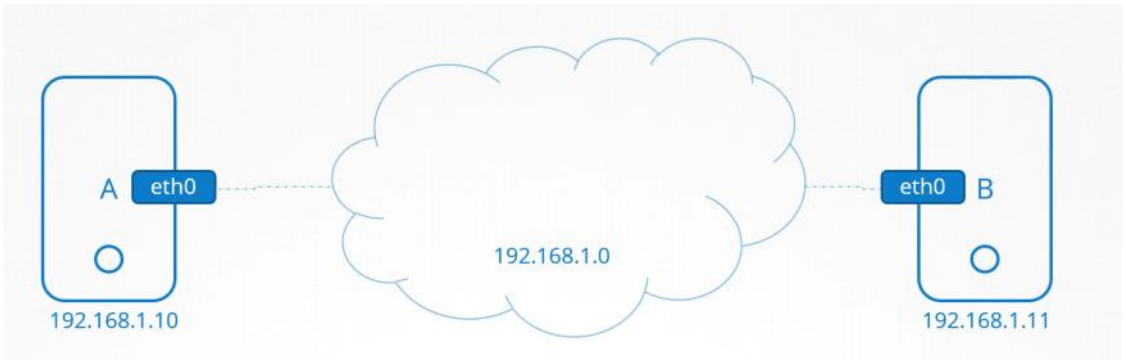
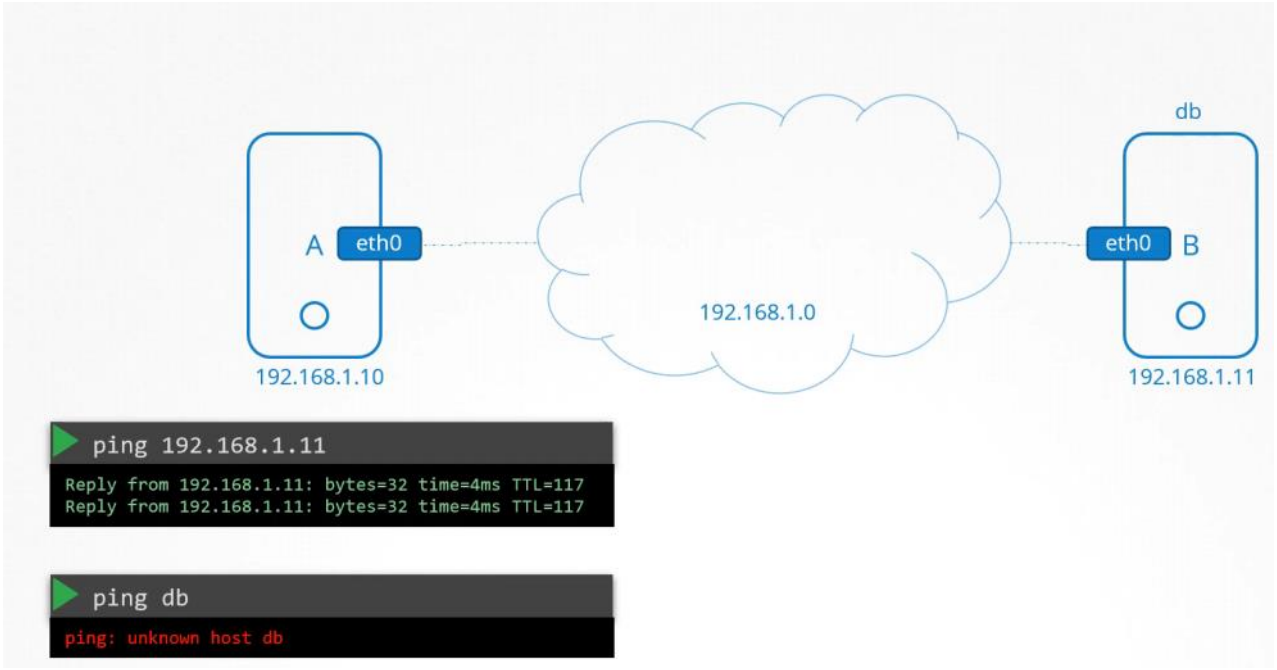
DNS For the Absolute Beginners





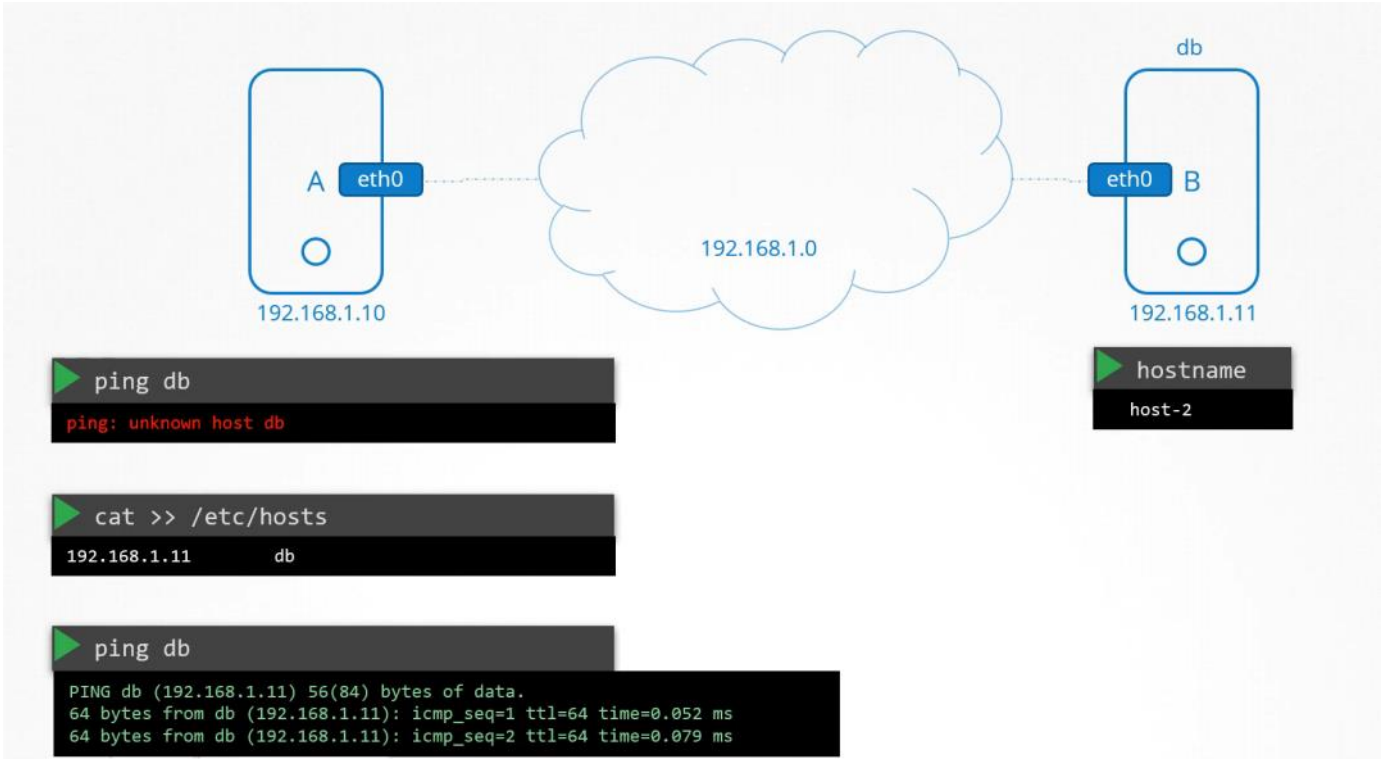

```
ping 192.168.1.11
Reply from 192.168.1.11: bytes=32 time=4ms TTL=117
Reply from 192.168.1.11: bytes=32 time=4ms TTL=117
```

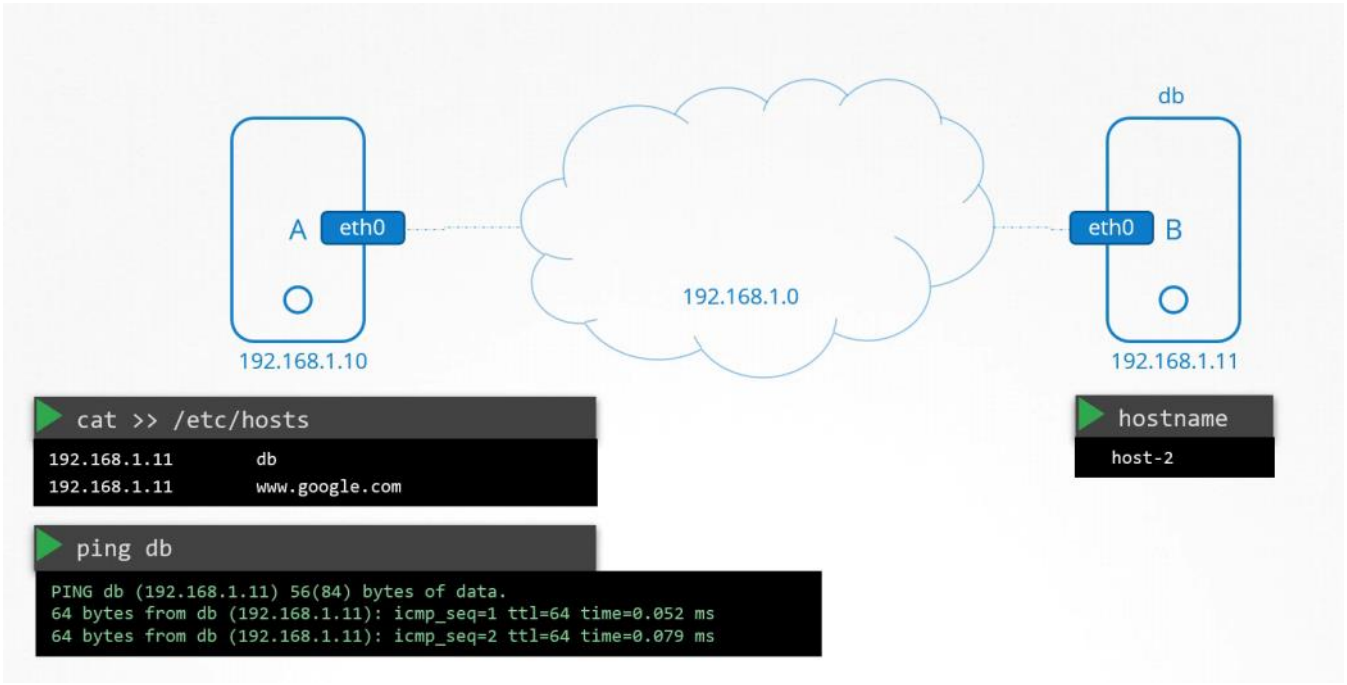
```
ping db
ping: unknown host db
```


```
ping db
ping: unknown host db
```

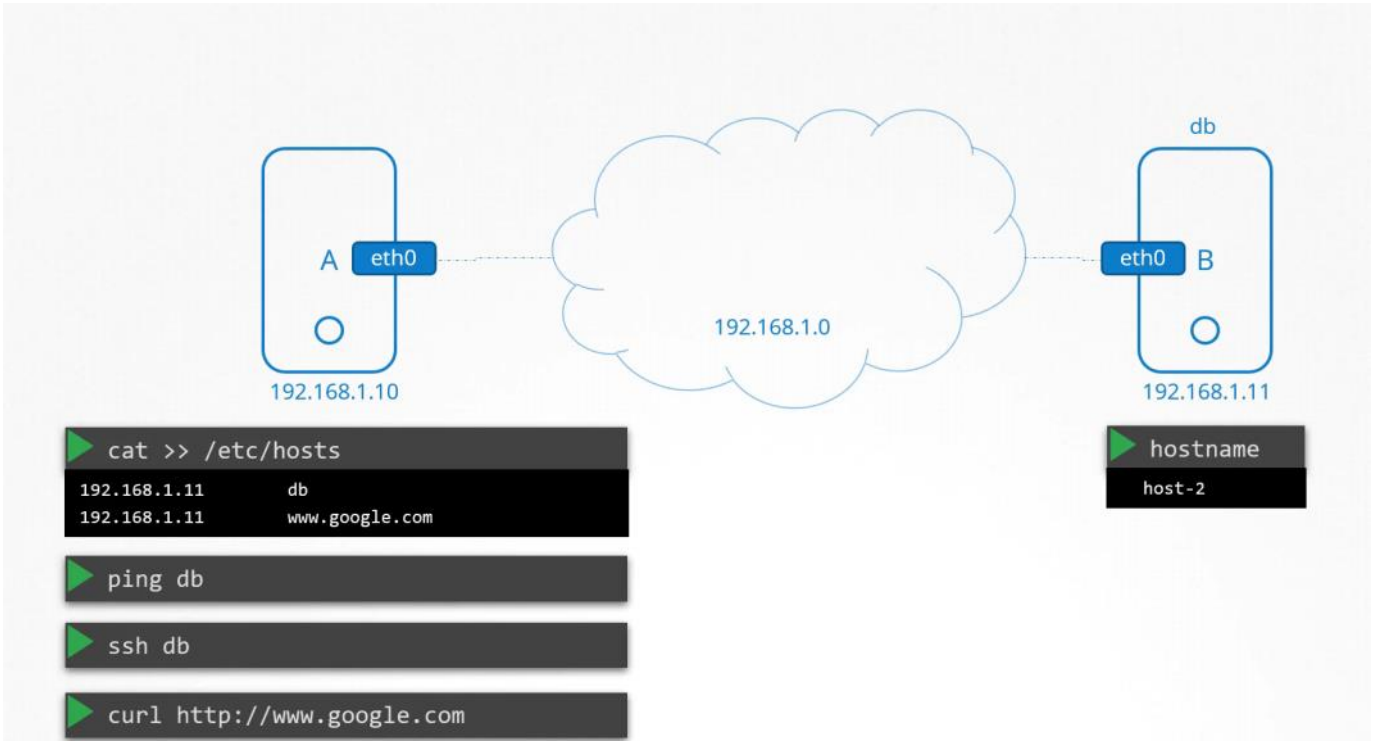
```
cat >> /etc/hosts
192.168.1.11        db
```

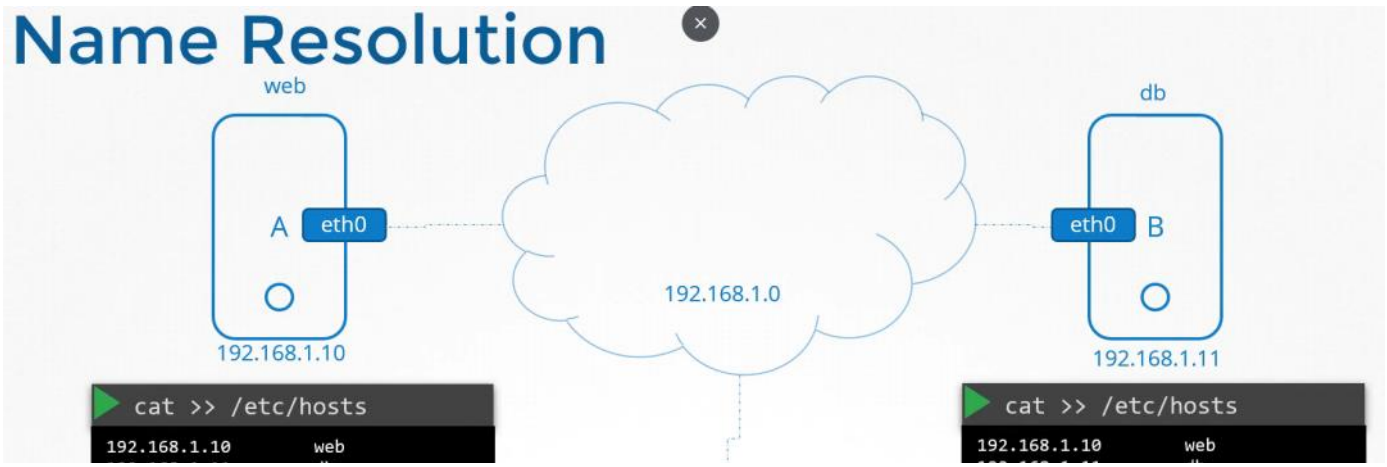
```
ping db
PING db (192.168.1.11) 56(84) bytes of data.
64 bytes from db (192.168.1.11): icmp_seq=1 ttl=64 time=0.052 ms
64 bytes from db (192.168.1.11): icmp_seq=2 ttl=64 time=0.079 ms
```

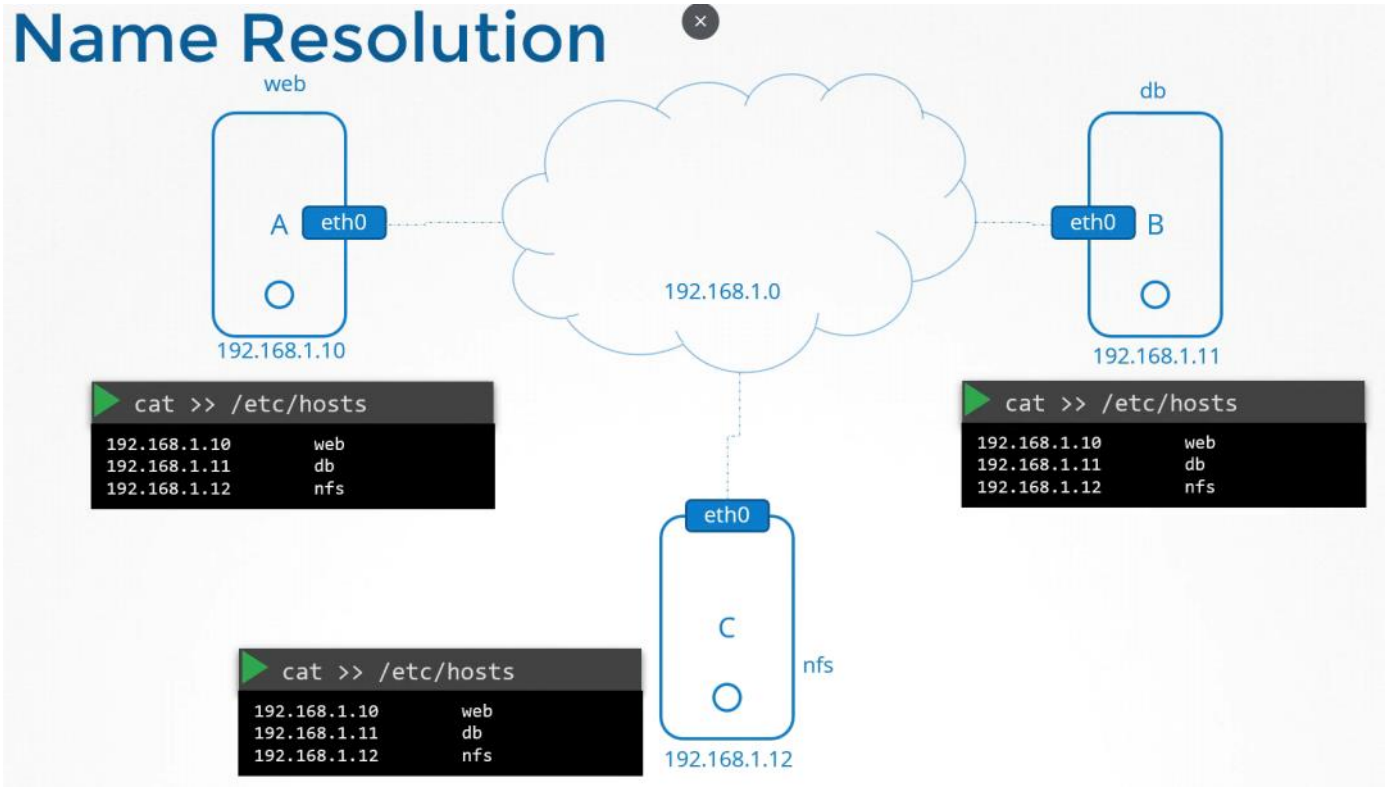

db
A
eth0
eth0
B
192.168.1.0
192.168.1.10
192.168.1.11
ping db
ping: unknown host db
hostname
host-2
cat >> /etc/hosts
192.168.1.11 db
ping db
PING db (192.168.1.11) 56(84) bytes of data.
64 bytes from db (192.168.1.11): icmp_seq=1 ttl=64 time=0.052 ms
64 bytes from db (192.168.1.11): icmp_seq=2 ttl=64 time=0.079 ms

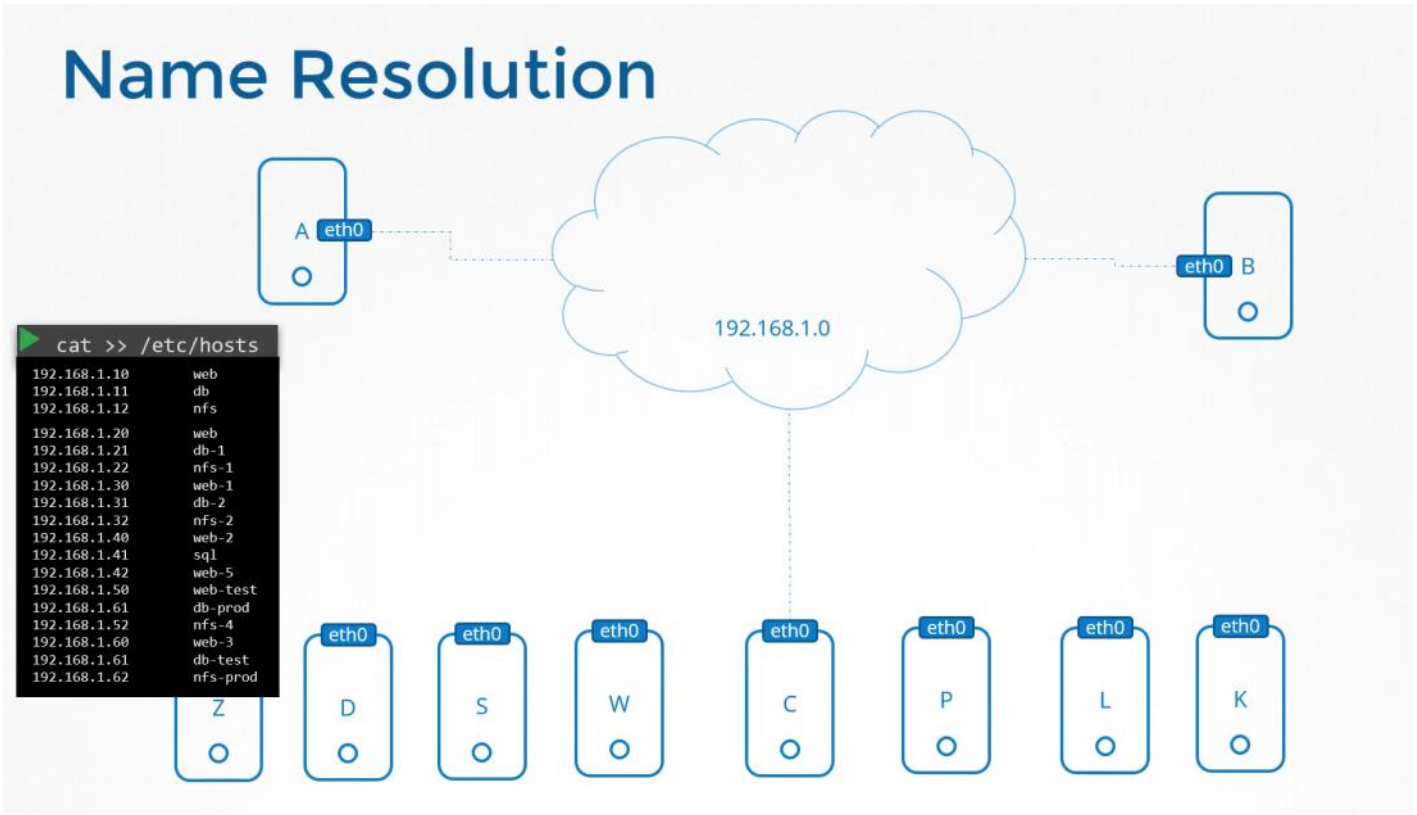

db
A
eth0
eth0
B
192.168.1.0
192.168.1.10
192.168.1.11
cat >> /etc/hosts
192.168.1.11 db
192.168.1.11 www.google.com
hostname
host-2
ping db
PING db (192.168.1.11) 56(84) bytes of data.
64 bytes from db (192.168.1.11): icmp_seq=1 ttl=64 time=0.052 ms
64 bytes from db (192.168.1.11): icmp_seq=2 ttl=64 time=0.079 ms

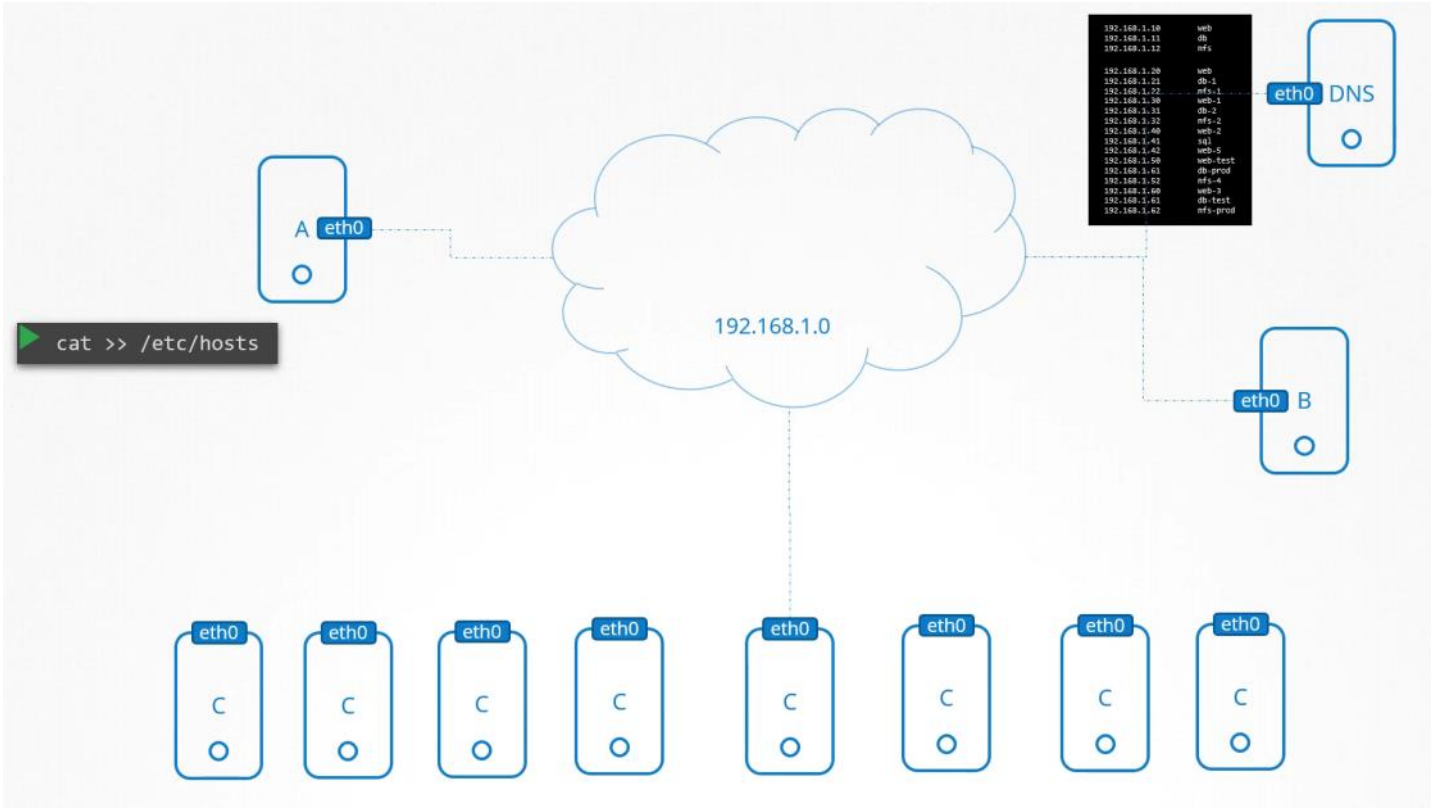

db
A
eth0
eth0
B
192.168.1.0
192.168.1.10
192.168.1.11
cat >> /etc/hosts
192.168.1.11 db
192.168.1.11 www.google.com
hostname
host-2
ping db
PING db (192.168.1.11) 56(84) bytes of data.
64 bytes from db (192.168.1.11): icmp_seq=1 ttl=64 time=0.052 ms
64 bytes from db (192.168.1.11): icmp_seq=2 ttl=64 time=0.079 ms
ping www.google.com
PING www.google.com (192.168.1.11) 56(84) bytes of data.
64 bytes from www.google.com (192.168.1.11): icmp_seq=1 ttl=64 time=0.052 ms
64 bytes from www.google.com (192.168.1.11): icmp_seq=2 ttl=64 time=0.079 ms

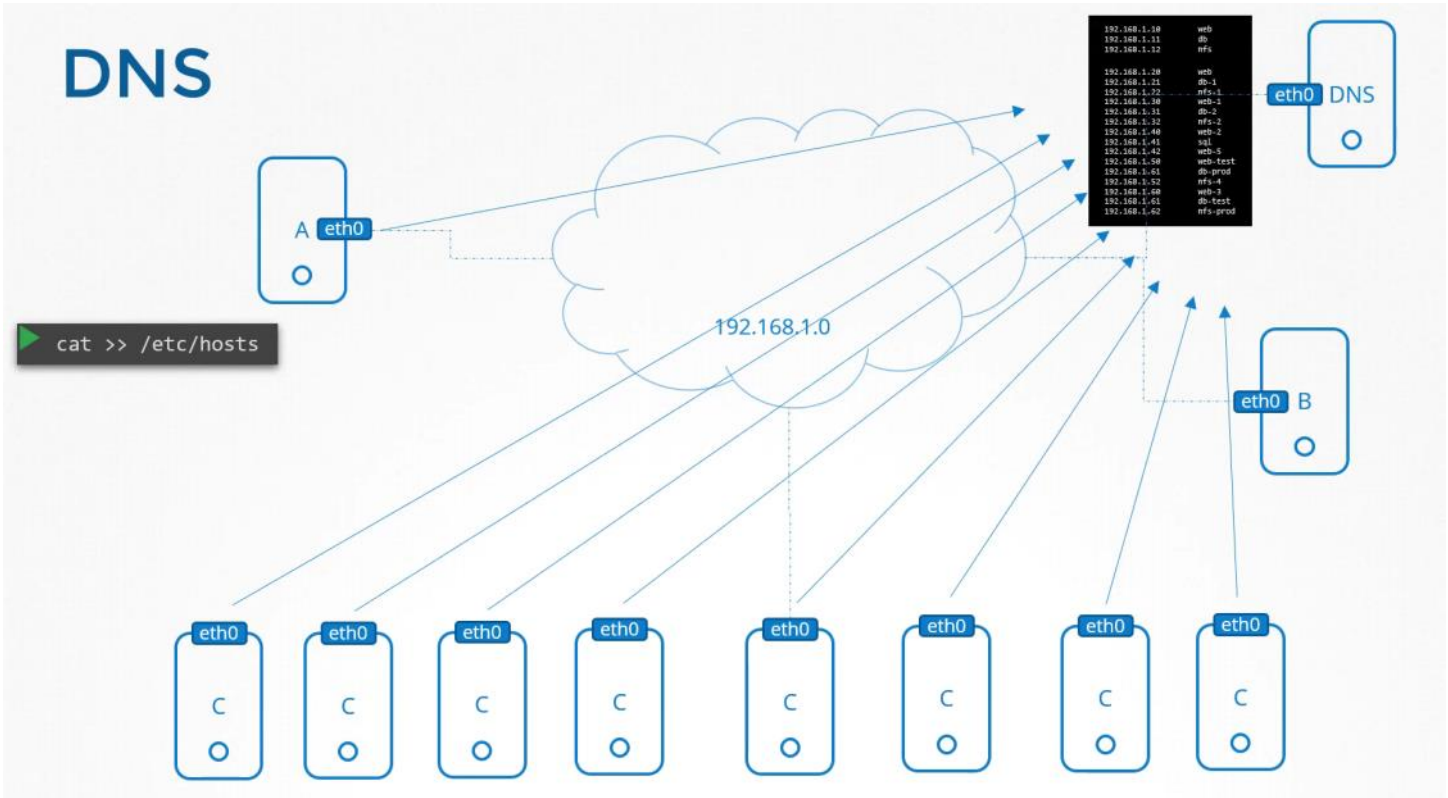

db
A
eth0
eth0
B
192.168.1.0
192.168.1.10
192.168.1.11
cat >> /etc/hosts
192.168.1.11 db
192.168.1.11 www.google.com
hostname
host-2
ping db
ssh db
curl http://www.google.com


Name Resolution
web
db
A
eth0
eth0
B
192.168.1.0
192.168.1.10
192.168.1.11
cat >> /etc/hosts
192.168.1.10 web
cat >> /etc/hosts
192.168.1.10 web


Name Resolution
web
db
A
eth0
eth0
B
192.168.1.0
192.168.1.10
192.168.1.11
cat >> /etc/hosts
192.168.1.10 web
192.168.1.11 db
192.168.1.12 nfs
cat >> /etc/hosts
192.168.1.10 web
192.168.1.11 db
192.168.1.12 nfs
eth0
C
nfs
192.168.1.12
cat >> /etc/hosts
192.168.1.10 web
192.168.1.11 db
192.168.1.12 nfs


Name Resolution
A
eth0
192.168.1.0
eth0
B
cat >> /etc/hosts
192.168.1.10 web
192.168.1.11 db
192.168.1.12 nfs
192.168.1.20 web
192.168.1.21 db-1
192.168.1.22 nfs-1
192.168.1.30 web-1
192.168.1.31 db-2
192.168.1.32 nfs-2
192.168.1.40 web-2
192.168.1.41 sql
192.168.1.42 web-5
192.168.1.50 web-test
192.168.1.61 db-prod
192.168.1.52 nfs-4
192.168.1.60 web-3
192.168.1.61 db-test
192.168.1.62 nfs-prod
Z
eth0
D
eth0
S
eth0
W
eth0
C
eth0
P
eth0
L
eth0
K


192.168.1.10 web
192.168.1.11 db
192.168.1.12 nfs
192.168.1.20 web
192.168.1.21 db-1
192.168.1.22 nfs-1
192.168.1.30 web-1
192.168.1.31 db-2
192.168.1.32 nfs-2
192.168.1.40 web-2
192.168.1.41 sql
192.168.1.42 web-5
192.168.1.50 web-test
192.168.1.61 db-prod
192.168.1.52 nfs-4
192.168.1.60 web-3
192.168.1.61 db-test
192.168.1.62 nfs-prod
eth0 DNS
A eth0
cat >> /etc/hosts
192.168.1.0
eth0 B
eth0 C
eth0 C
eth0 C
eth0 C
eth0 C
eth0 C
eth0 C
eth0 C


DNS
192.168.1.10 web
192.168.1.11 db
192.168.1.12 nfs
192.168.1.20 web
192.168.1.21 db-1
192.168.1.22 nfs-1
192.168.1.30 web-1
192.168.1.31 db-2
192.168.1.32 nfs-2
192.168.1.40 web-2
192.168.1.41 sql
192.168.1.42 web-5
192.168.1.50 web-test
192.168.1.61 db-prod
192.168.1.52 nfs-4
192.168.1.60 web-3
192.168.1.61 db-test
192.168.1.62 nfs-prod
eth0 DNS
A eth0
cat >> /etc/hosts
192.168.1.0
eth0 B
eth0 C
eth0 C
eth0 C
eth0 C
eth0 C
eth0 C
eth0 C
eth0 C

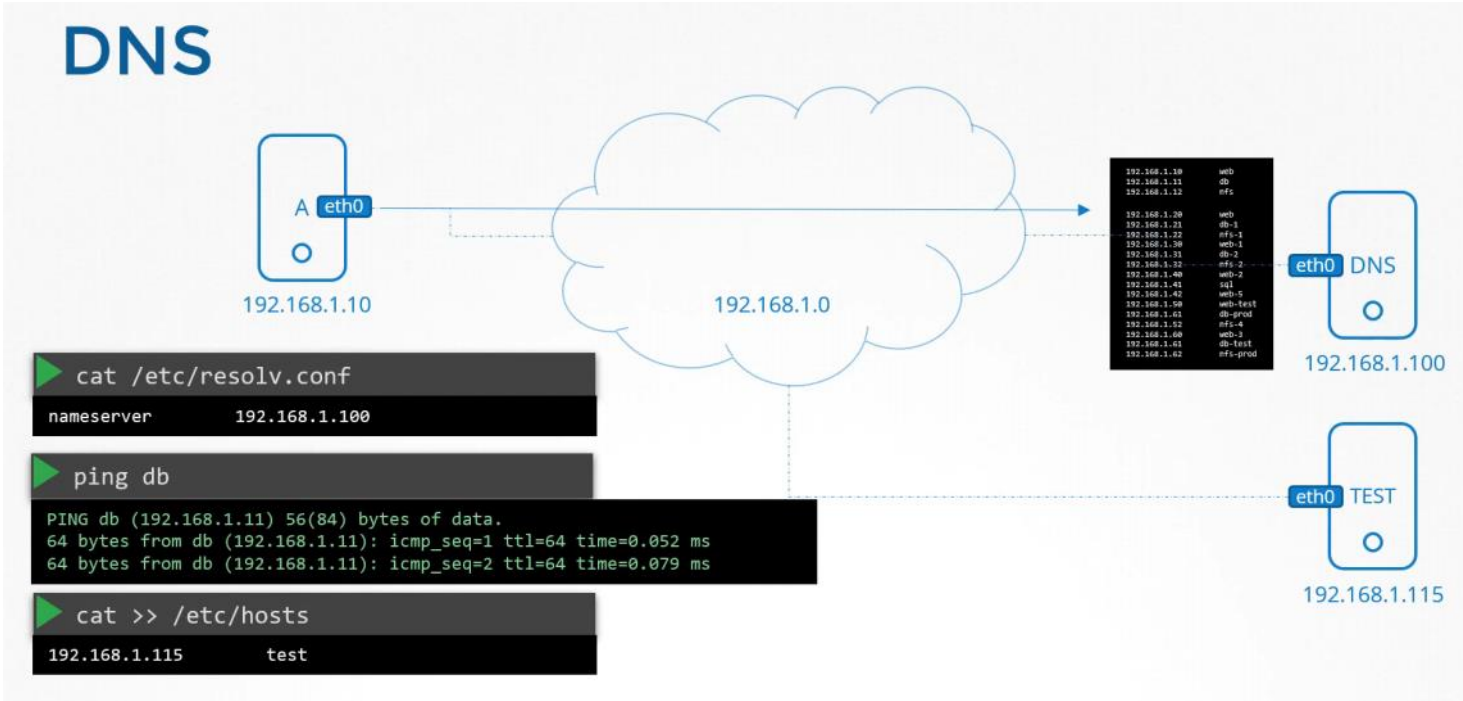

DNS
A eth0
192.168.1.10
192.168.1.0
192.168.1.10 web
192.168.1.11 db
192.168.1.12 nfs
192.168.1.20 web
192.168.1.21 db-1
192.168.1.22 nfs-1
192.168.1.30 web-1
192.168.1.31 db-2
192.168.1.32 nfs-2
192.168.1.40 web-2
192.168.1.41 sql
192.168.1.42 web-5
192.168.1.50 web-test
192.168.1.61 db-prod
192.168.1.52 nfs-4
192.168.1.60 web-3
192.168.1.61 db-test
192.168.1.62 nfs-prod
eth0 DNS
192.168.1.100

DNS


```
cat /etc/resolv.conf
nameserver        192.168.1.100
```

```
ping db
PING db (192.168.1.11) 56(84) bytes of data.
64 bytes from db (192.168.1.11): icmp_seq=1 ttl=64 time=0.052 ms
64 bytes from db (192.168.1.11): icmp_seq=2 ttl=64 time=0.079 ms
```

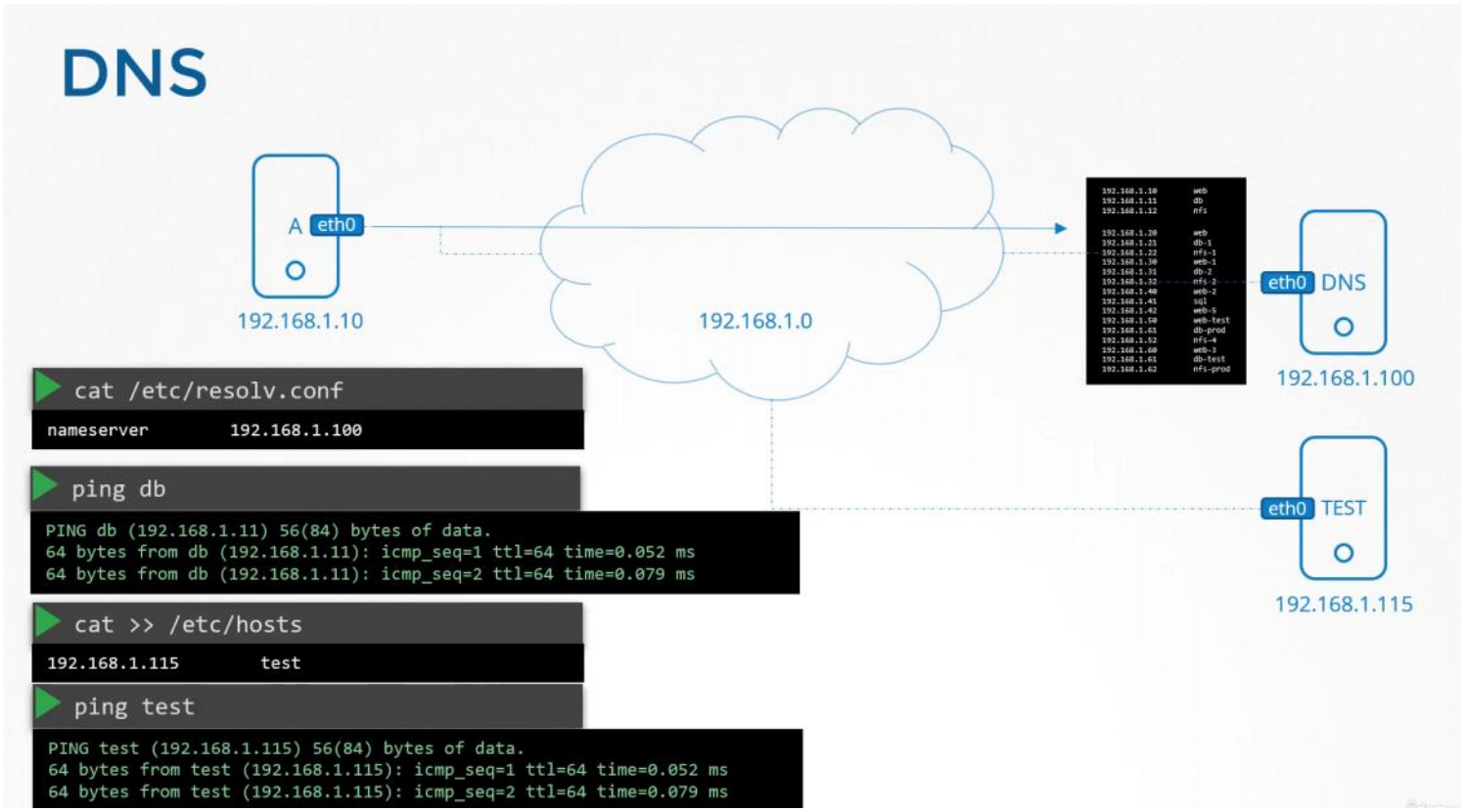
DNS

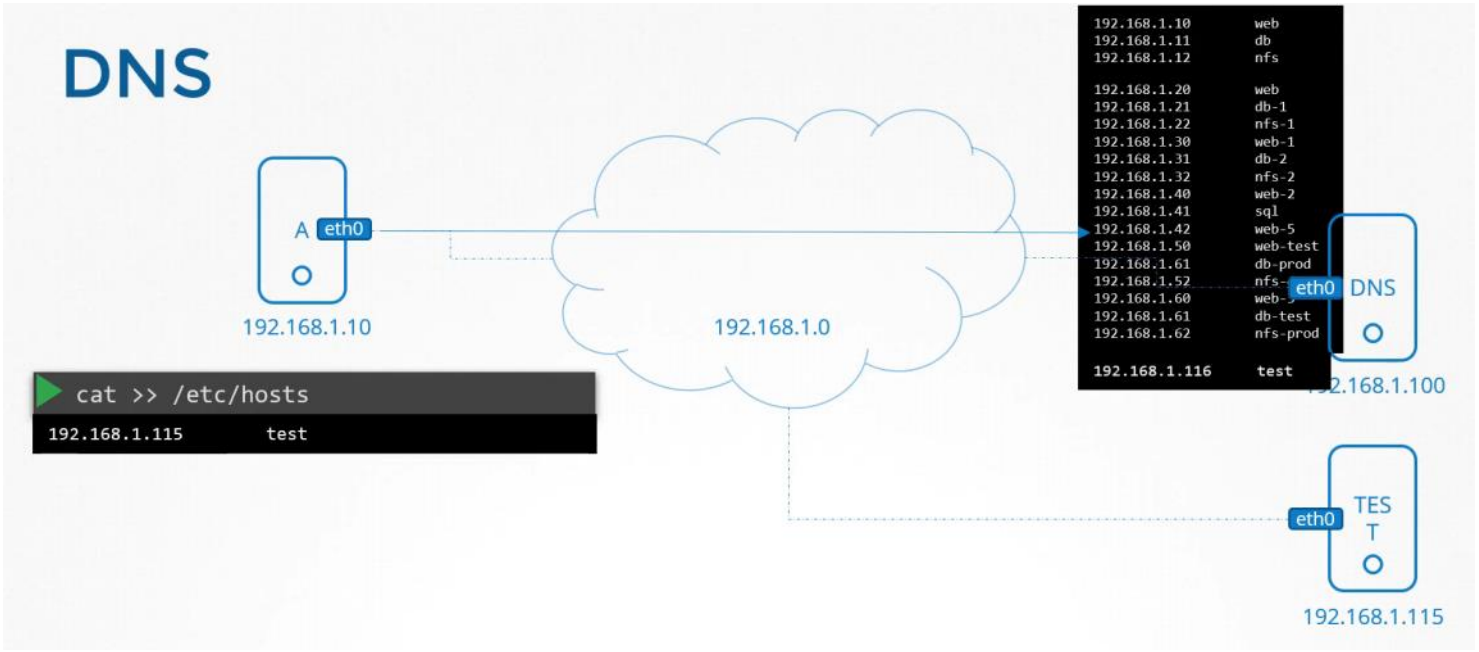


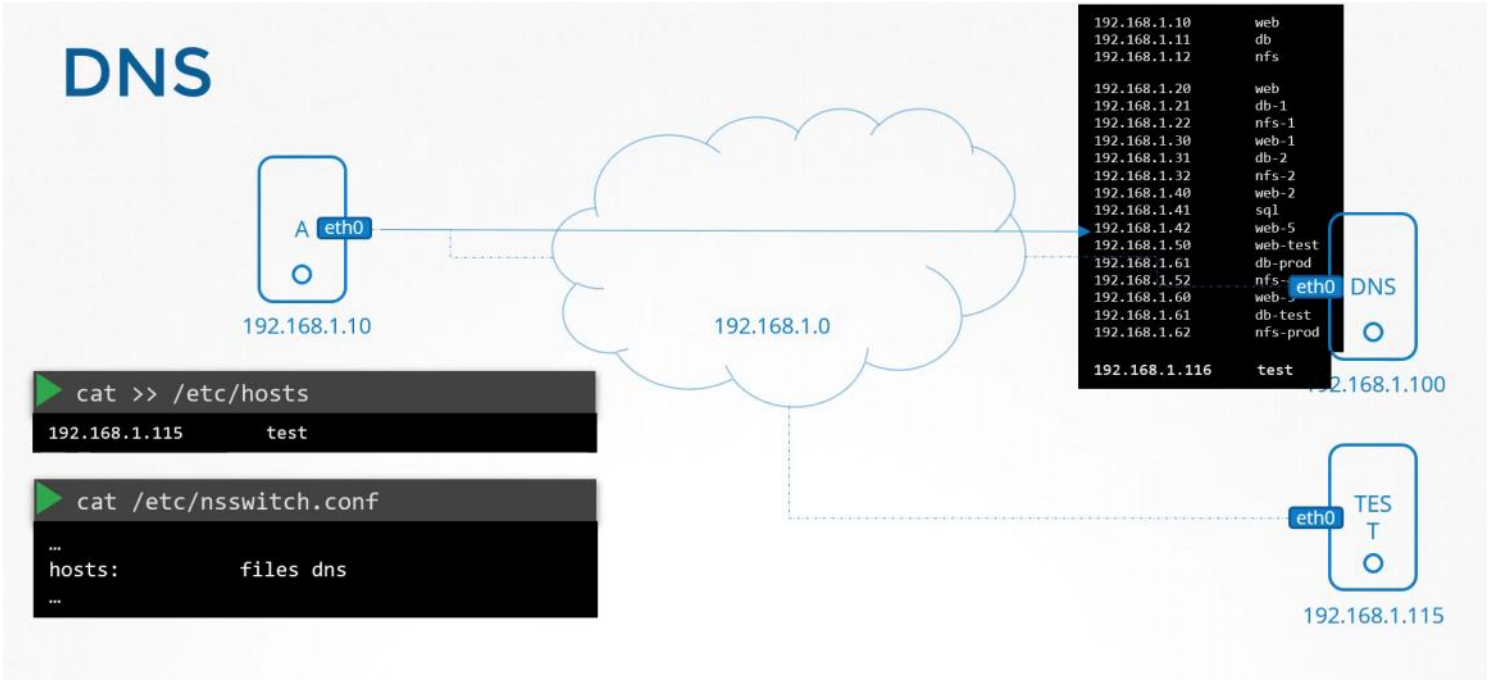

```
cat /etc/resolv.conf
nameserver        192.168.1.100
```

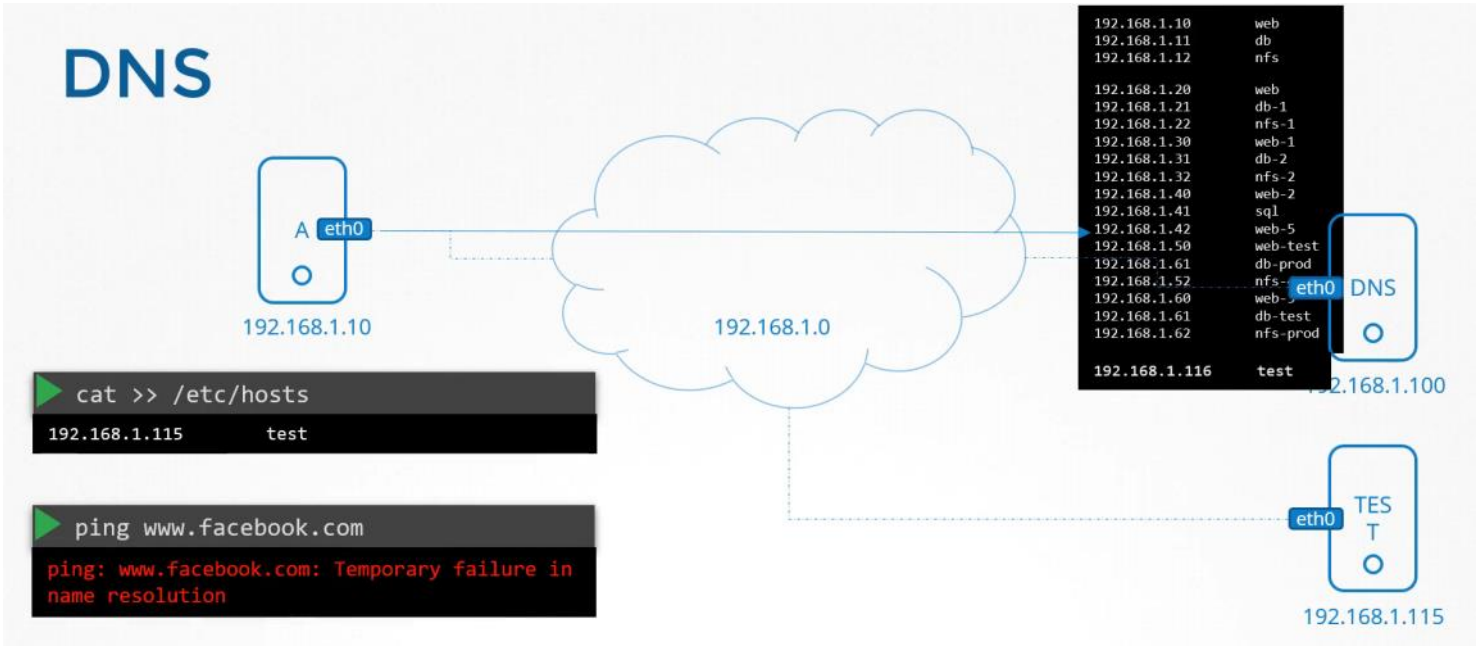
```
ping db
PING db (192.168.1.11) 56(84) bytes of data.
64 bytes from db (192.168.1.11): icmp_seq=1 ttl=64 time=0.052 ms
64 bytes from db (192.168.1.11): icmp_seq=2 ttl=64 time=0.079 ms
```

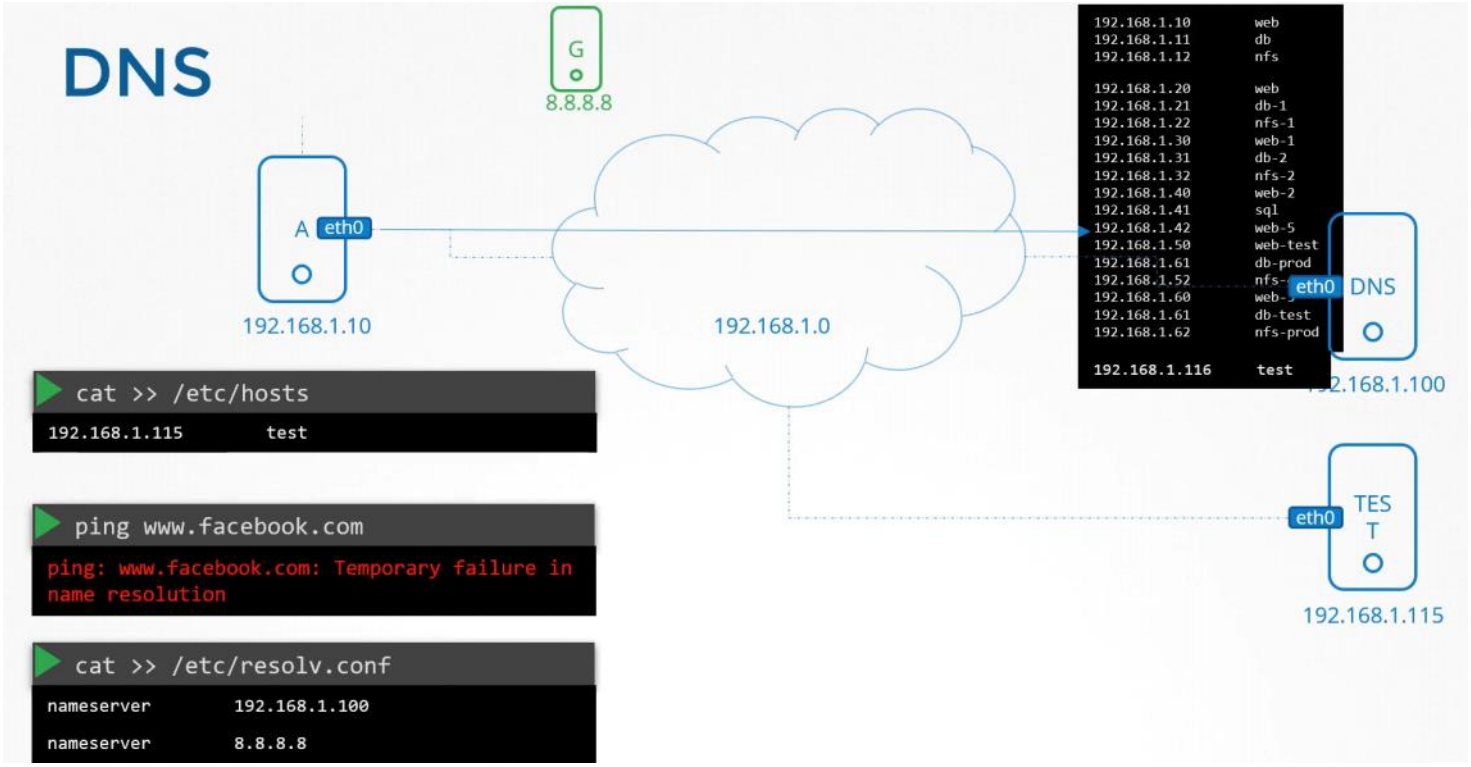
```
cat >> /etc/hosts
192.168.1.115        test
```

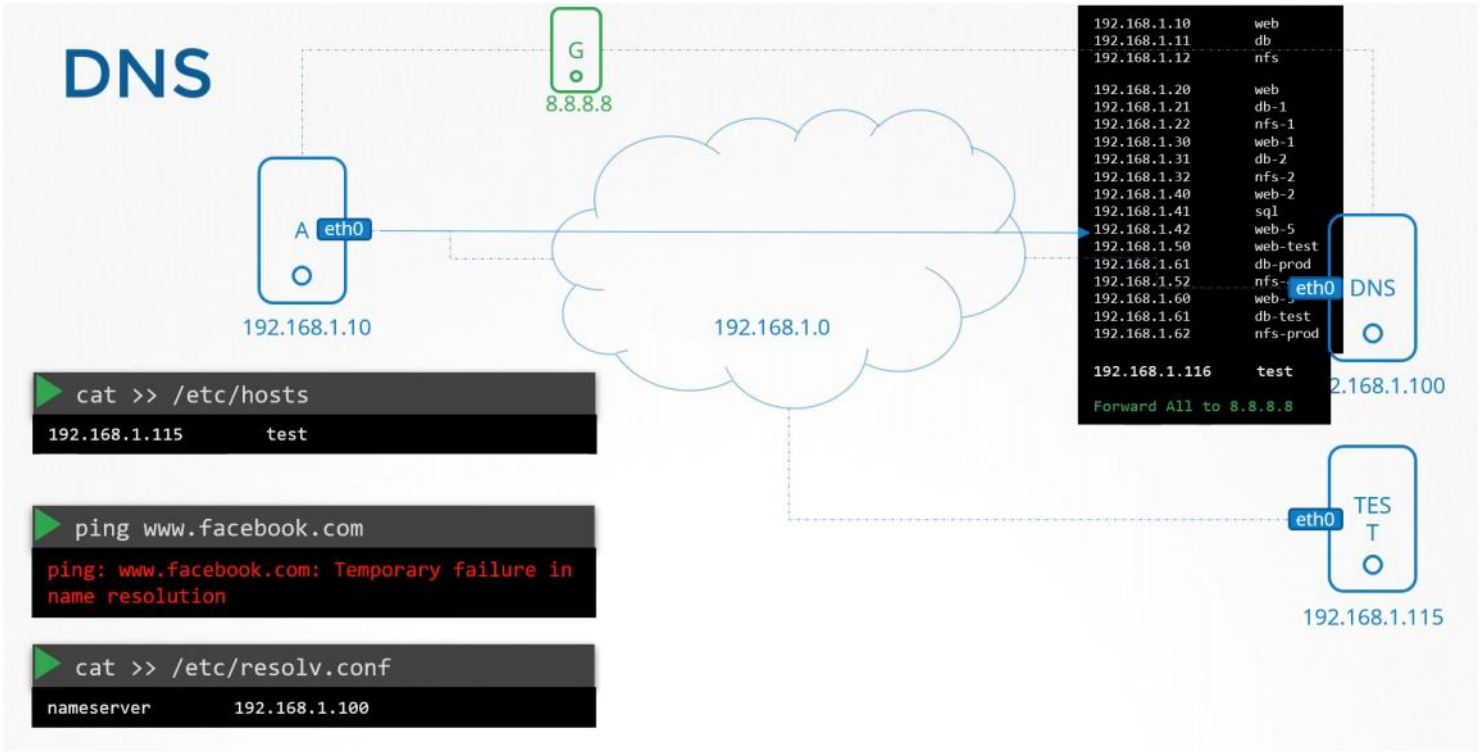

DNS
A
eth0
192.168.1.10
192.168.1.0
192.168.1.10 web
192.168.1.11 db
192.168.1.12 nfs
192.168.1.20 web
192.168.1.21 db-1
192.168.1.22 nfs-1
192.168.1.30 web-1
192.168.1.31 db-2
192.168.1.32 nfs-2
192.168.1.40 web-2
192.168.1.41 sql
192.168.1.42 web-5
192.168.1.50 web-test
192.168.1.61 db-prod
192.168.1.52 nfs-4
192.168.1.60 web-3
192.168.1.61 db-test
192.168.1.62 nfs-prod
eth0
DNS
192.168.1.100
cat /etc/resolv.conf
nameserver 192.168.1.100
ping db
PING db (192.168.1.11) 56(84) bytes of data.
64 bytes from db (192.168.1.11): icmp_seq=1 ttl=64 time=0.052 ms
64 bytes from db (192.168.1.11): icmp_seq=2 ttl=64 time=0.079 ms
eth0
TEST
192.168.1.115
cat >> /etc/hosts
192.168.1.115 test
ping test
PING test (192.168.1.115) 56(84) bytes of data.
64 bytes from test (192.168.1.115): icmp_seq=1 ttl=64 time=0.052 ms
64 bytes from test (192.168.1.115): icmp_seq=2 ttl=64 time=0.079 ms

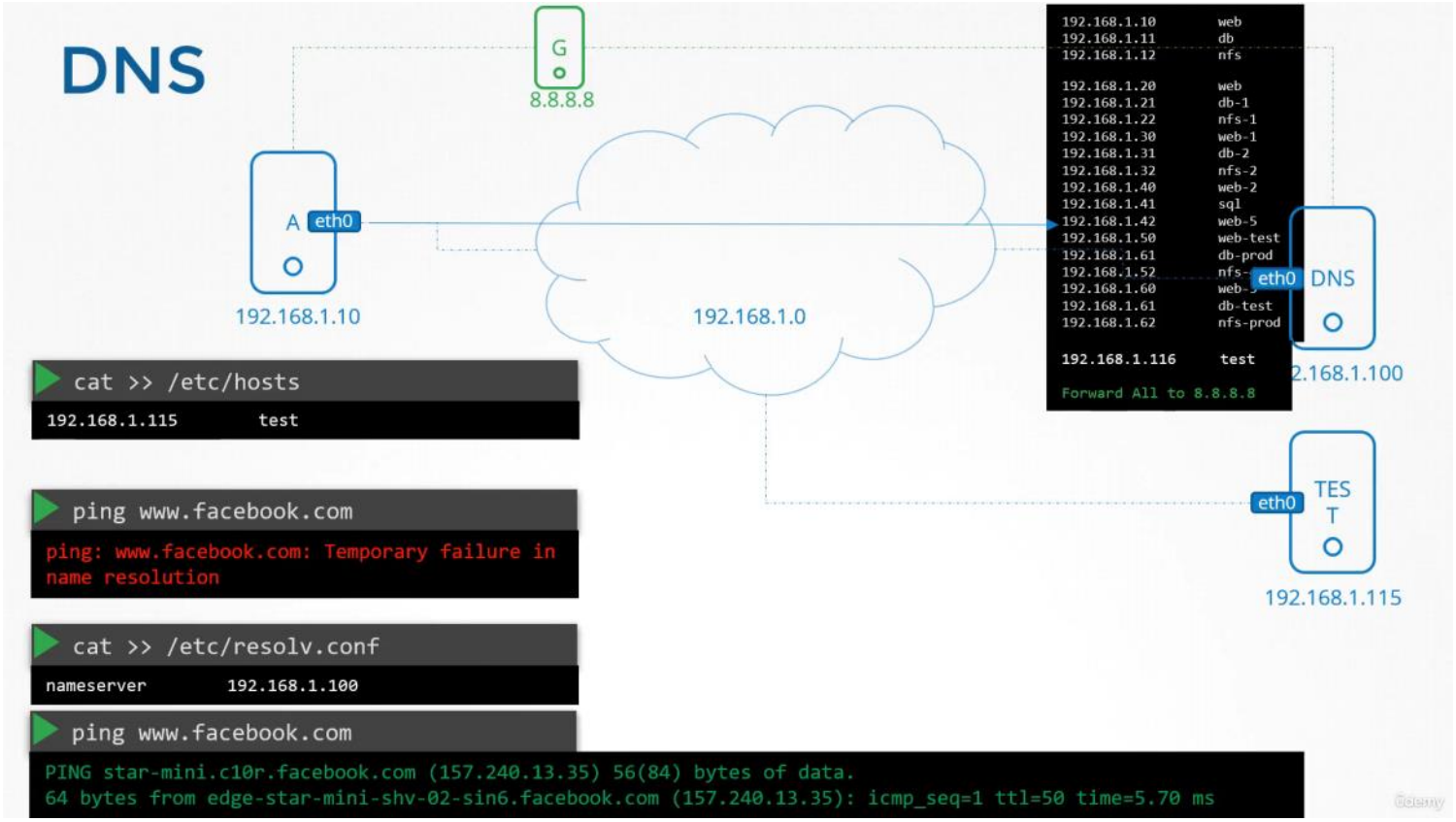

DNS
A
eth0
192.168.1.10
192.168.1.0
192.168.1.10 web
192.168.1.11 db
192.168.1.12 nfs
192.168.1.20 web
192.168.1.21 db-1
192.168.1.22 nfs-1
192.168.1.30 web-1
192.168.1.31 db-2
192.168.1.32 nfs-2
192.168.1.40 web-2
192.168.1.41 sql
192.168.1.42 web-5
192.168.1.50 web-test
192.168.1.61 db-prod
192.168.1.52 nfs-
192.168.1.60 web-
192.168.1.61 db-test
192.168.1.62 nfs-prod
192.168.1.116 test
eth0
DNS
192.168.1.100
cat >> /etc/hosts
192.168.1.115 test
eth0
TES
T
192.168.1.115


DNS
A
eth0
192.168.1.10
192.168.1.0
192.168.1.10 web
192.168.1.11 db
192.168.1.12 nfs
192.168.1.20 web
192.168.1.21 db-1
192.168.1.22 nfs-1
192.168.1.30 web-1
192.168.1.31 db-2
192.168.1.32 nfs-2
192.168.1.40 web-2
192.168.1.41 sql
192.168.1.42 web-5
192.168.1.50 web-test
192.168.1.61 db-prod
192.168.1.52 nfs-
192.168.1.60 web-
192.168.1.61 db-test
192.168.1.62 nfs-prod
192.168.1.116 test
eth0
DNS
192.168.1.100
cat >> /etc/hosts
192.168.1.115 test
cat /etc/nsswitch.conf
…
hosts: files dns
…
eth0
TES
T
192.168.1.115


DNS
A
eth0
192.168.1.10
192.168.1.0
192.168.1.10 web
192.168.1.11 db
192.168.1.12 nfs
192.168.1.20 web
192.168.1.21 db-1
192.168.1.22 nfs-1
192.168.1.30 web-1
192.168.1.31 db-2
192.168.1.32 nfs-2
192.168.1.40 web-2
192.168.1.41 sql
192.168.1.42 web-5
192.168.1.50 web-test
192.168.1.61 db-prod
192.168.1.52 nfs-
192.168.1.60 web-
192.168.1.61 db-test
192.168.1.62 nfs-prod
192.168.1.116 test
eth0
DNS
192.168.1.100
cat >> /etc/hosts
192.168.1.115 test
ping www.facebook.com
ping: www.facebook.com: Temporary failure in name resolution
eth0
TES
T
192.168.1.115


DNS
G
8.8.8.8
A
eth0
192.168.1.10
192.168.1.0
192.168.1.10 web
192.168.1.11 db
192.168.1.12 nfs
192.168.1.20 web
192.168.1.21 db-1
192.168.1.22 nfs-1
192.168.1.30 web-1
192.168.1.31 db-2
192.168.1.32 nfs-2
192.168.1.40 web-2
192.168.1.41 sql
192.168.1.42 web-5
192.168.1.50 web-test
192.168.1.61 db-prod
192.168.1.52 nfs-
192.168.1.60 web-
192.168.1.61 db-test
192.168.1.62 nfs-prod
192.168.1.116 test
eth0
DNS
192.168.1.100
eth0
TES
T
192.168.1.115
cat >> /etc/hosts
192.168.1.115 test
ping www.facebook.com
ping: www.facebook.com: Temporary failure in name resolution
cat >> /etc/resolv.conf
nameserver 192.168.1.100
nameserver 8.8.8.8


DNS
G
8.8.8.8
A
eth0
192.168.1.10
192.168.1.0
192.168.1.10 web
192.168.1.11 db
192.168.1.12 nfs
192.168.1.20 web
192.168.1.21 db-1
192.168.1.22 nfs-1
192.168.1.30 web-1
192.168.1.31 db-2
192.168.1.32 nfs-2
192.168.1.40 web-2
192.168.1.41 sql
192.168.1.42 web-5
192.168.1.50 web-test
192.168.1.61 db-prod
192.168.1.52 nfs-
192.168.1.60 web-
192.168.1.61 db-test
192.168.1.62 nfs-prod
192.168.1.116 test
Forward All to 8.8.8.8
eth0
DNS
2.168.1.100
eth0
TES
T
192.168.1.115
cat >> /etc/hosts
192.168.1.115 test
ping www.facebook.com
ping: www.facebook.com: Temporary failure in name resolution
cat >> /etc/resolv.conf
nameserver 192.168.1.100



Domain Names

wwwkubernetes.io

www.codepen.io

www.facebook.com

www.un.org

www.mit.edu

www.google.com

www.behance.net

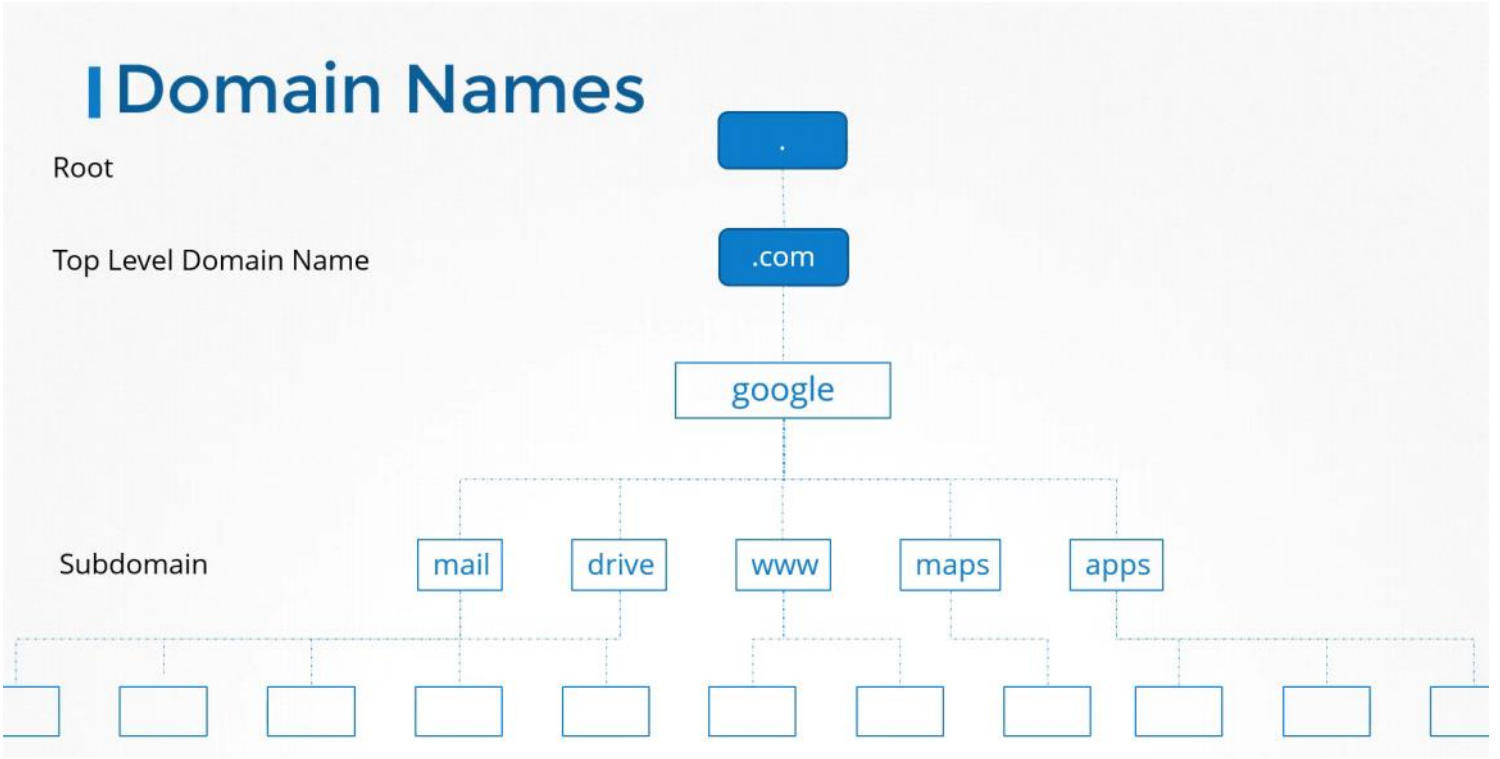
www.speedtest.net

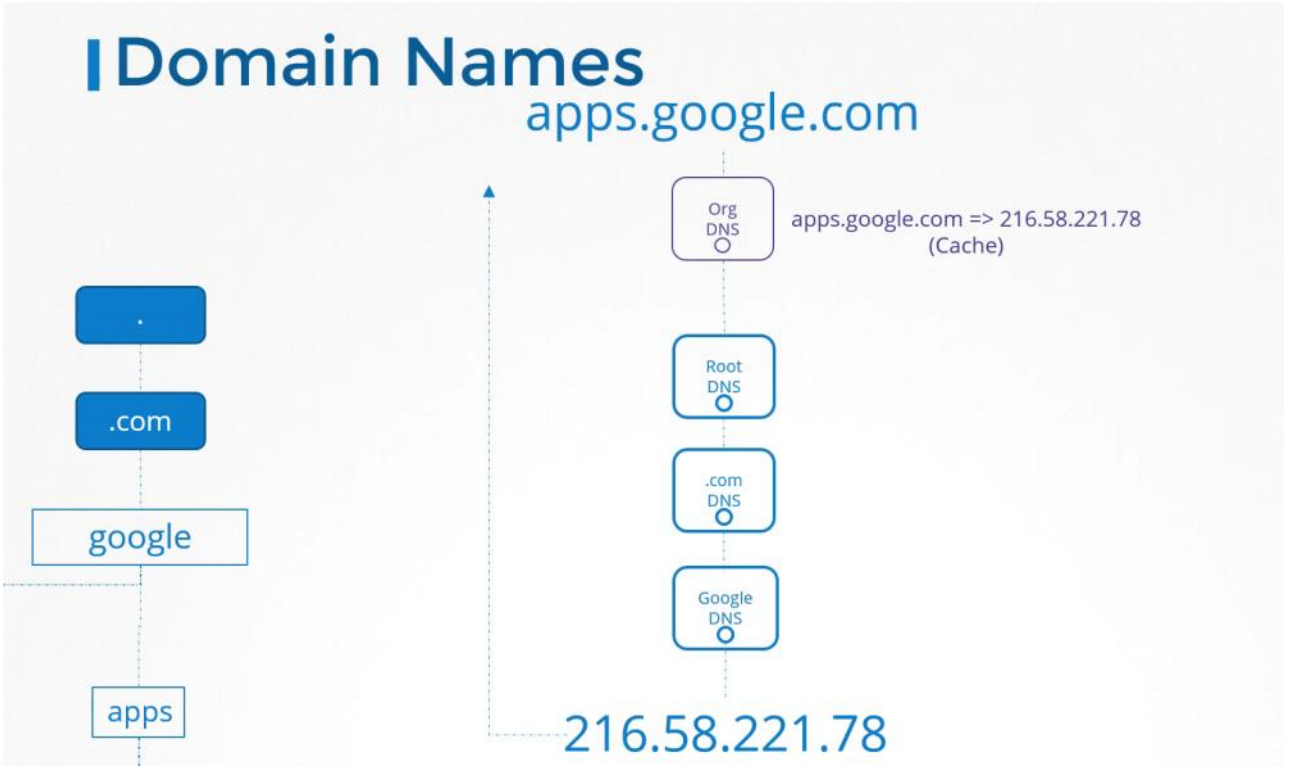
www.stanford.edu

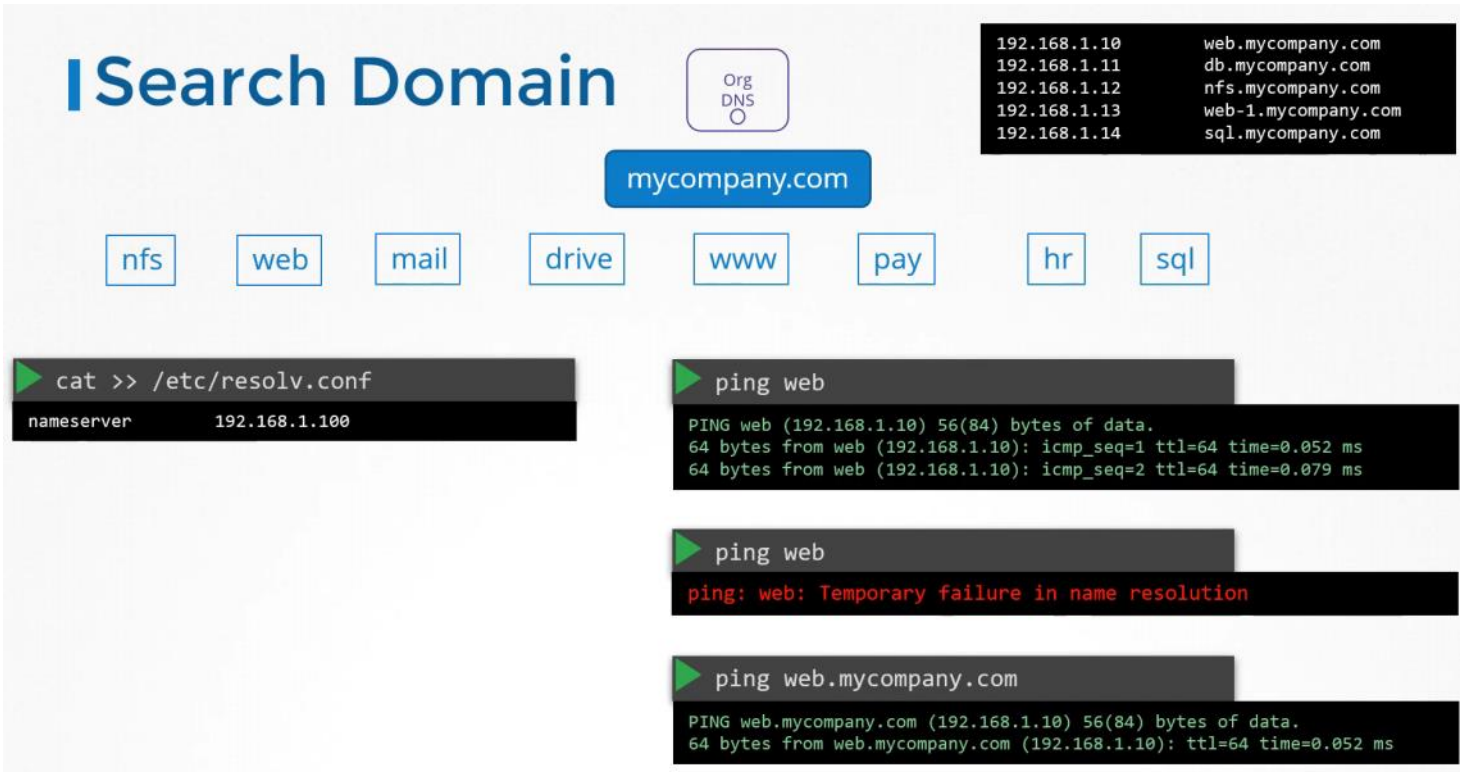
www.care.org

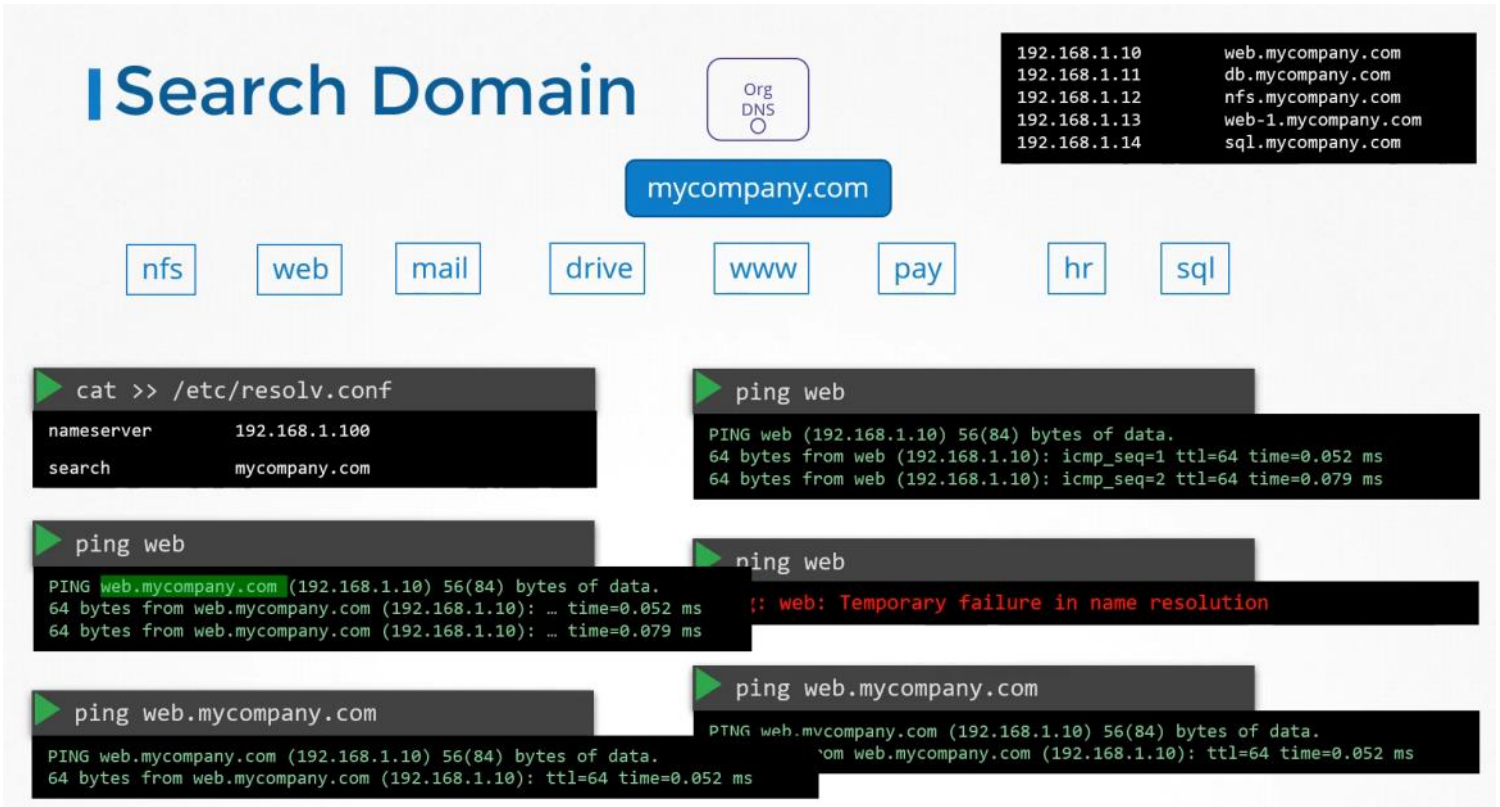
Domain Names

.com	.net	.edu	.org	.io
www.google	www.behance	www.stanford	www.care	www.kubernetes
www.facebook	www.speedtest	www.mit	www.un	www.codepen

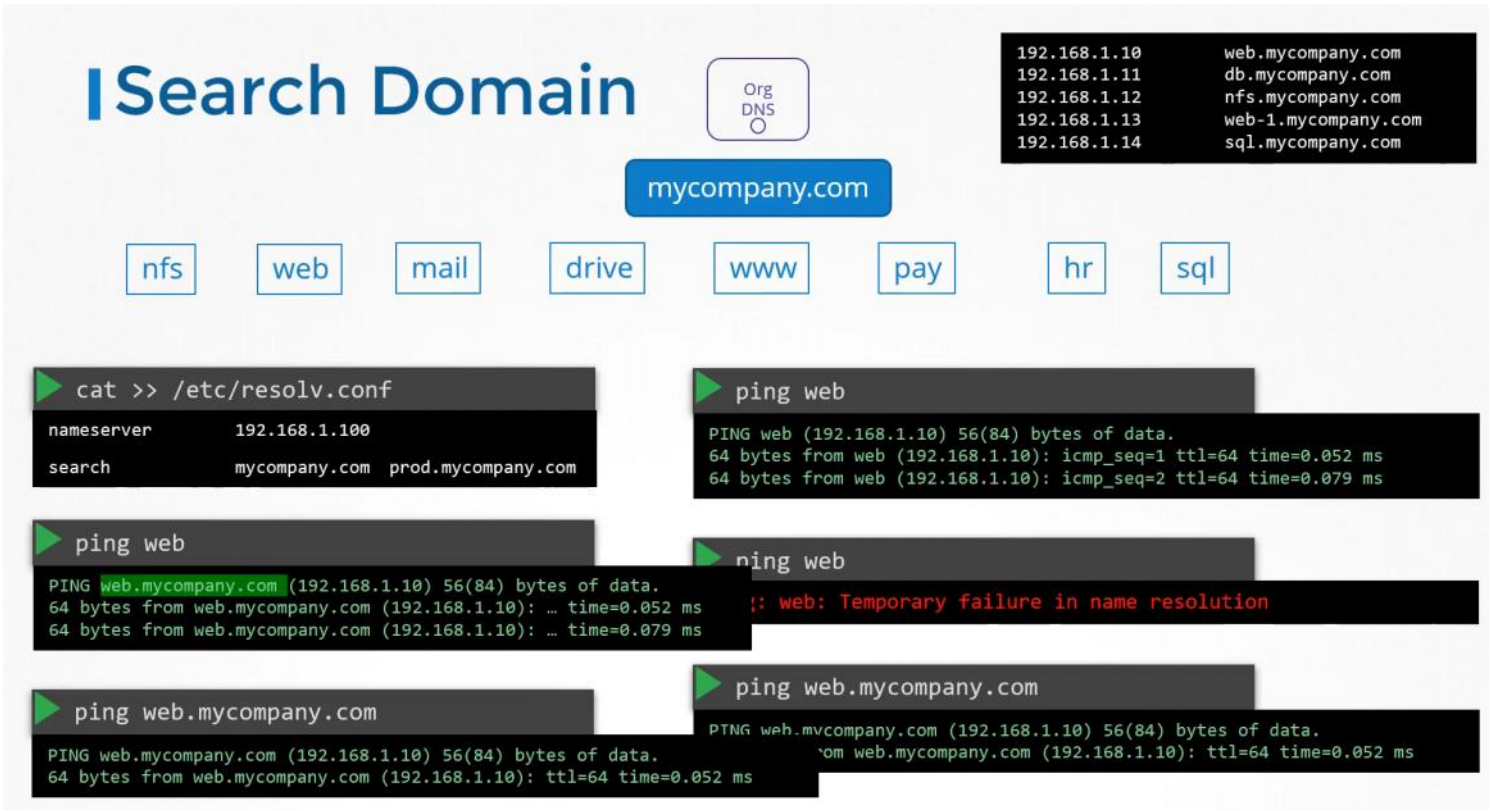

Domain Names
Root
Top Level Domain Name
Subdomain
.
.com
google
mail
drive
www
maps
apps


Domain Names
apps.google.com
Org DNS
apps.google.com => 216.58.221.78 (Cache)
Root DNS
.com DNS
Google DNS
216.58.221.78
.
.com
google
apps


Search Domain
Org DNS
mycompany.com
192.168.1.10 web.mycompany.com
192.168.1.11 db.mycompany.com
192.168.1.12 nfs.mycompany.com
192.168.1.13 web-1.mycompany.com
192.168.1.14 sql.mycompany.com
nfs
web
mail
drive
www
pay
hr
sql
cat >> /etc/resolv.conf
nameserver 192.168.1.100
ping web
PING web (192.168.1.10) 56(84) bytes of data.
64 bytes from web (192.168.1.10): icmp_seq=1 ttl=64 time=0.052 ms
64 bytes from web (192.168.1.10): icmp_seq=2 ttl=64 time=0.079 ms
ping web
ping: web: Temporary failure in name resolution
ping web.mycompany.com
PING web.mycompany.com (192.168.1.10) 56(84) bytes of data.
64 bytes from web.mycompany.com (192.168.1.10): ttl=64 time=0.052 ms


Search Domain
Org DNS
mycompany.com
192.168.1.10 web.mycompany.com
192.168.1.11 db.mycompany.com
192.168.1.12 nfs.mycompany.com
192.168.1.13 web-1.mycompany.com
192.168.1.14 sql.mycompany.com
nfs
web
mail
drive
www
pay
hr
sql
cat >> /etc/resolv.conf
nameserver 192.168.1.100
search mycompany.com
ping web
PING web (192.168.1.10) 56(84) bytes of data.
64 bytes from web (192.168.1.10): icmp_seq=1 ttl=64 time=0.052 ms
64 bytes from web (192.168.1.10): icmp_seq=2 ttl=64 time=0.079 ms
ping web
PING web.mycompany.com (192.168.1.10) 56(84) bytes of data.
64 bytes from web.mycompany.com (192.168.1.10): … time=0.052 ms
64 bytes from web.mycompany.com (192.168.1.10): … time=0.079 ms
ping web
: web: Temporary failure in name resolution
ping web.mycompany.com
PING web.mycompany.com (192.168.1.10) 56(84) bytes of data.
64 bytes from web.mycompany.com (192.168.1.10): ttl=64 time=0.052 ms

Search Domain



Record Types

A	web-server	192.168.1.1
AAAA	web-server	2001:0db8:85a3:0000:0000:8a2e:0370:7334
CNAME	food.web-server	eat.web-server, hungry.web-server

nslookup

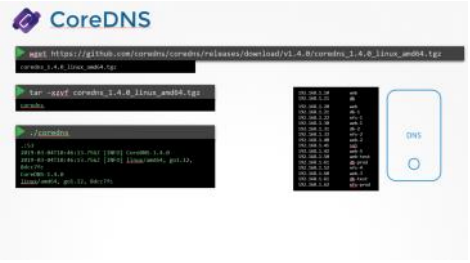
```
nslookup www.google.com
Server:         8.8.8.8
Address:        8.8.8.8#53

Non-authoritative answer:
Name:   www.google.com
Address: 172.217.0.132
```

Prerequisite - CoreDNS

In the previous lecture we saw why you need a DNS server and how it can help manage name resolution in large environments with many hostnames and Ips and how you can configure your hosts to point to a DNS server. In this article we will see how to configure a host as a DNS server.

We are given a server dedicated as the DNS server, and a set of Ips to configure as entries in the server. There are many DNS server solutions out there, in this lecture we will focus on a particular one – CoreDNS.

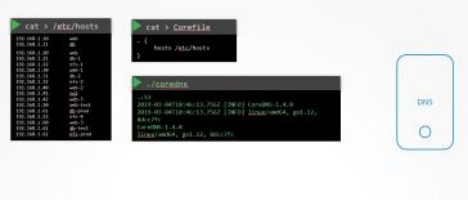
So how do you get core dns? CoreDNS binaries can be downloaded from their Github releases page or as a docker image. Let's go the traditional route. Download the binary using curl or wget. And extract it. You get the coredns executable.



Run the executable to start a DNS server. It by default listens on port 53, which is the default port for a DNS server.

Now we haven't specified the IP to hostname mappings. For that you need to provide some configurations. There are multiple ways to do that. We will look at one. First we put all of the entries into the DNS servers /etc/hosts file.

And then we configure CoreDNS to use that file. CoreDNS loads it's configuration from a file named Corefile. Here is a simple configuration that instructs CoreDNS to fetch the IP to hostname mappings from the file /etc/hosts. When the DNS server is run, it now picks the Ips and names from the /etc/hosts file on the server.



CoreDNS also supports other ways of configuring DNS entries through plugins. We will look at the plugin that it uses for Kubernetes in a later section.
Read more about CoreDNS here:
https://github.com/kubernetes/dns/blob/master/docs/specification.md
https://coredns.io/plugins/kubernetes/