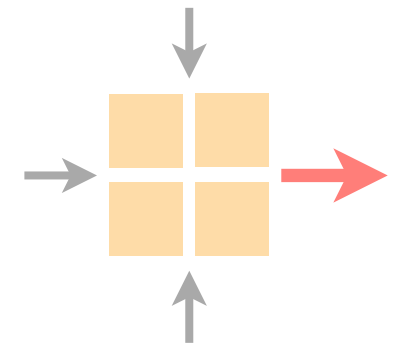


Communication Networks

Spring 2019



Tobias Bühler

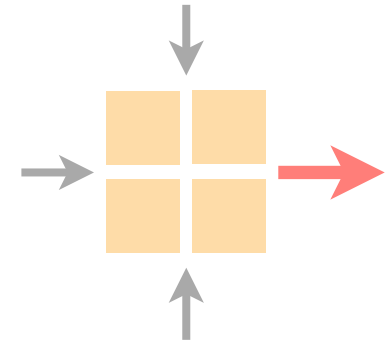
<https://comm-net.ethz.ch/>

ETH Zürich

February 28 2019

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?

tracert (*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-ntp-extgwa.net.nyu.edu (128.122.254.65)    83.006 ms   83.225 ms   83.279 ms
14  nyugwa-ntp-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

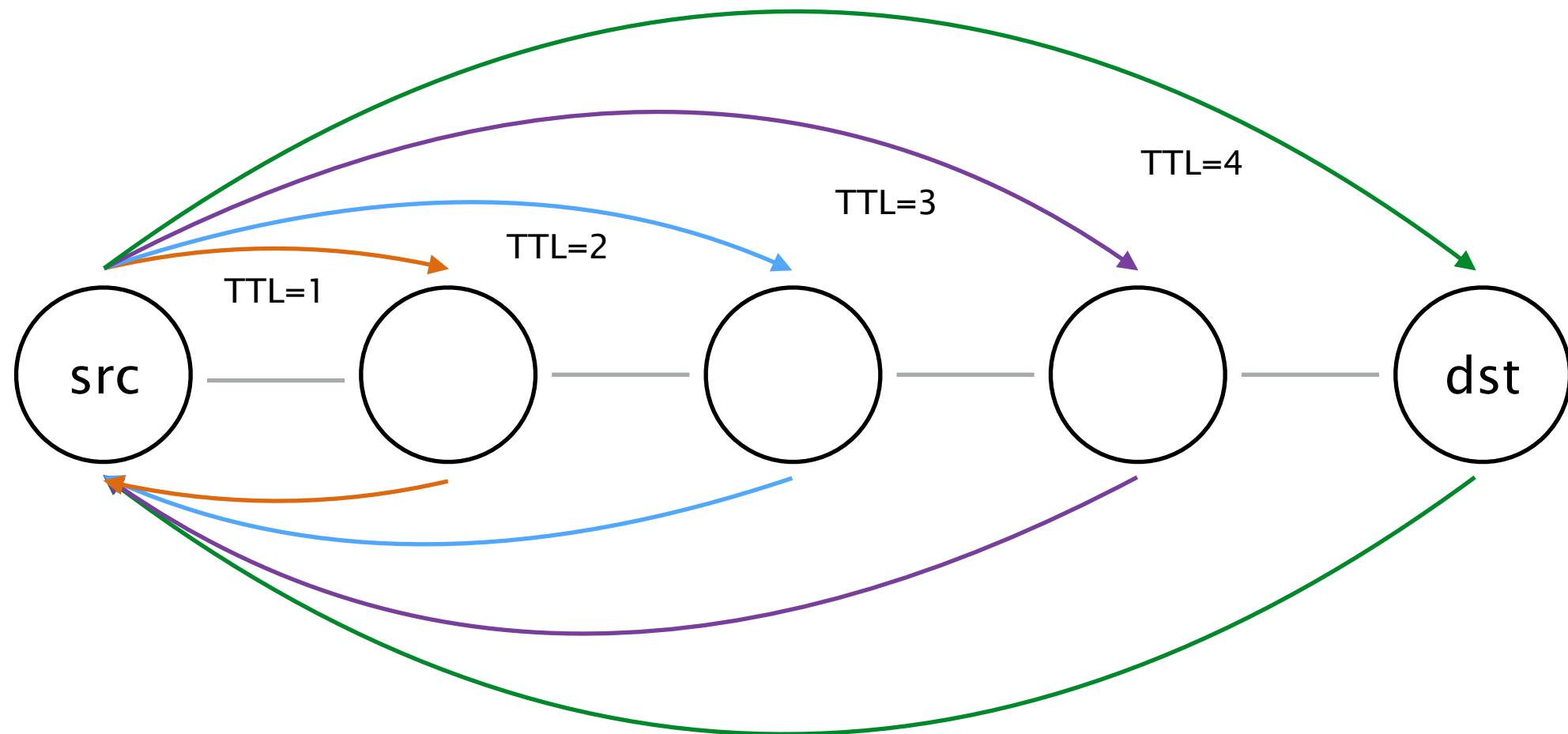
IP address

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/>

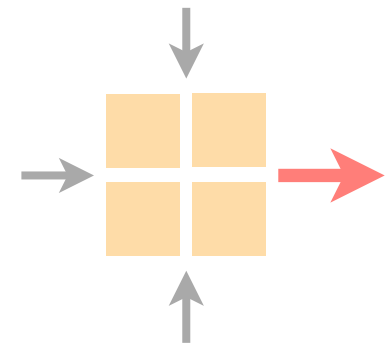
Packet capturing and replaying

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

Automatically detects various protocols and packet formats

Communication Networks

Exercise 1



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Overview current assignment

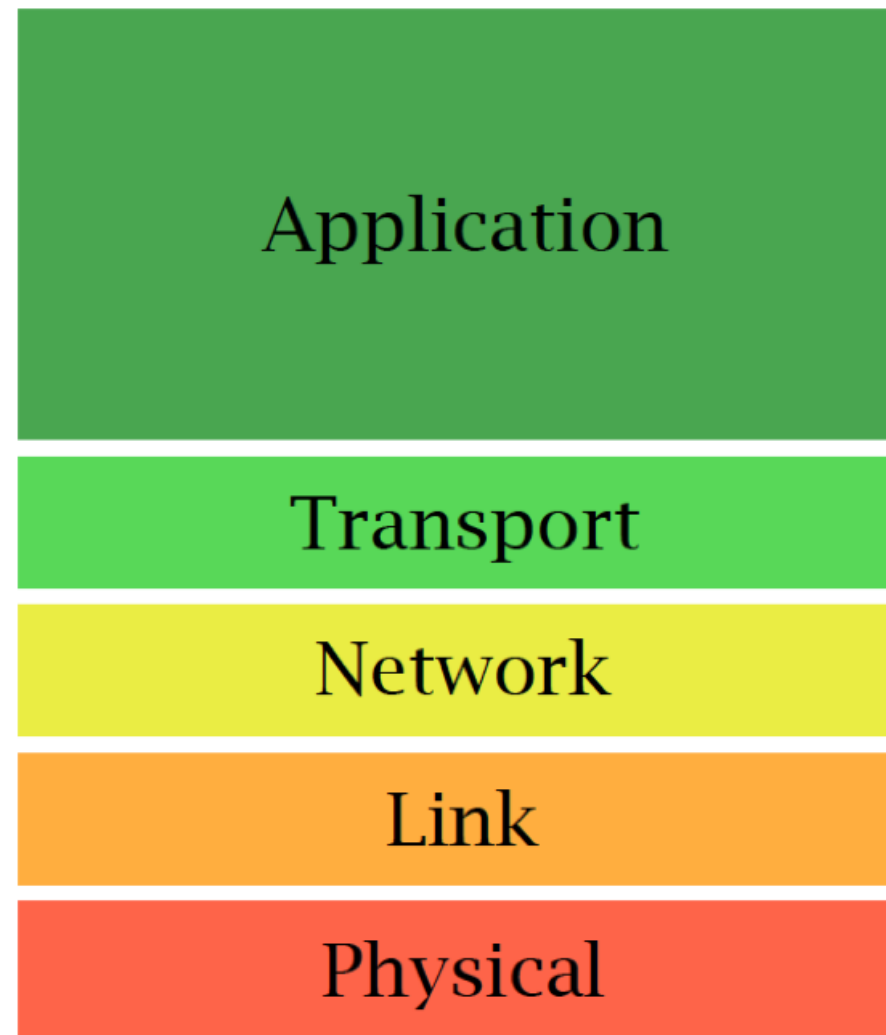
Questions?

Time for you to solve the tasks

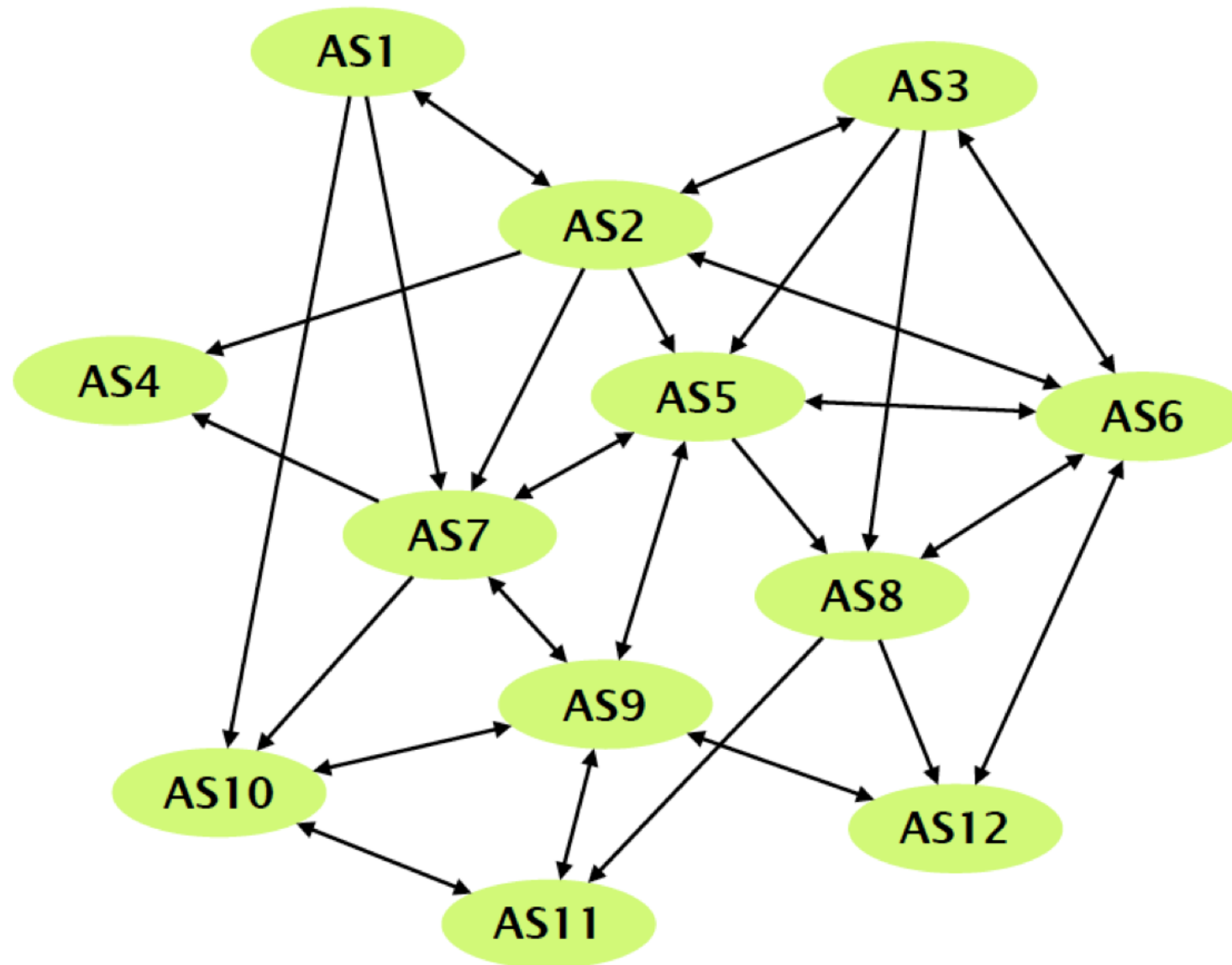
Solutions will be published next week

Task 1: Layer Model

Internet protocol stack



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\nHost: comm-net.ethz.ch\r\nConnection: keep-alive\r\nCache-Control: max-age=0\r\nUpgrade-Insecure-Requests: 1\r\nUser-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\nAccept-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.

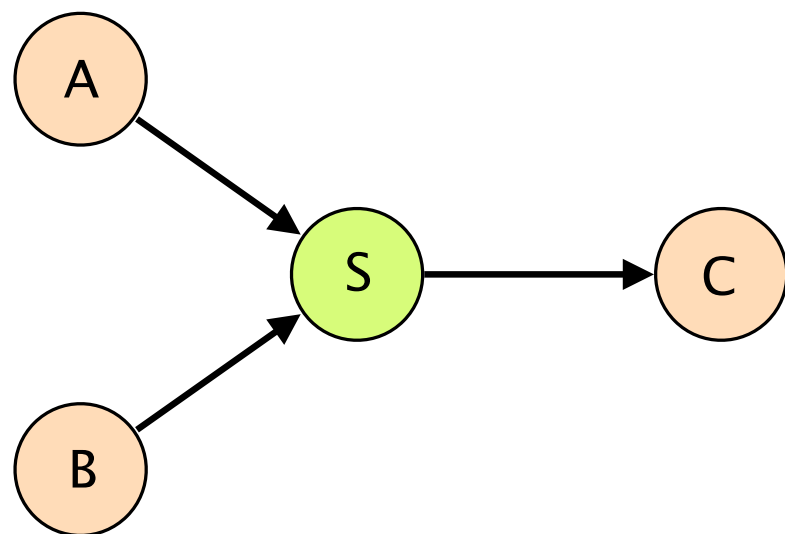


Delay? Bandwidth?

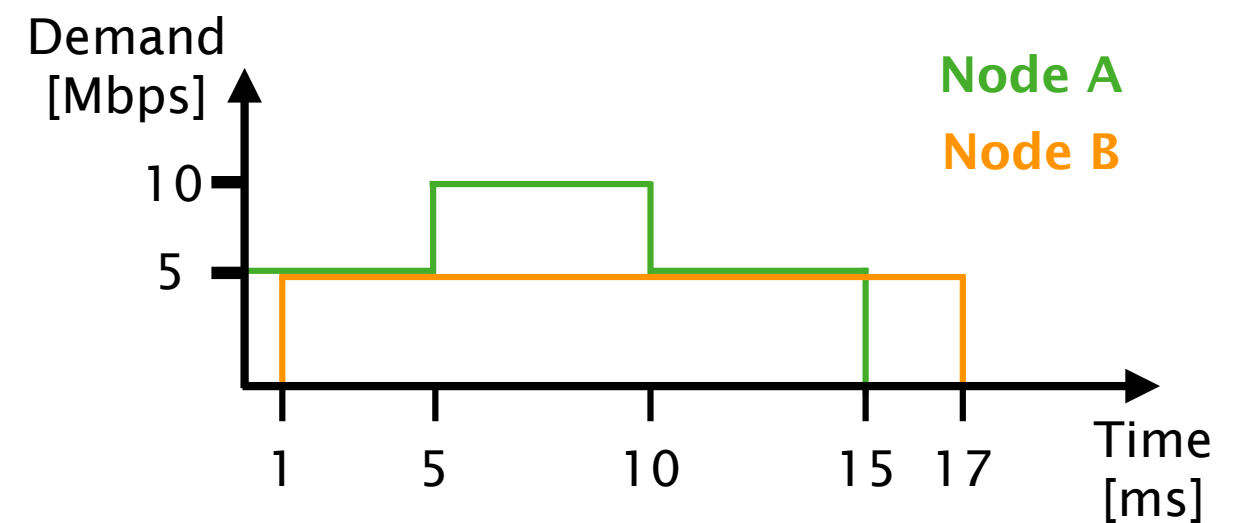
Task 5: Types of Delay



Task 6: Packet vs. Circuit Switching



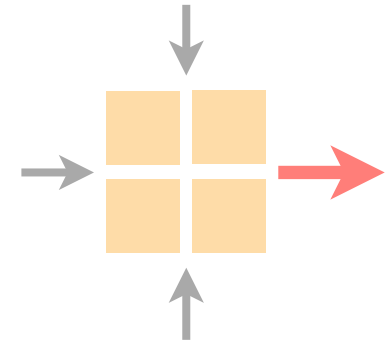
Network with a shared link



Different traffic demands

Communication Networks

Exercise 1



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Don't hesitate to ask questions
also over Slack (email) after the session

Main contact persons:

Tobias Eng. & Ger.

Alexander Eng. & Ger.

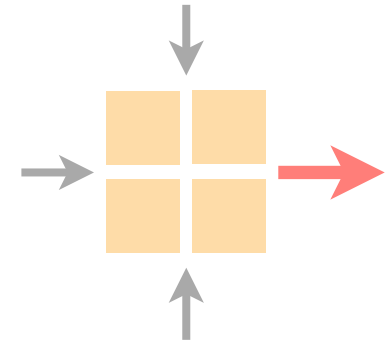
Rüdiger Eng. & Ger.

Hendrik Eng. & Ger.

Eric Eng. & Ger.

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