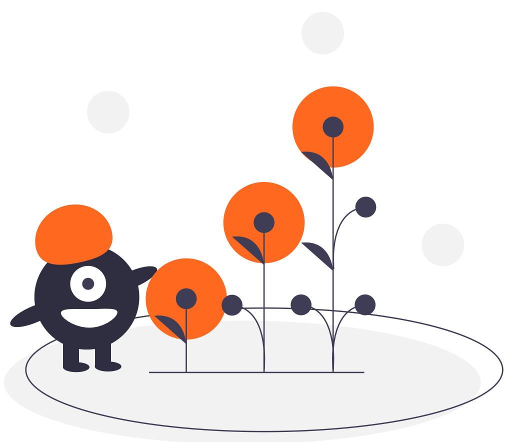


Spring Transaction Management: @Transactional In-Depth

Last updated on December 17, 2019 - 21 comments

You can use this guide to get a simple and practical understanding of how Spring's transaction management with the @Transactional annotation works.

The only prerequisite? You need to have a rough idea about ACID, i.e. what database transactions are and why to use them. Also, distributed transactions or reactive transactions are not covered here, though the general principles, in terms of Spring, still apply.

Introduction

In this guide you are going to learn about the main pillars of Spring core's *transaction abstraction framework* (a confusing term, isn't it?) - described with a lot of code examples:

- @Transactional (Declarative Transaction Management) vs Programmatic Transaction Management.
- Physical vs Logical transactions.
- Spring @Transactional and JPA / Hibernate integration.
- Spring @Transactional and Spring Boot or Spring MVC integration.
- Rollbacks, Proxies, Common Pitfalls and much more.

As opposed to, say, the official Spring documentation, this guide won't confuse you by diving right into the topic *Spring-first*.

Instead you are going to learn Spring transaction management the *unconventional way*: From the ground up, step by step. This means, starting with plain old JDBC transaction management.

Why?

Because everything that Spring does is *based on* these very JDBC basics. And you'll save a ton of time with Spring's @Transactional annotation later, if you grasp these basics.

How plain JDBC Transaction Management works

If you are thinking of skipping this section, without knowing JDBC transactions inside-out: **don't**.

How to start, commit or rollback JDBC transactions

The first important take-away is this: It does not matter if you are using Spring's @Transactional annotation, plain Hibernate, jOOQ or any other database library.

In the end, they *all do the very same thing* to open and close (let's call that 'manage') database transactions. Plain JDBC transaction management code looks like this:

```
import java.sql.Connection;

Connection connection =
dataSource.getConnection(); // (1)

try (connection) {
    connection.setAutoCommit(false); // (2)
    // execute some SQL statements...
    connection.commit(); // (3)

} catch (SQLException e) {
    connection.rollback(); // (4)
}
```

1. You need a connection to the database to start transactions. DriverManager.getConnection(url, user, password) would work as well, though in most enterprise-y applications you will have a data source configured and get connections from that.
2. This is the **only** way to start a database transaction in Java, even though the name might sound a bit off. *setAutoCommit(true)* wraps every single SQL statement in its own transaction and *setAutoCommit(false)* is the opposite: You are the master of the transaction.
3. Let's commit our transaction...

4. Or, rollback our changes, if there was an exception.

Yes, these 4 lines are (oversimplified) everything that Spring does whenever you are using the @Transactional annotation. In the next chapter you'll find out how that works. But before we go there, there's a tiny bit more you need to learn.

(A quick note for smarty-pants: Connection pool libraries like HikariCP might toggle the autocommit mode automatically for you, depending on the configuration. But that is an advanced topic.)

How to use JDBC isolation levels and savepoints

If you already played with Spring's @Transactional annotation you might have encountered something like this:

```
@Transactional(propagation=TransactionDefinition


isolation=TransactionDefinition.ISOLATION_READ_U
```

We will cover nested Spring transactions and isolation levels later in more detail, but again it helps to know that these parameters all boil down to the following, basic JDBC code:

```
import java.sql.Connection;

//
isolation=TransactionDefinition.ISOLATION_READ_U


connection.setTransactionIsolation(Connection.TR
 // (1)

// propagation=TransactionDefinition.NESTED

Savepoint savePoint =
connection.setSavepoint(); // (2)
...
connection.rollback(savePoint);
```

1. This is how Spring sets isolation levels on a database connection. Not exactly rocket science, is it?

2. Nested transactions in Spring are just JDBC / database savepoints. If you don't know what a savepoint is, have a look at this tutorial, for example. Note that savepoint support is dependent on your JDBC driver/database.

Recommended: Practice JDBC basics

You can find a ton of code examples and exercises on plain JDBC connections and transactions in the *Plain JDBC* chapter of **this Java database e-book**.

How Spring's or Spring Boot's Transaction Management works

As you now have a good JDBC transaction understanding, let's have a look at how plain, core Spring manages transactions. Everything here applies 1:1 to Spring Boot and Spring MVC, but more about that a bit later..

What actually *is* Spring's transaction management or its (rather confusingly named) transaction abstraction framework?

Remember, transaction management simply means: How does Spring start, commit or rollback JDBC transactions? Does this sound in any way familiar from above?

Here's the catch: Whereas with plain JDBC you only have one way (setAutocommit(false)) to manage transactions, Spring offers you many different, more convenient ways to achieve the same.

How to use Spring's Programmatic Transaction Management?

The first, but rather sparingly used way to define transactions in Spring is programmatically: Either through a TransactionTemplate or directly through the PlatformTransactionManager. Code-wise, it looks like this:

```
@Service
public class UserService {

    @Autowired
    private TransactionTemplate template;

    public Long registerUser(User user) {
        Long id = template.execute(status ->
{
            // execute some SQL that e.g.
            // inserts the user into the db
and returns the autogenerated id
            return id;
        });
    }
}
```

Compared with the plain JDBC example:

- You do not have to mess with opening or closing database connections yourself (try-finally). Instead you use Transaction Callbacks.
- You also do not have to catch SQLExceptions, as Spring converts these exceptions to runtime exceptions for you.
- And you have better integration into the Spring ecosystem. TransactionTemplate will use a TransactionManager internally, which will use a data source. All are beans that you have to specify in your Spring context configuration, but then don't have to worry about anymore later on.

While this counts as a minor improvement, programmatic transaction management is not what Spring's transaction framework mainly is about. Instead, it's all about *declarative transaction management*. Let's find out what that is.

How to use Spring's XML Declarative Transaction Management?

Back in the day, when XML configuration was the norm for Spring projects, you could configure transactions directly in XML. Apart from a couple of legacy, enterprise projects, you won't find this approach anymore in the wild, as it has been superseded with the much simpler @Transactional annotation.

We will not go into detail on XML configuration in this guide, but you can use this example as a starting point to dive deeper into it - if needed (taken straight from the official Spring documentation):

```
<!-- the transactional advice (what 'happens';
see the <aop:advisor/> bean below) -->
    <tx:advice id="txAdvice" transaction-
manager="txManager">
        <!-- the transactional semantics... --
>
        <tx:attributes>
            <!-- all methods starting with
'get' are read-only -->
            <tx:method name="get*" read-
only="true"/>
            <!-- other methods use the default
transaction settings (see below) -->
            <tx:method name="*"/>
        </tx:attributes>
    </tx:advice>
```

You are specifying an AOP advice (Aspect Oriented Programming) with the above XML block, that you can then apply to your UserService bean like so:

```
<aop:config>
    <aop:pointcut id="userServiceOperation"
expression="execution(*
x.y.service.UserService.*(..))"/>
    <aop:advisor advice-ref="txAdvice"
pointcut-ref="userServiceOperation"/>
</aop:config>

<bean id="userService"
class="x.y.service.UserService"/>
```

Your UserService bean would then look like this:

```
public class UserService {

    public Long registerUser(User user) {
        // execute some SQL that e.g.
        // inserts the user into the db and
retrieves the autogenerated id
        return id;
    }
}
```

From a Java code perspective, this declarative transaction approach looks a lot simpler than the programmatic approach. But it leads to a lot of complicated, verbose XML, with the pointcut and advisor configurations.

So, this leads to the question: Is there a better way for declarative transaction management instead of XML? Yes, there is: The @Transactional annotation.

How to use Spring's @Transactional annotation (Declarative Transaction Management)

Now let's have a look at what modern Spring transaction management usually looks like:

```
public class UserService {

    @Transactional
    public Long registerUser(User user) {
       // execute some SQL that e.g.
        // inserts the user into the db and
retrieves the autogenerated id
        // userDao.save(user);
        return id;
    }
}
```

How is this possible? There is no more XML configuration and there's also no other code needed. Instead, you now need to do two things:

- Make sure that your Spring Configuration is annotated with the @EnableTransactionManagement annotation (In Spring Boot this will be done *automatically for you*).
- Make sure you specify a transaction manager in your Spring Configuration (this you need to do anyway).
- And then Spring is smart enough to transparently handle transactions for you: Any bean's *public* method you annotate with the @Transactional annotation, will execute *inside a database transaction* (note: there are some pitfalls).

So, to get the @Transactional annotation working, all you need to do is this:

```
@Configuration
@EnableTransactionManagement
public class MySpringConfig {

    @Bean
    public PlatformTransactionManager
txManager() {
        return yourTxManager; // more on that
later
    }

}
```

Now, when I say Spring transparently handles transactions for you. What does that *really mean*?

Armed with the knowledge from the JDBC transaction example, the @Transactional UserService code above translates (simplified) directly to this:

```java
public class UserService {

    public Long registerUser(User user) {
        Connection connection =
dataSource.getConnection(); // (1)
        try (connection) {
            connection.setAutoCommit(false);
// (1)

            // execute some SQL that e.g.
            // inserts the user into the db
and retrieves the autogenerated id
            // userDao.save(user); <(2)

            connection.commit(); // (1)
        } catch (SQLException e) {
            connection.rollback(); // (1)
        }
    }
}
```

1. This is all just standard opening and closing of a JDBC connection. That's what Spring's transactional annotation does for you automatically, without you having to write it explicitly.

2. This is your own code, saving the user through a DAO or something similar.

This example might look a bit *magical*, but let's have a look at how Spring inserts this connection code for you.

CGlib & JDK Proxies - @Transactional under the covers

Spring cannot really rewrite your Java class, like I did above, to insert the connection code (unless you are using advanced techniques like bytecode weaving, but we are ignoring that for now).

Your registerUser() method really just calls userDao.save(user), there's no way to change that on the fly.

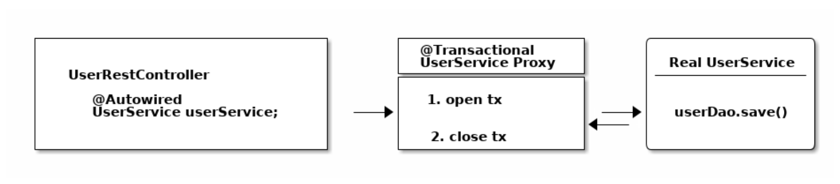
But Spring has an advantage. At its core, it is an IoC container. It instantiates a UserService for you and makes sure to autowire that UserService into any other bean that needs a UserService.

Now whenever you are using @Transactional on a bean, Spring uses a tiny trick. It does not just instantiate a UserService, but also a transactional *proxy* of that UserService.

It does that through a method called *proxy-through-subclassing* with the help of the Cglib library. There are also other ways to construct proxies (like

Dynamic JDK proxies), but let's leave it at that for the moment.

Let's see proxies in action in this picture:



As you can see from that diagram, the proxy has one job.

- Opening and closing database connections/transactions.
- And then delegating to the *real UserService*, the one you wrote.
- And other beans, like your UserRestController will never know that they are talking to a proxy, and not the *real* thing.

Quick Exam

Have a look at the following source code and tell me what *type* of UserService Spring automatically constructs, assuming it is marked with @Transactional or has a @Transactional method.

```
@Configuration
@EnableTransactionManagement
public static class MyAppConfig {

    @Bean
    public UserService userService() {  // (1)
        return new UserService();
    }
}
```

1. Correct. Spring constructs a dynamic CGLib proxy of your UserService class here that can open and close database transactions for you. You or any other beans won't even notice that it is not *your* UserService, but a proxy wrapping your UserService.

For what do you need a Transaction Manager (like PlatformTransactionManager)?

Now there's only one crucial piece of information missing, even though we have mentioned it a couple of times already.

Your UserService gets proxied on the fly, and the proxy manages transactions for you. But it is not the proxy itself handling all this transactional state (open, commit, close), the proxy delegates that work to a *transaction manager*.

Spring offers you a PlatformTransactionManager / TransactionManager interface, which, by default, comes with a couple of handy implementations. One of them is the datasource transaction manager.

It does exactly what you did so far to manage transactions, but first, let's look at the needed Spring configuration:

```
@Bean
public DataSource dataSource() {
    return new MysqlDataSource(); // (1)
}

@Bean
public PlatformTransactionManager txManager()
{
    return new
DataSourceTransactionManager(dataSource()); //
(2)
}
```

1. You create a database-specific or connection-pool specific datasource here. MySQL is being used for this example.
2. Here, you create your transaction manager, which needs a data source to be able to manage transactions.

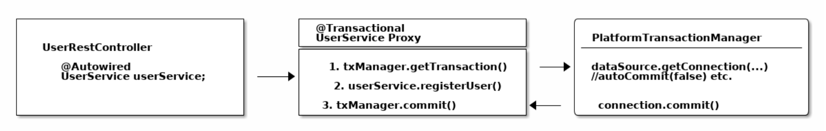
Simple as. All transaction managers then have methods like "doBegin" (for starting a transaction) or "doCommit", which look like this - taken straight from Spring's source code and simplified a bit:

Quick Links

```
blic class DataSourceTransactionManager
plements PlatformTransactionManager {

  @Override
  protected void doBegin(Object transaction,
ansactionDefinition definition) {
      Connection newCon =
tainDataSource().getConnection();
      // ...
      con.setAutoCommit(false);
      // yes, that's it!
  }

  @Override
  protected void
Commit(DefaultTransactionStatus status) {
      // ...
      Connection connection =
atus.getTransaction().getConnectionHolder().getCon

      try {
          con.commit();
      } catch (SQLException ex) {
          throw new
ansactionSystemException("Could not commit
BC transaction", ex);
      }
  }
```

So, the datasource transaction manager uses *exactly* the same code that you saw in the JDBC section, when managing transactions.

With this in mind, let’s extend our picture from above:



To sum things up:

1. If Spring detects the @Transactional annotation on a bean, it creates a dynamic proxy of that bean.
2. The proxy has access to a transaction manager and will ask it to open and close transactions / connections.
3. The transaction manager itself will simply do what you did in the plain Java section: Manage a good, old JDBC connection.

What is the difference between physical and logical transactions?

Imagine the following two transactional classes.

```
@Service
public class UserService {

    @Autowired
    private InvoiceService invoiceService;

    @Transactional
    public void invoice() {
        invoiceService.createPdf();
        // send invoice as email, etc.
    }
}

@Service
public class InvoiceService {

    @Transactional
    public void createPdf() {
        // ...
    }
}
```

UserService has a transactional invoice() method. Which calls another transactional method, createPdf() on the InvoiceService.

Now in terms of database transactions, this should really just be **one** database transaction. (Remember: *getConnection(). setAutocommit(false). commit().*) Spring calls this *physical transaction*, even though this might sound a bit confusing at first.

From Spring's side however, there's two *logical transactions* happening: First in UserService, the other one in InvoiceService. Spring has to be smart enough to know that both @Transactional methods, should use the same *underlying, physical* database transaction.

How would things be different, with the following change to InvoiceService?

```
@Service
public class InvoiceService {

    @Transactional(propagation =
Propagation.REQUIRES_NEW)
    public void createPdf() {
        // ...
    }
}
```

Changing the propagation mode to requires_new is telling Spring that createPDF() needs to execute in its own transaction, independent of any other, already existing transaction. Thinking back to the plain Java section of this guide, did you see a way to "split" a transaction in half? Neither did I.

Which basically means your code will open **two** (physical) connections/transactions to the database. (Again: *getConnection() x2. setAutocommit(false) x2. commit() x2*) Spring now has to be smart enough that the *two logical transactional* pieces (invoice()/createPdf()) now also map to two *different, physical* database transactions.

So, to sum things up:

- Physical Transactions: Are your actual JDBC transactions.
- Logical Transactions: Are the (potentially nested) @Transactional-annotated (Spring) methods.

This leads us to covering propagation modes in more detail.

What are @Transactional Propagation Levels used for?

When looking at the Spring source code, you'll find a variety of propagation levels or modes that you can plug into the @Transactional method.

```
  @Transactional(propagation =
Propagation.REQUIRED)

  // or

  @Transactional(propagation =
Propagation.REQUIRES_NEW)
  // etc
```

The full list:

- REQUIRED
- SUPPORTS
- MANDATORY
- REQUIRES_NEW
- NOT_SUPPORTED
- NEVER
- NESTED

Exercise:

In the plain Java section, I showed you *everything* that JDBC can do when it comes to transactions. Take a minute to think about what every single Spring propagation mode at the end *REALLY* does to your datasource or rather, your JDBC connection.

Then have a look at the following answers.

Answers:

- **Required (default)**: My method needs a transaction, either open one for me or use an existing one → *getConnection(). setAutocommit(false). commit().*
- **Supports**: I don't really care if a transaction is open or not, i can work either way → nothing to do with JDBC
- **Mandatory**: I'm not going to open up a transaction myself, but I'm going to cry if no one else opened one up → nothing to do with JDBC
- **Require_new:** I want my completely own transaction → *getConnection(). setAutocommit(false). commit().*
- **Not_Supported:** I really don't like transactions, I will even try and suspend a current, running transaction → nothing to do with JDBC
- **Never:** I'm going to cry if someone else started up a transaction → nothing to do with JDBC
- **Nested:** It sounds so complicated, but we are just talking savepoints! → *connection.setSavepoint()*

As you can see, most propagation modes really have nothing to do with the database or JDBC, but more with how you structure your program with Spring and how/when/where Spring expects transactions to be there.

Look at this example:

```
public class UserService {

     @Transactional(propagation =
Propagation.MANDATORY)
     public void myMethod() {
        // execute some sql
     }

}
```

In this case, Spring will *expect* a transaction to be open, whenever you call myMethod() of the UserService class. It *does not* open one itself, instead, if you call that method without a pre-existing transaction, Spring will throw an exception. Keep this in mind as additional points for "logical transaction handling".

What are @Transactional Isolation Levels used for?

This is almost a trick question at this point, but what happens when you configure the @Transactional annotation like so?

```
@Transactional(isolation =
Isolation.REPEATABLE_READ)
```

Yes, it does simply lead to this:

```
connection.setTransactionIsolation(Connection.TR
```

Database isolation levels are, however, a complex topic, and you should take some time to fully grasp them. A good start is the official Postgres Documentation and their section on isolation levels.

Also note, that when it comes to switching isolation levels *during* a transaction, you **must** make sure to consult with your JDBC driver/database to understand which scenarios are supported and which not.

The most common @Transactional pitfall

There is one pitfall that Spring beginners usually run into. Have a look at the following code:

```
@Service
public class UserService {

    @Transactional
    public void invoice() {
        createPdf();
        // send invoice as email, etc.
    }

    @Transactional(propagation =
Propagation.REQUIRES_NEW)
    public void createPdf() {
        // ...
    }
}
```

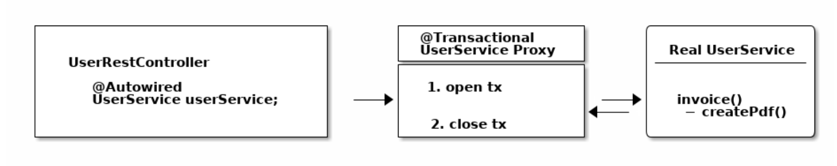
You have a UserService class with a transactional invoice method. Which calls createPDF(), which is also transactional.

How many physical transactions would you expect to be open, once someone calls invoice()?

Nope, the answer is not two, but one. Why?

Let's go back to the proxies' section of this guide. Spring creates that transactional UserService proxy for you, but once you are inside the UserService class and call other inner methods, there is no more proxy involved. This means, no new transaction for you.

Let’s have a look at it with a picture:



There’s some tricks (like self-injection), which you can use to get around this limitation. But the main takeaway is: always keep the proxy transaction boundaries in mind.

How to use @Transactional with Spring Boot or Spring MVC

So far, we have only talked about plain, core Spring. But what about Spring Boot? Or Spring Web MVC? Do they handle transactions any differently?

The short answer is: No.

With either frameworks (or rather: *all frameworks* in the Spring ecosystem), you will *always* use the @Transactional annotation, combined with a transaction manager and the @EnableTransactionManagement annotation. There is no other way.

The only difference with Spring Boot is, however, that it automatically sets the @EnableTransactionManagement annotation and creates a PlatformTransactionManager for you - with its JDBC auto-configurations. Learn more about auto-configurations here.

Recommended: Practice Spring Transactions

You can find a ton of code examples and exercises on Spring transactions in the *Spring transactions* chapter of **this Java database e-book**.

How Spring handles rollbacks (and default rollback policies)

The section on Spring rollbacks will be handled in the next revision of this guide.

How Spring and JPA / Hibernate Transaction Management works

The goal: Syncing Spring's @Transactional and Hibernate / JPA

At some point, you will want your Spring application to integrate with another database library, such as Hibernate (a popular JPA-implementation) or Jooq etc.

Let's take plain Hibernate as an example (note: it does not matter if you are using Hibernate directly,or Hibernate via JPA).

Rewriting the UserService from before to Hibernate would look like this:

```
public class UserService {

    @Autowired
    private SessionFactory sessionFactory; //
(1)

    public void registerUser(User user) {

        Session session =
sessionFactory.openSession(); // (2)

        // lets open up a transaction.
remember setAutocommit(false)!
        session.beginTransaction();

        // save == insert our objects
        session.save(user);

        // and commit it
        session.getTransaction().commit();

        // close the session == our jdbc
connection
        session.close();
    }
}
```

1. This is a plain, old Hibernate SessionFactory, the entry-point for all Hibernate queries.
2. Manually managing sessions (read: database connections) and transactions with Hibernate's API.

There is one huge problem with the above code, however:

- Hibernate would not know about Spring's @Transactional annotation.

- Spring's @Transactional would not know anything about Hibernate's transaction.

But we'd actually *love* for Spring and Hibernate to integrate seamlessly, meaning that they know about each others' transactions.

In plain code:

```
@Service
public class UserService {

    @Autowired
    private SessionFactory sessionFactory; //
(1)

    @Transactional
    public void registerUser(User user) {

sessionFactory.getCurrentSession().save(user);
// (2)
    }

}
```

1. The same SessionFactory as before
2. But no more manual state management. Instead, getCurrentSession() and @Transactional are *in sync*.

How to get there?

Using the HibernateTransactionManager

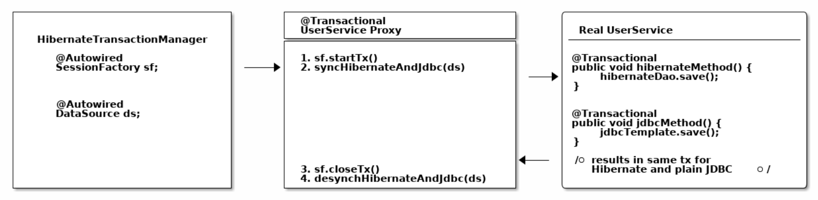
There is a very simple fix for this integration problem:

Instead of using a DataSourcePlatformTransactionManager in your Spring configuration, you will be using a HibernateTransactionManager (if using plain Hibernate) or JpaTransactionManager (if using Hibernate through JPA).

The specialized HibernateTransactionManager will make sure to:

1. Manage transactions through Hibernate, i.e. the SessionFactory.
2. Be smart enough to allow Spring to use that very same transaction in non-Hibernate, i.e. @Transactional Spring code.

As always, a picture might be simpler to understand (though note, the flow between the proxy and real service is only conceptually right and oversimplified).



```
@Autowired
SessionFactory sf;

@Autowired
DataSource ds;
```

```
1. sf.startTx()
2. syncHibernateAndJdbc(ds)

3. sf.closeTx()
4. desynchHibernateAndJdbc(ds)
```

```
@Transactional
public void hibernateMethod() {
        hibernateDao.save();
}

@Transactional
public void jdbcMethod() {
        jdbcTemplate.save();
}

/○ results in same tx for
   Hibernate and plain JDBC     ○/
```

That is, in a nutshell, how you integrate Spring and Hibernate.

For other integrations or a more in-depth understanding, it helps to have a quick look at all possible PlatformTransactionManager implementations that Spring offers.

Fin

By now, you should have a pretty good overview of how transaction management works with the Spring framework and how it also applies to other Spring libraries like Spring Boot or Spring WebMVC. The biggest takeaway should be, that it does not matter which framework you are using in the end, it is all about the JDBC basics.

Get them right (Remember: *getConnection(). setAutocommit(false). commit().*) and you will have a much easier understanding of what happens later on in your complex, enterprise application.

Thanks for reading.

Acknowledgements

Thanks to Andreas Eisele for feedback on the early versions of this guide. Thanks to Ben Horsfield for coming up with much-needed Javascript snippets to enhance this guide.

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Great article! THANK U! I've spent so much time trying to understand this topic earlier...

Anonymous
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Hello Khurram, SERIALIZABLE is still not working.What is the possible solution to this situation? @Transactional(isolation = Isolation.SERIALIZABLE) public void transfer(String fromIban, String toIban, Long transferCents) {

Account account = accountRepository.findById(fromIban) .orElseThrow(() ->new IllegalArgumentException("Can't find account with IBAN: " + fromIban)); Long fromBalance = account.getBalance();

if(fromBalance >= transferCents) {

Account account1 = accountRepository.findById(fromIban).orElseThrow(() ->new IllegalArgumentException("Can't find account with IBAN: " + fromIban)); long bal = account1.getBalance()+(-1) * transferCents; account1.setBalance(bal); Account account2 = accountRepository.findById(toIban).orElseThrow(() ->new IllegalArgumentException("Can't find account with IBAN: " + toIban)); long bal2 = account2.getBalance()+ transferCents; account2.setBalance(bal2); // addBalance(fromIban, (-1) * transferCents); //addBalance(toIban, transferCents); } } --- -- --------------------------- public void parallelExecution() { CountDownLatch startLatch = new CountDownLatch(1); CountDownLatch endLatch = new CountDownLatch(threadCount);

for (int i = 0; i < threadCount; i++) { new Thread(() -> { awaitOnLatch(startLatch); acountService.transfer("Alice-123", "Bob-456", 5L); endLatch.countDown(); }).start(); } //LOGGER.info("Starting threads"); startLatch.countDown(); awaitOnLatch(endLatch);

}

protected void awaitOnLatch(CountDownLatch latch) { try { latch.await(); } catch (InterruptedException e) { throw new IllegalStateException(e); } }

X

There's more where that came from

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private void create() { Account from = new Account(); from.setIban("Alice-123"); from.setOwner("Alice"); from.setBalance(10); accountRepository.save(from); Account to = new Account(); to.setIban("Bob-456"); to.setOwner("Bob"); to.setBalance(0L); accountRepository.save(to); } Result is 0,15 ..0,20

?
Anonymous
0 points · 2 months ago

Greetings from Indonesia, this in-depth explanation is what our team is currently looking. Thank you so much

?
Anonymous
0 points · 51 days ago

Thank you so much! I rarely comment on internet, but this is great!

?
Anonymous
0 points · 48 days ago

the best article , simple yet powerful, thank you

A
Arun Menon
0 points · 6 months ago

This is awesome. Thank you very much.

R
RyeBrye
0 points · 6 months ago

If you use the aspectj advice mode and use either compile-time weaving or load-time-weaving it *will* actually modify your class bytecode and *will* allow methods to call each other within the same class.

You can read more about it if you look up the details behind `@EnableTransactionManagement(mode=AdviceMode.ASPECTJ)``

M
Marco Behler
0 points · 6 months ago

Hi RyeBrye, yes, weaving is an option but really not in the scope of this guide regarding Spring's default behaviour. I might take it up in a further revision of the guide, though. Thanks for the suggestion.

L
leo mayer
0 points · 6 months ago

I think you are wrong comparing catching SqlException and rollback with @Transactional mechanism. Cuz Springs rollback mechanism only kicks in if an Error is thrown - not an Exception. For exception rollback you need to change the annotation! @Transactional(rollback=Exception.class). Otherwise no rollback would happen!

M
Marco Behler
0 points · 6 months ago

Hi Leo,

where do you get the idea from that Spring only rolls back errors (like OutOfMemory), not any (runtime) exception and that you would have to specify "Exception"? That would be a major detriment to using the annotation.

Here, taken straight from the Spring documentation:

By default, a transaction will be rolling back on RuntimeException and Error but not on checked exceptions (business exceptions).

X

Now, you might be hinting at "checked" exceptions, but then again "using" the connection throws a SQLException inevitably, which Spring will internally wrap in its own (runtime) exception, which will result in a rollback as well.

Though you might want to have a look at the reddit comments, there was a discussion about exceptions as well:

https://www.reddit.com/r/ja...

L **leo mayer**
0 points · 6 months ago

Hi Marco,

strange to read the documentation and than your conclusion. An SQLException is by no way a descendant of either Error or RuntimeException. How you conclude that this exception is wrapped interally? I don't see neither any evidence from the docu nor from the search results in Google. I have as well no evidence from my own expierence with running into that kind of problems while coding.

Perhaps there is a switch which could be used to tell Spring to wrap any kind of exception into an interal one which initiates a rollback. Beside the Annotation I didn't find anything.

M **Marco Behler**
0 points · 6 months ago

Let's assume that:

```
Connection connection = dataSource.getConnection();
try (connection) {
    connection.setAutoCommit(false);
   connection.prepareStatement("insertoo into users")
    connection.commit();
} catch (SQLException e) {
    connection.rollback();
}
```

(Even though this is not valid Java, as getConnection() will already throw the SQLException)

Is *roughly* equivalent to this:

`

@Autowired
private JdbcTemplate jdbcTemplate;

@Transactional
public void registerUser() {
jdbcTemplate.execute("insertoo into users "); // not valid sql
}`

Then JDBCTemplate doesn't make me catch the SQLException anymore, because it translates and re-throws that SQLException (that it defintely has to catch at some point as it is a checked exception) into a (runtime) DataAccessException. And that exception will be caught in TransactionAspectSupport later on, where Spring will try to be a good boy and rollback.

The specific Spring source code for this is here, taken straight from JdbcTemplate.

```
catch (SQLException ex) {
...
throw translateException("StatementCallback", sql, ex
}
```

Which will lead to a stracktrace like this:

```
org.springframework.jdbc.BadSqlGrammarException: State
Syntax error in SQL statement "INSERTOO[*] INTO BLAH '
```

Now obviously with Spring I don't *have* to use JdbcTemplate, but unless you ignore pretty much every Spring integration/helper/repository class and fall back to handling connections yourself, you will end up with wrapped (runtime) DataAccessExceptions.

Does that make sense?

L

leo mayer
0 points · 6 months ago

Your sample is little bit strange cuz your statement doesn't proof anything about rollback. To have a rollback scenario you must have at least two statements, e.g.

`

@Transactional

public void Foo(){

userReporsistory.save(userEntity1)

connection.prepareStatement("insertoo into users").execute();

}

`

The first statement is persisted although the second fails. Thats what the Spring docu says.

Fom the perspective of a rollback I would expect that the save of `userEnity1` wouldn't be persisted cuz I would expect a rollback - according to your logic it should be! But matter of fact the first statement isn't rolled back. And you are suggesting in your article that the annotation on the method grants a rollback for everything which is included in the statement. That's not the case!

M

Marco Behler
0 points · 6 months ago

I already had the feeling with your previous reply that you are arguing mainly about "ego", "a need to prove right and wrong" and "experience" but by now you are simply trolling.

My advice: Stop acting like a complete dickhead, when you could :

a) simply open up a debugger and run a bloody test case to see what *actually* happens and not what you *think* what happens and

B) make sure to not come up with a completely non-sensical and fabricated code example where you mix spring transaction handling with manual handling to prove "a point", ignoring everything I said in my last reply

C) learn the difference between errors and exceptions ,what a rollback is, or actually all jdbc and spring *basics* and THEN start making wild claims

That's the end of this discussion.

K **Khurram Naseem**
0 points · 6 months ago

Nice write up Marco, thank you. I've one exact question what's your take on for read only transactions? do you think there is any benefit to add transaction annotation for read only work i.e. "select"

M **Marco Behler**
0 points · 6 months ago

Hi Khurram,
I misinterpreted your question the first time around, I thought you were talking @Transactional(readOnly=true), which in the end (I think) calls setReadonly(true) on the jdbc connection, which is however just a hint, i.e. it depends on the database driver what really happens.

As for having @Transactional on services that maybe just execute a couple of selects: Yes, I would put the annotation there and , e.g. when executing Hibernate Criteria Queries (as opposed to HQL) without a transaction, you get an exception anyway, if I remember correctly.

M **Marco Behler**
0 points · 6 months ago

seemyotheranswer

A **Arne Vandamme**
0 points · 6 months ago

Fine guide Marco, thank you very much. Good and clear explanation. I immediately passed it on to some people at work to help them better understand the mechanics :-)

A possible suggestion for adding a second pitfall which I've several times: using REQUIRES_NEW opens a new connection as you state, but when nesting transactions and using a connection pool this can actually lead to pool starvation and deadlock-like scenarios. Much like the proxy pitfall, it appears to be something that is often overlooked and might be worth mentioning explicitly.

thanks again for the write up!

M **Marco Behler**
0 points · 6 months ago

Thank you, Arne. In the next revision of this guide, I'll also put your suggested pitfall, thanks!

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