The Surreptitious Assault on Privacy, Security, and Freedom

Mike Gerwitz

26 March, LibrePlanet 2017

N.B.: These slides appear as they were presented at LibrePlanet 2017 (with the exception of this slide).

For up-to-date slides, see:
https://mikegerwitz.com/talks/sapsf

For the source code to this presentation, see:
https://mikegerwitz.com/projects/sapsf

You're Being Tracked.

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(No, really, I have references.)

- Most people carry mobile phones
- Synonymous with individual

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- Excellent tracking devices

Fundamentally Needed

- Phone needs tower to make and receive calls
- Gives away approximate location [75]
- Multiple towers: signal delay; triangulate

[3]

Cell-Site Simulators

- IMSI-Catchers
- Masquerade as cell towers
- Most popular: Stingray

[30]

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- IMSI-Catchers
- Masquerade as cell towers
- Most popular: Stingray
- Free/libre Android program AIMSICD available on F-Droid attempts to detect [13]

[30]

TOP SECRET//SI//NOFORN

UNITED STATES

FOREIGN INTELLIGENCE SURVEILLANCE COURT

WASHINGTON, D.C.

IN RE APPLICATION OF THE
FEDERAL BUREAU OF INVESTIGATION
FOR AN ORDER REQUIRING THE
PRODUCTION OF TANGIBLE THINGS
FROM VERIZON BUSINESS NETWORK SERVICES,
INC. ON BEHALF OF MCI COMMUNICATION
SERVICES, INC. D/B/A VERIZON
BUSINESS SERVICES.

Docket Number: BR

13-80

SECONDARY ORDER

This Court having found that the Application of the Federal Bureau of

Senator Ron Wyden, 26 May 2011:

> *I have served on the Intelligence Committee for over a decade and I wish to deliver a warning this afternoon. When the American people find out how their government has secretly interpreted [the business records provision of FISA], they are going to be stunned and they are going to be angry.* [103]

Verizon Metadata

- June 2013—Guardian releases leaked document ordering Verizon to collect "telephony metadata" [43, 39]

  [. . .] (i) between the United States and abroad; or (ii) wholly within the United States, including local telephone calls. [116]

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- Routing information, source and destination telephone numbers, IMSI and IMEI numbers, and time and duration of the call [116, 78]
- "Business records" provision partly declassified by Clapper on 6 June 2013 [20]
- The American people were stunned and angry

Metadata Matters

[74]

- EFF on "Why Metadata Matters": [78]

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- EFF on "Why Metadata Matters": [78]
  - They know you rang a phone sex service at 2:24 am and spoke for 18 minutes. But they don't know what you talked about.
  - They know you spoke with an HIV testing service, then your doctor, then your health insurance company in the same hour. But they don't know what was discussed.

ESSID and MAC Broadcast

- Device may broadcast ESSIDs of past hidden networks
- Expose unique hardware identifiers (MAC address)

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  - MAC address randomization works poorly [61]

Global Positioning System (GPS)


[29]

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  - Legitimate: navigation, social media, photos, nearby friends, finding lost phones, location-relative searches, etc.

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  - Legitimate: navigation, social media, photos, nearby friends, finding lost phones, location-relative searches, etc.
- If phone is compromised, location is known

But I Want GPS!

- Is the program transparent in what data it sends? (Is the source code available?) [125]
  - 2010: 47 of top 100 Android and iOS apps sent location to devs and third parties [120]
  - Ex: *Angry Birds* sent address book, location, and device ID to third party [16]
- Does the program let you disable those [anti-]features?

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- Does the program let you disable those [anti-]features?
- Pre-download location-sensitive data (e.g. street maps)
  - OsmAnd (free software, Android and iOS) [80]

Location Services

- No GPS? No problem!
- Mozilla Location Services, OpenMobileNetwork, . . . [66, 77]
- Wifi Positioning System; Bluetooth networks; nearby cell towers [123]
  - Signal strength and SSIDs and MACs of Access Points [108, 52, 55]

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- Your device may report back nearby networks to build a more comprehensive database
- Works even where GPS and Cell signals cannot penetrate
  - Can be *more* accurate than GPS (e.g. what store in a shopping mall)

Untrusted/Proprietary OS

- Who does your phone work for?
  - Apple? Google? Microsoft? Blackberry? Your manufacturer too?
- Carry everywhere you go, but fundamentally cannot trust it [84]

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- Who does your phone work for?
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- Carry everywhere you go, but fundamentally cannot trust it [84]
- Some come with gratis surveillance
  - BLU phones sent SMS messages, contacts, call history, IMEIs, and more to third-party servers without users' knowledge or censent [54]

Free/Libre Mobile OS?

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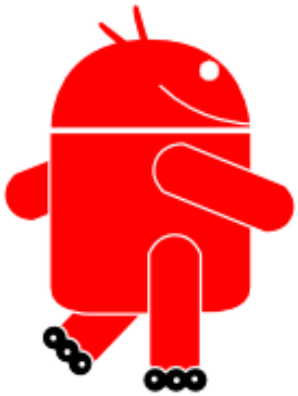
- Android is supposedly free software
  - But every phone requires proprietary drivers, or contains proprietary software
- Replicant [89]
  - Niche. Largely work of one developer now. (Help if you can!)



Replicant

Modem Isolation

- But modem still runs non-free software [88]
- Sometimes has access to CPU, disk, and memory [90]

What about your car?

- **Information about you and your accounts with us:** such as your name, address, telephone number, date of birth, e-mail address, login information, demographic data, gender, password, PIN, emergency contact information, information about the acquisition and financing of your vehicle, like whether or not you have financed or leased your vehicle, the lease/financing term, and billing information, like your credit card number, CVV code and expiration date.
- **Information about your vehicle:** such as license plate number, vehicle identification number (VIN), mileage, oil/battery status, fuel or charging history, electrical system function, gear status, and diagnostic trouble codes.
- **Information about the use of your vehicle, including operational and safety related information:** such as GPS location, speed, air bag deployments, crash avoidance alerts, impact data, safety system status, braking and swerving/cornering events, event data recorder (EDR) data, seat belt settings, vehicle direction (heading), camera image and sensor data, voice command information, stability control or anti-lock events, security/theft alerts, infotainment system usage, and WiFi data usage.
- **Information about your device and how you interact with our products and services, including apps and websites:** such as IP address, browser type, unique device identifier, cookie data, associated identifying and usage information from your mobile phone, laptop, or other device.

[83]

- Since 2011, retains all GPS and system data to sell to third parties

"We know everyone who breaks the law, we know when you're doing it. We have GPS in your car, so we know what you're doing. By the way, we don't supply that data to anyone." [26]

—Jim Farley, VP/Marketing and Sales, 2014

"If you've got nothing to hide, you've got nothing to fear." *[93, 100, 68]*

—Joeseph Gobbels, Nazi propaganda minister

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—Richard Graham, British MP

Private Cameras in Plain View; Tinderloin, SF

[8]

"The idea that you can sort of meet in a public place and quietly have a conversation that we're sort of accustomed to from spy movies, that is really not realistic anymore,"
—Nadia Kayyali, EFF [8]

Access to Data

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- Data can be obtained with a warrant or subpoena
- Data can be compromised
- Chilling effect
- If you own a surveillance system, be responsible and considerate
  - Best way to restrict data is to *avoid collecting it to begin with*

What if all those cameras—including private—were connected?

NYPD Domain Awareness System[86]

Although NYPD documents indicate that the system is specifically designed for anti-terrorism operations, any incidental data it collects "for a legitimate law enforcement or public safety purpose" by DAS can be utilized by the police department. [111]

Domain Awareness System

- Partnership between the NYPD and Microsoft at a cost of $230M in 2013 [33, 86]
  - Surveillance cameras, license plate readers, radiation detectors, 911 system, criminal records, ...
- $>$ 6,000 surveillance cameras, $\frac{2}{3}$ private businesses [33, 75]

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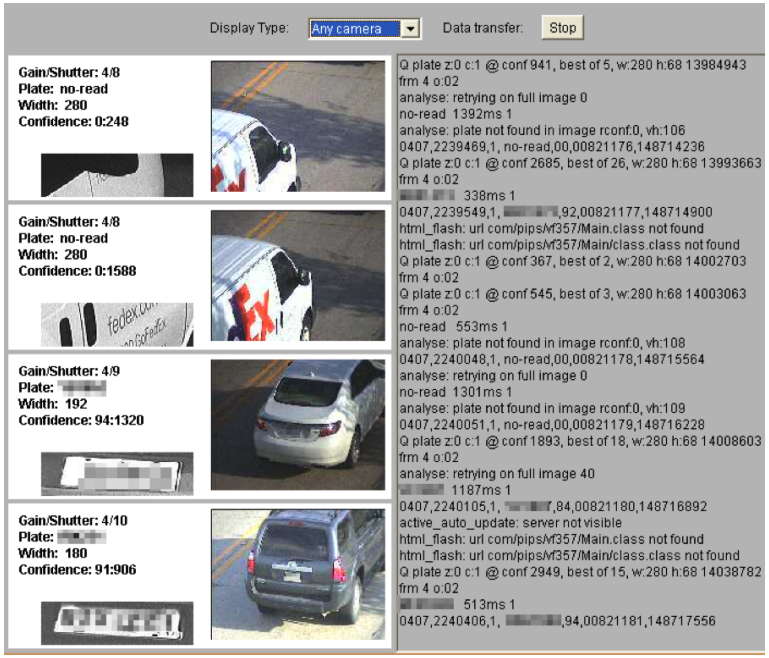
- Can search in seconds for terms like "red baseball cap" [33, 75]
- Detects "suspicious behaviors" like unattended bags and circling cars [33, 75]

Automated License Plate Readers (ALPRs)

[5]

- Scan passing cars' license plates [124, 5]
- Produce alphanumeric representation with timestamp and photograph

Automated License Plate Readers (ALPRs)



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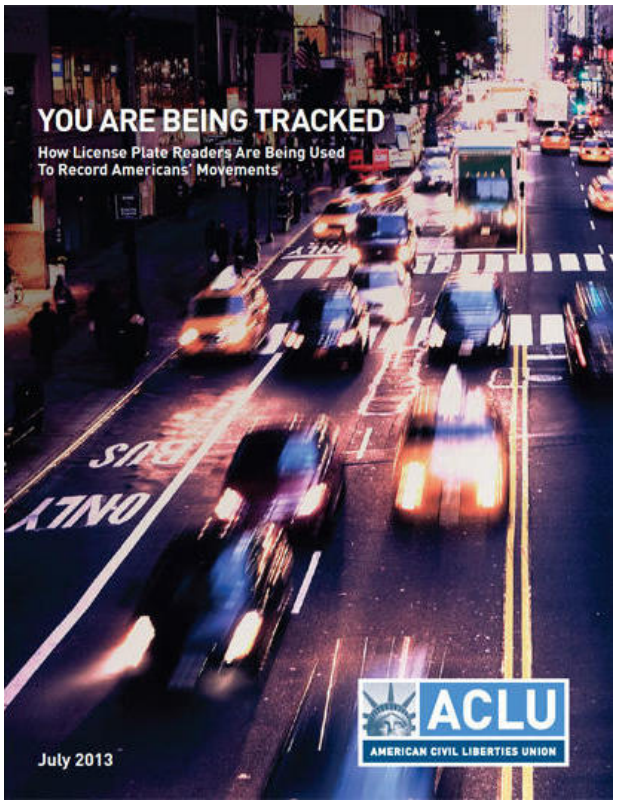

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Automatic Toll Readers

- Electronic toll booth using RFIDs or ALPRs [95]
  - In the North-East we have E-ZPass (RFID) [27]
  - Golden Gate Bridge requires FasTrack or plate-based

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- . . . and divorce cases, in case of FasTrack
- They're not very secure—easily cloned either [56, 41]

Akin To GPS Tracking

- *United States v. Jones*: GPS tracking constitutes search under Fourth Amendment [112]
- How is pervasive surveillance different if it achieves essentially the same result?

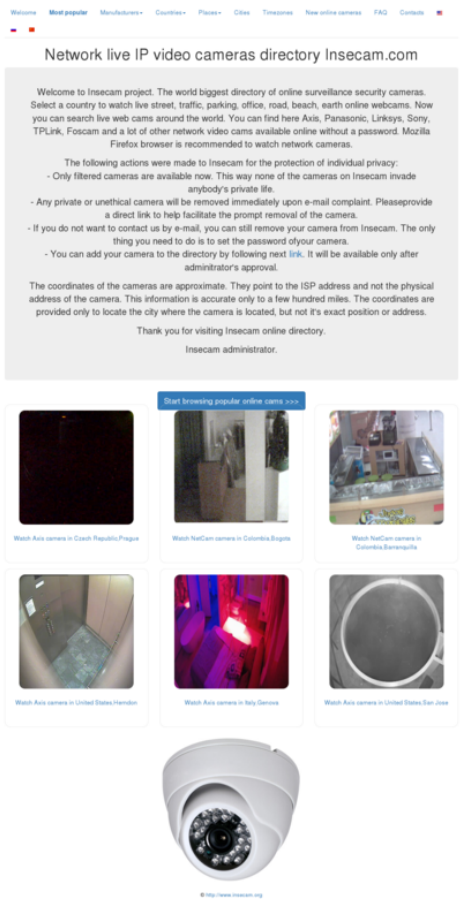
Cameras used to need physical access

Today. . . not always so much

The "S" In IoT Stands For "Security"

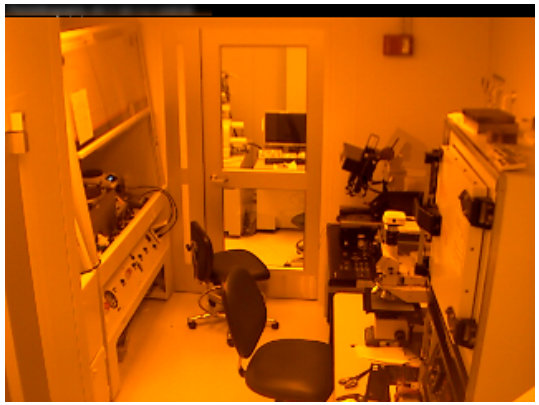
- Shodan—IoT search engine [98]
  - You'll also find other things. Secure your databases. [53]
  - Can search for specific devices
- If you are vulnerable, someone will find you
  - Mirai—620Gbps DDoS Krebs; 1Tbps OVH

Who's Watching?



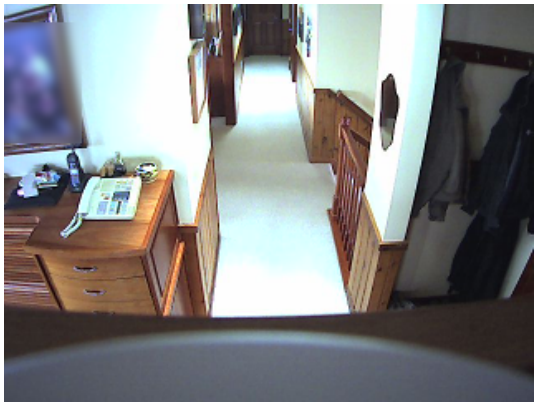
[48]

- Insecam is a directory of Internet-connected surveillance cameras[48]
- Live video feeds (browser connects directly to cameras)




3


3



"Please be aware that if your spoken words include personal or other sensitive information, that information will be among the data captured and transmitted to a third party through your use of Voice Recognition."

—Samsung SmartTV Privacy Policy, 2015

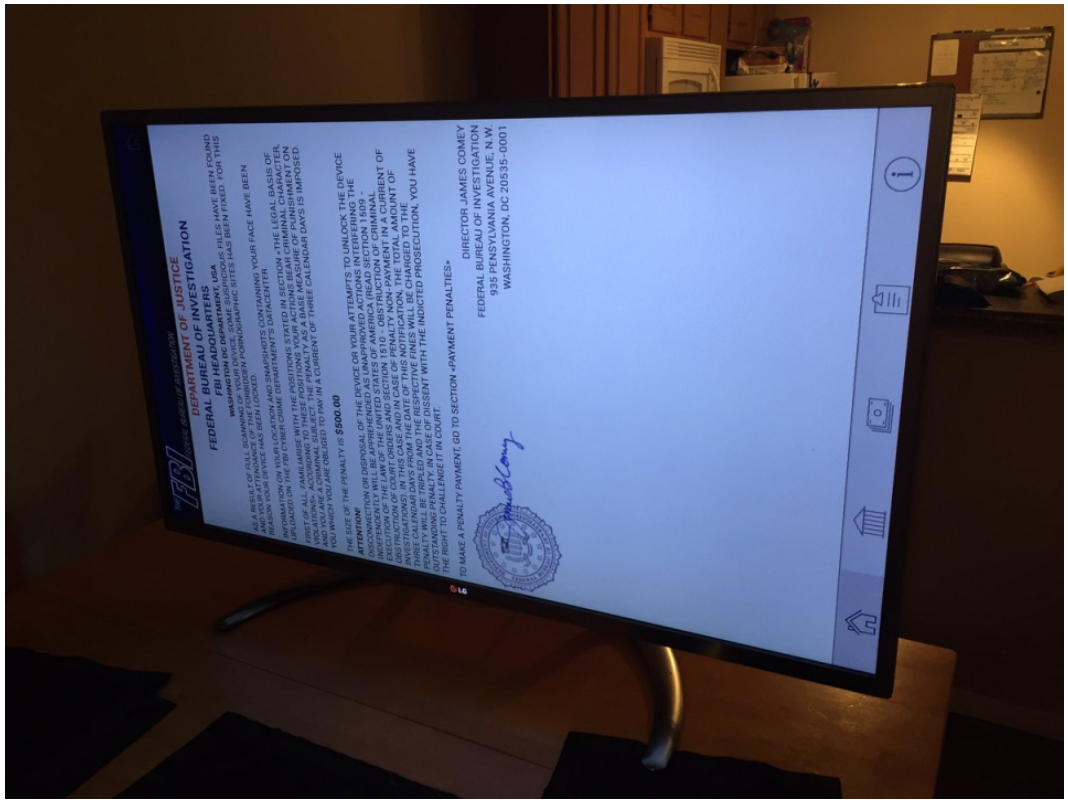
[45]

Weeping Angel

[119, 115]

- Suppress LEDs for “fake off”
- Record audio
- Remote shell and file transfer
- Extract WiFi credentials
- “TODO”: Record video

Smart TV Ransomware (LG)



[18]

Vulnerabilties Equities Process (VEP)

- Whether or not government should disclose vulnerability
- Hoarding is dangerous (Shadow Brokers / Equation Group; Vault 7 / CIA)
- Apple v. FBI

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- Whether or not government should disclose vulnerability
- Hoarding is dangerous (Shadow Brokers / Equation Group; Vault 7 / CIA)
- Apple v. FBI
- Makes us less safe!
  - "Cyberweapon" is an exploit—it cannot be contained

Amazon Echo—Always Listening

[65]

- Voice recognition on Amazon's servers; have recordings [102, 2]
- Warrant issued in murder case for recordings [102, 2]
- Always listening; "wake word" doesn't matter (they control the software; device can be compromised) [73]

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  - Should do voice recognition on the device
  - Run free software
  - Connect to *your own server* for actions
  - Hardware switch for microphone

Consder the Benign

- Water meter used in murder case as evidence [2]
  - 140 gallons between 1AM and 3AM in Winter?
- Thermostat?
  - Usage patterns could hint at when you're home
- Window/door sensors?

Creepy-Ass Children's Toys?

Germany

German parents told to destroy doll that can spy on children

German watchdog classifies My Friend Cayla doll as 'illegal espionage apparatus' and says shops and owners could face fines

Jayla, aged four, plays with a My Friend Cayla doll in the Hamleys toy shop in London. Photograph: Rob Stothard/Getty Images

This article is **1 month old**

Philip Oltermann

Friday 17 February 2017 16.53 GMT

[76]

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the ONION®???

UK world sport football opinion culture business lifestyle fashion environment tech

home › world › europe US americas asia australia africa middle east cities development

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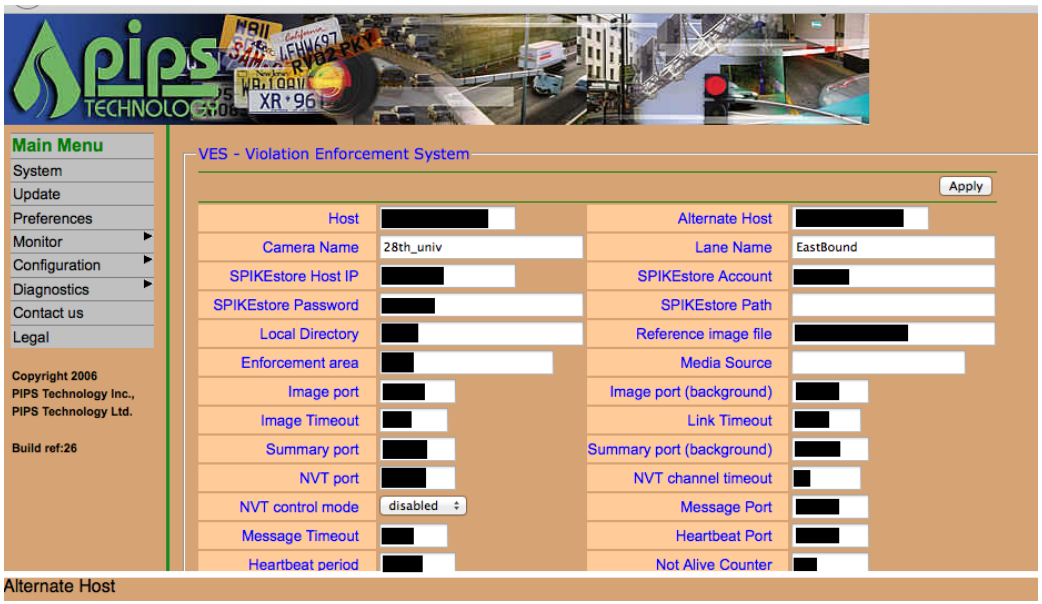
[76]

ALPRs Wide Open



[5]

- John Matherly (Shodan author) noticed many web-accessible PIPS control panels
- Other researcher found some accessible via telnet [34]

Biometrics

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- No face? Check your gait. [91, 114]
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- Even fingerprints and iris from high-resolutions photos (defeat Apple's TouchID) [44]

Collateral Damage

- Please don't put pictures of me on Facebook [101]
- Don't put pictures of my children anywhere [22]

Collateral Damage

- Please don't put pictures of me on Facebook [101]
- Don't put pictures of my children anywhere [22]
- That person in the distance is collateral damage [14, 4, 75]

Fleshy You $\Longleftrightarrow$ Virtual You

UNITED STATES OF AMERICA
FEDERAL TRADE COMMISSION
WASHINGTON, D.C. 20580

Bureau of Consumer Protection

[date]

BY ELECTRONIC MAIL

[App Developer]

Dear Sir or Madam:

You currently offer a mobile application for download in the Google Play store. We are writing to you today because of code included in the application that may allow third parties to monitor consumers' television viewing for ad targeting or analytics.

[64]

Ultrasound Tracking

$\cdots \iff$ TV $\iff$ Retail Store $\iff$ Mobile $\iff$ Web $\iff \cdots$

- Correlates users across devices; airgap bridge [63, 70]
  - Inaudible to humans
- Could deanonymize (e.g. Tor users) [62, 19]

Ultrasound Tracking

"Silverpush could generate a detailed log of the television content viewed while a user's mobile phone was turned on." [64]

Ultrasound Cross-Device Tracking (uXDT)

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  - Turn off your device when not in use
  - Keep device away from other media

Data Analytics

Data Analytics
(Building User Profiles)

Data Analytics
(Building User Profiles)
(Tracking)

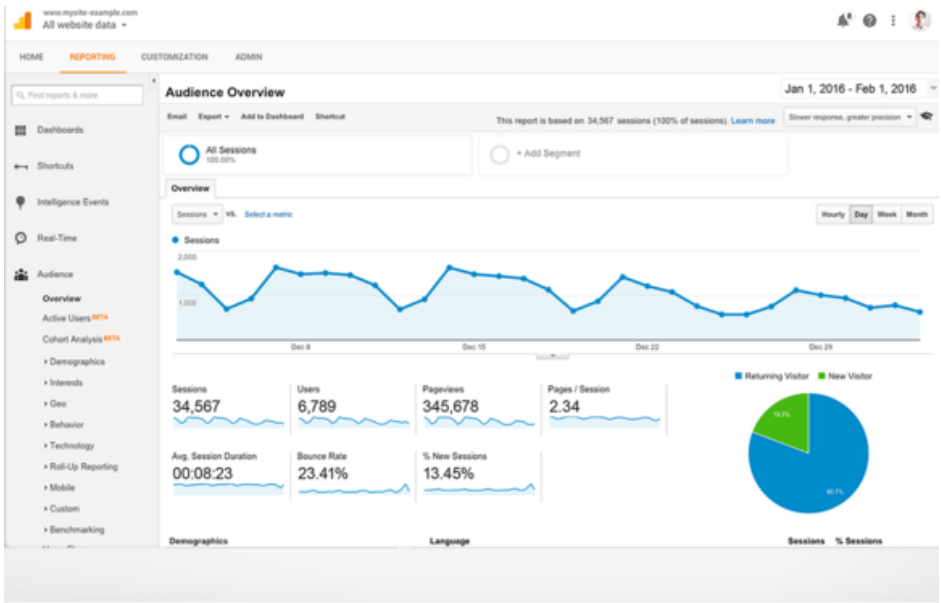
Spyware

Spyware
(With Science)

Trackers

- Website owners want to know what their visitors are doing
  - That in itself isn't an unreasonable concept
- Methods and data define the issue

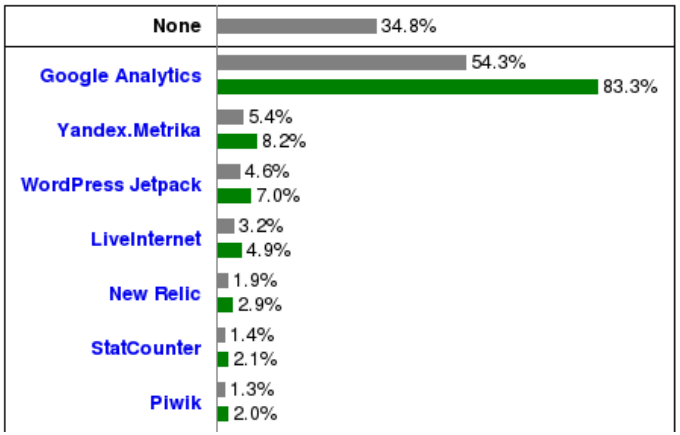
Google Analytics



[60]

- User location, screen resolution, time on page, heatmap, etc [6]
- Unique identifier assigned
- Fine-grained reporting for site owner

Google Analytics



[113]

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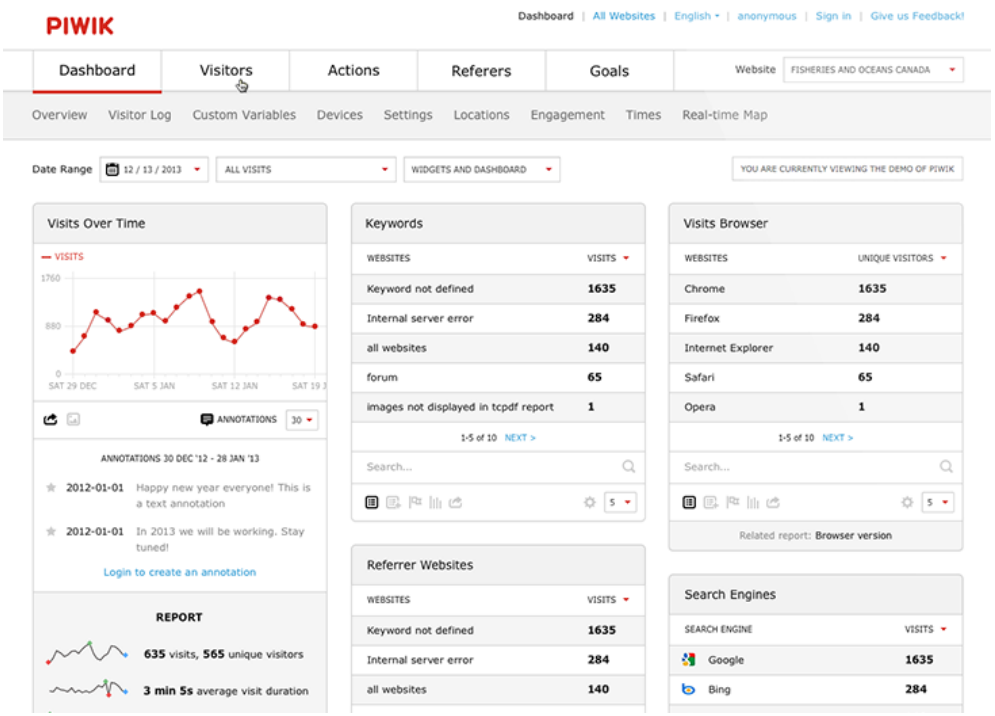
- Knows many sites user visited across Web [37]

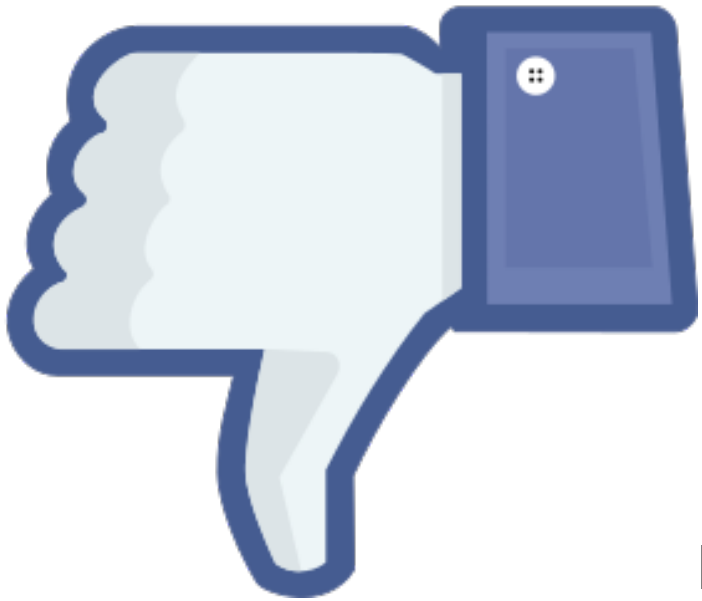
Piwik



[35]

- Data on your own servers [38]
- Visitor privacy settings [118]
- Privacy as a site owner

Like Buttons



[117]

- Infecting the Web with trackers under guise of community [51, 6, 110]
- Tracks regardless of whether you are logged in to Facebook [7, 92, 16]

Fingerprinting

EFF Research, 2010: [49, 46]

"In our analysis of anonymized data from around half a million distinct browsers, 84% had unique configurations. Among browsers that had Flash or Java installed, 94% were unique, and only 1% had fingerprints that were seen more than twice."

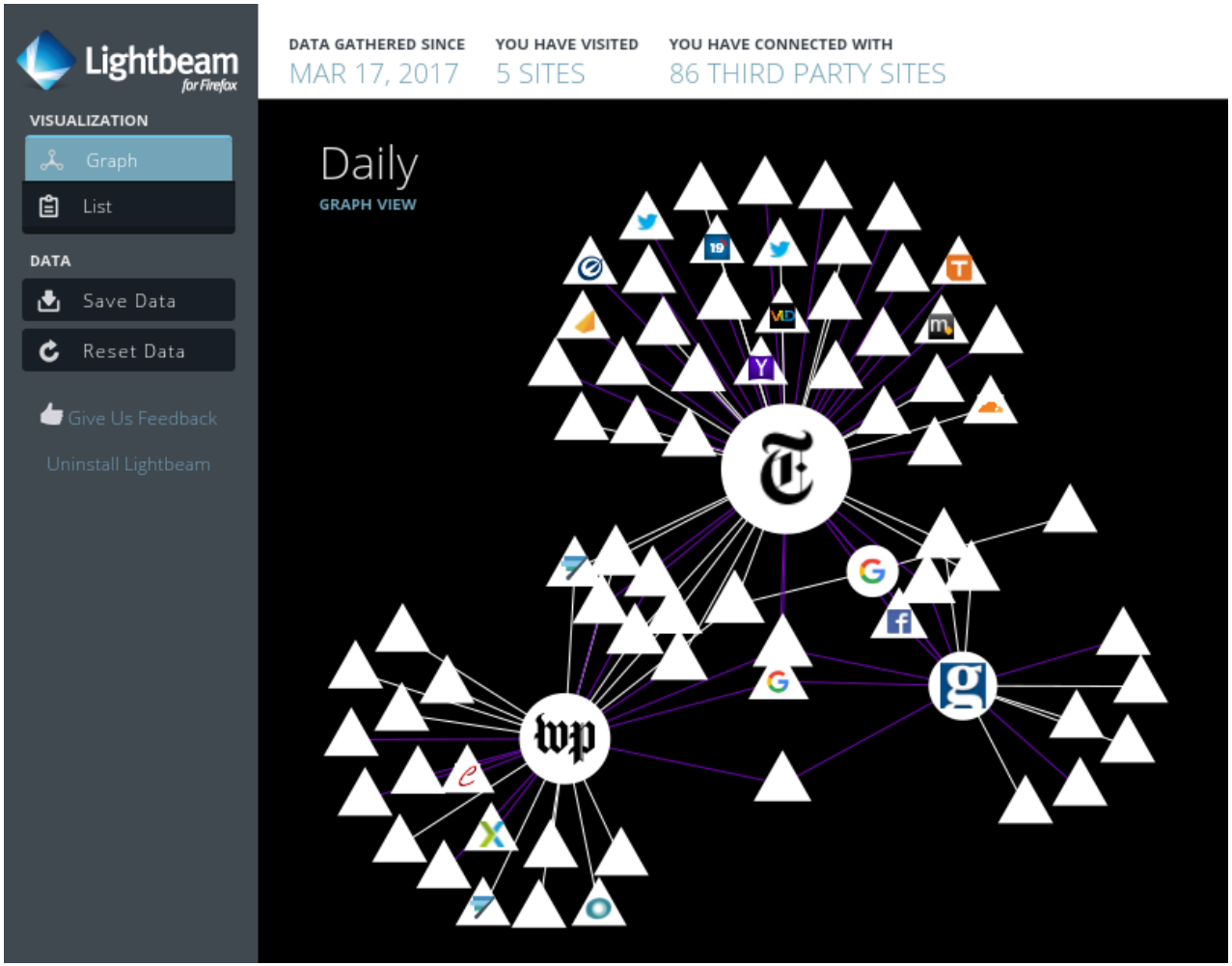
That was seven years ago.
You're really screwed today.*
[10, 46, 31, 50, 81, 1, 71, 9, 42, 12]

Alarmingly Effective

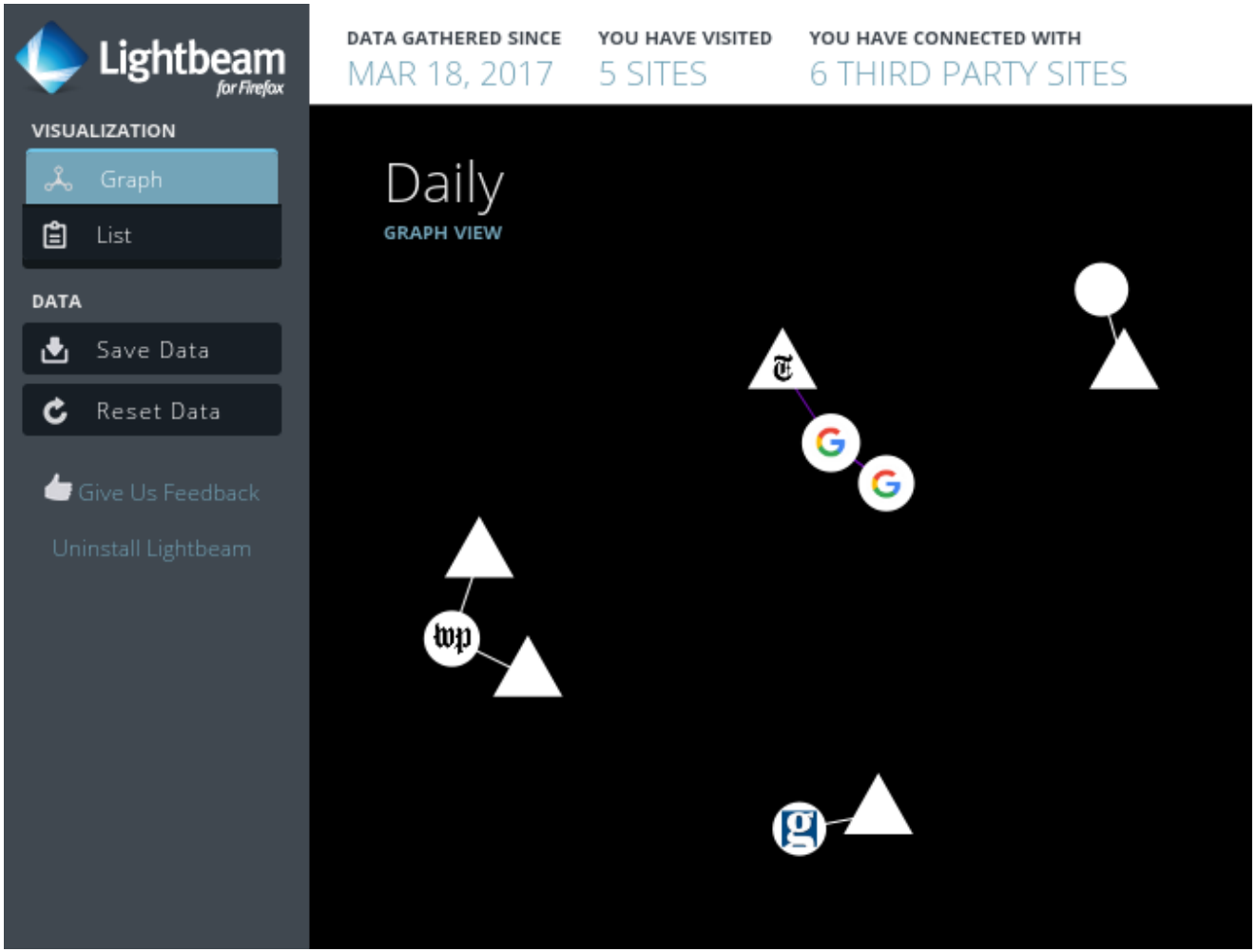
- Panopticlick (EFF) [32]
- User Agent, cookies, screen resolution, fonts, language, session storage, canvas, WebGL, ad blocker, audio, keystrokes, mouse movement, . . . [67]
- Can even track separate browsers on the same hardware [12, 42]

How Does This Happen?

- There is strong incentive to betray
  - Money (advertising)
  - Attention & praise
  - "Business intelligence"


Lightbeam
for Firefox
VISUALIZATION
Graph
List
DATA
Save Data
Reset Data
Give Us Feedback
Uninstall Lightbeam
DATA GATHERED SINCE
MAR 17, 2017
YOU HAVE VISITED
5 SITES
YOU HAVE CONNECTED WITH
86 THIRD PARTY SITES
Daily
GRAPH VIEW

[58]



(After mitigations)

How Do We Mitigate?

Disable the Damn JavaScript!

Disable the Damn JavaScript!

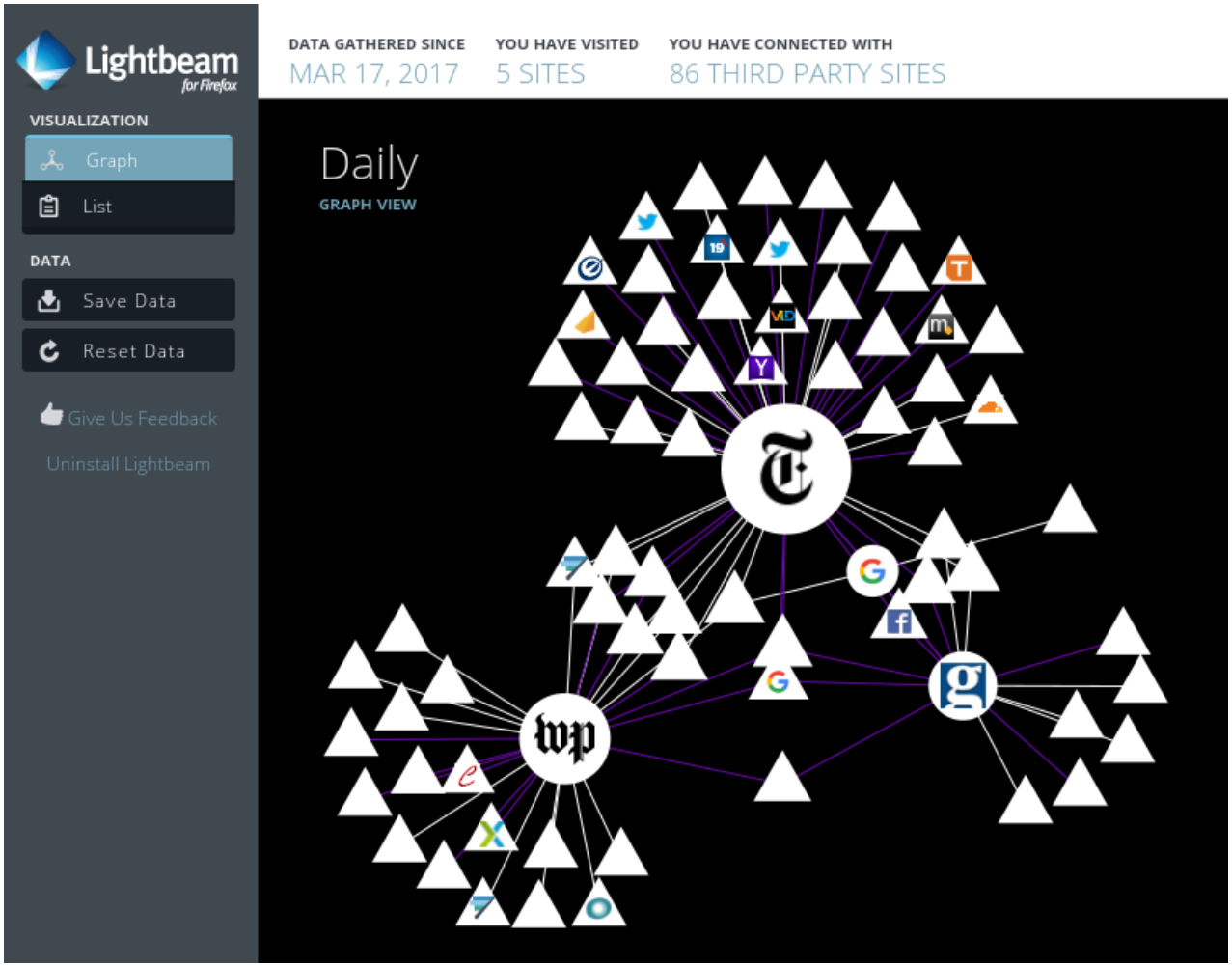
- Preempt most sophisticated and damning fingerprinting methods
  - Stop hardware profiling
  - Stop keystroke/mouse analysis [67]
  - Remember those audio beacons? [19]

Disable the Damn JavaScript!

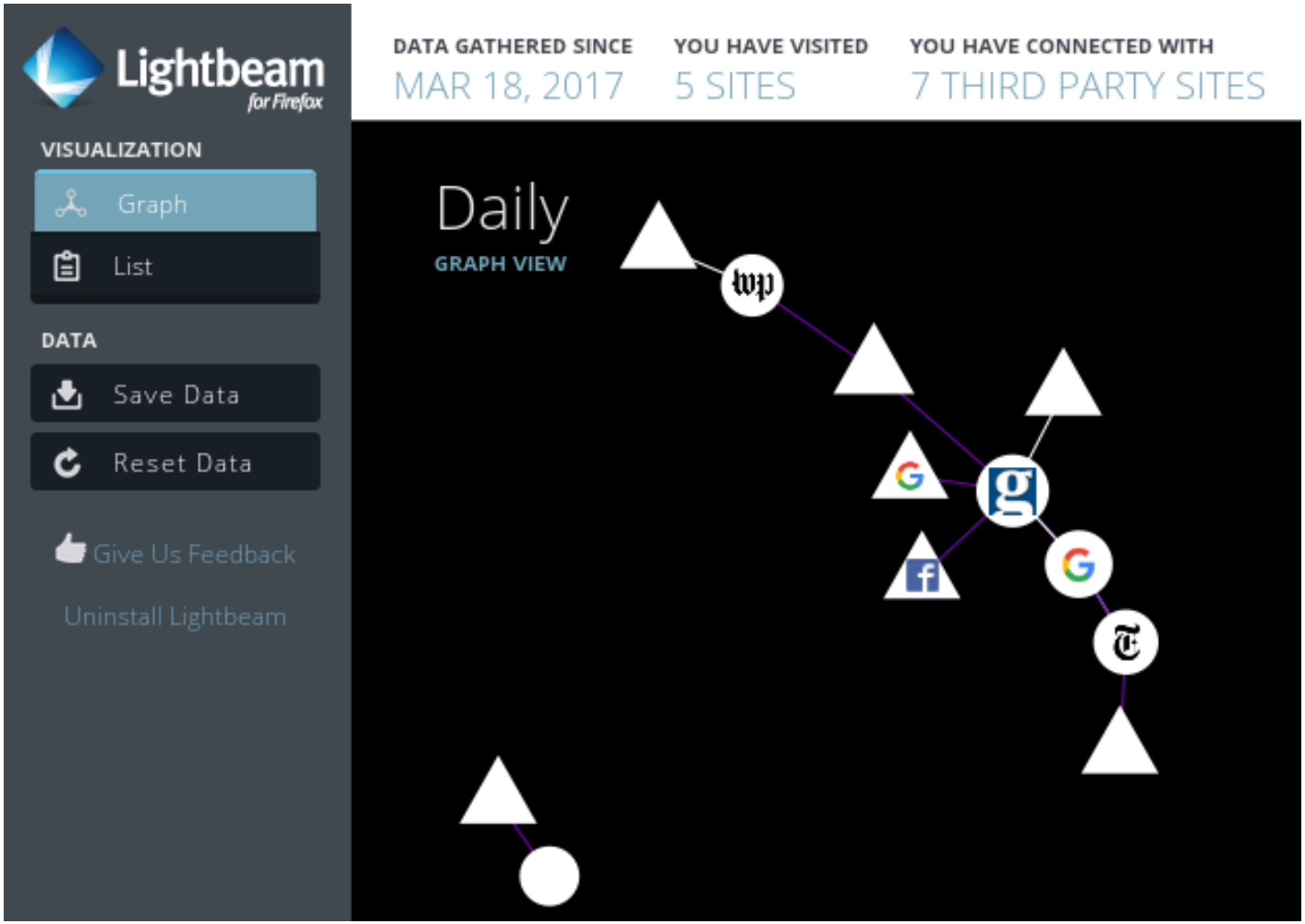
- Running arbitrary untrusted, unsigned, ephemeral code (*also from many third parties*) [40]
  - *Restore Online Freedom!* (My LibrePlanet 2016 talk)
  - LibreJS blocks non-free, but free doesn't mean free of malice

Disable the Damn JavaScript!

- NoScript blocks JavaScript based on URL patterns [72]
  - *Warning:* Allows some sites by default!
  - Also blocks media and fonts; provides XSS and clickjacking prevention

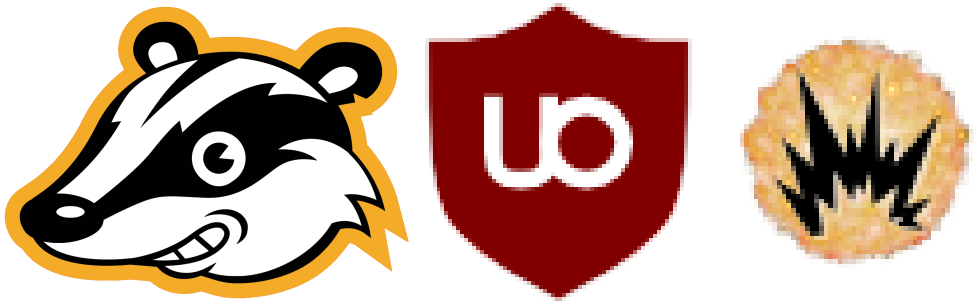


(Before NoScript)



(After NoScript with *no whitelist*)

Ads/Trackers; Security



- *Privacy Badger* blocks trackers [82, 87]
- *uBlock$_0$* "wide-spectrum blocker" [109]
- *Self-Destructing Cookies* clears cookies and LocalStorage [97]


HTTPS://
EVERYWHERE

Pseudonymity

Origin is unknown to server; unique identifier *is available* to server[121]

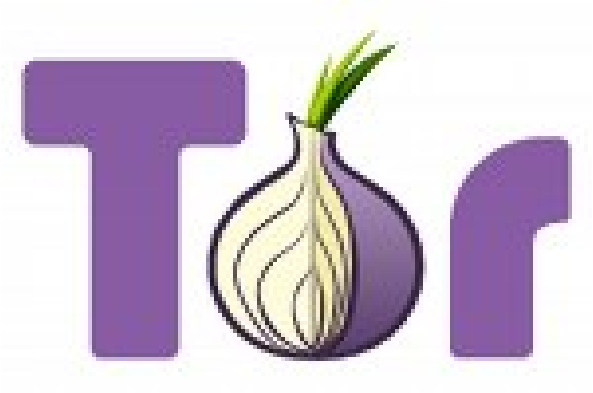
Anonymity

Origin is unknown to server; no unique identifier known by server[121]

IANAAE

(I Am Not An Anonymity Expert)

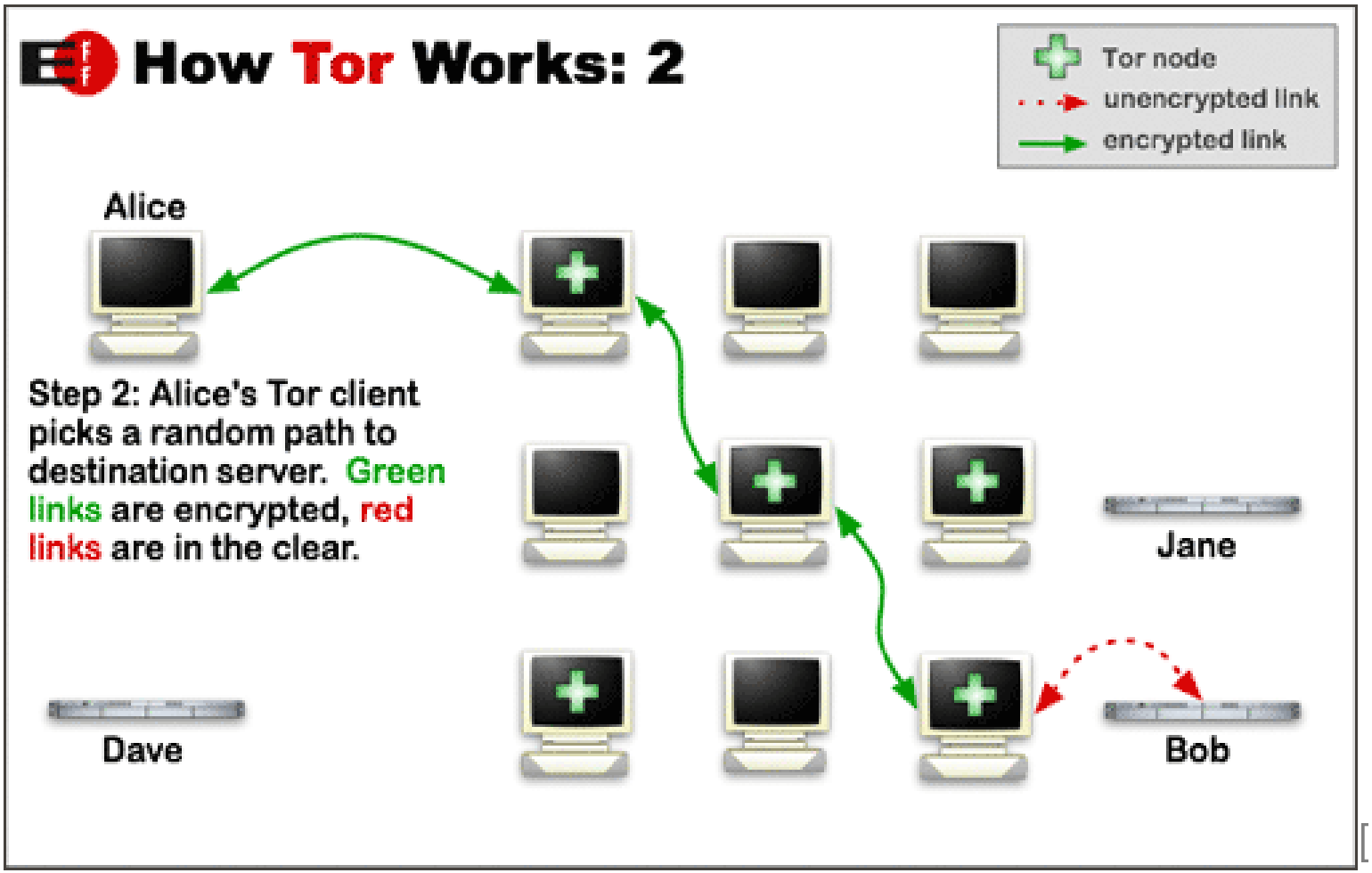
The Tor Network



- The Onion Router (Tor)
- Helps defend against traffic analysis

[85]

The Tor Network



[106]

TorBrowser, Tails, and Whonix

- Also need to change browsing habits [121]

TorBrowser, Tails, and Whonix

- Browser needs to be hardened
  - Remember: browser leaks a lot of data [32, 46]
  - TorBrowser is a hardened Firefox derivative [105, 81]

TorBrowser, Tails, and Whonix

- Operating System needs to be hardened
  - Tails—The Amnesic Incognito Live System

[104]

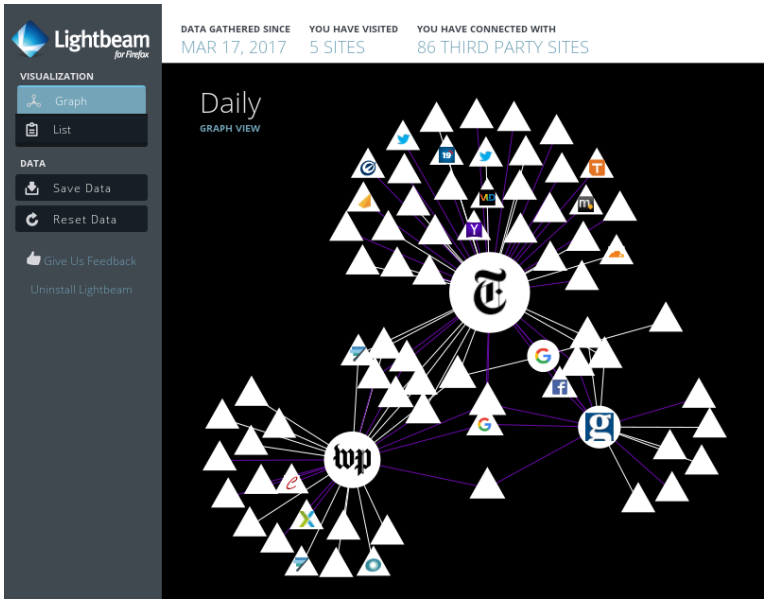
TorBrowser, Tails, and Whonix

- Operating System needs to be hardened
  - Tails—The Amnesic Incognito Live System [104]
  - Whonix—Multi-layer isolation in VMs [122]

"Big Data" (*Your* Big Data)

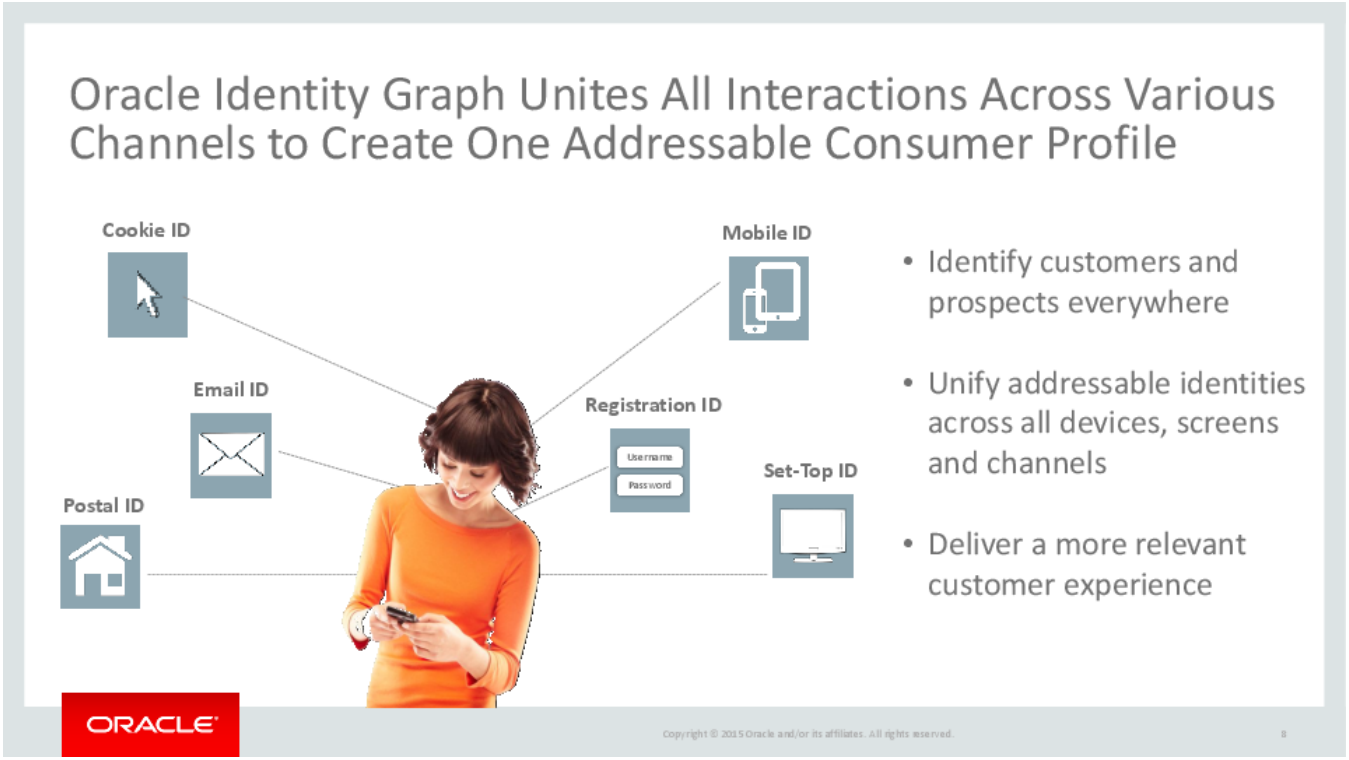
“Business Intelligence”

Data Brokers



- Ghostery lists over 3,000 companies receiving web/app data [21]

Oracle Identity Graph



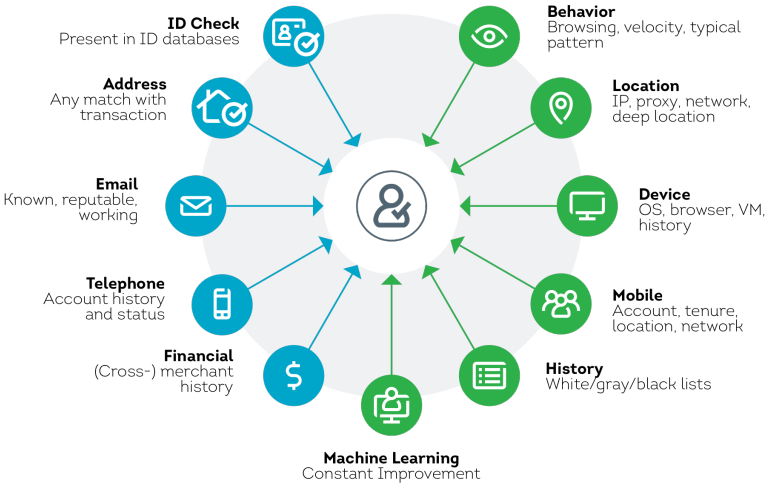
"Aggregates and provides insights on over $2 trillion in consumer spending from 1,500 data partners across 110 million US households" [79]

"More Relevant Customer Experience"

Target Pregnancy Prediction

- Records purchases, credit cards, coupons, surveys, refunds, customer helpline calls, email, website visits, . . . [16]
- Purchase more information from third parties [16]
- Identified 25 products to create a "pregnancy prediction" score and estimate due date [25]
  - Quantities of types of lotions, soaps, cotton balls, supplements, etc

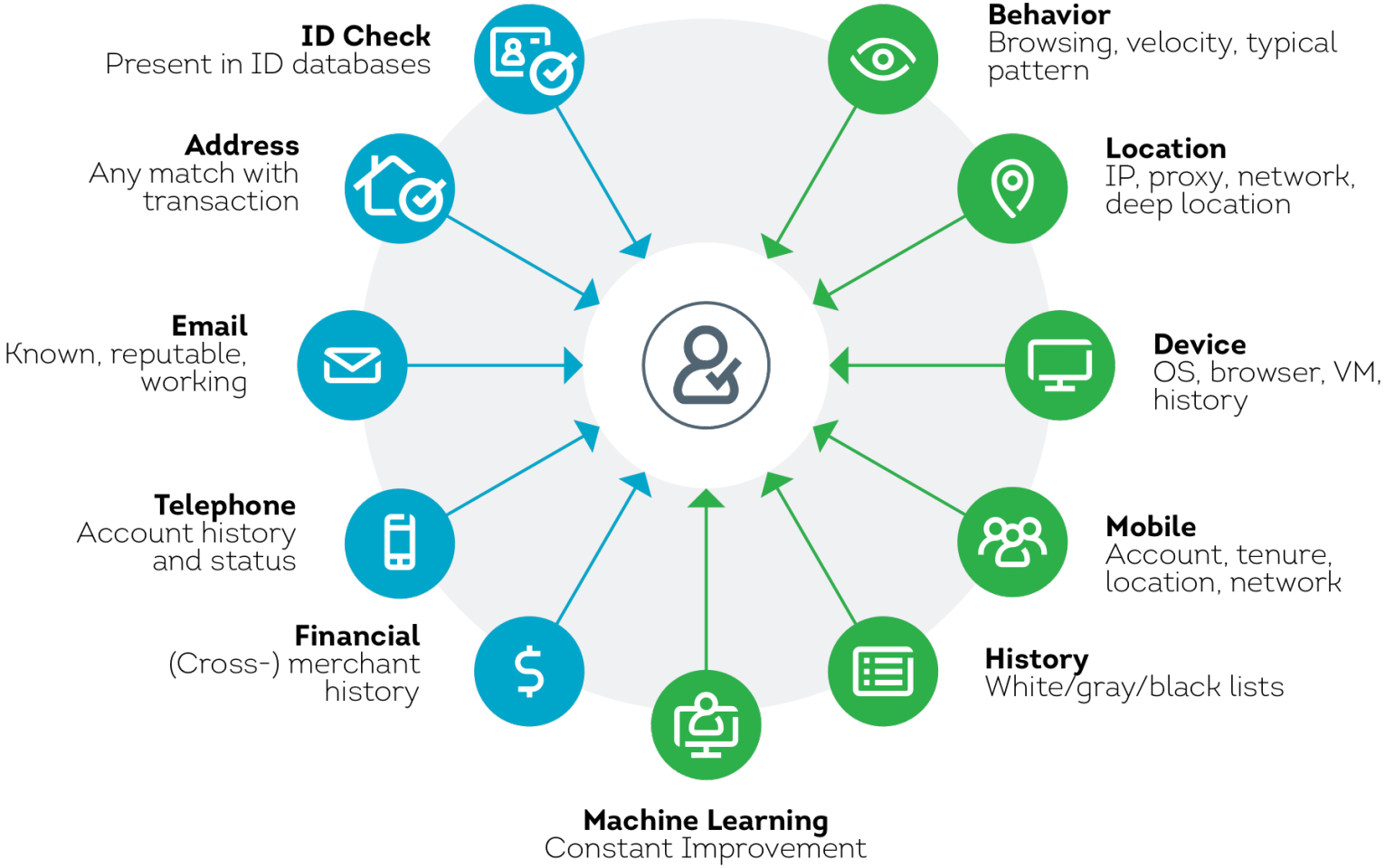
Transparency Needed



[107]

- Let users see their data in this graph!
- Erase nonpublic information that they don't want to be known
- Let them correct what is wrong
  - Also a problem with law enforcement / government
- Let them opt out!

Trustev Fraud Detection



[107]

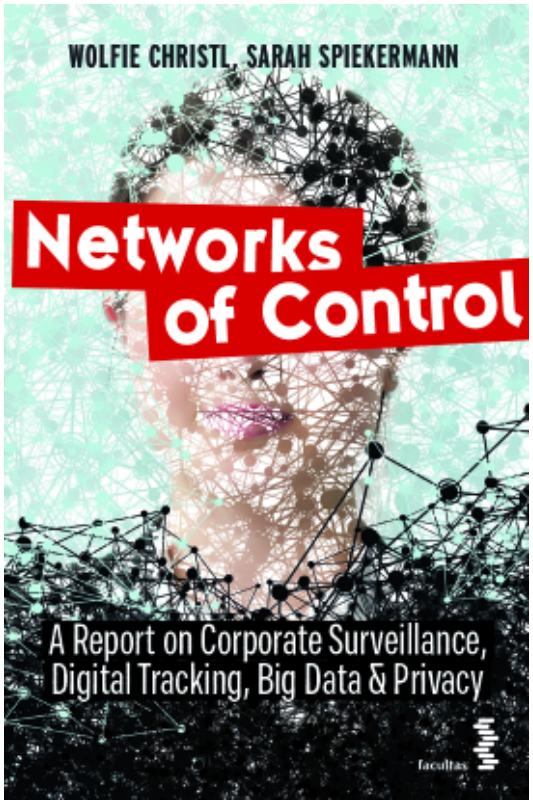
LexisNexis

- Risk management for insurance, finance, retail, travel, government, gaming, and healthcare [16]
- Data on over 500 million customers
- TrueID—34 billion records from over 10,000 sources [57]

"We help insurers assess their risk and streamline the underwriting process in 99% of all U.S. auto insurance claims and more than 90% of all homeowner claims."

Palantir

- Started by Peter Thiel of PayPal
- CIA, DHS, NSA, FBI, the CDC, the Marine Corps, the Air Force, Special Operations Command, West Point, the Joint IED-defeat organization and Allies, the Recovery Accountability and Transparency Board and the National Center for Missing and Exploited Children. [11]



[16, 15]

Shock and Awe

We're feeding into all of this!

Software as a Service Substitute (SaaSS)

- Disturbing trend to replace traditional software with services
- Do not own your own data *or* computations
- Companies balance privacy on their balance sheets
  - Countless data breaches

Decentralize!

- Host what you can (GNU Social, NextCloud, . . .)
- Damnit, Moxie (Signal)—use XMPP, OMEMO

"I Have Nothing To Hide"

Complacency

Complacency in the Status Quo

The status quo cannot hold.

We need to push back

You need to push back

Mike Gerwitz
mtg@gnu.org

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