

Lecture 15: Online Tracking

CMSC 25910

Spring 2022

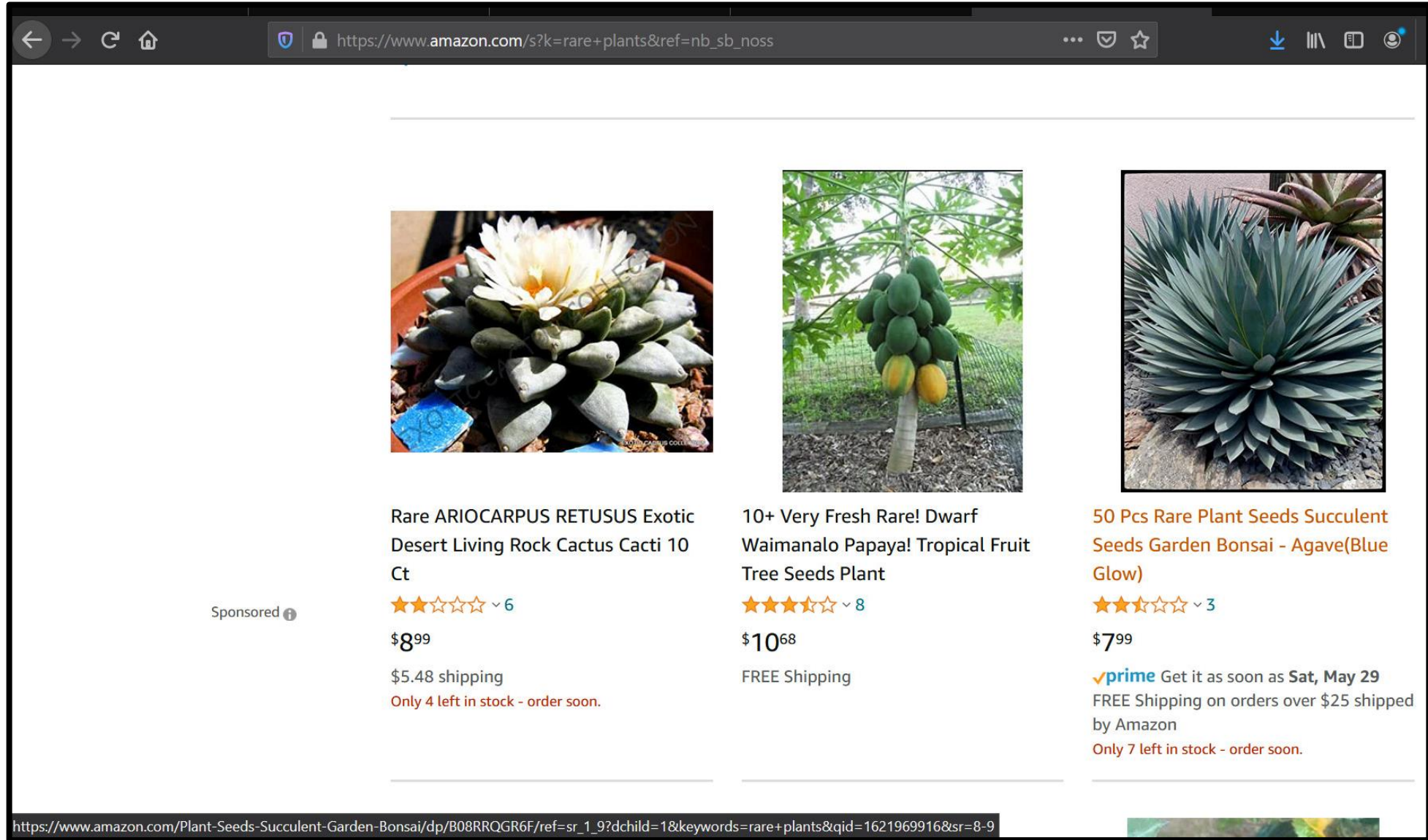
The University of Chicago



THE UNIVERSITY OF
CHICAGO

Tracking Website Visits

First-Party Tracking (The Website You Are Visiting)



The screenshot shows a web browser window with the address bar displaying https://www.amazon.com/s?k=rare+plants&ref=nb_sb_noss. The page content features three sponsored product listings:

- Product 1:** Rare ARIOCARPUS RETUSUS Exotic Desert Living Rock Cactus Cacti 10 Ct. Price: \$8⁹⁹. Shipping: \$5.48. Stock: Only 4 left in stock - order soon. Rating: 5 stars (6 reviews).
- Product 2:** 10+ Very Fresh Rare! Dwarf Waimanalo Papaya! Tropical Fruit Tree Seeds Plant. Price: \$10⁶⁸. Shipping: FREE. Stock: Not specified. Rating: 5 stars (8 reviews).
- Product 3:** 50 Pcs Rare Plant Seeds Succulent Seeds Garden Bonsai - Agave(Blue Glow). Price: \$7⁹⁹. Shipping: FREE. Stock: Only 7 left in stock - order soon. Rating: 5 stars (3 reviews). Prime delivery: Get it as soon as Sat, May 29.

The footer of the browser window shows the URL: 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)


<p>Sponsored ⓘ</p>	<p>Desert Living Rock Cactus Cacti 10 Ct</p> <p>★★★★☆ v 6</p> <p>\$8⁹⁹</p> <p>\$5.48 shipping</p> <p>Only 4 left in stock - order soon.</p>	<p>Waimanalo Papaya! Tropical Fruit Tree Seeds Plant</p> <p>★★★★☆ v 8</p> <p>\$10⁶⁸</p> <p>FREE Shipping</p>	<p>Seed Glow</p> <p>★★</p> <p>\$7⁹⁹</p> <p>✓prime</p> <p>FREE by An</p> <p>Only 7</p>
<p>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</p>			


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

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 title is "UChicago News" and the main content includes a paragraph about the UChicago Forward website, three news items with images, and a "Latest News" section. A video player for "Explore Chicago" is highlighted with a red box. The video player shows a street scene with the text "A WORLD-CLASS UNIVERSITY" and "Watch on YouTube".

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 calls home—filled with inspiration, innovation, and countless opportunities to explore.

[VISIT UCHICAGO >](#)

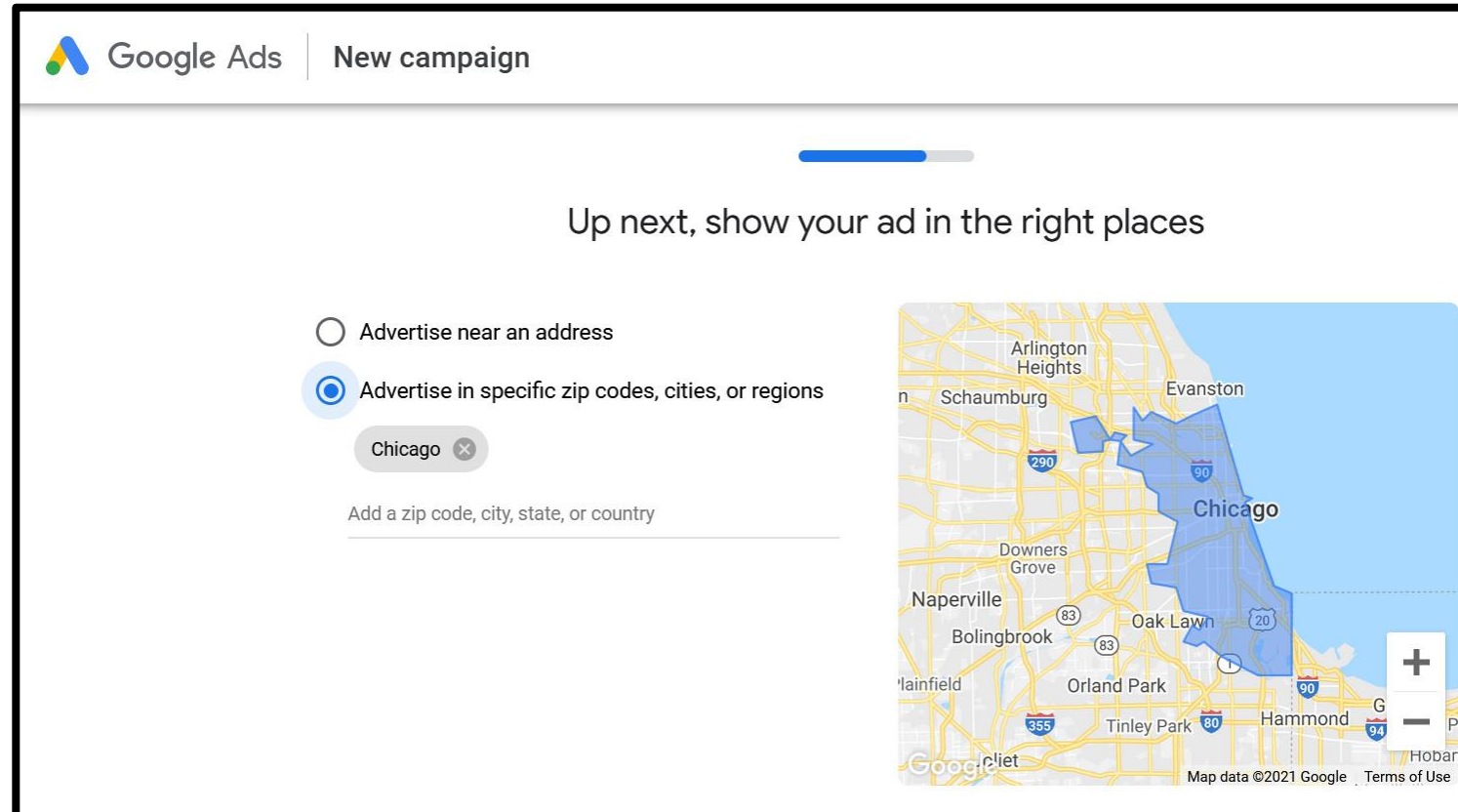
Explore Chicago: Discover the Global City UChicago...
Watch later Share

A WORLD-CLASS UNIVERSITY

Watch on  YouTube

Ad Targeting

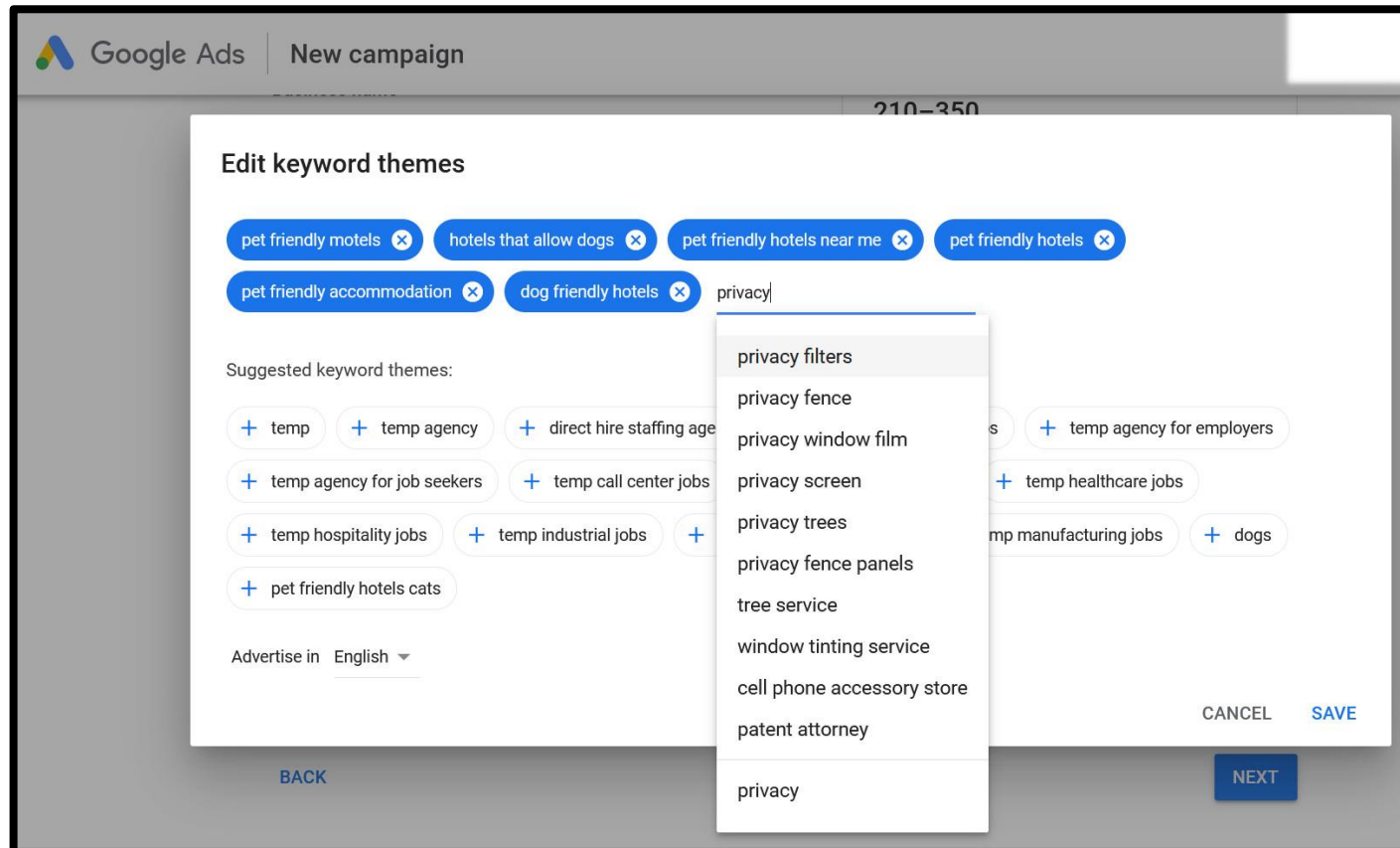
- Goal: Target advertisements to particular users
 - Based on interests, demographics, past interactions (online/offline)



The screenshot shows the Google Ads interface for creating a new campaign. At the top, it says "Google Ads | New campaign". Below this is a progress bar and the text "Up next, show your ad in the right places". There are two radio button options: "Advertise near an address" (unselected) and "Advertise in specific zip codes, cities, or regions" (selected). Under the selected option, there is a text input field containing "Chicago" with a close button (x) to its right. Below the input field is a placeholder text "Add a zip code, city, state, or country". To the right of the text input is a map of the Chicago area with a blue shaded region covering the city and its immediate surroundings. The map includes labels for various suburbs like Arlington Heights, Evanston, Schaumburg, Downers Grove, Naperville, Bolingbrook, Oak Lawn, Tinley Park, Orland Park, Hammond, and Hobart. Major highways like I-290, I-90, I-55, I-80, and I-94 are also visible. The Google logo and "Map data ©2021 Google Terms of Use" are at the bottom of the map.

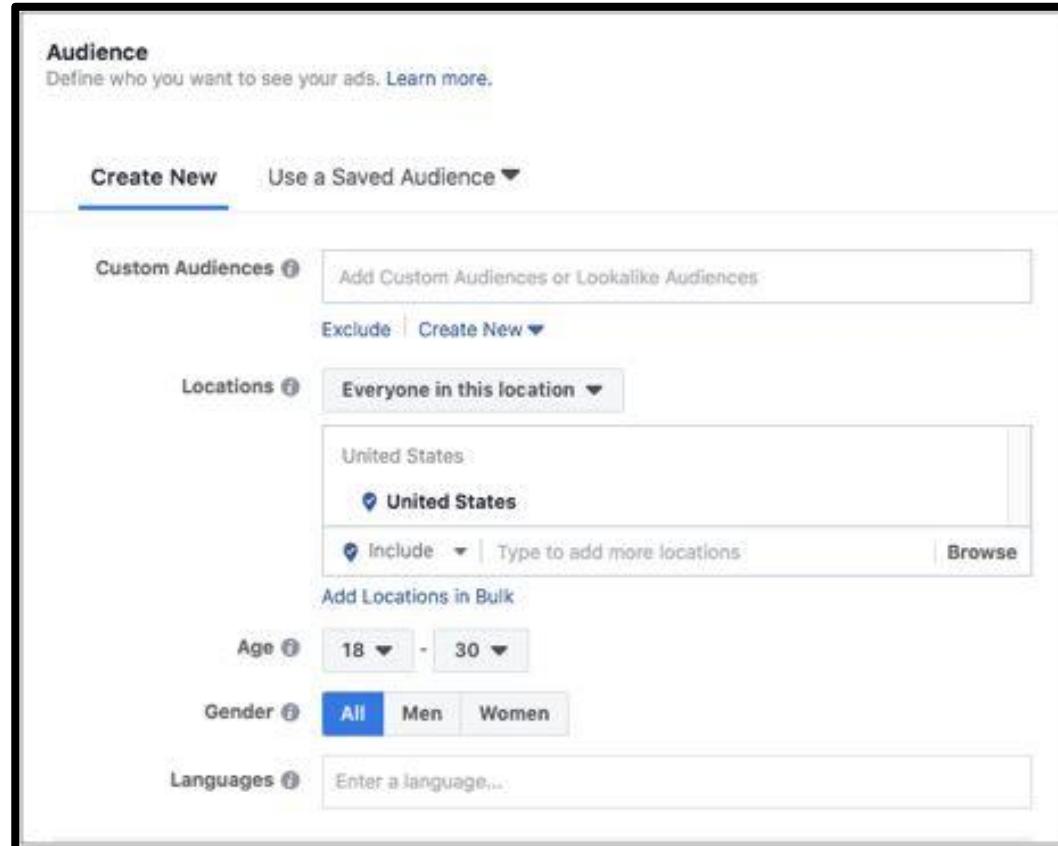
Ad Targeting

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



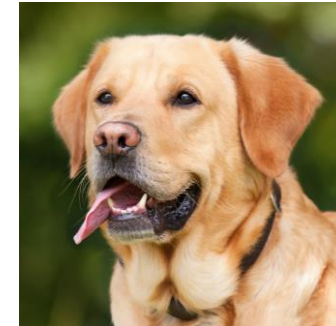
Ad Targeting

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



The screenshot displays the Facebook Audience targeting interface. At the top, it says "Audience" and "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 main section is titled "Custom Audiences" and contains a text input field with the placeholder "Add Custom Audiences or Lookalike Audiences". Below the input field are the options "Exclude" and "Create New" with a dropdown arrow. The "Locations" section has a dropdown menu set to "Everyone in this location". Below this is a list of locations, with "United States" selected and highlighted. There are also options for "Include" with a dropdown arrow, a text input field with the placeholder "Type to add more locations", and a "Browse" button. Below the locations section is the "Add Locations in Bulk" section. The "Age" section has two dropdown menus set to "18" and "30". The "Gender" section has three buttons: "All" (which is highlighted in blue), "Men", and "Women". The "Languages" section has a text input field with the placeholder "Enter a language...".

Data-Driven Inferences



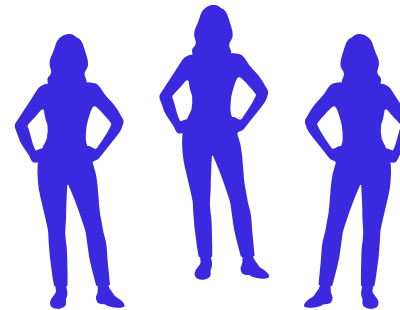
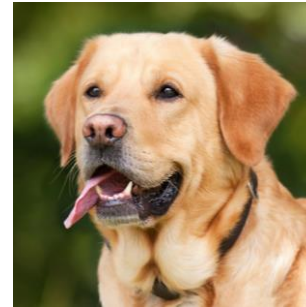
↘
You might like
dogs!

Targeted Advertising

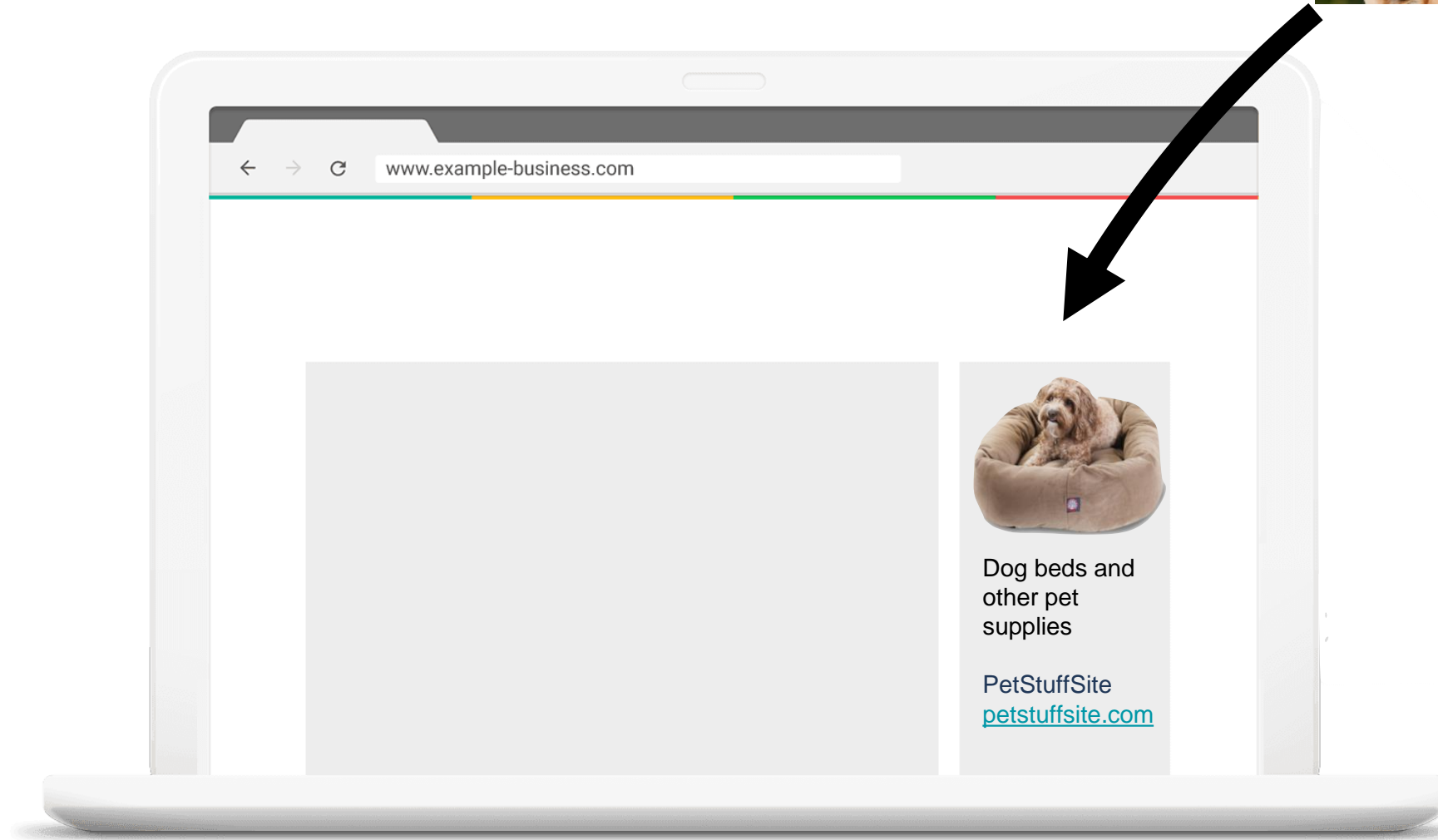
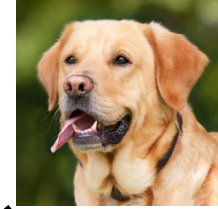
Interests & remarketing

Affinity audiences

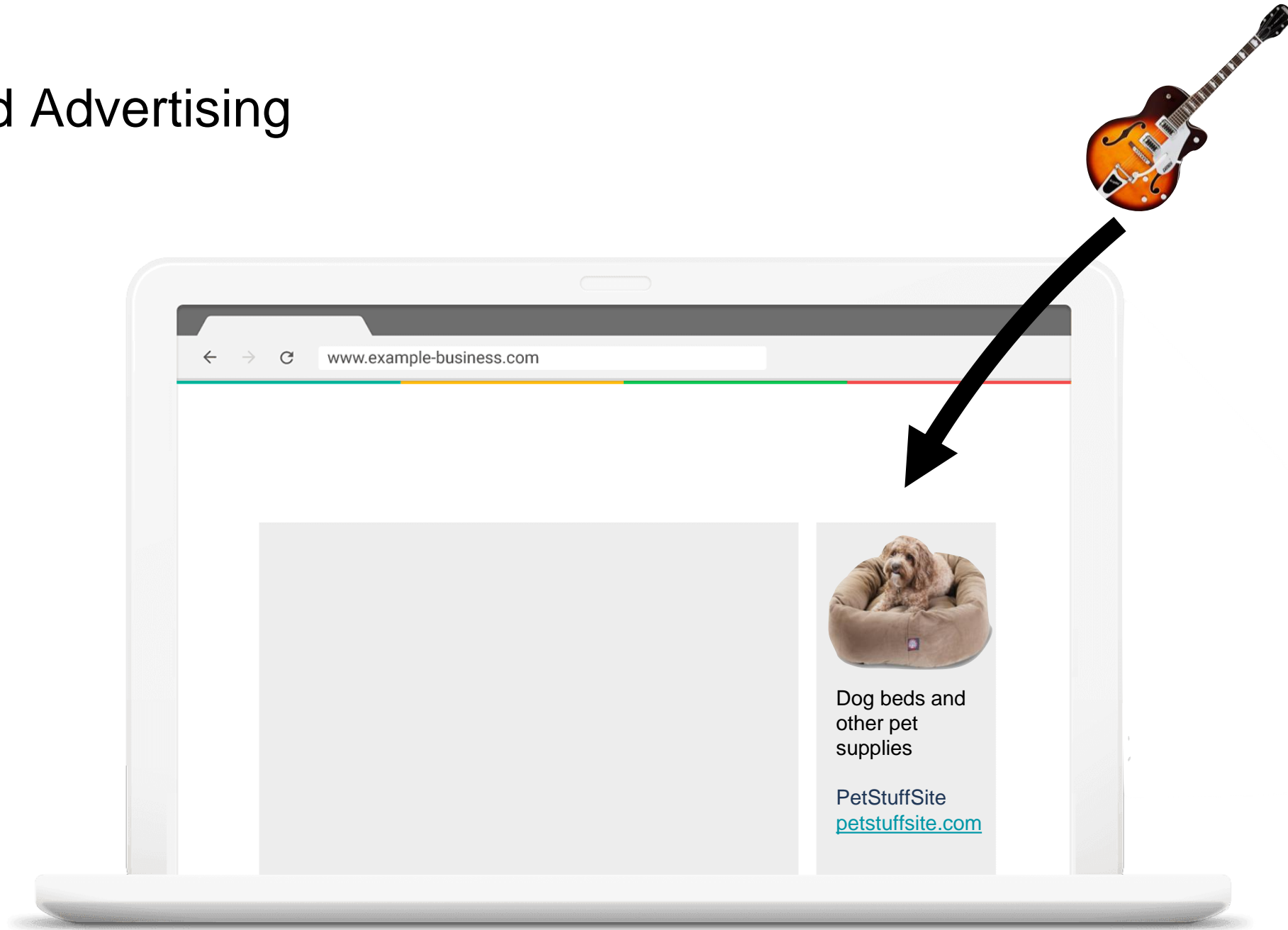
- Music Lovers >>
- News Junkies >>
- Nightlife Enthusiasts >>
- Outdoor Enthusiasts >>
- Pet Lovers >>



Targeted Advertising

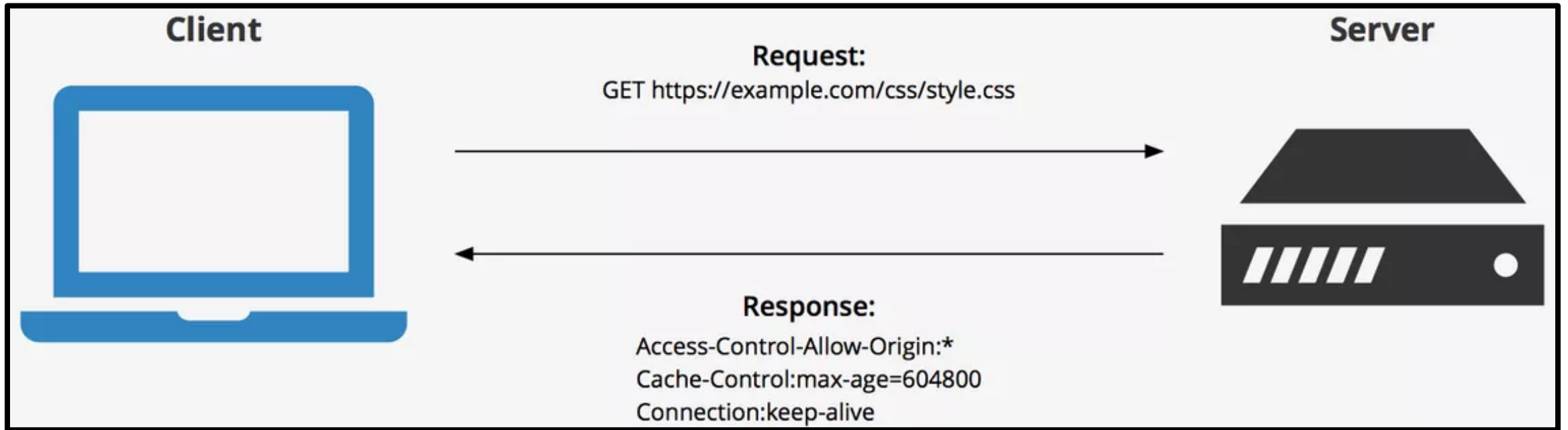


Targeted Advertising



Mechanics of Tracking (Cookie Version)

HTTP Basics



HTTP Headers (uchicago.edu)

The screenshot shows the Chrome DevTools Network tab with the 'Headers' sub-tab selected. The network log shows a 200 OK GET request to www.uchicago.edu. The response headers are expanded, showing a list of headers including date, content-type, server, x-frame-options, expires, pragma, vary, set-cookie, content-encoding, x-varnish, age, via, accept-ranges, and X-Firefox-Spdy. The request headers are also expanded, showing a list of headers including Host, User-Agent, Accept, Accept-Language, Accept-Encoding, DNT, Connection, Cookie, Upgrade-Insecure-Requests, If-Modified-Since, and TE.

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

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 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
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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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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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
```

Detail: HTTP Cookies



HTTP Headers (uchicago.edu): Response

▼ Response Headers (1.078 KB)

Raw

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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

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▼ Response Headers (1.078 KB) Raw   
HTTP/2 200 OK  
date: Tue, 25 May 2021 18:00:35 GMT  
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server: Apache  
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set-cookie: uchicago-prod_csrf_token=deleted; expires=Thu, 01-Jan-1970 00:00:01 GMT;  
set-cookie: uchicago-prod_csrf_token=86d47d8690aa7646e1628dd095cd5b464db16bd3; expir  
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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 displays the Chrome DevTools Network tab. The top navigation bar includes Inspector, Console, Debugger, Style Editor, Performance, Memory, Network, Storage, Accessibility, and Application. The Network tab is active, showing a list of requests. The selected request is a GET to `www.youtube.com` with a status of 200. The right-hand pane shows the 'Headers' tab, displaying 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)

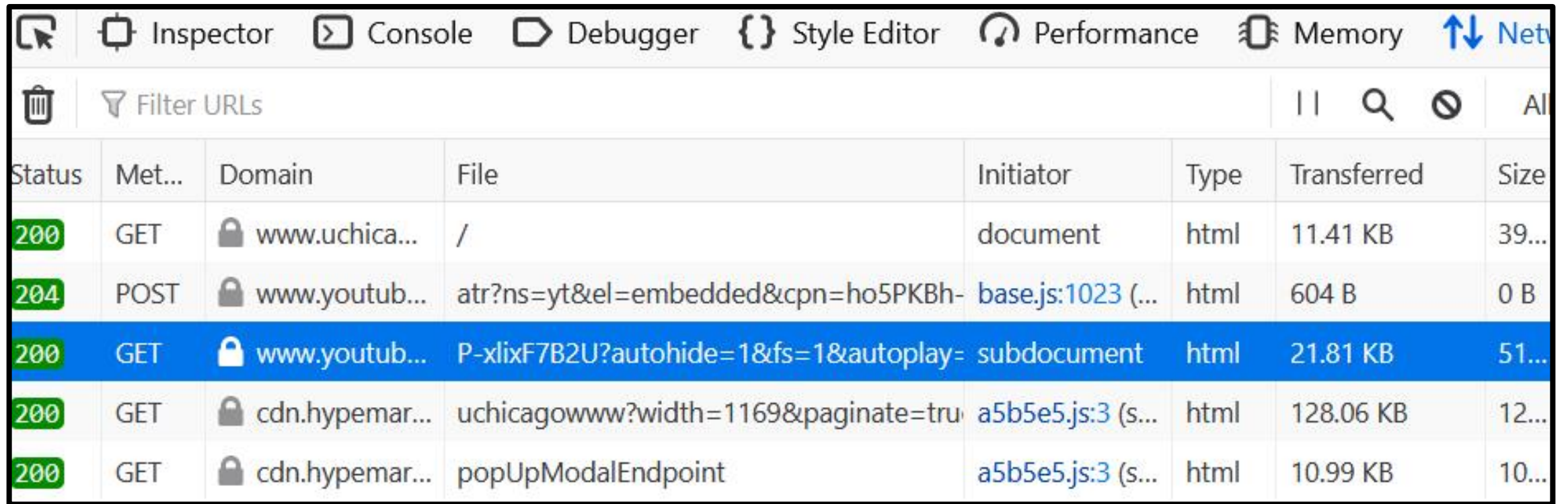
```
HTTP/3 200 OK
content-type: text/html; charset=utf-8
x-content-type-options: nosniff
cache-control: no-cache, no-store, max-age=0, must-revalidate
pragma: no-cache
expires: Mon, 01 Jan 1990 00:00:00 GMT
date: Tue, 25 May 2021 18:00:36 GMT
strict-transport-security: max-age=31536000
permissions-policy: ch-ua-full-version=*, ch-ua-platform=*, ch-ua-platform-version=*, ch-ua
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_INFO01_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)



The screenshot shows the Chrome DevTools Network tab with a list of requests. The third request is highlighted in blue. The interface includes tabs for Inspector, Console, Debugger, Style Editor, Performance, Memory, and Network. A search bar for filtering URLs is visible above the table.

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=p2jSvxCMeI
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=p2jSvxCMeI
Upgrade-Insecure-Requests: 1
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```

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=p2jSvxCMeI
Upgrade-Insecure-Requests: 1
TE: Trailers
```

Cookie Syncing

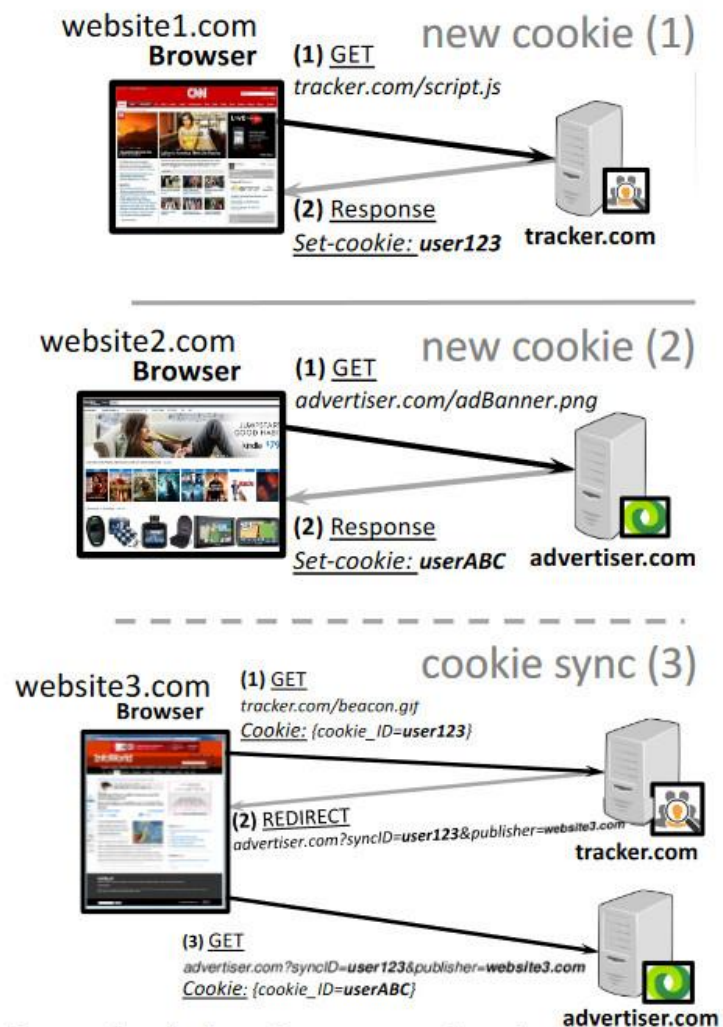
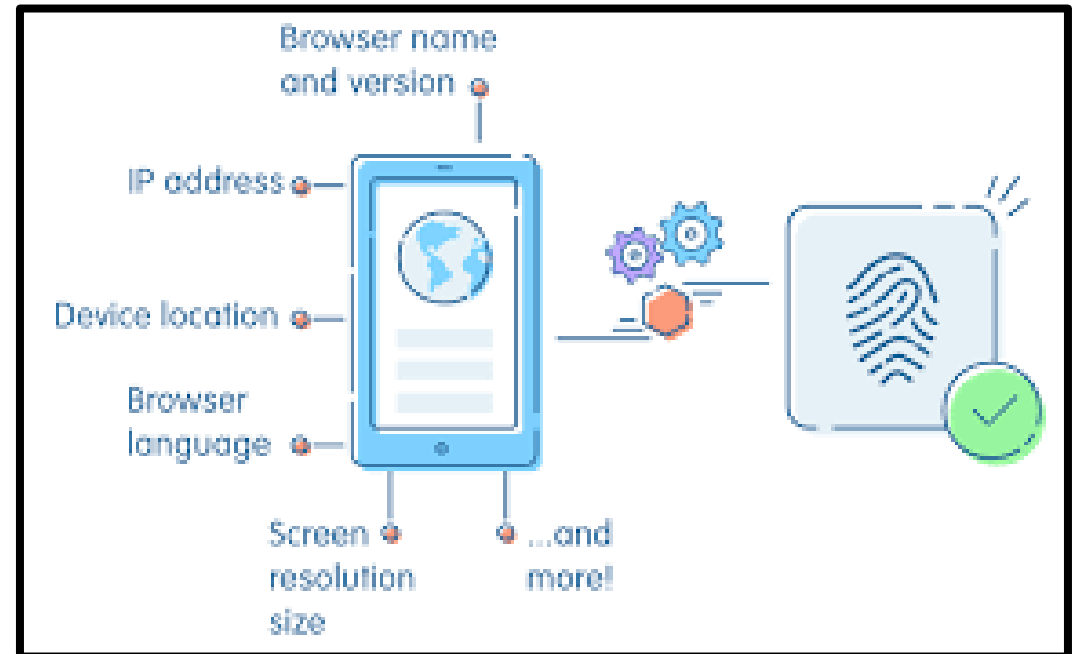


Figure 1: Example of advertiser.com and tracker.com synchronizing their cookieIDs. Interestingly, and without having any code in website3, advertiser.com learns that: (i) cookieIDs userABC==user123 and (ii) userABC has just visited the given website. Finally, both domains can conduct server-to-server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

EFF TURNS 30! LEARN MORE ABOUT US, AND HOW YOU CAN HELP.

EFF
ELECTRONIC FRONTIER FOUNDATION

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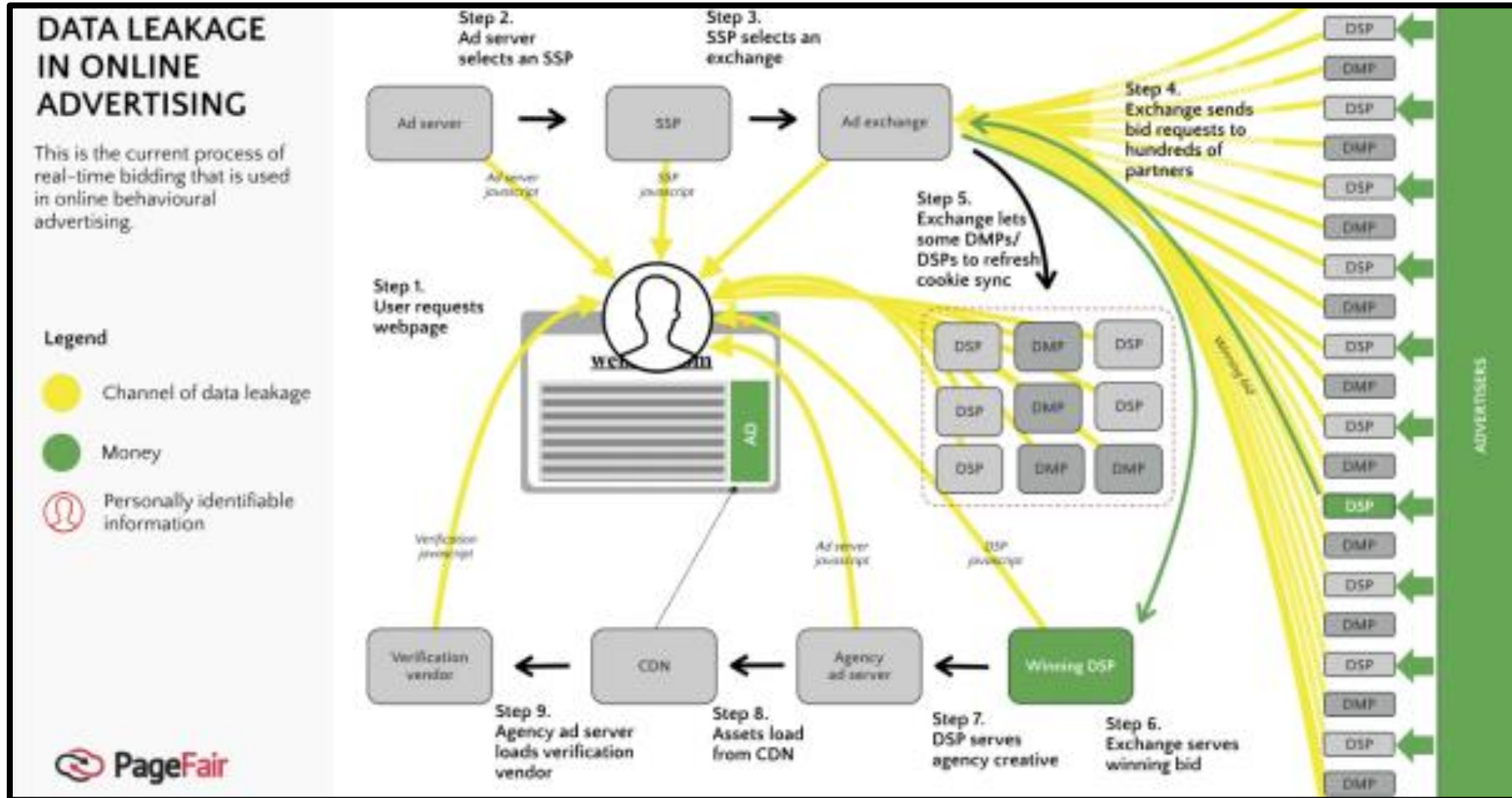
Panopticlick 3.0

BY ALAN TONER, PETER ECKERSLEY, AND BILL BUDINGTON | NOVEMBER 28, 2017

PANOPTICCLICK 3.0

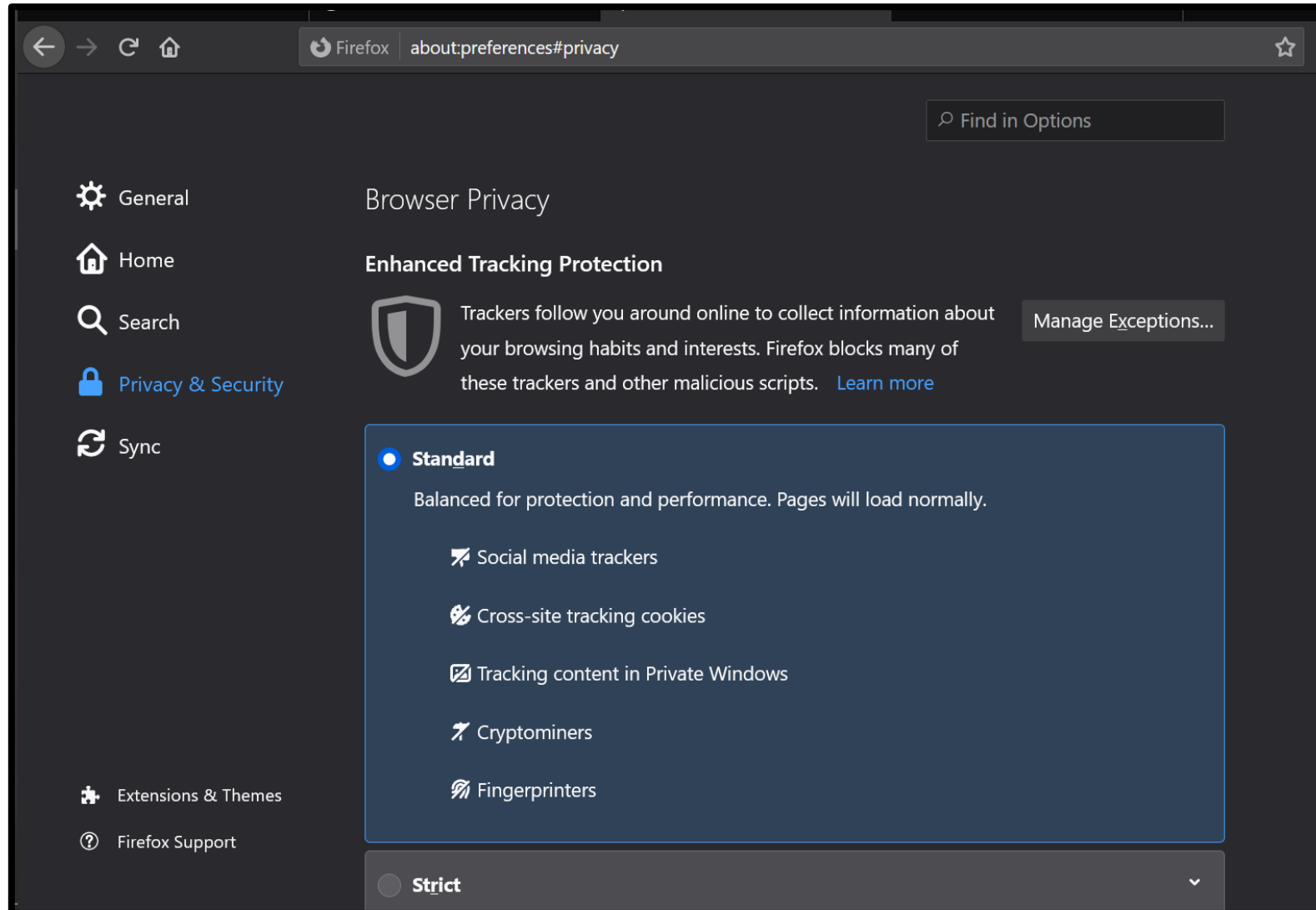
The Ecosystem Underlying Targeted Ads

Ad Bidding Marketplaces

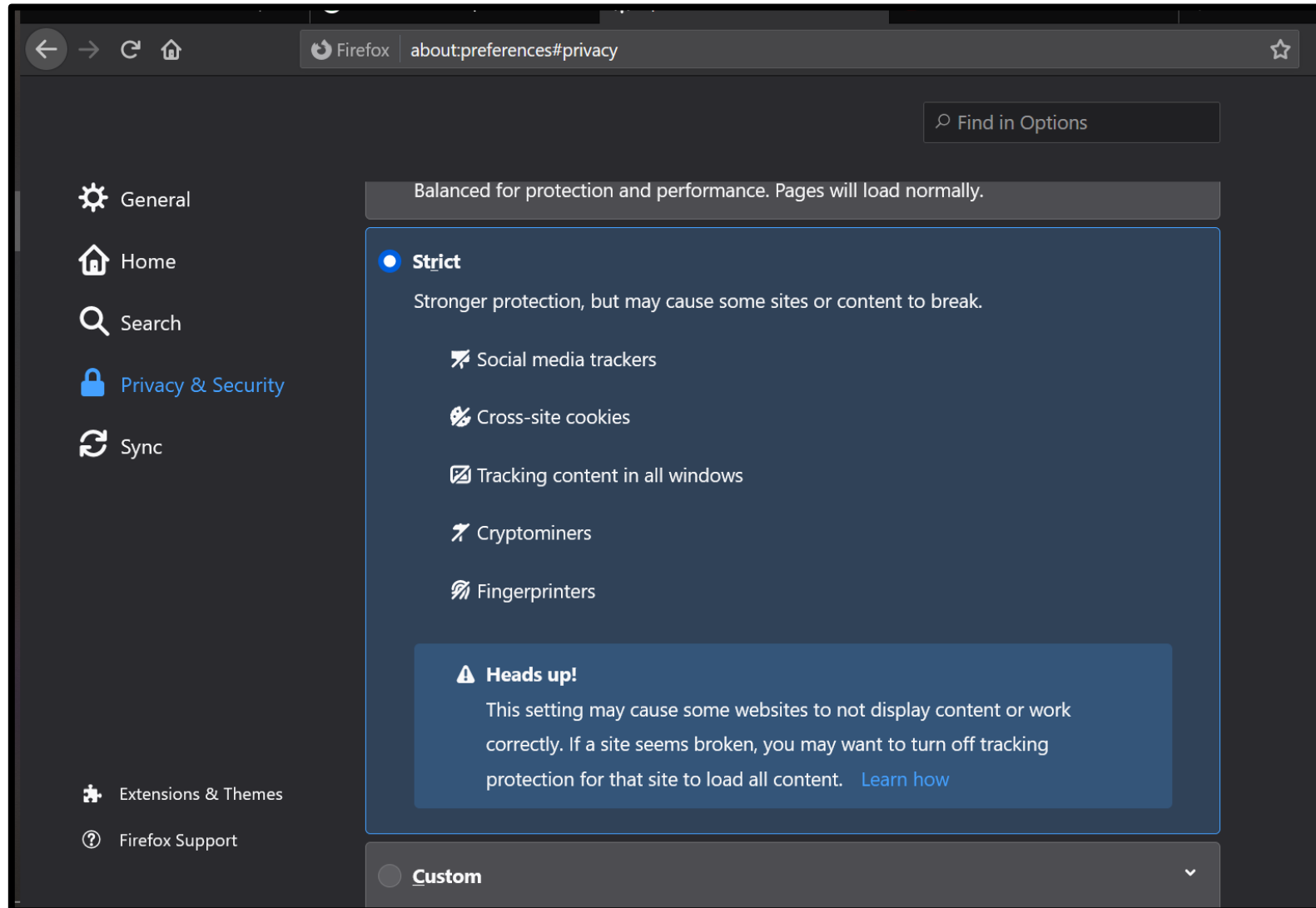


Anti-Tracking Mechanisms

Firefox Browser (New-ish) Default Settings

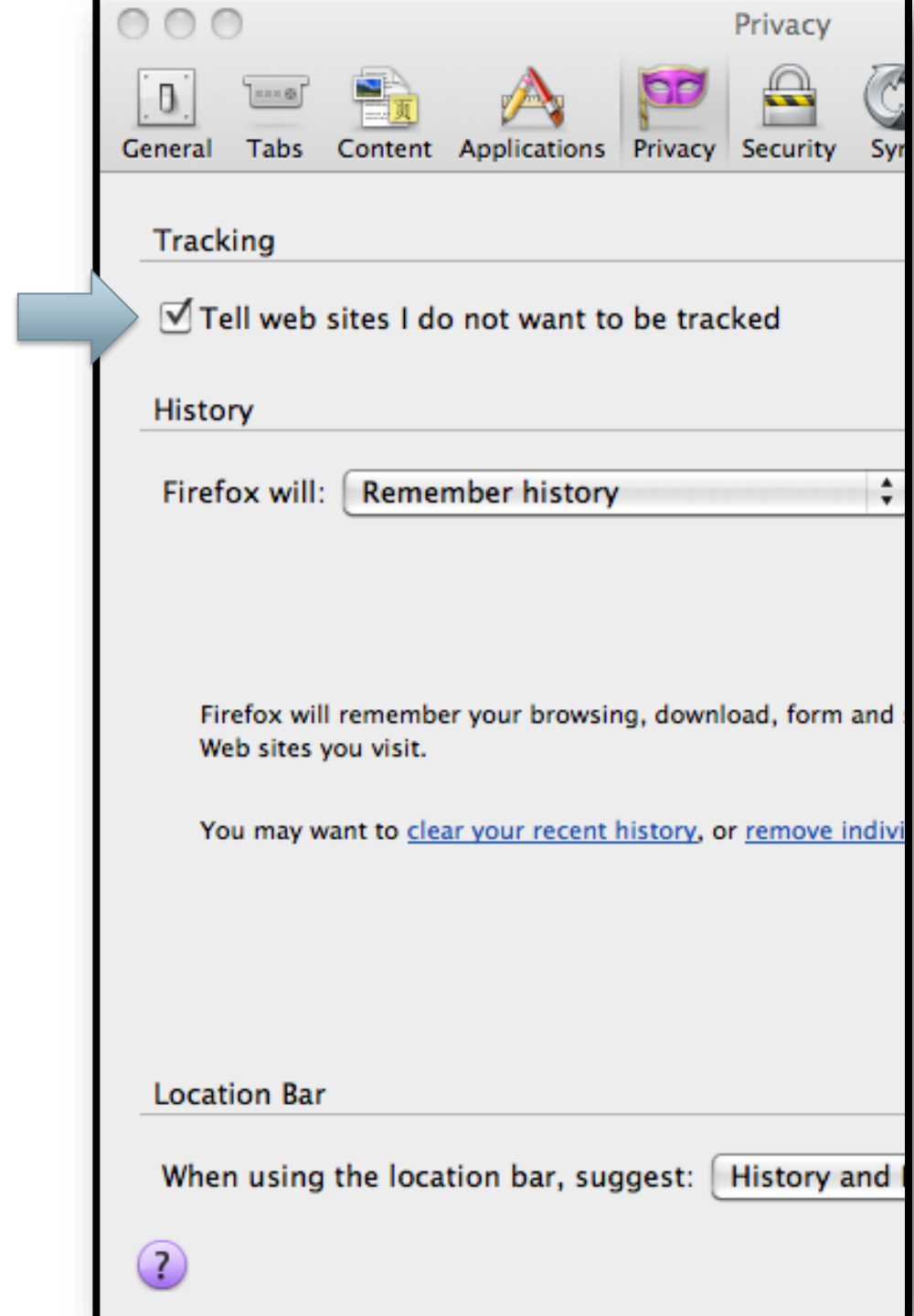


Firefox Browser Strict Settings



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 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

The screenshot displays the Ghostery browser extension interface. At the top, a blue header contains the Ghostery logo and the word "GHOSTERY". Below the header, the main content is split into two panels. The left panel shows a summary for the website "www.mynews.com", indicating that 22 trackers were found, with 4 of them blocked. A circular progress indicator shows the number 22. Below this, there are three buttons: "Trust Site" (with a shield icon), "Restrict Site" (with a lock icon), and "Pause Ghostery". A link "Map these trackers" is also present. The right panel, titled "TRACKERS", lists individual trackers with checkboxes to toggle their status. A "Block All" checkbox is at the top right of this panel. The "Advertising" category is expanded, showing 10 trackers, with 3 blocked. The blocked trackers are Advertising.com, Moat, and NetRatings-Site-Center, each with a red checkmark in a box. Other trackers listed include DoubleClick, Google Adsense, Korrelate, Polar-Mobile, ScoreCard Research Beacon, and Tacoda, all with empty checkboxes.

22 Trackers found on
www.mynews.com

22

4 Blocked

Trust Site

Restrict Site

Pause Ghostery

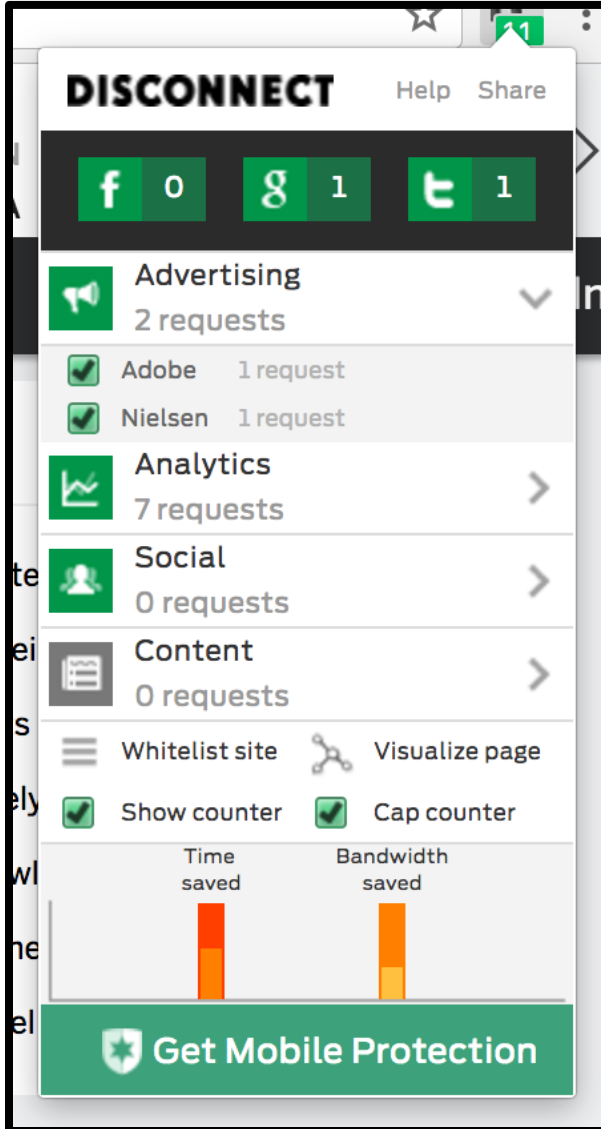
[Map these trackers](#)

TRACKERS Block All

Advertising
10 TRACKERS 3 Blocked

- Advertising.com
- DoubleClick
- Google Adsense
- Korrelate
- Moat
- NetRatings-Site-Center
- Polar-Mobile
- ScoreCard Research Beacon
- Tacoda

Existing Privacy Tools



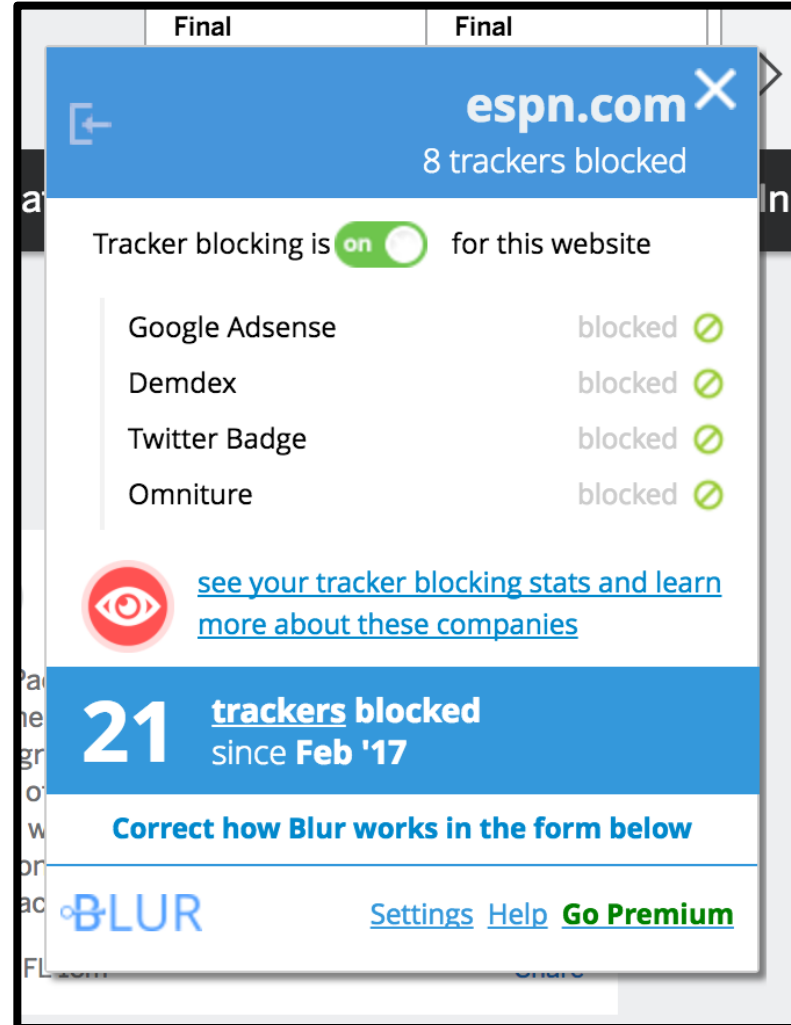
The screenshot shows the Disconnect browser extension interface. At the top, it says "DISCONNECT" with "Help" and "Share" links. Below this are social media sharing buttons for Facebook (0), Google+ (1), and Twitter (1). The main interface is divided into several categories, each with a green icon and a dropdown arrow:

- Advertising**: 2 requests. Includes a checklist for Adobe (1 request) and Nielsen (1 request).
- Analytics**: 7 requests.
- Social**: 0 requests.
- Content**: 0 requests.

At the bottom of the main interface, there are two sections:

- Whitelist site** and **Visualize page** (with a network diagram icon).
- Show counter** and **Cap counter** (both with checked checkboxes).

Below these are two bar charts labeled "Time saved" and "Bandwidth saved". At the very bottom is a green button that says "Get Mobile Protection".



The screenshot shows the Blur browser extension interface. At the top, it says "Final" twice. Below this is a blue header with the "espn.com" logo and a close button, and the text "8 trackers blocked".

The main interface shows "Tracker blocking is **on** for this website" with a green toggle switch. Below this is a list of blocked trackers:

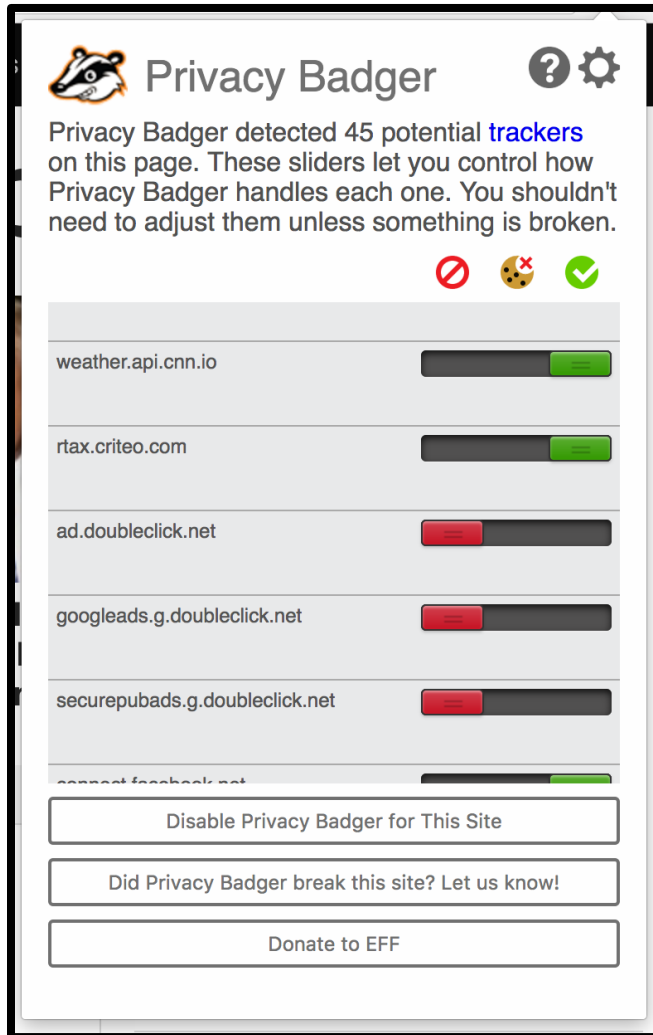
Google AdSense	blocked	🚫
Demdex	blocked	🚫
Twitter Badge	blocked	🚫
Omniure	blocked	🚫

Below the list is a red eye icon and a link: [see your tracker blocking stats and learn more about these companies](#).

At the bottom, there is a blue banner that says "21 trackers blocked since Feb '17". Below this is a link: [Correct how Blur works in the form below](#).

At the very bottom, there is the "BLUR" logo and links for [Settings](#), [Help](#), and [Go Premium](#).

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

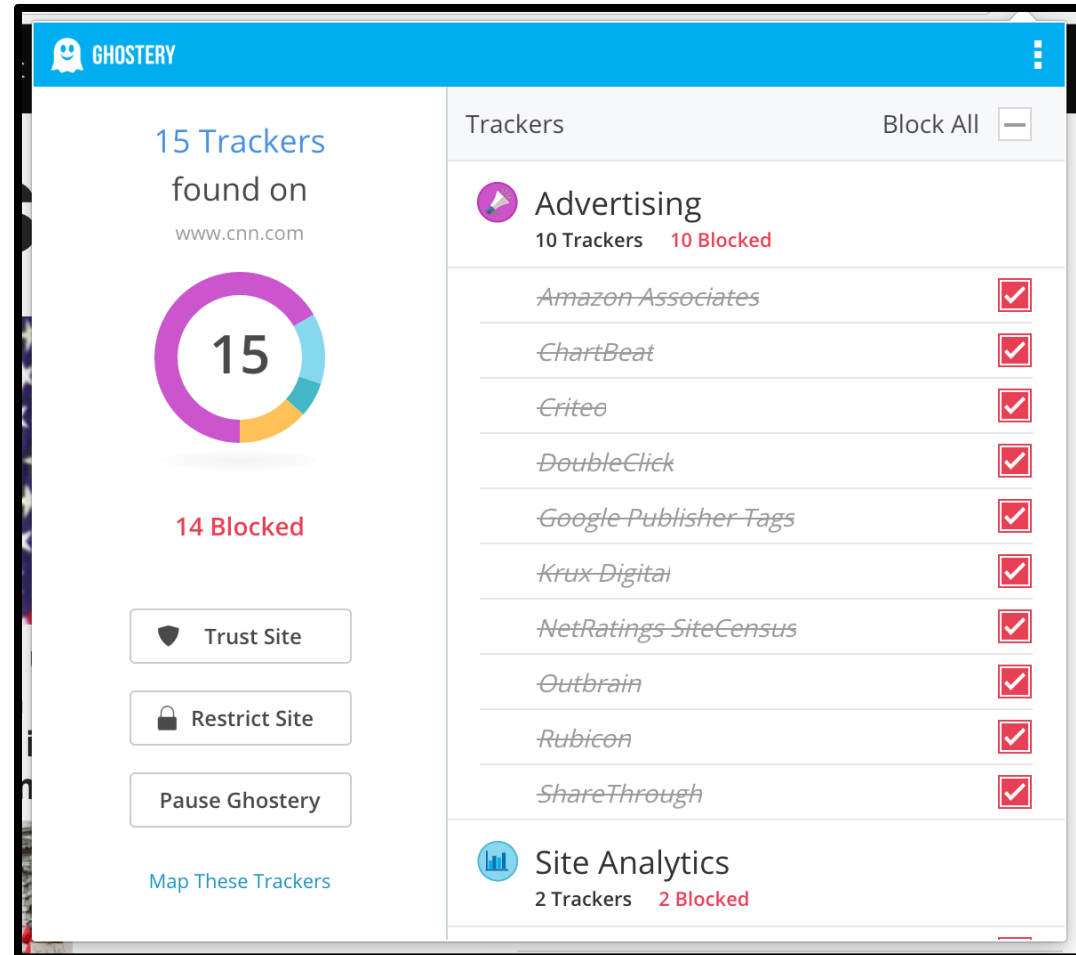
securepubads.g.doubleclick.net

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

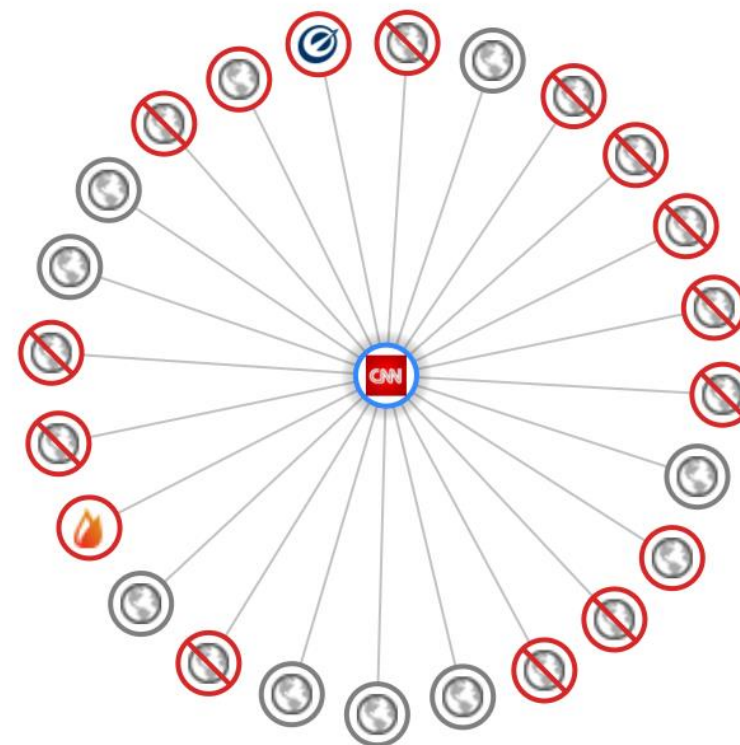
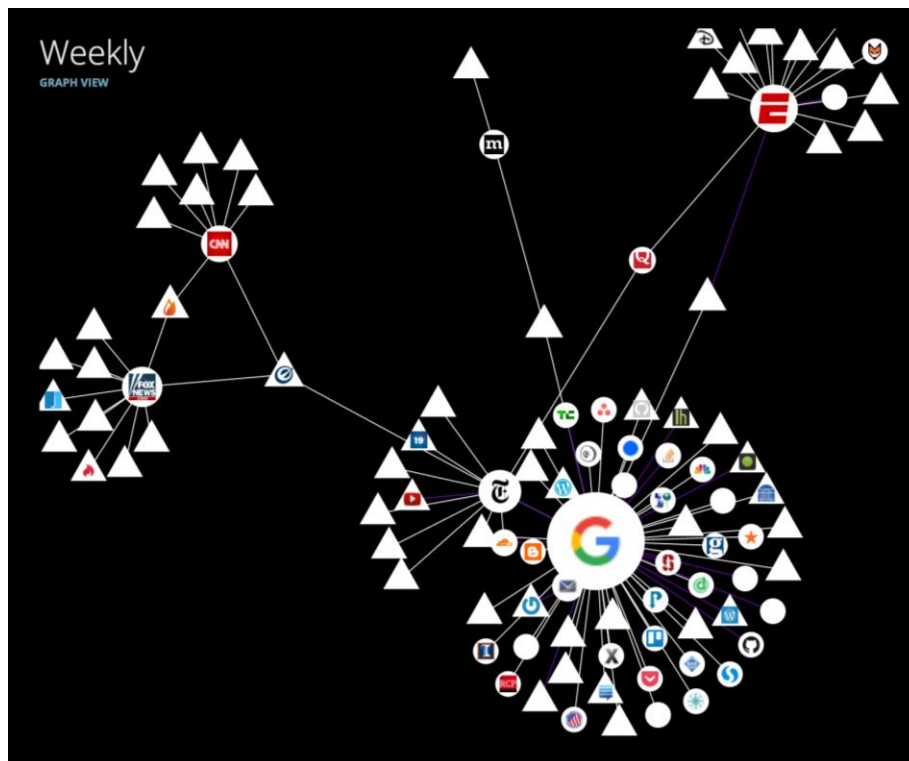
Trackers Block All

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 content includes the New York Times logo, the date 'Friday, March 16, 2018', and a navigation menu with categories like 'World', 'U.S.', 'Politics', 'N.Y.', 'Business', 'Opinion', 'Tech', 'Science', 'Health', and 'Sports'. A prominent article headline reads 'Trump's Steel Tariffs Open Lobbying Floodgate' by ANA SWANSON and KENNETH P. A smaller article titled 'TRILOBITES' features a cartoon drawing of a person's head with handwritten notes: 'A FEW GREYS. (EXPERIENCED)' and 'LISTENS.'. Other article snippets for 'Controlled' by DANIEL McCARTHY and 'Elite' by SUSAN JACOBY are visible.

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

The screenshot shows a web interface for 'Tracking Transparency'. At the top is a dark red navigation bar with links for 'Tracking Transparency', 'Interests', 'Trackers', 'Sites', 'Activity', 'About', and a settings gear icon. Below the navigation is a light grey 'Home' button. The main content area features a section titled 'What are trackers and interests?' with a diagram. The diagram shows an eye icon representing tracking, followed by an arrow to a thumbs-up icon representing interests, and another arrow to three circular icons (paw print, magnifying glass, question mark) representing personalization. Below the diagram are three columns of text explaining each concept. Further down, there are three summary cards: 'Your Top Trackers' with a list of five items, 'Your Top Interests' with a list of five items, and a statistics card showing '39 Trackers encountered', '7 Pages visited', and '6 Potential interests'. At the bottom right, there are two lists: 'Recent Interests' and 'Recent Sites'.

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

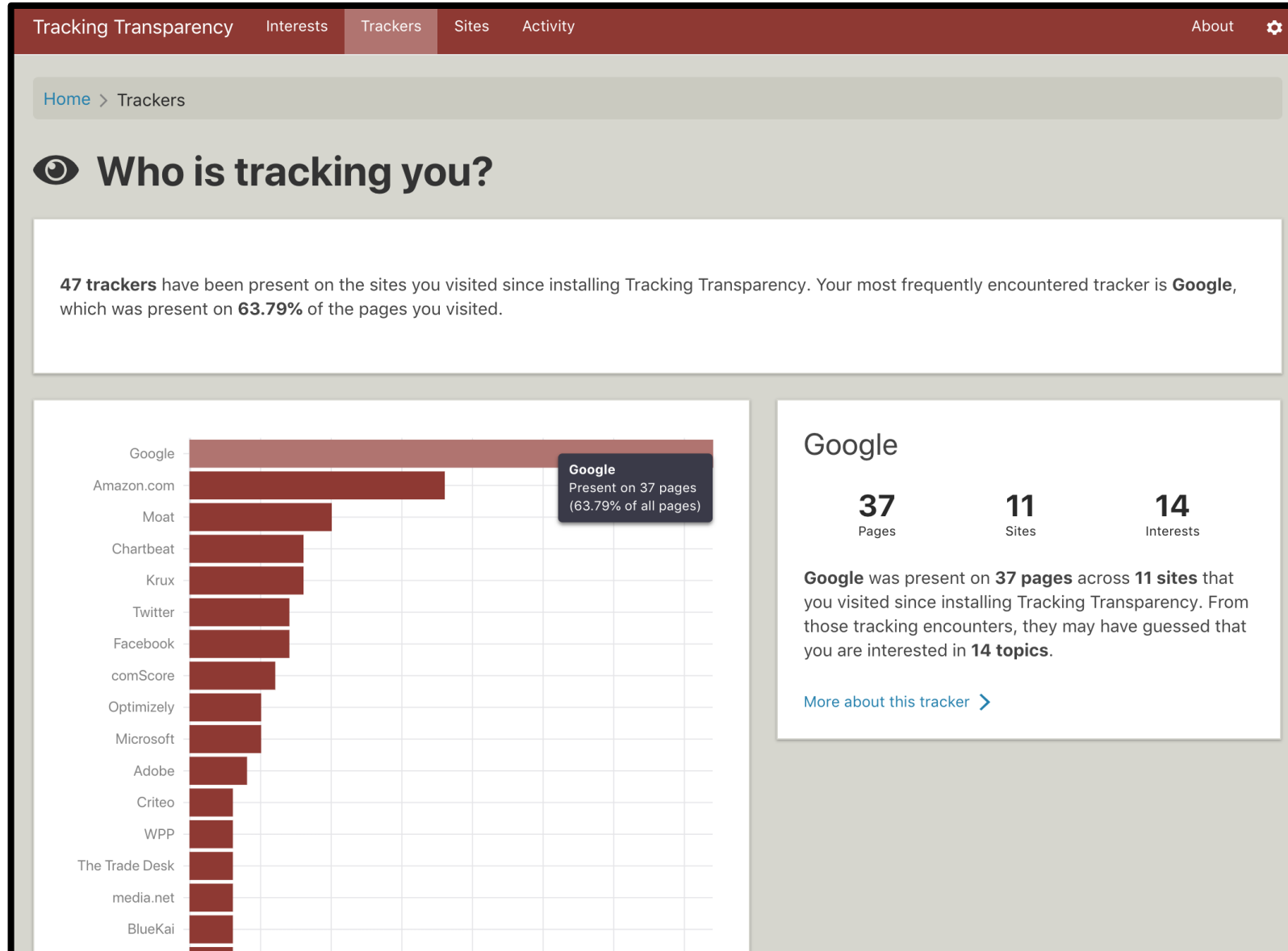
Recent Interests

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

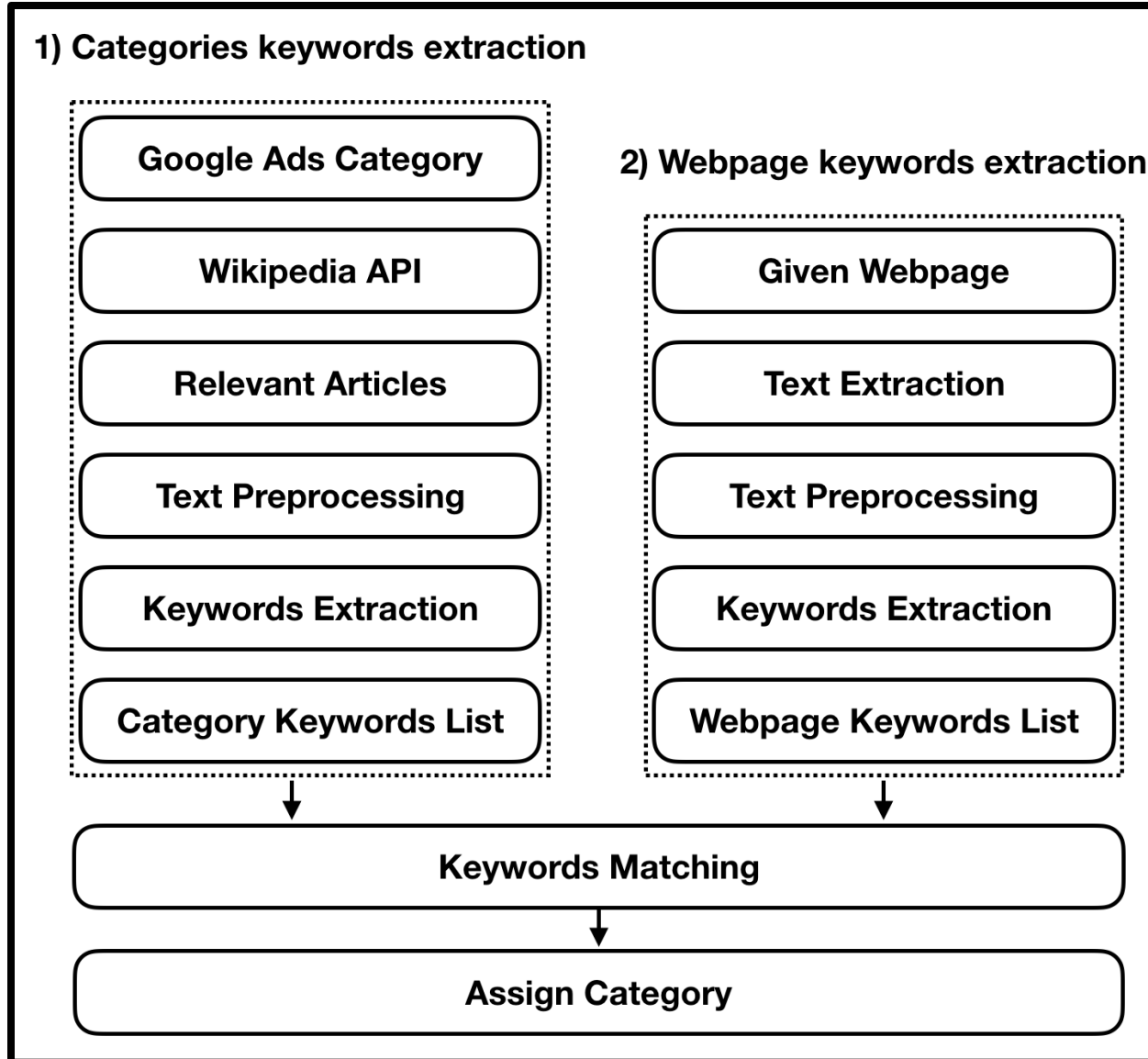
Recent Sites

- 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

Tracking Transparency Interests Trackers Sites Activity About ⚙️


Home > Interests

👍 What interests might they think you have?

Trackers collect information about the pages you visit and use this information to identify topics, or *interests*, that might be relevant to you. These interests are then used to target ads to you and personalize what you see online. Companies don't usually reveal how they determine your potential interests. Based on the pages you visited, Tracking Transparency's simulations have identified **52 topics** trackers might think are relevant to you.

For example, you recently visited [theverge.com](#), which Tracking Transparency has determined may be about [News](#).

The chart below shows the interests suggested by your browsing activity. Click a slice of the chart to see more details.



Home Improvement

Home Improvement

1
Sites

8
Trackers

1 of the sites you visited were about Home Improvement. These sites contained a total of **8 trackers**.

Home Improvement is a **somewhat popular** interest.

Other people are often **somewhat comfortable** with having their interest in this topic being used to personalize their web experience.

[More about this interest >](#)

Filters

Recency ⓘ ALL 24 HRS 7 DAYS

Popularity ⓘ ALL LESS MORE

Comfort ⓘ ALL LESS MORE

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



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 image shows a screenshot of the Mozilla Pocket website. At the top, there is a navigation bar with the Mozilla logo (moz://a) and links for Firefox Browsers, Products, Who We Are, and Innovation. A button for "Get a Firefox Account" is located on the right. The main content area features 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 positioned at the bottom left. On the right side, there are two overlapping device screens displaying the Pocket app interface. The desktop screen shows a "My List" of articles, including "Baby Boomers Reach the End of Their To-Do List" from nytimes.com and "There is no such thing as past or fut changing how we think about time" from theguardian.com. The mobile screen shows a similar list with articles like "7 Behaviors That Will Make You Insanely Productive" and "The 5 Essentials of a Well-Run Meeting".

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 nytimes.com
- 'There is no such thing as past or fut changing how we think about time theguardian.com
- Alexa Is a Revelation for the Blind theatlantic.com
- Columbia SPONSORED
- The Ultimate Guide to Winter outsideonline.com
- 6 Ways to Welcome Employees on Their First Day blog.asana.com
- How to Travel With Children nytimes.com
- How the Meaning of Digital Transformation Has Evolved hbr.org

Mozilla Pocket: Customization With Only Local Tracking

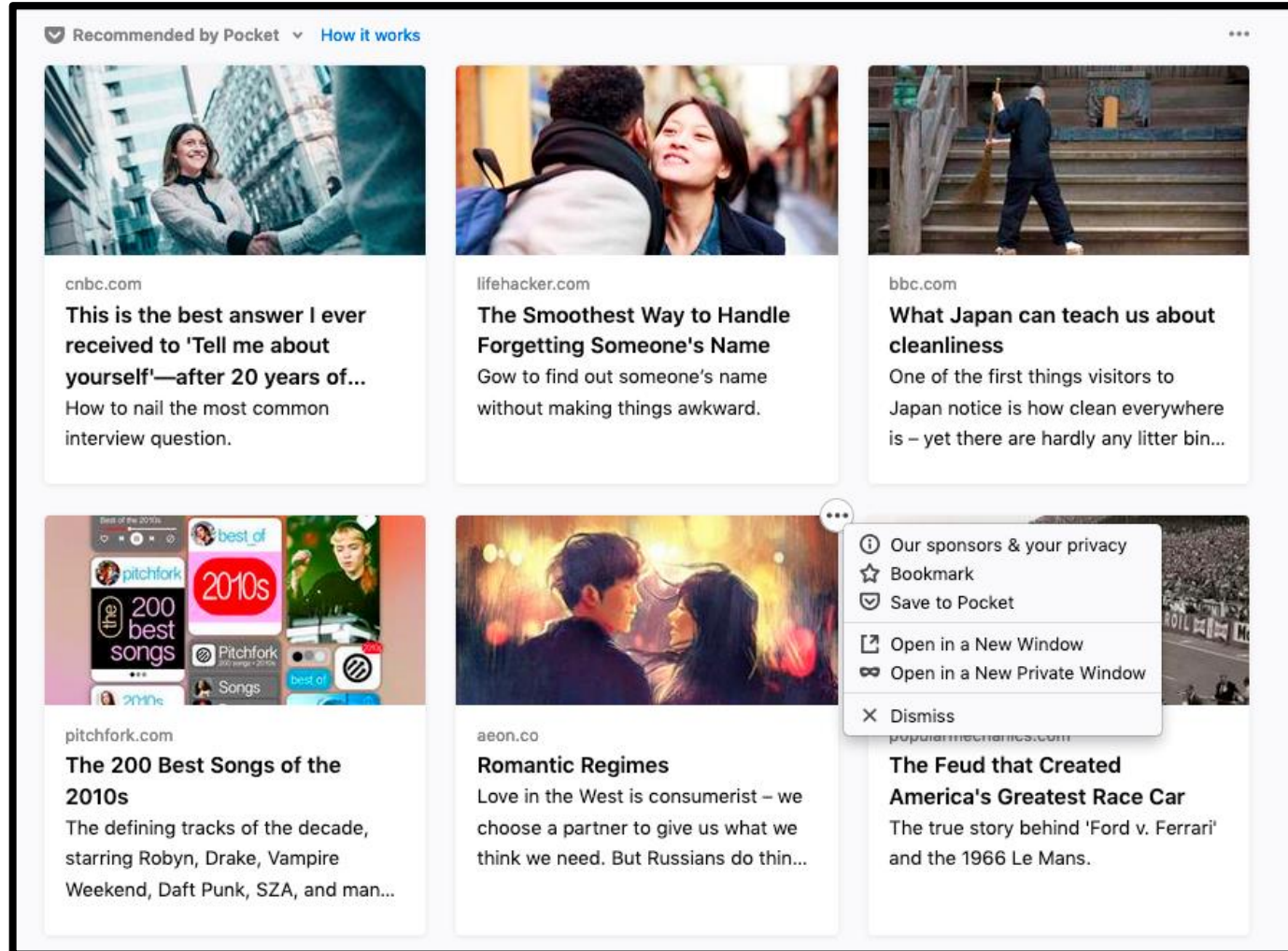
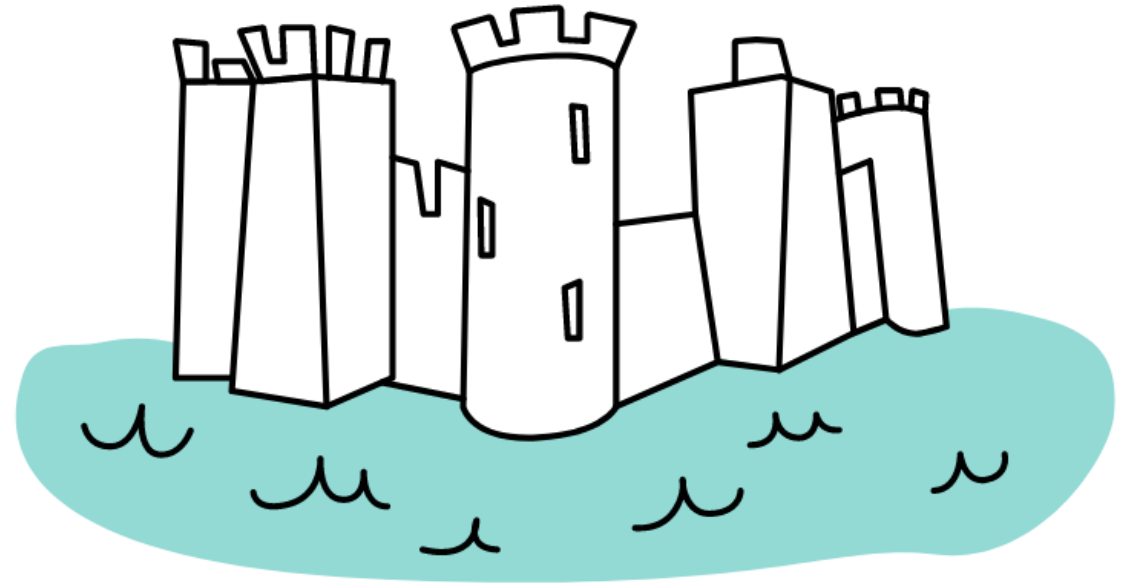


Image taken from <https://blog.mozilla.org/en/products/firefox/pocket-in-firefox/>

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

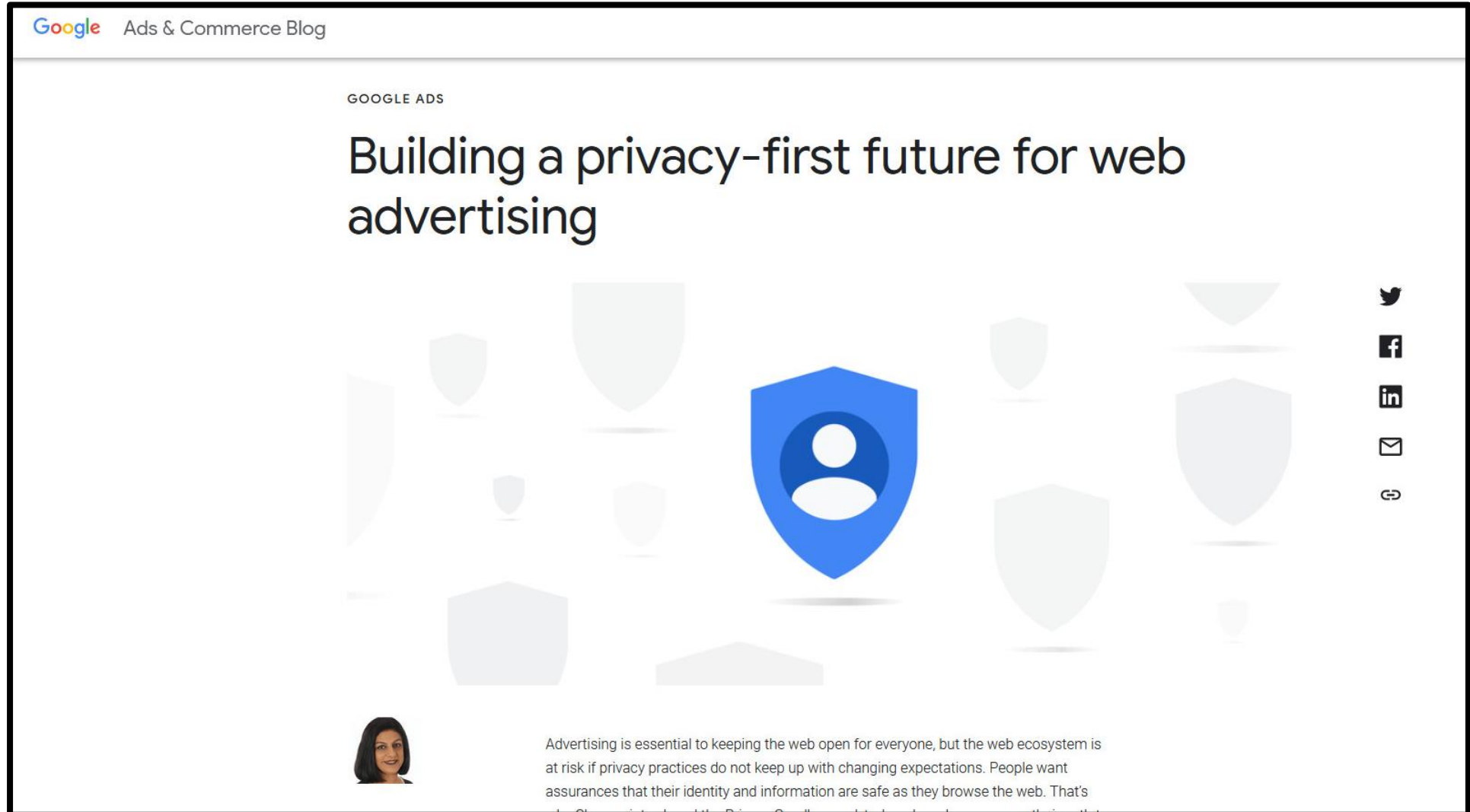
Are these stories in the new tab personalized to me?

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)



The image is a screenshot of a blog post from the Google Ads & Commerce Blog. At the top left, the Google logo is followed by the text 'Ads & Commerce Blog'. Below this, the text 'GOOGLE ADS' is centered. The main title of the post is 'Building a privacy-first future for web advertising'. The background of the post features a central blue shield icon with a white person silhouette, surrounded by several lighter grey shield icons of various sizes. On the right side, there is a vertical stack of social media sharing icons: Twitter, Facebook, LinkedIn, Email, and a link icon. At the bottom left, there is a small circular profile picture of a woman. To the right of the profile picture, the beginning of the article text is visible: 'Advertising is essential to keeping the web open for everyone, but the web ecosystem is at risk if privacy practices do not keep up with changing expectations. People want assurances that their identity and information are safe as they browse the web. That's'.

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

Google FLoC (EFF's Perspective)



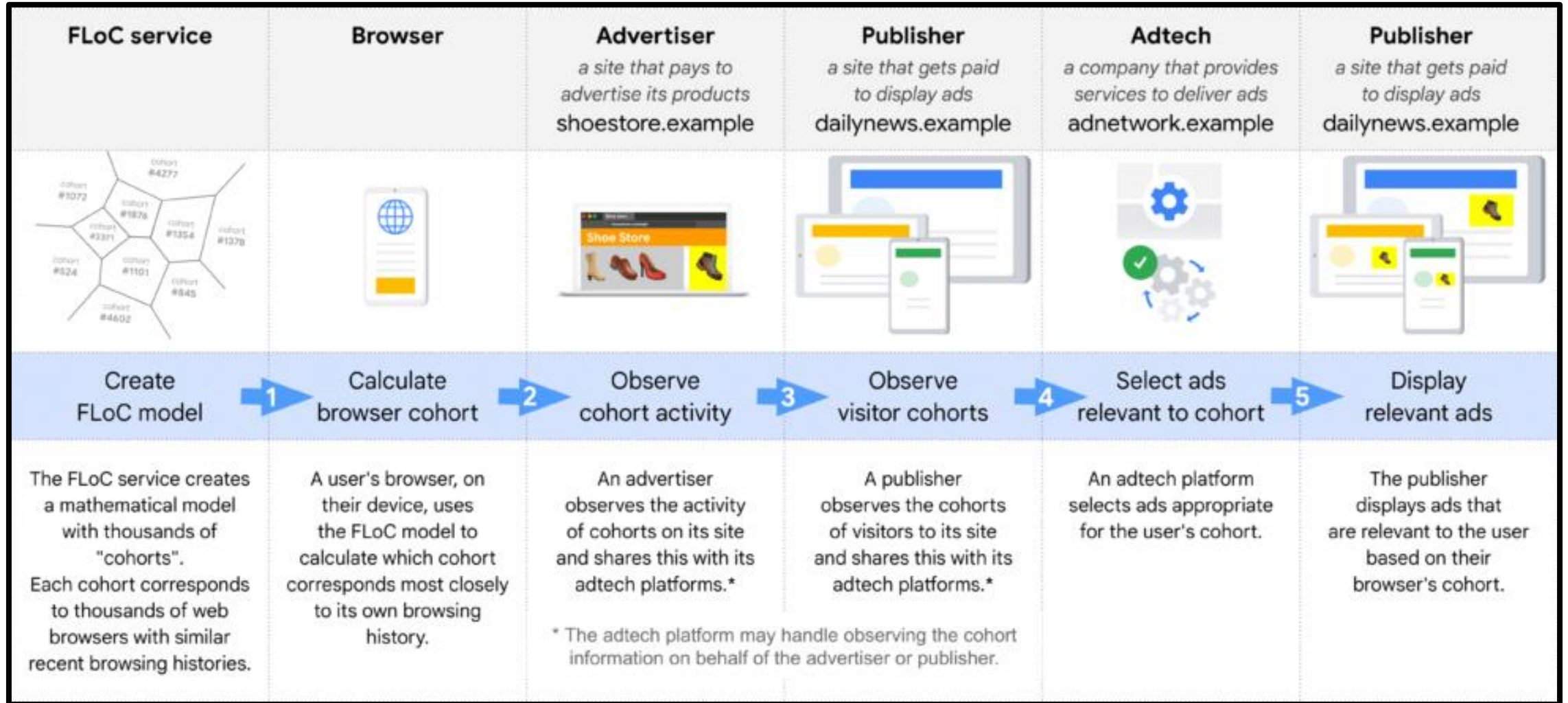
The image is a screenshot of the Electronic Frontier Foundation (EFF) website. At the top left is the EFF logo, which consists of the letters 'EFF' in a bold, black, sans-serif font, with a red square containing a white globe icon between the 'E' and the first 'F'. Below the logo, the words 'ELECTRONIC FRONTIER FOUNDATION' are written in a smaller, red, sans-serif font. To the right of the logo is a navigation menu with links for 'About', 'Issues', 'Our Work', 'Take Action', 'Tools', 'Donate', and a search icon. The main content area features the article title 'Google's FLoC Is a Terrible Idea' in a bold, black font. Below the title is the author's name 'BY BENNETT CYPHERS' and the date 'MARCH 3, 2021'. A large, stylized illustration follows, showing silhouettes of people in a dark room looking at large, glowing blue screens that display various data and interface elements. Below the illustration, there is an update section starting with 'Update, April 9, 2021: We've launched [Am I FLoCed](#), a new site that will tell you whether your Chrome browser has been turned into a guinea pig for Federated Learning of Cohorts or FLoC, Google's latest targeted advertising experiment.' To the right of the main text is a 'Join Our Newsletter!' section with a form for email address and postal code, and an anti-spam question. At the bottom of the article, there are two paragraphs of text: 'The third-party cookie is dying, and Google is trying to create its replacement.' and 'No one should mourn the death of the cookie as we know it. For more than two decades, the third-party cookie has been the lynchpin in a shadowy, seedy, multi-billion dollar advertising-surveillance industry on the Web; phasing out

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



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.

Google FLoC (Brave Browser's Perspective)

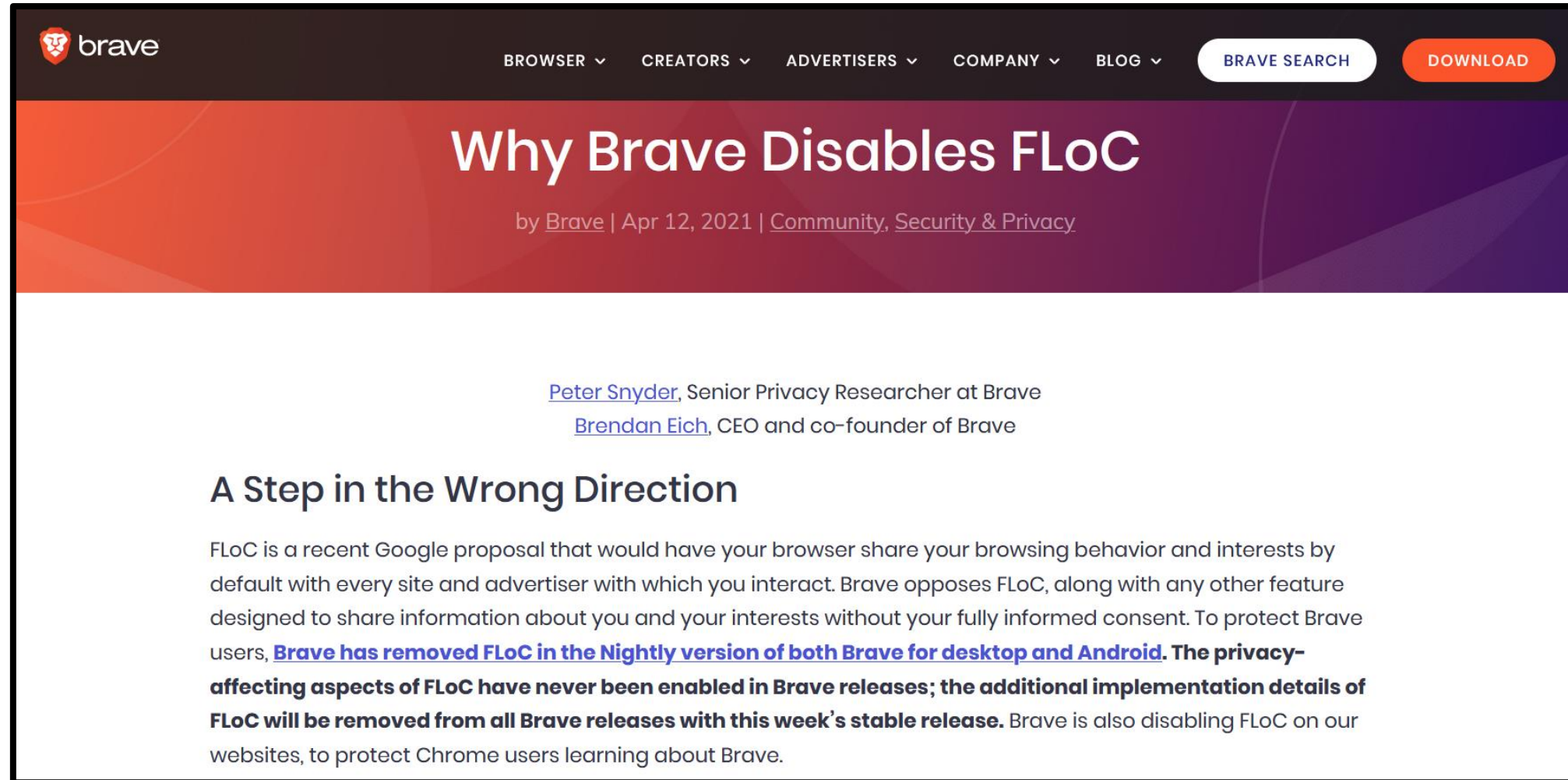


Image taken from <https://brave.com/why-brave-disables-floc/>

Google Topics API

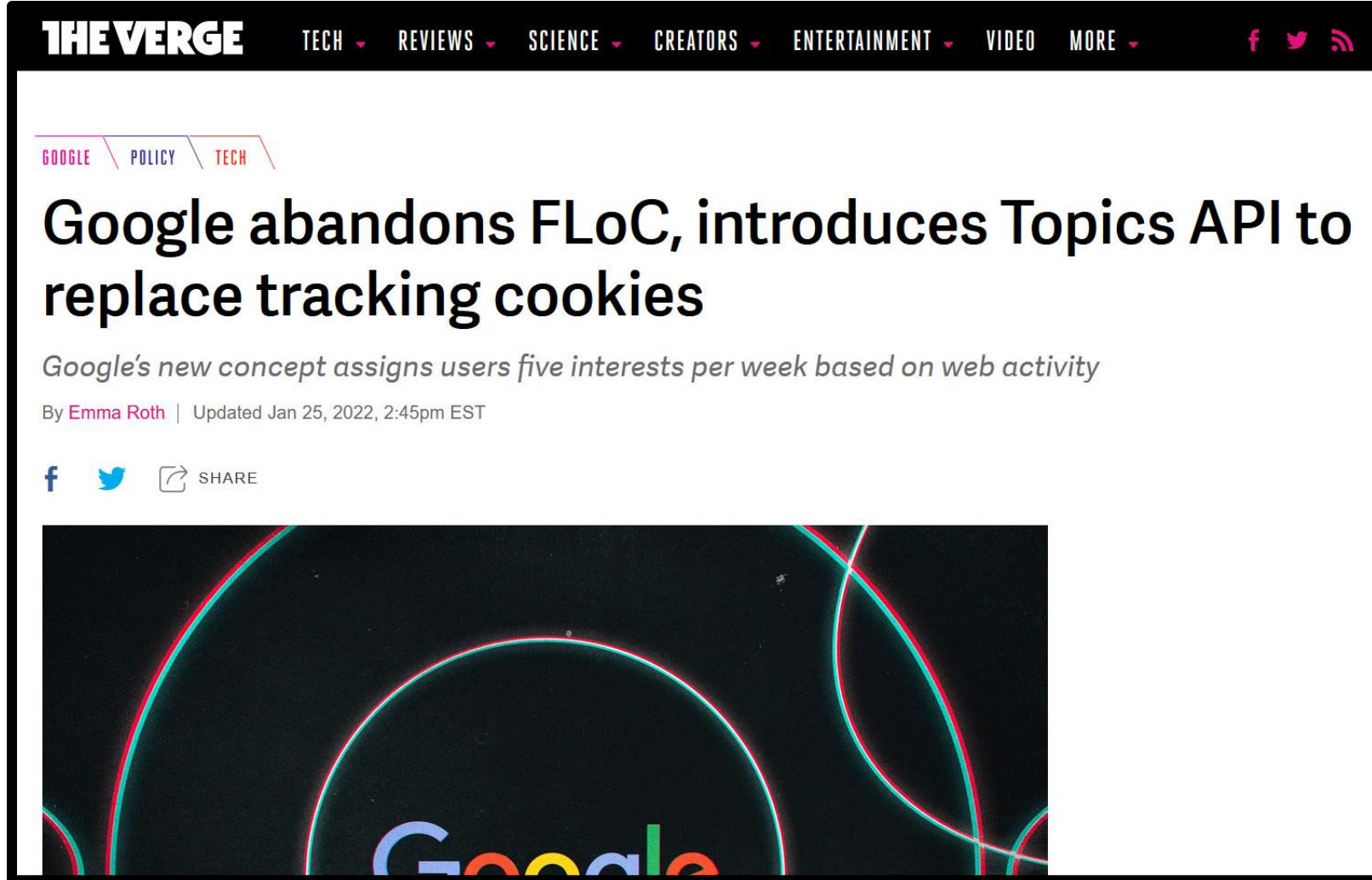


Image taken from <https://www.theverge.com/2022/1/25/22900567/google-floc-abandon-topics-api-cookies-tracking>

Google Topics API

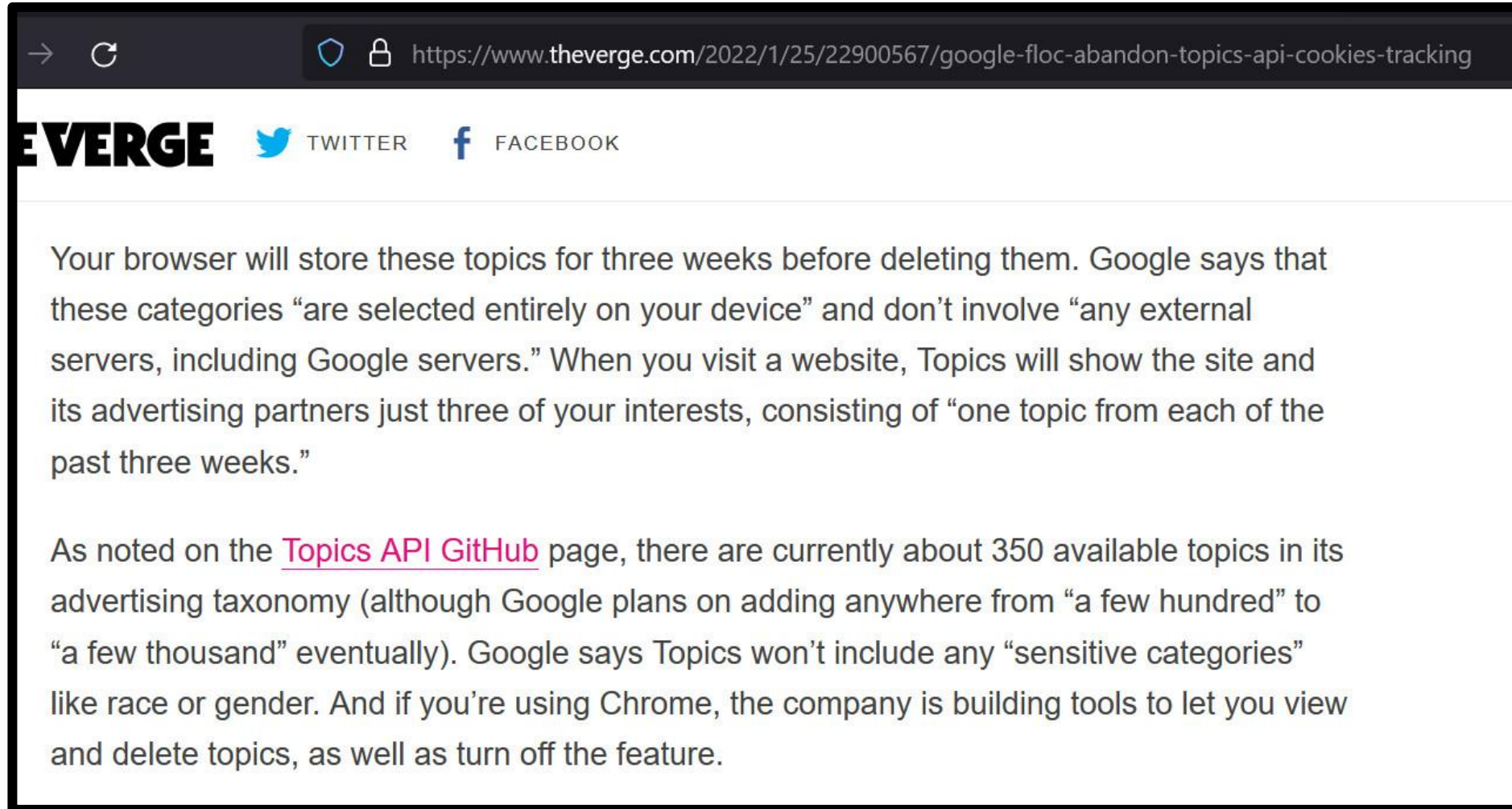


Image taken from <https://www.theverge.com/2022/1/25/22900567/google-floc-abandon-topics-api-cookies-tracking>

Google Topics API

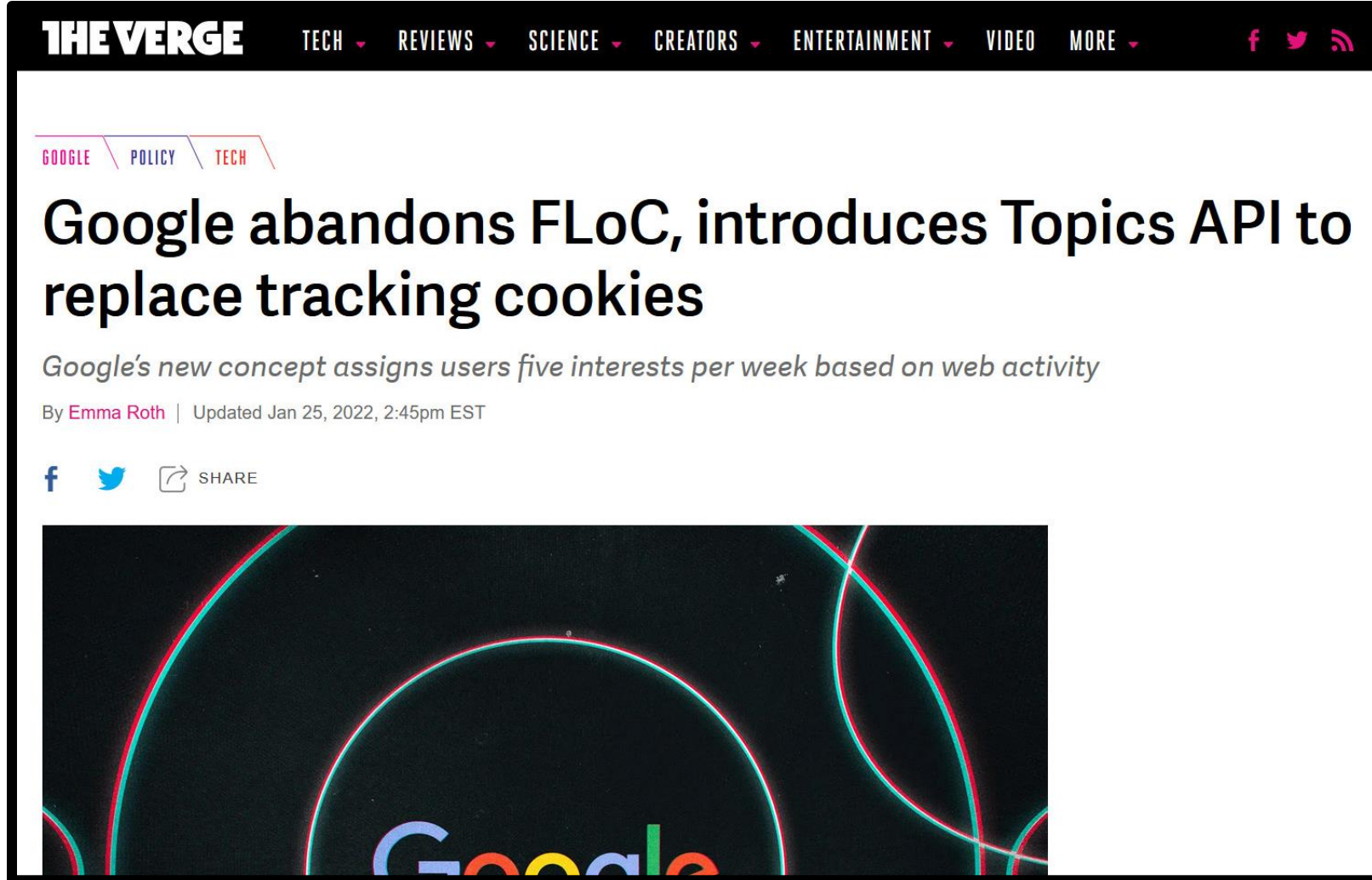


Image taken from <https://www.theverge.com/2022/1/25/22900567/google-floc-abandon-topics-api-cookies-tracking>

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

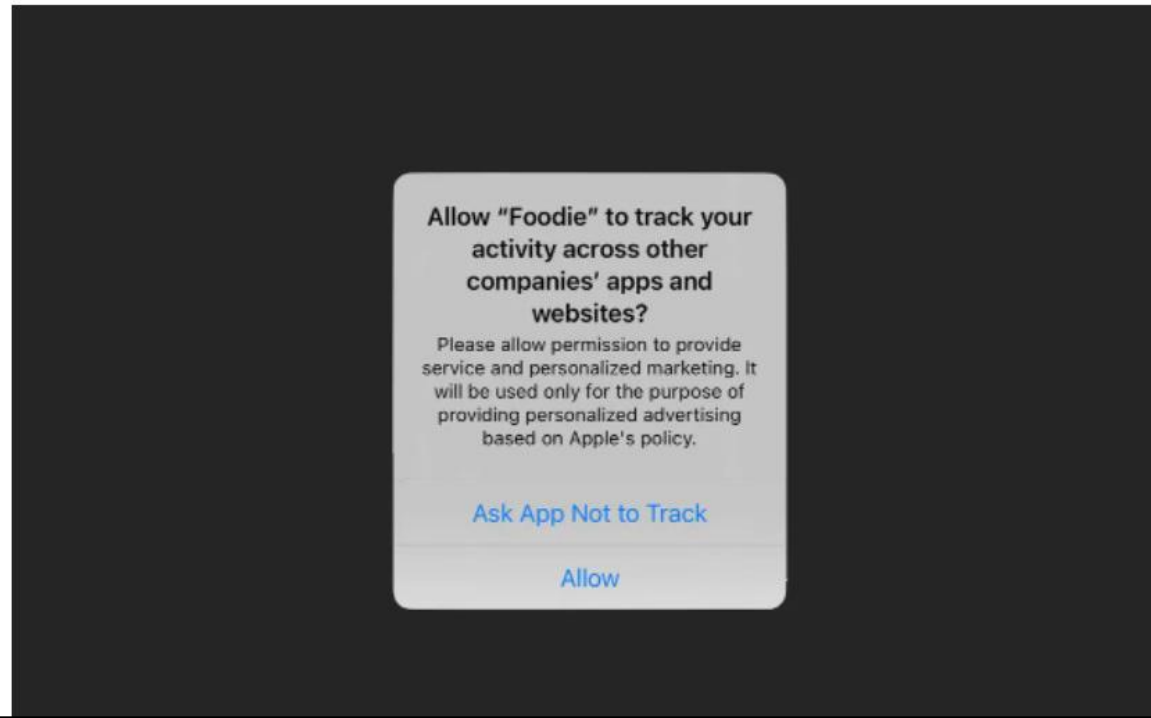


Image taken from <https://www.theverge.com/2021/4/27/22405474/apple-app-tracking-transparency-ios-14-5-privacy-update-facebook-data>

Android Tracking

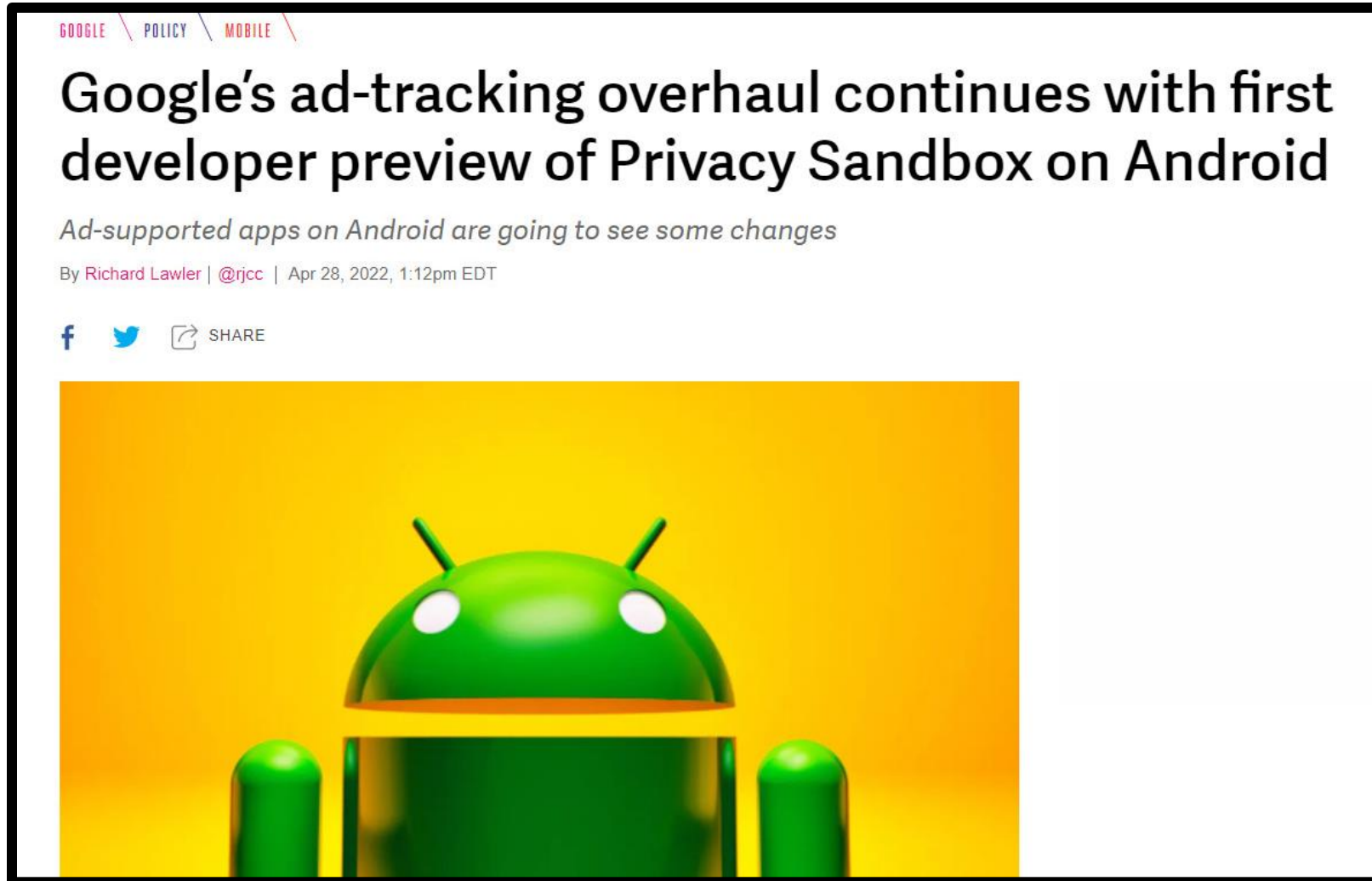


Image taken from <https://www.theverge.com/2022/4/28/23046608/android-advertising-privacy-sandbox-google-preview>