Лабораторна робота №2

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git:

1) Встановити і налаштувати Hazelcast https://hazelcast.com/open-source-projects/downloads/

2) Сконфігурувати і запустити 3 ноди (інстанси) об'єднані в кластер або як частину Java-застосування, або як окремі застосування https://docs.hazelcast.com/hazelcast/5.3/getting-started/get-started-binary#step-6-scale-your-cluster

   Ноди (аналогічно для всіх 3-х):

```
        % docker run --rm --network lab2 --name node1 \
    -e HZ_NETWORK_PUBLICADDRESS=192.168.0.106:5701 \
    -e HZ_CLUSTERNAME=lab2 \
    -p 5701:5701 hazelcast/hazelcast:latest
########################################
# JAVA=/usr/bin/java
# JAVA_OPTS=--add-modules java.se --add-exports java.base/jdk.internal.ref=ALL-UNNAMED --add-opens java.base/java.lang=ALL-UNNAMED --add-opens
java.base/sun.nio.ch=ALL-UNNAMED --add-opens java.management/sun.management=ALL-UNNAMED --add-opens jdk.management/com.sun.management.internal=
ALL-UNNAMED -Dhazelcast.logging.type=log4j2 -Dlog4j.configurationFile=file:/opt/hazelcast/config/log4j2.properties -Dhazelcast.config=/opt/haze
lcast/config/hazelcast-docker.xml -Djet.custom.lib.dir=/opt/hazelcast/custom-lib -Djava.net.preferIPv4Stack=true -XX:MaxRAMPercentage=80.0 -XX:
MaxGCPauseMillis=5
# CLASSPATH=/opt/hazelcast/*:/opt/hazelcast/lib:/opt/hazelcast/lib/*:/opt/hazelcast/bin/user-lib:/opt/hazelcast/bin/user-lib/*
########################################
2024-03-26 15:53:45,936 [ INFO] [main] [c.h.i.c.AbstractConfigLocator]: Loading configuration '/opt/hazelcast/config/hazelcast-docker.xml' from
 System property 'hazelcast.config'
2024-03-26 15:53:45,938 [ INFO] [main] [c.h.i.c.AbstractConfigLocator]: Using configuration file at /opt/hazelcast/config/hazelcast-docker.xml
2024-03-26 15:53:46,461 [ INFO] [main] [c.h.i.c.o.ExternalConfigurationOverride]: Detected external configuration entries in environment variab
les: [hazelcast.network.publicaddress=192.168.0.106:5701,hazelcast.clustername=lab2]
2024-03-26 15:53:46,506 [ INFO] [main] [c.h.i.AddressPicker]: [LOCAL] [lab2] [5.3.6] Using public address: [192.168.0.106]:5701
2024-03-26 15:53:46,543 [ INFO] [main] [c.h.s.logo]: [192.168.0.106]:5701 [lab2] [5.3.6]
        +       +  o    o     o     o---o o----o o      o---o     o     o----o o--o--o
        + +   + +  |    |    / \       /  |      |     /         / \    |         |
        + + + + +  o----o   o   o     o   o----o |    o         o   o   o----o    |
        + +   + +  |    |  /     \   /    |      |     \       /     \       |    |
        +       +  o    o o       o o---o o----o o----o o---o o       o o----o    o
2024-03-26 15:53:46,543 [ INFO] [main] [c.h.system]: [192.168.0.106]:5701 [lab2] [5.3.6] Copyright (c) 2008-2023, Hazelcast, Inc. All Rights Re
served.
2024-03-26 15:53:46,543 [ INFO] [main] [c.h.system]: [192.168.0.106]:5701 [lab2] [5.3.6] Hazelcast Platform 5.3.6 (20231109 - 9903dc9) starting
 at [192.168.0.106]:5701
2024-03-26 15:53:46,544 [ INFO] [main] [c.h.system]: [192.168.0.106]:5701 [lab2] [5.3.6] Cluster name: lab2
2024-03-26 15:53:46,544 [ INFO] [main] [c.h.system]: [192.168.0.106]:5701 [lab2] [5.3.6] Integrity Checker is disabled. Fail-fast on corrupted
executables will not be performed. For more information, see the documentation for Integrity Checker.
2024-03-26 15:53:46,544 [ INFO] [main] [c.h.system]: [192.168.0.106]:5701 [lab2] [5.3.6] Jet is enabled
2024-03-26 15:53:46,853 [ INFO] [main] [c.h.i.t.TpcServerBootstrap]: [192.168.0.106]:5701 [lab2] [5.3.6] TPC: disabled
2024-03-26 15:53:47,161 [ INFO] [main] [c.h.s.security]: [192.168.0.106]:5701 [lab2] [5.3.6] Enable DEBUG/FINE log level for log category com.h
azelcast.system.security  or use -Dhazelcast.security.recommendations system property to see 🔒 security recommendations and the status of curr
ent config.
2024-03-26 15:53:47,255 [ INFO] [main] [c.h.i.i.Node]: [192.168.0.106]:5701 [lab2] [5.3.6] Using Multicast discovery
```

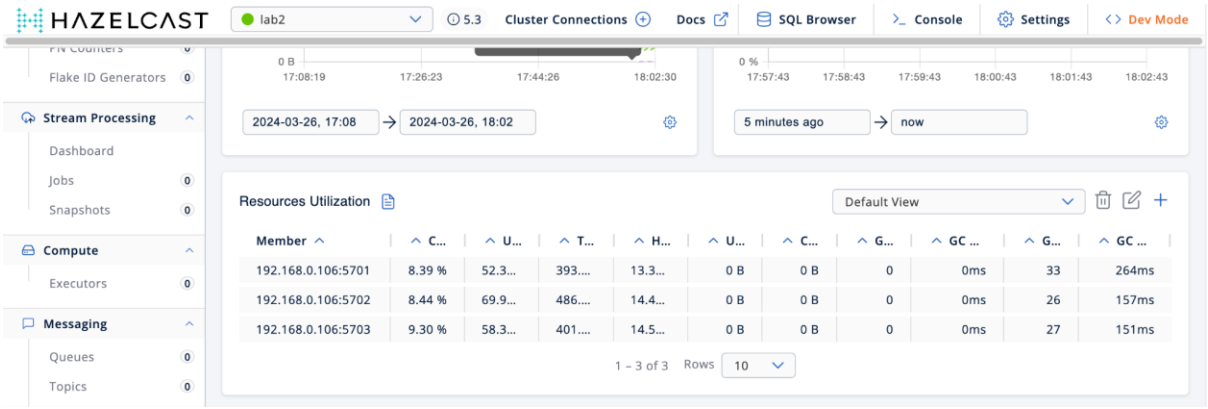
   Готовий кластер:

```
Members {size:3, ver:3} [
        Member [192.168.0.106]:5701 - 0457b509-6ebc-490e-ab79-396c36ab8283
        Member [192.168.0.106]:5702 - 11965861-4b05-421a-bdfe-8a8a1ede544c
        Member [192.168.0.106]:5703 - 482a603d-df11-4ad7-bd66-03e1becf5b3d this
]
```

   Management Server:

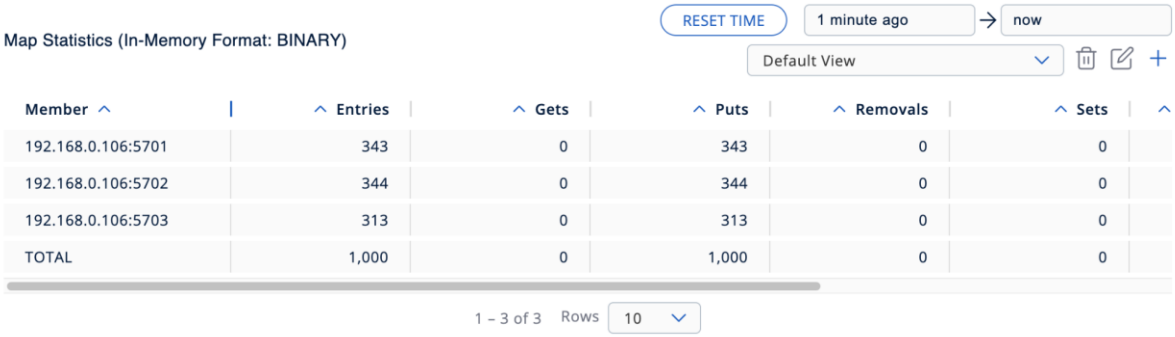
```
        ~ % docker run --rm -p 8080:8080 hazelcast/management-center
Container support enabled. Using automatic heap sizing. JVM will use up to 80% of the memory limit of the host.
+ exec java -server '-Dloader.path=/opt/hazelcast/management-center/bin/user-lib/*' --add-opens java.base/java.lang=ALL-UNNAMED -Dhazelcast.mc.
home=/data -Djava.net.preferIPv4Stack=true -XX:+UseContainerSupport -XX:MaxRAMPercentage=80 -cp /opt/hazelcast/management-center/bin/../hazelca
st-management-center-5.3.3.jar org.springframework.boot.loader.PropertiesLauncher
2024-03-26 15:59:16,362 [ INFO] [main] [c.h.w.MCApplication]: Starting MCApplication v5.3.3 using Java 17.0.8 on deb047f9e607 with PID 1 (/opt/
hazelcast/management-center/hazelcast-management-center-5.3.3.jar started by hazelcast in /opt/hazelcast/management-center)
2024-03-26 15:59:16,375 [ INFO] [main] [c.h.w.MCApplication]: No active profile set, falling back to 1 default profile: "default"
2024-03-26 15:59:18,980 [ INFO] [main] [c.h.w.c.SqlDbConfig]: Checking DB for required migrations.
2024-03-26 15:59:21,601 [ INFO] [main] [c.h.w.c.SqlDbConfig]: Number of applied DB migrations: 23.
2024-03-26 15:59:23,018 [ INFO] [main] [c.h.w.m.i.r.RocksDBLoader]: '/tmp' is used as RocksDB shared library directory
2024-03-26 15:59:23,305 [ INFO] [main] [c.h.w.m.i.r.RocksDBLoader]: '/tmp' is used as RocksDB shared library directory
2024-03-26 15:59:23,514 [ INFO] [main] [c.h.w.s.s.i.DisableLoginStrategy]: Login will be disabled for 5 seconds after 3 failed login attempts.
For every 3 consecutive failed login attempts, disable period will be multiplied by 10.
2024-03-26 15:59:25,756 [ INFO] [main] [c.h.w.MCApplication]: Started MCApplication in 9.964 seconds (JVM running for 11.378)
2024-03-26 15:59:25,785 [ INFO] [AsyncExecutor-1] [c.h.w.MCApplication]:

Hazelcast Management Center successfully started at http://localhost:8080
```

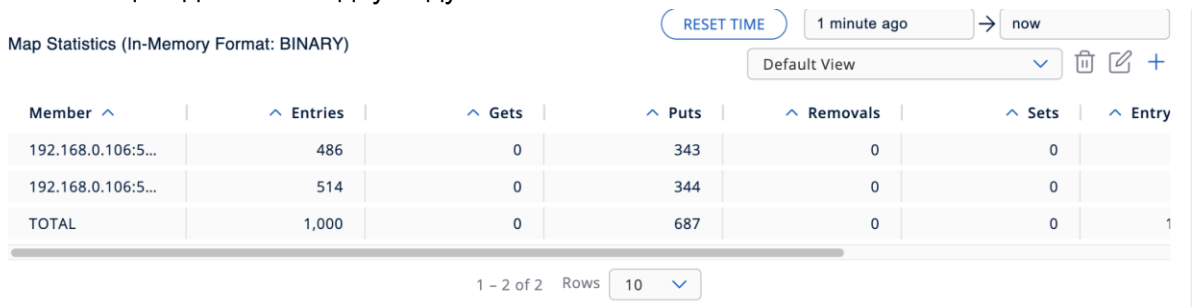


3) Продемонструйте роботу Distributed Map https://docs.hazelcast.com/hazelcast/5.3/data-structures/creating-a-map

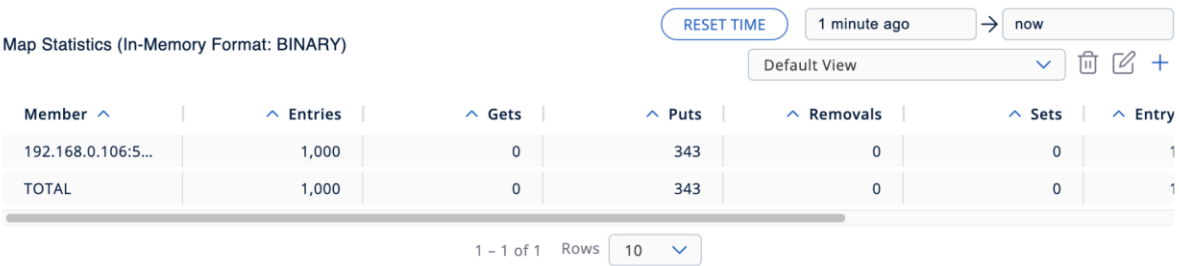
- використовуючи API створіть Distributed Map
- запишіть в неї 1000 значень з ключем від 0 до 1к
- за допомогою Management Center (https://docs.hazelcast.com/management-center/5.3/getting-started/install#before-you-begin) подивиться на розподіл значень по нодах



- подивитись як зміниться розподіл даних по нодах:
  - якщо відключити одну ноду



  - відключити дві ноди.



  - Чи буде втрата даних?

Втрата відсутня.

4) Продемонструйте роботу з Topic https://docs.hazelcast.com/hazelcast/5.3/data-structures/topic

- запустіть одного клієнта який буде писати в Topic значення 1..100, а двох інших які будуть читати з Topic

```
Published: 1
Published: 2
Published: 3
Published: 4
Published: 5
Published: 6
Published: 7
Published: 8
Published: 9
Published: 10
Published: 11
Published: 12
Published: 13
Published: 14
```

```
% python3 topic-subscriber.py
listening
press enter to stop
Received: Msg 1 at 2024-03-26 19:06:13.661
Received: Msg 2 at 2024-03-26 19:06:14.668
Received: Msg 3 at 2024-03-26 19:06:15.675
Received: Msg 4 at 2024-03-26 19:06:16.680
Received: Msg 5 at 2024-03-26 19:06:17.685
Received: Msg 6 at 2024-03-26 19:06:18.749
Received: Msg 7 at 2024-03-26 19:06:19.746
Received: Msg 8 at 2024-03-26 19:06:20.754
Received: Msg 9 at 2024-03-26 19:06:21.759
Received: Msg 10 at 2024-03-26 19:06:22.766
Received: Msg 11 at 2024-03-26 19:06:23.769
Received: Msg 12 at 2024-03-26 19:06:24.777
Received: Msg 13 at 2024-03-26 19:06:25.781
Received: Msg 14 at 2024-03-26 19:06:26.790
Received: Msg 15 at 2024-03-26 19:06:27.799
Received: Msg 16 at 2024-03-26 19:06:28.805
Received: Msg 17 at 2024-03-26 19:06:29.816
Received: Msg 18 at 2024-03-26 19:06:30.824
Received: Msg 19 at 2024-03-26 19:06:31.833
Received: Msg 20 at 2024-03-26 19:06:32.838
Received: Msg 21 at 2024-03-26 19:06:33.845
Received: Msg 22 at 2024-03-26 19:06:34.849
Received: Msg 23 at 2024-03-26 19:06:35.855
Received: Msg 24 at 2024-03-26 19:06:36.860
Received: Msg 25 at 2024-03-26 19:06:37.869
Received: Msg 26 at 2024-03-26 19:06:38.874
Received: Msg 27 at 2024-03-26 19:06:39.878
Received: Msg 28 at 2024-03-26 19:06:40.887
Received: Msg 29 at 2024-03-26 19:06:41.906
Received: Msg 30 at 2024-03-26 19:06:42.908
Received: Msg 31 at 2024-03-26 19:06:43.917
Received: Msg 32 at 2024-03-26 19:06:44.939
```

```
% python3 topic-subscriber.py
listening
press enter to stop
Received: Msg 1 at 2024-03-26 19:06:13.661
Received: Msg 2 at 2024-03-26 19:06:14.668
Received: Msg 3 at 2024-03-26 19:06:15.675
Received: Msg 4 at 2024-03-26 19:06:16.679
Received: Msg 5 at 2024-03-26 19:06:17.685
Received: Msg 6 at 2024-03-26 19:06:18.750
Received: Msg 7 at 2024-03-26 19:06:19.746
Received: Msg 8 at 2024-03-26 19:06:20.753
Received: Msg 9 at 2024-03-26 19:06:21.759
Received: Msg 10 at 2024-03-26 19:06:22.766
Received: Msg 11 at 2024-03-26 19:06:23.769
Received: Msg 12 at 2024-03-26 19:06:24.777
Received: Msg 13 at 2024-03-26 19:06:25.781
Received: Msg 14 at 2024-03-26 19:06:26.790
Received: Msg 15 at 2024-03-26 19:06:27.799
Received: Msg 16 at 2024-03-26 19:06:28.805
Received: Msg 17 at 2024-03-26 19:06:29.816
Received: Msg 18 at 2024-03-26 19:06:30.824
Received: Msg 19 at 2024-03-26 19:06:31.833
Received: Msg 20 at 2024-03-26 19:06:32.838
Received: Msg 21 at 2024-03-26 19:06:33.845
Received: Msg 22 at 2024-03-26 19:06:34.849
Received: Msg 23 at 2024-03-26 19:06:35.855
Received: Msg 24 at 2024-03-26 19:06:36.861
Received: Msg 25 at 2024-03-26 19:06:37.869
Received: Msg 26 at 2024-03-26 19:06:38.874
Received: Msg 27 at 2024-03-26 19:06:39.878
Received: Msg 28 at 2024-03-26 19:06:40.887
Received: Msg 29 at 2024-03-26 19:06:41.906
Received: Msg 30 at 2024-03-26 19:06:42.909
Received: Msg 31 at 2024-03-26 19:06:43.917
Received: Msg 32 at 2024-03-26 19:06:44.939
Received: Msg 33 at 2024-03-26 19:06:45.943
Received: Msg 34 at 2024-03-26 19:06:46.950
Received: Msg 35 at 2024-03-26 19:06:47.955
```

- яким чином будуть вичитуватись значення з Topic двома клієнтами? Залежить від конфігурації globalOrderEnabled. Якщо опцію вимкнено, повідомлення не впорядковуються і клієнти обробляють повідомлення у порядку їх публікації. У іншому випадку всі учасники, які слухають одну і ту ж тему, отримують її повідомлення в однаковому порядку.

- якщо один з читачів буде певний час неактивний, чи отримає він повідомлення які він пропустив?

Не відображаються.

```
listening
press enter to stop
Received: Msg 1 at 2024-03-26 19:09:55.745
Received: Msg 2 at 2024-03-26 19:09:56.775
Received: Msg 3 at 2024-03-26 19:09:57.786
Received: Msg 4 at 2024-03-26 19:09:58.792
Received: Msg 5 at 2024-03-26 19:09:59.797
Received: Msg 6 at 2024-03-26 19:10:00.807
Received: Msg 7 at 2024-03-26 19:10:01.815
Received: Msg 8 at 2024-03-26 19:10:02.823
Received: Msg 9 at 2024-03-26 19:10:03.832
Received: Msg 10 at 2024-03-26 19:10:04.840
Received: Msg 11 at 2024-03-26 19:10:05.848
Received: Msg 12 at 2024-03-26 19:10:06.856
Received: Msg 13 at 2024-03-26 19:10:07.865
Received: Msg 14 at 2024-03-26 19:10:08.870
Received: Msg 15 at 2024-03-26 19:10:09.875
Received: Msg 16 at 2024-03-26 19:10:10.881
```

```
press enter to stop
Received: Msg 15 at 2024-03-26 19:10:09.876
Received: Msg 16 at 2024-03-26 19:10:10.881
Received: Msg 17 at 2024-03-26 19:10:11.889
Received: Msg 18 at 2024-03-26 19:10:12.896
Received: Msg 19 at 2024-03-26 19:10:13.904
Received: Msg 20 at 2024-03-26 19:10:14.912
Received: Msg 21 at 2024-03-26 19:10:15.919
Received: Msg 22 at 2024-03-26 19:10:16.927
Received: Msg 23 at 2024-03-26 19:10:17.930
Received: Msg 24 at 2024-03-26 19:10:18.931
Received: Msg 25 at 2024-03-26 19:10:19.938
Received: Msg 26 at 2024-03-26 19:10:20.946
Received: Msg 27 at 2024-03-26 19:10:21.953
Received: Msg 28 at 2024-03-26 19:10:22.961
Received: Msg 29 at 2024-03-26 19:10:23.969
Received: Msg 30 at 2024-03-26 19:10:24.978
Received: Msg 31 at 2024-03-26 19:10:25.988
```

5) Робота з Bounded queue

- на основі Distributed Queue (https://docs.hazelcast.com/hazelcast/5.3/data-structures/queue#creating-an-example-queue) налаштуйте Bounded queue на 10 елементів (https://docs.hazelcast.com/hazelcast/5.3/data-structures/queue#configuring-queue)

```
<queue name="my-queue">
    <statistics-enabled>true</statistics-enabled>
    <max-size>10</max-size>
    <backup-count>1</backup-count>
```

- запустіть одного клієнта який буде писати в чергу значення 1..100, а двох інших які будуть читати з черги

```
Producing 0
Producing 1
Producing 2
Producing 3
Producing 4
Producing 5
Producing 6
Producing 7
Producing 8
Producing 9
Producing 10
```

```
% python3 bqueue-consumer.py
0
2
4
6
8
10
12
14
16
18
```

```
% python3 bqueue-consumer.py
1
3
5
7
9
11
13
15
17
19
```

- яким чином будуть вичитуватись значення з черги двома клієнтами?
  По черзі.

- перевірте яка буде поведінка на запис якщо відсутнє читання, і черга заповнена
  У такому випадку буде записано лише стільки записів, скільки було прописано у максимумі.

```
Producing 0
Producing 1
Producing 2
Producing 3
Producing 4
Producing 5
Producing 6
Producing 7
Producing 8
Producing 9
```