



RabbitMQ

A decorative border at the top of the slide consists of a row of yellow hexagons. Most are a light yellow color, but two are a darker, more saturated yellow. One dark hexagon is located near the left edge, and the other is near the right edge.

A Message broker written in Java with JMS 1.1



A decorative border at the bottom of the slide consists of a row of yellow hexagons. Most are a light yellow color, but two are a darker, more saturated yellow. One dark hexagon is located near the left edge, and the other is near the right edge.

Java Messaging Service (JMS)

- A specification that allows development of message based system.
- RabbitMQ acts as a broker of messages which sits in between applications and allows them to communicate in asynchronous and reliable way
- JDK 11 is mandatory
- Erlang must be installed
- <https://www.rabbitmq.com/tutorials/tutorial-one-dotnet.html>
- More can be found on above given URL

What is RabbitMQ?

- It was developed by JPMorgan and iMatix Corporation
- It provides high availability, scalability, reliability, performance and security for enterprise level messaging applications
- RabbitMQ acts as a broker of messages which sits in between applications and allows them to communicate in asynchronous and reliable way.
- The Advanced Message Queuing Protocol (AMQP) is an open standard application layer protocol for message-oriented and the features of AMQP are message orientation, queuing, routing (including point-to-point and publish-and-subscribe), reliability and security

Types of Messaging

- ***Point to Point*** - The broker sends messages to only one consumer, while the other consumers will wait till they get the messages from the broker. No consumer will get the same message.
- ***Publish/Subscribe*** - the Broker sends same copy of messages to all the active consumers. This type of communication is also known as Topic based communication where broker sends same message to all active consumer who has subscribed for particular Topic. This model supports one-way communication where no verification of transmitted messages is expected.

Why and when to Use RabbitMQ?

- By using RabbitMQ, we can remove some heavy work from our web applications such as sending a reports in Excel or Pdf format's or sending an email, SMS or another task such as trigger some other applications to start processing.
- RabbitMQ is an open source and cross-platform message broker so it's easy to use with many languages such as .Net, Java, Python, Ruby, Node.Js.

Why Erlang?

- Erlang is a general-purpose programming language and runtime environment.
- Erlang has built-in support for concurrency, distribution and fault tolerance. Erlang is used in several large telecommunication systems from Ericsson
- Download the latest version of Erlang from its home page and get it installed
<http://www.erlang.org/downloads>
- Download the RabbitMQ from website
<https://www.rabbitmq.com/download.html>
- By default, RabbitMQ works as windows service. To enable Web based Administration UI use `C:\Program Files\RabbitMQ Server\rabbitmq_server-3.9.13\sbin>rabbitmq-plugins.bat enable rabbitmq_management`

🔍 rabbitMQ Service - start

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Best match



RabbitMQ Service - start
App

Apps



RabbitMQ Service - stop >



RabbitMQ Logs >



RabbitMQ Database Directory >



RabbitMQ Service - remove >



RabbitMQ Command Prompt (sbin dir) >



RabbitMQ Service - (re)install >

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RabbitMQ Service - start
App

🔗 Open

👤 Run as administrator

📁 Open file location

📌 Pin to Start

📌 Pin to taskbar

🗑️ Uninstall

Beehive1

1.50 / 3.50 25.00 x 9.00



Why Erlang?

- `C:\Program Files\RabbitMQ Server\rabbitmq_server-3.9.13\sbin>rabbitmq-plugins enable rabbitmq_shovel
rabbitmq_shovel_management`
- `http://rabbitmq:15672/` with user name guest and password guest
- `http://localhost:15672/`
- `rabbitmqctl status`


```
C:\Program Files\RabbitMQ Server\rabbitmq_server-3.9.14\sbin>rabbitmqctl status
```

```
Status of node rabbit@LAPTOP-55R4GGB6 ...
```

```
←[1mRuntime←[0m
```

```
OS PID: 5388
```

```
OS: Windows
```

```
Uptime (seconds): 14629
```

```
Is under maintenance?: false
```

```
RabbitMQ version: 3.9.14
```

```
Node name: rabbit@LAPTOP-55R4GGB6
```

```
Erlang configuration: Erlang/OTP 24 [erts-12.3.1] [source] [64-bit] [smp:8:8] [ds:8:8:10] [async-threads:1] [jit]
```

```
Erlang processes: 399 used, 1048576 limit
```

```
Scheduler run queue: 1
```

```
Cluster heartbeat timeout (net_ticktime): 60
```

```
←[1mPlugins←[0m
```

```
Enabled plugin file: c:/Users/tbaru/AppData/Roaming/RabbitMQ/enabled_plugins
```

```
Enabled plugins:
```

```
* rabbitmq_management  
* amqp_client  
* rabbitmq_web_dispatch  
* cowboy  
* cowlib  
* rabbitmq_management_agent
```

```
←[1mData directory←[0m
```

```
Node data directory: c:/Users/tbaru/AppData/Roaming/RabbitMQ/db/rabbit@LAPTOP-55R4GGB6-mnesia
```

```
Raft data directory: c:/Users/tbaru/AppData/Roaming/RabbitMQ/db/rabbit@LAPTOP-55R4GGB6-mnesia/quorum/rabbit@LAPTOP-55R4GGB6
```

RabbitMQ Authentication Failed Error

- 1) In file explorer navigate to your user directory by pasting %userprofile% in your address bar.
- 2) In case if already .erlang.cookie file available in that location, just delete it otherwise go to the next step.
- 3) In a second File Explorer, navigate to C:\Windows\System32\config\systemprofile.
- 4) Find the file .erlang.cookie and copy it to your user directory.
- 5) Now your rabbitmqctl should be able to authenticate.

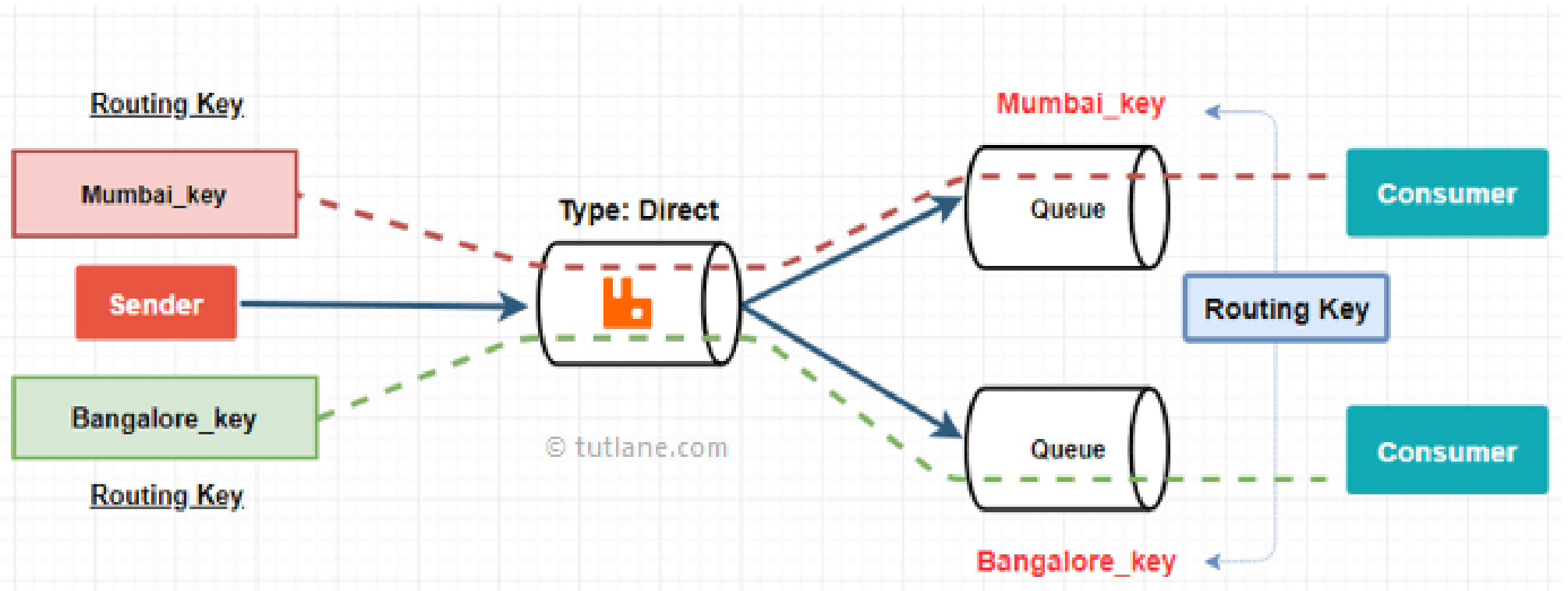
RabbitMQ Exchanges

- In rabbitmq, when producer creates a message that will not directly sent to a queue, instead first the message will be send to exchanges, then after that a routing agent reads and sends it to the appropriate queue with help of header attributes, bindings, and routing keys.

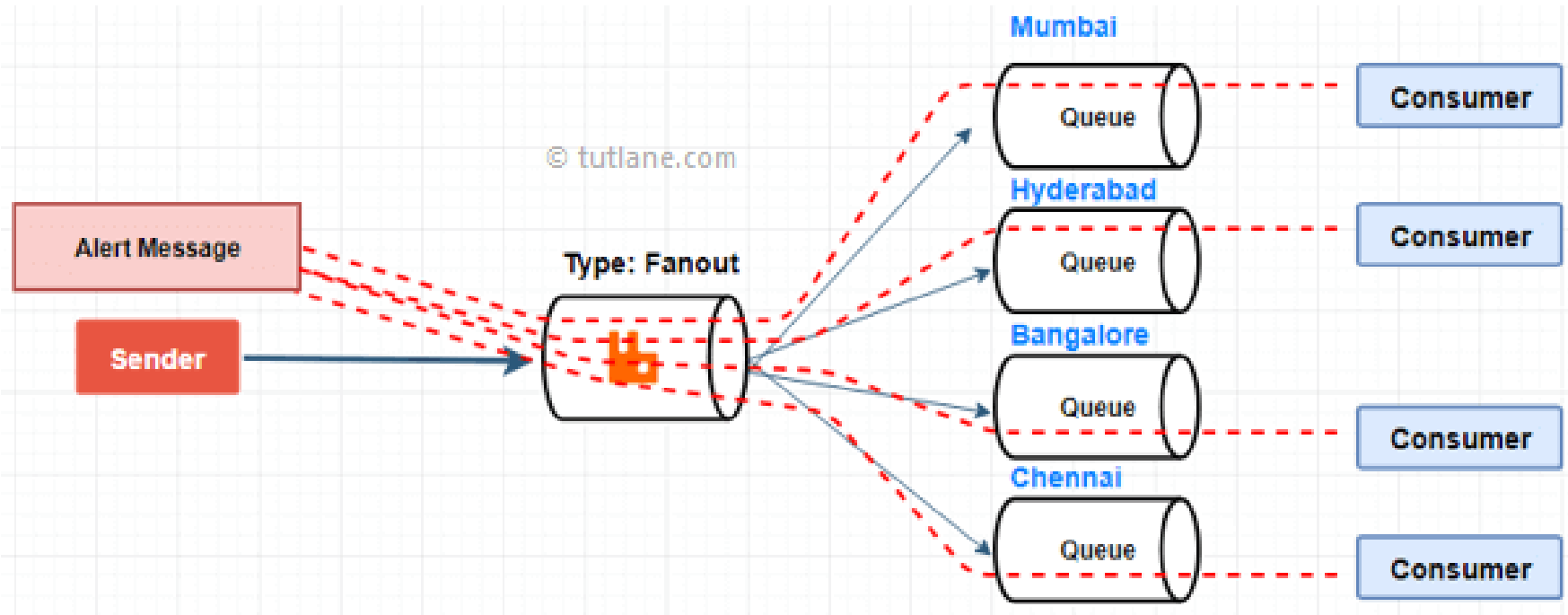
RabbitMQ Exchange Types

- **Direct** - deliver a messages to the queues based on the message routing key. In direct exchange, the message is routed to the queues whose binding key exactly matches with the routing key of the message.
- **Fanout** - fanout exchange will route messages to all of the queues that are bound to it.
- **Topic** - topic exchange will perform a wildcard match between the routing key and the routing pattern specified in the binding to publish a messages to queue.
- **Headers** - headers exchanges will use the message header attributes for routing.

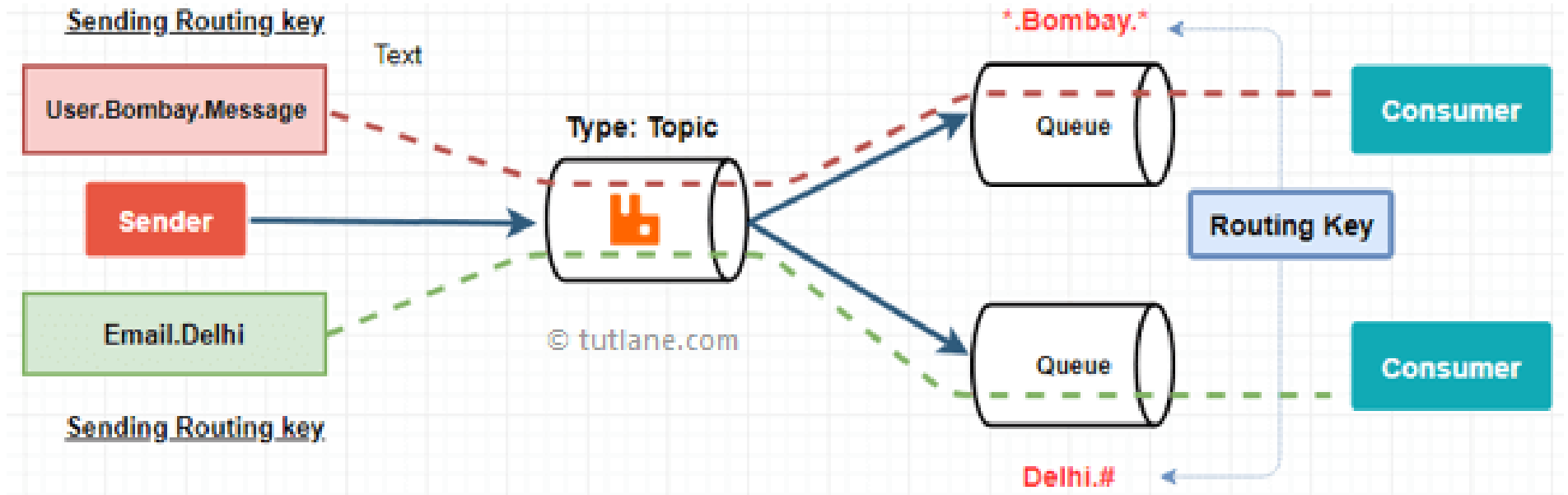
RabbitMQ Direct Exchange



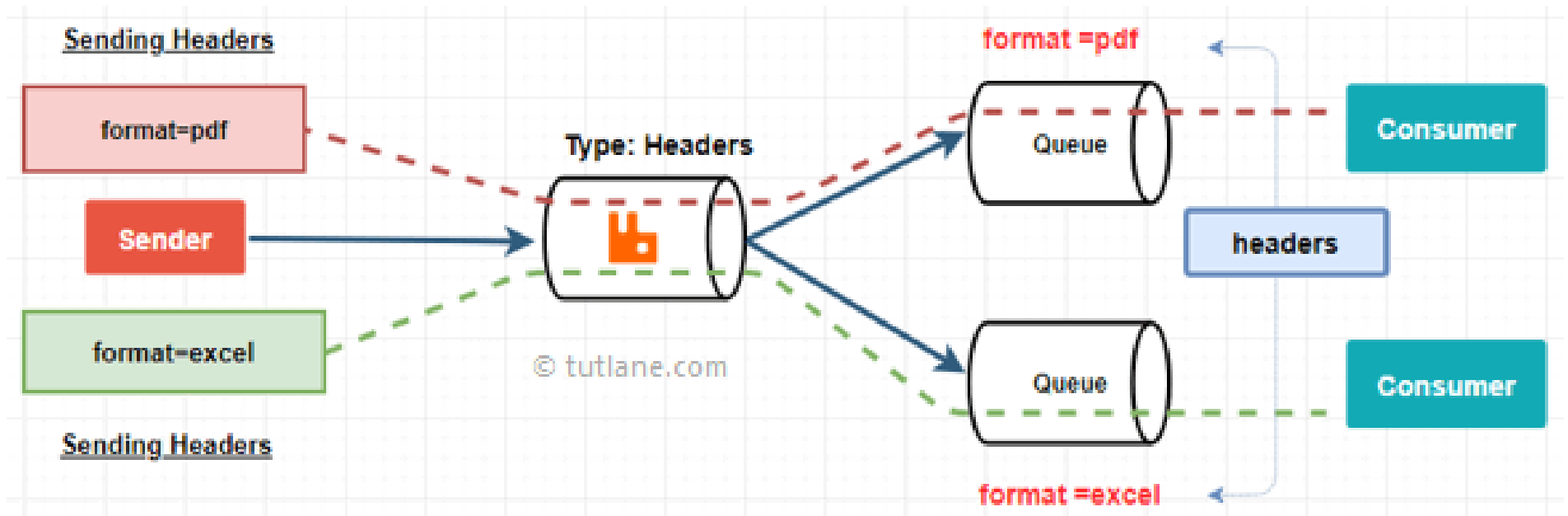
Fanout Exchange



Topic Exchange



How producer works?



How producer works?

- Producer class creates a connection, creates a channel, connects to a queue. If user enters quit then application terminates else it will send the message to the queue using basicPublish method.

Exchanges

Property	Description
Name	The name will be an exchange name which you will set and it must be unique.
Type	You can select required exchange type either topic or fanout, etc. based on your requirements.
Durability	By using durability (Durable, Transient) properties, If we select Durable, then the message will survive even after server restart. In case, if we select Tansient, then message will not service after server restart.
Auto Delete	By using auto delete property, we can set whether an exchange can delete if we unbind assigned queue.
Internal	If we set this property yes, then the exchange may not be used directly by publishers, but only when bound to other exchanges.
Alternate Exchange	If there is an issue in publishing message to exchange, then by using this property, we can specify an alternate exchange to send a message to queue.

Create Username and Password

- The default administrator username and password are guest and guest.
- On the navigation toolbar at the top, click Admin.
- In the navigation panel on the right, click Users.
- Under Users, click the administrator user.
- Click Update this user to expand the section.
- Next to Password, enter the new password twice, and then click Update user.
- `rabbitmqctl add_user passwordless-user "pa$$wordless"`
- `rabbitmqctl clear_password passwordless-user`



RabbitMQ 3.9.14 Erlang 24.3.3

Refreshed 2022-07-25 20:30:12 Refresh every 5 seconds

Virtual host All

Cluster rabbit@LAPTOP-55R4GGB6

User guest Log out

- Overview
- Connections
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- Queues
- Admin

Exchanges

All exchanges (8)

Pagination

Page 1 of 1 - Filter: ☐ Regex ?

Displaying 8 items , page size up to: 100

Name	Type	Features	Message rate in	Message rate out	+/-
(AMQP default)	direct	D	0.00/s	0.00/s	
MyExchange	fanout				
amq.direct	direct	D			
amq.fanout	fanout	D			
amq.headers	headers	D			
amq.match	headers	D			
amq.rabbitmq.trace	topic	D I			
amq.topic	topic	D			

Add a new exchange

Name:

Type: direct

Durability: Durable

Auto delete: ? No

Internal: ? No



RabbitMQ 3.9.14 Erlang 24.3.3

Refreshed 2022-07-25 20:36:28 Refresh every 5 seconds

Virtual host All

Cluster rabbit@LAPTOP-55R4GGB6

User guest Log out

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- Admin

Queues

All queues (1)

Pagination

Page 1 of 1 - Filter: ☐ Regex

Displaying 1 item , page size up to: 100

Overview				Messages			Message rates			+/-
Name	Type	Features	State	Ready	Unacked	Total	incoming	deliver / get	ack	
MyFirstQueue	classic		idle	1	0	1	0.00/s	0.00/s	0.00/s	

Add a new queue

Type: Classic

Name:

Durability: Durable

Auto delete: No

Arguments: = String

- Add Message TTL Auto expire Overflow behaviour Single active consumer
Dead letter exchange Dead letter routing key
Max length Max length bytes
Maximum priority Lazy mode Master locator

Add queue

Queues

Property	Description
Durability	If we mark queue as Durable, then it will survive even after server restarts.
Transient	If we mark exchange as Transient, then it will not survive after server restarts.

```
public class RabbitMQProducer {  
  
    private static String QUEUE = "MyFirstQueue";  
  
  
    public static void main(String[] args) throws IOException, TimeoutException {  
  
        ConnectionFactory factory = new ConnectionFactory();  
  
        factory.setHost("localhost");  
  
        try (Connection connection = factory.newConnection(); Channel channel =  
            connection.createChannel()) {  
  
            channel.queueDeclare(QUEUE, false, false, false, null);  
  
  
  
  
  
            Scanner input = new Scanner(System.in);  
  
            String message;  
  
            do {  
  
                System.out.println("Enter message: ");  
  
                message = input.nextLine();  
  
                channel.basicPublish("", QUEUE, null, message.getBytes());  
            } while (!message.equalsIgnoreCase("Quit"));  
        }  
    }  
}
```

RabbitMQ Consumer

- Consumer class creates a connection, creates a channel, creates a queue if not existent then receives message from queue if there is any and it will keep polling queue for messages. Once a message is delivered, it is handled by `basicConsume()` method using `deliverCallback`.


```
public class RabbitMQConsumerTest {  
  
    private static String QUEUE = "MyFirstQueue";  
  
    public static void main(String[] args) throws IOException, TimeoutException {  
        ConnectionFactory factory = new ConnectionFactory();  
        factory.setHost("localhost");  
        Connection connection = factory.newConnection();  
        Channel channel = connection.createChannel();  
  
        channel.queueDeclare(QUEUE, false, false, false, null);  
        System.out.println("Waiting for messages. To exit press CTRL+C");  
  
        DeliverCallback deliverCallback = (consumerTag, delivery) -> {  
            String message = new String(delivery.getBody(), StandardCharsets.UTF_8);  
            System.out.println("Received '" + message + "'");  
        };  
        channel.basicConsume(QUEUE, true, deliverCallback, consumerTag -> {  
            });  
    }  
}
```

RabbitMQ Bindings (Bind Queue to Exchange)

- Binding is a connection which is used to configure a relation between a queue and an exchange.
- Binding is a relationship between an exchange and a queue.
- This will be used for direct type exchange. In rabbitmq, exchange will route the request to particular queue on the basis of routing key.



RabbitMQ 3.9.14 Erlang 24.3.3

- Overview
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- Admin



Deliver (manual ack) 0.00/s

Deliver (auto ack) 0.00/s

Get (empty) 0.00/s

Get (manual ack) 0.00/s

Details	Features	State	idle	Messages ?	Total	Ready	Unacked	In memory	Persistent	Transient, Paged Out
	Policy	Consumers	0	Message body bytes ?	10 B	10 B	0 B	10 B	0 B	0 B
	Operator policy	Consumer capacity ?	0%	Process memory ?	12 kiB					
	Effective policy definition									

Consumers (0)

Bindings (1)

From	Routing key	Arguments
(Default exchange binding)		



Add binding to this queue

From exchange:

Routing key:

Arguments: = String

Bind

RabbitMQ Create Users

- To create a new user we need to navigate to Admin tab for that click on Admin tab.
- After navigate to Admin tab, we can see the default user (“guest”) details who is having “administrator” privileges and below that we have Add a user panel to add new user.
-

Users

All users

Filter: ☐ Regex ?

Name	Tags	Can access virtual hosts	Has password
guest	administrator	/, Dr. Tarkeshwar Barua, tbarua1	•

Add a user

Username:

Password: (confirm)

Tags: administrator

Add user

Comma-separated list of tags to apply to the user. Currently supported by the management plugin:

- management
User can access the management plugin
- polymaker
User can access the management plugin and manage policies and parameters for the vhosts they have access to.
- monitoring
User can access the management plugin and see all connections and channels as well as node-related information.
- administrator
User can do everything monitoring can do, manage users, vhosts and permissions, close other user's connections, and manage policies and parameters for all vhosts.

Note that you can set any tag here; the links for the above four tags are just for convenience.

Close

- Users
- Virtual Hosts
- Feature Flags
- Policies
- Limits
- Cluster

Create New User

Property	Description
Management	If we set this tag, the user can access management plugin.
Policy Maker	If we set this tag, the user can access management plugin and manage policies and parameters for the vhosts they have access to.
Monitoring	If we set this tag, the user can access management plugin and see all the connections and channels as well as node-related information.
Administrator	If we set this tag, the user can do everything in management like manage users, vhosts, permissions, close other user's connections, and manage policies and parameters for all vhosts.

```
public class AMQPPublisherDemo {  
  
    private static final String EXCHANGE = "MyExchange";  
  
    public static void main(String[] args) throws IOException, TimeoutException {  
        ConnectionFactory factory = new ConnectionFactory();  
        factory.setHost("localhost");  
  
        try (Connection connection = factory.newConnection(); Channel channel =  
            connection.createChannel()) {  
            channel.exchangeDeclare(EXCHANGE, "fanout");  
  
            Scanner input = new Scanner(System.in);  
  
            String message;  
  
            do {  
                System.out.println("Enter message: ");  
                message = input.nextLine();  
                channel.basicPublish(EXCHANGE, "", null, message.getBytes());  
            } while (!message.equalsIgnoreCase("Quit"));  
        }  
    }  
}
```

RabbitMQ Virtual Hosts

- Virtual hosts are like a virtual box which contains a logical grouping of connections, exchanges, queues, bindings, user permissions, policies etc.

Virtual Hosts

All virtual hosts

Filter: ☐ Regex ?

1 item, page size up to 100

Overview			Messages			Network		Message rates		+/-
Name	Users ?	State	Ready	Unacked	Total	From client	To client	publish	deliver / get	
/	guest	running	1	0	1	0 B/s	0 B/s	0.00/s	0.00/s	

Add a new virtual host

Name: *

Description:

Tags:

Add virtual host

- Users
- Virtual Hosts
- Feature Flags
- Policies
- Limits
- Cluster

```
public class AMQPSubscriberDemo {  
  
    private static String EXCHANGE = "MyExchange";  
  
    public static void main(String[] args) throws IOException, TimeoutException {  
        ConnectionFactory factory = new ConnectionFactory();  
        factory.setHost("localhost");  
        Connection connection = factory.newConnection();  
        Channel channel = connection.createChannel();  
        channel.exchangeDeclare(EXCHANGE, "fanout");  
  
        String queueName = channel.queueDeclare().getQueue();  
        channel.queueBind(queueName, EXCHANGE, "");  
        System.out.println("Waiting for messages. To exit press CTRL+C");  
  
        DeliverCallback deliverCallback = (consumerTag, delivery) -> {  
            String message = new String(delivery.getBody(), StandardCharsets.UTF_8);  
            System.out.println("Received '" + message + "'");  
        };  
        channel.basicConsume(queueName, true, deliverCallback, consumerTag -> {  
        });  
    }  
}
```

RabbitMQ Connections

- Connection is a TCP connection between our application and the rabbitmq broker.
- In rabbitmq web management portal, we can see all the live connections between rabbitmq broker and applications under Connections tab.
- If you are using SSL/TLS, then it will indicate with a dark dot “.” in the connection and it will also show which protocol is used and from client & to client network utilization details
- In our case there is no connection in Rabbit Broker



RabbitMQ 3.9.14 Erlang 24.3.3

Refreshed 2022-07-26 07:24:49 Refresh every 5 seconds

Virtual host All

Cluster rabbit@LAPTOP-55R4GGB6

User guest Log out

- Overview
- Connections
- Channels
- Exchanges
- Queues
- Admin

Connections

All connections (0)

Pagination

Page of 0 - Filter: ☐ Regex ?

Displaying 0 item , page size up to: 100

... no connections ...

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

RabbitMQ Channels

- channel is a virtual connection inside a connection and publishing or consuming a message from queue will happen over a channel.
- The Channels tab will show all the live channels of both producer and consumer messages along with that it will also show username, mode, state of channel, unconfirmed, prefetch, etc. Columns.



RabbitMQ 3.9.14 Erlang 24.3.3

Refreshed 2022-07-26 07:28:28 Refresh every 5 seconds

Virtual host All

Cluster rabbit@LAPTOP-55R4GGB6

User guest Log out

- Overview
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Channels

All channels (0)

Pagination

Page 1 of 0 - Filter: ☐ Regex ?

Displaying 0 item , page size up to: 100

... no channels ...

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

RabbitMQ Channels

Model	The Mode column can be either C (confirm) or T (transactional). If channel is transactional, then mode is T in case channel streaming publish confirmations then mode C.
State	It is used to show the state of channel.
Unconfirmed	It is used to show the number of published messages not yet confirmed.
Prefetch	It is used to show the details of per channel limit. In rabbitmq, each channel can have two prefetch counts one is per-consumer count, which will limit each new consumer created on the channel, and a global count, which is shared between all consumers on the channel
Unacked	It is used to show details of consumer that has promised to process them but has not acknowledged that they are processed .
Publish	It is used to show the message rates for publishing.
Confirm	It is used to show the message rates for confirming.
Deliver/get	It is used to show the delivered details.
ack	It is used to show the acknowledge details.

RabbitMQ Publish Messages to Queue

- we can directly publish messages to queue using web management portal for that we need to login into rabbitmq web management portal using default (guest) credentials
- After logging into rabbitmq web management portal, navigate to Queues tab and click on the queue (demoqueue) which you want to publish messages

Details

Features	State	<div><div></div> idle</div>	Total	Ready	Unacked	In memory	Persistent	Transient, Paged Out
Policy	Consumers	0	Messages ?	1	1	0	1	0
Operator policy			Message body bytes ?	10 B	10 B	0 B	10 B	0 B
Effective policy definition	Consumer capacity ?	0%	Process memory ?	12 kiB				

► Consumers (0)

► Bindings (1)

▼ Publish message

Message will be published to the default exchange with routing key **MyFirstQueue**, routing it to this queue.

Delivery mode: 1 - Non-persistent ▾

Headers: ?	=	String	▼
------------	---	--------	---

Properties: ? =

Payload:

Publish message

RabbitMQ Read Messages from Queue

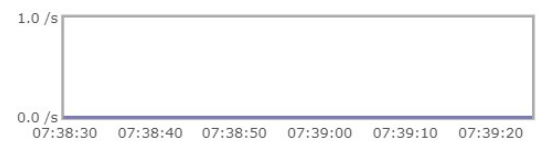
- we can read or consume a published messages from queue using web management portal for that we need to login into rabbitmq web management portal using default (guest) credentials
- After logging into rabbitmq web management portal, navigate to Queues tab and click on the queue (demoqueue) which you want to publish messages
- After clicking on particular queue (demoqueue), multiple panels will be shown from that click on Get messages panel like as shown below to read or get a messages from queue.



RabbitMQ 3.9.14 Erlang 24.3.3

- Overview
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Message rates last minute ?



Publish0.00/s

Deliver (manual ack)0.00/s

Deliver (auto ack)0.00/s

Consumer ack0.00/s

Redelivered0.00/s

Get (manual ack)0.00/s

Get (auto ack)0.00/s

Get (empty)0.00/s

Details

Features	State	idle								
Policy	Consumers	0	Messages ?	Total	Ready	Unacked	In memory	Persistent	Transient, Paged Out	
Operator policy	Consumer capacity ?	0%	Message body bytes ?	1	1	0	1	0	0	
Effective policy definition			Process memory ?	10 B	10 B	0 B	10 B	0 B	0 B	
				12 kiB						

- Consumers (0)
- Bindings (1)
- Publish message
- Get messages

Warning: getting messages from a queue is a destructive action. ?

Ack Mode: Nack message requeue true v

Encoding: Auto string / base64 v ?

Messages: 1

Get Message(s)

RabbitMQ Delete Messages from Queue

- we can delete a messages from queue or delete queue using web management portal for that we need to login into rabbitmq web management portal using default (guest) credentials
- After logging into rabbitmq web management portal, navigate to Queues tab and click on the queue (demoqueue) which you want to delete a message
- After clicking on particular queue (demoqueue), multiple panels will be shown from that click on Delete panel like as shown below to delete messages from queue



RabbitMQ 3.9.14 Erlang 24.3.3

Virtual host All Cluster rabbit@LAPTOP-55R4GGB6 User guest Log out

Overview Connections Channels Exchanges Queues Admin



ack 0.00/s

Deliver (manual ack) 0.00/s

Redelivered 0.00/s

Get (empty) 0.00/s

Deliver (auto ack) 0.00/s

Get (manual ack) 0.00/s

Details

Features	State	idle								
Policy	Consumers	0	Messages ?	Total	Ready	Unacked	In memory	Persistent	Transient, Paged Out	0
Operator policy	Consumer capacity ?	0%	Message body bytes ?	10 B	10 B	0 B	10 B	0 B		0 B
Effective policy definition			Process memory ?	12 kiB						

- Consumers (0)
- Bindings (1)
- Publish message
- Get messages
- Move messages

Delete

Delete Queue

- Purge
- Runtime Metrics (Advanced)