

The Future of Advertising & Privacy

How online tracking works

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Chief Technologist

US Federal Trade Commission



Agenda

- Types of ads
- Web tracking with cookies
- Web tracking beyond cookies
- Tracking beyond the web
- Opting-out

These views are my own and do not necessarily reflect the views of the Commission or any individual Commissioner

Contextual ads

The image shows a Google search for "funny t-shirts" with several contextual advertisements. The search results page displays various t-shirt designs and prices. A sidebar on the right shows "Shop on Google" with sponsored t-shirt ads. The background shows a website for "Digital Photo" with a Tamron lens advertisement.

Search Results:

- [Tees, Unique Designs - snorgtees.com](#)
funny t-shirt designs. Fast Shipping!
Ideas · Fast shipping · New Designs - \$12 · Soft shirts
- [Shop Culture Tees](#)
New This Week
- [Free, Over 1000 designs](#)
- [Shop Threadless Today - threadless.com](#)
Shop Now!
- [T-shirts.com](#)
Buy 3, Get 6 Free!
- [T-shirts on the Internet | 1000s of Designs](#)
Our funny shirts are available in lots of unique designs for

Shop on Google (Sponsored):

- [I'm Kind Of A Big Dill T-Shirt - ...](#)
\$6.00
6 Dollar Shirts
- [Sarcastic and Funny Light T-...](#)
\$14.95
CafePress.com
- [Sometimes I Use Words - medium ...](#)
\$19.99
Look HUMAN
- [Mordor Fun Run](#)
\$20.00
SnorgTees
- [I'm funny how? t-shirt](#)
\$15.95
GuideGear
- [Sub_Urban Riot Women's White ...](#)
\$44.00
Suburban Riot

Background Website (Digital Photo):

- Log In / Register
- Search
- Follow Us: Facebook, Twitter, Instagram
- Print | Digital | App
- Subscribe & Save
- How To | Galleries | Cameras | Gear | Columns | Buyer's Guide | Contests | News
- Blog | Subscribe
- Enter to win your choice of one of four tamron lenses! LEARN MORE >
- TAMRON
- Shooting With Soul: A Photographer's Technique Of Choice
Expressing your soul through favorite photography techniques.
- Popular Articles:
 - Hands On Review: Sony G Master Lenses
 - New Gear: April/May 2016

Run-of-network ads

The screenshot shows the weather.com website interface. At the top, there is a large banner for Black Friday with the text "AVAILABLE NOW BLACK FRIDAY WORTHY DEALS" and a "Shop Online" button. Below the banner is the website's navigation bar, which includes the Weather Channel logo, the current location "Pittsburgh, PA" with a temperature of "37°", and a search bar. The navigation bar also features links for "WEATHER", "MAPS", "SEVERE", "VIDEO & PHOTOS", "ACTIVITIES", "HEALTH", "TRAVEL", and a "SIGN UP FOR NEWSLETTER" button. Below the navigation bar, there are several content blocks: a weather forecast for Pittsburgh, PA, a map showing weather watches and warnings for Nicaragua, Costa Rica, and Panama, a "WEDNESDAY'S FORECAST" map, and a "OUR FAVORITE THINGS" section featuring a photo of people in costumes. The Black Friday advertisement is repeated in the top right corner of the content area.

AVAILABLE NOW
BLACK FRIDAY
WORTHY DEALS
Shop Online

Limited quantities. No rainchecks. ©2016 Best Buy

The Weather Channel
37° Pittsburgh, PA
US | °F
Search city, zip or place

WEATHER MAPS SEVERE VIDEO & PHOTOS ACTIVITIES HEALTH TRAVEL
SIGN UP FOR NEWSLETTER

Login / Sign Up

Pittsburgh, PA (15217)
37°F
PARTLY CLOUDY
--12°
A few clouds. Low 27F. Winds light and variable.
Full Forecast >

Nicaragua
Costa Rica
Panama
Watches, Warnings Issued for Otto; 174-Year-Old Record Could Fall
Read the Story

AVAILABLE NOW
BLACK FRIDAY
WORTHY DEALS
Shop Online

Limited quantities. No rainchecks. ©2016 Best Buy

OUR FAVORITE THINGS

Thanksgiving Used to Be Weird

Targeted ads

Require information about user, usually derived from web browsing history



Suggested Post



Teemazing.co

Sponsored ·

Like Page

Limited Edition! Tag someone related with this shirt

Click here to order => <http://www.peakgears.com/owcomputer>

Share & tag your family or your friends



920

113 Comments 558 Shares

Like

Comment

Share

Retargeted ads

Require information about recent product views at a specific website

ADVERTISEMENT

JOHN FLUEVOG®

 \$255	 \$359	 \$159.99
 \$179.99	 \$159.99	 \$129.99
 \$189.99	 \$445	 \$149.99
 \$99.99	 \$159.99	 \$199.99
 \$149.99	 \$199.99	 \$179.99

Woman Stalked Across 8 Websites By Obsessed Shoe Advertisement

NEWS IN BRIEF

October 12, 2015

VOL 51 ISSUE 41

News · Technology · Advertising · Fashion



LAWRENCEVILLE, GA—Expressing her growing unease at repeatedly spotting the same picture and text lurking in the corners of her favorite webpages, local woman Laura Spelman confirmed Monday that she has been stalked across eight different sites by an obsessed Nine West shoe advertisement. “When I first saw the ad for the black ballet flats in my Facebook news feed, it seemed harmless enough, but then I went to check the forecast on Weather.com and it was waiting there for me—it’s really kind of disturbing,” said Spelman, adding that she has taken to scrolling away from the fanatical ad as fast as possible whenever she catches sight of it. “I

Technology for ad tracking

- Cookies
- Third-party cookies
- Ad exchanges
- Cookie syncing
- Other identifiers used for tracking
- Cross-device tracking
- Probabilistic tracking

Hypertext Transfer Protocol (HTTP)



Web browser



Web server

Hypertext Transfer Protocol (HTTP)



Web browser

Request for content



Web page content

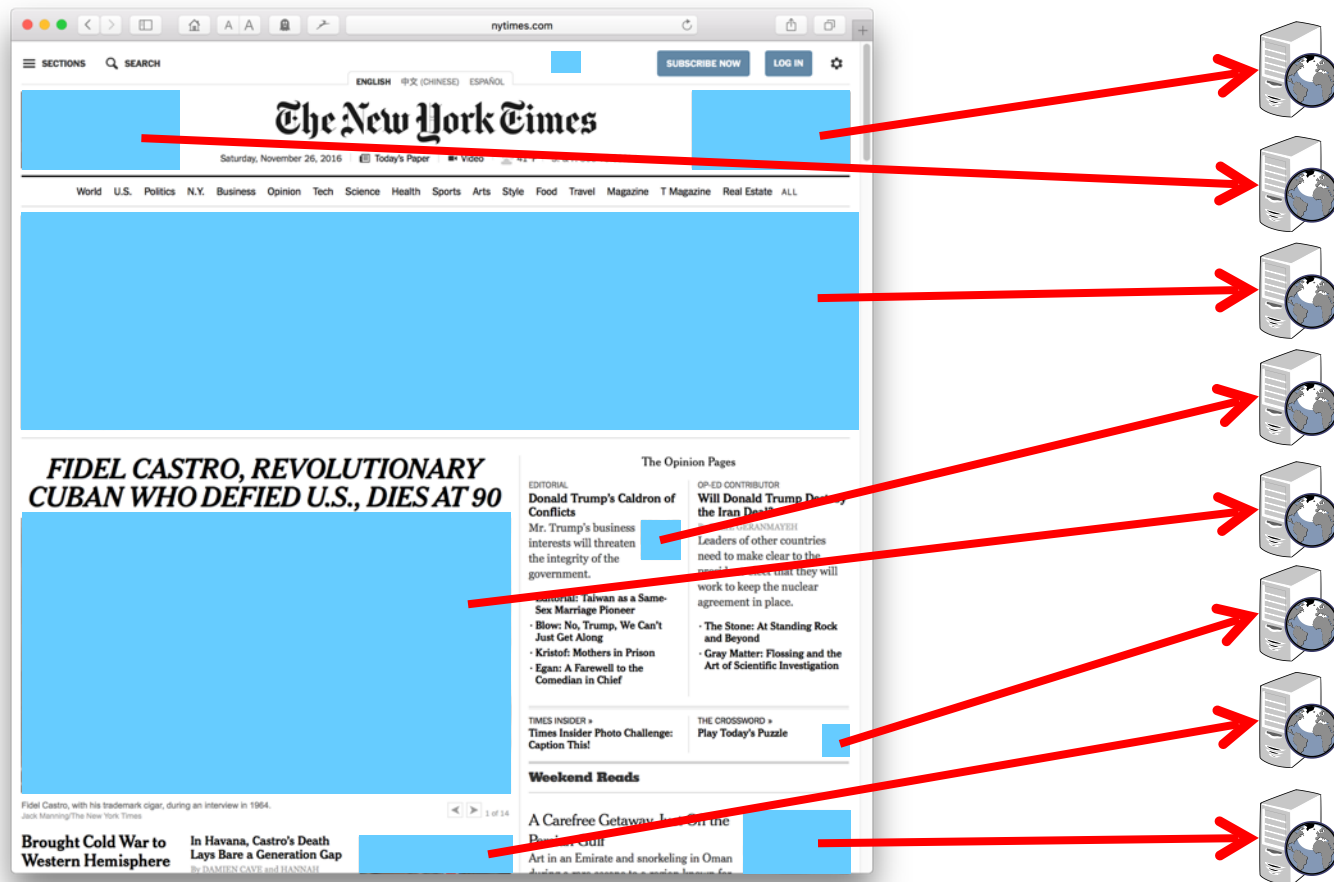


Web server

Browser makes HTTP requests for every object embedded in page

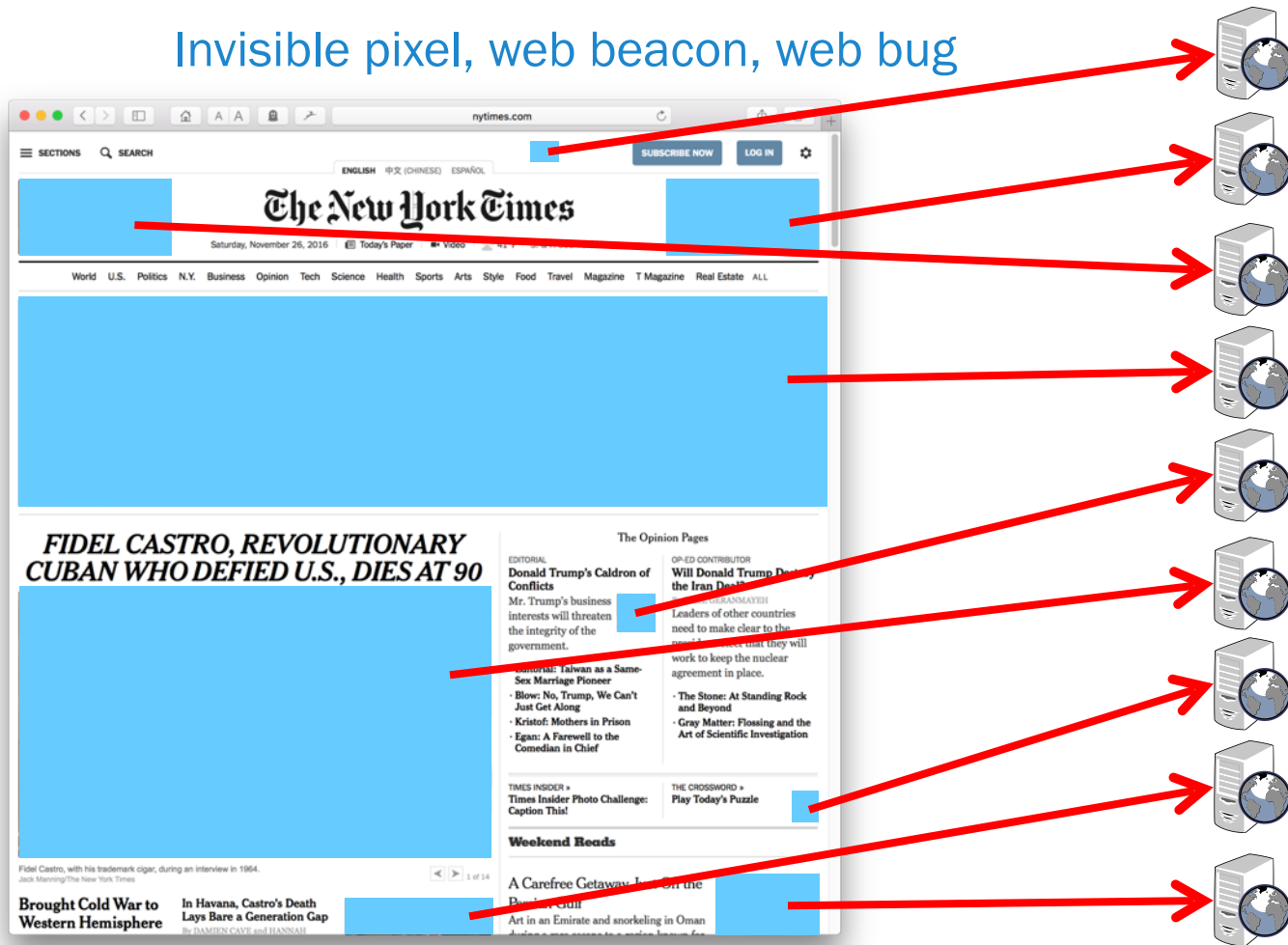


Browser makes HTTP requests for every object embedded in page



Browser makes HTTP requests for every object embedded in page

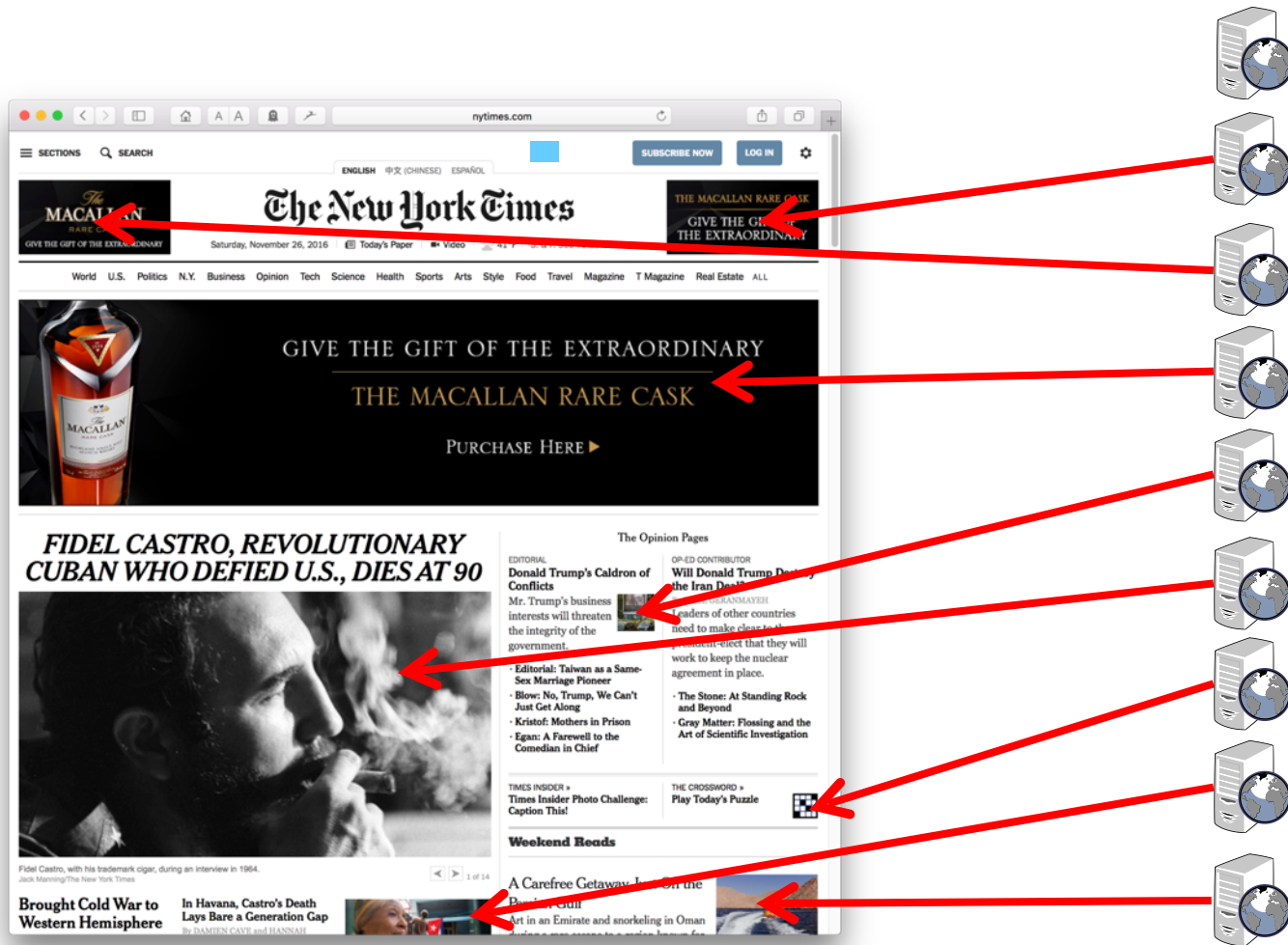
Invisible pixel, web beacon, web bug



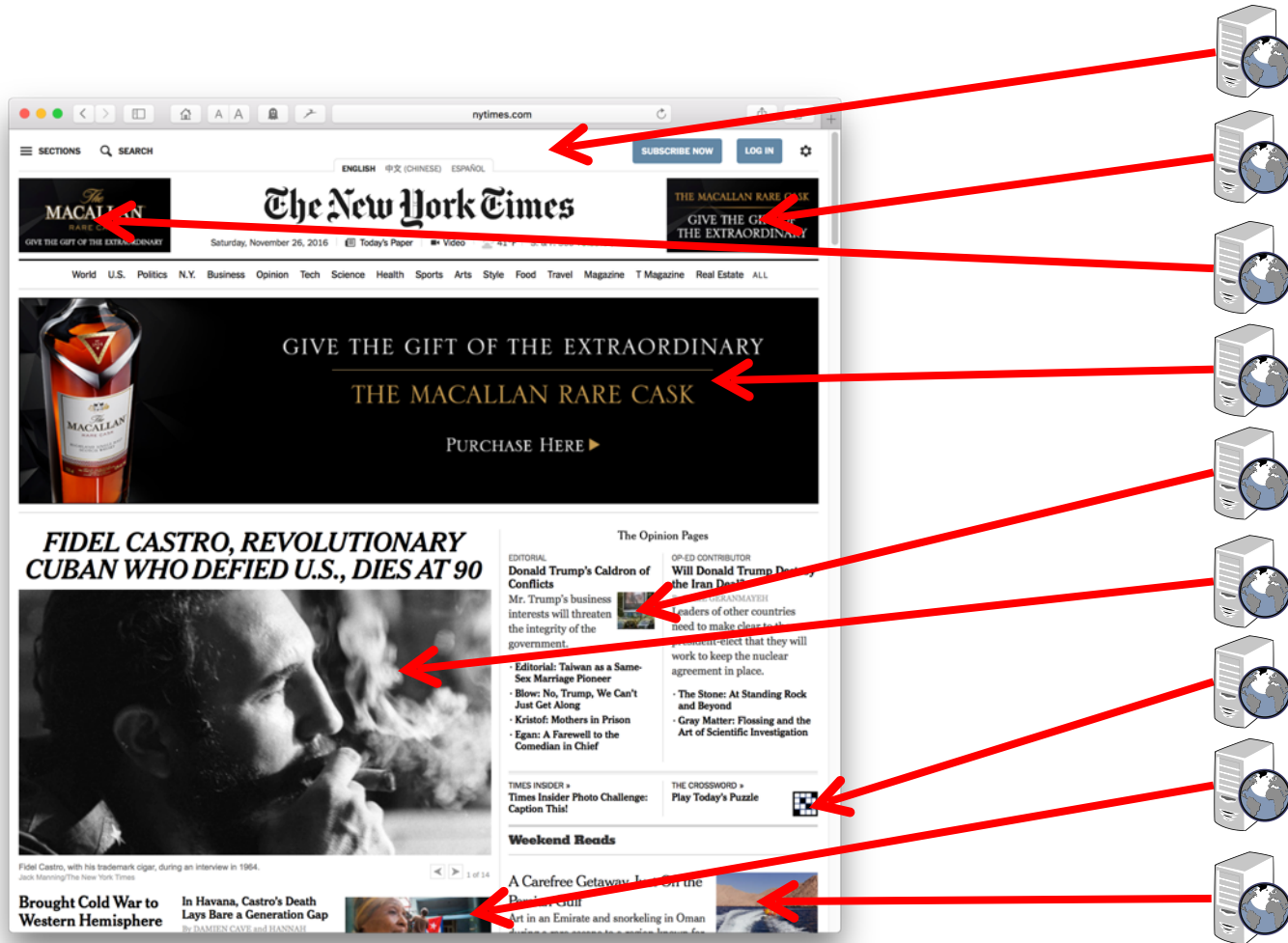
Web servers respond



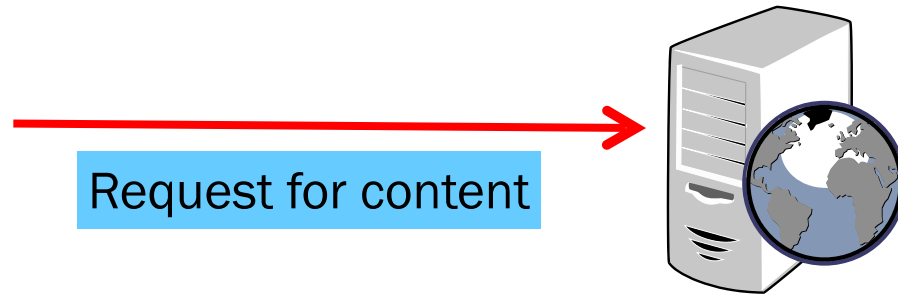
Web servers respond



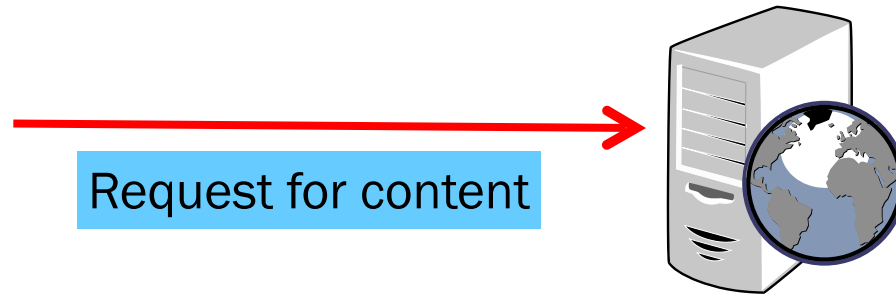
Web servers respond



What is in an HTTP request?

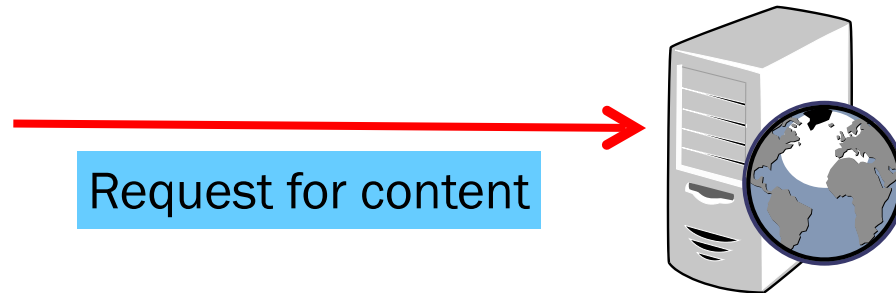


What is in an HTTP request?



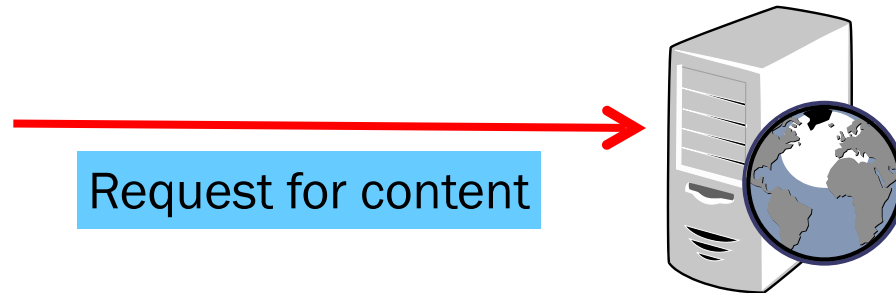
- Address of content being requested

What is in an HTTP request?



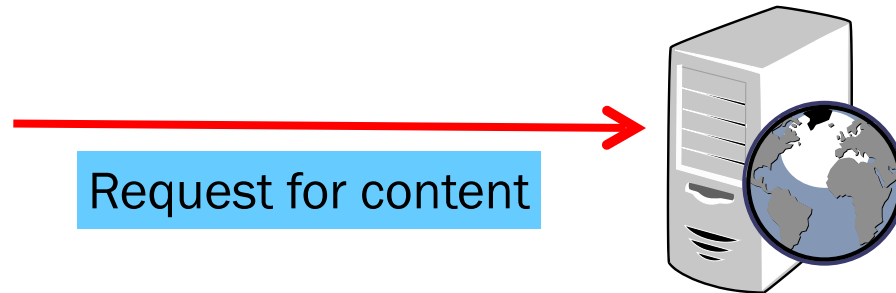
- Address of content being requested
- Text user typed into forms

What is in an HTTP request?



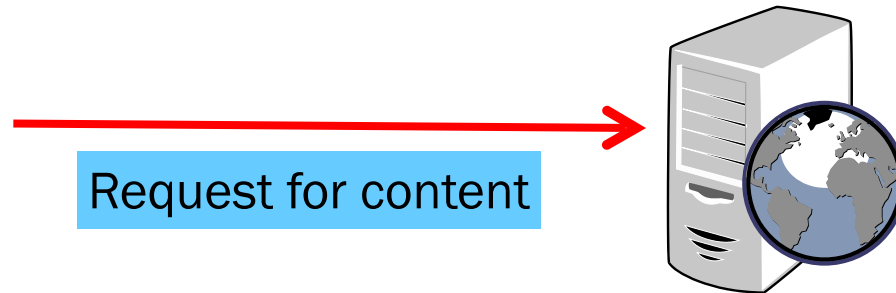
- Address of content being requested
- Text user typed into forms
- Referring website

What is in an HTTP request?



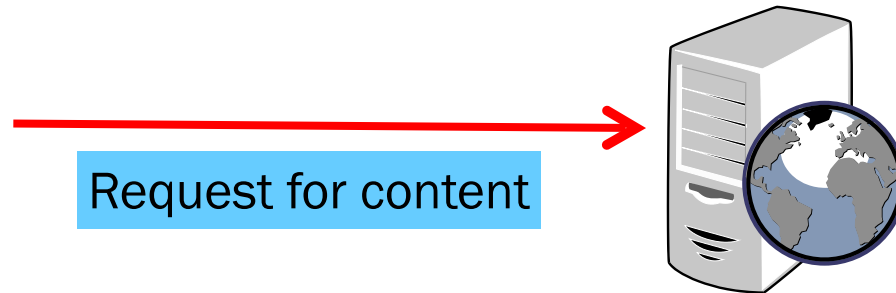
- Address of content being requested
- Text user typed into forms
- Referring website
- Type and version of user agent, platform

What is in an HTTP request?



- Address of content being requested
- Text user typed into forms
- Referring website
- Type and version of user agent, platform
- Characteristics of user agent and device
 - language, fonts, plugins, etc.

What is in an HTTP request?



- Address of content being requested
- Text user typed into forms
- Referring website
- Type and version of user agent, platform
- Characteristics of user agent and device
 - language, fonts, plugins, etc.
- Cookies

Content requested

- Address of requested content

GET /section/sports HTTP/1.1

GET /2016/11/26/sports/ncaafootball/ohio-state-buckeyes-michigan-wolverines-overtime.html HTTP/1.1

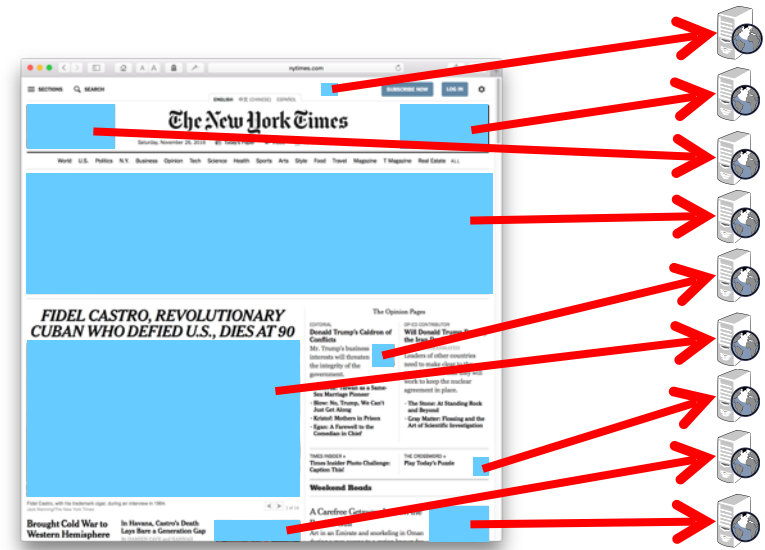
- Search queries or text typed into forms

GET /search?q=womens+soccer HTTP/1.1

Referer

- If you click on a link
 - The page that contains the link you clicked
- If a page is loading embedded content or ads
 - The page in which the content or ads are embedded
- May include search terms and form data

Referer: <http://www.nytimes.com/>



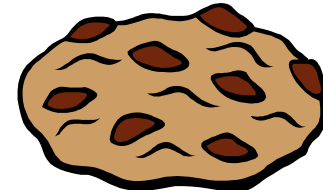
Referer: <http://query.nytimes.com/search/sitesearch?action=click&contentCollection=region=TopBar&WT.nav=searchWidget&module=SearchSubmit&pgtype=Homepage#/womens+soccer/>

Browser Characteristic	bits of identifying information	one in x browsers have this value	value
Limited supercookie test	0.42	1.34	DOM localStorage: Yes, DOM sessionStorage: Yes, IE userData: No
Hash of canvas fingerprint	7.93	243.84	4794755dcfab8cdd9b1ca201700eeb8e
Screen Size and Color Depth	4.88	29.43	1680x1050x24
Browser Plugin Details	6.29	78.11	Plugin 0: WebKit built-in PDF: : (Portable Document Format: application/pdf) (Port
Time Zone	3.65	12.52	
DNT Header Enabled?	0.82	1.76	
HTTP_ACCEPT Headers	4.75	27.0	
Hash of WebGL fingerprint	8.5	361.74	
Language	1.07	2.1	en-us
System Fonts	6.86	116.14	Andale Mono, Arial, Arial Black, Arial Hebrew, Arial Narrow, Arial Rounded MT Bold, Arial Unicode MS, Book Antiqua, Bookman Old Style, Calibri, Cambria, Cambria Math, Century, Century Gothic, Century Schoolbook, Comic Sans M S, Consolas, Courier, Courier New, Garamond, Geneva, Georgia, Helvetica, Helvetica Neue, Impact, Lucida Bright, Lucida Calligraphy, Lucida Console, Lucida Fax, LUCIDA GRANDE, Lucida Handwriting, Lucida Sans, Lucida Sans Typewriter, Lucida Sans Unicode, Microsoft Sans Serif, Monaco, Monotype Corsiva, MS Gothic, MS PGothic, MS Reference Sans Serif, MYRIAD PRO, Palatino, Palatino Linotype, Tahoma, Times, Times New Roman, Trebuchet MS, Verdana, Wingdings, Wingdings 2, Wingdings 3 (via javascript)
Platform	3.03	8.14	MacIntel
User Agent	8.41	339.95	Mozilla/5.0 (Macintosh; Intel Mac OS X 10_11_6) AppleWebKit/602.2.14 (KHTML, like Gecko) Version/10.0.1 Safari/602.2.14
Touch Support	0.5	1.41	Max touchpoints: 0; TouchEvent supported: false; onTouchStart supported: false
Are Cookies Enabled?	0.2	1.15	Yes

PANOPTICCLICK

Is your browser safe against tracking?

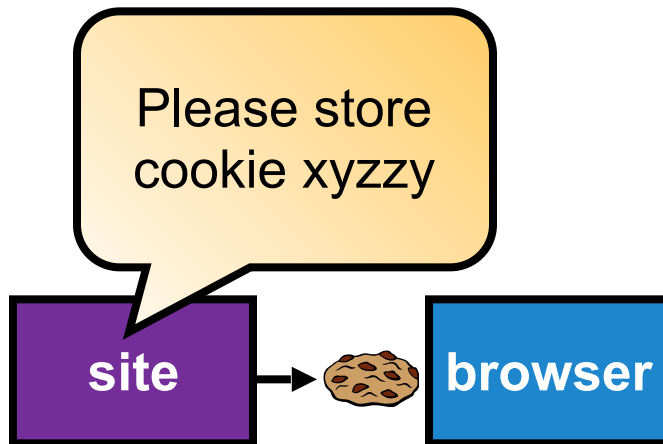
Cookies



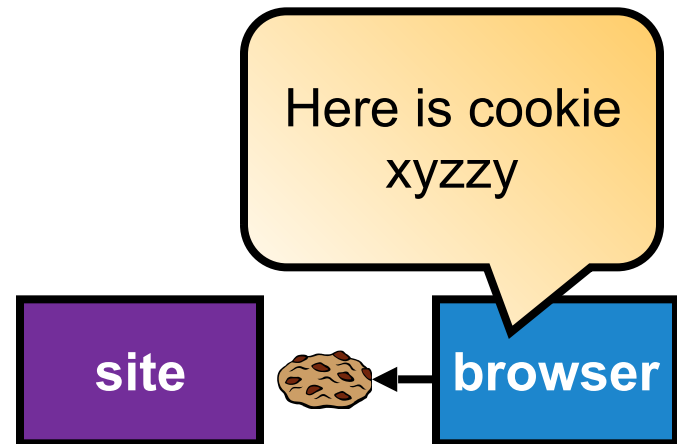
- **Maintain state** as you move around a website
 - Shopping carts
 - Multi-page forms
 - Saving preferences
- Recognize return visitors

Basic cookies

- A cookie stores a small string of characters
- A web site asks your browser to **set** a cookie
- Browser sends cookie whenever you return to site



First visit to site



Later visits

Cookie parameters

- By default, cookies are sent back to any host in a domain forever
- Sites can set time limit for cookies
 - **Session cookies** only sent for duration of browsing session
- Sites can restrict cookies to only certain hosts, directories, or files



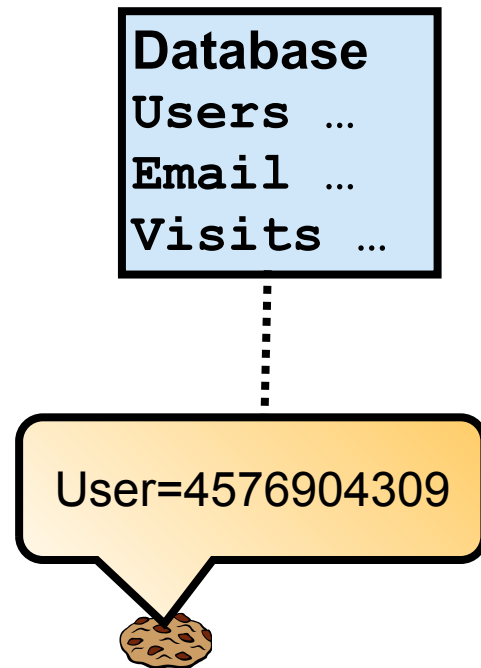
Cookie content

- Cookies can store user info or a database key that is used to look up user info



Cookie: user=joe; email=joe@x.com; visits=13

- User is just as linkable either way



Cookie: user=457690439

Settings chrome://settings

Chrome Settings

History Extensions Settings About

Search settings

Sign in
Signed in as lorrie@cs.cmu.edu. Manage your synced data on [Google Dashboard](#).

Disconnect your Google Account... Advanced sync settings...

On startup

- Open the New Tab page
- Continue where you left off
- Open a specific page or set of pages. [Set pages](#)

Appearance

Get themes Reset to default theme


- Show Home button
lorrie.cranor.org/ [Change](#)
- Always show the bookmarks bar

Search

Set which search engine is used when searching from the [omnibox](#).

Google Manage search engines...

People

 **Lorrie (current)**

- Enable Guest browsing
- Let anyone add a person to Chrome

Add person... Edit... Remove... Import bookmarks and settings...

Default browser

Make Google Chrome the default browser

Google Chrome is not currently your default browser.

[Show advanced settings...](#)

You can examine cookies stored by your browser

Chrome Settings

Search settings

Sign in

Signed in as lorrie@cs.cmu.edu. Manage your synced data on [Google Dashboard](#).

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[Add person...](#) [Edit...](#) [Remove...](#) [Import bookmarks and settings...](#)

Default browser

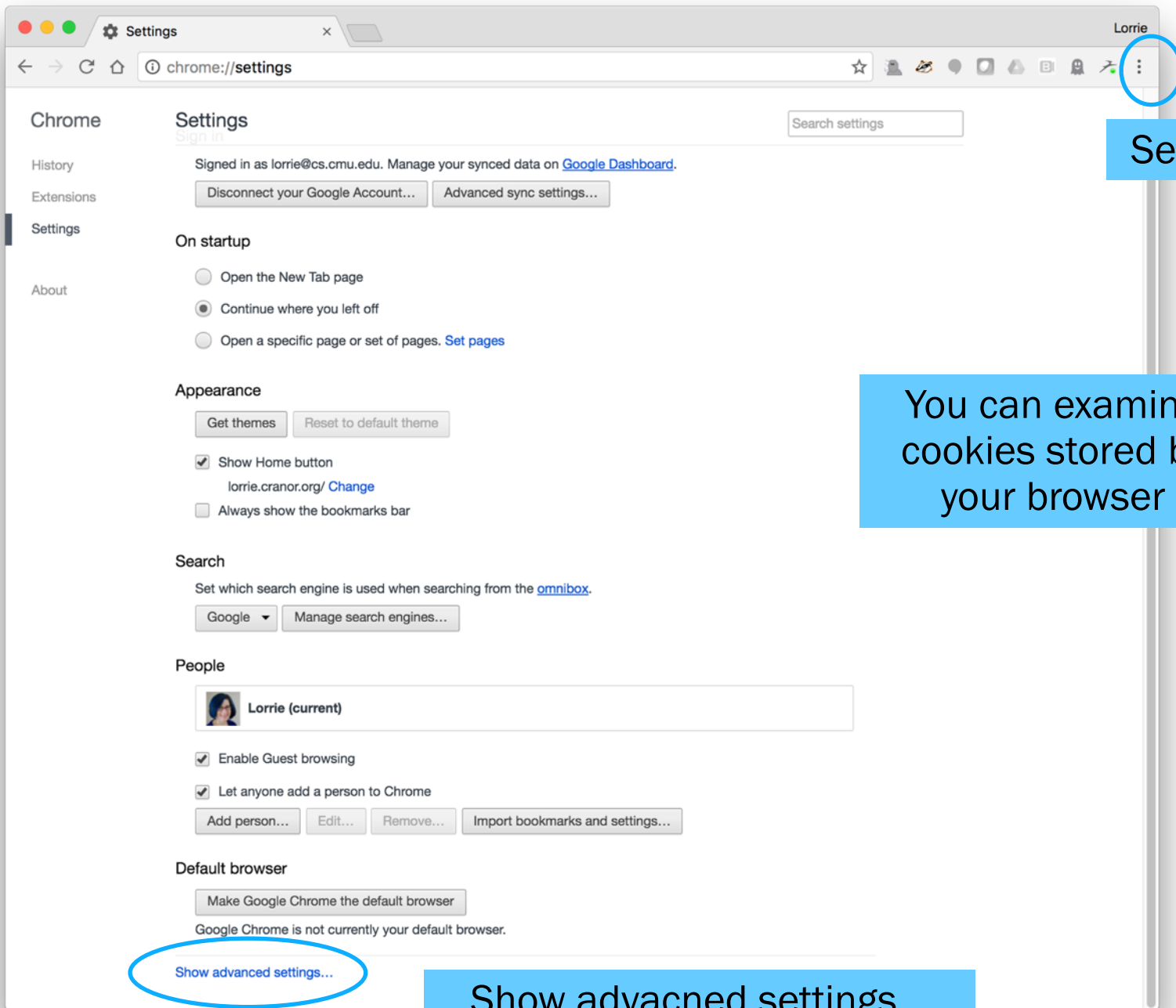
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Settings

You can examine cookies stored by your browser



Settings

You can examine cookies stored by your browser

Show advanced settings...

Settings x Lorrie

chrome://settings

Chrome Settings

History

Extensions

Settings

About

Default browser

Privacy

Passwords and forms

Web content

Network

Search settings

Add person... Edit... Remove... Import bookmarks and settings...

Make Google Chrome the default browser

Google Chrome is not currently your default browser.

Content settings... Clear browsing data...

Google Chrome may use web services to improve your browsing experience. You may optionally disable these services. [Learn more](#)

- Use a web service to help resolve navigation errors
- Use a prediction service to help complete searches and URLs typed in the address bar
- Use a prediction service to load pages more quickly
- Automatically report details of possible security incidents to Google
- Protect you and your device from dangerous sites
- Use a web service to help resolve spelling errors
- Automatically send usage statistics and crash reports to Google
- Send a "Do Not Track" request with your browsing traffic

Enable Autofill to fill out web forms in a single click. [Manage Autofill settings](#)

Offer to save passwords with Google Smart Lock for Passwords. [Manage passwords](#)

Font size: Medium Customize fonts...

Page zoom: 100%

Pressing Tab on a webpage highlights links, as well as form fields

Google Chrome is using your computer's custom proxy settings to connect to the network.

Settings

chrome://settings

Chrome Settings

History

Extensions

Settings

About

Default browser

Make Google Chrome the default browser

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Google Chrome may use web services to improve your browsing experience. You may optionally disable these services. [Learn more](#)

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Passwords and forms

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Web content

Font size: Medium Customize fonts...

Page zoom: 100%

- Pressing Tab on a webpage highlights links, as well as form fields

Network

Google Chrome is using your computer's custom proxy settings to connect to the network.

Settings - Content settings x Lorrie

chrome://settings/content

Chrome Settings

History
Extensions
Settings
About

Default browser
Privacy

Web content

Font size: Medium

Page zoom: 100%

Content settings

Cookies

- Allow local data to be set (recommended)
- Keep local data only until you quit your browser
- Block sites from setting any data
- Block third-party cookies and site data

Images

- Show all images (recommended)
- Do not show any images

JavaScript

- Allow all sites to run JavaScript (recommended)
- Do not allow any site to run JavaScript

Key generation

- Allow all sites to use key generation in forms.

Settings - Content settings x Lorrie

chrome://settings/content

Chrome Settings

History
Extensions
Settings
About

Default browser
Privacy

Content settings

Enable Guest browsing
 Let sites set cookies and site data

Content settings

Cookies

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- Keep local data only until you quit your browser
- Block sites from setting any data
- Block third-party cookies and site data

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- Do not show any images

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- Allow all sites to run JavaScript (recommended)
- Do not allow any site to run JavaScript

Key generation

- Allow all sites to use key generation in forms.

Web content

Font size:

Page zoom:

Settings - Cookies and site data x Lorrie

chrome://settings/cookies

Chrome Settings

Enable Guest browsing

Cookies and site data

Remove all Search cookies

Site	Locally stored data
www.nypost.com	Local storage
nyt.com	1 cookie
static01.nyt.com	Flash data
nyti.ms	1 cookie
nytimes.com	15 cookies NYT-BCET NYT-Loc NYT-S RMID WRUID __CT_Data _sp_id.75b0 adxcl adxcs anchorview nyt-a nyt-m optimizelyBuckets optimizelyEndUserId optimizelySegments
beta620.nytimes.com	Local storage
bits.blogs.nytimes.com	Local storage
bucks.blogs.nytimes.com	Local storage
economix.blogs.nytimes.com	Local storage
gadgetwise.blogs.nytimes.com	Local storage
lens.blogs.nytimes.com	Local storage
op-talk.blogs.nytimes.com	Local storage

Done

Web content

Font size: Medium Customize fonts...

Page zoom: 100%

Settings - Cookies and site data x Lorrie

chrome://settings/cookies

Chrome Settings

Enable Guest browsing

Cookies and site data

Remove all Search cookies

Site	Locally stored data
www.nypost.com	Local storage
nyt.com	1 cookie
static01.nyt.com	Flash data
nyti.ms	1 cookie
nytimes.com	15 cookies NYT-BCET NYT-Loc NYT-S RMID WRUID __CT_Data _sp_id.7510 adxcl adxcs anchorview nyt-a nyt-m optimizelyBuckets optimizelyEndUser optimizelySegments
beta620.nytimes.com	Local storage
bits.blogs.nytimes.com	Local storage
bucks.blogs.nytimes.com	Local storage
economix.blogs.nytimes.com	Local storage
gadgetwise.blogs.nytimes.com	Local storage
lens.blogs.nytimes.com	Local storage
op-talk.blogs.nytimes.com	Local storage

Done

Web content

Font size: Medium Customize fonts...

Page zoom: 100%

Settings - Cookies and site data x Lorrie

chrome://settings/cookies

Chrome Settings

Enable Guest browsing

Cookies and site data

Remove all Search cookies

Site	Locally stored data
nyti.ms	1 cookie
nytimes.com	15 cookies
	NYT-BCET NYT-Loc NYT-S RMID WRUID __CT_Data _sp_id.75b0 adxcl adxcs anchorview nyt-a nyt-m optimizelyBuckets optimizelyEndUserId optimizelySegments
	<div style="border: 1px solid #ccc; padding: 5px;"> <p>Name: adxcl</p> <p>Content: l*45479=588d76cf:1 *4536f=6013964f:1 *45231=6013964f:1</p> <p>Domain: .nytimes.com</p> <p>Path: /</p> <p>Send for: Any kind of connection</p> <p>Accessible to script: Yes</p> <p>Created: Thursday, November 17, 2016 at 8:25:52 AM</p> <p>Expires: Friday, November 17, 2017 at 8:25:51 AM</p> <p>Remove</p> </div>
beta620.nytimes.com	Local storage
bits.blogs.nytimes.com	Local storage
bucks.blogs.nytimes.com	Local storage

Done

Web content

Font size: Medium Customize fonts...

Page zoom: 100%

Settings - Cookies and site data x Lorrie

chrome://settings/cookies

Chrome Settings

Enable Guest browsing

Cookies and site data

Remove all Search cookies

Site	Locally stored data
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	adxcs anchorview nyt-a nyt-m optimizelyBuckets optimizelyEndUserId
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bits.blogs.nytimes.com	Local storage
bucks.blogs.nytimes.com	Local storage

Done

Web content

Font size: Medium Customize fonts...

Page zoom: 100%

Delete

Settings - Cookies and site data x Lorrie

chrome://settings/cookies

Search settings

Enable Guest browsing

Cookies and site data

Site	Locally stored data
nyti.ms	1 cookie
nytimes.com	15 cookies
	<p>NYT-BCET NYT-Loc NYT-S RMID WRUID __CT_Data _sp_id.75b0 adxcl</p> <p>adxcs anchorview nyt-a nyt-m optimizelyBuckets optimizelyEndUserId</p> <p>optimizelySegments</p> <div><p>Name: adxcl</p><p>Content: l*45479=588d76cf:1 *4536f=6013964f:1 *45231=6013964f:1</p><p>Domain: .nytimes.com</p><p>Path: /</p><p>Send for: Any kind of connection</p><p>Accessible to script: Yes</p><p>Created: Thursday, November 17, 2016 at 8:25:52 AM</p><p>Expires: Friday, November 17, 2017 at 8:25:51 AM</p><p>Remove</p></div>
beta620.nytimes.com	Local storage
bits.blogs.nytimes.com	Local storage
bucks.blogs.nytimes.com	Local storage

Remove all Search cookies

Done

Web content

Font size: Medium Customize fonts...

Page zoom: 100%

Remove all

Delete

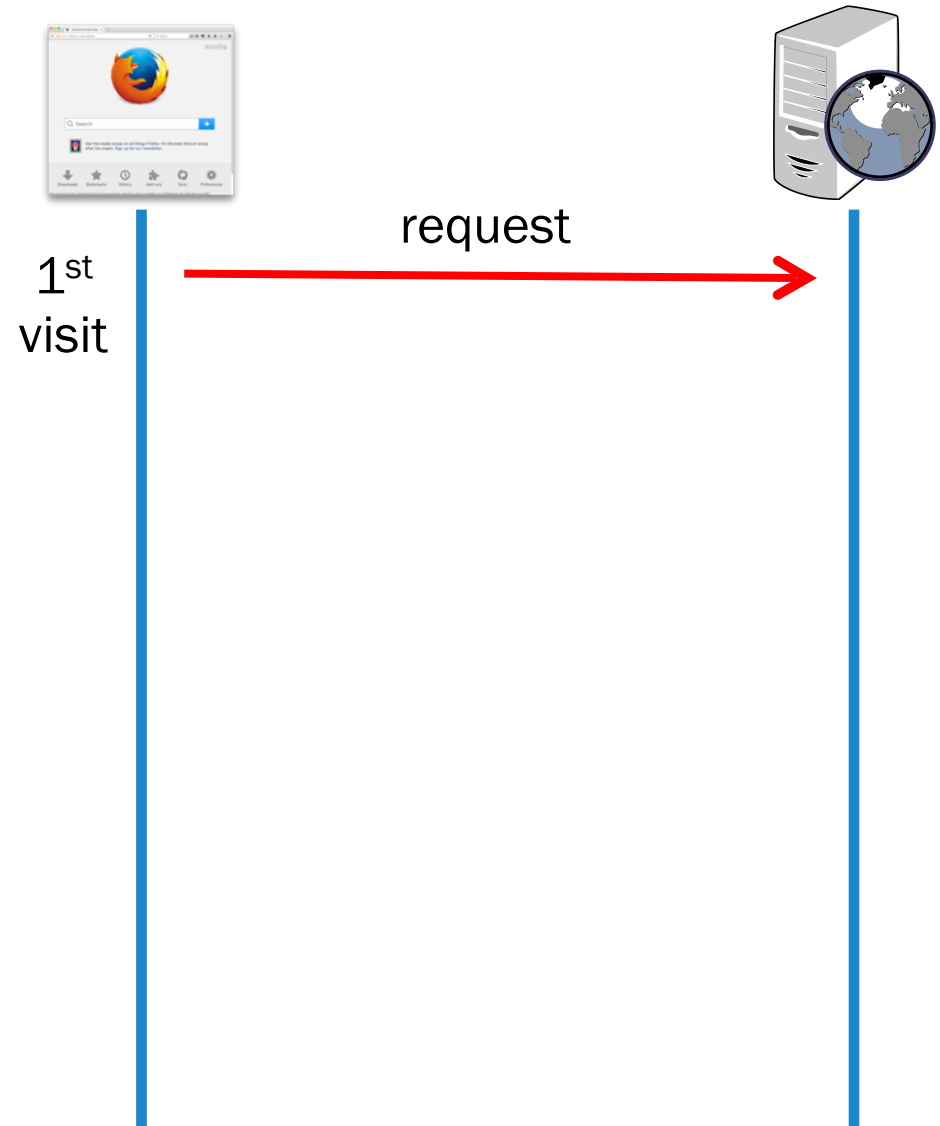
Cookie deletion

- If cookie is deleted by user or expires, no cookie is sent to website until a new cookie is set



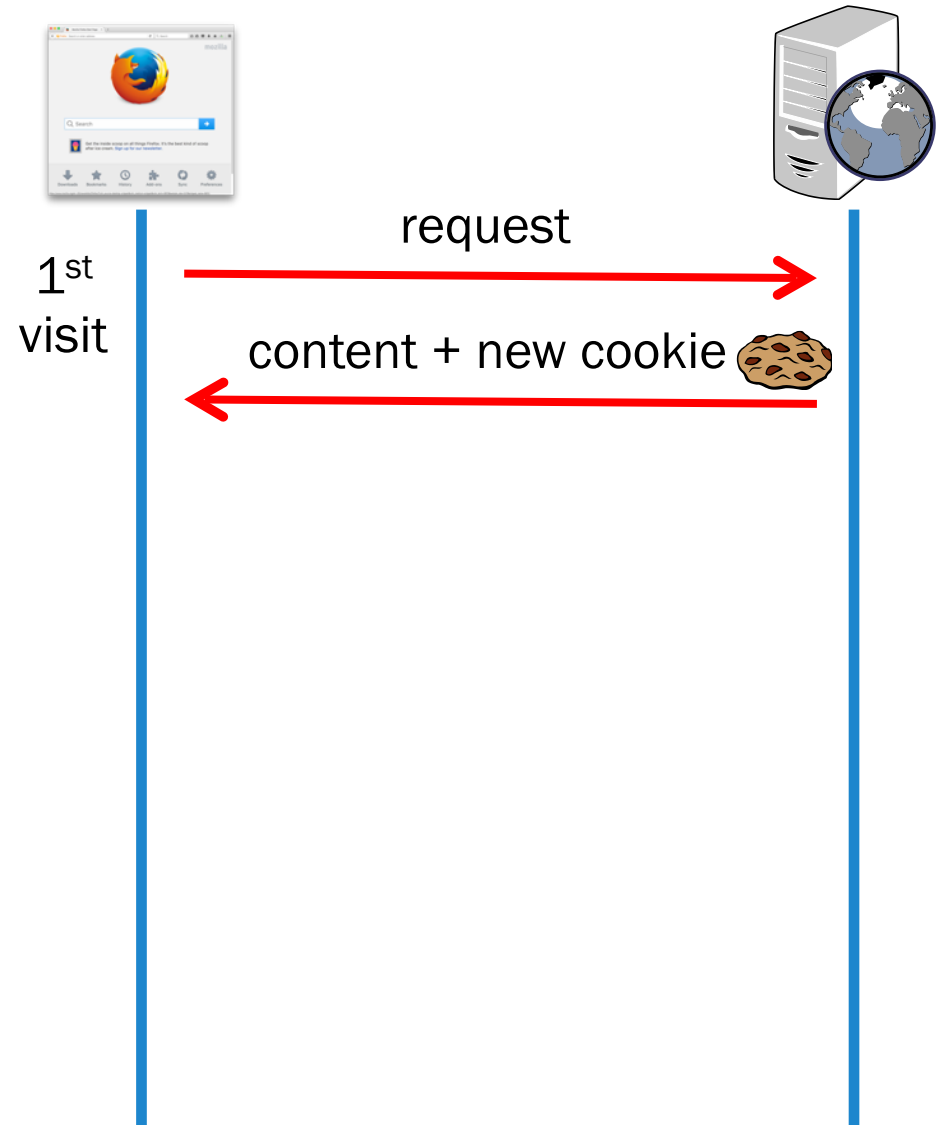
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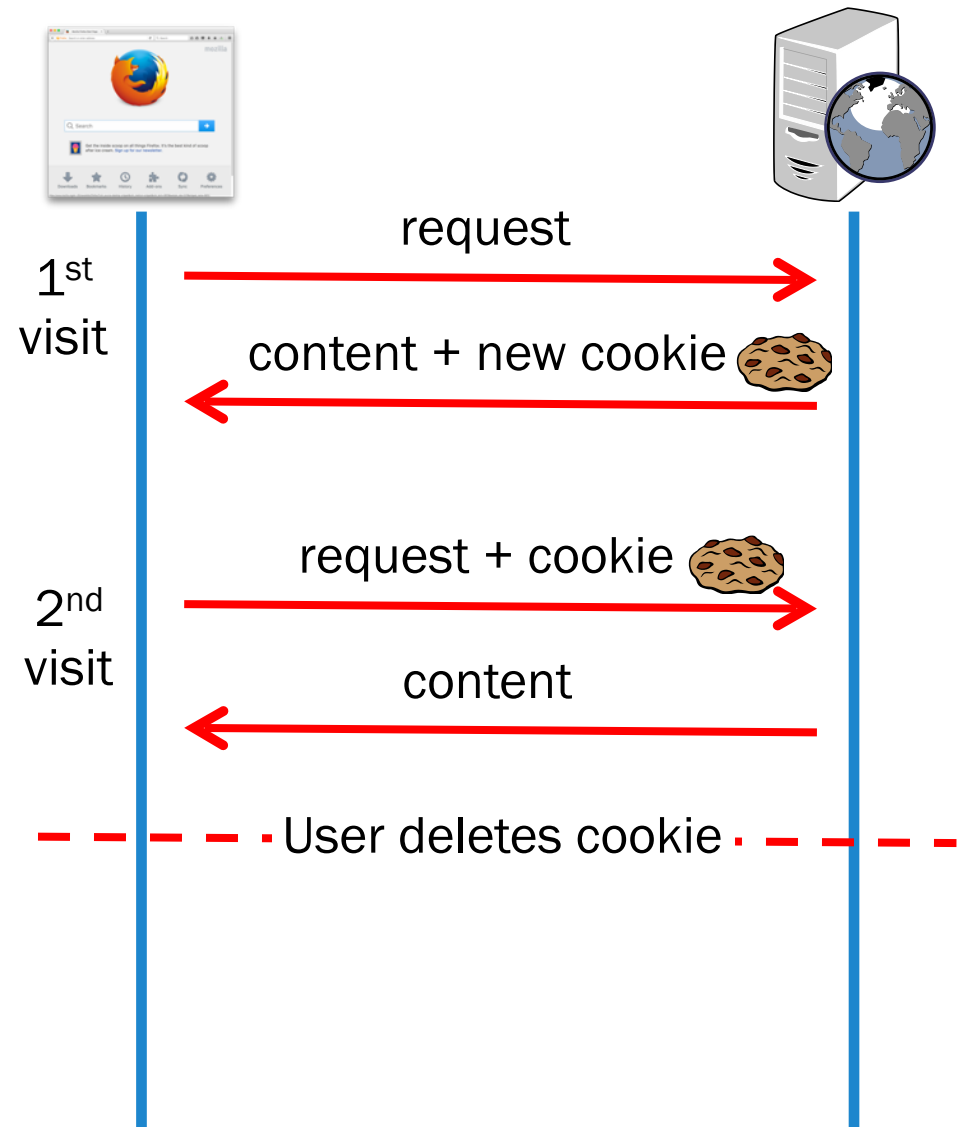
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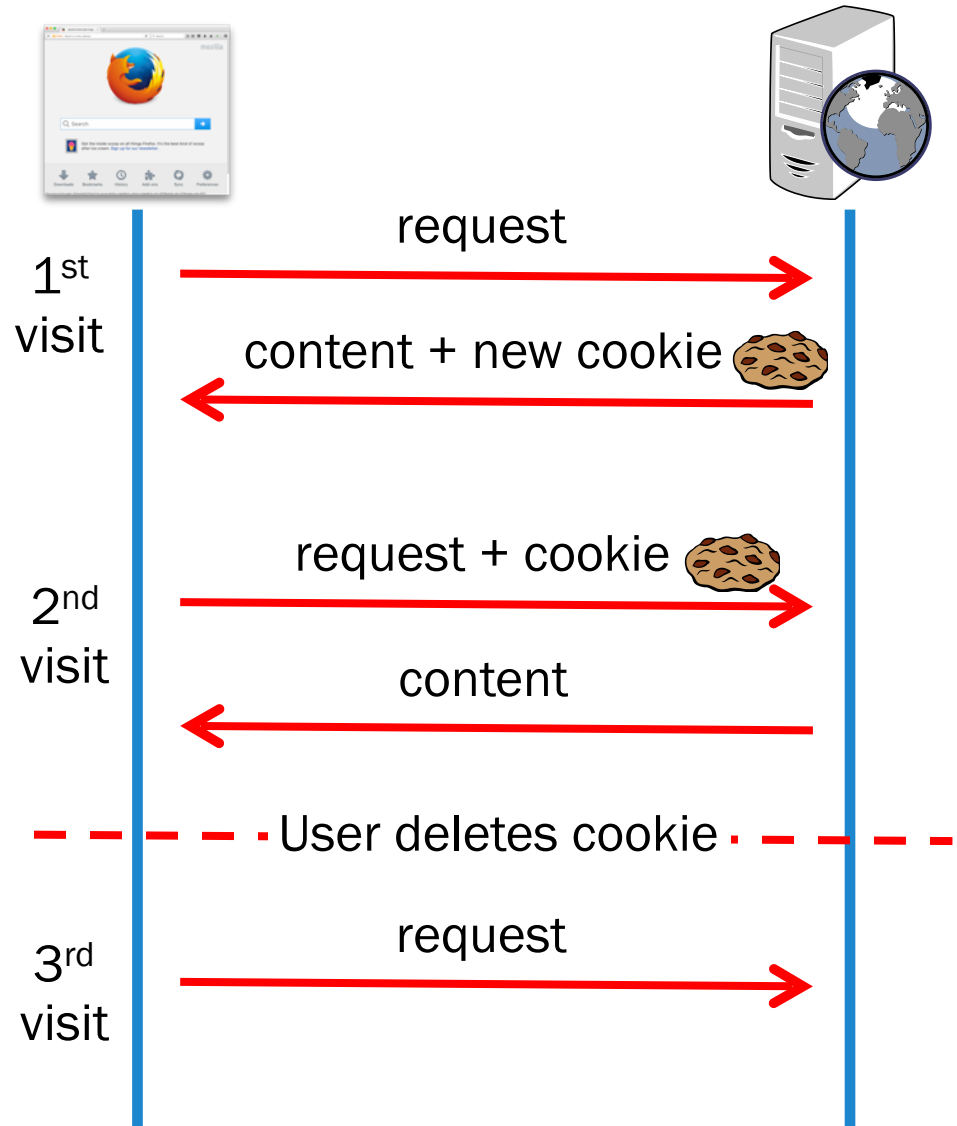
Cookie deletion

- If cookie is deleted by user or expires, no cookie is sent to website until a new cookie is set



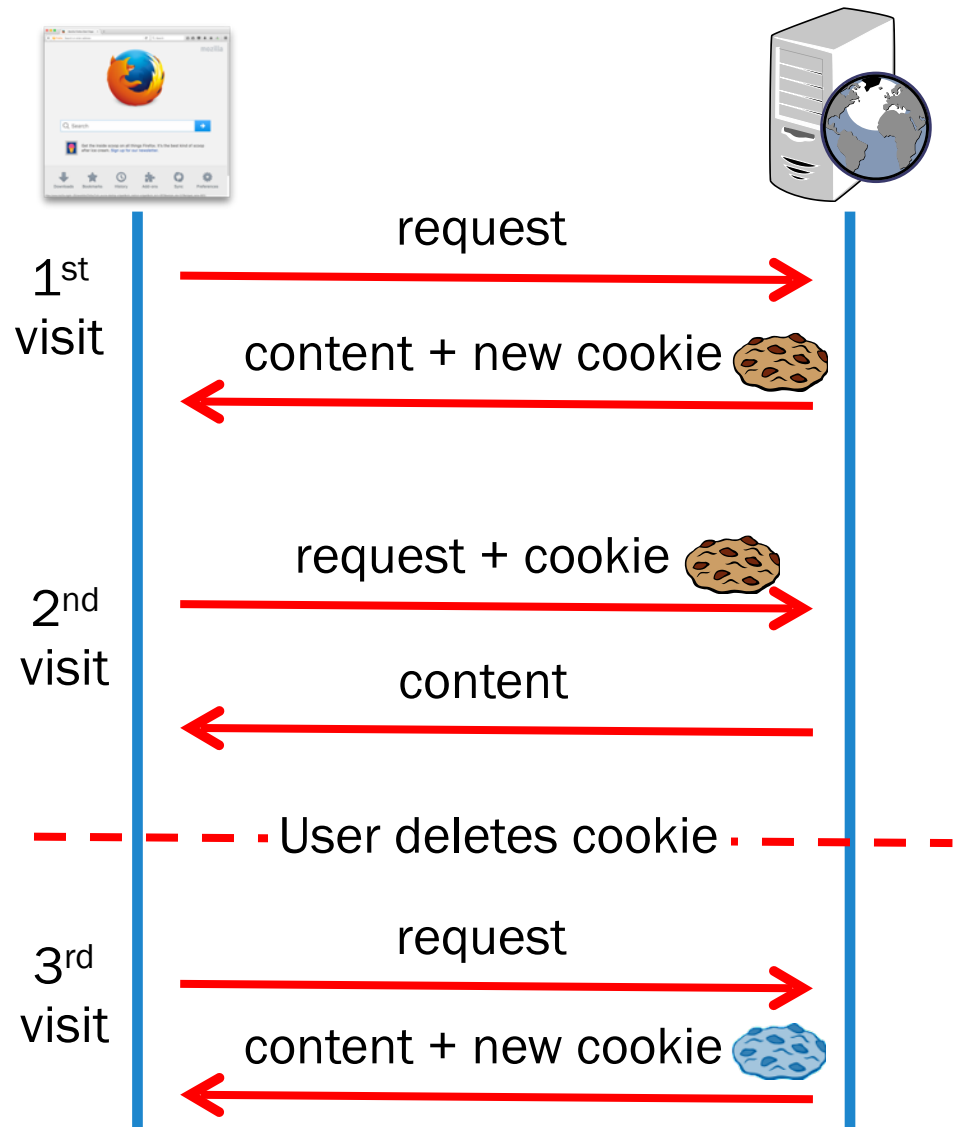
Cookie deletion

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Cookie deletion

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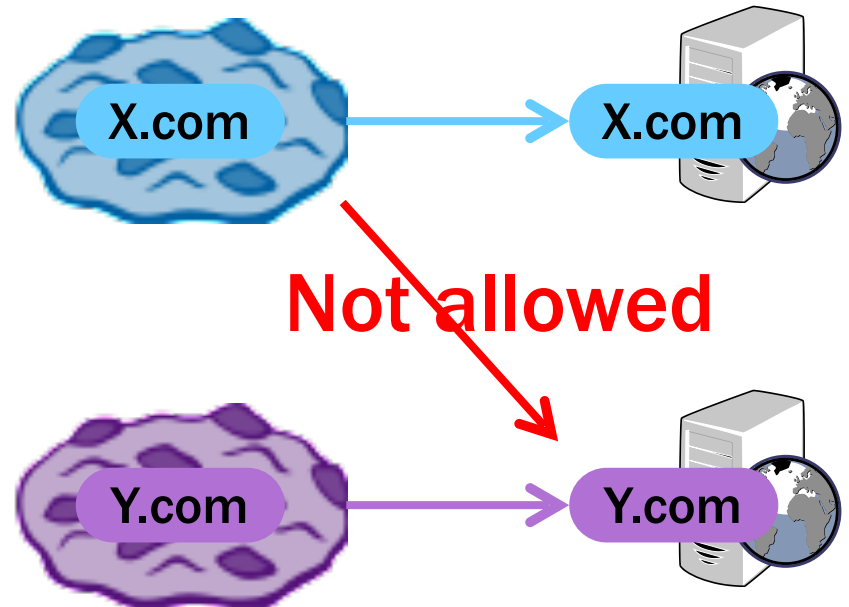


Same origin policy

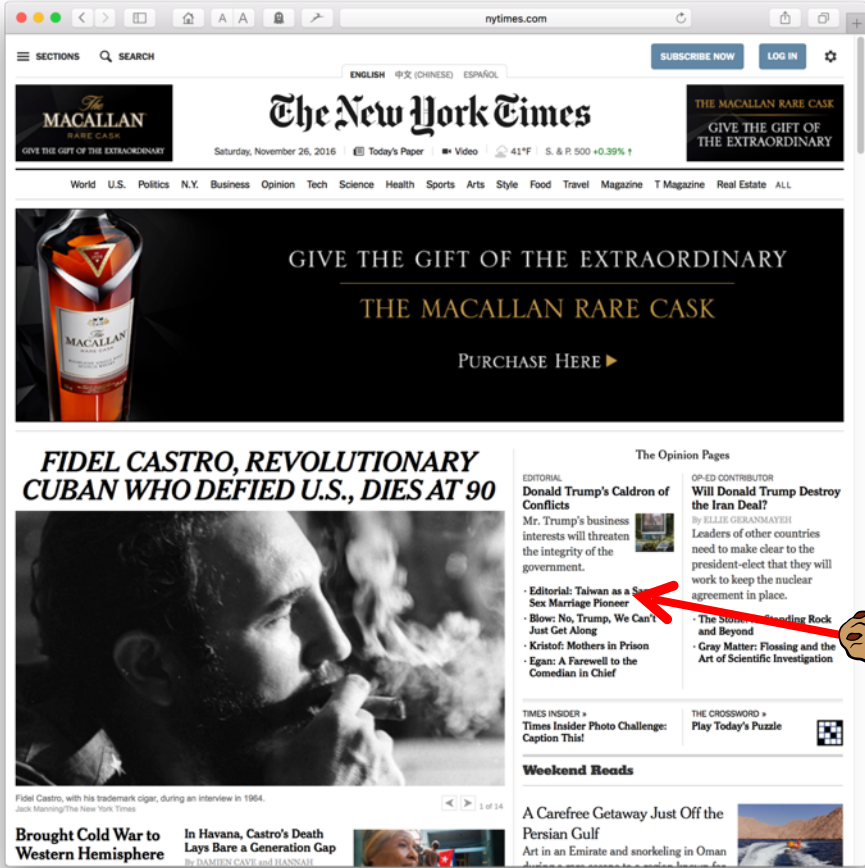


Same origin policy

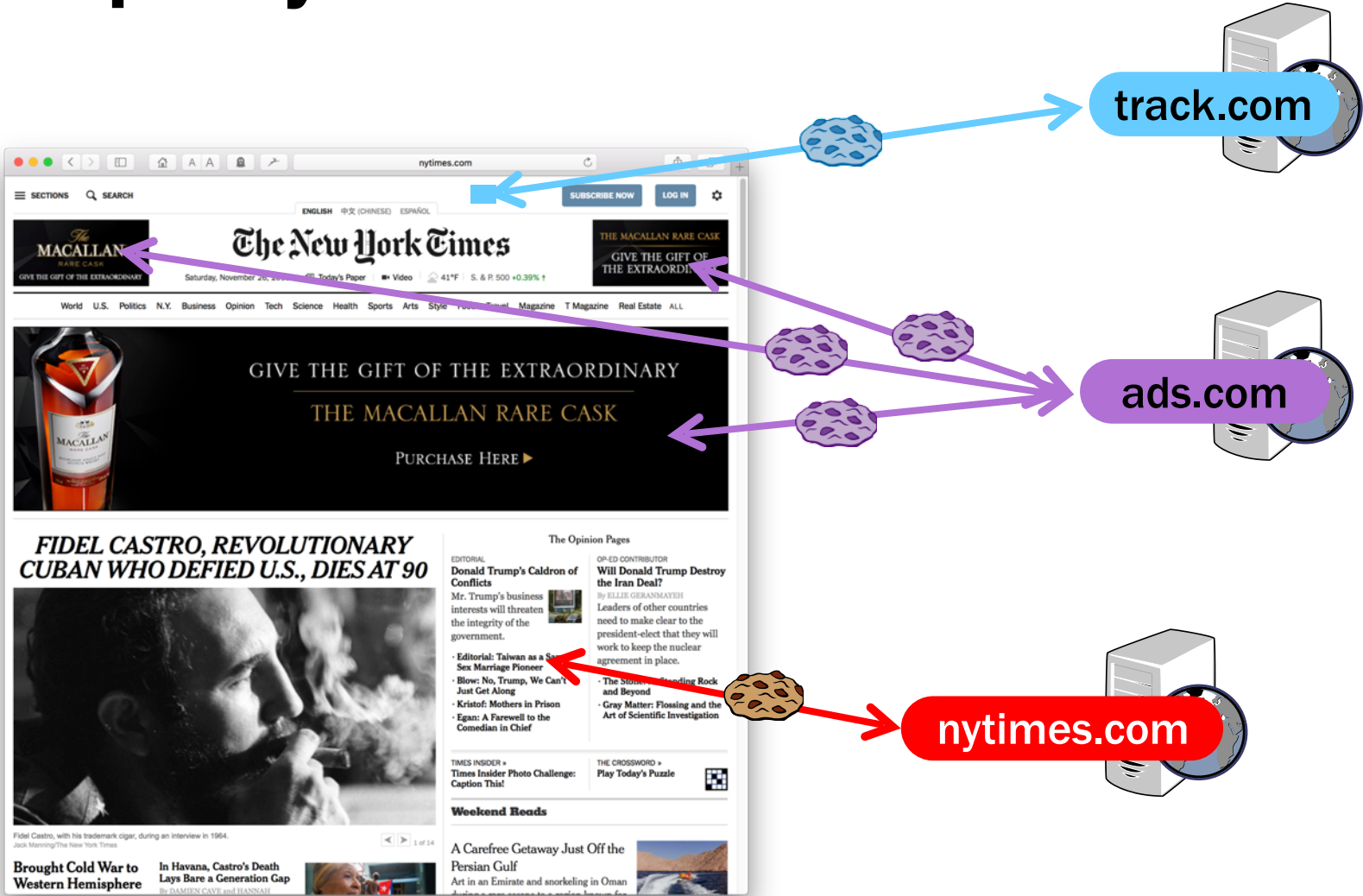
- Browsers can send cookies back only to the domain that set them
- Restriction designed to prevent tracking across sites
 - But, there are ways around this....



Third-party cookies

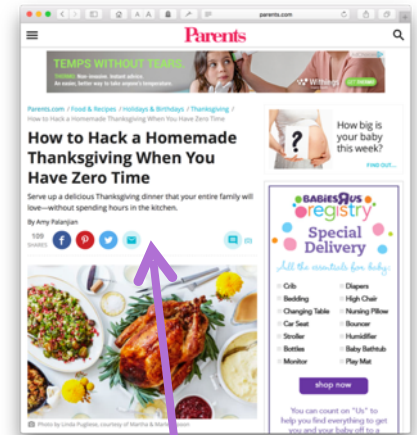


Third-party cookies

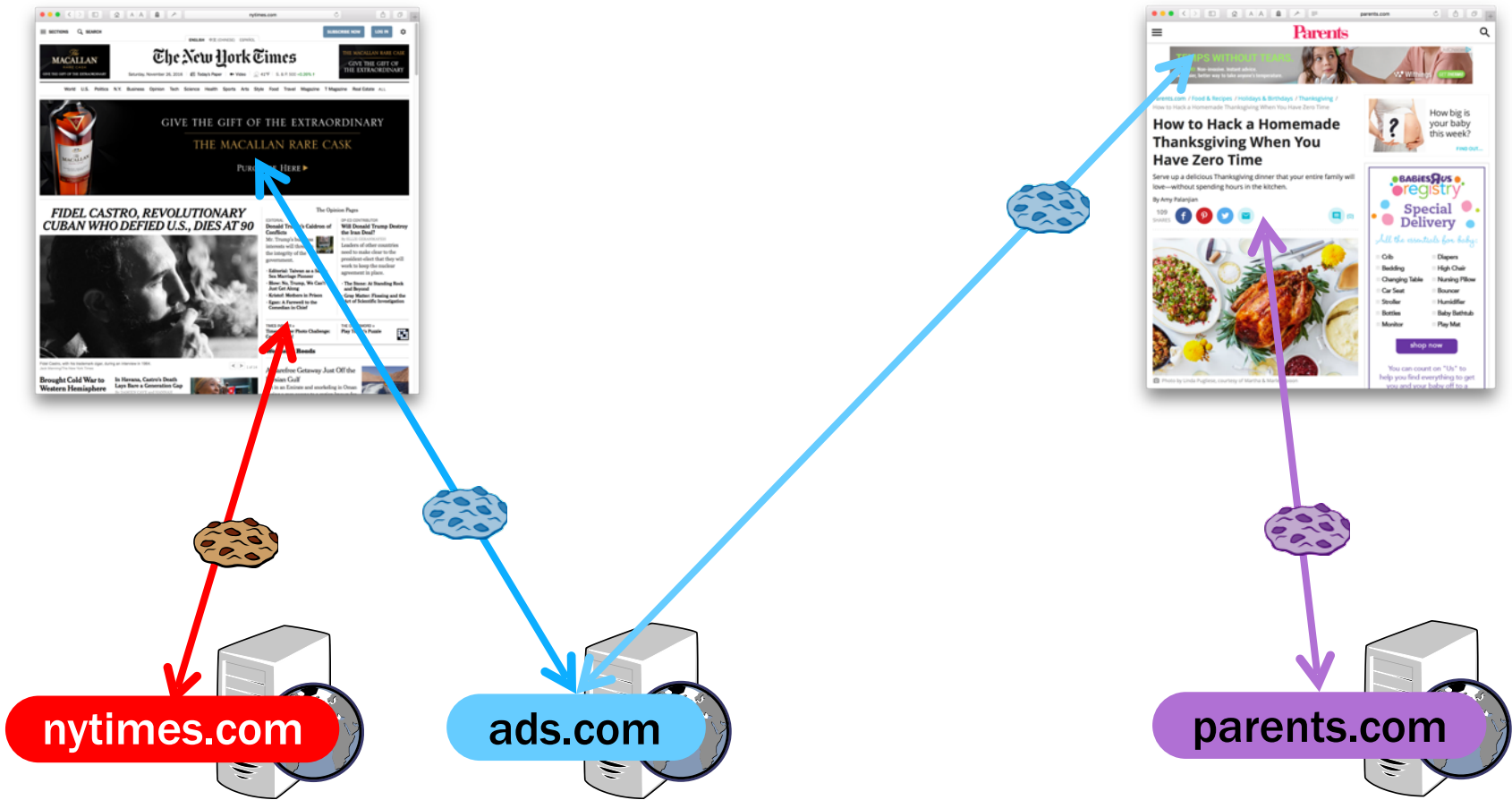


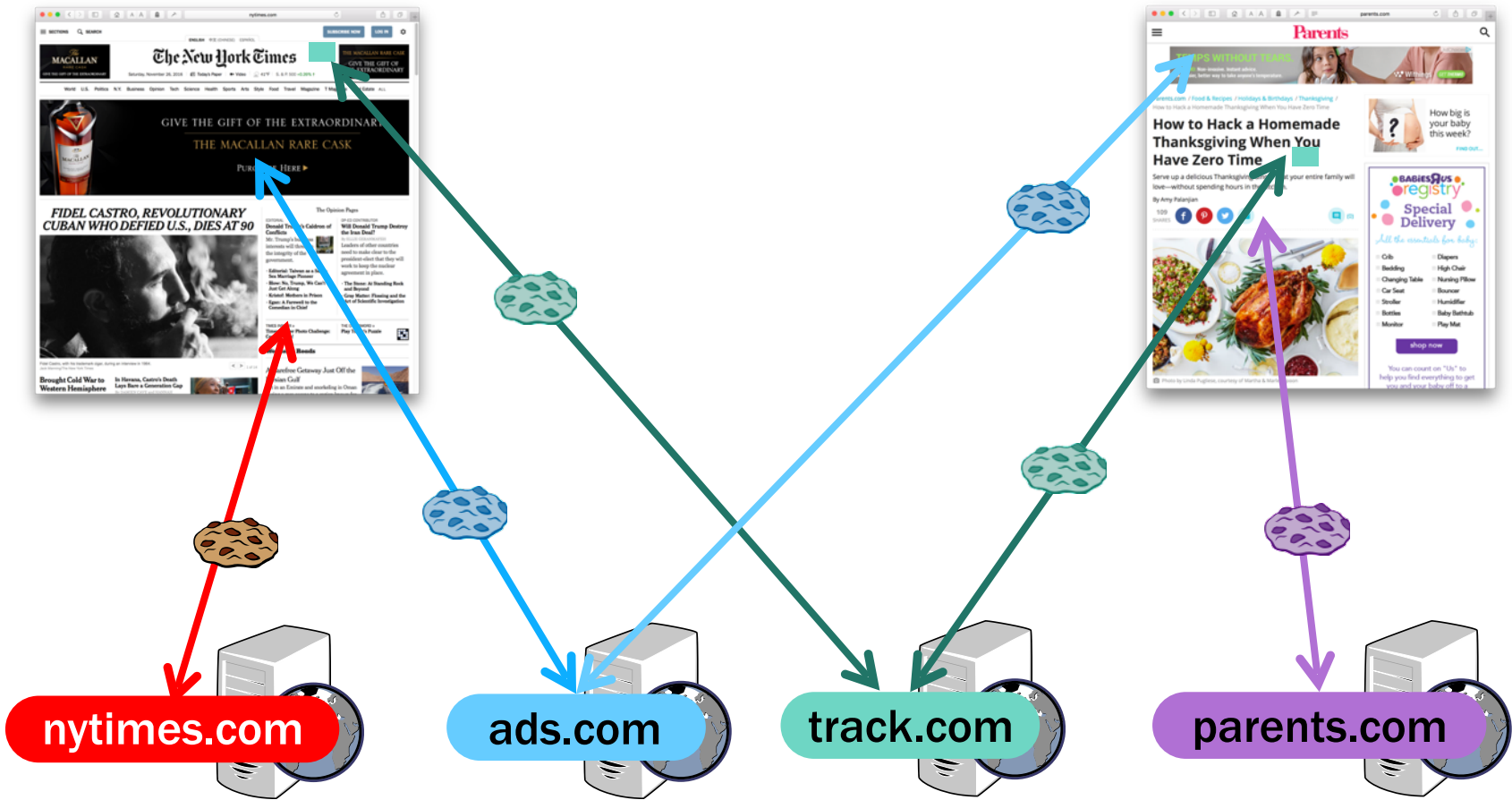


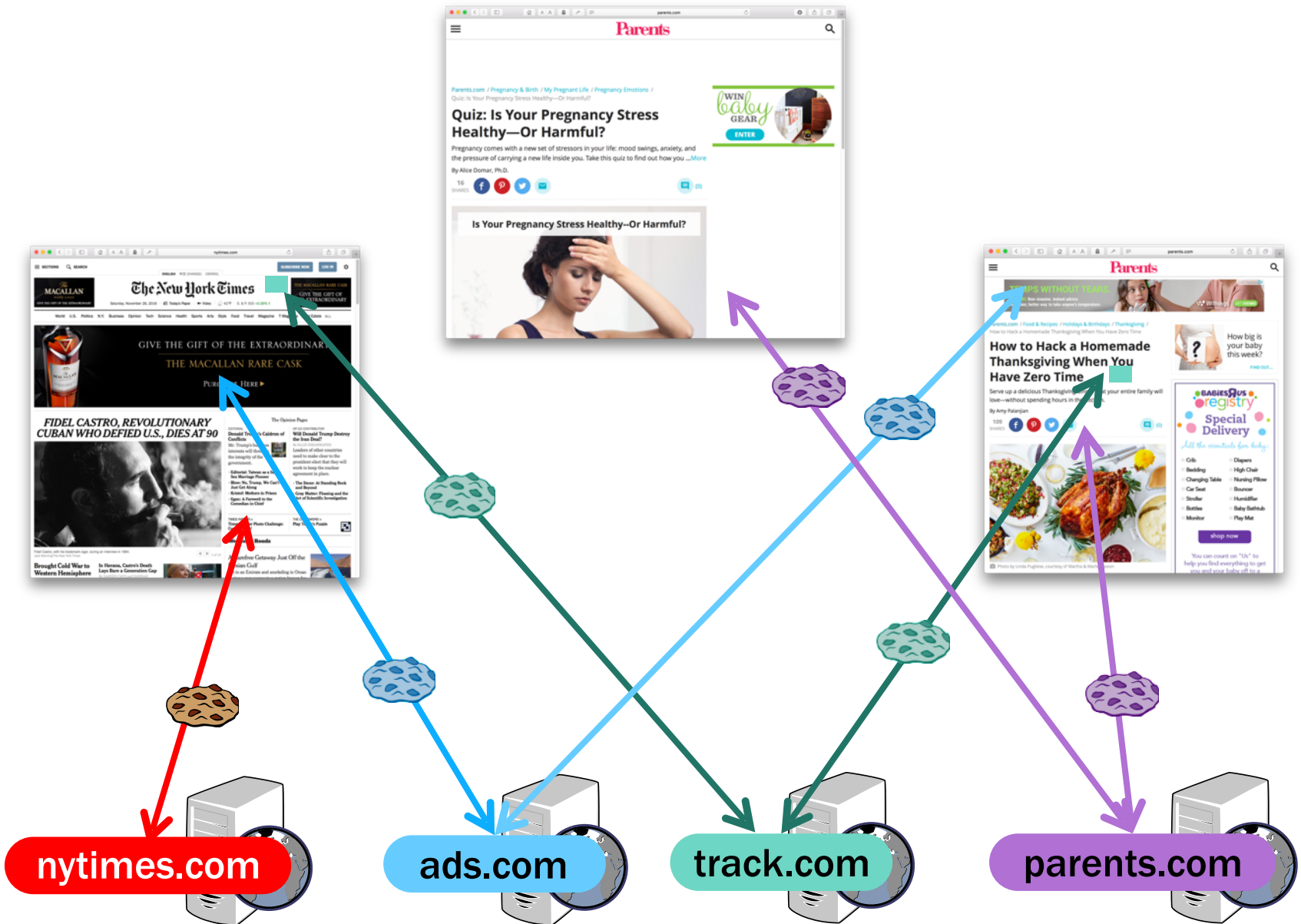
nytimes.com

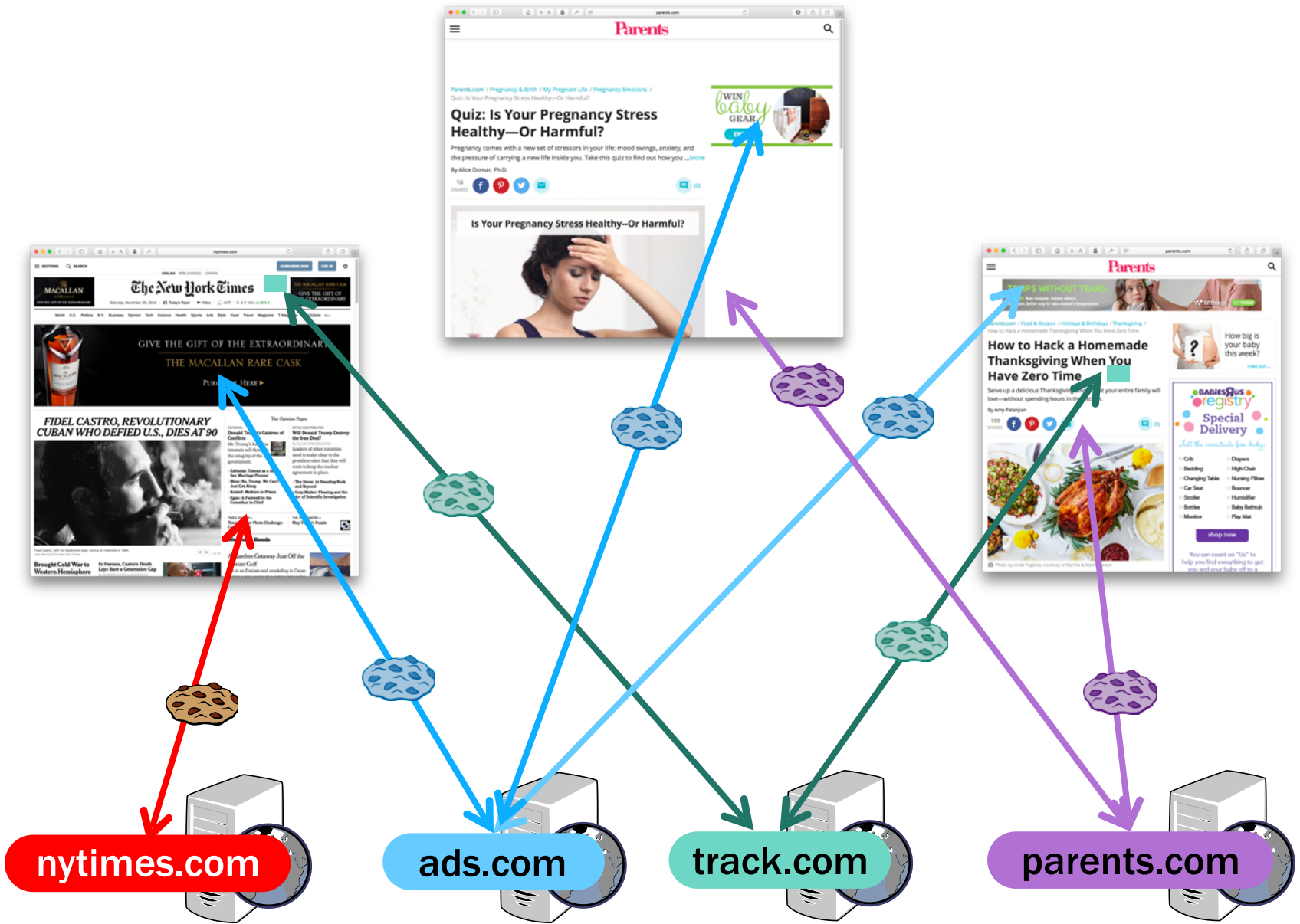


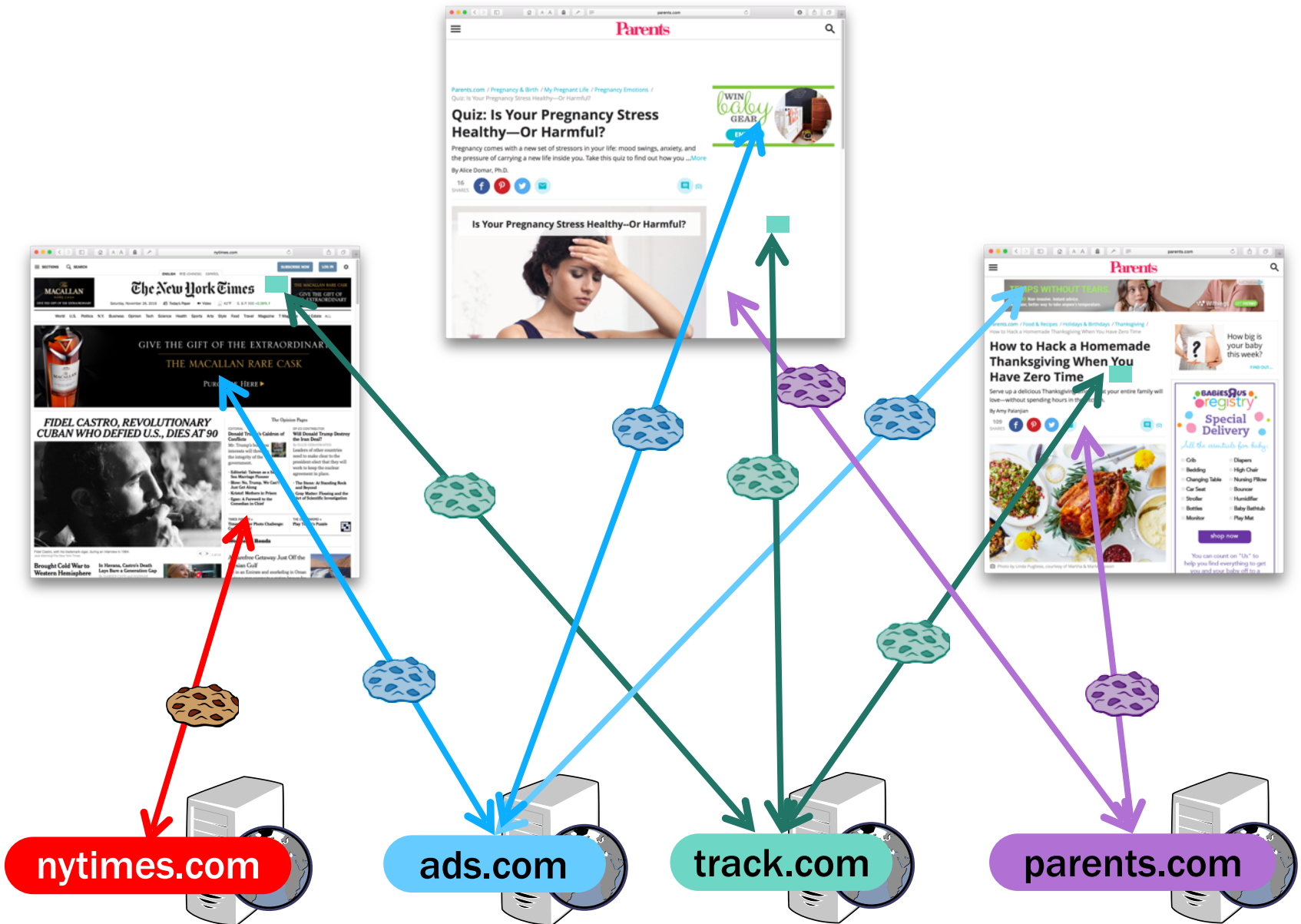
parents.com

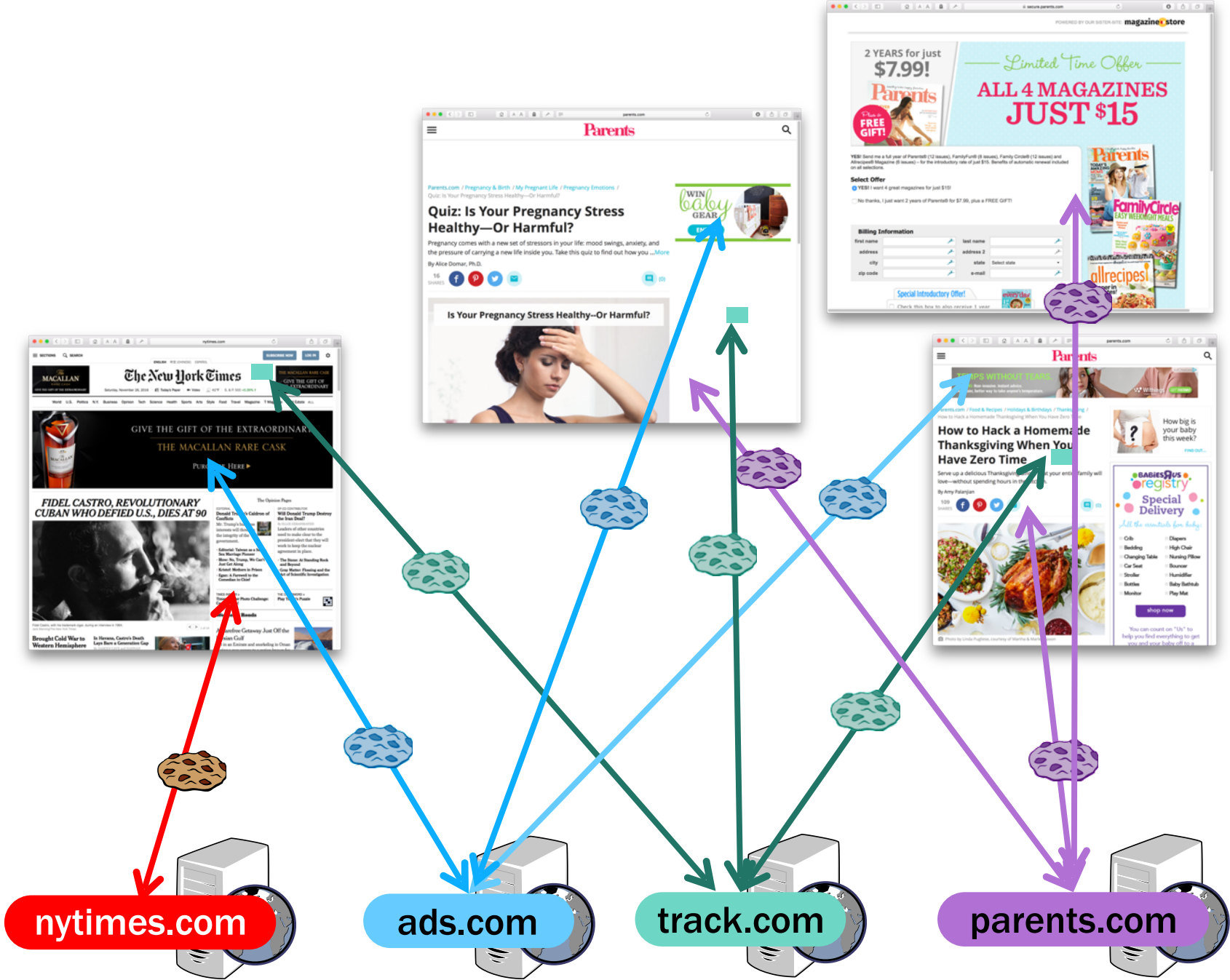


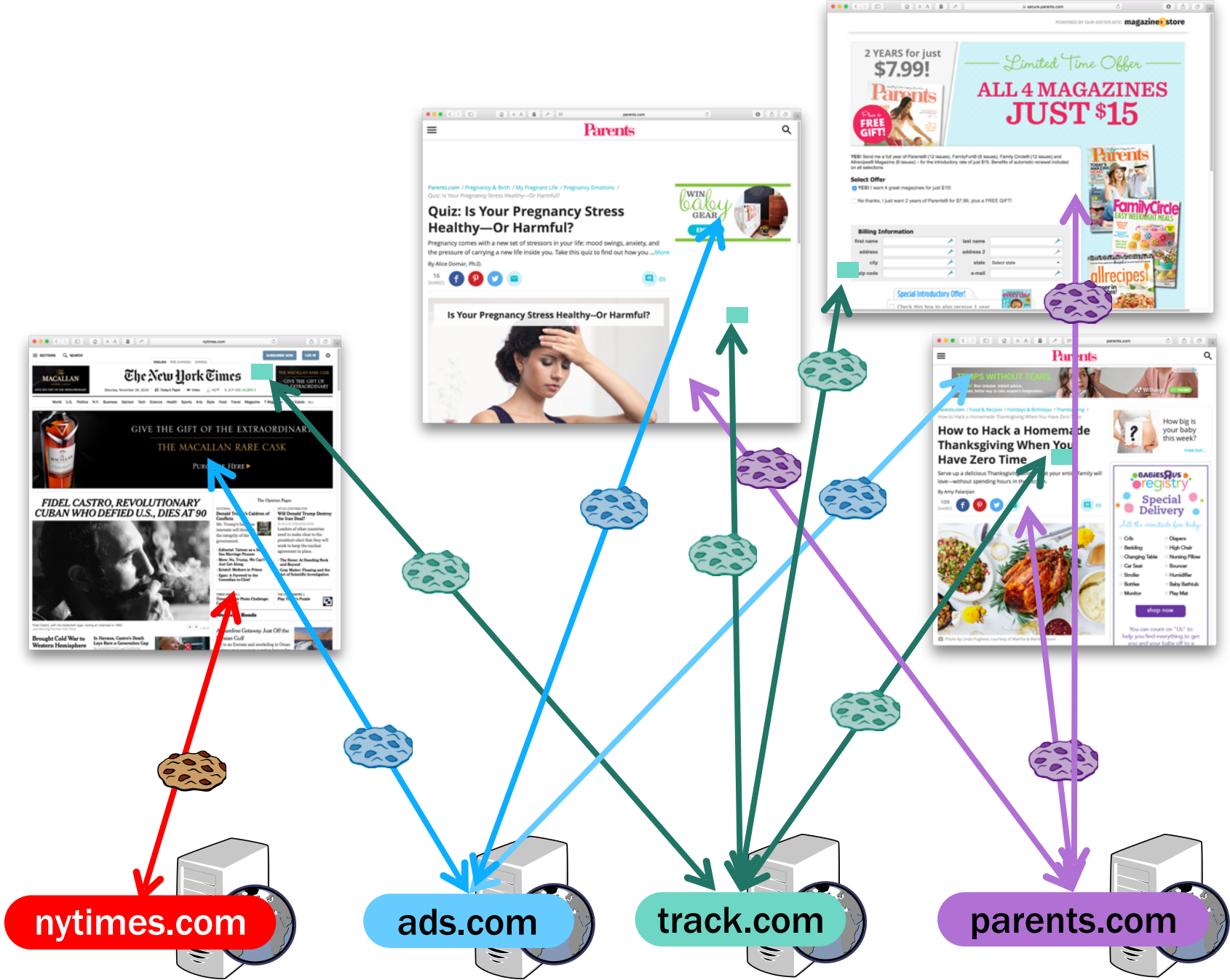






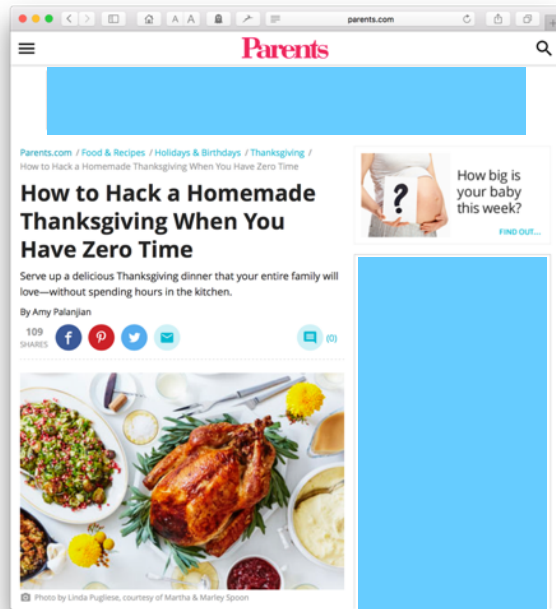






Actually, it is more complicated

^
MUCH

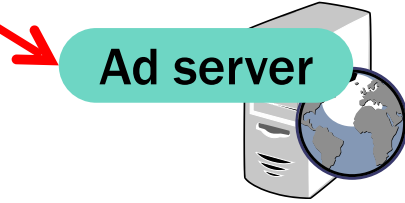
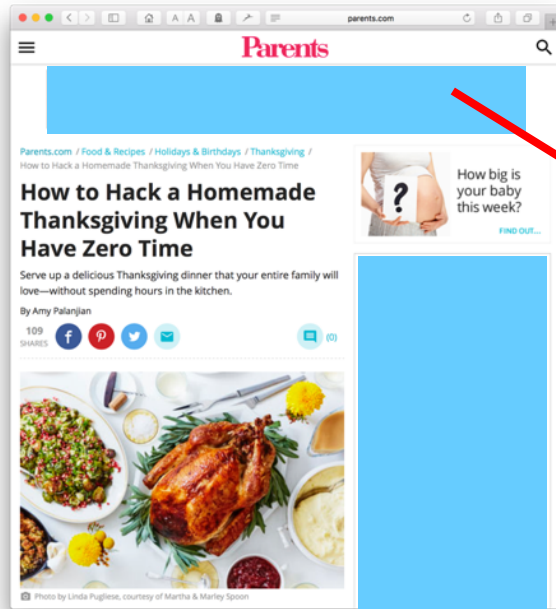


Actually, it is more complicated

MUCH

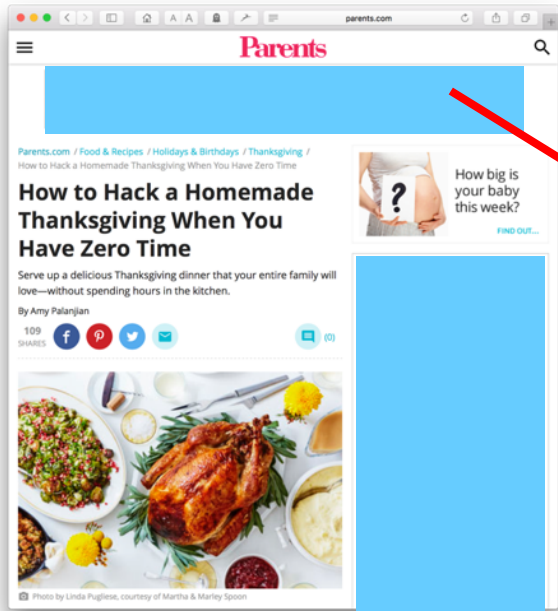


request + user ID



Actually, it is more complicated

MUCH



request + user ID

Ad server

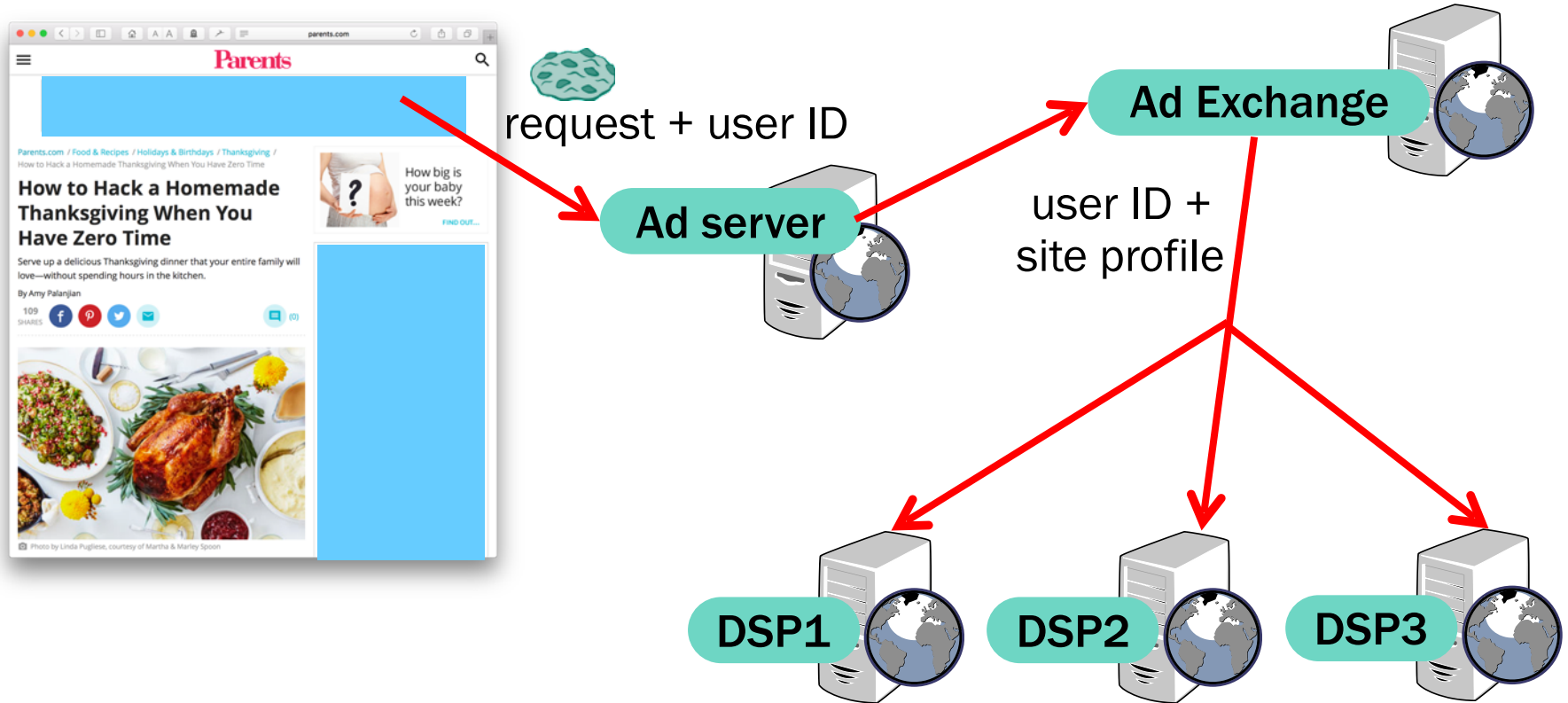


Ad Exchange



Actually, it is more complicated

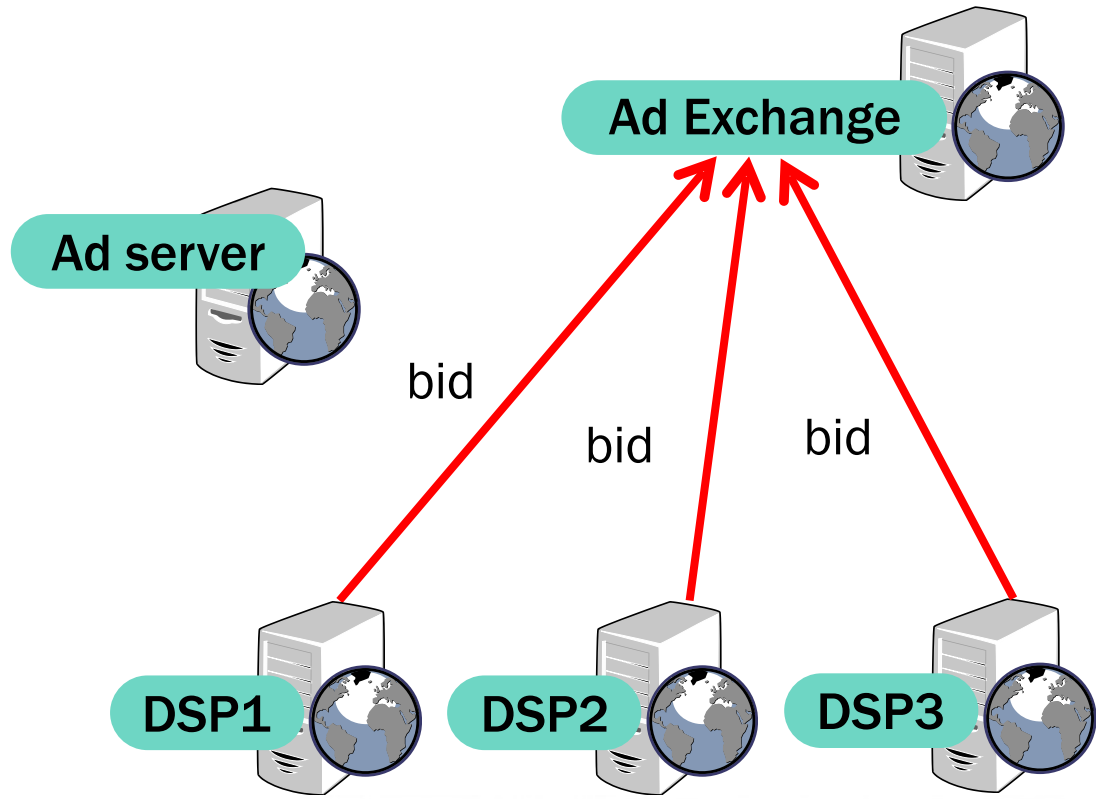
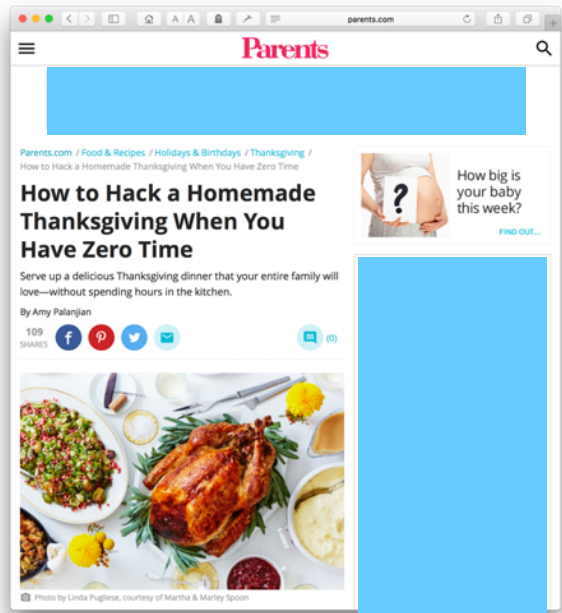
MUCH



Demand-side platform

Actually, it is more complicated

MUCH

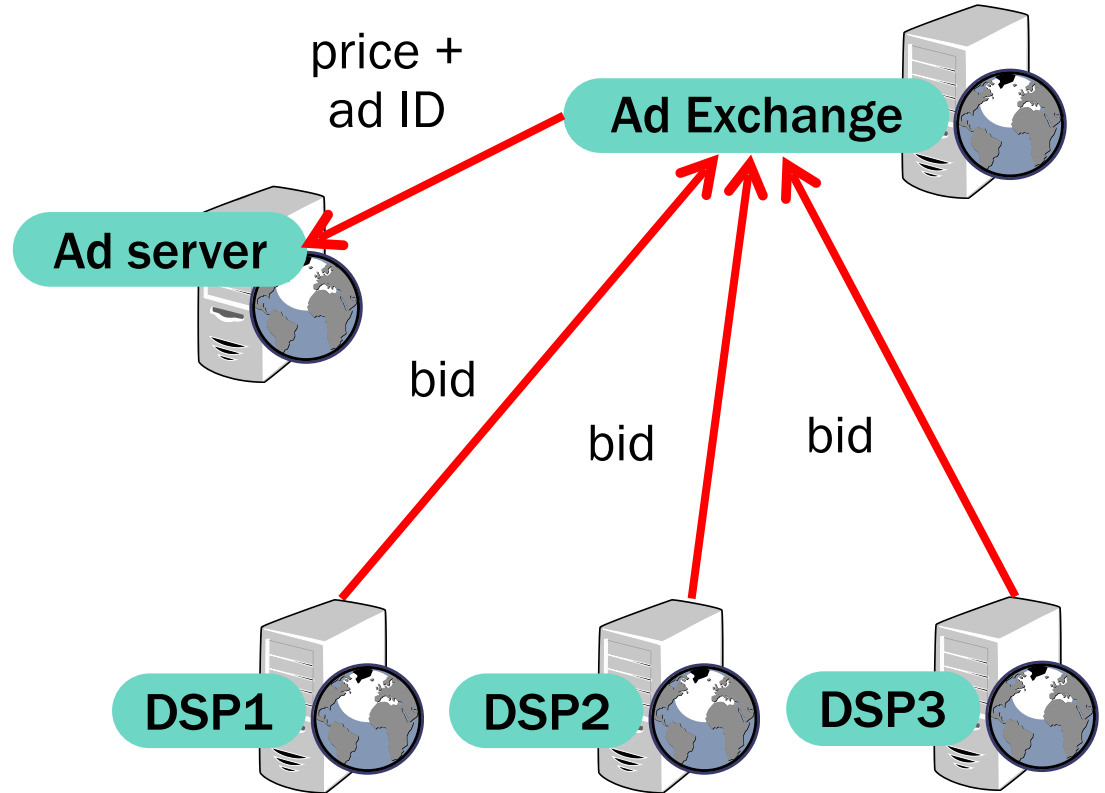
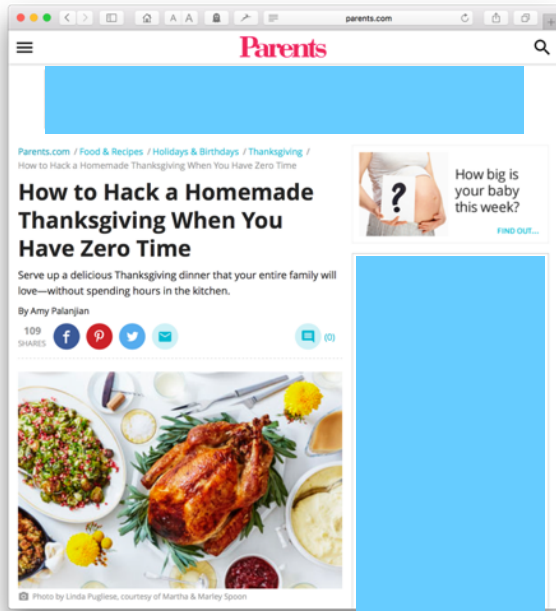


Real Time Bidding



Actually, it is more complicated

MUCH

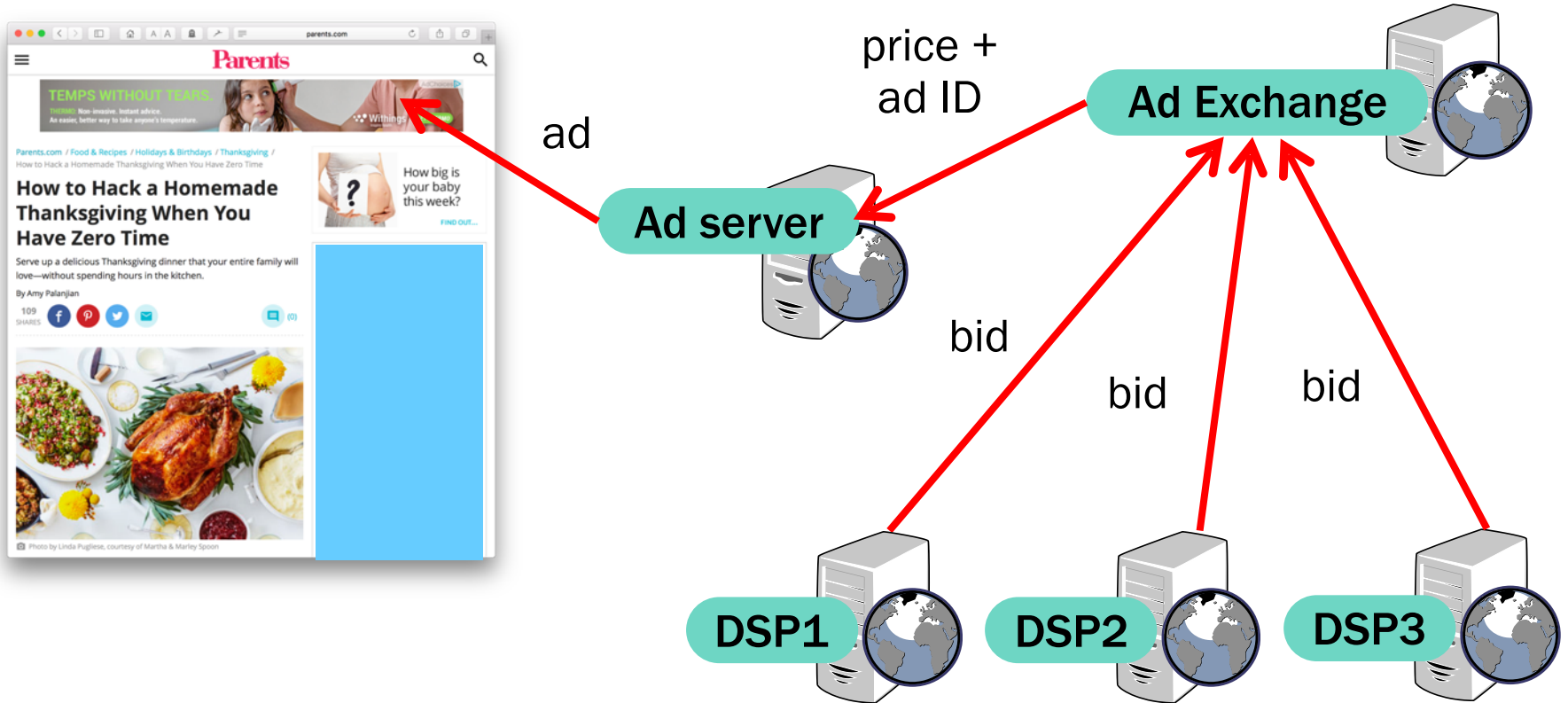


Real Time Bidding



Actually, it is more complicated

MUCH

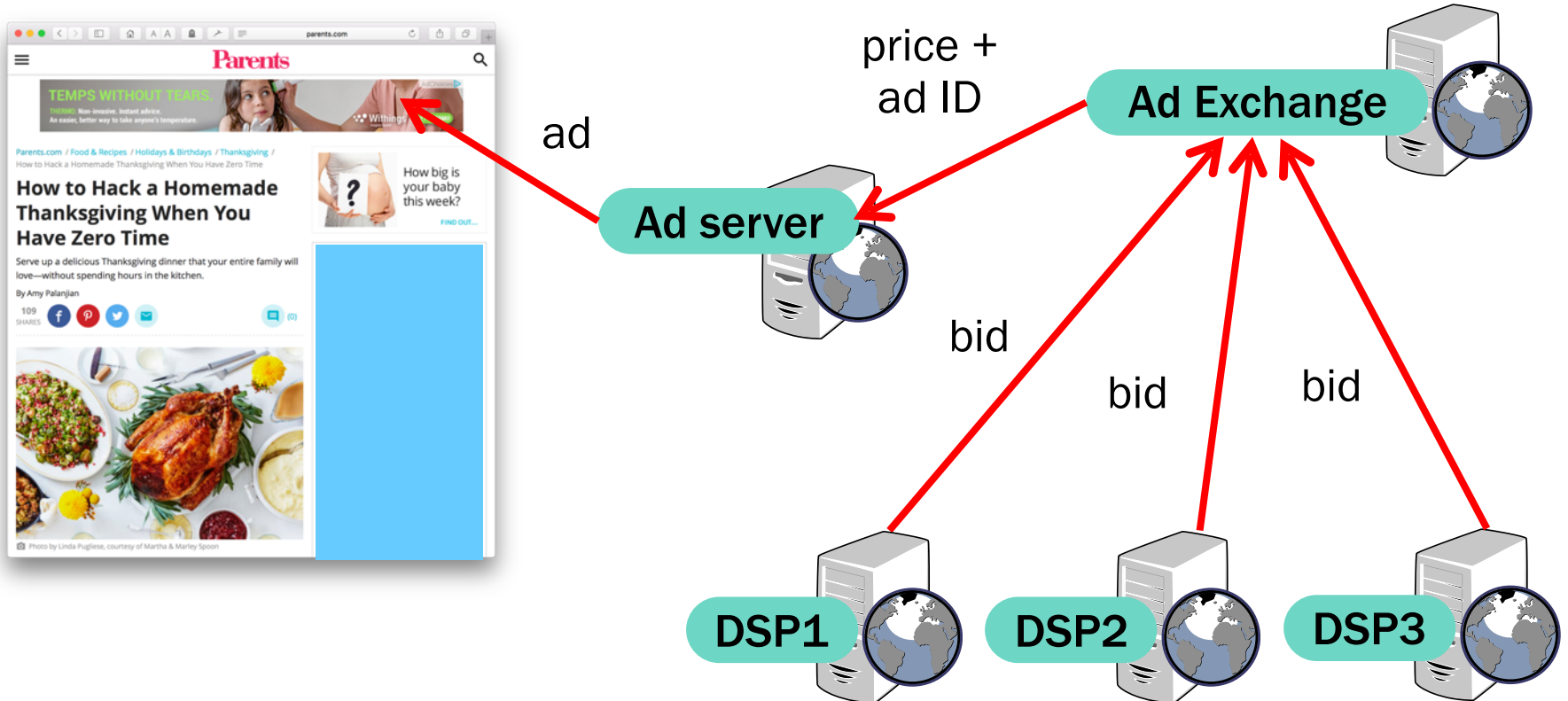


Real Time Bidding



Actually, it is more complicated

MUCH



Elapsed time < 1/3 second

DISPLAY LUMAescape



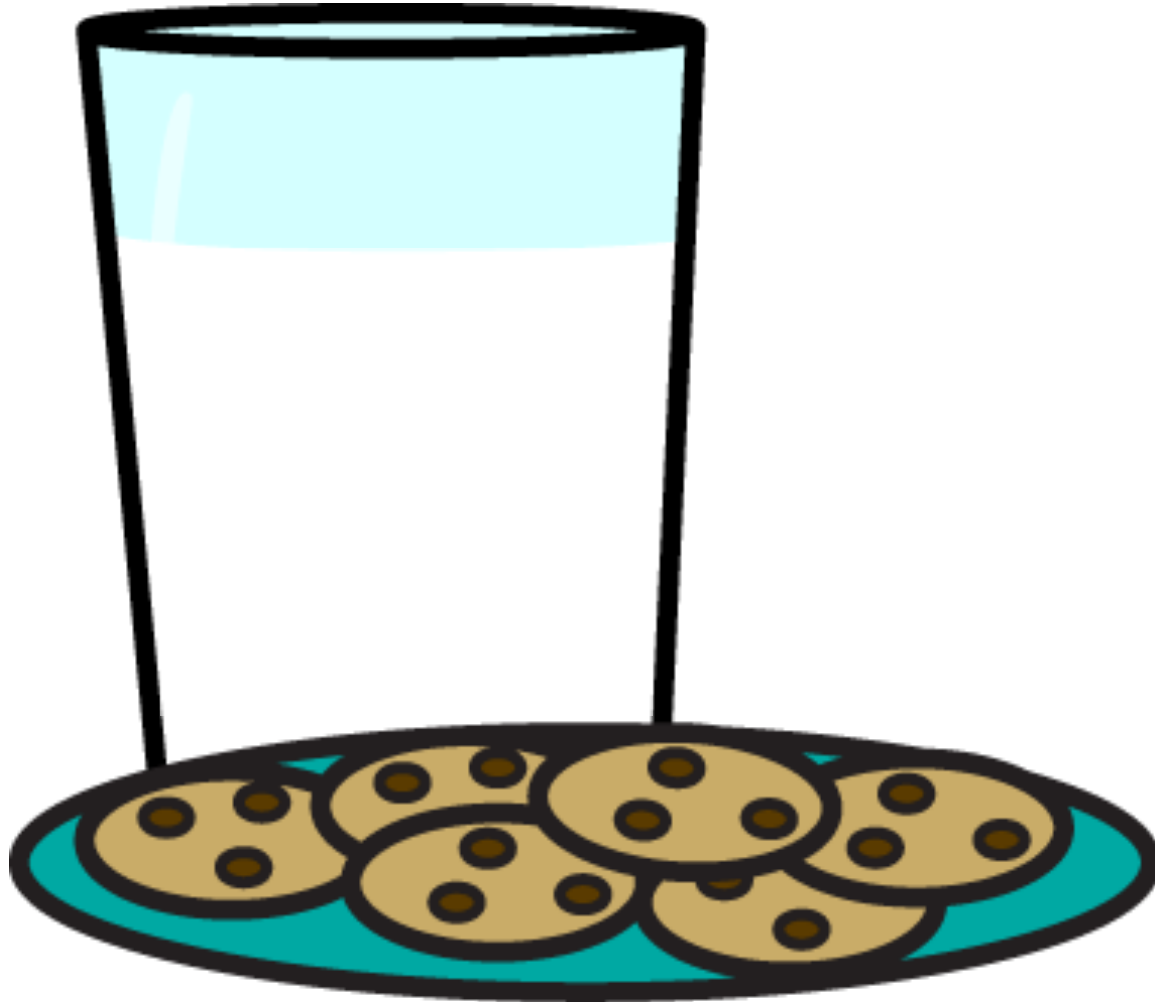
MARKETER

PUBLISHER



⌘ Denotes acquired company ⌘ Denotes shuttered company

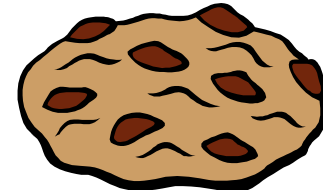
Cookie syncing




Cookie syncing



Cookie syncing



- Every website sets its own cookie
 - Knows user by a different ID
 - Can't share cookies due to same-origin policy
- In order to recognize user to bid at auction, common IDs are needed
 - Cookie syncing links IDs from different cookies
 - Can also be used to **respawn** deleted cookies


 ID=A123

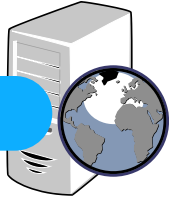
 ID=B678


 ID=C789



A.com 

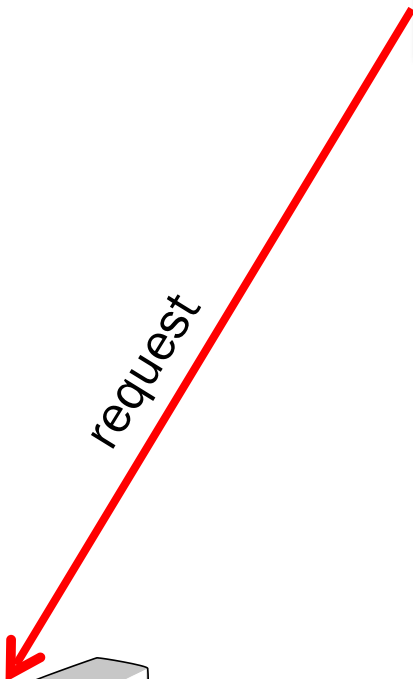
B.com 

C.com 

 ID=A123


 ID=B678

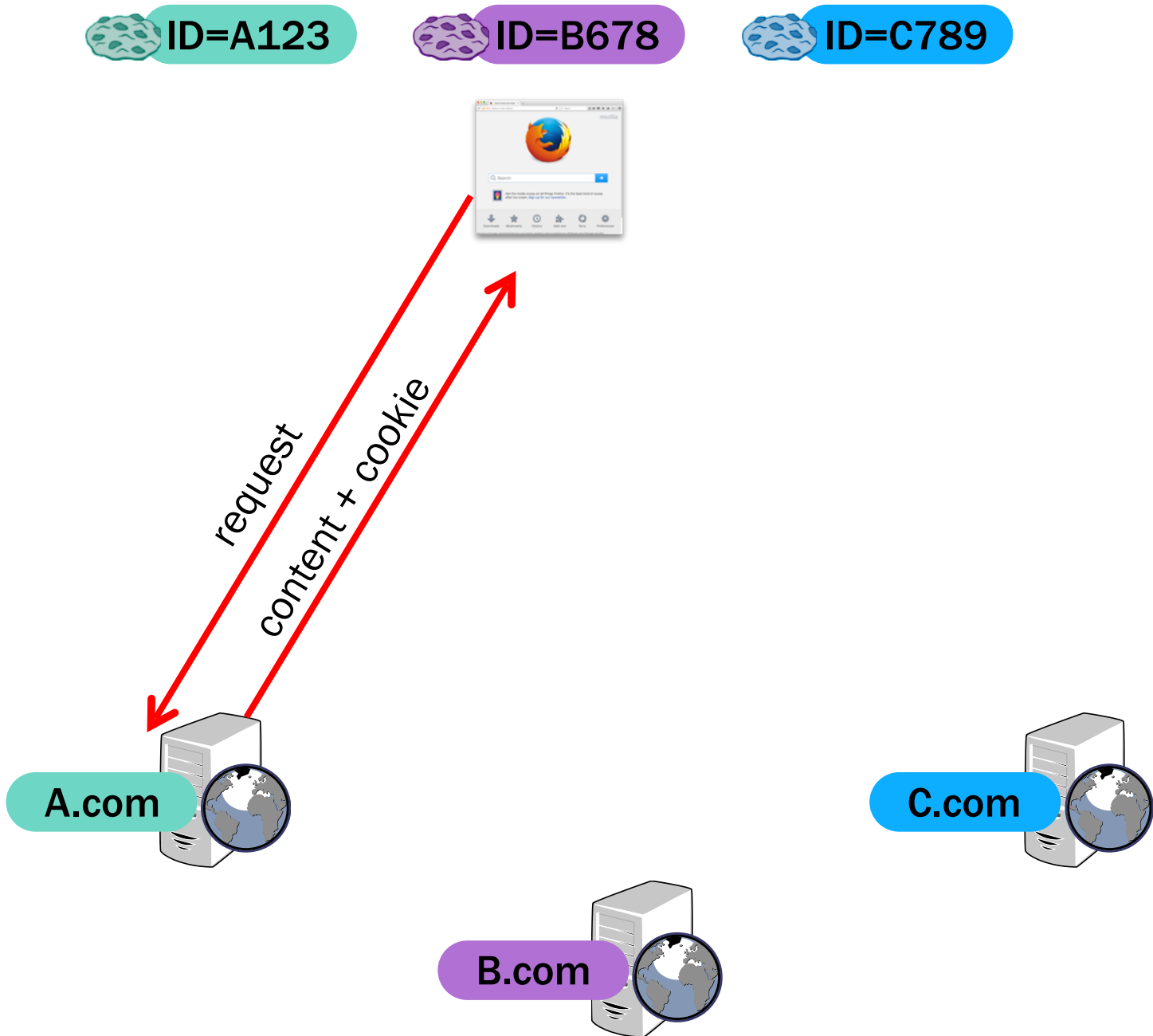
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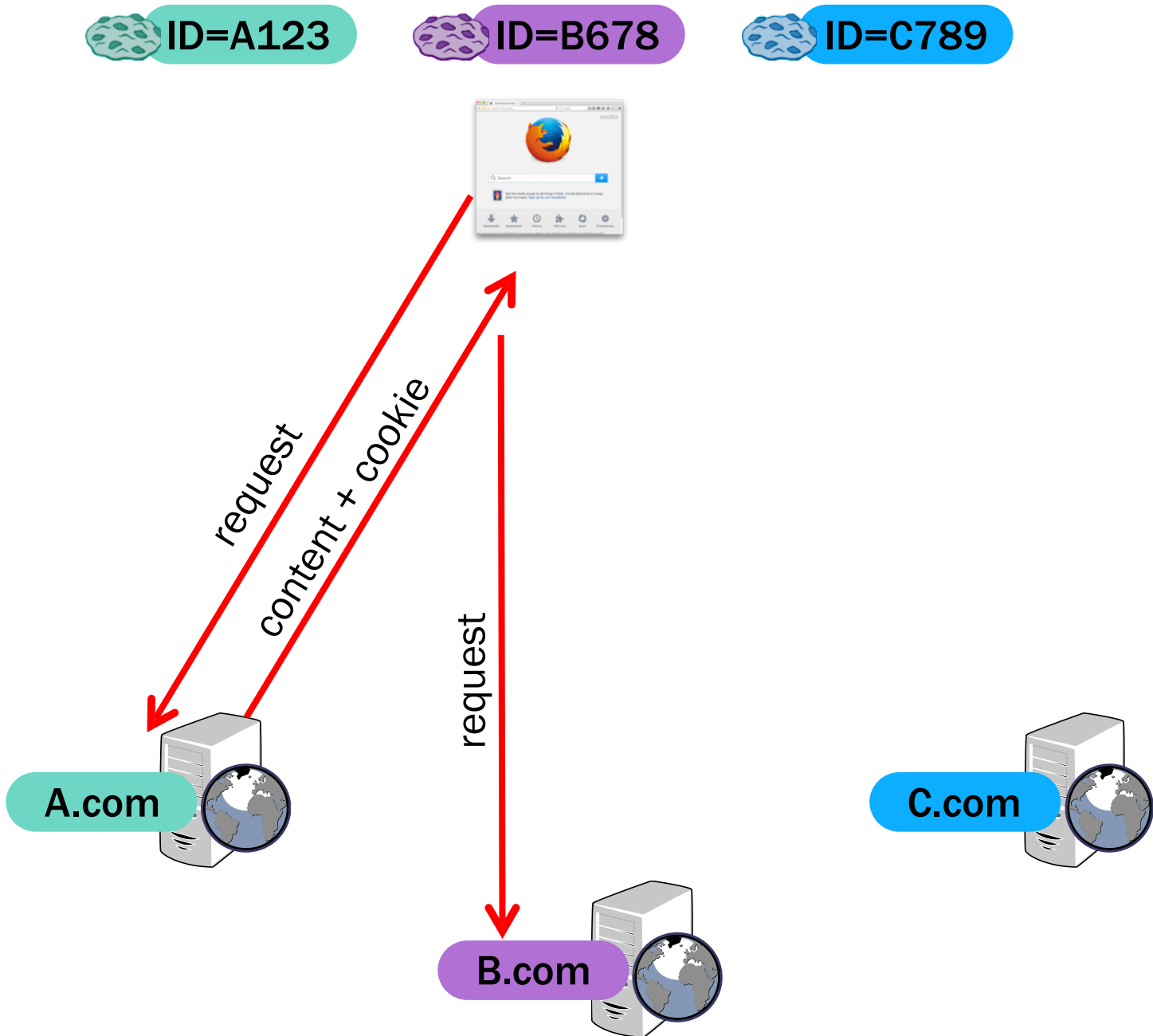


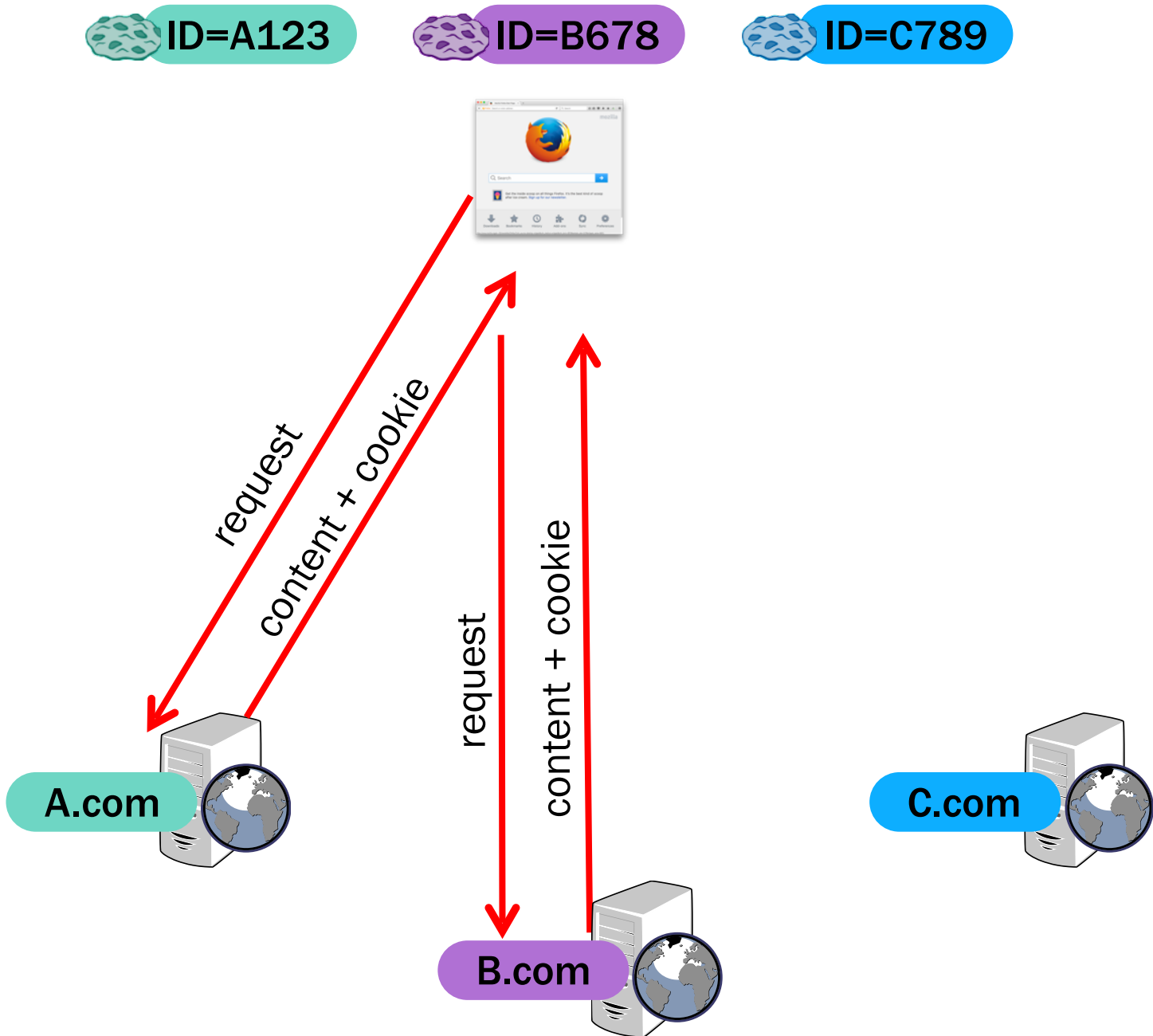
A.com 

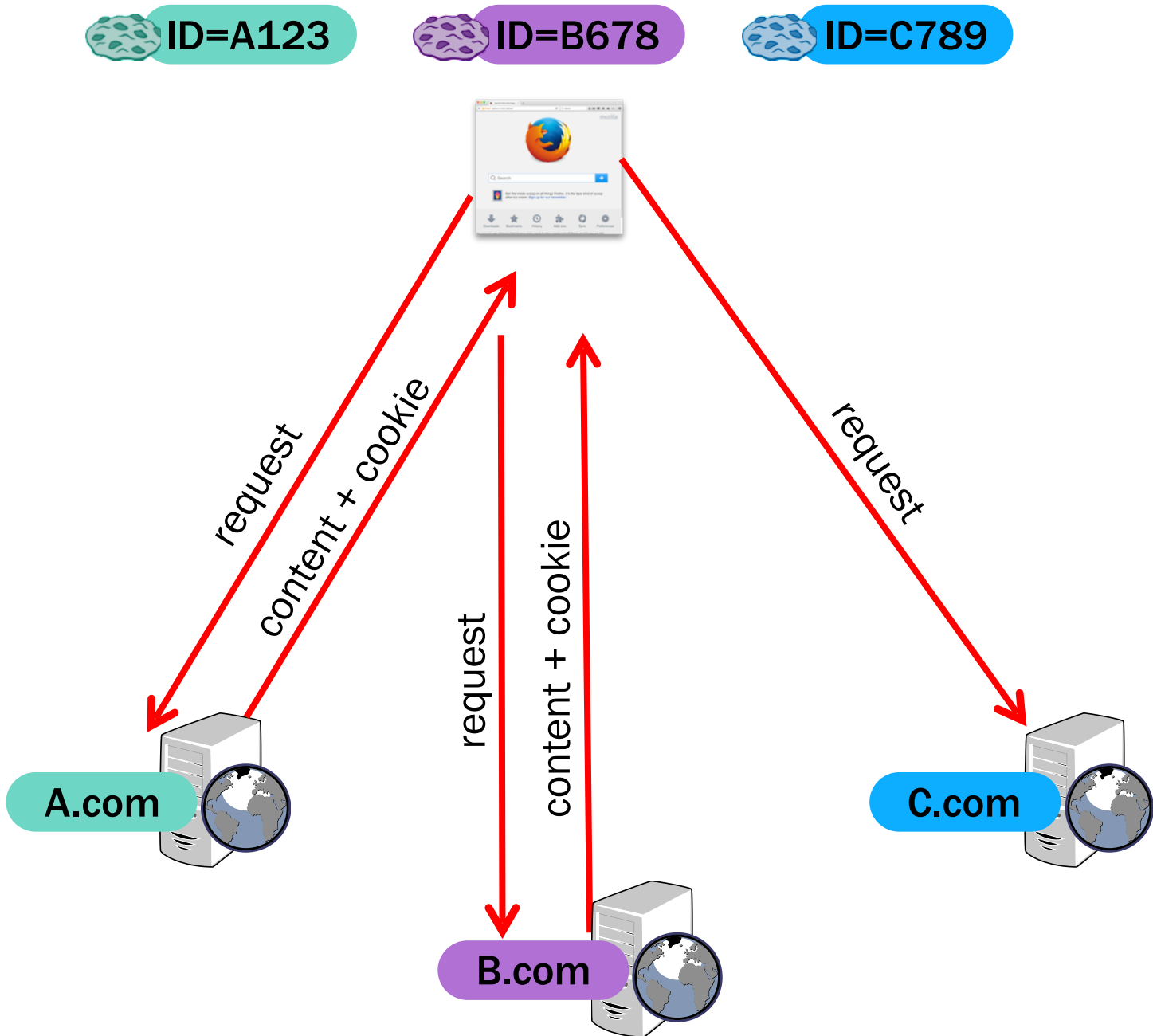
C.com 

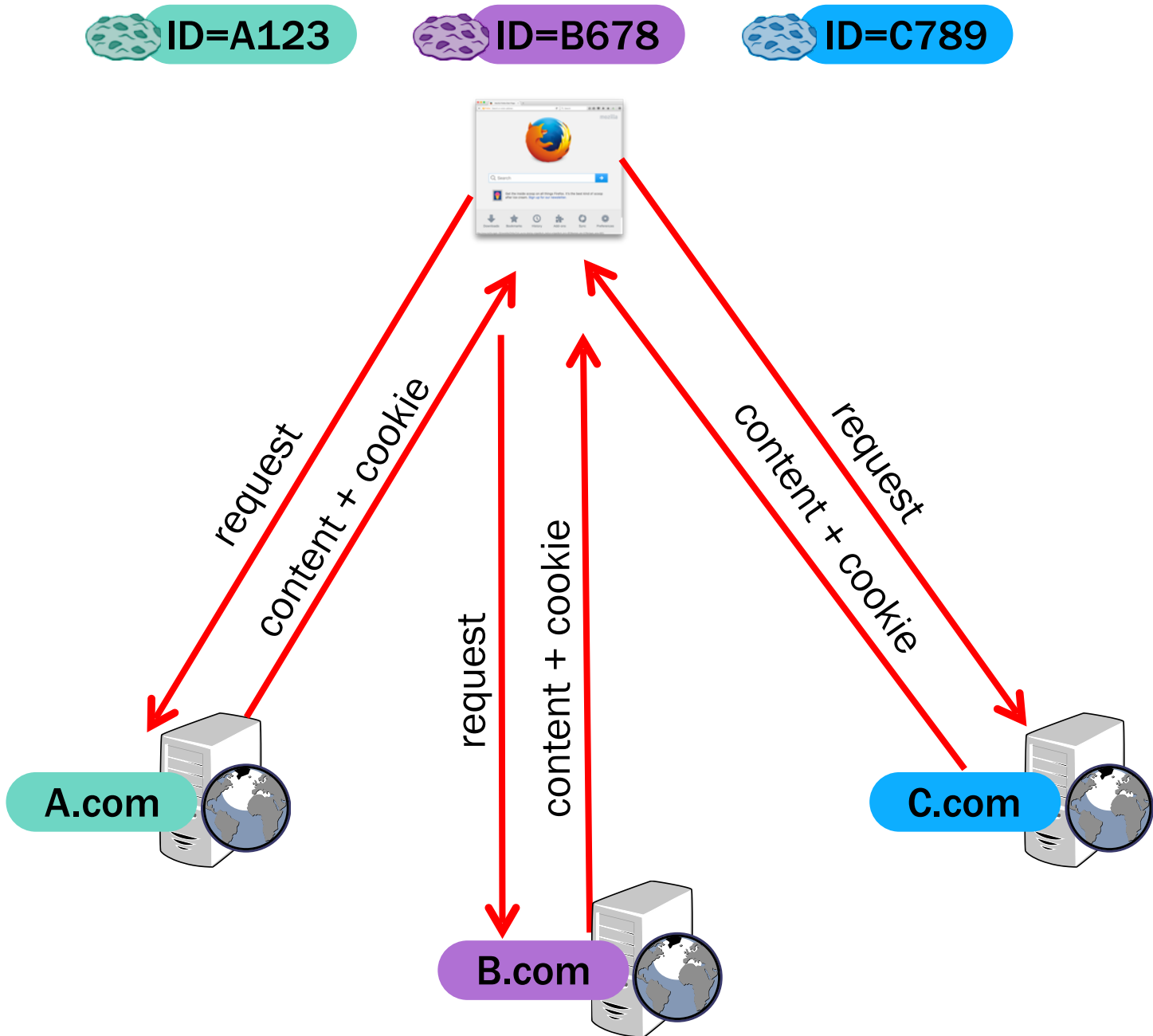
B.com 













 ID=A123

 ID=B678


 ID=C789





A.com 

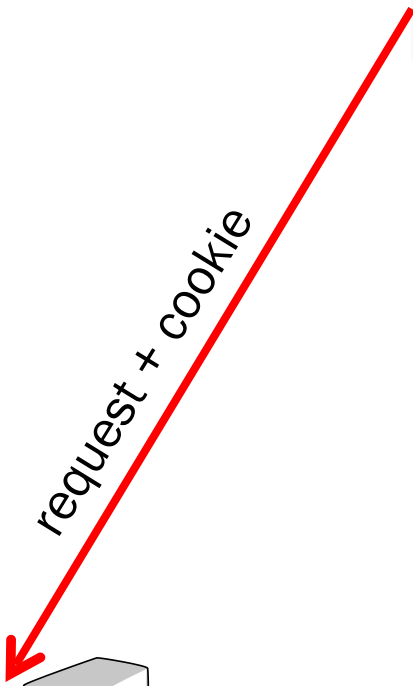
B.com 

C.com 

 ID=A123


 ID=B678

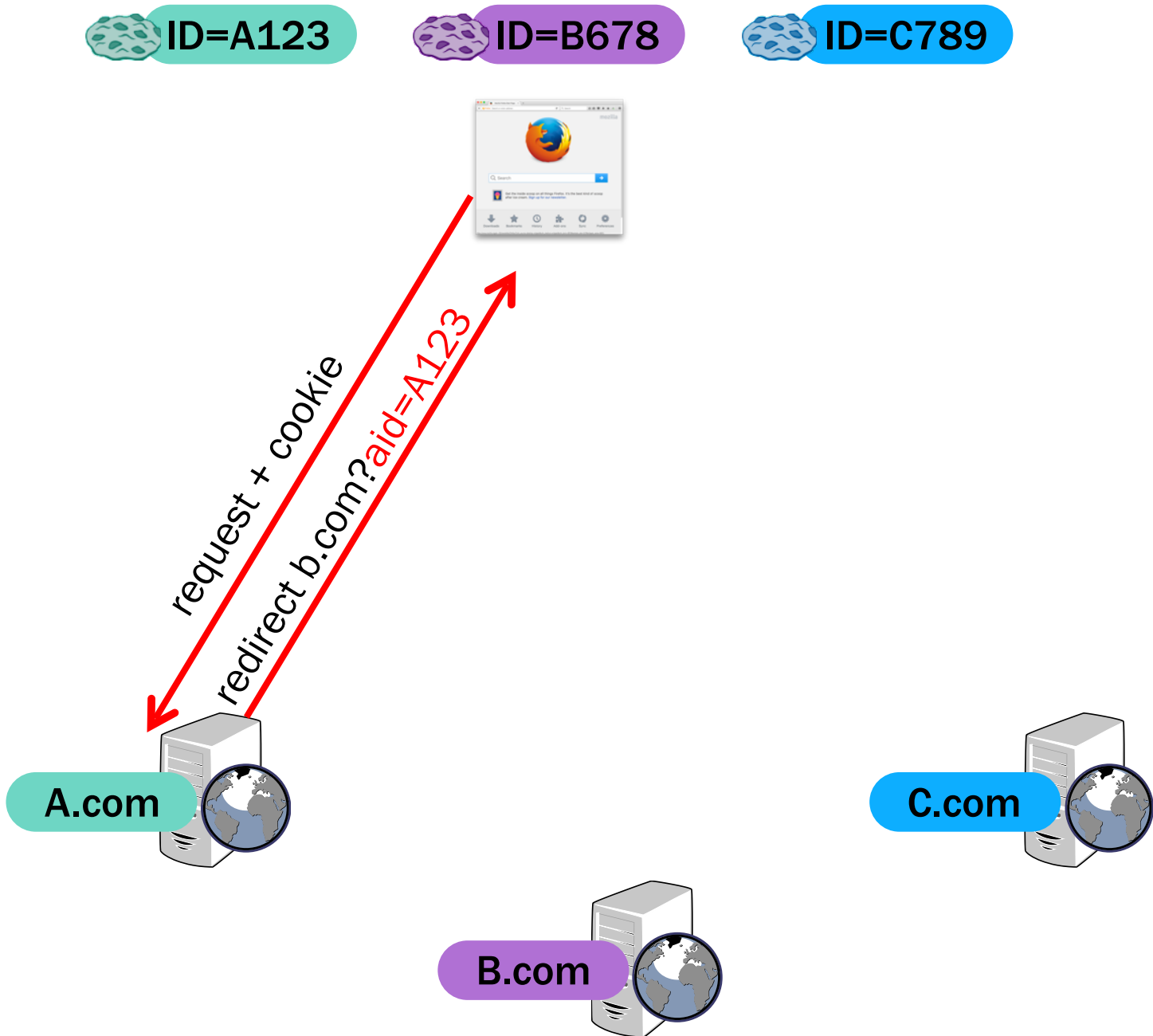
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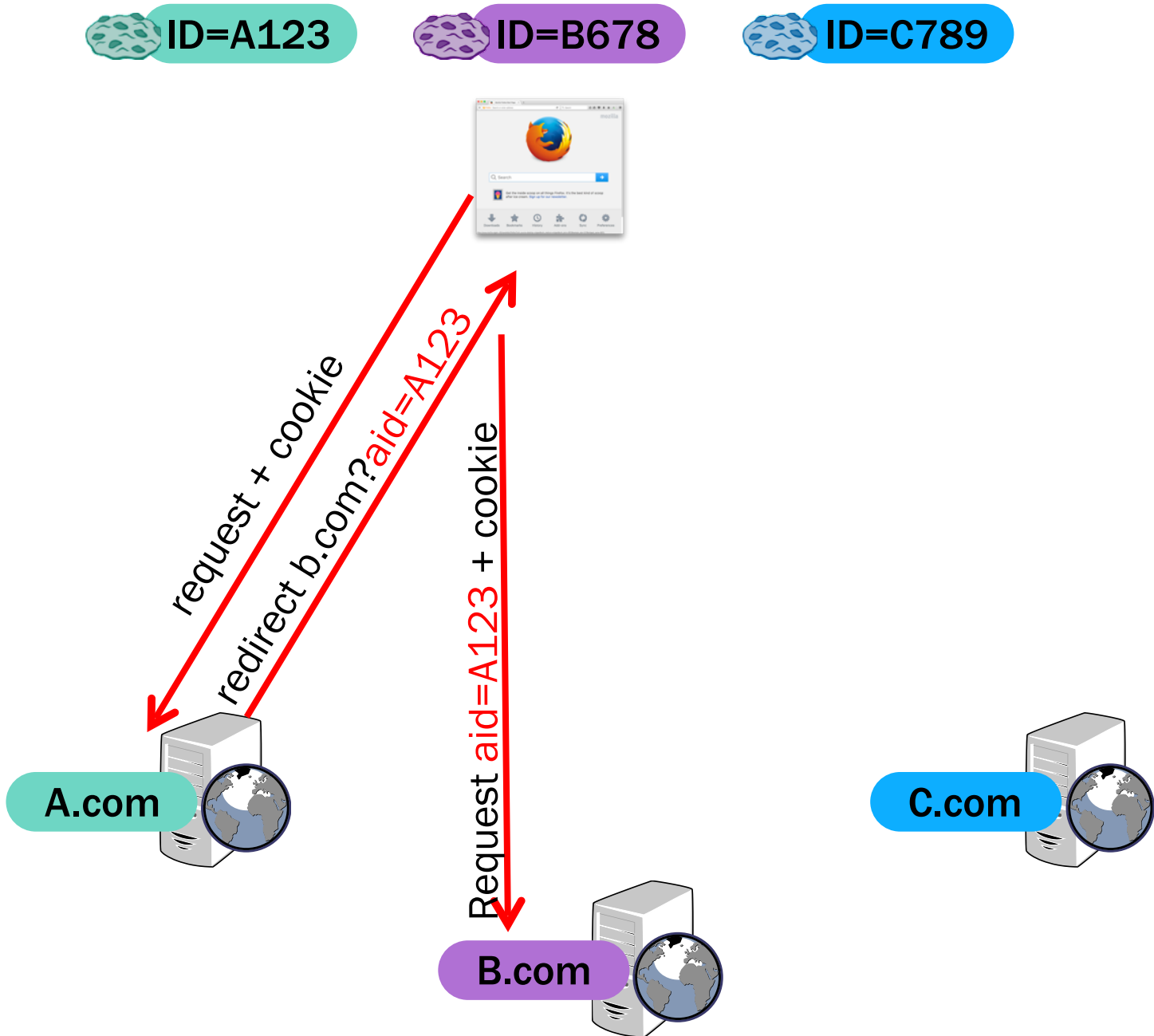


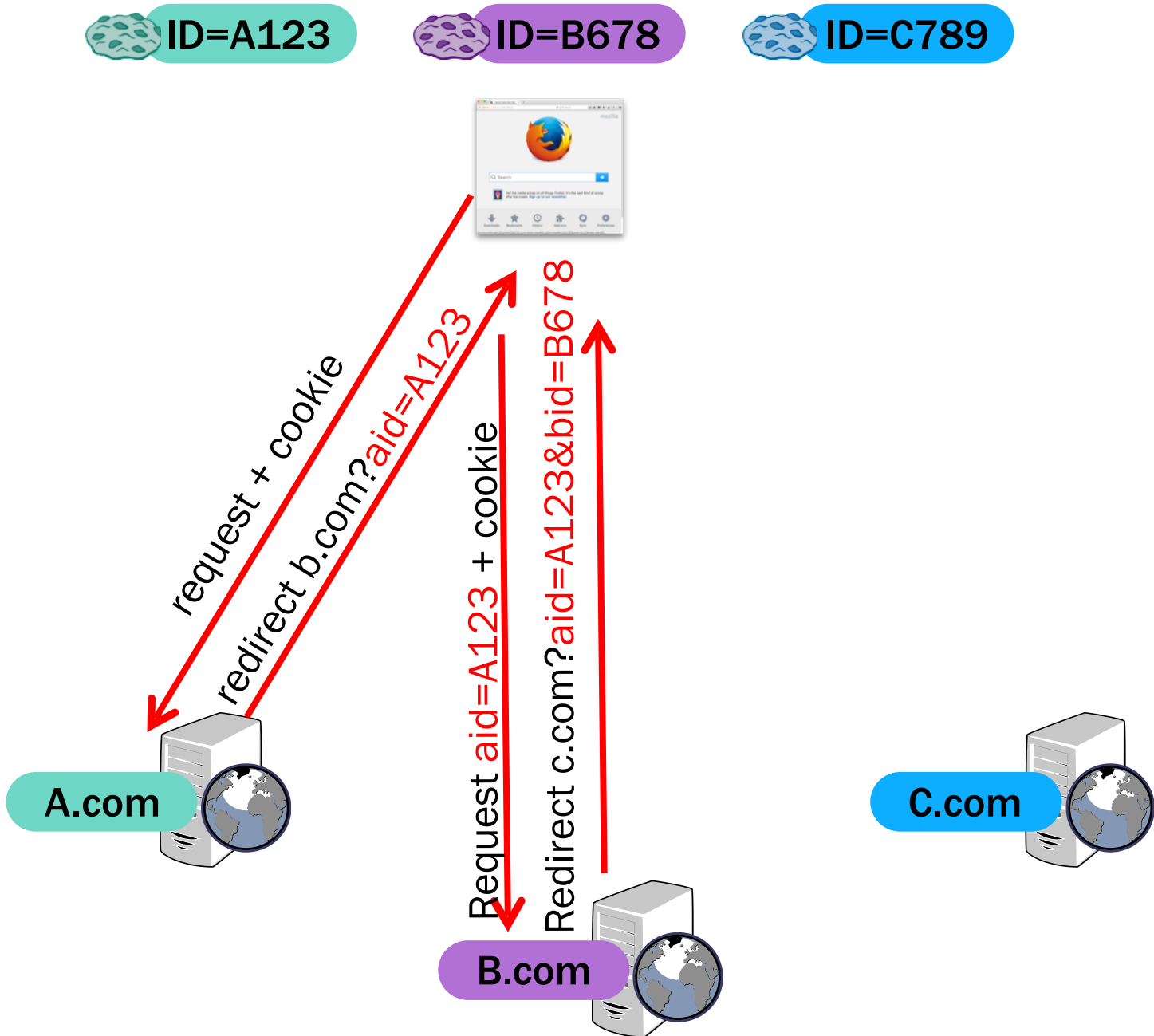
A.com 

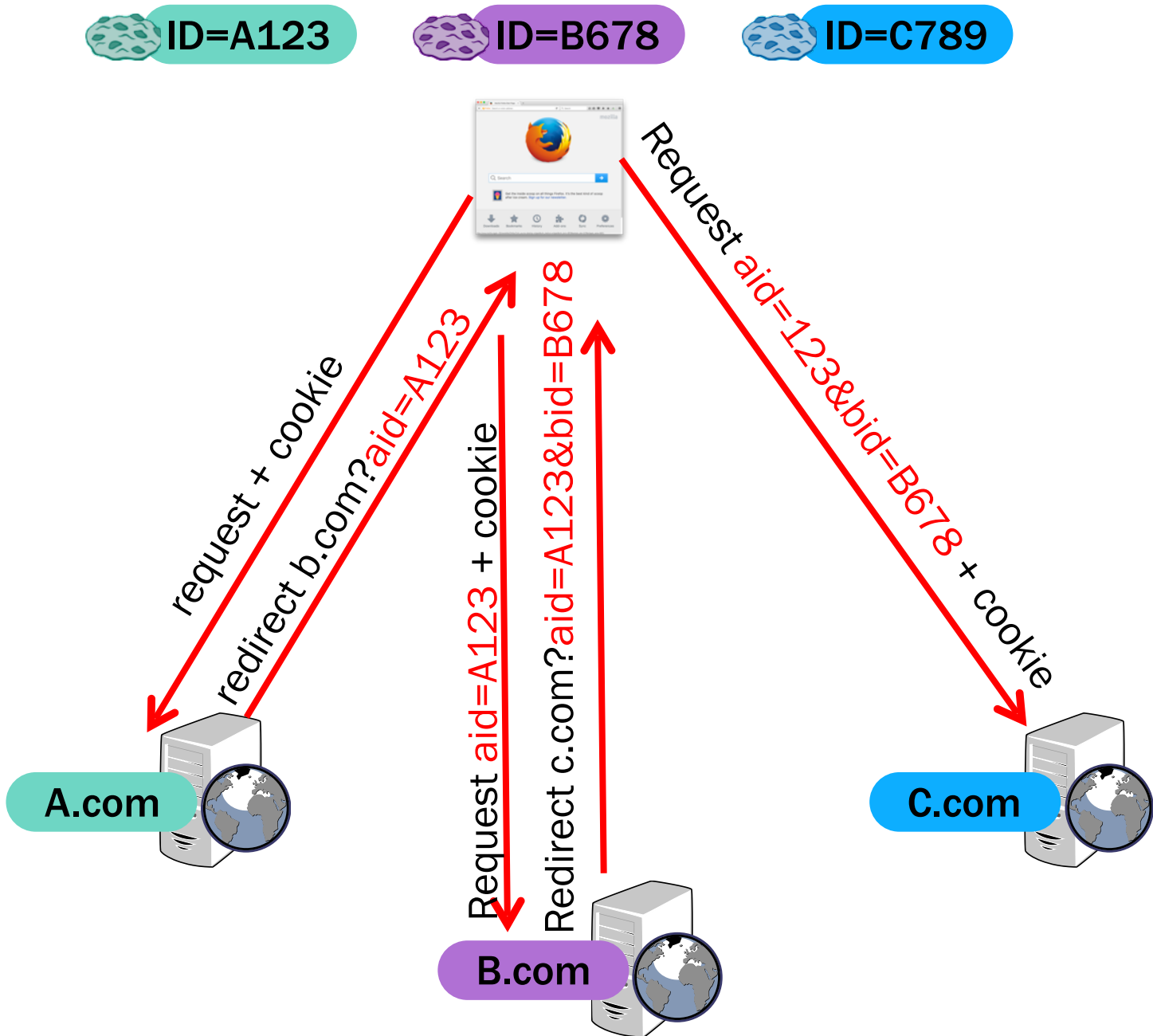
C.com 

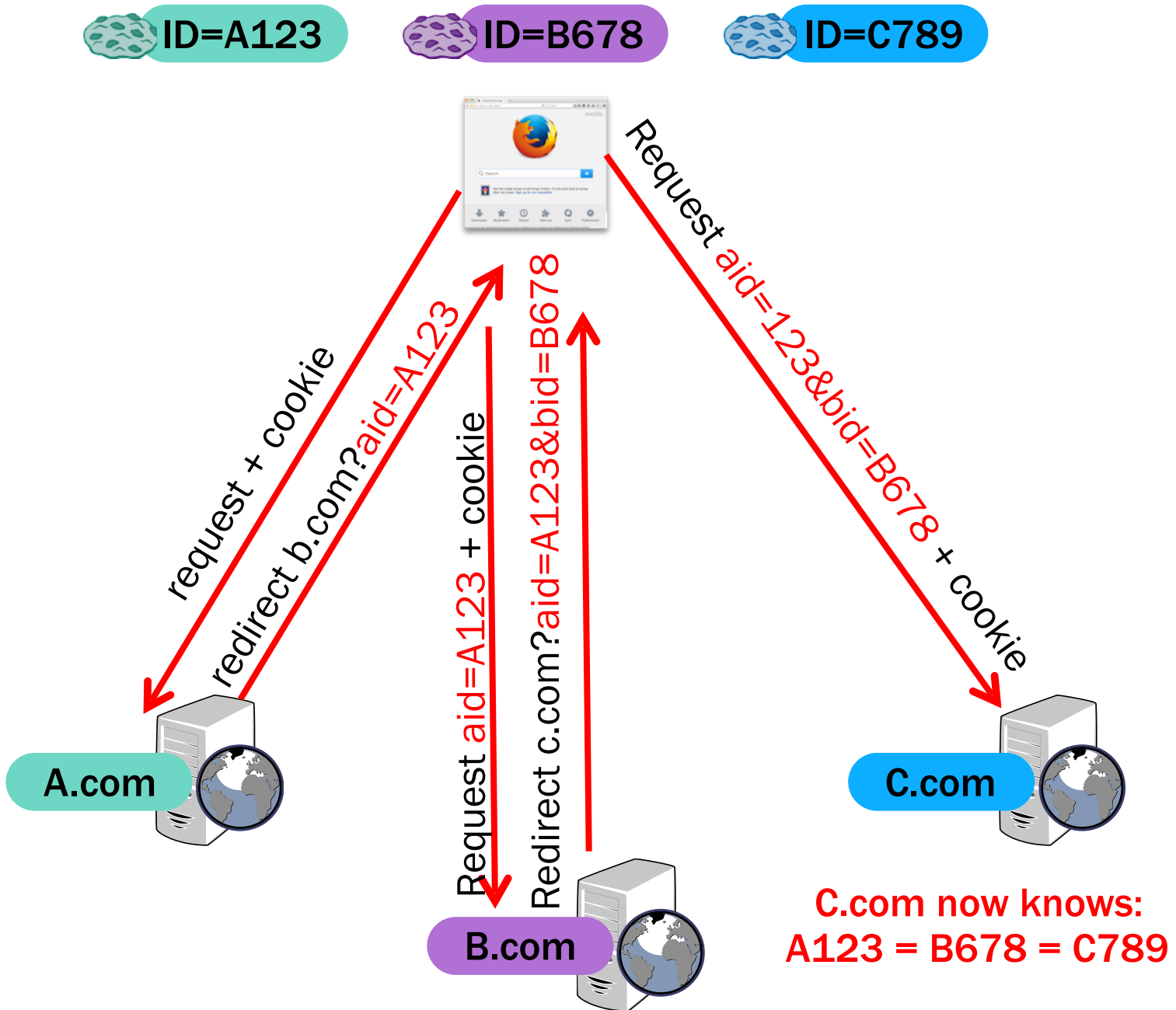
B.com 





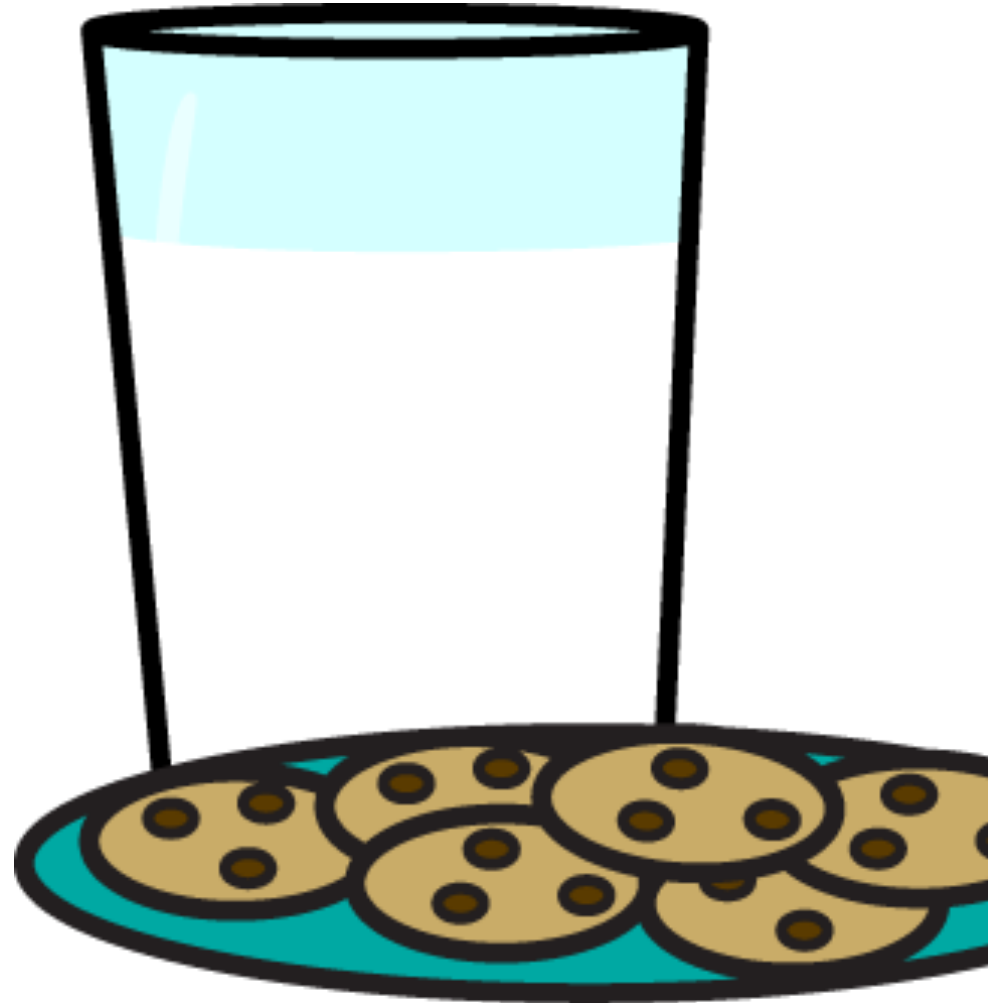






Once cookies are synced

- Companies can exchange data about users behind the scenes, merge profiles



Once cookies are synced

- Companies can exchange data about users behind the scenes, merge profiles



Identifiers beyond cookies

- IP address
- Storage associated with browser pluggins
 - Local Shared Object (LSO)
 - Silverlight Isolated Storage
- HTML5 DOM storage
- Cache mechanisms
 - ETags
 - Pixel hack (unique ID stored as a colored pixel)
- Javascript mechanisms
 - History sniffing
 - Browser fingerprinting

Browser fingerprinting

- Combination of device and browser characteristics forms a fairly unique fingerprint
 - Fonts
 - Timezone
 - Screen size and color depth
 - Browser plugins
 - ...



panopticlick.eff.org

A RESEARCH PROJECT OF THE ELECTRONIC FRONTIER FOUNDATION [DONATE](#)

PANOPTICCLICK

Is your browser safe against tracking?

When you visit a website, online trackers and the site itself may be able to identify you – even if you’ve installed software to protect yourself. It’s possible to configure your browser to thwart tracking, but many people don’t know how.


Panopticlick will analyze how well your browser and add-ons protect you against online tracking techniques. We’ll also see if your system is uniquely configured—and thus identifiable—even if you are using privacy-protective software.

[TEST ME](#)

Only **anonymous data** will be collected through this site.

Panopticlick is a research project of the Electronic Frontier Foundation. [Learn more](#)

[SHARE ON FACEBOOK](#) [SHARE ON TWITTER](#) [SHARE ON GOOGLE+](#)



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PANOPTICCLICK

Is your browser safe against tracking?

How well are you protected against non-consensual Web tracking? After analyzing your browser and add-ons, the answer is ...

Mixed results: you have **some protection** against Web tracking, but it has **some gaps**. We suggest re-configuring your protection software, or consider switching to a browser or OS that offers better protections.

Test	Result
Is your browser blocking tracking ads?	⚠️ partial protection
Is your browser blocking invisible trackers?	⚠️ partial protection
Does your browser unblock 3rd parties that promise to honor Do Not Track?	❌ no
Does your browser protect from fingerprinting?	❌ your browser has a unique fingerprint

Note: because tracking techniques are complex, subtle, and constantly evolving, Panopticlick does not measure all forms of tracking and protection.

Your browser fingerprint **appears to be unique** among the 186,338 tested so far.

Currently, we estimate that your browser has a fingerprint that conveys **at least 17.51 bits of identifying information**.

The measurements we used to obtain this result are listed below. You can [read more about our methodology, statistical results, and some defenses against fingerprinting here](#).

Your browser fingerprint appears to be unique among the 186,338 tested so far

Mobile device & location tracking

- Mobile device advertising IDs



- used to target, retarget, and frequency cap ads served through mobile apps
- Can be reset by user
- Limit ad tracking setting limits ad targeting
- Apple: IDFA
- Google: AAID



- Apps may collect location and send to advertisers
 - Multiple ways to obtain location, sometimes without notifying user
- Retail tracking based on MAC addresses when mobile devices search for wifi

Cross-device tracking



- Link a user's activity across their devices
 - Seamless user experience
 - Allow users to pickup where they left off on another device
 - Develop a user's profile across devices
 - Target ads across devices
 - Measure success of ad campaigns across devices
- Deterministic – user logs in or provides consistent identifier
- Probabilistic – infer user identity from IP address, location, browsing patterns, etc.
 - Websites may share hashed email addresses with ad networks to enable linking without transmitting PII

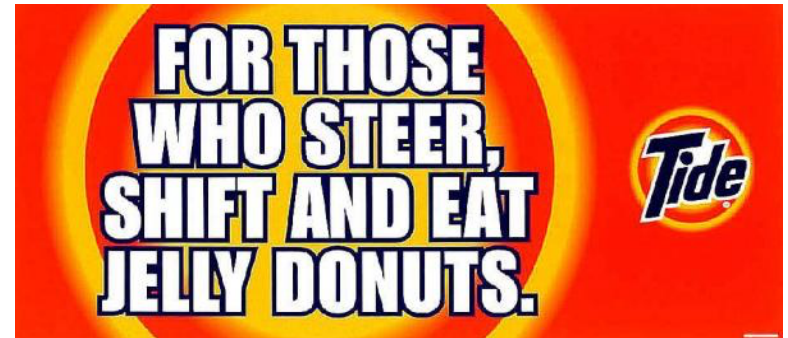
Audio beacons

- Ultrasonic inaudible sounds played by an ad
- Software in app activates microphone and listens for beacon sound played by another device in vicinity
- Identifies devices likely owned by same person
- Allows advertisements on mobile device to relate to programming user is watching on TV

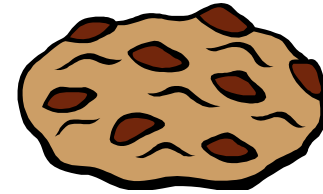


Data matching

- Matching offline and online data
- Allows marketers to see whether online ad results in offline purchase
- Hashed email address or other identifiers compared



Opt-out cookies



- Some third-party trackers allow you to opt-out of tracking by setting an opt-out cookie
- Opt-out cookie is used only to signal that you don't want to be tracked
- Deleting the cookie removes the opt-out
- Industry association websites let you set opt-out cookies for dozens of sites in one place
 - Aboutads.info

DIGITAL ADVERTISING ALLIANCE (DAA) SELF-REGULATORY PROGRAM

- Home
- Principles
- Consumers
- Companies
- Participants
- Resources
- News & Media Resources
- Blog
- Enforcement
- Contact



Digital Advertising Alliance (DAA) Self-Regulatory Program

Advertising Option Icon

Latest News: DAA Announces Mobile Privacy Enforcement to Begin September 1, 2015

The Digital Advertising Alliance (DAA) has announced that enforcement of its Principles in the mobile environment will begin on September 1, 2015, including new guidance specific to mobile, such as cross-app data, precise location data and personal directory data. The Council of Better Business Bureaus (CBBB) and Direct Marketing Association (DMA) will extend their ongoing independent oversight of the DAA Principles on browsers to the mobile space. [Read the press release here.](#)



Make choices with participating companies under the DAA Principles

The Digital Advertising Alliance (DAA) establishes and enforces responsible privacy practices across industry for relevant digital advertising, providing consumers with enhanced transparency and control. Through multifaceted [Principles](#) that apply to data gathered from a particular device in either the desktop or mobile environments, the DAA program addresses practices for multi-site data collection and use. The DAA is an independent non-profit organization led by the [leading advertising and marketing trade associations.](#)

For Consumers

Participating Associations



Digital Advertising Alliance Consumer Choice Page

[Home](#) [The Principles](#) [For Consumers](#) [For Companies](#) [List of Participants](#) [Resources](#) [News](#) [Blog](#) [Enforcement](#) [Contact](#)

Welcome to the Digital Advertising Alliance's consumer choice page. The companies participating in this page provide transparency and choice under the [DAA Principles](#).

Some of the ads you receive on Web pages are customized based on predictions about your interests generated from your visits to different Web sites. This type of ad customization is sometimes called "[online behavioral](#)" or "[interest-based](#)" advertising. Such online advertising [helps support the free content, products and services you get online](#). The DAA Principles apply to interest-based advertising and other applicable uses of Web viewing data collected from a particular computer or device over time and across unaffiliated Web sites.

Using the tools on this page, you can opt out from the collection of Web viewing data for interest-based advertising and other applicable uses, by some or all of the participating companies.

- See all the participating companies on this choice page and learn more about their practices;
- Also find out which participating companies have currently enabled customized ads for your browser;
- Check whether you've already opted out from participating companies;
- Exercise choice with some or all participating companies, using [opt-out cookies](#) to store your preferences in your browser; or
- Use the "Choose All Companies" feature to opt out from all currently participating companies in one step. [GO](#)

 [Help with the Opt Out Page](#)

 [FAQs About the DAA](#)

 [Feedback on This Site](#)

 [Protect My Choices](#)

All Participating Companies (0)

SHOW

Companies Customizing Ads For Your Browser (0)

SHOW

Existing Opt Outs (0)

SHOW



Checking Status...

This will take a few moments.

Your browser's status with participating companies is being checked. The results will be displayed in the tabs above.

- Use the "Choose All Companies" feature to opt out from all currently participating companies in one step. [GO](#)


All Participating Companies (129)	Companies Customizing Ads For Your Browser (0)	Existing Opt Outs (97)
	SHOW	SHOW
<p>These 129 companies participate in the DAA's consumer choice page.</p> <p>Click the company name to find out more about a participating company. To opt out from one or more companies, check the box(es) in the "Select" column next to the company name(s), and then hit the "Submit your choices" button. You can also click the "Select all shown" box to pre-check all the listed companies before you hit the "Submit" button. An [-] symbol in the check box indicates that you have already set an opt out for this company.</p> <p>Need help?</p>	<p>AOL Advertising opt out not completed <input type="checkbox"/></p> <hr/> <p>Atlas Solutions, LLC. opt out not completed <input type="checkbox"/></p> <hr/> <p>AudienceScience, Inc. opt out not completed <input type="checkbox"/></p> <hr/> <p>Catalina BuyerVision opt out not completed <input type="checkbox"/></p> <hr/> <p>Datonics (formerly AlmondNet Data Division) opt out not completed <input type="checkbox"/></p> <hr/> <p>Defy Media (formerly Break Media) http://www.defymedia.com <i>Defy Media is the premier media company for People 13-34. With owned and operated sites like Break, MadeMan, ScreenJunkies and Crushable, as well as huge YouTube followings on channels like AweMe, Clevver and Smosh, we serve up content that is consumed by users all over the web. In addition, Defy's ad network delivers unmatched access to consumers across key categories including entertainment, women and men's lifestyle, comedy and gaming.</i> <i>To learn more about how we collect and use information for online advertising, please visit http://www.defymedia.com/privacy-policy/.</i></p> <hr/> <p>eXeiate opt out not completed <input type="checkbox"/></p>	
	<p>Submitting your choices for the selected companies stores your opt out preference(s) in your browser. Learn More</p> <p style="text-align: right;">Submit your choices</p>	

Important things to remember about the choices you make on this page:

- These opt outs apply to interest-based advertising and other applicable uses of Web viewing data by the DAA's participating companies. You will still receive other types of online advertising from participating companies, and these companies (and the Web sites you visit) may still collect information for other purposes. [Learn more about the DAA Principles](#).
- The opt out choices you select are stored in opt out cookies only in this browser, so you should separately set your preferences for other browsers or computers you may use. Deleting browser cookies can remove your opt out preferences, so you should visit this page periodically to review your preferences, or update to include new participating companies.

Adchoices


- Symbol to indicated ads are targeted
- Click for more information and to opt-out



YAHOO!
--- ON THE ---
ROAD

Don't miss a beat

Ad Feedback

AdChoices 

This advertisement features a purple background with a circular logo containing the text "YAHOO! --- ON THE --- ROAD". Below the logo is a teal button with the text "Don't miss a beat". At the bottom left, there is a link for "Ad Feedback" and at the bottom right, the "AdChoices" logo with a play button icon.



It's 1702, a decade after
The Crucible's infamous seductress
danced with the devil in Salem.

MAY 4-26, 2013

Obigail
1702

CITY THEATRE

BY ROBERTO AGUIRRE-SACASA
DIRECTED BY TRACY BRIGDEN

BUY TICKETS >

This advertisement is for the play "Obigail 1702" at City Theatre. It features a purple and blue background with a woman's face. Text includes the dates "MAY 4-26, 2013", the playwright "BY ROBERTO AGUIRRE-SACASA", and the director "DIRECTED BY TRACY BRIGDEN". A yellow button at the bottom says "BUY TICKETS >". A small AdChoices icon is in the top right corner.




How Data Powers Your Experience



Pfizer endeavors to provide you with relevant, useful information tailored to your specific interests. We partner with online advertising companies to serve you ads likely to be of interest based on your web browsing activity.

Pfizer wants to provide you with clear information about how our ads are delivered to you and tools to control the types of advertising you receive from Pfizer. Below you will find a list of online advertising companies whose tracking of your browsing activity have been used to target this ad. You may click on the links below to find more information about these companies and to opt-out of their use of your information to target ads.

For more detailed information about our use of OBA and this opt-out tool, please refer to our [Privacy Policy](#). In addition, you may contact us at privacy.officer@pfizer.com

Ad companies:	Opt-out
 DoubleClick	<input type="checkbox"/>

Select All

OPT-OUT FROM
SELECTED COMPANIES 

About interest-based advertising



[Opt out of more companies](#)



[What happens when I opt out?](#)



[About the Self-Regulatory Program for Online Behavioral Advertising](#)



[Learn how interest-based advertising works](#)

Protect your privacy



[Ghostery](#)



YourAdChoices Gives You Control

When you click on the YourAdChoices Icon, you get control over how information about your interests is used for relevant advertising.

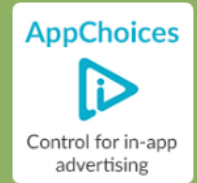
- > Put the YourAdChoices Icon to Work for You
- > Take Control with YourAdChoices
- > What's Behind the YourAdChoices Icon
- > The Benefits of Relevant Advertising



Take Control with YourAdChoices

Exercise choice on the Web for desktop and mobile—or mobile apps—with one or more participating companies.

[Learn More](#)



What's Behind the YourAdChoices Icon



YourAdChoices is brought to you by the Digital Advertising Alliance (DAA). Find

AdChoices icon study



- 1,505 participants
- Recruited through Amazon Mechanical Turk
- Between subjects online survey

Why did I get this ad?

Why did I get this ad?

The New York Times

Tuesday, October 25, 2011 Last Update: 11:21 PM ET

AIRFRANCE

AIRFRANCE

Search

CLICK HERE

Follow Us



Subscribe to Home Delivery Personalize Your Weather

Switch to Global Edition >

JOBS
REAL ESTATE
AUTOS
ALL CLASSIFIEDS

WORLD
U.S.
POLITICS
NEW YORK
BUSINESS
DEALBOOK
TECHNOLOGY
SPORTS
SCIENCE
HEALTH
OPINION
ARTS
Books
Movies
Music
Television
Theater
STYLE
Dining & Wine
Fashion & Style
Home & Garden
Weddings/

Europe Faces New Hurdles in Crisis Over Debt

By STEVEN ERLANGER and RACHEL DONADIO 20 minutes ago

On the eve of a European Union summit meeting, crucial financial measures were still unresolved.

• Tempers Flare as European Meeting Nears

I.B.M. Names Virginia Rometty as New Chief Executive

By STEVE LOHR 22 minutes ago

The selection of Ms.

Rometty, a senior vice president at I.B.M., will make her one of the highest-profile women executives in corporate America.



Archive Offers

THE WORLD SERIES



Dilip Vishwanat for The New York Times

Baseball's Game of Telephone

By PAT BORZI 3 minutes ago

Monday night's bullpen debacle by the Cardinals has put a new spotlight on baseball's reliance on landlines.

New Poll Finds a Deep Distrust of Government

By JEFF ZELENY and MEGAN THEE-BRENAN 3 minutes ago

With Election Day just over a year away, a deep

OPINION >

OP-ED | CLIFFORD WINSTON Are Law Schools and Bar Exams Necessary?

The barriers to entry for the legal industry exist to protect lawyers from competition with non-lawyers.

- Brooks: The Fighter Fallacy | Comments
- Nocera: Jobs's Biographer
- Cohen: Defending the E.U.
- Bruni: Have Glock
- Editorial: Refinancing
- Room for Debate: Will Amazon Kill Off Publishers?

Why did I get this ad?



Varied icon and taglines



Varied icon and taglines



- Why did I get this ad?
- Interest based ads
- AdChoices
- Sponsor ads
- Learn about your ad choices
- Configure ad preferences
- 'No tagline'



What people think happens if they click



56% More ads will pop up

45% Will take you to a page where you can buy advertisements on this website

27% Will take you to a page where you can opt out of tailored ads

Some taglines have better results

Configure Ad Preferences

42% More ads will pop up

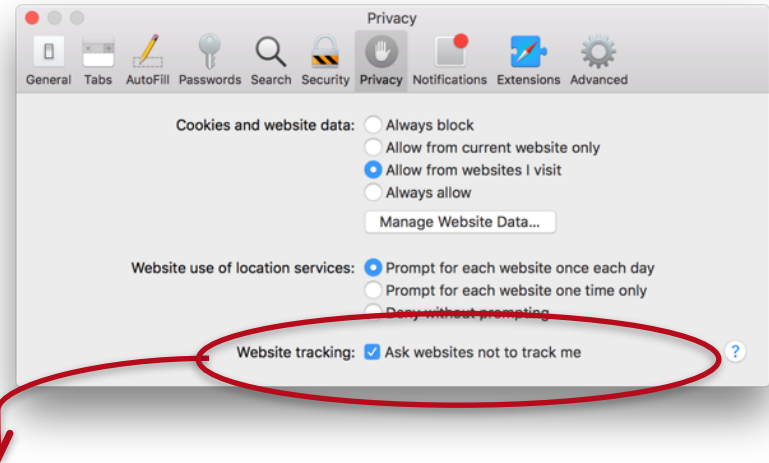
15% Will take you to a page where you can buy advertisements on this website

50% Will take you to a page where you can opt out of tailored ads

2015 online surveys

- 2015 study of online adults by Kelly Scott Madison agency
 - 26% are familiar with AdChoices campaign
 - 9% know what icon means
- 2015 Ipsos study of online adults on behalf of TRUSTe
 - 68% of US smartphone users concerned about tracking for targeted ads
 - 37% aware of AdChoices icon

Do Not Track

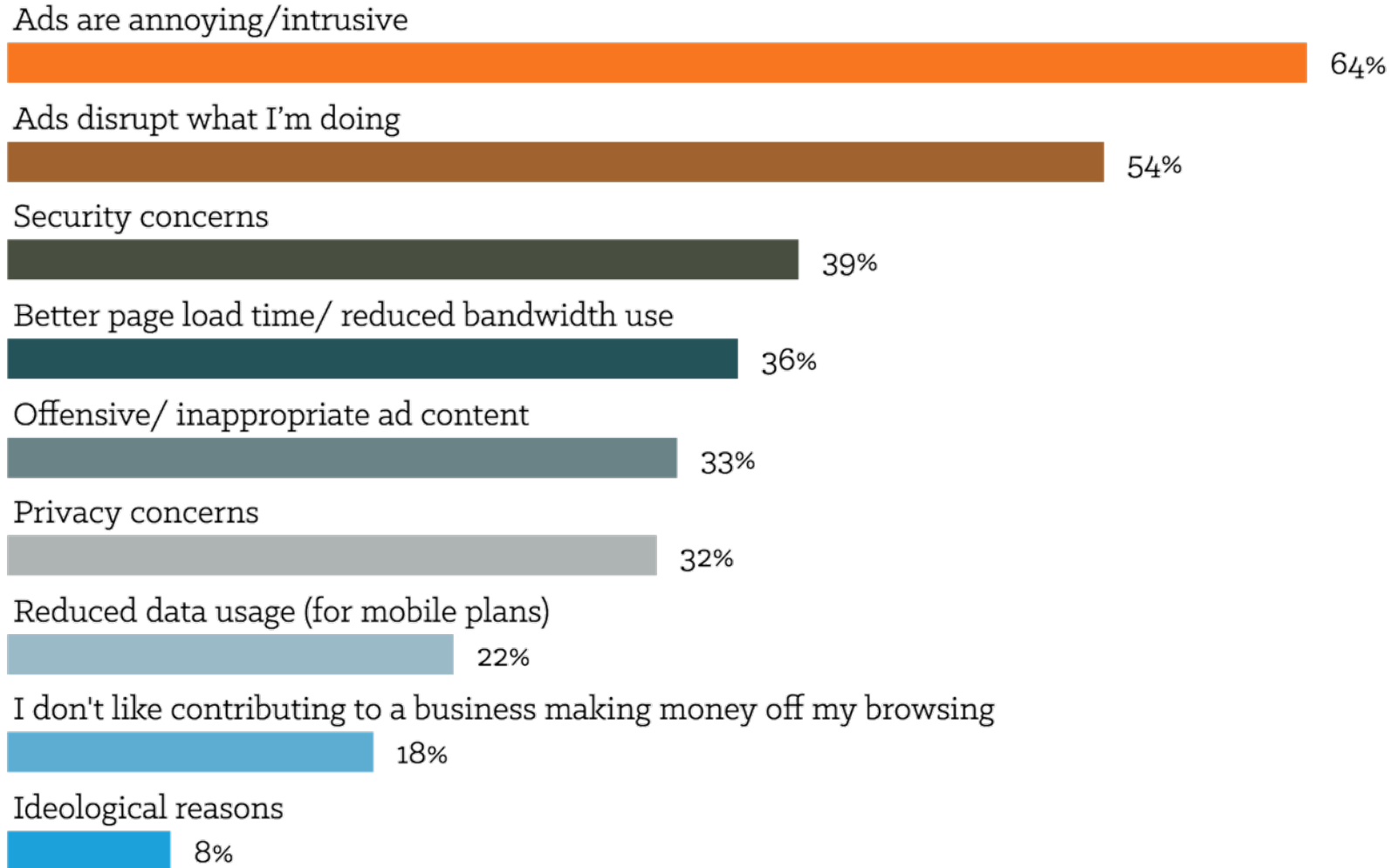


Website tracking: Ask websites not to track me

- Proposed W3C standard
- Allows web browsers to signal to websites that users do not want to be tracked
- Built into major web browsers but not widely adopted by websites

People use ad blockers because ads are annoying and disruptive

Why do you use an ad blocker?



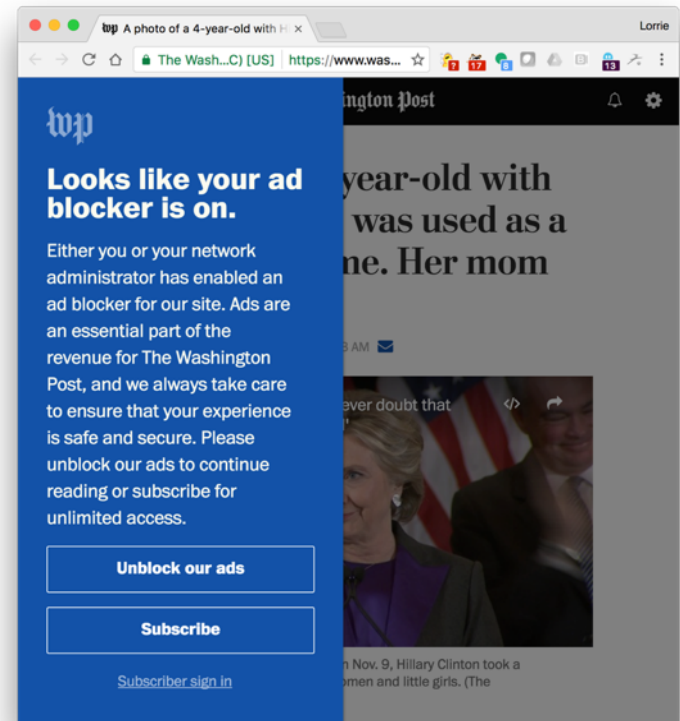
Base: 731 ad blocker users in the US, UK, Germany, and France

Source: HubSpot Adblock Plus Research Study, Q2 2016



Cookie blockers and ad blockers

- Lots of tools for blocking cookies, tracking, and ads
- Some websites are asking or requiring users to unblock



The future of advertising?



ftc.gov/tech

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