LDS TECH

THE CHURCH OF JESUS CHRIST OF LATTER-DAY SAINTS

Transaction Management with Spring

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BUILD UPON THE TRADITION OF SERVICE!

Notes

- This is a training **NOT** a presentation
- Please ask questions
- Prerequisites
  - A computer

Outline

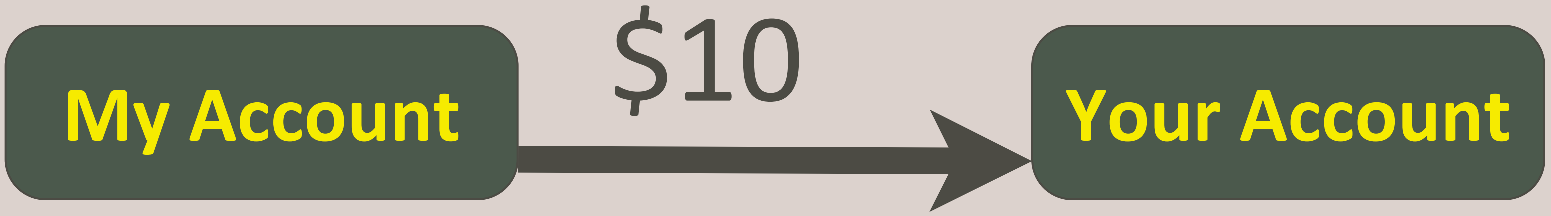
- Transaction Management
  - ACID
  - Demo Vanilla JDBC
- Spring Transaction Management
  - Java stack configuration
  - Programatic
  - Demo of Transaction Template
  - Declarative
  - Local vs Global & JTA
  - Lab

Transaction Management

ACID Transactions

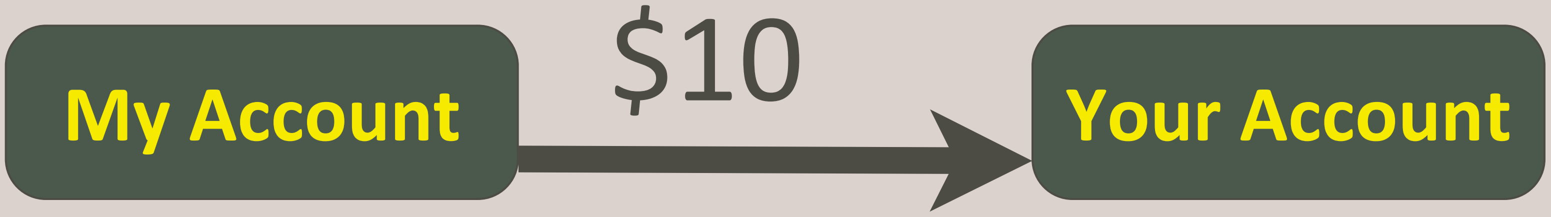
- ACID is a set of properties that define the reliability of a set of changes (to a database)
  - **A**tomic - all or nothing
  - **C**onsistent - results are valid
  - **I**solated - indicates when changes become visible
  - **D**urable - changes stick no matter what

ACID by Example



- Transfer funds between accounts
- This is a 2-step process
  - First, remove the money from my account (debit)
  - Second, add the money to your account (credit)

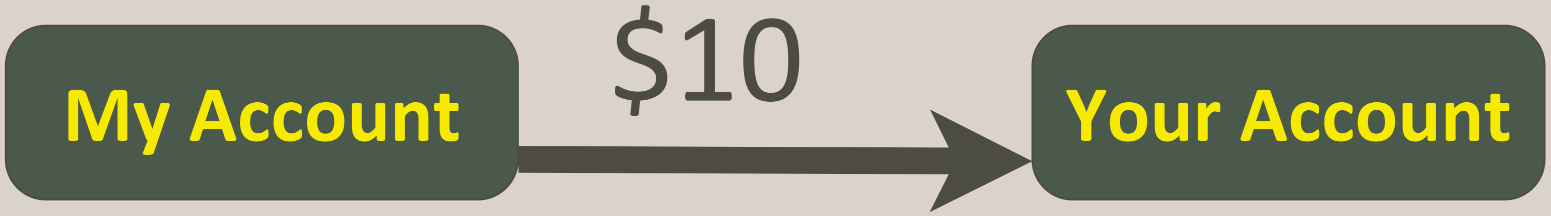
Atomic



Two-Step Process
1. Debit my account
2. Credit your account

- Atomic
  - If we group both steps together
  - and control that group such that either
    - both steps succeed or
    - nothing gets changed
  - then we've achieved atomicity

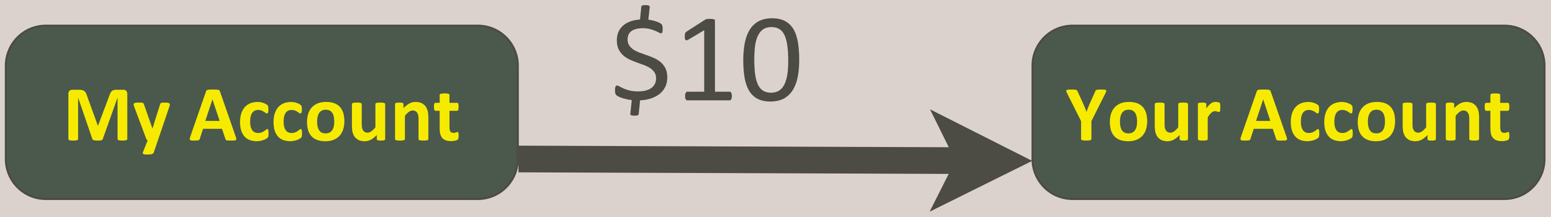
Consistent



Two-Step Process
1. Debit my account
2. Credit your account

- Consistent: results are valid
  - all keys and constraints remain in-tact[1]
  - my account is debited the same a mount that your account is credited - $10

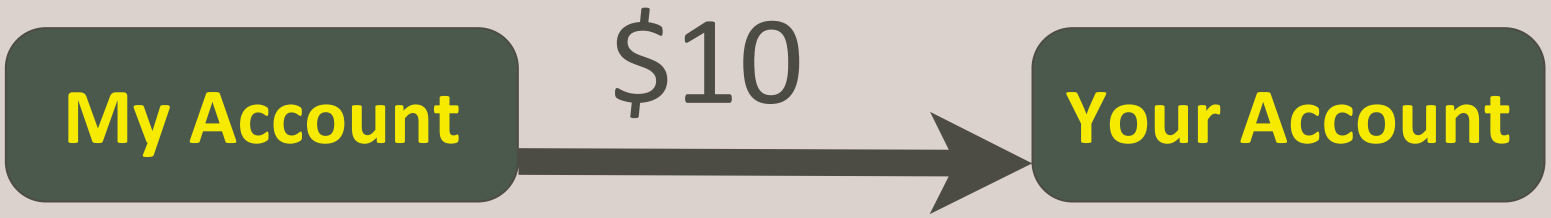
Isolated



Two-Step Process
1. Debit my account
2. Credit your account

- Isolated: when are changes visible?
  - If the change is isolated then neither of the changes should be visible through another connection until we indicate that the process is done (commit).

Durable



Two-Step Process
1. Debit my account
2. Credit your account

- Durable: changes stick
  - even if the database crashes

Transactions

- ACID is a set of properties that define the reliability of a set of changes (to a database)
  - **Atomic - all or nothing**
  - Consistent - results are valid
  - **Isolated - indicates when changes become visible**
  - Durable - changes stick no matter what

The Atomic and Isolated properties require demarcation of scope... i.e. the boundaries of a transaction

Demo
Transaction in Vanilla JDBC

Spring Transaction Management

Spring Transaction Management

- Spring provides a consistent abstraction for transaction management
  - declarative and programatic methods
  - consistent between JDBC, JPA/Hibernate etc.
  - nicely integrated with other Spring stuff
  - intuitive and easy to use

Spring Transaction Management

- Configuration in the Java Stack
  - ApplicationContext.xml
    - **<stack-db:transaction-manager />**
      - Configures a transaction manager named transactionManager
        - » **JpaTransactionManager** for JPA
        - » **DataSourceTransactionManager** otherwise
    - **<tx:annotation-driven />**
      - Configures the application to use @Transactional annotations to demarcate transaction boundaries declaratively

Spring Transaction Management

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- Two means of doing transactions in Spring programmatically
  - PlatformTransactionManager
    - not covered in this training
  - TransactionTemplate...

Spring Transaction Management

- TransactionTemplate
  - callback approach similar to JdbcTemplate
  - handles much of the boilerplate code
  - releases transactional resources
  - but couples your code to Spring’s transaction framework
  - **per Spring, use it only when necessary**

Demo

Demo

Spring TransactionTemplate

Spring Transaction Management

- Spring **declarative** transaction management
  - Simple
  - Non-invasive
  - handles much of the boilerplate code
  - releases transactional resources
  - Most common method
  - Recommended method (v.s. programatic)

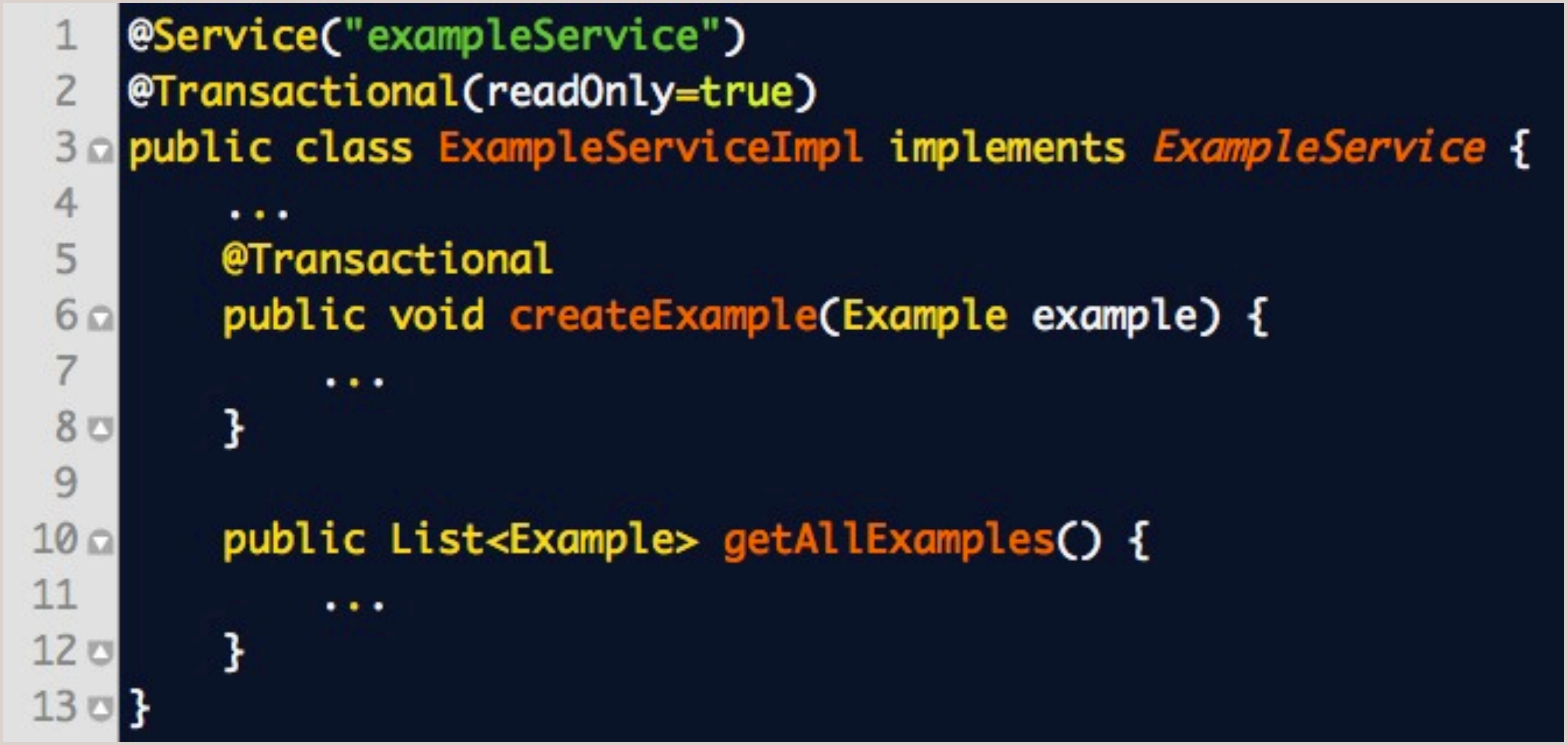
Spring Transaction Management

- Declarative transactions can be configured via xml or annotations - we'll cover annotations
- Specify transactional behavior on a per-method basis
- Spring takes care of the the rest (using AOP)

Spring Transaction Management

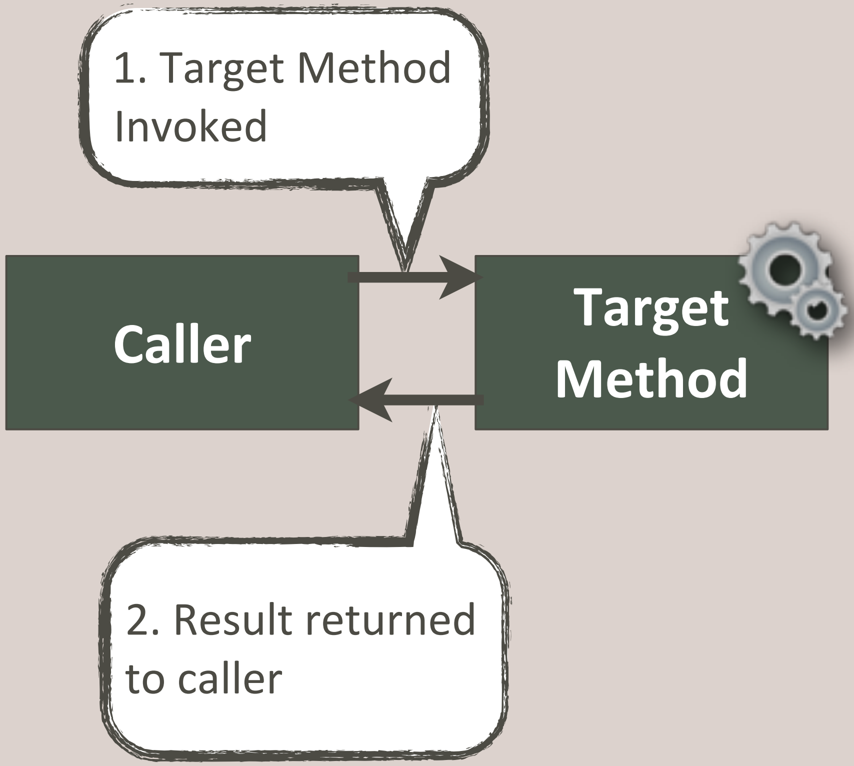
- **Mark the contents of a method to be within a transaction with @Transactional**
  - Use on the class definition or public method definition
  - avoid the interface
  - Method annotations override the class annotation

Spring Transaction Management



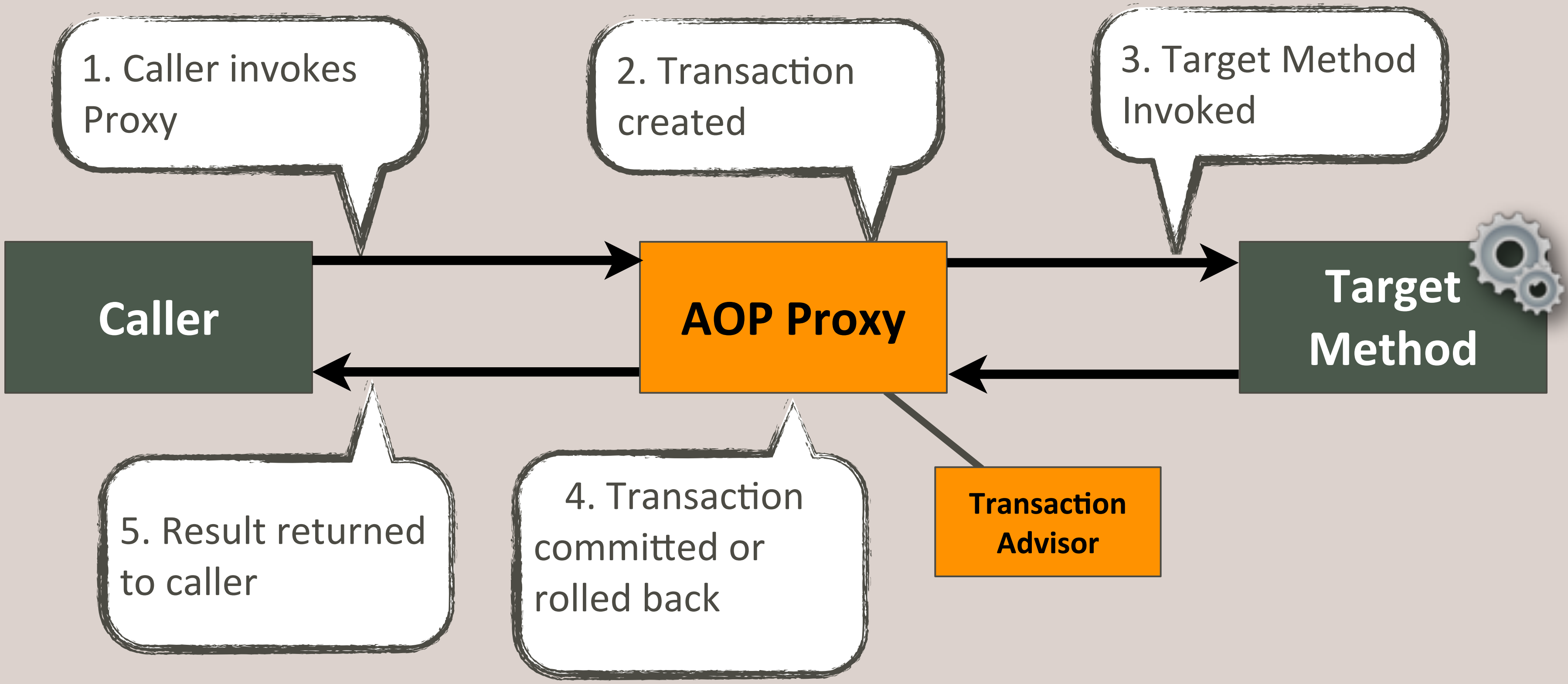
```java
@Service("exampleService")
@Transactional(readOnly=true)
public class ExampleServiceImpl implements ExampleService {
    ...
    @Transactional
    public void createExample(Example example) {
        ...
    }

    public List<Example> getAllExamples() {
        ...
    }
}
```

Spring Transaction Management



Flow of Control Without a Transaction

Spring Transaction Management



Flow of Control with a Spring Transaction

Spring Transaction Management

- Properties of @Transactional
  - value: name of the tx manager to use
  - propagation
  - isolation
  - readOnly
  - timeout
  - rollbackFor & rollbackForClassname
  - noRollbackFor & noRollbackForClassname

Spring Transaction Management

- Propagation property: defines what should happen when @Transactional is encountered and a transaction is already in progress
  - **Propagation.REQUIRED** - join the current transaction (default)
  - Propagation.REQUIRES_NEW - suspend the current transaction and start a new one
  - Propagation.NESTED - sets a new save point so the inner transaction can roll back without effecting the outer transaction(s)
  - See the Spring docs for others

Spring Transaction Management

- Isolation property: degree to which this transaction is isolated from the work of other transactions
  - DEFAULT - use the underlying datastore's value (the default if not specified)
  - READ_COMMITTED - dirty reads are not allowed
  - SERIALIZABLE - dirty reads, non-repeatable reads and phantom reads not allowed
  - Others not supported by Oracle RDBMS

Spring Transaction Management

- readOnly property
  - true or false
  - default is read/write (readOnly=false)
  - “Read-only transactions can be a useful optimization in some cases, such as when you are using Hibernate.”

Spring Transaction Management

- timeout property
  - in seconds
  - How long this transaction runs before timing out and being rolled back
  - defaults to the default timeout of the underlying transaction system

Spring Transaction Management

- rollbackFor & noRollbackFor properties
  - array of exception classes that cause rollback - must derive from throwable

- rollbackForClassname & noRollbackForClassname properties
  - same as above but provide a string of the class name

- Rollback Rules
  - runtime exceptions will cause a rollback
  - checked exceptions must be declared

Spring Transaction Management

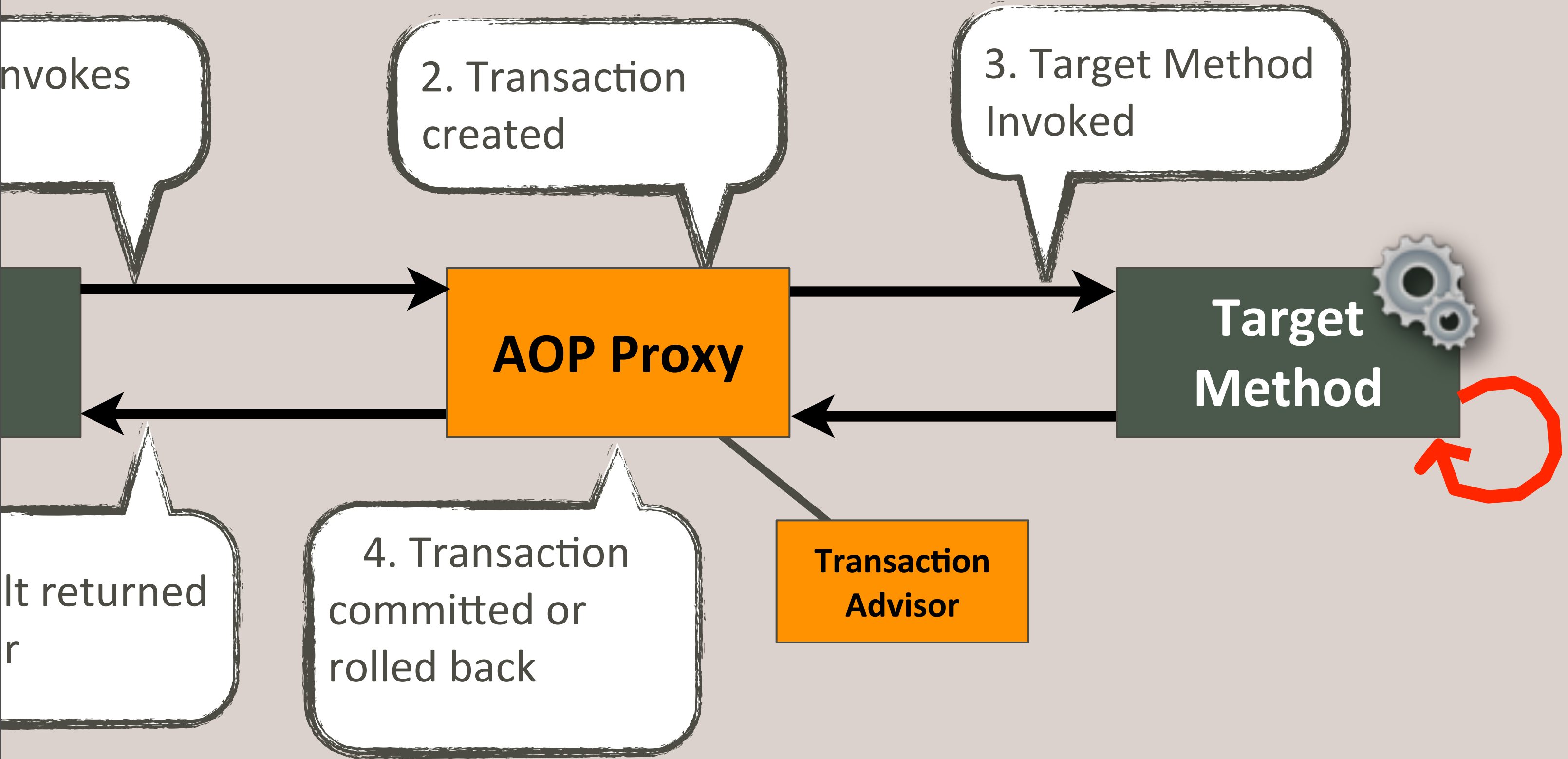
- rollbackFor & noRollbackFor properties
  - array of exception classes that cause rollback - must derive from throwable
- rollbackForClassname & noRollbackForClassname properties
  - same as above but provide a string of the class name

Spring Transaction Management

- Things to consider
  - Oracle implicitly commits after DDL statements
  - Nested transactions do not work with JPA
  - In proxy mode of spring AOP, only external method calls coming in through the proxy are intercepted. A method within the target object calling another method of the same class will not lead to transaction creation[1]

Spring Transaction Management

Subsequent Method Calls



Flow of Control with a Spring Transaction

Local vs. Global Transactions

Transactions

- Local Transactions
  - span one resource
  - a.k.a. resource local

- Example: Transferring funds between bank accounts within a single database using the same database connection

Transactions

- Global Transaction
  - span multiple resources
  - a.k.a. XA Transaction, distributed transaction
  - require two phase commits
  - complicated to configure properly for recovery
- Example: Transferring funds between banks
  - using a database connection to debit one account
  - and a web service to credit the other account

Transactions

- JTA (Java Transaction API)
  - a specification that defines standard interfaces between a transaction manager and the parties involved in a distributed transaction
  - http://www.oracle.com/technetwork/java/javaee/jta/

Transactions

- Spring transaction management can interface with JTA
  - Websphere's, Atomikos, etc.
- The Stack team recommends local transactions
  - If you think you need XA transactions please talk to a member of the stack team

Lab

- Declarative Transaction Lab
- https://tech.lds.org/wiki/Database_Development_2#Lab_2
- Summary
  – modify createExample() to perform 2 tasks
  – put the method into a transaction
  – verify

Solution
Transaction Lab

Conclusion

- Transactions help ensure data integrity
- Spring’s Declarative Transaction Management
  – Simple
  – Non-invasive
  – handles much of the boilerplate code
  – releases transactional resources
  – So use it

Questions?