

SORRY ABOUT YOUR WAF

Bypassing the Modern WAF

kasada
security redefined

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PREVIOUS PROFESSIONAL ROLES:

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- Information Security Engineer
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LINKS:

- <https://twitter.com/j0hnnyxm4s>
- <https://www.linkedin.com/in/johnnyxmas/>
- <https://www.youtube.com/c/johnnyxmas>
- <https://github.com/johnnyxmas>



WAF

WEB APPLICATION FIREWALLS

BASIC

- Very Basic Behavioral Analysis
- Just blacklists IPs (LOL)
- Trivial to Bypass

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SQLMap

<https://github.com/sqlmapproject/sqlmap>

```
[INFO] testing 'MySQL UNION query (NULL) - 1 to 10 columns'
[PAYLOAD] 1) ORD/**/ER B/**/Y 1#
[WARNING] reflective value(s) found and filtering out
[PAYLOAD] 1) UN/**/I/**/ON AL/**/L SE/**/L/**/E/**/CT NUL/**/L#
[DEBUG] setting match ratio for current parameter to 0.024
[PAYLOAD] 1) UNI/**/ON A/**/LL SE/**/LE/**/CT N/**/U/**/LL,N/**/U/**/LL#
[PAYLOAD] 1) U/**/NION AL/**/L SEL/**/ECT N/**/ULL,N/**/ULL,N/**/ULL#
[PAYLOAD] 1) U/**/N/**/I/**/ON A/**/LL S/**/EL/**/ECT NU/**/LL,NU/**/LL,NU/**/LL#
[PAYLOAD] 1) U/**/N/**/ION A/**/LL S/**/EL/**/CT N/**/U/**/LL,N/**/U/**/LL,N/**/U/**/LL,F
[PAYLOAD] 1) U/**/NI/**/ON AL/**/L S/**/E/**/ECT NU/**/LL,NU/**/LL,NU/**/LL,NU/**/LL#
[PAYLOAD] 1) UN/**/I/**/ON AL/**/L SE/**/LE/**/CT N/**/U/**/LL,N/**/U/**/LL,N/**/U/**/LL,N/**/
[PAYLOAD] 1) U/**/NION A/**/LL S/**/ELE/**/CT N/**/ULL,N/**/ULL,N/**/ULL,N/**/ULL,N/**/ULL,N/**/U
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[PAYLOAD] 1) UNIO/**/N AL/**/L S/**/ELECT NU/**/LL,NU/**/LL,NU/**/LL,NU/**/LL,NU/**/LL,NU/**/LL,NU
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[PAYLOAD] 1) U/**/N/**/ION A/**/LL S/**/EL/**/ECT NU/**/LL,NU/**/LL#
[PAYLOAD] 1) UN/**/ION AL/**/L S/**/ELECT NU/**/ULL,N/**/ULL,N/**/ULL#
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[PAYLOAD] 1) UNI/**/ON A/**/LL SELE/**/CT N/**/U/**/LL,N/**/U/**/LL,N/**/U/**/LL,N/**/U/**/LL#
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[PAYLOAD] 1) UNIO/**/N A/**/LL S/**/EL/**/E/**/CT NU/**/LL,NU/**/LL,NU/**/LL,NU/**/LL,NU/**/LL,NU/*
[PAYLOAD] 1) U/**/N/**/ION A/**/LL S/**/ELE/**/CT NU/**/LL,NU/**/LL,NU/**/LL,NU/**/LL,NU/**/LL,NU/*
[PAYLOAD] 1) O/**/RDER B/**/Y 1#
[PAYLOAD] 1) U/**/N/**/I/**/ON A/**/LL S/**/E/**/L/**/ECT N/**/ULL#
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[PAYLOAD] 1) U/**/NION AL/**/L S/**/E/**/L/**/E/**/CT N/**/U/**/LL,N/**/U/**/LL,N/**/U/**/LL,N/**/U/**/LL,N/*
[PAYLOAD] 1) U/**/NI/**/ON A/**/LL S/**/E/**/L/**/ECT NUL/**/L,NUL/**/L,NUL/**/L,NUL/**/L,NUL/**/L,NUL/**/L,
[PAYLOAD] 1) UNI/**/ON AL/**/L S/**/E/**/LE/**/CT NUL/**/L,NUL/**/L,NUL/**/L,NUL/**/L,NUL/**/L,NUL/**/L,NUL/*
[PAYLOAD] 1) U/**/NION A/**/LL S/**/ELECT NU/**/U/**/LL,N/**/U/**/LL,N/**/U/**/LL,N/**/U/**/LL,N/**/U/**/LL,F
```

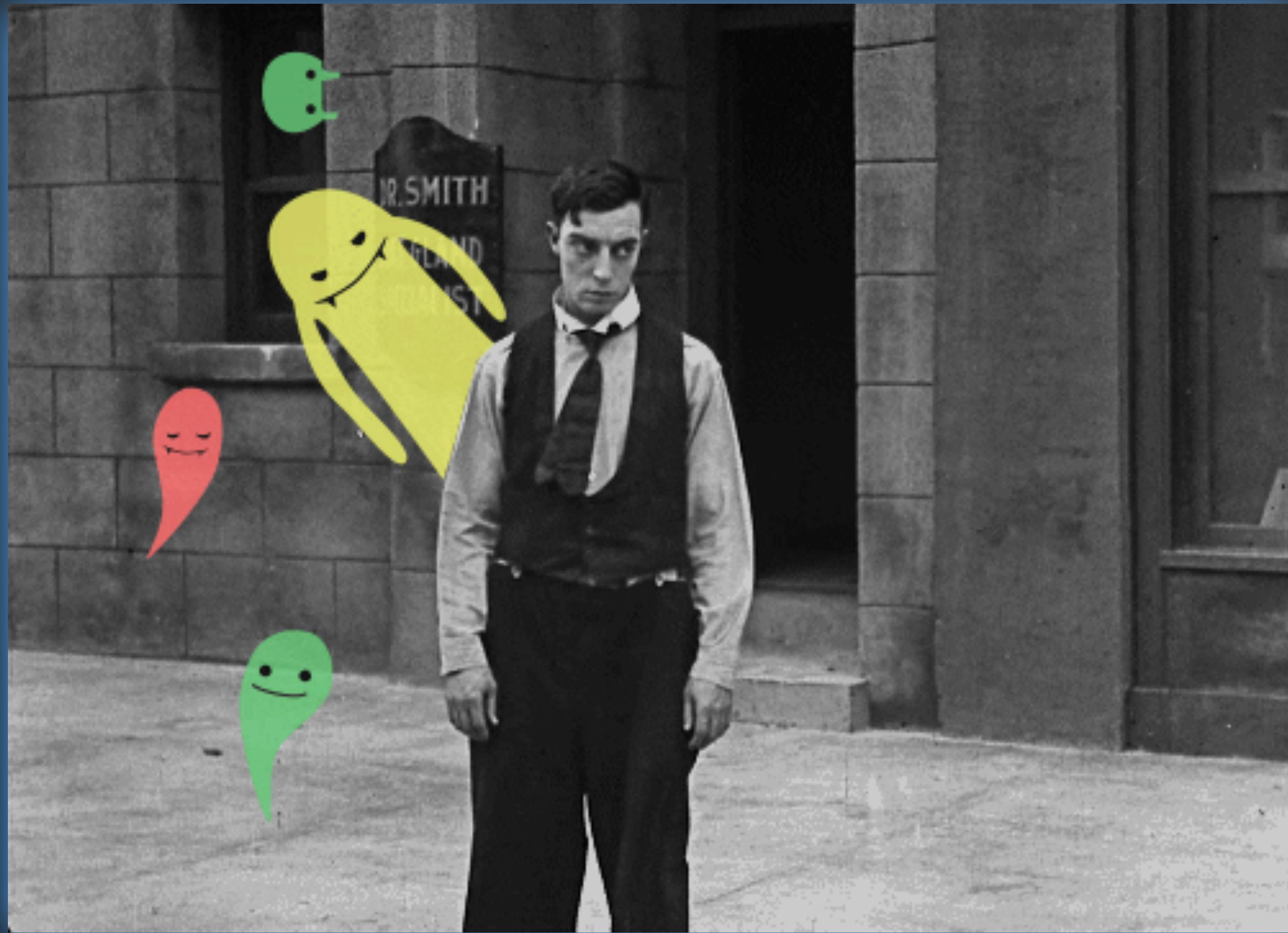
WAF

WEB APPLICATION FIREWALLS

SOPHISTIOCATED

- Often a Reverse Proxy
- Partially relies on js execution
- Fingerprints client environment

Also, they're both pretty useless. . .



...so let's get hacking!

BARE MINIMUMS



BARE MINIMUMS

Rotate Your IP

- Huge # of “Free Proxy” sites
 - <https://hide.me>
 - <https://hidester.com>
 - <https://www.proxysite.com/>
- Srsly just google “Free Proxies”



BARE MINIMUMS

Use Residential IPs

- Huge # of “Free Proxy” sites
- Hard to convince The Business to allow blocking residential IPs
- Residential IPs are easy to lease in bulk
- Residential IPs are not free
- Services like HolaVPN and MonkeySocks use users’ IPs



BARE MINIMUMS

Use The Usual HTTP Headers

- **BUT ALSO:**
 - Accept : */*
 - DNT : 1
 - X-Headers (Sometimes)
 - User-Agent (NO QUOTES)
 - Session Cookies (Sometimes)

BARE MINIMUMS

Rotate User-Agents

- Seriously, this gets past so many defenses
- Rotate with each HTTP request, if possible
- Also use this for whitelist fuzzing

Use Cookies

- Auth'd sessions often have more lenient throttling
- Some session cookies are *required*
- WATCH OUT FOR SNEAKY WAF COOKIES

Use POSTMan

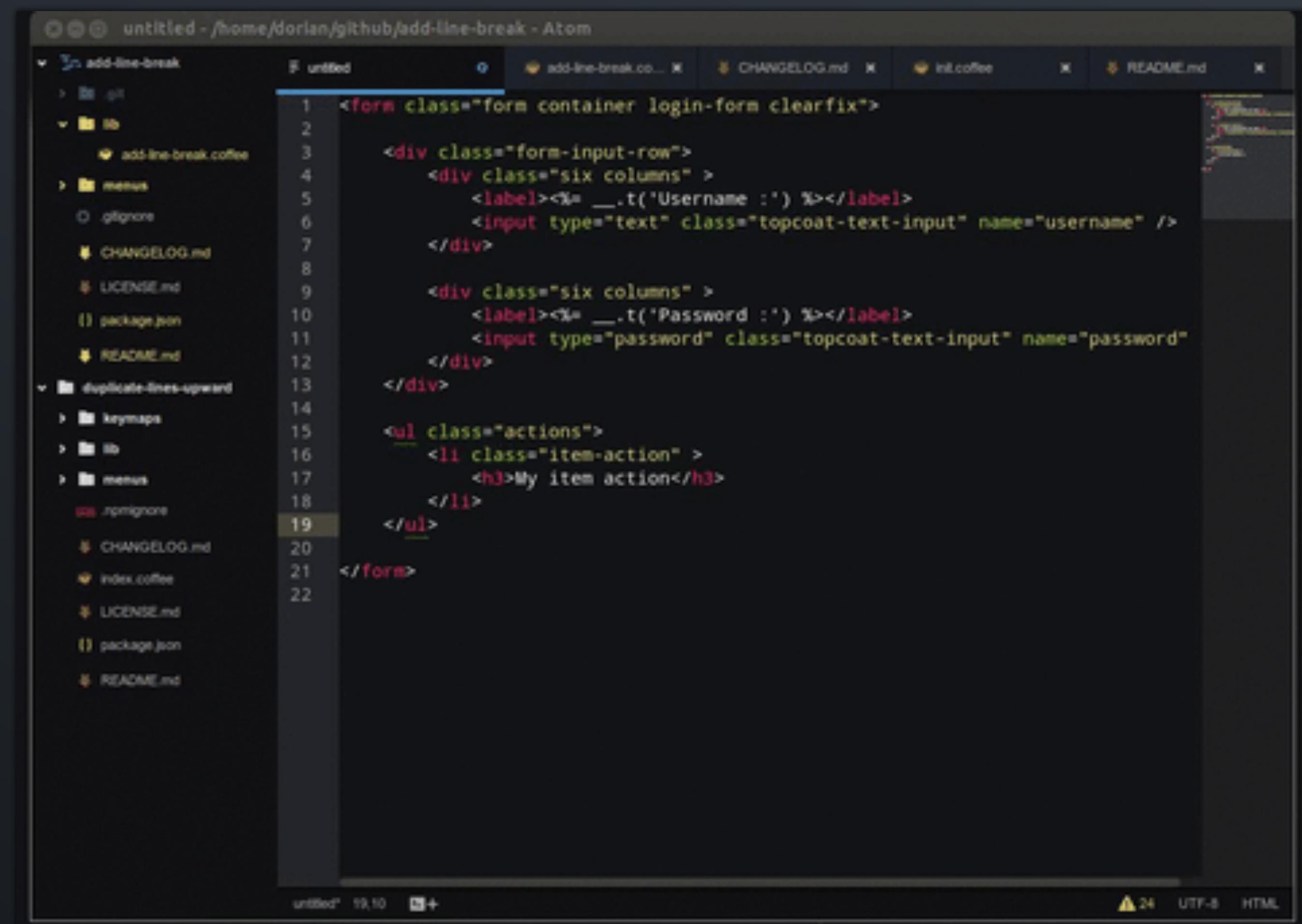
GENERATE CODE SNIPPETS <https://www.getpostman.com/> 

NodeJS Request ▾ Copy to Clipboard

```
1 var request = require("request");
2
3 var options = { method: 'GET',
4   url: 'https://www.google.com/maps/',
5   headers:
6     { 'cache-control': 'no-cache',
7       Connection: 'keep-alive',
8       'accept-encoding': 'gzip, deflate',
9       cookie: '1P_JAR=2019-06-24-18; NID=186=dDx6cEwmG56VcNuihi
-obWWt3llyfUg6kVVrpjtMtC_EA9ohbVYbeyVdiKRCsHwe3UL
-fghYwnpRE8EXTuR7WlctdnzshDumuGkGDSbFj843WNgqT2bkgA5Acoq2vMg8Io0SYxHkpDH7E
-EDD17EbN_3J4CCYeMwuxvsGeH1aSE',
10      Host: 'www.google.com',
11      'Postman-Token': '6e1a52b5-97e8-4b48-9a9b-d8ca0852ba38,a5efe231-2d51-4c5e-b572
-3c57c31869a3',
12      'Cache-Control': 'no-cache',
13      Accept: '*/*',
14      'User-Agent': 'PostmanRuntime/7.15.0' } };
15
16 request(options, function (error, response, body) {
17   if (error) throw new Error(error);
18
19   console.log(body);
20 });
21
```

SUPER BORING CODE DEMO

PLEASE BEAR WITH US FOR LIKE 2 MINUTES



The screenshot shows a dark-themed Atom code editor window. The left sidebar displays a file tree with several files: add-line-break.coffee, CHANGELOG.md, LICENSE.md, package.json, README.md, and two .gitignore files. The main editor area contains the following HTML code:

```
<form class="form container login-form clearfix">
  <div class="form-input-row">
    <div class="six columns" >
      <label><%= __.t('Username :') %></label>
      <input type="text" class="topcoat-text-input" name="username" />
    </div>

    <div class="six columns" >
      <label><%= __.t('Password :') %></label>
      <input type="password" class="topcoat-text-input" name="password" />
    </div>

  <ul class="actions">
    <li class="item-action" >
      <h3>My item action</h3>
    </li>
  </ul>
</form>
```

The status bar at the bottom indicates the file is 'untitled' with line 19, column 10, and a character count of 59,10. It also shows the encoding as UTF-8 and the language as HTML.

(IT'S COOL, WE PROMISE)

ADVANCED TACTICS FOR CLOUD WAFFS



EDGE ENUMERATION

Check Every System

- Find ASN's owned by target (ARIN, etc)
- Find domains owned by target to uncover additional ASNs (WHOIS)
- Find which IPs are hosting web servers (ScanCannon)
- Enumerate paths to find forms, APIs, data, etc (wfuzz, etc)

Smash DNS

- Find ASN's owned by target (ARIN, etc)
- Find domains owned by target to uncover additional ASNs
- Reverse Lookup on IPs to DNS names (human-language indicators)
- DNS History lookups
- DNS Zone Transfers
- DNS name fuzzing

EDGE ENUMERATION

Round-Robin the Edge Nodes

- Discover all edge nodes
- Hit one until it blocks you, then hit the next
- This exploits the sync delay (often 15 minutes) and conserves IPs

Unprotected Paths

- Layer 7 WAFs & their associated CDNs have path rules
- One application may have multiple login portals \ paths
- Some of these may be accidental or intentionally unprotected

Smash the API

- APIs are almost never fully-protected; often not at all
- Great if all you need is to steal data
- Can also be used to “test” credentials

SOPHISTICATED WAFs

Find the Origins

- Use previous enumeration (look for “origin” in DNS)
- UUID or hash DNS names
- Hitting these bypasses the WAF completely
- Watch out for firewalls

Ditch the Script, Share the Cookies

- Identify and block WAF javascript snippets
- *RUN* WAF Javascript and replay the resulting fingerprint cookie

OR. . .

AUTOMATE A REAL BROWSER



GIFsBOOM
.net

AUTOMATE A REAL BROWSER

<https://github.com/GoogleChrome/puppeteer>

- Looks like human activity
- Practically undetectable
- Scriptable AF
- Executes Javascript
- Properly leverages Cookies
- Multiple instances per IP

• Headless Chrome

• Puppeteer

• Selenium

Realistic WebDriver

- User_agent
- Navigator_Platform
- Color_depth
- Pixel_ratio
- Cpu_Class
- Hardware_concurrency
- Resolution
- Available_resolutions
- Timezone_offset
- Session_storage

SUMMARY:

- Rotate IP Addresses
 - Use Residential IPs
- Use the Usual HTTP Headers
- Use POSTMan
- Rotate your User-Agents
- Rotate session cookies
 - Rotate between targets
- Hit the Origin directly
- Use a Web Driver
 - Change the stock config!

THANKS FOR PLAYING!

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security redefined

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https://www.github.com/johnnyxmas/Talk_Decks