

Declarative Assembly of Web Applications from Predefined Concepts

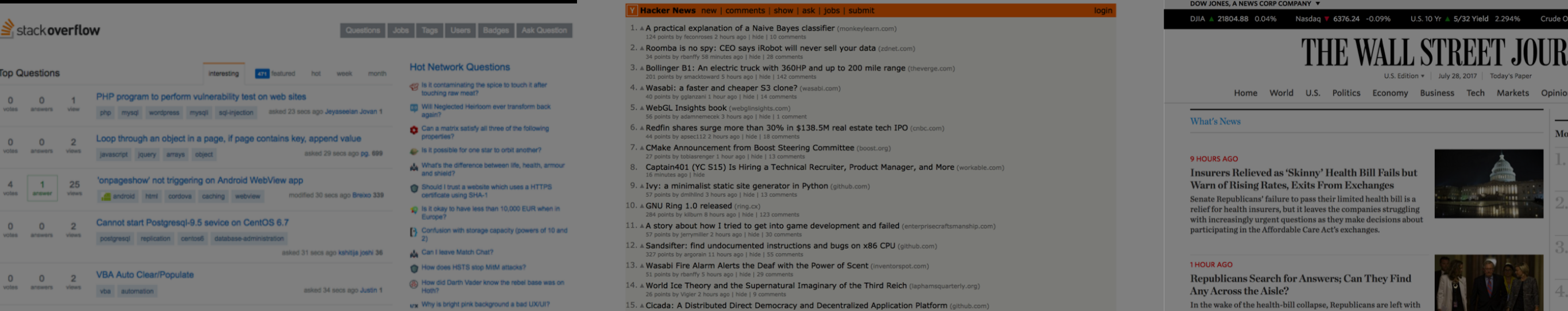
Santiago Perez De Rosso

Thesis Defense · Jan 27, 2020



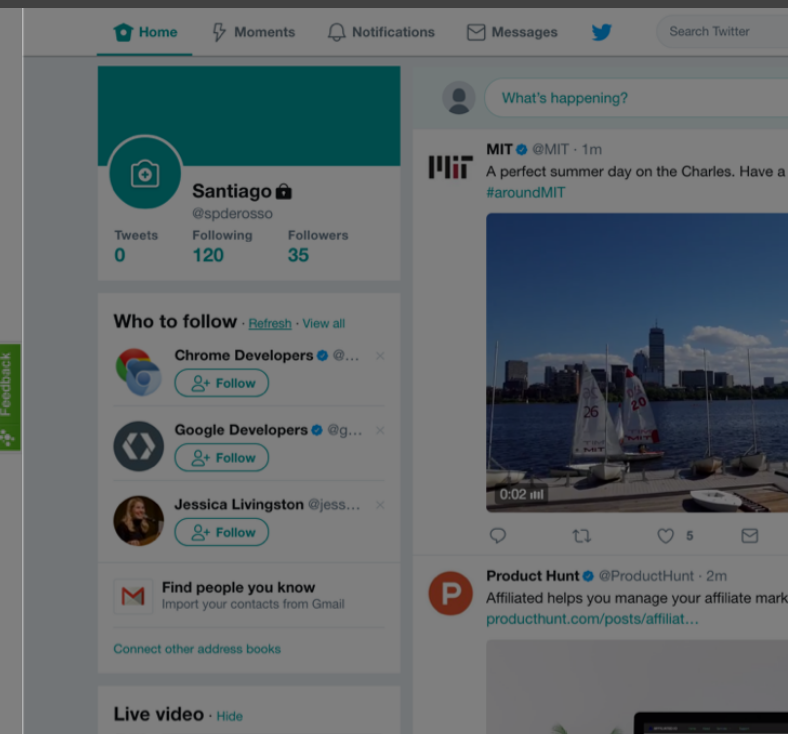
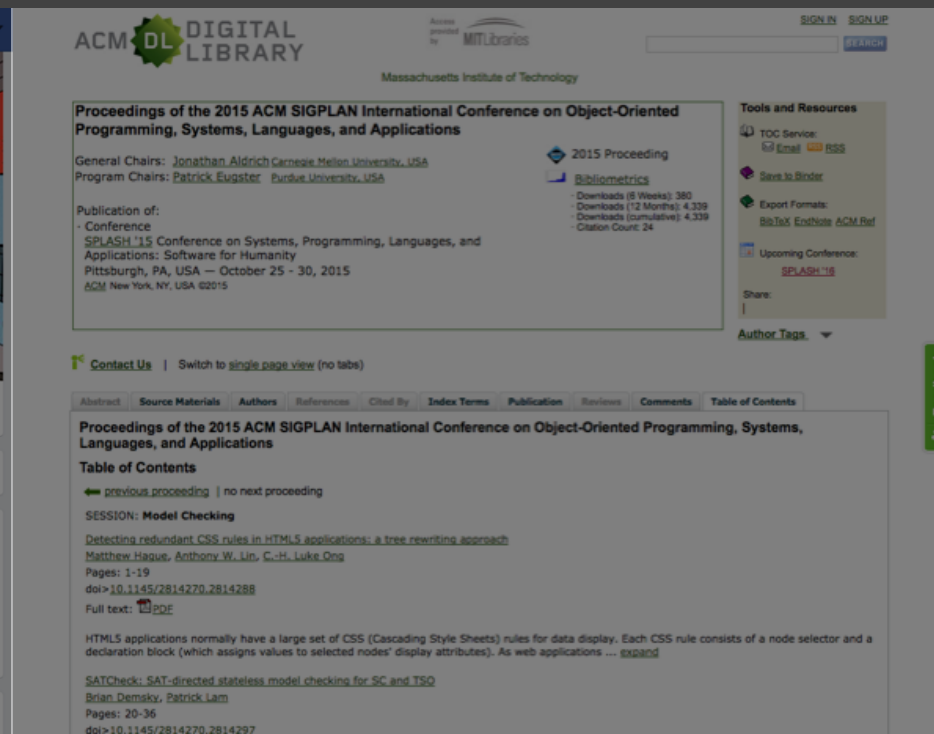
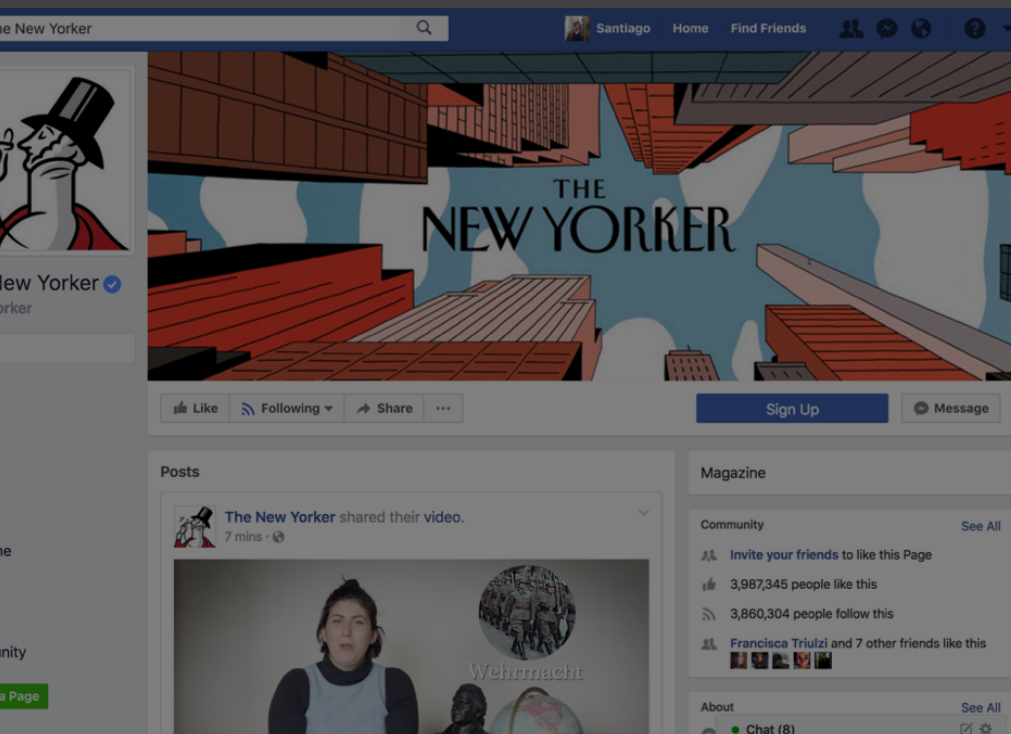
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Have you ever noticed most apps are fundamentally the same?

They are mostly combining pre-existing concepts in new ways



Home

Moments

Notifications

Messages

Search Twitter

Tweet

Santiago

@spderosso

Tweets 0

Following 120

Followers 35

Who to follow

Chrome Developers

Google Developers

Jessica Livingston

Find people you know


Live video

What's happening?

MIT

@MIT · 1m

A perfect summer day on the Charles. Have a great weekend! #FridayFeeling #aroundMIT



0:02

Product Hunt

@ProductHunt · 2m

Affiliated helps you manage your affiliate marketing beautifully

producthunt.com/posts/affiliat...

DOW JONES, A NEWS CORP COMPANY

DJIA 21804.88 0.04%

Nasdaq 6376.24 -0.09%

U.S. 10 Yr 5/32 Yield 2.294%

Crude Oil 49.58 1.10%

Euro 1.1746 0.60%

THE WALL STREET JOURNAL.

U.S. Edition July 28, 2017 Today's Paper

Home World U.S. Politics Economy Business Tech Markets Opinion Arts Life Real Estate

What's News

9 HOURS AGO

Insurers Relieved as 'Skinny' Health Bill Fails but Warn of Rising Rates, Exits From Exchanges

Senate Republicans' failure to pass their limited health bill is a relief for health insurers, but it leaves the companies struggling with increasingly urgent questions as they make decisions about participating in the Affordable Care Act's exchanges.

1 HOUR AGO

Republicans Search for Answers; Can They Find Any Across the Aisle?

In the wake of the health-bill collapse, Republicans are left with no obvious path forward. Except perhaps, Gerald F. Seib writes, to try to find a way to work with Democrats.

10 HOURS AGO

'Skinny' Repeal of Obamacare Fails in Senate

The slimmed-down health-law repeal was the Republicans' last-

Most Popular Videos

1. Sen. Graham: The 'Skinny' Bill Is a Disaster

2. John McCain Casts Deciding Vote to Defeat Health Bill

3. Dan Neil Drives VW's Atlas

4. Who and What Is Covered by Medicaid?

5. How Luxury Home Builders Build for Themselves

Most Popular Articles

Hacker News new | comments | show | ask | jobs | submit login

1. A practical explanation of a Naive Bayes classifier (monkeylearn.com)

2. Roomba is no spy: CEO says iRobot will never sell your data (zdnet.com)

3. Bollinger B1: An electric truck with 360HP and up to 200 mile range (theverge.com)

4. Wasabi: a faster and cheaper S3 clone? (wasabi.com)

5. WebGL Insights book (webglinsights.com)

6. Redfin shares surge more than 30% in \$138.5M real estate tech IPO (cnbc.com)

7. CMake Announcement from Boost Steering Committee (boost.org)

8. Captain401 (YC S15) Is Hiring a Technical Recruiter, Product Manager, and More (workable.com)

9. Ivy: a minimalist static site generator in Python (github.com)

10. GNU Ring 1.0 released (ring.cx)

11. A story about how I tried to get into game development and failed (enterprisecraftsmanship.com)

12. Sandsifter: find undocumented instructions and bugs on x86 CPU (github.com)

13. Wasabi Fire Alarm Alerts the Deaf with the Power of Scent (inventorspot.com)

14. World Ice Theory and the Supernatural Imaginary of the Third Reich (laphamsquarterly.org)

15. Cicada: A Distributed Direct Democracy and Decentralized Application Platform (github.com)

16. Future of Fake News (futureoffakenews.com)

17. AMD Threadripper Delidded, with a Multi-Core Surprise Under the Hood (extremetech.com)

18. How I've Lived the 4-Hour Work Week for a Decade (indiehackers.com)

19. Satirical maps of the world (bl.uk)

The New Yorker

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The New Yorker

@newyorker

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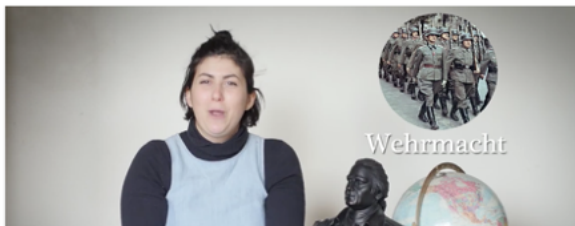
Following

Share

Posts

The New Yorker shared their video.

7 mins ·



Wehrmacht

Magazine

Community

Invite your friends to like this Page

3,987,345 people like this

3,860,304 people follow this

Francisca Trulzi and 7 other friends like this

About

Chat (8)



Language: English ▾

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THE WALL STREET JOURNAL.

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31 ▾

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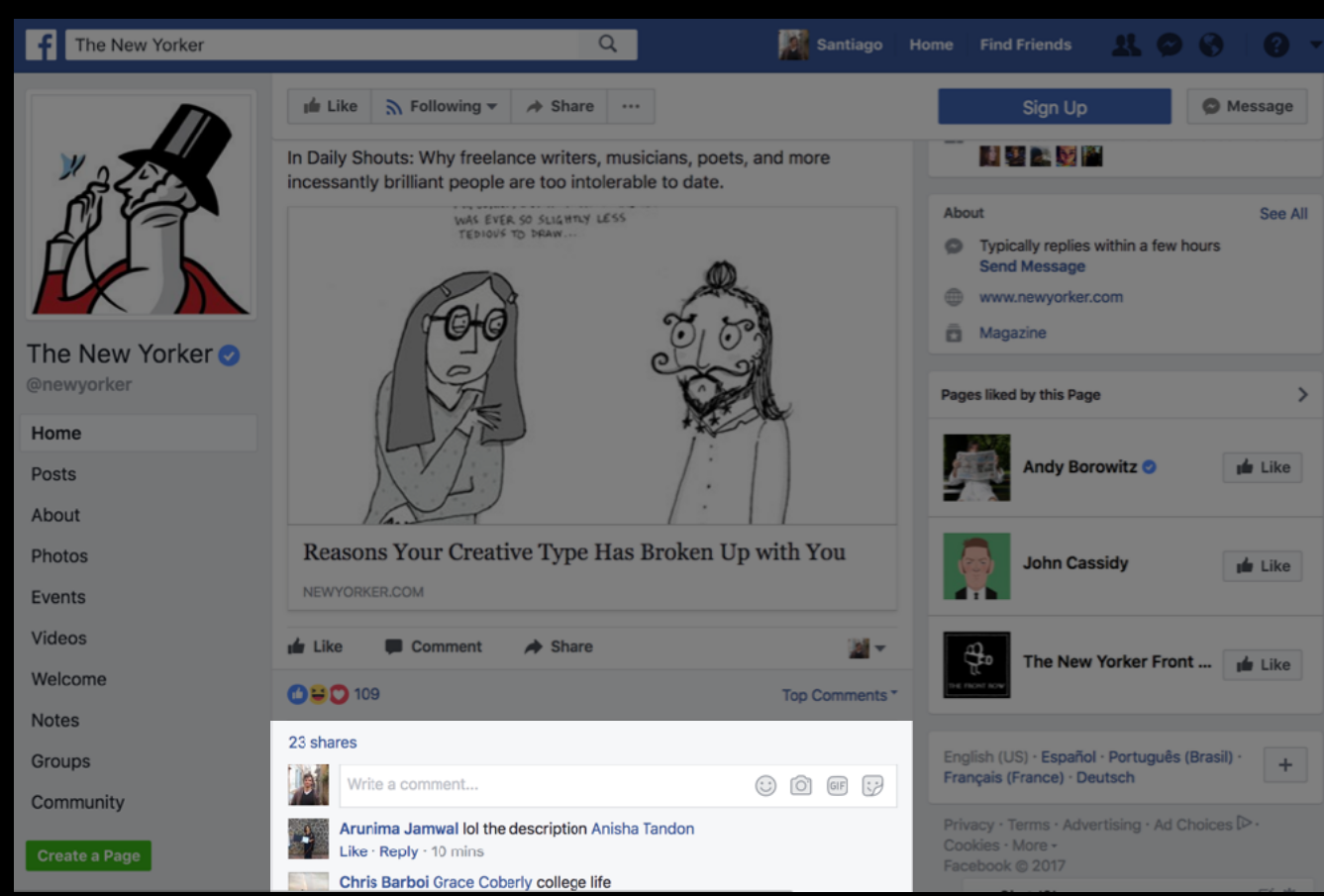
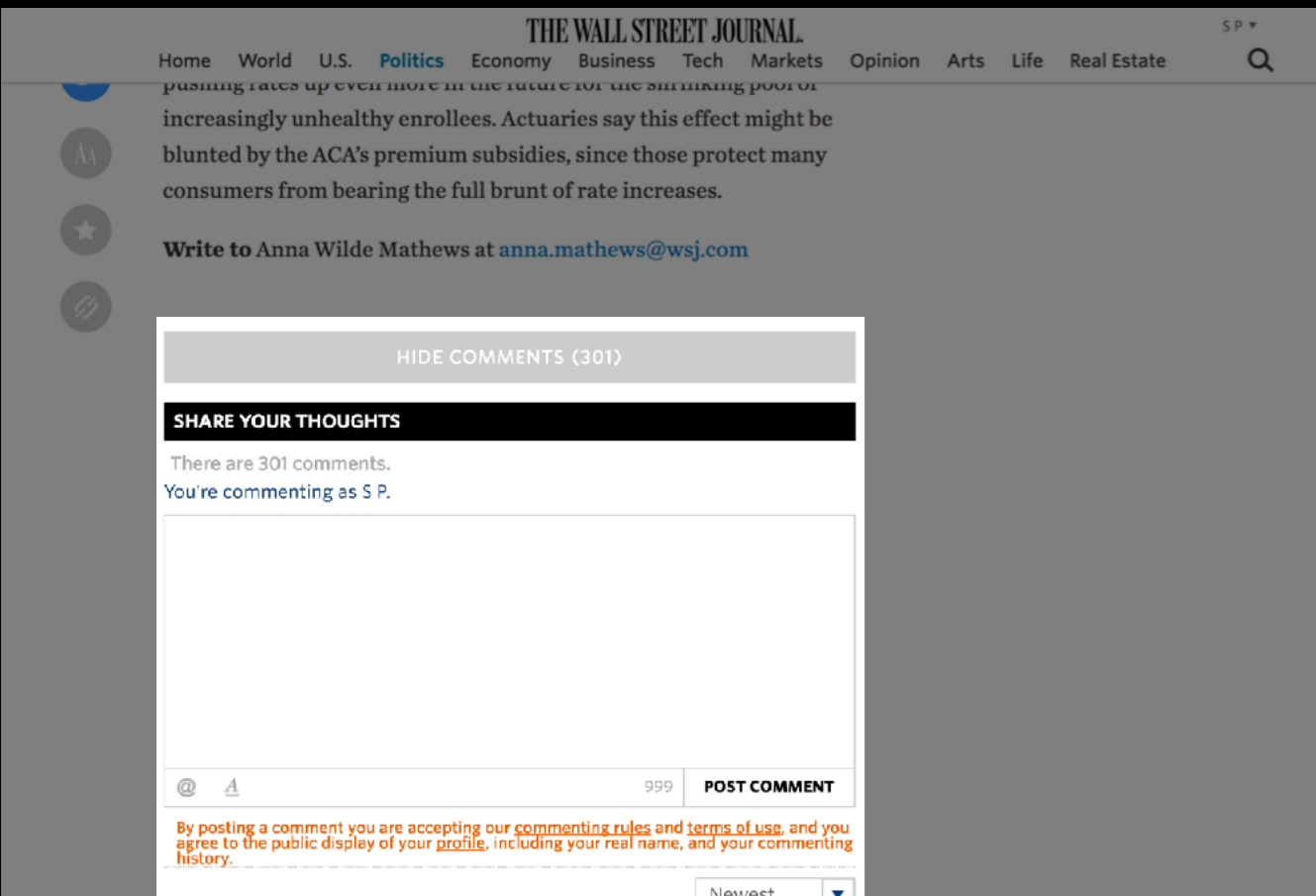
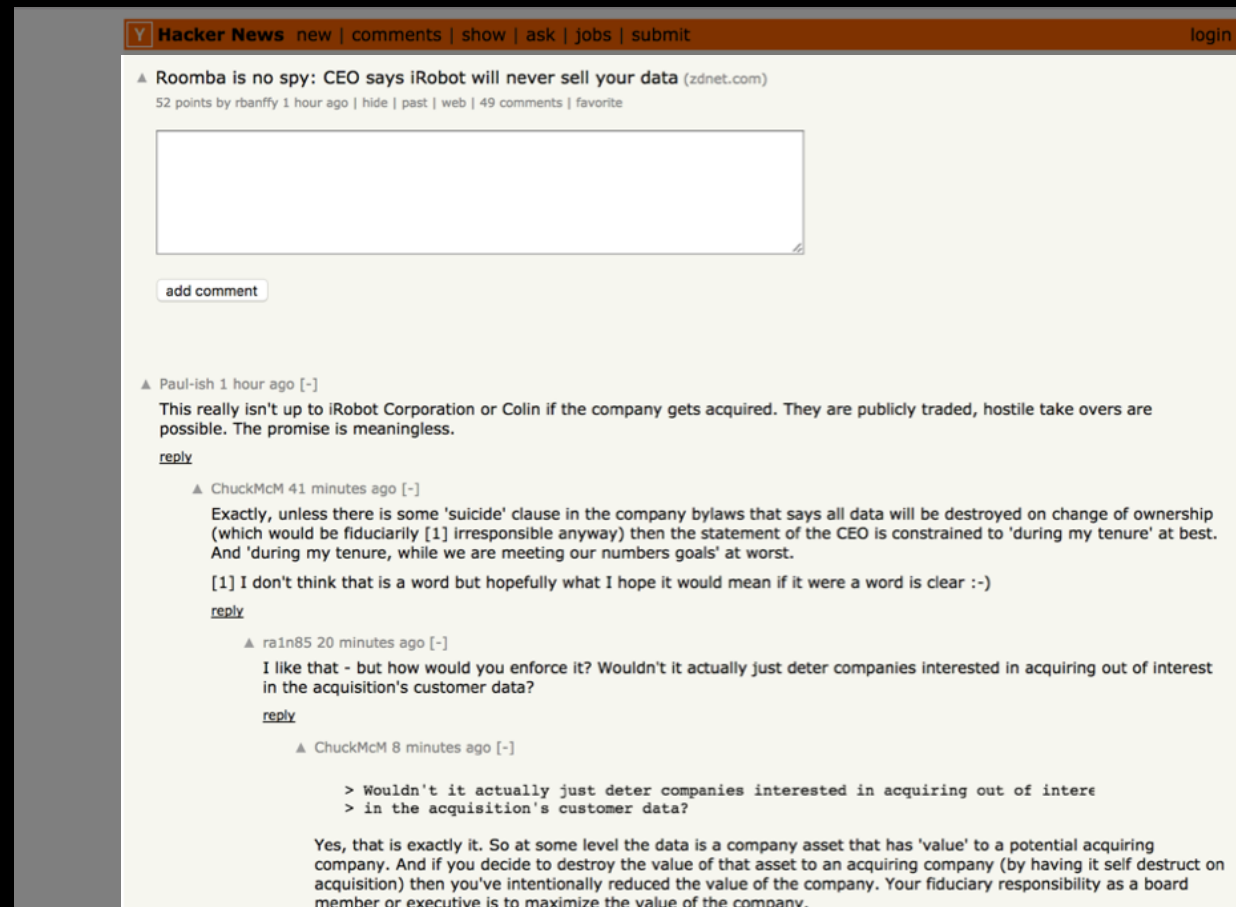
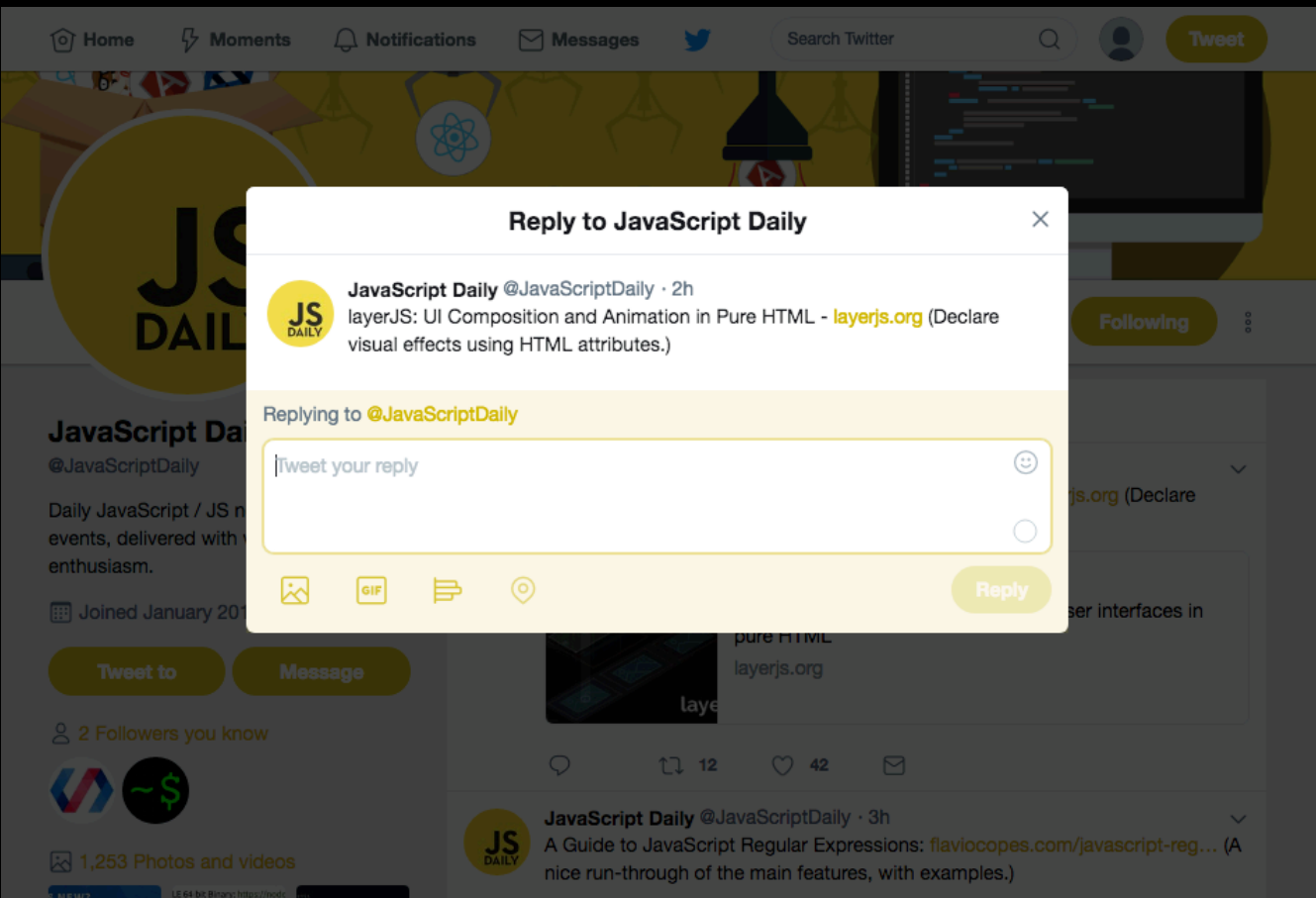
See photos and updates from friends in News Feed.



Share what's new in your life on your Timeline.



Find more of what you're looking for with Facebook Search.



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Moments

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Tweets

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Likes

Moments

Following

JavaScript Daily

@JavaScriptDaily

Daily JavaScript / JS news, links and events, delivered with wit and enthusiasm.

Joined January 2012

Tweet to

Message

2 Followers you know

1,253 Photos and videos

Tweets

Tweets & replies

Media

JavaScript Daily @JavaScriptDaily · 2h

layerJS: UI Composition and Animation in Pure HTML - [layerjs.org](#) (Declare visual effects using HTML attributes.)

layerJS

layerJS: build animated layered web user interfaces in pure HTML

layerjs.org

Like

42

JavaScript Daily @JavaScriptDaily · 3h

A Guide to JavaScript Regular Expressions: [flaviocopes.com/javascript-reg...](#) (A nice run-through of the main features, with examples.)

Hacker News

new | comments | show | ask | jobs | submit

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Roomba is no spy: CEO says iRobot will never sell your data (zdnet.com)

52 points by rbanffy 1 hour ago | hide | past | web | 49 comments | favorite

add comment

Paul-ish 1 hour ago [-]

This really isn't up to iRobot Corporation or Colin if the company gets acquired. They are publicly traded, hostile take overs are possible. The promise is meaningless.

reply

ChuckMcM 41 minutes ago [-]

Exactly, unless there is some 'suicide' clause in the company bylaws that says all data will be destroyed on change of ownership (which would be fiduciarilly [1] irresponsible anyway) then the statement of the CEO is constrained to 'during my tenure' at best. And 'during my tenure, while we are meeting our numbers goals' at worst.

[1] I don't think that is a word but hopefully what I hope it would mean if it were a word is clear :-)

reply

ra1n85 20 minutes ago [-]

I like that - but how would you enforce it? Wouldn't it actually just deter companies interested in acquiring out of interest in the acquisition's customer data?

reply

ChuckMcM 8 minutes ago [-]

> Wouldn't it actually just deter companies interested in acquiring out of intere

> in the acquisition's customer data?

Yes, that is exactly it. So at some level the data is a company asset that has 'value' to a potential acquiring company. And if you decide to destroy the value of that asset to an acquiring company (by having it self destruct on acquisition) then you've intentionally reduced the value of the company. Your fiduciary responsibility as a board member or executive is to maximize the value of the company.

THE WALL STREET JOURNAL

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Life

Real Estate

federal governments, for their people.

38 minutes ago

Like

3

Rustem Sharipov

★

Elitist and reactionary US government is completely disconnected from the realities of American life

39 minutes ago

Like

Share

Steven Scharf

★

@Rustem Sharipov What an insightful input. Thanks.

14 minutes ago

Like

Share

Wayne Gregersen

★

I do not understand at all you "Freedom" advocating right wingers who seem to understand that everyone needs to buy auto insurance to keep auto insurance affordable for all of us, but not understand the need to have universal health care for the same reason. The problem with health insurance is if you do not buy health insurance you still get free care if you have a catastrophic illness or injury. We don't let people die in the streets. So for those

The New Yorker

Santiago

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In Daily Shouts: Why freelance writers, musicians, poets, and more incessantly brilliant people are too intolerable to date.

Reasons Your Creative Type Has Broken Up with You

NEWYORKER.COM

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Top Comments

23 shares

Write a comment...

Arunima Jamwal lol the description Anisha Tandon

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Magazine

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Like

John Cassidy

Like

The New Yorker Front ...

Like

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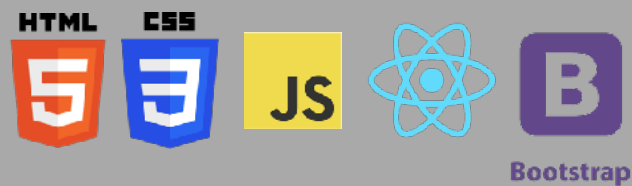
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Facebook © 2017

Problem

A lot of work

Client-side programming



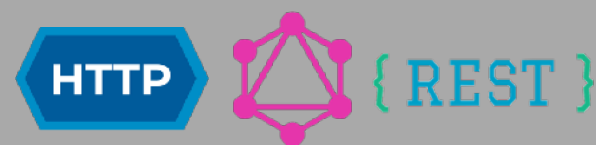
Server-side programming



Databases



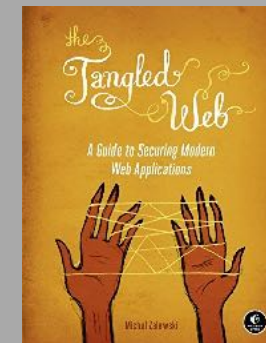
API Design



Usability



Security





your shopping bag

Item Details

Leaves warehouse in 1 - 2 full bus. days.


[Argentina Training Top](#)

Color: Pride Ink/White

Size: L

Article#: F89022

Qty:

[UPDATE CART](#)

Item price \$68.00

[Remove Item](#) | [Move to Wishlist](#)

Leaves warehouse in 1 - 2 full bus. days.


[Argentina Track Jacket](#)

Color: Bahia Lt Blue/Navy

Size: L

Article#: G77787

Qty:

! Quantity can not be zero.

[UPDATE CART](#)

Item price \$59.00

[Remove Item](#) | [Move to Wishlist](#)

Order Summary

Merchandise Subtotal \$127.00

Shipping and Handling \$5.00

Free Shipping on \$49 or more ([See Promotion Details](#)): -\$5.00

Pre-Tax Total \$127.00

[checkout](#)

Using a Promo Code? (Optional)

☒ No ☐ Yes

[checkout](#)

OR

Check Out with 



your shopping bag

Item Details

Leaves warehouse in 1 - 2 full bus. days.



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Pre-Tax Total \$127.00

[checkout](#)

Using a Promo Code? (Optional)



No



Yes

[checkout](#)

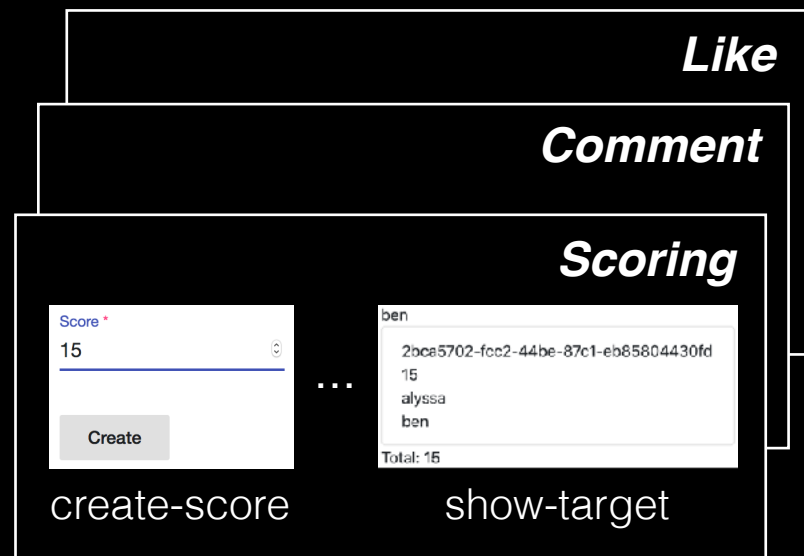
OR

Check Out with 

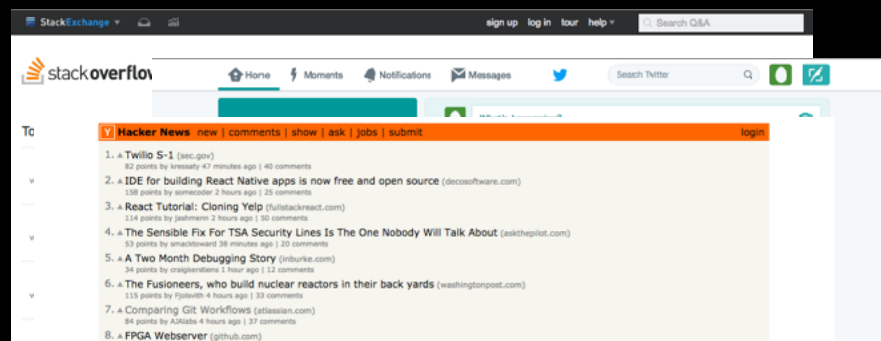
Opportunity

- concept reuse + simple assembly
- reduce the amount of knowledge & effort required to build web apps
- allow end-users to build more sophisticated apps themselves

The Déjà Vu Platform



```
<dv.component name="submit-post">
  <sn.navbar /> ...
  <dv.tx>
    <dv.gen-id /> ...
    <post.create-object id=dv.gen-id.id
      initialValue={ author: sn.navbar.user.username }
      showExclude=["author"] buttonLabel="Submit"
      newObjectSavedText="Post submitted" />
    <scoreposts.create-score targetId=dv.gen-id.id
      sourceId=sn.navbar.user.username
      value=0 hidden=true /> ...
  </dv.tx> ...
</dv.component>
```



catalog of concepts

- new modularity: concepts
- capture and reuse concept design & implementation

concept composition mechanism

- in HTML, no JS or server-side code
- join concept actions for aggregate behavior

web apps

- complex behavior
- rich graphical user interfaces

Key Ideas

1. Concepts as Modules

Concept: *Scoring*
Purpose: Score items

Score *

15

Create

...

ben

15	alyssa
5	louis

Total: 20

create-score

show-target

Concept: *Scoring*

Purpose: Score items

self-contained,
reusable increment
of functionality

Score *

15

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15

Create

...

ben

15	alyssa
5	louis

Total: 20

create-score

show-target

exports
components

Component includes:

- GUI element
- reactive I/O properties
- server-side action

2. Full-stack Modules

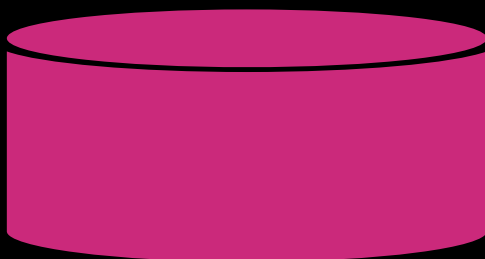
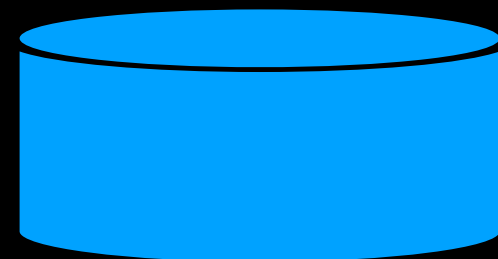
Post Concept

Scoring Concept

database

server

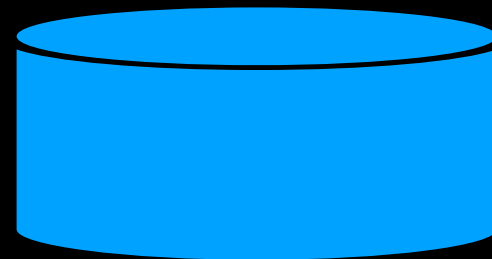
client



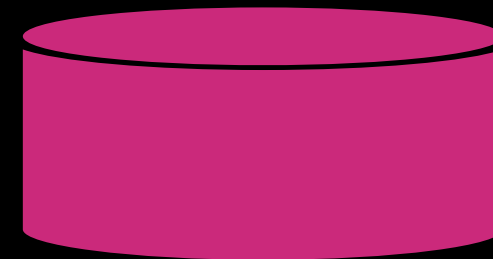
Post Concept

Scoring Concept

database



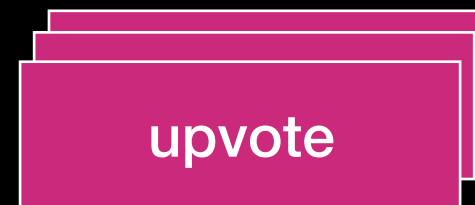
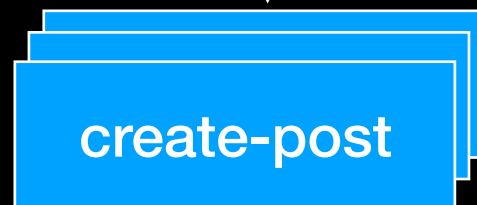
no communication



server



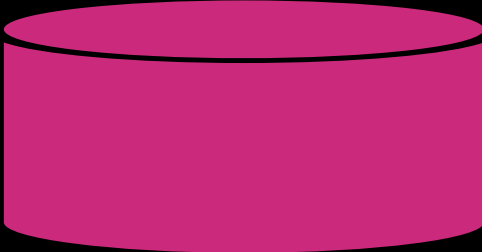
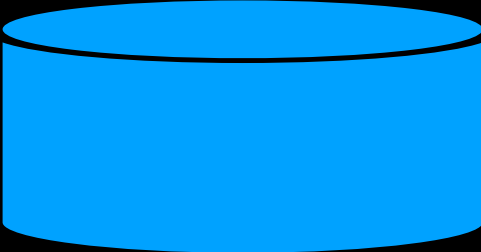
client



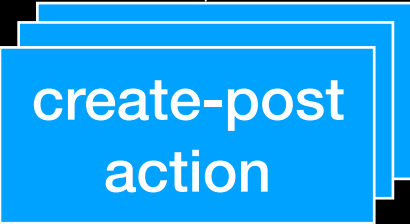
Post Concept

Scoring Concept

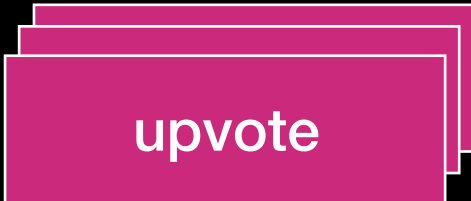
database



server



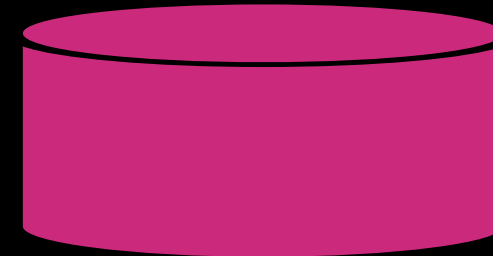
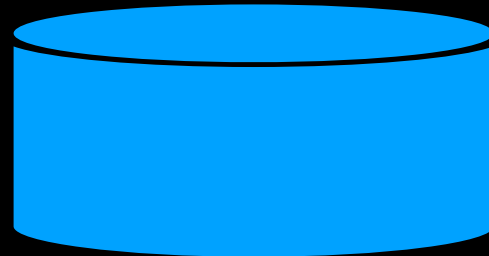
client



Post Concept

Scoring Concept

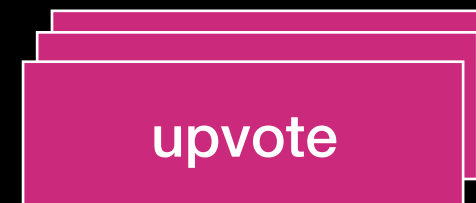
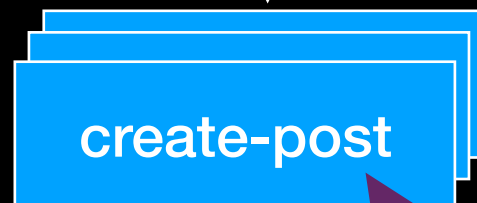
database



server



client



user interacts
with component

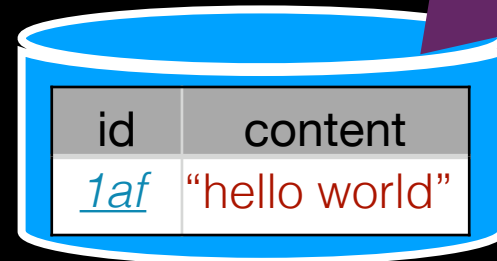


A purple callout box with a pointer directed at the 'create-post' client component, indicating user interaction.

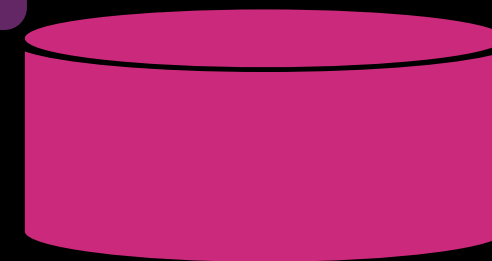
Post Concept

Scoring Concept

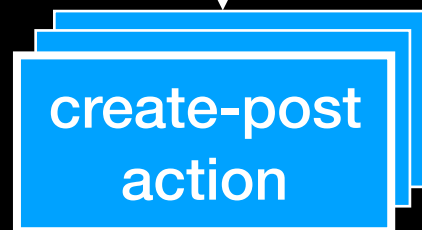
database



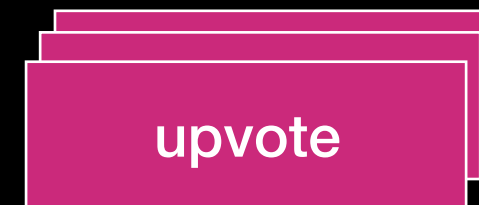
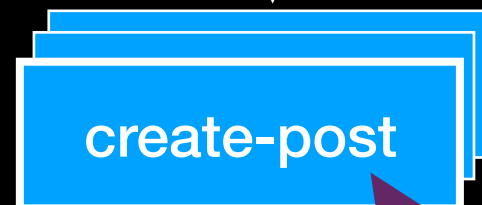
state of concept
changes



server



client



user interacts
with component

3. Declarative Synchronization

**goal: create
post with
initial score**

database

server

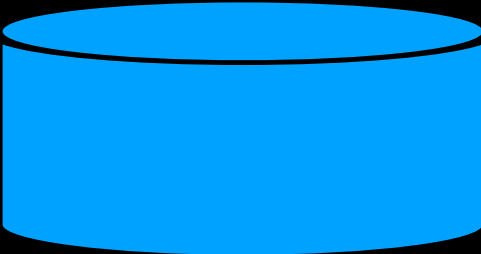
client

submit-post

**goal: create
post with
initial score**

Post Concept

database



server



client

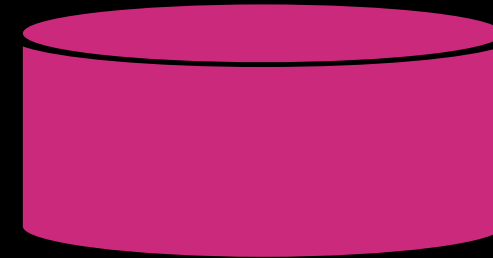
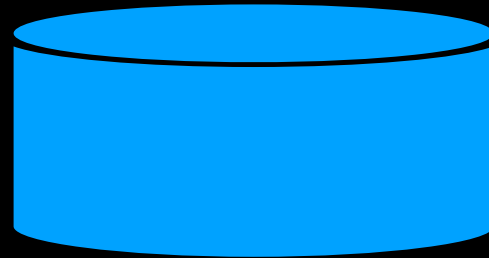


goal: create
post with
initial score

Post Concept

Scoring Concept

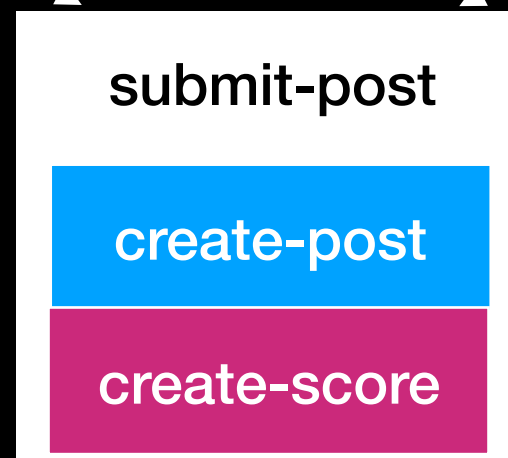
database



server



client

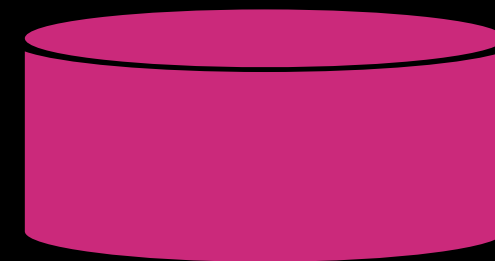
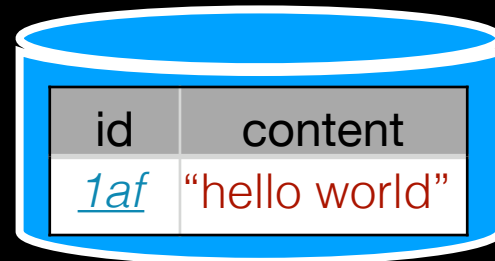


goal: create
post with
initial score

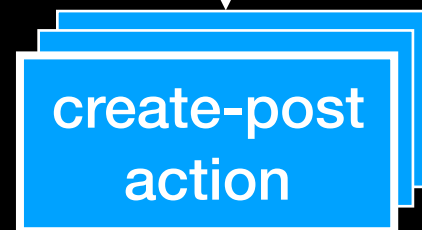
Post Concept

Scoring Concept

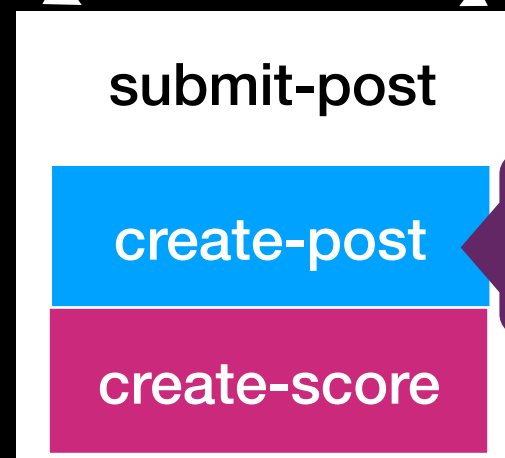
database



server



client



user interacts with
create-post

goal: create
post with
initial score

Post Concept

Scoring Concept

database

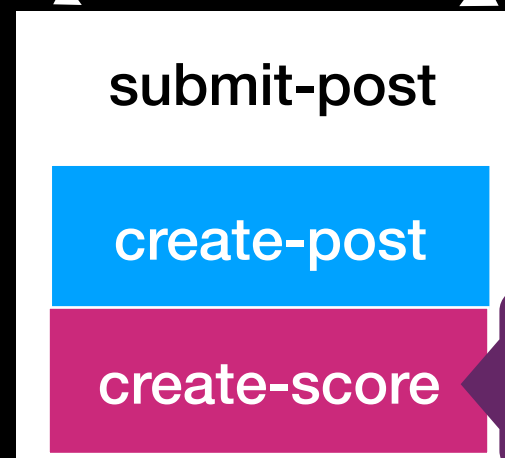
id	content
<u>1af</u>	"hello world"

id	value	sourceId	targetId
<u>2zf</u>	5	<u>3a9</u>	<u>a79</u>

server



client



user interacts with
create-score

goal: create
post with
initial score

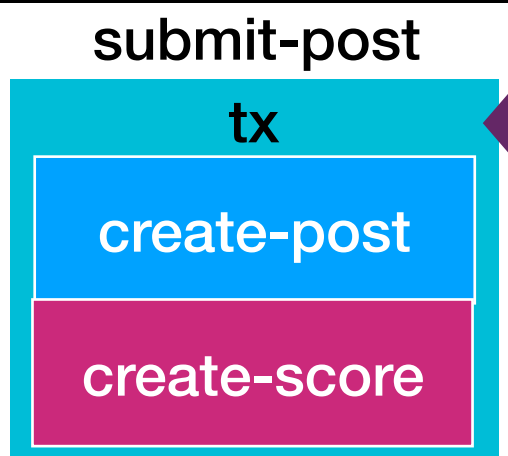
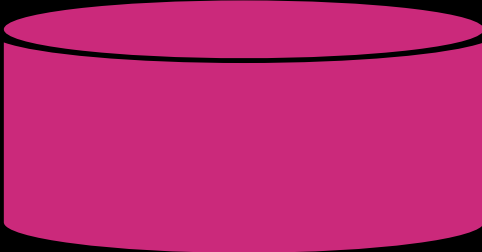
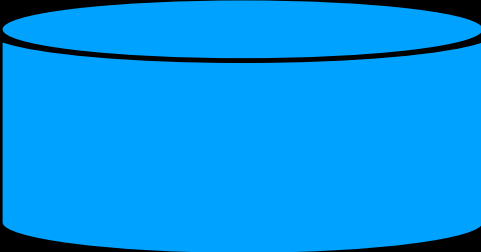
Post Concept

Scoring Concept

database

server

client



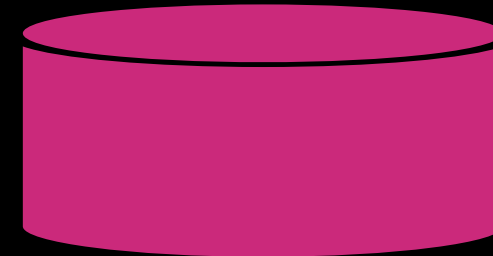
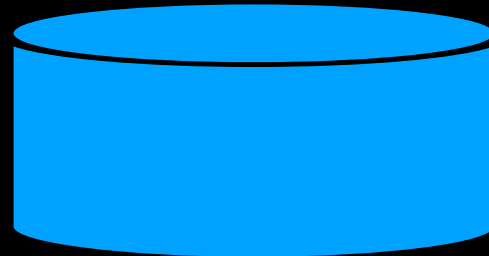
wrap in transaction

goal: create post with initial score

Post Concept

Scoring Concept

database



server



client



user interacts with
create-post

goal: create
post with
initial score

Post Concept

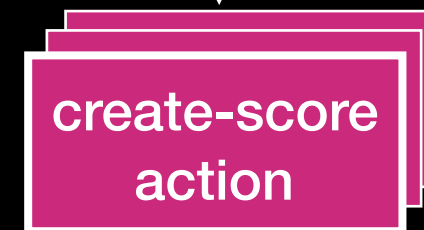
Scoring Concept

database

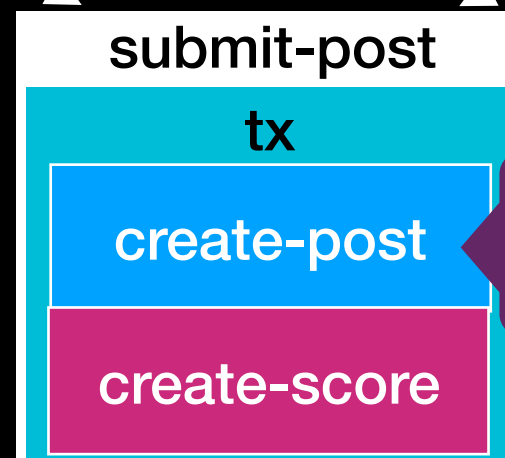
id	content
<u>1af</u>	"hello world"

id	value	sourceId	targetId
<u>2zf</u>	5	<u>3a9</u>	<u>a79</u>

server



client



user interacts with
create-post

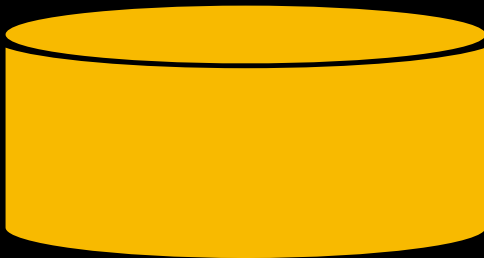
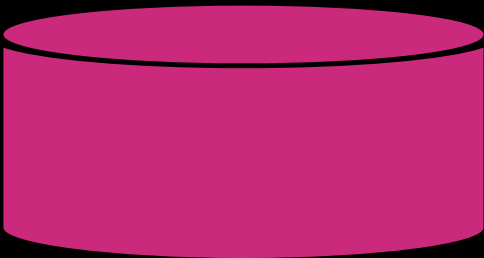
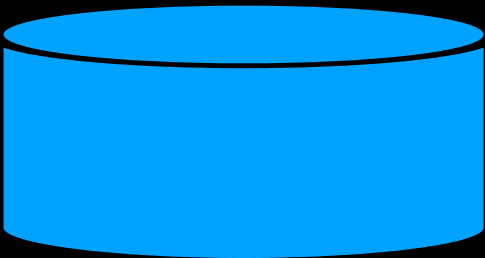
goal: create
post with
initial score

Post Concept

Scoring Concept

Auth Concept

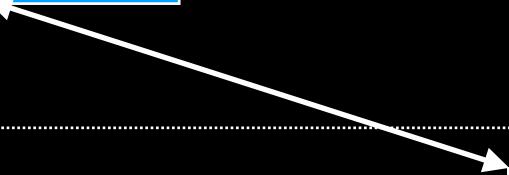
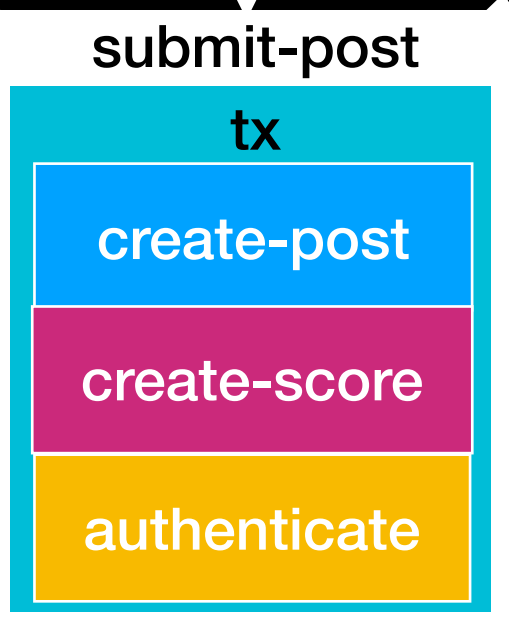
database



server



client

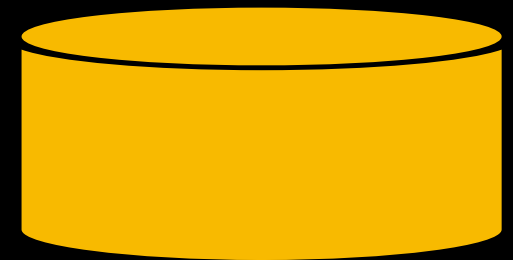
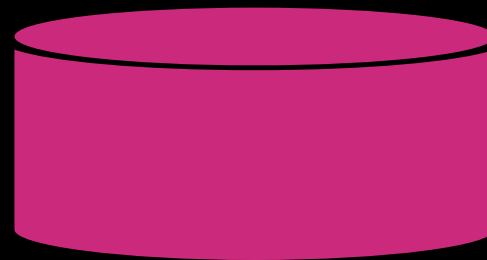
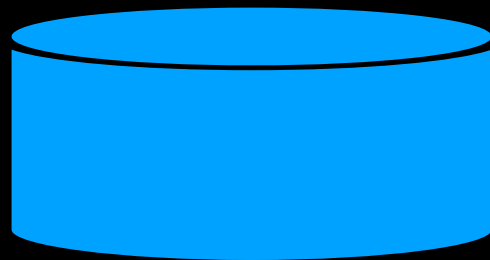


Post Concept

Scoring Concept

Auth Concept

database



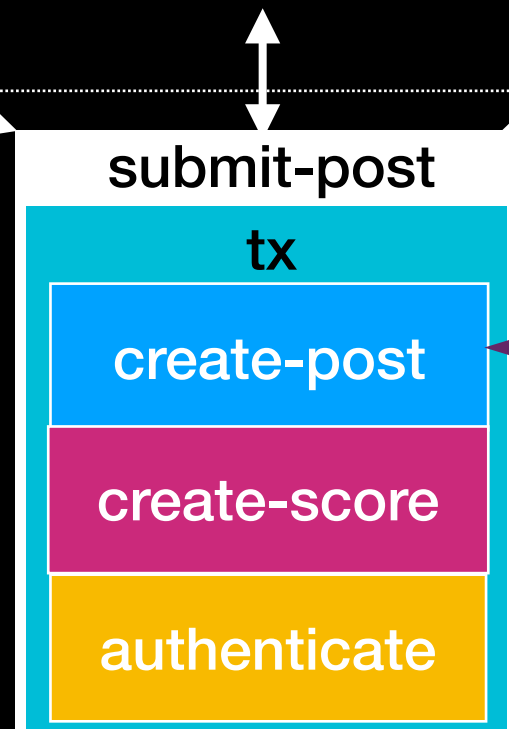
server



fails tx



client



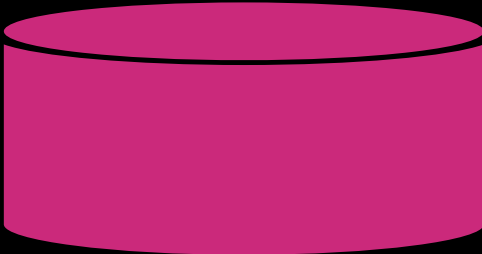
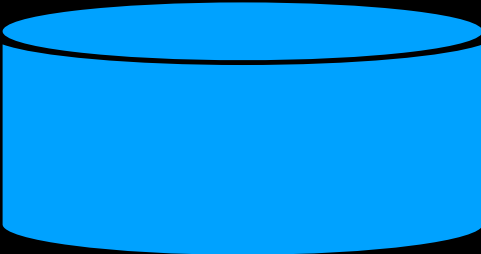
unauthenticated user interacts with create-post

4. ID Sharing

Post Concept

Scoring Concept

database



server



client

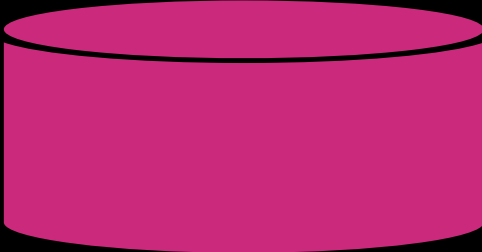
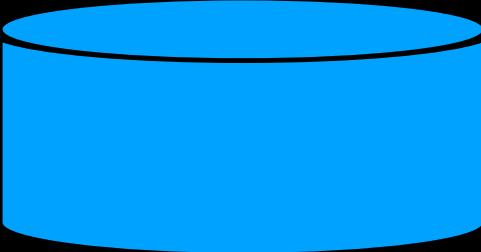


**goal: create
post with
initial score**

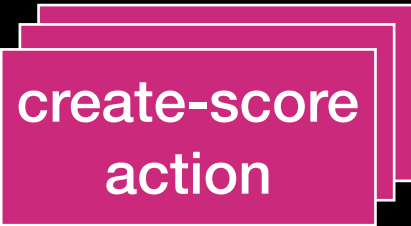
Post Concept

Scoring Concept

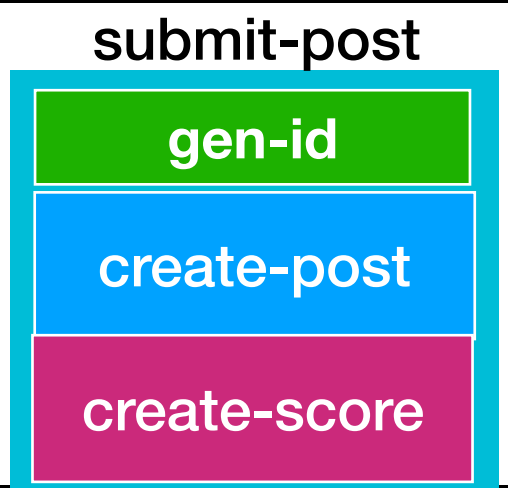
database



server



client



id=gen-id.id
targetId=gen-id.id
goal: create post with initial score

Post Concept

Scoring Concept

database

same ID

id	content
<u>1af</u>	hello world"

id	value	sourceId	targetId
<u>2zf</u>	5	<u>3a9</u>	<u>1af</u>

same ID

server

create-post
action

create-score
action

client

submit-post

gen-id

create-post

create-score

user interacts with
create-post

targetId=gen-id.id


goal: create
post with
initial score


Building Apps with Déjà Vu

A Sample Déjà Vu App

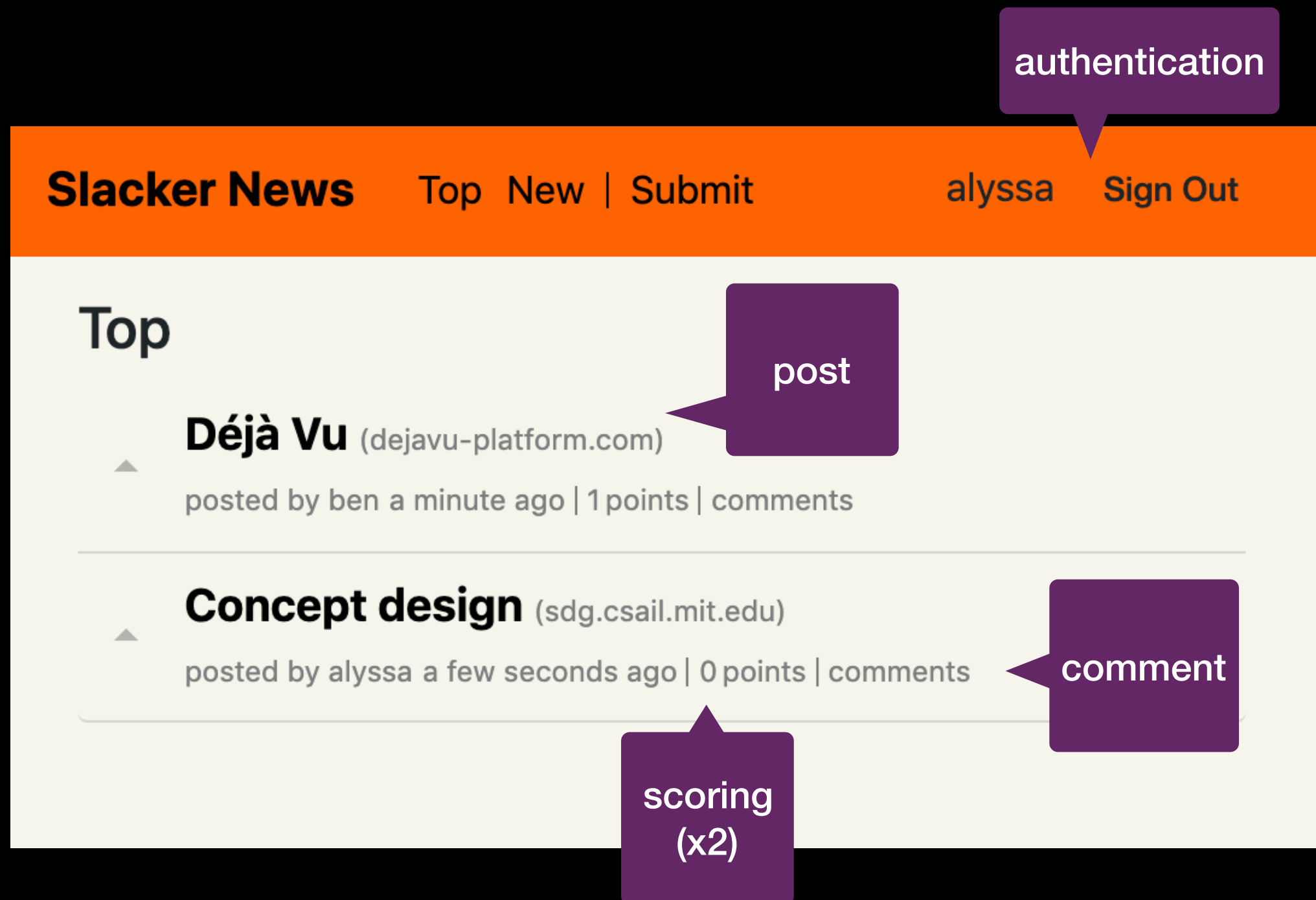
Slacker News Top New | Submit alyssa Sign Out

Top

 **Déjà Vu** (dejavu-platform.com)
posted by ben a minute ago | 1 points | comments

 **Concept design** (sdg.csail.mit.edu)
posted by alyssa a few seconds ago | 0 points | comments

A Sample Déjà Vu App



Top

No posts yet

Top



Déjà Vu (deja-vu-platform.com)

posted by ben a few seconds ago | 0 points | comments

Top

Déjà Vu (deja-vu-platform.com)



posted by ben 3 minutes ago | 1 points | comments



Catalog

Concept	Purpose
Authentication	Verify a user's identity with a username and password
Authorization	Control access to resources
Chat	Exchange messages in real time
Comment	Share reactions to items
Event	Schedule events
Follow	Receive updates from sources
Geolocation	Locate points of interest
Group	Organize members into groups so that they can be handled in aggregate
Label	Label items so that they can be found later
Match	Connect users after they both agree
Passkey	Verify a user's identity with a code
Property	Describe an object with properties that have values
Ranking	Rank items
Rating	Crowdsourcing evaluation of items
Schedule	Find a time to meet
Scoring	Keep track of scores
Task	Keep track of pieces of work to be done
Transfer	Transfer money or items between accounts

Catalog

Concept	Purpose
Authentication	Verify a user's identity with a username and password
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Scoring	Keep track of scores
Task	Keep track of pieces of work to be done
Transfer	Transfer money or items between accounts

for
posts

```

{
  "name": "sn",
  "usedConcepts": {
    "authentication": {},
    "comment": {},
    "post": {
      "name": "Property",
      "config": {
        "schema": {
          "title": "Post", "type": "object",
          "properties": {
            "author": { "type": "string" },
            "title": { "type": "string" },
            "url": { "type": "string", "format": "url" }
          },
          "required": [ "author", "title", "url" ]
        }
      }
    },
    "scoreposts": { "name": "Scoring" },
    "scorecomments": { "name": "Scoring" }
  },
  "routes": [
    { "path": "", "component": "home" },
    { "path": "/login", "component": "login" },
    { "path": "/post", "component": "show-post-details" },
    ...
  ]
}

```

dvconfig.json

used
concepts

```
{
  "name": "sn",
  "usedConcepts": {
    "authentication": {},
    "comment": {},
    "post": {
      "name": "Property",
      "config": {
        "schema": {
          "title": "Post", "type": "object",
          "properties": {
            "author": { "type": "string" },
            "title": { "type": "string" },
            "url": { "type": "string", "format": "url" }
          },
          "required": [ "author", "title", "url" ]
        }
      }
    },
    "scoreposts": { "name": "Scoring" },
    "scorecomments": { "name": "Scoring" }
  },
  "routes": [
    { "path": "", "component": "home" },
    { "path": "/login", "component": "login" },
    { "path": "/post", "component": "show-post-details" },
    ...
  ]
}
```

dvconfig.json

used
concepts

concept

instance
config

alias

```
{
  "name": "sn",
  "usedConcepts": {
    "authentication": {},
    "comment": {},
    "post": {
      "name": "Property",
      "config": {
        "schema": {
          "title": "Post", "type": "object",
          "properties": {
            "author": { "type": "string" },
            "title": { "type": "string" },
            "url": { "type": "string", "format": "url" }
          },
          "required": [ "author", "title", "url" ]
        }
      }
    },
    "scoreposts": { "name": "Scoring" },
    "scorecomments": { "name": "Scoring" }
  },
  "routes": [
    { "path": "", "component": "home" },
    { "path": "/login", "component": "login" },
    { "path": "/post", "component": "show-post-details" },
    ...
  ]
}
```

dvconfig.json

used
concepts

concept

instance
config

alias

schema
definition

```
{
  "name": "sn",
  "usedConcepts": {
    "authentication": {},
    "comment": {},
    "post": {
      "name": "Property",
      "config": {
        "schema": {
          "title": "Post", "type": "object",
          "properties": {
            "author": { "type": "string" },
            "title": { "type": "string" },
            "url": { "type": "string", "format": "url" }
          },
          "required": [ "author", "title", "url" ]
        }
      }
    },
    "scoreposts": { "name": "Scoring" },
    "scorecomments": { "name": "Scoring" }
  },
  "routes": [
    { "path": "", "component": "home" },
    { "path": "/login", "component": "login" },
    { "path": "/post", "component": "show-post-details" },
    ...
  ]
}
```

dvconfig.json

used
concepts

concept

instance
config

alias

schema
definition

routes

```
{
  "name": "sn",
  "usedConcepts": {
    "authentication": {},
    "comment": {},
    "post": {
      "name": "Property",
      "config": {
        "schema": {
          "title": "Post", "type": "object",
          "properties": {
            "author": { "type": "string" },
            "title": { "type": "string" },
            "url": { "type": "string", "format": "url" }
          },
          "required": [ "author", "title", "url" ]
        }
      }
    },
    "scoreposts": { "name": "Scoring" },
    "scorecomments": { "name": "Scoring" }
  },
  "routes": [
    { "path": "", "component": "home" },
    { "path": "/login", "component": "login" },
    { "path": "/post", "component": "show-post-details" },
    ...
  ]
}
```

dvconfig.json

```

<dv.component name="submit-post">
  <sn.navbar /> ...
  <dv.tx>
    <dv.gen-id /> ...
    <post.create-object id=dv.gen-id.id
      initialValue={ author: sn.navbar.user.username }
      showExclude=["author"] buttonLabel="Submit"
      newObjectSavedText="Post submitted" />
    <scoreposts.create-score targetId=dv.gen-id.id
      sourceId=sn.navbar.user.username
      value=0 hidden=true /> ...
  </dv.tx> ...
</dv.component>

```

submit-post.html

Slacker News
Top New | Submit
ben
Sign Out

sn.navbar

Submit

Title *

Url *

Submit

post.create-object

app name

component
name

instance name

```
<dv.component name="submit-post">
  <sn.navbar /> ...
  <dv.tx>
    <dv.gen-id /> ...
    <post.create-object id=dv.gen-id.id
      initialValue={ author: sn.navbar.user.username }
      showExclude=["author"] buttonLabel="Submit"
      newObjectSavedText="Post submitted" />
    <scoreposts.create-score targetId=dv.gen-id.id
      sourceId=sn.navbar.user.username
      value=0 hidden=true /> ...
  </dv.tx> ...
</dv.component>
```

submit-post.html

Slacker News Top New | Submit ben Sign Out

sn.navbar

Submit

Title *

Url *

Submit

post.create-object

```

<dv.component name="submit-post">
  <sn.navbar /> ...
  <dv.tx>
    <dv.gen-id /> ...
    <post.create-object id=dv.gen-id.id
      initialValue={ author: sn.navbar.user.username }
      showExclude=["author"] buttonLabel="Submit"
      newObjectSavedText="Post submitted" />
    <scoreposts.create-score targetId=dv.gen-id.id
      sourceId=sn.navbar.user.username
      value=0 hidden=true /> ...
  </dv.tx> ...
</dv.component>

```

submit-post.html

Slacker News
Top New | Submit
ben Sign Out

sn.navbar

Submit

Title *

Url *

Submit

post.create-object

```

<dv.component name="submit-post">
  <sn.navbar /> ...
  <dv.tx>
    <dv.gen-id /> ...
    <post.create-object id=dv.gen-id.id
      initialValue={ author: sn.navbar.user.username }
      showExclude=["author"] buttonLabel="Submit"
      newObjectSavedText="Post submitted" />
    <scoreposts.create-score targetId=dv.gen-id.id
      sourceId=sn.navbar.user.username
      value=0 hidden=true /> ...
  </dv.tx> ...
</dv.component>

```

hide

submit-post.html

Slacker News
Top New | Submit
 ben Sign Out

sn.navbar

Submit

Title *

Url *

Submit

post.create-object

```

<dv.component name="submit-post">
  <sn.navbar /> ...
  <dv.tx>
    <dv.gen-id /> ...
    <post.create-object id=dv.gen-id.id
      initialValue={ author: sn.navbar.user.username }
      showExclude=["author"] buttonLabel="Submit"
      newObjectSavedText="Post submitted" />
    <scoreposts.create-score targetId=dv.gen-id.id
      sourceId=sn.navbar.user.username
      value=0 hidden=true /> ...
  </dv.tx> ...
</dv.component>

```

submit-post.html

Slacker News
Top New | Submit
 ben Sign Out

sn.navbar

Submit

Title *

Url *

Submit

post.create-object

```

<dv.component name="submit-post">
  <sn.navbar /> ...
  <dv.tx> transaction
    <dv.gen-id /> ...
    <post.create-object id=dv.gen-id.id
      initialValue={ author: sn.navbar.user.username }
      showExclude=["author"] buttonLabel="Submit"
      newObjectSavedText="Post submitted" />
    <scoreposts.create-score targetId=dv.gen-id.id
      sourceId=sn.navbar.user.username
      value=0 hidden=true /> ...
  </dv.tx> ...
</dv.component>

```

submit-post.html

Slacker News
Top New | Submit
 ben Sign Out

sn.navbar

Submit

Title *

Url *

Submit

post.create-object

generate ID

```
<dv.component name="submit-post">
  <sn.navbar /> ...
  <dv.tx>
    <dv.gen-id /> ...
    <post.create-object id=dv.gen-id.id
      initialValue={ author: sn.navbar.user.username }
      showExclude=["author"] buttonLabel="Submit"
      newObjectSavedText="Post submitted" />
    <scoreposts.create-score targetId=dv.gen-id.id
      sourceId=sn.navbar.user.username
      value=0 hidden=true /> ...
  </dv.tx> ...
</dv.component>
```

ID used

ID used

submit-post.html

Slacker News Top New | Submit ben Sign Out

sn.navbar

Submit

Title *

Url *

Submit

post.create-object

```

<dv.component name="submit-post">
  <sn.navbar /> ...
  <dv.tx>
    <dv.gen-id /> ...
    <post.create-object id=dv.gen-id.id
      initialValue={ author: sn.navbar.user.username }
      showExclude=["author"] buttonLabel="Submit"
      newObjectSavedText="Post submitted" />
    <scoreposts.create-score targetId=dv.gen-id.id
      sourceId=sn.navbar.user.username
      value=0 hidden=true /> ...
  </dv.tx> ...
</dv.component>

```

submit-post.html

Slacker News
Top New | Submit
ben Sign Out

Submit

Title *

Url *

Submit

post.create-object

user clicks on
button

trigger run

```
<dv.component name="submit-post">
  <sn.navbar /> ...
  <dv.tx>
    <dv.gen-id /> ...
    <post.create-object id=dv.gen-id.id
      initialValue={ author: sn.navbar.user.username }
      showExclude=["author"] buttonLabel="Submit"
      newObjectSavedText="Post submitted" />
    <scoreposts.create-score targetId=dv.gen-id.id
      sourceId=sn.navbar.user.username
      value=0 hidden=true /> ...
  </dv.tx> ...
</dv.component>
```

submit-post.html

Slacker News Top New | Submit ben Sign Out

sn.navbar

Submit

Title *

Url *

Submit

post.create-object

user clicks on
button


```

<dv.component name="submit-post">
  <sn.navbar />
  <dv.tx>
    <dv.gen-id /> ..
    <post.create-object id=dv.gen-id.id
      initialValue={ author: sn.navbar.user.username }
      showExclude=["author"] buttonLabel="Submit"
      newObjectSavedText="Post submitted" />
    <scoreposts.create-score targetId=dv.gen-id.id
      sourceId=sn.navbar.user.username
      value=0 hidden=true /> ...
  </dv.tx> ...
</dv.component>

```

run create-post action

trigger run

run create-score action

submit-post.html

Slacker News
Top New | Submit
 ben Sign Out

sn.navbar

Submit

Title *

Url *

Submit
 post.create-object

user clicks on button

```

<dv.component name="show-post"> ...
  <post.show-object id=$id hidden=true /> ...
  <dv.if condition=post.show-object.loadedObject>
    <sn.upvote id=$id user=$user />
    <a href=post.show-object.loadedObject.url>
      {{post.show-object.loadedObject.title}}
    </a> ...
    (<post.show-url showBaseUrlOnly=true
      url=post.show-object.loadedObject.url />)
    posted by {{post.show-object.loadedObject.author}}
    <dv.show-date format='time-ago'
      date=post.show-object.loadedObject.timestamp /> ...
    <scoreposts.show-target
      id=$id showId=false
      showScores=false totalLabel="" /> points
    <dv.link href="/post" params={ id: $id }>
      comments
    </dv.link>
  </dv.if>
</dv.component>

```

show-post.html



sn.upvote

SPLASH 2019 (2019.splashcon.org)

dv.show-date

posted by ben

an hour ago

| 2

points |

comments

dv.link

scoreposts.show-target

load post

component input

```
<dv.component name="show-post" ...
  <post.show-object id=$id hidden=true /> ...
  <dv.if condition=post.show-object.loadedObject>
    <sn.upvote id=$id user=$user />
    <a href=post.show-object.loadedObject.url>
      {{post.show-object.loadedObject.title}}
    </a> ...
    (<post.show-url showBaseUrlOnly=true
      url=post.show-object.loadedObject.url />)
    posted by {{post.show-object.loadedObject.author}}
    <dv.show-date format='time-ago'
      date=post.show-object.loadedObject.timestamp /> ...
    <scoreposts.show-target
      id=$id showId=false
      showScores=false totalLabel="" /> points
    <dv.link href="/post" params={ id: $id }>
      comments
    </dv.link>
  </dv.if>
</dv.component>
```

show-post.html



sn.upvote

SPLASH 2019 (2019.splashcon.org)

posted by ben

dv.show-date

an hour ago

2

points

dv.link

comments

scoreposts.show-target

```

<dv.component name="show-post"> ...
  <post.show-object id=$id hidden=true /> ...
  <dv.if condition=post.show-object.loadedObject>
    <sn.upvote id=$id user=$user />
    <a href=post.show-object.loadedObject.url>
      {{post.show-object.loadedObject.title}}
    </a> ...
    (<post.show-url showBaseUrlOnly=true
      url=post.show-object.loadedObject.url />)
    posted by {{post.show-object.loadedObject.author}}
    <dv.show-date format='time-ago'
      date=post.show-object.loadedObject.timestamp /> ...
    <scoreposts.show-target
      id=$id showId=false
      showScores=false totalLabel="" /> points
    <dv.link href="/post" params={ id: $id }>
      comments
    </dv.link>
  </dv.if>
</dv.component>

```

post url

post title

post author

show-post.html



sn.upvote

SPLASH 2019 (2019.splashcon.org)

dv.show-date

dv.link




posted by ben an hour ago | 2 points | comments







scoreposts.show-target










What People Do Today


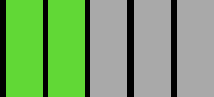










Conventional Approaches
















- General-purpose tools     
- Content Management Systems  
- End-User Development Tools   outsystems

	Quick Inclusion of New Functionality	Flexible Integration of New Functionality	Easy Implementation of Custom Behavior
General-Purpose Tools 			
Content Management Systems 			
End-User Development Tools 			
Déjà Vu			

	Quick Inclusion of New Functionality	Flexible Integration of New Functionality	Easy Implementation of Custom Behavior
General-Purpose Tools 			
Content Management Systems 			
End-User Development Tools 			
Déjà Vu			

	Quick Inclusion of New Functionality	Flexible Integration of New Functionality	Easy Implementation of Custom Behavior
General-Purpose Tools 			
Content Management Systems 			
End-User Development Tools 			
Déjà Vu			

	Quick Inclusion of New Functionality	Flexible Integration of New Functionality	Easy Implementation of Custom Behavior
General-Purpose Tools 			
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Déjà Vu			

	Quick Inclusion of New Functionality	Flexible Integration of New Functionality	Easy Implementation of Custom Behavior
General-Purpose Tools 			
Content Management Systems 			
End-User Development Tools 			
Déjà Vu			

Examples

1. Secret Party

View Party

Passkey Code *

Validate

New Party

Starts On *

02/07/2020



Start Time *

05:00 PM

Ends On *

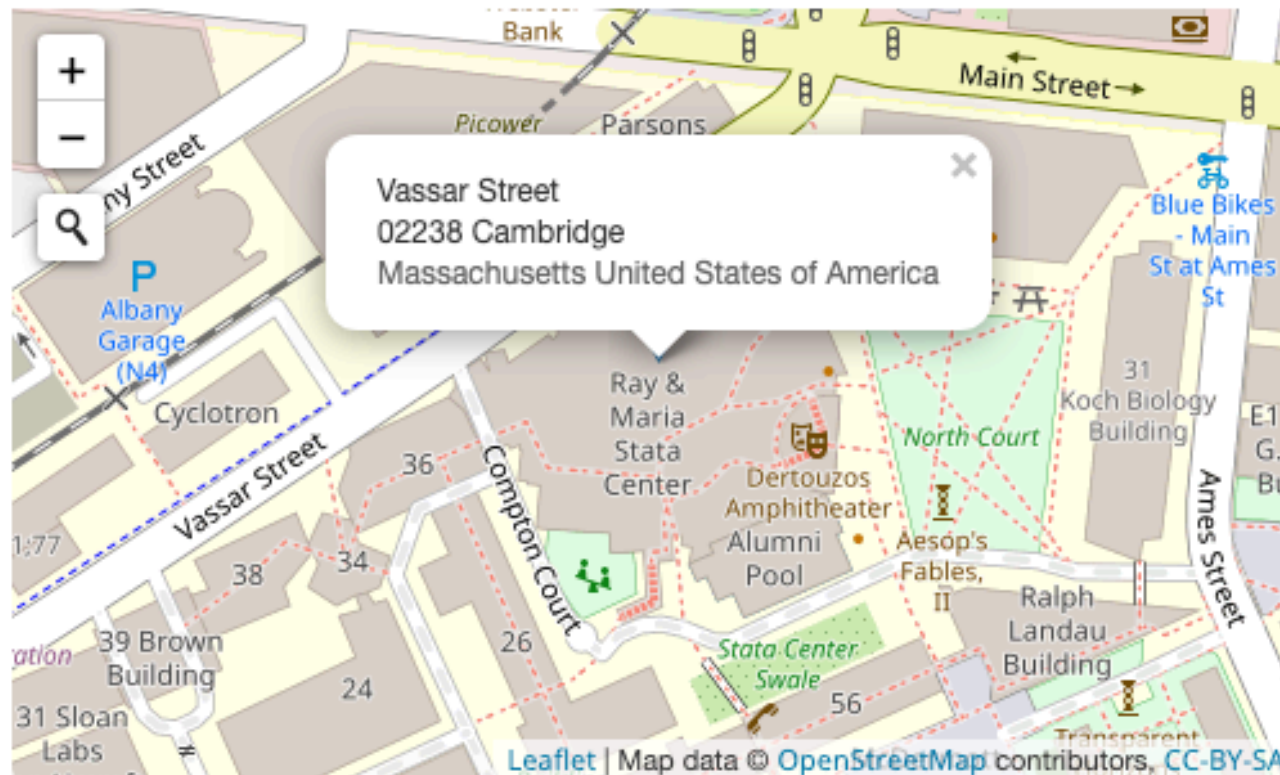
02/07/2020



End Time *

10:00 PM

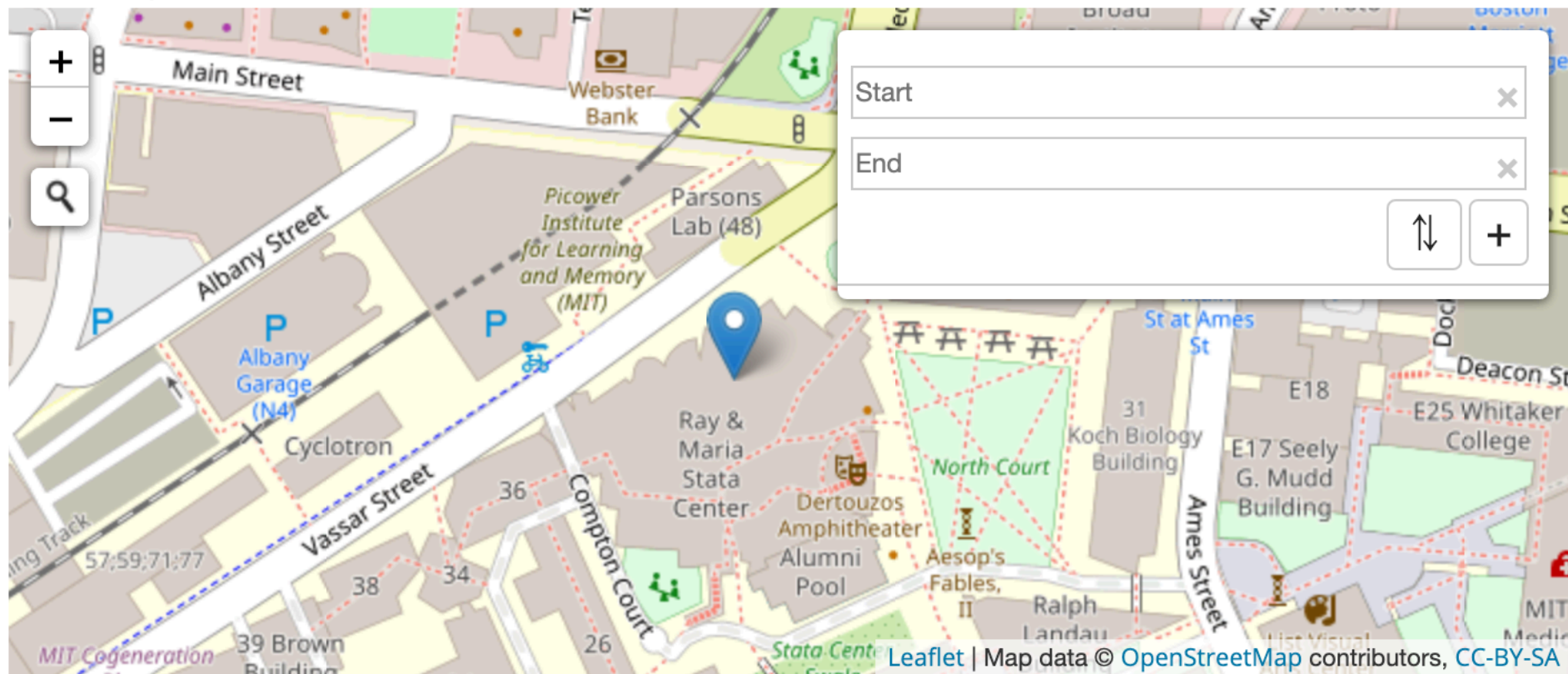
Create Party



Landing Page

alamo

Fri Feb 7, 2020 5:00 PM - 10:00 PM



Chat

should we bring food?

Tue Dec 10 2019 15:20:25 GMT-0800

anonymous

Content *

_____ //

Create Message

Party Page

View Party

Passkey Code *

alamo|

Validate

New Party

Starts On *



Start Time *

--:-- --

Ends On *



End Time *

--:-- --

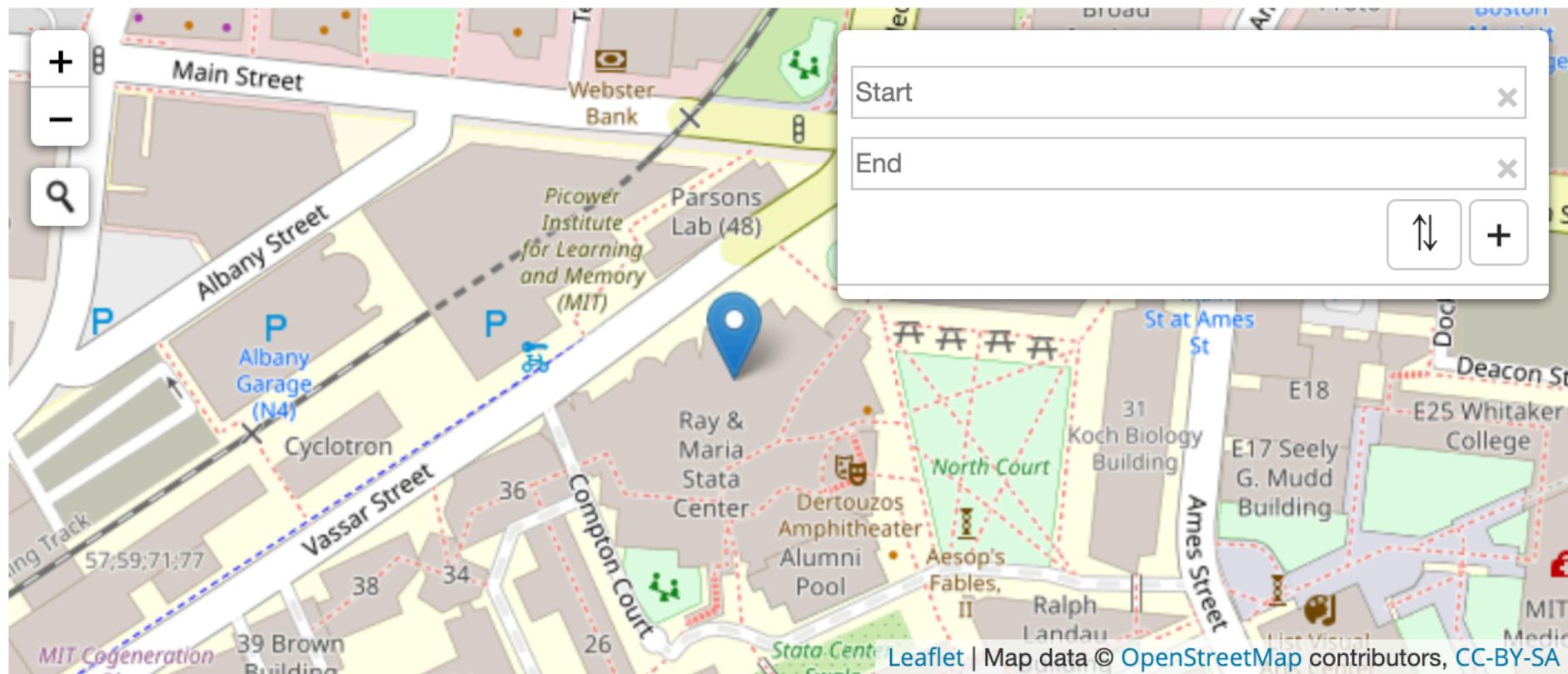
Create Party



Landing Page

alamo

Fri Feb 7, 2020 5:00 PM - 10:00 PM



Chat

should we bring food?

Tue Dec 10 2019 15:20:25 GMT-0800

anonymous

Content *

Create Message

Party Page

Challenge: lots of functionality

View Party

Passkey Code *

Validate

New Party

Starts On *

02/07/2020

Start Time *

05:00 PM

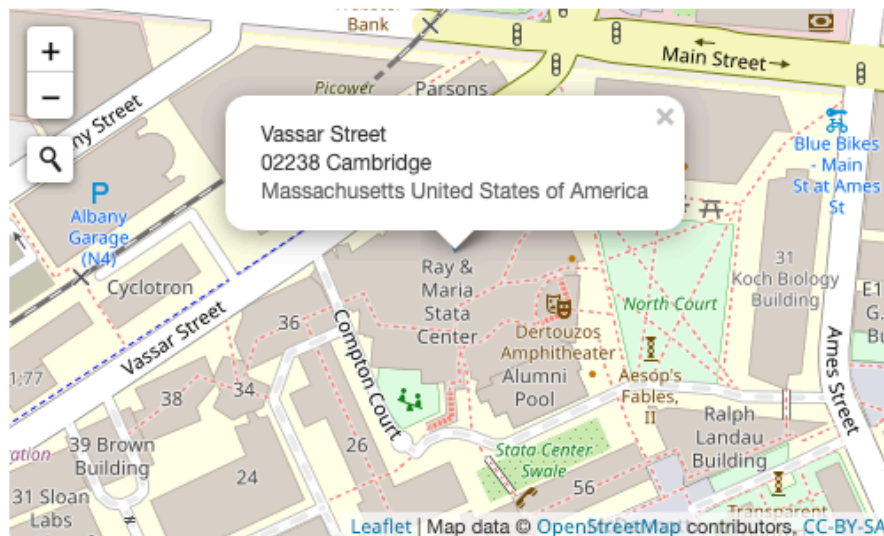
Ends On *

02/07/2020

End Time *

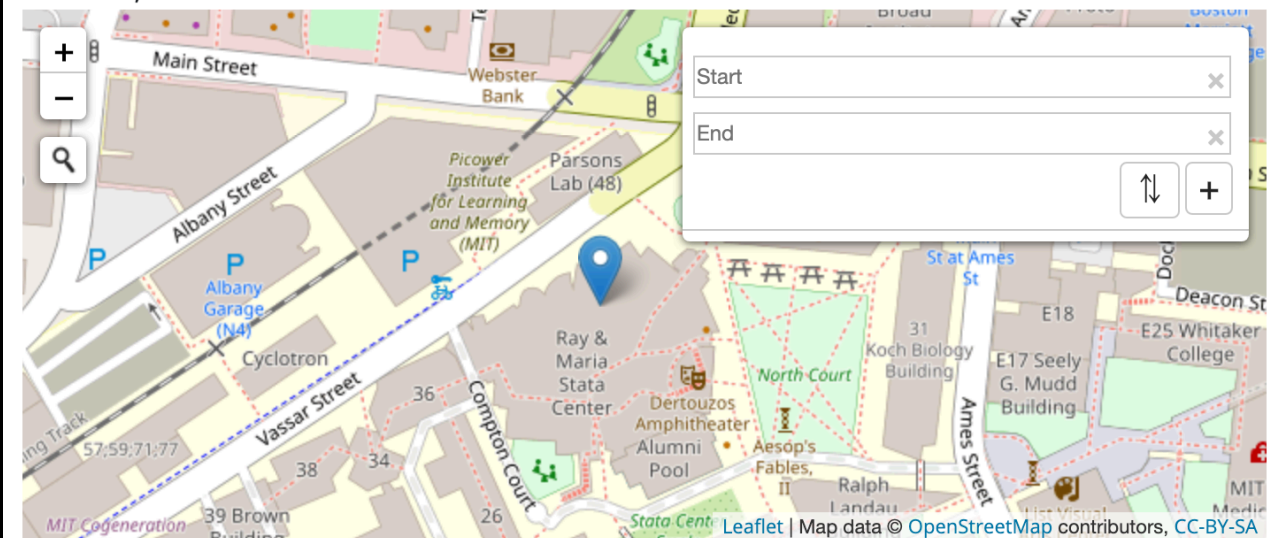
10:00 PM

Create Party



alamo

Fri Feb 7, 2020 5:00 PM - 10:00 PM



Chat

should we bring food?

Tue Dec 10 2019 15:20:25 GMT-0800

anonymous

Content *

Create Message

Challenge: lots of functionality

passkey
verification

View Party

Passkey Code *

Validate

New Party

Starts On *

02/07/2020

Start Time *

05:00 PM

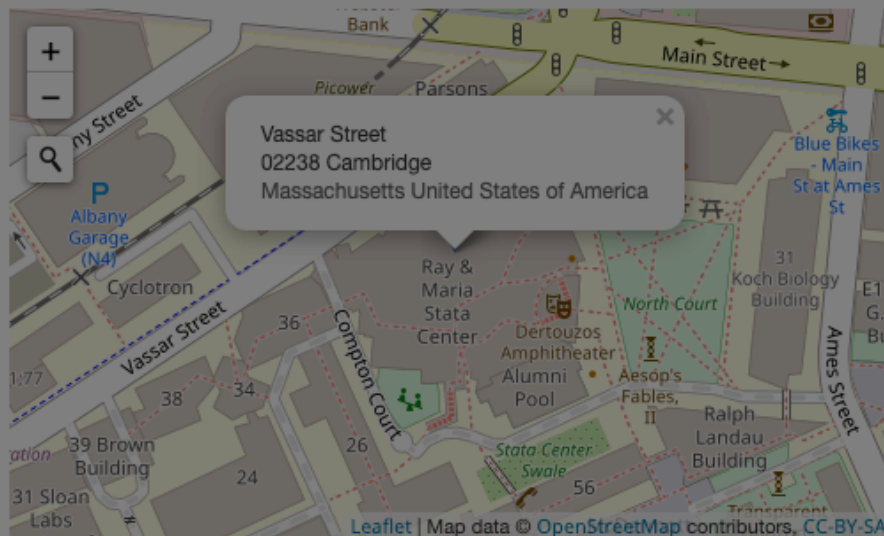
Ends On *

02/07/2020

End Time *

10:00 PM

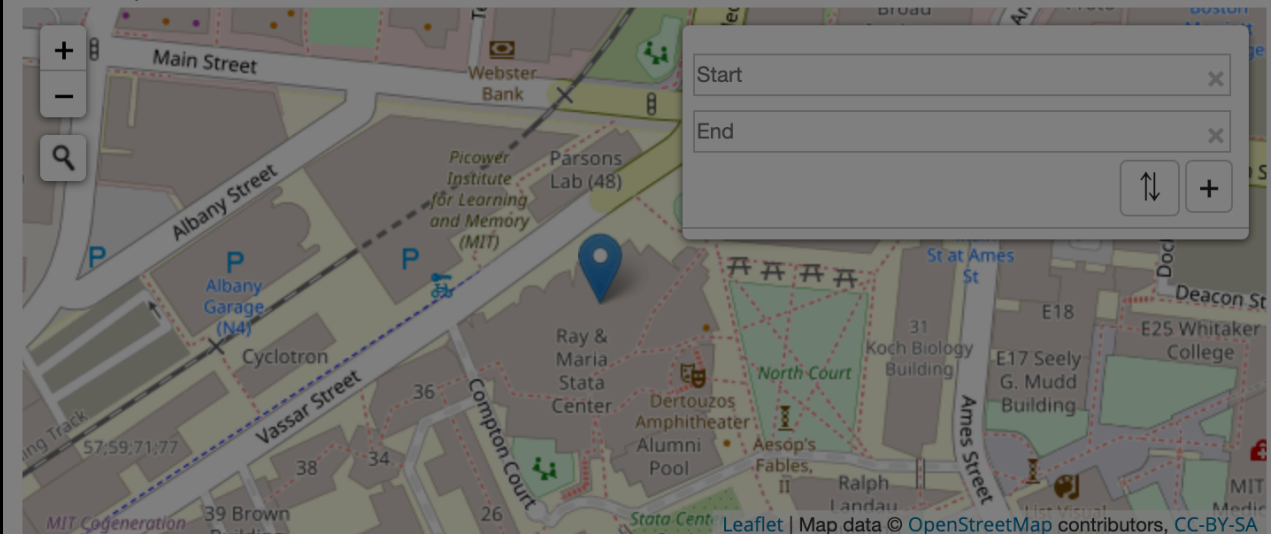
Create Party



passkey
generation

alamo

Fri Feb 7, 2020 5:00 PM - 10:00 PM



Chat

should we bring food?

Tue Dec 10 2019 15:20:25 GMT-0800

anonymous

Content *

Create Message

Challenge: lots of functionality

View Party

Passkey Code *

Validate

New Party

Starts On *

02/07/2020

Start Time *

05:00 PM

Ends On *

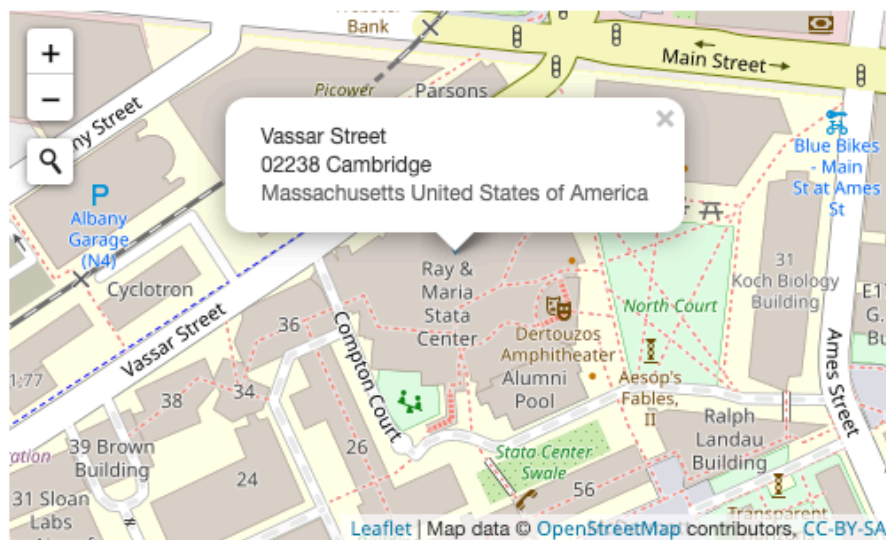
02/07/2020

End Time *

10:00 PM

Create Party

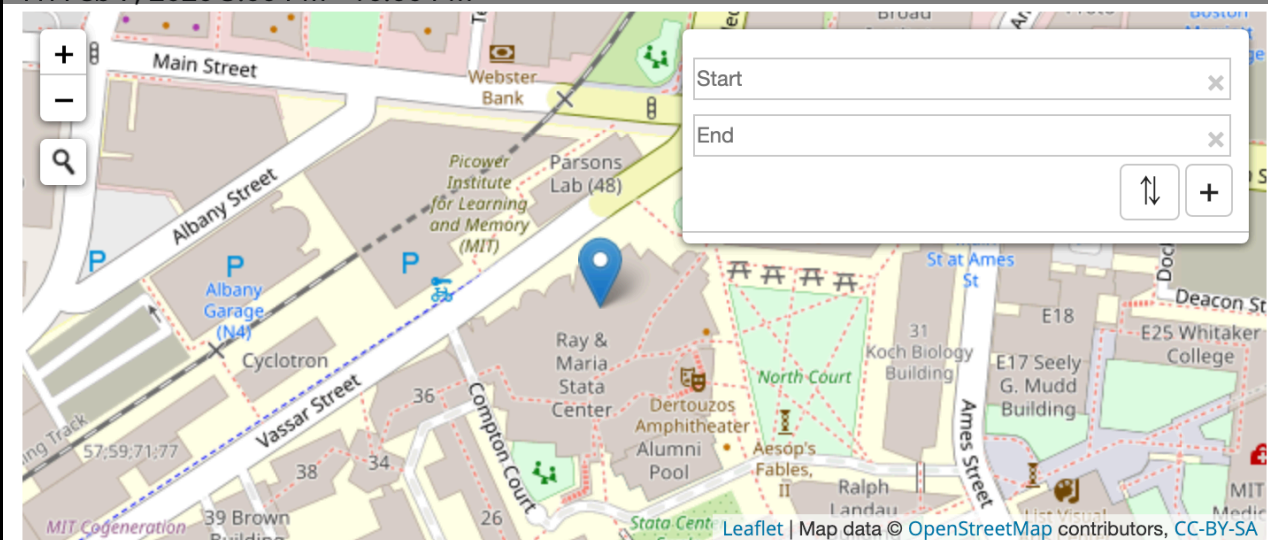
maps



alamo

Fri Feb 7, 2020 5:00 PM - 10:00 PM

maps



Chat

should we bring food?

Tue Dec 10 2019 15:20:25 GMT-0800

anonymous

Content *

Create Message

Challenge: lots of functionality

View Party

Passkey Code *

Validate

New Party

Starts On *
02/07/2020

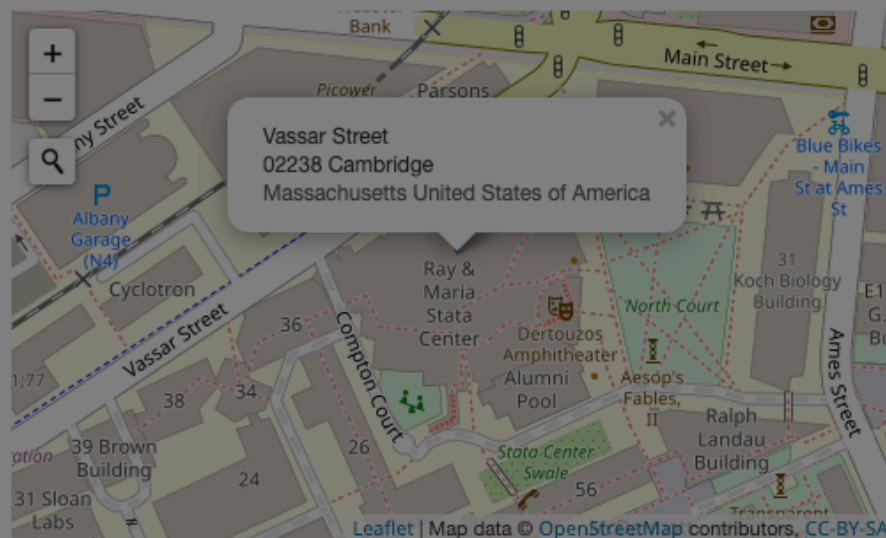
Start Time *
05:00 PM

Ends On *
02/07/2020

End Time *
10:00 PM

Create Party

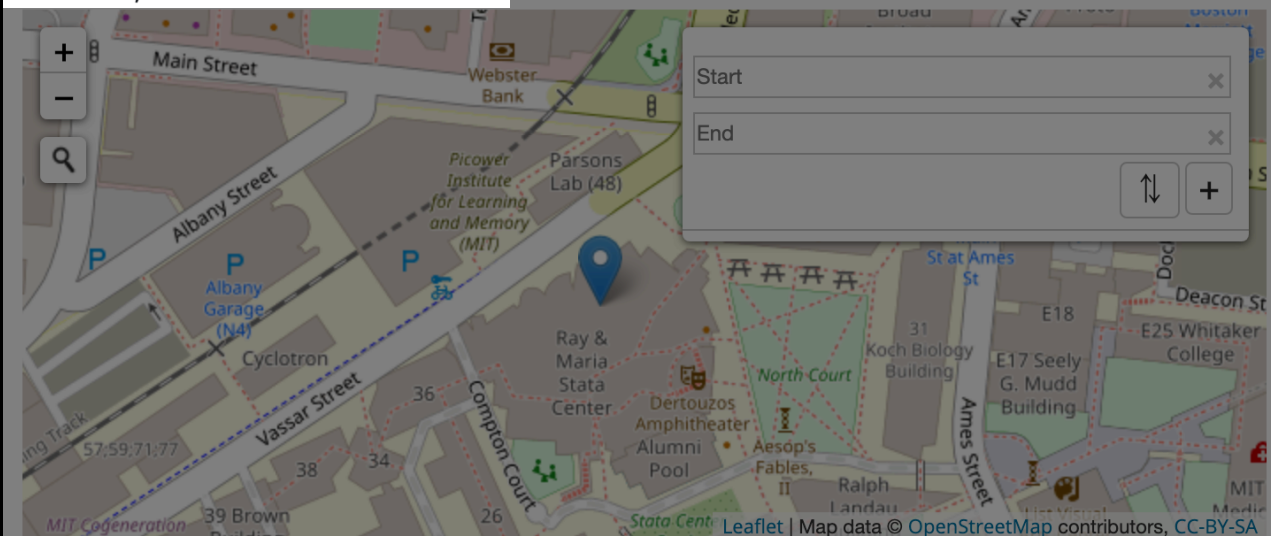
events



alamo

Fri Feb 7, 2020 5:00 PM - 10:00 PM

events



Chat

should we bring food?
Tue Dec 10 2019 15:20:25 GMT-0800
anonymous

Content *

Create Message

Challenge: lots of functionality

View Party

Passkey Code *

Validate

New Party

Starts On *

02/07/2020

Start Time *

05:00 PM

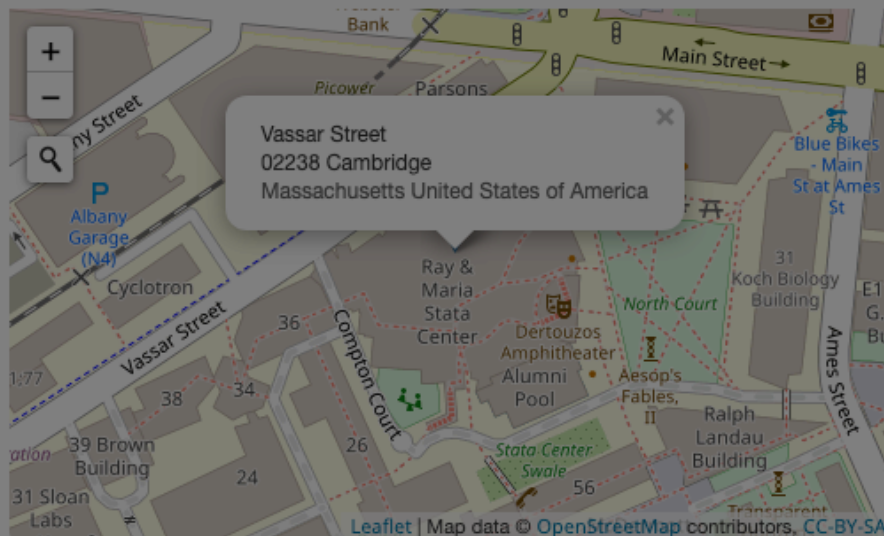
Ends On *

02/07/2020

End Time *

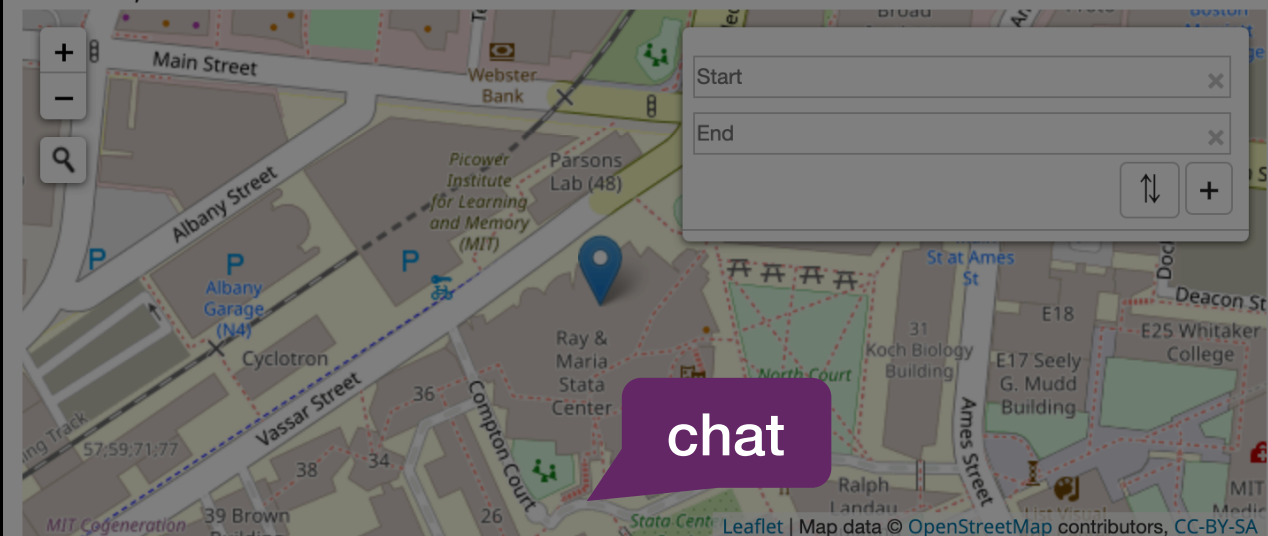
10:00 PM

Create Party



alamo

Fri Feb 7, 2020 5:00 PM - 10:00 PM



Chat

should we bring food?

Tue Dec 10 2019 15:20:25 GMT-0800

anonymous

Content *

Create Message

Challenge: lots of functionality

View Party

Passkey Code *

Validate

New Party

Starts On *

02/07/2020

Start Time *

05:00 PM

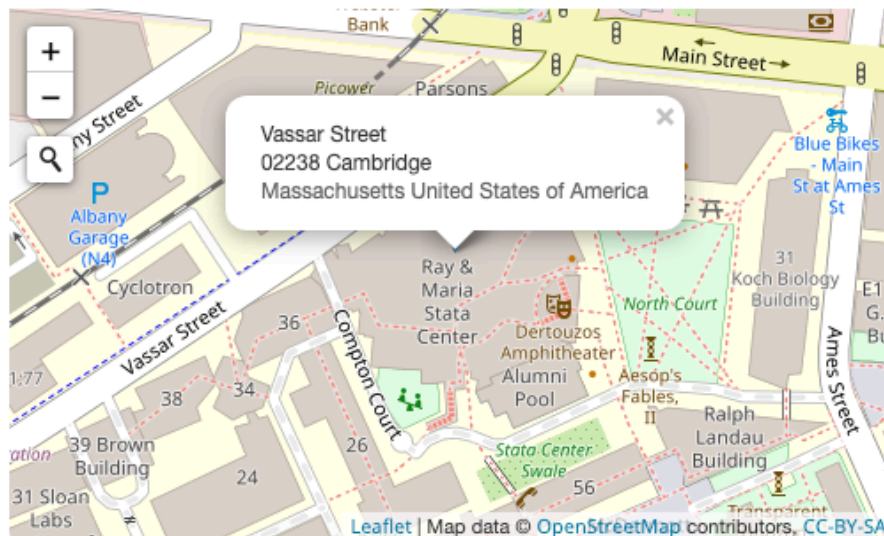
Ends On *

02/07/2020

End Time *

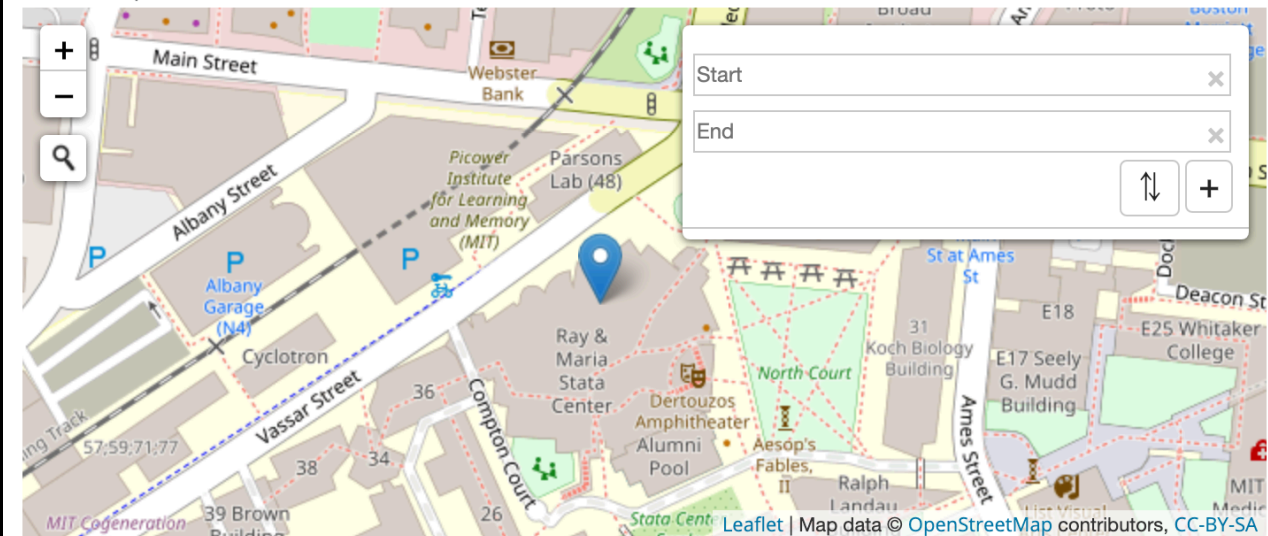
10:00 PM

Create Party



alamo

Fri Feb 7, 2020 5:00 PM - 10:00 PM



Chat

should we bring food?

Tue Dec 10 2019 15:20:25 GMT-0800

anonymous

Content *

Create Message

Secret Party

```
{
  "name": "secretparty",
  "usedConcepts": {
    "passkey": {},
    "event": {},
    "geolocation": {},
    "chat": {}
  },
  "routes": [
    { "path": "", "component": "landing" },
    { "path": "/party", "component": "party" }
  ]
}
```

```
@import "~@deja-vu/themes/scss/minimalist.scss";
main { margin: 30px; }
.side-by-side { display: flex; }
.map { height: 300px !important; }
.evt { margin-right: 20px; }
```

```
<dv.component name="landing">
  <main>
    <h1>View Party</h1>
    <dv.tx>
      <passkey.sign-in /><dv.link href="/party" />
    </dv.tx>
    <h1>New Party</h1>
    <dv.tx>
      <dv.gen-id /><dv.status />
      <passkey.create-passkey id=dv.gen-id.id hidden=true />
      <event.create-event class="evt" id=dv.gen-id.id
        showOptionToSubmit=false />
      <div class="map">
        <geolocation.create-marker-from-map id=dv.gen-id.id
          showOptionToSubmit=false />
      </div>
      <dv.button-link href="/party">Create Party</dv.button-link>
    </dv.tx>
  </main>
</dv.component>
```

```
<dv.component name="party">
  <main>
    <passkey.logged-in />
    <h1>{{passkey.logged-in.passkey?.code}}</h1>
    <event.show-event id=passkey.logged-in.passkey?.id waitOn=['id'] />
    <geolocation.show-marker id=passkey.logged-in.passkey?.id
      hidden=true />
    <div class="map">
      <geolocation.display-map expectMarkers=true
        markers=[geolocation.show-marker.loadedMarker] />
    </div>
    <h2>Chat</h2>
    <chat.show-chat id=passkey.logged-in.passkey?.id
      showId=false showMessageId=false />
    <chat.create-message authorId="anonymous"
      chatId=passkey.logged-in.passkey?.id />
  </main>
</dv.component>
```



```
{  
  "name": "secretparty",  
  "usedConcepts": {  
    "passkey": {},  
    "event": {},  
    "geolocation": {},  
    "chat": {}  
  },  
  "routes": [  
    { "path": "", "component": "landing" },  
    { "path": "/party", "component": "party" }  
  ]  
}
```

used
concepts

dvconfig.json

```

<dv.component name="landing">
  <main>
    <h1>View Party</h1>
    <dv.tx>
      <passkey.sign-in /><dv.link href="/party" />
    </dv.tx>
    <h1>New Party transaction
    <dv.tx>
      <dv.gen-id /><dv.status />
      <passkey.create-passkey id=dv.gen-id.id hidden=true />
      <event.create-event class="evt" id=dv.gen-id.id
        showOptionToSubmit=false />
      <div class="map">
        <geolocation.create-marker-from-map id=dv.gen-id.id
          showOptionToSubmit=false />
      </div>
      <dv.button-link href="/party">Create Party</dv.button-link>
    </dv.tx>
  </main>
</dv.component>

```

landing.html

```
<dv.component name="landing">
  <main>
    <h1>View Party</h1>
    <dv.tx>
      <passkey.sign-in /><dv.link href="/party" />
    </dv.tx>
    <h1>New Party transaction
    <dv.tx>
      <dv.gen-id /><dv.status />
      <passkey.create-passkey id=dv.gen-id.id hidden=true />
      <event.create-event class="evt" id=dv.gen-id.id
        showOptionToSubmit=false />
      <div class="map">
        <geolocation.create-marker-from-map id=dv.gen-id.id
          showOptionToSubmit=false />
      </div>
      <dv.button-link href="/party">Create Party</dv.button-link>
    </dv.tx>
  </main>
</dv.component>
```

transaction

create
passkey

create
event

create
location

landing.html

```
<dv.component name="landing">
  <main>
    <h1>View Party</h1>
    <dv.tx>
      <passkey.sign-in /><dv.link href="/party" />
    </dv.tx>
    <h1>New Party</h1>
    <dv.tx>
      <dv.gen-id /><dv.status />
      <passkey.create-passkey id=dv.gen-id.id hidden=true />
      <event.create-event class="evt" id=dv.gen-id.id
        showOptionToSubmit=false />
      <div class="map">
        <geolocation.create-marker-from-map id=dv.gen-id.id
          showOptionToSubmit=false />
      </div>
      <dv.button-link href="/party">Create Party</dv.button-link>
    </dv.tx>
  </main>
</dv.component>
```

hide component

generates
secret code
server-side

landing.html

```
<dv.component name="landing">
  <main>
    <h1>View Party</h1>
    <dv.tx>
      <passkey.sign-in /><dv.link href="/party" />
    </dv.tx>
    <h1>New Party</h1>
    <dv.tx>
      <dv.gen-id /><dv.status />
      <passkey.create-passkey id=dv.gen-id.id hidden=true />
      <event.create-event class="evt" id=dv.gen-id.id
        showOptionToSubmit=false />
      <div class="map">
        <geolocation.create-marker-from-map id=dv.gen-id.id
          showOptionToSubmit=false />
      </div>
      <dv.button-link href="/party">Create Party</dv.button-link>
    </dv.tx>
  </main>
</dv.component>
```

redirect

landing.html

```

<dv.component name="landing">
  <main>
    <h1>View Party</h1>
    <dv.tx>
      <passkey.sign-in /><dv.link href="/party" />
    </dv.tx>
    <h1>New Party</h1>
    <dv.tx>
      <dv.gen-id /><dv.status />
      <passkey.create-passkey id=dv.gen-id.id hidden=true />
      <event.create-event class="evt" id=dv.gen-id.id
        showOptionToSubmit=false />
      <div class="map">
        <geolocation.create-marker-from-map id=dv.gen-id.id
          showOptionToSubmit=false />
      </div>
      <dv.button-link href="/party">Create Party</dv.button-link>
    </dv.tx>
  </main>
</dv.component>

```

generate ID

ID used

ID used

ID used

landing.html

View Party

Passkey Code *

Validate

New Party

Starts On *

02/07/2020



Start Time *

05:00 PM

Ends On *

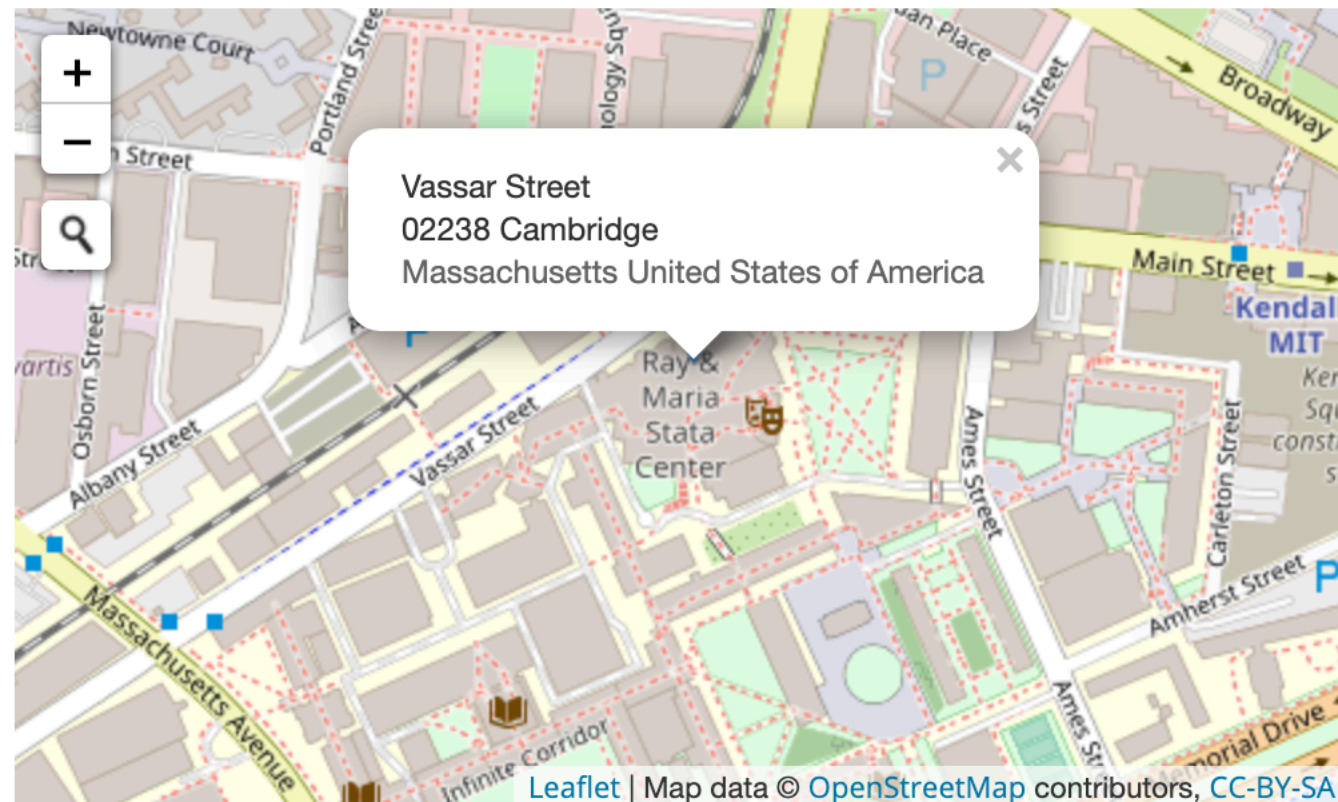
02/07/2020



End Time *

10:00 PM

Create Party



Landing Page

View Party

Passkey Code *

Validate

New Party

Starts On *

02/07/2020



Start Time *

05:00 PM

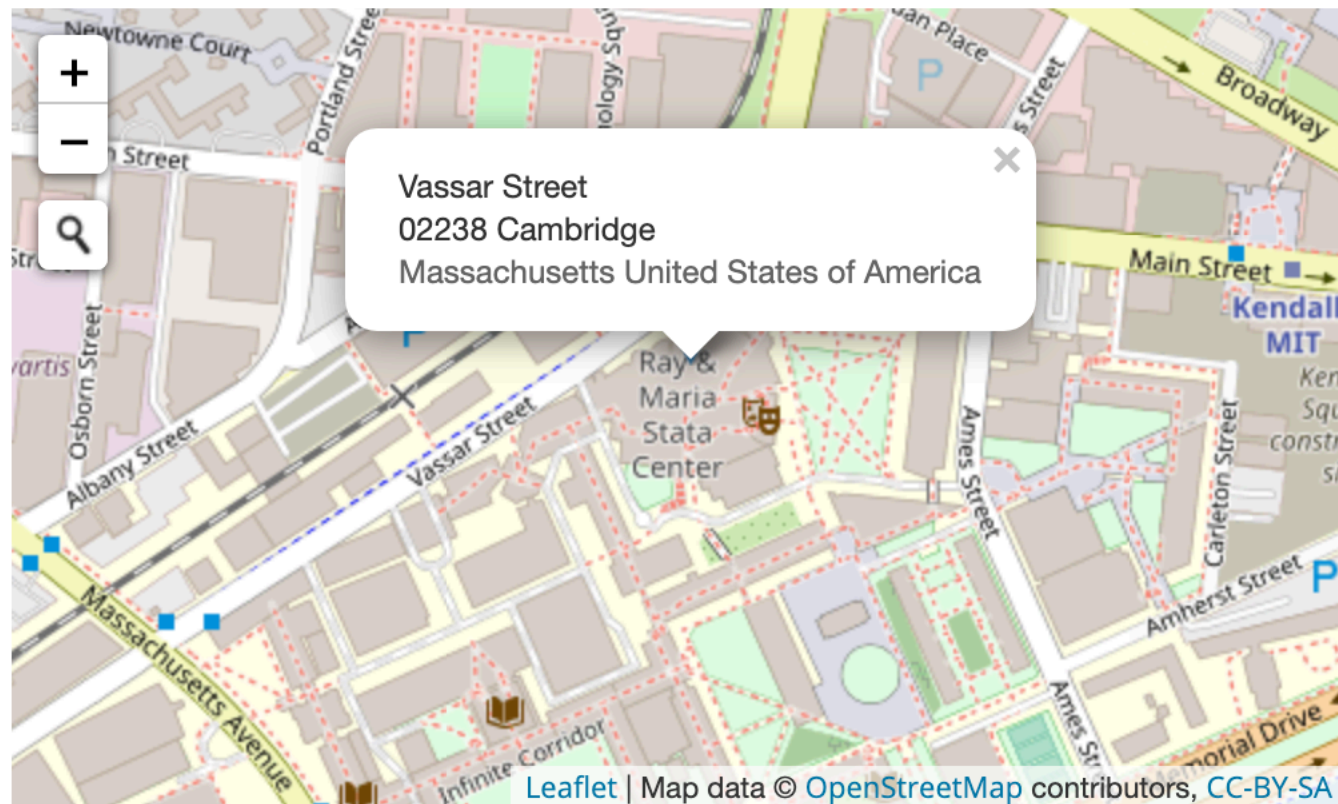
Ends On *

02/07/2020



End Time *

10:00 PM



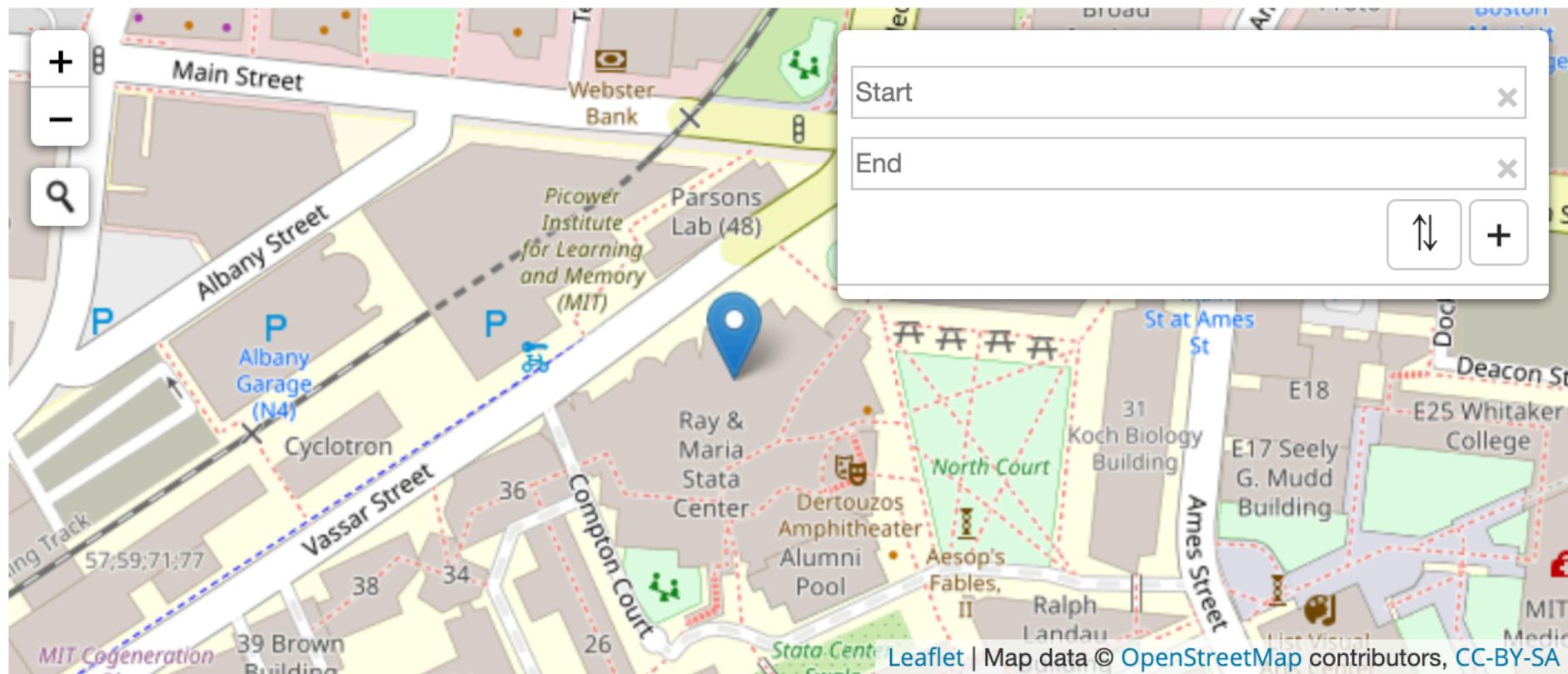
user clicks
button

Create Party

Landing Page

alamo

Fri Feb 7, 2020 5:00 PM - 10:00 PM



Chat

should we bring food?

Tue Dec 10 2019 15:20:25 GMT-0800

anonymous

Content *

Create Message

Party Page

get logged-
in passkey

retrieve
party ID

```
<dv.component name="party">
  <main>
    <passkey.logged-in />
    <h1>{{passkey.logged-in.passkey?.code}}</h1>
    <event.show-event id=passkey.logged-in.passkey?.id waitOn=['id'] />
    <geolocation.show-marker id=passkey.logged-in.passkey?.id
      hidden=true />
    <div class="map">
      <geolocation.display-map expectMarkers=true
        markers=[geolocation.show-marker.loadedMarker] />
    </div>
    <h2>Chat</h2>
    <chat.show-chat id=passkey.logged-in.passkey?.id
      showId=false showMessageId=false />
    <chat.create-message authorId="anonymous"
      chatId=passkey.logged-in.passkey?.id />
  </main>
</dv.component>
```

party.html

```
<dv.component name="party">
  <main>
    <passkey.logged-in />
    <h1>{{passkey.logged-in.passkey?.code}}</h1>
    <event.show-event id=passkey.logged-in.passkey?.id waitOn=['id'] />
    <geolocation.show-marker id=passkey.logged-in.passkey?.id
      hidden=true />
    <div class="map">
      <geolocation.display-map expectMarkers=true
        markers=[geolocation.show-marker.loadedMarker] />
    </div>
    <h2>Chat</h2>
    <chat.show-chat id=passkey.logged-in.passkey?.id
      showId=false showMessageId=false />
    <chat.create-message authorId="anonymous"
      chatId=passkey.logged-in.passkey?.id />
  </main>
</dv.component>
```

show date
& time

party.html

```
<dv.component name="party">
  <main>
    <passkey.logged-in />
    <h1>{{passkey.logged-in.passkey?.code}}</h1>
    <event.show-event id=passkey.logged-in.passkey?.id waitOn=['id'] />
    <geolocation.show-marker id=passkey.logged-in.passkey?.id
      hidden=true />
    <div class="map">
      <geolocation.display-map expectMarkers=true
        markers=[geolocation.show-marker.loadedMarker] />
    </div>
    <h2>Chat</h2>
    <chat.show-chat id=passkey.logged-in.passkey?.id
      showId=false showMessageId=false />
    <chat.create-message authorId="anonymous"
      chatId=passkey.logged-in.passkey?.id />
  </main>
</dv.component>
```

show map
with location

party.html

```
<dv.component name="party">
  <main>
    <passkey.logged-in />
    <h1>{{passkey.logged-in.passkey?.code}}</h1>
    <event.show-event id=passkey.logged-in.passkey?.id waitOn=['id'] />
    <geolocation.show-marker id=passkey.logged-in.passkey?.id
      hidden=true />
    <div class="map">
      <geolocation.display-map expectMarkers=true
        markers=[geolocation.show-marker.loadedMarker] />
    </div>
    <h2>Chat</h2>
    <chat.show-chat id=passkey.logged-in.passkey?.id
      showId=false showMessageId=false />
    <chat.create-message authorId="anonymous"
      chatId=passkey.logged-in.passkey?.id />
  </main>
</dv.component>
```

show party
chat room

party.html

```
@import "~@deja-vu/themes/scss/minimalist.scss";  
main { margin: 30px; }  
.side-by-side { display: flex; }  
.map { height: 300px !important; }  
.evt { margin-right: 20px; }
```

styles.scss


```
@import "~@deja-vu/themes/scss/minimalist.scss";
```

use theme

```
main { margin: 30px; }  
.side-by-side { display: flex; }  
.map { height: 300px !important; }  
.evt { margin-right: 20px; }
```

styles.scss

```
@import "~@deja-vu/themes/scss/minimalist.scss";
```

```
main { margin: 30px; }
```

```
.side-by-side { display: flex; }
```

```
.map { height: 300px !important; }
```

```
.evt { margin-right: 20px; }
```

CSS rules

styles.scss

Secret Party

```
{
  "name": "secretparty",
  "usedConcepts": {
    "passkey": {},
    "event": {},
    "geolocation": {},
    "chat": {}
  },
  "routes": [
    { "path": "", "component": "landing" },
    { "path": "/party", "component": "party" }
  ]
}
```

```
@import "~@deja-vu/themes/scss/minimalist.scss";
main { margin: 30px; }
.side-by-side { display: flex; }
.map { height: 300px !important; }
.evt { margin-right: 20px; }
```

```
<dv.component name="landing">
  <main>
    <h1>View Party</h1>
    <dv.tx>
      <passkey.sign-in /><dv.link href="/party" />
    </dv.tx>
    <h1>New Party</h1>
    <dv.tx>
      <dv.gen-id /><dv.status />
      <passkey.create-passkey id=dv.gen-id.id hidden=true />
      <event.create-event class="evt" id=dv.gen-id.id
        showOptionToSubmit=false />
      <div class="map">
        <geolocation.create-marker-from-map id=dv.gen-id.id
          showOptionToSubmit=false />
      </div>
      <dv.button-link href="/party">Create Party</dv.button-link>
    </dv.tx>
  </main>
</dv.component>
```

```
<dv.component name="party">
  <main>
    <passkey.logged-in />
    <h1>{{passkey.logged-in.passkey?.code}}</h1>
    <event.show-event id=passkey.logged-in.passkey?.id waitOn=['id'] />
    <geolocation.show-marker id=passkey.logged-in.passkey?.id
      hidden=true />
    <div class="map">
      <geolocation.display-map expectMarkers=true
        markers=[geolocation.show-marker.loadedMarker] />
    </div>
    <h2>Chat</h2>
    <chat.show-chat id=passkey.logged-in.passkey?.id
      showId=false showMessageId=false />
    <chat.create-message authorId="anonymous"
      chatId=passkey.logged-in.passkey?.id />
  </main>
</dv.component>
```

Secret Party

```
{
  "name": "secretparty",
  "usedConcepts": {
    "passkey": {},
    "event": {},
    "geolocation": {},
    "chat": {}
  },
  "routes": [
    { "path": "", "component": "landing" },
    { "path": "/party", "component": "party" }
  ]
}
```

```
@import "~@deja-vu/themes/scss/minimalist.scss";
main { margin: 30px; }
.side-by-side { display: flex; }
.map { height: 300px !important; }
.evt { margin-right: 20px; }
```

```
<dv.component name="landing">
  <main>
    <h1>View Party</h1>
    <dv.tx>
      <passkey.sign-in />
    </dv.tx>
    <h1>New Party</h1>
    <dv.tx>
      <dv.gen-id /><dv.status />
      <passkey.create-passkey id=dv.gen-id.id hidden=true />
      <event.create-event class="evt" id=dv.gen-id.id
        showOptionToSubmit=false />
      <div class="map">
        <geolocation.create-marker-from-map id=dv.gen-id.id
          showOptionToSubmit=false />
      </div>
      <dv.button-link href="/party">Create Party</dv.button-link>
    </dv.tx>
  </main>
</dv.component>
```

```
<dv.component name="party">
  <main>
```

< 60 LoC

```
    <h1>
      <passkey?.id waitOn=['id'] />
      <div class="map">
        <geolocation.display-map expectMarkers=true
          markers=[geolocation.show-marker.loadedMarker] />
      </div>
      <h2>Chat</h2>
      <chat.show-chat id=passkey.logged-in.passkey?.id
        showId=false showMessageId=false />
      <chat.create-message authorId="anonymous"
        chatId=passkey.logged-in.passkey?.id />
    </main>
  </dv.component>
```

2. Top Movie

login

Username *

Password *

Sign In

register

Username *

ben

Password *

.....

Retype Password *

.....

Register User

topmovie

Title *

King's Speech

Submit Movie

movies by # votes

upvote
movie

▲ Titanic | *3 points* | submitted 2 minutes ago

▲ Gladiator | *2 points* | submitted 3 minutes ago

▲ Interstellar | *0 points* | submitted a few seconds ago

Top Movies Page

Challenge: integration

topmovie

authentication

login

Username *

Password *

Sign In

register

Username *

ben

Password *

.....

Retype Password *

.....

Register User

topmovie

movie posting

Title *

King's Speech

Submit Movie

upvoting

▲ Titanic | 3 points | submitted 2 minutes ago

▲ Gladiator | 2 points | submitted 3 minutes ago

▲ Interstellar | 0 points | submitted a few seconds ago

Top Movie

```
{
  "name": "topmovie",
  "usedConcepts": {
    "movie": {
      "name": "property",
      "config": {
        "schema": {
          "title": "Movie", "type": "object",
          "properties": { "title": { "type": "string" } },
          "required": ["title"]
        }
      }
    },
    "authentication": {},
    "scoring": {}
  },
  "routes": [
    { "path": "", "component": "landing" },
    { "path": "/top", "component": "top-movies" }
  ]
}
```

```
@import "~@deja-vu/themes/scss/sugar.scss";

.side-by-side {
  display: flex;
  justify-content: space-evenly;
}

.lr-margin {
  margin-left: 20px;
  margin-right: 20px;
}

nav h1 {
  text-align: center;
  font-size: 40px;
}

.movie { display: flex; }
.movie-info { padding-top: 9px; }
```

```
<dv.component name="landing">
  <nav><h1>topmovie</h1></nav>
  <main class="side-by-side">
    <dv.tx>
      <h2>login</h2>
      <authentication.sign-in /><dv.link href="/top" hidden=true />
    </dv.tx>
    <dv.tx>
      <h2>register</h2>
      <authentication.register-user /><dv.link href="/top" hidden=true />
    </dv.tx>
  </main>
</dv.component>
```

```
<dv.component name="top-movies">
  <nav><h1>topmovie</h1></nav>
  <main class="lr-margin">
    <authentication.logged-in />
    <dv.tx>
      <dv.gen-id />
      <movie.create-object id=dv.gen-id.id buttonLabel="Submit Movie" />
      <scoring.create-score value=0 hidden=true
        sourceId=authentication.logged-in.user?.id targetId=dv.gen-id.id />
      <authentication.authenticate id=authentication.logged-in.user?.id
        hidden=true />
      <dv.link />
    </dv.tx>
    <scoring.show-targets-by-score showAscending=false
      noTargetsText="No movies yet"
      showTarget=<topmovie.show-movie target=$target
        user=authentication.logged-in.user /> />
  </main>
</dv.component>
```

```
<dv.component name="show-movie">
  <div class="movie">
    <dv.tx>
      <scoring.create-score submitMatIconName="arrow_drop_up"
        sourceId=$user.id targetId=$target.id
        showDoneMessage=false showOptionToInputValue=false value=1 />
      <authentication.authenticate id=$user.id hidden=true />
      <dv.link />
    </dv.tx>
    <div class="movie-info">
      <movie.show-object id=$target.id includeTimestamp=true
        hidden=true />
      <strong>{{movie.show-object.loadedObject?.title}}</strong>
      | <em>{{ $target.total }} points</em> | submitted <dv.show-date
        date=movie.show-object.loadedObject?.timestamp format="time-ago" />
    </div>
  </div>
```

```
{
  "name": "topmovie",
  "usedConcepts": {
    "movie": {
      "name": "property",
      "config": {
        "schema": {
          "title": "Movie", "type": "object",
          "properties": { "title": { "type": "string" } },
          "required": ["title"]
        }
      }
    },
    "authentication": {},
    "scoring": {},
  },
  "routes": [
    { "path": "", "component": "landing" },
    { "path": "/top", "component": "top-movies" }
  ]
}
```

save movies

register users

upvoting

dvconfig.json


```

<dv.component name="top-movies">
  <nav><h1>topmovie</h1></nav>
  <main class="lr-margin">
    <authentication.logged-in />
    <dv.tx>
      <dv.gen-id />
      <movie.create-object id=dv.gen-id.id buttonLabel="Submit Movie" />
      <scoring.create-score value=0 hidden=true
        sourceId=authentication.logged-in.user?.id targetId=dv.gen-id.id />
      <authentication.authenticate id=authentication.logged-in.user?.id
        hidden=true />
      <dv.link />
    </dv.tx>
    <scoring.show-targets-by-score showAscending=false
      noTargetsText="No movies yet"
      showTarget=<topmovie.show-movie target=$target
        user=authentication.logged-in.user /> />
  </main>
</dv.component>

```

submit
movie

top-movies.html

```

<dv.component name="top-movies">
  <nav><h1>topmovie</h1></nav>
  <main class="1x-margin">
    <authentication.logged-in />
    <dv.tx>
      <dv.gen-id />
      <movie.create-object id=dv.gen-id.id buttonLabel="Submit Movie" />
      <scoring.create-score value=0 hidden=true
        sourceId=authentication.logged-in.user?.id targetId=dv.gen-id.id />
      <authentication.authenticate id=authentication.logged-in.user?.id
        hidden=true />
      <dv.link />
    </dv.tx>
    <scoring.show-targets-by-score showAscending=false
      noTargetsText="No movies yet"
      showTarget=<topmovie.show-movie target=$target
        user=authentication.logged-in.user /> />
  </main>
</dv.component>

```

transaction

top-movies.html

```

<dv.component name="top-movies">
  <nav><h1>topmovie</h1></nav>
  <main class="lr-margin">
    <authentication.logged-in />
    <dv.tx>
      <dv.gen-id />
      <movie.create-object id=dv.gen-id.id buttonLabel="Submit Movie" />
      <scoring.create-score value=0 hidden=true
        sourceId=authentication.logged-in.user?.id targetId=dv.gen-id.id />
      <authentication.authenticate id=authentication.logged-in.user?.id
        hidden=true />
      <dv.link />
    </dv.tx>
    <scoring.show-targets-by-score showAscending=false
      noTargetsText="No movies yet"
      showTarget=<topmovie.show-movie target=$target
        user=authentication.logged-in.user /> />
  </main>
</dv.component>

```

transaction

create movie
object

top-movies.html

```

<dv.component name="top-movies">
  <nav><h1>topmovie</h1></nav>
  <main class="lr-margin">
    <authentication.logged-in />
    <dv.tx>
      <dv.gen-id />
      <movie.create-object id=dv.gen-id.id buttonLabel="Submit" />
      <scoring.create-score value=0 hidden=true
        sourceId=authentication.logged-in.user?.id targetId=dv.gen-id.id />
      <authentication.authenticate id=authentication.logged-in.user?.id
        hidden=true />
      <dv.link />
    </dv.tx>
    <scoring.show-targets-by-score showAscending=false
      noTargetsText="No movies yet"
      showTarget=<topmovie.show-movie target=$target
        user=authentication.logged-in.user /> />
  </main>
</dv.component>

```

transaction

create movie
object

initialize
movie score

top-movies.html


```

<dv.component name="top-movies">
  <nav><h1>topmovie</h1></nav>
  <main class="lr-margin">
    <authentication.logged-in />
    <dv.tx>
      <dv.gen-id />
      <movie.create-object id=dv.gen-id.id buttonLabel="Submit Movie" />
      <scoring.create-score value=0 hidden=true
        sourceId=authentication.logged-in.user?.id targetId=dv.gen-id.id />
      <authentication.authenticate id=authentication.logged-in.user?.id
        hidden=true />
      <dv.link />
    </dv.tx>
    <scoring.show-targets-by-score showAscending=false
      noTargetsText="No movies yet"
      showTarget=<topmovie.show-movie target=$target
        user=authentication.logged-in.user /> />
  </main>
</dv.component>

```

transaction

create movie
object

initialize
movie score

authenticate
user

top-movies.html

```

<dv.component name="top-movies">
  <nav><h1>topmovie</h1></nav>
  <main class="lr-margin">
    <authentication.logged-in />
    <dv.tx>
      <dv.gen-id />
      <movie.create-object id=dv.gen-id.id buttonLabel="Submit Movie" />
      <scoring.create-score value=0 hidden=true
        sourceId=authentication.logged-in.user?.id targetId=dv.gen-id.id />
      <authentication.authenticate id=authentication.logged-in.user?.id
        hidden=true />
      <dv.link />
    </dv.tx>
    <scoring.show-targets-by-score showAscending=false
      noTargetsText="No movies yet"
      showTarget=<topmovie.show-movie target=$target
        user=authentication.logged-in.user /> />
  </main>
</dv.component>

```

show movies by
upvotes

top-movies.html

```

<dv.component name="top-movies">
  <nav><h1>topmovie</h1></nav>
  <main class="lr-margin">
    <authentication.logged-in />
    <dv.tx>
      <dv.gen-id />
      <movie.create-object id=dv.gen-id.id buttonLabel="Submit Movie" />
      <scoring.create-score value=0 hidden=true
        sourceId=authentication.logged-in.user?.id targetId=dv.gen-id.id />
      <authentication.authenticate id=authentication.logged-in.user?.id
        hidden=true />
      <dv.link />
    </dv.tx>
    <scoring.show-targets-by-score showTargets=false
      noTargetsText="No movies yet"
      showTarget=<topmovie.show-movie target=$target
        user=authentication.logged-in.user /> />
  </main>
</dv.component>

```

component
input

top-movies.html

```

<dv.component name="show-movie">
  <div class="movie">
    <dv.tx>
      <scoring.create-score submitMatIconName="arrow_drop_up"
        sourceId=$user.id targetId=$target.id
        showDoneMessage=false showOptionToInputValue=false value=1 />
      <authentication.authenticate id=$user.id hidden=true />
      <dv.link />
    </dv.tx>
    <div class="movie-info">
      <movie.show-object id=$target.id includeTimestamp=true
        hidden=true />
      <strong>{{movie.show-object.loadedObject?.title}}</strong>
      | <em>{{ $target.total }} points</em> | submitted <dv.show-date
        date=movie.show-object.loadedObject?.timestamp format="time-ago" />
    </div>
  </div>
</div>

```

show-movie.html

▲ Gladiator | 2 points | submitted 3 minutes ago


```
<dv.component name="show-movie">
```

```
  <div class="movie">
```

upvote movie

```
    <dv.tx>
```

```
      <scoring.create-score submitMatIconName="arrow_drop_up"
```

```
        sourceId=$user.id targetId=$target.id
```

```
        showDoneMessage=false showOptionToInputValue=false value=1 />
```

```
      <authentication.authenticate id=$user.id hidden=true />
```

```
      <dv.link />
```

```
    </dv.tx>
```

```
  <div class="movie-info">
```

```
    <movie.show-object id=$target.id includeTimestamp=true
```

```
      hidden=true />
```

```
    <strong>{{movie.show-object.loadedObject?.title}}</strong>
```

```
    | <em>{{ $target.total }} points</em> | submitted <dv.show-date
```

```
      date=movie.show-object.loadedObject?.timestamp format="time-ago" />
```

```
  </div>
```

```
</div>
```

show-movie.html

▲ Gladiator | 2 points | submitted 3 minutes ago

```

<dv.component name="show-movie">
  <div class="movie">
    <dv.tx>
      <scoring.create-score submitMatIconName="arrow_drop_up"
        sourceId=$user.id targetId=$target.id
        showDoneMessage=false showOptionToInputValue=false value=1 />
      <authentication.authenticate id=$user.id hidden=true />
      <dv.link />
    </dv.tx>
    <div class="movie-info">
      <movie.show-object id=$target.id includeTimestamp=true
        hidden=true />
      <strong>{{movie.show-object.loadedObject?.title}}</strong>
      | <em>{{ $target.total }} points</em> | submitted <dv.show-date
        date=movie.show-object.loadedObject?.timestamp format="time-ago" />
    </div>
  </div>
</div>

```

show movie info

show-movie.html

▲ Gladiator | 2 points | submitted 3 minutes ago

Top Movie

topmovie

authentication

login

Username *

Password *

Sign In

register

Username *

ben

Password *

.....

Retype Password *

.....

Register User

topmovie

movie posting

Title *

King's Speech

Submit Movie

upvoting

▲ Titanic | 3 points | submitted 2 minutes ago

▲ Gladiator | 2 points | submitted 3 minutes ago

▲ Interstellar | 0 points | submitted a few seconds ago

3. Family Log

Family Log

Parent Login

Username *

Password *

Sign In

New Parent

Username *

ben

Password *

.....

Retype Password *

.....

Register User

Child Login

Username *

Password *

Sign In

Landing Page

Family Log

Log

playing videogames :)

eva

12/09 3:32pm

doing homework!

alyssa

12/08 6:05pm

New Child

Username *

Password *

Retype Password *

Create Child

Parent Home

Family Log

Log

playing videogames :)

eva

12/09 3:32pm

doing homework!

alyssa

12/08 6:05pm

New Child

Username *

louis

Password *

.....

Retype Password *

.....|

Create Child

Parent Home

Family Log

Parent Login

Username *

Password *

Sign In

New Parent

Username *

Password *

Retype Password *

Register User

Child Login

Username *

louis

Password *

.....

Sign In

Family Log

Log

playing videogames :)
eva
12/09 3:32pm

doing homework!
alyssa
12/08 6:05pm

Create Entry

Content *

reading book

Create Entry

Child Home

Challenge: custom behavior

Family Log

only parents can
create child
accounts

Log

playing videogames :)

eva

12/09 3:32pm

doing homework!

alyssa

12/08 6:05pm

New Child

Username *

louis

Password *

.....

Retype Password *

.....|

Create Child

Family Log

```
{
  "name": "familylog",
  "usedConcepts": {
    "entry": {
      "name": "property",
      "config": {
        "schema": {
          "title": "Entry", "type": "object",
          "properties": {
            "content": { "type": "string" },
            "author": { "type": "string" },
            "parentId": { "type": "string" }
          },
          "required": ["content", "author", "parentId"]
        }
      }
    },
    "parentauth": { "name": "authentication" },
    "childauth": { "name": "authentication" },
    "group": {}
  },
  "routes": [
    { "path": "/", "component": "landing" },
    { "path": "/parent", "component": "parent-home" },
    { "path": "/child", "component": "child-home" }
  ]
}
```

```
@import "~@deja-vu/themes/scss/basil-green.scss";
```

```
.side-by-side {
  display: flex;
  justify-content: space-evenly;
}
```

```
nav h1 {
  text-align: center;
  font-size: 40px;
}
```

```
.log { width: 60%; }
```

```
<dv.component name="parent-home">
  <nav><h1>Family Log</h1></nav>
  <parentauth.logged-in />
  <main class="side-by-side">
    <div class="log">
      <h2>Log</h2>
      <entry.show-objects showExclude=['parentId'] includeTimestamp=true
        fieldMatching={
          parentId: parentauth.logged-in.user?.id, waitOn: ['parentId']
        } />
    </div>
    <dv.tx>
      <h2>New Child</h2>
      <dv.gen-id />
      <parentauth.authenticate user=parentauth.logged-in.user
        hidden=true />
      <childauth.register-user id=dv.gen-id.id
        signIn=false buttonLabel="Create Child" />
      <group.add-to-group id=parentauth.logged-in.user?.id
        memberId=dv.gen-id.id hidden=true />
    </dv.tx>
  </main>
</dv.component>
```

```
<dv.component name="child-home">
  <nav><h1>Family Log</h1></nav>
  <main>
    <childauth.logged-in />
    <group.show-groups hidden=true waitOn=['withMemberId']
      withMemberId=childauth.logged-in.user?.id />
    <dv.if condition=group.show-groups.groupIds class="side-by-side">
      <div class="log">
        <h2>Log</h2>
        <entry.show-objects showExclude=['parentId'] includeTimestamp=true
          fieldMatching={
            parentId: group.show-groups.groupIds[0], waitOn: ['parentId']
          } />
      </div>
      <dv.tx>
        <h2>Create Entry</h2>
        <entry.create-object showExclude=['author', 'parentId']
          initialValue={
            author: childauth.logged-in.user?.username,
            parentId: group.show-groups.groupIds[0] } />
        <childauth.authenticate user=childauth.logged-in.user
          hidden=true />
        <dv.link />
      </dv.tx>
    </dv.if>
  </main>
</dv.component>
```

```
<dv.component name="landing">
  <nav><h1>Family Log</h1></nav>
  <main class="side-by-side">
    <dv.tx>
      <h1>Parent Login</h1>
      <parentauth.sign-in /><dv.link href="/parent" />
    </dv.tx>
    <dv.tx>
      <h1>New Parent</h1>
      <dv.gen-id />
      <group.create-group id=dv.gen-id.id hidden=true />
      <parentauth.register-user id=dv.gen-id.id />
      <dv.link href="/parent" />
    </dv.tx>
    <dv.tx>
      <h1>Child Login</h1>
      <childauth.sign-in /><dv.link href="/child" />
    </dv.tx>
  </main>
</dv.component>
```

```
{
  "name": "familylog",
  "usedConcepts": {
    "entry": {
      "name": "property",
      "config": {
        "schema": {
          "title": "Entry", "type": "object",
          "properties": {
            "content": { "type": "string" },
            "author": { "type": "string" },
            "parentId": { "type": "string" }
          },
          "required": ["content", "author", "parentId"]
        }
      }
    },
    "parentauth": { "name": "authentication" },
    "childauth": { "name": "authentication" },
    "group": {}
  },
  "routes": [
    { "path": "/", "component": "landing" },
    { "path": "/parent", "component": "parent-home" },
    { "path": "/child", "component": "child-home" }
  ]
}
```

dvconfig.json

```
{
  "name": "familylog",
  "usedConcepts": {
    "entry": {
      "name": "property",
      "config": {
        "schema": {
          "title": "Entry", "type": "object",
          "properties": {
            "content": { "type": "string" },
            "author": { "type": "string" },
            "parentId": { "type": "string" }
          },
          "required": ["content", "author", "parentId"]
        }
      }
    },
    "parentauth": { "name": "authentication" },
    "childauth": { "name": "authentication" },
    "group": {}
  },
  "routes": [
    { "path": "/", "component": "landing" },
    { "path": "/parent", "component": "parent-home" },
    { "path": "/child", "component": "child-home" }
  ]
}
```

associate entry
with parent

dvconfig.json

```
{
  "name": "familylog",
  "usedConcepts": {
    "entry": {
      "name": "property",
      "config": {
        "schema": {
          "title": "Entry", "type": "object",
          "properties": {
            "content": { "type": "string" },
            "author": { "type": "string" },
            "parentId": { "type": "string" }
          },
          "required": ["content", "author", "parentId"]
        }
      }
    },
    "parentauth": { "name": "authentication" },
    "childauth": { "name": "authentication" },
    "group": {}
  },
  "routes": [
    { "path": "/", "component": "landing" },
    { "path": "/parent", "component": "parent-home" },
    { "path": "/child", "component": "child-home" }
  ]
}
```

parent & child
authentication

dvconfig.json

```
{
  "name": "familylog",
  "usedConcepts": {
    "entry": {
      "name": "property",
      "config": {
        "schema": {
          "title": "Entry", "type": "object",
          "properties": {
            "content": { "type": "string" },
            "author": { "type": "string" },
            "parentId": { "type": "string" }
          },
          "required": ["content", "author", "parentId"]
        }
      }
    },
    "parentauth": { "name": "authentication" },
    "childauth": { "name": "authentication" },
    "group": {}
  },
  "routes": [
    { "path": "/", "component": "landing" },
    { "path": "/parent", "component": "parent-home" },
    { "path": "/child", "component": "child-home" }
  ]
}
```

associate a parent
with their children

dvconfig.json


```
<dv.component name="landing">
  <nav><h1>Family Log</h1></nav>
  <main class="side-by-side">
    <dv.tx>
      <h1>Parent Login</h1>
      <parentauth.sign-in /><dv.link href="/parent" />
    </dv.tx>
    <dv.tx>
      <h1>New Parent</h1>
      <dv.gen-id />
      <group.create-group id=dv.gen-id.id hidden=true />
      <parentauth.register-user id=dv.gen-id.id />
      <dv.link href="/parent" />
    </dv.tx>
    <dv.tx>
      <h1>Child Login</h1>
      <childauth.sign-in /><dv.link href="/child" />
    </dv.tx>
  </main>
</dv.component>
```

create parent

landing.html


```

<dv.component name="parent-home">
  <nav><h1>Family Log</h1></nav>
  <parentauth.logged-in />
  <main class="side-by-side">
    <div class="log">
      <h2>Log</h2>
      <entry.show-objects showExclude=['parentId'] includeTimestamp=true
        fieldMatching={
          parentId: parentauth.logged-in.user?.id, waitOn: ['parentId']
        } />
    </div>
    <dv.tx>
      <h2>New Child</h2>
      <dv.gen-id />
      <parentauth.authenticate user=parentauth.logged-in.user
        hidden=true />
      <childauth.register-user id=dv.gen-id.id
        signIn=false buttonLabel="Create Child" />
      <group.add-to-group id=parentauth.logged-in.user?.id
        memberId=dv.gen-id.id hidden=true />
    </dv.tx>
  </div.component>

```

create child

authenticate
parent

register
child

add to parent's
group

```

<dv.component name="child-home">
  <nav><h1>Family Log</h1></nav>
  <main>
    <childauth.logged-in />
    <group.show-groups hidden=true waitOn=['withMemberId']
      withMemberId=childauth.logged-in.user?.id />
    <dv.if condition=group.show-groups.groupIds class="side-by-side">
      <div class="log">
        <h2>Log</h2>
        <entry.show-objects showExclude=['parentId'] includeTimestamp=true
          fieldMatching={
            parentId: group.show-groups.groupIds[0], waitOn: ['parentId']
          } />
      </div>
      <dv.tx>
        <h2>Create Entry</h2>
        <entry.create-object showExclude=['author', 'parentId']
          initialValue={
            author: childauth.logged-in.user?.username,
            parentId: group.show-groups.groupIds[0] } />
        <childauth.authenticate user=childauth.logged-in.user
          hidden=true />
        <dv.link />
      </dv.tx>
    </dv.if>
  </main>
</dv.component>

```

child-home.html

```

<dv.component name="child-home">
  <nav><h1>Family Log</h1></nav>
  <main>
    <childauth.logged-in />
    <group.show-groups hidden=true waitOn=['withMemberId']
      withMemberId=childauth.logged-in.user?.id />
    <dv.if condition=group.show-groups.groupIds class="side-by-side">
      <div class="log">
        <h2>Log</h2>
        <entry.show-objects showExclude=['parentId'] includeTimestamp=true
          fieldMatching={
            parentId: group.show-groups.groupIds[0], waitOn: ['parentId']
          } />
      </div>
      <dv.tx>
        <h2>Create Entry</h2>
        <entry.create-object showExclude=['author', 'parentId']
          initialValue={
            author: childauth.logged-in.user?.username,
            parentId: group.show-groups.groupIds[0] } />
        <childauth.authenticate user=childauth.logged-in.user
          hidden=true />
        <dv.link />
      </dv.tx>
    </dv.if>
  </main>
</dv.component>

```

find the group the
logged-in child is
part of

child-home.html

```

<dv.component name="child-home">
  <nav><h1>Family Log</h1></nav>
  <main>
    <childauth.logged-in />
    <group.show-groups hidden=true waitOn=['withMemberId']
      withMemberId=childauth.logged-in.user?.id />
    <dv.if condition=group.show-groups.groupIds class="side"
      <div class="log">
        <h2>Log</h2>
        <entry.show-objects showExclude=['parentId'] includeTimestamp=true
          fieldMatching={
            parentId: group.show-groups.groupIds[0], waitOn: ['parentId']
          } />
      </div>
      <dv.tx>
        <h2>Create Entry</h2>
        <entry.create-object showExclude=['author', 'parentId']
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        <childauth.authenticate user=childauth.logged-in.user
          hidden=true />
        <dv.link />
      </dv.tx>
    </dv.if>
  </main>
</dv.component>

```

show log

use group ID

child-home.html

```

<dv.component name="child-home">
  <nav><h1>Family Log</h1></nav>
  <main>
    <childauth.logged-in />
    <group.show-groups hidden=true waitOn=['withMemberId']
      withMemberId=childauth.logged-in.user?.id />
    <dv.if condition=group.show-groups.groupIds class="side-by-side">
      <div class="log">
        <h2>Log</h2>
        <entry.show-objects showExclude=['parentId'] includeTimestamp=true
          fieldMatching={
            parentId: group.show-groups.groupIds[0], waitOn: ['parentId']
          } />
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        <childauth.authenticate user=childauth.logged-in.user
          hidden=true />
        <dv.link />
      </dv.tx>
    </dv.if>
  </main>
</dv.component>

```

use group ID

child-home.html

Family Log

parent
creates child

Log

playing videogames :)

eva

12/09 3:32pm

doing homework!

alyssa

12/08 6:05pm

New Child

Username *

Password *

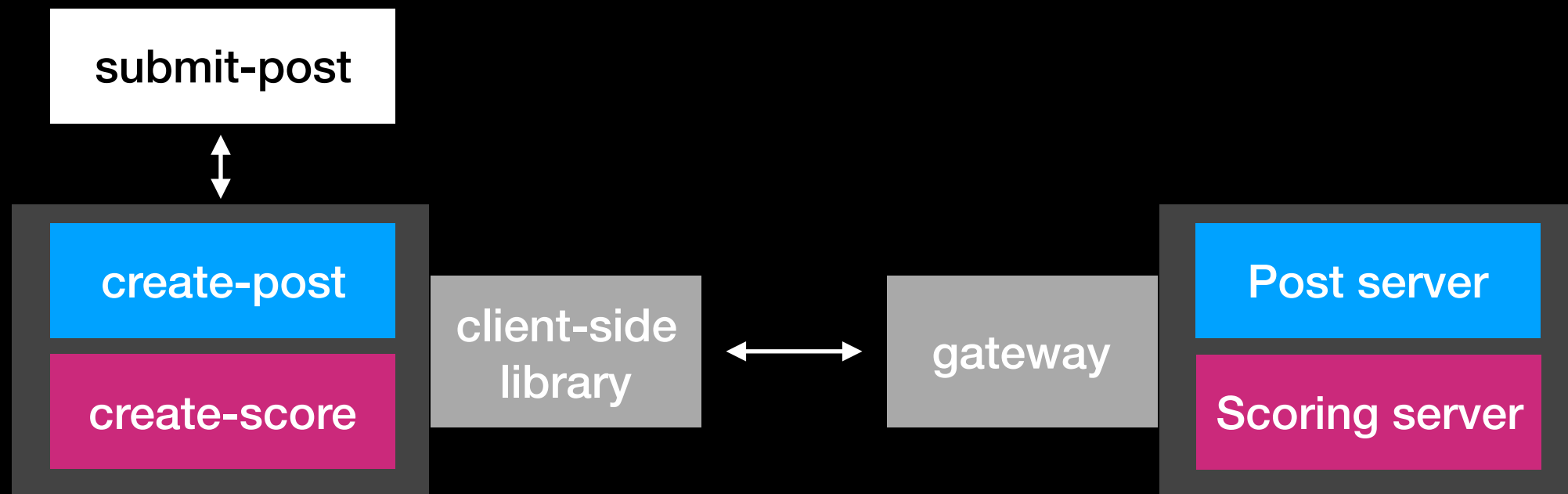
Retype Password *

Create Child

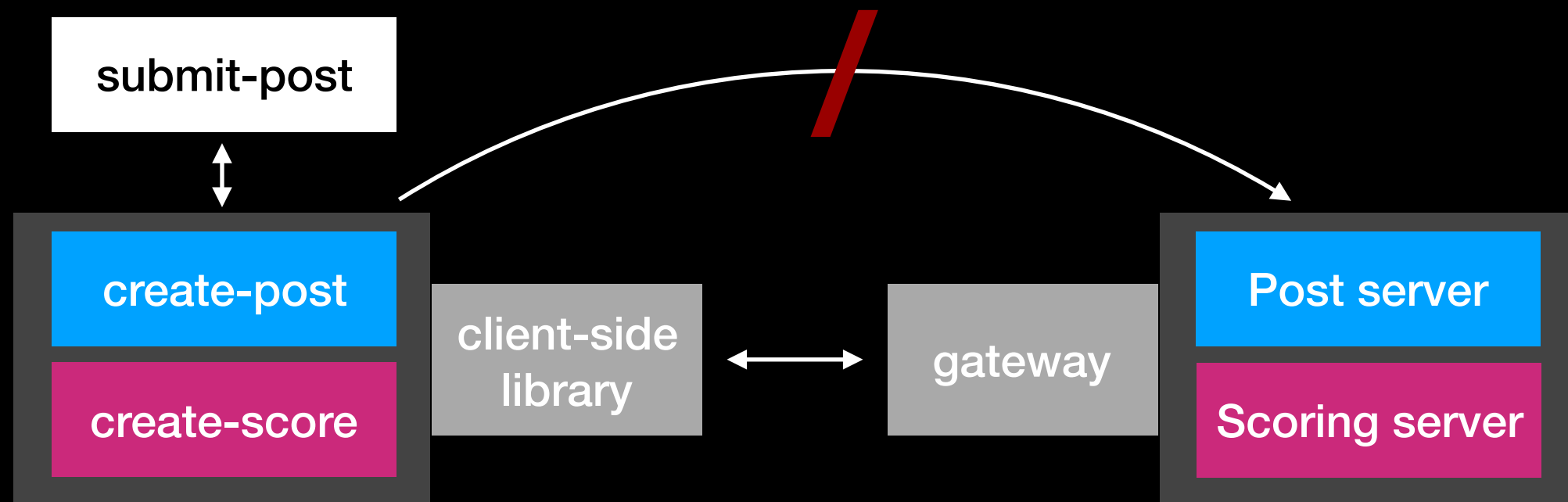
Parent Home

Platform Implementation

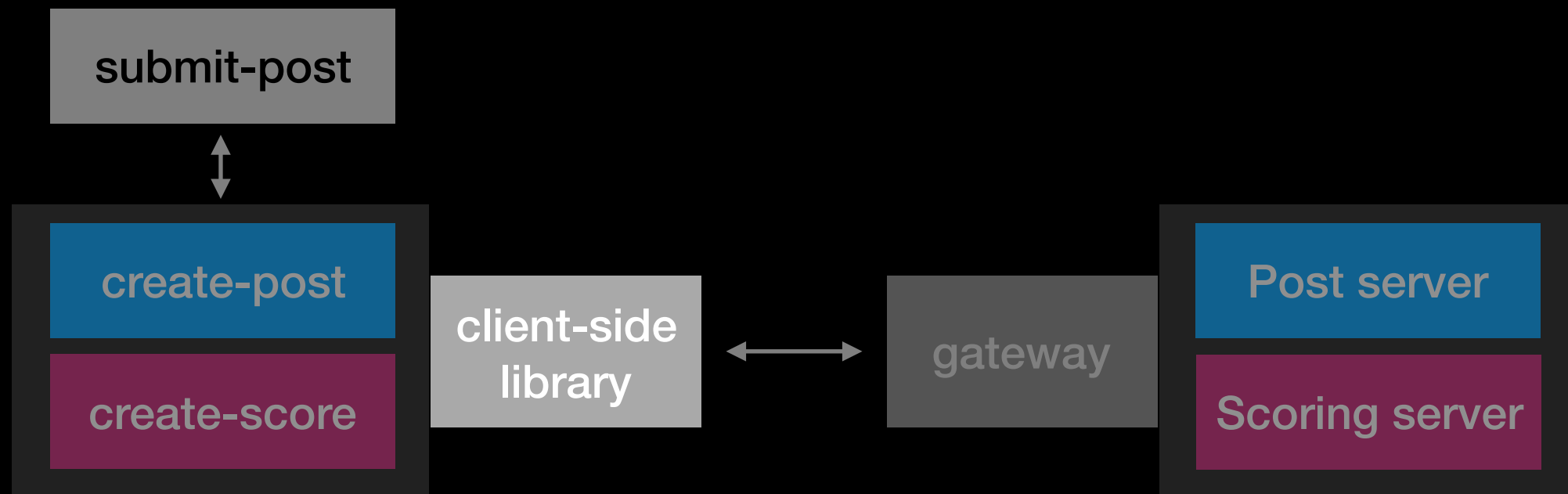
Architecture



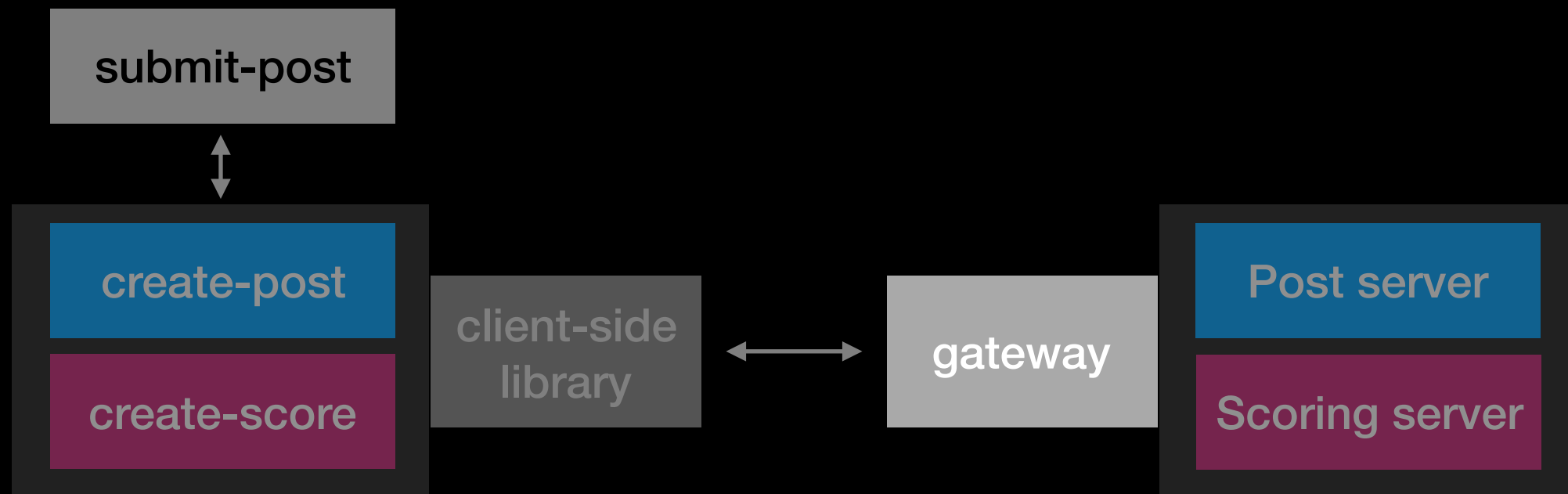
Architecture



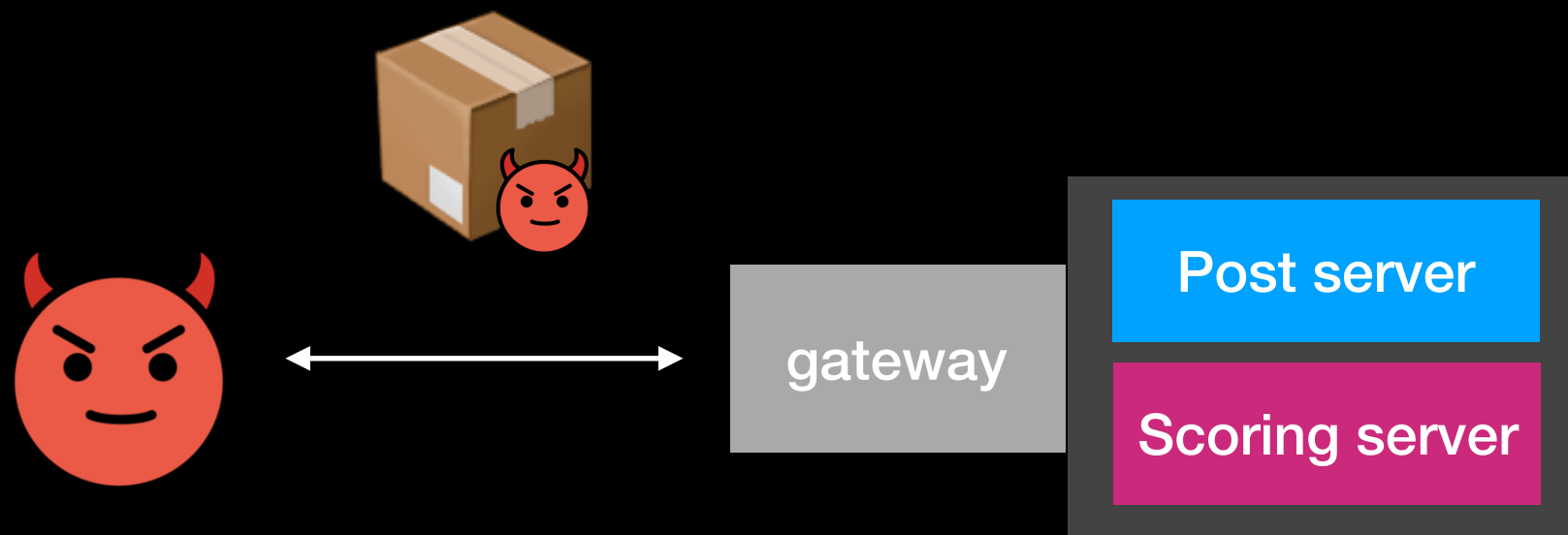
Architecture



Architecture



Security

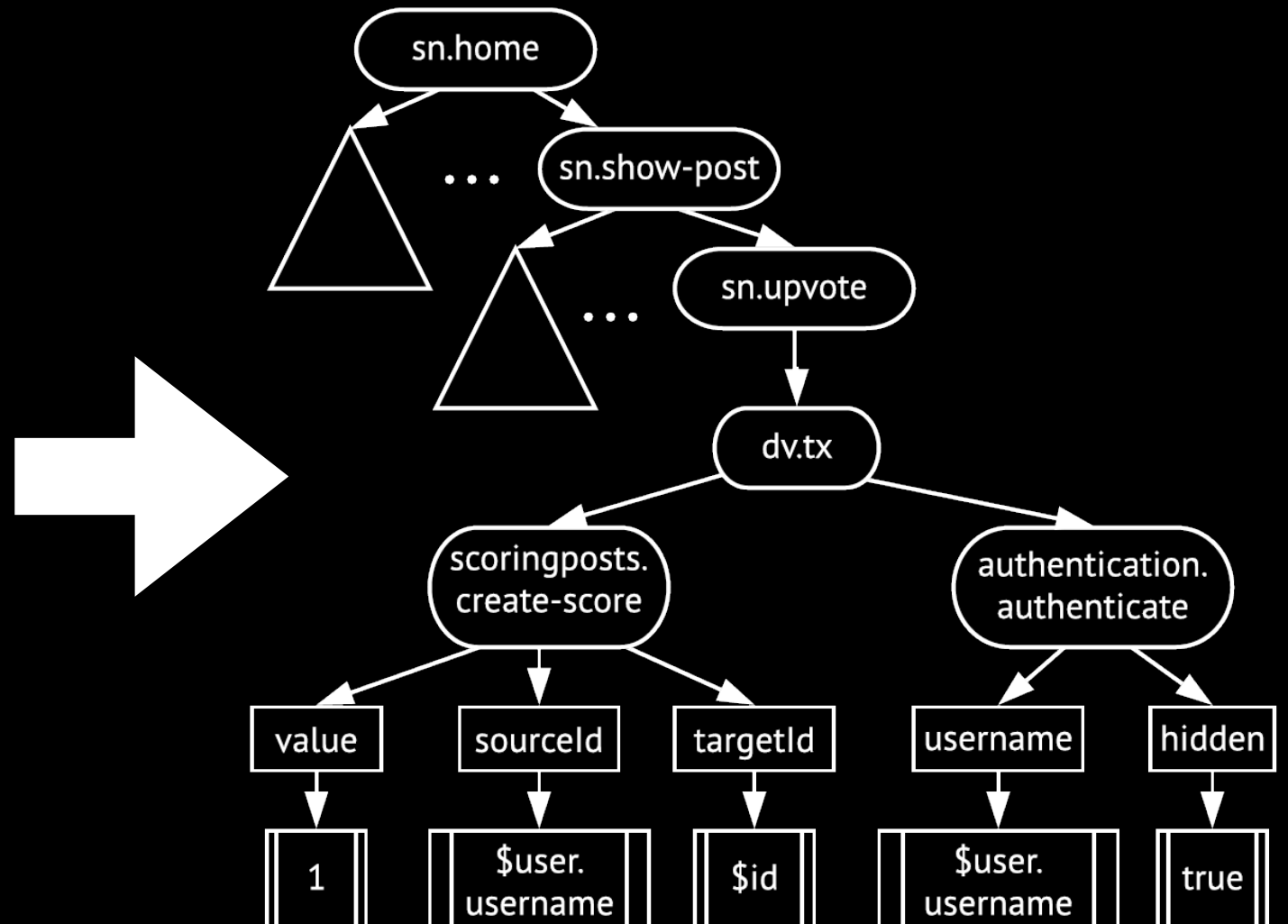


Security

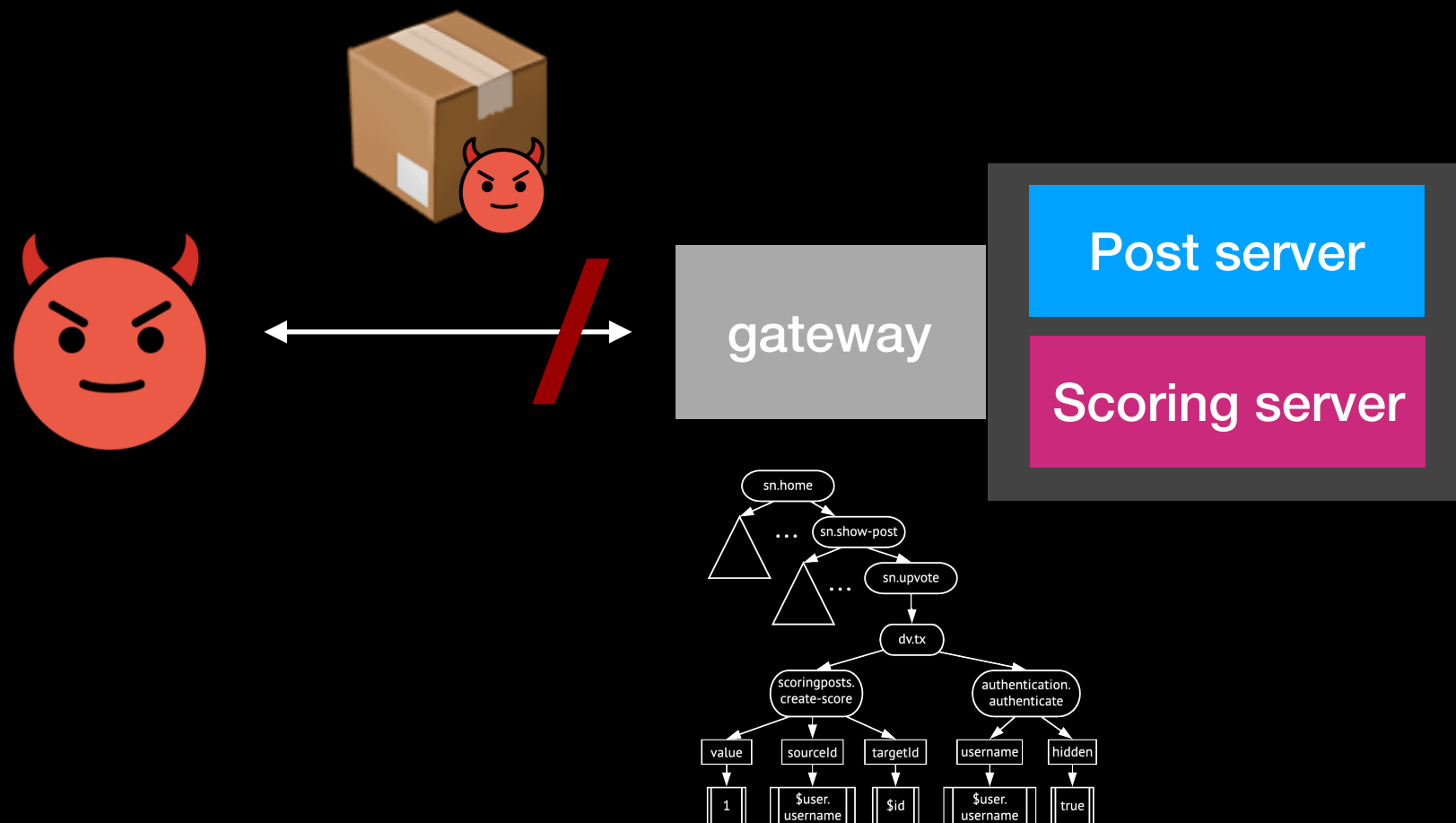
```
<dv.component name="show-post"> ...  
<post.show-object id=$id hidden=true /> ...  
</dv.component>
```

```
<dv.component name="submit-post">  
  <sn.navbar /> ...  
</dv.component>
```

```
{  
  "name": "sn",  
  "usedConcepts": {  
    "authentication": {},  
    "comment": {},  
    "post": {  
      "name": "Property",  
      "config": {  
        "schema": {  
          "title": "Post", "type": "object",  
          "properties": {  
            "author": { "type": "string" },  
            "title": { "type": "string" },  
            "url": { "type": "string", "format": "url" }  
          },  
          "required": [ "author", "title", "url" ]  
        },  
        "scoreposts": { "name": "Scoring" },  
        "scorecomments": { "name": "Scoring" }  
      },  
      "routes": [  
        { "path": "", "component": "home" },  
        { "path": "/login", "component": "login" },  
        { "path": "/post", "component": "show-post-details" },  
        ...  
      ]  
    }  
  }  
}
```



Security



Evaluation

Research Questions

- Can we build non-trivial apps without building app-specific concepts?
- How does the effort required to build an app using Déjà Vu compare to using standard general-purpose tools?
- How does the quality of Déjà Vu applications compare to those applications built with standard general-purpose tools?

Best Student Projects

App	Purpose
Accord	Support musical bands in the selection of setlists
ChoreStar	Make it easy for parents to assign chores to children
EasyPick	Recommend classes to college students
GroceryShip	Facilitate peer grocery delivery between students
Lingua	Develop language skills by chatting with native speakers
Listify	Crowdsource opinion-based rankings of anything
LiveScorecard	Provide a live leaderboard for climbing competitions
MapCampus	Allow students to plan events on campus
Phoenix	Help people discuss mental health and make friends
Potluck	Help people plan parties where guests bring supplies
Rendezvous	Plan public events on campus
SweetSpots	Mark spots on a map and review spots added by others

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AccordDashboardAbout

Music Lovers

Rock Music

Country Music

Jazz

Classics

Mozart Symphony No.3

by Mozart

Lyrics

(none)

Media

youtube.com/AZ3rDksE

Rubinstein's piano version

youtube.com/fBoeJD9sk

2010 Berlin Performance

youtube.com/JLldj8DE

2011 Munich Performance

Comments

No comments to show

Write your comment *

Create Comment

Added By Yuni1

Your Rating: ★★★★★

Average Rating: ★★★★★ 1 vote

ChoreStar

eddySign Out

StarBank Total: ★0

Chores

Uncompleted Chores

No uncompleted chores

Chores Pending Approval

No chores pending approval

Completed and Approved Chores

No approved chores

Rewards

Rewards You Can Buy

Rewards You Cannot Buy Yet

EasyPick

Logout

Filters

☒ HASS

☐ REST

☒ CIH

☐ CIHW

Grading

★☆☆☆☆ 1 & up

★☆☆☆☆ 2 & up

★☆☆☆☆ 3 & up

★☆☆☆☆ 4 & up

Pace

★☆☆☆☆ 1 & up

★☆☆☆☆ 2 & up

★☆☆☆☆ 3 & up

★☆☆☆☆ 4 & up

Contents

★☆☆☆☆ 1 & up

★☆☆☆☆ 2 & up

★☆☆☆☆ 3 & up

★☆☆☆☆ 4 & up

Overall

★☆☆☆☆ 1 & up

★☆☆☆☆ 2 & up

★☆☆☆☆ 3 & up

★☆☆☆☆ 4 & up

Classes

24,900 Intro to Linguistics

HASS CIH CIHW

Pace ★★★★★ 3 votes

Grading ★★★★★ 3 votes

Contents ★★★★★ 3 votes

Overall ★★★★★ 3 votes

Show Comments

You are delivering

Delivering to: unisushi

Pick Up Time: 5pm

Pick Up Location: new house

Items

Delivered

Your Requests

You don't have any non in-delivery requests.

To Deliver

	Item Name	Quantity	Price Estimate	Due	Pickup Location	Tips
✓	toothbrush	1	2	8/9	Senior House	0.5
✓	apples	5	5	8/9	EC	1
✓	bananas	5	5	8/9	EC	1
✓	pork belly	2	15	8/9	EC	2

Deliver Now

Lingua

Find Pen Pals119Logout

Chats:

Brett Yang

Eddy Chen

Hilary Hahn

Conversation:

Hilary Hahn : ★★★★★

Brett Yang : ★★★★★

Rate Your Conversation: ★★★★★

Brett Yang : Aug 7, 2019 3:19 PM

Sure!!

Correct Words

Hilary Hahn : Aug 7, 2019 3:19 PM

Hi Brett! I'm learning French right now! I saw that you are practicing English. Shall we talk in each other's language?

Correct Words

Content *

Create Message

Corrections:

No Corrections

Listify

pikachuSign Out

Who is the best cat?

Created by pikachuClose Voting

1. Niuniu

2. Puru

3. Luna

4. Maple

5. Loki

6. Gina

7. Eva

Welcome to Live ScoreCard

I am a ...

Host

Climber

Spectator

username *

password *

LOGIN

Don't have an account? Sign up here

mapMiT

HomeMy EventsMy GroupsLogged in as: pikachuSign Out

My Events

Create Event

Fire spinning spinjam

Host:

Description:

Time:

Location:

Room Number:

Location Description:

Spin fire together!

Thu Aug 8, 2019 11:11 AM - 12:11 PM

Ames Street, East Cambridge, Cambridge, Middlesex County, Massachusetts, 02142, USA

EC courtyard

EC courtyard

Cancel Event

Coffee night

Host:

Description:

Time:

Location:

Room Number:

Location Description:

let's brew coffee together and drink them

Wed Aug 21, 2019 12:11 AM - 1:11 AM

McDermott Court, East Cambridge, Cambridge, Middlesex County, Massachusetts, USA

H511

EC H511 - my room!

Cancel Event

Dashboard

Personal

Journal

FAQ

Availability

Week 32 in 2019

Search

Week

Day

	Sun	Mon	Tue	Wed	Thu	Fri	Sat
00:00	00:00-01:00	01:00-02:00					
01:00	01:00-02:00	02:00-03:00					
02:00	02:00-03:00	03:00-04:00					
03:00	03:00-04:00	04:00-05:00					
04:00	04:00-05:00	05:00-06:00					
05:00	05:00-06:00	06:00-07:00					
06:00	06:00-07:00	07:00-08:00					
07:00							
08:00							
09:00							
10:00							
11:00							
12:00							
13:00							
14:00							
15:00							
16:00							
17:00							
18:00							
19:00							
20:00							
21:00							
22:00							
23:00							

About Jsnov

✓ Enable Updates!

Description

I don't know what I'm talking about things.

2019-08-07-02

Location Rules

1392

Save Personal Info

Topics

Already Chosen Topics

No topics selected

Choose Topic

new topic...gender...family...pet...hobby...hobby...

about

Pollbook

benSign Out

Your Parties

Create a New Party

My birthday

Date: Thu Oct 24, 2019 3:00 PM - Sat Oct 26, 2019 4:00 PM

Host: ben

Location: My place

come celebrate my bday!

Guest List

No members

Add Guest

Choose Guest

Add to Guest List

Supply List

Item	Quantity	Unit
oreo cookies	1	bag
Count *		
Claim		

No claims

RENDEZVOUS

My ProfileLogout

Create Event

Hosted By jsnow

Cambridge

Massachusetts, USA

Sweet Spots

Hello, ben!Logout

quiet study room

Reviews

Rating: 6 out of 6

"very quiet"

By ben (Rep: 1)

1. Modularity Analysis

Concept/App	Accord	Chorestar	EasyPick	GroceryShip	Lingua	Listify	LiveScorecard	MapCampus	Phoenix	Potluck	Rendezvous	SweetSpots	#Apps	#Instances
Authentication	1	2	1	1	1	1	1	1	1	1	1	1	12	13
Authorization	1	1	1	1	1	1	1	2	1	1	1	1	12	13
Chat	0	0	0	0	1	0	0	0	0	0	0	0	1	1
Comment	1	0	1	0	0	0	0	0	1	0	1	1	5	5
Event	0	0	0	0	0	0	1	1	0	1	1	0	4	4
Follow	0	0	0	0	0	0	0	0	0	0	0	1	1	1
Geolocation	0	0	0	0	0	0	0	1	1	0	1	1	4	4
Group	1	0	0	0	2	1	3	1	0	1	1	0	7	10
Label	0	0	0	0	0	0	0	0	1	0	1	1	3	3
Match	0	0	0	0	0	0	0	0	1	0	0	0	1	1
Passkey	0	0	0	0	0	0	2	0	0	0	0	0	1	2
Property	5	3	3	3	2	2	4	3	2	2	2	1	12	32
Ranking	0	0	0	0	0	1	0	0	0	0	0	0	1	1
Rating	1	0	4	1	1	0	0	0	0	0	0	1	5	8
Schedule	0	0	0	0	0	0	0	0	1	0	0	0	1	1
Scoring	0	0	0	0	0	1	2	0	0	0	0	2	3	5
Task	0	1	0	0	0	0	1	0	0	0	0	0	2	2
Transfer	0	1	0	0	0	0	0	0	0	1	0	0	2	2
# Concept Types	6	5	5	4	6	6	8	6	8	6	8	9		
# Concept Instances	10	8	10	6	8	7	15	9	9	7	9	10		

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Event	0	0	0	0	0	0	1	1	0	1	1	0	4	4
Follow	0	0	0	0	0	0	0	0	0	0	0	1	1	1
Geolocation	0	0	0	0	0	0	0	1	1	0	1	1	4	4
Group	1	0	0	0	2	1	3	1	0	1	1	0	7	10
Label	0	0	0	0	0	0	0	0	1	0	1	1	3	3
Match	0	0	0	0	0	0	0	0	1	0	0	0	1	1
Passkey	0	0	0	0	0	0	2	0	0	0	0	0	1	2
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Rating	1	0	4	1	1	0	0	0	0	0	0	1	5	8
Schedule	0	0	0	0	0	0	0	0	1	0	0	0	1	1
Scoring	0	0	0	0	0	1	2	0	0	0	0	2	3	5
Task	0	1	0	0	0	0	1	0	0	0	0	0	2	2
Transfer	0	1	0	0	0	0	0	0	0	1	0	0	2	2
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Comment	1	0	1	0	0	0	0	0	1	0	1	1	5	5
Event	0	0	0	0	0	0	1	1	0	1	1	0	4	4
Follow	0	0	0	0	0	0	0	0	0	0	0	1	1	1
Geolocation	0	0	0	0	0	0	0	1	1	0	1	1	4	4
Group	1	0	0	0	2	1	3	1	0	1	1	0	7	10
Label	0	0	0	0	0	0	0	0	1	0	1	1	3	3
Match	0	0	0	0	0	0	0	0	1	0	0	0	1	1
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Follow	0	0	0	0	0	0	0	0	0	0	0	1	1	1
Geolocation	0	0	0	0	0	0	0	1	1	0	1	1	4	4
Group	1	0	0	0	2	1	3	1	0	1	1	0	7	10
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Task	0	1	0	0	0	0	1	0	0	0	0	0	2	2
Transfer	0	1	0	0	0	0	0	0	0	1	0	0	2	2
# Concept Types	6	5	5	4	6	6	8	6	8	6	8	9		
# Concept Instances	10	8	10	6	8	7	15	9	9	7	9	10		

Concept/App	Accord	Chorestar	EasyPick	GroceryShip	Lingua	Listify	LiveScorecard	MapCampus	Phoenix	Potluck	Rendezvous	SweetSpots	#Apps	#Instances
Authentication	1	2	1	1	1	1	1	1	1	1	1	1	12	13
Authorization	1	1	1	1	1	1	1	2	1	1	1	1	12	13
Chat	0	0	0	0	1	0	0	0	0	0	0	0	1	1
Comment	1	0	1	0	0	0	0	0	1	0	1	1	5	5
Event	0	0	0	0	0	0	1	1	0	1	1	0	4	4
Follow	0	0	0	0	0	0	0	0	0	0	0	1	1	1
Geolocation	0	0	0	0	0	0	0	1	1	0	1	1	4	4
Group	1	0	0	0	2	1	3	1	0	1	1	0	7	10
Label	0	0	0	0	0	0	0	0	1	0	1	1	3	3
Match	0	0	0	0	0	0	0	0	1	0	0	0	1	1
Passkey	0	0	0	0	0	0	2	0	0	0	0	0	1	2
Property	5	3	3	3	2	2	4	3	2	2	2	1	12	32
Ranking	0	0	0	0	0	1	0	0	0	0	0	0	1	1
Rating	1	0	4	1	1	0	0	0	0	0	0	1	5	8
Schedule	0	0	0	0	0	0	0	0	1	0	0	0	1	1
Scoring	0	0	0	0	0	1	2	0	0	0	0	2	3	5
Task	0	1	0	0	0	0	1	0	0	0	0	0	2	2
Transfer	0	1	0	0	0	0	0	0	0	1	0	0	2	2
# Concept Types	6	5	5	4	6	6	8	6	8	6	8	9		
# Concept Instances	10	8	10	6	8	7	15	9	9	7	9	10		

2. Effort Comparison

Effort Savings Metric

$$EffortSavings(a) = \frac{LoC(a_{dv}) + \sum_{c \text{ used in } a} \frac{f_{tech} \times LoC(c)}{\# \text{ of apps that use } c}}{f_{\Delta} \times LoC(a_s)}$$

Effort Savings Metric

size of the Déjà Vu
implementation of
application a

$$EffortSavings(a) = \frac{LoC(a_{dv}) + \sum_{c \text{ used in } a} \frac{f_{tech} \times LoC(c)}{\# \text{ of apps that use } c}}{f_{\Delta} \times LoC(a_s)}$$

a is an
application

Effort Savings Metric

$$EffortSavings(a) = \frac{LoC(a_{dv}) + \sum_{c \text{ used in } a} \frac{f_{tech} \times LoC(c)}{\# \text{ of apps that use } c}}{f_{\Delta} \times LoC(a_s)}$$

a is an application

size of the Déjà Vu implementation of application *a*

size of the student implementation of application *a*

Effort Savings Metric

The diagram illustrates the Effort Savings Metric formula. It features two callout boxes at the top: a blue box on the left labeled "Déjà Vu application code" pointing to the $\text{LoC}(a_{dv})$ term, and a blue box on the right labeled "used concepts code" pointing to the summation term. The formula itself is presented with the numerator and denominator enclosed in red dashed boxes.

$$\text{EffortSavings}(a) = \frac{\text{LoC}(a_{dv}) + \sum_{c \text{ used in } a} \frac{f_{tech} \times \text{LoC}(c)}{\# \text{ of apps that use } c}}{f_{\Delta} \times \text{LoC}(a_s)}$$

Effort Savings Metric

The diagram illustrates the Effort Savings Metric formula. The formula is presented as a fraction. The numerator consists of two parts: $\text{LoC}(a_{dv})$, which is highlighted by a callout box labeled "Déjà Vu application code", and a summation term $\sum_{c \text{ used in } a} \frac{f_{tech} \times \text{LoC}(c)}{\# \text{ of apps that use } c}$. This summation term is highlighted by a callout box labeled "used concepts code". The denominator is $f_{\Delta} \times \text{LoC}(a_s)$, which is highlighted by a callout box labeled "share cost of developing concept".

$$\text{EffortSavings}(a) = \frac{\text{LoC}(a_{dv}) + \sum_{c \text{ used in } a} \frac{f_{tech} \times \text{LoC}(c)}{\# \text{ of apps that use } c}}{f_{\Delta} \times \text{LoC}(a_s)}$$

Déjà Vu application code

used concepts code

share cost of developing concept

Effort Savings Metric

$$EffortSavings(a) = \frac{LoC(a_{dv}) + \sum_{c \text{ used in } a} \frac{f_{tech} \times LoC(c)}{\# \text{ of apps that use } c}}{f_{\Delta} \times LoC(a_s)}$$

account for tech differences

account for functionality differences

Metric Interpretation

$$EffortSavings(a) < 1$$

less effort to
use Déjà Vu

$$EffortSavings(a) \geq 1$$

more effort to
use Déjà Vu

Application	$\text{LoC}(a_{dv})$	$\sum_{c \in a.\mathcal{U}} \frac{f_{tech} \times \text{LoC}(c)}{ \mathcal{U}.c }$	$f_{\Delta} \times \text{LoC}(a_s)$	$\text{ES}(a)$
Accord	1,018	830	7,803	0.237
ChoreStar	600	1,487	2,865	0.728
EasyPick	771	669	2,845	0.506
GroceryShip	838	522	4,496	0.302
Lingua	630	1,298	4,175	0.462
Listify	1,047	1,323	5,288	0.448
LiveScorecard	1,429	2,075	7,868	0.445
MapCampus	834	947	3,426	0.520
Phoenix	1,165	3,384	6,356	0.715
Potluck	971	1,210	3,910	0.558
Rendezvous	1,502	1,401	4,048	0.717
SweetSpots	761	2,638	3,508	0.969

$$f_{tech} = f_{\Delta} = 0.9$$

Application	$\text{LoC}(a_{dv})$	$\sum_{c \in a.\mathcal{U}} \frac{f_{tech} \times \text{LoC}(c)}{ \mathcal{U}.c }$	$f_{\Delta} \times \text{LoC}(a_s)$	$\text{ES}(a)$
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$$f_{tech} = f_{\Delta} = 0.9$$

Concept/App	Accord	Chorestar	EasyPick	GroceryShip	Lingua	Listify	LiveScorecard	MapCampus	Phoenix	Potluck	Rendezvous	SweetSpots	#Apps	#Instances
Authentication	1	2	1	1	1	1	1	1	1	1	1	1	12	13
Authorization	1	1	1	1	1	1	1	2	1	1	1	1	12	13
Chat	0	0	0	0	1	0	0	0	0	0	0	0	1	1
Comment	1	0	1	0	0	0	0	0	1	0	1	1	5	5
Event	0	0	0	0	0	0	1	1	0	1	1	0	4	4
Follow	0	0	0	0	0	0	0	0	0	0	0	1	1	1
Geolocation	0	0	0	0	0	0	0	1	1	0	1	1	4	4
Group	1	0	0	0	2	1	3	1	0	1	1	0	7	10
Label	0	0	0	0	0	0	0	0	1	0	1	1	3	3
Match	0	0	0	0	0	0	0	0	1	0	0	0	1	1
Passkey	0	0	0	0	0	0	2	0	0	0	0	0	1	2
Property	5	3	3	3	2	2	4	3	2	2	2	1	12	32
Ranking	0	0	0	0	0	1	0	0	0	0	0	0	1	1
Rating	1	0	4	1	1	0	0	0	0	0	0	1	5	8
Schedule	0	0	0	0	0	0	0	0	1	0	0	0	1	1
Scoring	0	0	0	0	0	1	2	0	0	0	0	2	3	5
Task	0	1	0	0	0	0	1	0	0	0	0	0	2	2
Transfer	0	1	0	0	0	0	0	0	0	1	0	0	2	2
# Concept Types	6	5	5	4	6	6	8	6	8	6	8	9		
# Concept Instances	10	8	10	6	8	7	15	9	9	7	9	10		

Concept/App	Accord	Chorestar	EasyPick	GroceryShip	Lingua	Listify	LiveScorecard	MapCampus	Phoenix	Potluck	Rendezvous	SweetSpots	#Apps	#Instances
Authentication	1	2	1	1	1	1	1	1	1	1	1	1	12	13
Authorization	1	1	1	1	1	1	1	2	1	1	1	1	12	13
Chat	0	0	0	0	1	0	0	0	0	0	0	0	1	1
Comment	1	0	1	0	0	0	0	0	1	0	1	1	5	5
Event	0	0	0	0	0	0	1	1	0	1	1	0	4	4
Follow	0	0	0	0	0	0	0	0	0	0	0	1	1	1
Geolocation	0	0	0	0	0	0	0	1	1	0	1	1	4	4
Group	1	0	0	0	2	1	3	1	0	1	1	0	7	10
Label	0	0	0	0	0	0	0	0	1	0	1	1	3	3
Match	0	0	0	0	0	0	0	0	1	0	0	0	1	1
Passkey	0							0	0	0	0	0	1	2
Property	5							3	2	2	2	1	12	32
Ranking	0							0	0	0	0	0	1	1
Rating	1	0	4	1	1	0	0	0	0	0	0	1	5	8
Schedule	0	0	0	0	0	0	0	0	1	0	0	0	1	1
Scoring	0	0	0	0	0	1	2	0	0	0	0	2	3	5
Task	0	1	0	0	0	0	1	0	0	0	0	0	2	2
Transfer	0	1	0	0	0	0	0	0	0	1	0	0	2	2
# Concept Types	6	5	5	4	6	6	8	6	8	6	8	9		
# Concept Instances	10	8	10	6	8	7	15	9	9	7	9	10		

same concept,
multiple instances

Concept/App	Accord	Chorestar	EasyPick	GroceryShip	Lingua	Listify	LiveScorecard	MapCampus	Phoenix	Potluck	Rendezvous	SweetSpots	#Apps	#Instances
Authentication	1	2	1	1	1	1	1	1	1	1	1	1	12	13
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Comment	1	0	1	0	0	0	0	0	1	0	1	1	5	5
Event	0	0	0	0	0	0	1	1	0	1	1	0	4	4
Follow	0	0	0	0	0	0	0	0	0	0	0	1	1	1
Geolocation	0	0	0	0	0	0	0	1	1	0	1	1	4	4
Group	1	0	0	0	2	1	3	1	0	1	1	0	7	10
Label	0	0	0	0	0	0	0	0	1	0	1	1	3	3
Match	0	0	0	0	0	0	0	0	1	0	0	0	1	1
Passkey	0	0	0	0	0	0	2	0	0	0	0	0	1	2
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Ranking	0	0	0	0	0	1	0	0	0	0	0	0	1	1
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Schedule	0	0	0	0	0	0	0	0	1	0	0	0	1	1
Scoring	0	0	0	0	0	1	2	0	0	0	0	2	3	5
Task	0	1	0	0	0	0	1	0	0	0	0	0	2	2
Transfer	0	1	0	0	0	0	0	0	0	1	0	0	2	2
# Concept Types	6	5	5	4	6	6	8	6	8	6	8	9		
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$$f_{tech} = f_{\Delta} = 0.9$$

Concept/App	Accord	Chorestar	EasyPick	GroceryShip	Lingua	Listify	LiveScorecard	MapCampus	Phoenix	Potluck	Rendezvous	SweetSpots	#Apps	#Instances
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Authorization	1	1	1	1	1	1	1	2	1	1	1	1	12	13
Chat	0	0	0	0	1	0	0	0	0	0	0	0	1	1
Comment	1	0	1	0	0	0	0	0	1	0	1	1	5	5
Event	0	0	0	0	0	0	1	1	0	1	1	0	4	4
Follow	0	0	0	0	0	0	0	0	0	0	0	1	1	1
Geolocation	0	0	0	0	0	0	0	1	1	0	1	1	4	4
Group	1	0	0	0	2	1	3	1	0	1	1	0	7	10
Label	0	0	0	0	0	0	0	0	1	0	1	1	3	3
Match	0	0	0	0	0	0	0	0	1	0	0	0	1	1
Passkey	0	0	0	0	0	0	2	0	0	0	0	0	1	2
Property	5	3	3	3	2	2	4	3	2	2	2	1	12	32
Ranking	0	0	0	0	0	1	0	0	0	0	0	0	1	1
Rating	1	0	4	1	1	0	0	0	0	0	0	1	5	8
Schedule	0	0	0	0	0	0	0	0	1	0	0	0	1	1
Scoring	0	0	0	0	0	1	2	0	0	0	0	2	3	5
Task	0	1	0	0	0	0	1	0	0	0	0	0	2	2
Transfer	0	1	0	0	0	0	0	0	0	1	0	0	2	2
# Concept Types	6	5	5	4	6	6	8	6	8	6	8	9		
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Authorization	1	1	1	1	1	1	1	2	1	1	1	1	12	13
Chat	0	0	0	0	1	0	0	0	0	0	0	0	1	1
Comment	1	0	1	0	0	0	0	0	1	0	1	1	5	5
Event	0	0	0	0	0	0	1	1	0	1	1	0	4	4
Follow	0	0	0	0	0	0	0	0	0	0	0	1	1	1
Geolocation	0	0	0	0	0	0	0	1	1	0	1	1	4	4
Group	1	0	0	0	2	1	3	1	0	1	1	0	7	10
Label	0	0	0	0	0	0	0	0	1	0	1	1	3	3
Match	0	0	0	0	0	0	0	0	1	0	0	0	1	1
Passkey	0	0	0	0	0	0	2	0	0	0	0	0	1	2
Property	5	3	3	3	2	2	4	3	2	2	2	1	12	32
Ranking	0	0	0	0	0	1	0	0	0	0	0	0	1	1
Rating	1	0	4	1	1	0	0	0	0	0	0	1	5	8
Schedule	0	0	0	0	0	0	0	0	1	0	0	0	1	1
Scoring	0	0	0	0	0	1	2	0	0	0	0	2	3	5
Task	0	1	0	0	0	0	1	0	0	0	0	0	2	2
Transfer	0	1	0	0	0	0	0	0	0	1	0	0	2	2
# Concept Types	6	5	5	4	6	6	8	6	8	6	8	9		
# Concept Instances	10	8	10	6	8	7	15	9	9	7	9	10		

56 KLoC

Student Implementations

General-purpose Tools

48% less code

26 KLoC

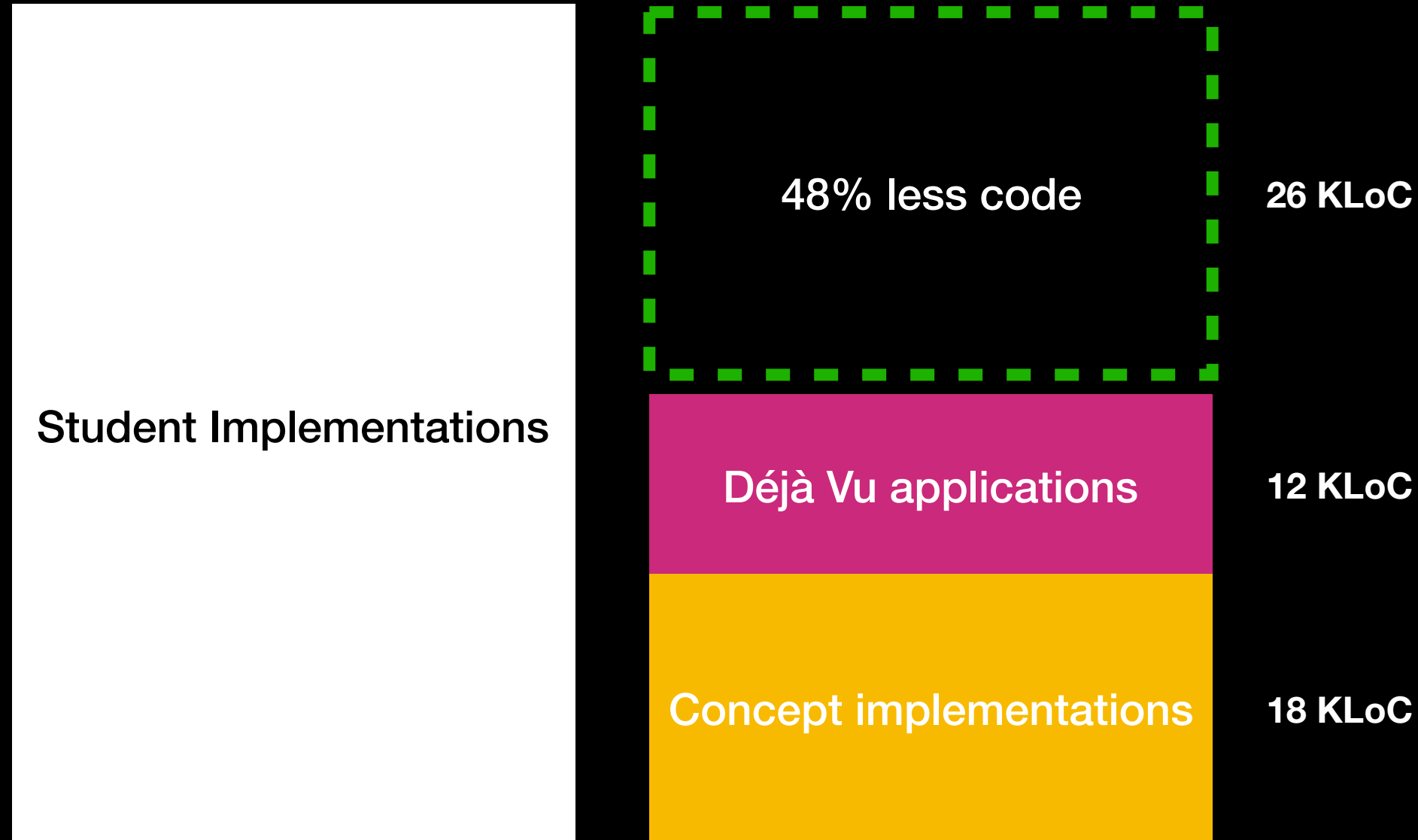
Déjà Vu applications

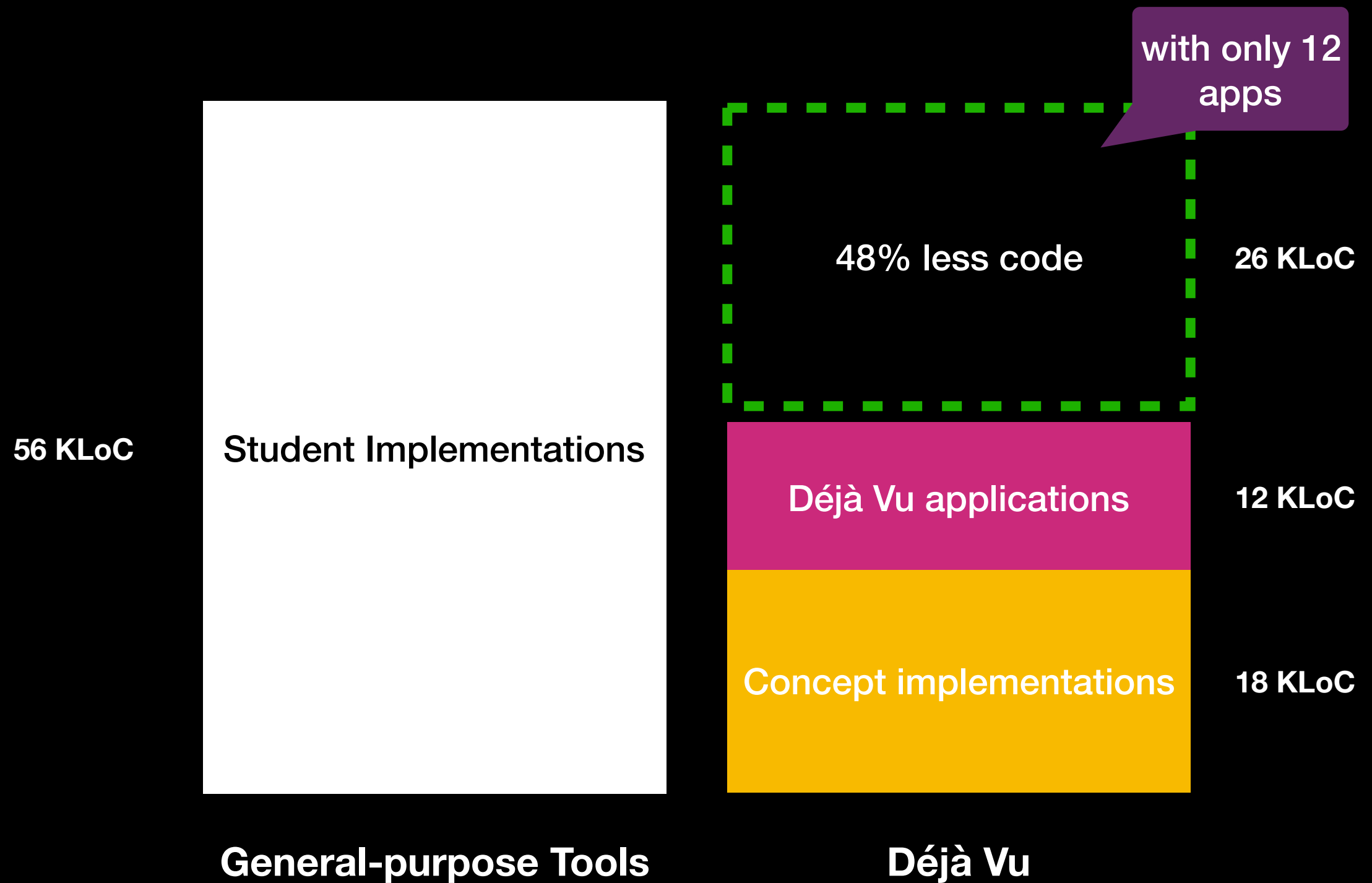
12 KLoC

Concept implementations

18 KLoC

Déjà Vu





56 KLoC

Student Implementations

80% less code

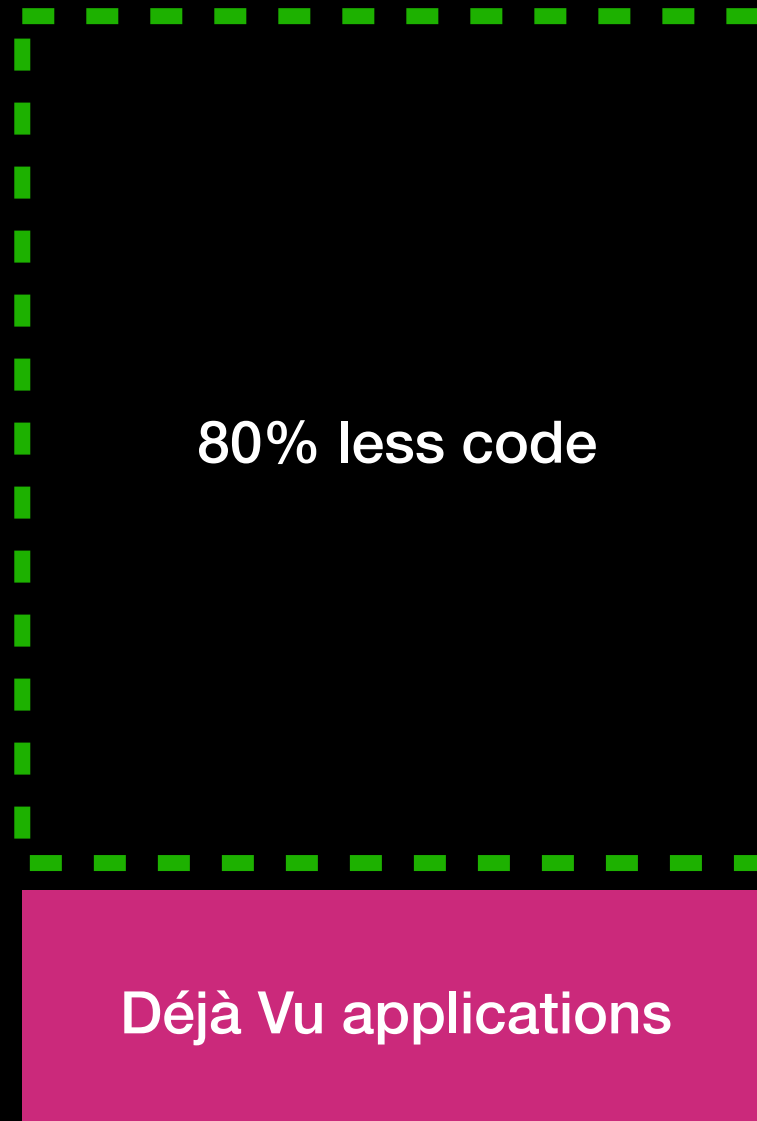
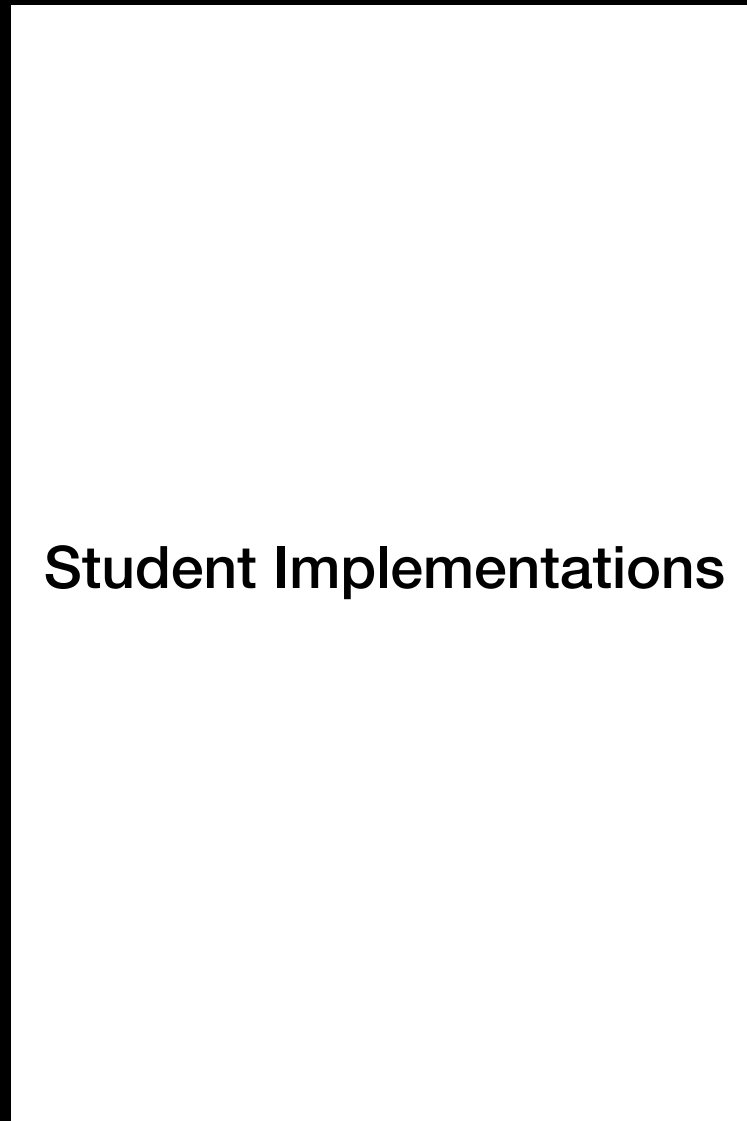
44 KLoC

Déjà Vu applications

12 KLoC

General-purpose Tools

Déjà Vu



3. Usability

Anomalous Concept

Phoenix

People want to meet you.

Login

Password has invalid characters.

benbitdiddle

ben@example.com

ben@example.com

.....

.....

REGISTER NOW

can't use symbols

mapMiT

Ben Bitdiddle

ben@mit.edu

.....

Your password must consist of 5-16 alphanumeric characters.

Sign Up

Already have an account? Login [here](#).

can't use symbols

Anomalous Concept

Phoenix

People want to meet you.

Login Register

can't use symbols

Password has invalid characters.

benbitdiddle

ben@example.com

unhelpful message

ben@example.com

.....

.....

REGISTER NOW

mapMiT

Ben Bitdiddle

ben@mit.edu

.....

can't use symbols

Your password must consist of 5-16 alphanumeric characters.

Sign Up

Already have an account? Login [here](#).

Anomalous Concept

Welcome to Listify

1. Create a Poll
2. Have people rank their preferences
3. See what you've all agreed upon!

Login | Sign up

ben

•

Register

Please select a longer password!

was there an error?

how long?

Déjà Vu



Welcome to Listify

1. Create a Poll
2. Have people rank their preferences
3. See what you've all agreed upon!

Login | Sign up

Username *

ben

Password *

•

Passwords must be **8- 20 characters long** .

Passwords must contain **at least 1 lowercase letter, 1 uppercase letter, 1 special character (!@#\$%^*&) and 1 number (0-9)** .

Retype Password *

Register User

Internally Inconsistent Concept

Welcome to Live ScoreCard

I am a ...

Host Climber Spectator

enter the competition code here

GO






can't input upper-case text

Internally Inconsistent Concept

Host

Competitions

Log Out

name	date	code	
<input type="text" value="competition name"/>	<input type="text" value="11/11/2019"/>	<input type="text" value="competition code"/>	
My Competition	11/11/2019	COMPETE	 0  0  

use upper-
case code

Internally Inconsistent Concept

Welcome to Live ScoreCard

I am a ...

Invalid login credentials. Please try again.

can't log-in to competition

Déjà Vu

Welcome to Live ScoreCard

I am a ...

Competition Code *

COMPETE

GO

Concept Coupling

Accord [Dashboard](#) [About](#) Logged In: Ben Bitdiddle ▾

Update Account Settings

First Name

Last Name

Current Password

New Password

Confirm New Password

Concept Coupling

Accord [Dashboard](#) [About](#) Logged In: Ben Bitdiddle ▾

Update Account Settings

First Name

Ben

Last Name

Bitdiddle

Current Password

Current Password

New Password

New Password

Confirm New Password

Confirm New Password

Update Account

update
profile

update
password

Concept Coupling

Accord [Dashboard](#) [About](#) Logged In: Ben Bitdiddle ▾

Update Account Settings

First Name

Last Name

Current Password

New Password

Confirm New Password

Déjà Vu

Accord

[Dashboard](#) [About](#)

[Ben](#)

[Account](#)

[Logout](#)

Update Profile

First Name

Ben

Last Name

Bitdiddle

Update Profile

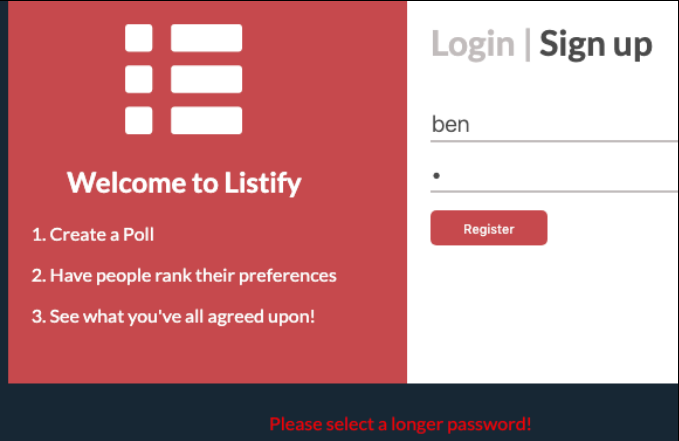
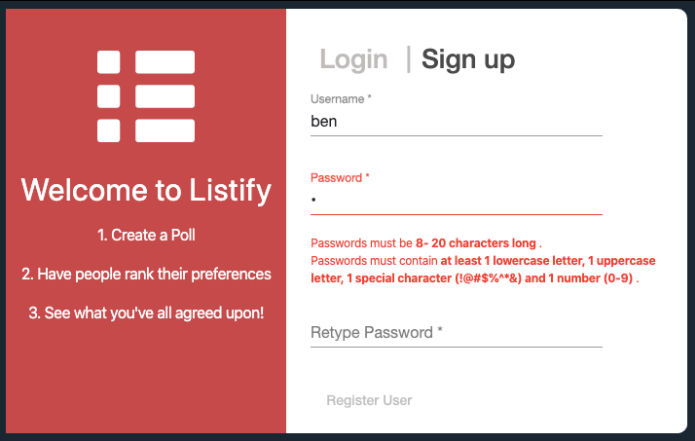
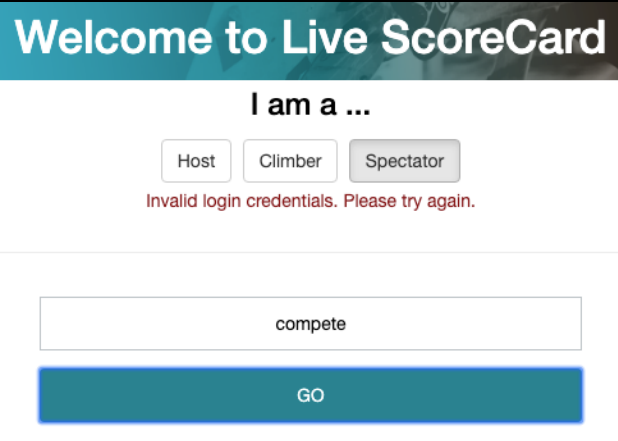
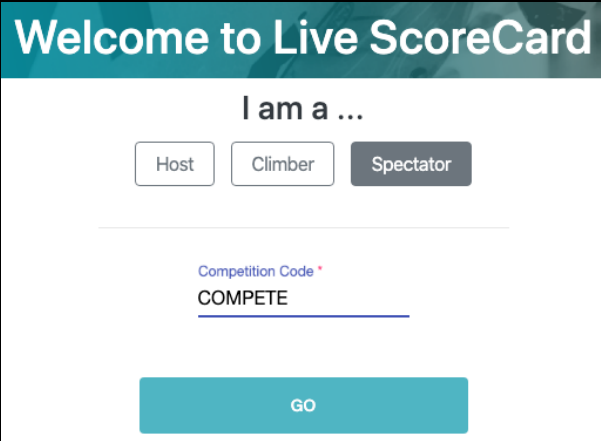
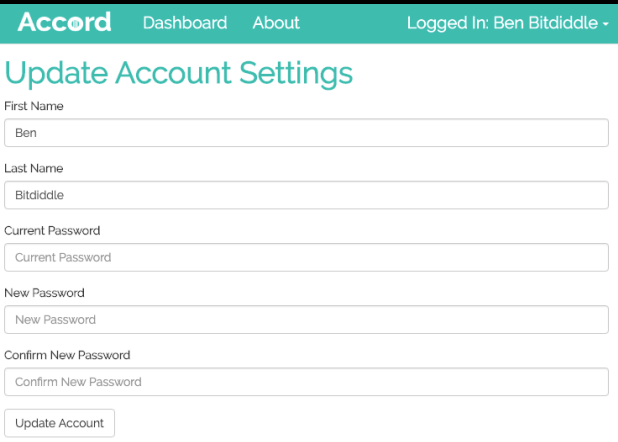
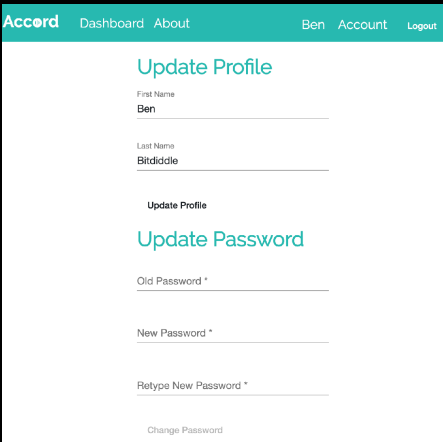
Update Password

Old Password *

New Password *

Retype New Password *

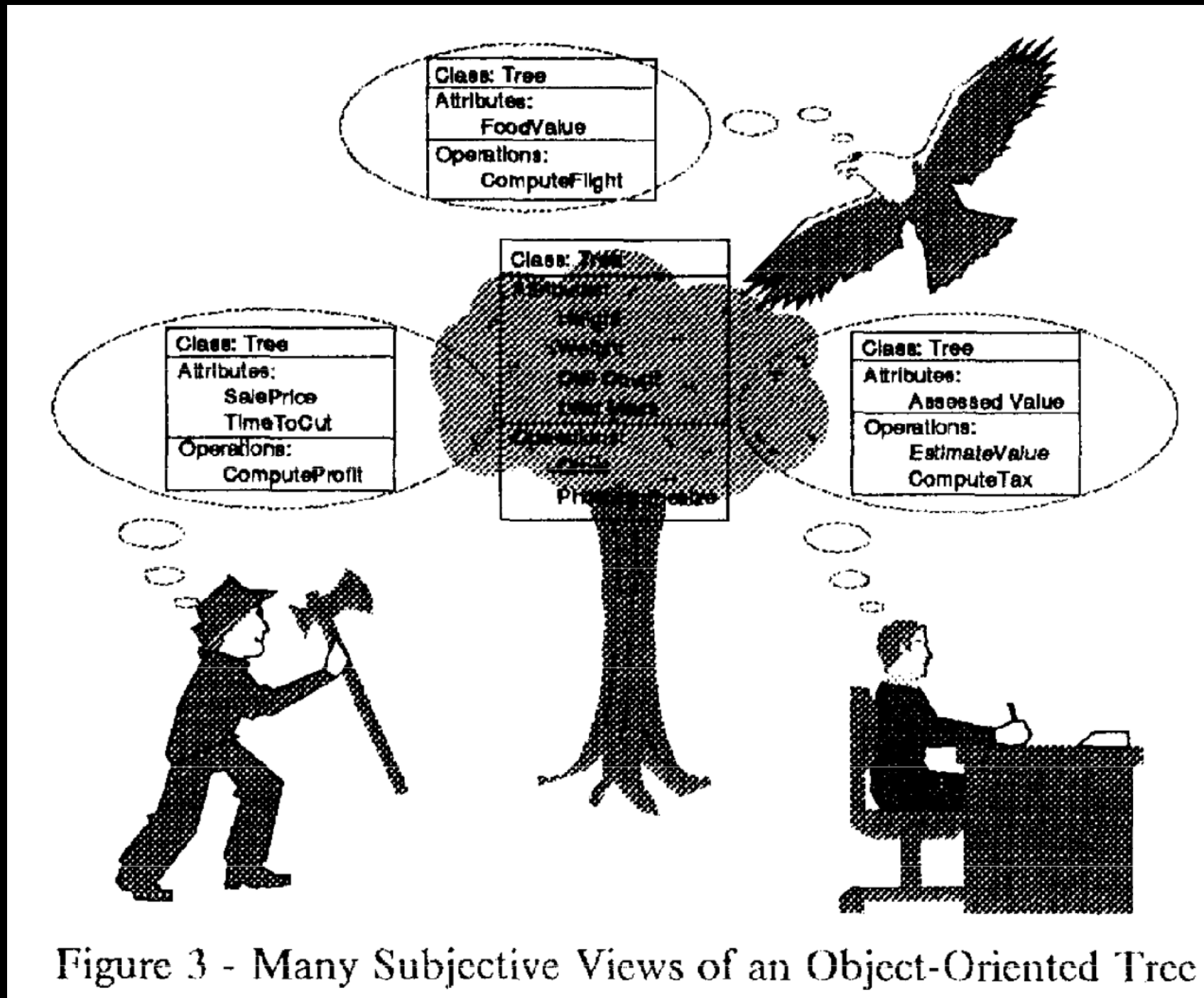
Change Password

Problem	Student Implementation	Déjà Vu Implementation	Mitigated by
Anomalous Concept			concept reuse
Internally Inconsistent Concept			concept as module
Concept Coupling			concepts decoupled by default

Related Work

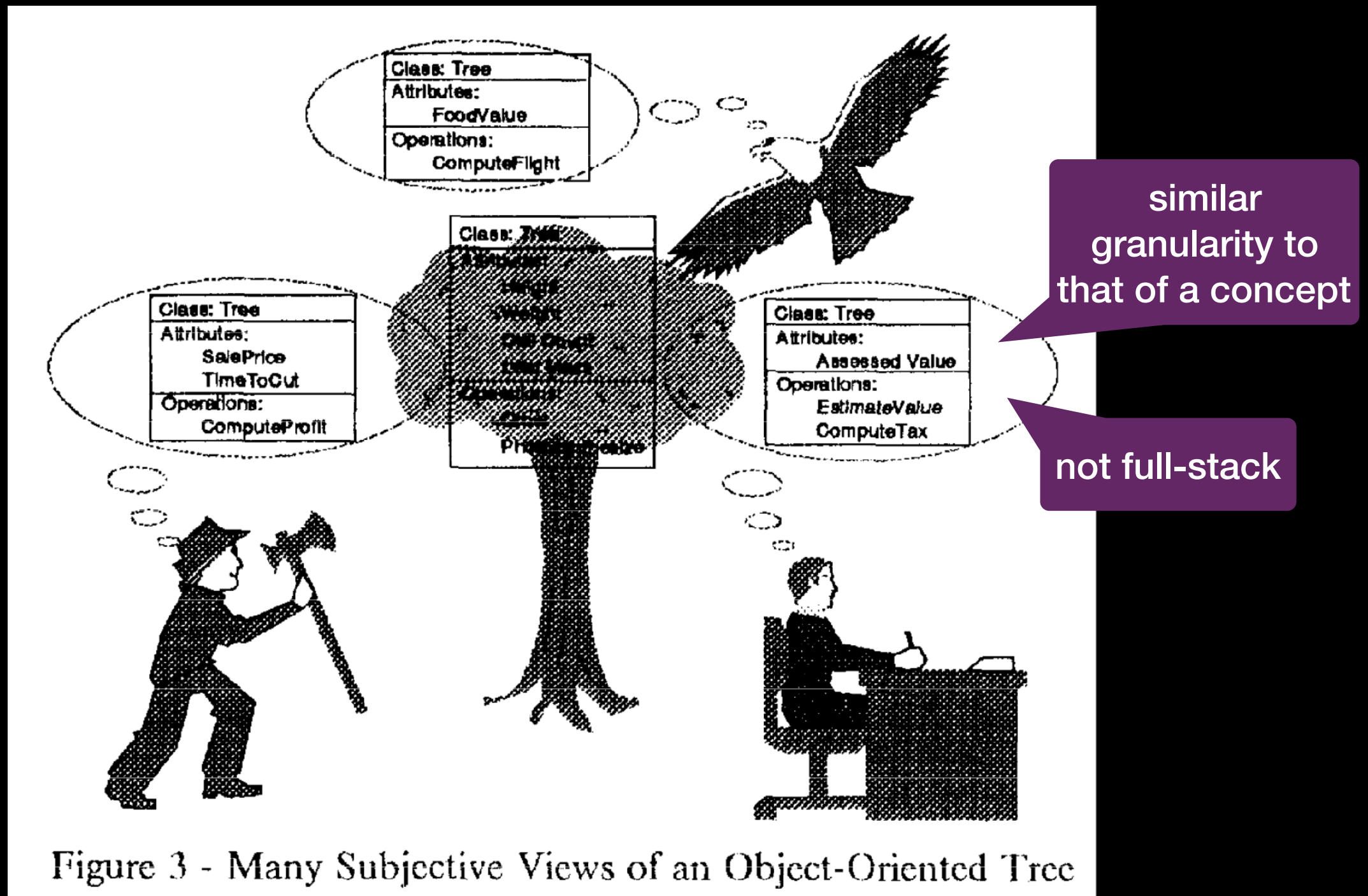
Subject-Oriented Programming

Harrison and Ossher - 1993



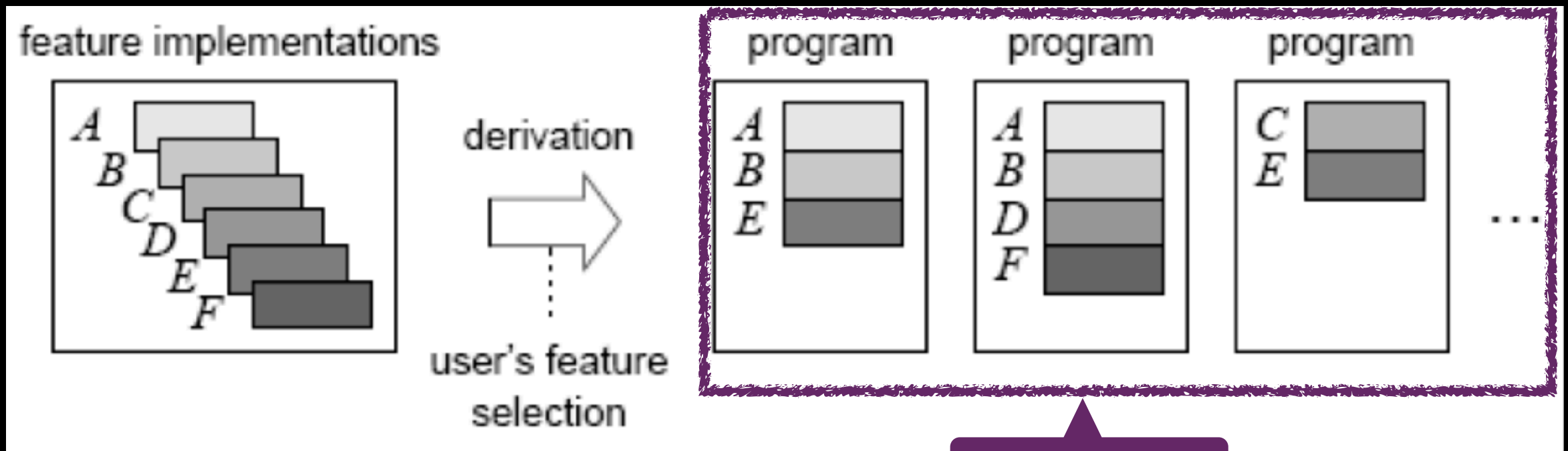
Subject-Oriented Programming

Harrison and Ossher - 1993



Feature-Oriented Programming

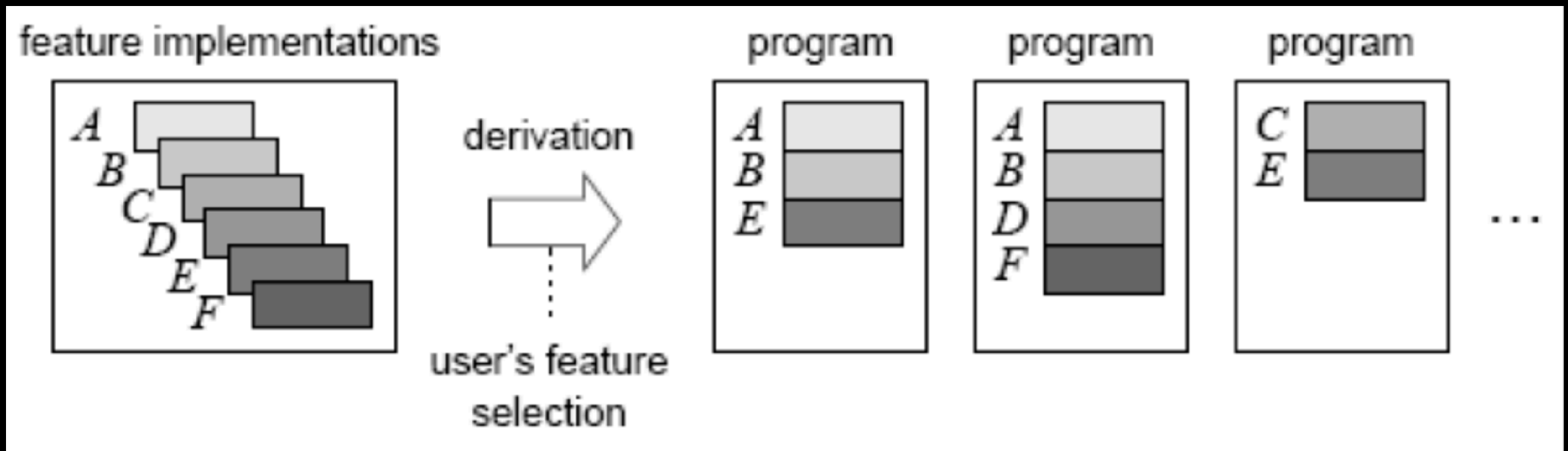
Batory, O'Malley, Apel, Kastner, ... - late 80's



software
product line

Feature-Oriented Programming

Batory, O'Malley, Apel, Kastner, ... - late 80's



similar in spirit
to Déjà Vu

Feature-Oriented Programming

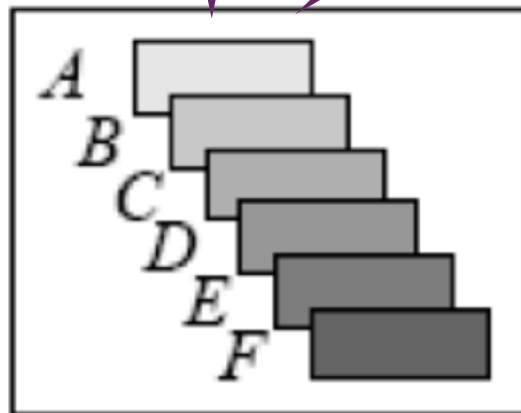
Batory, O'Malley, Apel, Kastner, ... - late 80's

different
granularity to
that of a concept

not full-stack

features are applied
to a program in a
predefined way

feature implementations

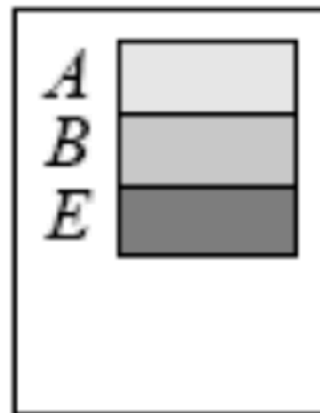


derivation



user's feature
selection

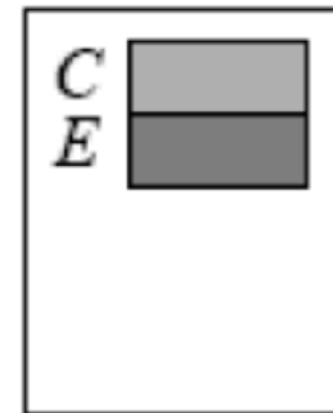
program



program



program



...

similar in spirit
to Déjà Vu

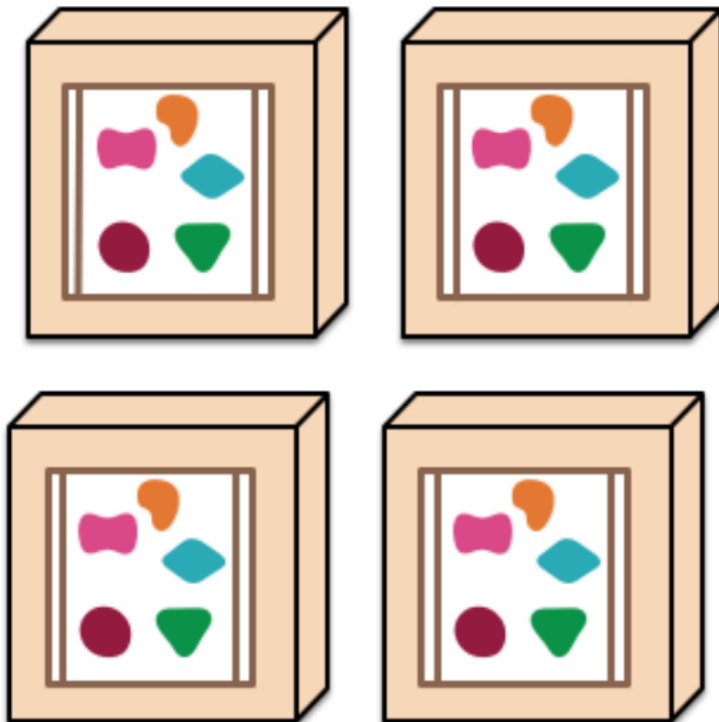
Microservices Architecture

Netflix, Amazon, ... - around 2011

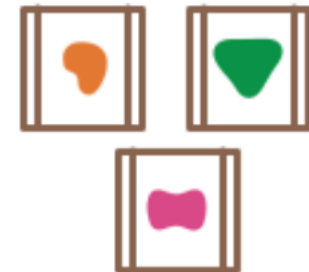
A monolithic application puts all its functionality into a single process...



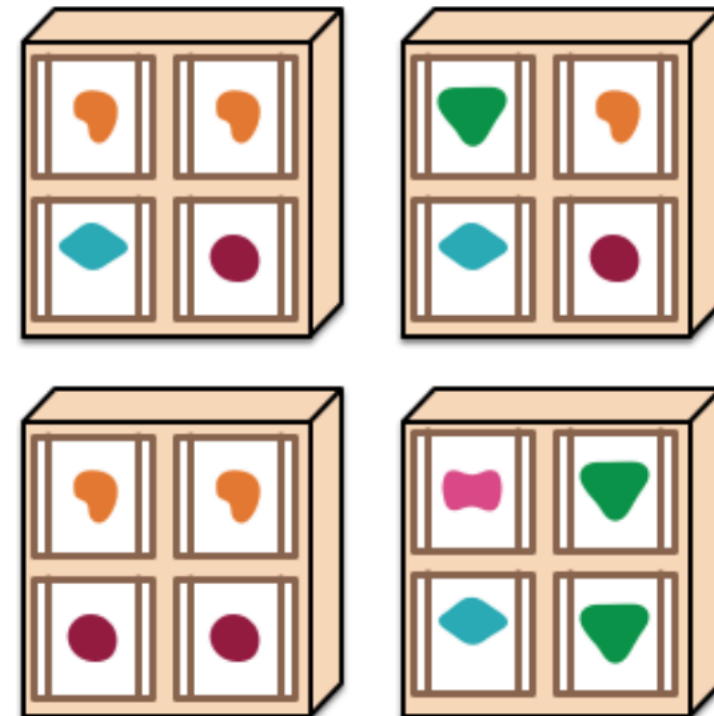
... and scales by replicating the monolith on multiple servers



A microservices architecture puts each element of functionality into a separate service...

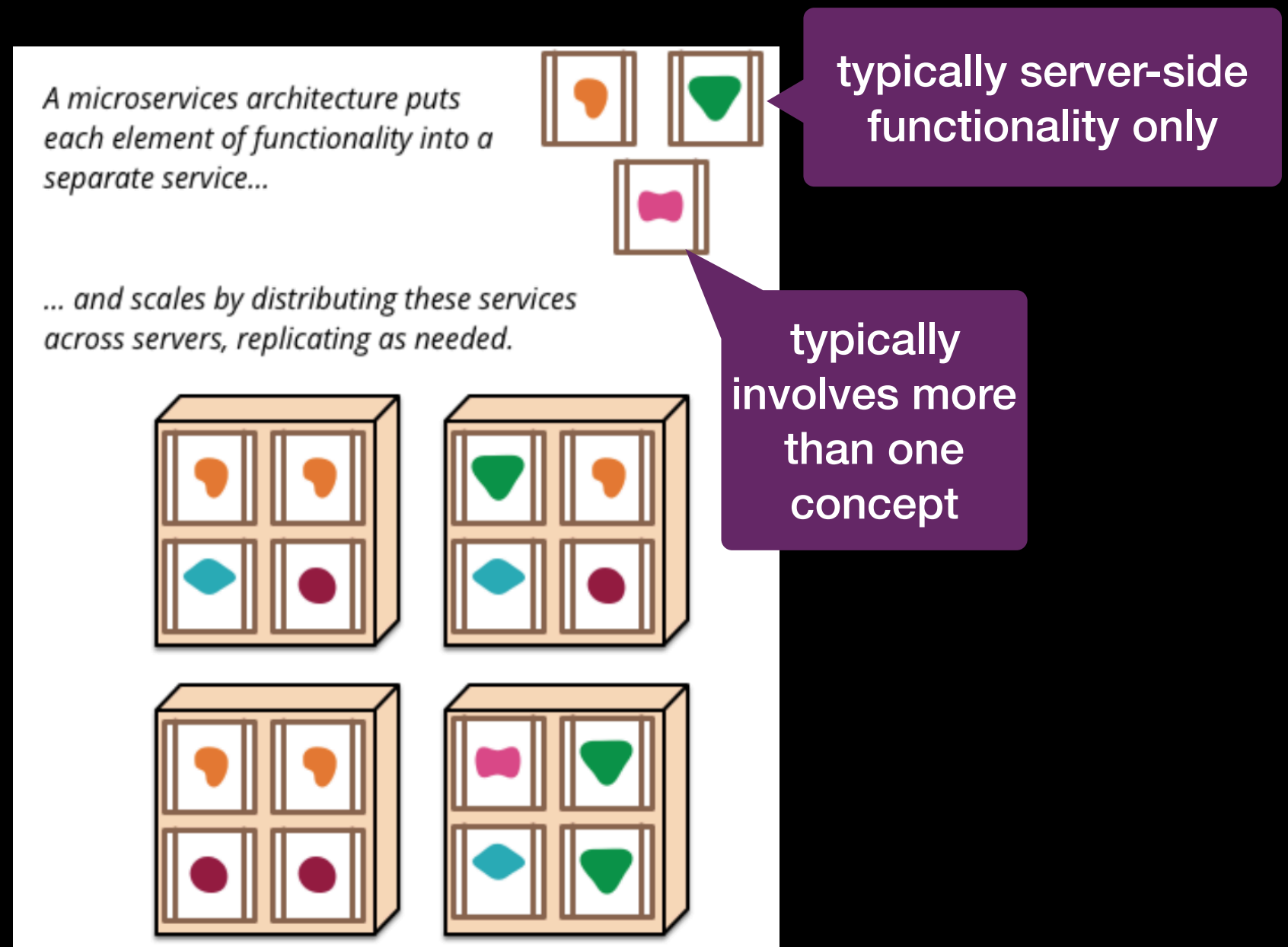


... and scales by distributing these services across servers, replicating as needed.



Microservices Architecture

Netflix, Amazon, ... - around 2011



**Stuff I Didn't Tell You
About**

Formal Semantics

$$\text{CHILD-OP} \frac{L \dot{\cup} \{ \langle \prec \sigma_i, \mathcal{C}_i, B_i, \iota_i \succ, \perp \rangle \}; \Sigma \xrightarrow{op} L \dot{\cup} \{ \langle \prec \sigma'_i, \mathcal{C}'_i, B'_i, \iota_i \succ, x \rangle \}; \Sigma'}{L \dot{\cup} \{ \langle \prec \sigma, \mathcal{C} \dot{\cup} \{ \prec \sigma_i, \mathcal{C}_i, B_i, \iota_i \succ \}, B, m \succ, \perp \rangle \}; \Sigma \xrightarrow{op} L \dot{\cup} \{ \langle \text{update}(\prec \sigma, \mathcal{C} \dot{\cup} \{ \prec \sigma'_i, \mathcal{C}'_i, B'_i, \iota_i \succ \}), B, m \succ \rangle, x \rangle \}; \Sigma'}$$

$$\text{CHILD-OR} \frac{L \dot{\cup} \{ \langle \prec \sigma_i, \mathcal{C}_i, B_i, c.n \succ, \perp \rangle \}; \Sigma \xrightarrow{a} L \dot{\cup} \{ \langle \prec \sigma'_i, \mathcal{C}'_i, B'_i, c.n \succ, x \rangle \}; \Sigma'}{L \dot{\cup} \{ \langle \prec \sigma, \mathcal{C} \dot{\cup} \{ \prec \sigma_i, \mathcal{C}_i, B_i, c.n \succ \}, B, m_v \succ, \perp \rangle \}; \Sigma \xrightarrow{op} L \dot{\cup} \{ \langle \text{update}(\prec \sigma, \mathcal{C} \dot{\cup} \{ \prec \sigma'_i, \mathcal{C}'_i, B'_i, c.n \succ \}), B, m_v \succ \rangle, x \rangle \}; \Sigma'}$$

$$L \dot{\cup} \{ \langle \prec \sigma_1, \mathcal{C}_1, B_1, c_1.n_1 \succ, \perp \rangle \}; \Sigma \xrightarrow{a} L \dot{\cup} \{ \langle \prec \sigma'_1, \mathcal{C}'_1, B'_1, c_1.n_1 \succ, x_1 \rangle \}; \Sigma'_1$$

⋮

$$L \dot{\cup} \{ \langle \prec \sigma_m, \mathcal{C}_m, B_m, c_m.n_m \succ, \perp \rangle \}; \Sigma \xrightarrow{a} L \dot{\cup} \{ \langle \prec \sigma'_m, \mathcal{C}'_m, B'_m, c_m.n_m \succ, x_m \rangle \}; \Sigma'_m$$

$$\mathcal{C} \subseteq \mathbb{AC}$$

$$x \in \{x_1, \dots, x_m\} \setminus \{\perp\} \vee \{x_1, \dots, x_m\} = \{\perp\} = \{x\}$$

$$c_i \neq c_j \forall i, j \in 1 \dots m$$

$$\text{CHILD-AND} \frac{L \dot{\cup} \{ \langle \prec \sigma, \mathcal{C} \dot{\cup} \{ \prec \sigma_i, \mathcal{C}_i, B_i, c_i.n_i \succ, \dots, \prec \sigma_m, \mathcal{C}_m, B_m, c_m.n_m \succ \}, B, n_{\wedge} \succ, \perp \rangle \}; \Sigma \xrightarrow{op} L \dot{\cup} \{ \langle \text{update}(\prec \sigma, \mathcal{C} \dot{\cup} \{ \prec \sigma'_1, \mathcal{C}'_1, B'_1, c_1.n_1 \succ, \dots, \prec \sigma'_m, \mathcal{C}'_m, B'_m, c_m.n_m \succ \}, B, n_{\wedge} \succ \rangle, x \rangle \}; \Sigma \otimes \Sigma'_1 \otimes \dots \otimes \Sigma'_m}{}$$

Graphical Environment

Déjà Vu Designer

+ New Component

App Component

home

⚙️

↔️

☐ Show I/O Hints

App Name

spots

🖥️

⋮

?

Components

Concepts

spots (app components) ▾

dv (built-in components) ▾

geolocation ▾

rating ▾

review ▾

Campus Spots

Find points of interest in campus

Show Spots

Add a Spot

📍

Spots

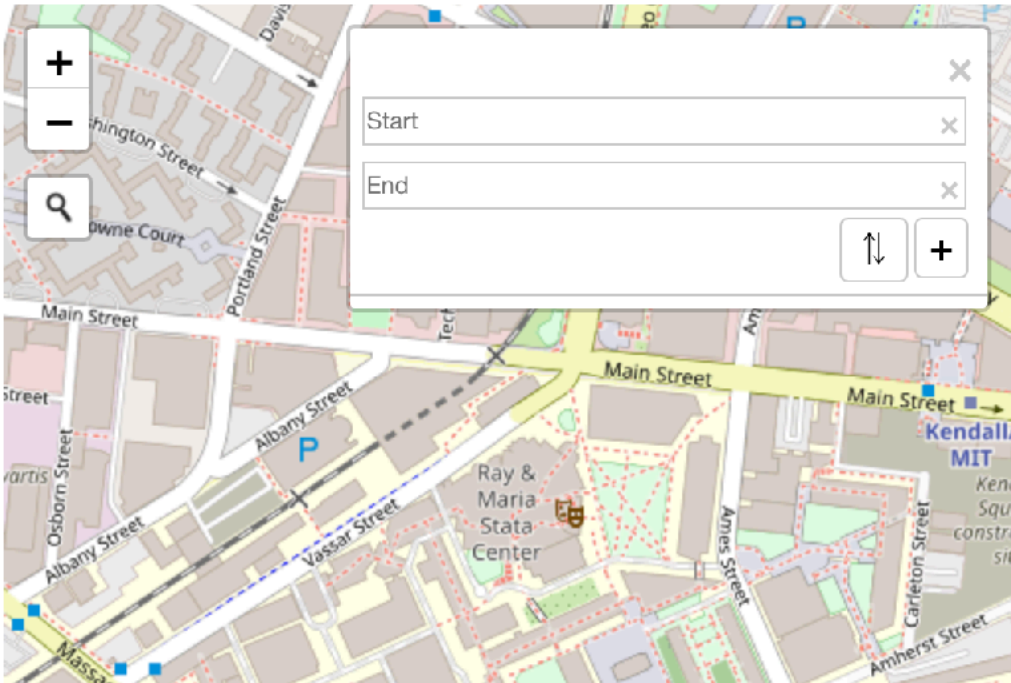
No spots to show. Create one!

+
-
🔍

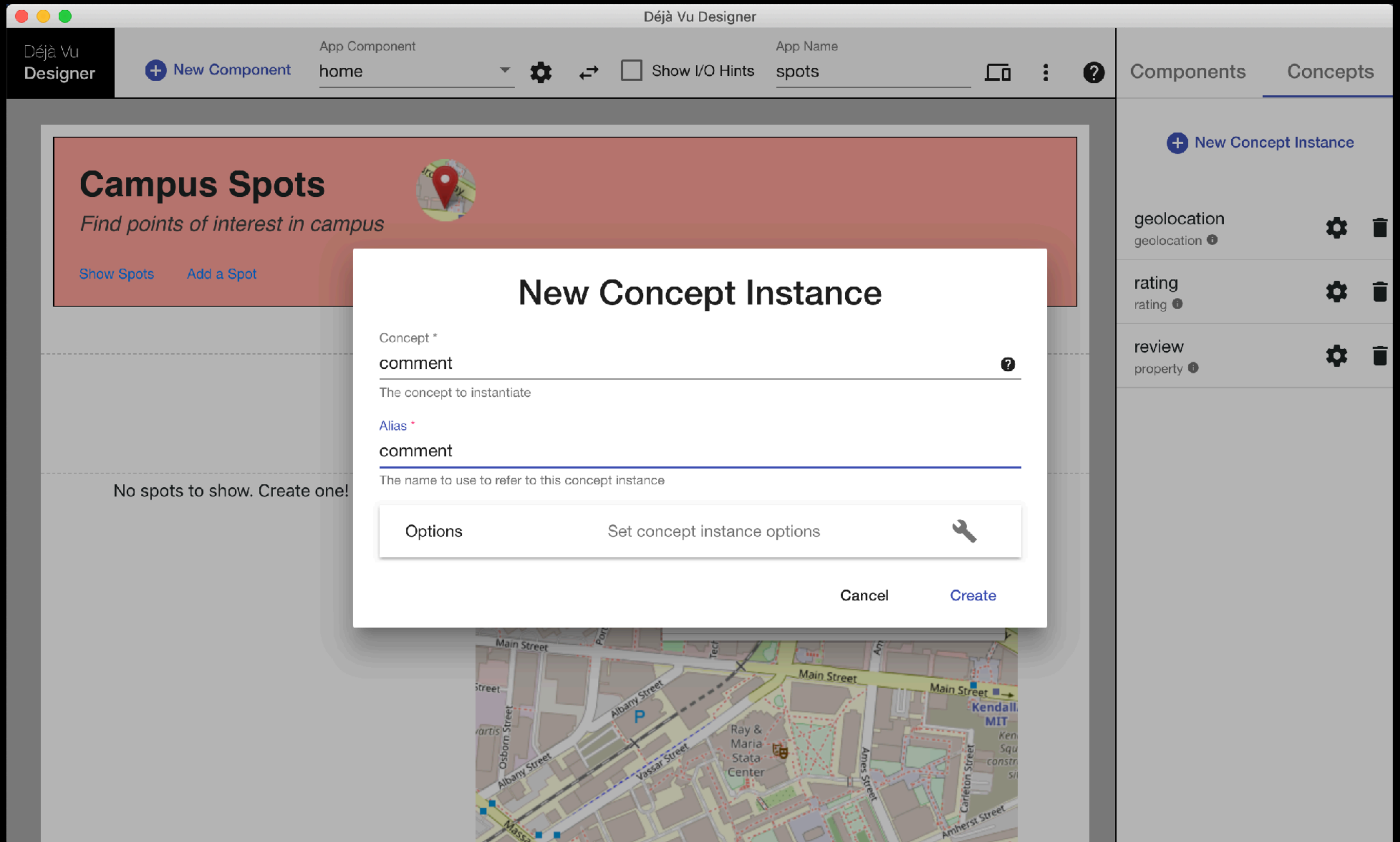
Start

End

↕️ +



Graphical Environment



Graphical Environment

Déjà Vu Designer

+ New Component

App Component

create-spot

⚙️

↔️

☐ Show I/O Hints

App Name

spots

🖥️

⋮

?

Components

Concepts

+ New Concept Instance

geolocation
geolocation ⓘ ⚙️ 🗑️

rating
rating ⓘ ⚙️ 🗑️

review
property ⓘ ⚙️ 🗑️

Review *

great spot!

↔️ 🗑️

Create Spot

Discussion

How Many Concepts?

App
Accord
ChoreStar
EasyPick
GroceryShin
Lingua
Listify
LiveSco
MapCampus
Phoenix
Potluck
Rendezvous
SweetSpots

10k apps

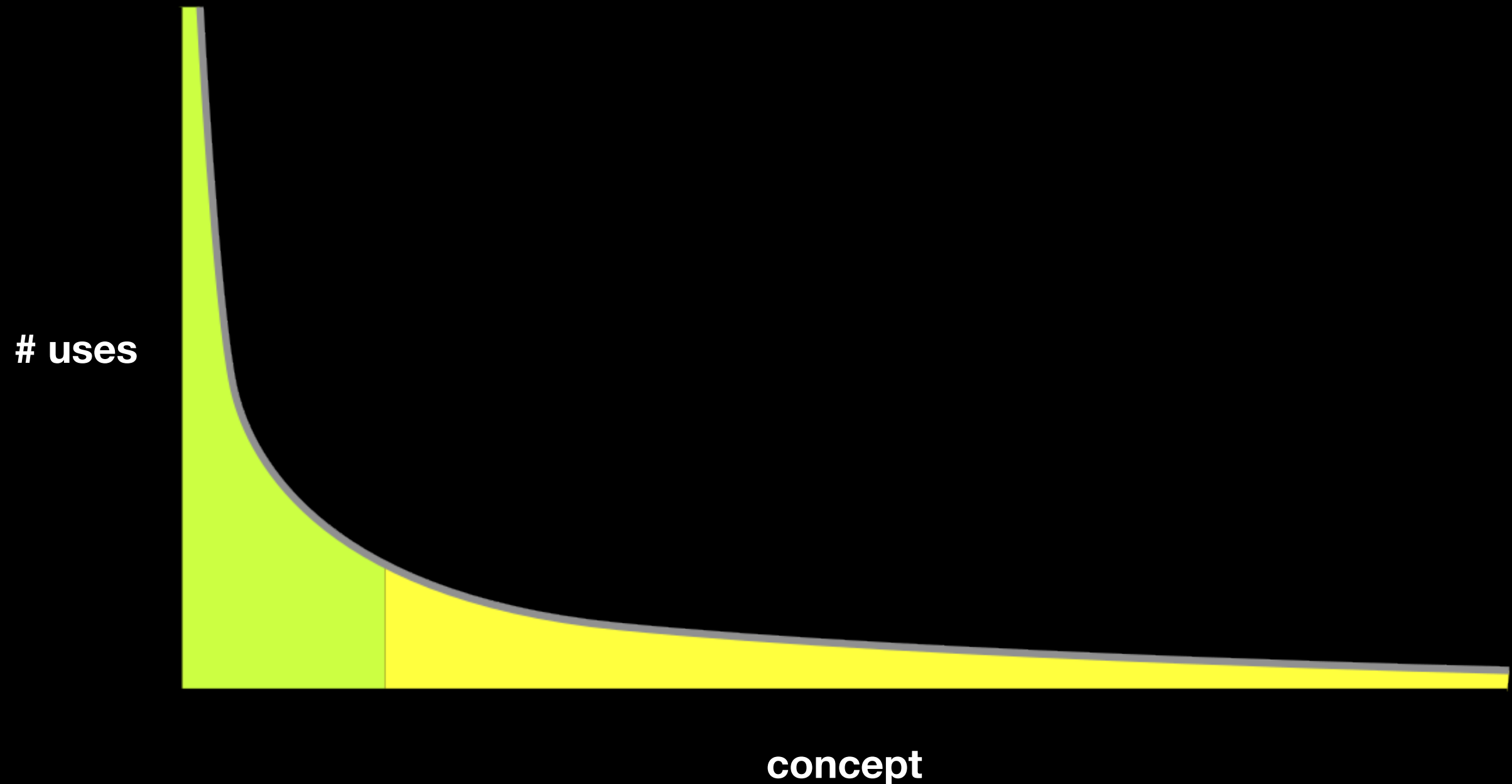
⋮

Concept
Authentication
Authorization
Chat
Com
Even
Foll
Geo
Group
Label
Match
Passkey
Property
Ranking
Rating
Schedule
Scoring
Task
Transfer

? concepts

⋮

Concept Usage Distribution?



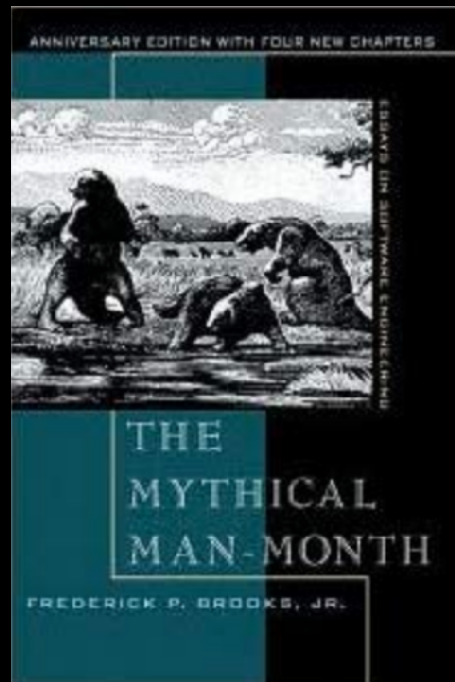
What Apps Are Better Suited for Déjà Vu?

$$EffortSavings(a) = \frac{LoC(a_{dv}) + \sum_{c \text{ used in } a} \frac{f_{tech} \times LoC(c)}{\# \text{ of apps that use } c}}{f_{\Delta} \times LoC(a_s)}$$

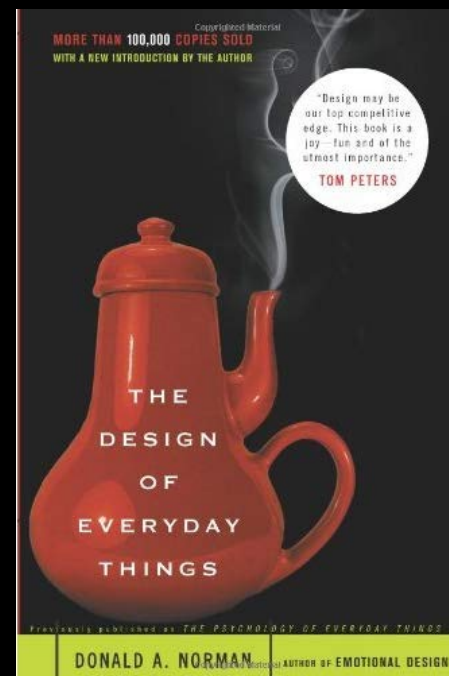


|Is *Déjà Vu* suitable for building a
web-based word processor like
Google Docs?

The Big Picture



conceptual integrity is “the most important consideration in system design”



a designer should craft a system image that reflects the conceptual model of the design

Other Potential Applications

- New way to do microservices
- New way to build software product lines
- New way to structure code within an application

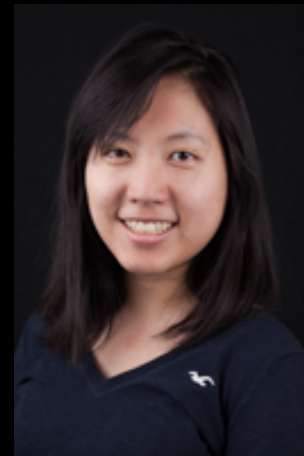
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Acknowledgements



Try Déjà Vu:

deja-vu-platform.com



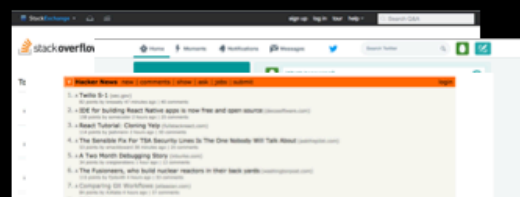
catalog of concepts

- new modularity: concepts
- capture and reuse concept design & implementation

```
<dv.component name="submit-post">
  <sn.navbar /> ...
  <dv.tx>
    <dv.gen-id /> ...
    <post.create-object id=dv.gen-id.id
      initialValue={ author: sn.navbar.user.username }
      showExclude=["author"] buttonLabel="Submit"
      newObjectSavedText="Post submitted" />
    <scoreposts.create-score targetId=dv.gen-id.id
      sourceId=sn.navbar.user.username
      value=0 hidden=true /> ...
  </dv.tx> ...
</dv.component>
```

concept composition mechanism

- in HTML, no JS or server-side code
- join concept actions for aggregate behavior



web apps

- complex behavior
- rich graphical user interfaces