Communication Networks

Spring 2020

Coralie Busse-Grawitz

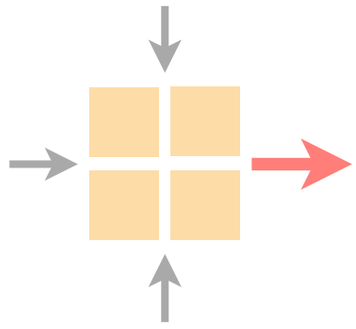
https://comm-net.ethz.ch/

ETH Zürich

February 27 2020

Communication Networks

Exercise 1



Demo network debugging tools

Overview current assignment

Questions?

Time for you to solve the tasks

Solutions will be published next week

Important network debugging tools

ping

Is a destination reachable?

traceroute (*tracert*)

How do I reach a destination?

Wireshark

Packet inspection

dig

DNS lookup (introduced later)

...

ping - important options (Linux)

-c count, number of queries

-i wait, time in seconds between each packet

-s packetsize, number of data bytes to send

-S src_addr, source address to use if multiple IPs available

...

traceroute - output

```
> traceroute www.nyu.edu

traceroute to web.gslb.nyu.edu (128.122.119.202), 64 hops max, 52 byte packets

 1  82.130.102.1                                  (82.130.102.1)      0.849 ms    0.616 ms    0.820 ms
 2  rou-ref-rz-bb-ref-rz-etx                      (10.10.0.41)        0.741 ms    0.671 ms    0.643 ms
 3  rou-fw-rz-ee-tik                              (10.1.11.129)       0.892 ms    0.836 ms    5.057 ms
 4  rou-fw-rz-gw-rz                               (192.33.92.170)     1.040 ms    0.852 ms    0.892 ms
 5  swiez2                                        (192.33.92.11)      0.982 ms    1.032 ms    0.974 ms
 6  swizh1-100ge-0-1-0-0.switch.ch                (130.59.38.110)     0.913 ms    0.884 ms    0.959 ms
 7  swice1-100ge-0-3-0-0.switch.ch                (130.59.36.93)      5.796 ms    6.485 ms    4.591 ms
 8  switch.mx1.gen.ch.geant.net                   (62.40.124.21)      4.213 ms    4.173 ms    4.203 ms
 9  ae4.mx1.par.fr.geant.net                      (62.40.98.152)      11.508 ms   13.460 ms   11.560 ms
10  et-3-1-0.102.rtsw.newy32aoa.net.internet2.edu (198.71.45.236)     85.752 ms   82.767 ms   82.455 ms
11  nyc-9208-i2-newy.nysernet.net                 (199.109.5.1)       82.457 ms   82.548 ms   82.434 ms
12  199.109.5.6                                   (199.109.5.6)       82.609 ms   82.624 ms   82.684 ms
13  dmzgwa-ptp-extgwa.net.nyu.edu                 (128.122.254.65)    83.006 ms   83.225 ms   83.279 ms
14  nyugwa-ptp-dmzgwa.net.nyu.edu                 (128.122.254.88)    82.815 ms   82.789 ms   82.701 ms
15  wsqdcgwa-vl902.net.nyu.edu                    (128.122.1.38)      83.156 ms   83.194 ms   82.933 ms
16  * * *
```

Hop

Domain name

IP address

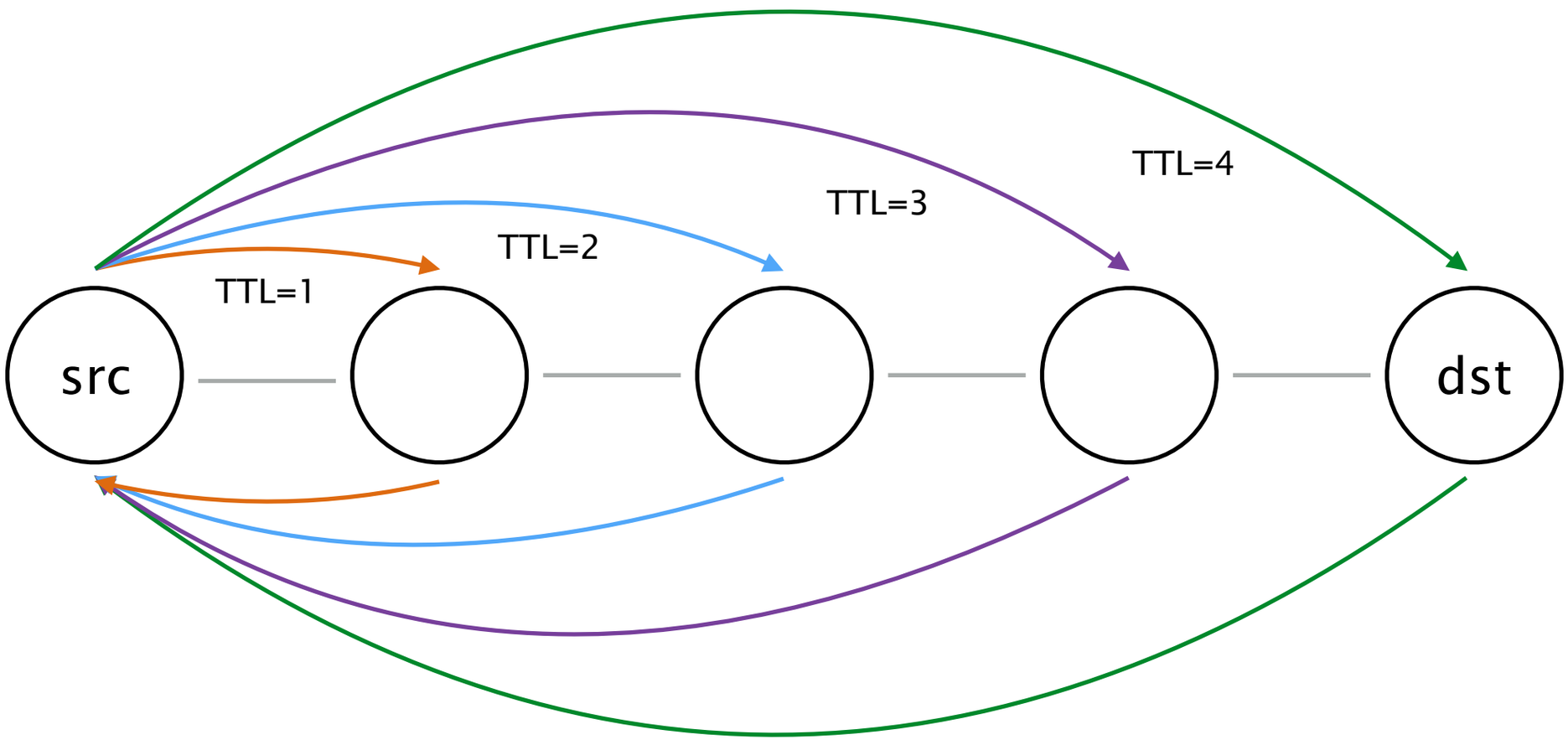
RTT measurements

No response/
timeout

Round Trip Time

Both directions!

traceroute - working principle



traceroute - problems

Behavior when multiple parallel paths exist

Will see that in the first group project

Devices that do not answer

Different forward and backward paths

...

Wireshark

https://www.wireshark.org/

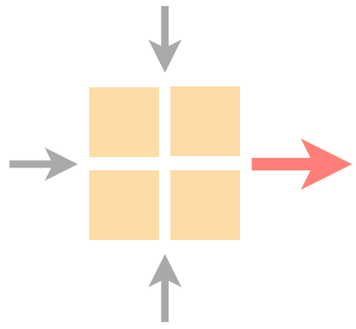
Packet capturing and replaying

Similar command line tools: *tshark* or *tcpdump*

Automatically detects various protocols and packet formats

Communication Networks

Exercise 1



Demo network debugging tools

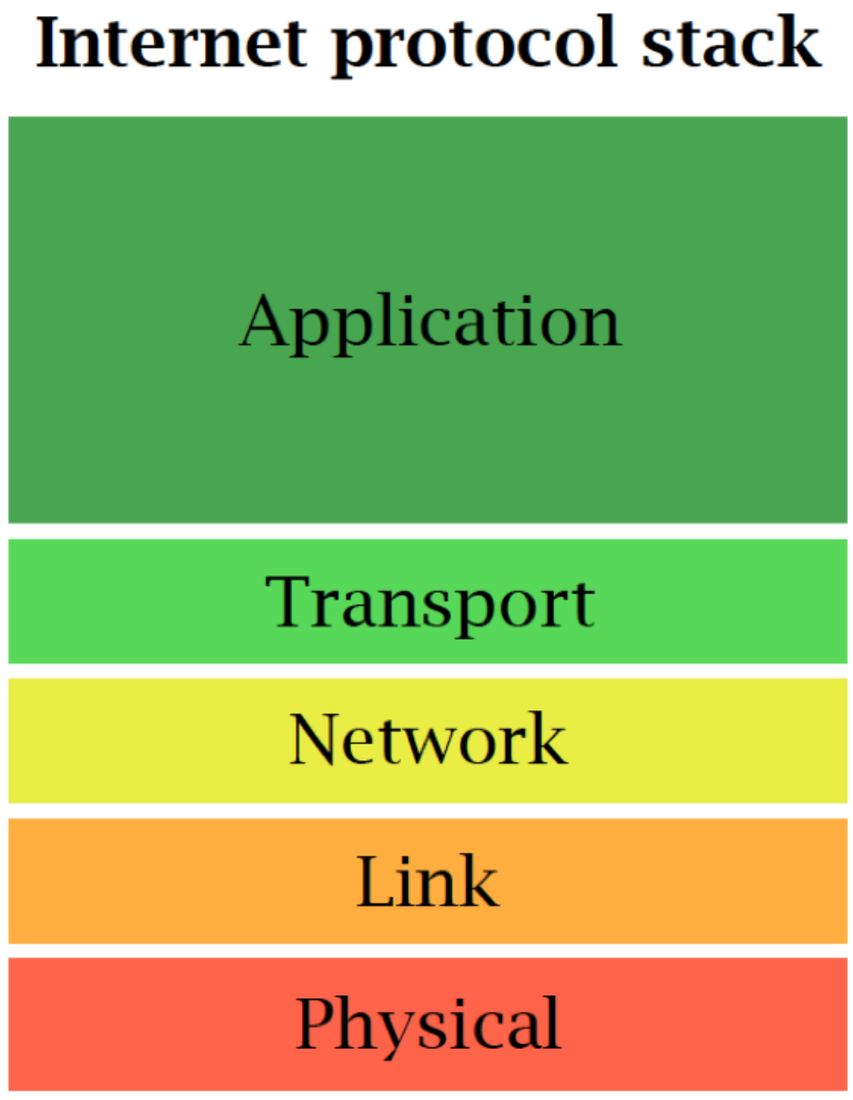
Overview current assignment

Questions?

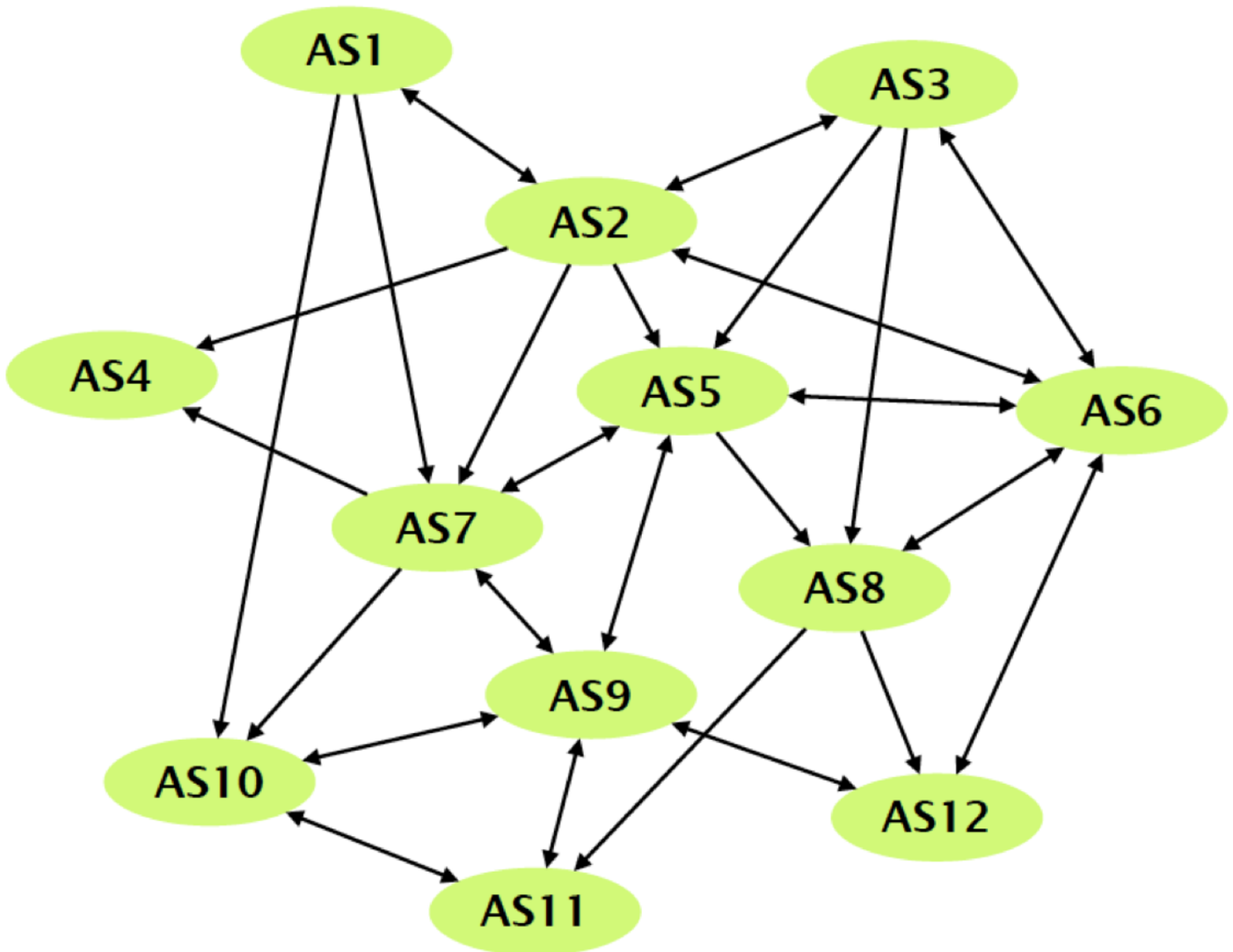
Time for you to solve the tasks

Solutions will be published next week

Task 1: Layer Model



Task 2: Internet Organization



Task 3: Internet Communication

64:a0:e7:42:2e:c2			
78:4f:43:6c:b7:e2			
4	5	2	657
1622		2	0
64	6	63144	
10.2.120.16			
82.130.102.210			

51236	80
3710236014	
866143669	
4 | 0 | 0 | 0 | 0 | 1 | 1 | 0 | 0 | 0	4117
4370	0

```
GET / HTTP/1.1\r\n
Host: comm-net.ethz.ch\r\n
Connection: keep-alive\r\n
Cache-Control: max-age=0\r\n
Upgrade-Insecure-Requests: 1\r\n
User-Agent: Mozilla/5.0 (Macintosh; Intel Mac OS X 10_12_3) ...
Accept: text/html,application/xhtml+xml,application/xml;q=0.9,...
Accept-Encoding: gzip, deflate, sdch\r\n
Accept-Language: de-DE,de;q=0.8,en-US;q=0.6,en;q=0.4\r\n
...
```

Look at your own traffic using Wireshark: https://www.wireshark.org/

Task 4: Network Characterization

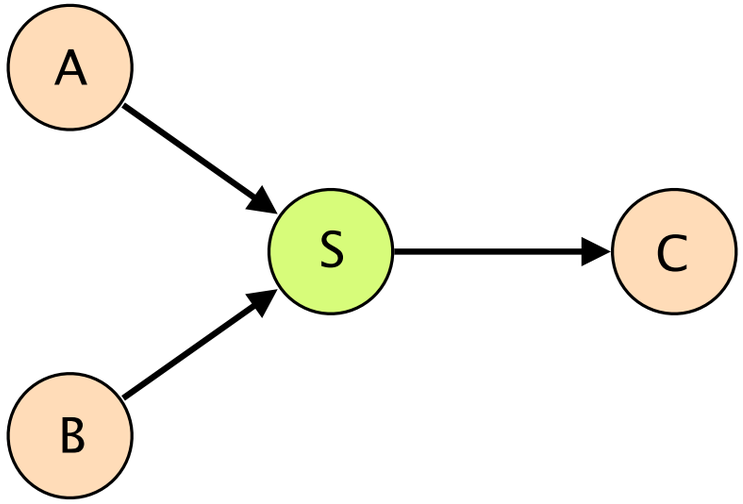
vs.

vs.

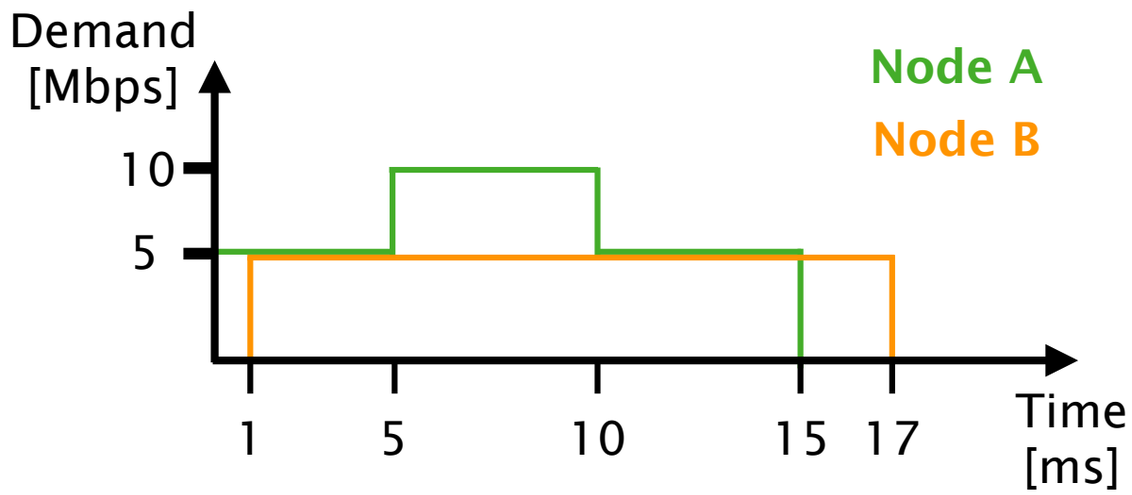
Delay? Bandwidth?

Task 5: Types of Delay

Task 6: Packet vs. Circuit Switching



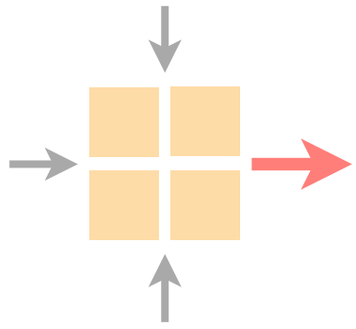
Network with a shared link



Different traffic demands

Communication Networks

Exercise 1



Demo network debugging tools

Overview current assignment

Questions?

Time for you to solve the tasks

Solutions will be published next week

Don’t hesitate to ask questions

also over Slack (email) after the session

Main contact persons:

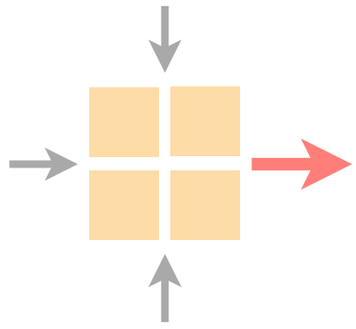
Tobias	Eng. & Ger.
Coralie	Eng. & Ger.
Rüdiger	Eng. & Ger.
Noah	Eng. & Ger.
Eric	Eng. & Ger.

“Internet Hackathon”

March 26, 6 - 10 pm

Communication Networks

Exercise 1



Demo network debugging tools

Overview current assignment

Questions?

Time for you to solve the tasks

Solutions will be published next week