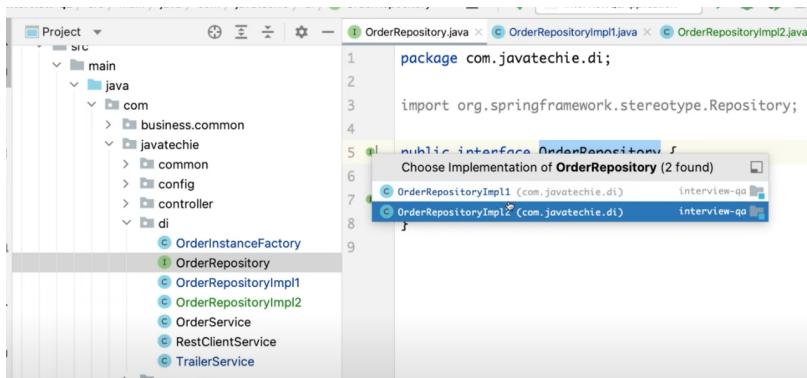


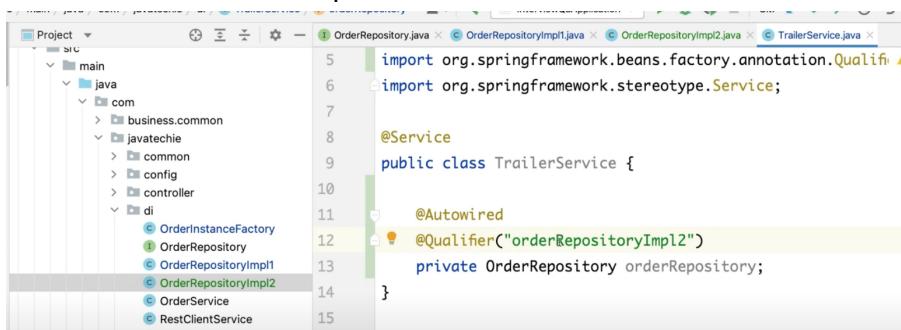
23. How will you resolve bean dependency ambiguity ?



```
8  @Service
9  public class TrailerService {
10
11     @Autowired
12     private OrderRepository orderRepository;
13 }
14
```



Qualifier bean solves the problem.



24. Can we avoid this dependency ambiguity without using @Qualifier ?

```

src/main/java/com/javatechie/di/TrailerService.java
public class TrailerService {
    @Autowired
    //@Qualifier("orderRepositoryImpl2")
    @Resource(name = "orderRepositoryImpl1")
    private OrderRepository orderRepository;
}

```

Qualifier given by Spring and it is done by Type where as Resource annotation by name provided by java (jakarta.resource).

```

@Service
public class TrailerService {
    @Autowired
    //@Qualifier("orderRepositoryImpl2")//byType
    @Resource(name = "orderRepositoryImpl1")//byName
    private OrderRepository orderRepository;
}

```

25. What is bean scope & Can you explain different type of bean scope ?

- Singleton
 - Prototype
 - Request
 - Session
 - Application
 - WebSocket
- Web-Based application*

Singleton

In the singleton scope, Spring Boot creates a single instance of the bean for the entire application context.



It is the default scope. So no need to code explicitly.

```

@Component
//@Scope("singleton")
public class BeanScopeTestService {
    public BeanScopeTestService() {
        System.out.println("BeanScopeTestService() instance created..");
    }
}

```

Call it in run method and notice it is created only one object and used everytime same object.

The screenshot shows the IntelliJ IDEA interface. On the left, there's a tool bar with icons for Structure, DB Browser, Pull Requests, and others. The main area shows Java code for a service class:

```
77 // ...
78 // ...
79 SingletonBean sb2 = context.getBean(SingletonBean.class);
80 System.out.println(sb1.getProtoTypeBean().hashCode() + " - " + sb2.getProtoTypeBean().hashCode());
81 BeanScopeTestService service1=context.getBean(BeanScopeTestService.class);
82 BeanScopeTestService service2=context.getBean(BeanScopeTestService.class);
83 BeanScopeTestService service3=context.getBean(BeanScopeTestService.class);
84 }
85 @Override
86 public void run(String... args) throws Exception {
```

Below the code is a 'Run' window titled 'InterviewQaApplication'. It displays the following log output:

```
2023-10-13T09:54:56.306+05:30  INFO 9677 --- [main] org.springframework.context.support.ClassPathXmlApplicationContext : Refreshing org.springframework.context.support.ClassPathXmlApplicationContext@700...: startup date [2023-10-13T09:54:56.306+05:30]; root of context hierarchy
2023-10-13T09:54:56.306+05:30  INFO 9677 --- [main] o.s.c.support.DefaultLifecycleProcessor : PostConstruct logic executed ...
2023-10-13T09:54:56.306+05:30  INFO 9677 --- [main] o.s.c.support.DefaultLifecycleProcessor : SecurityConfig loaded .....
2023-10-13T09:54:56.306+05:30  INFO 9677 --- [main] o.s.c.support.DefaultLifecycleProcessor : SwaggerConfig loaded .....
2023-10-13T09:54:56.306+05:30  INFO 9677 --- [main] o.s.c.support.DefaultLifecycleProcessor : BeanScopeTestService() instance created...
2023-10-13T09:54:56.306+05:30  INFO 9677 --- [main] o.s.c.support.DefaultLifecycleProcessor : SingletonBean() instantiated !!
2023-10-13T09:54:56.306+05:30  INFO 9677 --- [main] o.s.c.support.DefaultLifecycleProcessor : ProtoTypeBean() instantiate
2023-10-13T09:54:56.480+05:30  WARN 9677 --- [main] JpaBaseConfiguration$JpaWebConfiguration : spring.jpa.open-in-view is enabled by default. Therefore, by default, JPA queries cannot be registered as transactions.
2023-10-13T09:54:57.104+05:30  INFO 9677 --- [main] o.s.b.w.embedded.tomcat.TomcatWebServer : Tomcat started on port(s): 8080 (http)
```

Prototype

In the prototype scope, a new instance of the bean is created every time it is requested from the Spring container.

The screenshot shows the IntelliJ IDEA interface. On the left, there's a tool bar with icons for Project, Structure, DB Browser, and others. The main area shows Java code for a service class:

```
6
7     @Component
8     @Scope("prototype")
9     public class BeanScopeTestService {
10
11         public BeanScopeTestService() {
12             System.out.println("BeanScopeTestService() instance created..");
13         }
14     }
```

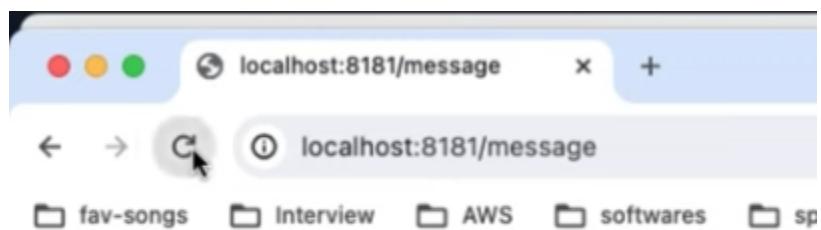
Below the code is a 'Run' window titled 'InterviewQaApplication'. It displays the following log output:

```
78 System.out.println(sb1.getProtoTypeBean().hashCode() + " - " + sb2.getProtoTypeBean().hashCode());
79 BeanScopeTestService service1=context.getBean(BeanScopeTestService.class);
80 BeanScopeTestService service2=context.getBean(BeanScopeTestService.class);
81 BeanScopeTestService service3=context.getBean(BeanScopeTestService.class);
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```

```
8  @Component
9  @Scope(value = WebApplicationContext.SCOPE_REQUEST, proxyMode = ScopedProxyMode.TARGET_CLASS)
10 public class RequestScopedBean {
11
12     private String message;
13
14     public RequestScopedBean() {
15         System.out.println("RequestScopedBean() constructor called !!");
16         this.message = "This is a request-scoped bean ";
17     }
18
19     public String getMessage() { return message; }
20 }
```

The screenshot shows the IntelliJ IDEA interface with the following details:

- Project Bar:** Shows multiple open files: `i1.java`, `OrderRepositoryImpl2.java`, `TrailerService.java`, `BeanScopeTestService.java`, and `InterviewQ`.
- Toolbars:** Includes "Project", "Structure", "DB Browser", and "Pull Requests".
- Code Editor:** Displays Java code for a controller named `DemoController`. The code includes annotations like `@RestController`, `@Autowired`, and `@GetMapping`. It defines fields for `RequestScopedBean` and `SessionScopedBean`. The `requestScopedBean` field has a tooltip indicating it is a `RequestScope` bean.
- Bottom Status Bar:** Shows icons for "Favorites" and "Project".



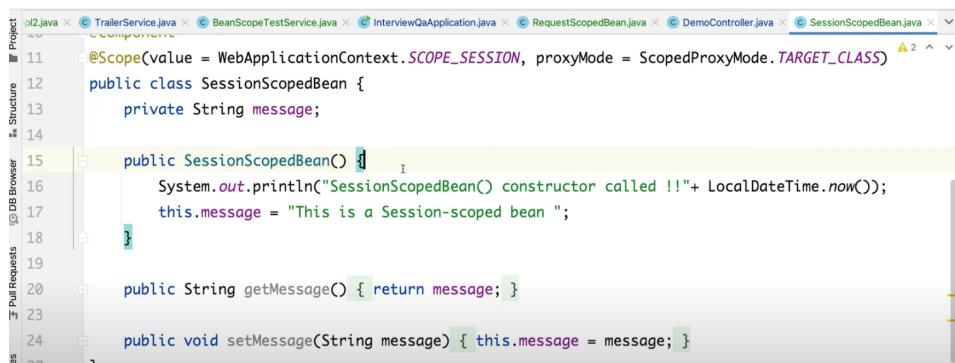
This is a request-scoped bean

10 hits and 10 objects created

It is important to have request scope bean in web application because each request hold some data specific to user. (eg: any form data).

4. Session scope

*It creates a single instance of the bean per user session.
The instance persists throughout the user's session and is typically discarded when the session ends.*



```
11  @Scope(value = WebApplicationContext.SCOPE_SESSION, proxyMode = ScopedProxyMode.TARGET_CLASS)
12  public class SessionScopedBean {
13      private String message;
14
15      public SessionScopedBean() {
16          System.out.println("SessionScopedBean() constructor called !!"+ LocalDateTime.now());
17          this.message = "This is a Session-scoped bean ";
18      }
19
20      public String getMessage() { return message; }
21
22      public void setMessage(String message) { this.message = message; }
```



```
@RestController
public class DemoController {

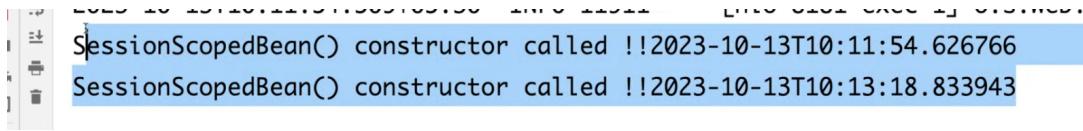
    /**
     * 
     * @Autowired
     * private RequestScopedBean requestScopedBean;
     */
    @Autowired
    private SessionScopedBean sessionScopedBean;

    @GetMapping("/message")
    public String getMessage() {
        return sessionScopedBean.getMessage();
    }

}
```

For demonstration purpose use the below properties

```
20
21      server.session.cookie.max-age= 1
22      server.session.timeout= 1
```



```
SessionScopedBean() constructor called !!2023-10-13T10:11:54.626766
SessionScopedBean() constructor called !!2023-10-13T10:13:18.833943
```

Object is created for every one min. In between if we trigger any number of times it won't create an object. Because it is a session object.

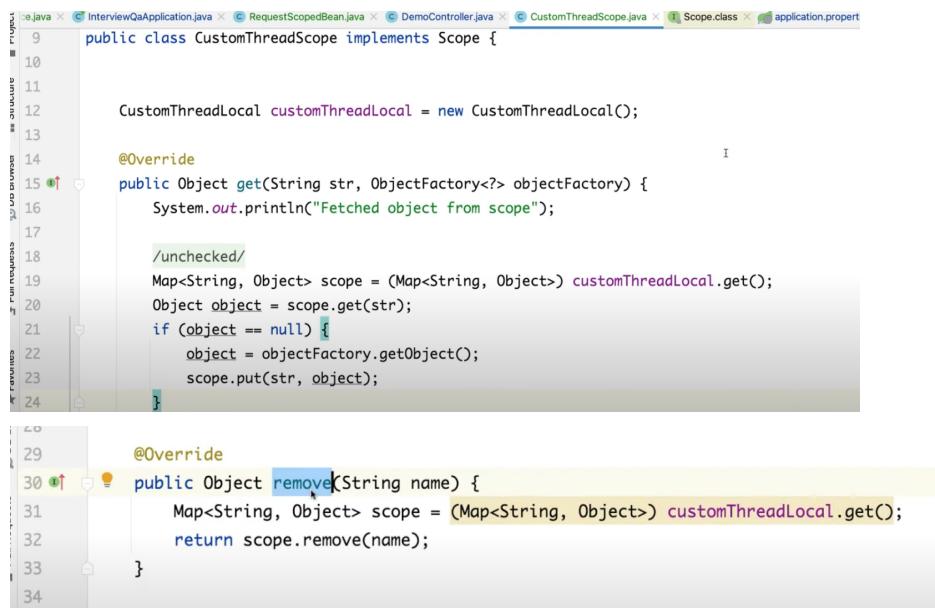
5. Application Scope but no example

The application scope is used in web-based Spring Boot applications to create a single instance of the bean for the entire web application context.

6. WebSocket Scope but no example

It creates a single instance of the bean per WebSocket session.

26. How to define custom bean scope ?



```
public class CustomThreadScope implements Scope {
    ...
    @Override
    public Object get(String str, ObjectFactory<?> objectFactory) {
        System.out.println("Fetched object from scope");
        ...
    }
    ...
    @Override
    public Object remove(String name) {
        Map<String, Object> scope = (Map<String, Object>) customThreadLocal.get();
        return scope.remove(name);
    }
}
```

```

44
45     @Override
46     public String getConversationId() { return null; }
47
48     class CustomThreadLocal extends ThreadLocal {
49         protected Map<String, Object> initialValue() {
50             System.out.println("Initializing ThreadLocal");
51             return new HashMap<String, Object>();
52         }
53     }
54 }
55
56 }
57

```

```

6 import org.springframework.context.annotation.Scope;
7 import org.springframework.stereotype.Component;
8
9 @Component
10 @Scope("threadScope")
11 public class Volunteer {
12
13 }
14

```

Here we are using some scope. How spring now such scope exists. For that we need to register that scope as shown below line 59 and 60

```

58
59     Scope scope = new CustomThreadScope();
60     context.getBeanFactory().registerScope(scopeName: "threadScope", scope);
61
62     Runnable childThread = () -> [
63         Volunteer v1 = context.getBean(Volunteer.class);
64         Volunteer v2 = context.getBean(Volunteer.class);
65         System.out.println("HashCode of two object created by child thread " + v1.hashCode() + " & " + v2.hashCode());
66     ];
67     new Thread(childThread).start();
68
69     // This code will be executed by main thread
70     Volunteer v1 = context.getBean(Volunteer.class);
71     Volunteer v2 = context.getBean(Volunteer.class);
72     System.out.println("HashCode of two object created by main thread " + v1.hashCode() + " & " + v2.hashCode());
73

```

In side run method register scope and run child thread and main thread and compare hascodes

```

Fetched object from scope
Initializing ThreadLocal
Fetched object from scope
Fetched object from scope
HashCode of two object created by child thread 2144204942 & 2144204942
HashCode of two object created by main thread 476238509 & 476238509
BeanScopeTestService() instance created..

```

27. Can you provide a few real-time use cases for when to choose Singleton scope and Prototype scope

- | | |
|-----------------------------------|-----------------------------------|
| Singleton scope :
_____ | Prototype Scope :
_____ |
| 1. Database Configuration | 1. User Sessions |
| 2. Service Layer | 2. Thread Safety |
| 3. Application Configuration | 3. Heavy Initialization |

28. can we inject prototype bean in singleton bean ? if yes what will happen if we inject prototype bean in singleton bean ?

```
5  
6 @Component  
7 public class SingletonBean {  
8  
9     @Autowired  
10    private ProtoTypeBean protoTypeBean;  
11  
12    public SingletonBean() {  
13        System.out.println("SingletonBean() instantiated !!");  
14    }  
15  
16    public ProtoTypeBean getProtoTypeBean() {  
17        return protoTypeBean;  
18    }  
19
```

If we inject a prototype inside a singleton - it loses the behavior of the prototype and behaves like a singleton

```
/////  
SingletonBean sb1 = context.getBean(SingletonBean.class);  
SingletonBean sb2 = context.getBean(SingletonBean.class);  
System.out.println(sb1.getProtoTypeBean().hashCode()+" - "+sb2.getProtoTypeBean().hashCode());
```

Change scope to prototype and give it a try like prototype inject to prototype there is no

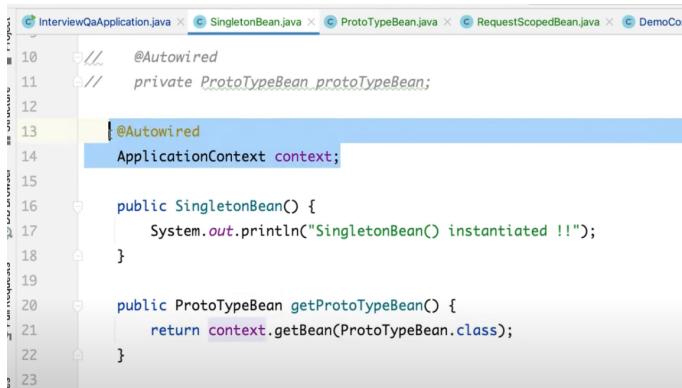
```
6  
7     @Component  
8     @Scope("prototype")  
9     public class SingletonBean {  
10
```

Run: InterviewQaApplication x
2023-10-13T10:46:04.564+05:30 INFO 16436 --- [main] c.c.i.QaApplication : DISCOUNT PRICE : 20
qq
Environment variable : qq
CONFIG VALUE : DataSourceConfig(username=root, password=Password)
CommandLineRunner run() method executed
SingletonBean() instantiated !
ProtoTypeBean() instaptiate
SingletonBean() instantiated !
ProtoTypeBean() instantate
1887701594 - 2063161693

problem.

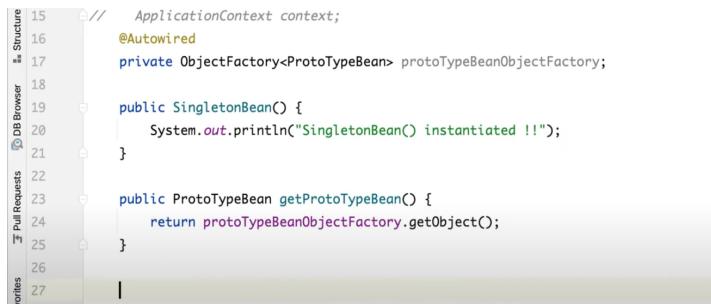
So how to resolve injecting a prototype to singleton. Instead of autowiring the prototype bean follow any of the approach

Approach 1. Using ApplicationContext.



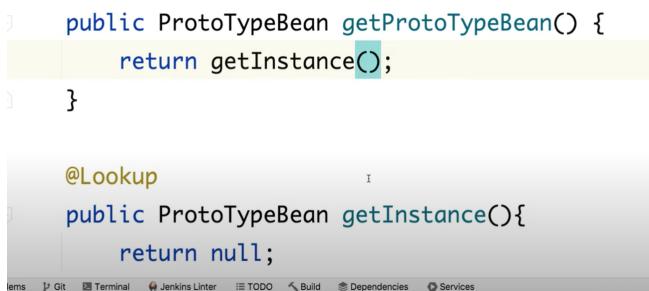
```
10 // Autowired
11 // private PrototypeBean protoTypeBean;
12
13 // Autowired
14 ApplicationContext context;
15
16 public SingletonBean() {
17     System.out.println("SingletonBean() instantiated !!");
18 }
19
20 public PrototypeBean getPrototypeBean() {
21     return context.getBean(PrototypeBean.class);
22 }
23
```

Approach 2 : using object factory

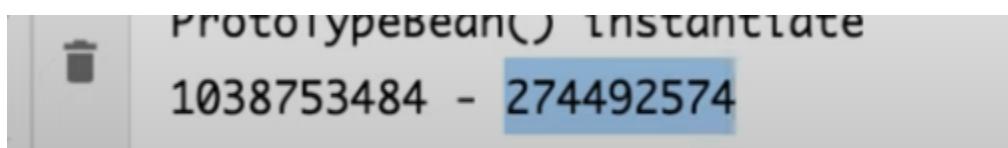


```
15 // ApplicationContextHolder;
16 // Autowired
17 private ObjectFactory<PrototypeBean> protoTypeBeanObjectFactory;
18
19 public SingletonBean() {
20     System.out.println("SingletonBean() instantiated !!");
21 }
22
23 public PrototypeBean getPrototypeBean() {
24     return protoTypeBeanObjectFactory.getObject();
25 }
26
```

Approach 3: Using Lookup



```
1 public PrototypeBean getPrototypeBean() {
2     return getInstance();
3 }
4
5 @Lookup
6 public PrototypeBean getInstance(){
7     return null;
8 }
```



29. What is the difference between spring singleton and plain singleton ?

Spring singleton per container it is singleton.

Plain Singleton per JVM it is singleton.

30 . What is the purpose of the BeanPostProcessor interface in Spring, and how can you use it to customize bean initialization and destruction?

- 1. Property Injection
- 2. Aspect-Oriented Programming
- 3. Custom Initialization Logic
- 4. Proxy Creation
- 5. Monitoring and Logging

```
public interface BeanPostProcessor {  
    @Nullable  
    default Object postProcessBeforeInitialization(Object bean, String beanName) throws BeansException {  
        return bean;  
    }  
  
    @Nullable  
    default Object postProcessAfterInitialization(Object bean, String beanName) throws BeansException {  
        return bean;  
    }  
}
```

The screenshot shows the Java code for the `BeanPostProcessor` interface. It includes two methods: `postProcessBeforeInitialization` and `postProcessAfterInitialization`, both of which return the `bean` object. The code is annotated with `@Nullable` and `BeansException`. The code editor has tabs for Reader Mode, Maven, Codecs, Cache, and Help.

We have below Bean. before initializing this bean in container how to validate.

```
@Bean  
public User user() {  
    User user = new User();  
    user.setUsername("john");  
    user.setPassword("t27t"); // The original, unencrypted password  
    return user;  
}  
  
@Component  
public class PasswordValidationBeanPostProcessor implements BeanPostProcessor {  
    @Override  
    public Object postProcessBeforeInitialization(Object bean, String beanName) throws BeansException {  
        if (bean instanceof User user) {  
            if (!isValidPassword(user.getPassword())) {  
                throw new IllegalArgumentException("Invalid password for user: " + user.getUsername());  
            }  
        }  
        return bean;  
    }  
}
```

The screenshot shows the Java code for a `User` bean and a `PasswordValidationBeanPostProcessor`. The `User` bean is annotated with `@Bean` and contains a constructor and a `setPassword` method. The `PasswordValidationBeanPostProcessor` is annotated with `@Component` and implements the `BeanPostProcessor` interface. It overrides the `postProcessBeforeInitialization` method to check if the password is valid. If not, it throws an `IllegalArgumentException`.

Before user bean initialization we are validating the bean.

```
public Object postProcessAfterInitialization(Object bean, String beanName)
```

The screenshot shows a debugger interface with a stack trace. The current frame is `InterviewQaApplication.main(InterviewQaApplication.java:55)`. A red dot indicates a breakpoint at the line `if (!isValidPassword(user.getPassword())) {` in the `postProcessBeforeInitialization` method of the `PasswordValidationBeanPostProcessor`. The stack trace also shows `application.run(SpringApplication.java:1295)` and `InterviewQaApplication.main(InterviewQaApplication.java:55)`.