

CMPT371 - D100

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- 1.a) $1.0 \times 10^9 \text{ bps} / 450 \times 10^6 \text{ bps} = 1000/450 \approx 2$
Maximum of 2 users

$450 \times 2 / 1000 = 90\%$ of bandwidth used with 2 users. Though users only transmitting 20% of the time, circuit switching requires the link to be reserved

- 1.b) $5 \times 2 = 10$ users
 $(10 \text{ choose } 0)(0.2^0)(0.8^{10}) + (10 \text{ choose } 1)(0.2^1)(0.8^9) + (10 \text{ choose } 2)(0.2^2)(0.8^8) \approx 67.7\%$

- 1.c) $(10 \text{ choose } 8)(0.2^8)(0.8^2) + (10 \text{ choose } 9)(0.2^9)(0.8^1) + (10 \text{ choose } 10)(0.2^{10})(0.8^0) \approx 0.0\%$

- 2.a) www.sfu.ca (BC, Canada) - see below (page 10) for traceroute data

21:30 16.750ms 10.889ms 11.029ms 16 hops

22:30 9.827ms 10.011ms 9.557ms 16 hops

23:30 25.298ms 24.739ms 24.682ms 16 hops

$u = \text{Mean} = (16.750 + 10.889 + 11.029 + 9.827 + 10.011 + 9.557 + 25.298 + 24.739 + 24.682) / 9$

$u = 15.865$

$s = \text{Standard deviation} = \sqrt{\sum (x_i - u)^2 / N}$ $*i = 1, n = N$ in \sum

$s = 6.708$

- 2.b) 16 routers in the path, no change between the hour separated tests

- 2.c) 7 different ISPs, delays do not seem to be between adjacent ISPs, but at specific routers that may be experiencing higher levels of traffic compared to others

- 2.d) www.scene.org (Rotterdam, Netherlands) - see below for traceroute data

21:30 162ms 161.883ms 164.499ms 11 hops

22:30 165.547ms 164.764ms 162.201ms 11 hops

23:30 163.764ms 163.974ms 163.716ms 11 hops

$u = \text{Mean} = ($

$162 + 161.883 + 164.499 + 165.547 + 164.764 + 162.201 + 163.974 + 163.974 + 163.716) / 9$

$u = 163.618$

$s = \text{Standard deviation} = \sqrt{\sum (x_i - u)^2 / N}$ $*i = 1, n = N$ in \sum

$s = 1.234$

11 routers in the path, no change between the hour separated tests

6 different ISPs, delays do not seem to be between adjacent ISPs, but at specific routers that may be experiencing higher levels of traffic compared to others

- 3.a) Bandwidth-delay product (BDP) = $100 \times 10^6 \text{ bps} \times 12 \times 10^3 \text{ km} / 2.0 \times 10^5 \text{ km/s}$

$\text{BDP} = 100 \times 10^6 \text{ bps} \times 6 \times 10^{-2} \text{ sec} = 6 \text{ megabits}$

- 3.b) 5 megabits since the file size is less than the bandwidth-delay product

- 3.c) The maximum amount of unacknowledged bits, that is the maximum number of bits in the link at any given time
- 3.d) Length of link/BDP = $12 \times 10^3 \text{ km} / 12 \times 10^6 \text{ bits} = 12 \times 10^{-3} \text{ kmpb} = 12 \text{ meters per bit}$
- 3.e) Propagation speed = s , transmission rate = R , length of the link = m , width of bit = w
 $m / m \cdot R / s = w$
 $s / R = w$
- 3.f) When $s / R = m$, the width of a bit is equal to the length of a link
- 4.a) Dedicated transmission rate = $1.0 \times 10^6 / 3 = (1/3) \times 10^6$
File size = $4 \text{ MB} = 4.0 \times 10^6 * 8 = 32 \times 10^6 \text{ bits}$
 $32 \times 10^6 \text{ bits} / (1/3) \times 10^6 \text{ bps} = 96 \text{ seconds} = 96,000 \text{ ms}$
- 4.b) $n = \text{file size} + \text{header size} = 0 + 4.0 \times 10^6 * 8 = 32 \times 10^6 \text{ bits}$
 $R = \text{transmission rate} = 1.0 \times 10^6 \text{ bps}$
 $B = \text{propagation delay} = 1.0 \times 10^{-3} \text{ sec}$
 $e = \text{processing delay} = 0$
 $P = \text{number of packets of size } n/P$
 $l = \text{links} = 3$
 $T_{ms} = \text{Total time of transmission}$
 $X = \text{number of packets that minimizes } T_{ms}$
- $X = \sqrt{(l-1)n / RB}$
 $X = \sqrt{(3-1) * (32.0 \times 10^6) / (1.0 \times 10^6 * 1.0 \times 10^{-3})} = \sqrt{64.0 \times 10^6 / 1.0 \times 10^3}$
 $= \sqrt{64.0 \times 10^3} \approx 252.98 \approx 253 \text{ packets}$
- 5.a) Pipelining a request means a client may send multiple requests without waiting for each response. A server must send its responses to the requests in the same order that the requests were received.
- 5.b) HTTP/1.1, like any generic data transfer protocol cannot regulate the content of the data that is transferred
- 5.c) Proxy caching using conditional GET reduces unnecessary network usage by allowing cached entities to be refreshed without requiring multiple requests or transferring data already held by the client.
It is not always necessary for a proxy cache to contact an origin server when a client requests an object. If the proxy cache holds the object that had been retrieved recently, it may not need to make a request to the origin server.
- 5.d) A client may request a non-persistent connection by using a keyword "Connection: close"

6. **IP address of SFU webserver: ns3.sfu.ca, 142.58.190.2**

- **aa flag set on @ns3.sfu.ca dig**

```
(base) justin@justin-MS-7A62:~$ dig @a.root-servers.net www.sfu.ca
; <<>> DiG 9.11.3-1ubuntu1.8-Ubuntu <<>> @a.root-servers.net www.sfu.ca
; (2 servers found)
;; global options: +cmd
;; Got answer:
;; ->>HEADER<<- opcode: QUERY, status: NOERROR, id: 13962
;; flags: qr rd; QUERY: 1, ANSWER: 0, AUTHORITY: 4, ADDITIONAL: 9
;; WARNING: recursion requested but not available
```

```
;; OPT PSEUDOSECTION:
; EDNS: version: 0, flags:; udp: 4096
;; QUESTION SECTION:
;www.sfu.ca.          IN  A
```

```
;; 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
```

```
;; Query time: 35 msec
;; SERVER: 2001:503:ba3e::2:30#53(2001:503:ba3e::2:30)
;; WHEN: Fri Sep 27 12:04:37 PDT 2019
;; MSG SIZE rcvd: 292
```

```
(base) justin@justin-MS-7A62:~$ dig @any.ca-servers.ca www.sfu.ca
; <<>> DiG 9.11.3-1ubuntu1.8-Ubuntu <<>> @any.ca-servers.ca www.sfu.ca
; (2 servers found)
;; global options: +cmd
;; Got answer:
;; ->>HEADER<<- opcode: QUERY, status: NOERROR, id: 18871
;; flags: qr rd; QUERY: 1, ANSWER: 0, AUTHORITY: 3, ADDITIONAL: 4
```

:: WARNING: recursion requested but not available

:: OPT PSEUDOSECTION:
; EDNS: version: 0, flags::; udp: 4096
; COOKIE: 2edc8b03ce3a4f8fd6f5562d5d8e5d5cd12e21175f9d34ba (good)
:: QUESTION SECTION:
;www.sfu.ca. IN A

:: AUTHORITY SECTION:
sfu.ca. 86400 IN NS ns3.sfu.ca.
sfu.ca. 86400 IN NS ns2.sfu.ca.
sfu.ca. 86400 IN NS whistler.sfu.ca.

:: ADDITIONAL SECTION:
whistler.sfu.ca. 86400 IN A 142.58.103.1
ns3.sfu.ca. 86400 IN A 142.58.190.2
ns2.sfu.ca. 86400 IN A 142.58.103.2

:: Query time: 20 msec
:: SERVER: 2001:500:a7::2#53(2001:500:a7::2)
:: WHEN: Fri Sep 27 12:05:00 PDT 2019
:: MSG SIZE rcvd: 174

(base) justin@justin-MS-7A62:~\$ dig @ns3.sfu.ca www.sfu.ca

; <<>> DiG 9.11.3-1ubuntu1.8-Ubuntu <<>> @ns3.sfu.ca www.sfu.ca
; (1 server found)
;; global options: +cmd
;; Got answer:
;; ->>HEADER<<- opcode: QUERY, status: NOERROR, id: 16181
;; flags: qr aa rd; QUERY: 1, ANSWER: 1, AUTHORITY: 3, ADDITIONAL: 4
;; WARNING: recursion requested but not available

:: OPT PSEUDOSECTION:
; EDNS: version: 0, flags::; udp: 4096
:: QUESTION SECTION:
;www.sfu.ca. IN A

:: ANSWER SECTION:
www.sfu.ca. 300 IN A 142.58.102.68

:: AUTHORITY SECTION:
sfu.ca. 300 IN NS ns2.sfu.ca.

```
sfu.ca.      300  IN  NS  whistler.sfu.ca.
sfu.ca.      300  IN  NS  ns3.sfu.ca.
```

```
:: ADDITIONAL SECTION:
```

```
whistler.sfu.ca. 300  IN  A  142.58.103.1
ns3.sfu.ca.     300  IN  A  142.58.190.2
ns2.sfu.ca.     300  IN  A  142.58.103.2
```

```
:: Query time: 11 msec
;; SERVER: 142.58.190.2#53(142.58.190.2)
;; WHEN: Fri Sep 27 12:05:13 PDT 2019
;; MSG SIZE rcvd: 162
```

IP address of Computing Science webserver: whistler.sfu.ca, 142.58.103.1

- **aa flag set on @ whistler.sfu.ca**

```
(base) justin@justin-MS-7A62:~$ dig @a.root-servers.net cs.sfu.ca
; <<>> DiG 9.11.3-1ubuntu1.8-Ubuntu <<>> @a.root-servers.net cs.sfu.ca
; (2 servers found)
;; global options: +cmd
;; Got answer:
;; ->>HEADER<<- opcode: QUERY, status: NOERROR, id: 63415
;; flags: qr rd; QUERY: 1, ANSWER: 0, AUTHORITY: 4, ADDITIONAL: 9
;; WARNING: recursion requested but not available
```

```
:: OPT PSEUDOSECTION:
```

```
; EDNS: version: 0, flags:; udp: 4096
```

```
:: QUESTION SECTION:
```

```
;cs.sfu.ca.      IN  A
```

```
:: 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
```

```
:: Query time: 34 msec
;; SERVER: 2001:503:ba3e::2:30#53(2001:503:ba3e::2:30)
;; WHEN: Fri Sep 27 12:11:19 PDT 2019
;; MSG SIZE rcvd: 291
```

```
(base) justin@justin-MS-7A62:~$ dig @any.ca-servers.ca cs.sfu.ca
```

```
; <<>> DiG 9.11.3-1ubuntu1.8-Ubuntu <<>> @any.ca-servers.ca cs.sfu.ca
; (2 servers found)
;; global options: +cmd
;; Got answer:
;; ->>HEADER<<- opcode: QUERY, status: NOERROR, id: 17211
;; flags: qr rd; QUERY: 1, ANSWER: 0, AUTHORITY: 3, ADDITIONAL: 4
;; WARNING: recursion requested but not available
```

```
:: OPT PSEUDOSECTION:
; EDNS: version: 0, flags:; udp: 4096
; COOKIE: e716fb27d20407349b49d4235d8e5ee864c6f6a7053ab5b7 (good)
;; QUESTION SECTION:
;cs.sfu.ca. IN A
```

```
:: AUTHORITY SECTION:
sfu.ca. 86400 IN NS whistler.sfu.ca.
sfu.ca. 86400 IN NS ns3.sfu.ca.
sfu.ca. 86400 IN NS ns2.sfu.ca.
```

```
:: ADDITIONAL SECTION:
whistler.sfu.ca. 86400 IN A 142.58.103.1
ns3.sfu.ca. 86400 IN A 142.58.190.2
ns2.sfu.ca. 86400 IN A 142.58.103.2
```

```
:: Query time: 20 msec
;; SERVER: 2001:500:a7::2#53(2001:500:a7::2)
;; WHEN: Fri Sep 27 12:11:36 PDT 2019
;; MSG SIZE rcvd: 173
```

```
(base) justin@justin-MS-7A62:~$ dig @whistler.sfu.ca cs.sfu.ca
```

```
; <<>> DiG 9.11.3-1ubuntu1.8-Ubuntu <<>> @whistler.sfu.ca cs.sfu.ca
; (1 server found)
;; global options: +cmd
```

```
;; Got answer:
;; ->>HEADER<<- opcode: QUERY, status: NOERROR, id: 53270
;; flags: qr aa rd; QUERY: 1, ANSWER: 1, AUTHORITY: 5, ADDITIONAL: 6
;; WARNING: recursion requested but not available
```

```
;; OPT PSEUDOSECTION:
; EDNS: version: 0, flags:; udp: 4096
;; QUESTION SECTION:
;cs.sfu.ca.      IN  A
```

```
;; ANSWER SECTION:
cs.sfu.ca.      3600 IN  A  142.58.102.68
```

```
;; AUTHORITY SECTION:
cs.sfu.ca.      3600 IN  NS  ns3.sfu.ca.
cs.sfu.ca.      3600 IN  NS  rcg-dns-01.rcg.sfu.ca.
cs.sfu.ca.      3600 IN  NS  rcg-dns-02.rcg.sfu.ca.
cs.sfu.ca.      3600 IN  NS  whistler.sfu.ca.
cs.sfu.ca.      3600 IN  NS  ns2.sfu.ca.
```

```
;; ADDITIONAL SECTION:
rcg-dns-01.rcg.sfu.ca. 3600 IN  A  199.60.1.81
rcg-dns-02.rcg.sfu.ca. 3600 IN  A  199.60.1.88
whistler.sfu.ca.      300  IN  A  142.58.103.1
ns2.sfu.ca.          300  IN  A  142.58.103.2
ns3.sfu.ca.          300  IN  A  142.58.190.2
```

```
;; Query time: 9 msec
;; SERVER: 142.58.103.1#53(142.58.103.1)
;; WHEN: Fri Sep 27 12:11:50 PDT 2019
;; MSG SIZE rcvd: 247
```

IP address of google.ca webserver: ns1.google.com, 2001:4860:4802:32::a

- **aa flag set on @ns1.google.com**

```
(base) justin@justin-MS-7A62:~$ dig @a.root-servers.net www.google.ca
; <<>> DiG 9.11.3-1ubuntu1.8-Ubuntu <<>> @a.root-servers.net www.google.ca
; (2 servers found)
;; global options: +cmd
;; Got answer:
;; ->>HEADER<<- opcode: QUERY, status: NOERROR, id: 46300
;; flags: qr rd; QUERY: 1, ANSWER: 0, AUTHORITY: 4, ADDITIONAL: 9
;; WARNING: recursion requested but not available
```

```

;; OPT PSEUDOSECTION:
; EDNS: version: 0, flags:; udp: 4096
;; QUESTION SECTION:
;www.google.ca.      IN    A

;; 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

```

```

;; Query time: 35 msec
;; SERVER: 2001:503:ba3e::2:30#53(2001:503:ba3e::2:30)
;; WHEN: Fri Sep 27 12:14:30 PDT 2019
;; MSG SIZE rcvd: 295

```

```

(base) justin@justin-MS-7A62:~$ dig @any.ca-servers.ca www.google.ca
; <<>> DiG 9.11.3-lubuntu1.8-Ubuntu <<>> @any.ca-servers.ca www.google.ca
; (2 servers found)
;; global options: +cmd
;; Got answer:
;; ->>HEADER<<- opcode: QUERY, status: NOERROR, id: 16153
;; flags: qr rd; QUERY: 1, ANSWER: 0, AUTHORITY: 4, ADDITIONAL: 1
;; WARNING: recursion requested but not available

```

```

;; OPT PSEUDOSECTION:
; EDNS: version: 0, flags:; udp: 4096
; COOKIE: 74f3925531524b346ebf8f3f5d8e5fa4317a9a4df779c512 (good)
;; QUESTION SECTION:
;www.google.ca.      IN    A

```

```

;; AUTHORITY SECTION:
google.ca.      86400  IN    NS    ns1.google.com.
google.ca.      86400  IN    NS    ns4.google.com.

```



```
google.ca.      86400  IN   NS    ns3.google.com.
google.ca.      86400  IN   NS    ns2.google.com.
```

```
:: Query time: 20 msec
;; SERVER: 2001:500:a7::2#53(2001:500:a7::2)
;; WHEN: Fri Sep 27 12:14:44 PDT 2019
;; MSG SIZE rcvd: 152
```

```
(base) justin@justin-MS-7A62:~$ dig @ns1.google.com www.google.ca
; <<>> DiG 9.11.3-1ubuntu1.8-Ubuntu <<>> @ns1.google.com www.google.ca
; (2 servers found)
;; global options: +cmd
;; Got answer:
;; ->>HEADER<<- opcode: QUERY, status: NOERROR, id: 31043
;; flags: qr aa rd; QUERY: 1, ANSWER: 1, AUTHORITY: 0, ADDITIONAL: 1
;; WARNING: recursion requested but not available
```

```
:: OPT PSEUDOSECTION:
; EDNS: version: 0, flags:; udp: 512
;; QUESTION SECTION:
;www.google.ca.      IN   A
```

```
:: ANSWER SECTION:
www.google.ca.      300  IN   A    172.217.3.195
```

```
:: Query time: 51 msec
;; SERVER: 2001:4860:4802:32::a#53(2001:4860:4802:32::a)
;; WHEN: Fri Sep 27 12:14:58 PDT 2019
;; MSG SIZE rcvd: 58
```

Traceroute returns:

```
www.sfu.ca
traceroute to www.sfu.ca (142.58.102.68), 30 hops max, 60 byte packets
 1 _gateway (192.168.1.254) 1.100 ms 1.377 ms 1.633 ms
 2 10.31.244.1 (10.31.244.1) 15.490 ms 26.465 ms 27.415 ms
 3 ae0.100.STTLWAWBGR80.bb.telus.com (154.11.10.9) 9.757 ms 154.11.10.11
  (154.11.10.11) 10.136 ms ae0.100.STTLWAWBGR80.bb.telus.com (154.11.10.9) 9.901 ms
 4 GTD-HTRV-R1.bb.telus.com (154.11.15.10) 10.303 ms 10.496 ms 10.723 ms
 5 100ge14-1.core1.yvr1.he.net (184.105.64.110) 14.088 ms 14.267 ms 14.717 ms
 6 bcnet.10gigabitethernet1-4.core1.yvr1.he.net (184.105.148.150) 20.110 ms 10.929 ms
 11.181 ms
 7 cr2-100g-bb3920ae2.vncv1.bc.net.bc.net (207.23.253.117) 8.962 ms 9.104 ms 9.266 ms
```

8 606-tx-sfu1-vncv1-cr2.vncv1.bc.net (134.87.30.241) 15.317 ms 15.504 ms 15.703 ms
 9 van-hcc1360-f3200d-1-van-hcc1360-border-1.net.sfu.ca (142.58.254.137) 10.221 ms 10.643 ms 11.020 ms
 10 van-int-sfu-ext-van-bcnet-int-sfu.net.sfu.ca (142.58.254.134) 11.194 ms 11.168 ms 11.339 ms
 11 van-hcc1360-core-1-van-hcc1360-f3200d-1.net.sfu.ca (142.58.254.129) 9.348 ms 9.711 ms 9.812 ms
 12 bby-wtb115-core-1-van-hcc1360-core-1.net.sfu.ca (142.58.29.9) 14.698 ms 14.891 ms 15.064 ms
 13 bby-wtb115-f3700d-1-bby-wtb115-core-1.net.sfu.ca (142.58.29.1) 9.952 ms 10.318 ms 10.784 ms
 14 bby-int-dc-sfu-bby-ext-campus.net.sfu.ca (142.58.29.42) 10.995 ms 11.126 ms 11.334 ms
 15 bby-wtb115-a7050-11-2-bby-int-dc-sfu.net.sfu.ca (142.58.29.243) 11.506 ms 11.775 ms 12.242 ms
 16 buntzenf.sfu.ca (142.58.102.68) 16.750 ms 10.889 ms 11.029 ms
 traceroute to www.sfu.ca (142.58.102.68), 50 hops max, 60 byte packets
 1 _gateway (192.168.1.254) 1.136 ms 1.312 ms 1.569 ms
 2 10.31.244.1 (10.31.244.1) 12.465 ms 13.595 ms 22.161 ms
 3 154.11.10.11 (154.11.10.11) 9.609 ms 10.020 ms ae0.100.STTLWAWBGR80.bb.telus.com (154.11.10.9) 10.131 ms
 4 GTD-HTRV-R1.bb.telus.com (154.11.15.10) 10.322 ms 10.449 ms 10.625 ms
 5 100ge14-1.core1.yvr1.he.net (184.105.64.110) 14.362 ms 14.425 ms 14.597 ms
 6 bcnet.10gigabitethernet1-4.core1.yvr1.he.net (184.105.148.150) 14.966 ms 13.104 ms 13.315 ms
 7 cr2-100g-bb3920ae2.vncv1.bc.net.bc.net (207.23.253.117) 11.116 ms 8.391 ms 8.151 ms
 8 606-tx-sfu1-vncv1-cr2.vncv1.bc.net (134.87.30.241) 14.965 ms 14.887 ms 14.948 ms
 9 van-hcc1360-f3200d-1-van-hcc1360-border-1.net.sfu.ca (142.58.254.137) 8.381 ms 8.877 ms 8.773 ms
 10 van-int-sfu-ext-van-bcnet-int-sfu.net.sfu.ca (142.58.254.134) 8.949 ms 8.816 ms 8.925 ms
 11 van-hcc1360-core-1-van-hcc1360-f3200d-1.net.sfu.ca (142.58.254.129) 9.659 ms 9.435 ms 9.355 ms
 12 bby-wtb115-core-1-van-hcc1360-core-1.net.sfu.ca (142.58.29.9) 9.848 ms 9.078 ms 8.661 ms
 13 bby-wtb115-f3700d-1-bby-wtb115-core-1.net.sfu.ca (142.58.29.1) 8.575 ms 8.765 ms 9.098 ms
 14 bby-int-dc-sfu-bby-ext-campus.net.sfu.ca (142.58.29.42) 8.874 ms 9.069 ms 9.056 ms
 15 bby-wtb115-a7050-11-2-bby-int-dc-sfu.net.sfu.ca (142.58.29.243) 9.640 ms 9.851 ms 9.613 ms
 16 buntzenf.sfu.ca (142.58.102.68) 9.827 ms 10.011 ms 9.557 ms
 traceroute to www.sfu.ca (142.58.102.68), 50 hops max, 60 byte packets
 1 _gateway (192.168.1.254) 1.260 ms 1.393 ms 1.695 ms
 2 10.31.244.1 (10.31.244.1) 16.486 ms 26.310 ms 36.395 ms
 3 ae0.100.STTLWAWBGR80.bb.telus.com (154.11.10.9) 22.830 ms 22.965 ms 154.11.10.11 (154.11.10.11) 24.255 ms
 4 GTD-HTRV-R1.bb.telus.com (154.11.15.10) 23.114 ms 24.485 ms 24.611 ms

5 100ge14-1.core1.yvr1.he.net (184.105.64.110) 27.838 ms 29.368 ms 29.561 ms
 6 bcnet.10gigabitethernet1-4.core1.yvr1.he.net (184.105.148.150) 29.536 ms 27.814 ms
 29.203 ms
 7 cr2-100g-bb3920ae2.vncv1.bc.net.bc.net (207.23.253.117) 27.612 ms 23.515 ms 22.750 ms
 8 606-tx-sfu1-vncv1-cr2.vncv1.bc.net (134.87.30.241) 27.660 ms 28.964 ms 27.855 ms
 9 van-hcc1360-f3200d-1-van-hcc1360-border-1.net.sfu.ca (142.58.254.137) 22.785 ms 24.187
 ms 22.663 ms
 10 van-int-sfu-ext-van-bcnet-int-sfu.net.sfu.ca (142.58.254.134) 22.576 ms 22.580 ms 22.360
 ms
 11 van-hcc1360-core-1-van-hcc1360-f3200d-1.net.sfu.ca (142.58.254.129) 23.345 ms 23.464
 ms 23.428 ms
 12 bby-wtb115-core-1-van-hcc1360-core-1.net.sfu.ca (142.58.29.9) 23.823 ms 26.774 ms
 25.085 ms
 13 bby-wtb115-f3700d-1-bby-wtb115-core-1.net.sfu.ca (142.58.29.1) 24.140 ms 23.946 ms
 23.747 ms
 14 bby-int-dc-sfu-bby-ext-campus.net.sfu.ca (142.58.29.42) 23.714 ms 24.512 ms 24.612 ms
 15 bby-wtb115-a7050-11-2-bby-int-dc-sfu.net.sfu.ca (142.58.29.243) 23.888 ms 25.165 ms
 25.333 ms
 16 buntzenf.sfu.ca (142.58.102.68) 25.298 ms 24.739 ms 24.682 ms

www.scene.org

traceroute to www.scene.org (145.24.145.163), 50 hops max, 60 byte packets

1 _gateway (192.168.1.254) 0.720 ms 0.836 ms 0.811 ms
 2 10.31.244.1 (10.31.244.1) 7.421 ms 15.095 ms 17.316 ms
 3 75.154.223.211 (75.154.223.211) 50.040 ms 50.028 ms 50.141 ms
 4 us-chi.nordu.net (208.115.136.151) 49.192 ms 49.433 ms 49.422 ms
 5 us-man.nordu.net (109.105.97.144) 85.639 ms 85.778 ms 85.981 ms
 6 nl-sar.nordu.net (109.105.97.138) 174.009 ms 172.753 ms nl-sar.nordu.net (109.105.97.65)
 172.116 ms
 7 ge-1-0-0.3630.jnr02.asd001a.surf.net (109.105.98.34) 172.703 ms 177.273 ms 174.849 ms
 8 lo0-2.asd002a-jnx-01-sn7-internet.surf.net (145.145.128.2) 161.379 ms 157.570 ms 160.310
 ms
 9 hro-router.customer.surf.net (145.145.24.14) 164.293 ms 162.076 ms 164.716 ms
 10 Surf-Zone-VIP-PAN.hro.nl (145.24.8.116) 176.947 ms 180.328 ms 178.401 ms
 11 webprod.scene.org (145.24.145.163) 178.582 ms * 178.725 ms

traceroute to www.scene.org (145.24.145.163), 50 hops max, 60 byte packets

1 _gateway (192.168.1.254) 0.701 ms 0.827 ms 0.805 ms
 2 10.31.244.1 (10.31.244.1) 7.008 ms 17.443 ms 19.154 ms
 3 75.154.223.211 (75.154.223.211) 48.872 ms 49.055 ms 49.277 ms
 4 us-chi.nordu.net (208.115.136.151) 49.449 ms 49.428 ms 49.592 ms
 5 us-man.nordu.net (109.105.97.144) 85.744 ms 85.873 ms 86.051 ms
 6 nl-sar.nordu.net (109.105.97.65) 173.672 ms 172.430 ms nl-sar.nordu.net (109.105.97.138)
 172.291 ms
 7 ge-1-0-0.3630.jnr02.asd001a.surf.net (109.105.98.34) 175.105 ms 174.997 ms 174.818 ms
 8 lo0-2.asd002a-jnx-01-sn7-internet.surf.net (145.145.128.2) 159.902 ms 157.982 ms 160.056
 ms

9 hro-router.customer.surf.net (145.145.24.14) 164.501 ms 162.229 ms 164.633 ms
10 Surf-Zone-VIP-PAN.hro.nl (145.24.8.116) 164.872 ms 164.369 ms 164.256 ms
11 webprod.scene.org (145.24.145.163) 162.000 ms 161.883 ms 164.499 ms
traceroute to www.scene.org (145.24.145.163), 50 hops max, 60 byte packets
1 _gateway (192.168.1.254) 0.772 ms 0.747 ms 0.720 ms
2 10.31.244.1 (10.31.244.1) 6.819 ms 10.481 ms 18.422 ms
3 75.154.223.211 (75.154.223.211) 49.163 ms 49.332 ms 49.513 ms
4 us-chi.nordu.net (208.115.136.151) 49.681 ms 49.856 ms 49.836 ms
5 us-man.nordu.net (109.105.97.144) 85.986 ms 86.138 ms 86.311 ms
6 nl-sar.nordu.net (109.105.97.138) 173.422 ms 172.275 ms 172.434 ms
7 ge-1-0-0.3630.jnr02.asd001a.surf.net (109.105.98.34) 172.902 ms 172.379 ms 172.572 ms
8 lo0-2.asd002a-jnx-01-sn7-internet.surf.net (145.145.128.2) 159.362 ms 160.555 ms 157.572 ms
ms
9 hro-router.customer.surf.net (145.145.24.14) 163.559 ms 170.963 ms 170.691 ms
10 Surf-Zone-VIP-PAN.hro.nl (145.24.8.116) 162.708 ms 164.642 ms 164.792 ms
11 webprod.scene.org (145.24.145.163) 165.547 ms 164.764 ms 162.201 ms