

WizFi360

Application – Throughput

Version 1.2

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History

Ver	Date	Description
1.0	Aug.2019	Initial version
1.1	Sep.2019	Add command mode throughput test result
1.2	Oct.2019	Modify contents about command mode

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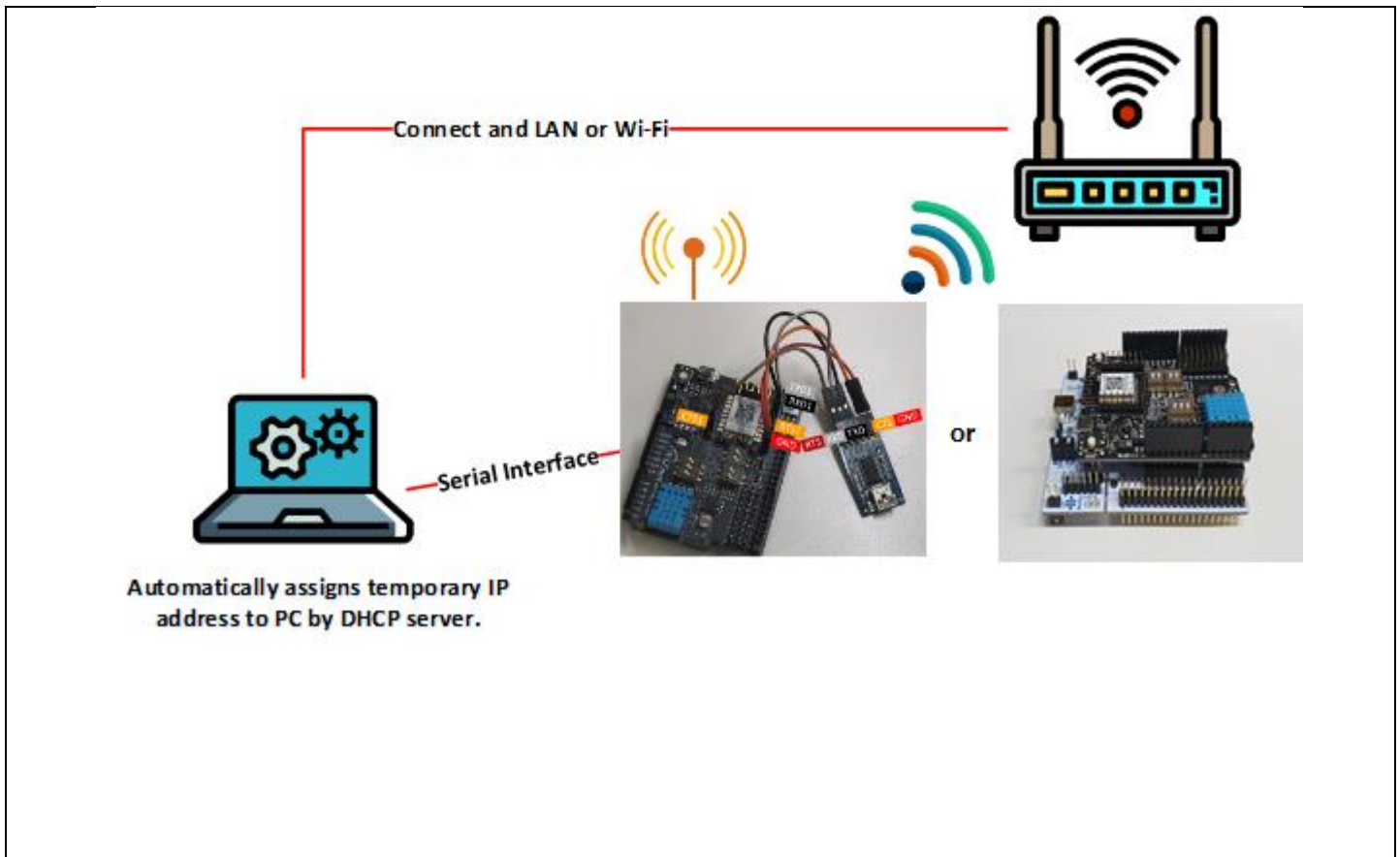
1. Test environment

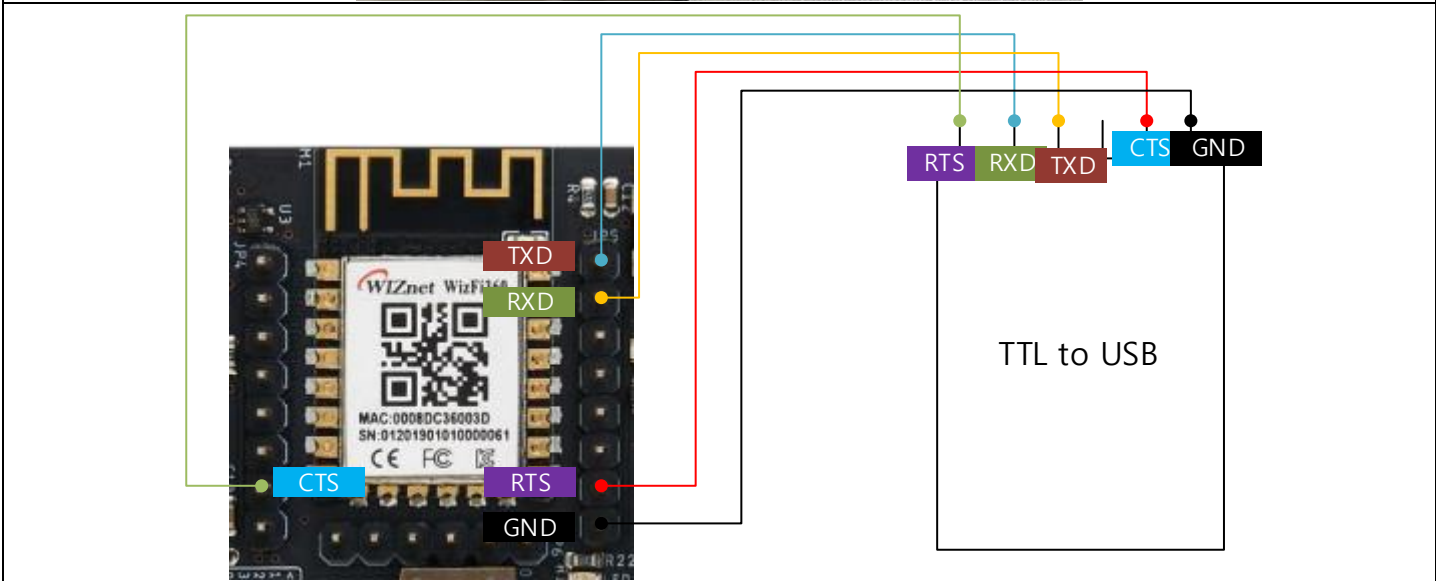
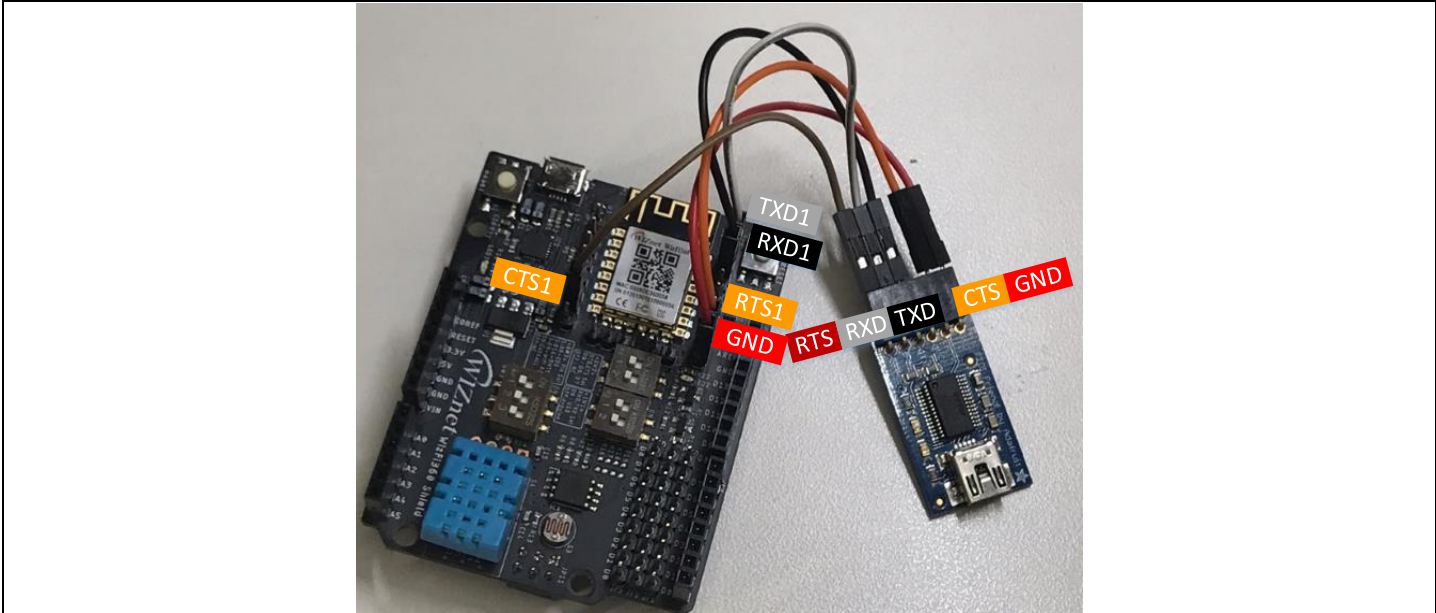
UART Throughput Test 를 하기 위해서는 CTS/RTS 를 이용한 제어 및 WizFi360 제어 Software 가 필요하다.

- WizFi360 EVB or WizFi360io
- STM32Fxxx EVB(NUCLEO-F401RE)
- PC
- Serial Tool
 - o YAT Serial Tool(Data Mode)
- WizFi360 제어 Software(Command Mode)
- 1Mbyte data file
- WiFi Router(SoftAP mode 를 사용할 경우 제외)

Data Mode 일 경우에는 YAT Serial Tool 를 이용하여 RTS/CTS 를 설정하고, DTR 로 Data Read 신호 설정해준다. 그런 후 RTS/CTS 가 제어하면서 데이터 전송이 이루어진다.

Command Mode 일 경우에는 AT+CIPSENDBUF command 를 이용하여 한번에 최대 보낼 수 있는 데이터 Byte 수인 2048 을 설정한 후 2048 Byte 크기의 Data 를 보내고, 또다시 AT+CIPSENDBUF 와 데이터를 반복해가면서 데이터 전송이 이루어진다.





2. Using Serial command

- Station Mode

AT command	Terminal
AT AT+CWMODE_CUR=1 AT+CWDHCP_CUR=1,1 AT+CWLAP AT+CWJAP_CUR="wizms1","maker0701" AT+CIPSTA_CUR?	<pre> AT<CR><LF> <CR><LF> OK<CR><LF> AT+CWMODE_CUR=1<CR><LF> <CR><LF> OK<CR><LF> AT+CWDHCP_CUR=1,1<CR><LF> <CR><LF> OK<CR><LF> AT+CWLAP<CR><LF> +CWLAP:(4,"DIR-815_Wiznet",-59,"[redacted]",1)<CR><LF> +CWLAP:(0,"ESP_574935",-71,"[redacted]",1)<CR><LF> +CWLAP:(3,"#WIZnet_irina",-46,"[redacted]",1)<CR><LF> +CWLAP:(3,"Matthew2.4",-63,"[redacted]",2)<CR><LF> +CWLAP:(3,"rena",-46,"[redacted]",3)<CR><LF> +CWLAP:(0,"iptime",-67,"[redacted]",4)<CR><LF> +CWLAP:(3,"Dap",-63,"[redacted]",5)<CR><LF> +CWLAP:(0,"ESP_577CC7",-67,"[redacted]",6)<CR><LF> +CWLAP:(3,"wizms1",-63,"[redacted]",6)<CR><LF> +CWLAP:(0,"Wizfi360",-69,"[redacted]",6)<CR><LF> +CWLAP:(4,"DLINK-IPv6",-55,"[redacted]",10)<CR><LF> +CWLAP:(0,"iptime",-59,"[redacted]",11)<CR><LF> +CWLAP:(3,"WIZnet_Scott",-51,"[redacted]",11)<CR><LF> +CWLAP:(0,"WizFi360_A1B2D1",-69,"[redacted]",11)<CR><LF> +CWLAP:(3,"Teddy_AP",-57,"[redacted]",13)<CR><LF> <CR><LF> OK<CR><LF> AT+CWJAP_CUR="wizms1","maker0701"<CR><LF> WIFI_DISCONNECT<CR><LF> WIFI_CONNECTED<CR><LF> WIFI_GOT_IP<CR><LF> <CR><LF> OK<CR><LF> AT+CIPSTA_CUR?<CR><LF> +CIPSTA_CUR:ip:"192.168.1.120"<CR><LF> +CIPSTA_CUR:gateway:"192.168.1.1"<CR><LF> +CIPSTA_CUR:netmask:"255.255.255.0"<CR><LF> <CR><LF> OK<CR><LF> </pre>

- UART CTS/RTS Setting

AT command	Terminal
AT+CWUART_CUR = 115200,8,1,0,1	<pre> AT+UART_CUR=115200,8,1,0,1<CR><LF> <CR><LF> OK<CR><LF> </pre>
Terminal Setting	

<ol style="list-style-type: none"> 1. Ctrl+Shift+S > Open the Settings 2. Flow Control안에 Hardware(RFR/CTS)로 변경 	
<ol style="list-style-type: none"> 3. Terminal창 아래에 오면 CTS/DTR이 초록으로 들어온 것을 확인할 수 있다. 	

- TCP Client /Data mode

AT command	Terminal
<p>AT+CIPSTART="TCP","192.168.100.27",5001 AT+CIPMODE=1 AT+CIPSEND</p>	<pre> AT+CIPSTART="TCP", "192.168.100.27", 5001<CR><LF> CONNECT<CR><LF> <CR><LF> OK<CR><LF> AT+CIPMODE=1<CR><LF> <CR><LF> OK<CR><LF> AT+CIPSEND<CR><LF> <CR><LF> > </pre>
Terminal Setting	
<ol style="list-style-type: none"> 1. DTR이 빨간불일 때, 1M.txt를 보내고, 2. DTR를 클릭해서 초록불로 바뀌면 데이터가 Serial을 통해 전송되게 된다. 	

- TCP Client / Command mode

AT command	Example Code
<p>AT+CIPSTART="TCP","192.168.100.27",5001 AT+CIPMODE=0 AT+CIPSENDERBUF=2048 Send the 2048byte data * 512times = 1Mbyte</p>	<pre> int8_t deviceTestThroughput_WizFi360(char *data, int len) { int8_t ret = RET_NOK; int cnt; int segid = 0; for(cnt = 0; cnt < (len / 4); cnt++) // 2k * 512 = 1M { if(ATCmdParser_send("AT+CIPSENDERBUF=%d", len)&& ATCmdParser_recv("OK") && ATCmdParser_recv(">")) { if(ATCmdParser_send("%s", data) && ATCmdParser_recv("%d,SEND OK", &segid)) { ret = RET_OK; } else { printf("Write data : failed\r\n"); } } else { printf("Set buffer : failed\r\n"); } } return ret; } </pre>

3. The result of UART Throughput

1Mbyte를 PC 혹은 WizFi360을 제어하는 MCU에서 WizFi360의 Serial(UART1)로 데이터를 보내고, TCP Server로 데이터를 전송한다.

Baud rate	Data mode		Command mode	
	Time	Speed(bit/s)	Time	Speed(bit/s)
115200	123s	66K	93.9s	87.2K
921600	16.3s	502K	14.0s	585.1K
1000000	14.9s	550K	13.0s	630.2K
1250000	12.7s	645K	11.0s	744.7K
1500000	10.5s	780K	10.0s	819.2K
2000000	9.7s	845K	8.0s	1.0M

해당 속도는 Wireshark를 이용하여, 데이터 전송시작부터 완료되는 시점까지의 시간을 측정한 것은 Appendix 1을 보면 된다.

Appendix 1

Baud rate	Data mode	Command mode
115200	123s : 66Kbit/s <pre> 3823 122.880000 192.168.100.27 192.168.100.28 TCP 54 5081 - 52161 [ACK] Seq=1023025 Win=6535 Len=0 3824 122.865190 192.168.100.28 192.168.100.27 TCP 498 52161 - 5081 [PSH, ACK] Seq=1023025 Ack=1 Win=6144 Len=436 [TCP segment of wlen 436 len 436] 3825 122.906828 192.168.100.27 192.168.100.28 TCP 54 5081 - 52161 [ACK] Seq=1023161 Ack=1 Win=6144 Len=0 3826 122.919779 192.168.100.28 192.168.100.27 TCP 594 52161 - 5081 [PSH, ACK] Seq=1023161 Ack=1 Win=6144 Len=540 [TCP segment of wlen 540 len 540] 3827 122.958838 192.168.100.27 192.168.100.28 TCP 54 5081 - 52161 [ACK] Seq=1024081 Win=64559 Len=0 </pre>	93.9s : 87.2Kbit/s <pre> 5 1.830141 192.168.0.2 192.168.0.4 TCP 1078 51003 - 8000 [ACK] Seq=1 Ack=2 Win=6144 Len=1024 6 1.830144 192.168.0.2 192.168.0.4 TCP 1078 51003 - 8000 [PSH, ACK] Seq=1025 Ack=2 Win=6144 Len=1024 8 1.830635 192.168.0.4 192.168.0.2 TCP 54 8000 - 51003 [ACK] Seq=2 Ack=2049 Win=64512 Len=0 12 2.013841 192.168.0.2 192.168.0.4 TCP 1078 51003 - 8000 [ACK] Seq=2049 Ack=2 Win=6144 Len=1024 13 2.013842 192.168.0.2 192.168.0.4 TCP 1078 51003 - 8000 [PSH, ACK] Seq=3073 Ack=2 Win=6144 Len=1024 3719 95.838545 192.168.0.2 192.168.0.4 TCP 1078 51003 - 8000 [PSH, ACK] Seq=1045505 Ack=2 Win=6144 Len=1024 3720 95.618677 192.168.0.4 192.168.0.2 TCP 54 8000 - 51003 [ACK] Seq=2 Ack=1046529 Win=64512 Len=0 3721 95.824157 192.168.0.2 192.168.0.4 TCP 1078 51003 - 8000 [ACK] Seq=1046529 Ack=2 Win=6144 Len=1024 3722 95.824158 192.168.0.2 192.168.0.4 TCP 1078 51003 - 8000 [PSH, ACK] Seq=1047553 Ack=2 Win=6144 Len=1024 3723 95.824292 192.168.0.4 192.168.0.2 TCP 54 8000 - 51003 [ACK] Seq=2 Ack=1048577 Win=64512 Len=0 </pre>
921600	16.3s : 502Kbit/s <pre> 2547 16.217822 192.168.100.28 192.168.100.27 TCP 1078 52165 - 5081 [ACK] Seq=1022161 Ack=1 Win=6144 Len=1024 [TCP segment of wlen 1024 len 1024] 2548 16.227868 192.168.100.27 192.168.100.28 TCP 54 5081 - 52165 [ACK] Seq=1023025 Win=6535 Len=0 2549 16.317118 192.168.100.28 192.168.100.27 TCP 878 52165 - 5081 [PSH, ACK] Seq=1023185 Ack=1 Win=6144 Len=816 [TCP segment of wlen 816 len 816] 2550 16.357729 192.168.100.27 192.168.100.28 TCP 54 5081 - 52165 [ACK] Seq=1024081 Win=64719 Len=0 </pre>	14.0s : 585.1Kbit/s <pre> 516 3.947736 192.168.0.2 192.168.0.4 TCP 1078 50155 - 8000 [ACK] Seq=1 Ack=2 Win=6144 Len=1024 517 3.947736 192.168.0.2 192.168.0.4 TCP 1078 50155 - 8000 [PSH, ACK] Seq=1025 Ack=2 Win=6144 Len=1024 518 3.947816 192.168.0.4 192.168.0.2 TCP 54 8000 - 50155 [ACK] Seq=2 Ack=2049 Win=64512 Len=0 519 3.974666 192.168.0.2 192.168.0.4 TCP 1078 50155 - 8000 [ACK] Seq=2049 Ack=2 Win=6144 Len=1024 520 3.974667 192.168.0.2 192.168.0.4 TCP 1078 50155 - 8000 [PSH, ACK] Seq=3073 Ack=2 Win=6144 Len=1024 2062 17.905709 192.168.0.2 192.168.0.4 TCP 1078 50155 - 8000 [PSH, ACK] Seq=1045505 Ack=2 Win=6144 Len=1024 2063 17.905776 192.168.0.4 192.168.0.2 TCP 54 8000 - 50155 [ACK] Seq=2 Ack=1046529 Win=64512 Len=0 2064 17.932838 192.168.0.2 192.168.0.4 TCP 1078 50155 - 8000 [ACK] Seq=1046529 Ack=2 Win=6144 Len=1024 2065 17.934456 192.168.0.2 192.168.0.4 TCP 1078 50155 - 8000 [PSH, ACK] Seq=1047553 Ack=2 Win=6144 Len=1024 2066 17.934582 192.168.0.4 192.168.0.2 TCP 54 8000 - 50155 [ACK] Seq=2 Ack=1048577 Win=64512 Len=0 </pre>
1000000	14.9s : 550Kbit/s <pre> 3868 14.774321 192.168.100.28 192.168.100.27 TCP 498 58128 - 5081 [PSH, ACK] Seq=1023125 Ack=1 Win=6144 Len=436 [TCP segment of wlen 436 len 436] 3869 14.815213 192.168.100.27 192.168.100.28 TCP 54 5081 - 58128 [ACK] Seq=1023161 Ack=1 Win=6144 Len=0 3870 14.819495 192.168.100.28 192.168.100.27 TCP 494 58128 - 5081 [PSH, ACK] Seq=1023161 Ack=1 Win=6144 Len=440 [TCP segment of wlen 440 len 440] 3871 14.859281 192.168.100.27 192.168.100.28 TCP 54 5081 - 58128 [ACK] Seq=1024081 Win=64659 Len=0 </pre>	13.0s : 630.2Kbit/s <pre> 15 9.855125 192.168.0.2 192.168.0.4 TCP 1078 60309 - 8000 [ACK] Seq=1 Ack=2 Win=6144 Len=1024 16 9.855126 192.168.0.2 192.168.0.4 TCP 1078 60309 - 8000 [PSH, ACK] Seq=1025 Ack=2 Win=6144 Len=1024 17 9.855287 192.168.0.4 192.168.0.2 TCP 54 8000 - 60309 [ACK] Seq=2 Ack=2049 Win=64512 Len=0 18 9.880881 192.168.0.2 192.168.0.4 TCP 1078 60309 - 8000 [ACK] Seq=2049 Ack=2 Win=6144 Len=1024 19 9.880881 192.168.0.2 192.168.0.4 TCP 1078 60309 - 8000 [PSH, ACK] Seq=3073 Ack=2 Win=6144 Len=1024 1550 22.852153 192.168.0.2 192.168.0.4 TCP 1078 60309 - 8000 [PSH, ACK] Seq=1045505 Ack=2 Win=6144 Len=1024 1551 22.852209 192.168.0.4 192.168.0.2 TCP 54 8000 - 60309 [ACK] Seq=2 Ack=1046529 Win=64512 Len=0 1552 22.852214 192.168.0.2 192.168.0.4 TCP 1078 60309 - 8000 [ACK] Seq=1046529 Ack=2 Win=6144 Len=1024 1553 22.852235 192.168.0.2 192.168.0.4 TCP 1078 60309 - 8000 [PSH, ACK] Seq=1047553 Ack=2 Win=6144 Len=1024 1554 22.852297 192.168.0.4 192.168.0.2 TCP 54 8000 - 60309 [ACK] Seq=2 Ack=1048577 Win=64512 Len=0 </pre>
1250000	12.7s : 645Kbit/s <pre> 2863 12.592480 192.168.100.28 192.168.100.27 TCP 498 58136 - 5081 [PSH, ACK] Seq=1023185 Ack=1 Win=6144 Len=436 [TCP segment of wlen 436 len 436] 2864 12.618881 192.168.100.27 192.168.100.28 TCP 54 5081 - 58136 [ACK] Seq=1023161 Ack=1 Win=6144 Len=0 2865 12.633959 192.168.100.28 192.168.100.27 TCP 434 58136 - 5081 [PSH, ACK] Seq=1023161 Ack=1 Win=6144 Len=440 [TCP segment of wlen 440 len 440] 2866 12.674856 192.168.100.27 192.168.100.28 TCP 54 5081 - 58136 [ACK] Seq=1024081 Win=64719 Len=0 </pre>	11.0s : 744.7Kbit/s <pre> 1 3.335673 192.168.0.2 192.168.0.4 TCP 1078 57187 - 8000 [ACK] Seq=1 Ack=2 Win=6144 Len=1024 7 3.351673 192.168.0.2 192.168.0.4 TCP 1078 57187 - 8000 [PSH, ACK] Seq=1025 Ack=2 Win=6144 Len=1024 5 3.351752 192.168.0.4 192.168.0.2 TCP 54 8000 - 57187 [ACK] Seq=2 Ack=2049 Win=64512 Len=0 6 3.372523 192.168.0.2 192.168.0.4 TCP 1078 57187 - 8000 [ACK] Seq=2049 Ack=2 Win=6144 Len=1024 7 3.372524 192.168.0.2 192.168.0.4 TCP 1078 57187 - 8000 [PSH, ACK] Seq=3073 Ack=2 Win=6144 Len=1024 1534 14.330917 192.168.0.2 192.168.0.4 TCP 1078 57187 - 8000 [PSH, ACK] Seq=1045505 Ack=2 Win=6144 Len=1024 1535 14.330971 192.168.0.4 192.168.0.2 TCP 54 8000 - 57187 [ACK] Seq=2 Ack=1046529 Win=64512 Len=0 1536 14.351216 192.168.0.2 192.168.0.4 TCP 1078 57187 - 8000 [ACK] Seq=1046529 Ack=2 Win=6144 Len=1024 1537 14.351217 192.168.0.2 192.168.0.4 TCP 1078 57187 - 8000 [PSH, ACK] Seq=1047553 Ack=2 Win=6144 Len=1024 1538 14.351275 192.168.0.4 192.168.0.2 TCP 54 8000 - 57187 [ACK] Seq=2 Ack=1048577 Win=64512 Len=0 </pre>
1500000	10.5s : 780Kbit/s <pre> 2242 10.389973 192.168.100.28 192.168.100.27 TCP 498 65021 - 5081 [PSH, ACK] Seq=1023074 Ack=1 Win=6144 Len=436 [TCP segment of wlen 436 len 436] 2244 10.430942 192.168.100.27 192.168.100.28 TCP 54 5081 - 65021 [ACK] Seq=1023161 Ack=1 Win=6144 Len=0 2245 10.445897 192.168.100.28 192.168.100.27 TCP 545 65021 - 5081 [PSH, ACK] Seq=1023161 Ack=1 Win=6144 Len=540 [TCP segment of wlen 540 len 540] 2247 10.486915 192.168.100.27 192.168.100.28 TCP 54 5081 - 65021 [ACK] Seq=1024081 Win=64688 Len=0 </pre>	10.0s : 819.2Kbit/s <pre> 4 3.939801 192.168.0.2 192.168.0.4 TCP 1078 60368 - 8000 [ACK] Seq=1 Ack=2 Win=6144 Len=1024 4 3.950812 192.168.0.2 192.168.0.4 TCP 1078 60368 - 8000 [PSH, ACK] Seq=1025 Ack=2 Win=6144 Len=1024 5 3.950819 192.168.0.4 192.168.0.2 TCP 54 8000 - 60368 [ACK] Seq=2 Ack=2049 Win=64512 Len=0 6 1.939981 192.168.0.2 192.168.0.4 TCP 1078 60368 - 8000 [ACK] Seq=2049 Ack=2 Win=6144 Len=1024 7 1.939981 192.168.0.2 192.168.0.4 TCP 1078 60368 - 8000 [PSH, ACK] Seq=3073 Ack=2 Win=6144 Len=1024 1537 11.937349 192.168.0.2 192.168.0.4 TCP 1078 60368 - 8000 [PSH, ACK] Seq=1045505 Ack=2 Win=6144 Len=1024 1538 11.937412 192.168.0.4 192.168.0.2 TCP 54 8000 - 60368 [ACK] Seq=2 Ack=1046529 Win=64512 Len=0 1539 11.955972 192.168.0.2 192.168.0.4 TCP 1078 60368 - 8000 [ACK] Seq=1046529 Ack=2 Win=6144 Len=1024 1540 11.955972 192.168.0.2 192.168.0.4 TCP 1078 60368 - 8000 [PSH, ACK] Seq=1047553 Ack=2 Win=6144 Len=1024 1541 11.956012 192.168.0.4 192.168.0.2 TCP 54 8000 - 60368 [ACK] Seq=2 Ack=1048577 Win=64512 Len=0 </pre>

2000000	9.7s : 845Kbit/s		8.0s : 1.0Mbit/s						
	6316 9.646387	192.168.100.28	192.168.100.27	TCP	490 65031 → 5001 [PSH, ACK] Seq=1023245 Ack=1 Min=6144				
	6317 9.686546	192.168.100.27	192.168.100.28	TCP	54 5001 → 65031 [ACK] Seq=1 Ack=1023681 Min=65099				
	6318 9.698409	192.168.100.28	192.168.100.27	TCP	374 65031 → 5001 [PSH, ACK] Seq=1023681 Ack=1 Min=6144				
	6319 9.731538	192.168.100.27	192.168.100.28	TCP	54 5001 → 65031 [ACK] Seq=1 Ack=1024001 Min=64779				
					3 2.492951	192.168.0.2	192.168.0.4	TCP	1078 63635 → 8000 [ACK] Seq=1 Ack=2 Min=6144 Len=1024
					4 2.496860	192.168.0.2	192.168.0.4	TCP	1078 63635 → 8000 [PSH, ACK] Seq=1025 Ack=2 Min=6144 Len=1024
					5 2.496929	192.168.0.4	192.168.0.2	TCP	54 8000 → 63635 [ACK] Seq=2 Ack=2049 Min=64512 Len=0
					6 2.506899	192.168.0.2	192.168.0.4	TCP	1078 63635 → 8000 [ACK] Seq=2049 Ack=2 Min=6144 Len=1024
					7 2.507544	192.168.0.2	192.168.0.4	TCP	1078 63635 → 8000 [PSH, ACK] Seq=3073 Ack=2 Min=6144 Len=1024
					1533 10.470341	192.168.0.2	192.168.0.4	TCP	1078 63635 → 8000 [PSH, ACK] Seq=1045505 Ack=2 Min=6144 Len=1024
					1534 10.470400	192.168.0.4	192.168.0.2	TCP	54 8000 → 63635 [ACK] Seq=2 Ack=1046529 Min=64512 Len=0
					1535 10.489628	192.168.0.2	192.168.0.4	TCP	1078 63635 → 8000 [ACK] Seq=1046529 Ack=2 Min=6144 Len=1024
					1536 10.489628	192.168.0.2	192.168.0.4	TCP	1078 63635 → 8000 [PSH, ACK] Seq=1047553 Ack=2 Min=6144 Len=1024
					1537 10.489604	192.168.0.4	192.168.0.2	TCP	54 8000 → 63635 [ACK] Seq=2 Ack=1048577 Min=64512 Len=0