OWASP
Open Web Application Security Project

The OWASP Amass Project

In-depth DNS Enumeration and Network Mapping

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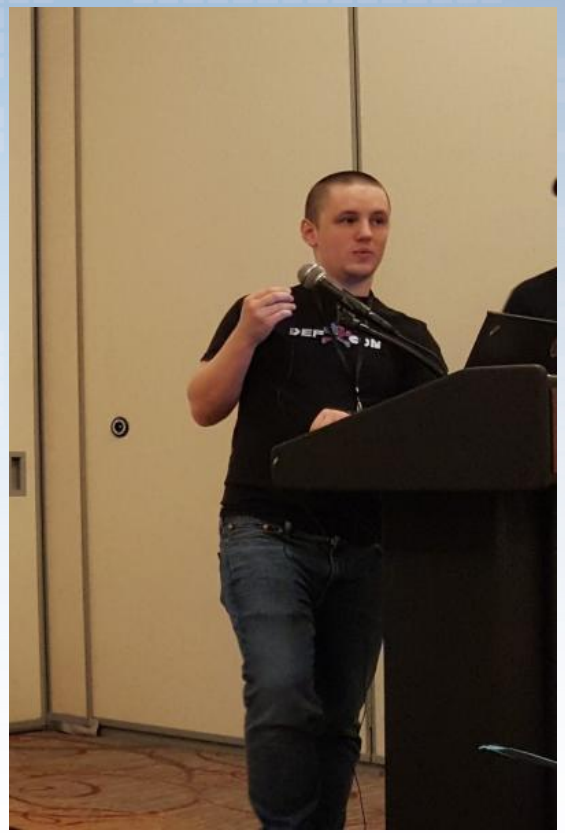

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Agenda

- Internet Exposure
- The Amass Project
- Demonstrations

Internet Exposure

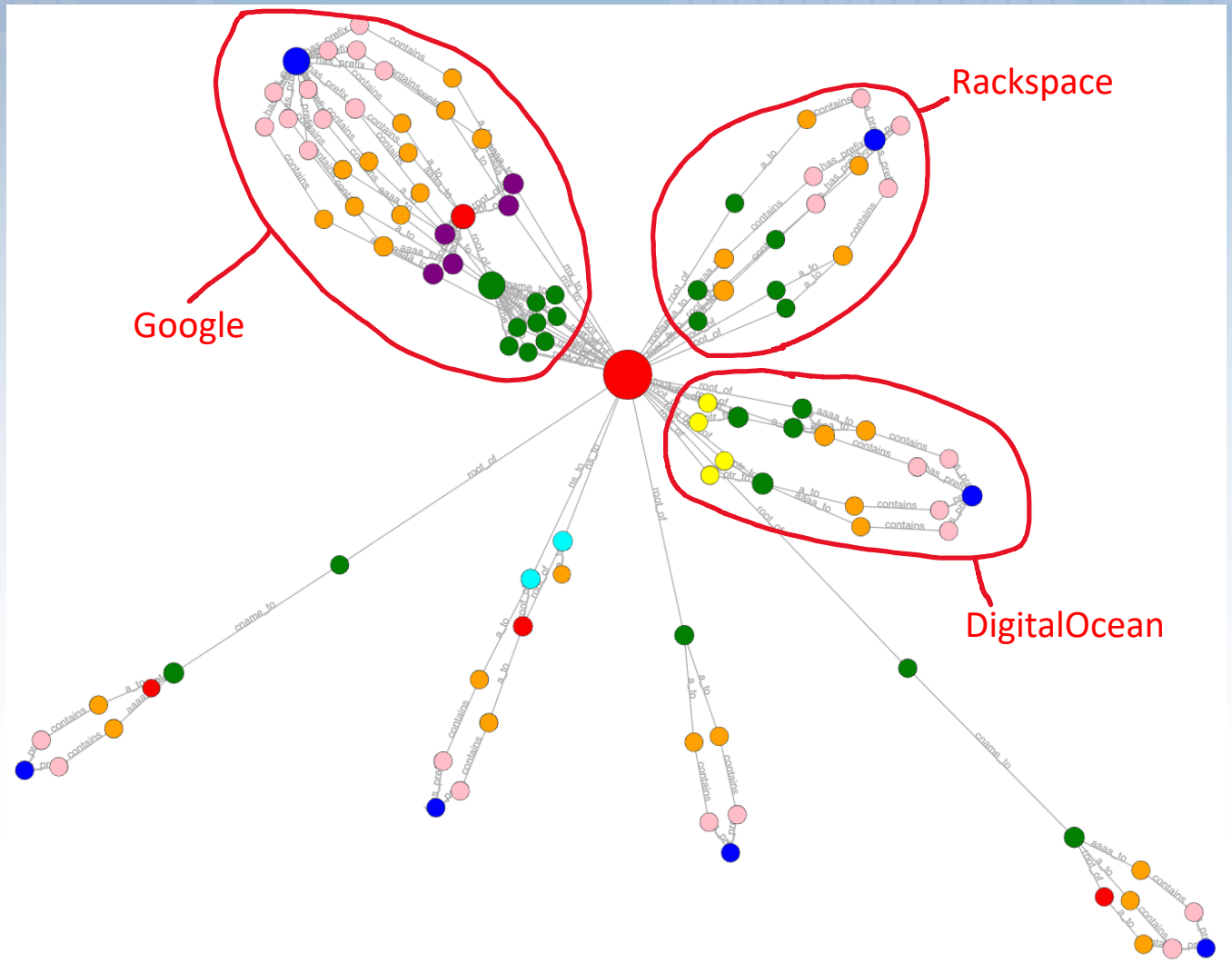
- Many organizations do not know what their infrastructure looks like on the Internet
- And consequently, do not understand what their networks look like to an adversary
- Assets only receive protection when **identified** and properly managed
  - This has become harder to perform due to enterprise networks becoming more fragmented; e.g. cloud solutions.

Internet Exposure - Methods

- Open Source Intelligence (OSINT) methods can discover much of an organization's external network infrastructure using:
  - DNS enumeration
  - TLS certificate transparency
  - Web scraping and archives
  - Passive scanning services with APIs
  - Whois and Reverse Whois
  - Registered autonomous system numbers (ASNs)

- Adversaries use these techniques to map networks on the Internet.

Internet Exposure - Visualization



- Red – Domain Name
- Green – Subdomain
- Yellow – PTR Record
- Purple – Mail Record
- Turquoise – Name Server
- Orange – IP Address
- Pink – Netblock
- Blue – AS Number

Internet Exposure Cont.

- Once an adversary has mapped a network, additional reconnaissance can be performed:
  - Visual inspection of websites; e.g. Aquatone
  - Discovery of web directories/files; e.g. Gobuster
  - Application layer scanning; e.g. ZGrab
  - Port scanning; e.g. Nmap

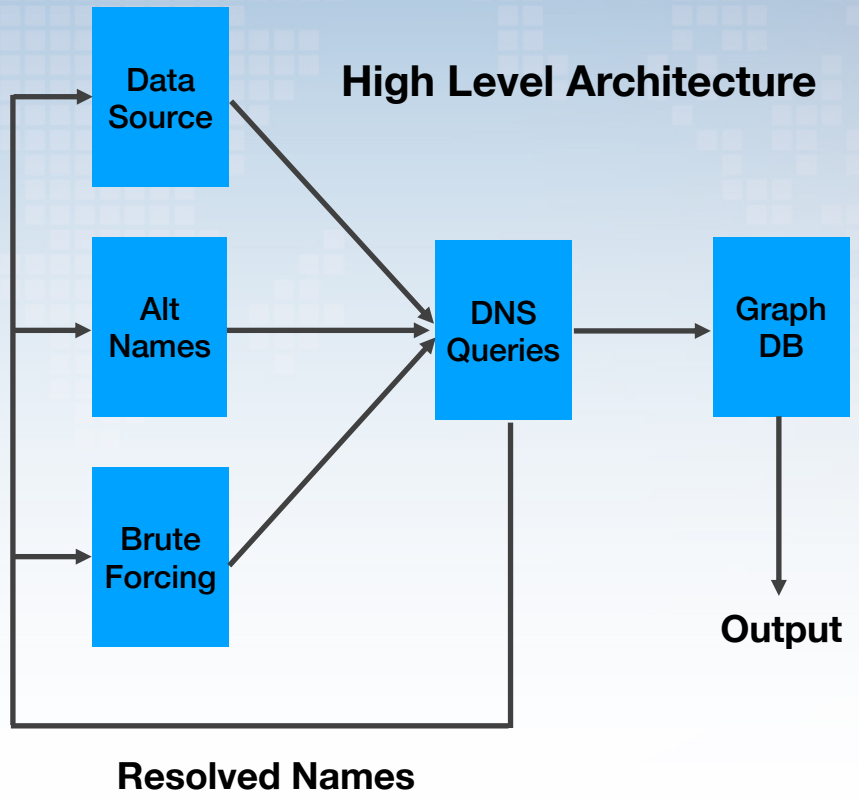
- Blue teams need to understand their exposure on the Internet better than adversaries do.

Internet Exposure – Use Cases

- Most organizations have more public exposure than they realize, and are starting to use OSINT and scanning techniques
- **Adobe** recently released the **Marinus** open source project that assists organizations in creating maps of their networks
  - Adobe Marinus utilizes the OWASP Amass project
- **Shodan Monitor** was recently announced that provides customers the ability to track devices exposed on the Internet
- These approaches allow security teams to understand exposure when **asset management is just not enough**.

The Amass Project

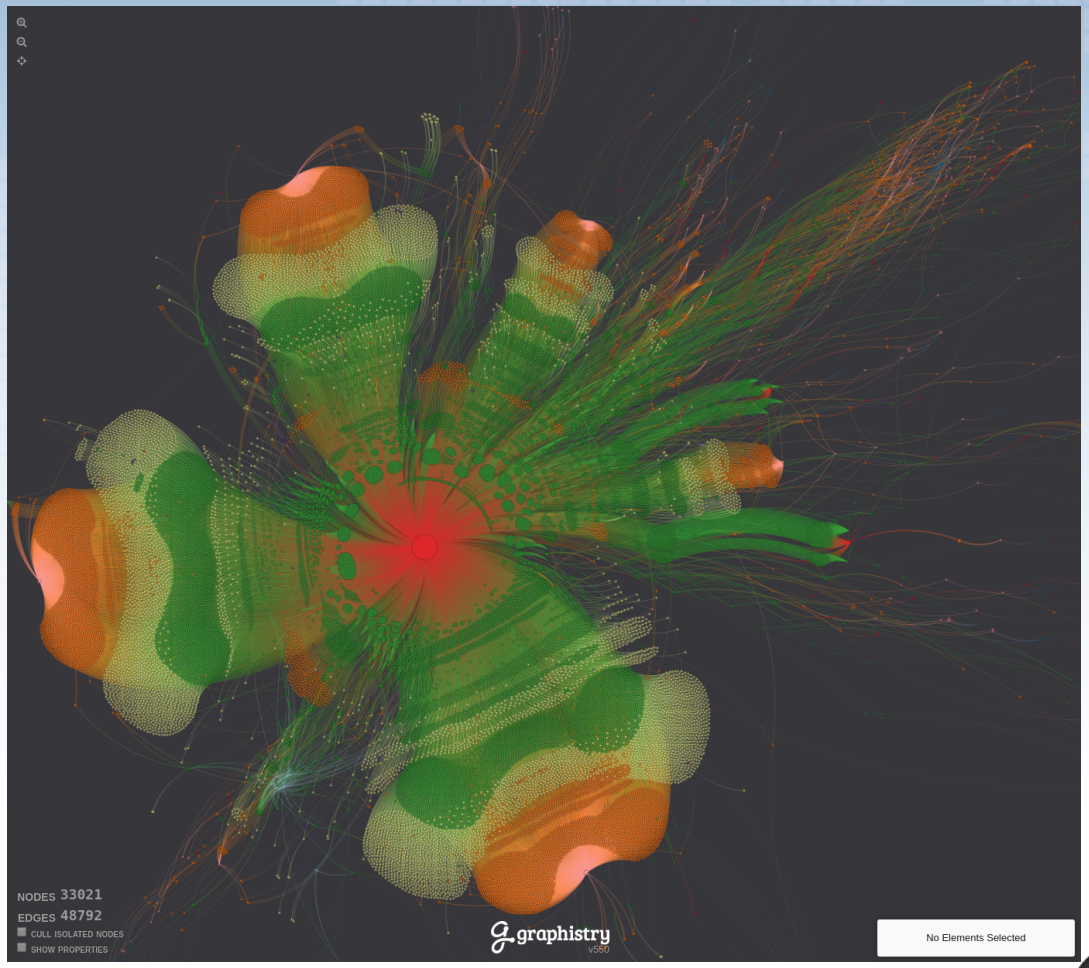
- In-depth DNS enumeration and network mapping
- Automates the various OSINT techniques
- Supports the visualization of findings
- Tracks changes to an organization's exposure.



The Amass Project – Use Cases

- Various **blue teams** benefit from quickly discovering changes in their organization's attack surface
- **Red teams** and **penetration testers** identify missing scope at the beginning of engagements
- **Bug bounty hunters** save time automating these techniques and finding new targets within scope
- OSINT **investigators** and **intelligence analysts** utilize Amass to hunt down threats on the Internet.

The Amass Project – Large Graph



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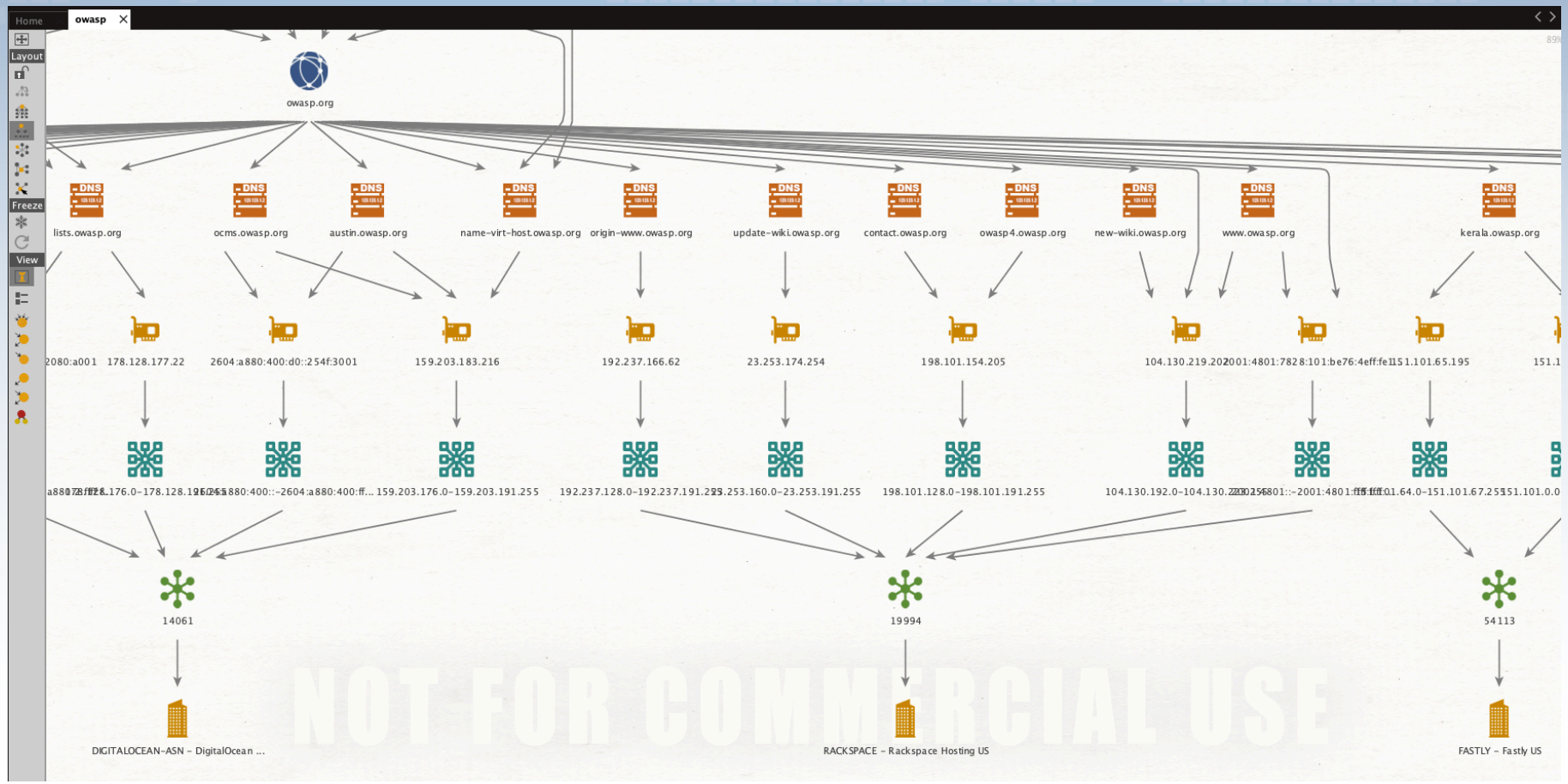
The Amass Project – Maltego



The Amass Project - FAQ

- Can Amass handle DNS wildcards?
  - Yes. DNS wildcard detection is performed automatically.
- Does Amass support limiting the rate of DNS queries?
  - Yes. The '-max-dns-queries' flag controls the number of simultaneous queries.
- Can Amass perform DNS name alterations?
  - Yes. Various types of permutations are attempted.

The Amass Project - Alterations

- Number Flipping
  - test1.owasp.org -> test2.owasp.org … test99.owasp.org
- Add suffixes and prefixes
  - test.owasp.org -> test-prod.owasp.org
  - test.owasp.org -> new-test.owasp.org
- Swapping of suffixes and prefixes
  - test-prod.owasp.org -> test-dev.owasp.org
- Fuzzy Label Searches
  - us.owasp.org -> uk.owasp.org
- Predictive name guessing using Markov models.

The Amass Project – Get it!

- Official project page: https://www.owasp.org/index.php/OWASP_Amass_Project
- Project repository: https://github.com/OWASP/Amass
- The Snapcraft package: https://snapcraft.io/amass
- The Homebrew package:

```
$ brew tap caffix/amass
$ brew install amass
```

Demonstration – netdomains

```
$ ./amass.netdomains -org "Utica College"
26808, US, ARIN, UTICA-COLLEGE - Utica College, US
$ ./amass.netdomains -asn 26808
utica.edu
uixio2.com
donotclickthislink.info
emailpixie.com
ucphishing.com
gophishme.com
uticocollege.com
$ ./amass.netdomains -asn 26808 -whois
utica.edu
518golf.com
aaronsonmicrobiology.com
aauputicacollege.org
aptalbany.com
bleedingsports.com
brianagreco.com
cimip.com
cimip.net
cimip.org
cnyctf.com
donotclickthislink.info
drhaasbeek.com
emailpixie.com
engageutica.com
fearofmissingoutmedia.us
gurdosgrassandsnow.com
hireucgrads.com
historichomeassociates.com
ihrec.org
ij-ccf.org
ijde.net
jecm.org
jeffpyoga.com
lavandexpress.com
lenoxlandtrust.org
```

Demonstration – netdomains

```
$ dig +short utica.edu
72.237.4.113
$ whois 72.237.4.113

#
# ARIN WHOIS data and services are subject to the Terms of Use
# available at: https://www.arin.net/resources/registry/whois/tou/
#
# If you see inaccuracies in the results, please report at
# https://www.arin.net/resources/registry/whois/inaccuracy_reporting/
#
# Copyright 1997-2019, American Registry for Internet Numbers, Ltd.
#



# start

NetRange:       72.237.4.0 - 72.237.4.255
CIDR:           72.237.4.0/24
NetName:        TELCOVE-SYRC-UTICCLG
NetHandle:      NET-72-237-4-0-1
Parent:         LVLT-ORG-72-236 (NET-72-236-0-0-1)
NetType:        Reassigned
OriginAS:
Customer:       UTICA COLLEGE (C01574955)
RegDate:        2007-02-20
Updated:        2007-02-20
Ref:            https://rdap.arin.net/registry/ip/72.237.4.0
```

```
$ ./amass.netdomains -cidr 72.237.4.0/24
utica.edu
uixio2.com
ucphishing.com
emailpixie.com
uticocollege.com
gophishme.com
donotclickthislink.info
$
```

Demonstration – Passive

```
$ ./amass -passive -d owasp.org
new-wiki.owasp.org
owasp.org
owasp4.owasp.org
austin.owasp.org
cheesemonkey.owasp.org
phpsec.owasp.org
name-virt-host.owasp.org
haroldtest.owasp.org
contact.owasp.org
www.lists.owasp.org
kerala.owasp.org
my.owasp.org
discourse.owasp.org
www.ocms.owasp.org
lists.owasp.org
owaspforce.owasp.org
groups.owasp.org
gapps.owasp.org
sl.owasp.org
www.owasp.org
docs.owasp.org
mail.owasp.org
tempcali.owasp.org
ocms.owasp.org
update-wiki.owasp.org
talk.owasp.org
dsandbox.owasp.org
es.owasp.org
calendar.owasp.org
admin.owasp.org
forum.owasp.org
```

Demonstration – Configuration

amass_config.ini

```
output_directory = amass_output
maximum_dns_queries = 10000
mode = active
port = 443

[bruteforce]
enabled = true
recursive = true
minimum_for_recursive = 0
wordlist_file = subdomains-top1mil-5000.txt
wordlist_file = namelist.txt

[alterations]
enabled = true
min_for_word_flip = 0
wordlist_file = alterations.txt
add_words = true
add_numbers = true
flip_words = true
flip_numbers = true
edit_distance = 1

[domains]
domain = owasp.org
```

Demonstration – amass

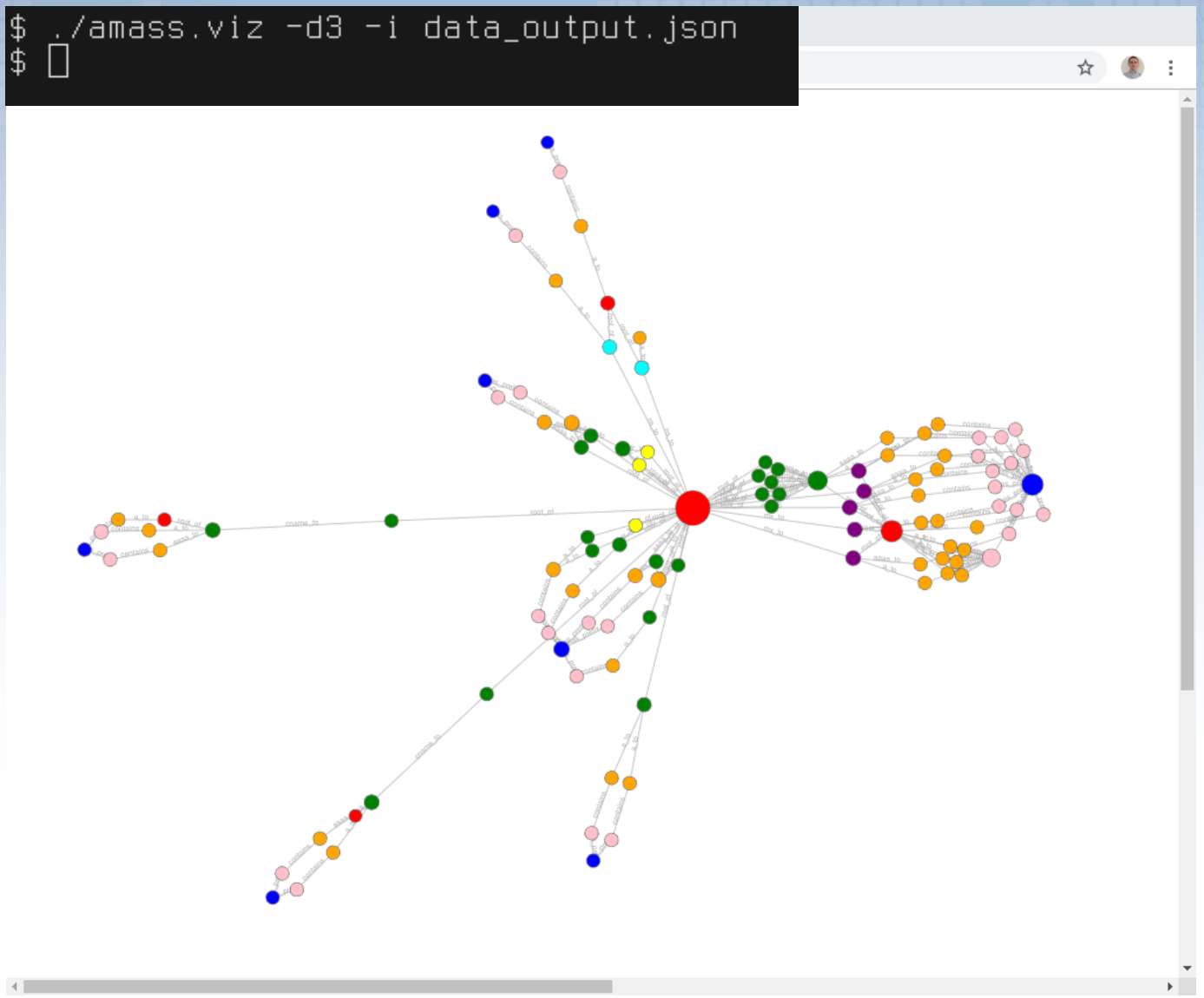
```
$ ./amass -config amass_config.ini -src -ipv4
[Crtsh]           lists.owasp.org 178.128.177.22
[Crtsh]           name-virt-host.owasp.org 159.203.183.216
[BufferOver]      ocms.owasp.org 159.203.183.216
[BufferOver]      new-wiki.owasp.org 104.130.219.202
[Brute Forcing]   origin-www.owasp.org 192.237.166.62
[BufferOver]      www.owasp.org 104.130.219.202
[Brute Forcing]   contact.owasp.org 198.101.154.205
[BufferOver]      kerala.owasp.org 151.101.1.195,151.101.65.195
[Crtsh]           austin.owasp.org 159.203.183.216
[Forward DNS]     owasp.org 104.130.219.202
[BufferOver]      owasp4.owasp.org 198.101.154.205
[BufferOver]      update-wiki.owasp.org 23.253.174.254
[BufferOver]      owaspforce.owasp.org 172.217.10.243
[Brute Forcing]   my.owasp.org 208.82.16.68
[Brute Forcing]   calendar.owasp.org 172.217.10.243
[Brute Forcing]   sl.owasp.org 172.217.10.243
[Brute Forcing]   groups.owasp.org 172.217.10.243
[Brute Forcing]   gapps.owasp.org 172.217.10.243
[Brute Forcing]   mail.owasp.org 172.217.10.243
[Brute Forcing]   docs.owasp.org 172.217.10.243
[Brute Forcing]   mod.owasp.org 172.217.10.243
Average DNS queries performed: 3843/sec, DNS names remaining: 108
Average DNS queries performed: 23/sec, DNS names remaining: 107
Average DNS queries performed: 14/sec, DNS names remaining: 98

OWASP Amass v2.9.10                               https://github.com/OWASP/Amass
--------------------------------------------------------------------------------
21 names discovered - cert: 3, api: 7, brute: 10, dns: 1
--------------------------------------------------------------------------------
ASN: 14061 - DIGITALOCEAN-ASN - DigitalOcean, LLC, US
        178.128.176.0/20        1    Subdomain Name(s)
        159.203.176.0/20        3    Subdomain Name(s)
ASN: 19994 - RACKSPACE - Rackspace Hosting, US
        23.253.160.0/19         1    Subdomain Name(s)
        104.130.192.0/19        3    Subdomain Name(s)
        192.237.128.0/18        1    Subdomain Name(s)
        198.101.128.0/18        2    Subdomain Name(s)
ASN: 54113 - FASTLY - Fastly, US
        151.101.0.0/22          1    Subdomain Name(s)
        151.101.64.0/22         1    Subdomain Name(s)
ASN: 15169 - GOOGLE - Google LLC, US
        172.217.10.0/24         8    Subdomain Name(s)
ASN: 13535 - NING - Ning Interactive, Inc., US
        208.82.16.0/24          1    Subdomain Name(s)
$
```

Demonstration – tracker

```
$ ./amass.tracker -d owasp.org
-------------------------------------------------------------------------------
Between 03/22 09:35:41 2019 EDT -> 03/22 09:36:57 2019 EDT
and     05/07 10:10:18 2019 EDT -> 05/07 10:13:12 2019 EDT
-------------------------------------------------------------------------------
Moved: gapps.owasp.org
         from   173.194.222.121,2607:f8b0:4006:810::2013
         to     172.217.10.243,2607:f8b0:4000:808::2013
Moved: docs.owasp.org
         from   173.194.222.121,2607:f8b0:4006:810::2013
         to     172.217.10.243,2607:f8b0:4000:808::2013
Moved: groups.owasp.org
         from   173.194.222.121,2607:f8b0:4006:810::2013
         to     172.217.10.243,2607:f8b0:4000:808::2013
Moved: mail.owasp.org
         from   173.194.222.121,2607:f8b0:4006:810::2013
         to     172.217.10.243,2607:f8b0:4000:808::2013
Moved: sl.owasp.org
         from   173.194.222.121,2607:f8b0:4006:810::2013
         to     172.217.10.243,2607:f8b0:4000:808::2013
Moved: calendar.owasp.org
         from   173.194.222.121,2607:f8b0:4006:810::2013
         to     172.217.10.243,2607:f8b0:4000:808::2013
Moved: owaspforce.owasp.org
         from   173.194.222.121,2607:f8b0:4006:810::2013
         to     172.217.10.243,2607:f8b0:4000:808::2013
Removed: discourse.owasp.org 216.218.240.87,2001:470:1:669::87
Found: mod.owasp.org 172.217.10.243,2607:f8b0:4000:808::2013
$
```

Demonstration – Visualizations

```
$ ./amass.viz -d3 -i data_output.json
$
```



Conclusion

- **Assets** only receive protection when **identified** and properly managed
- **Blue teams** benefit from quickly **discovering changes** in their organization's attack surface
- **OWASP Amass** performs in-depth DNS enumeration and network mapping by **utilizing** the methods in a **cyclic** manner.

Thank you!

Questions?