

ECE 4016 Assignment 1 README

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System Info

```
./+o+-
yyyyy- -yyyyyy+
: //+///// -yyyyyyo
.++ .:/+++++/-+.sss/`
.:++o: /+++++++:--:/-
o:+o+:++. `..`.-/oo++++/
.:+o:+o/. `+sss00+/
.++/+:+oo+o: ` /sss000.
/+++//+:`oo+o /::--:.
\+/+o+++`o+o ++/:///.
.++.o+++oo+:` /dddhhh.
.+o+oo:.` `oddhhhh+
\+.+o+o`-` ``. :ohdhhhh+
`o+++ `ohhhhhhhhhyo++os:
.o: `syhhhhhhh/.oo++o`
/osyyyyyyo++ooo+++/
` `` `+oo+++o\`
`oo++.
```

```
shitianhao@woot
OS: Ubuntu 20.04 focal
Kernel: x86_64 Linux 5.4.0-163-generic
Uptime: 2d 1h 24m
Packages: 2345
Shell: zsh 5.8
Disk: 4.6T / 7.5T (65%)
CPU: AMD EPYC 7551 32-Core @ 64x 2GHz
GPU: NVIDIA GeForce GTX 1080 Ti
RAM: 1761MiB / 48168MiB
```

```
> echo $CONDA_PREFIX
/home/shitianhao/.conda/envs/ece
> python --version
Python 3.9.18
```

As can be seen from the above screenshots, the current system is **Ubuntu 20.04** and the Python version is **3.9**

Execution Specification

1. `cd` into the directory of `server.py`
2. (optional) activate conda environment
3. Start the server and specify a flag with `--flag` or `-f`
 - 0 means querying the public DNS server
 - 1 means iterative querying from the root server
4. If the server is running correctly, you will see

```
DNS server is listening on 127.0.0.1:1234
```

5. Open a new terminal window and use the `dig` command

Execution Results

1. Testing fetching from Public Server

```
Woot ece 1 zsh
> python server.py --flag 0
DNS server is listening on 127.0.0.1:1234
#1: 223.5.5.5
=====
#1: 223.5.5.5
=====

> dig www.baidu.com @127.0.0.1 -p 1234
; <<> DiG 9.16.1-Ubuntu <<> www.baidu.com @127.0.0.1 -p 1234
;; global options: +cmd
;; Got answer:
;; -->HEADER<< opcode: QUERY, status: NOERROR, id: 21563
;; flags: qr aa rd ra ad; QUERY: 1, ANSWER: 3, AUTHORITY: 0, ADDITIONAL: 0

;; QUESTION SECTION:
;www.baidu.com.                IN      A

;; ANSWER SECTION:
www.baidu.com.                 81      IN      CNAME  www.a.shifen.com.
www.a.shifen.com.             81      IN      A      14.119.104.254
www.a.shifen.com.             81      IN      A      14.119.104.189

;; Query time: 19 msec
;; SERVER: 127.0.0.1#1234(127.0.0.1)
;; WHEN: Mon Oct 02 22:59:44 HKT 2023
;; MSG SIZE rcvd: 90

> dig www.example.com @127.0.0.1 -p 1234
; <<> DiG 9.16.1-Ubuntu <<> www.example.com @127.0.0.1 -p 1234
;; global options: +cmd
;; Got answer:
;; -->HEADER<< opcode: QUERY, status: NOERROR, id: 60024
;; flags: qr aa rd ra ad; QUERY: 1, ANSWER: 1, AUTHORITY: 0, ADDITIONAL: 0

;; QUESTION SECTION:
;www.example.com.              IN      A

;; ANSWER SECTION:
www.example.com.               3215    IN      A      93.184.216.34

;; Query time: 7 msec
;; SERVER: 127.0.0.1#1234(127.0.0.1)
;; WHEN: Mon Oct 02 22:59:51 HKT 2023
;; MSG SIZE rcvd: 49

>
>
```

2. Fetching from Root server

```
Woot ece 1 zsh
> python server.py --flag 1
DNS server is listening on 127.0.0.1:1234
#1: 198.41.0.4
#2: 192.12.94.30
#3: 220.181.33.31
#4: 198.41.0.4
#5: 192.12.94.30
#6: 110.242.68.134
#7: 180.76.76.95
=====
#1: 198.41.0.4
#2: 192.12.94.30
#3: 198.41.0.4
#4: 192.12.94.30
#5: 199.43.134.53
#6: 192.12.94.30
=====

> dig www.baidu.com @127.0.0.1 -p 1234
; <<> DiG 9.16.1-Ubuntu <<> www.baidu.com @127.0.0.1 -p 1234
;; global options: +cmd
;; Got answer:
;; -->HEADER<< opcode: QUERY, status: NOERROR, id: 58174
;; flags: qr aa rd ra ad; QUERY: 1, ANSWER: 3, AUTHORITY: 0, ADDITIONAL: 0

;; QUESTION SECTION:
;www.baidu.com.                IN      A

;; ANSWER SECTION:
www.baidu.com.                 1200    IN      CNAME  www.a.shifen.com.
www.a.shifen.com.             120     IN      A      157.148.69.80
www.a.shifen.com.             120     IN      A      157.148.69.74

;; Query time: 451 msec
;; SERVER: 127.0.0.1#1234(127.0.0.1)
;; WHEN: Mon Oct 02 23:02:04 HKT 2023
;; MSG SIZE rcvd: 90

> dig www.example.com @127.0.0.1 -p 1234
; <<> DiG 9.16.1-Ubuntu <<> www.example.com @127.0.0.1 -p 1234
;; global options: +cmd
;; Got answer:
;; -->HEADER<< opcode: QUERY, status: NOERROR, id: 36854
;; flags: qr aa rd ra ad; QUERY: 1, ANSWER: 1, AUTHORITY: 0, ADDITIONAL: 0

;; QUESTION SECTION:
;www.example.com.              IN      A

;; ANSWER SECTION:
www.example.com.               86400   IN      A      93.184.216.34

;; Query time: 887 msec
;; SERVER: 127.0.0.1#1234(127.0.0.1)
;; WHEN: Mon Oct 02 23:02:15 HKT 2023
;; MSG SIZE rcvd: 49

>
>
```

3. Implementation of Cache

```
Woot ~ ece 1 zsh
~/p/ECE-4016/A1_DNS main
> conda activate ece
> conda activate ece
> python server.py --flag 1
DNS server is listening on 127.0.0.1:1234
#1: 198.41.0.4
#2: 192.12.94.30
#3: 198.41.0.4
#4: 192.12.94.30
#5: 199.43.135.53
#6: 192.12.94.30
=====
Fetched IP from cache
=====
#1: 198.41.0.4
#2: 192.12.94.30
#3: 220.181.33.31
#4: 198.41.0.4
#5: 192.12.94.30
#6: 110.242.68.134
#7: 180.76.76.95
=====
Fetched IP from cache
=====

; <<<> DiG 9.16.1-Ubuntu <<<> www.baidu.com @127.0.0.1 -p 1234
; global options: +cmd
; Got answer:
; -->HEADER<<- opcode: QUERY, status: NOERROR, id: 50511
; flags: qr aa rd ra ad; QUERY: 1, ANSWER: 3, AUTHORITY: 0, ADDITIONAL: 0

; QUESTION SECTION:
;www.baidu.com.                IN      A

; ANSWER SECTION:
www.baidu.com.                1200    IN      CNAME    www.a.shifen.com.
www.a.shifen.com.            120     IN      A        157.148.69.80
www.a.shifen.com.            120     IN      A        157.148.69.74

; Query time: 863 msec
; SERVER: 127.0.0.1#1234(127.0.0.1)
; WHEN: Sat Oct 07 13:16:29 HKT 2023
; MSG SIZE rcvd: 90
> dig www.baidu.com @127.0.0.1 -p 1234

; <<<> DiG 9.16.1-Ubuntu <<<> www.baidu.com @127.0.0.1 -p 1234
; global options: +cmd
; Got answer:
; -->HEADER<<- opcode: QUERY, status: NOERROR, id: 30574
; flags: qr aa rd ra ad; QUERY: 1, ANSWER: 3, AUTHORITY: 0, ADDITIONAL: 0

; QUESTION SECTION:
;www.baidu.com.                IN      A

; ANSWER SECTION:
www.baidu.com.                1200    IN      CNAME    www.a.shifen.com.
www.a.shifen.com.            120     IN      A        157.148.69.80
www.a.shifen.com.            120     IN      A        157.148.69.74

; Query time: 0 msec
; SERVER: 127.0.0.1#1234(127.0.0.1)
; WHEN: Sat Oct 07 13:16:33 HKT 2023
; MSG SIZE rcvd: 90

~/p/ECE-4016/A1_DNS main ..... ece shitianhao@Woot 13:16:33
>
```