

1. Verify DNS Resolution :

First, I verified DNS resolution using this command :

`dig internal.example.com`

```
root@ubuntu: /home/patrickmasry
root@ubuntu:/home/patrickmasry# dig internal.example.com

; <<>> DiG 9.18.12-0ubuntu0.22.04.2-Ubuntu <<>> internal.example.com
;; global options: +cmd
;; Got answer:
;; ->>HEADER<<- opcode: QUERY, status: NOERROR, id: 48581
;; flags: qr aa rd ra ad; QUERY: 1, ANSWER: 1, AUTHORITY: 0, ADDITIONAL: 1

;; OPT PSEUDOSECTION:
; EDNS: version: 0, flags:; udp: 65494
;; QUESTION SECTION:
;internal.example.com.      IN      A

;; ANSWER SECTION:
internal.example.com.      0       IN      A      127.0.0.1

;; Query time: 1 msec
;; SERVER: 127.0.0.53#53(127.0.0.53) (UDP)
;; WHEN: Mon Apr 28 17:57:31 EEST 2025
;; MSG SIZE rcvd: 65

root@ubuntu:/home/patrickmasry#
```

Then I checked against Google's DNS server using this command :
`dig @8.8.8.8 internal.example.com`

```
root@ubuntu: /home/patrickmasry
root@ubuntu:/home/patrickmasry# dig @8.8.8.8 internal.example.com

; <<>> DiG 9.18.12-0ubuntu0.22.04.2-Ubuntu <<>> @8.8.8.8 internal.example.com
; (1 server found)
;; global options: +cmd
;; Got answer:
;; ->>HEADER<<- opcode: QUERY, status: NXDOMAIN, id: 56711
;; flags: qr rd ra ad; QUERY: 1, ANSWER: 0, AUTHORITY: 1, ADDITIONAL: 1

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

;; AUTHORITY SECTION:
example.com.          105     IN      SOA     ns.icann.org. noc.dns.icann.org.
2025011626 7200 3600 1209600 3600

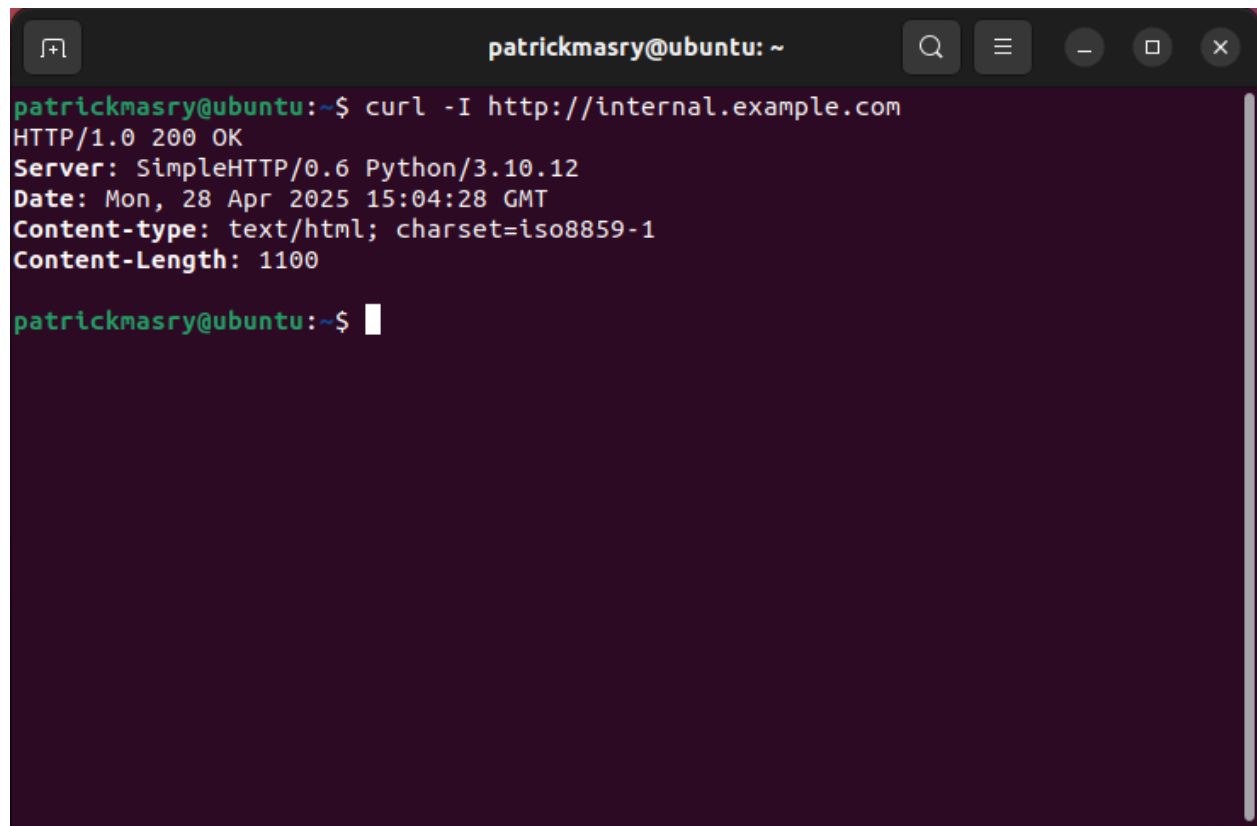
;; Query time: 789 msec
;; SERVER: 8.8.8.8#53(8.8.8.8) (UDP)
;; WHEN: Mon Apr 28 17:59:11 EEST 2025
;; MSG SIZE rcvd: 105

root@ubuntu:/home/patrickmasry#
```

2. Diagnose Service Reachability :

I confirmed the web service was reachable by this command :

`curl -I http://internal.example.com`

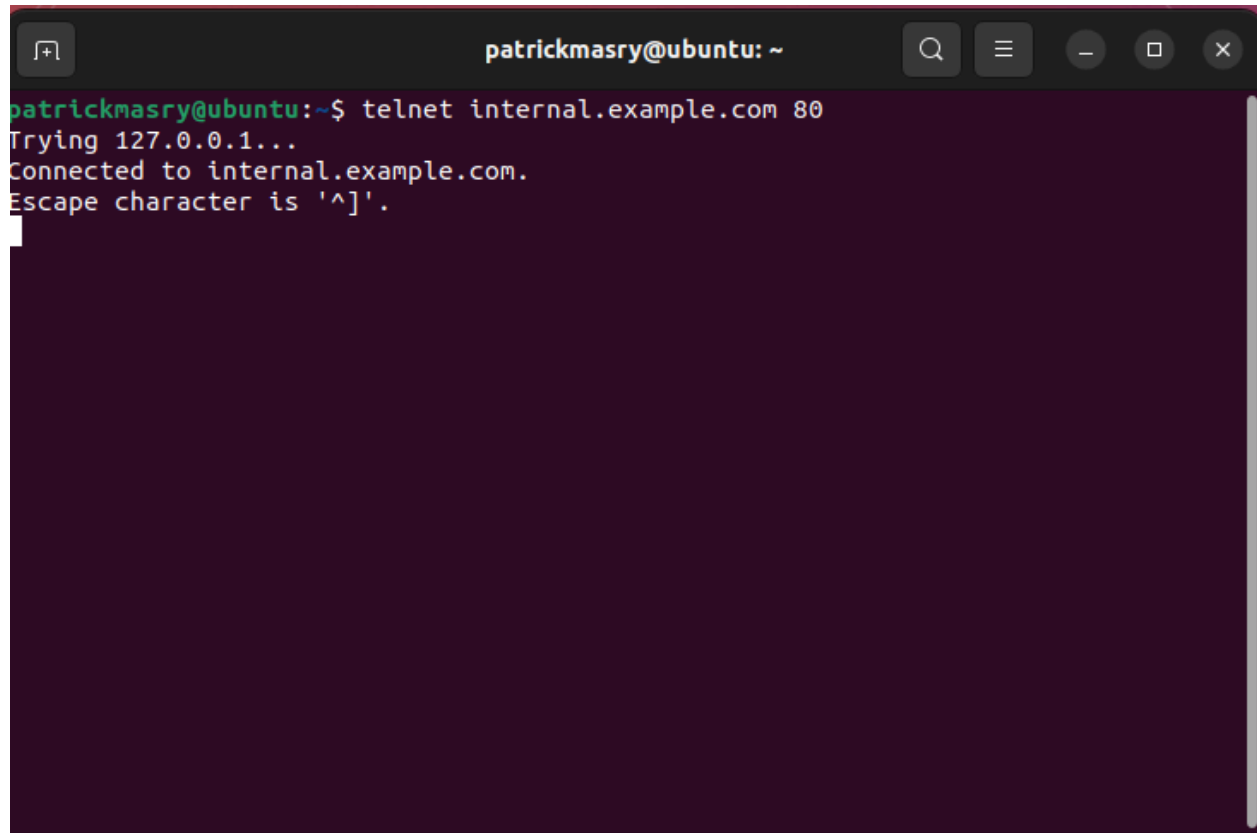
A terminal window titled 'patrickmasry@ubuntu: ~' with standard window controls. The terminal shows the command 'curl -I http://internal.example.com' being executed. The output is: 'HTTP/1.0 200 OK', 'Server: SimpleHTTP/0.6 Python/3.10.12', 'Date: Mon, 28 Apr 2025 15:04:28 GMT', 'Content-type: text/html; charset=iso8859-1', and 'Content-Length: 1100'. The prompt 'patrickmasry@ubuntu:~\$' is visible at the bottom with a cursor.

```
patrickmasry@ubuntu:~$ curl -I http://internal.example.com
HTTP/1.0 200 OK
Server: SimpleHTTP/0.6 Python/3.10.12
Date: Mon, 28 Apr 2025 15:04:28 GMT
Content-type: text/html; charset=iso8859-1
Content-Length: 1100

patrickmasry@ubuntu:~$
```

Then I checked port connectivity by this command :

`telnet internal.example.com 80`

A terminal window titled 'patrickmasry@ubuntu: ~' with standard window controls. The terminal shows the command 'telnet internal.example.com 80' being executed. The output indicates a successful connection to 127.0.0.1 on port 80, displaying 'Trying 127.0.0.1...', 'Connected to internal.example.com.', and 'Escape character is '^['.'.

```
patrickmasry@ubuntu:~$ telnet internal.example.com 80
Trying 127.0.0.1...
Connected to internal.example.com.
Escape character is '^['.
```

Then verified service is listening by this command :

`sudo ss -tlnp`

```
root@ubuntu: /home/patrickmasry
root@ubuntu:/home/patrickmasry# sudo ss -tlnp
State      Recv-Q    Send-Q    Local Address:Port    Peer Address:Port
Process
LISTEN     0         128       127.0.0.1:631         0.0.0.0:*
  users:(("cupsd",pid=676,fd=7))
LISTEN     0         5         0.0.0.0:80           0.0.0.0:*
  users:(("python3",pid=2178,fd=3))
LISTEN     0        4096      127.0.0.53%lo:53      0.0.0.0:*
  users:(("systemd-resolve",pid=492,fd=14))
LISTEN     0         128      [:::1]:631          [:::]*
  users:(("cupsd",pid=676,fd=6))
root@ubuntu:/home/patrickmasry#
```

Tracing the Issue and Listing All Possible Causes :

1. DNS Misconfiguration

- Possible Cause : The DNS configuration is incorrect.
- How to Confirm : Use the `dig` command; it shows an NXDOMAIN error or an incorrect IP address.
- How to Fix : Update the `/etc/hosts` file or correct the DNS server settings.
- Command : Use `sudo nano /etc/hosts`.

2. Web Service Not Running

- Possible Cause : The web service is not running.
- How to Confirm : Using `curl` fails, and `ss` or `netstat` show no listening service on the expected port.
- How to Fix : Restart or start the web service.
- Command : Use `sudo python3 -m http.server 80` to test or start the service.

3. Firewall Blocking Port

- Possible Cause : The firewall is blocking access to the required port.
- How to Confirm : Using `telnet` fails to connect, resulting in a timeout.
- How to Fix : Allow port 80 through the firewall.
- Command : Use `sudo ufw allow 80`.

4. Wrong IP in DNS

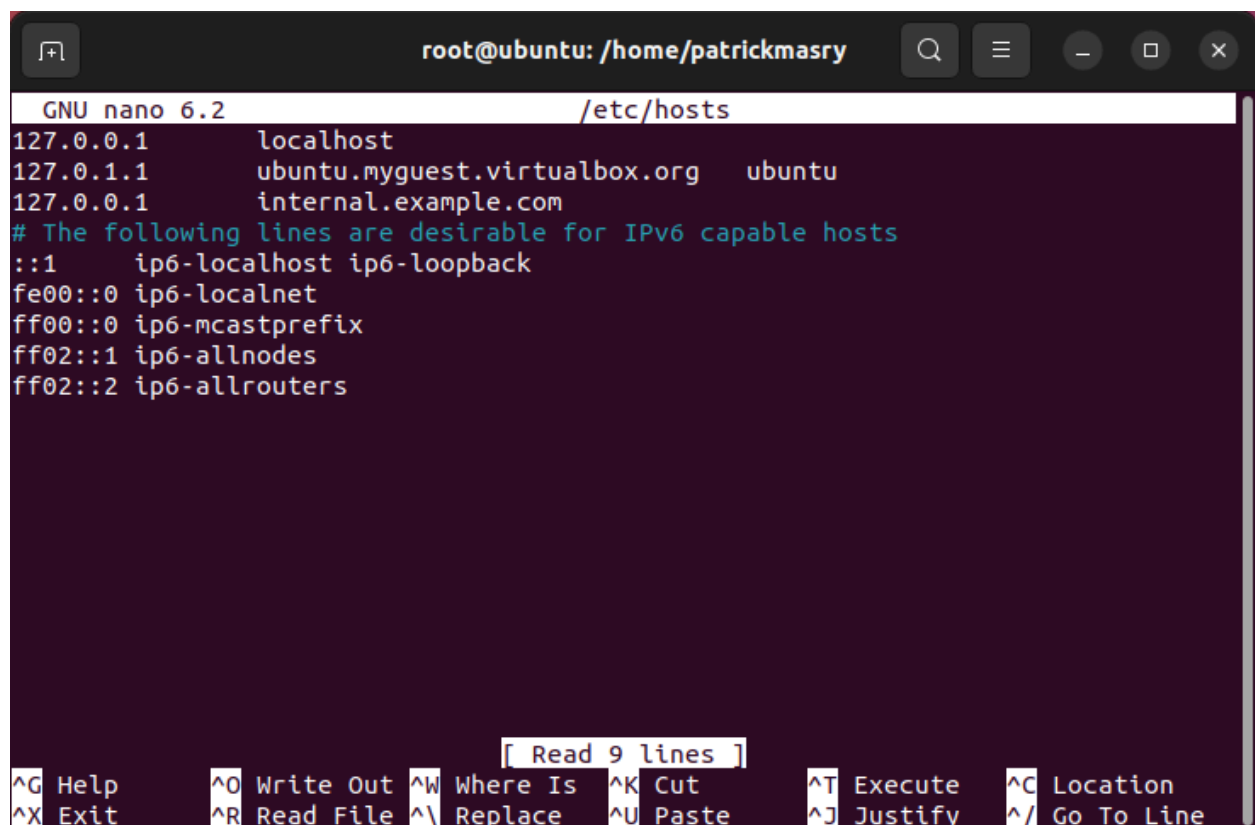
- Possible Cause : The DNS records contain an incorrect IP address.
- How to Confirm : Using `dig` shows an incorrect IP address.
- How to Fix : Update the DNS settings or modify the `/etc/hosts` file.
- Command : Use `sudo nano /etc/hosts`.

5. Routing Problems

- Possible Cause : There are issues with network routing.
- How to Confirm : The `ping` command fails even when DNS resolution is correct.
- How to Fix : Fix routing or firewall configurations.
- Command : Use `ping 127.0.0.1` to test basic connectivity.

Bonus section :

Configure a local [/etc/hosts](#) entry to bypass DNS for testing.



The screenshot shows a terminal window titled "root@ubuntu: /home/patrickmasry". Inside, the GNU nano 6.2 editor is open, editing the file /etc/hosts. The file contains the following text:

```
127.0.0.1    localhost
127.0.1.1    ubuntu.myguest.virtualbox.org  ubuntu
127.0.0.1    internal.example.com
# The following lines are desirable for IPv6 capable hosts
::1         ip6-localhost ip6-loopback
fe00::0     ip6-localnet
ff00::0     ip6-mcastprefix
ff02::1     ip6-allnodes
ff02::2     ip6-allrouters
```

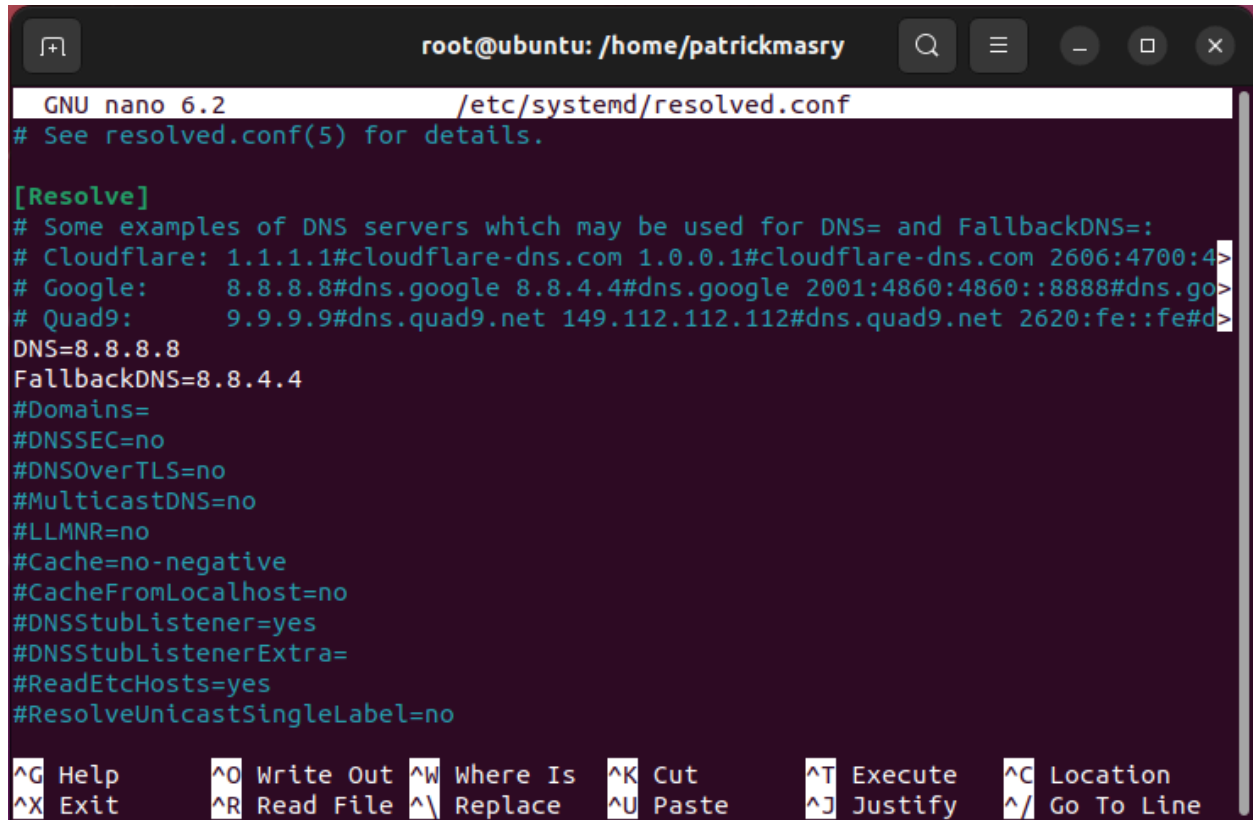
At the bottom of the terminal, a status bar displays the command shortcuts for nano:

^G Help	^O Write Out	^W Where Is	^K Cut	^T Execute	^C Location
^X Exit	^R Read File	^_ Replace	^U Paste	^J Justify	^_ Go To Line

Show how to persist DNS server settings using systemd-resolved or NetworkManager.

I used systemd-resolved

Edited `/etc/systemd/resolved.conf`

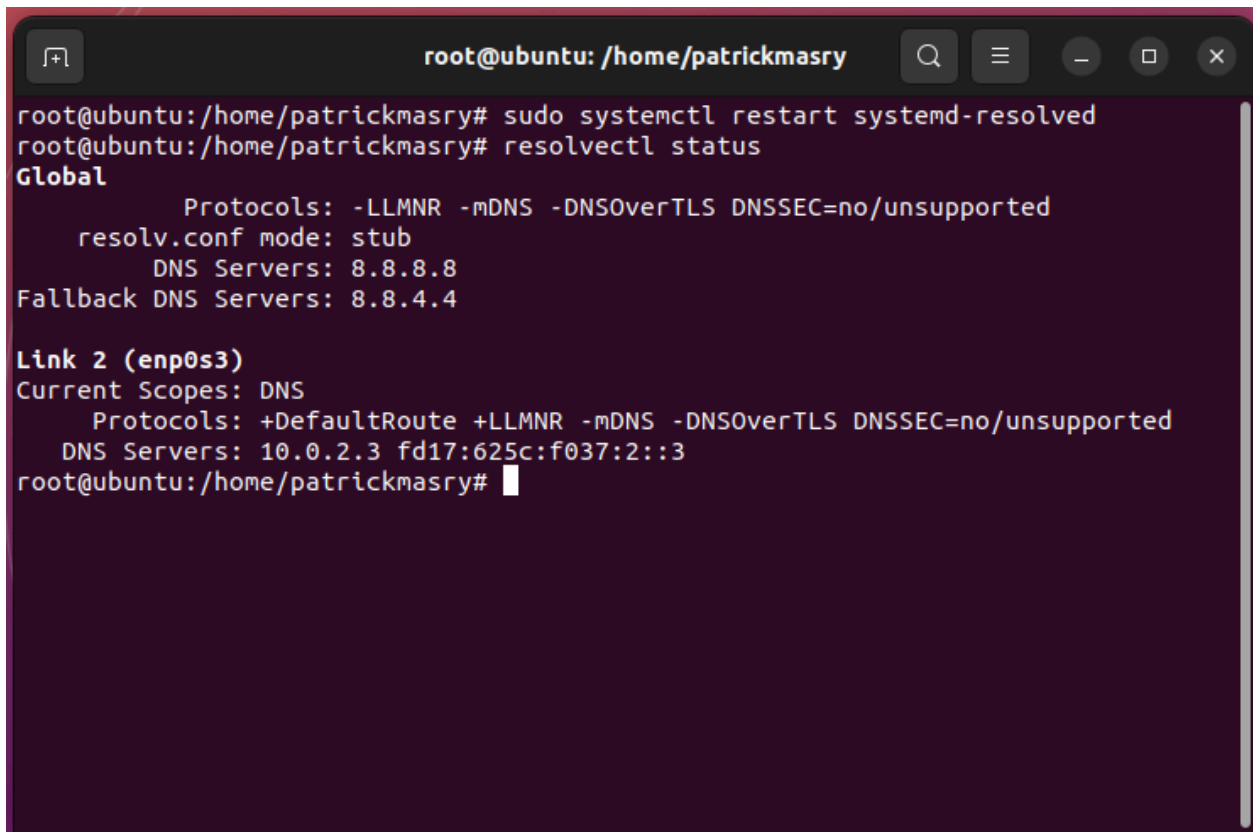


```
GNU nano 6.2 /etc/systemd/resolved.conf
# See resolved.conf(5) for details.

[Resolve]
# Some examples of DNS servers which may be used for DNS= and FallbackDNS=:
# Cloudflare: 1.1.1.1#cloudflare-dns.com 1.0.0.1#cloudflare-dns.com 2606:4700:4>
# Google:      8.8.8.8#dns.google 8.8.4.4#dns.google 2001:4860:4860::8888#dns.go>
# Quad9:       9.9.9.9#dns.quad9.net 149.112.112.112#dns.quad9.net 2620:fe::fe#d>
DNS=8.8.8.8
FallbackDNS=8.8.4.4
#Domains=
#DNSSEC=no
#DNSOverTLS=no
#MulticastDNS=no
#LLMNR=no
#Cache=no-negative
#CacheFromLocalhost=no
#DNSStubListener=yes
#DNSStubListenerExtra=
#ReadEtcHosts=yes
#ResolveUnicastSingleLabel=no

^G Help      ^O Write Out ^W Where Is  ^K Cut       ^T Execute  ^C Location
^X Exit      ^R Read File ^\ Replace  ^U Paste     ^J Justify  ^_ Go To Line
```


Then restarted the service and checked it's status

A terminal window with a dark background and light-colored text. The window title bar shows 'root@ubuntu: /home/patrickmasry' and standard window controls. The terminal content shows the execution of 'sudo systemctl restart systemd-resolved' followed by 'resolvectl status'. The output displays the global DNS configuration and the configuration for the 'Link 2 (enp0s3)' interface. The global configuration shows protocols as -LLMNR -mDNS -DNSOverTLS and DNSSEC as no/unsupported, with DNS servers at 8.8.8.8 and a fallback at 8.8.4.4. The interface configuration shows protocols as +DefaultRoute +LLMNR -mDNS -DNSOverTLS and DNSSEC as no/unsupported, with DNS servers at 10.0.2.3 and fd17:625c:f037:2::3.

```
root@ubuntu:/home/patrickmasry# sudo systemctl restart systemd-resolved
root@ubuntu:/home/patrickmasry# resolvectl status
Global
    Protocols: -LLMNR -mDNS -DNSOverTLS DNSSEC=no/unsupported
    resolv.conf mode: stub
    DNS Servers: 8.8.8.8
    Fallback DNS Servers: 8.8.4.4

Link 2 (enp0s3)
Current Scopes: DNS
    Protocols: +DefaultRoute +LLMNR -mDNS -DNSOverTLS DNSSEC=no/unsupported
    DNS Servers: 10.0.2.3 fd17:625c:f037:2::3
root@ubuntu:/home/patrickmasry#
```