

Computer Networks



INDRAPRASTHA INSTITUTE *of*
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Case 1:



Drop Probability (p) = 0.3

$T_1 = 0.1 \text{ s}$

$T_2 = 0.2 \text{ s}$

$T_3 = 0.1 \text{ s}$

$T_4 = 0.2 \text{ s}$



Average Delay for each frame



Delay for each frame:

```
Frame 1: Delay = 0.0000 seconds
Frame 2: Delay = 0.1155 seconds
Frame 3: Delay = 0.2752 seconds
Frame 4: Delay = 0.4448 seconds
Frame 5: Delay = 0.5517 seconds
Frame 6: Delay = 0.7443 seconds
Frame 7: Delay = 0.9297 seconds
Frame 8: Delay = 1.0917 seconds
Frame 9: Delay = 8.3083 seconds
Frame 10: Delay = 8.3083 seconds
Frame 11: Delay = 8.3695 seconds
Frame 12: Delay = 8.3673 seconds
Frame 13: Delay = 8.3208 seconds
Frame 14: Delay = 9.3021 seconds
Frame 15: Delay = 9.3752 seconds
Frame 16: Delay = 9.3775 seconds
Frame 17: Delay = 4.6813 seconds
Frame 18: Delay = 4.6882 seconds
Frame 19: Delay = 5.9873 seconds
Frame 20: Delay = 6.0477 seconds
```

Average delay: 4.7643 seconds

Average Transmissions



Number of transmissions for each frame:

```
Frame 1: 8 transmissions
Frame 2: 8 transmissions
Frame 3: 8 transmissions
Frame 4: 8 transmissions
Frame 5: 8 transmissions
Frame 6: 11 transmissions
Frame 7: 11 transmissions
Frame 8: 11 transmissions
Frame 9: 4 transmissions
Frame 10: 4 transmissions
Frame 11: 6 transmissions
Frame 12: 7 transmissions
Frame 13: 7 transmissions
Frame 14: 4 transmissions
Frame 15: 6 transmissions
Frame 16: 6 transmissions
Frame 17: 6 transmissions
Frame 18: 6 transmissions
Frame 19: 4 transmissions
Frame 20: 3 transmissions
```

Average number of transmissions per frame: 6.80

First Receive time successfully



```
First receive times at receiver (received at sender):
```

```
Frame 1: Received at 2024-11-12 23:03:33
Frame 2: Received at 2024-11-12 23:03:33
Frame 3: Received at 2024-11-12 23:03:33
Frame 4: Received at 2024-11-12 23:03:33
Frame 5: Received at 2024-11-12 23:03:33
Frame 6: Received at 2024-11-12 23:03:33
Frame 7: Received at 2024-11-12 23:03:34
Frame 8: Received at 2024-11-12 23:03:34
Frame 9: Received at 2024-11-12 23:03:41
Frame 10: Received at 2024-11-12 23:03:44
Frame 11: Received at 2024-11-12 23:04:00
Frame 12: Received at 2024-11-12 23:04:08
Frame 13: Received at 2024-11-12 23:04:08
Frame 14: Received at 2024-11-12 23:04:08
Frame 15: Received at 2024-11-12 23:04:09
Frame 16: Received at 2024-11-12 23:04:15
Frame 17: Received at 2024-11-12 23:04:16
Frame 18: Received at 2024-11-12 23:04:16
Frame 19: Received at 2024-11-12 23:04:19
Frame 20: Received at 2024-11-12 23:04:25
PS C:\Users\palak\OneDrive\Desktop\cnassignment3> |
```


Time first sent



```
Frame 1: Sent at 2024-11-12 23:03:33
Frame 2: Sent at 2024-11-12 23:03:33
Frame 3: Sent at 2024-11-12 23:03:33
Frame 4: Sent at 2024-11-12 23:03:33
Frame 5: Sent at 2024-11-12 23:03:33
Frame 6: Sent at 2024-11-12 23:03:33
Frame 7: Sent at 2024-11-12 23:03:33
Frame 8: Sent at 2024-11-12 23:03:33
Frame 9: Sent at 2024-11-12 23:03:37
Frame 10: Sent at 2024-11-12 23:03:39
Frame 11: Sent at 2024-11-12 23:03:48
Frame 12: Sent at 2024-11-12 23:03:53
Frame 13: Sent at 2024-11-12 23:03:53
Frame 14: Sent at 2024-11-12 23:03:53
Frame 15: Sent at 2024-11-12 23:03:53
Frame 16: Sent at 2024-11-12 23:04:00
Frame 17: Sent at 2024-11-12 23:04:02
Frame 18: Sent at 2024-11-12 23:04:02
Frame 19: Sent at 2024-11-12 23:04:09
Frame 20: Sent at 2024-11-12 23:04:17
```

Case 2 : $P=0.7$



Avg delay

We can observe an increase in avg delay

```
Delay for each frame:  
Frame 1: Delay = 0.0000 seconds  
Frame 2: Delay = 0.1907 seconds  
Frame 3: Delay = 0.2966 seconds  
Frame 4: Delay = 0.4291 seconds  
Frame 5: Delay = 0.6111 seconds  
Frame 6: Delay = 0.7287 seconds  
Frame 7: Delay = 0.8345 seconds  
Frame 8: Delay = 0.9826 seconds  
Frame 9: Delay = 6.6832 seconds  
Frame 10: Delay = 25.2210 seconds  
Frame 11: Delay = 24.9962 seconds  
Frame 12: Delay = 26.1275 seconds  
Frame 13: Delay = 24.1479 seconds  
Frame 14: Delay = 24.1327 seconds  
Frame 15: Delay = 24.0832 seconds  
Frame 16: Delay = 17.7308 seconds  
Frame 17: Delay = 16.5264 seconds  
Frame 18: Delay = 11.9941 seconds  
Frame 19: Delay = 12.0170 seconds  
Frame 20: Delay = 12.0659 seconds  
  
Average delay: 11.4900 seconds
```

Avg transmissions



Average transmission have been increased 3 times

Number of transmissions for each frame:

```
Frame 1: 9 transmissions
Frame 2: 35 transmissions
Frame 3: 36 transmissions
Frame 4: 38 transmissions
Frame 5: 44 transmissions
Frame 6: 44 transmissions
Frame 7: 44 transmissions
Frame 8: 46 transmissions
Frame 9: 38 transmissions
Frame 10: 13 transmissions
Frame 11: 12 transmissions
Frame 12: 10 transmissions
Frame 13: 4 transmissions
Frame 14: 4 transmissions
Frame 15: 10 transmissions
Frame 16: 8 transmissions
Frame 17: 14 transmissions
Frame 18: 14 transmissions
Frame 19: 20 transmissions
Frame 20: 23 transmissions
```

Average number of transmissions per frame: 23.30

First time sent



```
First send times for each frame:  
Frame 1: Sent at 2024-11-12 23:17:58  
Frame 2: Sent at 2024-11-12 23:17:58  
Frame 3: Sent at 2024-11-12 23:17:58  
Frame 4: Sent at 2024-11-12 23:17:58  
Frame 5: Sent at 2024-11-12 23:17:58  
Frame 6: Sent at 2024-11-12 23:17:58  
Frame 7: Sent at 2024-11-12 23:17:58  
Frame 8: Sent at 2024-11-12 23:17:58  
Frame 9: Sent at 2024-11-12 23:18:02  
Frame 10: Sent at 2024-11-12 23:18:15  
Frame 11: Sent at 2024-11-12 23:18:16  
Frame 12: Sent at 2024-11-12 23:18:18  
Frame 13: Sent at 2024-11-12 23:18:27  
Frame 14: Sent at 2024-11-12 23:18:27  
Frame 15: Sent at 2024-11-12 23:18:27  
Frame 16: Sent at 2024-11-12 23:18:36  
Frame 17: Sent at 2024-11-12 23:18:38  
Frame 18: Sent at 2024-11-12 23:18:44  
Frame 19: Sent at 2024-11-12 23:18:44  
Frame 20: Sent at 2024-11-12 23:18:44
```

first time received successfully and in order



```
First receive times at receiver (received at sender):
```

```
Frame 1: Received at 2024-11-12 23:17:58  
Frame 2: Received at 2024-11-12 23:17:59  
Frame 3: Received at 2024-11-12 23:17:59  
Frame 4: Received at 2024-11-12 23:17:59  
Frame 5: Received at 2024-11-12 23:17:59  
Frame 6: Received at 2024-11-12 23:17:59  
Frame 7: Received at 2024-11-12 23:17:59  
Frame 8: Received at 2024-11-12 23:17:59  
Frame 9: Received at 2024-11-12 23:18:09  
Frame 10: Received at 2024-11-12 23:18:40  
Frame 11: Received at 2024-11-12 23:18:41  
Frame 12: Received at 2024-11-12 23:18:44  
Frame 13: Received at 2024-11-12 23:18:51  
Frame 14: Received at 2024-11-12 23:18:51  
Frame 15: Received at 2024-11-12 23:18:52  
Frame 16: Received at 2024-11-12 23:18:54  
Frame 17: Received at 2024-11-12 23:18:54  
Frame 18: Received at 2024-11-12 23:18:56  
Frame 19: Received at 2024-11-12 23:18:56  
Frame 20: Received at 2024-11-12 23:18:56  
PS C:\Users\palak\OneDrive\Desktop\cncassignment3> █
```

Case 3 : $T3=0.2$, $T4=0.3$



We see an increase in delay

Delay for each frame:

```
Frame 1: Delay = 0.0000 seconds
Frame 2: Delay = 0.4591 seconds
Frame 3: Delay = 0.8515 seconds
Frame 4: Delay = 1.2651 seconds
Frame 5: Delay = 1.4862 seconds
Frame 6: Delay = 1.7264 seconds
Frame 7: Delay = 2.0797 seconds
Frame 8: Delay = 2.3795 seconds
Frame 9: Delay = 14.0350 seconds
Frame 10: Delay = 14.0966 seconds
Frame 11: Delay = 14.0486 seconds
Frame 12: Delay = 19.2839 seconds
Frame 13: Delay = 19.2406 seconds
Frame 14: Delay = 19.2065 seconds
Frame 15: Delay = 18.9700 seconds
Frame 16: Delay = 19.1353 seconds
Frame 17: Delay = 10.3865 seconds
Frame 18: Delay = 10.4555 seconds
Frame 19: Delay = 18.3181 seconds
Frame 20: Delay = 18.1004 seconds
```

Average delay: 10.2762 seconds

Avg transmissions



Increase in transmissions

Number of transmissions for each frame:

```
Frame 1: 6 transmissions
Frame 2: 6 transmissions
Frame 3: 6 transmissions
Frame 4: 9 transmissions
Frame 5: 9 transmissions
Frame 6: 9 transmissions
Frame 7: 9 transmissions
Frame 8: 9 transmissions
Frame 9: 7 transmissions
Frame 10: 7 transmissions
Frame 11: 11 transmissions
Frame 12: 8 transmissions
Frame 13: 8 transmissions
Frame 14: 9 transmissions
Frame 15: 14 transmissions
Frame 16: 14 transmissions
Frame 17: 11 transmissions
Frame 18: 11 transmissions
Frame 19: 7 transmissions
Frame 20: 7 transmissions
```

Average number of transmissions per frame: 8.85

First time sent



```
First send times for each frame:  
Frame 1: Sent at 2024-11-12 23:40:02  
Frame 2: Sent at 2024-11-12 23:40:02  
Frame 3: Sent at 2024-11-12 23:40:02  
Frame 4: Sent at 2024-11-12 23:40:02  
Frame 5: Sent at 2024-11-12 23:40:02  
Frame 6: Sent at 2024-11-12 23:40:02  
Frame 7: Sent at 2024-11-12 23:40:02  
Frame 8: Sent at 2024-11-12 23:40:02  
Frame 9: Sent at 2024-11-12 23:40:05  
Frame 10: Sent at 2024-11-12 23:40:05  
Frame 11: Sent at 2024-11-12 23:40:06  
Frame 12: Sent at 2024-11-12 23:40:09  
Frame 13: Sent at 2024-11-12 23:40:09  
Frame 14: Sent at 2024-11-12 23:40:10  
Frame 15: Sent at 2024-11-12 23:40:10  
Frame 16: Sent at 2024-11-12 23:40:10  
Frame 17: Sent at 2024-11-12 23:40:27  
Frame 18: Sent at 2024-11-12 23:40:28  
Frame 19: Sent at 2024-11-12 23:40:31  
Frame 20: Sent at 2024-11-12 23:40:31
```


First time received successfully



First receive times at receiver (received at sender):

```
Frame 1: Received at 2024-11-12 23:40:02
Frame 2: Received at 2024-11-12 23:40:03
Frame 3: Received at 2024-11-12 23:40:03
Frame 4: Received at 2024-11-12 23:40:03
Frame 5: Received at 2024-11-12 23:40:04
Frame 6: Received at 2024-11-12 23:40:04
Frame 7: Received at 2024-11-12 23:40:04
Frame 8: Received at 2024-11-12 23:40:04
Frame 9: Received at 2024-11-12 23:40:19
Frame 10: Received at 2024-11-12 23:40:19
Frame 11: Received at 2024-11-12 23:40:20
Frame 12: Received at 2024-11-12 23:40:28
Frame 13: Received at 2024-11-12 23:40:28
Frame 14: Received at 2024-11-12 23:40:29
Frame 15: Received at 2024-11-12 23:40:29
Frame 16: Received at 2024-11-12 23:40:29
Frame 17: Received at 2024-11-12 23:40:38
Frame 18: Received at 2024-11-12 23:40:38
Frame 19: Received at 2024-11-12 23:40:49
Frame 20: Received at 2024-11-12 23:40:49
```

D:\C:\Users\palak\OneDrive\Desktop\snassignment2>