Spring Into Better Unit Testing

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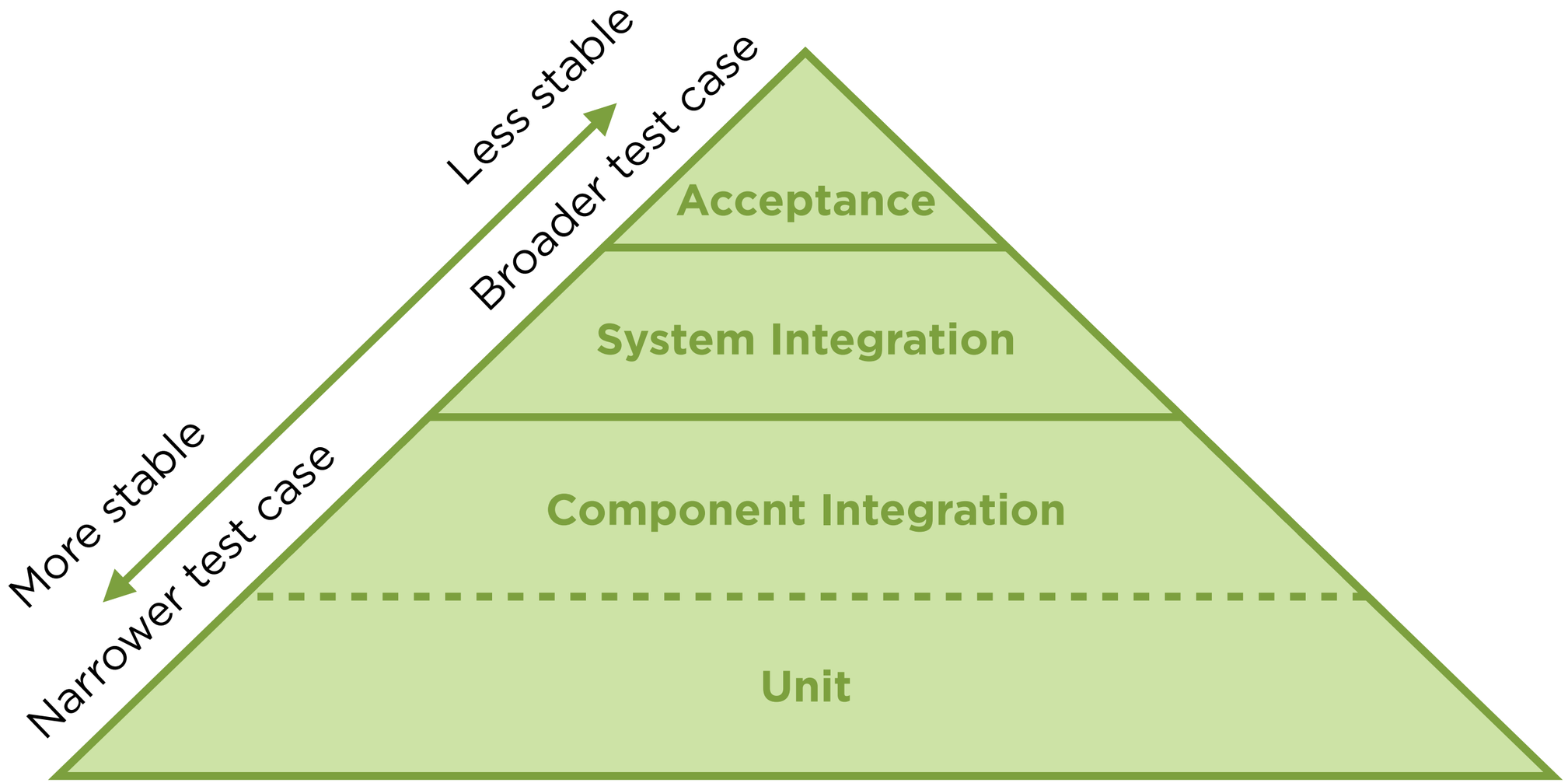
What is Automated Testing?



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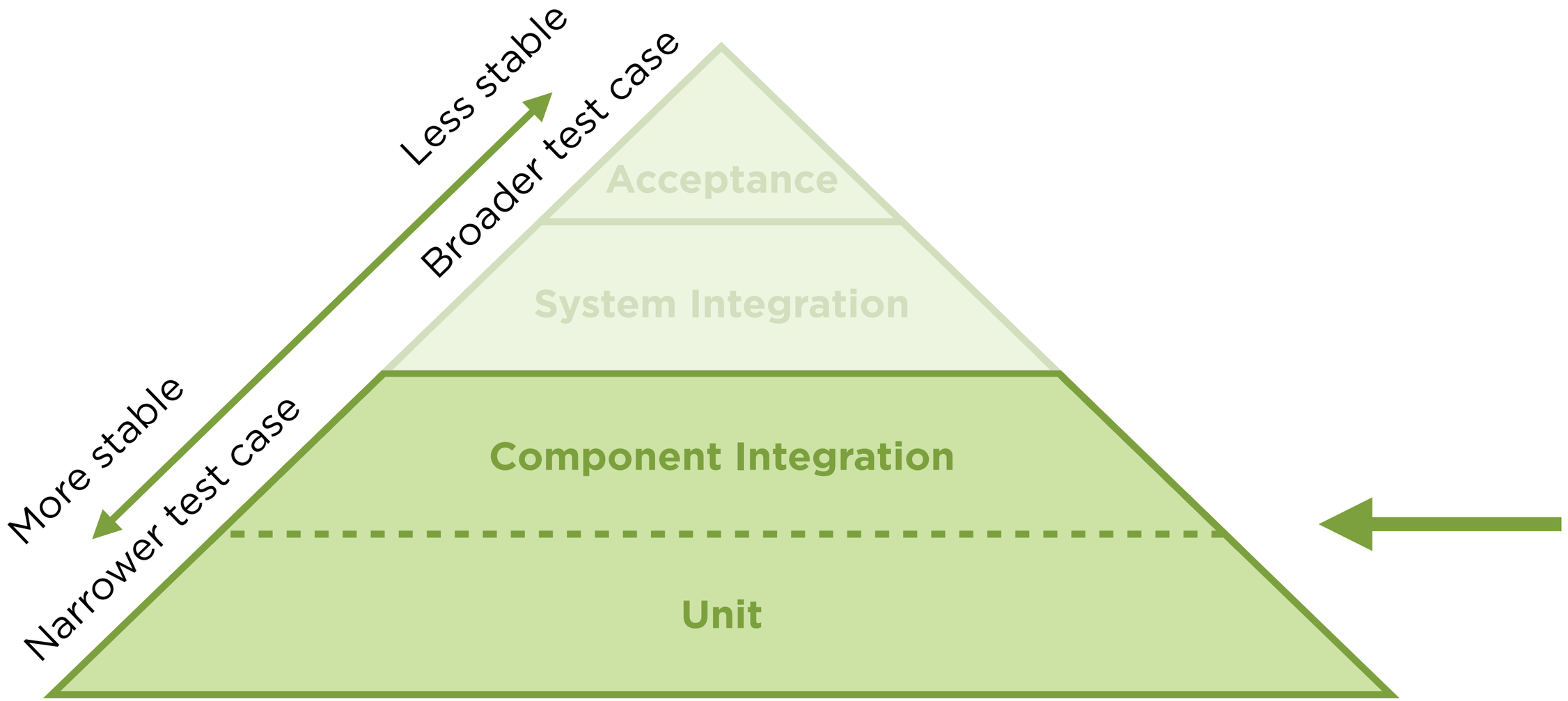


Benefits of Writing Automated Tests

Verify correctness

Document behavior

Detect regression

Why Don’t We Write Tests?

Time consuming

Difficult to maintain

Lack of value

What Is a Unit Test?

```
public Order createOrder(List<Items> items, String cusId, String ccNum){
   validateItems(items);

   RestTemplate rest = new RestTemplate();
   Customer cust = rest.get(customerUrl + cusId);
   Payment payment = rest.get(paymentUrl + ccNum);

   Order order = new Order();
   order.setItems(items);
   order.setCustomer(customer);
   order.setPayment(payment);

   String sql =
   "INSERT INTO ORDER (ORDER_ID, CUST_ID, PAYMENT_ID) VALUES (?, ?, ?)”;

   jdbcTemplate = new JdbcTemplate(dataSource);
   jdbcTemplate.update(sql, new Object[]  { order.getOrderId(), cust.getId(),
   payment.getId() });

   return order;
}
```

What Is a Unit Test?

```
@Test
public void throwExceptionWhenCustomerNotFound(){

   OrderService service = ...

   try{
      service.createOrder(null, “BAD_CUS_ID”, null);
      fail(“An Exception should had been thrown”);
   } catch(AServiceException e){
   }

}
```

Not a unit test

Reason: not ran in isolation

What Is a Unit Test?

```
public class Order{
   String orderNumber;

   public void setOrderNumber(String orderNumber){
      this.orderNumber = orderNumber;
   }

   public String getOrderNumber(){
      return orderNumber;
   }
}
```

What Is a Unit Test?

```
@Test
public void testSetOrderNumber()

   Order order = new Order();
   order.setOrderNumber("1234");

   assertEquals("1234", order.getOrderNumber());

}
```

Not a unit test

Reason: not verifying business behavior

What Is a Unit Test?

```
public Order createOrder(List<Items> items, String cusId, String ccNum){

   itemService.validateItems(items);
   Customer customer = customerService.findCustomer(cusId);
   Payment payment = paymentService.createPayment(ccNum);

   Order order = new Order();
   order.setItems(items);
   order.setCustomer(customer);
   order.setPayment(payment);

   orderDao.insertOrder(order);

   return order;
}
```

What Is a Unit Test?

```
@Test
public void testCreateOrder(){

   OrderService service = new OrderService(itemServiceDummy, customerMock,
   paymentMock, creditBankMock);

   try{
      service.createOrder(null, “BAD_CUS_ID”, null);
      fail(“An Exception should had been thrown”);
   } catch(ServiceException e){
      assertThat(“Customer Id: BAD_CUS_ID not found”, e.getMessage());
   }

   Order order = service.createOrder(testItemList(), “1234”, “1234”);
   assertNotNull(order);
}
```

Not a unit test

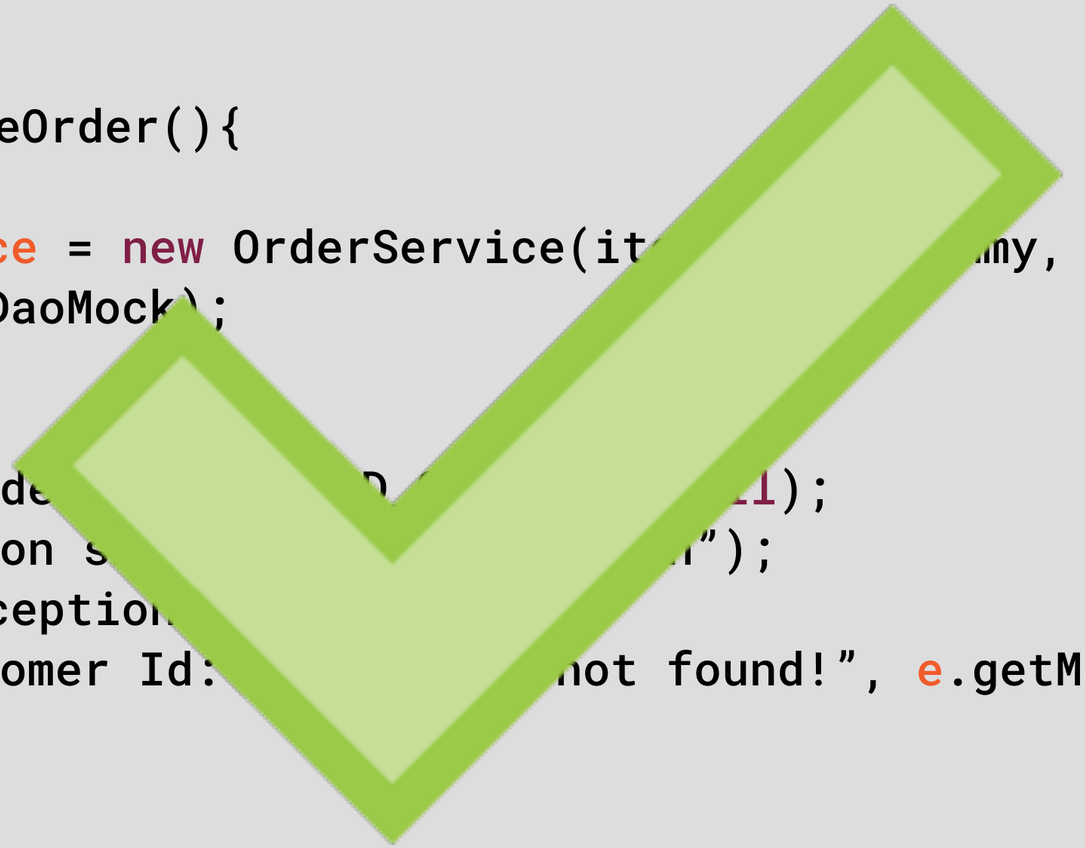
Reason: verifying multiple scenarios

What Is a Unit Test?

```
@Test
public void testCreateOrder(){

   OrderService service = new OrderService(it                my, customerMock,
   paymentMock, orderDaoMock);

   try{
      service.createOrde                D (                ll);
      fail("An Exception s                                n");
   } catch(AServiceExceptio
      assertThat("Customer Id:                 not found!", e.getMessage());
   }
}
```



S.O.L.I.D. Principles

Single Responsibility

Open/Closed

Liskov Substitution

Interface Segregation

Dependency Inversion

S.O.L.I.D. Principles

Cohesion Principles

Single Responsibility

Open/Closed

Liskov Substitution

Interface Segregation

Dependency Inversion

S.O.L.I.D. Principles

Dependency Abstraction Principles

Single Responsibility

Open/Closed

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Interface Segregation

Dependency Inversion

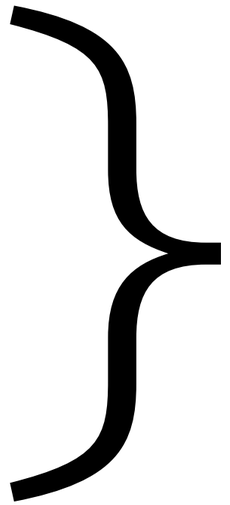
Single Responsibility

There should only be one reason for a class to change.

```
public class MainService {
   createOrder(){...
   }
   findCustomer(){...
   }
   deleteAccount(){...
   }
   updateAccount(){...
   }
   validateOrder(){...
   }
   update(){...
   }
   newCustomer(){...
   }
}
```

Single Responsibility

- **One service to rule them all**



- The methods have no theme. They cover domains from Order to Customer to Account.

Single Responsibility

```
public Order createOrder(List<Items> items, String cusId, String ccNum){
   validateItems(items);

   RestTemplate rest = new RestTemplate();
   Customer cust = rest.get(customerUrl + cusId);
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   Order order = new Order();
   order.setItems(items);
   order.setCustomer(cust);
   order.setPayment(payment);

   String sql =
   "INSERT INTO ORDER (ORDER_ID, CUST_ID, PAYMENT_ID) VALUES (?, ?, ?)";

   jdbcTemplate = new JdbcTemplate(dataSource);
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Single Responsibility

```
public Order createOrder(List<Items> items, String cusId, String ccNum){

   itemService.validateItems(items);
   Customer customer = customerService.findCustomer(cusId);
   Payment payment = paymentService.createPayment(ccNum);

   Order order = new Order();
   order.setItems(items);
   order.setCustomer(customer);
   order.setPayment(payment);

   orderDao.insertOrder(order);

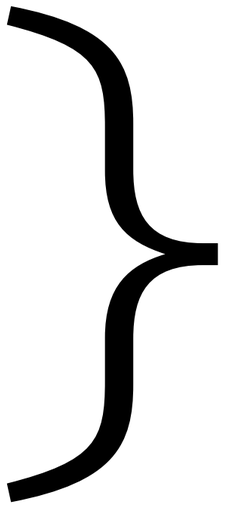
   return order;
}
```

Interface Segregation

Better to have many client specific interfaces than a single general purpose interface.

Interface Segregation

```
public interface MainDao {
  insertOrder();
  lookupOrder();
  deleteOrder();
  lookupCustomer();
  insertCustomer();
  deleteCustomer();
  insertPayment();
}
```



All of these methods will need to be implemented in a mock implementation.

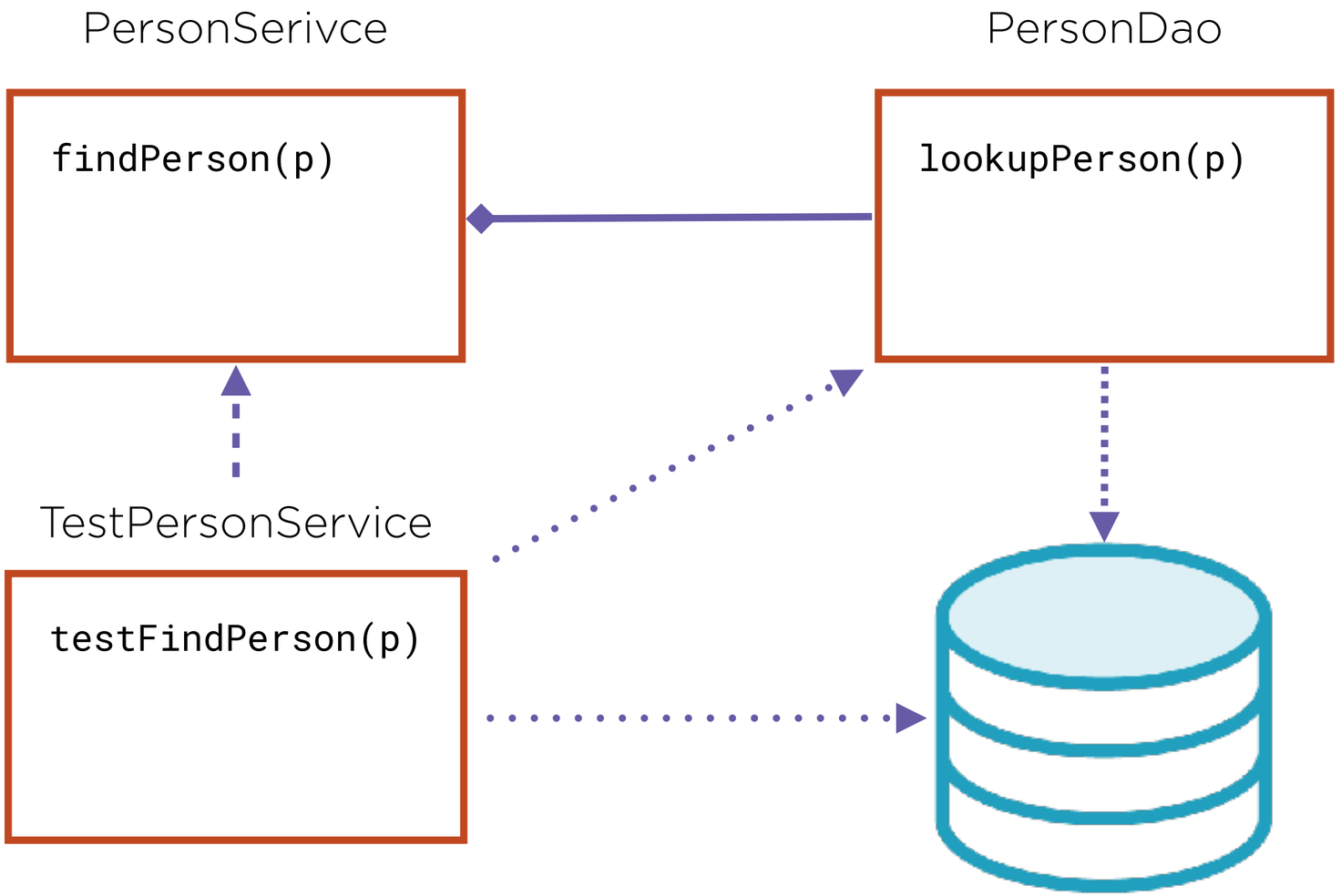
Interface Segregation

```
public interface OrderDao {
  insertOrder();
  lookupOrder();
  deleteOrder();
}
```

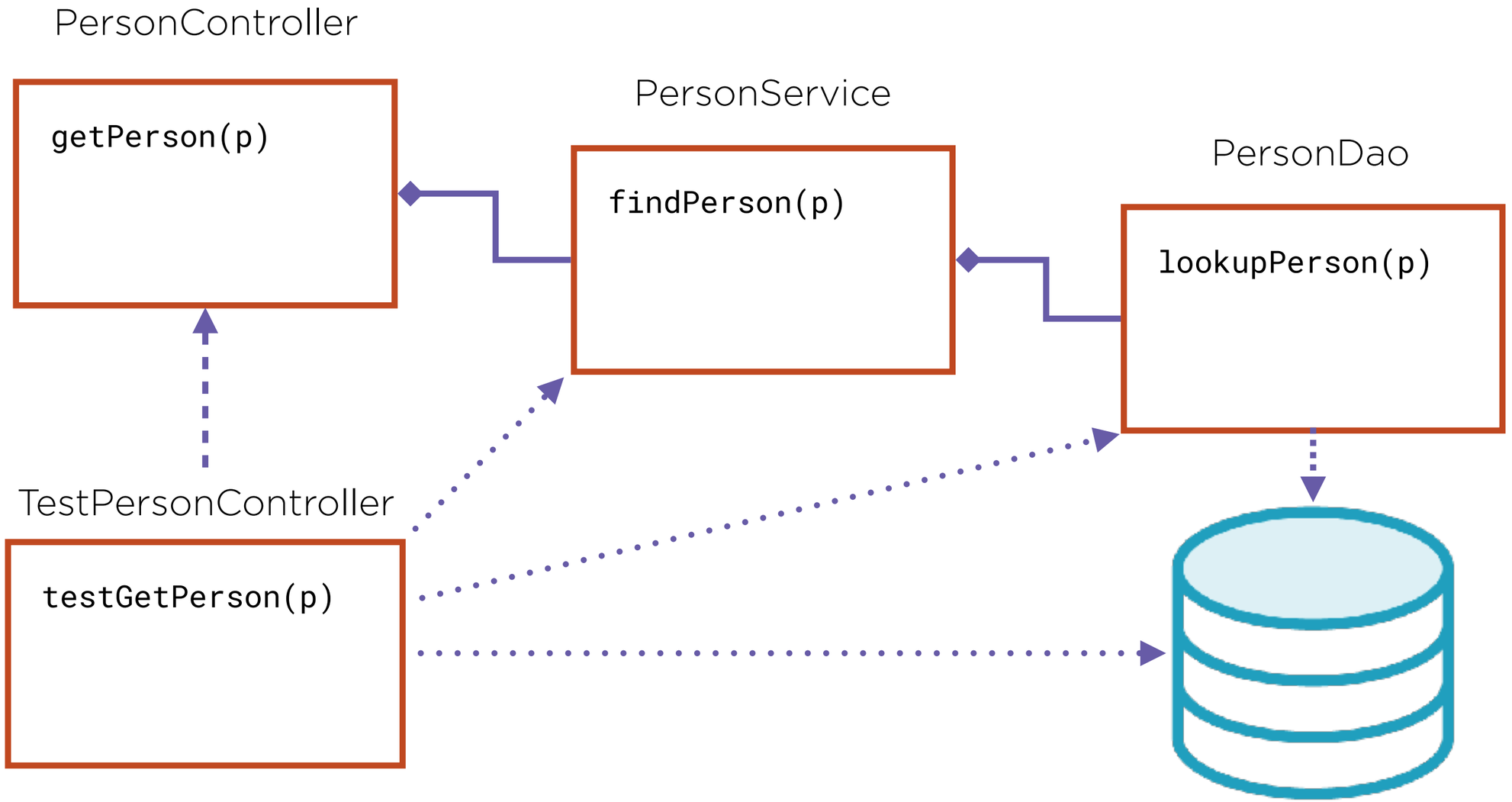
```
public interface
CustomerDao {
  lookupCustomer();
  insertCustomer();
  deleteCustomer();
}
```

- Fewer methods means easier to mock.

Dependency Abstraction Principles



Dependency Abstraction Principles



Dependency Abstraction Principles

- Open for Extension/Closed For Modification

  The behavior of a class can be extended. The extended behavior should not modify the code of the class.

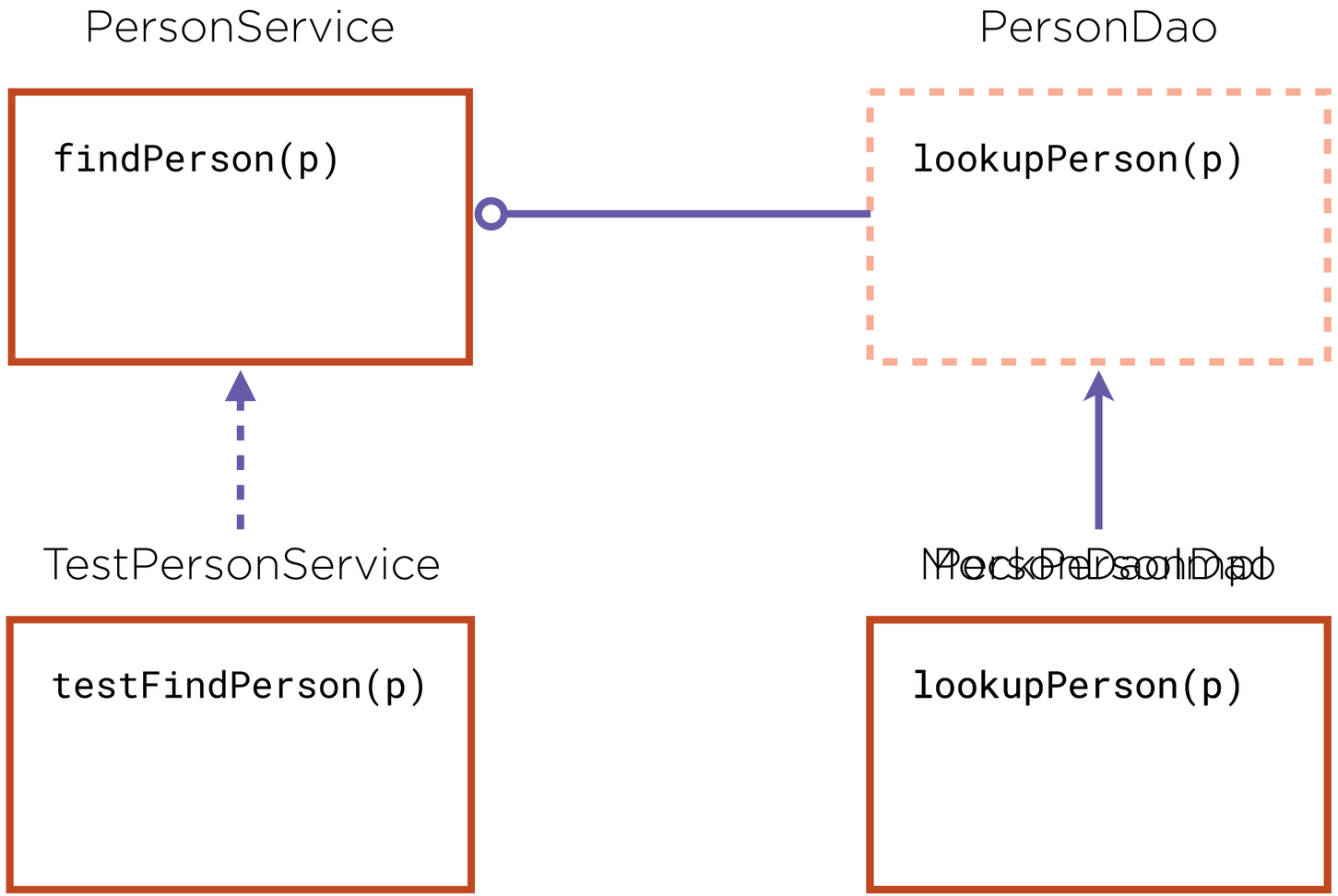
- Liskov Substitution

  The behavior of code should not change if a different subtype is used.

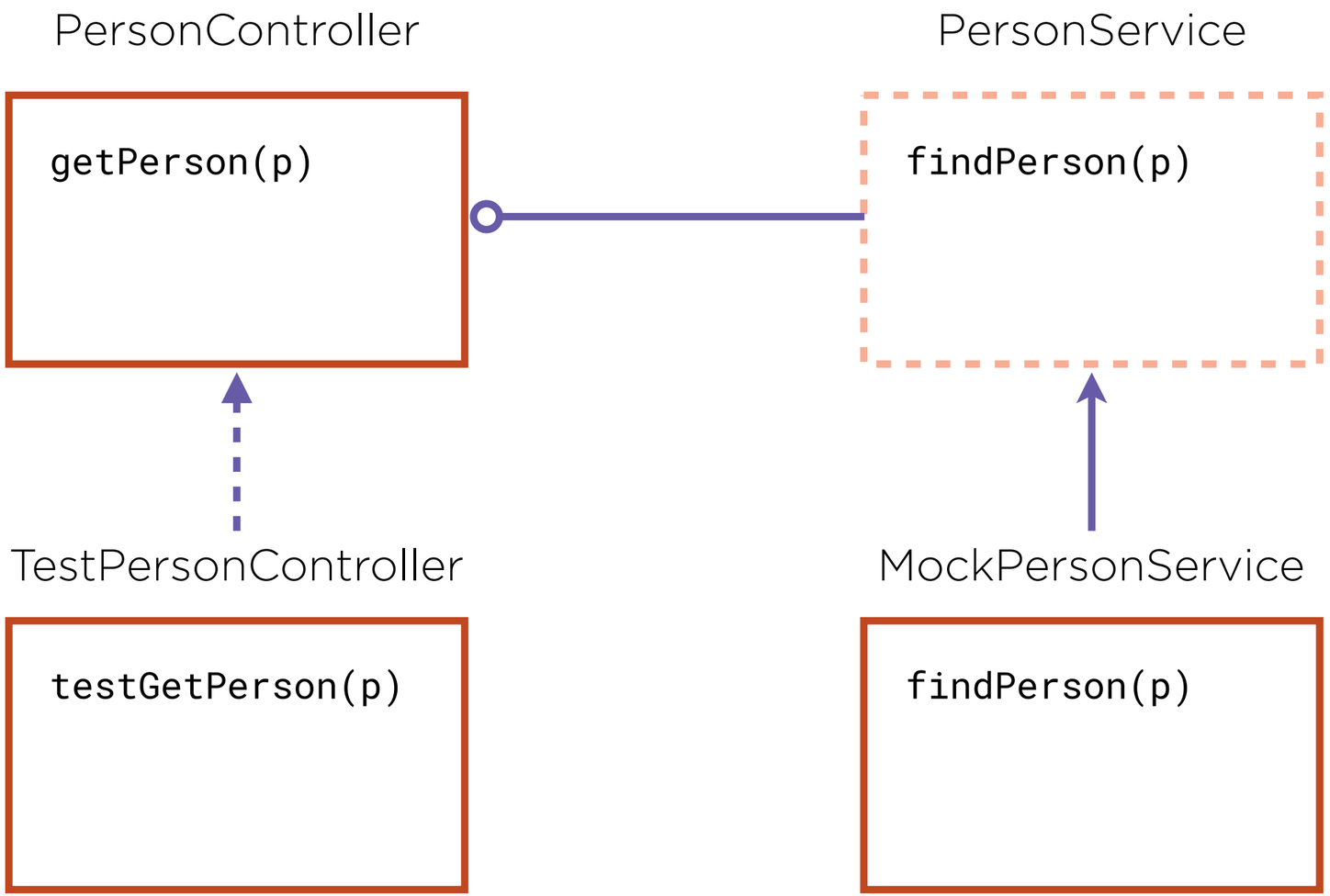
- Dependency Inversion

  High level classes should not depend on low level classes. Both should depend upon an abstraction.

Dependency Abstraction Principles



Dependency Abstraction Principles



Additional Design Considerations

```
public class PersonService{

@Autowired
private PersonDao dao;

   …
}
```

Do Not Use Field Injection

Using field injection means all tests depend on the Spring container.

“Field injection causes a unit test to break every time.”

Pivotal Team

```
@Component
public class PersonService{

private PersonDao dao;

  public PersonService(PersonDao dao){
    this.dao = dao;
  }
}
```

Do Use Constructor Injection

By passing in our dependencies through a constructor our tests no longer require the Spring to work!

Note: As of Spring 4.3, if you only have a single constructor in a class Spring will auto-detect it for autowiring. Hint! Hint!

```
public class PersonService{

private PersonDao dao;

  @Autowired(required=false)
  public void setPersonDao(PersonDao dao){
    this.dao = dao;
  }
}
```

Do Use Setter Injection

Use when a dependency is optional

```
public class Name {
  private String firstName;
  private String lastName;
  private String middleName;
  …
  public Name(){…
  public Name(String firstName, String lastName, String
  middleName,…){…
}
```

Provide an Default Constructor

Helpful for when a test doesn’t care about the contents of an object.

```
public class NameBuilder {
  private String firstName;
  private String lastName;
  …
  public NameBuilder firstName(String firstName){…
  public NameBuilder lastName(String lastName){…
  public Name build(){…
}
```

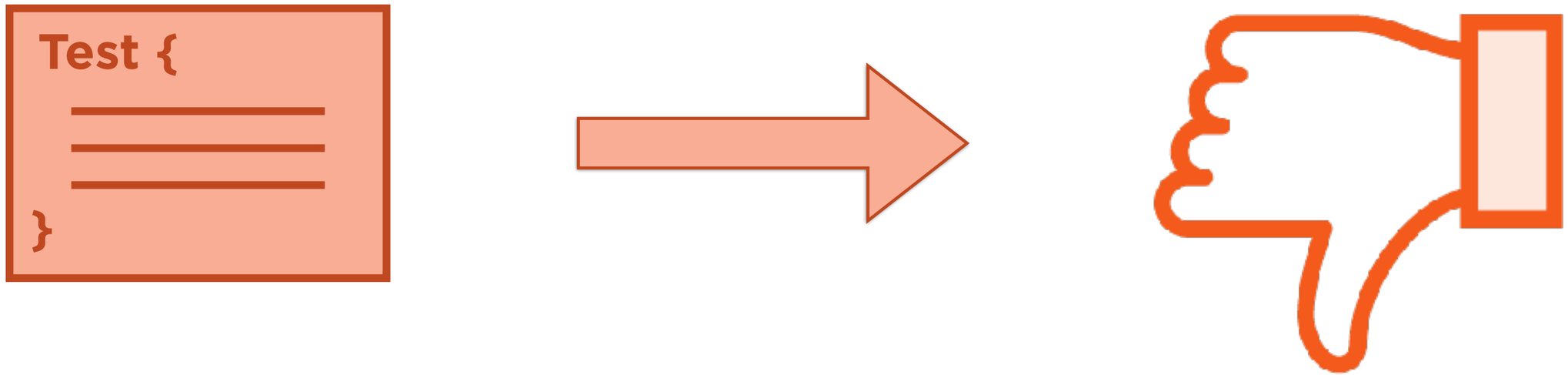
Use Builder Pattern

If some fields have constraints, like not being null, but other fields do not.

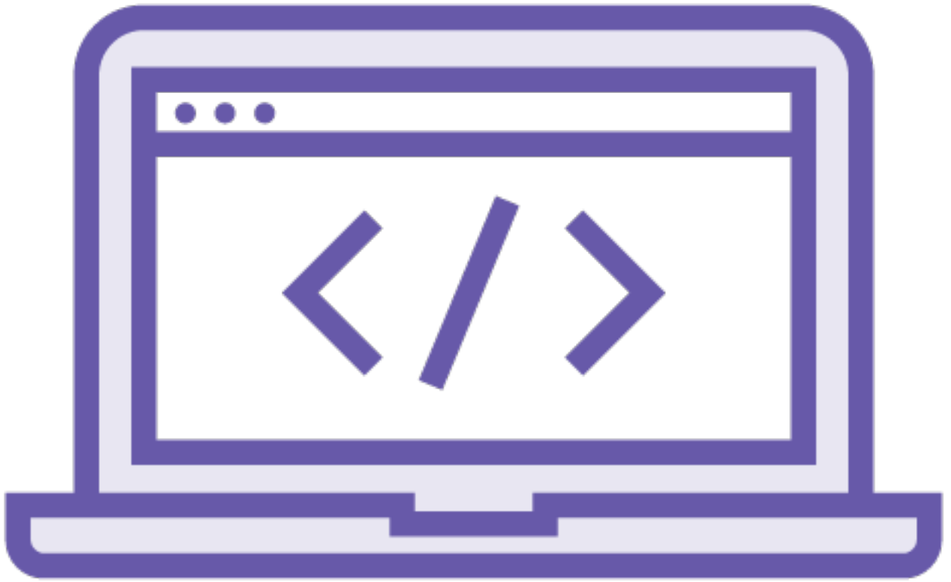
Note: Particularly helpful if a class has a lot of fields with the same type.

Test Driven Development

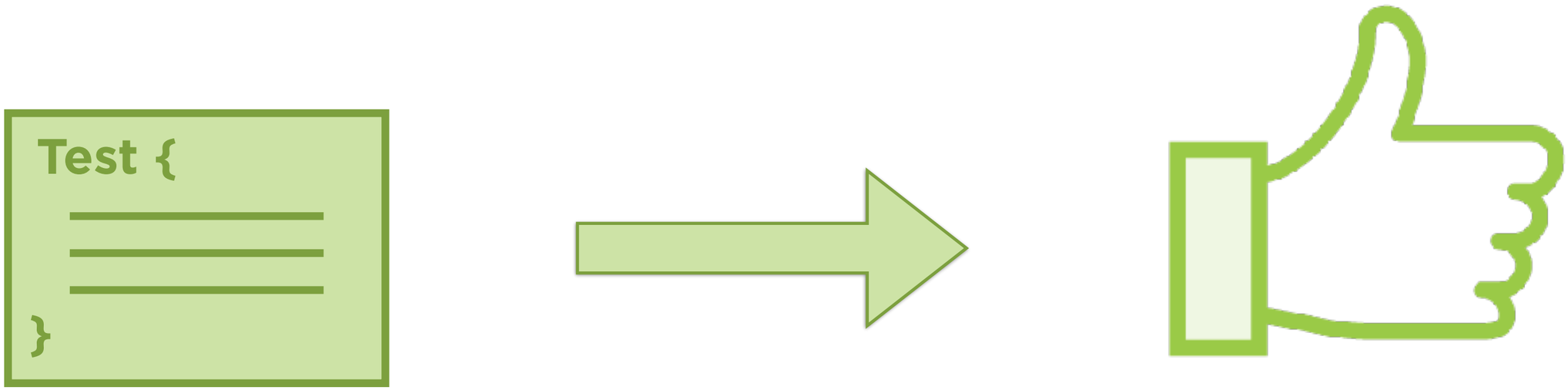
Write a Failing “Red” Test



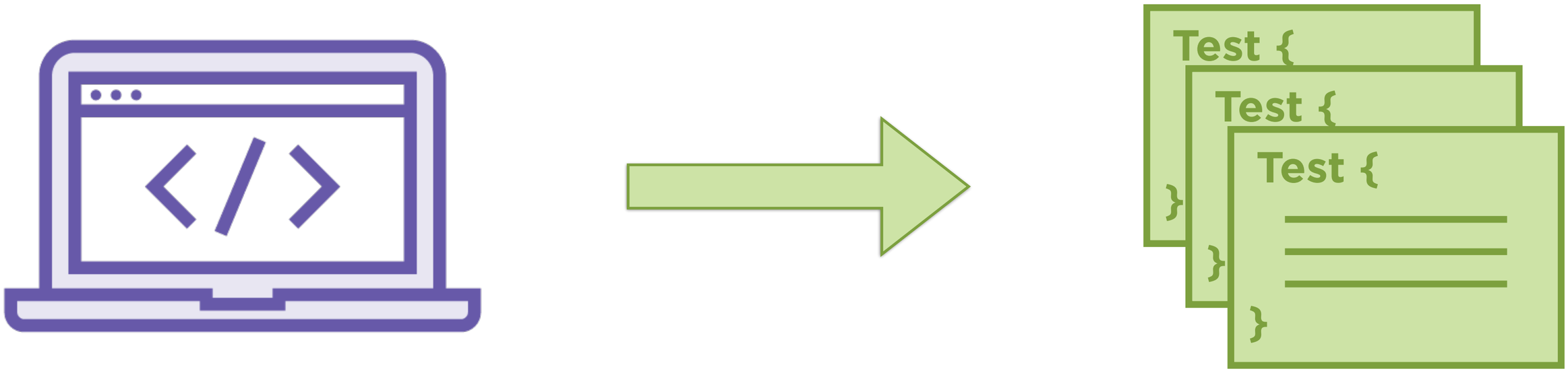
Implement the Feature



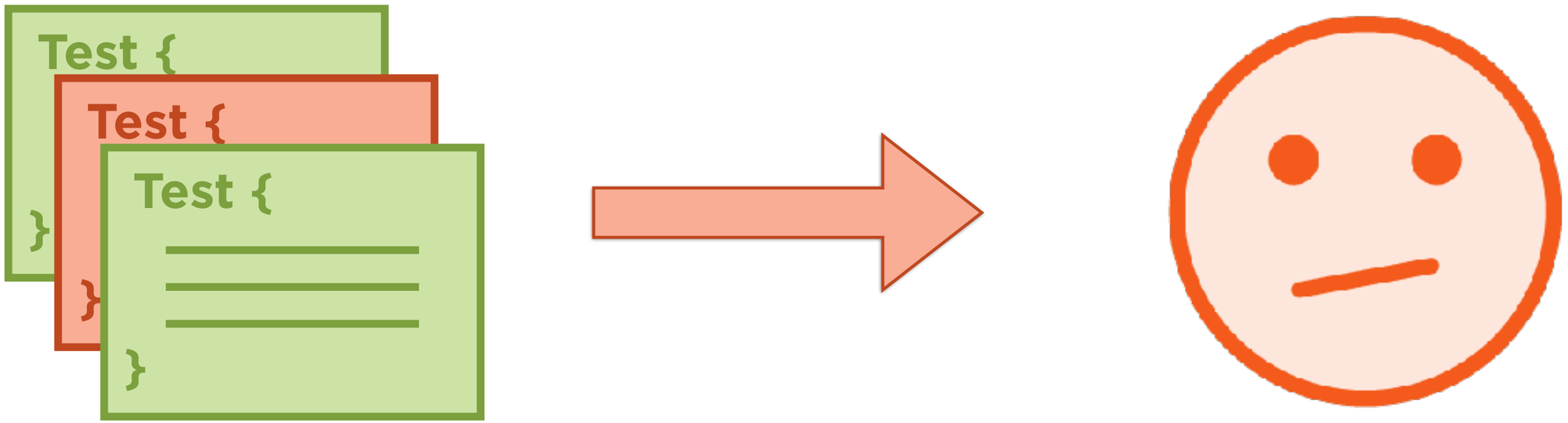
Run the Test Until It Passes (“Green”)



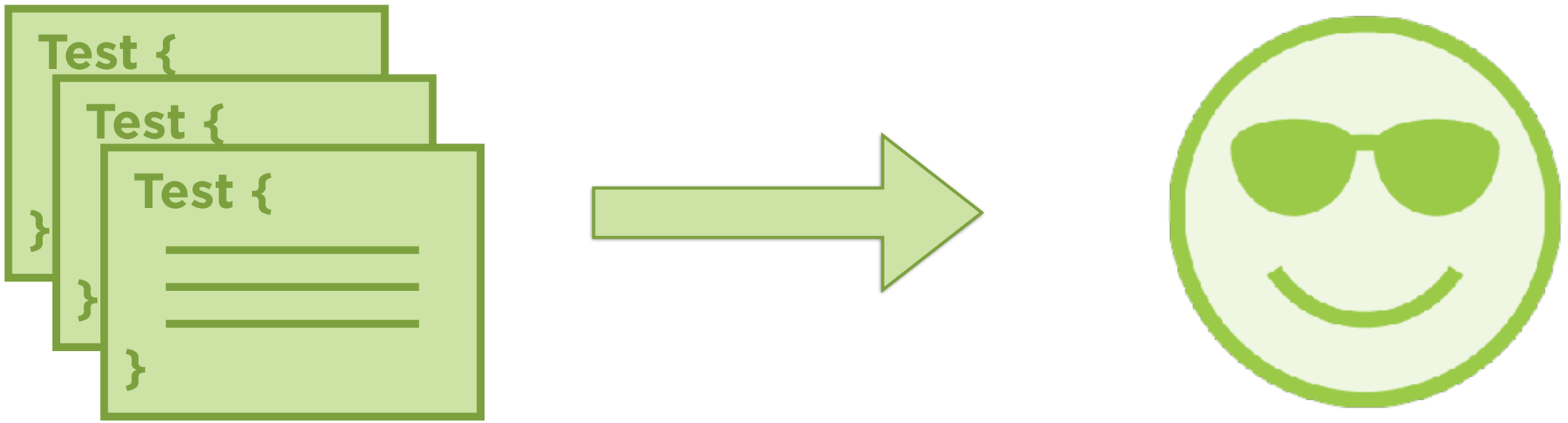
Add New Features and Test Cases

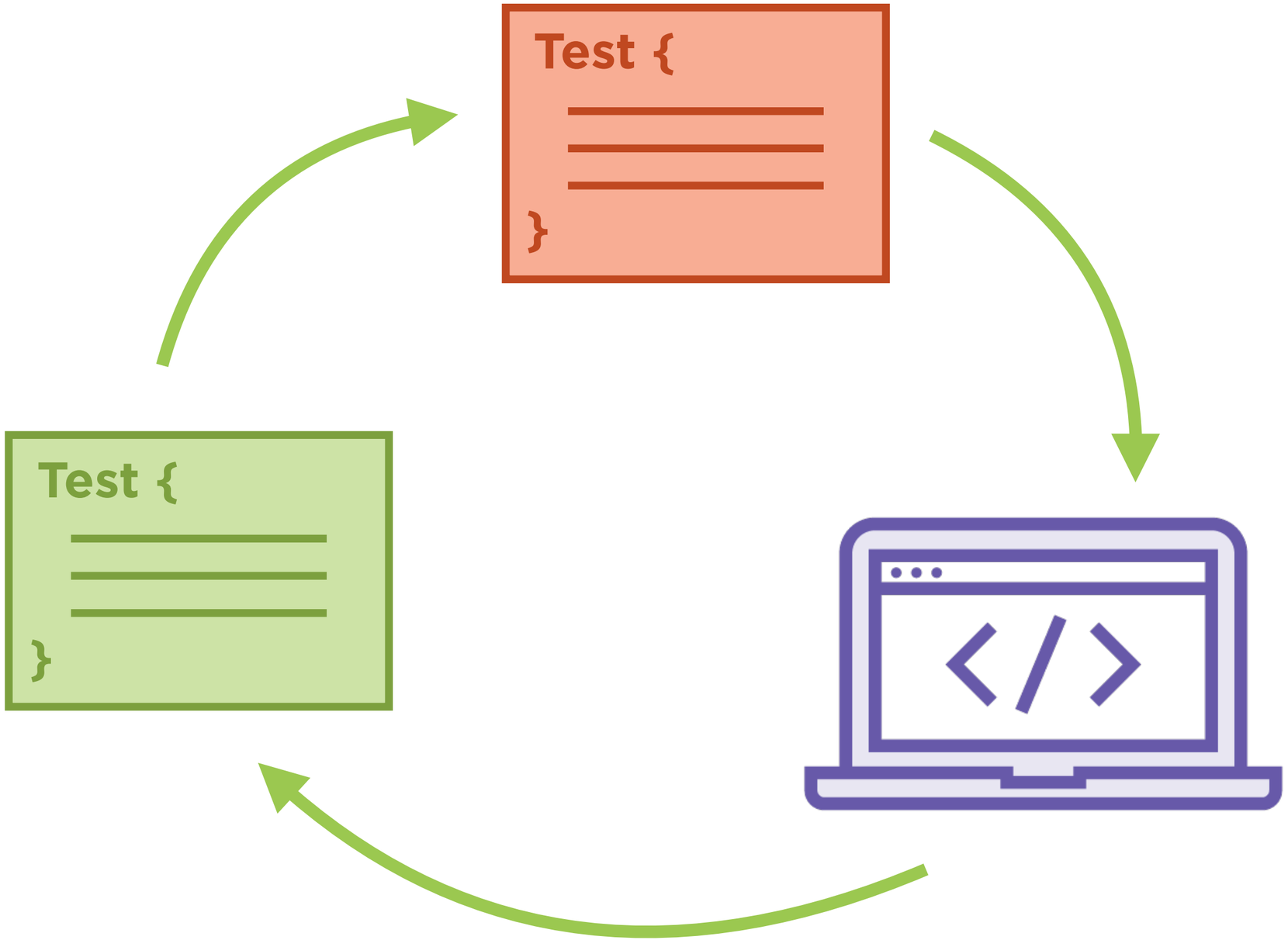


Detect Regressions



Refactor with Confidence

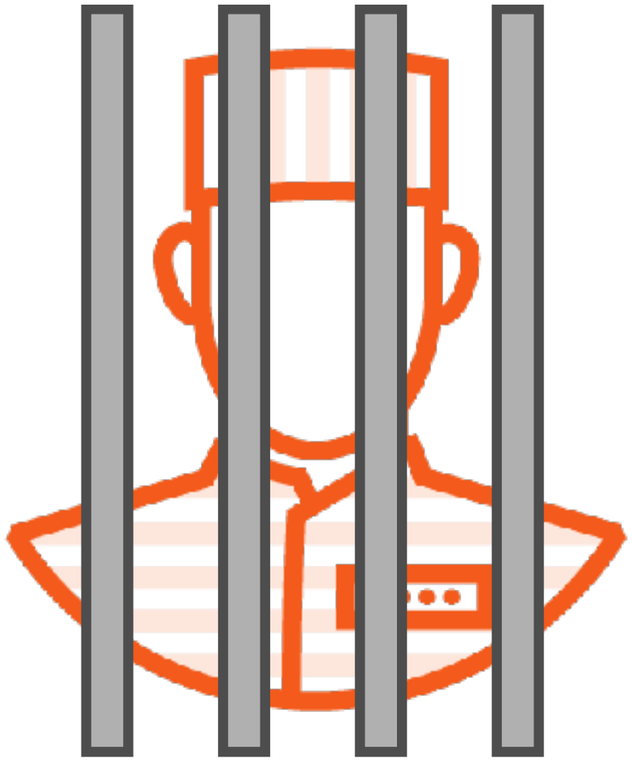



Test {
}
Test {
}

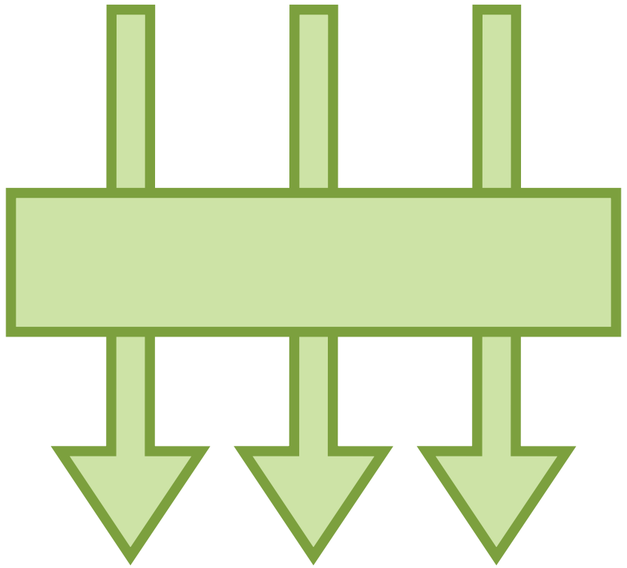
Component Integration Testing

What is Component Testing?

Goals of Component Testing



Goals of Component Testing



```
@RunWith(SpringRunner.class)
@DataJpaTest
public class TestCustomerRepo{

   @Autowired
   private TestEntityManager entityManager;

   @Autowired
   private CustomerRepo repo;

   ...

}
```

- Initializing the Spring container
- Allowing Spring to manage test dependencies

Additional Reading

https://www.petrikainulainen.net/