Red Hat Integration 2022.Q2

Developing Applications with Camel Extensions for Quarkus

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Legal Notice

Abstract

This guide is for developers writing Camel applications on top of Camel Extensions for Quarkus.

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PREFACE

MAKING OPEN SOURCE MORE INCLUSIVE

Red Hat is committed to replacing problematic language in our code, documentation, and web properties. We are beginning with these four terms: master, slave, blacklist, and whitelist. Because of the enormity of this endeavor, these changes will be implemented gradually over several upcoming releases. For more details, see our CTO Chris Wright's message .

CHAPTER 1. INTRODUCTION TO DEVELOPING APPLICATIONS WITH CAMEL EXTENSIONS FOR QUARKUS

This guide is for developers writing Camel applications on top of Camel Extensions for Quarkus.

Camel components which are supported in Camel Extensions for Quarkus have an associated Camel Extensions for Quarkus extension. For more information about the Camel Extensions for Quarkus extensions supported in this distribution, see the Camel Extensions for Quarkus reference guide.

IMPORTANT

Camel Extensions for Quarkus in Native Mode is a Technology Preview feature only.

CHAPTER 2. DEPENDENCY MANAGEMENT

2.1. QUARKUS TOOLING FOR STARTING A NEW PROJECT

A specific Camel Extensions for Quarkus release is supposed to work only with a specific Quarkus release.

The easiest and most straightforward way to get the dependency versions right in a new project is to use one of the Quarkus tools:

- code.quarkus.redhat.com - an online project generator,
- Quarkus Maven plugin

These tools allow you to select extensions and scaffold a new Maven project.

The generated **pom.xml** will look similar to the following:

```
<project>
  ...
  <properties>
    <quarkus.platform.artifact-id>quarkus-bom</quarkus.platform.artifact-id>
    <quarkus.platform.group-id>com.redhat.quarkus.platform</quarkus.platform.group-id>
    <quarkus.platform.version>
        <!-- The latest 2.2.x version from
https://maven.repository.redhat.com/ga/com/redhat/quarkus/platform/quarkus-bom -->
    </quarkus.platform.version>
    ...
  </properties>
  <dependencyManagement>
    <dependencies>
      <!-- The BOMs managing the dependency versions -->
      <dependency>
        <groupId>${quarkus.platform.group-id}</groupId>
        <artifactId>quarkus-bom</artifactId>
        <version>${quarkus.platform.version}</version>
        <type>pom</type>
        <scope>import</scope>
      </dependency>
      <dependency>
        <groupId>${quarkus.platform.group-id}</groupId>
        <artifactId>quarkus-camel-bom</artifactId>
        <version>${quarkus.platform.version}</version>
        <type>pom</type>
        <scope>import</scope>
      </dependency>
    </dependencies>
  </dependencyManagement>

  <dependencies>
    <!-- The extensions you chose in the project generator tool -->
    <dependency>
      <groupId>org.apache.camel.quarkus</groupId>
      <artifactId>camel-quarkus-sql</artifactId>
      <!-- No explicit version required here and below -->
```

```
    </dependency>
    ...
  </dependencies>
  ...
</project>
```

TIP

The universe of available extensions spans over Quarkus Core, Camel Quarkus and several other third party participating projects, such as Hazelcast, Cassandra, Kogito and OptaPlanner.

BOM stands for "Bill of Materials" - it is a **pom.xml** whose main purpose is to manage the versions of artifacts so that end users importing the BOM in their projects do not need to care which particular versions of the artifacts are supposed to work together. In other words, having a BOM imported in the **<depependencyManagement>** section of your **pom.xml** allows you to avoid specifying versions for the dependencies managed by the given BOM.

The particular BOMs that are contained in the **pom.xml** depend on the extensions that you select using the generator tools which are configured to select a minimal set of consistent BOMs.

If you choose to add an extension at a later point that is not managed by any of the BOMs in your **pom.xml** file, you do not need to search for the appropriate BOM manually. With the **quarkus-maven-plugin** you can select the extension, and the tool adds the appropriate BOM as required. You can also use the **quarkus-maven-plugin** to upgrade the BOM versions.

The **com.redhat.quarkus.platform** BOMs are aligned with each other which means that if an artifact is managed in more than one BOM, it is always managed with the same version. This has the advantage that application developers do not need to care for the compatibility of the individual artifacts that may come from various independent projects.

CHAPTER 3. DEFINING CAMEL ROUTES

Camel Extensions for Quarkus supports the Java DSL language to define Camel Routes.

3.1. JAVA DSL

Extending **org.apache.camel.builder.RouteBuilder** and using the fluent builder methods available there is the most common way of defining Camel Routes. Here is a simple example of a route using the timer component:

```
import org.apache.camel.builder.RouteBuilder;

public class TimerRoute extends RouteBuilder {

    @Override
    public void configure() throws Exception {
        from("timer:foo?period=1000")
                .log("Hello World");
    }
}
```

3.1.1. Endpoint DSL

Since Camel 3.0, you can use fluent builders also for defining Camel endpoints. The following is equivalent with the previous example:

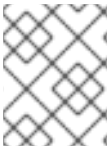
```
import org.apache.camel.builder.RouteBuilder;
import static org.apache.camel.builder.endpoint.StaticEndpointBuilders.timer;

public class TimerRoute extends RouteBuilder {

    @Override
    public void configure() throws Exception {
        from(timer("foo").period(1000))
                .log("Hello World");
    }
}
```

NOTE

Builder methods for all Camel components are available via **camel-quarkus-core**, but you still need to add the given component's extension as a dependency for the route to work properly. In case of the above example, it would be **camel-quarkus-timer**.

CHAPTER 4. CONFIGURATION

Camel Quarkus automatically configures and deploys a Camel Context bean which by default is started/stopped according to the Quarkus Application lifecycle. The configuration step happens at build time during Quarkus' augmentation phase and it is driven by the Camel Quarkus extensions which can be tuned using Camel Quarkus specific **quarkus.camel.*** properties.



NOTE

quarkus.camel.* configuration properties are documented on the individual extension pages - for example see Camel Quarkus Core.

After the configuration is done, a minimal Camel Runtime is assembled and started in the RUNTIME_INIT phase.

4.1. CONFIGURING CAMEL COMPONENTS

4.1.1. application.properties

To configure components and other aspects of Apache Camel through properties, make sure that your application depends on **camel-quarkus-core** directly or transitively. Because most Camel Quarkus extensions depend on **camel-quarkus-core**, you typically do not need to add it explicitly.

camel-quarkus-core brings functionalities from Camel Main to Camel Quarkus.

In the example below, you set a specific **ExchangeFormatter** configuration on the **LogComponent** via **application.properties**:

```
camel.component.log.exchange-formatter =
#class:org.apache.camel.support.processor.DefaultExchangeFormatter
camel.component.log.exchange-formatter.show-exchange-pattern = false
camel.component.log.exchange-formatter.show-body-type = false
```

4.1.2. CDI

You can also configure a component programmatically using CDI.

The recommended method is to observe the **ComponentAddEvent** and configure the component before the routes and the **CamelContext** are started:

```
import javax.enterprise.context.ApplicationScoped;
import javax.enterprise.event.Observes;
import org.apache.camel.quarkus.core.events.ComponentAddEvent;
import org.apache.camel.component.log.LogComponent;
import org.apache.camel.support.processor.DefaultExchangeFormatter;

@ApplicationScoped
public static class EventHandler {
    public void onComponentAdd(@Observes ComponentAddEvent event) {
        if (event.getComponent() instanceof LogComponent) {
            /* Perform some custom configuration of the component */
            LogComponent logComponent = ((LogComponent) event.getComponent());
            DefaultExchangeFormatter formatter = new DefaultExchangeFormatter();
```

```
            formatter.setShowExchangePattern(false);
            formatter.setShowBodyType(false);
            logComponent.setExchangeFormatter(formatter);
        }
    }
}
```

4.1.2.1. Producing a @Named component instance

Alternatively, you can create and configure the component yourself in a **@Named** producer method. This works as Camel uses the component URI scheme to look-up components from its registry. For example, in the case of a **LogComponent** Camel looks for a **log** named bean.

WARNING

Please note that while producing a **@Named** component bean will usually work, it may cause subtle issues with some components.

Camel Quarkus extensions may do one or more of the following:

- Pass custom subtype of the default Camel component type. See the Vert.x WebSocket extension example.
- Perform some Quarkus specific customization of the component. See the JPA extension example.

These actions are not performed when you produce your own component instance, therefore, configuring components in an observer method is the recommended method.

```
import javax.enterprise.context.ApplicationScoped;
import javax.inject.Named;

import org.apache.camel.component.log.LogComponent;
import org.apache.camel.support.processor.DefaultExchangeFormatter;

@ApplicationScoped
public class Configurations {
    /**
     * Produces a {@link LogComponent} instance with a custom exchange formatter set-up.
     */
    @Named("log") 1
    LogComponent log() {
        DefaultExchangeFormatter formatter = new DefaultExchangeFormatter();
        formatter.setShowExchangePattern(false);
        formatter.setShowBodyType(false);

        LogComponent component = new LogComponent();
        component.setExchangeFormatter(formatter);
```

```
        return component;
    }
}
```

1 The **"log"** argument of the **@Named** annotation can be omitted if the name of the method is the same.

4.2. CONFIGURATION BY CONVENTION

In addition to support configuring Camel through properties, **camel-quarkus-core** allows you to use conventions to configure the Camel behavior. For example, if there is a single **ExchangeFormatter** instance in the CDI container, then it will automatically wire that bean to the **LogComponent**.

4.3. METERING LABELS

You can apply labels to pods using the Metering Operator on OpenShift Container Platform version 4.8 and earlier. From version 4.9 onward, the Metering Operator is no longer available without a direct replacement.

NOTE

Do not add metering labels to any pods that an operator or a template deploys and manages.

Camel Quarkus can use the following metering labels:

- **com.company: Red_Hat**
- **rht.prod_name: Red_Hat_Integration**
- **rht.prod_ver: 2021.Q4**
- **rht.comp: "Camel-Quarkus"**
- **rht.comp_ver: 2.2.0**
- **rht.subcomp: {sub-component-name}**
- **rht.subcomp_t: application**

Additional resources

- Configuring and using Metering in OpenShift Container Platform

CHAPTER 5. CONTEXTS AND DEPENDENCY INJECTION (CDI) IN CAMEL QUARKUS

CDI plays a central role in Quarkus and Camel Quarkus offers a first class support for it too.

You may use **@Inject**, **@ConfigProperty** and similar annotations e.g. to inject beans and configuration values to your Camel **RouteBuilder**, for example:

```
import javax.enterprise.context.ApplicationScoped;
import javax.inject.Inject;
import org.apache.camel.builder.RouteBuilder;
import org.eclipse.microprofile.config.inject.ConfigProperty;

@ApplicationScoped (1)
public class TimerRoute extends RouteBuilder {

    @ConfigProperty(name = "timer.period", defaultValue = "1000") (2)
    String period;

    @Inject
    Counter counter;

    @Override
    public void configure() throws Exception {
        fromF("timer:foo?period=%s", period)
                .setBody(exchange -> "Incremented the counter: " + counter.increment())
                .to("log:cdi-example?showExchangePattern=false&showBodyType=false");
    }
}
```

(1) The **@ApplicationScoped** annotation is required for **@Inject** and **@ConfigProperty** to work in a **RouteBuilder**. Note that the **@ApplicationScoped** beans are managed by the CDI container and their life cycle is thus a bit more complex than the one of the plain **RouteBuilder**. In other words, using **@ApplicationScoped** in **RouteBuilder** comes with some boot time penalty and you should therefore only annotate your **RouteBuilder** with **@ApplicationScoped** when you really need it.

(2) The value for the **timer.period** property is defined in **src/main/resources/application.properties** of the example project.

TIP

Please refer to the Quarkus Dependency Injection guide for more details.

5.1. ACCESSING CAMELCONTEXT

To access **CamelContext** just inject it into your bean:

```
import javax.inject.Inject;
import javax.enterprise.context.ApplicationScoped;
import java.util.stream.Collectors;
import java.util.List;
import org.apache.camel.CamelContext;
```

```
@ApplicationScoped
public class MyBean {

    @Inject
    CamelContext context;

    public List<String> listRouteIds() {
        return context.getRoutes().stream().map(Route::getId).sorted().collect(Collectors.toList());
    }
}
```

5.2. CDI AND THE CAMEL BEAN COMPONENT

5.2.1. Refer to a bean by name

To refer to a bean in a route definition by name, just annotate the bean with **@Named("myNamedBean")** and **@ApplicationScoped**. The **@RegisterForReflection** annotation is important for the native mode.

```
import javax.enterprise.context.ApplicationScoped;
import javax.inject.Named;
import io.quarkus.runtime.annotations.RegisterForReflection;

@ApplicationScoped
@Named("myNamedBean")
@RegisterForReflection
public class NamedBean {
    public String hello(String name) {
        return "Hello " + name + " from the NamedBean";
    }
}
```

Then you can use the **myNamedBean** name in a route definition:

```
import org.apache.camel.builder.RouteBuilder;
public class CamelRoute extends RouteBuilder {
    @Override
    public void configure() {
        from("direct:named")
                .to("bean:namedBean?method=hello");
    }
}
```

CHAPTER 6. OBSERVABILITY

6.1. HEALTH & LIVENESS CHECKS

Health & liveness checks are supported via the MicroProfile Health extension.

They can be configured via the Camel Health API or via Quarkus MicroProfile Health.

All configured checks are available on the standard MicroProfile Health endpoint URLs:

- http://localhost:8080/q/health
- http://localhost:8080/q/health/live
- http://localhost:8080/q/health/ready

6.2. METRICS

We provide MicroProfile Metrics for exposing metrics.

Some basic Camel metrics are provided for you out of the box, and these can be supplemented by configuring additional metrics in your routes.

Metrics are available on the standard Quarkus metrics endpoint:

- http://localhost:8080/q/metrics

CHAPTER 7. NATIVE MODE

For additional information about compiling and testing application in native mode, see Producing a native executable in the *Compiling your Quarkus applications to native executables* guide.

IMPORTANT

Technology Preview features are not supported with Red Hat production service level agreements (SLAs), might not be functionally complete, and Red Hat does not recommend using them in production. These features provide early access to upcoming product features, enabling customers to test functionality and provide feedback during the development process. For more information, see Red Hat Technology Preview features support scope.

7.1. CHARACTER ENCODINGS

By default, not all **Charsets** are available in native mode.

```
Charset.defaultCharset(), US-ASCII, ISO-8859-1, UTF-8, UTF-16BE, UTF-16LE, UTF-16
```

If you expect your application to need any encoding not included in this set or if you see an **UnsupportedCharsetException** thrown in the native mode, please add the following entry to your **application.properties**:

```
quarkus.native.add-all-charsets = true
```

See also quarkus.native.add-all-charsets in Quarkus documentation.

7.2. LOCALE

By default, only the building JVM default locale is included in the native image. Quarkus provides a way to set the locale via **application.properties**, so that you do not need to rely on **LANG** and **LC_*** environement variables:

```
quarkus.native.user-country=US
quarkus.native.user-language=en
```

There is also support for embedding multiple locales into the native image and for selecting the default locale via Mandrel command line options **-H:IncludeLocales=fr,en**, **H:+IncludeAllLocales** and **-H:DefaultLocale=de**. You can set those via the Quarkus **quarkus.native.additional-build-args** property.

7.3. EMBEDDING RESOURCES IN THE NATIVE EXECUTABLE

Resources accessed via **Class.getResource()**, **Class.getResourceAsStream()**, **ClassLoader.getResource()**, **ClassLoader.getResourceAsStream()**, etc. at runtime need to be explicitly listed for including in the native executable.

This can be done using Quarkus **quarkus.native.resources.includes** and **quarkus.native.resources.excludes** properties in **application.properties** file as demonstrated below:

```
quarkus.native.resources.includes = docs/*,images/*
quarkus.native.resources.excludes = docs/ignored.adoc,images/ignored.png
```

In the example above, resources named **docs/included.adoc** and **images/included.png** would be embedded in the native executable while **docs/ignored.adoc** and **images/ignored.png** would not.

resources.includes and **resources.excludes** are both lists of comma separated Ant-path style glob patterns.

Please refer to Camel Extensions for Quarkus Reference for more details.

7.4. USING THE ONEXCEPTION CLAUSE IN NATIVE MODE

When using camel onException handling in native mode, it is the application developers responsibility to register exception classes for reflection.

For instance, having a camel context with onException handling as below:

```
onException(MyException.class).handled(true);
from("direct:route-that-could-produce-my-exception").throw(MyException.class);
```

The class **mypackage.MyException** should be registered for reflection, see more in Registering classes for reflection.

7.5. REGISTERING CLASSES FOR REFLECTION

By default, dynamic reflection is not available in native mode. Classes for which reflective access is needed, have to be registered for reflection at compile time.

In many cases, application developers do not need to care because Quarkus extensions are able to detect the classes that require the reflection and register them automatically.

However, in some situations, Quarkus extensions may miss some classes and it is up to the application developer to register them. There are two ways to do that:

1. The **@io.quarkus.runtime.annotations.RegisterForReflection** annotation can be used to register classes on which it is used, or it can also register third party classes via its **targets** attribute.

2. The **quarkus.camel.native.reflection** options in **application.properties**:

   ```
   quarkus.camel.native.reflection.include-patterns = org.apache.commons.lang3.tuple.*
   quarkus.camel.native.reflection.exclude-patterns = org.apache.commons.lang3.tuple.*Triple
   ```

   For these options to work properly, the artifacts containing the selected classes must either contain a Jandex index ('META-INF/jandex.idx') or they must be registered for indexing using the 'quarkus.index-dependency.*' options in 'application.properties' - e.g.

   ```
   quarkus.index-dependency.commons-lang3.group-id = org.apache.commons
   quarkus.index-dependency.commons-lang3.artifact-id = commons-lang3
   ```

7.6. REGISTERING CLASSES FOR SERIALIZATION

If serialization support is requested via **quarkus.camel.native.reflection.serialization-enabled**, the classes listed in CamelSerializationProcessor.BASE_SERIALIZATION_CLASSES are automatically registered for serialization.

Users can register more classes using **@RegisterForReflection(serialization = true)**.