Software Reengineering

Intermediate Report

Ma INF 2020-2021

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1 Assignment

The Assignment can be found at
`https://ansymore.uantwerpen.be/2021-reengineering-project`

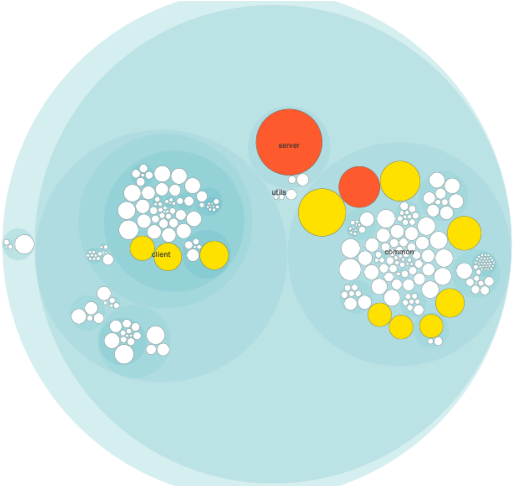
2 Introduction

For the previous milestone, I formed a group with Atisha Ribeiro. Unfortunately he decided to drop out this course, so I'm now my own group. I decided to fork the Megamek project myself, and added the assistents as collaborators again. The link to the new github repository is `https://github.com/IgorSchittekat/megamek`. In this report you can find the tools used so far to identify the parts that need to be re-engineered in the code.

3 Usage of Tools

3.1 CodeScene

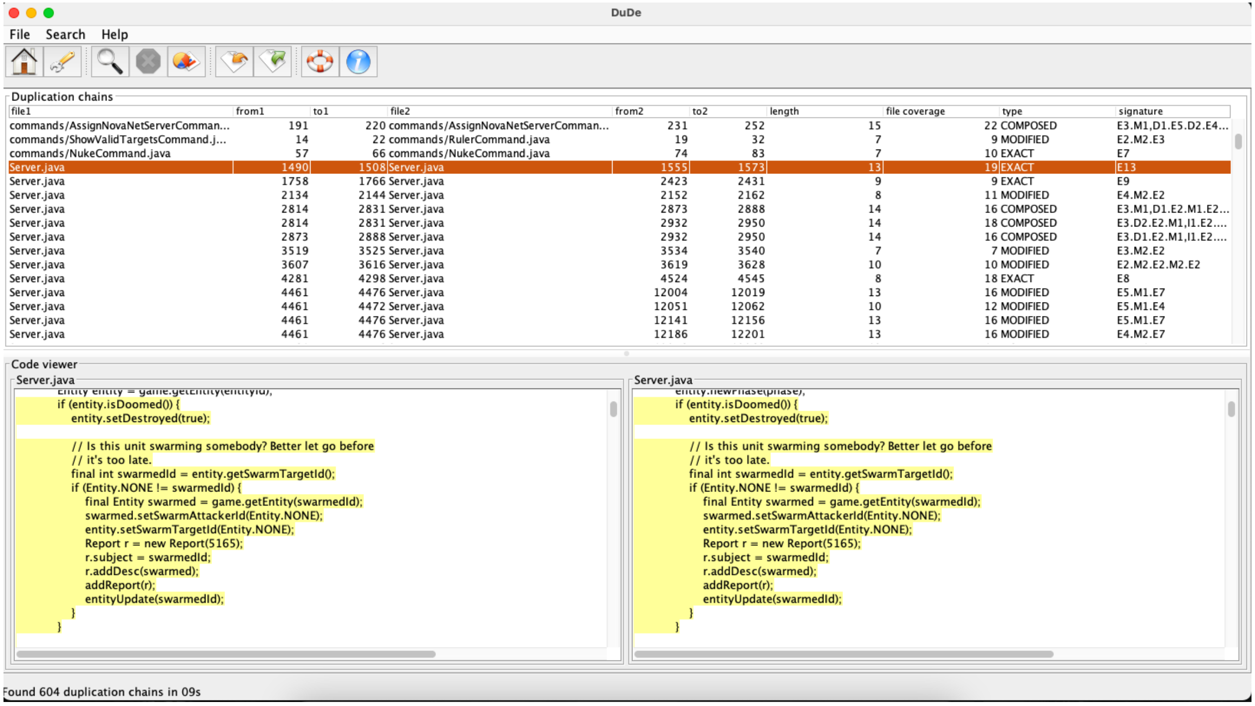
The first tool I used was CodeScene, to visualize the files that need refactoring. This tool pointed me to some files that might need a better look.



Here we can see that Server.java in the server and Entity.java in common are marked orange. Those are files that probably need refactoring first. In common there are also 7 files marked yellow: AnnoType.java, MiskType.java, Mech.java, Compute.java, WeaponAttackAction.java, Tank.java and Aero.java, which need a look as well, and in Client.ui.swing there are 3 files that I will look at first: CharLounge.java, MovementDisplay.java and BoardView1.java.

3.2 Dude

Next, I tried looking if there were code duplicates with Dude. This tool looked at the exact and modified duplicates. As noted by CodeScene, I found many duplicate parts in the Server.java file. When running this on the common folder, I found many more duplicates over the different files.



file1	from1	to1	file2	from2	to2	length	file coverage	type	signature
commands/AssignNovaNetServerComman...	191	220	commands/AssignNovaNetServerComman...	231	252	15	22	COMPOSED	E3.M1,D1.E5.D2.E4...
commands/ShowValidTargetsCommand.j...	14	22	commands/RulerCommand.java	19	32	7	9	MODIFIED	E2.M2.E3
commands/NukeCommand.java	57	66	commands/NukeCommand.java	74	83	7	10	EXACT	E7
Server.java	1490	1508	Server.java	1555	1573	13	19	EXACT	E13
Server.java	1758	1766	Server.java	2423	2431	9	9	EXACT	E9
Server.java	2134	2144	Server.java	2152	2162	8	11	MODIFIED	E4.M2.E2
Server.java	2814	2831	Server.java	2873	2888	14	16	COMPOSED	E3.M1,D1.E2.M1.E2...
Server.java	2814	2831	Server.java	2932	2950	14	18	COMPOSED	E3.D2.E2.M1,I1.E2....
Server.java	2873	2888	Server.java	2932	2950	14	16	COMPOSED	E3.D1.E2.M1,I1.E2....
Server.java	3519	3525	Server.java	3534	3540	7	7	MODIFIED	E3.M2.E2
Server.java	3607	3616	Server.java	3619	3628	10	10	MODIFIED	E2.M2.E2.M2.E2
Server.java	4281	4298	Server.java	4524	4545	8	18	EXACT	E8
Server.java	4461	4476	Server.java	12004	12019	13	16	MODIFIED	E5.M1.E7
Server.java	4461	4472	Server.java	12051	12062	10	12	MODIFIED	E5.M1.E4
Server.java	4461	4476	Server.java	12141	12156	13	16	MODIFIED	E5.M1.E7
Server.java	4461	4476	Server.java	12186	12201	13	16	MODIFIED	E4.M2.E7

```
        Entity entity = game.getEntity(entityId);
        if (entity.isDoomed()) {
            entity.setDestroyed(true);

            // Is this unit swarming somebody? Better let go before
            // it's too late.
            final int swarmedId = entity.getSwarmTargetId();
            if (Entity.NONE != swarmedId) {
                final Entity swarmed = game.getEntity(swarmedId);
                swarmed.setSwarmAttackerId(Entity.NONE);
                entity.setSwarmTargetId(Entity.NONE);
                Report r = new Report(5165);
                r.subject = swarmedId;
                r.addDesc(swarmed);
                addReport(r);
                entityUpdate(swarmedId);
            }
        }
```

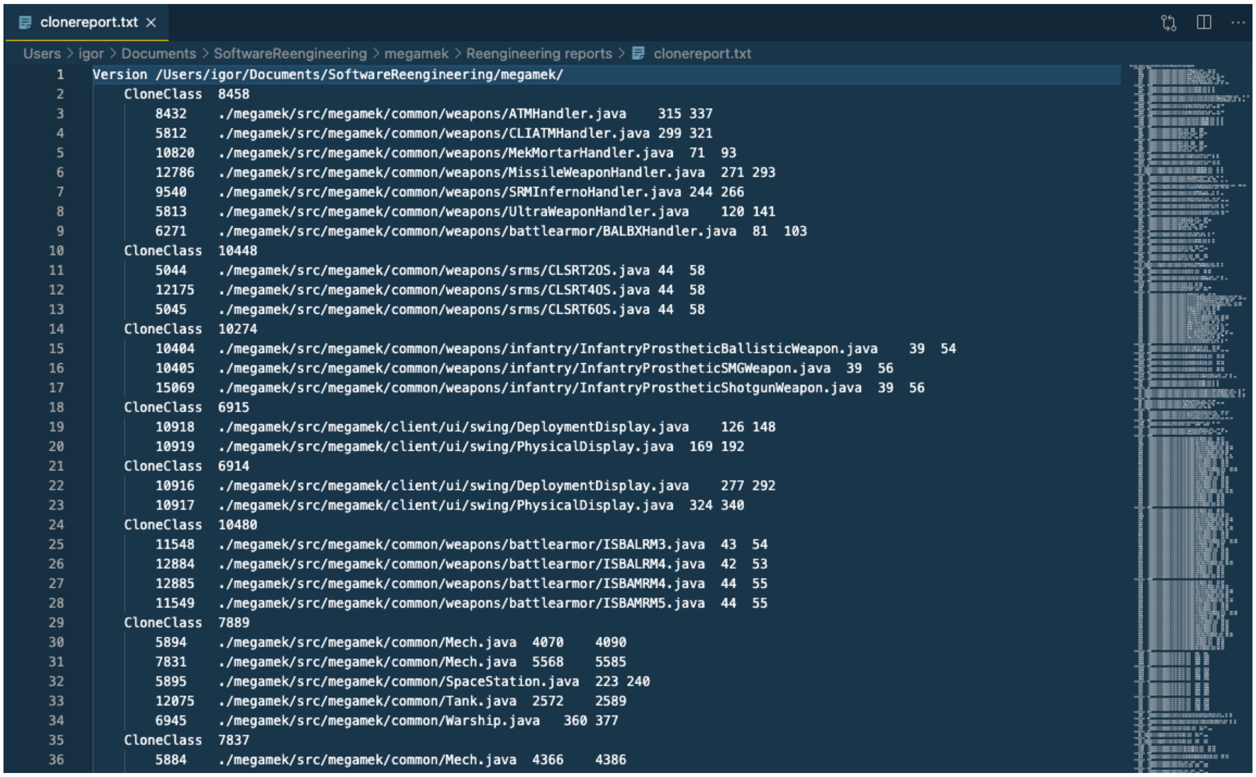
```
        entity.newPhase(phase);
        if (entity.isDoomed()) {
            entity.setDestroyed(true);

            // Is this unit swarming somebody? Better let go before
            // it's too late.
            final int swarmedId = entity.getSwarmTargetId();
            if (Entity.NONE != swarmedId) {
                final Entity swarmed = game.getEntity(swarmedId);
                swarmed.setSwarmAttackerId(Entity.NONE);
                entity.setSwarmTargetId(Entity.NONE);
                Report r = new Report(5165);
                r.subject = swarmedId;
                r.addDesc(swarmed);
                addReport(r);
                entityUpdate(swarmedId);
            }
        }
```

Found 604 duplication chains in 09s

3.3 iClones

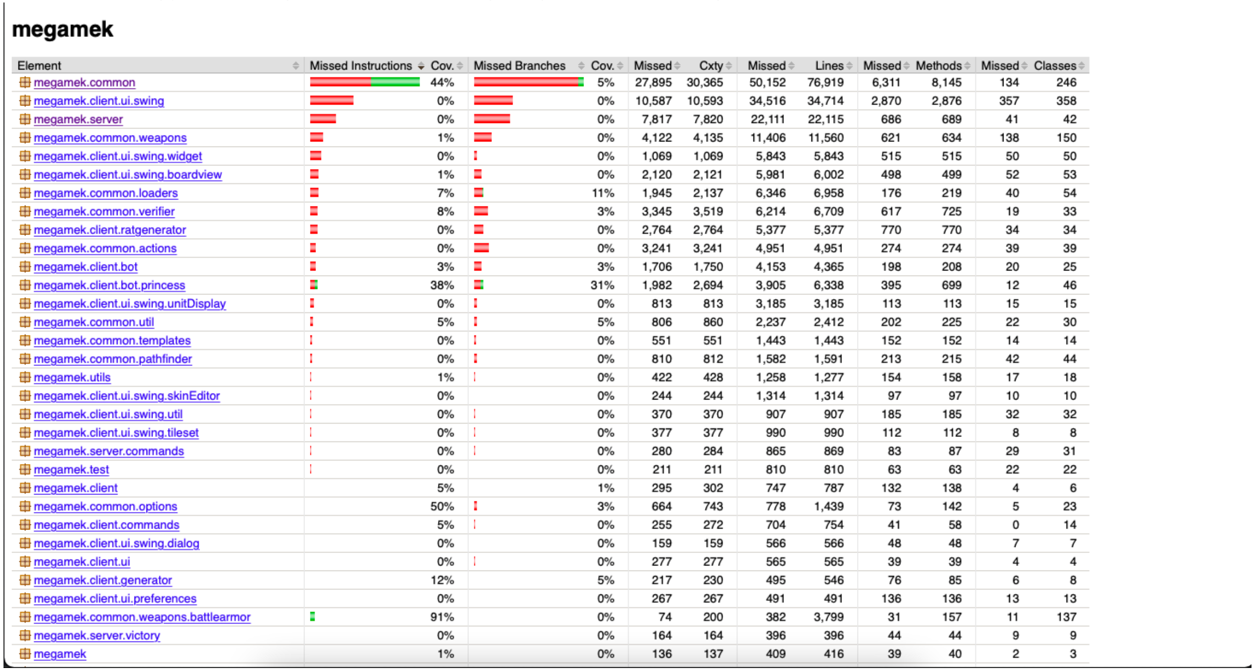
I also run iClones on the entire project to find duplicates. First I tried exporting to rcf format, but the provided rcf viewer kept crashing, and because it is a format only created by the creators of the tool to view the output, I couldn't find another tool to open the files. I decided to try the other export formats, but this was not very readable. I decided that it would be better to only focus on the duplicates that were provided by Dude.
Here is a screenshot from the txt dump, because the viewer didn't work for me:


clonereport.txt
Users > igor > Documents > SoftwareReengineering > megamek > Reengineering reports > clonereport.txt

```
Version /Users/igor/Documents/SoftwareReengineering/megamek/
    CloneClass  8458
        8432    ./megamek/src/megamek/common/weapons/ATMHandler.java    315 337
        5812    ./megamek/src/megamek/common/weapons/CLIATMHandler.java 299 321
        10820   ./megamek/src/megamek/common/weapons/MekMortarHandler.java  71  93
        12786   ./megamek/src/megamek/common/weapons/MissileWeaponHandler.java  271 293
        9540    ./megamek/src/megamek/common/weapons/SRMInfernoHandler.java 244 266
        5813    ./megamek/src/megamek/common/weapons/UltraWeaponHandler.java    120 141
        6271    ./megamek/src/megamek/common/weapons/battlearmor/BALBXHandler.java  81  103
    CloneClass  10448
        5044    ./megamek/src/megamek/common/weapons/srms/CLSRT2OS.java 44  58
        12175   ./megamek/src/megamek/common/weapons/srms/CLSRT4OS.java 44  58
        5045    ./megamek/src/megamek/common/weapons/srms/CLSRT6OS.java 44  58
    CloneClass  10274
        10404   ./megamek/src/megamek/common/weapons/infantry/InfantryProstheticBallisticWeapon.java    39  54
        10405   ./megamek/src/megamek/common/weapons/infantry/InfantryProstheticSMGWeapon.java  39  56
        15069   ./megamek/src/megamek/common/weapons/infantry/InfantryProstheticShotgunWeapon.java  39  56
    CloneClass  6915
        10918   ./megamek/src/megamek/client/ui/swing/DeploymentDisplay.java    126 148
        10919   ./megamek/src/megamek/client/ui/swing/PhysicalDisplay.java  169 192
    CloneClass  6914
        10916   ./megamek/src/megamek/client/ui/swing/DeploymentDisplay.java    277 292
        10917   ./megamek/src/megamek/client/ui/swing/PhysicalDisplay.java  324 340
    CloneClass  10480
        11548   ./megamek/src/megamek/common/weapons/battlearmor/ISBALRM3.java  43  54
        12884   ./megamek/src/megamek/common/weapons/battlearmor/ISBALRM4.java  42  53
        12885   ./megamek/src/megamek/common/weapons/battlearmor/ISBAMRM4.java  44  55
        11549   ./megamek/src/megamek/common/weapons/battlearmor/ISBAMRM5.java  44  55
    CloneClass  7889
        5894    ./megamek/src/megamek/common/Mech.java  4070    4090
        7831    ./megamek/src/megamek/common/Mech.java  5568    5585
        5895    ./megamek/src/megamek/common/SpaceStation.java  223 240
        12075   ./megamek/src/megamek/common/Tank.java  2572    2589
        6945    ./megamek/src/megamek/common/Warship.java   360 377
    CloneClass  7837
        5884    ./megamek/src/megamek/common/Mech.java  4366    4386
```

3.4 jacoco

When running jacoco to get the test coverage, I got the following report:



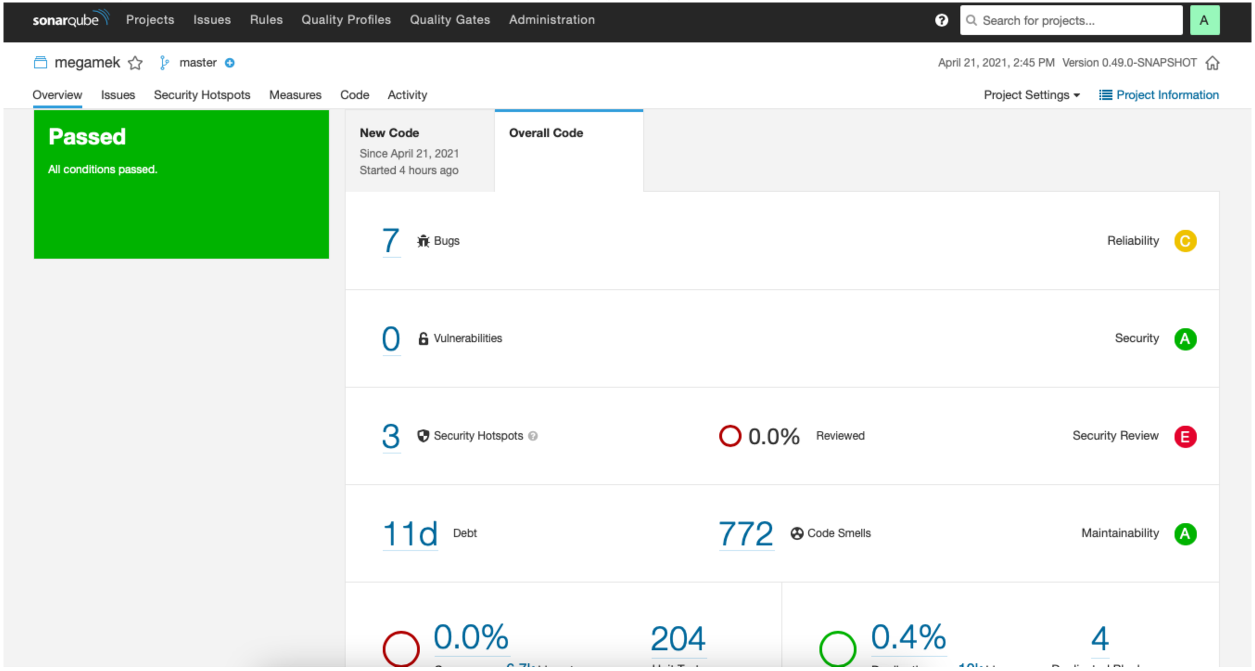
megamek

Element	Missed Instructions	Cov.	Missed Branches	Cov.	Missed	Cxty	Missed	Lines	Missed	Methods	Missed	Classes
megamek.common		44%		5%	27,895	30,365	50,152	76,919	6,311	8,145	134	246
megamek.client.ui.swing		0%		0%	10,587	10,593	34,516	34,714	2,870	2,876	357	358
megamek.server		0%		0%	7,817	7,820	22,111	22,115	686	689	41	42
megamek.common.weapons		1%		0%	4,122	4,135	11,406	11,560	621	634	138	150
megamek.client.ui.swing.widget		0%		0%	1,069	1,069	5,843	5,843	515	515	50	50
megamek.client.ui.swing.boardview		1%		0%	2,120	2,121	5,981	6,002	498	499	52	53
megamek.common.loaders		7%		11%	1,945	2,137	6,346	6,958	176	219	40	54
megamek.common.verifier		8%		3%	3,345	3,519	6,214	6,709	617	725	19	33
megamek.client.ratgenerator		0%		0%	2,764	2,764	5,377	5,377	770	770	34	34
megamek.common.actions		0%		0%	3,241	3,241	4,951	4,951	274	274	39	39
megamek.client.bot		3%		3%	1,706	1,750	4,153	4,365	198	208	20	25
megamek.client.bot.princess		38%		31%	1,982	2,694	3,905	6,338	395	699	12	46
megamek.client.ui.swing.unitDisplay		0%		0%	813	813	3,185	3,185	113	113	15	15
megamek.common.util		5%		5%	806	860	2,237	2,412	202	225	22	30
megamek.common.templates		0%		0%	551	551	1,443	1,443	152	152	14	14
megamek.common.pathfinder		0%		0%	810	812	1,582	1,591	213	215	42	44
megamek.utils		1%		0%	422	428	1,258	1,277	154	158	17	18
megamek.client.ui.swing.skinEditor		0%		0%	244	244	1,314	1,314	97	97	10	10
megamek.client.ui.swing.util		0%		0%	370	370	907	907	185	185	32	32
megamek.client.ui.swing.tileset		0%		0%	377	377	990	990	112	112	8	8
megamek.server.commands		0%		0%	280	284	865	869	83	87	29	31
megamek.test		0%		0%	211	211	810	810	63	63	22	22
megamek.client		5%		1%	295	302	747	787	132	138	4	6
megamek.common.options		50%		3%	664	743	778	1,439	73	142	5	23
megamek.client.commands		5%		0%	255	272	704	754	41	58	0	14
megamek.client.ui.swing.dialog		0%		0%	159	159	566	566	48	48	7	7
megamek.client.ui		0%		0%	277	277	565	565	39	39	4	4
megamek.client.generator		12%		5%	217	230	495	546	76	85	6	8
megamek.client.ui.preferences		0%		0%	267	267	491	491	136	136	13	13
megamek.common.weapons.battlearmor		91%		0%	74	200	382	3,799	31	157	11	137
megamek.server.victory		0%		0%	164	164	396	396	44	44	9	9
megamek		1%		0%	136	137	409	416	39	40	2	3

This report shows that very few parts of the code are covered, and thus many tests have to be written before we can refactor. The initial coverage report is pushed to the Github repo so I can compare this later.

3.5 SonarQube

I managed to run SonarQube, but only on single files at a time, and not even for all files. This was because the memory kept running out, even after increasing the allowed memory. When refactoring a class, this tool might come in handy, but because it runs out of memory so quickly, I decided not to use it to look for files that need refactoring because it would take too long to run everything separately.



Passed

All conditions passed.

New Code
Since April 21, 2021
Started 4 hours ago

Overall Code

7 Bugs — Reliability C

0 Vulnerabilities — Security A

3 Security Hotspots — 0.0% Reviewed — Security Review E

11d Debt — 772 Code Smells — Maintainability A

0.0% — 204 — 0.4% — 4

4 Reengineering goals

From the gathered information I decided to first take a look at Entity.java. It was marked orange by CodeScene, so I will look why and try to decide what needs to be refactored.
Once I understand the class, tests need to be written, as this class is not really covered. If I'm finished with that, I can refactor and test if nothing breaks.

Next I want to take a look at Server.java. It is a very large class which might need some refactoring. Because it is such a large file, I don't want to start with it immediately.
Again, the first goal is to look deeper at the class and try to understand what the methods do. Because it is a very large class I think it might be a god class and want to split it into different classes where possible.
Once I understand this class and decided it is worth refactoring, tests need to be written, as this class is not covered at all. This needs to be done beforehand to make sure nothing breaks.

After I am done with those 2 classes, I think I might look at other classes and try to remove duplicates if it is necessary.