[Proceeding] CrowdSurf: Empowering Informed Choices in the Web

Original Citation:

Availability:
This version is available at: http://porto.polito.it/2656559/ since: November 2016

Publisher:
ACM

Published version:
DOI:10.1145/2831347.2831349

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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

Regular Expression Matching

Action
  - Block
  - Redirect
  - Allow
  - Modify
  - Log and Report

Suggestions to Rules

Open Controller

Corporat...
CrowdSurf in a picture

- Opinions + Traffic samples
- Suggestions
- Ruled Interaction
- Rules
- Traffic samples

Open Controller

Corporate Controller

Web Services

26 August 2016
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
Impact on Web site loading time

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 vs

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

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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

googleanalytics
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