# 20 – Privacy and anonymity tools

Lorrie Cranor

April 3, 2017

*05-436 / 05-836 / 08-534 / 08-734 / 19-534 / 19-734*
*Usable Privacy and Security*

Carnegie Mellon University
CyLab

institute for SOFTWARE RESEARCH

Engineering & Public Policy

# Today's class

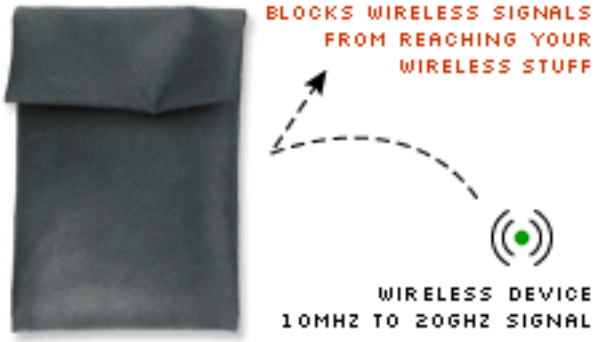
- Types of privacy tools
- Opt-out tools
- Anonymity tools
- Discussion

# Privacy space framework

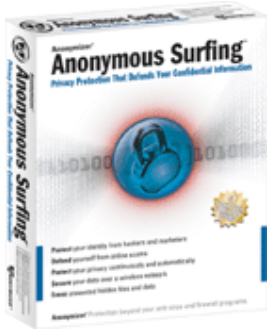
| Category | Description | Examples |
|---|---|---|
| Awareness | Informative | Display information about trackers on current webpage, whether location is being sent |
| Detection | Actively look for problems | Find trackers on current webpage |
| Prevention | Used as a precaution | Encryption tools, anonymity tools |
| Response | Taking action after a problem is detected | Tracking blocker |
| Recovery | Help you get back to normal | Patching bugs |

Benjamin Brunk. A user-centric privacy space framework. In Cranor and Gafinkel, eds. *Security and Usability*. O'Reilly 2005. p. 401-420.

# Privacy Enhancing Technologies




http://www.mobilecloak.com/



http://tor.eff.org/

**SECURITY SHREDDER SCISSORS** | Dept 60319

(#96385)

___Security Shredder Scissors(s) @ $12.97 $

CA residents must add 7.25% sales tax $

Add Shipping & Handling ~~$3.95~~ FREE

Please Print Clearly

TOTAL $

SEND ORDER TO: **Dream Products, Inc.** 412 DREAM LANE, VAN NUYS, CA 91496

❑Check or money order **payable** to: **Dream Products, Inc.**

Charge my: ❑ VISA ❑ MasterCard ❑ Discover®/NOVUS℠Cards

Card# Expiration Date ___/___

Name _____

Address _____

City _____ ST ___ Zip _____

**FOIL IDENTITY THIEVES WITH 5-BLADE SHREDDER SCISSORS**

Guard personal information and identity with easy-to-use 5-blade Security Shredder Scissors. No need for noisy shredding machines. Razor-sharp stainless steel blades slice and shred bank statements, receipts, old checks, private communications… even credit cards with ease. Great for home or office. 7" long with molded comfort handles. Hurry, order today and get FREE Shipping & Handling!

Satisfaction Guaranteed or Return For Your Money Back

# KEEP PRIVATE INFORMATION PRIVATE

www.DreamProductsCatalog.com (website offers may vary)

Delaware Lottery Games

Winning Numbers | Games | Where to Buy | Players Club | Claim Prizes | Rules
Winners | News + Events | Media Center | FAQs | For Retailers | Financials

search delottery.com GO

# When you win, we won't tell a soul.
## (You may have a harder time.)

When you win with the Delaware Lottery, privacy is our policy. We'll never release your name for promotional purposes - unless you tell us otherwise. Which means you can keep your good fortune as quiet as you want. So play Delaware Lottery Games. Because when you win big in our state, we won't say a word.

Click Here To Download Our "Guide To Winning Kit."

Kit includes: Guide To Winning Brochure, Mask Print Out, and Drawing Schedule

You could be the next winner?

Back to Top

Home | Contact Us | Directions | Site Map | Privacy Policy | Delaware State Government

Tell a Friend Sign up for Winning Number e-mails Play Responsibly

Wayne Lemons,
*Delaware Lottery Director*

Delaware Lottery Office
McKee Business Park
1575 McKee Road, Suite 102
Dover, DE 19904
Phone: 302-739-5291
Fax: 302-739-6706

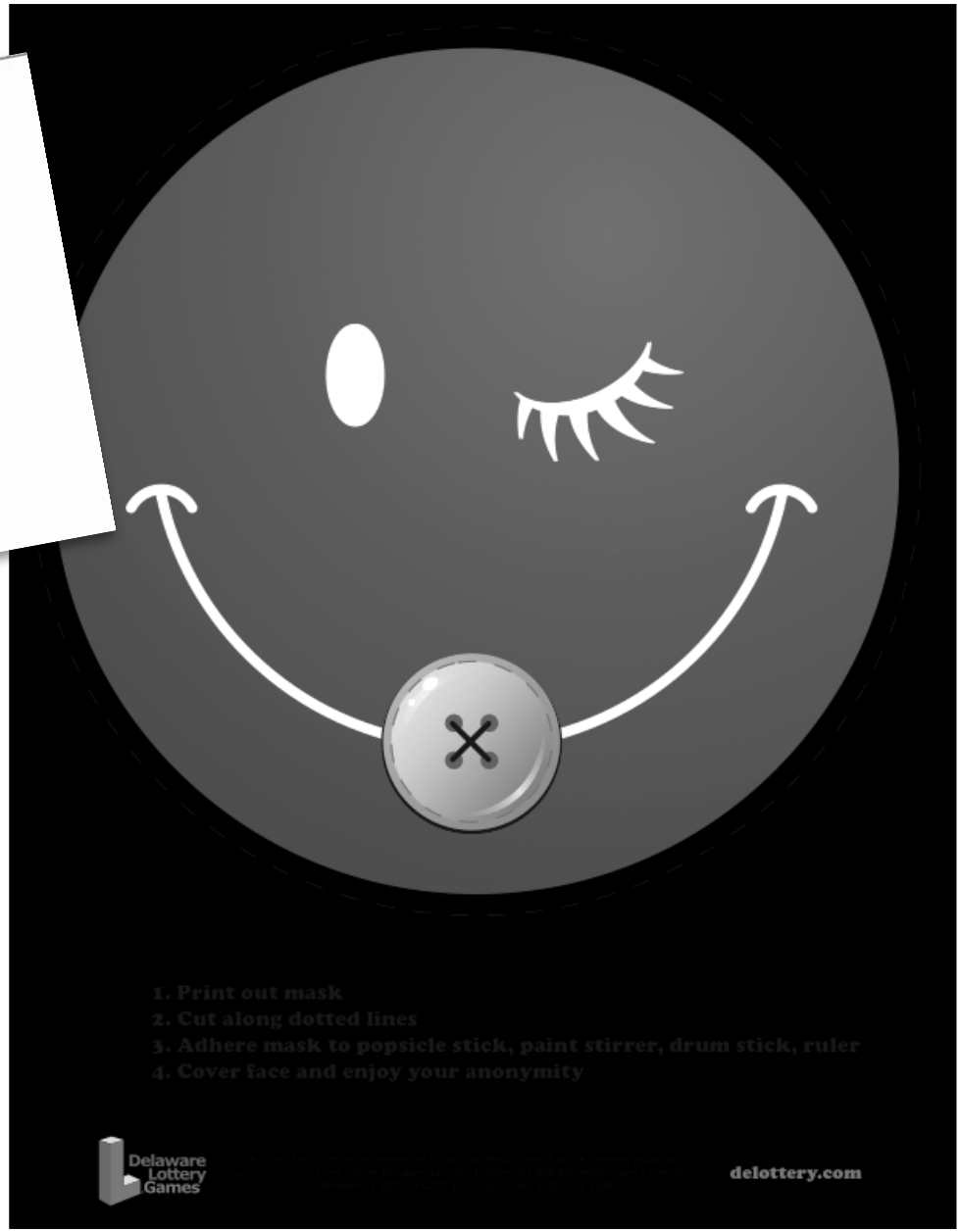
**Play Responsibly** — If you or someone you know has a gambling problem, call the Delaware Gambling Helpline — 1-888-850-8888.

**It's the Law** — You must be 18 years of age or older to purchase Delaware Lottery tickets.

Designed to comply with the accessibility guidelines developed through the WAI and the Web Presentation Guidelines for State of Delaware Agencies.

Winner privacy is our policy.

August 15, 2007
POWERBALL® Drawing
$10,000 Prize Winner
Purchased at 7-11 Foulk Road in Wilmington


1. Print out mask
2. Cut along dotted lines
3. Adhere mask to popsicle stick, paint stirrer, drum stick, ruler
4. Cover face and enjoy your anonymity
Delaware Lottery Games
delottery.com

# Types of privacy tools

- Cookie/tracker blockers
- Opt-out, do not track
- Tracking awareness
- Encryption
  - Email, chat, web traffic, VPN, files, file system, disk
- Cleaners/wipers
  - Delete/don't store browser history, delete files
- Anonymity
  - Web traffic, email, bulletin boards, surveys, voting
- Obfuscation
  - Add noise to web browsing, searches, databases
- Physical
  - Walls, curtains, blinds, laptop privacy screens, shredders
- Others?

# Where can privacy tools be implemented?

- Built into browsers
- Browser pluggins
- Mobile apps
- Standalone user tool
- Web-based
- Server-side tool
- Built into operating systems
- On the network (routers, firewalls, etc.)

# Challenges

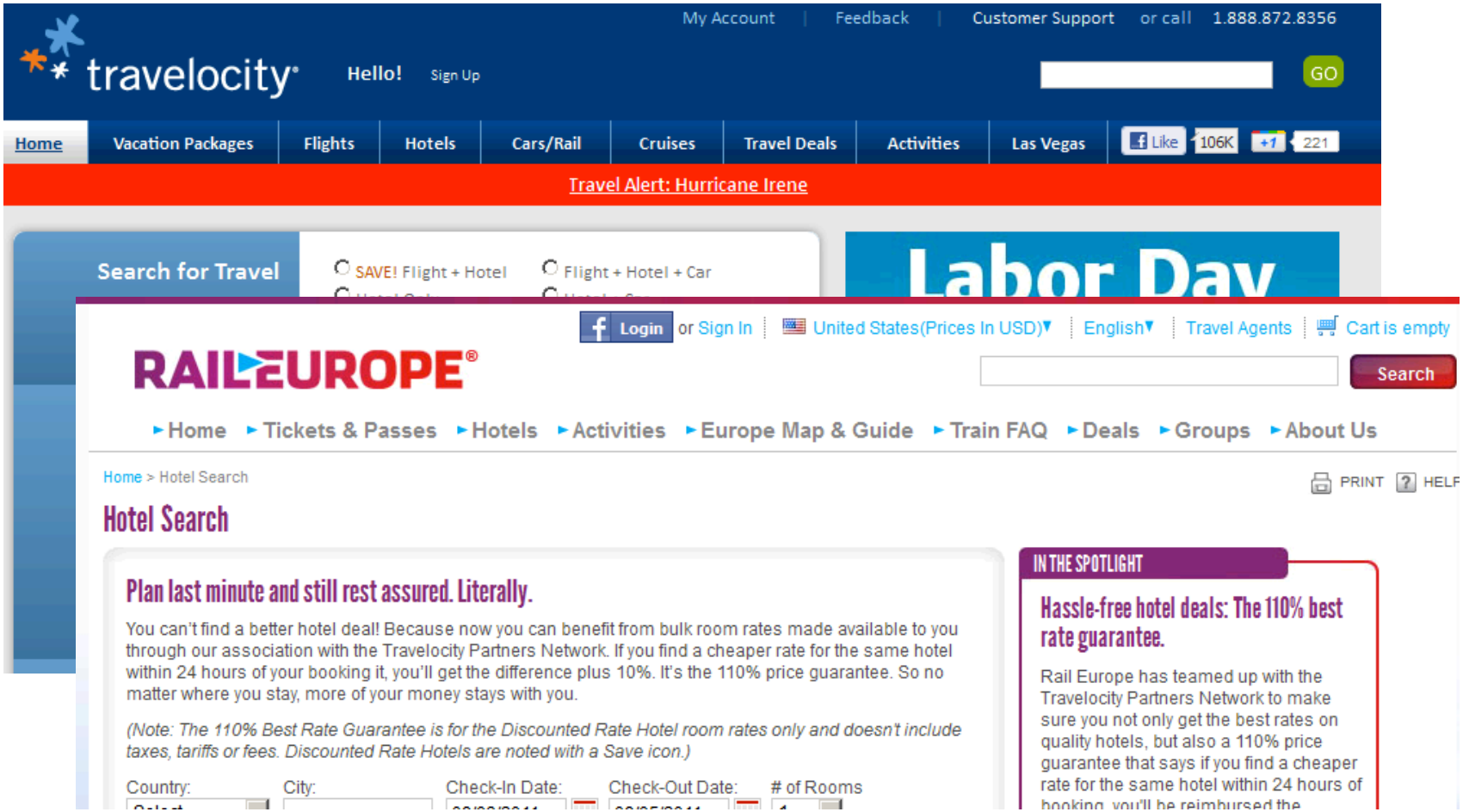
- Conveying the purpose of the tool
  - In what way does this tool protect privacy?
- Conveying current privacy state
  - Is tool currently on and working? Have trackers been detected?
- Configuration
  - Provide meaningful and flexible options users can understand and configure to match their preferences and meet their needs, don't overwhelm users with too many options they can't understand, make options easy to find and access
- Avoiding errors, failing safe
  - Will users believe they are protected when they are not?

# Why Johnny Can't Opt Out

- August 2011 lab study
- 45 participants, each evaluated 1 of 9 tools
  - Screened for non-technical, no knowledge about privacy tools but interested in testing them
- Protocol
  - Task 1: Learn about and install the tool
  - Task 2: Change tool settings
  - Task 3: Browsing scenario
  - Exit questionnaire

Why Johnny Can't Opt Out: A Usability Evaluation of Tools to Limit Online Behavioral Advertising. Pedro G. Leon, Blase Ur, Rebecca Balebako, Lorrie Faith Cranor, Richard Shay, and Yang Wang
*CHI 2012*

# Online behavioral advertising (OBA)



# Later that day…

On www.reference.com:

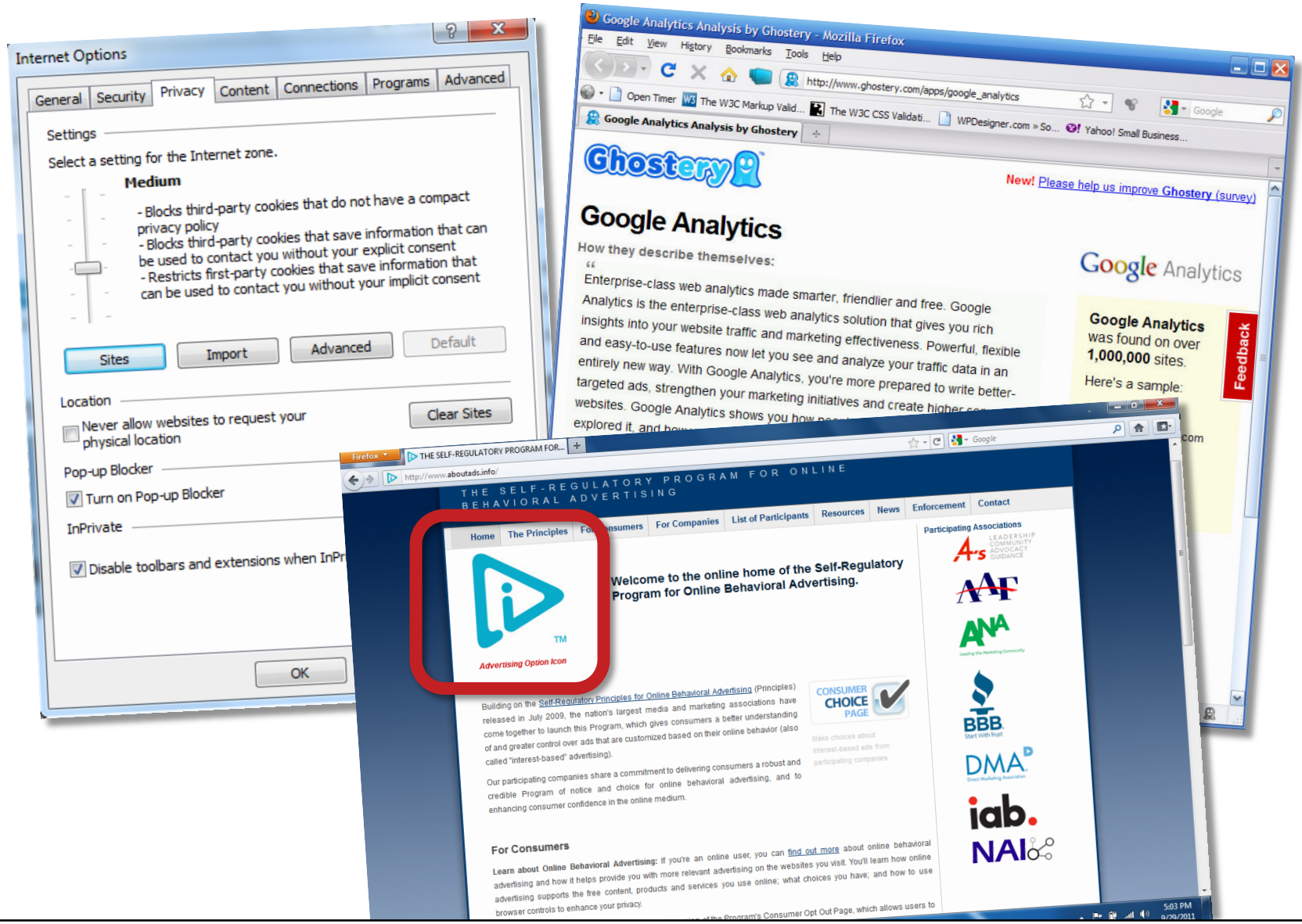
On www.cnn.com: is it OBA?

On www.nytimes.com

**Antwerp Vacations**
Enjoy Relaxation This Fall Only In Antwerp. More Info Here!
www.coolcapitals.com

**Traveling to Europe?**
All Inclusive Car Rental Prog in EU For American Tourists! Visit Us Now
www.renaultusa.com

# OBA choice mechanisms



# Three types of tools tested

**Blocking Tools**

ABINE

Ghostery

AdBlock Plus

TPLs

**Opt-out Tools**

DAA CONSUMER CHOICE PAGE

EVIDON

PrivacyMark

**Privacy built in browser**

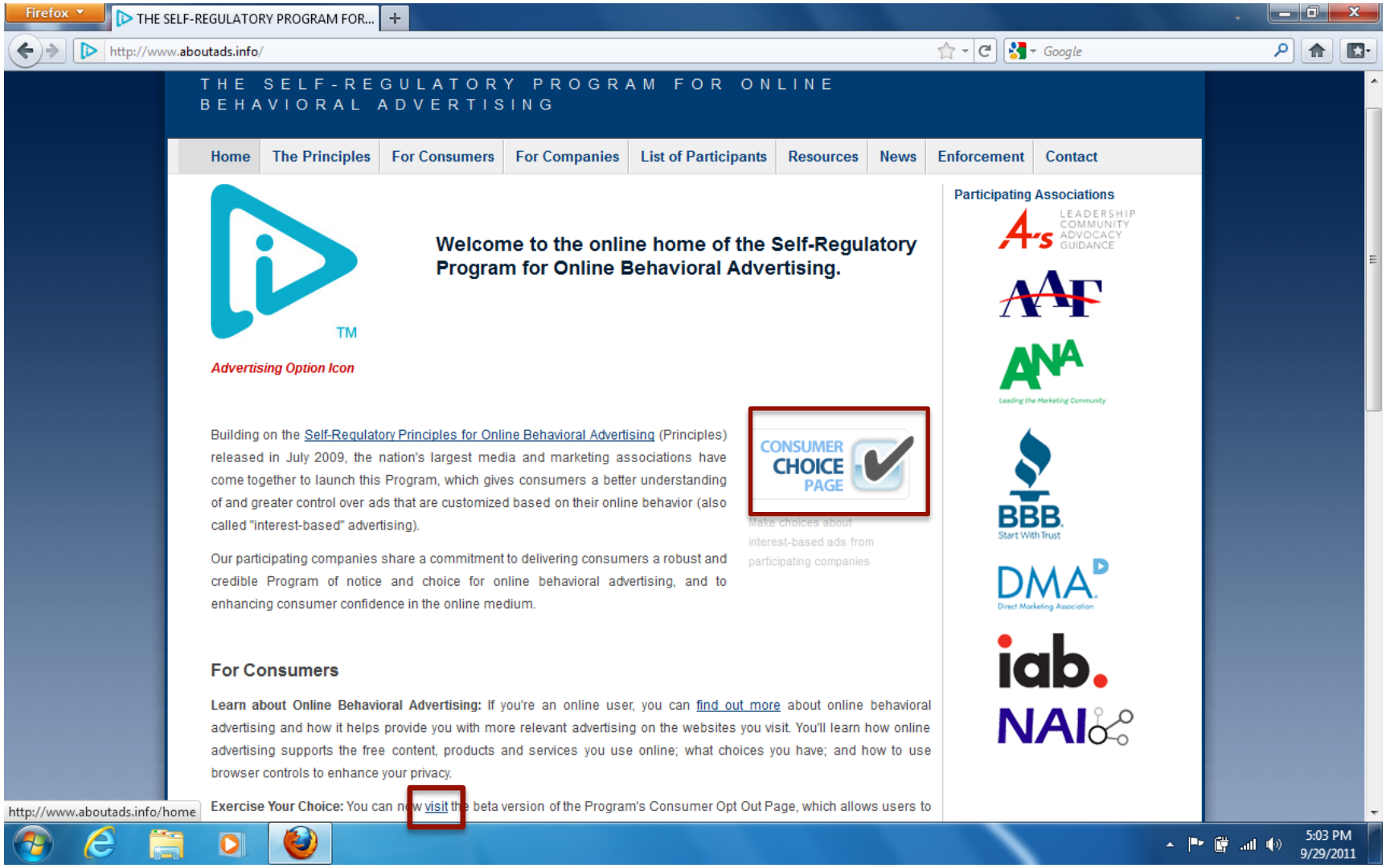
# Tools to provide notice & choice

- Support from industry, FTC, White House
- Do the tools work?
  - Does technology do what it is supposed to do?
  - Do companies respect user choices?
- Can consumers use them?
  - Do users understand tracking?
  - Do users understand what tools do?
  - Can users make tools do what they want?

# Major problems with all tools

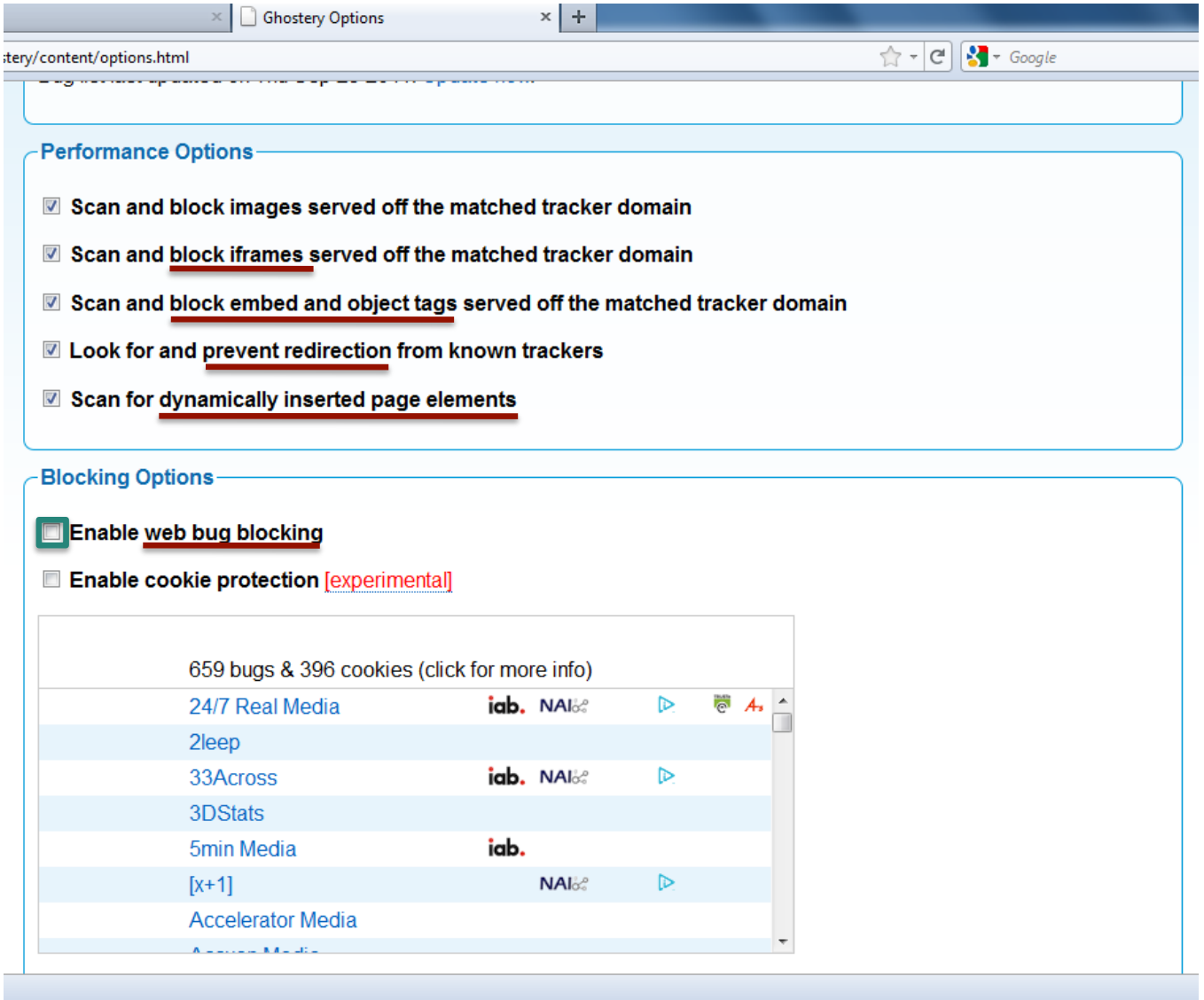
- Communication problems and confusing interfaces
- Inappropriate defaults
- Users can’t distinguish between trackers
- Need for feedback
- Users want protections that don’t break websites

# DAA website

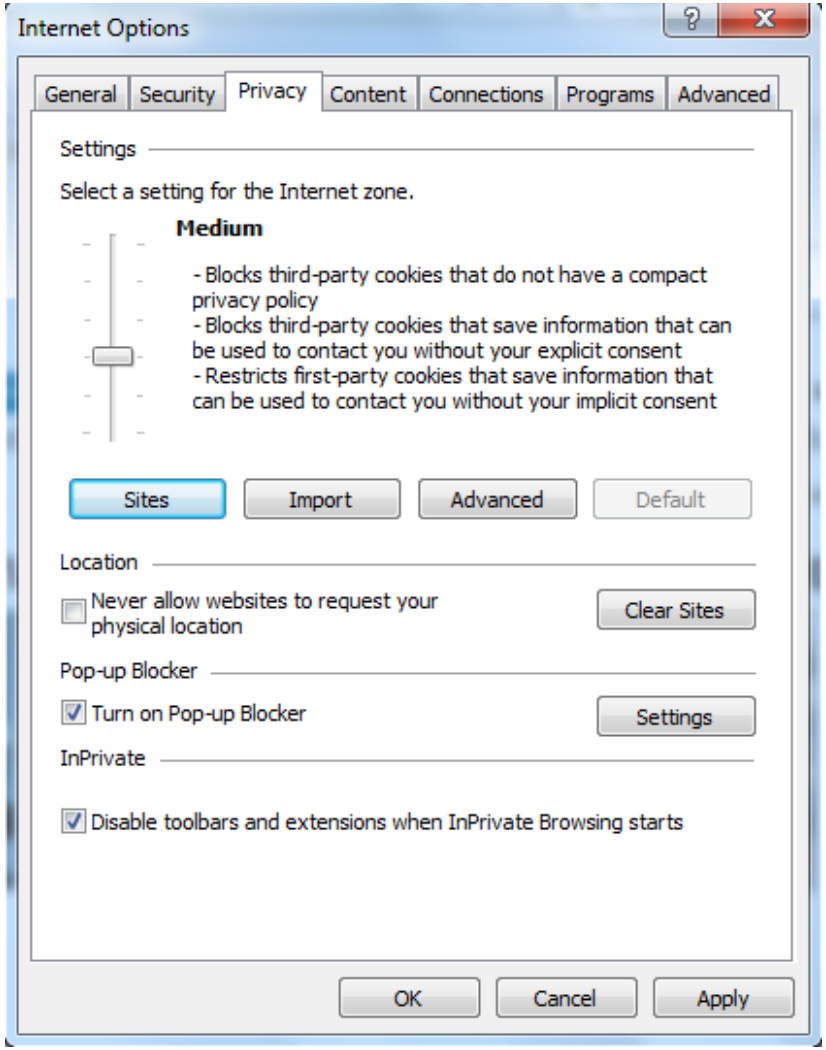

Firefox
THE SELF-REGULATORY PROGRAM FOR...
http://www.aboutads.info/
Google
THE SELF-REGULATORY PROGRAM FOR ONLINE BEHAVIORAL ADVERTISING
Home
The Principles
For Consumers
For Companies
List of Participants
Resources
News
Enforcement
Contact
TM
Advertising Option Icon
Welcome to the online home of the Self-Regulatory Program for Online Behavioral Advertising.
Building on the Self-Regulatory Principles for Online Behavioral Advertising (Principles) released in July 2009, the nation's largest media and marketing associations have come together to launch this Program, which gives consumers a better understanding of and greater control over ads that are customized based on their online behavior (also called "interest-based" advertising).
Our participating companies share a commitment to delivering consumers a robust and credible Program of notice and choice for online behavioral advertising, and to enhancing consumer confidence in the online medium.
CONSUMER CHOICE PAGE
Make choices about interest-based ads from participating companies
Participating Associations
For Consumers
Learn about Online Behavioral Advertising: If you're an online user, you can find out more about online behavioral advertising and how it helps provide you with more relevant advertising on the websites you visit. You'll learn how online advertising supports the free content, products and services you use online; what choices you have; and how to use browser controls to enhance your privacy.
Exercise Your Choice: You can now visit the beta version of the Program's Consumer Opt Out Page, which allows users to
http://www.aboutads.info/home
5:03 PM
9/29/2011

# Opting out can be challenging

# Ghostery configuration interface



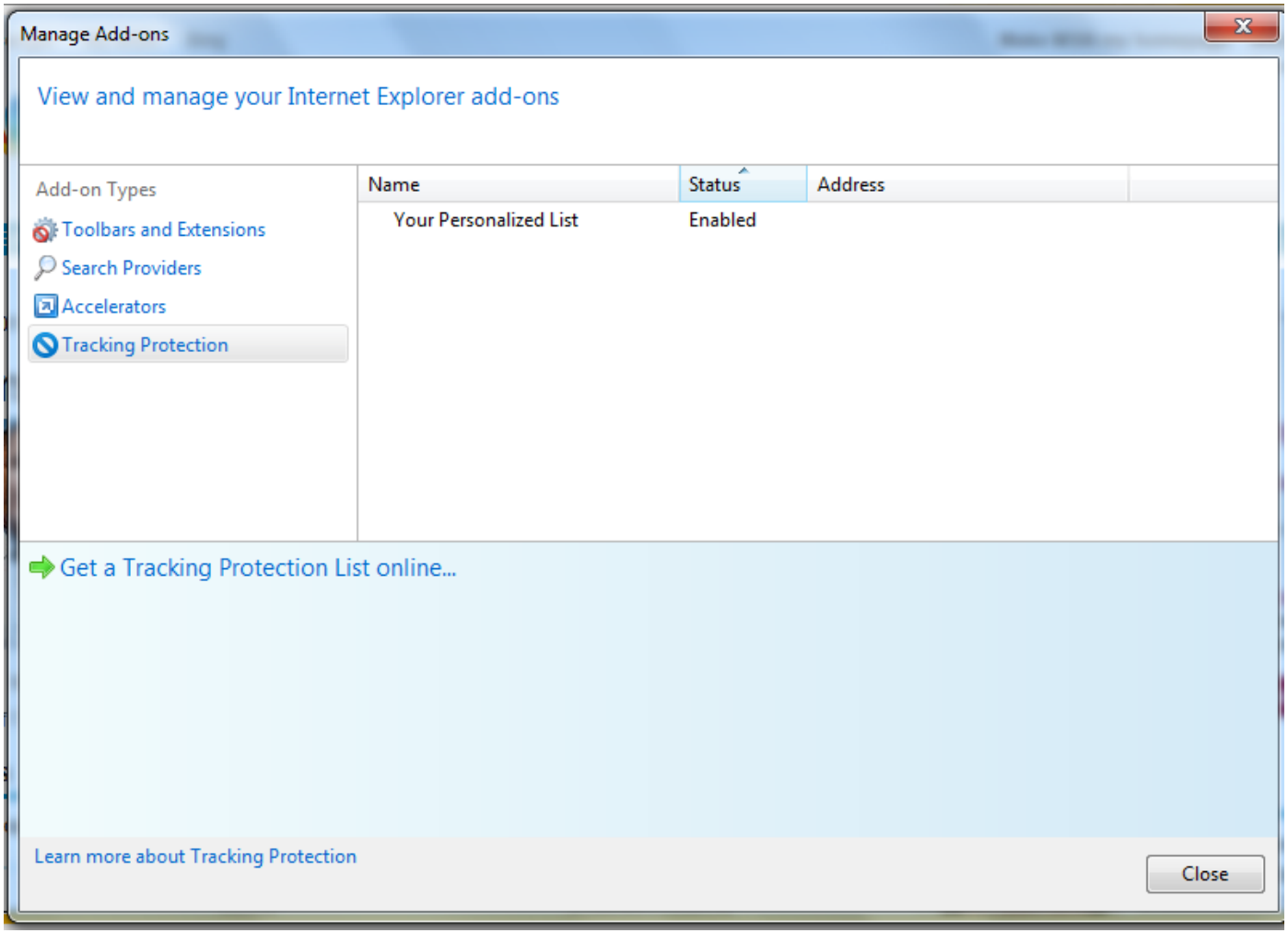
# IE settings use jargon




Blocks third-party cookies that do not have a compact privacy policy

Restricts first-party cookies that save information that can be used to contact you without your implicit consent

# IE tracking protection list

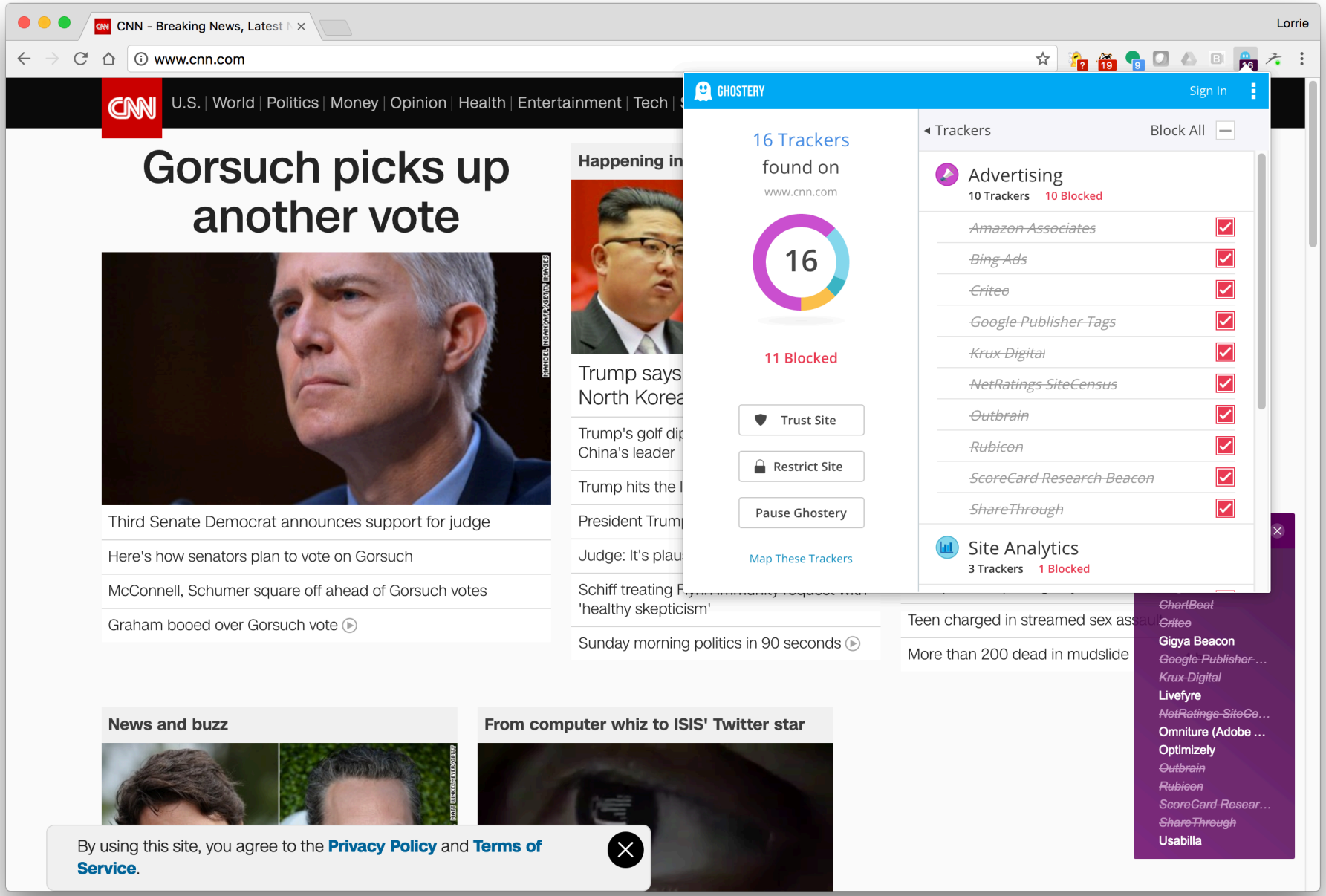


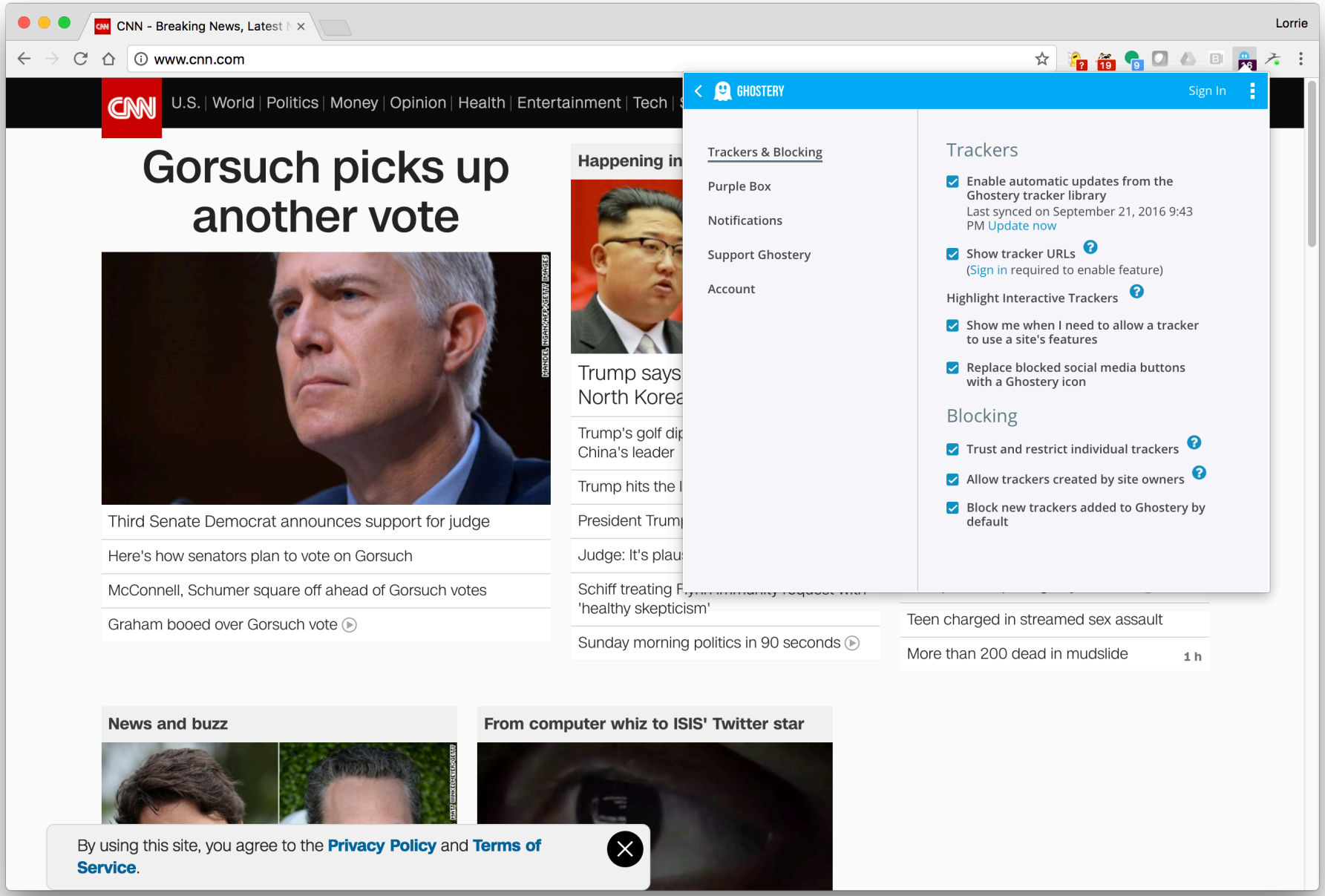
# Takeaways

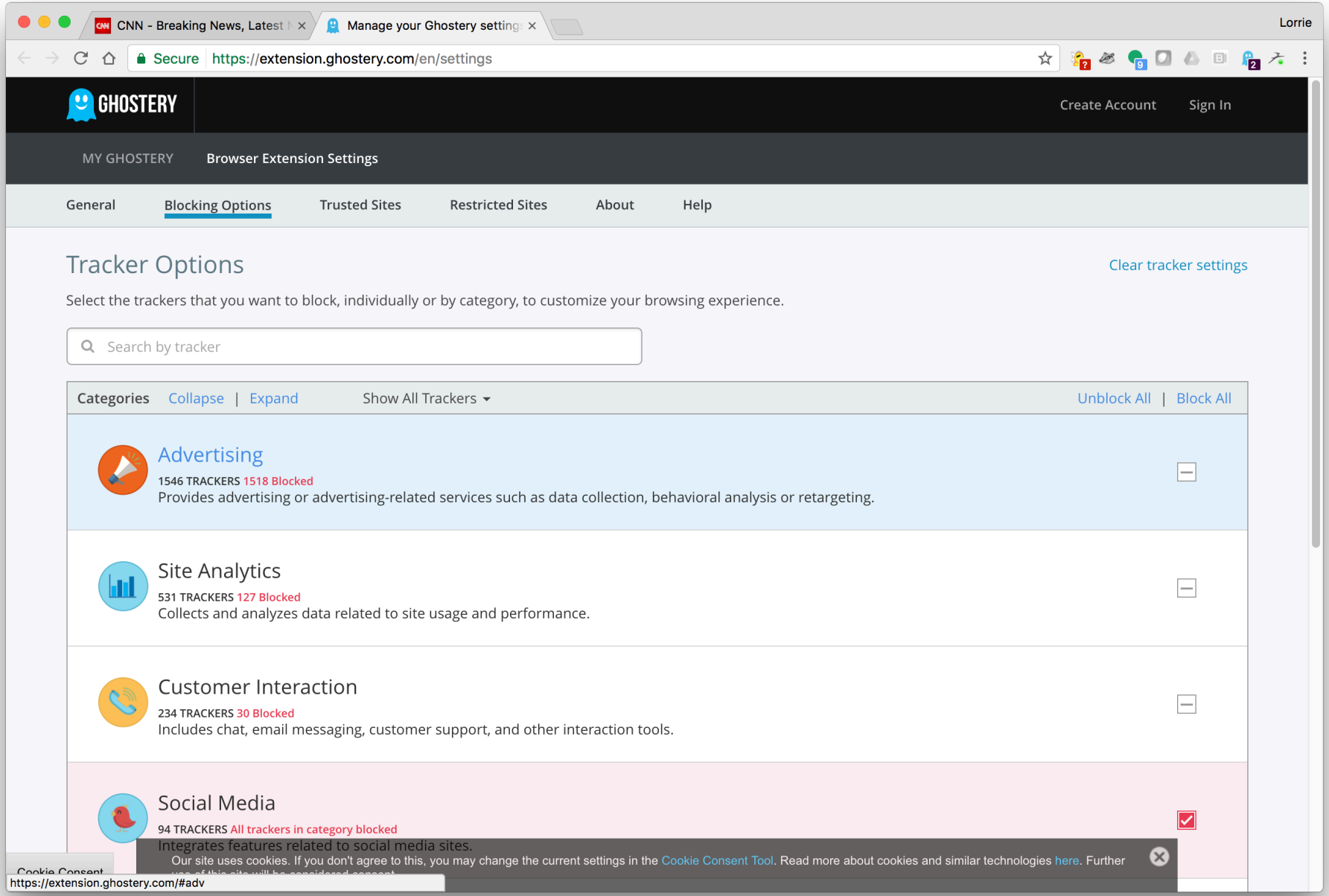
- Problematic defaults
- Poorly designed interfaces and jargon
- Feedback
- Misconceptions about opt-out tools
- Users unable to make meaningful decisions on a per-company basis

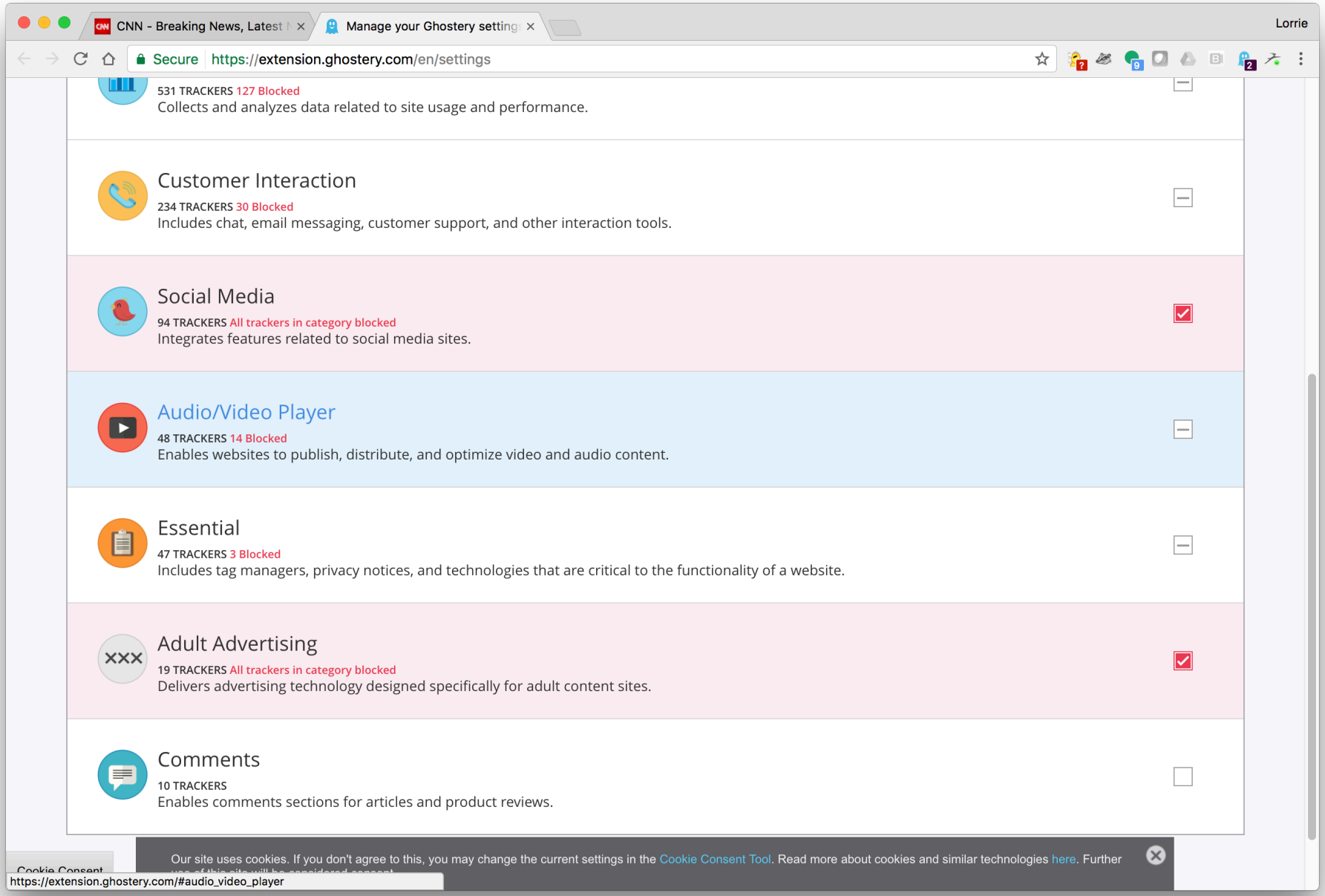
# Some recent improvements/changes

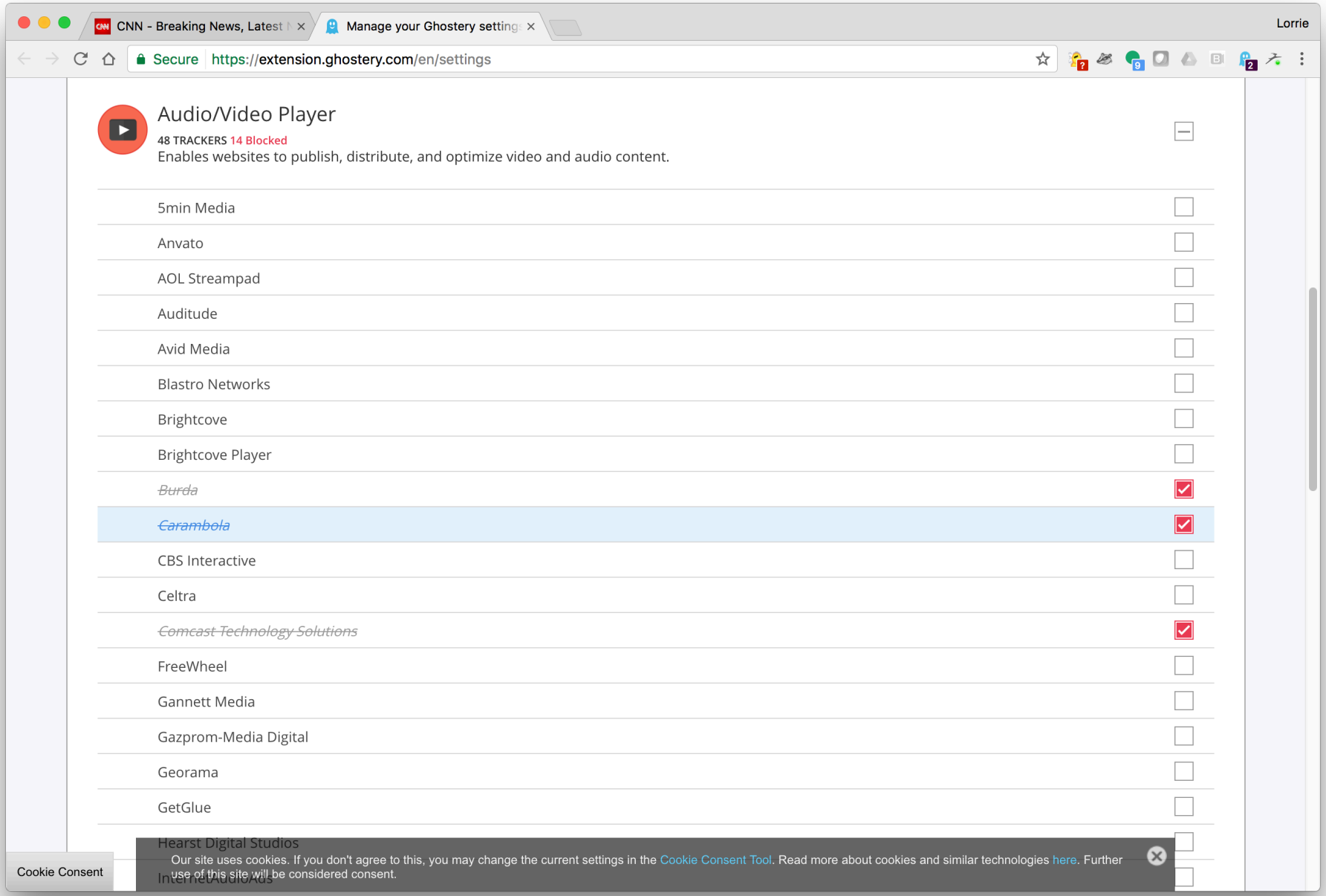
- Many changes to UIs of pluggin tools
- Microsoft removed some privacy features from Edge
- Do Not Track standard continues to be a work in progress
- DAA website hasn't changed much

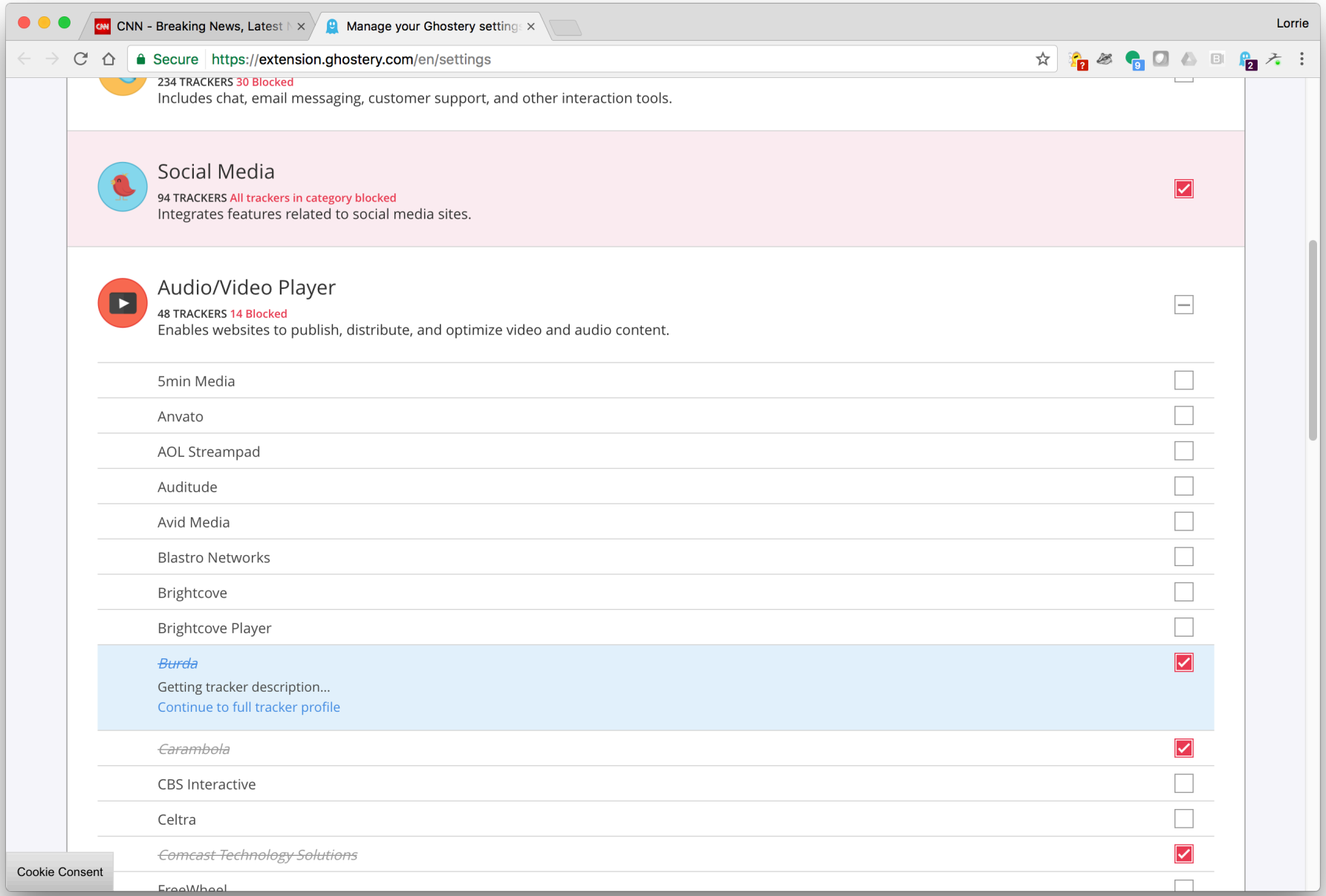

CNN - Breaking News, Latest
Lorrie
www.cnn.com
CNN
U.S. | World | Politics | Money | Opinion | Health | Entertainment | Tech
Gorsuch picks up another vote
Third Senate Democrat announces support for judge
Here's how senators plan to vote on Gorsuch
McConnell, Schumer square off ahead of Gorsuch votes
Graham booed over Gorsuch vote
Happening in
Trump says North Korea
Trump's golf dip China's leader
Trump hits the
President Trump
Judge: It's plau
Schiff treating
'healthy skepticism'
Sunday morning politics in 90 seconds
Teen charged in streamed sex assau
More than 200 dead in mudslide
News and buzz
From computer whiz to ISIS' Twitter star
By using this site, you agree to the Privacy Policy and Terms of Service.
GHOSTERY
Sign In
16 Trackers found on www.cnn.com
16
11 Blocked
Trust Site
Restrict Site
Pause Ghostery
Map These Trackers
Trackers
Block All
Advertising
10 Trackers 10 Blocked
Amazon Associates
Bing Ads
Criteo
Google Publisher Tags
Krux Digital
NetRatings SiteCensus
Outbrain
Rubicon
ScoreCard Research Beacon
ShareThrough
Site Analytics
3 Trackers 1 Blocked
ChartBeat
Criteo
Gigya Beacon
Google Publisher…
Krux Digital
Livefyre
NetRatings SiteCe…
Omniture (Adobe …
Optimizely
Outbrain
Rubicon
ScoreCard Resear…
ShareThrough
Usabilla

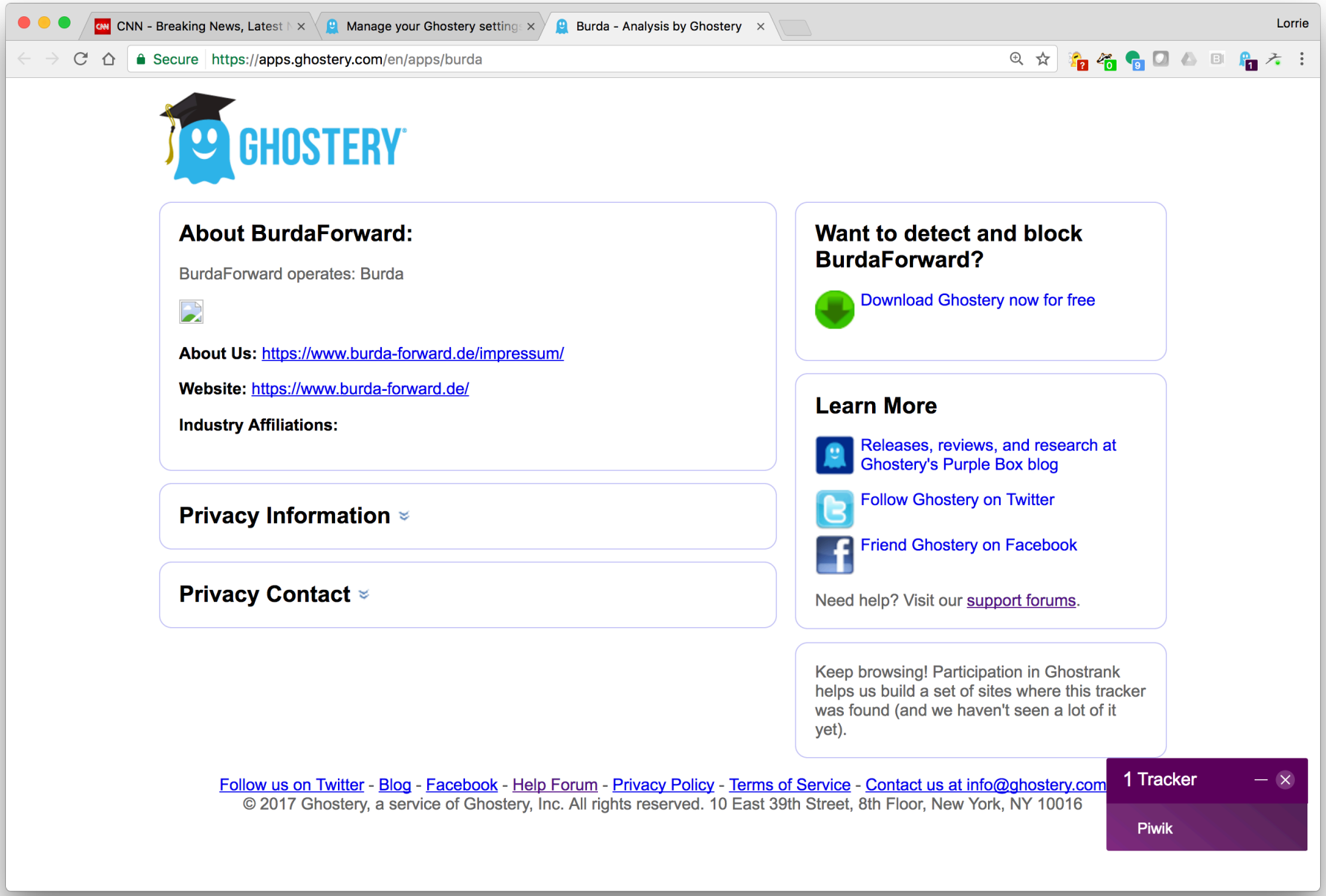

CNN - Breaking News, Latest
Lorrie
www.cnn.com
U.S. | World | Politics | Money | Opinion | Health | Entertainment | Tech
Gorsuch picks up another vote
Third Senate Democrat announces support for judge
Here's how senators plan to vote on Gorsuch
McConnell, Schumer square off ahead of Gorsuch votes
Graham booed over Gorsuch vote
Happening in
Trump says
North Korea
Trump's golf dip
China's leader
Trump hits the
President Trump
Judge: It's plau
Schiff treating
'healthy skepticism'
Sunday morning politics in 90 seconds
Teen charged in streamed sex assault
More than 200 dead in mudslide
1 h
News and buzz
From computer whiz to ISIS' Twitter star
By using this site, you agree to the Privacy Policy and Terms of Service.
GHOSTERY
Sign In
Trackers & Blocking
Purple Box
Notifications
Support Ghostery
Account
Trackers
Enable automatic updates from the Ghostery tracker library
Last synced on September 21, 2016 9:43 PM Update now
Show tracker URLs
(Sign in required to enable feature)
Highlight Interactive Trackers
Show me when I need to allow a tracker to use a site's features
Replace blocked social media buttons with a Ghostery icon
Blocking
Trust and restrict individual trackers
Allow trackers created by site owners
Block new trackers added to Ghostery by default

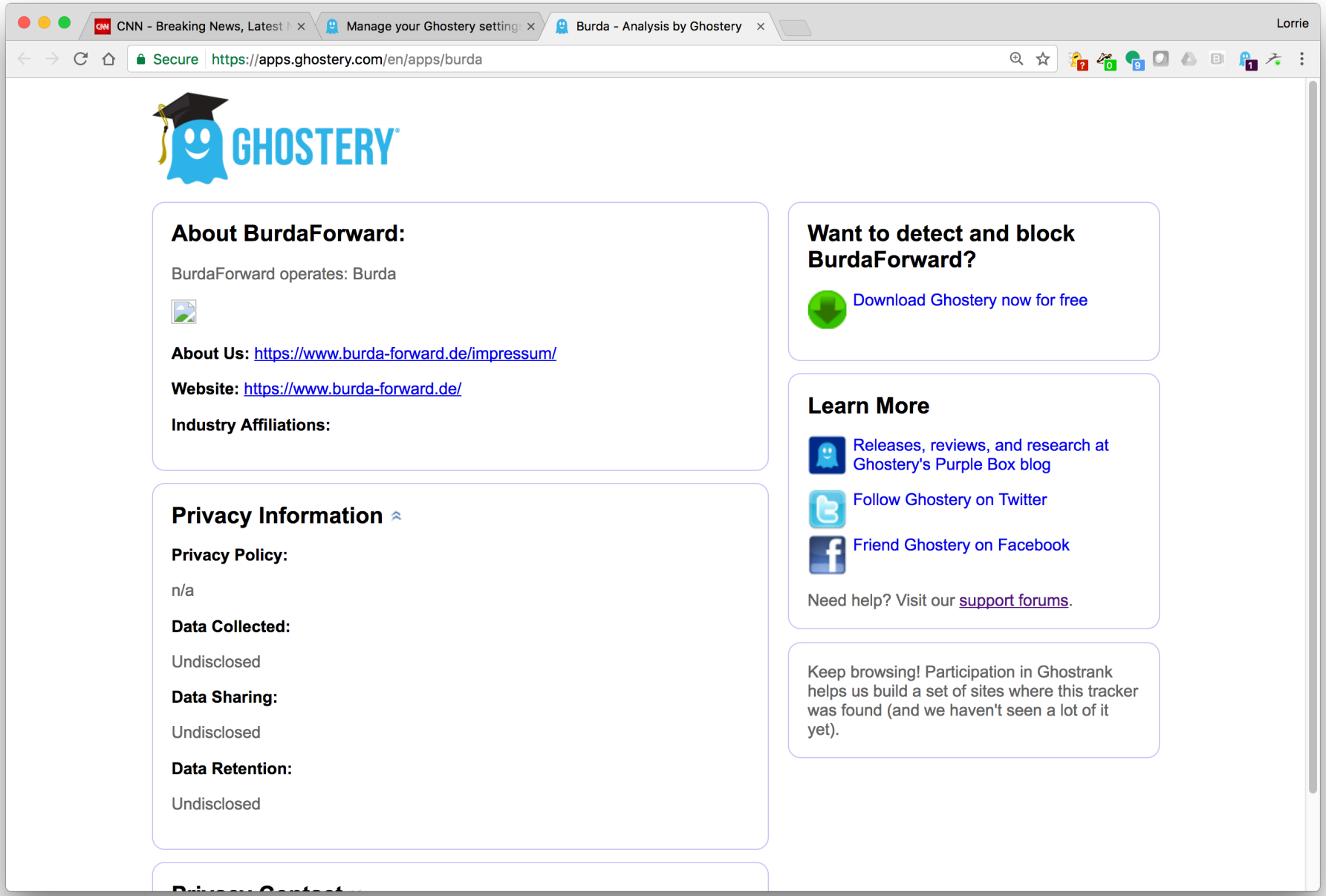

CNN - Breaking News, Latest
Manage your Ghostery setting
Lorrie
Secure https://extension.ghostery.com/en/settings
GHOSTERY
Create Account
Sign In
MY GHOSTERY
Browser Extension Settings
General
Blocking Options
Trusted Sites
Restricted Sites
About
Help
Tracker Options
Clear tracker settings
Select the trackers that you want to block, individually or by category, to customize your browsing experience.
Search by tracker
Categories
Collapse | Expand
Show All Trackers
Unblock All | Block All
Advertising
1546 TRACKERS 1518 Blocked
Provides advertising or advertising-related services such as data collection, behavioral analysis or retargeting.
Site Analytics
531 TRACKERS 127 Blocked
Collects and analyzes data related to site usage and performance.
Customer Interaction
234 TRACKERS 30 Blocked
Includes chat, email messaging, customer support, and other interaction tools.
Social Media
94 TRACKERS All trackers in category blocked
Integrates features related to social media sites.
Our site uses cookies. If you don't agree to this, you may change the current settings in the Cookie Consent Tool. Read more about cookies and similar technologies here. Further
Cookie Consent
https://extension.ghostery.com/#adv

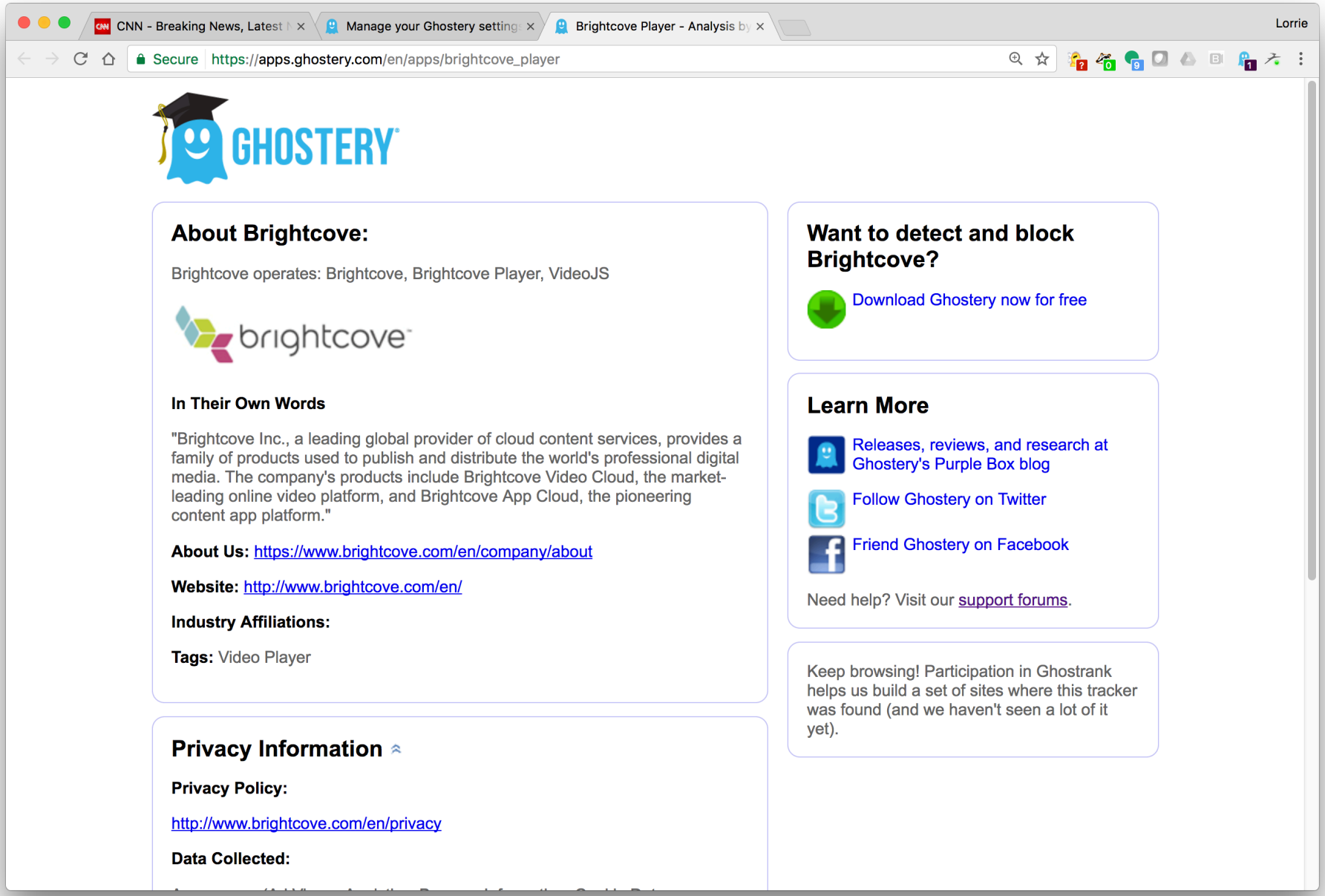

CNN - Breaking News, Latest
Manage your Ghostery setting
Lorrie
Secure
https://extension.ghostery.com/en/settings
531 TRACKERS 127 Blocked
Collects and analyzes data related to site usage and performance.
Customer Interaction
234 TRACKERS 30 Blocked
Includes chat, email messaging, customer support, and other interaction tools.
Social Media
94 TRACKERS All trackers in category blocked
Integrates features related to social media sites.
Audio/Video Player
48 TRACKERS 14 Blocked
Enables websites to publish, distribute, and optimize video and audio content.
Essential
47 TRACKERS 3 Blocked
Includes tag managers, privacy notices, and technologies that are critical to the functionality of a website.
Adult Advertising
19 TRACKERS All trackers in category blocked
Delivers advertising technology designed specifically for adult content sites.
Comments
10 TRACKERS
Enables comments sections for articles and product reviews.
Our site uses cookies. If you don't agree to this, you may change the current settings in the Cookie Consent Tool. Read more about cookies and similar technologies here. Further
https://extension.ghostery.com/#audio_video_player

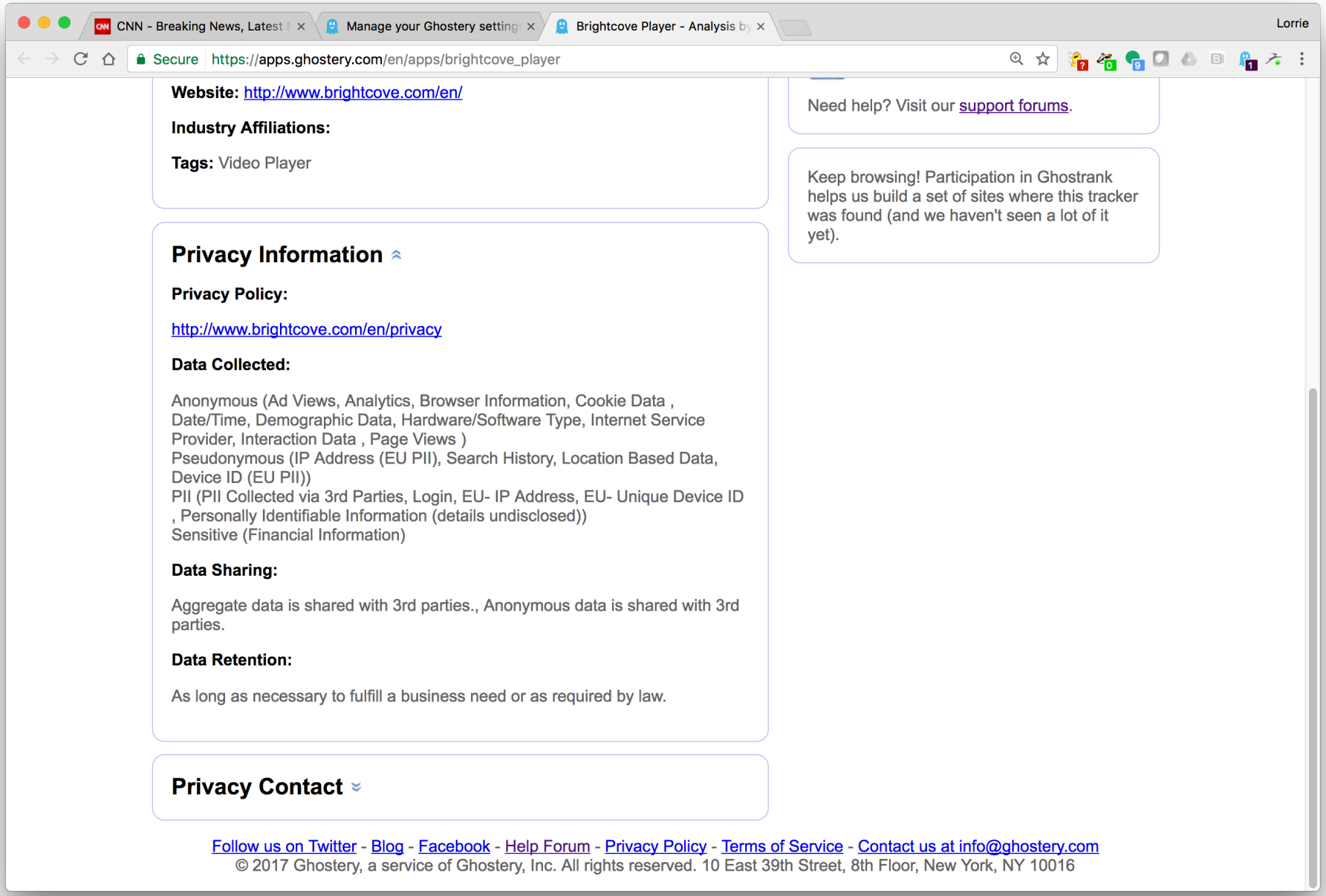

CNN - Breaking News, Latest
Manage your Ghostery setting
Lorrie
Secure
https://extension.ghostery.com/en/settings
Audio/Video Player
48 TRACKERS 14 Blocked
Enables websites to publish, distribute, and optimize video and audio content.
5min Media
Anvato
AOL Streampad
Auditude
Avid Media
Blastro Networks
Brightcove
Brightcove Player
Burda
Carambola
CBS Interactive
Celtra
Comcast Technology Solutions
FreeWheel
Gannett Media
Gazprom-Media Digital
Georama
GetGlue
Hearst Digital Studios
Cookie Consent
Our site uses cookies. If you don't agree to this, you may change the current settings in the Cookie Consent Tool. Read more about cookies and similar technologies here. Further use of this site will be considered consent.


CNN - Breaking News, Latest
Manage your Ghostery setting
Lorrie
Secure
https://extension.ghostery.com/en/settings
234 TRACKERS 30 Blocked
Includes chat, email messaging, customer support, and other interaction tools.
Social Media
94 TRACKERS All trackers in category blocked
Integrates features related to social media sites.
Audio/Video Player
48 TRACKERS 14 Blocked
Enables websites to publish, distribute, and optimize video and audio content.
5min Media
Anvato
AOL Streampad
Auditude
Avid Media
Blastro Networks
Brightcove
Brightcove Player
Burda
Getting tracker description...
Continue to full tracker profile
Carambola
CBS Interactive
Celtra
Comcast Technology Solutions
FreeWheel
Cookie Consent

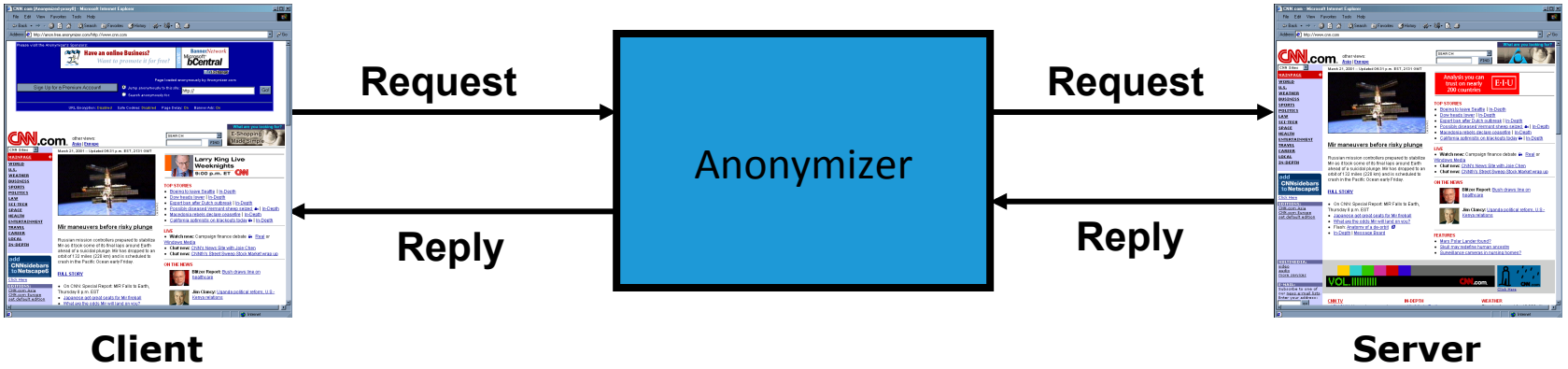

CNN - Breaking News, Latest
Manage your Ghostery setting
Burda - Analysis by Ghostery
Lorrie
Secure
https://apps.ghostery.com/en/apps/burda
GHOSTERY
About BurdaForward:
BurdaForward operates: Burda
About Us: https://www.burda-forward.de/impressum/
Website: https://www.burda-forward.de/
Industry Affiliations:
Privacy Information
Privacy Contact
Want to detect and block BurdaForward?
Download Ghostery now for free
Learn More
Releases, reviews, and research at Ghostery's Purple Box blog
Follow Ghostery on Twitter
Friend Ghostery on Facebook
Need help? Visit our support forums.
Keep browsing! Participation in Ghostrank helps us build a set of sites where this tracker was found (and we haven't seen a lot of it yet).
Follow us on Twitter - Blog - Facebook - Help Forum - Privacy Policy - Terms of Service - Contact us at info@ghostery.com
© 2017 Ghostery, a service of Ghostery, Inc. All rights reserved. 10 East 39th Street, 8th Floor, New York, NY 10016
1 Tracker
Piwik


CNN - Breaking News, Latest
Manage your Ghostery setting
Burda - Analysis by Ghostery
Lorrie
Secure
https://apps.ghostery.com/en/apps/burda
GHOSTERY
About BurdaForward:
BurdaForward operates: Burda
About Us: https://www.burda-forward.de/impressum/
Website: https://www.burda-forward.de/
Industry Affiliations:
Privacy Information
Privacy Policy:
n/a
Data Collected:
Undisclosed
Data Sharing:
Undisclosed
Data Retention:
Undisclosed
Want to detect and block BurdaForward?
Download Ghostery now for free
Learn More
Releases, reviews, and research at Ghostery's Purple Box blog
Follow Ghostery on Twitter
Friend Ghostery on Facebook
Need help? Visit our support forums.
Keep browsing! Participation in Ghostrank helps us build a set of sites where this tracker was found (and we haven't seen a lot of it yet).


CNN - Breaking News, Latest
Manage your Ghostery setting
Brightcove Player - Analysis by
Lorrie
Secure
https://apps.ghostery.com/en/apps/brightcove_player
GHOSTERY
About Brightcove:
Brightcove operates: Brightcove, Brightcove Player, VideoJS
brightcove
In Their Own Words
"Brightcove Inc., a leading global provider of cloud content services, provides a family of products used to publish and distribute the world's professional digital media. The company's products include Brightcove Video Cloud, the market-leading online video platform, and Brightcove App Cloud, the pioneering content app platform."
About Us: https://www.brightcove.com/en/company/about
Website: http://www.brightcove.com/en/
Industry Affiliations:
Tags: Video Player
Privacy Information
Privacy Policy:
http://www.brightcove.com/en/privacy
Data Collected:
Want to detect and block Brightcove?
Download Ghostery now for free
Learn More
Releases, reviews, and research at Ghostery's Purple Box blog
Follow Ghostery on Twitter
Friend Ghostery on Facebook
Need help? Visit our support forums.
Keep browsing! Participation in Ghostrank helps us build a set of sites where this tracker was found (and we haven't seen a lot of it yet).

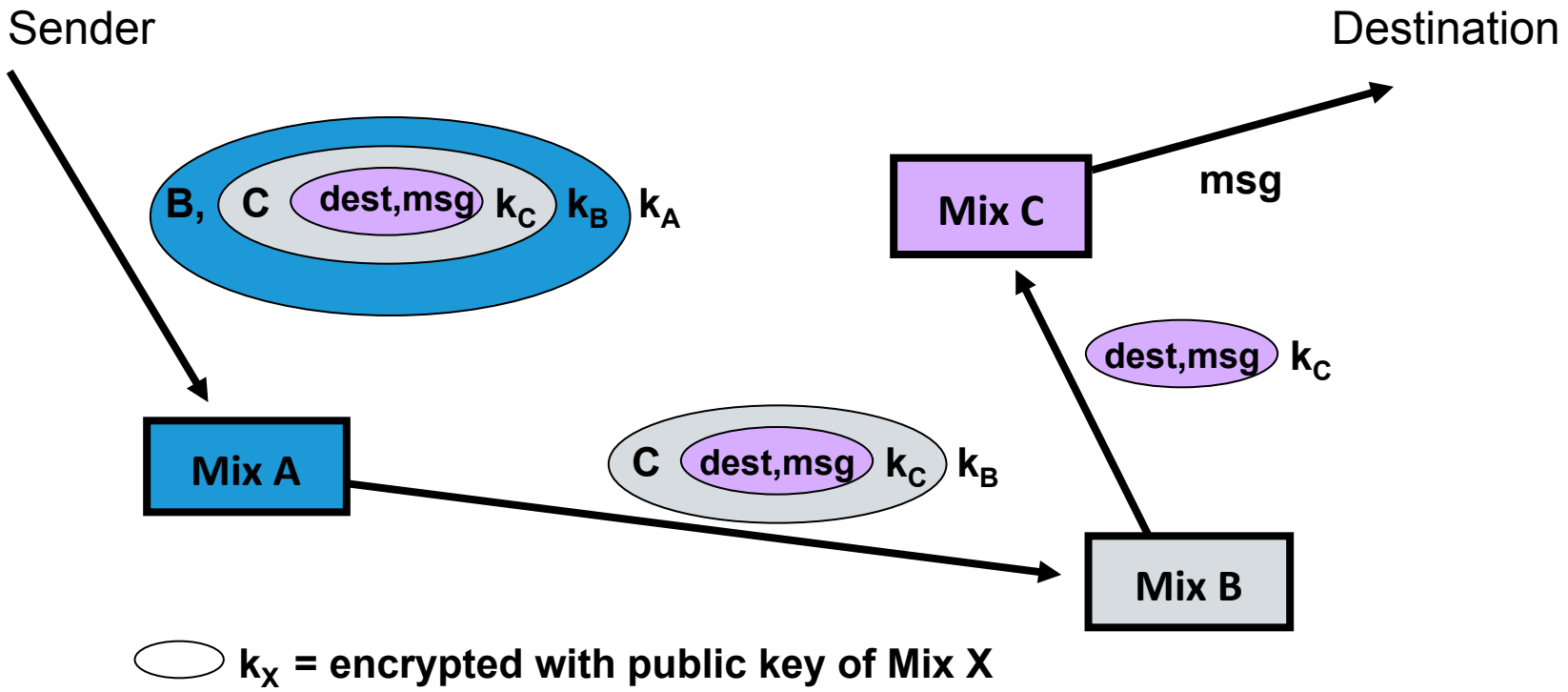

CNN - Breaking News, Latest
Manage your Ghostery setting
Brightcove Player - Analysis by
Lorrie
Secure
https://apps.ghostery.com/en/apps/brightcove_player
Website: http://www.brightcove.com/en/
Industry Affiliations:
Tags: Video Player
Privacy Information
Privacy Policy:
http://www.brightcove.com/en/privacy
Data Collected:
Anonymous (Ad Views, Analytics, Browser Information, Cookie Data , Date/Time, Demographic Data, Hardware/Software Type, Internet Service Provider, Interaction Data , Page Views )
Pseudonymous (IP Address (EU PII), Search History, Location Based Data, Device ID (EU PII))
PII (PII Collected via 3rd Parties, Login, EU- IP Address, EU- Unique Device ID , Personally Identifiable Information (details undisclosed))
Sensitive (Financial Information)
Data Sharing:
Aggregate data is shared with 3rd parties., Anonymous data is shared with 3rd parties.
Data Retention:
As long as necessary to fulfill a business need or as required by law.
Privacy Contact
Need help? Visit our support forums.
Keep browsing! Participation in Ghostrank helps us build a set of sites where this tracker was found (and we haven't seen a lot of it yet).
Follow us on Twitter - Blog - Facebook - Help Forum - Privacy Policy - Terms of Service - Contact us at info@ghostery.com
© 2017 Ghostery, a service of Ghostery, Inc. All rights reserved. 10 East 39th Street, 8th Floor, New York, NY 10016

# The Anonymizer

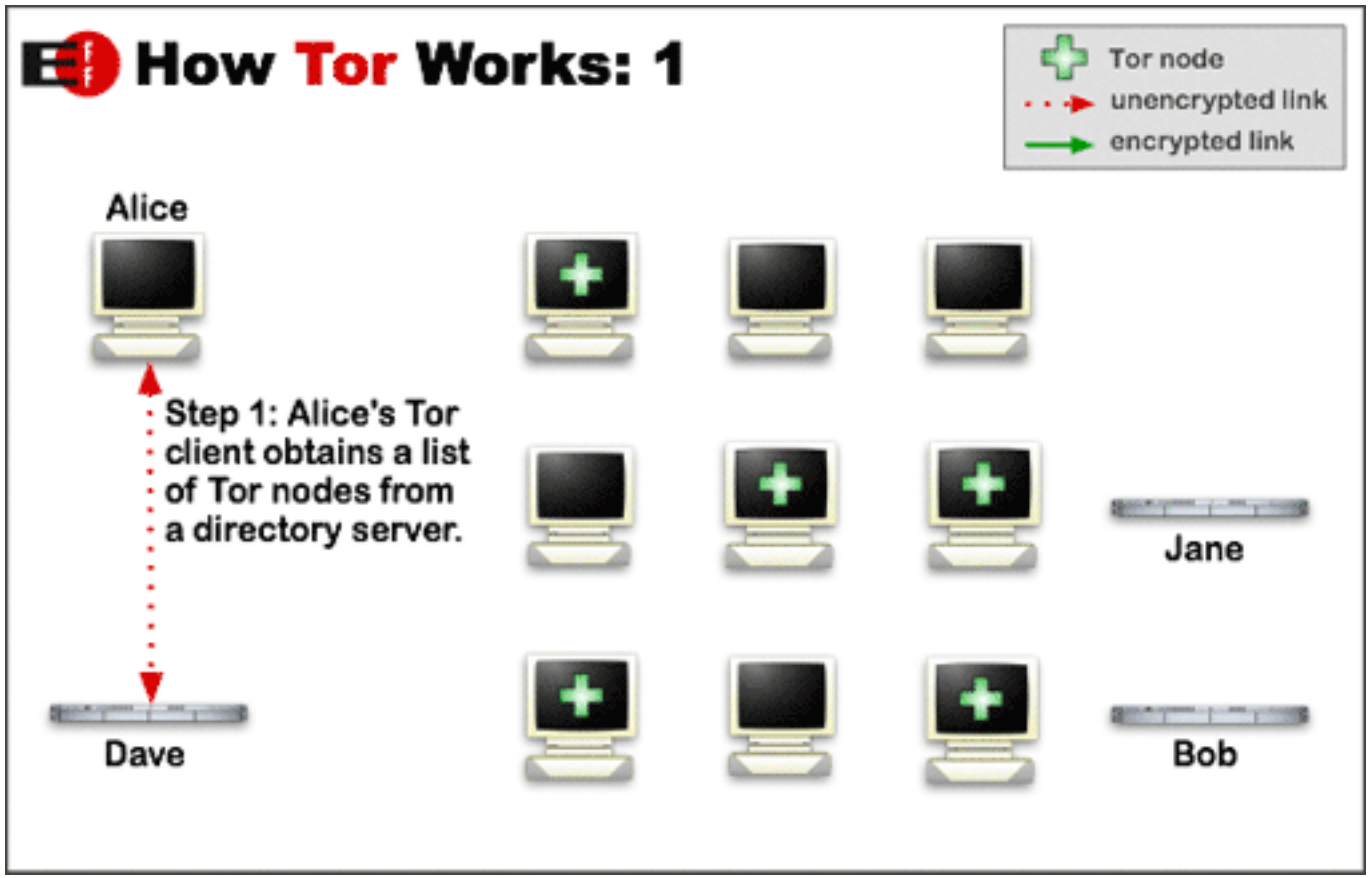


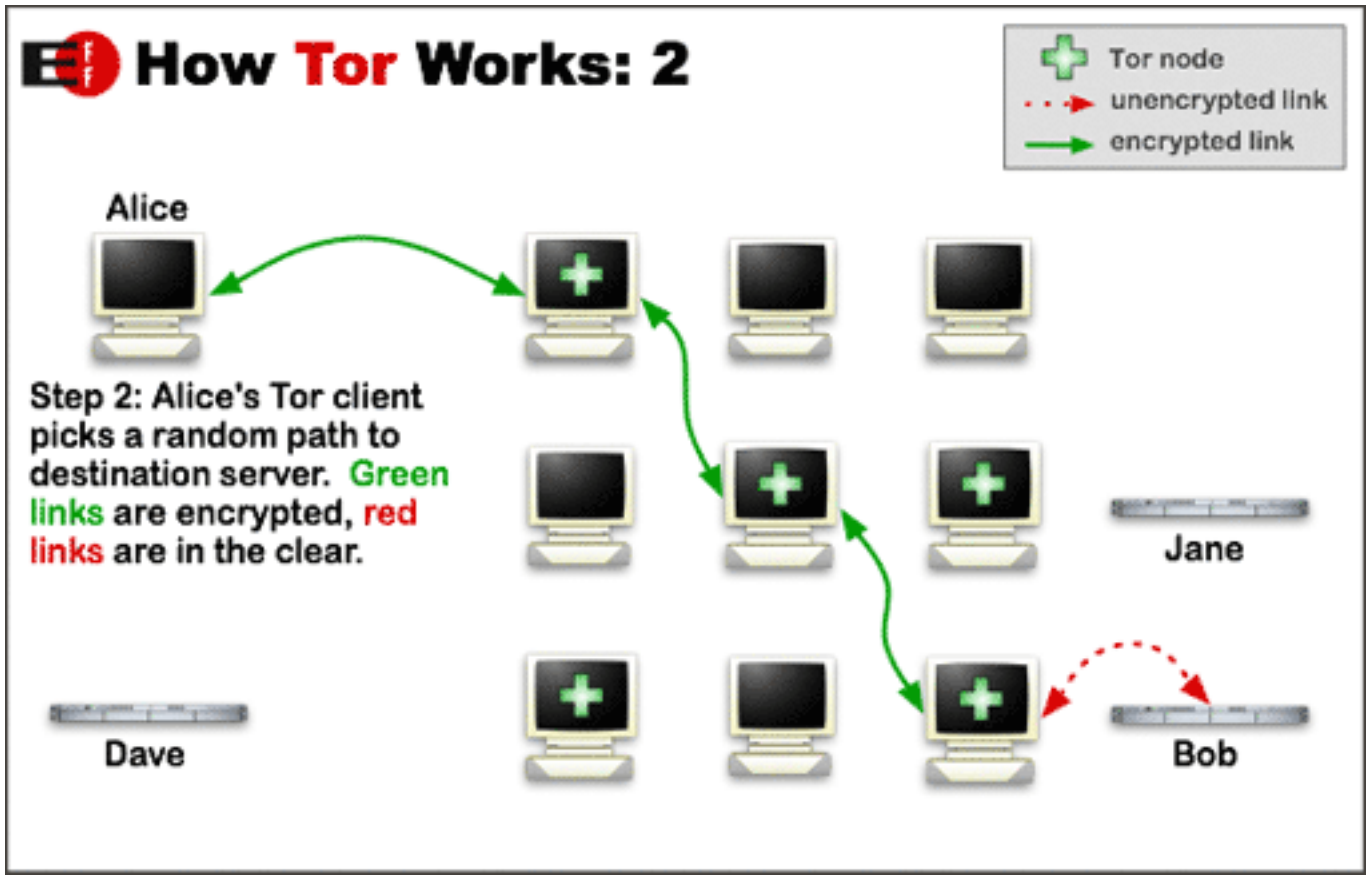

- Acts as a proxy for users
- Hides information from end servers
- Sees all web traffic
- Adds ads to pages (free service; subscription service also available)
- http://www.anonymizer.com

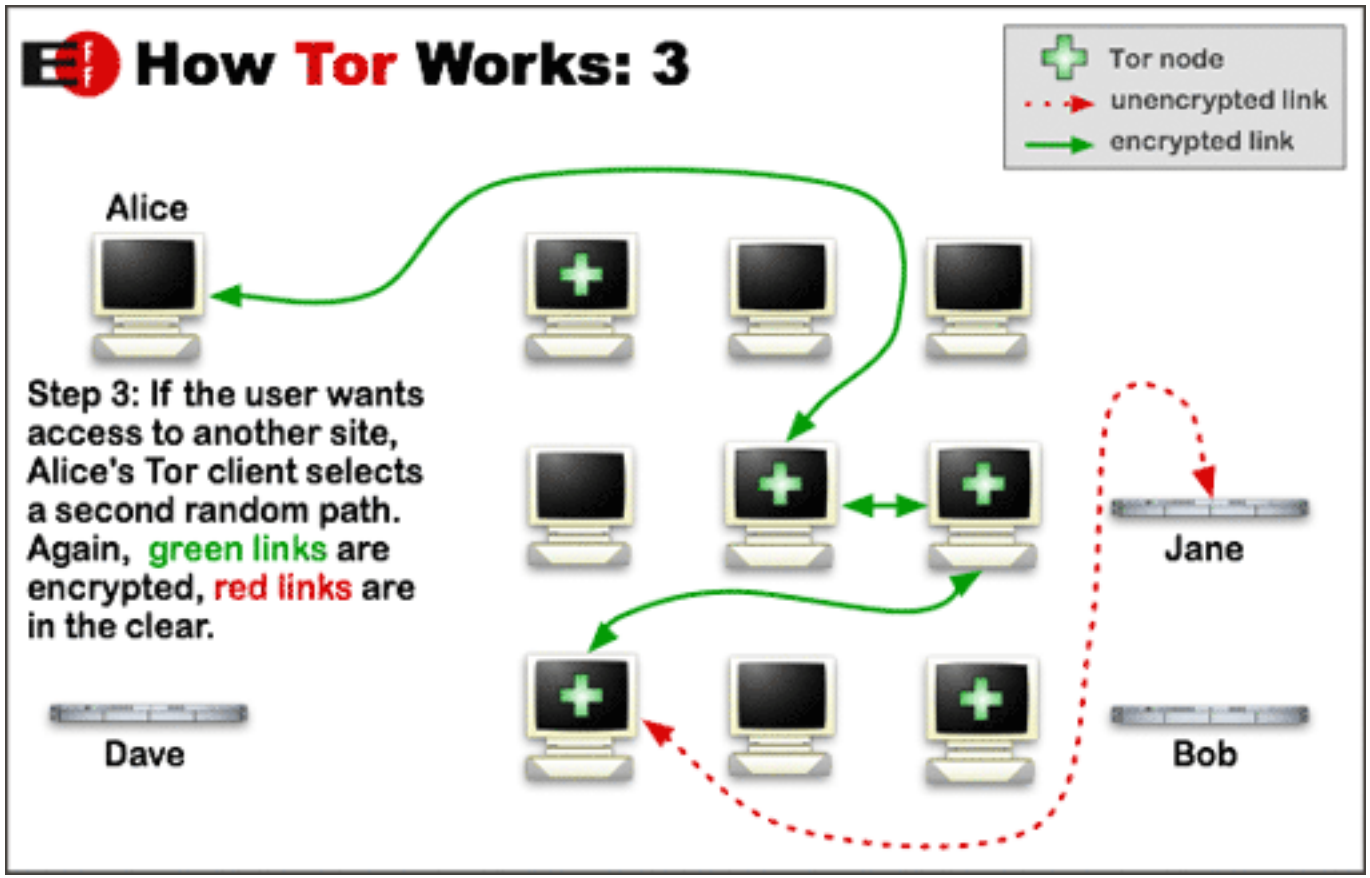
# Mixes [Chaum81]




Sender routes message randomly through network of “Mixes”, using layered public-key encryption.


How Tor Works: 1
Tor node
unencrypted link
encrypted link
Alice
Step 1: Alice's Tor client obtains a list of Tor nodes from a directory server.
Jane
Dave
Bob


How Tor Works: 2
Tor node
unencrypted link
encrypted link
Alice
Step 2: Alice's Tor client picks a random path to destination server. Green links are encrypted, red links are in the clear.
Jane
Dave
Bob


How Tor Works: 3
Tor node
unencrypted link
encrypted link
Alice
Step 3: If the user wants access to another site, Alice's Tor client selects a second random path. Again, green links are encrypted, red links are in the clear.
Jane
Dave
Bob

# Privacy tool discussion

- What are your favorite privacy tools?
- What functions do they perform?
- What makes them usable?