ISC.ORG/ANY

(DNS Amplification Attacks)

Eric Ziegast / ISC

DNS-OARC/ICANN

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The global leader in open source DNS

isc.org
Internet Systems Consortium

We want the Internet to work better.

BIND 10

The next big thing in DNS

ISC Professional Services

support	development
training	consulting
audit	design

Call in the experts!

SNS@ISC

The ultimate insurance policy for your DNS

ISC is Public Benefit

F-root	DHCP
SNS-PB	AFTR
BIND	and more

Do what you can to support us

SIE

Changing how the security communities productively collaborate

RPZ

New method for DNS-based policy enforcement

Taking back the DNS!

RPKI

Securing BGP from route hijacking

DNS Amplification

- What is it?
- Ingredients:
  - Bad actor (hosting, malware)
  - Lack of BCP38 filtering
  - Open recursive nameserver

Recipe Math

- Rent an unmetered 10Mbps server with stolen CC
  - Cloud? Bulletproof?
- Ask an open recursor a 36-byte "ANY" query resulting in 50x response directed at victim IP.
  - Your rate: 10 pps / 2880 bps (b = bits)
  - Victim rate: 10 pps / 144 kbps (will anyone notice?)
- Multiply by 3000 open recursors
  - Your rate: 60 kpps / 8.6 mbps (will ISP notice?)
  - Victim rate: 60 kpps / **432 mbps** (victim *will* notice)
- Add servers as necessary to get N Gbps

Very hard to trace

- Start from the point of view of victim ISP
  - Where are the packets coming from?
    - Backtracing skills in industry are weak
    - Do NOC people have the tools they need?
  - How do I mitigate the flood?
    - Turn off customer, nope
    - Beg upstreams for help
      - What do they do?

Winning!

- In 2009, bad actors used to prefer "./NS"
  - Small query, large answer, widely used
  - Hard to differentiate illegitimate queries
  - Great write-up with pointers:

    http://www.secureworks.com/research/threats/dns-amplification
- In 2011, "isc.org/ANY" is preferred

```
# dig @213.214.0.44 isc.org ANY | grep SIZE
;; MSG SIZE  rcvd: 3437
```

- Whose fault is this?
  - Must be ISC -> block ISC.ORG!
  - Must be DNSSEC -> scourge!

Why “isc.org/ANY”?

- Great documentation and tools available:
  - http://dnscurve.org/amplification.html
  - http://dnscurve.org/dnssecamp.html

    ♥ *thanks* ♥
  - Interesting rebuttal:
    - http://dankaminsky.com/2011/01/05/djb-ccc/
- Why not? Hackers love ISC
  - That bastard who took a stand against SPAM
  - Security involvement
- Sucks to be ISC – or does it?

The real problems

- Bad intentions
  - Someone wants to inflict harm
- Guns
  - Rent-a-server, cost-shifting, malware, botnets
- Bullets
  - Open recursors
  - Lack of BCP38 enforcement
- No accountability
  - Not easy to trace back
  - Crooks don't get caught (?)

BCP 38

Ingress Filtering for Multihomed Networks

http://tools.ietf.org/html/rfc2827

Snippet:

```
                   11.0.0.0/8
                          /
                      router 1
                        /
                       /
                      /                       204.69.207.0/24
ISP <----- ISP <---- ISP <--- ISP <-- router <-- attacker
 A          B         C        D         2
           /
          /
         /
     router 3
       /
   12.0.0.0/8
```

(also see BCP 84 - http://www.ietf.org/html/3704)

Peering

- What guidelines are used?
  - 24-hour NOC, Packet ratios, Multiple regions
- What about BCP38?
  - BCP38 ISP <=> BC38P ISP (yay!)
  - BCP38 ISP <=> non-BCP38 ISP

    Security headache – loaded gun

    Cost-shifting

    Need to filter traffic (?)

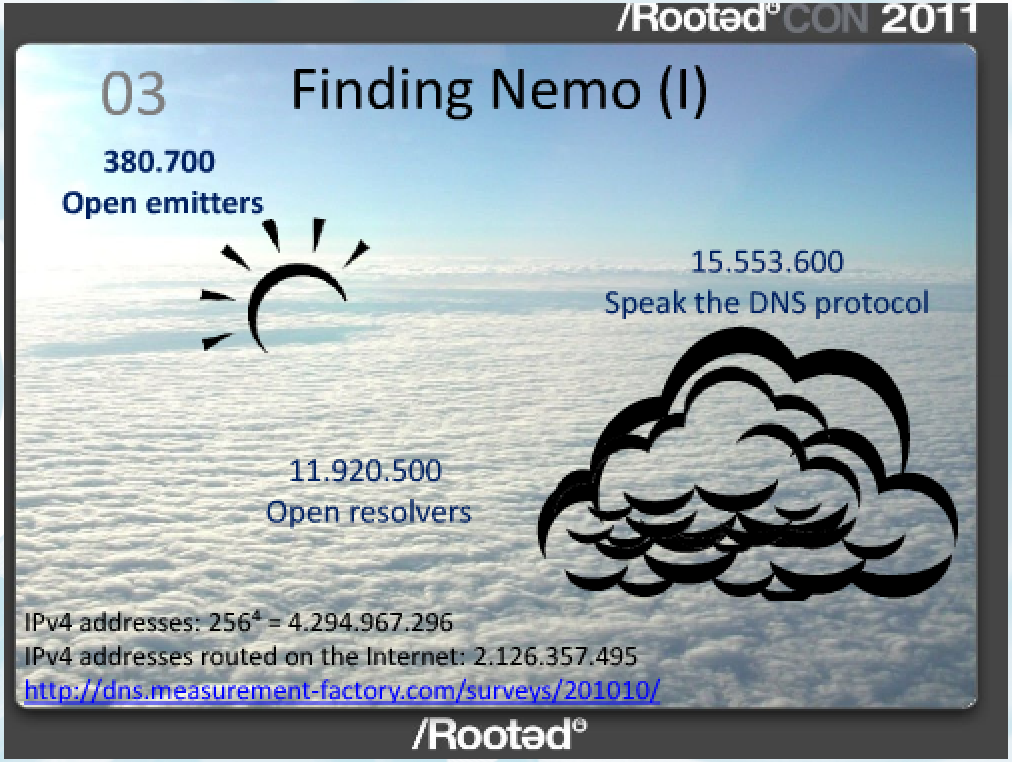
    Transitivity A<->B<->C

Peering (cont)

- Verification and reputation service for BCP38 enforcement?
- Transparency
  - How many Atlas/RIPE dongls are on your net?
  - Got a PCH box on there?
  - How about a Team Dragon box?

Open resolvers

- Check out RootCon 2011 presentation: http://tinyurl.com/6fxzxwd



/Rooted CON 2011

03 Finding Nemo (I)

380.700
Open emitters

15.553.600
Speak the DNS protocol

11.920.500
Open resolvers

IPv4 addresses: 256^4 = 4.294.967.296
IPv4 addresses routed on the Internet: 2.126.357.495
http://dns.measurement-factory.com/surveys/201010/

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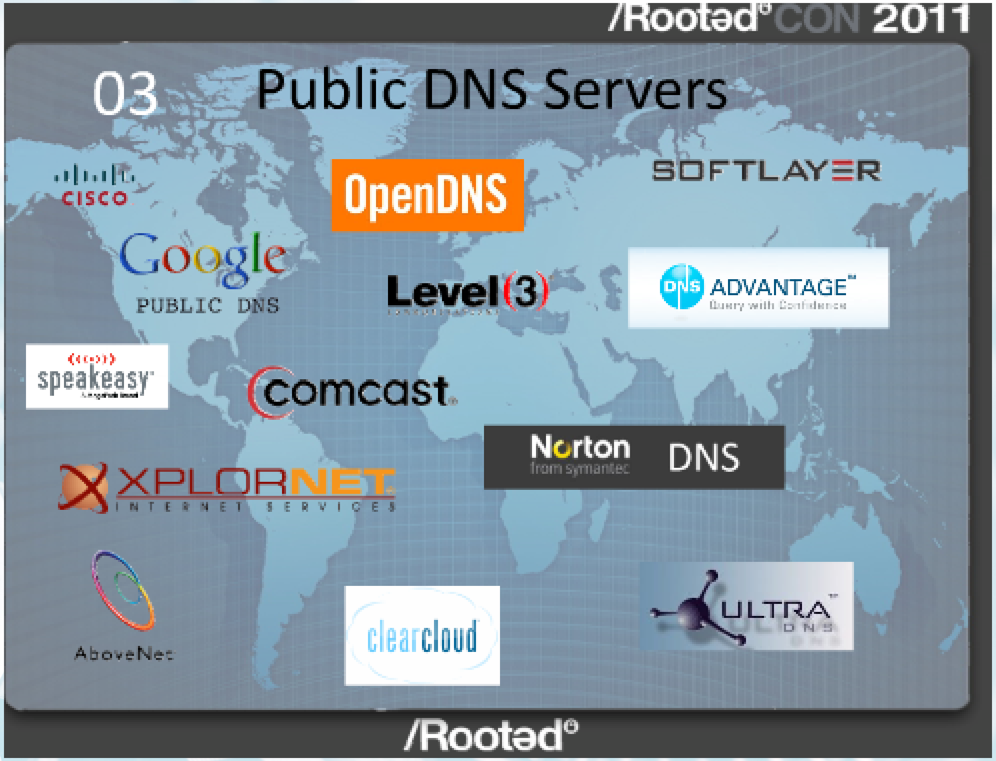
Do ISPs need to maintain OR?



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03 Public DNS Servers

CISCO
OpenDNS
SOFTLAYER
Google PUBLIC DNS
Level(3)
DNS ADVANTAGE Query with Confidence
speakeasy
comcast
Norton from symantec DNS
XPLORNET INTERNET SERVICES
AboveNet
clearcloud
ULTRA DNS
/Rooted®

Really?

ANY filtering?

- Curious:

```
# Verizon
$ dig @198.6.1.3 isc.org ANY | grep SIZE
;; MSG SIZE  rcvd: 258

# OpenDNS
$ dig @208.67.222.222  isc.org ANY | grep SIZE
;; MSG SIZE  rcvd: 140

# Google
$ dig @8.8.8.8 isc.org ANY | grep SIZE
;; MSG SIZE  rcvd: 2870

# Level3
$ dig @4.2.2.2  isc.org ANY | grep SIZE
;; MSG SIZE  rcvd: 3117
```

Mitigation

- Education campaigns
  - Does your ISP abide by BCPs?
  - Turn off or modify open recursors
    - Why are they needed?
      - Got Google, OpenDNS, Level3, Verizon, etc.
    - If you need to run one, use some BCPs
      - Rate limiting, monitoring, reactive filtering
- Open resolver tracking
  - Action -> ORBL? (IP list, RPZ+FW)
  - Rate limiting from known open resolvers?

Backtracing and the Art of War

- Great overview:
  - http://www.csm.ornl.gov/~dunigan/oci/bktrk.html
- Internet Samaurai mentoring
- 7 P's - no on-the-job training
- Centralized mobilization – real time

```
                    11.0.0.0/8
                         /
                     router 1
                       /
                      /                        204.69.207.0/24
ISP <----- ISP <---- ISP <--- ISP <-- router <-- attacker
 A          B         C        D         2
           /
          /
      router 3
        /
    12.0.0.0/8
```

ISC Plan

- We don't yet know the source
  - Malware activation? Hosting? Bad CPE?
  - Not benign (define “benign”) - target appears typical
- Blog the problem
  - FAQ, recommendations, BCPs, monitoring toolkit
- Auth server packet capture
  - Already easily see open resolvers used in attack
  - Real-time release of NS list
  - Backtrace: Plug into snort / capture infrastructure
    - CSIRT, NSP-SEC, CERTs, Rolodex

Plan A (cont.)

- Figure out and understand source
- Work with LE & operational security community to go after sources
- Unfortunately: Once we find it, the bad guys will adapt.
- Want to help?
  - Can offer feed directly to OARC servers
  - Login, join the fun