how to design innovative software

Daniel Jackson · Technion · March 27, 2024

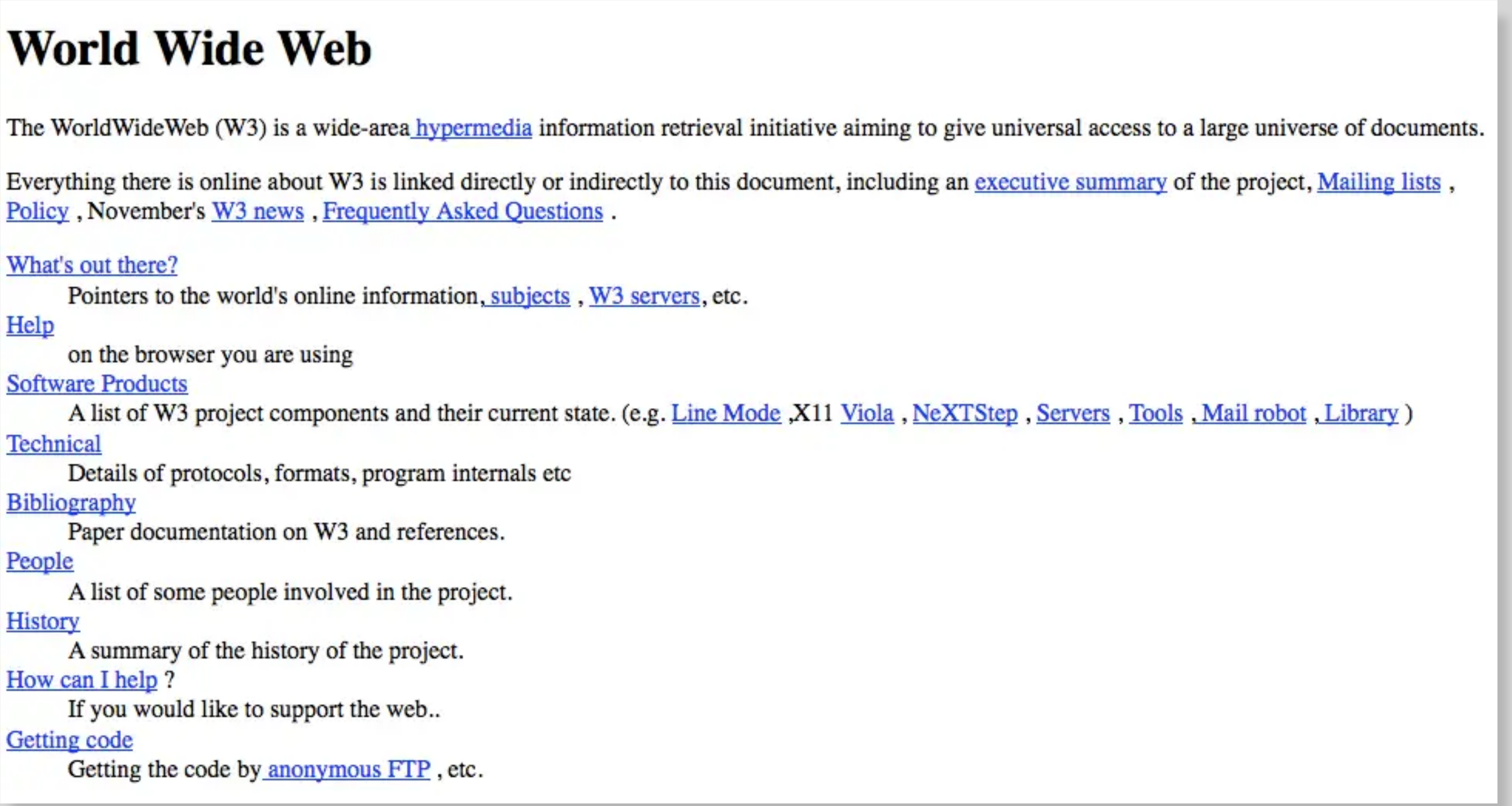
some questions

what does innovation in software **look like**?
what makes a software product **successful**?

scenarios of success

story #1:
TBL’s Web
(1989)

what was novel about the web?



World Wide Web

The WorldWideWeb (W3) is a wide-area hypermedia information retrieval initiative aiming to give universal access to a large universe of documents.

Everything there is online about W3 is linked directly or indirectly to this document, including an executive summary of the project, Mailing lists , Policy , November's W3 news , Frequently Asked Questions .

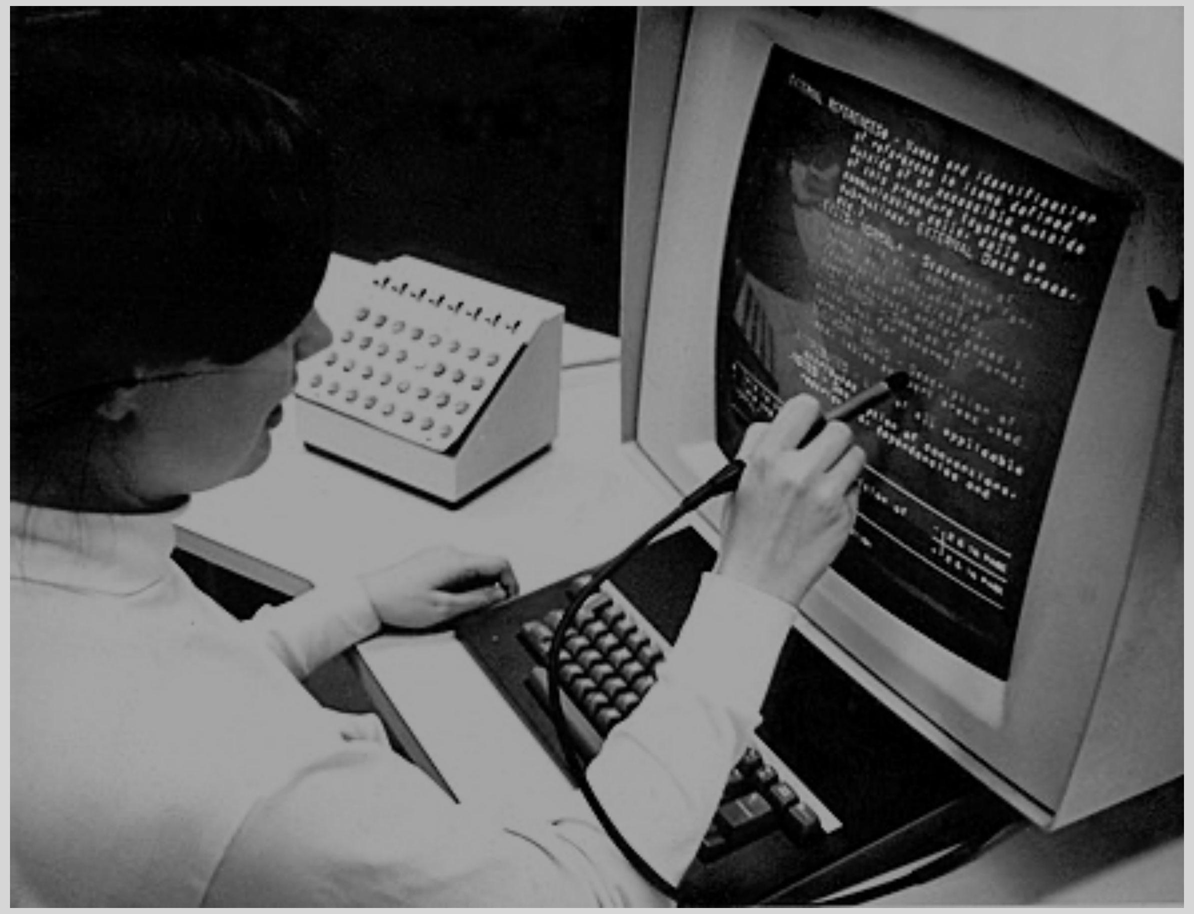
What's out there?
    Pointers to the world's online information, subjects , W3 servers, etc.
Help
    on the browser you are using
Software Products
    A list of W3 project components and their current state. (e.g. Line Mode ,X11 Viola , NeXTStep , Servers , Tools , Mail robot , Library)
Technical
    Details of protocols, formats, program internals etc
Bibliography
    Paper documentation on W3 and references.
People
    A list of some people involved in the project.
History
    A summary of the history of the project.
How can I help ?
    If you would like to support the web..
Getting code
    Getting the code by anonymous FTP , etc.

http://info.cern.ch/hypertext/WWW/TheProject.html

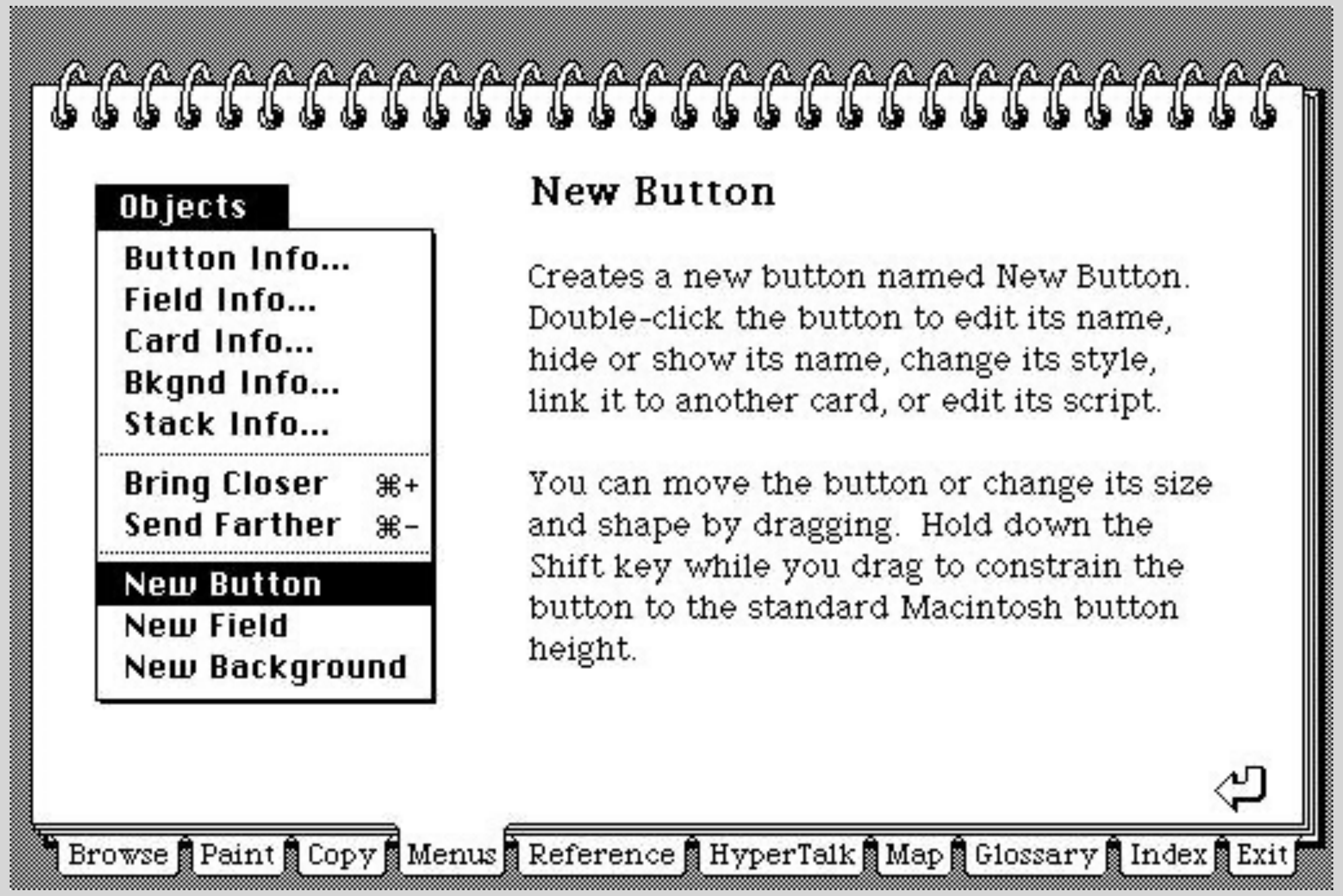
the technology?

NeXT computer
660MB hard disk
Motorola 68030, 25MHz
17” monitor with Display Postscript
built in ethernet connectivity

all old ideas?



Hypertext Editing System
(Nelson & van Dam, 1967)

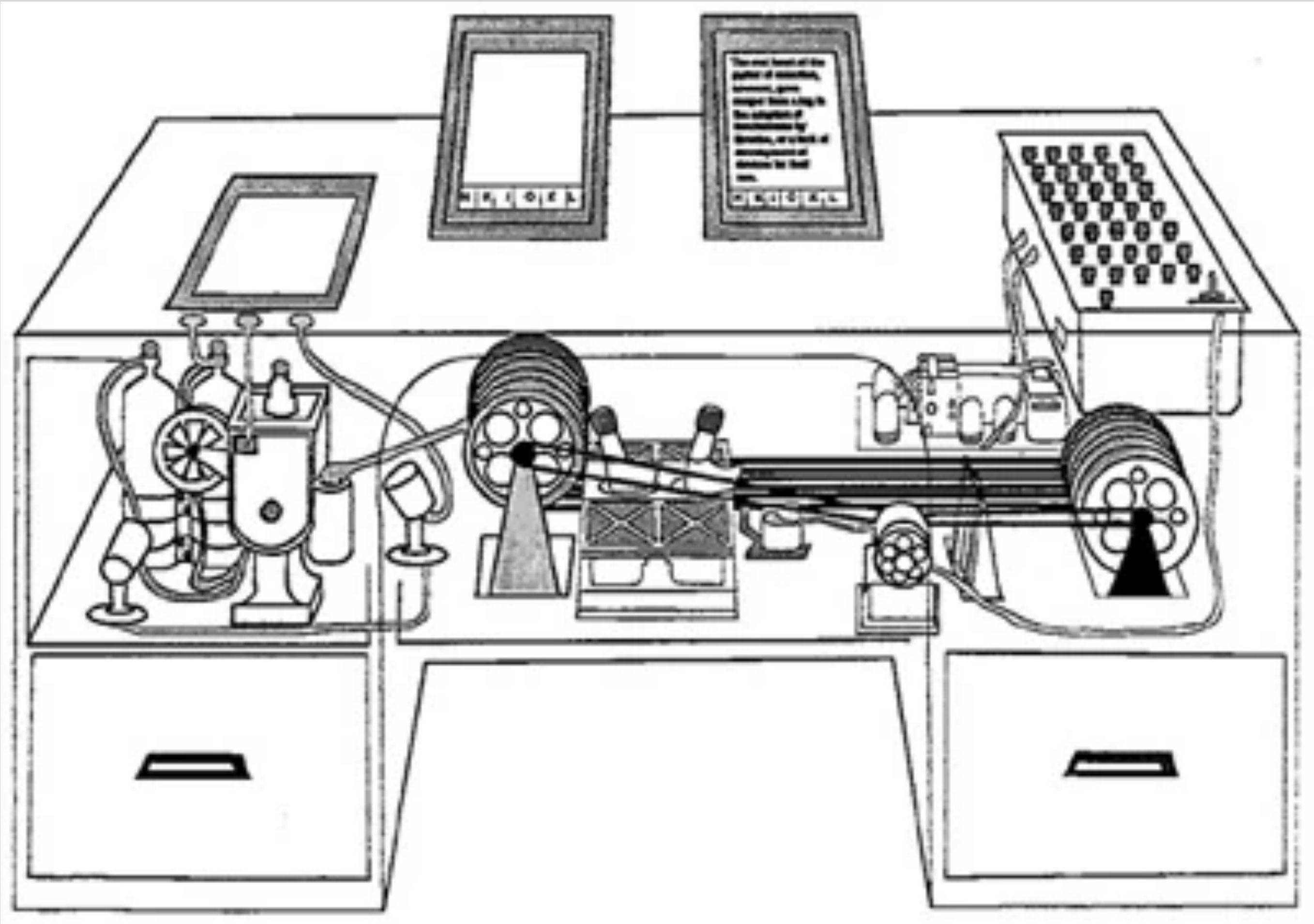


New Button

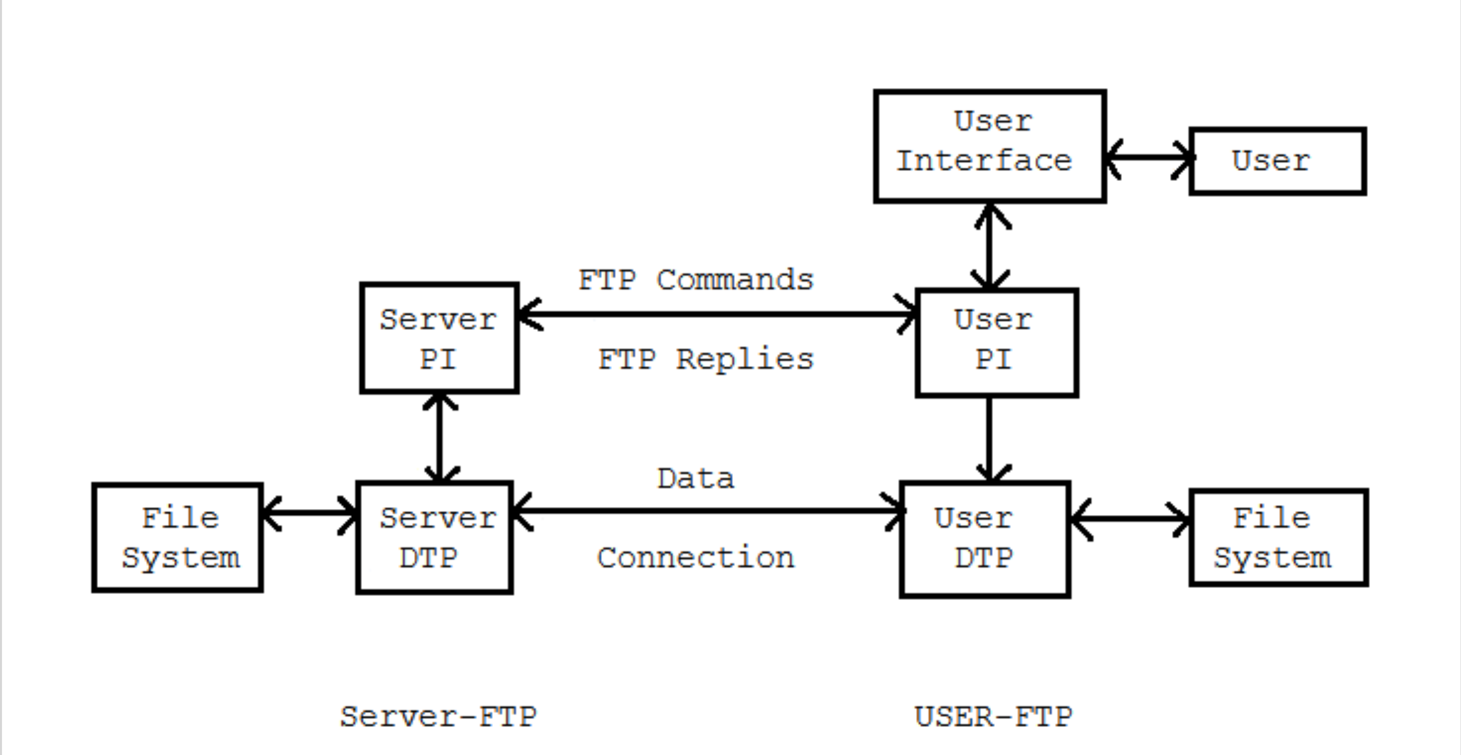
Creates a new button named New Button. Double-click the button to edit its name, hide or show its name, change its style, link it to another card, or edit its script.

You can move the button or change its size and shape by dragging. Hold down the Shift key while you drag to constrain the button to the standard Macintosh button height.

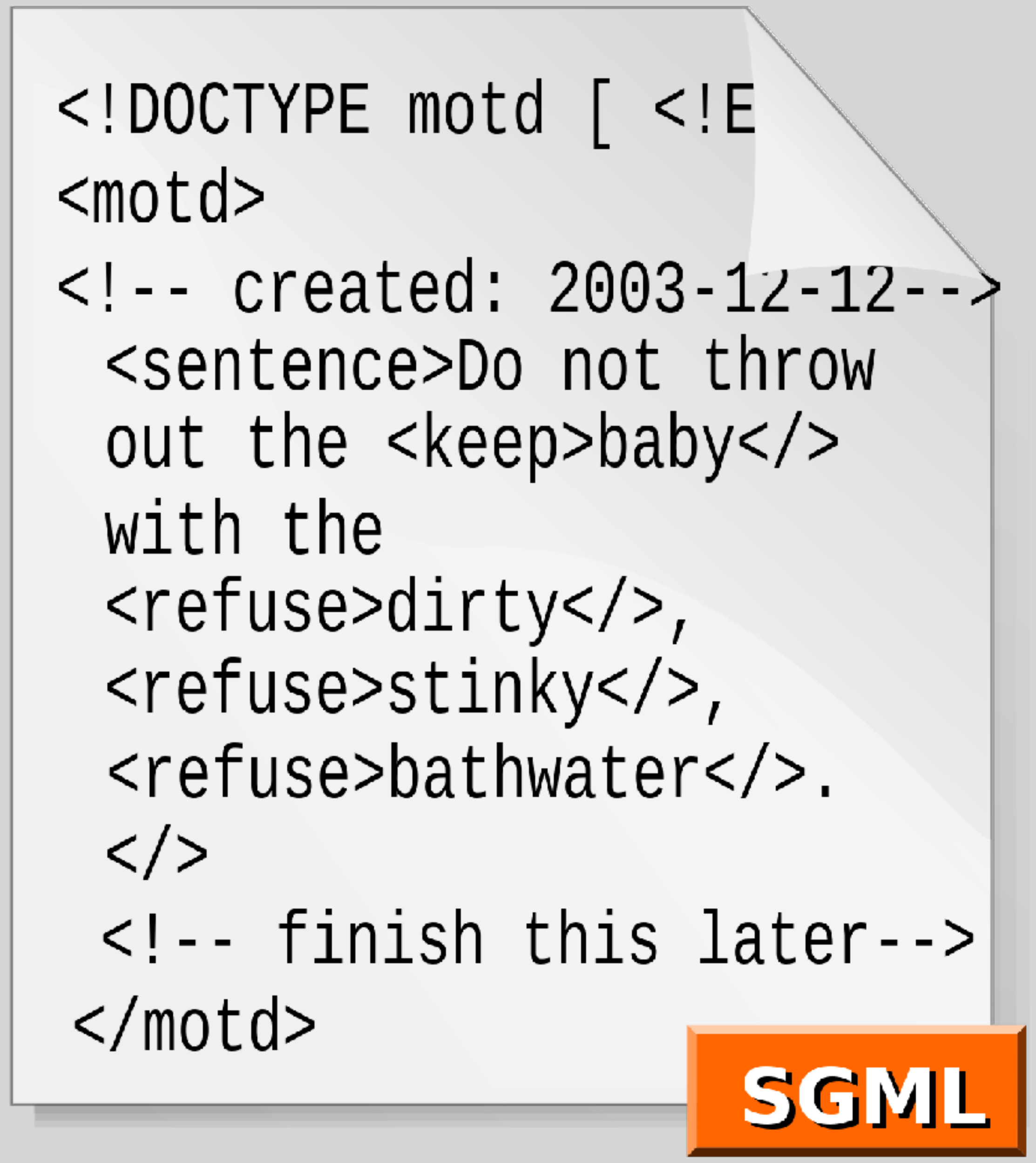
Apple HyperCard
(Bill Atkinson, 1987)



Memex
(Vannevar Bush, 1945)



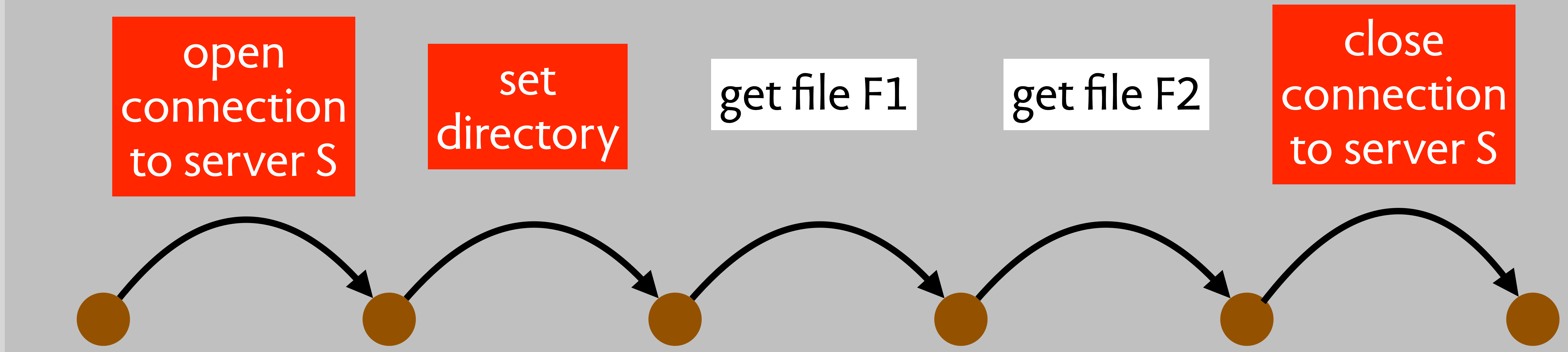
File Transfer Protocol
(Abhay Bhushan, 1971)



```
<!DOCTYPE motd [ <!E
<motd>
<!-- created: 2003-12-12-->
 <sentence>Do not throw
 out the <keep>baby</>
 with the
 <refuse>dirty</>,
 <refuse>stinky</>,
 <refuse>bathwater</>.
 </>
 <!-- finish this later-->
</motd>
```

SGML
(Charles Goldfarb, 1986)

a new way to get content



open connection to server S

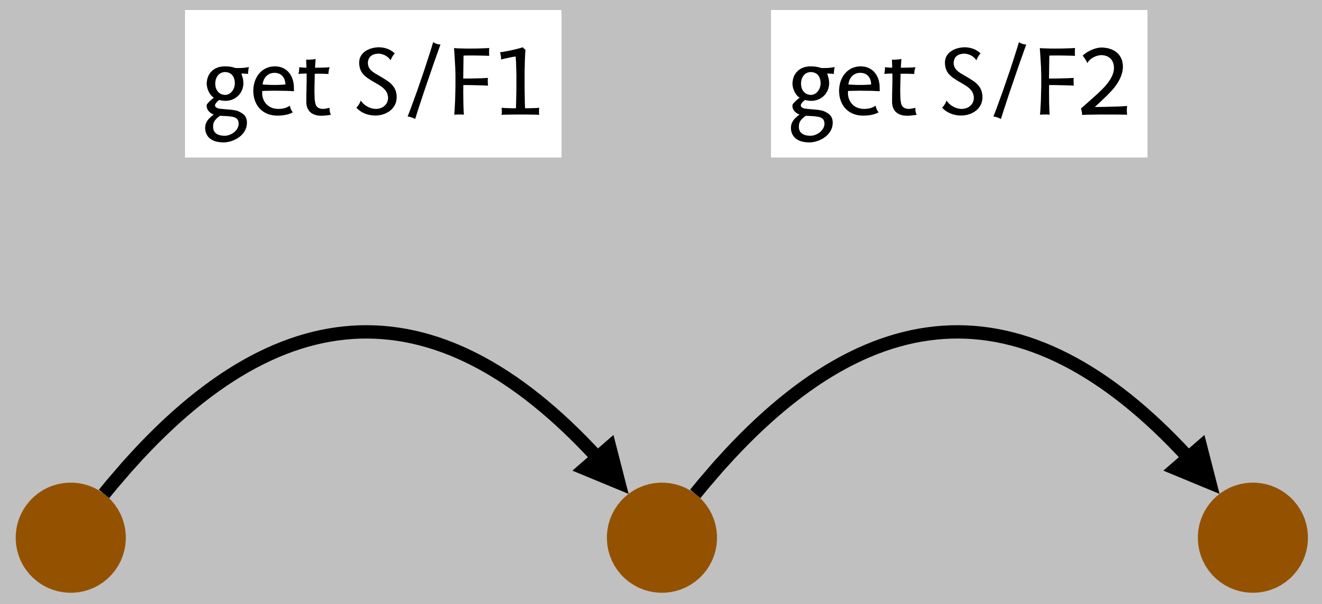
set directory

get file F1

get file F2

close connection to server S

old scenario with annoying constraints

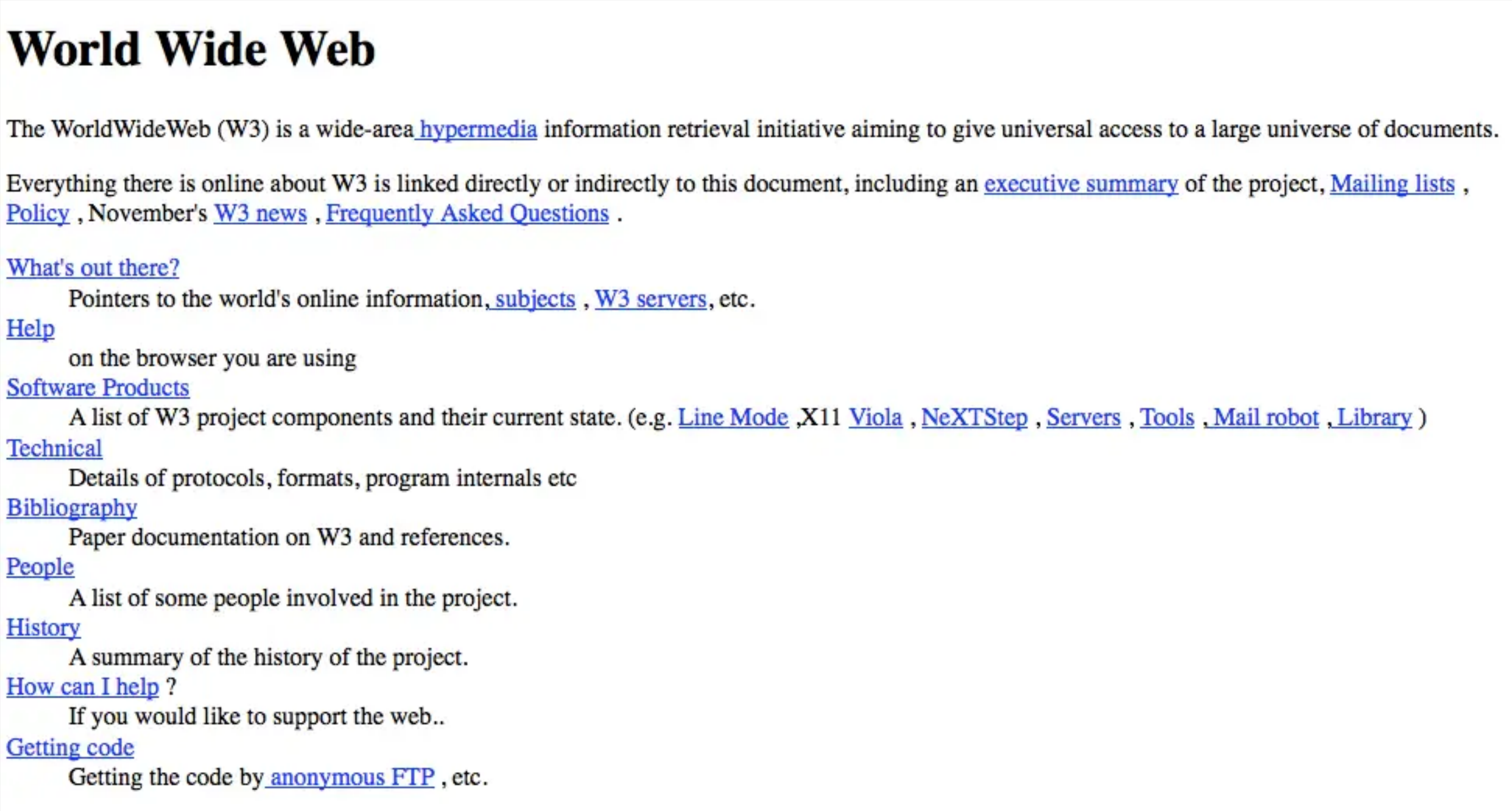


get S/F1

get S/F2

new scenario with constraints removed

this new scenario is embodied in the concept of the URL



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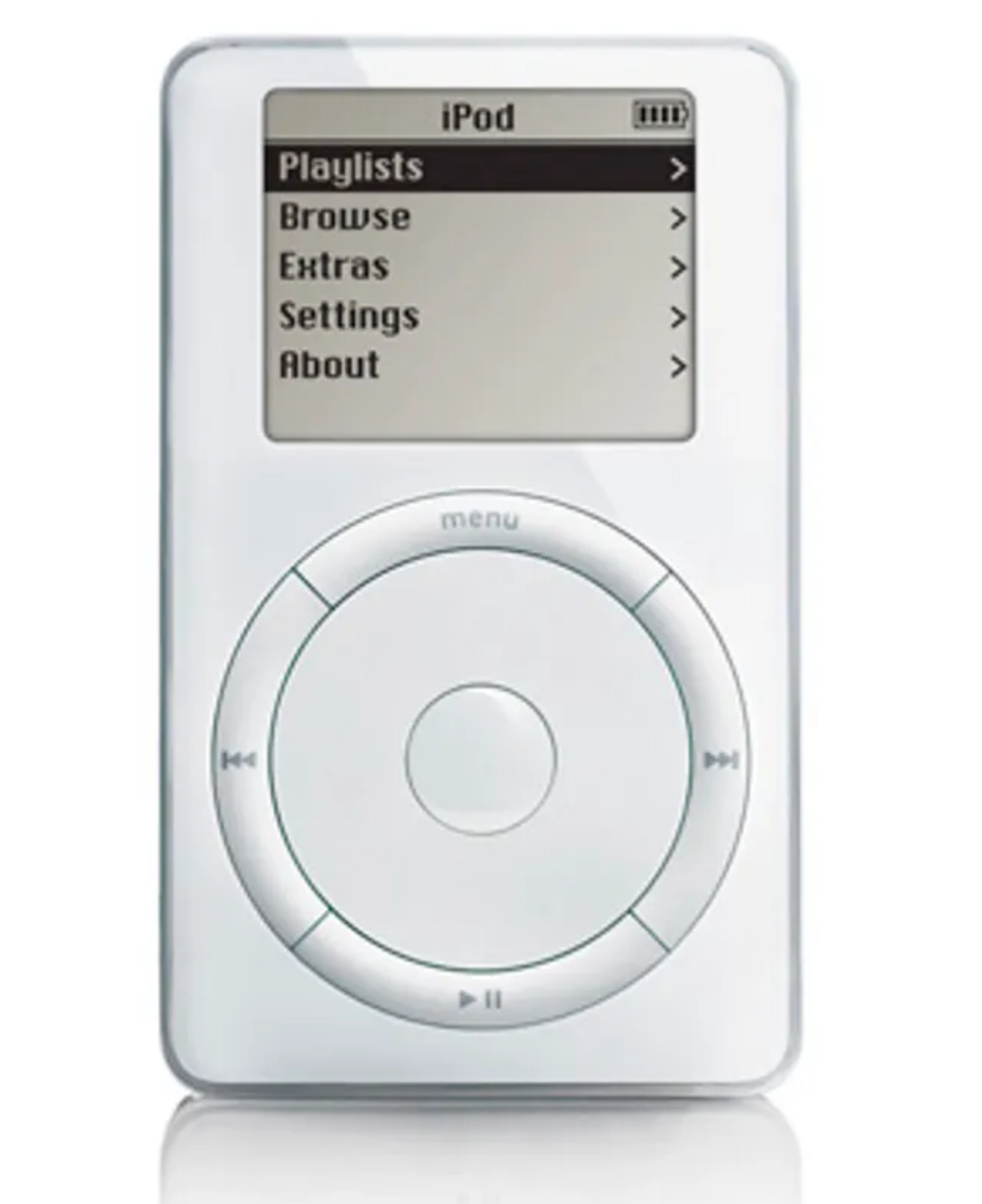
: Getting the code by anonymous FTP , etc.

http://info.cern.ch/hypertext/WWW/TheProject.html

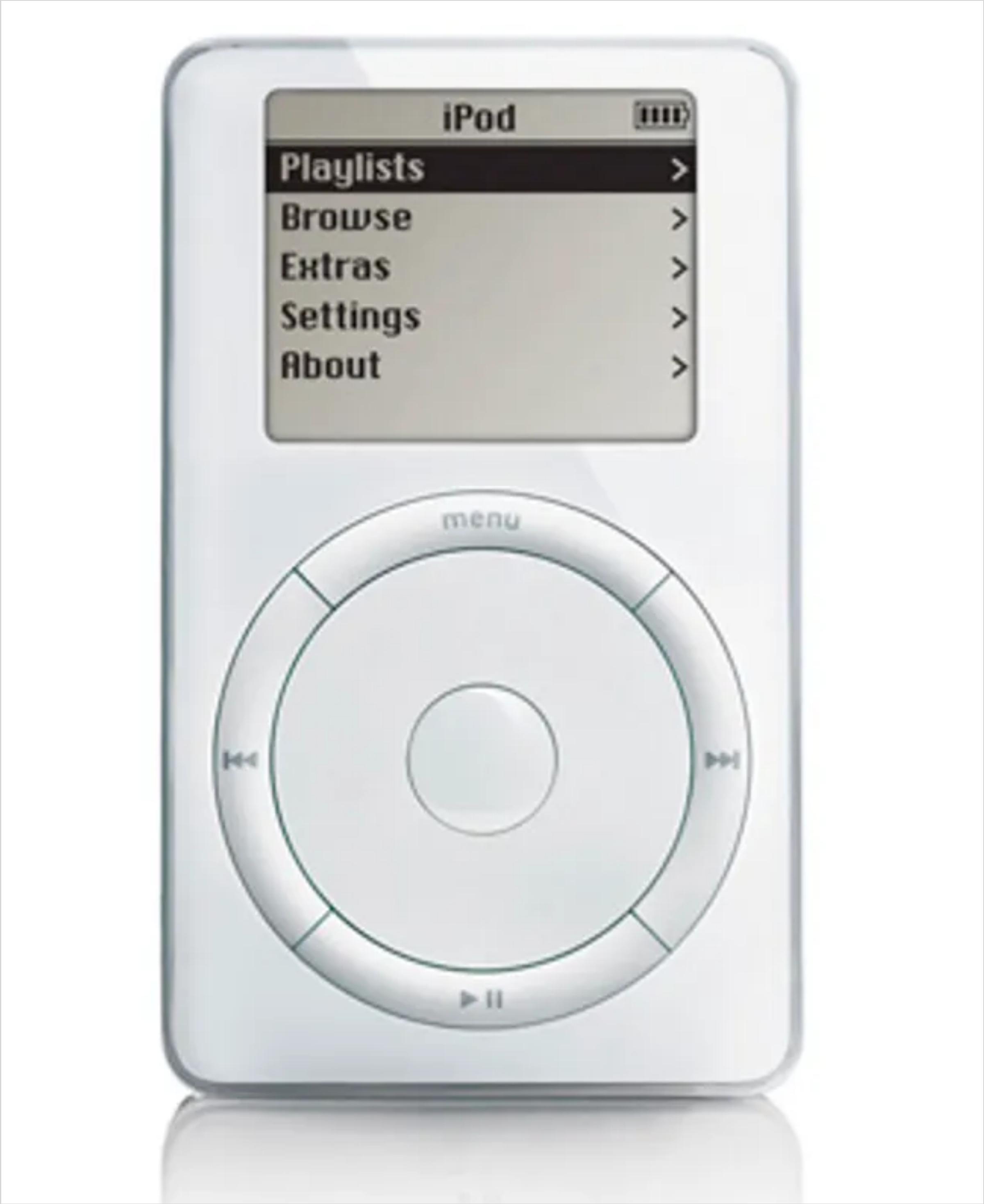
story #2:
iPod (2001)

what was novel about the iPod?

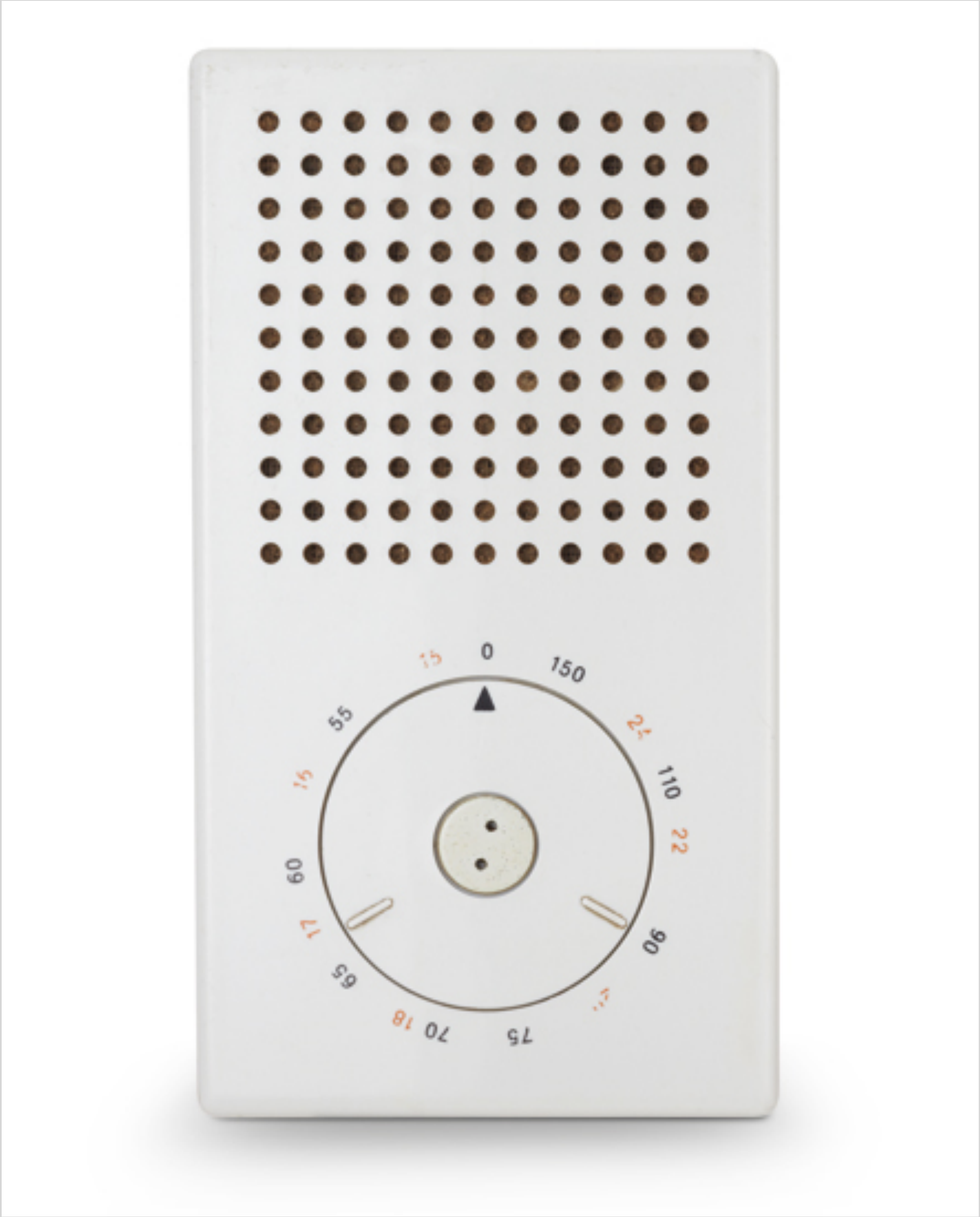


Apple iPod
(2001)

a new industrial design?



Apple iPod
(Jony Ive, 2001)



Braun Pocket Radio T3
(Dieter Rams, 1958)

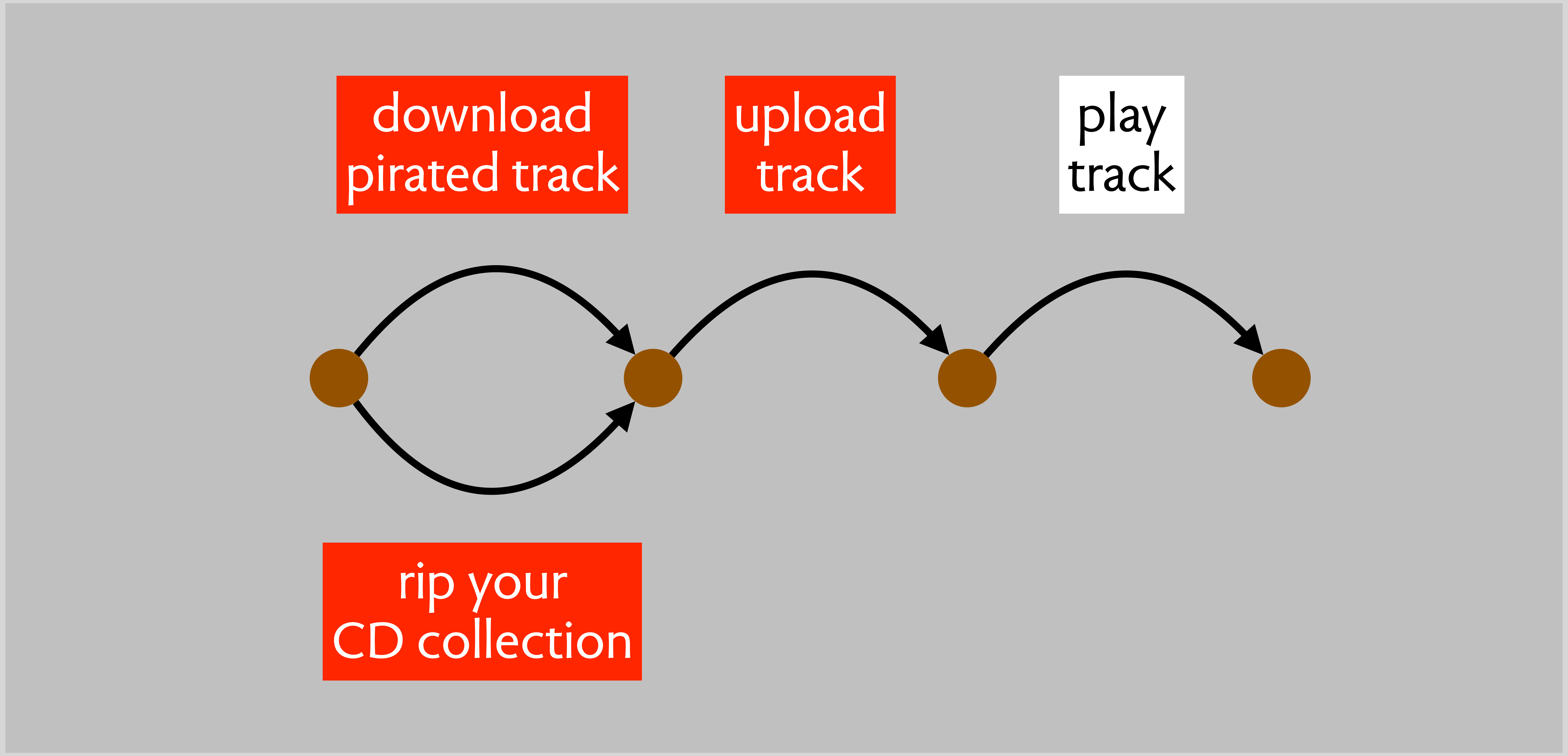
a technology breakthrough?

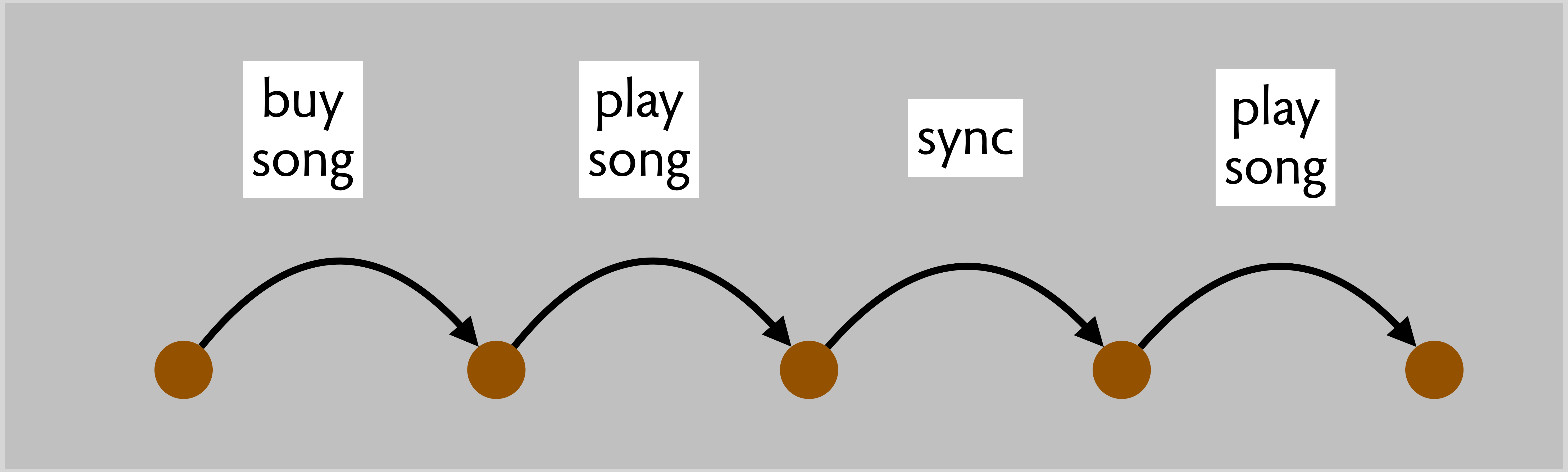
iPod 5GB drive
(Toshiba, 2001)

FireWire serial bus
(Apple, 1995)

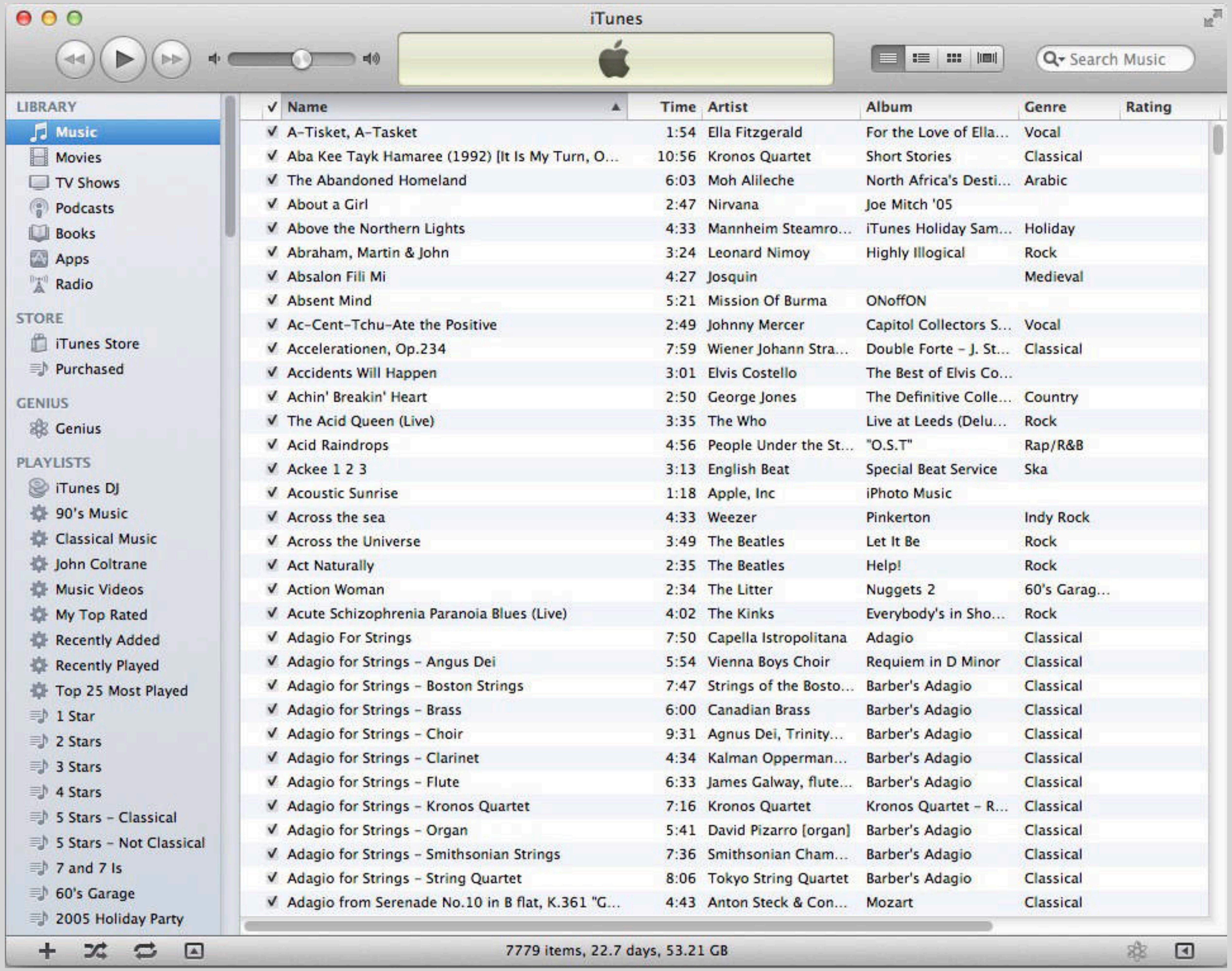
Personal Jukebox 5GB drive
(DEC, 1999)

the ipod scenario





supporting cast: iTunes

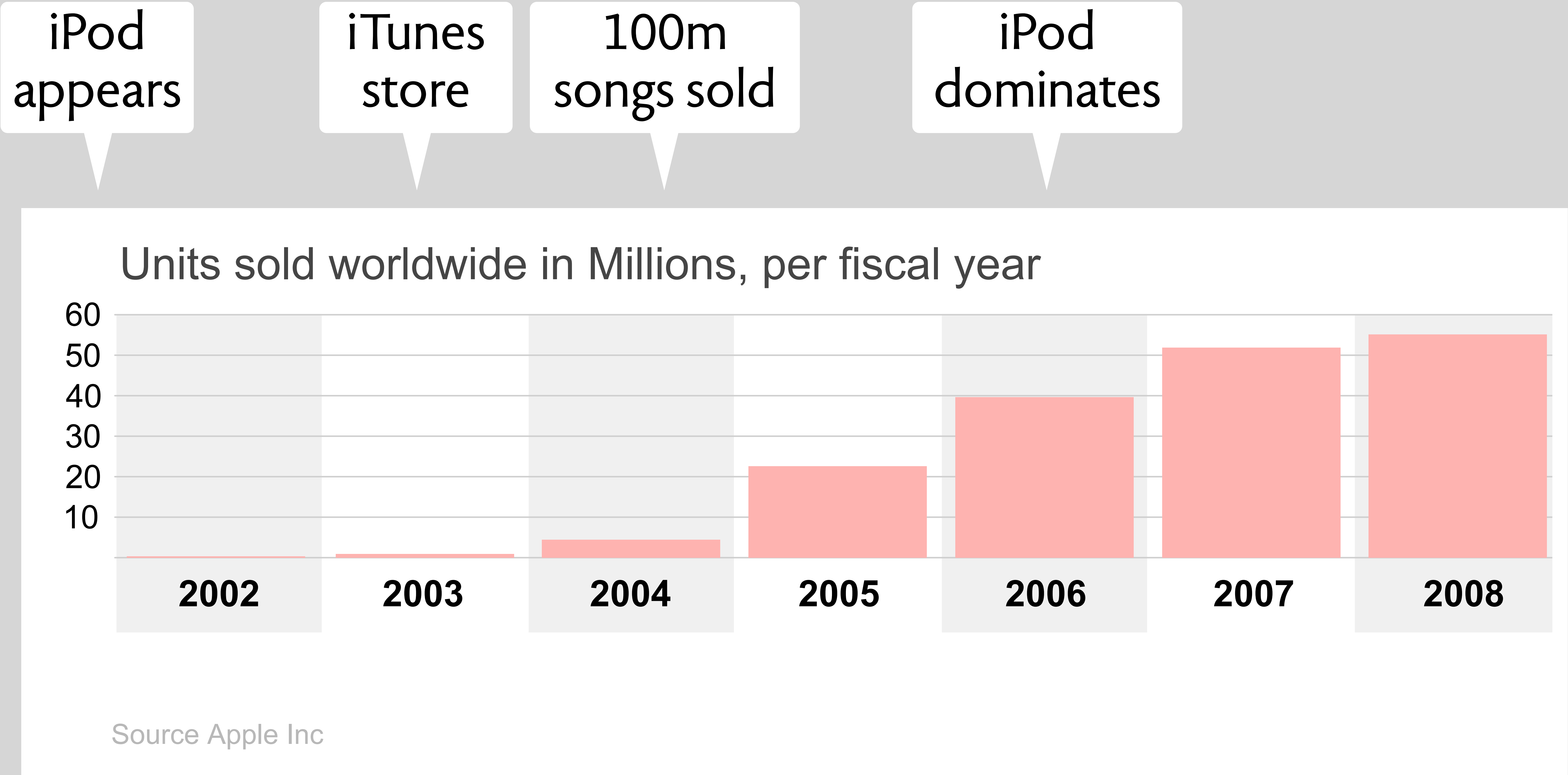


✓	Name	Time	Artist	Album	Genre	Rating
✓	A-Tisket, A-Tasket	1:54	Ella Fitzgerald	For the Love of Ella...	Vocal	
✓	Aba Kee Tayk Hamaree (1992) [It Is My Turn, O...	10:56	Kronos Quartet	Short Stories	Classical	
✓	The Abandoned Homeland	6:03	Moh Alileche	North Africa's Desti...	Arabic	
✓	About a Girl	2:47	Nirvana	Joe Mitch '05		
✓	Above the Northern Lights	4:33	Mannheim Steamro...	iTunes Holiday Sam...	Holiday	
✓	Abraham, Martin & John	3:24	Leonard Nimoy	Highly Illogical	Rock	
✓	Absalon Fili Mi	4:27	Josquin		Medieval	
✓	Absent Mind	5:21	Mission Of Burma	ONoffON		
✓	Ac-Cent-Tchu-Ate the Positive	2:49	Johnny Mercer	Capitol Collectors S...	Vocal	
✓	Accelerationen, Op.234	7:59	Wiener Johann Stra...	Double Forte - J. St...	Classical	
✓	Accidents Will Happen	3:01	Elvis Costello	The Best of Elvis Co...		
✓	Achin' Breakin' Heart	2:50	George Jones	The Definitive Colle...	Country	
✓	The Acid Queen (Live)	3:35	The Who	Live at Leeds (Delu...	Rock	
✓	Acid Raindrops	4:56	People Under the St...	"O.S.T"	Rap/R&B	
✓	Ackee 1 2 3	3:13	English Beat	Special Beat Service	Ska	
✓	Acoustic Sunrise	1:18	Apple, Inc	iPhoto Music		
✓	Across the sea	4:33	Weezer	Pinkerton	Indy Rock	
✓	Across the Universe	3:49	The Beatles	Let It Be	Rock	
✓	Act Naturally	2:35	The Beatles	Help!	Rock	
✓	Action Woman	2:34	The Litter	Nuggets 2	60's Garag...	
✓	Acute Schizophrenia Paranoia Blues (Live)	4:02	The Kinks	Everybody's in Sho...	Rock	
✓	Adagio For Strings	7:50	Capella Istropolitana	Adagio	Classical	
✓	Adagio for Strings - Angus Dei	5:54	Vienna Boys Choir	Requiem in D Minor	Classical	
✓	Adagio for Strings - Boston Strings	7:47	Strings of the Bosto...	Barber's Adagio	Classical	
✓	Adagio for Strings - Brass	6:00	Canadian Brass	Barber's Adagio	Classical	
✓	Adagio for Strings - Choir	9:31	Agnus Dei, Trinity...	Barber's Adagio	Classical	
✓	Adagio for Strings - Clarinet	4:34	Kalman Opperman...	Barber's Adagio	Classical	
✓	Adagio for Strings - Flute	6:33	James Galway, flute...	Barber's Adagio	Classical	
✓	Adagio for Strings - Kronos Quartet	7:16	Kronos Quartet	Kronos Quartet - R...	Classical	
✓	Adagio for Strings - Organ	5:41	David Pizarro [organ]	Barber's Adagio	Classical	
✓	Adagio for Strings - Smithsonian Strings	7:36	Smithsonian Cham...	Barber's Adagio	Classical	
✓	Adagio for Strings - String Quartet	8:06	Tokyo String Quartet	Barber's Adagio	Classical	
✓	Adagio from Serenade No.10 in B flat, K.361 "G...	4:43	Anton Steck & Con...	Mozart	Classical	

7779 items, 22.7 days, 53.21 GB

iTunes Media Player (2001); iTunes Music Store (2003)

explosion in sales came after iTunes took off



iPod appears

iTunes store

100m songs sold

iPod dominates

Units sold worldwide in Millions, per fiscal year

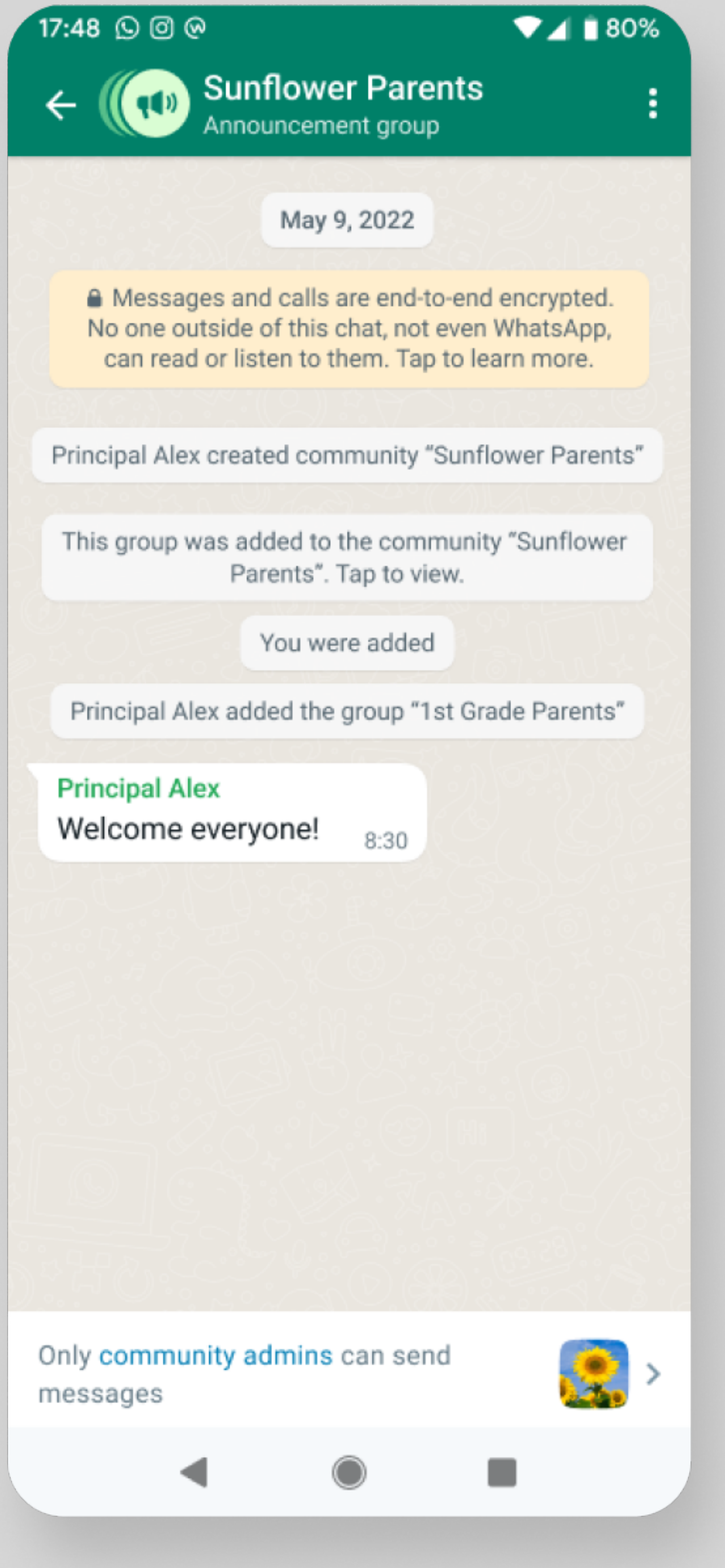
Source Apple Inc

Put some music on.
Built-in clip. 240 songs. Up to 12-hour battery. Just $79. One size fits all.
iPod shuffle

RIP 2d gen iPod Shuffle

story #3 WhatsApp (2009)

what was novel about WhatsApp?



May 9, 2022

Messages and calls are end-to-end encrypted. No one outside of this chat, not even WhatsApp, can read or listen to them. Tap to learn more.

Principal Alex created community "Sunflower Parents"

This group was added to the community "Sunflower Parents". Tap to view.

You were added

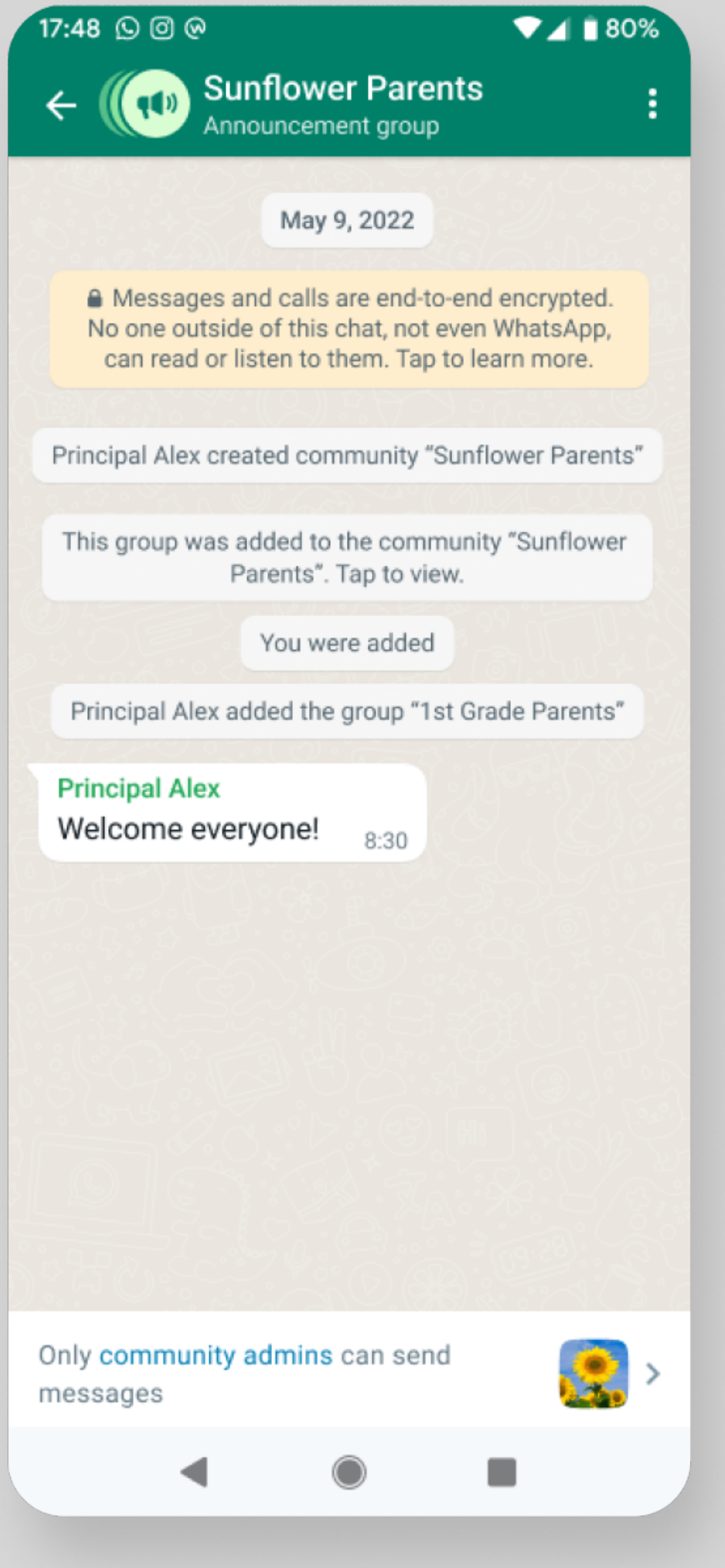
Principal Alex added the group "1st Grade Parents"

Principal Alex
Welcome everyone! 8:30

Only community admins can send messages

WhatsApp (2009)

was it free texting?



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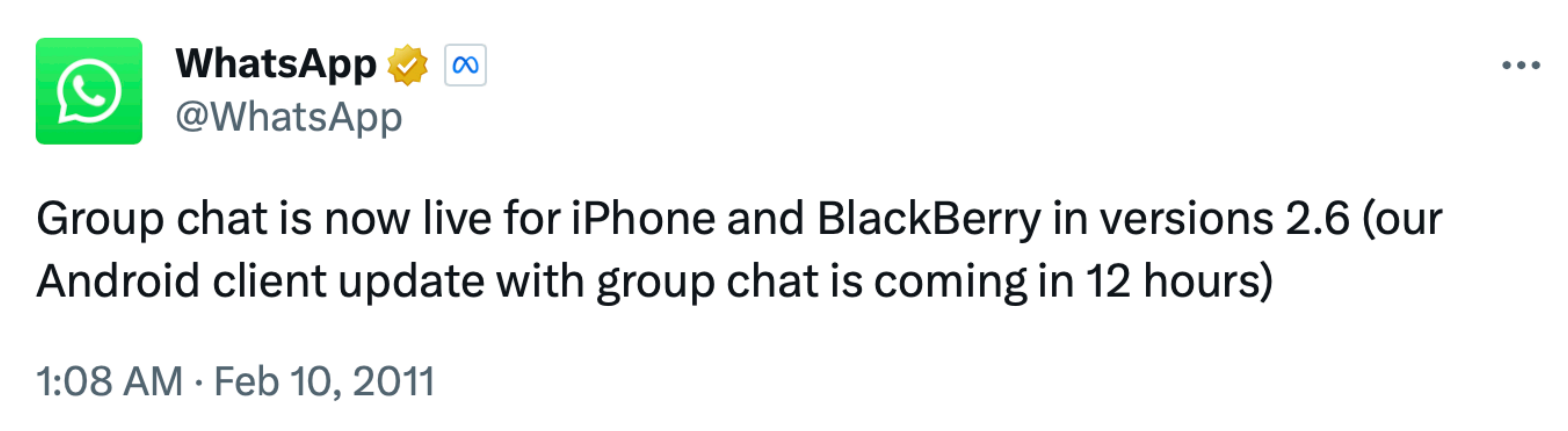
WhatsApp (2009)

first free-texting app
TextFree/Pinger (2006)

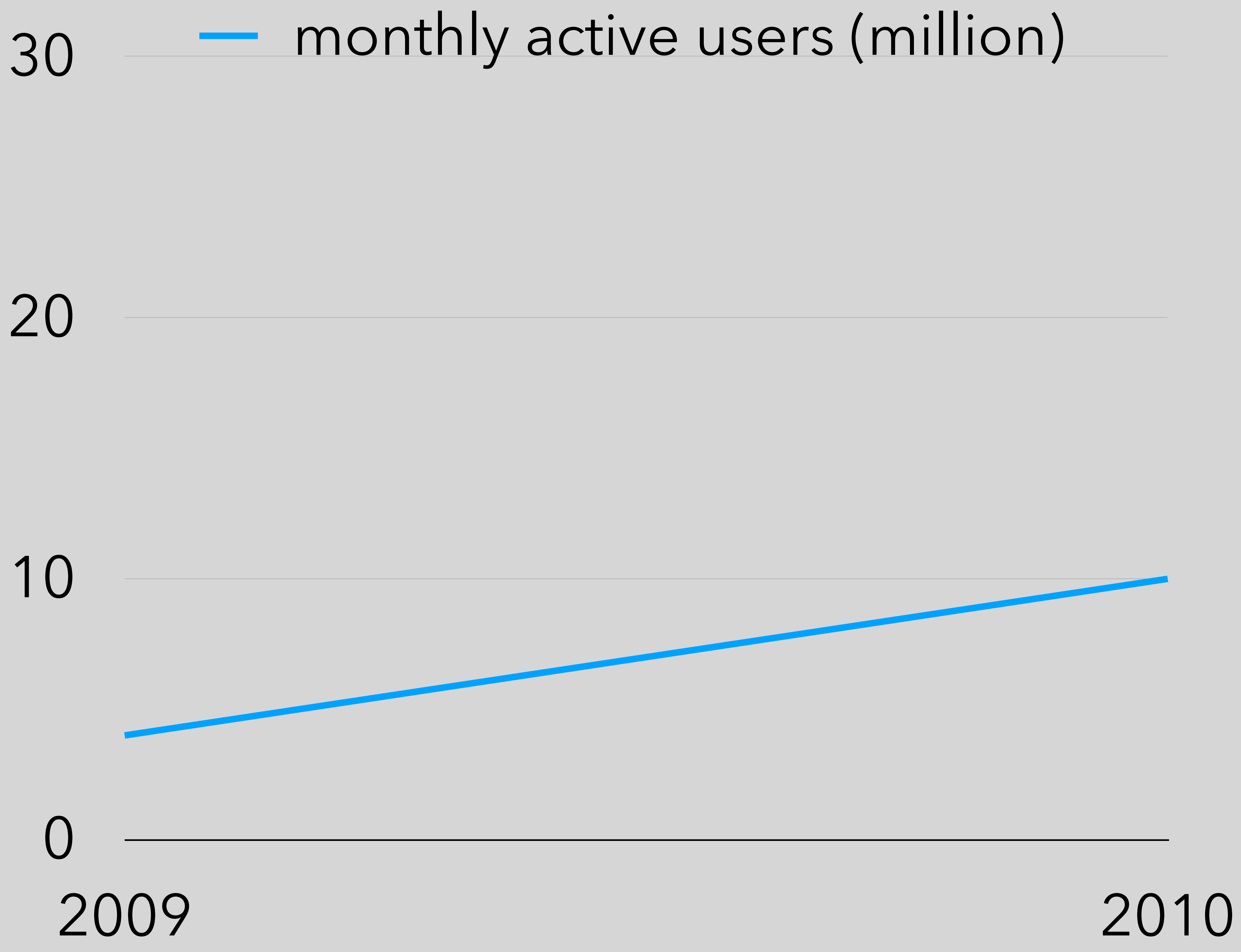
whatsapp's big moment

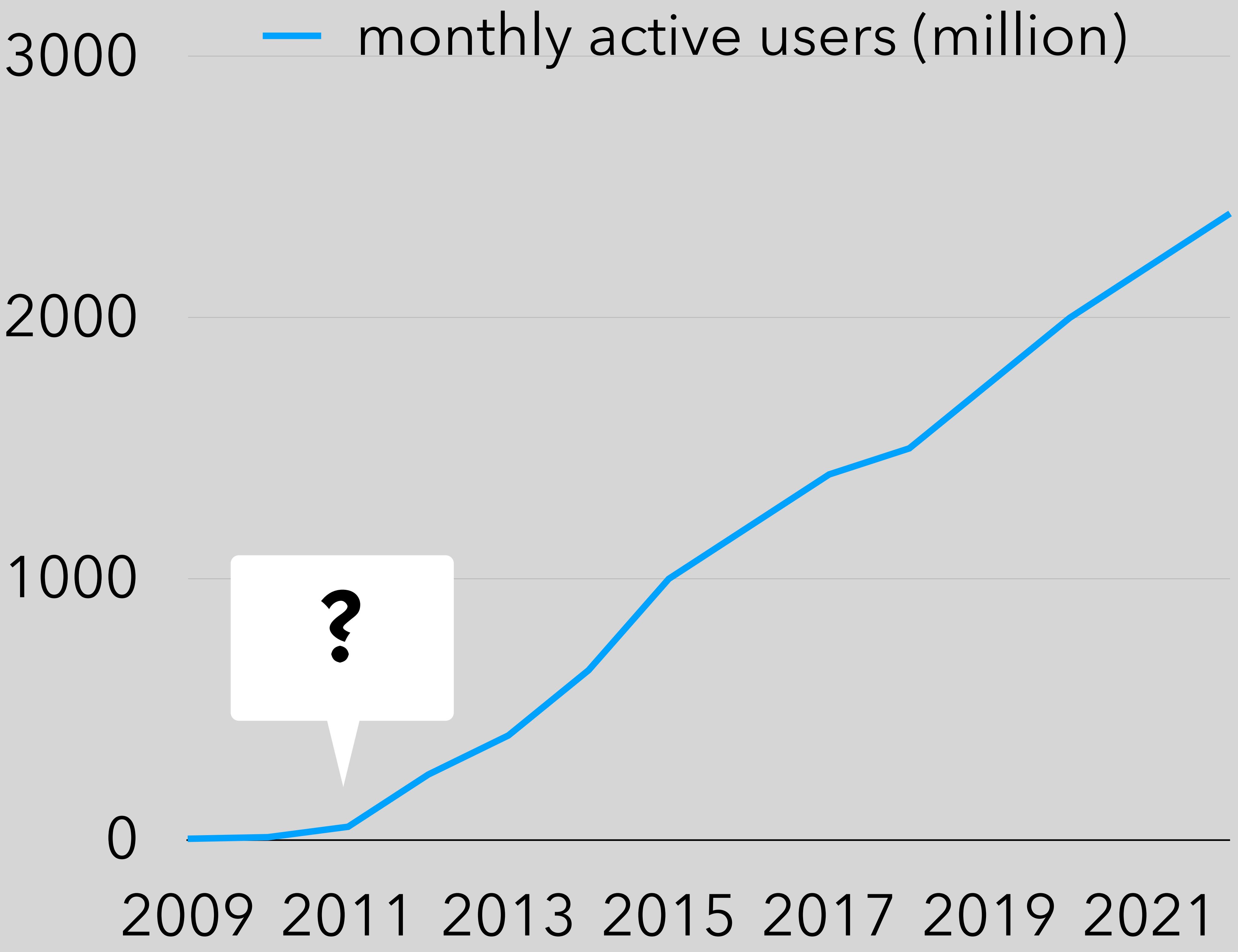


WhatsApp
@WhatsApp

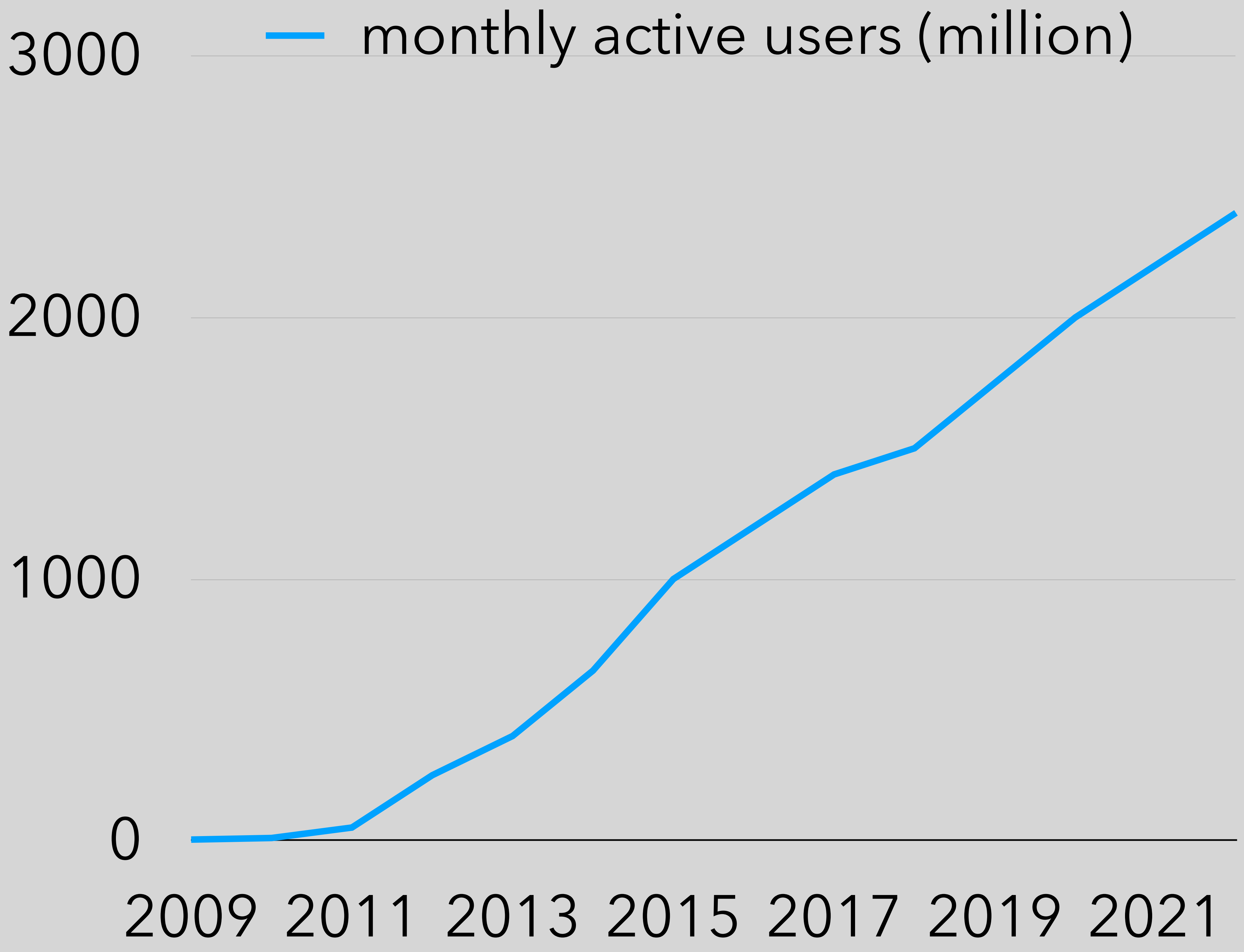
Group chat is now live for iPhone and BlackBerry in versions 2.6 (our Android client update with group chat is coming in 12 hours)

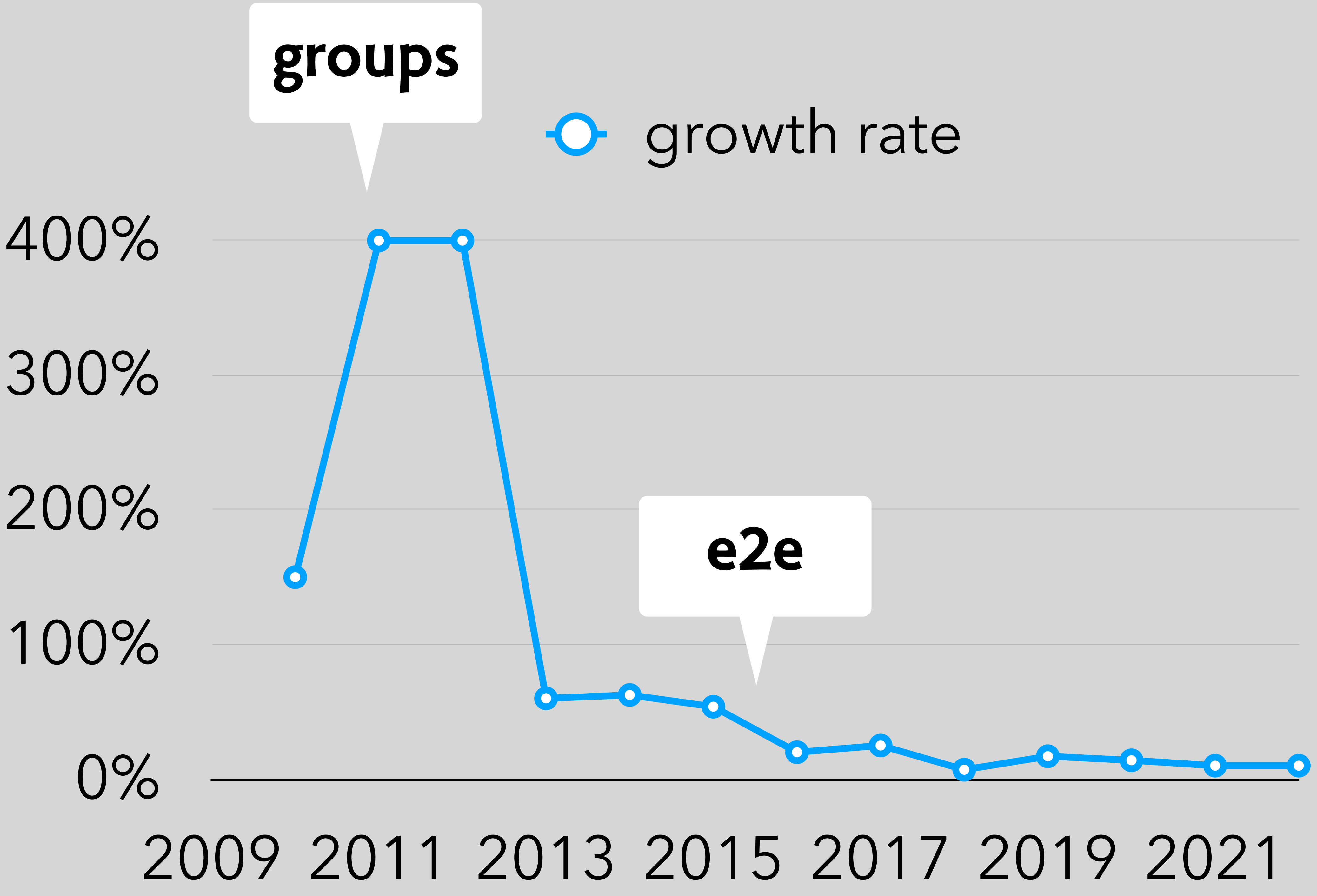
1:08 AM · Feb 10, 2011



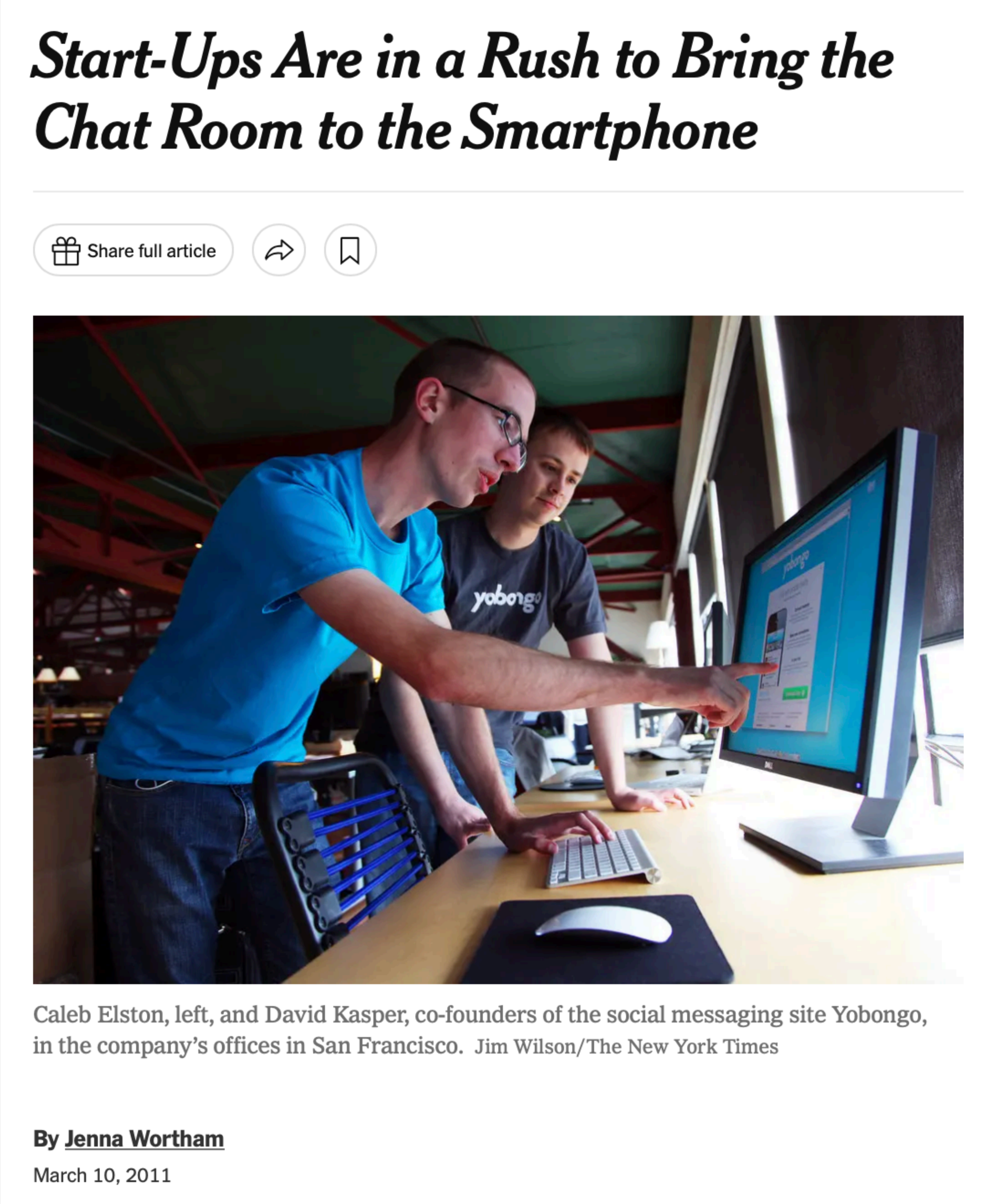


growing with groups





what was happening in 2011



Start-Ups Are in a Rush to Bring the Chat Room to the Smartphone

Caleb Elston, left, and David Kasper, co-founders of the social messaging site Yobongo, in the company's offices in San Francisco. Jim Wilson/The New York Times

By Jenna Wortham

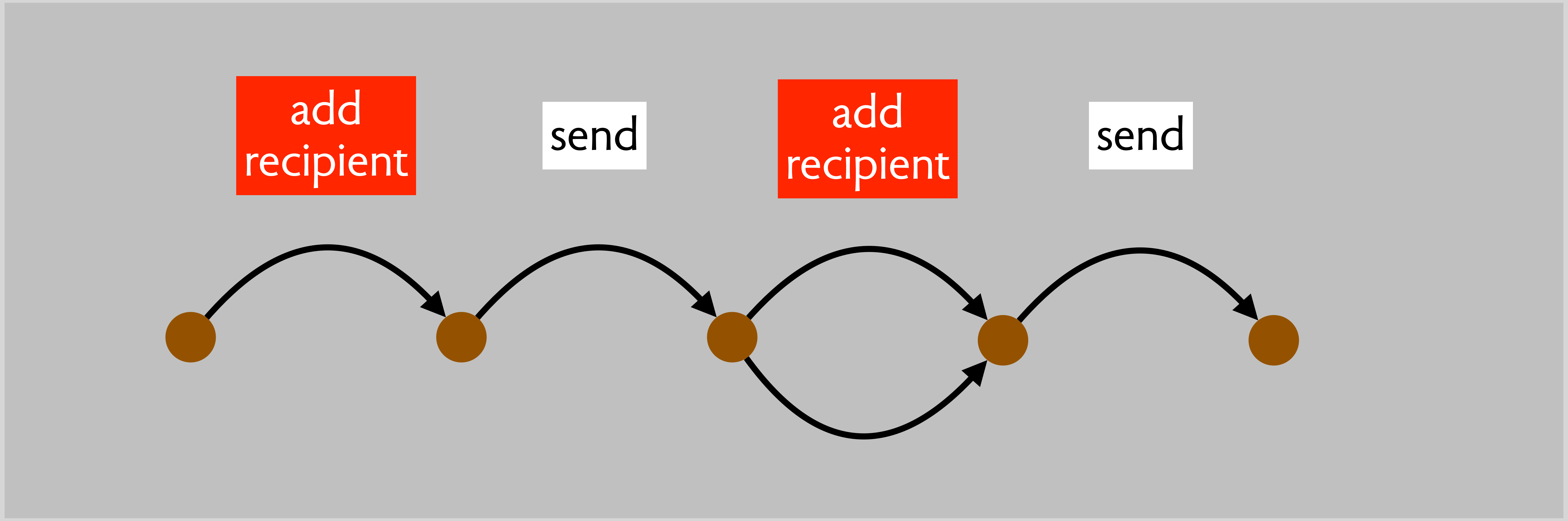
March 10, 2011

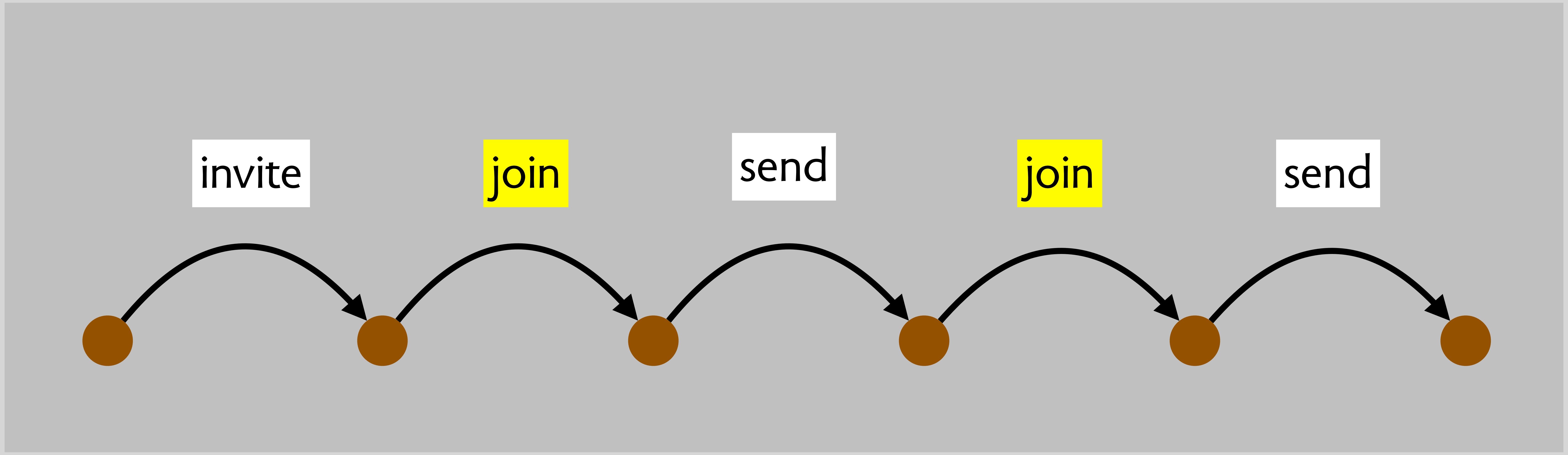
GroupMe

Beluga

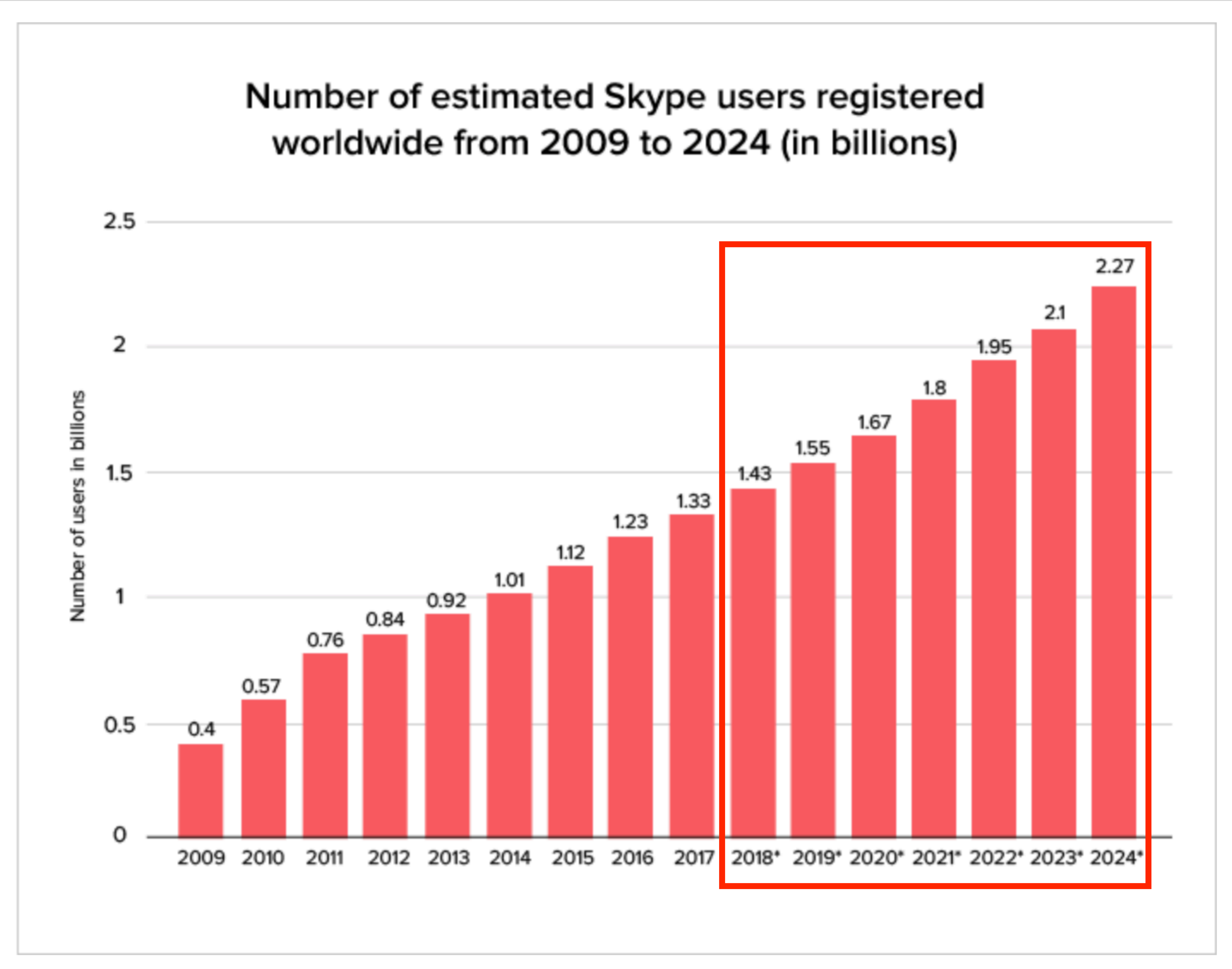
Yobongo

the group scenario





story #4
Zoom (2013)

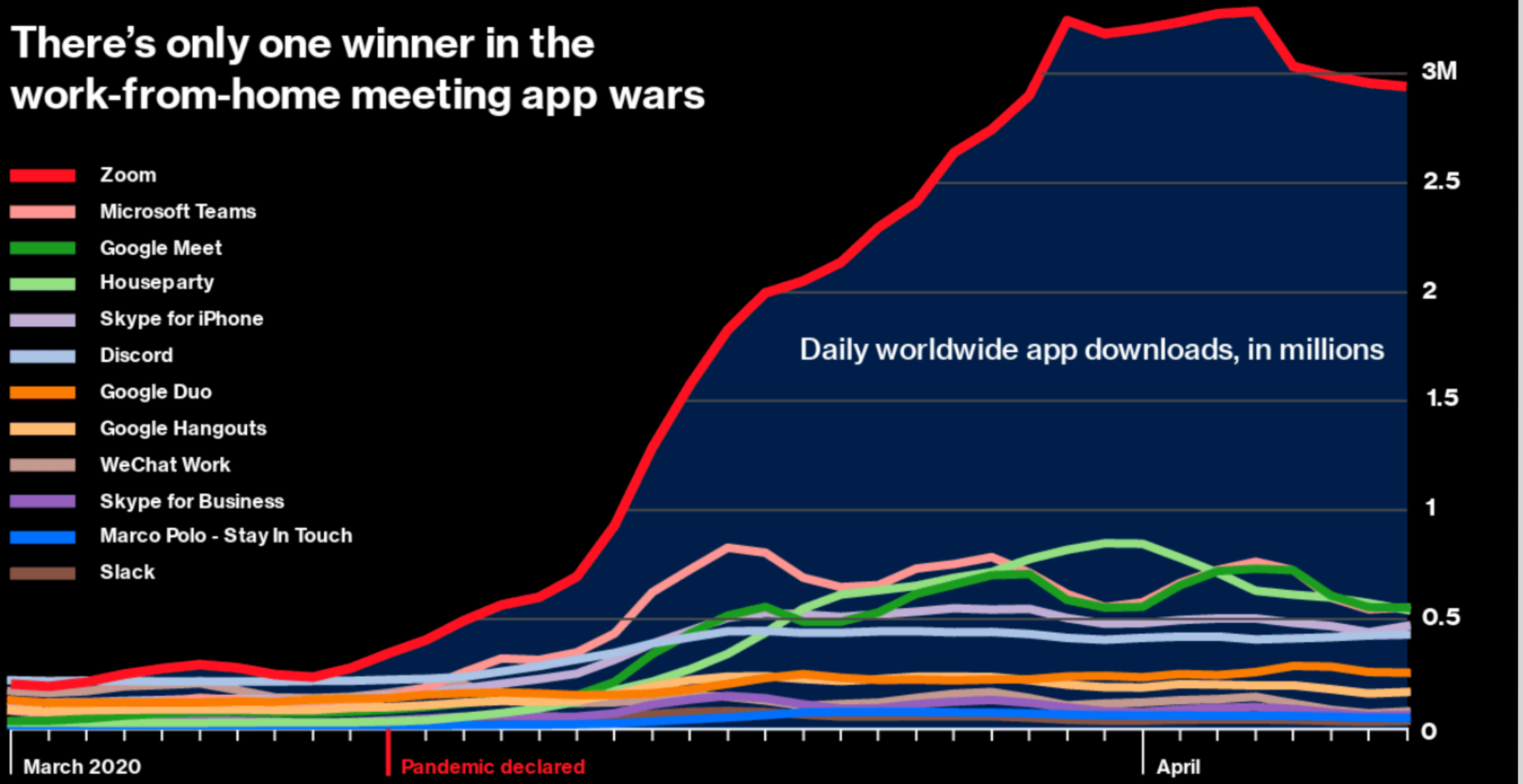


from Statistica: 2018-2024 estimated

BBOViz
Covid-19

Covid-19 / Zoom-a-Zoom-Zoom

There's only one winner in the work-from-home meeting app wars

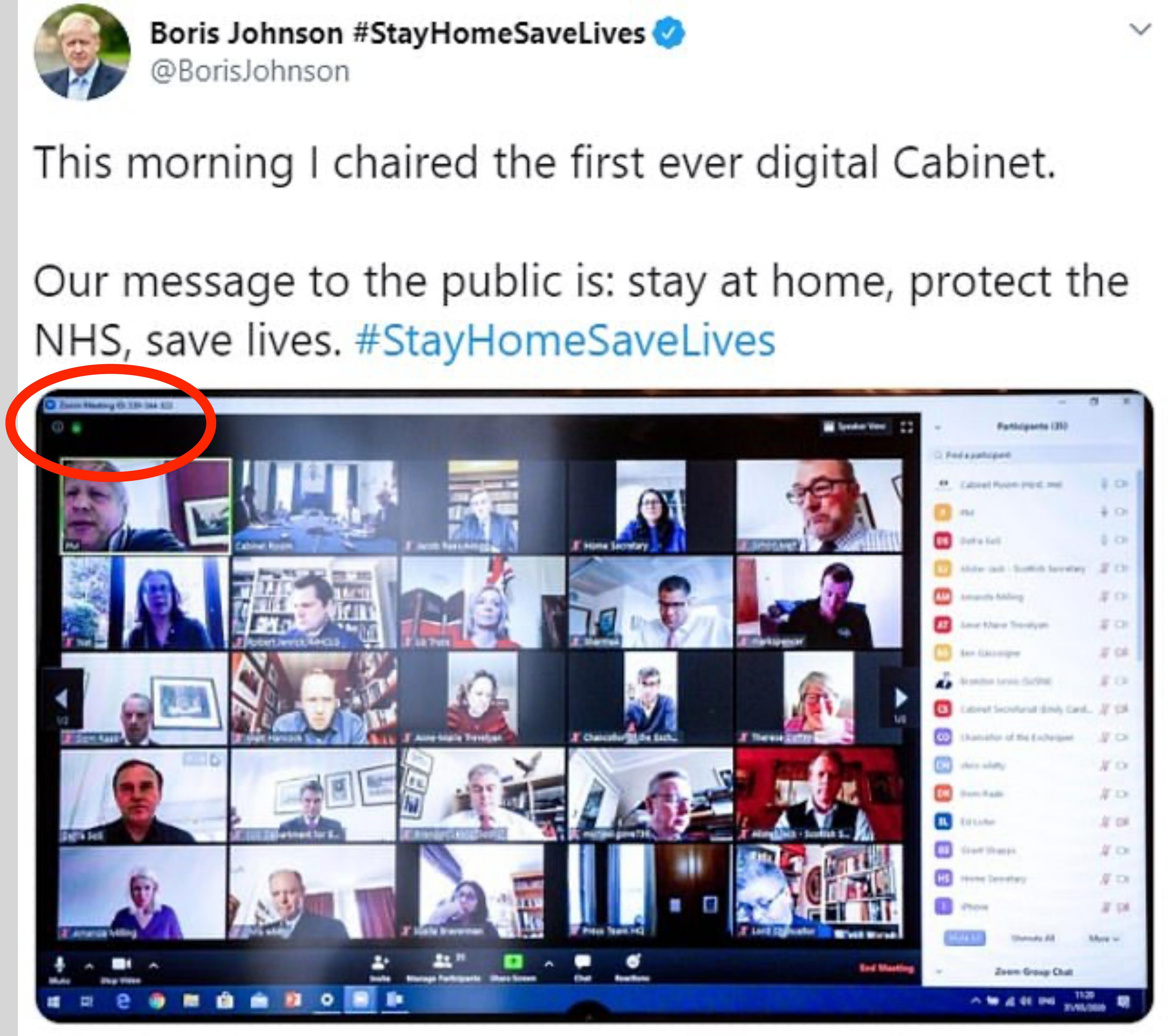


Source: Apptopia

BEN SCHOTT

BloombergOpinion

what was novel about Zoom?



Boris Johnson #StayHomeSaveLives
@BorisJohnson

This morning I chaired the first ever digital Cabinet.

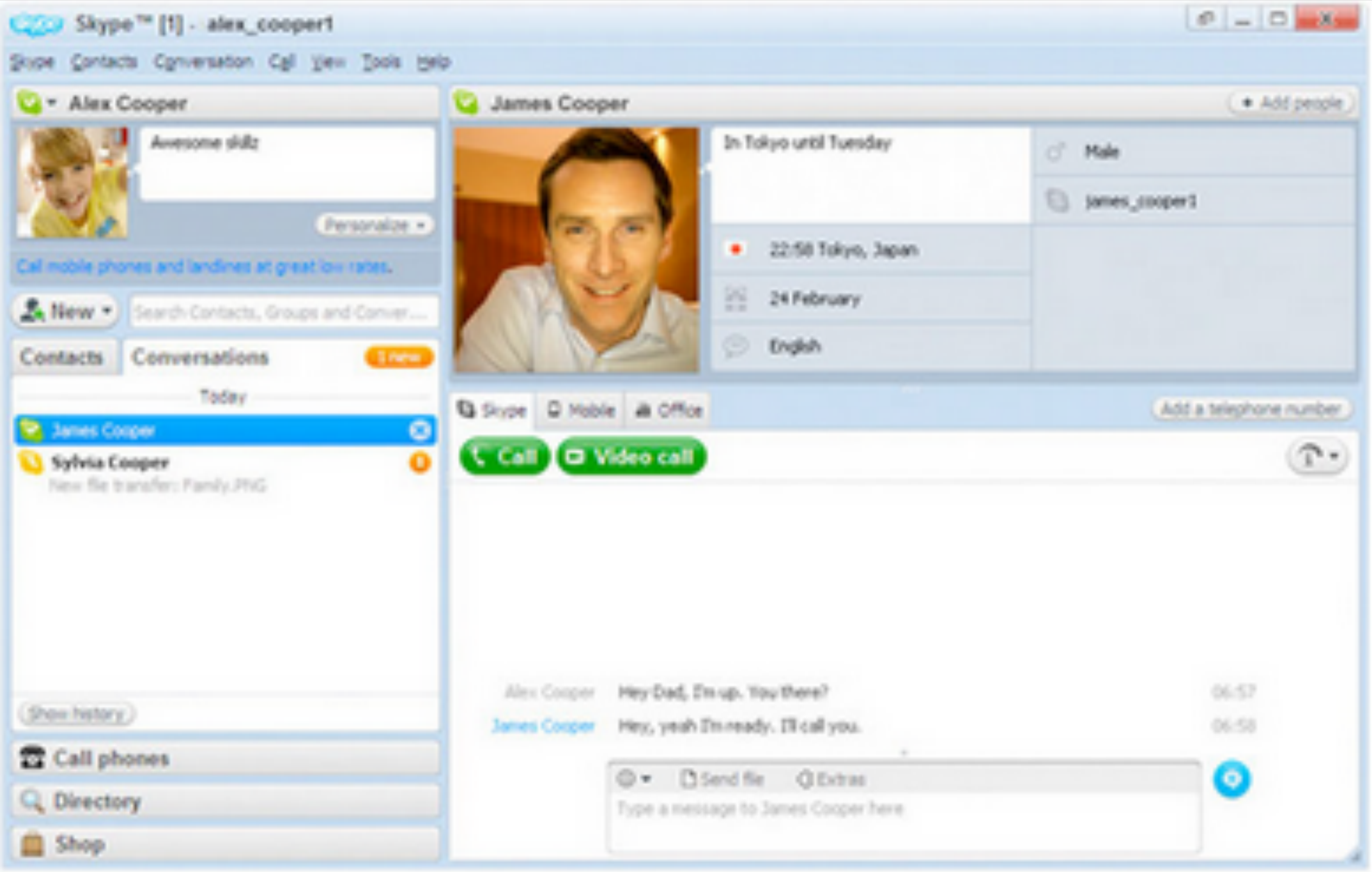
Our message to the public is: stay at home, protect the NHS, save lives. #StayHomeSaveLives

shares meeting id!

March 31, 2020

were video calls new?

Picturephone (1964)

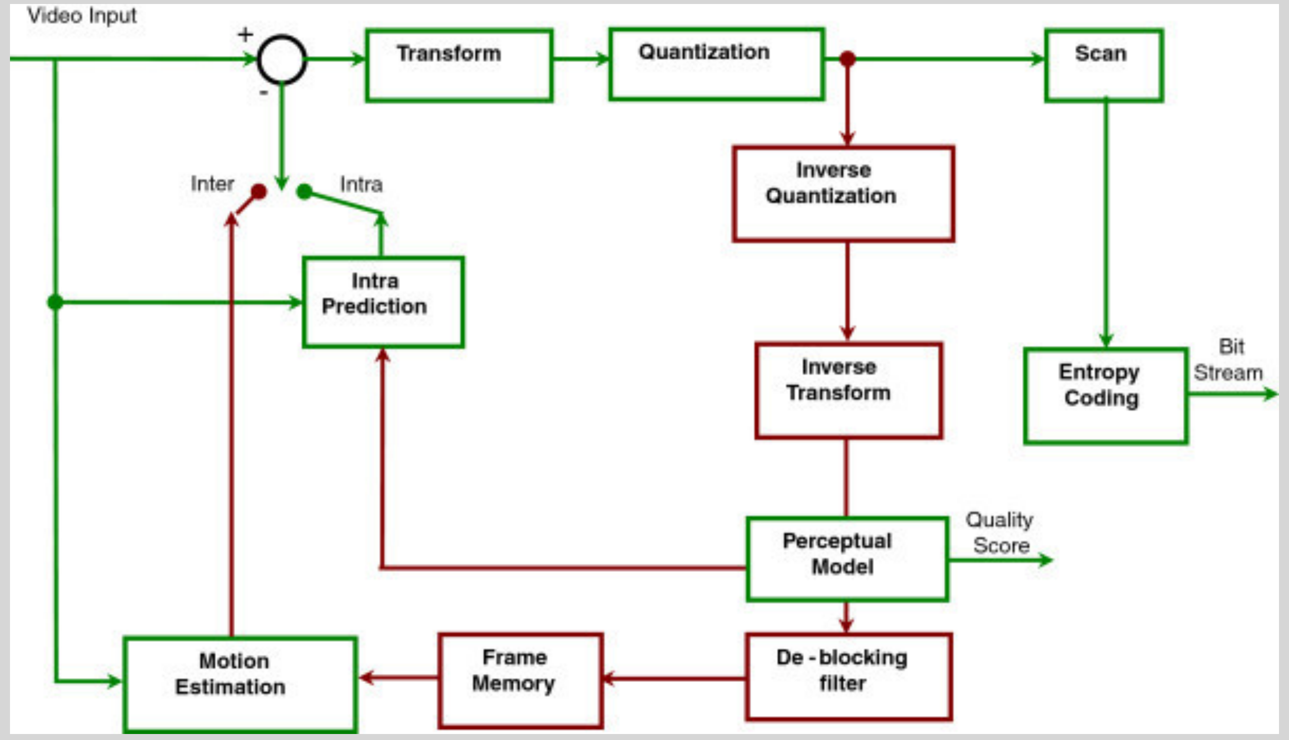


Alex Cooper Hey Dad, I'm up. You there? 06:57

James Cooper Hey, yeah I'm ready. I'll call you. 06:58

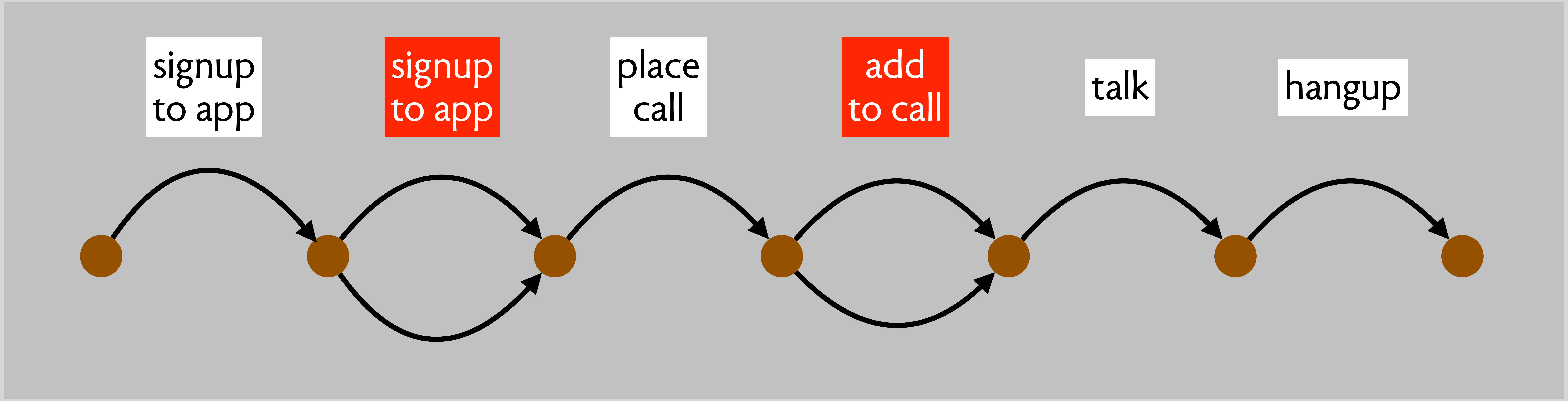
Skype (2009)

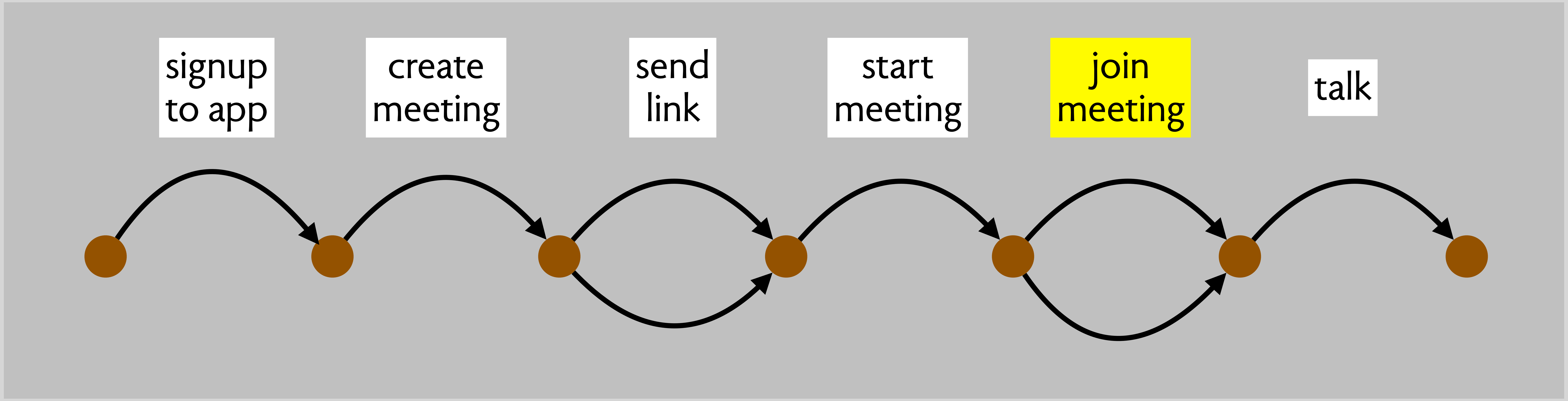
QuickCam (1994)
first commercial webcam



H.264 Video Codec (2003)

the meeting scenario





tracing zoom's meeting concept

Skype
initially P2P (2003)
Microsoft (2013)

FaceTime
Apple (2010)

Google Hangouts
in Google+ (2011)
own product (2013)
Duo replaces (2016)

Zoom
Eric Yuan (2013)

Google Meet
launched (2017)
absorbs Duo (2022)

Microsoft Teams
launched (2017)

meeting concept
added to Skype
April 2020

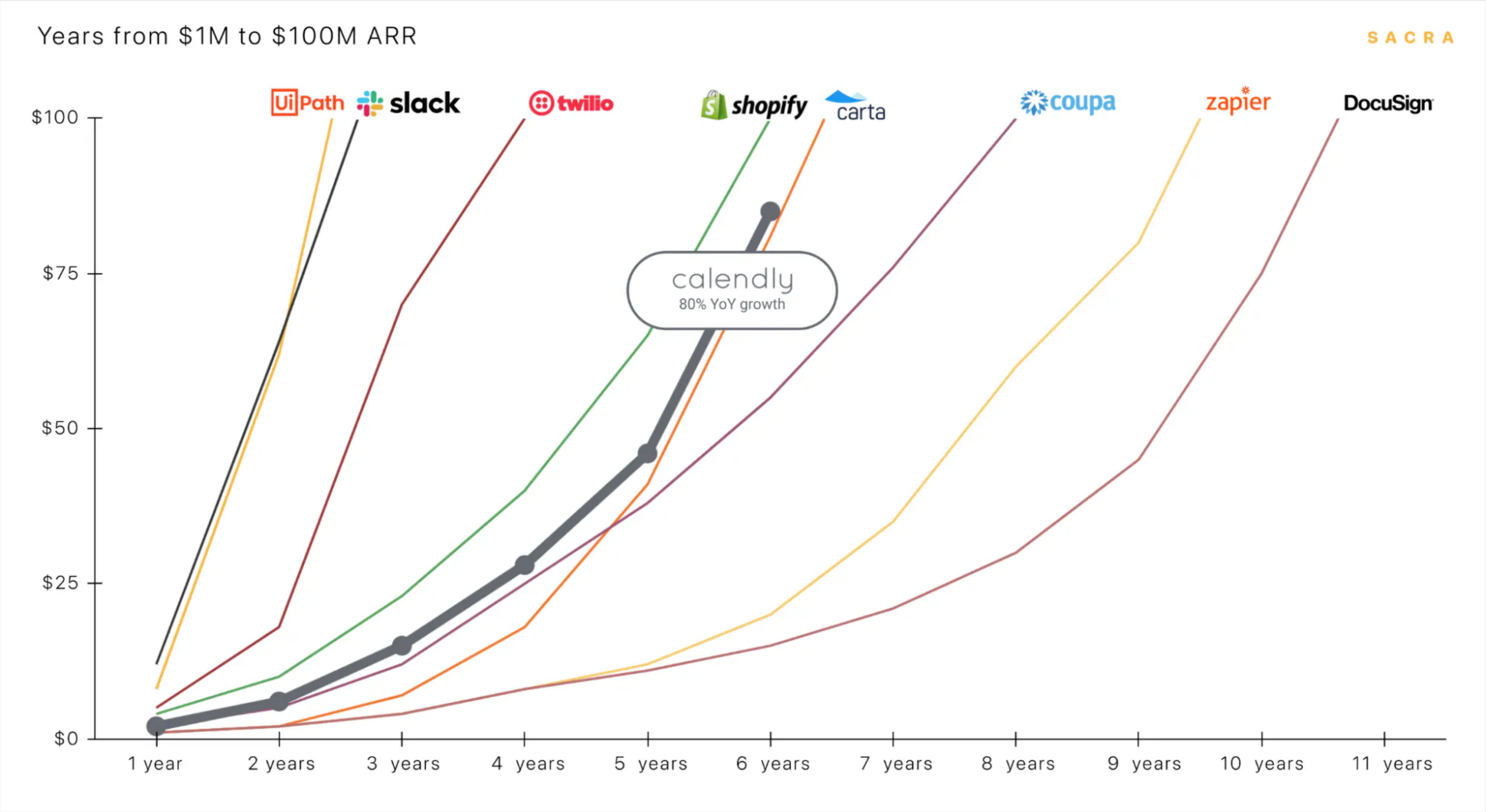
Join.me
LogMeIn (2010)

meeting scenario

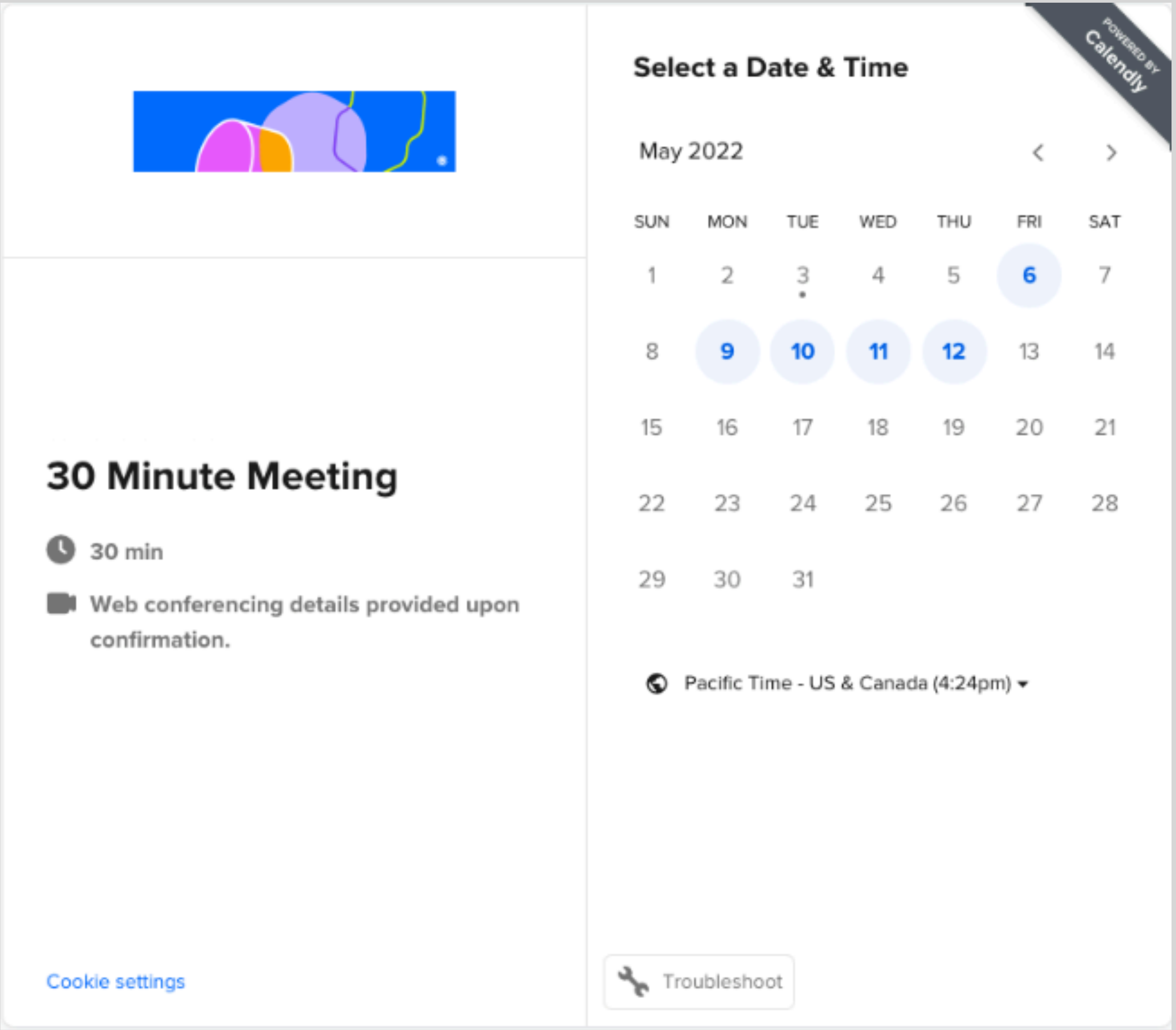
meeting scenario
added to Teams
June 2022?

story #5
Calendly (2013)

“the $4b Docusign of scheduling”



scheduling yourself



30 Minute Meeting

30 min

Web conferencing details provided upon confirmation.

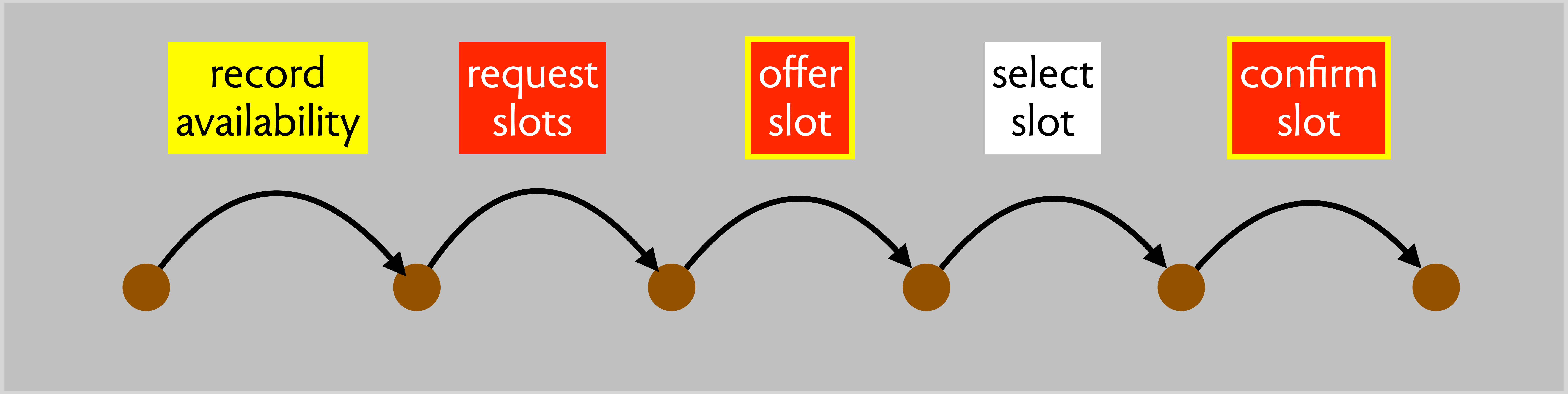
Select a Date & Time

May 2022

SUN	MON	TUE	WED	THU	FRI	SAT
1	2	3	4	5	6	7
8	9	10	11	12	13	14
15	16	17	18	19	20	21
22	23	24	25	26	27	28
29	30	31				

Pacific Time - US & Canada (4:24pm) ▾

fixing the scenario: scheduling a slot



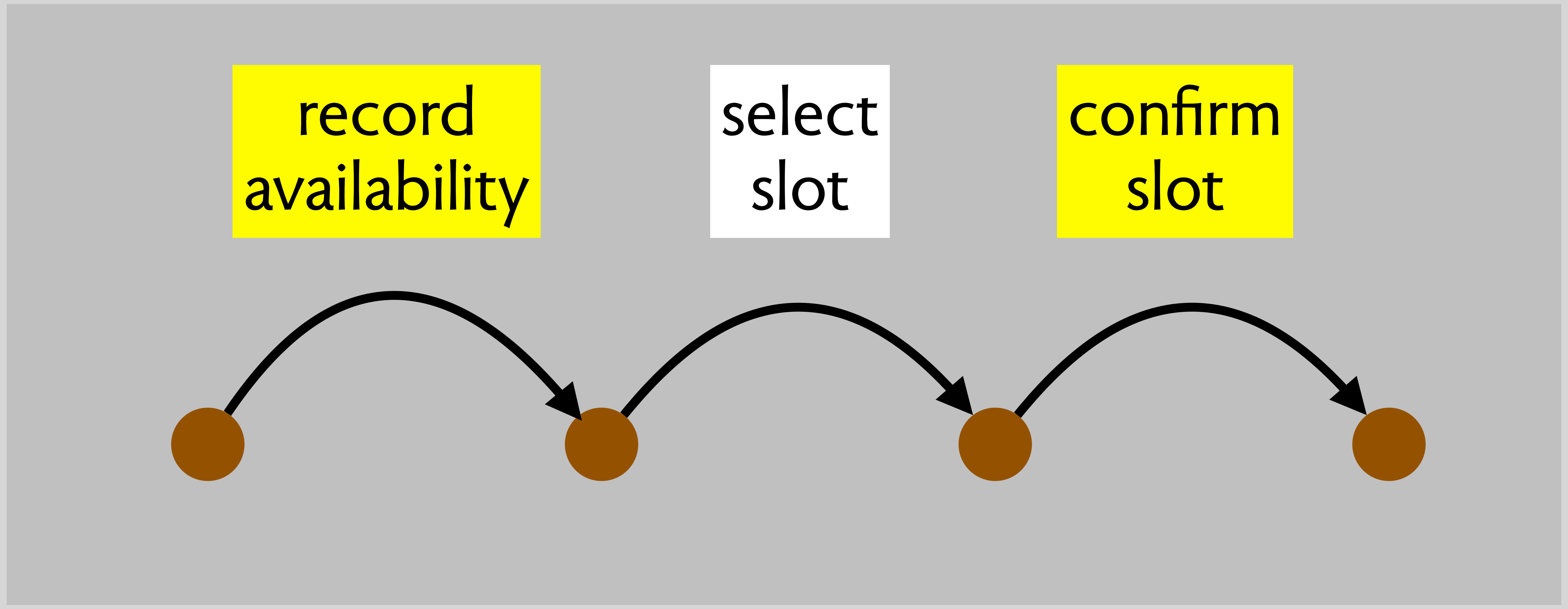
record availability

request slots

offer slot

select slot

confirm slot

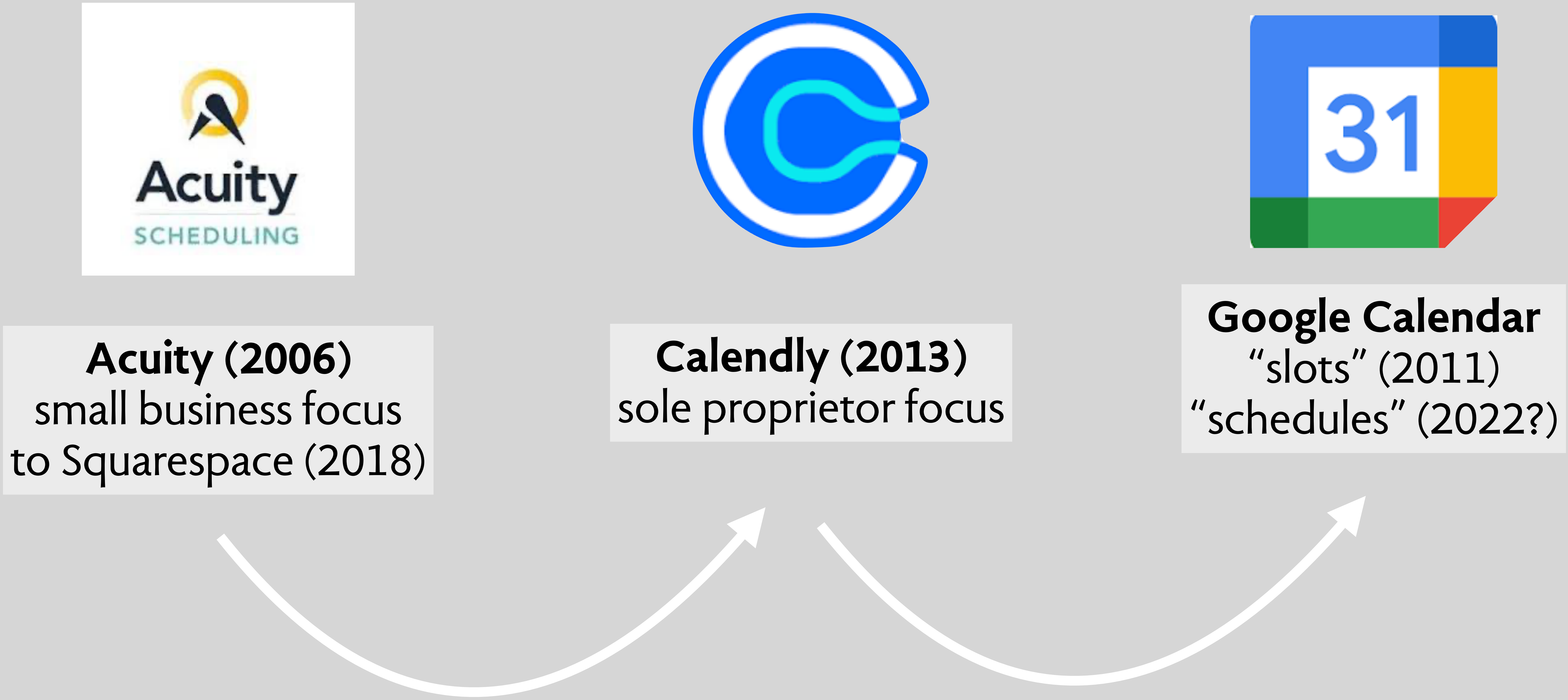


record availability

select slot

confirm slot

tracing self scheduling



Acuity (2006)
small business focus
to Squarespace (2018)

Calendly (2013)
sole proprietor focus

Google Calendar
“slots” (2011)
“schedules” (2022?)

self-scheduling scenario

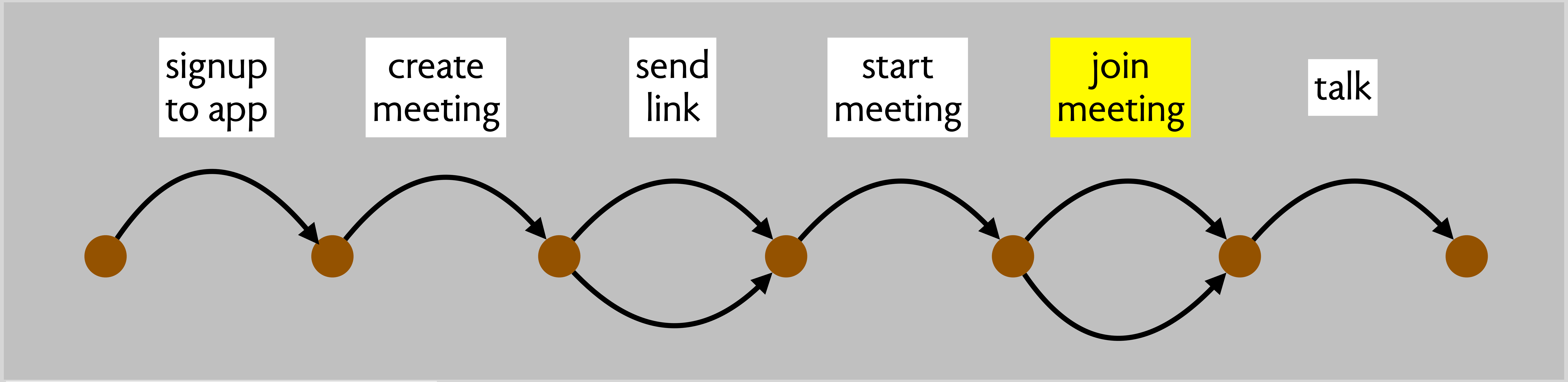
lessons so far

archetypal scenarios define innovations
a compelling story of how to use an innovation
and why it fulfills the user's purpose

innovations (almost) never enable new things
they just make them easier to do
an old scenario with pain points is replaced by new one

from scenarios to concepts

zoom isn't just the meeting protocol



signup to app

create meeting

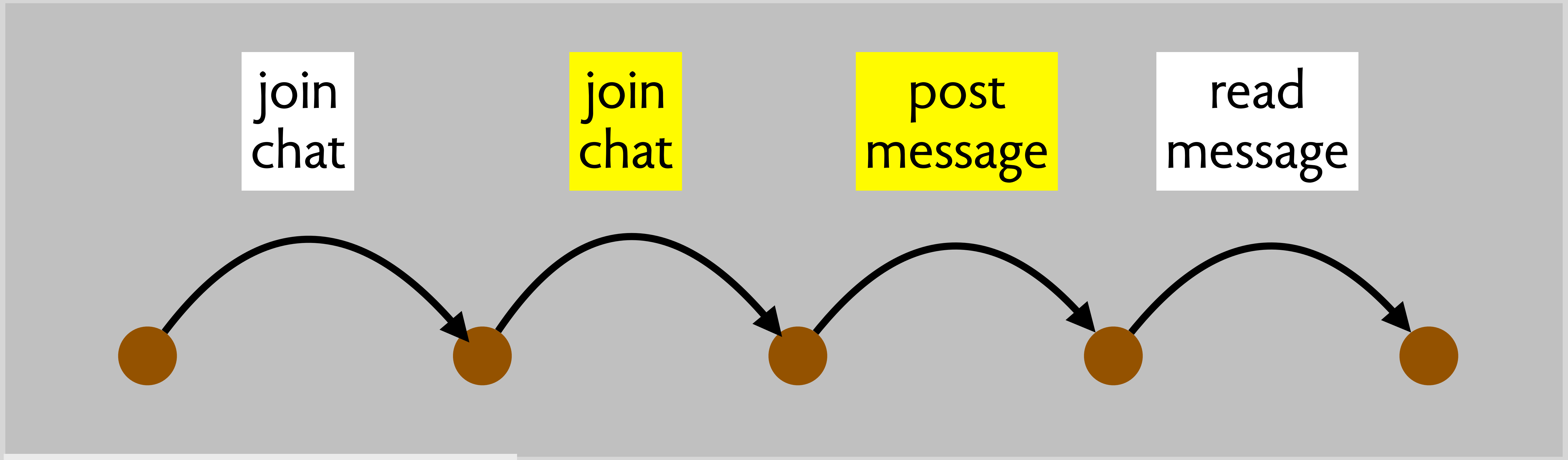
send link

start meeting

join meeting

talk

Zoom's meeting protocol



join chat

join chat

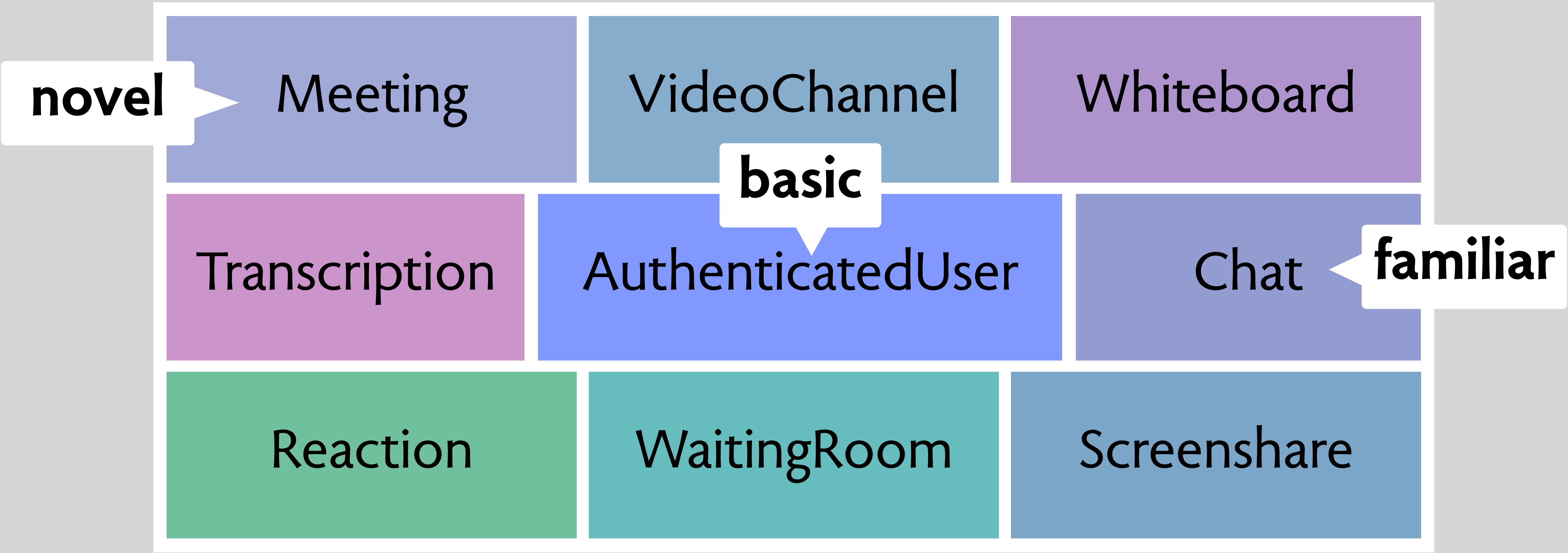
post message

read message

Zoom's chat protocol

software = concepts

Zoom



novel

Meeting

VideoChannel

Whiteboard

basic

Transcription

AuthenticatedUser

Chat

familiar

Reaction

WaitingRoom

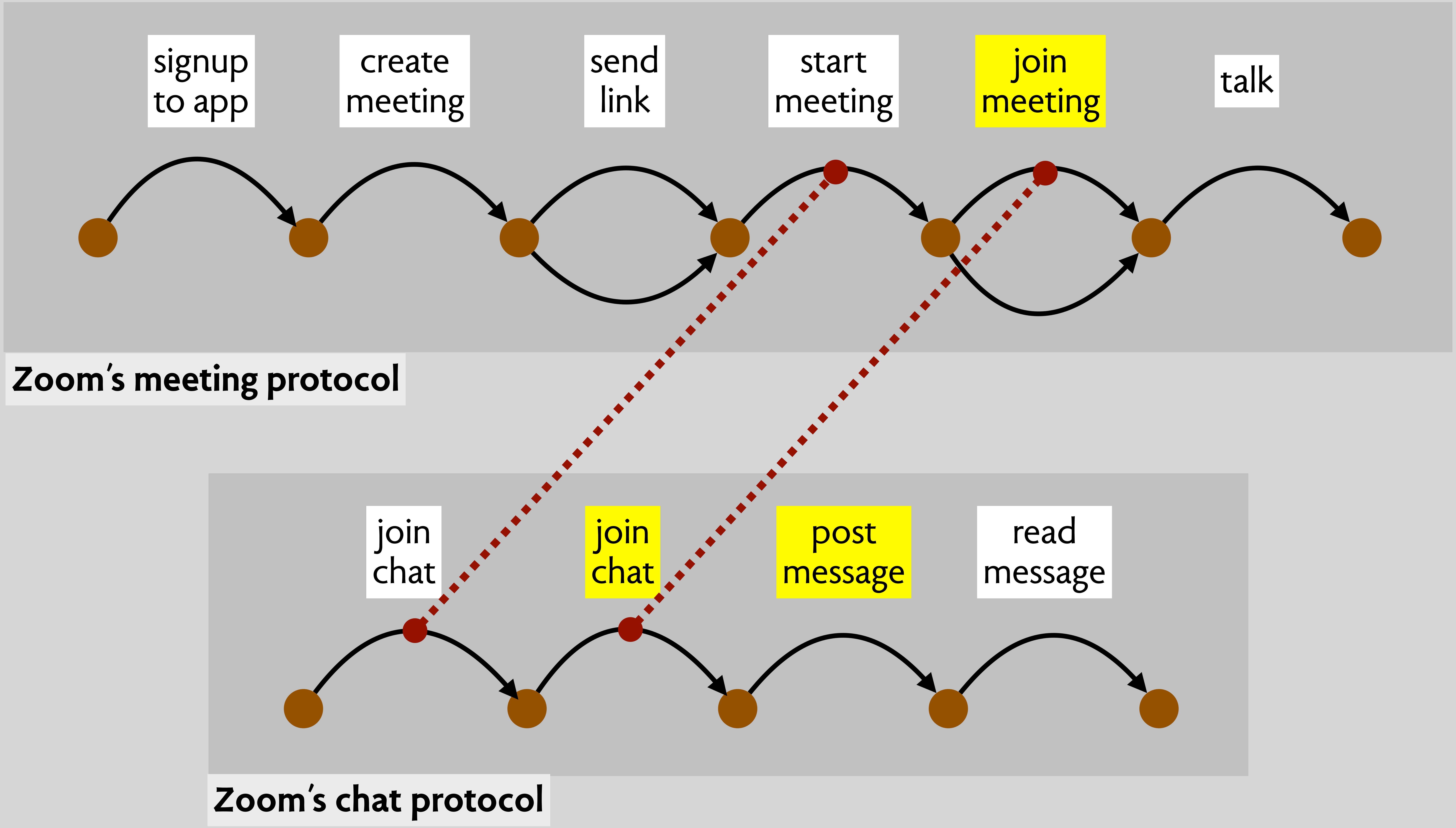
Screenshare

concepts aren't features

complete function, not parts
not aspects (encryption)
not actions (reassign host)
not user interface (shortcuts)

composable services
no base functionality
no layering
no dependencies

how are concepts composed? by synchronization



designing a concept

concept Chat

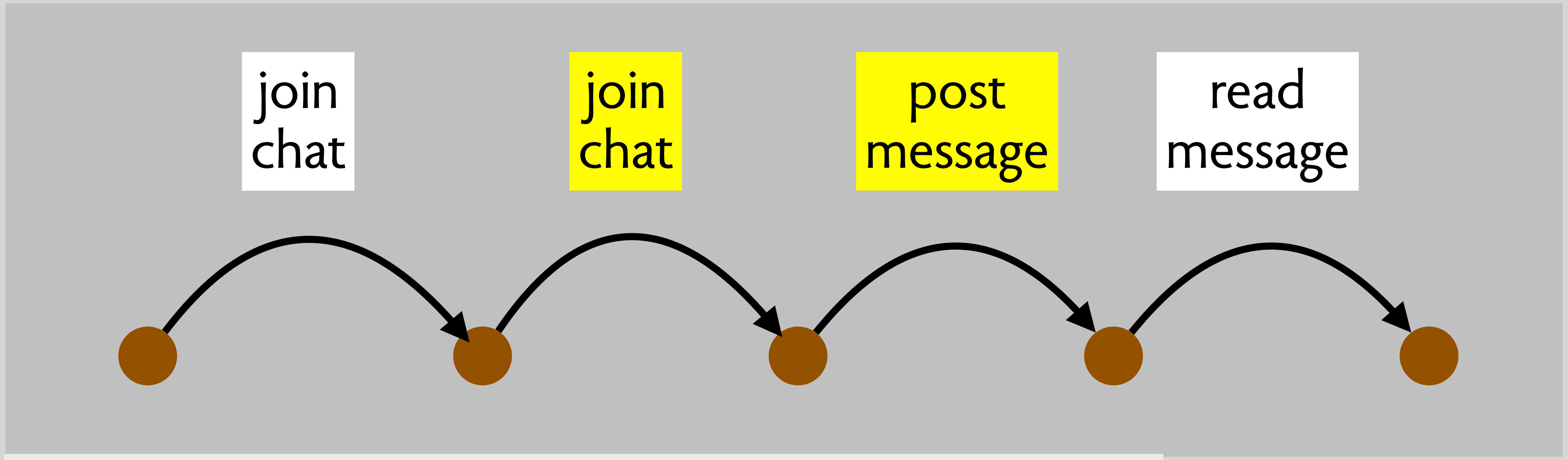
purpose share short messages in group

principle after two users join, if one posts a message, the other can read it

state
msgs: set Msg
content: Msg -> one String
posted: Msg -> one Date
joined: User -> one Date

actions
join (u: User)
post (u: User, s: String, out m: Msg)
view (u: User, out msgs: set Msg)
// returns all messages posted after
// u's joining date

actually a serious design flaw



The operational principle of Zoom's chat concept

the principle is **just a sketch** & doesn't address behavioral details eg, **which messages** can a user actually read?

how many “differentiator” concepts?

Gmail: email + search

Arc: tabs as bookmarks

no new concepts
combinational creativity

Zoom: meeting

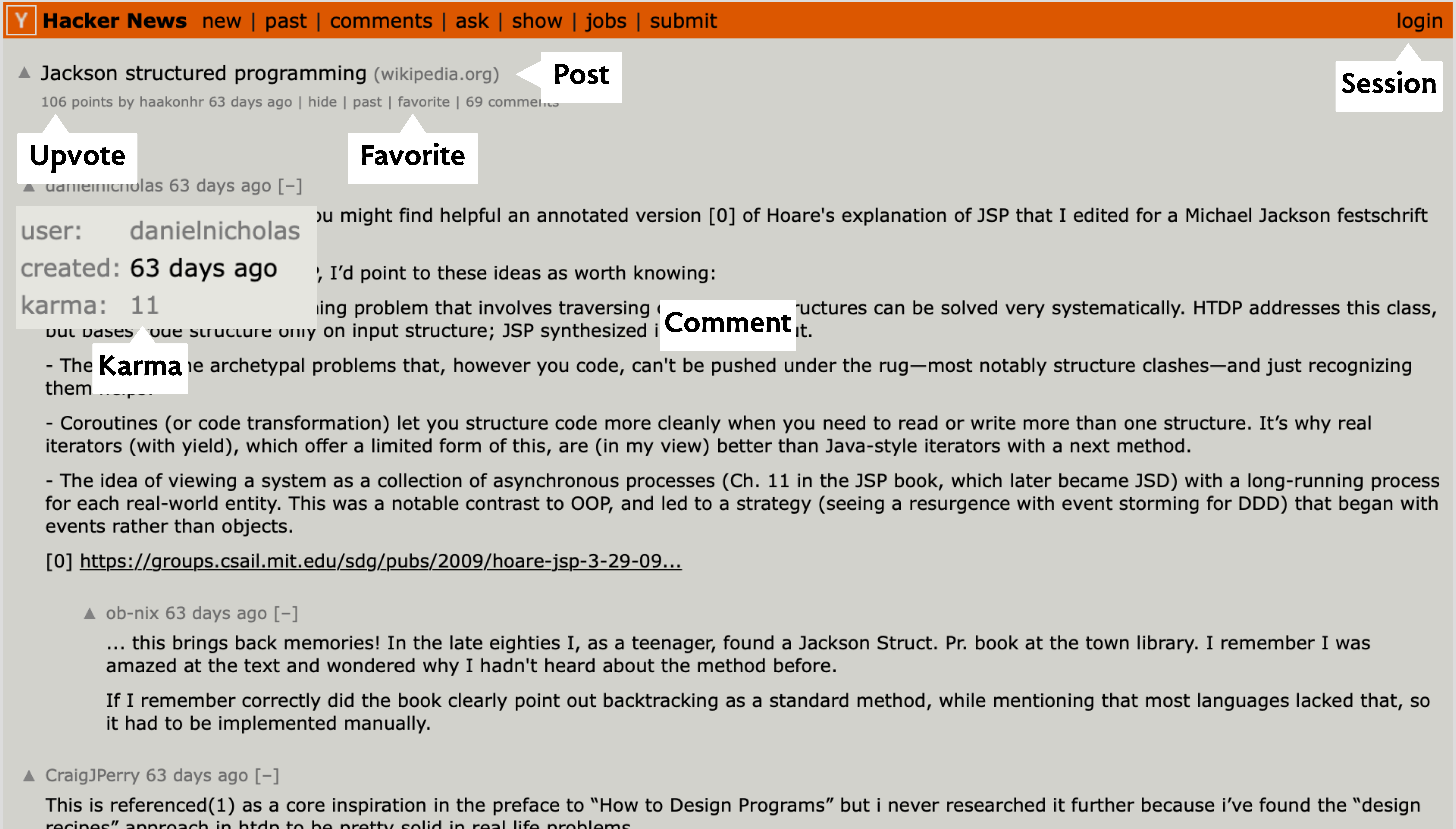
WhatsApp: group

one new concept
a better way to work

Photoshop: pixel array, layer, mask, channel, …

Quark: flow, kerning, bezier curves, …

many new concepts
a new paradigm



Y **Hacker News** new | past | comments | ask | show | jobs | submit login

▲ Jackson structured programming (wikipedia.org)

106 points by haakonhr 63 days ago | hide | past | favorite | 69 comments

▲ danielnicholas 63 days ago [–]

user: danielnicholas
created: 63 days ago
karma: 11

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[0] https://groups.csail.mit.edu/sdg/pubs/2009/hoare-jsp-3-29-09...

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Post

Session

Upvote

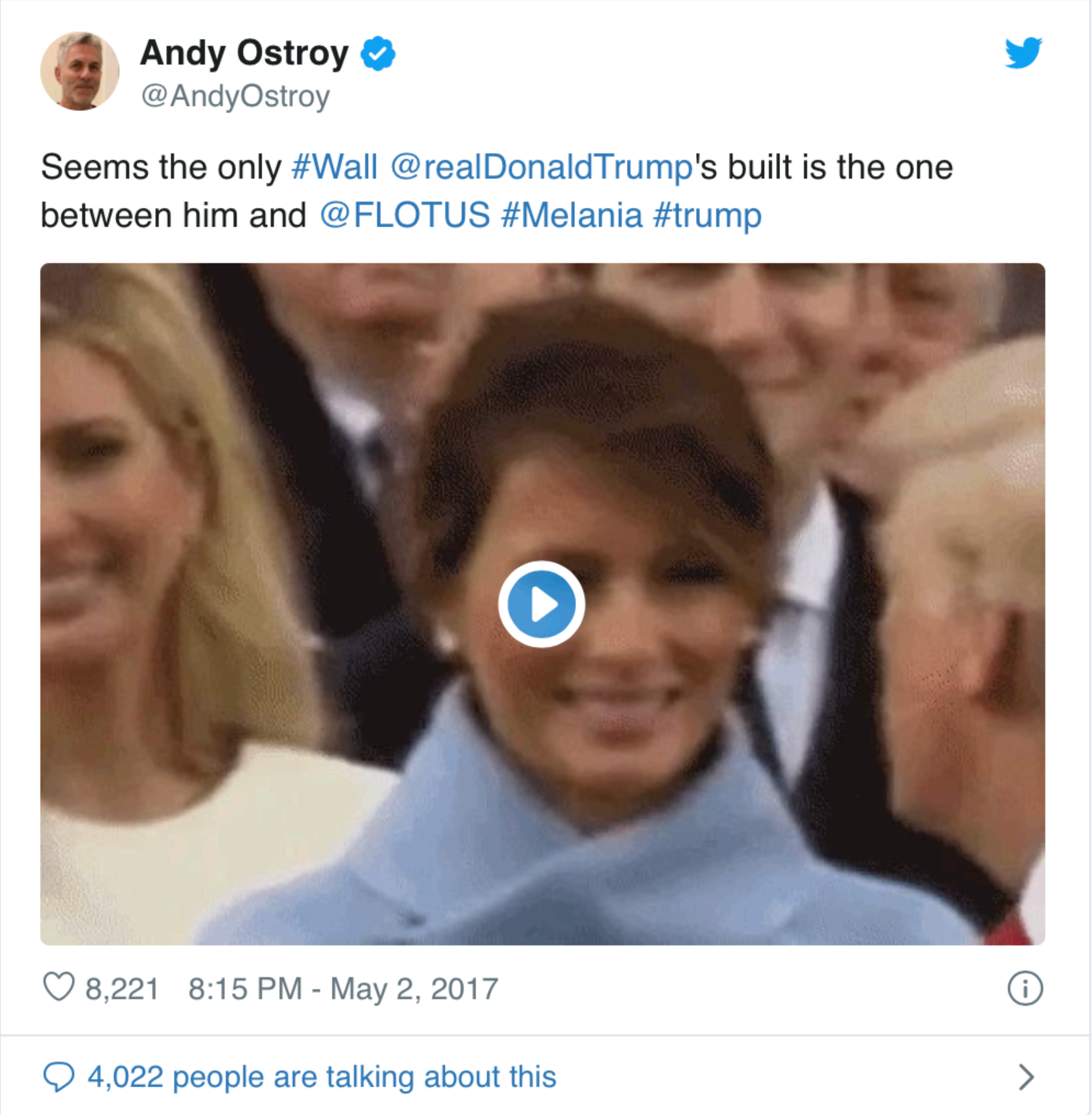
Favorite

Comment

Karma

applying concept design

clarify
your concepts

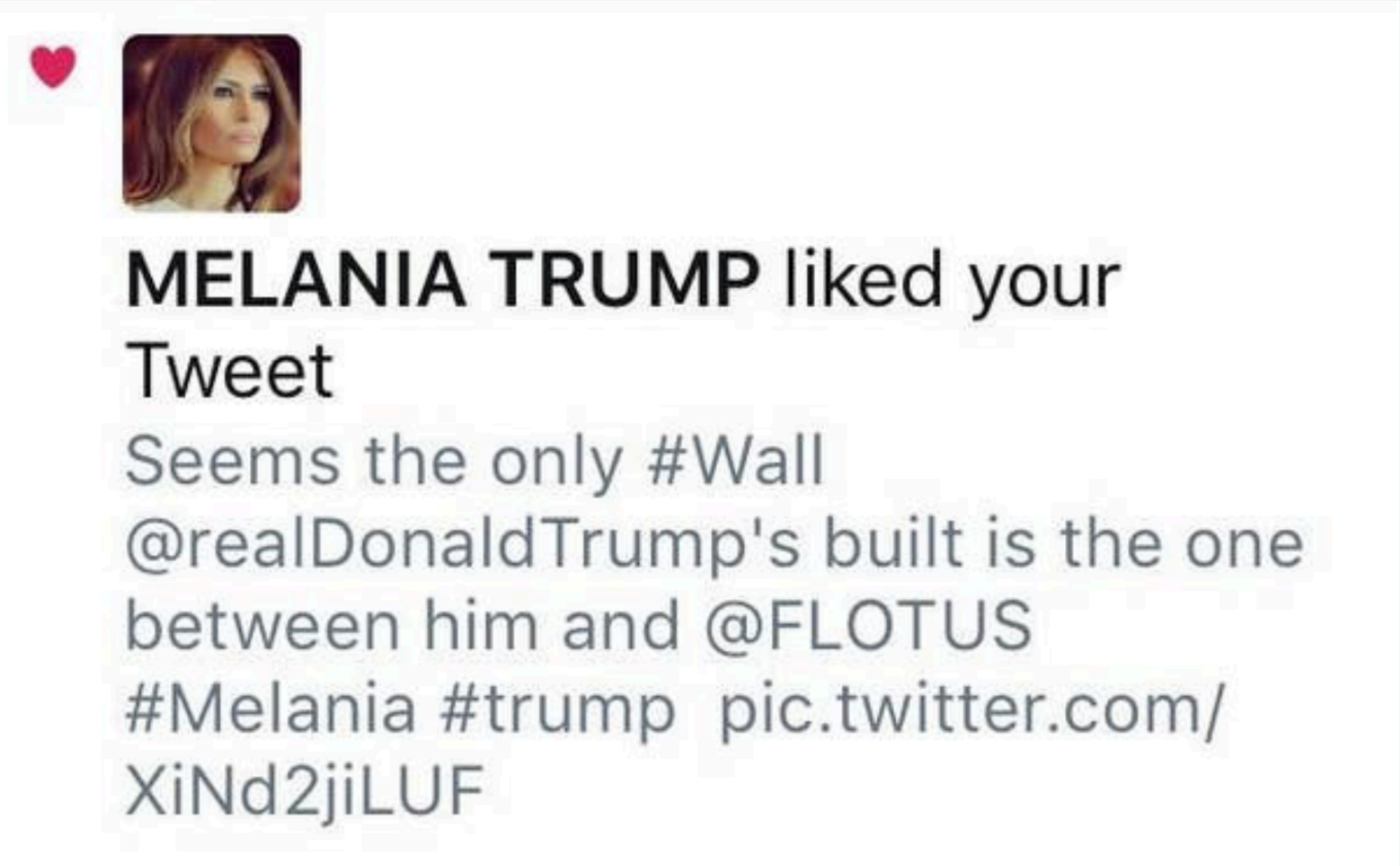


Andy Ostroy
@AndyOstroy

Seems the only #Wall @realDonaldTrump's built is the one between him and @FLOTUS #Melania #trump

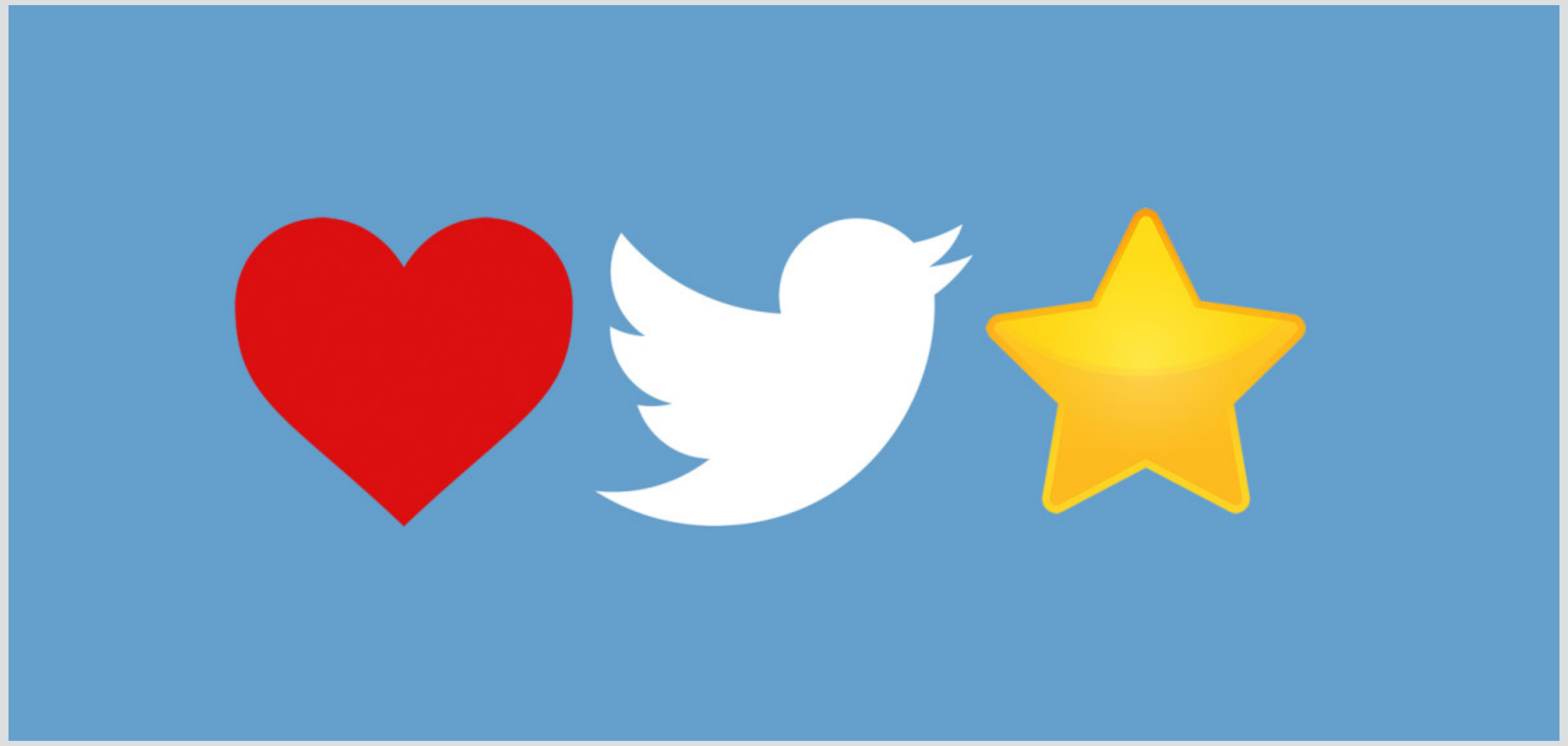
♡ 8,221 8:15 PM - May 2, 2017

4,022 people are talking about this



MELANIA TRUMP liked your Tweet

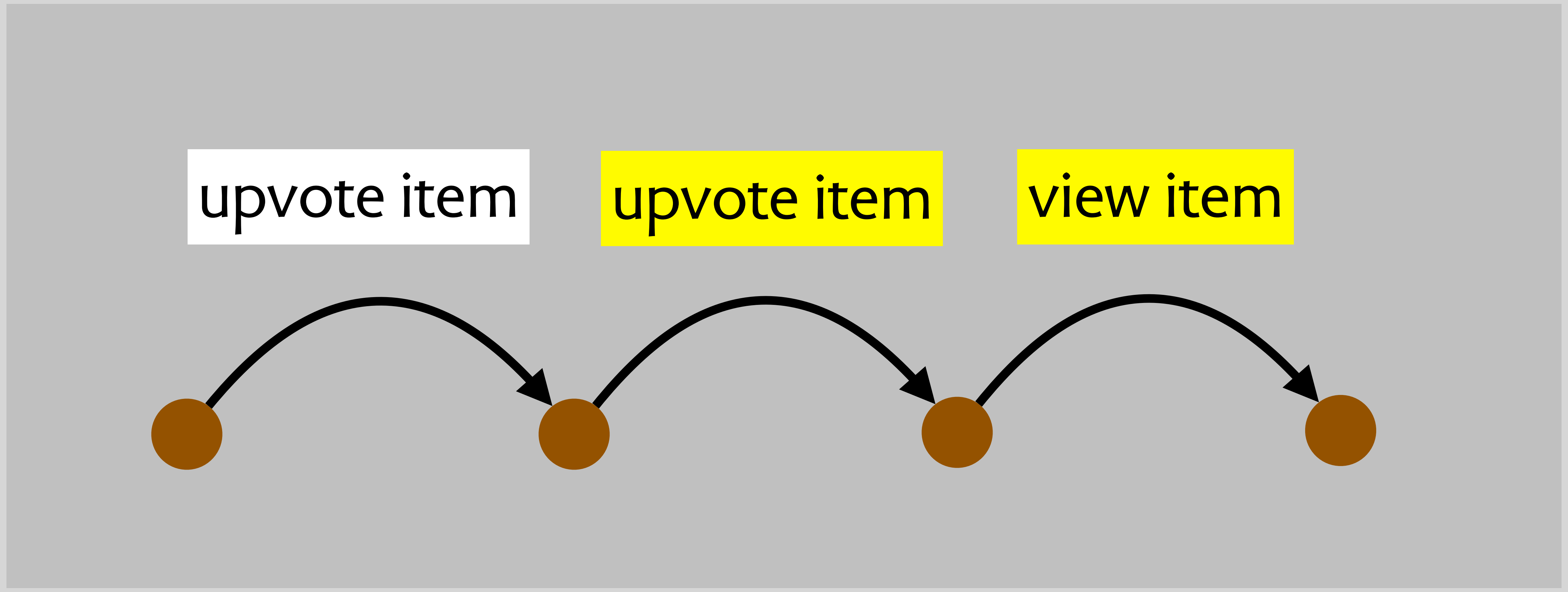
Seems the only #Wall @realDonaldTrump's built is the one between him and @FLOTUS #Melania #trump pic.twitter.com/XiNd2jiLUF



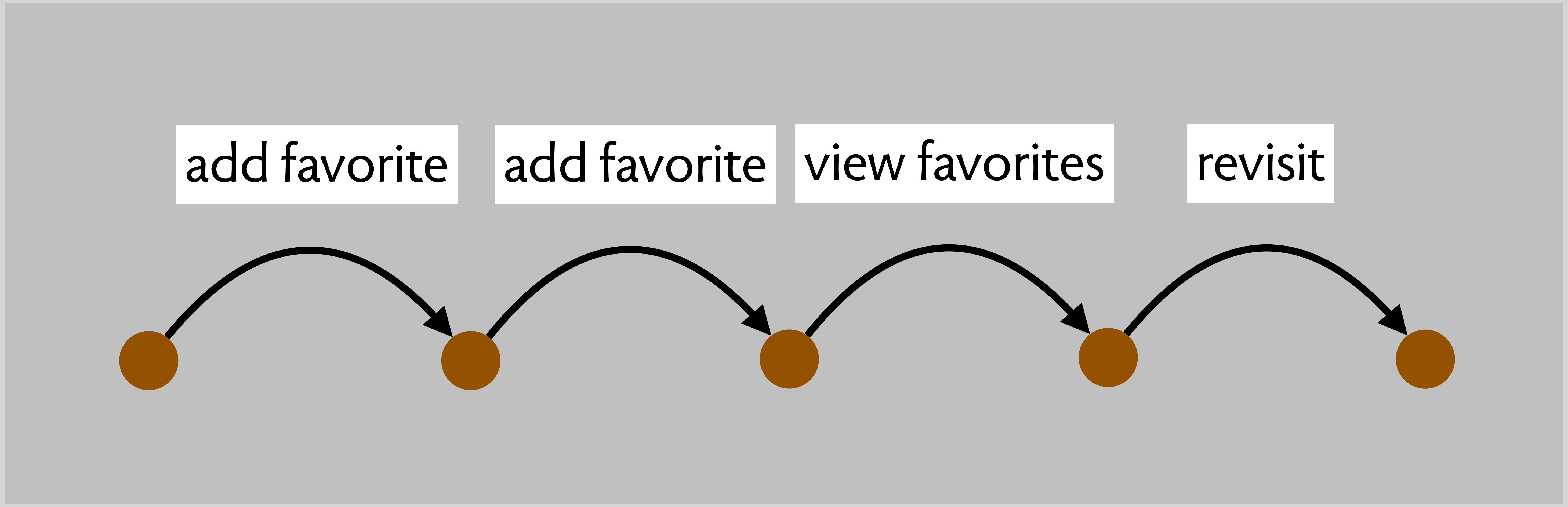
Nov 2, 2015: Twitter changes Favorite (Star) to Like (Heart)

We are changing our star icon for favorites to a heart and we’ll be calling them likes… **We know that at times the star could be confusing, especially to newcomers**. You might like a lot of things, but not everything can be your favorite. *Twitter press release*

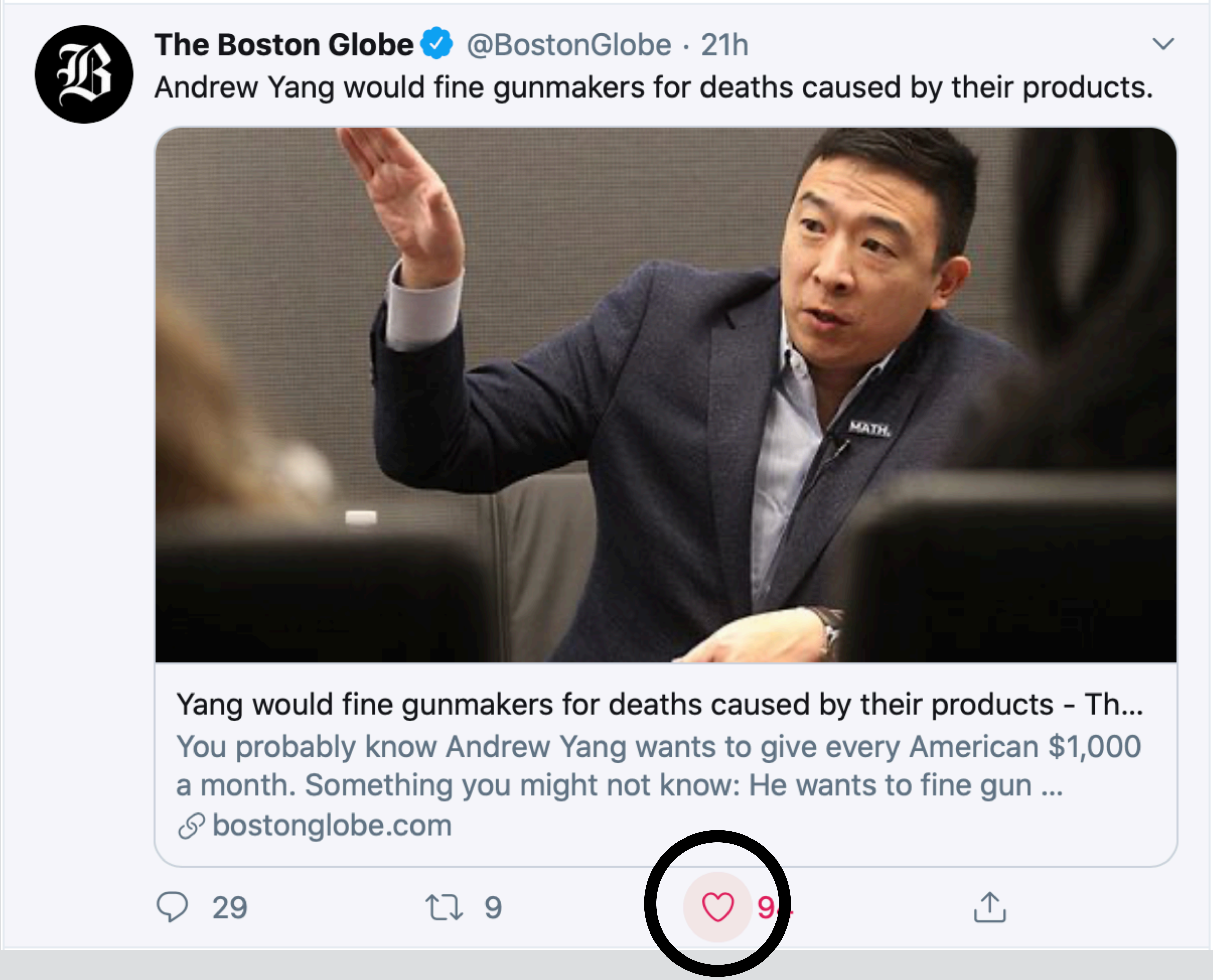
two different scenarios



Upvote concept: purpose is to crowdsource popularity



Favorite concept: purpose is to save items for later



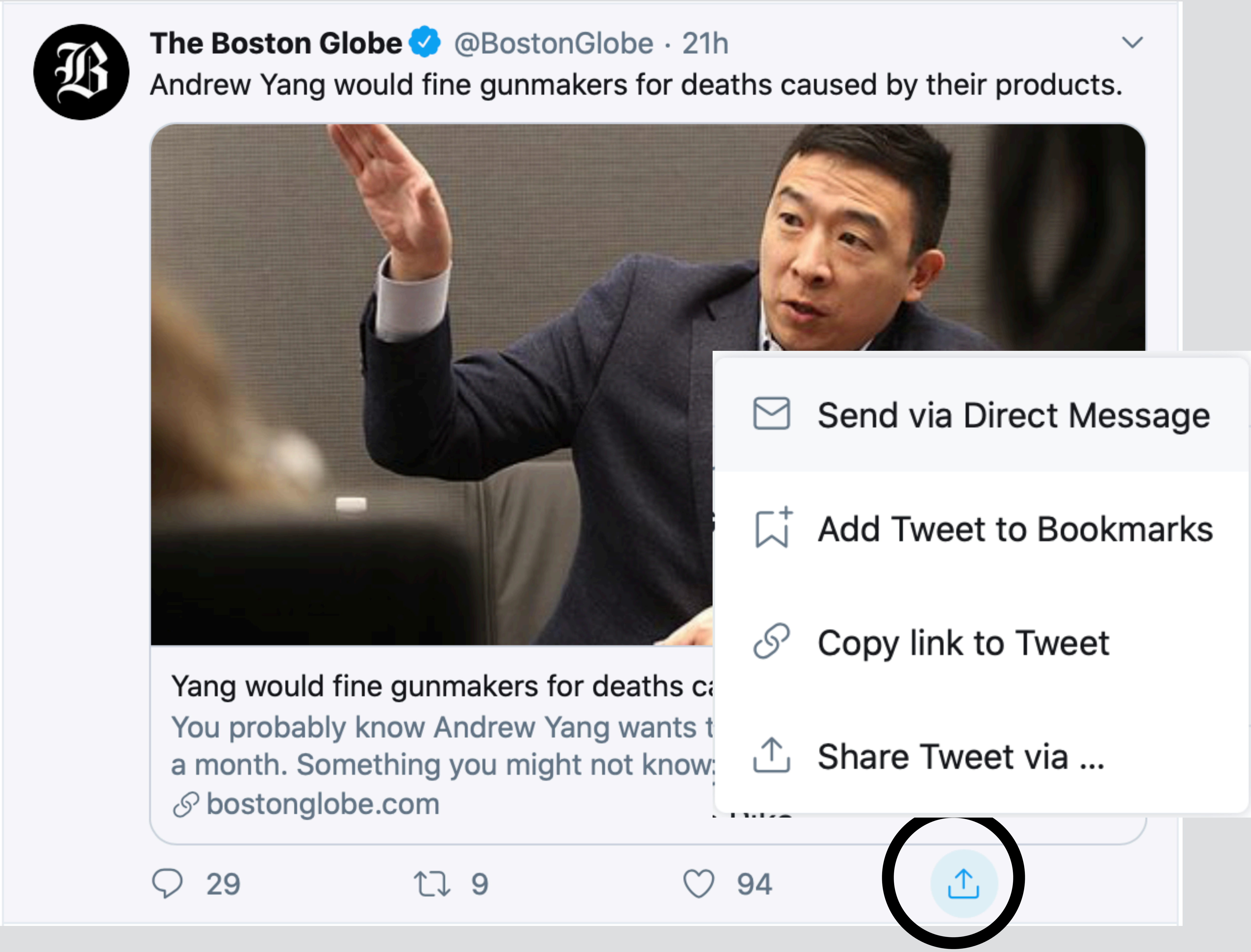
The Boston Globe @BostonGlobe · 21h

Andrew Yang would fine gunmakers for deaths caused by their products.

Yang would fine gunmakers for deaths caused by their products - Th...

You probably know Andrew Yang wants to give every American $1,000 a month. Something you might not know: He wants to fine gun ...

bostonglobe.com



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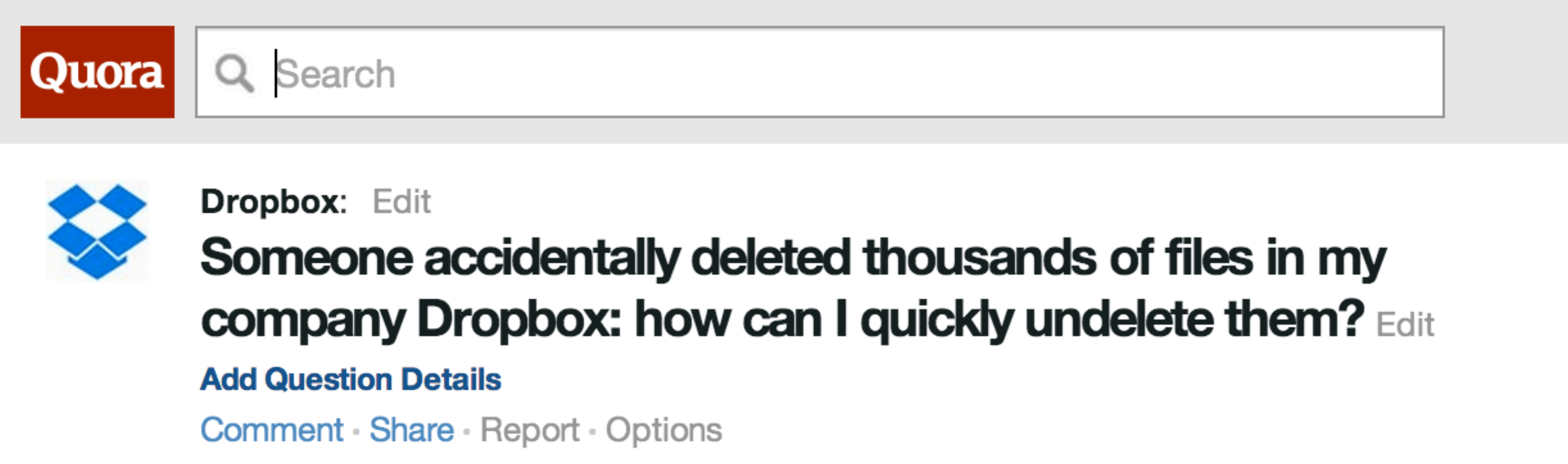
concept Upvote

concept Favorite

fix broken
concepts



Dropbox: Edit

Someone accidentally deleted thousands of files in my company Dropbox: how can I quickly undelete them? Edit

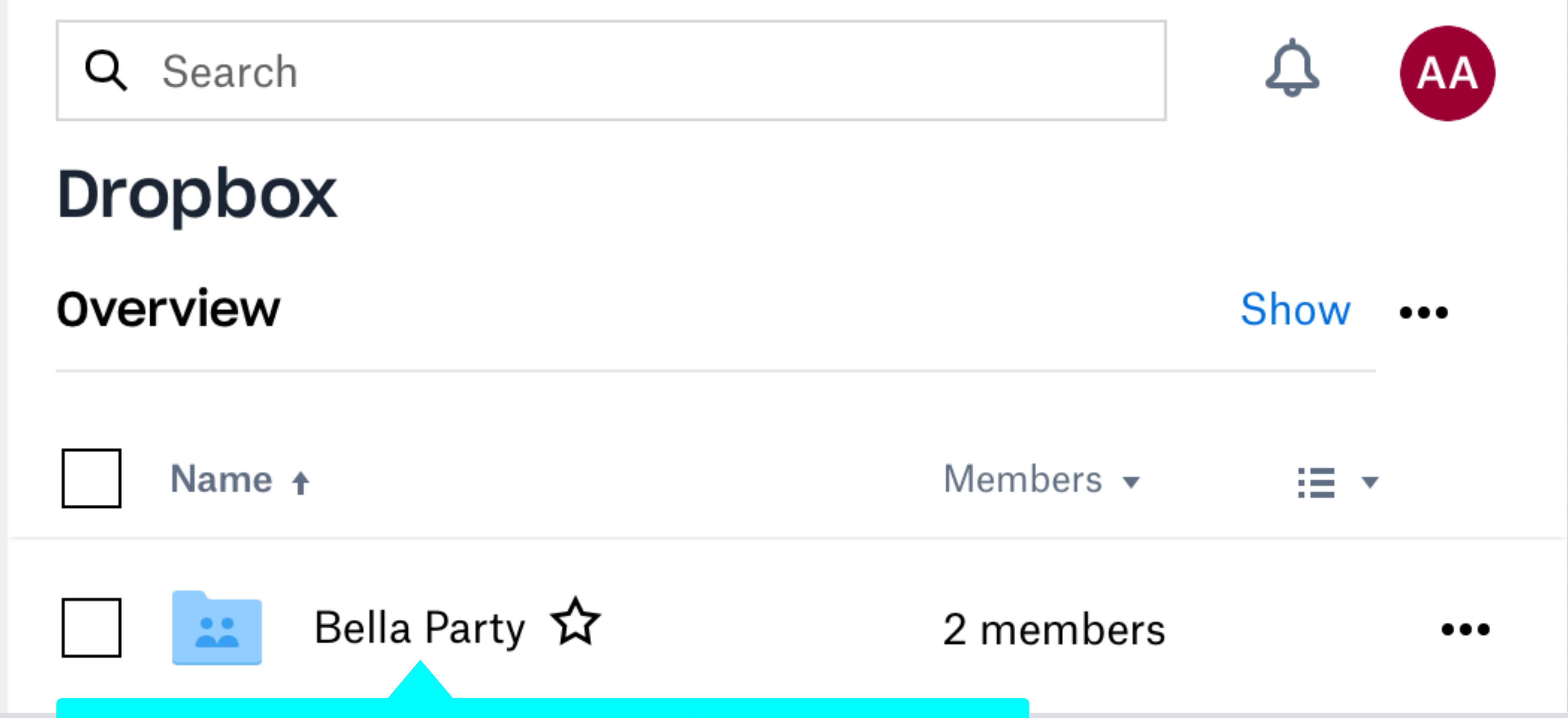
Sharing files with Dropbox (2021)

A family member of mine wanted to clear space on her drive

Listed very large files, and deleted ones she didn't recognize

Panicked message from colleague: where's our data?!

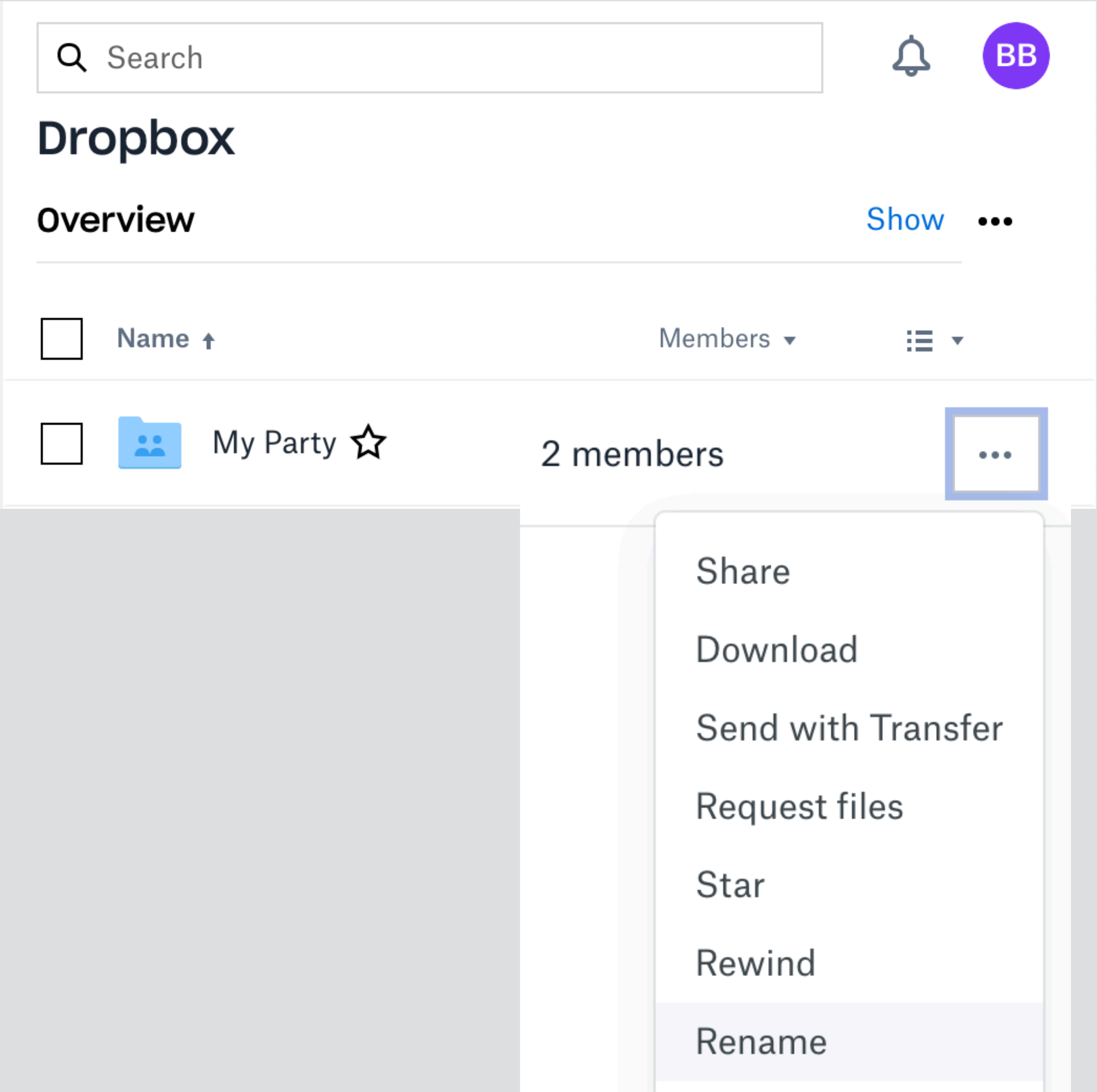
Ava is a party planner



does the name change for Ava too?

answer: no, Ava sees no change

Bella is having a party



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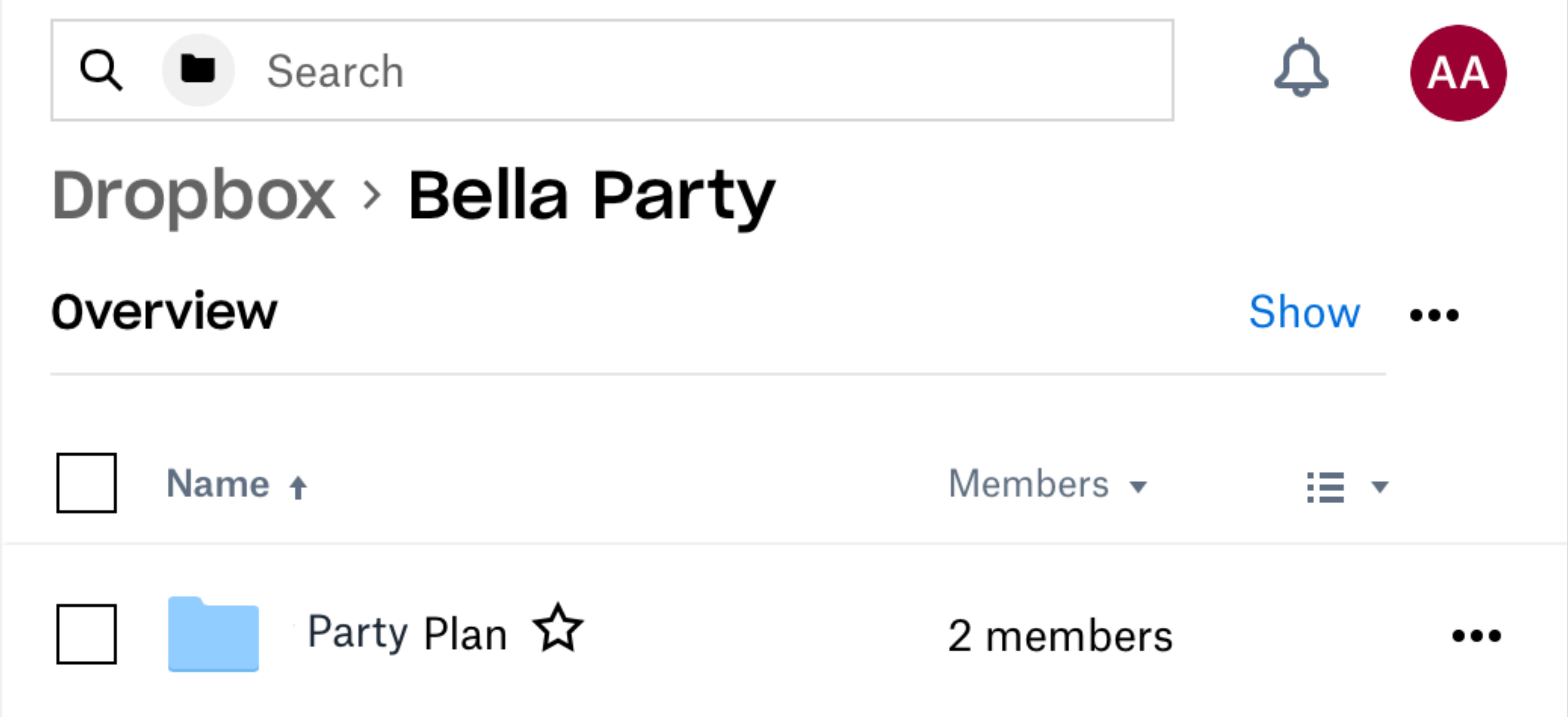
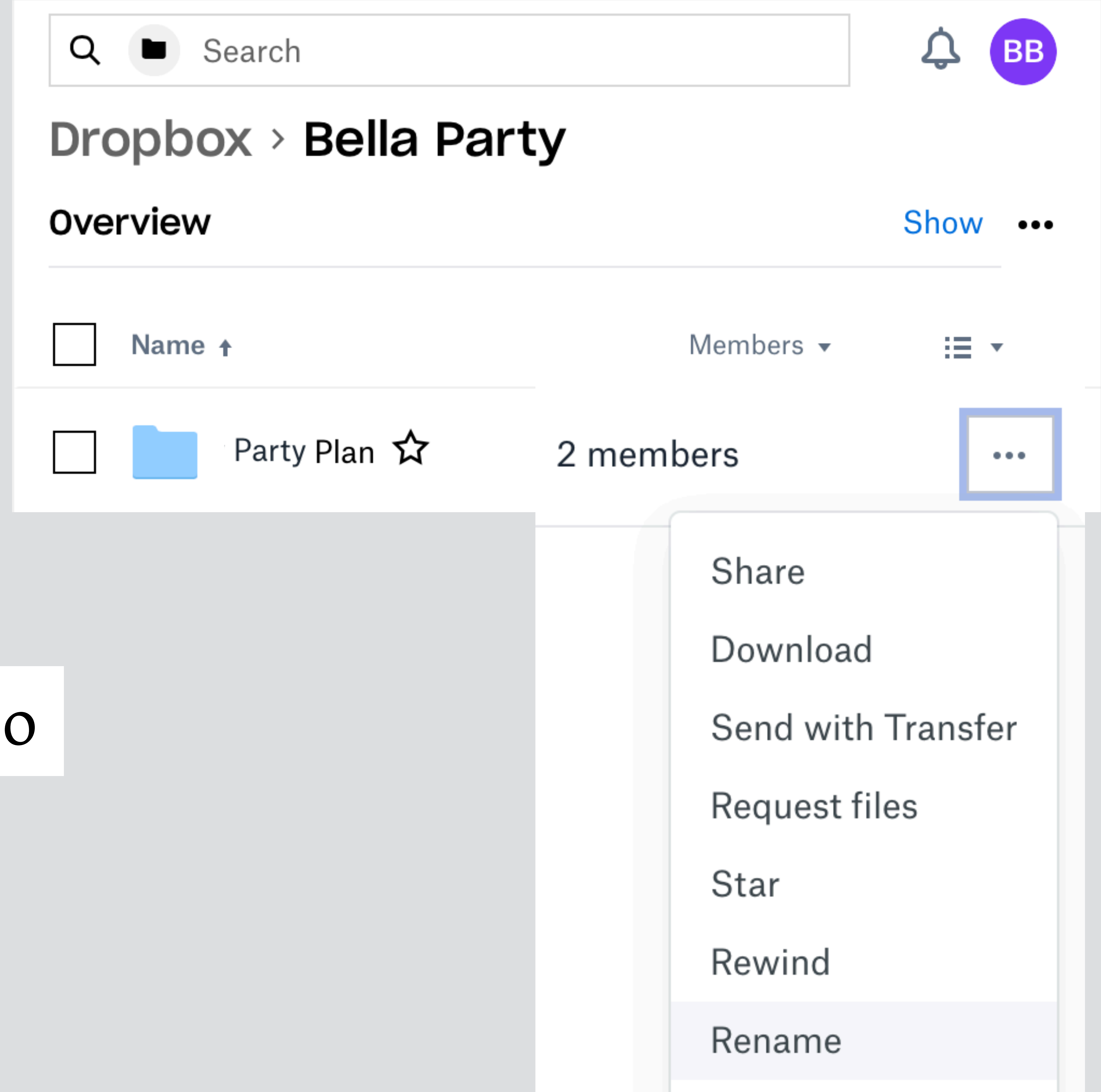


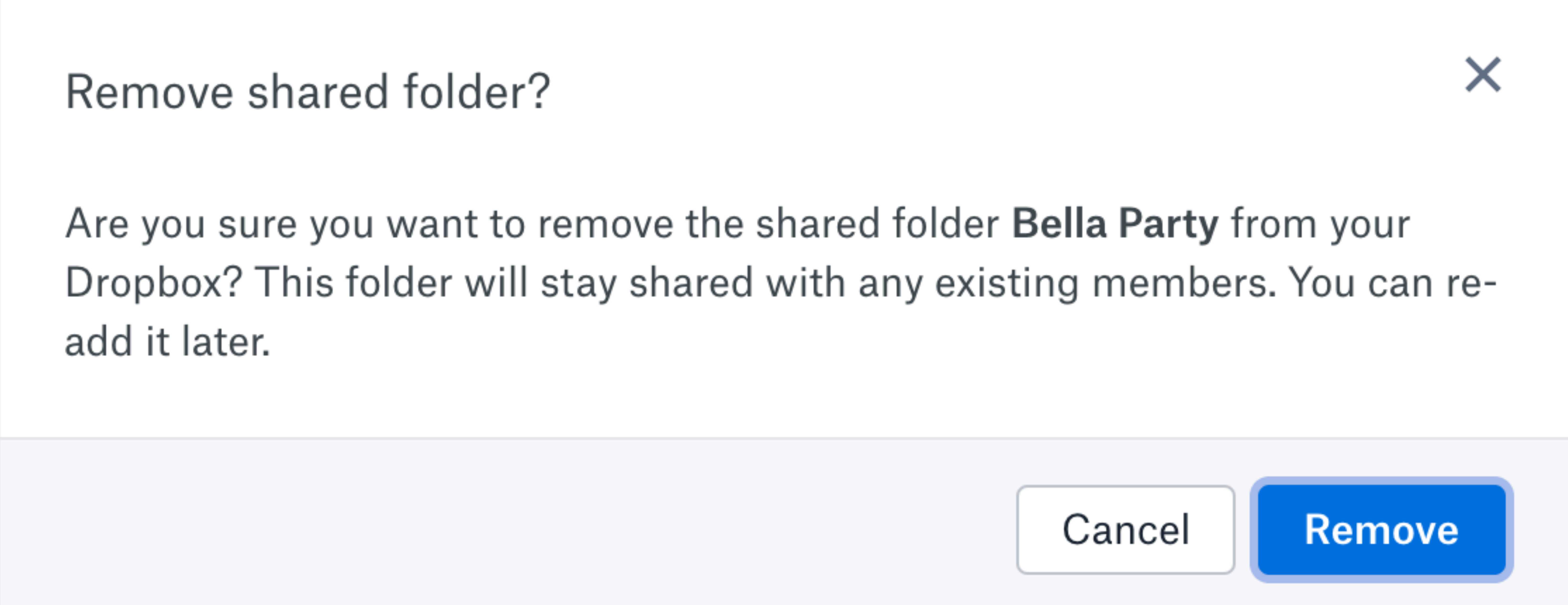
Bella is having a party



what about this case? folder inside shared folder

answer: yes, name changes for Ava too

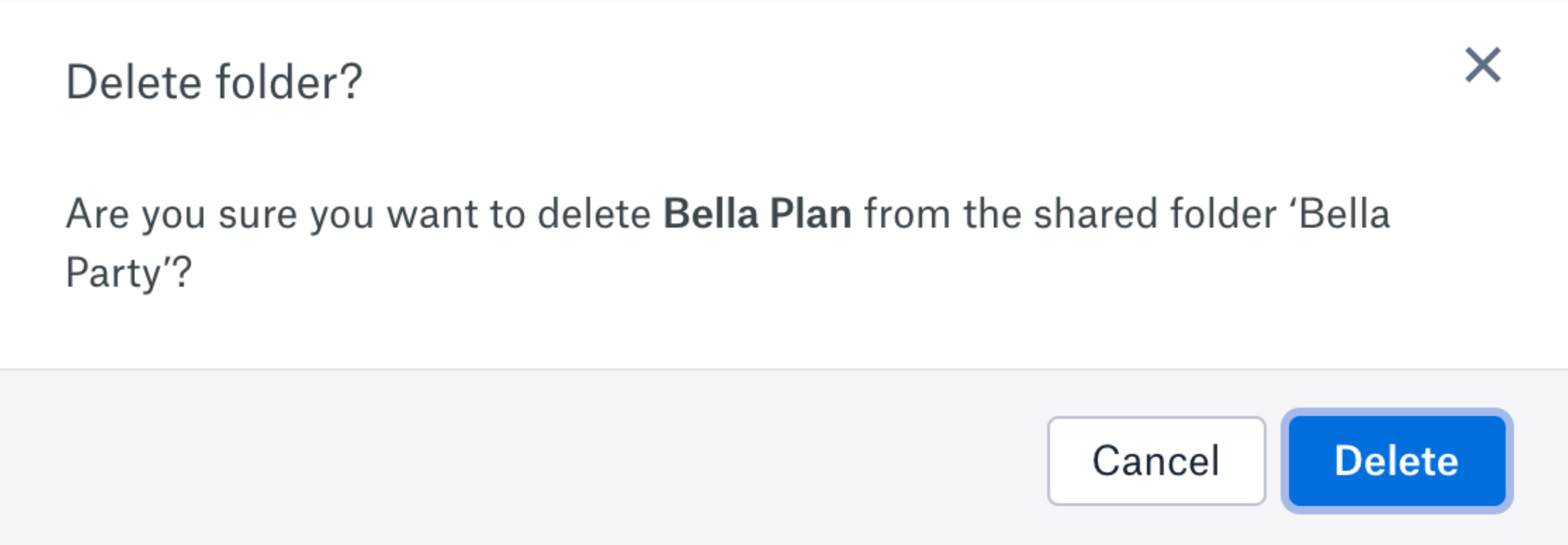
Bella deletes shared folder Bella Party



Remove shared folder?

Are you sure you want to remove the shared folder **Bella Party** from your Dropbox? This folder will stay shared with any existing members. You can re-add it later.

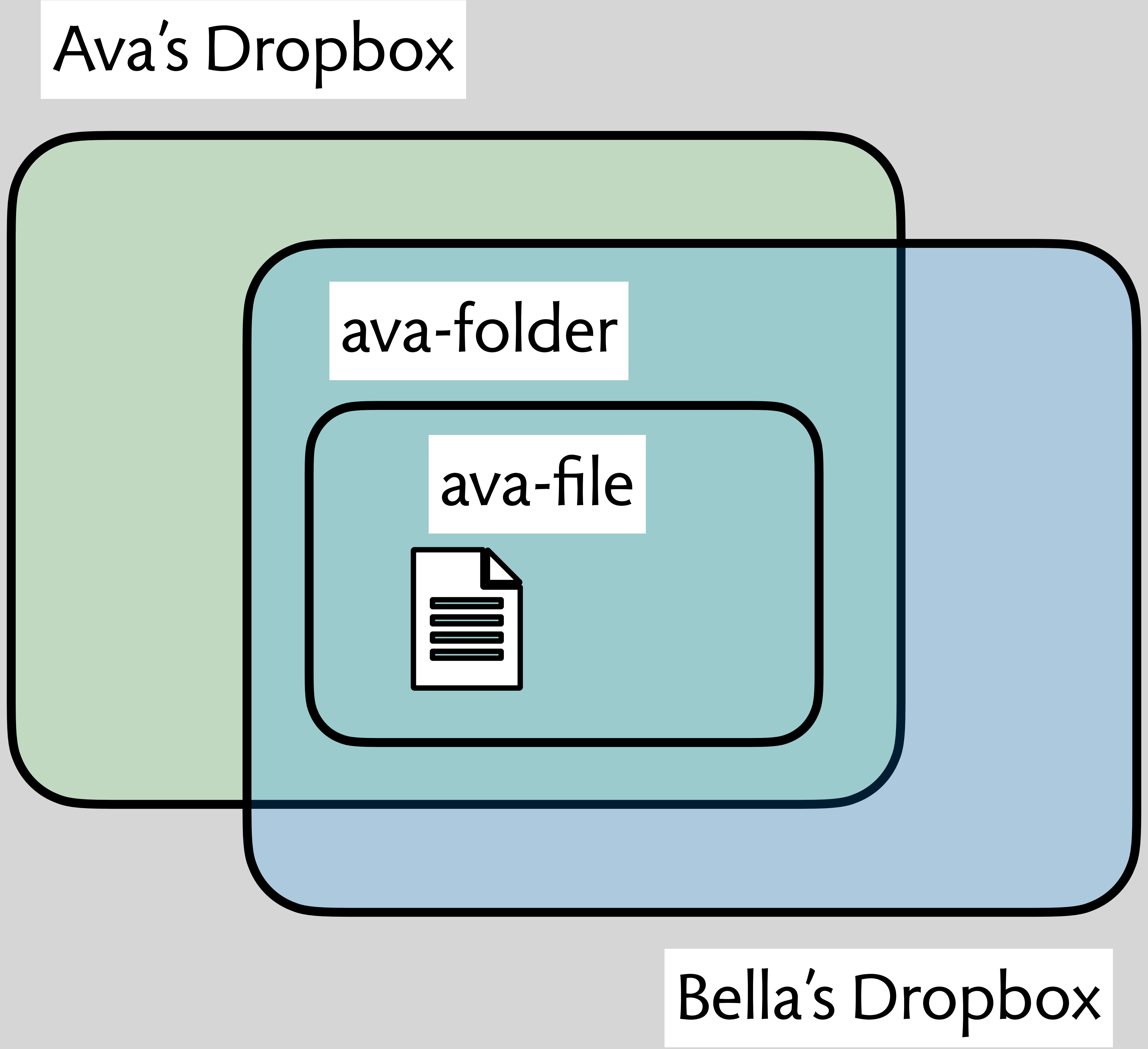
Bella deletes Bella Plan from shared folder Bella Party



Delete folder?

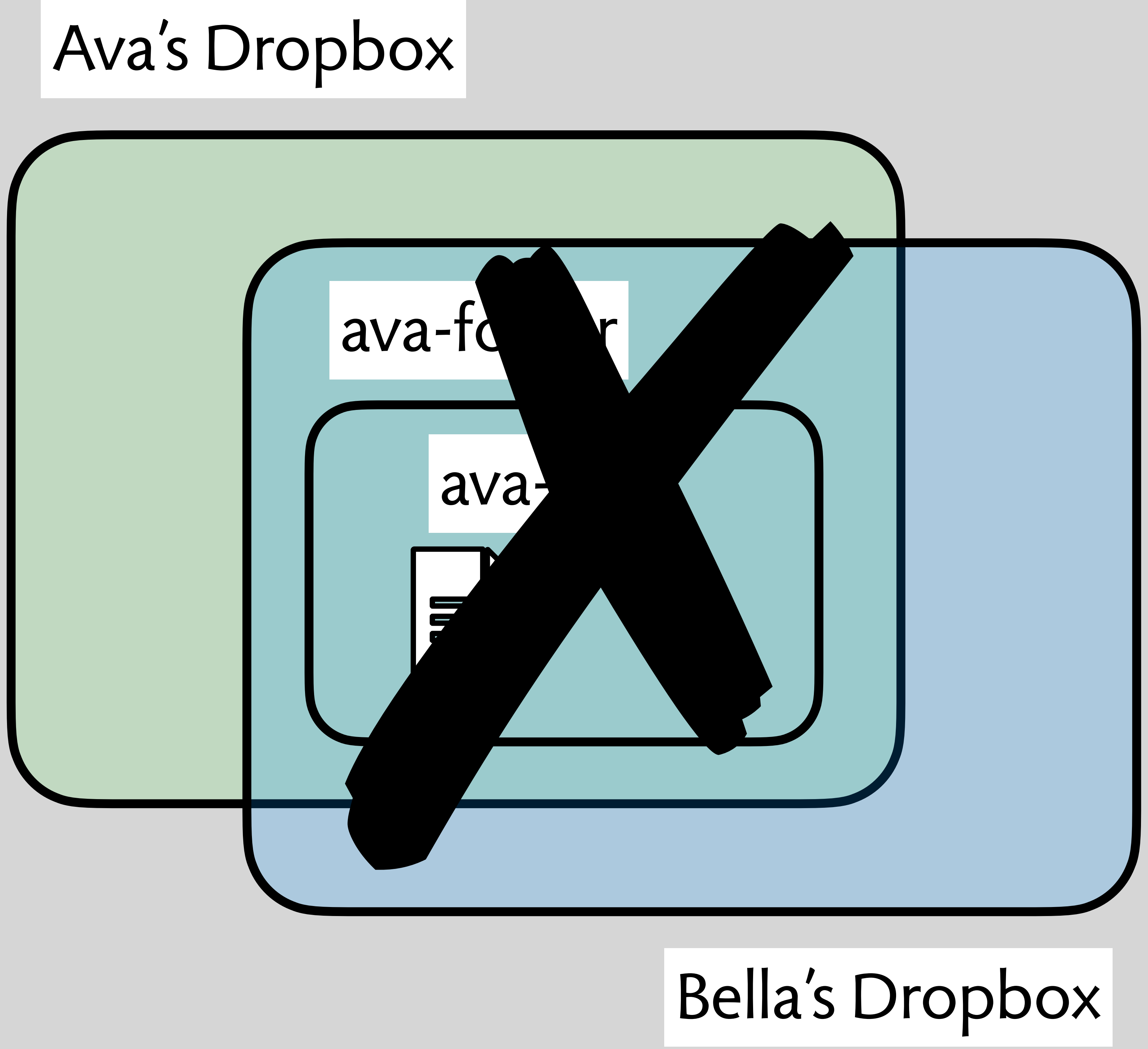
Are you sure you want to delete **Bella Plan** from the shared folder 'Bella Party'?

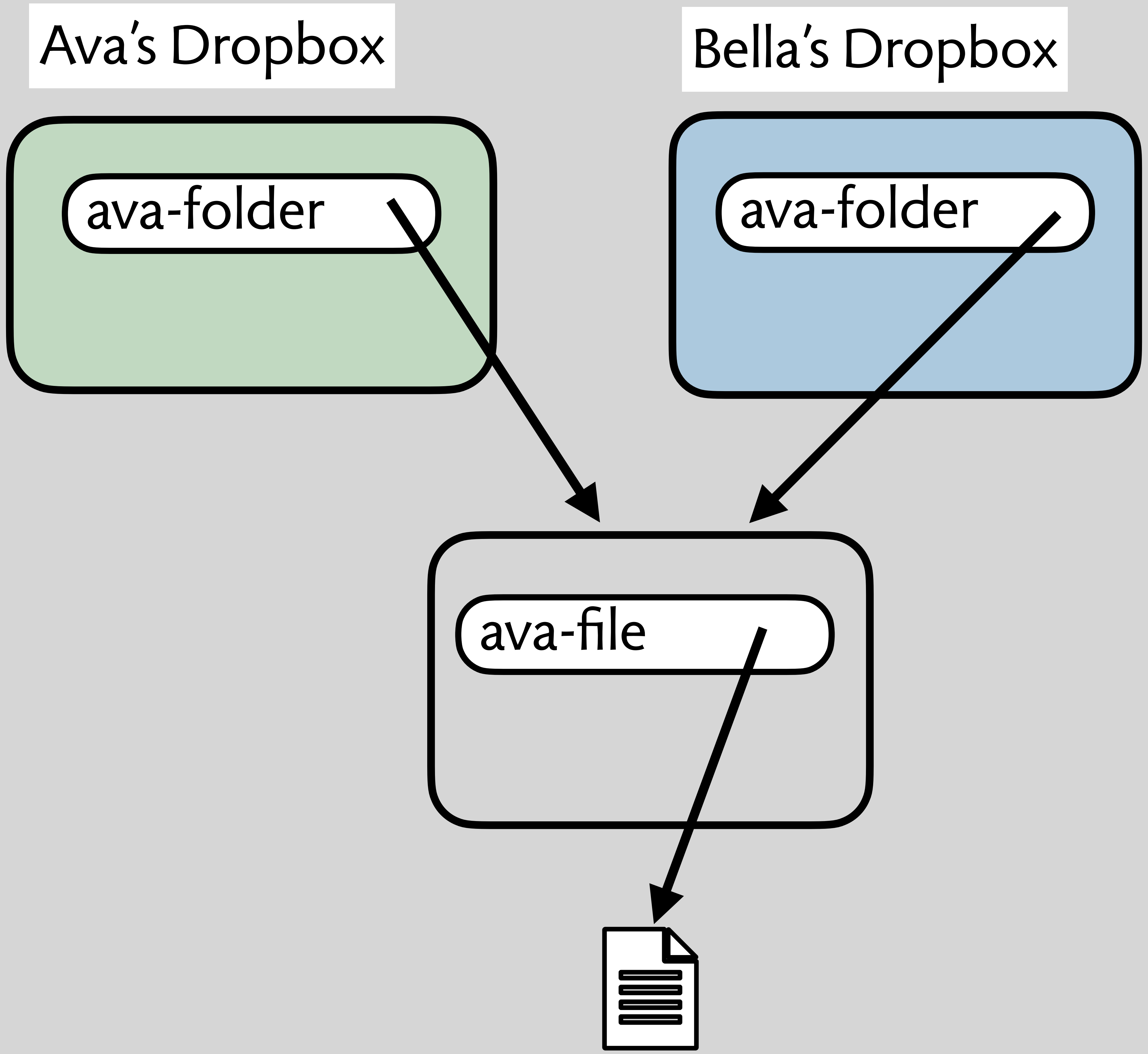
understanding dropbox



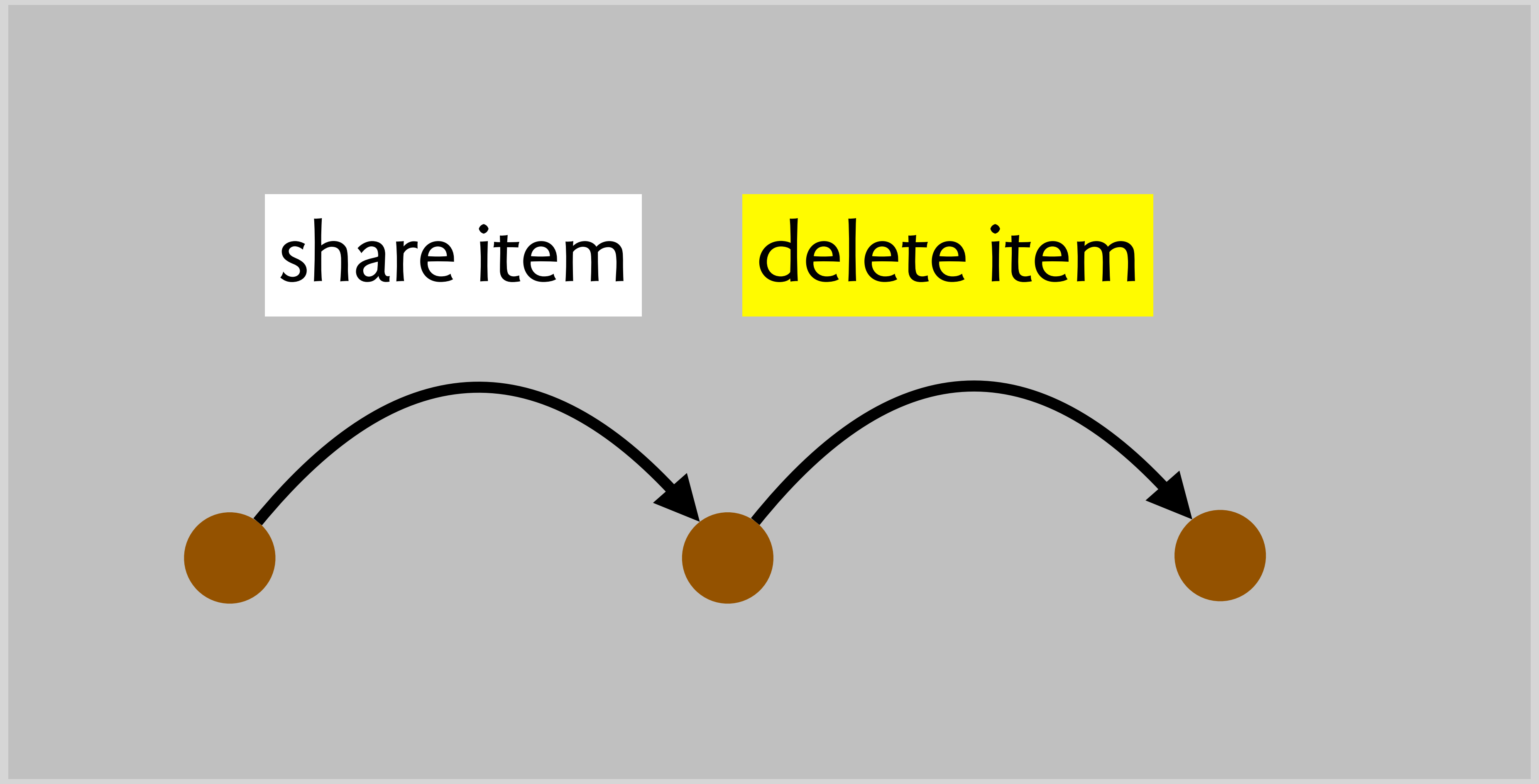
what if Bella deletes
the shared file?
or the shared folder?

correcting the picture





one scenario, two consequences



Item is shared directly: deletion removes item only for recipient

Item is shared indirectly: deletion removes item for owner too

why Dropbox deletions rarely matter that much

Shared Folder
concept

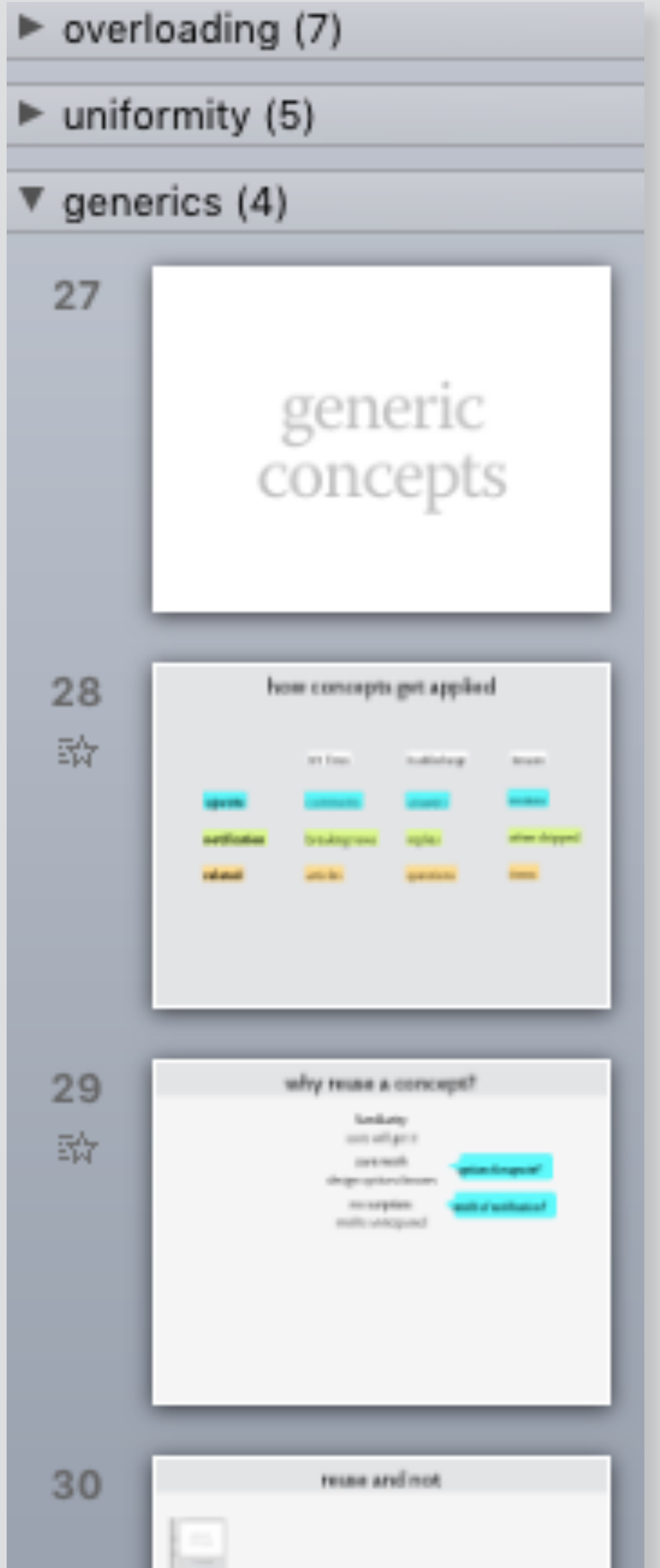
Trash
concept

AccessControl
concept

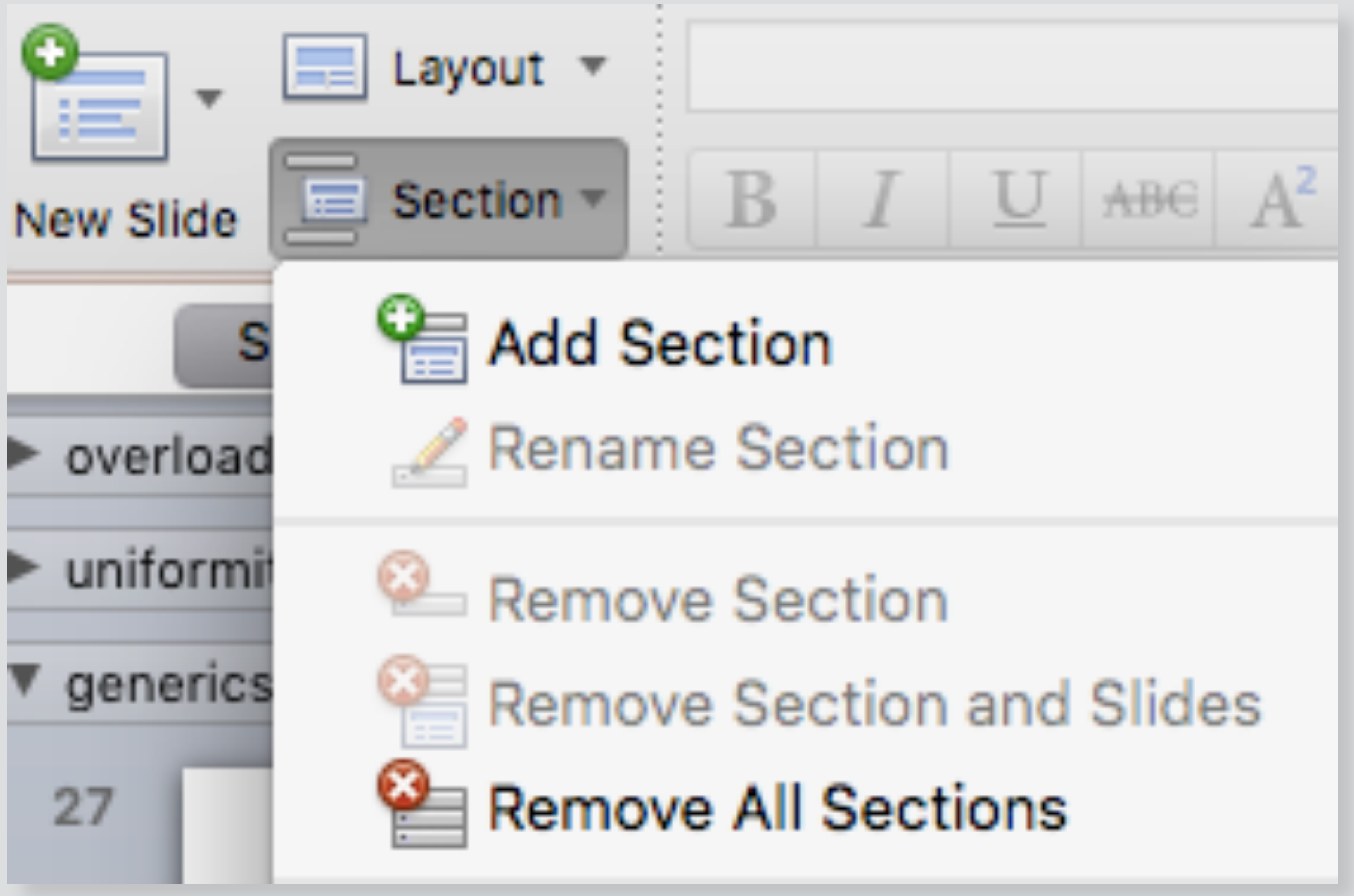
exploit
concept reuse

section: a tricky concept

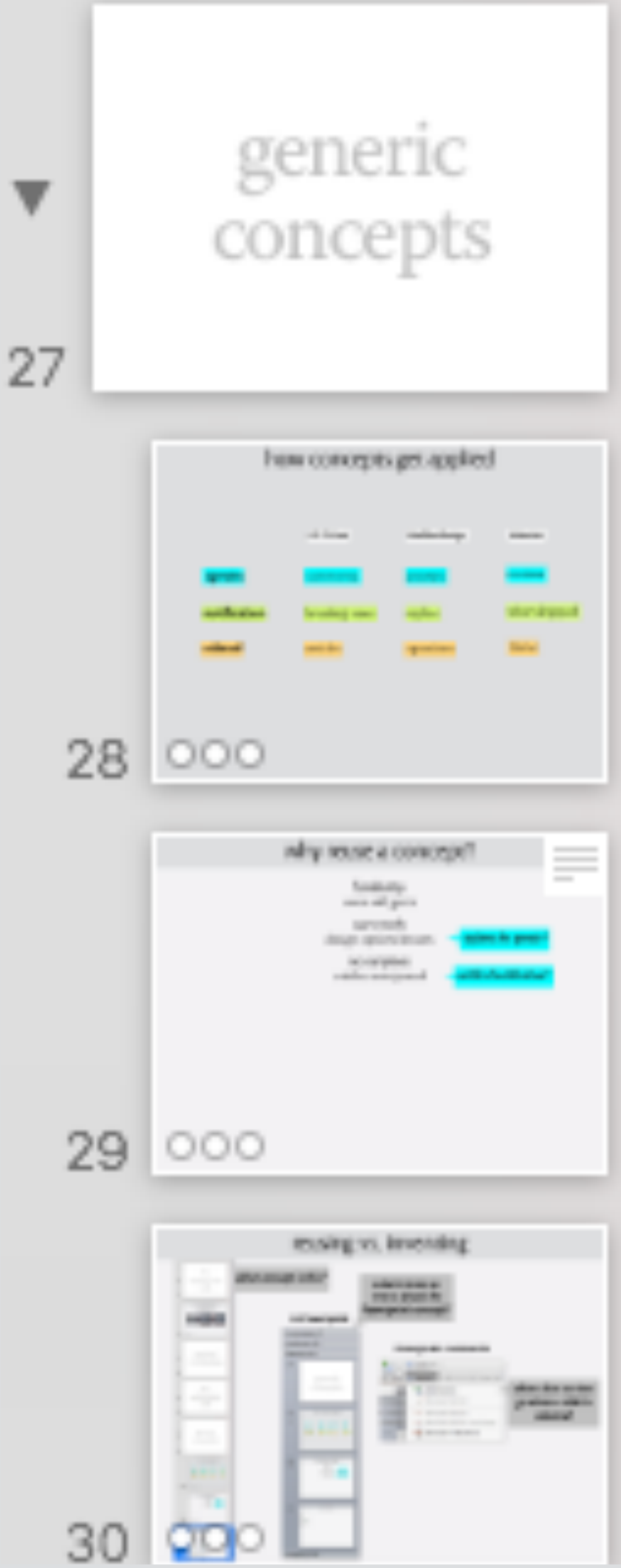
in Powerpoint



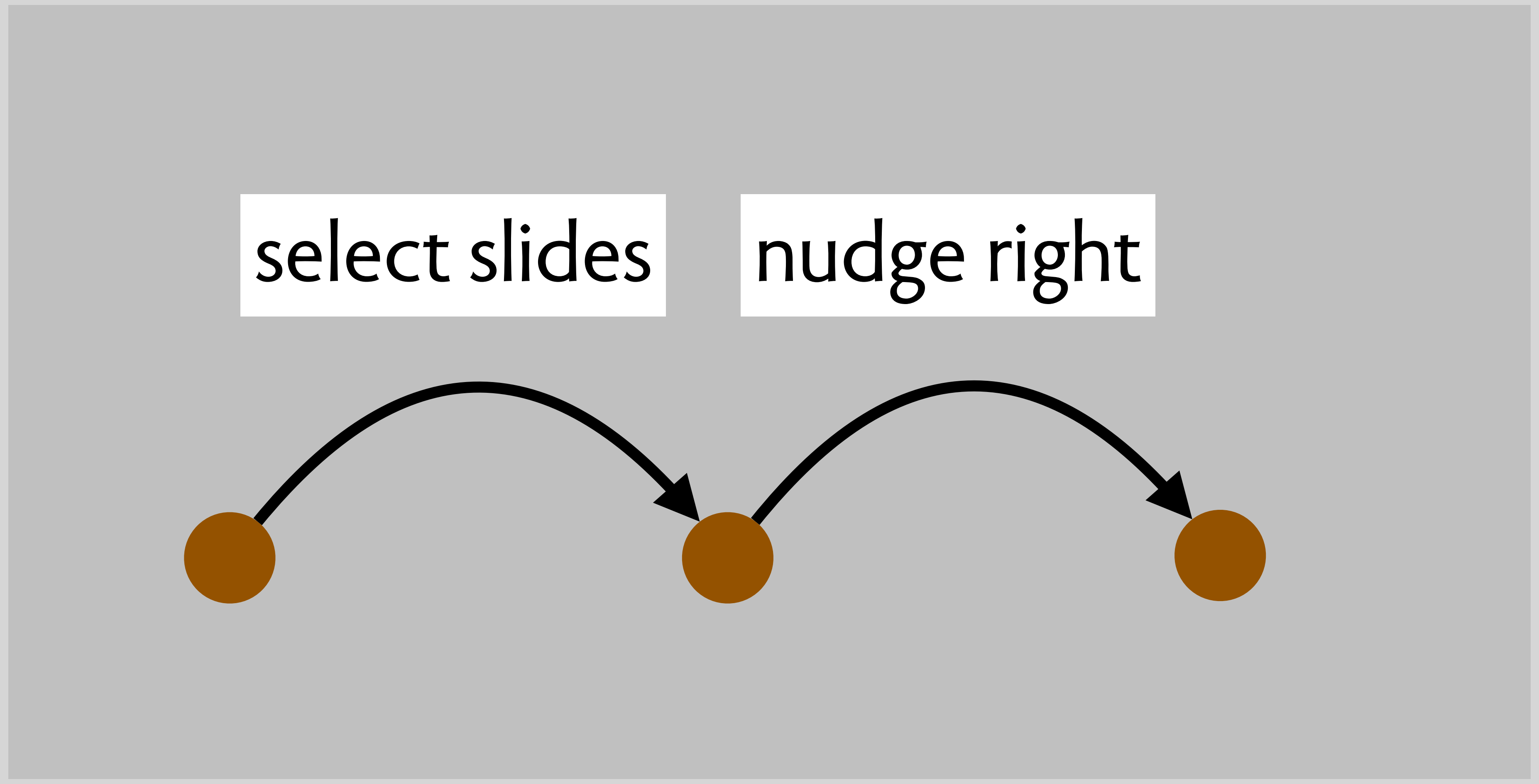
Powerpoint commands



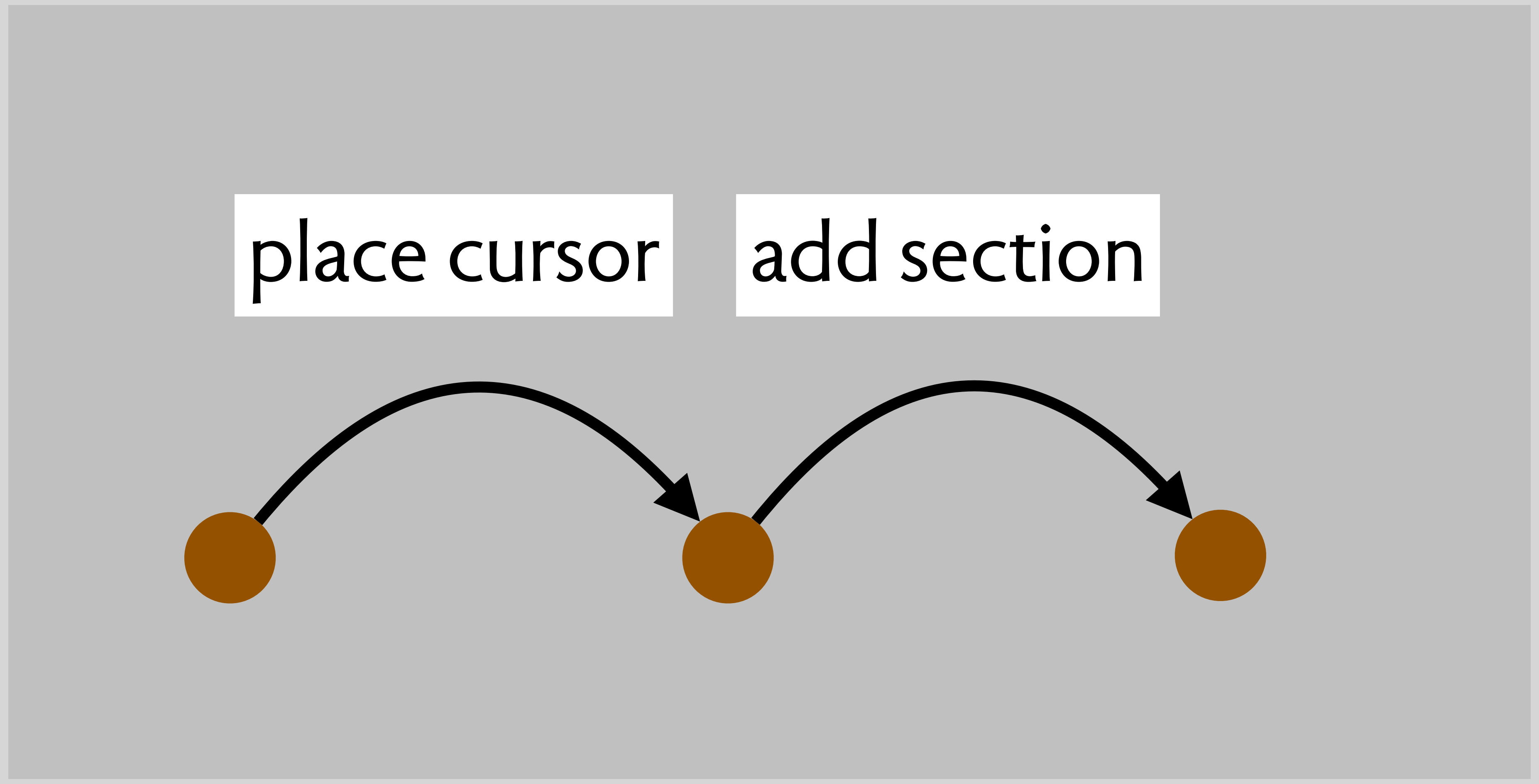
in Keynote



scenario effects that depend subtly on state



Keynote: nudged slides become children of preceding slide

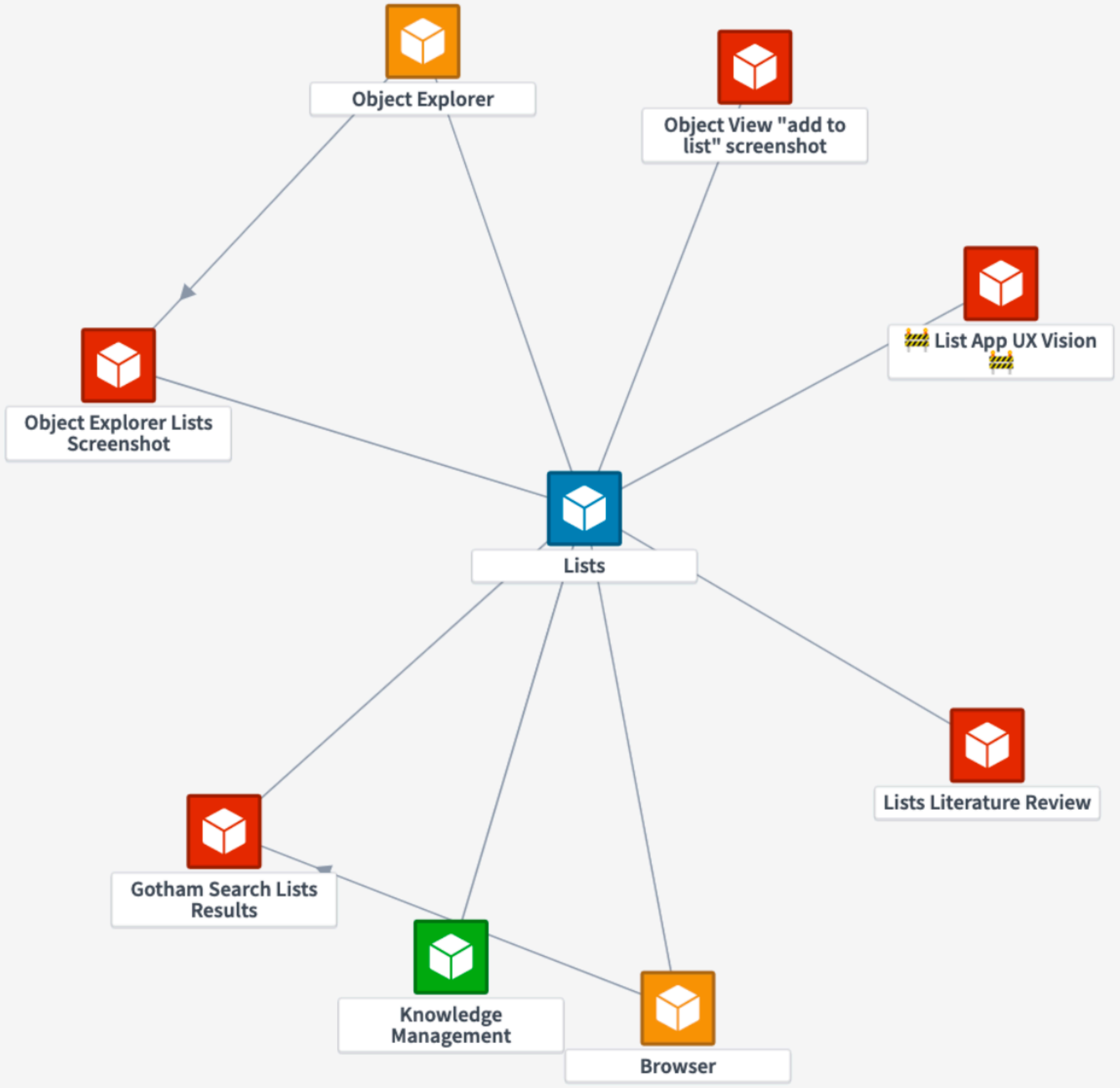


Powerpoint: section in which cursor is placed (?) is broken into two sections, containing all slides from cursor to next section

make a
concept catalog

concepts at Palantir (2023)

Wilczynski et al, arxiv.org/abs/2304.14975


Object Explorer
Object View "add to list" screenshot
🚧 List App UX Vision 🚧
Object Explorer Lists Screenshot
Lists
Lists Literature Review
Gotham Search Lists Results
Knowledge Management
Browser

challenges they were facing

issues not attributable to modules or even products
inconsistent UX across products for similar functions
"conceptual entropy": growing complexity

what they did

integrated concepts into company knowledge base
leaders bootstrapped by writing initial concepts
exploiting existing documents
now 200 concepts recorded, 280 regular users

concepts go beyond engineering

concepts used in marketing; IP lawyers interested too

concepts empower PMs

new career path: PMs given ownership of concepts

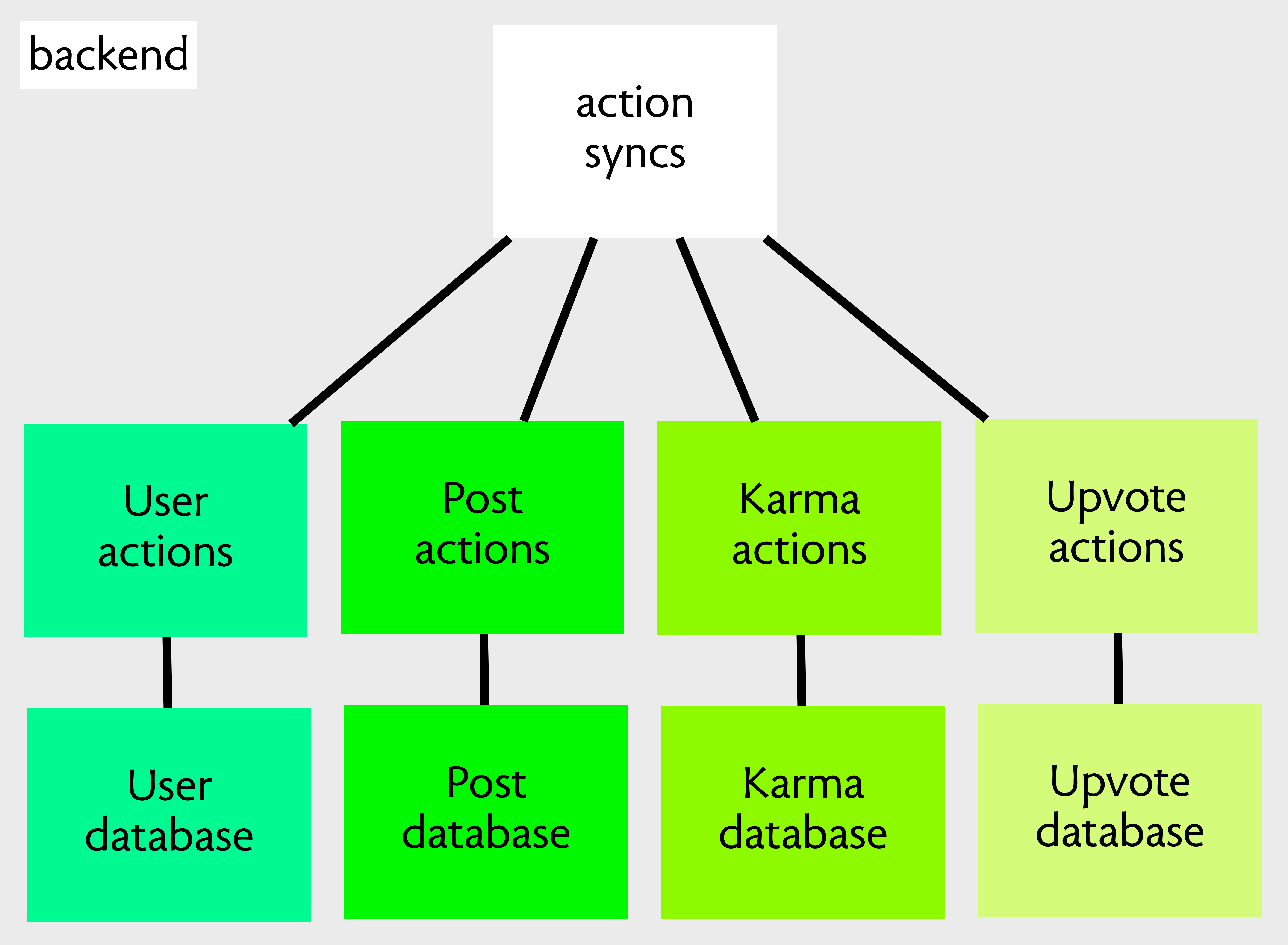
anticipated impacts

cataloging key assets & avoiding rework
aligning concepts across products, reuse
aligning marketing/design/engineering

modularize your code

with Abutalib Namazov

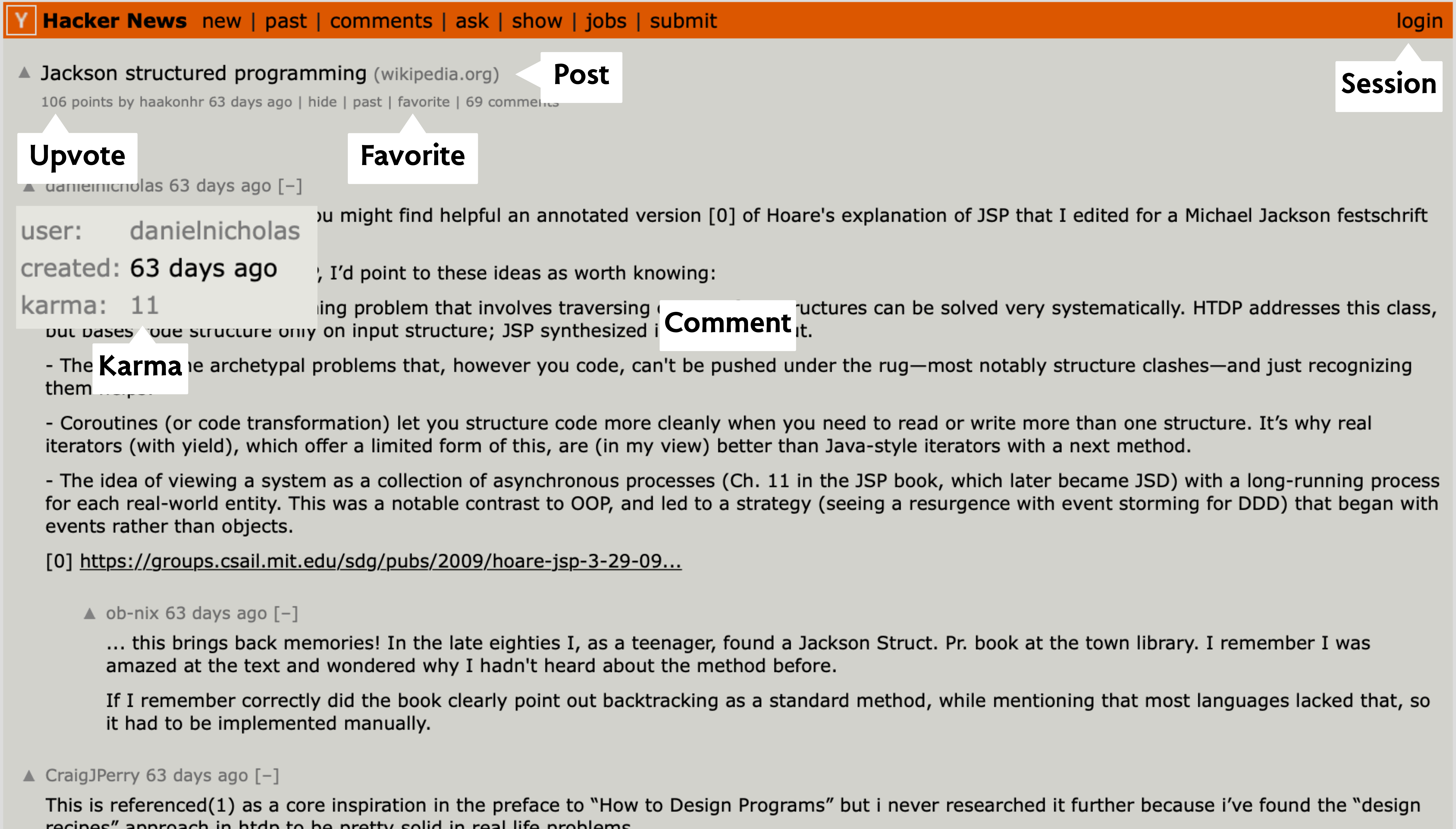
concepts as modules



6.1040 Software Studio
Vue + Node + Mongo
concepts are backend modules
concept architecture reduces student code
lets us provide concepts for user auth etc

Deja Vu (Perez De Rosso, 2019)
concept is full stack
app assembled from library of prebuilt concepts

new projects
weaving concepts (with Sullivan)
using LLMs to generate concepts & syncs



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user: danielnicholas

created: 63 days ago

karma: 11

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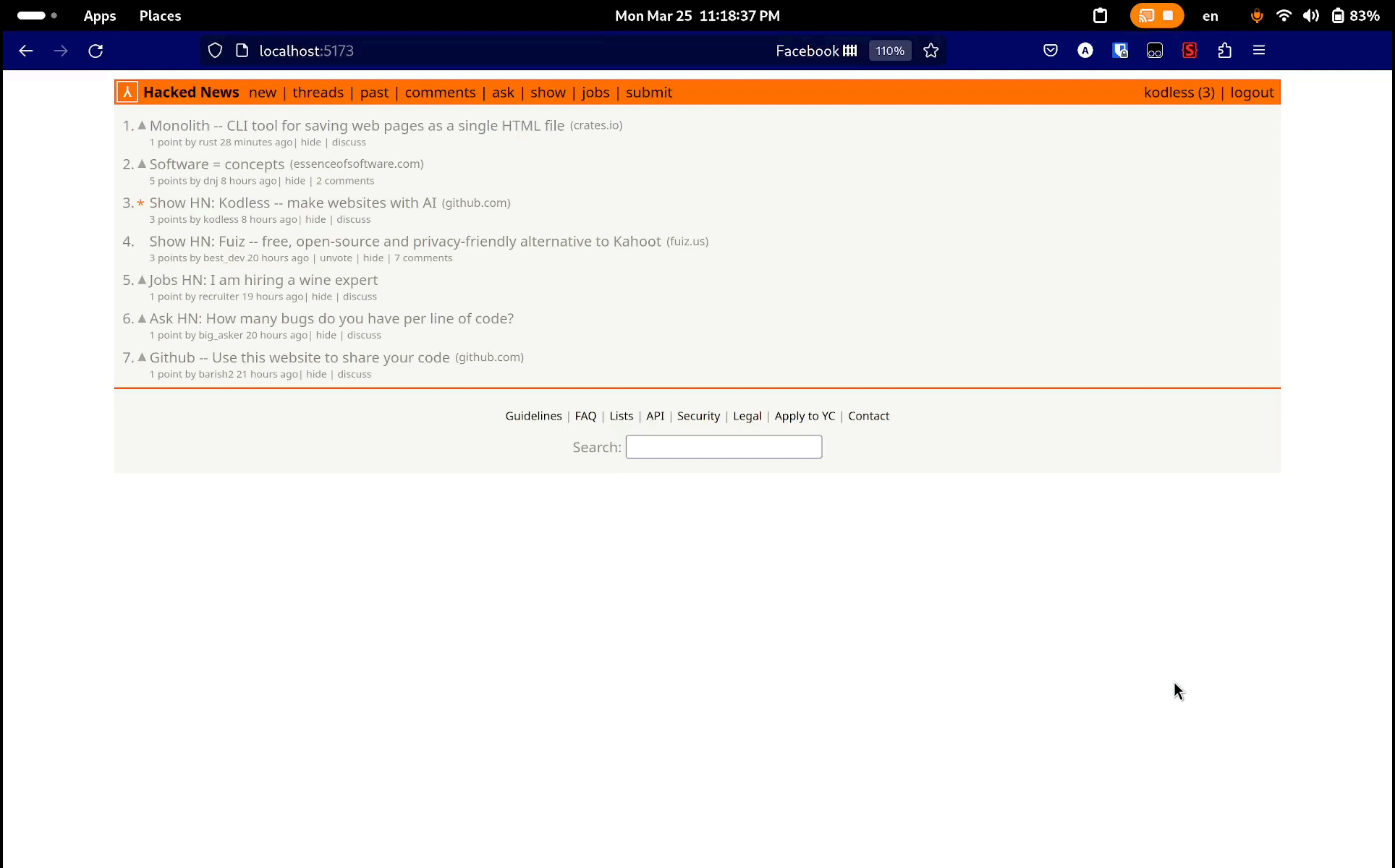

Hacked News new | threads | past | comments | ask | show | jobs | submit   kodless (3) | logout

1. ▲ Monolith -- CLI tool for saving web pages as a single HTML file (crates.io)
   1 point by rust 28 minutes ago| hide | discuss
2. ▲ Software = concepts (essenceofsoftware.com)
   5 points by dnj 8 hours ago| hide | 2 comments
3. * Show HN: Kodless -- make websites with AI (github.com)
   3 points by kodless 8 hours ago| hide | discuss
4. Show HN: Fuiz -- free, open-source and privacy-friendly alternative to Kahoot (fuiz.us)
   3 points by best_dev 20 hours ago | unvote | hide | 7 comments
5. ▲ Jobs HN: I am hiring a wine expert
   1 point by recruiter 19 hours ago| hide | discuss
6. ▲ Ask HN: How many bugs do you have per line of code?
   1 point by big_asker 20 hours ago| hide | discuss
7. ▲ Github -- Use this website to share your code (github.com)
   1 point by barish2 21 hours ago| hide | discuss

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how hackednews was built: the GPT prompts

list concepts

User, Post, Comment, Vote, Karma, Favorite

list the concept's state components

Each post should have author (generic), title (string), optional url (string), optional text (string)

list the concept's actions

- create, update, delete
- getByAuthor, getById
- getByIds, mapping from id to post
- get(options?: {dateStart?, dateEnd?, page?, count?, titlePrefix?}) where default page=1, count=30
- isUserAuthor

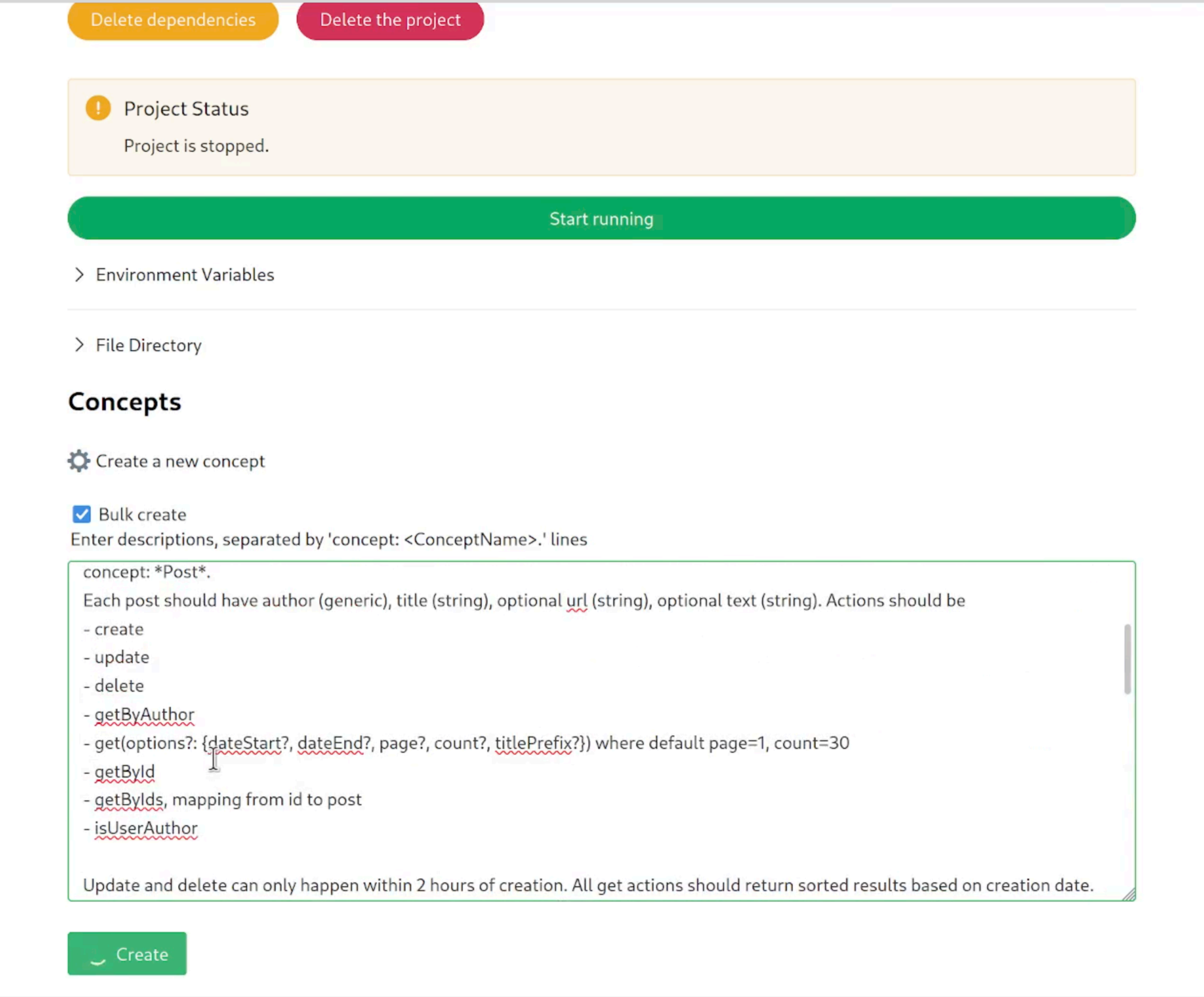
add any additional specification

Update and delete can only happen within 2 hours of creation. All get actions should return sorted results based on creation date.

list backend routes (synchronizations)

DELETE /posts/<id> – Delete a post, but not allowed if it has comments under it.

what the UI of the builder looks like



Project Status

Project is stopped.

Concepts

☑ Bulk create

Enter descriptions, separated by 'concept: <ConceptName>.' lines

concept: *Post*.

Each post should have author (generic), title (string), optional url (string), optional text (string). Actions should be

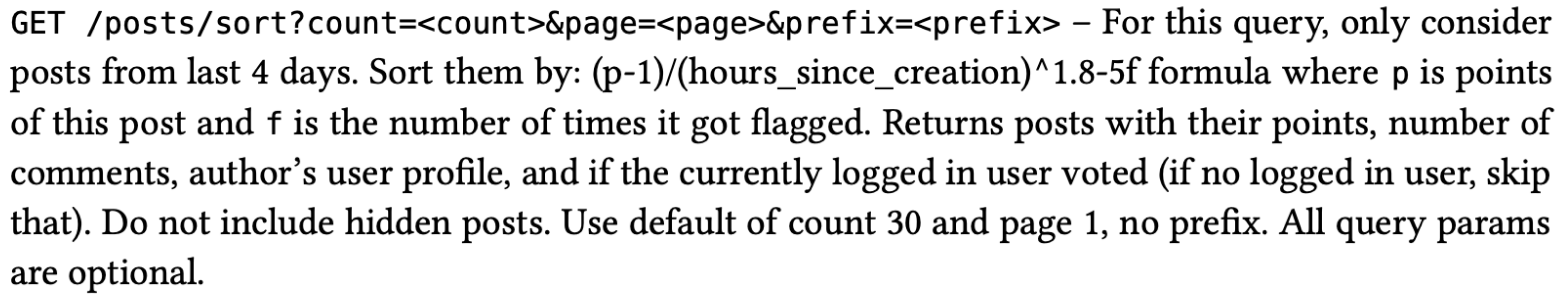
- create
- update
- delete
- getByAuthor
- get(options?: {dateStart?, dateEnd?, page?, count?, titlePrefix?}) where default page=1, count=30
- getById
- getByIds, mapping from id to post
- isUserAuthor

Update and delete can only happen within 2 hours of creation. All get actions should return sorted results based on creation date.

the good, the bad & the ugly

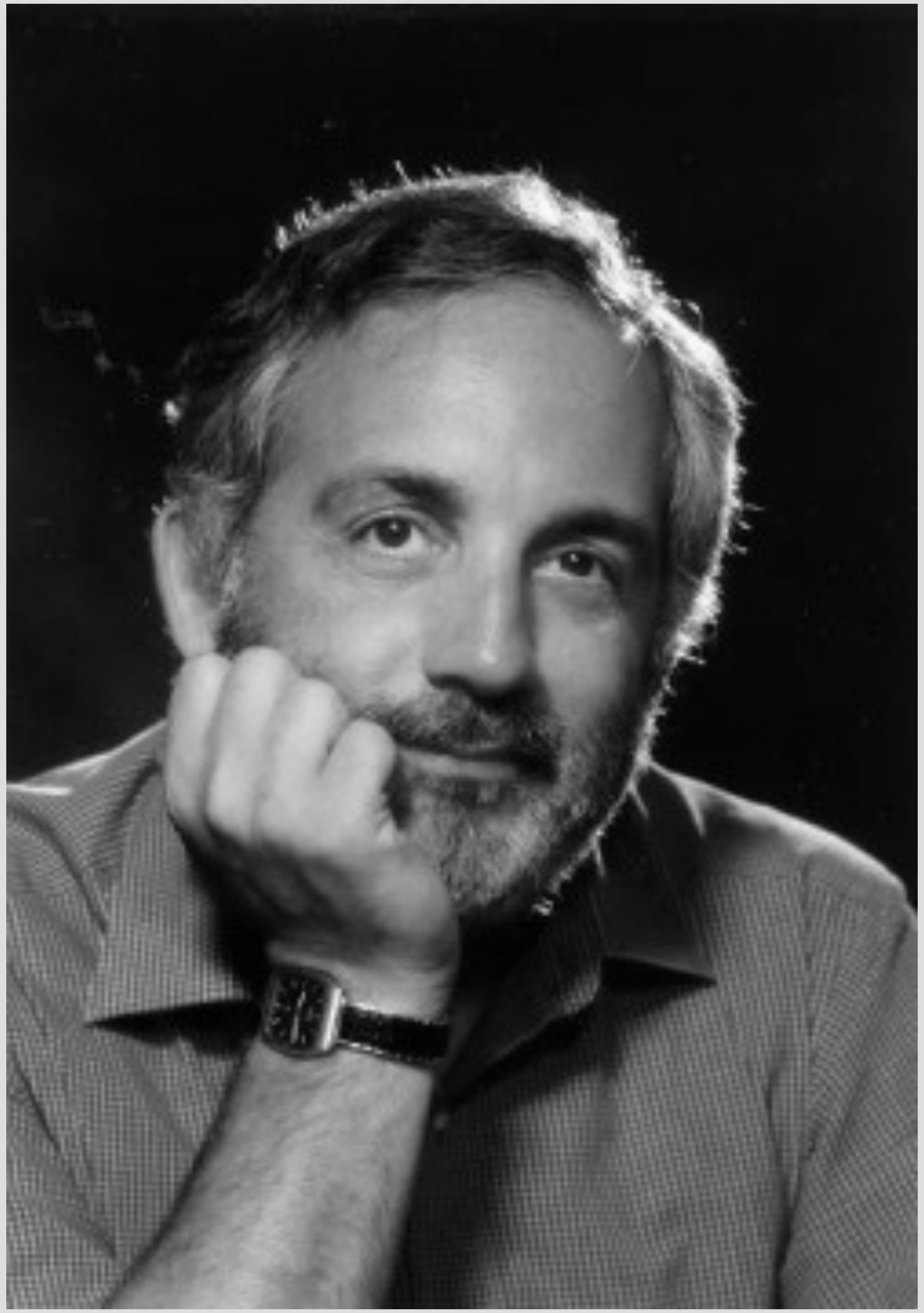
spec of HackedNews is < 1,000 words
covers all of HackerNews functionality
this **includes** specifications of all concepts
runs the first time, only minor tweaks needed
recursive comments coded from mention of "comment tree"

frontend is not yet built automatically, but we're close
sometimes **code quality** of routes isn't great (but they work)
sometimes generated code contains **type errors** but still works
some **routes are complicated** to describe

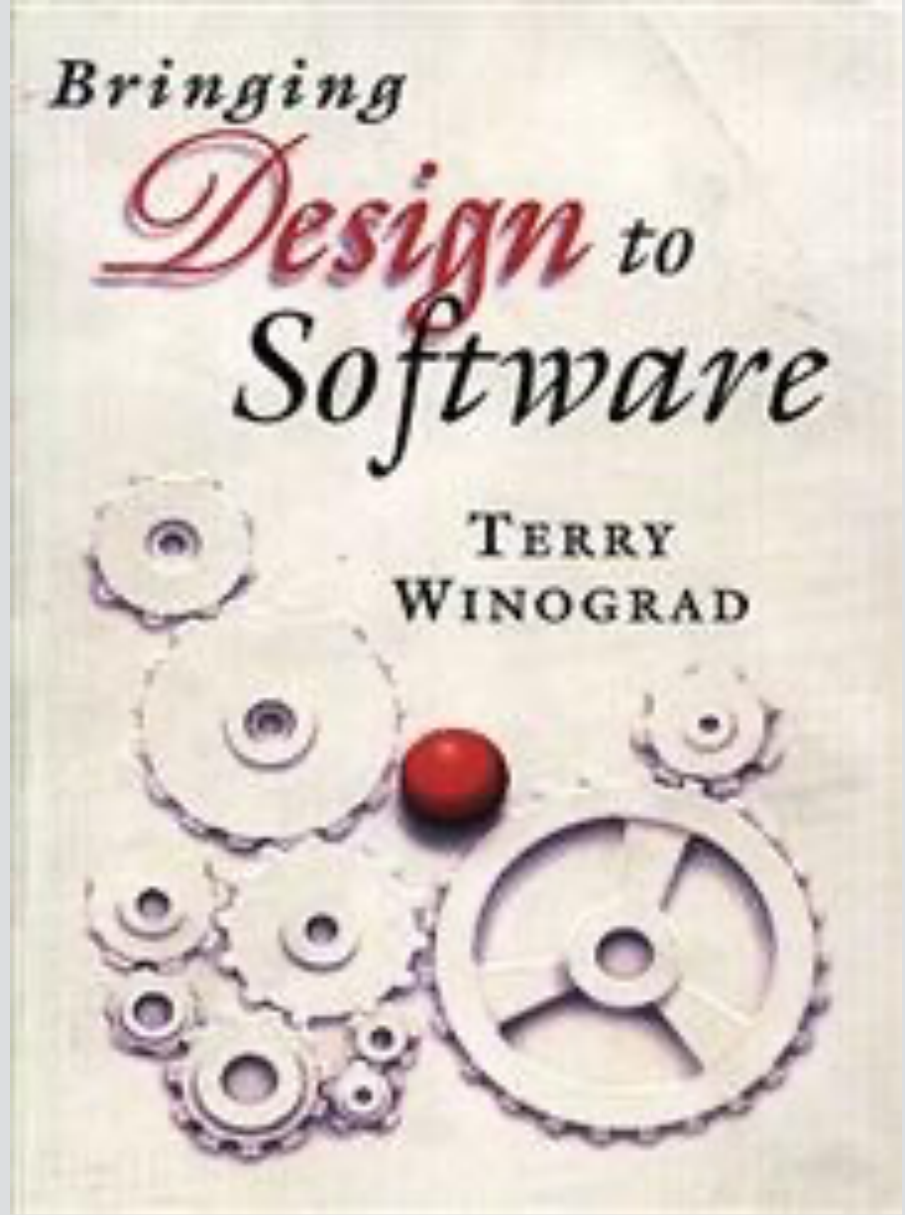


`GET /posts/sort?count=<count>&page=<page>&prefix=<prefix>` – For this query, only consider posts from last 4 days. Sort them by: (p-1)/(hours_since_creation)^1.8-5f formula where `p` is points of this post and `f` is the number of times it got flagged. Returns posts with their points, number of comments, author's user profile, and if the currently logged in user voted (if no logged in user, skip that). Do not include hidden posts. Use default of count 30 and page 1, no prefix. All query params are optional.

some major influences



Mitchell Kapor
entrepreneur, 1950–



When you go to design a house you talk to an architect first, not an engineer. Why is this?

Because the criteria for what makes a good building fall outside the domain of engineering.

Similarly, in computer programs, the selection of the **various components** must be driven by the conditions of use.

How is this to be done? By software designers.

Mitchell Kapor, *A Software Design Manifesto* (1996)

Michael Polanyi
scientist & philosopher, 1891-1976

> We have seen that a tool, a machine or a technical process is characterised by an **operational principle**, which differs altogether from an observational statement…
>
> Engineering includes the operational principles of machines and some knowledge of physics bearing on those principles.
>
> Physics and chemistry, on the other hand, include no knowledge of the operational principles of machines. Hence a complete physical and chemical topography of an object would not tell us whether it is a machine, and if so, how it works, and for what purpose.

Michael Polanyi, *Personal Knowledge* (1974)

Bruno Latour
sociologist, 1947–2022

Walls are a nice invention, but if there were no holes in them there would be no way to get in or out… The problem is that if you make holes in the walls, anything and anyone can get in and out (cows, visitors, dust, rats, noise…) So architects invented this hybrid: a wall hole, often called a door, which although common enough has always struck me as a miracle of technology.

The **cleverness of the invention hinges upon the hingepin**: instead of driving a hole through walls with a sledgehammer or a pick, you **simply gently push the door**…; furthermore—and here is the real trick—once you have passed through the door, you do not have to find **trowel and cement to rebuild the wall** you have just destroyed: you simply push the door gently back…

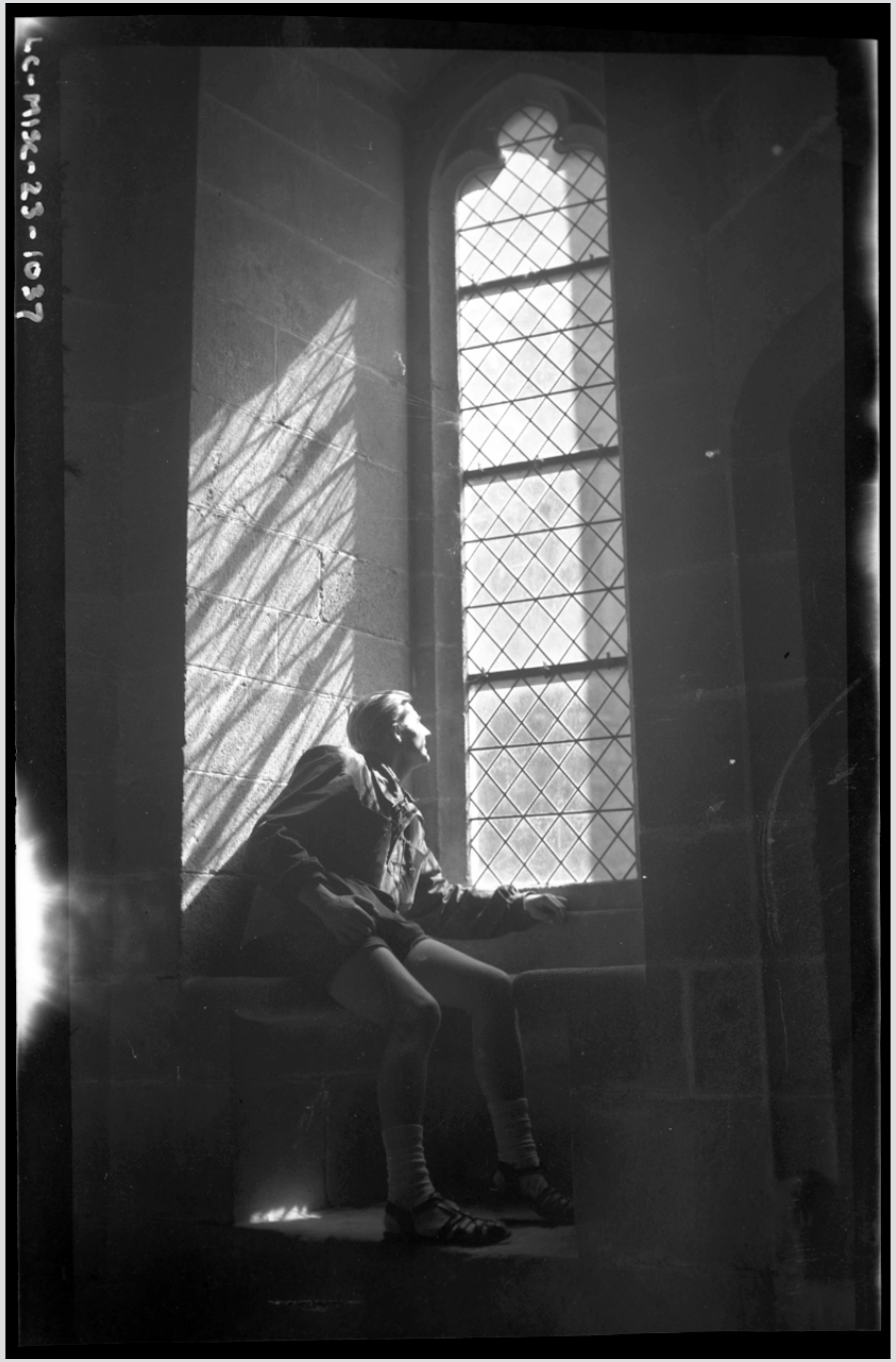
Bruno Latour, *Where Are the Missing Masses?* (1992)

Christopher Alexander
architect, 1936–2022

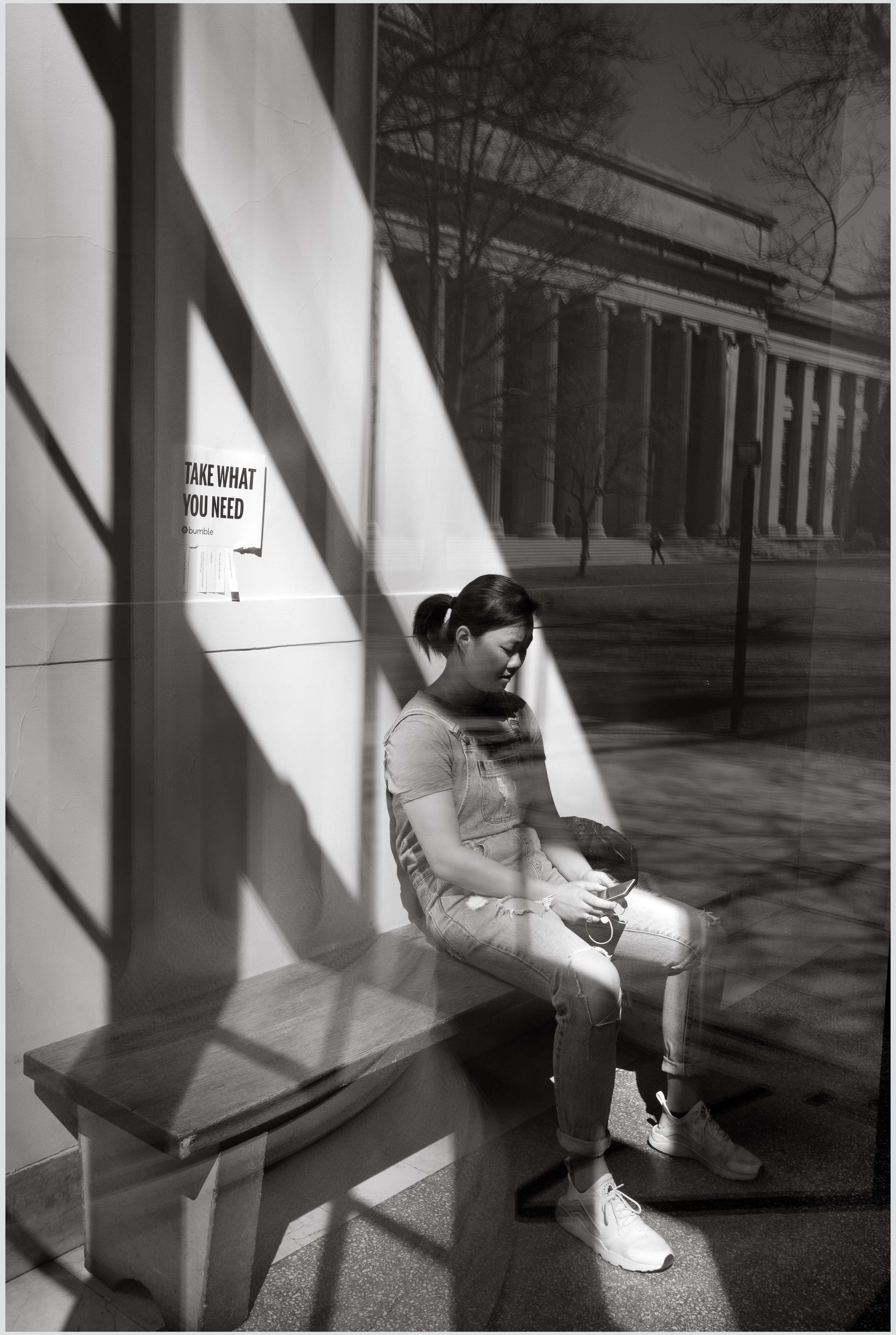
Such a list of requirements is **potentially endless**… But if we think of the requirements from a negative point of view, as potential **misfits**, there is a simple way of picking a finite set…

We take just those relations between form and context which obtrude most strongly, which demand attention most clearly, which seem most likely to go wrong. We cannot do better than this.

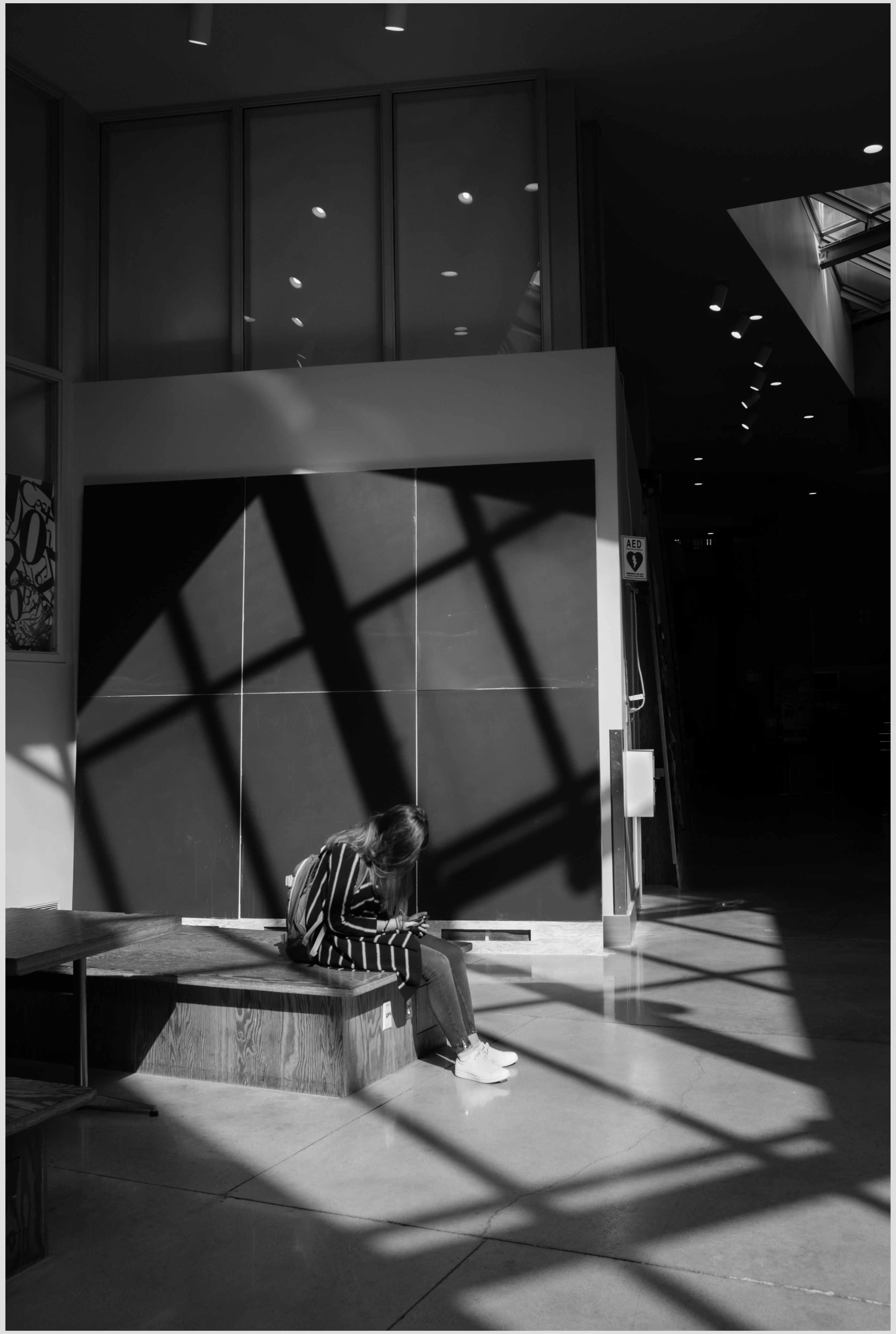
Christopher Alexander, *Notes on the Synthesis of Form* (1964)



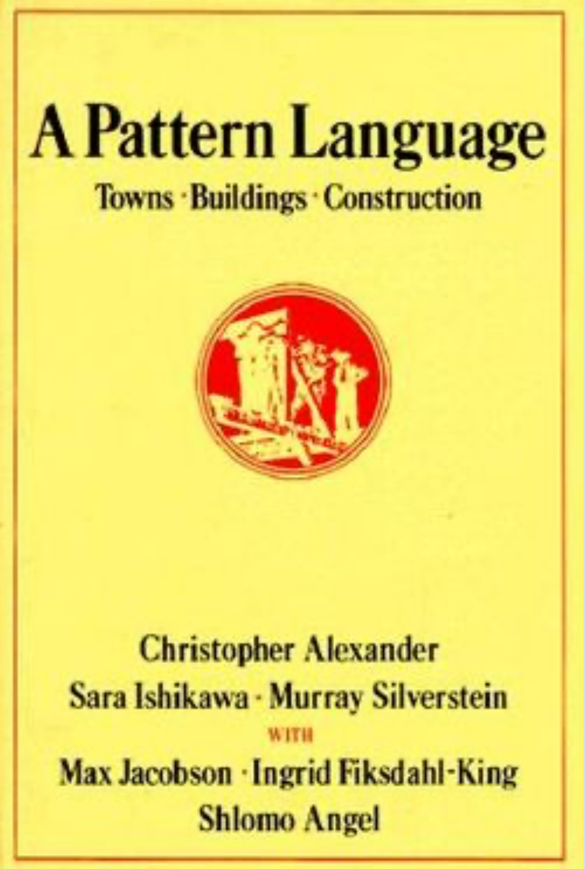
Mont Saint Michel (1450–1521)



MIT (Bosworth, 1916)



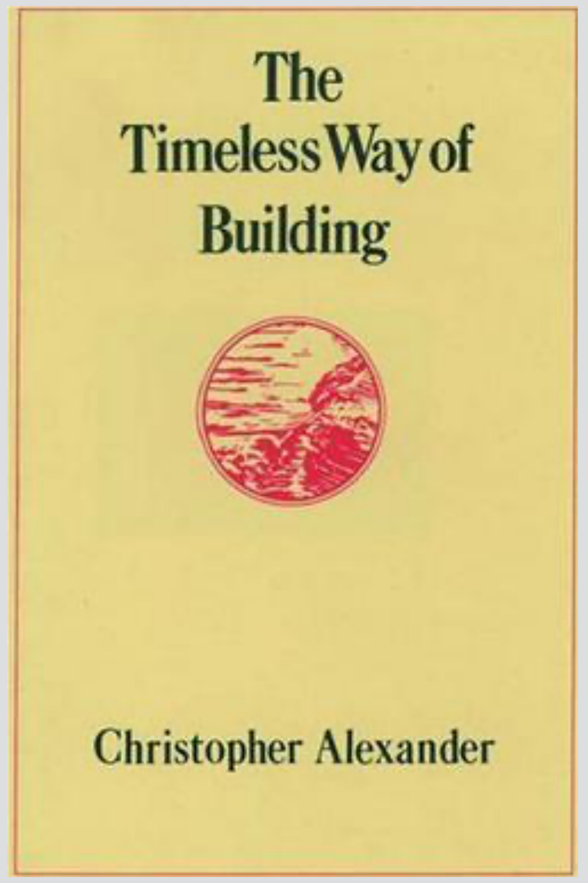
Stata Center (Gehry, 2004)



A Pattern Language

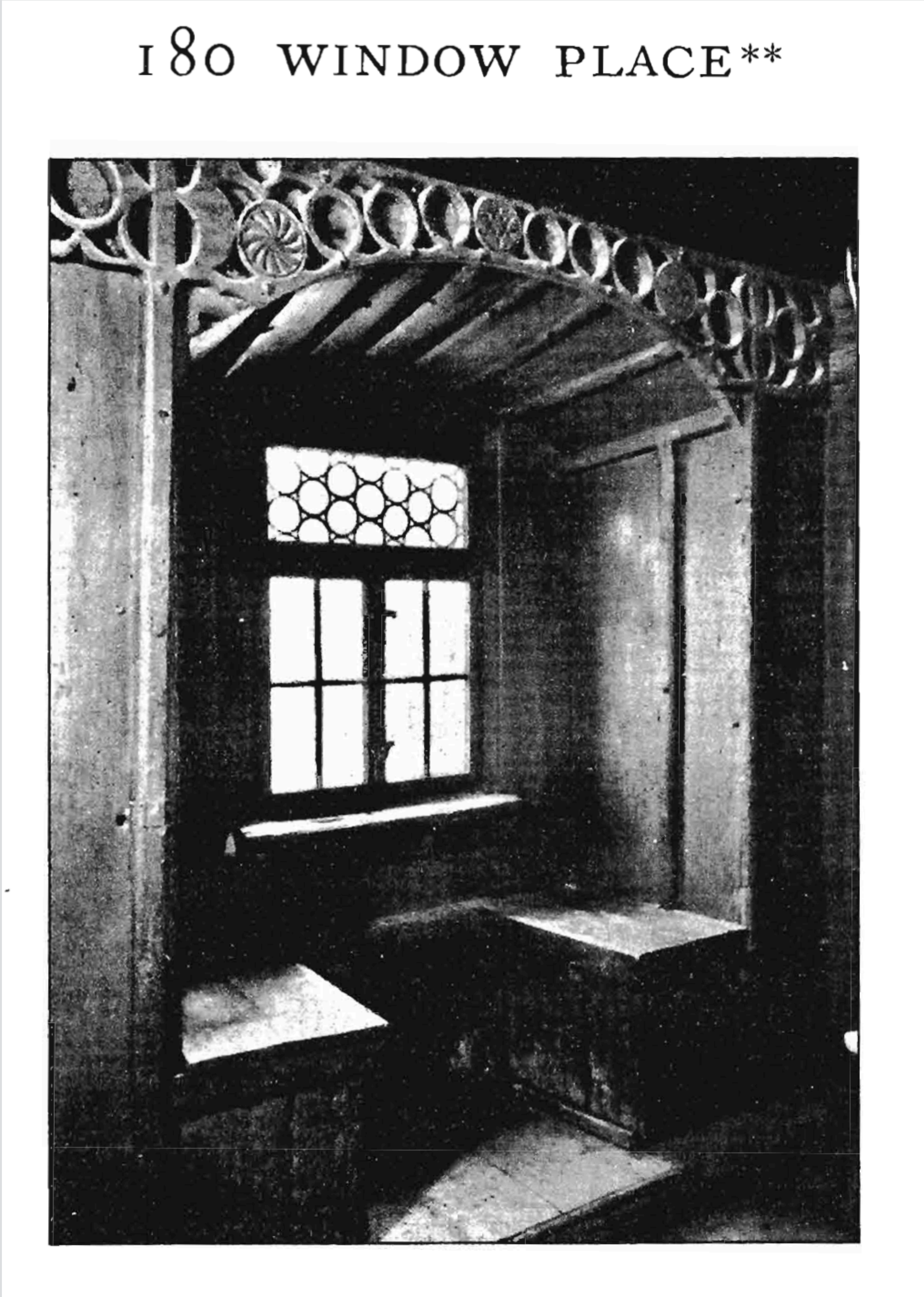
Towns · Buildings · Construction

Christopher Alexander
Sara Ishikawa · Murray Silverstein
WITH
Max Jacobson · Ingrid Fiksdahl-King
Shlomo Angel

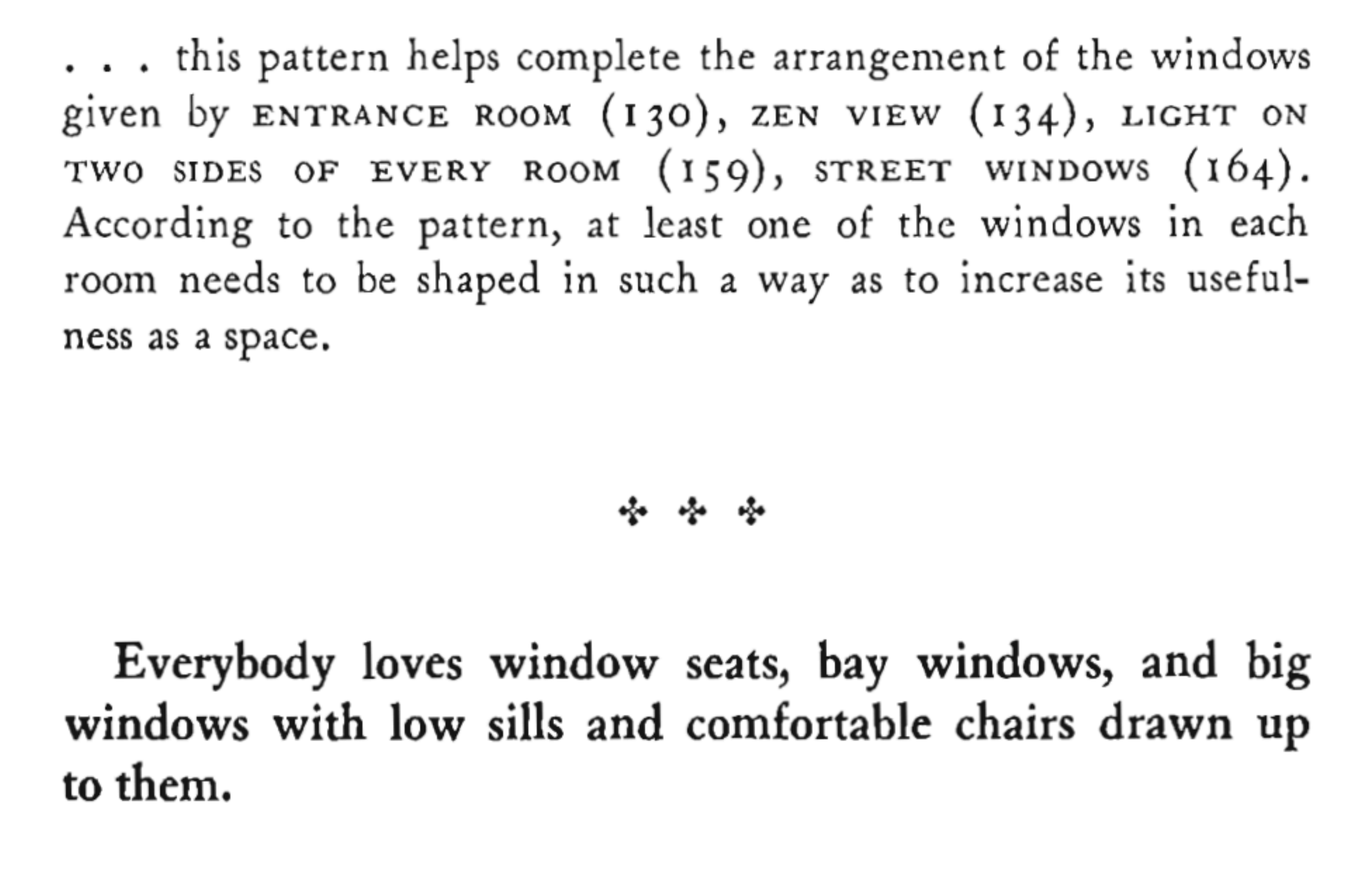


The Timeless Way of Building

Christopher Alexander



180 WINDOW PLACE**



. . . this pattern helps complete the arrangement of the windows given by ENTRANCE ROOM (130), ZEN VIEW (134), LIGHT ON TWO SIDES OF EVERY ROOM (159), STREET WINDOWS (164). According to the pattern, at least one of the windows in each room needs to be shaped in such a way as to increase its usefulness as a space.

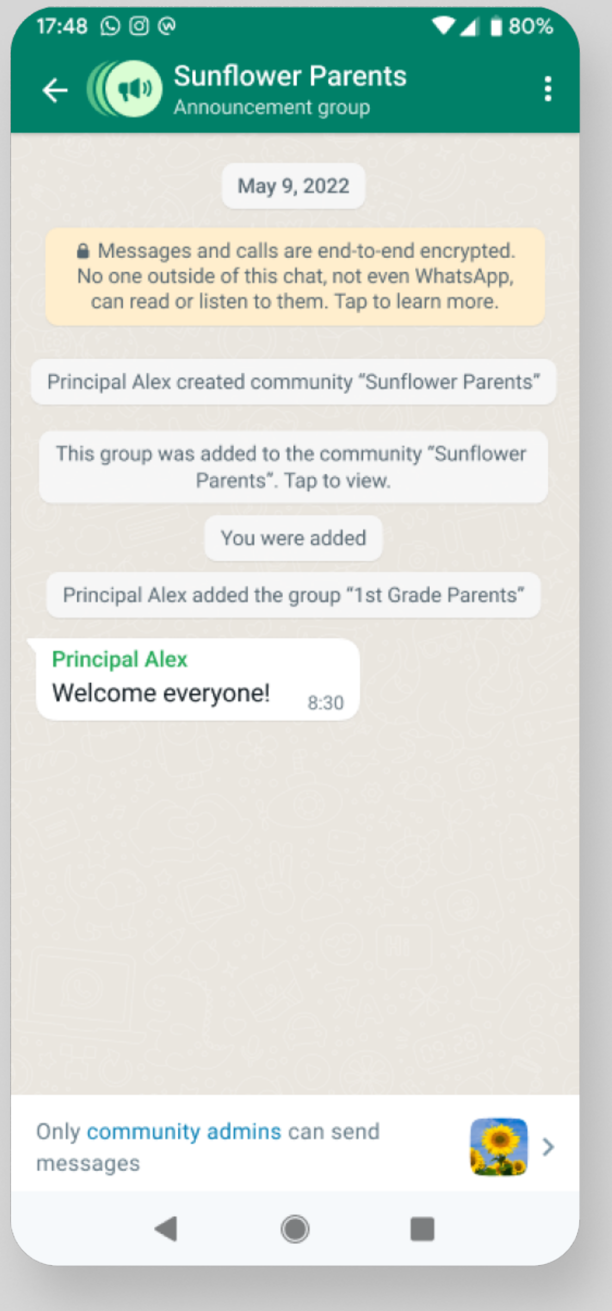
✣ ✣ ✣

Everybody loves window seats, bay windows, and big windows with low sills and comfortable chairs drawn up to them.

Christopher Alexander et al, *A Pattern Language* (1977)

takeaways

apps are defined by their concepts, sometimes just one



Sunflower Parents
Announcement group

May 9, 2022

Messages and calls are end-to-end encrypted. No one outside of this chat, not even WhatsApp, can read or listen to them. Tap to learn more.

Principal Alex created community "Sunflower Parents"

This group was added to the community "Sunflower Parents". Tap to view.

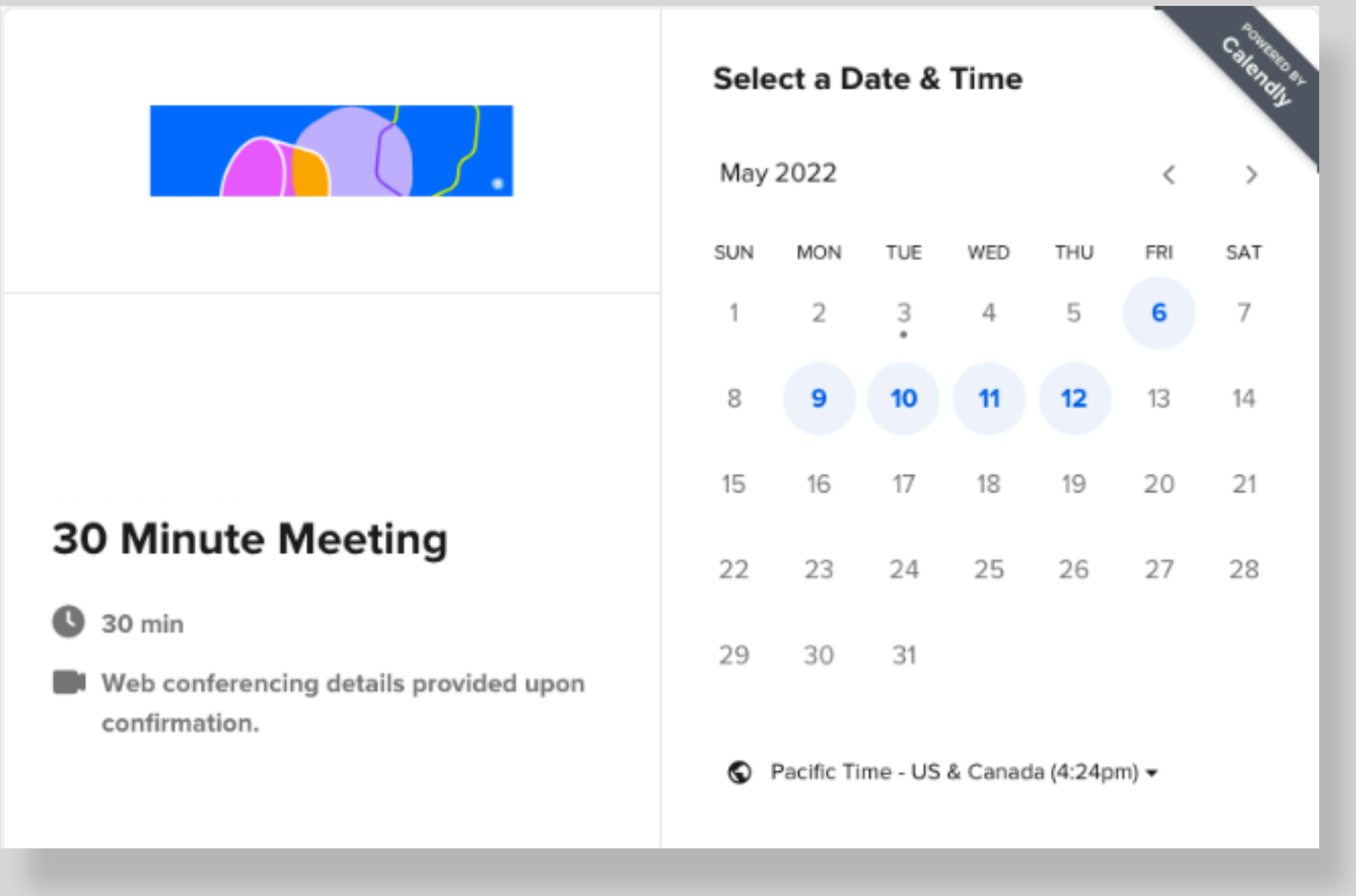
You were added

Principal Alex added the group "1st Grade Parents"

Principal Alex
Welcome everyone! 8:30

Only community admins can send messages

Group



30 Minute Meeting

30 min

Web conferencing details provided upon confirmation.

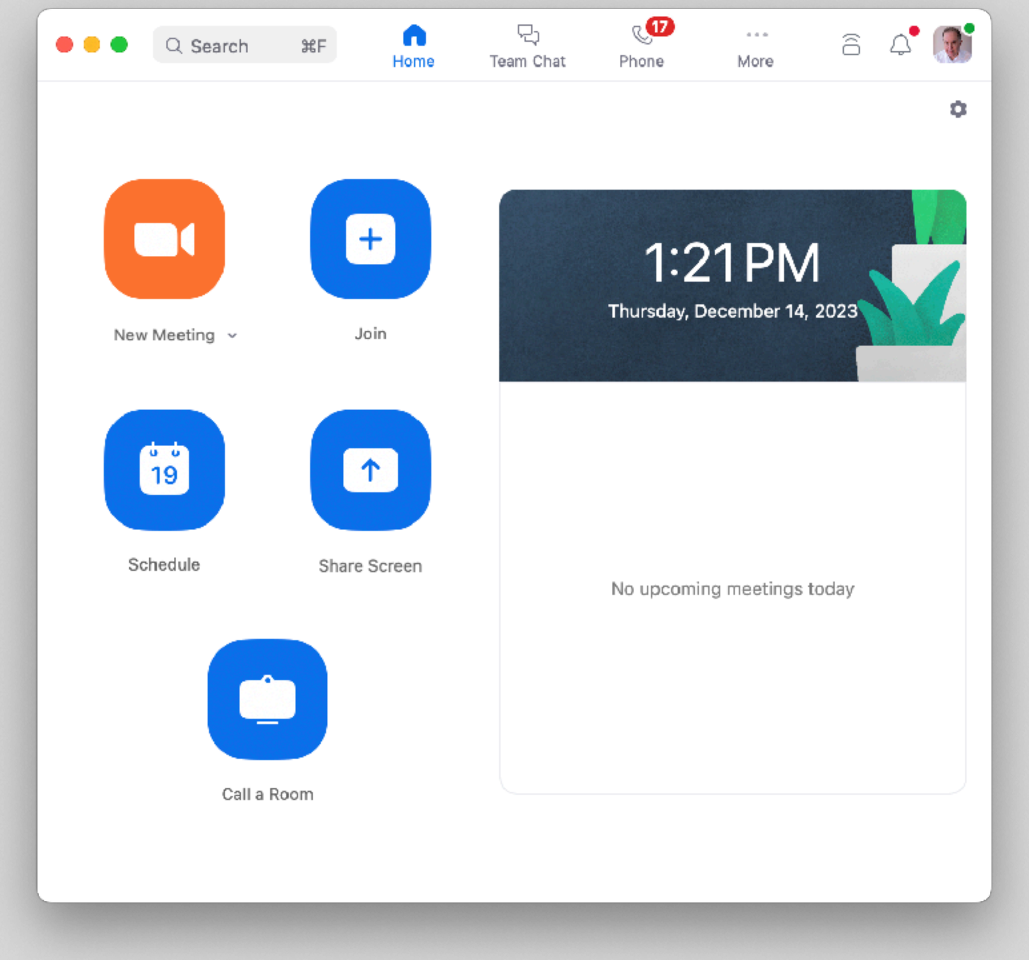
Select a Date & Time

May 2022

SUN	MON	TUE	WED	THU	FRI	SAT
1	2	3	4	5	6	7
8	9	10	11	12	13	14
15	16	17	18	19	20	21
22	23	24	25	26	27	28
29	30	31				

Pacific Time - US & Canada (4:24pm) ▾

Self-schedule

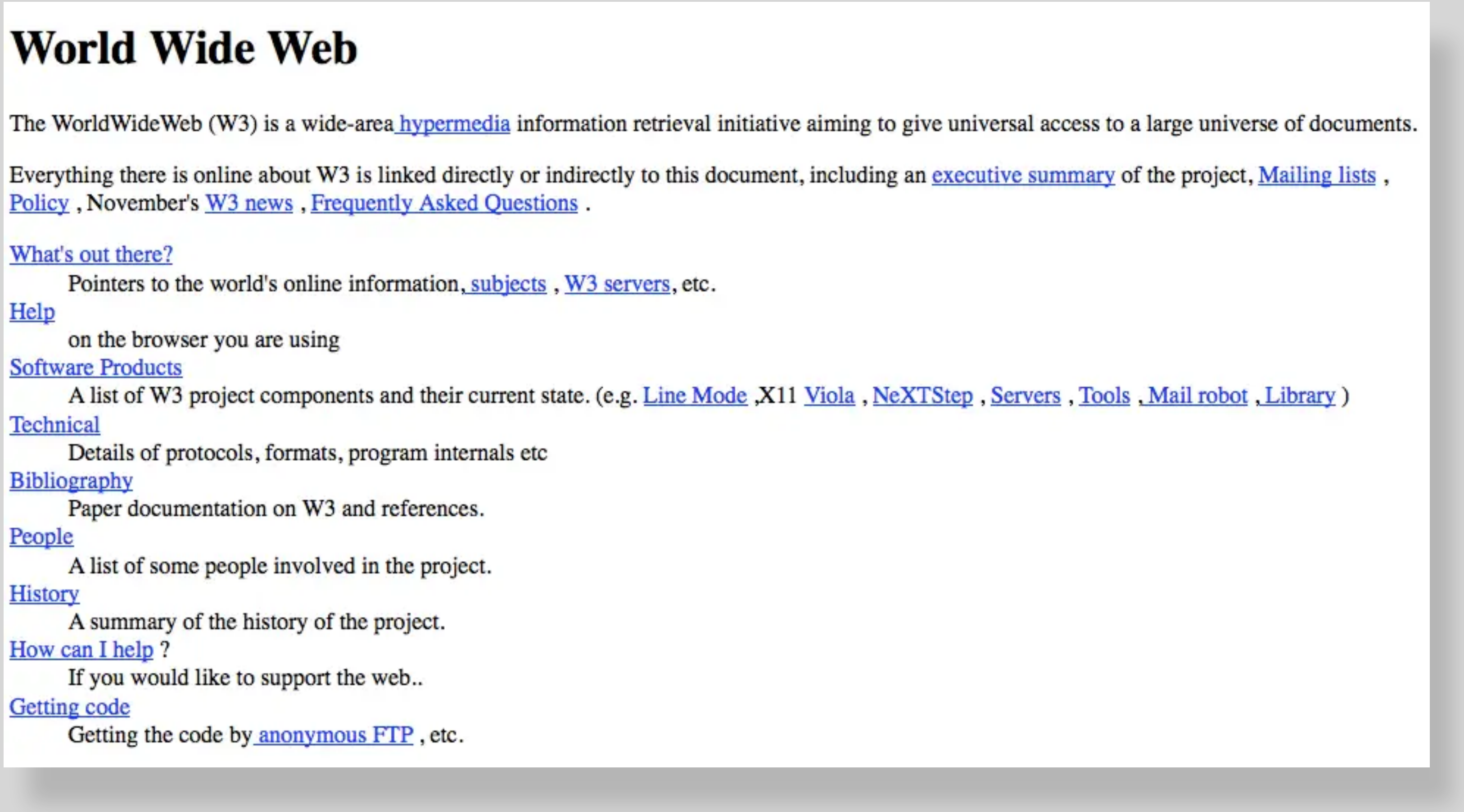


1:21PM
Thursday, December 14, 2023

No upcoming meetings today

Meeting

Song



World Wide Web

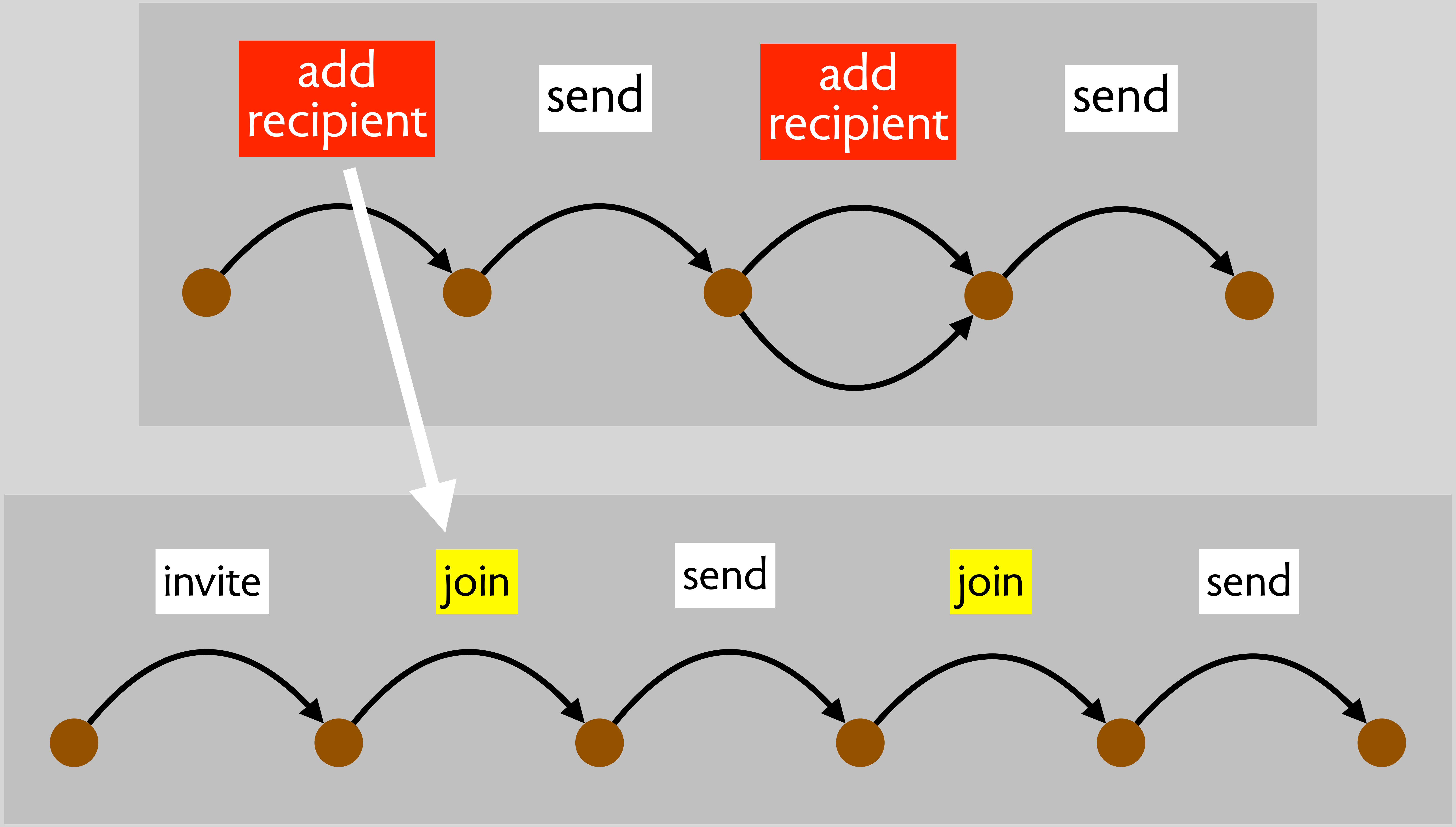
The WorldWideWeb (W3) is a wide-area hypermedia information retrieval initiative aiming to give universal access to a large universe of documents.

Everything there is online about W3 is linked directly or indirectly to this document, including an executive summary of the project, Mailing lists , Policy , November's W3 news , Frequently Asked Questions .

What's out there?
Pointers to the world's online information, subjects , W3 servers, etc.
Help
on the browser you are using
Software Products
A list of W3 project components and their current state. (e.g. Line Mode ,X11 Viola , NeXTStep , Servers , Tools , Mail robot , Library)
Technical
Details of protocols, formats, program internals etc
Bibliography
Paper documentation on W3 and references.
People
A list of some people involved in the project.
History
A summary of the history of the project.
How can I help ?
If you would like to support the web..
Getting code
Getting the code by anonymous FTP , etc.

URL

concept innovations undo constraints



add recipient

send

add recipient

send

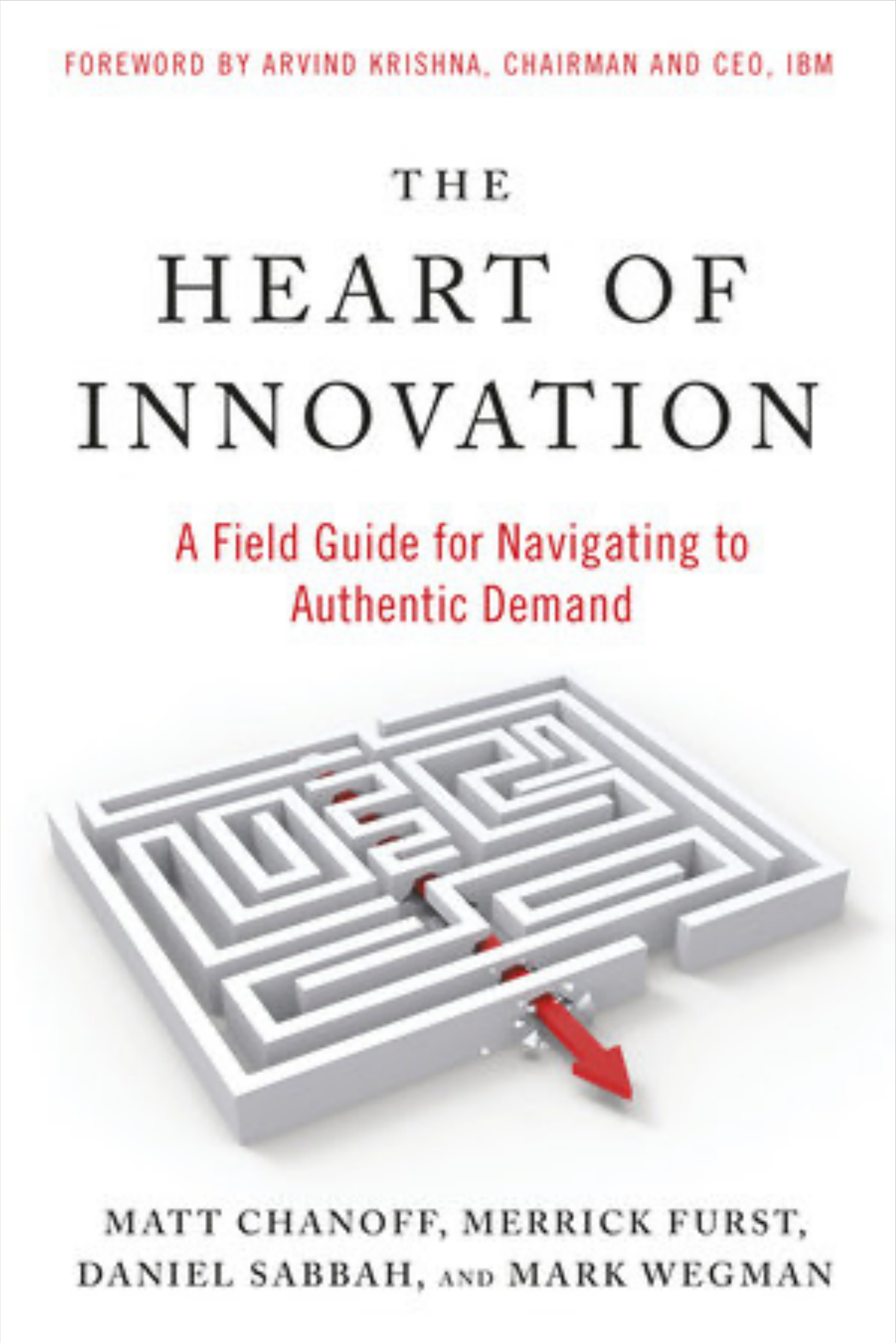
invite

join

send

join

send



FOREWORD BY ARVIND KRISHNA, CHAIRMAN AND CEO, IBM

THE HEART OF INNOVATION

A Field Guide for Navigating to Authentic Demand

MATT CHANOFF, MERRICK FURST,
DANIEL SABBAH, AND MARK WEGMAN

“not nots”:
it’s **not** OK to **not** have
group functionality

a new way to think about software

scenarios point to authentic demand

constraints and pain points

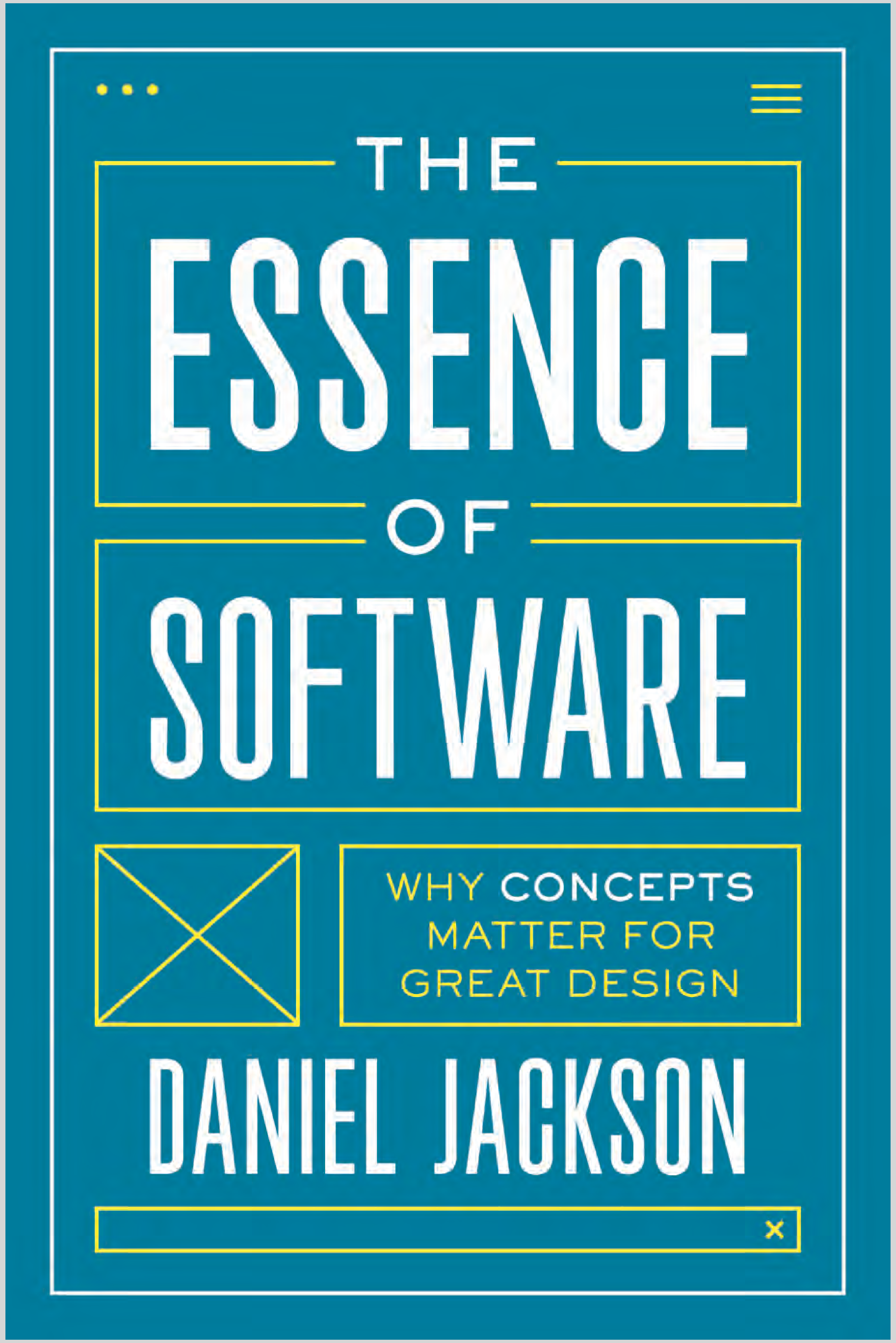
+ scenarios characterize concepts

operational principles

+ apps are concept compositions

flexibility, reuse and modularity

much more in book & website



https://essenceofsoftware.com

why Zoom is broken after all

dark concepts: going rogue

what conceptual models missed

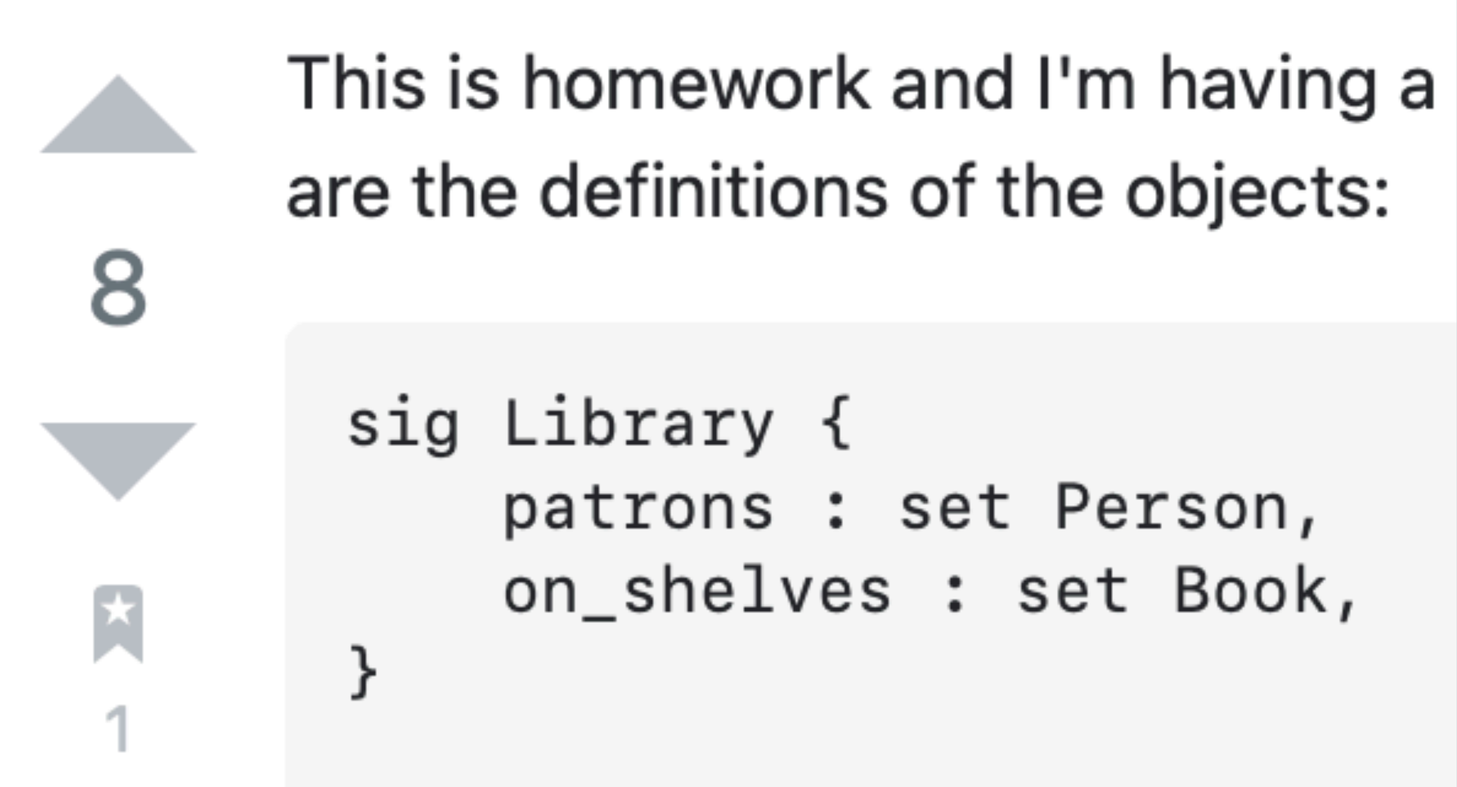
unused slides

concepts are deeper than UIs

concept Upvote

purpose rank items by popularity

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



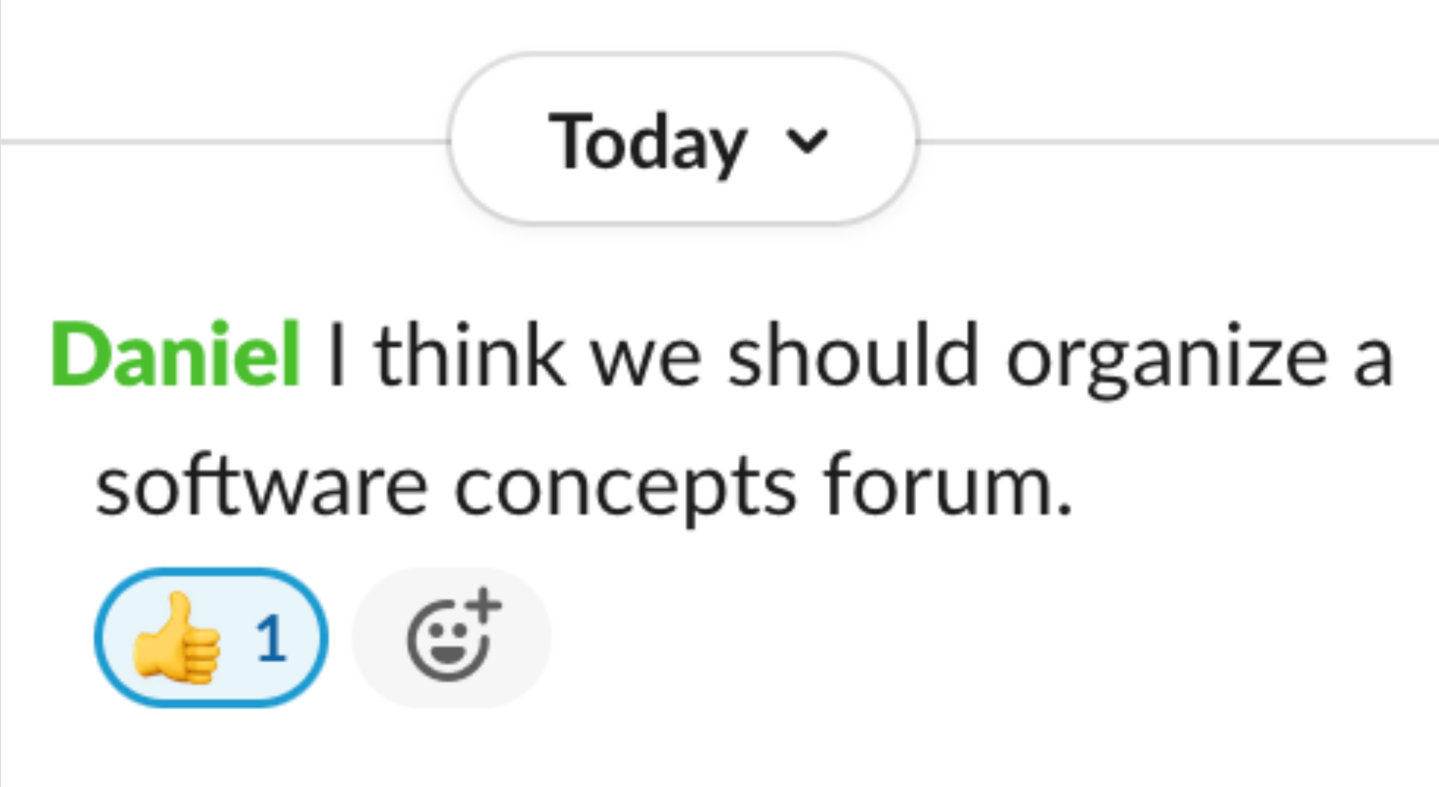
This is homework and I'm having a
are the definitions of the objects:

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

concept Reaction

purpose send reactions to author

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

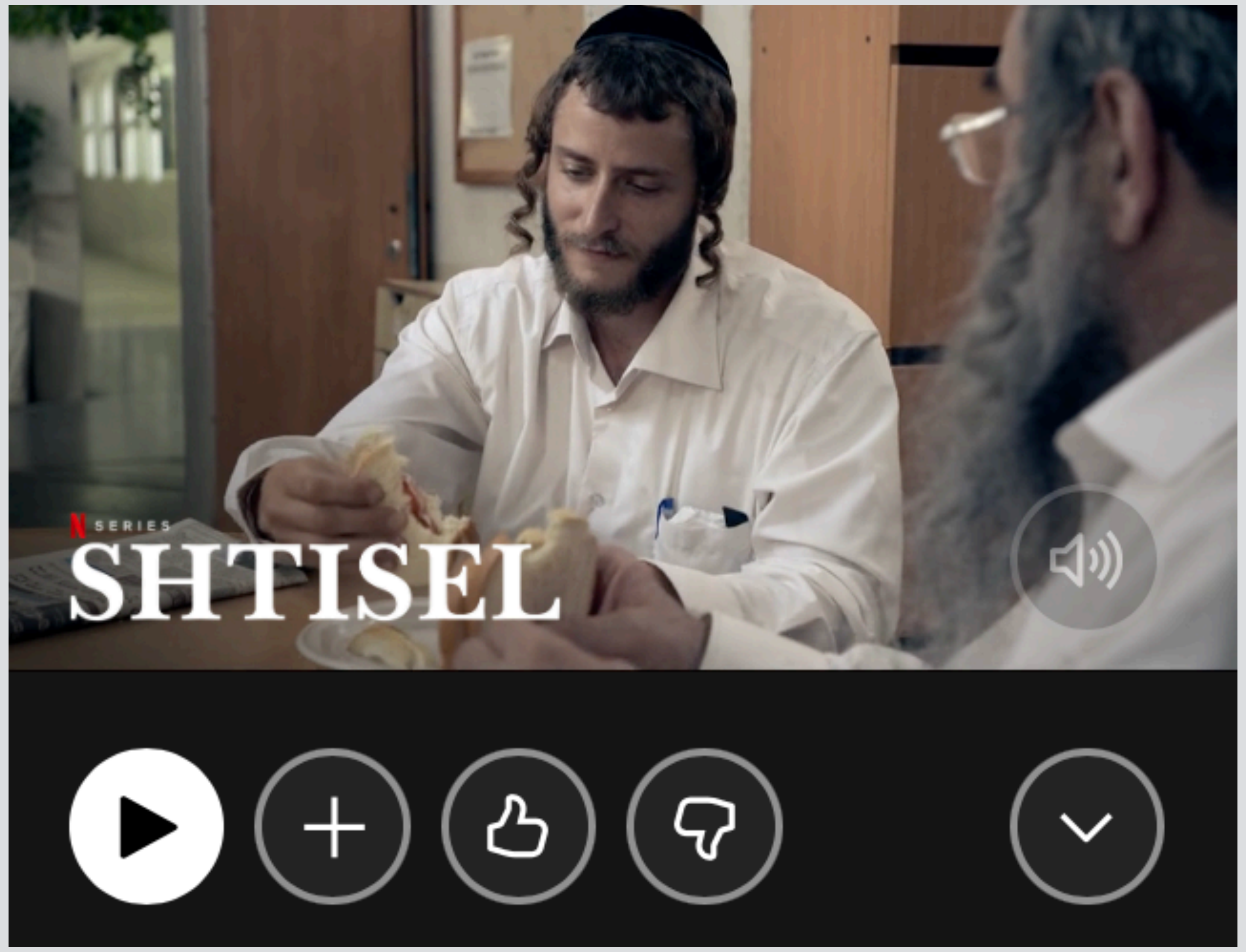


Daniel I think we should organize a software concepts forum.

concept Recommendation

purpose use prior likes to recommend

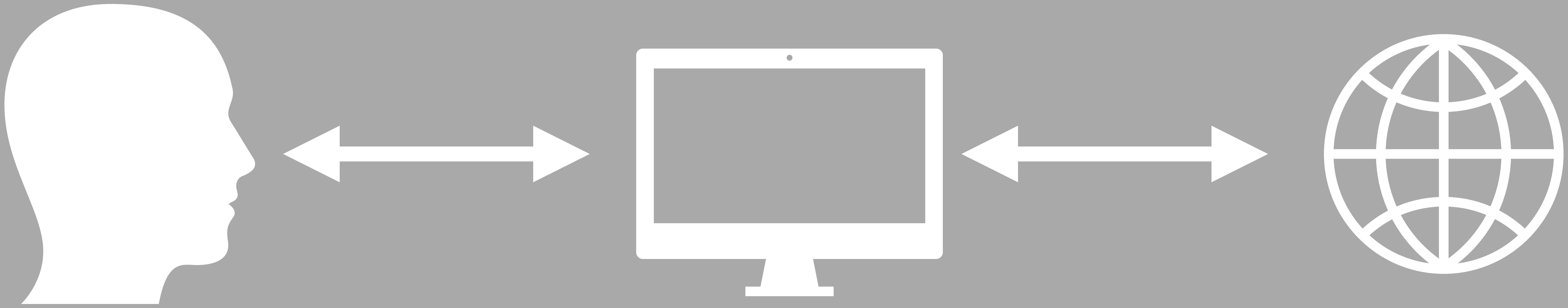
principle user's likes lead to ranking of kinds of items, determining which items are recommended



a traditional view of software failure

computer

a systems view that explains failures better



human user

computer

real world

confused user
issues wrong commands