

Apps, Trackers, Privacy, and Regulators

A Global Study of the Mobile Tracking Ecosystem

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Data&Society



Mobile tracking

CVS Discretely Shares Your Location with 40+ Other Sites

Posted by [Serge Egelman](#) on [August 25, 2017](#)

OnePlus denies sending users' clipboard data to China

Jan 29, 2018 Eva Yoo

News

Recently, we decided to take a closer look at app sharing location data. This is a concern, because

Why is this company tracking where you are on Thanksgiving?

A data collection service called SafeGraph collected 17 trillion location markers for 10 million smartphones during the holiday last year.





FIFA Soccer

ELECTRONIC ARTS Sports

E Everyone

Offers in-app purchases

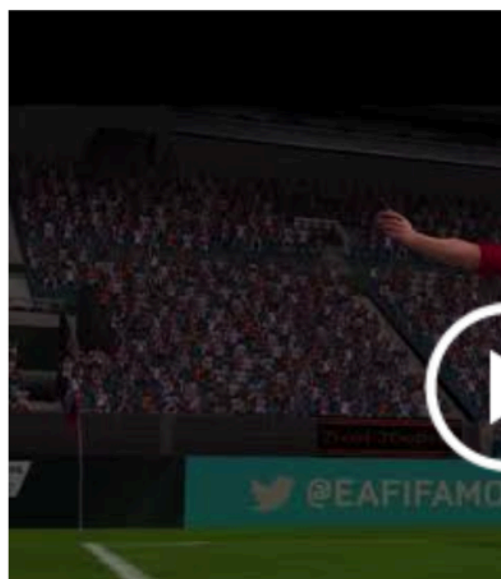
 This app is compatible with all of your devices.

 Editors' Choice

★★★★★ 3,059,307 

 Add to Wishlist

Install



Privacy Policy

PLEASE NOTE THAT THIS PRIVACY POLICY APPLIES ONLY TO THOSE USERS OF THE SERVICES WHO ARE AGE 13 AND OLDER. SPECIAL PROCEDURES ARE USED WHEN COLLECTING INFORMATION FROM USERS UNDER THE AGE OF 13, WHICH ARE DISCUSSED IN THE "POLICIES REGARDING CHILDREN UNDER THE AGE OF 13" SECTION BELOW.

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More than meets the eye

- 90% of mobile apps are free, many are monetized using ads
- Apps use 3rd-party services to collect tracking data and display ads
 - **Advertising and Tracking Services (ATS, for short)**
 - Not visible to the users
 - Data sharing policies are unknown to the users and

We aim to bring transparency to this ecosystem.

Questions to answer

2

Who are the parent organizations of these mobile ATSeS?



verizon



Alphabet



4

What do their privacy policies look like?

1

What are the domains associated with 3rd-party ATSeS used by mobile apps?



3

Which mobile ATSeS are capable of cross-device tracking?



Existing datasets are incomplete and/or inaccurate

McAfee Trusted Source

URL	Category
http://flurry.com	Internet Services
http://cloudflare.com	Internet Services

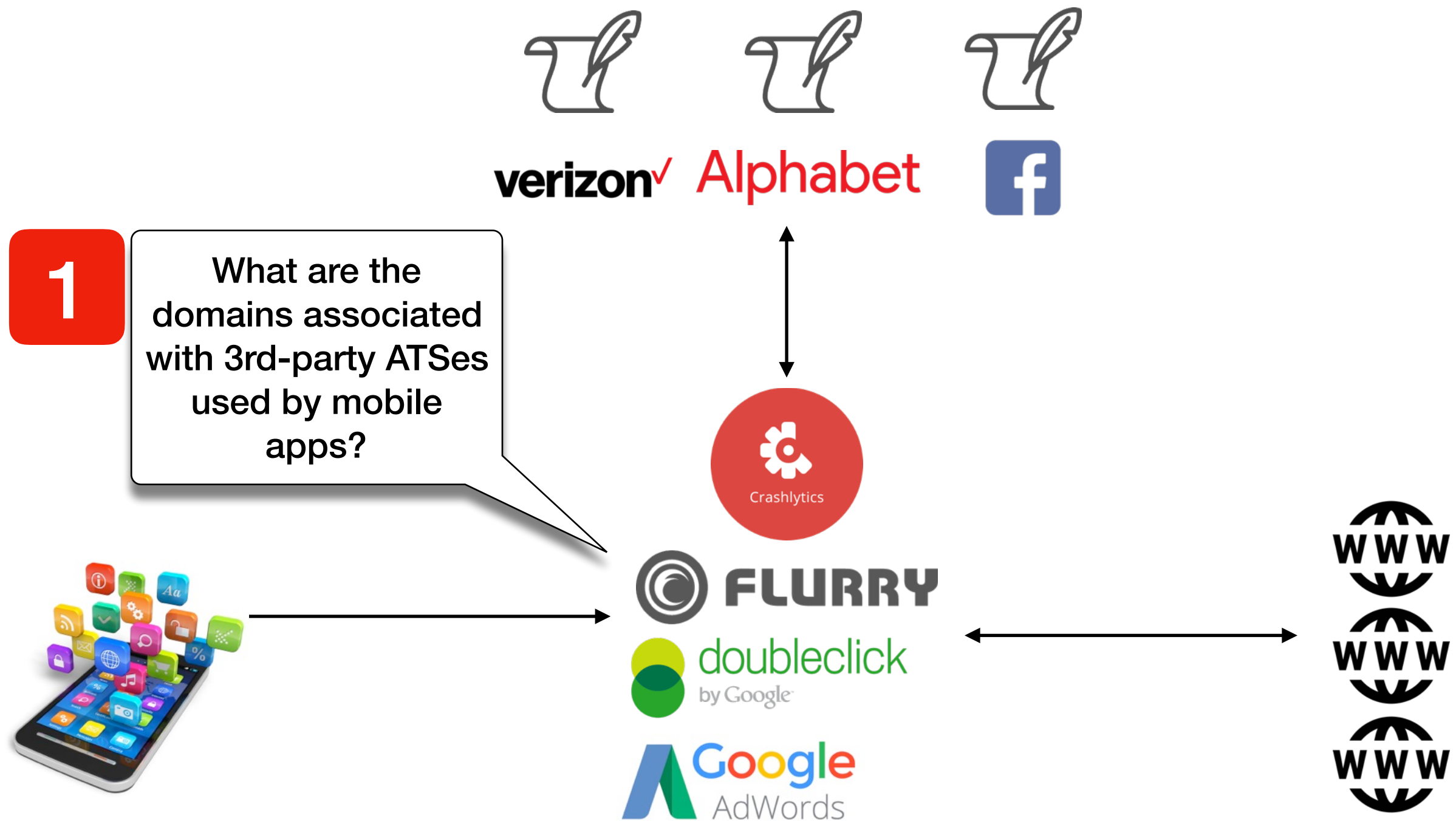
AdBlock Plus (EasyList)

URL	Category
http://flurry.com	None
http://cloudflare.com	None

OpenDNS Domain Tagging

URL	Category
http://flurry.com	Software/Technology, Advertising, Business Services
http://cloudflare.com	Business Service

Questions to answer



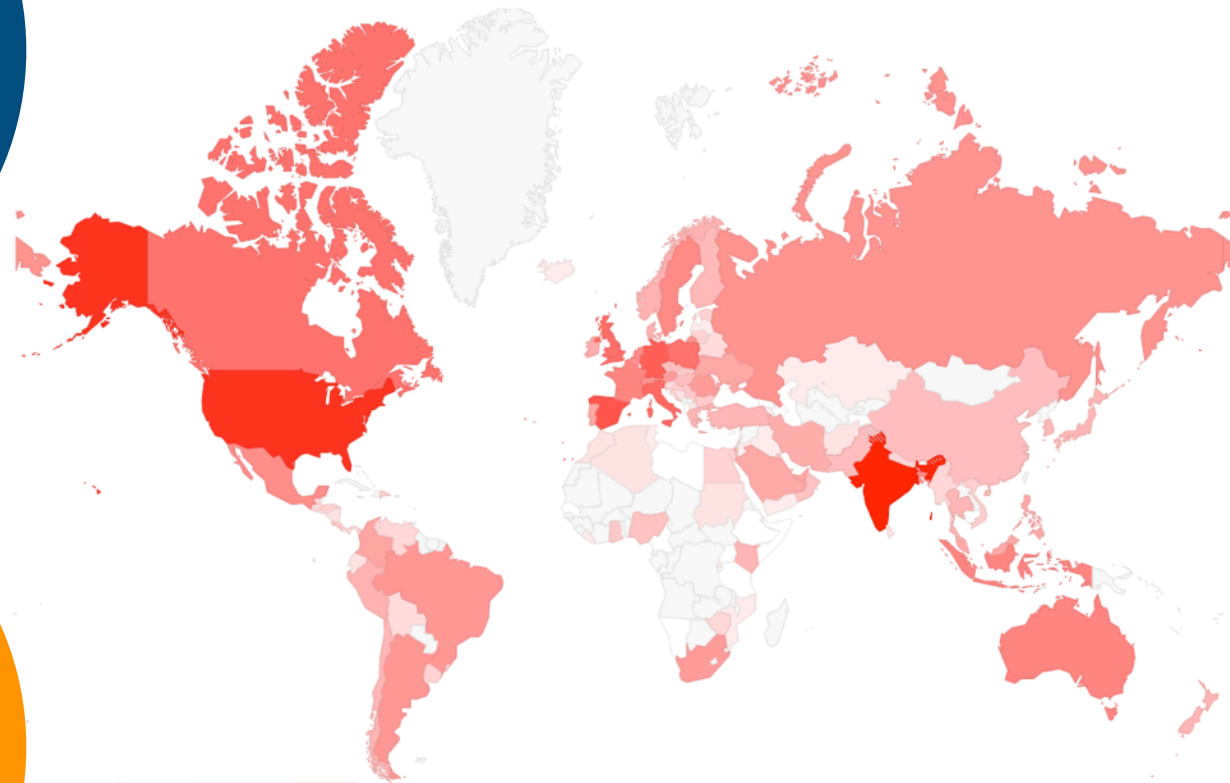
Lumen Dataset

**12,000
users**

**14,000
apps^[1]**

**8.5M
flows**

**40,000
domains^[2]**



[1] 48% of apps have at least 1M installs

[2] Top-10K domains are found on iOS traffic and account for 65% of total monthly traffic on a EU MNO



Lumen Privacy Monitor

Int. Computer Science Institute-UC Berkeley Tools

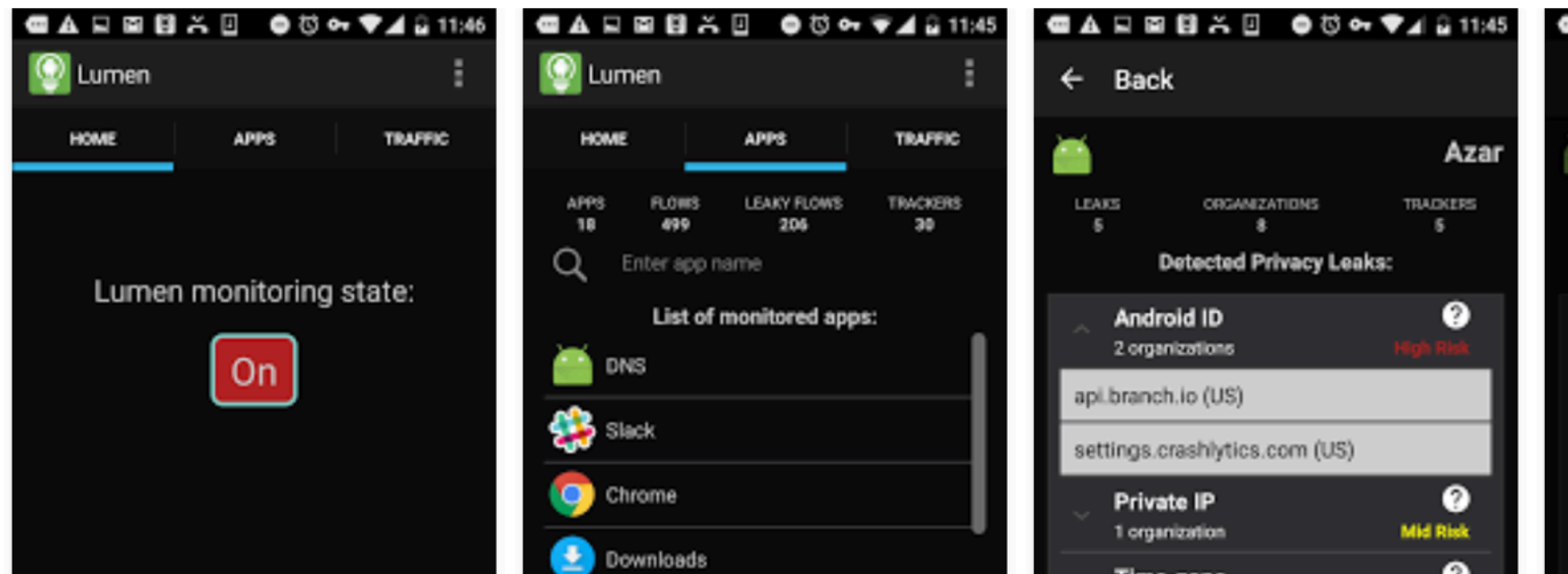
★★★★★ 85

E Everyone

i This app is compatible with all of your devices.

Add to Wishlist

Install

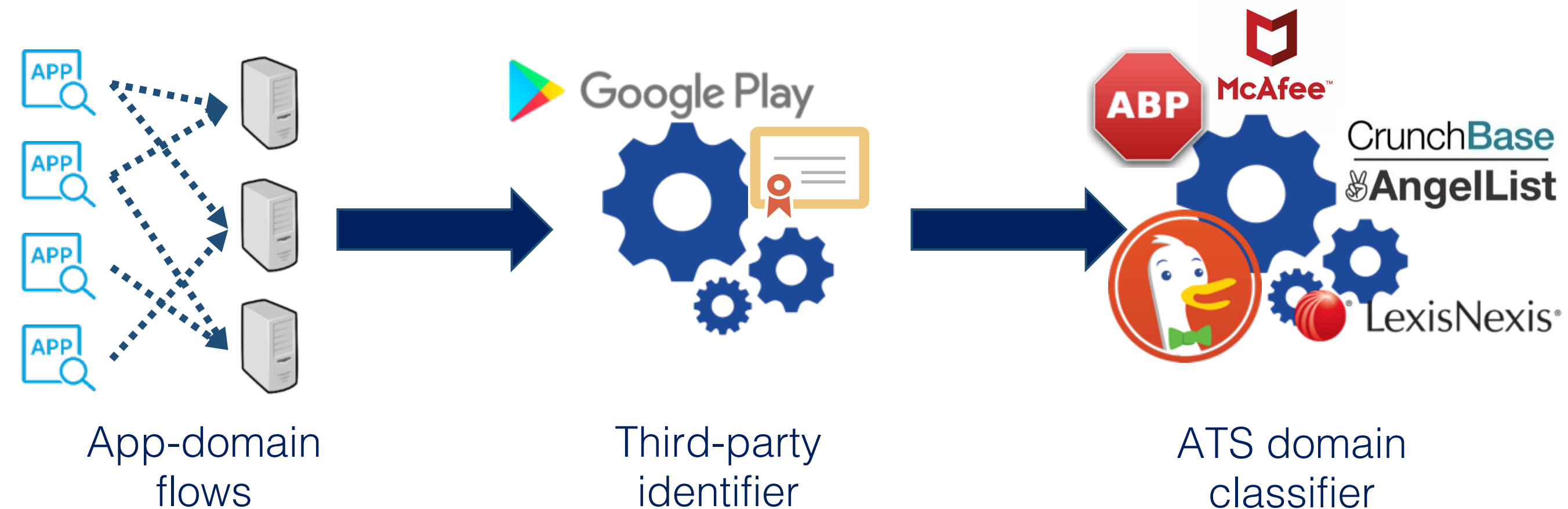


DATA
TRANSPARENCY
LAB

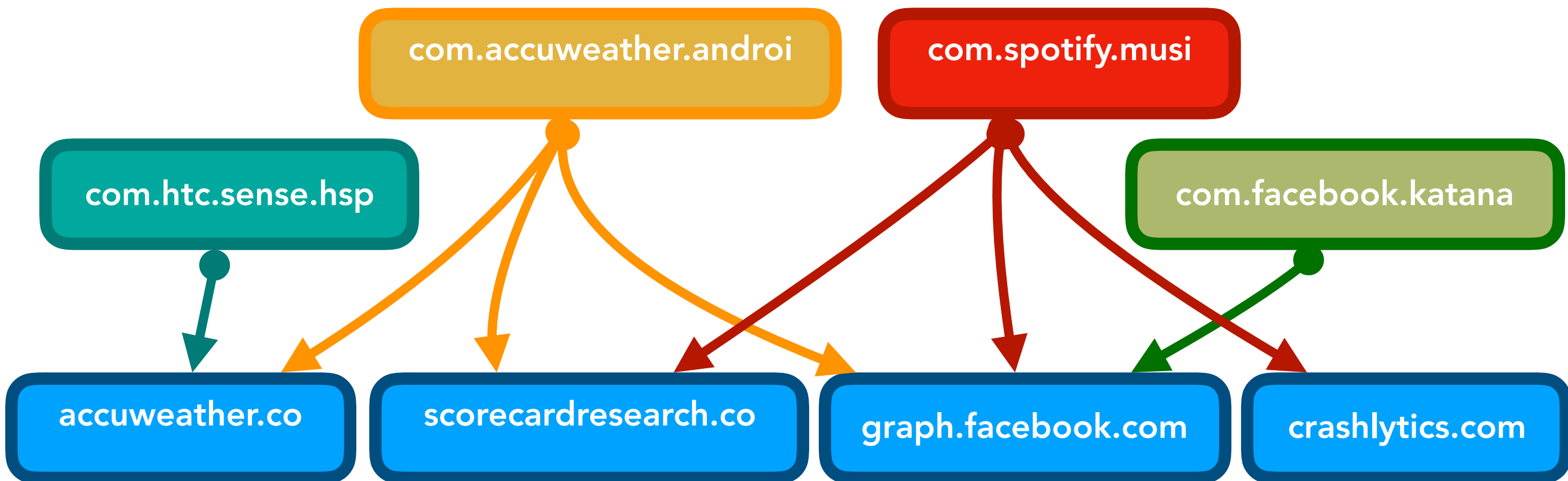


Funded by the Horizon 2020
Framework Programme of the
European Union

How we identified advertising and tracking services

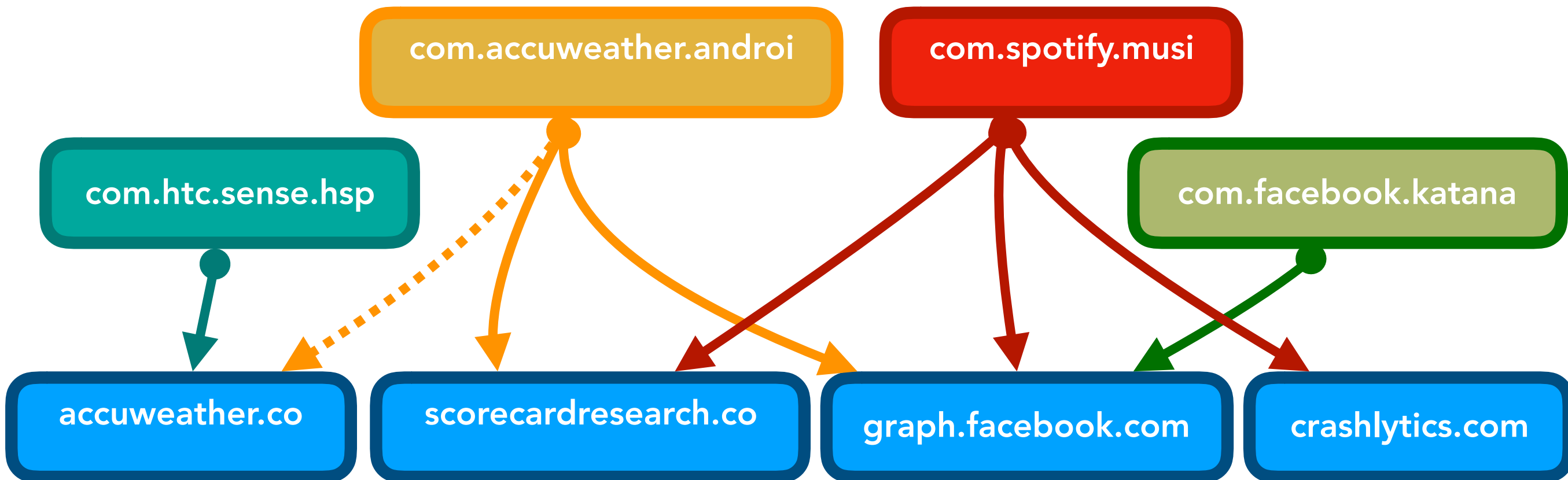


Identifying 3rd-Party Services



Identifying 3rd-Party Services

Step 1: Distinguish between 1st-party domains and 3rd-party ones



*.accuweather.com

Issued by: DigiCert SHA2 Secure
Expires: Sunday, August 25, 2019
Daylight Time

✓ This certificate is valid

▼ Details

Subject Name _____
Country US
State/Province Pennsylvania
Locality State College
Organization Accuweather, Inc.



*.facebook.com

Issued by: DigiCert SHA2 High
Expires: Friday, March 22, 2019

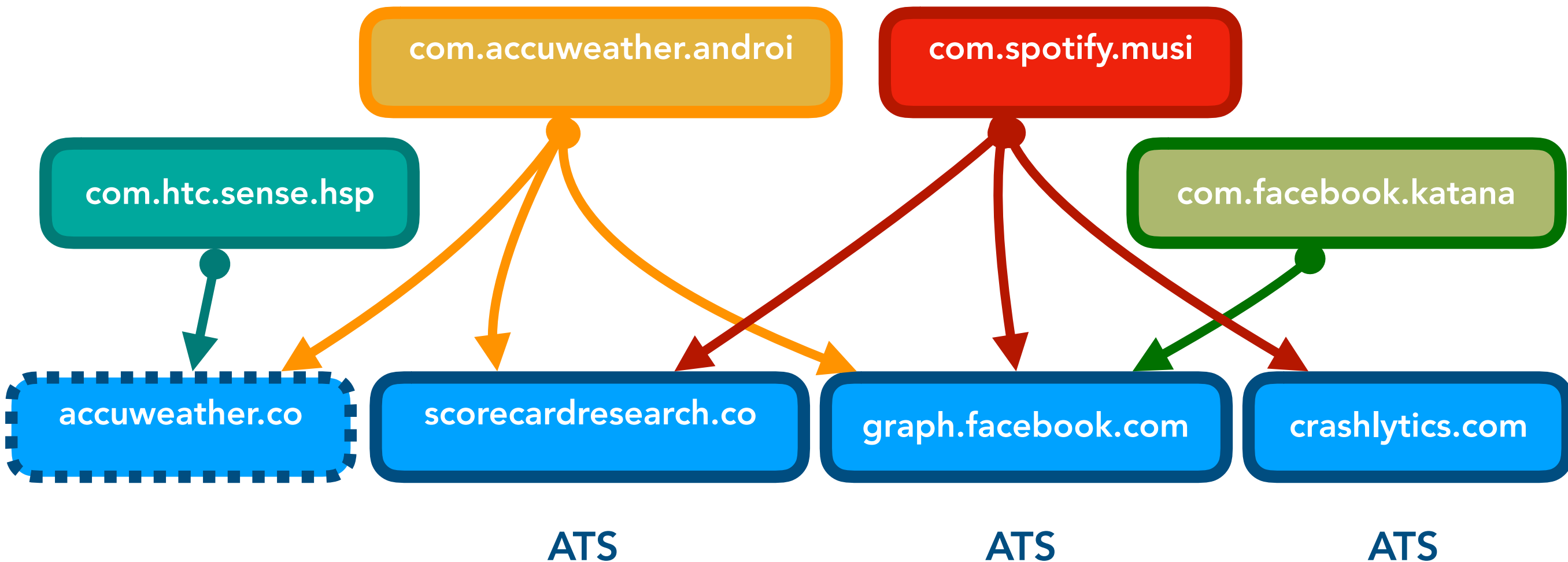
✓ This certificate is valid

▼ Details

Subject Name _____
Country US
State/Province California
Locality Menlo Park
Organization Facebook, Inc.

Identifying 3rd-Party Services

Step 2: Separate ATS and ATS-Capable domains from other 3rd-party services using ML

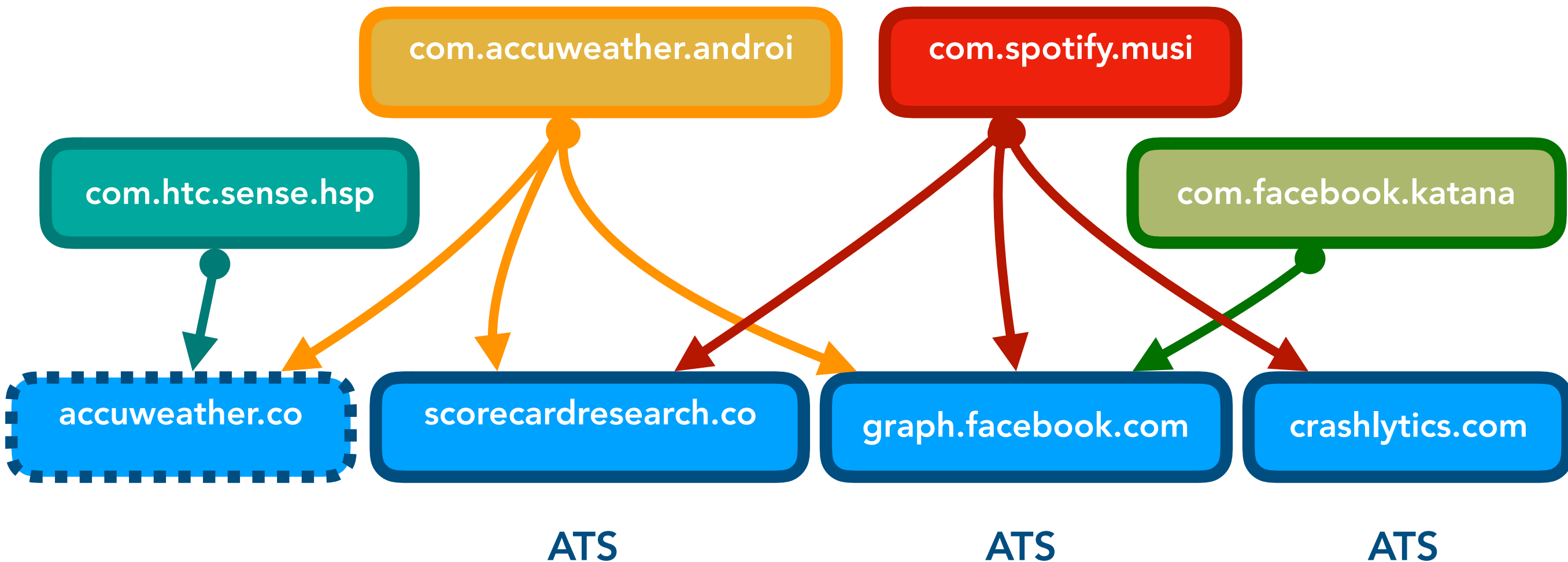


ATSeS discovered

Domains	3rd-party domains	ATS second-level domains	ATS-Capable second-level domains
40,553	8,099	2,121	730
Coverage	EasyList	38%	24%
	hpHosts	77%	35%

Identifying 3rd-Party Services

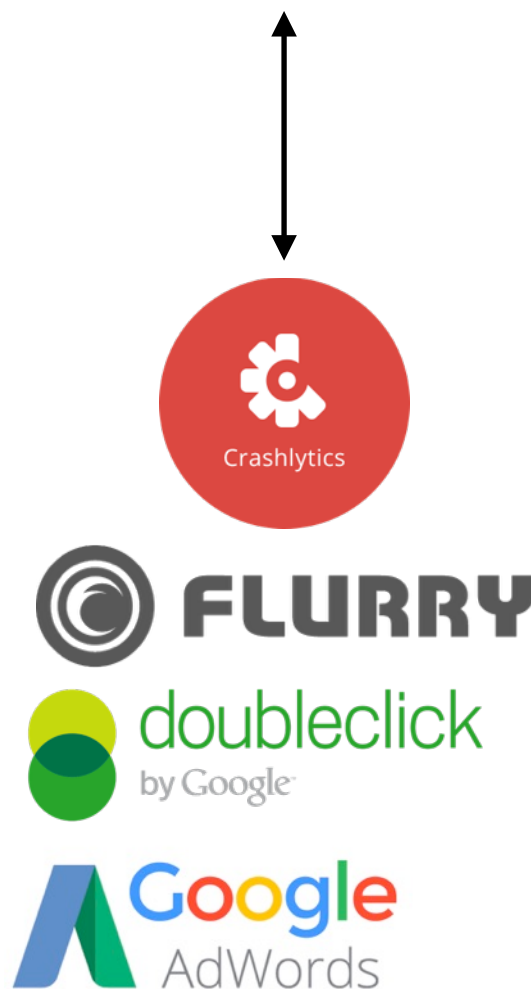
Step 2: Separate ATS domains from other 3rd-party services using ML



Questions to answer

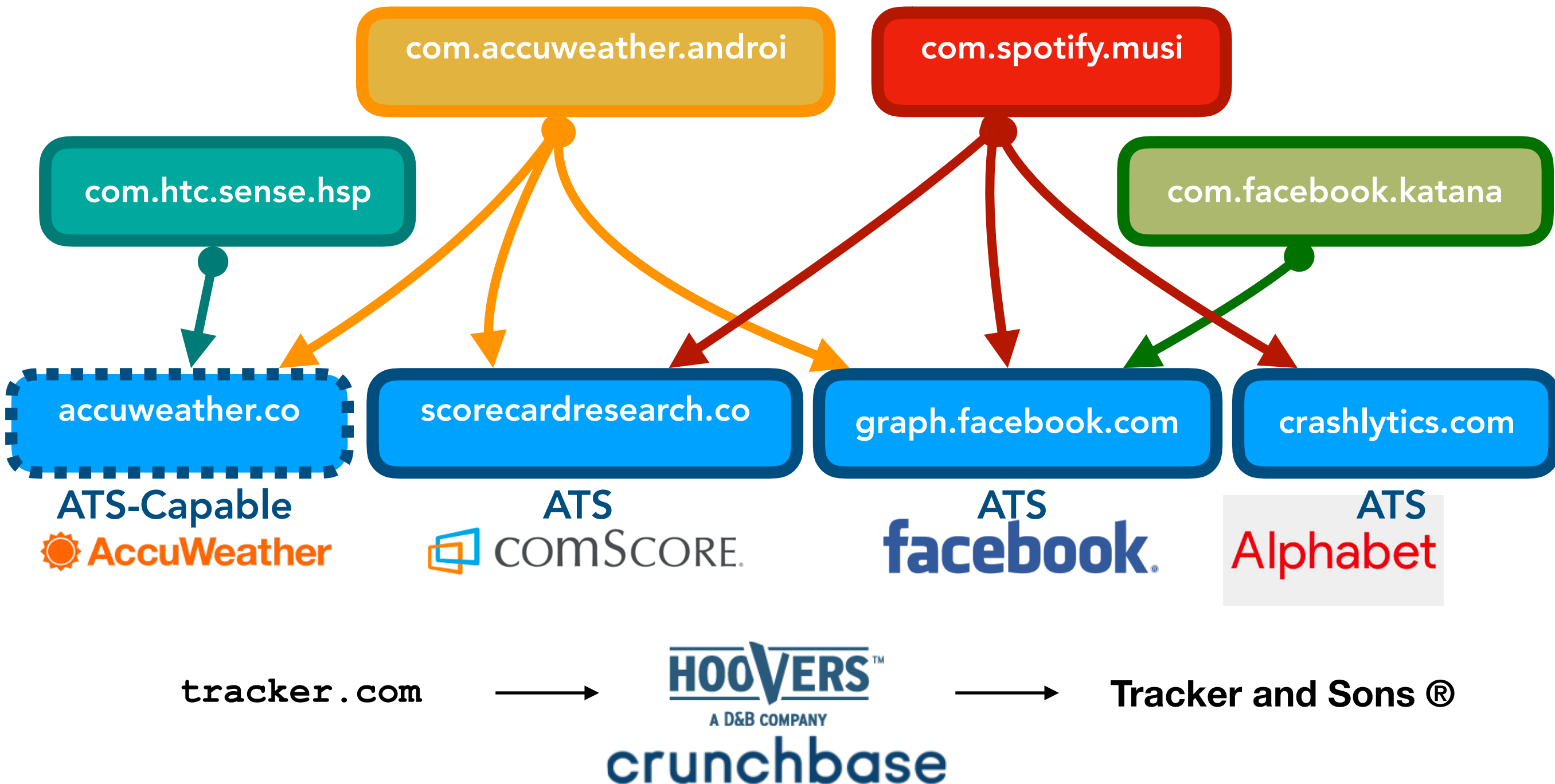
2

Who are the parent organizations of these mobile ATSeS?



Identifying Parent Companies

Identify parent company

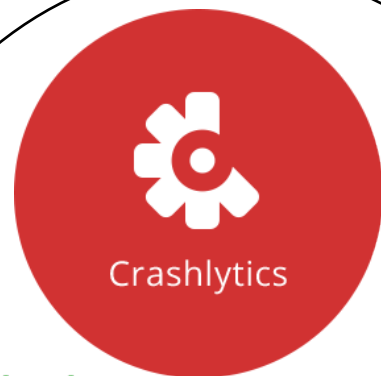


ATS parent companies

- 292 parent orgs. own nearly 2,000 ATSes
- As expected, big companies dominate, but...

#1 Alphabet

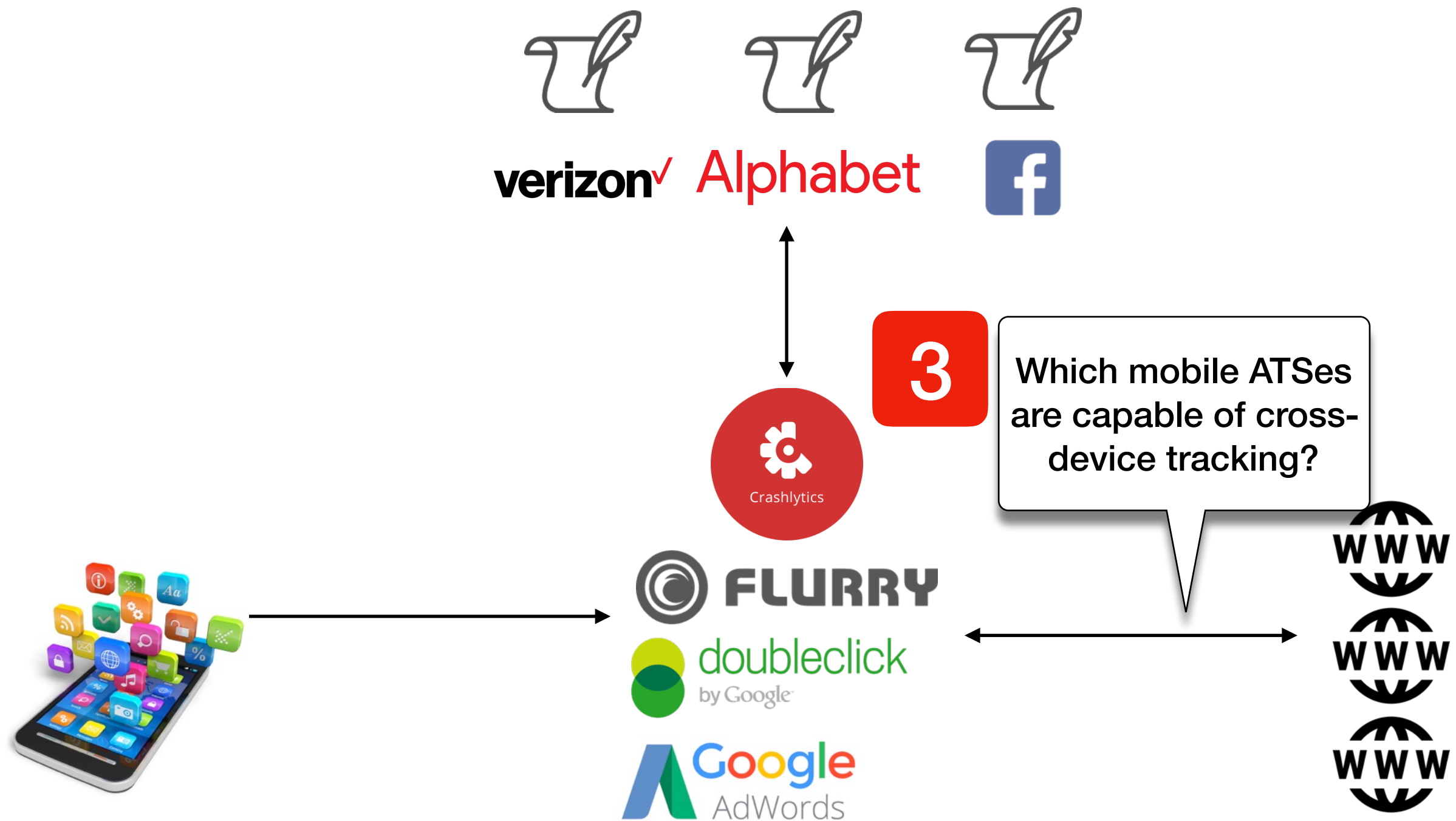
#4 verizon[✓]



Aol.

YAHOO!

Questions to answer



Cross-device Tracking

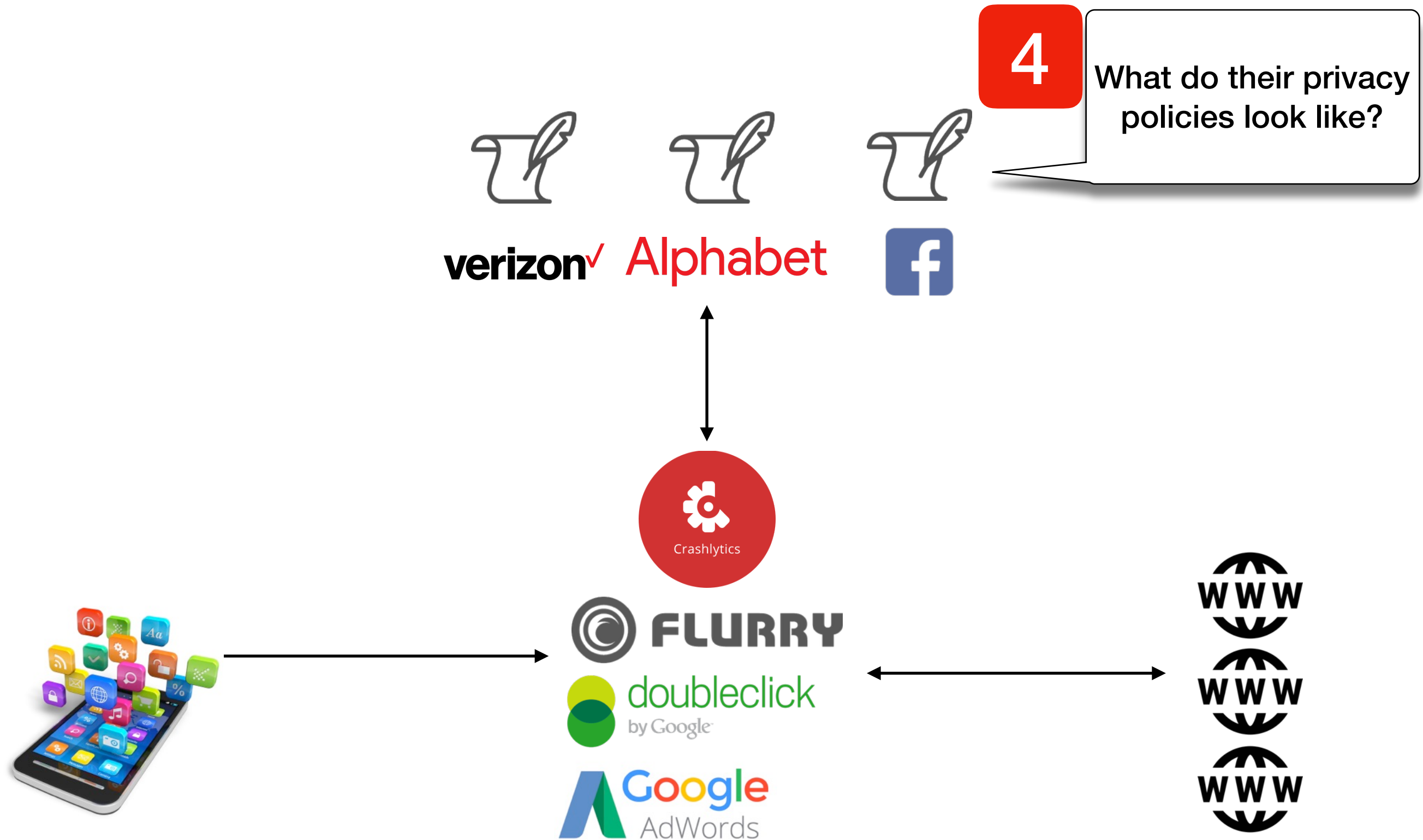
```

    return -1 !== k.indexOf("Google Web Preview") || 1E-4 > Math.random()
  )),
  ra = function() {
    try {
      a: {
        var a = e.document.querySelector("script[nonce]");
        if (a) {
          var b = a.nonce || a.getAttribute("nonce");
          if (b && oa.test(b)) {
            var c = b;
            break a
          }
        }
        c = void 0
      }
      return c
    }
    catch (d) {}
  };
  var r = function() {
    return e.googletag || (e.googletag = {})
  };
  var u = {
    1: "pagead2.googlesyndication.com",
    2: "pubads.g.doubleclick.net",
    3: "securepubads.g.doubleclick.net",
    173: "pubads.g.doubleclick.net",
    174: "securepubads.g.doubleclick.net",
    7: .02,
    13: 1500,
    23: .001,
    24: 200,
    27: .01,
    29: .01,
    33: "pagead2.googlesyndication.com",
    37: .01,
    38: .01
  };

```

Cross-device Tracking

- 15 out of top 20 parent organizations are also present in popular websites
- Cross-device tracking is already the norm!
- Users don't know their activities can be tracked across devices



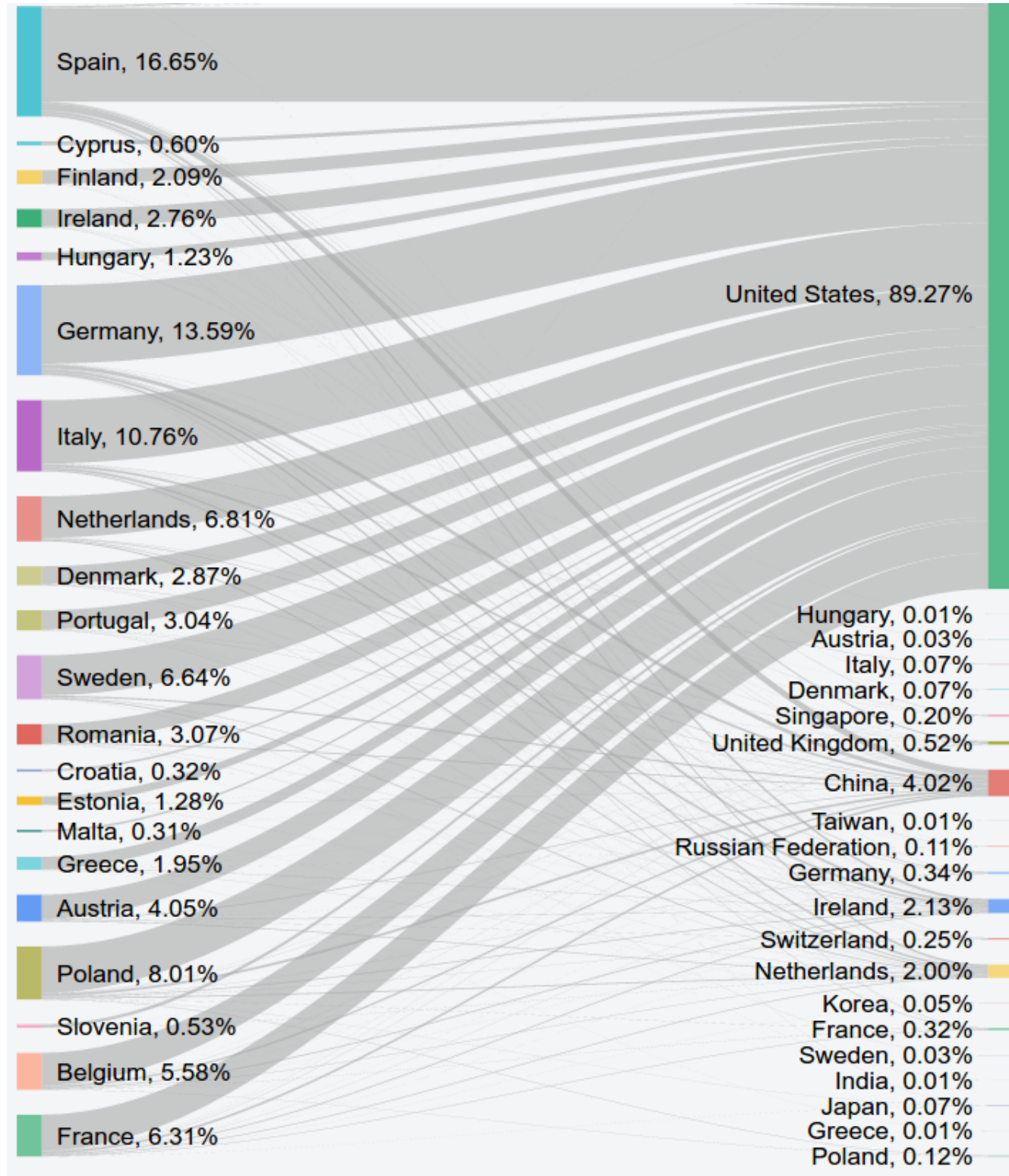
ATS Privacy Policies

Company	Has ad subsidiaries?	Data sharing with subsidiaries?	Data sharing with 3rd-parties?	Opt-out
Alphabet	✓	✓		Account settings
Facebook	✓	✓		Account settings
Twitter	✓	✓	✓	Account settings / DAA
Verizon	✓	✓	✓	Account settings
AppsFlyer			✓	Email
ChartBoost	✓	✓	✓	NAI/DAA webforms
Vungle	✓	✓	✓	Google ID Reset
AppLovin	✓	✓	✓	TRUSTe/EU YOC
Adjust			✓	NAI webform
Alibaba	✓	✓	✓	Webform

NAI: Network Advertising Initiative

DAA: Digital Advertising Alliance

Trackers without borders



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verizon^v Alphabet



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Summary

- Identified **2,123** mobile ATSeS using an automated mechanism to identify ATS domains, **233** of which were unreported by Web-based lists
- Found mobile ATS presence in the Web to be pervasive
- Identified **292** parent organizations running mobile ATSeS
- Top 10 parent companies allow either inter- or intra- organizational data sharing
- Most mobile ATSeS may be affected by proposed regulations in the EU



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www haystack.mobi