01_RabbitMQ+SpringBoot

时间：2022年12月31日22:25:35

Java

消息队列

SpringBoot + RabbitMQ

> 2022年最后一天了，时间有时候过得真快，昨晚梦到了大学的时光，故事很奇怪，有些遗憾被以另一种形式在梦中出现，可我一点也不想醒过来，但是生活还是要继续，一转眼我都已经毕业两年了。
>
> 希望2023年可以找到一个好工作，好好工作，好好赚钱
>
>
>

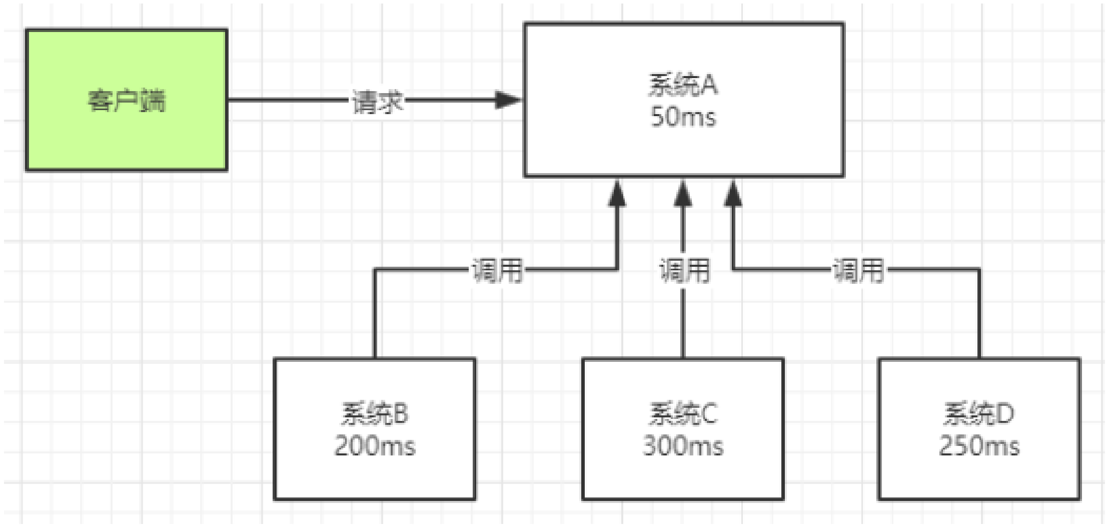
一、为什么要使用消息队列

① 解耦

> 假设有系统B、C、D都需要系统A的数据，于是系统A调用三个方法发送数据到B、C、D。这时，系统D不需要了，那就需要在系统A把相关的代码删掉。假设这时有个新的系统E需要数据，这时系统A又要增加调用系统E的代码。为了降低这种强耦合，就可以使用MQ，**系统A只需要把数据发送到MQ，其他系统如果需要数据，则从MQ中获取即可。**

② 异步

> 一个客户端请求发送进来，系统A会调用系统B、C、D三个系统，同步请求的话，响应时间就是系统A、B、C、D的总和，也就是800ms。**如果使用MQ，系统A发送数据到MQ，然后就可以返回响应给客户端，不需要**

> **再等待系统B、C、D的响应，可以大大地提高性能**。对于一些非必要的业务，比如发送短信，发送邮件等等，就可以采用MQ。
>
> 
>

③ 削峰

> 这其实是MQ一个很重要的应用。降低数据库请求峰值以避免数据库崩溃导致的服务瘫痪。
>
> 假设系统A在某一段时间请求数暴增，有5000个请求发送过来，系统A这时就会发送5000条SQL进入MySQL进行执行，MySQL对于如此庞大的请求当然处理不过来，MySQL就会崩溃，导致系统瘫痪。**如果使用MQ，系统A不再是直接发送SQL到数据库，而是把数据发送到MQ，MQ短时间积压数据是可以接受的，然后由消费者每次拉取2000条进行处理，防止在请求峰值时期大量的请求直接发送到MySQL导致系统崩溃。**

二、什么是RabbitMQ?

1. 基本介绍

> RabbitMQ是一款使用Erlang语言开发的，实现AMQP(高级消息队列协议)的开源消息中间件。
>
> - Erlang → 一款面向并发的编程语言
>   - 为什么国内Erlang不是很火?
>   - https://developer.aliyun.com/article/229322

2. 什么优点?

- 可靠性
  - 支持持久化、传输确认、发布确认
- 灵活的消息分发策略
  - 简单模式、工作队列模式、发布订阅模式、路由模式、通配符模式

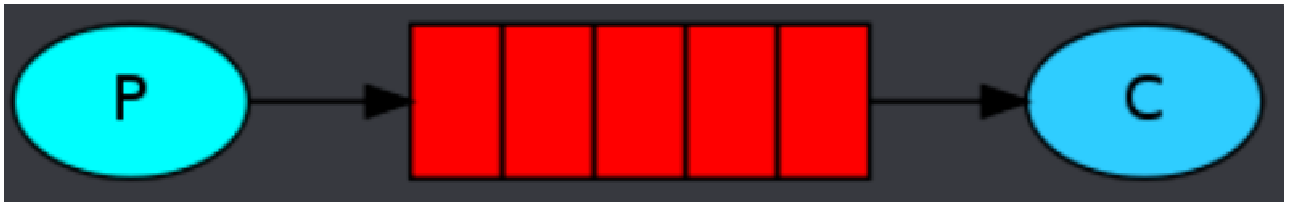
- 支持集群部署
- 支持多语言
- 支持多消息队列协议
    - STOMP、MQTT
- 支持插件机制
- 可视化管理界面

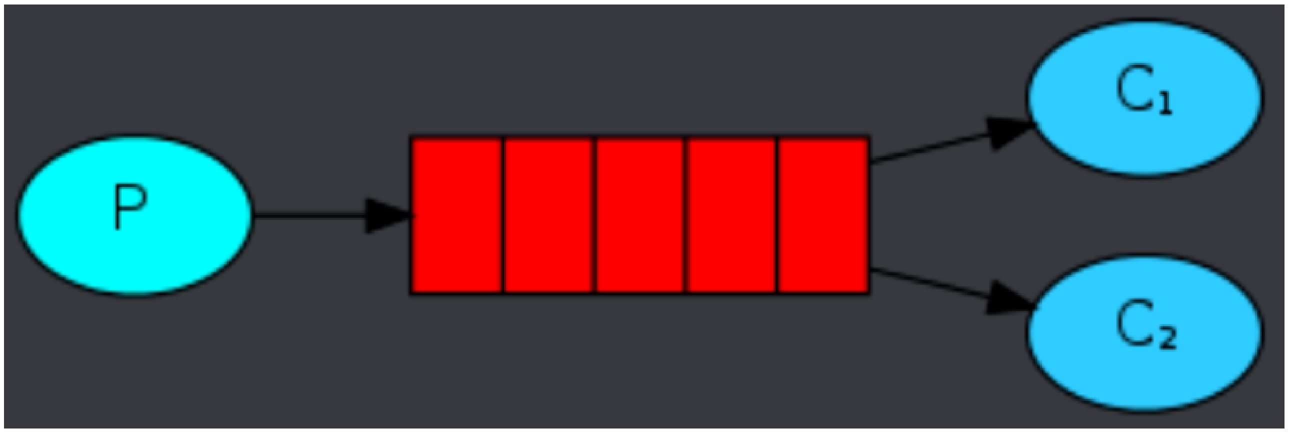
3. RabbitMQ组成部分

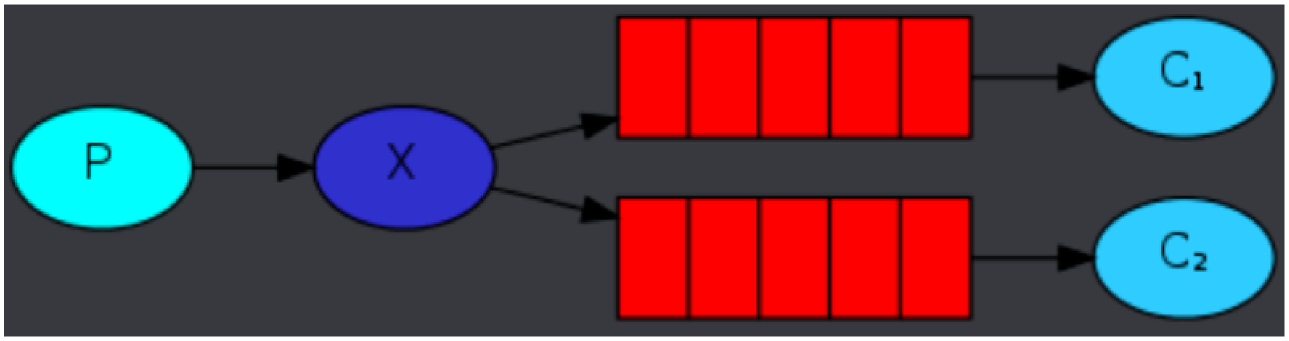
- Broker： 消息队列服务进程。此进程包括两个部分：Exchange和Queue。
- Exchange： 消息队列交换机。**按一定的规则将消息路由转发到某个队列。**
- Queue： 消息队列，存储消息的队列。
- Producer： 消息生产者。生产方客户端将消息同交换机路由发送到队列中。
- Consumer： 消息消费者。消费队列中存储的消息。

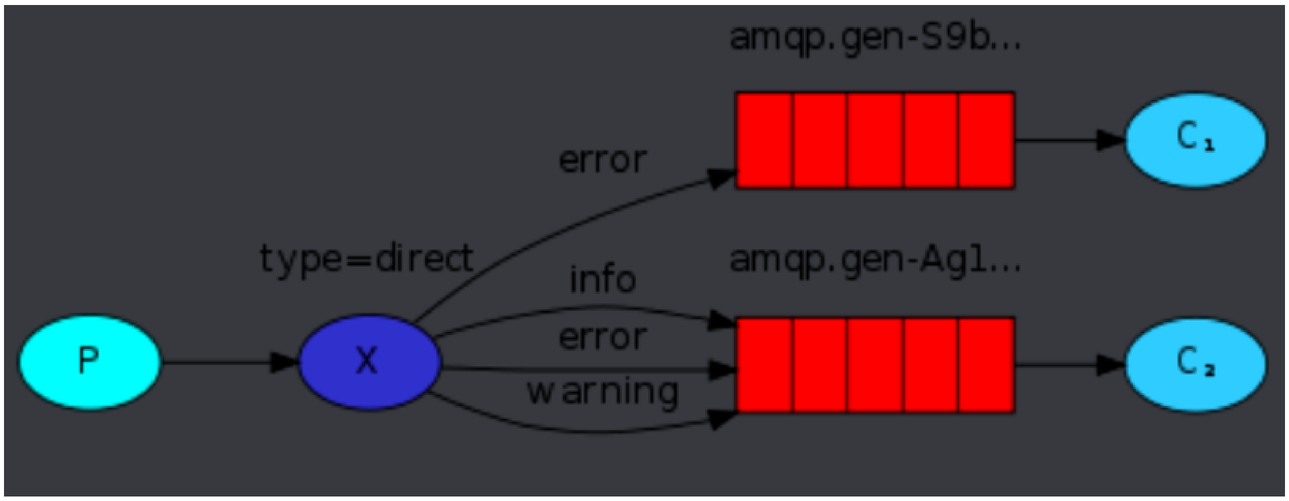
4. 消息发送模式（消息分发策略）

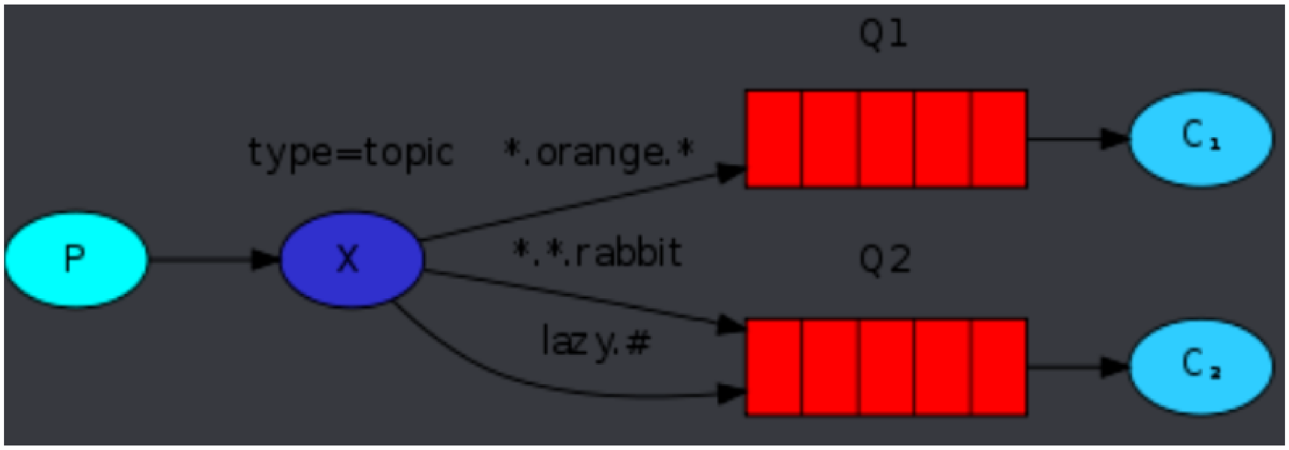
- 简单模式、工作队列模式、发布订阅模式、路由模式、通配符模式











三、SpringBoot集成RabbitMQ

> 推荐阅读：https://cloud.tencent.com/developer/article/1947188

1. Docker部署

> https://hub.docker.com/_/rabbitmq

docker pull rabbitmq:3.11.5-management

docker run --cpus=3 --memory=2GB -d --hostname my-rabbit-host-1 --name my-rabbit-1 -e RABBITMQ_DEFAULT_USER=admin -e RABBITMQ_DEFAULT_PASS=Rabbitmq12345 -p 15672:15672 -p 5672:5672 rabbitmq:3.11.5-management

- -h --hostname

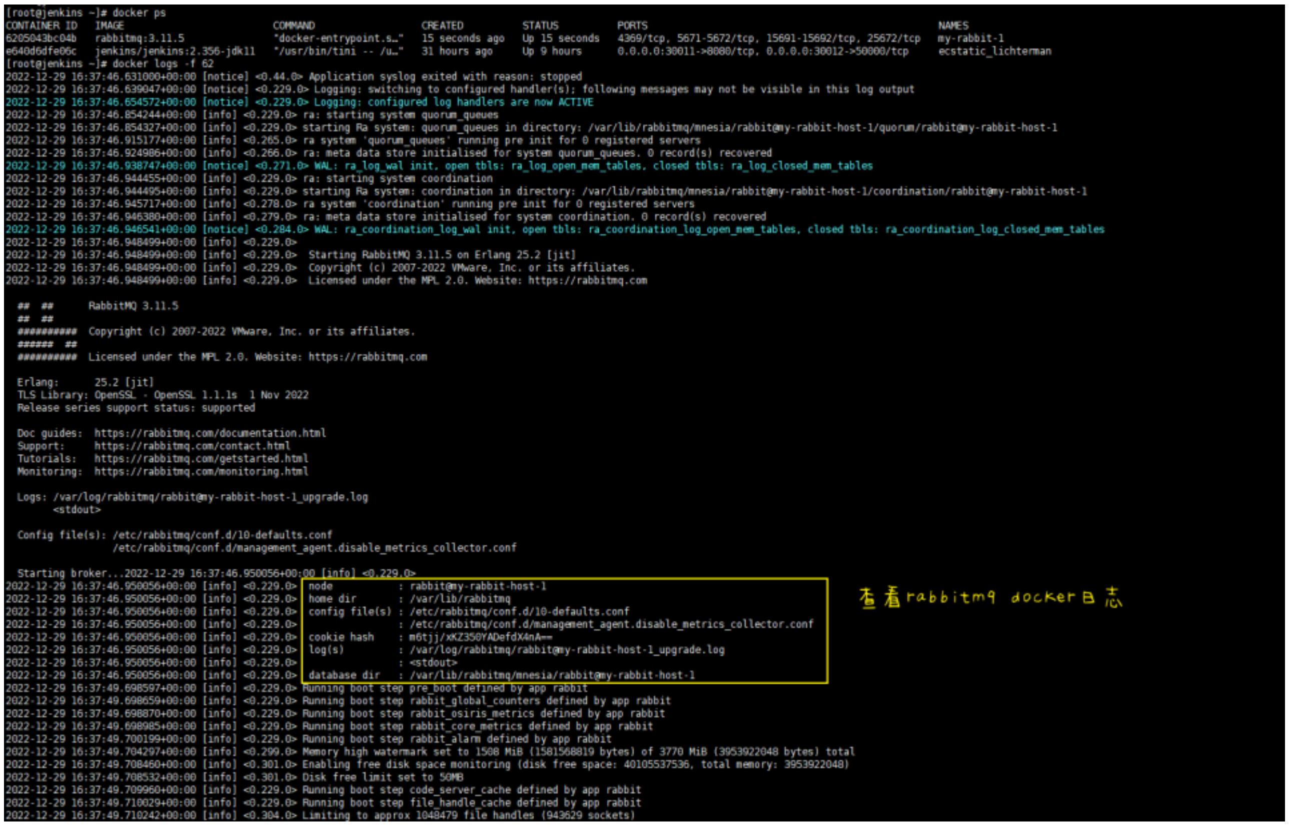
--cpus=3
--memory=2GB

这将启动侦听默认端口 5672 的 RabbitMQ 容器。如果你给它一分钟，然后做，你会在输出中看到一个类似于：`docker logs some-rabbit`

```
=INFO REPORT==== 6-Jul-2015::20:47:02 ===
node           : rabbit@my-rabbit
home dir       : /var/lib/rabbitmq
config file(s) : /etc/rabbitmq/rabbitmq.config
cookie hash    : UoNOcDhfxW9uoZ92wh6BjA==
log            : tty
sasl log       : tty
database dir   : /var/lib/rabbitmq/mnesia/rabbit@my-rabbit
```

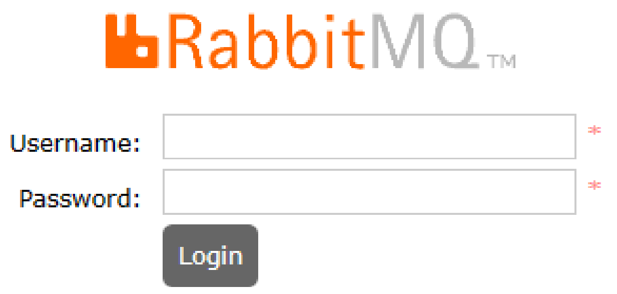
请注意那里，特别是它将我的"节点名称"附加到文件存储的末尾。默认情况下，此映像使所有卷全部生效。`database dir /var/lib/rabbitmq`

查看rabbitmq docker日志

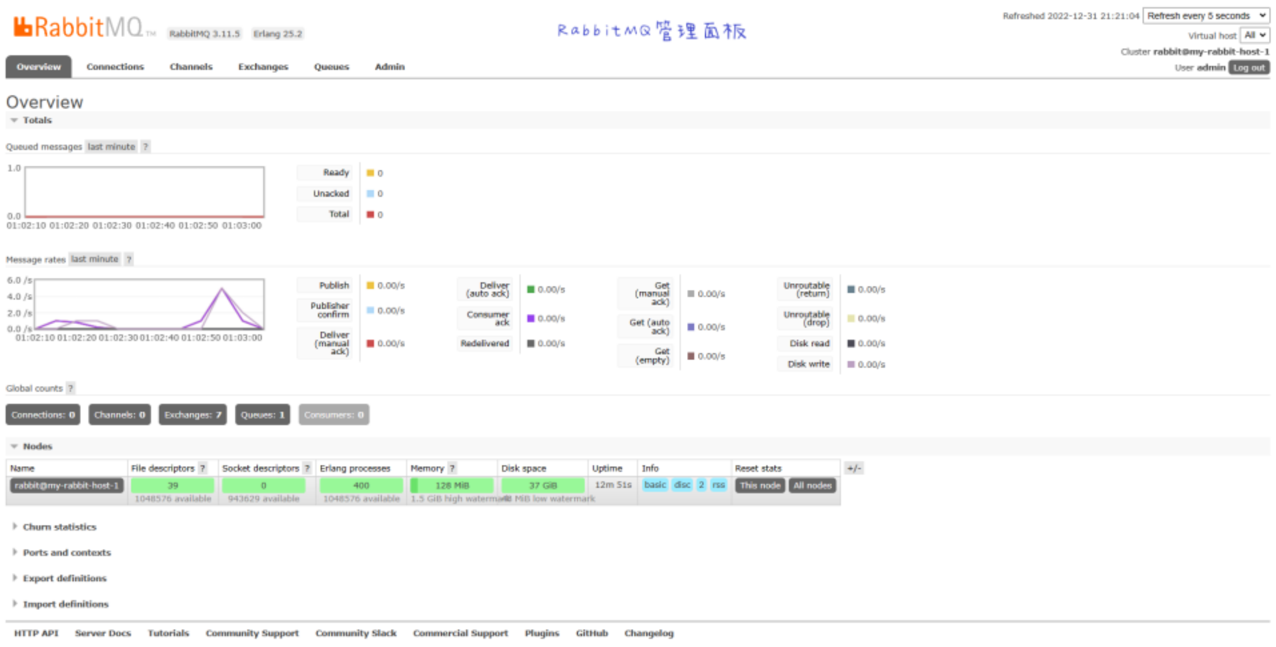


```
[root@jenkins ~]# docker ps
CONTAINER ID   IMAGE                       COMMAND                  CREATED          STATUS          PORTS                                                     NAMES
6205043bc04b   rabbitmq:3.11.5             "docker-entrypoint.s…"   15 seconds ago   Up 15 seconds   4369/tcp, 5671-5672/tcp, 15691-15692/tcp, 25672/tcp       my-rabbit-1
e640d6dfe06c   jenkins/jenkins:2.356-jdk11 "/usr/bin/tini -- /u…"   31 hours ago     Up 9 hours      0.0.0.0:30011->8080/tcp, 0.0.0.0:30012->50000/tcp         ecstatic_lichterman
[root@jenkins ~]# docker logs -f 62
2022-12-29 16:37:46.631000+00:00 [notice] <0.44.0> Application syslog exited with reason: stopped
2022-12-29 16:37:46.639047+00:00 [notice] <0.229.0> Logging: switching to configured handler(s); following messages may not be visible in this log output
2022-12-29 16:37:46.654572+00:00 [notice] <0.229.0> Logging: configured log handlers are now ACTIVE
2022-12-29 16:37:46.854244+00:00 [info] <0.229.0> ra: starting system quorum_queues
2022-12-29 16:37:46.854327+00:00 [info] <0.229.0> starting Ra system: quorum_queues in directory: /var/lib/rabbitmq/mnesia/rabbit@my-rabbit-host-1/quorum/rabbit@my-rabbit-host-1
2022-12-29 16:37:46.915177+00:00 [info] <0.265.0> ra system 'quorum_queues' running pre init for 0 registered servers
2022-12-29 16:37:46.924986+00:00 [info] <0.266.0> ra: meta data store initialised for system quorum_queues. 0 record(s) recovered
2022-12-29 16:37:46.938747+00:00 [notice] <0.271.0> WAL: ra_log_wal init, open tbls: ra_log_open_mem_tables, closed tbls: ra_log_closed_mem_tables
2022-12-29 16:37:46.944455+00:00 [info] <0.229.0> ra: starting system coordination
2022-12-29 16:37:46.944495+00:00 [info] <0.229.0> starting Ra system: coordination in directory: /var/lib/rabbitmq/mnesia/rabbit@my-rabbit-host-1/coordination/rabbit@my-rabbit-host-1
2022-12-29 16:37:46.945717+00:00 [info] <0.278.0> ra system 'coordination' running pre init for 0 registered servers
2022-12-29 16:37:46.946380+00:00 [info] <0.279.0> ra: meta data store initialised for system coordination. 0 record(s) recovered
2022-12-29 16:37:46.946541+00:00 [notice] <0.284.0> WAL: ra_coordination_log_wal init, open tbls: ra_coordination_log_open_mem_tables, closed tbls: ra_coordination_log_closed_mem_tables
2022-12-29 16:37:46.948499+00:00 [info] <0.229.0>
2022-12-29 16:37:46.948499+00:00 [info] <0.229.0>  Starting RabbitMQ 3.11.5 on Erlang 25.2 [jit]
2022-12-29 16:37:46.948499+00:00 [info] <0.229.0>  Copyright (c) 2007-2022 VMware, Inc. or its affiliates.
2022-12-29 16:37:46.948499+00:00 [info] <0.229.0>  Licensed under the MPL 2.0. Website: https://rabbitmq.com

  ##  ##      RabbitMQ 3.11.5
  ##  ##
  ##########  Copyright (c) 2007-2022 VMware, Inc. or its affiliates.
  ######  ##
  ##########  Licensed under the MPL 2.0. Website: https://rabbitmq.com

  Erlang:      25.2 [jit]
  TLS Library: OpenSSL - OpenSSL 1.1.1s  1 Nov 2022
  Release series support status: supported

  Doc guides:  https://rabbitmq.com/documentation.html
  Support:     https://rabbitmq.com/contact.html
  Tutorials:   https://rabbitmq.com/getstarted.html
  Monitoring:  https://rabbitmq.com/monitoring.html

  Logs: /var/log/rabbitmq/rabbit@my-rabbit-host-1_upgrade.log
        <stdout>

  Config file(s): /etc/rabbitmq/conf.d/10-defaults.conf
                  /etc/rabbitmq/conf.d/management_agent.disable_metrics_collector.conf

  Starting broker...2022-12-29 16:37:46.950056+00:00 [info] <0.229.0>
2022-12-29 16:37:46.950056+00:00 [info] <0.229.0> node           : rabbit@my-rabbit-host-1
2022-12-29 16:37:46.950056+00:00 [info] <0.229.0> home dir       : /var/lib/rabbitmq
2022-12-29 16:37:46.950056+00:00 [info] <0.229.0> config file(s) : /etc/rabbitmq/conf.d/10-defaults.conf
2022-12-29 16:37:46.950056+00:00 [info] <0.229.0>                : /etc/rabbitmq/conf.d/management_agent.disable_metrics_collector.conf
2022-12-29 16:37:46.950056+00:00 [info] <0.229.0> cookie hash    : m6tjj/xKZ350YADefdX4nA==
2022-12-29 16:37:46.950056+00:00 [info] <0.229.0> log(s)         : /var/log/rabbitmq/rabbit@my-rabbit-host-1_upgrade.log
2022-12-29 16:37:46.950056+00:00 [info] <0.229.0>                : <stdout>
2022-12-29 16:37:46.950056+00:00 [info] <0.229.0> database dir   : /var/lib/rabbitmq/mnesia/rabbit@my-rabbit-host-1
2022-12-29 16:37:49.698597+00:00 [info] <0.229.0> Running boot step pre_boot defined by app rabbit
2022-12-29 16:37:49.698659+00:00 [info] <0.229.0> Running boot step rabbit_global_counters defined by app rabbit
2022-12-29 16:37:49.698870+00:00 [info] <0.229.0> Running boot step rabbit_osiris_metrics defined by app rabbit
2022-12-29 16:37:49.698985+00:00 [info] <0.229.0> Running boot step rabbit_core_metrics defined by app rabbit
2022-12-29 16:37:49.700199+00:00 [info] <0.229.0> Running boot step rabbit_alarm defined by app rabbit
2022-12-29 16:37:49.704297+00:00 [info] <0.299.0> Memory high watermark set to 1508 MiB (1581568819 bytes) of 3770 MiB (3953922048 bytes) total
2022-12-29 16:37:49.708460+00:00 [info] <0.301.0> Enabling free disk space monitoring (disk free space: 40105537536, total memory: 3953922048)
2022-12-29 16:37:49.708532+00:00 [info] <0.301.0> Disk free limit set to 50MB
2022-12-29 16:37:49.709960+00:00 [info] <0.229.0> Running boot step code_server_cache defined by app rabbit
2022-12-29 16:37:49.710029+00:00 [info] <0.229.0> Running boot step file_handle_cache defined by app rabbit
2022-12-29 16:37:49.710242+00:00 [info] <0.304.0> Limiting to approx 1048479 file handles (943629 sockets)
```

登录管理面板



http://192.168.204.113:15672/



Refreshed 2022-12-31 21:21:04 Refresh every 5 seconds

Virtual host All

Cluster rabbit@my-rabbit-host-1

User admin

Overview

Totals

Queued messages last minute

Ready	0
Unacked	0
Total	0

Message rates last minute

Publish	0.00/s	Deliver (auto ack)	0.00/s	Get (manual ack)	0.00/s	Unroutable (return)	0.00/s
Publisher confirm	0.00/s	Consumer ack	0.00/s	Get (auto ack)	0.00/s	Unroutable (drop)	0.00/s
Deliver (manual ack)	0.00/s	Redelivered	0.00/s	Get (empty)	0.00/s	Disk read	0.00/s
						Disk write	0.00/s

Global counts

Connections: 0 Channels: 0 Exchanges: 7 Queues: 1 Consumers: 0

Nodes

Name	File descriptors	Socket descriptors	Erlang processes	Memory	Disk space	Uptime	Info	Reset stats
rabbit@my-rabbit-host-1	39 1048576 available	0 943629 available	400 1048576 available	128 MiB 1.5 GiB high watermark	37 GiB 48 MiB low watermark	12m 51s	basic disc 2 rss	This node All nodes

Churn statistics

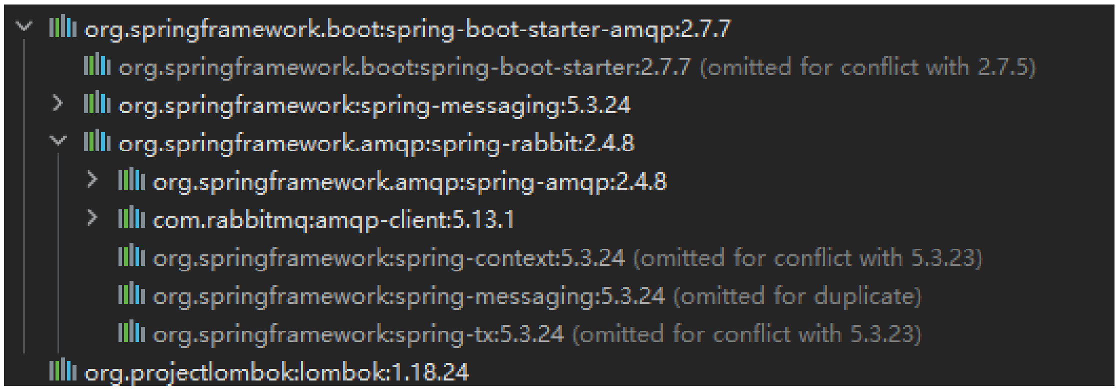
Ports and contexts

Export definitions

Import definitions

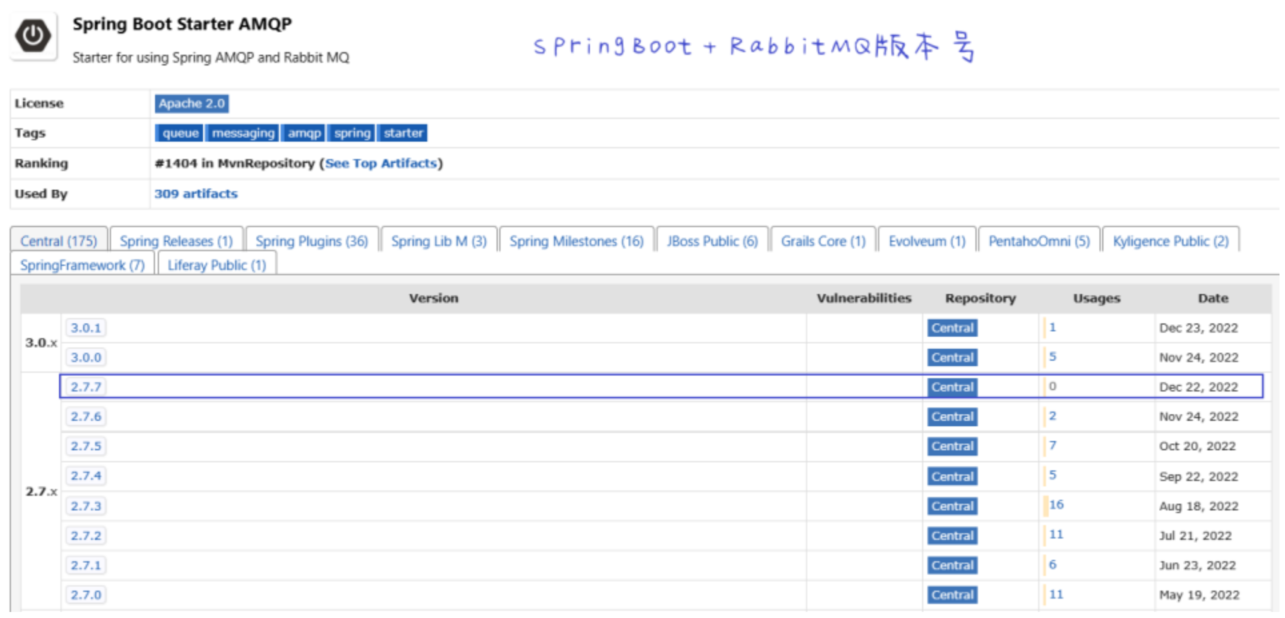
HTTP API Server Docs Tutorials Community Support Community Slack Commercial Support Plugins GitHub Changelog

2. 引入依赖



```
org.springframework.boot:spring-boot-starter-amqp:2.7.7
    org.springframework.boot:spring-boot-starter:2.7.7 (omitted for conflict with 2.7.5)
    org.springframework:spring-messaging:5.3.24
    org.springframework.amqp:spring-rabbit:2.4.8
        org.springframework.amqp:spring-amqp:2.4.8
        com.rabbitmq:amqp-client:5.13.1
        org.springframework:spring-context:5.3.24 (omitted for conflict with 5.3.23)
        org.springframework:spring-messaging:5.3.24 (omitted for duplicate)
        org.springframework:spring-tx:5.3.24 (omitted for conflict with 5.3.23)
org.projectlombok:lombok:1.18.24
```

```
<!-- 消息队列 -->
<dependency>
    <groupId>org.springframework.boot</groupId>
    <artifactId>spring-boot-starter-amqp</artifactId>
    <version>2.7.7</version>
</dependency>
```



Spring Boot Starter AMQP

Starter for using Spring AMQP and Rabbit MQ

SpringBoot + RabbitMQ版本号

License	Apache 2.0
Tags	queue messaging amqp spring starter
Ranking	#1404 in MvnRepository (See Top Artifacts)
Used By	309 artifacts

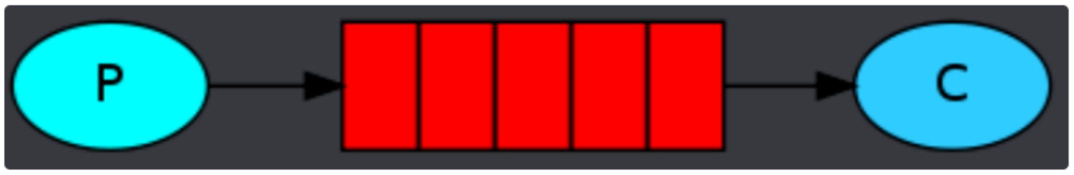
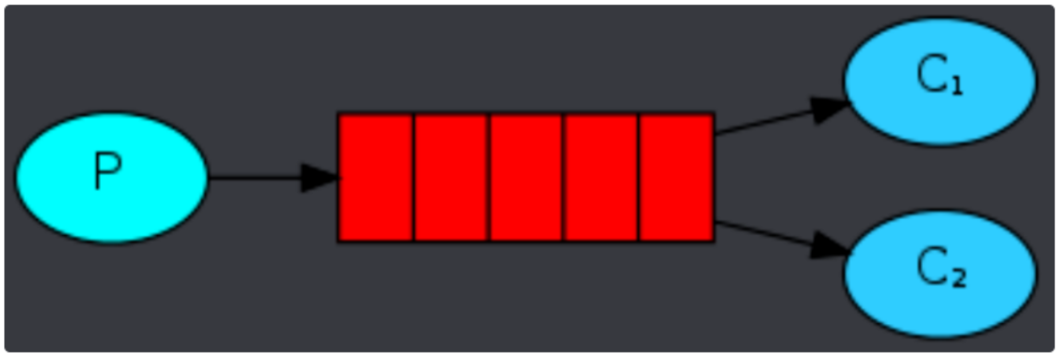
Central (175) | Spring Releases (1) | Spring Plugins (36) | Spring Lib M (3) | Spring Milestones (16) | JBoss Public (6) | Grails Core (1) | Evolveum (1) | PentahoOmni (5) | Kyligence Public (2) | SpringFramework (7) | Liferay Public (1)

	Version	Vulnerabilities	Repository	Usages	Date
3.0.x	3.0.1		Central	1	Dec 23, 2022
	3.0.0		Central	5	Nov 24, 2022
2.7.x	2.7.7		Central	0	Dec 22, 2022
	2.7.6		Central	2	Nov 24, 2022
	2.7.5		Central	7	Oct 20, 2022
	2.7.4		Central	5	Sep 22, 2022
	2.7.3		Central	16	Aug 18, 2022
	2.7.2		Central	11	Jul 21, 2022
	2.7.1		Central	6	Jun 23, 2022
	2.7.0		Central	11	May 19, 2022

3. 配置文件

```
spring:
  # RabbitMQ服务地址
  rabbitmq:
    host: 192.168.204.113
    port: 5672
    username: admin
    password: Rabbitmq12345
```

4. Producer+Consumer

> RabbitTemplate#convertAndSend(String routingKey, Object message): void
>
> 
>
>
> 
>

```
import lombok.RequiredArgsConstructor;
import org.springframework.amqp.rabbit.core.RabbitTemplate;
import org.springframework.stereotype.Component;

@Component
@RequiredArgsConstructor
```

```
public class Producer {

    private final static String QUEUE_NAME = "notice_queue";
    private final RabbitTemplate rabbitTemplate;

    public void produce() {
        String message = "疫情期间注意防护";
        System.out.println("乡长说：" + message);
        // String routingKey + Object message : void
        rabbitTemplate.convertAndSend(QUEUE_NAME, message);
    }
}
```

```
import org.springframework.amqp.rabbit.annotation.Queue;
import org.springframework.amqp.rabbit.annotation.RabbitHandler;
import org.springframework.amqp.rabbit.annotation.RabbitListener;
import org.springframework.stereotype.Component;

@Component
public class Consumer {
    private final static String QUEUE_NAME = "notice_queue";

    @RabbitHandler
    @RabbitListener(queuesToDeclare = @Queue(QUEUE_NAME))
    public void process(String message) {
        System.out.println("村里猿公子收到通知：" + message);
    }
}
```

```
import org.springframework.amqp.rabbit.annotation.Queue;
import org.springframework.amqp.rabbit.annotation.RabbitHandler;
import org.springframework.amqp.rabbit.annotation.RabbitListener;
import org.springframework.stereotype.Component;

@Component
public class Consumer1 {
    private final static String QUEUE_NAME = "notice_queue";

    @RabbitHandler
    @RabbitListener(queuesToDeclare = @Queue(QUEUE_NAME))
    public void process(String message) {
        System.out.println("村里菲公子收到通知：" + message);
    }
}
```

5. 消费者限制速度

```
import lombok.RequiredArgsConstructor;
import org.springframework.amqp.rabbit.config.SimpleRabbitListenerContainerFactory;
import org.springframework.amqp.rabbit.connection.CachingConnectionFactory;
import org.springframework.context.annotation.Bean;
import org.springframework.context.annotation.Configuration;

@Configuration
@RequiredArgsConstructor
public class RabbitMQConfig {
    private final CachingConnectionFactory connectionFactory;
    @Bean
    public SimpleRabbitListenerContainerFactory mqConsumerlistenerContainer() {
        SimpleRabbitListenerContainerFactory factory = new SimpleRabbitListenerContainerFactory();
        factory.setConnectionFactory(connectionFactory);
        // consumer限制消费速率
        // @RabbitHandler
        // @RabbitListener(queuesToDeclare = @Queue(QUEUE_NAME), containerFactory =
"mqConsumerlistenerContainer")
        factory.setPrefetchCount(2);
        return factory;
    }
}
```

```
import org.springframework.amqp.rabbit.annotation.Queue;
import org.springframework.amqp.rabbit.annotation.RabbitHandler;
import org.springframework.amqp.rabbit.annotation.RabbitListener;
import org.springframework.stereotype.Component;

@Component
public class Consumer {
    private final static String QUEUE_NAME = "notice_queue";

    @RabbitHandler
    @RabbitListener(queuesToDeclare = @Queue(QUEUE_NAME), containerFactory = "mqConsumerlistenerContainer")
    public void process(String message) {
        System.out.println("村里猿公子收到通知：" + message);
    }
}
```

四、Consumer手动签收消息

> 推荐阅读：https://blog.51cto.com/u_15461374/5938036

```
<!-- 消息队列+fastjson2 -->
<dependency>
    <groupId>org.springframework.boot</groupId>
    <artifactId>spring-boot-starter-amqp</artifactId>
    <version>2.7.7</version>
</dependency>
<dependency>
    <groupId>com.alibaba.fastjson2</groupId>
    <artifactId>fastjson2</artifactId>
    <version>2.0.21</version>
</dependency>
```

```
spring:
  # datasource:
  #   type: com.alibaba.druid.pool.DruidDataSource
  #   driver-class-name: com.mysql.cj.jdbc.Driver
  #   url: jdbc:mysql://192.168.204.112:23306/dev_test?
autoReconnect=true&useServerPreparedStmts=true&cachePrepStmts=true&rewriteBatchedStatements=true&allowMultiQue
```

```
import com.alibaba.fastjson2.JSONObject;
import lombok.RequiredArgsConstructor;
import org.springframework.amqp.core.Message;
import org.springframework.amqp.core.MessageBuilder;
import org.springframework.amqp.core.MessageProperties;
import org.springframework.amqp.rabbit.core.RabbitTemplate;
import org.springframework.stereotype.Component;

import java.util.UUID;

@Component
@RequiredArgsConstructor
public class Producer {
    private final RabbitTemplate rabbitTemplate;

    public void produce(String queueName) {
        JSONObject jsonObject = new JSONObject();
        jsonObject.put("email", "22222@qq.com");
        jsonObject.put("timestamp", System.currentTimeMillis());
        String jsonString = jsonObject.toJSONString();
        System.out.println("jsonString:" + jsonString);
        // 设置消息唯一id 保证每次重试消息id唯一
        Message message = MessageBuilder.withBody(jsonString.getBytes())
                .setContentType(MessageProperties.CONTENT_TYPE_JSON).setContentEncoding("utf-8")
                .setMessageId(UUID.randomUUID() + "").build();
        rabbitTemplate.convertAndSend(queueName, message);

    }
}

import com.alibaba.fastjson2.JSONObject;
import com.rabbitmq.client.Channel;
import org.springframework.amqp.core.Message;
import org.springframework.amqp.rabbit.annotation.Queue;
import org.springframework.amqp.rabbit.annotation.RabbitHandler;
import org.springframework.amqp.rabbit.annotation.RabbitListener;
import org.springframework.amqp.support.AmqpHeaders;
import org.springframework.messaging.handler.annotation.Headers;
import org.springframework.stereotype.Component;

import java.nio.charset.StandardCharsets;
import java.util.Map;

@Component
public class Consumer1 {
    private final String FANOUT_EMAIL_QUEUE = "fanout_email_queue";

    @RabbitHandler
    @RabbitListener(queuesToDeclare = @Queue(FANOUT_EMAIL_QUEUE))
    public void process(Message message, @Headers Map<String, Object> headers, Channel channel) throws Exception {
        // 获取消息Id
        String messageId = message.getMessageProperties().getMessageId();
        String msg = new String(message.getBody(), StandardCharsets.UTF_8);
        System.out.println("邮件消费者获取生产者消息" + "messageId:" + messageId + ",消息内容:" + msg);
        JSONObject jsonObject = JSONObject.parseObject(msg);
        // 获取email参数
        String email = jsonObject.getString("email");

        // 请求地址,发送邮件
        // String emailUrl = "http://127.0.0.1:8083/sendEmail?email=" + email;
        // JSONObject result = HttpClientUtils.httpGet(emailUrl);
        // if (result == null) {
```

```
        //      // 因为网络原因,造成无法访问,继续重试
        //      throw new Exception("调用接口失败!");
        // }

        // 手动签收
        channel.basicAck((Long) headers.get(AmqpHeaders.DELIVERY_TAG), false);
        System.out.println("执行结束....");
    }
}

import com.xii.mp.mq.Producer;
import org.junit.jupiter.api.Test;
import org.springframework.beans.factory.annotation.Autowired;
import org.springframework.boot.test.context.SpringBootTest;

import java.util.concurrent.TimeUnit;

@SpringBootTest
public class AppTest {
    private final String FANOUT_EMAIL_QUEUE = "fanout_email_queue";

    @Autowired
    private Producer producer;

    @Test
    public void test01() {
        for (int i = 0; i < 2; i++) {
            producer.produce(FANOUT_EMAIL_QUEUE);
            producer.produce(FANOUT_EMAIL_QUEUE);
            System.out.println("=".repeat(66)+i);
        }


        try { TimeUnit.SECONDS.sleep(1000); } catch (InterruptedException e) { throw new RuntimeException(e); }
    }
}
```

五、发布订阅模型

> 一个消息被多个消费者消费
>
> - 推荐阅读：https://cloud.tencent.com/developer/article/2051103

1. 创建两个Queue绑定到一个Exchange中

```
<!-- 消息队列+fastjson2 -->
<dependency>
    <groupId>org.springframework.boot</groupId>
    <artifactId>spring-boot-starter-amqp</artifactId>
    <version>2.7.7</version>
</dependency>
<dependency>
    <groupId>com.alibaba.fastjson2</groupId>
    <artifactId>fastjson2</artifactId>
    <version>2.0.21</version>
</dependency>

<!-- lombok -->
<dependency>
    <groupId>org.projectlombok</groupId>
    <artifactId>lombok</artifactId>
    <version>1.18.24</version>
</dependency>
```

```
spring:
  # datasource:
  #   type: com.alibaba.druid.pool.DruidDataSource
  #   driver-class-name: com.mysql.cj.jdbc.Driver
  #   url: jdbc:mysql://192.168.204.112:23306/dev_test?
autoReconnect=true&useServerPreparedStmts=true&cachePrepStmts=true&rewriteBatchedStatements=true&allowMultiQue
```

```
import org.springframework.amqp.core.Binding;
import org.springframework.amqp.core.BindingBuilder;
import org.springframework.amqp.core.FanoutExchange;
import org.springframework.amqp.core.Queue;
import org.springframework.context.annotation.Bean;
import org.springframework.stereotype.Component;

//Fanout 类型 发布订阅模式
@Component
public class FanoutConfig {

    // 邮件队列
    private final String FANOUT_EMAIL_QUEUE = "fanout_email_queue";

    // 短信队列
    private final String FANOUT_SMS_QUEUE = "fanout_sms_queue";
    // fanout 交换机
    private final String EXCHANGE_NAME = "fanoutExchange";

    // 1.定义邮件队列
    @Bean
    public Queue fanOutEamilQueue() {
        return new Queue(FANOUT_EMAIL_QUEUE);
    }

    // 2.定义短信队列
    @Bean
    public Queue fanOutSmsQueue() {
        return new Queue(FANOUT_SMS_QUEUE);
    }

    // 2.定义交换机
    @Bean
    FanoutExchange fanoutExchange() {
        return new FanoutExchange(EXCHANGE_NAME);
    }

    // 3.队列与交换机绑定邮件队列
    @Bean
    Binding bindingExchangeEmail(Queue fanOutEamilQueue, FanoutExchange fanoutExchange) {
        return BindingBuilder.bind(fanOutEamilQueue).to(fanoutExchange);
    }

    // 4.队列与交换机绑定短信队列
    @Bean
    Binding bindingExchangeSms(Queue fanOutSmsQueue, FanoutExchange fanoutExchange) {
        return BindingBuilder.bind(fanOutSmsQueue).to(fanoutExchange);
    }
}
```

2. 生产者

```
import com.alibaba.fastjson2.JSONObject;
import lombok.RequiredArgsConstructor;
import org.springframework.amqp.core.Message;
import org.springframework.amqp.core.MessageBuilder;
import org.springframework.amqp.core.MessageProperties;
import org.springframework.amqp.rabbit.core.RabbitTemplate;
import org.springframework.stereotype.Component;

import java.util.UUID;

@Component
@RequiredArgsConstructor
public class Producer {
    private final RabbitTemplate rabbitTemplate;

    public void produce(String queueName) {
        JSONObject jsonObject = new JSONObject();
        jsonObject.put("email", "22222@qq.com");
        jsonObject.put("phoneNumber", "12222222222");
        jsonObject.put("timestamp", System.currentTimeMillis());
        String jsonString = jsonObject.toJSONString();
        System.out.println("jsonString:" + jsonString);
        // 设置消息唯一id 保证每次重试消息id唯一
        Message message = MessageBuilder.withBody(jsonString.getBytes())
                .setContentType(MessageProperties.CONTENT_TYPE_JSON).setContentEncoding("utf-8")
                .setMessageId(UUID.randomUUID() + "").build();
//         rabbitTemplate.convertAndSend(queueName, message);
        rabbitTemplate.convertAndSend(queueName, "", message);

    }
}
```

3. 邮件消费者+短信消费者

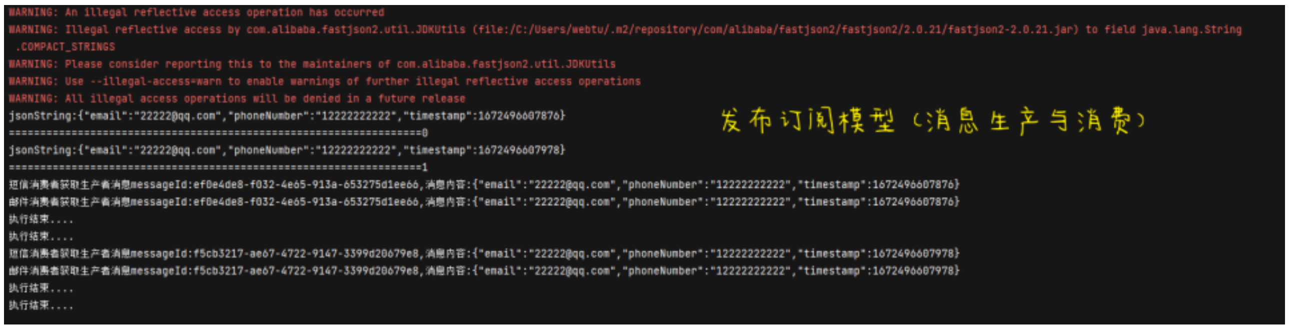
```
import com.alibaba.fastjson2.JSONObject;
import com.rabbitmq.client.Channel;
import org.springframework.amqp.core.Message;
import org.springframework.amqp.rabbit.annotation.Queue;
import org.springframework.amqp.rabbit.annotation.RabbitHandler;
import org.springframework.amqp.rabbit.annotation.RabbitListener;
import org.springframework.amqp.support.AmqpHeaders;
import org.springframework.messaging.handler.annotation.Headers;
import org.springframework.stereotype.Component;

import java.nio.charset.StandardCharsets;
import java.util.Map;
```

```
@Component
public class Consumer1 {
    private final String FANOUT_EMAIL_QUEUE = ”fanout_email_queue”;

    @RabbitHandler
    @RabbitListener(queuesToDeclare = @Queue(FANOUT_EMAIL_QUEUE))
    public void process(Message message, @Headers Map<String, Object> headers, Channel channel) throws Exception {
        // 获取消息Id
        String messageId = message.getMessageProperties().getMessageId();
        String msg = new String(message.getBody(), StandardCharsets.UTF_8);
        System.out.println(”邮件消费者获取生产者消息” + ”messageId:” + messageId + ”,消息内容:” + msg);
        JSONObject jsonObject = JSONObject.parseObject(msg);
        // 获取email参数
        String email = jsonObject.getString(”email”);

        // 请求地址,发送邮件
        // String emailUrl = ”http://127.0.0.1:8083/sendEmail?email=” + email;
        // JSONObject result = HttpClientUtils.httpGet(emailUrl);
        // if (result == null) {
        //     // 因为网络原因,造成无法访问,继续重试
        //     throw new Exception(”调用接口失败!”);
        // }

        // 手动签收
        channel.basicAck((Long) headers.get(AmqpHeaders.DELIVERY_TAG), false);
        System.out.println(”执行结束....”);
    }
}

import com.alibaba.fastjson2.JSONObject;
import com.rabbitmq.client.Channel;
import org.springframework.amqp.core.Message;
import org.springframework.amqp.rabbit.annotation.Queue;
import org.springframework.amqp.rabbit.annotation.RabbitHandler;
import org.springframework.amqp.rabbit.annotation.RabbitListener;
import org.springframework.amqp.support.AmqpHeaders;
import org.springframework.messaging.handler.annotation.Headers;
import org.springframework.stereotype.Component;

import java.nio.charset.StandardCharsets;
import java.util.Map;

@Component
public class Consumer {
    private final String FANOUT_SMS_QUEUE = ”fanout_sms_queue”;

    @RabbitHandler
    @RabbitListener(queuesToDeclare = @Queue(FANOUT_SMS_QUEUE))
    public void process(Message message, @Headers Map<String, Object> headers, Channel channel) throws Exception {
        // 获取消息Id
        String messageId = message.getMessageProperties().getMessageId();
        String msg = new String(message.getBody(), StandardCharsets.UTF_8);
        System.out.println(”短信消费者获取生产者消息” + ”messageId:” + messageId + ”,消息内容:” + msg);
        JSONObject jsonObject = JSONObject.parseObject(msg);
        // 获取phoneNumber参数
        String phoneNumber = jsonObject.getString(”phoneNumber”);
        // 请求地址,发送短信
        // String smsUrl = "http://127.0.0.1:8083/sendSMS?phoneNumber=" + phoneNumber;
        // JSONObject result = HttpClientUtils.httpGet(smsUrl);
        // if (result == null) {
        //     // 因为网络原因,造成无法访问,继续重试
        //     throw new Exception("调用接口失败!");
        // }

        // 手动签收
        channel.basicAck((Long) headers.get(AmqpHeaders.DELIVERY_TAG), false);
        System.out.println("执行结束....");
    }
}
```

4. 测试生产数据（生产两条数据）

```
import com.xii.mp.mq.Producer;
import org.junit.jupiter.api.Test;
import org.springframework.beans.factory.annotation.Autowired;
import org.springframework.boot.test.context.SpringBootTest;

import java.util.concurrent.TimeUnit;

@SpringBootTest
public class AppTest {
    // 邮件队列
    private final String FANOUT_EMAIL_QUEUE = "fanout_email_queue";

    // 短信队列
    private final String FANOUT_SMS_QUEUE = "fanout_sms_queue";
    // fanout 交换机
    private final String EXCHANGE_NAME = "fanoutExchange";

    @Autowired
    private Producer producer;

    @Test
    public void test01() {
        for (int i = 0; i < 2; i++) {
            producer.produce(EXCHANGE_NAME);
            System.out.println("=".repeat(66)+i);
        }


        try { TimeUnit.SECONDS.sleep(1000); } catch (InterruptedException e) { throw new RuntimeException(e); }
    }
}
```

5. 测试结果



发布订阅模型（消息生产与消费）

```
WARNING: An illegal reflective access operation has occurred
WARNING: Illegal reflective access by com.alibaba.fastjson2.util.JDKUtils (file:/C:/Users/webtu/.m2/repository/com/alibaba/fastjson2/fastjson2/2.0.21/fastjson2-2.0.21.jar) to field java.lang.String
 .COMPACT_STRINGS
WARNING: Please consider reporting this to the maintainers of com.alibaba.fastjson2.util.JDKUtils
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
jsonString:{"email":"22222@qq.com","phoneNumber":"12222222222","timestamp":1672496607876}
==================================================================0
jsonString:{"email":"22222@qq.com","phoneNumber":"12222222222","timestamp":1672496607978}
==================================================================1
短信消费者获取生产者消息messageId:ef0e4de8-f032-4e65-913a-653275d1ee66,消息内容:{"email":"22222@qq.com","phoneNumber":"12222222222","timestamp":1672496607876}
邮件消费者获取生产者消息messageId:ef0e4de8-f032-4e65-913a-653275d1ee66,消息内容:{"email":"22222@qq.com","phoneNumber":"12222222222","timestamp":1672496607876}
执行结束....
执行结束....
短信消费者获取生产者消息messageId:f5cb3217-ae67-4722-9147-3399d20679e8,消息内容:{"email":"22222@qq.com","phoneNumber":"12222222222","timestamp":1672496607978}
邮件消费者获取生产者消息messageId:f5cb3217-ae67-4722-9147-3399d20679e8,消息内容:{"email":"22222@qq.com","phoneNumber":"12222222222","timestamp":1672496607978}
执行结束....
执行结束....
```