

Q1: What's the role of DNS? Please describe it using your own words.

DNS的作用是进行域名解析，根据域名查出对应的IP地址。

Q2: How can you ask a specific DNS server (instead of the default) for information about a domain name? For example, once the default server crashes and you wish to ask the other server 8.8.8.8, what command should you use?

如果要使用特定的DNS服务器进行查询，可以使用@后跟DNS服务器IP地址的方式来强制使用某DNS Server。

```
dig @8.8.8.8 域名
```

可以向特定的8.8.8.8DNS服务器寻找域名的解析结果。

Q3: Do you know the process of solving the domain name of "ipads.se.sjtu.edu.cn"? How many queries did it take to find the IP address for ipads? Include the sequence of commands that you used.

解析过程如下：

```
dig .ns
```

```
zengyuxin@zeng:~$ dig . ns

; <<>> DiG 9.11.5-P4-5.1+deb10u5-Debian <<>> . ns
;; global options: +cmd
;; Got answer:
;; ->>HEADER<<- opcode: QUERY, status: NOERROR, id: 48353
;; flags: qr rd ra ad; QUERY: 1, ANSWER: 13, AUTHORITY: 0, ADDITIONAL: 1
;; OPT PSEUDOSECTION:
; EDNS: version: 0, flags:; MBZ: 0x0005, udp: 4096
;; QUESTION SECTION:
;.                               IN      NS
;; ANSWER SECTION:
.                               5       IN      NS      d.root-servers.net.
.                               5       IN      NS      j.root-servers.net.
.                               5       IN      NS      g.root-servers.net.
.                               5       IN      NS      l.root-servers.net.
.                               5       IN      NS      a.root-servers.net.
.                               5       IN      NS      i.root-servers.net.
.                               5       IN      NS      b.root-servers.net.
.                               5       IN      NS      f.root-servers.net.
.                               5       IN      NS      c.root-servers.net.
.                               5       IN      NS      h.root-servers.net.
.                               5       IN      NS      e.root-servers.net.
.                               5       IN      NS      k.root-servers.net.
.                               5       IN      NS      m.root-servers.net.

;; Query time: 5 msec
;; SERVER: 192.168.228.2#53(192.168.228.2)
;; WHEN: Fri Dec 10 08:11:13 EST 2021
;; MSG SIZE rcvd: 239
```

```
dig @d.root-servers.net ipads.se.sjtu.edu.cn +norecurse
```

```
zengyuxin@zeng:~$ dig @d.root-servers.net ipads.se.sjtu.edu.cn +norecurse
; <<>> DiG 9.11.5-P4-5.1+deb10u5-Debian <<>> @d.root-servers.net ipads.se.sjtu.edu.cn +norecurse
; (2 servers found)
;; global options: +cmd
;; Got answer:
;; ->>HEADER<<- opcode: QUERY, status: NOERROR, id: 41896
;; flags: qr; QUERY: 1, ANSWER: 0, AUTHORITY: 8, ADDITIONAL: 11

;; OPT PSEUDOSECTION:
; EDNS: version: 0, flags:; udp: 1232
; COOKIE: 3baf0405a4f3b5e27de45d1a61b352985b9cd51043461315 (good)
;; QUESTION SECTION:
;ipads.se.sjtu.edu.cn.          IN      A

;; AUTHORITY SECTION:
cn.          172800 IN      NS      g.dns.cn.
cn.          172800 IN      NS      a.dns.cn.
cn.          172800 IN      NS      f.dns.cn.
cn.          172800 IN      NS      d.dns.cn.
cn.          172800 IN      NS      ns.cernet.net.
cn.          172800 IN      NS      c.dns.cn.
cn.          172800 IN      NS      e.dns.cn.
cn.          172800 IN      NS      b.dns.cn.

;; ADDITIONAL SECTION:
a.dns.cn.    172800 IN      A        203.119.25.1
b.dns.cn.    172800 IN      A        203.119.26.1
c.dns.cn.    172800 IN      A        203.119.27.1
d.dns.cn.    172800 IN      A        203.119.28.1
e.dns.cn.    172800 IN      A        203.119.29.1
f.dns.cn.    172800 IN      A        195.219.8.90
g.dns.cn.    172800 IN      A        66.198.183.65
ns.cernet.net. 172800 IN      A        202.112.0.44
a.dns.cn.    172800 IN      AAAA     2001:dc7::1
d.dns.cn.    172800 IN      AAAA     2001:dc7:1000::1

;; Query time: 29 msec
;; SERVER: 199.7.91.13#53(199.7.91.13)
;; WHEN: Fri Dec 10 08:14:00 EST 2021
;; MSG SIZE rcvd: 404
```

```
dig @g.dns.cn ipads.se.sjtu.edu.cn +norecurse
```

```

zengyuxin@zeng:~$ dig @g.dns.cn ipads.se.sjtu.edu.cn +norecurse

; <<>> DiG 9.11.5-P4-5.1+deb10u5-Debian <<>> @g.dns.cn ipads.se.sjtu.edu.cn +norecurse
; (1 server found)
;; global options: +cmd
;; Got answer:
;; ->>HEADER<<- opcode: QUERY, status: NOERROR, id: 50038
;; flags: qr; QUERY: 1, ANSWER: 0, AUTHORITY: 5, ADDITIONAL: 5

;; OPT PSEUDOSECTION:
; EDNS: version: 0, flags:; udp: 4096
;; QUESTION SECTION:
;ipads.se.sjtu.edu.cn.          IN      A

;; AUTHORITY SECTION:
edu.cn.          172800 IN      NS      ns2.cuhk.hk.
edu.cn.          172800 IN      NS      dns2.edu.cn.
edu.cn.          172800 IN      NS      ns2.cernet.net.
edu.cn.          172800 IN      NS      deneb.dfn.de.
edu.cn.          172800 IN      NS      dns.edu.cn.

;; ADDITIONAL SECTION:
dns.edu.cn.      172800 IN      A        202.38.109.35
dns2.edu.cn.     172800 IN      A        202.112.0.13
dns.edu.cn.      172800 IN      AAAA     2001:250:c006::35
dns2.edu.cn.     172800 IN      AAAA     2001:da8:1:100::13

;; Query time: 444 msec
;; SERVER: 66.198.183.65#53(66.198.183.65)
;; WHEN: Fri Dec 10 08:16:07 EST 2021
;; MSG SIZE rcvd: 253

```

```
dig @dns.edu.cn ipads.se.sjtu.edu.cn +norecurse
```

```

zengyuxin@zeng:~$ dig @dns.edu.cn ipads.se.sjtu.edu.cn +norecurse

; <<>> DiG 9.11.5-P4-5.1+deb10u5-Debian <<>> @dns.edu.cn ipads.se.sjtu.edu.cn +norecurse
; (2 servers found)
;; global options: +cmd
;; Got answer:
;; ->>HEADER<<- opcode: QUERY, status: NOERROR, id: 4605
;; flags: qr; QUERY: 1, ANSWER: 0, AUTHORITY: 2, ADDITIONAL: 5

;; OPT PSEUDOSECTION:
; EDNS: version: 0, flags:; udp: 4096
; COOKIE: 9b5903ee235358afdd4b028d61b3534bda07ebe6720fe56c (good)
;; QUESTION SECTION:
;ipads.se.sjtu.edu.cn.          IN      A

;; AUTHORITY SECTION:
sjtu.edu.cn.      172800 IN      NS      dns.sjtu.edu.cn.
sjtu.edu.cn.      172800 IN      NS      apple.sjtu.edu.cn.

;; ADDITIONAL SECTION:
apple.sjtu.edu.cn. 172800 IN      A        202.112.26.43
dns.sjtu.edu.cn.   172800 IN      A        202.120.2.90
apple.sjtu.edu.cn. 172800 IN      AAAA     2001:da8:8000:6180:150:112:26:43
dns.sjtu.edu.cn.   172800 IN      AAAA     2001:da8:8000:1:202:120:2:90

;; Query time: 29 msec
;; SERVER: 202.38.109.35#53(202.38.109.35)
;; WHEN: Fri Dec 10 08:16:59 EST 2021
;; MSG SIZE rcvd: 214

```

```
dig @dns.sjtu.edu.cn ipads.se.sjtu.edu.cn +norecurse
```

```

zengyuxin@zeng:~$ dig @dns.sjtu.edu.cn ipads.se.sjtu.edu.cn +norecurse
; <<>> DiG 9.11.5-P4-5.1+deb10u5-Debian <<>> @dns.sjtu.edu.cn ipads.se.sjtu.edu.cn +norecurse
; (2 servers found)
;; global options: +cmd
;; Got answer:
;; ->>HEADER<<- opcode: QUERY, status: NOERROR, id: 25314
;; flags: qr; QUERY: 1, ANSWER: 0, AUTHORITY: 1, ADDITIONAL: 2

;; OPT PSEUDOSECTION:
; EDNS: version: 0, flags:; udp: 4096
;; QUESTION SECTION:
;ipads.se.sjtu.edu.cn.          IN      A

;; AUTHORITY SECTION:
se.sjtu.edu.cn.                3600    IN      NS      seserver.se.sjtu.edu.cn.

;; ADDITIONAL SECTION:
seserver.se.sjtu.edu.cn. 3600    IN      A        202.120.40.2

;; Query time: 3 msec
;; SERVER: 202.120.2.90#53(202.120.2.90)
;; WHEN: Fri Dec 10 08:18:05 EST 2021
;; MSG SIZE rcvd: 88

```

```
dig @202.120.40.2 ipads.se.sjtu.edu.cn +norecurse
```

```

zengyuxin@zeng:~$ dig @202.120.40.2 ipads.se.sjtu.edu.cn +norecurse
; <<>> DiG 9.11.5-P4-5.1+deb10u5-Debian <<>> @202.120.40.2 ipads.se.sjtu.edu.cn +norecurse
; (1 server found)
;; global options: +cmd
;; Got answer:
;; ->>HEADER<<- opcode: QUERY, status: NOERROR, id: 62364
;; flags: qr aa; QUERY: 1, ANSWER: 1, AUTHORITY: 0, ADDITIONAL: 1

;; OPT PSEUDOSECTION:
; EDNS: version: 0, flags:; udp: 4000
;; QUESTION SECTION:
;ipads.se.sjtu.edu.cn.          IN      A

;; ANSWER SECTION:
ipads.se.sjtu.edu.cn.          3600    IN      A        202.120.40.85

;; Query time: 4 msec
;; SERVER: 202.120.40.2#53(202.120.40.2)
;; WHEN: Fri Dec 10 08:21:29 EST 2021
;; MSG SIZE rcvd: 65

```

这一步可以找到 `ipads.se.sjtu.edu.cn` 的IP地址，即 `202.120.40.85`。

找到这个IP地址需要经过六次查询，使用的命令序列如上所示。

Q4: Did the default server have the answer in its cache? How do you know?

采用 `docsmall.com` 进行测试。用

```
dig docsmall.com
```

命令进行IP解析，可以看到第一次查询用时远高于第二次的用时，说明default server中有缓存。

第一次查询：

```

zengyuxin@zeng:~$ dig docsmall.com

; <<>> DiG 9.11.5-P4-5.1+deb10u5-Debian <<>> docsmall.com
;; global options: +cmd
;; Got answer:
;; ->>HEADER<<- opcode: QUERY, status: NOERROR, id: 10004
;; flags: qr rd ra; QUERY: 1, ANSWER: 1, AUTHORITY: 0, ADDITIONAL:
;
;; OPT PSEUDOSECTION:
; EDNS: version: 0, flags:; MBZ: 0x0005, udp: 4096
;; QUESTION SECTION:
;docsmall.com.                IN      A

;; ANSWER SECTION:
docsmall.com.                5        IN      A      101.37.152.214

;; Query time: 210 msec
;; SERVER: 192.168.228.2#53(192.168.228.2)
;; WHEN: Fri Dec 10 07:45:15 EST 2021
;; MSG SIZE rcvd: 57

```

第二次查询:

```

zengyuxin@zeng:~$ dig docsmall.com

; <<>> DiG 9.11.5-P4-5.1+deb10u5-Debian <<>> docsmall.com
;; global options: +cmd
;; Got answer:
;; ->>HEADER<<- opcode: QUERY, status: NOERROR, id: 37198
;; flags: qr rd ra; QUERY: 1, ANSWER: 1, AUTHORITY: 0, ADDITIONAL: 1
;
;; OPT PSEUDOSECTION:
; EDNS: version: 0, flags:; MBZ: 0x0005, udp: 4096
;; QUESTION SECTION:
;docsmall.com.                IN      A

;; ANSWER SECTION:
docsmall.com.                5        IN      A      101.37.152.214

;; Query time: 4 msec
;; SERVER: 192.168.228.2#53(192.168.228.2)
;; WHEN: Fri Dec 10 07:45:20 EST 2021
;; MSG SIZE rcvd: 57

```