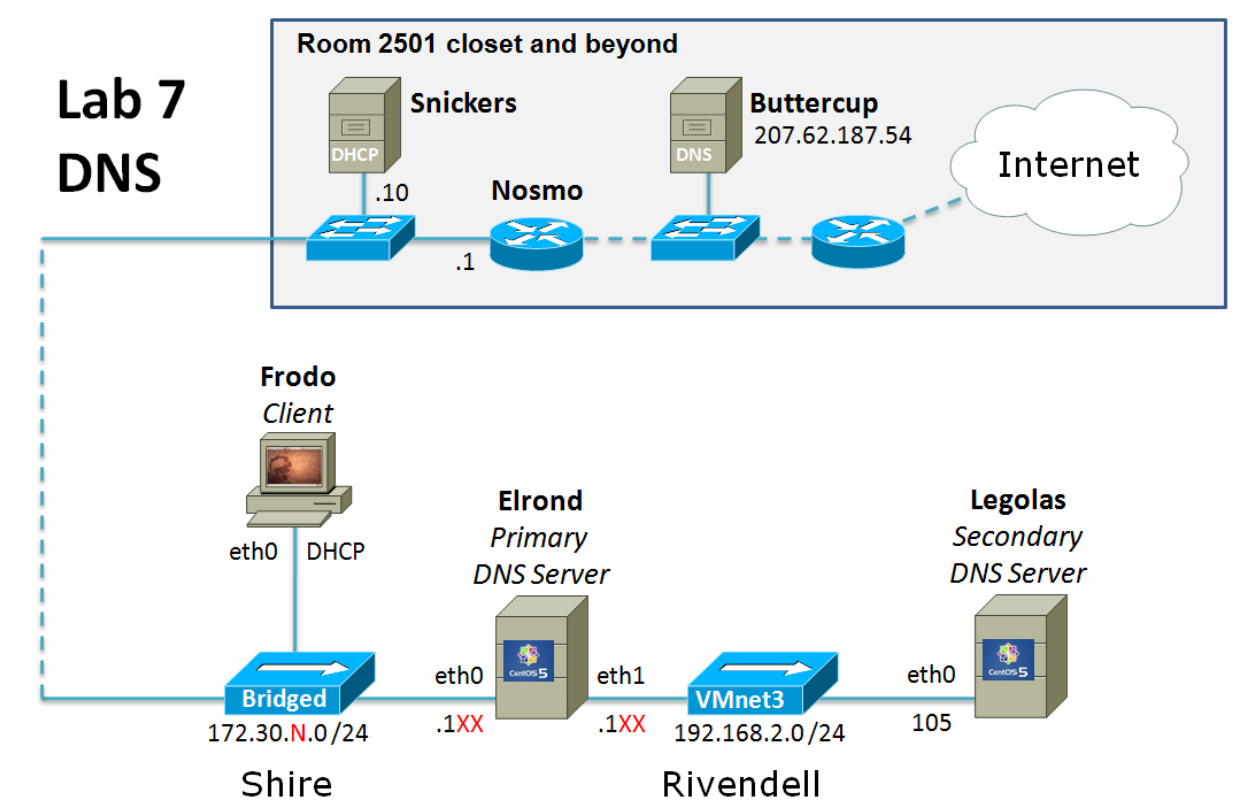
Cabrillo College

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. Please read over the entire lab before proceeding with the individual steps to obtain an overview of what you are trying to accomplish.



.1XX is based on your station number and the IP Table in the Appendix
N=1 for the classroom and N=4 for the CIS lab or CTC

Supplies

- VMWare Server 1.08 or higher
- 192 VMs shown above

Preconfiguration

- Original versions of all VMs. Note, this will set the network configurations back to down or DHCP settings.
- You will need access to a DHCP server to assign addresses for the 172.30.N.0/24 network. This is already configured if the lab is done using the CIS VMware Stations in the CIS Lab (room 2504) or the CTC. If you plan to do this lab at home see: http://simms-teach.com/howtos/129-working-at-home.pdf

Forum

Use the forum to ask and answer questions, collaborate, and report any equipment issues. Post tips and any lessons learned when you have finished. Forum is at: http://simms-teach.com/forum/viewforum.php?f=18

Background

The Domain Name System (DNS) is what makes life a lot easier for humans using networks. Without DNS servers, one would have to either remember the IP addresses for every host and website or attempt to keep millions of /etc/hosts file synchronized and updated. A DNS server is responsible for taking a name like **www.hp.com** or **opus.cabrillo.edu** and resolving them to the correct IP addresses. A DNS server can be responsible for the names in it's own domain and can communicate with other DNS servers to obtain IP addresses for other domains.

The commands we will be using for this lab are:

- named
- rndc
- host
- dig
- rpm
- ping

The configuration of the **named** daemon will require root access.

Procedure

When you join Elrond to the 172.30.N.0 network, it has access to a remote DNS server, but a remote DNS server will not resolve the names local to our private subnets.

There are several mechanisms for resolving host names into IP addresses; the /etc/hosts file is just one of them. In this lab you will configure the Domain Naming Service (DNS) to perform this function.

Setup

1. Revert Frodo, Legolas and Elrond to their snapshots.
2. Install the DNS service packages on both Elrond and Legolas:
    a. Cable their eth0 interfaces to the Bridged "hub"

   b. Use **dhclient eth0** to get an IP address using DHCP.
   c. Install the DNS server and caching packages. Note, BIND stands for Berkeley Internet Name Domain and the DNS server daemon is called "named".
      yum install bind caching-nameserver
   d. Use **dhclient –r** to release their DHCP IP addresses.
3. Use **lokkit** to disable the firewalls on Elrond and Legolas. In addition set SELinux to Permissive mode.
4. Cable Elrond, Legolas and Frodo as shown in the map above.

Part 1

Configure the NIC's on Elrond and Legolas according to the diagram above. Use the two primary methods of name resolution (DNS server and the /etc/hosts file) to ping Legolas and google.com.

1. Log in to Elrond as root.
2. Configure Elrond to join the Shire and Rivendell networks as shown above:
   Configure static IP addresses on eth0 and eth1
   Configure the default gateway to 172.30.N.1
   Configure the DNS server to be 207.62.187.54
   Enable packet forwarding
   Verify Elrond has Internet access
3. Verify that the necessary software was installed:
   rpm -qi bind
   rpm -qi caching-nameserver
   You should be running version 9 of the Berkeley Internet Name Domain (BIND) services.
4. Currently, what server is configured as your primary name server? (hint: check the /etc/resolv.conf file). Yes, this is the Cabrillo DNS server we configured above. Ping this name server's IP address. Is it reachable by you? If you are successful, you currently have access to a name server, otherwise you are depending on the **/etc/hosts** file for name resolution.
5. Configure Legolas to join the Rivendell network.
6. On Elrond, try pinging Legolas by it's name (**ping Legolas**). Does it work? It shouldn't because the Cabrillo name server knows nothing about the Rivendell network and there is no entry for Legolas in /etc/hosts.
7. Try it again after adding the line:
   `192.168.2.105 legolas`
   to the end of /etc/hosts. It should work now.
8. Now **ping google.com**. It should work because the Cabrillo DNS server is quite capable of resolving the name google.com to an IP address. **Note the IP address** in the ping output.
9. Remove the DNS server configuration:
   > /etc/resolv.conf
   and try pinging google.com again. It should fail now.
10. Add another entry to /etc/hosts using the IP address of the previous successful ping to google.com:
    `xxx.xxx.xxx.xxx  google.com`
    and try again. It should work again now.
11. Currently, the /etc/hosts file is searched for name resolution before DNS. Since we want to test DNS, we must indicate to the system that we wish to use DNS before the /etc/hosts file to resolve host names to IP addresses. To do this, you must edit the **/etc/nsswitch.conf** file:

Change the line: `hosts files dns`
to read: `hosts dns files`

12. OK, edit /etc/hosts and remove the entries for legolas and google.com. We are going to make our own DNS server for Rivendell.

Part 2

We will now configure our own server to be the primary name server, and start up the DNS, (or named) service. You will need the caching-nameserver package that contains the configuration files for a name server.

1. Verify that the caching-nameserver package is installed:
   rpm -qa | grep caching
2. Edit the /etc/resolv.conf file to indicate yourself (127.0.0.1) as the primary name server, with "rivendell" as the domain. This file should consist of the following two lines:
   ```
   search rivendell
   nameserver 127.0.0.1
   ```
   What does the search line do? The search string is appended to names being resolved. In this case, if the user tries to look up arwen, then arwen.rivendell is tried first, then just arwen.
3. The main configuration file for the BIND DNS server implementation is the named.conf file in the /etc directory. Rather than create it from scratch, use the starter version in the Appendix.
4. Make sure the permissions on this file will allow named to read them:
   chmod 640 /etc/named.conf
   chown root:named /etc/named.conf
5. Now insert the following two zones above the last line of the file:

```
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; };
};
```

   Pay close attention to the semicolons and quote marks in this file!
   To check the syntax of this file, you can run the command:
   named-checkconf
   If there is no output from this command, the syntax is probably ok.
6. You have just declared your forward and reverse lookup zones to your DNS daemon (named), that is, when you launch it.
7. The next task is to create these two zone files. They need to reside in the directory specified at the top of your /etc/named.conf file - in the options section. What directory is that?
8. Change directory to /var/named and create the two zone database files, db.rivendell and db.2.168.192. There are starter files in the Appendix you may use for this.
9. Make sure the permissions on these files will allow named to read them.

10. Look at these files and note the small size of the domain we are covering. Notice that "Rivendell" is a top-level domain, but clearly is not registered with the DNS "root" servers listed in named.ca.
11. Edit these two files to supply the IP numbers and names appropriate to station.
12. Now start the DNS name daemon, named, with:
    service named start
13. Check to make sure the named daemon is running using the command:
    ps -e | grep named
    if it's not running, check your named.conf file for syntax errors.

Part 3

You are now ready to test your DNS service. We will use the host command, which uses DNS only for name resolution. If you want to use a regular client like ping, and you want to be absolutely sure name resolution is not happening via the */etc/hosts* file, then comment out all entries except for your loopback address from the hosts file.

Verify that your system's firewall is disabled before you try to do any name resolution.

1. Use the host command to test your DNS. Try the following commands:
   host legolas.rivendell.
   host legolas.rivendell
   host legolas
   host Elrond
   host ELROND
   host fang
   host 192.168.2.105
   host 192.168.2.200
   host www.domain.foo
   host opus.cabrillo.edu
   host www.yahoo.com
2. Can you explain the success or failure of these commands? Note: a system does not need to be running to look up its IP address in the DNS database files.
3. If you make a change to any of your zone files, you will have to instruct the named server to re-read those files. You can do this in one of two ways:
   1. restart the server with: **service named restart**
   2. run the rndc command: **rndc reload**

   Of these two ways, the latter is the better, especially since the named service script doesn't work on older RedHat versions of Linux.

Part 4

Now let's create a secondary name server to relieve the load on the server we just configured.

1. Log on to Legolas as root.
2. Edit the */etc/hosts* file, removing all lines except for the loopback address.
3. Edit the */etc/resolv.conf* to specify the nameserver with Legolas' IP address, and use the same search name of Rivendell.
4. Create your */etc/named.conf* file (use the starter file in the Appendix) and add the following zone information just above the last line in that file:

```
zone "rivendell" {
  type slave;
  file "db.rivendell";
  masters { ip-address of master; };
        };
```

5. Set the permissions on /var/named so named can create new files in that directory.
6. Before bringing up the slave server, take a look at the SOA record in the primary's zone file, db.rivendell. Note the five numeric fields in the SOA record; these are used to configure the slave server in terms of when and how often it should update its zone information from the primary server. Note that 3 hours, (10800 seconds) would be a long time to wait for a refresh. You might want to drop that number to 60 seconds.
   When you change a value in a configuration file, what has to be done to get the server to recognize it?
   ANS: Rather than restarting your Primary DNS server, you can run the following command to reload the configuration and zone files: **rndc reload**
7. Now start the named daemon for the Secondary server:
   service named start
8. Use the host command to test the various hosts on the network.
9. Change directory to */var/named*, and run the ls command.
   Is the db.rivendell database file there? Display it on your screen, and note the time conversions in the SOA record. Do they look right?
10. Add an address record to the database file of your primary name server:
    galadriel IN A 192.168.2.108
    What has to be done for this change to take affect? ANS: The serial number needs to be increased and an **rndc reload** done.
11. Test this new host addition with the host command:
    host galadriel
    Test both the primary and secondary name servers.
12. What has to happen to get the secondary server to pull this new information? (ANS: You have to wait for the Refresh time interval to pass.)
    The secondary server's db.rivendell file should be updated automatically if you configured this properly. You can watch the zone transfer by looking at the log files:
    tail -f /var/log/messages
    I have noted that sometimes the refresh takes up to five minutes to happen.
13. The dig command can be used to look up information about a particular name server, and about a particular request made of that name server.
    dig @207.62.187.53 opus.cabrillo.edu
    By default, dig will lookup the nameserver specified in */etc/resolv.conf*, but you can specify any dns server after the '@' sign. The second argument is the query you are looking up. Note the diferent SECTIONS in the output of the dig command.

To turn in

Your *lab07* **text** file should contain the following sections.

- Standard boilerplate information:
  CIS 192 Lab *XX*
  Name
  Date
  TBA hours*: X.X*

Station number: CIS-Lab-*XX*

- /etc/named.conf of your primary name server
- /etc/named.conf of your secondary name server
- a copy of the db.rivendell file from your primary name server
- a copy of the db.rivendell file from your secondary name server
- the last 10 lines of the /var/log/messages file from your secondary name server, showing the zone load and transfer
- Example command summary

The command summary should be a concise set of documented examples that can be used as a resource for repeated operations in future labs.

Check your work for completeness then submit as many times as you wish up until the due date deadline. Remember, **late work is not accepted**, so start early, plan ahead for things to go wrong and use the forum to ask questions.

[p]scp lab07 cis192@opus.cabrillo.edu:lab07.*lastname*

Grading rubric (30 points)

2 points for correct submittal, professional appearance and quality
5 points for a syntactically correct named.conf file for the primary server with the zone entries as specified in the lab.
5 points for a syntactically correct named.conf file for the secondary server with modifications described in the lab.
5 points for the edited db.rivendell file from the primary server
5 points for the automatically generated db.rivendell file from the zone transfer to the secondary server.
5 points for the log file showing the load time and the zone transfer to the secondary server.
3 points for complete and concise command summary

\+ **Spring Break Gift Lab bonus** = as long as you turn in something on the due date your score will be increased to the full 30 points

Appendix - Static IP address table by station number:

Station	IP	Static 1	Static 2
CIS-Lab-01	172.30.4.101	172.30.4.121	172.30.4.122
CIS-Lab-02	172.30.4.102	172.30.4.123	172.30.4.124
CIS-Lab-03	172.30.4.103	172.30.4.125	172.30.4.126
CIS-Lab-04	172.30.4.104	172.30.4.127	172.30.4.128
CIS-Lab-05	172.30.4.105	172.30.4.129	172.30.4.130
CIS-Lab-06	172.30.4.106	172.30.4.131	172.30.4.132
CIS-Lab-07	172.30.4.107	172.30.4.133	172.30.4.134

CIS-Lab-08	172.30.4.108	172.30.4.135	172.30.4.136
CIS-Lab-09	172.30.4.109	172.30.4.137	172.30.4.138
CIS-Lab-10	172.30.4.110	172.30.4.139	172.30.4.140
CIS-Lab-11	172.30.4.111	172.30.4.141	172.30.4.142
CIS-Lab-12	172.30.4.112	172.30.4.143	172.30.4.144
Pod 1		172.30.4.113	172.30.4.145
Pod 2		172.30.4.114	172.30.4.146
Pod 3		172.30.4.115	172.30.4.147
Pod 4		172.30.4.116	172.30.4.148

Appendix - named.conf starter file:

```
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; };
};
```

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

Appendix – db.rivendell starter file

```
[root@elrond named]# cat /var/named/db.rivendell
$TTL 604800
; Rivendell Zone Definition
;
;
Rivendell.      IN SOA elrond.rivendell. root.rivendell. (
                2009040300      ; 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.???
elrond          IN A 192.168.2.???
;
;CNAME records
```

Appendix – db.2.168.192 starter 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.  (
                                      2007041400 ; Serial
                                      28800      ; Refresh
                                      14400      ; Retry
                                      3600000    ; Expire
                                      86400 )    ; Minimum
;
;Name Server Records
;
2.168.192.in-addr.arpa. IN NS elrond.rivendell.
;
;Address Records
???                     IN PTR  legolas.rivendell.
???                     IN PTR  elrond.rivendell.

[root@elrond named]#
```

Elrond (Part 1)

```
[root@elrond ~]# vmware-toolbox &
[1] 5411

[root@elrond ~]# cat /etc/sysconfig/network-scripts/ifcfg-eth0
# Advanced Micro Devices [AMD] 79c970 [PCnet32 LANCE]
DEVICE=eth0
ONBOOT=yes
BOOTPROTO=static
HWADDR=00:0c:29:e3:93:8a
IPADDR=172.30.4.107
NETMASK=255.255.255.0
NETWORK=172.30.4.0
BROADCAST=172.30.4.255


[root@elrond ~]# cat /etc/sysconfig/network-scripts/ifcfg-eth1
# Advanced Micro Devices [AMD] 79c970 [PCnet32 LANCE]
DEVICE=eth1
ONBOOT=yes
BOOTPROTO=static
HWADDR=00:0c:29:e3:93:94
IPADDR=192.168.2.107
NETMASK=255.255.255.0
NETWORK=192.168.2.0
BROADCAST=192.168.2.255
[root@elrond ~]#


[root@elrond ~]# cat /etc/sysconfig/network
NETWORKING=yes
NETWORKING_IPV6=no
HOSTNAME=elrond.localdomain
GATEWAY=172.30.4.1
[root@elrond ~]#


[root@elrond ~]# cat /etc/resolv.conf
nameserver 207.62.187.54
[root@elrond ~]#

[root@elrond ~]# service network restart
Shutting down interface eth0:                              [  OK  ]
Shutting down interface eth1:                              [  OK  ]
Shutting down loopback interface:                          [  OK  ]
Bringing up loopback interface:                            [  OK  ]
Bringing up interface eth0:                                [  OK  ]
Bringing up interface eth1:                                [  OK  ]

[root@elrond ~]# ifconfig
eth0      Link encap:Ethernet  HWaddr 00:0C:29:E3:93:8A
          inet addr:172.30.4.107  Bcast:172.30.4.255  Mask:255.255.255.0
```

```
          inet6 addr: fe80::20c:29ff:fee3:938a/64 Scope:Link
          UP BROADCAST RUNNING MULTICAST  MTU:1500  Metric:1
          RX packets:7415 errors:0 dropped:0 overruns:0 frame:0
          TX packets:3437 errors:0 dropped:0 overruns:0 carrier:0
          collisions:0 txqueuelen:1000
          RX bytes:4946160 (4.7 MiB)  TX bytes:270718 (264.3 KiB)
          Interrupt:177 Base address:0x1400

eth1      Link encap:Ethernet  HWaddr 00:0C:29:E3:93:94
          inet addr:192.168.2.107  Bcast:192.168.2.255  Mask:255.255.255.0
          inet6 addr: fe80::20c:29ff:fee3:9394/64 Scope:Link
          UP BROADCAST RUNNING MULTICAST  MTU:1500  Metric:1
          RX packets:4293 errors:0 dropped:0 overruns:0 frame:0
          TX packets:1185 errors:0 dropped:0 overruns:0 carrier:0
          collisions:0 txqueuelen:1000
          RX bytes:360205 (351.7 KiB)  TX bytes:1191885 (1.1 MiB)
          Interrupt:185 Base address:0x1480

lo        Link encap:Local Loopback
          inet addr:127.0.0.1  Mask:255.0.0.0
          inet6 addr: ::1/128 Scope:Host
          UP LOOPBACK RUNNING  MTU:16436  Metric:1
          RX packets:104 errors:0 dropped:0 overruns:0 frame:0
          TX packets:104 errors:0 dropped:0 overruns:0 carrier:0
          collisions:0 txqueuelen:0
          RX bytes:9841 (9.6 KiB)  TX bytes:9841 (9.6 KiB)

[root@elrond ~]#

[root@elrond ~]# route -n
Kernel IP routing table
Destination     Gateway         Genmask         Flags Metric Ref    Use Iface
172.30.4.0      0.0.0.0         255.255.255.0   U     0      0        0 eth0
192.168.2.0     0.0.0.0         255.255.255.0   U     0      0        0 eth1
169.254.0.0     0.0.0.0         255.255.0.0     U     0      0        0 eth1
0.0.0.0         172.30.4.1      0.0.0.0         UG    0      0        0 eth0
[root@elrond ~]#

[root@elrond ~]# cat /etc/sysctl.conf
# Kernel sysctl configuration file for Red Hat Linux
#
# For binary values, 0 is disabled, 1 is enabled.  See sysctl(8) and
# sysctl.conf(5) for more details.

# Controls IP packet forwarding
net.ipv4.ip_forward = 1

# Controls source route verification
net.ipv4.conf.default.rp_filter = 1

# Do not accept source routing
net.ipv4.conf.default.accept_source_route = 0

# Controls the System Request debugging functionality of the kernel
kernel.sysrq = 0
```

```
# Controls whether core dumps will append the PID to the core filename
# Useful for debugging multi-threaded applications
kernel.core_uses_pid = 1

# Controls the use of TCP syncookies
net.ipv4.tcp_syncookies = 1

# Controls the maximum size of a message, in bytes
kernel.msgmnb = 65536

# Controls the default maxmimum size of a mesage queue
kernel.msgmax = 65536

# Controls the maximum shared segment size, in bytes
kernel.shmmax = 4294967295

# Controls the maximum number of shared memory segments, in pages
kernel.shmall = 268435456
[root@elrond ~]#

[root@elrond ~]# sysctl -p
net.ipv4.ip_forward = 1
net.ipv4.conf.default.rp_filter = 1
net.ipv4.conf.default.accept_source_route = 0
kernel.sysrq = 0
kernel.core_uses_pid = 1
net.ipv4.tcp_syncookies = 1
kernel.msgmnb = 65536
kernel.msgmax = 65536
kernel.shmmax = 4294967295
kernel.shmall = 268435456

[root@elrond ~]#


[root@elrond ~]# ping google.com
PING google.com (74.125.45.100) 56(84) bytes of data.
64 bytes from yx-in-f100.google.com (74.125.45.100): icmp_seq=1 ttl=244
time=62.9 ms
64 bytes from yx-in-f100.google.com (74.125.45.100): icmp_seq=2 ttl=244
time=77.4 ms
64 bytes from yx-in-f100.google.com (74.125.45.100): icmp_seq=3 ttl=244
time=79.0 ms

[root@elrond ~]# yum install bin caching-nameserver
Loading "fastestmirror" plugin
Determining fastest mirrors
 * base: mirror.stanford.edu
 * updates: mirror.stanford.edu
 * addons: mirror.stanford.edu
 * extras: mirror.steadfast.net
base                      100% |=========================| 1.1 kB    00:00
primary.xml.gz            100% |=========================| 878 kB    00:19
base      : ################################################## 2508/2508
updates                   100% |=========================|  951 B    00:00
primary.xml.gz            100% |=========================|  69 kB    00:02
```

```
updates   : ################################################## 83/83
addons                   100% |=========================|  951 B    00:00
extras                   100% |=========================| 1.1 kB    00:00
primary.xml.gz           100% |=========================|  90 kB    00:01
extras    : ################################################## 298/298
Setting up Install Process
Parsing package install arguments
No package bin available.
Resolving Dependencies
--> Running transaction check
---> Package caching-nameserver.i386 30:9.3.4-10.P1.el5 set to be updated
--> Processing Dependency: bind = 30:9.3.4-10.P1.el5 for package: caching-
nameserver
--> Running transaction check
---> Package bind.i386 30:9.3.4-10.P1.el5 set to be updated
--> Processing Dependency: bind-libs = 30:9.3.4-10.P1.el5 for package: bind
--> Running transaction check
--> Processing Dependency: bind-libs = 30:9.3.4-6.0.3.P1.el5_2 for package:
bind-utils
---> Package bind-libs.i386 30:9.3.4-10.P1.el5 set to be updated
--> Running transaction check
---> Package bind-utils.i386 30:9.3.4-10.P1.el5 set to be updated
--> Finished Dependency Resolution

Dependencies Resolved

================================================================================
 Package                 Arch       Version           Repository        Size
================================================================================
Installing:
 caching-nameserver      i386       30:9.3.4-10.P1.el5  base               58
k
Updating:
 bind-libs               i386       30:9.3.4-10.P1.el5  base              836
k
Installing for dependencies:
 bind                    i386       30:9.3.4-10.P1.el5  base              953
k
Updating for dependencies:
 bind-utils              i386       30:9.3.4-10.P1.el5  base              167
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): bind-libs-9.3.4-10 100% |=========================| 836 kB    00:05
(2/4): caching-nameserver 100% |=========================|  58 kB    00:01
(3/4): bind-9.3.4-10.P1.e 100% |=========================| 953 kB    00:06
(4/4): bind-utils-9.3.4-1 100% |=========================| 167 kB    00:01
Running rpm_check_debug
Running Transaction Test
```

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

Installed: caching-nameserver.i386 30:9.3.4-10.P1.el5
Dependency Installed: bind.i386 30:9.3.4-10.P1.el5
Updated: bind-libs.i386 30:9.3.4-10.P1.el5
Dependency Updated: bind-utils.i386 30:9.3.4-10.P1.el5
Complete!


[root@elrond ~]# rpm -qi bind
Name        : bind                         Relocations: (not relocatable)
Version     : 9.3.4                             Vendor: CentOS
Release     : 10.P1.el5                     Build Date: Wed 21 Jan 2009
04:27:43 AM PST
Install Date: Tue 31 Mar 2009 05:37:54 PM PDT      Build Host:
builder16.centos.org
Group       : System Environment/Daemons    Source RPM: bind-9.3.4-
10.P1.el5.src.rpm
Size        : 2191596                          License: BSD-like
Signature   : DSA/SHA1, Sun 08 Mar 2009 06:45:18 PM PDT, Key ID
a8a447dce8562897
URL         : http://www.isc.org/products/BIND/
Summary     : The Berkeley Internet Name Domain (BIND) DNS (Domain Name
System) server.
Description :
BIND (Berkeley Internet Name Domain) is an implementation of the DNS
(Domain Name System) protocols. BIND includes a DNS server (named),
which resolves host names to IP addresses; a resolver library
(routines for applications to use when interfacing with DNS); and
tools for verifying that the DNS server is operating properly.
[root@elrond ~]#


[root@elrond ~]# rpm -qi caching-nameserver
Name        : caching-nameserver           Relocations: (not relocatable)
Version     : 9.3.4                             Vendor: CentOS
Release     : 10.P1.el5                     Build Date: Wed 21 Jan 2009
04:27:43 AM PST
Install Date: Tue 31 Mar 2009 05:38:05 PM PDT      Build Host:
builder16.centos.org
Group       : System Environment/Daemons    Source RPM: bind-9.3.4-
10.P1.el5.src.rpm
Size        : 44601                            License: BSD-like
Signature   : DSA/SHA1, Sun 08 Mar 2009 06:45:19 PM PDT, Key ID
a8a447dce8562897
URL         : http://www.isc.org/products/BIND/
Summary     : Default BIND configuration files for a caching nameserver
Description :
```

```
The  caching-nameserver package includes the configuration files which will
make
the ISC BIND named DNS name server act as a simple caching nameserver.
A caching nameserver is a DNS Resolver, as defined in RFC 1035, section 7.
ISC BIND named(8) provides a very efficient, flexible and robust resolver as
well as a server of authoritative DNS data - many users use this package
along with BIND to implement their primary system DNS resolver service.
If you would like to set up a caching name server, you'll need to install
bind, bind-libs, and bind-utils along with this package.
[root@elrond ~]#

[root@elrond ~]# cat /etc/resolv.conf
nameserver 207.62.187.54

 [root@elrond ~]# ping -c2 207.62.187.54
PING 207.62.187.54 (207.62.187.54) 56(84) bytes of data.
64 bytes from 207.62.187.54: icmp_seq=1 ttl=253 time=5.03 ms
64 bytes from 207.62.187.54: icmp_seq=2 ttl=253 time=2.94 ms

--- 207.62.187.54 ping statistics ---
2 packets transmitted, 2 received, 0% packet loss, time 1000ms
rtt min/avg/max/mdev = 2.946/3.988/5.030/1.042 ms
[root@elrond ~]#

[root@elrond ~]# ping -c2 192.168.2.105
PING 192.168.2.105 (192.168.2.105) 56(84) bytes of data.
64 bytes from 192.168.2.105: icmp_seq=1 ttl=64 time=0.566 ms
64 bytes from 192.168.2.105: icmp_seq=2 ttl=64 time=1.71 ms

--- 192.168.2.105 ping statistics ---
2 packets transmitted, 2 received, 0% packet loss, time 1001ms
rtt min/avg/max/mdev = 0.566/1.138/1.711/0.573 ms

[root@elrond ~]# ping legolas
ping: unknown host legolas

[root@elrond ~]# cat /etc/hosts
# Do not remove the following line, or various programs
# that require network functionality will fail.
127.0.0.1       elrond.localdomain elrond localhost.localdomain localhost
::1             localhost6.localdomain6 localhost6
[root@elrond ~]#

[root@elrond ~]# vi /etc/hosts
[root@elrond ~]# cat /etc/hosts
# Do not remove the following line, or various programs
# that require network functionality will fail.
127.0.0.1       elrond.localdomain elrond localhost.localdomain localhost
::1             localhost6.localdomain6 localhost6

192.168.2.105 legolas

[root@elrond ~]# ping -c2 legolas
PING legolas (192.168.2.105) 56(84) bytes of data.
64 bytes from legolas (192.168.2.105): icmp_seq=1 ttl=64 time=1.07 ms
64 bytes from legolas (192.168.2.105): icmp_seq=2 ttl=64 time=0.563 ms
```

```
--- legolas ping statistics ---
2 packets transmitted, 2 received, 0% packet loss, time 999ms
rtt min/avg/max/mdev = 0.563/0.818/1.073/0.255 ms
[root@elrond ~]#

[root@elrond ~]# ping -c2 google.com
PING google.com (74.125.45.100) 56(84) bytes of data.
64 bytes from yx-in-f100.google.com (74.125.45.100): icmp_seq=1 ttl=244
time=413 ms
64 bytes from yx-in-f100.google.com (74.125.45.100): icmp_seq=2 ttl=244
time=100 ms

--- google.com ping statistics ---
2 packets transmitted, 2 received, 0% packet loss, time 1000ms
rtt min/avg/max/mdev = 100.828/256.963/413.098/156.135 ms
[root@elrond ~]#

[root@elrond ~]# > /etc/resolv.conf

[root@elrond ~]# ping google.com
ping: unknown host google.com

[root@elrond ~]# vi /etc/hosts
[root@elrond ~]# cat /etc/hosts
# Do not remove the following line, or various programs
# that require network functionality will fail.
127.0.0.1       elrond.localdomain elrond localhost.localdomain localhost
::1             localhost6.localdomain6 localhost6

192.168.2.105 legolas
74.125.45.100 google.com


[root@elrond ~]# ping -c2 google.com
PING google.com (74.125.45.100) 56(84) bytes of data.
64 bytes from google.com (74.125.45.100): icmp_seq=1 ttl=244 time=304 ms
64 bytes from google.com (74.125.45.100): icmp_seq=2 ttl=244 time=242 ms

--- google.com ping statistics ---
2 packets transmitted, 2 received, 0% packet loss, time 999ms
rtt min/avg/max/mdev = 242.346/273.583/304.821/31.241 ms


[root@elrond ~]# vi /etc/nsswitch.conf
[root@elrond ~]# cat /etc/nsswitch.conf
#
# /etc/nsswitch.conf
#
# An example Name Service Switch config file. This file should be
# sorted with the most-used services at the beginning.
#
# The entry '[NOTFOUND=return]' means that the search for an
# entry should stop if the search in the previous entry turned
# up nothing. Note that if the search failed due to some other reason
# (like no NIS server responding) then the search continues with the
```

```
# next entry.
#
# Legal entries are:
#
#       nisplus or nis+         Use NIS+ (NIS version 3)
#       nis or yp               Use NIS (NIS version 2), also called YP
#       dns                     Use DNS (Domain Name Service)
#       files                   Use the local files
#       db                      Use the local database (.db) files
#       compat                  Use NIS on compat mode
#       hesiod                  Use Hesiod for user lookups
#       [NOTFOUND=return]       Stop searching if not found so far
#

# To use db, put the "db" in front of "files" for entries you want to be
# looked up first in the databases
#
# Example:
#passwd:    db files nisplus nis
#shadow:    db files nisplus nis
#group:     db files nisplus nis

passwd:     files
shadow:     files
group:      files

#hosts:     db files nisplus nis dns
hosts:      dns files

# Example - obey only what nisplus tells us...
#services:   nisplus [NOTFOUND=return] files
#networks:   nisplus [NOTFOUND=return] files
#protocols:  nisplus [NOTFOUND=return] files
#rpc:        nisplus [NOTFOUND=return] files
#ethers:     nisplus [NOTFOUND=return] files
#netmasks:   nisplus [NOTFOUND=return] files

bootparams: nisplus [NOTFOUND=return] files

ethers:     files
netmasks:   files
networks:   files
protocols:  files
rpc:        files
services:   files

netgroup:   nisplus

publickey:  nisplus

automount:  files nisplus
aliases:    files nisplus

[root@elrond ~]#


[root@elrond ~]# vi /etc/hosts
```

```
[root@elrond ~]# cat /etc/hosts
# Do not remove the following line, or various programs
# that require network functionality will fail.
127.0.0.1       elrond.localdomain elrond localhost.localdomain localhost
::1             localhost6.localdomain6 localhost6

[root@elrond ~]#
```

Elrond (Part 2)

```
[root@elrond ~]# rpm -qa | grep caching
caching-nameserver-9.3.4-10.P1.el5

[root@elrond ~]# vi /etc/resolv.conf
[root@elrond ~]# cat /etc/resolv.conf
search rivendell
nameserver 127.0.0.1

[root@elrond named]# 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";
[root@elrond named]#

[root@elrond named]# cat /etc/rndc.key
key "rndckey" {
        algorithm       hmac-md5;
        secret
"CLA1Va1djwhjxMoxeoyrSoRN0ySWGN454VbkWYrBzquF9ZzDiIWyrOttsCvZ";
};

[root@elrond named]# ls -l /etc/rndc.key
-rw-r----- 1 root named 113 Mar 31 17:38 /etc/rndc.key
[root@elrond named]#


[root@elrond named]# chmod 640 /etc/named.conf
[root@elrond named]# chown root:named /etc/named.conf
[root@elrond named]# ls -l /etc/named.conf
-rw-r----- 1 root named 961 Apr  5 15:58 /etc/named.conf
[root@elrond named]#

[root@elrond named]# named-checkconf
[root@elrond named]#

[root@elrond named]# cat /var/named/db.rivendell
$TTL 604800
; Rivendell Zone Definition
;
;
Rivendell.      IN SOA hostname.rivendell. root.rivendell. (
                2009040300      ; 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
;
;CNAME records

[root@elrond named]# cat /var/named/db.2.168.192
$TTL    86400
;192.168.2.* Reverse Zone Definition
;
2.168.192.in-addr.arpa. IN SOA  elrondn.rivendell. root.rivendell.  (
                                        2007041400 ; Serial
                                        28800      ; Refresh
                                        14400      ; 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.

[root@elrond named]#

[root@elrond named]# service named restart
Stopping named:                                            [  OK  ]
Starting named:                                            [  OK  ]

[root@elrond ~]# rndc reload
server reload successful
[root@elrond ~]#

[root@elrond named]# ps -ef | grep named
named    16873     1  0 17:42 ?        00:00:00 /usr/sbin/named -u named
root     16883 15679  0 17:42 pts/1    00:00:00 grep named
[root@elrond named]#
```

Elrond (part 3)

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

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

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

[root@elrond ~]# host Elrond
Elrond.rivendell has address 192.168.2.107

[root@elrond ~]# host ELROND
ELROND.rivendell has address 192.168.2.107
```

```
[root@elrond ~]# host fang
Host fang not found: 3(NXDOMAIN)

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

[root@elrond ~]# host 192.168.2.200
Host 200.2.168.192.in-addr.arpa not found: 3(NXDOMAIN)

[root@elrond ~]# host www.domain.foo
Host www.domain.foo not found: 3(NXDOMAIN)

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

[root@elrond ~]# host www.yahoo.com
www.yahoo.com is an alias for www.wa1.b.yahoo.com.
www.wa1.b.yahoo.com is an alias for www-real.wa1.b.yahoo.com.
www-real.wa1.b.yahoo.com has address 209.131.36.158
```

Elrond (Part 4)

```
[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;
};

//
// 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";


[root@elrond ~]# cat /var/named/named.ca

; <<>> DiG 9.5.0b2 <<>> +bufsize=1200 +norec NS . @a.root-servers.net
;; global options:  printcmd
;; Got answer:
;; ->>HEADER<<- opcode: QUERY, status: NOERROR, id: 7033
;; flags: qr aa; QUERY: 1, ANSWER: 13, AUTHORITY: 0, ADDITIONAL: 20

;; OPT PSEUDOSECTION:
; EDNS: version: 0, flags:; udp: 4096
;; QUESTION SECTION:
;.                              IN      NS

;; ANSWER SECTION:
.                       518400  IN      NS      D.ROOT-SERVERS.NET.
.                       518400  IN      NS      E.ROOT-SERVERS.NET.
.                       518400  IN      NS      F.ROOT-SERVERS.NET.
.                       518400  IN      NS      G.ROOT-SERVERS.NET.
.                       518400  IN      NS      H.ROOT-SERVERS.NET.
.                       518400  IN      NS      I.ROOT-SERVERS.NET.
.                       518400  IN      NS      J.ROOT-SERVERS.NET.
.                       518400  IN      NS      K.ROOT-SERVERS.NET.
.                       518400  IN      NS      L.ROOT-SERVERS.NET.
.                       518400  IN      NS      M.ROOT-SERVERS.NET.
.                       518400  IN      NS      A.ROOT-SERVERS.NET.
.                       518400  IN      NS      B.ROOT-SERVERS.NET.
.                       518400  IN      NS      C.ROOT-SERVERS.NET.

;; ADDITIONAL SECTION:
A.ROOT-SERVERS.NET.     3600000 IN      A       198.41.0.4
A.ROOT-SERVERS.NET.     3600000 IN      AAAA    2001:503:ba3e::2:30
B.ROOT-SERVERS.NET.     3600000 IN      A       192.228.79.201
C.ROOT-SERVERS.NET.     3600000 IN      A       192.33.4.12
D.ROOT-SERVERS.NET.     3600000 IN      A       128.8.10.90
E.ROOT-SERVERS.NET.     3600000 IN      A       192.203.230.10
F.ROOT-SERVERS.NET.     3600000 IN      A       192.5.5.241
```

```
F.ROOT-SERVERS.NET.     3600000 IN      AAAA    2001:500:2f::f
G.ROOT-SERVERS.NET.     3600000 IN      A       192.112.36.4
H.ROOT-SERVERS.NET.     3600000 IN      A       128.63.2.53
H.ROOT-SERVERS.NET.     3600000 IN      AAAA    2001:500:1::803f:235
I.ROOT-SERVERS.NET.     3600000 IN      A       192.36.148.17
J.ROOT-SERVERS.NET.     3600000 IN      A       192.58.128.30
J.ROOT-SERVERS.NET.     3600000 IN      AAAA    2001:503:c27::2:30
K.ROOT-SERVERS.NET.     3600000 IN      A       193.0.14.129
K.ROOT-SERVERS.NET.     3600000 IN      AAAA    2001:7fd::1
L.ROOT-SERVERS.NET.     3600000 IN      A       199.7.83.42
M.ROOT-SERVERS.NET.     3600000 IN      A       202.12.27.33
M.ROOT-SERVERS.NET.     3600000 IN      AAAA    2001:dc3::35

;; Query time: 110 msec
;; SERVER: 198.41.0.4#53(198.41.0.4)
;; WHEN: Tue Feb 26 15:05:57 2008
;; MSG SIZE  rcvd: 615

[root@elrond ~]# cat /var/named/localhost.zone
$TTL    86400
@               IN SOA  @       root (
                                        42              ; serial (d. adams)
                                        3H              ; refresh
                                        15M             ; retry
                                        1W              ; expiry
                                        1D )            ; minimum

                IN NS           @
                IN A            127.0.0.1
                IN AAAA         ::1

[root@elrond ~]# cat /var/named/named.local
$TTL    86400
@       IN      SOA     localhost. root.localhost.  (
                                      1997022700 ; Serial
                                      28800      ; Refresh
                                      14400      ; Retry
                                      3600000    ; Expire
                                      86400 )    ; Minimum
        IN      NS      localhost.
1       IN      PTR     localhost.


[root@elrond ~]# cat /var/named/db.rivendell
$TTL 604800
; Rivendell Zone Definition
;
;
Rivendell.      IN SOA elrond.rivendell. root.rivendell. (
                2009040312      ; 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 ~]# cat /var/named/db.2.168.192
$TTL    86400
;192.168.2.* Reverse Zone Definition
;
2.168.192.in-addr.arpa. IN SOA  elrondn.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 ~]# cat /etc/rndc.key
key "rndckey" {
        algorithm       hmac-md5;
        secret
"CLA1Va1djwhjxMoxeoyrSoRN0ySWGN454VbkWYrBzquF9ZzDiIWyrOttsCvZ";
};

[root@elrond ~]# host william
william.rivendell has address 192.168.2.114
[root@elrond ~]# host galadriel
galadriel.rivendell has address 192.168.2.108
[root@elrond ~]#
[root@elrond ~]# host www.umich.edu
www.umich.edu has address 141.211.13.224
www.umich.edu has address 141.211.13.226
www.umich.edu has address 141.211.144.188
www.umich.edu has address 141.211.144.190
[root@elrond ~]# host 192.168.2.114
114.2.168.192.in-addr.arpa domain name pointer william.rivendell.
[root@elrond ~]#
```

```
[root@elrond ~]# dig @elrond elrond.rivendell

; <<>> DiG 9.3.4-P1 <<>> @elrond elrond.rivendell
; (1 server found)
;; global options:  printcmd
;; Got answer:
;; ->>HEADER<<- opcode: QUERY, status: NOERROR, id: 14028
;; flags: qr aa rd ra; QUERY: 1, ANSWER: 1, AUTHORITY: 1, ADDITIONAL: 0

;; QUESTION SECTION:
;elrond.rivendell.              IN      A

;; ANSWER SECTION:
elrond.rivendell.       604800  IN      A       192.168.2.107

;; AUTHORITY SECTION:
rivendell.              604800  IN      NS      elrond.rivendell.

;; Query time: 1 msec
;; SERVER: 192.168.2.107#53(192.168.2.107)
;; WHEN: Mon Apr  6 11:17:22 2009
;; MSG SIZE  rcvd: 64

[root@elrond ~]# dig @legolas elrond.rivendell

; <<>> DiG 9.3.4-P1 <<>> @legolas elrond.rivendell
; (1 server found)
;; global options:  printcmd
;; Got answer:
;; ->>HEADER<<- opcode: QUERY, status: NOERROR, id: 14115
;; flags: qr aa rd ra; QUERY: 1, ANSWER: 1, AUTHORITY: 1, ADDITIONAL: 0

;; QUESTION SECTION:
;elrond.rivendell.              IN      A

;; ANSWER SECTION:
elrond.rivendell.       604800  IN      A       192.168.2.107

;; AUTHORITY SECTION:
rivendell.              604800  IN      NS      elrond.rivendell.

;; Query time: 8 msec
;; SERVER: 192.168.2.105#53(192.168.2.105)
;; WHEN: Mon Apr  6 11:18:18 2009
;; MSG SIZE  rcvd: 64

[root@elrond ~]#

[root@elrond ~]# dig @207.62.187.53 opus.cabrillo.edu

; <<>> DiG 9.3.4-P1 <<>> @207.62.187.53 opus.cabrillo.edu
; (1 server found)
;; global options:  printcmd
;; Got answer:
;; ->>HEADER<<- opcode: QUERY, status: NOERROR, id: 21709
;; flags: qr aa rd; QUERY: 1, ANSWER: 1, AUTHORITY: 3, ADDITIONAL: 1
```

```
;; QUESTION SECTION:
;opus.cabrillo.edu.             IN      A

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

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

;; ADDITIONAL SECTION:
buttercup.cabrillo.edu. 300     IN      A       207.62.187.54

;; Query time: 28 msec
;; SERVER: 207.62.187.53#53(207.62.187.53)
;; WHEN: Mon Apr  6 11:20:36 2009
;; MSG SIZE  rcvd: 134

[root@elrond ~]#
```

Legolas (Part 1)

```
[root@legolas ~]# cat /etc/sysconfig/network
NETWORKING=yes
NETWORKING_IPV6=no
HOSTNAME=legolas.localdomain
GATEWAY=192.168.2.107

[root@legolas ~]# cat /etc/sysconfig/network-scripts/ifcfg-eth0
# Advanced Micro Devices [AMD] 79c970 [PCnet32 LANCE]
DEVICE=eth0
ONBOOT=yes
BOOTPROTO=static
HWADDR=00:0c:29:30:86:76
IPADDR=192.168.2.105
NETMASK=255.255.255.0
NETWORK=192.168.2.0
BROADCAST=192.168.2.255

[root@legolas ~]# ifconfig
eth0      Link encap:Ethernet  HWaddr 00:0C:29:30:86:76
          inet addr:192.168.2.105  Bcast:192.168.2.255  Mask:255.255.255.0
          inet6 addr: fe80::20c:29ff:fe30:8676/64 Scope:Link
          UP BROADCAST RUNNING MULTICAST  MTU:1500  Metric:1
          RX packets:2986 errors:0 dropped:0 overruns:0 frame:0
          TX packets:1078 errors:0 dropped:0 overruns:0 carrier:0
          collisions:0 txqueuelen:1000
          RX bytes:1326181 (1.2 MiB)  TX bytes:100613 (98.2 KiB)
          Interrupt:177 Base address:0x1400

lo        Link encap:Local Loopback
          inet addr:127.0.0.1  Mask:255.0.0.0
```

```
          inet6 addr: ::1/128 Scope:Host
          UP LOOPBACK RUNNING  MTU:16436  Metric:1
          RX packets:99 errors:0 dropped:0 overruns:0 frame:0
          TX packets:99 errors:0 dropped:0 overruns:0 carrier:0
          collisions:0 txqueuelen:0
          RX bytes:9406 (9.1 KiB)  TX bytes:9406 (9.1 KiB)

[root@legolas ~]# route -n
Kernel IP routing table
Destination     Gateway         Genmask         Flags Metric Ref    Use Iface
192.168.2.0     0.0.0.0         255.255.255.0   U     0      0        0 eth0
169.254.0.0     0.0.0.0         255.255.0.0     U     0      0        0 eth0
0.0.0.0         192.168.2.107   0.0.0.0         UG    0      0        0 eth0
[root@legolas ~]#
```

Legolas (Part 4)

```
[root@legolas ~]# 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" {
        type slave;
```

```
        file "db.rivendell";
        masters { 192.168.2.107; };
};

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

[root@legolas ~]# cat /var/named/db.rivendell
$ORIGIN .
$TTL 604800     ; 1 week
rivendell               IN SOA  elrond.rivendell. root.rivendell. (
                                2009040312 ; serial
                                60         ; refresh (1 minute)
                                15         ; retry (15 seconds)
                                1209600    ; expire (2 weeks)
                                300        ; minimum (5 minutes)
                                )
                        NS      elrond.rivendell.
$ORIGIN rivendell.
elrond                  A       192.168.2.107
galadriel               A       192.168.2.108
legolas                 A       192.168.2.105
localhost               A       127.0.0.1
william                 A       192.168.2.114


[root@legolas ~]# tail /var/log/messages
Apr  6 10:40:20 legolas named[19615]: listening on IPv4 interface eth0,
192.168.2.105#53
Apr  6 10:40:20 legolas named[19615]: command channel listening on
127.0.0.1#953
Apr  6 10:40:20 legolas named[19615]: zone 0.0.127.in-addr.arpa/IN: loaded
serial 1997022700
Apr  6 10:40:20 legolas named[19615]: zone localhost/IN: loaded serial 42
Apr  6 10:40:20 legolas named[19615]: zone rivendell/IN: loaded serial
2009040310
Apr  6 10:40:20 legolas named[19615]: running
Apr  6 10:46:27 legolas named[19615]: zone rivendell/IN: Transfer started.
Apr  6 10:46:27 legolas named[19615]: transfer of 'rivendell/IN' from
192.168.2.107#53: connected using 192.168.2.105#55966
Apr  6 10:46:27 legolas named[19615]: zone rivendell/IN: transferred serial
2009040312
Apr  6 10:46:27 legolas named[19615]: transfer of 'rivendell/IN' from
192.168.2.107#53: end of transfer


[root@legolas ~]# cat /etc/resolv.conf
search rivendell
nameserver 192.168.2.105


[root@legolas ~]# host galadriel
galadriel.rivendell has address 192.168.2.108
[root@legolas ~]#

[root@legolas ~]# host elrond
```

```
elrond.rivendell has address 192.168.2.107
[root@legolas ~]# host legolas
legolas.rivendell has address 192.168.2.105
[root@legolas ~]# host www.umich.edu
www.umich.edu has address 141.211.13.224
www.umich.edu has address 141.211.13.226
www.umich.edu has address 141.211.144.188
www.umich.edu has address 141.211.144.190
[root@legolas ~]# host 192.168.2.105
Host 105.2.168.192.in-addr.arpa not found: 3(NXDOMAIN)
[root@legolas ~]# dig @legolas galadriel.rivendell

; <<>> DiG 9.3.4-P1 <<>> @legolas galadriel.rivendell
; (1 server found)
;; global options:  printcmd
;; Got answer:
;; ->>HEADER<<- opcode: QUERY, status: NOERROR, id: 59179
;; flags: qr aa rd ra; QUERY: 1, ANSWER: 1, AUTHORITY: 1, ADDITIONAL: 1

;; QUESTION SECTION:
;galadriel.rivendell.           IN      A

;; ANSWER SECTION:
galadriel.rivendell.    604800  IN      A       192.168.2.108

;; AUTHORITY SECTION:
rivendell.              604800  IN      NS      elrond.rivendell.

;; ADDITIONAL SECTION:
elrond.rivendell.       604800  IN      A       192.168.2.107

;; Query time: 4 msec
;; SERVER: 127.0.0.1#53(127.0.0.1)
;; WHEN: Mon Apr  6 11:24:30 2009
;; MSG SIZE  rcvd: 90

[root@legolas ~]#
```