

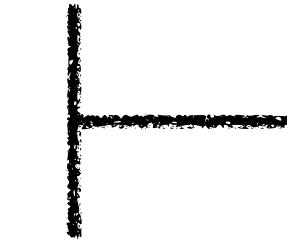


DSC 291 Privacy-sensitive Data Systems (week 1b)

Haojian Jin

Logistics

1. Canvas access
2. Enrollment
3. Discussion leader signup
4. Find your partners (2-3 people each team).
5. Arrange a meeting with me in the next two weeks.



Due this Sunday!

Recap

- Week 2: Apple AirTag, Contact Tracing
- Week 3: Android permission, Browser cookie consent
- Week 4: P3P
- Week 5: Target pregnancy prediction
- Week 6: US Census Bureau
- Week 7: Facebook cambridge analytic
- Week 8: Big brother privacy
- Week 9: Dark patterns

Today's topic: Why is privacy hard?

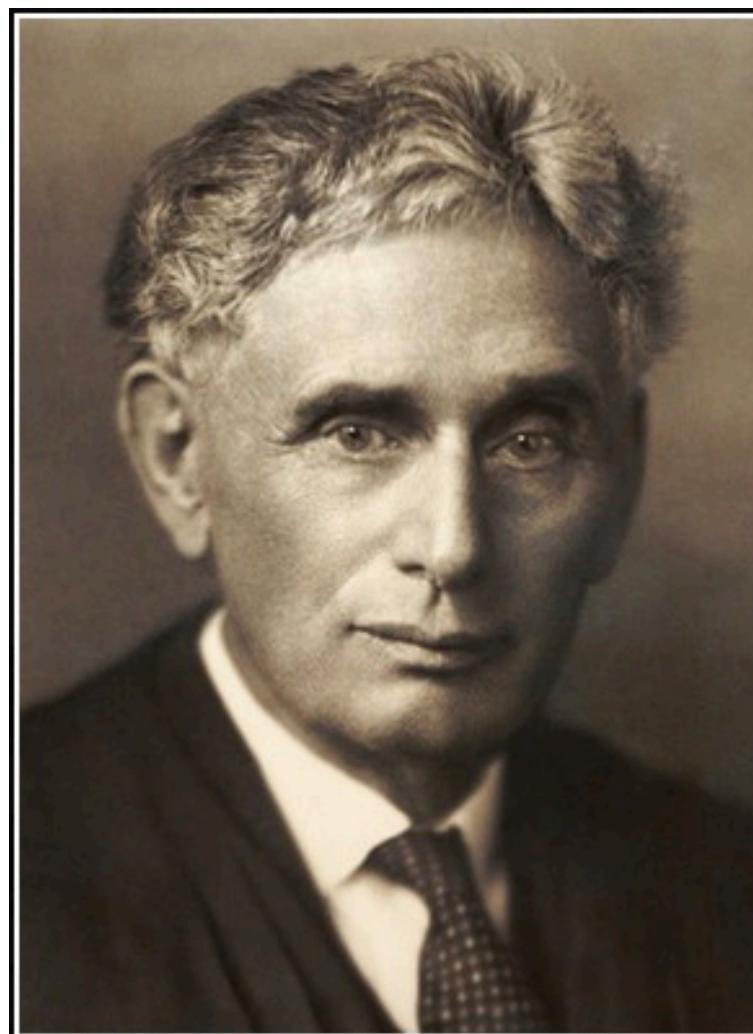
- 10 reasons^[1]
 - Lots of examples from smartphones and web
 - Lessons learned from community's previous failures
 - Directions for research and practice

[1] Adapted from <https://cacm.acm.org/blogs/blog-cacm/235401-why-is-privacy-so-hard/fulltext>

#1 Privacy is a broad and fuzzy term

- Privacy is a broad umbrella term that captures concerns about our relationships with others.
 - The right to be left alone
 - Control and feedback over one's data
 - Anonymity (most popular among researchers)
 - Presentation of self (impression management)
 - Right to be forgotten
 - Contextual integrity (take social norms into account)
- Each definition leads to a different way of handling privacy.

Right to be left alone: Do not call list, blocking.



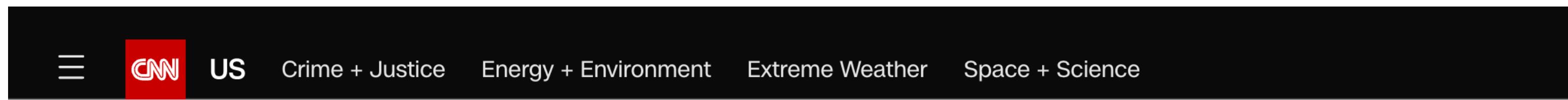
The right most valued by all civilized men is the right to be left alone.

— Louis D. Brandeis —

AZ QUOTES

The screenshot shows the homepage of the Federal Trade Commission's National Do Not Call Registry. At the top, the FTC logo and the text "FEDERAL TRADE COMMISSION" and "PROTECTING AMERICA'S CONSUMERS" are visible. Below the logo, there are links for "Back to ftc.gov | Español", "Resources | Privacy & Security | Home", and "En Español". The main title "National Do Not Call Registry" is prominently displayed with a house icon. Below the title are three circular icons: a green one for "Report Unwanted Calls" showing a computer and phone, a blue one for "Verify Your Registration" showing a checkmark, and an orange one for "Register Your Phone" showing a hand holding a phone. A descriptive text block below the icons states: "The National Do Not Call Registry gives you a choice about whether to receive telemarketing calls". A bulleted list of information follows: "• You can [register](#) your home or mobile phone for **free**. • After you register, **other types of organizations may still call you**, such as charities, political groups, debt collectors and surveys. To learn more, read our [FAQs](#). • If you received an unwanted call after your number was on the National Registry for 31 days, [report it to the FTC](#)." At the bottom, a section for "Sellers and telemarketers:" provides instructions to go to <https://telemarketing.donotcall.gov>.

Why Right to be forgotten?



A 17-year-old boy died by suicide hours after being scammed. The FBI says it's part of a troubling increase in 'sextortion' cases.

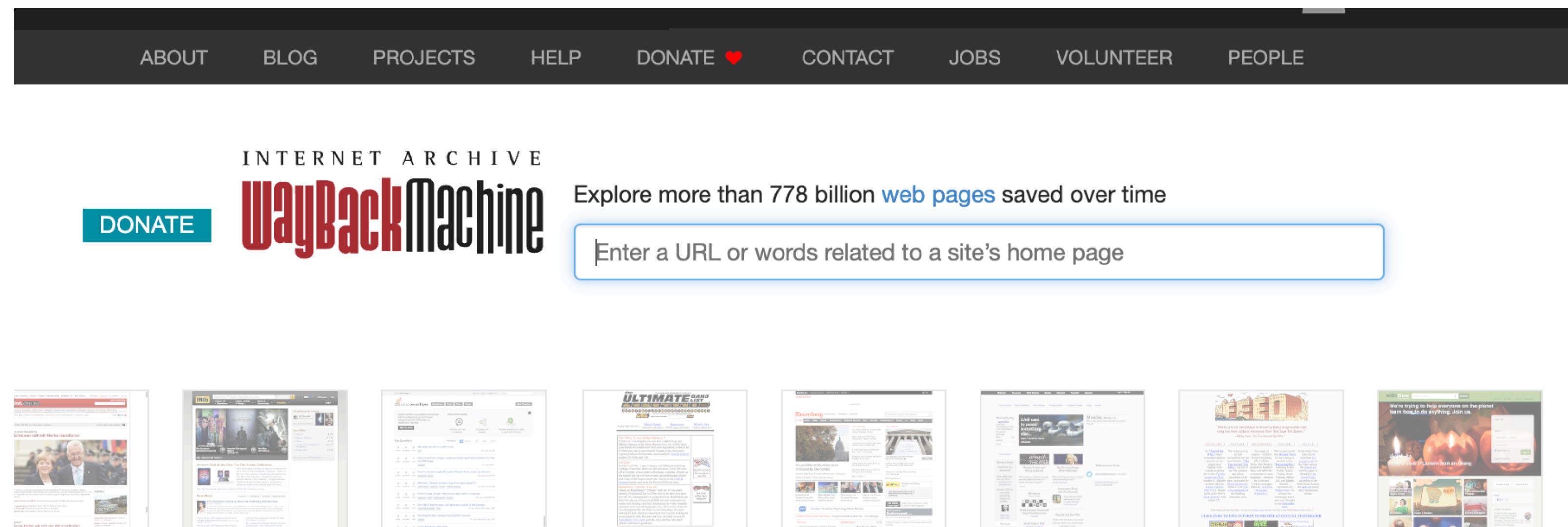
By Josh Campbell and Jason Kravarik, CNN

Updated 11:40 AM EDT, Mon May 23, 2022



<https://www.cnn.com/2022/05/20/us/ryan-last-suicide-sextortion-california/index.html>

Wayback machine



The screenshot shows the Wayback Machine homepage. At the top, there is a dark navigation bar with white text links for ABOUT, BLOG, PROJECTS, HELP, DONATE (with a red heart icon), CONTACT, JOBS, VOLUNTEER, and PEOPLE. Below the navigation bar, the Internet Archive logo is visible, followed by the Wayback Machine logo. A teal "DONATE" button is positioned next to the Wayback Machine logo. To the right of the logo, a message reads "Explore more than 778 billion web pages saved over time". Below this message is a search bar with the placeholder text "Enter a URL or words related to a site's home page". At the bottom of the page, there is a horizontal grid of nine thumbnail images showing different web archive snapshots from various websites.

Demo link: https://web.archive.org/web/20131101000000*/shift-3.com

Right to be forgotten: delete from search engine, services



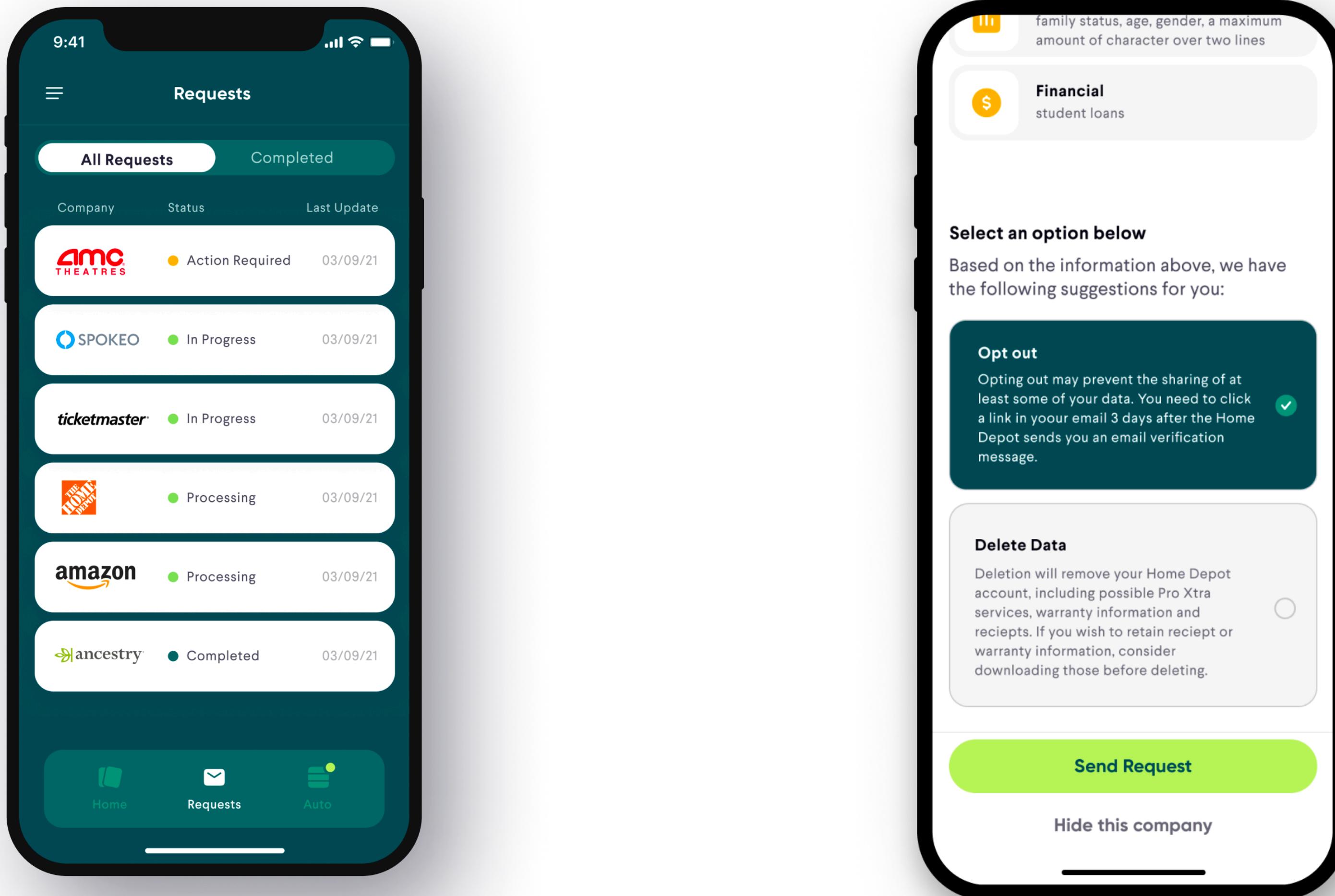
Consumers' "Right to Delete" under US State Privacy Laws

By [Glenn A. Brown](#) on March 3, 2021

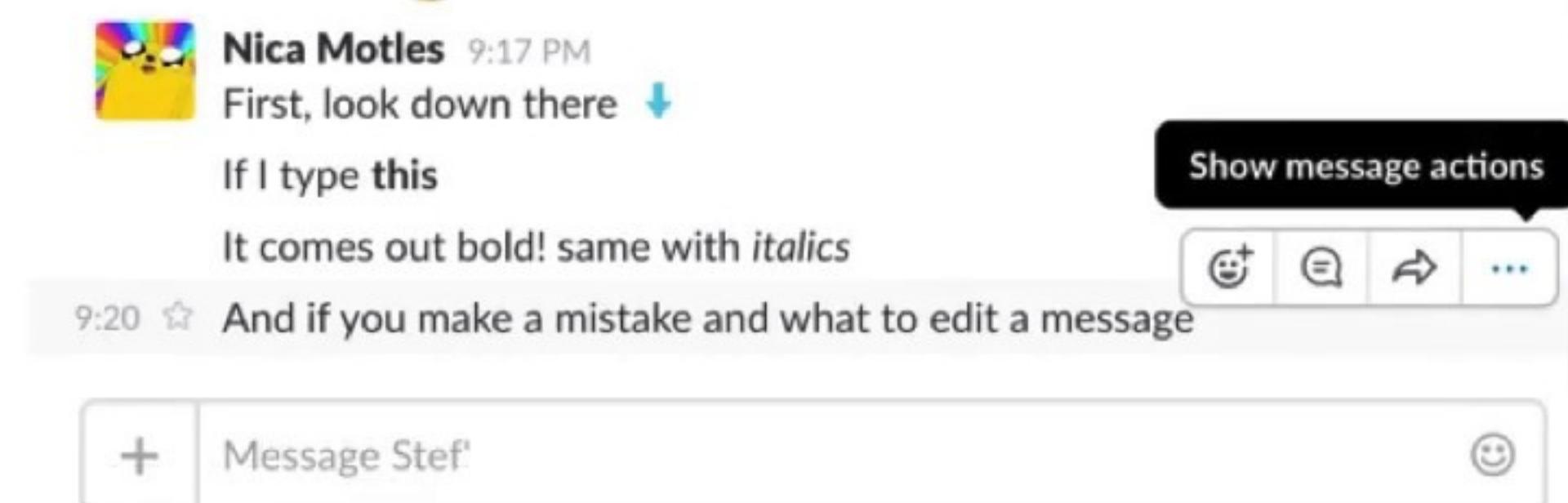
Posted in [California Privacy Rights Act \(CPRA\)](#), [CCPA](#), [US](#)

Businesses have to ***confirm receipt of a deletion request*** within 10 business days ... ***permanently and completely erasing the personal information*** within 45 calendar days.

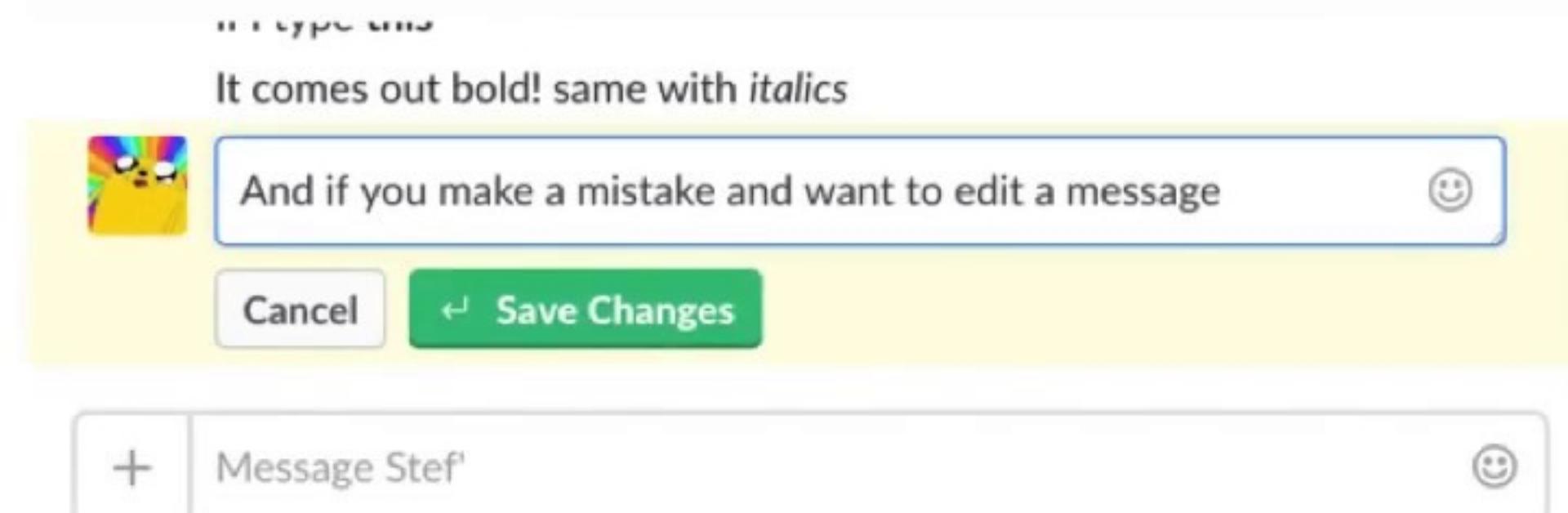
Permission slip by consumer reports



Demo: Enhancing Email Functionality using Late Bound Content



You can edit messages after the fact if you had a typo:



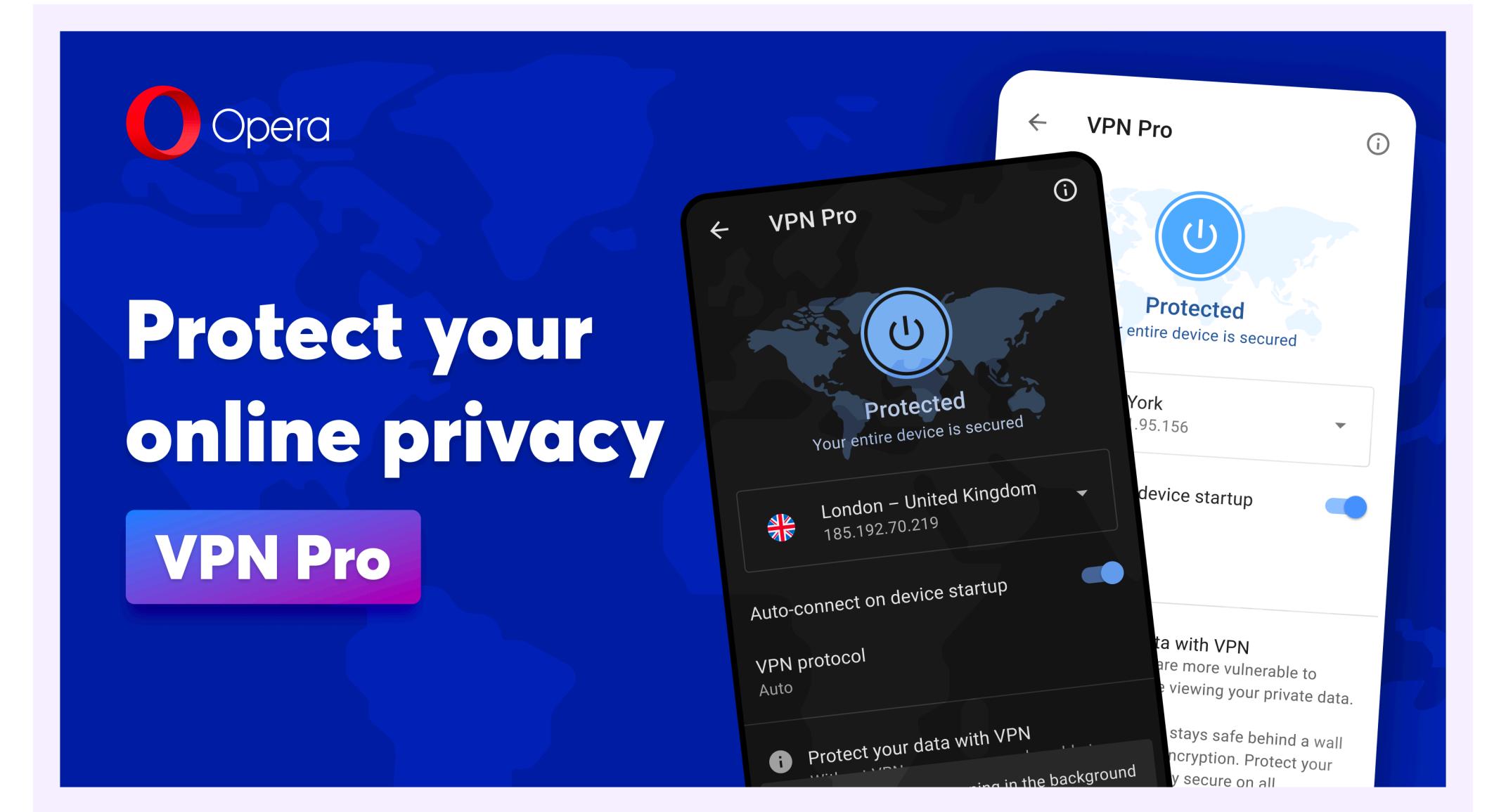
And you can even delete them if you made a really bad mistake.

Continuous edit - Slack

Many more questions!

- Deleting data is hard.
 - Data transmission and storage are so hard.
 - Distributed system, multiple copies.
 - Data stored across different countries.
 - Different user preferences.
 -

Anonymity: VPN



Personally Identifiable Information (PII)

- Data privacy is primarily about how orgs collect, use, and protect sensitive data (PII)
 - Ex. Name, street address, unique IDs, pictures
 - Vague definitions.
 - Rules about data use, privacy notices, developer understanding.

Fair Information Practices

- Notice / Awareness
- Choice / Consent
- Access / Participation
- Integrity / Security
- Enforcement / Redress

The image shows a document titled "A CONSUMER INTERNET PRIVACY BILL of RIGHTS". At the top is the official seal of the White House. Below the title, a statement reads: "The Obama Administration believes America must apply our timeless privacy values to the new technologies and circumstances of our times. Citizens are entitled to have their personal data handled according to these principles." The document lists seven principles, each with an icon and a brief description:

- Individual Control**: Consumers have a right to exercise control over what personal data companies collect from them and how they use it.
- Access and Accuracy**: Consumers have a right to access and correct personal data in usable formats, in a manner that is appropriate to the sensitivity and risk associated with the data.
- Transparency**: Consumers have a right to easily understandable and accessible information about privacy and security practices.
- Focused Collection**: Consumers have a right to reasonable limits on the personal data that companies collect and retain.
- Respect for Context**: Consumers have a right to expect that companies will collect, use, and disclose personal data in ways that are consistent.
- Accountability**: Companies should be accountable to enforcement authorities and consumers for adhering to these principles.
- Security**: Consumers have a right to secure and responsible handling of personal data.

At the bottom, a link reads "LEARN MORE AT WHITEHOUSE.GOV".

An AI Bill of Rights



[Safe and Effective
Systems](#)



[Algorithmic
Discrimination
Protections](#)



[Data Privacy](#)



[Notice and
Explanation](#)



[Human Alternatives,
Consideration, and
Fallback](#)

[Applying the Blueprint for an AI
Bill of Rights](#)

[Download the Blueprint for an AI
Bill of Rights](#)

Procedural + Consequential Perspectives

- Procedural perspective
 - Did you follow this set of rules? •
 - Did you check off all of the boxes? •
 - Somewhat hard to measure too (Better? Worse?) •
- Outcome-oriented
 - Computer scientists love this approach, can measure!
 - K-anonymity, differential privacy
 - However, these approaches tend to be narrow

#2 Technological Capabilities Rapidly Growing

- Data gathering easy and pervasive
 - Everything on the web (web clicks, browsing history, video watching)
 - Sensors (cameras, microphones, standby)
 - Transaction data (online shopping)

#2 Technological Capabilities Rapidly Growing

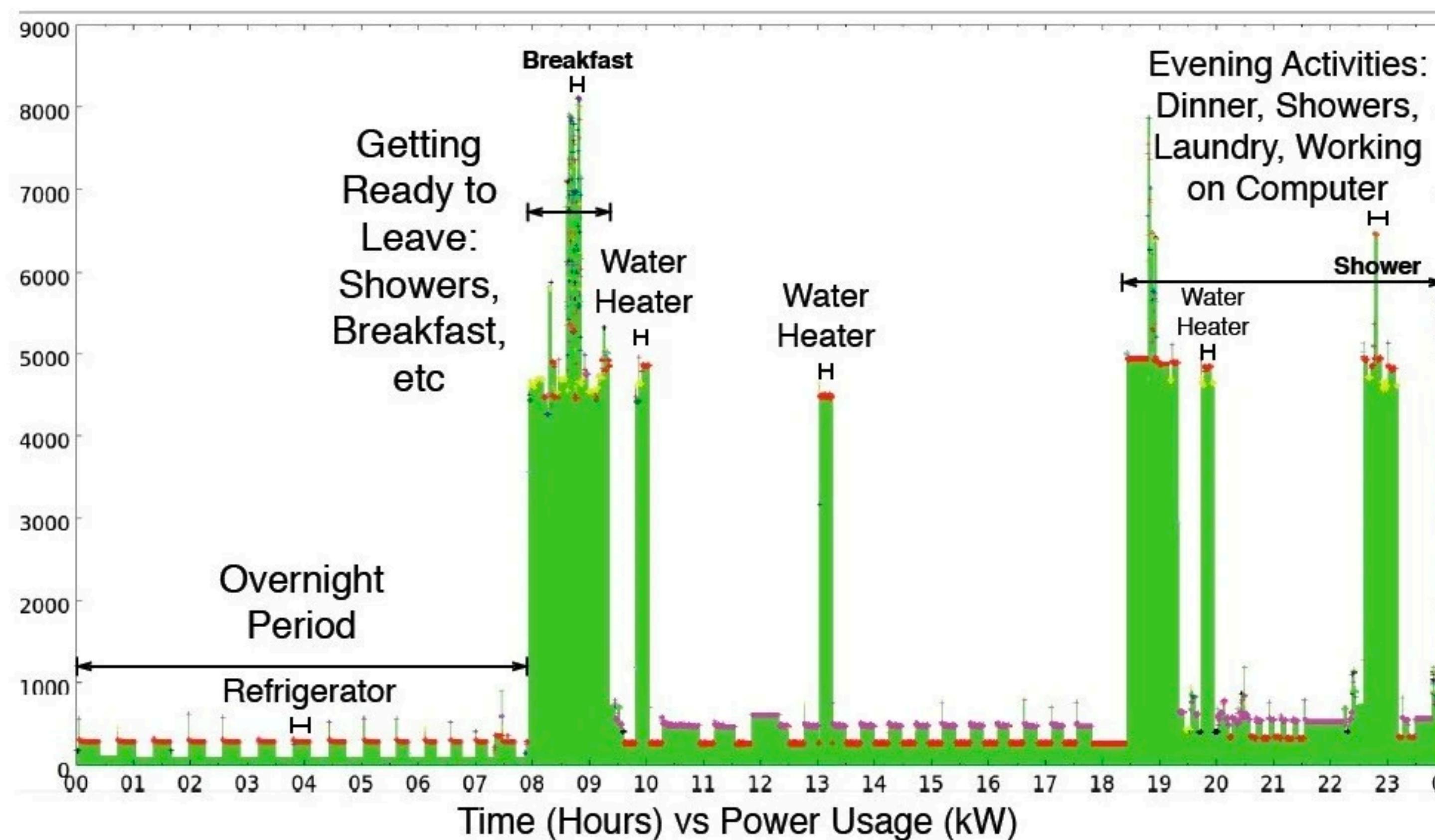
- Data storage and querying bigger and faster



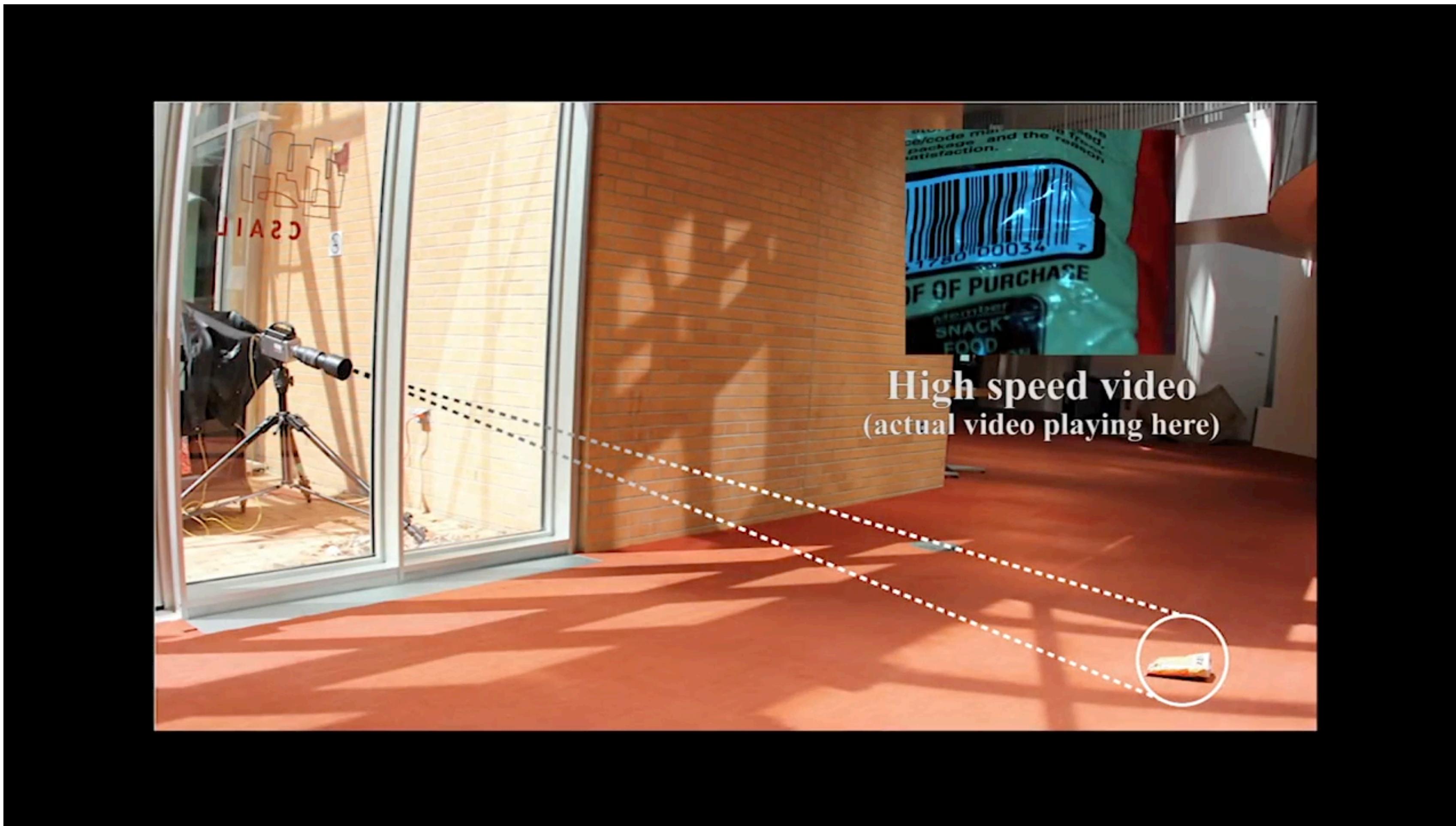
1TB hard drive in 1937.
the largest vertical letter file in the world.
4000 SqFt.
with over 3000 drawers
10 feet long managed by 20 workers.
Access speed was ~3 minutes per KB.

#2 Technological Capabilities Rapidly Growing

- Inferences are becoming more powerful.



Sky is the limit.



When sounds hits an object, it causes that object to vibrate.

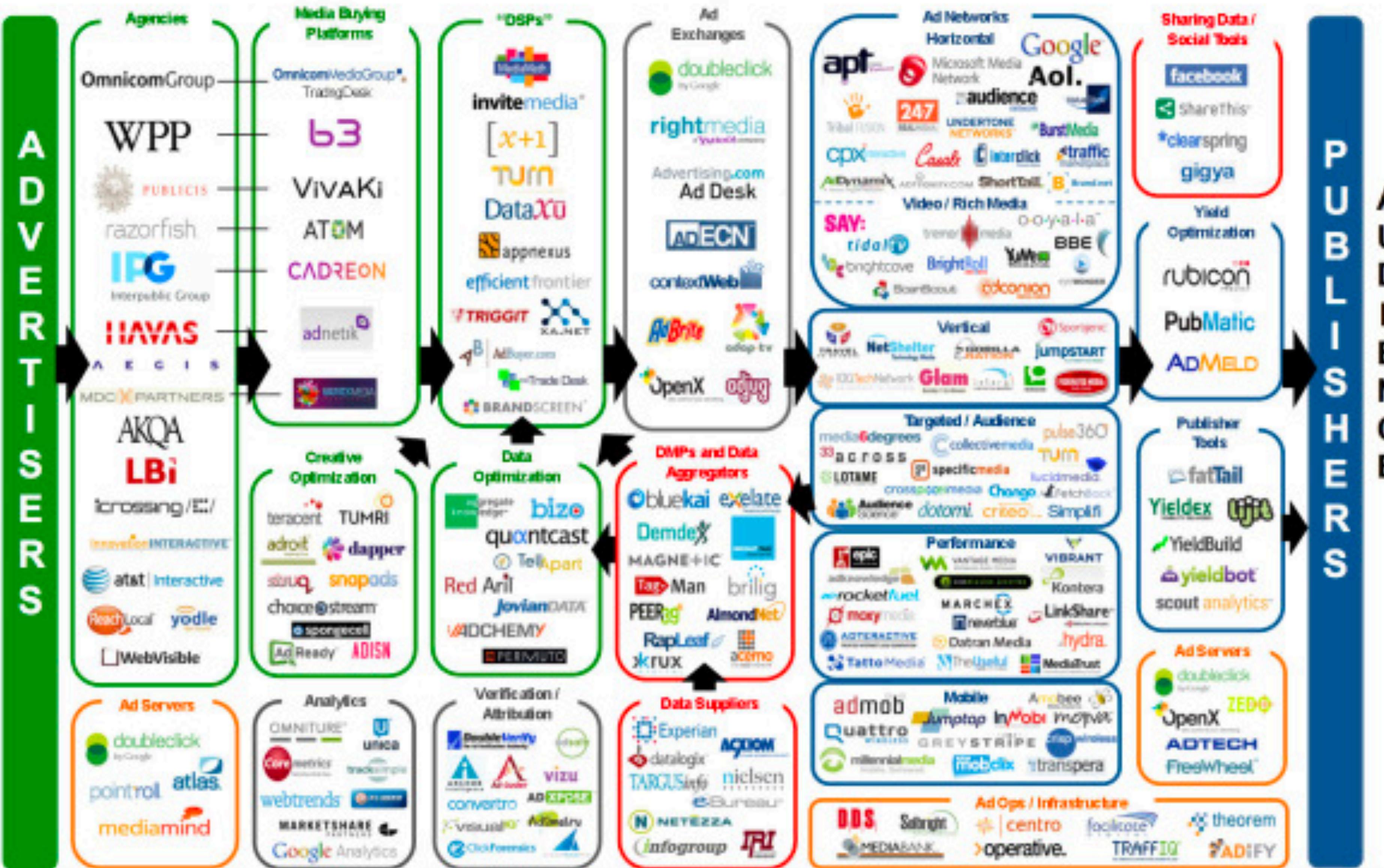
#2 Technological Capabilities Rapidly Growing

- More inferences
 - Are you healthy (Microphone/Camera)?
 - Are you pregnant (Purchases at Target)?
 - Personality type (Instagram, smartphone).
 - Are you depressed or not? (Smartphone)
 - Workplace social network + performance (Call logs)
 - In-home activities (Laptop usages)
 - ...

#2 Technological Capabilities Rapidly Growing

- Data sharing more widespread
 - Lots of companies collecting and sharing data about you.
 - It is hard to explain to end users.
 - It is hard to track them.

Display Advertising Technology Landscape



#3 Strong Incentives for Companies to Collect Data

- More data -> better ML models -> bottom line
 - Increasing relevance of online ads worth millions
 - “Post-purchase monetization”

[Home](#) > [Tech](#) > There's A Simple Reason Why Your New Smart TV Was So Affordable: It's Collecting And Selling Your Data

There's a simple reason why your new smart TV was so affordable: It's collecting and selling your data

■ BEN GILBERT | JAN 12, 2019, 17:30 IST

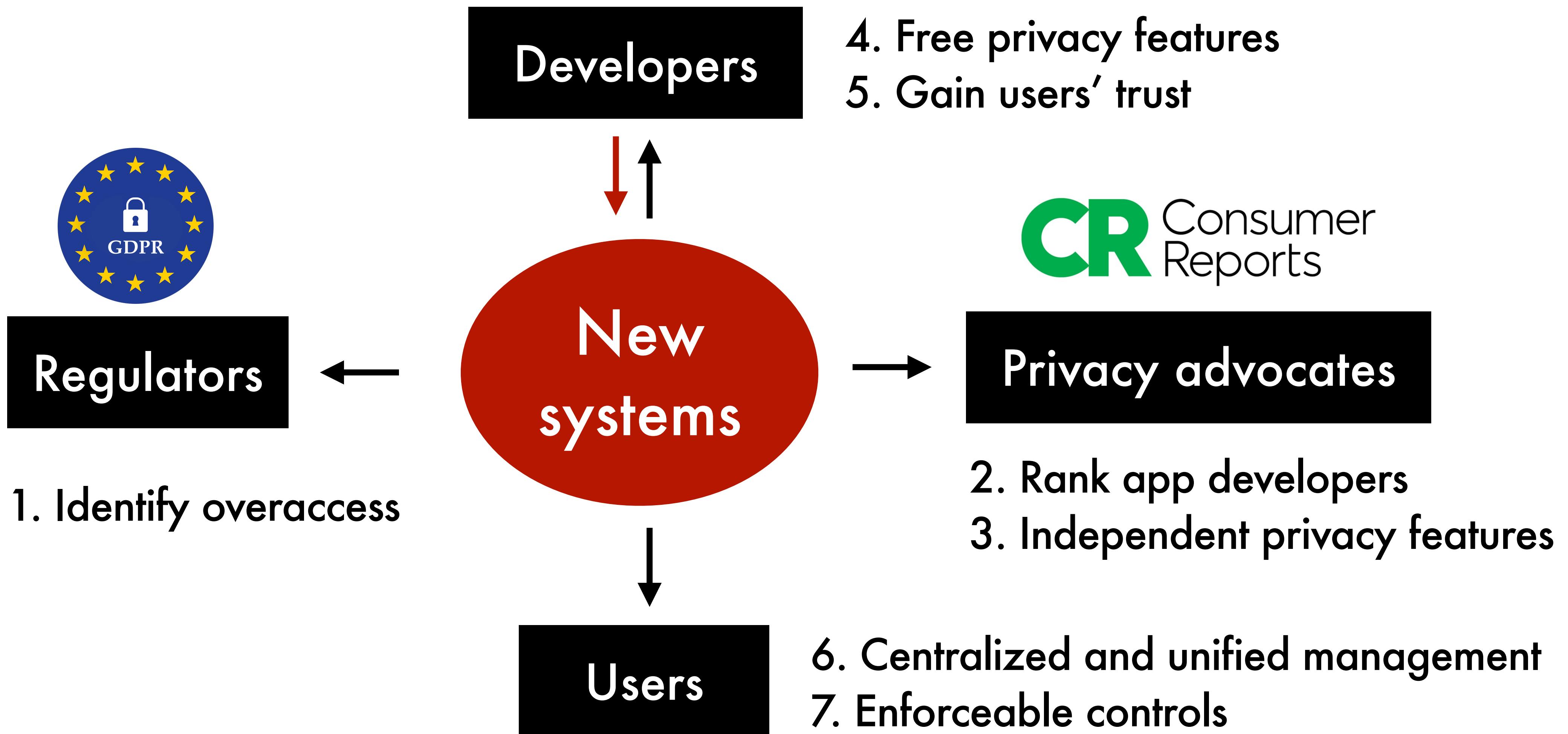


POPULAR ON BI



Jack Ma, the Alibaba who view in 2020 Thailand as t control of his

Let the good privacy drive out the bad privacy



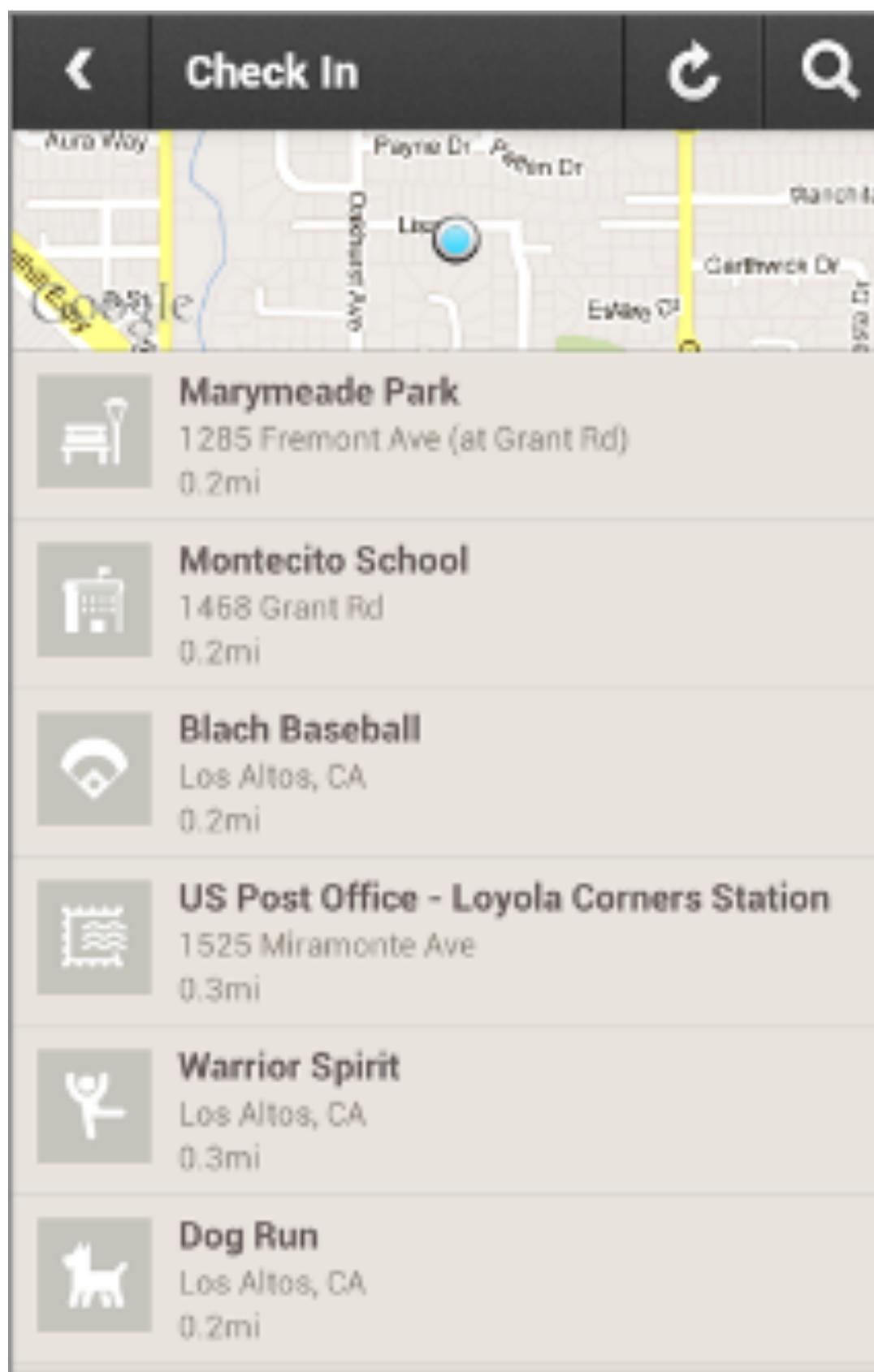
#4A Same Device, Different Perspectives

- Locator badges for nurses
- Hospital administration's perspective
 - Coordination ("Where is Alice?")
 - Protect from spurious claims ("Nurse never came")
- Nurses' perspective
 - Surveillance ("Tracking how long I was in restroom")
- Clear value + management trusted -> ok •
- Existing tensions -> rejected badges



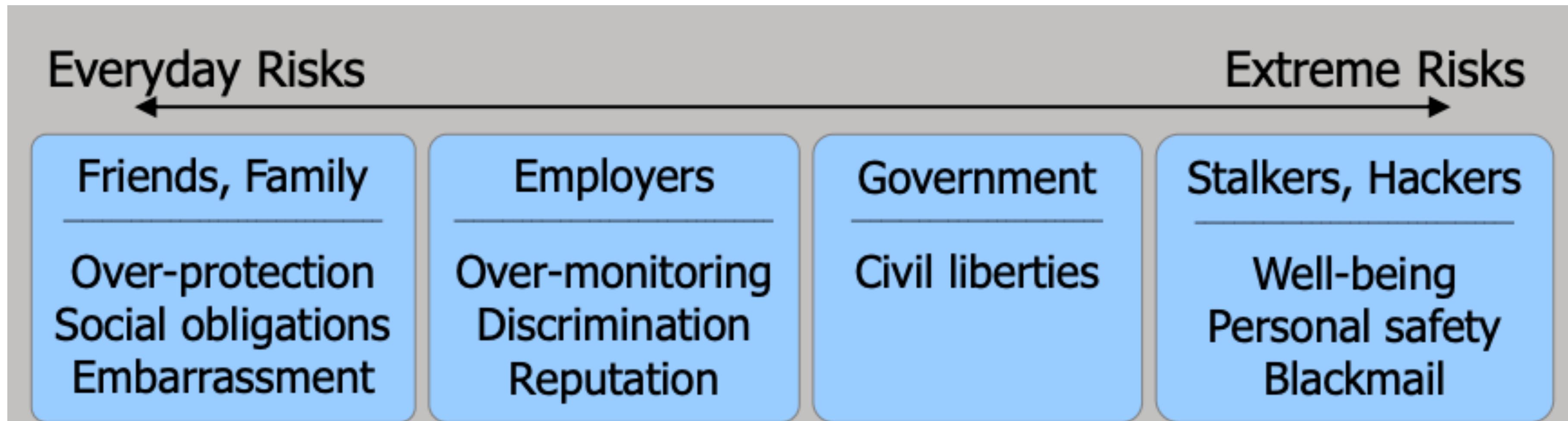
#4B Same Data, Different Perspectives

- Data may be ok in one context, creepy in another



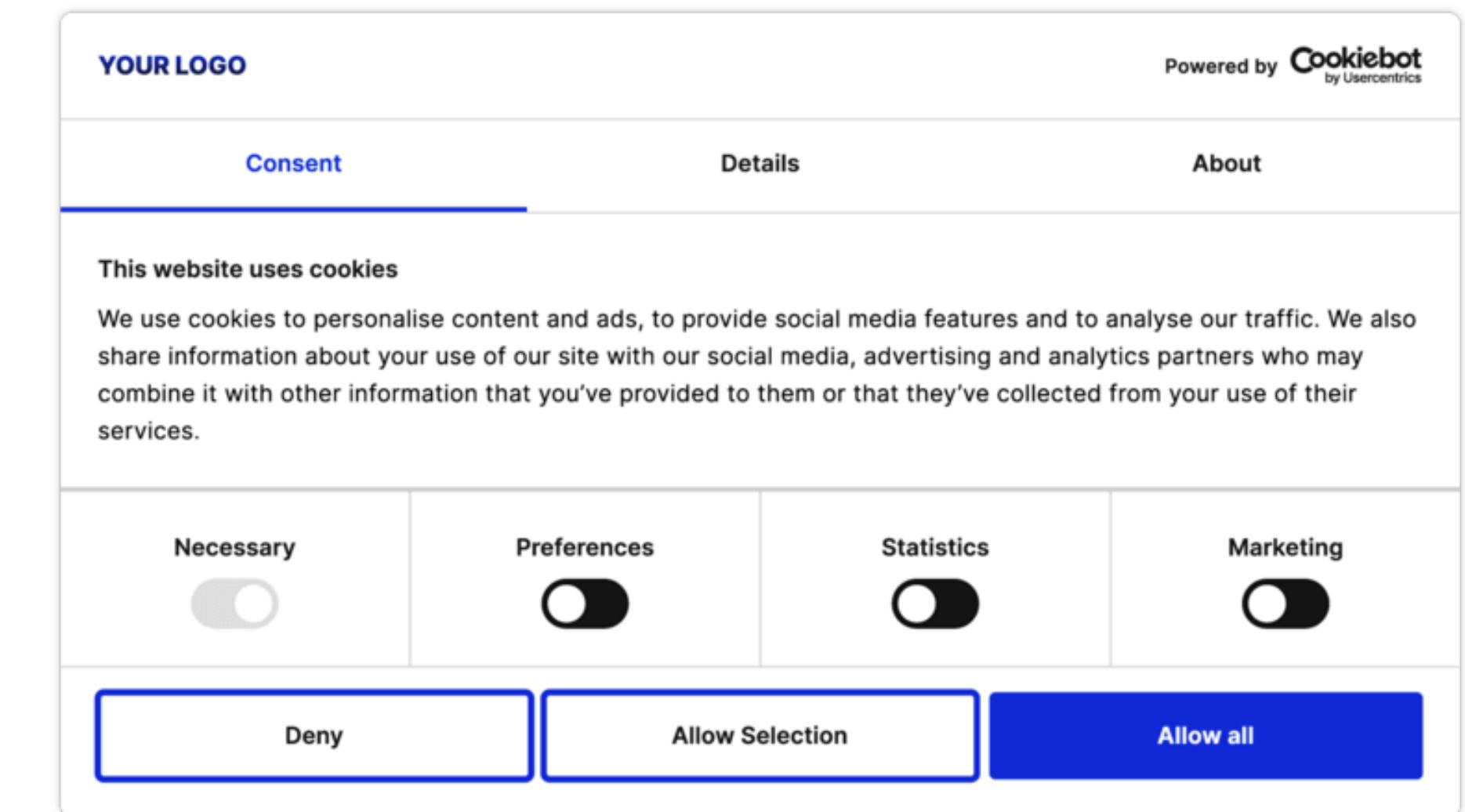
#5 Wide Range of Privacy Risks

- It's not just Big Brother or just corporations •
- Privacy is about our relationships with every other individual and organization out there
- Will need different solutions for different relations
- Ex. Data privacy useless for friends + family

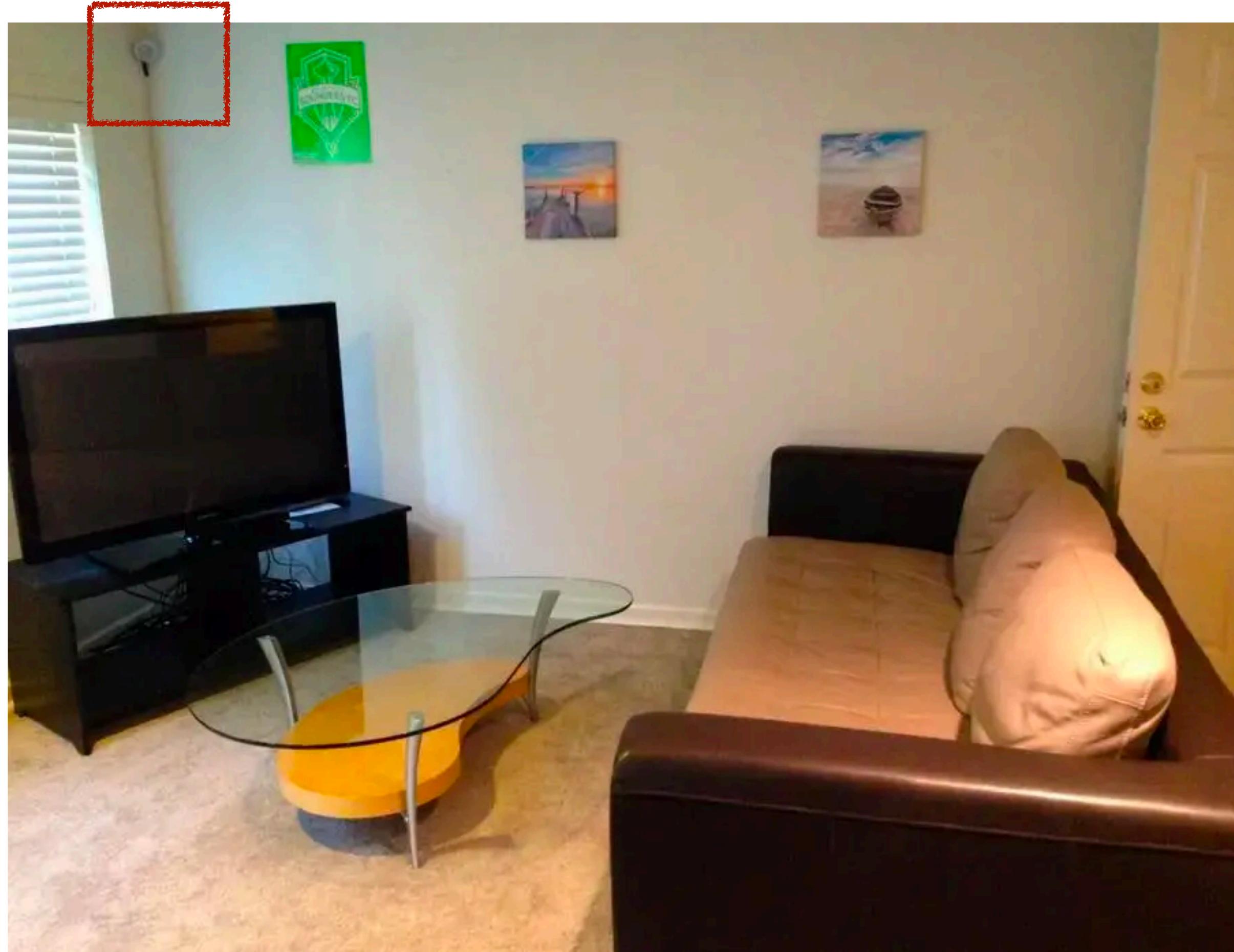


#6 Burden on End-Users is Too High

- Individuals have to make too many decisions
 - Is this device good for privacy?
 - Should I install this app?
 - What are all the settings I need to know?
 - What are all the terms and conditions?
 - Trackers, cookies, VPNs, anonymizers, etc



Cameras in Airbnb

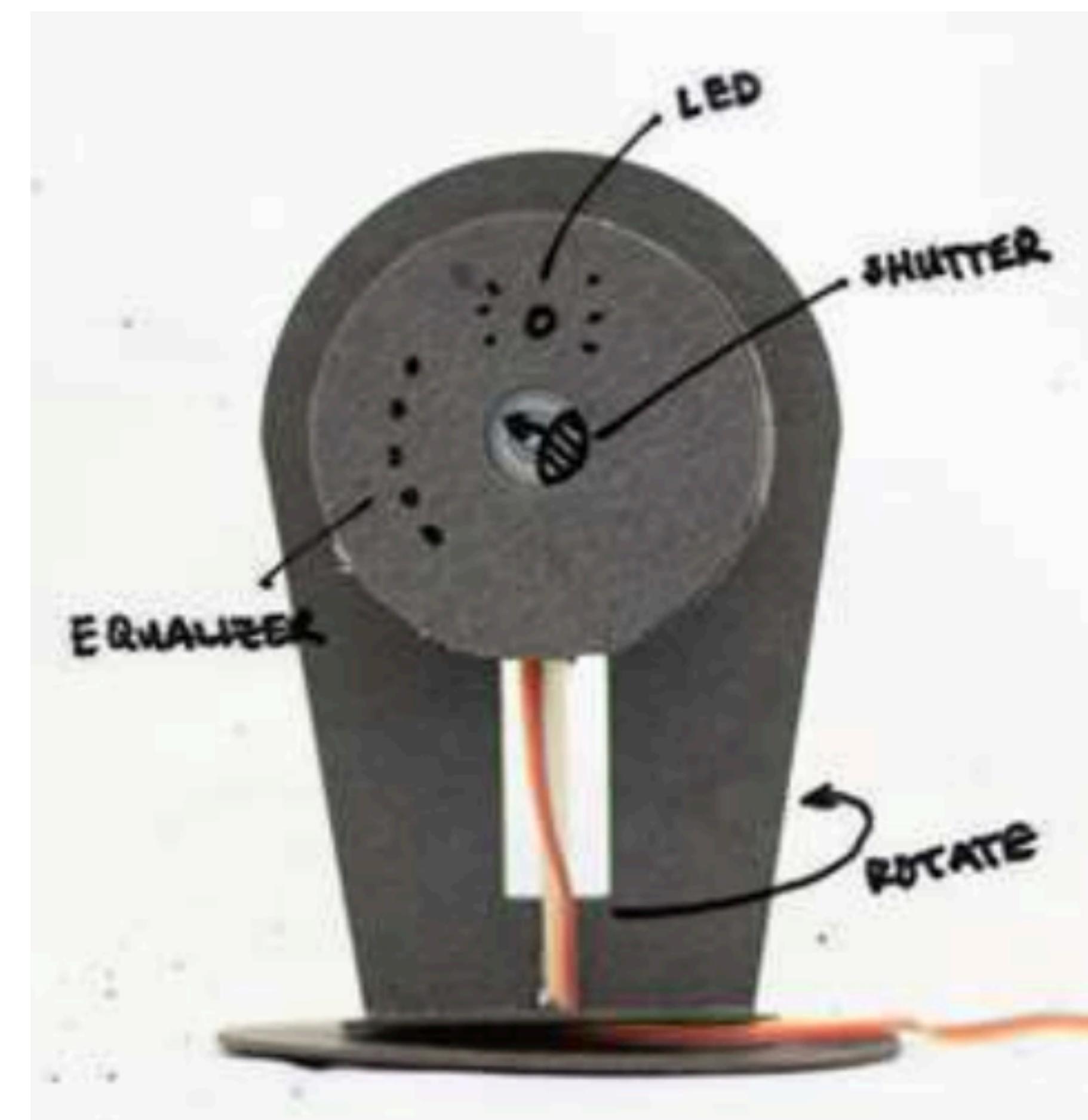
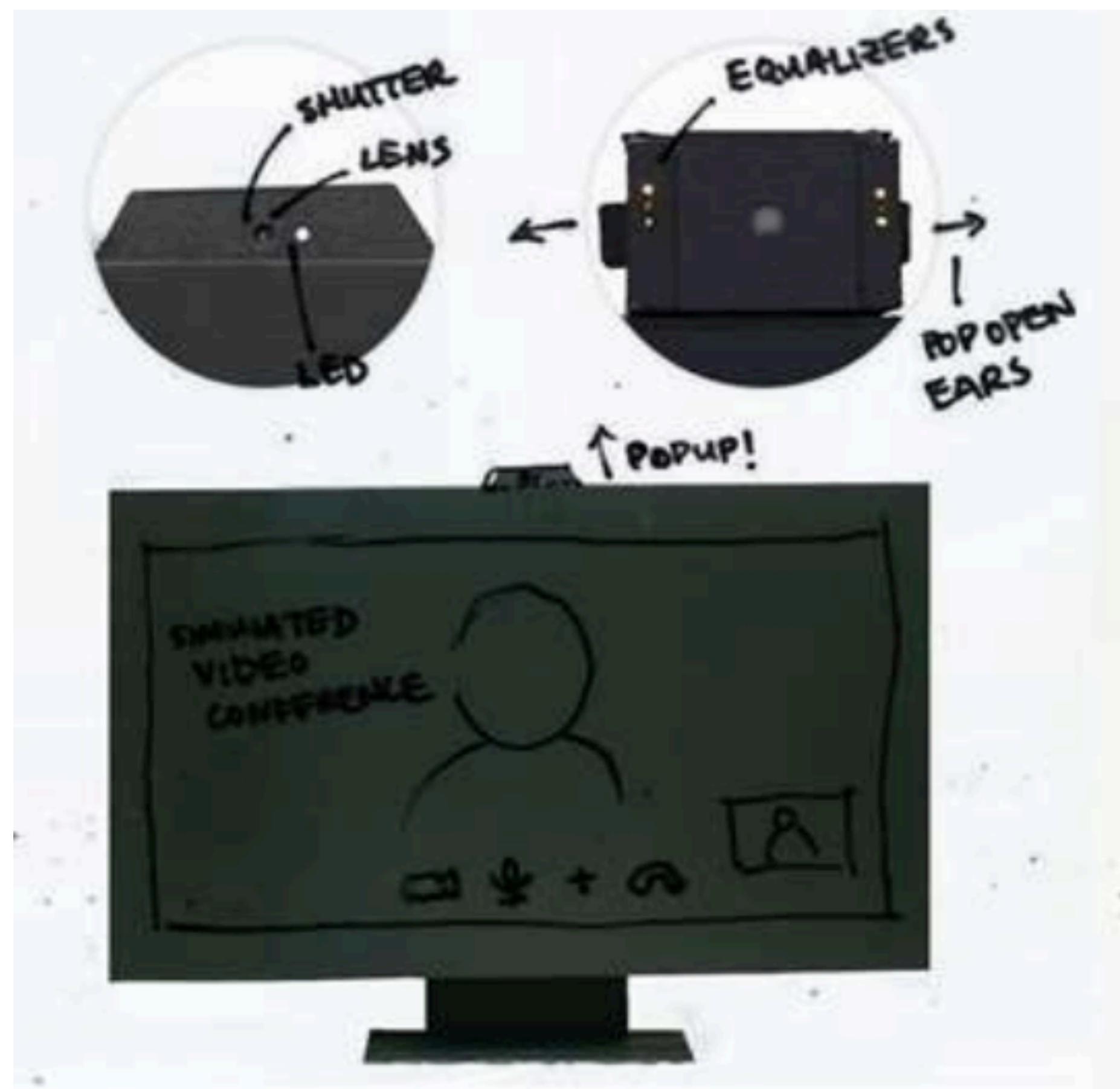


Travel

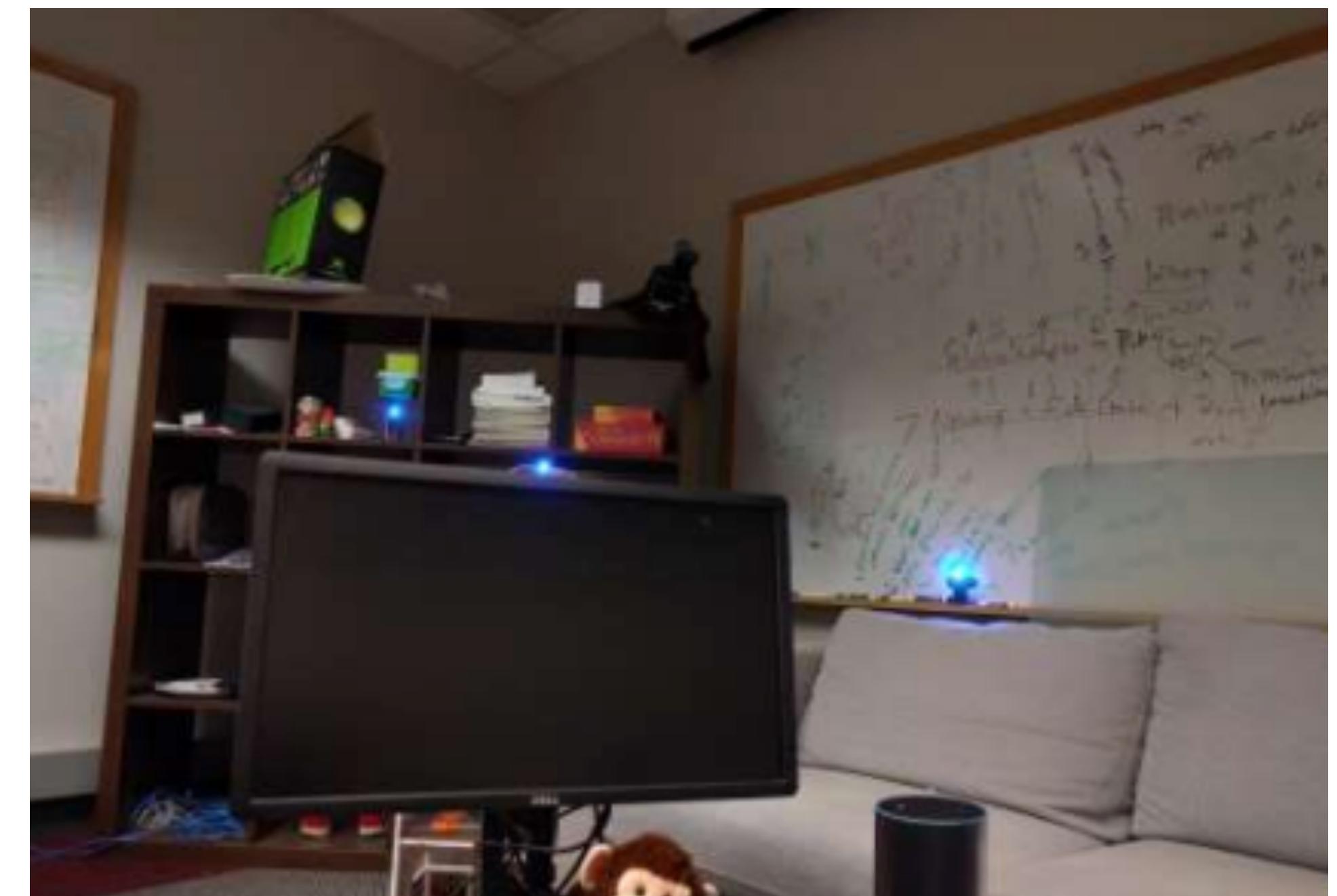
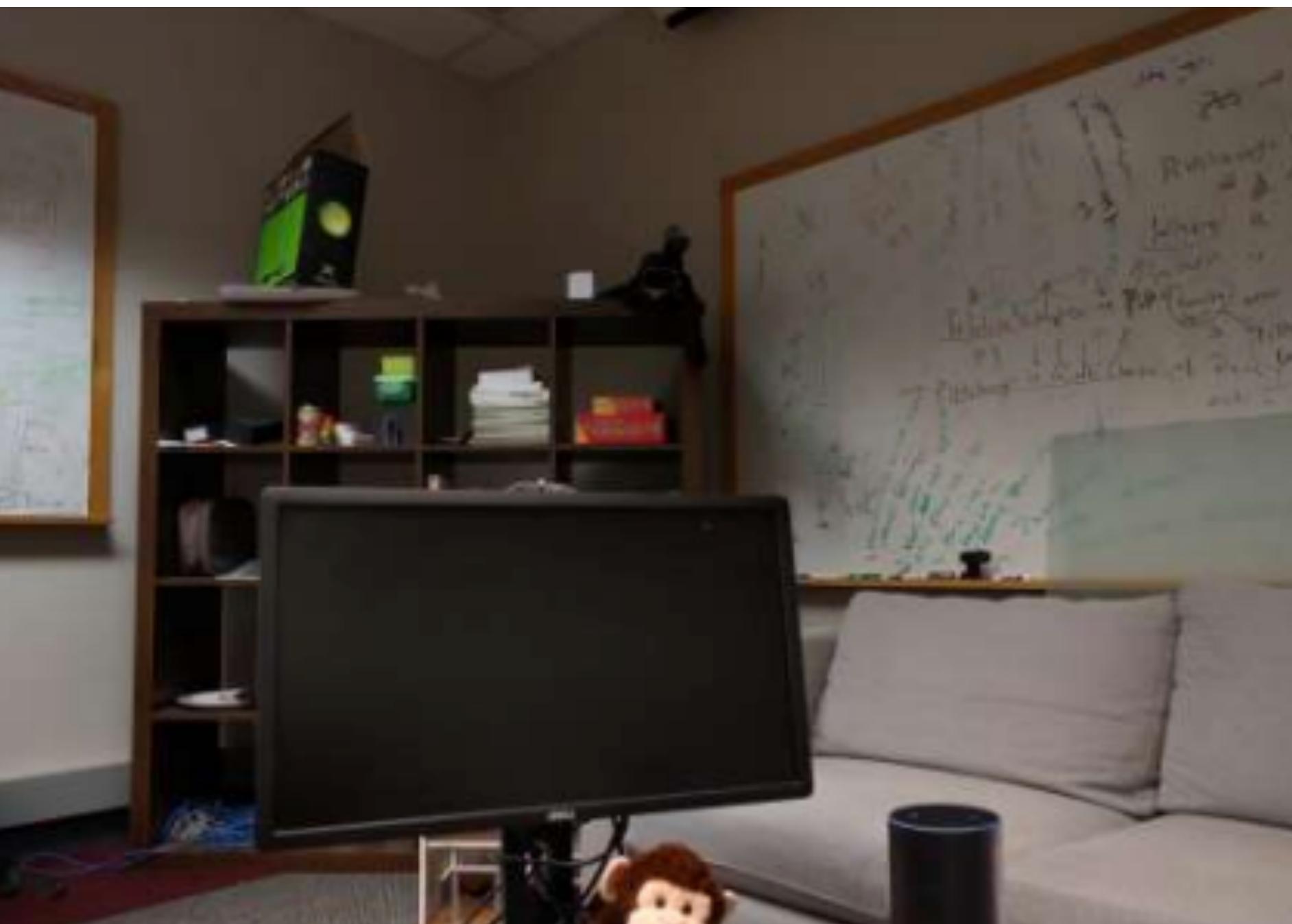
AIR SPY Airbnb guest finds surveillance camera inside his rented apartment but is told he 'consented' to it as it appeared in photos of the property

He claimed he was not made aware of the internal camera while booking

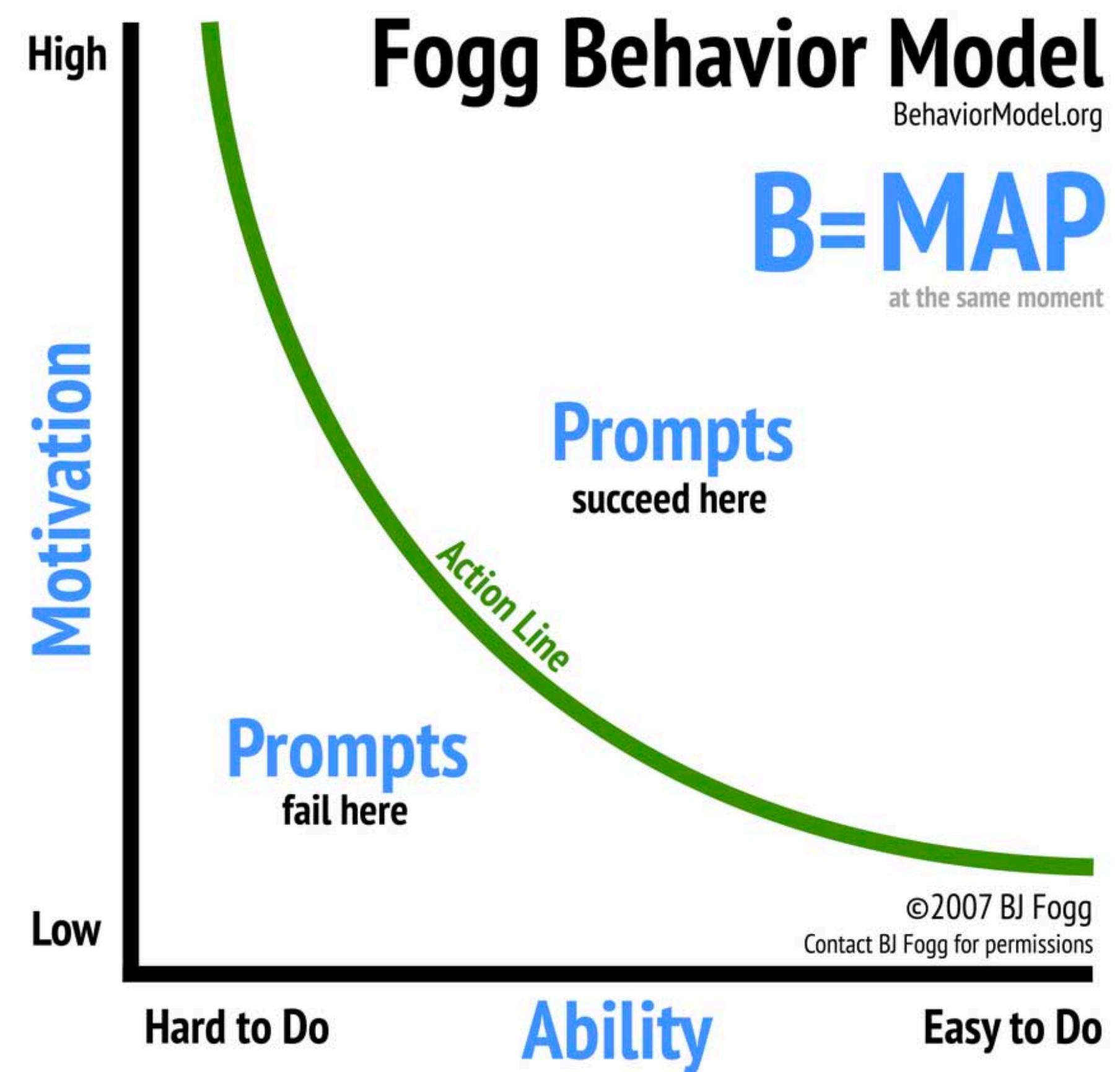
Design patterns



Can we make it easy to locate devices?



#7 Low Knowledge, Awareness, Motivation by Practitioners

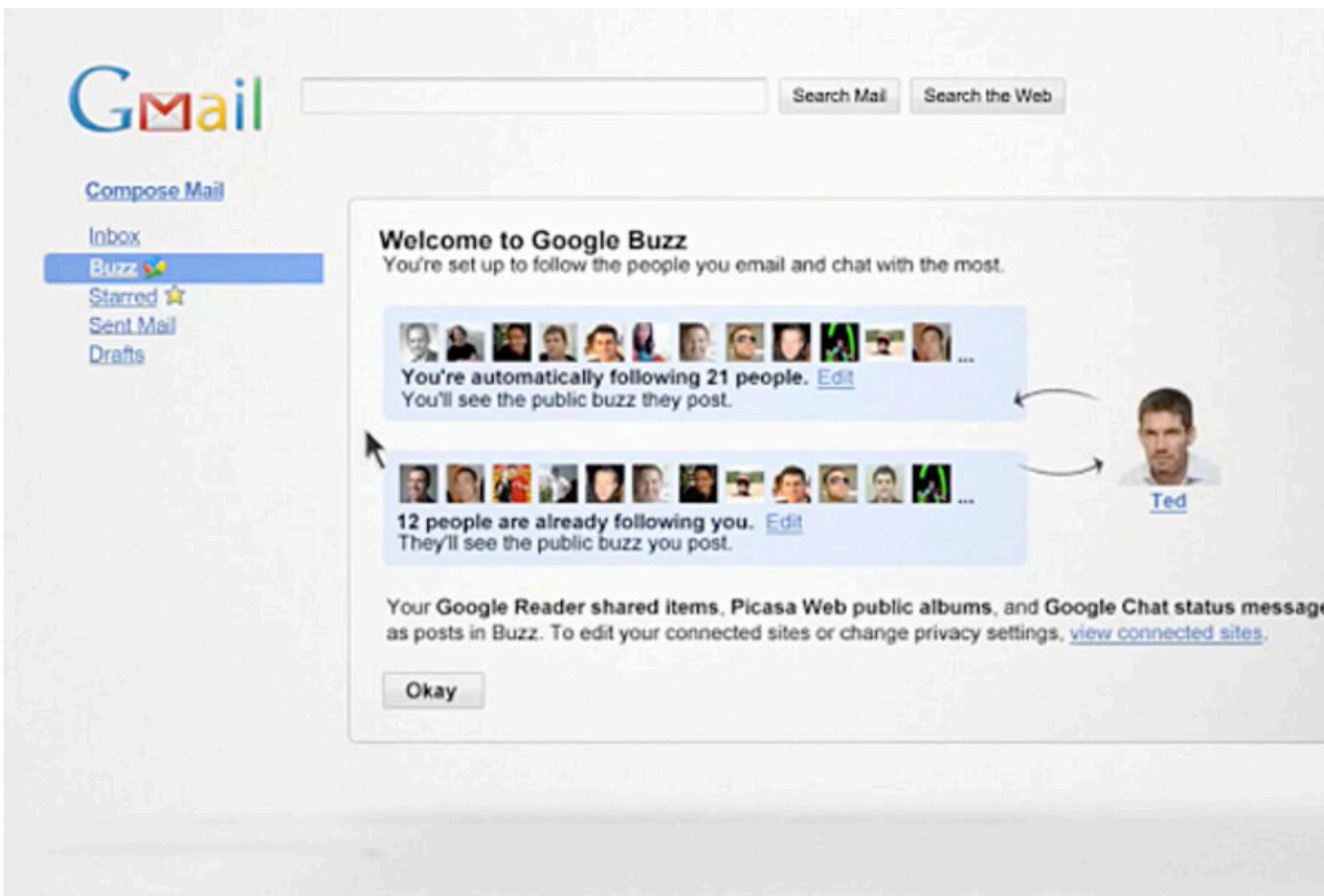


<https://behaviormodel.org/>

#7 Low Awareness

- Low awareness of privacy issues in their apps.
 - Google Buzz
 - Zoom Attention
 - Google Meeting
 - OKCupid
 - PrivacyGrade

Google Buzz



Zoom attention



Zoom attention

Uju Anya @UjuAnya

My child got sent to Zoom detention for not paying attention in Zoom 4th grade. Email said here's the link to access the room to serve detention.

I swear I'm trying so hard to take this life seriously.

9:49 PM · Apr 6, 2021 · Twitter for iPhone

31.2K Retweets 3,560 Quote Tweets 336.2K Likes

Uju Anya @UjuAnya · Apr 6

Replying to @UjuAnya

So, more details. This is an office referral, where the teacher gives repeated verbal warnings over time, then escalates to sending the child to the principal's office and notifying parents. At "detention" she's supposed to discuss and reflect with the behavior interventionist.

43 318 11.4K

Uju Anya @UjuAnya · Apr 6

The repeated behavior the teacher warned my 9yo and emailed me previously about is my child's inability to focus consistently in online class and complete the assignments. She frequently gets distracted, plays computer games, ignores the teacher, or just signs off Zoom.

129 443 11.8K

Google Meet

Add title

Event Focus time Out of office Task Reminder Appointment schedule

Thursday, January 12 5:00pm – 6:00pm
Time zone · Does not repeat

[Find a time](#)

 Add guests

 Add Google Meet video conferencing

 Add rooms or location

 Add description or attachments

 Haojian Jin ●
Busy · Default visibility · Notify 10 minutes before

More options Save

OKCupid | Facebook Social Contagion

OKCupid: we experiment on users.
Everyone does

Dating service's co-founder claims it lied to users to test theory about compatibility



The screenshot shows an OKCupid profile page for a user named Alice. The top navigation bar includes a search bar and links for "Browse Matches", "Messages", "Visitors", "Quickmatch", and "Events". The main profile area features a large photo of Alice, who is described as "Online". Her stats are listed as "100% Match" and "0% Enemy". She has a 3-star rating. Below her photo is her name, "Alice", followed by her location, "30 - F - New York, NY (3 Miles)". There are tabs for "About" (which is currently selected) and "Photos". The "About" section contains her self-summary: "I get the hiccups almost every day. I grew up in England but I'm American. My mother's side of the family is Icelandic and I would love to live there some day. I was raised as a Tibetan Buddhist. I have one bad eye, one ear lower than the other, and one foot smaller than the other. I love bad jokes. Yes I really did go to space camp (I was 16, so technically it was Advanced Space Academy)." It also includes sections for "You might like", "Recently visited", and "What I'm doing with my life".

#7 Low Knowledge

- Developers have low knowledge of privacy.
 - What is PII?
 - How should I interpret policies?

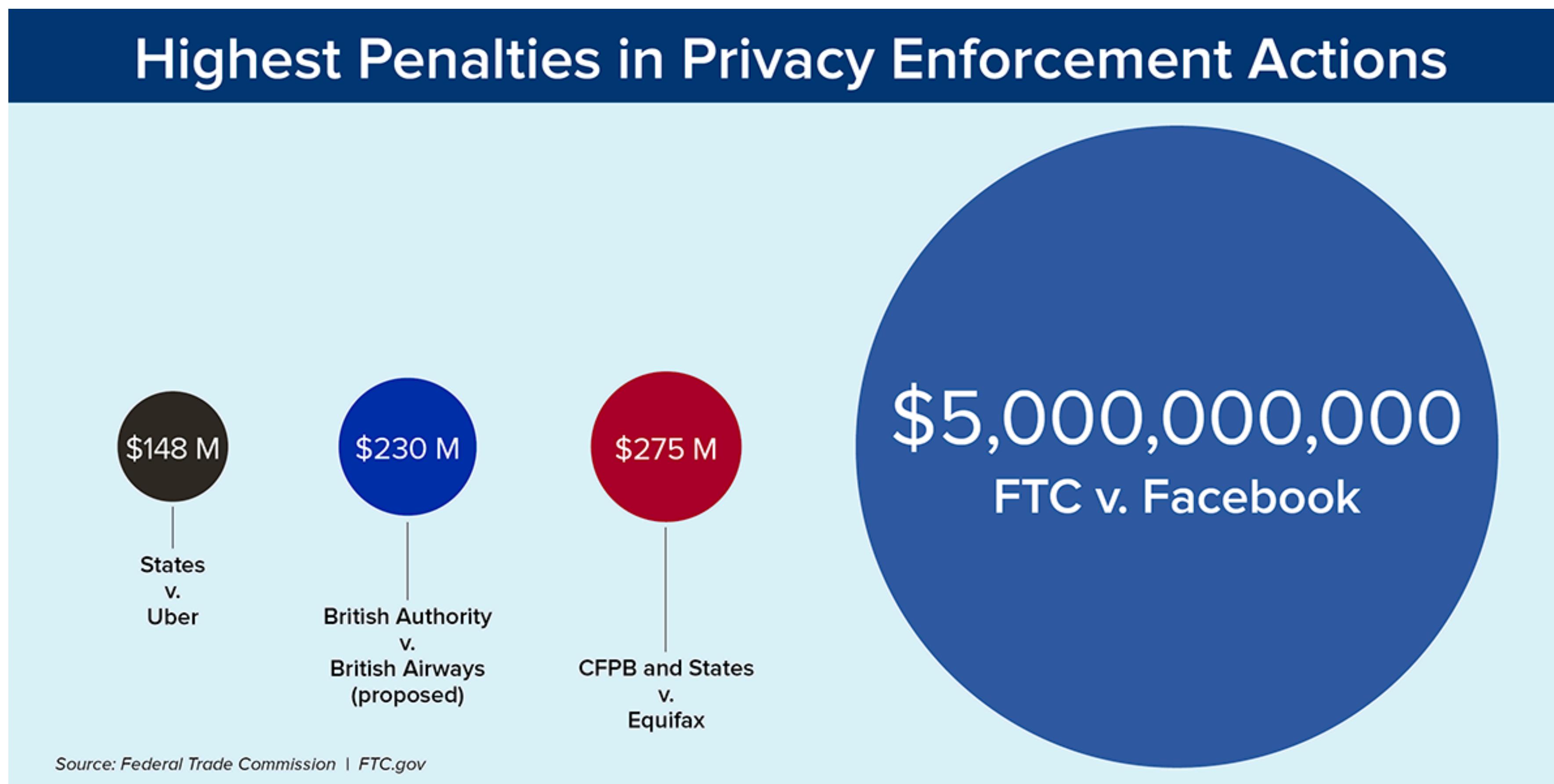


Home > Application Development

Stack Overflow survey: Nearly half of developers are self-taught

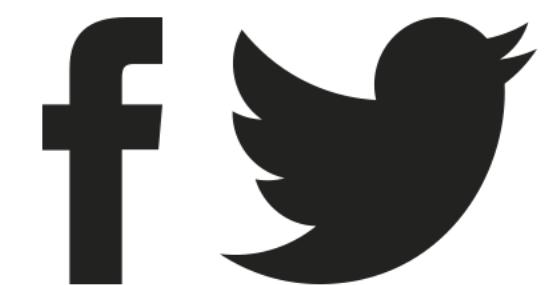
Stack Overflow Developer Survey finds 48 percent of respondents never received a degree in computer science

Low Motivation (1)



Low Motivation (2)

Social



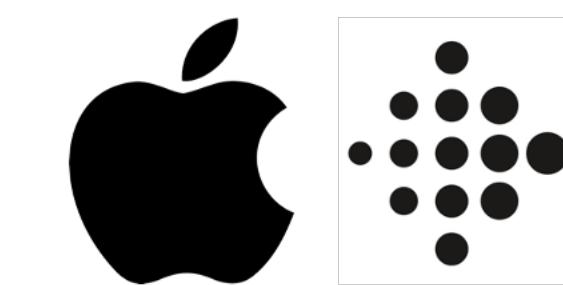
Shopping



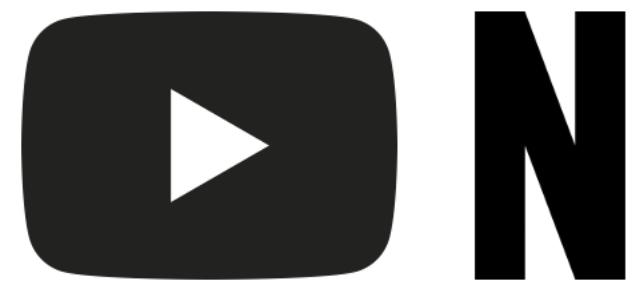
Communication



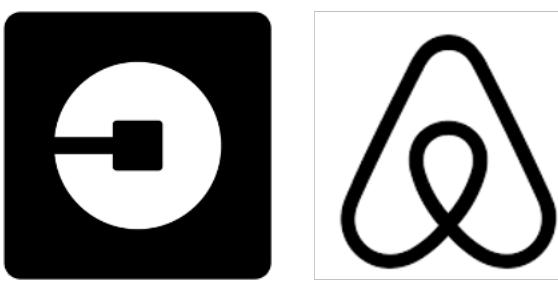
Health & Fitness



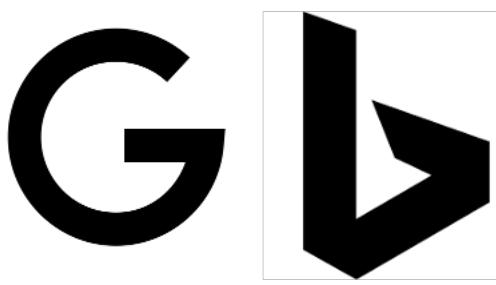
Entertainment



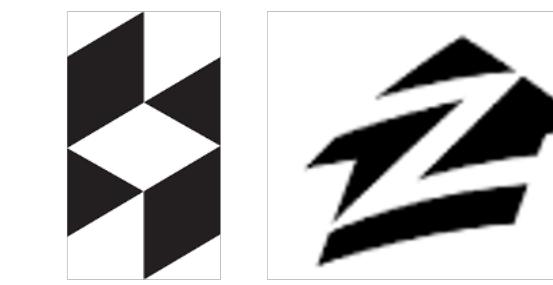
Travel



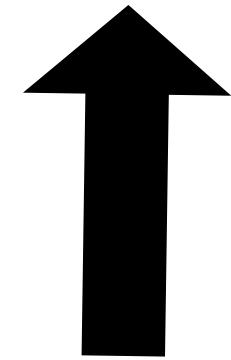
Search



Home & House



.....



Millions of small
companies

#8 Companies Get Little Pushback on Privacy

- Lack of Transparency
- Lack of Authority
- Lack of Incentives

PrivacyGrade

PrivacyGrade

Search for an app

BROWSE APPS LIBRARIES STATS FAQ NEWS BLOG



PrivacyGrade: Grading The Privacy Of Smartphone Apps

We're a team of researchers from Carnegie Mellon University. We have assigned privacy grades to Android apps based on some techniques we have developed to analyze their privacy-related behaviors. [Learn more here.](#)

Selected Apps

Most Popular Apps

Most Controversial

See More



Lazors



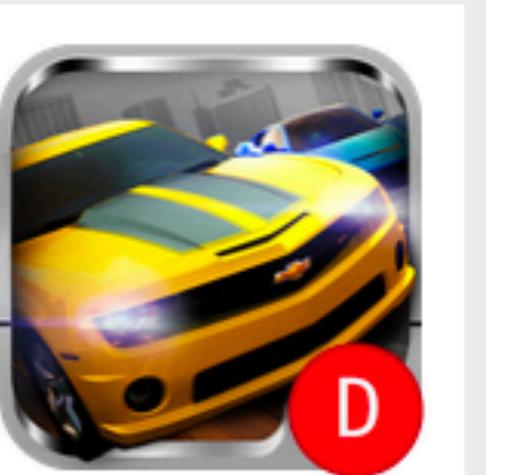
Instagram



Temple Run 2



Angry Birds



Drag Racing

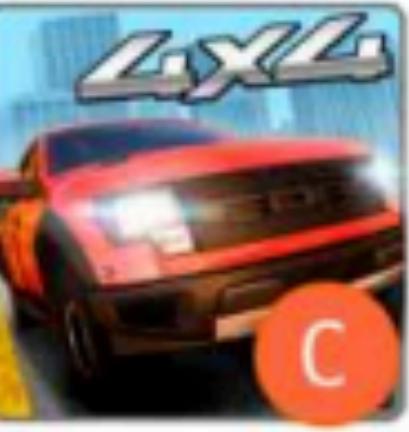
* Selected apps by us showcasing the full spectrum of grades

PrivacyGrade

PrivacyGrade Search for an app BROWSE APPS LIBRARIES STATS FAQ NEWS BLOG

 Drag Racing ANDROID APP ON Google play Developer: Creative Mobile Category: Game Racing Poor Privacy Grade

Related Apps App Description Privacy Analysis

 C Drag Racing...
The following description comes from the Google Play Store description of the app:
- Drive 50+ officially licensed cars, from hot hatches to american muscle and 1000HP supercars
- Buy your dream car, install performance upgrades and show your skills in 1/4 or 1/2 mile races
- Challenge millions of players online: race 1 on 1, drive your opponent's
[Read More](#)

SENSITIVE PERMISSIONS USED BY THIS APP

PERMISSION	WHAT	WHY
Read phone status and identity	Can read phone current state	It appears this app uses this data to log you in.

App was last analyzed by Privacy Grade on: 08/19/2014 Why does this app have this grade? Our method for grading apps uses a privacy model that we built. This model is based on crowdsourced surveys that we conducted to capture people's expectations and comfort levels with various app behaviors.

#9 Unclear What the Right Thing To Do Is

- Even if a company wants to be privacy-sensitive,
 - It is not always clear what the right thing to do is

#9 Unclear What the Right Thing To Do Is

- Even if a company wants to be privacy-sensitive,
 - It is not always clear what the right thing to do is
- For developers,
 - Best way of informing people?
 - Best way of storing data?
 - Best way of assess what is / isn't acceptable?
- For auditors,
 - How to enforce? What to push?

Consent cookie makes the problem worse.

YOUR LOGO

Powered by **Cookiebot**
by Usercentrics

Consent **Details** **About**

This website uses cookies

We use cookies to personalise content and ads, to provide social media features and to analyse our traffic. We also share information about your use of our site with our social media, advertising and analytics partners who may combine it with other information that you've provided to them or that they've collected from your use of their services.

Necessary	Preferences	Statistics	Marketing
<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>

Deny **Allow Selection** **Allow all**

#10 Probabilistic and Emergent Behaviors (everything else)



(a) Three samples in criminal ID photo set S_c .

Automated Inference
on Criminality using
Face Images:

95% accuracy



(b) Three samples in non-criminal ID photo set S_n

Figure 1. Sample ID photos in our data set.

#10 Probabilistic and Emergent Behaviors (everything else)



Learn more about setting healthy boundaries:

www.MilitaryOneSource.mil/MobilizeHelp

Family Advocacy Program: 800-342-9647

National Domestic Violence Hotline: 800-799-7233



Summary - 10 Reasons

- #1 Privacy is a broad and fuzzy term
- #2 Technological Capabilities Rapidly Growing
- #3 Strong Incentives for Companies to Collect Data
- #4 Same Device/Data, Different Perspectives
- #5 Wide Range of Privacy Risks
- #6 Burden on End-Users Too High
- #7 Low Knowledge, Awareness, Motivation by Devs
- #8 Companies Get Little Pushback on Privacy
- #9 Unclear What the Right Thing To Do Is
- #10 Probabilistic and Emergent Behaviors