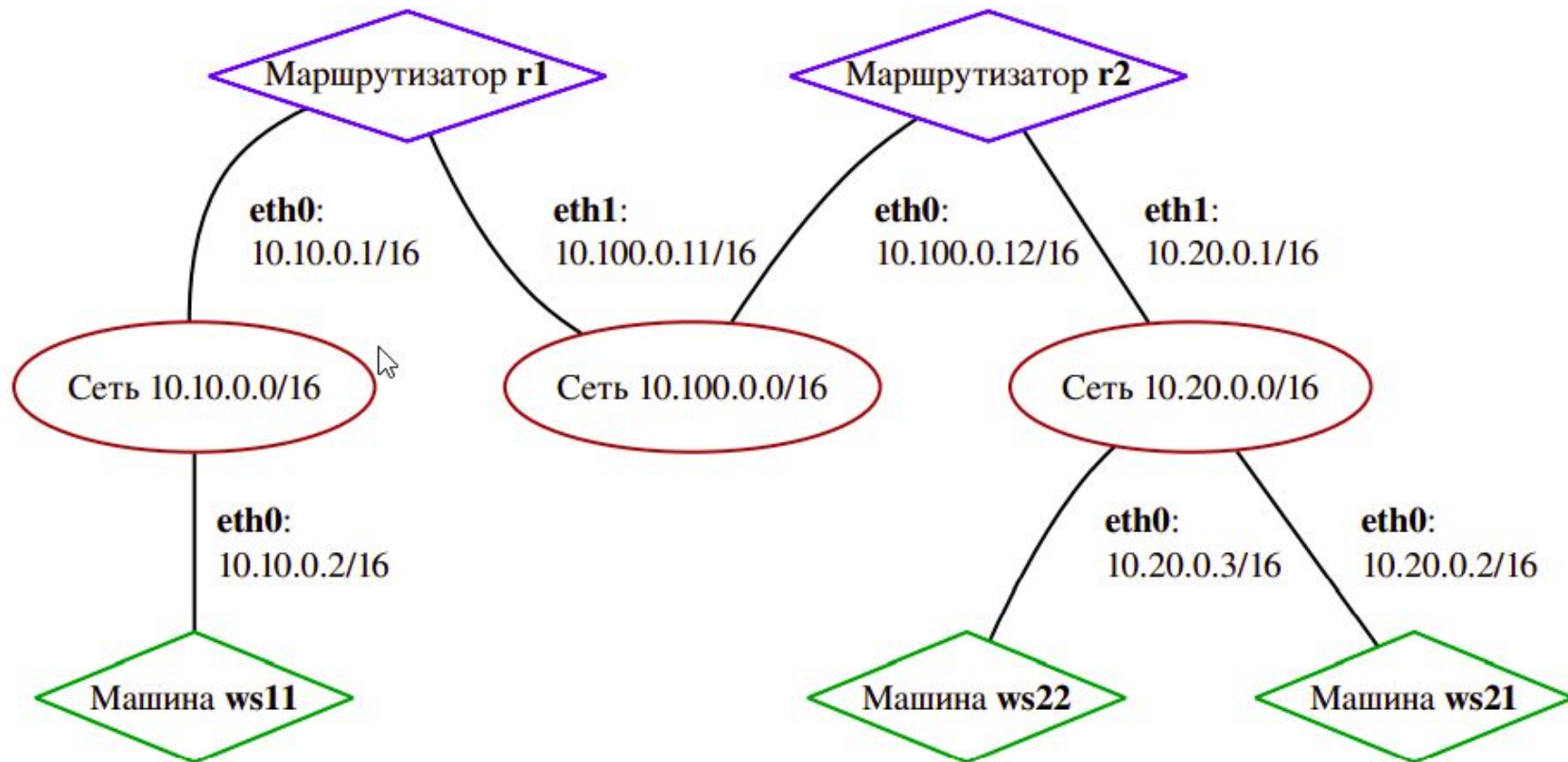# Lection 05:
ttl, traceroute, fragmentation, books

v.2022.10.05
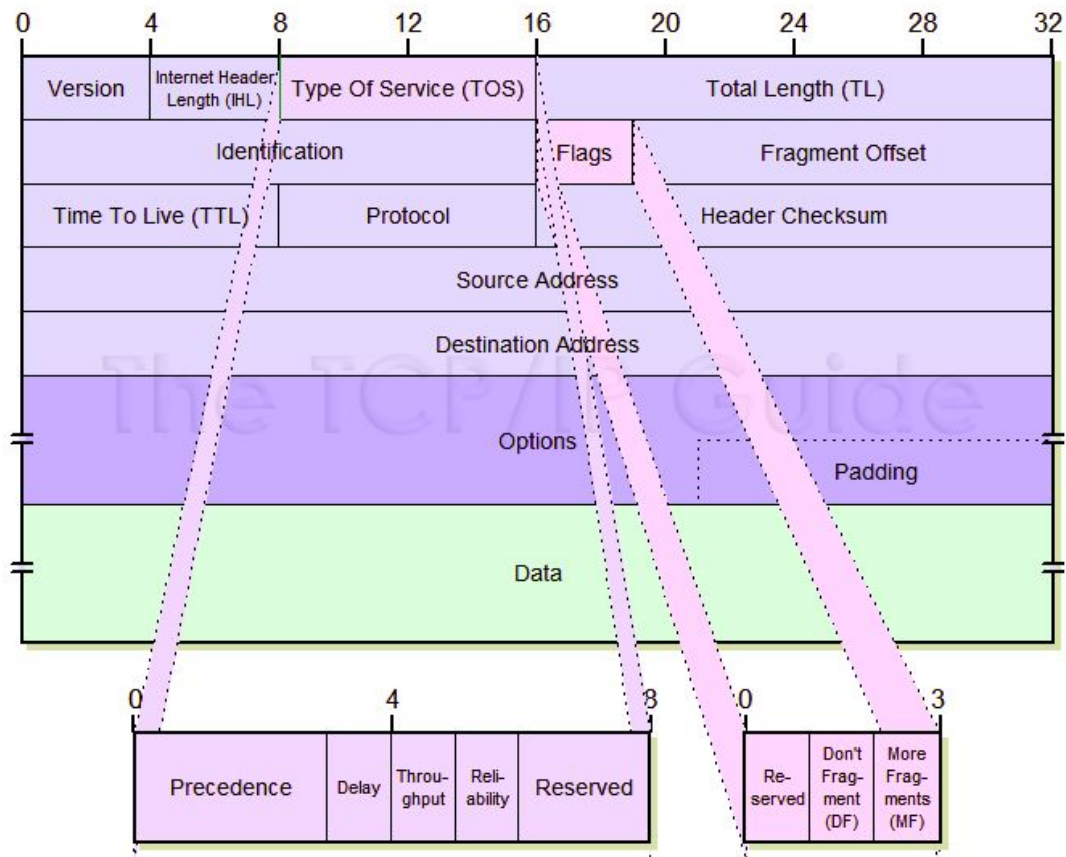
lab-ip
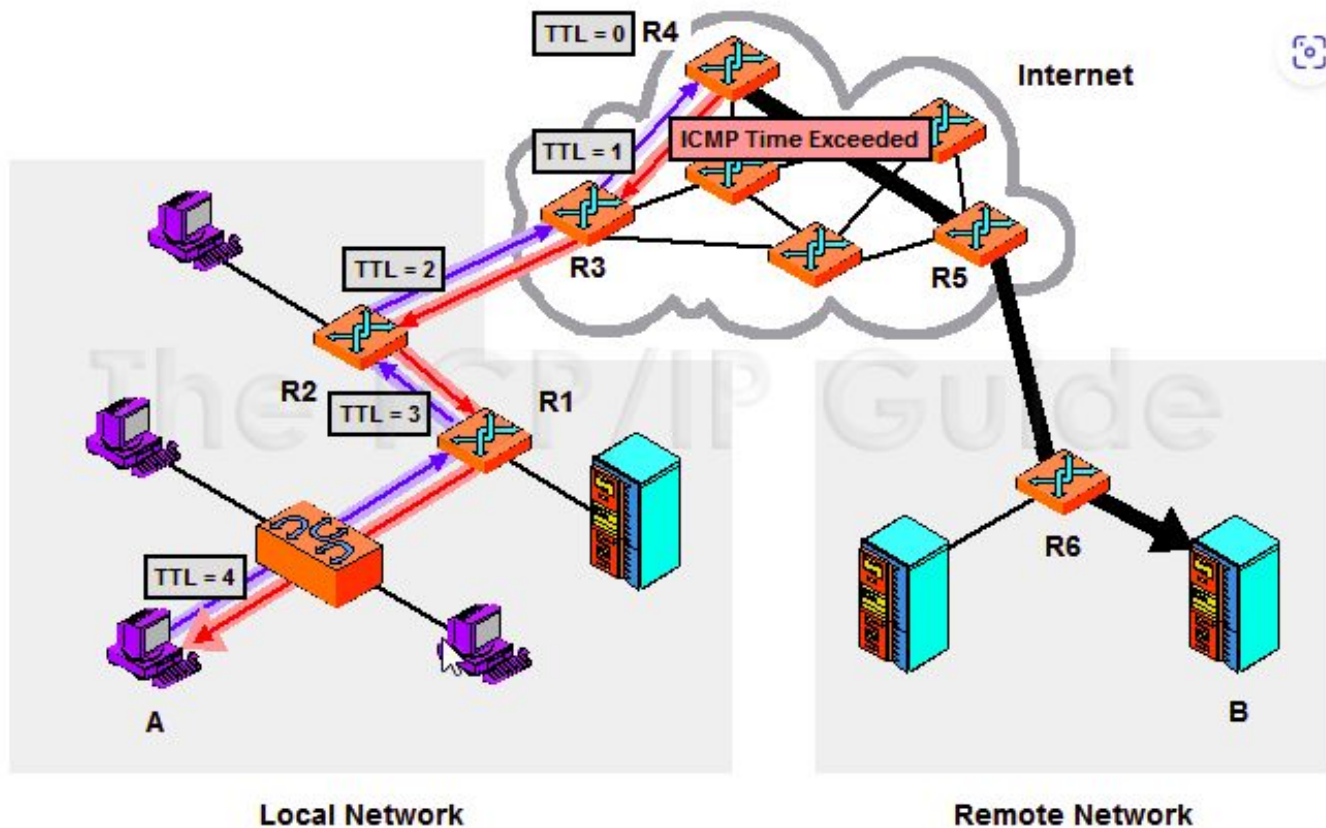
Ip datagram encapsulation

Ip datagram

loop

TTL = 0 R4

TTL = 1

ICMP Time Exceeded

Internet

TTL = 2

R3

R5

R2

TTL = 3 R1

TTL = 4

A

R6

B

Local Network

Remote Network

5
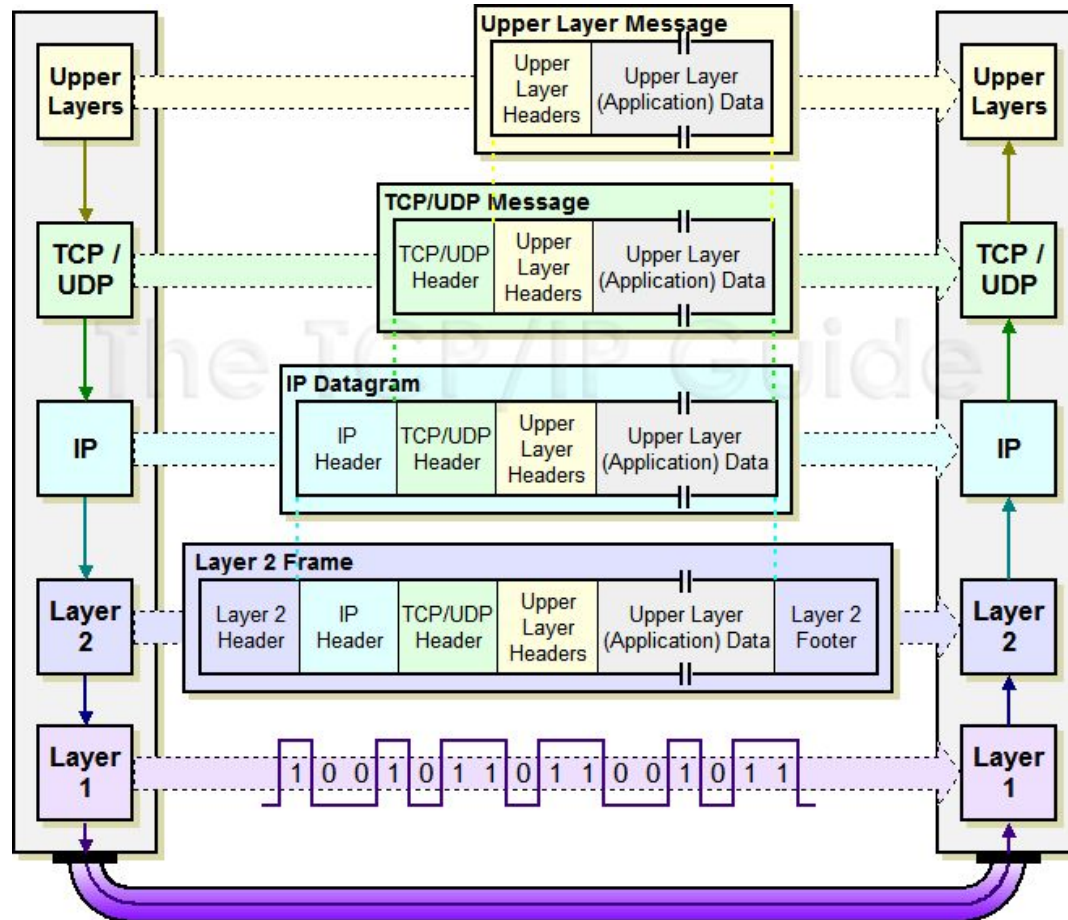
traceroute

```
student@git:~$ traceroute ya.ru
traceroute to ya.ru (87.250.250.242), 30 hops max, 60 byte packets
 1  h65.net32.bmstu.ru (195.19.32.65)  0.470 ms  0.451 ms  0.434 ms
 2  tv11-2-gw.msk.runnet.ru (194.190.254.105)  0.867 ms  0.827 ms  0.817 ms
 3  styri.yndx.net (195.208.208.116)  1.572 ms  1.858 ms  1.674 ms
 4  * * *
 5  ya.ru (87.250.250.242)  4.859 ms  4.572 ms  4.813 ms
```

loop

```
wsll:~# traceroute 10.20.0.20
traceroute to 10.20.0.20 (10.20.0.20), 64 hops max, 40 byte packets
 1  10.10.0.1 (10.10.0.1)  7 ms  2 ms  1 ms
 2  10.100.0.12 (10.100.0.12)  12 ms  1 ms  1 ms
 3  10.10.0.1 (10.10.0.1)  2 ms  1 ms  1 ms
 4  10.100.0.12 (10.100.0.12)  1 ms  1 ms  3 ms
 5  * 10.10.0.1 (10.10.0.1)  2 ms  2 ms
 6  10.100.0.12 (10.100.0.12)  1 ms  2 ms  1 ms
 7  10.10.0.1 (10.10.0.1)  2 ms  *  2 ms
 8  10.100.0.12 (10.100.0.12)  2 ms  2 ms  2 ms
 9  10.10.0.1 (10.10.0.1)  2 ms  2 ms  *
10  10.100.0.12 (10.100.0.12)  3 ms  2 ms  2 ms
11  10.10.0.1 (10.10.0.1)  2 ms  2 ms  2 ms
```

ping -s 10 -c1 10.10.0.2

ETH HEADER	IP HEADER	ICMP HEADER	DATA	*TOTAL*
14	20	8	10	=52

ping -s 2000 -c1 10.10.0.2

ETH HEADER	IP HEADER	ICMP HEADER	DATA	*TOTAL*
14	20, offset=0, MF=1	8	1472	=1514

ETH HEADER	IP HEADER	ICMP HEADER	DATA	*TOTAL*
14	20, offset=1480, MF=0	0	528	=562

```
02:6f:25:be:4d:ef > 0e:ab:f8:0c:10:4b, ethertype IPv4 (0x0800), length 1514: (tos
0x0, ttl 64, id 64640, offset 0, flags [+], proto ICMP (1), length 1500) 10.10.0.2 >
10.10.0.1: ICMP echo request, id 21762, seq 1, length 1480

02:6f:25:be:4d:ef > 0e:ab:f8:0c:10:4b, ethertype IPv4 (0x0800), length 562: (tos 0x0,
ttl 64, id 64640, offset 1480, flags [none], proto ICMP (1), length 548) 10.10.0.2 >
10.10.0.1: icmp
```
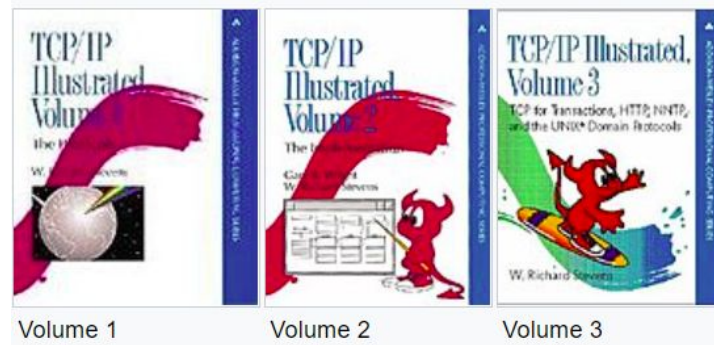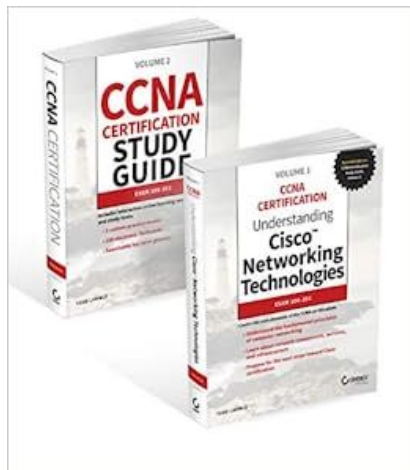
ping -s 2000 -c1 10.10.0.2

Books

Volume 1   Volume 2   Volume 3
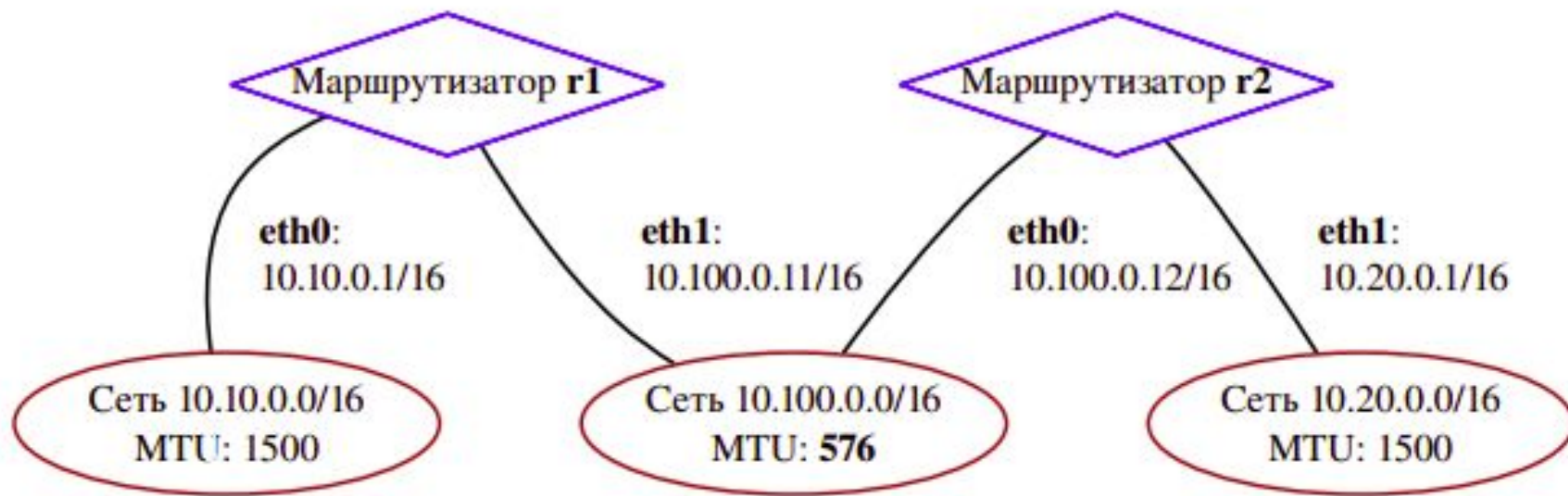
- [TCP/IP Illustrated - Wikipedia](#)

- [Library Genesis (libgen.is)](#)

- [The TCP/IP Guide - The TCP/IP Guide (tcpipguide.com)](#)

- [CCNA - Wikipedia](#)