

Lecture 15: Online Tracking

CMSC 25910

Spring 2023

The University of Chicago



Tracking Website Visits

First-Party Tracking (The Website You Are Visiting)

← → ↻ 🏠 https://www.amazon.com/s?k=rare+plants&ref=nb_sb_noss ⋮ 🔒 ⭐ ⬇ 📖 📱



Rare ARIOCARPUS RETUSUS Exotic Desert Living Rock Cactus Cacti 10 Ct

★★★★☆ ~ 6

\$8⁹⁹

\$5.48 shipping

Only 4 left in stock - order soon.



10+ Very Fresh Rare! Dwarf Waimanalo Papaya! Tropical Fruit Tree Seeds Plant

★★★★☆ ~ 8

\$10⁶⁸

FREE Shipping



50 Pcs Rare Plant Seeds Succulent Seeds Garden Bonsai - Agave(Blue Glow)

★★★★☆ ~ 3

\$7⁹⁹

✓prime Get it as soon as **Sat, May 29**

FREE Shipping on orders over \$25 shipped by Amazon

Only 7 left in stock - order soon.

https://www.amazon.com/Plant-Seeds-Succulent-Garden-Bonsai/dp/B08RRQGR6F/ref=sr_1_9?dchild=1&keywords=rare+plants&qid=1621969916&sr=8-9

First-Party Tracking (The Website You Are Visiting)

Sponsored ⓘ	Desert Living Rock Cactus Cacti 10 Ct ★★★★☆ ∨ 6 \$8⁹⁹ \$5.48 shipping Only 4 left in stock - order soon.	Waimanalo Papaya! Tropical Fruit Tree Seeds Plant ★★★★☆ ∨ 8 \$10⁶⁸ FREE Shipping	Seed Glow ★★ \$7⁹⁹ ✓prime FREE by An Only 7
https://www.amazon.com/Plant-Seeds-Succulent-Garden-Bonsai/dp/B08RRQGR6F/ref=sr_1_9?dchild=1&keywords=rare+plants&qid=1621969916&sr=8-9			

Third-Party Tracking (**Not** The Website You Are Visiting)

The screenshot shows a web browser window with the address bar displaying <https://www.uchicago.edu>. The page content includes the UChicago News header, a COVID-19 update, three news articles with images, a 'Latest News' section, and a video player for 'Explore Chicago' with a 'Watch on YouTube' button. The browser's address bar and the video player's interface are highlighted to illustrate third-party tracking.

UChicago News

- Visit the [UChicago Forward website](#), for the University's COVID-19 health protocols, campus guidelines, and other Spring Quarter information.

 What Americans are thinking a year after George Floyd's death

 Big Brains podcast: Why You're Likely Paying An Unfair Share of Property Taxes

 University announces COVID-19 vaccine requirement for all students

Latest News

Founded at UChicago, nonprofit Climate Vault proposes new solution for carbon reduction

[MORE NEWS >](#)

 Explore Chicago: Discover the Global City UChicago...
Watch later Share
A WORLD-CLASS UNIVERSITY
Watch on  YouTube

Explore Chicago

Discover the global city UChicago calls home—filled with inspiration, innovation, and countless opportunities to explore.

[VISIT UCHICAGO >](#)

Third-Party Tracking (**Not** The Website You Are Visiting)

The screenshot shows a web browser at the URL <https://www.uchicago.edu>. The page is titled "UChicago News" and contains several news items. A red box highlights a video player for "Explore Chicago: Discover the Global City UChicago...". The video player includes a play button, a "Watch later" button, a "Share" button, and a "Watch on YouTube" button. The video content shows a street scene with people walking and a large building in the background. The text "A WORLD-CLASS UNIVERSITY" is overlaid on the video. To the right of the video player, there is a section titled "Explore Chicago" with a description: "Discover the global city UChicago calls home—filled with inspiration, innovation, and countless opportunities to explore." and a link "VISIT UCHICAGO >".

UChicago News

- Visit the [UChicago Forward website](#), for the University's COVID-19 health protocols, campus guidelines, and other Spring Quarter information.

 What Americans are thinking a year after George Floyd's death

 Big Brains podcast: Why You're Likely Paying An Unfair Share of Property Taxes

 University announces COVID-19 vaccine requirement for all students

Latest News

Founded at UChicago, nonprofit Climate Vault proposes new solution for carbon reduction

[MORE NEWS >](#)

 Explore Chicago: Discover the Global City UChicago...  

A WORLD-CLASS UNIVERSITY

Watch on  YouTube

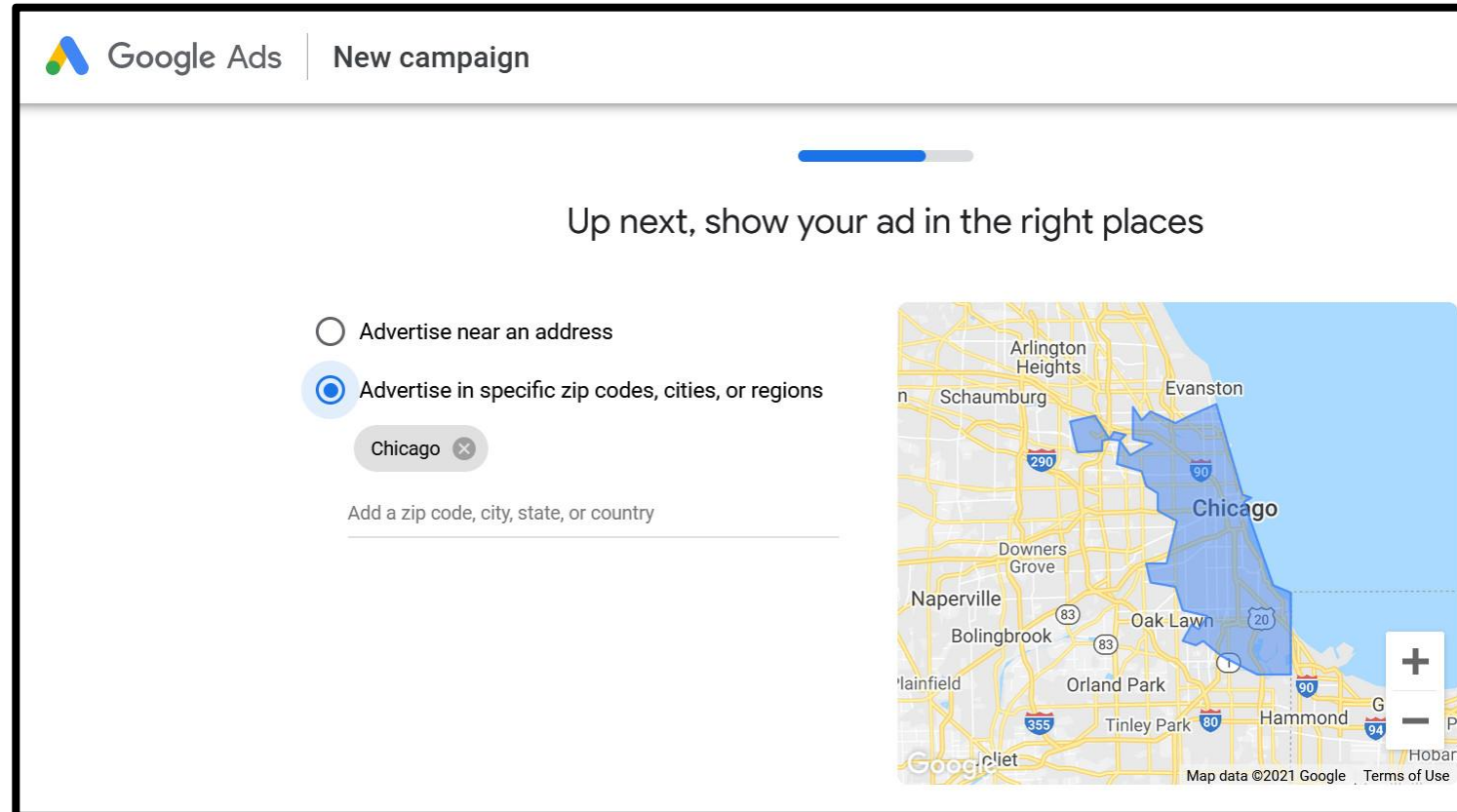
Explore Chicago

Discover the global city UChicago calls home—filled with inspiration, innovation, and countless opportunities to explore.

[VISIT UCHICAGO >](#)

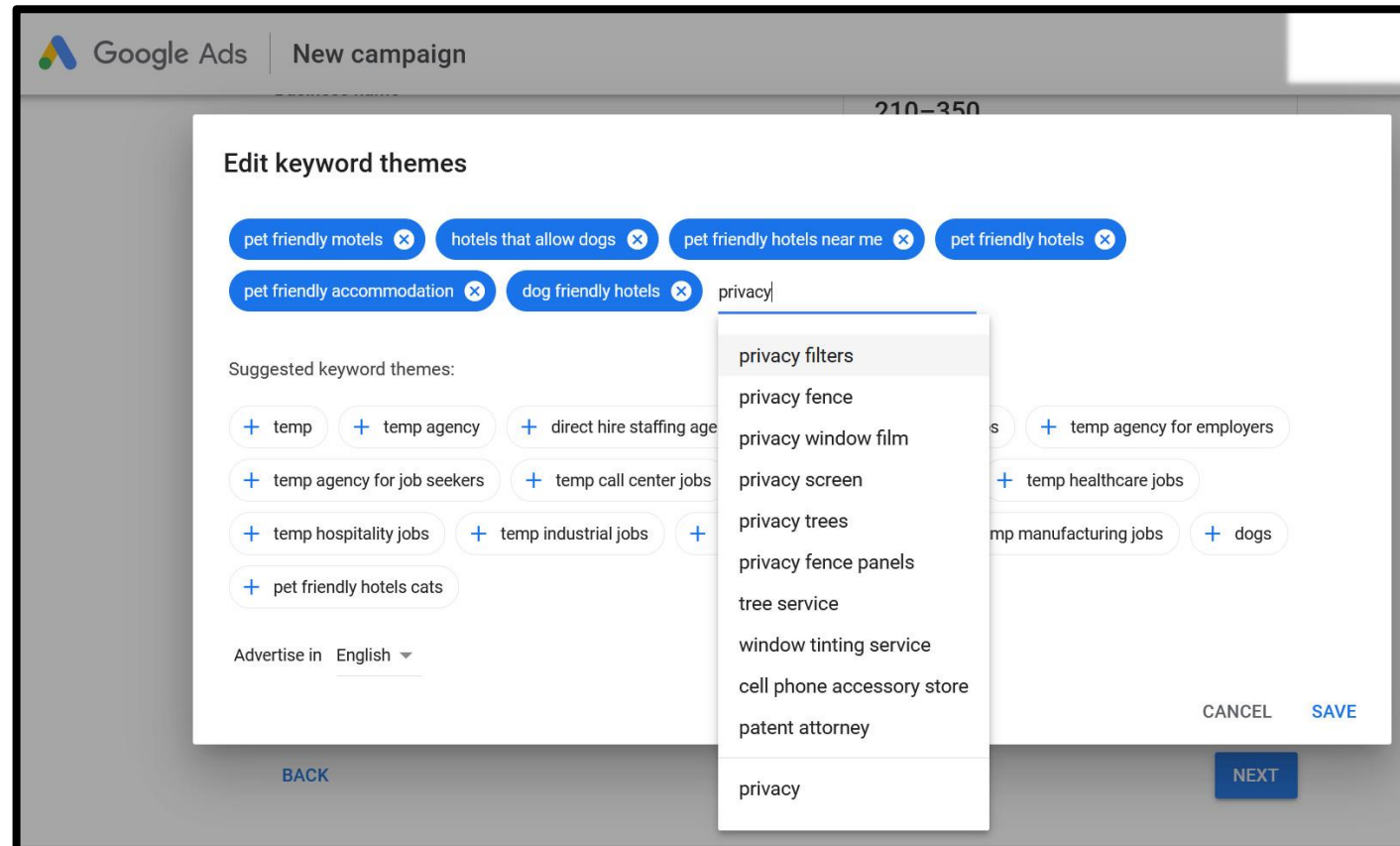
Ad Targeting

- Goal: Target advertisements to particular users
 - Based on interests, demographics, past interactions (online/offline)



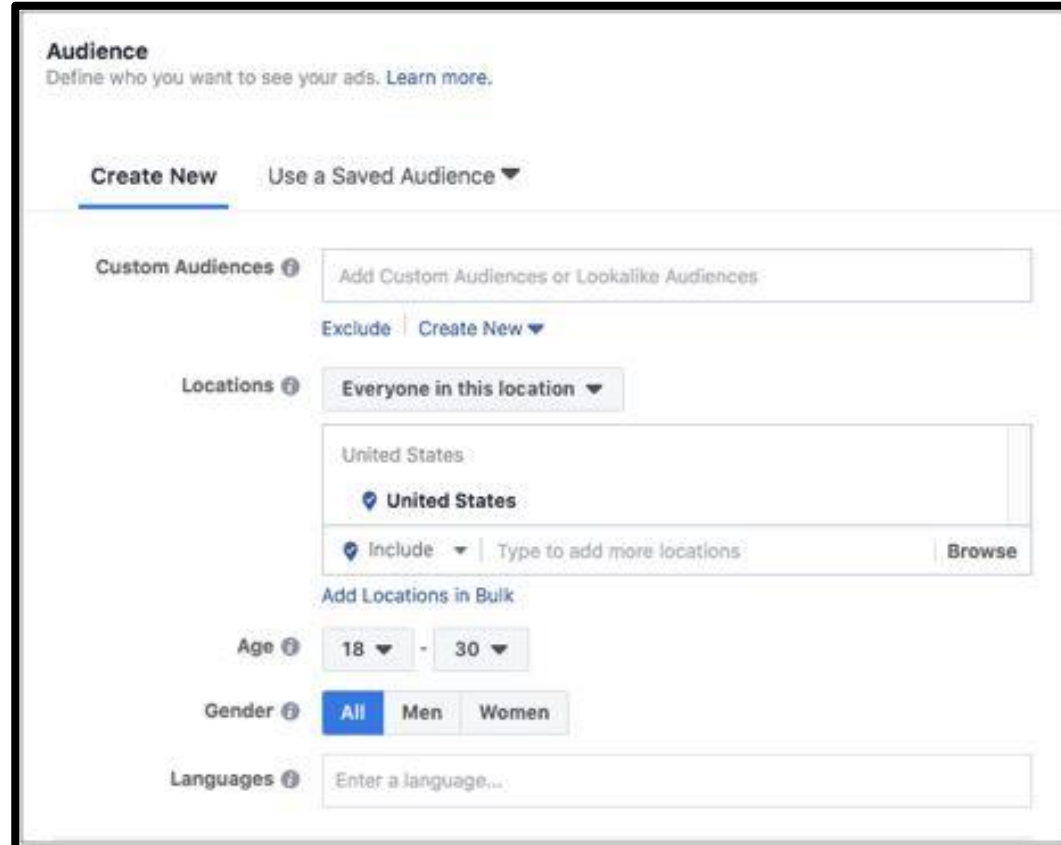
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Ad Targeting

- Goal: Target advertisements to particular users
 - Based on interests, demographics, past interactions (online/offline)



The image shows a screenshot of the Facebook Audience targeting interface. At the top, the heading "Audience" is followed by the instruction "Define who you want to see your ads. Learn more." Below this, there are two tabs: "Create New" (which is underlined) and "Use a Saved Audience" with a dropdown arrow. The "Create New" tab is active, showing a section for "Custom Audiences" with a text input field labeled "Add Custom Audiences or Lookalike Audiences". Below this input field are links for "Exclude" and "Create New" with a dropdown arrow. The "Locations" section features a dropdown menu set to "Everyone in this location". Below this is a search bar containing "United States" with a location pin icon and a dropdown arrow. Below the search bar is a section with a location pin icon, a dropdown menu set to "Include", a text input field labeled "Type to add more locations", and a "Browse" button. Below this is a link "Add Locations in Bulk". The "Age" section has two dropdown menus set to "18" and "30" with a minus sign between them. The "Gender" section has three buttons: "All" (which is highlighted in blue), "Men", and "Women". The "Languages" section has a text input field labeled "Enter a language...".

Audience
Define who you want to see your ads. [Learn more.](#)

Create New Use a Saved Audience ▼

Custom Audiences ⓘ Add Custom Audiences or Lookalike Audiences

Exclude Create New ▼

Locations ⓘ Everyone in this location ▼

United States

📍 United States

📍 Include ▼ Type to add more locations Browse

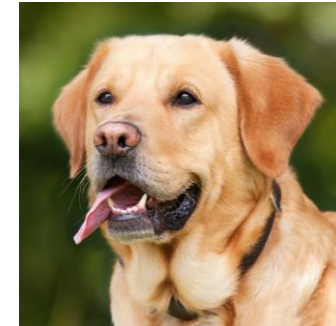
[Add Locations in Bulk](#)

Age ⓘ 18 ▼ - 30 ▼

Gender ⓘ All Men Women

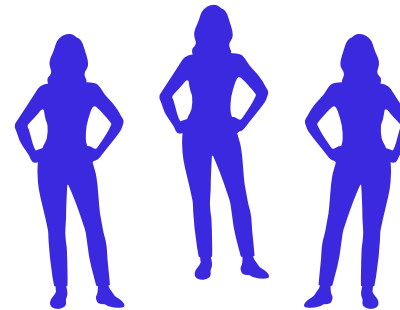
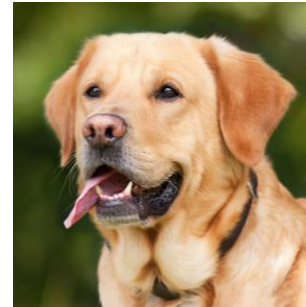
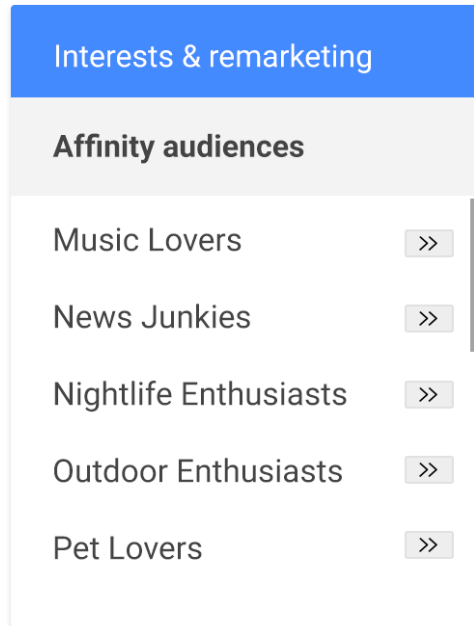
Languages ⓘ Enter a language...

Data-Driven Inferences

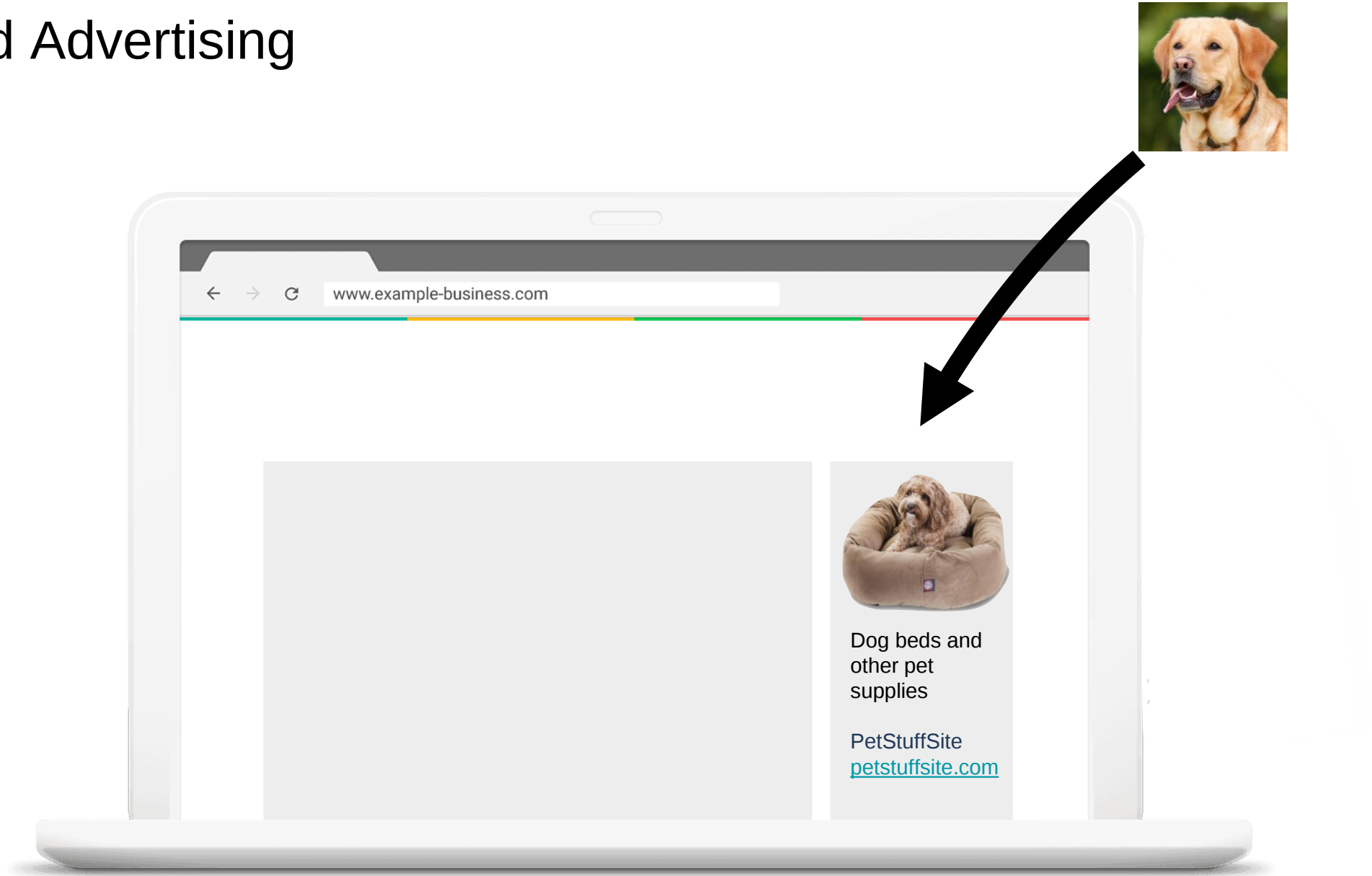


↖
You might like
dogs!

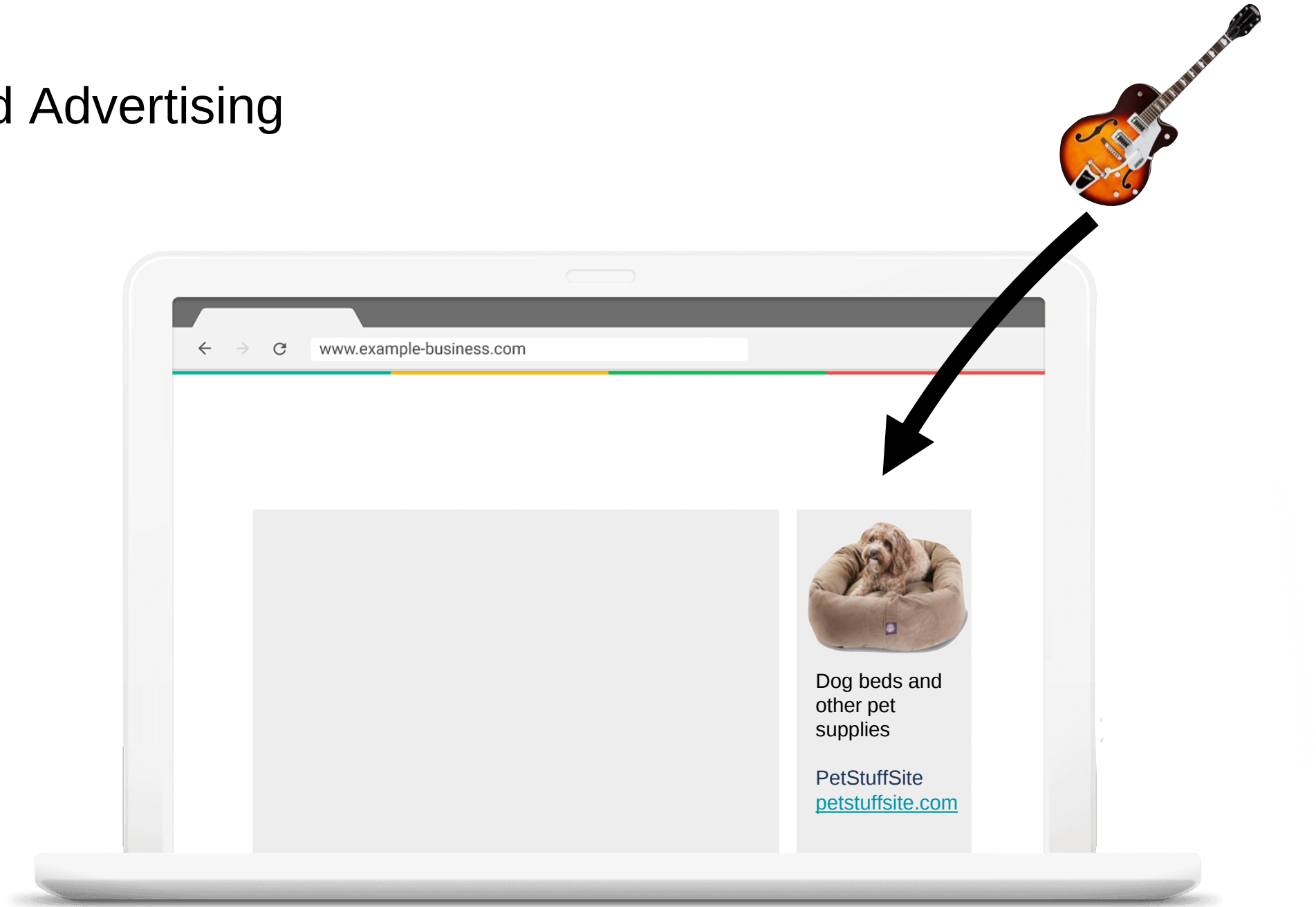
Targeted Advertising



Targeted Advertising

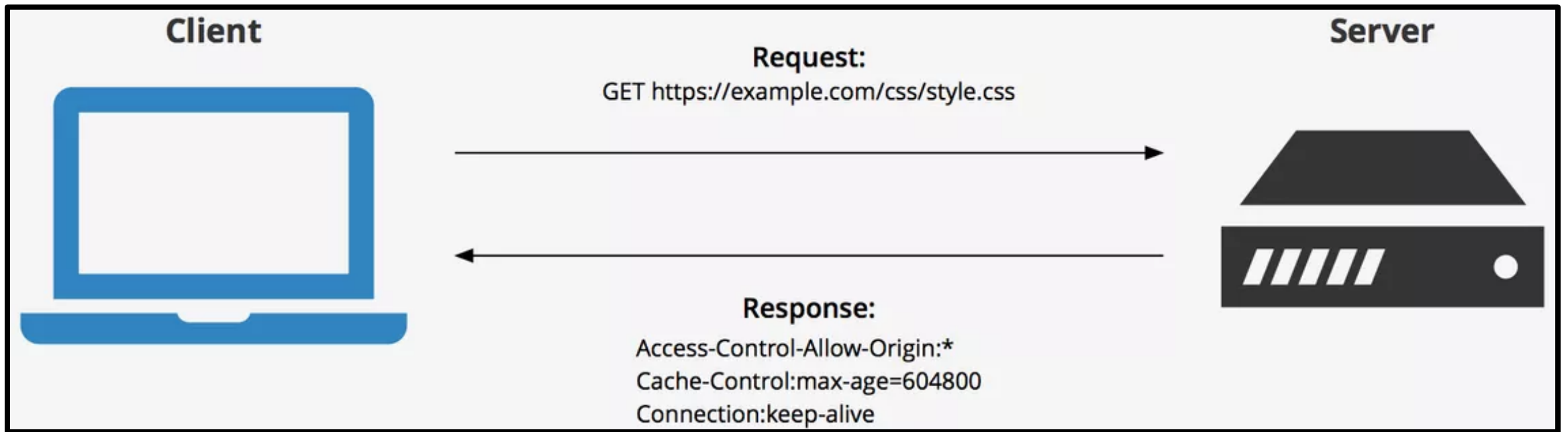


Targeted Advertising



Mechanics of Tracking (Cookie Version)

HTTP Basics



HTTP Headers (uchicago.edu)

The screenshot displays the Chrome DevTools Network tab with the 'Headers' sub-tab selected. The network log on the left shows a list of requests. The first request, a GET to 'www.uchicago.edu /', is selected, and its response headers are displayed on the right. The status bar at the bottom indicates 5 requests, 229.65 KB / 172.86 KB transferred, and a load time of 1.70 s.

Status	Meth...	Domain	File	Initiator	Type	Transferred	Size
200	GET	www.uchicago.edu	/	document	html	11.41 KB	39.87...
204	POST	www.youtube.com	atr?ns=yt&el=embedded&cpn=ho5PKBh-p_	base.js:1023 (x...	html	604 B	0 B
200	GET	www.youtube.com	P-xlixF7B2U?autohide=1&fs=1&autoplay=0&	subdocument	html	21.81 KB	51.50...
200	GET	cdn.hypem.com	uchicagowww?width=1169&paginate=true&	a5b5e5.js:3 (su...	html	128.06 KB	127.6...
200	GET	cdn.hypem.com	popUpModalEndpoint	a5b5e5.js:3 (su...	html	10.99 KB	10.64...

Response Headers (1.078 KB)

```
HTTP/2 200 OK
date: Tue, 25 May 2021 18:00:35 GMT
content-type: text/html; charset=UTF-8
server: Apache
x-frame-options: SAMEORIGIN
expires: Mon, 26 Jul 1997 05:00:00 GMT
pragma: no-cache
vary: Accept-Encoding
set-cookie: uchicago-prod_last_visit=1306605629; expires=Wed, 25-May-2022 18:00:29 GMT
set-cookie: uchicago-prod_last_activity=1621965629; expires=Wed, 25-May-2022 18:00:29 GMT
set-cookie: uchicago-prod_tracker=%7B%220%22%3A%22index%22%2C%22token%22%3A%2226944a%22%22%7D; expires=Thu, 01-Jan-1970 00:00:01 GMT
set-cookie: uchicago-prod_csrf_token=deleted; expires=Thu, 01-Jan-1970 00:00:01 GMT
set-cookie: uchicago-prod_csrf_token=86d47d8690aa7646e1628dd095cd5b464db16bd3; expires=Thu, 01-Jan-1970 00:00:01 GMT
last-modified: Tue, 25 May 2021 18:00:29 GMT
content-encoding: gzip
x-varnish: 10696657 9201444
age: 5
via: 1.1 varnish (Varnish/5.2)
accept-ranges: bytes
X-Firefox-Spdy: h2
```

Request Headers (735 B)

```
GET / HTTP/2
Host: www.uchicago.edu
User-Agent: Mozilla/5.0 (Windows NT 10.0; Win64; x64; rv:88.0) Gecko/20100101 Firefox/88.0
Accept: text/html,application/xhtml+xml,application/xml;q=0.9,image/webp,*/*;q=0.8
Accept-Language: en-US,en;q=0.5
Accept-Encoding: gzip, deflate, br
DNT: 1
Connection: keep-alive
Cookie: uchicago-prod_last_visit=1306604446; uchicago-prod_last_activity=1621964446;
Upgrade-Insecure-Requests: 1
If-Modified-Since: Tue, 25 May 2021 17:40:36 GMT
TE: Trailers
```

5 requests | 229.65 KB / 172.86 KB transferred | Finish: 4.03 min | DOMContentLoaded: 451 ms | load: 1.70 s

HTTP Headers (uchicago.edu): Request

▼ Request Headers (735 B) Raw ☒

GET / HTTP/2
Host: www.uchicago.edu
User-Agent: Mozilla/5.0 (Windows NT 10.0; Win64; x64; rv:88.0) Gecko/20100101 Firefox/88.0
Accept: text/html,application/xhtml+xml,application/xml;q=0.9,image/webp,*/*;q=0.8
Accept-Language: en-US,en;q=0.5
Accept-Encoding: gzip, deflate, br
DNT: 1
Connection: keep-alive
Cookie: uchicago-prod_last_visit=1306604446; uchicago-prod_last_activity=1621964446;
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HTTP Headers (uchicago.edu): Request

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GET / HTTP/2
Host: www.uchicago.edu
User-Agent: Mozilla/5.0 (Windows NT 10.0; Win64; x64; rv:88.0) Gecko/20100101 Firefo
Accept: text/html,application/xhtml+xml,application/xml;q=0.9,image/webp,*/*;q=0.8
Accept-Language: en-US,en;q=0.5
Accept-Encoding: gzip, deflate, br
DNT: 1
Connection: keep-alive
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< >

HTTP Headers (uchicago.edu): Request

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Accept-Language: en-US,en;q=0.5
Accept-Encoding: gzip, deflate, br
DNT: 1
Connection: keep-alive
Cookie: uchicago-prod_last_visit=1306604446; uchicago-prod_last_activity=1621964446;
Upgrade-Insecure-Requests: 1
If-Modified-Since: Tue, 25 May 2021 17:40:36 GMT
TE: Trailers
```

Detail: HTTP Cookies



Image taken from <https://networkencyclopedia.com/http-cookie/>

HTTP Headers (uchicago.edu): Response

▼ Response Headers (1.078 KB) Raw ☒

```
HTTP/2 200 OK
date: Tue, 25 May 2021 18:00:35 GMT
content-type: text/html; charset=UTF-8
server: Apache
x-frame-options: SAMEORIGIN
expires: Mon, 26 Jul 1997 05:00:00 GMT
pragma: no-cache
vary: Accept-Encoding
set-cookie: uchicago-prod_last_visit=1306605629; expires=Wed, 25-May-2022 18:00:29 G
set-cookie: uchicago-prod_last_activity=1621965629; expires=Wed, 25-May-2022 18:00:2
set-cookie: uchicago-prod_tracker=%7B%220%22%3A%22index%22%2C%22token%22%3A%2226944a
set-cookie: uchicago-prod_csrf_token=deleted; expires=Thu, 01-Jan-1970 00:00:01 GMT;
set-cookie: uchicago-prod_csrf_token=86d47d8690aa7646e1628dd095cd5b464db16bd3; expir
last-modified: Tue, 25 May 2021 18:00:29 GMT
content-encoding: gzip
x-varnish: 10696657 9201444
age: 5
via: 1.1 varnish (Varnish/5.2)
accept-ranges: bytes
X-Firefox-Spdy: h2
```

HTTP Headers (uchicago.edu): Response

▼ Response Headers (1.078 KB) Raw ☒

```
HTTP/2 200 OK
date: Tue, 25 May 2021 18:00:35 GMT
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set-cookie: uchicago-prod_csrf_token=deleted; expires=Thu, 01-Jan-1970 00:00:01 GMT;
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last-modified: Tue, 25 May 2021 18:00:29 GMT
content-encoding: gzip
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age: 5
via: 1.1 varnish (Varnish/5.2)
accept-ranges: bytes
X-Firefox-Spdy: h2
```

HTTP Headers (uchicago.edu → youtube.com)

The screenshot shows the Chrome DevTools Network tab with the 'Headers' sub-tab selected. The network log on the left shows a list of requests. The third request, a GET to 'P-xlixF7B2U?autoplay=1&fs=1&autohide=1&rel=0&modestbranding=1&showinfo=0&hd=1&...', is selected. The right pane displays the response headers for this request.

Status	Met...	Domain	File	Initiator	Type	Transferred	Size
200	GET	www.uchica...	/	document	html	11.41 KB	39...
204	POST	www.youtub...	atr?ns=yt&el=embedded&cpn=ho5PKBh-	base.js:1023 (...)	html	604 B	0 B
200	GET	www.youtub...	P-xlixF7B2U?autohide=1&fs=1&autoplay=...	subdocument	html	21.81 KB	51...
200	GET	cdn.hypemar...	uchicagowww?width=1169&paginate=tru	a5b5e5.js:3 (s...	html	128.06 KB	12...
200	GET	cdn.hypemar...	popUpModalEndpoint	a5b5e5.js:3 (s...	html	10.99 KB	10...

Response Headers (642 B)

```
HTTP/3 200 OK
content-type: text/html; charset=utf-8
x-content-type-options: nosniff
cache-control: no-cache, no-store, max-age=0, must-revalidate
pragma: no-cache
expires: Mon, 01 Jan 1990 00:00:00 GMT
date: Tue, 25 May 2021 18:00:36 GMT
strict-transport-security: max-age=31536000
permissions-policy: ch-ua-full-version=*, ch-ua-platform=*, ch-ua-platform-version=*, ch-u
content-encoding: br
server: ESF
x-xss-protection: 0
alt-svc: h3-29=":443"; ma=2592000,h3-T051=":443"; ma=2592000,h3-Q050=":443"; ma=2592000,h3
```

Request Headers (621 B)

```
GET /embed/P-xlixF7B2U?autohide=1&fs=1&autoplay=0&rel=0&modestbranding=1&showinfo=0&hd=1&e
Host: www.youtube.com
User-Agent: Mozilla/5.0 (Windows NT 10.0; Win64; x64; rv:88.0) Gecko/20100101 Firefox/88.0
Accept: text/html,application/xhtml+xml,application/xml;q=0.9,image/webp,*/*;q=0.8
Accept-Language: en-US,en;q=0.5
Accept-Encoding: gzip, deflate, br
DNT: 1
Alt-Used: www.youtube.com
Connection: keep-alive
Referer: https://www.uchicago.edu/
Cookie: VISITOR_INFO1_LIVE=dActKPajViQ; PREF=tz=America.Chicago&f4=4000000; YSC=p2jSvxCMeI
Upgrade-Insecure-Requests: 1
TE: Trailers
```

5 requests | 229.65 KB / 172.86 KB transferred | Finish: 4.03 min | DOMContentLoaded: 451 ms | load: 1.70 s

HTTP Headers (uchicago.edu → youtube.com)

Inspector Console Debugger Style Editor Performance Memory Net							
Filter URLs							All
Status	Met...	Domain	File	Initiator	Type	Transferred	Size
200	GET	www.uchica...	/	document	html	11.41 KB	39...
204	POST	www.youtub...	atr?ns=yt&el=embedded&cpn=ho5PKBh-	base.js:1023 (...)	html	604 B	0 B
200	GET	www.youtub...	P-xlixF7B2U?autohide=1&fs=1&autoplay=	subdocument	html	21.81 KB	51...
200	GET	cdn.hypemar...	uchicagowww?width=1169&paginate=tru	a5b5e5.js:3 (s...	html	128.06 KB	12...
200	GET	cdn.hypemar...	popUpModalEndpoint	a5b5e5.js:3 (s...	html	10.99 KB	10...

HTTP Headers (uchicago.edu → youtube.com)

▼ Request Headers (621 B)

Raw 

```
GET /embed/P-xlixF7B2U?autohide=1&fs=1&autoplay=0&rel=0&modestbranding=1&showinfo=0&hd=1&e
Host: www.youtube.com
User-Agent: Mozilla/5.0 (Windows NT 10.0; Win64; x64; rv:88.0) Gecko/20100101 Firefox/88.0
Accept: text/html,application/xhtml+xml,application/xml;q=0.9,image/webp,*/*;q=0.8
Accept-Language: en-US,en;q=0.5
Accept-Encoding: gzip, deflate, br
DNT: 1
Alt-Used: www.youtube.com
Connection: keep-alive
Referer: https://www.uchicago.edu/
Cookie: VISITOR_INFO01_LIVE=dACtKPaJViQ; PREF=tz=America.Chicago&f4=4000000; YSC=p2jSvxCMel
Upgrade-Insecure-Requests: 1
TE: Trailers
```

HTTP Headers (uchicago.edu → youtube.com)

▼ Request Headers (621 B)

Raw 

```
GET /embed/P-xlixF7B2U?autohide=1&fs=1&autoplay=0&rel=0&modestbranding=1&showinfo=0&hd=1&e
Host: www.youtube.com
User-Agent: Mozilla/5.0 (Windows NT 10.0; Win64; x64; rv:88.0) Gecko/20100101 Firefox/88.0
Accept: text/html,application/xhtml+xml,application/xml;q=0.9,image/webp,*/*;q=0.8
Accept-Language: en-US,en;q=0.5
Accept-Encoding: gzip, deflate, br
DNT: 1
Alt-Used: www.youtube.com
Connection: keep-alive
Referer: https://www.uchicago.edu/
Cookie: VISITOR_INFO01_LIVE=dACtKPaJViQ; PREF=tz=America.Chicago&f4=4000000; YSC=p2jSvxCMel
Upgrade-Insecure-Requests: 1
TE: Trailers
```

HTTP Headers (uchicago.edu → youtube.com)

▼ Request Headers (621 B)

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GET /embed/P-xlixF7B2U?autohide=1&fs=1&autoplay=0&rel=0&modestbranding=1&showinfo=0&hd=1&e
Host: www.youtube.com
User-Agent: Mozilla/5.0 (Windows NT 10.0; Win64; x64; rv:88.0) Gecko/20100101 Firefox/88.0
Accept: text/html,application/xhtml+xml,application/xml;q=0.9,image/webp,*/*;q=0.8
Accept-Language: en-US,en;q=0.5
Accept-Encoding: gzip, deflate, br
DNT: 1
Alt-Used: www.youtube.com
Connection: keep-alive
Referer: https://www.uchicago.edu/
Cookie: VISITOR_INFO01_LIVE=dACtKPaJViQ; PREF=tz=America.Chicago&f4=4000000; YSC=p2jSvxCMel
Upgrade-Insecure-Requests: 1
TE: Trailers
```

Cookie Syncing

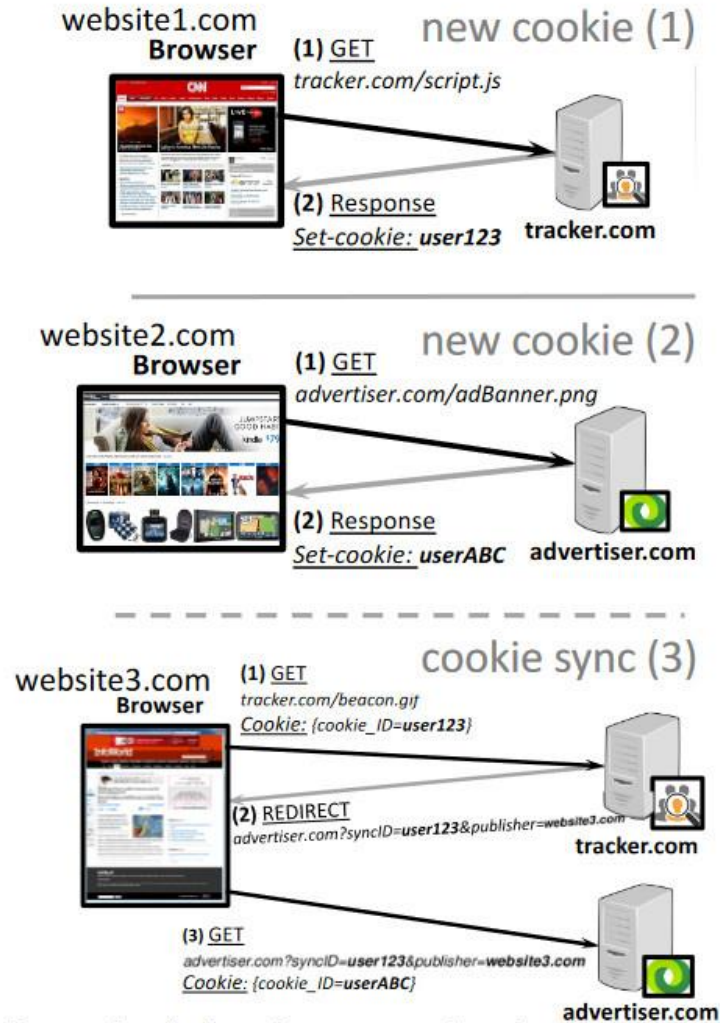
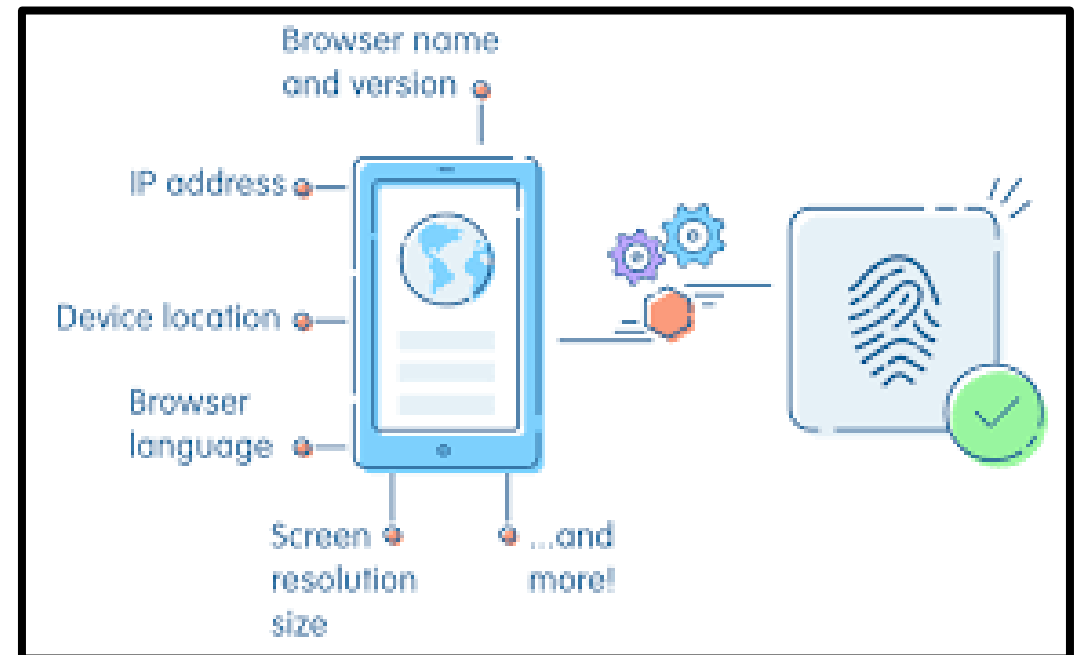


Figure 1: Example of advertiser.com and tracker.com synchronizing their cookieIDs. Interestingly, and without having any code in website3, advertiser.com learns that: (i) cookieIDs `userABC==user123` and (ii) `userABC` has just visited the given website. Finally, both domains can conduct server-to-server user data merges.

Mechanics of Tracking (Fingerprinting Version)

Browser Fingerprinting

- Use features of the browser that are relatively unique to your machine
 - Fonts
 - GPU model anti-aliasing (Canvas fingerprinting)
 - User-agent string
 - *(Often not)* IP address *(Why not?)*

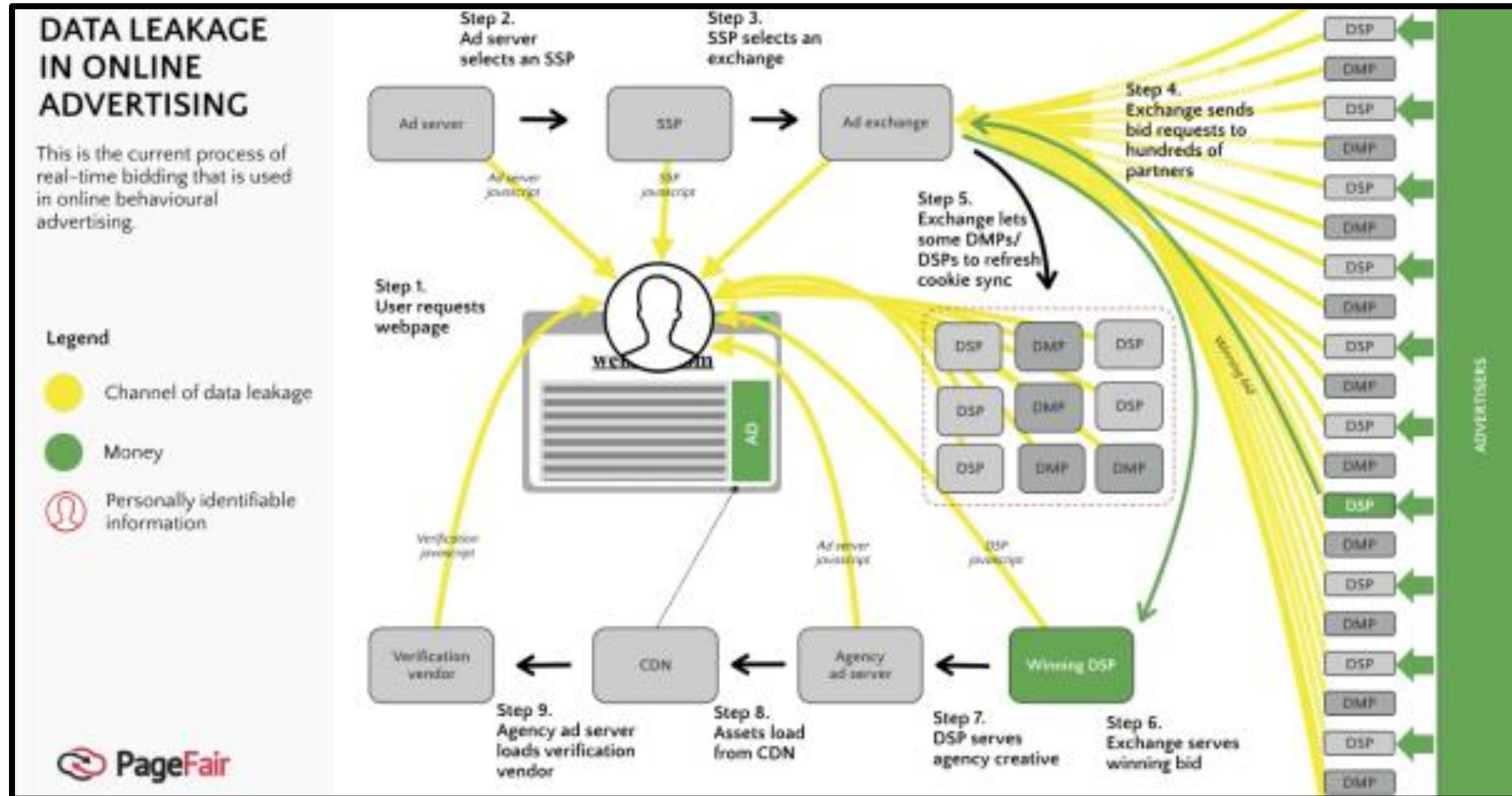


See Fingerprinting Happening



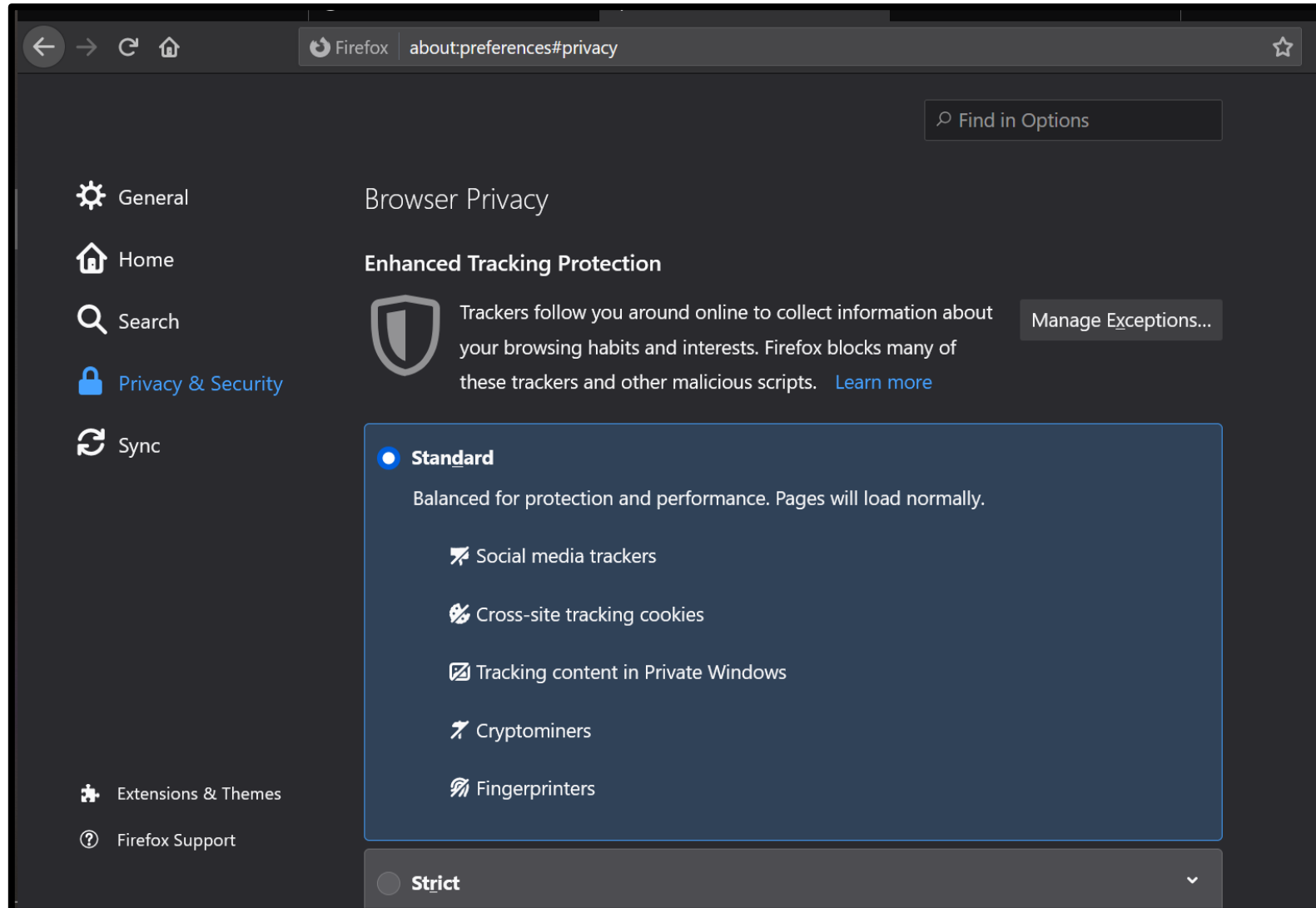
The Ecosystem Underlying Targeted Ads

Ad Bidding Marketplaces

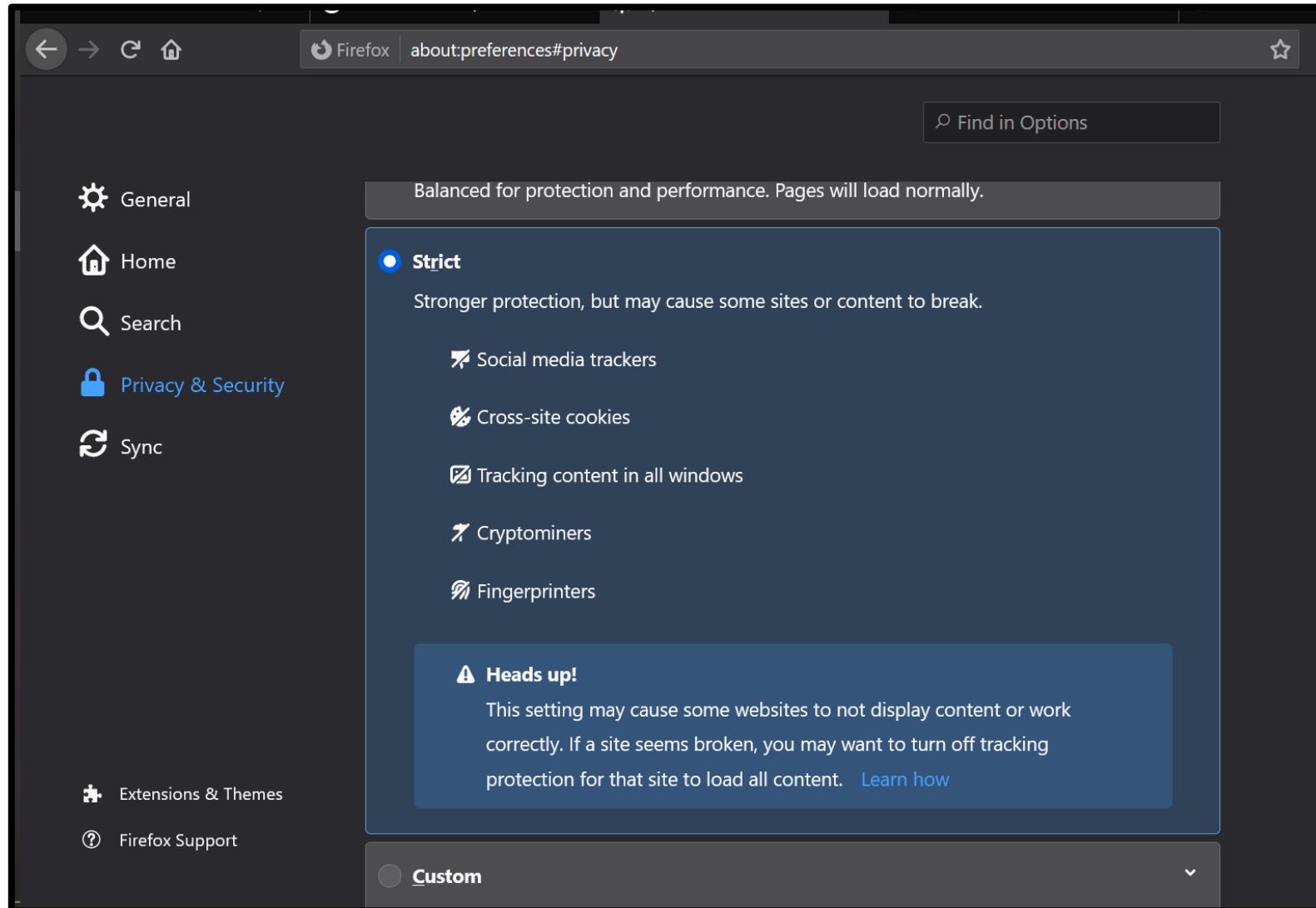


Anti-Tracking Mechanisms

Firefox Browser (New-ish) Default Settings

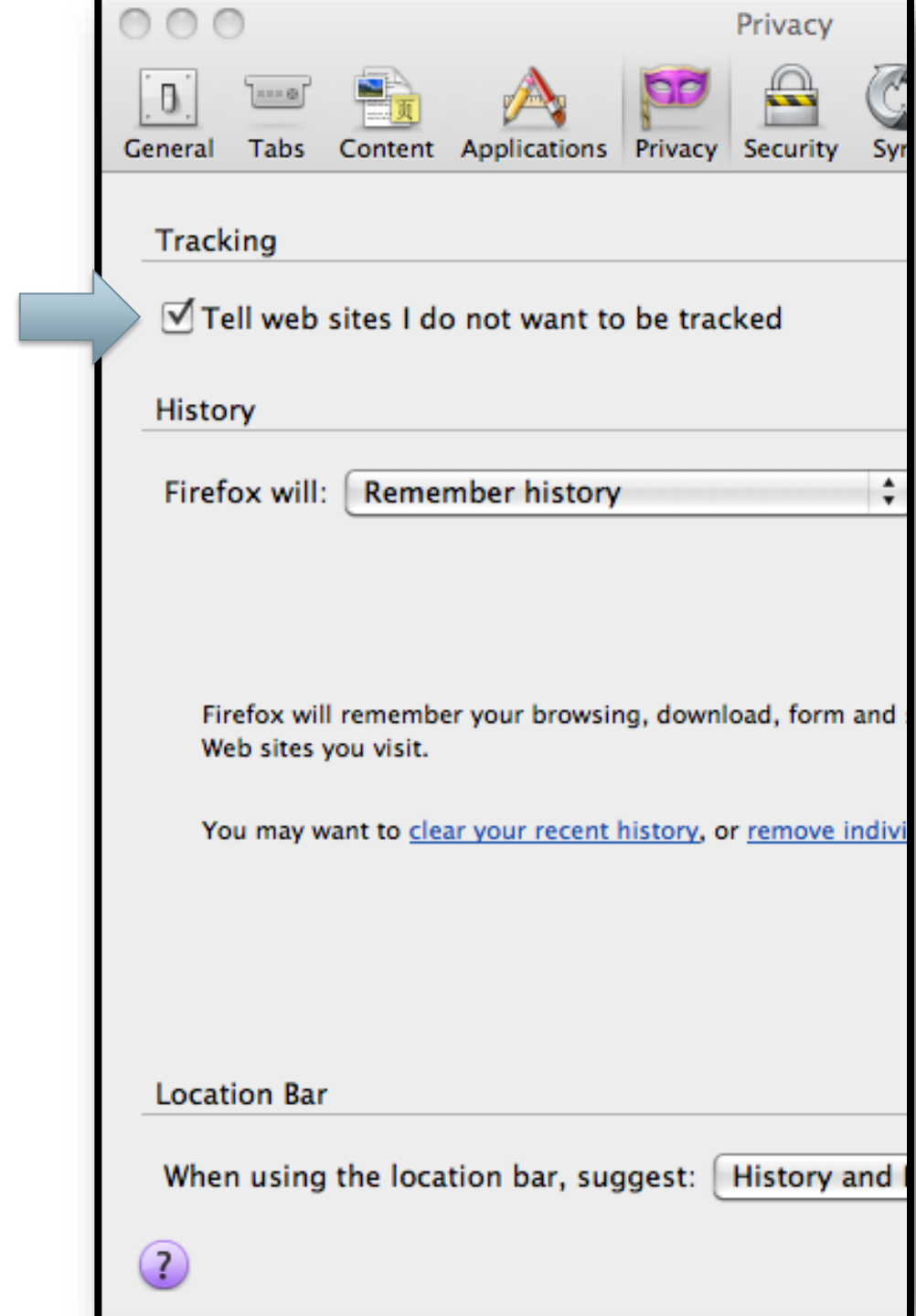


Firefox Browser Strict Settings



Do not track

- W3C standard
- User checks a box
- Browser sends a “do not track” header to website
- Website stops “tracking”
- W3C working group tried to define what “stopping tracking” meant



Tools to stop tracking, effective?

- Browser privacy settings
 - Cookie blocking
 - P3P
 - Tracking Protection Lists
 - Do Not Track
- Browser add-ons
- Opt-out cookies
- Digital Advertising Alliance (DAA) AdChoices icon and associated opt-out pages



DoNotTrackMe



Transparency Mechanisms

Transparency Dashboards

- Summaries of inferred preferences and demographics

How your ads are personalized

Ads are based on personal info you've added to your Google Account, data from advertisers that partner with Google, and Google's estimation of your interests. Choose any factor to learn more or update your preferences. [Learn more](#)

 Accounting & Finance Jobs	 Action & Adventure Films
 Action & Platform Games	 Adventure Games
 Android OS	 Autos & Vehicles
 Banking	 Bars, Clubs & Nightlife
 Beaches & Islands	 Blues
 Bollywood & South Asian Film	 Books & Literature
 Business & Productivity Software	 Business News

Ads Preferences

Ads on Search and Gmail

Ads on the web

Opt out

Ads on the web

Make the ads you see on the web more interesting

Many websites, such as news sites and blogs, partner with us to show ads to their visitors. To see ads that are more related to you and your interests, edit the categories below, which are based on sites you have recently visited. [Learn More](#)

Your interests are associated with an advertising cookie that's stored in your browser. If you don't want us to store your interests, you can opt out below. Your ads preferences only apply in this browser on this computer. They are reset if you delete your browser's cookies.

[Watch a video: Ads Preferences on GDN explained](#)

Your categories

Below you can review the interests and inferred demographics that Google has associated with your cookie. You can [remove](#) or [edit](#) these at any time.

Arts & Entertainment

Computers & Electronics

Computers & Electronics - Consumer Electronics - Gadgets & Portable Electronics - PDAs & Handhelds

Internet & Telecom

Internet & Telecom - Mobile & Wireless - Mobile Phones - Smart Phones

Law & Government

Science

Your demographics

We infer your age and gender based on the websites you've visited. You can [remove](#) or [edit](#) these at any time.

Age: 35-44

Gender: Male

Google

Ghostery

 GHOSTERY

22 Trackers
found on
www.mynews.com



22

4 Blocked

 Trust Site

 Restrict Site

Pause Ghostery

[Map these trackers](#)

TRACKERS

Block All ☐

 Advertising

10 TRACKERS 3 Blocked

Advertising.com

☒

DoubleClick

☐

Google Adsense

☐

Korrelate

☐

~~Moot~~

☒

~~NetRatings Site Center~~

☒

~~Polar Mobile~~

☒

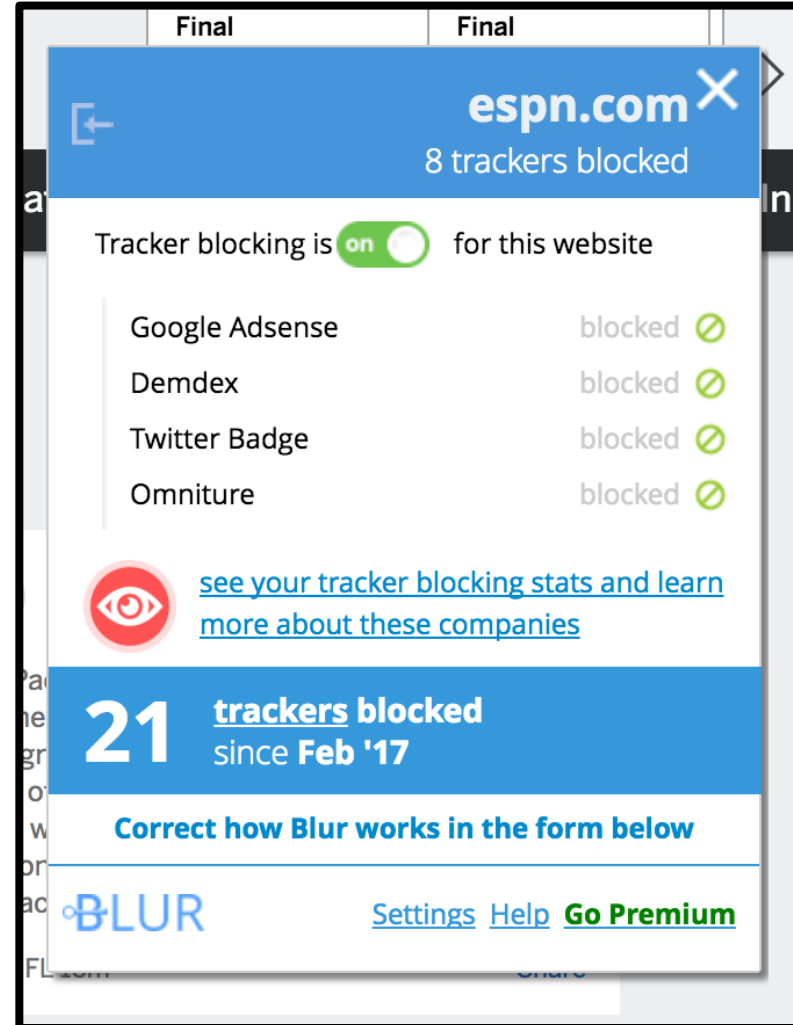
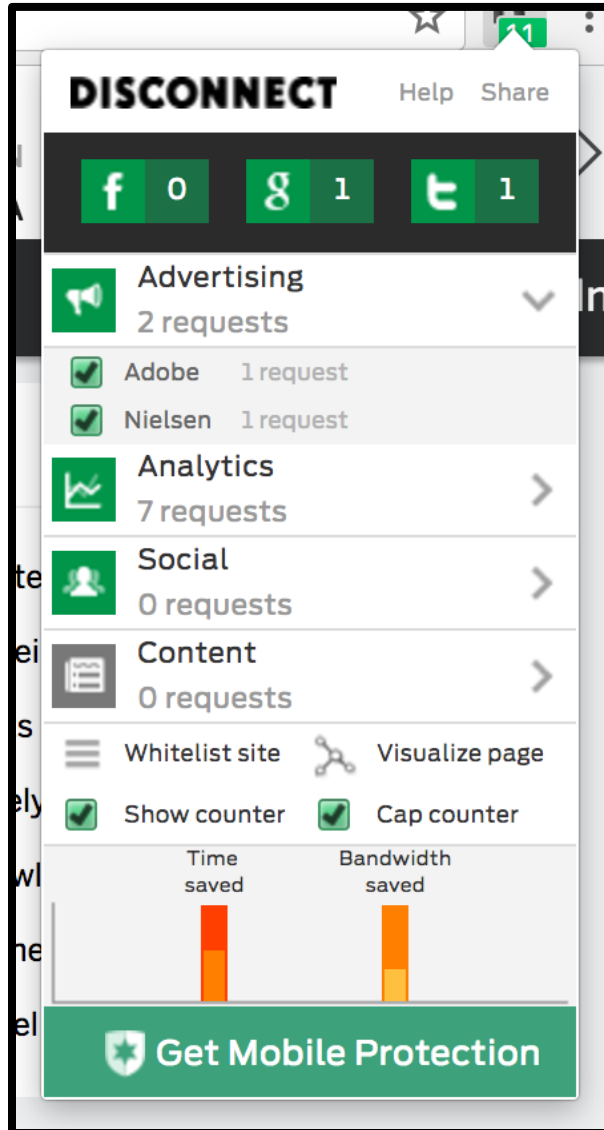
ScoreCard Research Beacon

☐

Tacoda

☐

Existing Privacy Tools



Existing Privacy Tools

 **Privacy Badger**  

Privacy Badger detected 45 potential **trackers** on this page. These sliders let you control how Privacy Badger handles each one. You shouldn't need to adjust them unless something is broken.

weather.api.cnn.io	
rtax.criteo.com	
ad.doubleclick.net	
googleads.g.doubleclick.net	
securepubads.g.doubleclick.net	
connect.facebook.net	

Disable Privacy Badger for This Site

Did Privacy Badger break this site? Let us know!

Donate to EFF

 **GHOSTERY** 

15 Trackers
found on
www.cnn.com

15

14 Blocked

Trust Site

Restrict Site

Pause Ghostery

Map These Trackers

Trackers

Block All 

Advertising

10 Trackers 10 Blocked

Amazon Associates

ChartBeat

Criteo

DoubleClick

Google Publisher Tags

Krux Digital

NetRatings SiteCensus

Outbrain

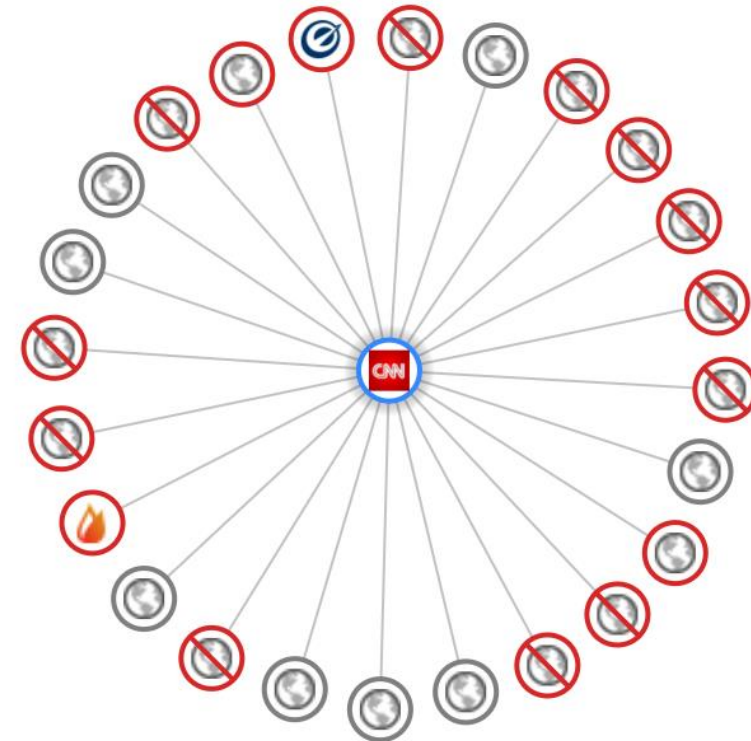
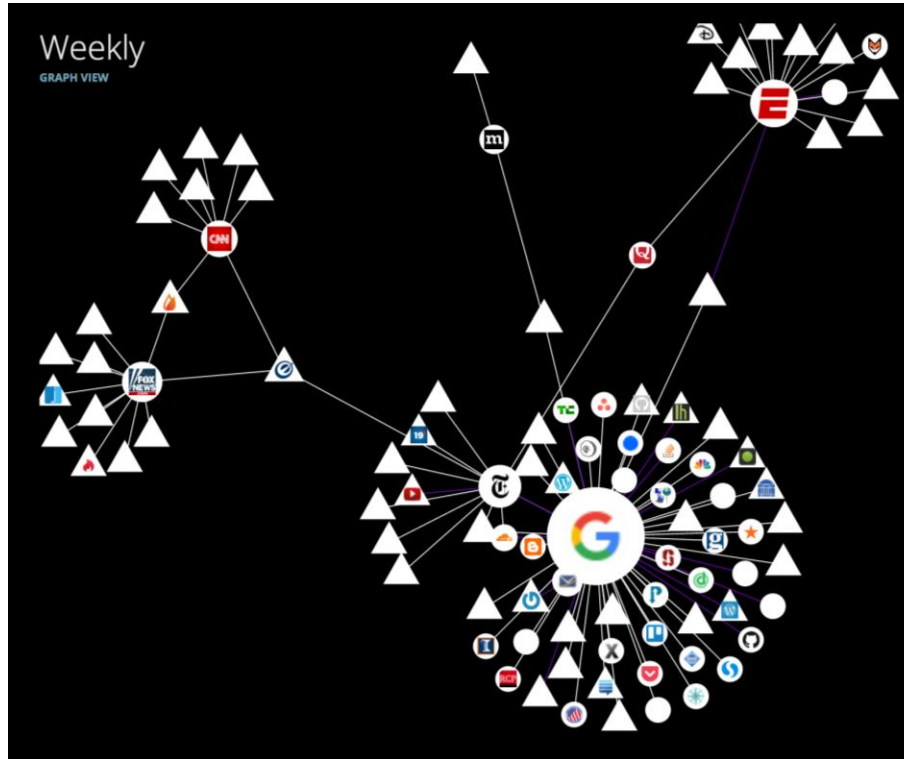
Rubicon

ShareThrough

Site Analytics

2 Trackers 2 Blocked

Visualization: Connection Graphs



(Our Group's) Tracking Transparency

The screenshot shows a Firefox browser window with three tabs: 'Debugging with Firefox Developer', 'Tracking Transparency', and 'The New York Times - Breaking'. The address bar shows 'https://www.nytimes.com'. The page displays the New York Times homepage with the date 'Friday, March 16, 2018'. A red notification box from the 'Tracking Transparency' extension is overlaid on the right side of the page. The notification text reads: 'On The New York Times - Breaking ..., there are 5 trackers. One of these trackers is Google, which knows about your activity on this page and 3829 others. In total, 169 trackers have seen you visit 12313 pages. The Tracking Transparency extension has determined that these companies could have inferred your interest in 162 topics.' Below the text is a button that says 'Show me more about what the trackers know'. The background page shows the New York Times masthead and a headline about 'Trump's Steel Tariffs Open Lobbying Floodgate'.

Tracking Transparency

On The New York Times - Breaking ..., there are 5 trackers.

One of these trackers is **Google**, which knows about your activity on this page and **3829** others.

In total, *169 trackers* have seen you visit *12313 pages*. The Tracking Transparency extension has determined that these companies could have inferred your interest in *162 topics*.

Show me more about what the trackers know

(Our Group's) Tracking Transparency

[Tracking Transparency](#) [Interests](#) [Trackers](#) [Sites](#) [Activity](#) [About](#) 

Home

What are *trackers* and *interests*?



When you browse online, your online activity can be tracked by ad networks and analytics companies.

We call these *trackers*.

→ 

These companies track your browsing to make guesses about what topics you might be interested in.

We call these topics *interests*.

→   

Companies can personalize your online experience based on these interests. *Click on the circles above to learn more.*

Your Top Trackers

- Google
- Chartbeat
- Optimizely
- Microsoft
- Amazon.com

Your Top Interests

- Law & Government
- Online Communities
- People & Society
- News
- Shopping

39 Trackers encountered

7 Pages visited

6 Potential interests

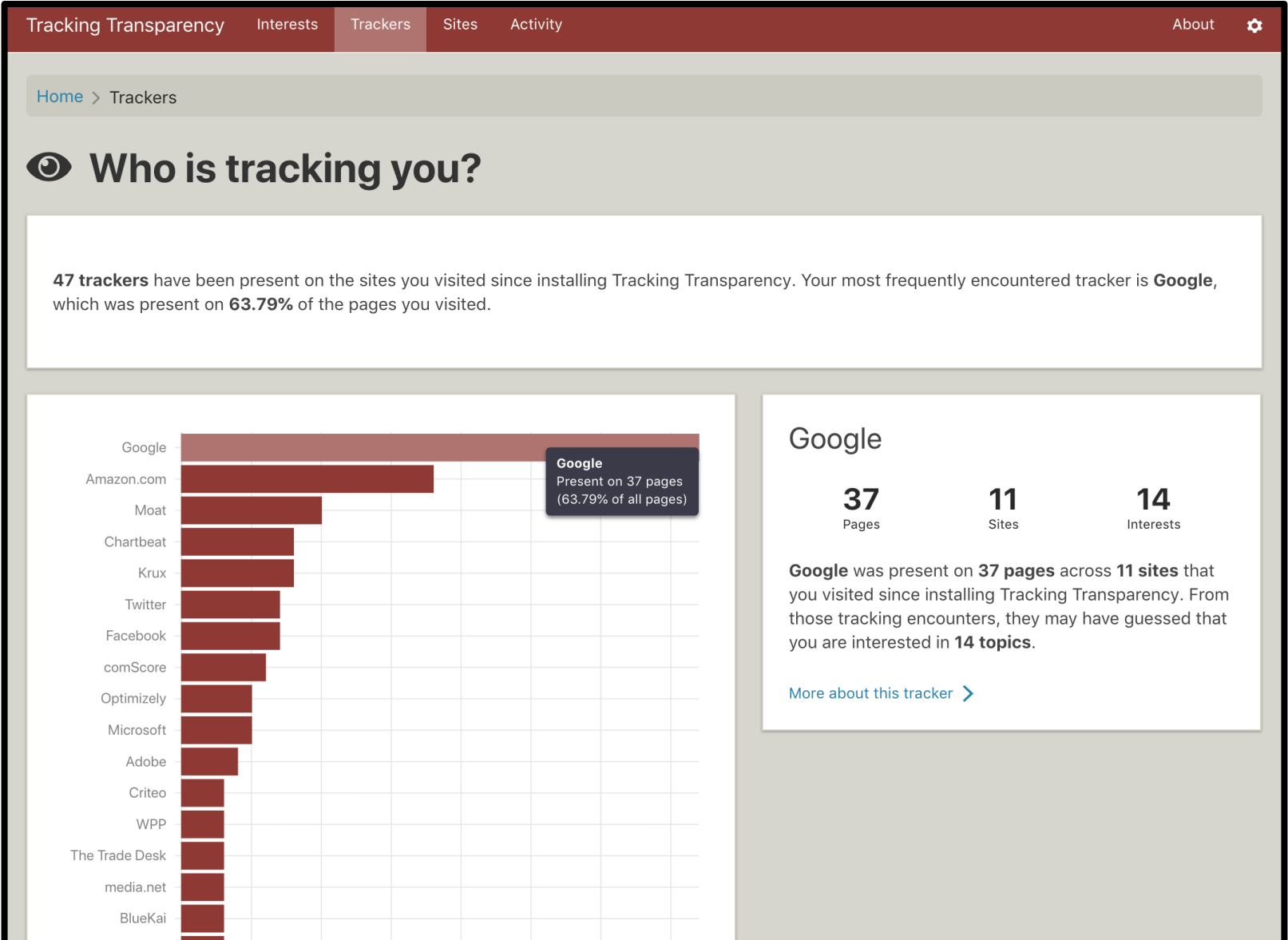
Recent Interests

- Law & Government
- Computers & Electronics
- Shopping
- News
- People & Society

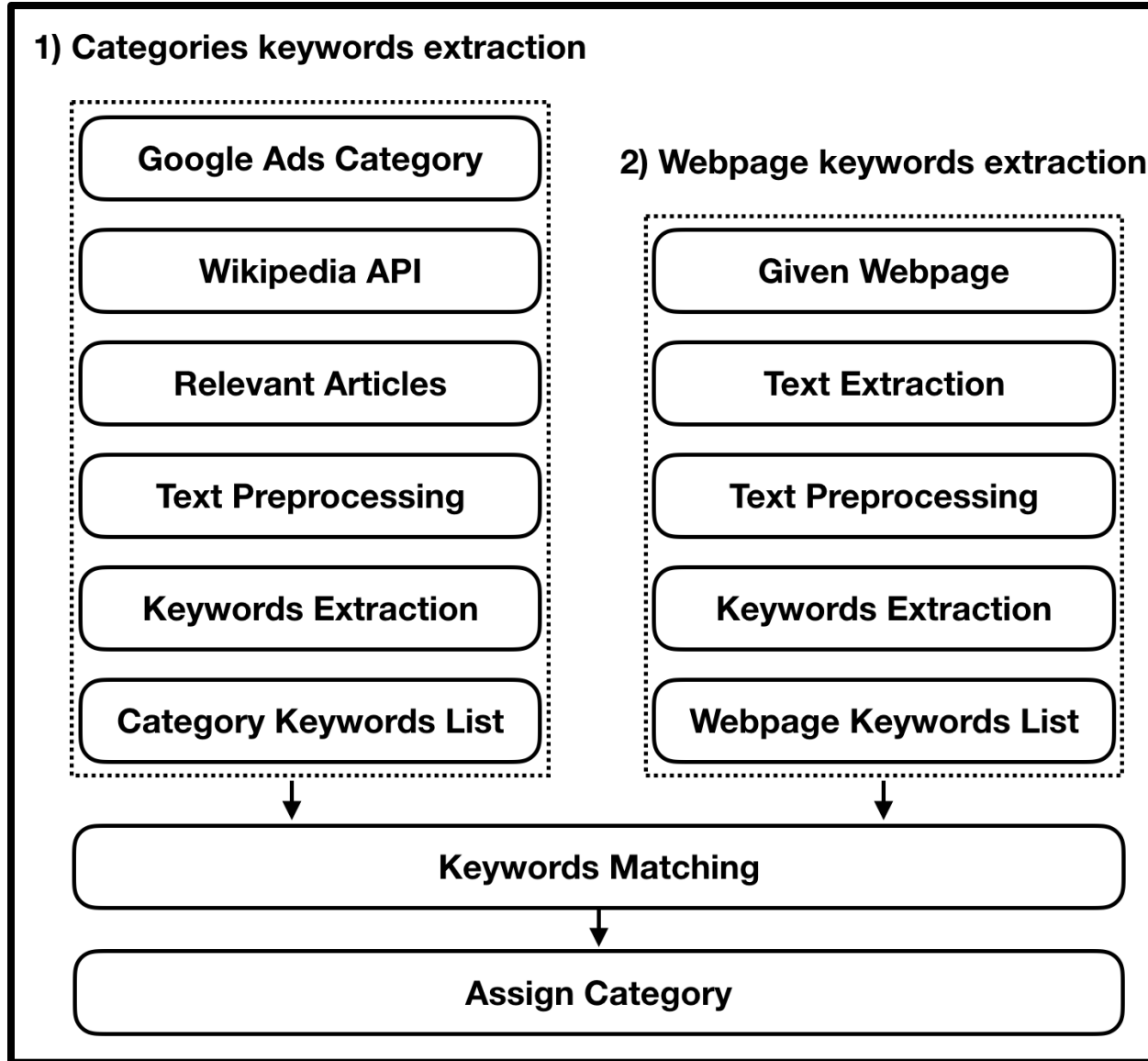
Recent Sites

- twitter.com
- eff.org
- amazon.com
- cnn.com
- nytimes.com

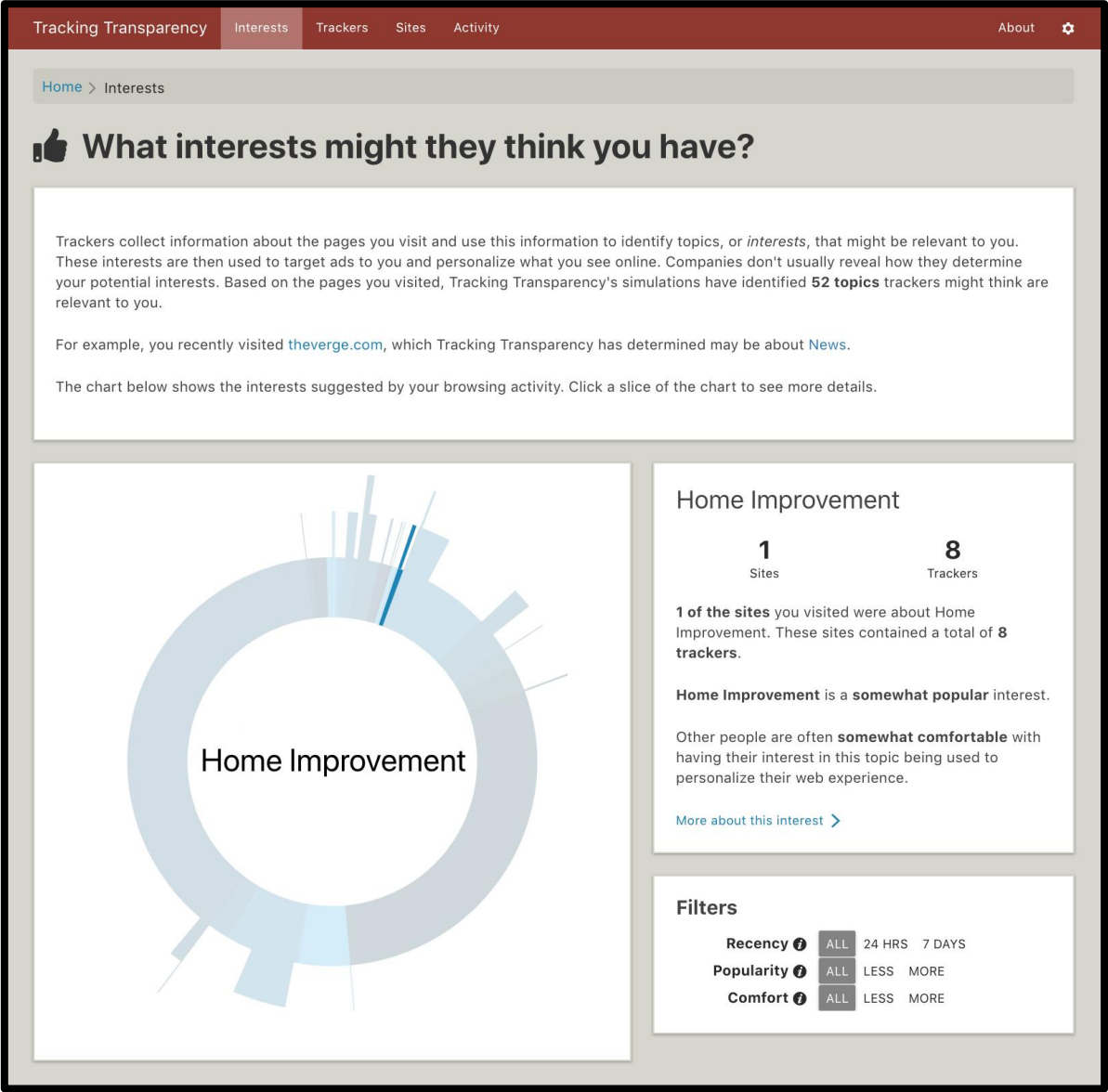
(Our Group's) Tracking Transparency



(Our Group's) Tracking Transparency



(Our Group's) Tracking Transparency



Mozilla Firefox Protections Dashboard



The Politics of Transparency



Ad Observer

By NYU Cybersecurity for Democracy

Who is paying for online advertising to target you? Who's showing you ads because you're married, or you're a liberal or work in the oil industry or some other category? Are they saying different things to different people? Help hold them accountable by installing our browser plugin, which sends us the ads you see on Facebook and YouTube, without compromising your privacy.

 **Install for Chrome**

 **Install for Firefox**

<https://adobservatory.org/>

The Politics of Transparency

How it works

Ad Observer is a tool you add to your Web browser. It copies the ads you see on Facebook and YouTube, so anyone can see them in [our public database](#). (See documentation [here](#).) If you want, you can enter basic demographic information about yourself in the tool to help improve our understanding of why advertisers targeted you. However, we'll never ask for information that could identify you.

It doesn't collect your personal information. We take your privacy very seriously. [You can view the extension code on Github](#).

[See Mozilla privacy review](#).

What we collect

- The advertiser's name and disclosure string.
- The ad's text, image, and link.
- The information Facebook provides about how the ad was targeted.
- When the ad was shown to you.
- Your browser language.

What we don't collect

Anything personally identifying, including:

- Your Facebook ID number.
- Your name, birthday, friend list, etc.
- How you interacted with ads or anything else.

<https://adobservatory.org/>

The Politics of Transparency

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TECH

Facebook Disables Access for NYU Research Into Political-Ad Targeting

Researchers say the data provided information on misinformation in political ads; Facebook says the work violated its terms of service



What Facebook Panel's Decision Means for Trump, Social Networks

Facebook's independent oversight board said in May that the company was justified when it banned former President Trump following the Jan. 6 Capitol attack, but gave Facebook six months to decide on a permanent ban. WSJ's Brad Reagan explains what comes next. Photo: Andre M. Chang/Zuma Press

By [Meghan Bobrowsky](#)
Updated Aug. 4, 2021 5:54 pm ET

<https://www.wsj.com/articles/facebook-cuts-off-access-for-nyu-research-into-political-ad-targeting-11628052204>

Examining Two Technical Alternatives for Targeting

Mozilla Pocket: Customization With Only Local Tracking

The screenshot displays the Mozilla Pocket website. At the top, the Mozilla logo (moz://a) is on the left, and navigation links for "Firefox Browsers", "Products", "Who We Are", and "Innovation" are in the center. A "Get a Firefox Account" button is on the right. The main section has a teal background with the Pocket logo and the headline "An Award-Winning App From Firefox". Below this, a paragraph states: "Over 10 million users rely on Pocket to discover and savor the best articles, news, stories and videos. And as a member of the Firefox family, privacy is paramount." A blue button labeled "Try Pocket Now" is at the bottom left. On the right, a large image shows a desktop and a smartphone displaying the Pocket app interface. The desktop screen shows "My List" with articles from nytimes.com and theguardian.com. The smartphone screen shows a similar view with articles from inc.com and asana.com, including a sponsored post from Asana.

moz://a Firefox Browsers Products Who We Are Innovation [Get a Firefox Account](#)

✓ pocket

An Award-Winning App From Firefox

Over 10 million users rely on Pocket to discover and savor the best articles, news, stories and videos. And as a member of the Firefox family, privacy is paramount.

[Try Pocket Now](#)

My List

Baby Boomers Reach the End of Their To-Do List

'There is no such thing as past or future changing how we think about time

7 Behaviors That Will Make You Insanely Productive
inc.com · 3 min

The 5 Essentials of a Well-Run Meeting
inc.com · 5 min

Asana
6 Ways to Welcome Employees on Their First Day
blog.asana.com

8 likes 1 repost

Save

How to Travel With Children
nytimes.com · 10 min

How the Meaning of Digital Transformation Has Evolved
hbr.org · 3 min

Alexa Is a Revelation for the Blind

Columbia
The Ultimate Guide to Winter
outsideonline.com

theatlantic.com

Mozilla Pocket: Customization With Only Local Tracking

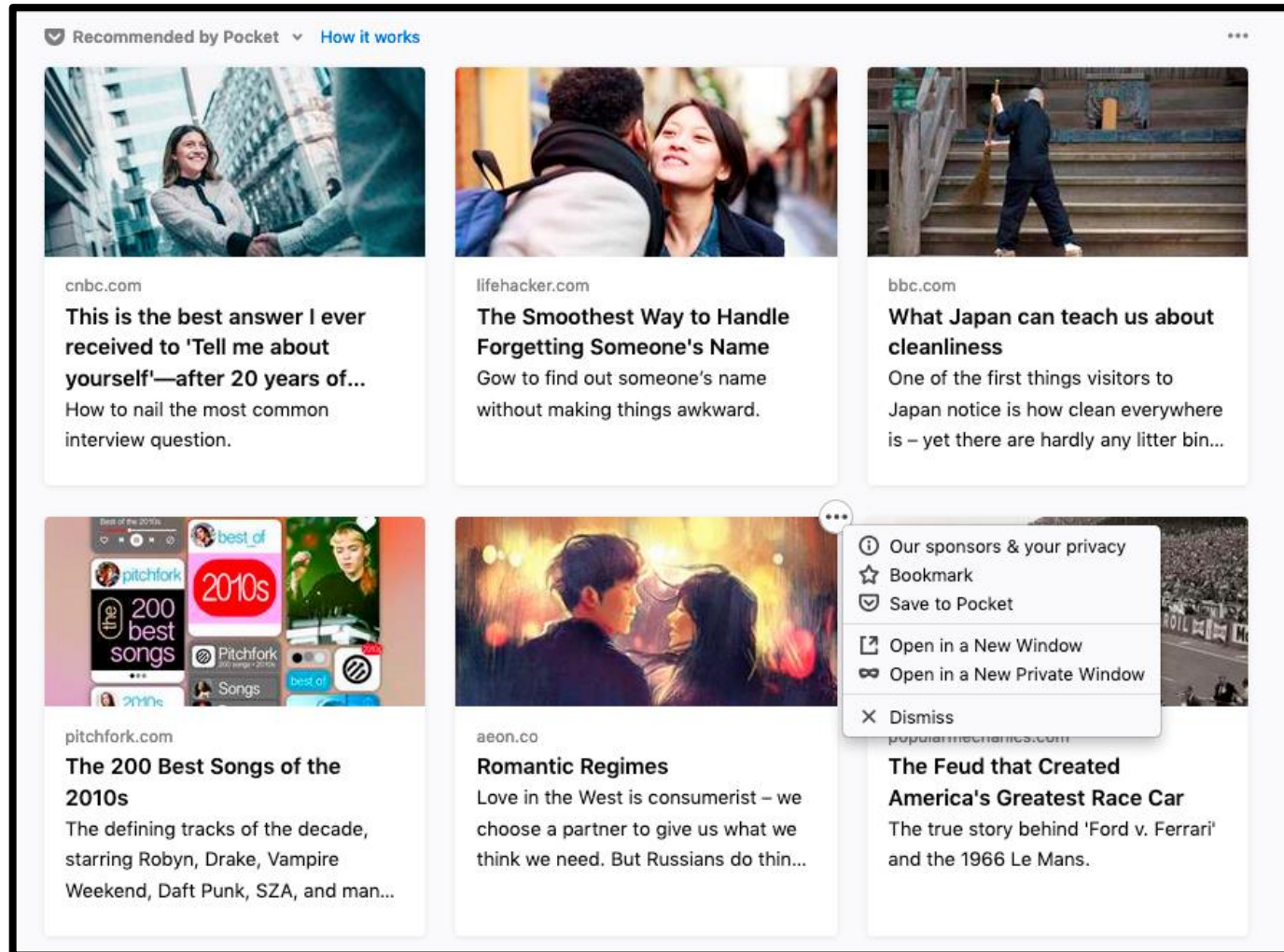
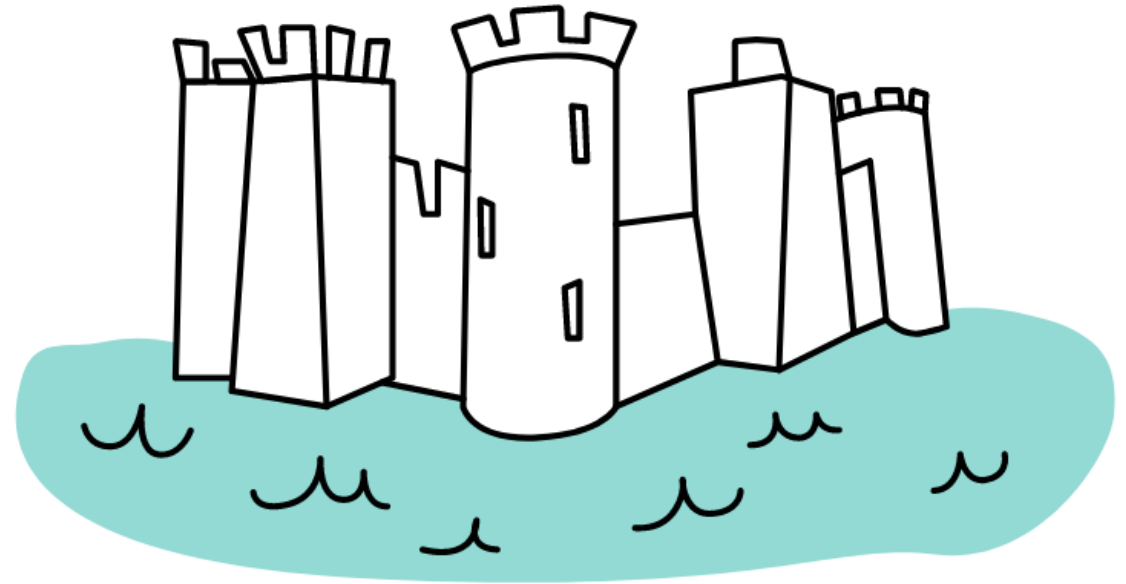


Image taken from <https://blog.mozilla.org/en/products/firefox/pocket-in-firefox/>

Mozilla Pocket: Customization With Only Local Tracking

Your data stays private. Always.

In addition to dishing up captivating stories, we also show you relevant, highly-vetted content from select sponsors. Rest assured, your browsing data never leaves your personal copy of Firefox—we don't see it, and our sponsors don't either. Want more details? Here's the full scoop on [how privacy works in Pocket](#).



Mozilla Pocket: Customization With Only Local Tracking

Are these stories in the new tab personalized to me?

For the most part, no. Most recommendations on your new tab come from a general list of the best of stories on the web. But Pocket is actively exploring ways to deliver personalized recommendations in a way that vigorously protects users' privacy. Importantly, **neither Mozilla nor Pocket ever receives a copy of your browser history**. When personalization does occur, recommendations rely on a process of story sorting and filtering that happens locally in your personal copy of Firefox.

Is information collected when I interact with these new tab recommendations? What information is collected and what controls do I have?

By default, when recommendations from Pocket are displayed on your new tab, we collect information about how many times they appear and how many times they are clicked. However, this information is not associated with any of the technical and interaction information about you or your copy of Firefox. You can learn more about [the data we collect](#) and you can [opt out of data collection](#).

Google FLoC (Google's Perspective)

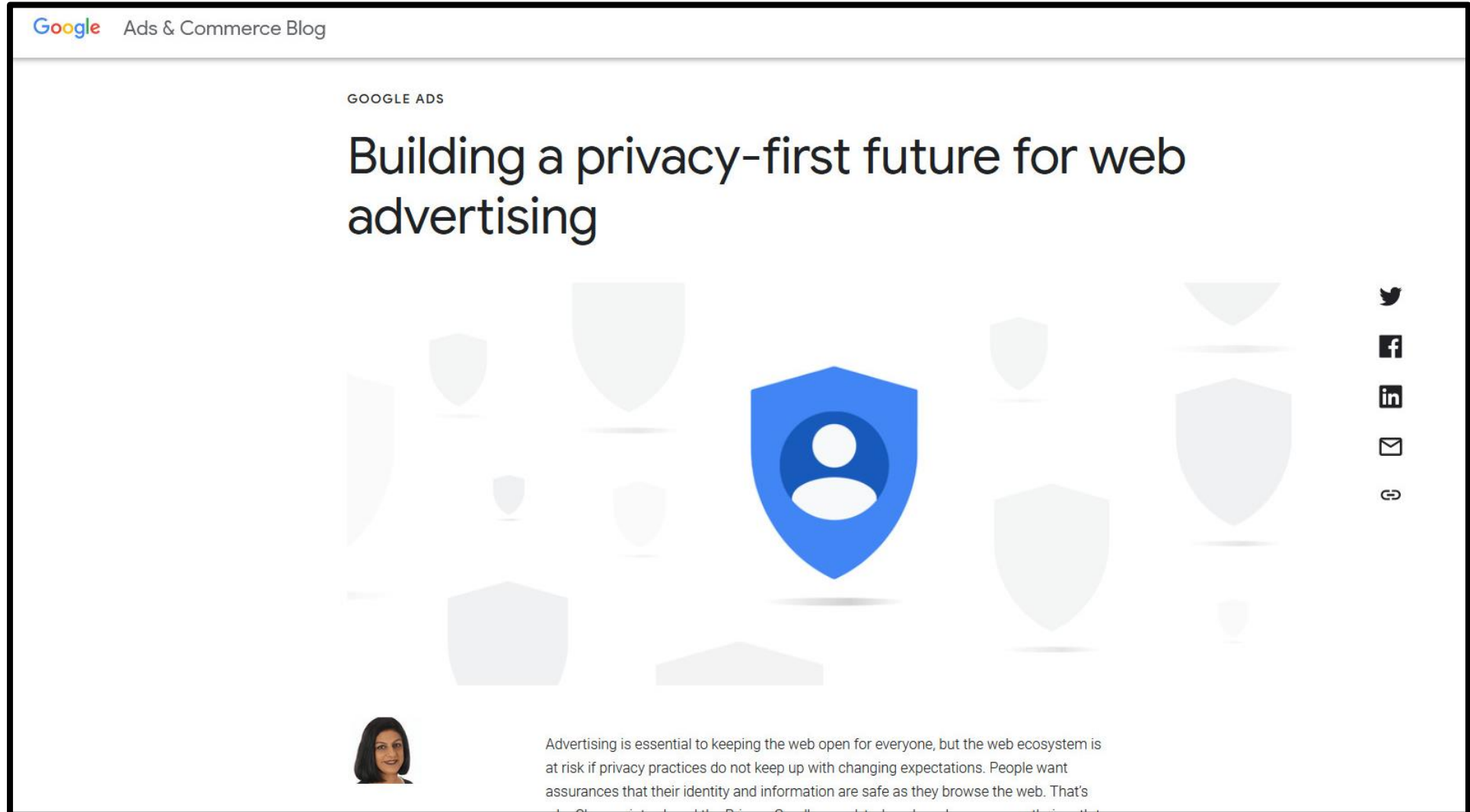


Image taken from <https://blog.google/products/ads-commerce/2021-01-privacy-sandbox/>

Google FLoC (EFF's Perspective)



Image taken from <https://www.eff.org/deeplinks/2021/03/googles-floc-terrible-idea>

Google FLoC

- Federated Learning of Cohorts
- Clusters users based on their browsing activity and assigns a cohort ID
 - Uses SimHash for clustering
 - Clusters intended to contain 1,000s of users
- Criticisms include fingerprintability, ability to tie cohort to PII, and collapse of different browsing contexts
- (Abandoned in early 2022)

Google FLoC: Architecture

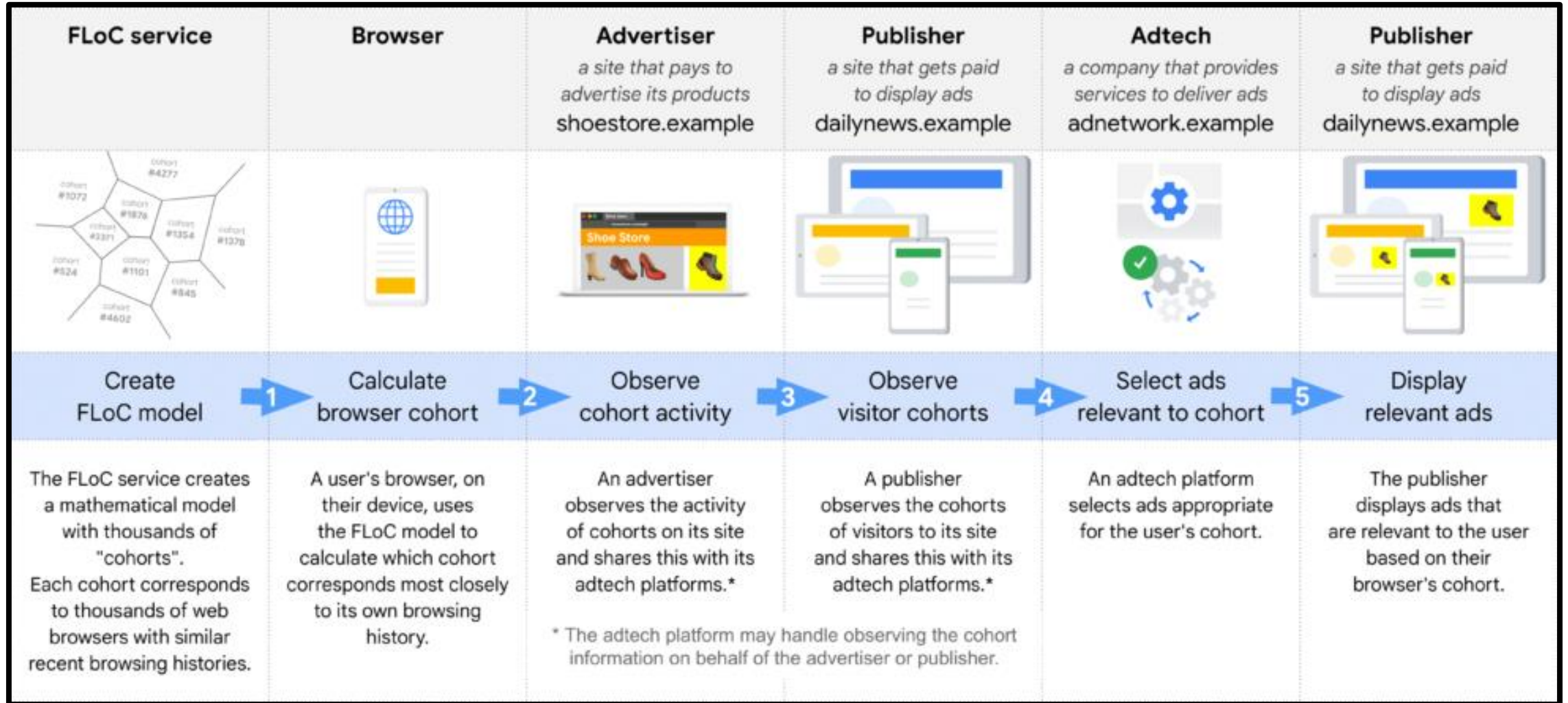


Image taken from <https://arstechnica.com/gadgets/2021/04/everybody-hates-floc-googles-tracking-plan-for-chrome-ads/>

Google FLoC: Architecture

Selecting Interest-based Ads Using FLoC

1. Browsers use a FLoC service to get the mathematical model, consisting of many calculated "cohorts." In this model, each cohort corresponds to many web browsers having similar recent browsing histories and contains a unique ID.
2. Using that [FLoC Model algorithm](#), your browser calculates your cohort.
3. Let's say you visited the site of an advertiser abc.com that sells kitchen appliances. Then that site requests the cohort ID from your browser.
4. If you visited additional pages of the advertiser, like searching kitchen utensils, it would record those interests.
5. Advertisers record these cohort activities periodically and share that information with the ad tech company that helps to deliver advertisements.
6. In the same manner, let's say you visited a publisher site that sells ad space; it will also request your cohort ID.
7. Then the publisher site requests advertisements relevant to that cohort from the ad tech company.
8. The ad tech company combines the data received from the advertiser company about the cohort's interests and data from the publishing company.
9. Next, the ad tech company chooses suitable ads according to the interests of the cohort.
10. The publisher site then displays the selected advertisement relevant to the interests of the cohort.

Image taken from <https://www.privacyaffairs.com/google-floc/>

Google FLoC (Brave Browser's Perspective)

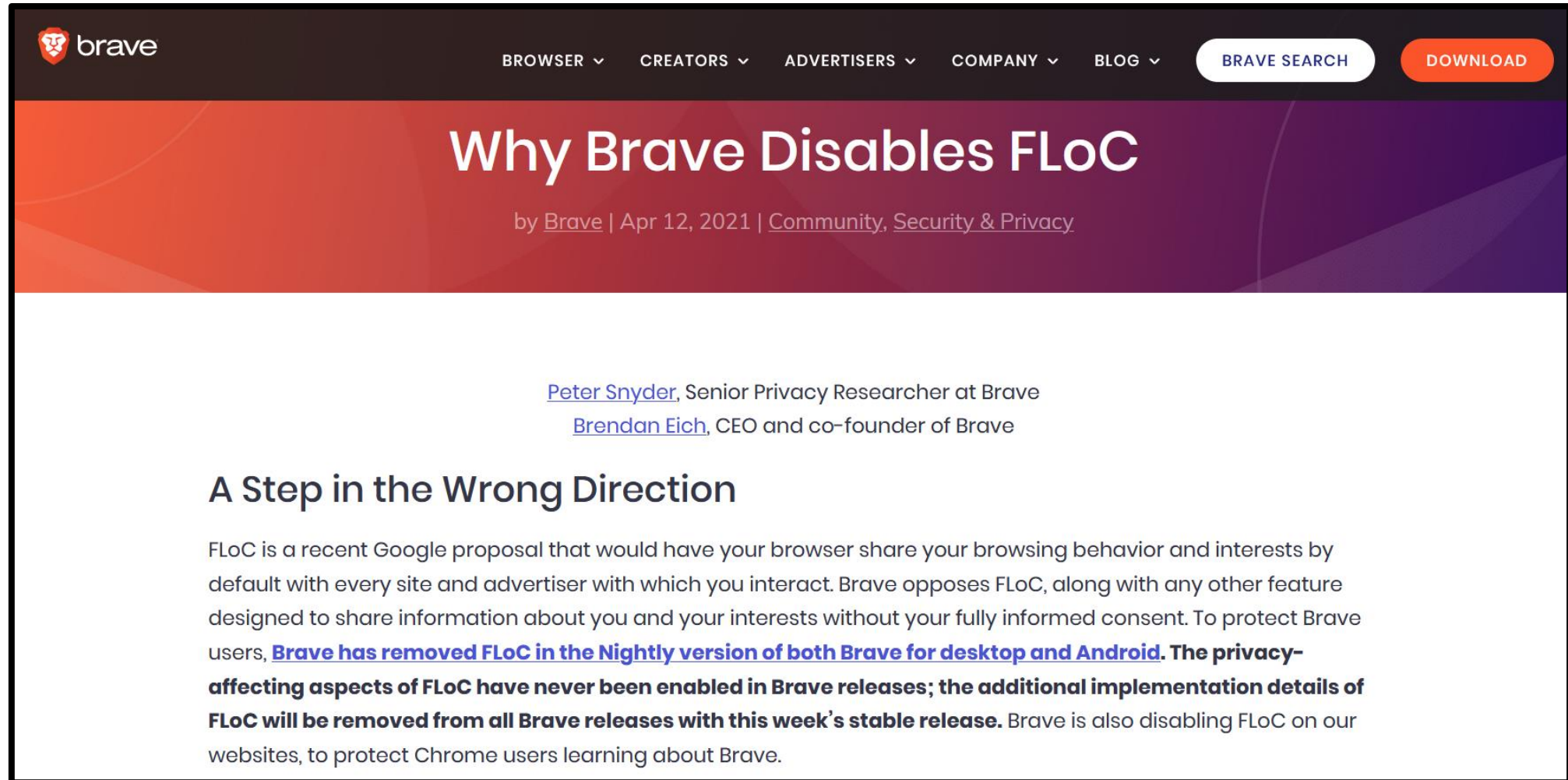


Image taken from <https://brave.com/why-brave-disables-floc/>

Google Topics API

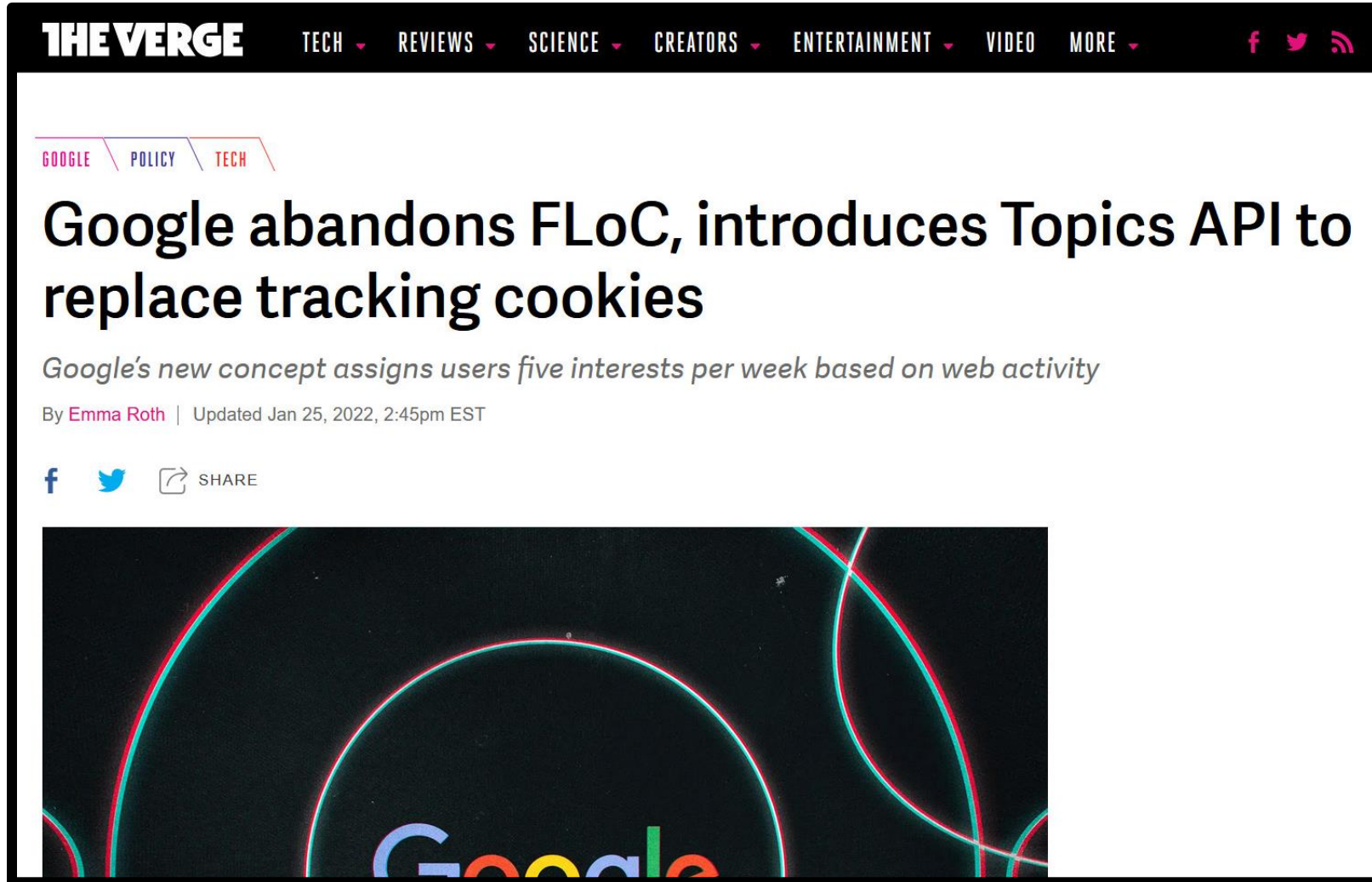


Image taken from <https://www.theverge.com/2022/1/25/22900567/google-floc-abandon-topics-api-cookies-tracking>

Google Topics API

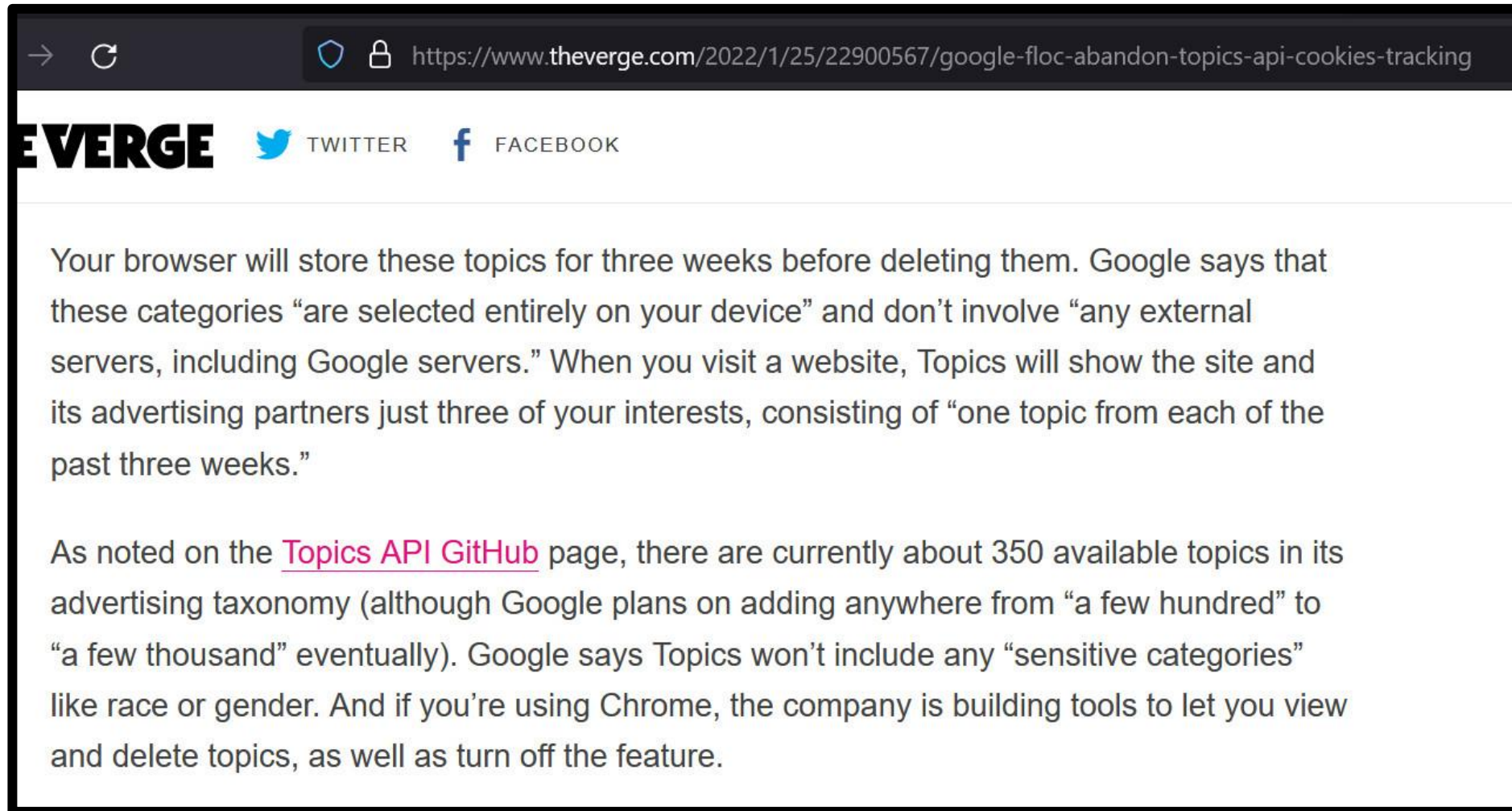


Image taken from <https://www.theverge.com/2022/1/25/22900567/google-floc-abandon-topics-api-cookies-tracking>

Google Topics API

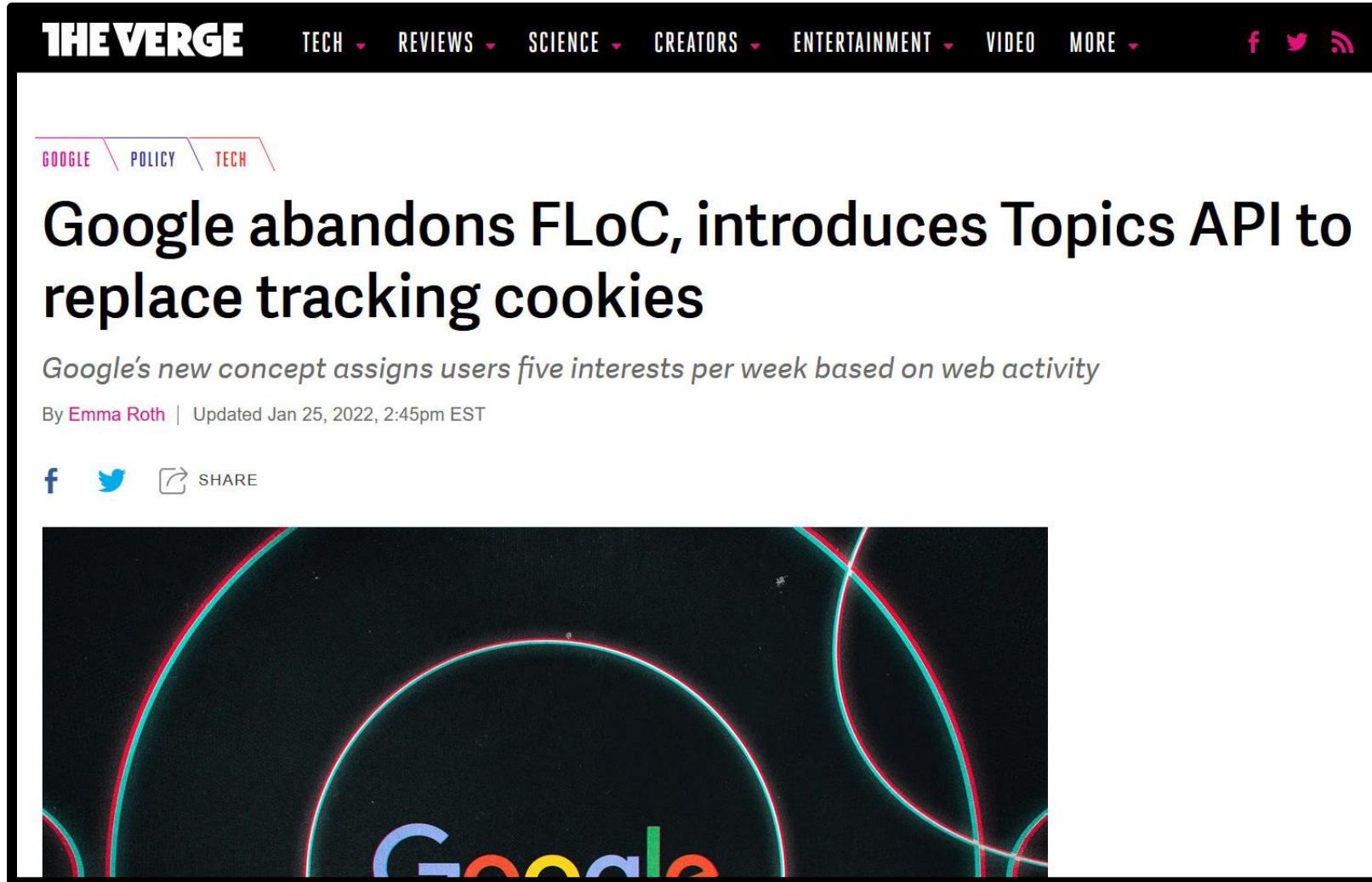


Image taken from <https://www.theverge.com/2022/1/25/22900567/google-floc-abandon-topics-api-cookies-tracking>

The Impact of Companies' Decisions

iOS App Tracking Transparency

Why Apple's new privacy feature is such a big deal

What does App Tracking Transparency actually mean?

By [Chaim Gartenberg](#) | [@cgartenberg](#) | Apr 27, 2021, 10:30am EDT

[f](#) [Twitter](#) [SHARE](#)

Allow "Foodie" to track your activity across other companies' apps and websites?

Please allow permission to provide service and personalized marketing. It will be used only for the purpose of providing personalized advertising based on Apple's policy.

[Ask App Not to Track](#)

[Allow](#)

Image taken from <https://www.theverge.com/2021/4/27/22405474/apple-app-tracking-transparency-ios-14-5-privacy-update-facebook-data>

Android Tracking

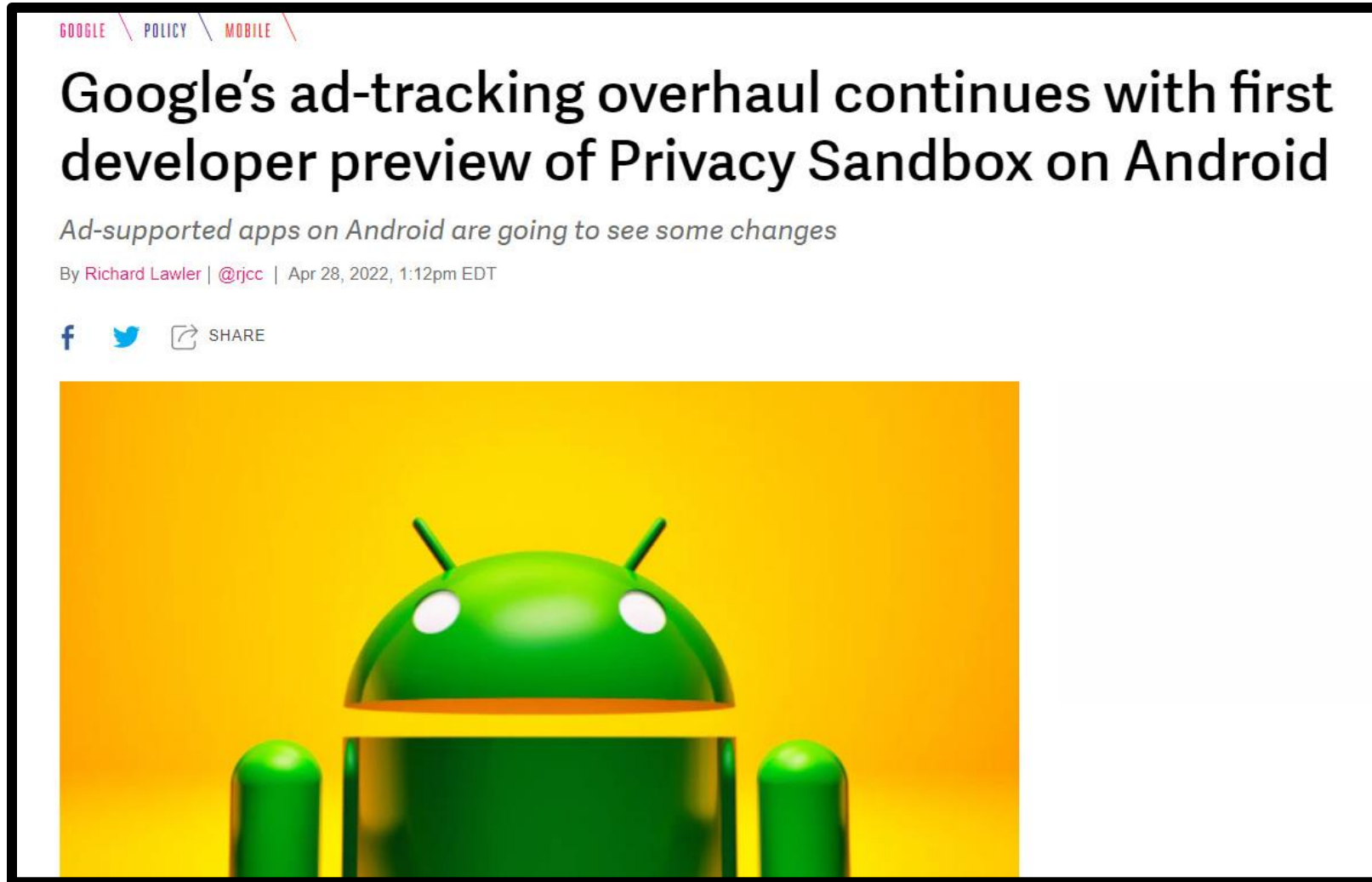


Image taken from <https://www.theverge.com/2022/4/28/23046608/android-advertising-privacy-sandbox-google-preview>