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Spring

...

Brown Brothers Harriman
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Agenda

1. REST/Spring MVC
2. Spring AOP
3. Aplikacja szkoleniowa do rozwiązywania zadań
4. Spring Security
5. Architektura zorientowana na zdarzenia i pluginy
6. JMS
7. Async
8. Spring Data
9. Transakcje
10. Profile uruchomieniowe aplikacji

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Przedstawienie siebie

- doświadczenie zawodowe
- znane technologie
- projekty
- znajomość zagadnień z agendy
- oczekiwania odnośnie szkolenia
- oczekiwania odnośnie prowadzącego

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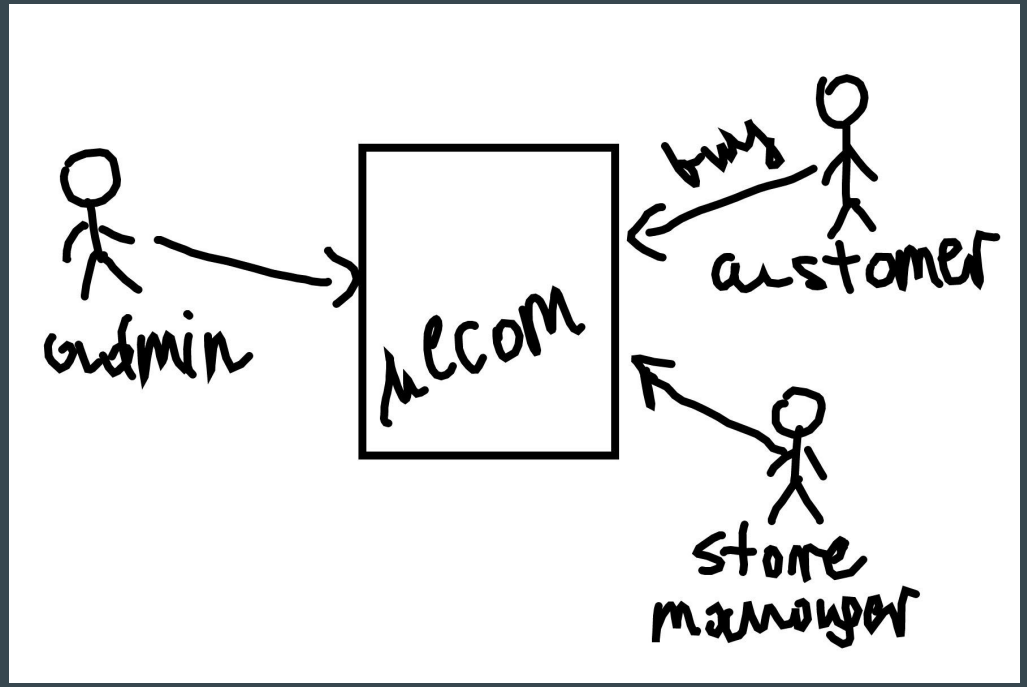
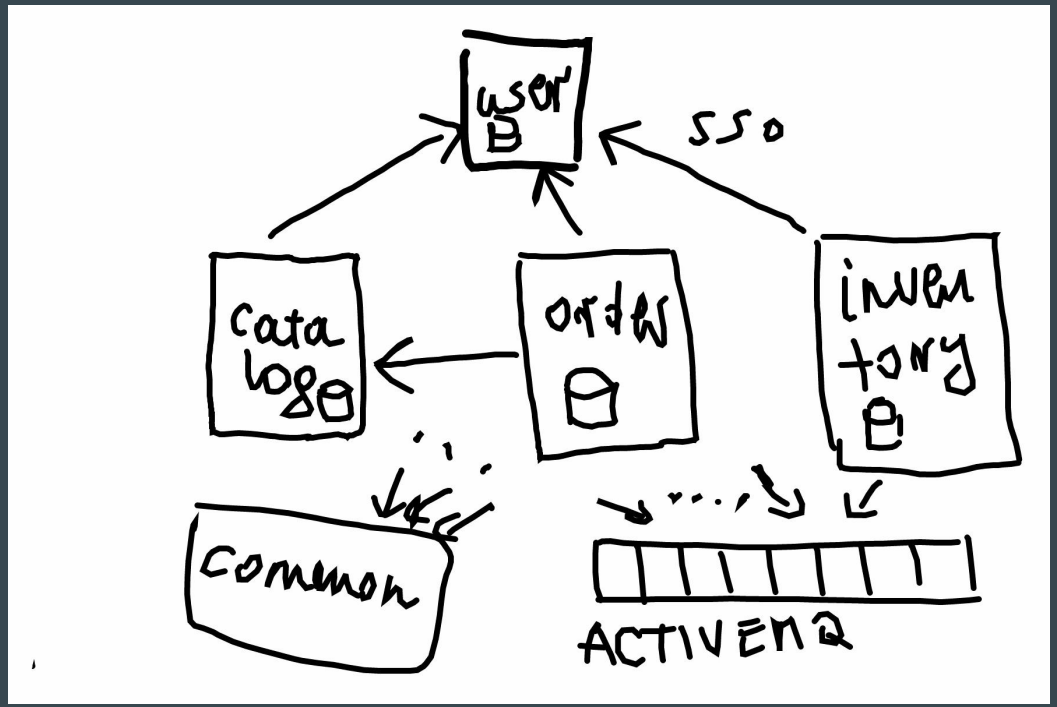
Aplikacja szkoleniowa do rozwiązywania zadań

Architektura od strony użytkownika



Aplikacja szkoleniowa do rozwiązywania zadań

Mikroserwisy



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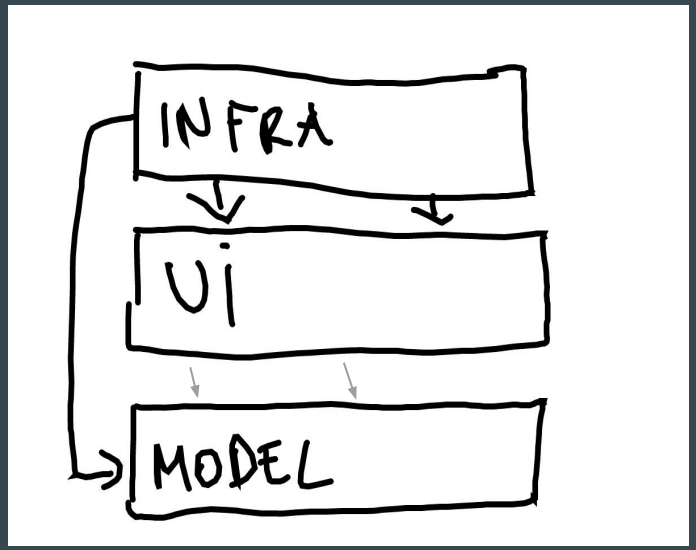
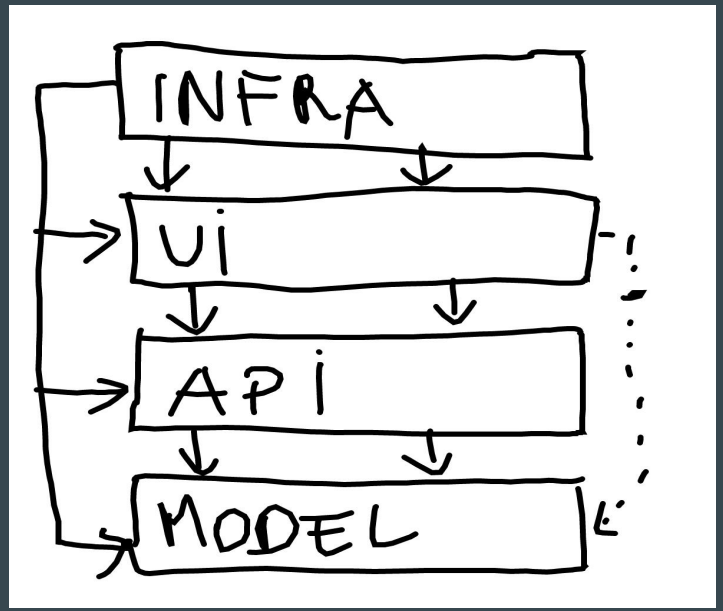
Aplikacja szkoleniowa do rozwiązywania zadań

Architektura pojedynczych serwisów

CRUD



Rich Domain Model



Spring Security - features

- oficjalny moduł springa
- autentykacja i autoryzacja (role based)
- web security
  - servlet api
  - spring mvc
- method security, domain object security ACL
- zabezpieczenia przed atakami
  - CSRF
  - Session Fixation
  - password encoding
- różne strategie autentykacji
  - inMemory, HTTP Basic, JDBC, LDAP, CAS, OAuth, OpenID, custom
- testability

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Spring Security - zależności

```
<dependency>
  <groupId>org.springframework.security</groupId>
  <artifactId>spring-security-config</artifactId>
</dependency>
<dependency>
  <groupId>org.springframework.security</groupId>
  <artifactId>spring-security-web</artifactId>
</dependency>
<dependency>
  <groupId>org.springframework.security</groupId>
  <artifactId>spring-security-ldap</artifactId>
</dependency>
<dependency>
  <groupId>org.springframework.security</groupId>
  <artifactId>spring-security-cas</artifactId>
</dependency>
<dependency>
  <groupId>org.springframework.security</groupId>
  <artifactId>spring-security-openid</artifactId>
</dependency>
```

Spring Security - Core

1. SecurityContextHolder, ThreadLocal
2. SecurityContext
3. AuthenticationManager
4. Authentication
5. GrantedAuthority
6. UserDetailsService, UserDetails

Spring Security - Autentykacja

1. Użytkownik podaje login i hasło
2. System pomyślnie weryfikuje hasło dla podanego loginu lub zwraca błąd autentykacji
3. System pobiera informacje o uprawnieniach użytkownika
4. System ustawia kontekst zabezpieczeń dla zalogowanego użytkownika
5. Użytkownik używa aplikacji, system sprawdza uprawnienia użytkownika do wykonywania poszczególnych operacji (autoryzacja)

1. `Authentication`
2. `AuthenticationManager waliduje Authentication`
3. `AuthenticationManager zwraca instancję Authentication ze wszystkimi detalami użytkownika`
4. `SecurityContextHolder.getContext().setAuthentication(… )`

Spring Security - Autentykacja Web

1. Użytkownik odwiedza stronę www
2. Użytkownik klika w link wymagający autoryzowanego dostępu
3. Serwer odsyła komunikat mówiący o konieczności zalogowania (HTTP 401 lub redirect)
4. Przeglądarka pobiera w jakiś sposób credentiale
5. Przeglądarka wysyła żądanie autentykacji
6. Serwer sprawdza poprawność credentiali, ew. wracamy do punktu 3
7. Oryginalny request który wymagał autoryzacji jest powtarzany (ew. HTTP 403)

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Spring Security - Request Filtering

1. ChannelProcessingFilter
2. SecurityContextPersistenceFilter
3. ConcurrentSessionFilter
4. LogoutFilter
5. **Mechanizm autentykacji - UsernamePasswordAuthenticationFilter, CasAuthenticationFilter, BasicAuthenticationFilter, Ldap, oAuth, custom..., AuthenticationSuccessHandler and AuthenticationFailureHandler**
6. RememberMeAuthenticationFilter
7. AnonymousAuthenticationFilter
8. ExceptionTranslationFilter, AuthenticationEntryPoint
9. FilterSecurityInterceptor

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Spring Security - Mechanizmy autentykacji

• HTTP basic • Username Password	potrzebują dostępu do bazy danych użytkowników: • in memory • dao (UserDetailsService) • ldap
• Central Authentication Server • OpenId • OAuth	logowanie następuje u zewnętrznego dostawcy tożsamości (Single Sign On)
Custom	pełna dowolność skąd pobierzemy użytkownika, musimy go ustawić w SecurityContextHolder

Spring Security - Remember me

- cookie z danymi pozwalającymi rozpoznać użytkownika

```
base64(
        username + ":" + expirationTime + ":" +
        md5Hex(username + ":" + expirationTime + ":" password + ":" + key)
)
```

- RememberMeFilter

Spring Security - Autoryzacja

na poziomie requestów

```
@Configuration
public class WebSecurityConfig extends WebSecurityConfigurerAdapter {

  protected void configure(HttpSecurity http) throws Exception {
     http
        .authorizeRequests()
        .antMatchers("/resources/**", "/signup", "/about").permitAll()
        .antMatchers("/admin/**").hasRole("ADMIN")
        .antMatchers("/db/**").access("hasRole('ADMIN') and hasRole('DBA')")
        .anyRequest().authenticated();
  }


}
```

Spring Security - Autoryzacja

na poziomie metod (AOP)

```
@Configuration
@EnableGlobalMethodSecurity(securedEnabled = true)
public class SpringSecurityConfig extends WebSecurityConfigurerAdapter {
```

```
public interface BankService {
  @Secured("IS_AUTHENTICATED_ANONYMOUSLY")
  Account readAccount(Long id);

  @Secured("IS_AUTHENTICATED_ANONYMOUSLY")
  Account[] findAccounts();

  @Secured("ROLE_TELLER")
  Account post(Account account, double amount);
}
```

Spring Security - Autoryzacja

spring security expressions

```
@Configuration
@EnableGlobalMethodSecurity(prePostEnabled = true)
public class SpringSecurityConfig extends WebSecurityConfigurerAdapter {
```

```
public interface BankService {
  @PreAuthorize("isAnonymous()")
  Account readAccount(Long id);

  @PreAuthorize("hasAuthority('ROLE_TELLER')")
  Account[] findAccounts();

  @PreAuthorize("hasAuthority('ROLE_TELLER') || isRememberMe() || @myBean.someMethod(account, amount)")
  Account post(Account account, double amount);
}
```

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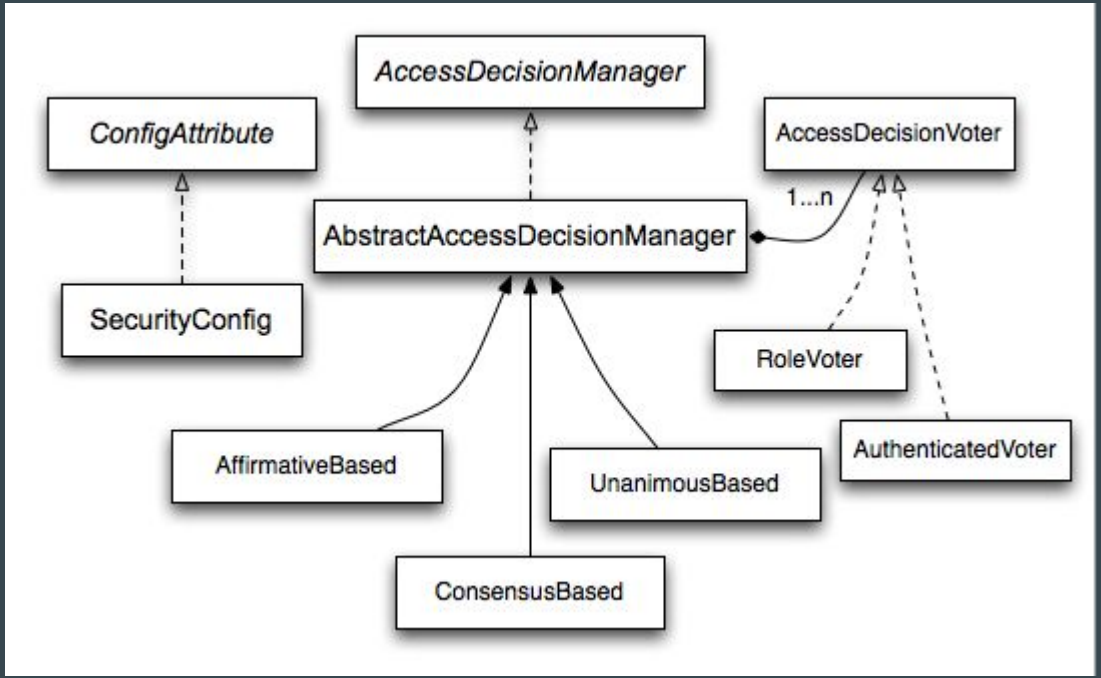
Spring Security - Autoryzacja

pod maską



Spring Security - konfiguracja

- domyślne ustawienia

```
protected void configure(HttpSecurity http) throws Exception {
        http.
                authorizeRequests().
                   anyRequest().authenticated().
        and().
                formLogin().
        and().
                httpBasic();
}
```

Spring Security - konfiguracja

```
@Configuration
public class WebSecurityConfig extends WebSecurityConfigurerAdapter {

   protected void configure(HttpSecurity http) throws Exception {
      http
          .addFilterBefore(myFilter, UsernamePasswordAuthenticationFilter.class)
         .authorizeRequests()
         .antMatchers("/resources/**", "/signup", "/about").permitAll()
         .antMatchers("/admin/**").hasRole("ADMIN")
         .antMatchers("/db/**").access("hasRole('ADMIN') and hasRole('DBA')")
         .anyRequest().authenticated();
   }


}
```

Spring Security - hashowanie haseł

- PasswordEncoder
- 5f4dcc3b5aa765d61d8327deb882cf99
- salt
- BcryptPasswordEncoder

```
class OrderService {

  private OrderRepository orderRepository;
  private OrderMailer mailer;
  private AdminMailer mailer;
  private WarehouseFacade warehouseFacade;
  private EngravingFacade engravingFacade;
  private boolean warehouseModuleActive;
  private boolean engravingEnabled;

  @Transactional
  public void place(Long orderId) {
    Order order = orderRepository.get(orderId);
    order.place();
    mailer.sendConfirmationEmail(order);
    boolean reminderSent = false;
    if(warehouseModuleActive)
      warehouseFacade.scheduleShipping(order);
    else {
      adminMailer.sendOrderRemainder(order);
      reminderSent = true;
    }
    if(order.hasEngravableItems())
      if(engravingEnabled)
        engravingFacade.engrave(order.getItems());
      else
      if(!reminderSent)
        adminMailer.sendOrderRemainder(order);
  }

}
```

Zdarzenia i pluginy

Zmniejszamy coupling, zwiększamy kohezję

```
class OrderProcess {

   private OrderRepository orderRepository;

   @Transactional
   public void place(Long orderId) {
      Order order = orderRepository.get(orderId);
      order.place();
   }

}
```

```
@Entity
public class Order {

   @Transient
   private EventPublisher eventPublisher;

   public void place() {
      //.. some domain logic
      eventPublisher.publish(new OrderPlacedEvent(this));
   }

}
```

Spring - zdarzenia

publikacja zdarzeń

```
package org.springframework.context;

public interface ApplicationEventPublisher {

  void publishEvent(ApplicationEvent event);

  void publishEvent(Object event);

}
```

Spring - zdarzenia

odbiór zdarzeń

```
@Component
public class OrderPlacedCustomerNotifier {

   private OrderMailer orderMailer;
   private OrderRepository orderRepository;

   @EventListener
   public void orderPlaced(OrderPlacedEvent event) {
      Order order = orderRepository.get(event.getAggregateId());
      orderMailer.notifyCustomer(order);
   }

}
```

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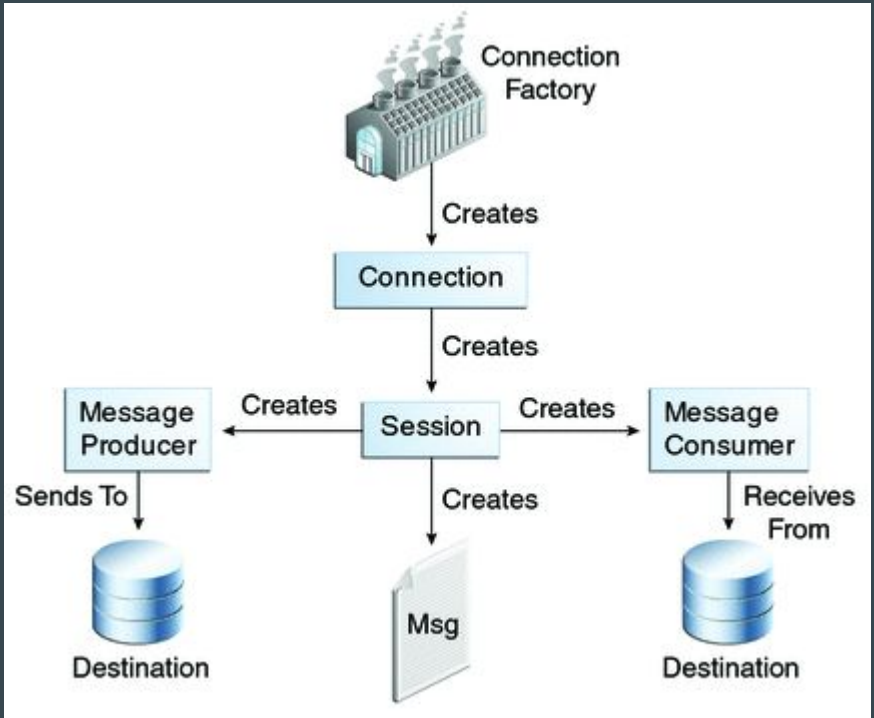
Spring - pluginy

Jak aktywować listenery w zależności od wdrożenia?

- include/not include on classpath
- XML
- @Conditional + config
- Profiles

JMS - programming model



- Messaging domains
  - P2P
  - Pub/Sub
- Administrative objects (destinations, ConnectionFactory)
  - Qeue
  - Topic

Spring - JMS

- uproszczenie korzystania z JMS API
- wysyłanie wiadomości
  - JmsTemplate
- odbiór wiadomości
  - message listeners
  - message driven beans
- konwersja
- wsparcie dla transakcji

Spring JmsTemplate

- wysyłanie
- odbieranie synchroniczne
- przeglądanie kolejek

```
public class JmsTemplate {
        public <T> T execute(SessionCallback<T> action, boolean startConnection) {...}
        public void send(MessageCreator messageCreator) {...}
        public void send(final Destination destination, final MessageCreator messageCreator) {...}
        public void send(final String destinationName, final MessageCreator messageCreator) {...}
        public void convertAndSend(String destinationName, final Object message) {...}
        public void convertAndSend(Destination destination, final Object message) {...}
        public void convertAndSend(Object message, MessagePostProcessor postProcessor) {...}
        public <T> T browse(BrowserCallback<T> action) {...}
        public <T> T browse(Queue queue, BrowserCallback<T> action) {...}
        public <T> T browse(String queueName, BrowserCallback<T> action) {...}
        public Message receive() {...}
        public Message receive(Destination destination) {...}
        ….
}
```

Spring JmsTemplate

```
public class JmsQueueSender {

   private JmsTemplate jmsTemplate;
   private Queue queue;

   public void setConnectionFactory(ConnectionFactory cf) {
      this.jmsTemplate = new JmsTemplate(cf);
   }

   public void setQueue(Queue queue) {
      this.queue = queue;
   }

   public void simpleSend() {
      this.jmsTemplate.send(this.queue, new MessageCreator() {
         public Message createMessage(Session session) throws JMSException {
            return session.createTextMessage("hello queue world");
         }
      });
   }
}
```

Spring Jms MessageConverter

- konwersja Message <-> user Object

```
public interface MessageConverter {

  Message toMessage(Object object, Session session);

  Object fromMessage(Message message);

}
```

- SimpleMessageConverter
- MappingJacksonToMessageConverter
- MarshallingMessageConverter

Spring Message Driven Beans

- asynchroniczne odbieranie wiadomości

```
public class ExampleListener implements MessageListener {

   public void onMessage(Message message) {
      if (message instanceof TextMessage) {
         try {
            System.out.println(((TextMessage) message).getText());
         }
         catch (JMSException ex) {
            throw new RuntimeException(ex);
         }
      }
      else {
         throw new IllegalArgumentException("Message must be of type TextMessage");
      }
   }

}
```

```
<bean id="messageListener" class="jmsexample.ExampleListener" />
<bean id="jmsContainer"
class="org.springframework.jms.listener.DefaultMessageListenerContainer">
            <property name="connectionFactory" ref="connectionFactory"/>
            <property name="destination" ref="destination"/>
            <property name="messageListener" ref="messageListener" />
</bean>
```

Spring Message Driven Beans

- asynchroniczne odbieranie wiadomości - annotation driven

```
@Component
class SomeService {
   @JmsListener(destination = "my-queue")
   public void somethingHappened(String data) {

   }
}
```

- odbiór i wysyłanie odpowiedzi

```
@JmsListener(destination = "myDestination")
@SendTo("status")
public OrderStatus processOrder(Order order) {
   // order processing
   return status;
}
```

Spring JMS konfiguracja

```
@Configuration
@EnableJms
public class SpringConfig {
@Bean
public JmsListenerContainerFactory<?> myFactory(ConnectionFactory connectionFactory,
                                    DefaultJmsListenerContainerFactoryConfigurer configurer) {
  DefaultJmsListenerContainerFactory factory = new DefaultJmsListenerContainerFactory();
  // This provides all boot's default to this factory, including the message converter
  configurer.configure(factory, connectionFactory);
  // You could still override some of Boot's default if necessary.
  return factory;
}

@Bean // Serialize message content to json using TextMessage
public MessageConverter jacksonJmsMessageConverter() {
  MappingJackson2MessageConverter converter = new MappingJackson2MessageConverter();
  converter.setTargetType(MessageType.TEXT);
  converter.setTypeIdPropertyName("_type");
  return converter;
}
```

Spring JMS Transakcje

- lokalne transakcje
  - przetwarzanie message w transakcji jms
  - operacje bazodanowe w transakcji db
- rozproszone transakcje
  - jta (bitronix, atomikos)
  - transakcja jms i db

Spring Async

- przetwarzanie w tle
  - asynchroniczne (AsyncTaskExecutor)
  - planowanie (TaskScheduler)

```
public interface AsyncTaskExecutor extends TaskExecutor {

        void execute(Runnable task, long startTimeout);

        Future<?> submit(Runnable task);

        <T> Future<T> submit(Callable<T> task);
}
```

```
public interface TaskScheduler {

  ScheduledFuture<?> schedule(Runnable task, Trigger trigger);


  ScheduledFuture<?> schedule(Runnable task, Date startTime);

 ScheduledFuture<?> scheduleAtFixedRate(Runnable task, Date
startTime, long period);

  ScheduledFuture<?> scheduleAtFixedRate(Runnable task, long
period);

  ScheduledFuture<?> scheduleWithFixedDelay(Runnable task, Date
startTime, long delay);

  ScheduledFuture<?> scheduleWithFixedDelay(Runnable task, long
delay);

}
```

- SimpleAsyncTaskExecutor, ThreadPoolTaskExecutor....

Spring Async - konfiguracja

```
@Configuration
@EnableAsync
@EnableScheduling
public class AppConfig {

        @Override
        public Executor getAsyncExecutor() {
          ThreadPoolTaskExecutor executor = new ThreadPoolTaskExecutor();
          executor.setCorePoolSize(2);
          executor.setMaxPoolSize(2);
          executor.setQueueCapacity(500);
          executor.setThreadNamePrefix("DMS-Async-Executor");
          executor.initialize();
          return executor;
        }

}
```

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Spring Async - użycie

```
@Scheduled(fixedDelay=5000)
public void doSomething() {
   // something that should execute periodically
}

@Scheduled(fixedRate=5000)
public void doSomething() {
   // something that should execute periodically
}

@Scheduled(initialDelay=1000, fixedRate=5000)
public void doSomething() {
   // something that should execute periodically
}

@Scheduled(cron="*/5 * * * * MON-FRI")
public void doSomething() {
   // something that should execute on weekdays only
}
```

```
@Async
void doSomething() {
   // this will be executed asynchronously
}

@Async
void doSomething(String s) {
   // this will be executed asynchronously
}

@Async
Future<String> returnSomething(int i) {
   // this will be executed asynchronously
}
```

Spring Async - error handling

```
public class MyAsyncUncaughtExceptionHandler implements AsyncUncaughtExceptionHandler {

   @Override
   public void handleUncaughtException(Throwable ex, Method method, Object... params) {
      // handle exception
   }
}
```

Spring Async - events a transakcje

```
@Component
public class PrintDocumentScheduler {

   @EventListener
   @Async
   public void documentPublished(DocumentPublishedEvent event) {
      Logger.getLogger(PrintDocumentScheduler.class).info("Scheduling document printing!");
   }

}
```

```
@Component
public class PrintDocumentScheduler {

   @TransactionalEventListener
   @Async
   public void documentPublished(DocumentPublishedEvent event) {
      Logger.getLogger(PrintDocumentScheduler.class).info("Scheduling document printing!");
   }

}
```

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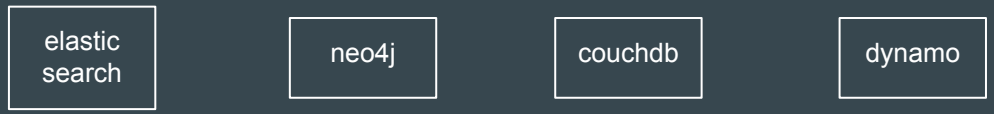
Spring Data

- abstrakcja dostępu do danych, max redukcja boiler plate
- implementacje dla różnych baz danych

- community



Spring Data - Repository

```
@NoRepositoryBean
public interface CrudRepository<T, ID extends Serializable> extends Repository<T, ID> {
  <S extends T> S save(S id);

  <S extends T> Iterable<S> save(Iterable<S> ids);

  T findOne(ID id);

  boolean exists(ID id);

  Iterable<T> findAll();

  Iterable<T> findAll(Iterable<ID>id);

  long count();

  void delete(ID id);

  void delete(T entity);

  void delete(Iterable<? extends T>entities);

  void deleteAll();
}
```

Spring Data - Repository

```
@NoRepositoryBean
public interface PagingAndSortingRepository<T, ID extends Serializable> extends CrudRepository<T, ID> {
  Iterable<T> findAll(Sort sort);

  Page<T> findAll(Pageable pagable);
}
```

Spring Data - własne repozytorium bazowe

```
@NoRepositoryBean
public interface MyBaseRepo<T, ID extends Serializable> extends Repository<T, ID> {

        <S extends T> S save(S var1);

        T findOne(ID var1);

        default T get(ID id) throws NotFoundException {...}

}
```

Spring Data - definiowanie kwerend

- strategie
  - CREATE
    - find...By, read...By, count...By, query...By, get...By
  - USE_DECLARED_QUERY
    - @Query, @NamedQuery lub inne w zależności od impl
  - CREATE_IF_NOT_FOUND
- @EnableJpaRepositories(...)

Spring Data - przykłady kwerend

```
public interface UserRepository extends Repository<User, Long> {

List<Person> findByEmailAddressAndLastname(EmailAddress emailAddress, String lastname);

List<Person> findDistinctPeopleByLastnameOrFirstname(String lastname, String firstname);
List<Person> findPeopleDistinctByLastnameOrFirstname(String lastname, String firstname);

// Enabling ignoring case for an individual property
List<Person> findByLastnameIgnoreCase(String lastname);
// Enabling ignoring case for all suitable properties
List<Person> findByLastnameAndFirstnameAllIgnoreCase(String lastname, String firstname);

// Enabling static ORDER BY for a query
List<Person> findByLastnameOrderByFirstnameAsc(String lastname);
List<Person> findByLastnameOrderByFirstnameDesc(String lastname);

@Query("SELECT p FROM Person p WHERE p.some = :some")
List<Person> findBySomeCustomQuery(@Param("some") String some);

}
```

Spring Data - przykłady kwerend

```
public interface UserRepository extends Repository<User, Long> {

User findFirstByOrderByLastnameAsc();

User findTopByOrderByAgeDesc();

Page<User> queryFirst10ByLastname(String lastname, Pageable pageable);

Slice<User> findTop3ByLastname(String lastname, Pageable pageable);

List<User> findFirst10ByLastname(String lastname, Sort sort);

List<User> findTop10ByLastname(String lastname, Pageable pageable);

}
```

Spring Data - custom functionality

```
public interface UserRepositoryCustomFunc {

        void comeCustomMethod();

}

public interface UserRepository extends CrudRepository<User, Long>, UserRepositoryCustomFunc {
        ...
}

public class UserRepositoryCustomFuncImpl implements UserRepositoryCustomFunc  {

        public void comeCustomMethod() { … }

}
```

Spring Data - custom functionality

```
public interface CustomRepository<T, ID extends Serializable> extends Repository<T, ID> {

   void comeCustomMethod1();
   void comeCustomMethod2();

}

public class CustomRepositoryImpl<T, ID extends Serializable>extends SimpleJpaRepository<T, ID> implements CustomRepository<T, ID>  {

   private final EntityManager entityManager;

   public MyRepositoryImpl(JpaEntityInformation entityInformation, EntityManager entityManager) {
      super(entityInformation, entityManager);
      this.entityManager = entityManager;
   }

   @Override
   public void comeCustomMethod1() {...}

   @Override
   public void comeCustomMethod2() {...}

}
```

```
@EnableJpaRepositories(repositoryBaseClass = CustomRepositoryImpl.class)
```

Spring Boot - profile

```
@Configuration
@Profile("production")
public class ProductionConfiguration {

   @Bean
   SmsSender smsSender() {return new RealSmsSender();}

}

@Configuration
@Profile("development")
public class DevelopmentConfiguration {

   @Bean
   SmsSender smsSender() {return new FakeSmsSender();}

}
```

Spring Boot - profile

```
@Component
@Profile("production")
public class ProdOnlyBean {

}

@Configuration
public class SpringConfiguration {

   @Bean
   @Profile("test")
   SmsSender smsSender() {return new FakeSmsSender();}

}
```

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Spring Boot - aktywacja profili

- w pliku application.properties:
  - `spring.profiles.active=dev,hsqldb`
- jvm param
  - `-Dspring.profiles.active=dev,hsqldb`
- programowo
  - SpringApplication.setActiveProfiles(String... profiles)

Spring Boot - koniguracja per profil

- application-production.properties
- application-test.properties
- application-qa.properties