

SORRY ABOUT YOUR WAF

Bypassing the Modern WAF

kasada
security redefined

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PREVIOUS PROFESSIONAL ROLES:

- Network Engineer
- Systems Engineer
- Information Security Engineer
- Information Security Consultant
- Penetration Tester
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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

```
[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/**/ECT N/**/U/**/LL,N/**/U/**/LL,N/**/U/**/LL,N#
[PAYLOAD] 1> U/**/NI/**/ON AL/**/L S/**/E/**/L/**/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#
[PAYLOAD] 1> U/**/NI/**/ON AL/**/L S/**/E/**/LE/**/CT N/**/U/**/LL,N/**/U/**/LL,N/**/U/**/LL,N#
[PAYLOAD] 1> UNIO/**/N AL/**/L S/**/ELECT NU/**/LL,NU/**/LL,NU/**/LL,NU/**/LL,NU/**/LL,NU#
[PAYLOAD] 1> ORD/**/ER B/**/Y 1#
[PAYLOAD] 1> UNI/**/ON A/**/LL SE/**/LECT NU/**/LL#
[PAYLOAD] 1> U/**/N/**/ION A/**/LL S/**/EL/**/ECT NU/**/LL,NU/**/LL#
[PAYLOAD] 1> UN/**/ION AL/**/L S/**/ELECT N/**/ULL,N/**/ULL,N/**/ULL#
[PAYLOAD] 1> UNIO/**/N A/**/LL SEL/**/ECT NU/**/LL,NU/**/LL,NU/**/LL,NU/**/LL#
[PAYLOAD] 1> UNI/**/ON A/**/LL SELE/**/CT N/**/U/**/LL,N/**/U/**/LL,N/**/U/**/LL,N/**/U/**/LL#
[PAYLOAD] 1> UN/**/ION A/**/LL SE/**/LE/**/CT NU/**/LL,NU/**/LL,NU/**/LL,NU/**/LL#
[PAYLOAD] 1> U/**/N/**/I/**/ON A/**/LL S/**/E/**/L/**/ECT NU/**/LL,NU/**/LL,NU/**/LL,NU/**/LL,N#
[PAYLOAD] 1> UNI/**/ON AL/**/L S/**/E/**/L/**/E/**/CT NU/**/LL,NU/**/LL,NU/**/LL,NU/**/LL,NU/**/LL#
[PAYLOAD] 1> UNIO/**/N A/**/LL S/**/EL/**/E/**/CT NU/**/LL,NU/**/LL,NU/**/LL,NU/**/LL,NU/**/LL#
[PAYLOAD] 1> U/**/N/**/ION A/**/LL S/**/ELE/**/CT NU/**/LL,NU/**/LL,NU/**/LL,NU/**/LL,NU/**/LL#
[PAYLOAD] 1> O/**/RDER B/**/Y 1#
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[PAYLOAD] 1> UNI/**/ON AL/**/L S/**/E/**/LE/**/CT NUL/**/L,NUL/**/L,NUL/**/L,NUL/**/L,NUL#
[PAYLOAD] 1> U/**/NION A/**/LL S/**/ELECT N/**/U/**/LL,N/**/U/**/LL,N/**/U/**/LL,N/**/U/**/LL,N#
```

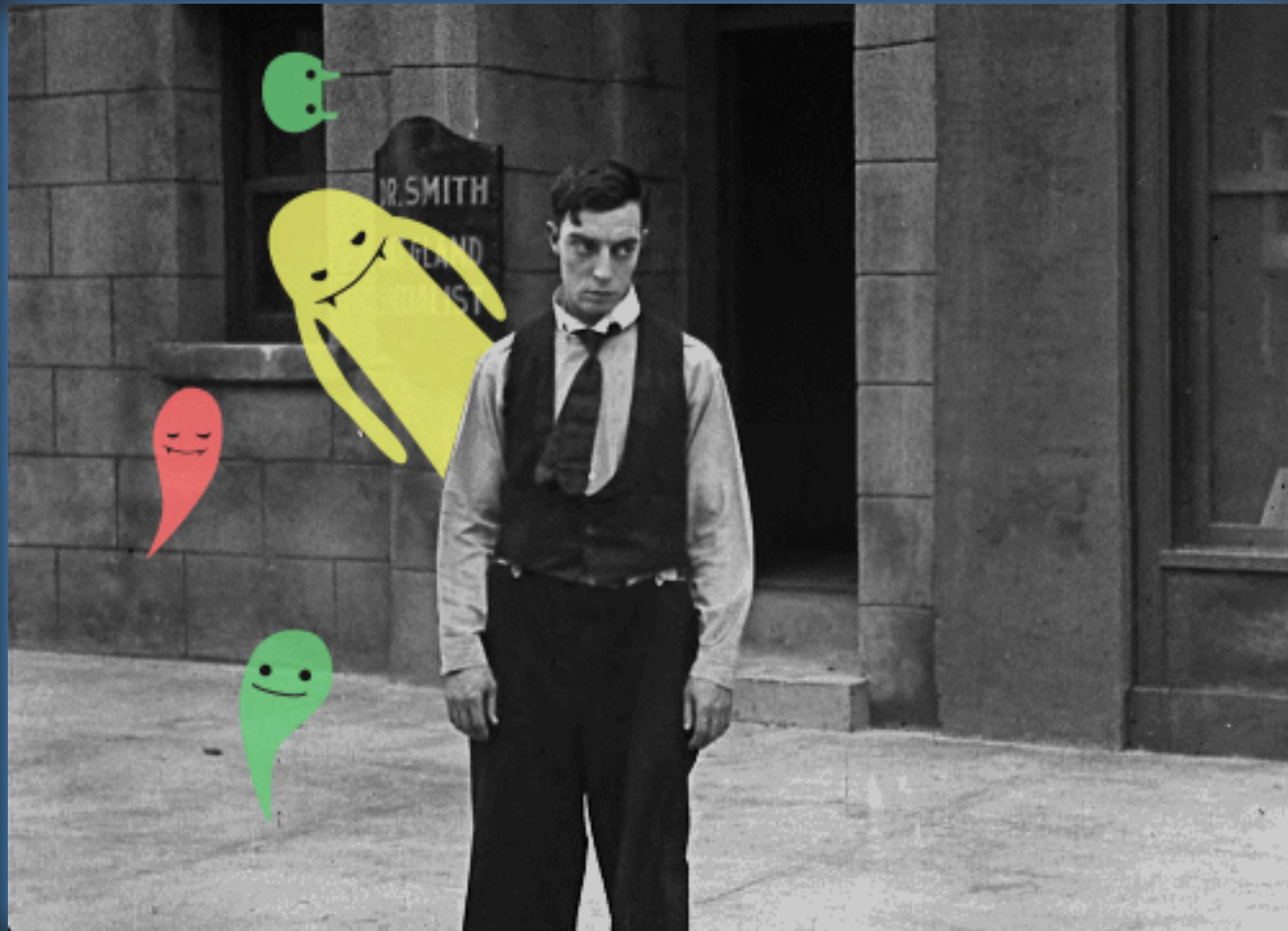
WAF

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 IPs (and use Residential)

- 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

Rotate User-Agents

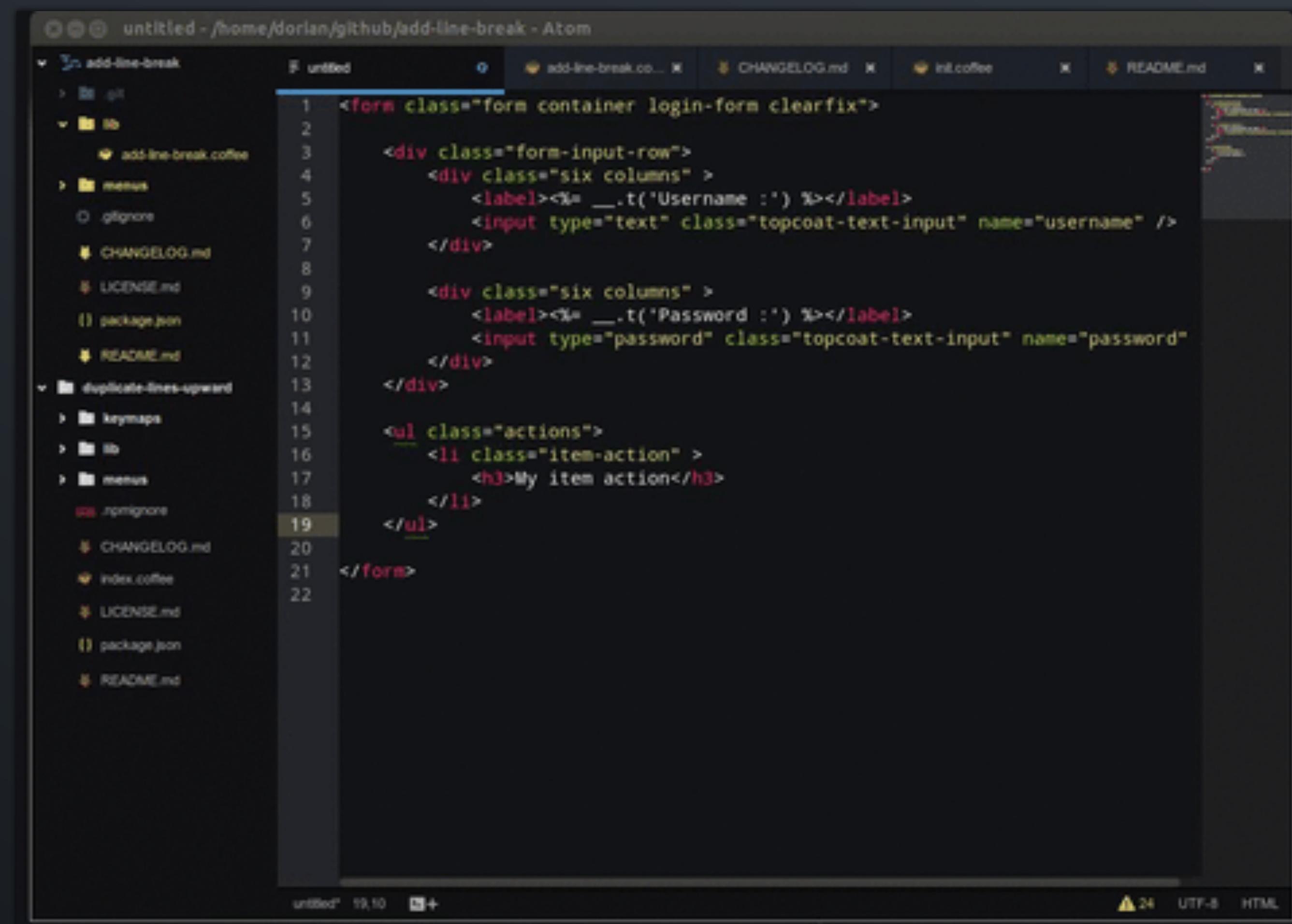
- Seriously, this gets past so many defenses
- Rotate with each HTTP request, if possible
- Also use this for whitelist fuzzing

Use Cookies

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

SUPER BORING CODE DEMO

PLEASE BEAR WITH US FOR LIKE 2 MINUTES



A screenshot of the Atom code editor interface. The title bar says "untitled - /home/dorian/github/add-line-break - Atom". The left sidebar shows a file tree with several files: add-line-break.coffee, CHANGELOG.md, LICENSE.md, package.json, README.md, and duplicate-lines-upward.coffee. 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>
  </div>
</form>
```

The status bar at the bottom shows "untitled 99,10" and "UTF-8 HTML".

(IT'S COOL, WE PROMISE)

ADVANCED TACTICS FOR CLOUD WAFFS



BE THE LUCHADOR *AND* THE OSTRICHES

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

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

- Headless Chrome
- Zombie.JS
- Phantom.JS
- Puppeteer
- Arachni

CHANGE. THESE.

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

THANKS FOR PLAYING!

Kasada
security redefined

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