

# Test Document

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## Local area network Test



### Client send and get file to Server

#### Normal test

1. 先尝试发送一个小音乐文件到服务端，测试

```
the Seq:4014 packet come
4014| Recive the Seq:4014 packet
client send the ack = 4014
the Seq:4015 packet come
4015| Recive the Seq:4015 packet
client send the ack = 4015
the Seq:4016 packet come
4016| Recive the Seq:4016 packet
client send the ack = 4016
the Seq:4017 packet come
4017| Recive the Seq:4017 packet
client send the ack = 4017
the Seq:4018 packet come
4018| Recive the Seq:4018 packet
client send the ack = 4018
the Seq:4019 packet come
4019| Recive the Seq:4019 packet
client send the ack = 4019
File download is finished! The number of packets is 4020
File transfer is finished! The number of packets is 4020
finish transfer: test.mp3 to localhost/127.0.0.1
PS H:\MyUDP\MyClient>
```

能够顺利传输文件，通过debug信息可知发送的包的数量也是一致的。

	test.mp3		test.mp3
文件类型:	MP3 文件 (.mp3)	文件类型:	MP3 文件 (.mp3)
打开方式:	Groove 音乐	打开方式:	Groove 音乐
位置:	H:\MyUDP\Myserver	位置:	H:\MyUDP
大小:	3.92 MB (4,115,463 字节)	大小:	3.92 MB (4,115,463 字节)
占用空间:	3.92 MB (4,116,480 字节)	占用空间:	3.92 MB (4,116,480 字节)
创建时间:	2018年12月3日, 23:11:10	创建时间:	2018年12月3日, 23:01:16
修改时间:	2018年12月4日, 21:49:43	修改时间:	2018年12月4日, 13:39:12
访问时间:	2018年12月3日, 23:11:10	访问时间:	2018年12月3日, 23:01:16

打开文件夹可以看到文件大小一致。

2. 尝试从服务器端接收一个569MB的linux镜像到客户端，测试是否能够顺利传输。

```

cwnd:7 rwnd:45 client send the ack = 592893
Server receive ack = 592889, the rwnd of client is 47 Now t the Seq:592894 packet come
cwnd:6 rwnd:46 592894| Recive the Seq:592894 packet
Server receive ack = 592890, the rwnd of client is 49 Now t client send the ack = 592894
cwnd:5 rwnd:47 the Seq:592895 packet come
Server receive ack = 592891, the rwnd of client is 48 Now t 592895| Recive the Seq:592895 packet
cwnd:4 rwnd:48 client send the ack = 592895
Server receive ack = 592892, the rwnd of client is 47 Now t the size of cache is 7
cwnd:3 rwnd:47 the size of cache is 6
Server receive ack = 592893, the rwnd of client is 46 Now t the size of cache is 5
cwnd:2 rwnd:46 the size of cache is 4
Server receive ack = 592894, the rwnd of client is 45 Now t the size of cache is 3
cwnd:1 rwnd:45 the size of cache is 2
Server receive ack = 592895, the rwnd of client is 44 Now t the size of cache is 1
File transfer is finished! The number of packets is 592896 File download is finished! The number of packets is 592896
finish transfer: test.iso to /127.0.0.1 The program runs: 786383 ms.
PS H:\MyUDP\MyClient>

```

可以得知接收正常，通过计算时间可知速率大概在900KB/s左右。

Windows PowerShell (3)	25.0%	83.2 MB	1.0 MB/秒
Java(TM) Platform SE binary	10.8%	47.5 MB	1.0 MB/秒
Windows PowerShell	0%	31.5 MB	0 MB/秒
控制台窗口主进程	14.3%	4.2 MB	0 MB/秒
Windows PowerShell (3)	36.8%	78.1 MB	1.0 MB/秒
Java(TM) Platform SE binary	19.6%	43.5 MB	1.0 MB/秒
Windows PowerShell	0%	30.8 MB	0 MB/秒
控制台窗口主进程	17.2%	3.8 MB	0 MB/秒

在传输过程中观察应用的内存可知所占内存大约为发送和接受缓存区的内存，符合窗口大小。且限制缓存区的大小可以防止内存过多导致崩溃。

Flow control test

```
Server receive ack = 592841, the rwnd of client is 47 Now the rwnd of server is 49  
cwnd:48 rwnd:47  
Server receive ack = 592842, the rwnd of client is 46 Now the rwnd of server is 47  
cwnd:47 rwnd:46  
Server receive ack = 592843, the rwnd of client is 45 Now the rwnd of server is 46  
cwnd:46 rwnd:45  
Server receive ack = 592844, the rwnd of client is 44 Now the rwnd of server is 45  
cwnd:45 rwnd:44  
Server receive ack = 592845, the rwnd of client is 43 Now the rwnd of server is 44  
cwnd:44 rwnd:43  
Server receive ack = 592846, the rwnd of client is 42 Now the rwnd of server is 43  
cwnd:43 rwnd:42  
Server receive ack = 592847, the rwnd of client is 41 Now the rwnd of server is 42  
cwnd:42 rwnd:41  
Server receive ack = 592848, the rwnd of client is 40 Now the rwnd of server is 41  
cwnd:41 rwnd:40  
Server receive ack = 592849, the rwnd of client is 39 Now the rwnd of server is 40  
cwnd:40 rwnd:39  
Server receive ack = 592850, the rwnd of client is 38 Now the rwnd of server is 39  
cwnd:39 rwnd:38  
Server receive ack = 592851, the rwnd of client is 37 Now the rwnd of server is 38  
cwnd:38 rwnd:37  
Server receive ack = 592852, the rwnd of client is 37 Now the rwnd of server is 37  
cwnd:37 rwnd:38  
Send the 592890 packet  
Server receive ack = 592853, the rwnd of client is 37 Now the rwnd of server is 38  
cwnd:37 rwnd:37  
Server receive ack = 592854, the rwnd of client is 39 Now the rwnd of server is 37  
cwnd:36 rwnd:38  
Send the 592891 packet  
Send the 592892 packet  
Server receive ack = 592855, the rwnd of client is 40 Now the rwnd of server is 38  
cwnd:37 rwnd:39  
Send the 592893 packet  
Send the 592894 packet  
Server receive ack = 592856, the rwnd of client is 41 Now the rwnd of server is 39  
cwnd:38 rwnd:40  
Send the 592895 packet  
Server receive ack = 592857, the rwnd of client is 42 Now the rwnd of server is 40  
cwnd:38 rwnd:41
```

流量控制：在传输过程中可以得知服务端在发送时，接收返回来的ack同时得到接收端的接受窗口大小，同时并不断增加，且不会超过rwnd这个限制。我设定的是会最大化利用，所以当有37个包待确认，最大窗口为39时，会发两个包出去。

### Congestion control test

```

cwnd:11 rwnd:8
Server receive ack = 1536, the rwnd of client is 42 Now the rwnd of server is 8
cwnd:11 rwnd:7
Server receive ack = 1536, the rwnd of client is 42 Now the rwnd of server is 7
cwnd:11 rwnd:6
Server receive ack = 1536, the rwnd of client is 42 Now the rwnd of server is 6
cwnd:11 rwnd:5
Server receive ack = 1536, the rwnd of client is 42 Now the rwnd of server is 5
cwnd:11 rwnd:4
Server begin to tranfer the data again 1540--1547
Srver re - transfer the data 1540
Srver re - transfer the data 1541
Srver re - transfer the data 1542
Server receive ack = 1537, the rwnd of client is 42 Now the rwnd of server is 4
cwnd:10 rwnd:5
Srver re - transfer the data 1543
Server receive ack = 1538, the rwnd of client is 49 Now the rwnd of server is 5
Srver re - transfer the data 1544
cwnd:9 rwnd:6
Srver re - transfer the data 1545
Server receive ack = 1539, the rwnd of client is 48 Now the rwnd of server is 6
Srver re - transfer the data 1546
cwnd:8 rwnd:7
Srver re - transfer the data 1547
Server receive ack = 1540, the rwnd of client is 47 Now the rwnd of server is 7
cwnd:7 rwnd:8
Send the 1548 packet
Server receive ack = 1540, the rwnd of client is 46 Now the rwnd of server is 8
cwnd:8 rwnd:7

```

拥塞控制：当发生丢包等事件时，会降低窗口的大小，使得发送的包变少，即使回来的rwnd很大，但考虑到链路状态，因此减少发往链路的数据包。

### Lose packet test

```

Server begin to tranfer the data again 246--284
Srver re - transfer the data 246
Srver re - transfer the data 247
Srver re - transfer the data 248
Srver re - transfer the data 249
Srver re - transfer the data 250
Srver re - transfer the data 251
Srver re - transfer the data 252
Srver re - transfer the data 253
Srver re - transfer the data 254
Srver re - transfer the data 255
Srver re - transfer the data 256
Srver re - transfer the data 257
Srver re - transfer the data 258
Srver re - transfer the data 259

```

丢包测试：在客户端设定一个随机数，随机丢包，当丢包时，会出现原本设定的回退N步的效果，即把丢失的包之后的全部包重新传输一遍。

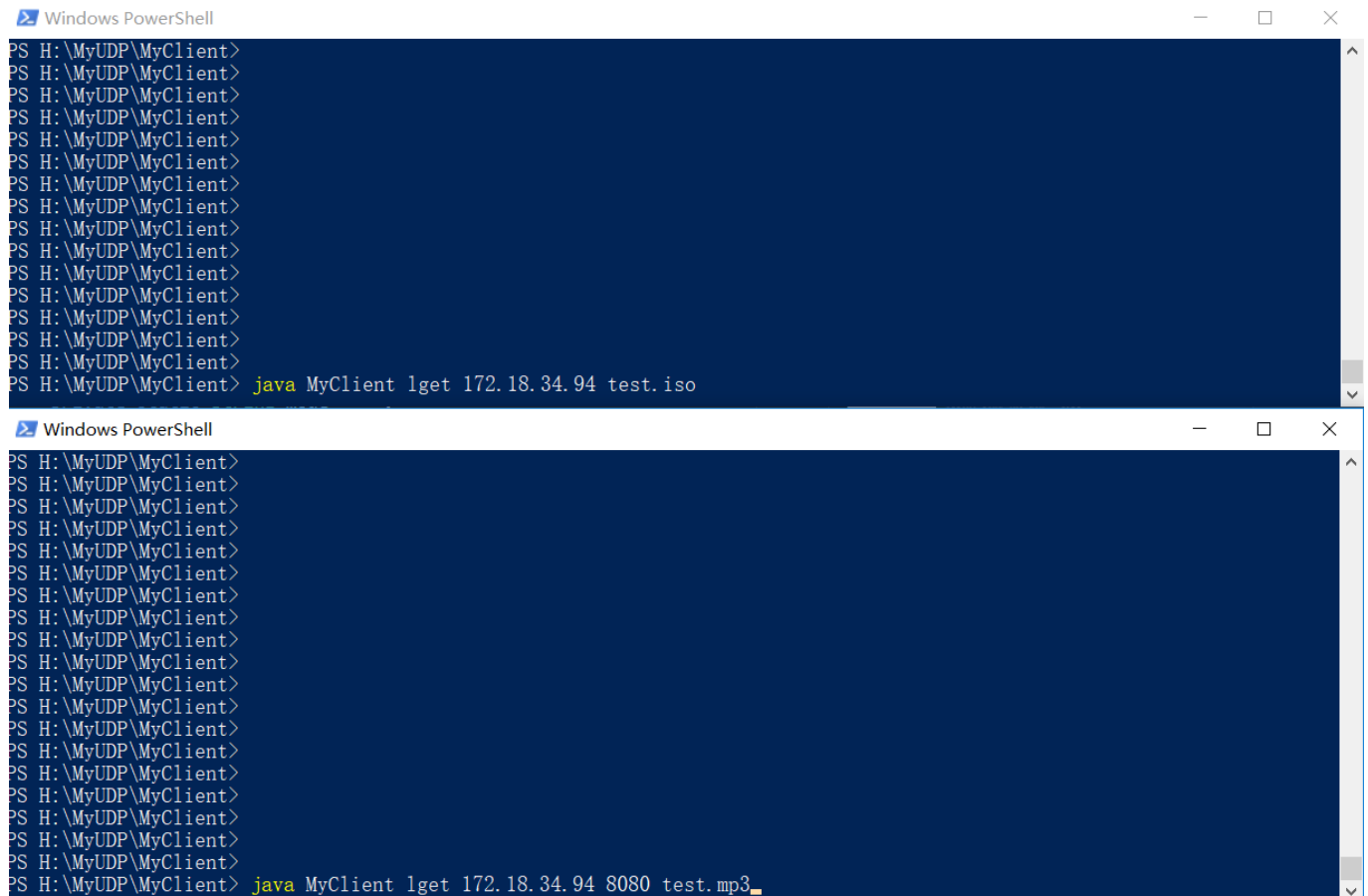
## Internet Test

在局域网测试过后，到公网测试一下。

## Client send and get file to Server

### Normal test

同样的音乐文件和镜像文件传输,同时测试一下多线程的实现。



The image shows two screenshots of a Windows PowerShell window. The top screenshot shows a series of 15 'PS H:\MyUDP\MyClient>' prompts, with the final one followed by the command 'java MyClient lget 172.18.34.94 test.iso'. The bottom screenshot shows another series of 15 'PS H:\MyUDP\MyClient>' prompts, with the final one followed by the command 'java MyClient lget 172.18.34.94 8080 test.mp3'.

```
Windows PowerShell
PS H:\MyUDP\MyClient>
PS H:\MyUDP\MyClient>
PS H:\MyUDP\MyClient>
PS H:\MyUDP\MyClient>
PS H:\MyUDP\MyClient>
PS H:\MyUDP\MyClient>
PS H:\MyUDP\MyClient>
PS H:\MyUDP\MyClient>
PS H:\MyUDP\MyClient>
PS H:\MyUDP\MyClient>
PS H:\MyUDP\MyClient>
PS H:\MyUDP\MyClient>
PS H:\MyUDP\MyClient>
PS H:\MyUDP\MyClient>
PS H:\MyUDP\MyClient>
PS H:\MyUDP\MyClient> java MyClient lget 172.18.34.94 test.iso

Windows PowerShell
PS H:\MyUDP\MyClient>
PS H:\MyUDP\MyClient>
PS H:\MyUDP\MyClient>
PS H:\MyUDP\MyClient>
PS H:\MyUDP\MyClient>
PS H:\MyUDP\MyClient>
PS H:\MyUDP\MyClient>
PS H:\MyUDP\MyClient>
PS H:\MyUDP\MyClient>
PS H:\MyUDP\MyClient>
PS H:\MyUDP\MyClient>
PS H:\MyUDP\MyClient>
PS H:\MyUDP\MyClient>
PS H:\MyUDP\MyClient>
PS H:\MyUDP\MyClient>
PS H:\MyUDP\MyClient>
PS H:\MyUDP\MyClient>
PS H:\MyUDP\MyClient>
PS H:\MyUDP\MyClient> java MyClient lget 172.18.34.94 8080 test.mp3
```

由结果可得知多线程实现两个客户端同时访问服务端并且获取文件。

```
Windows PowerShell
the Seq:4839 packet come
4839| Receive the Seq:4839 packet
client send the ack = 4839
the Seq:4840 packet come
4840| Receive the Seq:4840 packet
client send the ack = 4840
the Seq:4841 packet come
4841| Receive the Seq:4841 packet
client send the ack = 4841
the Seq:4842 packet come
4842| Receive the Seq:4842 packet
client send the ack = 4842
the Seq:4843 packet come
4843| Receive the Seq:4843 packet
client send the ack = 4843
the Seq:4844 packet come

Windows PowerShell
the Seq:862 packet come
the size of cache is 3
the size of cache is 2
the size of cache is 1
862| Receive the Seq:862 packet
client send the ack = 862
the Seq:863 packet come
863| Receive the Seq:863 packet
the size of cache is 1
client send the ack = 863
the Seq:864 packet come
864| Receive the Seq:864 packet
the size of cache is 1
client send the ack = 864
the Seq:865 packet come
865| Receive the Seq:865 packet
the size of cache is 1
client send the ack = 865
the Seq:866 packet come
```

其余的流量控制和拥塞控制都是和局域网（本机）上的差不多一样的。只是在互联网上即使不刻意丢失数据包，也有可能因为某种原因丢失或者是网路堵塞造成超时。

## Flow control test

```
选择Windows PowerShell
the size of cache is 3
the Seq:12106 packet come
12106| Receive the Seq:12106 packet
the size of cache is 3
client send the ack = 12106
the size of cache is 2
the size of cache is 2
the size of cache is 1
the Seq:12107 packet come
12107| Receive the Seq:12107 packet
client send the ack = 12107
the size of cache is 1
the Seq:12108 packet come
12108| Receive the Seq:12108 packet
client send the ack = 12108
the Seq:12109 packet come
12109| Receive the Seq:12109 packet
client send the ack = 12109
the size of cache is 2
the size of cache is 1
PS H:\MyUDP\MyClient>
```

## Congestion control test



```

Server receive ack = 11885, the rwnd of client is 48 Now the rwnd of server is 50
cwnd:49 rwnd:48
Server receive ack = 11886, the rwnd of client is 47 Now the rwnd of server is 48
cwnd:48 rwnd:47
Server receive ack = 11887, the rwnd of client is 46 Now the rwnd of server is 47
cwnd:47 rwnd:46
Server receive ack = 11888, the rwnd of client is 45 Now the rwnd of server is 46
cwnd:46 rwnd:45
Server receive ack = 11889, the rwnd of client is 44 Now the rwnd of server is 45
cwnd:45 rwnd:44
Server receive ack = 11890, the rwnd of client is 43 Now the rwnd of server is 44
cwnd:44 rwnd:43
Server receive ack = 11891, the rwnd of client is 43 Now the rwnd of server is 43
cwnd:43 rwnd:44
Send the 11935 packet
Server receive ack = 11892, the rwnd of client is 44 Now the rwnd of server is 44
cwnd:43 rwnd:45
Send the 11936 packet
Send the 11937 packet
Server receive ack = 11893, the rwnd of client is 45 Now the rwnd of server is 45
cwnd:44 rwnd:46
Send the 11938 packet
Send the 11939 packet

```

### Lose packet test

```

Server receive ack = 625, the rwnd of client is 41 Now the rwnd of server is 42
cwnd:41 rwnd:41
Server receive ack = 626, the rwnd of client is 42 Now the rwnd of server is 41
cwnd:40 rwnd:42
Send the 667 packet
Send the 668 packet
Server begin to tranfer the data again 627--668
Srver re - transfer the data 627
Srver re - transfer the data 628
Srver re - transfer the data 629
Srver re - transfer the data 630
Srver re - transfer the data 631
Srver re - transfer the data 632
Srver re - transfer the data 633
Srver re - transfer the data 634
Srver re - transfer the data 635

```