



University of  
New Hampshire

# UNH

## Domain Name Service

### Overview of the University of New Hampshire DNS Operation

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- DNS at UNH
  - Authoritative
  - Delegations, Sub-Domains
  - Caching
- Dynamic DNS
- Protecting DNS

# DNS Resource Records

- Name                      eg. www.unh.edu
- Type                      A PTR AAAA CNAME TXT MX
- Class                      IN for Internet Record
- Rdlength                  length in octets of Rdata
- Rdata                      Describes the Resource
- (address of the name)

# Address Record example

```
dig www.unh.edu
---
;; ANSWER SECTION:
www.unh.edu.      300      IN      A      132.177.132.99
~
~
~
```

NAME	TTL	CLASS	TYPE	RDATA
www.unh.edu	300	IN	A	132.177.128.99

# TXT (text) Record example

```
dig unh.edu txt
---
;; ANSWER SECTION:
unh.edu.      300      IN       TXT      "brevo-code:59b3a18744d24f960bd78166f34f87c5"
unh.edu.      300      IN       TXT      "v=spf1 include:%{i}._ip.%{h}._ehlo.%{d}._spf.vali.email ~all"
unh.edu.      300      IN       TXT      "kalFjJr0aINP1W3NsIkMJ54W1nbfYaEq+KB2Sv59vuwk+IvYl3B6oS+BXZTUWmV3sh8gOda8PKaPR06UthtKw=="
unh.edu.      300      IN       TXT      "MS=ms83123557"
unh.edu.      300      IN       TXT      "ecostruxure-it-verification=a5d461d6-381e-414f-a841-406d35adc6de"
unh.edu.      300      IN       TXT      "p97pdo41uabdp794oeslgiqm0c"
unh.edu.      300      IN       TXT      "facebook-domain-verification=365v2rdn8vcv8khorj0t2omd96cjot"
unh.edu.      300      IN       TXT      "google-site-verification=RGZA0mMI8yyY4n5P5CCjwKkFispZEjJDQ0ZPM3n0ihs"
unh.edu.      300      IN       TXT      "bCPyawUYSK6Mb3g4rkXkG8UamHfRF6oPVSuSN+Prgu9eqkpFCjBT05/Iriv+oY/oiap0gYLVnvsknUbMv3pf5Q=="
unh.edu.      300      IN       TXT      "DZC" "T6MFEfQ"
unh.edu.      300      IN       TXT      "docusign=48670095-e238-4b1c-a4d8-46985245e60c"
unh.edu.      300      IN       TXT      "brevo-code:2234ddef09ed2b8787c6d93f0d819572"
unh.edu.      300      IN       TXT      "Sendinblue-code:160d1089769095a328703e634f5de06f"
unh.edu.      300      IN       TXT      "google-site-verification=EdWChc29r-pivLURIP1-SDQG5x_x7nn52SszSo_WaWUI"
unh.edu.      300      IN       TXT      "adobe-idp-site-verification=c72276468d8ad7daa06fc05b3fb7d859465513ffc061216675fe8bd22b236f12"
```

NAME	TTL	TYPE	RDATA
unh.edu	300	TXT	"v=spf1 include:%{i}._ip.%{h}._ehlo.%{d}._spf.vali.email ~all"
unh.edu	300	TXT	"docusign=48670095-e238-4b1c-a4d8-46985245e60c"
unh.edu	300	TXT	"DZC" "T6MFEfQ"
unh.edu	300	TXT	"facebook-domain verification=365v2rdn8vct2omd96cjot"

# Resource Records

( a few of many )



TYPE	Purpose – what RR resolves
SOA	Start of Authority – admin info, primary NS and email
NS	Domain to a name of a authoritative nameserver
A	Name to IPv4 address
AAAA	Name to IPV6 address
MX	Mail eXchange, resolves mail server(s) for domain
PTR	Reverse IP address to a name (eg 99.128.177.132.in-addr.arpa.)
CNAME	Alias name to Canonical (DNS) Name

RFC1035 Early specifications for initial set of DNS Resource Records  
[www.rfc-editor.org/rfc/rfc1035.html](http://www.rfc-editor.org/rfc/rfc1035.html)

# CNAME Record example

```
agate ~]$ dig unhserves.unh.edu

;; Got answer:
;; ->>HEADER<<- opcode: QUERY, status: NOERROR, id: 58316
;; flags: qr rd ra; QUERY: 1, ANSWER: 5, AUTHORITY: 1, ADDITIONAL: 1

;; OPT PSEUDOSECTION:
; EDNS: version: 0, flags:; udp: 65494
;; QUESTION SECTION:
;unhserves.unh.edu.          IN      A

;; ANSWER SECTION:
unhserves.unh.edu.          7081    IN      CNAME   unh.galaxydigital.com.
unh.galaxydigital.com.     58      IN      CNAME   elb15.galaxydigital.com.
elb15.galaxydigital.com.   58      IN      CNAME   galaxydigital-com-15-2023129066.us-east-1.elb.amazonaws.com.
```

NAME	TYPE	RDATA
unhserves.unh.edu.	CNAME	unh.galaxydigital.com.
unh.galaxydigital.com.	CNAME	elb15.galaxydigital.com.
elb15.galaxydigital.com.	CNAME	galaxydigital-com-15-2023129066.us-east-1.elb.amazonaws.com.
galaxydigital-com-15-2023129066.us-east-1.elb.amazonaws.com.	A	34.199.250.226 (not shown in example above)
galaxydigital-com-15-2023129066.us-east-1.elb.amazonaws.com.	A	52.44.160.248 (not shown in example above)

# Name Servers

## Using '**dig**' to find name servers

```
dig . ns
```

Return list of root name servers

```
dig edu ns @k.edu-servers.net
```

Knows who name servers are for 2 level edu domains

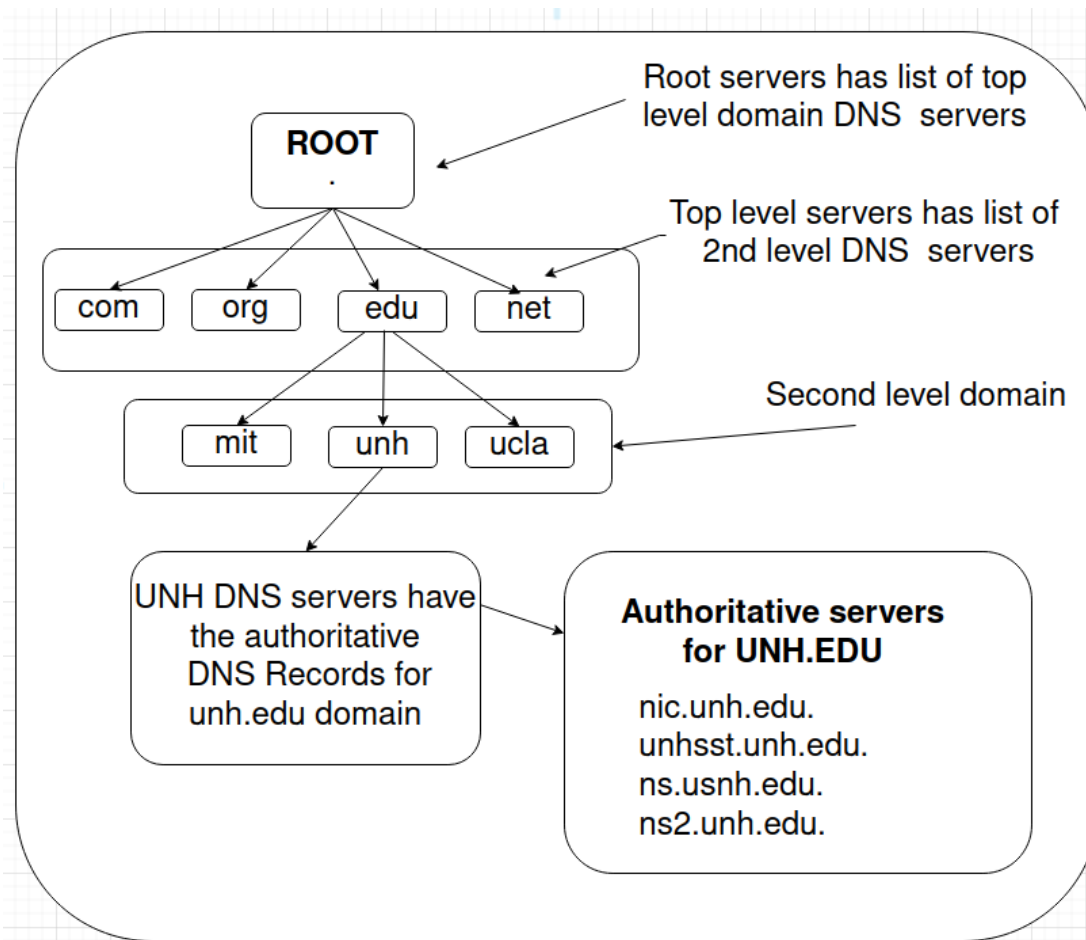
```
dig unh.edu. ns @nic.unh.edu
```

Return name servers for domain unh.edu

Authoritative for all DNS Resource Records in domain “unh.edu.”

==





# DNS Hierarchy

root to 2 level edu domains

```
agate ~]$ dig unh.edu ns @b.edu-servers.net
```

```
;; Got answer:
```

```
;; ->HEADER<<- opcode: QUERY, status: NOERROR, id: 38700
```

```
;; flags: qr rd; QUERY: 1, ANSWER: 0, AUTHORITY: 4, ADDITIONAL: 8
```

```
;; WARNING: recursion requested but not available
```

```
;; OPT PSEUDOSECTION: ; EDNS: version: 0, flags:; udp: 4096
```

```
;; QUESTION SECTION:
```

```
;unh.edu.                IN      NS
```

```
;; AUTHORITY SECTION:
```

```
unh.edu.                172800  IN      NS      nic.unh.edu.
```

```
unh.edu.                172800  IN      NS      unhsst.unh.edu.
```

```
unh.edu.                172800  IN      NS      ns2.unh.edu.
```

```
unh.edu.                172800  IN      NS      ns.usnh.edu.
```

```
;; ADDITIONAL SECTION:
```

```
nic.unh.edu.           172800  IN      A        132.177.128.99
```

```
nic.unh.edu.           172800  IN      AAAA     2606:4100:1800:80::8063
```

```
unhsst.unh.edu.        172800  IN      A        132.177.128.56
```

```
unhsst.unh.edu.        172800  IN      AAAA     2606:4100:1800:80::8038
```

```
ns2.unh.edu.           172800  IN      A        132.177.102.30
```

```
ns2.unh.edu.           172800  IN      AAAA     2606:4100:3fff:102::102:30
```

```
ns.usnh.edu.           172800  IN      A        158.65.126.94
```

```
;; Query time: 103 msec
```

```
;; SERVER: 2001:503:231d::2:30#53(b.edu-servers.net) (UDP)
```

```
;; WHEN: Thu Sep 14 14:49:05 EDT 2023
```

```
;; MSG SIZE rcvd: 263
```

```

agate ~]$ dig unh.edu ns @ns2.unh.edu

; <<>> DiG 9.18.17 <<>> unh.edu ns @ns2.unh.edu
;; global options: +cmd
;; Got answer:
;; ->>HEADER<<- opcode: QUERY, status: NOERROR, id: 18944
;; flags: qr aa rd ra; QUERY: 1, ANSWER: 6, AUTHORITY: 0, ADDITIONAL: 9

;; OPT PSEUDOSECTION:
; EDNS: version: 0, flags:: udp: 1220
; COOKIE: 1a42ea3017dd58d22402b46965044657f475a64c8a19a3fb (good)
;; QUESTION SECTION:
;unh.edu.                                IN      NS

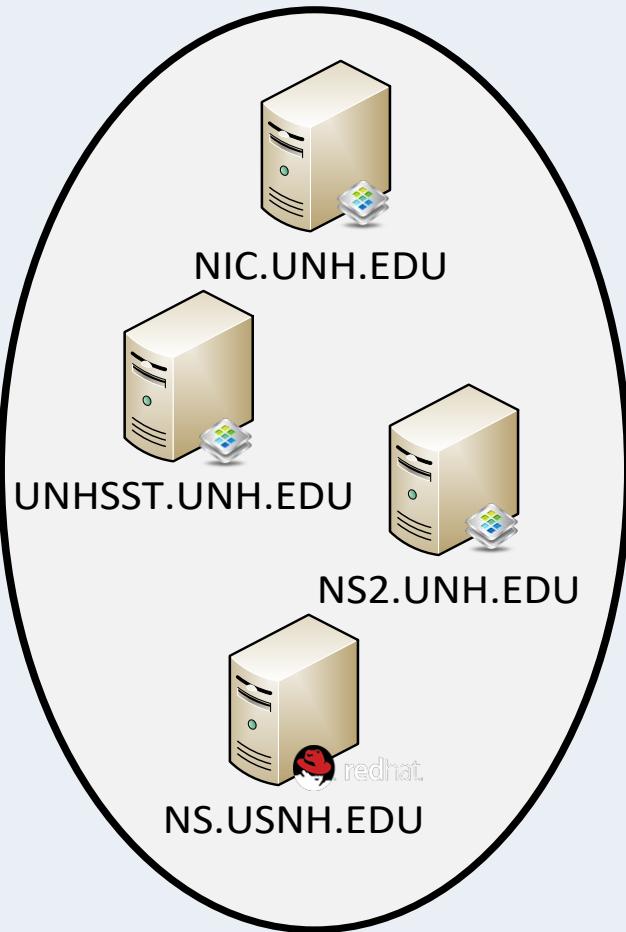
;; ANSWER SECTION:
unh.edu.      86400    IN      NS      unhsst.unh.edu.
unh.edu.      86400    IN      NS      nic.unh.edu.
unh.edu.      86400    IN      NS      ns.usnh.edu.
unh.edu.      86400    IN      NS      psu-ns2.plymouth.edu.
unh.edu.      86400    IN      NS      psu-ns1.plymouth.edu.
unh.edu.      86400    IN      NS      ns2.unh.edu.

;; ADDITIONAL SECTION:
unhsst.unh.edu. 86400    IN      AAAA    2606:4100:1800:80::8038
ns2.unh.edu.    86400    IN      AAAA    2606:4100:3fff:102::102:30
nic.unh.edu.    86400    IN      AAAA    2606:4100:1800:80::8063
psu-ns2.plymouth.edu. 28800    IN      A       158.136.1.101
psu-ns1.plymouth.edu. 28800    IN      A       158.136.1.92
unhsst.unh.edu. 86400    IN      A       132.177.128.56
ns2.unh.edu.    86400    IN      A       132.177.102.30
nic.unh.edu.    86400    IN      A       132.177.128.99

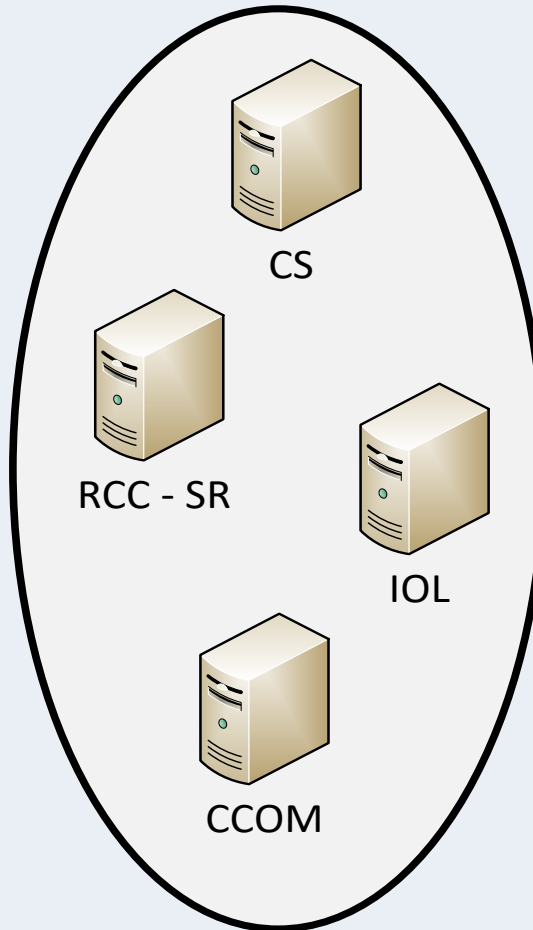
;; Query time: 2 msec
;; SERVER: 2606:4100:3fff:102::102:30#53(ns2.unh.edu) (UDP)
;; WHEN: Fri Sep 15 07:56:07 EDT 2023
;; MSG SIZE rcvd: 360

```

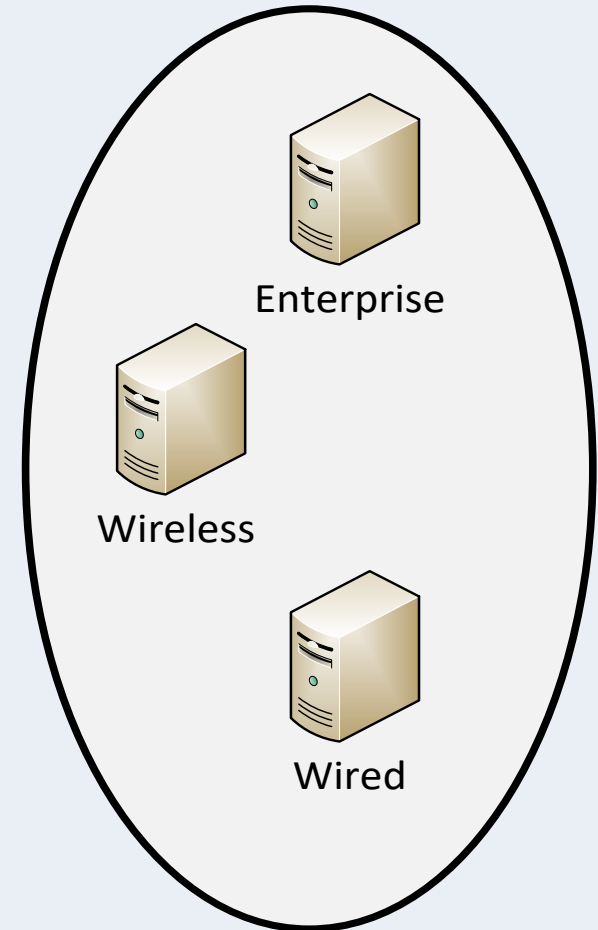
# Servers and Roles



UNH  
Authoritative



Delegated  
Authoritative



Caching

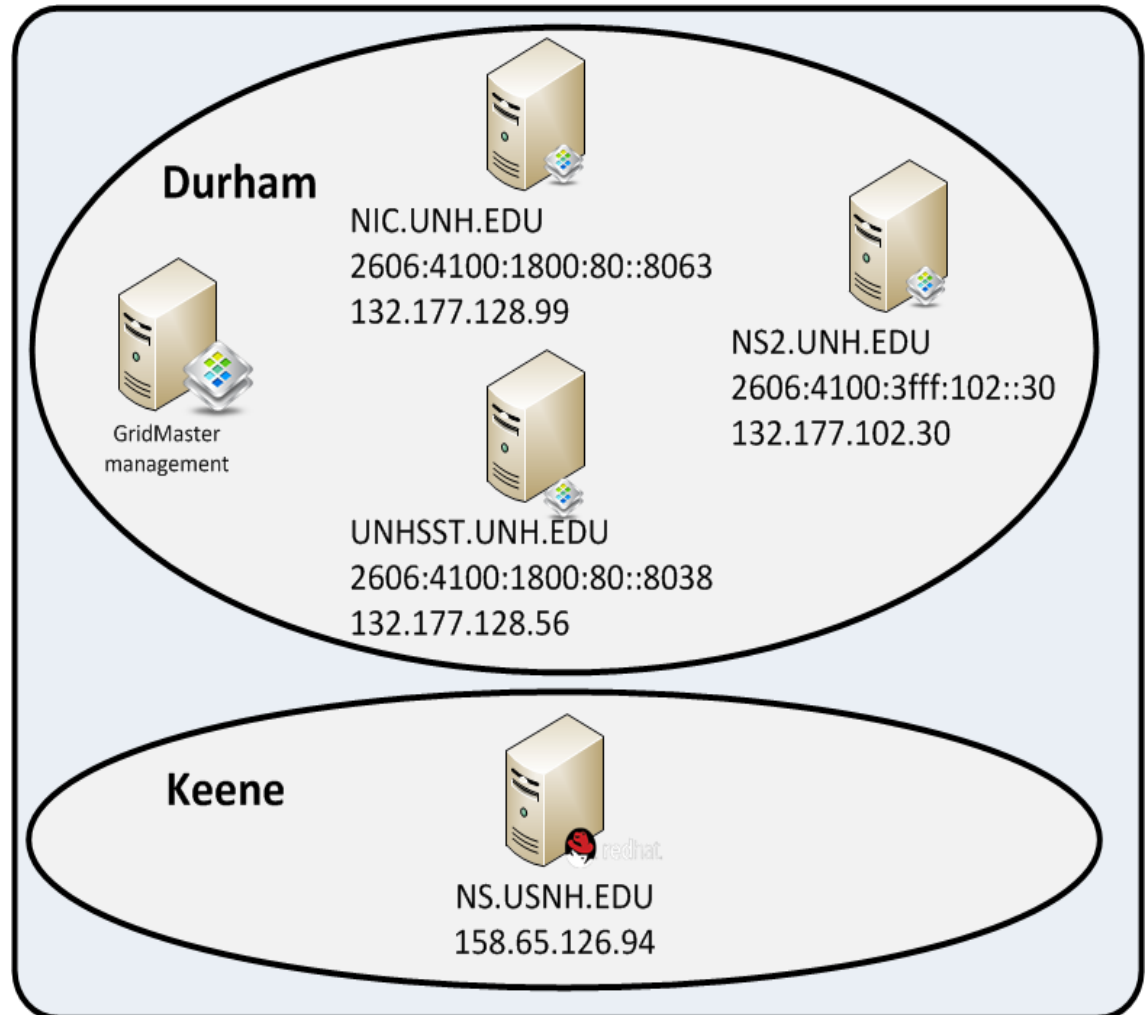
# UNH Authoritative DNS

- DNS Records originate here
  - domains - **UNH.EDU & USNH.EDU**
- Main DNS servers are appliances
  - DDI appliance (sold by infoblox.com)
- NS.USNH.EDU
  - RedHat runs BIND (isc.org)
- Delegate sub-domains
  - example – **CS.UNH.EDU & IOL.UNH.EDU**

# UNH

## Authoritative DNS

- GridMaster manages changes
- DNS servers run independent
- ns.usnh.edu Redhat
  - Disaster Recovery
  - Independent of Infoblox
- Serves
  - several EDU domains
  - com, org & more
  - Delegates to other DNS
- ns.usnh.edu
  - Secondary for Plymouth
  - Independent of Infoblox
- ns2.unh.edu
  - Secondary for Keene



## Zones

Members

Name Server Groups

Shared Record Groups

Blacklist Rulesets

DNS64 Groups

[DNS Home](#) > [UNH](#)

unh.edu

Authoritative Zone



Records

Subzones

Quick Filter 

Off

Filter On

[Show Filter](#)[Toggle flat view](#)

Go to

Go

<input type="checkbox"/>	Name ▾	Type	Comment
<input type="checkbox"/>	<a href="#">gs.unh.edu</a>	Authoritative	UNH-GamingDevices_rail2014
<input type="checkbox"/>	<a href="#">green.unh.edu</a>	Authoritative	GREEN-Fresh-rfc1918
<input type="checkbox"/>	<a href="#">fd22.unh.edu</a>	Authoritative	
<input type="checkbox"/>	<a href="#">exres.unh.edu</a>	Authoritative	
<input type="checkbox"/>	<a href="#">dr.unh.edu</a>	Authoritative	UNH-DR_site-Keene
<input type="checkbox"/>	<a href="#">csc24.unh.edu</a>	Authoritative	
<input type="checkbox"/>	<a href="#">cs.unh.edu</a>	Delegation	Computer Science
<input type="checkbox"/>	<a href="#">comptech.unh.edu</a>	Delegation	UNH_Manchester-ComputerTechnology
<input type="checkbox"/>	<a href="#">colsa-buzzr.unh.edu</a>	Delegation	COLSA -Phil Hammond, 2010-0330.
<input type="checkbox"/>	<a href="#">colsa-buzzr-dev.unh.edu</a>	Delegation	COLSA, Phil Hammond, 2010-0330.
<input type="checkbox"/>	<a href="#">cmu.unh.edu</a>	Authoritative	add for m.delgreco, stk 20140610
<input type="checkbox"/>	<a href="#">cat.unh.edu</a>	Authoritative	
<input type="checkbox"/>	<a href="#">blue.unh.edu</a>	Authoritative	for UNH-IT
<input type="checkbox"/>	<a href="#">bas.unh.edu</a>	Authoritative	Building_Automation_Systems
<input type="checkbox"/>	<a href="#">backup.unh.edu</a>	Authoritative	for_ECG_Exagrid_VLAN-670vid
<input type="checkbox"/>	<a href="#">avs.unh.edu</a>	Authoritative	UNH-AT-AVS
<input type="checkbox"/>	<a href="#">atc.unh.edu</a>	Authoritative	AT-Cluster-IPv6
<input type="checkbox"/>	<a href="#">alert.unh.edu</a>	Authoritative	
<input type="checkbox"/>	<a href="#">ad.unh.edu</a>	Authoritative	Microsoft_Active_Directory
<input type="checkbox"/>	<a href="#">ac.unh.edu</a>	Authoritative	AT_Cluster_IPv6



<input type="checkbox"/> Name ▾	Type	Comment
<input type="checkbox"/> <a href="#">8.e.f.ip6.arpa</a>	Authoritative	Empty_Zone
<input type="checkbox"/> <a href="#">0.0.1.4.6.0.6.2.ip6.arpa</a>	Authoritative	NetBlock-32
<input type="checkbox"/> <a href="#">168.192.in-addr.arpa</a>	Authoritative	NIC-ONLY
<input type="checkbox"/> <a href="#">65.158.in-addr.arpa</a>	Authoritative	Keene_ARPA-Secondary
<input type="checkbox"/> <a href="#">177.132.in-addr.arpa</a>	Authoritative	
<input type="checkbox"/> <a href="#">0.0.127.in-addr.arpa</a>	Auto-created	
<input type="checkbox"/> <a href="#">10.in-addr.arpa</a>	Authoritative	NIC-ONLY
<input type="checkbox"/> <a href="#">yesleadership.org</a>	Authoritative	NIC-NS2-NS
<input type="checkbox"/> <a href="#">whocaresaboutkelsey.com</a>	Authoritative	
<input type="checkbox"/> <a href="#">webmailunhedu.webs.com</a>	Authoritative	RPZ
<input type="checkbox"/> <a href="#">walpole.k12.nh.us</a>	Authoritative	
<input type="checkbox"/> <a href="#">usnhgateway.org</a>	Authoritative	
<input type="checkbox"/> <a href="#">usnh.edu</a>	Authoritative	
<input type="checkbox"/> <a href="#">universityofnewhampshire.college</a>	Authoritative	20150922, test xyz initiative
<input type="checkbox"/> <a href="#">unhtraining.com</a>	Authoritative	
<input type="checkbox"/> <a href="#">unhm.net</a>	Authoritative	UNHM
<input type="checkbox"/> <a href="#">unhbcoe.org</a>	Authoritative	Hosted_By_WebSolutions
<input type="checkbox"/> <a href="#">unh.test</a>	Authoritative	AT-WebSolutions
<input type="checkbox"/> <a href="#">unh.edu</a>	Authoritative	
<input type="checkbox"/> <a href="#">unh.dev</a>	Authoritative	AT-WebSolutions
<input type="checkbox"/> <a href="#">unh.college</a>	Authoritative	20150318, stk@unh.edu



# Delegating DNS

- Example CS.UNH.EDU

- add NS Records on parent (nic.unh.edu)

- cs.unh.edu.      86400 IN    NS      lava.cs.unh.edu.

- cs.unh.edu.      86400 IN    A    132.177.4.32

- Delegate sub-domains

- ad.unh.edu

- bas.unh.edu

- 152.177.132.in-addr.arpa

- 0.C.8.3.0.0.1.4.6.0.6.2.ip6.arpa

# Delegating DNS

- cs.unh.edu
  - Administrative
  - Separation
- ad.unh.edu
  - Microsoft Active Directory
  - Allow Dynamic changes
- bas.unh.edu & 68.177.132.in-addr.arpa
  - protect and/or hide from public

# Check if it is Sub-domain

- Verify a sub-domain
    - use `dig <sub-domain> ns`
    - **`dig cs.unh.edu ns`**
- ;; ANSWER SECTION:
- ```
cs.unh.edu. 600 IN NS cs.unh.edu.  
cs.unh.edu. 600 IN NS lava.cs.unh.edu.
```
- **`dig +trace cs.unh.edu ns`**
    - Recursive from the root DNS servers
    - need port 53 (udp) open or fails

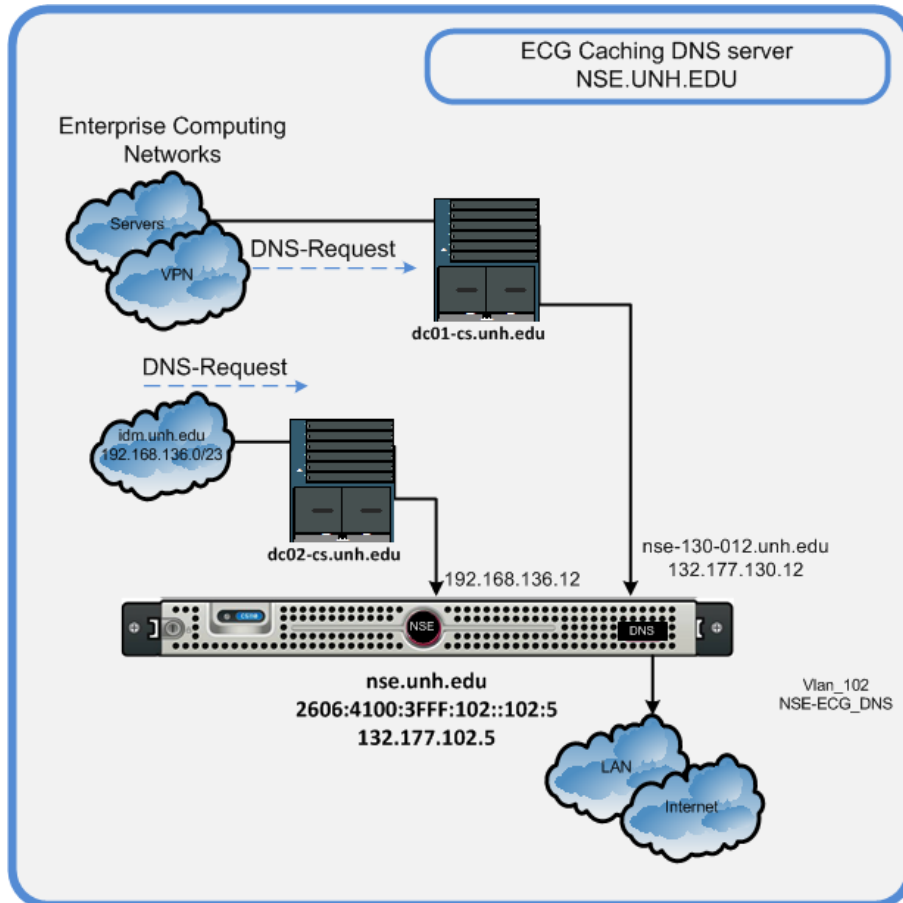
# Caching DNS

- Recursive DNS –serves local
- Cache answer for TTL
- NOT Authoritative
- Separation from Auth. & Internet
- Level of protection from DDOS

# Caching DNS

- Recursive DNS –
  - serves local
  - temp storage of answer
  - **NOT** Authoritative
  - Separation from Authoritative & Internet
  - some protection from DDOS

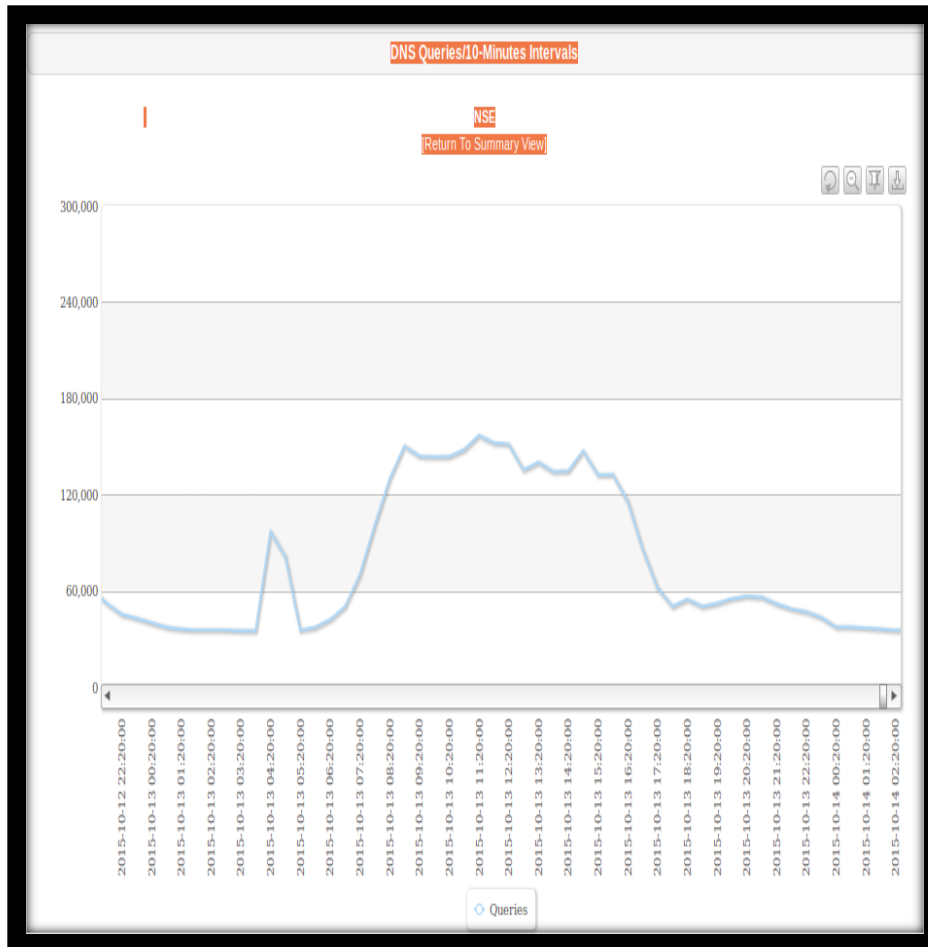
# nse.unh.edu - Caching DNS



- Listens on ECG and IDM subnets
- Sends out Vlan 102
- Only internal clients can query DNS
- Location, Data center
- Local network connections

# NSE caching queries per second

## Normal weekday queries



## Normal queries

Peak approx. 2500/second

Top client Queries 11:20 – 11:29

Client DB server (8037)

– - 13 queries/second

VPN client (2833)

- 5 queries/second

# nse.unh.edu query log

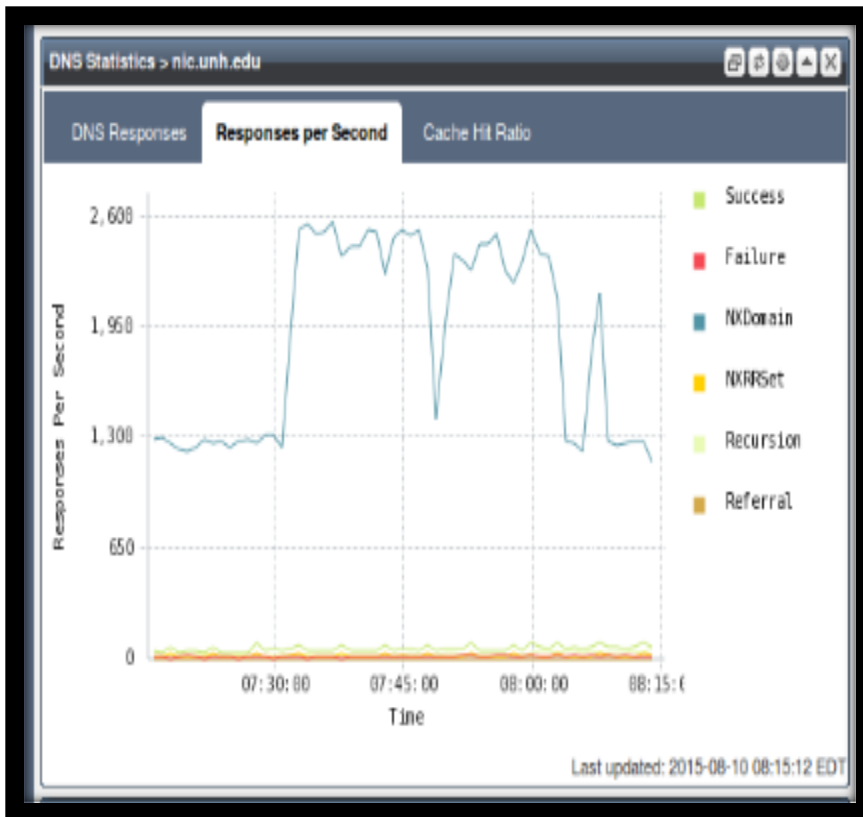
13-Oct-15 11:50:01.994 q: client 132.177.161.193#22479 query: lb3-black.unh.edu

11:50:01.968 132.177.161.193#39875 (180.161.177.132.in-addr.arpa) Q: 180.161.177.132.in-addr.arpa IN PTR + (192.168.102.5)  
11:50:01.994 132.177.161.193#22479 (lb3-black.unh.edu) Q: lb3-black.unh.edu IN A + (192.168.102.5)  
11:50:02.130 132.177.161.193#22860 (lb3-black.unh.edu) Q: lb3-black.unh.edu IN A + (192.168.102.5)  
11:50:02.250 132.177.161.193#30147 (lb3-black.unh.edu) Q: lb3-black.unh.edu IN A + (192.168.102.5)  
11:50:02.361 132.177.161.193#28911 (lb3-black.unh.edu) Q: lb3-black.unh.edu IN A + (192.168.102.5)  
11:50:02.467 132.177.161.193#21597 (lb3-black.unh.edu) Q: lb3-black.unh.edu IN A + (192.168.102.5)  
11:50:02.569 132.177.161.193#52978 (lb3-black.unh.edu) Q: lb3-black.unh.edu IN A + (192.168.102.5)  
11:50:02.673 132.177.161.193#50610 (lb3-black.unh.edu) Q: lb3-black.unh.edu IN A + (192.168.102.5)  
11:50:02.753 132.177.161.193#52939 (lb3-black.unh.edu) Q: lb3-black.unh.edu IN A + (192.168.102.5)  
**11:53:01.900** 132.177.161.193#34319 (pencil.unh.edu) Q: pencil.unh.edu IN AAAA + (192.168.102.5)  
11:53:01.901 132.177.161.193#22062 (pencil.unh.edu) Q: pencil.unh.edu IN A + (192.168.102.5)  
11:53:01.913 132.177.161.193#46408 (pencil.unh.edu) Q: pencil.unh.edu IN AAAA + (192.168.102.5)  
11:53:01.914 132.177.161.193#52382 (pencil.unh.edu) Q: pencil.unh.edu IN A + (192.168.102.5)  
11:53:01.964 132.177.161.193#41402 (52.161.177.132.in-addr.arpa) Q: 52.161.177.132.in-addr.arpa IN PTR + (192.168.102.5)  
11:53:01.966 132.177.161.193#30622 (pencil.unh.edu) Q: pencil.unh.edu IN A + (192.168.102.5)  
11:53:01.968 132.177.161.193#24242 (pencil.unh.edu) Q: pencil.unh.edu IN A + (192.168.102.5)  
11:53:01.969 132.177.161.193#44205 (52.161.177.132.in-addr.arpa) Q: 52.161.177.132.in-addr.arpa IN PTR + (192.168.102.5)  
11:53:01.971 132.177.161.193#42586 (pencil.unh.edu) Q: pencil.unh.edu IN A + (192.168.102.5)  
11:53:01.972 132.177.161.193#34541 (52.161.177.132.in-addr.arpa) Q: 52.161.177.132.in-addr.arpa IN PTR + (192.168.102.5)  
11:53:01.973 132.177.161.193#53834 (52.161.177.132.in-addr.arpa) Q: 52.161.177.132.in-addr.arpa IN PTR + (192.168.102.5)  
11:53:01.974 132.177.161.193#18784 (pencil.unh.edu) Q: pencil.unh.edu IN A + (192.168.102.5)  
11:53:01.974 132.177.161.193#22564 (pencil.unh.edu) Q: pencil.unh.edu IN A + (192.168.102.5)  
11:53:01.975 132.177.161.193#26878 (pencil.unh.edu) Q: pencil.unh.edu IN A + (192.168.102.5)  
11:53:01.976 132.177.161.193#52517 (52.161.177.132.in-addr.arpa) Q: 52.161.177.132.in-addr.arpa IN PTR + (192.168.102.5)  
11:53:01.977 132.177.161.193#33120 (52.161.177.132.in-addr.arpa) Q: 52.161.177.132.in-addr.arpa IN PTR + (192.168.102.5)  
11:53:01.982 132.177.161.193#43594 (pencil.unh.edu) Q: pencil.unh.edu IN A + (192.168.102.5)  
11:53:01.983 132.177.161.193#30019 (52.161.177.132.in-addr.arpa) Q: 52.161.177.132.in-addr.arpa IN PTR + (192.168.102.5)  
11:53:01.985 132.177.161.193#37300 (pencil.unh.edu) Q: pencil.unh.edu IN A + (192.168.102.5)  
11:53:01.986 132.177.161.193#28130 (52.161.177.132.in-addr.arpa) Q: 52.161.177.132.in-addr.arpa IN PTR + (192.168.102.5)  
**11:53:02.094** 132.177.161.193#51282 (pencil.unh.edu) Q: pencil.unh.edu IN A + (192.168.102.5)  
**11:53:02.097** 132.177.161.193#28778 (pencil.unh.edu) Q: pencil.unh.edu IN A + (192.168.102.5)  
**11:53:02.128** 132.177.161.193#18951 (pencil.unh.edu) Q: pencil.unh.edu IN A + (192.168.102.5)  
**11:53:02.130** 132.177.161.193#40745 (pencil.unh.edu) Q: pencil.unh.edu IN A + (192.168.102.5)  
**11:53:02.134** 132.177.161.193#27932 (pencil.unh.edu) Q: pencil.unh.edu IN A + (192.168.102.5)

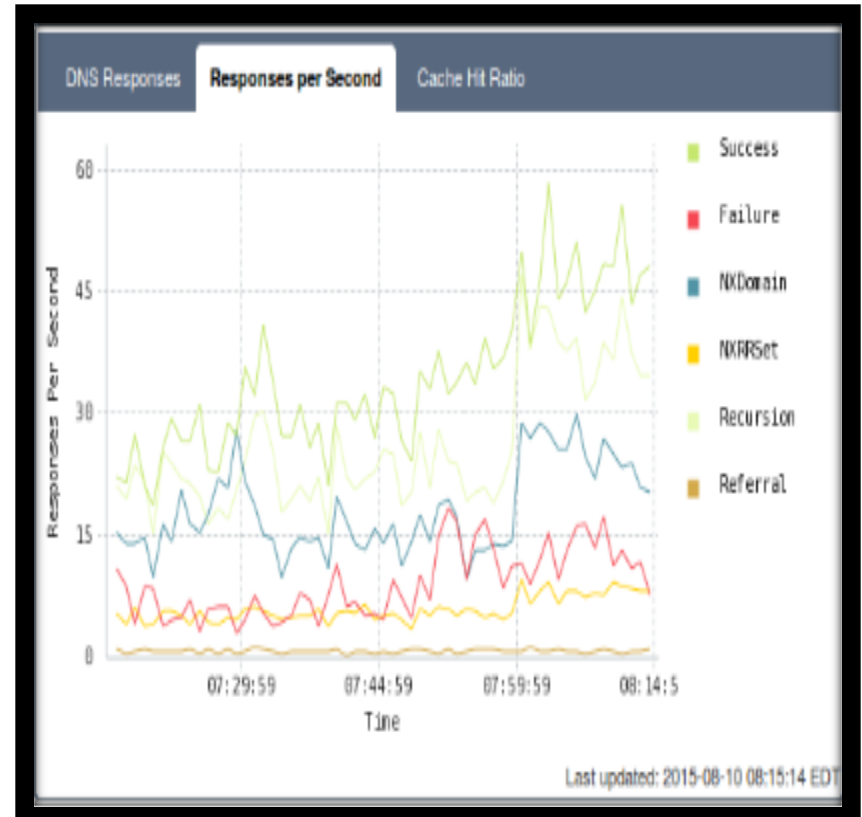


# Query per seconds

## Flooding queries



## Normal queries



# Dynamic DNS

- Add, Delete, Modify DNS Records
- By some type of ACL
  - IP address range (eg. 132.177.154.0/24)
  - TSIG, Key based method, pub/private
  - DHCP – allowed, uses TXT KEYs for authorization
- What are the benefits?
- What problems might this introduce?

# DYNAMIC Records added by DHCP Servers

android-20e04ff00aa41224.yfi.unh.edu. 1800 IN A 10.20.117.120

android-20e04ff00aa41224.yfi.unh.edu. 1800 IN TXT "31a6d863566147dadeac47a2f9d05cef42"

android-20e04ff00aa43438.yfi.unh.edu. 1800 IN A 10.20.192.133

android-20e04ff00aa43438.yfi.unh.edu. 1800 IN TXT "316898c737fa8f778f3beae80fa193e7ef"

bobs-iphone.yfi.unh.edu. 1800 IN TXT "31c661ed44d84143bce6e889e83d28e6aa"

bobs-iphone.yfi.unh.edu. 1800 IN A 10.20.177.222

stevesiphone.yfi.unh.edu. 900 IN TXT "31f48b06e39b39862c10d685379f634ae4"

stevesiphone.yfi.unh.edu. 900 IN A 10.20.43.69

canoe.ad.unh.edu. 1800 IN TXT "31c99b6c34d7bcfa38dd2005ccb93baefd"

canoe.ad.unh.edu. 1800 IN A 132.177.214.205

# DNS Security Extensions

Authenticity & Integrity of answer

Adds six new DNS Record Records

Public Private Key pair

chain of trust (must trust ROOT DNS)

|                           |                                    |
|---------------------------|------------------------------------|
| RRSIG (digital signature) | NSEC (proof of nonexistence)       |
| DNSKEY (public key)       | NSEC3 (proof of nonexistence)      |
| DS (parent-child)         | NSEC3PARAM (proof of nonexistence) |

# DNS Security Extensions

```
dig @8.8.8.8 www.it710.net A +dnssec+multiline
```

Answer – Address Record

```
www.it710.net.      300 IN A      132.177.132.99
```

```
=====
```

RR Signature

```
www.it710.net.      300 IN RRSIG A 5 3 300 (
```

```
20161028003420 20161024001451 10863 it710.net.
```

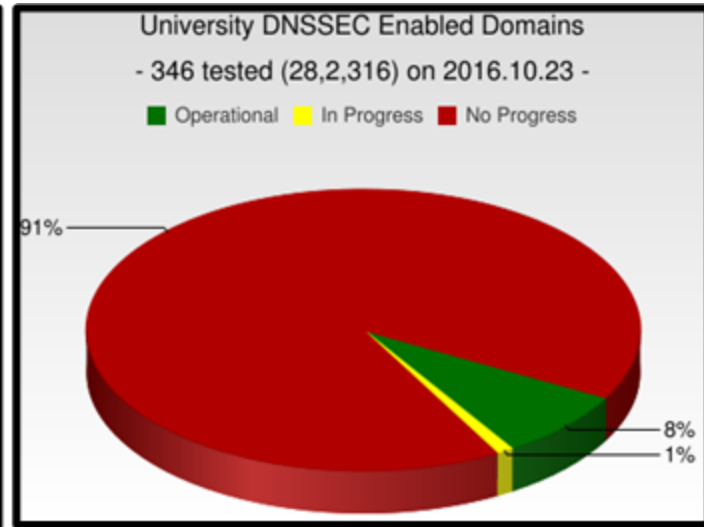
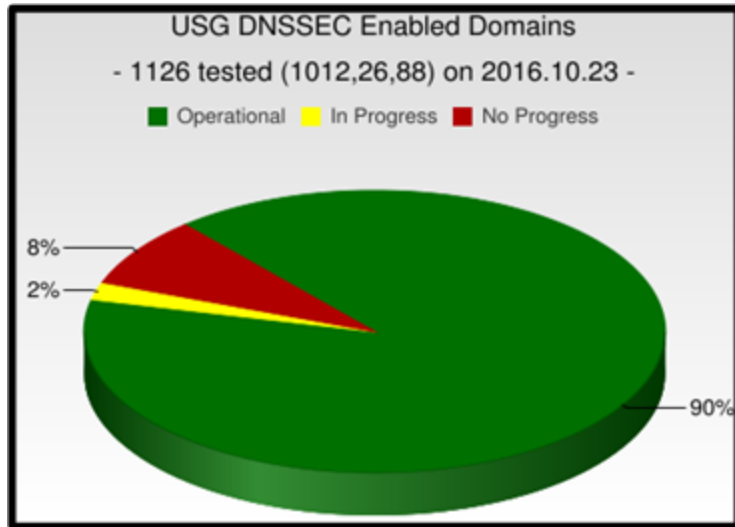
```
ILhTy/mx911GHyaGHhGxqi8SD8NuQfN1YdB2GfKAELgw
```

```
zmyHNIC4uyyg5Zpzclp0qHuYlWm2LSXU09ypsw+hdG4M
```

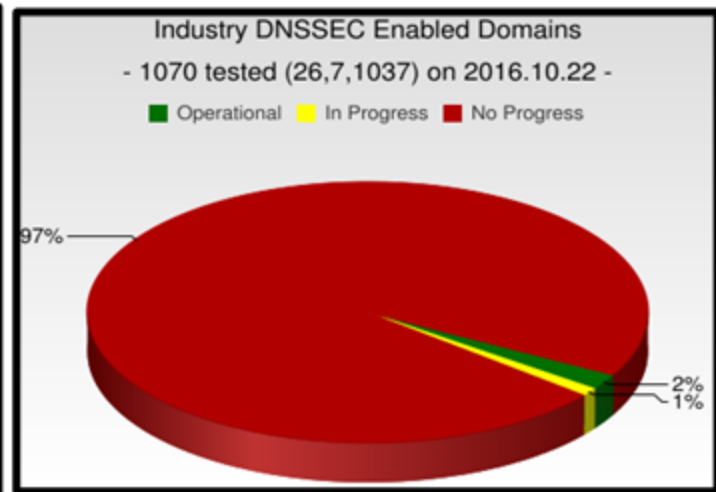
```
h7IMMmlhkxw2mXucMsSVo5NIhjjiFDlwgvksEeDJE/Wc
```

```
mGJD90Nq21NgsXbm5LmjikAPiadX3Rd9m3YoJL4=)
```

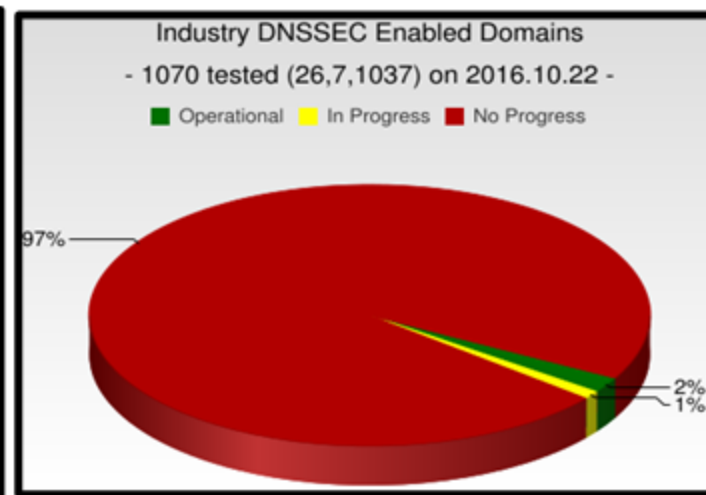
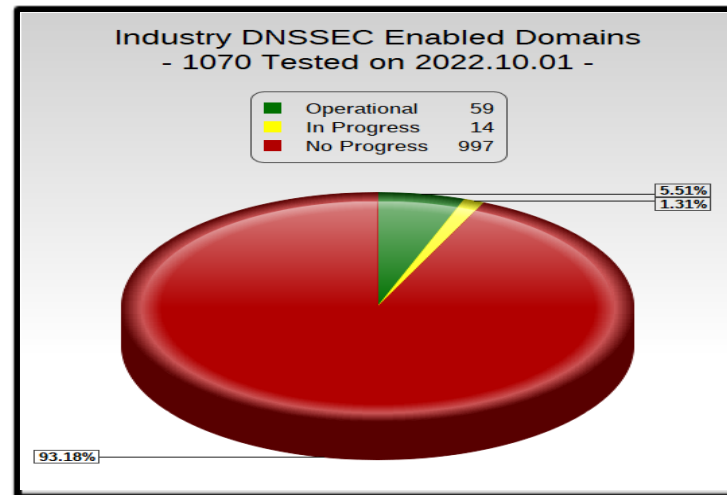
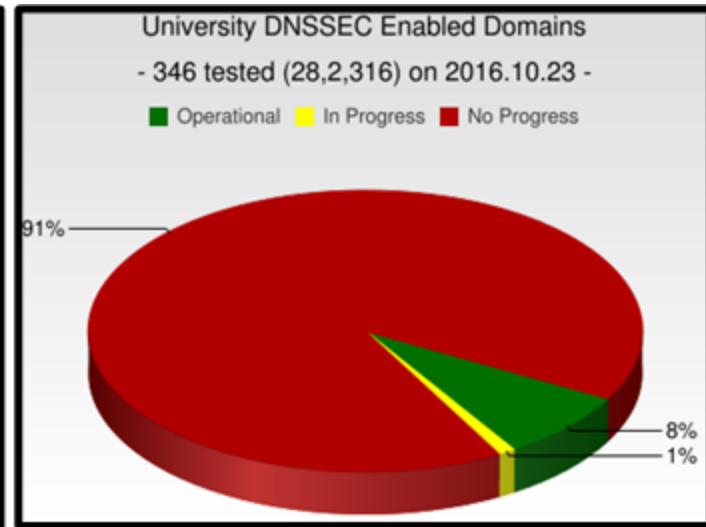
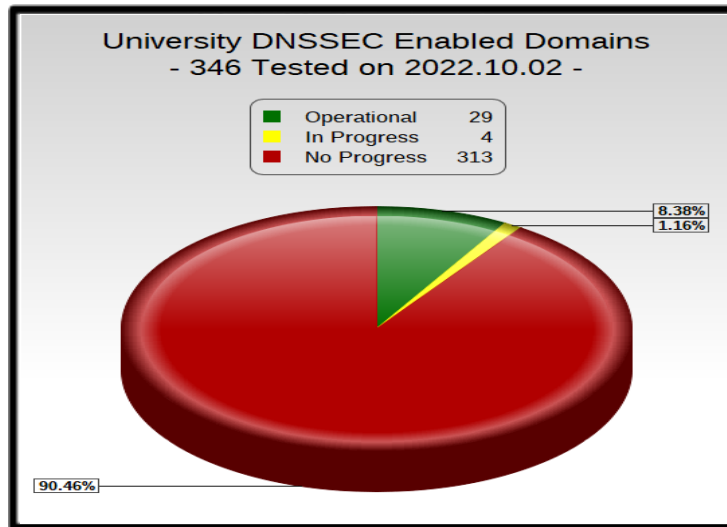
# DNSSEC statistics - nist.gov



| DNSSEC Progress<br>October 2016 |                  |    |      |
|---------------------------------|------------------|----|------|
| ORG                             | working Progress |    | None |
| USG                             | 90%              | 2% | 8%   |
| University                      | 8%               | 1% | 91%  |
| Industry                        | 2%               | 1% | 97%  |



# DNSSEC 2022 compare 2016





University of  
New Hampshire

# University of New Hampshire

## DNS Overview

Thank You  
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