

## Computer Networks Lab 7: Study of Domain Name Server

1. Configure the below topology to setup DNS server. R1 will use R2 as DNS server to make DNS resolutions.

First, let's begin with R1. We'll setup hostname and IP related information.



R1 IP configurations:

```
enable
configure terminal
hostname R1
interface e0/0
ip address 10.10.10.1 255.255.255.0
no shut
do wr
end
```

R2 IP and Hostname Configurations:

```
enable
config t
hostname R2
int e0/0
ip address 10.10.10.2 255.255.255.0
no shut
do wr
end
Setting up R2 as DNS Server
config t
ip dns server
ip host loopback.R2.com 2.2.2.2
```

```
R1(config)#interface f0/0
R1(config-if)#ip address 10.10.10.1 255.255.255.0
R1(config-if)#no shut
R1(config-if)#do w
*Mar  1 00:04:44.939: %LINK-3-UPDOWN: Interface FastEthernet0/0, changed state to up
*Mar  1 00:04:45.939: %LINEPROTO-5-UPDOWN: Line protocol on Interface FastEthernet0/0, changed state to up
R1(config-if)#do wr
Building configuration...
[OK]
R1(config-if)#end
R1#
*Mar  1 00:04:53.203: %SYS-5-CONFIG I: Configured from console by console
```

```
R2#enable
R2#config t
Enter configuration commands, one per line. End with CNTL/Z.
R2(config)#ip dns server
R2(config)#ip host loopback.R2.com 2.2.2.2
R2(config)#interface loopback 1
R2(config-if)#
*Mar  1 00:06:49.103: %LINEPROTO-5-UPDOWN: Line protocol on Interface Loopback1,
  changed state to up
R2(config-if)#ip address 2.2.2.2 255.255.255.255
R2(config-if)#end
R2#
*Mar  1 00:06:58.887: %SYS-5-CONFIG_I: Configured from console by console
R2#
```

Let's verify that loopback interface we just created is working. This will show us that the hostname correctly setup locally on R2.  
ping loopback.R2.com

```
R2#ping loopback.R2.com

Type escape sequence to abort.
Sending 5, 100-byte ICMP Echos to 2.2.2.2, timeout is 2 seconds:
!!!!
Success rate is 100 percent (5/5), round-trip min/avg/max = 1/2/4 ms
R2#
```

Now it's time to setup R1 to resolve hostnames using R2. On R1 type;

config terminal

ip domain lookup

ip name-server 10.10.10.2

Set R1 to use R2 as default gateway to get to loopback interface on R2. So that after R1 resolves loopback.R2.com, it can reach 2.2.2.2 through its default route (R2).

on R1 type:

config t

ip route 0.0.0.0 0.0.0.0 10.10.10.2

end

This tells our router that to get to any network not in it's routing table, it's next hop is 10.10.10.2 which is our router R2.

Now on R1, do a ping to loopback.R2.com and you should get a success message.

ping loopback.R2.com repeat 3

```
R1#ping loopback.R2.com repeat 3

Translating "loopback.R2.com"...domain server (10.10.10.2) [OK]

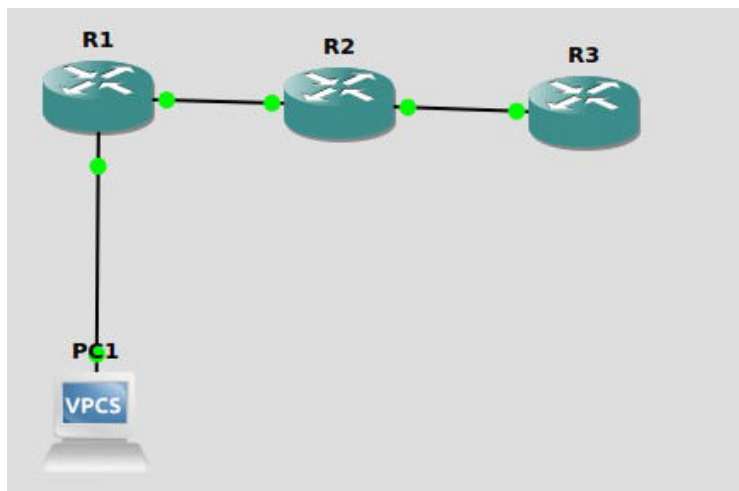
Type escape sequence to abort.
Sending 3, 100-byte ICMP Echos to 2.2.2.2, timeout is 2 seconds:
!!!
Success rate is 100 percent (3/3), round-trip min/avg/max = 60/61/64 ms
R1#
```

If you captured the traffic, you'll see DNS query and Answer as shown in Wireshark capture screen shot below.

Capturing from - [R1 FastEthernet0/0 to R2 FastEthernet0/0]						
File Edit View Go Capture Analyze Statistics Telephony Wireless Tools Help						
Apply a display filter ... <Ctrl-/>						
No.	Time	Source	Destination	Protocol	Length	Info
1	0.000000	c4:02:1a:9e:00:00	c4:02:1a:9e:00:00	LOOP	60	Reply
2	3.766840	c4:01:1a:80:00:00	c4:01:1a:80:00:00	LOOP	60	Reply
3	6.956847	10.10.10.1	10.10.10.2	DNS	75	Standard query 0x2901 A loopback.R2.com
4	6.961210	10.10.10.2	10.10.10.1	DNS	91	Standard query response 0x2901 A loopback.R2.com A 2.2.2.2
5	6.966991	10.10.10.1	2.2.2.2	ICMP	114	Echo (ping) request id=0x0002, seq=0/0, ttl=255 (reply in 6)
6	6.971456	2.2.2.2	10.10.10.1	ICMP	114	Echo (ping) reply id=0x0002, seq=0/0, ttl=255 (request in 5)
7	6.977131	10.10.10.1	2.2.2.2	ICMP	114	Echo (ping) request id=0x0002, seq=1/256, ttl=255 (reply in 8)
8	6.981600	2.2.2.2	10.10.10.1	ICMP	114	Echo (ping) reply id=0x0002, seq=1/256, ttl=255 (request in 7)
9	6.987274	10.10.10.1	2.2.2.2	ICMP	114	Echo (ping) request id=0x0002, seq=2/512, ttl=255 (reply in 10)
10	6.991808	2.2.2.2	10.10.10.1	ICMP	114	Echo (ping) reply id=0x0002, seq=2/512, ttl=255 (request in 9)
11	6.997545	c4:01:1a:80:00:00	c4:02:1a:9e:00:00	CDP/VTP/DTP/PagP/UD...	350	Device ID: R1 Port ID: FastEthernet0/0
12	10.011434	c4:02:1a:9e:00:00	c4:02:1a:9e:00:00	LOOP	60	Reply
13	13.549521	c4:01:1a:80:00:00	c4:01:1a:80:00:00	LOOP	60	Reply
14	18.278291	c4:02:1a:9e:00:00	DEC-MOP-Remote-Cons...	0x6002	77	DEC DNA Remote Console
15	19.963076	c4:02:1a:9e:00:00	c4:02:1a:9e:00:00	LOOP	60	Reply
Ethernet II, Src: c4:02:1a:9e:00:00 (c4:02:1a:9e:00:00), Dst: c4:01:1a:80:00:00 (c4:01:1a:80:00:00)						
Internet Protocol Version 4, Src: 10.10.10.2, Dst: 10.10.10.1						
User Datagram Protocol, Src Port: 53, Dst Port: 56950						
Domain Name System (response)						
Transaction ID: 0x2901						
Flags: 0x0100 Standard query response, No error						
Questions: 1						
Answer RRs: 1						
Authority RRs: 0						
Additional RRs: 0						
Queries						
loopback.R2.com: type A, class IN						
Answers						
loopback.R2.com: type A, class IN, addr 2.2.2.2						
[Request In: 3]						
[Time: 0.004363800 seconds]						
0000	c4 01 1a 80 00 00 c4 02 1a 9e 00 00 00 08 00 45 00	.....E				
0010	00 40 00 02 00 00 ff 11 93 07 0a 0a 0a 02 0a 0a	.....M				
0020	0a 01 00 35 de 76 00 39 b1 cb 29 01 81 00 00 01	...5.v.9...				
0030	00 01 00 00 00 00 00 6c 6f 6f 70 02 01 63 0b 02	...l oopback				
0040	00 02 03 03 0f 00 00 00 01 00 01 c0 0c 00 01 00	R2.com...				
0050	01 00 00 00 0a 00 04 02 02 02 02	.....				
Text item (text), 21 bytes						
				Packets: 47 - Displayed: 47 (100.0%)	Profile: Default	

### III. LAB EXERCISE

Suppose you are connecting to [www.mycsemit.com](http://www.mycsemit.com) to read a page, you are a user sitting at a client's machine. You can access the [www.mycsemit.com](http://www.mycsemit.com) web server. The server machine finds the page you requested and sends it to you. Build a scenario using GNS3 to demonstrate the interaction of the DNS Server and DNS Client. Place DNS Server behind two routers.



```
R2#config t
Enter configuration commands, one per line. End with CNTL/Z.
R2(config)#ip dns server
R2(config)#ip host www.mycsemit.com 10.10.10.3
R2(config)#ip route 10.10.10.0 255.255.255.0 10.10.10.2
                        ^
% Invalid input detected at '^' marker.

R2(config)#ip route 10.10.10.0 255.255.255.0 10.10.10.2
%Invalid next hop address (it's this router)
R2(config)#ip route 10.10.10.0 255.255.255.0 10.10.10.1
R2(config)#end
R2#
*Mar  1 01:16:40.863: %SYS-5-CONFIG_I: Configured from console by console
R2#
```

```
R1#ping www.mycsemit.com
Translating "www.mycsemit.com"...domain server (10.10.10.2) [OK]
Type escape sequence to abort.
Sending 5, 100-byte ICMP Echos to 10.10.10.3, timeout is 2 seconds:
.....
Success rate is 0 percent (0/5)
```

No.	Time	Source	Destination	Protocol	Length	Info
567	2396.412869	c4:01:1a:80:00:00	c4:01:1a:80:00:00	LOOP	60	Reply
568	2404.376191	c4:02:1a:9e:00:00	c4:02:1a:9e:00:00	LOOP	60	Reply
569	2406.116064	c4:01:1a:80:00:00	c4:01:1a:80:00:00	LOOP	60	Reply
570	2409.412283	10.10.10.1	10.10.10.2	DNS	76	Standard query 0x5b3e A www.mycsemit.com
571	2409.420931	10.10.10.2	10.10.10.1	DNS	92	Standard query response 0x5b3e A www.mycsemit.com A 10.10.10.3
572	2409.422542	c4:01:1a:80:00:00	Broadcast	ARP	60	who has 10.10.10.3? Tell 10.10.10.1
573	2411.327753	c4:01:1a:80:00:00	Broadcast	ARP	60	who has 10.10.10.3? Tell 10.10.10.1
574	2413.312902	c4:01:1a:80:00:00	Broadcast	ARP	60	who has 10.10.10.3? Tell 10.10.10.1
575	2414.442694	c4:02:1a:9e:00:00	c4:02:1a:9e:00:00	LOOP	60	Reply
576	2415.355946	c4:01:1a:80:00:00	Broadcast	ARP	60	who has 10.10.10.3? Tell 10.10.10.1
577	2415.671395	c4:01:1a:80:00:00	c4:01:1a:80:00:00	LOOP	60	Reply
578	2417.290132	c4:01:1a:80:00:00	Broadcast	ARP	60	who has 10.10.10.3? Tell 10.10.10.1
579	2424.694811	c4:02:1a:9e:00:00	c4:02:1a:9e:00:00	LOOP	60	Reply
580	2425.604201	c4:01:1a:80:00:00	c4:01:1a:80:00:00	LOOP	60	Reply
581	2428.410625	c4:02:1a:9e:00:00	CDP/VTP/DTP/PAGP/UDLD	CDP	359	Device ID: R2 Port ID: FastEthernet0/0
<hr/>						
Frame 571: 92 bytes on wire (736 bits), 92 bytes captured (736 bits) on interface -, id 0						
Ethernet II, Src: c4:02:1a:9e:00:00 (c4:02:1a:9e:00:00), Dst: c4:01:1a:80:00:00 (c4:01:1a:80:00:00)						
Internet Protocol Version 4, Src: 10.10.10.2, Dst: 10.10.10.1						
User Datagram Protocol, Src Port: 53, Dst Port: 65466						
Domain Name System (response)						
Transaction ID: 0x5b3e						
Flags: 0x8180 Standard query response, No error						
Questions: 1						
Answer RRs: 1						
Authority RRs: 0						
Additional RRs: 0						
Queries						
www.mycsemit.com: type A, class IN						
Name: www.mycsemit.com						
[Name Length: 16]						
[Label Count: 3]						
Type: A (Host Address) (1)						
Class: IN (0x0001)						
Answers						
www.mycsemit.com: type A, class IN, addr 10.10.10.3						
Name: www.mycsemit.com						
Type: A (Host Address) (1)						
Class: IN (0x0001)						
Time to live: 10 (10 seconds)						
Data length: 4						
Address: 10.10.10.3						
[Request In: 570]						
[Time: 0.000648000 seconds]						