textual constraints
    - If more than one user share a purchase (e.g. two people split an appetizer), separate purchases are entered into the database with evenly split cost.
    - A VenmoCharge cannot be sent unless the Receipt contains a Purchase of value

greater than zero.
    - A Purchase must have a value that is greater than zero.
    - A Purchase is madeBy one of Split.li's users.
    - A Purchase is madeFor one of Venmo's users, whose Venmo username we can pull from the Split.li user's relationship to them if they are friends on Venmo, or a Venmo email address/phone number if the Split.li user is not friends with them.

- Schema
    - Users
        - have many Receipts
        - attributes:
            - string venmo_username
    - Receipts
        - belong to Users
        - has many Purchases and Venmo_charges
        - attributes:
            - integer user_id
            - string name
    - Purchases
        - belongs to Receipts
        - has one User
        - attributes:
            - integer receipt_id,
            - integer made_by (a User.id)
            - string made_to (a Venmo username, email address, or phone number)
    - Venmo_charges
        - belongs to receipts
        - attributes:
            - integer from_user (a User.id)
            - string to_user (a Venmo username, email address, or phone number)
            - float amount
            - string note

Behavior

Feature Descriptions

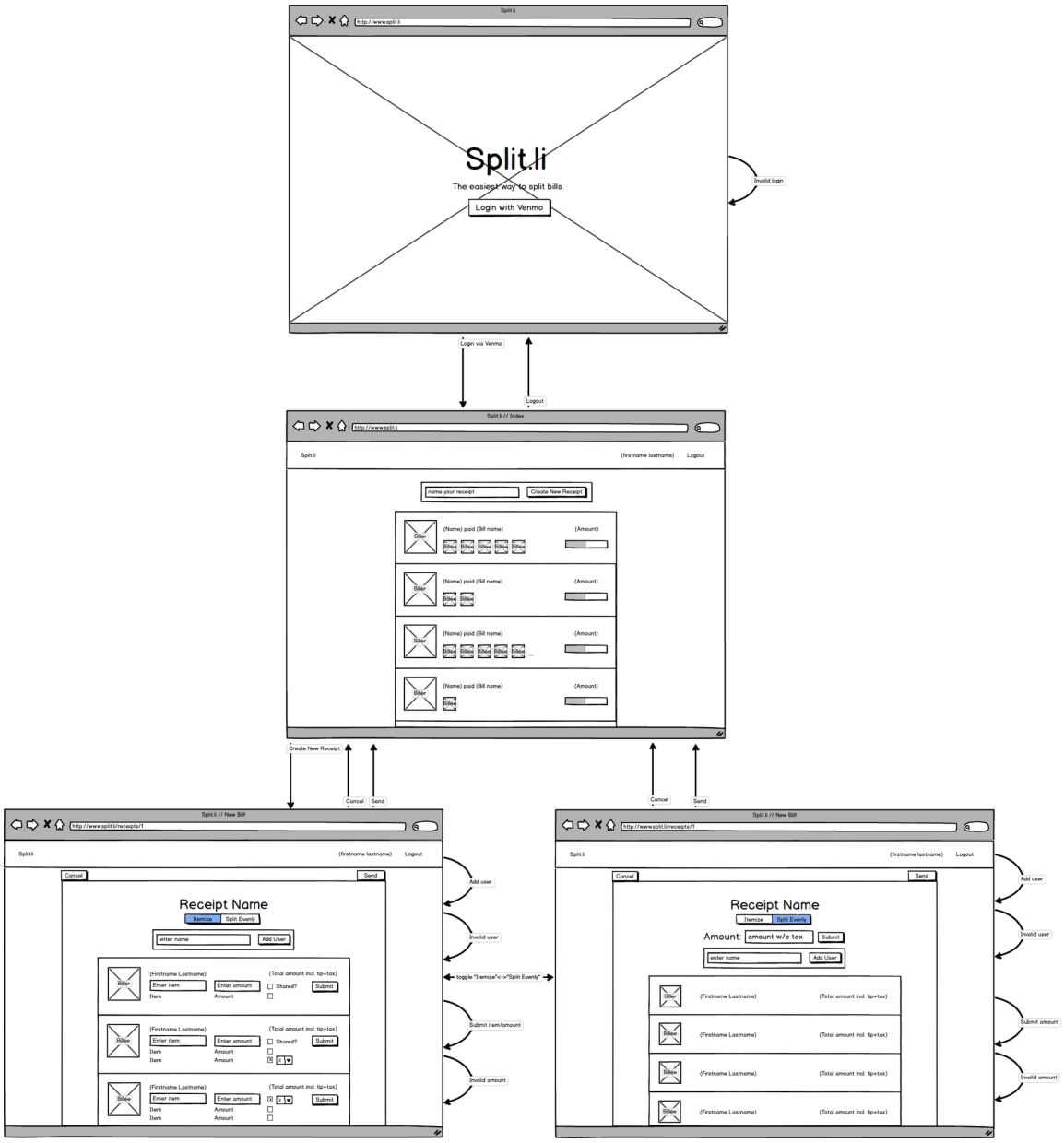
primary author: Sylvan

- **Venmo integration.** Sign-up and log-in done through Venmo, allowing reimbursement through Venmo charges and payments.
- **Bill calculator.** Remove the hassle of adding purchases, dividing tax, and scrambling for tip dollars: Split.li will do the math for you.

- **Split evenly function.** Don't care about the details? Split.li can just split the total bill evenly among everyone.
- **More reliable reimbursement.** Split.li sends Venmo charges immediately after a receipt is entered, encouraging friends to send payment before even leaving the restaurant.
- **Payment history.** Users can view receipts and track who has and has not paid them back with Split.li's progress bar.
- **Mobile-friendly.** Use Split.li anytime at your convenience.

User Interface

primary author: Katie



(to view full-size, click here: http://web.mit.edu/ksiegel/www/mockup_6170.png)

Security Concerns

primary author: Ari

- Split.li makes secure payments with Venmo, utilizing their API's OAuth.
- Split.li does not expose OAuth tokens to prevent fradulent Venmo charges
- Split.li's use of Venmo for all payment concerns ensures that securing OAuth tokens will secure users payment permissions, as we do not keep any balances between users.
- Split.li does not store any sensitive information, such as passwords, which can be exploited if made available
- Split.li does not use insecure third party plug-ins
- Split.li does keep a history of past group purchases for use on the newsfeed page. However, a person can only view a past purchase if they are both a Split.li user and involved in the purchase, either as the person who paid the entire bill or as one of the people who paid that person back.

Challenges

Design Challenges

primary author: Ari

- Implement a bill splitter such that a bill can be divided either evenly or through itemized purchases
    - Input people then add items to each person
        - Pros: Only need to type in each users name once. Intuitive to think of each billee and what items they must pay for.
        - Cons: Makes designing the interaction for splitting an individual item more difficult.
        - We chose this option to make itemizing a recipt as easy as possible. This design minimizes the typing that a User must do, as each user must only be typed in once. Also, when considering how this will be used, we thought that this design aligns with a user's process of splitting a bill: going person by person and adding their contribution to the total bill.
    - Input items individually, with a field for the person
        - Pros: Works well with model of a user going down a receipt and adding each item, then asking who had that item. Easy to have multiple people sharing an item
        - Cons: Must input each users name multiple times thus making the user do more work.
- Account for tax and tip splitting such that each user pays a "fair" amount.
    - One option is to let user input the additional tax and tip for each payer.
        - Pros: customizable as the user of the app can choose exactly how much each person will pay for tax and tip

        - Cons: user must still do some mental math to decide how much each payer is paying, and make sure enough tax and tip have been included.

    - When a receipt is completed, tax and tip will be calculated for each person (proportionally to what their purchase amount) and added to their expense. Then a VenmoCharge will be created.
        - Pros: only work for the user is adding tax and tip percentages as necessary (tax varies by states), no mental math required
        - Cons: removes ability of the user to set tax and tip amounts on a person by person basis.
        - As an application that strives to remove the human element from calculating a bill, it makes more sense to implement this solution. Someone using Split.li presumably does not want to calculate their friends' expense. It does not make sense to calculate purchase values but not tax/tip for our users.

- Multiple people splitting an item
    - Add a 'split item' check box for each item. This creates a drop down to choose the number of people splitting an item, and adds the proper fields
        - Pros: Removes all requirement for calculation from the user.
        - Cons: Clutters up the UI a little
        - Again, as Split.li strives to do as many calculations as possible for our users, it makes more sense for us to incorporate a way to split an item in our UI rather than have our user do the calculation. Note that it would still possible for the User to input the same item multiple times and divide the cost by themselves, if they so choose. We are simply offering an alternative.

    - Make the user input multiple separate items and divide the cost.
        - Pros: Makes for a cleaner UI by removing some fields and complexity.
        - Cons: Makes the user do mental calculation of splitting an item.