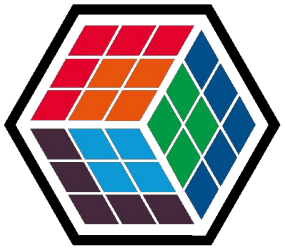

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Eventos de Aplicação com Spring

Lucas Farias

Sobre mim

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- Lucas Farias
- Backend Sênior no iFood (Logística)
- Graduado em Ciência da Computação
- Especialização em Sistemas Corporativos

@luksrn

ifood

O que será a palestra

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Spring Framework Documentation

Version 5.1.10.RELEASE

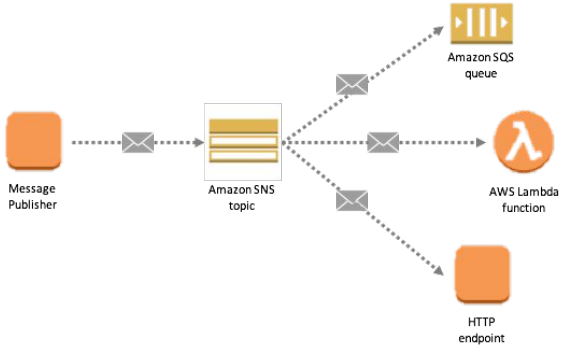
What's New, *Upgrade Notes*, *Supported Versions*, and other topics, independent of release cadence, are maintained externally on the project's Github Wiki.

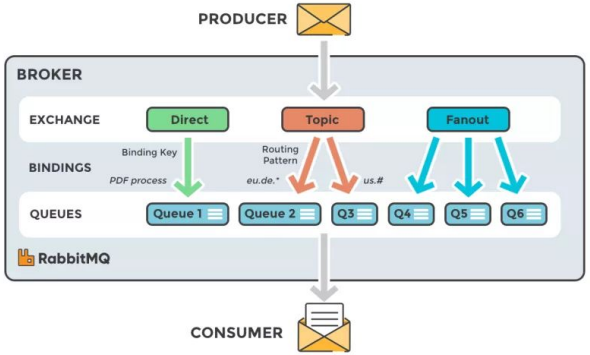
Overview	history, design philosophy, feedback, getting started.
Core	IoC Container, Events, Resources, i18n, Validation, Data Binding, Type Conversion, SpEL, AOP.
Testing	Mock Objects, TestContext Framework, Spring MVC Test, WebTestClient.
Data Access	Transactions, DAO Support, JDBC, O/R Mapping, XML Marshalling.
Web Servlet	Spring MVC, WebSocket, SockJS, STOMP Messaging.
Web Reactive	Spring WebFlux, WebClient, WebSocket.
Integration	Remoting, JMS, JCA, JMX, Email, Tasks, Scheduling, Caching.
Languages	Kotlin, Groovy, Dynamic Languages.

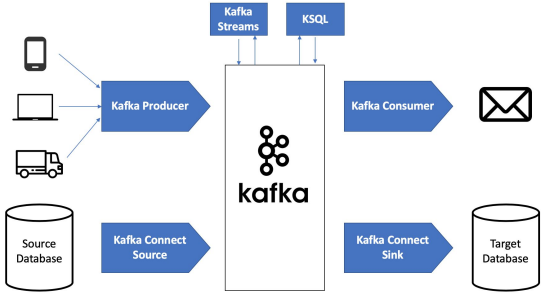
O que não será a palestra

Modelos de arquitetura baseada em eventos

- RabbitMQ
- SNS/SQS
- Kafka
- Pulsar
- etc...







Como vou conduzir...

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- Dado um exemplo, será analisado um possível código
  - Possível cenário de Teste
  - Possível código para satisfazer Controller -> **Service**
- Discutir sobre alguns problemas do exemplo
- Conceitos de **Eventos de Aplicação**

Cenário de exemplo

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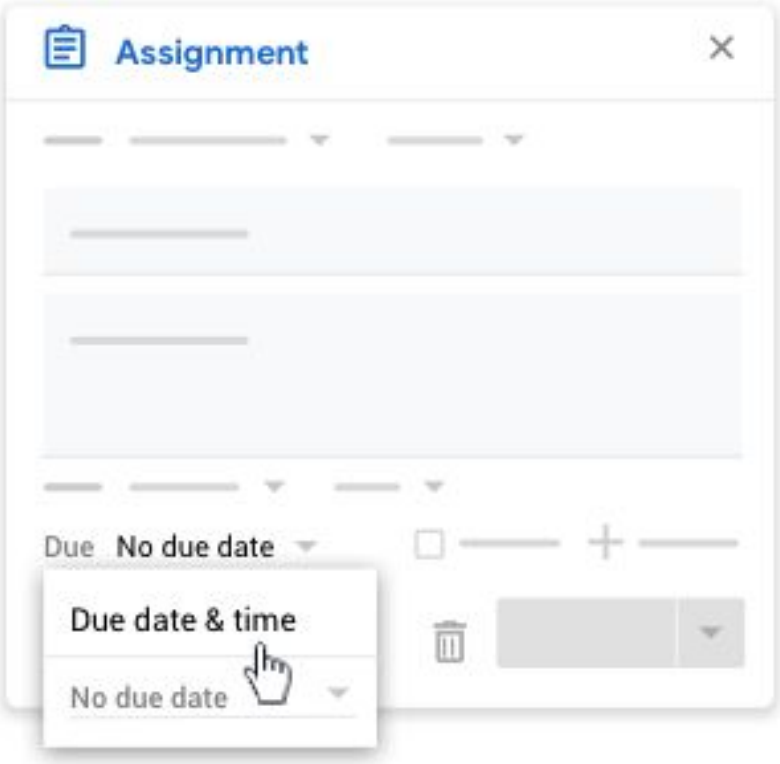

Os requisitos são simples:

- Apenas um **título** para aula, uma **descrição** detalhada e um **prazo** para entrega.
- Os alunos matriculados no curso devem ser **notificados via email**.

https://support.google.com/edu/classroom/answer/6020265?co=GENIE.Platform%3DDesktop&hl=en

O que estamos esperando...

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```
// Given {Hidden}...

CreateAssignmentRequest payload = new CreateAssignmentRequest(
        "Spring Application Events", "TDC talk about Spring event", Instant.now());

//when
MvcResult mvcResult = mvc.perform(post("/course/{courseId}/assignment/create", 1L)
        .contentType(MediaType.APPLICATION_JSON)
        .content(objectMapper.writeValueAsString(payload))
).andReturn();

// Then ...
```

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```
....

// then
SoftAssertions softly = new SoftAssertions();

softly.assertThat(mvcResult.getResponse().getStatus())
        .isEqualTo(HttpStatus.CREATED.value());

List<Assignment> assignments = assignmentService.findAllByCourse(new Course(1L));
softly.assertThat(assignments)
        .hasSize(1)
        .flatExtracting(Assignment::getTitle, Assignment::getInstructions)
        .contains("Spring Application Events", "TDC talk about Spring event");

softly.assertThat(mockingDetails(emailService).getInvocations().size()).isEqualTo(2);
softly.assertThat(emailCaptor.getAllValues())
        .hasSize(2)
        .containsExactlyInAnyOrder(emailToBenjamin, emailToZooey);

softly.assertAll();
```

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```
....

// then
SoftAssertions softly = new SoftAssertions();

softly.assertThat(mvcResult.getResponse().getStatus())
        .isEqualTo(HttpStatus.CREATED.value());

List<Assignment> assignments = assignmentService.findAllByCourse(new Course(1L));
softly.assertThat(assignments)
        .hasSize(1)
        .flatExtracting(Assignment::getTitle, Assignment::getInstructions)
        .contains("Spring Application Events", "TDC talk about Spring event");

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        .hasSize(2)
        .containsExactlyInAnyOrder(emailToBenjamin, emailToZooey);

softly.assertAll();
```

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```
....

// then
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        .hasSize(1)
        .flatExtracting(Assignment::getTitle, Assignment::getInstructions)
        .contains("Spring Application Events", "TDC talk about Spring event");

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softly.assertThat(emailCaptor.getAllValues())
        .hasSize(2)
        .containsExactlyInAnyOrder(emailToBenjamin, emailToZooey);

softly.assertAll();
```

Como poderia ser implementado...

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```
@PostMapping("/course/{courseId}/assignment/create")
public ResponseEntity<?> createAssignment(@PathVariable("courseId") Course course,
                                          @RequestBody CreateAssignmentRequest request){
    try {
        Assignment assignment = assignmentService.create(course,
                        conversionService.convert(request, Assignment.class));
        Resource<Assignment> resource = assembler.toResource(assignment);
        return ResponseEntity.created(
                    URI.create(resource.getId().expand().getHref())
                ).build();
    } catch (Exception e){
        return ResponseEntity.status(HttpStatus.INTERNAL_SERVER_ERROR).build();
    }
}
```

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```
@Service
@AllArgsConstructor
public class AssignmentService {
   private AssignmentRepository assignmentRepository;
   private EmailService emailService;
   private CourseRepository courseRepository;
   @Transactional
   public Assignment create(Course course, Assignment assignment){
       // Any other validations,action here...
       assignmentRepository.save(assignment);

       courseRepository.findStudents(course).forEach( student ->  {
           Email email = new Email(student.getEmail(),
                   "New assignment created '" + assignment.getTitle() +"'",
                           assignment.getInstructions());
           emailService.send(email);
       });
       return assignment;
   }
}
```

Testes OK!?

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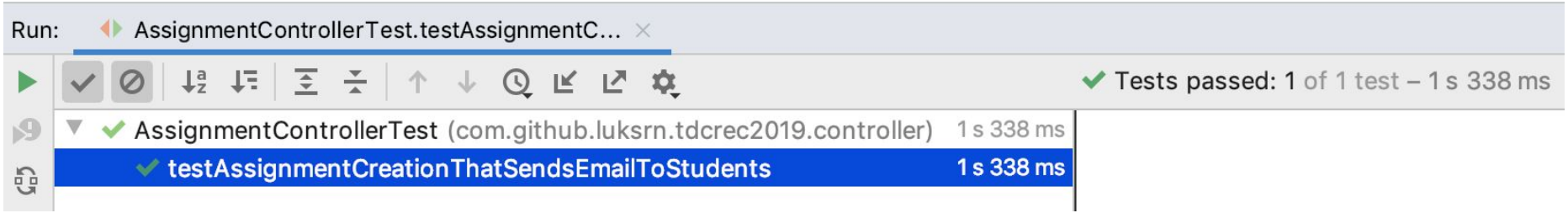

Qual o problema?

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- Design de código

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```
@Service
@AllArgsConstructor
public class AssignmentService {
    private AssignmentRepository assignmentRepository;
    private EmailService emailService;
    private CourseRepository courseRepository;
    @Transactional
    public Assignment create(Course course, Assignment assignment){
        // Any other validations,action here...
        assignment.setCourse(course);
        assignmentRepository.save(assignment);

        courseRepository.findStudents(course).forEach( student ->  {
            Email email = new Email(student.getEmail(),
                    "New assignment created '" + assignment.getTitle() +"'",
                            assignment.getInstructions());
            emailService.send(email);
        });
        return assignment;
    }
}
```

THE DEVELOPER'S CONFERENCE

```
@Service
@AllArgsConstructor
public class AssignmentService {
    private AssignmentRepository assignmentRepository;
    private EmailService emailService;
    private CourseRepository courseRepository;
    @Transactional
    public Assignment create(Course course, Assignment assignment){
        // Any other validations,action here...
        assignment.setCourse(course);
        assignmentRepository.save(assignment);

        courseRepository.findStudents(course).forEach( student ->  {
            final Email email = new Email(student.getEmail(),
                    "New assignment created '" + assignment.getTitle() +"'",
                            assignment.getInstructions());
            emailService.send(email);
        });
        return assignment;
    }
}
```

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Qual o outro problema?

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Novo caso de teste

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```
CreateAssignmentRequest payload = new CreateAssignmentRequest(
        null, null, null); // ← Invalid payload

//when
MvcResult mvcResult = mvc.perform(post("/course/{courseId}/assignment/create",
1L)
        .contentType(MediaType.APPLICATION_JSON)
        .content(objectMapper.writeValueAsString(payload))
).andReturn();

// then
SoftAssertions softly = new SoftAssertions();
softly.assertThat(mvcResult.getResponse().getStatus())
        .isEqualTo(HttpStatus.BAD_REQUEST.value());
softly.assertThat(assignmentService.findAllByCourse(new Course(1L))).isEmpty();
softly.assertThat(mockingDetails(emailService).getInvocations())
    .as("Shouldn't interact with EmailService").isEmpty();
softly.assertAll();
```

Novo caso de teste

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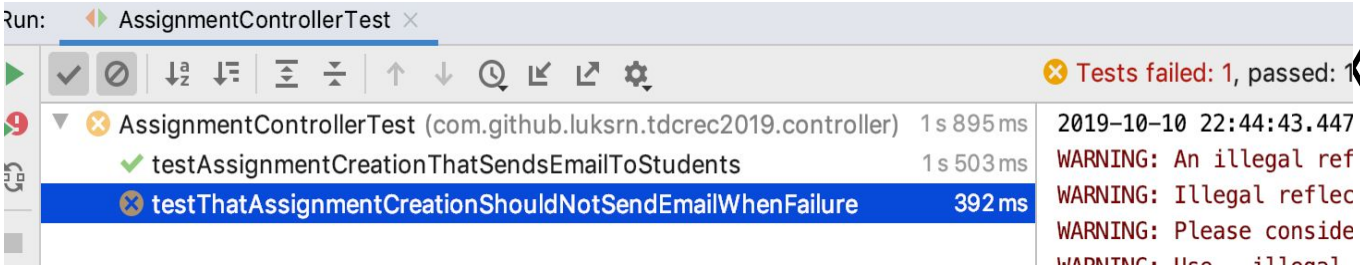
```
CreateAssignmentRequest payload = new CreateAssignmentRequest(
        null, null, null); // ← Invalid payload

//when
MvcResult mvcResult = mvc.perform(post("/course/{courseId}/assignment/create",
1L)
        .contentType(MediaType.APPLICATION_JSON)
        .content(objectMapper.writeValueAsString(payload))
).andReturn();

// then
SoftAssertions softly = new SoftAssertions();
softly.assertThat(mvcResult.getResponse().getStatus())
        .isEqualTo(HttpStatus.BAD_REQUEST.value());
softly.assertThat(assignmentService.findAllByCourse(new Course(1L))).isEmpty();
softly.assertThat(mockingDetails(emailService).getInvocations())
    .as("Shouldn't interact with EmailService").isEmpty();
softly.assertAll();
```



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```
The following 2 assertions failed:
1) expected:<[4]00> but was:<[5]00>
2) [Shouldn't interact with EmailService]
Expecting empty but was:<[emailService bean.send(
    Email(to=benjamin@email.com, subject=New assignment created
'null', body=null)
);,
    emailService bean.send(
    Email(to=zoey@email.com, subject=New assignment created
'null', body=null)
);]>
```

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```
@Service
@AllArgsConstructor
public class AssignmentService {
    private AssignmentRepository assignmentRepository;
    private EmailService emailService;
    private CourseRepository courseRepository;

    @Transactional
    public Assignment create(Course course, Assignment assignment){
        // Any other validations,action here...
        assignment.setCourse(course);
        assignmentRepository.save(assignment);

        courseRepository.findStudents(course).forEach( student ->  {
            final Email email = new Email(student.getEmail(),
                    "New assignment created '" + assignment.getTitle() +"'",
                            assignment.getInstructions());
            emailService.send(email);
        });
        return assignment;
    }
```

Visão conceitual **@Transactional**

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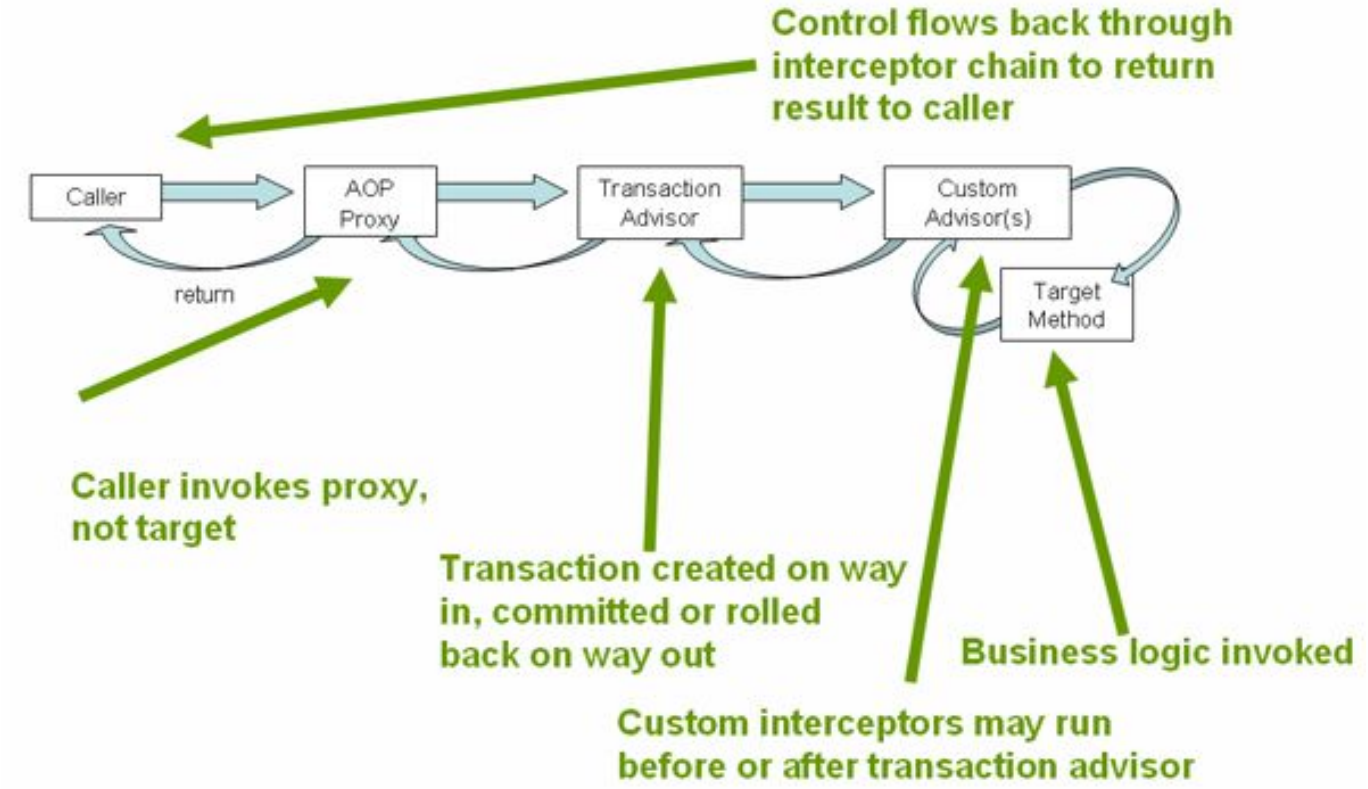

https://docs.spring.io/spring/docs/current/spring-framework-reference/data-access.html#tx-decl-explained

Qual o problema?

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- Sincronização de Transação
  - Mais difícil de ser identificado
  - Extração de código para fora do Service?!
    - Alteração de assinatura
    - Como fica uma situação de composição?
  - E se… integração com:
    - SNS? RabbitMQ? Redis?...

Podemos fazer diferente?

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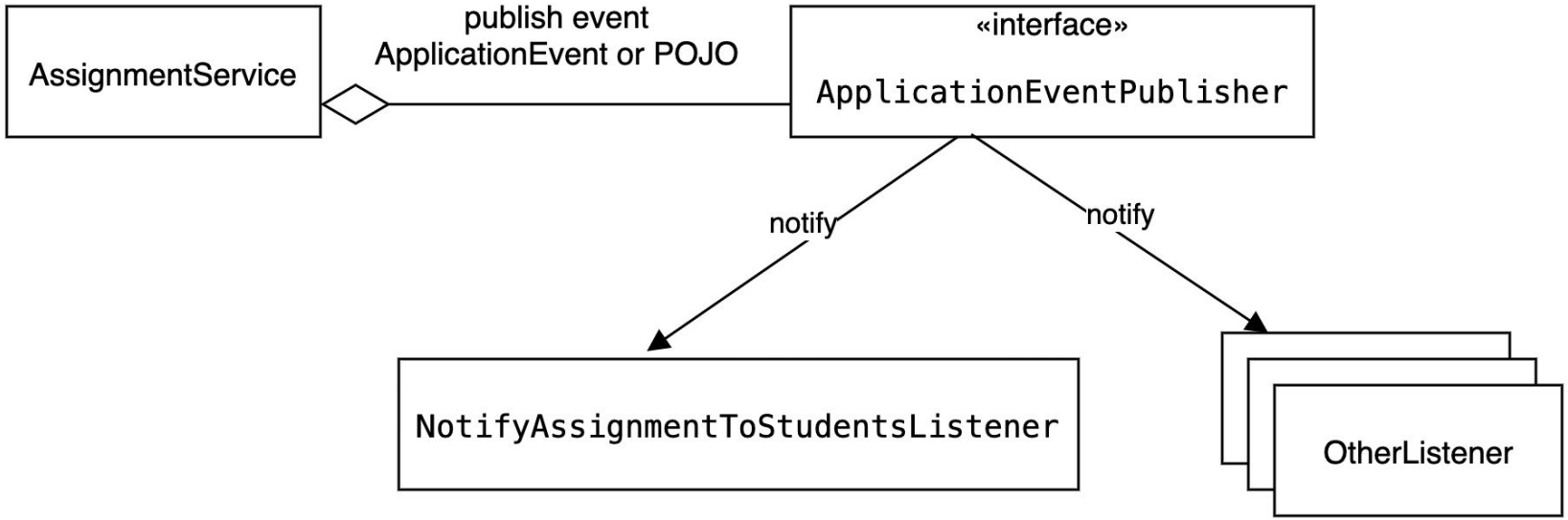
- E se...ao cadastrar a atividade fosse gerado um **evento** de "Atividade criada".
- Se a **notificação de alunos** fosse um **ouvinte** deste evento?
- Se uma ação fosse executada **após o Commit** da transação?

Eventos de Aplicação



O que seria nosso evento?

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```
@Value
public final class AssignmentCreated {
    private Assignment assignment;
}
```

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```
@Service
@AllArgsConstructor
public class AssignmentService {
    private AssignmentRepository assignmentRepository;
    private EmailService emailService;
    private CourseRepository courseRepository;
    @Transactional
    public Assignment create(Course course, Assignment assignment){
        // Any other validations,action here...
        assignment.setCourse(course);
        assignmentRepository.save(assignment);

        courseRepository.findStudents(course).forEach( student ->  {
            final Email email = new Email(student.getEmail(),
                    "New assignment created '" + assignment.getTitle() +"'",
                            assignment.getInstructions());
            emailService.send(email);
        });
        return assignment;
    }
}
```

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```
@Component
@AllArgsConstructor
public class NotifyAssignmentToStudentsListener {
    private EmailService emailService;
    private CourseRepository courseRepository;

    @EventListener
    public void onApplicationEvent(AssignmentCreated event){
        Assignment assignment = event.getAssignment();
        // course#getStudents is Lazy, so...
      courseRepository.findStudents(assignment.getCourse()).forEach(
          student ->  {
            Email email = new Email(student.getEmail(),
                    "New assignment created '" + assignment.getTitle() +"'",
                    assignment.getInstructions());
            emailService.send(email);
        });
    }}
```

THE DEVELOPER'S CONFERENCE

```
@Service
@AllArgsConstructor
public class AssignmentService {

    private AssignmentRepository assignmentRepository;
    private ApplicationEventPublisher publisher;

    @Transactional
    public Assignment create(final Course course, final Assignment assignment){
        // Any other validations,action here...
        assignment.setCourse(course);
        assignmentRepository.save(assignment);

        publisher.publishEvent(new AssignmentCreated(assignment));

        return assignment;
    }
```

Mas espera… whaaat?

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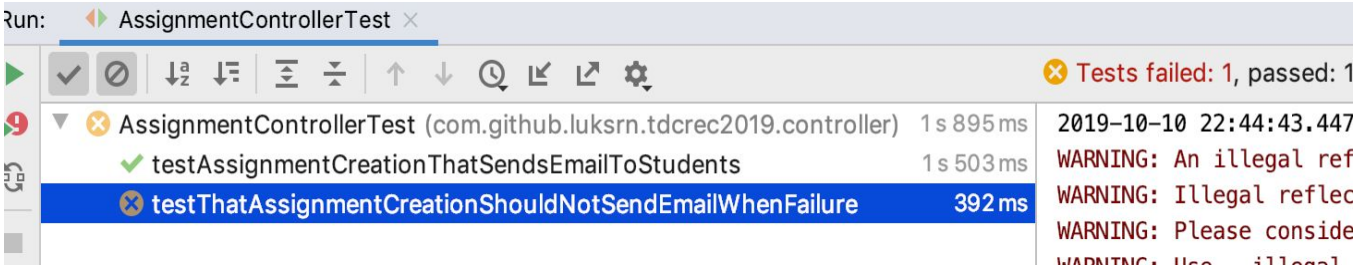
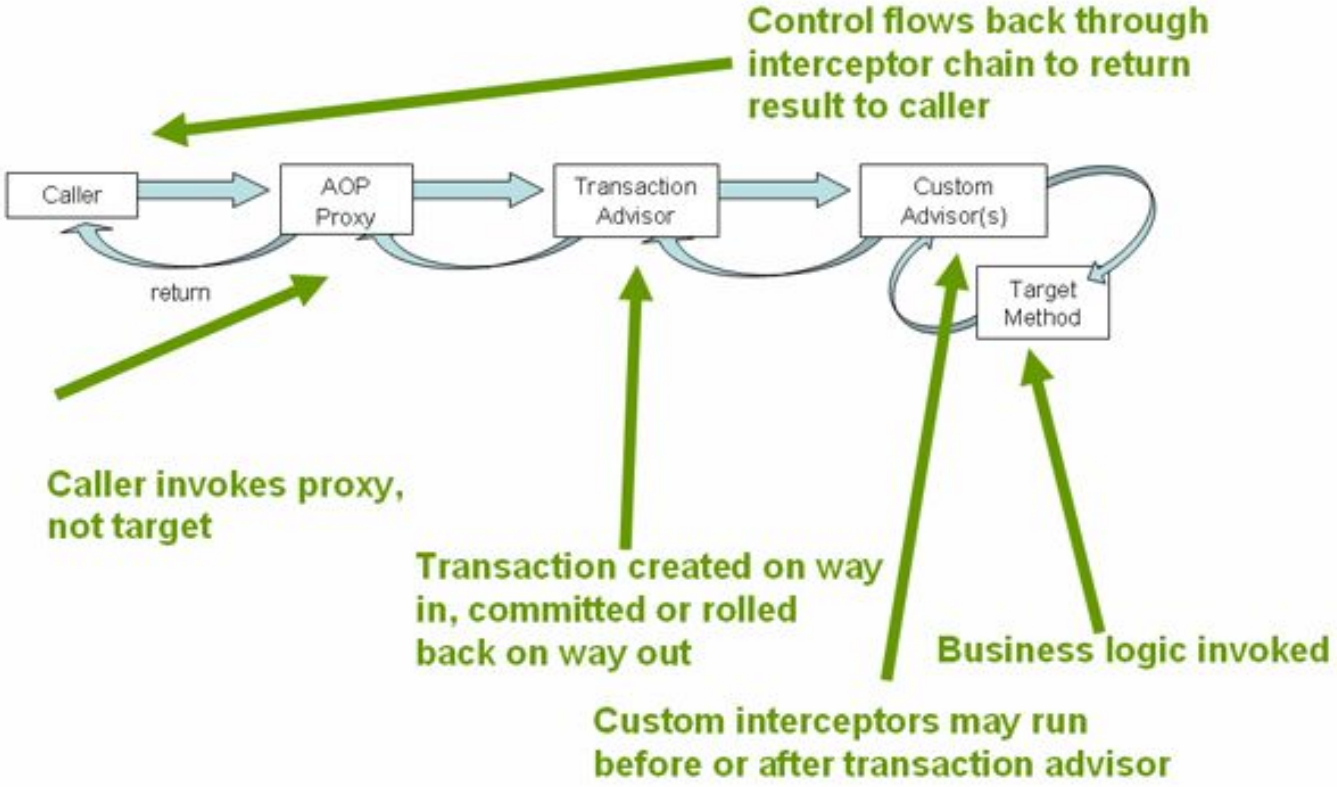


```
The following 2 assertions failed:
1) expected:<[4]00> but was:<[5]00>
2) [Shouldn't interact with EmailService]
Expecting empty but was:<[emailService bean.send(
    Email(to=benjamin@email.com, subject=New assignment created
'null', body=null)
)...]>
```

Visão conceitual @Transactional



https://docs.spring.io/spring/docs/current/spring-framework-reference/data-access.html#tx-decl-explained

THE DEVELOPER'S CONFERENCE

```
@Component
@AllArgsConstructor
public class NotifyAssignmentToStudentsListener {
   private EmailService emailService;
   private CourseRepository courseRepository;

   @TransactionalEventListener(phase = TransactionPhase.AFTER_COMMIT)
   public void handle(AssignmentCreated event){
       Assignment assignment = event.getAssignment();
       // course#getStudents is Lazy, so...
     courseRepository.findStudents(assignment.getCourse()).forEach(
         student ->  {
           final Email email = new Email(student.getEmail(),
                   "New assignment created '" + assignment.getTitle() +"'",
                   assignment.getInstructions());
           emailService.send(email);
       });
   }}
```

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Run: AssignmentControllerTest

Tests passed: 2 of 2 tests

AssignmentControllerTest (com.github.luksrn.tdcrec2019.contr 1 s 695 ms

testAssignmentCreationThatSendsEmailToStudents 1 s 421 ms

testThatAssignmentCreationShouldNotSendEmailWhenFailure 274 ms

/Users/lucasfarias/.sdkma

23:36:51.505 [main] DEBUG

23:36:51.529 [main] DEBUG

23:36:51.541 [main] DEBUG

Considerações

- Código fica menos acoplado, seguindo o príncipio do **SO**LID
  - **S**ingle Responsibility
  - **O**pen Closed
- Boa opção para tratar **Sincronização de ações com Transação**
- Conheça outras funcionalidades
  - Eventos genéricos
  - Eventos Assíncronos
  - Conditional com SpEL

Considerações

- Como tratar consistência entre os Listeners?
  - **Spring Retry**
- Quando seu domínio possuir **diversos estados** que alteram em **eventos**, e que realiza **ações em cada transição** soluções melhores podem ser aplicadas.
  - **Spring State Machine**

Código da apresentação

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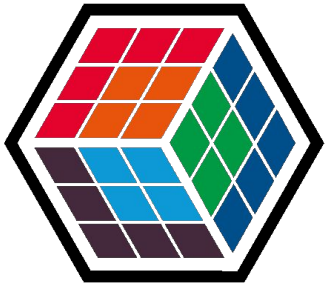
https://github.com/luksrn/java-eventos-tdcrecife2019



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