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)

-\texttt{c} \hspace{0.5cm} \text{count, number of queries}
-\texttt{i} \hspace{0.5cm} \text{wait, time in seconds between each packet}
-\texttt{s} \hspace{0.5cm} \text{packetsize, number of data bytes to send}
-\texttt{S} \hspace{0.5cm} \text{src_addr, source address to use if multiple IPs available}

...
traceroute - output

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

1 82.130.102.1
2 rou-ref-rz-bb-ref-rz-etx (10.10.0.41)
3 rou-fw-rz-ee-tik (10.1.11.129)
4 rou-fw-rz-gw-rz (192.33.92.11)
5 swiez2 (192.33.92.11)
6 swizh1-100ge-0-1-0-0.switch.ch (130.59.38.110)
7 swice1-100ge-0-3-0-0.switch.ch (130.59.36.93)
8 switch.mx1.gen.ch.geant.net (62.40.124.21)
9 ae4.mx1.par.fr.geant.net (62.40.98.152)
10 et-3-1-0.102.rtsw.newy32aoa.net.internet2.edu (198.71.45.236)
11 nyc-9208-12-newy.nysernet.net (199.109.5.1)
12 199.109.5.6 (199.109.5.6)
13 dmzgwpa-tpextgw.net.nyu.edu (128.122.254.65)
14 nyugwa-tp-dmzgw.net.nyu.edu (128.122.254.88)
15 wsqdcgw-vl902.net.nyu.edu (128.122.1.38)
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
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Task 1: Layer Model

Internet protocol stack

- Application
- Transport
- Network
- Link
- Physical
Task 2: Internet Organization
Task 3: Internet Communication

Look at your own traffic using Wireshark: https://www.wireshark.org/
Task 4: Network Characterization

Delay? Bandwidth?
Task 5: Types of Delay
Task 6: Packet vs. Circuit Switching

Network with a shared link

Different traffic demands
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Don’t hesitate to ask questions
also over Slack (email) after the session

Main contact persons:

<table>
<thead>
<tr>
<th>Name</th>
<th>Language</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tobias</td>
<td>Eng. &amp; Ger.</td>
</tr>
<tr>
<td>Coralie</td>
<td>Eng. &amp; Ger.</td>
</tr>
<tr>
<td>Rüdiger</td>
<td>Eng. &amp; Ger.</td>
</tr>
<tr>
<td>Noah</td>
<td>Eng. &amp; Ger.</td>
</tr>
<tr>
<td>Eric</td>
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</tr>
</tbody>
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“Internet Hackathon”
March 26, 6 - 10 pm
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