Netze und Verteilte Systeme

Programmierprojekt Teil 3

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Description

Usage TX

C:

./TX ipAddr portRX packet_size send_delay file_name

java:

java TX ipAddr portRX packet_size send_delay file_name

- **ipAddr** - IP address to send datagrams (default: 127.0.0.1)
- **portRX** - port to send datagrams (default: 4711)
- **packet_size** - size of a packet in Bytes (default: 1000)
- **send_delay** - delay in microsec between blocks (default: 200)
- **file_name** - name of a file to transmit (default: to_send.jpg)

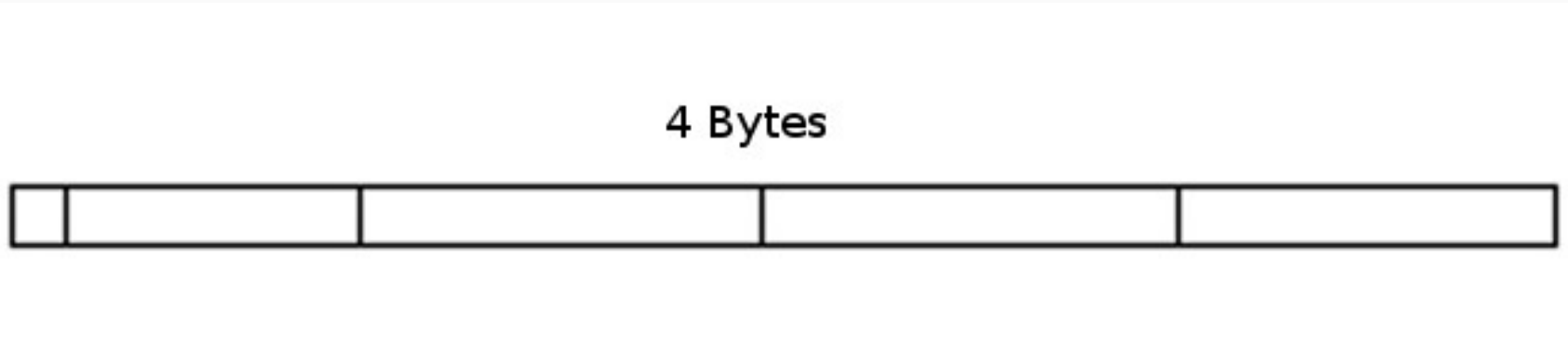
Usage RX

C:
./RX portRX

java:
java portRX

- **portRX** - port to recieve datagrams (default: 4711)

Header structure



A header consists of 4 bytes.

First bit is used to indicate the last packet.

31 bits left for sequence number

TX description

TX description

1. Read file
   1.1 Read file in buffer
   1.2 Calculate CRC32 and add to filebytes
   1.3 Split filebytes in packages
2. Initialize UPD Socket
3. Transmit one packet
4. Wait for acknowlegment {DELAY} microseconds.
   4.1 If a right acknowlegment was recieved -¿ send next packet.
   4.2 If all packets were acknowlegment - end transmission.

RX description

1. Initialize UPD Socket
2. Listen for incomming packages
   - 2.1 Write databits from package in a memory
   - 2.2 Send an acknowlegment packet with seq_num as payload
   - 2.3 If last-package-bit was seen, the size of file and Amount of packets can be defined.
   - 2.4 If not all of package were recieved, then goto punkt 2.
3. Assemble a file
4. Calculate CRC32 and compare with recieved one.

Tests

Tests description

- For each set of parameters, the speed measurement is performed 10 times. After that, the average value is calculated
- The running time and the transfer rate are calculated only for the file transfer phase. Time for initialization and assembly / disassembly of the file is not taken into account.
- System Characteristics:
  - OS: Ubuntu 18.04 64-bit
  - Processor: AMD Ryzen @ 3.50GHz x 4
  - Memory: 8GB
- Secont System for WLAN tests:
  - OS: Ubuntu 16.04 64-bit
  - Processor: Pentium T4200 @ 2.00GHz x 2
  - Memory: 4GB

Tests: C to C

TX.c to RX.c: Manipulate delays

File size	Packet size (Bytes)	Delay (microseconds)	Elapsed time (s)	Speed (Mbps)
100Kb	1000	200	0.003	258,98
100Kb	1000	50	0.003	254,92
100Kb	1000	10	0,004	223,3
1Mb	1000	200	0,025	322,0
1Mb	1000	50	0,024	332,0
1Mb	1000	10	0,023	347,8
10Mb	1000	200	0,207	386,4
10Mb	1000	50	0,226	352,9
10Mb	1000	10	0,314	254,3

TX.c to RX.c: Manipulate with size of packet

File size	Packet size (Bytes)	Delay (microseconds)	Elapsed time (s)	Speed (Mbps)
100Kb	1000	50	0.003	254,92
100Kb	10000	50	0.001	786,1
1Mb	1000	50	0,024	332,0
1Mb	10000	50	0,007	1198,0
1Mb	65000	50	0,004	2407,6
10Mb	1000	50	0,226	352,9
10Mb	10000	50	0,058	1378,32
10Mb	65000	50	0,034	2298,6

TX.c to RX.c: WLAN tests

File size	Packet size (Bytes)	Delay (microseconds)	Elapsed time (s)	Speed (Mbps)
100Kb	1000	1000	0.310	2,7
100Kb	1000	2000	0.211	3.8
100Kb	10000	5000	0.108	8.26
100Kb	10000	20000	0.068	13.87
1Mb	1000	2000	2.191	4.0
1Mb	10000	10000	0,651	13.4
1Mb	50000	50000	0,571	15.3
10Mb	1000	2000	24,721	3,4
10Mb	10000	10000	7.14	11.8
10Mb	50000	50000	4.97	16.9

Tests: C to Java

TX.c to RX.java: Manipulate delays

File size	Packet size (Bytes)	Delay (microseconds)	Elapsed time (s)	Speed (Mbps)
100Kb	1000	200	0,035	28.3
100Kb	1000	1000	0,029	33.7
100Kb	1000	5000	0,030	32.1
1Mb	1000	200	0,086	109.0
1Mb	1000	1000	0,084	109.1
1Mb	1000	5000	0,089	104.4
10Mb	1000	200	0.511	165.2
10Mb	1000	1000	0.552	153.9
10Mb	1000	5000	0.515	165.0

TX.c to RX.java: Manipulate with size of packet

File size	Packet size (Bytes)	Delay (microseconds)	Elapsed time (s)	Speed (Mbps)
100Kb	1000	200	0,035	28.3
100Kb	10000	200	0,021	37.4
1Mb	1000	200	0,086	109.0
1Mb	10000	200	0,061	146.4
1Mb	65000	200	0,051	175.9
10Mb	1000	200	0.511	165.2
10Mb	10000	200	0.301	277.6
10Mb	65000	200	0.258	341.6

TX.c to RX.java: WLAN tests

File size	Packet size (Bytes)	Delay (microseconds)	Elapsed time (s)	Speed (Mbps)
100Kb	1000	1000	0.450	1.8
100Kb	1000	2000	0.291	2.9
100Kb	10000	5000	0.128	6.7
100Kb	10000	20000	0.332	2.4
1Mb	1000	2000	2.521	3.4
1Mb	10000	10000	0,847	10.3
1Mb	50000	50000	0,789	11.2
10Mb	1000	2000	24,471	3.4
10Mb	10000	10000	7.38	11.3
10Mb	50000	50000	5.95	14.1

Tests: Java to C

TX.java to RX.c: Manipulate delays

File size	Packet size (Bytes)	Delay (microseconds)	Elapsed time (s)	Speed (Mbps)
100Kb	1000	1000	0,011	95.9
100Kb	1000	2000	0,015	74.9
1Mb	1000	1000	0,031	150.91
1Mb	1000	2000	0,064	146.7
10Mb	1000	1000	1.774	47.5
10Mb	1000	2000	2.181	38.5
10Mb	1000	5000	2.548	33.1

TX.java to RX.c: Manipulate with size of packet

File size	Packet size (Bytes)	Delay (microseconds)	Elapsed time (s)	Speed (Mbps)
100Kb	1000	1000	0,011	95.9
100Kb	10000	1000	0,002	351.7
1Mb	1000	1000	0,031	150.91
1Mb	10000	1000	0,020	435.9
1Mb	65000	1000	0,021	403.1
10Mb	1000	1000	1.774	47.5
10Mb	10000	1000	0,115	765.6
10Mb	65000	1000	0.116	740.2

TX.java to RX.c: WLAN tests

File size	Packet size (Bytes)	Delay (microseconds)	Elapsed time (s)	Speed (Mbps)
100Kb	1000	1000	0.231	3.53
100Kb	1000	2000	0.361	2.26
100Kb	10000	5000	0.108	8.62
1Mb	1000	2000	5.419	1.62
1Mb	10000	10000	2,551	3.5
1Mb	50000	50000	2,211	4.1
10Mb	1000	2000	57.65	1.46
10Mb	10000	10000	17.49	4.81
10Mb	50000	20000	15.26	5.51

Tests: Java to Java

TX.java to RX.java: Manipulate delays

File size	Packet size (Bytes)	Delay (microseconds)	Elapsed time (s)	Speed (Mbps)
100Kb	1000	1000	0,151	5.43
100Kb	1000	2000	0,268	3.18
1Mb	1000	1000	1,402	6.25
1Mb	1000	2000	2,510	3.48
10Mb	1000	1000	12.57	6.69
10Mb	1000	2000	23.12	3.64

TX.java to RX.java: Manipulate with size of packet

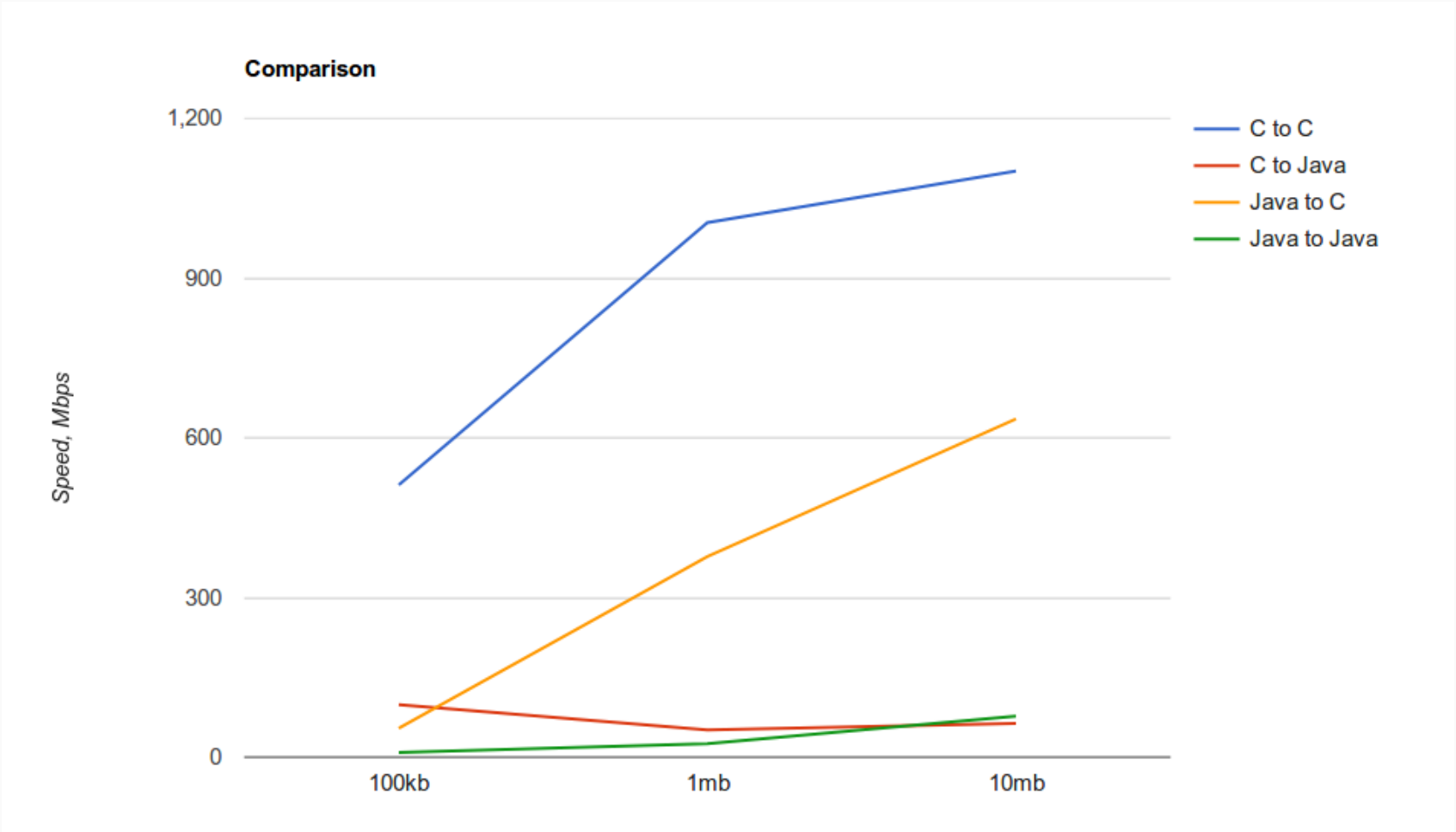
File size	Packet size (Bytes)	Delay (microseconds)	Elapsed time (s)	Speed (Mbps)
100Kb	1000	1000	0,151	5.43
100Kb	10000	1000	0,092	24.77
1Mb	1000	1000	1,402	6.25
1Mb	10000	1000	0,221	39.72
1Mb	65000	1000	0,098	95.25
10Mb	1000	1000	12.57	6.69
10Mb	10000	1000	1,888	44.65
10Mb	65000	1000	0.69	121.07

TX.java to RX.java: WLAN tests

File size	Packet size (Bytes)	Delay (microseconds)	Elapsed time (s)	Speed (Mbps)
100Kb	1000	1000	0.560	1.47
100Kb	1000	2000	0.544	1.52
100Kb	10000	5000	0.801	1.03
1Mb	1000	2000	5.149	1.70
1Mb	10000	10000	1.933	4.53
1Mb	50000	50000	2.198	4.01
10Mb	1000	2000	51.12	1.64
10Mb	10000	10000	18.42	4.56
10Mb	50000	20000	17.39	4.83

Compare the best of results

Compare


Comparison
1,200
900
600
300
0
Speed, Mbps
100kb
1mb
10mb
C to C
C to Java
Java to C
Java to Java

WLAN results

WLAN c-to-c results

- Die bertragungsrate durch das Shuttle ist um ein Vielfaches niedriger
- Aufgrund der Tatsache, dass der empfangende Computer viel schwcher ist als das Senden, war es notwendig, den Delay-parameter signifikant zu erhhen, um akzeptable Geschwindigkeiten zu erreichen