Engineering for Software

Amplifying Creativity

Dave Farley

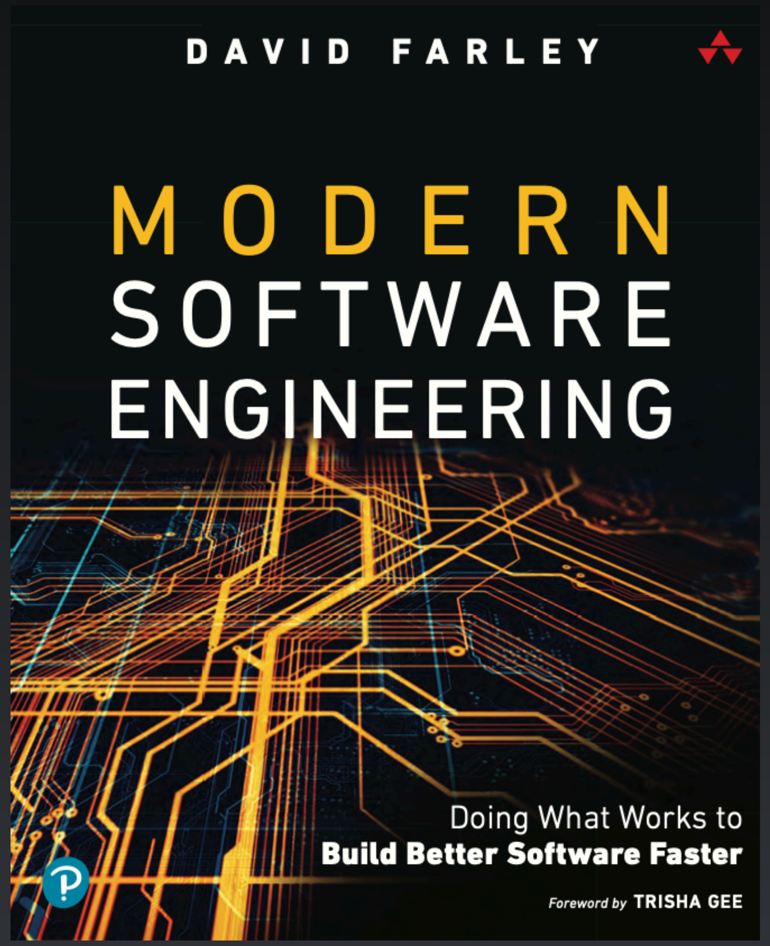
https://www.davefarley.net

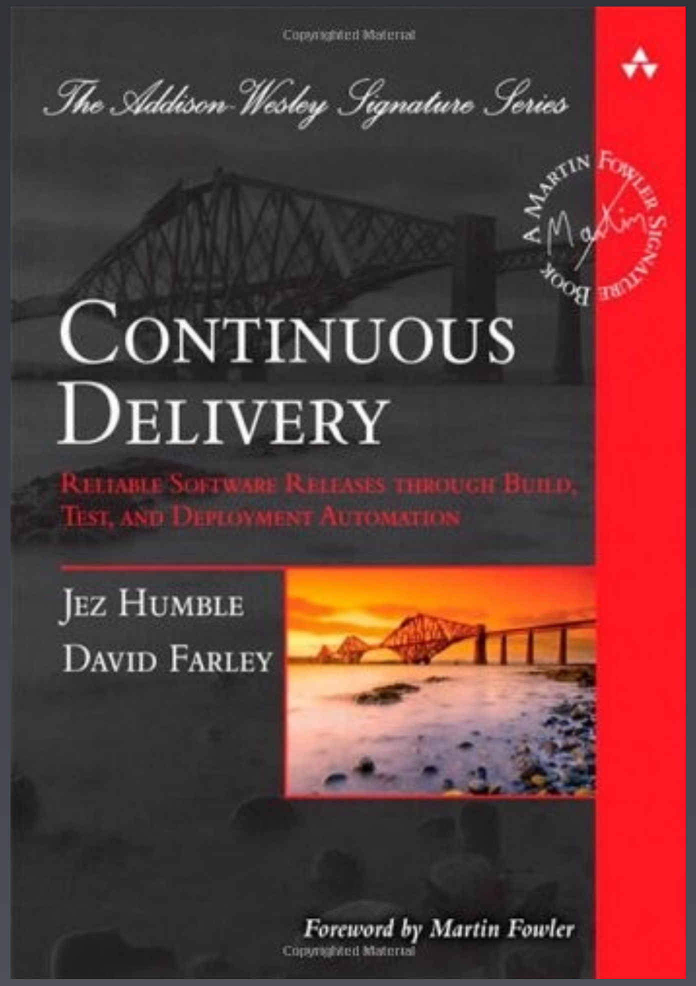
@davefarley77

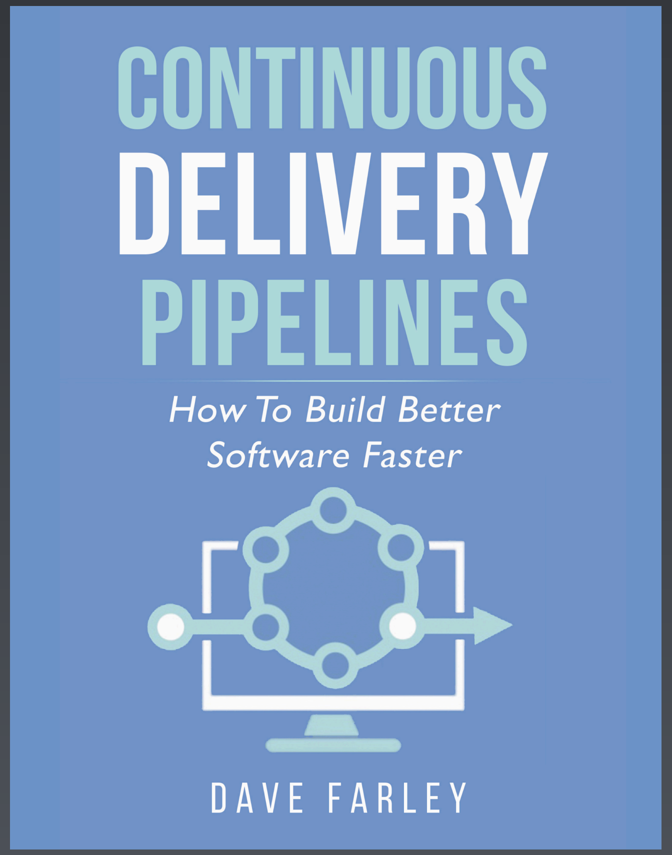
https://bit.ly/CDonYT

Continuous Delivery ltd

http://www.continuous-delivery.co.uk


DAVID FARLEY
MODERN SOFTWARE ENGINEERING
Doing What Works to Build Better Software Faster
Foreword by TRISHA GEE


The Addison-Wesley Signature Series
CONTINUOUS DELIVERY
Reliable Software Releases through Build, Test, and Deployment Automation
Jez Humble
David Farley
Foreword by Martin Fowler


CONTINUOUS DELIVERY PIPELINES
How To Build Better Software Faster
DAVE FARLEY

What Does "Software Engineering" Mean?

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“The Things We Can’t Afford to Get Wrong”

“The Things We Can’t Afford to Get Wrong”

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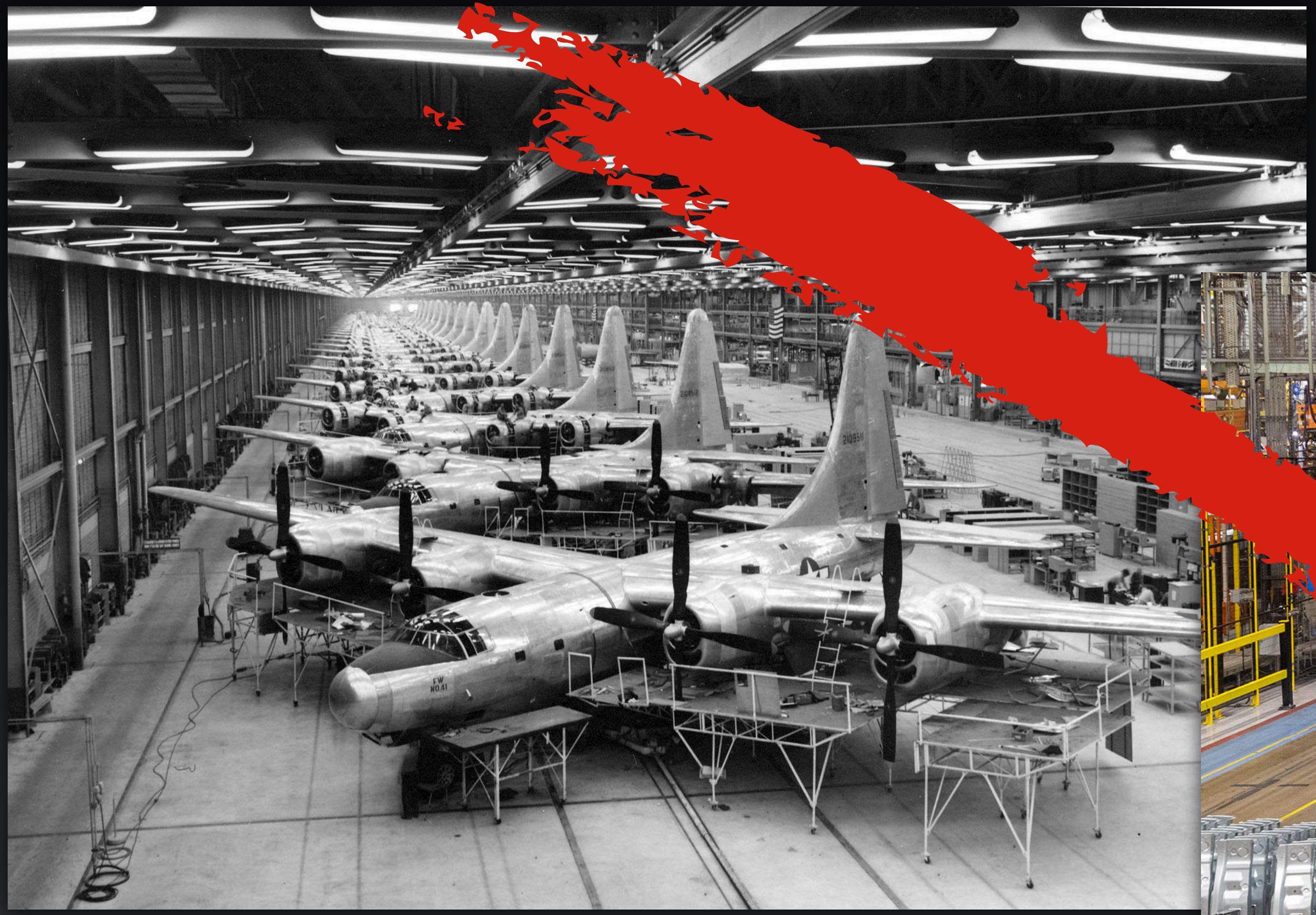
~~“The Things We Can’t Afford to Get Wrong”~~



This is NOT Our Problem!

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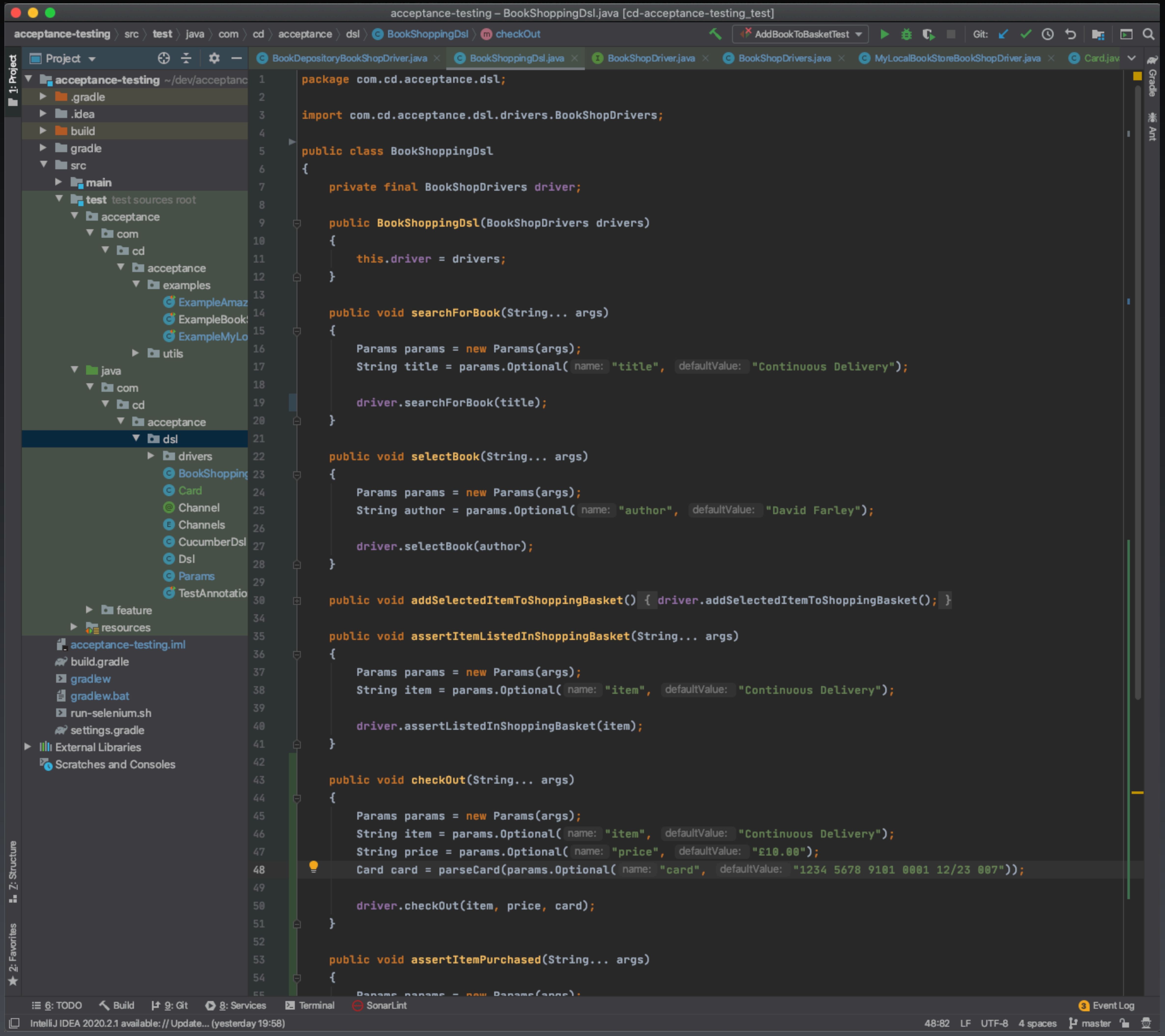

acceptance-testing – BookShoppingDsl.java [cd-acceptance-testing_test]

```java
package com.cd.acceptance.dsl;

import com.cd.acceptance.dsl.drivers.BookShopDrivers;

public class BookShoppingDsl
{
    private final BookShopDrivers driver;

    public BookShoppingDsl(BookShopDrivers drivers)
    {
        this.driver = drivers;
    }

    public void searchForBook(String... args)
    {
        Params params = new Params(args);
        String title = params.Optional( name: "title",  defaultValue: "Continuous Delivery");

        driver.searchForBook(title);
    }

    public void selectBook(String... args)
    {
        Params params = new Params(args);
        String author = params.Optional( name: "author",  defaultValue: "David Farley");

        driver.selectBook(author);
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    public void addSelectedItemToShoppingBasket() { driver.addSelectedItemToShoppingBasket(); }

    public void assertItemListedInShoppingBasket(String... args)
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        Params params = new Params(args);
        String item = params.Optional( name: "item",  defaultValue: "Continuous Delivery");

        driver.assertListedInShoppingBasket(item);
    }

    public void checkOut(String... args)
    {
        Params params = new Params(args);
        String item = params.Optional( name: "item",  defaultValue: "Continuous Delivery");
        String price = params.Optional( name: "price",  defaultValue: "£10.00");
        Card card = parseCard(params.Optional( name: "card",  defaultValue: "1234 5678 9101 0001 12/23 007"));

        driver.checkOut(item, price, card);
    }

    public void assertItemPurchased(String... args)
    {
        Params params = new Params(args);
```

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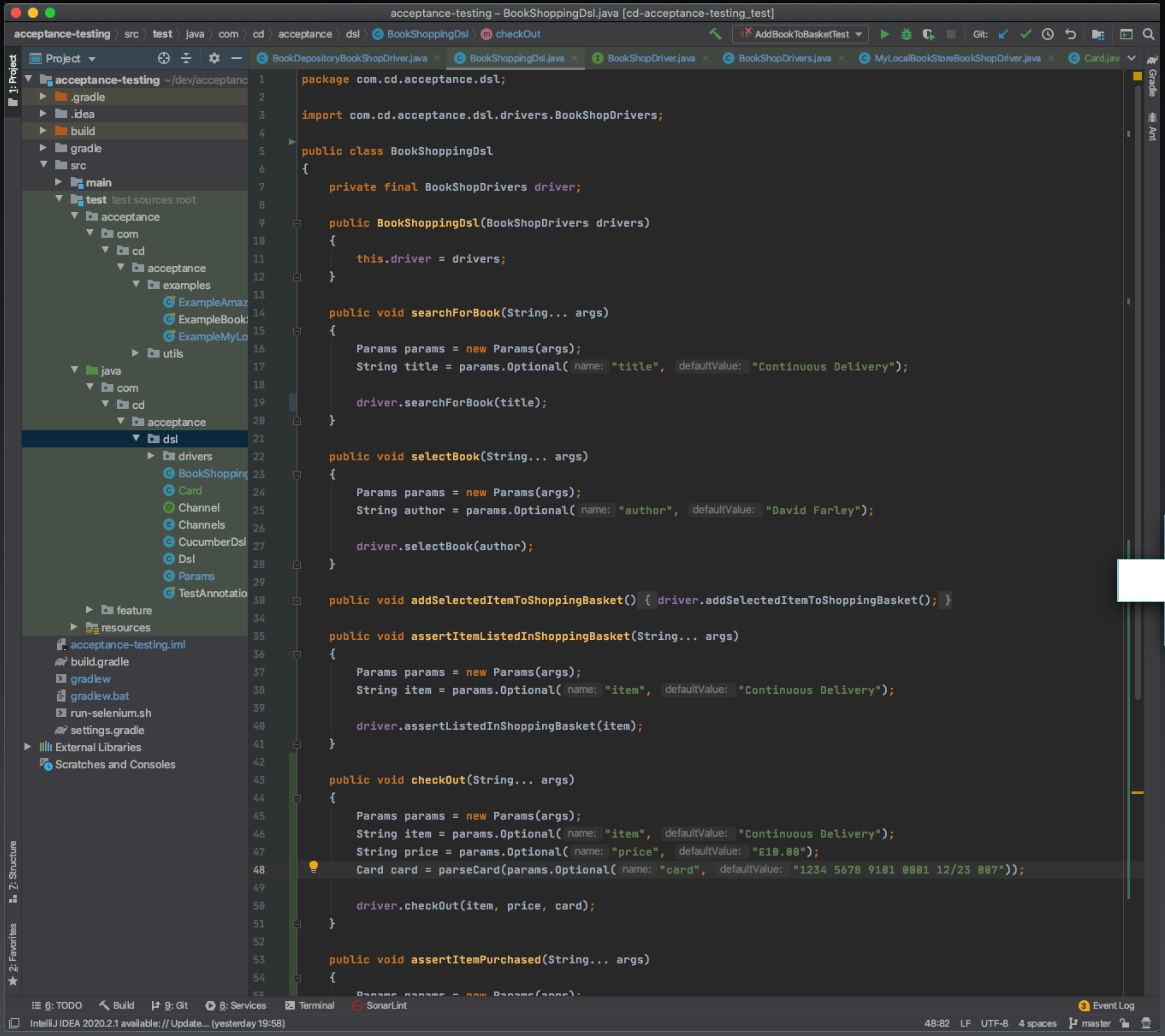

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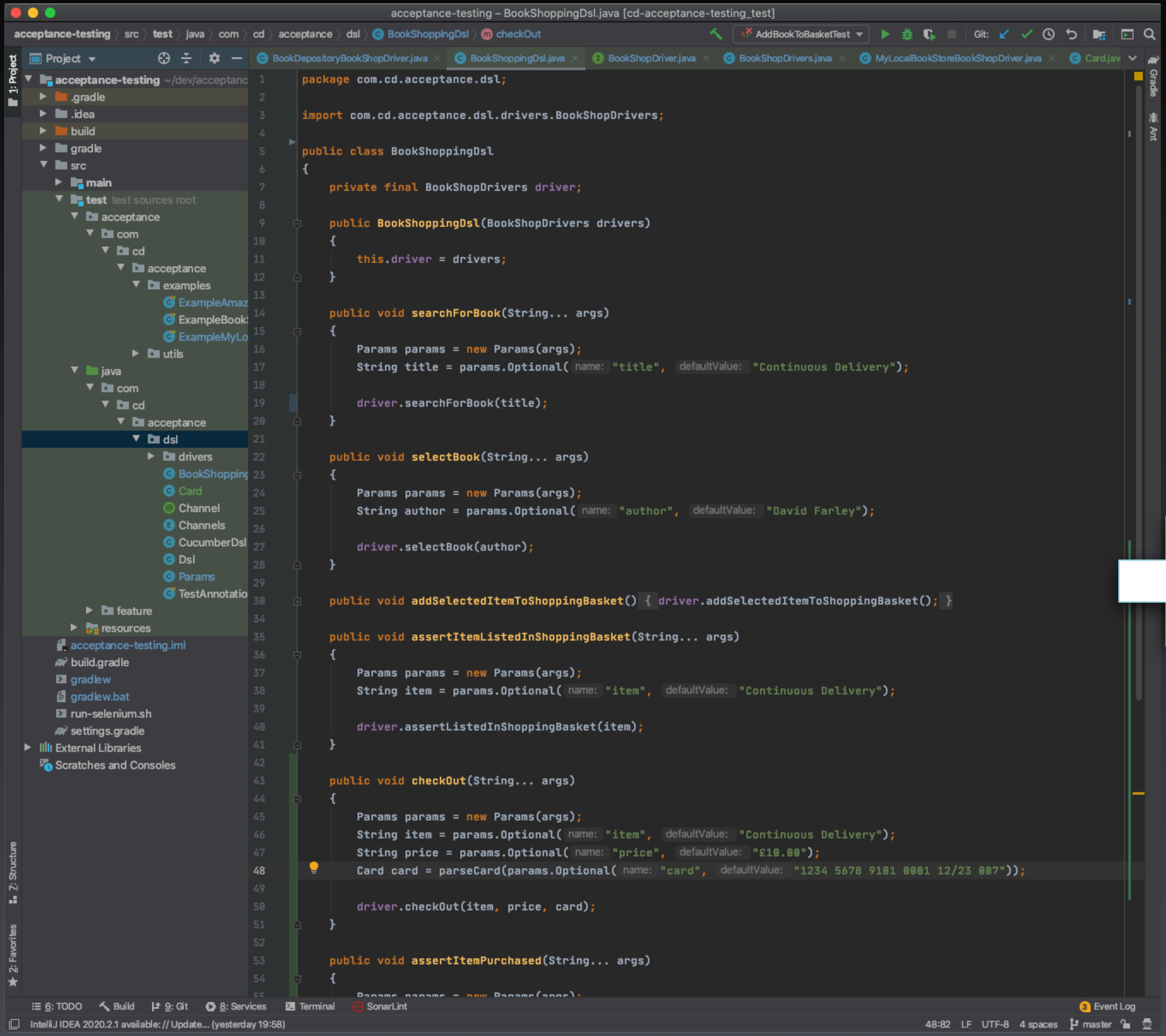
acceptance-testing – BookShoppingDsl.java [cd-acceptance-testing_test]
BookDepositoryBookShopDriver.java
BookShoppingDsl.java
BookShopDriver.java
BookShopDrivers.java
MyLocalBookStoreBookShopDriver.java
AddBookToBasketTest

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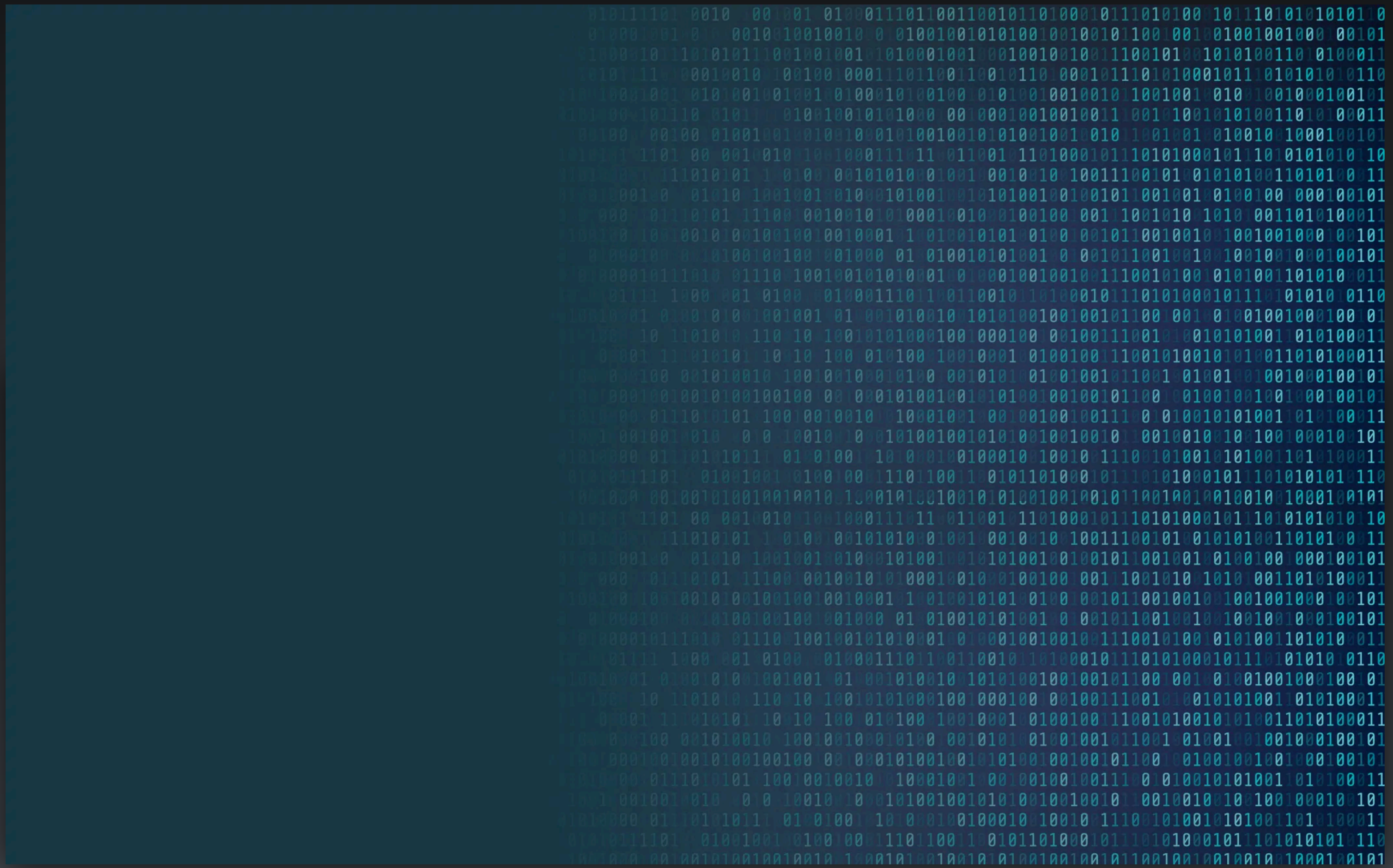

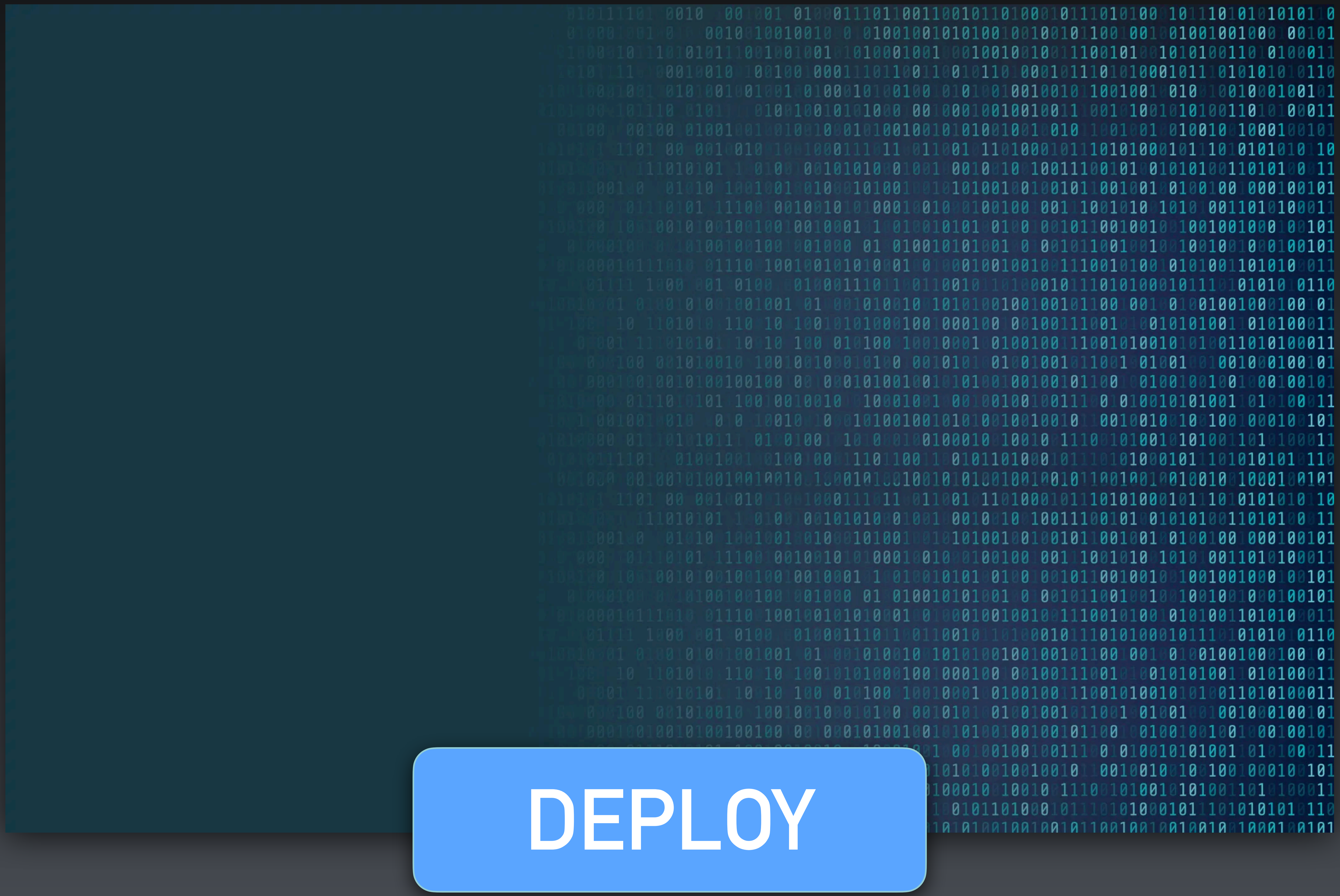
DEPLOY

We Can Recreate Entire Systems for Free!

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Engineering:

"Designing, Building & Repairing things in a Principled way"

Alan Kay

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Engineering: Design for Failure

Alan Kay

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All Engineering is not the same!

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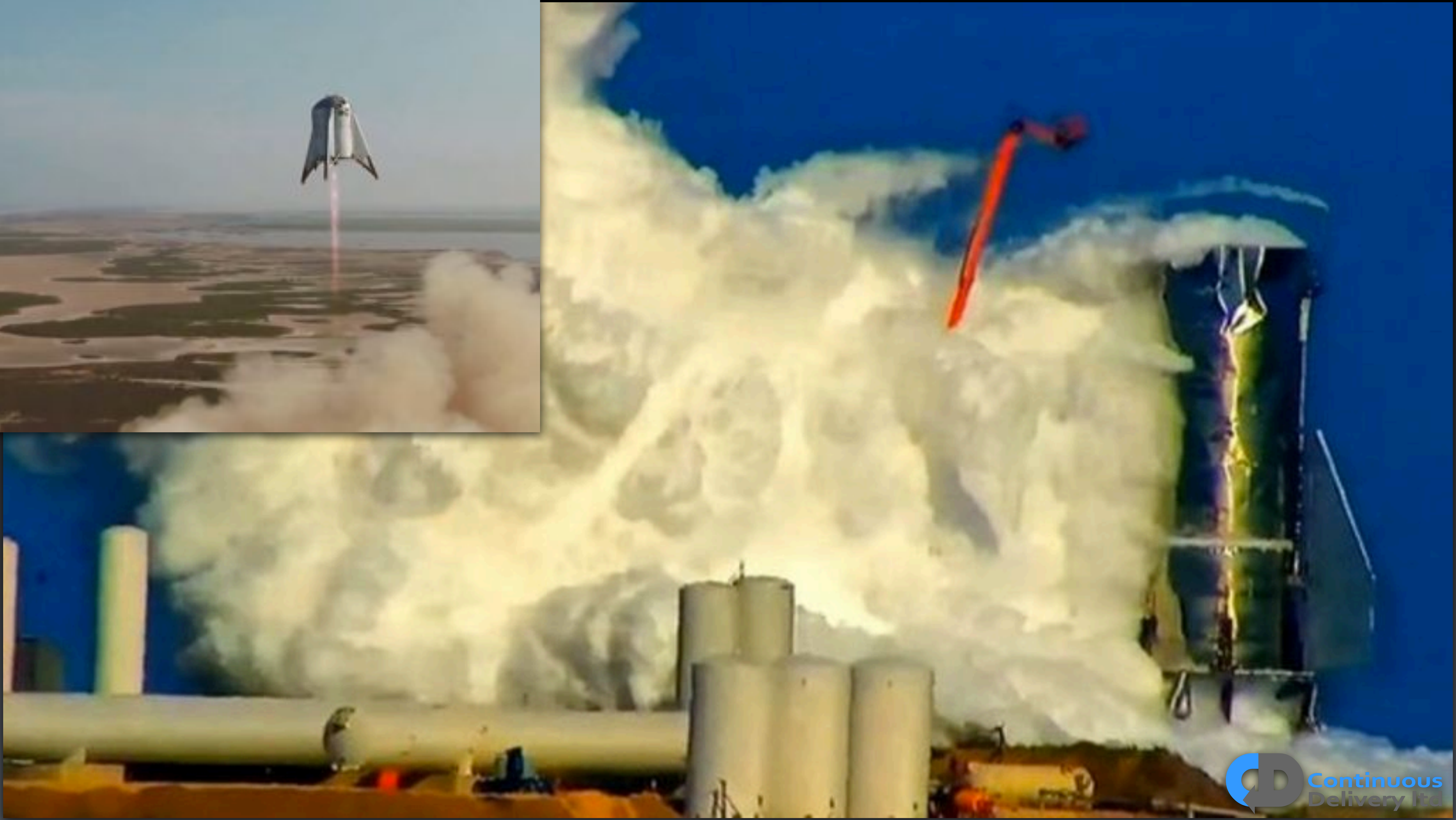

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Engineering *IS* About Exploration & Discovery

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Engineering *IS* About Exploration & Discovery

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Software Development *IS* About Exploration & Discovery

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Optimise for Learning

Continuous Delivery ltd

Optimise for Learning

Iteration

Continuous Delivery ltd

Optimise for Learning

Iteration

Feedback

Continuous Delivery ltd

Optimise for Learning

Iteration

Feedback

Incremental

Continuous Delivery ltd

Optimise for Learning

Iteration

Feedback

Incremental

Experimental

Continuous Delivery ltd

Optimise for Learning

Iteration

Feedback

Incremental

Experimental

Empirical

Software Development is also about Managing Complexity

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Optimise to Manage Complexity

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Optimise to Manage Complexity

Modularity

Optimise to Manage Complexity

Modularity

Abstraction

Optimise to Manage Complexity

Modularity

Abstraction

Separation of Concerns

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Optimise to Manage Complexity

Modularity
Abstraction
Separation of Concerns
Loose Coupling

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Optimise to Manage Complexity

Modularity

Abstraction

Separation of Concerns

Loose Coupling

Cohesion

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Principles of Applying Engineering Thinking

- Optimise for Learning
- Optimise to Manage/Limit Complexity
- Control the Variables
- Make Evidence Based Decisions
  (Run the Experiments)
- Never Assume You Have the Correct Answer
- Find Ways to Falsify Ideas Simply
  (More Experiments!)

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Testability

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What Do We Value In Good Code?

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What Do We Value In Good Code?

- It Has to Work!

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What Do We Value In Good Code?

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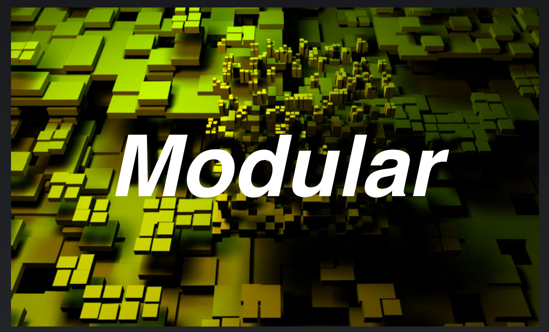
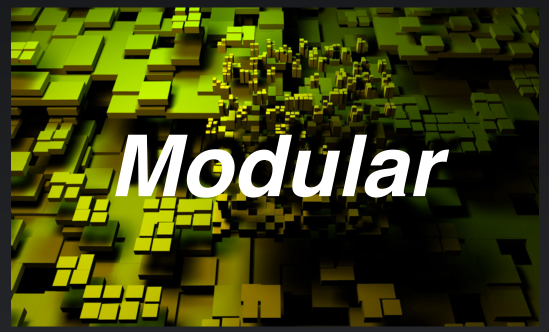
- Modular



What Do We Value In Good Code?

- It Has to Work!
- Modular
- Loosely-coupled



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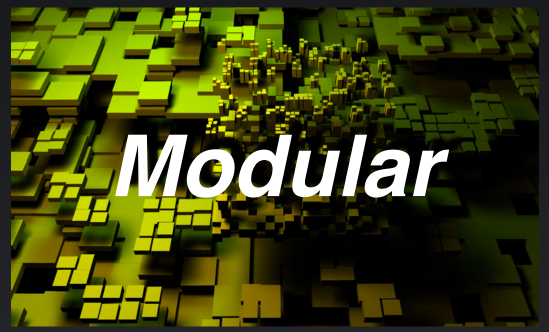
- High-Cohesion



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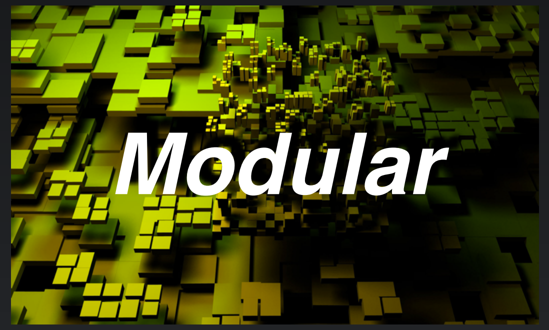

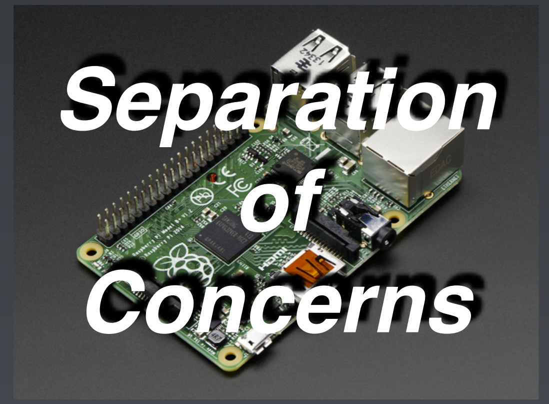

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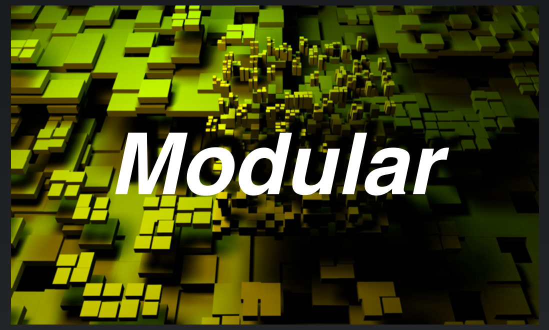

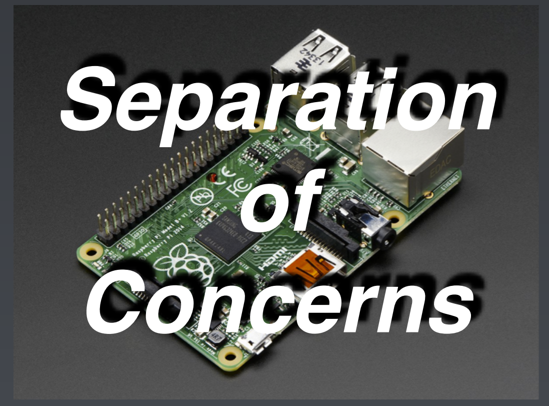

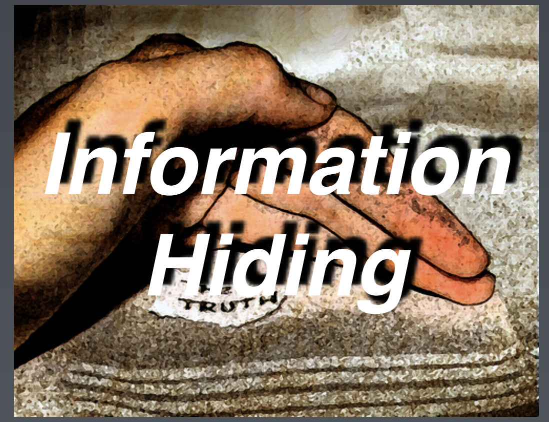

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What Drives Quality? - Before TDD

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The Skill, Experience and Integrity of an individual programmer.

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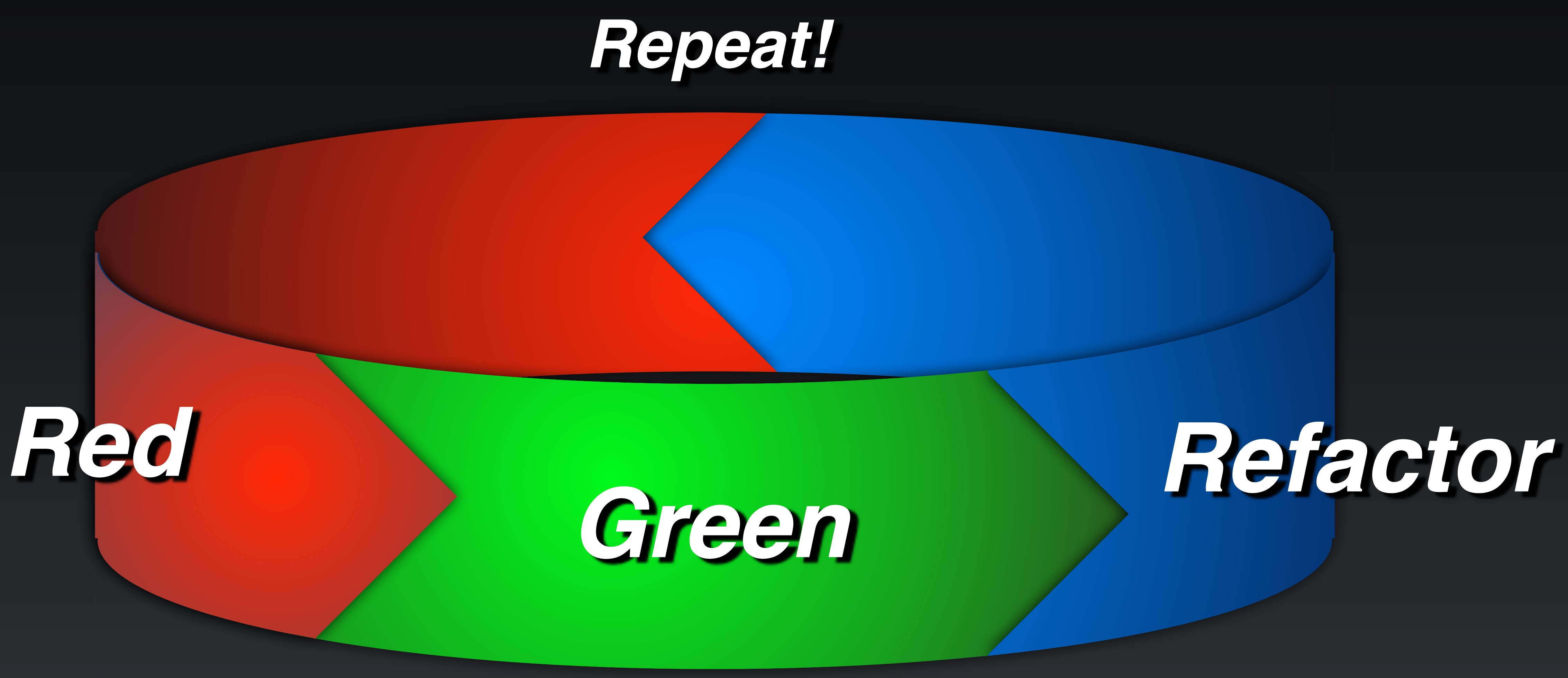
TDD is…

TDD is…



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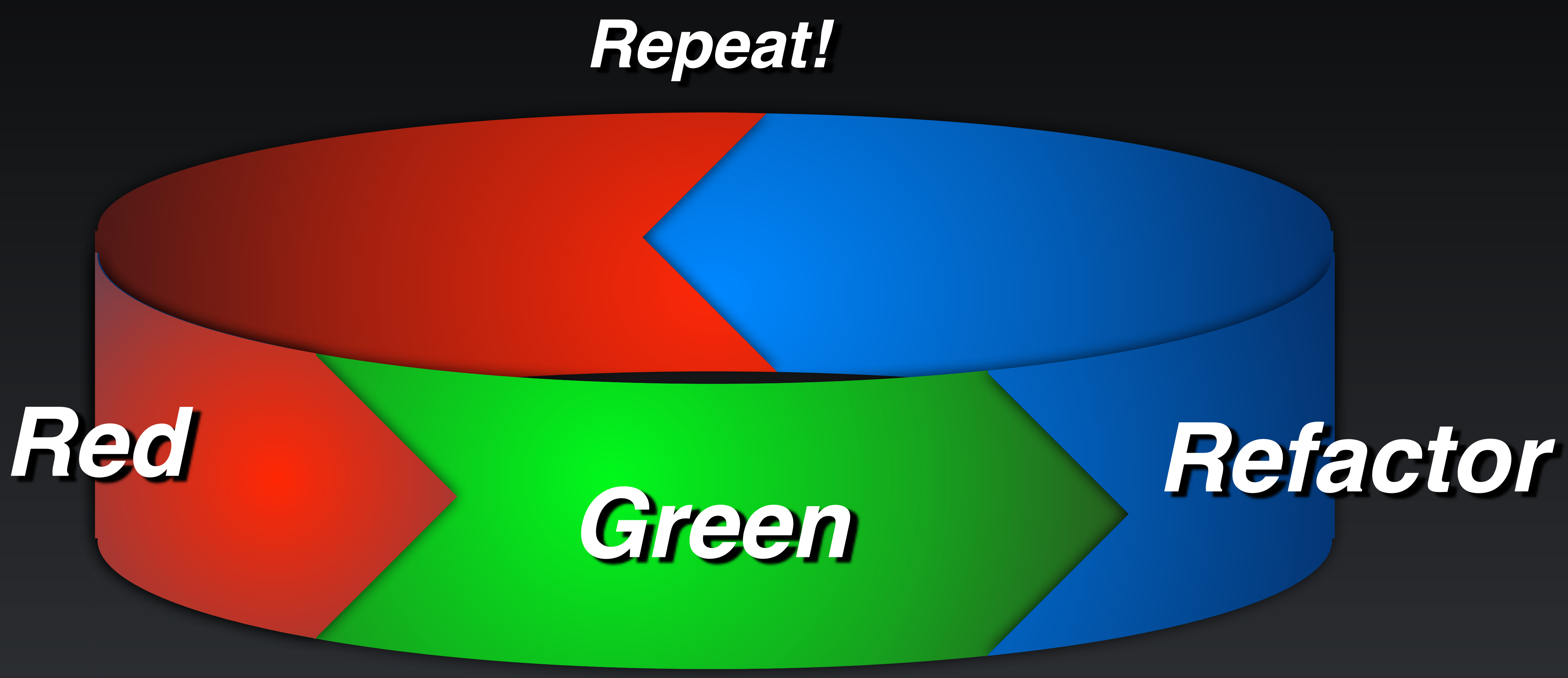

- Write a Test - See it Fail

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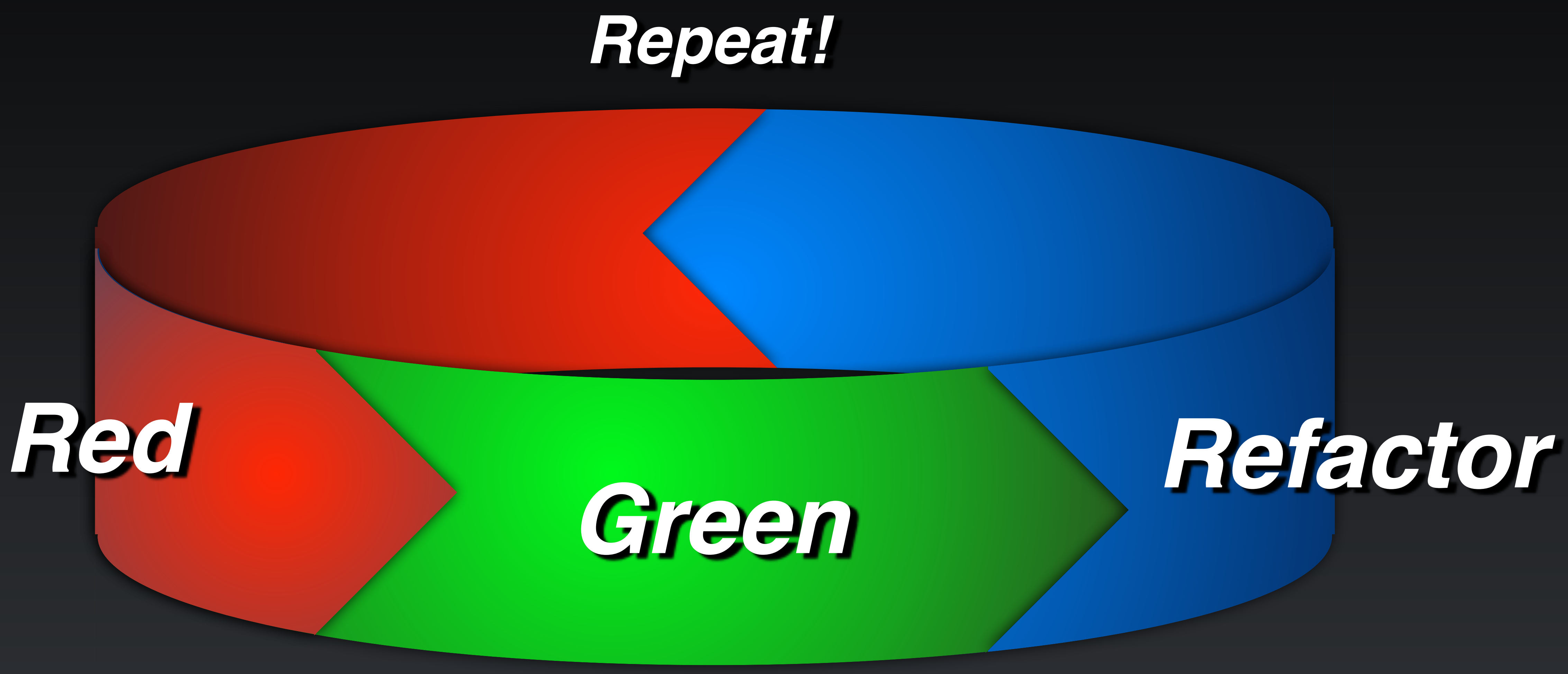

- Write a Test - See it Fail
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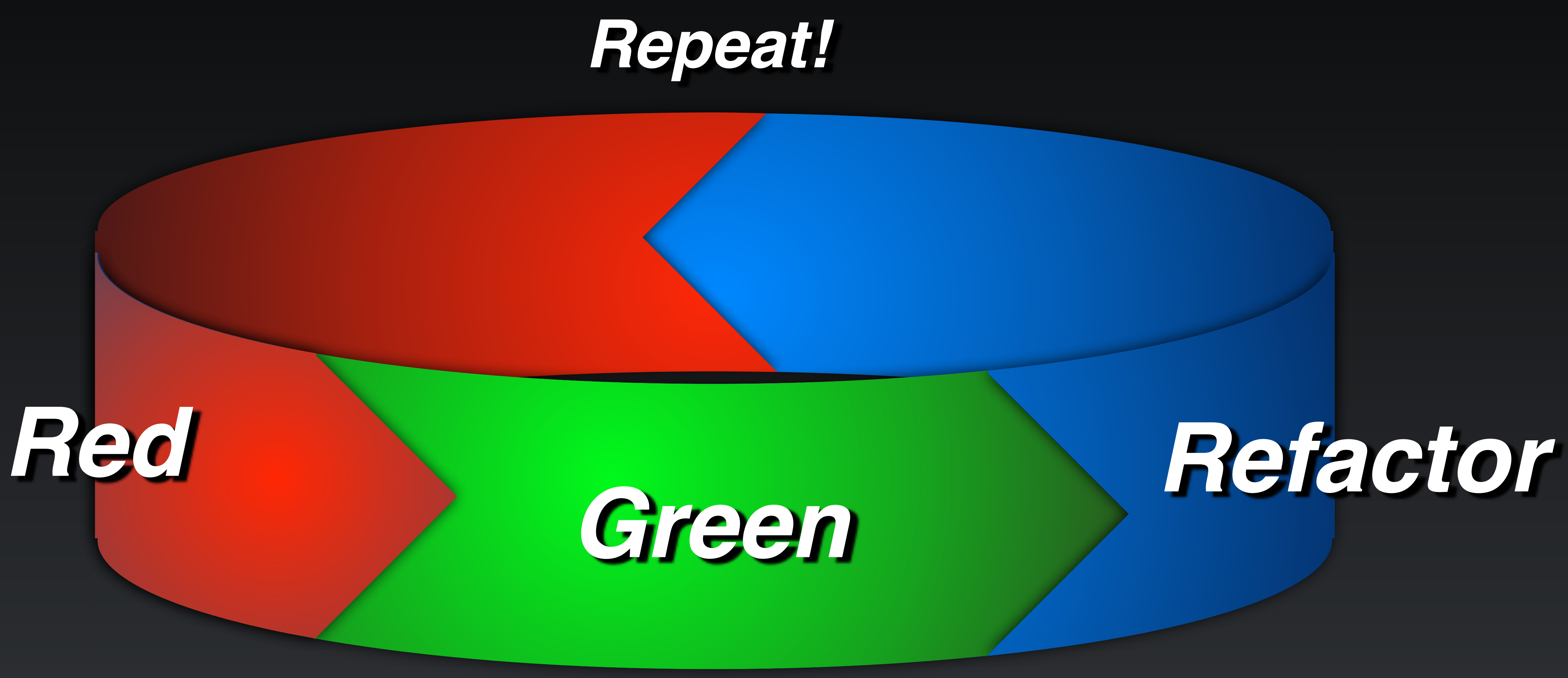
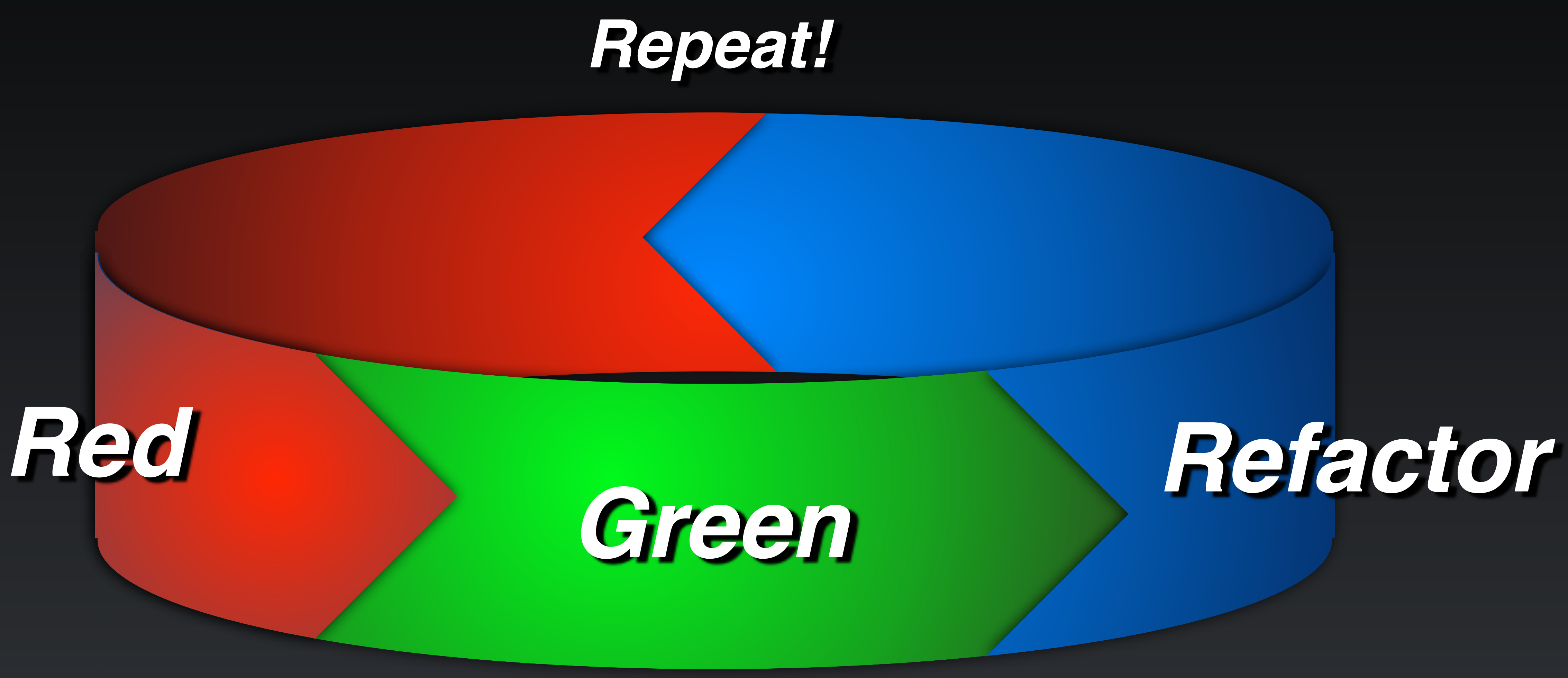
TDD is…



- Write a Test - See it Fail
- Write Code to Make the Test Pass - See it Pass
- Modify the Code to Make it Clean and Elegant

TDD is…



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- Next Test…

What Makes Code Testable?

What Makes Code Testable?

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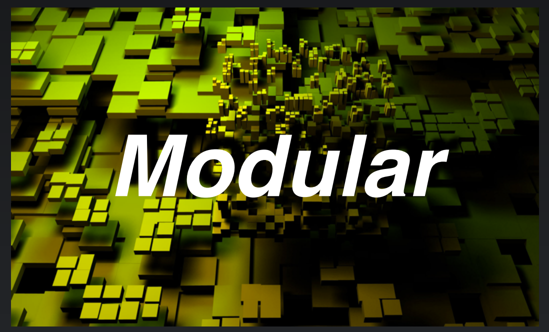

What Makes Code Testable?

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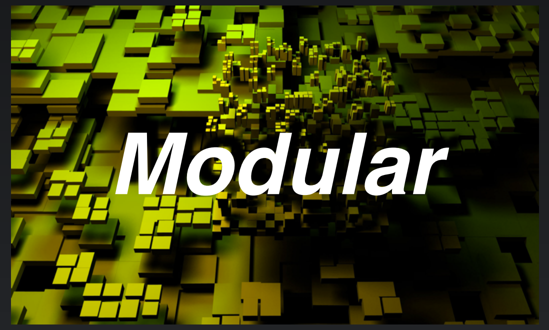

What Makes Code Testable?

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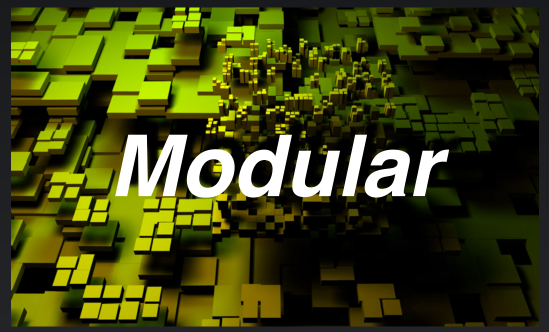

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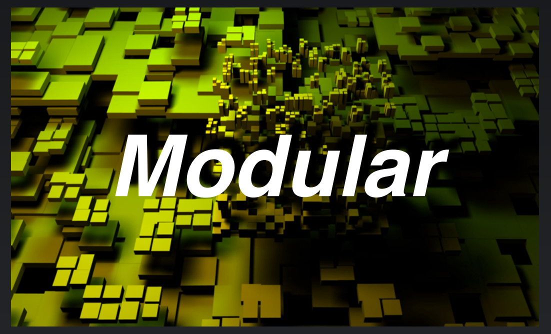

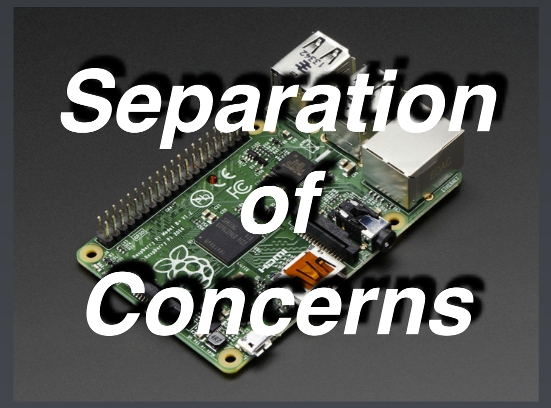

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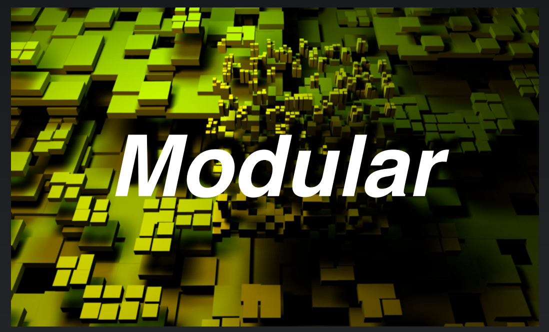

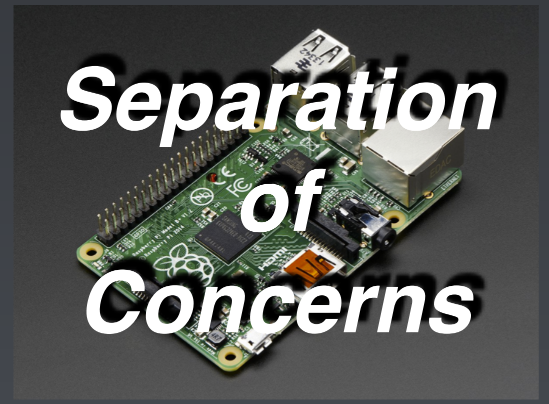

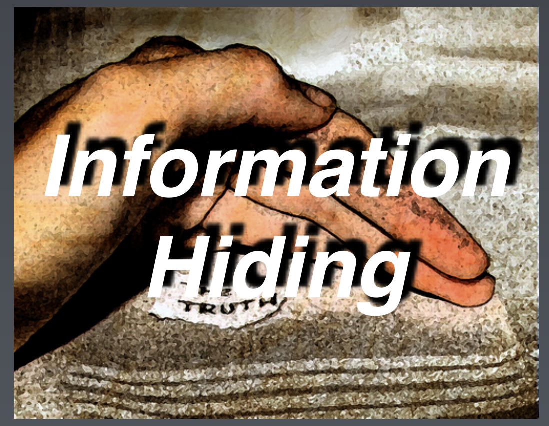

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What Drives Quality - Before TDD

The Skill, Experience and Integrity of an individual programmer.

What Drives Quality - Before TDD

Are You
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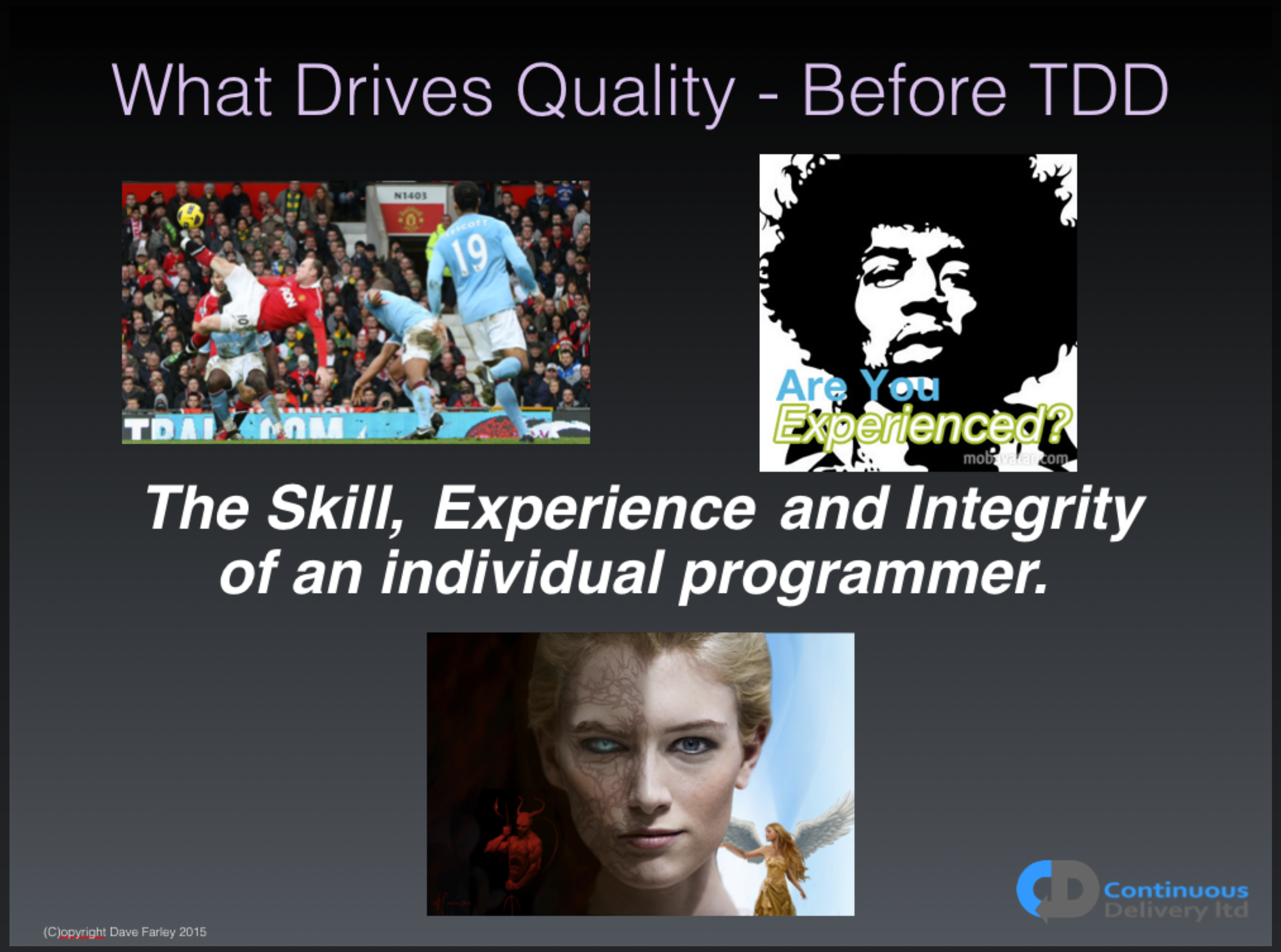

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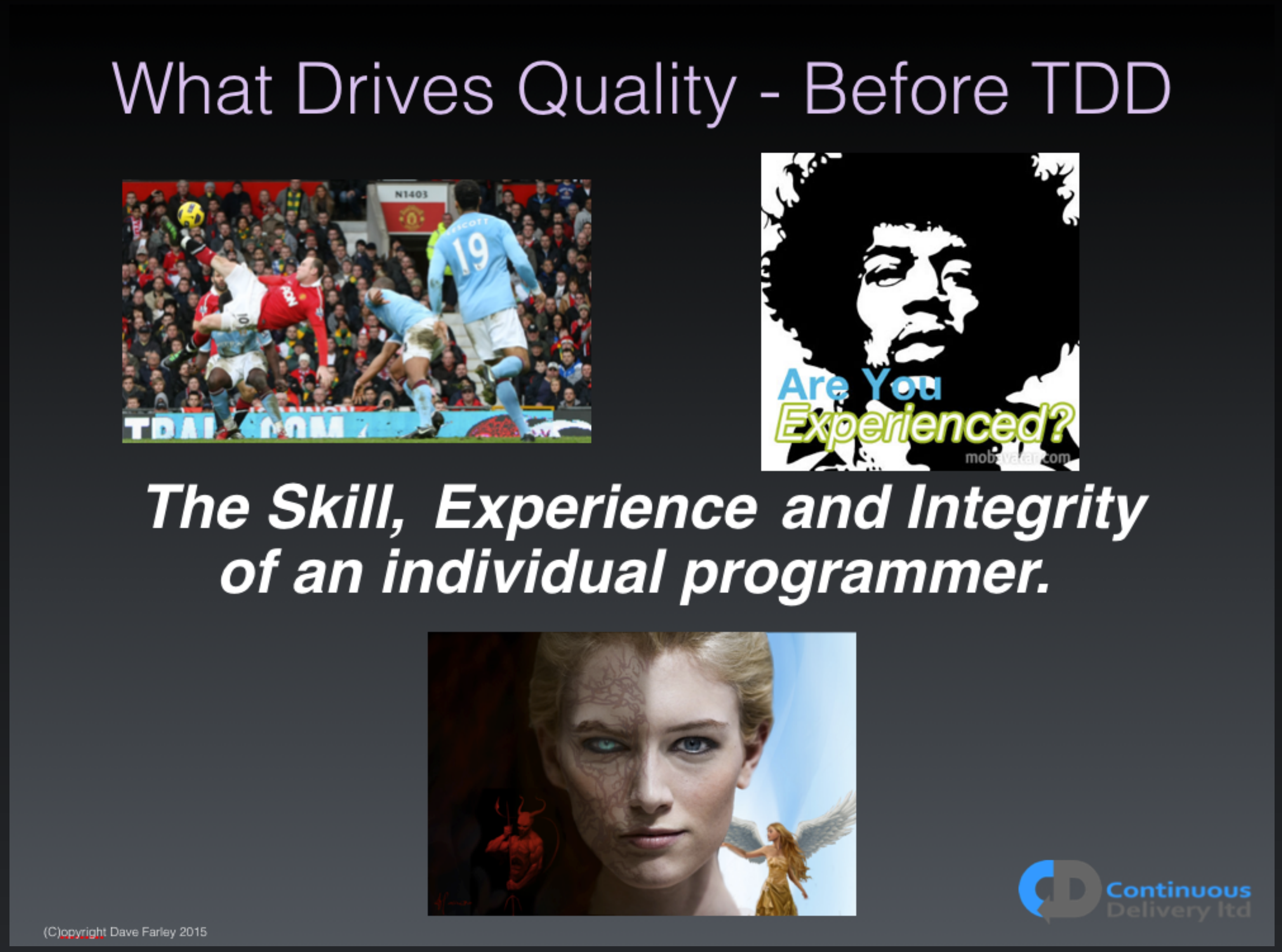

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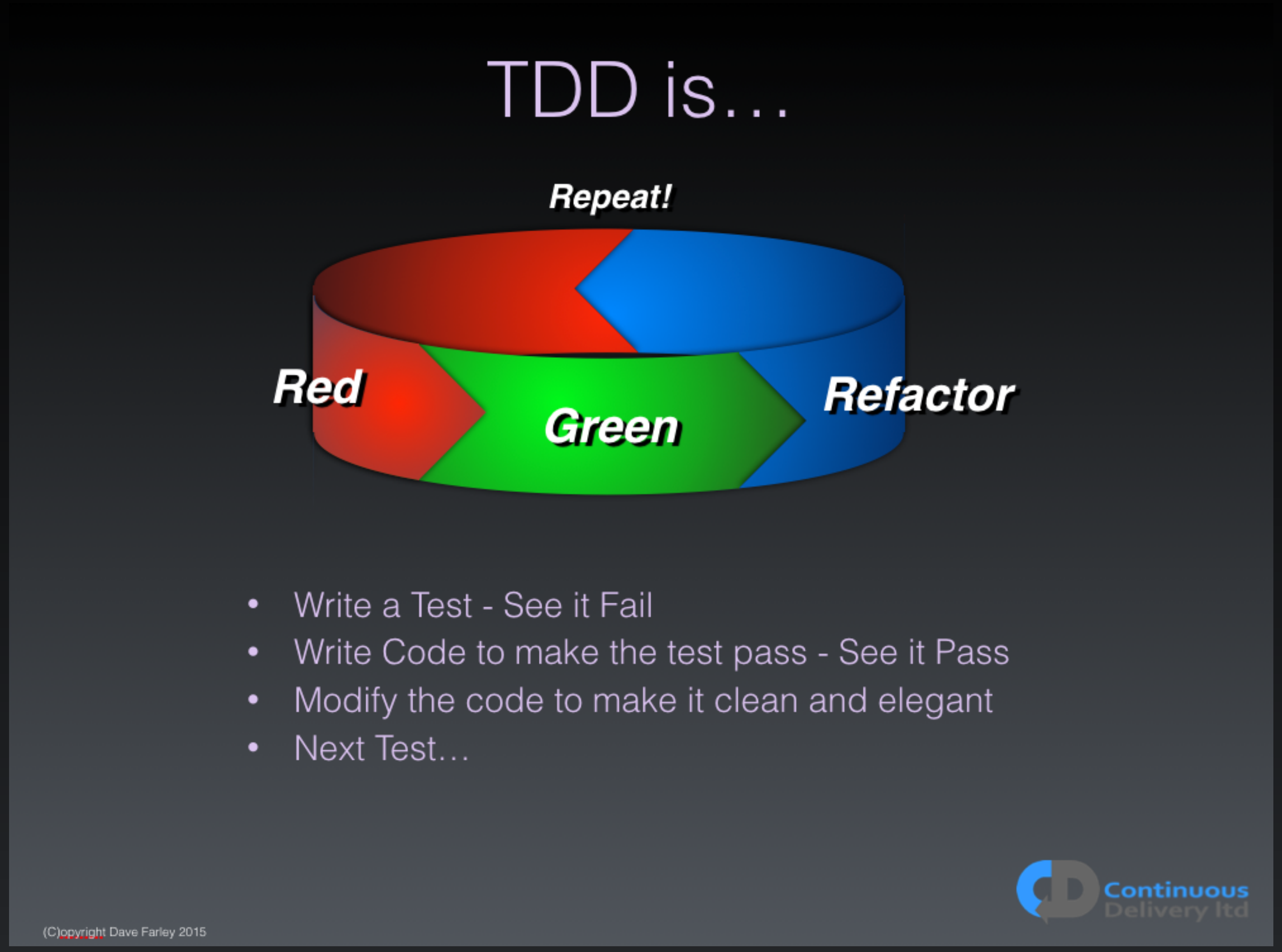

TDD is…

Repeat!
Red
Green
Refactor

- Write a Test - See it Fail
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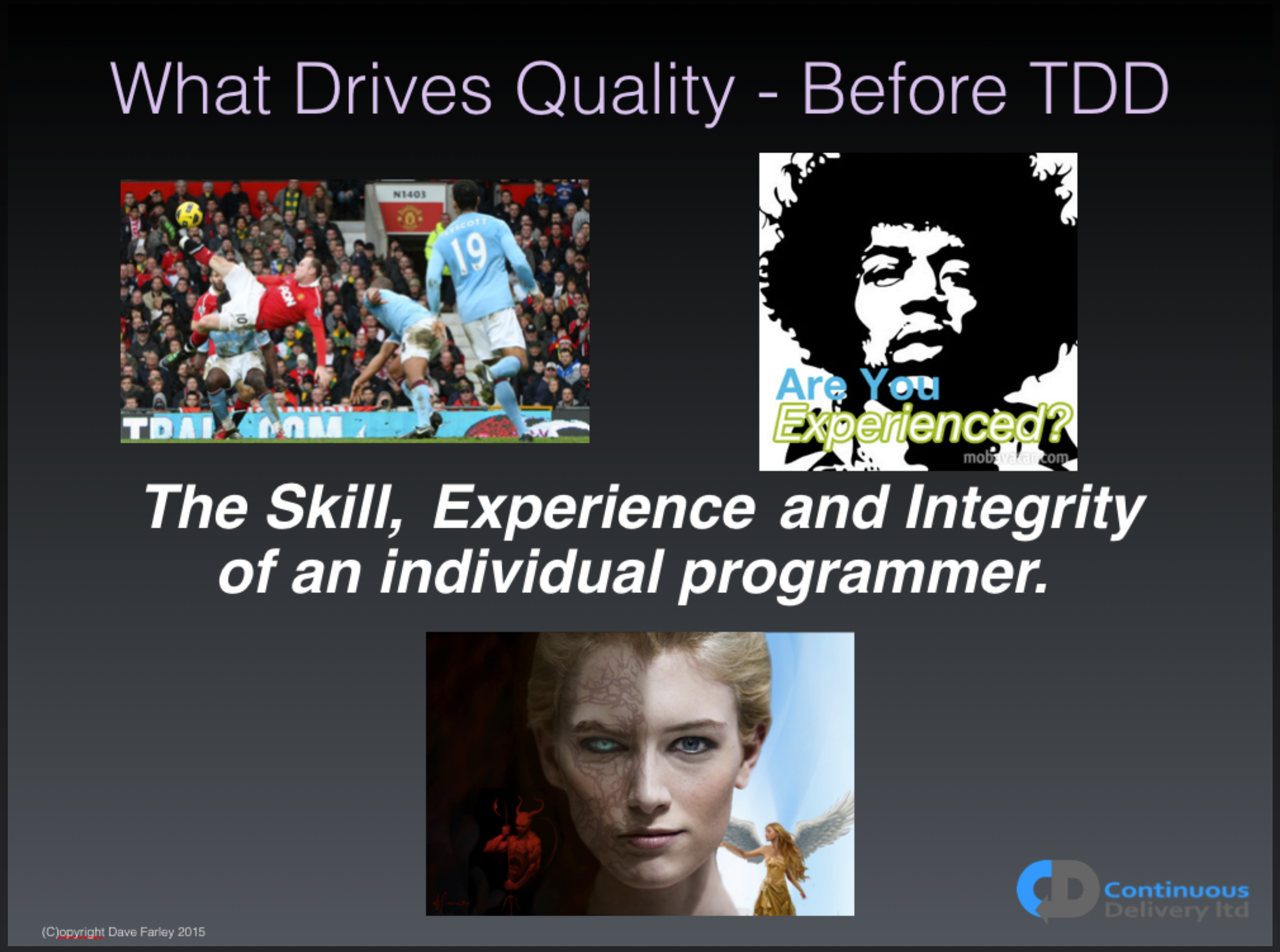

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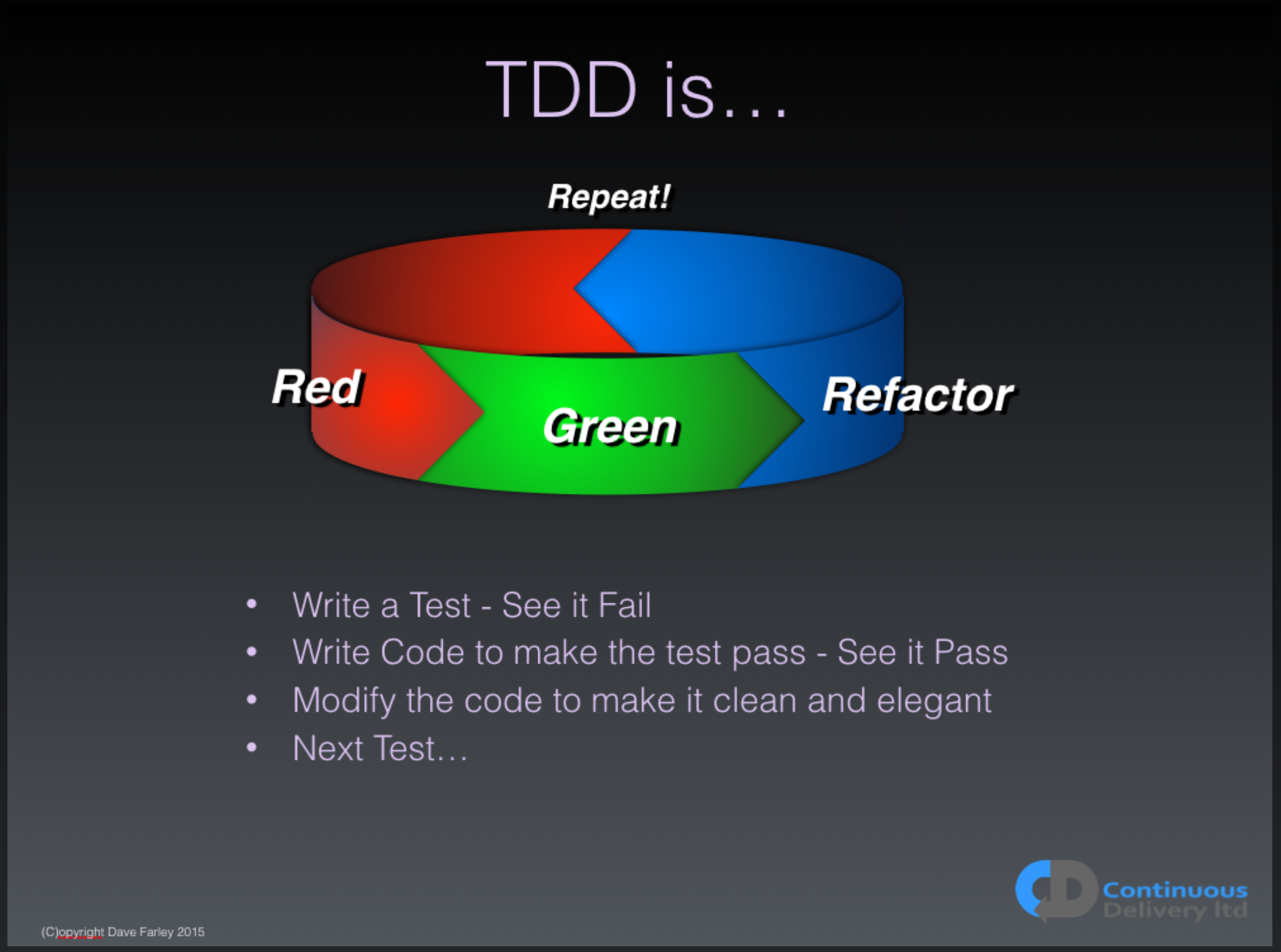

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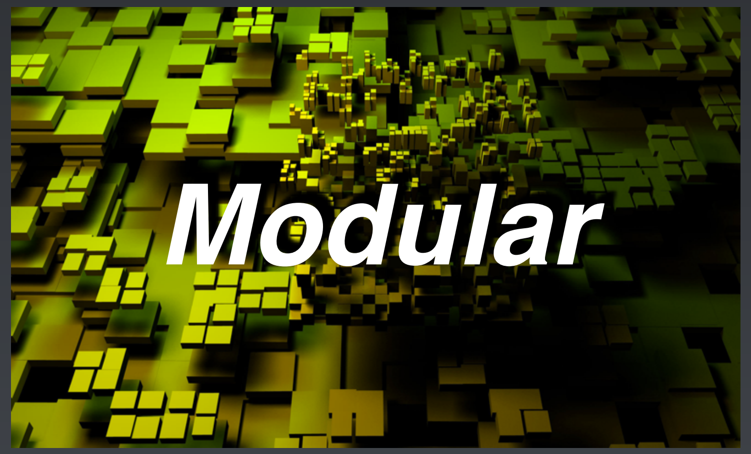

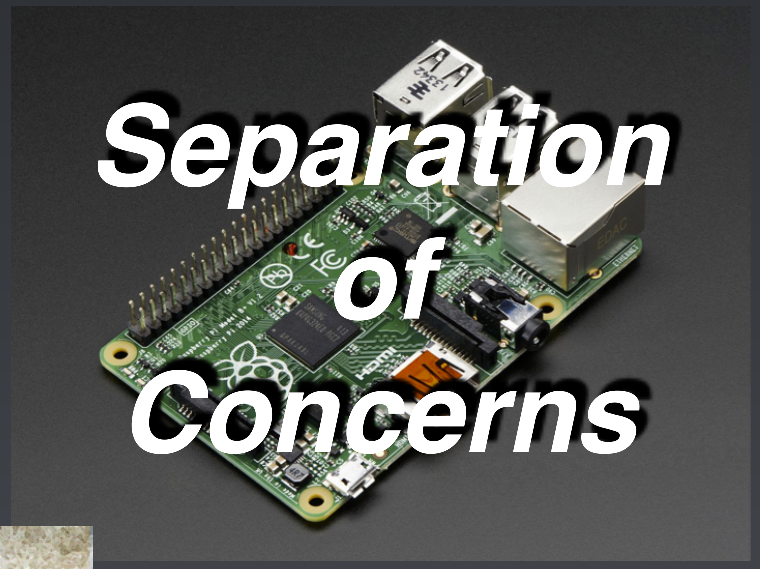

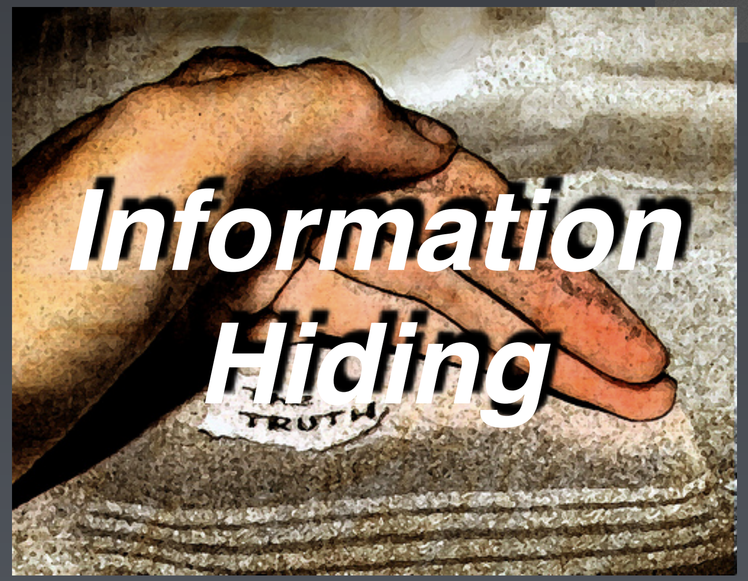

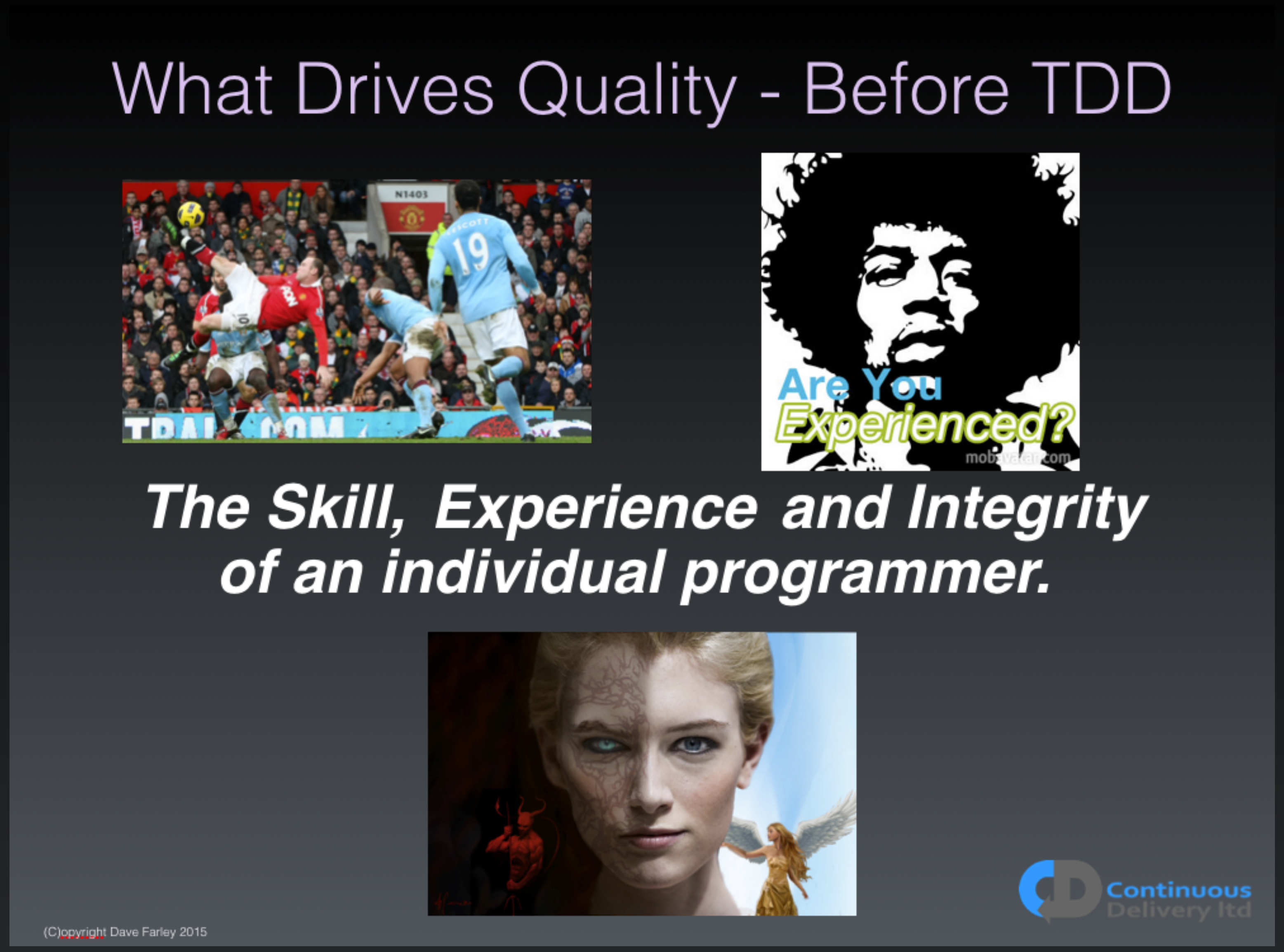

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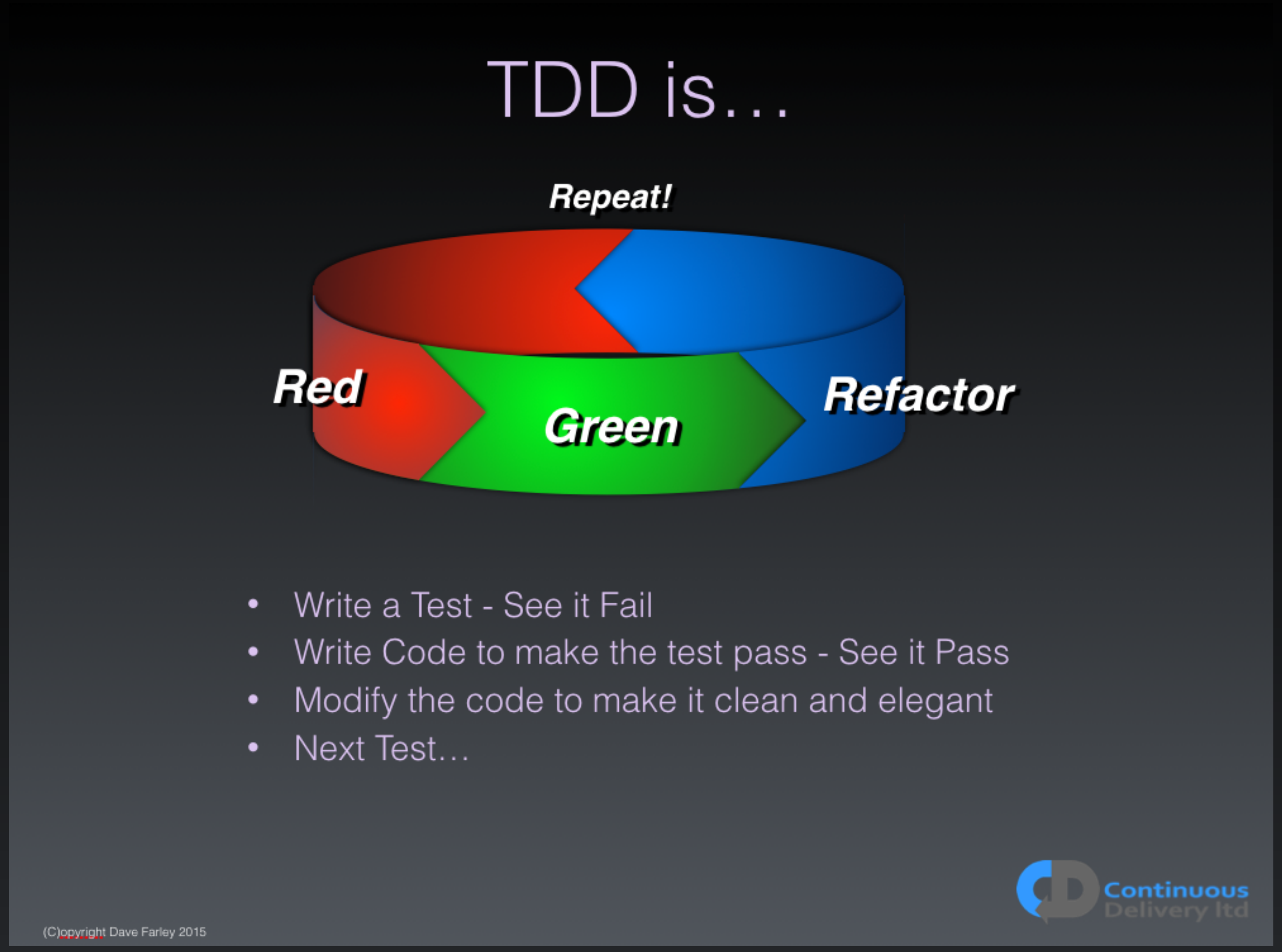

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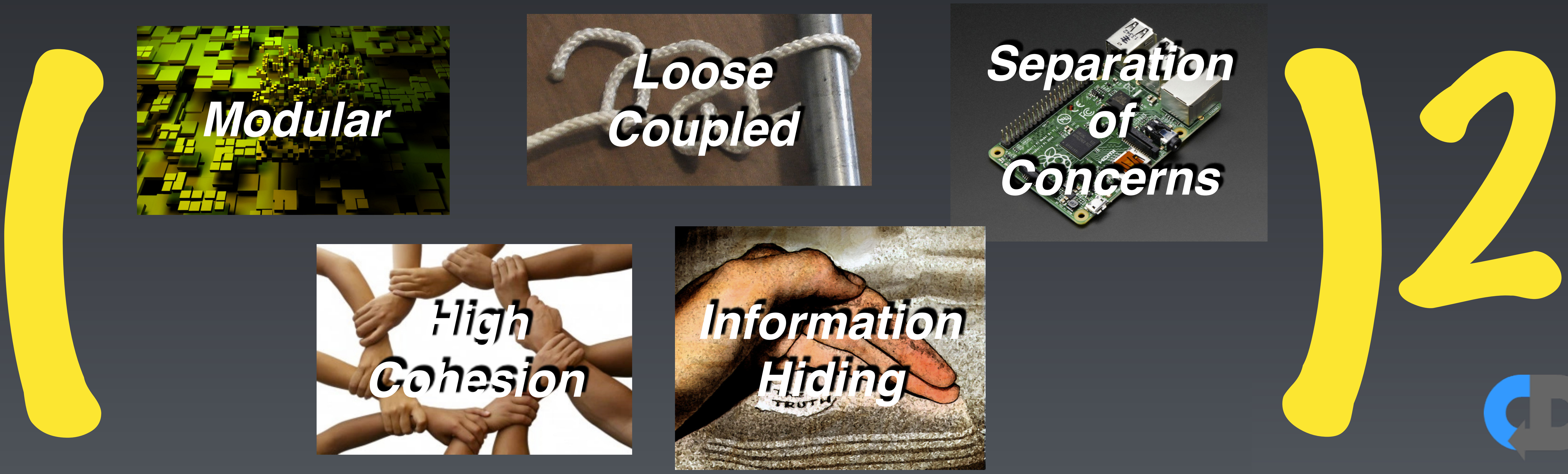

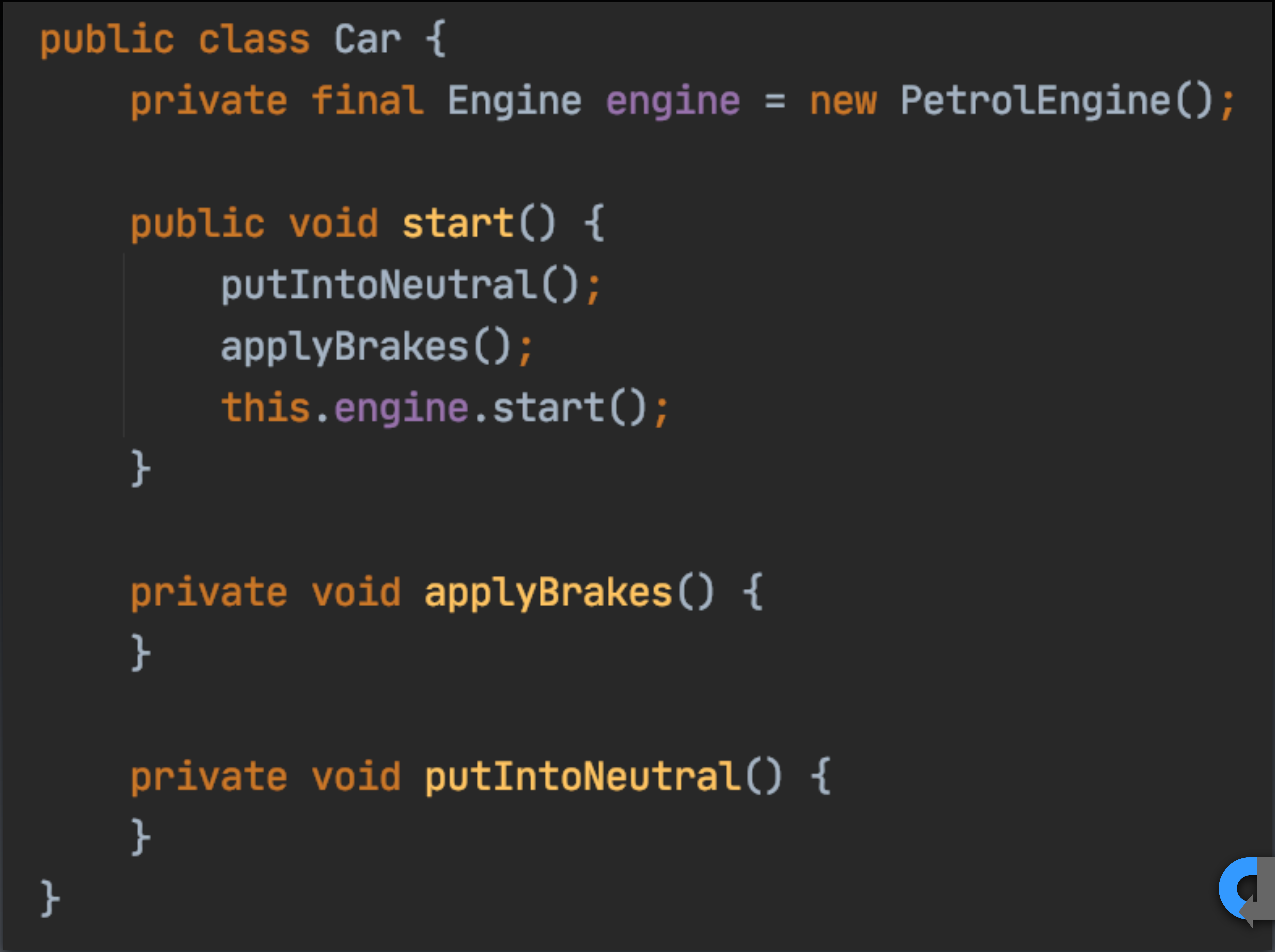

```java
public class Car {
    private final Engine engine = new PetrolEngine();

    public void start() {
        putIntoNeutral();
        applyBrakes();
        this.engine.start();
    }

    private void applyBrakes() {
    }

    private void putIntoNeutral() {
    }
}
```

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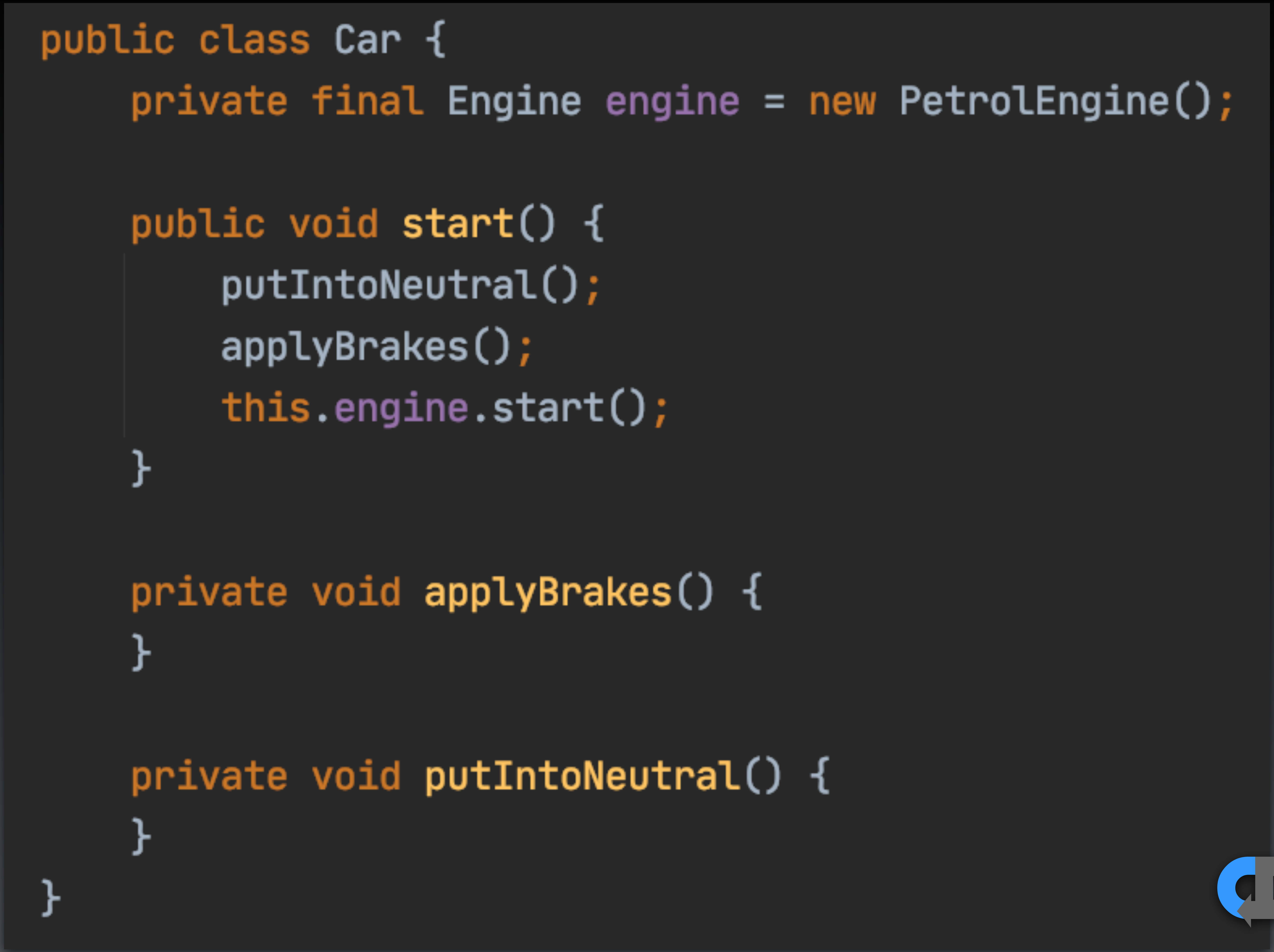

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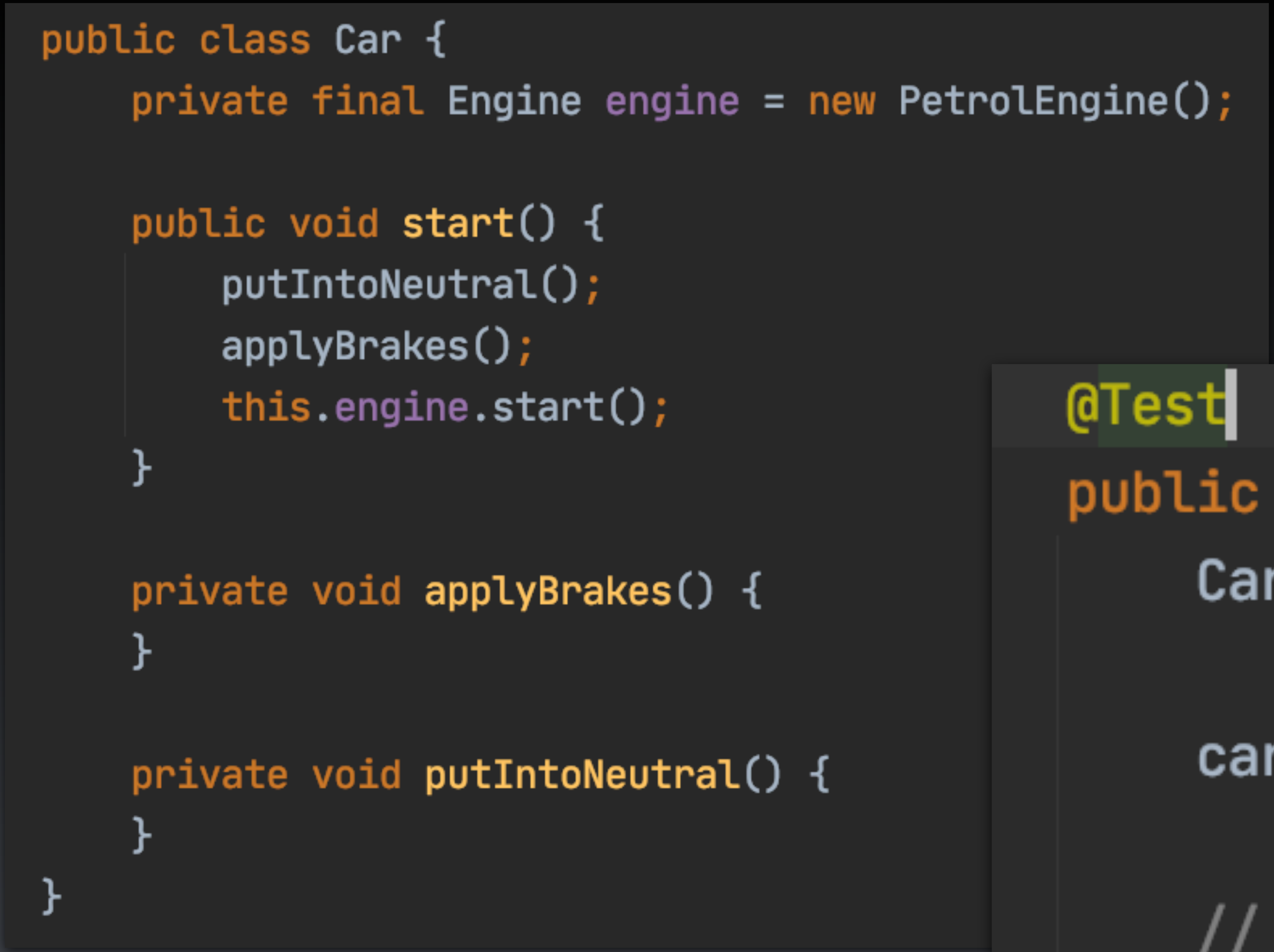
        putIntoNeutral();
        applyBrakes();
        this.engine.start();
    }

    private void applyBrakes() {
    }

    private void putIntoNeutral() {
    }
}
```

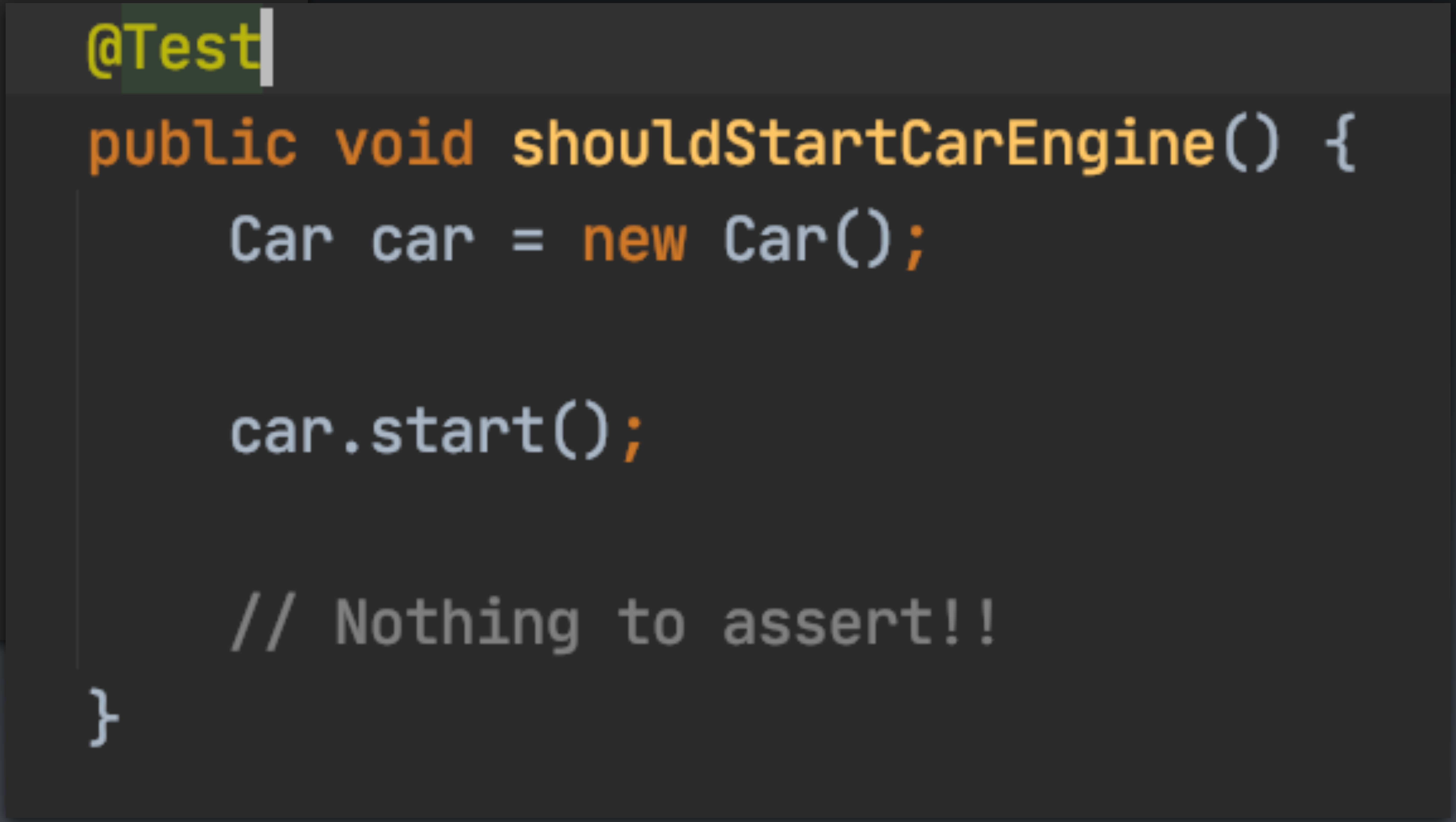


```java
public class Car {
    private final Engine engine = new PetrolEngine();

    public void start() {
        putIntoNeutral();
        applyBrakes();
        this.engine.start();
    }

    private void applyBrakes() {
    }

    private void putIntoNeutral() {
    }
}
```



```java
@Test
public void shouldStartCarEngine() {
    Car car = new Car();

    car.start();

    // Nothing to assert!!
}
```

Continuous Delivery ltd

```java
public class Car {
    private final Engine engine = new PetrolEngine();

    public void start() {
        putIntoNeutral();
        applyBrakes();
        this.engine.start();
    }

    private void applyBrakes() {
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    car.start();

    // Nothing to assert!!
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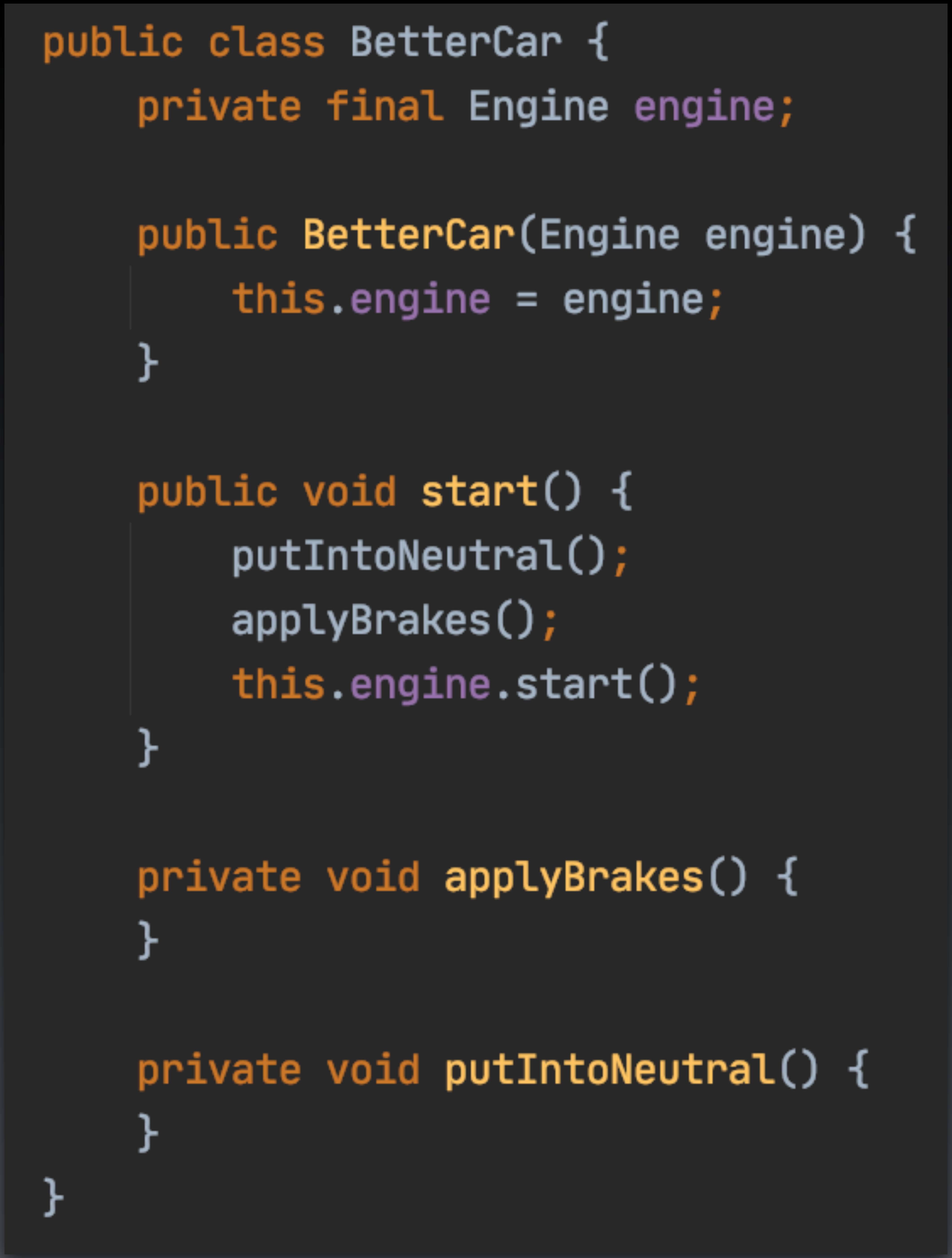
Continuous Delivery ltd

Continuous Delivery ltd



```java
public class BetterCar {
    private final Engine engine;

    public BetterCar(Engine engine) {
        this.engine = engine;
    }

    public void start() {
        putIntoNeutral();
        applyBrakes();
        this.engine.start();
    }

    private void applyBrakes() {
    }

    private void putIntoNeutral() {
    }
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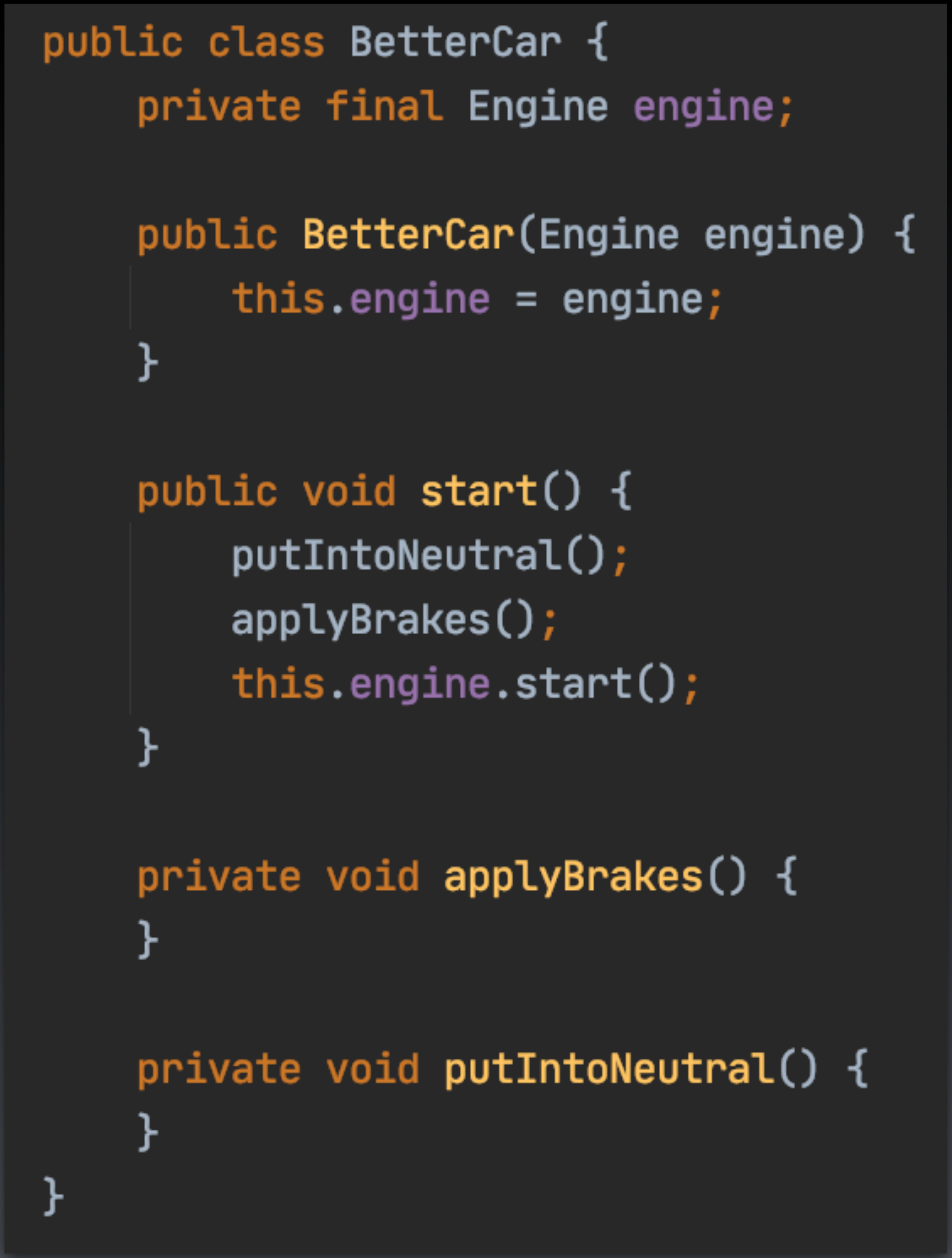

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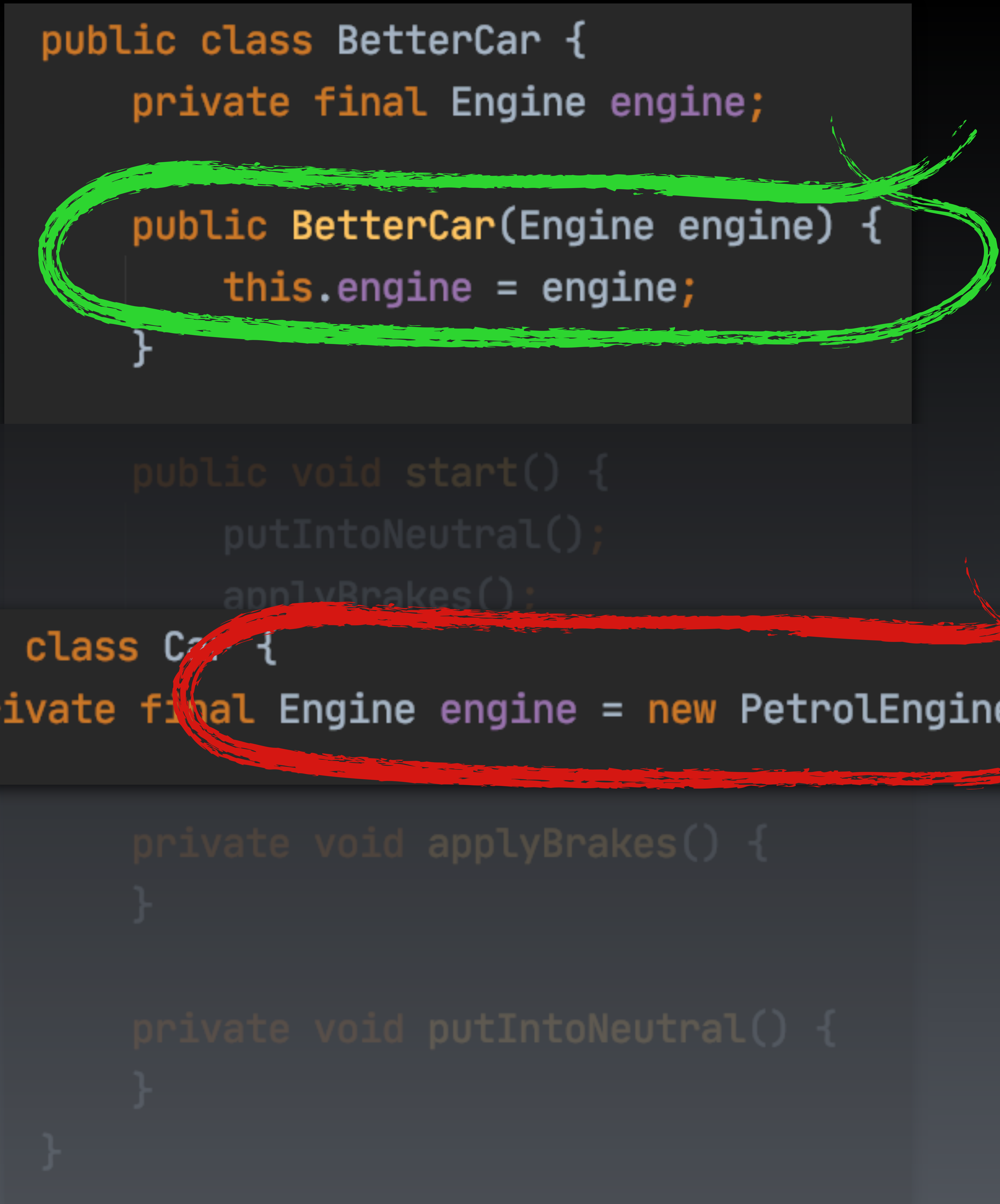

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    private final Engine engine;

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        this.engine = engine;
    }

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        putIntoNeutral();
        applyBrakes();

    private void applyBrakes() {
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    }
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```

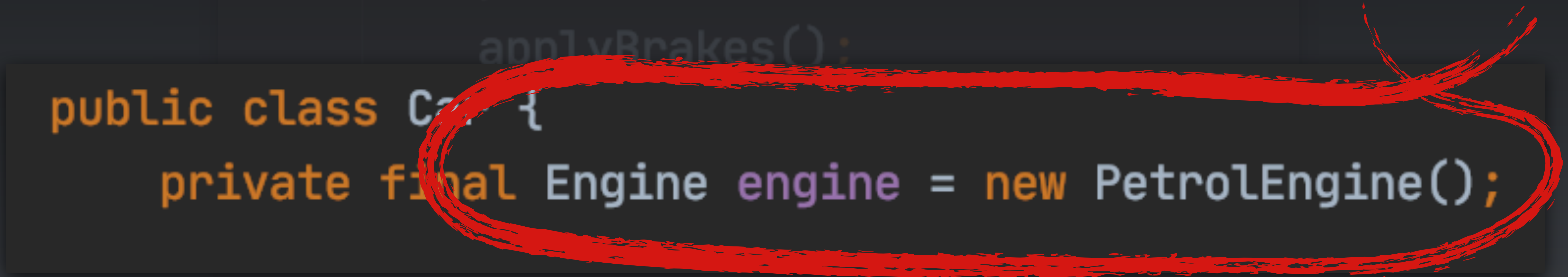

```java
public class Car {
    private final Engine engine = new PetrolEngine();
```

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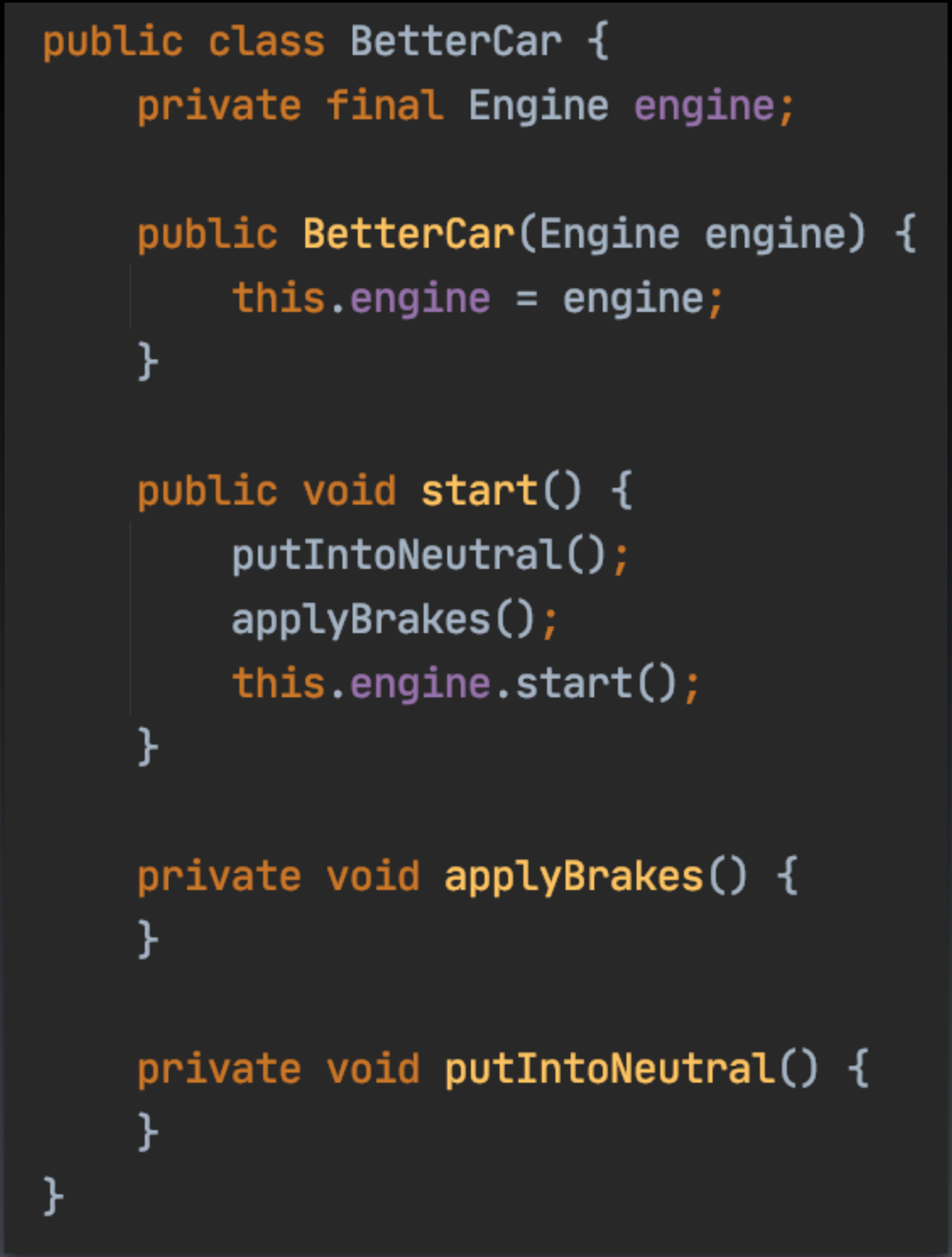
Delivery ltd



```java
public class BetterCar {
    private final Engine engine;

    public BetterCar(Engine engine) {
        this.engine = engine;
    }

    public void start() {
        putIntoNeutral();
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        this.engine.start();
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        applyBrakes();
        this.engine.start();
    }

    private void applyBrakes() {
    }

    private void putIntoNeutral() {
    }
}
```
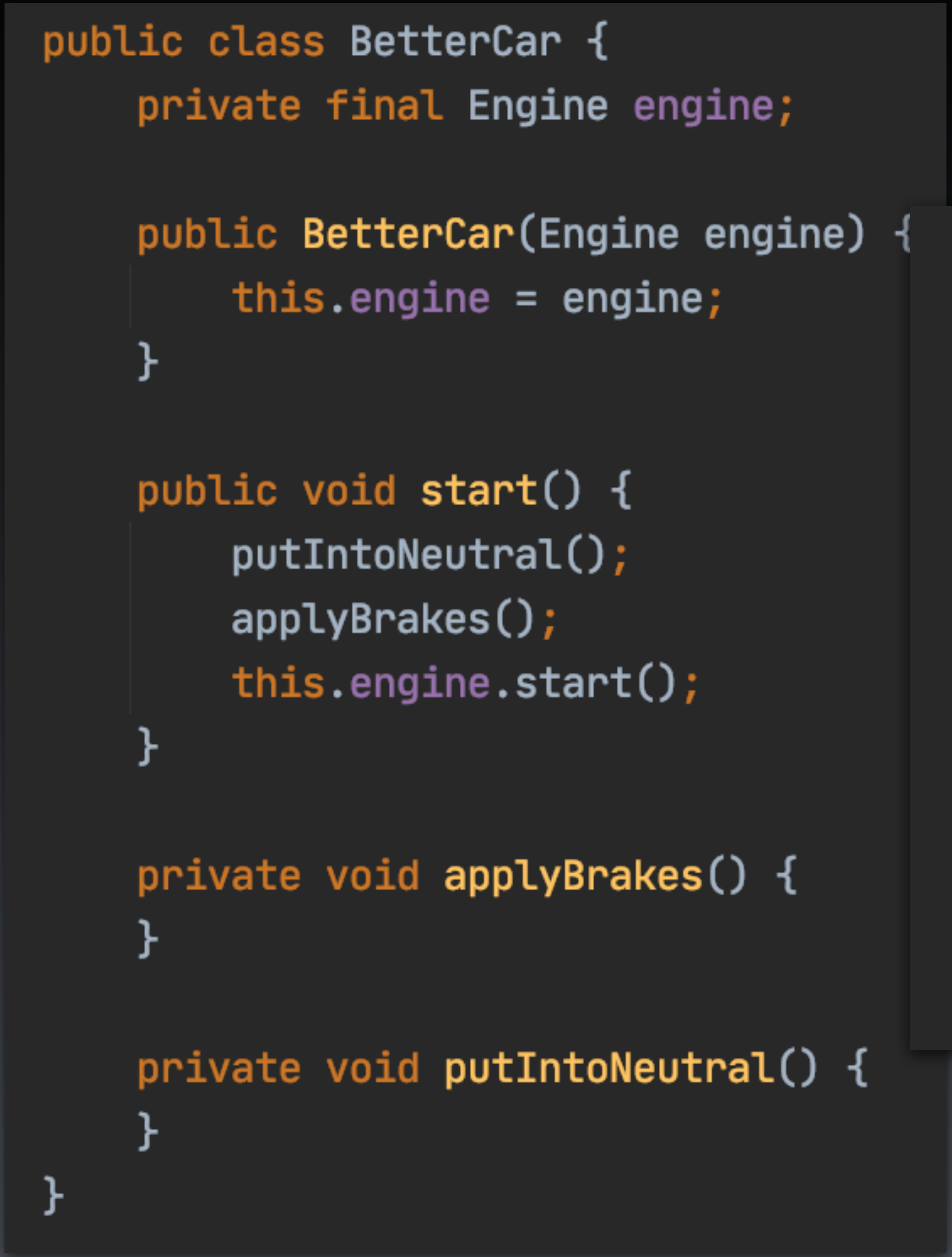

```java
@Test
public void shouldStartBetterCarEngine() {

}
```



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public class BetterCar {
    private final Engine engine;

    public BetterCar(Engine engine) {
        this.engine = engine;
    }

    public void start() {
        putIntoNeutral();
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        this.engine.start();
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    private void applyBrakes() {
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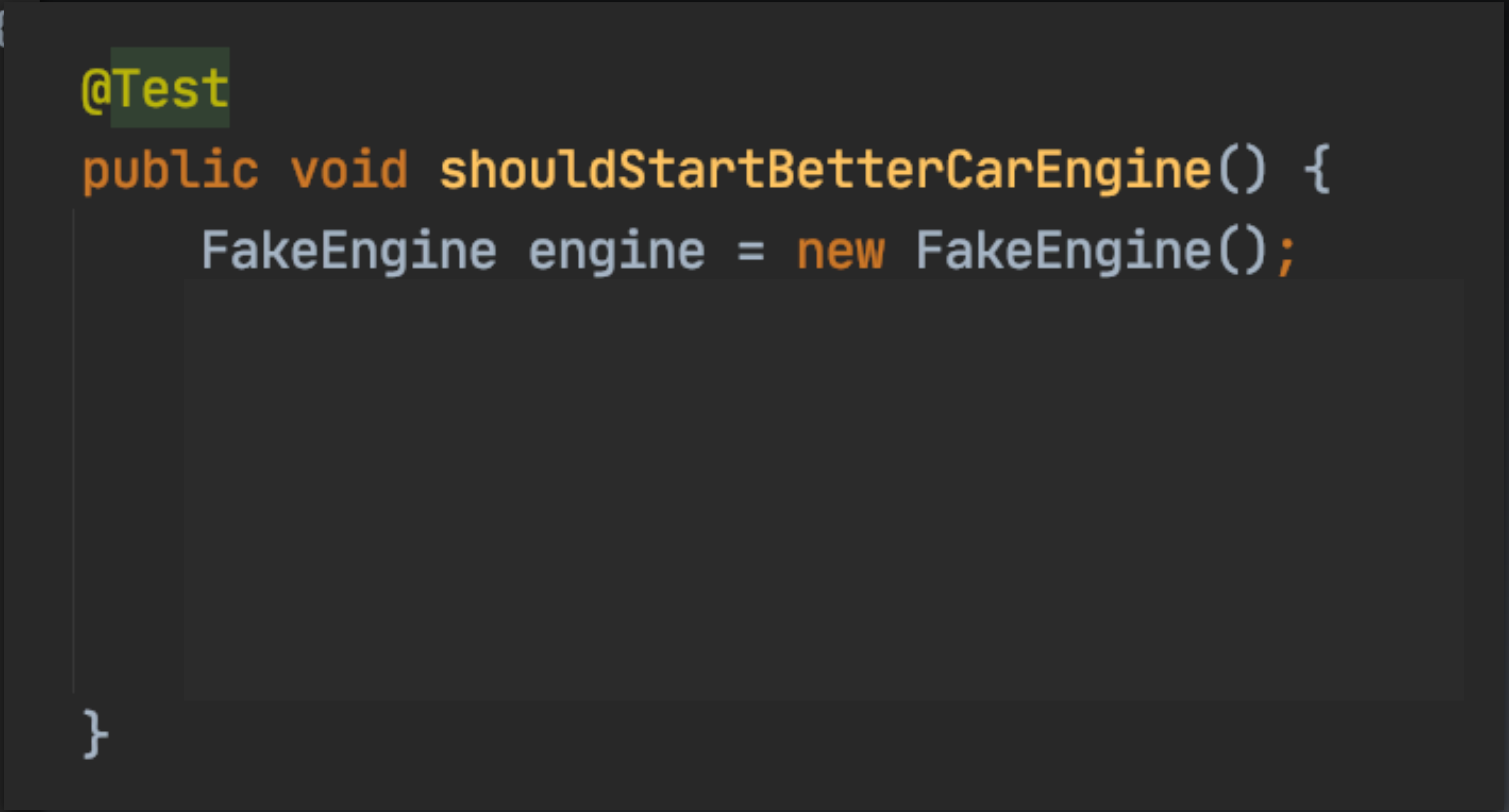
```

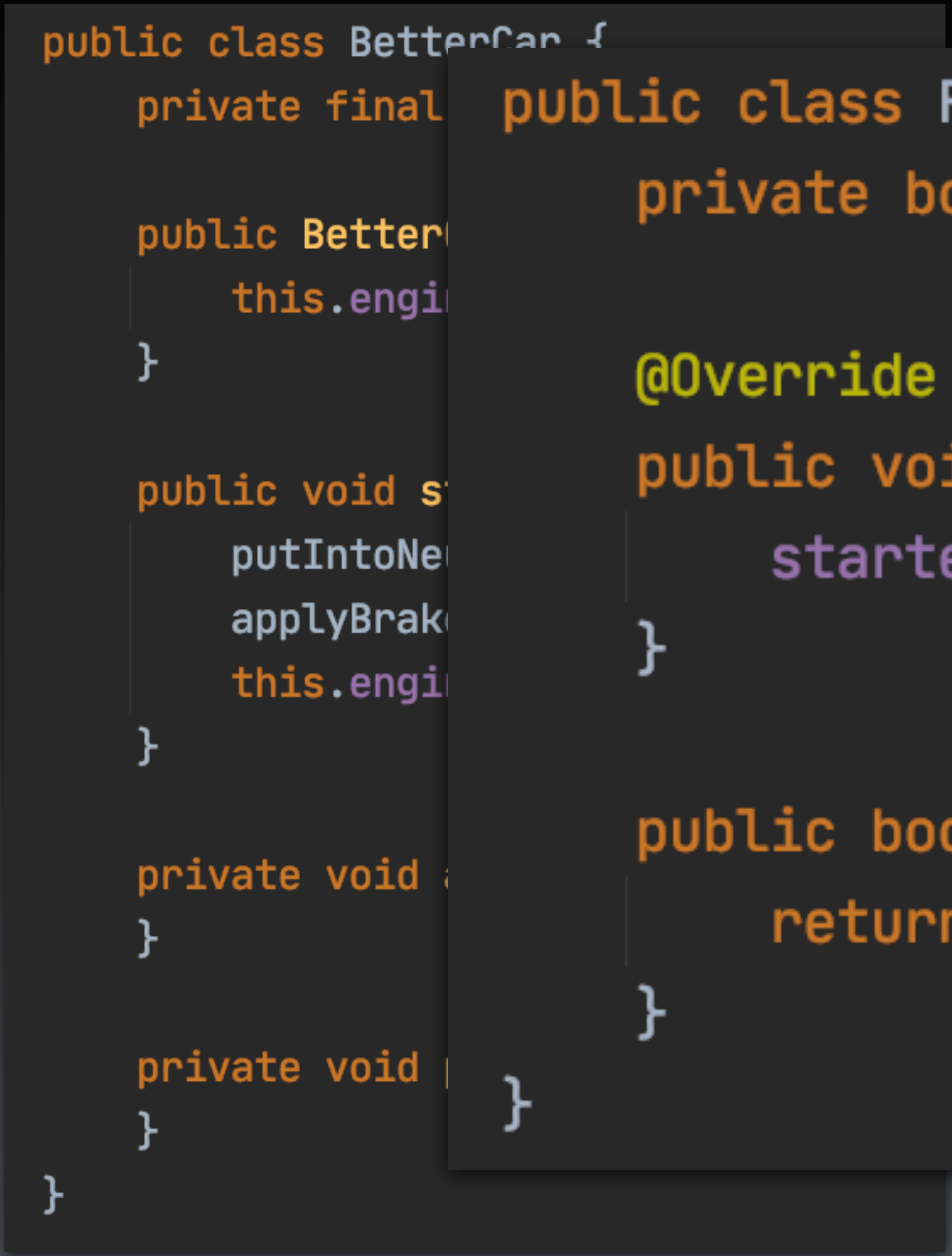


```java
@Test
public void shouldStartBetterCarEngine() {
    FakeEngine engine = new FakeEngine();



}
```

Continuous
Delivery ltd



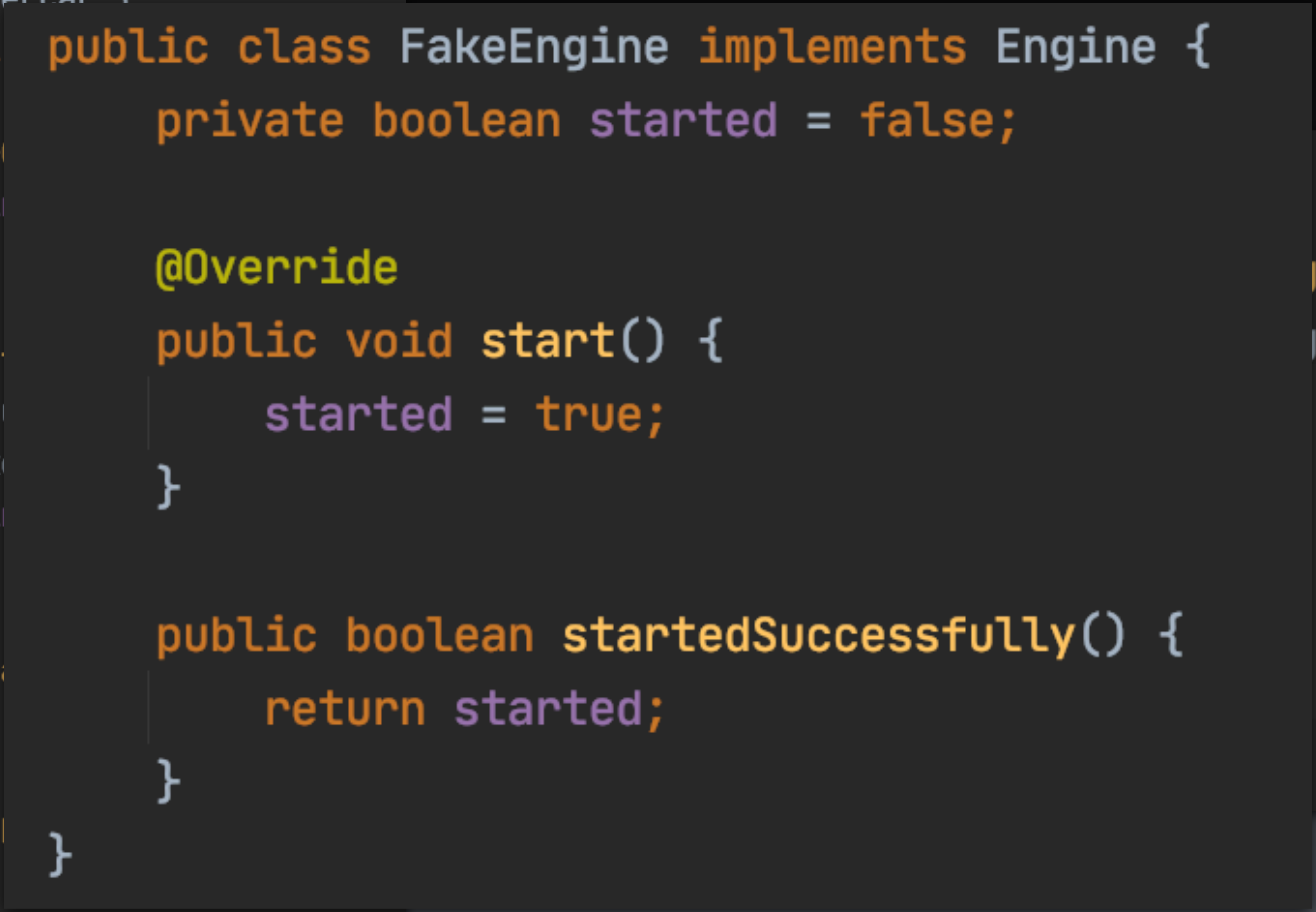
```
public class BetterCar {
    private final

    public Better
        this.engi
    }

    public void s
        putIntoNe
        applyBrak
        this.engi
    }

    private void
    }

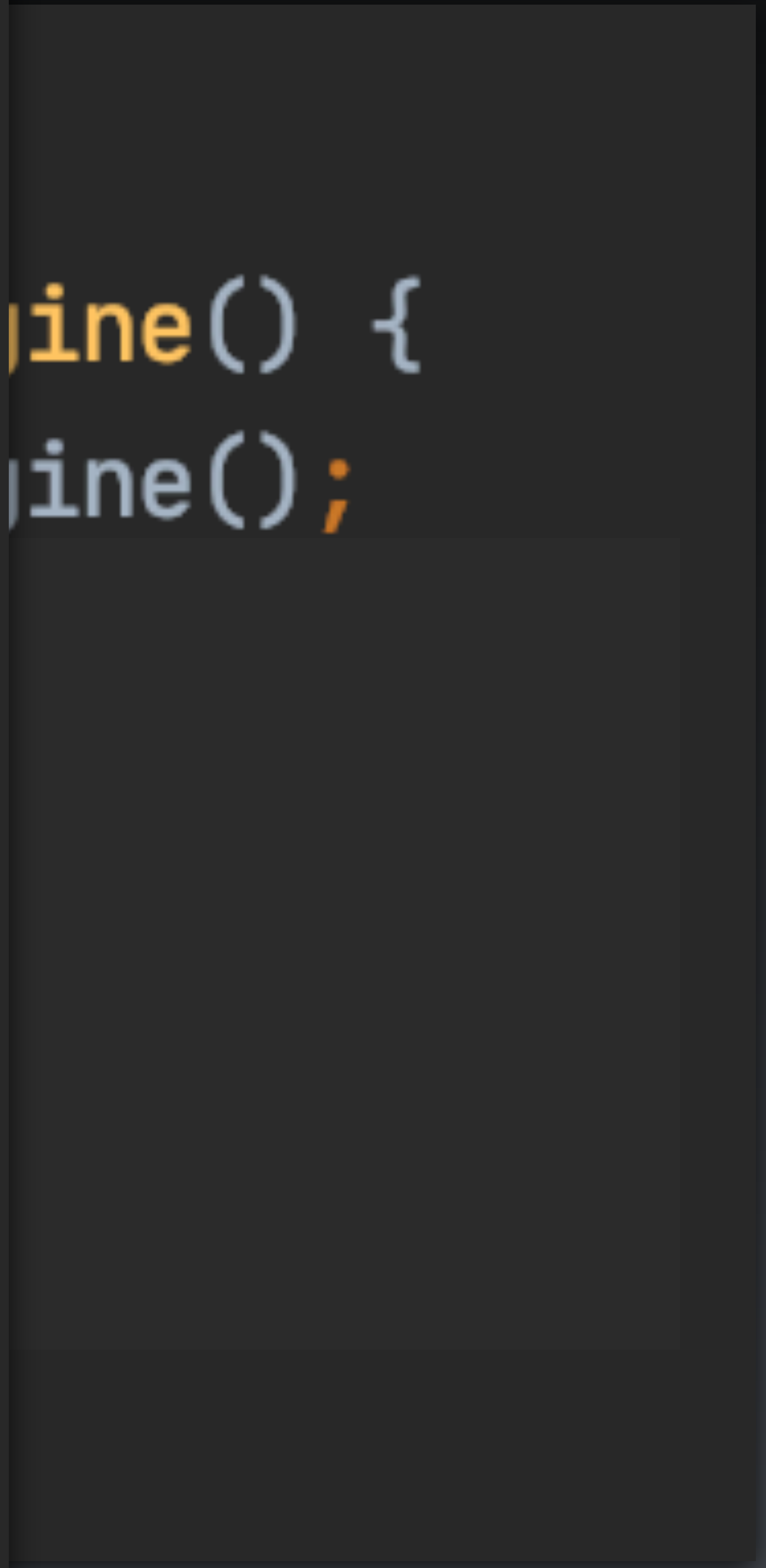
    private void
    }
}
```



```
public class FakeEngine implements Engine {
    private boolean started = false;

    @Override
    public void start() {
        started = true;
    }

    public boolean startedSuccessfully() {
        return started;
    }
}
```



```
ine() {
ine();
```

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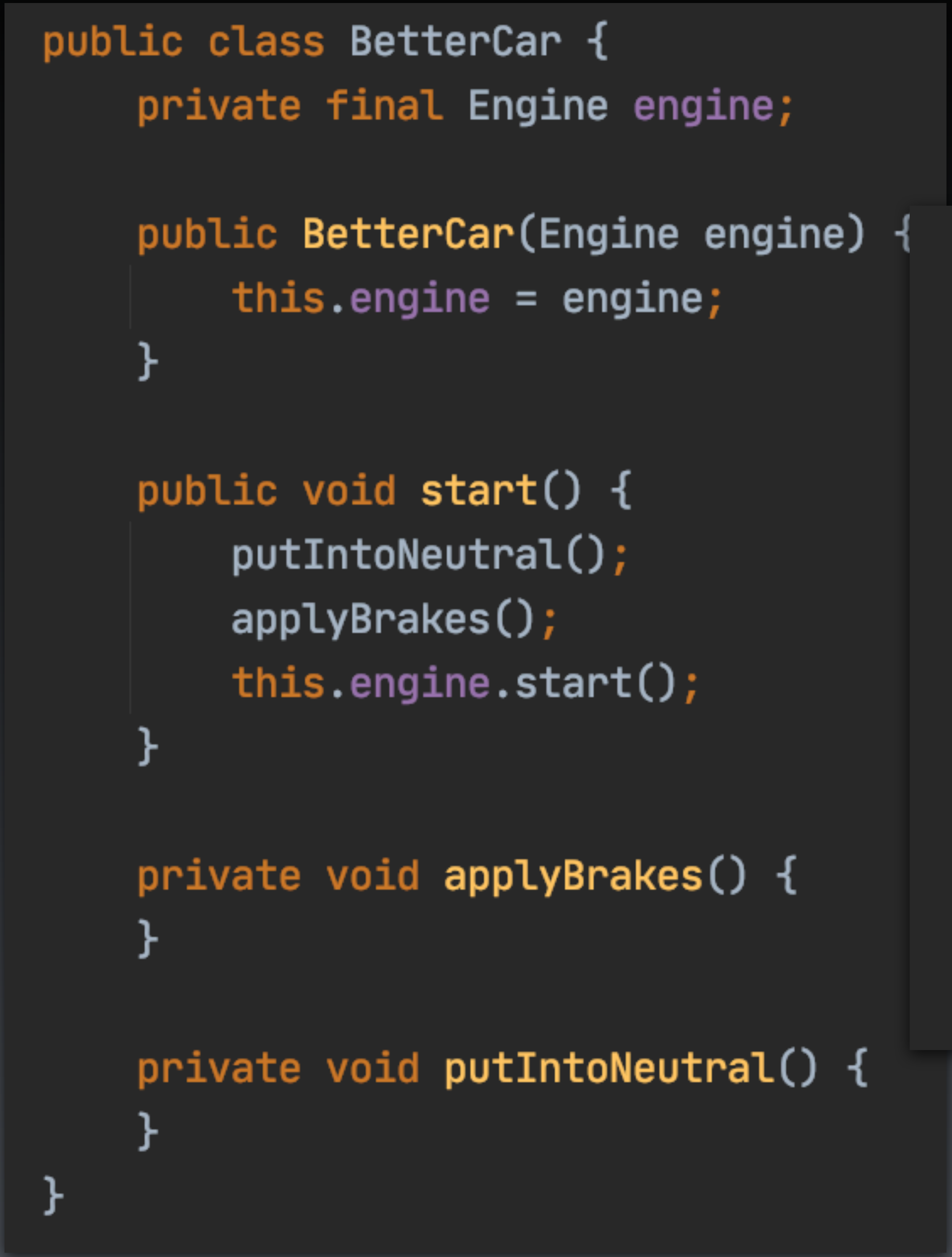

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    private final Engine engine;

    public BetterCar(Engine engine) {
        this.engine = engine;
    }

    public void start() {
        putIntoNeutral();
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        this.engine.start();
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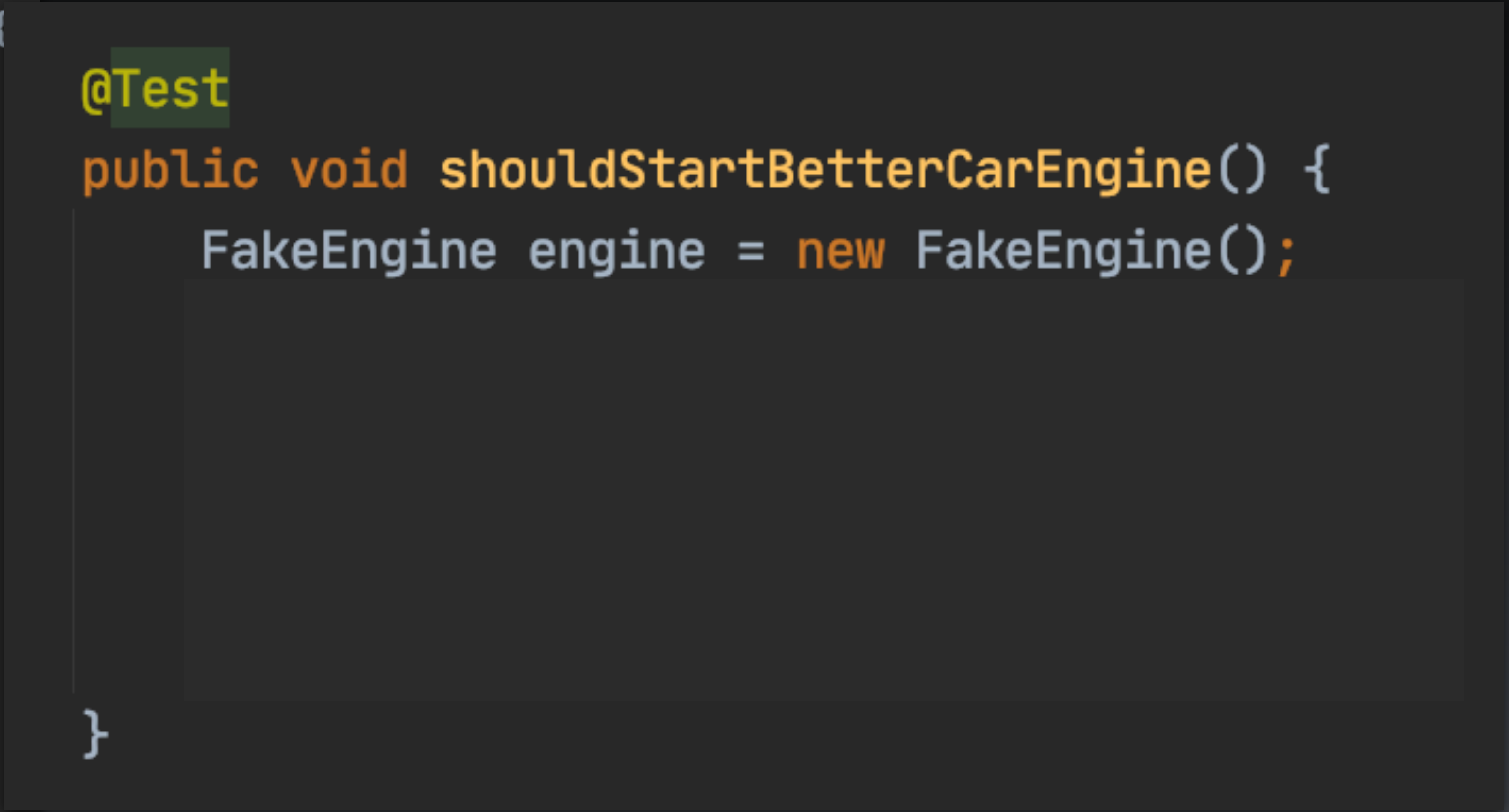

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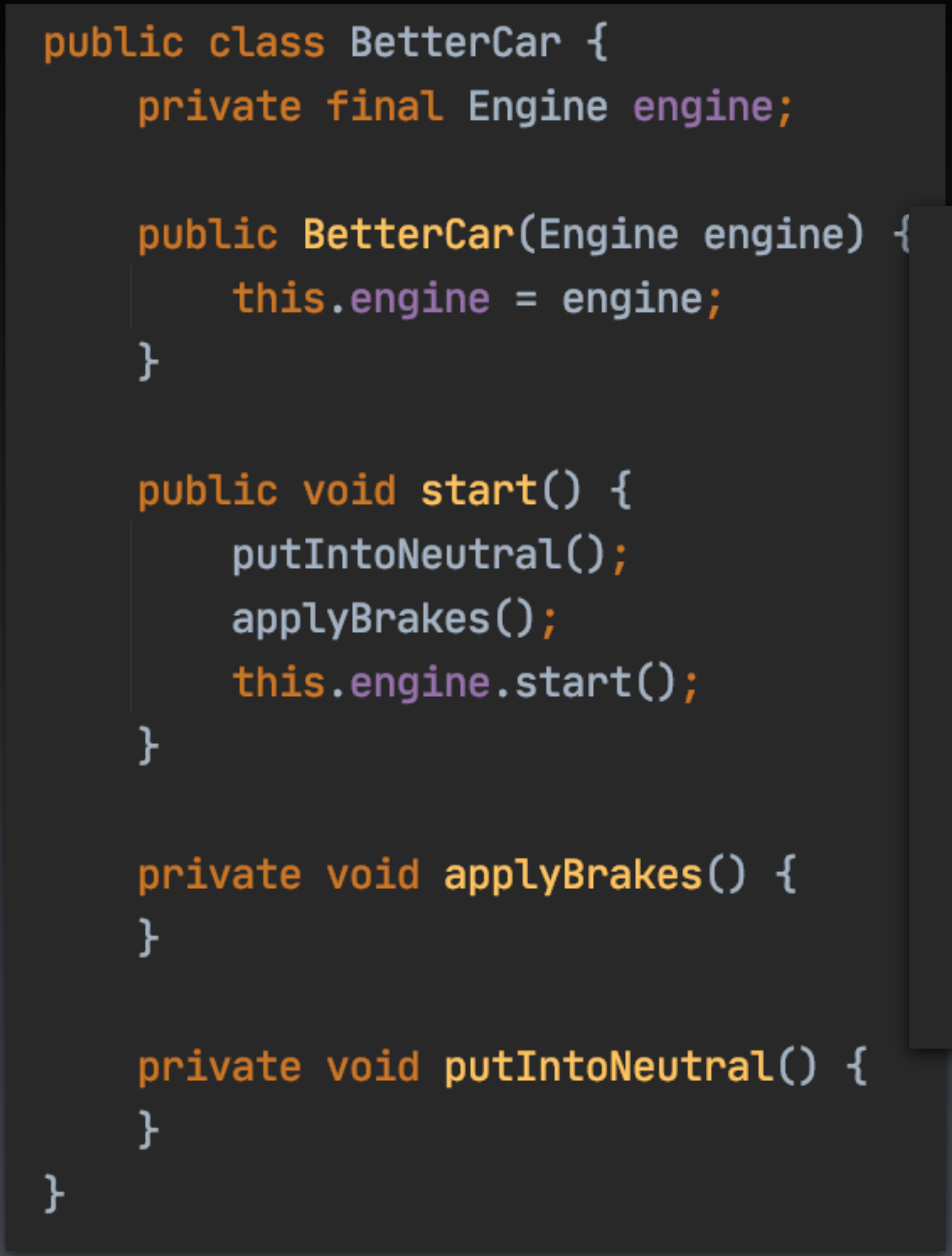
    FakeEngine engine = new FakeEngine();


}
```

Continuous Delivery ltd



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    public BetterCar(Engine engine) {
        this.engine = engine;
    }

    public void start() {
        putIntoNeutral();
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        this.engine.start();
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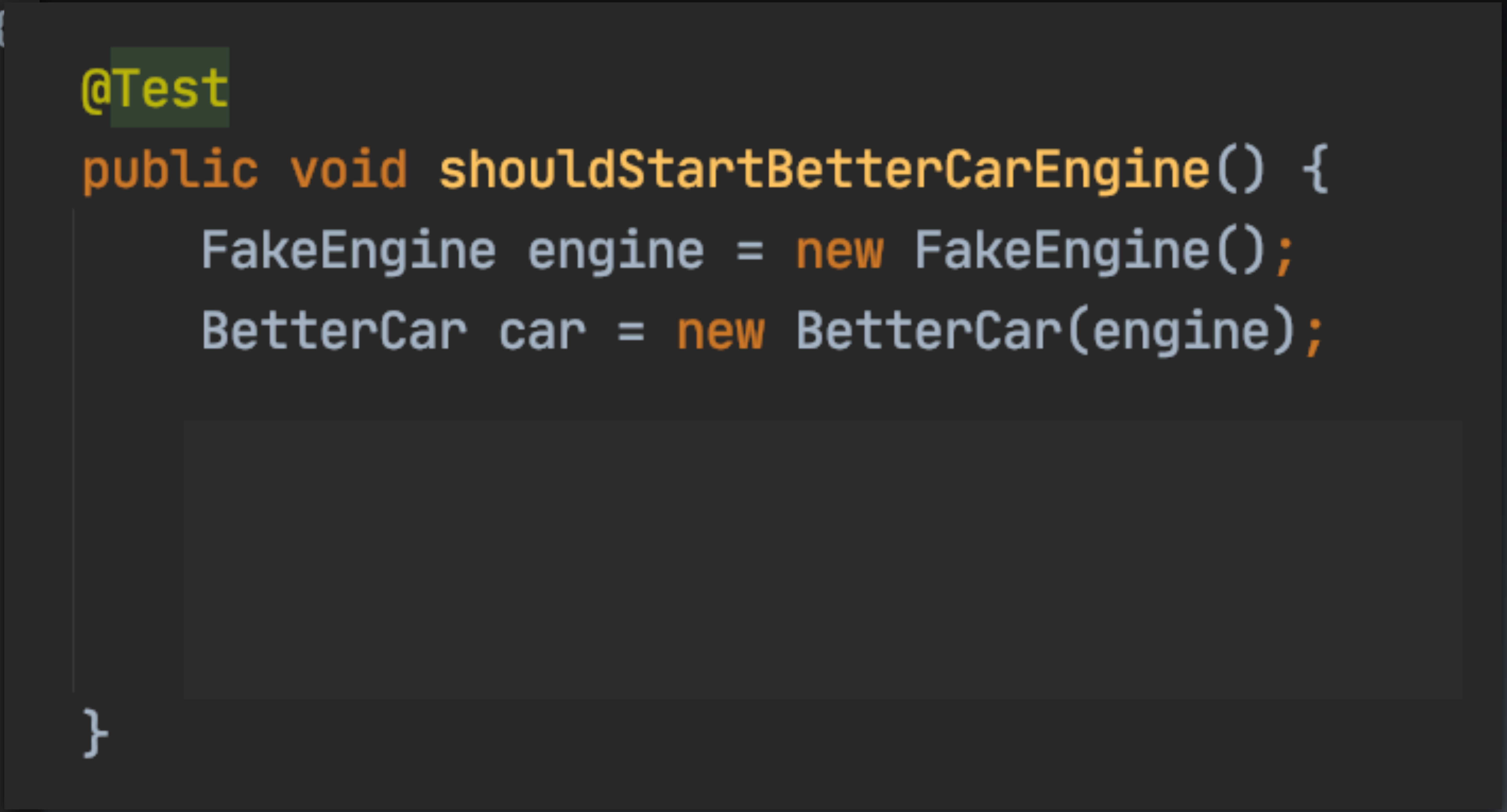

```java
@Test
public void shouldStartBetterCarEngine() {
    FakeEngine engine = new FakeEngine();
    BetterCar car = new BetterCar(engine);


}
```

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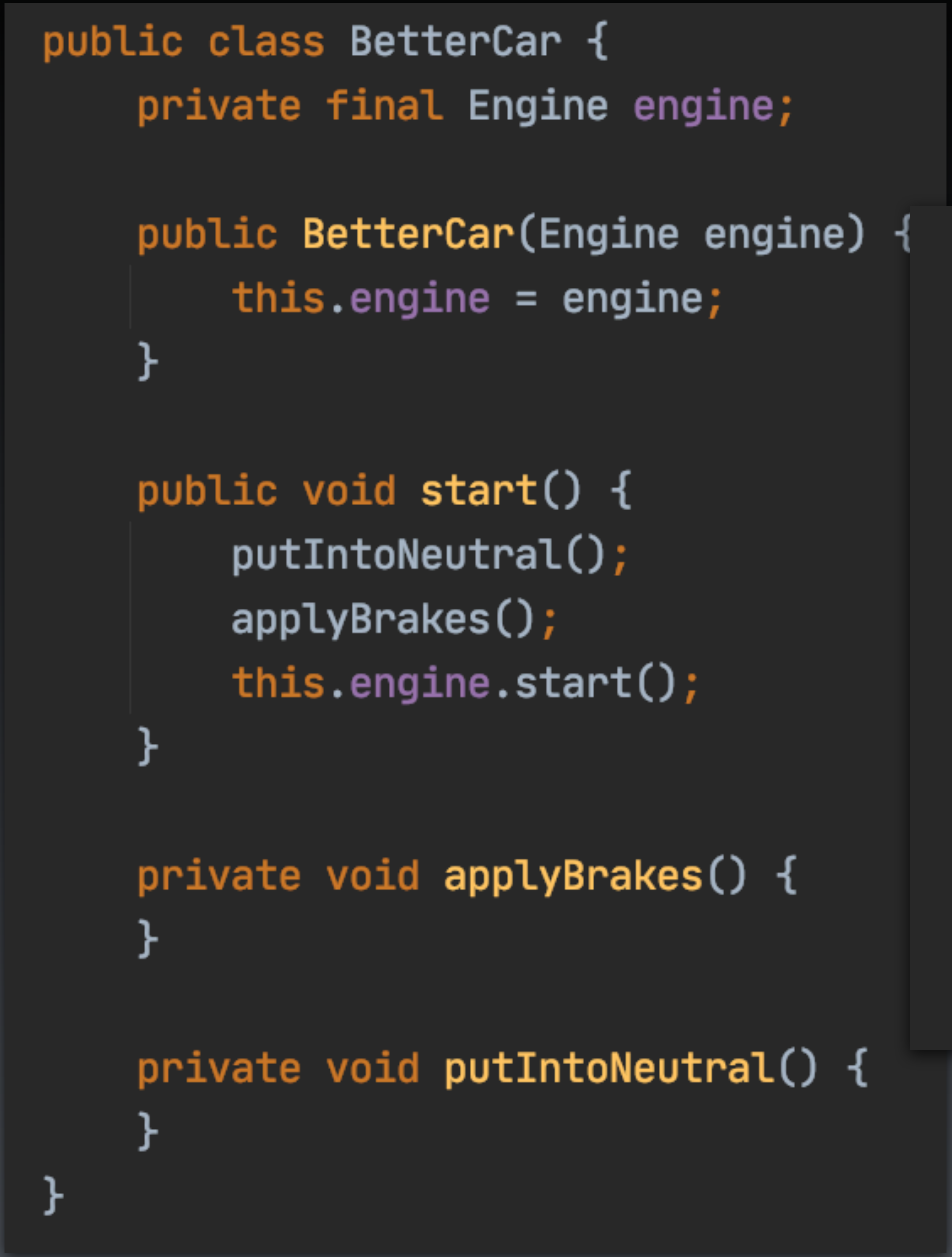
Delivery ltd



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        this.engine.start();
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    private void applyBrakes() {
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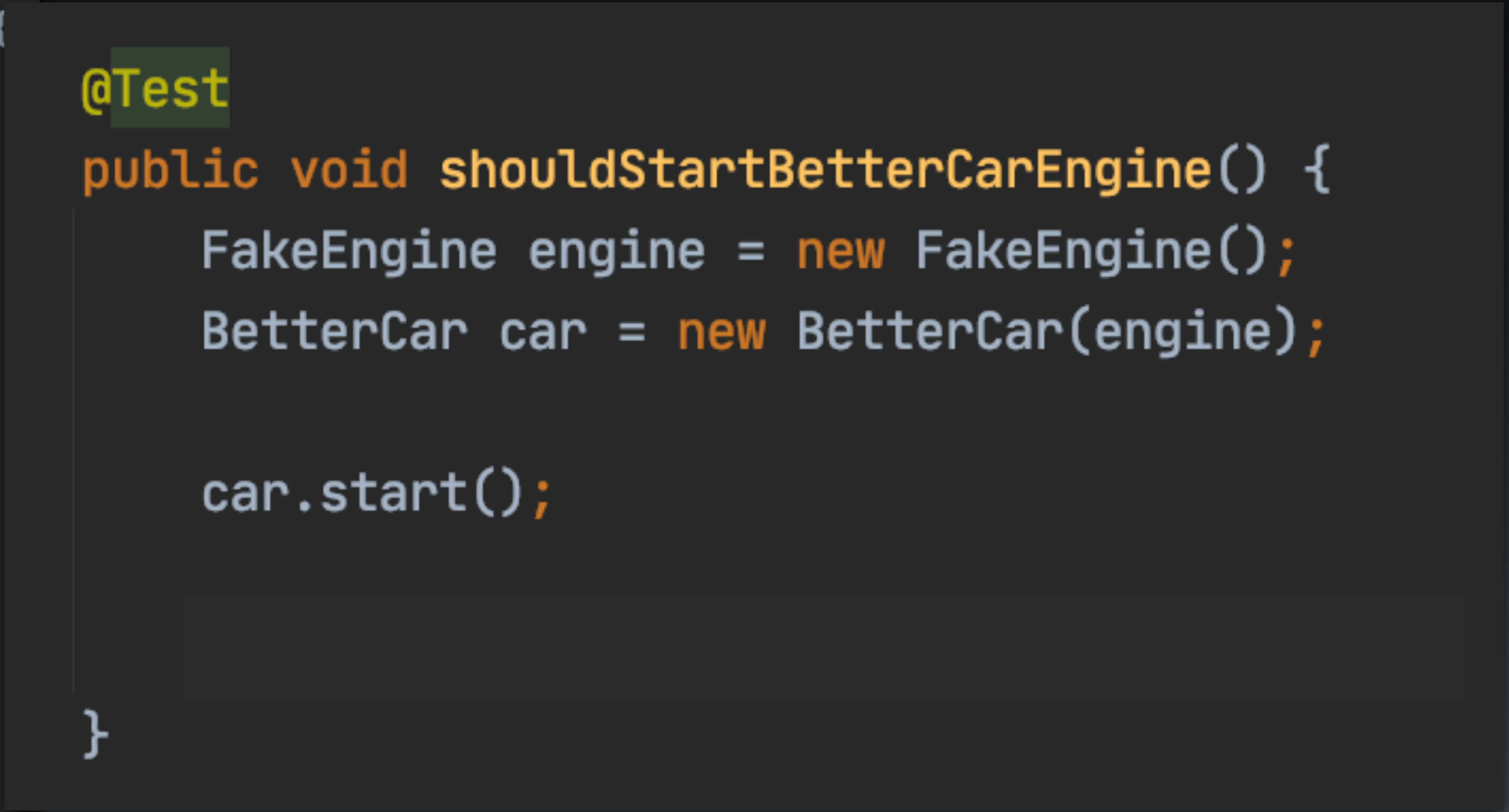

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@Test
public void shouldStartBetterCarEngine() {
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    BetterCar car = new BetterCar(engine);

    car.start();


}
```

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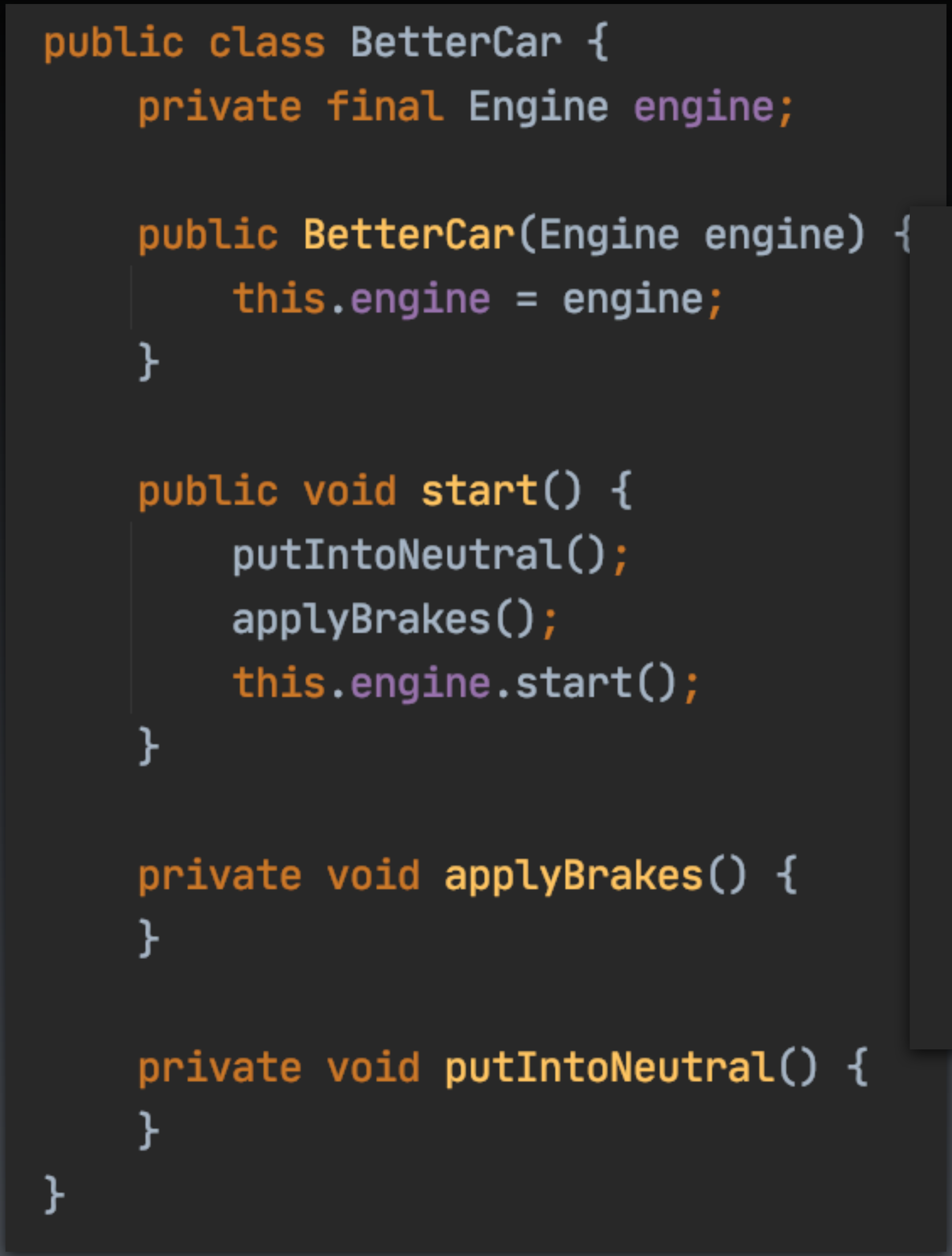

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    private final Engine engine;

    public BetterCar(Engine engine) {
        this.engine = engine;
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    public void start() {
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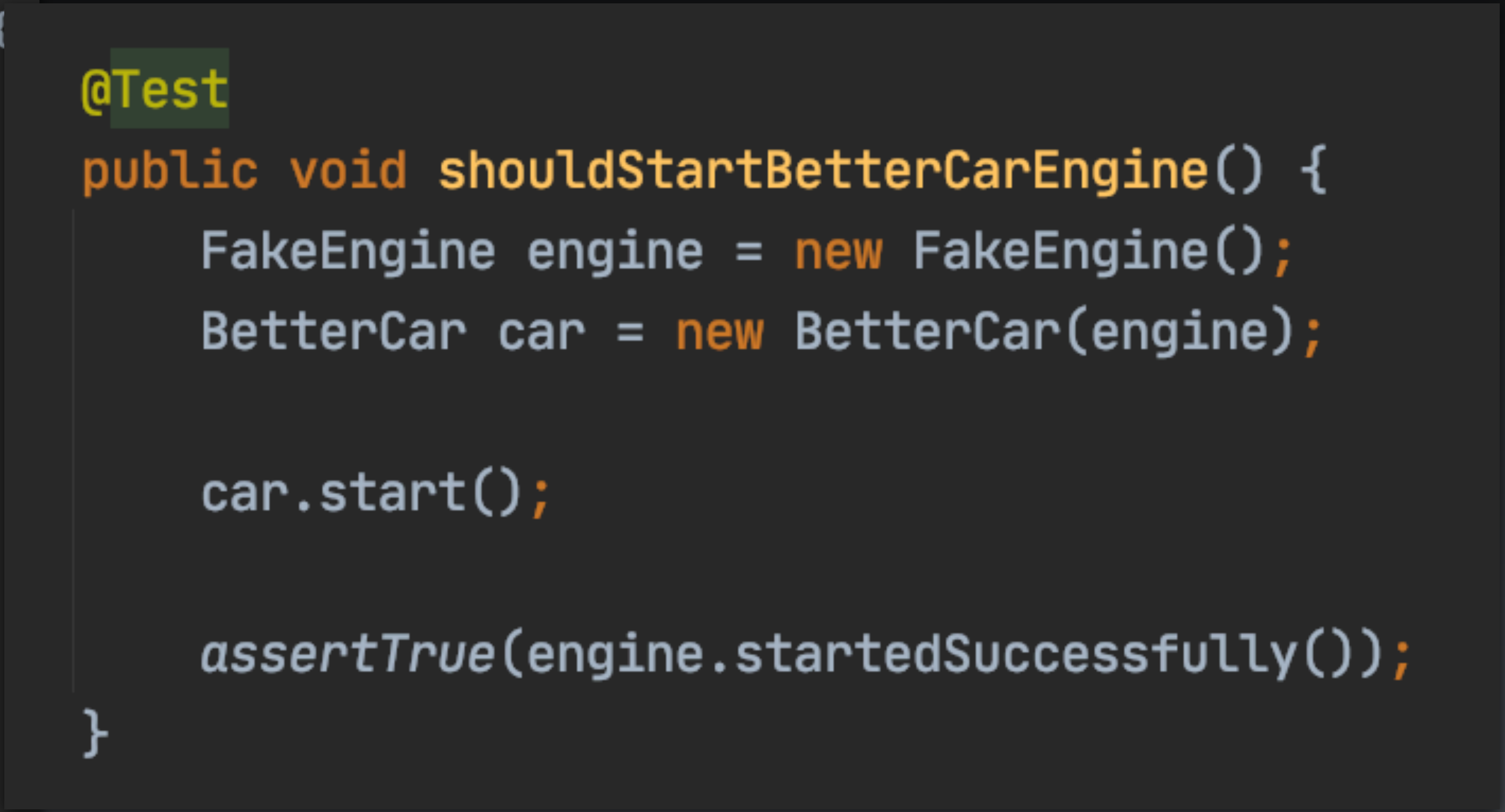

```java
@Test
public void shouldStartBetterCarEngine() {
    FakeEngine engine = new FakeEngine();
    BetterCar car = new BetterCar(engine);

    car.start();

    assertTrue(engine.startedSuccessfully());
}
```

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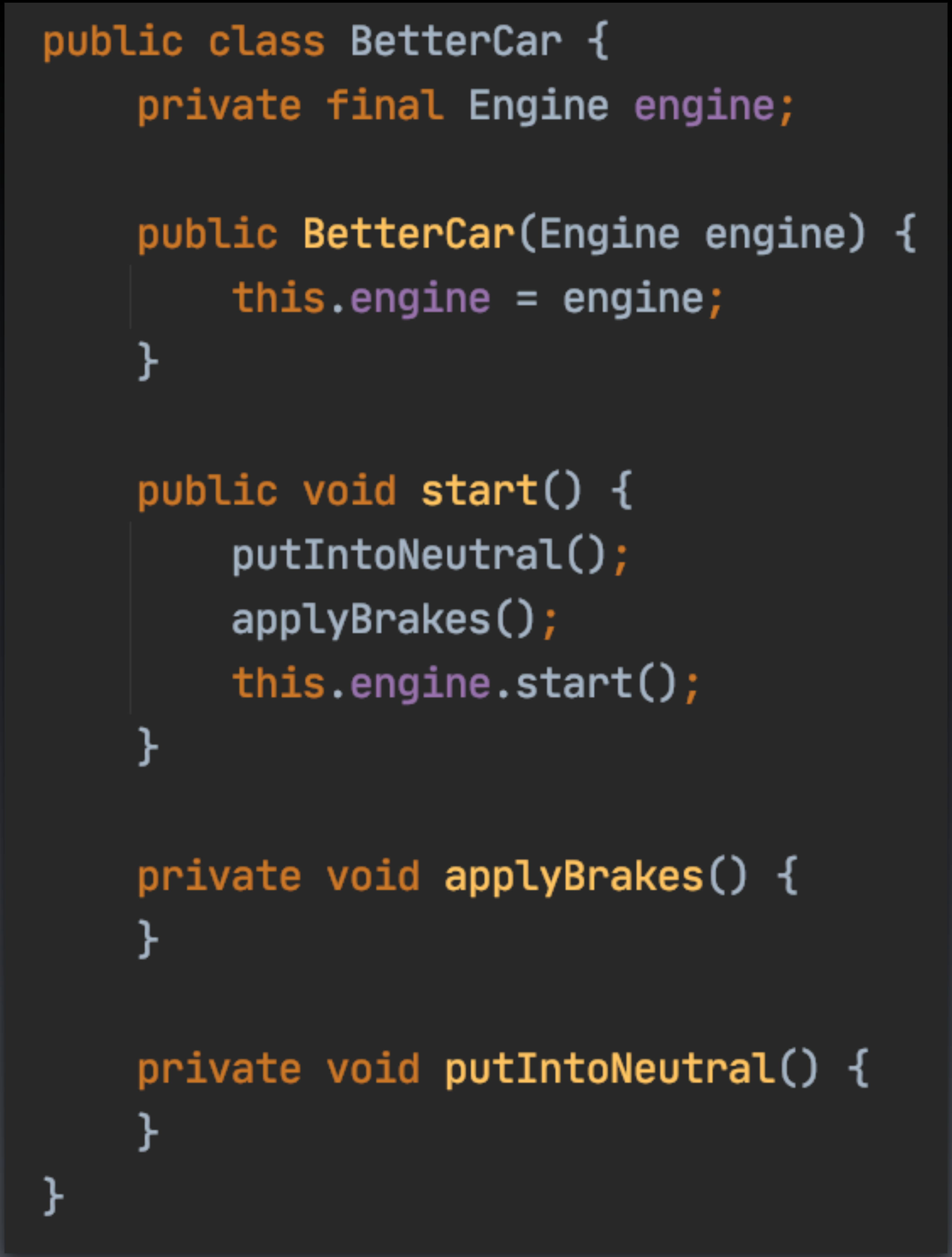

```java
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    public BetterCar(Engine engine) {
        this.engine = engine;
    }

    public void start() {
        putIntoNeutral();
        applyBrakes();
        this.engine.start();
    }

    private void applyBrakes() {
    }

    private void putIntoNeutral() {
    }
}
```

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```java
public class BetterCar {
    private final Engine engine;

    public BetterCar(Engine engine) {
        this.engine = engine;
    }
```

```java
public void createCars() {





}
```

```java
}
```

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```java
public class BetterCar {
    private final Engine engine;

    public BetterCar(Engine engine) {
        this.engine = engine;
    }
```

```java
public void createCars() {

    BetterCar petrolCar = new BetterCar(new PetrolEngine());

}
```

```java
}
```

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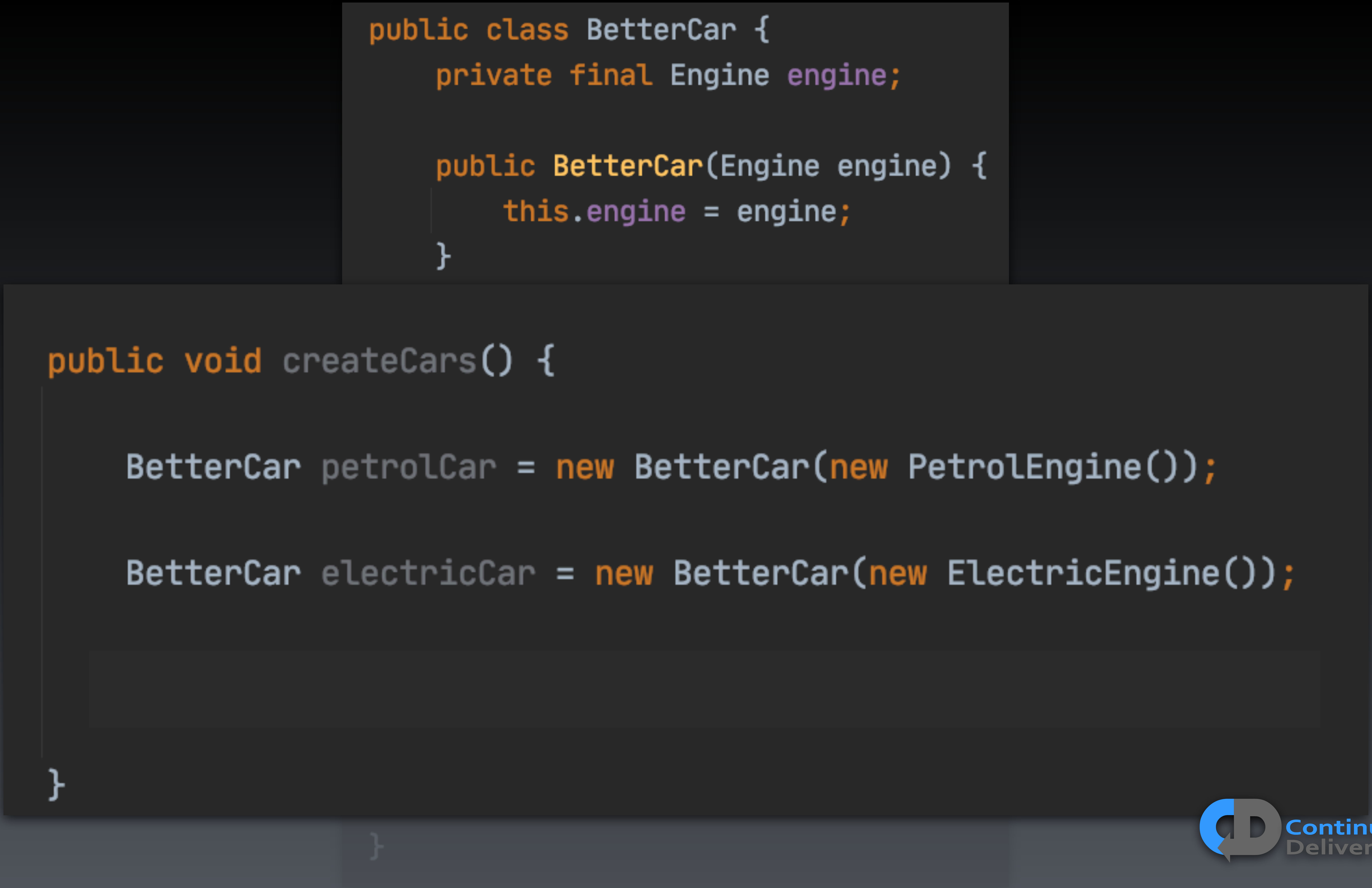
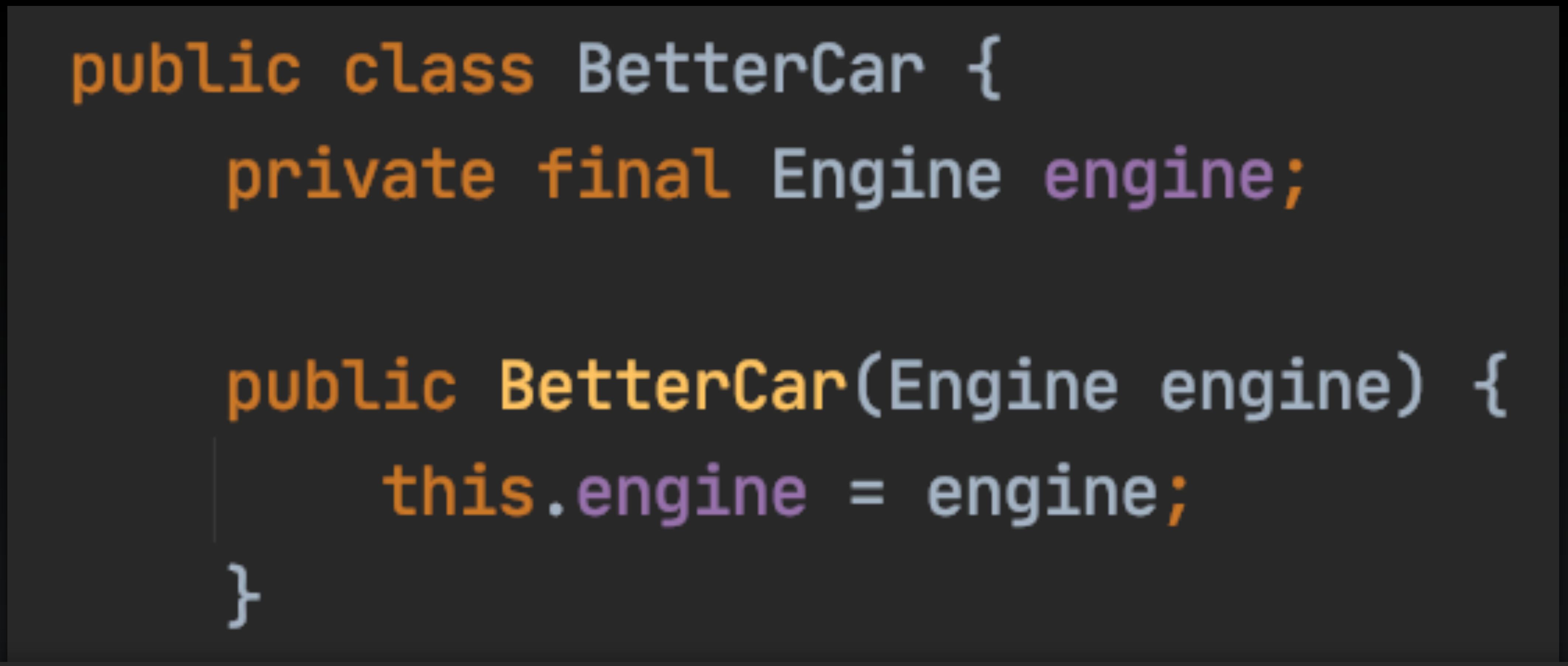


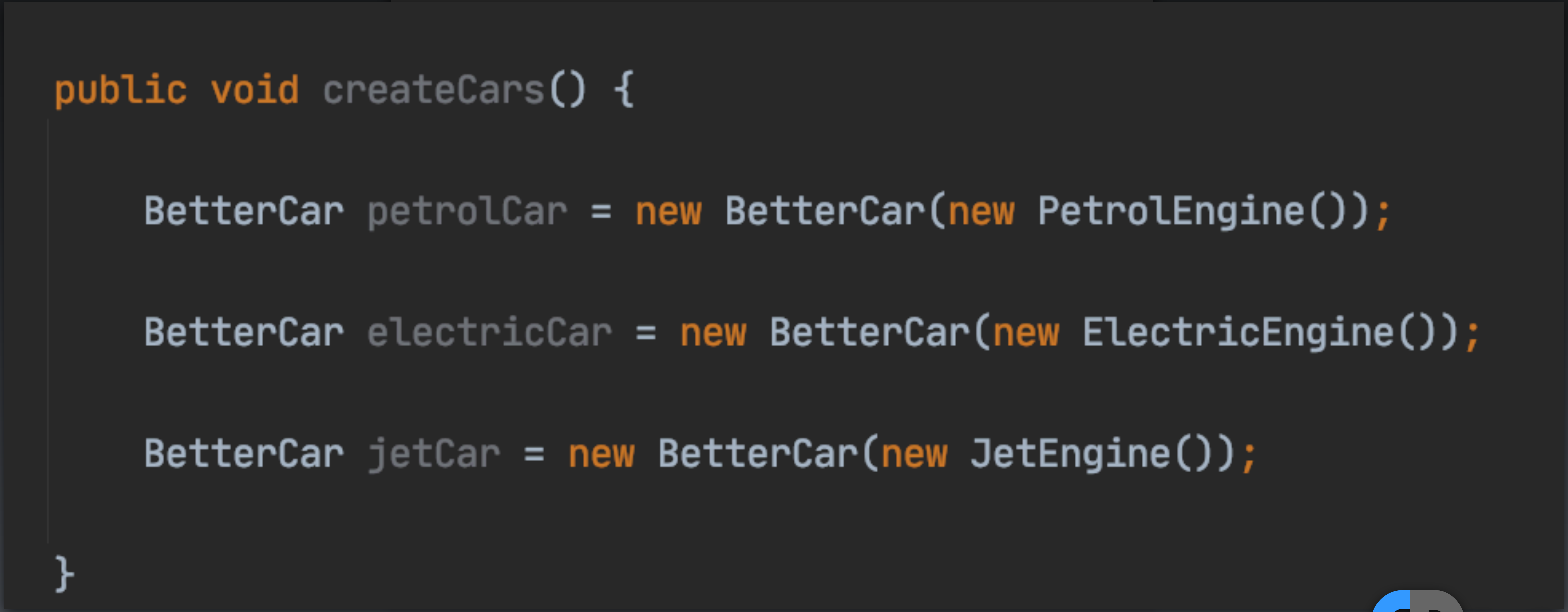
```java
public class BetterCar {
    private final Engine engine;

    public BetterCar(Engine engine) {
        this.engine = engine;
    }
```

```java
public void createCars() {

    BetterCar petrolCar = new BetterCar(new PetrolEngine());

    BetterCar electricCar = new BetterCar(new ElectricEngine());

}
```

```java
}
```



```
public class BetterCar {
    private final Engine engine;

    public BetterCar(Engine engine) {
        this.engine = engine;
    }
```



```
public void createCars() {

    BetterCar petrolCar = new BetterCar(new PetrolEngine());

    BetterCar electricCar = new BetterCar(new ElectricEngine());

    BetterCar jetCar = new BetterCar(new JetEngine());

}
```

```
}
```

Working Experimentally

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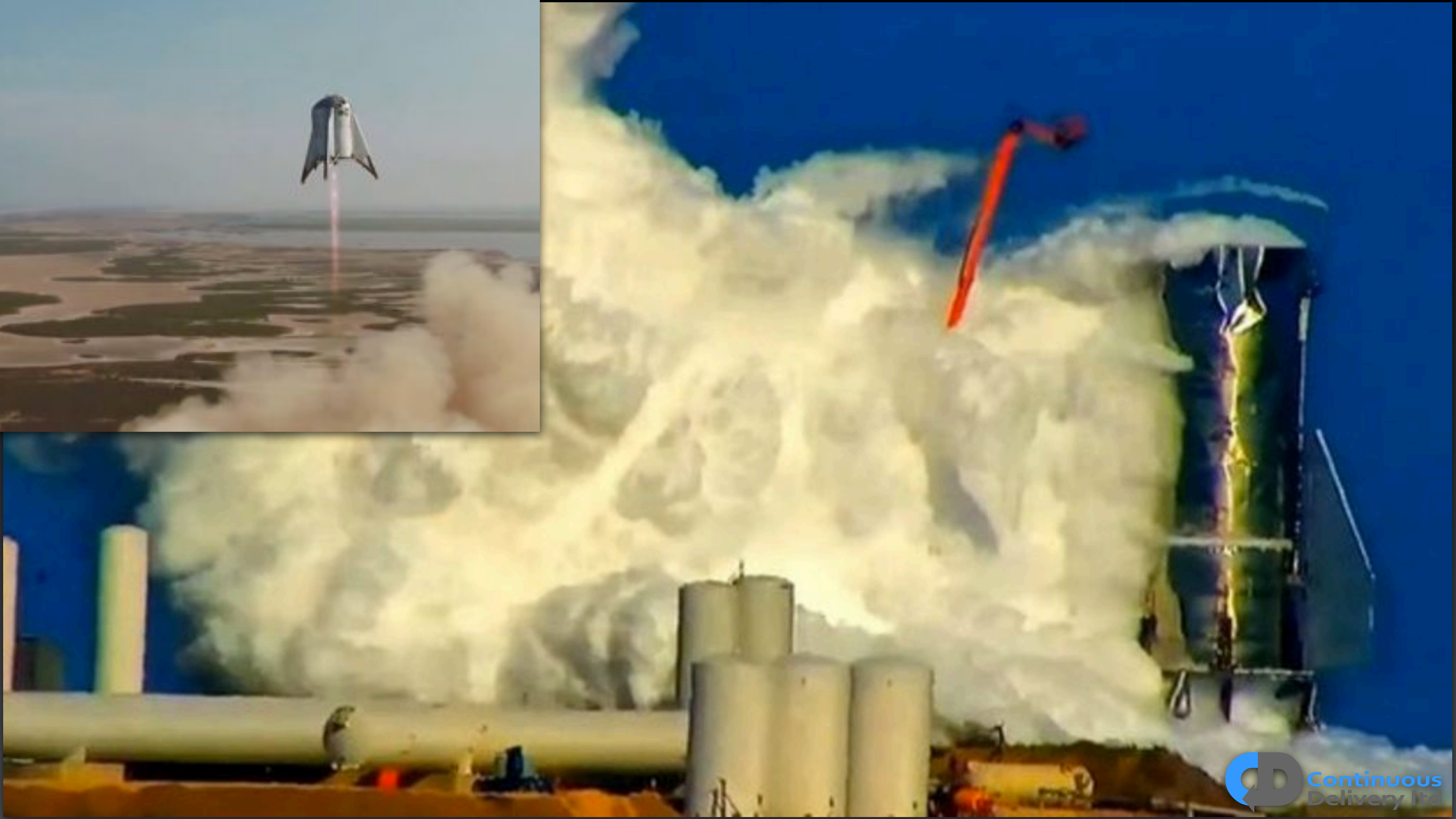

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Small Steps

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Gather Feedback

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Predict the Results

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Control the Variables

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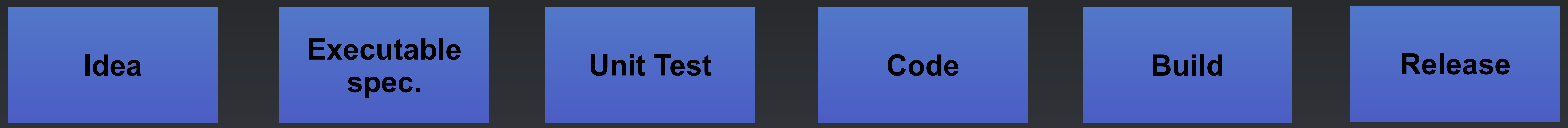
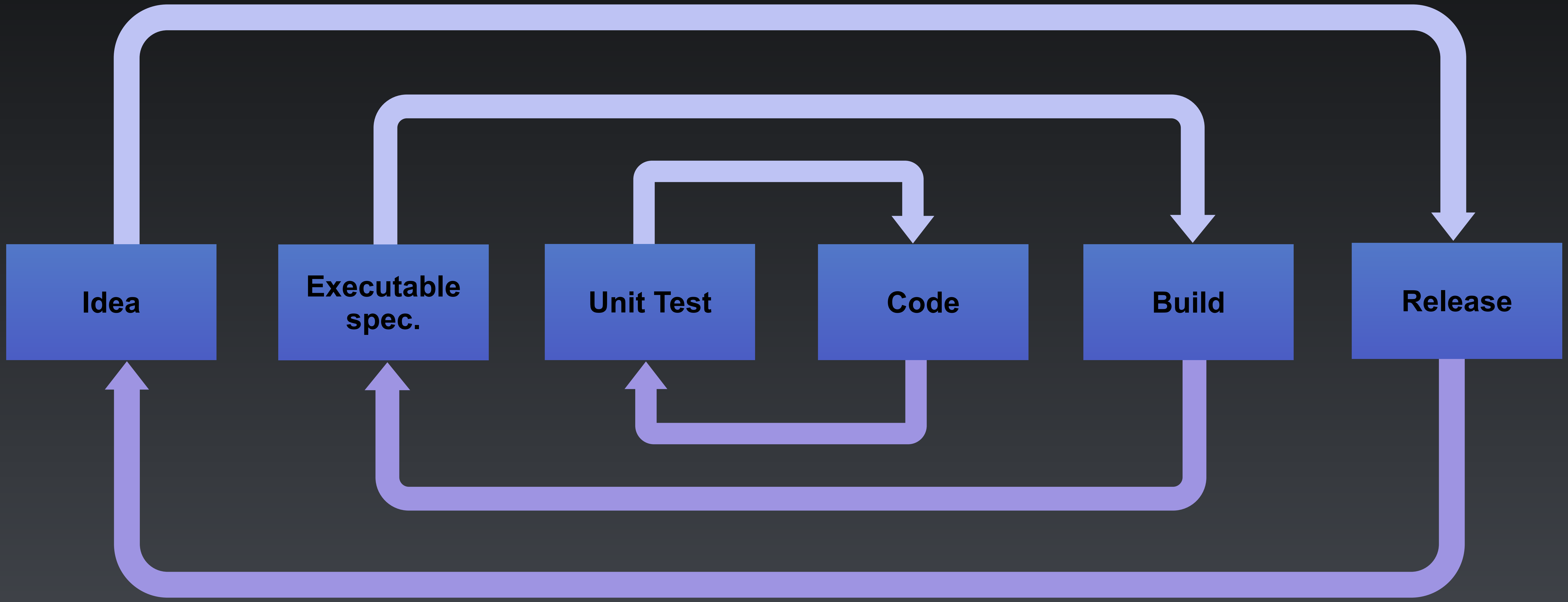
What Really Works?

Smart Automation - a repeatable, reliable process for releasing software



What Really Works?

Smart Automation - a repeatable, reliable process for releasing software



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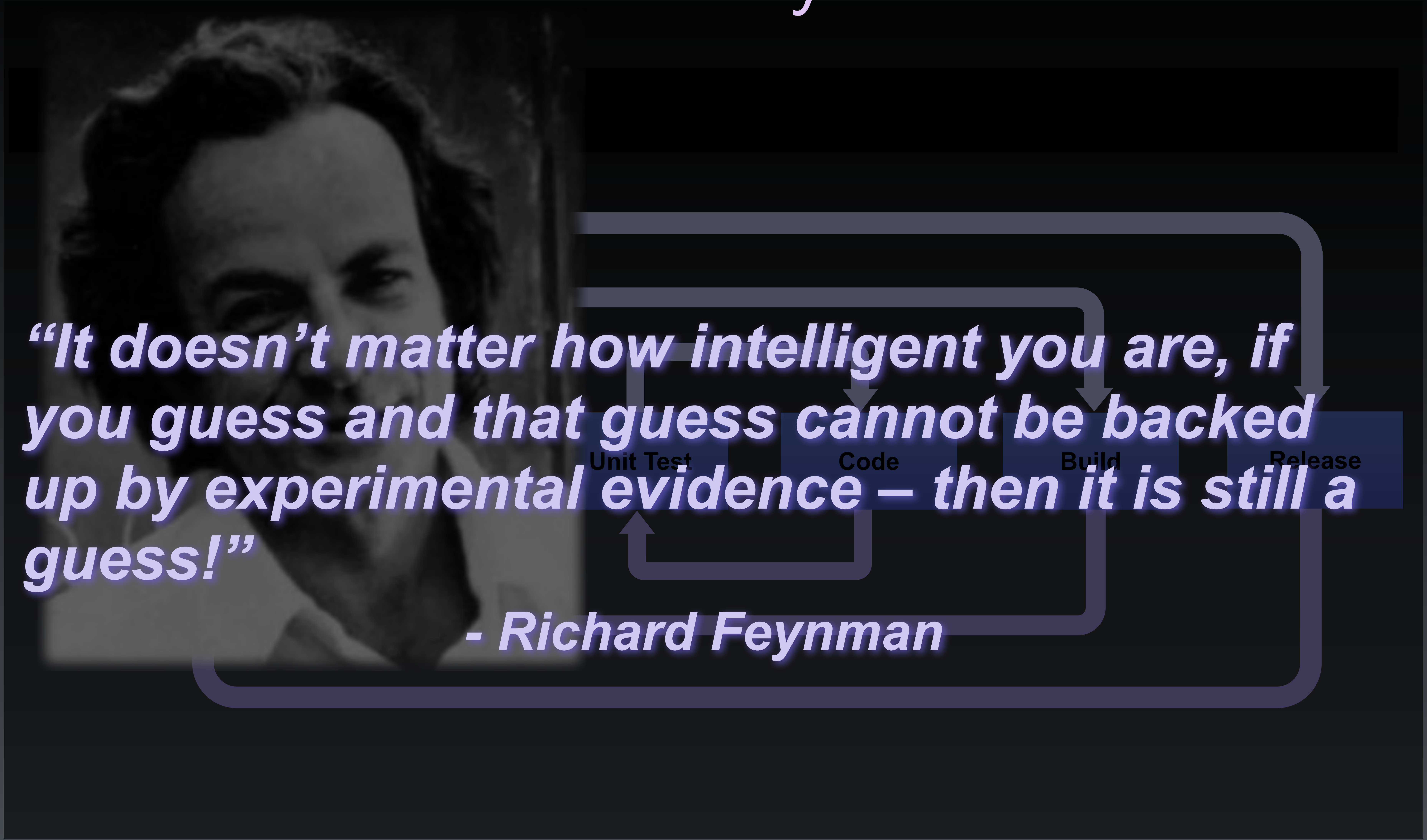
What Really Works?



"It doesn't matter how intelligent you are, if you guess and that guess cannot be backed up by experimental evidence – then it is still a guess!"

- Richard Feynman

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Speed

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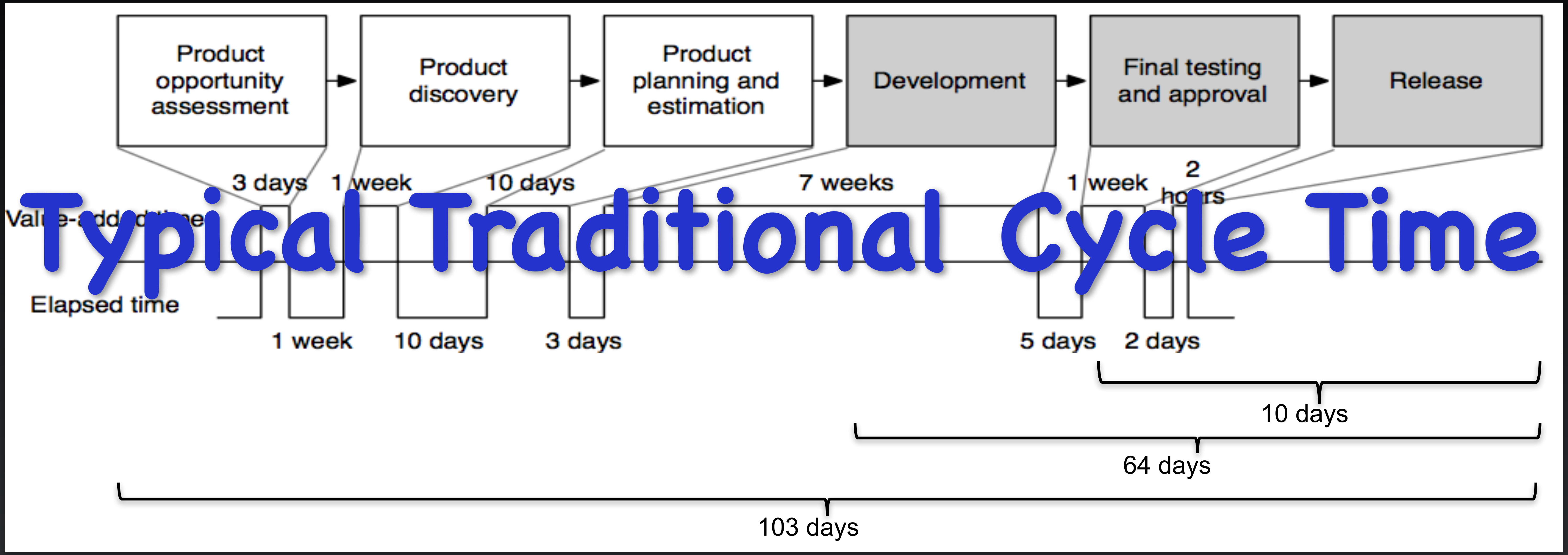
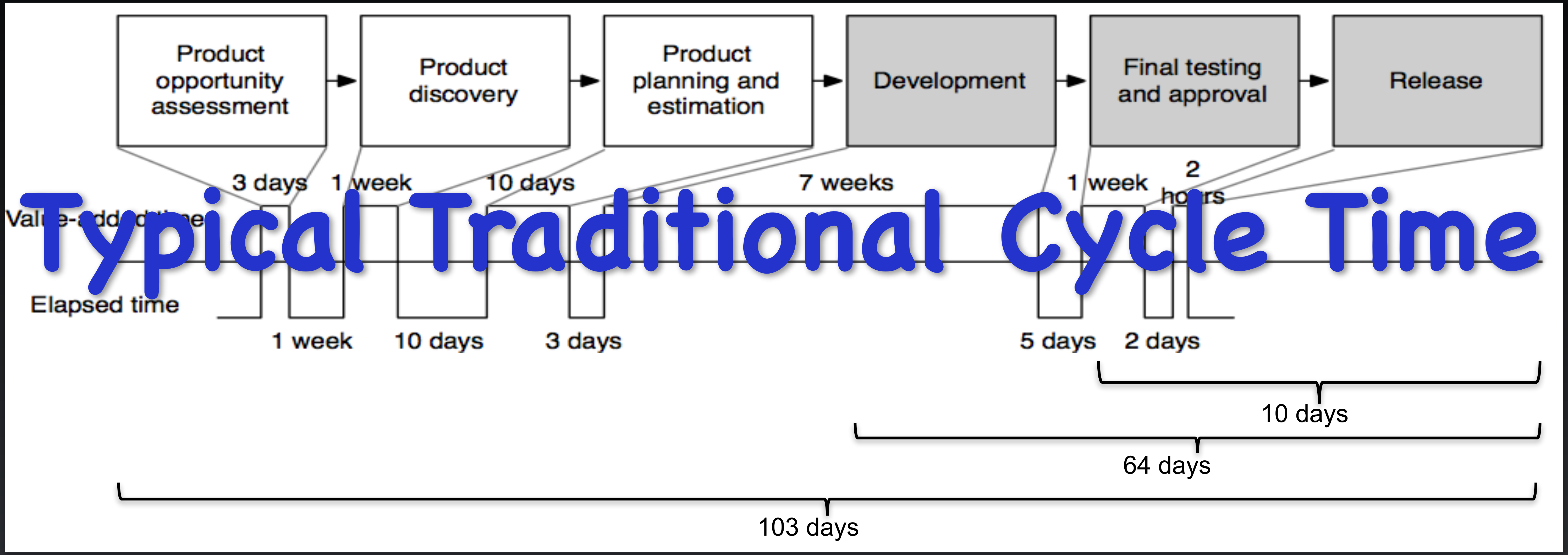
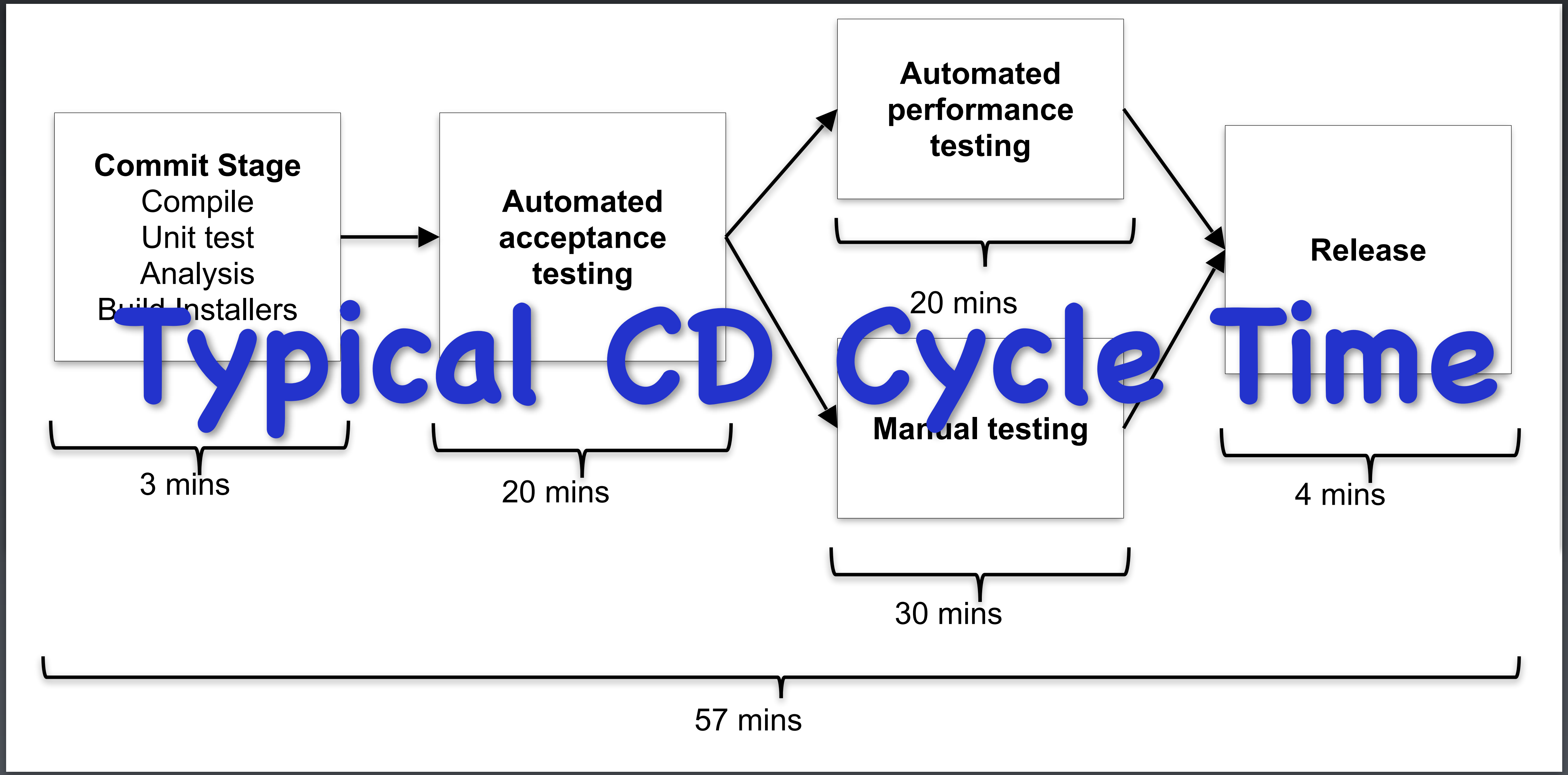
Cycle-Time


Product opportunity assessment
Product discovery
Product planning and estimation
Development
Final testing and approval
Release
3 days
1 week
10 days
7 weeks
1 week
2 hours
Value-added time
Elapsed time
1 week
10 days
3 days
5 days
2 days
10 days
64 days
103 days
Typical Traditional Cycle Time

Cycle-Time





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What Is Continuous Delivery?

“Our highest priority is to satisfy the customer through early and continuous delivery of valuable software.”

- **The first principle of the agile manifesto.**
- **The logical extension of continuous integration.**
- **A holistic approach to development.**
- **Every commit creates a release candidate.**
- **Finished means released into the hands of users, delivering value!**

The Principles of Continuous Delivery

- Create a repeatable, reliable process for releasing software.
- Automate almost everything.
- Keep everything under version control.
- If it hurts, do it more often – bring the pain forward.
- Build quality in.
- Done means released.
- Everybody is responsible for the release process.
- Improve continuously.

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“If Agile software development was the opening act to a great performance, Continuous Delivery is the headliner.”

Forrester Research 2013

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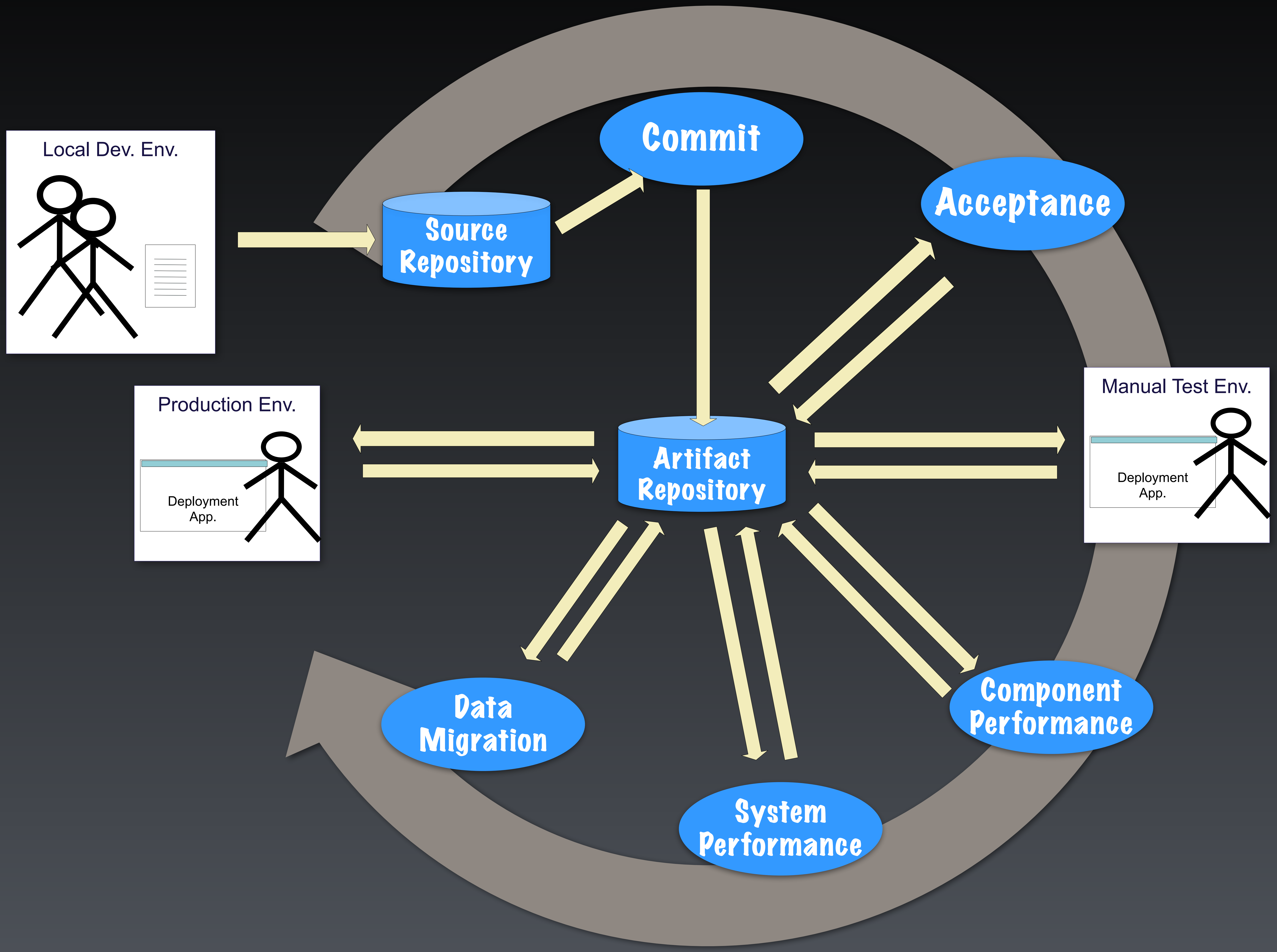

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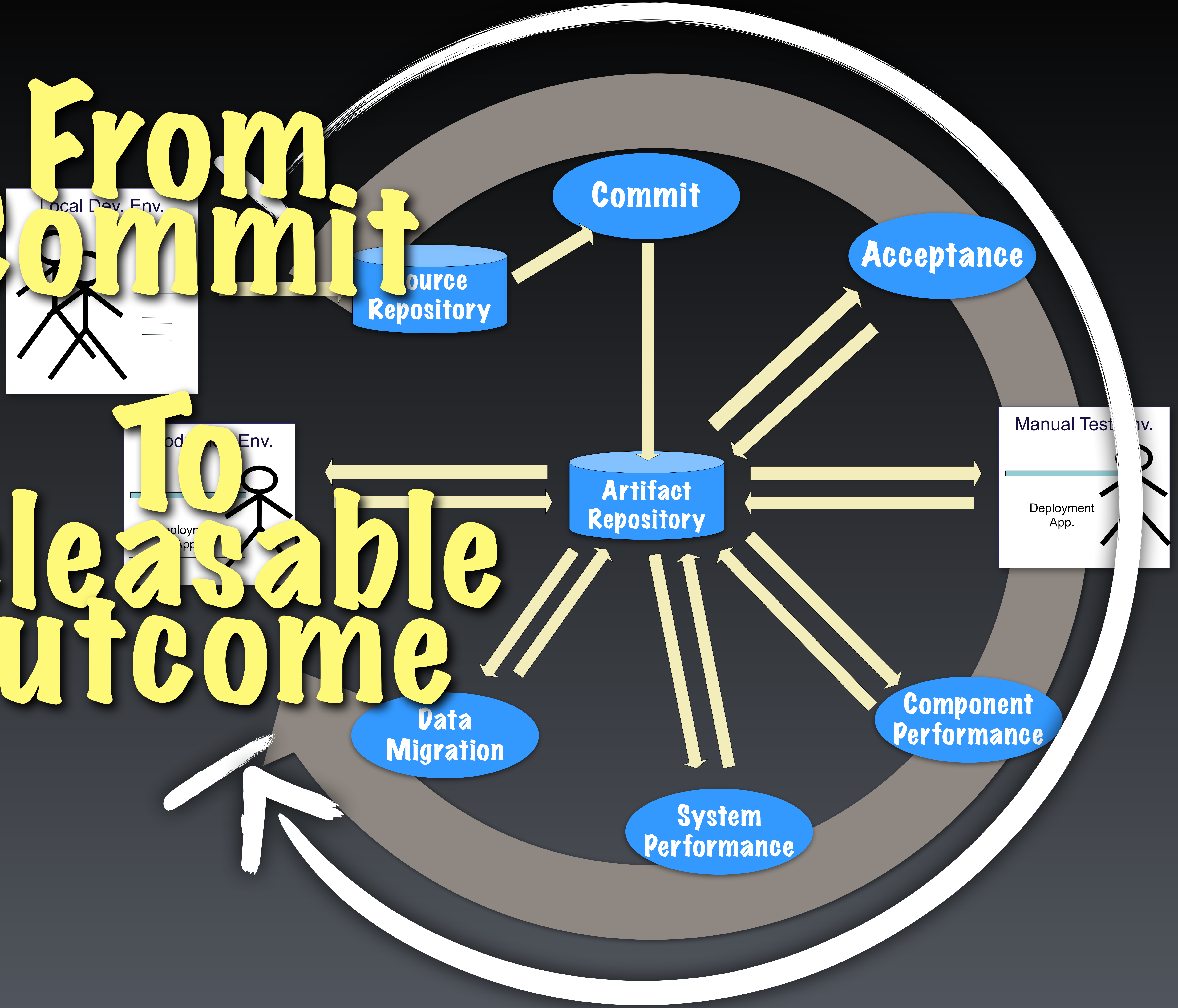
From Commit To Releasable Outcome



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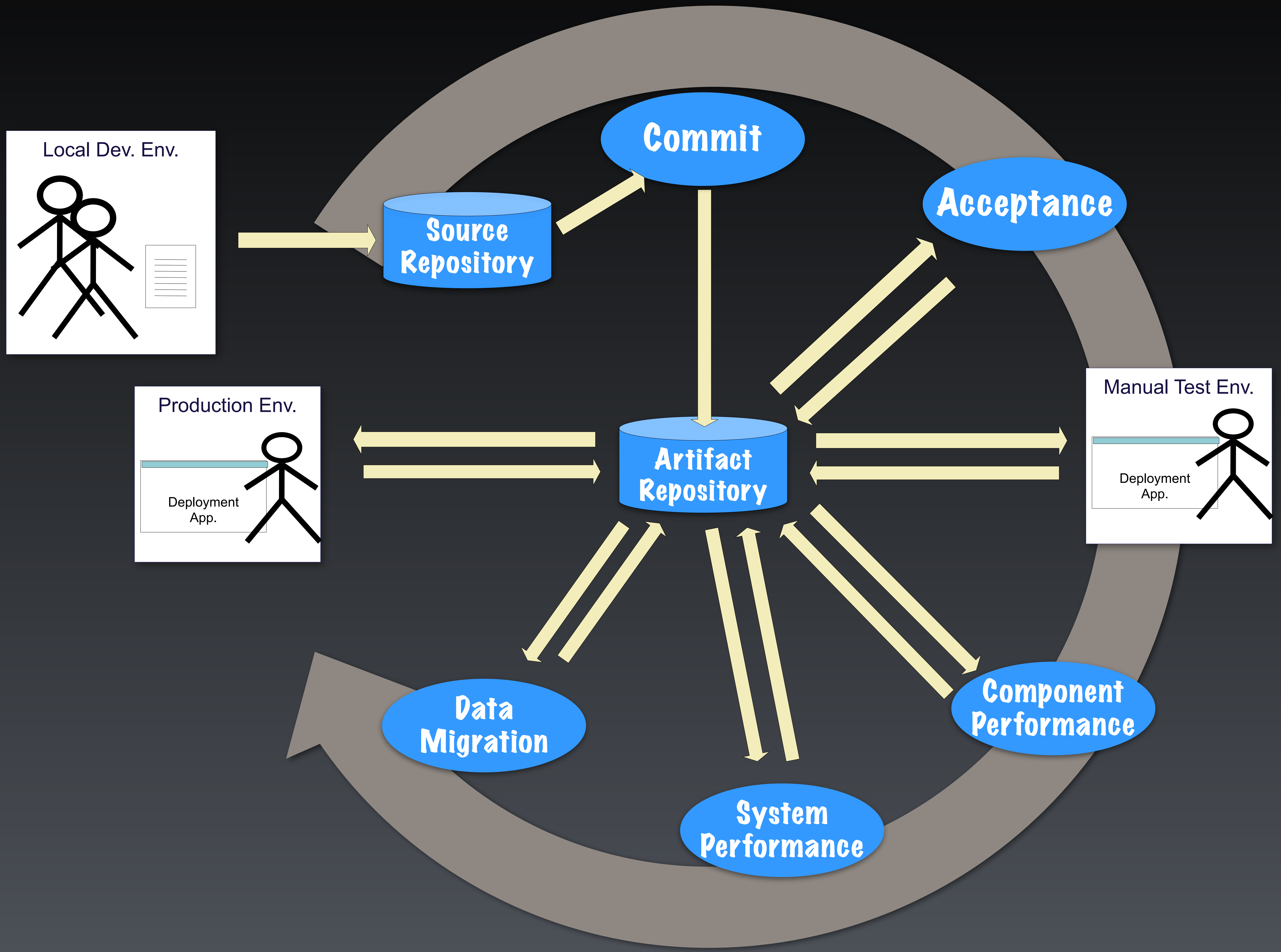

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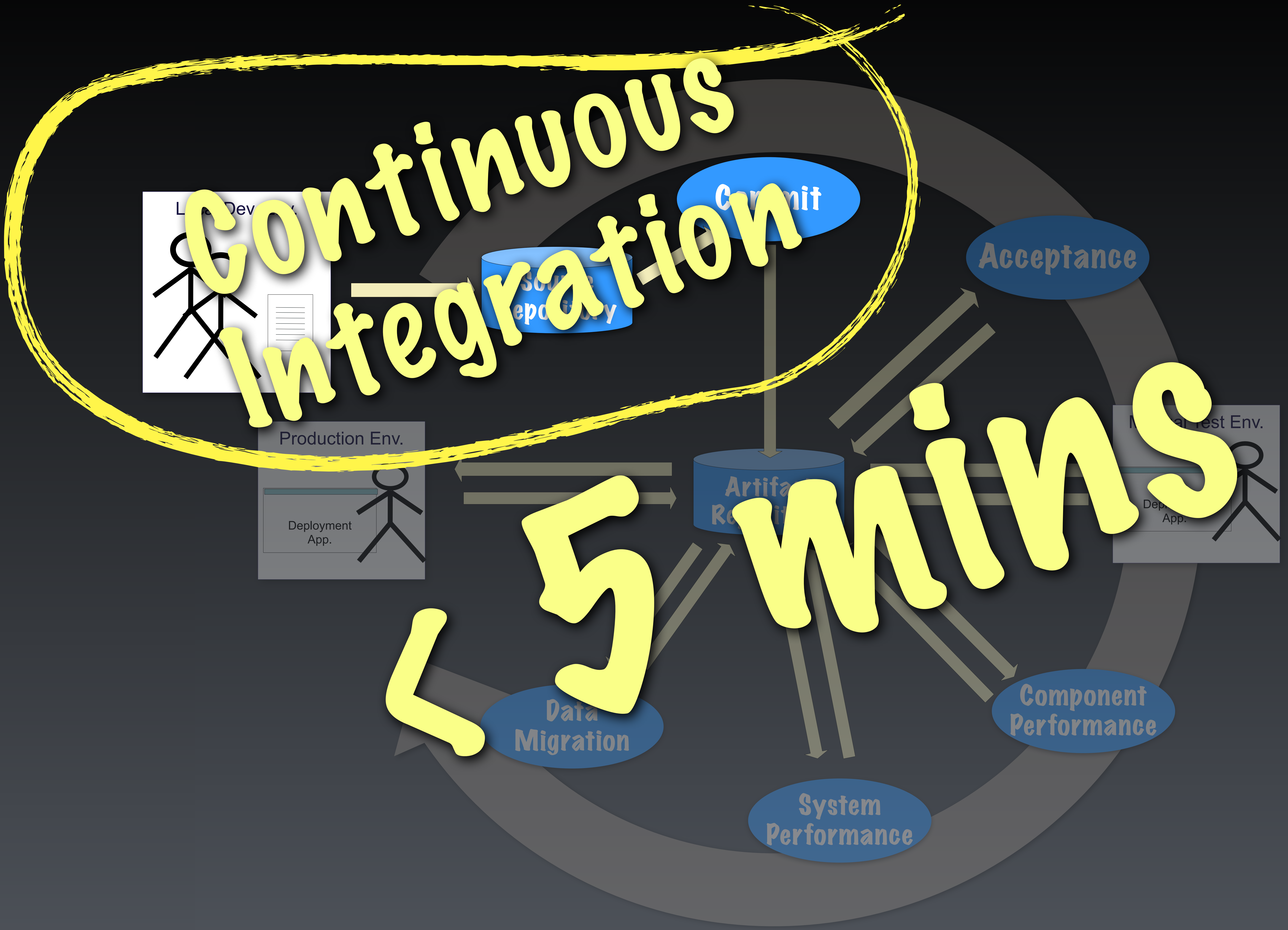

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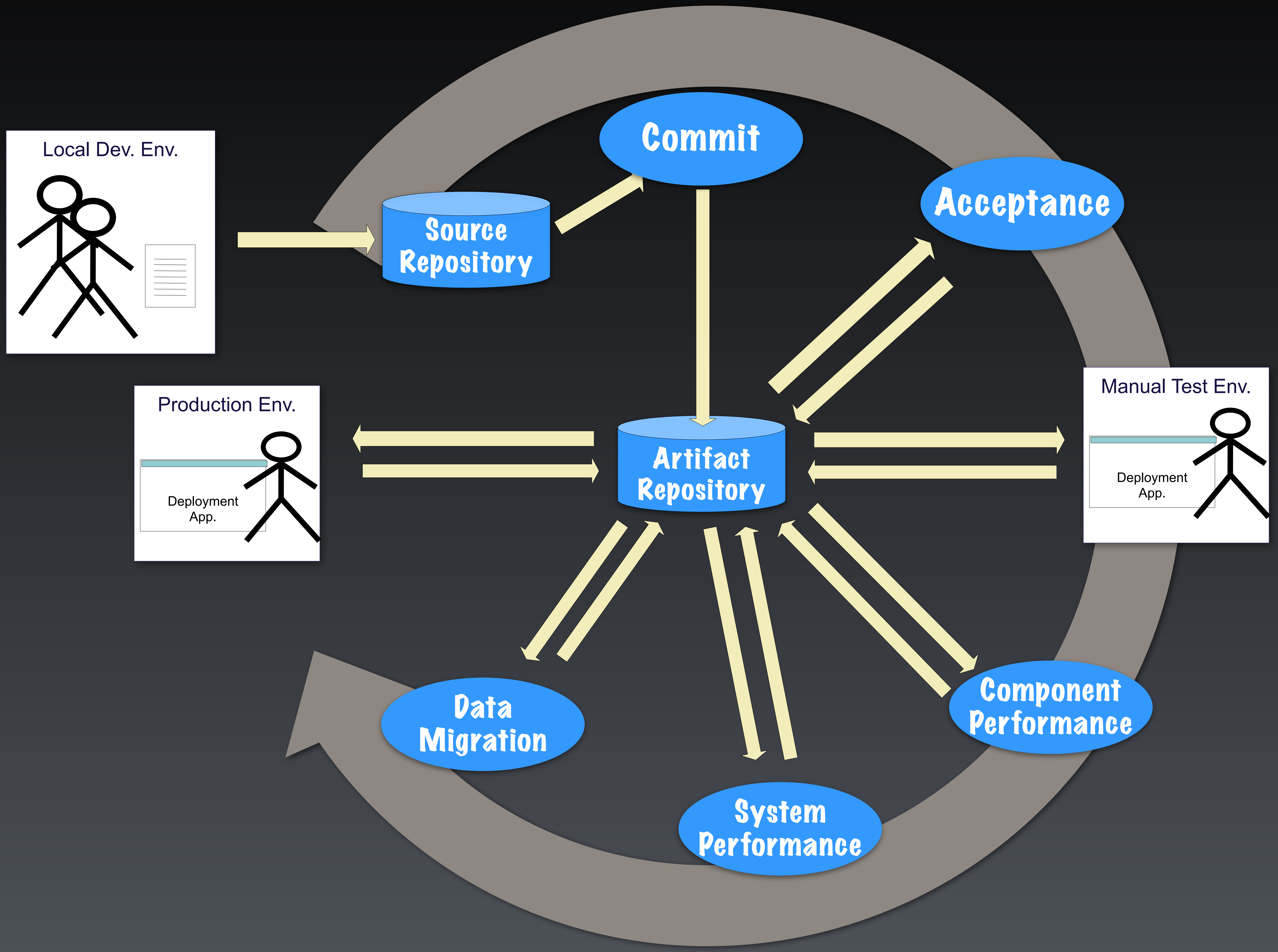

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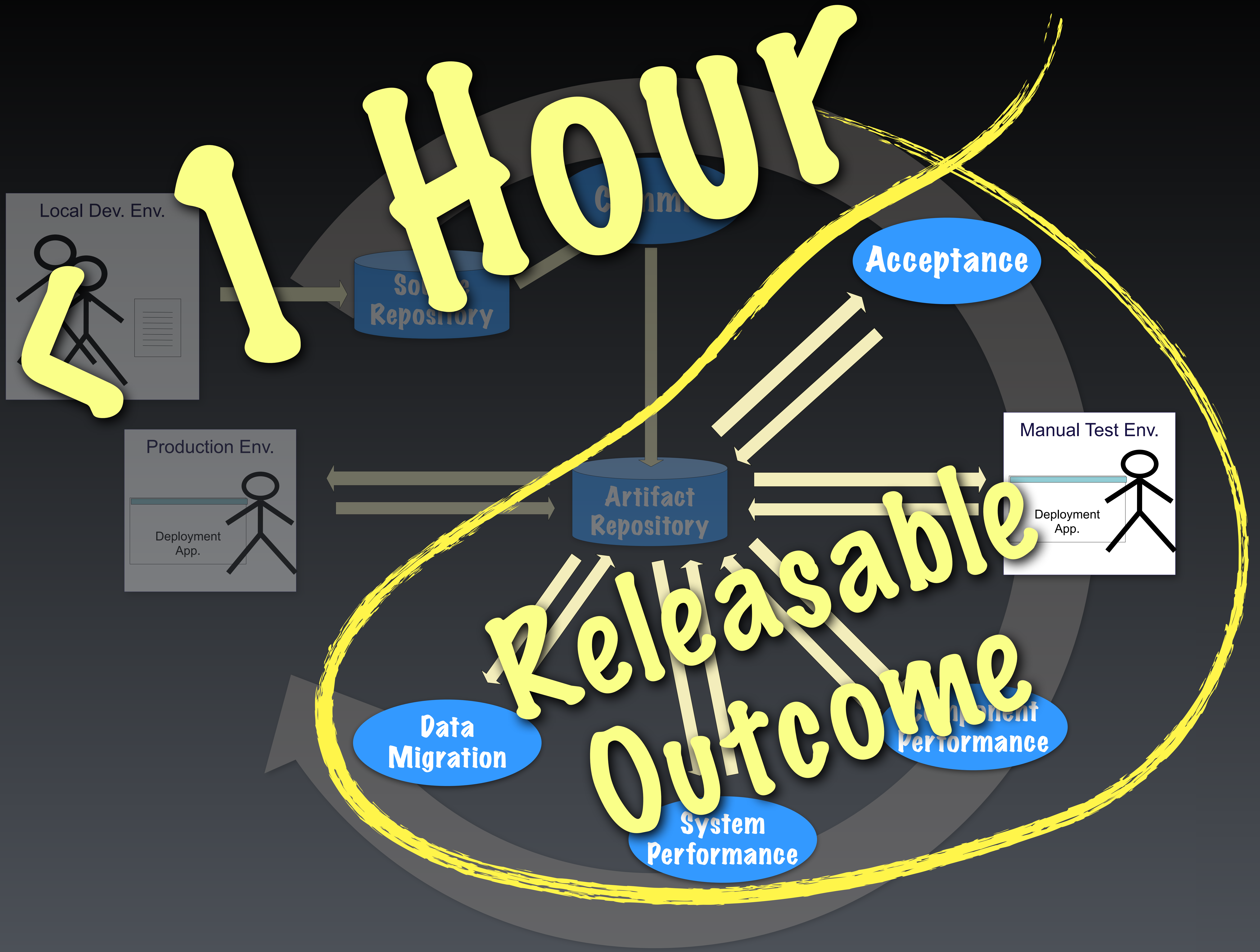

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Engineering: Design, Simulate, Build

Alan Kay

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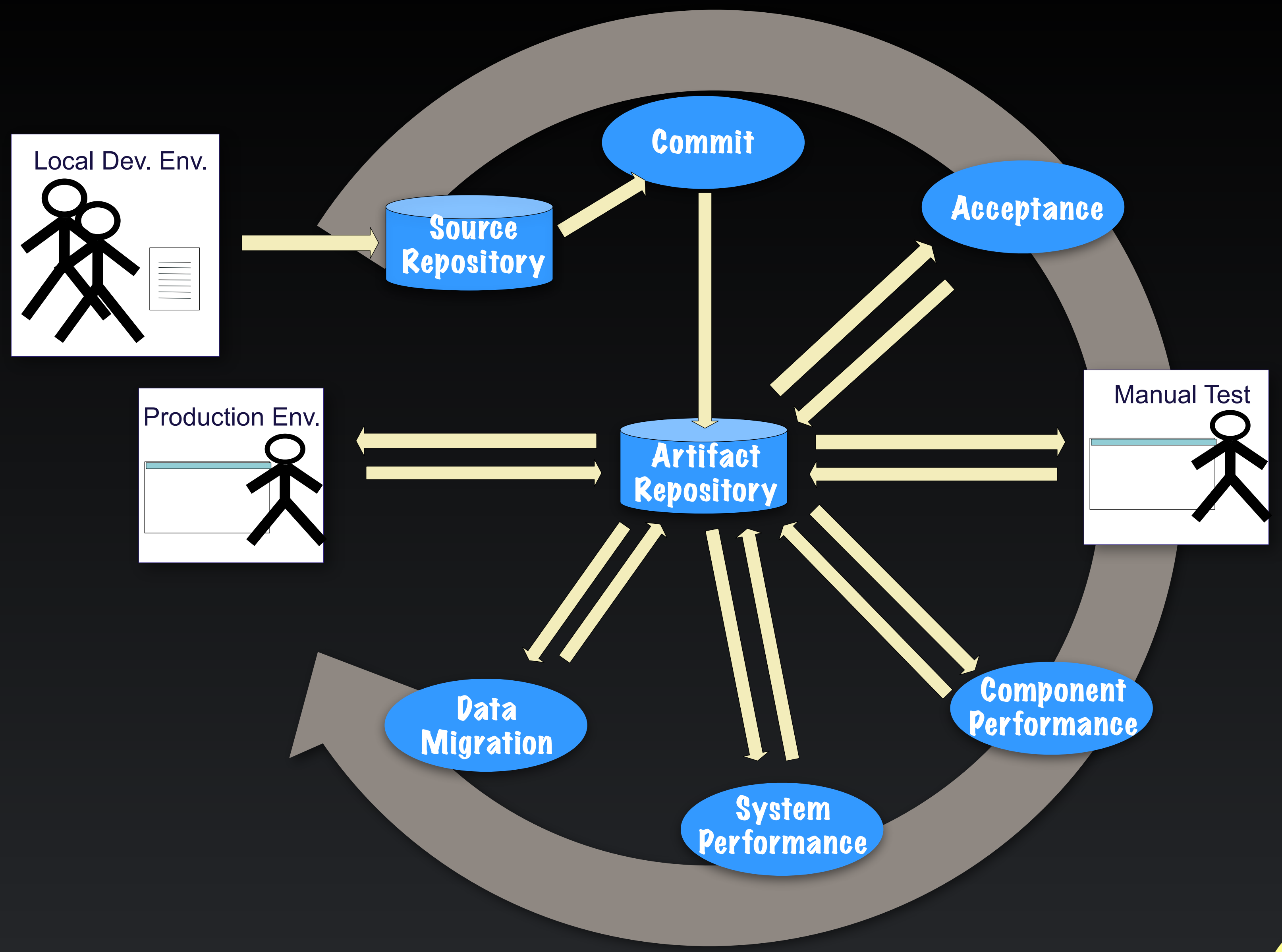

Engineering: Design, Simulate, Build

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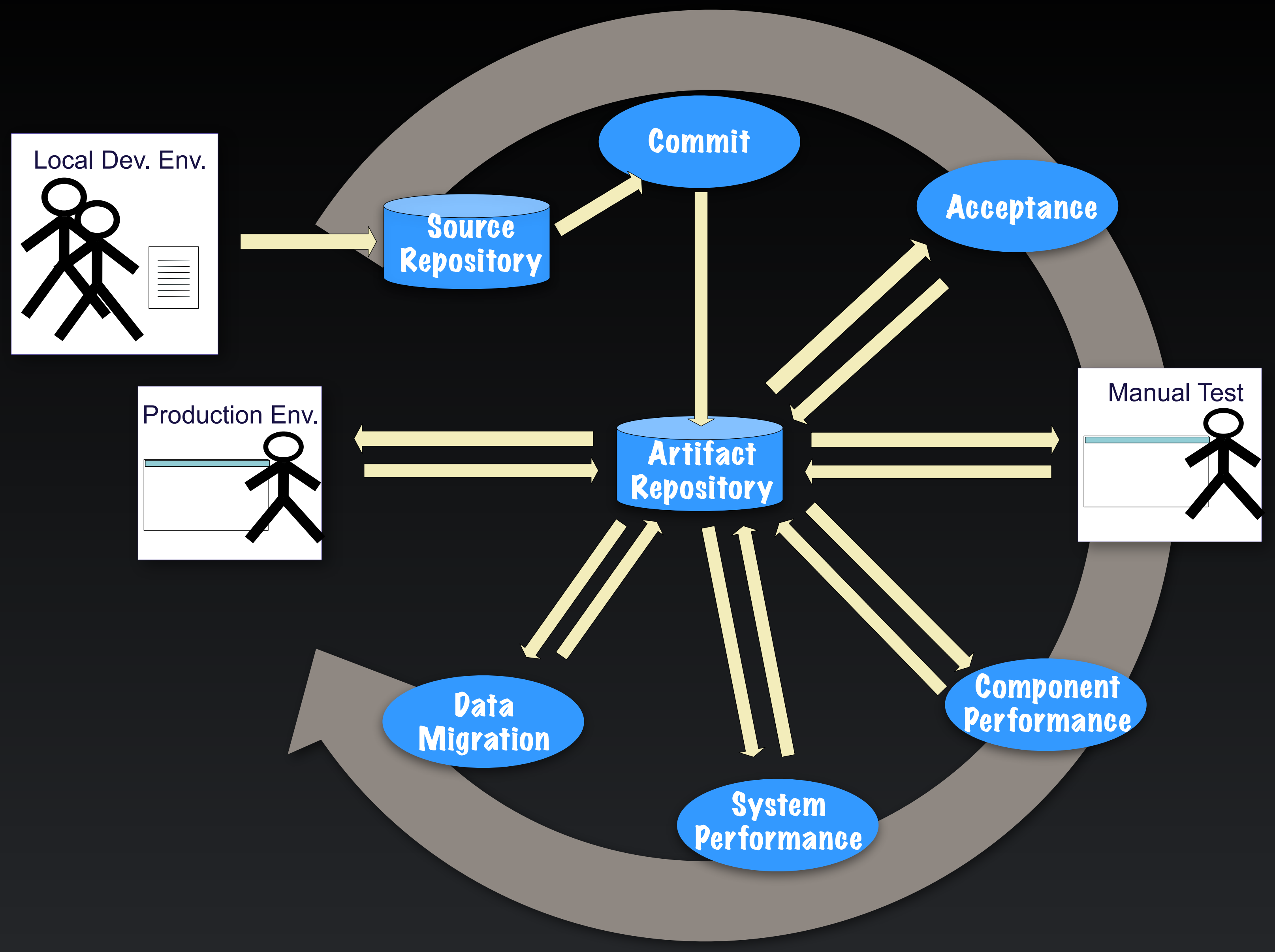

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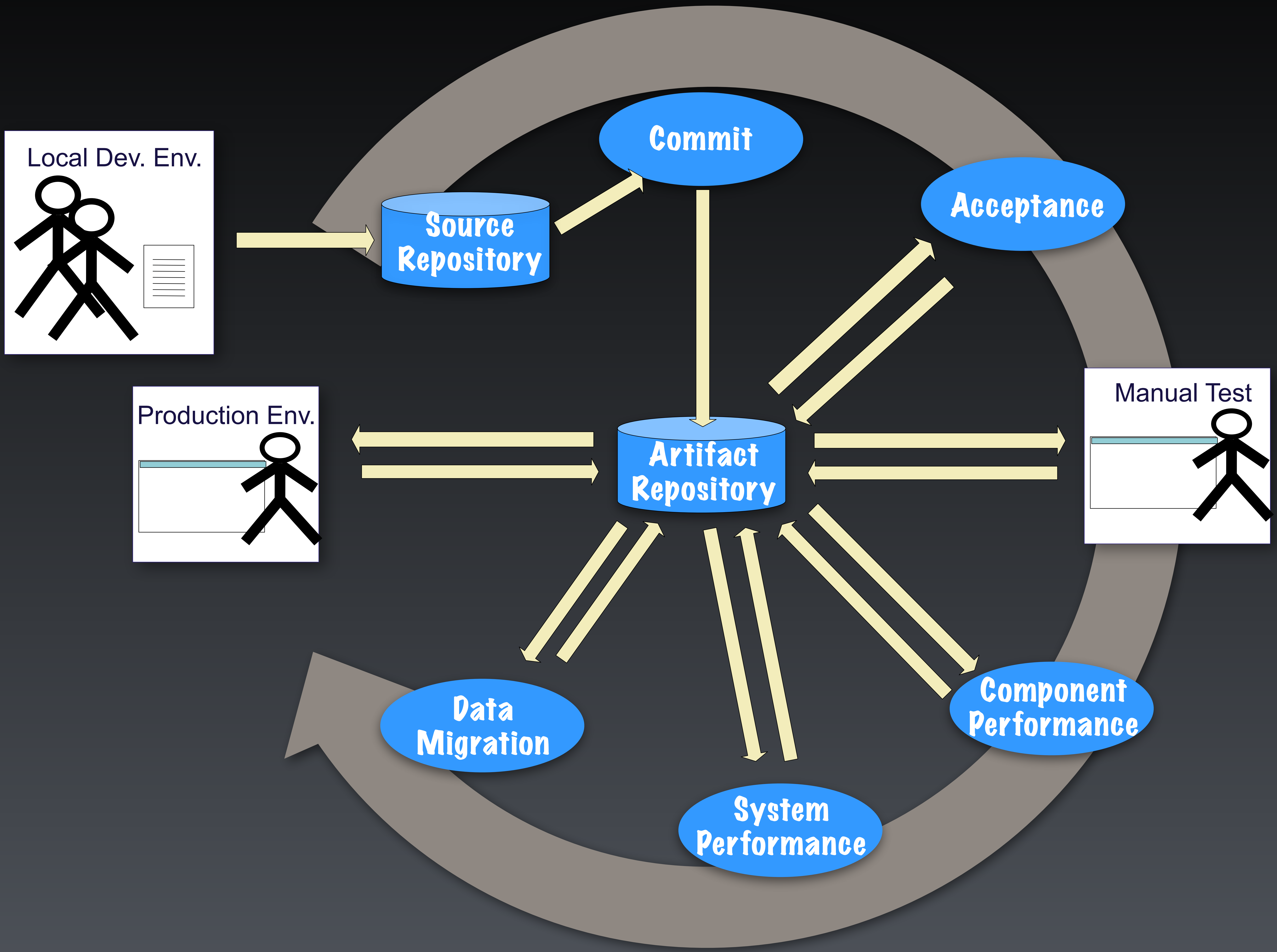

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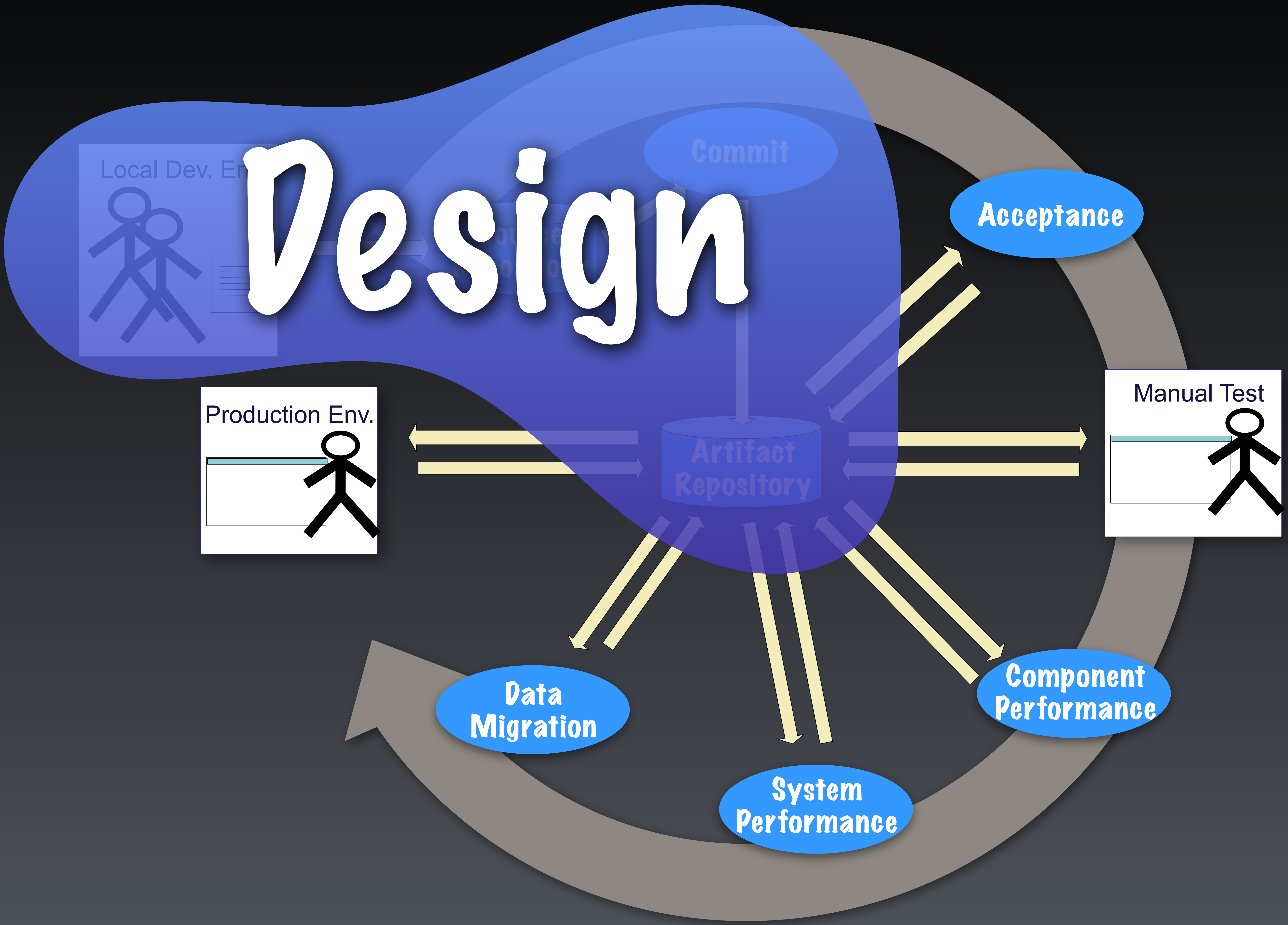
Design



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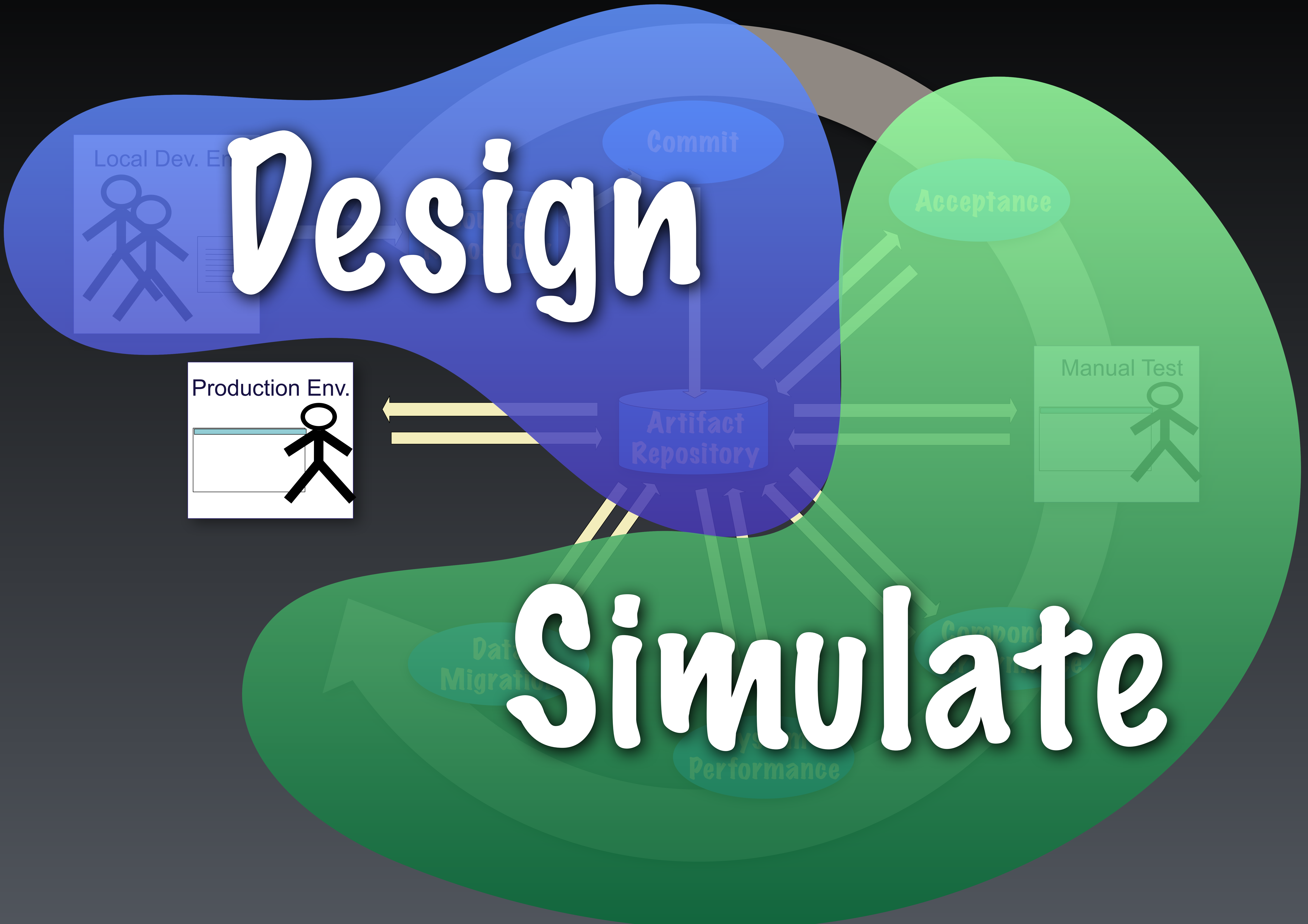

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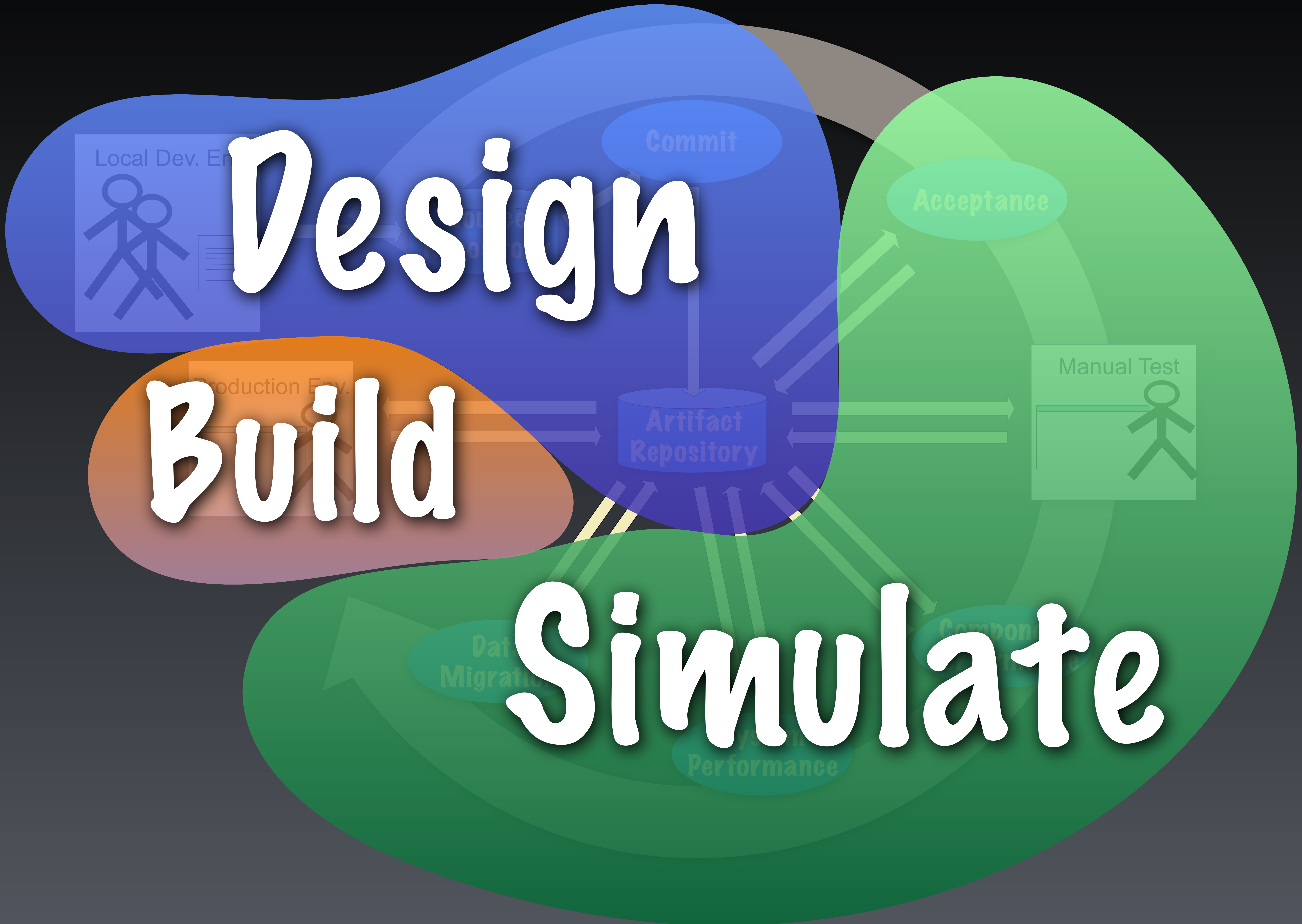

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https://bit.ly/CDonYT

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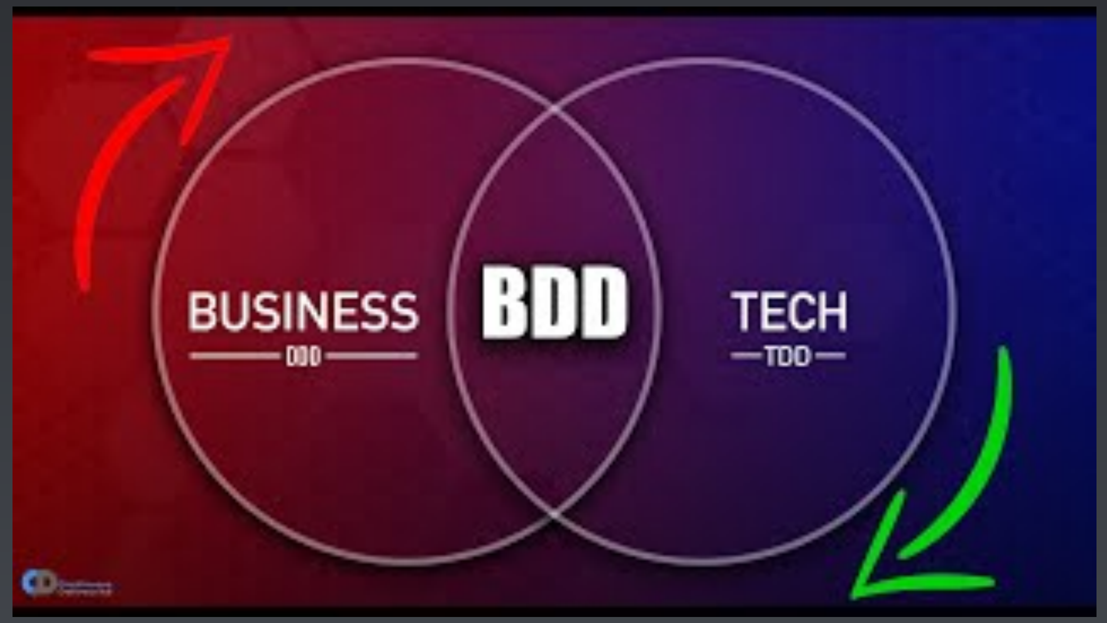

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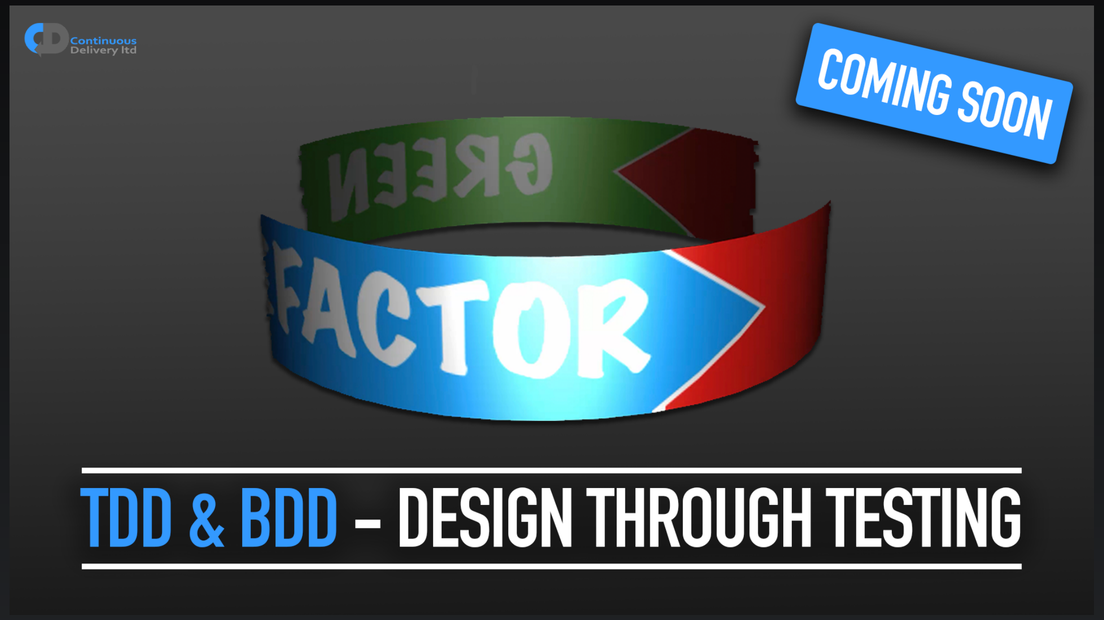

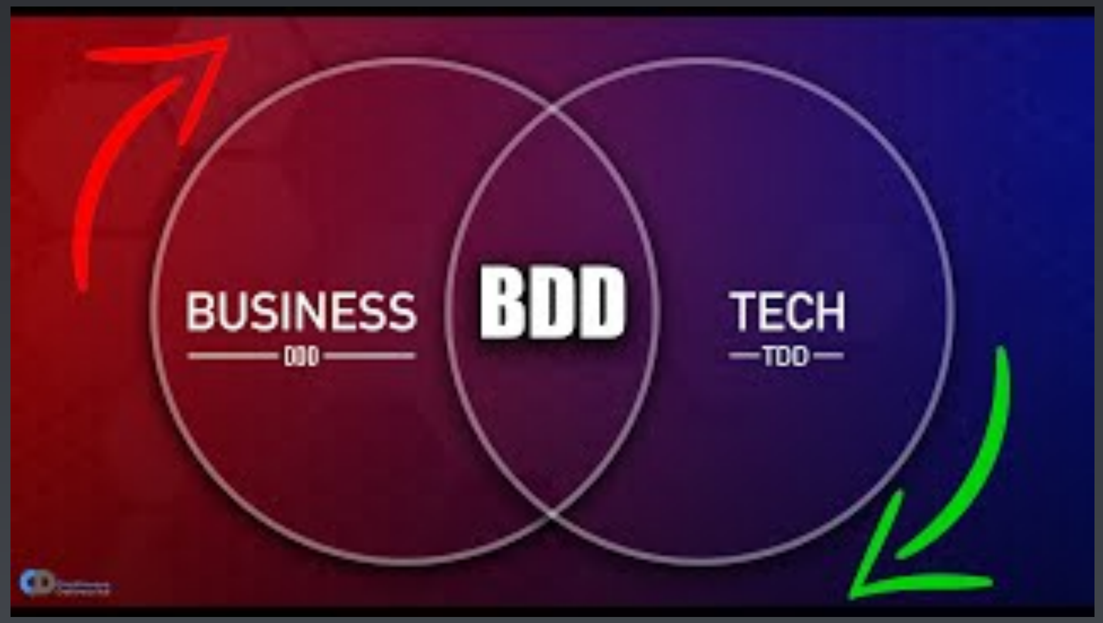

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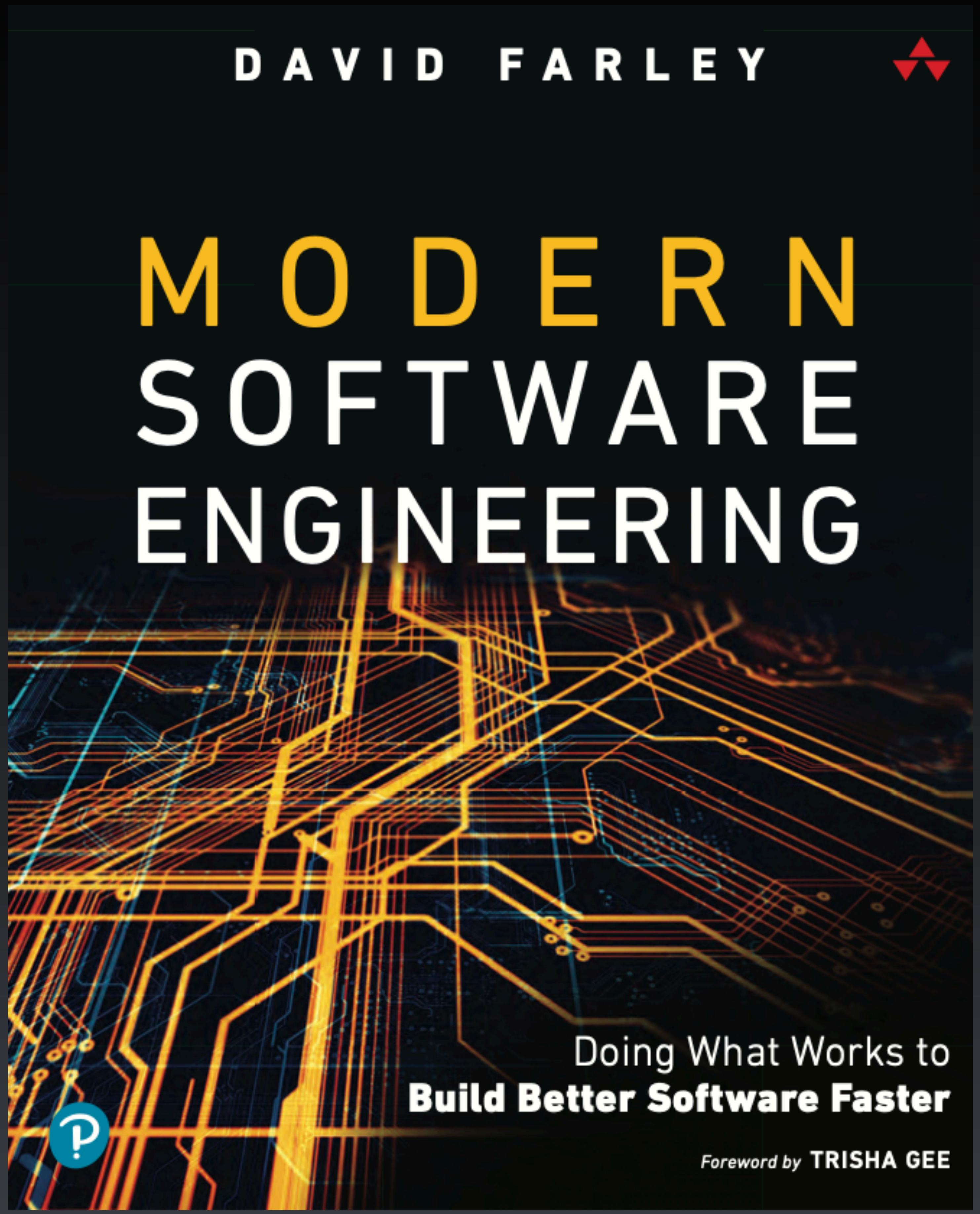
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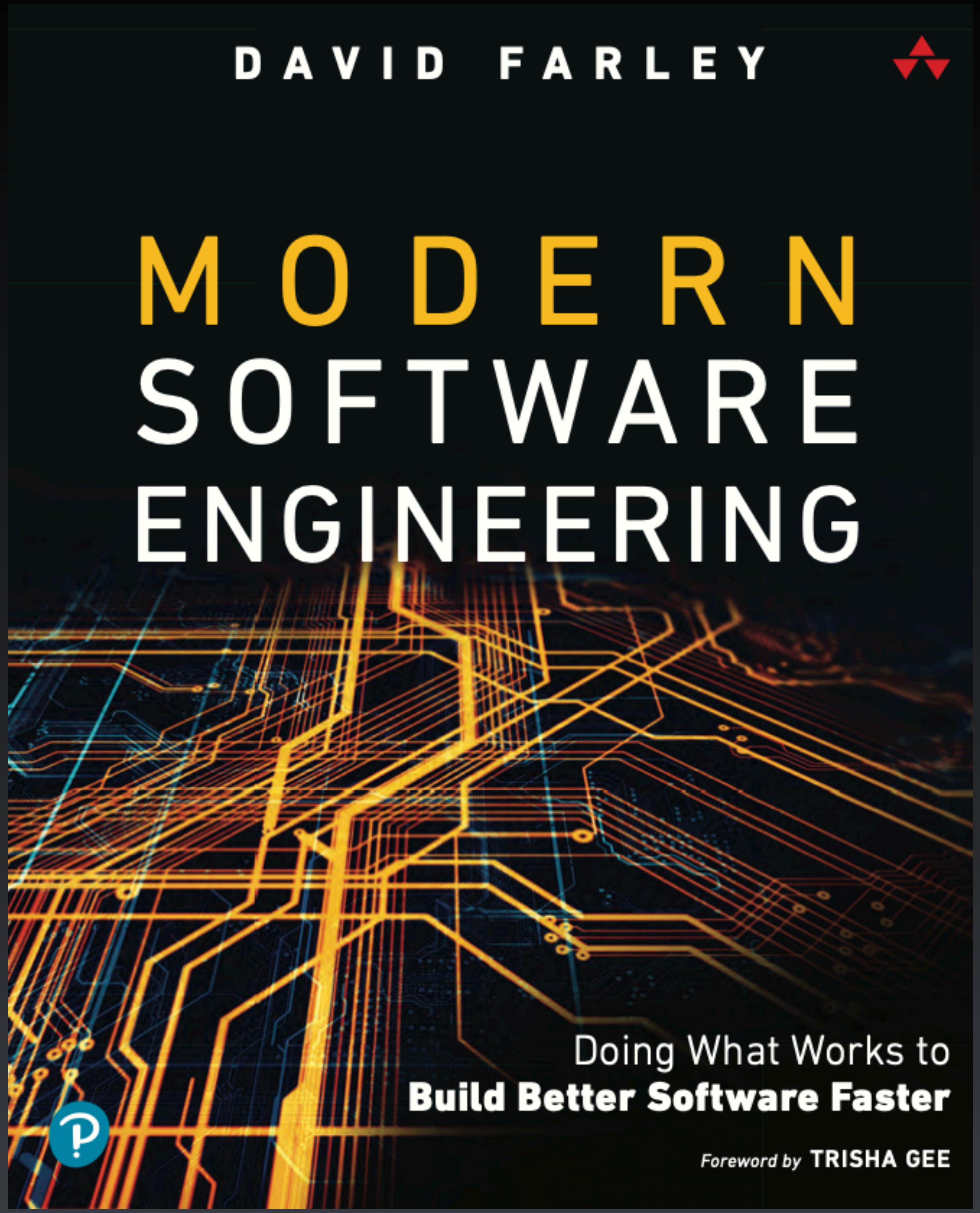

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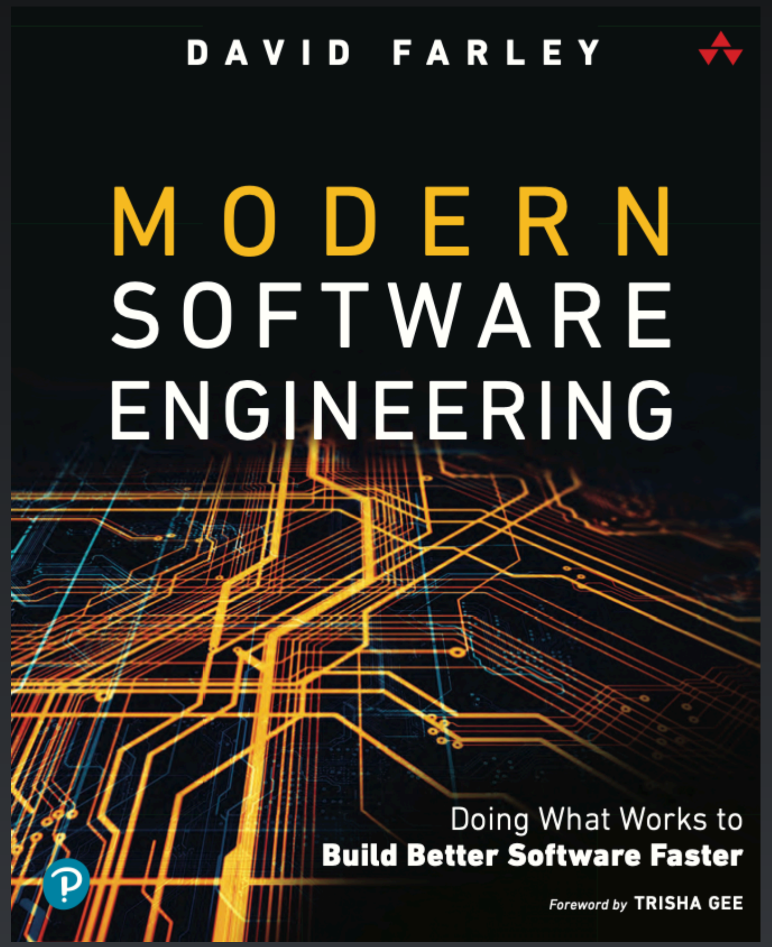
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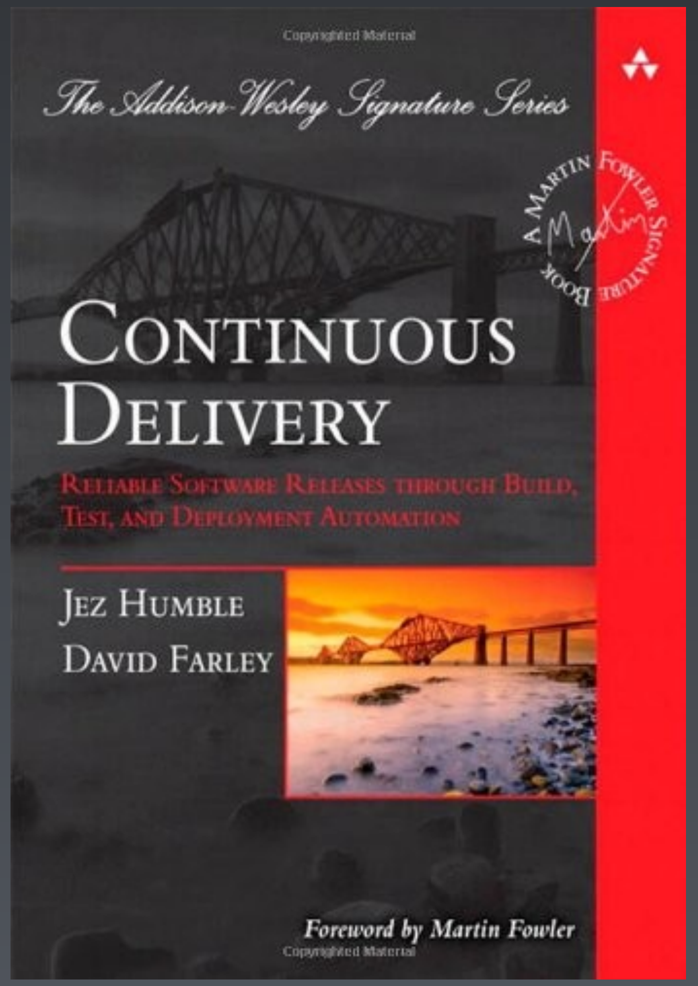
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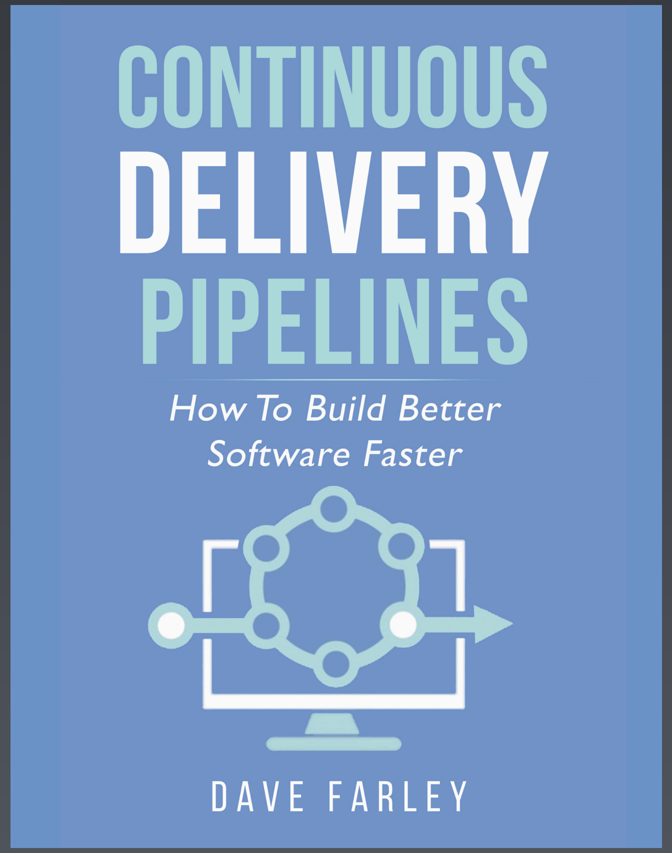
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