Lesson Module Status

- Slides
- Whiteboard with 1st minute quiz

- Flashcards
- Web Calendar summary
- Web book pages
- Commands
- Howtos

- Test 2 published and locked
- DNS Lab tested
- Lab template in depot

- Backup slides, Confer links, handouts on flash drive
- 9V backup battery for microphone

Course history and credits

Jim Griffin

- Jim created the original version of this course
- Jim's site: http://cabrillo.edu/~jgriffin/

Rick Graziani

- Thanks to Rick Graziani for the use of some of his great network slides
- Rick's site: http://cabrillo.edu/~rgraziani/

CIS 192 - Lesson 9

Instructor: **Rich Simms**
Dial-in: **888-450-4821**
Passcode: **761867**


Solomon


Sean C.


Chris


Corey


Bryan


Sean F.


Tony


David


Donna


Dave


Evan


Gabriel


Elia


Tajvia


Carlos


Adam


Ben


Laura

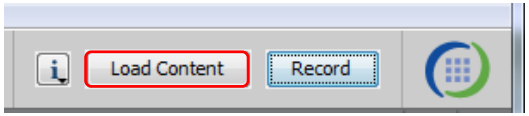
VMs for tonight

Frodo, Elrond

Email me (risimms@cabrillo.edu) a relatively current photo of your face for 3 points extra credit

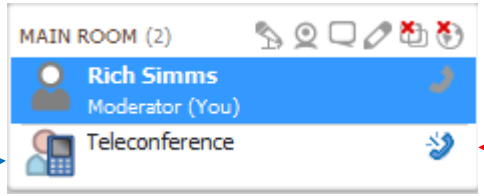
CCC Confer

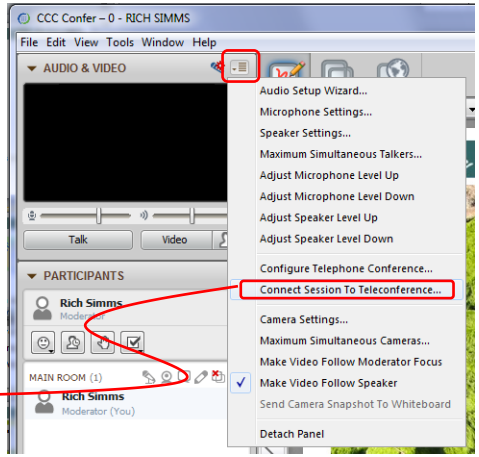
[ ] Preload White Board with *cis*lesson??*-WB*



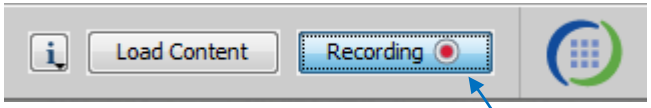
[ ] Connect session to Teleconference

Session now connected to teleconference





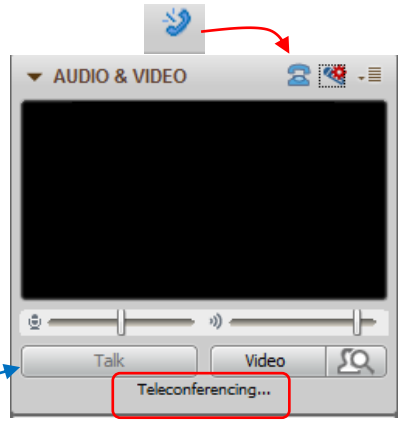
[ ] Is recording on?



Red dot means recording

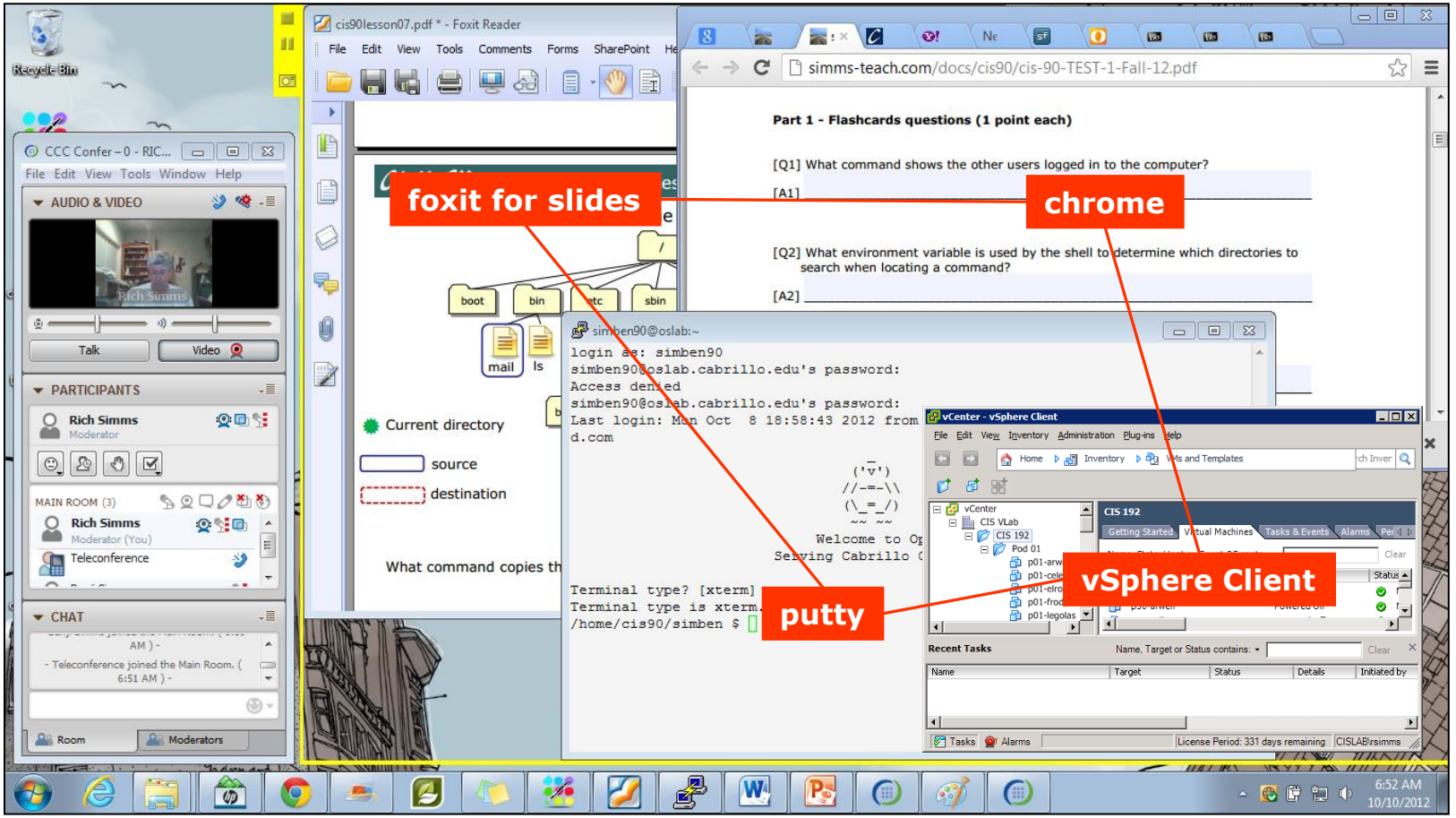
[ ] Use teleconferencing, not mic

Should be greyed out



CCC Confer

- [ ] **Video (webcam) optional**
- [ ] **layout and share apps**

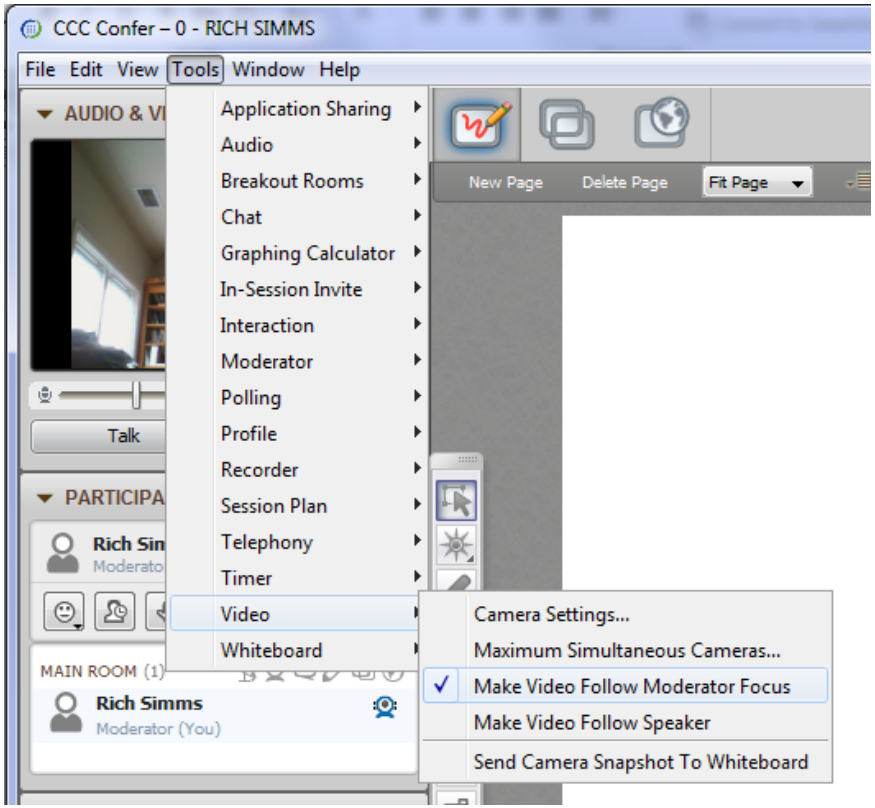


CCC Confer

[ ] Video (webcam) optional

[ ] Follow moderator

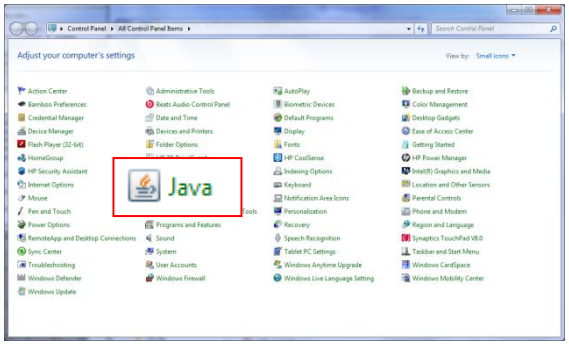
[ ] Double-click on postages stamps



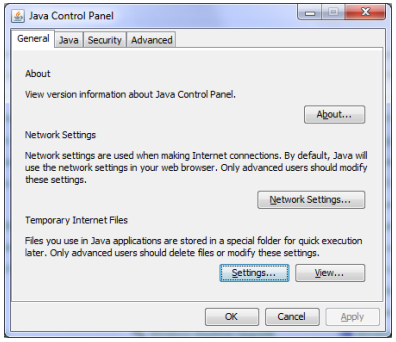
Universal Fix for CCC Confer:

1) Shrink (500 MB) and delete Java cache
2) Uninstall and reinstall latest Java runtime

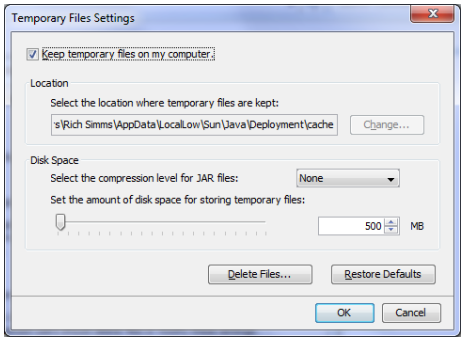
Control Panel (small icons)



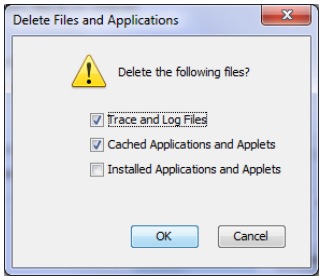
General Tab > Settings…



500MB cache size



Delete these



Google Java download

First Minute Quiz

Please answer these questions **in the order** shown:

Use CCC Confer White Board

For credit email answers to:
risimms@cabrillo.edu
within the first few minutes of class

The Domain Name System

Objectives	Agenda
• Configure both a primary Domain Name Server for a specified zone, and a secondary name server for redundancy and observing a zone transfer.	• No quiz today! • Questions on previous material • Housekeeping • DNS Overview • dig command • host command • Forward zone database • Reverse zone database • named.conf • Zone transfer • Troubleshooting • Demo • Lab 7 • Wrap • Test 2

Questions

Lesson material?

Labs?

How this course works?

Chinese Proverb	他問一個問題，五分鐘是個傻子，他不問一個問題仍然是一個傻瓜永遠。 *He who asks a question is a fool for five minutes; he who does not ask a question remains a fool forever.*

Questions

Practice Test?

Practice Test?

Practice Test?

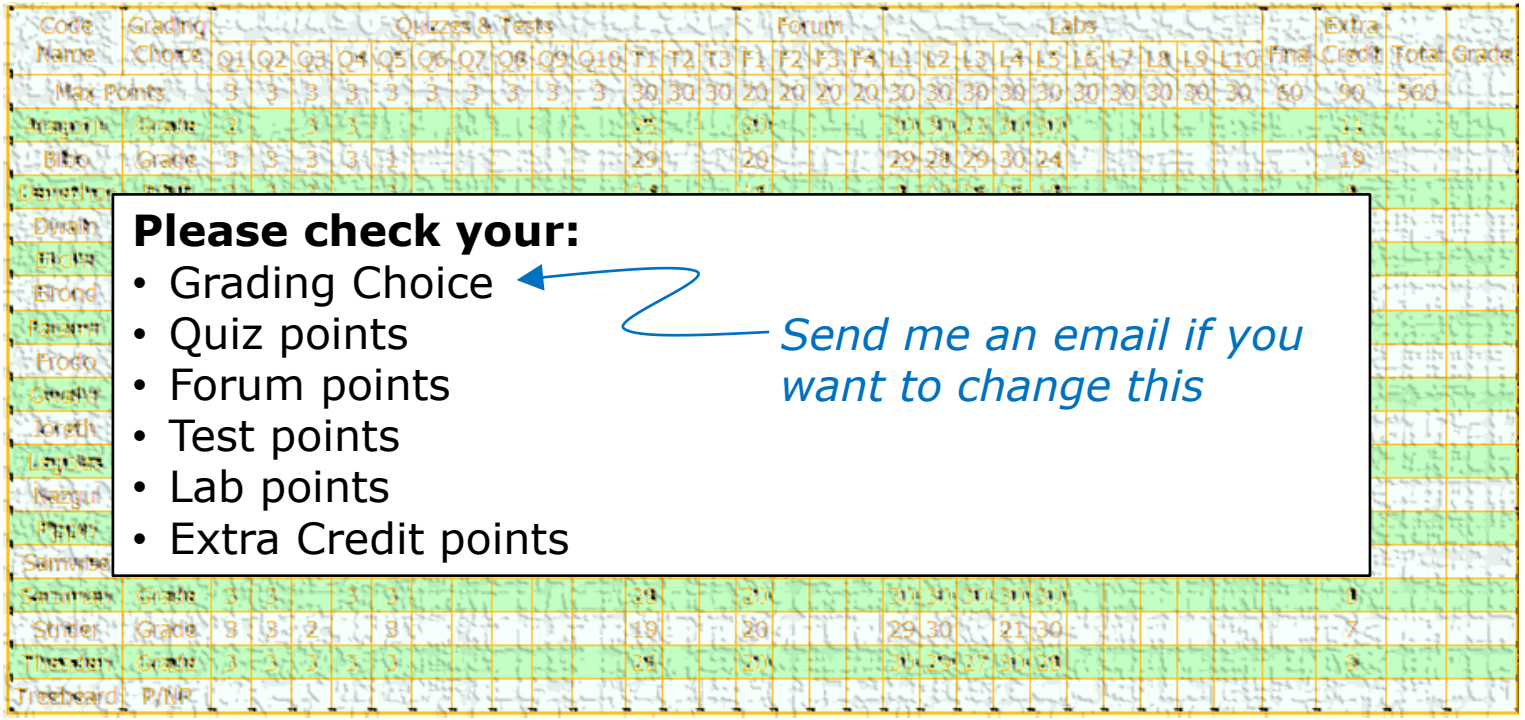
Chinese Proverb	他問一個問題，五分鐘是個傻子，他不問一個問題仍然是一個傻瓜永遠。 *He who asks a question is a fool for five minutes; he who does not ask a question remains a fool forever.*

Housekeeping

- Test tonight
- No labs due today!
- Note you can earn up to 90 points of extra credit (labs, typos, howtos, etc.)
- Extra credit labs available:
  - X1 SSH Tunneling (30 points)
  - X2 PPP (30-50 points)
- HowTos
  - Up to 20 points extra credit for a publishable HowTo document (will be published on the class website)
  - 10 points additional if you do a class presentation
  - Topics must be pre-approved with instructor

Grades Web Page

http://simms-teach.com/cis192grades.php



Don't know you secret LOR code name?

… then email me your student survey to get it!

Help with labs

Like some help with labs?

I'm in the CIS Lab Monday afternoons
- See schedule at http://webhawks.org/~cislab/

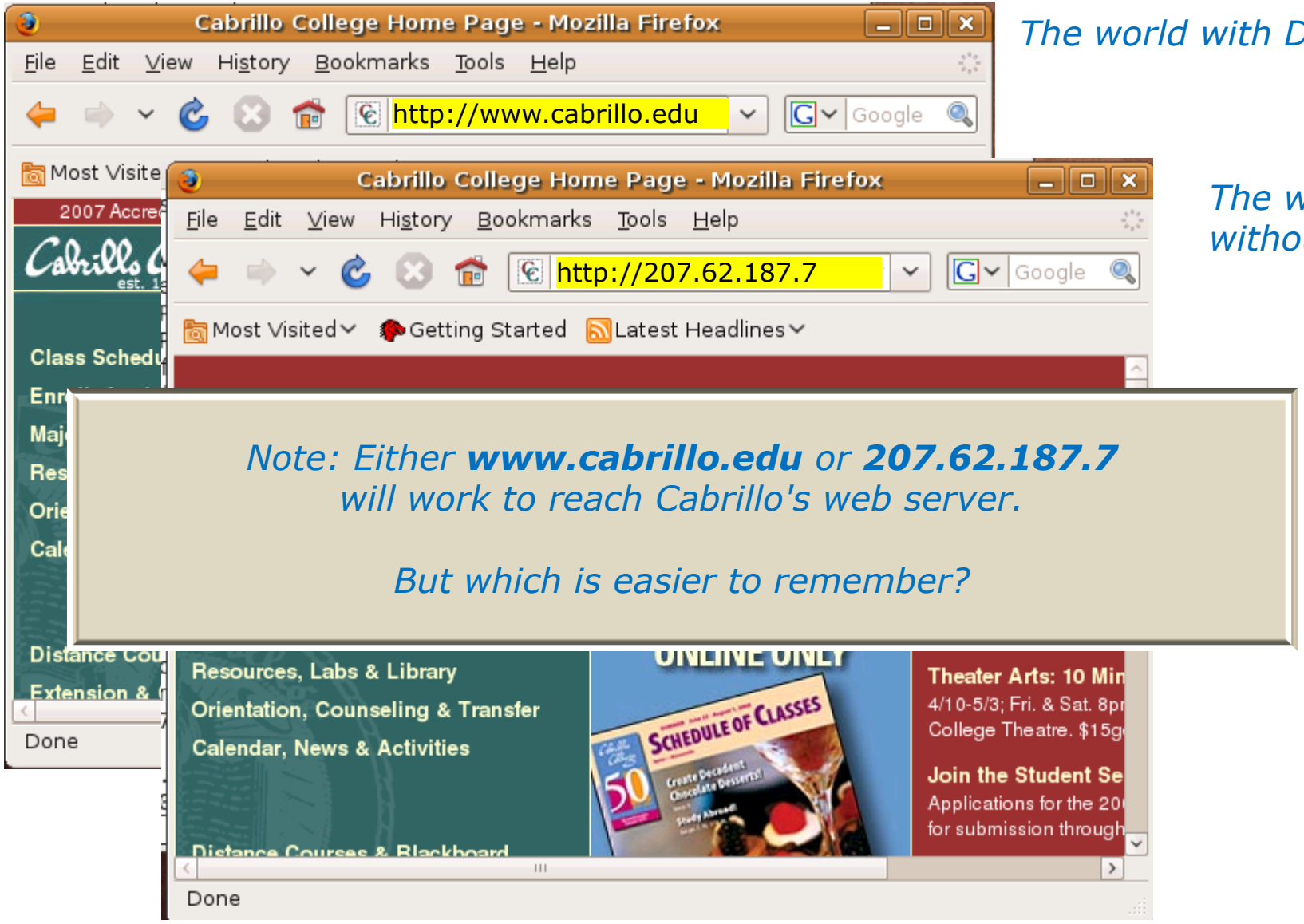
or see me during office hours

or contact me to arrange another time online

DNS Overview

The world with DNS

The world without DNS



*Note: Either **www.cabrillo.edu** or **207.62.187.7** will work to reach Cabrillo's web server.*

But which is easier to remember?

Paul worked at the Information Sciences Institute of the University of Southern California

An Overview of Domain Name System

Created in 1983 from the work led by Paul Mockapetris

Improves the deficiencies of the */etc/hosts* file

DNS manages two databases (zones)

- Forward lookup zones: for mapping Domain names to IP addresses
- Reverse lookup zones: for mapping IP addresses to Domain names

Three components to DNS:

- Resolver
- The Server
  - Primary
  - Secondary
  - Caching
- Database files (db.*domain-name)*

Supports two type of queries:

- Recursive
- Iterative

Most popular implementation of DNS is Berkely Internet Name Daemon (BIND)

Maintained by the Internet Systems Consortium: *www.isc.org*

An Overview of Domain Name System

Can you imagine trying to keep these files updated on every single host in the world?

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Supports two type of queries:

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- Iterative

In reality, the DNS is a huge, global distributed database spread across all the DNS servers in the world.

Each DNS server is authoritative for its own domain and maintains these forward and reverse lookup zones.

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Maintained by the Internet Systems Consortium: *www.isc.org*

DNS - Domain Name System

Forward lookup

name to IP

```
[root@elrond]# host opus.cabrillo.edu
opus.cabrillo.edu has address 207.62.186.9
```

Reverse lookup

IP to name

```
[root@elrond]# host 207.62.186.9
9.186.62.207.in-addr.arpa domain name pointer opus.cabrillo.edu.
```

DNS works both ways

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Three components to DNS:

- Resolver
- The Server
  - Primary
  - Secondary
  - Caching
- Database files (db.*domain-name)*

The client side of DNS. It initiates and sequences the queries that lead to the resolution of a name into an IP address

Supports two type of queries:

- Recursive
- Iterative

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Three components to DNS:

- Resolver
- The Server
  - Primary
  - Secondary
  - Caching
- Database files (db.*domain-name)*

Also known as the master server. This server maintains a database of hostname/IP pairs for the systems it serves. This server also provides authoritative answers for these same systems.

Supports two type of queries:

- Recursive
- Iterative

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Three components to DNS:

- Resolver
- The Server
  - Primary
  - Secondary
  - Caching
- Database files (db.*domain-name)*

Also known as a slave server. This server is identical to the primary server except it does not maintain its own database. It's data is obtained instead from the primary server. Used as backup when the primary server is down and for load balancing.

Supports two type of queries:

- Recursive
- Iterative

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- Reverse lookup zones: for mapping IP addresses to Domain names

Three components to DNS:

- Resolver
- The Server
  - Primary
  - Secondary
  - Caching
- Database files (db.*domain-name)*

Has no database of its own and does not obtain one from another server. Caching servers make queries on behalf of clients and cache the answers. Caching servers are used for site performance improvement.

Supports two type of queries:

- Recursive
- Iterative

Most popular implementation of DNS is Berkely Internet Name Daemon (BIND)

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Three components to DNS:

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  - Primary
  - Secondary
  - Caching
- Database files (db.*domain-name)*

Contain the database resource records such as A records that map a hostname to a IP address, PTR records that map IP addresses to hostnames, NS records for name servers, and CNAME records for aliases.

Supports two type of queries:

- Recursive
- Iterative

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Three components to DNS:

- Resolver
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  - Primary
  - Secondary
  - Caching
- Database files (db.*domain-name)*

Supports two type of queries:

- Recursive
- Iterative

Provide either an answer or an error message

Most popular implementation of DNS is Berkely Internet Name Daemon (BIND)

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An Overview of Domain Name System

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- Forward lookup zones: for mapping Domain names to IP addresses
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Three components to DNS:

- Resolver
- The Server
  - Primary
  - Secondary
  - Caching
- Database files (db.*domain-name)*

Supports two type of queries:

- Recursive
- Iterative

Provide either an answer or a referral to another DNS server

Most popular implementation of DNS is Berkely Internet Name Daemon (BIND)

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An Overview of Domain Name System

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Three components to DNS:

- Resolver
- The Server
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  - Secondary
  - Caching
- Database files (db.*domain-name)*

Supports two type of queries:

- Recursive
- Iterative

This is what we will install and configure in Lab 7

Most popular implementation of DNS is Berkely Internet Name Daemon (BIND)

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- Recursive
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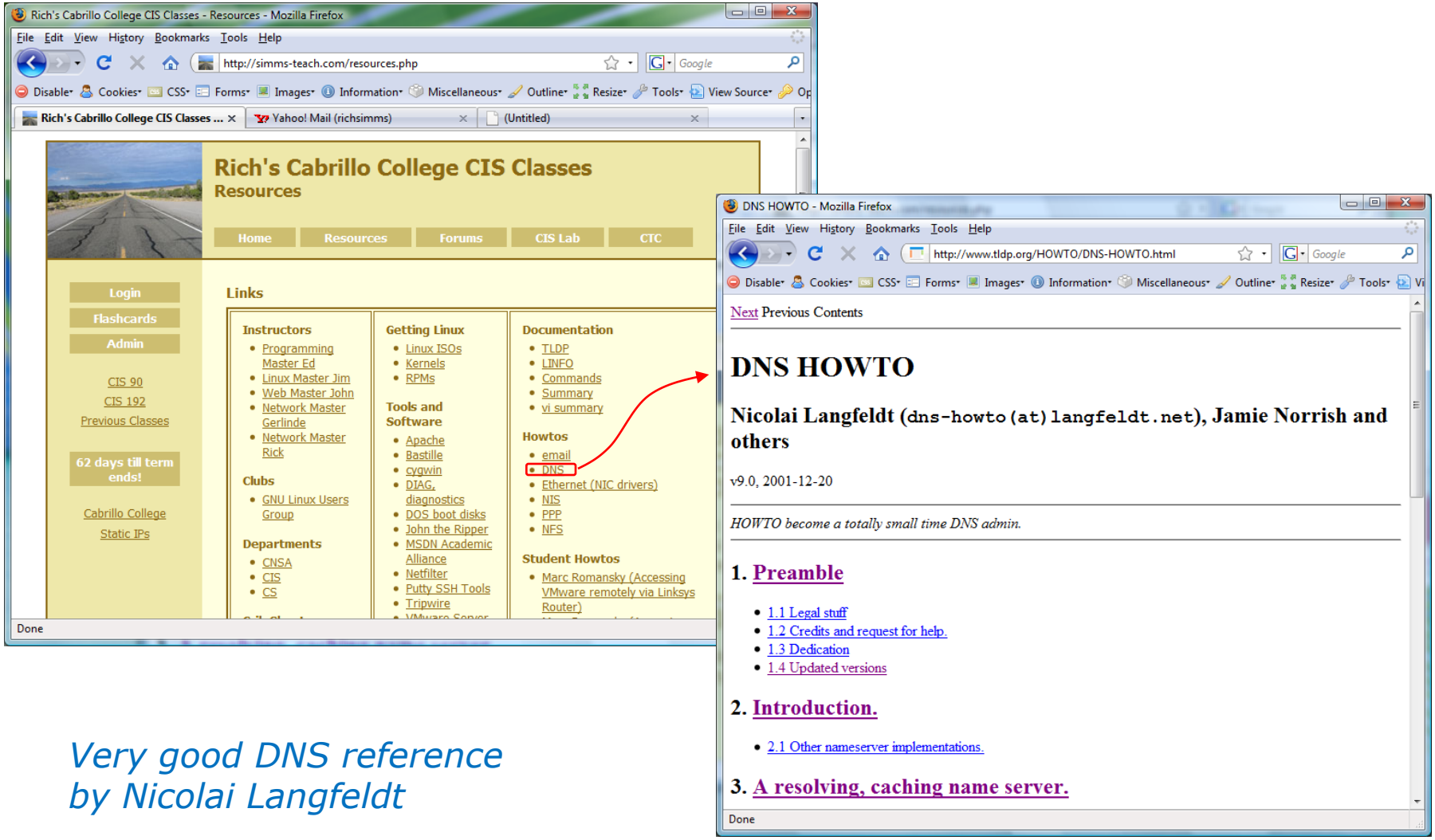
Maintained by the Internet Systems Consortium: *www.isc.org*

http://www.tldp.org/HOWTO/DNS-HOWTO.html



Very good DNS reference by Nicolai Langfeldt

DNS Example

(when getting a web page)

DNS - Domain Name System

Using ARP

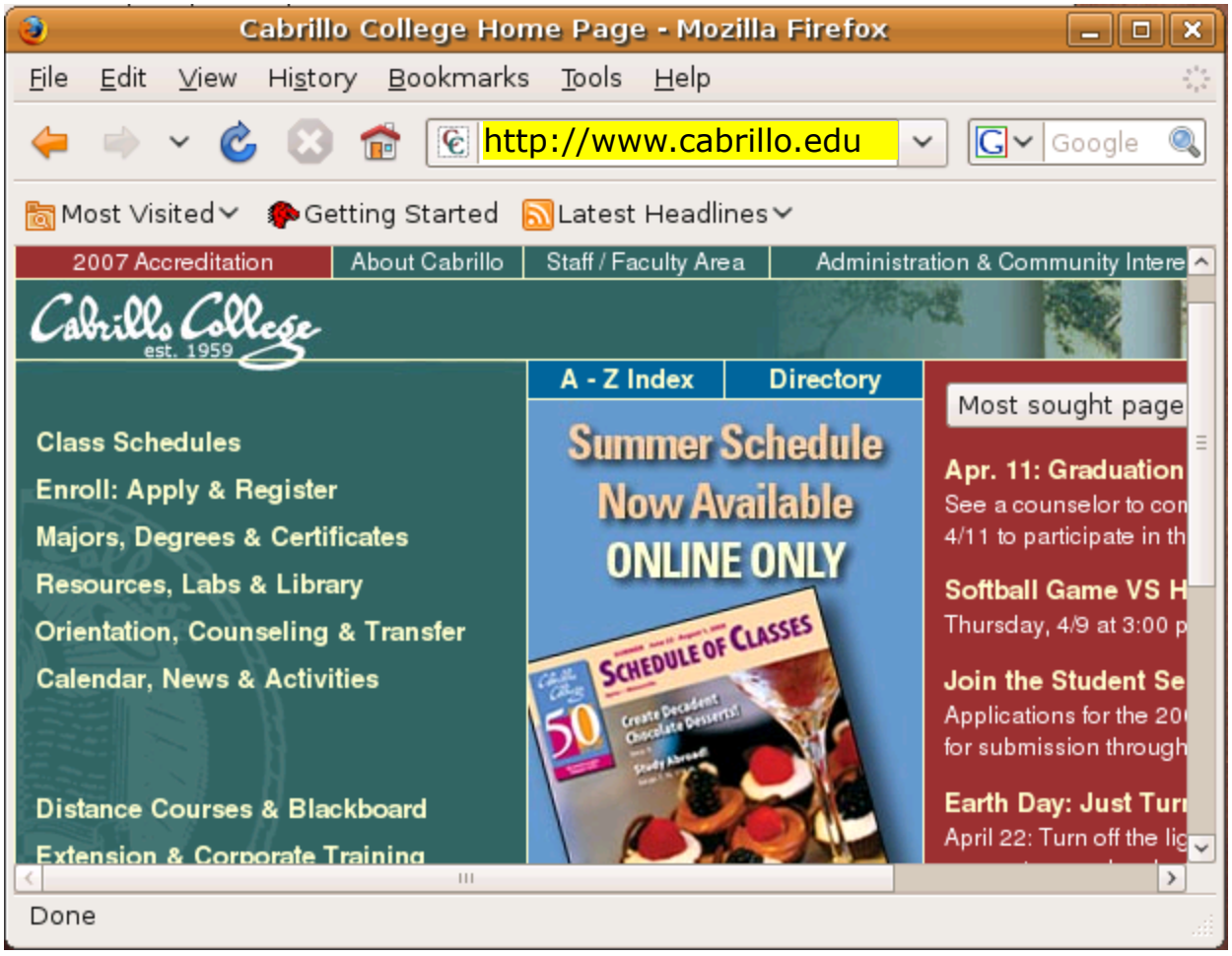
Who has this IP address?

Solution: Use ARP to get MAC address

Using DNS

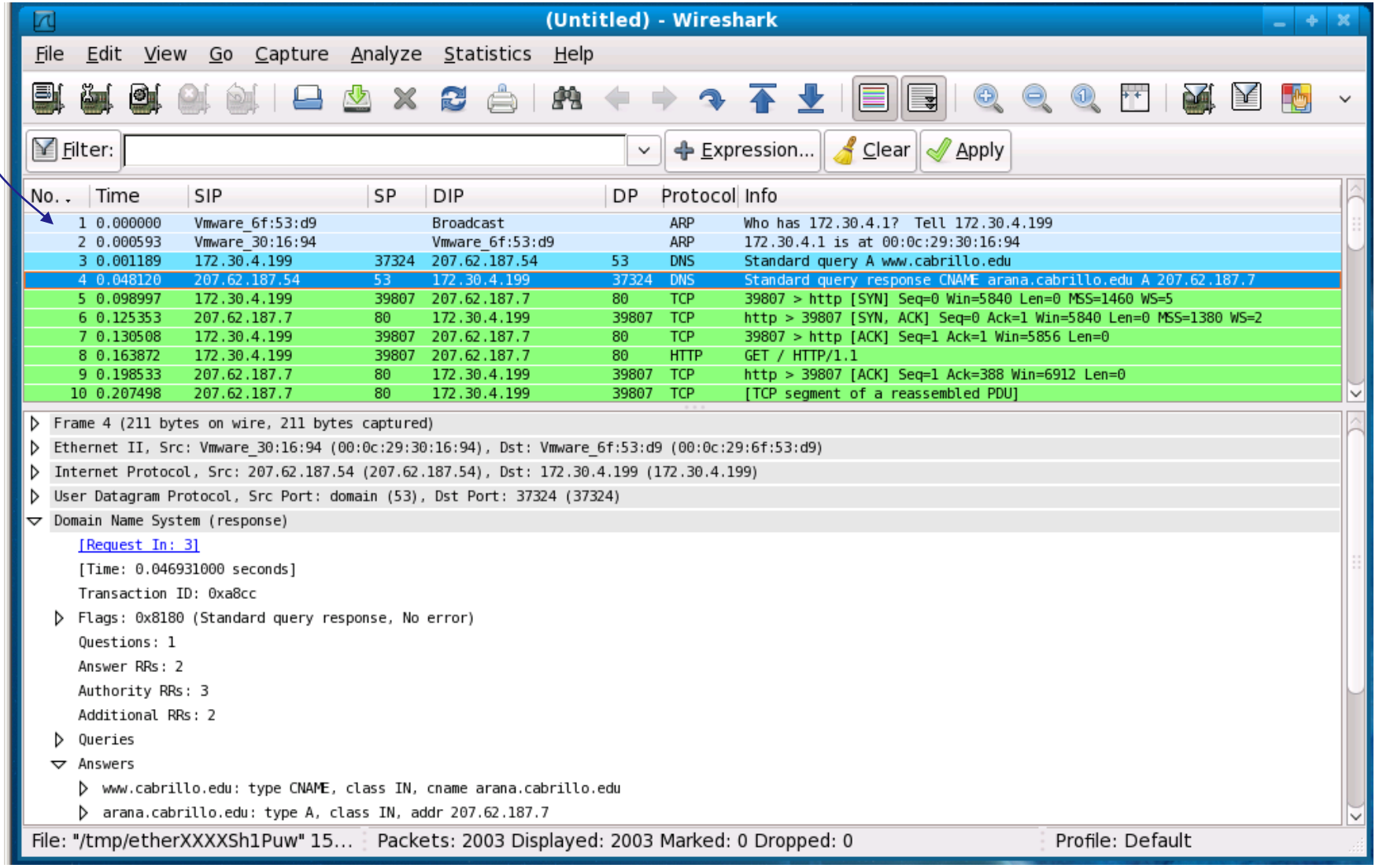
What is the IP address for this hostname?

Solution: Use DNS to resolve hostname

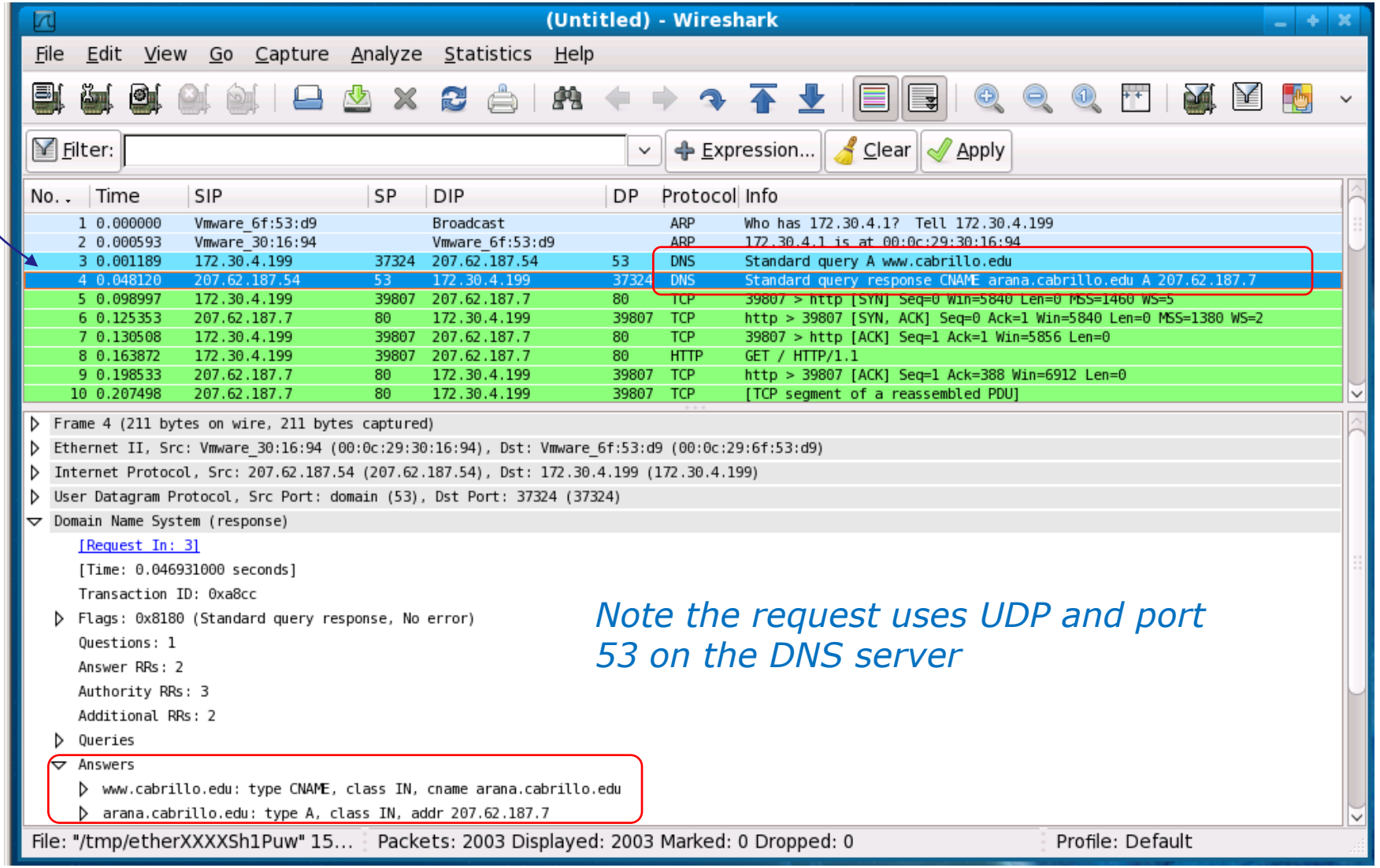


Lets see how DNS is used to get this web page

First, we need the MAC address of the router. This is necessary information for any packets to be sent outside the local subnet. ARP is used for this.

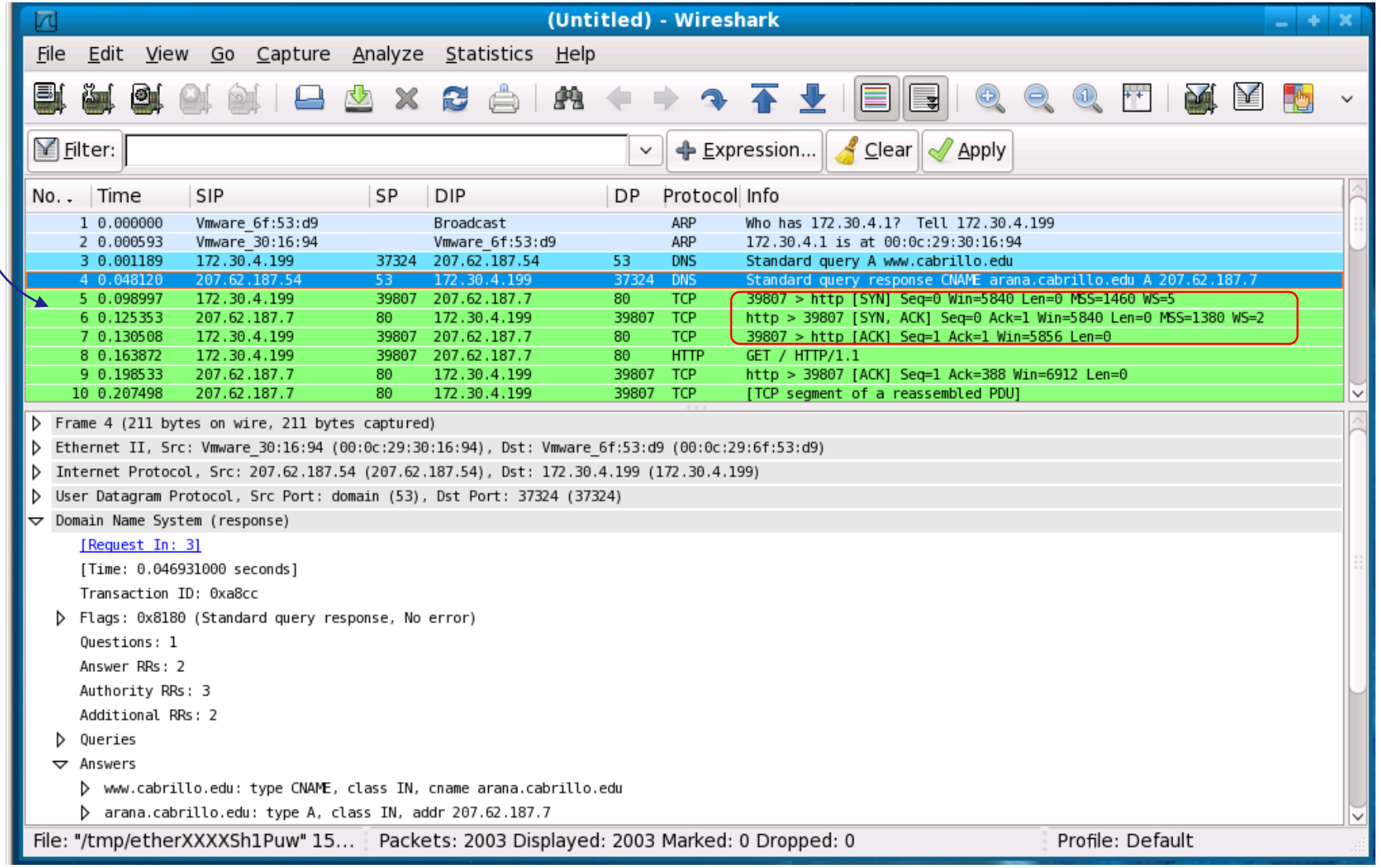


Next, we send a DNS request to the server specified in /etc/resolv.conf to resolve the name www.cabrillo.edu. The answer comes back as 207.62.187.7.

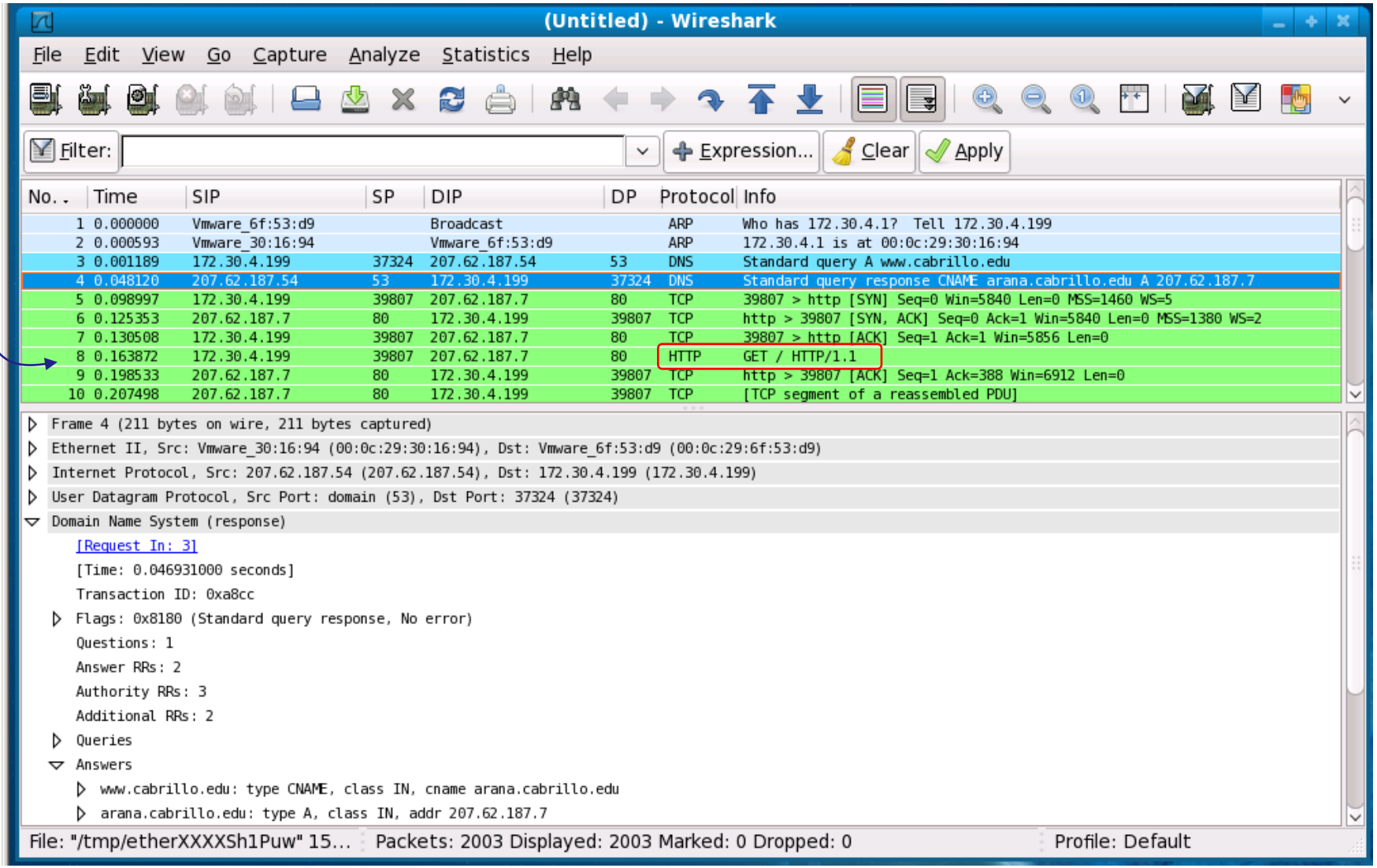


Note the request uses UDP and port 53 on the DNS server

Next a connection is made using with a three-way handshake with the web server



And finally the actual web page is requested …



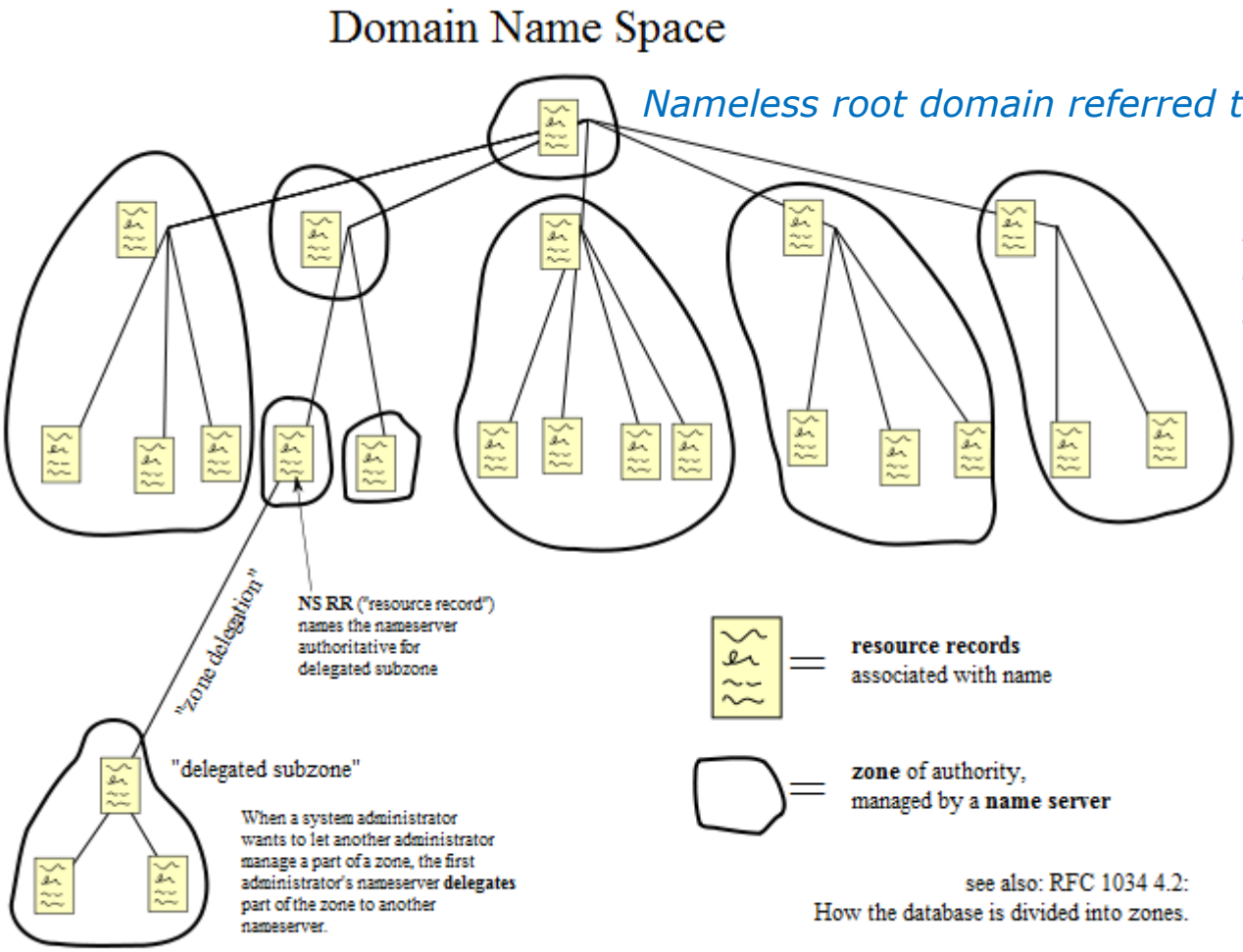
DNS Continued

The DNS Namespace

- Top most domain in the namespace hierarchy is "."
- Top-level domains: .com, .net, .gov, .edu, .org .us, ...
- Special domain for reverse lookups: *in-addr.arpa*
- Fully Qualified Domain Names read from right to left
- Name registration was handled by InterNIC; now belongs to companies for profit.

InterNIC - Internet Network Information Center. Handled domain names and IP addresses prior to 1988 before getting turned over to ICANN

ICANN - Internet Corporation for Assigned Names and Numbers. ICANN accredits the domain name registrars (the companies that compete with other and register domain names)

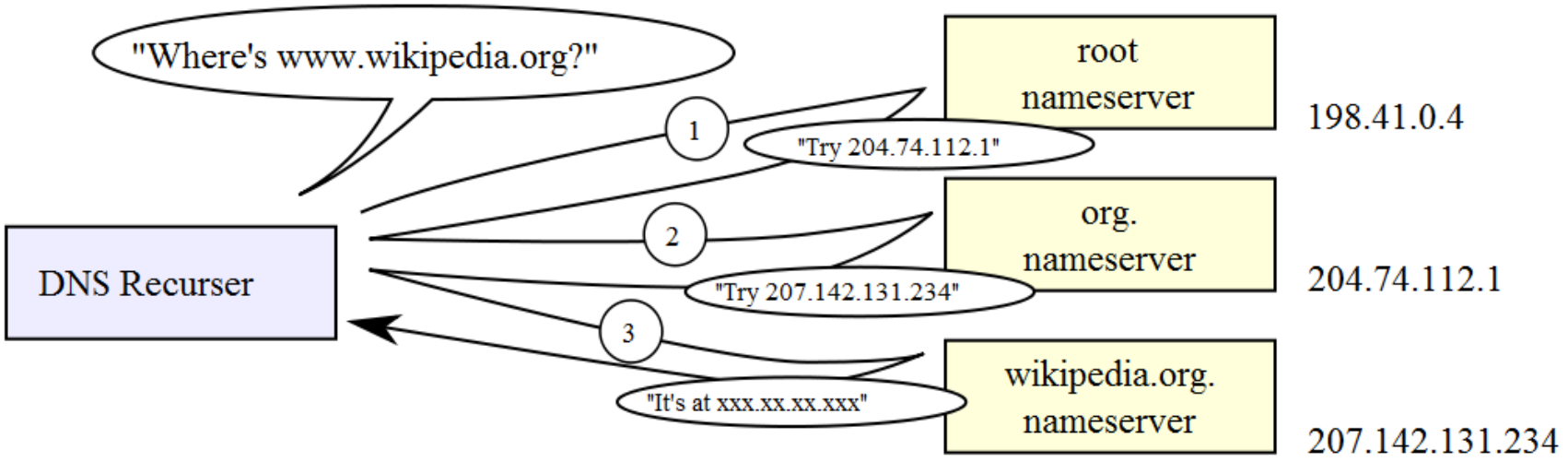


Nameless root domain referred to via "."

Generic TLD's - Top Level Domains (com, edu, net, org, mil, etc.)

Next level domains (e.g. hp.com, cabrillo.edu, yahoo.com, webhawks.org, etc.

source: http://en.wikipedia.org/wiki/File:Domain_name_space.svg



source: http://en.wikipedia.org/wiki/File:An_example_of_theoretical_DNS_recursion.svg

One place where recursion is often used is with the local name server on a network. Rather than making client machine resolvers perform iterative resolution, it is common for the resolver to generate a recursive request to the local DNS server, which then generates iterative requests to other servers as needed. As you can see, recursive and iterative requests can be combined in a single resolution, providing significant flexibility to the process as a whole.
source: http://www.tcpipguide.com/free/t_DNSBasicNameResolutionTechniquesIterativeandRecurs-4.htm

DNS Database Resource Record types:

SOA - Start of Authority

NS - Nameserver

A - Address

PTR - Pointer (for reverse lookups)

CNAME - Aliases

MX - mail hubs

dig example

(showing manual iterative queries)

dig command

dig (domain information groper)

- Tool to interrogate DNS servers
- Performs DNS lookups and displays the answers from the DNS server queried.
- Will use name server specified in /etc/resolv.conf unless another is specified

Some query options

+[no]recurse - [do not] use recursive queries
+[no]question - [do not] print question section when an answer is returned
+[no]stats - [do not] print query statistics
+[no]cmd - [do not] print dig version information
… for more, use **man dig**

An example of what life is like as a resolver doing a forward lookup

(using the dig command)

dig opus.cabrillo.edu (start with root "." servers)

```
[root@elrond ~]# dig +norecurse +noques +nostats +nocmd opus.cabrillo.edu
;; Got answer:
;; ->>HEADER<<- opcode: QUERY, status: NOERROR, id: 19571
;; flags: qr ra; QUERY: 1, ANSWER: 0, AUTHORITY: 13, ADDITIONAL: 13

;; AUTHORITY SECTION:
.                       3600000 IN      NS      A.ROOT-SERVERS.NET.
.                       3600000 IN      NS      L.ROOT-SERVERS.NET.
.                       3600000 IN      NS      I.ROOT-SERVERS.NET.
.                       3600000 IN      NS      E.ROOT-SERVERS.NET.
.                       3600000 IN      NS      D.ROOT-SERVERS.NET.
.                       3600000 IN      NS      F.ROOT-SERVERS.NET.
.                       3600000 IN      NS      B.ROOT-SERVERS.NET.
.                       3600000 IN      NS      M.ROOT-SERVERS.NET.
.                       3600000 IN      NS      J.ROOT-SERVERS.NET.
.                       3600000 IN      NS      G.ROOT-SERVERS.NET.
.                       3600000 IN      NS      K.ROOT-SERVERS.NET.
.                       3600000 IN      NS      H.ROOT-SERVERS.NET.
.                       3600000 IN      NS      C.ROOT-SERVERS.NET.

;; ADDITIONAL SECTION:
B.ROOT-SERVERS.NET.     604794  IN      A       192.228.79.201
C.ROOT-SERVERS.NET.     604761  IN      A       192.33.4.12
E.ROOT-SERVERS.NET.     604794  IN      A       192.203.230.10
F.ROOT-SERVERS.NET.     604791  IN      A       192.5.5.241
F.ROOT-SERVERS.NET.     604794  IN      AAAA    2001:500:2f::f
G.ROOT-SERVERS.NET.     604794  IN      A       192.112.36.4
I.ROOT-SERVERS.NET.     604794  IN      A       192.36.148.17
J.ROOT-SERVERS.NET.     604794  IN      A       192.58.128.30
K.ROOT-SERVERS.NET.     604794  IN      A       193.0.14.129
K.ROOT-SERVERS.NET.     604791  IN      AAAA    2001:7fd::1
L.ROOT-SERVERS.NET.     604794  IN      AAAA    2001:500:3::42
M.ROOT-SERVERS.NET.     604794  IN      A       202.12.27.33
M.ROOT-SERVERS.NET.     604791  IN      AAAA    2001:dc3::35

[root@elrond ~]#
```

We don't get an answer but we do get referred to a long list of root name servers we can ask.

Pick one at random to continue

IP addresses for these servers

dig opus.cabrillo.edu (edu. servers)

```
[root@elrond ~]# dig +norecurse +noques +nostats +nocmd opus.cabrillo.edu @J.ROOT-SERVERS.NET.
;; Got answer:
;; ->>HEADER<<- opcode: QUERY, status: NOERROR, id: 53616
;; flags: qr; QUERY: 1, ANSWER: 0, AUTHORITY: 7, ADDITIONAL: 8

;; AUTHORITY SECTION:
edu.                    172800  IN      NS      E.GTLD-SERVERS.NET.
edu.                    172800  IN      NS      F.GTLD-SERVERS.NET.
edu.                    172800  IN      NS      G.GTLD-SERVERS.NET.
edu.                    172800  IN      NS      L.GTLD-SERVERS.NET.
edu.                    172800  IN      NS      A.GTLD-SERVERS.NET.
edu.                    172800  IN      NS      C.GTLD-SERVERS.NET.
edu.                    172800  IN      NS      D.GTLD-SERVERS.NET.

;; ADDITIONAL SECTION:
A.GTLD-SERVERS.NET.     172800  IN      A       192.5.6.30
A.GTLD-SERVERS.NET.     172800  IN      AAAA    2001:503:a83e::2:30
C.GTLD-SERVERS.NET.     172800  IN      A       192.26.92.30
D.GTLD-SERVERS.NET.     172800  IN      A       192.31.80.30
E.GTLD-SERVERS.NET.     172800  IN      A       192.12.94.30
F.GTLD-SERVERS.NET.     172800  IN      A       192.35.51.30
G.GTLD-SERVERS.NET.     172800  IN      A       192.42.93.30
L.GTLD-SERVERS.NET.     172800  IN      A       192.41.162.30

[root@elrond ~]#
```

Still no answer but we get referred to a list of generic top level domain name servers for the edu domain

Pick one at random to continue

IP addresses for the edu domain nameservers

dig opus.cabrillo.edu (cabrillo.edu. servers)

```
[root@elrond ~]# dig +norecurse +noques +nostats +nocmd opus.cabrillo.edu @F.GTLD-SERVERS.NET.
;; Got answer:
;; ->>HEADER<<- opcode: QUERY, status: NOERROR, id: 17333
;; flags: qr; QUERY: 1, ANSWER: 0, AUTHORITY: 3, ADDITIONAL: 3

;; AUTHORITY SECTION:
cabrillo.edu.           172800  IN      NS      buttercup.cabrillo.edu.
cabrillo.edu.           172800  IN      NS      ns1.csu.net.
cabrillo.edu.           172800  IN      NS      ns2.csu.net.

;; ADDITIONAL SECTION:
buttercup.cabrillo.edu. 172800  IN      A       207.62.187.54
ns1.csu.net.            172800  IN      A       130.150.102.100
ns2.csu.net.            172800  IN      A       130.150.102.20

[root@elrond ~]#
```

IP addresses for the Cabrillo name servers

Still no answer but we get referred to a list of cabrillo name servers for the cabrillo.edu domain

Pick one at random to continue

dig opus.cabrillo.edu (resolved)

```
[root@elrond ~]# dig +norecurse +noques +nostats +nocmd opus.cabrillo.edu @ns1.csu.net.
;; Got answer:
;; ->>HEADER<<- opcode: QUERY, status: NOERROR, id: 6591
;; flags: qr aa ra; QUERY: 1, ANSWER: 1, AUTHORITY: 3, ADDITIONAL: 3

;; ANSWER SECTION:
opus.cabrillo.edu.      300     IN      A       207.62.186.9

;; AUTHORITY SECTION:
cabrillo.edu.           300     IN      NS      ns1.csu.net.
cabrillo.edu.           300     IN      NS      ns2.csu.net.
cabrillo.edu.           300     IN      NS      buttercup.cabrillo.edu.

;; ADDITIONAL SECTION:
ns1.csu.net.            15219   IN      A       130.150.102.100
ns2.csu.net.            15324   IN      A       130.150.102.20
buttercup.cabrillo.edu. 300     IN      A       207.62.187.54

[root@elrond ~]#
```

Hooray! It worked …. we got an answer!

host command

host command

Forward lookup

```
[root@elrond named]# host www.google.com
www.google.com is an alias for www.l.google.com.
www.l.google.com has address 74.125.127.99
www.l.google.com has address 74.125.127.103
www.l.google.com has address 74.125.127.104
www.l.google.com has address 74.125.127.147
```

Reverse lookup

```
[root@elrond named]# host 74.125.127.99
99.127.125.74.in-addr.arpa domain name pointer pz-in-f99.google.com.
[root@elrond named]#
```

Note the structure of the IP address "hostname" (reverse order with top of tree on the right and leaves to the left)

DNS Service Installation

DNS Installation and Configuration

CentOS 6.3 update
caching-nameserver package no longer needed. It now appears to be bundled with bind

Package names: bind, caching-nameserver

Daemon name: /usr/sbin/named

Startup script: /etc/rc.d/init.d/named start
or **service named start**

Database files:
/var/named/named.ca *IP address of root servers*
/var/named/db.*in-addr.arpa* *reverse lookups*
/var/named/db.*domain-name* *forward lookups*

Configuration files:
/etc/named.conf *Overall configuration file*
/etc/resolv.conf *DNS server to use*
/etc/nsswitch.conf *Lookup order definition*

To reload configuration files: **rndc reload**

Service Applications

Steps to installing services

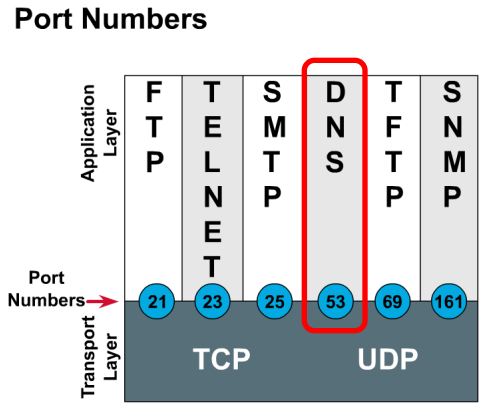
1. Install software package using **yum**, **rpm** or build from source code
2. Customize service's configuration file
3. Modify the firewall to allow access to the service
4. Customize SELinux context settings to allow use
5. Start the service
6. Configure service to automatically start when system boots
7. Monitor and verify service is running
8. Troubleshoot as necessary
9. Monitor log files as appropriate
10. Configure additional security

Installing and Configuring DNS Service (Red Hat Family)

DNS

- Resolves names like "opus.cabrillo.edu" to IP addresses
- Client-server model
- Uses port 53
- "named" - the name of the daemon (service)
- "bind" - the name of the DNS package

```
[root@elrond bin]# cat /etc/services | grep -w 53
domain          53/tcp                  # name-domain server
domain          53/udp
[root@elrond bin]#
```



Installing and Configuring DNS Service (Red Hat Family)

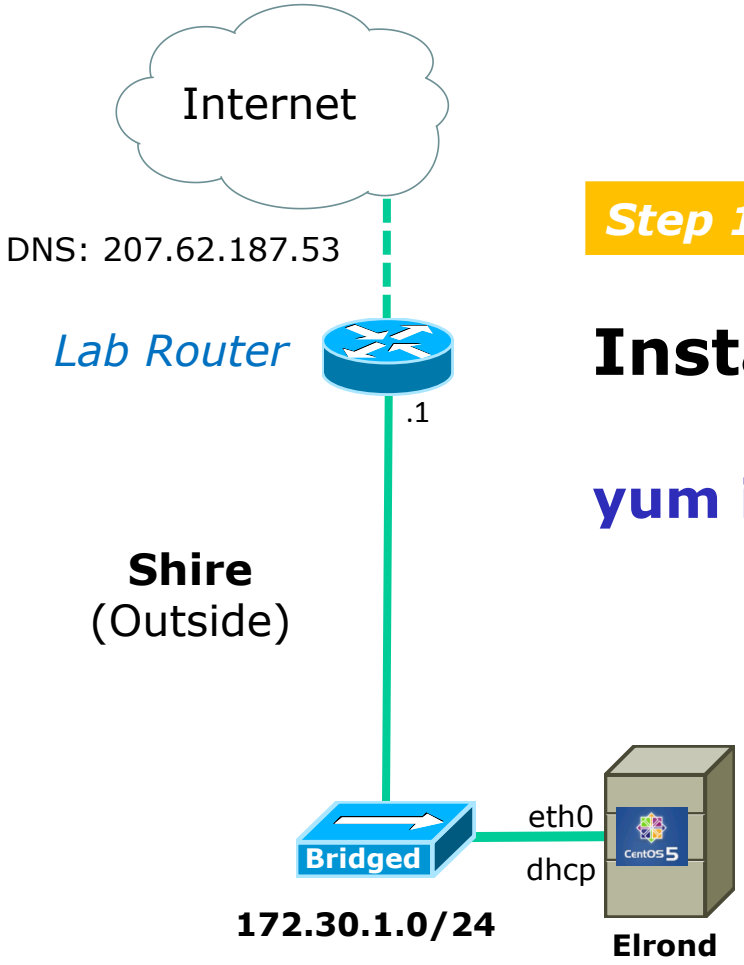
Is it installed?

```
[root@elrond bin]# rpm -qa | grep bind
bind-utils-9.3.6-4.P1.el5_4.2
ypbind-1.19-12.el5
bind-libs-9.3.6-4.P1.el5_4.2
bind-9.3.6-4.P1.el5_4.2
[root@elrond bin]# rpm -qa | grep caching-nameserver
caching-nameserver-9.3.6-4.P1.el5_4.2
[root@elrond bin]#
```

CentOS 6.3 update
caching-nameserver package no longer needed. It now appears to be bundled with bind

The highlighted packages above are require to install the DNS service.

Installing Software Package (using yum)



Step 1 *Installing service with yum*

Installing DNS service

yum install bind caching-nameserver

CentOS 6.3 update
caching-nameserver package no longer needed. It now appears to be bundled with bind

Internet connection is required for yum installs

Installing Software Package (using yum)

```
[root@elrond ~]# yum install bind caching-nameserver
Loaded plugins: fastestmirror
Loading mirror speeds from cached hostfile
 * addons: mirror.5ninesolutions.com
 * base: ftp.osuosl.org
 * extras: mirrors.liquidweb.com
 * updates: mirror.nwresd.org
Setting up Install Process
Resolving Dependencies
--> Running transaction check
---> Package bind.i386 30:9.3.6-4.P1.el5_4.2 set to be updated
--> Processing Dependency: bind-libs = 30:9.3.6-4.P1.el5_4.2 for package:
bind
---> Package caching-nameserver.i386 30:9.3.6-4.P1.el5_4.2 set to be
updated
--> Running transaction check
--> Processing Dependency: bind-libs = 30:9.3.6-4.P1.el5 for package:
bind-utils
---> Package bind-libs.i386 30:9.3.6-4.P1.el5_4.2 set to be updated
--> Running transaction check
---> Package bind-utils.i386 30:9.3.6-4.P1.el5_4.2 set to be updated
--> Finished Dependency Resolution

Dependencies Resolved
```

CentOS 6.3 update
caching-nameserver package no longer needed. It now appears to be bundled with bind

Note that bind has two dependencies: bind-libs and bind-utils

Installing Software Package (using yum)

```
================================================================================
 Package                 Arch     Version                       Repository   Size
================================================================================
Installing:
 bind                    i386     30:9.3.6-4.P1.el5_4.2         updates     978 k
 caching-nameserver      i386     30:9.3.6-4.P1.el5_4.2         updates      61 k
Updating for dependencies:
 bind-libs               i386     30:9.3.6-4.P1.el5_4.2         updates     857 k
 bind-utils              i386     30:9.3.6-4.P1.el5_4.2         updates     170 k

Transaction Summary
================================================================================
Install       2 Package(s)
Update        2 Package(s)
Remove        0 Package(s)

Total download size: 2.0 M
Is this ok [y/N]: y
Downloading Packages:
(1/4): caching-nameserver-9.3.6-4.P1.el5_4.2.i386.rpm    |  61 kB     00:01
(2/4): bind-utils-9.3.6-4.P1.el5_4.2.i386.rpm            | 170 kB     00:01
(3/4): bind-libs-9.3.6-4.P1.el5_4.2.i386.rpm             | 857 kB     00:05
(4/4): bind-9.3.6-4.P1.el5_4.2.i386.rpm                  | 978 kB     00:06
--------------------------------------------------------------------------------
Total                                       130 kB/s | 2.0 MB     00:15
```

Note that bind has two dependencies: bind-libs and bind-utils

Installing Software Package (using yum)

```
Running rpm_check_debug
Running Transaction Test
Finished Transaction Test
Transaction Test Succeeded
Running Transaction
  Updating       : bind-libs                                              1/6
  Installing     : bind                                                   2/6
  Installing     : caching-nameserver                                     3/6
  Updating       : bind-utils                                             4/6
  Cleanup        : bind-libs                                              5/6
  Cleanup        : bind-utils                                             6/6

Installed:
  bind.i386 30:9.3.6-4.P1.el5_4.2 caching-nameserver.i386 30:9.3.6-4.P1.el5_4.2

Dependency Updated:
  bind-libs.i386 30:9.3.6-4.P1.el5_4.2   bind-utils.i386 30:9.3.6-4.P1.el5_4.2

Complete!
```

Installing Software Package (using rpm)

Elrond

Step 1 alternative *Installing service with rpm*

Installing DNS service

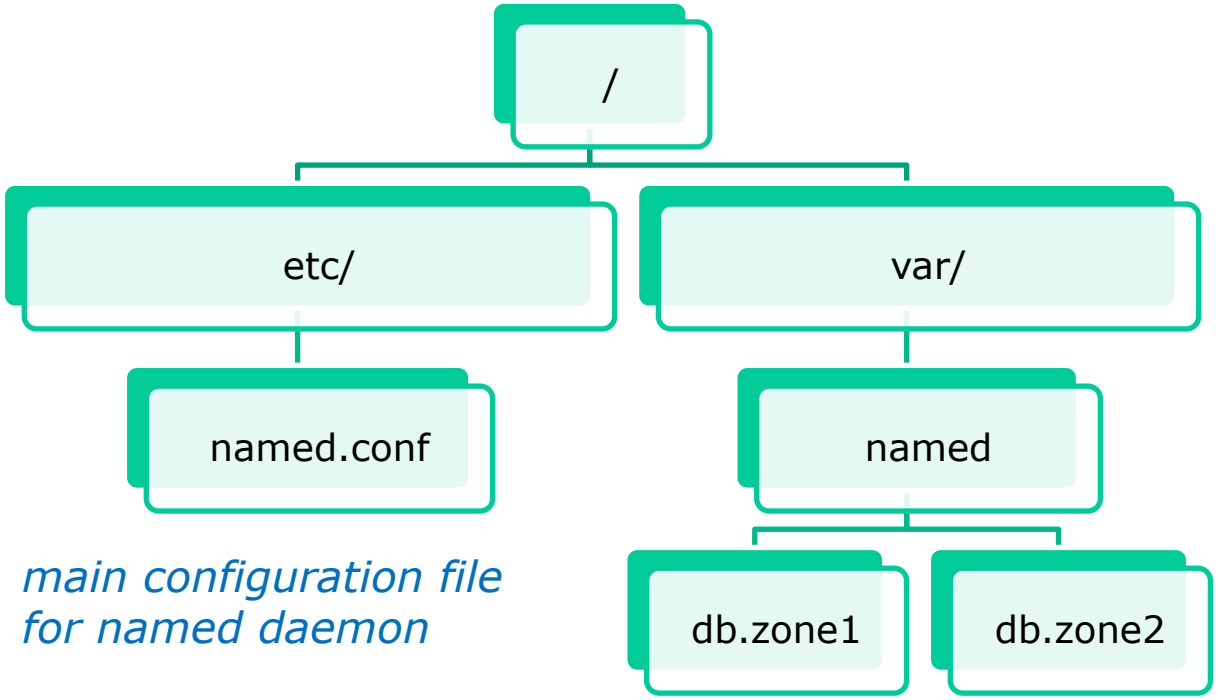
```
[root@elrond packages]# ls {bind,caching}*
bind-9.3.6-4.P1.el5_4.2.i386.rpm
bind-libs-9.3.6-4.P1.el5_4.2.i386.rpm
bind-utils-9.3.6-4.P1.el5_4.2.i386.rpm
caching-nameserver-9.3.6-4.P1.el5_4.2.i386.rpm

[root@elrond packages]# rpm -Uvh bind* caching*
Preparing...                ########################################### [100%]
   1:bind-libs              ########################################### [ 25%]
   2:bind                   ########################################### [ 50%]
   3:bind-utils             ########################################### [ 75%]
   4:caching-nameserver     ########################################### [100%]
[root@elrond packages]#
```

Use the rpm command to install the rpm package files

Installing and Configuring DNS service

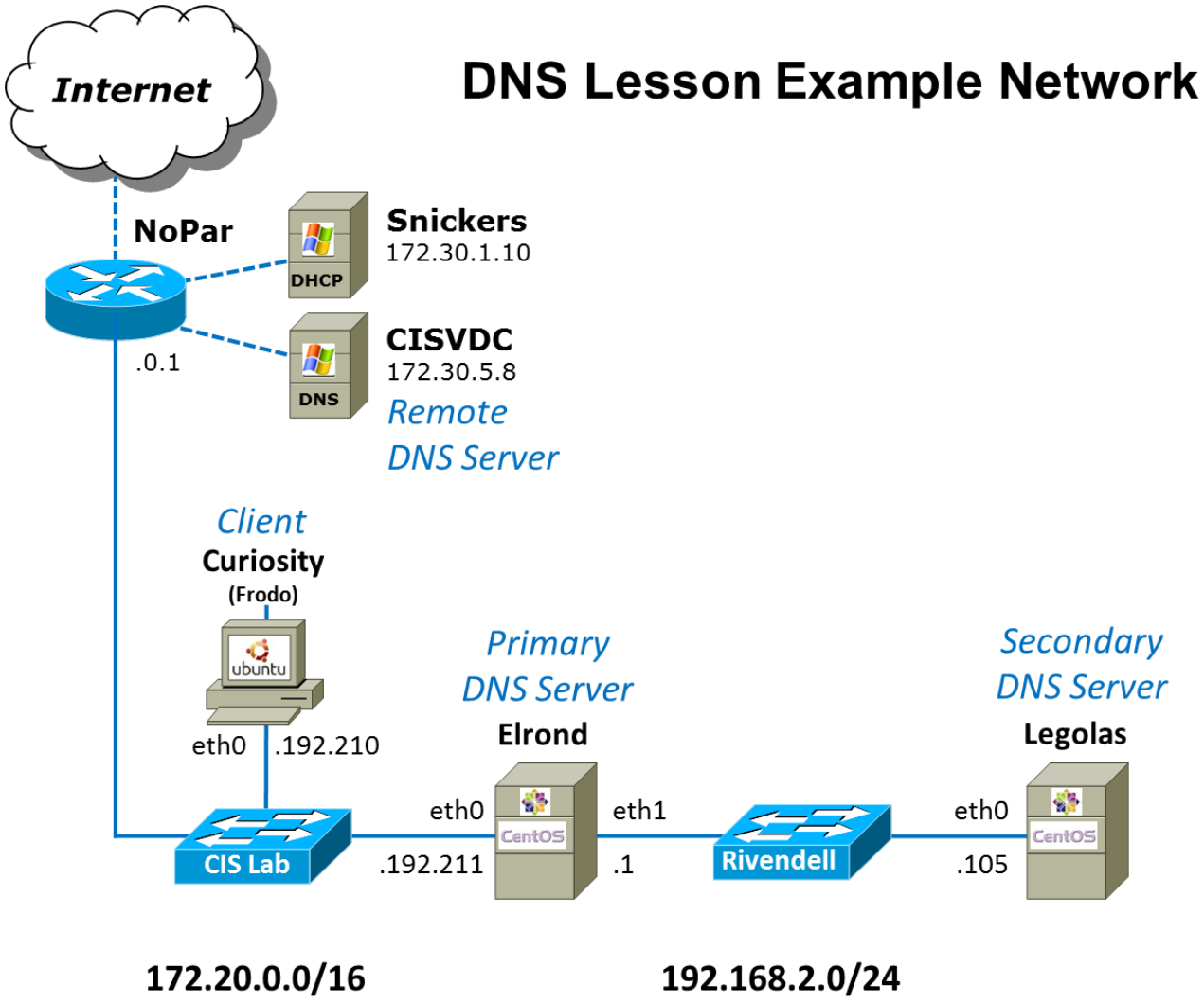
Step 2 *Customize the configuration files*



main configuration file for named daemon

zone database files for each forward and reverse lookup zone

named.conf


DNS Lesson Example Network
Internet
NoPar
.0.1
Snickers
172.30.1.10
DHCP
CISVDC
172.30.5.8
DNS
Remote
DNS Server
Client
Curiosity
(Frodo)
ubuntu
eth0
.192.210
CIS Lab
Primary
DNS Server
Elrond
eth0
.192.211
CentOS
eth1
.1
Rivendell
Secondary
DNS Server
Legolas
eth0
.105
CentOS
172.20.0.0/16
192.168.2.0/24

```
[root@elrond packages]# cat /etc/named.conf
options {
        directory "/var/named";
        /*
        * If there is a firewall between you and nameservers you want
        * to talk to, you might need to uncomment the query-source
        * directive below. Previous versions of BIND always asked
        * questions using port 53, but BIND 8.1 uses an unprivileged
        * port by default.
        */
        // query-source address * port 53;
};

//
// a caching only nameserver config
//
controls {
        inet 127.0.0.1 allow { localhost; } keys { rndckey; };
};

zone "." IN {
        type hint;
        file "named.ca";
};

zone "localhost" IN {
        type master;
        file "localhost.zone";
        allow-update { none; };
};

zone "0.0.127.in-addr.arpa" IN {
        type master;
        file "named.local";
        allow-update { none; };
};

zone "rivendell" IN {
        type master;
        file "db.rivendell";
        allow-update { none; };
};

zone "2.168.192.in-addr.arpa" IN {
        type master;
        file "db.2.168.192";
        allow-update { none; };
};

// A key file needs to be referenced for use by rndc
include "/etc/rndc.key";
```

options *clause - specifies the location of the zone files and can control source port used for queries for firewalls*

controls *clause - access controls for remote administration services e.g. the rndc utility*

zone *clauses - specifies zone databases for ., localhost (forward and reverse) and each zone (forward and reverse) this DNS server is responsible for*

key *clause (included) - specifies a key to use to authenticate various actions for use of the rndc utility*

named.conf

options *clause - specifies the location of the zone files and can control source port used for queries for firewalls*

```
[root@elrond]# cat /etc/named.conf
options {
        directory "/var/named";
        /*
        * If there is a firewall between you and nameservers you want
        * to talk to, you might need to uncomment the query-source
        * directive below. Previous versions of BIND always asked
        * questions using port 53, but BIND 8.1 uses an unprivileged
        * port by default.
        */
        // query-source address * port 53;
};
< snipped >
```

This is where the zone database files reside

Highlighted text is all comments

named.conf

controls *clause - access controls for remote administration services e.g. the rndc utility*

```
[root@elrond packages]# cat /etc/named.conf

< snipped >

controls {
        inet 127.0.0.1 allow { localhost; } keys { rndckey; };
};

<snipped>
```

IP address on server that will accept connections from the rndc utility

One or more hosts that are allowed access

key to use for authentication

named.conf

```
[root@elrond packages]# cat /etc/named.conf
< snipped >
zone "localhost" IN {
        type master;
        file "localhost.zone";
        allow-update { none; };
};

zone "0.0.127.in-addr.arpa" IN {
        type master;
        file "named.local";
        allow-update { none; };
};

zone "rivendell" IN {
        type master;
        file "db.rivendell";
        allow-update { none; };
};

zone "2.168.192.in-addr.arpa" IN {
        type master;
        file "db.2.168.192";
        allow-update { none; };
};
< snipped >
```

zone *clauses - specifies zone databases for ., localhost (forward and reverse) and each zone (forward and reverse) this DNS server is responsible for*

In Lab 7 you will setup forward and reverse zones for the Rivendell domain

named.conf

***key** clause (included) - specifies a key to use to authenticate various actions or use of the rndc utility*

```
[root@elrond]# cat /etc/named.conf
< snipped >

// A key file needs to be referenced for use by rndc.
include "/etc/rndc.key";
```

```
[root@elrond]# cat /etc/rndc.key
key "rndckey" {
        algorithm       hmac-md5;
        secret          "JzQP0lELDl77xshHK96ZeILDiNMtdqwehs8rMpmVHAXYvYb1jQBqr50Snsrp";
};
```

Centos 6.3 Update

To create a key for rndc:

```
[root@elrond]# rndc-confgen -a -r /dev/urandom
[root@elrond]# chgrp named /etc/rndc.key
[root@elrond]# chmod 640 /etc/rndc.key
```

forward lookup zone database

Zone file

```
[root@elrond ~]# cat /var/named/db.rivendell
$TTL 604800
; Rivendell Zone Definition
;
;
Rivendell.      IN SOA elrond.rivendell. root.rivendell. (
                2009040304      ; serial number
                60              ; refresh rate in seconds
                15              ; retry in seconds
                1209600         ; expire in seconds
                300)            ; minimum in seconds
;
;
;
;Name Server Records
Rivendell.      IN NS elrond.rivendell.
;
;Address Records
localhost       IN A 127.0.0.1
legolas         IN A 192.168.2.105
elrond          IN A 192.168.2.107
galadriel       IN A 192.168.2.108
william         IN A 192.168.2.114
;
;CNAME records
[root@elrond ~]#
```

This is the Rivendell zone file which is very close to the one you will use for Lab 7

Zone file

```
[root@elrond ~]# cat /var/named/db.rivendell
$TTL 604800
; Rivendell Zone Definition
;
;
Rivendell.      IN SOA elrond.rivendell. root.rivendell. (
                2009040304      ; serial number
                60              ; refresh rate in seconds
                15              ; retry in seconds
                1209600         ; expire in seconds
                300)            ; minimum in seconds
;
;
;
;Name Server Records
Rivendell.      IN NS elrond.rivendell.
;
;Address Records
localhost       IN A 127.0.0.1
legolas         IN A 192.168.2.105
elrond          IN A 192.168.2.107
galadriel       IN A 192.168.2.108
william         IN A 192.168.2.114
;
;CNAME records
[root@elrond ~]#
```

TTL = Time to live in seconds. How long a DNS record from this zone should be cached.

The longer the TTL value the faster domain resolution time periods will be.

Examples:

$TTL 86400
$TTL 1440m
$TTL 24h
$TTL 1d

Zone file

```
[root@elrond ~]# cat /var/named/db.rivendell
$TTL 604800
; Rivendell Zone Definition
;
;
Rivendell.      IN SOA elrond.rivendell. root.rivendell. (
                2009040304      ; serial number
                60              ; refresh rate in seconds
                15              ; retry in seconds
                1209600         ; expire in seconds
                300)            ; minimum in seconds
;
;
;
;Name Server Records
Rivendell.      IN NS elrond.rivendell.
;
;Address Records
localhost       IN A 127.0.0.1
legolas         IN A 192.168.2.105
elrond          IN A 192.168.2.107
galadriel       IN A 192.168.2.108
william         IN A 192.168.2.114
;
;CNAME records
[root@elrond ~]#
```

Comments start with a ;

Zone file

```
[root@elrond ~]# cat /var/named/db.rivendell
$TTL 604800
; Rivendell Zone Definition
;
;
Rivendell.      IN SOA elrond.rivendell. root.rivendell. (
                2009040304      ; serial number
                60              ; refresh rate in seconds
                15              ; retry in seconds
                1209600         ; expire in seconds
                300)            ; minimum in seconds
;
;
;
;Name Server Records
Rivendell.      IN NS elrond.rivendell.
;
;Address Records
localhost       IN A 127.0.0.1
legolas         IN A 192.168.2.105
elrond          IN A 192.168.2.107
galadriel       IN A 192.168.2.108
william         IN A 192.168.2.114
;
;CNAME records
[root@elrond ~]#
```

Primary domain name

Note the final dot for the top level root domain

Zone file

```
[root@elrond ~]# cat /var/named/db.rivendell
$TTL 604800
; Rivendell Zone Definition
;
;
Rivendell.      IN SOA elrond.rivendell. root.rivendell. (
                2009040304      ; serial number
                60              ; refresh rate in seconds
                15              ; retry in seconds
                1209600         ; expire in seconds
                300)            ; minimum in seconds
;
;
;
;Name Server Records
Rivendell.      IN NS elrond.rivendell.
;
;Address Records
localhost       IN A 127.0.0.1
legolas         IN A 192.168.2.105
elrond          IN A 192.168.2.107
galadriel       IN A 192.168.2.108
william         IN A 192.168.2.114
;
;CNAME records
[root@elrond ~]#
```

Class of the zone

IN = Internet

Zone file

```
[root@elrond ~]# cat /var/named/db.rivendell
$TTL 604800
; Rivendell Zone Definition
;
;
Rivendell.      IN SOA elrond.rivendell. root.rivendell. (
                2009040304      ; serial number
                60              ; refresh rate in seconds
                15              ; retry in seconds
                1209600         ; expire in seconds
                300)            ; minimum in seconds
;
;
;
;Name Server Records
Rivendell.      IN NS elrond.rivendell.
;
;Address Records
localhost       IN A 127.0.0.1
legolas         IN A 192.168.2.105
elrond          IN A 192.168.2.107
galadriel       IN A 192.168.2.108
william         IN A 192.168.2.114
;
;CNAME records
[root@elrond ~]#
```

Record type

SOA = Start of Authority

Zone file

```
[root@elrond ~]# cat /var/named/db.rivendell
$TTL 604800
; Rivendell Zone Definition
;
;
Rivendell.      IN SOA elrond.rivendell. root.rivendell. (
                2009040304      ; serial number
                60              ; refresh rate in seconds
                15              ; retry in seconds
                1209600         ; expire in seconds
                300)            ; minimum in seconds
;
;
;
;Name Server Records
Rivendell.      IN NS elrond.rivendell.
;
;Address Records
localhost       IN A 127.0.0.1
legolas         IN A 192.168.2.105
elrond          IN A 192.168.2.107
galadriel       IN A 192.168.2.108
william         IN A 192.168.2.114
;
;CNAME records
[root@elrond ~]#
```

The primary DNS server for this zone

Zone file

```
[root@elrond ~]# cat /var/named/db.rivendell
$TTL 604800
; Rivendell Zone Definition
;
;
Rivendell.      IN SOA elrond.rivendell. root.rivendell. (
                2009040304      ; serial number
                60              ; refresh rate in seconds
                15              ; retry in seconds
                1209600         ; expire in seconds
                300)            ; minimum in seconds
;
;
;
;Name Server Records
Rivendell.      IN NS elrond.rivendell.
;
;Address Records
localhost       IN A 127.0.0.1
legolas         IN A 192.168.2.105
elrond          IN A 192.168.2.107
galadriel       IN A 192.168.2.108
william         IN A 192.168.2.114
;
;CNAME records
[root@elrond ~]#
```

The email address of the person/authority in charge. Note the "@" is replaced by a "."

Zone file

```
[root@elrond ~]# cat /var/named/db.rivendell
$TTL 604800
; Rivendell Zone Definition
;
;
Rivendell.      IN SOA elrond.rivendell. root.rivendell. (
                2009040304      ; serial number
                60              ; refresh rate in seconds
                15              ; retry in seconds
                1209600         ; expire in seconds
                300)            ; minimum in seconds
;
;
;
;Name Server Records
Rivendell.      IN NS elrond.rivendell.
;
;Address Records
localhost       IN A 127.0.0.1
legolas         IN A 192.168.2.105
elrond          IN A 192.168.2.107
galadriel       IN A 192.168.2.108
william         IN A 192.168.2.114
;
;CNAME records
[root@elrond ~]#
```

Serial number, typically YYYYMMDDNN.

***Must be updated** to a larger number whenever zone file is updated or the changes will be ignored by BIND*

Zone file

```
[root@elrond ~]# cat /var/named/db.rivendell
$TTL 604800
; Rivendell Zone Definition
;
;
Rivendell.      IN SOA elrond.rivendell. root.rivendell. (
                2009040304      ; serial number
                60              ; refresh rate in seconds
                15              ; retry in seconds
                1209600         ; expire in seconds
                300)            ; minimum in seconds
;
;
;
;Name Server Records
Rivendell.      IN NS elrond.rivendell.
;
;Address Records
localhost       IN A 127.0.0.1
legolas         IN A 192.168.2.105
elrond          IN A 192.168.2.107
galadriel       IN A 192.168.2.108
william         IN A 192.168.2.114
;
;CNAME records
[root@elrond ~]#
```

Refresh rate

How often the secondary server should poll the primary to refresh it data

It is set to only 60 seconds for Lab 7 so we can see zone transfers happen quickly. Normally you would set this to a longer time.

Zone file

```
[root@elrond ~]# cat /var/named/db.rivendell
$TTL 604800
; Rivendell Zone Definition
;
;
Rivendell.      IN SOA elrond.rivendell. root.rivendell. (
                2009040304      ; serial number
                60              ; refresh rate in seconds
                15              ; retry in seconds
                1209600         ; expire in seconds
                300)            ; minimum in seconds
;
;
;
;Name Server Records
Rivendell.      IN NS elrond.rivendell.
;
;Address Records
localhost       IN A 127.0.0.1
legolas         IN A 192.168.2.105
elrond          IN A 192.168.2.107
galadriel       IN A 192.168.2.108
william         IN A 192.168.2.114
;
;CNAME records
[root@elrond ~]#
```

Retry

A value typically an hour or less that the secondary server should repeat an update request if the primary failed to respond.

Zone file

```
[root@elrond ~]# cat /var/named/db.rivendell
$TTL 604800
; Rivendell Zone Definition
;
;
Rivendell.      IN SOA elrond.rivendell. root.rivendell. (
                2009040304      ; serial number
                60              ; refresh rate in seconds
                15              ; retry in seconds
                1209600         ; expire in seconds
                300)            ; minimum in seconds
;
;
;
;Name Server Records
Rivendell.      IN NS elrond.rivendell.
;
;Address Records
localhost       IN A 127.0.0.1
legolas         IN A 192.168.2.105
elrond          IN A 192.168.2.107
galadriel       IN A 192.168.2.108
william         IN A 192.168.2.114
;
;CNAME records
[root@elrond ~]#
```

Expire

In the case where the secondary server can no longer reach the primary, this is the amount of time the zone information can be used.

Secondary servers will stop responding to requests for this zone once the data has expired.

A successful refresh (a zone update) will reset the timers and the cycle will begin again.

Zone file

```
[root@elrond ~]# cat /var/named/db.rivendell
$TTL 604800
; Rivendell Zone Definition
;
;
Rivendell.      IN SOA elrond.rivendell. root.rivendell. (
                2009040304      ; serial number
                60              ; refresh rate in seconds
                15              ; retry in seconds
                1209600         ; expire in seconds
                300)            ; minimum in seconds
;
;
;
;Name Server Records
Rivendell.      IN NS elrond.rivendell.
;
;Address Records
localhost       IN A 127.0.0.1
legolas         IN A 192.168.2.105
elrond          IN A 192.168.2.107
galadriel       IN A 192.168.2.108
william         IN A 192.168.2.114
;
;CNAME records
[root@elrond ~]#
```

Minimum

How long a non-authoritative server should cache an entry in case of failed lookups

Zone file

```
[root@elrond ~]# cat /var/named/db.rivendell
$TTL 604800
; Rivendell Zone Definition
;
;
Rivendell.      IN SOA elrond.rivendell. root.rivendell. (
                2009040304      ; serial number
                60              ; refresh rate in seconds
                15              ; retry in seconds
                1209600         ; expire in seconds
                300)            ; minimum in seconds
;
;
;
;Name Server Records
Rivendell.      IN NS elrond.rivendell.
;
;Address Records
localhost       IN A 127.0.0.1
legolas         IN A 192.168.2.105
elrond          IN A 192.168.2.107
galadriel       IN A 192.168.2.108
william         IN A 192.168.2.114
;
;CNAME records
[root@elrond ~]#
```

NS (Name Server) records indicate the authoritative name servers for this zone.

Public domains are required to have at least two name servers.

Private domains may have just one.

Zone file

```
[root@elrond ~]# cat /var/named/db.rivendell
$TTL 604800
; Rivendell Zone Definition
;
;
Rivendell.      IN SOA elrond.rivendell. root.rivendell. (
                2009040304      ; serial number
                60              ; refresh rate in seconds
                15              ; retry in seconds
                1209600         ; expire in seconds
                300)            ; minimum in seconds
;
;
;
;Name Server Records
Rivendell.      IN NS elrond.rivendell.
;
;Address Records
localhost       IN A 127.0.0.1
legolas         IN A 192.168.2.105
elrond          IN A 192.168.2.107
galadriel       IN A 192.168.2.108
william         IN A 192.168.2.114
;
;CNAME records
[root@elrond ~]#
```

Each A records matches a hostname with an IPv4 address.

reverse lookup zone database

Zone file

```
[root@elrond named]# cat db.2.168.192
$TTL    86400
;192.168.2.* Reverse Zone Definition
;
2.168.192.in-addr.arpa. IN SOA  elrond.rivendell. root.rivendell.  (
                                      2009040311 ; Serial
                                      60         ; Refresh
                                      15         ; Retry
                                      3600000    ; Expire
                                      86400 )    ; Minimum
;
;Name Server Records
;
2.168.192.in-addr.arpa. IN NS elrond.rivendell.
;
;Address Records
105                     IN PTR  legolas.rivendell.
107                     IN PTR  elrond.rivendell.
108                     IN PTR  galadriel.rivendell.
114                     IN PTR  william.rivendell.
[root@elrond named]#
```

This reverse lookup zone is very close to the one you will use for Lab 7

Zone file

```
[root@elrond named]# cat db.2.168.192
$TTL    86400
;192.168.2.* Reverse Zone Definition
;
2.168.192.in-addr.arpa. IN SOA  elrond.rivendell. root.rivendell.  (
                                      2009040311 ; Serial
                                      60         ; Refresh
                                      15         ; Retry
                                      3600000    ; Expire
                                      86400 )    ; Minimum
;
;Name Server Records
;
2.168.192.in-addr.arpa. IN NS elrond.rivendell.
;
;Address Records
105                     IN PTR  legolas.rivendell.
107                     IN PTR  elrond.rivendell.
108                     IN PTR  galadriel.rivendell.
114                     IN PTR  william.rivendell.
[root@elrond named]#
```

TTL = Time to live. How long a DNS record from this zone should be cached.

The longer the TTL value the faster domain resolution time periods will be.

Examples:

$TTL 86400
$TTL 1440m
$TTL 24h
$TTL 1d

Zone file

```
[root@elrond named]# cat db.2.168.192
$TTL    86400
;192.168.2.* Reverse Zone Definition
;
2.168.192.in-addr.arpa. IN SOA  elrond.rivendell. root.rivendell.  (
                                      2009040311 ; Serial
                                      60         ; Refresh
                                      15         ; Retry
                                      3600000    ; Expire
                                      86400 )    ; Minimum

;
;Name Server Records
;
2.168.192.in-addr.arpa. IN NS elrond.rivendell.
;
;Address Records
105                     IN PTR  legolas.rivendell.
107                     IN PTR  elrond.rivendell.
108                     IN PTR  galadriel.rivendell.
114                     IN PTR  william.rivendell.
[root@elrond named]#
```

Comments start with a ;

Zone file

```
[root@elrond named]# cat db.2.168.192
$TTL    86400
;192.168.2.* Reverse Zone Definition
;
2.168.192.in-addr.arpa. IN SOA  elrond.rivendell. root.rivendell.  (
                                      2009040311 ; Serial
                                      60         ; Refresh
                                      15         ; Retry
                                      3600000    ; Expire
                                      86400 )    ; Minimum
;
;Name Server Records
;
2.168.192.in-addr.arpa. IN NS elrond.rivendell.
;
;Address Records
105                     IN PTR  legolas.rivendell.
107                     IN PTR  elrond.rivendell.
108                     IN PTR  galadriel.rivendell.
114                     IN PTR  william.rivendell.
[root@elrond named]#
```

Primary domain name

Zone file

```
[root@elrond named]# cat db.2.168.192
$TTL    86400
;192.168.2.* Reverse Zone Definition
;
2.168.192.in-addr.arpa. IN SOA  elrond.rivendell. root.rivendell.  (
                                      2009040311 ; Serial
                                      60         ; Refresh
                                      15         ; Retry
                                      3600000    ; Expire
                                      86400 )    ; Minimum
;
;Name Server Records
;
2.168.192.in-addr.arpa. IN NS elrond.rivendell.
;
;Address Records
105                     IN PTR  legolas.rivendell.
107                     IN PTR  elrond.rivendell.
108                     IN PTR  galadriel.rivendell.
114                     IN PTR  william.rivendell.
[root@elrond named]#
```

Class of the zone

IN = Internet

Zone file

```
[root@elrond named]# cat db.2.168.192
$TTL    86400
;192.168.2.* Reverse Zone Definition
;
2.168.192.in-addr.arpa. IN SOA  elrond.rivendell. root.rivendell.  (
                                      2009040311 ; Serial
                                      60         ; Refresh
                                      15         ; Retry
                                      3600000    ; Expire
                                      86400 )    ; Minimum
;
;Name Server Records
;
2.168.192.in-addr.arpa. IN NS elrond.rivendell.
;
;Address Records
105                     IN PTR  legolas.rivendell.
107                     IN PTR  elrond.rivendell.
108                     IN PTR  galadriel.rivendell.
114                     IN PTR  william.rivendell.
[root@elrond named]#
```

Record type

SOA = Start of Authority

Zone file

```
[root@elrond named]# cat db.2.168.192
$TTL    86400
;192.168.2.* Reverse Zone Definition
;
2.168.192.in-addr.arpa. IN SOA  elrond.rivendell. root.rivendell.  (
                                      2009040311 ; Serial
                                      60         ; Refresh
                                      15         ; Retry
                                      3600000    ; Expire
                                      86400 )    ; Minimum
;
;Name Server Records
;
2.168.192.in-addr.arpa. IN NS elrond.rivendell.
;
;Address Records
105                     IN PTR  legolas.rivendell.
107                     IN PTR  elrond.rivendell.
108                     IN PTR  galadriel.rivendell.
114                     IN PTR  william.rivendell.
[root@elrond named]#
```

The primary DNS server for this zone

Zone file

```
[root@elrond named]# cat db.2.168.192
$TTL    86400
;192.168.2.* Reverse Zone Definition
;
2.168.192.in-addr.arpa. IN SOA  elrond.rivendell. root.rivendell.  (
                                      2009040311 ; Serial
                                      60         ; Refresh
                                      15         ; Retry
                                      3600000    ; Expire
                                      86400 )    ; Minimum
;
;Name Server Records
;
2.168.192.in-addr.arpa. IN NS elrond.rivendell.
;
;Address Records
105                     IN PTR  legolas.rivendell.
107                     IN PTR  elrond.rivendell.
108                     IN PTR  galadriel.rivendell.
114                     IN PTR  william.rivendell.
[root@elrond named]#
```

The email address of the person/authority in charge. Note the "@" is replaced by a "."

Zone file

```
[root@elrond named]# cat db.2.168.192
$TTL    86400
;192.168.2.* Reverse Zone Definition
;
2.168.192.in-addr.arpa. IN SOA  elrond.rivendell. root.rivendell.  (
                                2009040311 ; Serial
                                60         ; Refresh
                                15         ; Retry
                                3600000    ; Expire
                                86400 )    ; Minimum
;
;Name Server Records
;
2.168.192.in-addr.arpa. IN NS elrond.rivendell.
;
;Address Records
105                     IN PTR  legolas.rivendell.
107                     IN PTR  elrond.rivendell.
108                     IN PTR  galadriel.rivendell.
114                     IN PTR  william.rivendell.
[root@elrond named]#
```

Serial number, typically YYYYMMDDNN.

***Must be updated** to a larger number whenever zone file is updated or the changes will be ignored by BIND*

Zone file

```
[root@elrond named]# cat db.2.168.192
$TTL    86400
;192.168.2.* Reverse Zone Definition
;
2.168.192.in-addr.arpa. IN SOA  elrond.rivendell. root.rivendell.  (
                                      2009040311 ; Serial
                                      60         ; Refresh
                                      15         ; Retry
                                      3600000    ; Expire
                                      86400 )    ; Minimum
;
;Name Server Records
;
2.168.192.in-addr.arpa. IN NS elrond.rivendell.
;
;Address Records
105                     IN PTR  legolas.rivendell.
107                     IN PTR  elrond.rivendell.
108                     IN PTR  galadriel.rivendell.
114                     IN PTR  william.rivendell.
[root@elrond named]#
```

Refresh rate

How often the secondary server should poll the primary to refresh it data

It is set to only 60 seconds for Lab 7 so we can see zone transfers happen quickly. Normally you would set this to a longer time.

Zone file

```
[root@elrond named]# cat db.2.168.192
$TTL    86400
;192.168.2.* Reverse Zone Definition
;
2.168.192.in-addr.arpa. IN SOA  elrond.rivendell. root.rivendell.  (
                                      2009040311 ; Serial
                                      60         ; Refresh
                                      15         ; Retry
                                      3600000    ; Expire
                                      86400 )    ; Minimum
;
;Name Server Records
;
2.168.192.in-addr.arpa. IN NS elrond.rivendell.
;
;Address Records
105                     IN PTR  legolas.rivendell.
107                     IN PTR  elrond.rivendell.
108                     IN PTR  galadriel.rivendell.
114                     IN PTR  william.rivendell.
[root@elrond named]#
```

Retry

A value typically an hour or less that the secondary server should repeat an update request if the primary failed to respond.

Zone file

```
[root@elrond named]# cat db.2.168.192
$TTL    86400
;192.168.2.* Reverse Zone Definition
;
2.168.192.in-addr.arpa. IN SOA  elrond.rivendell. root.rivendell.  (
                                      2009040311 ; Serial
                                      60         ; Refresh
                                      15         ; Retry
                                      3600000    ; Expire
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;
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105                     IN PTR  legolas.rivendell.
107                     IN PTR  elrond.rivendell.
108                     IN PTR  galadriel.rivendell.
114                     IN PTR  william.rivendell.
[root@elrond named]#
```

Expire

In the case where the secondary server can no longer reach the primary, this is the amount of time the zone information can be used.

Secondary servers will stop responding to requests for this zone once the data has expired.

A successful refresh (a zone update) will reset the timers and the cycle will begin again.

Zone file

```
[root@elrond named]# cat db.2.168.192
$TTL    86400
;192.168.2.* Reverse Zone Definition
;
2.168.192.in-addr.arpa. IN SOA  elrond.rivendell. root.rivendell.  (
                                      2009040311 ; Serial
                                      60         ; Refresh
                                      15         ; Retry
                                      3600000    ; Expire
                                      86400 )    ; Minimum
;
;Name Server Records
;
2.168.192.in-addr.arpa. IN NS elrond.rivendell.
;
;Address Records
105                     IN PTR  legolas.rivendell.
107                     IN PTR  elrond.rivendell.
108                     IN PTR  galadriel.rivendell.
114                     IN PTR  william.rivendell.
[root@elrond named]#
```

Minimum

How long a non-authoritative server should cache an entry in case of failed lookups

Zone file

```
[root@elrond named]# cat db.2.168.192
$TTL    86400
;192.168.2.* Reverse Zone Definition
;
2.168.192.in-addr.arpa. IN SOA  elrond.rivendell. root.rivendell.  (
                                      2009040311 ; Serial
                                      60         ; Refresh
                                      15         ; Retry
                                      3600000    ; Expire
                                      86400 )    ; Minimum
;
;Name Server Records
;
2.168.192.in-addr.arpa. IN NS elrond.rivendell.
;
;Address Records
105                     IN PTR  legolas.rivendell.
107                     IN PTR  elrond.rivendell.
108                     IN PTR  galadriel.rivendell.
114                     IN PTR  william.rivendell.
[root@elrond named]#
```

NS (Name Server) records indicate the authoritative name servers for this zone.

Public domains are required to have at least two name servers.

Private domains may have just one.

Zone file

```
[root@elrond named]# cat db.2.168.192
$TTL    86400
;192.168.2.* Reverse Zone Definition
;
2.168.192.in-addr.arpa. IN SOA  elrond.rivendell. root.rivendell.  (
                                      2009040311 ; Serial
                                      60         ; Refresh
                                      15         ; Retry
                                      3600000    ; Expire
                                      86400 )    ; Minimum
;
;Name Server Records
;
2.168.192.in-addr.arpa. IN NS elrond.rivendell.
;
;Address Records
105                     IN PTR  legolas.rivendell.
107                     IN PTR  elrond.rivendell.
108                     IN PTR  galadriel.rivendell.
114                     IN PTR  william.rivendell.
[root@elrond named]#
```

Each PTR record matches a hostname with an IPv4 address.

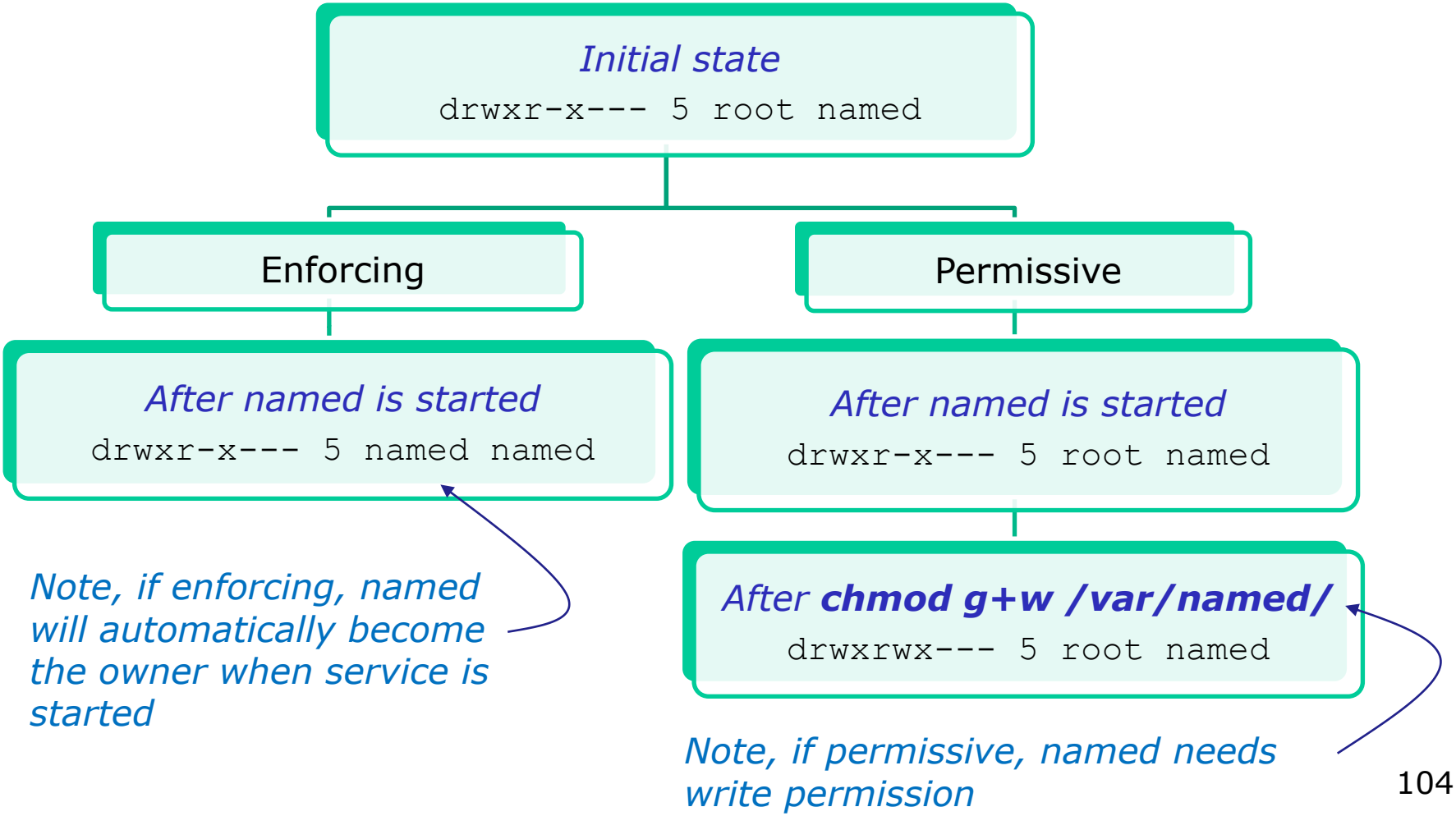
Zone file

```
[root@elrond named]# cat db.2.168.192
$TTL    86400
;192.168.2.* Reverse Zone Definition
;
2.168.192.in-addr.arpa. IN SOA  elrond.rivendell. root.rivendell.  (
                                      2009040311 ; Serial
                                      60         ; Refresh
                                      15         ; Retry
                                      3600000    ; Expire
                                      86400 )    ; Minimum
;
;Name Server Records
;
2.168.192.in-addr.arpa. IN NS elrond.rivendell.
;
;Address Records
105                     IN PTR  legolas.rivendell.
107                     IN PTR  elrond.rivendell.
108                     IN PTR  galadriel.rivendell.
114                     IN PTR  william.rivendell.
[root@elrond named]#
```

The IP address 192.168.2.105 resolves to Legolas

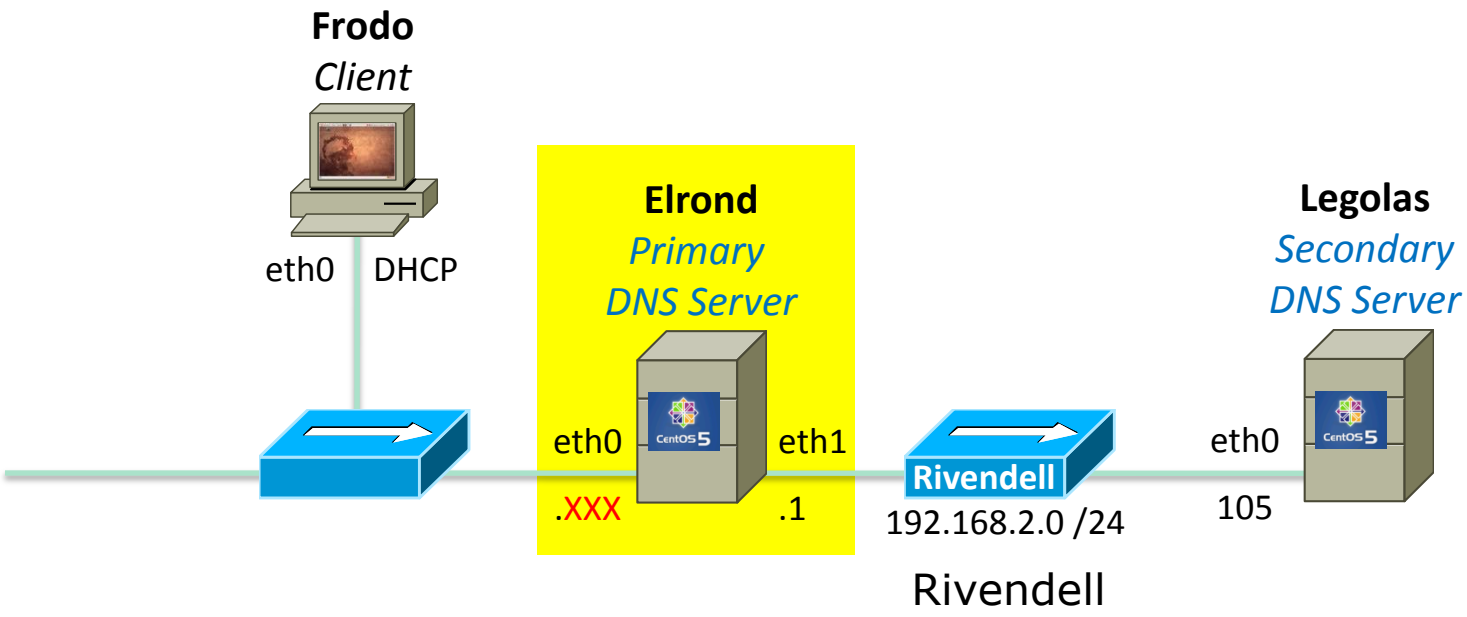
Secondary Nameserver must allow named to write to /var/named/

Step 2 ***/var/named*** *directory permissions and ownership*



Installing and Configuring DNS Service (Red Hat Family)

Step 3 *Firewall modifications*



Elrond is the primary nameserver

Open UDP 53 to allow incoming DNS requests

Open TCP port 53 to allow zone transfers to secondary servers

Allow forwarding of DNS queries to Internet DNS servers

Installing and Configuring DNS Service

CentOS default firewall on primary nameserver

```
[root@elrond etc]# iptables -L -n --line-numbers
Chain INPUT (policy ACCEPT)
num  target     prot opt source               destination
1    RH-Firewall-1-INPUT  all  --  0.0.0.0/0            0.0.0.0/0

Chain FORWARD (policy ACCEPT)
num  target     prot opt source               destination
1    RH-Firewall-1-INPUT  all  --  0.0.0.0/0            0.0.0.0/0

Chain OUTPUT (policy ACCEPT)
num  target     prot opt source               destination

Chain RH-Firewall-1-INPUT (2 references)
num  target     prot opt source               destination
1    ACCEPT     all  --  0.0.0.0/0            0.0.0.0/0
2    ACCEPT     icmp --  0.0.0.0/0            0.0.0.0/0           icmp type 255
3    ACCEPT     esp  --  0.0.0.0/0            0.0.0.0/0
4    ACCEPT     ah   --  0.0.0.0/0            0.0.0.0/0
5    ACCEPT     udp  --  0.0.0.0/0            224.0.0.251         udp dpt:5353
6    ACCEPT     udp  --  0.0.0.0/0            0.0.0.0/0           udp dpt:631
7    ACCEPT     tcp  --  0.0.0.0/0            0.0.0.0/0           tcp dpt:631
8    ACCEPT     all  --  0.0.0.0/0            0.0.0.0/0           state RELATED,ESTABLISHED
9    ACCEPT     tcp  --  0.0.0.0/0            0.0.0.0/0           state NEW tcp dpt:22
10   REJECT     all  --  0.0.0.0/0            0.0.0.0/0           reject-with icmp-host-prohibited
[root@elrond etc]#
```

Problem 1: Forward traffic is being subjected to input rules which will block forwarded DNS requests to Internet servers

CentOS 6.3 update
The INPUT chain is now used rather than the custom RH-Firewall-1-INPUT chain.

Problem 2: UDP/TCP port 53 is not open by default which will block incoming DNS requests and zone transfer file requests

Installing and Configuring DNS Service

CentOS 6.3 update
The INPUT chain is now used rather than the custom RH-Firewall-1-INPUT chain.

CentOS firewall modifications on primary nameserver

Open UDP port 53 for DNS queries

```
iptables -I RH-Firewall-1-INPUT 6 -p udp -m udp --dport 53 -j ACCEPT
```

Open TCP port 53 for zone transfers

```
iptables -I RH-Firewall-1-INPUT 6 -s 192.168.2.0/24 -p tcp -m tcp --dport 53 -j ACCEPT
```

Allow unrestricted traffic forwarding

```
iptables -D FORWARD 1
```

Provide NAT service so Rivendell hosts have Internet access

```
iptables -t nat -A POSTROUTING -o eth0 -j MASQUERADE
```

The last rule enables the secondary DNS server on Legolas to send DNS queries to other Internet DNS servers

Installing and Configuring DNS Service

CentOS modified firewall for primary nameserver

```
[root@elrond bin]# iptables -L -n
Chain INPUT (policy ACCEPT)
target     prot opt source               destination
RH-Firewall-1-INPUT  all  --  0.0.0.0/0            0.0.0.0/0

Chain FORWARD (policy ACCEPT)
target     prot opt source               destination

Chain OUTPUT (policy ACCEPT)
target     prot opt source               destination

Chain RH-Firewall-1-INPUT (1 references)
target     prot opt source               destination
ACCEPT     all  --  0.0.0.0/0            0.0.0.0/0
ACCEPT     icmp --  0.0.0.0/0            0.0.0.0/0           icmp type 255
ACCEPT     esp  --  0.0.0.0/0            0.0.0.0/0
ACCEPT     ah   --  0.0.0.0/0            0.0.0.0/0
ACCEPT     udp  --  0.0.0.0/0            224.0.0.251         udp dpt:5353
ACCEPT     tcp  --  192.168.2.0/24       0.0.0.0/0           tcp dpt:53
ACCEPT     udp  --  0.0.0.0/0            0.0.0.0/0           udp dpt:53
ACCEPT     udp  --  0.0.0.0/0            0.0.0.0/0           udp dpt:631
ACCEPT     tcp  --  0.0.0.0/0            0.0.0.0/0           tcp dpt:631
ACCEPT     all  --  0.0.0.0/0            0.0.0.0/0           state RELATED,ESTABLISHED
ACCEPT     tcp  --  0.0.0.0/0            0.0.0.0/0           state NEW tcp dpt:22
REJECT     all  --  0.0.0.0/0            0.0.0.0/0           reject-with icmp-host-prohibited
[root@elrond bin]#
```

Forwarded traffic is no longer blocked

CentOS 6.3 update
The INPUT chain is now used rather than the custom RH-Firewall-1-INPUT chain.

UDP port 53 and TCP port 53 are now open to allow DNS queries and zone transfer file requests

Installing and Configuring DNS Service

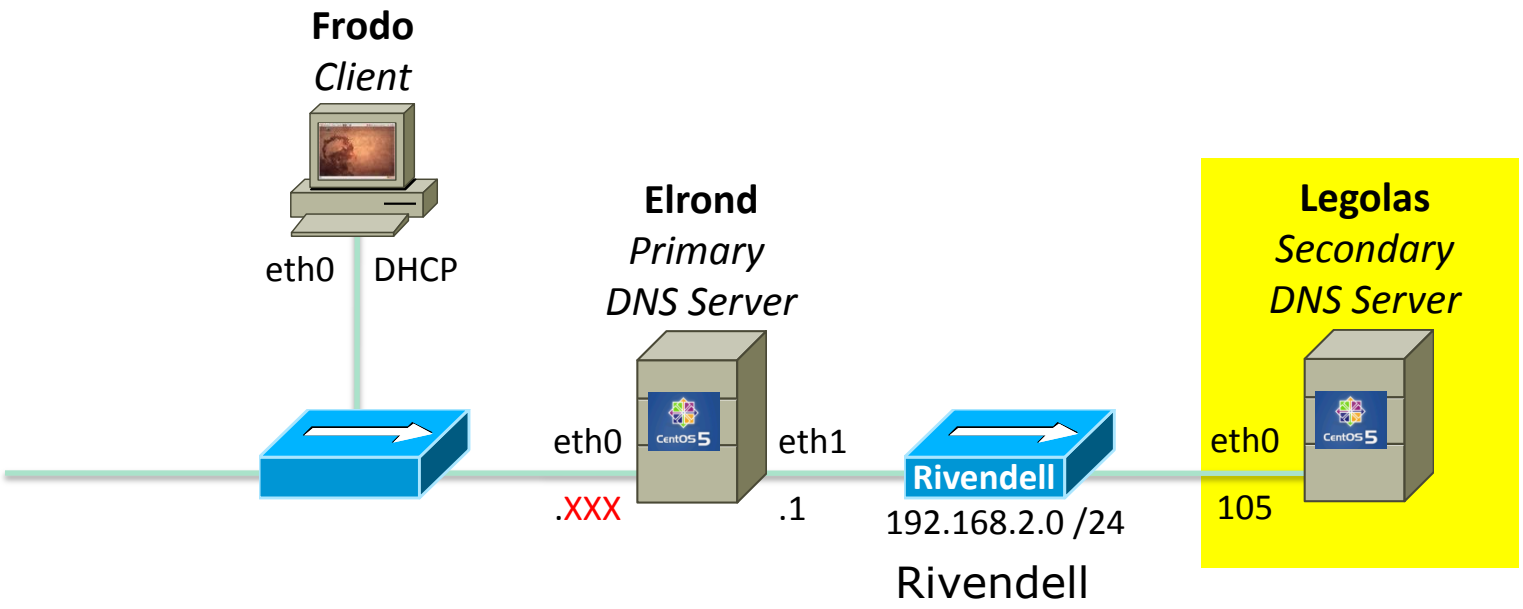
CentOS modified firewall for primary nameserver

```
[root@elrond bin]# iptables -t nat -L -n
Chain PREROUTING (policy ACCEPT)
target     prot opt source               destination

Chain POSTROUTING (policy ACCEPT)
target     prot opt source               destination
MASQUERADE  all  --  0.0.0.0/0            0.0.0.0/0

Chain OUTPUT (policy ACCEPT)
target     prot opt source               destination
[root@elrond bin]#
```

Provide NAT service so Rivendell hosts have Internet access. Note: This allows the secondary name server on Legolas to make DNS queries to other Internet name servers.

Installing and Configuring DNS Service (Red Hat Family)

Step 3 *Firewall modifications*



Legolas is the secondary nameserver

Open UDP 53 to allow incoming DNS requests

Installing and Configuring DNS Service

CentOS default firewall on secondary nameserver

```
[root@legolas etc]# iptables -L -n --line-numbers
Chain INPUT (policy ACCEPT)
num  target     prot opt source               destination
1    RH-Firewall-1-INPUT  all  --  0.0.0.0/0            0.0.0.0/0

Chain FORWARD (policy ACCEPT)
num  target     prot opt source               destination
1    RH-Firewall-1-INPUT  all  --  0.0.0.0/0            0.0.0.0/0

Chain OUTPUT (policy ACCEPT)
num  target     prot opt source               destination

Chain RH-Firewall-1-INPUT (2 references)
num  target     prot opt source               destination
1    ACCEPT     all  --  0.0.0.0/0            0.0.0.0/0
2    ACCEPT     icmp --  0.0.0.0/0            0.0.0.0/0           icmp type 255
3    ACCEPT     esp  --  0.0.0.0/0            0.0.0.0/0
4    ACCEPT     ah   --  0.0.0.0/0            0.0.0.0/0
5    ACCEPT     udp  --  0.0.0.0/0            224.0.0.251         udp dpt:5353
6    ACCEPT     udp  --  0.0.0.0/0            0.0.0.0/0           udp dpt:631
7    ACCEPT     tcp  --  0.0.0.0/0            0.0.0.0/0           tcp dpt:631
8    ACCEPT     all  --  0.0.0.0/0            0.0.0.0/0           state RELATED,ESTABLISHED
9    ACCEPT     tcp  --  0.0.0.0/0            0.0.0.0/0           state NEW tcp dpt:22
10   REJECT     all  --  0.0.0.0/0            0.0.0.0/0           reject-with icmp-host-prohibited
[root@elrond etc]#
```

CentOS 6.3 update
The INPUT chain is now used rather than the custom RH-Firewall-1-INPUT chain.

UDP port 53 is not open by default which will block incoming DNS requests

Installing and Configuring DNS Service

CentOS firewall modifications on secondary nameserver

Open UDP port 53 for DNS queries

```
iptables -I RH-Firewall-1-INPUT 6 -p udp -m udp --dport 53 -j ACCEPT
```

CentOS 6.3 update
The INPUT chain is now used rather than the custom RH-Firewall-1-INPUT chain.

Installing and Configuring DNS Service

CentOS modified firewall for secondary nameserver

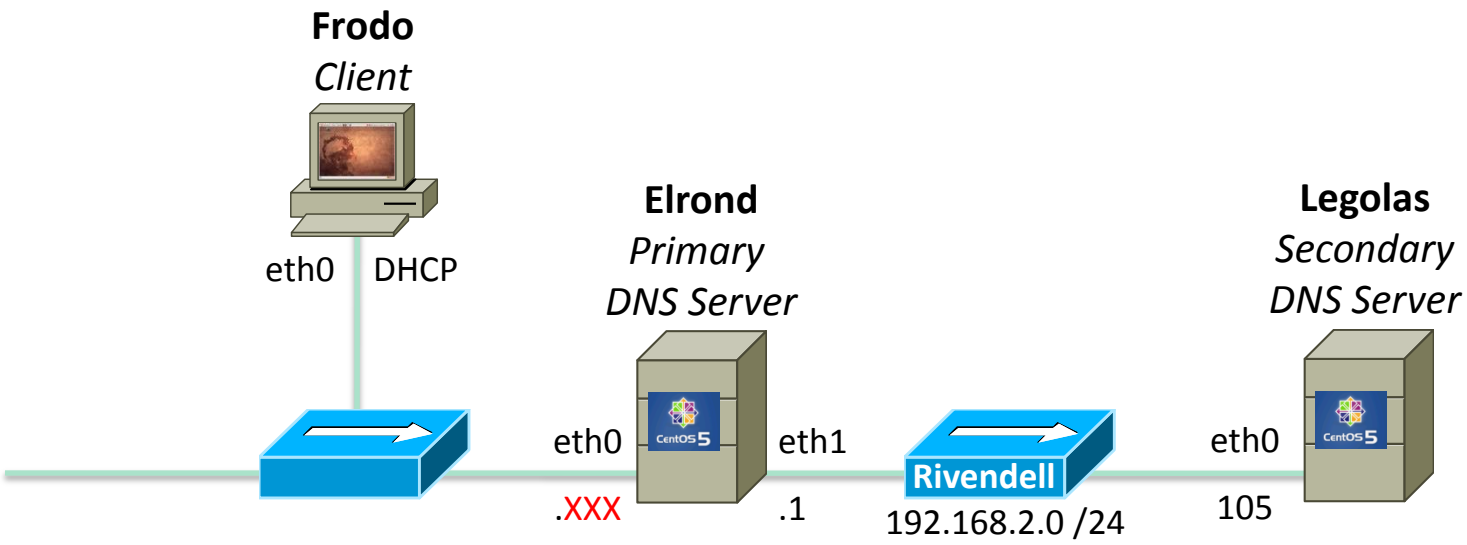
```
[root@legolas bin]# iptables -L -n --line-numbers
Chain INPUT (policy ACCEPT)
num  target     prot opt source               destination
1    RH-Firewall-1-INPUT  all  --  0.0.0.0/0            0.0.0.0/0

Chain FORWARD (policy ACCEPT)
num  target     prot opt source               destination
1    RH-Firewall-1-INPUT  all  --  0.0.0.0/0            0.0.0.0/0

Chain OUTPUT (policy ACCEPT)
num  target     prot opt source               destination

Chain RH-Firewall-1-INPUT (2 references)
num  target     prot opt source               destination
1    ACCEPT     all  --  0.0.0.0/0            0.0.0.0/0
2    ACCEPT     icmp --  0.0.0.0/0            0.0.0.0/0           icmp type 255
3    ACCEPT     esp  --  0.0.0.0/0            0.0.0.0/0
4    ACCEPT     ah   --  0.0.0.0/0            0.0.0.0/0
5    ACCEPT     udp  --  0.0.0.0/0            224.0.0.251         udp dpt:5353
6    ACCEPT     udp  --  0.0.0.0/0            0.0.0.0/0           udp dpt:53
7    ACCEPT     udp  --  0.0.0.0/0            0.0.0.0/0           udp dpt:631
8    ACCEPT     tcp  --  0.0.0.0/0            0.0.0.0/0           tcp dpt:631
9    ACCEPT     all  --  0.0.0.0/0            0.0.0.0/0           state RELATED,ESTABLISHED
10   ACCEPT     tcp  --  0.0.0.0/0            0.0.0.0/0           state NEW tcp dpt:22
11   REJECT     all  --  0.0.0.0/0            0.0.0.0/0           reject-with icmp-host-prohibited
[root@legolas bin]#
```

CentOS 6.3 update
The INPUT chain is now used rather than the custom RH-Firewall-1-INPUT chain.

UDP port 53 is now open to allow DNS requests

Installing and Configuring DNS Service (Red Hat Family)

Step 4 *SELinux modifications (used in Lab 7)*



Installing and Configuring DNS service

Step 4 *SELinux*

- On the primary and secondary server leave the SELinux setting as Enforcing
- On the secondary server, make the following change to allow the named daemon (named) to write zone files in /var/named/

setsebool -P named_write_master_zones=1

https://bugzilla.redhat.com/show_bug.cgi?id=545128
https://bugzilla.redhat.com/show_bug.cgi?id=147824

SELinux Administration (sidetrack)

Set permissive mode

```
[root@legolas ~]# setenforce permissive
[root@legolas ~]# getenforce
Permissive
```

Set enforcing mode

```
[root@legolas ~]# setenforce enforcing
[root@legolas ~]# getenforce
Enforcing
```

Show SELinux status

```
[root@legolas ~]# sestatus
SELinux status:                 enabled
SELinuxfs mount:                /selinux
Current mode:                   enforcing
Mode from config file:          enforcing
Policy version:                 21
Policy from config file:        targeted
```

SELinux Administration (sidetrack)

Set SELinux boolian flag on

```
[root@legolas ~]# setsebool -P named_write_master_zones=1
```

Show SELinux boolian flag

```
[root@legolas ~]# getsebool named_write_master_zones
named_write_master_zones --> on
```

Set SELinux boolian flag off

```
[root@legolas ~]# setsebool -P named_write_master_zones=0
```

Show SELinux boolian flag

```
[root@legolas ~]# getsebool named_write_master_zones
named_write_master_zones --> off
```

*Note, the -P option on **setsebool** makes the setting persistent across system restarts*

SELinux Administration (sidetrack)

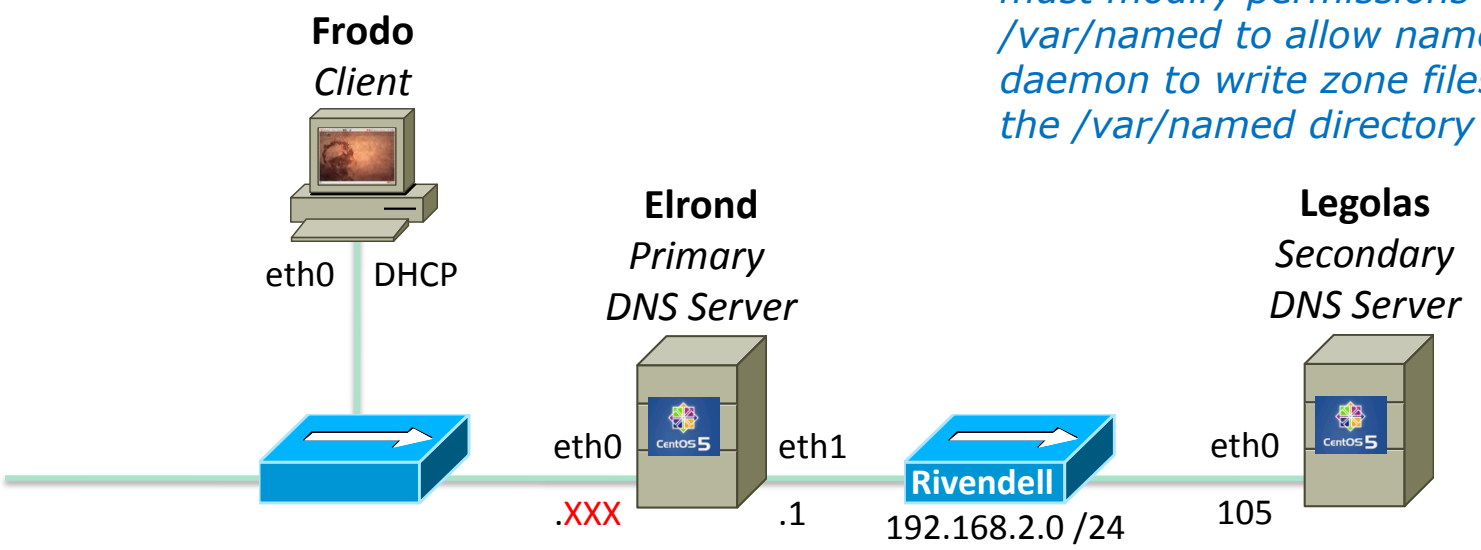
Show all SELinux boolean flags

```
[root@legolas ~]# getsebool -a
NetworkManager_disable_trans --> off
allow_console_login --> off
allow_cvs_read_shadow --> off
allow_daemons_dump_core --> on
allow_daemons_use_tty --> on
allow_domain_fd_use --> on
allow_execheap --> off
allow_execmem --> on
allow_execmod --> off
allow_execstack --> on
allow_ftpd_anon_write --> off
allow_ftpd_full_access --> off
< snipped >
```

Installing and Configuring DNS Service (Red Hat Family)

Step 3 *SELinux modifications*

*Note, if you do run the **secondary** nameserver in **Permissive** mode, then you must modify permissions on /var/named to allow named daemon to write zone files into the /var/named directory*



*Note, if you run the **secondary** nameserver in **Enforcing** mode, then you must use the setsebool command to allow the named daemon to write zone files to /var/named/*

Installing and Configuring DNS service

Step 4 *SELinux*

Elrond (permissive)
- no sebool commands needed
- no owner changes needed for /var/named
- no permission changes needed for /var/named

Primary

Legolas (permissive)
- no sebool commands needed
- no owner changes needed for /var/named
- permission change required (for named to write zone files)

```
[root@legolas ~]# ls -ld /var/named
drwxr-x--- 5 root named 4096 Apr 14 08:48 /var/named

[root@legolas ~]# chmod g+w /var/named/
[root@legolas ~]# ls -ld /var/named
drwxrwx--- 5 root named 4096 Apr 14 08:48 /var/named
```

Secondary

*Note, if you do run the **secondary** nameserver in **Permissive** mode, then you must modify permissions on /var/named to allow named daemon write zone files into the /var/named directory*

Installing and Configuring DNS service

Step 4 *SELinux*

Elrond (enforcing)
- no sebool commands
- no owner changes
- no permission changes

Primary

Legolas (enforcing)
- **setsebool -P named_write_master_zones=1**
- no owner changes needed for /var/named
- no permission changes needed for /var/named

Secondary

Note, named was automatically made owner of this directory

```
[root@legolas bin]# ls -ld /var/named
drwxr-x--- 5 named named 4096 Apr 14 10:16 /var/named
```

*Note, if you run the **secondary** nameserver in **Enforcing** mode, then you must use the setsebool command above to allow the named daemon to write zone files to /var/named/*

On the Secondary Nameserver

Step 4 *SELinux and Permissions*

	Elrond commands	Legolas commands
Enforcing	NA	setsebool -P named_write_master_zones=1
Permissive	NA	chmod g+w /var/named/

No changes need to be made on the primary nameserver

On the secondary nameserver, named needs to be able to write zone files to the /var/named directory

Installing and Configuring DNS service

Step 5 *Start service*

```
[root@arwen ~]# service named start
Starting named:                                            [   OK   ]
```

Installing and Configuring DNS service

If service is already running use the following to reread configuration files:

```
[root@elrond ~]# service named restart
```

or

```
[root@elrond ~]# rndc reload
```

Installing and Configuring DNS service

Step 6 *Configure automatic service startup*

To automatically start service at system boot use:

```
[root@elrond ~]# chkconfig named on
[root@elrond ~]# chkconfig --list named
named           0:off   1:off   2:on    3:on    4:on    5:on    6:off
```

To not start service at system boot use:

```
[root@elrond ~]# chkconfig named off
[root@elrond ~]# chkconfig --list named
named           0:off   1:off   2:off   3:off   4:off   5:off   6:off
```

Installing and Configuring DNS service

Step 7 *Monitor and verify service is running*

named process

```
[root@elrond bin]# ps -ef | grep named
named     9869     1  0 14:31 ?        00:00:00 /usr/sbin/named -u named
root      9984  3200  0 14:48 pts/0    00:00:00 grep named
[root@elrond bin]#
```

Installing and Configuring DNS service

Step 7 *Monitor and verify service is running*

```
[root@elrond bin]# service named status
number of zones: 4
debug level: 0
xfers running: 0
xfers deferred: 0
soa queries in progress: 0
query logging is OFF
recursive clients: 0/1000
tcp clients: 0/100
server is up and running
named (pid  9869) is running...
[root@elrond bin]#
```

Installing and Configuring DNS service

Step 7 *Verify service is running*

netstat

```
[root@elrond bin]# netstat -tln
Active Internet connections (only servers)
Proto Recv-Q Send-Q Local Address               Foreign Address             State
tcp        0      0 127.0.0.1:2208              0.0.0.0:*                   LISTEN
tcp        0      0 0.0.0.0:876                 0.0.0.0:*                   LISTEN
tcp        0      0 0.0.0.0:111                 0.0.0.0:*                   LISTEN
tcp        0      0 192.168.2.1:53              0.0.0.0:*                   LISTEN
tcp        0      0 172.30.1.125:53             0.0.0.0:*                   LISTEN
tcp        0      0 127.0.0.1:53                0.0.0.0:*                   LISTEN
tcp        0      0 127.0.0.1:631               0.0.0.0:*                   LISTEN
tcp        0      0 127.0.0.1:953               0.0.0.0:*                   LISTEN
tcp        0      0 127.0.0.1:25                0.0.0.0:*                   LISTEN
tcp        0      0 127.0.0.1:2207              0.0.0.0:*                   LISTEN
tcp        0      0 :::22                       :::*                        LISTEN
[root@elrond bin]#
```

*Use **netstat -tl** command to see what port names your system is listening for requests on*

Installing and Configuring DNS service

Step 7 *Verify service is running*

netstat

```
[root@elrond bin]# netstat -uln
Active Internet connections (only servers)
Proto Recv-Q Send-Q Local Address               Foreign Address             State
udp        0      0 192.168.2.1:53              0.0.0.0:*
udp        0      0 172.30.1.125:53             0.0.0.0:*
udp        0      0 127.0.0.1:53                0.0.0.0:*
udp        0      0 0.0.0.0:870                 0.0.0.0:*
udp        0      0 0.0.0.0:5353                0.0.0.0:*
udp        0      0 0.0.0.0:873                 0.0.0.0:*
udp        0      0 0.0.0.0:111                 0.0.0.0:*
udp        0      0 0.0.0.0:631                 0.0.0.0:*
udp        0      0 0.0.0.0:33530               0.0.0.0:*
udp        0      0 :::36992                    :::*
udp        0      0 :::5353                     :::*
[root@elrond bin]#
```

*Use **netstat -tln** command to see what port numbers your system is listening for requests on*

Installing and Configuring DNS service

Try it!

```
[root@elrond bin]# host elrond
elrond.rivendell has address 192.168.2.1

[root@elrond bin]# host legolas
legolas.rivendell has address 192.168.2.105

[root@elrond bin]# host 192.168.2.105
105.2.168.192.in-addr.arpa domain name pointer legolas.rivendell.
```

Installing and Configuring DNS service

Step 8 *Troubleshooting*

Problem: primary to secondary transfer failing

From /var/log/messages:

```
Apr 13 10:22:43 legolas named[13585]: the working directory is not writable
Apr 13 10:22:43 legolas named[13585]: zone 0.0.127.in-addr.arpa/IN: loaded serial
1997022700
Apr 13 10:22:43 legolas named[13585]: zone localhost/IN: loaded serial 42
Apr 13 10:22:43 legolas named[13585]: running
Apr 13 10:22:43 legolas named[13585]: zone rivendell/IN: Transfer started.
Apr 13 10:22:43 legolas named[13585]: transfer of 'rivendell/IN' from
192.168.2.1#53: connected using 192.168.2.105#50197
Apr 13 10:22:43 legolas named[13585]: dumping master file: tmp-gU4SMMpaFs: open:
permission denied
Apr 13 10:22:43 legolas named[13585]: transfer of 'rivendell/IN' from
192.168.2.1#53: failed while receiving responses: permission denied
```

Solution:

Configure SElinux to allow named to write zone files on secondary:

setsebool -P named_write_master_zones=1

(https://bugzilla.redhat.com/show_bug.cgi?id=545128)

Installing and Configuring DNS service

Step 8 *Troubleshooting*

Problem: primary to secondary transfer failing

From /var/log/messages:

```
Apr  6 07:01:15 legolas named[16429]: zone rivendell/IN: refresh:
retry limit for master 192.168.2.107#53 exceeded (source 0.0.0.0#0)
Apr  6 07:01:15 legolas named[16429]: zone rivendell/IN: Transfer
started.
Apr  6 07:01:15 legolas named[16429]: transfer of 'rivendell/IN' from
192.168.2.107#53: failed to connect: host unreachable
Apr  6 07:01:15 legolas named[16429]: transfer of 'rivendell/IN' from
192.168.2.107#53: end of transfer
```

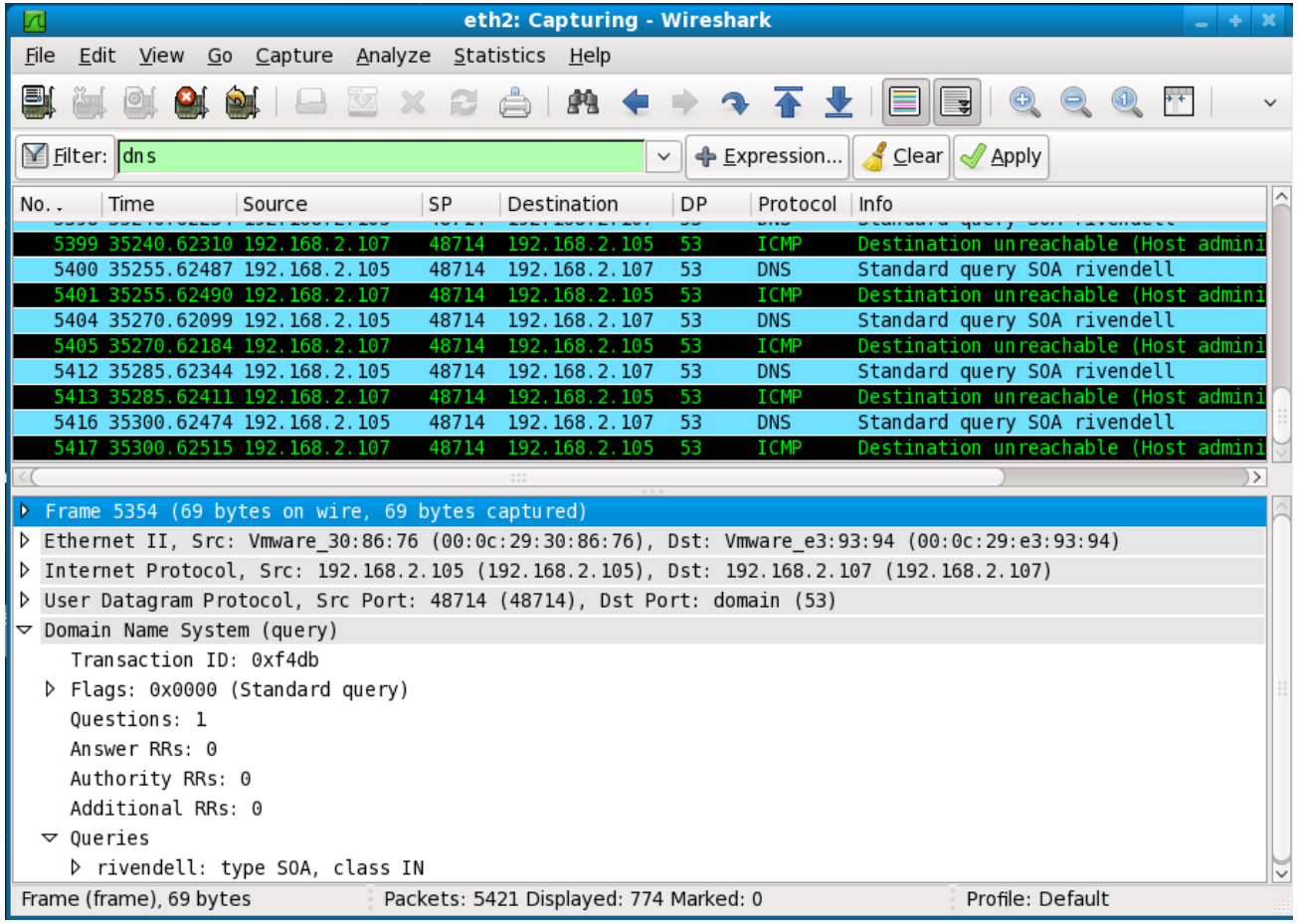
Solution:

Firewall on master is blocking connection by secondary for transfer
Open UDP port 53 (for DNS requests) and TCP port 53 (for zone file transfers) on primary

Installing and Configuring DNS service

Step 8 *Troubleshooting*

Zone transfer failing when blocked by firewall on primary



Installing and Configuring DNS service

Step 9 *Monitor log files*

```
[root@elrond ~]# cat /var/log/messages | grep named
Apr 14 15:05:24 elrond named[10126]: using default UDP/IPv4 port range: [1024, 65535]
Apr 14 15:05:24 elrond named[10126]: using default UDP/IPv6 port range: [1024, 65535]
Apr 14 15:05:24 elrond named[10126]: listening on IPv4 interface lo, 127.0.0.1#53
Apr 14 15:05:24 elrond named[10126]: listening on IPv4 interface eth0, 172.30.1.125#53
Apr 14 15:05:24 elrond named[10126]: listening on IPv4 interface eth1, 192.168.2.1#53
Apr 14 15:05:24 elrond named[10126]: command channel listening on 127.0.0.1#953
Apr 14 15:05:24 elrond named[10126]: the working directory is not writable
Apr 14 15:05:24 elrond named[10126]: zone 0.0.127.in-addr.arpa/IN: loaded serial
1997022700
Apr 14 15:05:24 elrond named[10126]: zone 2.168.192.in-addr.arpa/IN: loaded serial
2010041500
Apr 14 15:05:24 elrond named[10126]: zone localhost/IN: loaded serial 42
Apr 14 15:05:24 elrond named[10126]: zone rivendell/IN: loaded serial 2010041500
Apr 14 15:05:24 elrond named[10126]: running
Apr 14 15:05:24 elrond named[10126]: zone 2.168.192.in-addr.arpa/IN: sending notifies
(serial 2010041500)
Apr 14 15:05:24 elrond named[10126]: client 192.168.2.1#11553: received notify for zone
'2.168.192.in-addr.arpa'
[root@elrond bin]#
```

*Use **tail -f /var/log/messages** to monitor in real time*

Installing and Configuring DNS service

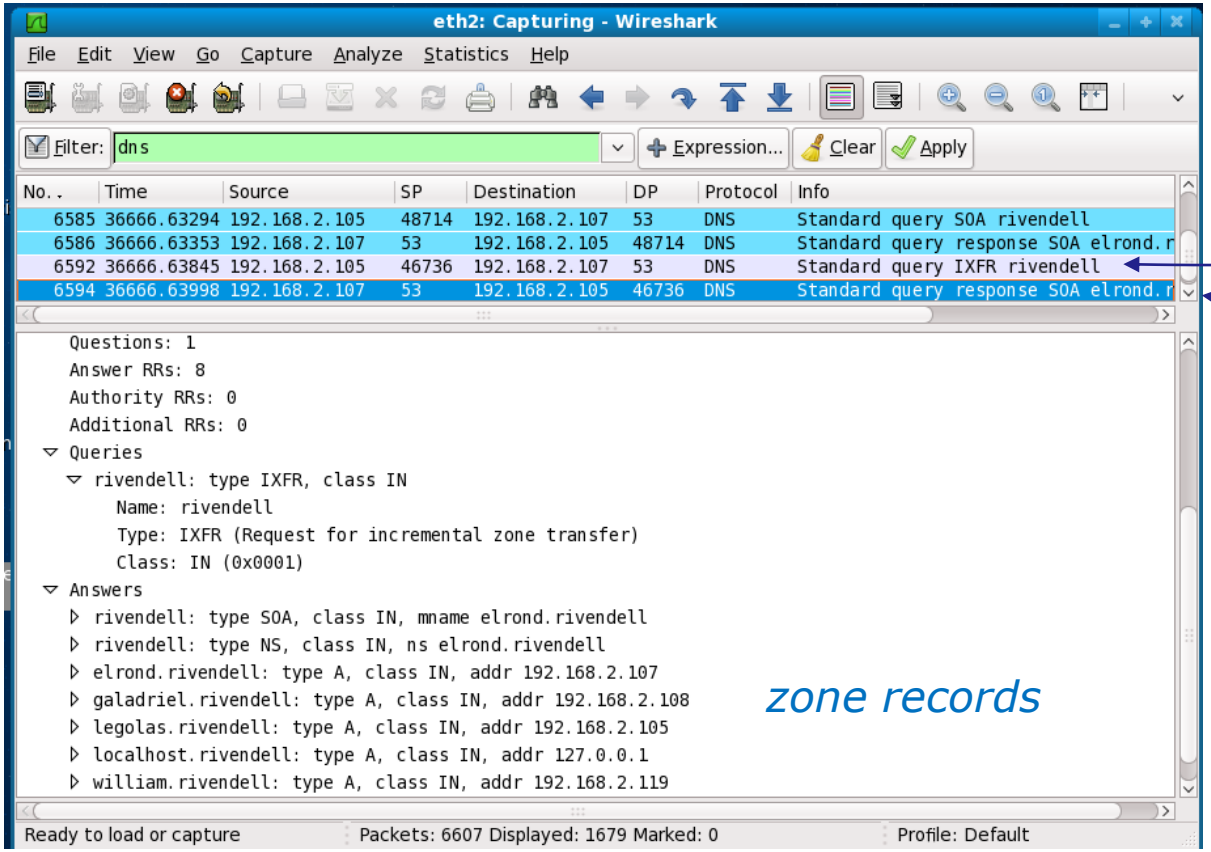
Step 10 *Configure additional security*

See 15.15 in the text book for more information

zone transfer

Zone transfer

The secondary server does this to obtain the zone databases from the primary server



*A **successful** zone transfer*

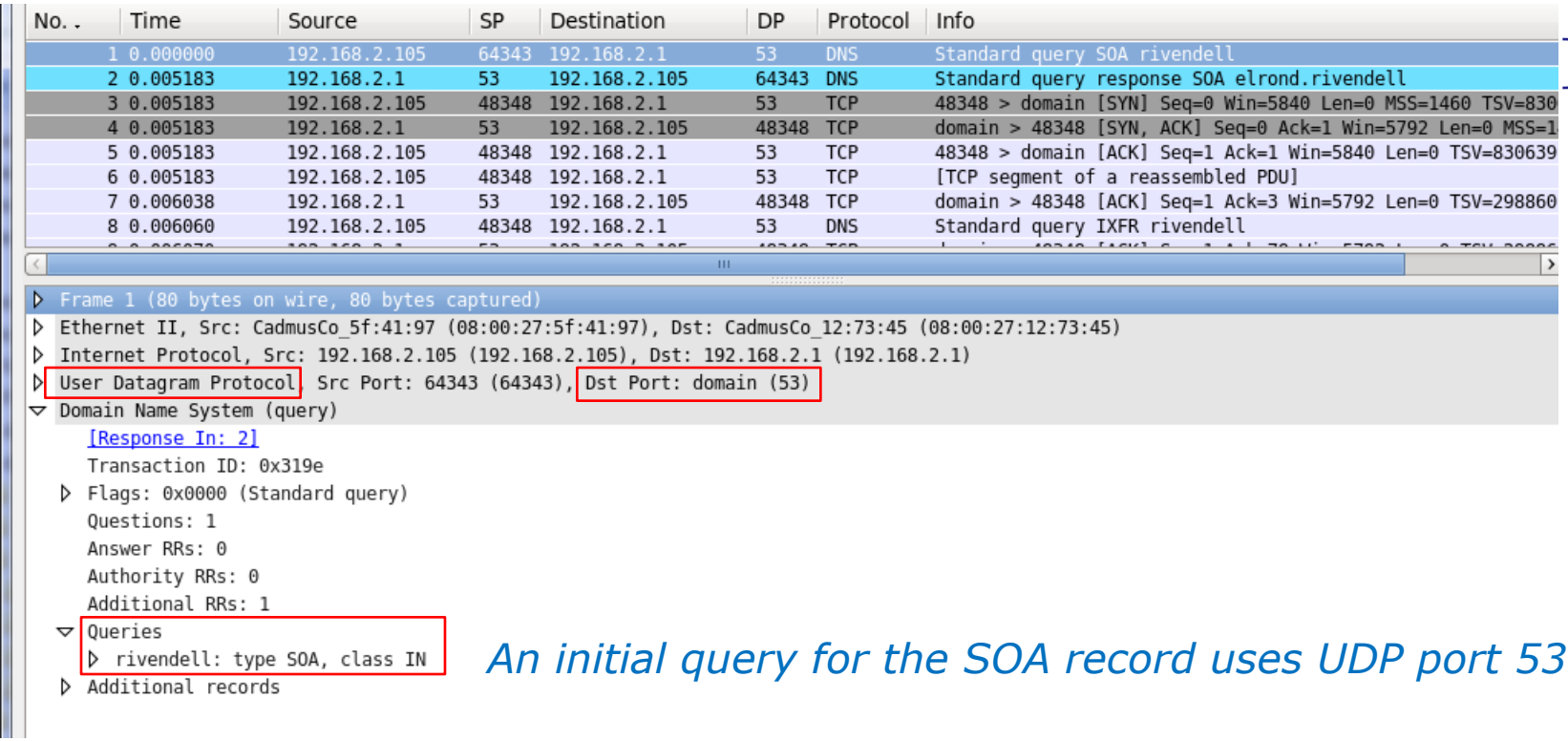
Request from secondary

Response from primary

/var/log/messages:

```
Apr  6 07:30:59 legolas named[16429]: zone rivendell/IN: Transfer started.
Apr  6 07:30:59 legolas named[16429]: transfer of 'rivendell/IN' from
192.168.2.107#53: connected using 192.168.2.105#46736
Apr  6 07:30:59 legolas named[16429]: zone rivendell/IN: transferred serial
2009040309
Apr  6 07:30:59 legolas named[16429]: transfer of 'rivendell/IN' from
192.168.2.107#53: end of transfer
```

Zone transfer involves UPD and TCP requests to port 53



UDP

An initial query for the SOA record uses UDP port 53

Zone transfer involves UPD and TCP requests to port 53

1	0.000000	192.168.2.105	64343	192.168.2.1	53	DNS	Standard query SOA rivendell
2	0.005183	192.168.2.1	53	192.168.2.105	64343	DNS	Standard query response SOA elrond.rivendell
3	0.005183	192.168.2.105	48348	192.168.2.1	53	TCP	48348 > domain [SYN] Seq=0 Win=5840 Len=0 MSS=1460 TSV=830
4	0.005183	192.168.2.1	53	192.168.2.105	48348	TCP	domain > 48348 [SYN, ACK] Seq=0 Ack=1 Win=5792 Len=0 MSS=1
5	0.005183	192.168.2.105	48348	192.168.2.1	53	TCP	48348 > domain [ACK] Seq=1 Ack=1 Win=5840 Len=0 TSV=830639
6	0.005183	192.168.2.105	48348	192.168.2.1	53	TCP	[TCP segment of a reassembled PDU]
7	0.006038	192.168.2.1	53	192.168.2.105	48348	TCP	domain > 48348 [ACK] Seq=1 Ack=3 Win=5792 Len=0 TSV=298860
8	0.006060	192.168.2.105	48348	192.168.2.1	53	DNS	Standard query IXFR rivendell

UDP

```
Authority RRs: 1
Additional RRs: 2
▽ Queries
  ▷ rivendell: type SOA, class IN
▽ Answers
  ▽ rivendell: type SOA, class IN, mname elrond.rivendell
      Name: rivendell
      Type: SOA (Start of zone of authority)
      Class: IN (0x0001)
      Time to live: 7 days
      Data length: 36
      Primary name server: elrond.rivendell
      Responsible authority's mailbox: root.rivendell
      Serial number: 2010041504
      Refresh interval: 1 minute
      Retry interval: 15 seconds
      Expiration limit: 14 days
      Minimum TTL: 5 minutes
▽ Authoritative nameservers
```

The SOA record information is sent back as the answer to the query using UDP

Zone transfer involves UPD and TCP requests to port 53

	Time	Source	SP	Destination	DP	Protocol	Info
1	0.000000	192.168.2.105	64343	192.168.2.1	53	DNS	Standard query SOA rivendell
2	0.005183	192.168.2.1	53	192.168.2.105	64343	DNS	Standard query response SOA elrond.rivendell
3	0.005183	192.168.2.105	48348	192.168.2.1	53	TCP	48348 > domain [SYN] Seq=0 Win=5840
4	0.005183	192.168.2.1	53	192.168.2.105	48348	TCP	domain > 48348 [SYN, ACK] Seq=0 Ack=
5	0.005183	192.168.2.105	48348	192.168.2.1	53	TCP	48348 > domain [ACK] Seq=1 Ack=1 Win
6	0.005183	192.168.2.105	48348	192.168.2.1	53	TCP	[TCP segment of a reassembled PDU]
7	0.006038	192.168.2.1	53	192.168.2.105	48348	TCP	domain > 48348 [ACK] Seq=1 Ack=3 Win=5792 Len=0 TSV=29886012
8	0.006060	192.168.2.105	48348	192.168.2.1	53	DNS	Standard query IXFR rivendell
9	0.006070	192.168.2.1	53	192.168.2.105	48348	TCP	domain > 48348 [ACK] Seq=1 Ack=78 Win=5792 Len=0 TSV=29886012
10	0.006082	192.168.2.1	53	192.168.2.105	48348	DNS	Standard query response SOA elrond.r
11	0.006094	192.168.2.105	48348	192.168.2.1	53	TCP	48348 > domain [ACK] Seq=78 Ack=244 Win=6912 Len=0 TSV=830639
12	0.066301	192.168.2.105	48348	192.168.2.1	53	TCP	48348 > domain [FIN, ACK] Seq=78 Ack
13	0.067774	192.168.2.1	53	192.168.2.105	48348	TCP	domain > 48348 [FIN, ACK] Seq=244 Ac
14	0.067977	192.168.2.105	48348	192.168.2.1	53	TCP	48348 > domain [ACK] Seq=79 Ack=245

3 way open handshake

zone transfer

*3 way closing handshake**

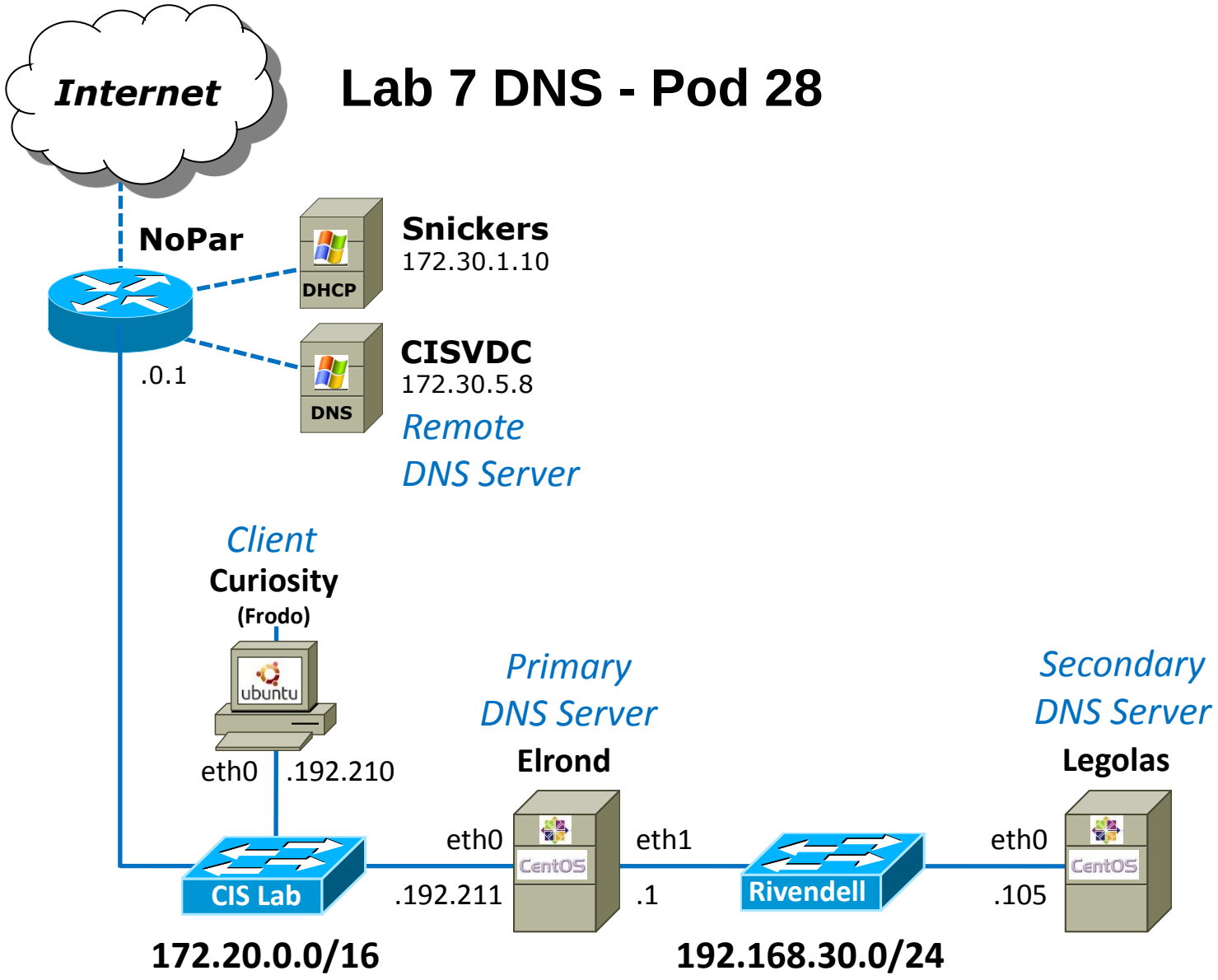
TCP

```
▷ Flags: 0x8480 (Standard query response, No error)
  Questions: 1
  Answer RRs: 8
  Authority RRs: 0
  Additional RRs: 0
▽ Queries
  ▷ rivendell: type IXFR, class IN
▽ Answers
  ▷ rivendell: type SOA, class IN, mname elrond.rivendell
  ▷ rivendell: type NS, class IN, ns elrond.rivendell
  ▷ elrond.rivendell: type A, class IN, addr 192.168.2.1
  ▷ galadriel.rivendell: type A, class IN, addr 192.168.2.211
  ▷ legolas.rivendell: type A, class IN, addr 192.168.2.105
  ▷ localhost.rivendell: type A, class IN, addr 127.0.0.1
  ▷ william.rivendell: type A, class IN, addr 192.168.2.114
  ▷ rivendell: type SOA, class IN, mname elrond.rivendell
```

Which is then followed by a connection to TCP port 53 for the actual data transfer

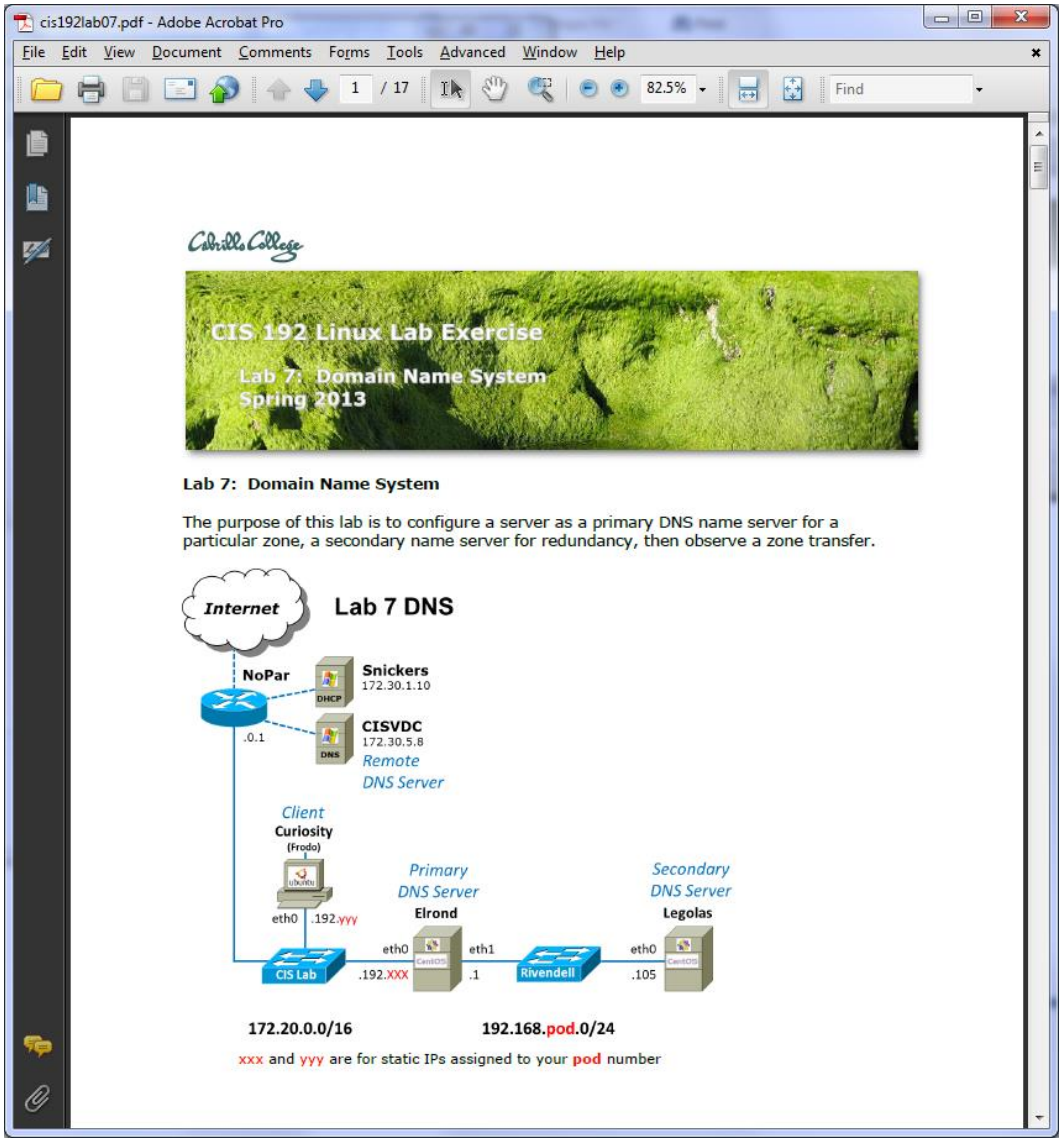
Note the closing handshake is 3-way rather than 4-way. This alternative closing handshake combines step 2 (ACK) and step 3 (FIN, ACK) from 192.168.2.1 into a single step (FIN, ACK)

Reference DNS Installation


Internet
Lab 7 DNS - Pod 28
NoPar
.0.1
DHCP
Snickers
172.30.1.10
DNS
CISVDC
172.30.5.8
Remote
DNS Server
Client
Curiosity
(Frodo)
ubuntu
eth0
.192.210
Primary
DNS Server
Elrond
eth0
.192.211
CentOS
CIS Lab
172.20.0.0/16
eth1
.1
Rivendell
192.168.30.0/24
Secondary
DNS Server
Legolas
eth0
.105
CentOS

Lab 7

Lab 7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Cabrillo College
CIS 192 Linux Lab Exercise
Lab 7: Domain Name System
Spring 2013
Lab 7: Domain Name System
The purpose of this lab is to configure a server as a primary DNS name server for a particular zone, a secondary name server for redundancy, then observe a zone transfer.
Internet
Lab 7 DNS
NoPar
.0.1
Snickers
172.30.1.10
DHCP
CISVDC
172.30.5.8
DNS
Remote
DNS Server
Client
Curiosity
(Frodo)
eth0
.192.yyy
CIS Lab
Primary
DNS Server
Elrond
eth0
.192.XXX
eth1
.1
Rivendell
Secondary
DNS Server
Legolas
eth0
.105
172.20.0.0/16
192.168.pod.0/24
xxx and yyy are for static IPs assigned to your pod number

Wrap

New commands, daemons:

named	DNS daemon
host	For testing DNS
dig	DNS information
nslookup	Being phased out
rndc reload	Reload DNS configuration files
setenforce	
getenforce	
setsebool	
getsebool	
sestatus	

Configuration files

- /etc/named.conf
- /var/named/*
- /etc/resolv.conf
- /etc/nsswitch.conf
- /etc/hosts

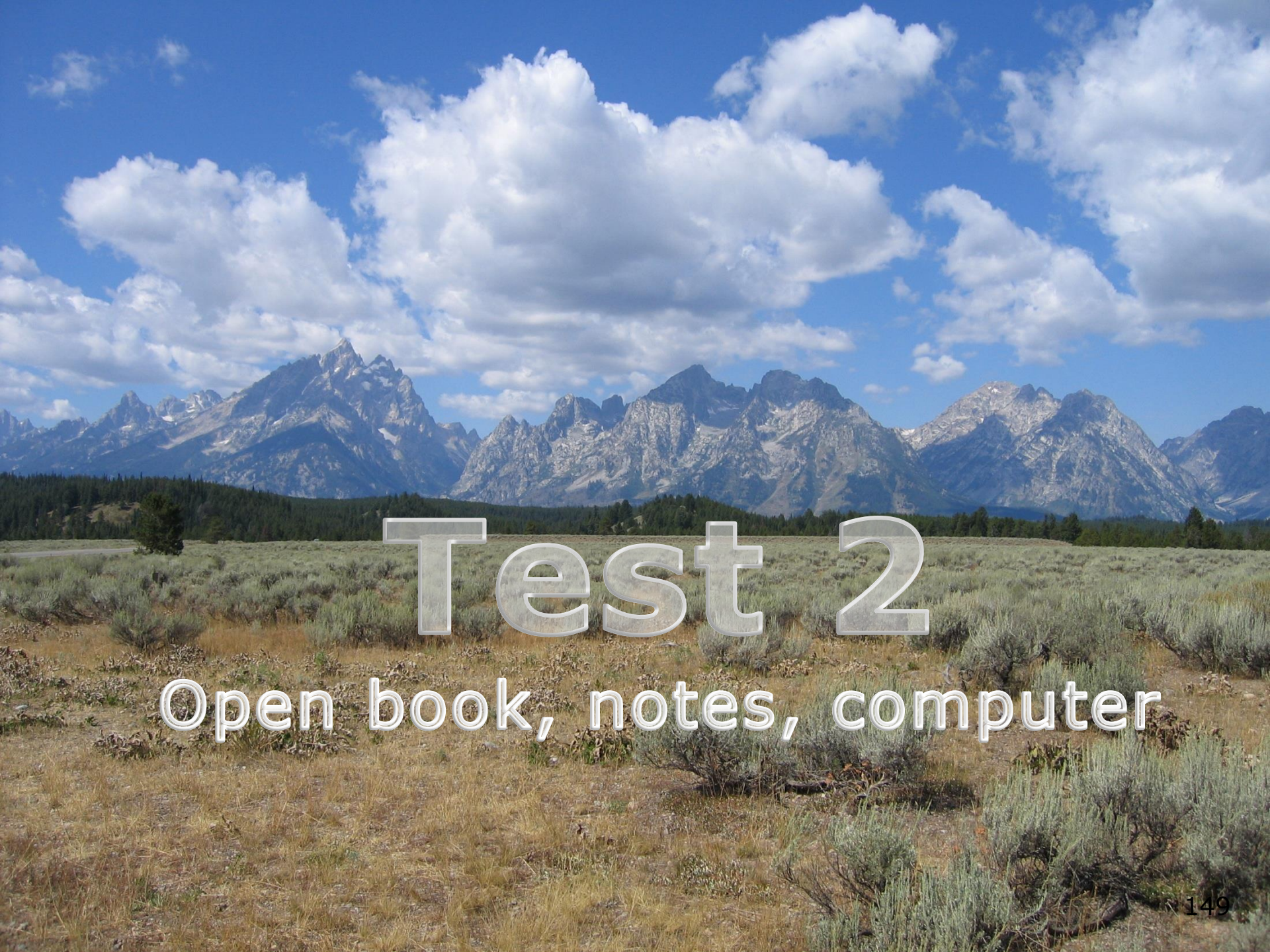
Next Class (after Spring Break)

Assignment: Check Calendar Page
http://simms-teach.com/cis192calendar.php

Lab 7 due

Quiz questions for next class:

- What two packages must be installed to setup a name server with caching?
- What is the purpose of a PTR record?
- How does the serial number effect zone transfers?


Test 2
Open book, notes, computer

Backup