DNS and Flow

Bulk DNS Analysis

Ed Stoner
DNS and Flow

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Summary

There is a wealth of information in DNS traffic that can add another dimension to flow analysis. We will explore different techniques to analyze DNS traffic and combine that analysis with flow analysis.
## DNS packet format

### Message Format

<table>
<thead>
<tr>
<th>Header</th>
<th>Question</th>
<th>Answer, Authority, and Additional</th>
</tr>
</thead>
<tbody>
<tr>
<td>ID</td>
<td>QNAME</td>
<td>NAME</td>
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<td>QR</td>
<td>QTYPE</td>
<td>TYPE</td>
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<tr>
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<tr>
<td>ARCOUNT</td>
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</tbody>
</table>

### Header

- **ID**
- **QR**
- **OPCODE**
- **AA**
- **TC**
- **RD**
- **RA**
- **Z**
- **RCODE**
- **QDCOUNT**
- **ANCOUNT**
- **NSCOUNT**
- **ARCOUNT**

### Question

- **QNAME**
- **QTYPE**
- **QCLASS**

### Answer, Authority, and Additional

- **NAME**
- **TYPE**
- **CLASS**
- **TTL**
- **RDLENGTH**
- **RDATA**
Passive DNS

Why we want to:

- No additional queries for someone to see
- You see more than you otherwise would
- Can detect things you otherwise couldn't
- You see what machines actually used ...
Passive DNS

Why we need to:

Client 1: www.goodsite.com, 10.1.2.3
Client 2: www.badsite.com, 10.1.2.3

N1: one to one mapping

N2: one to one, one to many, no mapping
Our Setup

- SIE channel 5
  - ~ 260 million packets/day (3100 packets/sec)
  - Represents ~ 370 million packets (de-dup over 4 hours)
  - ~ 200 Bytes/packet
  - ~ 56 GB day raw / ~ 17 GB day with gzip
  - 200,000 msgs per file, ~ 1200 files per day
  - Typical query time between 30 min and 2 hours
Traffic Summary

RBLs account for many millions of A record request per day.
For certain networks, up to 80% of lookups are to RBLs.
Common RBLs seen: ciphertrust.net, vcxde.com, borderware.com, sonicwall.com, fzrbl.org
Fast Flux

- Lots of IP addresses per one domain name
- Provides better uptime for bad sites
  - Load distribution
  - Hard to trace
  - Hard to takedown

- How to find
  - Iterate over message with
    - Low ttl (less than 2000 seconds)
    - Lots of A records per message (10 or more)
  - Iterate by qname of possible messages
    - Total number of uniq A records/IP addresses (25 or more)
    - Total number of ASNS (20 or more)
Fast Flux found (10/20/2009, 10/23/2009)

browers-ca.com.til1tli.net.
browers-ca.com.til1tli.net.
cadtrans.net.til1tli.com.
cpan.cpanel.net.
csajn.com.
dessaxzaa.co.uk.
diff.cpanel.net.
doubleclickr.ru.
fffeefti.co.uk.
heiiikuv.eu.
httpupdate.cpanel.net.
layer1.cpanel.net.
layer2.cpanel.net.
mgrpra.com.
okkkikla.eu.
okkkikl.eu.
rdate.cpanel.net.
rdate.darkorb.net.
rrref1aaz.eu.
sclrz.com.
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Malicious Domains

- Registered by bad actor – not compromised
- How to find
  - Cheat by starting with list
    - APWG
    - Maybe won’t have to
  - Name has large amount of unique characters (over 20)
  - Name has tld in middle (www.yourbank.com.imbad.com)
Other

- DNS exfiltration/tunneling
  - Over 40 uniq chars in qname
- DNS amplification
  - For DDOS participation
- Outbound connections with no previous resolution
- DNS rebinding
  - www.attacker.com -> some.public.ip, ttl = 2
  - www.attacker.com -> 10.1.mydatabase.ip
- Just plain out of the ordinary
  - ns1.ziyouforever.com (zi you men – “door to freedom”)
    - 784bc3c09961b67b5f3f6f6783a54881b59f5e53680937d7ce281407.6.bnhyj.com
    - 08f0b06a25a5cf1f9df501bc39306fbc6ff7875646817b4845c17da0.6.ewsxz.com
On with the flow

- How to use results with flow
- Pysilk

```python
import ncap
import sdnslib
import silk

ips = silk.IPSet()
f = ncap.ncapfile('/path/to/my/file')

for msg in f:
    dnsmsg = sdnslib.message(msg.payload)
    for rr in dnsmsg.answers:
        ips.add(rr['address'])

ips.save('/path/to/my/ip.set')
```
IPs to names

```python
import ncap
import sdnslib
import silk
lookup = {}
for msg in ncap.ncapfile('/path/to/my/file.ncap')
    dnsmsg = sdnslib.message(msg.payload)
    for rr in dnsmsg.answers:
        lookup[rr['name']] = rr['address']
for rec in silk.SilkFile('/path/to/my/file.rw')
    print lookup[rec.dip]
```