

6.1040 · software studio · fall 2022

# concept composition

Daniel Jackson & Arvind Satyanarayan

# introduction

# designing automation



Schindler's PORT elevator

## use cases

scenarios for user interactions  
a popular approach in industry  
user stories are similar but shorter

## what use case does photo suggest?

1. user flashes id card
2. screen indicates elevator bank to take
3. user enters next elevator there
4. user eventually taken to floor

## can we identify distinct concepts?

UserAuth: authenticate user (with card)  
Directory: look up info for user  
PortElevator: take person to desired floor



# today's plan

## **exploring automation**

more automation: less work but less flexibility too

## **defining automation**

as synchronization of concepts

## **separation of concerns**

composition mechanism gives you decomposition too!

break a composite concept into smaller ones

factor out known concepts, eg. Directory

enriching  
concept designs

# so far, concepts defined by purpose & operational principle

**concept** Upvote

**purpose** rank items by popularity

**principle** after series of upvotes of items, the items are ranked by their number of upvotes

**concept** Reaction

**purpose** send reactions to author

**principle** when user selects reaction, it's shown to the author (often in aggregated form)

**concept** Recommendation

**purpose** use prior likes to recommend

**principle** user's likes lead to ranking of kinds of items, determining which items are recommended



8



1

This is homework and I'm having a  
are the definitions of the objects:

```
sig Library {  
    patrons : set Person,  
    on_shelves : set Book,  
}
```

Today ▾

Daniel I think we should organize a software concepts forum.

1



# enriching the design: state and actions

**concept** Upvote

**purpose** rank items by popularity

**principle** after series of upvotes of items, the items are ranked by their number of upvotes

**state**

votes for each item, up or down  
which user issued each vote  
ranked sequence of items

**actions**

user upvotes an item  
user downvotes an item  
user unvotes an item

**concept** Reaction

**purpose** send reactions to author

**principle** when user selects reaction, it's shown to the author (often in aggregated form)

**state**

reactions for each item  
which user issued each reaction

**actions**

user changes reaction to item

**concept** Recommendation

**purpose** use prior likes to recommend

**principle** user's likes lead to ranking of kinds of items, determining which items are recommended

**state**

likes/dislikes by user for items  
classification of items into kinds  
recommendations for each user

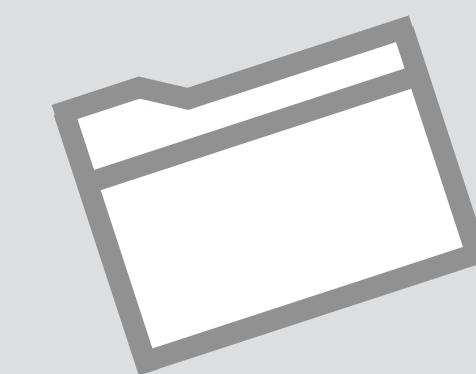
**actions**

user likes an item  
user dislikes an item

*note incompleteness of operational principle*

a zoo of concepts

# a very familiar organizational concept



**concept** Folder

**purpose** organize items

**principle** if an object is moved to a folder, and that folder is moved to another folder, it still contains the object

**state**

a fixed root folder

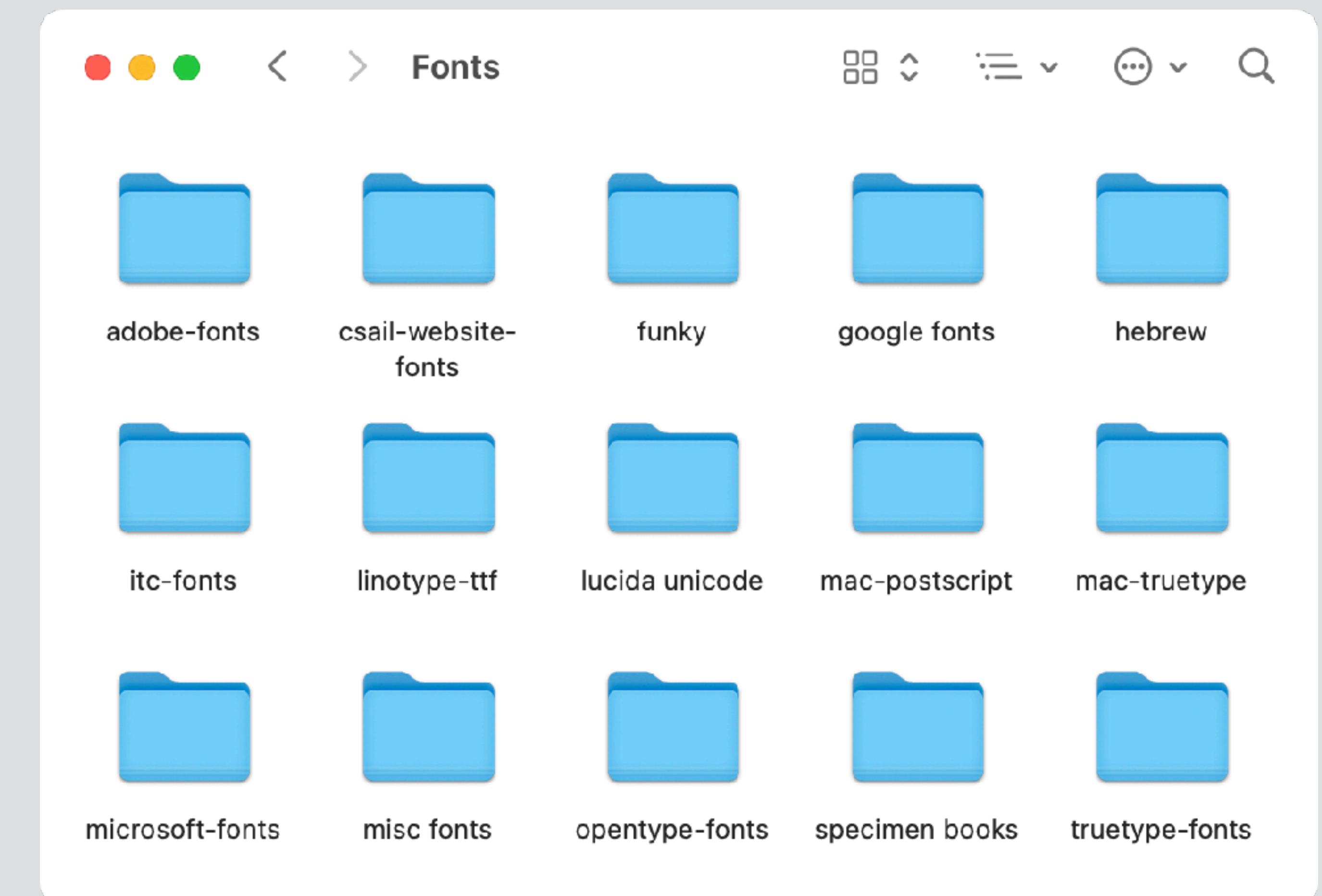
for each folder, the objects (folders or items) it contains

**actions**

create a folder

delete a folder

move an object to a folder



# another common organizational concept



**concept** Label

**purpose** organize items

**principle** if label is added to an item and not removed, then filtering on that label will display that item

**state**

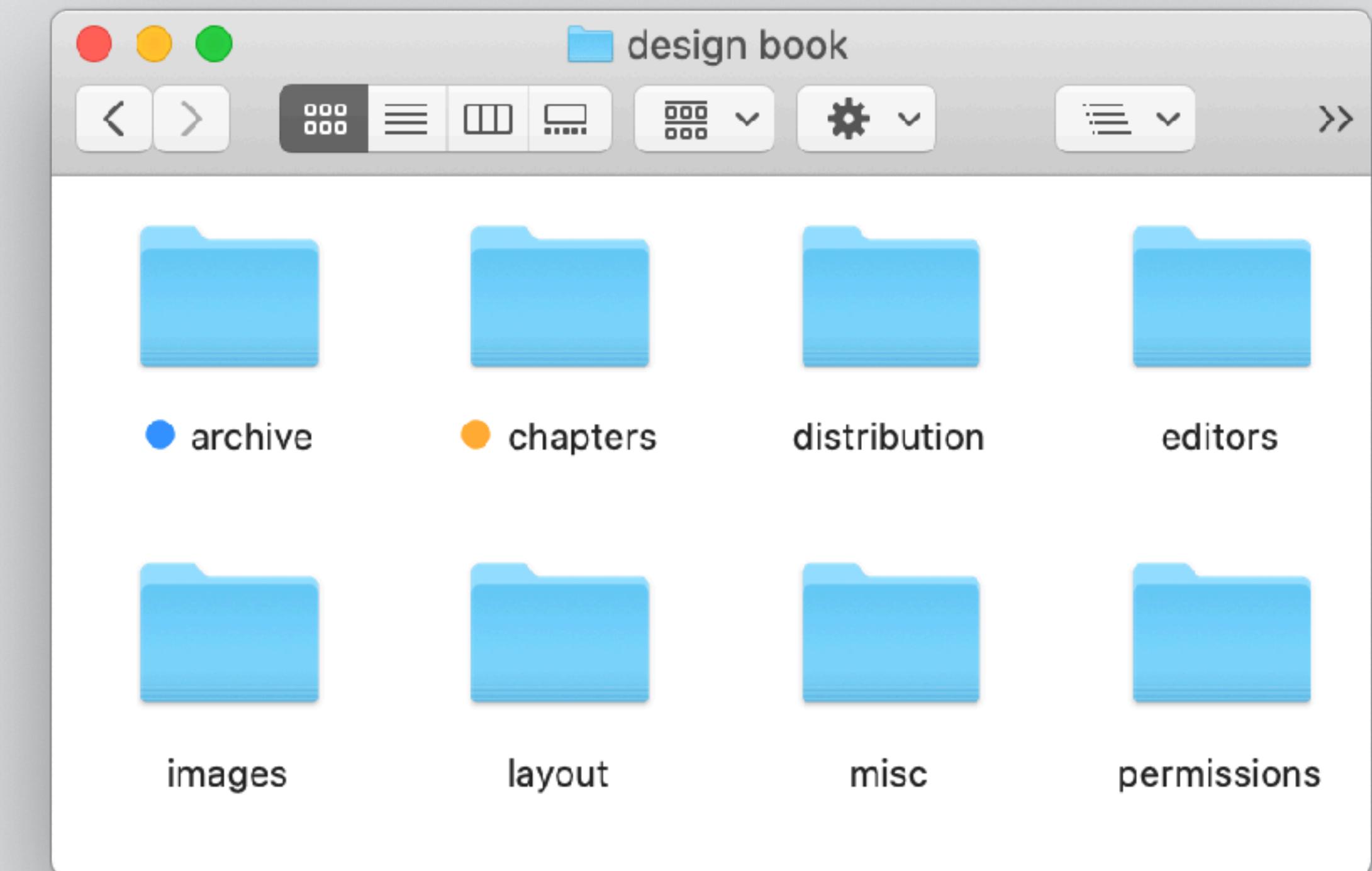
labels for each item

**actions**

add label to an item

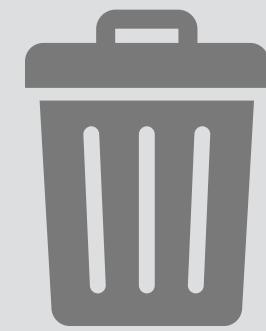
remove label from an item

filter on a set of labels



what's this concept called in Discourse?

# a product-defining concept



**concept** Trash

**purpose** allow undeletion

**principle** if an object is deleted, and the trash is not emptied, it can be restored; if an object is deleted and the trash is emptied, the object is gone but its space is regained

**state**

set of all objects

set of objects in trash

**actions**

delete an object

restore an object

empty the trash

# two social media concepts



## concept Post

**purpose** publish small media

**principle** after a user creates a post, it's associated with that user as author

### state

set of posts with authors

### actions

create a post  
delete a post  
edit a post



## concept Friend

**purpose** limit access to published items

**principle** if two users become friends, and one publishes an item, the other can then access it

### state

who's friends with who  
published items by user  
which users can access which items

### actions

users become friends  
users unfriend  
user publishes item  
user accesses item

# a strange social media concept



**concept** Tag

**purpose** crowdsource identification

**principle** if a user is tagged in an item, then their identity becomes associated with it

**state**

which users tagged in which items

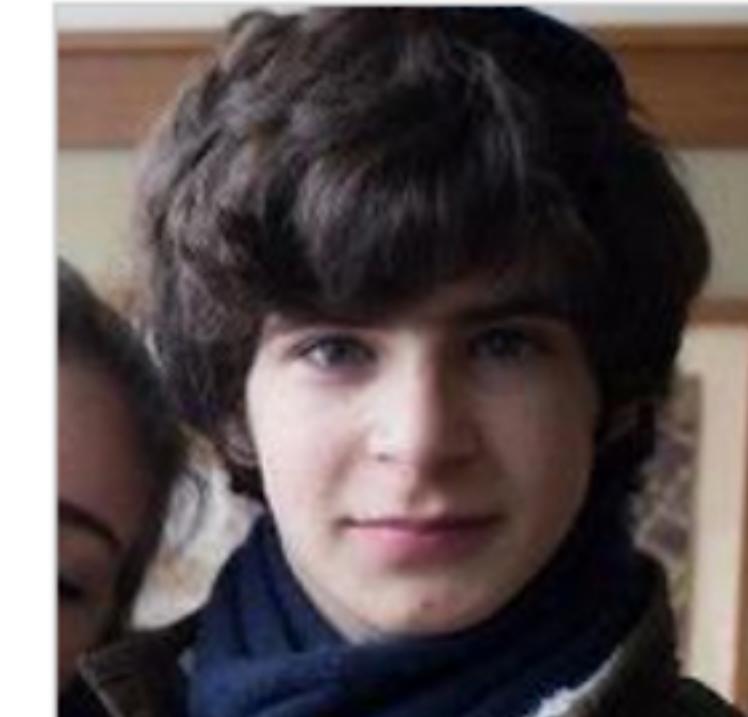
**actions**

user tagged in item

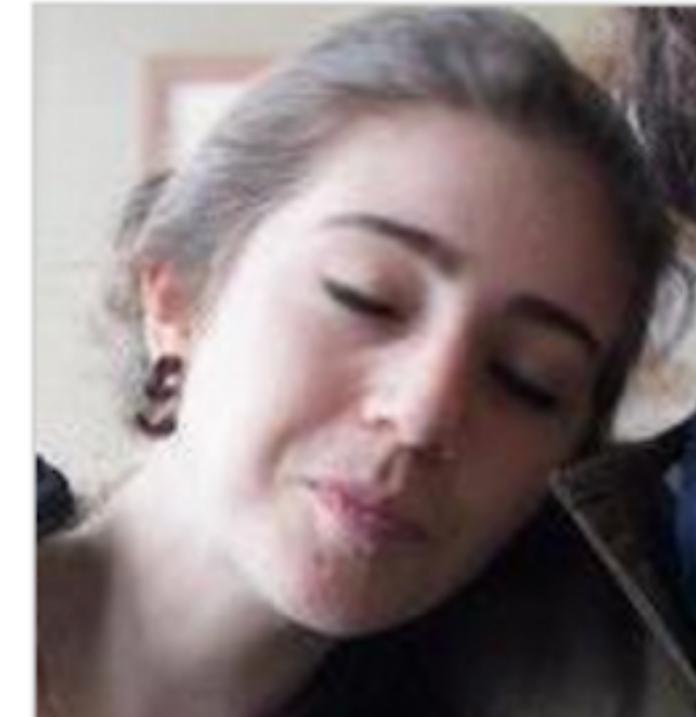
user untagged in item

## Who Is in These Photos?

To tag your friends, review the suggested names and click Save Tags at the bottom of this page. If a name is missing or incorrect, list a new name and press Enter. Remember: If someone doesn't like a photo, they can untag themselves or ask you to take it down.



Who is this?



Who is this?

[Skip Tagging Friends](#)

[Save Tags](#)

syncing concepts  
for automation

# tighten-loosen design moves: tradeoff automation/flexibility



tighten



light pull / door lock

airplane toilet lock



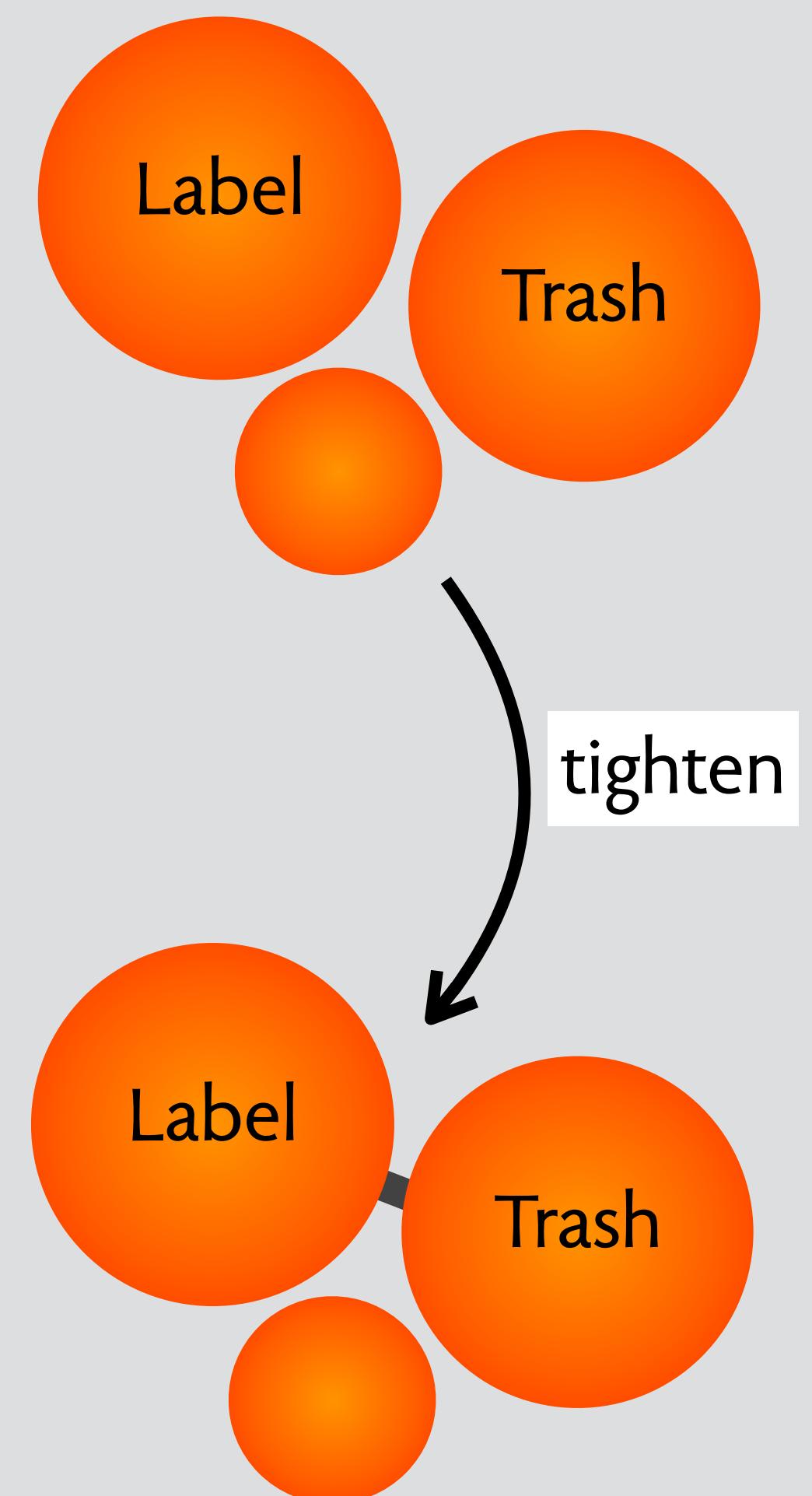
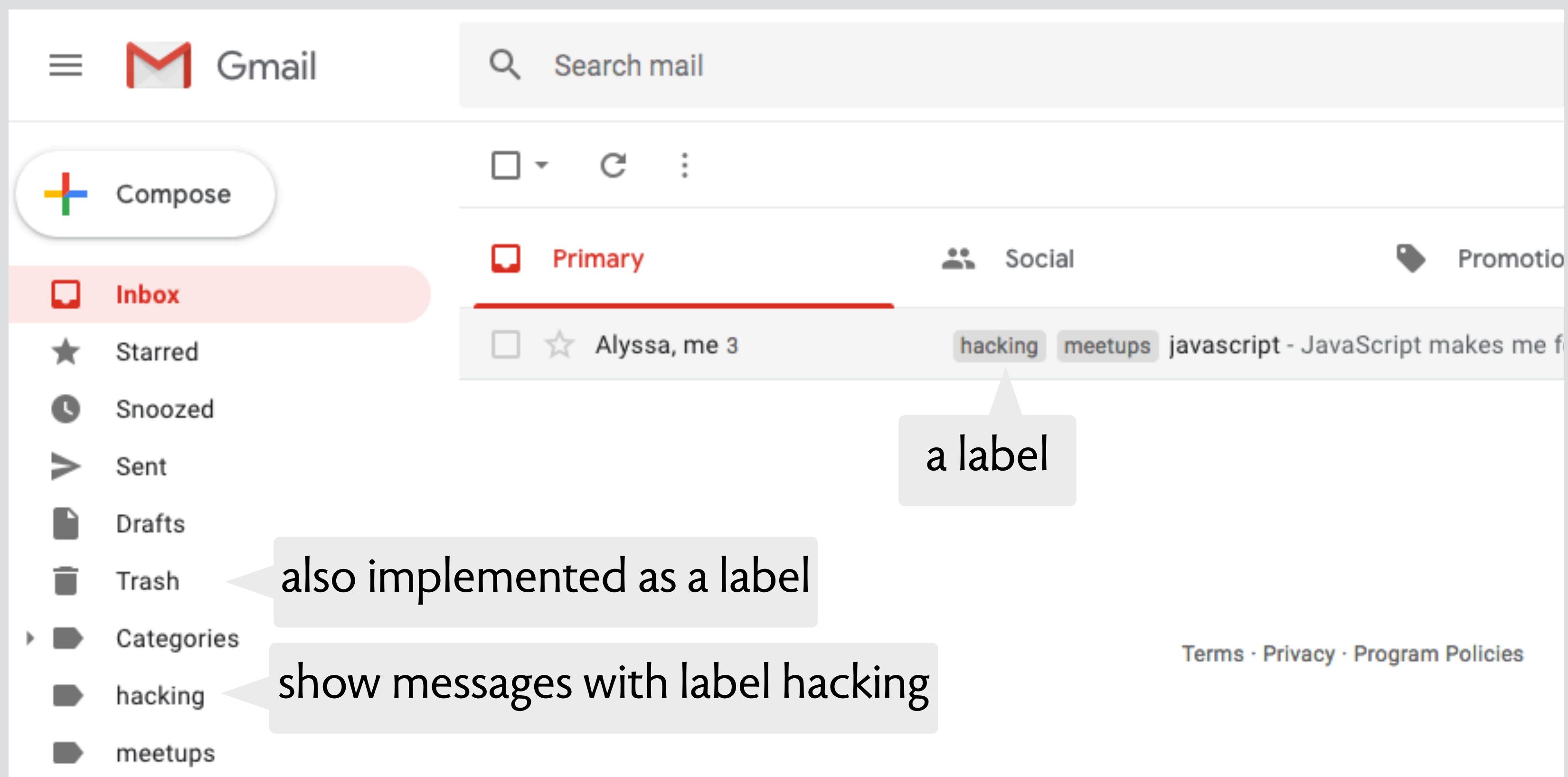
loosen



dimmers with separate controls

rotary dimmer switch

# tighten: label and trash concepts in Gmail



# what's the sync?



## concept Trash

### purpose allow undeletion

**principle** if an object is deleted, and the trash is not emptied, it can be restored; if an object is deleted and the trash is emptied, the object is gone but its space is regained

### actions

delete an object

restore an object

empty the trash



## concept Label

### purpose organize items

**principle** if label is added to an item and not removed, then filtering on that label will display that item

### actions

add label to an item

remove label from an item

filter on a set of labels

## sync rules

**when** delete i (Trash) **also** add '*trashed*' to i (Label) **and vice versa**  
**when** restore i (Trash) **also** remove '*trashed*' to i (Label) **and vv**

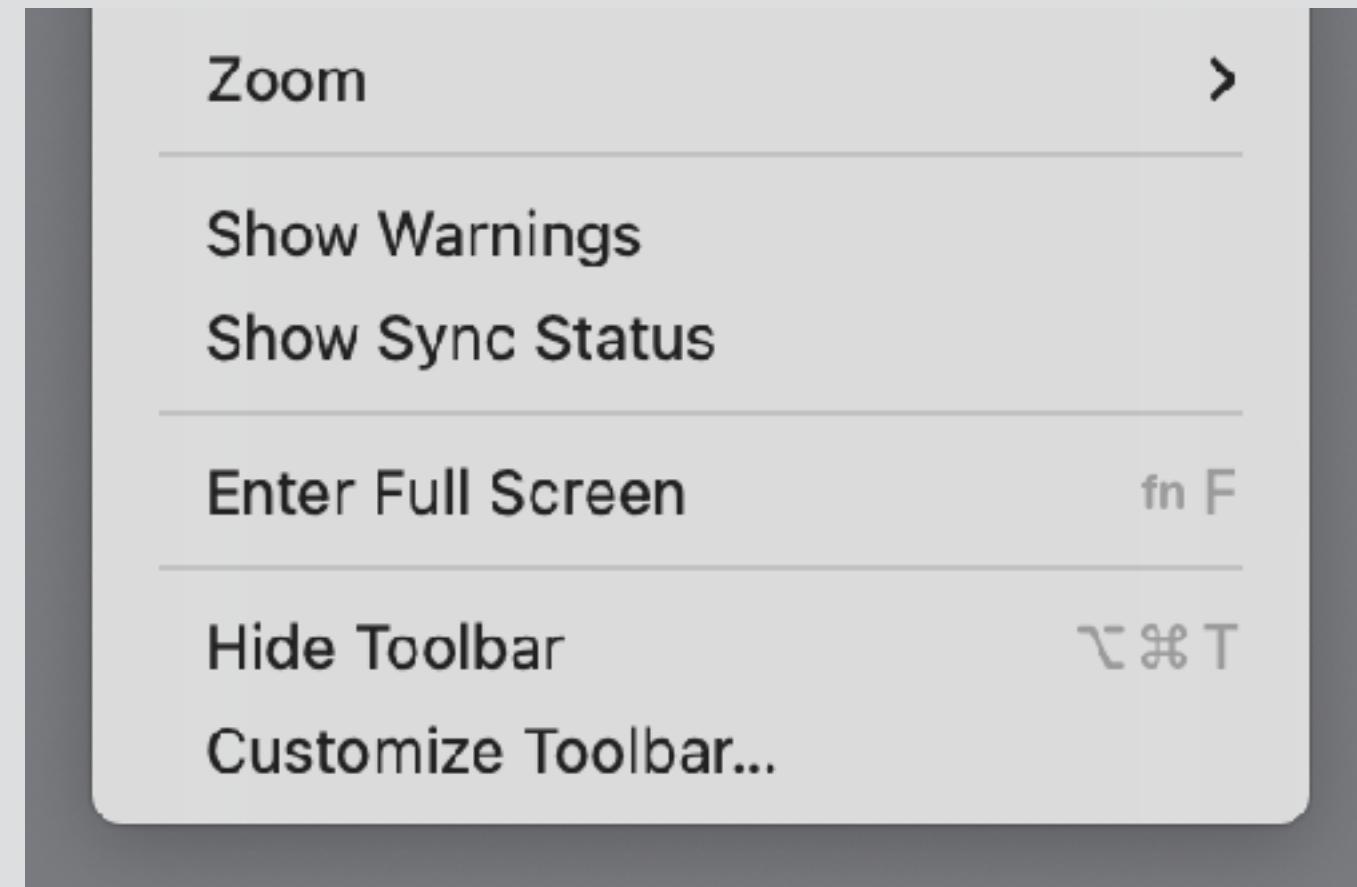
# a tricky aspect of this synchronization...

The image displays four sequential screenshots of a Gmail search interface, showing how different search filters affect message synchronization across various accounts.

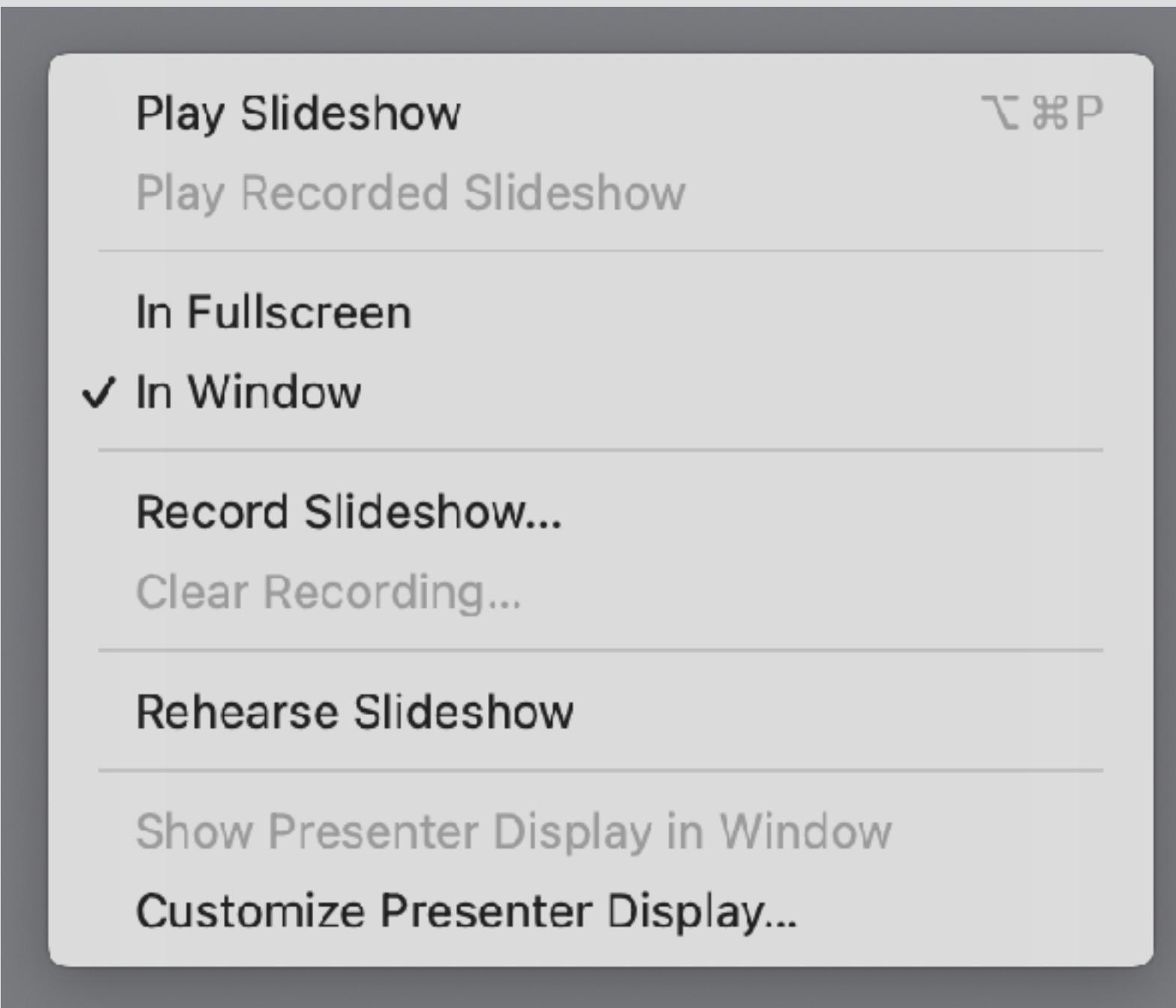
- Top Screenshot:** A search for "label:trash". A callout box on the left says "click on trash". The results show two messages: one from "me, Alyssa" and one from "Andy from Google". The message from Alyssa has a yellow "Updates" label.
- Second Screenshot:** A search for "label:todo label:trash". A callout box on the left says "filter on todo and trash". The results show one message from "me, Alyssa" in the trash, which is also labeled "Updates".
- Third Screenshot:** A search for "label:todo". A callout box on the left says "filter on todo label". The results show no messages, with a message at the bottom stating "There are no conversations with this label."
- Bottom Screenshot:** A search for "label:todo OR label:meetup". A callout box on the left says "filter on something else". The results show a message from "me, Alyssa" in the trash, which is also labeled "Updates".

In all screenshots, the search bar shows the filter applied, and the message list includes the "Updates" label. The "Updates" label is only present on the messages from "me, Alyssa" because they are in the trash, which is where the "Updates" label is typically applied by Gmail's sync logic.

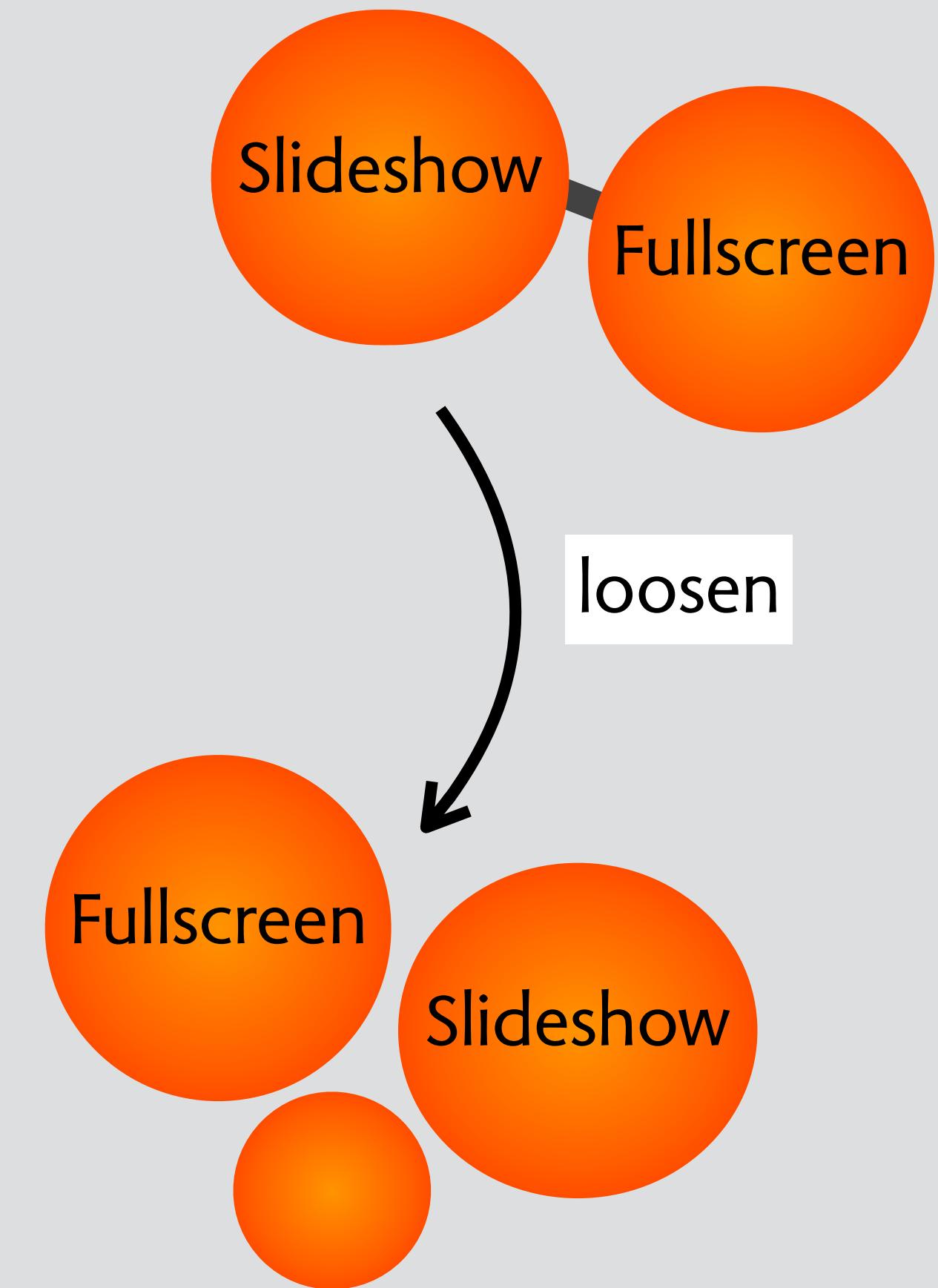
# loosen: slideshow and full screen



full screen toggle  
emerges as concept  
(c. 2010?)



play-in-window option  
turn off synchronization  
(2021)



using concepts  
to clarify privacy

# some social media scenarios: what rules some out?

Alyssa posts item 1  
Ben posts item 2  
Alyssa upvotes item 2  
Ben tags Cy in item 1



Alyssa posts item 1  
Ben posts item 1  
Alyssa upvotes item 1  
Ben tags Cy in item 1



violates behavior  
of Post concept

Alyssa posts item 1  
Alyssa upvotes item 2  
Ben posts item 2  
Ben tags Cy in item 1



violates basic  
existence rule

*now take Friend concept into account*

Alyssa friends Ben  
Alyssa posts item 1  
Ben upvotes item 1

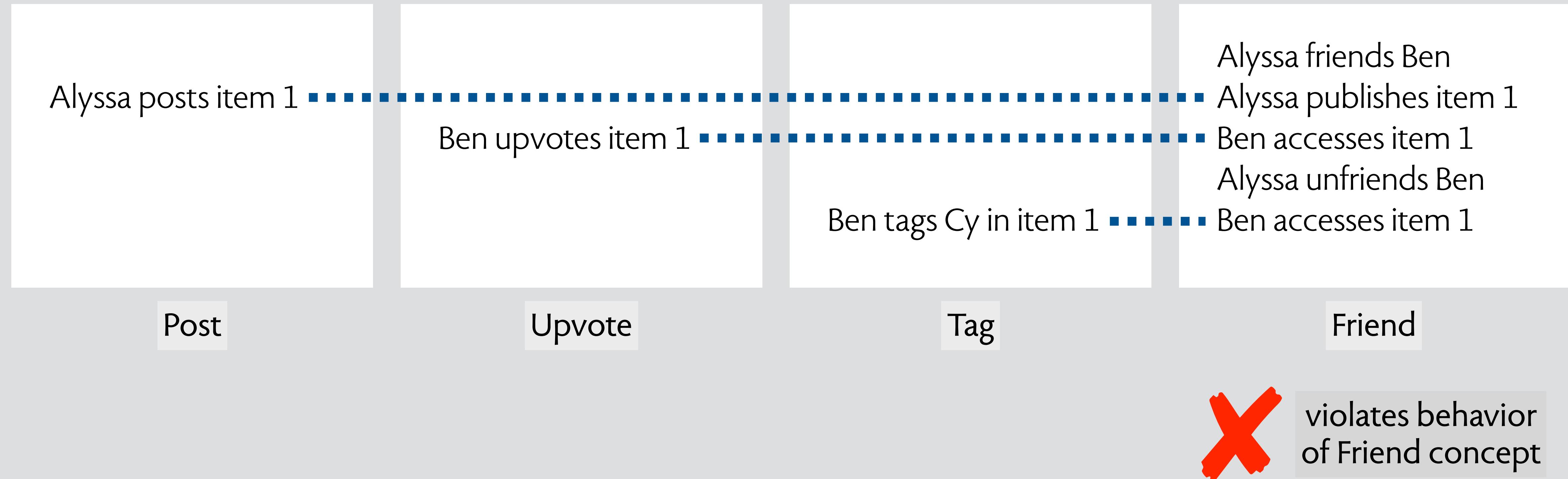


Alyssa friends Ben  
Alyssa posts item 1  
Ben upvotes item 1  
Alyssa unfriends Ben  
Ben tags Cy in item 1



violates behavior  
of Friend concept

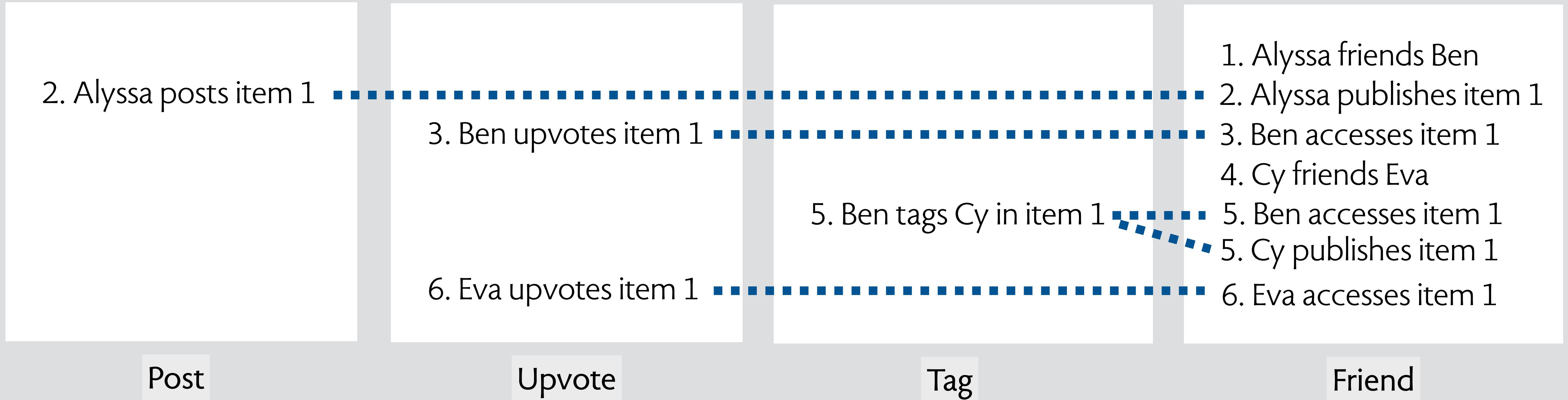
# breaking the scenario into concepts



sync rules

**when** u posts i (Post) **also** u publishes i (Friend)  
**when** u upvotes i (Upvote) **also** u accesses i (Friend)  
**when** u tags u' in i (Tag) **also** u accesses i (Friend)

# a confusing Facebook sync



sync rules

**when** u posts i (Post) **also** u publishes i (Friend)  
**when** u upvotes i (Upvote) **also** u accesses i (Friend)  
**when** u tags u' in i (Tag) **also** u accesses i (Friend)  
**when** u tags u' in i (Tag) **also** u' publishes i (Friend)

spotting  
sync problems

AS

**Arvind Satyanarayan**

November 15, 2018 at 2:04 PM

Re: TALK: Monday 11-19-2018 Kanit (Ham) Wongsuphasawat: No...

[Details](#)

Cc: [seminars@csail.mit.edu](mailto:seminars@csail.mit.edu), [HCI-Seminar@lists.csail.mit.edu](mailto:HCI-Seminar@lists.csail.mit.edu)



This message is from a mailing list.

[Unsubscribe](#)

**Despite some erroneous messages sent to this list accidentally, Kanit's talk is happening!  
Please join us on Monday.**

2:14 58%

⌚ ⚡ ⚡ 64%



HCI Seminar

Wednesday, Dec



Daniel's Calendar

Delete

Duplicate

Copy to...

Help & feedback

seminar announced as **email** to listserv with attached calendar event

event **installed** automatically in user's calendar

user **deletes** event from calendar

**Canceling and deleting events in the Google Calendar mobile app is similar to on a desktop.**

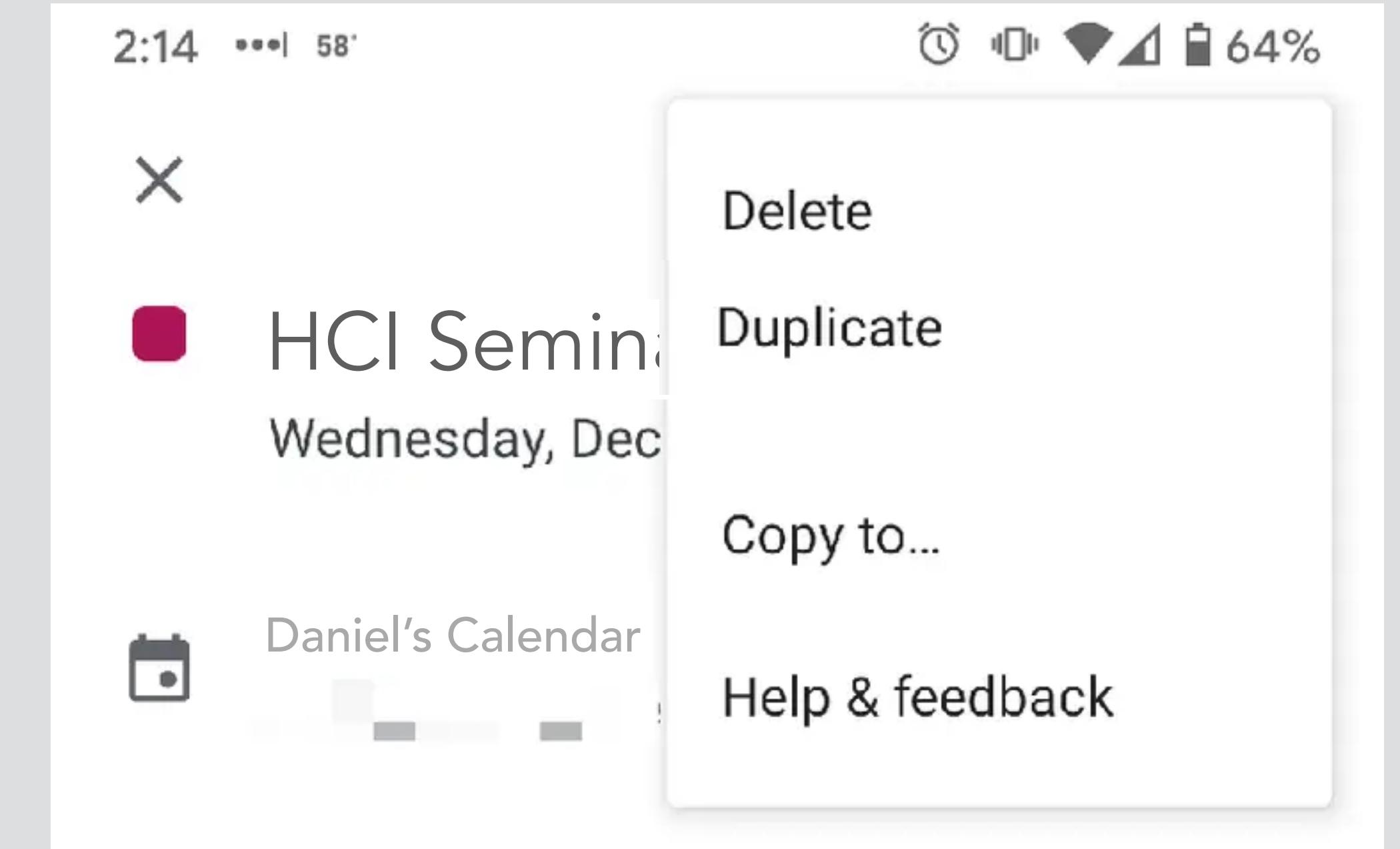
1. First, open Google Calendar.
2. Tap on the event you wish to cancel.
3. Press on the three dots in the top right corner of the event window.
4. Select Delete.
5. Tap Delete event. Google Calendar will send a cancellation email to the guests.

Mar 22, 2021

<https://wpamelia.com> › Blog

[How to Cancel an Event in Google Calendar - Amelia booking ...](#)

**cancellation** email automatically sent to other invitees



**concept** Calendar

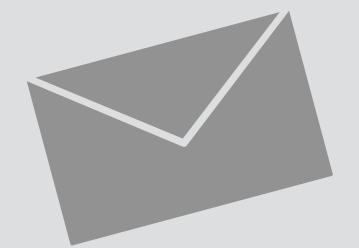
**purpose** record upcoming engagements

**actions**

create an event

delete an event

...



**concept** Invitation

**purpose** coordinate event participants

**actions**

accept invitation

decline invitation

...



## Are you sure you want to delete this event?

Deleting this meeting will remove it from your calendar and notify the invitees that this event has been deleted. You can't undo this action.

Cancel

Delete

a long time problem in iCal too  
how to delete spam calendar events?



## Are you sure you want to delete this event?

Deleting this event will notify the organizer that you're declining the event and deleting it from your calendar. You can't undo this action.

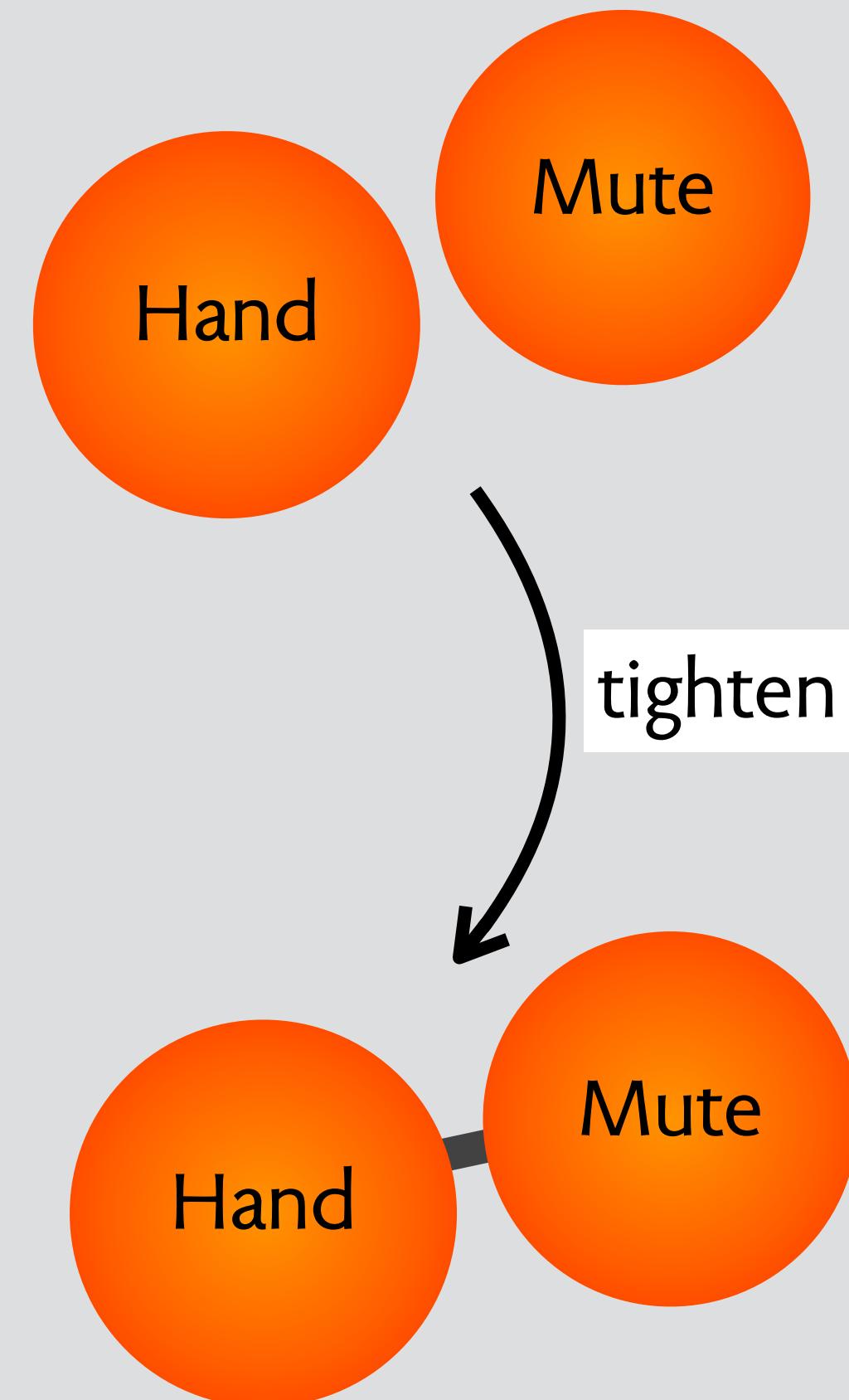
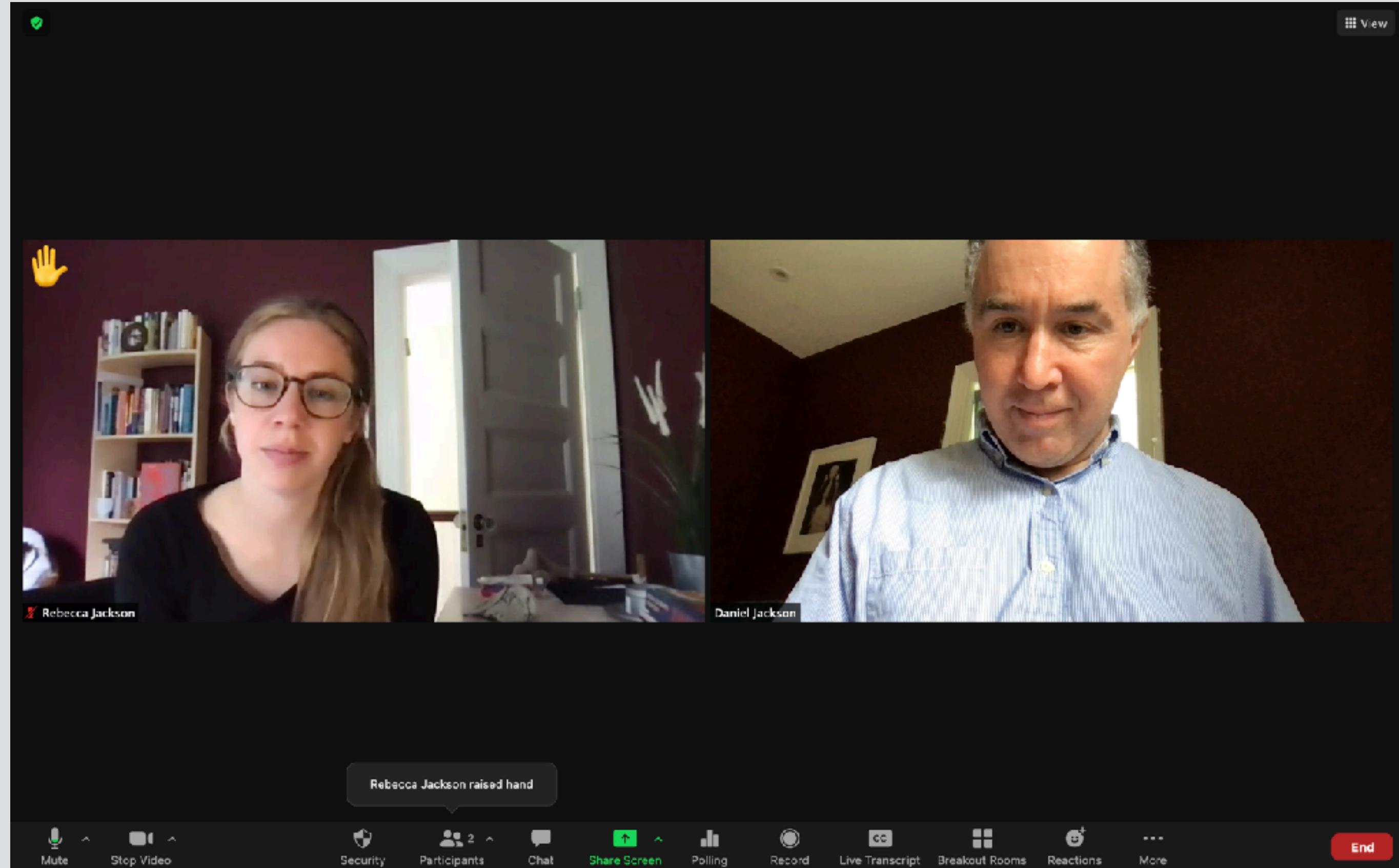
Cancel

Delete and Don't Notify

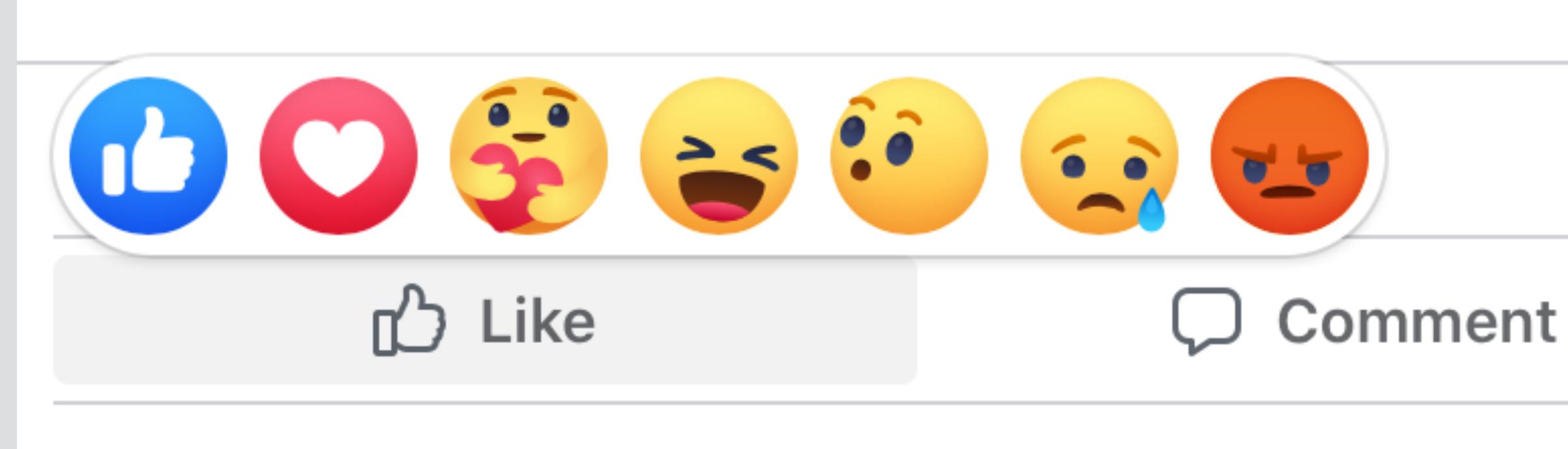
Delete and Notify

resolution to design problem  
make sync optional

# sticky hands in zoom



# what's going on in Facebook reactions?



Monica's blog post: problem that angry reaction = 5 likes?  
Should angry reactions count negatively?

**Can you analyze this example in terms of concept composition?**



**concept** Upvote

**purpose** rank items by popularity

**actions**

upvote an item

...



**concept** Reaction

**purpose** convey emotion to author

**actions**

angry reaction

...

synergy in  
software design

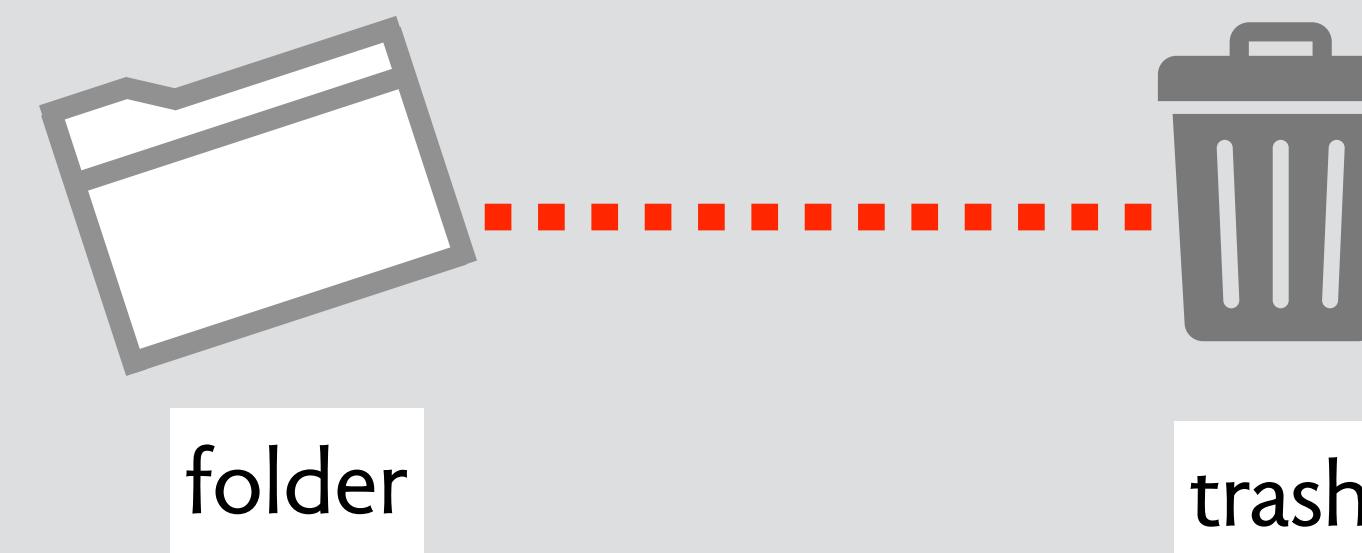
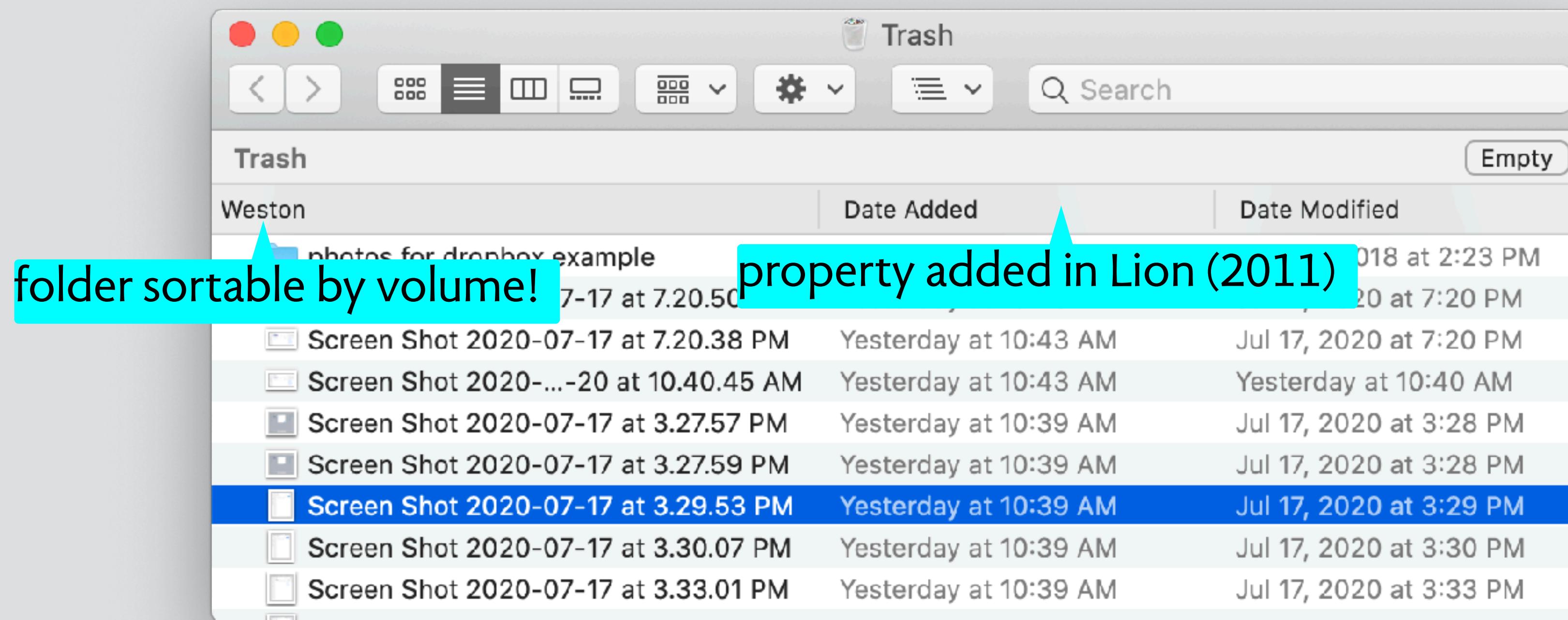
# label syncs: example of synergy

The screenshot shows the Gmail inbox interface. On the left, there's a sidebar with icons forCompose, **Inbox** (which is highlighted with a red oval), Starred, Snoozed, Sent, Drafts, Trash, Categories, hacking, and meetups. The main area has a search bar at the top. Below it are filter buttons for Primary, Social, and Promotions. A message from Alyssa is previewed, showing the subject "hacking meetups javascript - JavaScript makes me f..." and three labels: hacking, meetups, and javascript. At the bottom, it says "0 GB (0%) of 15 GB used" and has Manage and Terms · Privacy · Program Policies links.

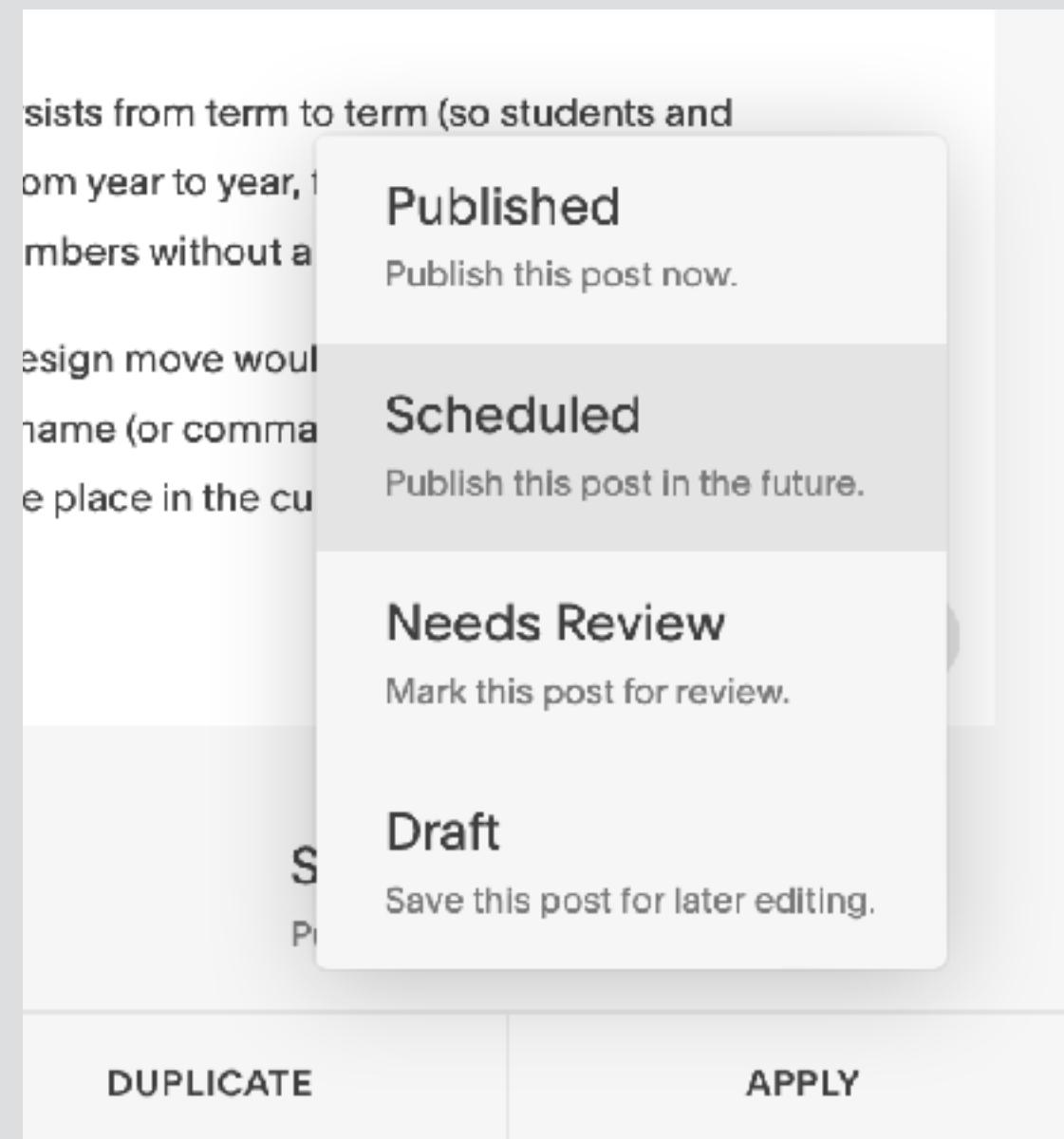
implemented as a label

don't need “display list of drafts” functionality

# macintosh trash (1984-2016+)



# metadata and publication status in Hugo



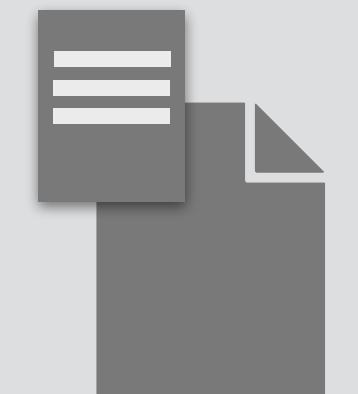
Squarespace: can schedule blog posts but not other pages, and can change pub date independently (only affects order)

A screenshot of a Hugo blog post page. The title is 'The Class Number Dilemma'. Below the title is a subtitle: 'Who knew such a simple thing could be so challenging?'. Underneath that is the publish date: 'February 24, 2022 · 3 min · Daniel Jackson'. Above the page content, there is a code block showing the YAML front matter for the post:

```
author: "Daniel Jackson"
title: "The Class Number Dilemma"
date: "2022-02-24"
description: "A Concept Example in Everyday Life"
summary: "Who knew such a simple thing could be so challenging?"
```

Hugo: any page can have date field to schedule, just set date in future

what does Jekyll do?



Metadata



Schedule

takeaways

# takeaways

## **composition by synchronization**

simpler than procedure call

preserves independence of concepts

## **two separate questions**

how do the concepts behave?

how are they synchronized?

## **synergy**

a clever and powerful strategy

but often requires some cleverness

<http://tiny.cc/61040-fa22-mud>

<http://tiny.cc/61040-fa22-feedback>