Project 3: Tripper

Design Analysis

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1. Overview:

[Primary author: Jesika Haria]

Tripper is a browser-based cost sharing application that was designed to help groups of friends going to a road trip to upload and share their costs. The uniqueness of Tripper is that it allows users to submit both monetary and non-monetary (e.g. driving time) costs. Users can create and invite friends to a road trip, upload and share their costs, and to split costs within a group seamlessly and effortlessly.

2. Purpose and goals:

[Primary author: Jesika Haria]

Road trips with friends are fun, but splitting the costs is not because:

a) People often forget how they incurred the cost unless they record it immediately
b) It is hard to visualize the total amount of money spent on the trip
c) Costs are not all monetary: driving the car, planning, etc. all need time and effort, which should count towards a common cost
d) It is hard to figure out who owes who at the end of the trip, especially when there are more than two participants.

We're developing Tripper so that you can have fun on a road trip with friends without the inconvenience of splitting costs. With Tripper, you can:

a) Record your expenses as you go
b) View and analyze your expenses and compare it to your friends in a clean interface
c) Our unique way of defining cost in terms of 'tokens' allows you to set an exchange rate for the value you bring to the trip. For example, 1 USD = 10 Tokens; 1 hour of driving = 5 Tokens.
d) Our unique splitting tool aggregates everyone's costs (in token units) for a trip, converts it back to USD, and allows you to pay to a common pool that is split up across outstanding recipients.

3. Motivation and Context:

[Primary author: Jesika Haria]

We chose this application specifically because we're avid road trippers and campers, but find applications like Billmonk to be essentially fancy calculators. Also, there are no applications in the market right now that allow us to define our own currency exchange for activities, and we want to factor that in making a truly equitable split for road trip costs.

This is the real power of Tripper: to allow users to collectively value their friends' effort and time in making their road trips awesome. Tripper is positioned to take advantage of both the niche market of road trippers, and introduce an innovative model for 'cost'.

4. Planed Minimal Viable Product:

[Primary author: Jesika Haria]

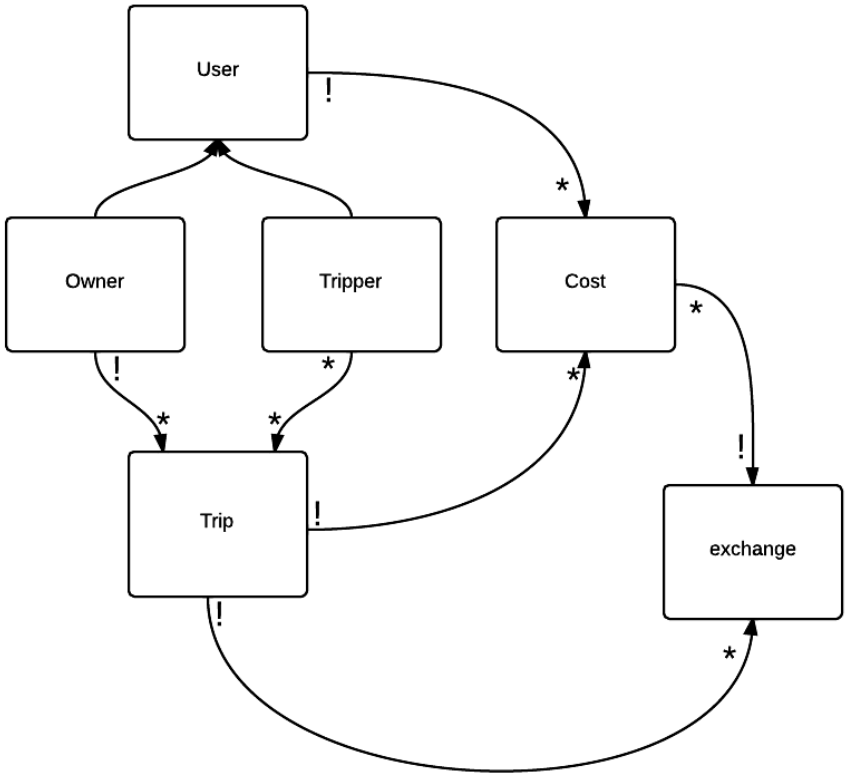
A minimum viable product would be:

a) **Before the trip:** A user should be able to create a trip and define a group of existing users as eligible to submit costs to the trip.
b) **During the trip:** Every user should be able to view a trip's total costs, their own share of the costs, and add or delete their costs from the trip. The minimal definition of cost is monetary cost, measured in USD.
c) **After the trip:** Each user should be able to cash out or repay their remaining balance.

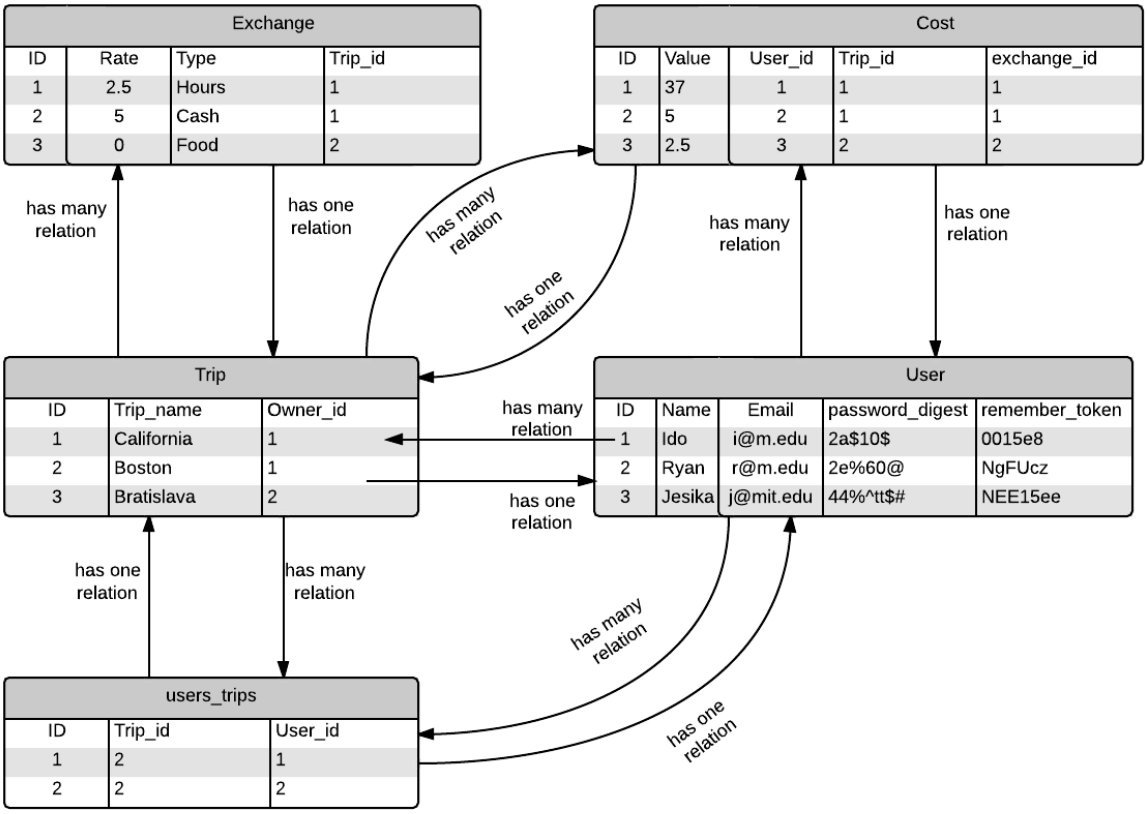
5. Concepts

[Primary author: Ido Efrati]

5.1. Data Modal



5.2. Database design and relations



As seen in the above diagram Tripper consists of five tables, a trip table, a user table, a cost table, an exchange table and a users_trip table.
The user table has an encrypted password to protect from attacks, and an encrypted session token to prevent from sessions attacks. Most of the validation is performed only at the model level (presence of required field, and correct format), but uniqueness validation is performed both on the model level and on the database level. The reason behind the double uniqueness validation is to prevent a duplicated creation of an entry, if the user clicks the sign up button twice with a slow Internet connection.

A Trip has a title, and an owner (the user who created the trip, this is being shown by the relationship between a trip and a user). A trip owner cannot be changed after a trip was created. The owner field stored as an integer that corresponded to the primary key of a user in the user table.

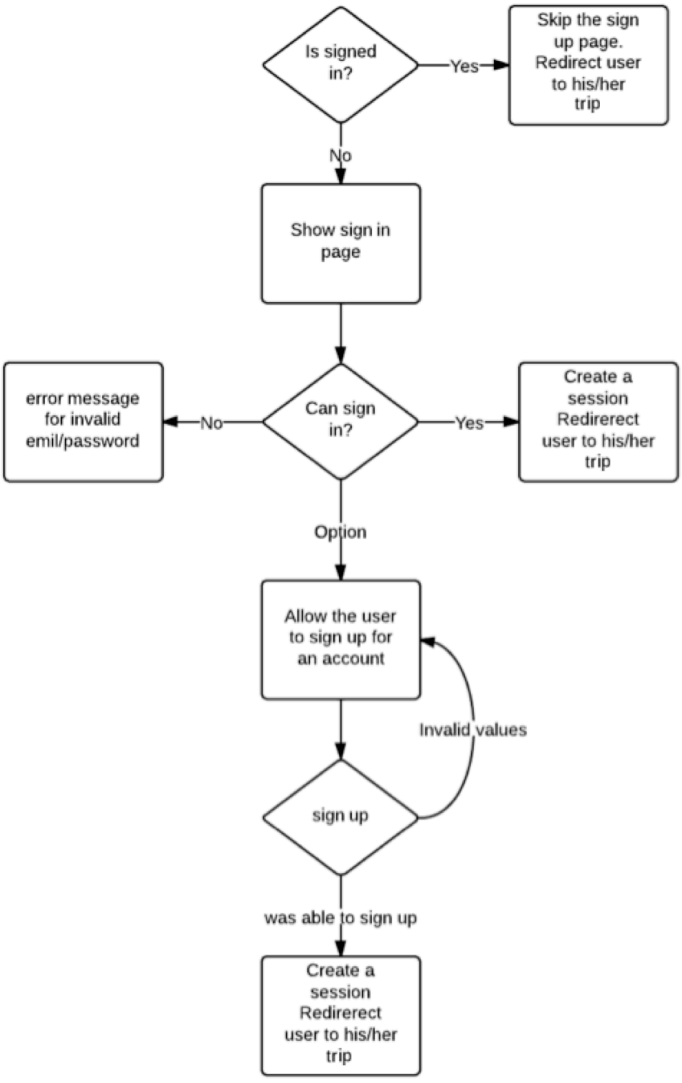
A users_trips table has a trip_id stored as an integer that corresponded to the primary key of a trip in the trip table, and a user_id (the user who has access to that trip, a tripper). This relationship is different from stored as an integer that corresponded to the primary key of a user in the user table.

An exchange has trip_id stored as an integer that corresponded to the primary key of the trip in the trip table. Each trip has its own exchange rate.
Finally, a cost has a trip_id stored as an integer that corresponds to the primary key of the trip in the trip table, a user_id stored as an integer that corresponds to the primary key of the user table, and an exchange_id stored as an integer that corresponds to the primary key of the exchange rate.

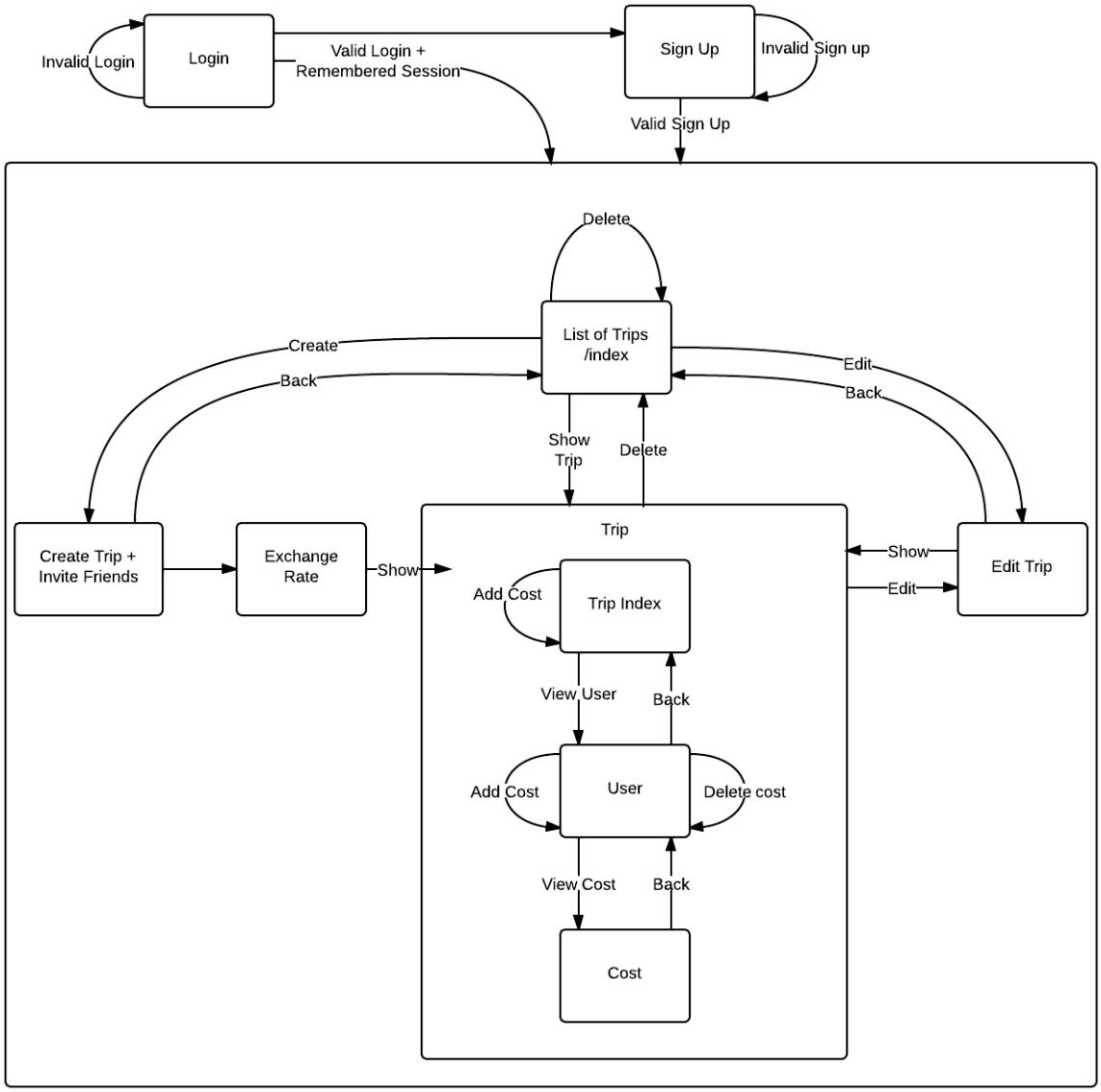
5.2.1. Dependencies

There are several dependencies in the above scheme. If a user was deleted from the database all of their costs will be deleted as well. If an owner deleted a trip from the database, all of the costs associated with this trip, and the users_trips relations associated with this trip will be deleted as well.

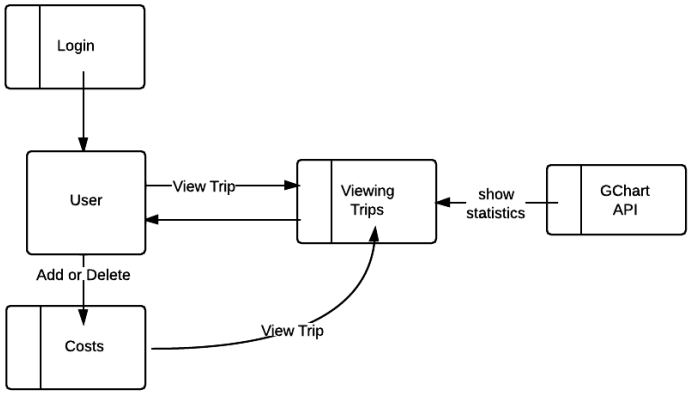
5.3. Users and session



5.4. State Machine



5.5. Context Diagram



6. Functionality and features

[Primary author: Ido Efrati]

6.1. User's features:

Sign up – users can create an account on Tripper.
Sign in – users can sign in to Tripper if they have an account.
Sign out – users can clear their session. After a sign out a user will be require a new sign in.

6.2. Trip's features:

Create trip - user can create a new road trip as long as the user specifies the required fields.
View trip - user can see more details about a specific road trip.
Edit trip - user can update road trips' name.
Cancel a trip- user can delete a road trip from the system.

6.3. Cost's features:

Add cost- users can submit their monetary and non-monetary contributions to the road trip.
Delete cost- users can remove their monetary and non-monetary contributions from a road trip
View cost - users can see more details about a specific cost.

6.4. Shared features:

Invite friends – users can to share a road trip with other users.
Exchange rate - enables trippers to specify a translation of non-monetary contribution to Tokens, to allow for a more general definition of "cost".

6.5. Splitting features:

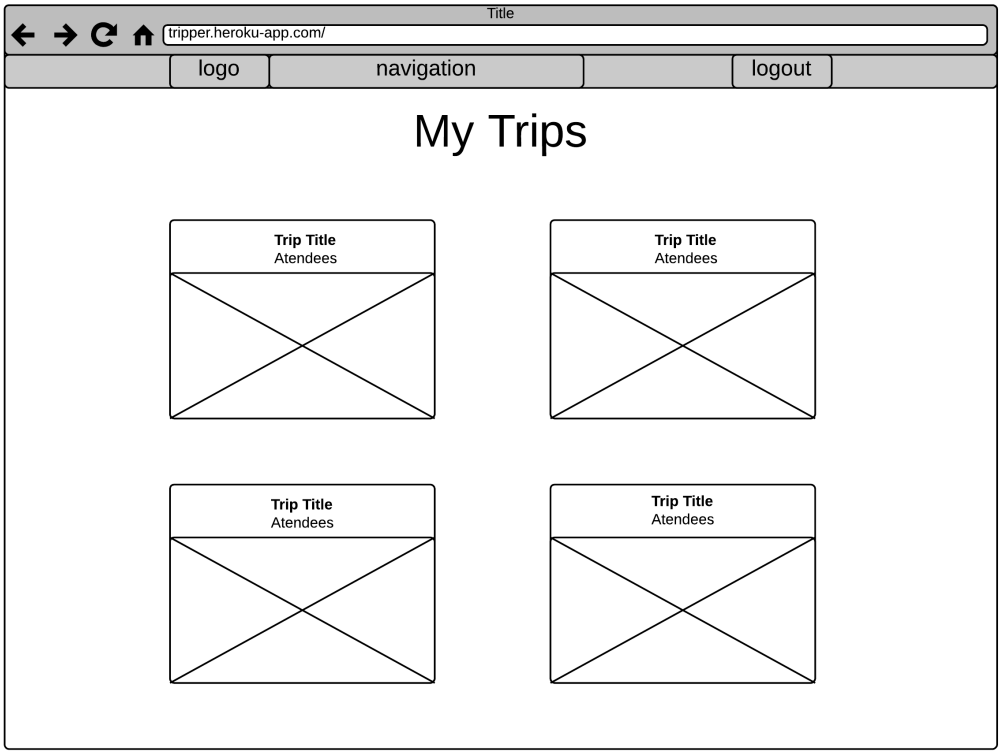
Splitting cost - splits the road trips costs evenly among trippers. Users will know how many tokens they own to other users or how many tokens

other users owe them. Tokens will be translated to monetary at the end of the road trip.
Analytics - users can view the total trip cost distribution and their own personal cost distribution.

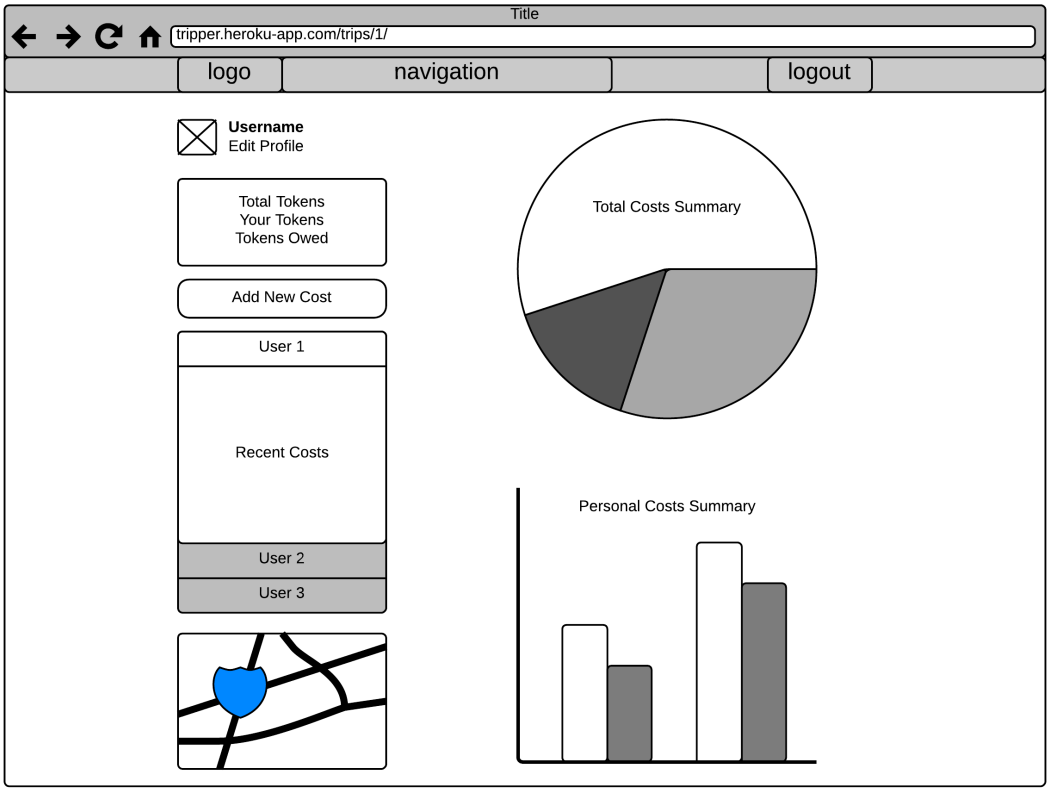
7. User Interface and Wireframe

[Primary author: Ryan Lacey]

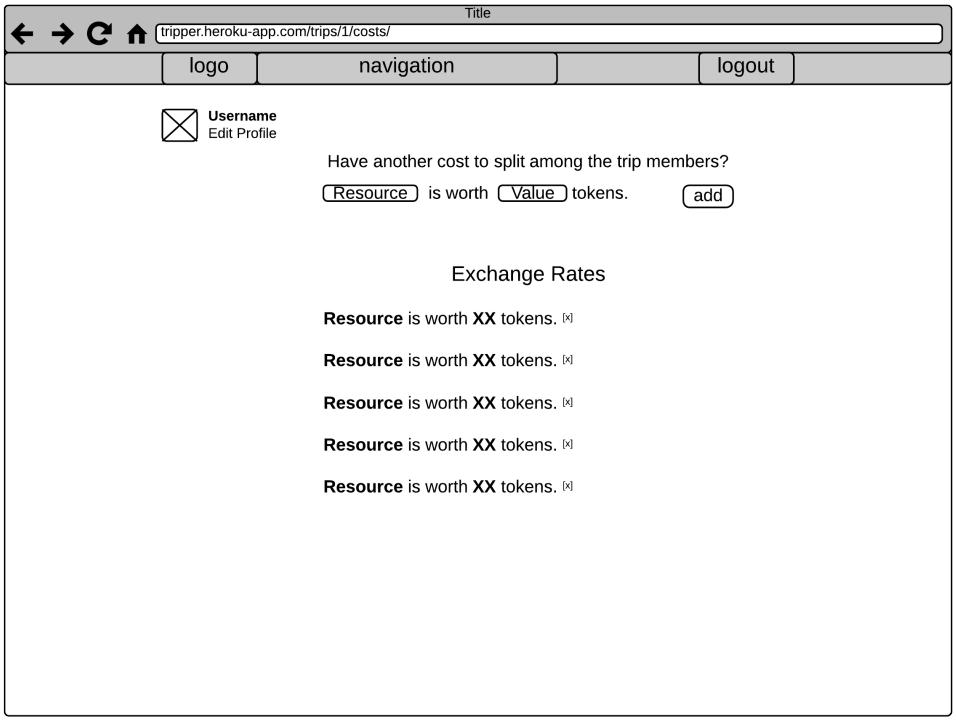
7.1. All trips page:



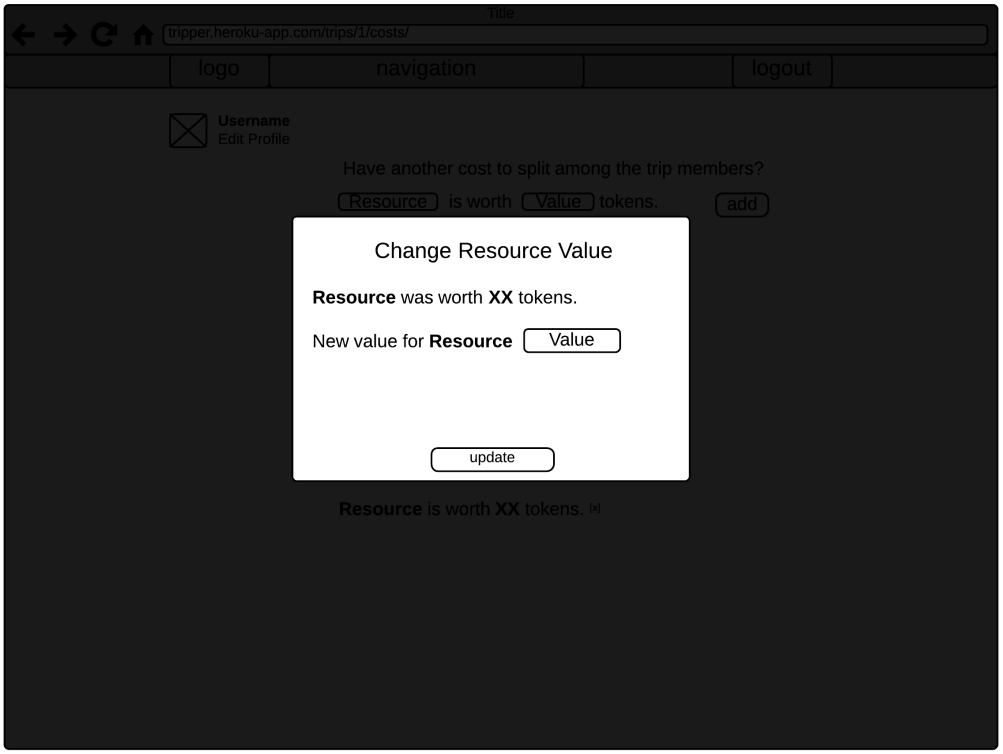
7.2. Specific trip page:



7.3. Exchange rate page:



7.4. Update form modal:



8. Security

[Primary author: Ryan Lacey]

8.1. Security Policy

8.1.1. Site

8.1.1.1. Site content can only be accessed by registered, logged in users.

8.1.2. Trips

8.1.2.1. Users can only view, access, and delete trips that they are a member of.

8.1.2.2. Trip members are fixed upon trip creation. Only the trip creator can select members.

8.1.3. Exchanges

8.1.3.1. Users have view, edit and destroy privileges for all exchanges of a trip that they are a member of.

8.1.3.2. Exchanges are only displayed in the context of a trip.

8.2. Costs

8.2.1. Users have view and destroy privileges for all costs of a trip that they are a member of.

8.2.2. Costs are only displayed in the context of a trip.

8.2.3. Users can only create costs under their own name.

8.3. Threat Model

8.3.1. An unauthenticated user can construct requests (curl, Postman) to application.

8.3.2. A user with basic credentials can construct requests or make requests via forms.

8.3.3. A third party website can try to load data from application.

8.3.4. Can assume no interest from criminal syndicates, since only minimal problem information stored (name and email) and no actual transfer of funds is handled through the site.

8.4. Mitigations

8.4.1. Standard strategies to address code vulnerabilities (such as injection, XSRF, etc) provided by Rails framework.

8.4.2. Users must know fellow users' emails to include them in a trip.

8.4.3. Use of access control to prevent any interactions with trips or associated trip content of which the user is not a member.

Security implementation

8.5. Authentications

8.5.1. User authentication

When a user tries to log in the server will authenticate their username and password with the username and encrypted password that are stored in the database. Only if the two match will the user be granted access and assigned a session.

8.5.2. Session authentication

When the server verifies if a user is already signed in, it will compare the encrypted session that is stored in the User table under remember_token to an encrypted version of the local cookie. Only if the two match will a user be granted access to his or her notes. By doing so the server guarantees that the cookie was not tampered with and prevents unauthorized access.

8.6. Access control:

Users cannot tamper with the URL in an attempt to gain access to a trip that they do not own or that they were not explicitly made a group member of. If a user tries to access a link before a session was established, then he or she will not be able to access the site. If the user is already logged in and tries to change the URL path to access a different trip (i.e. changing the id value in the URL) he or she will be redirected to their respective trips listing.

8.7. Functionality safety:

A trip's members are fixed when a trip is created, so there is no risk of anyone viewing information you have submitted that you had not originally intended to share with. Access security based off table data. Protection from standard web attacks (SQL injection, cross site scripting, cross site request forgery, etc.) is provided by Rails framework.

9. Design Challenges

[Primary author: Ido Efrati]

9.1. Supporting analytics and graphs.

9.1.1. Possible solutions

Google Charts for rails – Does not support interactive graphs. Graphs are rendered as pictures

HighCharts – unlike Google Charts it is interactive. However, it has license limitations and an unfamiliar API.

9.1.2. Actual solution

GoogleVisualr – interactive graphs with a familiar API. For the above reasons we decided to use GoogleVisualr.

9.2. Users cannot be added for a trip after creation.

In order to maintain a notion of a leg in a trip, users cannot join to a road trip in the middle. If a new group is formed in the middle of a road trip, we view this as a new trip. One of the design challenges that we had to overcome is how to prevent users from mistakenly create a road trip without inviting their friends to it.

9.2.1. Possible solutions

Option 1: If an invited user does not exist in the system. Tripper will fail and won't allow the user to create a trip.

Option 2: Create a trip even if an invited user does not exist in the system.

9.2.2. Actual solution

Give feedback at the time of the invitation process, and allow users to create the trip. As users type an email in order to invite his or her friends they get a visual feedback for the existence of the email in the system (green for existing user, and red for non existing). If users decide to create a trip despite the feedback, then Tripper will ignore the invalid users, and create a trip only with only the valid users.

9.3. Tokens are Tripper's unique way of defining cost that is not cash related. Tokens allow users to set an exchange rate for the value they bring to the trip. For example, 1 USD = 10 Tokens; 1 hour of driving = 5 Tokens.

9.3.1. Possible solution:

Only allow users to use cash. However, this solution would not allow users to value their friends' contributions.

9.3.2. Actual solution:

Users specify their own rates and tripper unique splitting tool aggregates everyone's costs (in token units) for a trip, creates common pool that is split up across outstanding recipients.

10. Implemented Minimal Viable Product

[Primary author: Ryan Lacey]

10.1. Goal: Web application that would track costs (both monetary and non-monetary) accumulated during a trip and calculate how much each user owes as a fair contributor to the trip costs.

10.2. Features included

10.2.1. Trip creation

10.2.2. Friends association with trips

10.2.3. Cost tracking, allocation, and graphical display

10.3. Issues postponed

10.3.1. Live-updates of data display

10.3.2. Trip mapping

10.3.3. Conversion of token differences to currency