RabbitMQ tutorial - "Hello World!"

Introduction

INFO

Prerequisites

This tutorial assumes RabbitMQ is installed and running on `localhost` on the standard port (5672). In case you use a different host, port or credentials, connections settings would require adjusting.

Where to get help

If you're having trouble going through this tutorial you can contact us through GitHub Discussions or RabbitMQ community Discord.

RabbitMQ is a message broker: it accepts and forwards messages. You can think about it as a post office: when you put the mail that you want posting in a post box, you can be sure that the letter carrier will eventually deliver the mail to your recipient. In this analogy, RabbitMQ is a post box, a post office, and a letter carrier.

The major difference between RabbitMQ and the post office is that it doesn't deal with paper, instead it accepts, stores, and forwards binary blobs of data – *messages*.

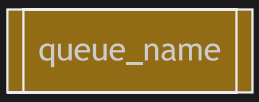
RabbitMQ, and messaging in general, uses some jargon.

- *Producing* means nothing more than sending. A program that sends messages is a *producer* :

- *A queue* is the name for the post box in RabbitMQ. Although messages flow through RabbitMQ and your applications, they can only be stored inside a *queue*. A *queue* is only bound by the host's memory & disk limits, it's essentially a large message buffer.

  Many *producers* can send messages that go to one queue, and many *consumers* can try to receive data from one *queue*.

  This is how we represent a queue:

- *Consuming* has a similar meaning to receiving. A *consumer* is a program that mostly waits to receive messages:

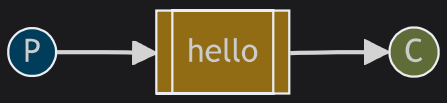
Note that the producer, consumer, and broker do not have to reside on the same host; indeed in most applications they don't. An application can be both a producer and consumer, too.

"Hello World"

(using the .NET/C# Client)

In this part of the tutorial we'll write two programs in C#; a producer that sends a single message, and a consumer that receives messages and prints them out. We'll gloss over some of the detail in the .NET client API, concentrating on this very simple thing just to get started. It's the "Hello World" of messaging.

In the diagram below, "P" is our producer and "C" is our consumer. The box in the middle is a queue - a message buffer that RabbitMQ keeps on behalf of the consumer.



> **The .NET client library**

> RabbitMQ speaks multiple protocols. This tutorial uses AMQP 0-9-1, which is an open, general-purpose protocol for messaging. There are a number of clients for RabbitMQ in many different languages. We'll use the .NET client provided by RabbitMQ.
>
> The client supports .NET Core as well as .NET Framework 4.5.1+. This tutorial will use RabbitMQ .NET client 5.0 and .NET Core so you will ensure you have it installed and in your PATH.
>
> You can also use the .NET Framework to complete this tutorial however the setup steps will be different.
>
> RabbitMQ .NET client 5.0 and later versions are distributed via nuget.
>
> This tutorial assumes you are using PowerShell on Windows. On MacOS and Linux nearly any shell will work.

Setup

First let's verify that you have .NET Core toolchain in `PATH`:

```
dotnet --help
```

should produce a help message.

Now let's generate two projects, one for the publisher and one for the consumer:

```
dotnet new console --name Send
mv Send/Program.cs Send/Send.cs
dotnet new console --name Receive
mv Receive/Program.cs Receive/Receive.cs
```

This will create two new directories named `Send` and `Receive`.

Then we add the client dependency.

```
cd Send
dotnet add package RabbitMQ.Client
```

```
cd ../Receive
dotnet add package RabbitMQ.Client
```

Now we have the .NET project set up we can write some code.

Sending

We'll call our message publisher (sender) `Send.cs` and our message consumer (receiver) `Receive.cs`. The publisher will connect to RabbitMQ, send a single message, then exit.

In `Send.cs`, we need to use some namespaces:

```
using System.Text;
using RabbitMQ.Client;
```

then we can create a connection to the server:

```
var factory = new ConnectionFactory { HostName = "localhost" };
using var connection = factory.CreateConnection();
using var channel = connection.CreateModel();
...
```

The connection abstracts the socket connection, and takes care of protocol version negotiation and authentication and so on for us. Here we connect to a RabbitMQ node on the local machine - hence the *localhost*. If we wanted to connect to a node on a different machine we'd simply specify its hostname or IP address here.

Next we create a channel, which is where most of the API for getting things done resides.

To send, we must declare a queue for us to send to; then we can publish a message to the queue:

```
using System.Text;
using RabbitMQ.Client;
```

```
var factory = new ConnectionFactory { HostName = "localhost" };
using var connection = factory.CreateConnection();
using var channel = connection.CreateModel();

channel.QueueDeclare(queue: "hello",
                     durable: false,
                     exclusive: false,
                     autoDelete: false,
                     arguments: null);

const string message = "Hello World!";
var body = Encoding.UTF8.GetBytes(message);

channel.BasicPublish(exchange: string.Empty,
                     routingKey: "hello",
                     basicProperties: null,
                     body: body);
Console.WriteLine($" [x] Sent {message}");

Console.WriteLine(" Press [enter] to exit.");
Console.ReadLine();
```

Declaring a queue is idempotent - it will only be created if it doesn't exist already. The message content is a byte array, so you can encode whatever you like there.

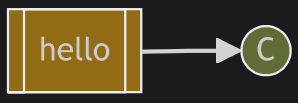
When the code above finishes running, the channel and the connection will be disposed. That's it for our publisher.

Here's the whole Send.cs class.

> **Sending doesn't work!**
>
> If this is your first time using RabbitMQ and you don't see the "Sent" message then you may be left scratching your head wondering what could be wrong. Maybe the broker was started without enough free disk space (by default it needs at least 50 MB free) and is therefore refusing to accept messages. Check the broker log file to see if there is a resource alarm logged and reduce the free disk space threshold if necessary. The Configuration guide will show you how to set `disk_free_limit`.

Receiving

As for the consumer, it is listening for messages from RabbitMQ. So unlike the publisher which publishes a single message, we'll keep the consumer running continuously to listen for messages and print them out.



The code (in `Receive.cs`) has almost the same `using` statements as `Send`:

```
using System.Text;
using RabbitMQ.Client;
using RabbitMQ.Client.Events;
```

Setting up is the same as the publisher; we open a connection and a channel, and declare the queue from which we're going to consume. Note this matches up with the queue that `Send` publishes to.

```
var factory = new ConnectionFactory { HostName = "localhost" };
using var connection = factory.CreateConnection();
using var channel = connection.CreateModel();

channel.QueueDeclare(queue: "hello",
                     durable: false,
                     exclusive: false,
                     autoDelete: false,
                     arguments: null);
...
```

Note that we declare the queue here as well. Because we might start the consumer before the publisher, we want to make sure the queue exists before we try to consume messages from it.

We're about to tell the server to deliver us the messages from the queue. Since it will push us messages asynchronously, we provide a callback. That is what `EventingBasicConsumer.Received` event handler does.

```
using System.Text;
using RabbitMQ.Client;
using RabbitMQ.Client.Events;
```

```
var factory = new ConnectionFactory { HostName = "localhost" };
using var connection = factory.CreateConnection();
using var channel = connection.CreateModel();

channel.QueueDeclare(queue: "hello",
                     durable: false,
                     exclusive: false,
                     autoDelete: false,
                     arguments: null);

Console.WriteLine(" [*] Waiting for messages.");

var consumer = new EventingBasicConsumer(channel);
consumer.Received += (model, ea) =>
{
    var body = ea.Body.ToArray();
    var message = Encoding.UTF8.GetString(body);
    Console.WriteLine($" [x] Received {message}");
};
channel.BasicConsume(queue: "hello",
                     autoAck: true,
                     consumer: consumer);

Console.WriteLine(" Press [enter] to exit.");
Console.ReadLine();
```

Here's the whole Receive.cs class.

Putting It All Together

Open two terminals.

You can run the clients in any order, as both declares the queue. We will run the consumer first so you can see it waiting for and then receiving the message:

```
cd Receive
dotnet run
```

Then run the producer:

```
cd Send
dotnet run
```

The consumer will print the message it gets from the publisher via RabbitMQ. The consumer will keep running, waiting for messages, so try restarting the publisher several times.

Time to move on to part 2 and build a simple *work queue*.