Исследование пропускной способности сети

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Задание на дом

- С помощью утилиты TamoSoft Throughput Test определить пропускную способность сети, состоящей из двух ПК, соединенных через:
 - 1) Wi-Fi-роутер, к которому оба ПК подключены с помощью сетевого кабеля
 - 2) Wi-Fi-роутер, к которому один ПК подключен с помощью сетевого кабеля, а второй через Wi-Fi
 - 3) Wi-Fi-poytep, к которому оба ПК подключены через Wi-Fi
 - 4) Напрямую через Wi-Fi в режиме Ad Hoc
- Для генерации трафика использовать настройку **TCP only**
- Длительность каждого теста не менее 1 минуты
- С помощью Wireshark собрать передаваемый трафик и определить среднюю скорость входящего и исходящего потоков между ПК. Сравнить с показаниями TamoSoft

ПО для измерений

- Скачайте и установите на ПК1 и ПК2 утилиту TamoSoft Throughput Test
- <u>https://www.tamos.ru/products/throughput-test/</u>
- <u>https://www.tamos.ru/download/main/</u>
- Вместо TamoSoft Throughput Test можно воспользоваться утилитой iPerf:
- <u>https://ru.wikipedia.org/wiki/lperf</u>
- https://iperf.fr/

Оформление результатов (1/2)

	ПК1	ПК2	Wi-Fi-роутер
Модель устройства			
Максимальная скорость Ethernet			
Максимальная скорость Wi-Fi			
Максимальная скорость Ad Hoc			

Оформление результатов (2/2)

	TamoSoft (Average), Мбит/с		Wireshark (Average), Мбит/с		
	Up	Down	Up	Down	
Wi-Fi-роутер, 2 кабеля					
Wi-Fi-роутер, 1 кабель					
Wi-Fi-роутер, без кабеля					
Напрямую через Ad Hoc					

Wi-Fi-роутер, 2 кабеля



Используемое оборудование

	ПК1	ПК2	Wi-Fi-роутер
Модель	ThinkPad X230	ThinkPad X201i	Thomson TG585
Ethernet	1000 Мбит/с	1000 Мбит/с	100 Мбит/с
Wi-Fi (802.11n)	300 Мбит/с	150 Мбит/с	65 Мбит/с
Ad Hoc (802.11g)	54 Мбит/с	54 Мбит/с	

ПК1: Run Server

👳 TamoSoft	Throughput Test	- Server - Ver. 1.0 Build 34	
Port: 27100	×	Apply	TAMO
Protocol:			
IPv4	© IPv6		
Listening 192.168.1 Press F1	g on port 2710 1.65 for help.	0 at the following IP ad	dresses:
			-

ΠK2: Run Client > TCP only > Connect

👳 TamoSoft Throughput Tes	t - Client - Ver. 1.0 Build 34		
Server IP or IPv6 address:			
192.168.1.65	•	Connect	TAMO
Server port: C	QoS traffic type:		
27100	Best Effort 🔹	Disconnect	
TCP only			
TCP Up: 0.00 Mbps (TCP Down: 0.00 Mbps (Round-trip time: 0.0	Ave: 0.00) UI Ave: 0.00) UI ms	DP Up: 0.00 Mbps (Ave: DP Down: 0.00 Mbps (Ave:	0.00), Loss: 0.0%
Chart:	© Loss ⊚ RTT		
0			TCP Upstream TCP Downstream UDP Upstream UDP Downstream
Status log:			
Ready for testing. En throughput test and c	ter the IP address o lick "Connect". Pres	f the computer running t s F1 for help.	the server part of the 🔺
			~

Если на ПК2 и ПК1 есть фаервол

COMODO Firewall Alert	С
TTClient.exe is trying to connect to the Internet	
Application: <u>TTClient.exe</u> Remote: 192.168.1.65 - TCP Port: 27100	-
Security Considerations TTClient.exe is a safe application. You can safely allow this request.	
Allow this request Fewer Options	0
Treat this application as Trusted Application	0
Remember my answer	\checkmark
How should I answer? OK OK Cancel	0

сомо	DO Оповеще	ние Фаервола				
	Приложени входящее	le TTServer.exe пытается принять интернет соединение				
Q	Приложение: Хост: Порт:	<u>TTServer.exe</u> 192.168.1.64 - TCP 27100				
Совет по безопасности TTServer.exe - безопасное приложение. Однако вы собираетесь принять входящее соединение от другого компьютера. Если вы точно не знаете, как поступить, вам следует заблокировать этот запрос.						
 Разрешить этот запрос Меньше вариантов Блокировать этот запрос Обработать приложение как Доверенное приложение ✓ Запомнить мой выбор 						
🕜 Помоц	<u>lb</u>	🗸 Да 🧭 Отмена				

Идет трафик ТСР между ПК2 и ПК1

Server IP or IPv6 address:	\frown
192.168.1.65 Connect	TAMO
Server port: QoS traffic type:	
27100 Best Effort	
TCP only	Port:
	27100 Apply
TCP Up: 95.03 Mbps (Ave: 93.67) UDP Up: 0.00 Mbps (Ave: 0.00), Lo TCP Down: 94.96 Mbps (Ave: 94.92) UDP Down: 0.00 Mbps (Ave: 0.00), Lo	ss: 0.0% ^
Round-trip time: 2.1 ms	Protocol:
.hart: 🔘 Throughput 🔘 Loss 🛛 🔘 RTT	
	TCP Upstream TCP Downstream UDP Upstream UDP Downstream
Status log:	
throughput test and click "Connect". Press F1 for help. [1:27:59 PM] Connecting to 192.168.1.65 [1:28:05 PM] Performing tests. Click "Disconnect" to finish.	

ПК2: Выбираем захват на Local

📶 The Wireshark Network Analyzer	
File Edit View Go Capture Analyze Statistics Telephony Wireless Tools Help	
🧧 🔳 🔬 🕲 📙 陆 🕱 🛅 🥄 🗇 👳 空 🗿 🖳 🗨 🔍 🔍 🧮	
Apply a display filter < Ctrl-/>	+ 💌
Welcome to Wireshark	
Capture	
using this filter: 📙 tcp 🛛 All interfaces shown 🔻	
VMware Network Adapter VMnet8	

Learn

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You are running Wireshark 3.2.3 (v3.2.3-0-gf39b50865a13). You have disabled automatic updates.

No Packets

Profile: Default

ПК2: 1 минуту спустя > Disconnect

👳 TamoSoft Throughput Test - Client -	Ver. 1.0 Build 34	
Server IP or IPv6 address:		
192.168.1.65	✓ Connect	TAMO
Server port: QoS traffic	ype:	
27100 🚔 Best Effort	 Disconnect 	
TCP only		
TCP Up: 95.03 Mbps (Ave: 94 TCP Down: 95.15 Mbps (Ave: 95 Round-trip time: 2.1 ms	88) UDP Up: 0.00 Mbps (Av. 03) UDP Down: 0.00 Mbps (Av.	e: 0.00), Loss: 0.0% e: 0.00), Loss: 0.0%
Chart: Throughput Chart:	© RTT	
		TCP Upstream TCP Downstream UDP Upstream UDP Downstream
Status log:		
[2:14:22 PM] Connecting to 19 [2:14:22 PM] Performing tests [2:15:28 PM] Disconnected	2.168.1.65 Click "Disconnect" to finish.	Ē

Statistics > Conversations > IPv4

📕 router + 2 cables.pcap		- 6 X
File Edit View Go Capture Analyze Statistics Telephony Wireless Tools Help		
<u> </u>		
Wireshark - Conversations - router + 2 cables.pcap		
Ethernet · 1 IPv6 TCP · 2 UDP		
Address A Address B Packets Bytes Packets A \rightarrow B Bytes A \rightarrow B Packets B \rightarrow A Bytes B \rightarrow A Rel Start Duration Bits/s A \rightarrow B Bits/s B \rightarrow A		
192.168.1.64 192.168.1.65 258,174 264 M 129,309 132 M 128,865 131 M 0.000000 64.0805 16 M		16 M
Name resolution Limit to display filter Absolute start time	Conv	ersation Types 🔻
	Copy Follow Stream Graph Close	Help
router + 2 cables.pcap	ets: 258174 · Displayed: 258174 (100.0%)	Profile: Default

Или фильтруем трафик к серверу

- Используем фильтр ip.**dst** == 192.168.1.65
- Нажимаем <Enter>
- Далее в меню Statistics (Статистика) выбираем Capture File Properties (Свойства Файла Захвата)
- Смотрим строку Average bits/s (В среднем бит/с) в столбце <u>Displayed</u> (Показано)
- В данном случае видим: 16 М (т.е. **16 Мбит/с**)
- В TamoSoft скорость Up была около **95 Мбит/с**

Statistics > Capture File Properties

router + 2 cables.pcap			▲ Wireshark · Capture	File Properties · router + 2 cables.pcap					
Fil	File Edit View Go Capture Analyze Statistics Telephony Wireles			Details					
	🔳 🙋 💽 🕌 🛅	🔀 🖾 🍳 🗢 🖻	≌ ↑ ୬ 🗐 🗏 🍳 ବ୍	File					
	ip.dst == 192.168.1.65			riie					
No.	Time	Source	Destination	Name:	C:\Users\RAD\Downloads\router + 2 cable	s.pcap			
	2 0.003158	192.168.1.64	192.168.1.65	Hash (SHA256):	200 MD 2a457e73422514ace4121b54b084c720c2	fa7d13d05fbb5306dbe1	935101a786		
	4 0.111836	192.168.1.64	192.168.1.65	Hash (RIPEMD 160):	eb99092165fdb8b5eda78e14c8f20b8688e	62d18			
	6 0.220996	192.168.1.64	192.168.1.65	Hash (SHA1):	1bbba261cb92c37a79b795fb5ba2aac8a4f	4c11d			
	8 0.333972	192.168.1.64	192.168.1.65	Format:	Wireshark/tcpdump/ pcap				
	9 0.334003	192.168.1.64	192.168.1.65	Encapsulation:	Ethernet				
	10 0.334010	192.168.1.64	192.168.1.65	Snapshot length:	65535				
	11 0.334018	192.168.1.64	192.168.1.65	Time					
	12 0.334025	192.168.1.64	192.168.1.65						
	13 0.334033	192.168.1.64	192.168.1.65	First packet:	2020-04-18 13:56:45				
	14 0.334042	192.168.1.64	192.168.1.65	Last packet:	2020-04-18 13:57:49				
⊳	Frame 2: 86 bytes	on wire (688 bits)	, 86 bytes captured (688	Elapseu:	00:01:04				
\triangleright	Ethernet II, Src:	WistronI_76:b1:d9	(3c:97:0e:76:b1:d9), Dst	Capture					
⊳	Internet Protocol	Version 4, Src: 19	2.168.1.64, Dst: 192.168						
\triangleright	Transmission Cont	rol Protocol, Src P	Port: 53949 (53949), Dst	Hardware:	Unknown				
⊳	Data (32 bytes)			Application:	Linknown				
				Interfaces Interface Unknown	Dropped packets Unknown	<u>Capture filter</u> Unknown	<u>Link type</u> Ethernet	<u>Pack</u> 6553	et size limit 5 bytes
									/
				Statistics					
				Measurement	Captured		Displayed	Marked	
				Packets	258174		129309 (50.1%)	-	
				Time span, s	64.080		64.077 2019 0	_	
				Average packet size. B	1025		1027	_	
				Bytes	264530812		132802146 (50.2%)	0	
				Average bytes/s	4128 k		2072 k	_	
				Average bits/s	33 M		16 M	-	
				Capture file comments					
00	00 f0 de f1 25 bb	5d 3c 97 0e 76 h	1 49 08 00 45 00						
00	0 00 48 04 17 40	00 80 06 00 00 c	0 a8 01 40 c0 a8 ·H··6						
00	020 01 41 d2 bd 69	dc 02 ec 46 8e 7	7 14 a5 00 50 18 · A··i						
00	30 f7 70 84 0c 00	00 04 00 00 00 0	0 00 00 00 00 00 ·p···						
00	00 00 00 00 00 00	0 00 00 00 00 00 0	0 00 00 00 00 00						
	Destination: IPv4	address		Refresh			Save Comments	s Close Cop	oy To Clipboard Help

Затем смотрим трафик от сервера

- Используем фильтр ip.**src** == 192.168.1.65
- Нажимаем <Enter>
- Далее в меню Statistics (Статистика) выбираем Capture File Properties (Свойства Файла Захвата)
- Смотрим строку Average bits/s (В среднем бит/с) в столбце <u>Displayed</u> (Показано)
- В данном случае видим: 16 М (т.е. **16 Мбит/с**)
- В TamoSoft скорость Down была около **95 Мбит/с**

Statistics > Capture File Properties

🦲 router + 2 ca	ables.pcap			📕 Wireshark · Capture	File Properties · rou	ter + 2 cables.pcap				- • ·
File Edit Vi	iew Go C	apture Analyze S	Statistics Telephony Wireles	Details						
) 🕌 🔤 🎽	। ⊆ । ९ ⇔ ⇒	≌↑⊻⊒≡ಅ,⊂	File						
ip.src == 192	2.168.1.65			THC.						
No. Time	2	Source	Destination	Name:	C: Users RAD Dow	nloads\router + 2 cables.	.pcap			
_ 10.0	00000	192.168.1.65	192.168.1.64	Hash (SHA256):	2a457e73422514a	ce4121b54b084c720c2fa	7d13d05fbb5306dbe	1935101a786		
3 0.0	04888	192.168.1.65	192.168.1.64	Hash (RIPEMD160):	eb99092165fdb8b	5eda78e14c8f20b8688e6	2d18			
5 0.1	13494	192.168.1.65	192.168.1.64	Hash (SHA1):	1bbba261cb92c37a	a79b795fb5ba2aac8a4f4c	:11d			
7 0.2	22558	192.168.1.65	192.168.1.64	Format:	Wireshark/tcpdump	o/ pcap				
52 0.3	34979	192.168.1.65	192.168.1.64	Encapsulation:	Ethernet					
55 0.3	35310	192.168.1.65	192.168.1.64	snapsnot length:	05555					
58 0.3	35642	192.168.1.65	192.168.1.64	Time						
61 0.3	35975	192.168.1.65	192.168.1.64							
64 0.3	36006	192.168.1.65	192.168.1.64	First packet:	2020-0	4-18 13:56:45				
6/0.3	36309	192.168.1.65	192.168.1.64	Flansed:	00:01:0	14				
Frame 1: 0	60 bytes o	n wire (480 bits	;), 60 bytes captured (48							
Ethernet 3	II, Src: W	istronI_25:bb:5d	(f0:de:f1:25:bb:5d), Ds	Capture						
Internet I	Protocol V	ersion 4, Src: 1	92.168.1.65, Dst: 192.16	Hardware:	Linknov	'n				
Transmiss:	ion Contro	l Protocol, Src	Port: 27100 (27100), Dst	OS:	Unknov	'n				
				Application:	Unknov	vn				
				Interfaces						
				Interface	Droppe	d packets	Capture filter	Link type		Packet size limit
				Unknown	Unknov	'n	Unknown	Ethernet		65535 bytes
				Charline						
				Statistics						
				Measurement		Captured		Displayed	Marked	<u>l</u>
				Packets		258174		128865 (49.9%)	-	
				Time span, s		64.080		64.080	-	
				Average pps		4028.9		1022	_	
				Bytes		264530812		131728666 (49.8%)	0	
				Average bytes/s		4128 k		2055 k	_	
				Average bits/s		33 M		16 M	-	
				Capture file comments						
0000 30 97	0e 76 b1 c	19 f0 de f1 25 l	bh 5d 08 00 45 00							
0010 00 28	3e e4 40 0	0 80 06 38 1a	c0 a8 01 41 c0 a8 (> 6							
0020 01 40	69 dc d2 b	d 77 14 a5 00	02 ec 46 8e 50 10 @i							
0030 f7 90	92 48 00 0	0 00 00 00 00 00	00 00 ···H							
🔵 🍸 router	r + 2 cables.pc	ар		Refresh				Save Commen	ts Close	Copy To Clipboard Help

Почему в Wireshark меньше?

- Согласно собранному с помощью Wireshark файлу захвата, реальная скорость передачи существенно меньше заявленной в окне TamoSoft Throughput Test
- Однако показания TamoSoft Throughput Test лучше согласуются с возможностями тестируемого Wi-Fiроутера, который использует технологию Fast Ethernet (100BaseT) со скоростью передачи 100 Мбит/с в полнодуплексном режиме
- Данное расхождение обусловлено тем, что для определения пропускной способности TamoSoft Throughput Test посылает данные периодически, а вовсе не сплошной чередой (см. скриншоты далее)
- В итоге объем реально передаваемого трафика оказывается в разы меньше, чем позволяет тестируемая сеть

Statistic > TCP Stream Graphs >

🥖 router + 2 cables.pcap	
File Edit View Go Capture Analyze Statistics Telephony Wireless Tools Help	
🚄 🔳 🙍 🛞 🔑 🔚 🔀 🔄 🔍 🖘 🗟 Capture File Properties 🛛 Ctrl+Alt+Shift+C	
Apply a display filter <ctrl-></ctrl-> Resolved Addresses	→ +
No. Time Source Protocol Hierarchy	
1 0.000000 192.168.1.65 Conversations	0 → 53949 [ACK] Seq=1 Ack=1 Win=63376 Len=0
2 0.003158 192.168.1.64 Endpoints	9 → 27100 [PSH, ACK] Seq=1 Ack=1 Win=63344 Len=32
3 0.004888 192.168.1.65 Packet Lengths	→ 53949 [PSH, ACK] Seq=1 Ack=33 Win=63344 Len=32
4 0.111836 192.168.1.64 //O Graph	→ ∠7/100 [PSh, ALK] SEq=33 ACK=33 Win=03312 Len=32
6 0.220996 192.168.1.64 Service Response Time	\rightarrow 27100 [PSH, Ack] Seq=5 Ack=65 Win=63200 Len=32
7 0.222558 192.168.1.65	→ 53949 [PSH, ACK] Seq=65 Ack=97 Win=63280 Len=32
8 0.333972 192.168.1.64 DHCP (BOOTP) Statistics	0 → 27100 [ACK] Seq=1 Ack=1 Win=64240 Len=1460 [TCP segment of a reassembled PDU]
9 0.334003 192.168.1.64 ONC-RPC Programs	P → 27100 [ACK] Seq=1461 Ack=1 Win=64240 Len=1460 [TCP segment of a reassembled PDU]
10 0.334010 192.168.1.64 29West	0 → 27100 ACK Seq=2921 Ack=1 Win=64240 Len=1460 TCP segment of a reassembled PDU
▷ Frame 74257: 54 bytes on wire (43) ANCP	
Ethernet II, Src: WistronI_76:b1:0	b:5d (f0:de:f1:25:bb:5d)
Transmission Control Protocol, Spice Collected	198), Seg: 36989991, Ack: 36989991, Len: 0
UNS	
Flow Graph	
HART-IP	
HPFEEDS	
HTTP +	
HTTP2	
Sametime	
TCP Stream Graphs	Time Sequence (Stevens)
UDP Multicast Streams	Time Sequence (tcptrace)
	Throughput
F5	Round Trip Time
IPv4 Statistics	Window Scaling
IPv6 Statistics	- Mindow scaling
0000 T0 de T1 25 bb 5d 3c 97 0e 76 b1 d9 08 00 45 00	
0020 01 41 d2 be 69 dc 0d bd b0 af 7b 9c 04 1f 50 10 ·A··i····{··P·	
0030 fa f0 83 ec 00 00	
O router + 2 cables.pcap	Packets: 258174 · Displayed: 258174 (100.0%) Profile: Defau

Time Sequence (Stevens)



Wi-Fi-роутер, 1 кабель



ПК2: Беспроводное соединение





ПК2: Выбираем захват на Wireless

📕 The Wireshark Network Analyzer	- 6 💌
File Edit View Go Capture Analyze Statistics Telephony Wireless Tools Help	
🛋 🔳 🖉 🕲 📙 陆 🕱 🖆 I 9. 🗇 🕸 🔄 🖶 🚍 🔍 9. 🤤 🏛	
Apply a display filter <ctrl-></ctrl->	+ 💌
Welcome to Wireshark	
Capture	
using this filter: 📙 tcp 🛛 All interfaces shown 🔻	
VMware Network Adapter VMnet8 / Wireless Network Connection 2 VMware Network Connection 3 Local Area Connection Wireless Network Connection	

-	-	10	•
c	a		

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You are running Wireshark 3.2.3 (v3.2.3-0-gf39b50865a13). You receive automatic updates.

No Packets

Profile: Default

Wi-Fi-роутер, без кабеля



ПК1: Беспроводное соединение



👳 TamoSoft Throughput Test - Server - Ver. 1.0 Build 34	
Port: 27100 Apply Protocol:	TAMO
Listening on port 27100 at the following IP addre 192.168.1.67 Press F1 for help.	esses:
	*

ПК2: Беспроводное соединение





ПК2: Выбираем захват на Wireless

📕 The Wireshark Network Analyzer	- 6 💌
File Edit View Go Capture Analyze Statistics Telephony Wireless Tools Help	
🛋 🔳 🖉 🕲 📙 陆 🕱 🖆 I 9. 🗇 🕸 🔄 🖶 🚍 🔍 9. 🤤 🏛	
Apply a display filter <ctrl-></ctrl->	+ 💌
Welcome to Wireshark	
Capture	
using this filter: 📙 tcp 🛛 All interfaces shown 🔻	
VMware Network Adapter VMnet8 / Wireless Network Connection 2 VMware Network Connection 3 Local Area Connection Wireless Network Connection	

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	-	-	8.0	-	
	-	а			
		-	-	-	-

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You are running Wireshark 3.2.3 (v3.2.3-0-gf39b50865a13). You receive automatic updates.

No Packets

Напрямую через Ad Hoc



ПK2: Network and Sharing Center

Control Panel Home Manage wireless networks Change advanced sharing settings Change advanced sharing Setings Change advanced sharing Setings Change your networkis Change your networkis Change your networkis Change your networkis Change your networkis Change your networkis Set up a new connection or network Set up a new connection or network Set up a new connection or network Connect to a network Change your networking settings Set up a new connection or network Set up a new connection or network Set up a new connection or network Connect to a network Connect to a network Connect to a wireless, wired, dial-up, ad hoc, or VPN network connection. Connect to a wireless, wired, dial-up, or VPN network connection. Choose homegroup and sharing options Access files and printers located on other network computers, or change sharing settings. Toubleshoot problems Diagnose and repair network problems, or get troubleshooting information.		Manuface Balance and Manuface Contra		
Control Panel Home View your basic network information and set up connections Manage wireless networks Image:	Control Panel	Network and Internet Network and Sharing Center	✓ ♦ Search Control Panel	, ,
	Control Panel Home Manage wireless networks Change adapter settings Change advanced sharing settings	View your basic network information and set up connections View your basic network information and set up connections View your basic network information and set up connections View your basic network information and set up connections View your basic network information and set up connections View your basic network information and set up connections View your basic network information and set up connections View your basic network View your active networks View your active networks Vou are currently not connected to any networks. Change your networking settings View your active network is straing others Set up a new connection or network Set up a new connection or network Set up a wireless, broadband, dial-up, ad hoc, or VPN connection; or set up a router or access point. View Connect to a network Connect to a network Connect or reconnect to a wireless, wired, dial-up, or VPN network connection. View Choose homegroup and sharing options Access files and printers located on other network computers, or change sharing settings. Toubleshoot problems Diagnose and repair network problems, or get troubleshooting information.		

Set up a new connection or network

Control Panel >	Network and Internet Network and Sharing Center	✓ 4 Search Control Panel
Control Panel Home Manage wireless networks Change adapter settings Change advanced sharing	View your basic network information and set up connections	
settings	View your active networks Connect to a network You are currently not connected to any networks.	
	Change your networking settings	
	Connect to a network Connect or reconnect to a wireless, wired, dial-up, or VPN network connection.	
	Choose homegroup and sharing options Access files and printers located on other network computers, or change sharing settings.	
	Troubleshoot problems Diagnose and repair network problems, or get troubleshooting information.	
See also		
HomeGroup		
Intel® PROSet/Wireless Tools		
Lenovo - Internet Connection		
Windows Firewall		

Set up a wireless ad hoc > Next



Windows Firewall

Set Up an Ad Hoc Network > Next



33

Give your network a name > Next

Set Up an Ad Hoc Netwo	ork	
Give your network a r	name and choose security o	ptions
Network name:	TEST2	
Security type:	No authentication (Open)	Help me choose
Security key:		Hide characters
Save this network		
		Next Cancel

The network is ready to use > Close



ПК2: До и после подключения ПК1





ПК1: Ad Hoc соединение



👳 TamoSoft Throughput Test - Server - Ver. 1.0 B	Build 34 🗖 🖻 🖾
Port: 27100 Apply Protocol:	TAMOOFT
Listening on port 27100 at the follo 169.254.20.109 Press F1 for help.	wing IP addresses:

ПК2: Ad Hoc соединение





ПК2: Выбираем захват на Wireless

📕 The Wireshark Network Analyzer	- 6 💌
File Edit View Go Capture Analyze Statistics Telephony Wireless Tools Help	
🛋 🔳 🖉 🕲 📙 陆 🕱 🖆 I 9. 🗇 🕸 🔄 🖶 🚍 🔍 9. 🤤 🏛	
Apply a display filter <ctrl-></ctrl->	+ 💌
Welcome to Wireshark	
Capture	
using this filter: 📙 tcp 🛛 All interfaces shown 🔻	
VMware Network Adapter VMnet8 / Wireless Network Connection 2 VMware Network Connection 3 Local Area Connection Wireless Network Connection	

-	-	10	•
c	a		

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You are running Wireshark 3.2.3 (v3.2.3-0-gf39b50865a13). You receive automatic updates.

No Packets

Profile: Default

Итоговая таблица для TamoSoft

	TamoSoft (Average), Мбит/с		Wireshark (Average), Мбит/с		
	Up	Down	Up	Down	
Wi-Fi-роутер, 2 кабеля	95	95			
Wi-Fi-роутер, 1 кабель	38	32			
Wi-Fi-роутер, без кабеля	19	19			
Напрямую через Ad Hoc	13	13			