INSTRUCTIONS

Spring Overview

Module Objectives

After completing this lesson, you should be able to do the following

- Define the Spring Framework
- Explain what Spring is used for
- Discuss why Spring is successful
- Explain where it fits in your world

Agenda

- **What is the Spring Framework?**
- Spring is a DI Container
- Spring Framework History
- What is Spring Used For?

What is the Spring Framework?

Spring is an Open Source, Lightweight, DI (Dependency Injection) Container and Framework for building Java enterprise applications

- ☑ Open Source
- ☑ Lightweight
- ☑ DI Container (IoC Container)
- ☑ Framework

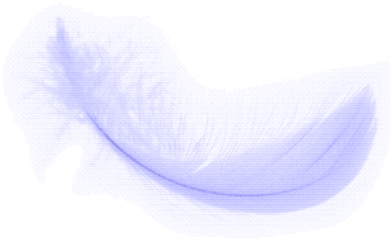
Spring Framework is Open Source

- Spring binary and source code are freely available
- Apache 2 licence
- Code is available at:
  - https://github.com/spring-projects/spring-framework
- Binaries available at Maven Central
  - http://mvnrepository.com/artifact/org.springframework
- Documentation available at:
  - https://docs.spring.io/spring-framework/docs/current/reference/html/

The use of a transitive dependency management system (Maven, Gradle, Ant/Ivy) is recommended for any Java application

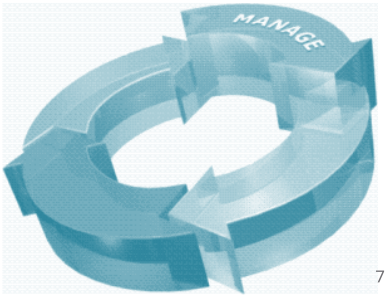
The Spring Framework is Lightweight

- Spring applications do not require a Java EE application server
  - But they can be deployed on one
- Spring is not *invasive*
  - Does not require you to extend framework classes or implement framework interfaces for most usage
  - You write your code as POJOs
- Low overhead
  - Spring jars are relatively small
    - JARs used in this course are < 8MB



The Spring Framework Provides a DI Container

- Spring serves as a Dependency Injection (DI) container for your application objects
  - Your objects do not have to worry about finding / connecting to each other
- Spring instantiates and injects dependencies into your objects
- Spring also serves as a lifecycle manager



Dependency Injection (DI) Container is sometimes called Inversion of Control (IoC) Container
https://docs.spring.io/spring-framework/docs/current/spring-framework-reference/core.html#beans-introduction

Spring Framework: More Than Just a DI Container

- Enterprise applications must deal with a wide variety of technologies / architectures / deployment-platforms
  - Containerization, Cloud, Micro-services
  - JDBC, Transactions, ORM / JPA, NoSQL
  - Events, Streaming, Reactive, Messaging, JMS, AMQP, Tasks, Scheduling
  - Security, OAuth2, OpenID Connect
  - Monitoring, Observability
  - ...
- Spring provides framework classes, interfaces, and annotations to simplify working with lower-level technologies
- Highly extensible and customizable

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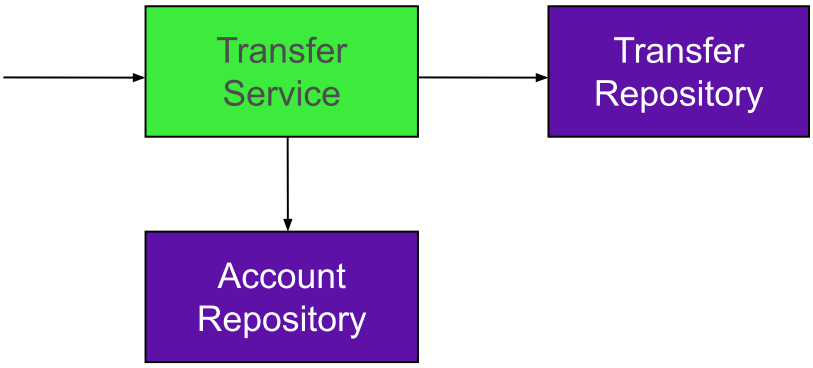
Goal of the Spring Framework

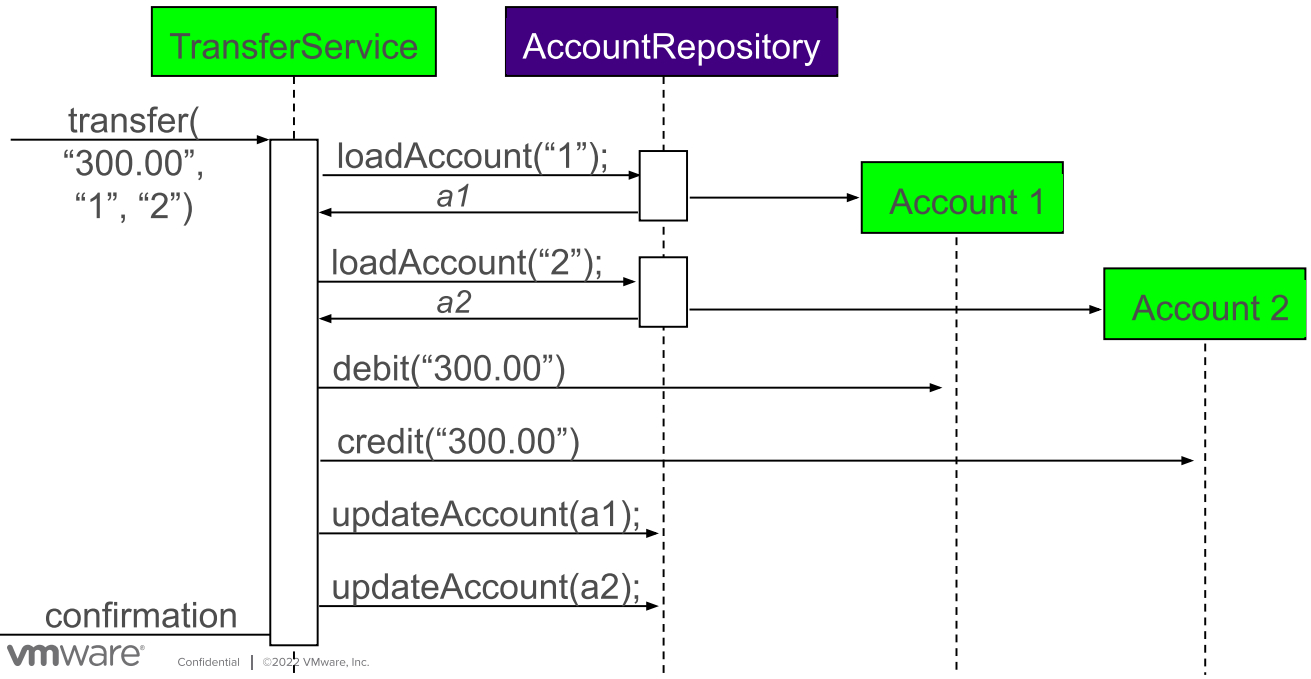
- Provide comprehensive infrastructural support for developing enterprise Java applications
  - Spring deals with the plumbing
  - You focus on solving the business domain problems
- *Key Principles*
  - Don't Repeat Yourself (DRY)
  - Separation of Concerns
  - Convention over Configuration
  - Testability

DI Example: Banking Application Configuration

A typical application consists of several parts working together to carry out a use case



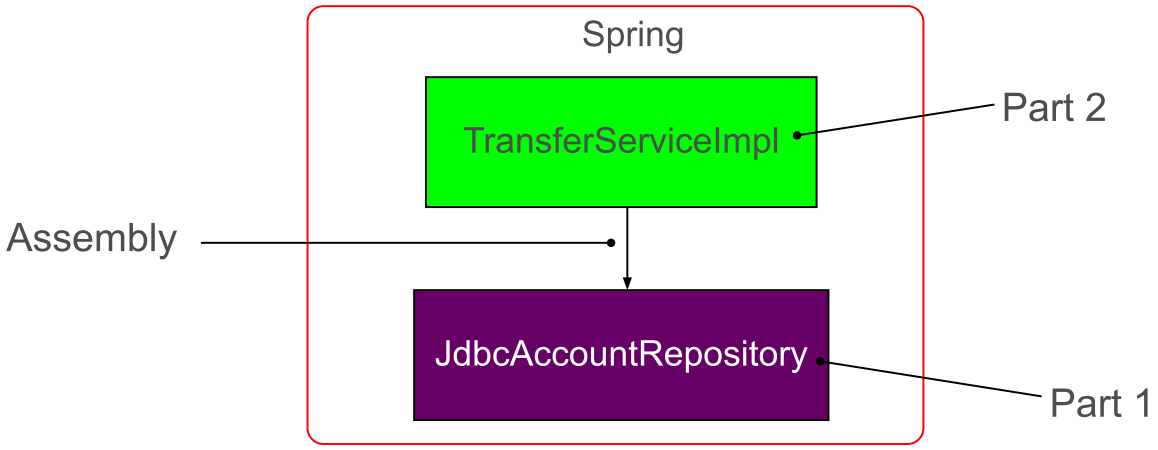
Example: Do Money Transfer



Questions to Consider

- How would we configure the application to ensure all components are assembled correctly?
  - How can we instantiate *TransferService* and *AccountRepository* objects?
  - How can we make the *AccountRepository* object available to the *TransferService* object?
- How can we easily swap out an implementation without re-writing the application?
  - How can we make different types of *AccountRepository* objects available to the *TransferService* object?

Money Transfer System Assembly




```
(1) repository = new JdbcAccountRepository(…);
(2) service = new TransferServiceImpl();
(3) service.setAccountRepository(repository);
```


Parts are Just Plain Old Java Objects (POJOs)

```
public class JdbcAccountRepository implements AccountRepository {
    …
}
```

Implements an interface

Part 1

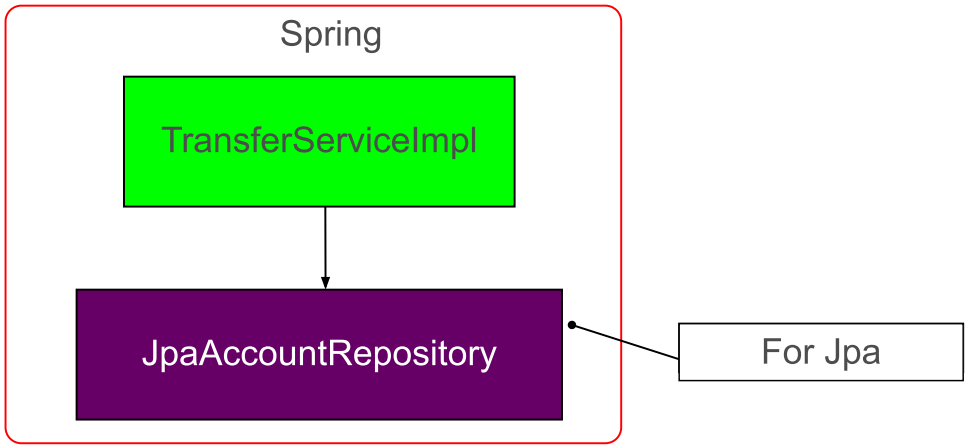
```
public class TransferServiceImpl implements TransferService {
   private AccountRepository accountRepository;

   public void setAccountRepository(AccountRepository ar) {
      accountRepository = ar;
   }
   …
}
```

Part 2

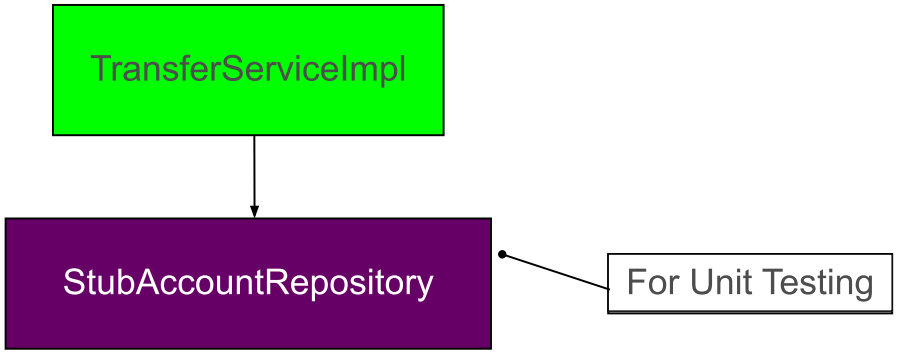
Depends on an *interface:*
– conceals complexity of implementation;
– allows for swapping out implementation

Swapping Out Part Implementations




```
(1) repository = new JpaAccountRepository(…);
(2) service = new TransferServiceImpl();
(3) service.setAccountRepository(repository);
```


Swapping Out Part Implementations




```
(1) repository = new StubAccountRepository();
(2) service = new TransferServiceImpl();
(3) service.setAccountRepository(repository);
```

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Why is Spring Successful?

- Started in the early 2000s with Rod Johnson's book
- Java ecosystem was radically different than today
  - J2EE APIs were often difficult to use and test
  - Spring aimed to simplify
    - Configuration via Dependency Injection
    - Transaction Management and JDBC Data Access
    - Support for multiple deployment environments
- Spring becomes popular as an example of creating enterprise applications
  - Integration with selected JSR Specs

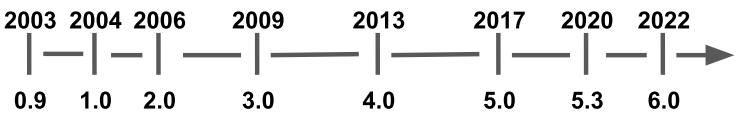
Why is Spring Successful?

- Provide choice at every level
- Embrace change and different perspectives
- Strong backwards compatibility
- Careful API design
- High standard for code quality
- OSS Community
- Developer support on forums, Stack Overflow
- Support of conferences and user groups

Spring excels at being adaptable to change

- Initial integration with other open source projects
  - Hibernate, Quartz, Multiple View Technologies
- Spring projects created for common enterprise domains
  - Spring Security, Batch, Integration
- Spring projects created for new domains
  - Spring Data: NoSQL + JPA, Spring Cloud
- Spring Boot created to further simplify DevEx
- Spring Framework support for Kotlin

Spring Framework Release Timeline:



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What is Spring Used For?

- Spring provides comprehensive infrastructural support for developing enterprise Java applications
  - Spring deals with the plumbing
  - So you can focus on solving the business domain
- Spring used to build enterprise applications dealing with:


Web apps


Messaging


Persistence


Batch/Tasks


Integration/Streaming

The Current World

- Spring continues to adapt and innovate
  - JDK Versions
  - Native Compilation
  - Reactive Programming
  - Stream Processing
  - Kotlin Support
  - Kubernetes