CrowdSurf

Empowering Transparency in the Web

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ACM SIGCOMM,
Florianopolis

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POLITECNICO DI TORINO

Symantec

Introduction

Do you know what you HTTP?

Example

Web tracking

Thousands o ect our data

- ❑ Browsing h
- ❑ Religious, ferences

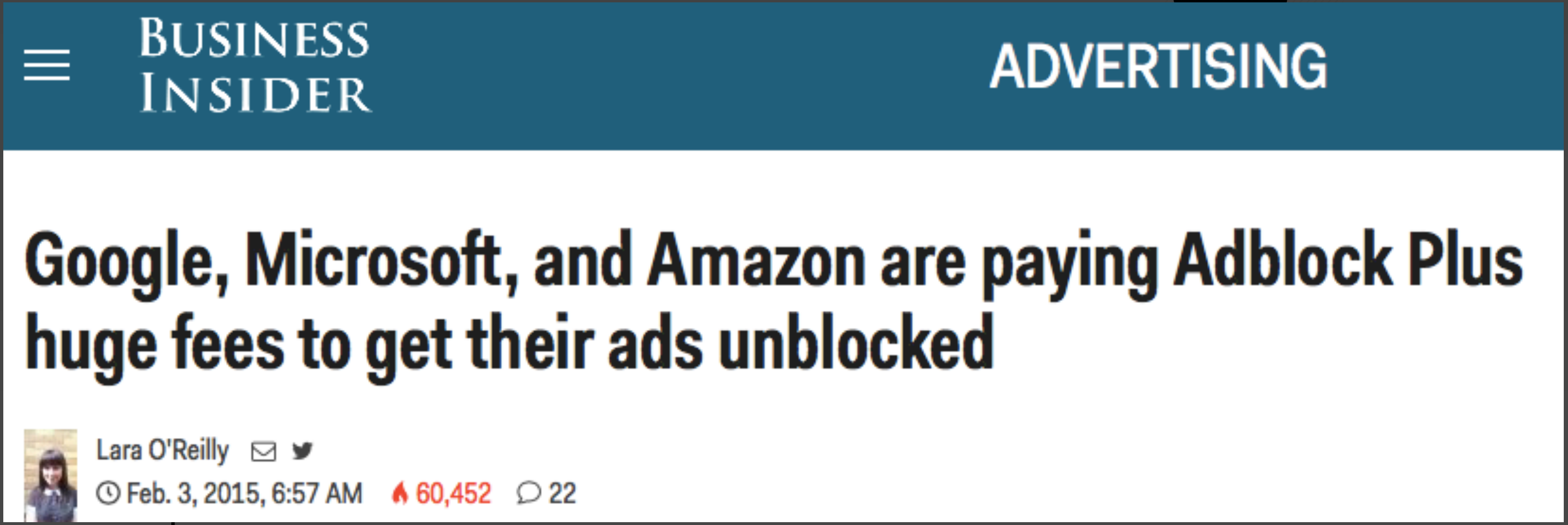
- ❑ On averag **as soon as the browser st**
- ❑ Some trac [1]
- ❑ **71% of wel** racker [1]

[1] Metwalley, H. et al. "*The On* *rements*", TMA 2015

The Open Question

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

Partial solutions



BUSINESS INSIDER

ADVERTISING

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 22

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

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

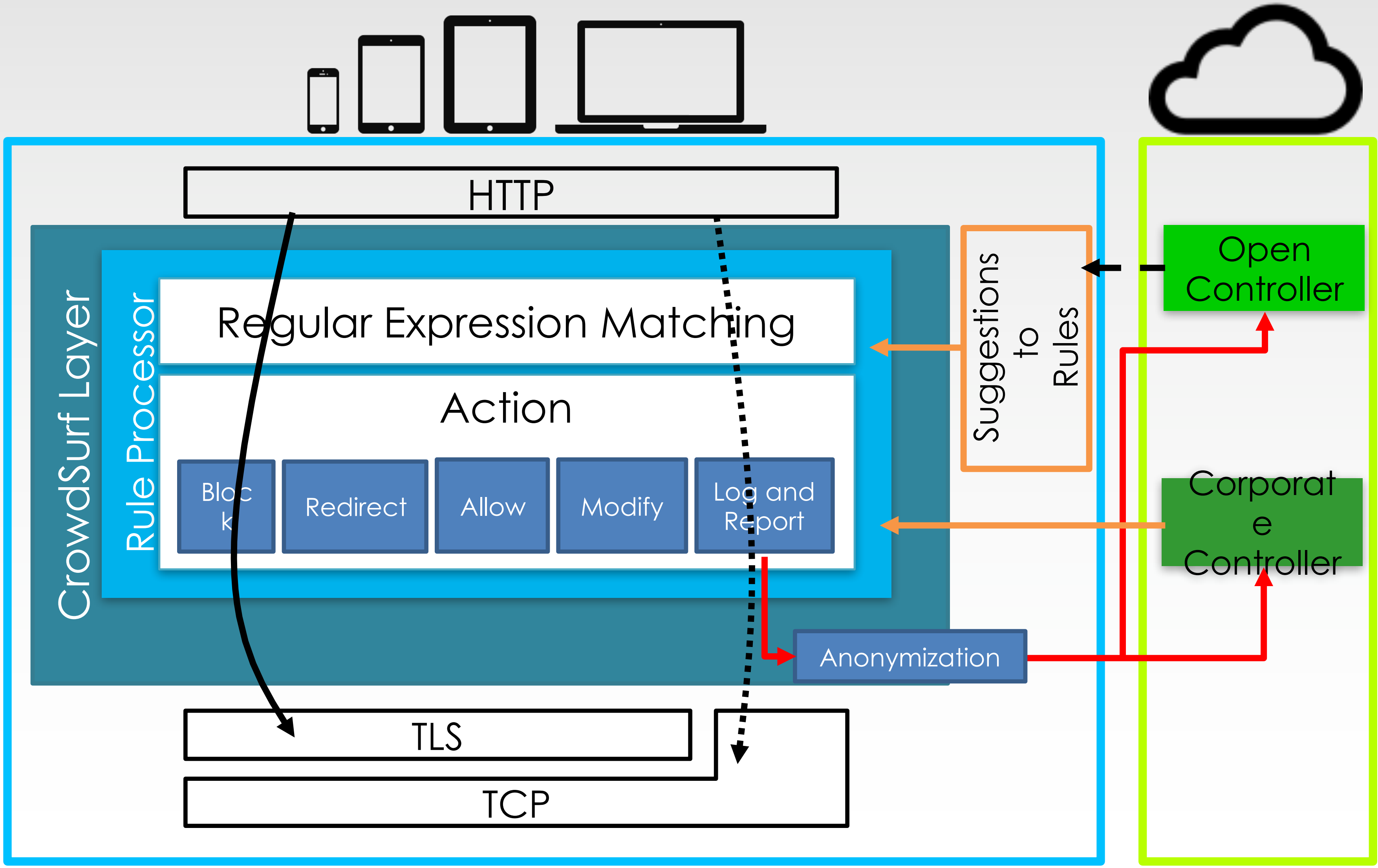
Open Controller

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

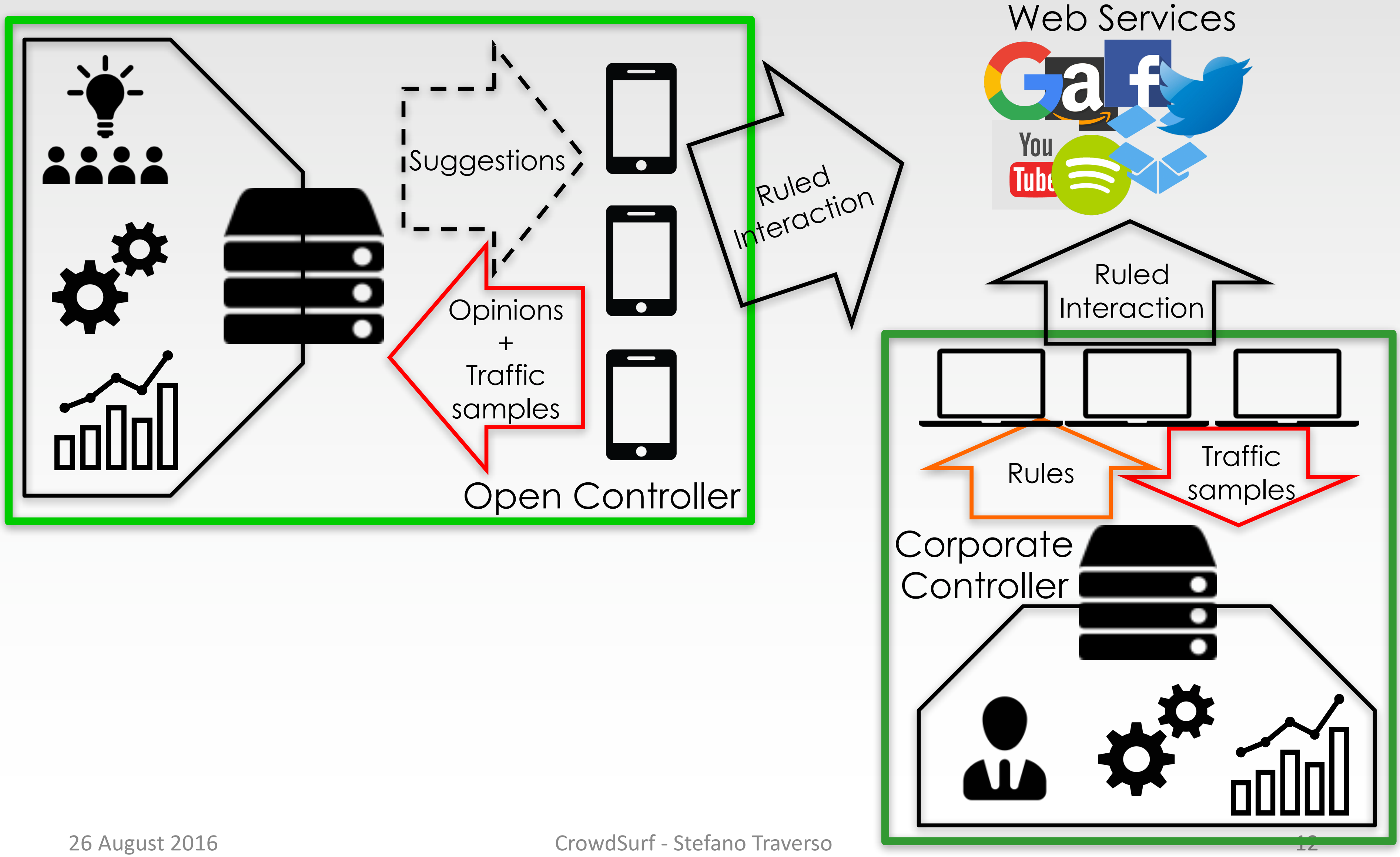
Corporate Controller

- **Builds directly rules** for employees
- Employees can not customize rules
- All devices follow the same rules

The CrowdSurf Layer



CrowdSurf in a picture



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

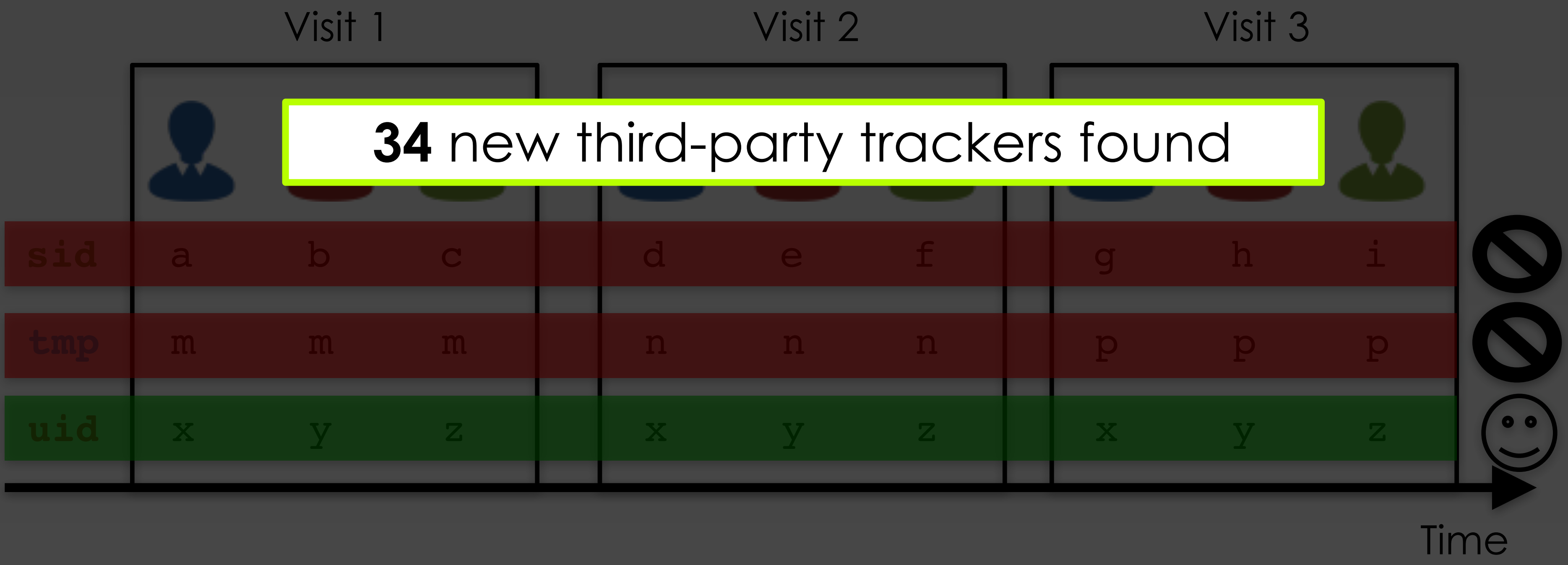
   http://acmetrack.com/query?**key1**=X&**key2**=Y

3. Extract keys (**key1**, **key2**) and their values
4. Check the presence of key values uniquely associated to the users

[2] Metwalley, H. et al "Unsupervised Detection of Web Trackers", IEEE Globecom 2015

Example of Data Analyzer: Automatic Tracker Detector

```
http://acmetrack.com/query?sid=X&tmp=Y&uid=Z
```



	Visit 1			Visit 2			Visit 3			
sid	a	b	c	d	e	f	g	h	i	🚫
tmp	m	m	m	n	n	n	p	p	p	🚫
uid	x	y	z	x	y	z	x	y	z	☺

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

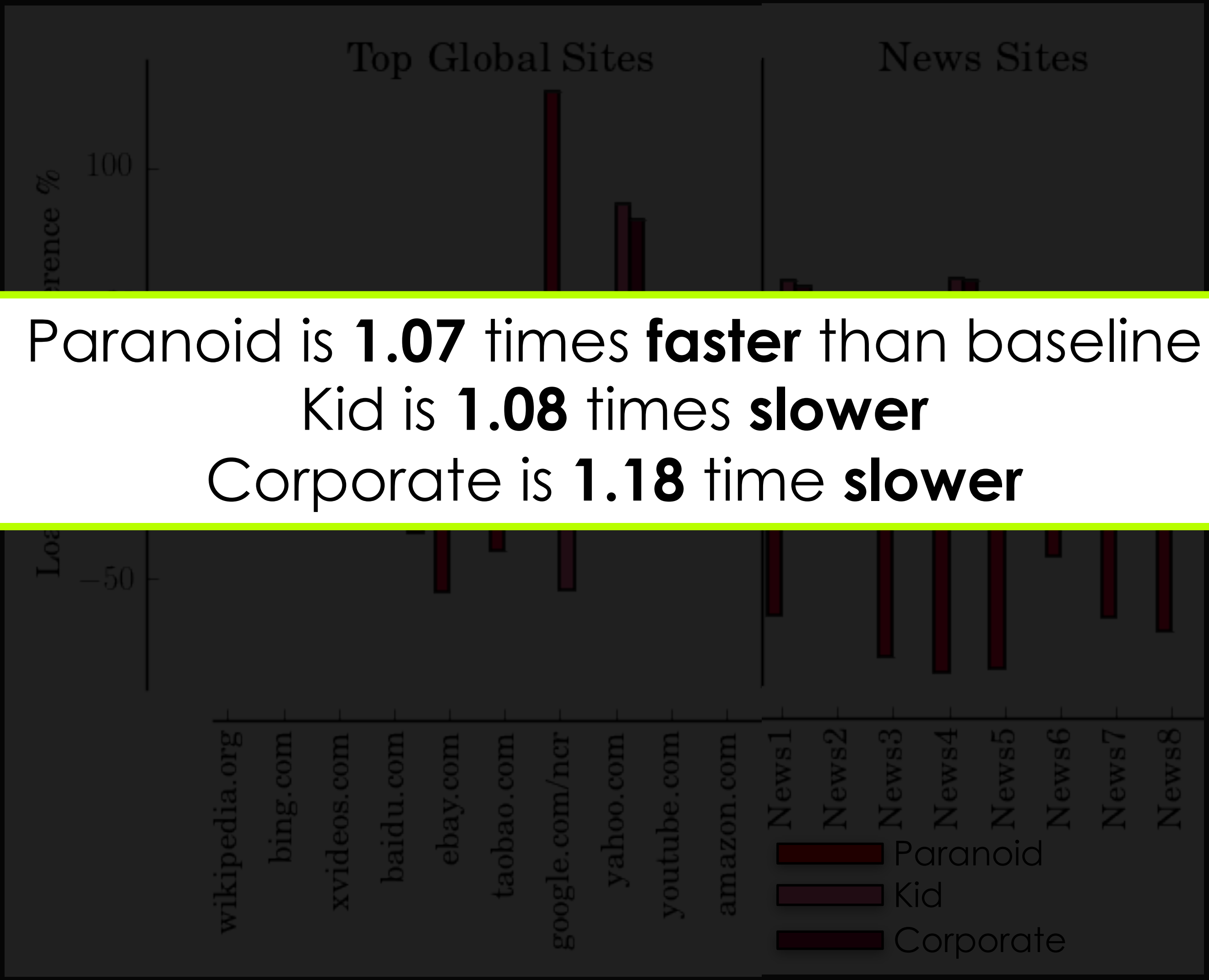
Kid Profile

- □ 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** acitivity 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** time **slower**

Conclusion

Open Problems

- Lot of details to consider
- Design/develop/stardardize a new network layer
- Protecting users’ privacy
  - Anonymizing HTTP/S traffic
- Usability
- Involve users to join
- Protection from malicious biases

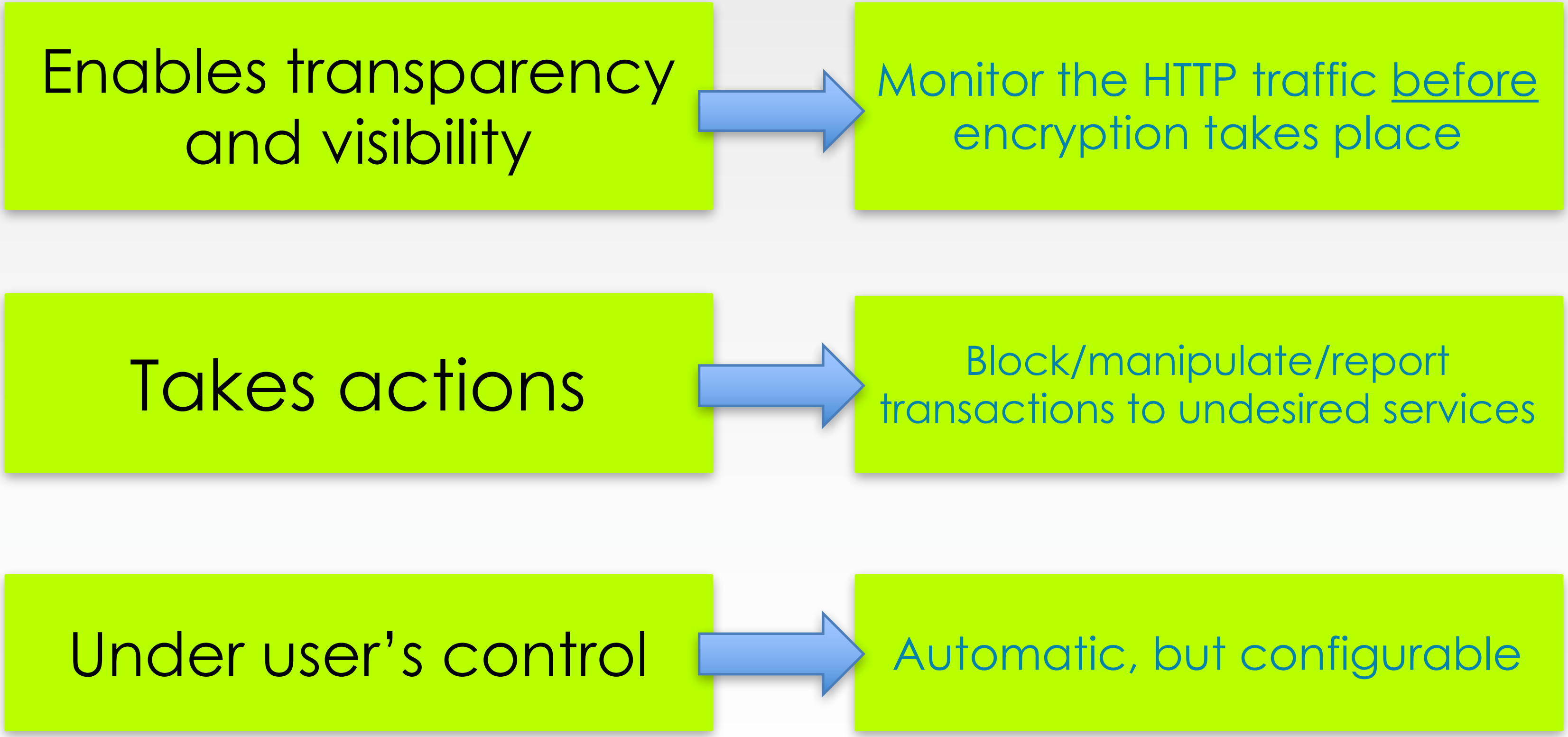
CrowdSurf

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 → 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

vs

Dataset

HTTP trace from ISP running Tstat

- ❑ 10 days of October 2014
- ❑ ~19k monitored users
- ❑ ~240k HTTP transactions per day

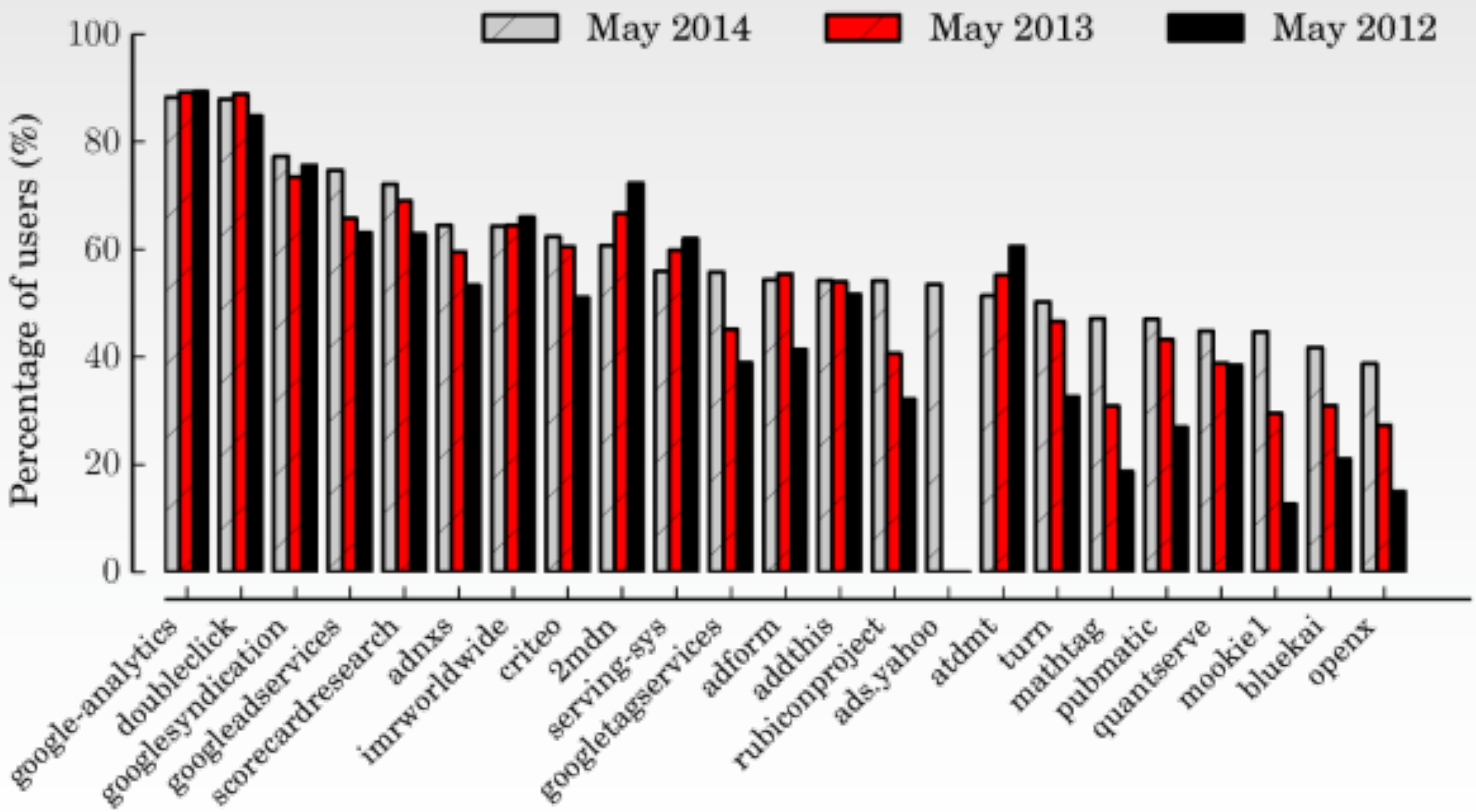
34 new third-party trackers found

	Thir	
News1	cl.adform.net	xid
	atemda.com	bidderuid
	x.bidswitch.net	user_id
	www.77tracking.com	rand
	rack.movad.net	us
	ovo01.webtrekk.net	cs2
	dis.criteo.com	uid
	p.rfihub.com	bk-uuid
	ib.adnxs.com	xid

	bedded Third-arty Trackers
Portal1	26
News1	13
E-commerce1	12
E-commerce2	9
E-commerce3	4
Portal2	4
Porn	3
Sportnews	1
SearchEngine	1

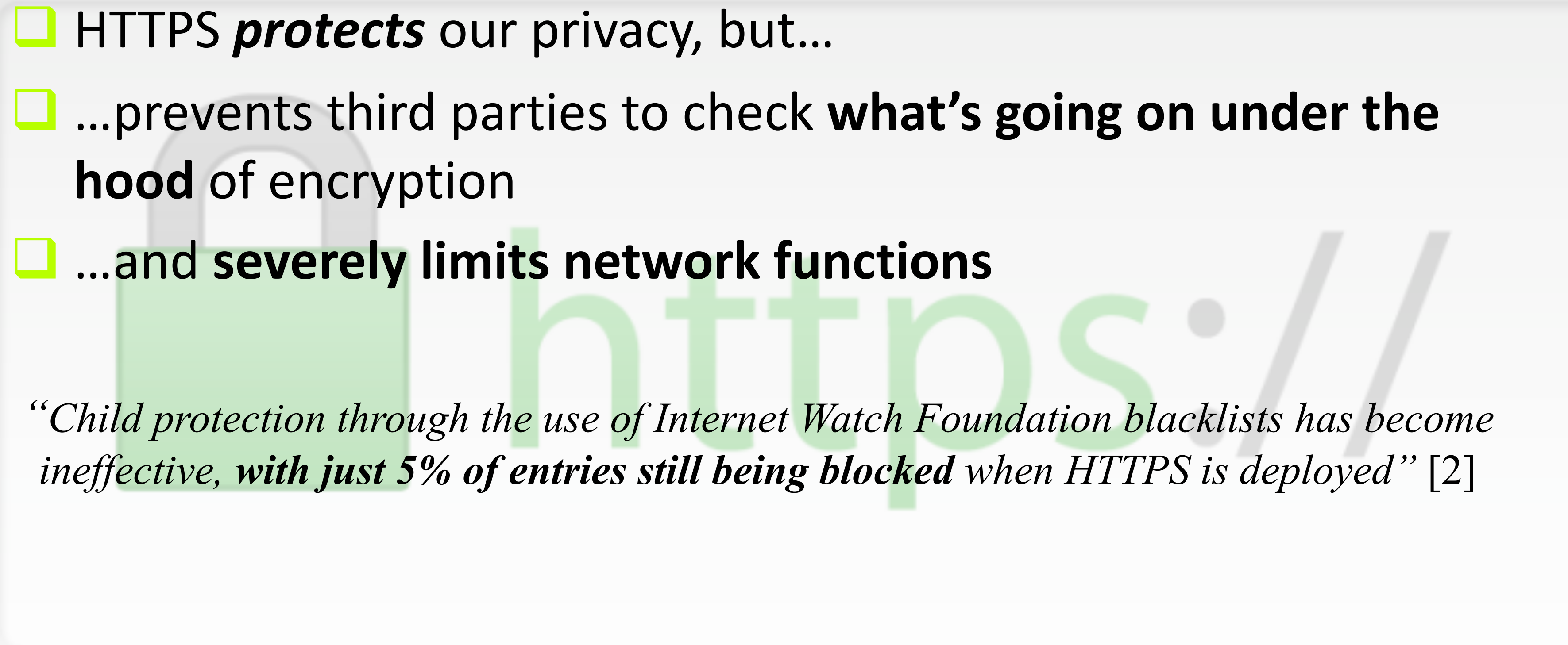
Example

A growing business around our data



[3] Metwalley, H. et al. "*The Online Tracking Horde: A View from Passive Measurements*", TMA 2015

Loss of visibility and control

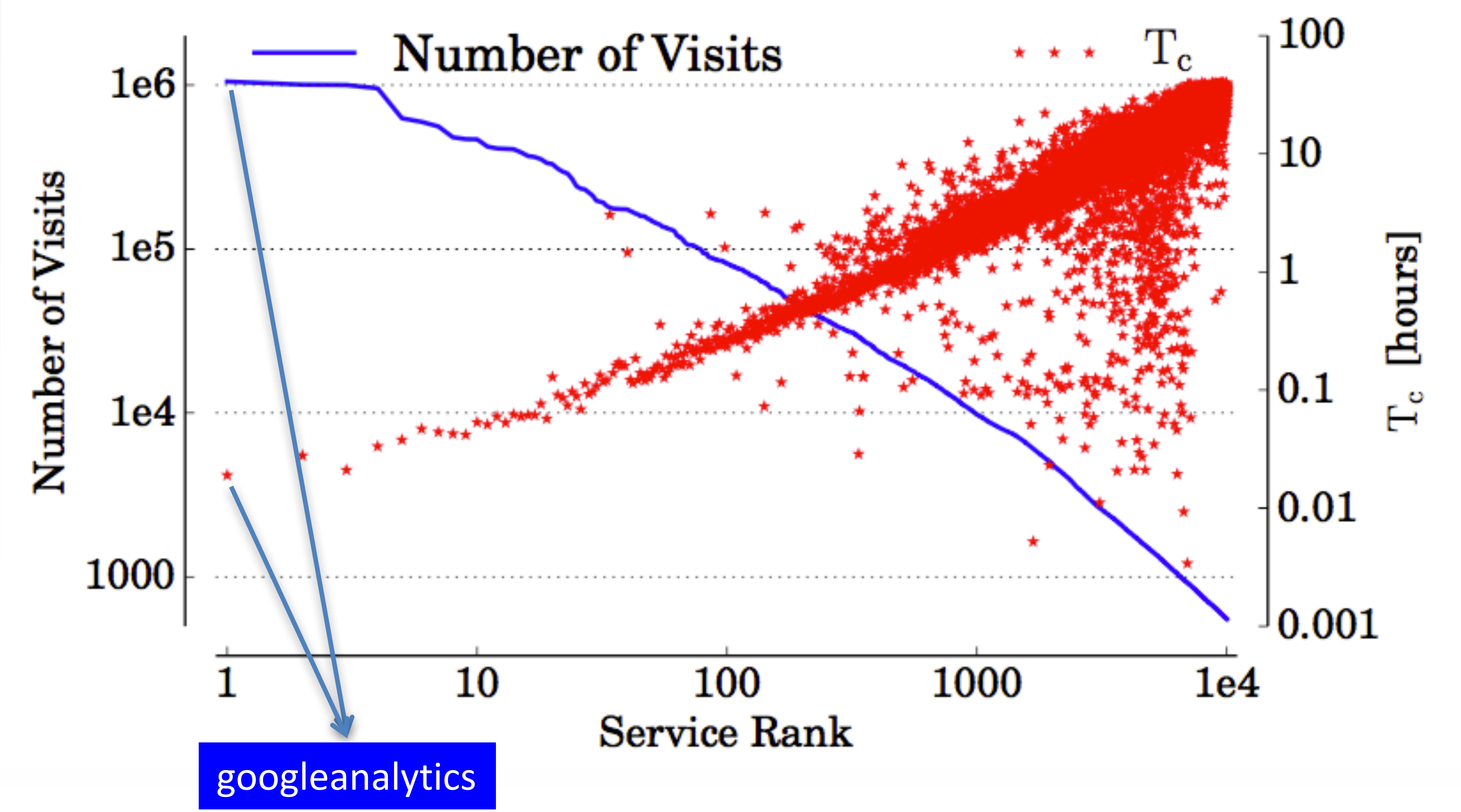


- HTTPS ***protects*** our privacy, but…
- …prevents third parties to check **what's going on under the hood** of encryption
- …and **severely limits network functions**

*"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]

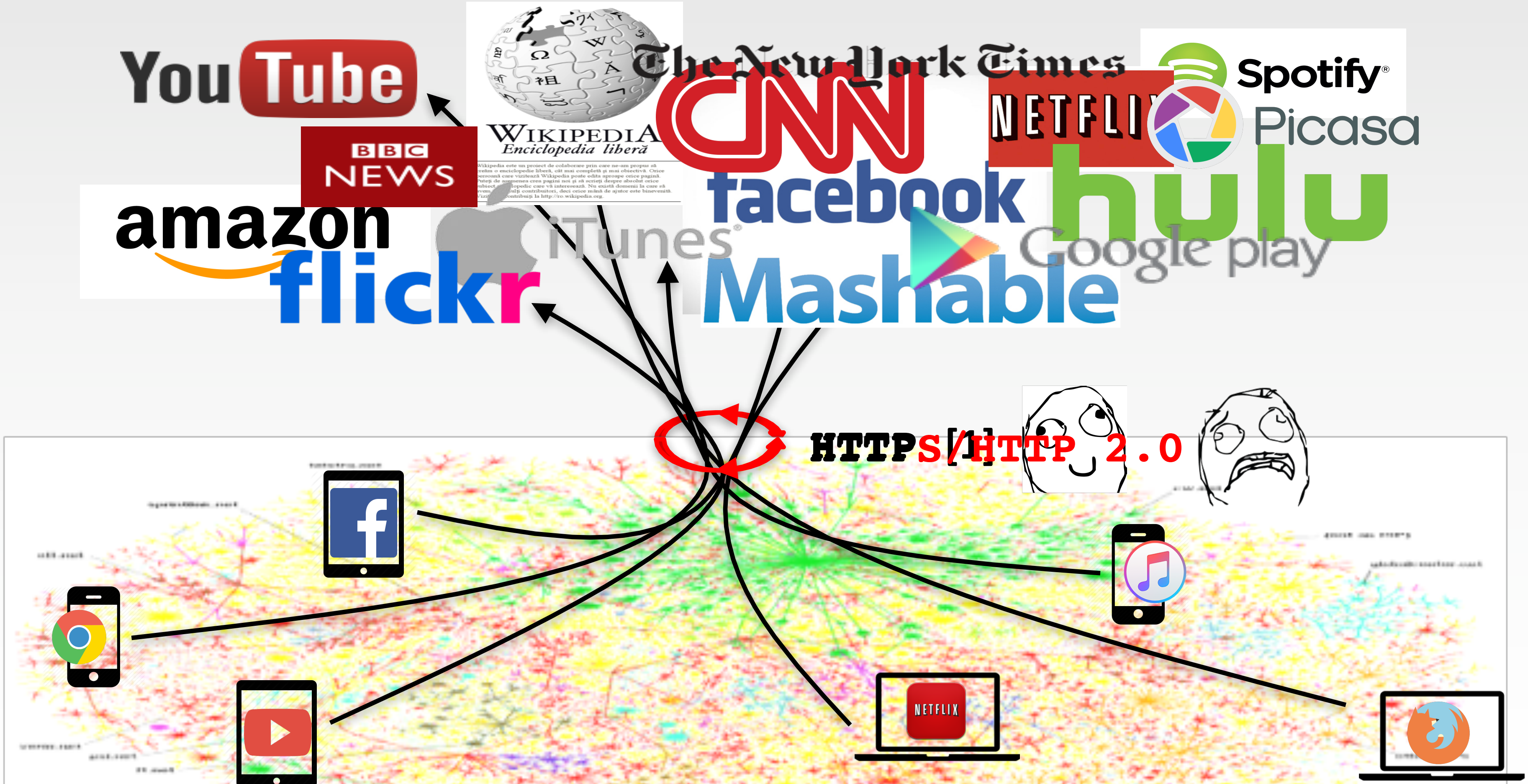
[2] Naylor, D. et al. *"The Cost of the "S" in HTTPS"*, CoNEXT 2014

Time to collect a dataset



googleanalytics

Monitoring the Web



HTTP[1]

HTTPS/HTTP 2.0

[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
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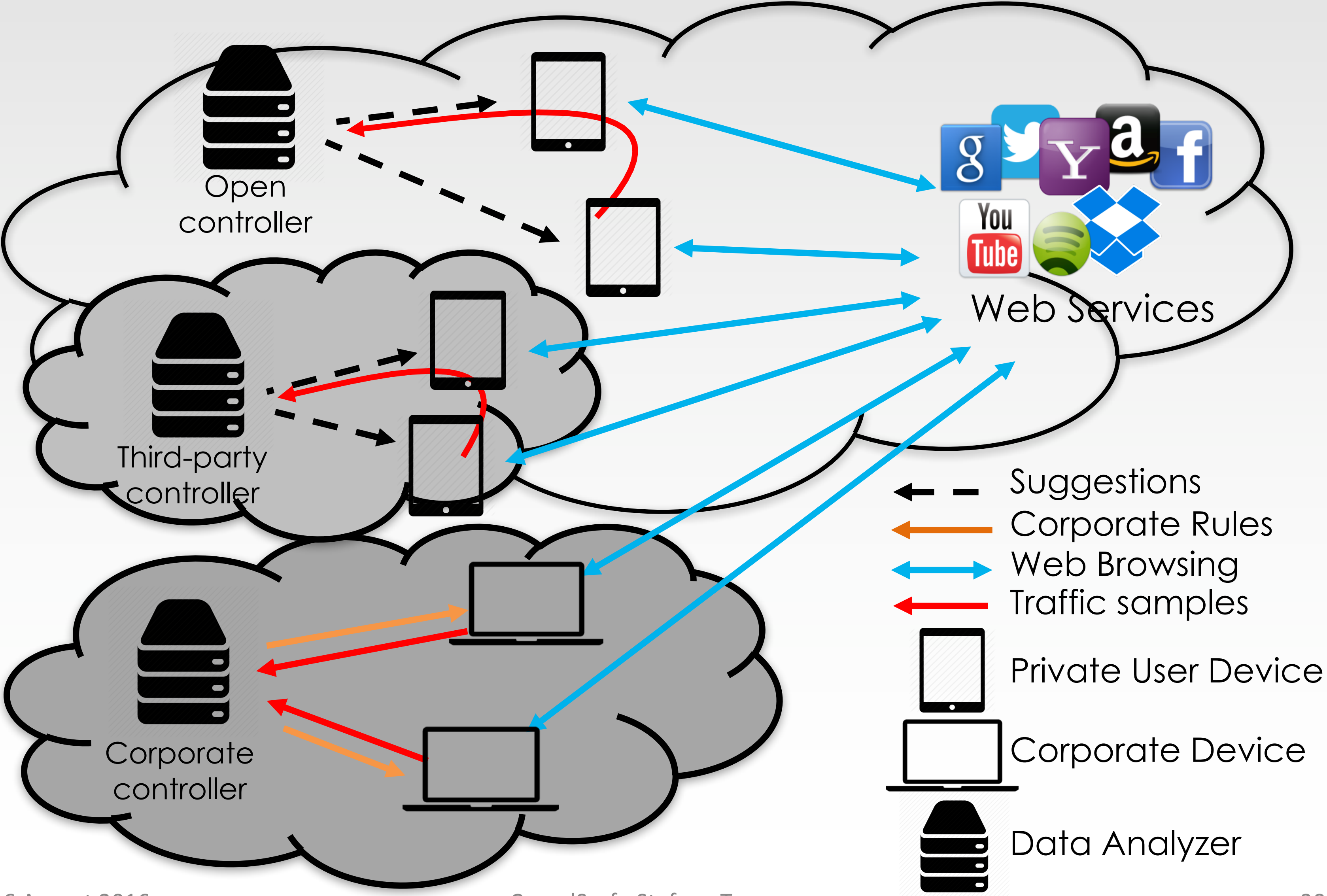
CrowdSurf in a picture


Open controller
Web Services
Third-party controller
Corporate controller
Suggestions
Corporate Rules
Web Browsing
Traffic samples
Private User Device
Corporate Device
Data Analyzer