Be Assertive with Spring

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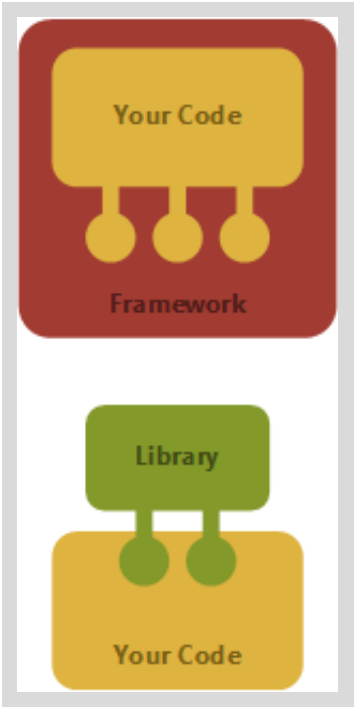
"Regarding opinionated / unopinionated frameworks, I think they appeal to different types of developers. I now have 20 years of experience. In my first 5-8 years I loved frameworks like Spring. However, as I gained more experience, I felt I needed a framework's "opinion" less and less. Now I avoid them."

https://www.infoq.com/news/2018/10/the-road-to-micronaut-1.0

Frameworks vs Libraries

Frameworks

Puts work into a frame



http://tomasp.net/blog/2015/library-frameworks/

Frameworks exist beyond software

Franchizes

Project Management Methodologies (for example, Scrum)

Frameworks

Take time to learn and outdate quickly

Go out of fashion/get abandoned

Increase complexity/weight

Require expert help

Own you

Meanwhile in Scala ecosystem...

(...) It's not a web-framework but rather a more general toolkit for providing and consuming HTTP-based services.

https://doc.akka.io/docs/akka-http/current/introduction.html#philosophy

"All non-trivial abstractions, to some degree, are leaky."

https://www.joelonsoftware.com/2002/11/11/the-law-of-leaky-abstractions/

Frameworks' Internals

- Runtime reflection
- Classpath scanning
- Thread-locals
- Runtime annotation-processing
- Proxies/AOP

"The Meaning of Life", Monty Python

Can you spot an issue? #1

```
import org.springframework.transaction.annotation.Transactional;

class UserService {

    // ...

    @Transactional
    private void createUser(User user) {
        // ...
    }

}
```

@Transactional doesn't work with private methods

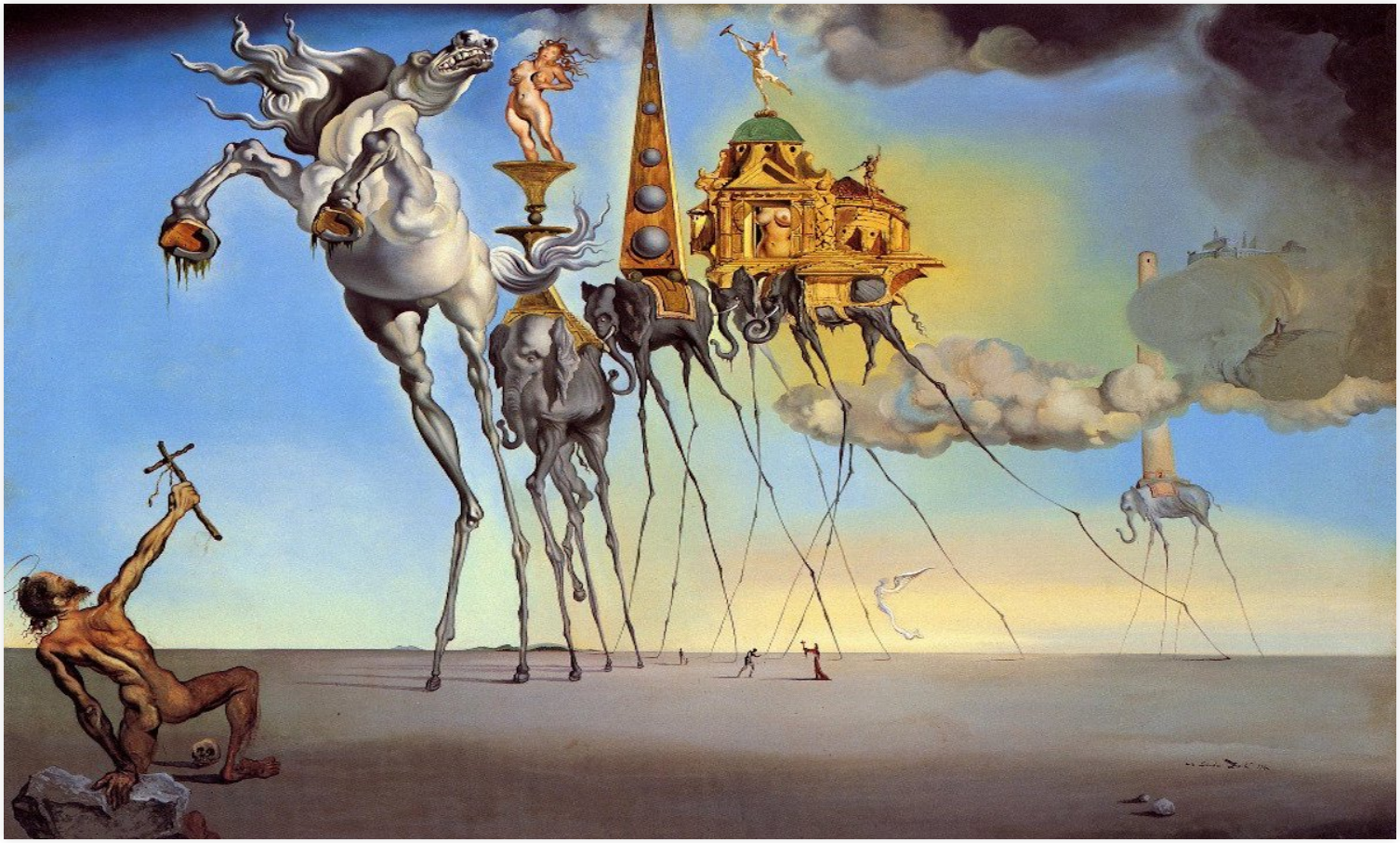
Can you spot an issue? #2

```
import org.springframework.transaction.annotation.Transactional;

class UserService {

    // ...

    public void createUser(User user) {
        createCredentials(user.getId());
        // ...
    }

    @Transactional
    public void createCredentials(Integer id) {
        // ...
    }

}
```

@Transactional doesn't work when called by another method from the same class

Spring-native Solution

```
class UserService {

    private final ApplicationContext applicationContext;
    private volatile UserService self;

    public UserService(ApplicationContext applicationContext) {
        this.applicationContext = applicationContext;
    }

    @PostConstruct
    private void init() {
        self = applicationContext.getBean(UserService.class);
    }

    // ...

    public void createUser(User user) {
        self.createCredentials(user.getId());
        // ...
    }

    @Transactional
    public void createCredentials(Integer id) {
        // ...
    }

}
```



"Scala programmer confronts Java project that uses Maven, Spring, and Hibernate" - Salvador Dali, oil painting, 1946

https://twitter.com/progpaintings/status/723276501081190400

Magic-less Solution

```
class UserService {

    private final TransactionTemplate transactionTemplate;

    public UserService(TransactionTemplate transactionTemplate) {
        this.transactionTemplate = transactionTemplate;
    }

    public void createUser(User user) {
        transactionTemplate.executeWithoutResult(txStatus -> {
            createCredentials(user.getId());
        });
    }

    private void createCredentials(Integer id) {
        // ...
    }

}
```

Make Them Suffer / Scala Implicit Hell

OCT 14TH, 2015

Make them suffer is a series of posts about Scala and Akka. Previously we discussed how to avoid concurrency problems and keeping internal actors state isolated in Akka. In this episode I want to show you why Scala code looks so magical and hard to undersrand. But I'm gonna start with a long introduction.

http://spiridonov.pro/2015/10/14/scala-implicit-hell/

Dependency Hell

Common when using shared modules

> *Dependency hell is a colloquial term for the frustration of some software users who have installed software packages which have dependencies on specific versions of other software packages.*

https://en.wikipedia.org/wiki/Dependency_hell

Zero-Dependencies, duh!

```
<dependencies>
    ...

    <dependency>
        <groupid>org.assertj</groupid>
        <artifactid>assertj-core</artifactid>
        <version>${assertj.version}</version>
        <scope>test</scope>
    </dependency>
</dependencies>
```

Not that easy to apply in practice

... but internal dependencies can be shaded*

This and other architectural decisions can be enforced

arch-unit

```
import static com.tngtech.archunit.lang.syntax.ArchRuleDefinition.classes;

 @Test
 void shouldHaveZeroDependencies() {
     classes()
       .that().resideInAPackage("com.pivovarit.collectors")
       .should()
       .onlyDependOnClassesThat()
       .resideInAnyPackage("com.pivovarit.collectors", "java..")
       .as("the library should depend only on core Java classes")
       .because("so that users don't experience dependency hell")
       .check(classes);
 }

@Test
void shouldHaveSinglePackage() {
    classes()
      .should().resideInAPackage("com.pivovarit.collectors")
      .check(classes);
}
```

source

Another leaky abstraction: ORM

JPA/Hibernate

Often seen: domain full of framework-specific annotations

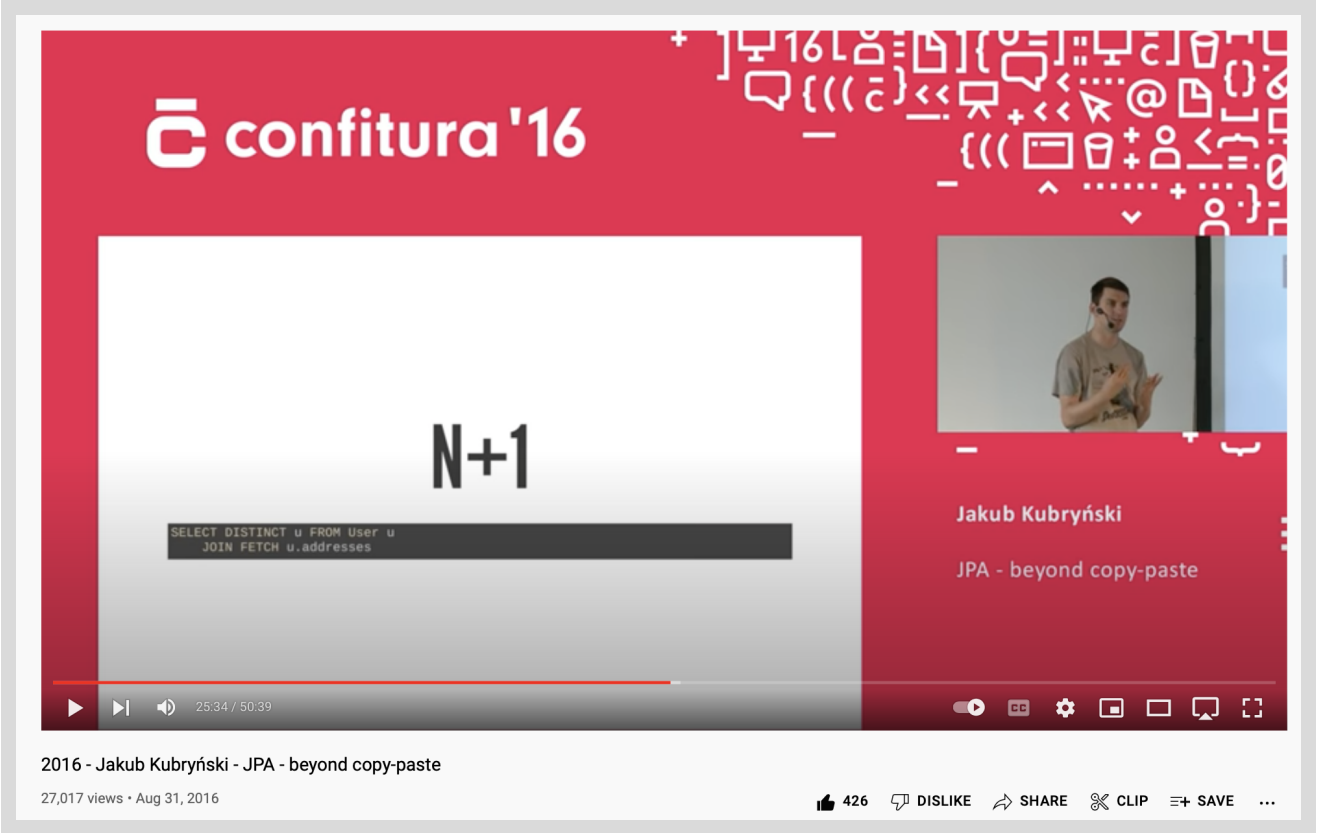
```
package com.pivovarit.domain;

import javax.persistence.Column;
import javax.persistence.Entity;

@Entity
public class User {

    private Long id;

    @Column
    private String name;
}
```

Not really a problem as long as the model is simple and graspable

```
@OneToMany(@HowManyDBADoYouNeedToChangeALightBulb)
@OneToManyMore @AnyOne @AnyBody
@YouDoNotTalkAboutOneToMany // Fightclub, LOL
@TweakThisWithThat(
    tweak = {
        @TweakID(name = "id", preferredValue = 1839),
        @TweakID(name = "test", preferredValue = 839),
        @TweakID(name = "test.old", preferredValue = 34),
    },
    inCaseOf = {
        @ConditionalXMLFiltering(run = 5),
    }
)
@ManyToMany @Many @AnnotationsTotallyRock @DeclarativeProgrammingRules @NoMoreExplicitAlgorithm
@Fetch @FetchMany @FetchWithDiscriminator(name = "no_name")
@SeveralAndThenNothing @MaybeThisDoesSomething
@JoinTable(joinColumns = {
    @JoinColumn(name = "customer_id", referencedColumnName = "id")
})
@DoesThisEvenMeanAnything @DoesAnyoneEvenReadThis
@PrefetchJoinWithDiscriminator @JustTrollingYouKnow @LOL
@IfJoiningAvoidHashJoins @ButUseHashJoinsWhenMoreThan(records = 1000)
@XmlDataTransformable @SpringPrefechAdapter
private Collection employees;
```

source: http://www.annotatiomania.com

JPA Beyond Copy-Paste



https://youtu.be/UPWkpl5PL_w

SQL is complete and self-sufficient, too bad that not type-safe...

```
String sql = create
  .select(BOOK.TITLE, AUTHOR.FIRST_NAME, AUTHOR.LAST_NAME)
  .from(BOOK)
  .join(AUTHOR).on(BOOK.AUTHOR_ID.eq(AUTHOR.ID))
  .where(BOOK.PUBLISHED_IN.eq(1948))
  .getSQL();
```

https://www.jooq.org

Kotlin Exposed

```
fun findLastRentalId(customerId: CustomerId): RentalId? =
  RentalTable
    .select { RentalTable.customerId eq customerId.value }
    .orderBy(RentalTable.startDate, true)
    .map { RentalId(it[RentalTable.id]) }
    .firstOrNull()
```

https://github.com/JetBrains/Exposed

JdbcTemplate

```
@Override
public Collection<Movie> findAll() {
    return jdbcTemplate.query("SELECT * FROM movie",
      JdbcTemplateMovieRepository::mapper);
}
```

```
private static Movie mapper(ResultSet resultSet, int i)
  throws SQLException {
    return new Movie(new MovieId(
      resultSet.getLong("id")),
      resultSet.getString("title"),
      MovieType.valueOf(resultSet.getString("type")));
}
```

But frameworks don't need to be that invasive as well, if you don't let them be.

Let's look again

```
package com.pivovarit.domain;

import javax.persistence.Column;
import javax.persistence.Entity;

@Entity
public class User {

    private Long id;

    @Column
    private String name;
}
```

ORM as plugin

```
package com.pivovarit.domain;

public class User {
    private final Long id;
    private final String name;
}
```

```
package com.pivovarit.persistence;

import javax.persistence.Column;
import javax.persistence.Entity;

@Entity
public class PersistedUser {

    private Long id;

    @Column
    private String name;
}
```

Spring

```
import org.springframework.*;

@Component
public class FooFacade {

    @Autowired
    private FooService fooService;

    @PostConstruct
    public void foo() {
        fooService.foo();
    }
}
```

```
public static void main(String[] args) {
    // ???
}
```

- - Tight coupling with the DI framework
- - Forces weak encapsulation
- - Forces mutability

```java
import org.springframework.*;

@Component
public class FooFacade {

    private final FooService fooService;

    @Autowired
    public FooFacade(FooService fooService) {
        this.fooService = fooService;
    }

    @PostConstruct
    public void foo() {
        fooService.foo();
    }
}
```

```java
public static void main(String[] args) {
    FooFacade fooFacade = new FooFacade(new FooService());
    fooFacade.foo();
}
```

- - Tight coupling with the DI framework
- + Can be instantiated independently
- + Internals can be encapsulated

```java
import org.springframework.*;

@Component
public class FooFacade {

    private final FooService fooService;

    // @Autowired
    public FooFacade(FooService fooService) {
        this.fooService = fooService;
    }

    @PostConstruct
    public void foo() {
        fooService.foo();
    }
}
```

```java
public static void main(String[] args) {
    FooFacade fooFacade = new FooFacade(new FooService());
    fooFacade.foo();
}
```

- - Tight coupling with the DI framework
- + Can be instantiated independently
- + Internals can be encapsulated

```
public class FooFacade {

    private final FooService fooService;

    public FooFacade(FooService fooService) {
        this.fooService = fooService;
        foo();
    }

    void foo() {
        fooService.foo();
    }
}
```

```
public static void main(String[] args) {
    FooFacade fooFacade = new FooFacade(new FooService());
}
```

- ...but where's the config?

```java
import org.springframework.context.annotation.Bean;
import org.springframework.context.annotation.Configuration;

@Configuration
public class FooConfiguration {

    @Bean
    FooService fooService() {
        return new FooService();
    }

    @Bean
    FooFacade fooFacade(FooService fooService) {
        return new FooFacade(fooService);
    }
}
```

- Domain code free of framework configuration

```
import org.springframework.context.annotation.Bean;
import org.springframework.context.annotation.Configuration;

@Configuration
public class FooConfiguration {

    @Bean
    FooFacade fooFacade() {
        return new FooFacade(new FooService());
    }
}
```

- Domain code free of framework configuration

```java
import org.springframework.beans.factory.annotation.Autowired;
import org.springframework.stereotype.Component;

@Component
public class FooFacade {

    @Autowired
    private FooService fooService;

    public void foo() {
        fooService.foo();
    }
}
```

Same framework - both invasive and non-invasive

```java
public class FooFacade {

    private final FooService fooService;

    public FooFacade(FooService fooService) {
        this.fooService = fooService;
    }
}
```

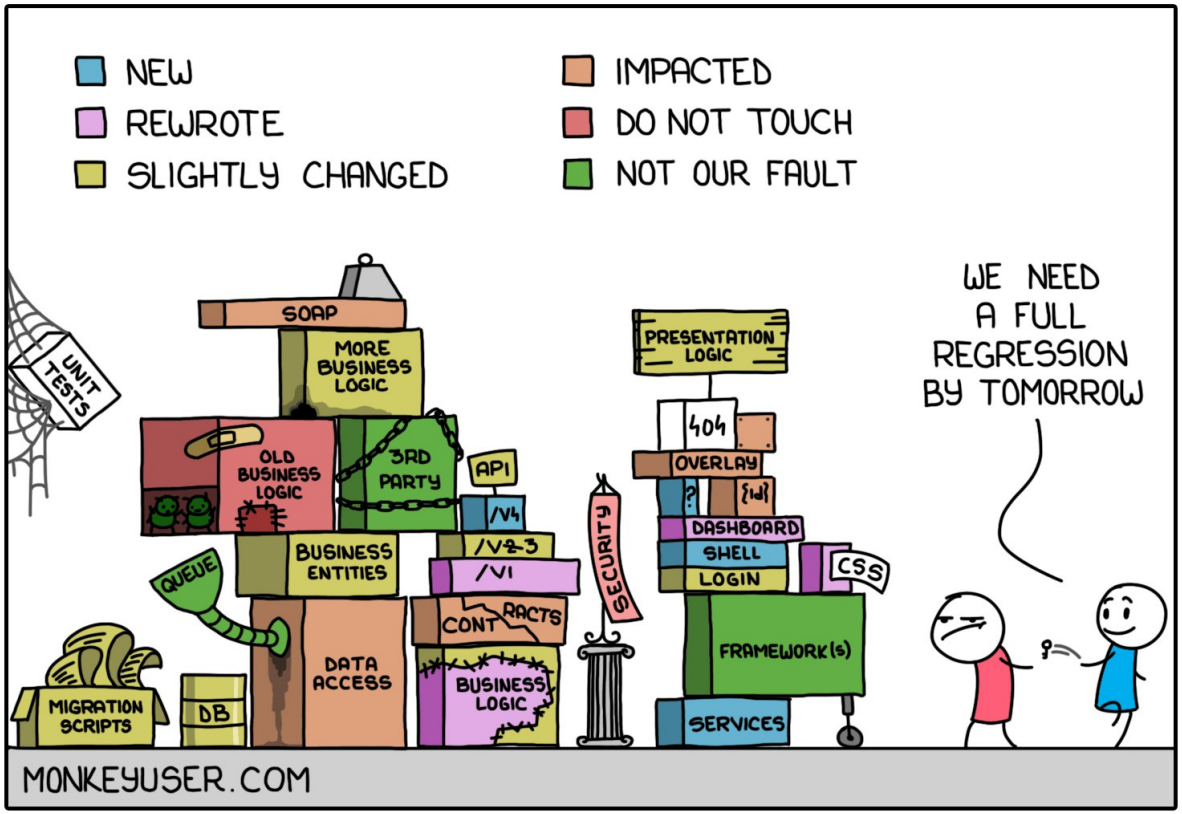
```java
import org.springframework.context.annotation.Bean;
import org.springframework.context.annotation.Configuration;

@Configuration
public class FooConfiguration {

     @Bean
     FooFacade fooFacade() {
         return new FooFacade(new FooService());
     }
}
```

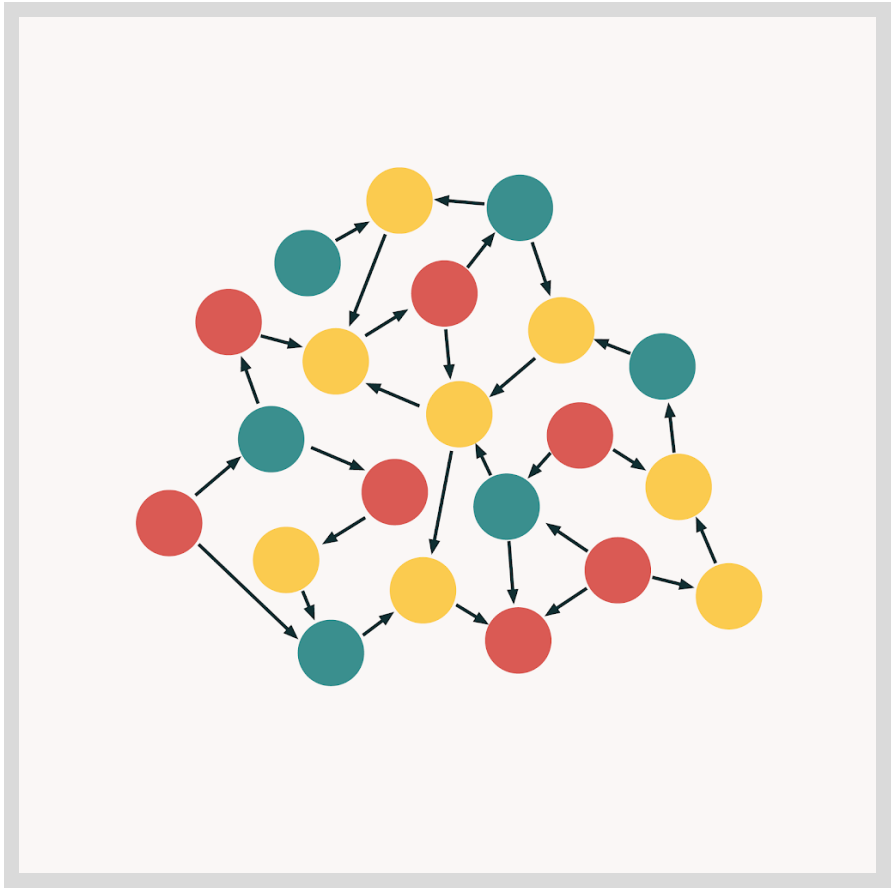
Composition/Delegation is your friend

```
public interface UserSessionRepository {
    // ...
}
```

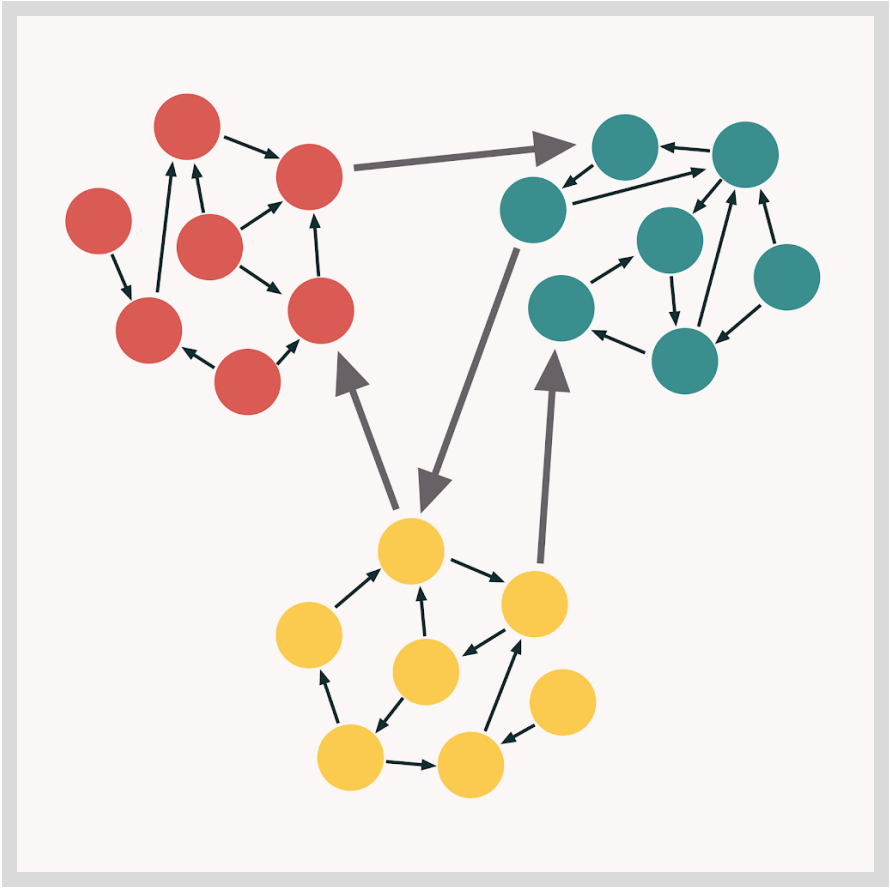
```
public class CachingUserSessionRepository
  implements UserSessionRepository {

    private final UserSessionRepository;
    // ...
}
```

MINOR CHANGE



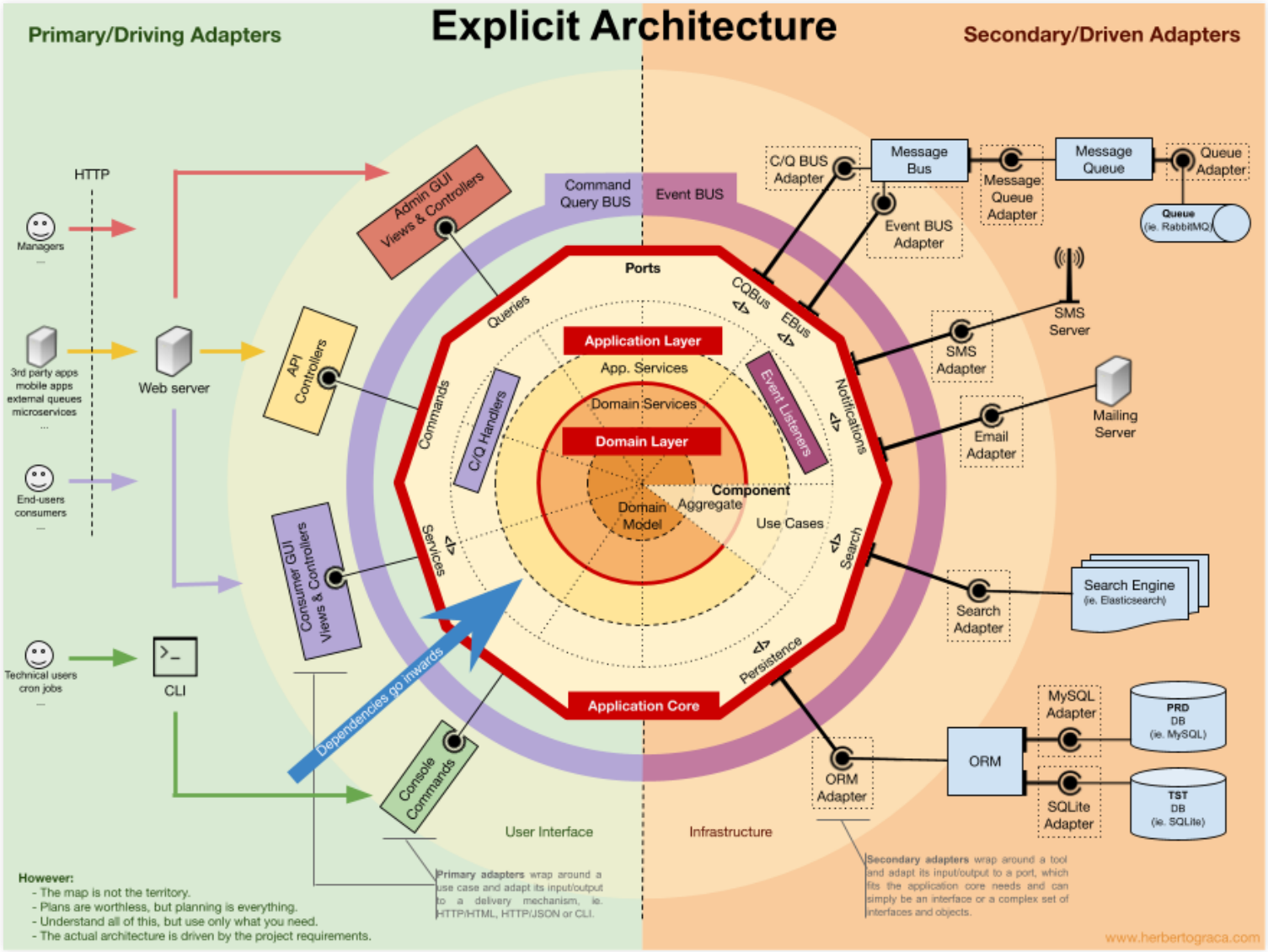


source: https://enterprisecraftsmanship.com/posts/cohesion-coupling-difference/



source: https://enterprisecraftsmanship.com/posts/cohesion-coupling-difference/

Hexagonal/Clean Architecture



Pragmatic Hexagonal/Clean Architecture

TL;DR use interfaces!

```
class UserService {

    private final UserRepository userRepository;

    private final AccountRepository accountRepository;

    public UserService(
      UserRepository userRepository,
      AccountRepository accountRepository) {
        this.userRepository = userRepository;
        this.accountRepository = accountRepository;
    }

    // ...
    interface UserRepository {
        List<User> getAll();
    }

    interface AccountRepository {
        Optional<Account> findById(int id);
    }

}
```

```java
@RestController
public class UserController {

    private final UserService userService;

    public UserController(UserService userService) {
        this.userService = userService;
    }

    @GetMapping("/users/{id}")
    public Optional<UserResponse> findById(@PathVariable int id) {
        return userService.findById(id).map(UserConverter::toResponse);
    }
}
```

Real Life Example (Axon and Kafka)

Don’t do this at home

```
import org.axonframework.eventhandling.annotation.EventHandler;

public class SessionEventsHandler {

    //...

    @EventHandler
    public void handle(SessionStartedEvent event) {
        // ...
    }

    @EventHandler
    public void handle(SessionEndedEvent event) {
        // ...
    }
}
```

```java
@FunctionalInterface
public interface EventHandler {
    Map<String, EventRoute> getRoutingConfig();
}
```

```java
public class SessionEventsHandler implements EventHandler {

    // ...

    private void playerSessionStarted(SessionStartedEvent event) {
        // ...
    }

    private void playerSessionEnded(SessionEndedEvent event) {
        // ...
    }

    @Override
    public Map<String, EventRoute> getRoutingConfig() {
        return Map.ofEntries(
          route(
            SessionEndedEvent.ROUTING_KEY,
            SessionEndedEvent.class,
            this::playerSessionEnded),
          route(
            SessionStartedEvent.ROUTING_KEY,
            SessionStartedEvent.class,
            this::playerSessionStarted)
        );
    }
}
```

```
public class RabbitEventStreamListener implements MessageListener {

    // ...

    private final Map<String, EventRoute> eventRoutes;

    @Override
    public void onMessage(Message message) {
        var route = eventRoutes.get(message.getMessageProperties().getReceivedRoutingKey());
        if (null != route) {
            route.getEventHandler().accept(new DomainMessage(...);
        } else {
            log.warn("couldn't find a matching routing for routing key");
        }
    }
}
```

```java
@Configuration
@Profile("kafka-eventstream")
public class KafkaEventStreamConfiguration {

    @Bean
    public KafkaEventStreamListener kafkaEventStreamListener(
      List<EventHandler> handlers, ObjectMapper mapper) {

        var eventRoutes = handlers.stream()
          .flatMap(h -> h.getRoutingConfig().entrySet().stream())
          .collect(
            groupingBy(Map.Entry::getKey,
              mapping(Map.Entry::getValue, toUnmodifiableSet())));

        return new KafkaEventStreamListener(mapper, eventRoutes);
    }
}
```

```java
@Configuration
@Profile("rabbit-eventstream")
public class RabbitEventStreamConfiguration {

    @Bean
    public Collection<MessageListenerContainer> rabbitEventStreamListener(
      @Value("${rabbitmq.axon.exchange}") String axonExchangeName,
      @Value("${rabbitmq.axon.queuePrefix}") String axonQueuePrefix,
      AmqpAdmin amqpAdmin,
      RabbitListenerContainerFactory eventstreamRabbitListenerContainerFactory,
      List<EventHandler> handlers,
      ConfigurableBeanFactory beanFactory,
      ObjectMapper mapper) {

        TopicExchange axonExchange = new TopicExchange(axonExchangeName);
        amqpAdmin.declareExchange(axonExchange);

        return handlers.stream()
          .map(handler -> buildRabbitListener(...))
          .collect(toUnmodifiableList());
    }

    private static MessageListenerContainer buildRabbitListener(
      EventHandler handler,
      ConfigurableBeanFactory beanFactory,
      ObjectMapper mapper,
      String queuePrefix,
      AmqpAdmin amqpAdmin,
      TopicExchange axonExchange,
      RabbitListenerContainerFactory eventstreamRabbitListenerContainerFactory) { ... }
}
```

Things to try

Unopinionated: Ratpack

Ratpack is a set of Java libraries for building scalable HTTP applications.

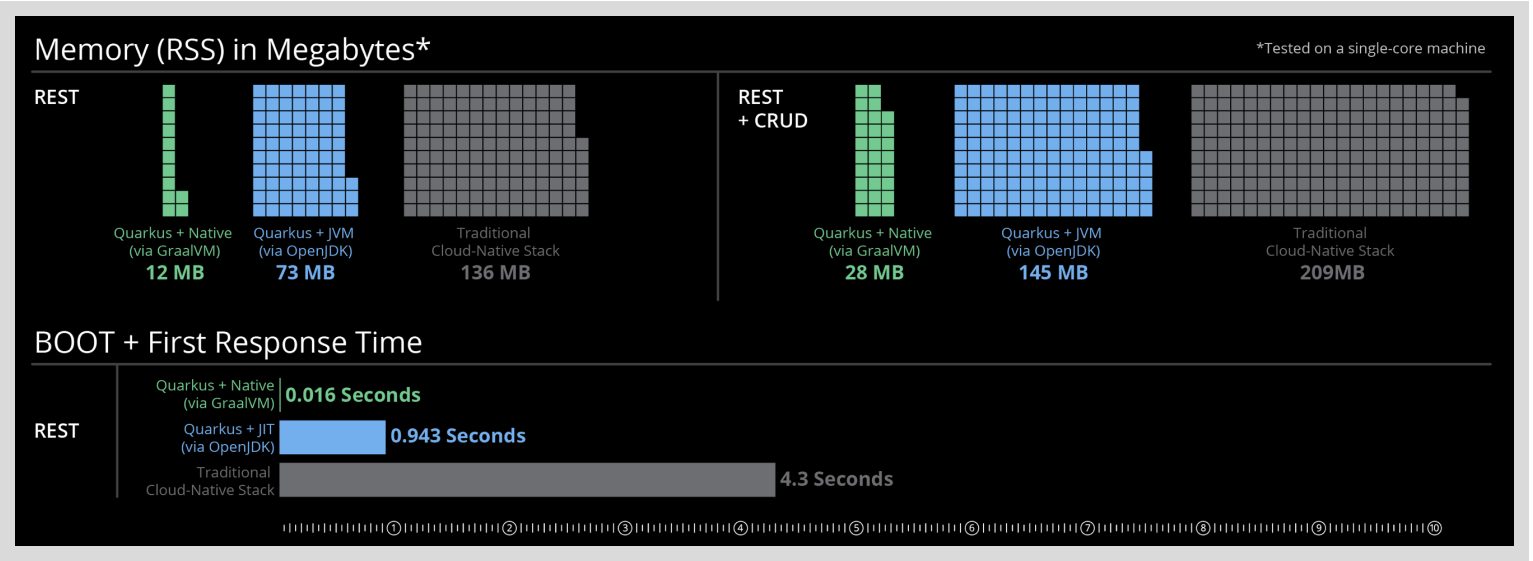
It is a lean and powerful foundation, not an all-encompassing framework.

https://ratpack.io https://www.youtube.com/watch?v=rqCHb9M3uiI

```
public class MyApp {

    public static void main(String[] args) throws Exception {
      RatpackServer.start(s -> s
          .serverConfig(c -> c.baseDir(BaseDir.find()))
          .registry(Guice.registry(b -> b.module(MyModule.class)))
          .handlers(chain -> chain
              .path("foo", ctx -> ctx.render("from the foo handler"))
              .path("bar", ctx -> ctx.render("from the bar handler"))
              .prefix("nested", nested -> {
                nested.path(":var1/:var2?", ctx -> {
                  Map<String, String> pathTokens = ctx.getPathTokens();
                  ctx.render(
                    "from the nested handler, var1: " + pathTokens.get("var1") +
                      ", var2: " + pathTokens.get("var2")
                  );
                });
              })
              .path("injected", MyHandler.class)
              .prefix("static", nested -> nested.fileSystem("assets/images", Chain::files))
              .all(ctx -> ctx.render("root handler!"))
          )
      );
    }
  }
```

Opinionated: Quarkus

$ ./my-native-java-rest-app
Quarkus started in 0.008s



- GraalVM Support
- Build-time Initialization
- Hot Reload

http://quarkus.io

Using common sense is the ultimate Best Practice™.

Thank You!

https://pivovarit.github.io/talks/assertive-spring

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