# IETF Hackathon: DNS/DNSSEC/ DNS Privacy

IETF 102
14-15 July, 2018
Montreal

# Hackathon Plan

- 2 type of project
  - Solving real operations issues
    - Multi-Vendor DNSSEC
    - CNAME at Parent/APEX
  - DNS Privacy
    - Oblivious DNS
    - DoH/DoT

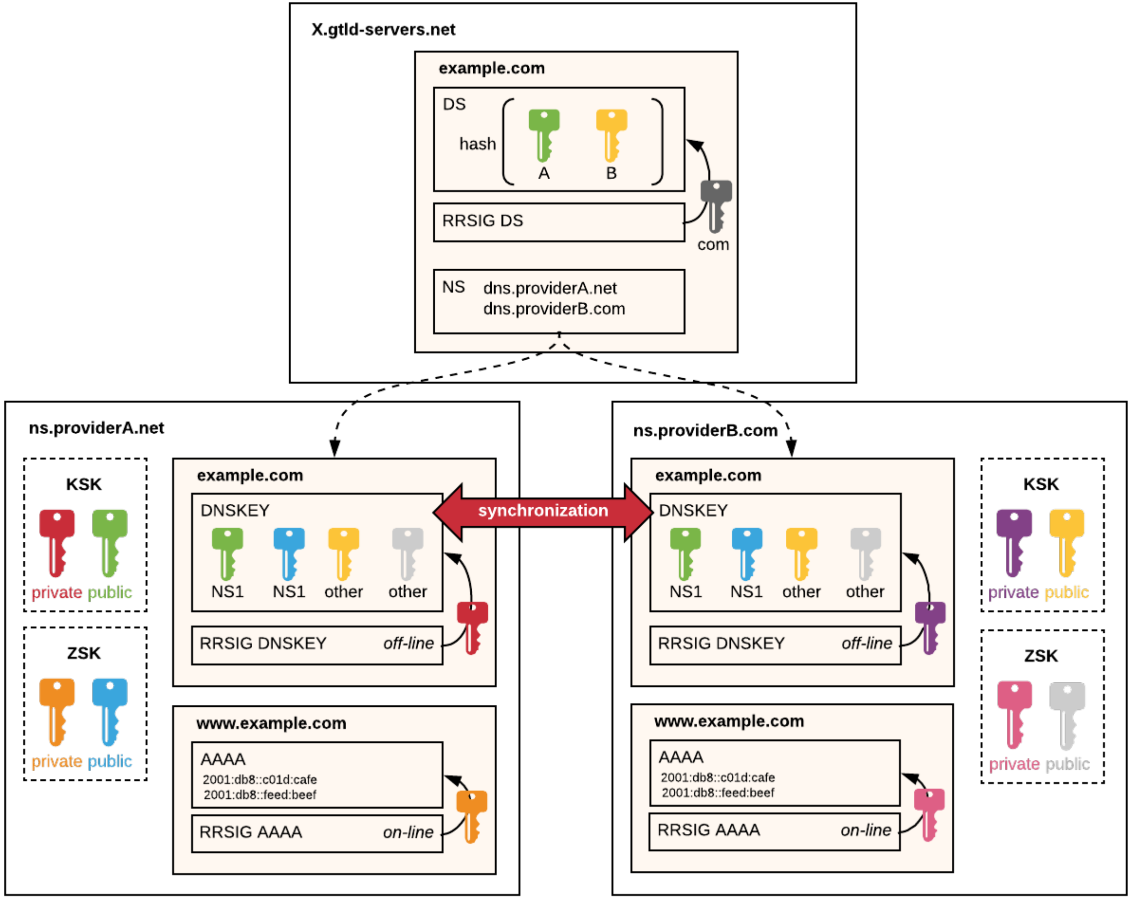
# Multi-provider DNSSEC

draft-huque-dnsop-multi-provider-dnssec-03

- **Multi-provider models** allow DNSSEC to be deployed across multiple DNS providers

- **Each independently signing the same zone.**

- This mode of operation is needed to accommodate configurations that deploy non-standardized features like traffic management.



X.gtld-servers.net

example.com

DS hash A B

RRSIG DS

com

NS dns.providerA.net dns.providerB.com

ns.providerA.net

KSK private public

ZSK private public

example.com

DNSKEY NS1 NS1 other other

RRSIG DNSKEY *off-line*

www.example.com

AAAA 2001:db8::c01d:cafe 2001:db8::feed:beef

RRSIG AAAA *on-line*

synchronization

ns.providerB.com

example.com

DNSKEY NS1 NS1 other other

RRSIG DNSKEY *off-line*

www.example.com

AAAA 2001:db8::c01d:cafe 2001:db8::feed:beef

RRSIG AAAA *on-line*

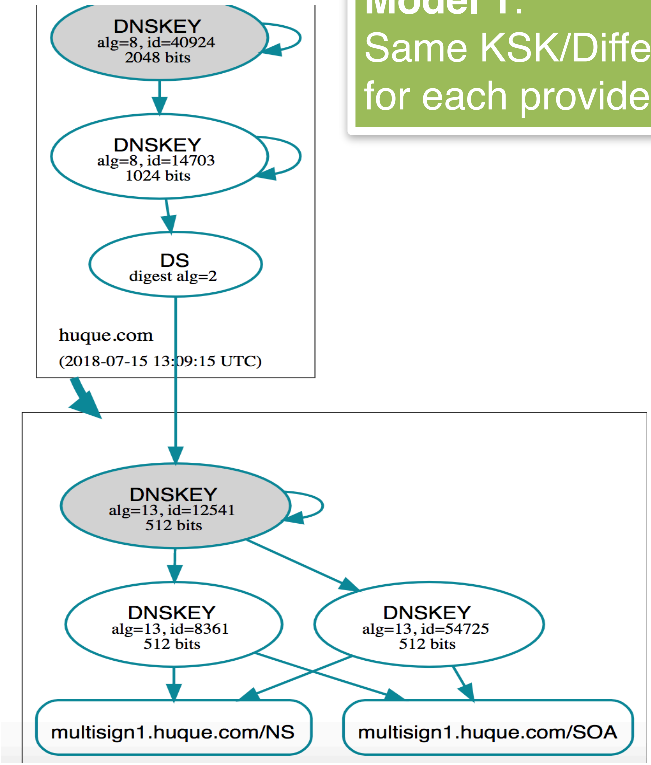
KSK private public

ZSK private public

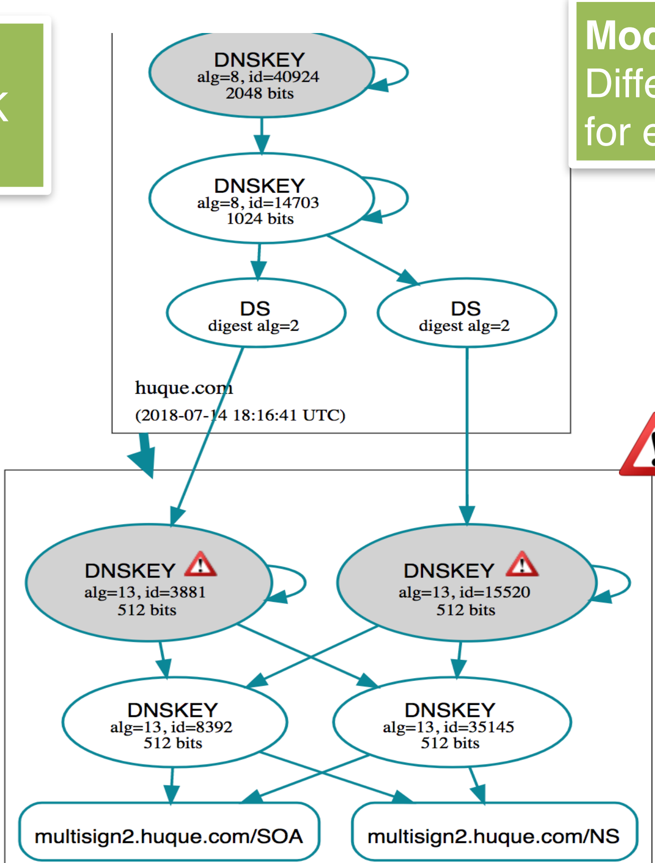
# Multi-provider DNSSEC

[draft-huque-dnsop-multi-provider-dnssec-03](draft-huque-dnsop-multi-provider-dnssec-03)

**Model 1**:
Same KSK/Different ZSK
for each provider



**Model 2:**
Different KSK/ZSK
for each provider



⚠ Some DNS diagnostic tools flag this configuration even though validation works. These tools will likely need to be updated.

# Accomplishments

Pallavi Aras
Jan Vcelak
Shumon Huque
Dave Blacka
Ralph Dolmans
Lucas Estienne

- **Deployed** and **validated** that **both multi-provider models work**
- Noted that some **DNS diagnostic tools** issue warnings, because they didn’t anticipate some configurations
- Drafted minimal **API for DNS providers** to synchronize ZSK public keys
- **Tools to check** DNSKEY and DS RRsets across servers for consistency

Ondrej Sury

# CNAME + DNAME draft

draft-sury-dnsop-cname-plus-dname/

1. Real Ops Issue: No (std) CNAME at Parent/Apex - we need a fix!!

2. **Put CNAME + DNAME in the parent zone & see what works/breaks**

3. **Put CNAME + DNAME into the apex of the zone & see what works/breaks**

- Setup:
  - Auth server: BIND 9.13.2 + experimental/cname-at-apex branch
  - Zones: cname-at-apex.rocks, cname-plus-dname.rocks

# CNAME + DNAME draft

Ondrej Sury

draft-sury-dnsop-cname-plus-dname/

1. Real Ops Issue: No (std) CNAME at Parent/Apex - we need a fix!!
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Ondrej Sury

# CNAME + DNAME draft

draft-sury-dnsop-cname-plus-dname/

1. Real Ops Issue: No (std) CNAME at Parent/Apex - we need a fix!!
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3. **Put CNAME + DNAME into the apex of the zone & see what works/ breaks** 👎

- Setup:
  - Auth server: BIND 9.13.2 + experimental/cname-at-apex branch
  - Zones: cname-at-apex.rocks, cname-plus-dname.rocks

# CNAME + DNAME @ PARENT Results

| DNSSEC Validation Enabled | No QNAME Minimization | Relaxed QNAME Minimization | Strict QNAME Minimization |
|---|---|---|---|
| BIND 9.11.4 | **OK!** | N/A | N/A |
| BIND 9.12.2 | **OK!** | N/A | N/A |
| BIND 9.13.2 | **OK!** | **OK!** | **OK!** |
| PDNS Recursor 4.1.3 | **DNAME fails [2]** | N/A | N/A |
| Unbound 1.7.3 | **OK!** | **OK!** | **OK!** |
| Knot Resolver 2.4.0 | N/A | **Mixed [1]** | N/A |
| Google Public DNS | **OK!** | N/A | N/A |
| Verisign Public DNS | **OK!** | N/A | N/A |
| Quad 9 | **DNAME fails [2]** | N/A | N/A |
| Cloudflare 1.1.1.1 | N/A | **Mixed [1]** | N/A |

1. DNAME returns SERVFAIL *AND* Correct Resource Records
2. PowerDNS 4.2 has some DNAME fixes in the roadmap

# CNAME at APEX Results

| DNSSEC Validation Enabled | No QNAME Minimization | Relaxed QNAME Minimization | Strict QNAME Minimization |
|---|---|---|---|
| BIND 9.11.4 | CNAME MASKS APEX | N/A | N/A |
| BIND 9.12.2 | CNAME MASKS APEX | N/A | N/A |
| BIND 9.13.2 | CNAME MASKS APEX | CNAME MASKS APEX | CNAME MASKS APEX |
| PDNS Recursor 4.1.3 | CNAME MASKS APEX | N/A | N/A |
| Unbound 1.7.3 | CNAME MASKS APEX | CNAME MASKS APEX | CNAME MASKS APEX |
| Knot Resolver 2.4.0 | N/A | CNAME MASKS APEX [1] | N/A |
| Google Public DNS | CNAME MASKS APEX [1] | N/A | N/A |
| Verisign Public DNS | CNAME MASKS APEX | N/A | N/A |
| Quad 9 | CNAME MASKS APEX | N/A | N/A |
| Cloudflare 1.1.1.1 | N/A | CNAME MASKS APEX [1] | N/A |

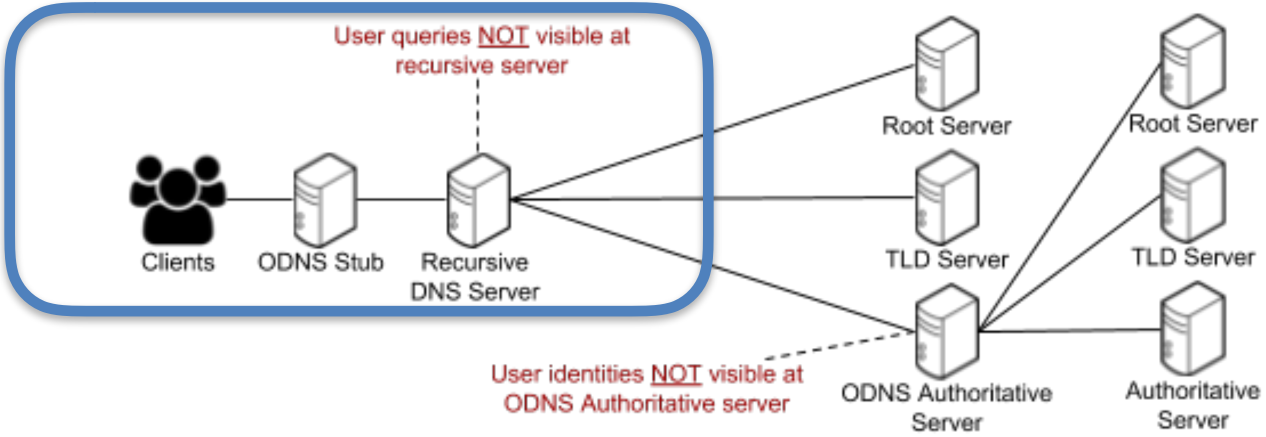
[1] MX is masked to CNAME target, but SOA isn’t

Nick Feamster
Willem Toorop
Ralph Dolmans
Allison Mankin

# Oblivious DNS

draft-annee-dprive-oblivious-dns/

GOAL: No single entity stub/recursive sees both client IP + query : add **ODNS stub**


User queries NOT visible at recursive server
Clients
ODNS Stub
Recursive DNS Server
Root Server
TLD Server
ODNS Authoritative Server
Root Server
TLD Server
Authoritative Server
User identities NOT visible at ODNS Authoritative server

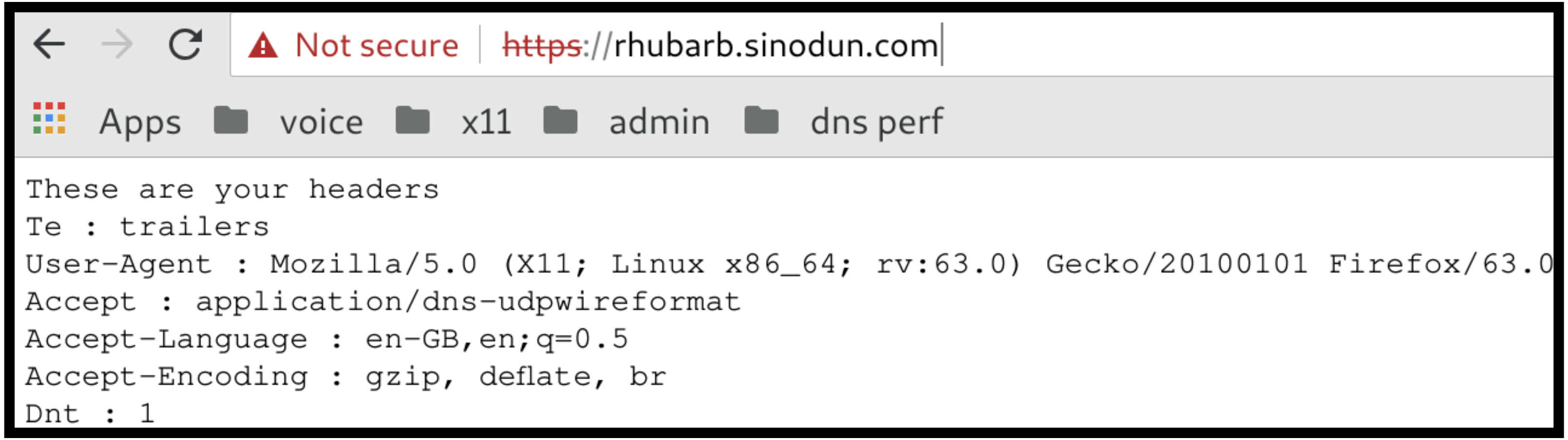
- Existing golang prototype: work started on porting to C (getdns/unbound)
- **DNS recommendations fed back to draft authors (and golang code)**
- Lots of new very cool (and short!) crypto implemented in C

# DoH work

- **DoHPE:** Privacy/anonymity profile DoH (new draft)
- **DoH fingerprinting tool**
  Proxies requests, displays headers (few lines of go)

Sara Dickinson,
Stephane Bortzmeyer, ++

John Dickinson



```
These are your headers
Te : trailers
User-Agent : Mozilla/5.0 (X11; Linux x86_64; rv:63.0) Gecko/20100101 Firefox/63.0
Accept : application/dns-udpwireformat
Accept-Language : en-GB,en;q=0.5
Accept-Encoding : gzip, deflate, br
Dnt : 1
```

# Other projects

- **Recursive to Auth TLS:** draft-bortzmeyer-dprive-resolver-to-auth/

  Port of old DNS-over-TLS patch to NSD trunk. Successful testing with kdig, getdns, etc.  Some performance and corner case testing. No surprises…yet.

  Stephane Bortzmeyer

- **DNS Zone Digest:** draft-wessels-dns-zone-digest/
  Several updates will be reported to the authors

  Shane Kerr

# Wrap Up

**Team members:**

Stephane Bortzmeyer
Shane Kerr
Benno Overeinder
John Dickinson
Willem Toorop
Ralph Dolmans
Sara Dickinson
David Blacka
Shumon Huque
Jan Vcelak
Ondrey Sury
Allison Mankin

**First timers @ IETF/Hackathon:**

Vaughan Perry
Pallavi Aras
Lucas Estienne