Rock’em Sock’em Robots

Bot Swatting Like The Pros

Aaron Bedra
Principal Engineer, Groupon
@abedra
keybase.io/abedra

"Well, there's a judge and a subject, and... the judge asks questions and, depending on the subject's answers, determines who he is talking with... what he is talking with, and, um... All you have to do is ask me a question."

-- Alan Turing, The Imitation Game

Asymmetric warfare

The internet is
powered by robots

Alibaba.com

YAHOO!

bing

Ask.com™

Yandex

Google

Aol.

We employ teams of people to help manage good robots

But all robots are not created equal

```
10.20.253.8 - - [08/Apr/2015:09:17:52 +0000]
"POST /login HTTP/1.1" 200 267"-" “curl/
7.35.0” "77.77.165.233"
```

```
10.20.253.8 - - [08/Apr/2015:10:20:21 +0000]
"POST /login HTTP/1.1" 200 267"-" "Mozilla/
5.0 (Windows NT 6.1; WOW64; rv:8.0) Gecko/
20100101 Firefox/8.0" "77.77.165.233"
```

Some robots are more trouble than they are worth

How much of your traffic is bot related?

How much of it should be?

Who here does testing/tracking?

How bad do these robots throw off your tests?

What else are bots doing on your site?

Let’s talk about common types

Spiders

The root of most things
we will talk about

They are often used inside of scrapers and scanners to find content

But can be used on their own as well

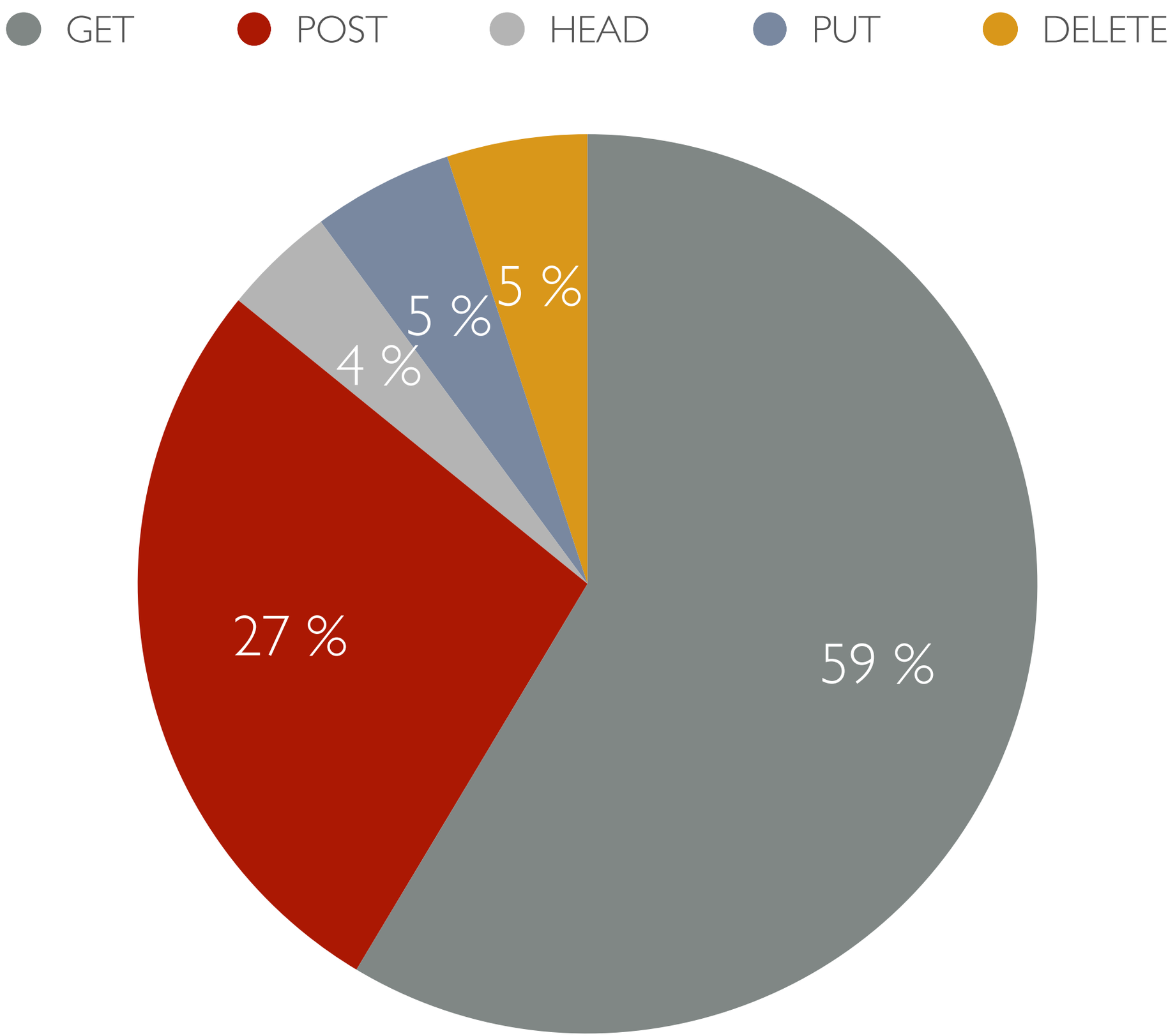
Trivial to build

How to build a spider

- Go to starting page
- Gather all links on the page and put them into a queue
- Visit link in queue (gathering links and adding to queue)
- Repeat until queue is empty (or sentinel)
- Keep a record of all links visited

Spiders are usually easy to detect

They deviate from typical behavior quickly


GET
POST
HEAD
PUT
DELETE
5 %
5 %
4 %
27 %
59 %

Simply sampling traffic and comparing for deviation can usually catch a spider

Velocity can also be an indicator

Scrapers

They want your data

Scenario 1: You provide an API

Either stop them outright
or refer them to the API

Scenario 2: You don’t and they shouldn’t be doing this

Stop them

Scenario 3: You don’t provide an API and you should

Stop being lazy

APIs are for machines,
Web Interfaces are for
Humans

If there’s no reason for a machine, don’t allow it*

Most of the time
scrapers are dumb

<!– –>

Start with simple

Accept that a small portion of really intelligent scrapers will make it through

Detection is similar to spiders

In fact, a spider might precede a scraper

But behavior deviation is still an acceptable detection mechanism

Scanners

Unlike scrapers and spiders, scanners are purely malicious

They are looking for vulnerabilities in your application(s)

They are also pretty easy to spot

They deviate from normal behavior

They submit obviously malicious data

And they produce a lot of 404s

You want to block these*

WAFs can help

But prefer running a WAF in passive mode

Other

Fraud, (D)DoS,
Espionage, etc.

Still falls in the
“malicious” category

But behaves differently

Usually has a focused target

Almost obviously so

Detection is a little harder here, but still follows the previous rules

What to look for

Anomalies

Anything that let's you reject H_0

But first you have to define “normal”

And what has to change to be “not normal”

```
10.20.253.8 - - [08/Apr/2015:08:20:21 +0000]
"POST /login HTTP/1.1" 200 267"-" "Mozilla/
5.0 (Windows NT 6.1; WOW64; rv:8.0) Gecko/
20100101 Firefox/8.0" "77.77.165.233"
```

```
10.20.253.8 - - [08/Apr/2015:08:20:22 +0000]
"POST /users/king-roland/credit_cards HTTP/
1.1" 302 2085 "-" "Mozilla/5.0 (Windows NT
6.1; WOW64; rv:8.0) Gecko/20100101 Firefox/
8.0" "77.77.165.233"
```

```
10.20.253.8 - - [08/Apr/2015:08:20:23 +0000]
"POST /users/king-roland/credit_cards HTTP/
1.1" 302 2083 "-" "Mozilla/5.0 (Windows NT
6.1; WOW64; rv:8.0) Gecko/20100101 Firefox/
8.0" "77.77.165.233"
```

```
10.20.253.8 - - [08/Apr/2015:08:20:24 +0000]
"POST /users/king-roland/credit_cards HTTP/
1.1" 302 2085 "-" "Mozilla/5.0 (Windows NT
6.1; WOW64; rv:8.0) Gecko/20100101 Firefox/
8.0" "77.77.165.233"
```

What do you see?

I see a carding attack

!?!?

Login Request

```
10.20.253.8 - - [08/Apr/2015:08:20:21 +0000]
"POST /login HTTP/1.1" 200 267"-" "Mozilla/
5.0 (Windows NT 6.1; WOW64; rv:8.0) Gecko/
20100101 Firefox/8.0" "77.77.165.233"
```

Add credit card to account #1

1 sec delay

```
10.20.253.8 - - [08/Apr/2015:08:20:22 +0000]
"POST /users/king-roland/credit_cards HTTP/
1.1" 302 2085 "-" "Mozilla/5.0 (Windows NT
6.1; WOW64; rv:8.0) Gecko/20100101 Firefox/
8.0" "77.77.165.233"
```

Add credit card to account #2

1 sec delay

```
10.20.253.8 - - [08/Apr/2015:08:20:23 +0000]
"POST /users/king-roland/credit_cards HTTP/
1.1" 302 2083 "-" "Mozilla/5.0 (Windows NT
6.1; WOW64; rv:8.0) Gecko/20100101 Firefox/
8.0" "77.77.165.233"
```

FF 8 on Windows 7
or Bot?

Add credit card to account #3

1 sec delay

```
10.20.253.8 - - [08/Apr/2015:08:20:24 +0000]
"POST /users/king-roland/credit_cards HTTP/
1.1" 302 2085 "-" "Mozilla/5.0 (Windows NT
6.1; WOW64; rv:8.0) Gecko/20100101 Firefox/
8.0" "77.77.165.233"
```

Plovdiv Bulgaria

FF 8 on Windows 7
or Bot?

Add credit card to account #3

1 sec delay

```
10.20.253.8 - - [08/Apr/2015:08:20:24 +0000]
"POST /users/king-roland/credit_cards HTTP/
1.1" 302 2085 "-" "Mozilla/5.0 (Windows NT
6.1; WOW64; rv:8.0) Gecko/20100101 Firefox/
8.0" "77.77.165.233"
```

Doesn't follow 302

FF 8 on Windows 7 or Bot?

Plovdiv Bulgaria

And this continues

10,000 more times

Behavior deviation

Velocity

Access pattern

Time of day

Geo Location

HTTP verb distribution

User Agent

Header order

Success rate

209.0.141.228	AS32479 OPENBAND MULTIMEDIA, LLC	Reston, Virginia, United States	1010	0	0	0	1010	100	0	100	0	0			Details Whitelist Blacklist

Excessive Response Codes

IP	Requests	% Success	# 403	%403	# 404	% 404	# 4xx	% 4xx	# 5xx	% 5xx
209.0.141.228	1878	0.00	0	0.00	1878	100.00	1878	100.00	0	0.00

Going deeper

“Of course machines can't think as people do. A machine is different from a person. Hence, they think differently.”

-- Alan Turing, The Imitation Game

What’s our goal?

Block robots as quickly as possible

Embed detection scripts in your applications

They should gather information and POST back to you

JS can do a lot

developer.mozilla.org/en-US/docs/Web/API/Navigator

```
var ua = navigator.userAgent;
var resolution = function () {
  var dimensions = (screen.height > screen.width) ?
                   [screen.height, screen.width] :
                   [screen.width, screen.height];
  if (dimensions != "undefined") {
    return dimensions;
  }
}
var platform = function () {
  if (navigator.platform) {
    return navigator.platform;
  }
}
```

You can also use Flash

The details that you gather can make it really easy to spot a bot

If it doesn’t execute it’s probably a bot*

But there’s a lot to examine

User Agent

Screen Resolution

Cursor movement pattern

What plugins are installed?

Fingerprint(s)

Store the fingerprints of known bots

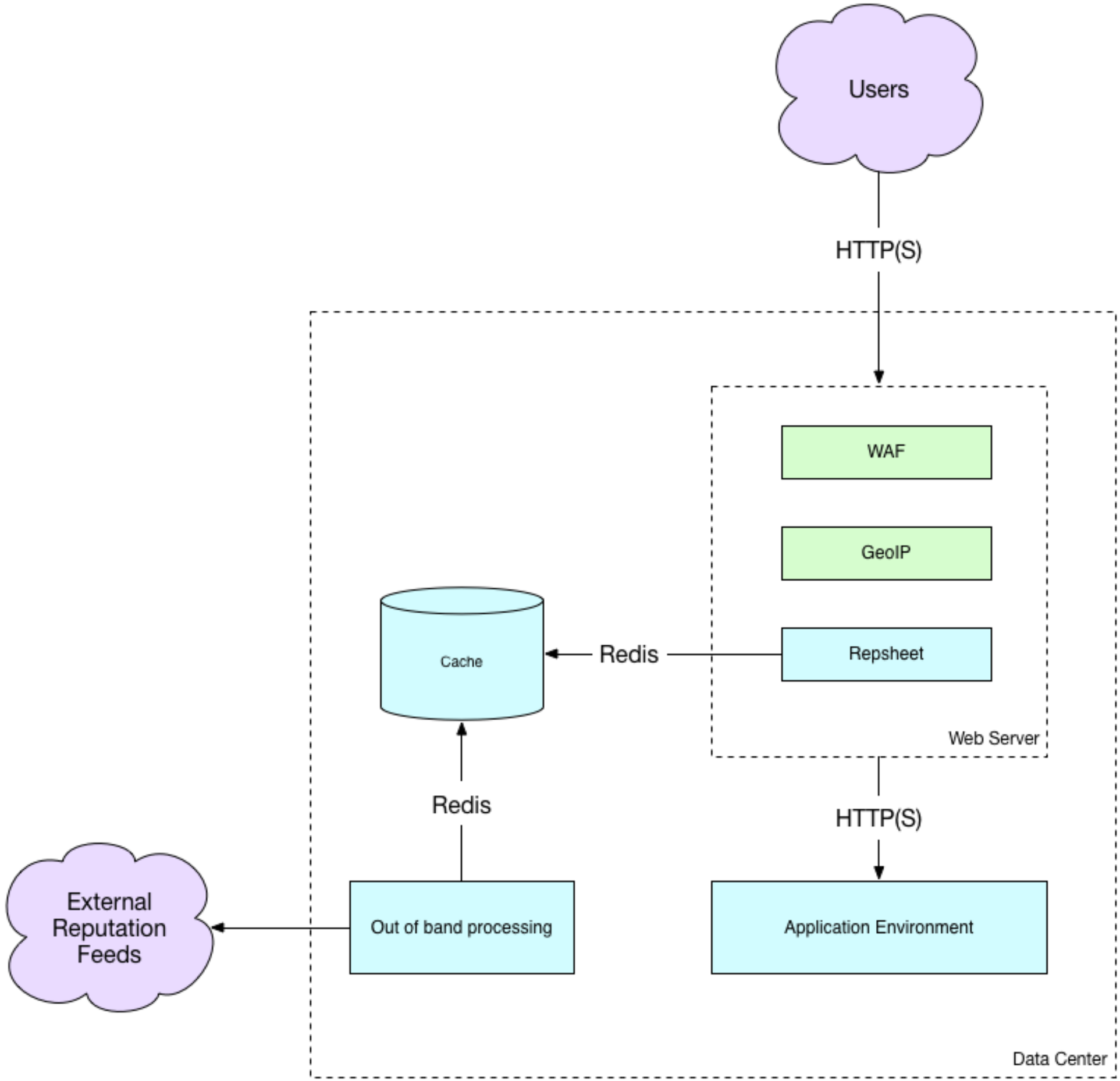
github.com/Valve/
fingerprintjs

Wrapping up

We employ teams of people to manage the good robots

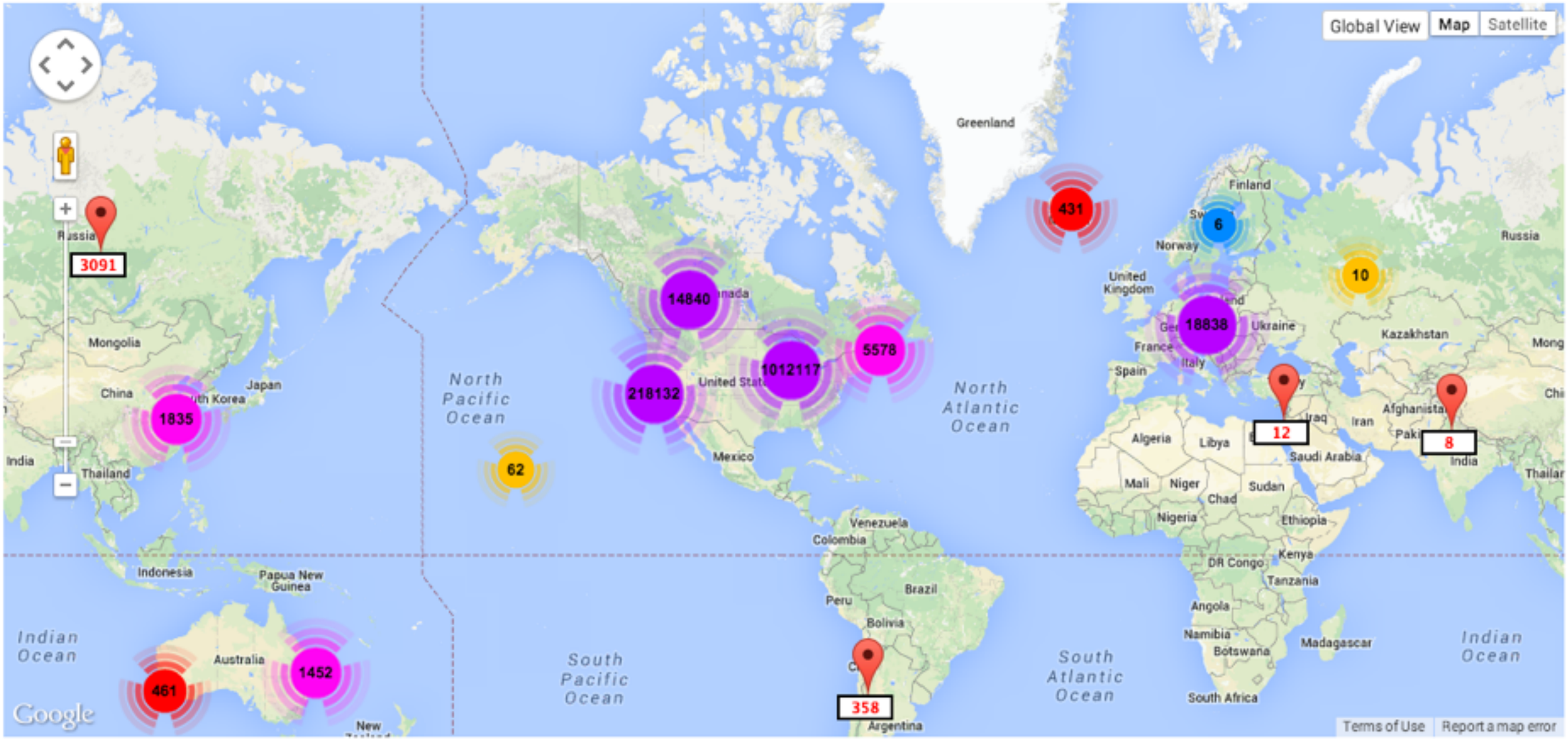
Maybe it’s time to hire a team of people that manages the bad ones too

We need to build systems that do this detection


Users
HTTP(S)
WAF
GeoIP
Repsheet
Web Server
Cache
Redis
Redis
HTTP(S)
External Reputation Feeds
Out of band processing
Application Environment
Data Center

Groupon Online Defense ip uuid Reasons Search

Current Blocking Manual Operations Signed in as: abedra



1 2 3 4 5 6 7 8 9 10 Next

entity	asn	count	location	permalink	reason	violations
64.233.172.32	AS15169 Google Inc.	142597	Mountain View, California, United States		ip-response-code+block	142580
69.47.170.204	AS12083 WideOpenWest Finance LLC	71894	Glen Ellyn, Illinois, United States		ip-blocked-history+block ip-response-code+block	1587456
23.23.189.197	AS14618 Amazon.com, Inc.	44812	Ashburn, Virginia, United States		ip-blocked-history+block ip-response-code+block	751546

Reduce the noise

Reduce the impact of attacks

Improve confidence in your data

References

- github.com/repsheet
- developer.mozilla.org/en-US/docs/Web/API/Navigator
- github.com/Valve/fingerprintjs
- github.com/Valve/fingerprintjs2

CHICAGO
INTERNATIONAL
SOFTWARE DEVELOPMENT
CONFERENCE 2015

goto; conference

Questions?

Please remember to evaluate via the GOTO Guide App