Introduction

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INF 5750

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- Technical basis
  - Interfaces
  - Three-layer architecture
- Framework and tool overview

Interfaces – What is it?

- Defines a contract with implementing classes
- Defines which methods of a class which other classes can access

```
public interface List
{
    int maxSize = 1000;

    boolean add( Object o );
    Object get( int index );
    Object remove( int index );

    // other...
}
```

Interfaces – How to use it?

- Declared using the *interface* keyword
- Can only contain method signatures and constant declarations
- Abstract – can’t be instantiated
- An implementing class must implement all methods – or be *abstract* itself
- A class may implement any number of interfaces
- Method signatures are public
- Constants are public and static

```
public interface List
{
    int maxSize = 1000;

    boolean add( Object o );
    Object get( int index );
    Object remove( int index );

    // other...
}
```

Interfaces - Example

```
public interface List
{
   boolean add( Object o );
   Object get( int index );
   Object remove( int index );
}
```

The interface

An implementation backed by an array

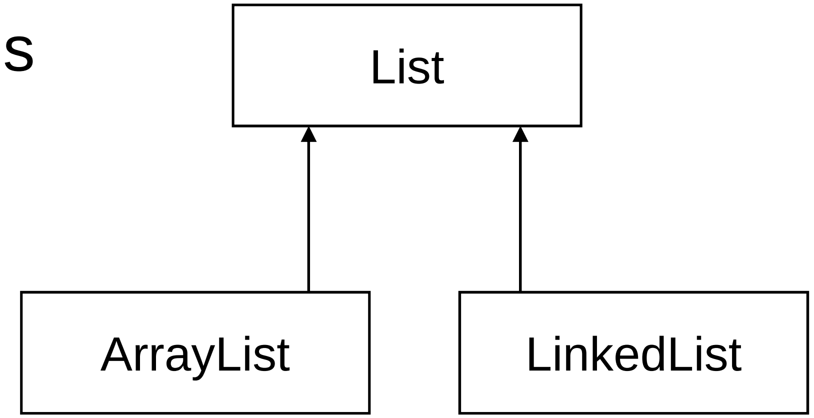
```
List someList = new ArrayList();
```

Instantiation

```
public class ArrayList
   implements List
{
   private Object[] array = new Object[100];

   public boolean add( Object o )
   {
      array[ size++ ] = o;
      return true;
   }

   public Object get( int index )
   {
      return array[ index ];
   }

   public Object remove( int index )
   {
      E temp = array[ index ];
      array[ index ] = null;
      return temp;
   }
```

Interfaces - Advantages

- Easy to switch implementations



Program to concrete classes (bad practise!)

```
LinkedList list = new LinkedList();

LinkedList list = new ArrayList();
```

Won't work! Cannot convert from ArrayList to LinkedList

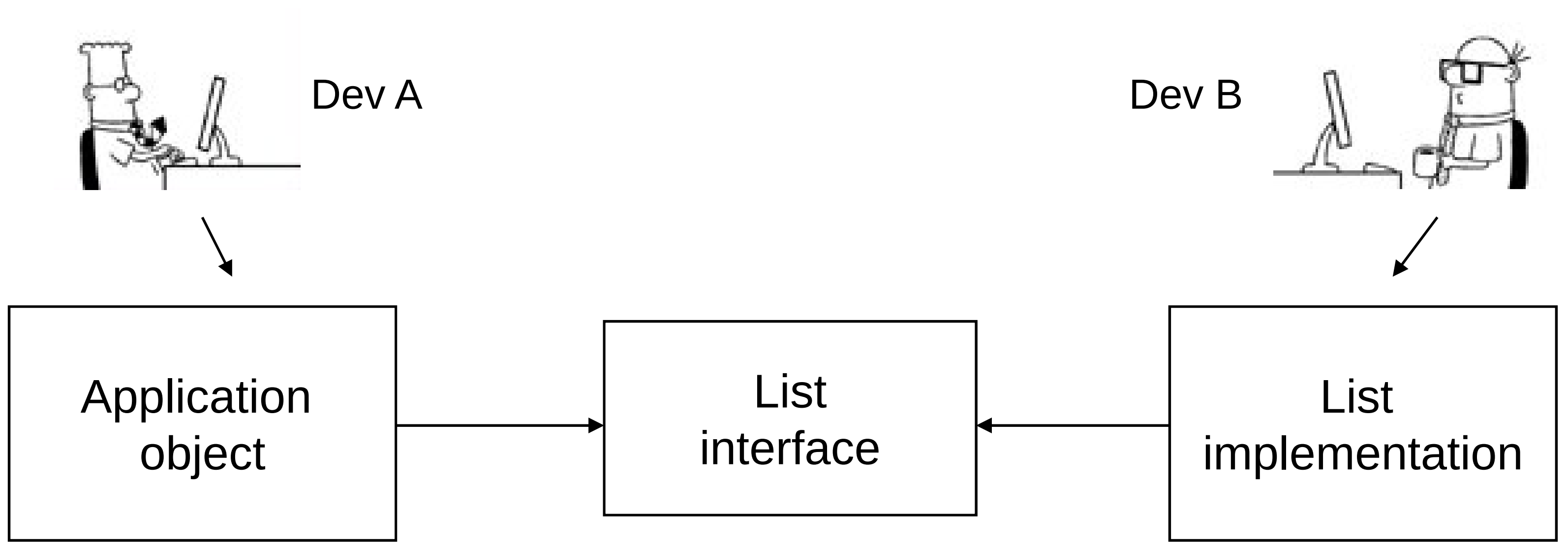
Program to interfaces (good practise!)

```
List list = new LinkedList();

List list = new ArrayList();
```

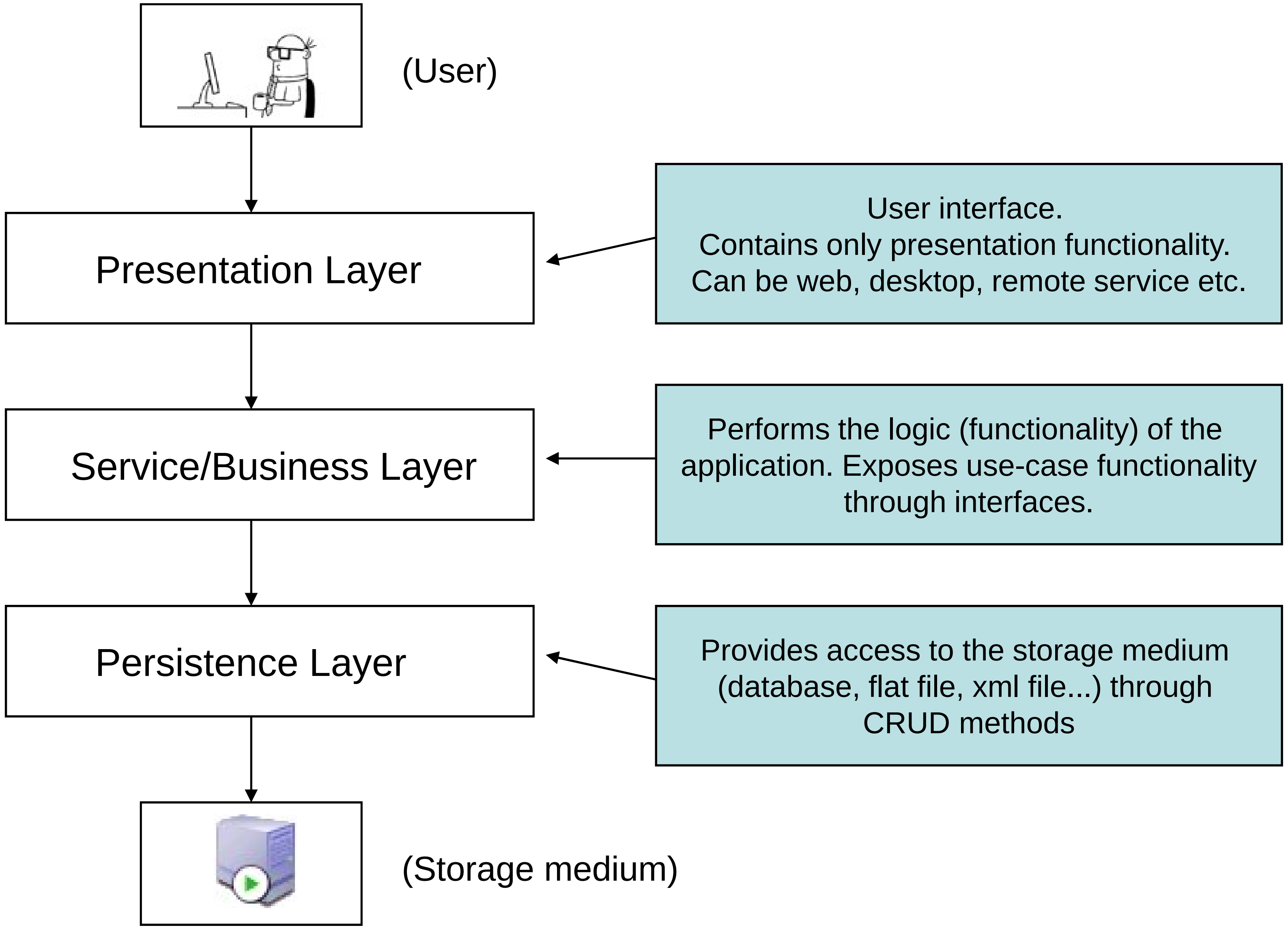
Works! Choose your own implementation!

Interfaces - Advantages

- In projects with many co-operating objects:
  - Interactions between objects can be defined prior to implementation
  - Implementation details can be hidden



Three-layer architecture

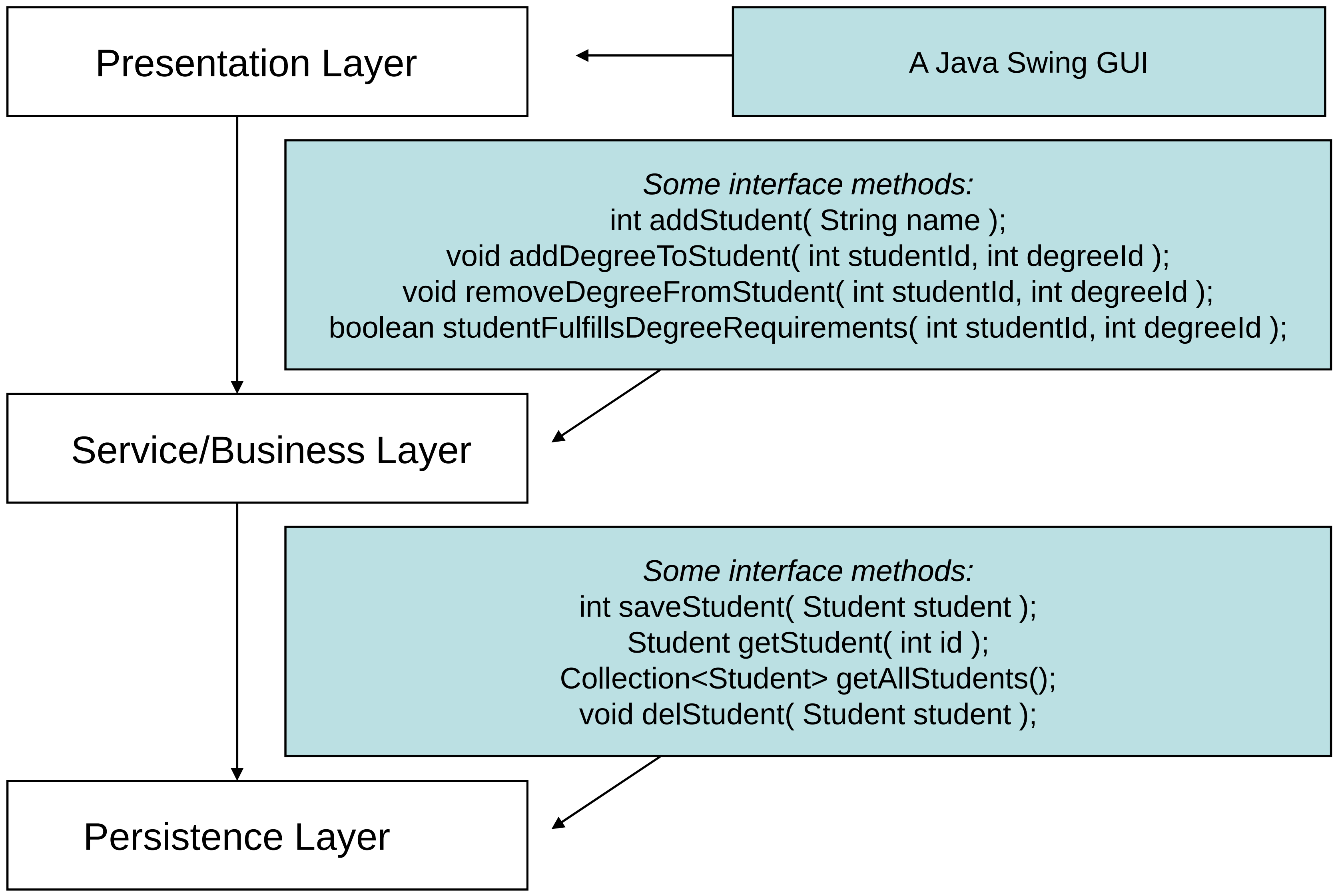


User interface.
Contains only presentation functionality.
Can be web, desktop, remote service etc.

Performs the logic (functionality) of the application. Exposes use-case functionality through interfaces.

Provides access to the storage medium (database, flat file, xml file...) through CRUD methods

Example: The student system



Some interface methods:

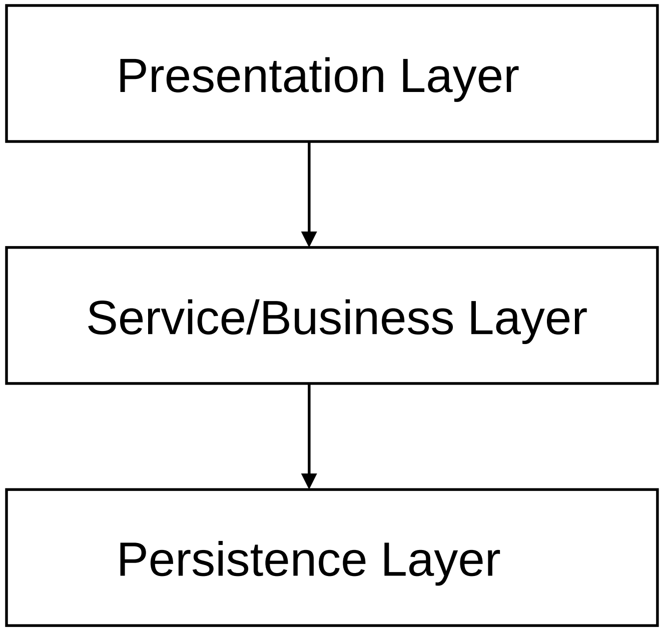
```
int addStudent( String name );
void addDegreeToStudent( int studentId, int degreeId );
void removeDegreeFromStudent( int studentId, int degreeId );
boolean studentFulfillsDegreeRequirements( int studentId, int degreeId );
```

Some interface methods:

```
int saveStudent( Student student );
Student getStudent( int id );
Collection<Student> getAllStudents();
void delStudent( Student student );
```

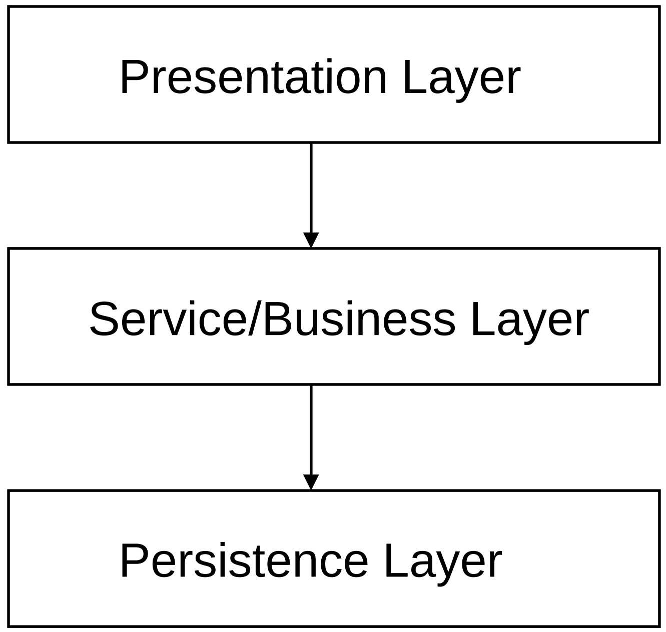
Principles

- Separation of concerns
  - Presentation layer contains presentation logic only!
- Presentation layer communicates only with service layer
  - No shortcuts...
- Assume nothing about the implementation!
  - Only interact with the contract (the interface)

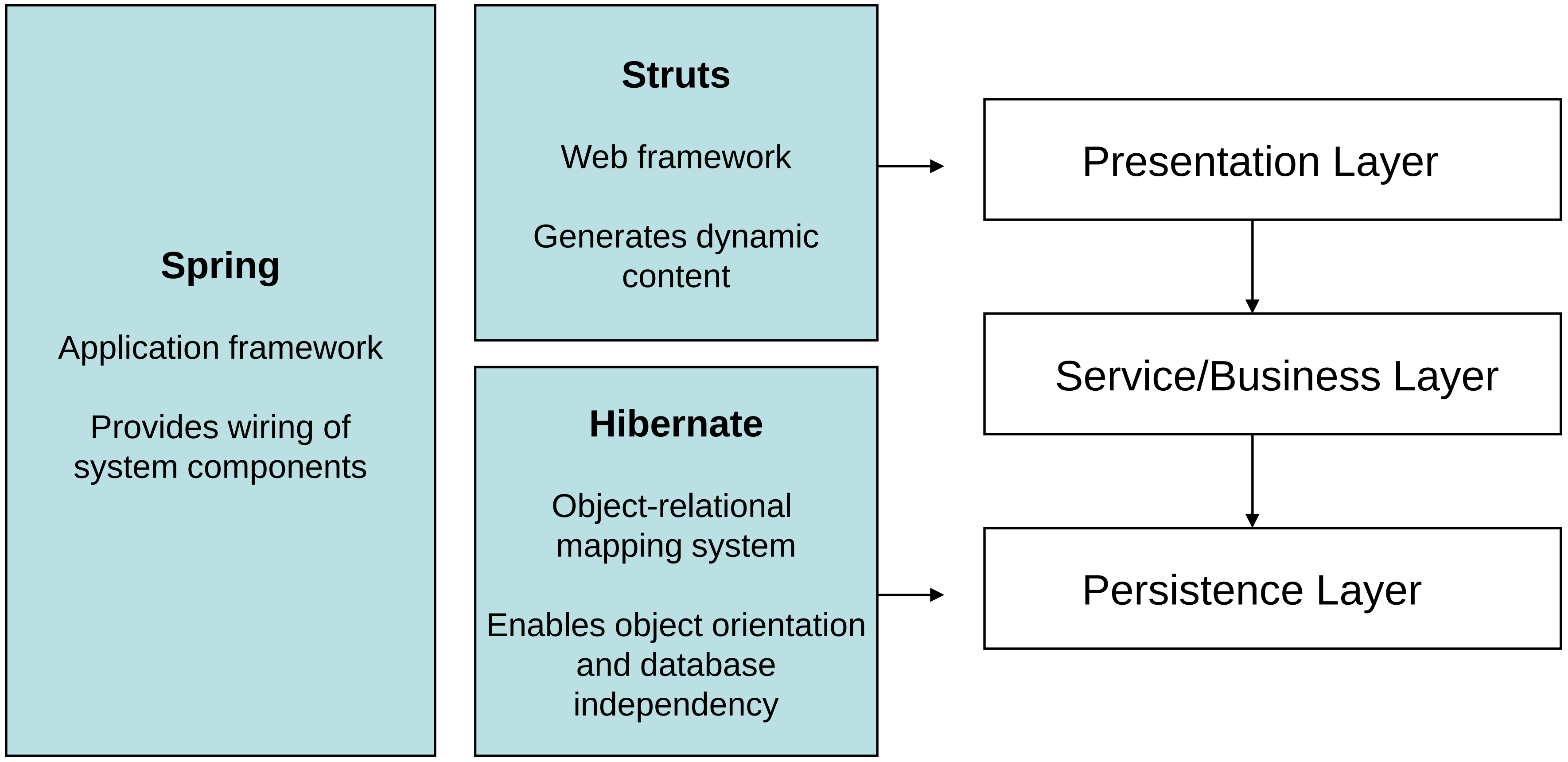


Advantages

- Flexibility
  - Easy to replace the layers
- Reusability
  - Re-use of components
- Testability
  - Mockup-implementations
- Maintainability
  - Cleaner, understandable code
- Scalability
  - Distribution of components across servers



Framework overview



Spring
Application framework
Provides wiring of system components
Struts
Web framework
Generates dynamic content
Hibernate
Object-relational mapping system
Enables object orientation and database independency
Presentation Layer
Service/Business Layer
Persistence Layer

Framework overview

Maven

Software project
management tool

Helps with:
Build process
Project structure
Dependency management
Information and documentation

Subversion

Revision control system

Enables multiple developers
to work on the same source
code base

JUnit

Unit testing framework

Verifies that individual units of code
are working properly