

Designing Privacy Tools for Web Browsing

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Usable Privacy and Security
Carnegie Mellon University

Johnny is very shy and withdrawn, invariably helpful but with little interest in people or in the world of reality. A meek and tidy soul, he has a need for order and structure, and a passion for detail.

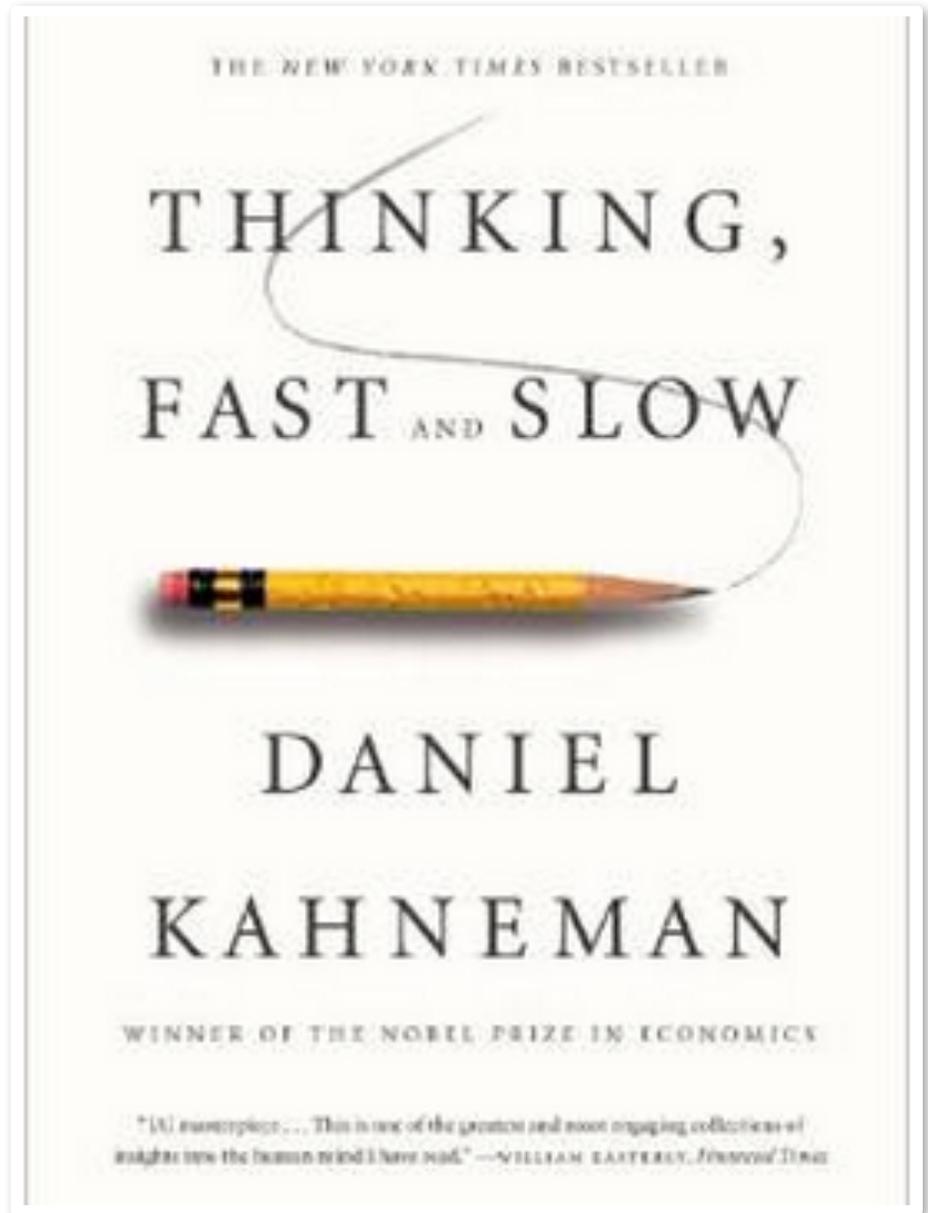
Is Johnny more likely to be a librarian or a farmer?

Thinking, Fast and Slow. Daniel Kahneman, 2013

Agenda

- Hurdles In Privacy Decision Making
- Choice Architecture
- Assessment of Privacy Tools for Web Browsing: A Choice Architecture Focus
 - Advertising Industry Opt-Out Tools
 - Tracking Blockers Browser Plugins
 - Privacy Tools for Facebook
- Conclusion

Hurdles in (Privacy) Decision Making



Asymmetric and Incomplete Information

- Many unknowns and uncertainty for the user
 - How user information will be used?
 - Who is collecting user information?
 - What other information the website knows about the user?
 - With whom would user information be shared?
 - How does the website protect user information?
 - Can user control or limit how website uses his information?

Bounded Rationality

- Limited memory resources
- Limited cognition resources
- Limited attention
- Difficult to assess or foresee risks
- Difficult to assess all alternatives

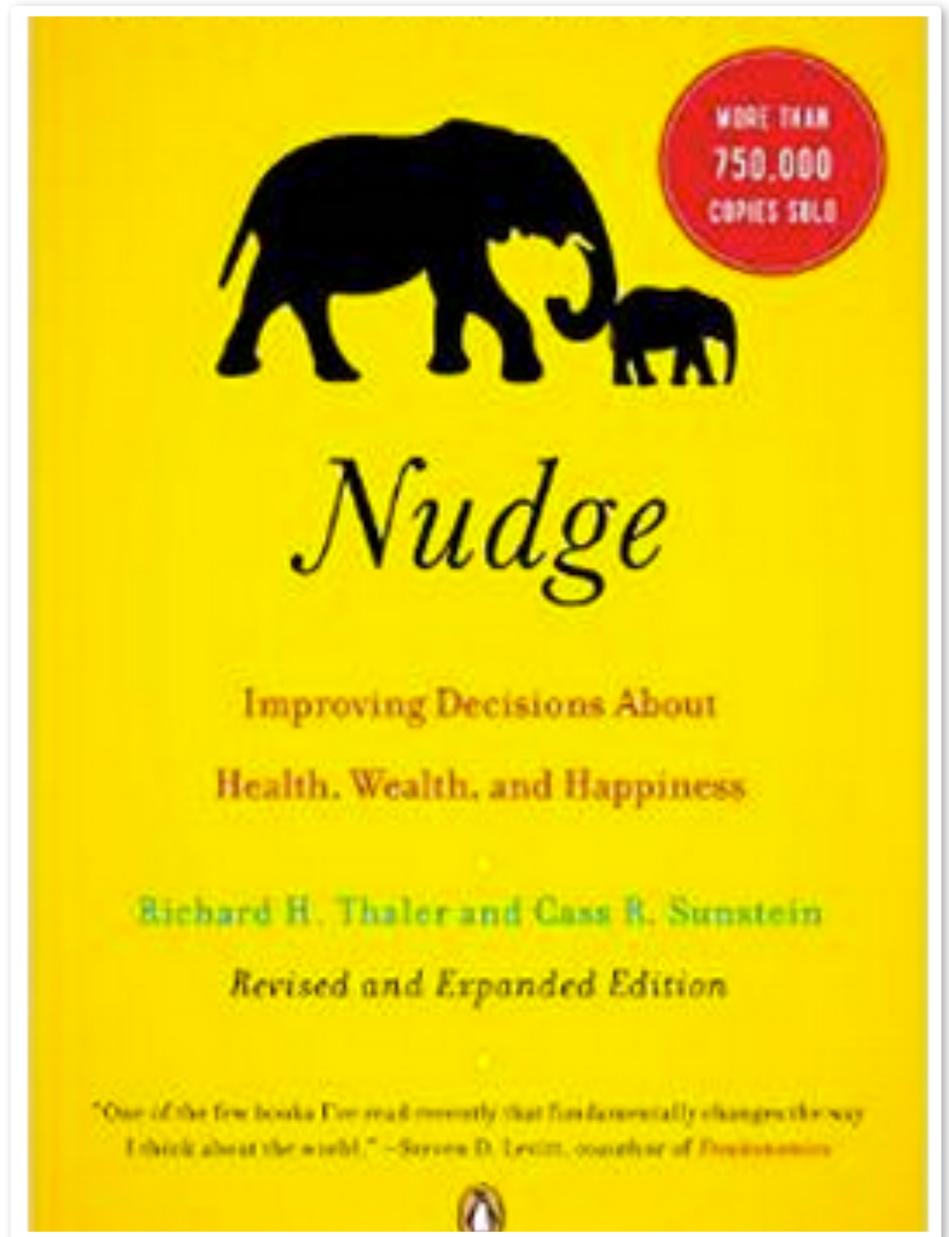
Behavioral Biases

- Optimism and Overconfidence
 - Underestimate Privacy Risks
- Status Quo
 - Conform to the norms
 - Affinity to default choices
- Hyperbolic Time Discounting
 - Overestimate present benefits of disclosure
 - Underestimate future risks
- Loss Aversion
 - Losses are weighted more than gains
 - Endowment effect

Decision Making Heuristics

- Availability
- Representativeness
- Anchoring

Choice Architecture



Design Choices

- Information: Reduces information asymmetries and provides a realistic perspective of risks
 - Awareness
 - Education
 - Feedback
- Presentation: Provides contextual cues through the User Interface to reduce cognitive load and convey the risk properly
 - Framing
 - Ordering
 - Saliency
 - Structure

Design Choices

- Defaults: Reduce users' effort by configuring the system according to what is most likely to conform to most users' expectations
- Incentives: Motivate users to behave according to their stated preferences
 - Cost (e.g., make it harder to use a system or feature)
 - Rewards
- Time: Define the right moment to intervene

Decision Making Heuristics

- Availability
- Representativeness
- Anchoring

Ad Industry Opt-Out Tools



Sun Joe Lawn Mowers 14 in. 12-A...
\$149
SHOP >

LET'S KNOCK IT OUT.
More doing.

AdChoices



Arnold Schwarzenegger shows off his \$2M ride

Splash News

LET'S TACKLE TO DO'S.

BLACK+DECKER Lawn Mowers 17 in. Walk-Behi...
\$169
SHOP >

AdChoices

LET'S TACKLE TO DO'S.



BLACK+DECKER Lawn
Mowers 20 in. 13-Amp C...

\$199

SHOP >

SHOP >

AdChoices

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 (121)

SHOW

Companies Customizing Ads For Your Browser (3)

Existing Opt Outs (0)

SHOW

These 3 participating companies have enabled interest-based ads for this web browser.

Click the company name to find out more about a participating company. To opt out from interest-based ads by 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 use click the "Select all shown" box to pre-check all the listed companies before you hit the "Submit" button.

[Need help?](#)

COMPANY NAME

SELECT ALL SHOWN

Microsoft Advertising

Undertone

Yahoo

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[Need help?](#)

COMPANY NAME

SELECT ALL SHOWN

Microsoft Advertising

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Yahoo

Submitting your choices for the selected companies stores your opt out preference(s) in your browser. [Learn More.](#)

Submit your choices

All Participating Companies (121)

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These 121 companies participate in the DAA's consumer choice page.

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[Need help?](#)

COMPANY NAME

SELECT ALL SHOWN

Accuen Inc.

status currently unavailable

eBay Enterprise (formerly FetchBack)

status currently unavailable

Videology

status currently unavailable

33Across

Acxiom

Adara Media, Inc.

Adblade Premium Ad Network

AddThis (including XGraph)

Adelphic

Adobe Media Optimizer

Submitting your choices for the selected companies stores your opt out preference(s) in your browser. [Learn More.](#)

Submit your choices

Tracking Blockers Browser Plugins



DISCONNECT



GHOSTERY

D. DISCONNECT

Disconnect lets you visualize and block the invisible websites that track your browsing history. Click the interactive items below to find out more!

Toolbar button

The **toolbar button** shows you the total number of tracking requests on every page you go to. Click the button to see and block or unblock the requests.

Dropdown

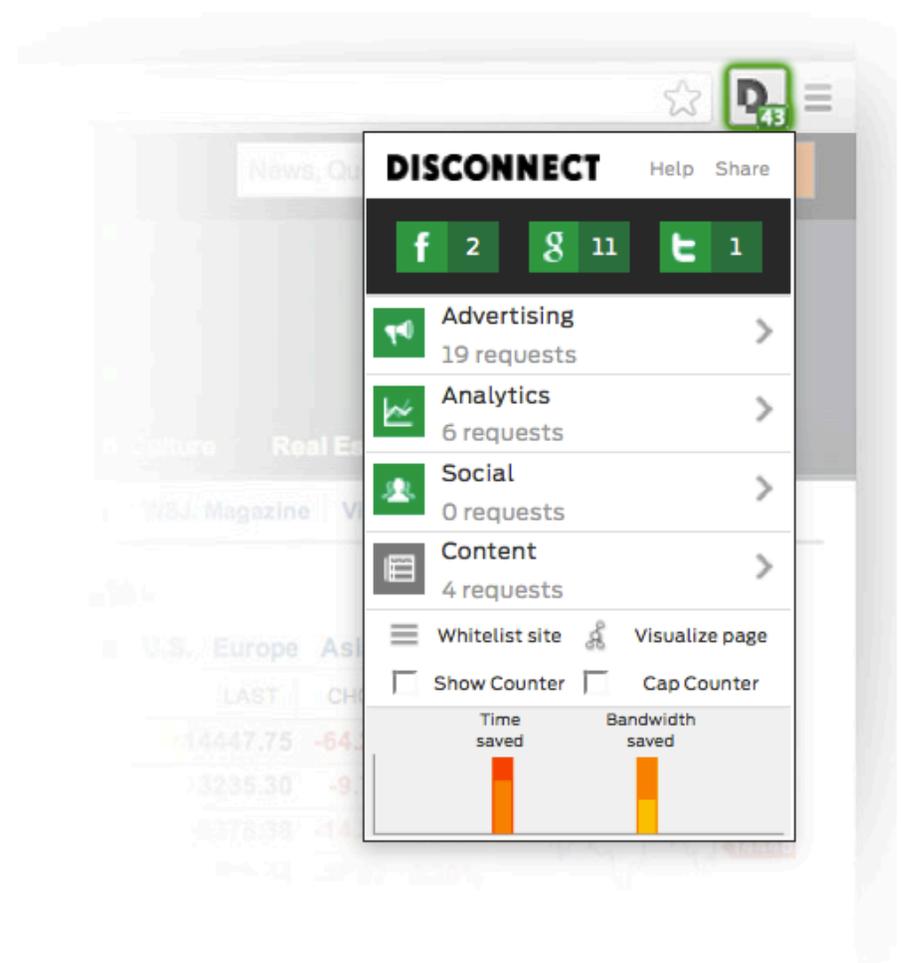
Navbar

Common tracking sites

Other tracking sites

Options

Dashboard



D. DISCONNECT

Disconnect lets you visualize and block the invisible websites that track your browsing history. Click the interactive items below to find out more!

Toolbar button

Dropdown

The **dropdown** shows you the number of tracking requests by company. Green means the requests are blocked. Gray means they're unblocked. Click any icon or checkbox to block or unblock requests.

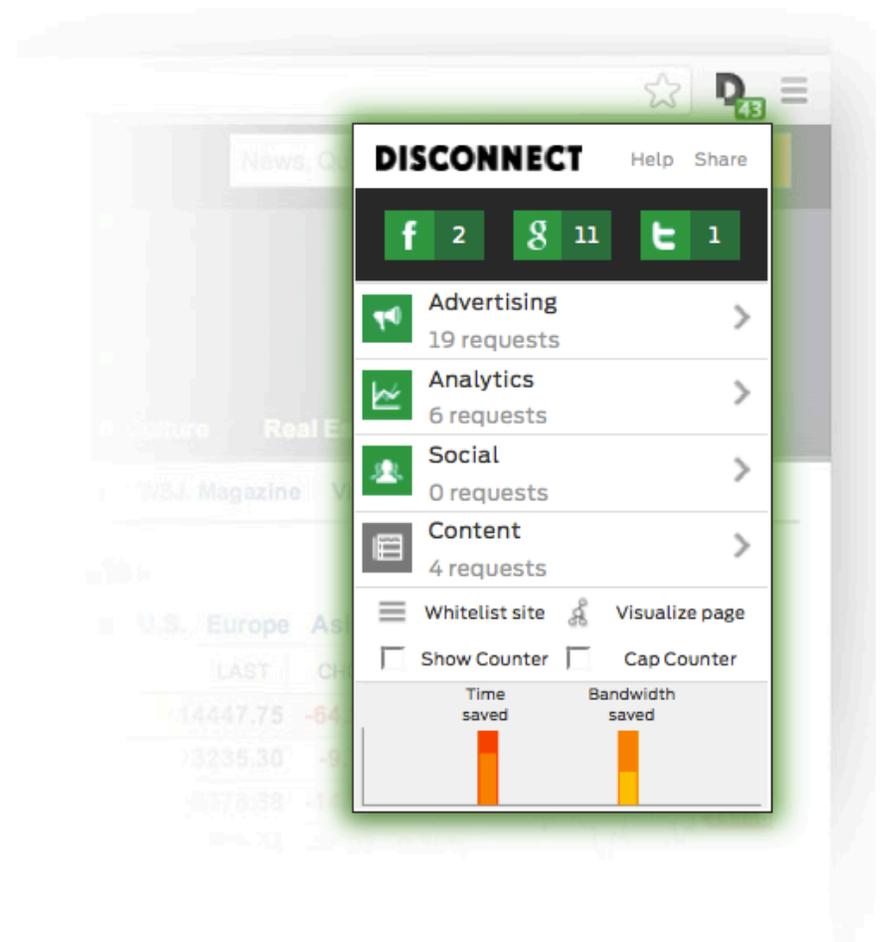
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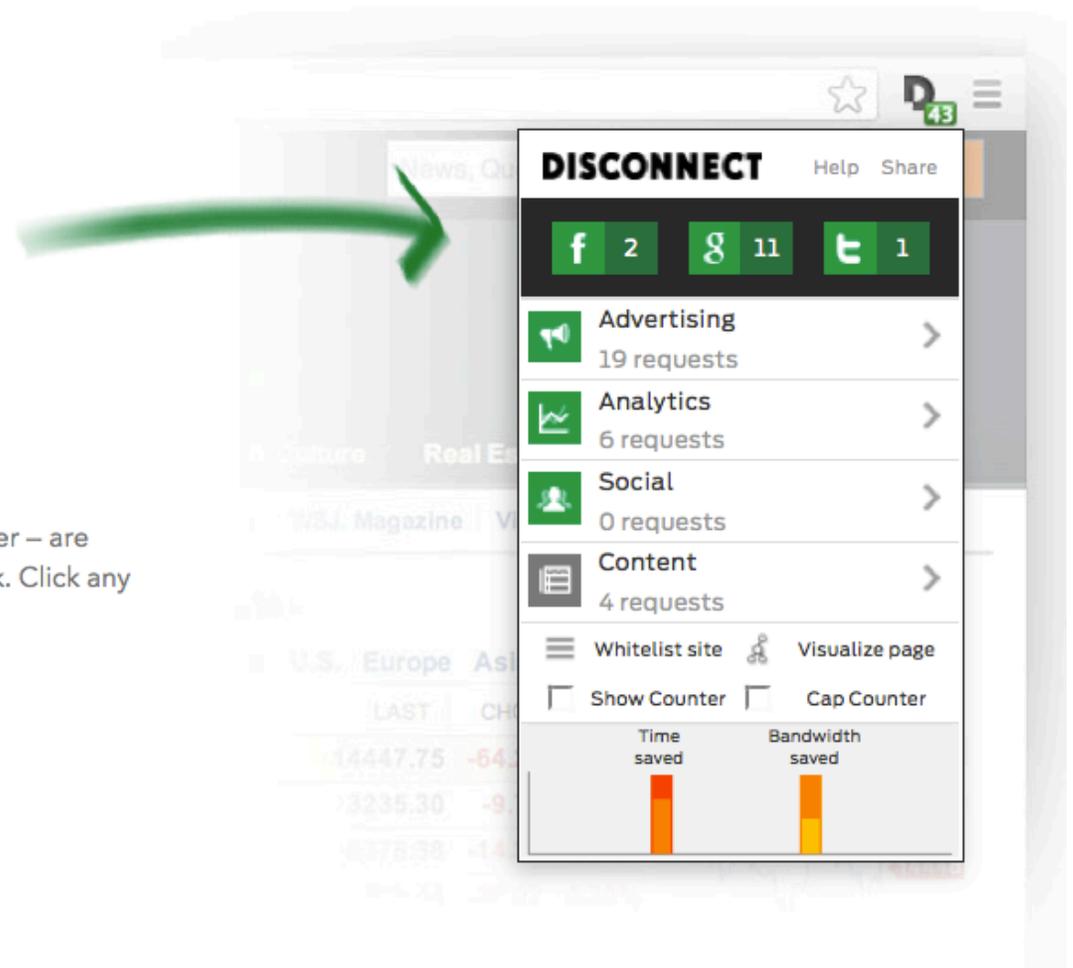
Common tracking sites

Common tracking sites – Facebook, Google, and Twitter – are shown separately to make them easy to block or unblock. Click any icon to block or unblock a site.

Other tracking sites

Options

Dashboard





The New York Times
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Using Cash and Charm, Putin Tries to Subvert E.U. Sanctions



EDITORIAL APPRECIATIONS
Victor Gotbaum, the City's Shop Steward
 It is hard not to be nostalgic for people who recognized the

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Lessons of Rolling Stone's 'A Rape on Campus'
 Procedures for investigating campus sexual assault may be changing, but some basic rules

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The New York Times

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4 WEEKS JUST
Try it now

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Using Cash and Charm, Putin Tries to Subvert E.U. Sanctions

By ANDREW HIGGINS 5:42 PM ET



EDITORIAL APPRECIATIONS Victor Gotbaum, the City's Shop Steward

It is hard not to be nostalgic for people who recognized the need for shared sacrifice



The Opinion Pages

TAKING NOTE | ANNA NORTH
Lessons of Rolling Stone's 'A Rape on Campus'
 Procedures for investigating campus sexual assault may be changing, but some basic rules of journalism still hold true

DISCONNECT Help Props

f 0 g 8 t 35

- Advertising 4 requests >
- Analytics 4 requests >
- Social 0 requests >
- Content 0 requests >

Whitelist site Show counter

Time saved Bandwidth saved

DISCONNECT Help Props

f 0 g 8 t 35

Advertising 4 requests

- Moat 1 request
- Krux 1 request
- Nielsen 1 request
- AudienceScience 1 request

Analytics 4 requests

Social 0 requests

Content 0 requests

Whitelist site Show counter

Time saved Bandwidth saved

Verbose Description



Skip Wizard

Introduction

Welcome to Ghostery for Firefox version 5.4.3!

Ghostery looks for third-party page elements (or "trackers") on the web pages you visit. These can be things like social network widgets, advertisements, invisible pixels used for tracking and analytics, and so on. Ghostery notifies you that these things are present, and which companies operate them. You can learn more about these companies, and if you wish, choose to block the trackers they operate.

This quick walkthrough will highlight some of Ghostery's options and give you a chance to set things up straight-away. You can change any of these decisions (and view more options) by visiting the full Ghostery options page at any time. If you have any questions during the process, drop us a line at support@ghostery.com.

Verbose Description



Skip Wizard

Ghostrank™

Help support Ghostery by sending anonymous statistical data back to Ghostery HQ.

When you enable Ghostrank, Ghostery collects anonymous data about the trackers you've encountered and the sites on which they were placed. This data is about tracking elements and the webpages on which they are found, **not you or your browsing habits**.

... [See more](#).

Click here to enable Ghostrank

Default Active Alert Bubble



Skip Wizard

Notification



When Ghostery detects trackers on a page you're visiting, it displays the companies that operate those elements in a purple box at the top right corner of the screen. If you'd rather Ghostery work in the background, you can uncheck the box below.

There are more ways to customize the purple box on Ghostery's options page.

[Click here to enable Alert Bubble](#)

Blocking Choices Shown Late and Off by Default



Skip Wizard

Blocking

Ghostery can prevent the page elements it detects from running in your browser.

Blocking trackers will prevent them from running in your browser, which can help control how your behavioral data is tracked. Keep in mind that some trackers are potentially useful, such as social network feed widgets or browser-based games ... Blocking may have an unintended effect on the sites you visit.

Please [let us know](#) if you run into any issues.

Trackers that got blocked will be crossed out in the alert bubble and the findings panel.

Trackers | **Cookies**

Blocking **no** trackers.

When you block a tracker, that tracker is prevented from communicating with its third-party provider.

Show

Search for

A/B Testing 9 | Affiliate Marketing 47 | Analytics 116 | Audio / Music Player 4 | Behavior Tracking 48 | Commenting System 5 | Cookie Respawning 2 | Device Fingerprinting 4 | E-mail Analytics 23 | Feedback 18 | [Show more tags...](#)

[Select all](#) | [Select none](#) | [Expand all](#) | [Collapse all](#)

>	<input type="checkbox"/>	Advertising	978 trackers: blocking none
>	<input type="checkbox"/>	Analytics	317 trackers: blocking none
>	<input type="checkbox"/>	Beacons	380 trackers: blocking none
>	<input type="checkbox"/>	Privacy	19 trackers: blocking none
>	<input type="checkbox"/>	Widgets	290 trackers: blocking none

Discouraging Blocking Tracking



Skip Wizard

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Please [let us know](#) if you run into any issues.

Trackers that got blocked will be crossed out in the alert bubble and the findings panel.

Trackers | Cookies

Blocking **no** cookies.

When you block a cookie, selected third-party providers are unable to write cookies to your browser.

Warning! When combined with other cookie monitoring addons such as **Beef Taco**, **Cookie Monster**, and **Google Opt-Out**, this feature can cause **unresponsive script** errors. If you experience this error, please try disabling this feature or conflicting addons.

Show

Search for

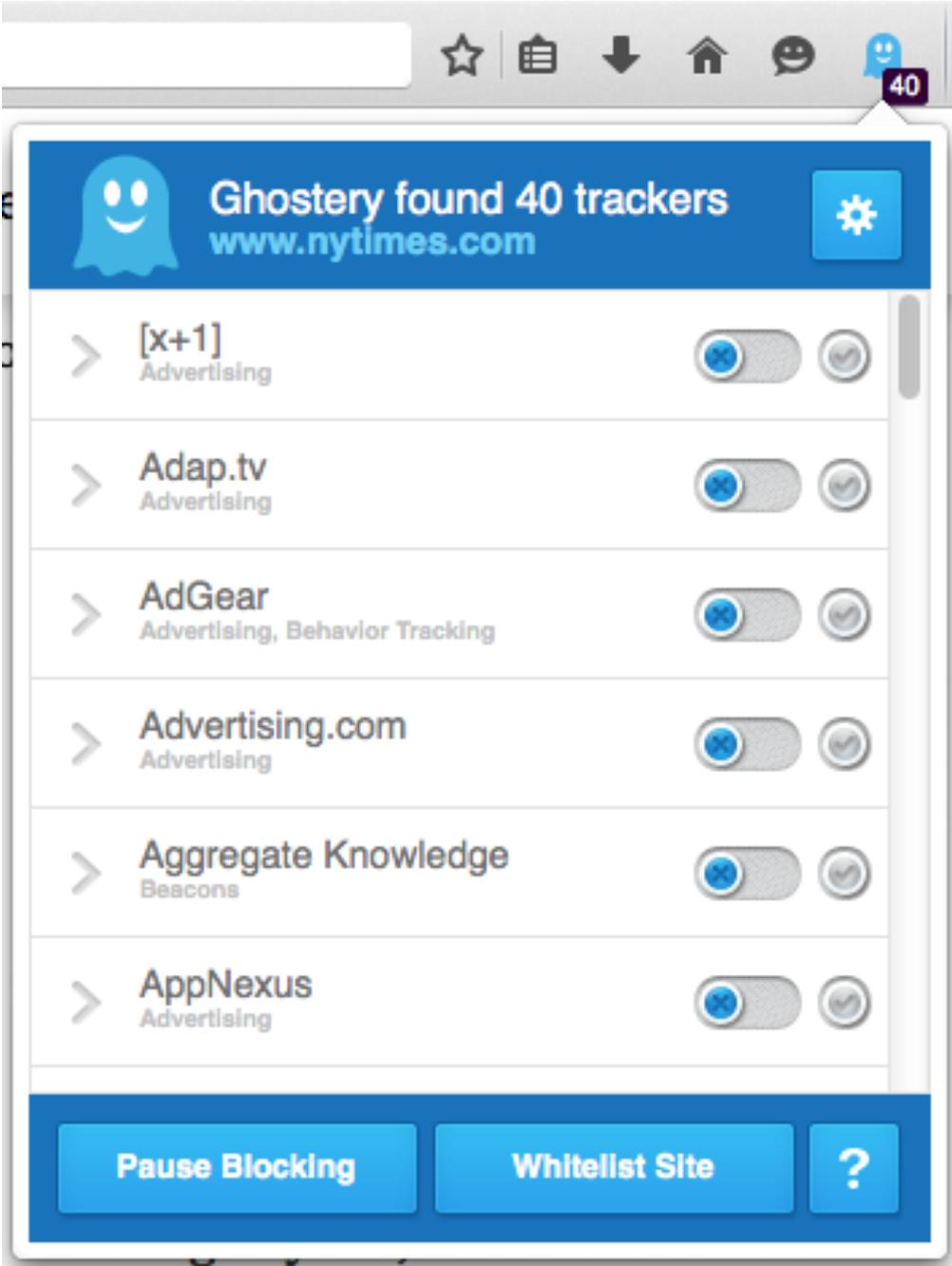
Select all | Select none | Expand all | Collapse all

>	<input type="checkbox"/>	Advertising	426 cookies: blocking none
>	<input type="checkbox"/>	Analytics	132 cookies: blocking none
>	<input type="checkbox"/>	Beacons	154 cookies: blocking none
>	<input type="checkbox"/>	Widgets	30 cookies: blocking none

Creating Awareness

The screenshot shows the New York Times homepage from April 6, 2015. The main headline is "G.O.P. Senator Is a Major Player in Iran Nuclear Accord" by Ashley Parker and Peter Baker. Below it is a photo of a basketball being held up by two hands. To the right, there is a section for "The Opinion Page" featuring an article by Victor Gotbaum titled "Shop Steward". A sidebar on the right lists various advertising products such as "Aggregate Knowledge", "AppNexus", "Audience Science", "BlueKai", "Casale Media", "Centro", "Chango", "ChartBeat", "Connexity", "Datalogix", "DataXu", "DoubleClick", "DoubleClick Floodlight", "Dynamic Yield", "eXelate", "Google AdSense", "Google Analytics", "KruX Digital", "LiveRamp", "Media Optimizer (Adobe)", "Moat", "NetRatings", "SiteCensus", "Neustar AdAdvisor", "New Relic", "New York Times", "Optimax Media Delivery", "Quantcast", "RadiumOne", "Rocket Fuel", "ScoreCard Research Beacon", "Tapad", "TradeDesk", "Turn", "Twitter Advertising", "Typekit by Adobe", and "WebTrends".

Ineffective Visual Cues



Privacy Tools for Facebook



Privacy Checkup

Skip



Hi Charlie — Sorry to interrupt. You haven't changed who can see your posts lately, so we just wanted to make sure you're sharing this post with the right audience. (Your current setting is Public, though you can change this whenever you post.) [Learn more.](#)

Who do you want to share this post with?

 Friends

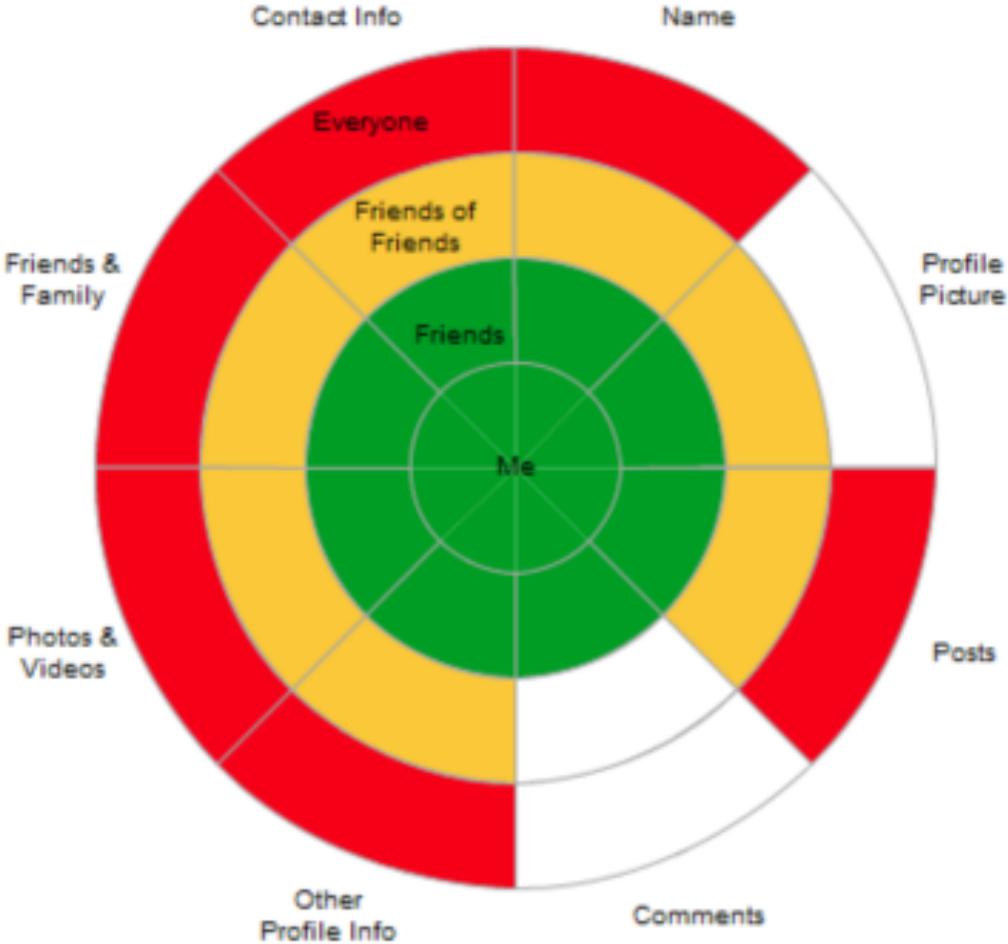
 Public

 More Options

Privacy Settings

Invite Friends | f Share | f

Questions? See our FAQ!



Additional Settings you should be aware of:

✓ Facebook partners **can not** use your public info

✗ Friends **can** share your info

✗ Advertisers **can** show your info to friends in ads

Facebook Nudges

Passive aggressive people irritate the hell out of me, if you can't say something to my face maybe you should keep your mouth shut.



Friends ▾

Post



These people and 102 more can see your post.

Passive aggressive people irritate the hell out of me, if you can't say something to my face maybe you should keep your mouth shut.



Friends ▾

Post

Your post will be published in **3 seconds**.

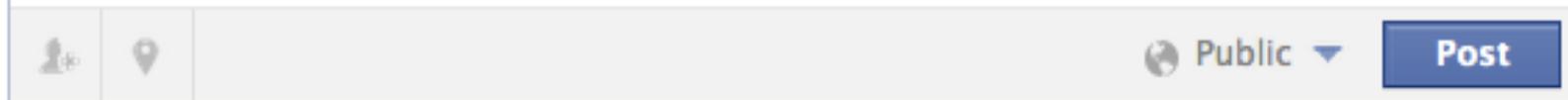
Post Now

Edit

Cancel

Improved Awareness

So I bought a Rick Pitino Makers bottle for \$50 and turned around and sold it for \$180, lol...



These people and ANYONE ON THE INTERNET can see your post.

“That was almost the ‘Oh wow’ moment when I realized that more people could see my posts than I thought about”

Stop and Think

Congratulations to the great State of Mississippi for ratifying the 13th Amendment of the U.S. Constitution to ban slavery. Oh wait, wasn't that supposed to be done 148 years ago?

Facebook post creation interface showing a countdown timer: "Your post will be published in 3 seconds." Below the timer are buttons for "Post Now", "Edit", and "Cancel".

“It helped me avoid getting into fights on Facebook because you have to **stop and think.**”

“I used it to correct grammatical errors or statuses that looked off.”

Stop and Think

not excited about still being sick wtf

   Friends ▼ Post

Your post will be published in **3 seconds**.

Post Now Edit Cancel

not excited about still being sick after spending all afternoon in bed not doing my paper or having fun.

   Friends ▼ Post

Your post will be published in **3 seconds**.

Post Now Edit Cancel

Conclusions

- Behavioral biases affect privacy decision making
- Good tool design needs to take these biases into account
- Tools can both mitigate and leverage biases to assist user decisions
- Every design choice will impact user behavior
- Good tools can have a positive impact on user behaviors
- Usability testing can help to assess the effectiveness of privacy tools