Lab 3: File Servers, Traffic Generators, and Monitoring

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CS536

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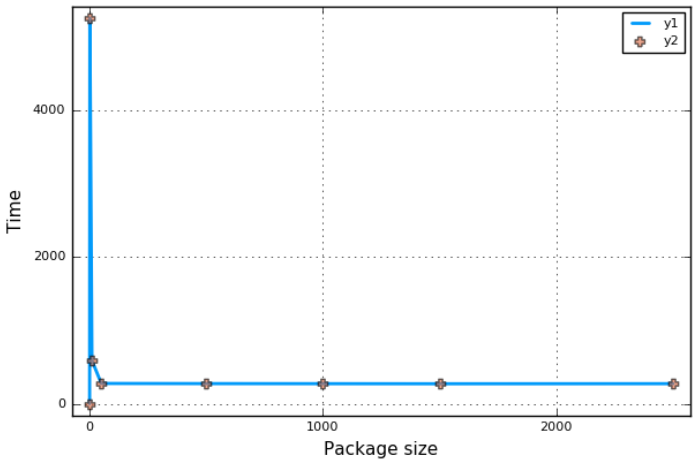
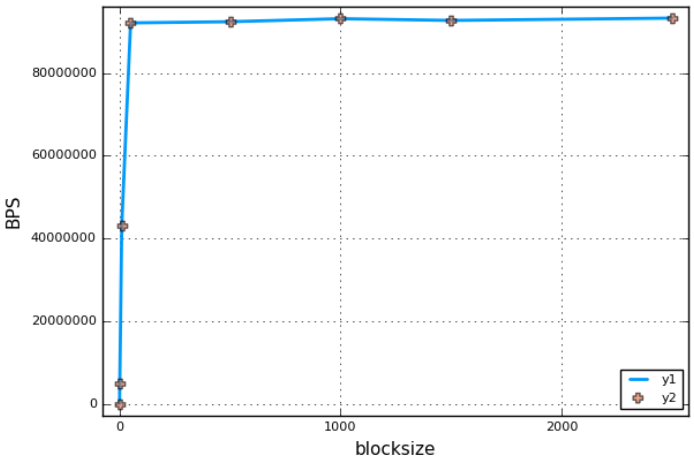
Problem 1.
For this problem, I use an audio file (i.e.) with file size of 3183357 bytes (≈ 3.1 MB). I use both check sum and Linux `diff` to check for the authenticity of the downloaded files. With TCP, we did not have any corrupted files.
Below are the results of time and through put for different package sizes:

Package size	Time	Reliable Through Put
1 byte	5265 ms	4,836,939 bps
10 bytes	590 ms	43,152,693 bps
50 bytes	276 ms	92,095,696 bps
500 bytes	274 ms	92,382,231 bps
1000 bytes	273 ms	93,115,342 bps
1500 bytes	272 ms	92,695,123 bps
2500 bytes	273 ms	93,255,654 bps
10000 bytes	275 ms	92,895,832 bps

Below is plotted graph of the data:

While the small package size may limit reliable through put, much bigger package size also does not have much impact on throughput. As the package size reach a certain value, the



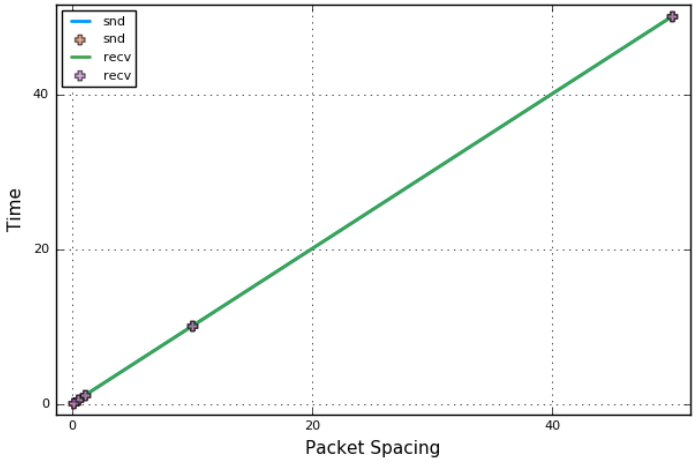


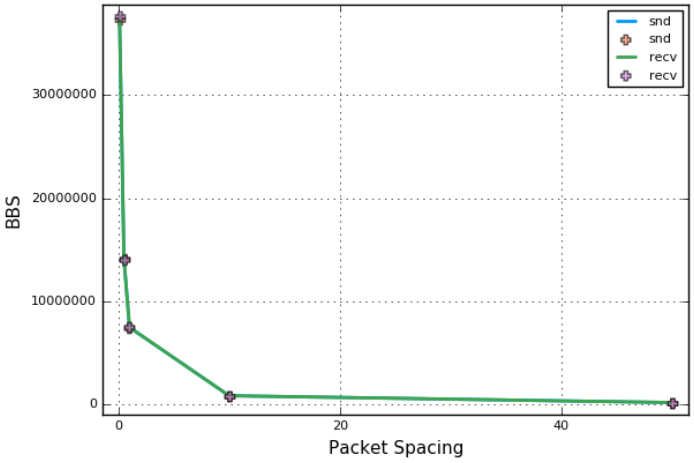
reliable throughput and transmission time did not change. Thus, to improve the server performance, I may choose package size to be power of two because it may be helpful for computers and kernels, not too big so that we can fit inside processor (i.e L2 cache) ...

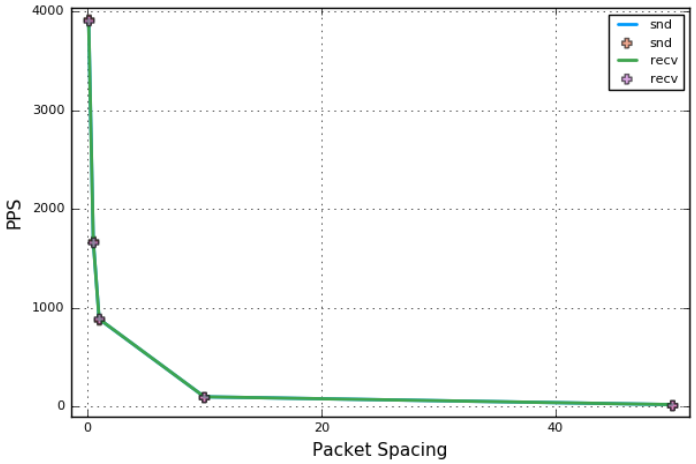
Problem 2.
For payload-size = 1000 bytes, packet-count = 1000. We obtain the following result with different packet-spacing:
`Traffic_rcv` was run at *sslab*01. `Traffic_snd` was run at my home.

	Sender			Receiver		
Packet Spacing	Time	BPS	PPS	Time	BPS	PPS
50ms	50.136s	167965 bps	20 pps	50.141 s	167679 bps	20 pps
10ms	10.125s	831171 bps	99 pps	10.126 s	830265 bps	99 pps
1ms	1.128s	7457984 bps	886 pps	1.127 s	7466294 bps	887 pps
.5ms	.596s	14119573 bps	1678 pps	.599 s	14035791 bps	1667 pps
.1ms	.226s	37289592 bps	3923 pps	.223 s	37680936 bps	3916 pps

Graph:







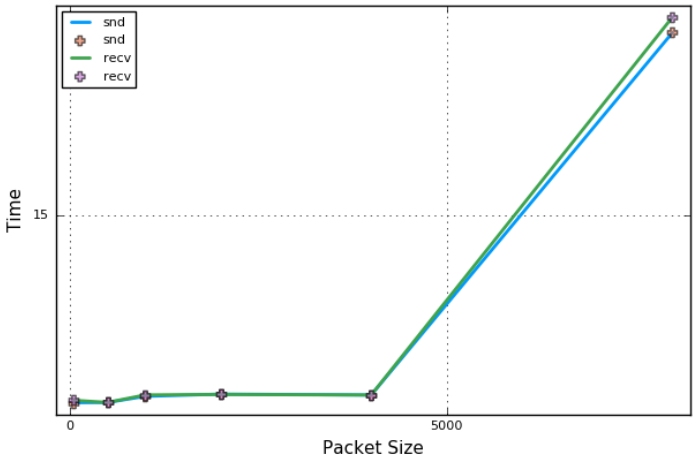
Yes, throughput numbers are approximately equal for both client and server. When package spacing reduces from 50ms to .1 ms, completion decreases, throughput increases, and pps

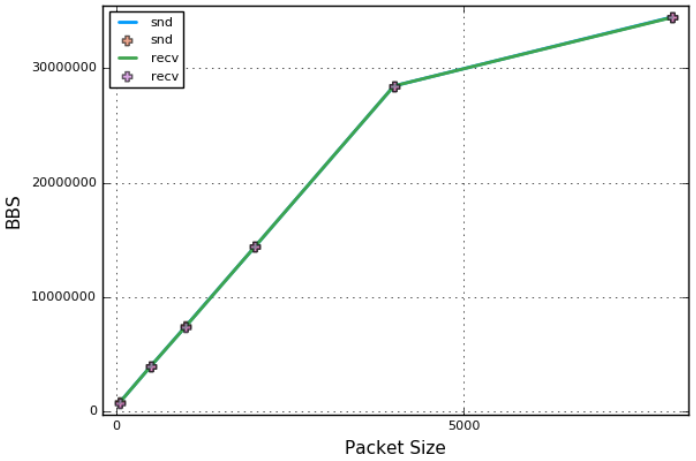
increases. Yes, I think the observed result are consistent with what theoretically expected because by reducing the spacing time, we allow the receiver to process incoming datagram with faster rate. Hover, after reducing the time spacing to less than equal to .1 ms, there is no improvement in completion time. I think `0.1 ms` about how long it takes for the os to handle `rcvfrom`

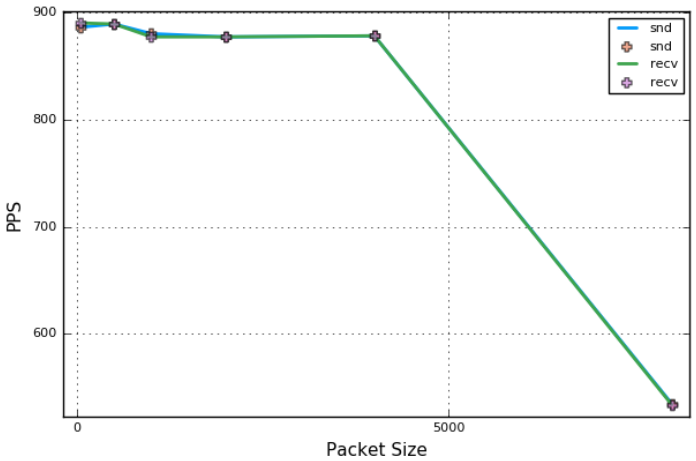
For payload-size = 10000 bytes, packet-spacing = 1 ms. We obtain the following result with different packet-spacing:

	Sender			Receiver		
Packet size	Time	BPS	PPS	Time	BPS	PPS
50 bytes	11.234s	737458.188 bps	886 pps	11.282 s	727746 bps	890 pps
500 bytes	11.238s	3929357 bps	889 pps	11.239 s	3929083 bps	889 pps
1000 bytes	11.362s	7407060 bps	880 pps	11.390 s	7388543 bps	877 pps
2000 bytes	11.406s	14398335 bps	877 pps	11.399 s	14399694 bps	877 pps
4000 bytes	11.388s	28465396 bps	878 pps	11.388 s	28463406 bps	878 pps
8000 bytes	18.675s	34492452 bps	535 pps	534.986 s	34461664 bps	534 pps

Graphs:







For small payload, the completion time and the PPS are consistent, and the throughput increases as payload increases. However, For payload size of $\geq$ 8000 bytes, we experience a slow down in completion time.

Problem 3.
For this problem, I used `borg20`. To generate traffic, I used:
`rsh 192.168.1.2 './sender 192.168.1.1 10000 100 15 10000'`
Below are two sample of results:

```
0x0000:  3a56 8f3e 2af8 babc 4274 5230 0800 4500  :V.>*...BtR0..E.
0x0010:  0080 8e13 4000 4011 2906 c0a8 0102 c0a8  ....@.@.).......
0x0020:  0101 dbb0 2710 006c 83d1 4c4c 4c4c 4c4c  ....'..l..LLLLLL
0x0030:  4c4c 4c4c 4c4c 4c4c 4c4c 4c4c 4c4c 4c4c  LLLLLLLLLLLLLLLL
0x0040:  4c4c 4c4c 4c4c 4c4c 4c4c 4c4c 4c4c 4c4c  LLLLLLLLLLLLLLLL
0x0050:  4c4c 4c4c 4c4c 4c4c 4c4c 4c4c 4c4c 4c4c  LLLLLLLLLLLLLLLL
0x0060:  4c4c 4c4c 4c4c 4c4c 4c4c 4c4c 4c4c 4c4c  LLLLLLLLLLLLLLLL
0x0070:  4c4c 4c4c 4c4c 4c4c 4c4c 4c4c 4c4c 4c4c  LLLLLLLLLLLLLLLL
0x0080:  4c4c 4c4c 4c4c 4c4c 4c4c 4c4c 4c4c       LLLLLLLLLLLLLL
```

```
0x0000:  babc 4274 5230 3a56 8f3e 2af8 0800 45c0  ..BtR0:V.>*...E.
0x0010:  009c 6bea 0000 4001 8a63 c0a8 0101 c0a8  ..k...@..c......
0x0020:  0102 0303 8f17 0000 0000 4500 0080 8e13  ..........E.....
0x0030:  4000 4011 2906 c0a8 0102 c0a8 0101 dbb0  @.@.).....
0x0040:  2710 006c 83d1 4c4c 4c4c 4c4c 4c4c 4c4c  '..l..LLLLLLLLL
0x0050:  4c4c 4c4c 4c4c 4c4c 4c4c 4c4c 4c4c 4c4c  LLLLLLLLLLLLLLLL
0x0060:  4c4c 4c4c 4c4c 4c4c 4c4c 4c4c 4c4c 4c4c  LLLLLLLLLLLLLLLL
0x0070:  4c4c 4c4c 4c4c 4c4c 4c4c 4c4c 4c4c 4c4c  LLLLLLLLLLLLLLLL
0x0080:  4c4c 4c4c 4c4c 4c4c 4c4c 4c4c 4c4c 4c4c  LLLLLLLLLLLLLLLL
0x0090:  4c4c 4c4c 4c4c 4c4c 4c4c 4c4c 4c4c 4c4c  LLLLLLLLLLLLLLLL
0x00a0:  4c4c 4c4c 4c4c 4c4c 4c4c                 LLLLLLLLLL
```

48-bit MAC Address: Inspecting first 6 bytes.

- Source: `ba:bc:42:74:52:30` or `babc 4274 5230`
- Destination: `3a:56:8f:3e:2a:f8` or `3a56 8f3e 2af8`

Two bytes type/length: IPv4 (`0800`)
Identify `DIX` vs `802.3`: Because we only use character of our first name as payload body, it's not difficult to see that the `802.03` Ethernet has longer header because of LLC header. Thus, in our sample, the latter sample is `802.03` Ethernet frame.
Version Number: 4 because of `4500`
Port number: Inspect next 4 bytes after IP payload

- Source Port: `dbb0` (i.e. in decimal 56240)
- Destination Port: `2710` (i.e. in decimal 10000)

UDP Payload: Inspecting next 2 bytes after port number which is `006c` (i.e in decimal 108) which is total of payload size and header. Thus, payload size is 100 bytes which is consistent with our input.