

# Context Propagation in Quarkus

Traditional blocking code uses `ThreadLocal` variables to store contextual objects in order to avoid passing them as parameters everywhere. Many Quarkus extensions require those contextual objects to operate properly: `RESTEasy`, `ArC` and `Transaction` for example.

If you write reactive/async code, you have to cut your work into a pipeline of code blocks that get executed "later", and in practice after the method you defined them in have returned. As such, `try/finally` blocks as well as `ThreadLocal` variables stop working, because your reactive code gets executed in another thread, after the caller ran its `finally` block.

`MicroProfile Context Propagation` was made to make those Quarkus extensions work properly in reactive/async settings. It works by capturing those contextual values that used to be in thread-locals, and restoring them when your code is called.

## Setting it up

If you are using `SmallRye Reactive Streams Operators` (the `quarkus-smallrye-reactive-streams-operators` module), you get automatic context propagation for all your streams, because the `quarkus-smallrye-context-propagation` module is automatically imported.

If you are not using `SmallRye Reactive Streams Operators`, add the following to your `pom.xml`:

```
<dependencies>
  <!-- Context Propagation extension -->
  <dependency>
    <groupId>io.quarkus</groupId>
    <artifactId>quarkus-smallrye-context-
propagation</artifactId>
  </dependency>
</dependencies>
```

With this, you will get context propagation for `ArC`, `RESTEasy` and transactions, if you are using them.

## Usage example with SmallRye Reactive Streams Operators

If you are using `SmallRye Reactive Streams Operators` (the `quarkus-smallrye-reactive-streams-operators` module), you get context propagation out of the box, so, for example, let's write a REST endpoint that reads the next 3 items from a `Kafka topic`, stores them in a database using `Hibernate ORM with Panache` (all in the same transaction) before returning them to the client, you can do it like this:

```

// Get the price-stream Kafka topic
@Inject
@Channel("price-stream") Publisher<Double> prices;

@Transactional
@GET
@Path("/prices")
public Publisher<Double> prices() throws SystemException {
    // get the next three prices from the price stream
    return ReactiveStreams.fromPublisher(prices)
        .limit(3)
        .map(price -> {
            // store each price before we send them
            Price priceEntity = new Price();
            priceEntity.value = price;
            // here we are all in the same transaction
            // thanks to context propagation
            priceEntity.persist();

            return price;
        })
        .buildRs();
}

```

Notice that thanks to automatic support for context propagation with Reactive Streams Operators this works out of the box.

## Usage example for CompletionStage

If you are using `CompletionStage` you need manual context propagation. You can do that by injecting a `ThreadContext` or `ManagedExecutor` that will propagate every context. For example, here we use the `Vert.x Web Client` to get the list of Star Wars people, then store them in the database using `Hibernate ORM with Panache` (all in the same transaction) before returning them to the client:

```

@Inject ThreadContext threadContext;
@Inject Vertx vertx;

@Transactional
@GET
@Path("/people")
public CompletionStage<Person> people() throws SystemException
{
    // Create a REST client to the Star Wars API
    WebClient client = WebClient.create(vertx,
        new WebClientOptions()
            .setDefaultHost("swapi.co")
            .setDefaultPort(443)
            .setSsl(true));
    // get the list of Star Wars people, with context capture
    return threadContext.withContextCapture(client.get(
"/api/people/").send())
        .thenApply(response -> {
            JsonObject json = response.bodyAsJsonObject();
            List<Person> persons = new ArrayList<>(json
.getInteger("count"));
            // Store them in the DB
            // Note that we're still in the same
transaction as the outer method
            for (Object element : json.getJsonArray(
"results")) {
                Person person = new Person();
                person.name = ((JsonObject)element)
.getString("name");
                person.persist();
                persons.add(person);
            }
            return persons;
        });
}

```

Using `ThreadContext` or `ManagedExecutor` you can wrap most useful functional types and `CompletionStage` in order to get context propagated.



The injected `ManagedExecutor` uses the Quarkus thread pool.

## Adding support for RxJava2

If you use Reactive Streams Operators (the `quarkus-smallrye-reactive-streams-operators` module), you get support for `RxJava2` context propagation automatically, but if you don't, you may want to include the following modules to get `RxJava2` support:

```

<dependencies>
  <!-- Automatic context propagation for RxJava2 -->
  <dependency>
    <groupId>io.smallrye</groupId>
    <artifactId>smallrye-context-propagation-propagators-
rxjava2</artifactId>
  </dependency>
  <!--
    Required if you want transactions extended to the end of
    methods returning
    an RxJava2 type.
  -->
  <dependency>
    <groupId>io.smallrye.reactive</groupId>
    <artifactId>smallrye-reactive-converter-
rxjava2</artifactId>
  </dependency>
  <!-- Required if you return RxJava2 types from your REST
    endpoints -->
  <dependency>
    <groupId>org.jboss.resteasy</groupId>
    <artifactId>resteasy-rxjava2</artifactId>
  </dependency>
</dependencies>

```