

Lab 2: Hazelcast

Task 1

Запускаю через docker compose три вузли в кластер (код compose на гіт)

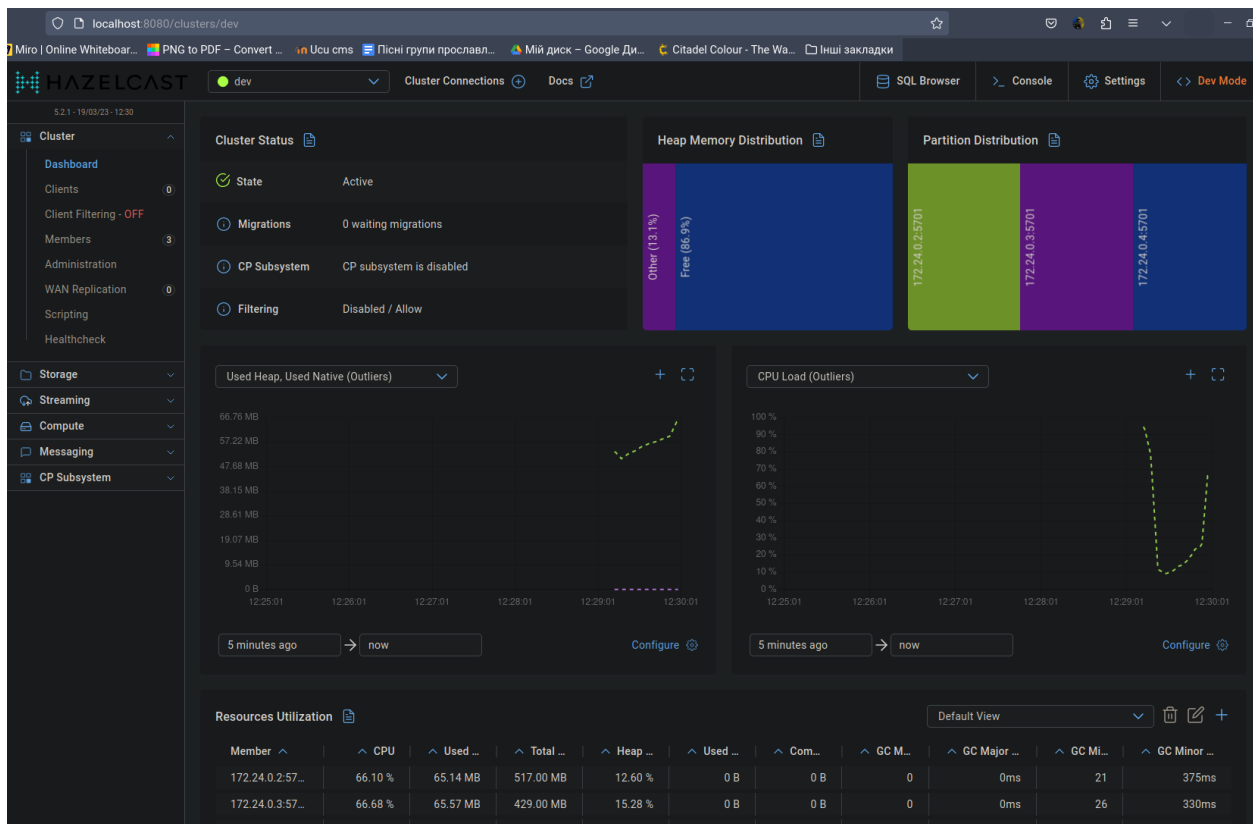
```
$ docker compose up
....
Members {size:3, ver:3} [
  lab2-hazelcast-node-1-1 | Member [172.24.0.3]:5701 - f8032262-65c2-4f5e-bb16-1aae6f5fb671
  lab2-hazelcast-node-1-1 | Member [172.24.0.2]:5701 - 5048f39f-5a0c-48a3-add8-b9bf50e52371
  lab2-hazelcast-node-1-1 | Member [172.24.0.4]:5701 - 1331a733-f653-4c65-9653-74fc2a3d3f9a this
  lab2-hazelcast-node-1-1 |
]
```

Запускаю менеджер через той самий docker compose

```
lab2-management-center-1 | 2023-03-19 10:01:26,995 [ INFO] [AsyncExecutor-1] [c.h.w.MCApplication]: Hazelcast Management Center successfully started
at http://localhost:8080
lab2-management-center-1 | 2023-03-19 10:01:27,030 [ INFO] [AsyncExecutor-1] [c.h.w.MCApplication]: Hazelcast Management Center 5.2.1 (20221201 - f06
fa4a), Hazelcast client version: 5.2.1, embedded Jetty version: 9.4.49.v20220914
lab2-management-center-1 | 2023-03-19 10:01:27,030 [ INFO] [AsyncExecutor-2] [c.h.w.s.ClusterManager]: Connecting to 1 enabled cluster(s) on startup.
lab2-hazelcast-node-2-1 | 2023-03-19 10:01:27,811 [ INFO] [hz.hardcore.goodall.priority-generic-operation.thread-0] [c.h.c.i.p.t.AuthenticationMessa
geTask]: [172.24.0.2]:5701 [dev] [5.2.1] Received auth from Connection[id=4, /172.24.0.2:5701->/172.24.0.5:34565, qualifier=null, endpoint=[172.24.0.5
]:34565, remoteUid=7c004500-2c7a-4fc7-9e84-858966940057, alive=true, connectionType=MCJVM, planeIndex=-1], successfully authenticated, clientUid: 7c
004500-2c7a-4fc7-9e84-858966940057, client name: MC-Client-dev, client version: 5.2.1
lab2-management-center-1 | 2023-03-19 10:01:27,822 [ INFO] [MC-Client-dev.lifecycle-1] [c.h.w.s.MCClientManager]: MC Client connected to cluster dev.
lab2-management-center-1 | 2023-03-19 10:01:27,850 [ INFO] [MC-Client-dev.event-4] [c.h.w.s.MCClientManager]: Started communication with member: Memb
er [172.24.0.3]:5701 - f8032262-65c2-4f5e-bb16-1aae6f5fb671
lab2-management-center-1 | 2023-03-19 10:01:27,851 [ INFO] [MC-Client-dev.event-4] [c.h.w.s.MCClientManager]: Started communication with member: Memb
er [172.24.0.4]:5701 - 1331a733-f653-4c65-9653-74fc2a3d3f9a
lab2-management-center-1 | 2023-03-19 10:01:27,851 [ INFO] [MC-Client-dev.event-4] [c.h.w.s.MCClientManager]: Started communication with member: Memb
er [172.24.0.2]:5701 - 5048f39f-5a0c-48a3-add8-b9bf50e52371
```

Task 2

Перевіряємо в менеджері, що всі три вузли сконфігуровані.



Resources Utilization

Member	CPU	Used ...	Total ...	Heap ...	Used ...	Com...	GC M...	GC Major ...	GC Mi...	GC Minor ...
172.24.0.2:57...	21.21 %	69.17 MB	517.00 MB	13.38 %	0 B	0 B	0	0ms	32	447ms
172.24.0.3:57...	20.73 %	87.43 MB	429.00 MB	20.38 %	0 B	0 B	0	0ms	35	369ms
172.24.0.4:57...	17.37 %	53.53 MB	416.00 MB	12.87 %	0 B	0 B	0	0ms	33	358ms

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Task 3

Запис 1000 чисел

Заныск HazelOne.java

```
com.example.Hazel
Sep. 20, 2023 9:33:56 ДП com.hazelcast.internal.config.AbstractConfigLocator
INFO: Loading 'hazelcast-client-default.xml' from the classpath.
Sep. 20, 2023 9:33:57 ДП com.hazelcast.client.impl.spi.ClientInvocationService
INFO: HzClient_1 [dev] [5.2.2] Running with 2 response threads, dynamic=true
Sep. 20, 2023 9:33:57 ДП com.hazelcast.core.LifecycleService
INFO: HzClient_1 [dev] [5.2.2] HazelcastClient 5.2.2 (20230215 - a221adc) is STARTING
Sep. 20, 2023 9:33:57 ДП com.hazelcast.core.LifecycleService
INFO: HzClient_1 [dev] [5.2.2] HazelcastClient 5.2.2 (20230215 - a221adc) is STARTED
WARNING: An illegal reflective access operation has occurred
WARNING: Illegal reflective access by com.hazelcast.internal.networking.nio.SelectorOptimizer (file:/home/ilya/.m2/repository/com/hazelcast/hazelcast/5.2.2/hazelcast-5.2.2.jar) to field sun.nio.ch.SelectorImpl.selectedKeys
WARNING: Please consider reporting this to the maintainers of com.hazelcast.internal.networking.nio.SelectorOptimizer
WARNING: Use --illegal-access=warn to enable warnings of further illegal reflective access operations
WARNING: All illegal access operations will be denied in a future release
Sep. 20, 2023 9:33:57 ДП com.hazelcast.client.impl.connection.ClientConnectionManager
INFO: HzClient_1 [dev] [5.2.2] Trying to connect to cluster: dev
Sep. 20, 2023 9:33:57 ДП com.hazelcast.client.impl.connection.ClientConnectionManager
INFO: HzClient_1 [dev] [5.2.2] Trying to connect to [127.0.0.1]:5701
Sep. 20, 2023 9:33:57 ДП com.hazelcast.core.LifecycleService
INFO: HzClient_1 [dev] [5.2.2] HazelcastClient 5.2.2 (20230215 - a221adc) is CLIENT_CONNECTED
Sep. 20, 2023 9:33:57 ДП com.hazelcast.client.impl.connection.ClientConnectionManager
INFO: HzClient_1 [dev] [5.2.2] Authenticated with server [172.24.0.3]:5701:34341991-e7c9-4ea1-85a0-776fda4f35ab, server version: 5.2.1, local address: /127.0.0.1:48155
Sep. 20, 2023 9:33:57 ДП com.hazelcast.internal.diagnostics.Diagnostics
INFO: HzClient_1 [dev] [5.2.2] Diagnostics disabled. To enable add -Dhazelcast.diagnostics.enabled=true to the JVM arguments.
Sep. 20, 2023 9:33:57 ДП com.hazelcast.client.impl.spi.ClientClusterService
INFO: HzClient_1 [dev] [5.2.2]

Members [3] {
  Member [172.24.0.2]:5701 - 9c6c30a7-6182-45df-8349-2e0e2734c732
  Member [172.24.0.3]:5701 - 34341991-e7c9-4ea1-85a0-776fda4f35ab
  Member [172.24.0.4]:5701 - b29aef9f-cfc7-4c2f-bcc6-6f4414137e73
}

Sep. 20, 2023 9:33:57 ДП com.hazelcast.client.impl.connection.ClientConnectionManager
INFO: HzClient_1 [dev] [5.2.2] Authenticated with server [172.24.0.2]:5701:9c6c30a7-6182-45df-8349-2e0e2734c732, server version: 5.2.1, local address: /172.24.0.1:38027
Sep. 20, 2023 9:33:57 ДП com.hazelcast.client.impl.connection.ClientConnectionManager
INFO: HzClient_1 [dev] [5.2.2] Authenticated with server [172.24.0.4]:5701:b29aef9f-cfc7-4c2f-bcc6-6f4414137e73, server version: 5.2.1, local address: /172.24.0.1:38787
Sep. 20, 2023 9:33:57 ДП com.hazelcast.client.impl.statistics.ClientStatisticsService
```

Map Statistics (In-Memory Format: BINARY) RESET TIME 1 minute ago → now Default View 🗑️ 📄

Member ^	^ Entries	^ Gets	^ Puts	^ Removals	^ Sets	^ Entry Memory	^ E
172.24.0.2:5701	344	0	344	0	0	42.62 kB	
172.24.0.3:5701	332	0	332	0	0	41.15 kB	
172.24.0.4:5701	324	0	324	0	0	40.15 kB	
TOTAL	1000	0	1000	0	0	123.92 kB	

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Після відключення одного з вузлів, всі дані розсортувалися по решті двох, тож втрати даних не відбулося.

Map Statistics (In-Memory Format: BINARY) RESET TIME 1 minute ago → now Default View 🗑️ 📄

Member ^	^ Entries	^ Gets	^ Puts	^ Removals	^ Sets	^ Entry Memory	^ E
172.24.0.2:5701	1000	0	344	0	0	123.92 kB	
TOTAL	1000	0	344	0	0	123.92 kB	

1 - 1 of 1 Rows 10 ^

Map Statistics (In-Memory Format: BINARY) RESET TIME 1 minute ago → now Default View 🗑️ 📄

Member ^	^ Entries	^ Gets	^ Puts	^ Removals	^ Sets	^ Entry Memory	^ E
172.24.0.2:5701	491	0	344	0	0	60.83 kB	
172.24.0.3:5701	509	0	332	0	0	63.08 kB	
TOTAL	1000	0	676	0	0	123.92 kB	

Task 4

Зanyк HazelLockingTest

Запуск одночасно всіх трьох варіантів у різних потоках. Без блокування ми бачимо race condition, з різними типами блокування проблем не виникає.

```
Pessimistic starting
Race starting
Optimistic starting
Pessimistic starting
Optimistic starting
Race starting
Pessimistic starting
Race starting
Optimistic starting
Race finished! Result = 1016
Race finished! Result = 1017
Race finished! Result = 1018
Optimistic finished! Result = 2560
Optimistic finished! Result = 2961
Optimistic finished! Result = 3000
Pessimistic finished! Result = 2998
Pessimistic finished! Result = 2999
Pessimistic finished! Result = 3000
```

Task 5

Запускаю HazelQueueTest.java

Щоб зробити чергу обмеженою, я додав конфігураційний файл черги.

```
queueConfig.setName("queue")
            .setMaxSize(10);
```

```
Producing: 1
Producing: 2
Consumed: 2
Consumed: 1
Producing: 3
Producing: 4
Producing: 5
Producing: 6
Producing: 7
Producing: 8
Producing: 9
Producing: 10
Producing: 11
Producing: 12
Producing: 13
Producing: 14
Producing: 15
Producing: 16
Producing: 17
Producing: 18
Producing: 19
Producing: 20
Producing: 21
Producing: 22
Producing: 23
Producing: 24
Producing: 25
Producing: 26
Producing: 27
Producing: 28
Producing: 29
Producing: 30
Producing: 31
Producing: 32
Producing: 33
Producing: 34
Producing: 35
Producing: 36
Producing: 37
Producing: 38
Producing: 39
```

```
Producing: 86
Producing: 87
Producing: 88
Producing: 89
Producing: 90
Producing: 91
Producing: 92
Producing: 93
Producing: 94
Producing: 95
Producing: 96
Producing: 97
Producing: 98
Producing: 99
Producer Finished!
Consumed: 3
Consumed: 4
Consumed: 5
Consumed: 6
Consumed: 7
Consumed: 8
Consumed: 9
Consumed: 10
Consumed: 11
Consumed: 12
Consumed: 13
Consumed: 14
Consumed: 15
Consumed: 16
Consumed: 18
Consumed: 17
Consumed: 19
Consumed: 20
Consumed: 21
Consumed: 22
Consumed: 24
Consumed: 23
Consumed: 25
Consumed: 26
Consumed: 27
Consumed: 28
```

```
Consumed: 64
Consumed: 65
Consumed: 66
Consumed: 67
Consumed: 68
Consumed: 69
Consumed: 70
Consumed: 71
Consumed: 72
Consumed: 74
Consumed: 73
Consumed: 75
Consumed: 76
Consumed: 77
Consumed: 78
Consumed: 79
Consumed: 80
Consumed: 81
Consumed: 82
Consumed: 83
Consumed: 84
Consumed: 85
Consumed: 86
Consumed: 87
Consumed: 88
Consumed: 89
Consumed: 90
Consumed: 91
Consumed: 92
Consumed: 93
Consumed: 94
Consumed: 95
Consumed: 96
Consumed: 98
Consumed: 97
Consumed: 99
Consumed: -1
Consumer Finished!
бер. 22, 2023 4:36:11
INFO: hz.client_1 [de
бер. 22, 2023 4:36:11
```

Після цього я запустив лише продюсера і не отримав ніяких помилок

```
public static void main(String[] args) {  
    Thread thread1 = new Thread(ProducerBQ::start);  
    // Thread thread2 = new Thread(ConsumerBQ::start);  
    // Thread thread3 = new Thread(ConsumerBQ::start);  
  
    thread1.start();  
    // thread2.start();  
    // thread3.start();  
}
```

Якщо читачів є двоє, то вони можуть консюмити значення послідовно, але вивід може відрізнятися через багатопоточність.

```
Consumed: 22  
Consumed: 24  
Consumed: 23
```