بنام خدا

درس آزمایشگاه شبکه‌های کامپیوتری

آزمایش ۶ پارت دوم

تهیه‌کنندگان:

الناز رضایی ۹۸۴۱۱۳۸۷

حوریه سبزواری ۹۸۴۱۲۰۰۴

ج) بررسی تأثیر مکانیزم «اخطار صریح ازدحام» بر RTT و «پنجرهٔ ازدحام»

سوال۴:

```
                                    "host: h1"                          _  □  ⊗
110.1:  2832.4kbps avg (      0.0[inst],   401.9[mov.avg]) cwnd 1172 rtt6453.3ms
111.1:  2805.9kbps avg (      0.0[inst],   361.7[mov.avg]) cwnd 896 rtt6384.5ms
111.3:  2805.9kbps avg (      0.0[inst],   361.7[mov.avg]) cwnd 879 rtt6379.9ms
111.3:  2805.9kbps avg (      0.0[inst],   361.7[mov.avg]) cwnd 880 rtt6380.3ms
111.3:  2805.9kbps avg (      0.0[inst],   361.7[mov.avg]) cwnd 881 rtt6381.3ms
111.3:  2805.9kbps avg (      0.0[inst],   361.7[mov.avg]) cwnd 883 rtt6375.9ms
111.3:  2805.9kbps avg (      0.0[inst],   361.7[mov.avg]) cwnd 884 rtt6373.0ms
112.4:  3307.9kbps avg (48421.6[inst],  5167.7[mov.avg]) cwnd 1027 rtt5895.5ms
112.4:  3307.9kbps avg (48421.6[inst],  5167.7[mov.avg]) cwnd 1028 rtt5890.3ms
113.4:  3289.7kbps avg ( 1290.5[inst],  4780.0[mov.avg]) cwnd 1077 rtt5846.8ms
114.4:  3308.9kbps avg ( 5421.9[inst],  4844.2[mov.avg]) cwnd 1440 rtt2925.1ms
115.4:  3312.3kbps avg ( 3691.7[inst],  4728.9[mov.avg]) cwnd 1458 rtt3236.9ms
116.5:  3316.7kbps avg ( 3822.9[inst],  4638.3[mov.avg]) cwnd 1488 rtt2400.3ms
117.5:  3316.9kbps avg ( 3334.4[inst],  4507.9[mov.avg]) cwnd 1519 rtt3434.0ms
118.5:  3312.3kbps avg ( 2789.1[inst],  4336.0[mov.avg]) cwnd 1547 rtt4472.6ms
119.5:  3311.2kbps avg ( 3177.1[inst],  4220.1[mov.avg]) cwnd 1577 rtt4845.3ms
120.6:  3296.0kbps avg ( 1548.6[inst],  3953.0[mov.avg]) cwnd 1591 rtt5255.7ms
121.6:  3291.0kbps avg ( 2695.8[inst],  3827.3[mov.avg]) cwnd 1613 rtt5827.7ms
122.6:  3278.3kbps avg ( 1821.5[inst],  3626.7[mov.avg]) cwnd 1627 rtt6241.1ms
123.7:  3270.6kbps avg ( 2344.9[inst],  3498.5[mov.avg]) cwnd 1642 rtt6862.8ms
124.7:  3278.3kbps avg ( 4208.0[inst],  3569.5[mov.avg]) cwnd 1664 rtt6697.0ms
125.7:  3272.1kbps avg ( 2526.8[inst],  3465.2[mov.avg]) cwnd 1675 rtt6779.2ms
```

نرخ ماشین h۱ حدود ۳۲۰۰ است. rtt ۶۰۰۰ و اندازه‌ی پنجره‌ی ازدحام بین ۸۰۰ و ۱۷۰۰ است.

سوال۵:

```
                                    "host: h1"                          _  □
115.4:  2789.1kbps avg ( 1666.0[inst],  2664.0[mov.avg]) cwnd 20 rtt 98.2ms
115.8:  2789.1kbps avg ( 1666.0[inst],  2664.0[mov.avg]) cwnd 22 rtt100.7ms
116.2:  2785.6kbps avg ( 2469.1[inst],  2644.5[mov.avg]) cwnd 11 rtt 73.5ms
116.4:  2785.6kbps avg ( 2469.1[inst],  2644.5[mov.avg]) cwnd 14 rtt 38.1ms
116.7:  2785.6kbps avg ( 2469.1[inst],  2644.5[mov.avg]) cwnd 17 rtt 46.3ms
117.0:  2785.6kbps avg ( 2469.1[inst],  2644.5[mov.avg]) cwnd 20 rtt 62.3ms
117.3:  2793.1kbps avg ( 3570.1[inst],  2737.1[mov.avg]) cwnd 22 rtt 72.3ms
117.6:  2793.1kbps avg ( 3570.1[inst],  2737.1[mov.avg]) cwnd 16 rtt 61.4ms
117.9:  2793.1kbps avg ( 3570.1[inst],  2737.1[mov.avg]) cwnd 19 rtt 68.9ms
118.6:  2789.0kbps avg ( 2411.0[inst],  2704.5[mov.avg]) cwnd 21 rtt267.2ms
118.9:  2789.0kbps avg ( 2411.0[inst],  2704.5[mov.avg]) cwnd 16 rtt 90.1ms
119.3:  2789.0kbps avg ( 2411.0[inst],  2704.5[mov.avg]) cwnd 19 rtt118.3ms
119.7:  2786.7kbps avg ( 2557.2[inst],  2689.7[mov.avg]) cwnd 21 rtt108.2ms
120.5:  2786.7kbps avg ( 2557.2[inst],  2689.7[mov.avg]) cwnd 16 rtt194.0ms
120.9:  2777.3kbps avg ( 1786.2[inst],  2599.4[mov.avg]) cwnd 19 rtt 86.0ms
121.4:  2777.3kbps avg ( 1786.2[inst],  2599.4[mov.avg]) cwnd 21 rtt104.6ms
121.7:  2777.3kbps avg ( 1786.2[inst],  2599.4[mov.avg]) cwnd 22 rtt 66.3ms
122.0:  2778.6kbps avg ( 2918.2[inst],  2631.3[mov.avg]) cwnd 11 rtt 49.1ms
122.2:  2778.6kbps avg ( 2918.2[inst],  2631.3[mov.avg]) cwnd 14 rtt 32.1ms
122.4:  2778.6kbps avg ( 2918.2[inst],  2631.3[mov.avg]) cwnd 17 rtt 40.8ms
122.7:  2778.6kbps avg ( 2918.2[inst],  2631.3[mov.avg]) cwnd 20 rtt 61.3ms
123.0:  2787.2kbps avg ( 3772.3[inst],  2745.4[mov.avg]) cwnd 22 rtt 69.8ms
```

نرخ ماشین h۱ حدود ۲۷۸۰ است. rtt ۶۰ و اندازه‌ی پنجره‌ی ازدحام بین ۱۱ و ۲۲ است.

سوال۶:

مقدار congestion window، مقدار rtt و مقدار average rate کاهش پیدا کرده است. زیرا فرستنده از ازدحام خبردار می‌شود.

د) عدالت در TCP و تاثیر RTT

سوال ۷:


```
"host: h1"                                                    ×

root@mininet-vm:/home/mininet/lab10# ping 10.10.1.3 -c4
PING 10.10.1.3 (10.10.1.3) 56(84) bytes of data.
64 bytes from 10.10.1.3: icmp_seq=1 ttl=63 time=614 ms
64 bytes from 10.10.1.3: icmp_seq=2 ttl=63 time=302 ms
64 bytes from 10.10.1.3: icmp_seq=3 ttl=63 time=301 ms
64 bytes from 10.10.1.3: icmp_seq=4 ttl=63 time=301 ms

--- 10.10.1.3 ping statistics ---
4 packets transmitted, 4 received, 0% packet loss, time 3002ms
rtt min/avg/max/mdev = 301.007/379.567/614.350/135.552 ms
```

سوال ۸:


```
"host: h1"                                                    ×

658.3:    718.2kbps avg (   463.8[inst],   450.6[mov.avg]) cwnd 11 rtt327.3ms
659.4:    717.8kbps avg (   475.2[inst],   453.0[mov.avg]) cwnd 14 rtt308.5ms
660.4:    717.4kbps avg (   464.0[inst],   454.1[mov.avg]) cwnd 17 rtt350.1ms
661.4:    717.1kbps avg (   497.1[inst],   458.4[mov.avg]) cwnd 19 rtt381.9ms
662.4:    717.0kbps avg (   651.9[inst],   477.8[mov.avg]) cwnd 22 rtt332.1ms
663.5:    717.0kbps avg (   740.2[inst],   504.0[mov.avg]) cwnd 25 rtt369.2ms
664.5:    716.7kbps avg (   497.0[inst],   503.3[mov.avg]) cwnd 13 rtt353.1ms
665.5:    716.7kbps avg (   728.8[inst],   525.9[mov.avg]) cwnd 15 rtt309.1ms
666.5:    716.5kbps avg (   629.9[inst],   536.3[mov.avg]) cwnd 19 rtt314.8ms
667.6:    716.3kbps avg (   563.6[inst],   539.0[mov.avg]) cwnd 21 rtt350.6ms
668.6:    716.2kbps avg (   629.6[inst],   548.1[mov.avg]) cwnd 24 rtt382.0ms
669.6:    716.3kbps avg (   817.5[inst],   575.0[mov.avg]) cwnd 27 rtt311.2ms
670.6:    716.9kbps avg (  1104.1[inst],   627.9[mov.avg]) cwnd 30 rtt311.6ms
671.7:    717.4kbps avg (  1016.9[inst],   666.8[mov.avg]) cwnd 33 rtt349.7ms
672.7:    717.3kbps avg (   674.1[inst],   667.5[mov.avg]) cwnd 24 rtt382.4ms
673.7:    717.7kbps avg (   949.4[inst],   695.7[mov.avg]) cwnd 19 rtt307.7ms
674.7:    717.6kbps avg (   707.2[inst],   696.9[mov.avg]) cwnd 22 rtt311.1ms
675.8:    717.7kbps avg (   762.5[inst],   703.4[mov.avg]) cwnd 25 rtt349.1ms
676.8:    717.9kbps avg (   817.3[inst],   714.8[mov.avg]) cwnd 28 rtt381.9ms
677.8:    718.3kbps avg (   972.5[inst],   740.6[mov.avg]) cwnd 31 rtt308.1ms
678.8:    718.9kbps avg (  1126.4[inst],   779.2[mov.avg]) cwnd 34 rtt326.6ms
679.8:    719.5kbps avg (  1126.8[inst],   813.9[mov.avg]) cwnd 37 rtt363.7ms
680.9:    718.9kbps avg (   342.4[inst],   766.8[mov.avg]) cwnd 18 rtt349.5ms
681.9:    719.7kbps avg (  1226.1[inst],   812.7[mov.avg]) cwnd 21 rtt316.1ms
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657.3:    652.7kbps avg (  993.5[inst],   684.6[mov.avg]) cwnd 28 rtt304.4ms
658.3:    653.3kbps avg ( 1017.0[inst],   717.8[mov.avg]) cwnd 31 rtt325.8ms
659.3:    653.9kbps avg ( 1016.5[inst],   747.7[mov.avg]) cwnd 34 rtt375.3ms
660.4:    653.9kbps avg (  673.7[inst],   740.3[mov.avg]) cwnd 17 rtt334.2ms
661.4:    654.1kbps avg (  773.3[inst],   743.6[mov.avg]) cwnd 20 rtt338.3ms
662.4:    653.9kbps avg (  563.4[inst],   725.6[mov.avg]) cwnd 22 rtt369.4ms
663.4:    654.0kbps avg (  718.4[inst],   724.8[mov.avg]) cwnd 25 rtt354.6ms
664.5:    654.3kbps avg (  861.6[inst],   738.5[mov.avg]) cwnd 28 rtt339.0ms
665.5:    654.8kbps avg (  928.1[inst],   757.5[mov.avg]) cwnd 31 rtt380.8ms
666.5:    655.4kbps avg ( 1037.7[inst],   785.5[mov.avg]) cwnd 34 rtt308.8ms
667.5:    656.2kbps avg ( 1193.2[inst],   826.3[mov.avg]) cwnd 37 rtt313.0ms
668.6:    657.1kbps avg ( 1248.7[inst],   868.5[mov.avg]) cwnd 40 rtt358.4ms
669.6:    657.9kbps avg ( 1193.3[inst],   901.0[mov.avg]) cwnd 42 rtt378.1ms
670.6:    658.8kbps avg ( 1248.5[inst],   935.7[mov.avg]) cwnd 45 rtt378.6ms
671.6:    659.6kbps avg ( 1159.2[inst],   958.1[mov.avg]) cwnd 24 rtt323.9ms
672.7:    660.1kbps avg (  983.9[inst],   960.7[mov.avg]) cwnd 27 rtt307.5ms
673.7:    660.5kbps avg (  927.5[inst],   957.3[mov.avg]) cwnd 30 rtt339.6ms
674.7:    660.8kbps avg (  862.0[inst],   947.8[mov.avg]) cwnd 33 rtt379.5ms
675.7:    660.8kbps avg (  674.0[inst],   920.4[mov.avg]) cwnd 16 rtt348.4ms
676.8:    660.7kbps avg (  563.4[inst],   884.7[mov.avg]) cwnd 19 rtt350.1ms
677.8:    660.3kbps avg (  452.6[inst],   841.5[mov.avg]) cwnd 14 rtt382.0ms
678.8:    660.1kbps avg (  496.0[inst],   807.0[mov.avg]) cwnd 11 rtt330.0ms
679.8:    659.8kbps avg (  498.5[inst],   776.1[mov.avg]) cwnd 15 rtt305.0ms
680.9:    659.6kbps avg (  519.4[inst],   750.4[mov.avg]) cwnd 18 rtt331.9ms
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650.3:    638.5kbps avg (  674.0[inst],   842.6[mov.avg]) cwnd 23 rtt375.0ms
651.3:    638.5kbps avg (  607.6[inst],   819.1[mov.avg]) cwnd 12 rtt335.2ms
652.3:    638.2kbps avg (  451.1[inst],   782.3[mov.avg]) cwnd 15 rtt308.0ms
653.3:    638.1kbps avg (  565.6[inst],   760.7[mov.avg]) cwnd 18 rtt334.6ms
654.3:    637.9kbps avg (  552.5[inst],   739.8[mov.avg]) cwnd 21 rtt379.5ms
655.4:    638.0kbps avg (  695.8[inst],   735.4[mov.avg]) cwnd 24 rtt315.9ms
656.4:    638.3kbps avg (  817.1[inst],   743.6[mov.avg]) cwnd 27 rtt346.6ms
657.4:    638.7kbps avg (  873.4[inst],   756.6[mov.avg]) cwnd 29 rtt380.9ms
658.4:    639.2kbps avg (  994.3[inst],   780.4[mov.avg]) cwnd 32 rtt337.2ms
659.5:    639.9kbps avg ( 1082.7[inst],   810.6[mov.avg]) cwnd 35 rtt354.2ms
660.5:    640.0kbps avg (  728.8[inst],   802.4[mov.avg]) cwnd 27 rtt382.6ms
661.5:    640.6kbps avg ( 1016.8[inst],   823.9[mov.avg]) cwnd 20 rtt307.3ms
662.5:    640.7kbps avg (  718.0[inst],   813.3[mov.avg]) cwnd 23 rtt325.9ms
663.6:    641.0kbps avg (  773.4[inst],   809.3[mov.avg]) cwnd 26 rtt373.4ms
664.6:    640.8kbps avg (  541.2[inst],   782.5[mov.avg]) cwnd 13 rtt379.5ms
665.6:    640.3kbps avg (  298.3[inst],   734.1[mov.avg]) cwnd  9 rtt383.5ms
666.6:    639.8kbps avg (  331.4[inst],   693.8[mov.avg]) cwnd  9 rtt340.1ms
667.7:    639.3kbps avg (  320.3[inst],   656.5[mov.avg]) cwnd 11 rtt316.0ms
668.7:    638.9kbps avg (  364.5[inst],   627.3[mov.avg]) cwnd 14 rtt343.3ms
669.7:    638.5kbps avg (  397.8[inst],   604.3[mov.avg]) cwnd 16 rtt378.1ms
670.7:    638.0kbps avg (  331.4[inst],   577.0[mov.avg]) cwnd  9 rtt351.6ms
671.8:    637.6kbps avg (  331.4[inst],   552.5[mov.avg]) cwnd 12 rtt365.2ms
672.8:    637.2kbps avg (  386.7[inst],   535.9[mov.avg]) cwnd 15 rtt372.4ms
673.8:    637.1kbps avg (  541.4[inst],   536.4[mov.avg]) cwnd 18 rtt308.2ms
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651.0:    742.3kbps avg (    662.8[inst],   642.3[mov.avg]) cwnd 23 rtt356.8ms
652.0:    742.2kbps avg (    696.2[inst],   647.7[mov.avg]) cwnd 25 rtt384.4ms
653.1:    742.5kbps avg (    927.3[inst],   675.7[mov.avg]) cwnd 29 rtt319.4ms
654.1:    742.8kbps avg (    928.3[inst],   700.9[mov.avg]) cwnd 31 rtt357.2ms
655.1:    742.4kbps avg (    519.3[inst],   682.8[mov.avg]) cwnd 16 rtt378.4ms
656.1:    742.6kbps avg (    828.4[inst],   697.3[mov.avg]) cwnd 18 rtt336.5ms
657.1:    742.2kbps avg (    530.4[inst],   680.6[mov.avg]) cwnd 20 rtt363.7ms
658.2:    741.6kbps avg (    342.3[inst],   646.8[mov.avg]) cwnd 11 rtt362.4ms
659.2:    741.5kbps avg (    696.3[inst],   651.3[mov.avg]) cwnd 14 rtt311.7ms
660.2:    741.1kbps avg (    475.1[inst],   634.1[mov.avg]) cwnd 17 rtt340.8ms
661.2:    740.7kbps avg (    497.1[inst],   620.4[mov.avg]) cwnd 19 rtt377.9ms
662.3:    740.5kbps avg (    585.5[inst],   616.9[mov.avg]) cwnd 22 rtt369.0ms
663.3:    740.5kbps avg (    762.1[inst],   631.4[mov.avg]) cwnd 25 rtt349.4ms
664.3:    740.8kbps avg (    905.4[inst],   658.8[mov.avg]) cwnd 28 rtt303.1ms
665.3:    741.2kbps avg (   1016.6[inst],   694.6[mov.avg]) cwnd 31 rtt325.3ms
666.4:    741.7kbps avg (   1039.0[inst],   729.0[mov.avg]) cwnd 34 rtt368.2ms
667.4:    742.2kbps avg (   1060.6[inst],   762.2[mov.avg]) cwnd 37 rtt363.5ms
668.4:    742.9kbps avg (   1248.2[inst],   810.8[mov.avg]) cwnd 40 rtt346.0ms
669.4:    743.6kbps avg (   1148.8[inst],   844.6[mov.avg]) cwnd 42 rtt381.4ms
670.5:    744.0kbps avg (   1038.4[inst],   864.0[mov.avg]) cwnd 22 rtt312.2ms
671.5:    744.2kbps avg (    861.4[inst],   863.7[mov.avg]) cwnd 26 rtt303.6ms
672.5:    744.4kbps avg (    884.2[inst],   865.8[mov.avg]) cwnd 29 rtt317.0ms
673.5:    744.7kbps avg (    950.0[inst],   874.2[mov.avg]) cwnd 31 rtt360.6ms
674.6:    744.4kbps avg (    519.3[inst],   838.7[mov.avg]) cwnd 16 rtt383.5ms
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سوال ۹: مقادیر حاصل از آزمایش با مقادیر نظری کمی تفاوت دارند.

سوال ۱۰: همانطور که از اندازه cwnd قابل مشاهده است تا جایی که loss رخ ندهد افزایش می‌یابد و پس از loss کاهش می‌یابد که نشان‌دهنده‌ی تاخیر صف است.