

Computer Networks

WS20/21

Exercise 7

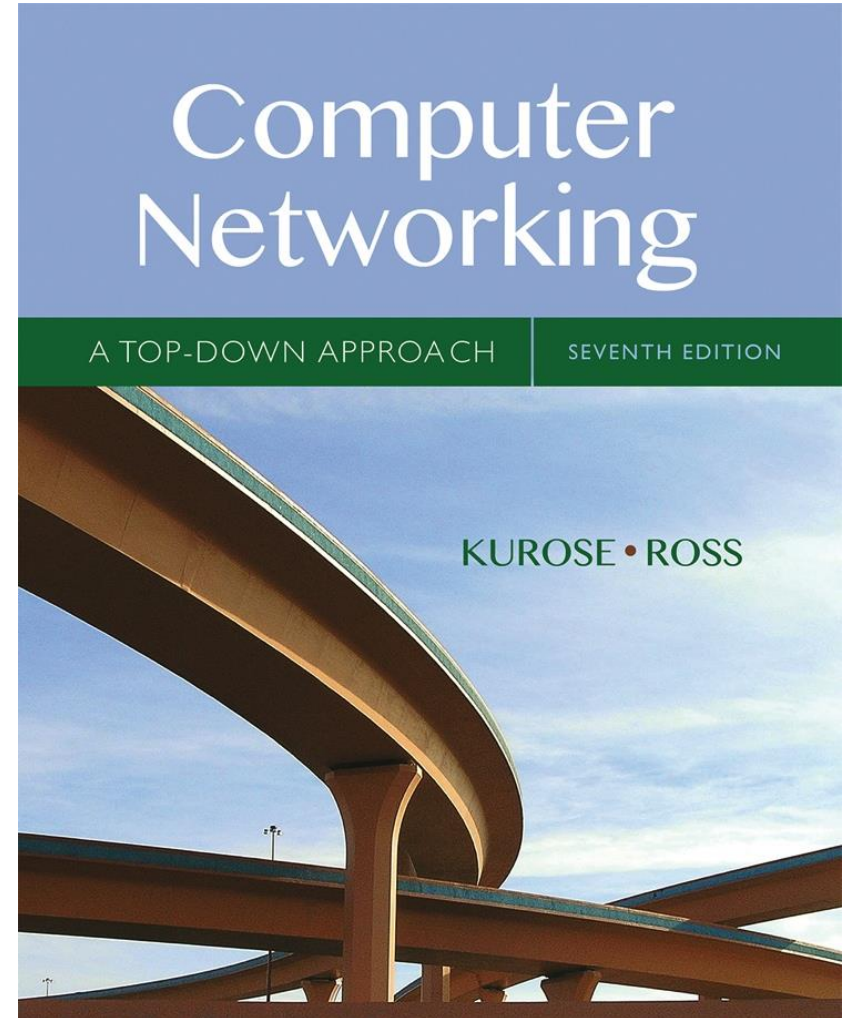
Recommendation

Try to borrow (or buy) this book:

Computer Networking: A Top Down Approach

7th edition. Jim Kurose, Keith Ross,
Pearson, 2019.

It is very good to understand!



CRC checksums

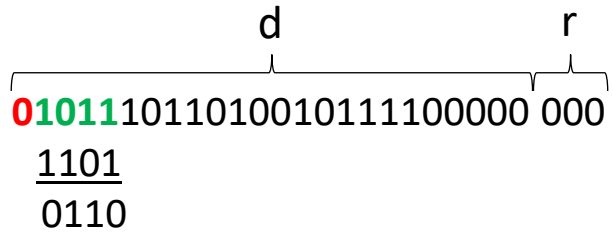
Please calculate the CRC R of

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

Use the 4 bit generator

$$G = 1101$$

CRC checksum



G has 4 bits \Rightarrow r must be $4-1 = 3$ bits

A	B	A XOR B
0	0	0
0	1	1
1	0	1
1	1	0

CRC checksum

010111011010010111100000 000

1101

01101

1101

0000

A	B	A XOR B
0	0	0
0	1	1
1	0	1
1	1	0

CRC checksum

0101110**1101**0010111100000 000

1101

01101

1101

0000 **1101**

1101

0000

A	B	A XOR B
0	0	0
0	1	1
1	0	1
1	1	0

CRC checksum

010111011010010111100000 000

1101

01101

1101

0000 1101

1101

0000 **1011**

1101

0110

A	B	A XOR B
0	0	0
0	1	1
1	0	1
1	1	0

CRC checksum

010111011010010111100000 000

1101

01101

1101

0000 1101

1101

0000 1011

1101

01101

1101

0000

A	B	A XOR B
0	0	0
0	1	1
1	0	1
1	1	0

CRC checksum

010111011010010111100000 000

1101

01101

1101

0000 1101

1101

0000 1011

1101

01101

1101

00001000

1101

0101

A	B	A XOR B
0	0	0
0	1	1
1	0	1
1	1	0

CRC checksum

010111011010010111100000 000

1101

01101

1101

0000 1101

1101

0000 1011

1101

01101

1101

00001000

1101

01010

1101

0111

A	B	A XOR B
0	0	0
0	1	1
1	0	1
1	1	0

CRC checksum

010111011010010111100000 000

1101

01101

1101

0000 1101

1101

0000 1011

1101

01101

1101

00001000

1101

01010

1101

01110

1101

0011

A	B	A XOR B
0	0	0
0	1	1
1	0	1
1	1	0

CRC checksum

010111011010010111100000 **000**

1101

01101

1101

0000 1101

1101

0000 1011

1101

01101

1101

00001000

1101

01010

1101

01110

1101

0011**00**

1101

0001

A	B	A XOR B
0	0	0
0	1	1
1	0	1
1	1	0

CRC checksum

010111011010010111100000 00**0**

```

1101
01101
1101
0000 1101
1101
0000 1011
1101
01101
1101
00001000
1101
01010
1101
01110
1101
001100
1101
00010

```

A	B	A XOR B
0	0	0
0	1	1
1	0	1
1	1	0

R is always of length $|G|-1$
 $\Rightarrow R = 010$

Purpose of the link layer

What is the purpose of the link layer?

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Answer:

Hop-to-hop connection within **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

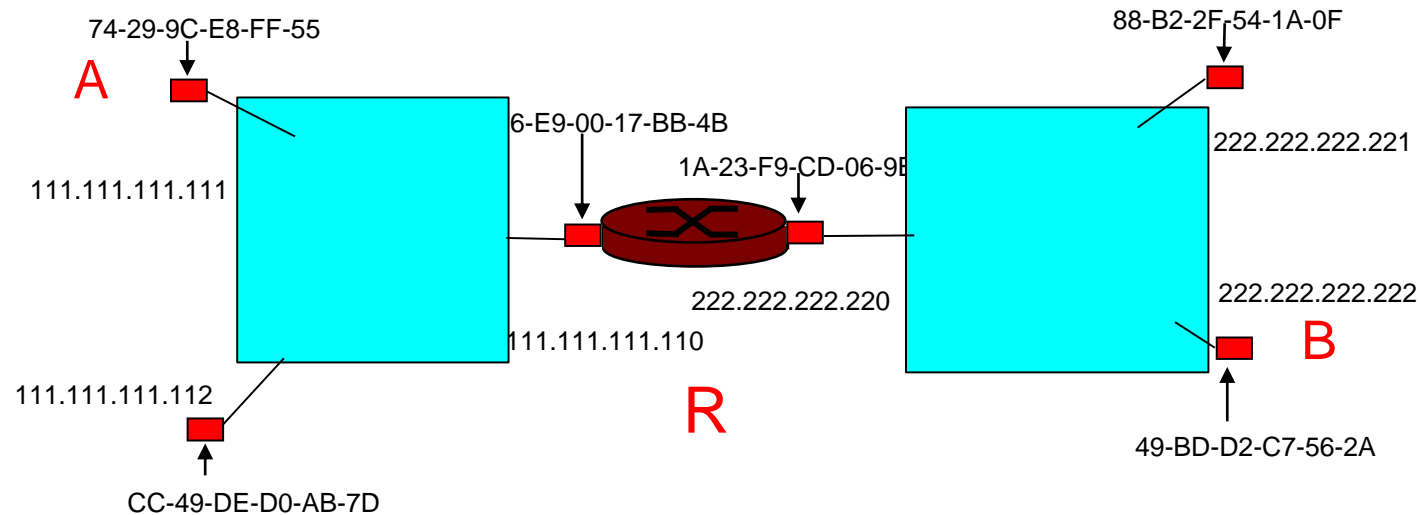
What happens, if you want to connect to a host that is not in your local area network?

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

Why does Ethernet use exponential backoff for collision detection?

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Why does Ethernet use exponential backoff for collision detection?

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.

Any Questions?

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