

# Exercise 2

Osamah Barakat

Osamah.barakat@cs.uni-goettingen.de

# CRC checksums

Please calculate the CRC  $R$  of

$$D = 0101\ 1101\ 1010\ 0101\ 1110\ 0000.$$

Use the 4 bit generator

$$G = 1101.$$

*Note:*

*$R$  is always of length  $|G|-1$*

# CRC (Done by Julian & Markus)

Handwritten CRC calculation on a chalkboard. The dividend (D) is 0101 1101 1010 0101 1110 0000. The divisor is 1101. The remainder (R) is 010.

The calculation shows the following steps:

```
0101 1101 1010 0101 1110 0000 0000
1101
-----
01101
1101
-----
000001101
1101
-----
0000001011
1101
-----
01101
1101
-----
01000
1101
-----
01010
1101
-----
0010
```

The remainder is  $R = 010$ .

Additional notes on the board include "0's of G-1" and a boxed "010" at the end of the calculation.

# Purpose of the link layer

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Answer:

Hop-to-hop connection in one network  
(NOT between networks)

# ARP and inter-networking

What happens, if you want to connect to a host that is not in your local area network?

# ARP and inter-networking

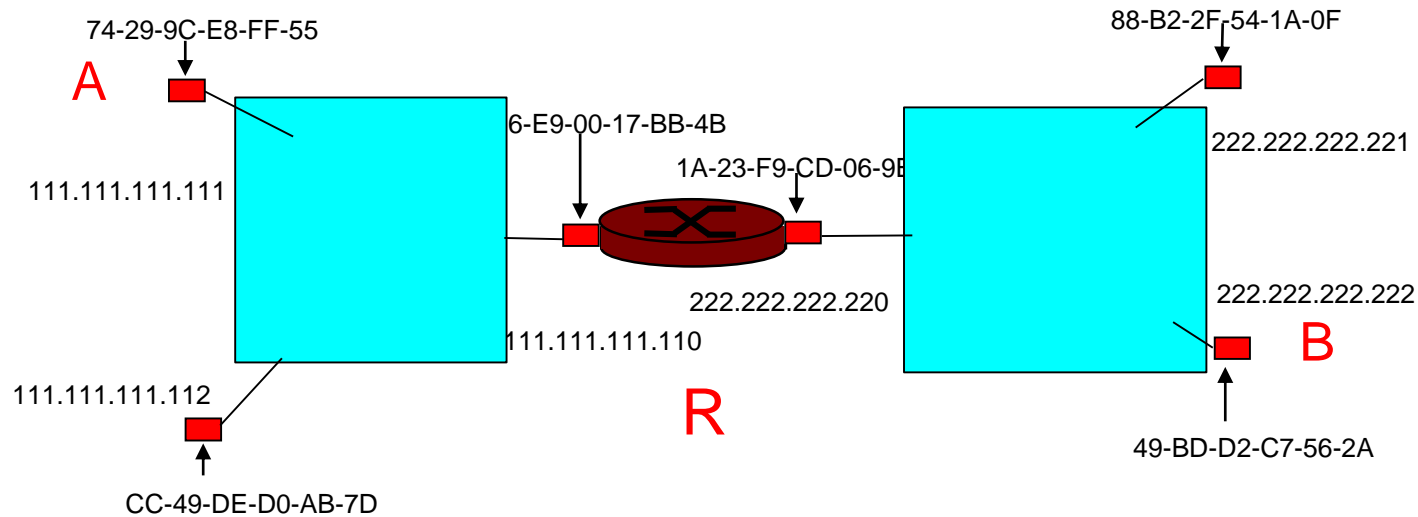
What happens, if you want to connect to a host that is not in your local area network?

Answer:

Remember: ARP is layer 2, routers are layer 3.  
Inter-networking is the job of the network layer.

ARP is serving in looking up the MAC of the router that connects to the network of the destination node.

- 1.A creates IP datagram with source A, destination B
- 2.A uses ARP to get R's MAC address for 111.111.111.110
- 3.A creates link-layer frame with R's MAC address as dest, frame contains A-to-B IP datagram
- 4.A's NIC sends frame
- 5.R's NIC receives frame
- 6.R removes IP datagram from Ethernet frame, sees destination B
- 7.R uses ARP to get B's MAC address
- 8.R creates frame containing A-to-B IP datagram sends to B





# MAC and IP addresses

Please name a conceptual difference between MAC and IP addresses

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Answer:

MAC addresses are unique identifiers for a specific device.

IP addresses for devices may change frequently

# Exponential backoff

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Answer:

Exponential backoff is a simple way to quickly resolve a collision and to adapt to varying congestion states.

It does not require additional signalling among nodes.