Creating RESTful web services with Spring Boot

The Spring framework

- Free and open source
- Inversion of Control Container (IoC)
- Modules
  - DI / AOP
  - Data /Security
  - Web MVC/ REST
  - So much more +++

What is Spring Boot ?

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- Getting started with Spring Boot is easy
- Convention over configuration
- SPRING CLI
- Entry Point
- Starter POMs
- Production Ready
- Run anywhere!

Starter POMs

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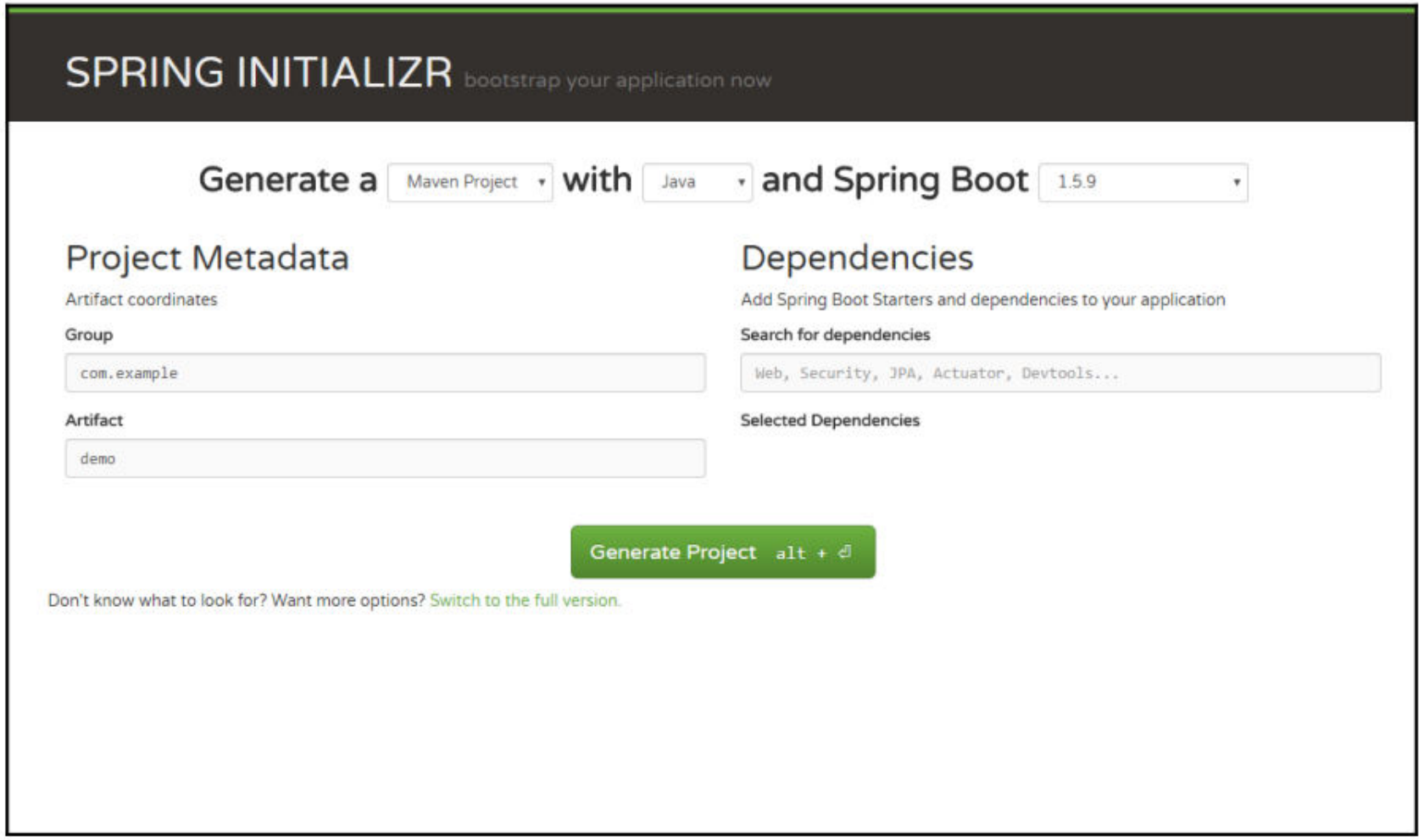
- spring-boot-starter-*
- Set of convenient dependency descriptors
- So what starter POMs are available ?
  - docs.spring.io
  - The most common ones :

    - `spring-boot-starter`
    - `spring-boot-starter-actuator`
    - `spring-boot-starter-jdbc`
    - `spring-boot-starter-data-*`
    - `spring-boot-starter-test`
    - `spring-boot-starter-security`
    - `spring-boot-starter-web`

Create a BOOTiful app on the fly

- ... With Spring Initializr Project -> http://start.spring.io



Executable JARs

- Spring Boot includes a Maven plugin that can package the project as an executable jar.
- Add the plugin to your <plugins> section if you want to use it

```
<build>
    <plugins>
        <plugin>
            <groupId>org.springframework.boot</groupId>
            <artifactId>spring-boot-maven-plugin</artifactId>
        </plugin>
    </plugins>
</build>
```

Spring Boot: Auto Configuration

- Spring Boot Auto Configuration attempts to automatically configure your Spring application based on the jar dependencies that you have added

- Autoconfiguration is not invasive

REST

- architectural principle for managing state information

A few RESTful principles

- In REST principles, all resources are identified by the Uniform Resource Identifier (URI).
- HTTP REST resources are represented in some media types, such as XML, JSON, and RDF.
- RESTful resources are self-descriptive
- In REST principles, the server will not keep any state about the client session on the server side; hence, it's stateless
- With RESTful web services, a client can cache any response coming from the server. The server can mention how, and for how long, it can cache the responses.

HTTP Verbs

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HTTP METHOD	PATH	DESCRIPTION
GET	/users	Gets all users in the repository
GET	/users/{id}	Gets the user with an id of 1
POST	/users	Creates a new user
PUT	/users/1	Creates or updates an existing user
DELETE	/users/1	Deletes user with an id of 1

HTTP Status Codes

Status Code	Description
1xx	Informational
2xx	Success
3xx	Redirection
4xx	Client Error

Spring MVC

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- **FrontController = DispatcherServlet**
- **@EnableWebMvc** : Spring Boot adds it automatically when it sees Spring MVC on the classpath
- This flags the application as a webapp & activates features like : setting up the DispatcherServlet for us
- Web service components have special annotations like @Service, @RestController – provide hints of the role that the class has

CRUD operations with Spring Boot

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```java
@RestController
@RequestMapping("/user")
public class UserController {

    @Autowired
    UserService userService;

    @RequestMapping("")
    public List<User> getAllUsers() { return userService.getAllUsers(); }

    @GetMapping("/{id}")
    public User getUser(@PathVariable("id") Integer id) { return userService.getUser(id); }

    @PostMapping(value = "")
    public Map<String, Object> createUser(@RequestParam(value = "userid") Integer userid,
                                          @RequestParam(value = "username") String username) {
        Map<String, Object> map = new LinkedHashMap<>();
        userService.createUser(userid, username);
        map.put("result", "added");
        return map;
    }
```

CRUD operations with Spring Boot

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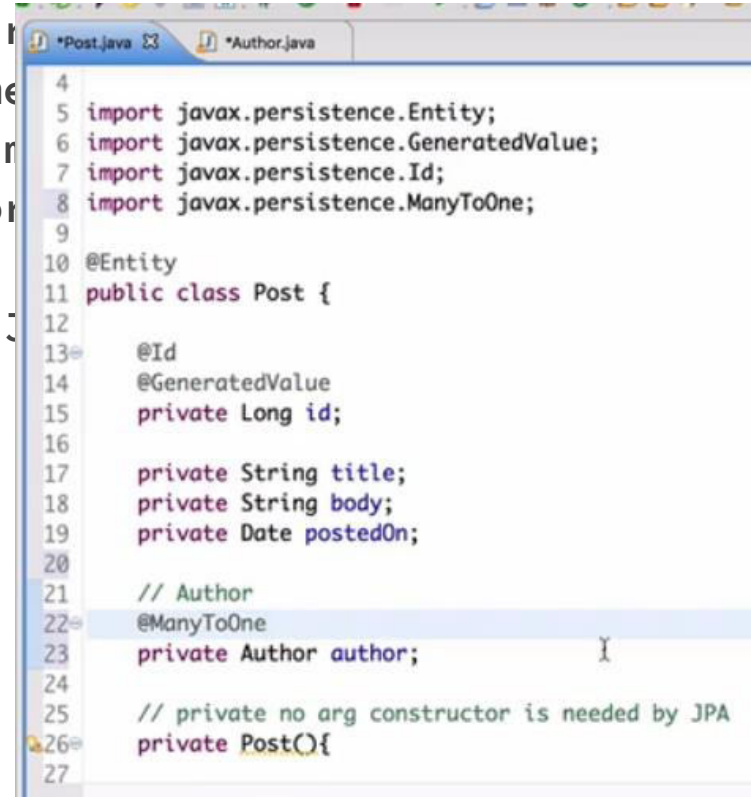
```
@PutMapping(value = "/{userid}")
public Map<String, Object> updateUser(@PathVariable Integer userid,
                                      @RequestParam(value = "username") String username) {
    Map<String, Object> map = new LinkedHashMap<>();
    userService.updateUser(userid, username);
    map.put("result", "updated");
    return map;
}

@DeleteMapping(value = "/{id}")
public Map<String, Object> deleteUser(
        @PathVariable("id") Integer userid) {
    Map<String, Object> map = new LinkedHashMap<>();
    userService.deleteUser(userid);
    map.put("result", "deleted");
    return map;
}
}
```

Data Access with Spring Boot

- Creating Entities & Repositories

  - Spring-boot-starter-jpa
  - we're using JPA , a way allows us to map objects to r
  - it has Hibernate, one of the most popular JPA impleme
  - it gives us spring-data-jpa which makes it easy to ir
  - it gives us spring-orm which gives us core ORM suppor

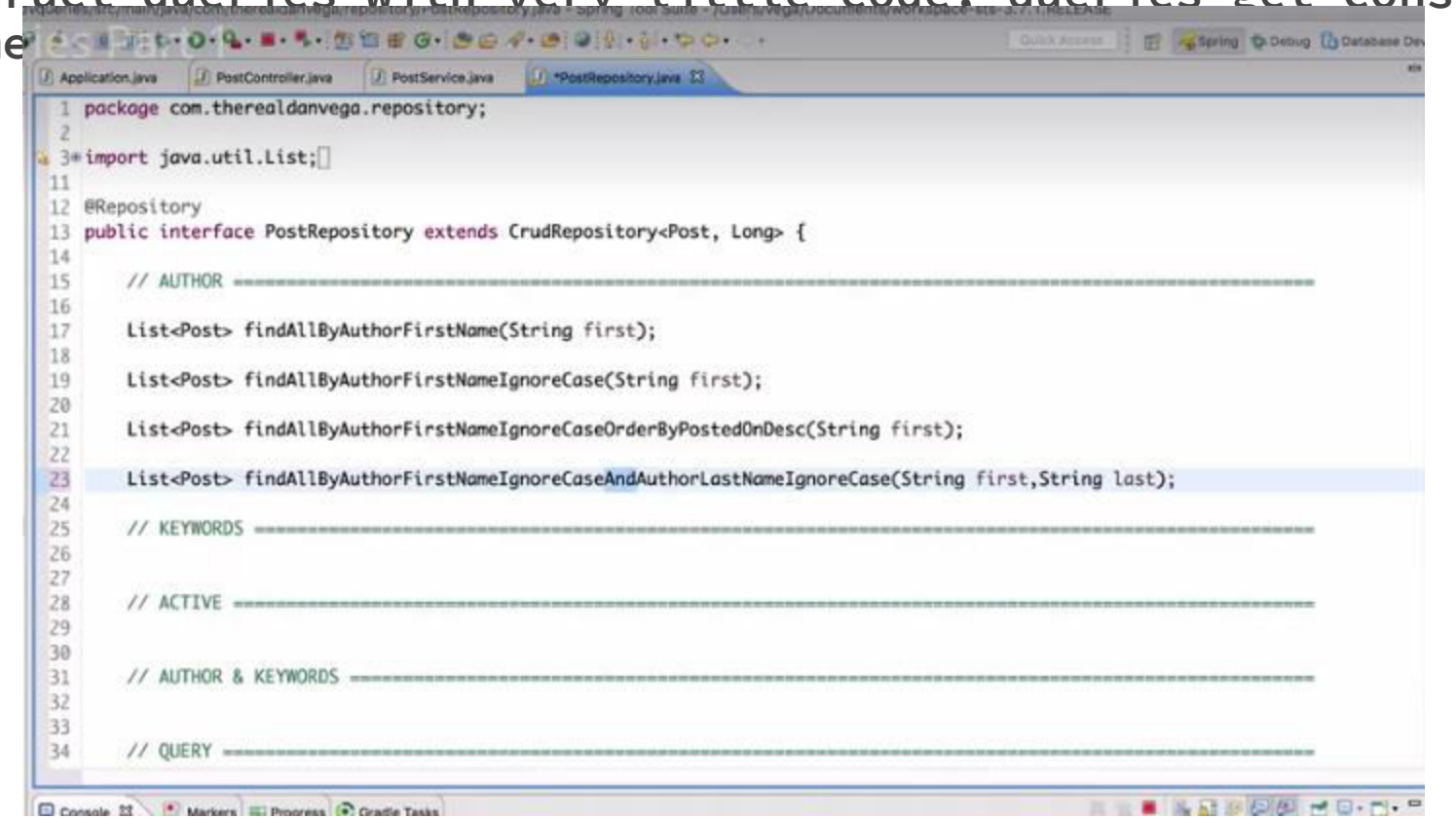
  - flag a POJO with @Entity if you want it to become a J



Data Access with Spring Boot

- We get a lot of methods out of the box from CrudRepository : save(entity), findOne(id), exists(id), delete(id), delete(entity)

- construct queries with very little code, queries get constructed by Spring from the me



Testing RESTful web services

- Junit
- MockMvc
- @MockBean
- JPA components Tests
- WebMVC component Test

Security & JWT

- JWT tokens are URL-safe and web browser-compatible especially for Single Sign-On (SSO) contexts.

- JWT has three parts:
- Header
- Payload/body
- Signature

- OAuth2.0

Building a REST Client

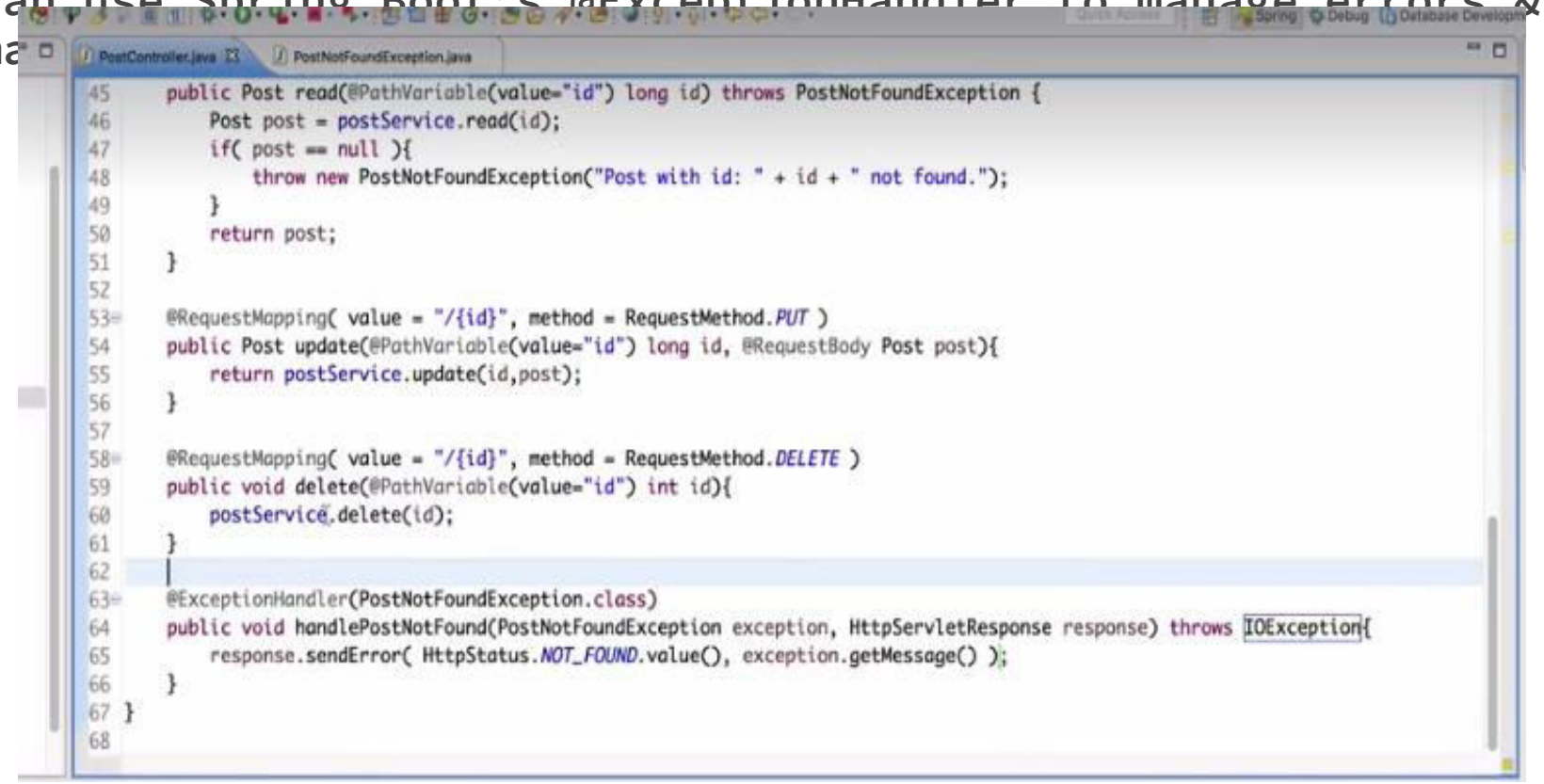
- If we want to build a REST Client to consume another REST API, SpringTemplate is a Spring class used to consume REST API from the client side .

- RestTemplate can be used use to call GET, POST, PUT, DELETE, and other advanced HTTP methods (OPTIONS, HEAD)

```
@RestController
@RequestMapping("/client")
public class ClientController {

	private final Logger _log = LoggerFactory.getLogger(this.getClass());

	@Autowired
	private RestTemplate template;

	@ResponseBody
	@RequestMapping("/test")
	public Map<String, Object> test(){
		Map<String, Object> map = new LinkedHashMap<>();

		String content = template.getForObject("http://localhost:8080/", String.class);
		map.put("result", content);

		return map;
	}
```

Error Handling

- usually when we deal with an unexpected situation in REST APIs, it will automatically throw an HTTP error such as 404
- we might need a JSON format result regardless of whether things go right or wrong
- we can use Spring Boot's @ExceptionHandler to manage errors & display them in JSON forma



```
45    public Post read(@PathVariable(value="id") long id) throws PostNotFoundException {
46        Post post = postService.read(id);
47        if( post == null ){
48            throw new PostNotFoundException("Post with id: " + id + " not found.");
49        }
50        return post;
51    }
52
53    @RequestMapping( value = "/{id}", method = RequestMethod.PUT )
54    public Post update(@PathVariable(value="id") long id, @RequestBody Post post){
55        return postService.update(id,post);
56    }
57
58    @RequestMapping( value = "/{id}", method = RequestMethod.DELETE )
59    public void delete(@PathVariable(value="id") int id){
60        postService.delete(id);
61    }
62
63    @ExceptionHandler(PostNotFoundException.class)
64    public void handlePostNotFound(PostNotFoundException exception, HttpServletResponse response) throws IOException{
65        response.sendError( HttpStatus.NOT_FOUND.value(), exception.getMessage() );
66    }
67 }
68
```

QUESTIONS & ANSWERS