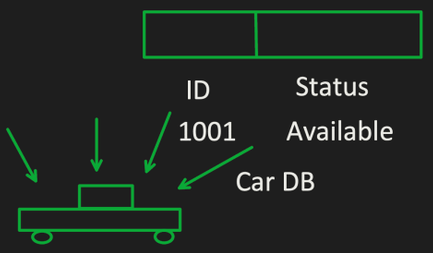
Critical Section

Code segment, where shared resources are being accessed and modified.

```
{
    Read Car Row with id: 1001
    If Status is Available:
        Update it to Booked
}
```



When multiple request try to access this critical section, Data Inconsistency can happen.

Its solution is usage of **TRANSACTION**

- It helps to achieve ACID property.

A (Atomicity):
Ensures all operations within a transaction are completed successfully. If any operation fails, the entire transaction will get rollback.

C (Consistency):
Ensures that DB state before and after the transactions should be Consistent only.

I (Isolation):
Ensures that, even if multiple transactions are running in parallel, they do not interfere with each other.

Durability:
Ensures that committed transaction will never lost despite system failure or crash.

```
BEGIN_TRANSACTION:

    - Debit from A
    - Credit to B
    if all success:
        COMMIT;
    Else
        ROLLBACK;

END_TRANSACTION;
```

In Spring boot , we can use **@Transactional** annotation.

And for that:

1. we need to add below Dependency in pom.xml
   (based on DB we are using, suppose we are using RELATIONAL DB)

Spring boot Data JPA (Java persistence API): helps to interact with Relational databases without writing much code.

```
<dependency>
    <groupId>org.springframework.boot</groupId>
    <artifactId>spring-boot-starter-data-jpa</artifactId>
</dependency>
```

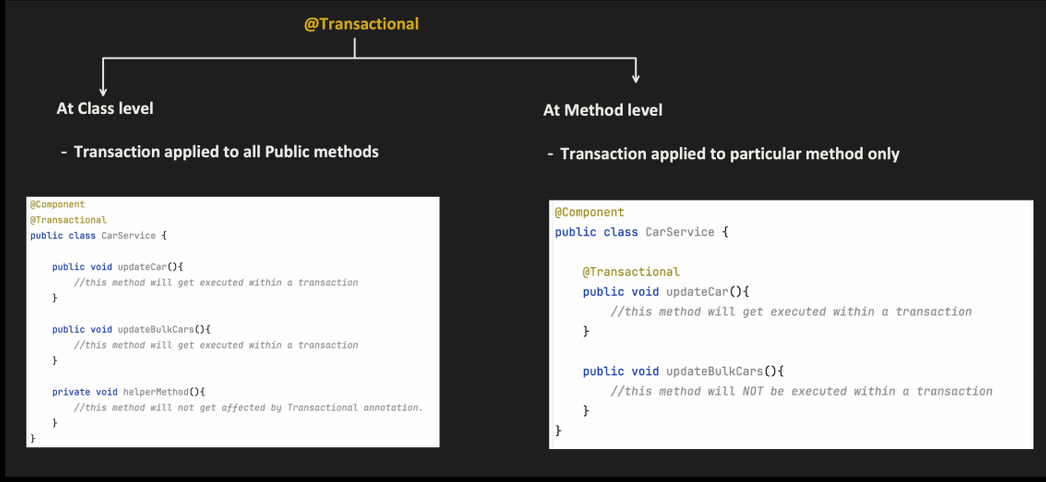
+

Database driver dependency is also required (that we will see in next topic)

2. Activate, Transaction Management by using @EnableTransactionManagment in main class.
   (spring boot generally Auto configure it, so we don't need to specially add it)

```
@SpringBootApplication
@EnableTransactionManagement
public class SpringbootApplication {

    public static void main(String args[]) { SpringApplication.run(SpringbootApplication.class, args); }
}
```




```
@Component
@Transactional
public class CarService {

    public void updateCar(){
        //this method will get executed within a transaction
    }

    public void updateBulkCars(){
        //this method will get executed within a transaction
    }

    private void helperMethod(){
        //this method will not get affected by Transactional annotation.
    }
}
```

```
@Component
public class CarService {

    @Transactional
    public void updateCar(){
        //this method will get executed within a transaction
    }

    public void updateBulkCars(){
        //this method will NOT be executed within a transaction
    }
}
```

Transaction Management in Spring boot uses AOP.

1. **Uses Point cut expression to search for method, which has @Transactional annotation like:**
   @within(*org.springframework.transaction.annotation.Transactional)*

2. **Once Point cut expression matches, run an "Around" type Advice.**
   Advice is:
   invokeWithinTransaction method present present in ***TransactionalInterceptor*** class.

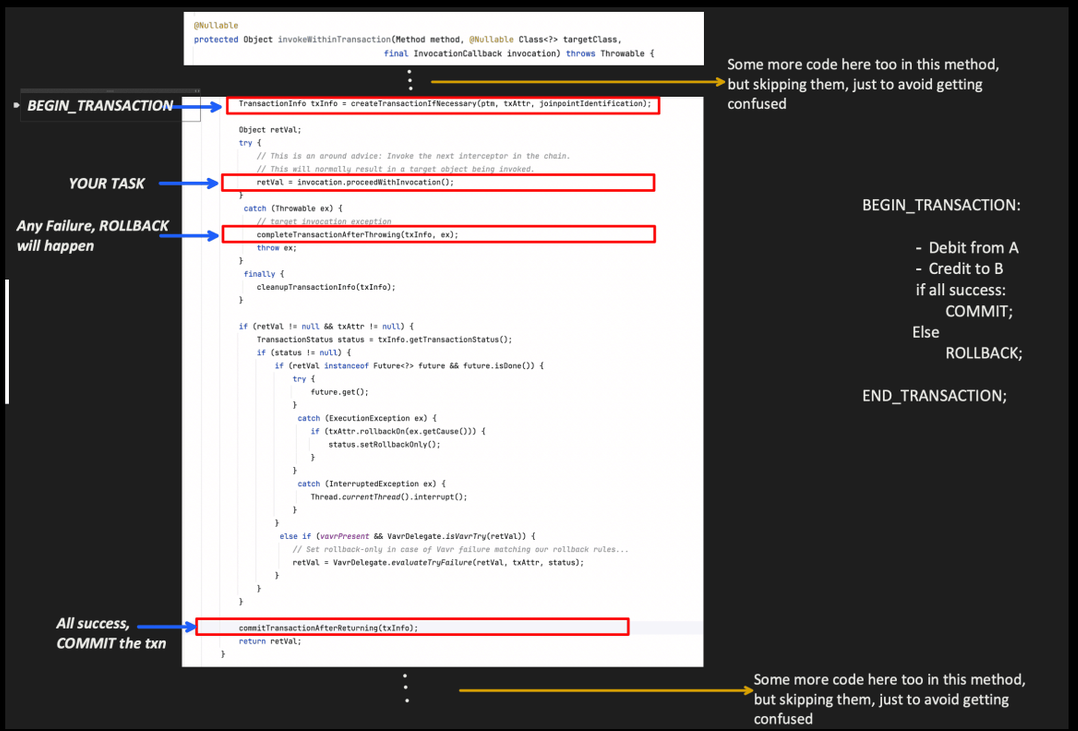
```java
@RestController
@RequestMapping(value = "/api/")
public class UserController {

    @Autowired
    User user;

    @GetMapping(path = "/updateuser")
    public String updateUser(){
        user.updateUser();
        return "user is updated successfully";
    }
}
```

```java
@Component
public class User {

    @Transactional
    public void  updateUser(){
        System.out.println("UPDATE QUERY TO update the user db values");
    }
}
```



NOW, we know, how TRANSACTIONAL works, we will now see below topics in depth:

- **Transaction Context**
- **Transaction Manager**
  - Programmatic
  - Declarative
- **Propagation**
  - REQUIRED
  - REQUIRED_NEW
  - SUPPORTS
  - NOT_SUPPORTED
  - MANDATORY
  - NEVER
  - NESTED
- **Isolation level**
  - READ_UNCOMMITTED
  - READ_COMMITTED
  - REPEATABLE_READ
  - SERIALIZABLE
- **Configure Transaction Timeout**
- **What is Read only transaction**

etc..