

Assignment 3

Introduction:

The goal of our assignment was to improve the mutation testing of 4 of our classes by at least 20%. We started by analyzing the classes in our code using pitest, in order to find out which classes perform the worst when it comes to mutation testing.

After performing the tests, we chose the classes with the lowest mutation score, also taking into consideration how useful the improvement of mutation score on that class would be for our codebase. Of course, choosing the classes only by mutation code would not be the smartest choice since some classes (like the once in the config file or some jwt classes from authentication) include standard code and so it has a lower chance of containing bugs. The final classes we chose to improve on after taking all of this into consideration were: the **EquipmentService** class in the Equipment microservice, the **UserController** and **UserService** classes in the User microservice and the **FieldService** class in the Field microservice.

Class mutation score before and after:

EquipmentService

Commit [37b902a3](#)

Before: **nl.tudelft.sem.template.equipment.services**

Number of Classes	Line Coverage	Mutation Coverage
1	100% <div><div>21/21</div></div>	80% <div><div>8/10</div></div>

Breakdown by Class

Name	Line Coverage	Mutation Coverage
EquipmentService.java	100% <div><div>21/21</div></div>	80% <div><div>8/10</div></div>

After: **nl.tudelft.sem.template.equipment.services**

Number of Classes	Line Coverage	Mutation Coverage
1	100% <div><div>21/21</div></div>	100% <div><div>10/10</div></div>

Breakdown by Class

Name	Line Coverage	Mutation Coverage
EquipmentService.java	100% <div><div>21/21</div></div>	100% <div><div>10/10</div></div>

UserController

Commit [29b37d57](#)

Before:

nl.tudelft.sem.template.user.controllers

Number of Classes	Line Coverage	Mutation Coverage
1	100% <div><div>15/15</div></div>	13% <div><div></div><div>1/8</div></div>

Breakdown by Class

Name	Line Coverage	Mutation Coverage
UserController.java	100% <div><div>15/15</div></div>	13% <div><div></div><div>1/8</div></div>

After:

nl.tudelft.sem.template.user.controllers

Number of Classes	Line Coverage	Mutation Coverage
1	100% <div><div>15/15</div></div>	50% <div><div>4/8</div></div>

Breakdown by Class

Name	Line Coverage	Mutation Coverage
UserController.java	100% <div><div>15/15</div></div>	50% <div><div>4/8</div></div>

FieldService

Commit [827a98b7](#)

Before:

nl.tudelft.sem.template.field.services

Number of Classes	Line Coverage	Mutation Coverage
1	100% <div><div>7/7</div></div>	0% <div><div></div><div>0/4</div></div>

Breakdown by Class

Name	Line Coverage	Mutation Coverage
FieldService.java	100% <div><div>7/7</div></div>	0% <div><div></div><div>0/4</div></div>

After:

nl.tudelft.sem.template.field.services

Number of Classes	Line Coverage	Mutation Coverage
1	100% <div><div>7/7</div></div>	100% <div><div>4/4</div></div>

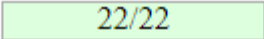
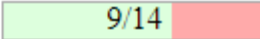
Breakdown by Class

Name	Line Coverage	Mutation Coverage
FieldService.java	100% <div><div>7/7</div></div>	100% <div><div>4/4</div></div>

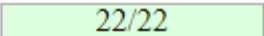
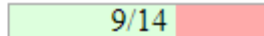
UserService

Commit [dc0de67d](#)

Before: **nl.tudelft.sem.template.user.services**

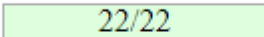
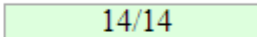
Number of Classes	Line Coverage	Mutation Coverage
1	100% 	64% 

Breakdown by Class

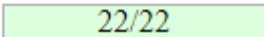
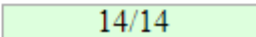
Name	Line Coverage	Mutation Coverage
UserService.java	100% 	64% 

After:

nl.tudelft.sem.template.user.services

Number of Classes	Line Coverage	Mutation Coverage
1	100% 	100% 

Breakdown by Class

Name	Line Coverage	Mutation Coverage
UserService.java	100% 	100% 

The images above document the exact increase of mutation coverage in **EquipmentService**, **UserController**, **FieldService** and **UserService** respectively. The changes are made in the commit links underneath the heading with the classes. Through the additional testing applications of mutation testing, all the selected classes have their coverage improved by at least 20%.