

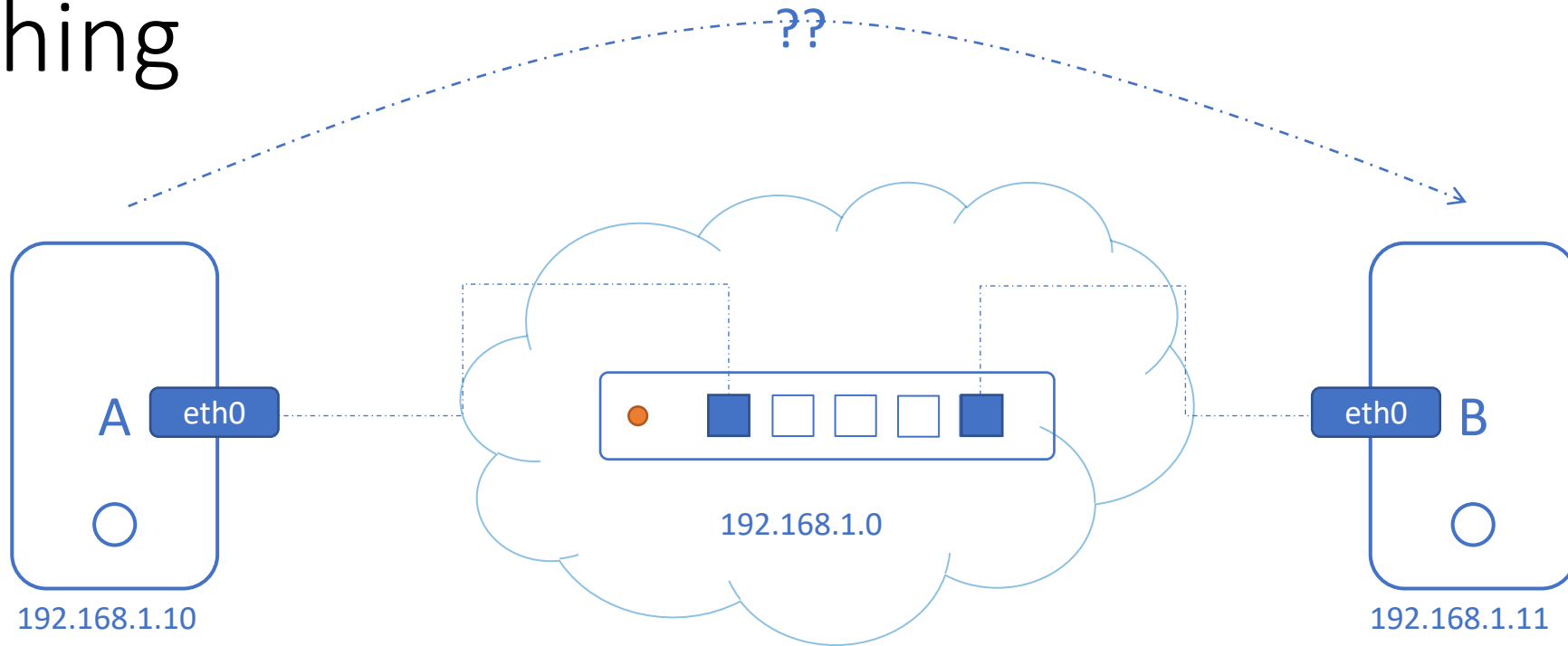


{KODE}{KLOUD



# NETWORKING BASICS

# Switching



```
▶ ip link
```

```
eth0: <BROADCAST,MULTICAST,UP,LOWER_UP> mtu 1500 qdisc fq_codel state UP mode DEFAULT group default qlen 1000
```

```
▶ ip addr add 192.168.1.10/24 dev eth0
```

```
▶ ip link
```

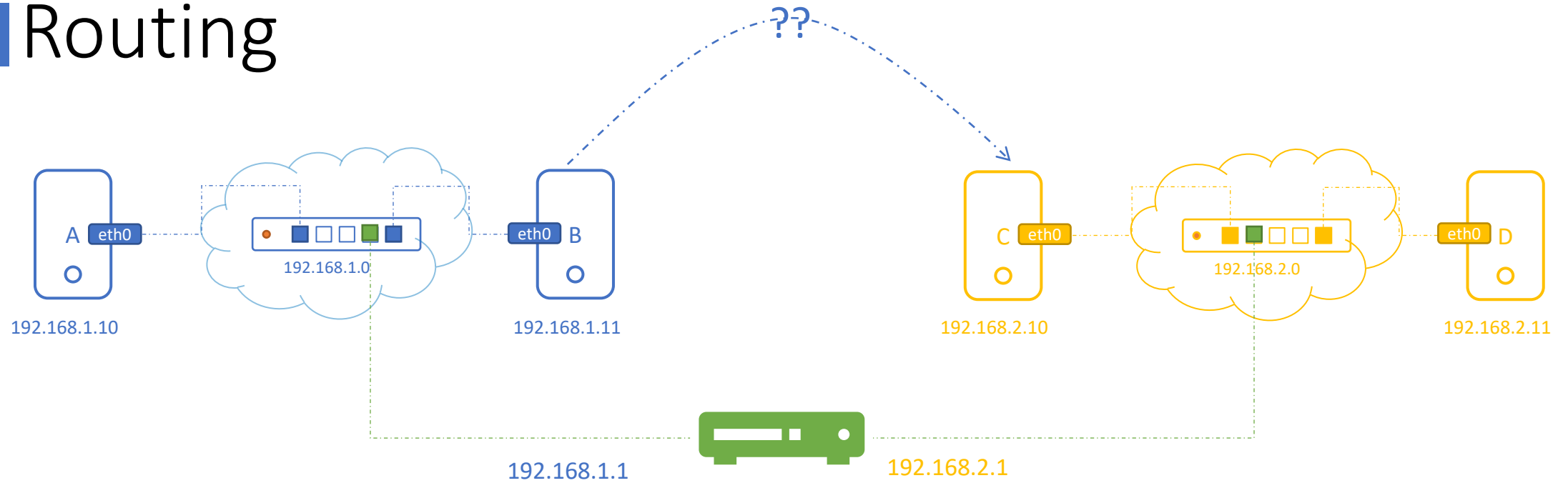
```
eth0: <BROADCAST,MULTICAST,UP,LOWER_UP> mtu 1500 qdisc fq_codel state UP mode DEFAULT group default qlen 1000
```

```
▶ ip addr add 192.168.1.11/24 dev eth0
```

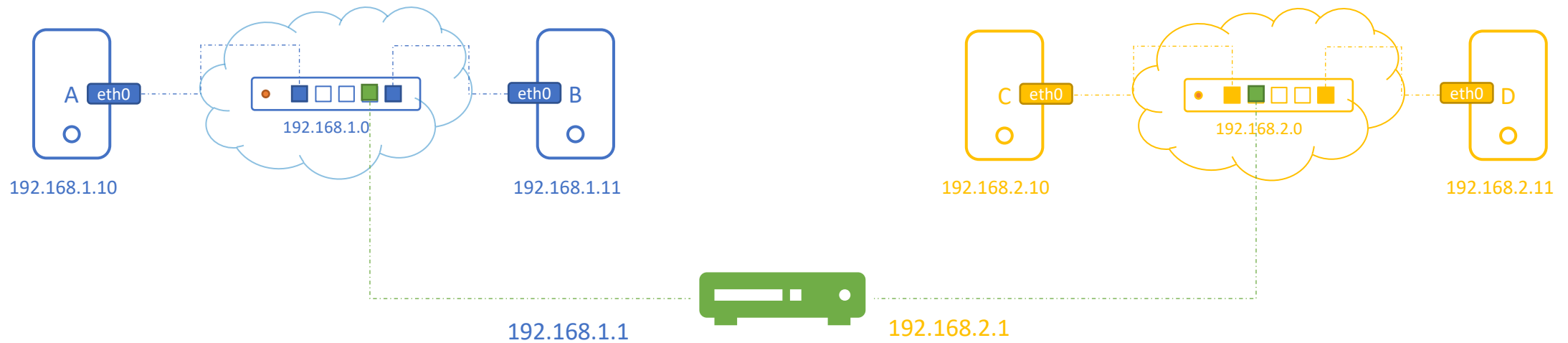
```
▶ ping 192.168.1.11
```

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

# Routing



# Gateway



▶ route

```
Kernel IP routing table
```

Destination	Gateway	Genmask	Flags	Metric	Ref	Use	Iface
-------------	---------	---------	-------	--------	-----	-----	-------

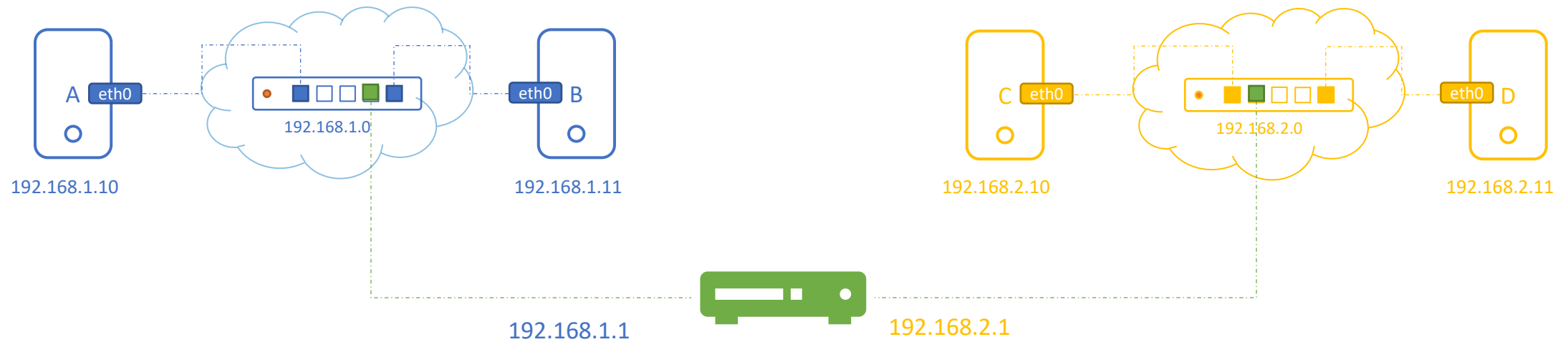
▶ ip route add 192.168.2.0/24 via 192.168.1.1

▶ route

```
Kernel IP routing table
```

Destination	Gateway	Genmask	Flags	Metric	Ref	Use	Iface
192.168.2.0	192.168.1.1	255.255.255.0	UG	0	0	0	eth0

# Gateway



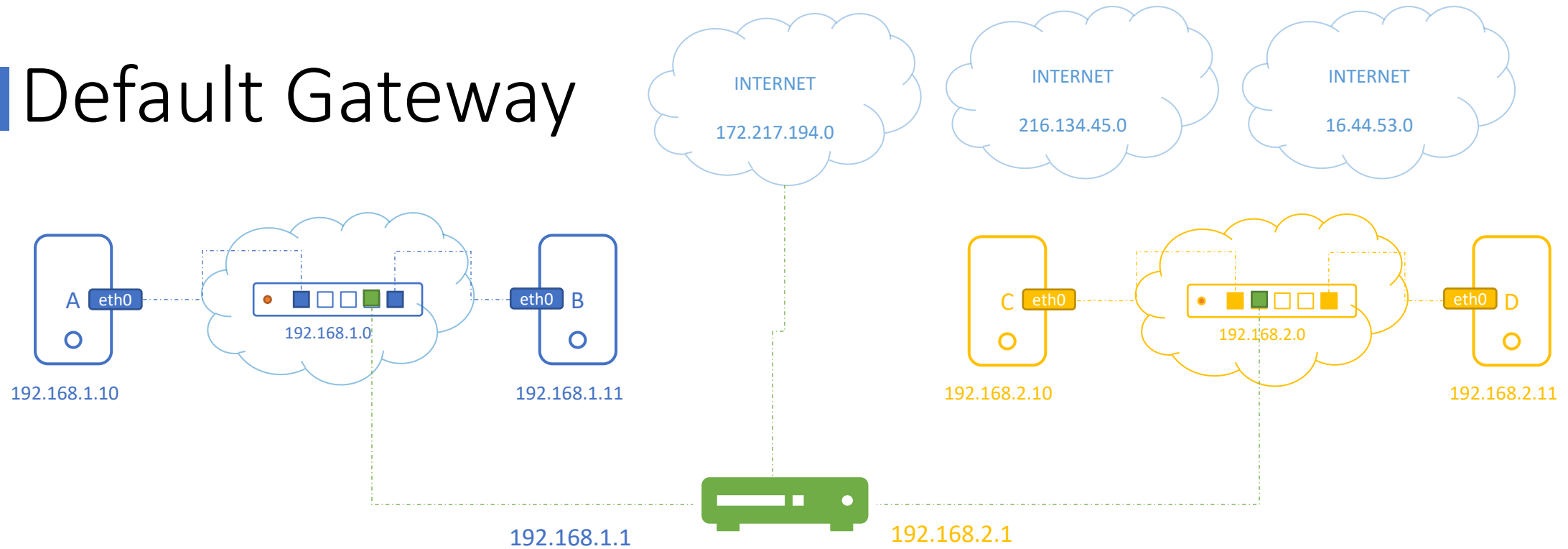
```
▶ ip route add 192.168.1.0/24 via 192.168.2.1
```

```
▶ route
```

```
Kernel IP routing table
```

Destination	Gateway	Genmask	Flags	Metric	Ref	Use	Iface
192.168.1.0	192.168.2.1	255.255.255.0	UG	0	0	0	eth0

# Default Gateway



```
ip route add 192.168.1.0/24 via 192.168.2.1
```

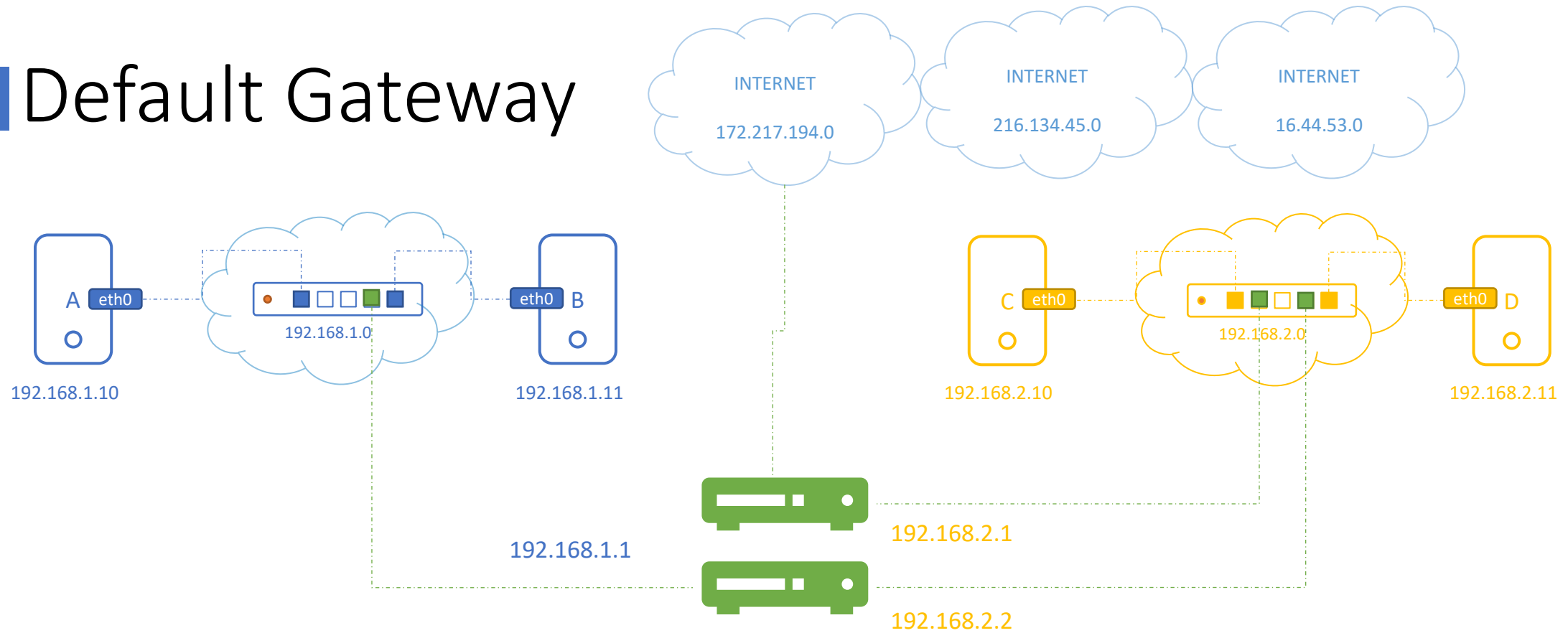
```
ip route add default via 192.168.2.1
```

```
route
```

```
Kernel IP routing table
```

Destination	Gateway	Genmask	Flags	Metric	Ref	Use	Iface
192.168.1.0	192.168.2.1	255.255.255.0	UG	0	0	0	eth0
0.0.0.0	192.168.2.1	255.255.255.0	UG	0	0	0	eth0
192.168.2.0	0.0.0.0	255.255.255.0	UG	0	0	0	eth0

# Default Gateway



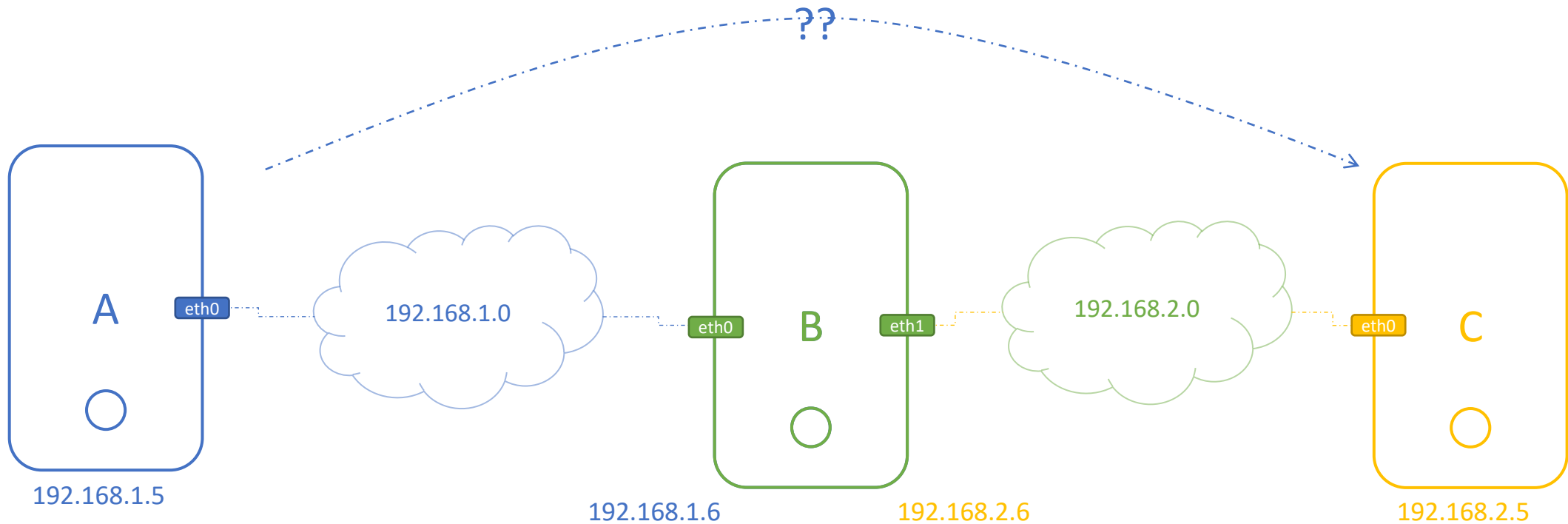
```
▶ ip route add 192.168.1.0/24 via 192.168.2.2
```

```
▶ route
```

```
Kernel IP routing table
```

Destination	Gateway	Genmask	Flags	Metric	Ref	Use	Iface
default	192.168.2.1	255.255.255.0	UG	0	0	0	eth0
192.168.1.0	192.168.2.2	255.255.255.0	UG	0	0	0	eth0



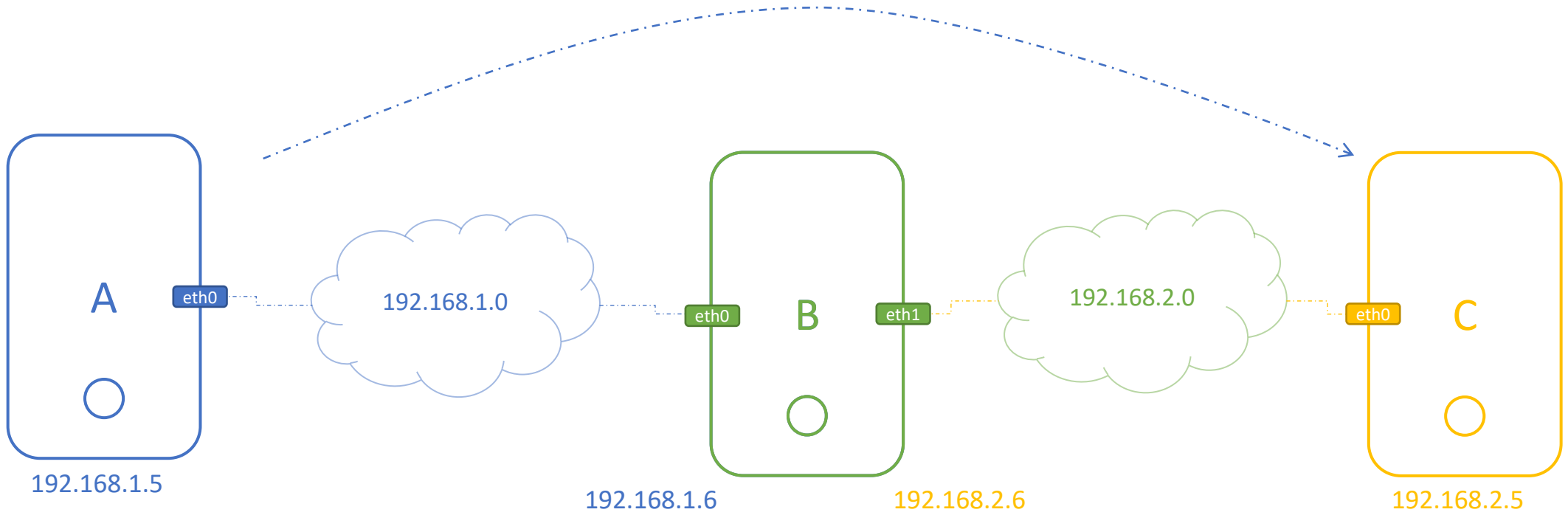


```
▶ ping 192.168.2.5  
Connect: Network is unreachable
```

```
▶ ip route add 192.168.2.0/24 via 192.168.1.6
```

```
▶ ip route add 192.168.1.0/24 via 192.168.2.6
```

```
▶ ping 192.168.2.5
```



```

▶ cat /proc/sys/net/ipv4/ip_forward
0

```

```

▶ echo 1 > /proc/sys/net/ipv4/ip_forward
1

```

```

/etc/sysctl.conf
...
net.ipv4.ip_forward = 1
...

```

```

▶ ping 192.168.2.5

```

```

Reply from 192.168.2.5: bytes=32 time=4ms TTL=117
Reply from 192.168.2.5: bytes=32 time=4ms TTL=117
Reply from 192.168.2.5: bytes=32 time=4ms TTL=117
Reply from 192.168.2.5: bytes=32 time=4ms TTL=117

```

.6

# Take Aways

```
▶ ip link
```

```
▶ ip addr
```

```
▶ ip addr add 192.168.1.10/24 dev eth0
```

```
▶ ip route
```

```
▶ ip route add 192.168.1.0/24 via 192.168.2.1
```

```
▶ cat /proc/sys/net/ipv4/ip_forward
```

```
1
```

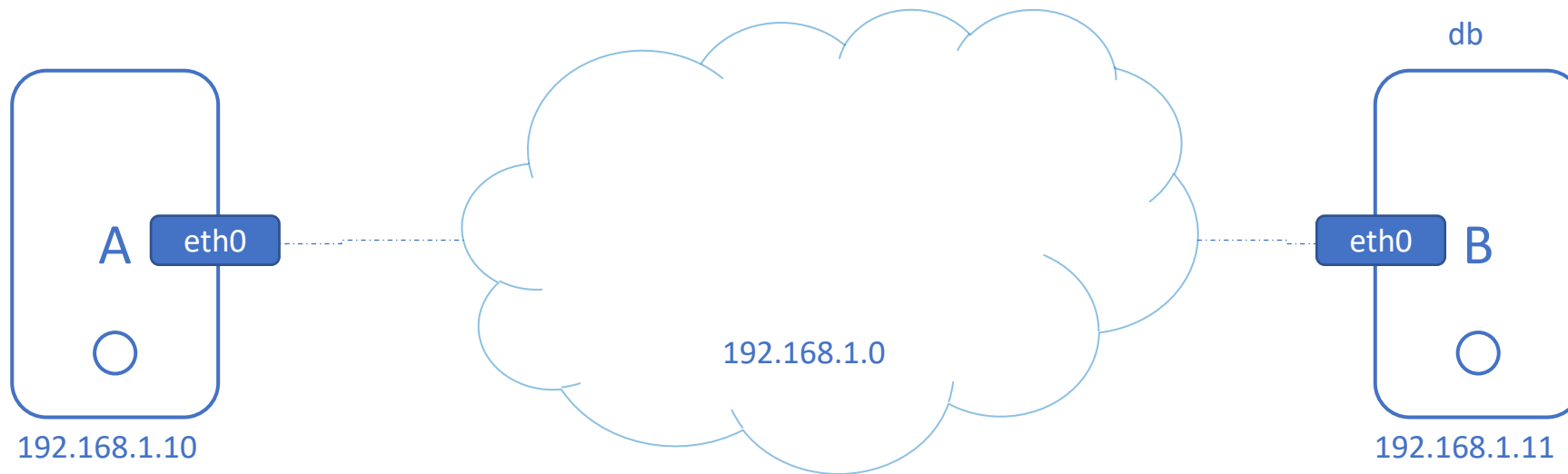
```
▶ route
```



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# DNS

For the Absolute Beginners

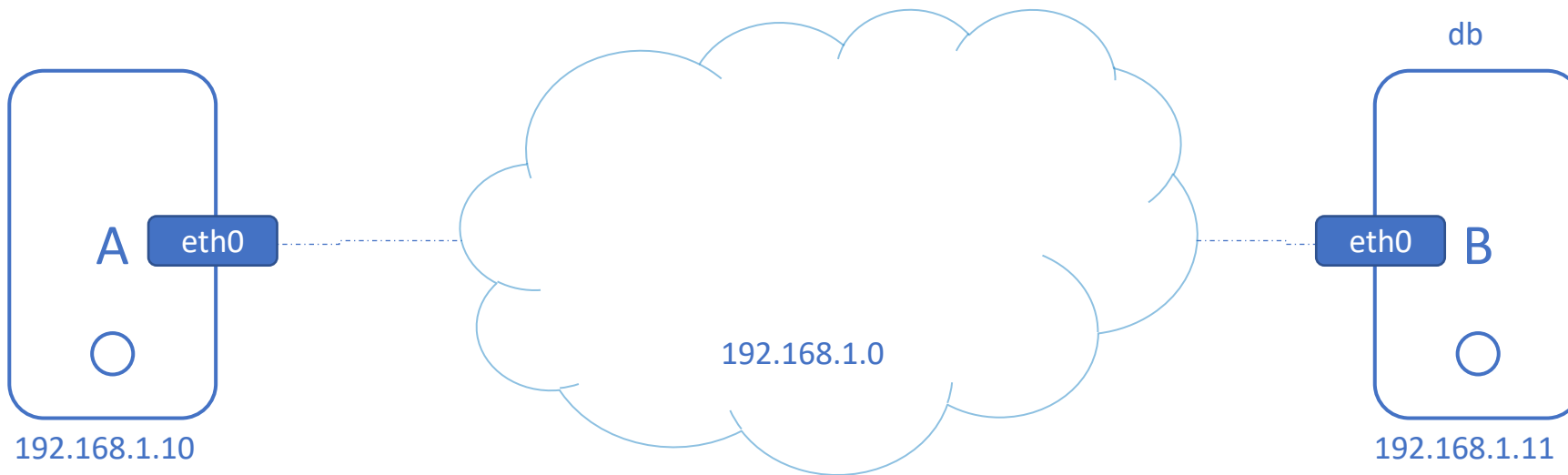


```
▶ ping 192.168.1.11
```

```
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
```

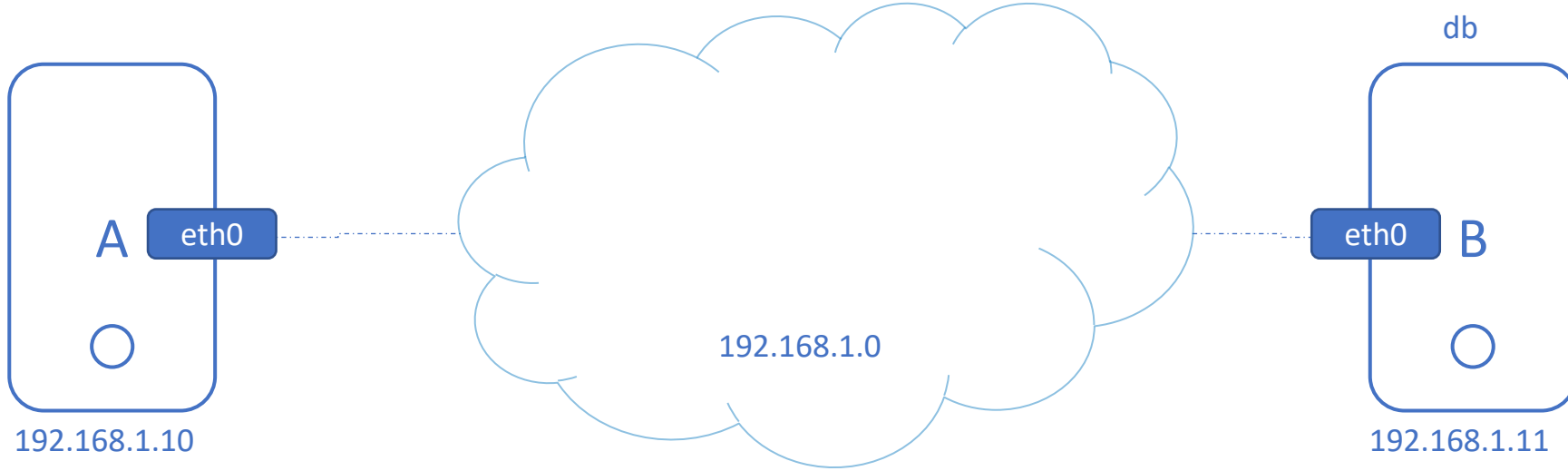
```
192.168.1.11 db
```

```
▶ 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
```

```
▶ hostname
```

```
host-2
```



```
▶ cat >> /etc/hosts
192.168.1.11      db
192.168.1.11      www.google.com
```

```
▶ hostname
host-2
```

```
▶ ping db
```

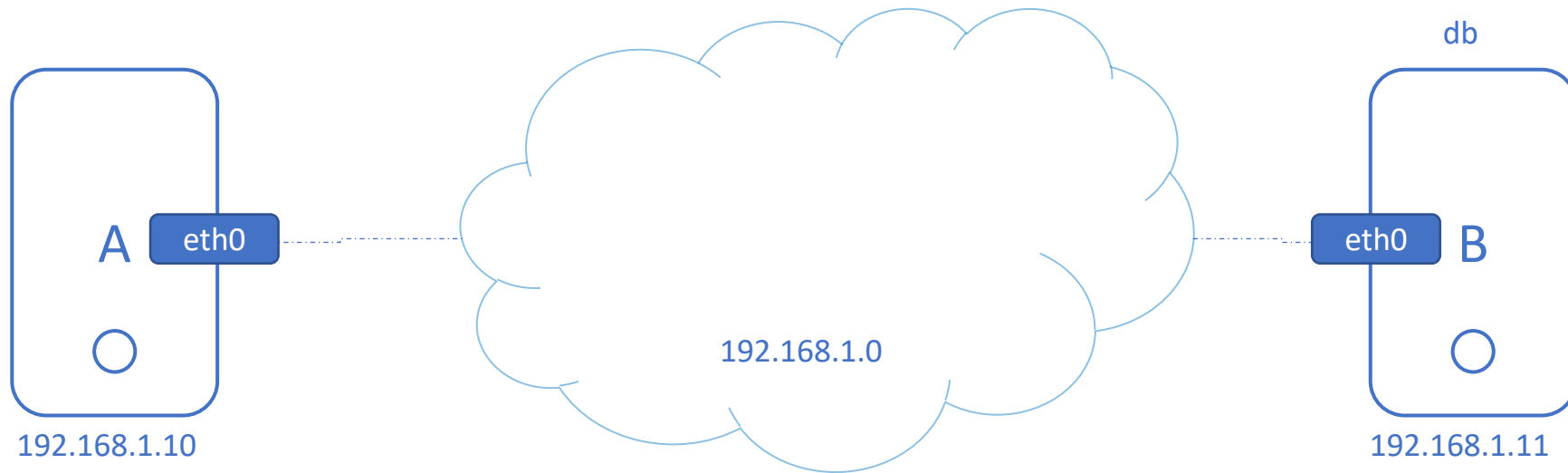
```
PING db (192.168.1.11) 56(84) bytes of data.
64 bytes from db (192.168.1.11): icmp_seq=1 ttl=64 time=0.052 ms
64 bytes from db (192.168.1.11): icmp_seq=2 ttl=64 time=0.079 ms
```

```
▶ 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
```



# Name Resolution



```
▶ cat >> /etc/hosts
192.168.1.11    db
192.168.1.11    www.google.com
```

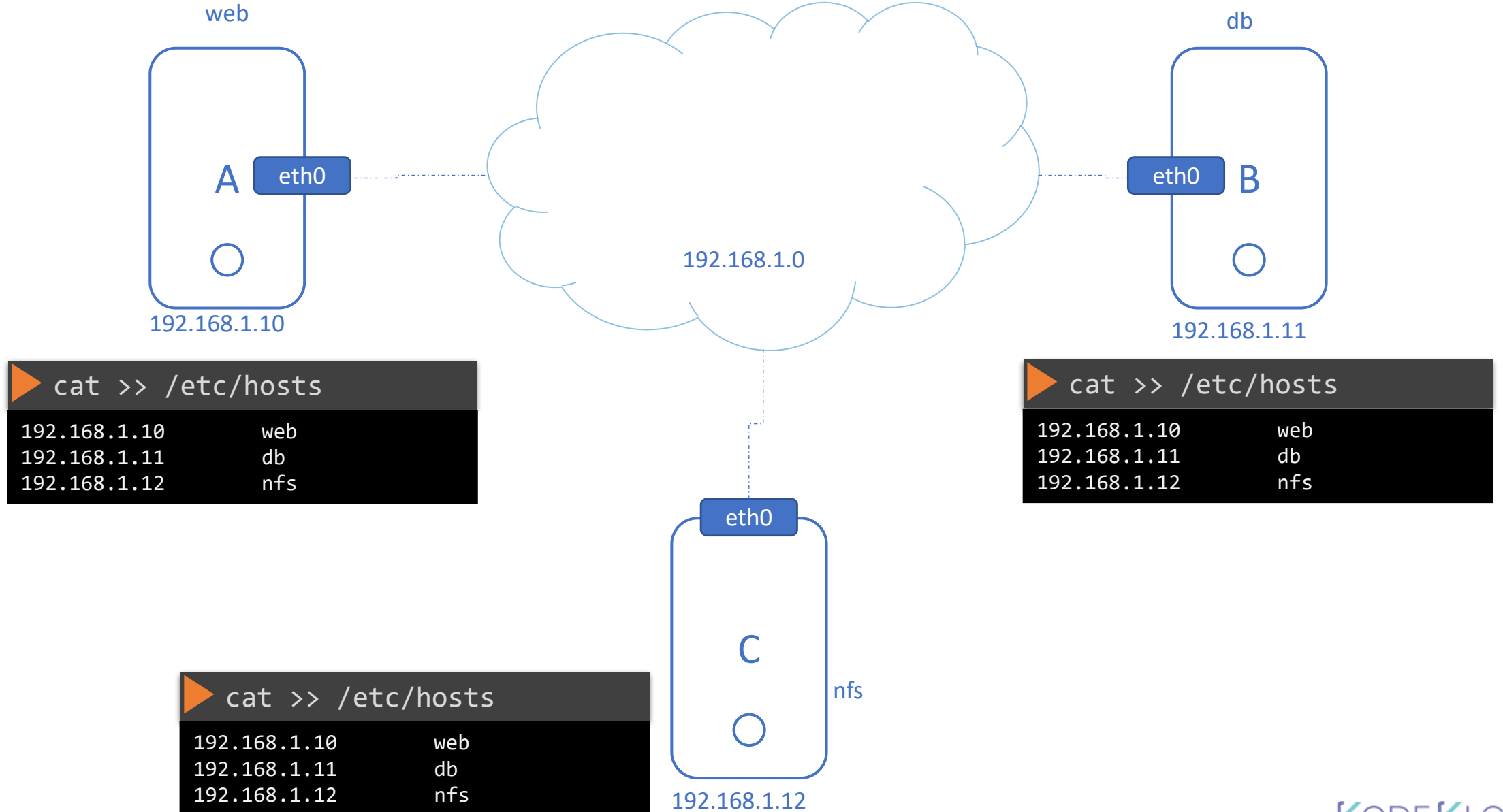
```
▶ ping db
```

```
▶ ssh db
```

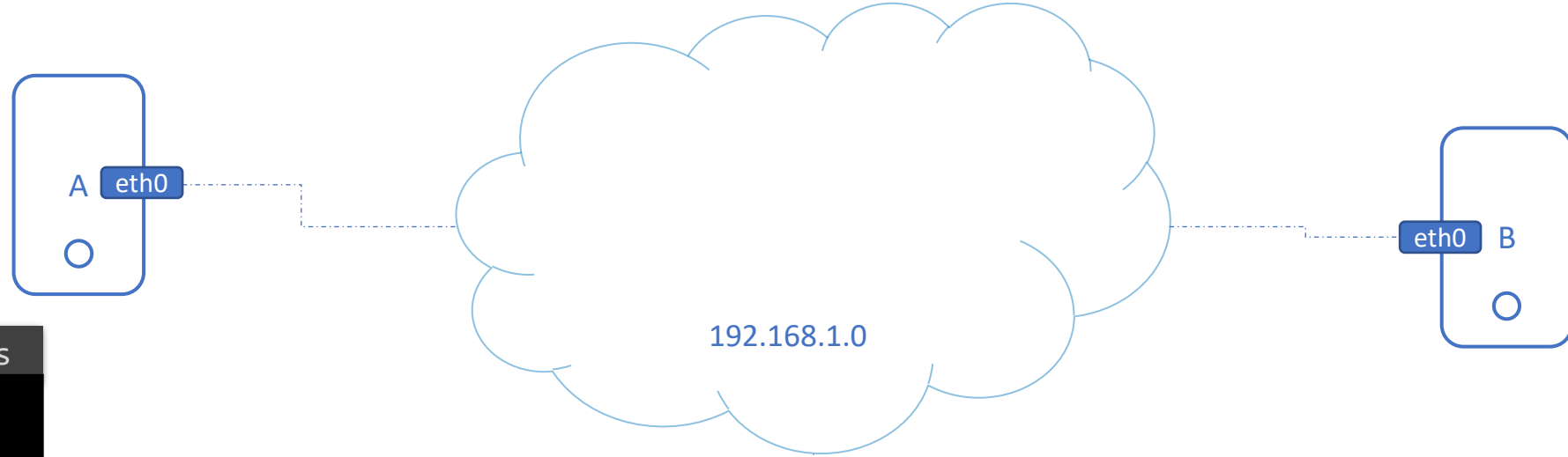
```
▶ curl http://www.google.com
```

```
▶ hostname
host-2
```

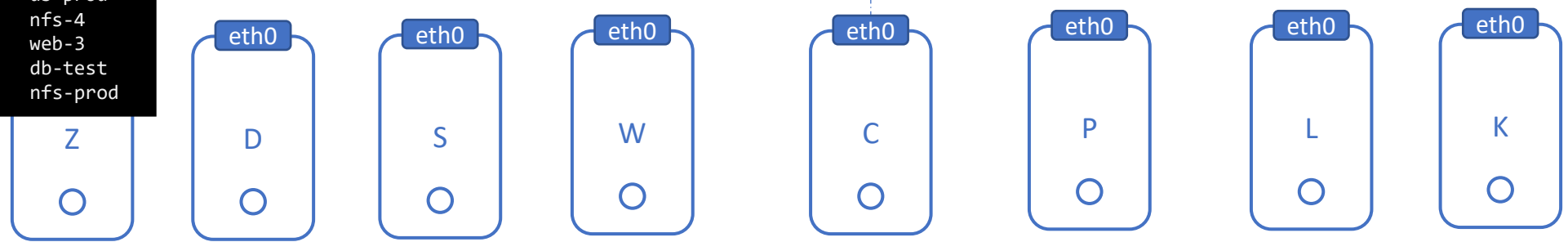
# Name Resolution



# Name Resolution

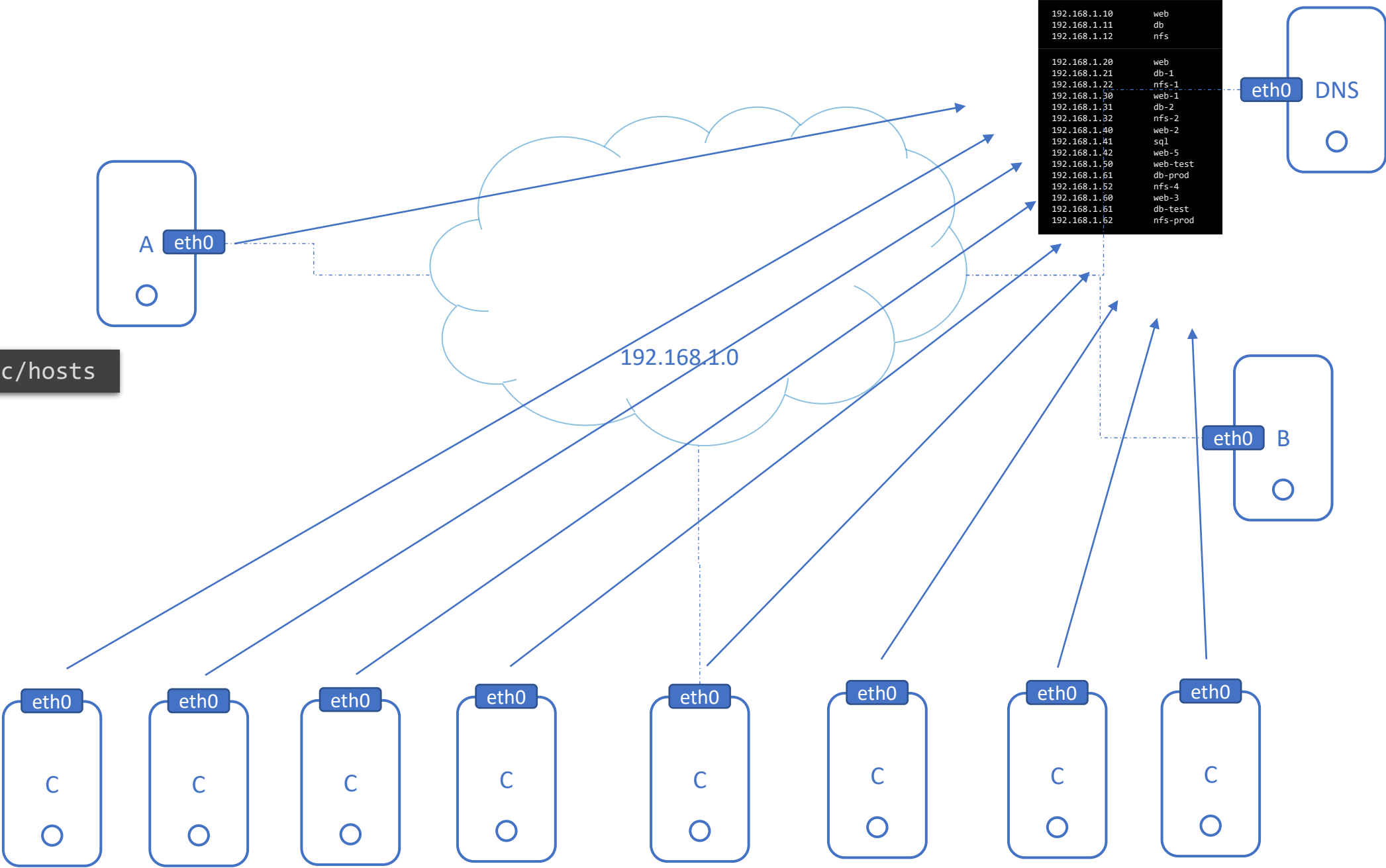


```
cat >> /etc/hosts
192.168.1.10 web
192.168.1.11 db
192.168.1.12 nfs
192.168.1.20 web
192.168.1.21 db-1
192.168.1.22 nfs-1
192.168.1.30 web-1
192.168.1.31 db-2
192.168.1.32 nfs-2
192.168.1.40 web-2
192.168.1.41 sql
192.168.1.42 web-5
192.168.1.50 web-test
192.168.1.61 db-prod
192.168.1.52 nfs-4
192.168.1.60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

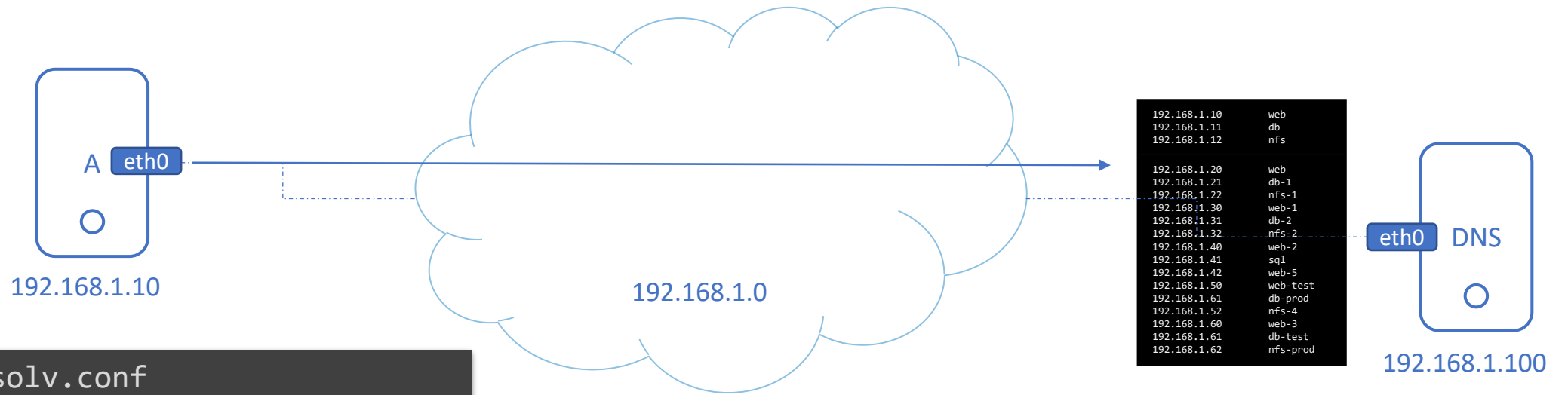


# DNS

```
cat >> /etc/hosts
```



# DNS



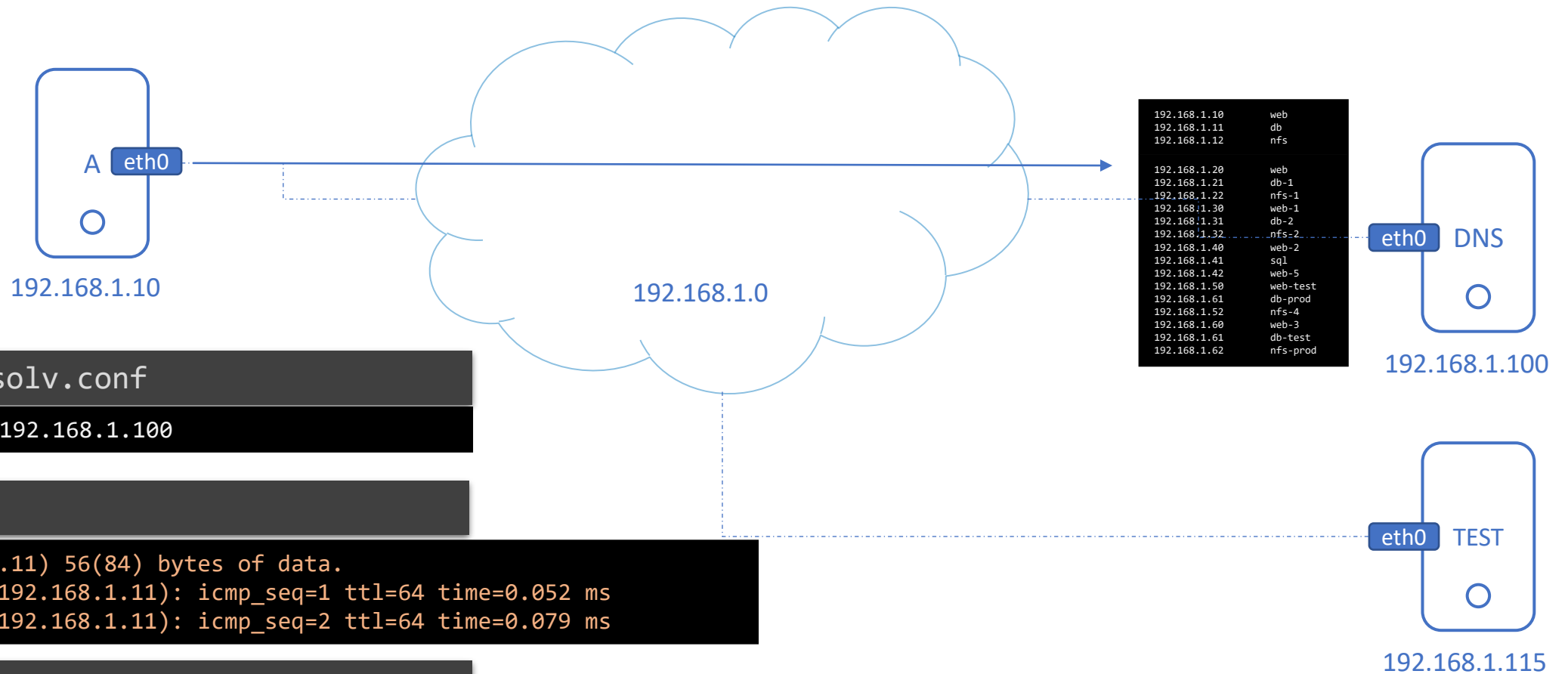
```
▶ cat /etc/resolv.conf
```

```
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



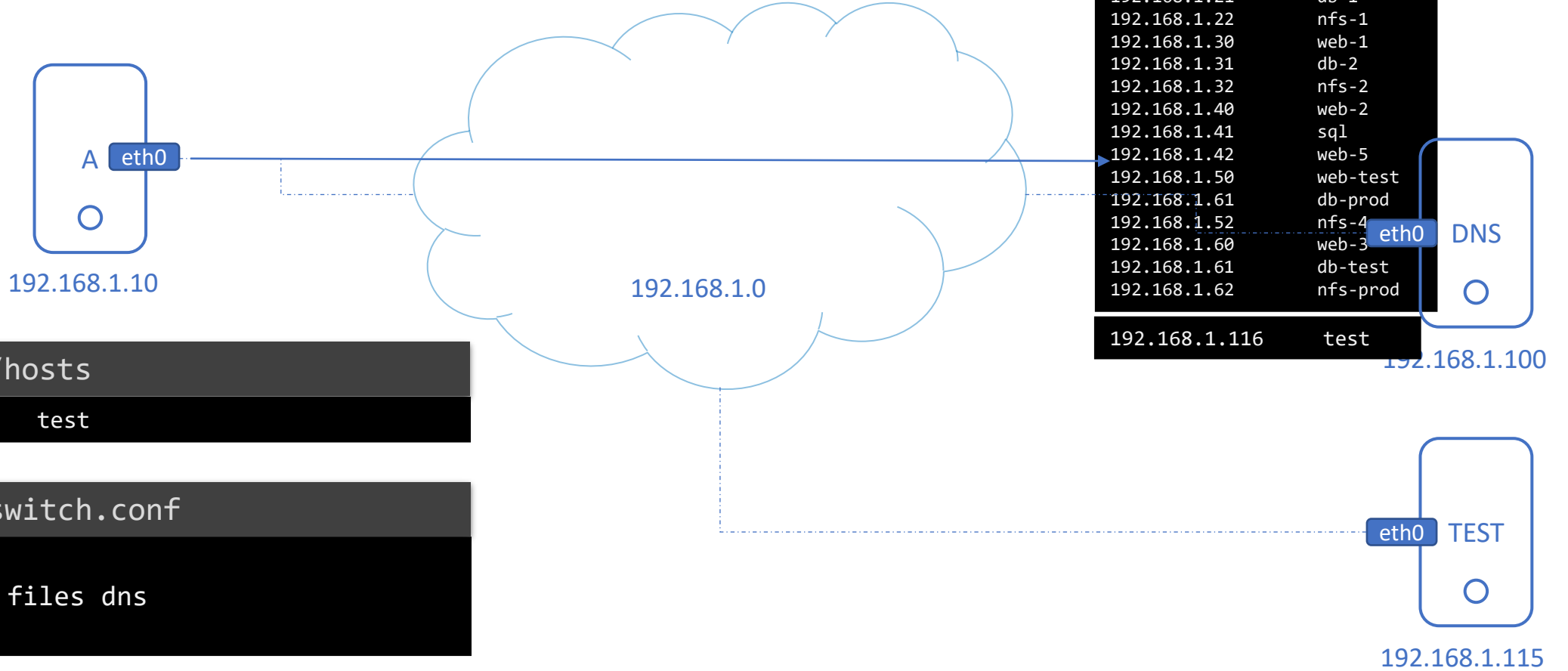
```
cat /etc/resolv.conf
nameserver 192.168.1.100
```

```
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
```

```
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
```

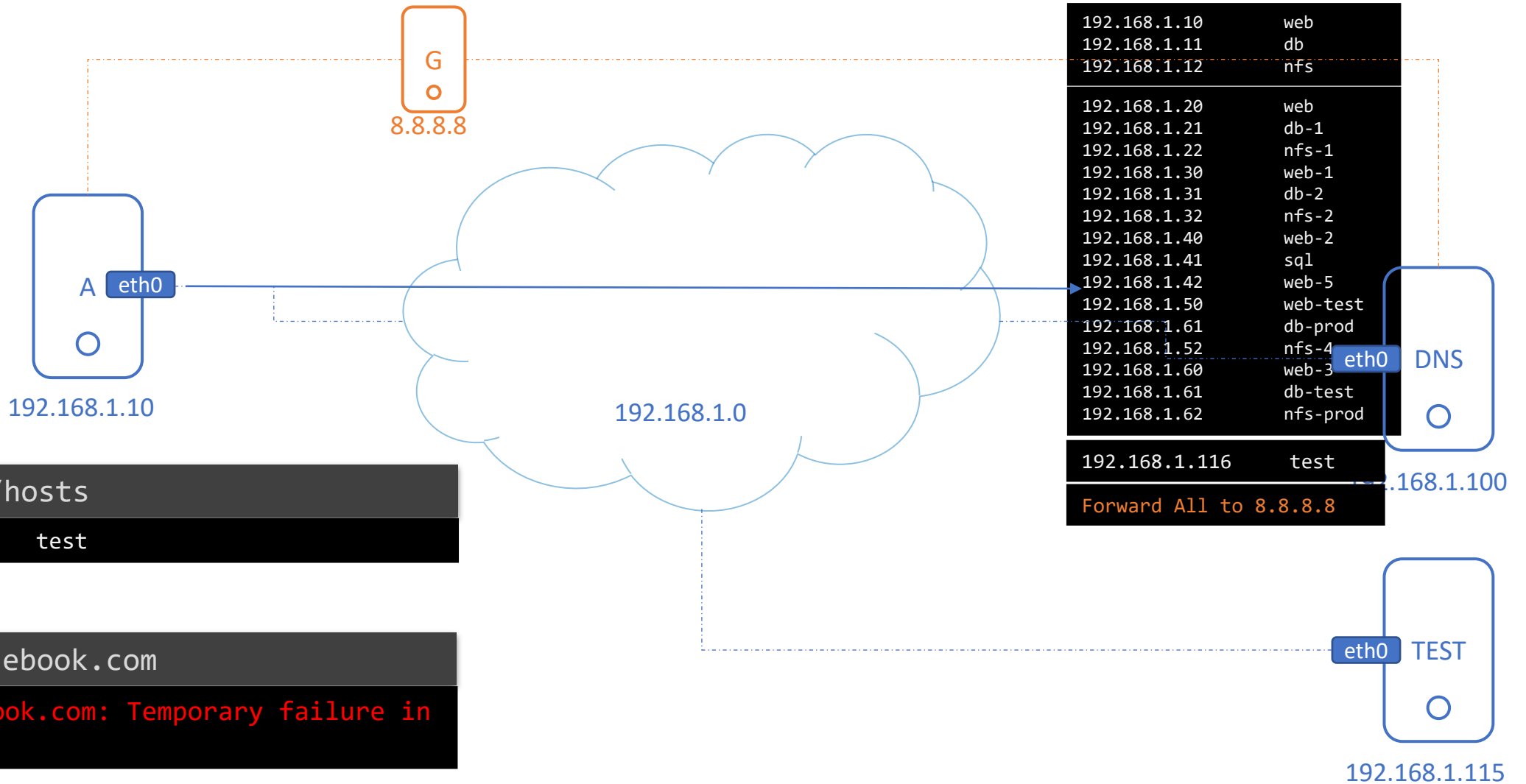
# DNS



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

```
cat /etc/nsswitch.conf
...
hosts: files dns
...
```

# DNS



```
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
```

```
ping www.facebook.com
```

```
PING star-mini.c10r.facebook.com (157.240.13.35) 56(84) bytes of data.  
64 bytes from edge-star-mini-shv-02-sin6.facebook.com (157.240.13.35): icmp_seq=1 ttl=50 time=5.70 ms
```



# | Domain Names

[www.kubernetes.io](http://www.kubernetes.io)

[www.codepen.io](http://www.codepen.io)

[www.facebook.com](http://www.facebook.com)

[www.un.org](http://www.un.org)

[www.mit.edu](http://www.mit.edu)

[www.google.com](http://www.google.com)

[www.behance.net](http://www.behance.net)

[www.speedtest.net](http://www.speedtest.net)

[www.stanford.edu](http://www.stanford.edu)

[www.care.org](http://www.care.org)

# | Domain Names

.com

www.google  
www.facebook

.net

www.behance  
www.speedtest

.edu

www.stanford  
www.mit

.org

www.care  
www.un

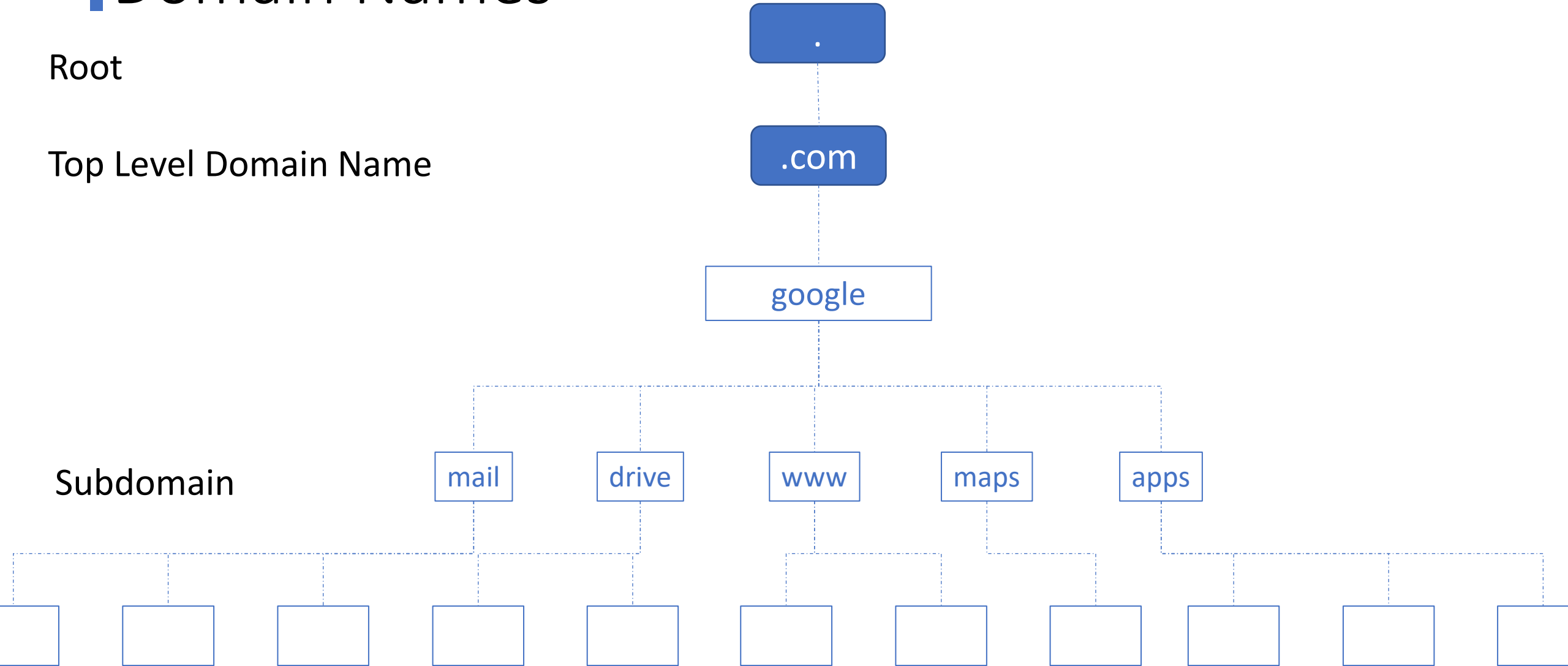
.io

www.kubernetes  
www.codepen

# Domain Names

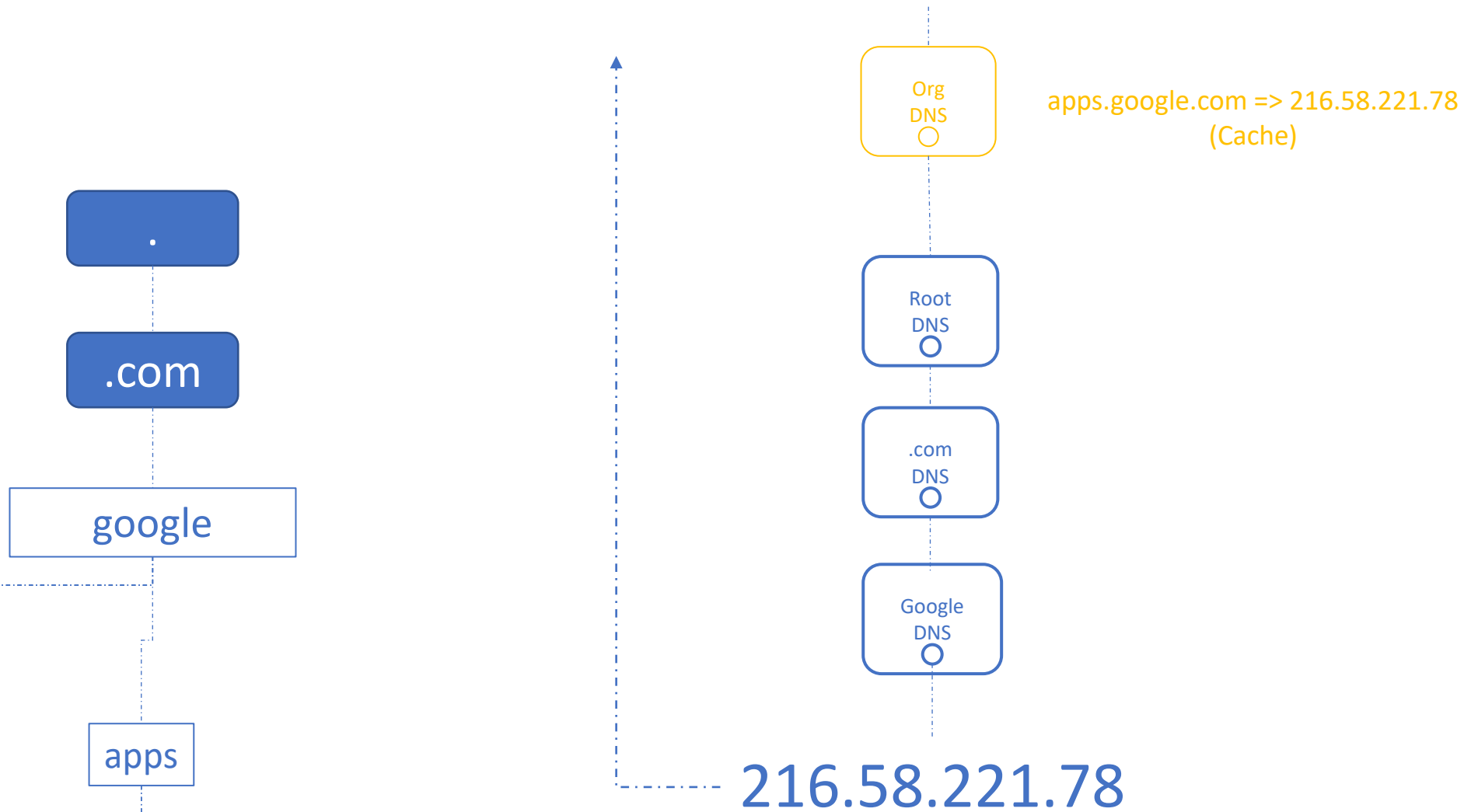
Root

Top Level Domain Name

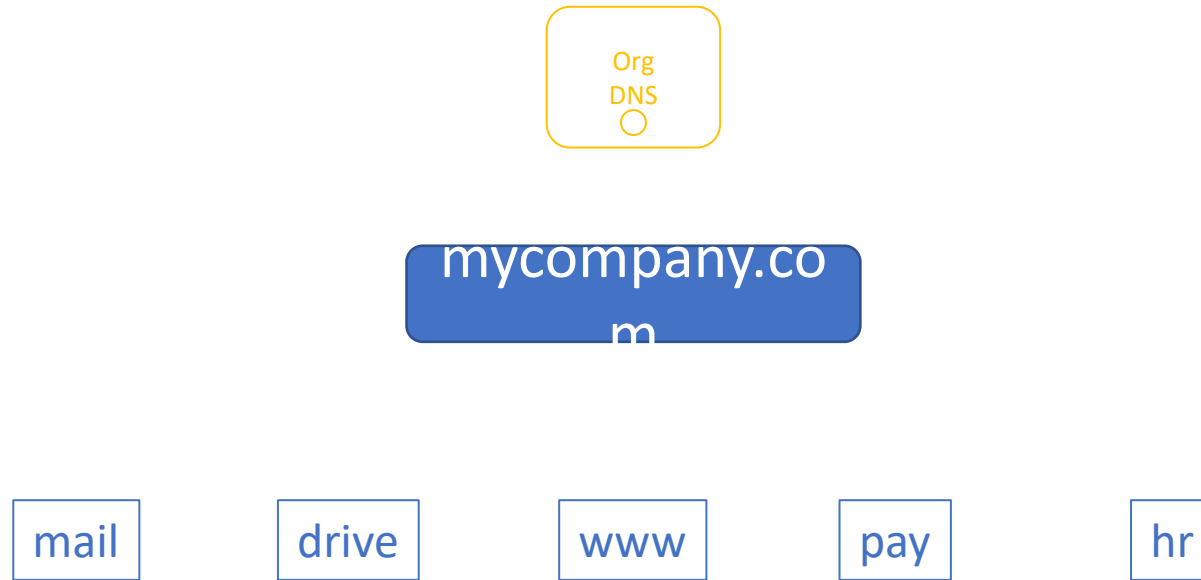


# Domain Names

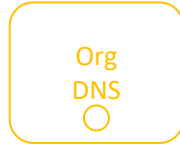
apps.google.com



# Domain Names



# Search Domain



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



```
cat >> /etc/resolv.conf
nameserver 192.168.1.100
search mycompany.com prod.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
```

```
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
```

# 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
```



# dig

```
▶ dig www.google.com
```

```
; <<>> DiG 9.10.3-P4-Ubuntu <<>> www.google.com
;; global options: +cmd
;; Got answer:
;; ->>HEADER<<- opcode: QUERY, status: NOERROR, id: 28065
;; flags: qr rd ra; QUERY: 1, ANSWER: 6, AUTHORITY: 0, ADDITIONAL: 1

;; OPT PSEUDOSECTION:
; EDNS: version: 0, flags:; udp: 512
;; QUESTION SECTION:
;www.google.com.                IN      A

;; ANSWER SECTION:
www.google.com.                245     IN      A      64.233.177.103
www.google.com.                245     IN      A      64.233.177.105
www.google.com.                245     IN      A      64.233.177.147
www.google.com.                245     IN      A      64.233.177.106
www.google.com.                245     IN      A      64.233.177.104
www.google.com.                245     IN      A      64.233.177.99

;; Query time: 5 msec
;; SERVER: 8.8.8.8#53(8.8.8.8)
;; WHEN: Sun Mar 24 04:34:33 UTC 2019
;; MSG SIZE rcvd: 139
```