Spring In Action

# Core - Internals

1. Springs core is a **container** – **Spring application context**.
2. The container does the magic of **dependency injection** – initializes dependencies and injects them into the components that need them.
3. Automatic configuration = Autowiring + Component Scanning.
4. @Autowired means automatic injection into the constructor. You either need to add the annotation or inject the dependency manually.
5. @SpringBootApplication = @SpringBootConfiguration + @EnableAutoConfiguration + @ComponentScan
6. Spring uses **Tomcat** by default as the web server.
7. Spring devTools provide automatic restart on code change. It has too class loaders that load to the JVM. One contains code. The other contains the dependencies.
8. When annotating a class with configuration property, you can reference the variables inside that class in the YAML file as constants.

# Data – JPA

1. Custom **JPA** queries can be parsed (according to some criteria) in a way that **JPA** understands it. (readByDate – verb + By + predicate)

# Configurations

1. The configurations of spring can be set through the following ways: **JVM properties, OS envs, CLI args and App property configuration files**.
2. It aggregates the configs into a context where the spring beans can be injected.
3. The connection pool uses **Tomcats JDBC**, if not it uses **Hikari**.
4. Setting **server.port** to 0 will generate random port numbers every time.
5. Adding @ConfigurationProperties(prefix="bazz")at the top of the class will make the class referenceable as bazz from outsize of the files and accessing the properties of that class can be done through bazz.property.
6. Configuring **profiles** can make it easier than **envs** or **CLI args** to work differently with **dev** or **prod** environments which can be created using with **Yamls**.

# RESTful

1. Using the @RestController is the same as using the @Controller. But for REST services you should either annotate all the methods with @ResponseBody or return **ResponseEntity.**
2. The @RequestMapping annotation has the produces attribute that refers to the data type returned. ({"application/json", "text/xml"})
3. Methods that apply to uploading methods like POST or PATCH can have a property consumes that refers to the content that is uploaded. ("application/json")
4. The annotation @ResponseStatus replaces the use of **ResponseEntity**’s status code.
5. **HATEOAS** basically means creating self-describing APIs that contain links to other related resources.
6. **HATEOAS** can be easily implemented using the Resource/’s class in order to wrap returned content.
7. The **Data REST** dependency addsREST endpoints according to the data repositories you have. The endpoints are also associated with **HATEOAS.**
8. spring.data.rest.base-path property sets the base path for **Data REST**.
9. **Data REST** pluralizes the name for the entity/repository. (/api/people)
10. @RestResource’s rel and path attributes let you set the entity name and path.
11. Using custom @RestController along with **Data REST** introduces two problems: No-alignment between the paths and non-awareness of the two controllers with each other’s entities.
12. Of the many ways of consuming Springs REST APIs internally, there are mainly three: **RestTemplate**, **Traverson** and **WebClient**.

# Security

1. Spring securities auto-configuration has the following properties: **Authentication prompt for all routes**, **no authorization roles** and **no login page**.

# Messaging

1. With Spring, there are some ways of async messaging: **JMS**, **AMQP**s (**RabbitMQ**) and **Kafka**.
2. Those tools need a **message broker**.
3. **JMS** uses **Apache** **ActiveMQ** or **Artemis**. Both run on **TCP**.
4. In message consumption, there are two ways of handling incoming messages: **Pull Model** and **Push Model**.
5. **Pull Model**: An invoked method that is blocked by a **thread** until a message arrives. (blocking IO)
6. **Push Model**: An **event listener** is registered for when the message arrives it fires. (Non-blocking IO)
7. **JMS** only uses the **Pull Model**.
8. The **Push** **Model** of **JMS** is implemented using the@JmsListener annotation.
9. In **RabbitMQ**, the **queue** is the only thing the consuming app needs to know.
10. **RabbitMQ** has both **Pull** and **Push Models**. In receiving methods, if you set a **timeout** the **Pull Model** is invoked. Else, the **Push Model** is invoked.
11. Annotating a method using@RabbitListener will make the method a **message listener**.
12. Apache Kafka run in clusters which makes it very scalable.
13. Apache kafka’s broker does not push the messages like RabbitMQ. It waits for the consumer to consume them.
14. The way Apache Kafka consumes messages is through listening to messages in a method that is annotated using @KafkaListener.

# Integration

1. Spring integration provides many features as one of them is creating pipelines of components which data can flow through.
2. Message Sources are the way to do tasks with integrations. You watch for changes, incoming messages or etc.. and continue through the pipeline.
3. Eg. In order to write a file, you need the following components wrapped as a pipeline:
4. Messaging Gateway: which receives the request.
5. Channels that are auto-configured if you use their names even without declaring them as beans.
6. Transformer: a component that changes the message before writing it to a file.
7. Service Activator: the writing handler. This deals with the last channel.
8. You can use the **Java DSL (domain-specific language)** to make the flow more readable with only one configuration bean.
9. Channels: Pass messages from one element to another.
10. Filters: Conditionally allow messages to pass through the flow.
11. Transformers: Change message values and/or convert message payloads.
12. Routers: Direct messages to one of several channels.
13. Splitters: Split incoming messages into many messages, sent to different channels.
14. Aggregators: Combining multiple messages from separate channels into a message.
15. Service activators: Hand a message to Java method for processing, then publish the return value to an output channel.
16. Channel adapters: Connect a channel to external systems for input/output.
17. Gateways: Pass data into an integration flow.

# Reactor

1. Reactor is a project that adds asynchronous programming to Spring.
2. It makes it non-blocking IO like Node.js.
3. It is different from Java Streams because Java Streams use a single thread and is imperative.
4. The Reactor project for spring has two main modules: Flux and Mono (Observable and Single for JavaRX).
5. Using static Flux functions, you can achieve many operations on arrays and iterables.
6. In order to make an API fully non-blocking, all you have to do is to change the types to Mono/Flux and the framework will treat them as asynchronous.
7. Springs Reactor project allows you to write APIs in a functional manner using the components: RequestPredicate, RouterFunction, ServerRequest and ServerResponse.
8. Spring Reactor has webclient which is RestTemplates alternative for reactives.
9. There is no support for relational databases in Reactor.
10. The four supported databases are: MongoDB, Couchbase, Redis and Cassandra.
11. You can use JPA and relational databases but the reactivity does not reach the persistence layer.
12. When using any reactive repository, make sure that you add reactive data types such as Mono or Flux. Otherwise, you will get a Couldn't find PersistentEntity for type error.
13. Reactive repositories don’t need an annotation.

# Cloud - Eureka

1. Eureka is an open source project – server that was created by Netflix. It acts as a registry and allows you to register other services to it as in a microservice architecture.
2. There is a chance that dependency conflicts happen if you include more dependencies than required.
3. Eureka tries to check for the registered services every 30 seconds. If no service is registered after three cycles, it shows a red message indicating that there is a network issue.
4. The Eureka dashboard on the default port shows the nodes connected to it named by the spring.application.name property.
5. You can resolve the message by setting eureka.server.enable-self-preservation to false
6. The connection between the server and the client should be obvious.:

* The server has an endpoint on which clients can connect to. That endpoint is /eureka.
* The port that the client connects to by default is 8761 so the servers port should be configured to that.
* Or the port that the client connects to should be changed.
* You can change the URL that the clients connect to (from the clients properties) or the URL that the server takes (from the servers properties) with eureka.client.service-url.defaultZone.

1. You can make a RestTemplate load balanced with @LoadBalanced.
2. Using Feign, you can map direct HTTP calls to specific service names (only by including the node names)

# Cloud – Config Server

1. Springs cloud config server is a server that can externalize service properties in order for the loose coupling of configurations.
2. You can use Git repos or Hashicorps Vault to store credential properties.
3. Apart from the required dependencies, all you need to add to the application is the @EnableConfigServer annotation.
4. In order to connect the config server to a git repo, you add spring.cloud.config.server.git.uri to the servers application.properties.
5. You can also let the server get config files from subpaths using spring.cloud.config.server.git.search-paths.
6. The config server then exposes the endpoint on /application/default/:label?{optional} for other services to connect to.
7. For private repos, you set the username and password properties on spring.cloud.config.server.git.
8. The spring.cloud.config.server.git.password property should be an access token generated for your account.
9. In the client services, the only property that should be set is spring.cloud.config.uri.
10. The bootstrap.properties file contains the configuration that is set before the application.properties. Because the bootstrap has a context in which the application context falls in.
11. There are two ways of adding security in Config Server:

* Symmetric: setting the encryption.key to a value and using it everywhere.
* Asymmetric: creating RSA key and setting the key-store encryption properties.
* Note: the dependencies required to import the bootstrap must be set. Otherwise, the application will not reach out to the bootstrap file.

1. When configuring the security of the server to run on RSA algorithm, you should have JCE – Java Cryptography Extension.
2. The encrypt.key-store.location property for RSA encryption should be as: classpath:/file.jks where classpath refers to the resources folder.
3. Comparing the keytool RSA generator and the bootstrap properties, we can see the password is -storepass and secret is -keystore.
4. The server then exposes two endpoints that receive plane text data from POST requests: /encrypt and /decrypt.
5. When saving an encrypted key in a git repos application.properties, you should prefix it with {cipher}. So when the server loads the properties, it decrypts it.

Important Note: The difference between Config Server and Eureka is that Cloud Config Server acts as a centralized config mechanism. Eureka on the other hand is meant so that services can discover each other without having to hard code the host and port anywhere.

# Cloud – Circuit Breaker

1. The circuit breaker pattern is like an electrical circuit. It is normally closed so the current flows. When it fails, the circuit opens and the current does not flow.
2. This is applied in software for failure handling in three cases:

* REST API call failures.
* Database query failures.
* Slow methods.

1. The Hystrix project has been deprecated for over two years now and the alternative of it by Spring is Resilience4J.

# Cloud – Spring Actuator

1. Spring Actuator is a project that can help you understand the application only by hitting API endpoints prefixed with /actuator.
2. Once included in pom.xml, routes are automatically included into the paths.
3. You can change the base path with management.endpoints.web.base-path.
4. Only the info and health path are exposed at first. In order to expose all, you should add them to management.endpoints.web.exposure.include.
5. You can add info to the application with info.keyword…
6. You can contribute to the Actuators info by creating a component that implements the InfoContributor interface and overrides the contribute method.
7. Spring security can be applied to Spring Actuators endpoints in order to restrict access to it.

# Cloud – Spring Admin Server

1. The Spring Admin Server is a server that connects to the Spring Actuator and provide a UI to the endpoint data.
2. The sever becomes ready for connection with other Actuator services.
3. The clients can connect to the server with spring.boot.admin.client.url.
4. Authentication can be added with spring.security.user.

# 3rd Party Libraries – Lombok

1. **Lombok** is not a Spring library. It is a 3rd party.
2. **Lombok** does the internal initialization of the setters and getters behind.

# Spring Data – JdbcTemplate

1. There are two ways of accessing a database: **JDBC** and **JPA**.
2. All exceptions that might be thrown in accessing database with java cannot be caught with SQLException. Some of them will be thrown for **handling upstream**.
3. Using **Lombok** can save you creating setters and getters in entities.

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| Current | Replacement |
| Hystrix | [Resilience4j](https://github.com/resilience4j/resilience4j) |
| Hystrix Dashboard/Turbine | Micrometer + Monitoring System |
| Ribbon | Spring Cloud Loadbalancer |
| Zuul 1 | Spring Cloud Gateway |
| Archaius 1 | Spring Boot external config + Spring Cloud Config |