CrowdSurf
Empowering Transparency in the Web

25 Aug 2016, ACM SIGCOMM, Florianopolis

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Introduction
Do you know what you HTTP?
Example
Web tracking

Thousands of Web trackers collect our data

- Browsing histories
- Religious, sexual, and political preferences

- On average, the first tracker is met as soon as the browser starts
- Some trackers reach 96% of users
- 71% of websites host at least one tracker

How to know and choose which services our data is exchanged with and how?
Partial solutions

In network devices
- Firewalls and proxies
  - Fail in case of encrypted traffic (HTTPS)
  - Lack scalability
  - Managed by third parties

On client
- Browser plugins
  - Limited scope
  - No control on device traffic
  - Not transparent

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Google, Microsoft, and Amazon are paying Adblock Plus huge fees to get their ads unblocked

Lara O'Reilly
Feb. 3, 2015, 6:57 AM
60,452 views
22 comments
A New System

Goal
Let users re-gain visibility and control on the information they exchange with Web services

Design Principles
- Holistic: working in any scenario
- Client-centric: available on any kind of device
- Practical, not revolutionary: use existing technology
- Crowd-sourced: knowledge built on a community of users
- Automatic: little engagement of the user
- Privacy-safe: never compromise users’ privacy
Cloud
- A **controller** collects information about the services users visit
  - Explicit -> their opinion
  - Implicit -> traffic samples
- Users’ contributions processed by **data-analyzers** and the **advising community**
- Results = **suggestions** about the reputation of services

Client
- Users download the suggestions they like
- the **CrowdSurf Layer** translates them into **rules**
- Rules = **actions** on users’ traffic
  - Regexp + action
CrowdSurf Controllers

Open Controller
- Collaborative approach
- Users improve the wisdom of the system
  - Traffic samples and opinions
  - Build data analyzers and suggestions

Corporate Controller
- Builds directly rules for employees
- Employees can not customize rules
- All devices follow the same rules
The CrowdSurf Layer

- HTTP
- TLS
- TCP

Rule Processor
- Regular Expression Matching
- Action:
  - Block
  - Redirect
  - Allow
  - Modify
  - Log and Report

Suggestions to Rules

Open Controller

Corporate Controller

Anonymization
CrowdSurf in a picture

Web Services

Opinions

Traffic samples

Suggestions

Ruled Interaction

Open Controller

Rules

Traffic samples

Corporate Controller
Proof of Concept
Prototype

Controller
- Java-based web service
- Communicates with CrowdSurf devices
- Hosts a data analyzer for identification of tracking sites
- Collects traffic samples
- Distributes suggestions

Client
- Implemented as a Firefox plugin
- Supports block, redirect, log&report
Example of Data Analyzer: Automatic Tracker Detector

Unsupervised methodology to identify third-party trackers [2]

- Observation:
  - Trackers usually embed UIDs as URL parameters

- Procedure:
  1. Input: HTTP traffic samples provided by CS users
  2. Take all HTTP queries to third-party services
     http://acmetrack.com/query?key1=X&key2=Y
  3. Extract keys (key1, key2) and their values
  4. Check the presence of key values uniquely associated to the users

Example of Data Analyzer: Automatic Tracker Detector


34 new third-party trackers found
Performance Implications of running CrowdSurf

Different user profiles

Paranoid Profile
- Blocks
  - adv/tracking
  - JS code
- Does not report traffic samples

Kid Profile
- Activates child protection rules
- Reports traffic to trackers

Corporate Profile
- Redirects search.google.com to search.bing.com
- Blocks social networks, e-commerce sites, trackers
- Reports activity on DropBox
Paranoid is 1.07 times faster than baseline
Kid is 1.08 times slower
Corporate is 1.18 times slower
Conclusion
Open Problems

- Lot of details to consider
- Design/develop/standardize a new network layer
- Protecting users’ privacy
  - Anonymizing HTTP/S traffic
- Usability
- Involve users to join
- Protection from malicious biases
Holistic, crowd-sourced system for the auditing of the information we expose in the Web

https://www.myermes.com
Thank you!
Need a new model that…

Enables transparency and visibility

Monitor the HTTP traffic before encryption takes place

Takes actions

Block/manipulate/report transactions to undesired services

Under user’s control

Automatic, but configurable
## Example of Data Analyzer: Automatic Tracker Detector

### Automatic Tracker Detector

### Dataset
- HTTP trace from ISP running Tstat
  - 10 days of October 2014
  - ~19k monitored users
  - ~240k HTTP transactions per day

### Third Party Trackers Found

<table>
<thead>
<tr>
<th>Third Party Trackers</th>
<th>Count</th>
</tr>
</thead>
<tbody>
<tr>
<td>News1</td>
<td>13</td>
</tr>
<tr>
<td>E-commerce1</td>
<td>12</td>
</tr>
<tr>
<td>E-commerce2</td>
<td>9</td>
</tr>
<tr>
<td>E-commerce3</td>
<td>4</td>
</tr>
<tr>
<td>Portal2</td>
<td>4</td>
</tr>
<tr>
<td>Porn</td>
<td>3</td>
</tr>
<tr>
<td>Sportnews</td>
<td>1</td>
</tr>
<tr>
<td>SearchEngine</td>
<td>1</td>
</tr>
</tbody>
</table>

### Miscellaneous Third Party Trackers

- atemda.com
- x.bidswitch.net
- www.77tracking.com
- rack.movad.net
- ovo01.webtrekk.net
- dis.criteo.com
- dis.criteo.com
- p.rfihub.com
- ib.adnxs.com
- x.bidswitch.net
- user_id
- rand
- us
- cs2
- uid
- bk-uuid
- xid

**34 new third-party trackers found**
Example
A growing business around our data

Loss of visibility and control

- HTTPS protects our privacy, but...
- ...prevents third parties to check what’s going on under the hood of encryption
- ...and severely limits network functions

“Child protection through the use of Internet Watch Foundation blacklists has become ineffective, with just 5% of entries still being blocked when HTTPS is deployed” [2]

Time to collect a dataset

[Diagram showing the relationship between service rank and number of visits, with annotations for Google Analytics.]
Monitoring the Web

CrowdSurf Controllers

**Open Controller**
- Collaborative approach
- Users improve the wisdom of the system
  - Traffic samples and opinions
  - Build data analyzers and suggestions

**Third party Controller**
- Suggestions for **commercial purposes**
- Opens to a market of suggestions

**Corporate Controller**
- **Builds directly rules** for employees
- Employees can not customize rules
- All devices follow the same rules
CrowdSurf in a picture

Open controller

Third-party controller

Corporate controller

Web Services

Google

Twitter

Yahoo

Amazon

Facebook

YouTube

Spotify

Corporate Rules

Web Browsing

Traffic samples

Suggestions

Private User Device

Corporate Device

Data Analyzer