

# 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 `Mutiny` (the `quarkus-mutiny` extension), you just need to add the the `quarkus-smallrye-context-propagation` extension to enable context propagation.

In other words, add the following dependencies to your `pom.xml`:

```
<dependencies>
  <!-- Mutiny and RestEasy support extensions if not already
included -->
  <dependency>
    <groupId>io.quarkus</groupId>
    <artifactId>quarkus-mutiny</artifactId>
  </dependency>
  <dependency>
    <groupId>io.quarkus</groupId>
    <artifactId>quarkus-resteasy-mutiny</artifactId>
  </dependency>
  <!-- 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 Mutiny



## *Mutiny*

This section uses Mutiny reactive types, if you're not familiar with them, read the [Getting Started with Reactive guide](#) first.

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 prices stream
@Inject
@Channel("prices") Publisher<Double> prices;

@Transactional
@GET
@Path("/prices")
@Produces(MediaType.SERVER_SENT_EVENTS)
@SseElementType(MediaType.TEXT_PLAIN)
public Publisher<Double> prices() {
    // get the next three prices from the price stream
    return Multi.createFrom().publisher(prices)
        .transform().byTakingFirstItems(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;
            // the transaction is committed once the stream
            // completes
        });
}
```

Notice that thanks to Mutiny support for context propagation, this works out of the box. The 3 items are persisted using the same transaction and this transaction is committed when the stream completes.

## 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 as

JSON using [JSON-B](#) or [Jackson](#):

```
@Inject ThreadContext threadContext;
@Inject ManagedExecutor managedExecutor;
@Inject Vertx vertx;

@Transactional
@GET
@Path("/people")
@Produces(MediaType.APPLICATION_JSON)
public CompletionStage<List<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())
        .thenApplyAsync(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;
        }, managedExecutor);
}
```

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>
```