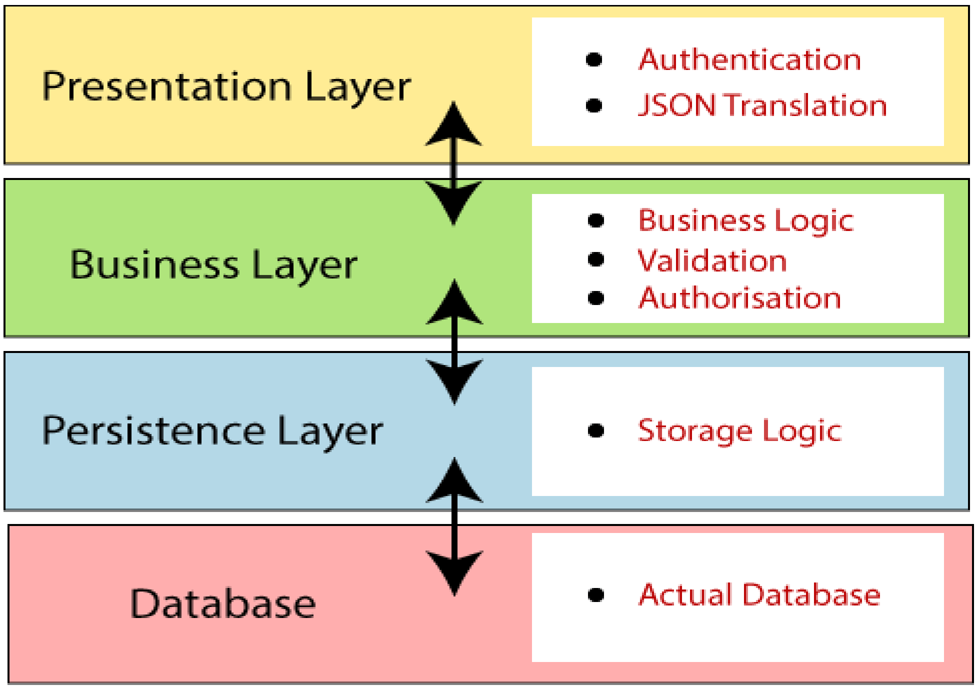
Spring Boot Architecture

Spring Boot is a module of the Spring Framework. It is used to create stand-alone, production-grade Spring Based Applications with minimum efforts. It is developed on top of the core Spring Framework.

Spring Boot follows a layered architecture in which each layer communicates with the layer directly below or above (hierarchical structure) it.

Before understanding the **Spring Boot Architecture**, we must know the different layers and classes present in it. There are **four** layers in Spring Boot are as follows:

- **Presentation Layer**
- **Business Layer**
- **Persistence Layer**
- **Database Layer**



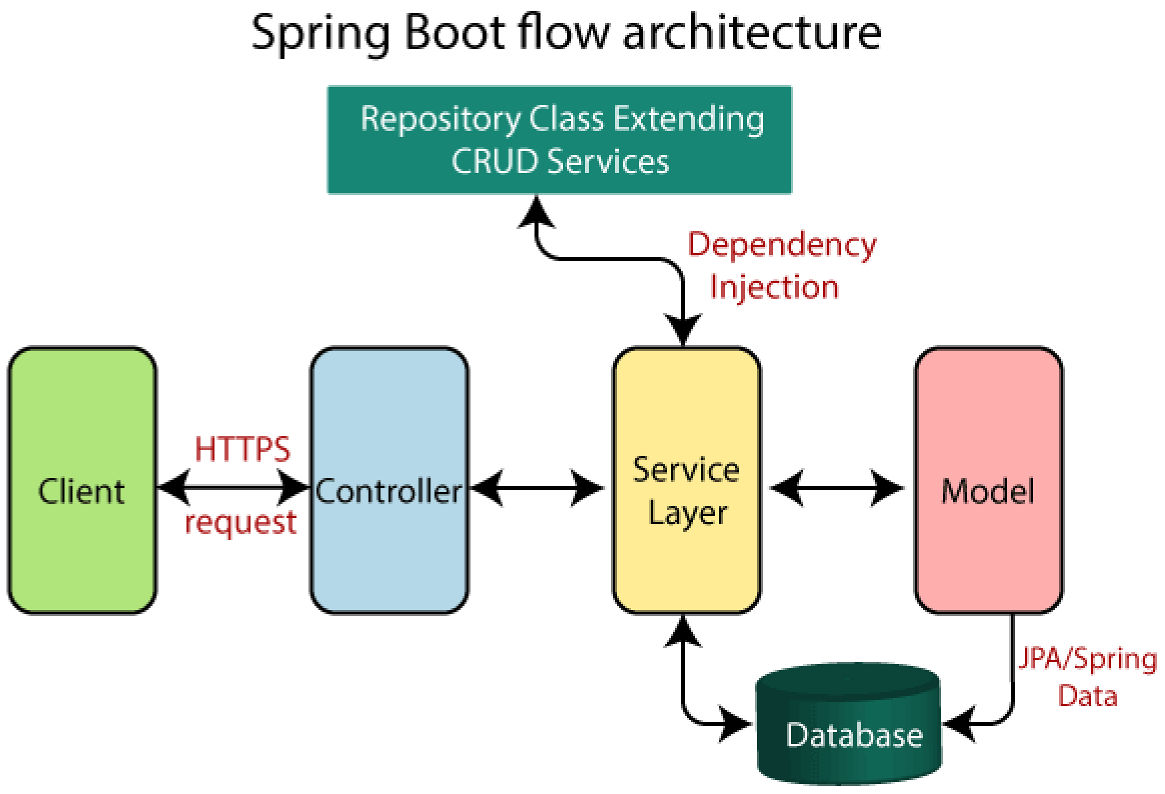
Presentation Layer: The presentation layer handles the HTTP requests, translates the JSON parameter to object, and authenticates the request and transfer it to the business layer. In short, it consists of **views** i.e., frontend part.

Business Layer: The business layer handles all the **business logic**. It consists of service classes and uses services provided by data access layers. It also performs **authorization** and **validation**.

Persistence Layer: The persistence layer contains all the **storage logic** and translates business objects from and to database rows.

Database Layer: In the database layer, **CRUD** (create, retrieve, update, delete) operations are performed.

Spring Boot Flow Architecture



- Now we have validator classes, view classes, and utility classes.
- Spring Boot uses all the modules of Spring-like Spring MVC, Spring Data, etc. The architecture of Spring Boot is the same as the architecture of Spring MVC, except one thing: there is no need for **DAO** and **DAOImpl** classes in Spring boot.
- Creates a data access layer and performs CRUD operation.
- The client makes the HTTP requests (PUT or GET).
- The request goes to the controller, and the controller maps that request and handles it. After that, it calls the service logic if required.
- In the service layer, all the business logic performs. It performs the logic on the data that is mapped to JPA with model classes.
- A JSP page is returned to the user if no error occurred.

Spring Boot Annotations

Spring Boot Annotations is a form of metadata that provides data about a program. In other words, annotations are used to provide **supplemental** information about a program. It is not a part of the application that we develop. It does not have a direct effect on the operation of the code they annotate. It does not change the action of the compiled program.

In this section, we are going to discuss some important **Spring Boot Annotation** that we will use later in this tutorial.

@Autowired: Spring provides annotation-based auto-wiring by providing @Autowired annotation. It is used to autowire spring bean on setter methods, instance variable, and constructor. When we use @Autowired annotation, the spring container auto-wires the bean by matching data-type.

Example

```java
@Component
public class Customer
{
private Person person;
@Autowired
public Customer(Person person)
{
this.person=person;
}
}
```

@Configuration: It is a class-level annotation. The class annotated with @Configuration used by Spring Containers as a source of bean definitions.

Example

```java
@Configuration
public class Vehicle
{
@BeanVehicle engine()
{
return new Vehicle();
}
}
```

@ComponentScan: It is used when we want to scan a package for beans. It is used with the annotation @Configuration. We can also specify the base packages to scan for Spring Components.

Example

```
@ComponentScan(basePackages = "com.javatpoint")
@Configuration
public class ScanComponent
{
// ...
}
```

@Bean: It is a method-level annotation. It is an alternative of XML <bean> tag. It tells the method to produce a bean to be managed by Spring Container.

Example

```
@Bean
public BeanExample beanExample()
{
return new BeanExample ();
}
```

Spring Framework Stereotype Annotations

@Component: It is a class-level annotation. It is used to mark a Java class as a bean. A Java class annotated with **@Component** is found during the classpath. The Spring Framework pick it up and configure it in the application context as a **Spring Bean**.

Example

```
@Component
public class Student
{
.......
}
```

@Controller: The @Controller is a class-level annotation. It is a specialization of **@Component**. It marks a class as a web request handler. It is often used to serve web pages. By default, it returns a string that indicates which route to redirect. It is mostly used with **@RequestMapping** annotation.

Example

```
@Controller
@RequestMapping("books")
public class BooksController
{
@RequestMapping(value = "/{name}", method = RequestMethod.GET)
public Employee getBooksByName()
{
return booksTemplate;
}
}
```

@Service: It is also used at class level. It tells the Spring that class contains the **business logic**.

Example

```
package com.javatpoint;
@Service
public class TestService
{
public void service1()
{
//business code
}
}
```

@Repository: It is a class-level annotation. The repository is a **DAOs** (Data Access Object) that access the database directly. The repository does all the operations related to the database.

```
package com.javatpoint;
@Repository
public class TestRepository
{
public void delete()
{
//persistence code
}
}
```

Spring Boot Annotations

- **@EnableAutoConfiguration:** It auto-configures the bean that is present in the classpath and configures it to run the methods. The use of this annotation is reduced in Spring Boot 1.2.0 release because developers provided an alternative of the annotation, i.e. **@SpringBootApplication**.
- **@SpringBootApplication:** It is a combination of three annotations **@EnableAutoConfiguration, @ComponentScan,** and **@Configuration**.

Spring MVC and REST Annotations

- **@RequestMapping:** It is used to map the **web requests**. It has many optional elements like **consumes, header, method, name, params, path, produces**, and **value**. We use it with the class as well as the method.
- **Example**

```
@Controller
public class BooksController
{
@RequestMapping("/computer-science/books")
public String getAllBooks(Model model)
{
//application code
return "bookList";
}
```

- **@GetMapping:** It maps the **HTTP GET** requests on the specific handler method. It is used to create a web service endpoint that **fetches** It is used instead of using: **@RequestMapping(method = RequestMethod.GET)**
- **@PostMapping:** It maps the **HTTP POST** requests on the specific handler method. It is used to create a web service endpoint that **creates** It is used instead of using: **@RequestMapping(method = RequestMethod.POST)**
- **@PutMapping:** It maps the **HTTP PUT** requests on the specific handler method. It is used to create a web service endpoint that **creates** or **updates** It is used instead of using: **@RequestMapping(method = RequestMethod.PUT)**

- **@DeleteMapping:** It maps the **HTTP DELETE** requests on the specific handler method. It is used to create a web service endpoint that **deletes** a resource. It is used instead of using: **@RequestMapping(method = RequestMethod.DELETE)**
- **@PatchMapping:** It maps the **HTTP PATCH** requests on the specific handler method. It is used instead of using: **@RequestMapping(method = RequestMethod.PATCH)**
- **@RequestBody:** It is used to **bind** HTTP request with an object in a method parameter. Internally it uses **HTTP MessageConverters** to convert the body of the request. When we annotate a method parameter with **@RequestBody,** the Spring framework binds the incoming HTTP request body to that parameter.
- **@ResponseBody:** It binds the method return value to the response body. It tells the Spring Boot Framework to serialize a return an object into JSON and XML format.
- **@PathVariable:** It is used to extract the values from the URI. It is most suitable for the RESTful web service, where the URL contains a path variable. We can define multiple @PathVariable in a method.
- **@RequestParam:** It is used to extract the query parameters form the URL. It is also known as a **query parameter**. It is most suitable for web applications. It can specify default values if the query parameter is not present in the URL.
- **@RequestHeader:** It is used to get the details about the HTTP request headers. We use this annotation as a **method parameter**. The optional elements of the annotation are **name, required, value, defaultValue.** For each detail in the header, we should specify separate annotations. We can use it multiple time in a method
- **@RestController:** It can be considered as a combination of **@Controller** and **@ResponseBody** annotations**.** The @RestController annotation is itself annotated with the @ResponseBody annotation. It eliminates the need for annotating each method with @ResponseBody.
- **@RequestAttribute:** It binds a method parameter to request attribute. It provides convenient access to the request attributes from a controller method. With the help of @RequestAttribute annotation, we can access objects that are populated on the server-side.