

Computer Networks Task1

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Note: the file was automatically converted to a PDF. Sorry if the formatting is not perfect

Here are some screenshots on running a VM

Running a Yandex VM

The screenshot displays the Yandex Cloud console interface for a specific virtual machine. On the left, a sidebar menu lists various management options: Overview (selected), Disks and Storage, Snapshots, Access Rights, Operations, Monitoring, Serial Console, and Serial Port. The main panel, titled 'Обзор' (Overview), provides key information about the VM: its unique identifier, current status (Running), name, creation date (21.01.2026), internal FQDN, and availability zone. Below this, the 'Доступ' (Access) section shows that OS Login is disabled. Two expandable boxes offer connection instructions: one for SSH clients with a terminal command, and another for the Yandex Cloud CLI.

Обзор	
Идентификатор	epdrvthtisgg39dovbue
Статус	Running
Имя	compute-vm-2-1-10-hdd-1768992849890
Дата создания	21.01.2026, в 1:58 дня
Внутренний FQDN	compute-vm-2-1-10-hdd-1768992849890.ru-central1.internal
Зона доступности	ru-central1-b

Доступ

Доступ по OS Login: Выключен

Подключиться с помощью SSH-клиента

Для подключения к машине с помощью SSH используйте следующую команду:

```
ssh -l user 178.154.199.103
```

В случае утери SSH-ключа есть [инструкция по восстановлению доступа к ВМ](#).

Подключиться с помощью CLI Yandex Cloud

Server IP: 178.154.199.103

Client IP (started locally): 192.168.3.10

Server sends to a client

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Client sends to a server

tcp.port == 10000									
Source	Destination	Protocol	Length	Info					
178.154.199.103	192.168.3.10	TCP	66	10000 → 55143 [ACK] Seq=1 Ack=1					
178.154.199.103	192.168.3.10	TCP	86	10000 → 55143 [PSH, ACK] Seq=1 A					
192.168.3.10	178.154.199.103	TCP	66	55143 → 10000 [ACK] Seq=1 Ack=21					
192.168.3.10	178.154.199.103	TCP	1274	55143 → 10000 [PSH, ACK] Seq=1 A					
178.154.199.103	192.168.3.10	TCP	66	10000 → 55143 [ACK] Seq=21 Ack=1					
178.154.199.103	192.168.3.10	TCP	86	10000 → 55143 [PSH, ACK] Seq=21					
192.168.3.10	178.154.199.103	TCP	66	55143 → 10000 [ACK] Seq=1209 Ack					
192.168.3.10	178.154.199.103	TCP	1274	55143 → 10000 [PSH, ACK] Seq=120					
178.154.199.103	192.168.3.10	TCP	66	10000 → 55143 [ACK] Seq=41 Ack=2					
178.154.199.103	192.168.3.10	TCP	86	10000 → 55143 [PSH, ACK] Seq=41					
192.168.3.10	178.154.199.103	TCP	66	55143 → 10000 [ACK] Seq=2417 Ack					
192.168.3.10	178.154.199.103	TCP	1274	55143 → 10000 [PSH, ACK] Seq=241					
> Frame 6: Packet, 1274 bytes on wire (10192 b				0040	59 fd b2 58 81 78 1c 5f	03 d5 05 8d cc			
> Ethernet II, Src: Apple_6f:5c:4c (5c:9b:a6:6				0050	e7 1b 92 fd de dd d3 65	eb f3 c0 5c 40			
> Internet Protocol Version 4, Src: 192.168.3.				0060	dc d5 2a c2 f0 d2 b0 12	2f 07 8c 6c 9f			
> Transmission Control Protocol, Src Port: 551				0070	ca 90 00 56 0f 6a 97 cc	65 ed c1 88 de			
Data (1208 bytes)				0080	c9 a2 d5 72 b3 f7 e3 dd	54 e9 49 e1 94			
Data [...]: b25881781c5f03d5058dced7d0ee71f				0090	e0 97 e6 5f ac bf 55 70	c4 56 84 88 f8			
[Length: 1208]				00a0	b6 ba 6d e5 24 dc 48 d4	13 70 6b 7c e9			
				00b0	a8 2c 6d 74 05 a2 29 87	6e dc f7 9d 41			
				00c0	50 47 af 86 ea a9 27 ad	a6 d6 c3 3a 22			
				00d0	5b 48 07 7b d2 32 26 f2	d0 6b f0 0c 5e			
				00e0	c7 01 db 71 16 ac f8 05	09 92 48 d5 a8			
				00f0	d1 00 e5 ed 75 7b ce 27	85 1a a5 f3 23			
				0100	ea 76 37 3d 35 32 ec 74	92 e9 93 a1 71			
				0110	ce 1e 7f ee ca 45 9c ee	7a 82 34 b3 ee			
				0120	8e 65 8c d6 98 75 64 6b	f1 1f 64 02 4d			

The process is not very heavy (using htop)

0.7% Tasks: 33, 42 thr, 70 kthr; 1 running

0.0% Load average: 0.00 0.00 0.00

Mem[|||||] 172M/960M Uptime: 00:47:17

Swp[||] 224K/2.00G

[Main]

[I/O]

PID	USER	PRI	NI	VIRT	RES	SHR	S	CPU%	MEM%	TIME+	Command
3053	user	20	0	15004	7068	5120	S	0.7	0.7	0:00.41	sshd: user@pts/2
3105	user	20	0	2536M	53320	24448	S	0.7	5.4	0:01.01	java -cp ./task1-1.0-SNAPSHOT.jar
1	root	20	0	22396	13536	9568	S	0.0	1.4	0:03.13	/sbin/init
279	root	19	-1	50368	16384	15360	S	0.0	1.7	0:00.46	/usr/lib/systemd/systemd-journald
323	root	RT	0	282M	26880	8576	S	0.0	2.7	0:00.08	/sbin/multipathd -d -s
339	root	20	0	282M	26880	8576	S	0.0	2.7	0:00.00	/sbin/multipathd -d -s
342	root	RT	0	282M	26880	8576	S	0.0	2.7	0:00.00	/sbin/multipathd -d -s

Note: at first my server was breaking

That's what I mean:

It started reading bytes from client normally

Then the messages started arriving very very fast

And finally the server just locked and didn't receive anything

Just hanging like this

The way I discovered to fix it was to send to the server not only the bytes array

with data but also the size of that buffer

```
ByteBuffer bb = ByteBuffer.allocate(4);  
        bb.putInt(dataLength);  
        out.write(bb.array());  
        out.write(dataToSend);
```

And then the server will read exactly the size of the buffer

That was crazy to fix so hopefully it works correctly

Note: I'll be using $N = 500$ or less

$N = 5000$ is incredibly slow

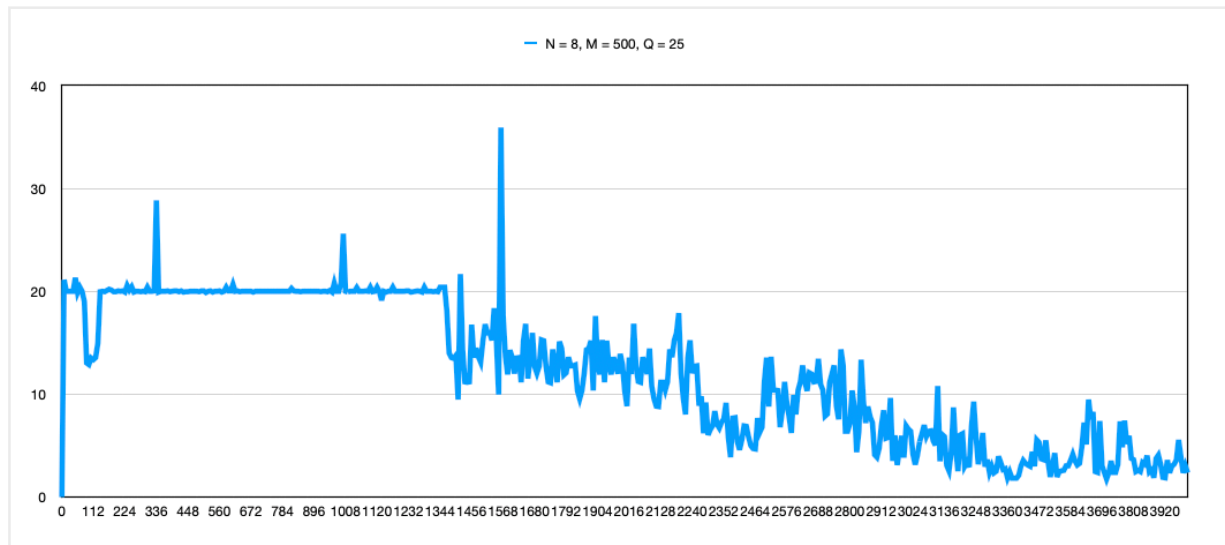
I just runs forever

Local test

No sure it it is relevant

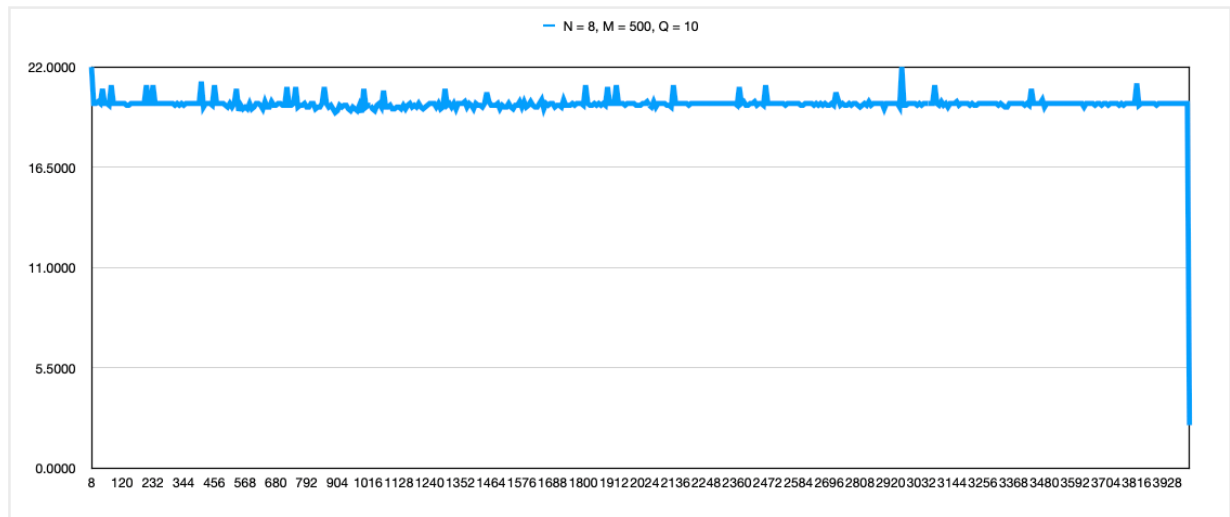
But the time depends on the array size almost linearly

$N=8$, $M=500$, $Q=25$



Now let's do the VM

$N = 8$, $M = 500$, $Q = 10$

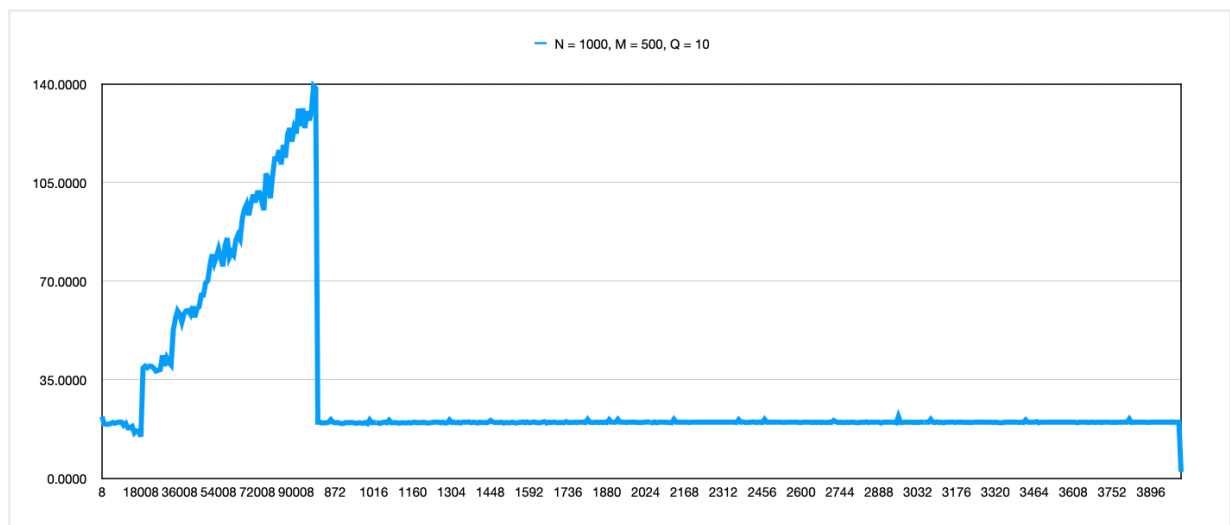


Our first test

With low N the speed pretty much stays the same

The increases in array sizes have almost no influence on speed

N = 1000, M=100, Q = 10



When using N = 1000 it got much slower

So using M = 100 iterations here (I mislicked on the picture and wrote M=500; it is actually M=100)

We can see that the time really increases as the array size grows

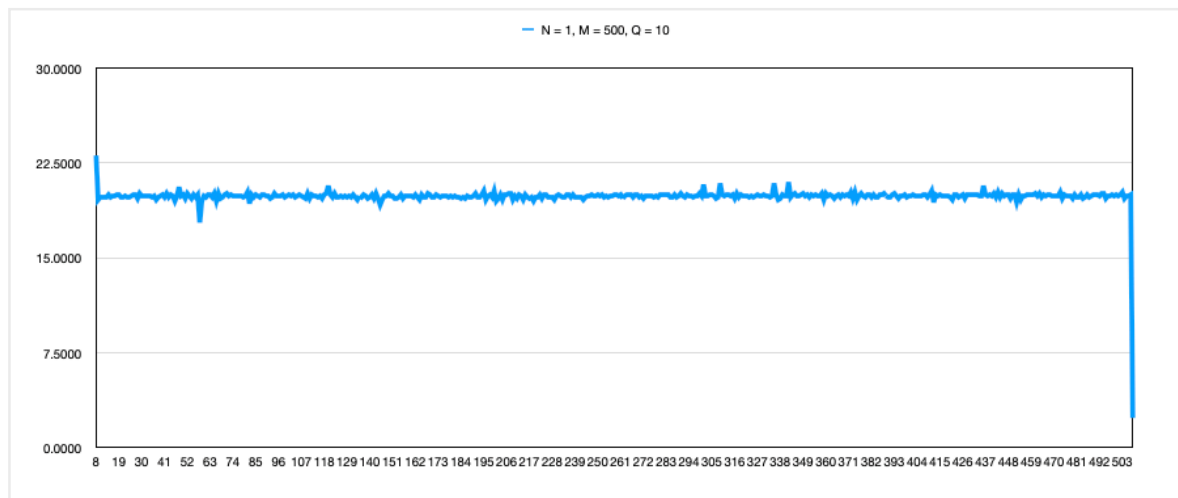
And then it hits a threshold and drops, staying low

Honestly that's quite interesting

I've read it is related to header overhead

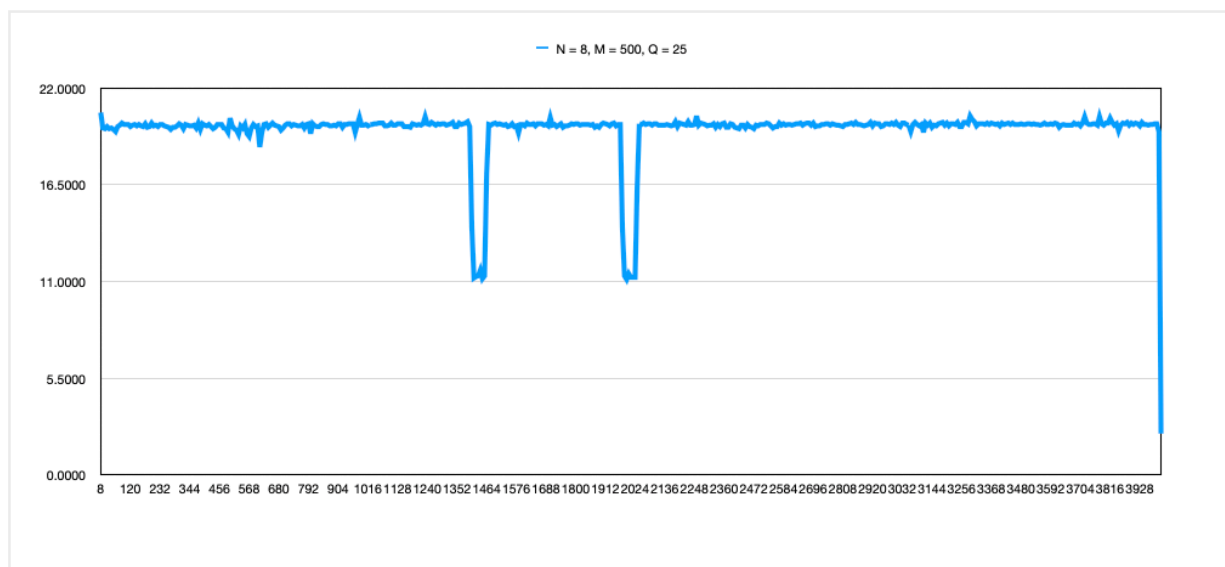
So as the array size gets large enough we can send them as full packets which is more efficient

N=1, M=500, Q=10



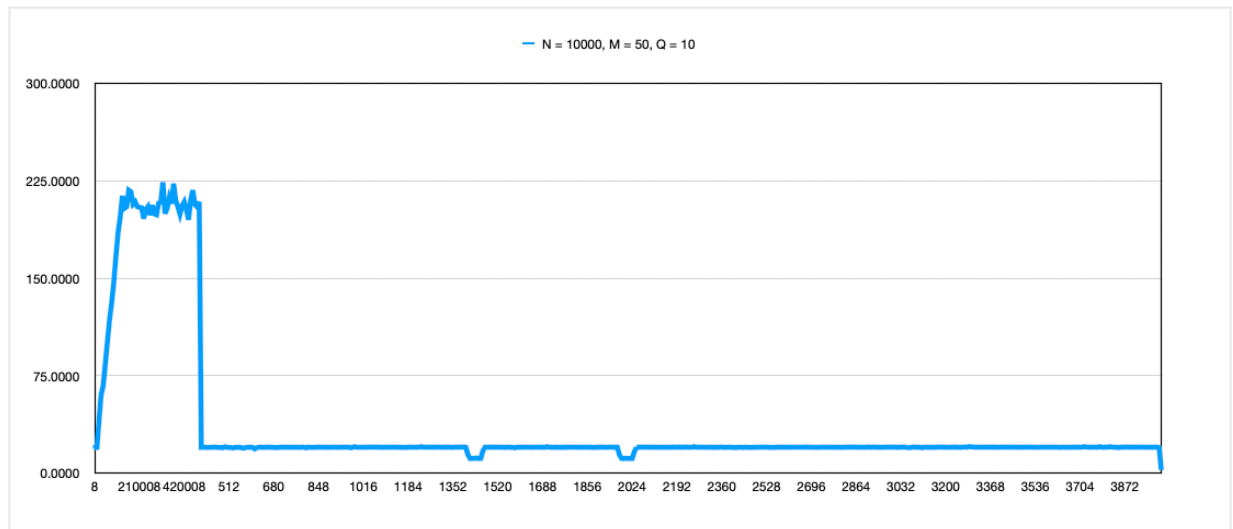
Here we will see if making N = 1 (small sizes) improves the speed
It is actually pretty much the same as N = 8

N=8, M=500, Q=25



Here we will see what difference increasing Q makes
It is similar to our first VM graph - stable time across the array sizes
And we see two drops - probably some Java / Network optimizations

N=10,000, M=50, Q=10



I was really interested to see if sending super big array sizes influences the speed
Making $N=10,000$

We are running just for about 50 iterations so that I don't wait for a week)

Looking at the logs in CLI, it gets much slower (at least feels like that)

Looking at the graph, we see similar picture to $N=1000$

Yet it seems like at first the speed is not optimized at all is consistently very high - about 225,000

And then it gets optimized to the level of $N=1000$

Maybe it is because the longer the connection runs the more optimized it gets

So that's cool