Assignment 2 - Report

CODE REFACTORING

After a 4-week development period, we observed, using the MetricsTree plugin available in IntelliJ's marketplace, that various project metrics were outside of the ideal range. The ones that we deemed as most important were the *Number of Methods* and *Maintainability Index, Response for a class*, *Weighted methods per class* & *Cyclomatic complexity*.

The *Number of Methods* was alerted by the plugin in all of the more complex classes. We have refactored the code such that we incorporated a maximum of 10 methods inside a class. Here are the methods and classes along with the changes that have been done to improve code metrics:

1. Classes

UserService

In the first version of the app, the service responsible for creating a link between the APIs and the database contained 18 methods, which meant that it was hard to find a method you were looking for. The *UserService* was a huge class that was creating a blob class smell, while also being hard to maintain and further test.

UserService has been divided into 2 components: the *UserService* that is still in use and the *UserTimeService*, each of which has a unique set of implementations. We also removed all the APIs that would only use one setter at a time and reformatted the method that updates the user to do all the changes into one single method. This reduced the original class's number of methods and improved readability (depending on the kind of method you want to add or modify, you can refer to the particular service). In consequence, by doing this the overall *Maintainability Index* has been lowered from around 50 to an average of 40 between all the new classes and lowered the number of methods to 10.

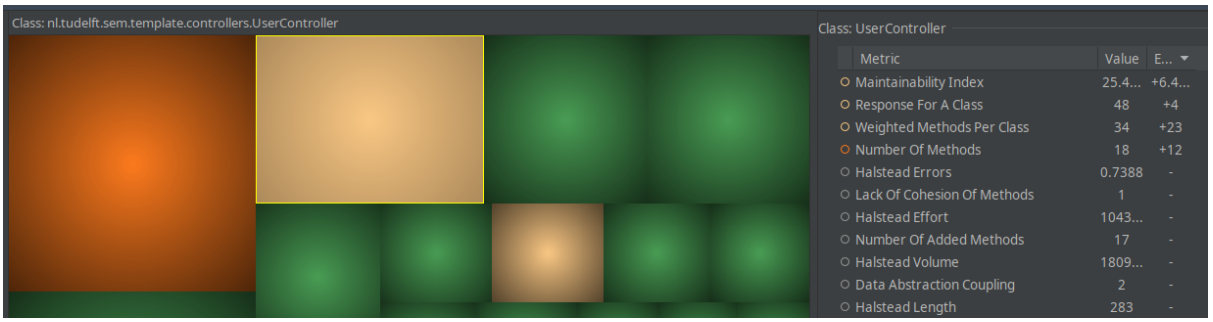
UserController

In the EventController two metrics have been improved. Namely the *Number of methods* and *Response for a class* - the number of foreign methods called by the controller.
This has been done by:

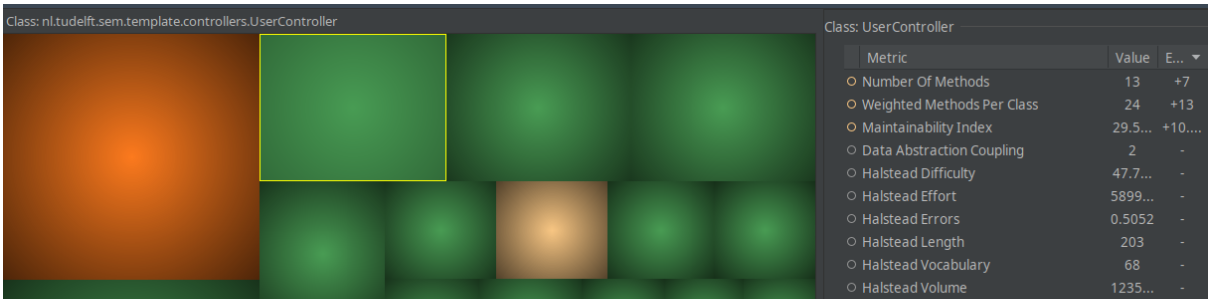
1. deleting endpoints for editing a single field in the user class. Before that, we would have for instance separate method for editing the name of the user and a separate method for editing the name of the organization they belong to.
2. merging those methods. Those methods have been incorporated into one method to update many fields of a user at once. If the client wants to just update one field that is still possible because the method does not need all the arguments in order to function.

The main code smell that was eliminated was the “blob class” and “duplicate code”. The functionalities of those methods have been inserted into one method removing the need to maintain many methods in the future. The following screenshots show the metrics that have been improved:

BEFORE



AFTER



User

In the User class, we focused on improving the number of methods and the number of attributes, since those metrics were the most out of range. The biggest problem was the large number of attributes for which we had getters and setters, which as a consequence increased the number of methods as well. The main changes to improve these metrics were:

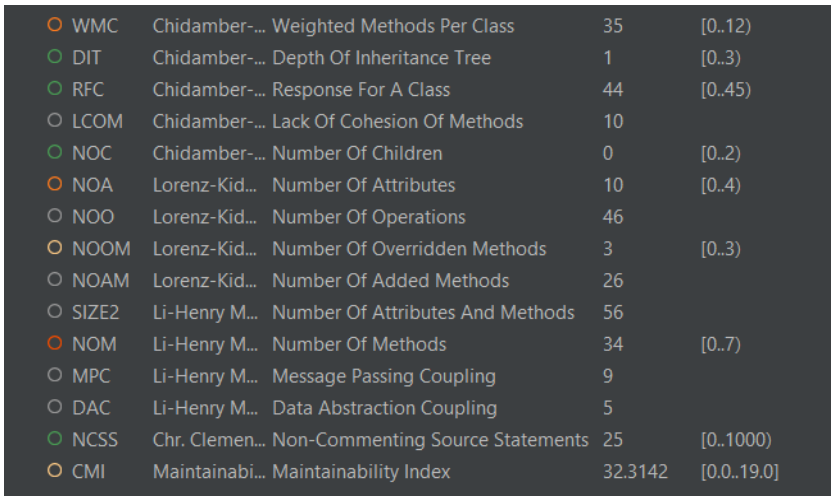
1. creating the UserInfo class to contain the user's personal information, reducing the number of attributes of User significantly
2. creating a converter for the UserInfo class to be able to store it in the database
3. removing a constructor, methods relating to changing the schedule and methods that were never used

These changes also improved other metrics, such weighted methods per class and the number of overridden methods.

The code smells that were improved are

- Dead code by removing an unused method
- Large class by delegating some functionalities of User to UserInfo

BEFORE



AFTER

WMC	Chidamber-...	Weighted Methods Per Class	16	[0..12)
DIT	Chidamber-...	Depth Of Inheritance Tree	1	[0..3)
RFC	Chidamber-...	Response For A Class	22	[0..45)
LCOM	Chidamber-...	Lack Of Cohesion Of Methods	5	
NOC	Chidamber-...	Number Of Children	0	[0..2)
NOA	Lorenz-Kid...	Number Of Attributes	5	[0..4)
NOO	Lorenz-Kid...	Number Of Operations	26	
NOOM	Lorenz-Kid...	Number Of Overridden Methods	2	[0..3)
NOAM	Lorenz-Kid...	Number Of Added Methods	9	
SIZE2	Li-Henry M...	Number Of Attributes And Methods	31	
NOM	Li-Henry M...	Number Of Methods	14	[0..7)
MPC	Li-Henry M...	Message Passing Coupling	4	
DAC	Li-Henry M...	Data Abstraction Coupling	4	
NCSS	Chr. Clemen...	Non-Commenting Source Statements	15	[0..1000)
CMI	Maintainabi...	Maintainability Index	40.4711	[0.0..19.0]

EventService

In the event service we focused on improving weighted methods for class and response for a class as those metrics were out of their regular range. We noticed that we used a lot of getters and setters along with some complex if statements to handle the eligibility of the user to enrol for the event. The main changes that helped with minimizing the metrics were:

1.) changing the long if statements list in *updateById* method into one method called merge that was added to the Event class that handles updating all relevant fields of the event and creates a copy of it

2.) creating utility class ValidityChecker that handles all the logic connected with checking if the user can join the event as well as if the user info is filled correctly and can be used to match the user to events.

3.) creating utility class PositionMatcher that handles filtering all events to end up only with all the events that can be joined by a user.

Overall our changes enabled us to reduce the following code smells:

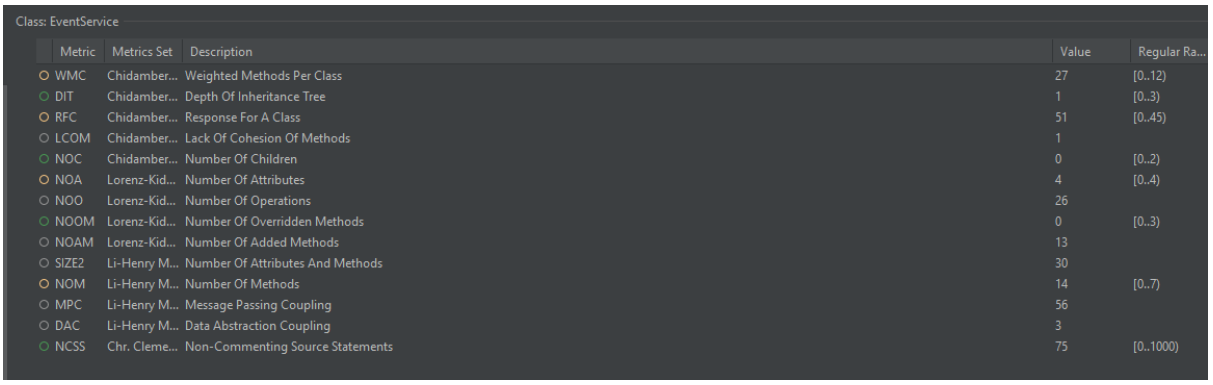
1. Overcomplicated class by reducing the number of weighted methods per class
2. Duplicate code by extracting all methods into util classes that can be reusable

BEFORE

Class: EventService

Metric	Metrics Set	Description	Value	Regular Range
WMC	Chidamber-Kemerer Metrics Set	Weighted Methods Per Class	55	[0..12)
DIT	Chidamber-Kemerer Metrics Set	Depth Of Inheritance Tree	1	[0..3)
RFC	Chidamber-Kemerer Metrics Set	Response For A Class	74	[0..45)
LCOM	Chidamber-Kemerer Metrics Set	Lack Of Cohesion Of Methods	2	
NOC	Chidamber-Kemerer Metrics Set	Number Of Children	0	[0..2)
NOA	Lorenz-Kidd Metrics Set	Number Of Attributes	4	[0..4)
NOO	Lorenz-Kidd Metrics Set	Number Of Operations	25	
NOOM	Lorenz-Kidd Metrics Set	Number Of Overridden Methods	0	[0..3)
NOAM	Lorenz-Kidd Metrics Set	Number Of Added Methods	12	
SIZE2	Li-Henry Metrics Set	Number Of Attributes And Methods	29	
NOM	Li-Henry Metrics Set	Number Of Methods	13	[0..7)
MPC	Li-Henry Metrics Set	Message Passing Coupling	114	
DAC	Li-Henry Metrics Set	Data Abstraction Coupling	3	
NCSS	Chr. Clemens Lee Metrics Set	Non-Commenting Source Statements	121	[0..1000)

AFTER



Class: EventService

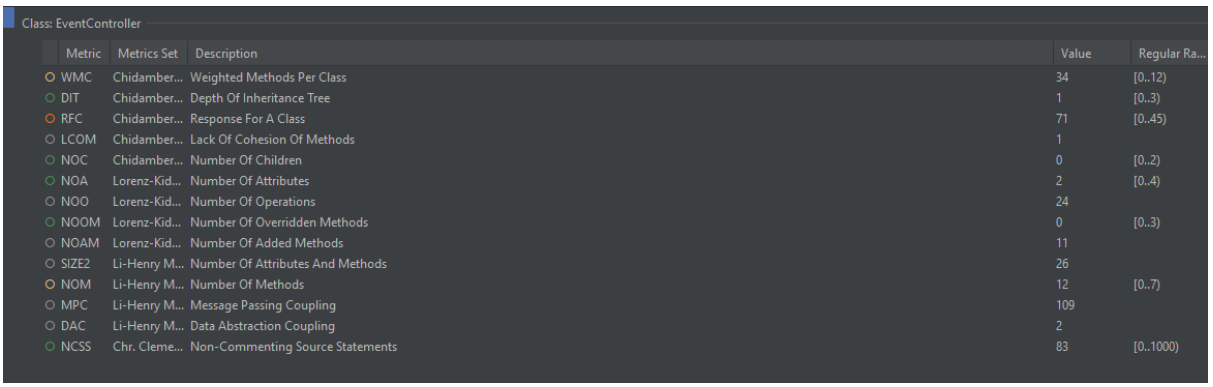
Metric	Metrics Set	Description	Value	Regular Ra...
WMC	Chidamber...	Weighted Methods Per Class	27	[0..12)
DIT	Chidamber...	Depth Of Inheritance Tree	1	[0..3)
RFC	Chidamber...	Response For A Class	51	[0..45)
LCOM	Chidamber...	Lack Of Cohesion Of Methods	1	
NOC	Chidamber...	Number Of Children	0	[0..2)
NOA	Lorenz-Kid...	Number Of Attributes	4	[0..4)
NOO	Lorenz-Kid...	Number Of Operations	26	
NOOM	Lorenz-Kid...	Number Of Overridden Methods	0	[0..3)
NOAM	Lorenz-Kid...	Number Of Added Methods	13	
SIZE2	Li-Henry M...	Number Of Attributes And Methods	30	
NOM	Li-Henry M...	Number Of Methods	14	[0..7)
MPC	Li-Henry M...	Message Passing Coupling	56	
DAC	Li-Henry M...	Data Abstraction Coupling	3	
NCSS	Chr. Cleme...	Non-Commenting Source Statements	75	[0..1000)

EventController

In the case of EventController we also noticed too high a value of *Weighted methods per class* and *Response for a class*, along with the number of methods. The main reason for such a high score was the number of operations handled in a controller that should have been handled by services. We also noticed that some of the methods do identical things but for different parameters so we decided to merge getEventsByUser, *matchEvents* and *getEvents* into one method that handled different options according to RequestParams such as “owner” and “match”. Also, we saw that the *getRequests* method is redundant as the user can just check the queue of the event by requesting the event by id. Similarly accept and reject methods were merged into one that takes additional RequestParam outcome to indicate whether the user is to be rejected or accepted. This helped with reducing duplicated code as both of the methods were identical in terms of exception handling and notification sending.

Also, we changed the previously used WebClient to restTemplate to communicate with different microservices and moved all communication to the EventService class. This helped us with making our methods easier to maintain as we don’t require any logic that handles setting up the WebClient, because all of that is done in the service using RestTemplate config that we use throughout our application. In the end, we managed to reduce the value of all the metrics significantly, and the new value of *Response for a class* metric is in its regular range. By implementing all the above-mentioned changes we also reduced the OverComplicated Classes code smell by extracting all logic responsible.

BEFORE



Class: EventController

Metric	Metrics Set	Description	Value	Regular Ra...
WMC	Chidamber...	Weighted Methods Per Class	34	[0..12)
DIT	Chidamber...	Depth Of Inheritance Tree	1	[0..3)
RFC	Chidamber...	Response For A Class	71	[0..45)
LCOM	Chidamber...	Lack Of Cohesion Of Methods	1	
NOC	Chidamber...	Number Of Children	0	[0..2)
NOA	Lorenz-Kid...	Number Of Attributes	2	[0..4)
NOO	Lorenz-Kid...	Number Of Operations	24	
NOOM	Lorenz-Kid...	Number Of Overridden Methods	0	[0..3)
NOAM	Lorenz-Kid...	Number Of Added Methods	11	
SIZE2	Li-Henry M...	Number Of Attributes And Methods	26	
NOM	Li-Henry M...	Number Of Methods	12	[0..7)
MPC	Li-Henry M...	Message Passing Coupling	109	
DAC	Li-Henry M...	Data Abstraction Coupling	2	
NCSS	Chr. Cleme...	Non-Commenting Source Statements	83	[0..1000)

AFTER

Class: EventController

Metric	Metrics Set	Description	Value	Regular Ra...
WMC	Chidamber...	Weighted Methods Per Class	23	[0..12)
DIT	Chidamber...	Depth Of Inheritance Tree	1	[0..3)
RFC	Chidamber...	Response For A Class	38	[0..45)
LCOM	Chidamber...	Lack Of Cohesion Of Methods	1	
NOC	Chidamber...	Number Of Children	0	[0..2)
NOA	Lorenz-Kid...	Number Of Attributes	2	[0..4)
NOO	Lorenz-Kid...	Number Of Operations	20	
NOOM	Lorenz-Kid...	Number Of Overridden Methods	0	[0..3)
NOAM	Lorenz-Kid...	Number Of Added Methods	7	
SIZE2	Li-Henry M...	Number Of Attributes And Methods	22	
NOM	Li-Henry M...	Number Of Methods	8	[0..7)
MPC	Li-Henry M...	Message Passing Coupling	46	
DAC	Li-Henry M...	Data Abstraction Coupling	2	
NCSS	Chr. Cleme...	Non-Commenting Source Statements	54	[0..1000)

2. Methods

UpdateById - UserService

```
public Optional<User> updateById(Long id, String name, String organization,
String gender, Certificate certificate, List<Position> positions) {
```

Here we have focused on the method update a user by their Id in the UserService of the User microservice which was responsible for telling the JPA repository to update the fields of a particular user. This method had two code smells.

1. long parameter list - previously the method would have all the parameters that are: name, organization, gender, certificate, and list of positions. To eliminate this an additional object has been created to store those parameters namely the **UserModel**. This way the method has only two parameters: the id and the *userModel*.
2. long method - The user, that was supposed to be updated, was retrieved many times from the Optional object, this introduced more complexity and also made the code longer so instead of this we saved the optional do a User object and then performed the necessary changes. It reduced the lines of code from 42 to 31.

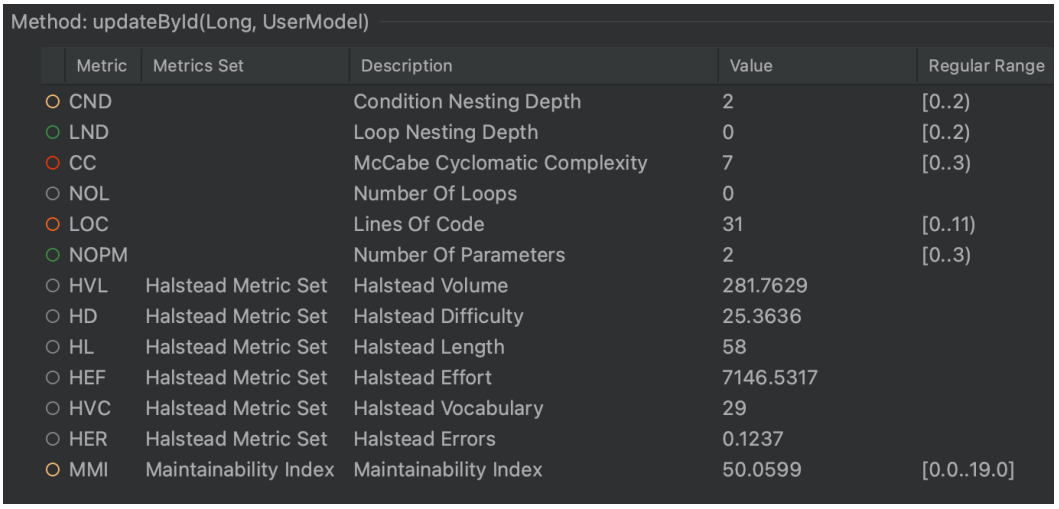
```
Optional<User> toUpdate = getById(id);
User user = toUpdate.get();
```

BEFORE

Method: updateById(Long, String, String, String, Certificate, List<Position>)

Metric	Metrics Set	Description	Value	Regular Range
CND		Condition Nesting Depth	2	[0..2)
LND		Loop Nesting Depth	0	[0..2)
CC		McCabe Cyclomatic Complexity	7	[0..3)
NOL		Number Of Loops	0	
LOC		Lines Of Code	42	[0..11)
NOPM		Number Of Parameters	6	[0..3)
HVL	Halstead Metric Set	Halstead Volume	433.8179	
HD	Halstead Metric Set	Halstead Difficulty	21.6471	
HL	Halstead Metric Set	Halstead Length	86	
HEF	Halstead Metric Set	Halstead Effort	9390.8815	
HVC	Halstead Metric Set	Halstead Vocabulary	33	
HER	Halstead Metric Set	Halstead Errors	0.1484	
MMI	Maintainability Index	Maintainability Index	45.868	[0.0..19.0]

AFTER



Event - equals and hashcode

The Event class has a large number of attributes compared to other classes. This caused the *equals* and *hashcode* methods to have a very high *Cyclomatic Complexity*, raising the *Weighted Methods per Class* metric to 70. Since events have unique and non-null labels, we were able to replace these methods generated by Lombok with custom versions that make use of the label uniqueness:

1. The *equals* method is used to compare every attribute of the two events before returning true. It now only checks the label.
2. The *hashCode* method also used every attribute before, whereas now it only hashes the label.

Even though the Event object has a unique numerical identifier, we chose to use the label for these specific methods because there is a constructor for Event that doesn't require an id. These are used in some of our tests to check if event creation works. The label, on the other hand, is present for every event. Changing these methods alone decreased the *Weighted Methods per Class* metric by 33.

The *Cyclomatic Complexity* of the equals method was reduced from 25 to 4, and from the hashCode method from 12 to 1.

Class: Event

Metric	Value	Excess
Access To Foreign Data	3	
Coupling Between Objects	19	+6
Data Abstraction Coupling	6	-
Depth Of Inheritance Tree	1	
Halstead Difficulty	16.8293	-
Halstead Effort	13025....	-
Halstead Errors	0.1845	-
Halstead Length	129	-
Halstead Vocabulary	64	-
Halstead Volume	774.0	-
Lack Of Cohesion Of Methods	9	-
Maintainability Index	30.7722	+11.77...
Message Passing Coupling	16	-
Non-Commenting Source Statements	21	
Number Of Accessor Methods	11	+8
Number Of Added Methods	28	-
Number Of Attributes	11	+8
Number Of Attributes And Methods	57	-
Number Of Children	0	
Number Of Methods	34	+28
Number Of Operations	46	-
Number Of Overridden Methods	3	+1
Number Of Public Attributes	0	
Response For A Class	47	+3
Tight Class Cohesion	0.0714	-0.2586
Weighted Methods Per Class	70	+59
Weight Of A Class	0.6071	

BEFORE

Class: Event

Metric	Value	Excess
Access To Foreign Data	3	
Coupling Between Objects	19	+6
Data Abstraction Coupling	6	-
Depth Of Inheritance Tree	1	
Halstead Difficulty	22.5213	-
Halstead Effort	22654....	-
Halstead Errors	0.2669	-
Halstead Length	161	-
Halstead Vocabulary	76	-
Halstead Volume	1005.9...	-
Lack Of Cohesion Of Methods	9	-
Maintainability Index	33.7073	+14.70...
Message Passing Coupling	20	-
Non-Commenting Source Statements	27	
Number Of Accessor Methods	11	+8
Number Of Added Methods	27	-
Number Of Attributes	11	+8
Number Of Attributes And Methods	56	-
Number Of Children	0	
Number Of Methods	33	+27
Number Of Operations	45	-
Number Of Overridden Methods	3	+1
Number Of Public Attributes	0	
Response For A Class	49	+5
Tight Class Cohesion	0.0655	-0.2645
Weight Of A Class	0.5926	
Weighted Methods Per Class	37	+26

AFTER

Send notification - NotificationController

The method that automatically sends notifications to a specific user based on the enqueue request outcome was 32 lines long and had some hard-coded microservice ports. This method made use of WebClient to send requests to other microservices, while the rest of the application uses *restTemplate*. To make the NotificationController cleaner and more robust, while lowering the number of lines of code in the method, we now use *restTemplate* instead of WebClient.

BEFORE

Method: sendNotification(Long, String, Outcome)

Metric	Metrics Set	Description	Value	Regular Ra
CND		Condition Nesting Depth	1	[0..2)
LND		Loop Nesting Depth	0	[0..2)
CC		McCabe Cyclomatic Complexity	4	[0..3)
NOL		Number Of Loops	0	
LOC		Lines Of Code	32	[0..11)
NOPM		Number Of Parameters	3	[0..3)
HVL	Halstead M...	Halstead Volume	412.5315	
HD	Halstead M...	Halstead Difficulty	16.1905	
HL	Halstead M...	Halstead Length	77	
HEF	Halstead M...	Halstead Effort	6679.0815	
HVC	Halstead M...	Halstead Vocabulary	41	
HER	Halstead M...	Halstead Errors	0.1182	
MMI	Maintainabi...	Maintainability Index	48.6707	[0.0..19.0]

AFTER

Method: sendNotification(Long, String, Outcome)

Metric	Metrics Set	Description	Value	Regular Ra
CND		Condition Nesting Depth	1	[0..2)
LND		Loop Nesting Depth	0	[0..2)
CC		McCabe Cyclomatic Complexity	3	[0..3)
NOL		Number Of Loops	0	
LOC		Lines Of Code	25	[0..11)
NOPM		Number Of Parameters	3	[0..3)
HVL	Halstead M...	Halstead Volume	284.3459	
HD	Halstead M...	Halstead Difficulty	10.8182	
HL	Halstead M...	Halstead Length	55	
HEF	Halstead M...	Halstead Effort	3076.1054	
HVC	Halstead M...	Halstead Vocabulary	36	
HER	Halstead M...	Halstead Errors	0.0705	
MMI	Maintainabi...	Maintainability Index	52.1795	[0.0..19.0]

EnqueueById - Event Service

In this method we noticed a very high cyclomatic complexity and high line count. We distinguished that this method's main functionality is verifying if the user is eligible to join the event using a sequence of if statements. We extracted it into the utility class to the method *canJoin*. In the method, we got rid of if statements and used proper names to then check if all the conditions are met. This reduced the cyclomatic complexity of the original method to 4 and lines of code to 23 while in the extracted method we now have cyclomatic complexity of 10 and 20 lines of code. Because of the high number of checks, we have to make it very hard to reduce the cyclomatic complexity ever further. The only way would be to make a few more methods to check every criterion.

BEFORE

Method: enqueueById(Long, User, PositionName, long)

Metric	Metrics Set	Description	Value	Regular Ra...
CND		Condition Nesting Depth	1	[0..2)
LND		Loop Nesting Depth	0	[0..2)
CC		McCabe Cyclomatic Complexity	15	[0..3)
NOL		Number Of Loops	0	
LOC		Lines Of Code	50	[0..11)
NOPM		Number Of Parameters	4	[0..3)

AFTER

Method: enqueueById(Long, Long, PositionName, long)

Metric	Metrics Set	Description	Value	Regular Ra...
CND		Condition Nesting Depth	1	[0..2)
LND		Loop Nesting Depth	0	[0..2)
CC		McCabe Cyclomatic Complexity	4	[0..3)
NOL		Number Of Loops	0	
LOC		Lines Of Code	23	[0..11)
NOPM		Number Of Parameters	4	[0..3)

Method: canJoin(PositionName, long)

Metric	Metrics Set	Description	Value	Regular Ra...
CND		Condition Nesting Depth	0	[0..2)
LND		Loop Nesting Depth	0	[0..2)
CC		McCabe Cyclomatic Complexity	10	[0..3)
NOL		Number Of Loops	0	
LOC		Lines Of Code	20	[0..11)
NOPM		Number Of Parameters	2	[0..3)

getMatchedEvents - eventService

In this method, we focused on reducing cyclomatic complexity and lines of code. What we noticed is that there are two loops that do basically the same thing. We extracted this functionality to the utility class and created *matchPositions* method. This got rid of the two loops needed in the original method which reduced the lines of code in the original method as well as cyclomatic complexity. Because of the nested loops and if statements in the loop that matched the events we could not get the cyclomatic complexity of the *matchPosition* method lower than 7 but it still is an improvement in comparison to the previous version of the method.

BEFORE

Method: getMatchedEvents(User)

Metric	Metrics Set	Description	Value	Regular Ra...
CND		Condition Nesting Depth	1	[0..2)
LND		Loop Nesting Depth	2	[0..2)
CC		McCabe Cyclomatic Complexity	13	[0..3)
NOL		Number Of Loops	4	
LOC		Lines Of Code	33	[0..11)
NOPM		Number Of Parameters	1	[0..3)

AFTER

Method: getMatchedEvents(Long)

Metric	Metrics Set	Description	Value	Regular Ra...
CND		Condition Nesting Depth	1	[0..2)
LND		Loop Nesting Depth	0	[0..2)
CC		McCabe Cyclomatic Complexity	2	[0..3)
NOL		Number Of Loops	0	
LOC		Lines Of Code	18	[0..11)
NOPM		Number Of Parameters	1	[0..3)

Method: matchPositions(List<Position>, List<Event>, User)

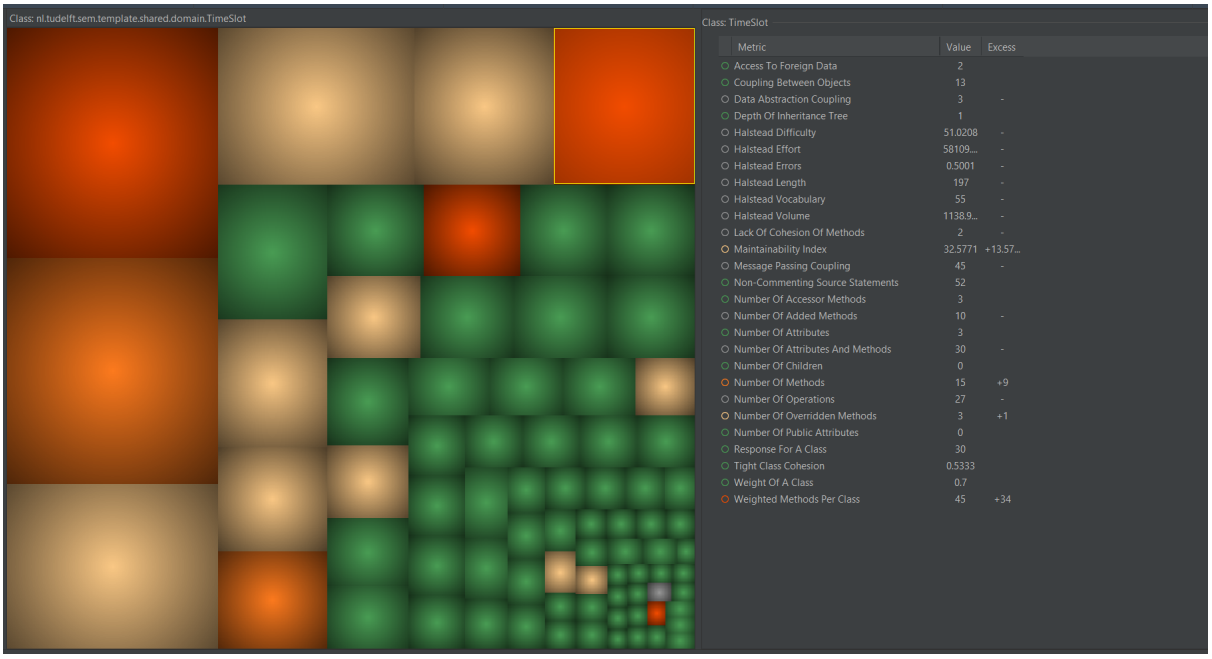
Metric	Metrics Set	Description	Value	Regular Ra...
CND		Condition Nesting Depth	1	[0..2)
LND		Loop Nesting Depth	2	[0..2)
CC		McCabe Cyclomatic Complexity	7	[0..3)
NOL		Number Of Loops	2	
LOC		Lines Of Code	20	[0..11)
NOPM		Number Of Parameters	3	[0..3)

matchSchedule - TimeSlot

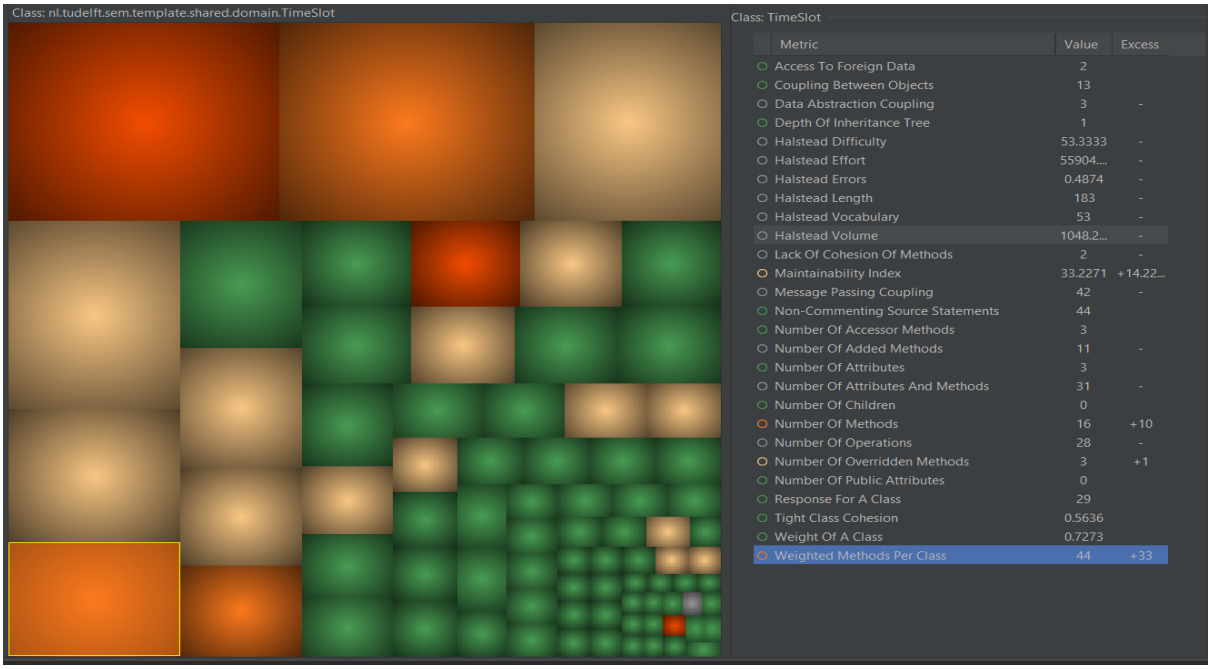
In this method we noticed a very high cyclomatic complexity, duplicated code, and an overall long and complicated method (code smell). Initially, because of the structure of the

class that is able to also maintain recursive timeslots, we had 2 for-loops that had the same functionality. Those were externalized to another function to reduce code duplication and increase maintainability, thus, reducing the technical dept. Moreover, because we changed how a recurring timeslot is stored (if a slot is recurring, the week is now set to -1, instead of a rand value), it allows us to delete one of the three arrays that were used to handle the slots in the function. This means that we will call the auxiliary function(the one we mentioned we externalized some functionality to it) timeless, making the *matchSchedule* function easier to understand and maintain.

BEFORE



AFTER



Finally, we made a few minor changes to the general code, such as removing commented lines of code, correcting grammatical errors in the documentation, and getting rid of console printouts that were used to debug the course of any procedure.

Enqueue - Event (shared)

The enqueue method is used to check if the position a user wants to fill is actually available. However, this is something we were already checking in the EventService. Therefore, we were able to remove redundant lines of code and prevent the system from doing unnecessary extra work.

BEFORE

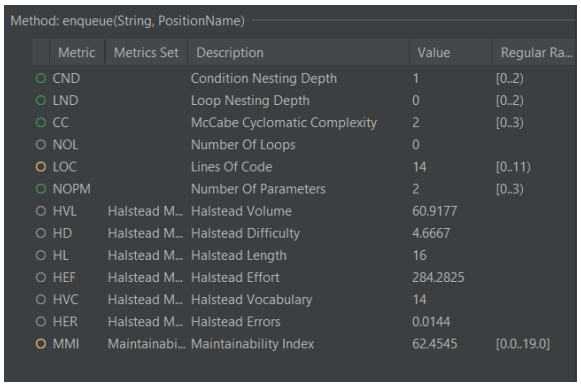
```
public boolean enqueue(String name, PositionName position) {
    if (!positions.contains(position)) {
        return false;
    }

    queue.add(new Request(name, position));
    return true;
}
```

AFTER

```
public boolean enqueue(String name, PositionName position) {
    return queue.add(new Request(name, position));
}
```

The *Lines Of Code* was reduced from 14 to 10.

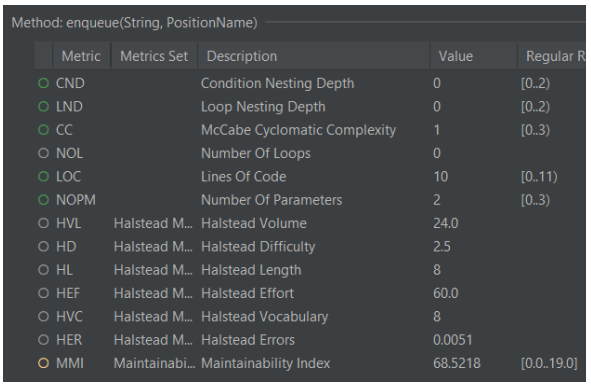
BEFORE



Method: enqueue(String, PositionName)

Metric	Metrics Set	Description	Value	Regular Ra...
CND		Condition Nesting Depth	1	[0..2)
LND		Loop Nesting Depth	0	[0..2)
CC		McCabe Cyclomatic Complexity	2	[0..3)
NOL		Number Of Loops	0	
LOC		Lines Of Code	14	[0..11)
NOPM		Number Of Parameters	2	[0..3)
HVL	Halstead M...	Halstead Volume	60.9177	
HD	Halstead M...	Halstead Difficulty	4.6667	
HL	Halstead M...	Halstead Length	16	
HEF	Halstead M...	Halstead Effort	284.2825	
HVC	Halstead M...	Halstead Vocabulary	14	
HER	Halstead M...	Halstead Errors	0.0144	
MMI	Maintainabi...	Maintainability Index	62.4545	[0.0..19.0]

AFTER



Method: enqueue(String, PositionName)

Metric	Metrics Set	Description	Value	Regular R
CND		Condition Nesting Depth	0	[0..2)
LND		Loop Nesting Depth	0	[0..2)
CC		McCabe Cyclomatic Complexity	1	[0..3)
NOL		Number Of Loops	0	
LOC		Lines Of Code	10	[0..11)
NOPM		Number Of Parameters	2	[0..3)
HVL	Halstead M...	Halstead Volume	24.0	
HD	Halstead M...	Halstead Difficulty	2.5	
HL	Halstead M...	Halstead Length	8	
HEF	Halstead M...	Halstead Effort	60.0	
HVC	Halstead M...	Halstead Vocabulary	8	
HER	Halstead M...	Halstead Errors	0.0051	
MMI	Maintainabi...	Maintainability Index	68.5218	[0.0..19.0]

BUG FIXES

In the previous version, we wouldn't check to see if the time period entered by a rower would actually be practicable before adding a new time slot to a user's schedule. Now, when someone tries to call one of the *addTimeSlot* methods inside the *UserTimeSlotService,* we'll also alert the system when the period's end time is later than its start time or for weeks that have a negative index and disallow incorrect schedules. We also noticed that when registering the attributes in the constructor that actually created a user were in the wrong order, this created a problem that lead to a mismatch in the request and response of registering a user (email, netId, name, and organization were swapped). By changing the order to the correct one we got rid of the bug. The last bug that was fixed was that the position was still available after a user in the queue was accepted. We fixed it by adding some logic in dequeue method in Event class to account for removing the position along with request.

Some tests were prepared for checks that did not exist. After also verifying that when adding a new user it doesn’t already exist inside the database, we have created fitting tests for this new feature and also for the one previously mentioned.