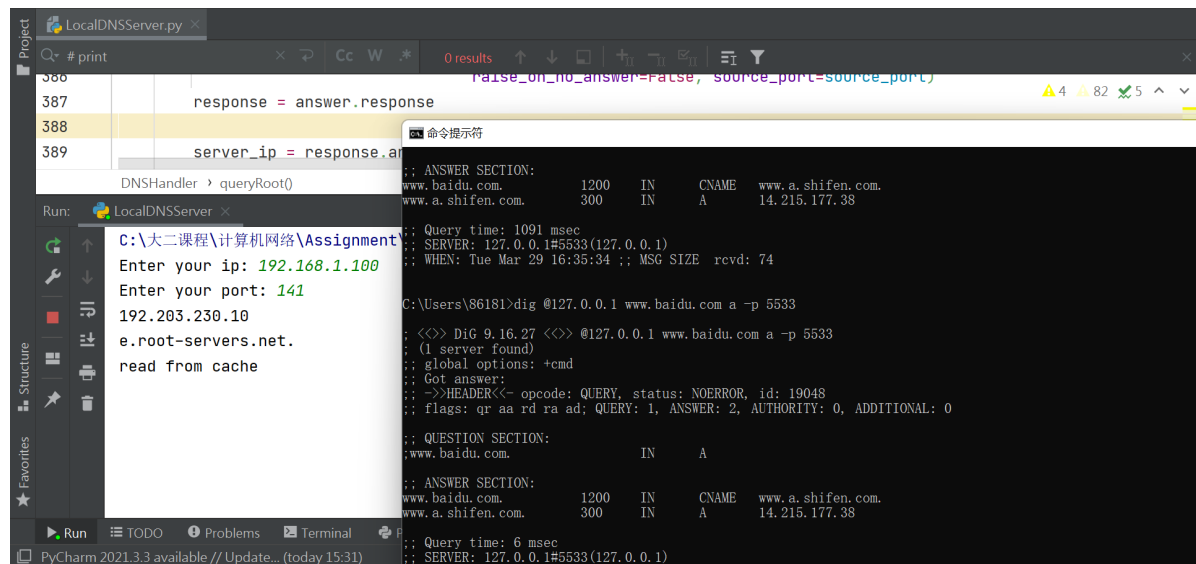


# CS305 计算机网络第一次编程作业报告

按照文档的要求，实现了一个本地的DNS服务器，可以支持 A 类型的查询以及缓存的操作

首先是查询 `www.baidu.com` 的IP地址，为了同时展示缓存机制，所以在TTL允许的时间范围内进行了两次查询，查询结果如下所示



```
LocalDNSServer.py
386
387         response = answer.response
388
389         server_ip = response.answer[0].ipaddress
        DNSHandler → queryRoot()

Run: LocalDNSServer
C:\大二课程\计算机网络\Assignment\
Enter your ip: 192.168.1.100
Enter your port: 141
192.203.230.10
e.root-servers.net.
read from cache

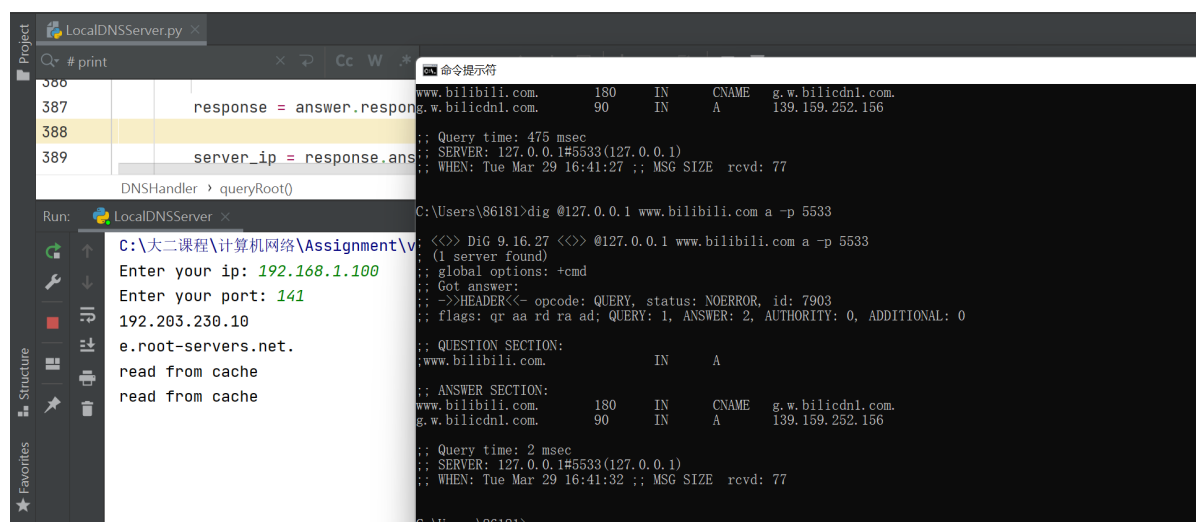
命令提示符
C:\Users\86181>dig @127.0.0.1 www.baidu.com a -p 5533
;; ANSWER SECTION:
www.baidu.com.      1200    IN      CNAME   www.a.shifen.com.
www.a.shifen.com.   300     IN      A        14.215.177.38
; Query time: 1091 msec
; SERVER: 127.0.0.1#5533(127.0.0.1)
; WHEN: Tue Mar 29 16:35:34 ;; MSG SIZE rcvd: 74
C:\Users\86181>dig @127.0.0.1 www.baidu.com a -p 5533
;<<> DiG 9.16.27 <<> @127.0.0.1 www.baidu.com a -p 5533
(1 server found)
; global options: +cmd
; Got answer:
;-->HEADER<-- opcode: QUERY, status: NOERROR, id: 19048
; flags: qr aa rd ra ad; QUERY: 1, ANSWER: 2, 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.   300     IN      A        14.215.177.38
; Query time: 6 msec
; SERVER: 127.0.0.1#5533(127.0.0.1)
```

在第一次查询时，本地没有缓存，所以是通过迭代查询的方式一步步地向根DNS服务器，TLD DNS 服务器，权威服务器得到 `www.baidu.com` 的IP地址

在第二次查询的时候，由于本地已经有对应IP地址的缓存，所以可以很快速地返回目标结果，并按照要求在控制台打印输出 `read from cache` 字样

紧接着进行对 `www.bilibili.com` 的查询

在之前的基础上，进行两次对 `www.bilibili.com` 的查询，和对 `www.baidu.com` 的查询类似，同样在报文中显示了 `www.bilibili.com` 的规范主机名以及正确的IP地址，并且在第二次查询时打印了 `read from cache` 字样

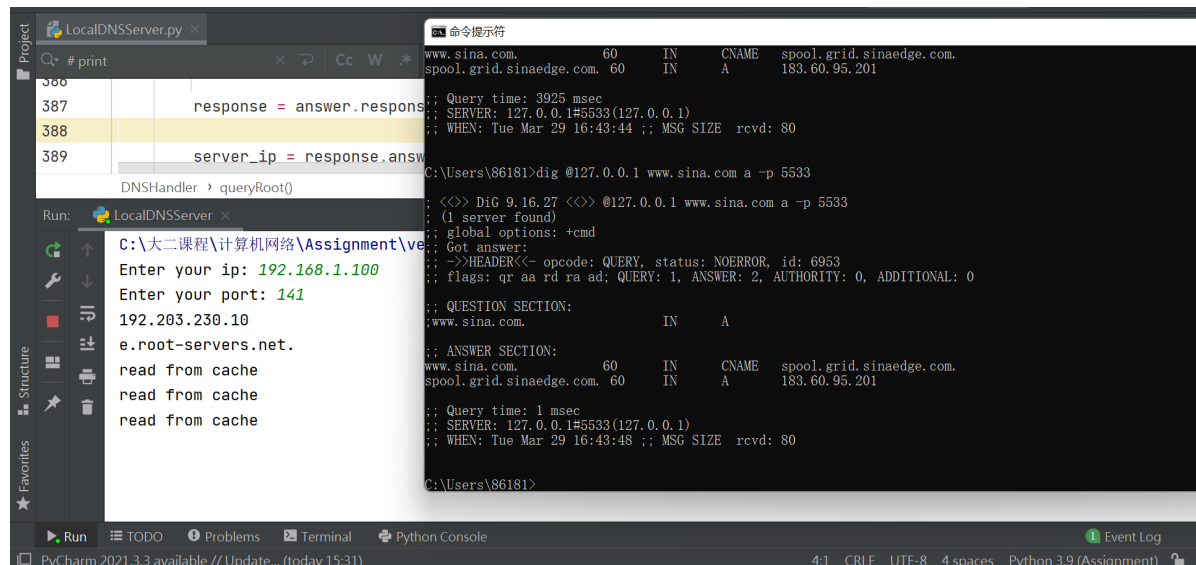


```
LocalDNSServer.py
386
387         response = answer.response
388
389         server_ip = response.answer[0].ipaddress
        DNSHandler → queryRoot()

Run: LocalDNSServer
C:\大二课程\计算机网络\Assignment\
Enter your ip: 192.168.1.100
Enter your port: 141
192.203.230.10
e.root-servers.net.
read from cache
read from cache

命令提示符
C:\Users\86181>dig @127.0.0.1 www.bilibili.com a -p 5533
;; ANSWER SECTION:
www.bilibili.com.   180     IN      CNAME   g.w.bilicdn1.com.
g.w.bilicdn1.com.   90      IN      A        139.159.252.156
; Query time: 475 msec
; SERVER: 127.0.0.1#5533(127.0.0.1)
; WHEN: Tue Mar 29 16:41:27 ;; MSG SIZE rcvd: 77
C:\Users\86181>dig @127.0.0.1 www.bilibili.com a -p 5533
;<<> DiG 9.16.27 <<> @127.0.0.1 www.bilibili.com a -p 5533
(1 server found)
; global options: +cmd
; Got answer:
;-->HEADER<-- opcode: QUERY, status: NOERROR, id: 7903
; flags: qr aa rd ra ad; QUERY: 1, ANSWER: 2, AUTHORITY: 0, ADDITIONAL: 0
; QUESTION SECTION:
; www.bilibili.com.            IN      A
; ANSWER SECTION:
www.bilibili.com.   180     IN      CNAME   g.w.bilicdn1.com.
g.w.bilicdn1.com.   90      IN      A        139.159.252.156
; Query time: 2 msec
; SERVER: 127.0.0.1#5533(127.0.0.1)
; WHEN: Tue Mar 29 16:41:32 ;; MSG SIZE rcvd: 77
C:\Users\86181>
```

在查询完成 `www.bilibili.com` 的IP地址之后，我们进行了对 `www.sina.com` 的IP地址查询，同样是进行两次



```
LocalDNSServer.py
386
387
388 response = answer.response
389
server_ip = response.answer
DNSHandler -> queryRoot()

Run: LocalDNSServer
C:\大二课程\计算机网络\Assignment\ve
Enter your ip: 192.168.1.100
Enter your port: 141
192.203.230.10
e.root-servers.net.
read from cache
read from cache
read from cache

命令提示符
www.sina.com. 60 IN CNAME spool.grid.sinaedge.com.
spool.grid.sinaedge.com. 60 IN A 183.60.95.201

Query time: 3925 msec
SERVER: 127.0.0.1#5533(127.0.0.1)
WHEN: Tue Mar 29 16:43:44 ;; MSG SIZE rcvd: 80

C:\Users\86181>dig @127.0.0.1 www.sina.com a -p 5533
;<>> DiG 9.16.27 <>> @127.0.0.1 www.sina.com a -p 5533
(1 server found)
global options: +cmd
Got answer:
->>HEADER<<- opcode: QUERY, status: NOERROR, id: 6953
flags: qr aa rd ra ad; QUERY: 1, ANSWER: 2, AUTHORITY: 0, ADDITIONAL: 0

QUESTION SECTION:
www.sina.com. IN A

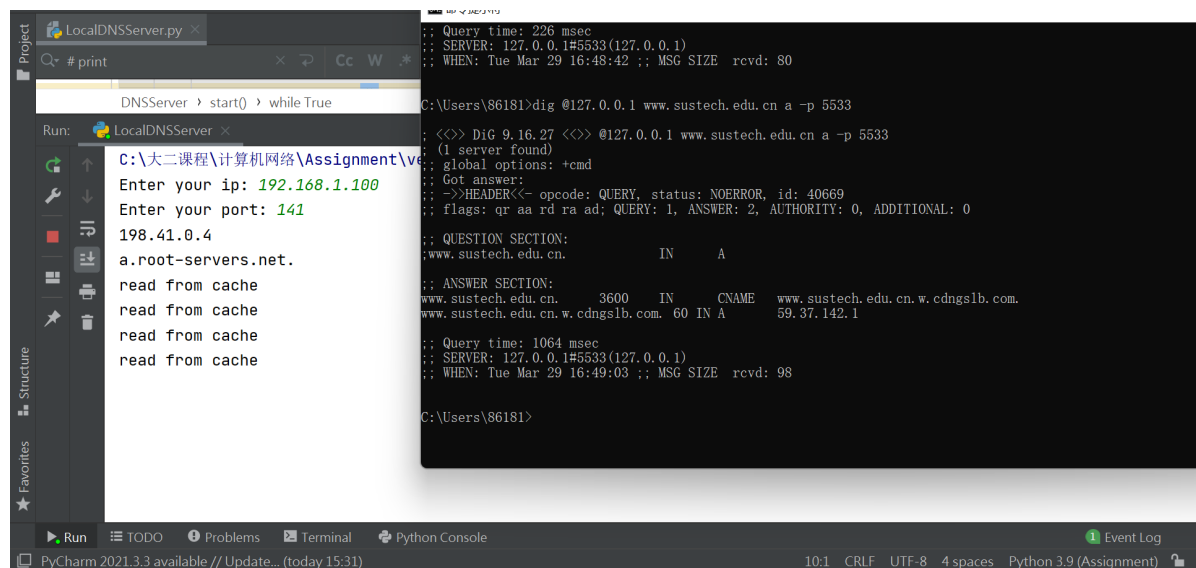
ANSWER SECTION:
www.sina.com. 60 IN CNAME spool.grid.sinaedge.com.
spool.grid.sinaedge.com. 60 IN A 183.60.95.201

Query time: 1 msec
SERVER: 127.0.0.1#5533(127.0.0.1)
WHEN: Tue Mar 29 16:43:48 ;; MSG SIZE rcvd: 80

C:\Users\86181>
```

可以看到，第一次依然是向各级DNS服务器进行迭代查询，第二次则直接从缓存当中读取，显示 `read from cache` 字样

最后，进行对 `www.sustech.edu.cn` 的IP地址查询，依然是查询两次，和之前的查询一样，返回了正确的结果



```
LocalDNSServer.py
DNSServer -> start() -> while True

Run: LocalDNSServer
C:\大二课程\计算机网络\Assignment\ve
Enter your ip: 192.168.1.100
Enter your port: 141
198.41.0.4
a.root-servers.net.
read from cache
read from cache
read from cache
read from cache

Query time: 226 msec
SERVER: 127.0.0.1#5533(127.0.0.1)
WHEN: Tue Mar 29 16:48:42 ;; MSG SIZE rcvd: 80

C:\Users\86181>dig @127.0.0.1 www.sustech.edu.cn a -p 5533
;<>> DiG 9.16.27 <>> @127.0.0.1 www.sustech.edu.cn a -p 5533
(1 server found)
global options: +cmd
Got answer:
->>HEADER<<- opcode: QUERY, status: NOERROR, id: 40669
flags: qr aa rd ra ad; QUERY: 1, ANSWER: 2, AUTHORITY: 0, ADDITIONAL: 0

QUESTION SECTION:
www.sustech.edu.cn. IN A

ANSWER SECTION:
www.sustech.edu.cn. 3600 IN CNAME www.sustech.edu.cn.w.cdngslb.com.
www.sustech.edu.cn.w.cdngslb.com. 60 IN A 59.37.142.1

Query time: 1064 msec
SERVER: 127.0.0.1#5533(127.0.0.1)
WHEN: Tue Mar 29 16:49:03 ;; MSG SIZE rcvd: 98

C:\Users\86181>
```

关于DNS本地服务器的Python代码的实现部分，已经在代码当中加上了详细的英文注释