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)

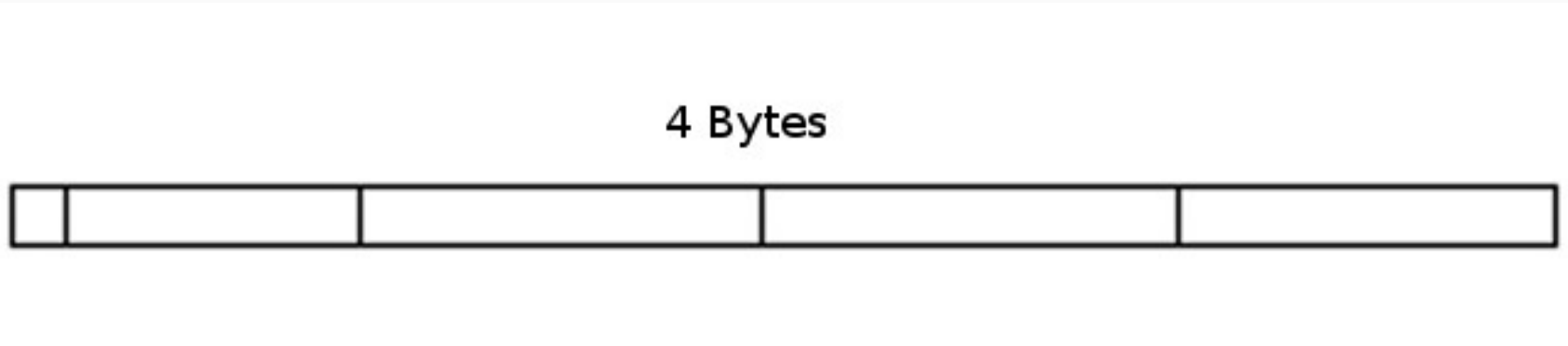
Usage RX

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)	Block size (packets)	Delay (microseconds)	Elapsed time (s)	Speed (Mbps)
100Kb	1000	100	200	0,135	6,4
100Kb	1000	100	1000	0,088	9,4
100Kb	1000	100	5000	0,082	9,9
1Mb	1000	100	200	0,708	13,2
1Mb	1000	100	1000	0,624	14,4
1Mb	1000	100	5000	0,622	14,4
10Mb	1000	100	200	3,020	27,8
10Mb	1000	100	1000	3,012	27,8
10Mb	1000	100	5000	3,104	27,5

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

File size	Packet size (Bytes)	Block size (packets)	Delay (microseconds)	Elapsed time (s)	Speed (Mbps)
100Kb	1000	100	200	0,133	6,6
100Kb	10000	100	200	0,055	15,4
1Mb	1000	100	200	0,576	15,5
1Mb	10000	100	200	0,384	23,5
1Mb	65000	100	200	0,248	36.2
10Mb	1000	100	200	3,101	27,2
10Mb	10000	100	200	1,162	75,8
10Mb	65000	100	200	1,061	79,5

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

File size	Packet size (Bytes)	Block size (packets)	Delay (microseconds)	Elapsed time (s)	Speed (Mbps)
100Kb	1000	100	200	0,133	6,6
100Kb	1000	500	200	0,152	5.8
1Mb	1000	50	200	0,264	16,6
1Mb	1000	100	200	0,576	15,5
1Mb	1000	500	200	0,574	15,4
10Mb	1000	50	200	4,080	20,6
10Mb	1000	100	200	3,101	27,2
10Mb	1000	500	200	3,300	26,6
10Mb	1000	2000	200	3,94	21,4

TX.c to RX.java: Best results

File size	Packet size (Bytes)	Block size (packets)	Delay (microseconds)	Elapsed time (s)	Speed (Mbps)
100Kb	65000	100	1000	0,040	99,0
1Mb	65000	100	1000	0,177	51,1
10Mb	65000	100	1000	1,748	63,2

Tests: Java to C

TX.java to RX.c: Manipulate delays

File size	Packet size (Bytes)	Block size (packets)	Delay (microseconds)	Elapsed time (s)	Speed (Mbps)
100Kb	1000	100	1000	0,081	10,13
100Kb	1000	100	2000	0,080	10,14
1Mb	1000	100	1000	0,404	21,9
1Mb	1000	100	2000	0,448	19,7
10Mb	1000	100	1000	2,120	39,6
10Mb	1000	100	2000	2.151	38,8
10Mb	1000	100	5000	2.548	32,7

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

File size	Packet size (Bytes)	Block size (packets)	Delay (microseconds)	Elapsed time (s)	Speed (Mbps)
100Kb	1000	100	1000	0,081	10,13
100Kb	10000	100	1000	0,016	53,1
1Mb	1000	100	1000	0,404	21,9
1Mb	10000	100	1000	0,088	99,0
1Mb	65000	100	1000	0,020	376,9
10Mb	1000	100	1000	2,120	39,6
10Mb	10000	100	1000	0,482	183,8
10Mb	65000	100	1000	0.136	635,4

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

File size	Packet size (Bytes)	Block size (packets)	Delay (microseconds)	Elapsed time (s)	Speed (Mbps)
100Kb	1000	100	1000	0,081	10,13
100Kb	1000	500	1000	0,013	54,8
1Mb	1000	50	1000	0,418	20,9
1Mb	1000	100	1000	0,404	21,9
1Mb	1000	500	1000	0,574	6,9
10Mb	1000	50	1000	2,312	36,2
10Mb	1000	100	1000	2,120	39,6
10Mb	1000	500	1000	3,288	26,2
10Mb	1000	2000	1000	31,190	2,8

TX.java to RX.c: Best results

File size	Packet size (Bytes)	Block size (packets)	Delay (microseconds)	Elapsed time (s)	Speed (Mbps)
100Kb	1000	500	1000	0,013	54,8
1Mb	65000	100	1000	0,020	376,9
10Mb	65000	100	1000	0.136	635,4

Tests: Java to Java

TX.java to RX.java: Manipulate delays

File size	Packet size (Bytes)	Block size (packets)	Delay (microseconds)	Elapsed time (s)	Speed (Mbps)
100Kb	1000	100	1000	0,169	4,9
100Kb	1000	100	2000	0,218	4,3
1Mb	1000	100	1000	1,022	8,7
1Mb	1000	100	2000	0,900	9,7
10Mb	1000	100	1000	4,142	20,3
10Mb	1000	100	2000	4,148	20,2

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

File size	Packet size (Bytes)	Block size (packets)	Delay (microseconds)	Elapsed time (s)	Speed (Mbps)
100Kb	1000	100	1000	0,169	4,9
100Kb	10000	100	1000	0,092	8,9
1Mb	1000	100	1000	1,022	8,7
1Mb	10000	100	1000	0,710	13,2
1Mb	65000	100	1000	0,378	23,7
10Mb	1000	100	1000	4,142	20,3
10Mb	10000	100	1000	2,788	31,9
10Mb	65000	100	1000	1,91	77,5

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

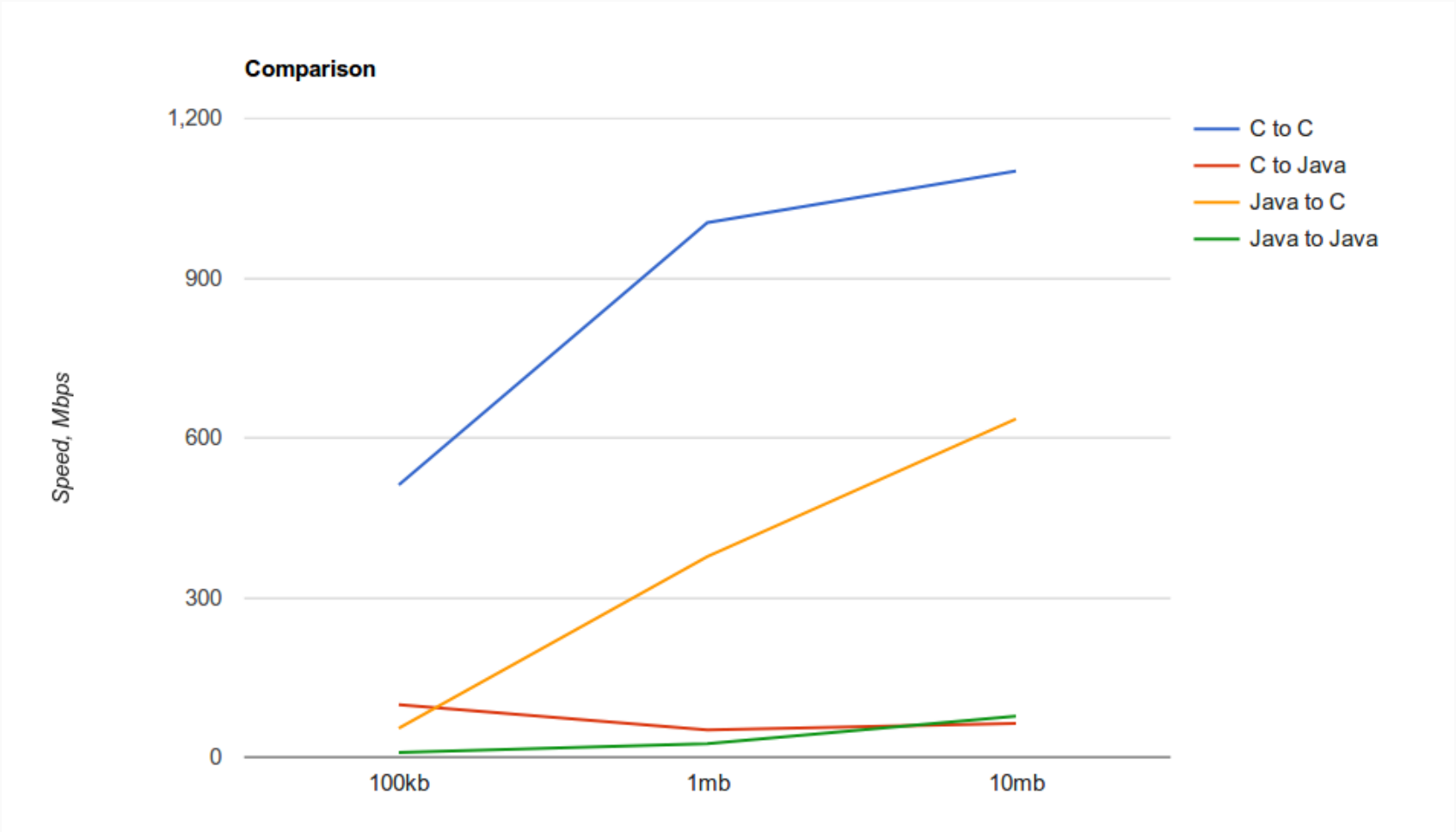
File size	Packet size (Bytes)	Block size (packets)	Delay (microseconds)	Elapsed time (s)	Speed (Mbps)
100Kb	1000	100	1000	0,169	4,9
100Kb	1000	500	1000	0,167	4,9
1Mb	1000	50	1000	1,010	8,8
1Mb	1000	100	1000	1,022	8,7
1Mb	1000	500	1000	1,188	7,5
10Mb	1000	50	1000	3,87	21,7
10Mb	1000	100	1000	4,142	20,3
10Mb	1000	500	1000	6,388	13,9

TX.java to RX.java: Best results

File size	Packet size (Bytes)	Block size (packets)	Delay (microseconds)	Elapsed time (s)	Speed (Mbps)
100Kb	10000	100	1000	0,092	8,9
1Mb	65000	100	5000	0,346	25,4
10Mb	65000	100	1000	1,91	77,5

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