Hunting with Passive DNS

Ben April – CTO Farsight Security, Inc.

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Agenda

I. Passive DNS in 5 minutes
II. Examples
    I. Phishing
    II. Fake-Pharma
    III. Counterfeit [Currency|Identification|Merchandise|Etc]
III. Limits to Passive DNS
IV. Key Takeaways

Tools - 3 ways to use the same API

- **DNSDB Scout -** Found in the Chrome or Firefox add-on stores.
- **Maltego** – https://paterva.com/ part of the transform hub.
- **Dnsdbq** – https://github.com/dnsdb/dnsdbq

Disclaimers

- Query results based on live data presented as I found it. Might not be polite.
- The data in this deck is a snapshot in time. It is already outdated.
- Don’t use DNS on it’s own to convict. (Sinkholes etc)
- TPL: White

Passive DNS in 5 minutes

Everything begins with DNS …

DNS as Map

- Most everything we do on the Internet…
  --B2B Web, B2B Web, E-mail, I-M, <*your idea here*>
  *…relies on TCP/*IP, and begins with a DNS lookup
- Mobile Internet is dominated by search …
  … but search itself relies extensively upon DNS
- DNS has a rigorous internal structure
  --Things that are in fact related*, are* related in DNS
  -- You can have *Whois* privacy, but not DNS privacy

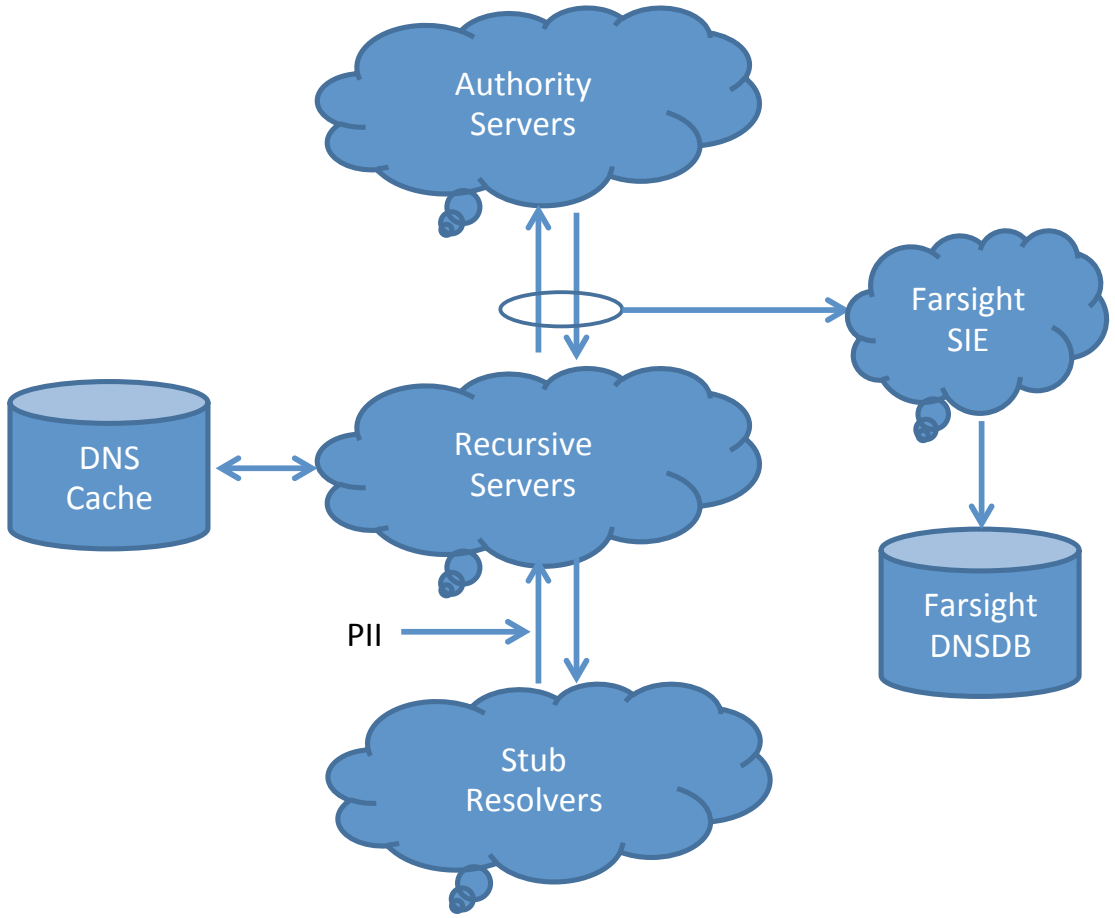
Internal Infrastructure

- Domain names are grouped into zones
  -- Like *root* zone, or “COM”, or “EXAMPLE.COM”
- A *zone* has one or more *name servers*
  -- Like “COM. NS a gtld-servers.net”
- Each *name server* has one or more *addresses*
  -- Like “a.gtld-servers.net A. 192.5.6.30”
- Other domain names also have *addresses*
  -- Like “www.apnic.net A. 203.119.102.244”
- IP *addresses* are grouped into *netblocks*
  -- Like “192.5.6.0/24” or “203.119.103.240/28”

Passive DNS: Lots of Keys/Many values

- DNS Key = {QNAME, QCLASS,QTYPE}
- pDNS key = {QNAME, QCLASS,QTYPE, RDATA, bailiwick}
- Output based on an open standard draft https://tools.ietf.org/id/draft-dulaunoy-dnsop-passive-dns-cof-03.html

Passive DNS Architecture



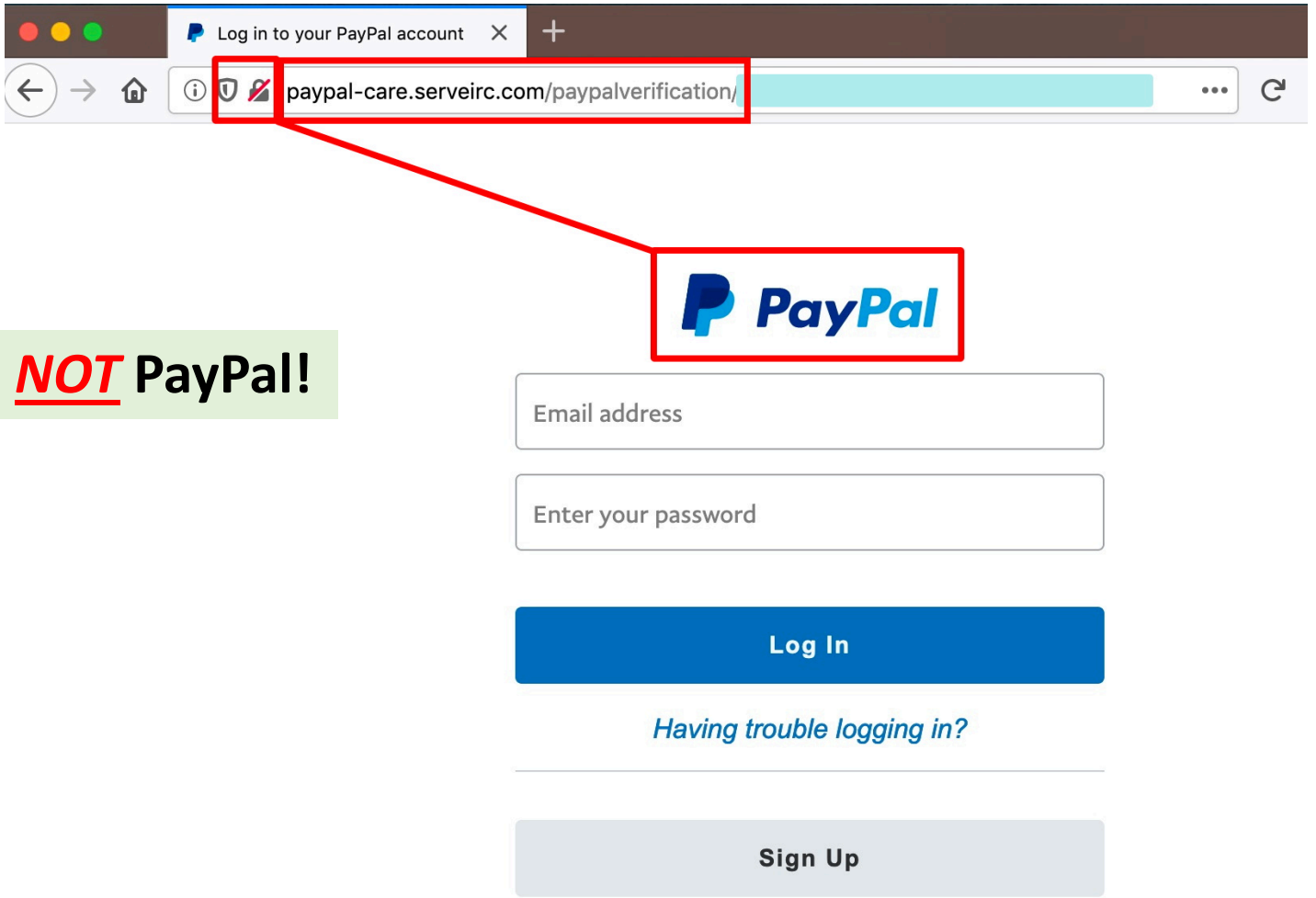
Passive DNS Data Options

- CERT.at/Aconet Passive DNS (inquire: kaplan@cert.at or lendl@cert.at)
- https://www.farsightsecurity.com/solutions/dnsdb/
- https://www.passivedns.cn/help/
- https://www.opendns.com/enterprise-security/resources/data-sheets/investigate/
- https://www.riskiq.com/products/passivetotal/
- https://securitytrails.com/corp/feeds
- https://www.virustotal.com/#search
- https://zetalytics.com/
- http://www.circl.lu/services/passive-dns/
- http://passivedns.mnemonic.no/search/
- https://www.cs.auckland.ac.nz/research/groups/sde/dhdb-index.php

Threat Hunting Using DNS

Example I. Phishing

This is "probably" *NOT* PayPal!



Let's Check Domain Whois For The Base Domain Name...

$ whois serveirc.com

[...]

Registrant Name: Dan Durrer

Registrant Organization: **No-IP.com**

Registrant Street: 425 Maestro Dr. Second Floor

Registrant City: Reno

Registrant State/Province: NV

Registrant Postal Code: 89511

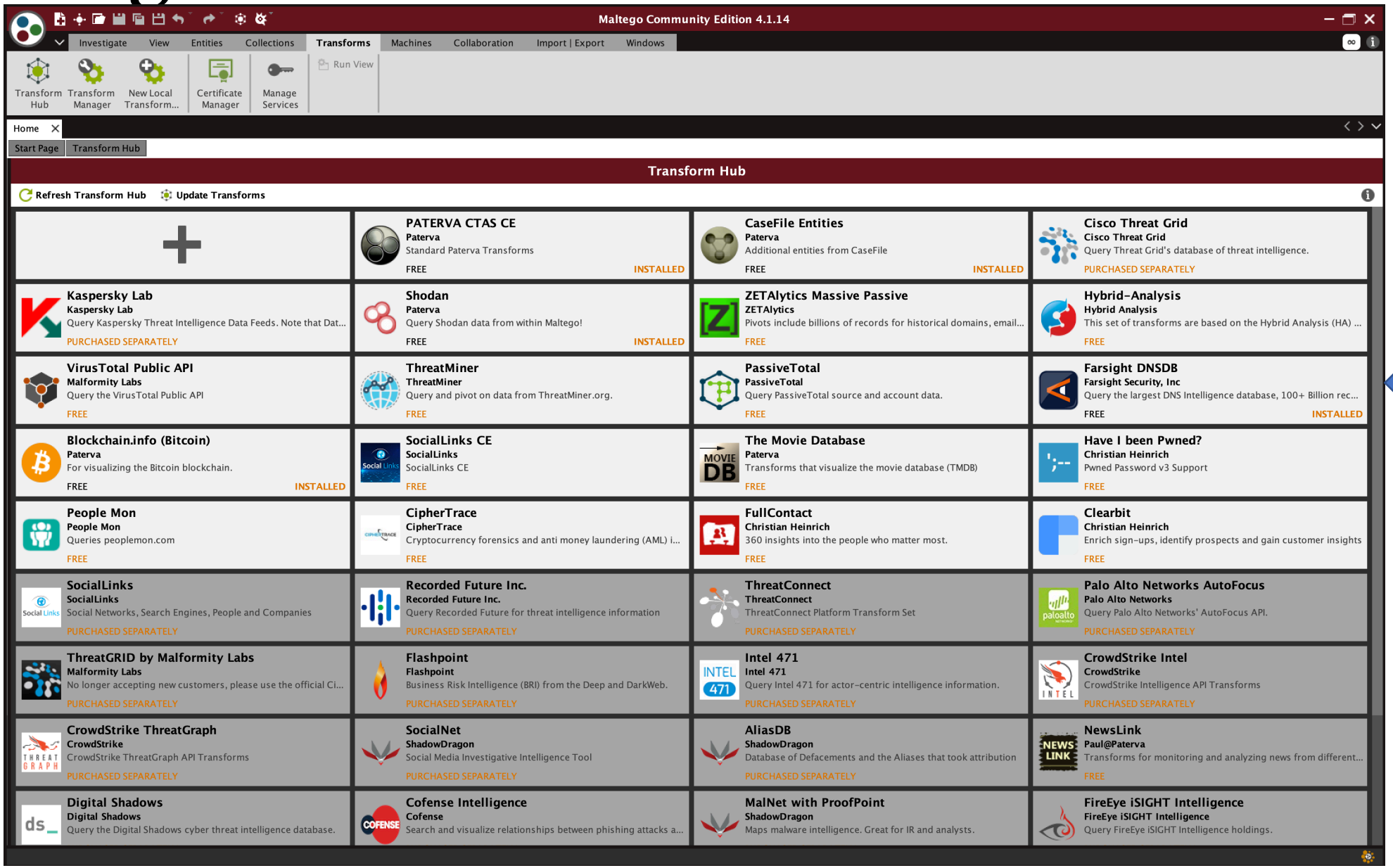
Registrant Country: US

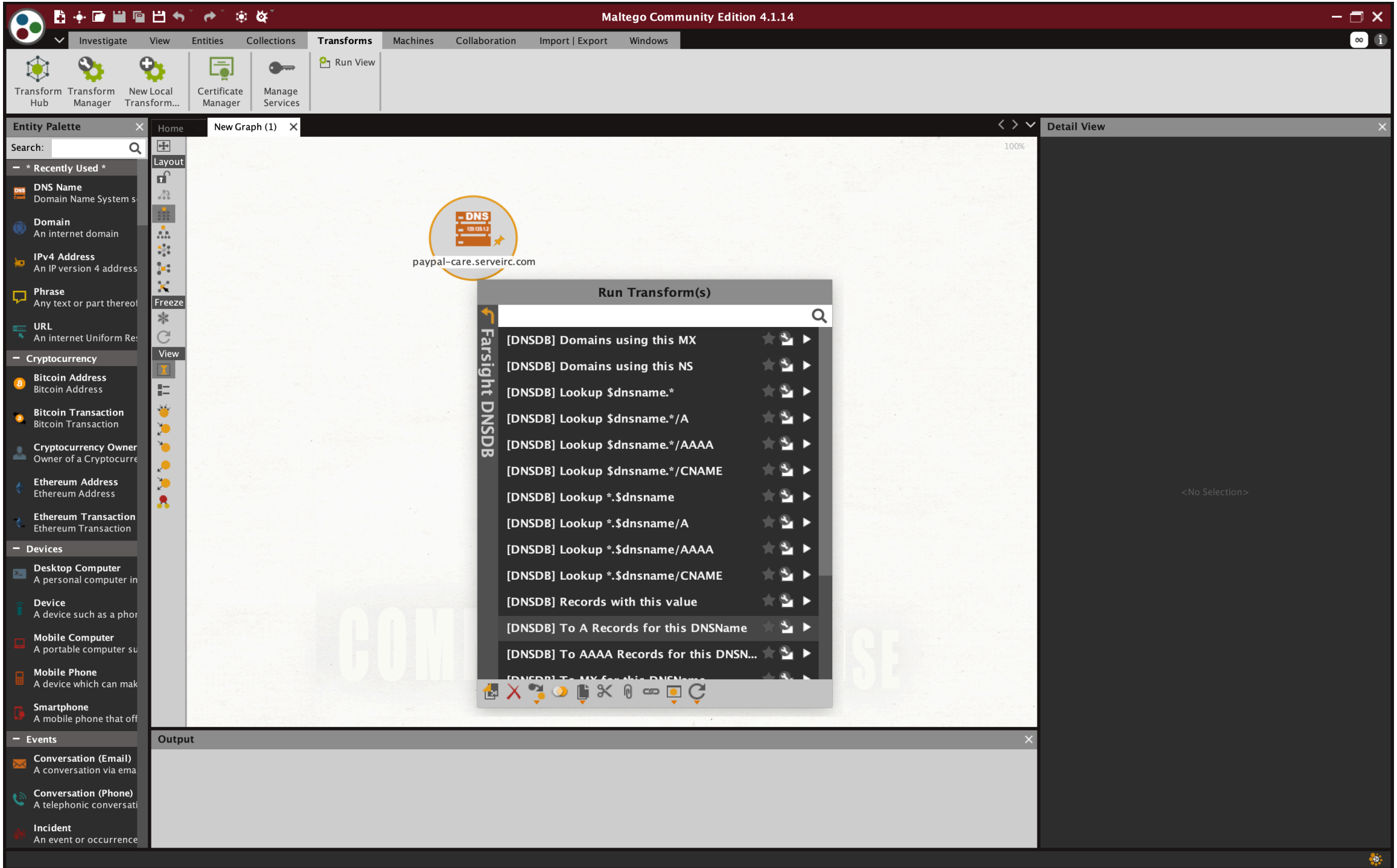
Registrant Phone: +1.7758531883

Registrant Email: **domains@no-ip.com**

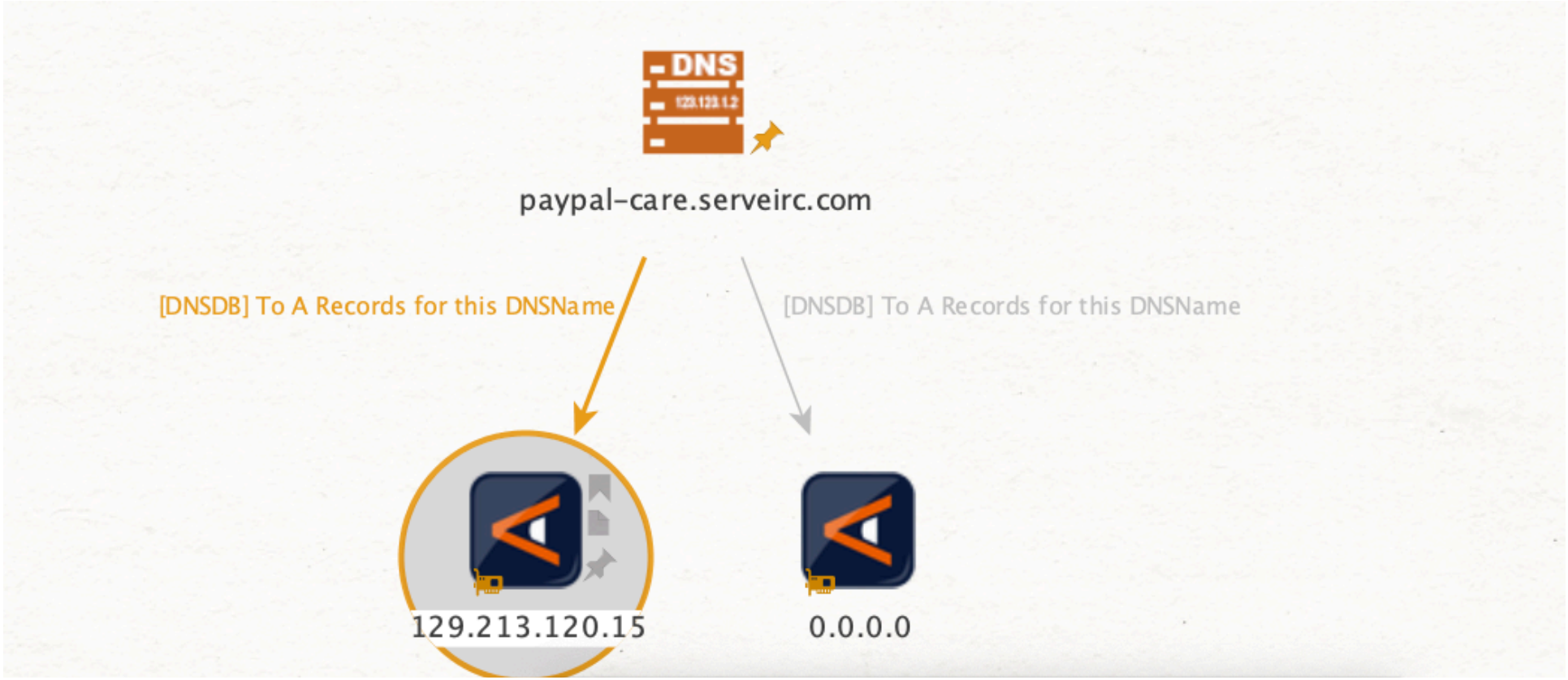
[...]

Maltego Transforms




Maltego Community Edition 4.1.14
Investigate
View
Entities
Collections
Transforms
Machines
Collaboration
Import | Export
Windows
Transform Hub
Transform Manager
New Local Transform...
Certificate Manager
Manage Services
Run View
Entity Palette
Search:
* Recently Used *
DNS Name
Domain
IPv4 Address
Phrase
URL
Cryptocurrency
Bitcoin Address
Bitcoin Transaction
Cryptocurrency Owner
Ethereum Address
Ethereum Transaction
Devices
Desktop Computer
Device
Mobile Computer
Mobile Phone
Smartphone
Events
Conversation (Email)
Conversation (Phone)
Incident
Home
New Graph (1)
Layout
Freeze
View
100%
paypal-care.serveirc.com
Run Transform(s)
Farsight DNSDB
[DNSDB] Domains using this MX
[DNSDB] Domains using this NS
[DNSDB] Lookup $dnsname.*
[DNSDB] Lookup $dnsname.*/A
[DNSDB] Lookup $dnsname.*/AAAA
[DNSDB] Lookup $dnsname.*/CNAME
[DNSDB] Lookup *.$dnsname
[DNSDB] Lookup *.$dnsname/A
[DNSDB] Lookup *.$dnsname/AAAA
[DNSDB] Lookup *.$dnsname/CNAME
[DNSDB] Records with this value
[DNSDB] To A Records for this DNSName
[DNSDB] To AAAA Records for this DNSN...
Output
Detail View
<No Selection>

Maltego



DNSDB Scout

Successful Query for: paypal-care.serveirc.com ANY (Limit 2000)

EXPORT AS CSV | EXPORT AS JSON | API DOCS

Show 25 entries

Time Last Seen	Time First Seen	Count	Bailiwick	RRname	RRtype	Rdata
2019-04-22 22:25:34	2019-04-12 18:15:29	9	serveirc.com.	paypal-care.serveirc.com.	A	0.0.0.0
2019-04-10 18:21:00	2019-03-22 18:38:05	32	serveirc.com.	paypal-care.serveirc.com.	A	129.213.120.15

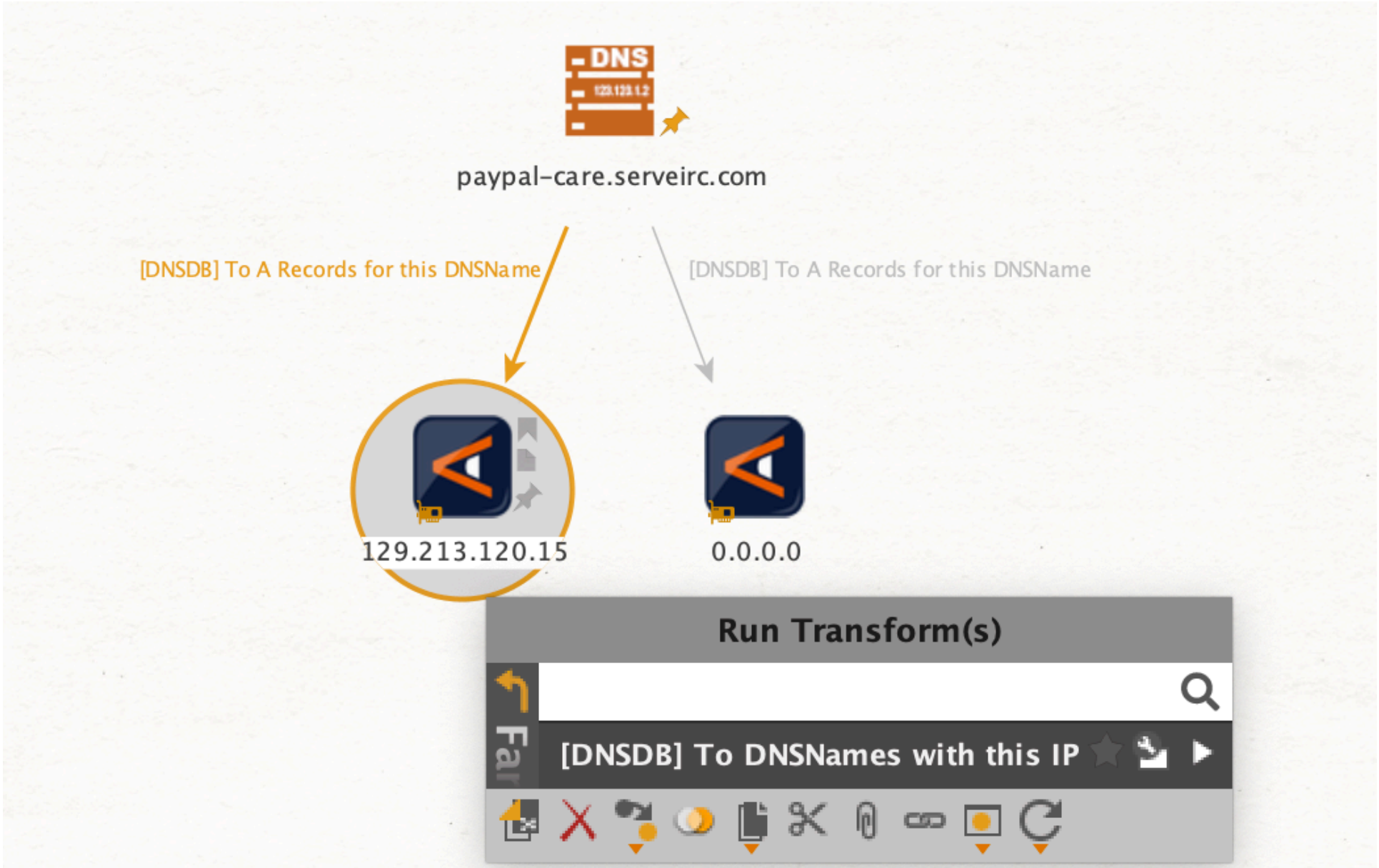
Showing 1 to 2 of 2 entries

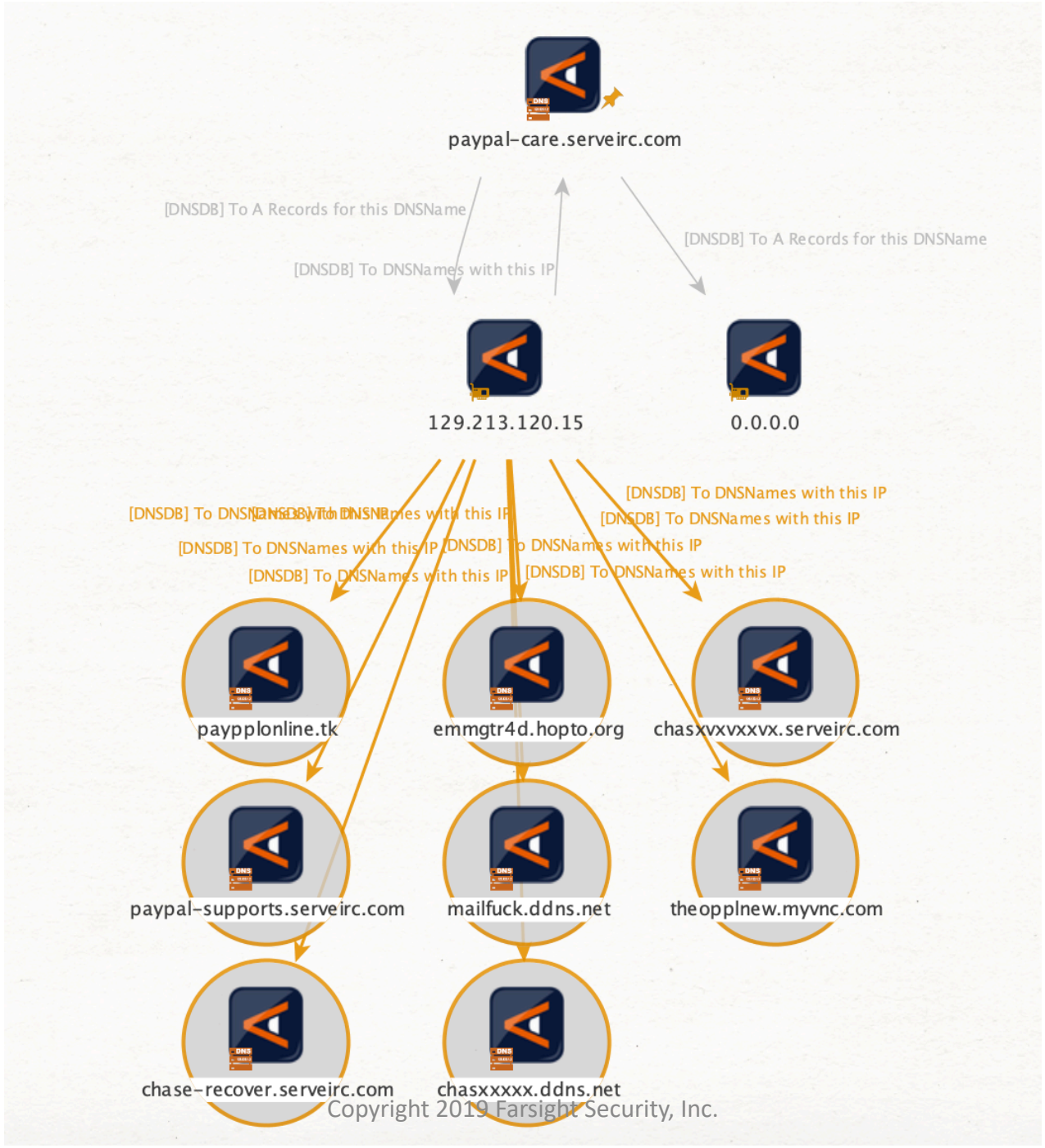
First | Previous | 1 | Next | Last

dnsdbq

```
bapril@rd2:~$ dnsdbq -r paypal-care.serveirc.com
;; record times: 2019-04-12 18:15:29 .. 2019-04-22 22:25:34
;; count: 9; bailiwick: serveirc.com.
paypal-care.serveirc.com.  A  0.0.0.0

;; record times: 2019-03-22 18:38:05 .. 2019-04-10 18:21:00
;; count: 32; bailiwick: serveirc.com.
paypal-care.serveirc.com.  A  129.213.120.15
```





Detail View

IPv4 Address
maltego.IPv4Address
129.213.120.15

- Relationships

- Incoming

paypal-care.serveirc.com

- Outgoing

chasxvxvxxvx.serveirc.com
paypal-care.serveirc.com
chasxxxxx.ddns.net
paypal-supports.serveirc.com
emmgtr4d.hopto.org
theopplnew.myvnc.com
paypplonline.tk
mailfuck.ddns.net
chase-recover.serveirc.com

- DNSDB Output

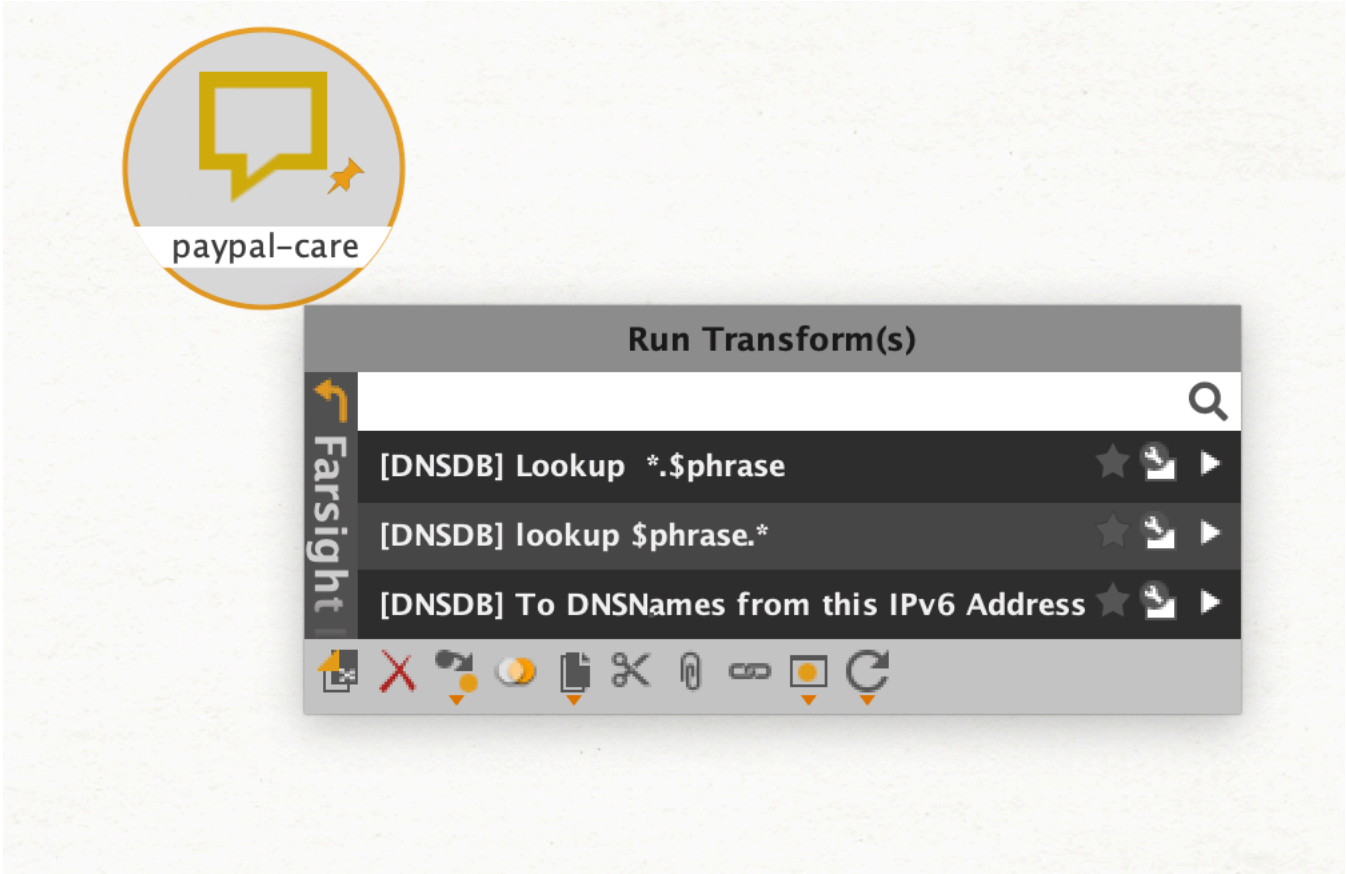
```
;;  bailiwick: serveirc.com.
;;      count: 32
;; first seen: 2019-03-22 18:38:05 -0000
;;  last seen: 2019-04-10 18:21:00 -0000
paypal-care.serveirc.com. IN A 129.213.120.15
```

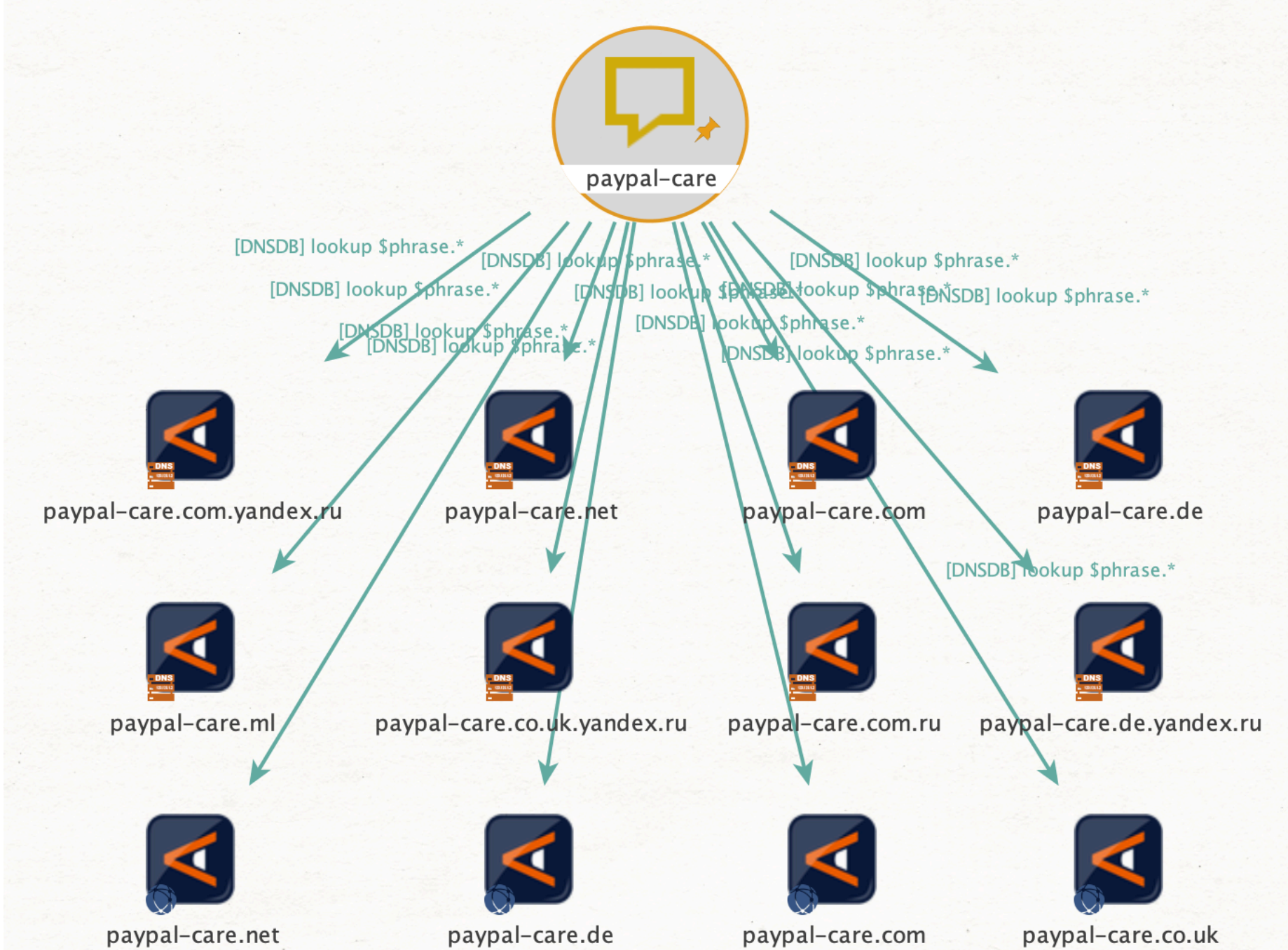
- DNSDB JSON Output

{"count": 32, "time_first": 1553279885, "rrtype": "A", "rrname": "paypal-care.serveirc.com.", "bailiwick": "serveirc.com.", "rdata": ["129.213.120.15"], "time_last": 1554920460}

- Generator detail

Source	paypal-care.serveirc.com	(DNS Name)
Transform	[DNSDB] To A Records for this DNSName	
Gen. date	2019-05-08 11:53:22.663 -0400	





Threat Hunting Using DNS

Example II. Fake-Pharma

Pom-Pharmacy.com

No customer reviews yet
Be the first to Write a Review

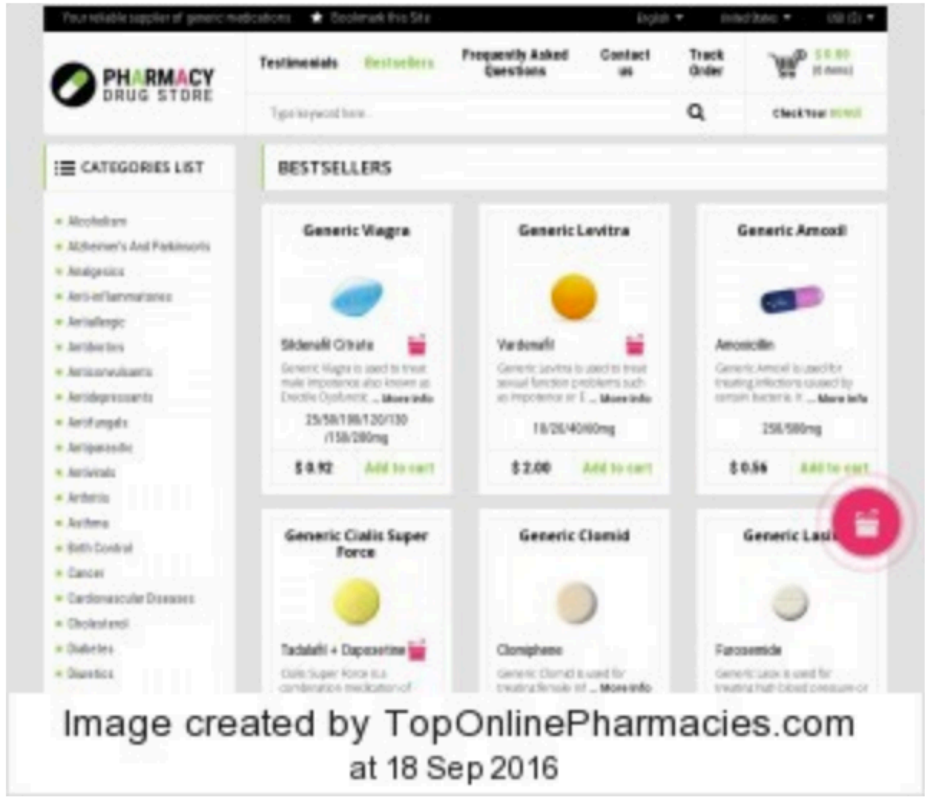


Image created by TopOnlinePharmacies.com
at 18 Sep 2016

Site Title	POM Pharmacy
Website	pom-pharmacy.com
Status	**Unavailable**, see **Alternatives**
Product Range	Wide Selection of Indian Generics
Shipping Area	Worldwide
Shipping Options	Standard Airmail, 14-21 days - $10.00
	Courier Service, 5-9 days - $30.00
Payment Methods	VISA MasterCard AMEX JCB BTC
Alexa Popularity	8488791

Site Self-Description

POM Pharmacy

Successful Query for: pom-pharmacy.com A (Limit 50000)

EXPORT AS CSV | EXPORT AS JSON | API DOCS

Show 25 entries

Time Last Seen	Time First Seen	Count	Bailiwick	RRname	RRtype	Rdata
2019-05-06 14:14:04	2017-10-06 17:20:44	1377	pom-pharmacy.com.	pom-pharmacy.com.	A	66.212.148.115
2017-09-26 12:28:46	2017-03-17 12:51:24	390	pom-pharmacy.com.	pom-pharmacy.com.	A	74.81.170.110
2017-03-14 22:42:18	2016-08-18 17:33:38	1414	pom-pharmacy.com.	pom-pharmacy.com.	A	104.28.22.110 104.28.23.110
2016-08-17 22:23:15	2016-02-15 00:10:04	1921	pom-pharmacy.com.	pom-pharmacy.com.	A	185.92.221.211
2016-02-14 21:56:42	2013-07-19 01:33:42	12025	pom-pharmacy.com.	pom-pharmacy.com.	A	50.7.195.186

Showing 1 to 5 of 5 entries

First Previous 1 Next Last

Successful Query for: pom-pharmacy.com ANY (Limit 50000)

EXPORT AS CSV | EXPORT AS JSON | API DOCS

Show 25 entries

Time Last Seen	Time First Seen	Count	Bailiwick	RRname	RRtype	Rdata
2019-05-07 00:42:49	2017-03-15 21:21:39	15494	com.	pom-pharmacy.com.	NS	ns1.seizedservers.com. ns2.seizedservers.com.
2019-05-06 14:14:04	2017-10-06 17:20:44	1377	pom-pharmacy.com.	pom-pharmacy.com.	A	66.212.148.115
2018-03-22 16:02:25*	2017-03-16 16:02:32*	372	com.	pom-pharmacy.com.	NS	ns1.seizedservers.com. ns2.seizedservers.com.
2017-09-26 12:28:46	2017-03-17 12:51:24	390	pom-pharmacy.com.	pom-pharmacy.com.	A	74.81.170.110
2017-03-15 16:02:35*	2014-01-24 17:13:12*	1141	com.	pom-pharmacy.com.	NS	duke.ns.cloudflare.com. lily.ns.cloudflare.com.
2017-03-14 22:42:18	2016-08-18 17:33:38	1414	pom-pharmacy.com.	pom-pharmacy.com.	A	104.28.22.110 104.28.23.110
2017-03-14 22:42:18	2014-01-23 22:48:40	7841	com.	pom-pharmacy.com.	NS	duke.ns.cloudflare.com. lily.ns.cloudflare.com.

Successful Query for: ns1.seizedservers.com. (name) NS (Limit 50000)

EXPORT AS CSV | EXPORT AS JSON | API DOCS

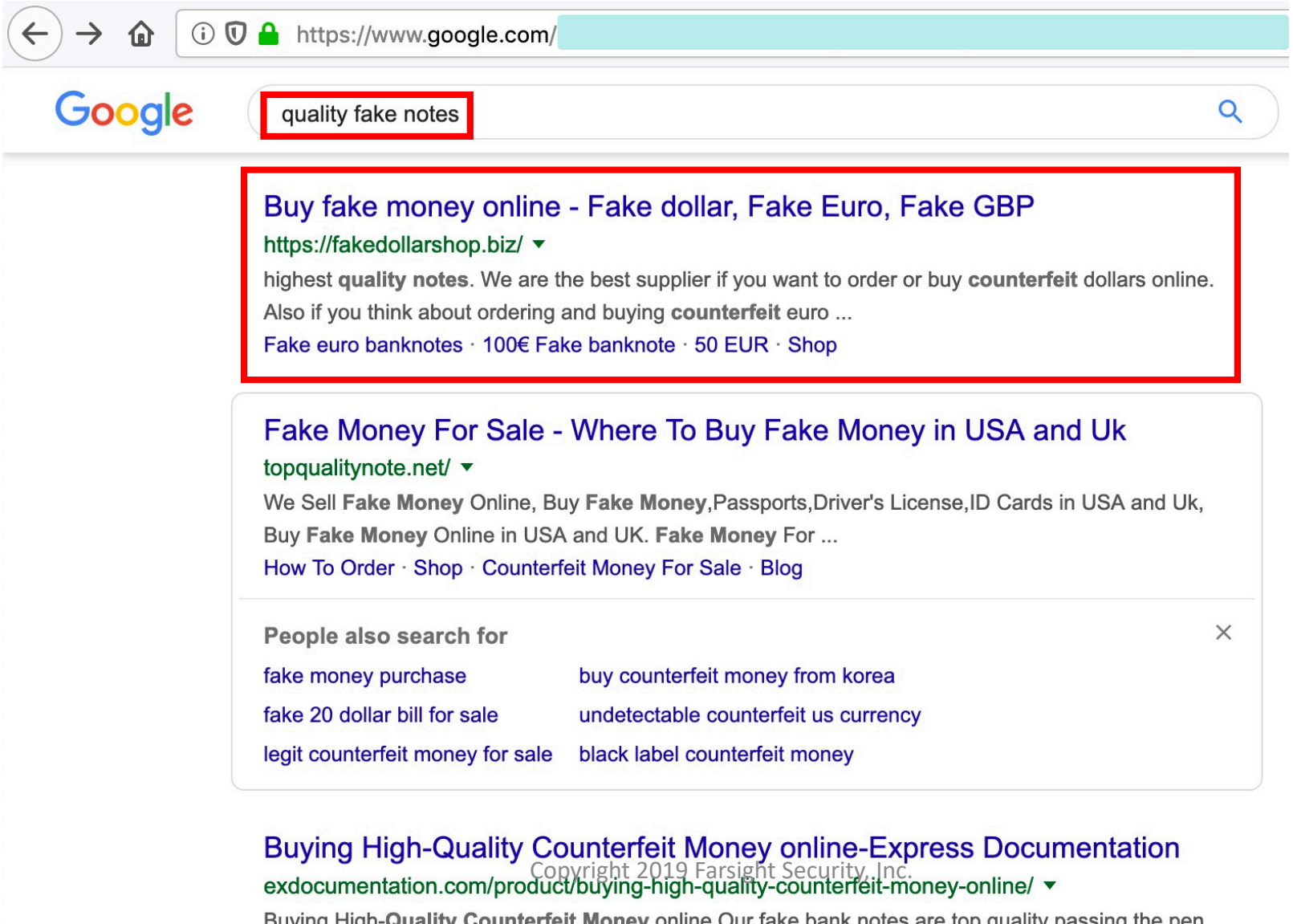
Show 25 entries

Time Last Seen	Time First Seen	Count	RRname	RRtype	Rdata
2019-05-07 01:28:18	2017-03-16 01:16:29	4130	cialisonlinecl.com.	NS	ns1.seizedservers.com.
2019-05-07 01:28:08	2016-04-25 15:49:20	5949	onlinerx-solutions.com.	NS	ns1.seizedservers.com.
2019-05-07 01:27:57	2017-03-17 19:23:26	3525	eudrg.com.	NS	ns1.seizedservers.com.
2019-05-07 01:27:23	2017-03-17 05:21:50	3925	erowdi.com.	NS	ns1.seizedservers.com.
2019-05-07 01:26:55	2017-03-16 23:21:17	10685	ph-mo.com.	NS	ns1.seizedservers.com.
2019-05-07 01:25:16	2017-03-16 23:04:25	4332	eeepharmacy.com.	NS	ns1.seizedservers.com.
2019-05-07 01:23:48	2017-03-16 14:02:08	12702	alexapharma.com.	NS	ns1.seizedservers.com.
2019-05-07 01:23:35	2019-02-14 21:38:16	2499	srscover.com.	NS	ns1.seizedservers.com.

Threat Hunting Using DNS

Example III. Counterfeit [Currency|Identification|Merchandise|Etc]

Nonetheless, Counterfeit Currency Does Get Advertised Online



https://fakedollarshop.biz/product-category/fake-dollar-banknotes/

fakedollarshop

HOME SHOP NEWS KNOWLEDGE BASE CONTACT US LOGIN CART / $0.00 0

SHOP / FAKE DOLLAR BANKNOTES

Sort by popularity

BROWSE

- Fake dollar banknotes
- Fake euro banknotes
- Fake pound banknotes

FILTER Price: $5 — $25

FAKE DOLLAR BANKNOTES
10 USD
$5.00

FAKE DOLLAR BANKNOTES
20 USD
$9.00

FAKE DOLLAR BANKNOTES
100 USD
$25.00

What Do We See In DNSDB?

Time Last Seen	Time First Seen	Count	Bailiwick	RRname	RRtype	Rdata
2019-04-11 07:55:35	2018-03-03 16:06:39	2195	fakedollarshop.biz.	fakedollarshop.biz.	A	104.27.170.199 104.27.171.199

Showing 1 to 1 of 1 entries

First | Previous | 1 | Next | Last

Whois confirms that **those IP addresses are associated with Cloudflare**, a "reverse proxy" provider that acts to conceal the actual location of a web site's webservers.

Cloudflare also intermingles domains from various customers on the same IPs, thereby making it more difficult to identify closely-related domains

Cloudflare is an example of a site that complicates passive DNS-based approaches.

Get a list of Cloudflare nameservers

```
bapril@rd2:~$ dnsdbq -r *.ns.cloudflare.com/A -j | jq -r '.rrname' | sort | uniq | head
abby.ns.cloudflare.com.
adam.ns.cloudflare.com.
ada.ns.cloudflare.com.
adel.ns.cloudflare.com.
adi.ns.cloudflare.com.
adrian.ns.cloudflare.com.
aida.ns.cloudflare.com.
aiden.ns.cloudflare.com.
ajay.ns.cloudflare.com.
alan.ns.cloudflare.com.
bapril@rd2:~$ dnsdbq -r *.ns.cloudflare.com/A -j | jq -r '.rrname' | sort | uniq > cloudflare_ns.txt
bapril@rd2:~$ wc -l cloudflare_ns.txt
401 cloudflare_ns.txt
```

Get domains associated with the NS list

```
bapril@rd2:~$ cat cloudflare_ns.txt | sed -e "s/^/rdata\/name\//" | sed -e "s/$/\/NS/" | dnsdbq -f -l 1000000 -j > cf_domains.json
```

```
bapril@rd2:~$ wc -l cf_domains.json
77911620 cf_domains.json
```

```
bapril@rd2:~$ cat cf_domains.json | sed -e "/^--$/d" | jq -r '.rrname' > cf_domains.txt
```

```
bapril@rd2:~$ wc -l cf_domains.txt
77911219 cf_domains.txt
```

```
bapril@rd2:~$ ls -lha |grep cf_
-rw-r--r--  1 bapril bapril  11G May  8 04:07 cf_domains.json
-rw-r--r--  1 bapril bapril 1.3G May  8 04:20 cf_domains.txt
```

```
bapril@rd2:~$ grep counterfit cf_domains.txt
encounterfit.com.
counterfitsucks.pw.
counterfitterssav.com.
philjohnsonscounterfitters.com.
encounterfit.com.
buycounterfitmoney.online.
buycounterfitmoney.online.
counterfittin.com.
counterfittin.com.
counterfitllc.com.
counterfitllc.com.
counterfittin.com.
counterfittin.com.
counterfitllc.com.
counterfitllc.com.
counterfit.net.
counterfit.net.
counterfit.io.
counterfitsucks.pw.
counterfitterssav.com.
philjohnsonscounterfitters.com.
counterfit.io.
counterfit.net.
counterfit.net.
bapril@rd2:~$
```

```
bestwatchestoyoucenter.com.
bestwatchestoyoureview.com.
cheapwatches2youcenter.com.
cheapwatches2youreview.com.
cheapwatches4mencenter.com.
cheapwatches4menreview.com.
cheapwatches4youcenter.com.
cheapwatches4youreview.com.
shopwatchestoyoucenter.com.
shopwatchestoyoureview.com.
bestwatches4womencenter.com.
bestwatches4womenreview.com.
bestwatchesformencenter.com.
bestwatchesformenreview.com.
cheapwatchestoyoucenter.com.
cheapwatchestoyoureview.com.
mywatchesforwomencenter.com.
mywatchesforwomenreview.com.
shopwatches4womencenter.com.
shopwatches4womenreview.com.
cheapwatches4womencenter.com.
cheapwatches4womenreview.com.
bestwatchesforwomencenter.com.
bestwatchesforwomenreview.com.
finejewelrywatchesandmore.com.
modernwatchesonlinemarket.com.
cheapsmartwatches.net.
replicaswisswatches.net.
rosegoldwatches.xyz.
watchescoupon.info.
dealsondesignerwristwatches.info.
clothingshoesmenswatchesorigin.info.
watchestoday.site.
```

```
canadian-pharmacy.tech.
canadian-trustpharmacy.party.
online-pharmacy.website.
onlineuspharmacy.accountant.
wceapharmacy.com.
shopko-pharmacy.com.
thefacepharmacy.com.
canadianonlinepharmacys.com.
pharmacytechniciansinfo.com.
pharmacytechnicianschoolsusa.com.
gibsonpharmacy.net.
capsulepharmacy.in.
upharmacypdf.ml.
hotcanadianpharmacy.us.
wceapharmacy.com.
shopko-pharmacy.com.
www.shopko-pharmacy.com.
thefacepharmacy.com.
safe-pharmacy-24.com.
canadianonlinepharmacys.com.
pharmacytechniciansinfo.com.
pharmacytechnicianschoolsusa.com.
gibsonpharmacy.net.
canadianpharmacyonline.top.
bachelorofscienceinpharmacy.xyz.
pharmacytechnicianschoolspa.xyz.
howtobecomeapharmacytechnician.xyz.
onlineschoolsforpharmacytechnician.xyz.
pharmacyplus.date.
```

Limits to Passive DNS

Simple Passive DNS Works GREAT…

- **Lots of related domains coexist on a single IP** (or small CIDR block), with no innocent 3rd party domains
- **Many related domains use the same set of dedicated name servers**, with no innocent 3rd party domains
- **The bad guy is apparently stubbornly fond of a favorite domain,** despite being kicked off provider after provider after provider

Passive DNS has a harder time with:

- **ZERO interrelated data points** – e.g., "lone wolf" or domain names, IP addresses, name servers, etc.

- **TOO many related resources** – CDNs etc.

- Related bad guy resources are **comingled inextricably** with innocent 3rd party resources.

Limits Inherent to Passive DNS Results

- **Passive DNS is based on observed DNS queries.** While our sensors see most popular DNS names (and many unpopular ones!) no passive DNS service can guarantee that they'll "always" see "everything." ("Absence of evidence is not evidence of absence.")

- Some content may be intentionally filtered from DNSDB for a variety of reasons. Some traffic may be of low value (example: randomized subdomain attack traffic), other traffic may be reveal proprietary information (such as DNS blocklist content), etc.

- Don't put too much weight on reported counts. In particular, be careful of making comparisons between different domains based on counts. Because we collect passive DNS from above large caching recursive resolvers, those counts will be strongly influenced by the time-to-live values used by each domain.

- Domains can "lie" about where they live (if they do lie, the IPs they *claim* to use may not respond, but we don't check that)

Key Takeaways

- Almost everything we do online uses DNS
  - People can use the Internet to lie, but the Internet itself does not.
- Bad guys often will reuse DNS assets for their malicious infrastructures
- Passive DNS reveals subtle relationships among DNS datasets, from domain names to IP addresses to name or mail or web or file servers
- Uncovering shared Internet infrastructure connections can advance investigations, from e-crime to nation-state attacks
- DNSDB API Trial Key is available for commercial use, however LEO and other non-profits can apply for a grant. Farsight is committed to making the Internet safer for all users.
- Running a sensor and contribute data.
- Additional resources: DNSDB® Get Started Guide (https://www.farsightsecurity.com/get-started-guide)
- Have questions? Contact vixie@fsi.io or bapril@fsi.io

Questions

@bapril

bapril@fsi.io