CrowdSurf
Empowering Transparency in the Web

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Hassan Metwalley
Stefano Traverso
Marco Mellia
Stanislav Miskovic
Mario Baldi
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 up to 96% of users
- 71% of websites host at least one tracker

The Open Question

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

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

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

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

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
CrowdSurf in a picture

- Web Services

- Opinions + Traffic samples

- Suggestions

- Ruled Interaction

- Open Controller

- Corporate Controller

- Rules

- Traffic samples
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
     \[\text{http://acmetrack.com/query?key1=X&key2=Y}\]
  3. Extract keys (\textbf{key1}, \textbf{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
CrowdSurf

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

Takes actions

Under user’s control

Monitor the HTTP traffic before encryption takes place

Block/manipulate/report transactions to undesired services

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

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<th>Third-party Trackers</th>
<th>Portal1</th>
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<td>Portal2</td>
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**34 new third-party trackers found**

<table>
<thead>
<tr>
<th>Tracker</th>
<th>Domain</th>
<th>Key</th>
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<tr>
<td>atemda.com</td>
<td>bidderuid</td>
<td>bidderuid</td>
</tr>
<tr>
<td>x.bidswitch.net</td>
<td>user_id</td>
<td>user_id</td>
</tr>
<tr>
<td><a href="http://www.77tracking.com">www.77tracking.com</a></td>
<td>rand</td>
<td>rand</td>
</tr>
<tr>
<td>rack.movad.net</td>
<td>us</td>
<td>us</td>
</tr>
<tr>
<td>ovo01.webtrekk.net</td>
<td>cs2</td>
<td>cs2</td>
</tr>
<tr>
<td>dis.criteo.com</td>
<td>uid</td>
<td>uid</td>
</tr>
<tr>
<td>p.rfihub.com</td>
<td>bk-uuid</td>
<td>bk-uuid</td>
</tr>
<tr>
<td>ib.adnxs.com</td>
<td>xid</td>
<td>xid</td>
</tr>
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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

googleanalytics
Monitoring the Web

[1] Popa, L. et al., "HTTP As the Narrow Waist of the Future Internet," ACM HotNets, 2010
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

Suggestions
Corporate Rules
Web Browsing
Traffic samples
Private User Device
Corporate Device
Data Analyzer