

## COMP 3203 Assignment 2

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1.

- a. In the example in the textbook (page 120), we saw that when the client sends a line consisting of a single period, it indicates the end of the message to the server.

```
S: 220 hamburger.edu
C: HELO crepes.fr
S: 250 Hello crepes.fr, pleased to meet you
C: MAIL FROM: <alice@crepes.fr>
S: 250 alice@crepes.fr ... Sender ok
C: RCPT TO: <bob@hamburger.edu>
S: 250 bob@hamburger.edu ... Recipient ok
C: DATA
S: 354 Enter mail, end with "." on a line by
itself
C: Do you like ketchup?
C: How about pickles?
C: .
S: 250 Message accepted for delivery
C: QUIT
S: 221 hamburger.edu closing connection
```

- b. The HTTP uses the Content Length header field to indicate length of a header field

```
HTTP/1.1 200 OK
Connection: close
Date: Tue, 18 Aug 2015 15:44:04 GMT
Server: Apache/2.2.3 (CentOS)
Last-Modified: Tue, 18 Aug 2015 15:11:03 GMT
Content-Length: 6821
Content-Type: text/html
```

(data data data data data ...)

- c. No, since HTTP messages could be binary data (since they are more efficient to parse and leads to slightly smaller frames and are less error prone) whereas in SMTP the message body must be in ASCII format. Therefore we cannot use the same method for HTTP and SMTP to mark the end of a message body.

2.

a. Delegation chain for cisl.carleton.ca

Command 1: dig +trace cisl.carleton.ca

```
C:\Users\nirmi>dig +trace cisl.carleton.ca

; <>> DiG 9.16.25 <>> +trace cisl.carleton.ca
;; global options: +cmd
.          338523  IN      NS      f.root-servers.net.
.          338523  IN      NS      j.root-servers.net.
.          338523  IN      NS      c.root-servers.net.
.          338523  IN      NS      a.root-servers.net.
.          338523  IN      NS      b.root-servers.net.
.          338523  IN      NS      d.root-servers.net.
.          338523  IN      NS      l.root-servers.net.
.          338523  IN      NS      e.root-servers.net.
.          338523  IN      NS      k.root-servers.net.
.          338523  IN      NS      h.root-servers.net.
.          338523  IN      NS      m.root-servers.net.
.          338523  IN      NS      g.root-servers.net.
.          338523  IN      NS      i.root-servers.net.
.          338523  IN      RRSIG  NS 8 0 518400 20220225170000 20220212160000 9799 . W3Wpzu808LP1zBYUpt
m7X36eE8usDH0TzYpqp0AKKZ/QLJY+JEy+w3TB xy4KEsp2kNAhykskaHh9Wt10ACRqAZMcIkIMSi6+Xwlqz459osbnx2RB 020iL9Qbu0edgKTnmw+6A
9FfVL9k83eyh0/lzmsgtuQKhYjZd6c6WF4h P0ekCMJ+mMcrtW4dwyMp3iYxeT0UIV0fPCZnTdf8fuhqoVUb4uMeg+Vh yhPGYj2WrTAY/zPdpiQG6CQN
DHqyZc0wiwBTZlj+7u9oRdWSXc46PUGK 1LTepDVnFCxhw0jR4n1MTC/iNkQpbGE003WwvrURbwaCcCFMZppaM84 up4FyA==
;; Received 1097 bytes from 192.168.2.1#53(192.168.2.1) in 11 ms

ca.          172800  IN      NS      any.ca-servers.ca.
ca.          172800  IN      NS      x.ca-servers.ca.
ca.          172800  IN      NS      c.ca-servers.ca.
ca.          172800  IN      NS      j.ca-servers.ca.
ca.          86400  IN      DS      48662 8 2 B88605073AE242E4917A795ADA1EAC2580C0FA9D622B228926FECB40 8B
41C3F9
ca.          86400  IN      RRSIG  DS 8 1 86400 20220225170000 20220212160000 9799 . TN1xJxa2p+MVZdSX7yL
XkqQ/1zilYm1fV0cSMYFH6BAGEUhiEx40gEb ONU0PiPoq2s4tRhKYsfis9xyvLT0LDZBU57zv02Q806nyIdfXUk/84EX pa1QVEq6SsMvgD9Iy//v9T
dSvb++ytaMVEP9xqgaHU5N/AI1yrkIOUBy nIyEQcwX0ED/izYAXkYlTlWShGho8BPWwMVAUFOL8J+MCMxe5/0fQRO qeWgs0q8tUnJwvFeHb4NM1UxK
Mr0f5Pe4qYBlFSxaB9g6CQ6iWp+A7pd enPe+N6U1GwC8UK4A18c3kVy3D8cBivhvGJ2026S3p40I1F08HsgGv9R VGPZ+Q==
;; Received 633 bytes from 198.41.0.4#53(a.root-servers.net) in 28 ms

carleton.ca. 86400  IN      NS      ns1.d-zone.ca.
carleton.ca. 86400  IN      NS      ns1.carleton.ca.
carleton.ca. 86400  IN      NS      ns2.d-zone.ca.
carleton.ca. 86400  IN      NS      ns2.carleton.ca.
t8k75i4tj36jf102o518ir5q4l99kmqm.ca. 3600 IN NSEC3 1 1 5 - T8M1UC6TIL2UFI0RBGM0I9U6P09HL5UU NS SOA RRSIG DNSKEY NSEC3
PARAM
74g25r787jg24qikgb8mhamfr9119vbb.ca. 3600 IN NSEC3 1 1 5 - 74H3D7D6SLM6868R1FBAI0Q9K9PQ3G26 NS DS RRSIG
t8k75i4tj36jf102o518ir5q4l99kmqm.ca. 3600 IN RRSIG NSEC3 8 2 3600 20220217133029 20220210162833 44701 ca. cEoD3Ve3ImA
4EWuV4oXqtDXPyM1JjCWsTQ1ZK1/wSLMTs68paI0mvDwN WhtvHJWPEUJlxi7J2Z2DYj4gxy86SMcbjzHnN1TeMQd7i1XmZNn3yZ3 OHCNg1ZTewBrNm
Hjmya4G+Jqvfbxsay6PQUg74EJN/mUkGvTsLfRHVsR bFQ=
74g25r787jg24qikgb8mhamfr9119vbb.ca. 3600 IN RRSIG NSEC3 8 2 3600 20220217061527 20220210162833 44701 ca. J/B5YBmTofA
ov8x9d1IvELFGcI9CPGIBlV1qsClUWCac3Aa4TVgNvASF AQ26xx86Q0fs404imptlWAr69seUicJ503tPJLS088P9MXR1Hb8UUHQk tgGW9fBalg2aLK
pHngX00Fb0kn9dFMR1MO+mbyMzFGe4w5Qt3oQ5dx2h K/c=
;; Received 752 bytes from 199.4.144.2#53(any.ca-servers.ca) in 18 ms

cisl.carleton.ca. 14400  IN      A      134.117.225.9
;; Received 89 bytes from 134.117.253.195#53(ns1.carleton.ca) in 17 ms
```

I will be using the following for the commands

f.root-servers.net

x.ca-servers.ca

ns1.carleton.ca

Second command: dig +norecurse @a.root-servers.net any cisl.carleton.ca

```
;; AUTHORITY SECTION:
ca. 172800 IN NS any.ca-servers.ca.
ca. 172800 IN NS x.ca-servers.ca.
ca. 172800 IN NS c.ca-servers.ca.
ca. 172800 IN NS j.ca-servers.ca.

;; ADDITIONAL SECTION:
any.ca-servers.ca. 172800 IN A 199.4.144.2
any.ca-servers.ca. 172800 IN AAAA 2001:500:a7::2
x.ca-servers.ca. 172800 IN A 199.253.250.68
x.ca-servers.ca. 172800 IN AAAA 2620:10a:80ba::68
c.ca-servers.ca. 172800 IN A 185.159.196.2
c.ca-servers.ca. 172800 IN AAAA 2620:10a:8053::2
j.ca-servers.ca. 172800 IN A 198.182.167.1
j.ca-servers.ca. 172800 IN AAAA 2001:500:83::1
```

Third Command: dig +norecurse @c.ca-servers.ca any cisl.carleton.ca

```
;; AUTHORITY SECTION:
carleton.ca. 86400 IN NS ns1.d-zone.ca.
carleton.ca. 86400 IN NS ns1.carleton.ca.
carleton.ca. 86400 IN NS ns2.d-zone.ca.
carleton.ca. 86400 IN NS ns2.carleton.ca.

;; ADDITIONAL SECTION:
ns1.carleton.ca. 86400 IN A 134.117.253.195
ns2.carleton.ca. 86400 IN A 134.117.253.196
ns1.d-zone.ca. 86400 IN A 162.219.54.2
ns1.d-zone.ca. 86400 IN AAAA 2620:10a:80eb::2
ns2.d-zone.ca. 86400 IN A 162.219.55.2
ns2.d-zone.ca. 86400 IN AAAA 2620:10a:80ec::2
```

Fourth Command: dig +norecurse @ns1.carleton.ca any cisl.carleton.ca

```
; <<>> DiG 9.16.25 <<>> +norecurse @ns1.carleton.ca any cisl.carleton.ca
; (1 server found)
;; global options: +cmd
;; Got answer:
;; ->HEADER<- opcode: QUERY, status: NOERROR, id: 53868
;; flags: qr aa; QUERY: 1, ANSWER: 5, AUTHORITY: 0, ADDITIONAL: 1

;; OPT PSEUDOSECTION:
; EDNS: version: 0, flags:; udp: 4096
; COOKIE: 5d592ac2f53dea9f85df07786208565b506e7622796da080 (good)
;; QUESTION SECTION:
;cisl.carleton.ca. IN ANY

;; ANSWER SECTION:
cisl.carleton.ca. 14400 IN NS ns1.carleton.ca.
cisl.carleton.ca. 14400 IN NS mario.ccs1.carleton.ca.
cisl.carleton.ca. 14400 IN NS zelda.ccs1.carleton.ca.
cisl.carleton.ca. 14400 IN A 134.117.225.9
cisl.carleton.ca. 14400 IN SOA mario.ccs1.carleton.ca. admin.ccs1.carleton.ca. 2021110502 3600 3600 1209600 3600

;; Query time: 15 msec
;; SERVER: 134.117.253.195#53(134.117.253.195)
;; WHEN: Sat Feb 12 19:52:44 Eastern Standard Time 2022
;; MSG SIZE rcvd: 194
```

From here we get the IP address to be 134.117.225.9

b. Running the dig command for stem.open.ac.uk we get

```
C:\Users\nirmal>dig +trace stem.open.ac.uk

;<<> Dig 0.16.25 <<> +trace stem.open.ac.uk
;; global options: +cmd

303625 IN NS d.root-servers.net.
303625 IN NS a.root-servers.net.
303625 IN NS b.root-servers.net.
303625 IN NS k.root-servers.net.
303625 IN NS h.root-servers.net.
303625 IN NS l.root-servers.net.
303625 IN NS j.root-servers.net.
303625 IN NS g.root-servers.net.
303625 IN NS i.root-servers.net.
303625 IN NS c.root-servers.net.
303625 IN NS e.root-servers.net.
303625 IN NS a.root-servers.net.
303625 IN NS f.root-servers.net.
303625 IN RRSIG NS 8 0 518400 20220225220000 20220212210000 9799 . nH5vm455j7Q+voXuag8B6NRcVhK7XNR6YDzDUINDt/YR3nd6FoZAE5 gF8CutE86149K4+Hwv6jgAPz1vPKIZdfu38lVd00JHSVrhqvhd8JfC DNRW6X13z0gH07gllz8n3w
SpHQ1ZuVqtdA134HweeX07/yosf12Up0 ysvf1lNIEZANPV47FrGhrfjdyErpHTBUuQw1lhxa+mS5ShnQNZ0741 1Q3Uu+we+kiBi0BPuIRh2f8RvP5T3H22o69H+Uw+QkTADPF51QeBUtt qdUsxtHuCTu24nky58K1gLDu5beQ2TF1890vZvdceE+FUvGx0Th0v14 4B4H1A==
;; Received 1097 bytes from 192.168.2.1#53(192.168.2.1) in 11 ms

uk. 172800 IN NS nsa.nic.uk.
uk. 172800 IN NS nsb.nic.uk.
uk. 172800 IN NS nsc.nic.uk.
uk. 172800 IN NS nsd.nic.uk.
uk. 172800 IN NS dns1.nic.uk.
uk. 172800 IN NS dns2.nic.uk.
uk. 172800 IN NS dns3.nic.uk.
uk. 172800 IN NS dns4.nic.uk.
uk. 86400 IN DS 43876 8 2 A187ED02AC18D140924173BC7E827A1153582072394F92728A37E2353 BC659603
uk. 86400 IN RRSIG DS 8 1 86400 20220225220000 20220212210000 9799 . Q8/37166w7eMhMCHQ2ruX2kLtkw07N10h30/CXJ060c21pP/Sz/b9vs fy1g/FYbhs1wJeddcn1ch3X73q8ZImfhZS8Qctbn074ao74HXfZJ7DH n1UcKSAB88rc2V93VuQn1J3Rs
13h1j+frEes+edE1d05RZm5jpx17qm 9/91YkL13+OHFntMkAPMDjpxFEwa+03K65q37J1C29RF-rj/V/ZEBSa ouZvq5X+psCF+jg585M1Cin6/4828xAcBTHvXZC8BrUv9rgfZrmQgm UZvcTYCzrJK91UG693FWtXLaH0Ky1y6ADUZtc7595DcUmUqZT0YVKSX q1a/eQ==
;; Received 883 bytes from 199.7.91.13#53(d.root-servers.net) in 46 ms

ac.uk. 172800 IN NS auth03.ns.uu.net.
ac.uk. 172800 IN NS ns0.ja.net.
ac.uk. 172800 IN NS ns2.ja.net.
ac.uk. 172800 IN NS ns1.surfnet.nl.
ac.uk. 172800 IN NS ns3.ja.net.
ac.uk. 172800 IN NS ns4.ja.net.
ac.uk. 172800 IN NS dns-3.dfn.de.
ac.uk. 300 IN DS 45874 8 2 A1DC3AF78C8BF46CF074F68ESEC1C0B8C19A40891FF54C78ABD0389 9CDA902F
ac.uk. 300 IN RRSIG DS 8 2 300 20220226125158 20220212125142 43056 uk. hAbbk1Ah9tbf1Rf1rYH0q18tK+r/arm2Z7k1kFTR6Bv6A4JcmYh1sA xdEtEg1Ie/nly1cpo7KE0X2Z0VopG5hmzrdDacIVR1J3KpGx1PezyU hxx48AST73tnBqalN0Ypr6jff
P/jyX14zn480OC1o3652px8M0uJddF 1Wg+
;; Received 449 bytes from 156.154.100.3#53(nsa.nic.uk) in 28 ms

open.ac.uk. 86400 IN NS dns1.easydns.com.
open.ac.uk. 86400 IN NS nse-0.open.ac.uk.
open.ac.uk. 86400 IN NS ns8.dnsmadeeasy.com.
open.ac.uk. 86400 IN NS ns5.dnsmadeeasy.com.
open.ac.uk. 86400 IN NS nse-1.open.ac.uk.
open.ac.uk. 86400 IN NS ns7.dnsmadeeasy.com.
open.ac.uk. 86400 IN NS dns3.easydns.org.
open.ac.uk. 86400 IN NS dns2.easydns.net.
open.ac.uk. 86400 IN NS nse-2.open.ac.uk.
1VL4LGD81EC321LDH315KG7HFA3A2SSR.ac.uk. 14400 IN NSEC3 1 0 10 - 1VQH6G78EP38RG91VRJLGNCDLQ568P0 NS
1VL4LGD81EC321LDH315KG7HFA3A2SSR.ac.uk. 14400 IN RRSIG NSEC3 8 3 14400 20220314090712 20220212090712 15465 ac.uk. buqGxW132OR3mrVvbdaf/1fW1xxYmaRSUs0230+NZKwXyxe8mx2ps6ex ev2wnyQldx8XU8QoVpMGNEmPm0kpp9kuCsg518peoJ8QCdr88/VahLE3 jysk/jJE
Hf5pRfWfgab6Kvmla3UDngfCE58ncvIRE+u051V1H0R01 10C=
;; Received 575 bytes from 193.62.157.66#53(ns4.ja.net) in 106 ms

stem.open.ac.uk. 3600 IN A 137.108.200.32
```

We will use the following delegation chain for getting the site IP address

d.root-servers.net

nsa.nic.uk

ns0.ja.net

dns2.easydns.net

Second Command: dig +norecurse @a.root-servers.net any stem.open.ac.uk

```
;; AUTHORITY SECTION:
uk.          172800  IN      NS      dns1.nic.uk.
uk.          172800  IN      NS      dns4.nic.uk.
uk.          172800  IN      NS      nsa.nic.uk.
uk.          172800  IN      NS      nsd.nic.uk.
uk.          172800  IN      NS      nsc.nic.uk.
uk.          172800  IN      NS      nsb.nic.uk.
uk.          172800  IN      NS      dns3.nic.uk.
uk.          172800  IN      NS      dns2.nic.uk.

;; ADDITIONAL SECTION:
dns1.nic.uk. 172800  IN      A       213.248.216.1
dns1.nic.uk. 172800  IN      AAAA    2a01:618:400::1
dns4.nic.uk. 172800  IN      A       43.230.48.1
dns4.nic.uk. 172800  IN      AAAA    2401:fd80:404::1
nsa.nic.uk.   172800  IN      A       156.154.100.3
nsa.nic.uk.   172800  IN      AAAA    2001:502:ad09::3
nsd.nic.uk.   172800  IN      A       156.154.103.3
nsd.nic.uk.   172800  IN      AAAA    2610:a1:1010::3
nsc.nic.uk.   172800  IN      A       156.154.102.3
nsc.nic.uk.   172800  IN      AAAA    2610:a1:1009::3
nsb.nic.uk.   172800  IN      A       156.154.101.3
nsb.nic.uk.   172800  IN      AAAA    2001:502:2eda::3
dns3.nic.uk.  172800  IN      A       213.248.220.1
dns3.nic.uk.  172800  IN      AAAA    2a01:618:404::1
dns2.nic.uk.  172800  IN      A       103.49.80.1
dns2.nic.uk.  172800  IN      AAAA    2401:fd80:400::1
```

Third Command: dig +norecurse @nsa.nic.uk any stem.open.ac.uk

```
;; AUTHORITY SECTION:
ac.uk.       172800  IN      NS      ns3.ja.net.
ac.uk.       172800  IN      NS      ns1.surfnet.nl.
ac.uk.       172800  IN      NS      ns0.ja.net.
ac.uk.       172800  IN      NS      dns-3.dfn.de.
ac.uk.       172800  IN      NS      ns4.ja.net.
ac.uk.       172800  IN      NS      ns2.ja.net.
ac.uk.       172800  IN      NS      auth03.ns.uu.net.
```

Fourth Command: dig +norecurse @ns0.ja.net any stem.open.ac.uk

```
;; AUTHORITY SECTION:
open.ac.uk.      86400    IN       NS       ns5.dnsmadeeasy.com.
open.ac.uk.      86400    IN       NS       dns1.easydns.com.
open.ac.uk.      86400    IN       NS       nse-2.open.ac.uk.
open.ac.uk.      86400    IN       NS       nse-1.open.ac.uk.
open.ac.uk.      86400    IN       NS       ns7.dnsmadeeasy.com.
open.ac.uk.      86400    IN       NS       ns6.dnsmadeeasy.com.
open.ac.uk.      86400    IN       NS       dns3.easydns.org.
open.ac.uk.      86400    IN       NS       dns2.easydns.net.
open.ac.uk.      86400    IN       NS       nse-0.open.ac.uk.

;; ADDITIONAL SECTION:
nse-0.open.ac.uk. 86400    IN       A        137.108.198.108
nse-1.open.ac.uk. 86400    IN       A        137.108.198.109
nse-2.open.ac.uk. 86400    IN       A        137.108.198.110
```

Fifth Command: dig +norecurse @dns2.easydns.net any stem.open.ac.uk

```
;; ANSWER SECTION:
stem.open.ac.uk.  3600     IN       A        137.108.200.32
```

The IP address is 137.108.200.32