THE DEVELOPER'S CONFERENCE

Entregando testes de valor

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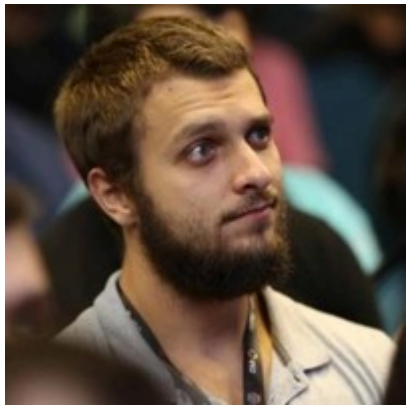
Marco Nicolodi

Sobre nós



Desenvolvedores

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Line of Business ASP.NET Core API

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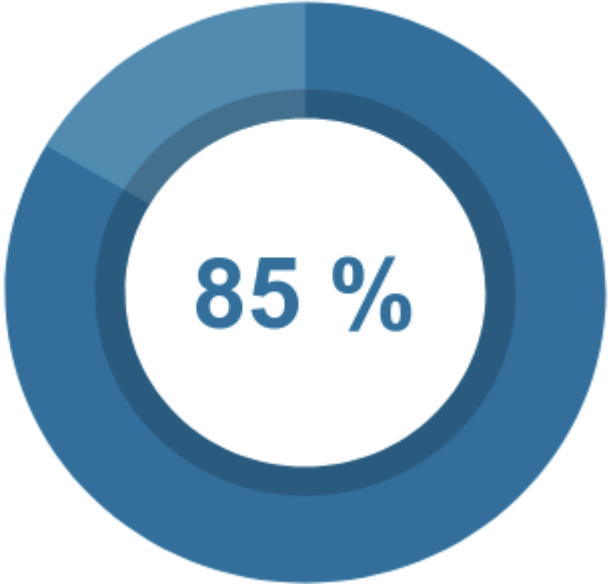
Coverage



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Parece bom

O que acontecia

- Mecheu == quebrou
- Teste não passava confiança
- Dificil de entender/ler/refatorar/olhar/cheirar/TUDO
- Degradavel
- Diminui velocidade da entrega
- “//” era a salvação

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```
[Fact]
public async void Update_ShouldUpdateDocument()
{
    //Arrange
    var context = InMemoryDocContextFactory.Create();
    var unitOfWork = new DocUnitOfWork(context, _logger);

    var elaboration = new Stage() { Type = StageType.Elaboration, Name = "Elaboration" };
    var approval = new Stage() { Type = StageType.Approval, Name = "Approval" };
    var consensus = new Stage() { Type = StageType.Approval, Name = "Consensus" };

    context.Stages.Add(elaboration);
    context.Stages.Add(approval);
    context.Stages.Add(consensus);

    var oldCategory = new Category()
    {
        Initials = "CAT",
        Name = "Category",
        Stages = new List<CategoryStage>() {
            new CategoryStage() { Order = 1, Stage = elaboration },
            new CategoryStage() { Order = 2, Stage = approval },
        },
    };
    var newCategory = new Category()
    {
        Initials = "DOG",
        Name = "Dogcary",
        Stages = new List<CategoryStage>() {
            new CategoryStage() { Order = 1, Stage = elaboration },
            new CategoryStage() { Order = 2, Stage = consensus },
        }
    };

    context.Categories.Add(oldCategory);
    context.Categories.Add(newCategory);
```

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```
var document = new Document()
{
    CategoryId = oldCategory.Id,
    SuggestedCode = new SuggestedCode() { Code = 5, DocumentId = 1 },
    ProcessGuid = ProcessMother.AutomatedTest().Id,
    Title = "Arroz",
    Code = "Codecept",
    Stages = new List<DocumentStage>() {
        new DocumentStage() {
            StageId = elaboration.Id,
            Responsibles = new List<DocumentStageResponsible>()
            {
                new DocumentStageResponsible() { ResponsibleGuid = UserMother.MrCatraId },
            },
        },
        new DocumentStage()
        {
            StageId = approval.Id,
            Responsibles = new List<DocumentStageResponsible>()
            {
                new DocumentStageResponsible() { ResponsibleGuid = UserMother.MrCatraId },
                new DocumentStageResponsible() { ResponsibleGuid = UserMother.PabloEscobarId },
            },
        },
    },
    Revisions = new List<Revision>()
    {
        new Revision() {
            Stages = new List<RevisionStage>(),
            PublishDate = DateTime.Now,
            RevisionRequestHistory = new List<RevisionRequest>()
        },
    }
};

context.Documents.Add(document);
```

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```
var mutation = new UpdateDocumentMutation()
{
    Category = newCategory.Id,
    Code = "CAT0006",
    Title = "Title",
    Process = ProcessMother.AutomatedTest().Id,
    Stages = new List<UpdateDocumentMutationStage>() {
        new UpdateDocumentMutationStage()
        {
            Id = elaboration.Id,
            Responsibles = new List<Guid>() { UserMother.PabloEscobarId },
            DaysToDueDate = 27
        },
        new UpdateDocumentMutationStage()
        {
            Id = consensus.Id,
            Responsibles = new List<Guid>() { UserMother.MrCatraId },
            DaysToDueDate = 7,
        },
    },
};

var business = new Mock<IDocumentBusiness>().Object;

context.SaveChanges();
var documentService = new DocumentWriteService(unitOfWork, null, business, null, null, context, null, null, null, null)

//Act & Assert
var updatedDocument = await documentService.Update(document.Id, mutation);
Assert.Equal(updatedDocument.Code, mutation.Code);
Assert.Equal(updatedDocument.CategoryId, mutation.Category);
Assert.Equal(updatedDocument.Title, mutation.Title);
Assert.Equal(updatedDocument.ProcessGuid, mutation.Process);
Assert.Equal(6, updatedDocument.SuggestedCode.Code);
updatedDocument.Stages.First().StageId.Should().Equals(elaboration.Id);
Assert.Equal(27, updatedDocument.Stages.First().DaysToDueDate);
updatedDocument.Stages.Last().StageId.Should().Equals(consensus.Id);
Assert.Equal(7, updatedDocument.Stages.Last().DaysToDueDate);
updatedDocument.Stages.First().Responsibles.Count().Equals(1);
updatedDocument.Stages.First().Responsibles.First().ResponsibleGuid.Equals(UserMother.PabloEscobarId);
updatedDocument.Stages.Last().Responsibles.Count().Equals(1);
updatedDocument.Stages.Last().Responsibles.First().ResponsibleGuid.Equals(UserMother.MrCatraId);
```

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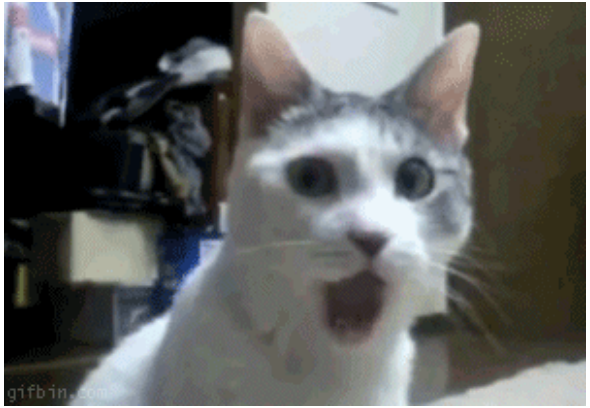

119 linhas

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Como saímos deste cenário

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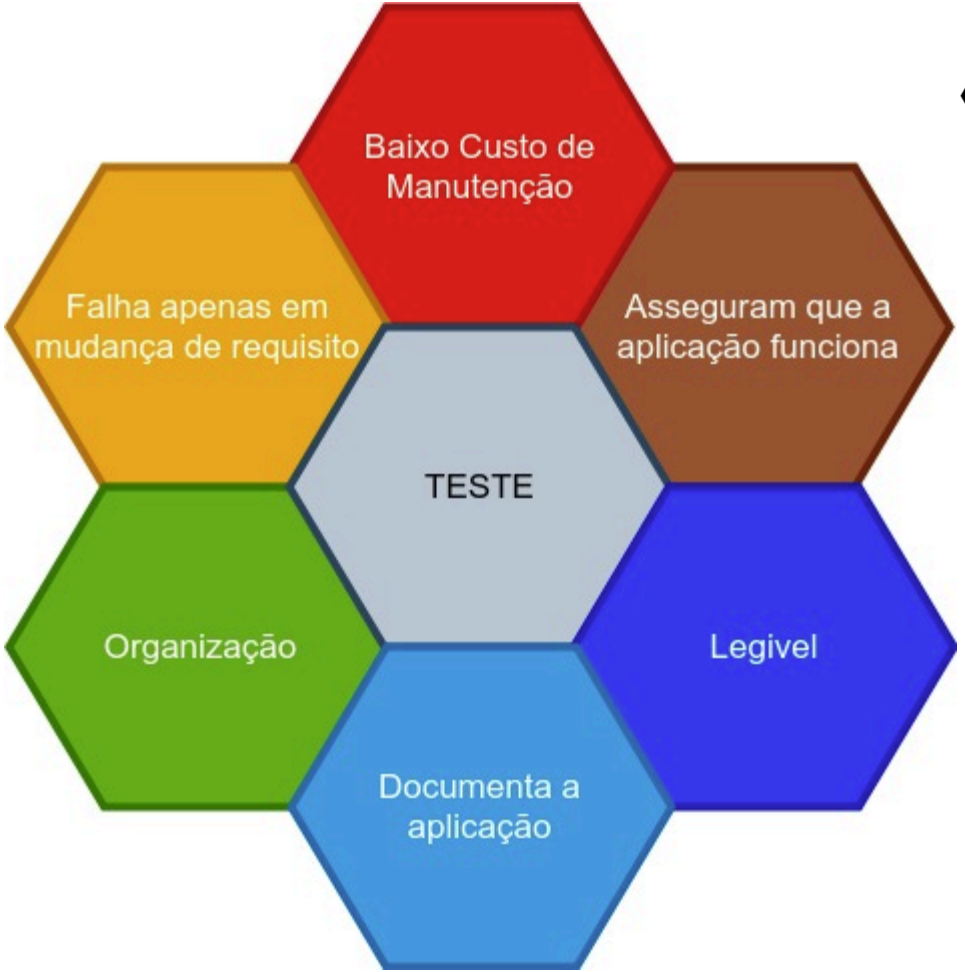
Quais as características de um bom teste?



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Entender

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```
[Fact]
public async void RejectRevisionRequestTransfer_ShouldThrowNotFoundException_WhenDocumentDoesNotExist()

[Fact]
public async void RejectRevisionRequestTransfer_ShouldThrowNotFoundException_WhenDocumentDoesNotHaveAElaborationStage()

[Fact]
public async void RejectRevisionRequestTransfer_ShouldThrowNotFoundException_WhenThereIsNoOpenRevisionRequest()

[Fact]
public async void RejectRevisionRequestTransfer_ShouldCallBusinessAndUpdateRequestAndPublishRejectedRevisionRequestTransferEvent()
```

Use a propriedade **DisplayName** para cenários de casos de uso

Documentação

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```
[Fact (DisplayName=@"
    GIVEN I have a document
    WHEN I update information
    THEN the document must have the new information
")]
0 references | Run Test | Debug Test
public async void Update_ShouldUpdateDocument()
{
```

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```
[Fact(DisplayName = @"
    GIVEN
        that SteveJobs is responsible for the elaboration stage of the document
        AND SteveJobs and GeorgeBush are responsibles for the approval stage of the document
    WHEN
        I replace SteveJobs with MrCatra
    THEN
        MrCatra should be the new responsible for the elaboration stage
        AND GeorgeBush and MrCatra should be the new responsibles for the approval stage
")]
public async void Replace_ShouldReplaceResponsibles()
{
```

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Fixtures

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```
[Fact]
public async void Update_ShouldUpdateDocument()
{
    //Arrange
    var context = InMemoryDocContextFactory.Create();
    var unitOfWork = new DocUnitOfWork(context, _logger);

    var elaboration = new Stage() { Type = StageType.Elaboration, Name = "Elaboration" };
    var approval = new Stage() { Type = StageType.Approval, Name = "Approval" };
    var consensus = new Stage() { Type = StageType.Approval, Name = "Consensus" };

    context.Stages.Add(elaboration);
    context.Stages.Add(approval);
    context.Stages.Add(consensus);

    var oldCategory = new Category()
    {
        Initials = "CAT",
        Name = "Category",
        Stages = new List<CategoryStage>() {
            new CategoryStage() { Order = 1, Stage = elaboration },
            new CategoryStage() { Order = 2, Stage = approval },
        },
    };
    var newCategory = new Category()
    {
        Initials = "DOG",
        Name = "Dogcary",
        Stages = new List<CategoryStage>() {
            new CategoryStage() { Order = 1, Stage = elaboration },
            new CategoryStage() { Order = 2, Stage = consensus },
        }
    };

    context.Categories.Add(oldCategory);
    context.Categories.Add(newCategory);
```

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```
var document = new Document()
{
    CategoryId = oldCategory.Id,
    SuggestedCode = new SuggestedCode() { Code = 5, DocumentId = 1 },
    ProcessGuid = ProcessMother.AutomatedTest().Id,
    Title = "Arroz",
    Code = "Codecept",
    Stages = new List<DocumentStage>() {
        new DocumentStage() {
            StageId = elaboration.Id,
            Responsibles = new List<DocumentStageResponsible>()
            {
                new DocumentStageResponsible() { ResponsibleGuid = UserMother.MrCatraId },
            },
        },
        new DocumentStage()
        {
            StageId = approval.Id,
            Responsibles = new List<DocumentStageResponsible>()
            {
                new DocumentStageResponsible() { ResponsibleGuid = UserMother.MrCatraId },
                new DocumentStageResponsible() { ResponsibleGuid = UserMother.PabloEscobarId },
            },
        },
    },
    Revisions = new List<Revision>()
    {
        new Revision() {
            Stages = new List<RevisionStage>(),
            PublishDate = DateTime.Now,
            RevisionRequestHistory = new List<RevisionRequest>()
        },
    }
};

context.Documents.Add(document);
```

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Modelo único levam a fixtures maiores

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Bounded contexts simplificam as entidades e os testes

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```
var document = new Document()
{
    CategoryId = oldCategory.Id,
    SuggestedCode = new SuggestedCode() { Code = 5, DocumentId = 1 },
    ProcessGuid = ProcessMother.AutomatedTest().Id,
    Title = "Arroz",
    Code = "Codecept",
    Stages = new List<DocumentStage>() {
        new DocumentStage() {
            StageId = elaboration.Id,
            Responsibles = new List<DocumentStageResponsible>()
            {
                new DocumentStageResponsible() { ResponsibleGuid = UserMother.MrCatraId },
            },
        },
        new DocumentStage()
        {
            StageId = approval.Id,
            Responsibles = new List<DocumentStageResponsible>()
            {
                new DocumentStageResponsible() { ResponsibleGuid = UserMother.MrCatraId },
                new DocumentStageResponsible() { ResponsibleGuid = UserMother.PabloEscobarId },
            },
        },
    },
    Revisions = new List<Revision>()
    {
        new Revision() {
            Stages = new List<RevisionStage>(),
            PublishDate = DateTime.Now,
            RevisionRequestHistory = new List<RevisionRequest>()
        },
    }
};

context.Documents.Add(document);
```

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Object Mothers have essentially one job: give birth to good defaults and test-ready entities.

```
var document = DocumentMother.DocumentWithOnePendingRevisionInElaboration();
```

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12 references

```
public static Document DocumentWithOnePendingRevisionInElaboration(
    int id = 1,
    string code = "CEA001",
    string title = "Document Title",
    User elaborator = null,
    List<User> approvers = null,
    List<File> files = null,
    Process process = null
)
{
    var categoryElaborationApproval = CategoryMother.ElaborationApproval();
    process = process ?? ProcessMother.AutomatedTest();

    var document = Document(
        id: id,
        code: code,
        title: title,
        process: process,
        category: categoryElaborationApproval
    );

    elaborator = elaborator ?? UserMother.MrCatra();
    approvers = approvers ?? new List<User>() { UserMother.PabloEscobar() };
    files = files ?? new List<File>();

    AddDocumentStages(document, elaborator, approvers);

    document.Revisions.Add(RevisionMother.OneCyclePendingElaboration(document, files));

    return document;
}
```

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Coesão

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O quanto os membros de uma classe estão relacionadas com ela

```
public interface IDocumentService
{
    Task<Page<DocumentListViewModel>> List(PaginationOptions paginationOptions, SortOptions sortOptions,
    Task<DocumentDetailsViewModel> FindDetails(int id);
    Task<DocumentFormViewModel> FindForm(int id);
    Task<List<TaskViewModel>> GetLoggedUserTasks();
    Task<CurrentStageViewModel> CurrentStage(int documentId);
    List<StageViewModel> GetCurrentStageStages(int documentId);
    int Count(DocumentFilterOptions filterOptions);
    string GetSuggestedCode(int categoryId);
    Task<Document> Insert(InsertDocumentRequest request);
    Task<Document> Update(int id, UpdateDocumentRequest request);
    Task CompleteElaboration(int documentId, CompleteElaborationRequest request);
    Task MarkFileAsViewed(int documentId);
    Task UpdateElaborationFile(int documentId, File file);
    Task ApproveOrReproveRevision(int documentId, bool approve, RevisionApprovalRequest request);
    Task RequestRevision(int documentId, RequestRevisionRequest request);
    Task RejectRevisionRequestTransfer(int documentId, RejectRevisionRequestTransferRequest request);
    Task RejectRevisionRequest(int documentId, RejectRevisionRequestRequest request);
    Task StartRevision(int documentId, RevisionObservationMutation observation);
    Task TransferRevisionRequest(int documentId, TransferRevisionRequest request);
    Task CancelRevision(int documentId);
}
```

```
public DocumentWriteService(
    IDocumentRepository repository,
    IDocumentSpecification specification,
    RequestContext requestContext,
    IStorageClient storageClient,
    DocContext context,
    IEventBus eventBus,
    IQualyteamLogger logger,
    IFileService fileService,
    IMediator mediator,
    IPaymentGateway paymentGateway,
    IPdfConverter pdfConverter
)
{
    _repository = repository;
    _specification = specification;
    _requestContext = requestContext;
    _storageClient = storageClient;
    _context = context;
    _eventBus = eventBus;
    _logger = logger;
    _fileService = fileService;
    _mediator = mediator;
    _paymentGateway = paymentGateway;
    _pdfConverter = pdfConverter;
}
```

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Builders

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```
var documentService = new DocumentWriteService(unitOfWork, null, business, null, null, context, null, null, null, null);
```

```
var documentService = new DocumentWriteServiceBuilder()
    .WithUnitOfWork(unitOfWork)
    .WithBusiness(business)
    .WithContext(context)
    .Build();
```

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Asserções & Use Fluent Assertions

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Asserções únicas ou múltiplas?


É TRETA, É TRETA,
É TRETAAAAA

Asserções

Únicas

- Muitos testes para o mesmo cenário
- Análise mais rápida do real problema

Múltiplas

- Ajuda em testes mais complexos
- Mais difícil saber o que quebrou

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```
revision.Changes.Should().Be(requestPayload.Changes);
elaborationResult.Approved.Should().BeTrue("because we just completed the elaboration stage");
revision.Stages.Should()HaveCount(2, "because the next stage has been created");
createdStage.Order.Should().Be(2, "because it  happens after the elaboration");
createdStage.StageId.Should().Be(StageMother.ApprovalStageid, "because the next stage is the approval stage");
```

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```
documentFromDatabase
    .GetLastPublishedRevision()
    .GetOpenRevisionRequest()
    .ResponsibleGuid
    .Should()
    .Be(UserMother.MrCatraId, "because we replaced SteveJobs with MrCatra and SteveJobs was the requester of this revision");

documentFromDatabase
    .GetLastPublishedRevision()
    .GetClosedRevisionRequest()
    .ResponsibleGuid
    .Should()
    .Be(UserMother.SteveJobsId, "because we shouldnt change history");
```

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Como resultado

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```
[Fact (DisplayName=@"
    GIVEN I have a document
    WHEN I update your information
    THEN the document must have the new information
")]
0 references | Run Test | Debug Test
public async void Update_ShouldUpdateDocument()
{
    var document = DocumentMother.DocumentWithOnePublishedAndOnePendingRevisionInApproval();

    context.Documents.Add(document);

    var mutation = DocumentMother.DocumentWithNoStages();

    context.SaveChanges();
    var documentService = new DocumentWriteServiceBuilder()
        .WithUnitOfWork(unitOfWork)
        .WithBusiness(business)
        .WithContext(context)
        .Build();

    var updatedDocument = await documentService.Update(document.Id, mutation);

    updatedDocument.Code.Should().Be(mutation.Code);
    updatedDocument.Title.Should().Be(mutation.Title);
    updatedDocument.SuggestedCode.Code.Should().Be(6);

    var firstStage = updatedDocument.Stages.First();
    firstStage.DaysToDueDate.Should().Be(27);
    firstStage.Responsibles.Should().HaveCount(1);
    firstStage.Responsibles.First().ResponsibleGuid.Should().Be(UserMother.PabloEscobarId);

    var lastStage = updatedDocument.Stages.Last();
    lastStage.DaysToDueDate.Should().Be(7);
    lastStage.Responsibles.Should().HaveCount(1);
    lastStage.Responsibles.First().ResponsibleGuid.Should().Be(UserMother.MrCatraId);
}
```

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Melhoramos... mas queríamos ir além

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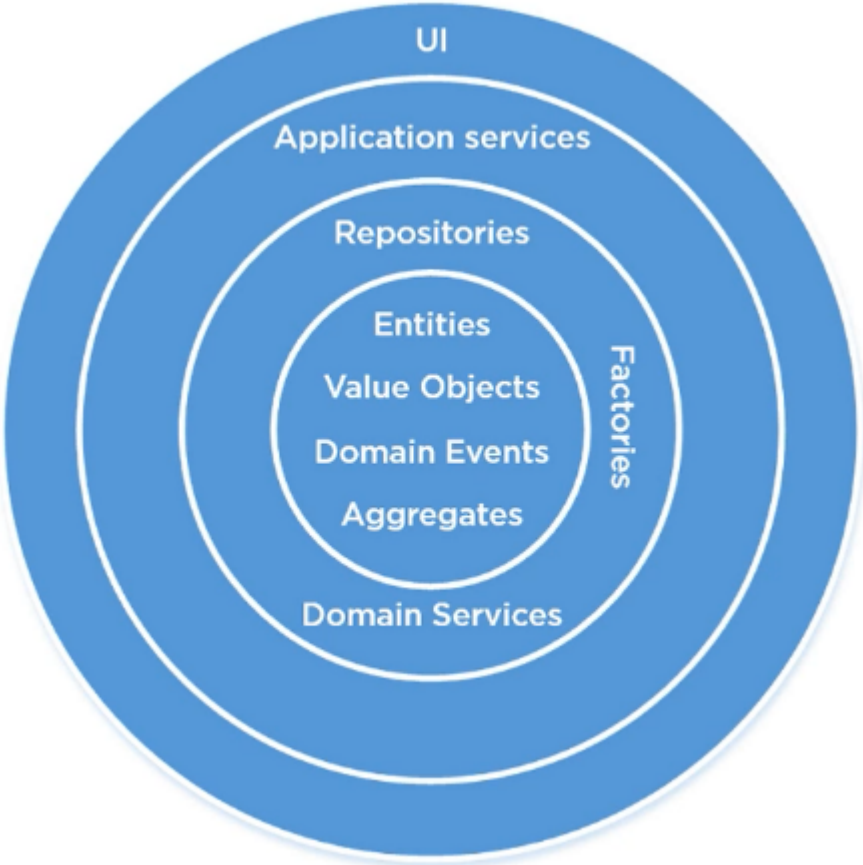
Arquiteturas



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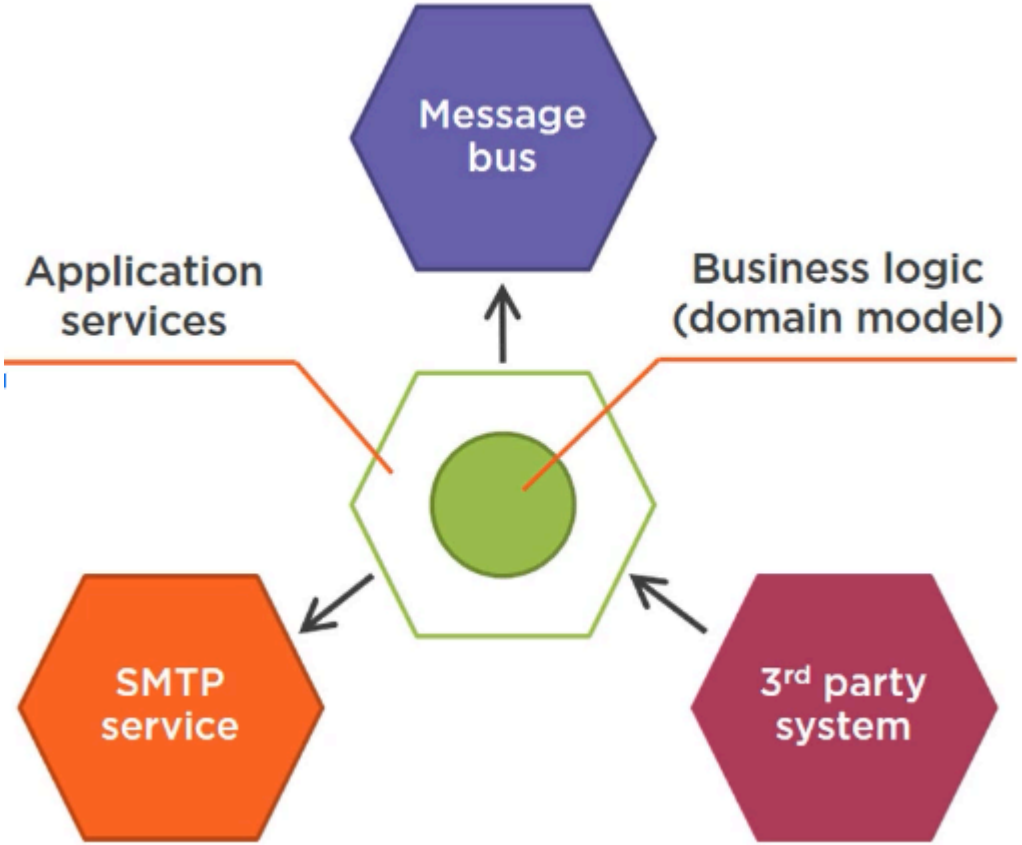
Message bus
Application services
Business logic (domain model)
SMTP service
3rd party system

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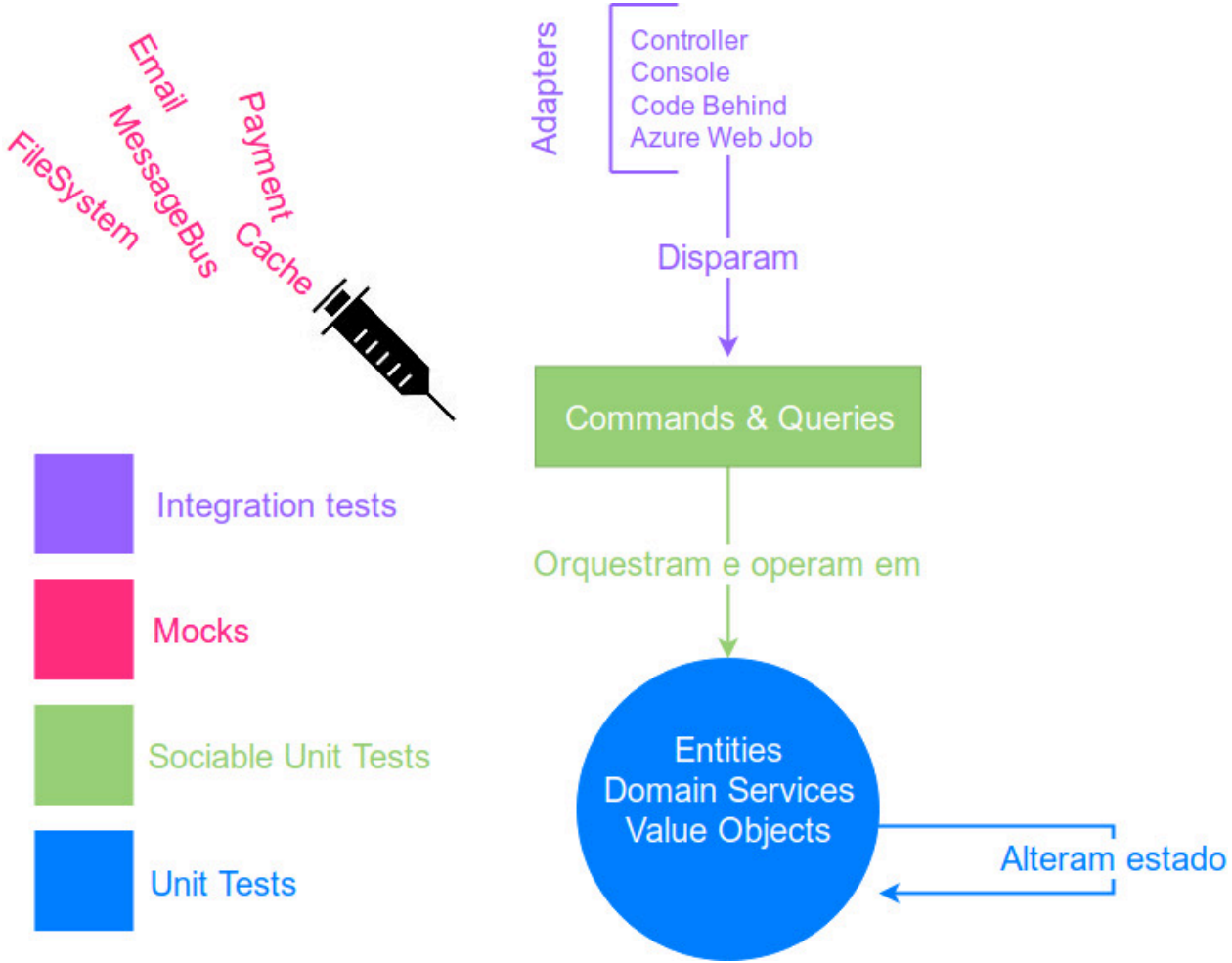
Proteja seu dominio das **extremidades**



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Classes de serviço de aplicação não são coesas

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Use MediatR para orquestração de casos de uso

```
public class AplicarAVagaCommandHandler : IRequestHandler<AplicarAVagaCommand>
{
    public AplicarAVagaCommandHandler(
        IRepositorioDeCandidatos _repositorioDeCandidatos,
        IRepositorioDeVagas _repositorioDeVagas,
        IEventBus _eventBus,
        ILogger _logger
    ){
        //Atribui dependencias
    }

    public async Task Handle(AplicarAVagaCommand comando)
    {
        var candidato = await _repositorioDeCandidatos.Encontrar(comando.IdCandidato);
        var vaga = await _repositorioDeVagas.Encontrar(comando.IdVaga);

        candidato.Aplicar(vaga);

        _eventBus.Publicar(candidato.EventosLevantados);
        _logger.Info($"Candidato {candidato.Nome} aplicou a vaga {vaga.Identificacao}");
    }
}
```

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Encapsulamento

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```
[Fact]
public async void Update_ShouldUpdateDocument()
{
    //Arrange
    var context = InMemoryDocContextFactory.Create();
    var unitOfWork = new DocUnitOfWork(context, _logger);

    var elaboration = new Stage() { Type = StageType.Elaboration, Name = "Elaboration" };
    var approval = new Stage() { Type = StageType.Approval, Name = "Approval" };
    var consensus = new Stage() { Type = StageType.Approval, Name = "Consensus" };

    context.Stages.Add(elaboration);
    context.Stages.Add(approval);
    context.Stages.Add(consensus);

    var oldCategory = new Category()
    {
        Initials = "CAT",
        Name = "Category",
        Stages = new List<CategoryStage>() {
            new CategoryStage() { Order = 1, Stage = elaboration },
            new CategoryStage() { Order = 2, Stage = approval },
        },
    };
    var newCategory = new Category()
    {
        Initials = "DOG",
        Name = "Dogcary",
        Stages = new List<CategoryStage>() {
            new CategoryStage() { Order = 1, Stage = elaboration },
            new CategoryStage() { Order = 2, Stage = consensus },
        }
    };

    context.Categories.Add(oldCategory);
    context.Categories.Add(newCategory);
```

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```
public class Category
{
    public int Id { get; set; }
    public string Initials { get; set; }
    public string Name { get; set; }
    public virtual ICollection<CategoryStage> Stages { get; set; }
}
```

```
public class Category
{
    public string Initials => Name.Substring(0, 2).ToUpper();
    public string Name { get; protected set; }
    public virtual ICollection<CategoryStage> Stages { get; }

    private Category(string name, ICollection<CategoryStage> stages)
    {
        Name = name;
        Stages = stages;
    }
    protected Category() { }

    public void ChangeName(string name) => Name = name;

    public static Category Basic(string name, string initials)
    => new Category(name, initials, Stages.Stages());

    public static Category Enterprise(string name, string initials)
    => new Category(name, initials, Stages.Enterprise());
}
```

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```
var context = InMemoryDocContextFactory.Create();

context.Categories.Add(Category.Basic("Dogcary"));
context.Categories.Add(Category.Enterprise("Category"));
```

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The **new** keyword considered harmful

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Mocks

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Setups diminuem a velocidade de escrita

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```
var specificationMock = new Mock<ISpecification>();
specificationMock.Setup(s => s.IsSatisfiedBy(It.IsAny<Document>())).Returns(true);

var waterMarkStrategyMock = new Mock<IWaterMarkStrategy>();
waterMarkStrategy.Setup(w => w.Generate()).Returns(Watermark.None);

var mapperMock = new Mock<IMapper>();
mapperMock.Setup(s => s.Map(It.IsAny<Document>())).Returns(new ControlledCopyDTO(sut.Id, sut.Name))

var handler = new PrintControlledCopyCommandHandler(
    specificationMock.Object,
    waterMarkStrategyMock.Object,
    mapperMock.Object
);
```

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```
var handler = new PrintControlledCopyCommandHandler(
    new DocumentIsPrintable(),
    new NullWaterMarkStrategy(),
    AutoMapperFactory.Create(),
);
```

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Te prendem a um detalhe de implementação

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```
var specificationMock = new Mock<ISpecification>();
specificationMock.Setup(s => s.IsSatisfiedBy(It.IsAny<Document>)).Returns(true);

var handler = new PrintControlledCopyCommandHandler(specificationMock.Object);

var result = await handler.Handle(new PrintControlledCopyCommand(revisionId), CancellationToken.None);

result.Status.Should().Be(Result.Success)
```

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Diminuem a confiança de que o código funciona

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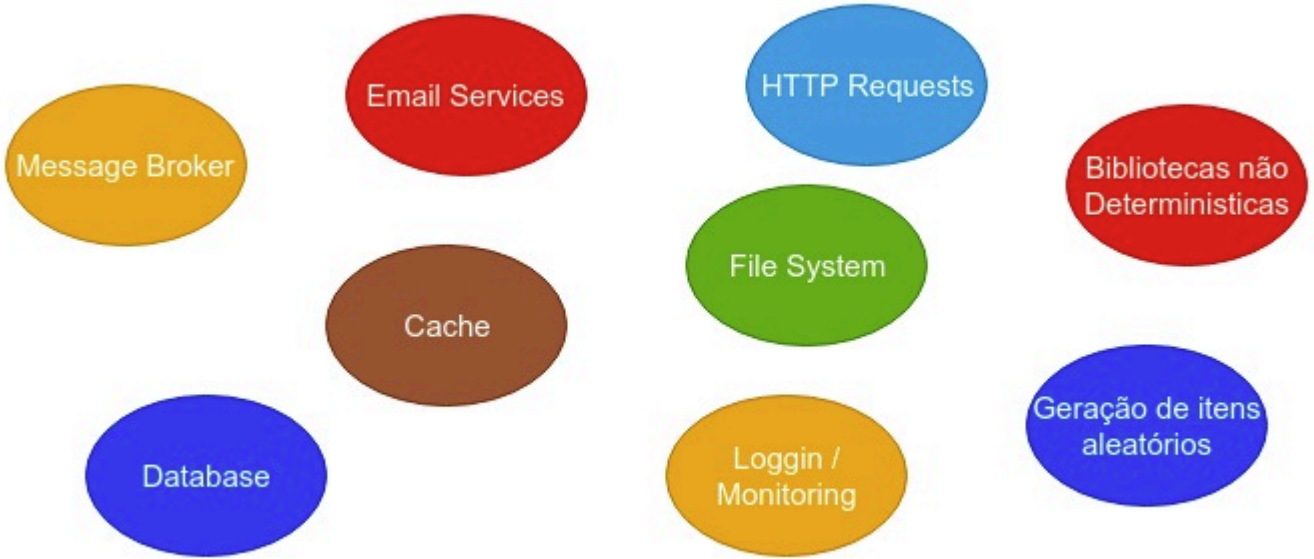
Faça mocks de **dependências instáveis**


Email Services
HTTP Requests
Message Broker
Bibliotecas não Deterministicas
File System
Cache
Geração de itens aleatórios
Database
Loggin / Monitoring

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Nossa concepção de cobertura também foi alterada

100% Coverage =

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É o que tem pra hoje.

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Testes automatizados fazem parte da cultura **ágil**

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Seu time deve **amar** a suite de testes

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Devem **auxiliar** a refatoração

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Refatorar é lindo.
Manter funcionando é arte

Obrigado

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Contatos

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