



What's in a (c)name?

Setting up a DNS from scratch
James Arcus

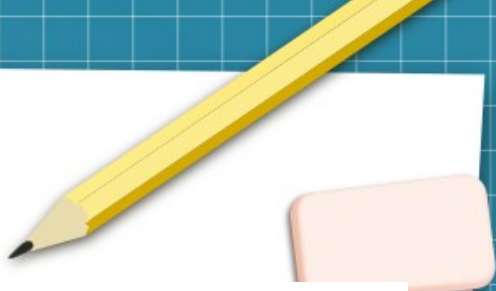
So what is DNS, actually?

- We know hosts (can) have *names*
 - Better than remembering IP addresses
 - “Decoupled” from current network position
- Names aren’t useful if people don’t know them
 - /etc/hosts used to be it

```
HOST : 129.139.64.8 : CUS.PICA.ARMY.MIL : GOULD : UNIX : TCP/TELNET,TCP/FTP,TCP/SNTP :
HOST : 129.139.68.8 : FSACL.PICA.ARMY.MIL : VAX-8800 : UNIX : TCP/TELNET,TCP/FTP,TCP/SNTP :
HOST : 129.139.70.8 : VE860.PICA.ARMY.MIL : CYBER-170/860 : NOS/VE : TCP/FTP :
HOST : 129.139.96.8 : SPARRON.PICA.ARMY.MIL : MASSCOMP : UNIX : TCP/TELNET,TCP/SNTP,TCP/FTP,UDP/DOMAIN :
HOST : 129.79.1.9 : IUGATE.UCS.INDIANA.EDU,INDIANA.EDU : MICROVAX-II : ULTRIX : TCP/TELNET,TCP/FTP,TCP/FINGER,TCP/SNTP,TCP/NICNAME,UDP/DOMAIN :
HOST : 129.139.68.9 : COR4.PICA.ARMY.MIL : GOULD : UNIX : TCP/TELNET,TCP/FTP,TCP/SNTP :
HOST : 129.139.70.9 : NOSBE.PICA.ARMY.MIL : CYBER-170/860 : NOS : TCP/FTP :
HOST : 129.252.43.9, 129.252.41.11 : THEUSC.CSD.SCAROLINA.EDU : IBM : AIX : TCP/TELNET,TCP/FTP,TCP/SNTP,UDP/DOMAIN :
HOST : 129.15.1.10 : ZOO.BACKBONE.UOKNOR.EDU : APPLE-MACII : AUX : TCP/TELNET,TCP/SNTP,TCP/TIME,TCP/FTP,TCP/TFPT,TCP/FINGER,UDP/DOMAIN :
HOST : 129.52.28.10 : FASTC-ISSU.WPAFB.AF.MIL,ISS1.AF.MIL : IBM-3081 :: TCP/TELNET,TCP/FTP,TCP/SNTP :
HOST : 129.57.1.10 : SURAGATE.CEBAF.GOV :: UDP/DOMAIN :
HOST : 129.131.1.10 : SUNNET.CHINALAKE.NAVY.MIL : SUN : SUNOS : TCP/DOMAIN :
HOST : 129.139.70.10 : CDCGW.PICA.ARMY.MIL : CYBER-170 : NOS : TCP/TELNET,TCP/FTP :
HOST : 129.177.31.10 : ARTEMIS.CHR.NO : SUN : UNIX ::
HOST : 129.214.214.10 : SWORD.ENG.PYRAMID.COM ::::
HOST : 129.229.40.10 : CERL.CECER.ARMY.MIL : SPARCSTATION : SUNOS : TCP/FTP,TCP/IP,TCP/TELNET,TCP/SNTP :
HOST : 129.43.1.11 : FCS2805.NCICFRF.GOV,NCICFRF.GOV : SUN-3/280 : UNIX : TCP/TELNET,TCP/FTP,TCP/SNTP,TCP/TIME,TCP/FINGER,TCP/RLOGIN,TCP/RSH,UDP/DOMAIN :
HOST : 129.139.68.11 : OBCE.PICA.ARMY.MIL : SPERRY-5000/80 : UNIX : TCP/TELNET,TCP/FTP,TCP/SNTP :
HOST : 129.139.70.11 : ROTE.PICA.ARMY.MIL : GOULD-6040 : UNIX : TCP/TELNET,TCP/FTP,TCP/SNTP :
HOST : 129.246.101.11 : CS.IDA.ORG,IDA.ORG : SUN-3/160 : UNIX : UDP/DOMAIN,TCP/TELNET,TCP/FTP,TCP/SNTP,TCP/TIME,TCP/FINGER :
HOST : 129.48.20.12 : ASD.WPAFB.AF.MIL : TOLERANT : TX : TCHP,TCP/TELNET,TCP/SNTP,TCP/FTP :
HOST : 129.100.2.12 : JULIAN.UWO.CA ::::
HOST : 129.139.68.12 : MCD.PICA.ARMY.MIL : SPERRY-5000/80 : UNIX : TCP/TELNET,TCP/FTP,TCP/SNTP :
HOST : 129.139.70.12 : SOR.PICA.ARMY.MIL : GOULD-6040 : UNIX : TCP/TELNET,TCP/FTP,TCP/SNTP :
HOST : 129.100.2.13 : HYDRA.UWO.CA : VAX-6330 : VMS : TCP/TELNET,TCP/FTP,TCP/SNTP,TCP/TIME,TCP/FINGER,TCP/NAME,UDP/DOMAIN :
HOST : 129.139.68.13 : AFES.PICA.ARMY.MIL : SPERRY-5000/80 : UNIX : TCP/TELNET,TCP/FTP,TCP/SNTP :
HOST : 129.139.68.14 : SAACONS.PICA.ARMY.MIL : SPERRY-5000 : UNIX : TCP/TELNET,TCP/FTP,TCP/SNTP :
HOST : 129.73.1.15 : SIEMENS.COM,SIEMENS.SIEMENS.COM : MICROVAX-II :: TCP/TELNET,TCP/SNTP,TCP/FTP,UDP/DOMAIN :
HOST : 129.139.68.16 : COBMS.PICA.ARMY.MIL : PYRAMID-9810 : UNIX : TCP/TELNET,TCP/FTP,TCP/SNTP :
HOST : 129.139.68.17 : AED.PICA.ARMY.MIL : PYRAMID-9820 : UNIX : TCP/TELNET,TCP/FTP,TCP/SNTP,UDP/DOMAIN :
HOST : 129.48.28.18 : ASE03.WPAFB.AF.MIL : SUN : UNIX : TCP/FTP,TCP/SNTP,TCP/TELNET :
HOST : 129.139.76.19 : VENOM.PICA.ARMY.MIL : ALLIANT : UNIX : TCP/TELNET,TCP/FTP,TCP/SNTP :
HOST : 129.179.161.19 : ZEUS.CDC.COM ::::
HOST : 129.7.1.20 : UH.EDU : MICROVAX-II : VMS : UDP/DOMAIN :
HOST : 129.139.68.20 : FSAC2.PICA.ARMY.MIL : VAX-8600 : UNIX : TCP/FTP,TCP/SNTP,TCP/TELNET :
HOST : 129.139.76.20 : CIE2.PICA.ARMY.MIL : CELERTY-1260 : UNIX : TCP/TELNET,TCP/FTP,TCP/SNTP :
HOST : 129.238.33.20 : SUNBEAM.PLK.AF.MIL :::: UDP/DOMAIN :
HOST : 129.139.76.21 : CIE3.PICA.ARMY.MIL : CELERTY-1260 : UNIX : TCP/TELNET,TCP/FTP,TCP/SNTP :
HOST : 129.238.33.21 : SUNSPOT.PLK.AF.MIL :::: UDP/DOMAIN :
HOST : 129.48.4.22 : P2.AHS.WPAFB.AF.MIL : VAX-8650 : VMS : TCP/FTP,TCP/SNTP,TCP/TELNET :
HOST : 129.48.4.23 : P3.AHS.WPAFB.AF.MIL : VAX-8600 : VMS : TCP/FTP,TCP/SNTP,TCP/TELNET :
HOST : 129.97.140.23 : MAYTAG.WATERLOO.EDU : SEQUENT-S27 : UNIX : TCP/TELNET,TCP/FTP,TCP/SNTP,TCP/FINGER,TCP/DOMAIN,UDP/DOMAIN :
```

So what is DNS, actually?

- Names are more useful in hierarchies
 - How many “mailserver1”s are there in the world?
 - Administrative vs. physical
- Names are more useful if people can add them and learn them
 - Need an automated system



```
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HOST : 129.246.101.11 : CS.IDA.ORG,IDA.ORG : SUN-3/160 : UNIX : UDP/DOMAIN,TCP/TELNET,TCP/FTP,TCP/SNTP,TCP/TIME,TCP/FINGER :
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HOST : 129.48.4.23 : P3.AHS.WPAFB.AF.MIL : VAX-8600 : VMS : TCP/FTP,TCP/SNTP,TCP/TELNET :
HOST : 129.97.140.23 : MAYTAG.WATERLOO.EDU : SEQUENT-S27 : UNIX : TCP/TELNET,TCP/FTP,TCP/SNTP,TCP/FINGER,TCP/DOMAIN,UDP/DOMAIN :
```

So what is DNS, actually?



- Wikipedia: “*The Domain Name System (DNS) is a **hierarchical** and **distributed** naming system for computers, services, and other resources in the Internet*”
- Written as a dot-separated sequence of parts, from right-to-left (for some reason!): *motsugo.ucc.gu.uwa.edu.au. (note the trailing dot, which is usually omitted)*
- Components are separated into “zones” that can be “delegated”
 - Top of the hierarchy is the root zone, “.”
- Two main roles for a server:
 - Authoritative: Hosts the data for some part of the DNS
 - Recursive: Gathers and caches data from authoritative servers
- Common server software includes: BIND (both), Unbound (recursive), KnotDNS (authoritative), *inter alia*

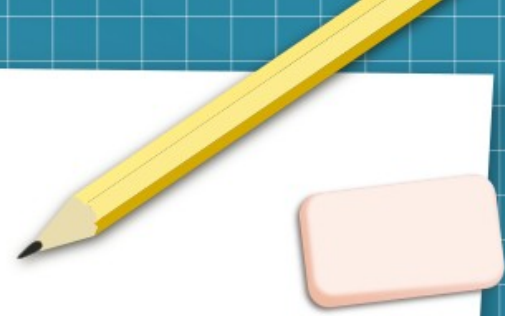
Configuring BIND

- Configured in /etc/named.conf or /etc/bind/named.conf
- Configuration is split into a series of “zones” which define administrative boundaries
- Zone data then stored in “zonefiles” either under /etc/bind/domains/ or /var/named

```
1 $TTL 3600
2 @ IN SOA monnik.ucc.asn.au. postmaster.ucc.asn.au. (
3     2023050700 ; Serial
4     14400      ; Refresh 4.0 hours
5     3600      ; Retry 1.0 hours
6     604800    ; Expire 168.0 hours
7     3600      ; Minimum 1.0 hours
8 )
9 IN NS monnik.ucc.asn.au.
10 IN MX 10 mx1.forwardemail.net.
11 IN MX 10 mx2.forwardemail.net.
12 IN A      130.95.13.9
13 IN TXT    "v=spf1 ip4:203.27.114.0/23 ip4:130.95.0.0/16 ip4:139.138.31.0/
14           24 ip4:139.138.42.0/24 include:spf.smtp-engine.com
15           include:spf.forwardemail.net -all"
16 IN TXT
17           google-site-verification=ZronXybrT3Uj0lqvkiKfEWAHeCWbkdSRFFlsy7AqPw
18           IN TXT forward-email-site-verification=Blxh9Nqdbl
19 ; Active directory domain
20 ad IN NS samson.ucc.asn.au.
21 localhost IN A 127.0.0.1
22 IN AAAA ::1
23 ucc-2016-3.dk2 IN TXT "v=DKIM1; k=rsa; t=y; p=MIGfMA0GCQgS1b3DQEBAQUAA4GNAD
24           CBI0KBoQC5fG0BeHII4S1f0IguwwuLcbWmHv0JaNyUgubDIEvYXpaZ0dd5WrB08s0CteZxbKl0vMQFK
25           ITSS1Z4tToWr7+06w3enVHKAfYt6qYSONz14pcK3HKHg2DHW1aFm6csyJD0g0tk7dHgAqdjg01tPn84
26           dbrAGJJ24mxipDMS0V0IDAQAB"
27 ucc-2016-3.domainkey IN TXT "v=DKIM1; k=rsa; t=y; p=MIGfMA0GCQgS1b3DQEBAQU
28           AA4GNADCB10KBoQC5fG0BeHII4S1f0IguwwuLcbWmHv0JaNyUgubDIEvYXpaZ0dd5WrB08s0CteZxb
29           Kl0vMQFKITSS1Z4tToWr7+06w3enVHKAfYt6qYSONz14pcK3HKHg2DHW1aFm6csyJD0g0tk7dHgAqdj
30           g01tPn84dbrAGJJ24mxipDMS0V0IDAQAB"
31 ipcamerall IN A 192.168.22.14
32 IN LOC 31 58 52.1 S 115 49 11.7 E 20m 10m 10m 2m
33 ; Easy minecraft server connection
34 _minecraft_tcp.mc IN SRV 1 0 25565 ptero-host.ucc.asn.au.
35 _acme-challenge.eggman IN CNAME root-eggman.quovadis-challenges.ucc.asn.au.
36 _acme-challenge.missile-web IN CNAME
37   _liz-missile-web.quovadis-challenges.ucc.asn.au.
38 _acme-challenge.ptero IN CNAME root-pterovadis-challenges.ucc.asn.au.
39 _acme-challenge.ptero-daemon IN CNAME
40   root-pterovadis-challenges.ucc.asn.au.
41 _acme-challenge.ptero-host IN CNAME
42   root-pterovadis-challenges.ucc.asn.au.
43 _matrix-identity.tcp IN SRV 10 0 443 matrix.ucc.asn.au.
44 IN LOC 31 58 52.1 S 115 49 11.7 E 20m 10m 10m 2m
45 arm-build IN A 130.95.13.160
46 IN HINFO "VM on Atlantic cluster" "Debian GNU/Linux"
47 IN LOC 31 58 52.1 S 115 49 11.7 E 20m 10m 10m 2m
48 bird-engames IN A 130.95.13.178
49 IN HINFO "Bird's (BRD) engames Minecraft server, mc.engam.es:25566"
50   "Debian GNU/Linux"
51 IN LOC 31 58 52.1 S 115 49 11.7 E 20m 10m 10m 2m
52 cjnb-minecraft IN A 130.95.13.188
53 IN HINFO "VM on Machop" "Debian GNU/Linux"
54 IN LOC 31 58 52.1 S 115 49 11.7 E 20m 10m 10m 2m
55 _acme-challenge.meetings IN CNAME
```

Demo: The UCC Zones

- Common record types:
 - A (IPv4 address)
 - AAAA (IPv6 address)
 - MX (mail server)
 - NS (DNS name server)
 - TXT (generic text)



Activity: A simple, replacement root



- Every record starts with basic info in SOA
- Each line is a record (or part of one, with the bracket syntax)
- Fields: name, TTL, class, type, value
- ; begins a comment
- Note the “glue record” that solves the bootstrapping problem
 - How do I find the name server for something if I don't have the name server for it?
- Needs a server config as well



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