Communication Networks
Spring 2021

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

ETH Zürich
April 01 2021
IP example from the lecture

Given the prefix 82.130.0.0/17

Compute

# of addressable hosts
the prefix mask
network address
1st host address
last host address
broadcast address
IP example from the lecture

Given the prefix 82.130.0.0/17

Compute

# of addressable hosts $2^{(32 - 17)} - 2 = 32766$
the prefix mask $11111111.11111111.10000000.00000000$
network address
1st host address
last host address
broadcast address
**IP example from the lecture**

Given the prefix 82.130.0.0/17

**Compute**

<table>
<thead>
<tr>
<th># of addressable hosts</th>
<th>2 ** (32 - 17) - 2 = 32766</th>
</tr>
</thead>
<tbody>
<tr>
<td>the prefix mask</td>
<td>11111111.11111111.10000000.00000000</td>
</tr>
<tr>
<td>network address</td>
<td>82.130.0.0</td>
</tr>
<tr>
<td>1st host address</td>
<td>82.130.0.1</td>
</tr>
<tr>
<td>last host address</td>
<td></td>
</tr>
<tr>
<td>broadcast address</td>
<td></td>
</tr>
</tbody>
</table>
Given the prefix 82.130.0.0/17

Compute

- 
  # of addressable hosts
  \[2^{32 - 17} - 2 = 32766\]
- 
  the prefix mask
  \[11111111.11111111.10000000.00000000\]
- 
  network address
  82.130.0.0
- 
  1st host address
  82.130.0.1
- 
  last host address
  82.130.127.254
- 
  broadcast address
  82.130.127.255
Communication Networks
Exercise 5

General information

Solution to last week’s assignment

Overview current assignment

Solutions will be published next week
Group registration

Please register your groups for the routing project: 

Use the #group_search channel on Slack if you look for other group members

Let us know via Slack or email if there are any problems
Mid-course survey

The survey is still open: https://docs.google.com/forms/d/e/1FAIpQLScECdAOOsby50zcPjAMnFP9Y2PleCd_SOekXDPBalyl9iKTg/viewform

Thanks to all of you who already gave us some feedback

After the Easter break we will show you the results and announce possible changes based on your feedback
Communication Networks

Exercise 5

General information

Solution to last week’s assignment

Overview current assignment

Solutions will be published next week
How long would a transfer take?

Consider a Go-Back-N sender and receiver directly connected by a 10 Mbps link with a propagation delay of 100 milliseconds. The retransmission timer is set to 3 seconds and the window has a length of 4 segments.

Draw a time-sequence diagram (see left) showing the transmission of 10 segments (each segment contains 10,000 bits). An ACK is transmitted as soon as the last bit of the corresponding data segment is received. The size of an ACK is very small, that means they have an negligible transmission delay.

Solution:

The acknowledgments always point to the next expected sequence number and not to the sequence number of the last received segment. This means that, for example, the segment with sequence number 5 is acknowledged with A6.
Task 4.2-b) **Setting**

Go-Back-N (GBN) sender and receiver

10Mbps link with propagation delay of 100ms

A data segment contains 10’000 bits (ACKs very small)
we need 1ms to transmit 10’000 bits given a 10Mbps link

3 second retransmission timer and a window of 4 segments

For task b), the 3rd and last segment are lost *once*
Task 4.2-b) normal transmission of the first 2 segments

1ms transmission delay for 10'000 bits

100ms propagation delay

„Zero“ transmission delay for small ACKs

ACK points to next expected data segment
Task 4.2-b) 3rd segment is lost (no ACK)

A1 and A2 free up two slots in the window

Next expected data segment is still 2
Task 4.2-b) retransmission timeout reached at 3202ms

Duplicate ACKs do not reset the timer

3000ms since the last "new" ACK
Task 4.2-b) **GBN retransmission of segments 2-5**

![Diagram of GBN retransmission](image)

**All N segments in the window are retransmitted (Go-Back-N)**

**Receiver can answer with new ACKs**
Task 4.2-b) **last segment (9) is lost**

No more segments to send even though there is space in the window.

No duplicate ACKs this time as last segment was lost.

Beginning no longer shown.
Task 4.2-b) **last segment retransmitted after 3000ms**

3000ms since the last "new" ACK

Sender only terminates after receiving ACK for last segment
General information

Solution to last week’s assignment

Overview current assignment

Solutions will be published next week
Task 1: Duplicate MAC address

Switch learns how to map MACs to ports
Task 1: Duplicate MAC address

Switch learns how to map A to port 1
Task 1: Duplicate MAC address

Dst D unknown: broadcast
Task 1: Duplicate MAC address

Switch learns how to map D to port 4
Task 1: Duplicate MAC address

Dst A known, no broadcast required
Task 1: Duplicate MAC address

More details: Slides 69-72 (week 5)
Task 2: Imposter

<table>
<thead>
<tr>
<th>Who am I?</th>
<th>How do I acquire an IP address?</th>
</tr>
</thead>
<tbody>
<tr>
<td>MAC-to-IP binding</td>
<td>Dynamic Host Configuration Protocol (DHCP)</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Who are you?</th>
<th>Given an IP address reachable on a link, how do I find out what MAC to use?</th>
</tr>
</thead>
<tbody>
<tr>
<td>IP-to-MAC binding</td>
<td>Address Resolution Protocol (ARP)</td>
</tr>
</tbody>
</table>

More details: Slides 31-45 (week 5)
Task 3 & 4: **Spanning Tree**

More details: Slides 73-84 (week 5)

**Tip**: compared to a single switch, you already have knowledge of the entire network. I.e., you immediately know which switch will be the root.
Task 5: VLAN

More details: Slides 18-39 (week 6)
Communication Networks

Exercise 5

General information

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