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## **TP N°2\_JMS :**

**Implémentation d'une communication  
asynchrone avec  
JMS, Spring et ActiveMQ (Artemis) Externe**

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## 1. Prérequis

- JDK 17
- Connexion internet

## 2. Objectifs

1. Installation de ActiveMQ/Artemis
2. Développement d'un producer JMS : `@EnableJms, JmsTemplate`
3. Développement d'un consumer JMS en mode asynchrone : `@JmsListener`
4. Envoyer/Réceptionner un liste d'objets Java « Produit » à travers le Broker de type ActiveMQ(Artemis) externe
5. Console d'administration ActiveMQ(Artemis).

## 3. Installation de ActiveMQ/Artemis

- Accéder au site <https://activemq.apache.org/>
- Télécharger et copier le dossier « Artemis » vers « \JMS\apache-artemis-2.31.2»
- C:\>set JAVA\_HOME=D:\jdk-17.0.9
- C:\>echo %JAVA\_HOME%  
➔ D:\jdk-17.0.9
- La création d'une instance d'un broker se fait en deux phase :
  1. Lancer la commande : « apache-artemis-2.31.2\bin\artemis.cmd »

```
C:\ JMS\apache-artemis-2.31.2\bin\artemis.cmd"

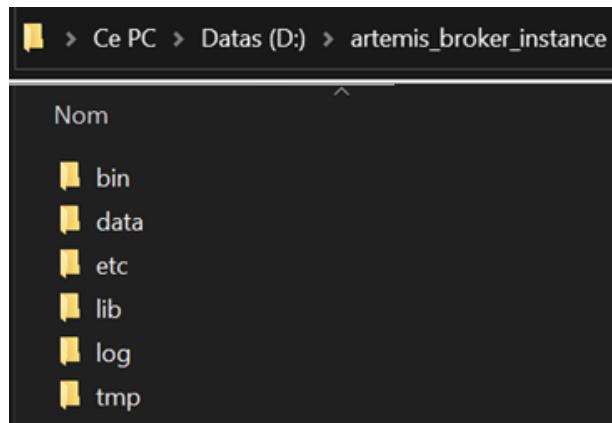
Apache ActiveMQ Artemis 2.31.2 >

For a list of commands, type help or press <TAB>:
Type exit or press <CTRL-D> to leave the session:
Apache ActiveMQ Artemis 2.31.2 >
```

2. Lancer la commande : « `create D:\artemis_broker_instance` »

```
Apache ActiveMQ Artemis 2.31.2 > create D:\artemis_broker_instance
```

Le dossier « D:\artemis\_broker\_instance » est créé. Ce dossier va contenir l'ensemble des données « files d'attentes, Topics, ... » et les fichiers de journalisation, traçabilité...



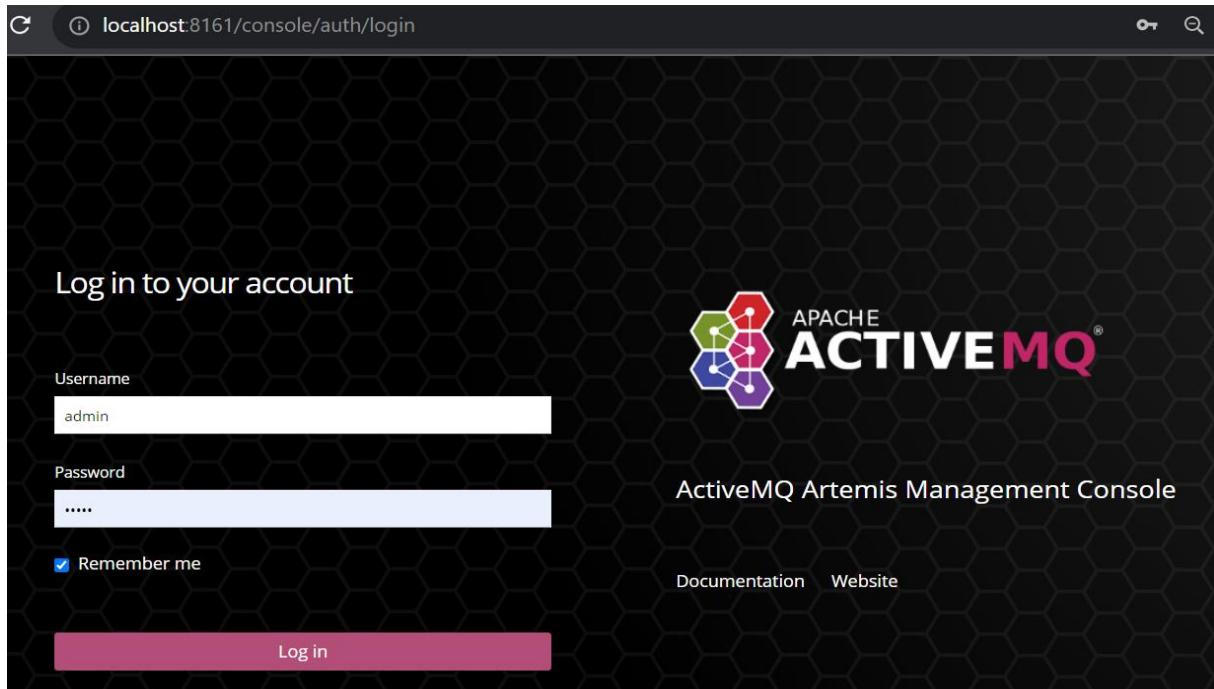
3. Démarrer l'instance du broker qui vient d'être créée :

D:\artemis\_broker\_instance\bin\artemis run

```
Apache ActiveMQ Artemis 2.31.2

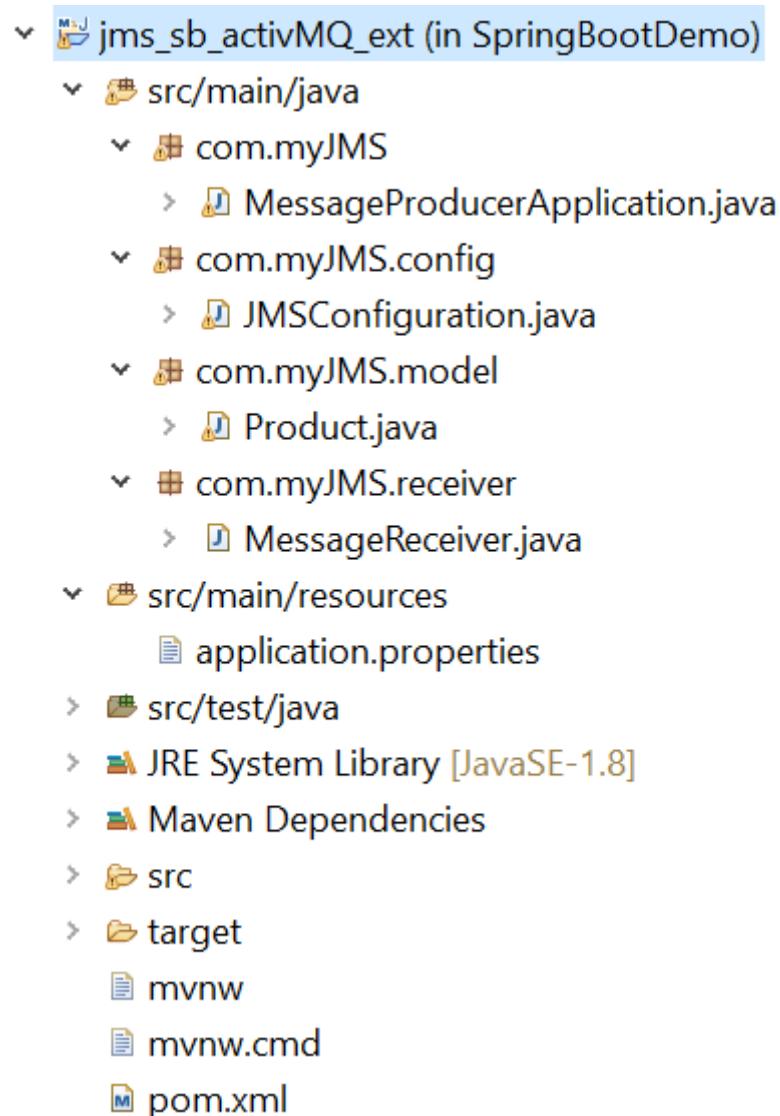
[AMQ10100: Starting ActiveMQ Artemis Server version 2.31.2
AMQ22100: live Message Broker is starting with configuration Broker Configuration
Started NIO Acceptor at 0.0.0.0:61616 for protocols [CORE,MQTT,AMQP,STOMP,HORNETQ,OPENWIRE]
Protocol module found: [artemis-server]. Adding protocol support for: CORE
Protocol module found: [artemis-amqp-protocol]. Adding protocol support for: AMQP
Protocol module found: [artemis-hornetq-protocol]. Adding protocol support for: HORNETQ
Protocol module found: [artemis-mqtt-protocol]. Adding protocol support for: MQTT
Protocol module found: [artemis-openwire-protocol]. Adding protocol support for: OPENWIRE
Protocol module found: [artemis-stomp-protocol]. Adding protocol support for: STOMP
AMQ241003: Starting embedded web server
Jolokia overridden property: [key=policyLocation, value=file:/D:/artemis_broker_instance/etc/jolokia-access.xml]
AMQ241001: HTTP Server started at http://localhost:8161
Artemis Jolokia REST API available at http://localhost:8161/console/jolokia
Artemis Console available at http://localhost:8161/console
```

4. Accéder à la console d'Artemis : <http://localhost:8161/>



## 5. Développement d'un Producer et Consumer (en mode Asynchrone)

- Créer le projet Maven « jms\_sb\_activMQ\_ext »



- Modifier le fichier « pom.xml » généré comme suit :

```
<?xml version="1.0" encoding="UTF-8"?>
<project xmlns="http://maven.apache.org/POM/4.0.0"
    xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance"
    xsi:schemaLocation="http://maven.apache.org/POM/4.0.0
http://maven.apache.org/xsd/maven-4.0.0.xsd">
    <modelVersion>4.0.0</modelVersion>
    <parent>
        <groupId>org.springframework.boot</groupId>
        <artifactId>spring-boot-starter-parent</artifactId>
        <version>2.1.4.RELEASE</version>
        <relativePath /> <!-- lookup parent from repository --&gt;
    &lt;/parent&gt;
    &lt;groupId&gt;com.myJMS&lt;/groupId&gt;
    &lt;artifactId&gt;JMS_SPRINGBOOT_ACTIVE_MQ_EXTERNE&lt;/artifactId&gt;
    &lt;version&gt;0.0.1-SNAPSHOT&lt;/version&gt;
    &lt;name&gt;SpringBootDemo&lt;/name&gt;
    &lt;description&gt;JMS_SPRINGBOOT_ACTIVE_MQ_EXTERNE&lt;/description&gt;

    &lt;properties&gt;
        &lt;java.version&gt;1.8&lt;/java.version&gt;</pre>
```

```

</properties>

<dependencies>

<dependency>
<groupId>org.springframework.boot</groupId>
<artifactId>spring-boot-starter-activemq</artifactId>
</dependency>
<!-- <dependency>
      <groupId>org.apache.activemq</groupId>
      <artifactId>activemq-broker</artifactId>
    </dependency> -->
    <dependency>
      <groupId>com.google.code.gson</groupId>
      <artifactId>gson</artifactId>
    </dependency>
    <dependency>
      <groupId>org.springframework.boot</groupId>
      <artifactId>spring-boot-starter-test</artifactId>
      <scope>test</scope>
    </dependency>
</dependencies>

<build><plugins><plugin><groupId>org.springframework.boot</groupId>
<artifactId>spring-boot-maven-
plugin</artifactId></plugin></plugins></build>
</project>

```

a. Le fichier « application.properties »

```

spring.activemq.broker-url=tcp://localhost:61616
spring.activemq.user=admin
spring.activemq.password=****
#spring.jms.cache.session-cache-size=5
#spring.activemq.pool.enabled=true
#spring.activemq.pool.max-connections=50

```

a. La classe model « Product »

```

package com.myJMS.model;

import java.io.Serializable;

public class Product implements Serializable
{
    private int productId;
    private String name;
    private int quantity;

    public int getProductId()
    {
        return productId;
    }

    public void setProductId(int productId)
}

```

```

    {
        this.productId = productId;      }

    public String getName()
    {
        return name; }

    public void setName(String name)
    {
        this.name = name; }

    public int getQuantity()
    {
        return quantity; }

    public void setQuantity(int quantity)
    {
        this.quantity = quantity; }
    @Override
    public String toString() {
        return "Product [productId=" + productId + ", name=" +
name + ", quantity=" + quantity
                + "]"; }
}

```

b. Développement du producer « MessageProducerApplication »:

```

package com.myJMS;

import org.springframework.boot.SpringApplication;
import org.springframework.boot.autoconfigure.SpringBootApplication;
import org.springframework.context.ConfigurableApplicationContext;
import org.springframework.jms.annotation.EnableJms;
import org.springframework.jms.core.JmsTemplate;

import com.myJMS.model.Product;

@SpringBootApplication
@EnableJms
public class MessageProducerApplication
{
    private static final String MESSAGE_QUEUE = "message_queue";

    public static void main(String[] args)
    {
        // Launch the application
        ConfigurableApplicationContext context =
        SpringApplication.run(MessageProducerApplication.class, args);

        // Get JMS template bean reference
        JmsTemplate jmsTemplate = context.getBean(JmsTemplate.class);

        for (int i = 1; i <= 10; i++)
        {
            Product product = new Product();
            product.setProductId(i);
            product.setName("Laptop");
            product.setQuantity(10 + i);
        }
    }
}

```

```

        // Send a message
System.out.println(" *** MessageProducerApplication : Sending a
product " + i);

jmsTemplate.convertAndSend(MESSAGE_QUEUE, product);
    }
}
}

```

c. Développement du consommateur « **MessageReceiver** »

```

package com.myJMS.receiver;

import org.springframework.jms.annotation.JmsListener;
import org.springframework.stereotype.Component;

import com.myJMS.model.Product;

@Component
public class MessageReceiver
{
    private static final String MESSAGE_QUEUE = "message_queue";

    @JmsListener(destination = MESSAGE_QUEUE)
    public void receiveMessage(Product product)
    {
        System.out.println(" ** MessageReceiver ***
receiveMessage(Product product) " + product);
    }
}

```

d. Exécuter la classe main : **MessagingJmsApplication**

```

.
/\ \ /____\ . - - - ( ) - - - \ \ \ \ \
( ( ) \____| - | - | - | - | - | \ \ \ \ \
\ \ \ ) | [ ) | [ | [ | [ | ( | [ ) ) ) )
' | [ ] | . [ ] | [ | [ | [ \ , | / / / /
=====| =====| =====| /=/ / / / /
:: Spring Boot ::          (v2.1.4.RELEASE)

```

```

INFO 35392 --- [           main]
com.myJMS.MessageProducerApplication : Starting

```

```
MessageProducerApplication
\JMS\TP_JMS\SpringBoot_JMS_ActiveMQ_Example\SpringBootDemo)
com.myJMS.MessageProducerApplication      : Started
MessageProducerApplication
*** MessageProducerApplication : Sending a product 1
*** MessageProducerApplication : Sending a product 2
*** MessageProducerApplication : Sending a product 3
*** MessageProducerApplication : Sending a product 4
*** MessageProducerApplication : Sending a product 5
*** MessageProducerApplication : Sending a product 6
*** MessageProducerApplication : Sending a product 7
*** MessageProducerApplication : Sending a product 8
*** MessageProducerApplication : Sending a product 9
*** MessageProducerApplication : Sending a product 10
** MessageReceiver *** receiveMessage(Product product)
Product [productId=1, name=Laptop, quantity=11]
** MessageReceiver *** receiveMessage(Product product)
Product [productId=2, name=Laptop, quantity=12]
** MessageReceiver *** receiveMessage(Product product)
Product [productId=3, name=Laptop, quantity=13]
** MessageReceiver *** receiveMessage(Product product)
Product [productId=4, name=Laptop, quantity=14]
** MessageReceiver *** receiveMessage(Product product)
Product [productId=5, name=Laptop, quantity=15]
** MessageReceiver *** receiveMessage(Product product)
Product [productId=6, name=Laptop, quantity=16]
** MessageReceiver *** receiveMessage(Product product)
Product [productId=7, name=Laptop, quantity=17]
** MessageReceiver *** receiveMessage(Product product)
Product [productId=8, name=Laptop, quantity=18]
** MessageReceiver *** receiveMessage(Product product)
Product [productId=9, name=Laptop, quantity=19]
** MessageReceiver *** receiveMessage(Product product)
Product [productId=10, name=Laptop, quantity=20]
```

| ID       | Client ID                            | Users | protocol | Session Count | Remote Address   | Local Address         | Creation Time                 | Actions               |
|----------|--------------------------------------|-------|----------|---------------|------------------|-----------------------|-------------------------------|-----------------------|
| 1e3b7ba3 | ID:L31422978-56430-1703770639049-0:1 | admin | OPENWIRE | 4             | /127.0.0.1:56431 | tcp://127.0.0.1:61616 | Thu Dec 28 14:37:19 WEST 2023 | <a href="#">Close</a> |

- User : Admin

| ID                                     | Connection | User  | Consumer Count | Producer Count | Creation Time                 | Actions               |
|--|------------|-------|----------------|----------------|-------------------------------|-----------------------|
| 38cc07d2-a586-11ee-89c2-a8934acf8ae7   | 1e3b7ba3   | admin | 0              | 0              | Thu Dec 28 14:37:19 WEST 2023 | <a href="#">Close</a> |
| ID:L31422978-56430-1703770639049-1:1:1 | 1e3b7ba3   | admin | 0              | 0              | Thu Dec 28 14:37:19 WEST 2023 | <a href="#">Close</a> |
| ID:L31422978-56430-1703770639049-1:1:1 | 1e3b7ba3   | admin | 1              | 0              | Thu Dec 28 14:37:19 WEST 2023 | <a href="#">Close</a> |
| ID:L31422978-56430-1703770639049-1:1:2 | 1e3b7ba3   | admin | 0              | 1              | Thu Dec 28 14:37:19 WEST 2023 | <a href="#">Close</a> |

- 1 Consumer.
- 1 Producer

| ID         | Session                              | Client ID                            | Protocol | Queue         | Queue Type | Filter | Address       | Remote Address   | Local Address         | Creation Time                 | Actions               |
|------------|--------------------------------------|--------------------------------------|----------|---------------|------------|--------|---------------|------------------|-----------------------|-------------------------------|-----------------------|
| 2147483939 | ID:L31422978-56430-1703770639049-0:1 | ID:L31422978-56430-1703770639049-0:1 | OPENWIRE | message_queue | anycast    |        | message_queue | /127.0.0.1:56431 | tcp://127.0.0.1:61616 | Thu Dec 28 14:37:19 WEST 2023 | <a href="#">Close</a> |

Search tr □ □

Status Connections Sessions Consumers Producers Addresses Queues Attributes Operations Chart Broker diagram

0.0.0.0
 

- acceptors
- addresses

### Browse Producers ?

| Filter Field.. |   | Operation..                           | Value                               | ascending | ID    | <input type="button" value="Q"/> | <input type="button" value="Reset"/> | Columns               |
|----------------|---|---------------------------------------|-------------------------------------|-----------|-------|----------------------------------|--------------------------------------|-----------------------|
| ID             | Name                                    | Session                               | Client ID                           | Protocol  | User  | Address                          | Remote Address                       | Local Address         |
| 1              | IDL31422978-56430-1703770639049-1:1;2:1 | IDL31422978-56430-1703770639049-1:1;2 | IDL31422978-56430-1703770639049-0:1 | OPENWIRE  | admin | message_queue                    | /127.0.0.1:56431                     | tcp://127.0.0.1:61616 |

10 per page 1-1 of 1 << < > >> 1 of 1

Search tr □ □

Status Connections Sessions Consumers Producers Addresses Queues Attributes Operations Chart Broker diagram

0.0.0.0
 

- acceptors
- addresses

### Browse Queues ?

| Filter Field.. |                | Operation..    | Value        | ascending | ID      | <input type="button" value="Q"/> | <input type="button" value="Reset"/> | Columns        |               |            |            |
|----------------|----------------|----------------|--------------|-----------|---------|----------------------------------|--------------------------------------|----------------|---------------|------------|------------|
| ID             | Name           | Address        | Routing Type | Filter    | Durable | Max Consumers                    | Purge On No Consumers                | Consumer Count | Message Count | Actions    |            |
| 3              | DLQ            | DLQ            | ANYCAST      |           | true    | -1                               | false                                | 0              | 20            | attributes | operations |
| 7              | ExpiryQueue    | ExpiryQueue    | ANYCAST      |           | true    | -1                               | false                                | 0              | 0             | attributes | operations |
| 25             | message_queue  | message_queue  | ANYCAST      |           | true    | -1                               | false                                | 1              | 0             | attributes | operations |
| 574            | message_queuee | message_queuee | ANYCAST      |           | true    | -1                               | false                                | 0              | 0             | attributes | operations |

10 per page 1-4 of 4 << < > >> 1 of 1

localhost:8161/console/artemis/artemisConnections?tab=artemis&nid=root-org.apache.activemq.artemis-0.0.0-a... Redémarrer pour mettre à jour :

## message\_queue

Status Connections Sessions Consumers Producers Addresses Queues Attributes Operations Chart More

| ID       | Client ID                            | Users | protocol | Count | Session | Remote Address   | Local Address         | Creation Time                 | Actions               |
|----------|--------------------------------------|-------|----------|-------|---------|------------------|-----------------------|-------------------------------|-----------------------|
| a4c6025b | ID:L31422978-51896-1699009579564-0:1 | admin | OPENWIRE | 4     |         | /127.0.0.1:51899 | tcp://127.0.0.1:61616 | Fri Nov 03 12:06:19 WEST 2023 | <a href="#">Close</a> |

10 per page 1 of 1

message\_queue

Status Connections Sessions Consumers Producers Addresses Queues Attributes Operations Chart More

| ID                                     | Connection | User  | Consumer Count | Producer Count | Creation Time                 | Actions               |
|--|------------|-------|----------------|----------------|-------------------------------|-----------------------|
| 0431f011-7a39-11ee-b7dc-a8934acf8ae7   | a4c6025b   | admin | 0              | 0              | Fri Nov 03 12:06:19 WEST 2023 | <a href="#">Close</a> |
| ID:L31422978-51896-1699009579564-1:1-1 | a4c6025b   | admin | 0              | 0              | Fri Nov 03 12:06:19 WEST 2023 | <a href="#">Close</a> |
| ID:L31422978-51896-1699009579564-1:1:1 | a4c6025b   | admin | 1              | 0              | Fri Nov 03 12:06:19 WEST 2023 | <a href="#">Close</a> |
| ID:L31422978-51896-1699009579564-1:1:2 | a4c6025b   | admin | 0              | 1              | Fri Nov 03 12:06:19 WEST 2023 | <a href="#">Close</a> |

10 per page 1 of 4

## message\_queue

Status Connections Sessions Consumers Producers Addresses Queues Attributes Operations Chart More

### Browse Consumers

| ID | Session                              | Client ID                            | Protocol | Queue         | Queue Type | Filter | Address       | Remote Address   | Local Address         | Creation Time                 | Actions               |
|----|--------------------------------------|--------------------------------------|----------|---------------|------------|--------|---------------|------------------|-----------------------|-------------------------------|-----------------------|
| 94 | ID:L31422978-51896-1699009579564-1:1 | ID:L31422978-51896-1699009579564-0:1 | OPENWIRE | message_queue | anycast    |        | message_queue | /127.0.0.1:51899 | tcp://127.0.0.1:61616 | Fri Nov 03 12:06:19 WEST 2023 | <a href="#">Close</a> |

10 per page 1 of 1

## message\_queue

org.apache.activemq.artemis:broker="0.0.0.0",component=addresses,address="message\_queue",subcomponent=queues,routing-type="anycast",queue="message\_queue"

Status Connections Sessions Consumers Producers Addresses Queues Attributes Operations Chart More ▾

### Browse Producers ?

| Filter Field.. |  | Operation..                            | Value                                | ascending | ID    | <input type="button" value="Q"/> | Reset            | Columns               |
|----------------|--|--|--------------------------------------|-----------|-------|----------------------------------|------------------|-----------------------|
| ID             | Name                                     | Session                                | Client ID                            | Protocol  | User  | Address                          | Remote Address   | Local Address         |
| 1              | ID:L31422978-51896-1699009579564-1:1:2:1 | ID:L31422978-51896-1699009579564-1:1:2 | ID:L31422978-51896-1699009579564-0:1 | OPENWIRE  | admin | message_queue                    | /127.0.0.1:51899 | tcp://127.0.0.1:61616 |
| 10 per page    |  |  | 1 of 1                               |           |       | <input type="button" value="1"/> | > >>             |                       |

## message\_queue

org.apache.activemq.artemis:broker="0.0.0.0",component=addresses,address="message\_queue",subcomponent=queues,routing-type="anycast",queue="message\_queue"

Status Connections Sessions Consumers Producers Addresses **Queues** Attributes Operations Chart More ▾

### Browse Queues ?

| Filter Field.. |               | Operation..   | Value        | ascending | ID      | <input type="button" value="Q"/> | Reset                 | Columns        |               |                       |
|----------------|---------------|---------------|--------------|-----------|---------|----------------------------------|-----------------------|----------------|---------------|-----------------------|
| ID             | Name          | Address       | Routing Type | Filter    | Durable | Max Consumers                    | Purge On No Consumers | Consumer Count | Message Count | Actions               |
| 3              | DLQ           | DLQ           | ANYCAST      |           | true    | -1                               | false                 | 0              | 0             | attributes operations |
| 7              | ExpiryQueue   | ExpiryQueue   | ANYCAST      |           | true    | -1                               | false                 | 0              | 0             | attributes operations |
| 25             | message_queue | message_queue | ANYCAST      |           | true    | -1                               | false                 | 1              | 0             | attributes operations |
| 10 per page    |               |               | 1 of 1       |           |         | <input type="button" value="1"/> | > >>                  |                | > >>          |                       |

On peut lancer plusieurs fois le Producer et vérifier que le nombre de messages augmentent dans la file d'attente, et que le l'opération de consommation se fait de manière aléatoire :

⊕ ⊖

- > ■ JMImplementation
- > ■ com.sun.management
- > ■ hawtio
- > ■ java.lang
- > ■ java.nio
- > ■ java.util.logging
- > ■ jdk.management.jfr
- > ■ jmx4perl
- > ■ jolokia
- ✓ ■ org.apache.activemq.artemis
- ✓ ■ 0.0.0.0
- > ■ acceptors
- ✓ ■ addresses
  - ⌚ ■ \$sys.mqtt.sessions
  - > ■ DLQ
  - > ■ ExpiryQueue
  - ⌚ ■ activemq.notifications
  - ⌚ ■ jsa-topic
- ✓ ■ message\_queue
  - ✓ ■ queues
  - ✓ ■ anycast

⌚ ■ message\_queue... >

> ■ message\_queuee

### message\_queue

org.apache.activemq.artemis:broker="0.0.0.0",component=addresses,address="message\_queue",subcomponent=queues,routing-type="anycast",queue="message\_queue"

| Attributes                         | Operations   |
|------------------------------------|--|
| Messages acknowledged              | 40   |
| Messages added                     | 41   |
| Messages expired                   | 0  |
| Messages killed                    | 1  |
| Name                               | message_queue  |
| Object Name                        | org.apache.activemq.artemis:broker="0.0.0.0",component=addresses,addr... |
| Paused                             | false  |
| Persistent size                    | 0  |
| Prepared transaction message count | 0  |
| Purge on no consumers              | false  |
| Retroactive resource               | false  |
| Ring size                          | -1   |
| Routing type                       | ANYCAST  |
| Scheduled count                    | 0  |
| Scheduled size                     | 0  |
| Temporary                          | false  |
| User                               | admin  |