

Mutation Testing

POM.xml file

```
<plugin>
  <groupId>org.pitest</groupId>
  <artifactId>pitest-maven</artifactId>
</plugin>
```

Command Line Execution using Maven command

```
E:\Marist\Semester2\SoftwareVerificationAndMaintenance\roomScheduler>mvn org.pitest:pitest-
maven:mutationCoverage
```

```
[INFO] Scanning for projects...
```

```
[WARNING]
```

```
[WARNING] Some problems were encountered while building the effective model for
RoomScheduler:RoomScheduler:jar:0.0.1-SNAPSHOT
```

```
[WARNING] 'build.plugins.plugin.version' for org.pitest:pitest-maven is missing. @ line 35,
column 11
```

```
[WARNING]
```

```
[WARNING] It is highly recommended to fix these problems because they threaten the stability of
your build.
```

```
[WARNING]
```

```
[WARNING] For this reason, future Maven versions might no longer support building such
malformed projects.
```

```
[WARNING]
```

```
[INFO]
```

```
[INFO] -----
```

```
[INFO] Building Room Scheduler 0.0.1-SNAPSHOT
```

```
[INFO] -----
```

```
[INFO]
```

```
[INFO] --- pitest-maven:1.4.0:mutationCoverage (default-cli) @ RoomScheduler ---
```

```
Downloading from central: https://repo.maven.apache.org/maven2/org/apache/maven/doxia/doxia-
sink-api/1.1/doxia-sink-api-1.1.jar
```

```
Downloaded from central: https://repo.maven.apache.org/maven2/org/apache/maven/doxia/doxia-
sink-api/1.1/doxia-sink-api-1.1.jar (13 kB at 8.1 kB/s)
```

```
[INFO] Found plugin : Default csv report plugin
```

```
[INFO] Found plugin : Default xml report plugin
```

```
[INFO] Found plugin : Default html report plugin
```

```
[INFO] Found plugin : Static initializer code detector plugin
```

```
[INFO] Found plugin : Static initializer filter plugin
```

```
[INFO] Found plugin : Excluded annotations plugin
```

```
[INFO] Found plugin : Inlined finally block filter plugin
```

```
[INFO] Found plugin : Try with resources filter
```

```
[INFO] Found plugin : Implicit null check filter
```

```
[INFO] Found plugin : For each loop filter
```

```
[INFO] Found plugin : Logging calls filter
[INFO] Found plugin : Infinite for loop filter
[INFO] Found plugin : Long running iterator loop filter
[INFO] Found plugin : For loop counter filter
[INFO] Found plugin : Kotlin junk mutations filter
[INFO] Found plugin : Max mutations per class limit
[INFO] Found plugin : Equals shortcut equivalent mutant filter
[INFO] Found plugin : Trivial return vals equivalence filter
[INFO] Found plugin : Mutant export plugin
[INFO] Found shared classpath plugin : Default mutation engine
[INFO] Found shared classpath plugin : JUnit plugin
[INFO] Found shared classpath plugin : TestNG plugin
[INFO] Adding org.pitest:pitest to SUT classpath
[INFO] Mutating from
E:\Marist\Semester2\SoftwareVerificationAndMaintenance\roomScheduler\target\classes
[INFO] Defaulting target classes to match packages in build directory
2:30:18 PM PIT >> INFO : Verbose logging is disabled. If you encounter an problem please enable
it before reporting an issue.
2:30:20 PM PIT >> INFO : Sending 10 test classes to minion
2:30:20 PM PIT >> INFO : Sent tests to minion
2:30:20 PM PIT >> INFO : MINION : 2:30:20 PM PIT >> INFO : Checking environment

2:30:21 PM PIT >> INFO : MINION : 2:30:21 PM PIT >> INFO : Found 46 tests

2:30:21 PM PIT >> INFO : MINION : 2:30:21 PM PIT >> INFO : Dependency analysis reduced number
of potential tests by 0

2:30:21 PM PIT >> INFO : MINION : 2:30:21 PM PIT >> INFO : 46 tests received

2:30:21 PM PIT >> INFO : Calculated coverage in 2 seconds.
2:30:22 PM PIT >> WARNING : Found more than one mutation similar on same line in a finally
block. Can't correct for inlining.
2:30:22 PM PIT >> WARNING : Found more than one mutation similar on same line in a finally
block. Can't correct for inlining.
2:30:22 PM PIT >> WARNING : Found more than one mutation similar on same line in a finally
block. Can't correct for inlining.
2:30:22 PM PIT >> WARNING : Found more than one mutation similar on same line in a finally
block. Can't correct for inlining.
2:30:22 PM PIT >> INFO : Created 6 mutation test units
2:30:34 PM PIT >> INFO : Completed in 15 seconds
=====
- Timings
=====
> scan classpath : < 1 second
> coverage and dependency analysis : 2 seconds
> build mutation tests : < 1 second
> run mutation analysis : 11 seconds
-----
> Total : 14 seconds
-----
```

```
=====
- Statistics
=====
```

```
>> Generated 390 mutations Killed 70 (18%)
>> Ran 244 tests (0.63 tests per mutation)
=====
```

```
- Mutators
=====
```

```
> org.pitest.mutationtest.engine.gregor.mutators.ConditionalsBoundaryMutator
```

```
>> Generated 5 Killed 0 (0%)
> KILLED 0 SURVIVED 1 TIMED_OUT 0 NON_VIABLE 0
> MEMORY_ERROR 0 NOT_STARTED 0 STARTED 0 RUN_ERROR 0
> NO_COVERAGE 4
-----
```

```
> org.pitest.mutationtest.engine.gregor.mutators.IncrementsMutator
```

```
>> Generated 3 Killed 1 (33%)
> KILLED 1 SURVIVED 0 TIMED_OUT 0 NON_VIABLE 0
> MEMORY_ERROR 0 NOT_STARTED 0 STARTED 0 RUN_ERROR 0
> NO_COVERAGE 2
-----
```

```
> org.pitest.mutationtest.engine.gregor.mutators.VoidMethodCallMutator
```

```
>> Generated 239 Killed 13 (5%)
> KILLED 13 SURVIVED 70 TIMED_OUT 0 NON_VIABLE 0
> MEMORY_ERROR 0 NOT_STARTED 0 STARTED 0 RUN_ERROR 0
> NO_COVERAGE 156
-----
```

```
> org.pitest.mutationtest.engine.gregor.mutators.ReturnValsMutator
```

```
>> Generated 42 Killed 24 (57%)
> KILLED 24 SURVIVED 1 TIMED_OUT 0 NON_VIABLE 0
> MEMORY_ERROR 0 NOT_STARTED 0 STARTED 0 RUN_ERROR 0
> NO_COVERAGE 17
-----
```

```
> org.pitest.mutationtest.engine.gregor.mutators.MathMutator
```

```
>> Generated 14 Killed 11 (79%)
> KILLED 11 SURVIVED 0 TIMED_OUT 0 NON_VIABLE 0
> MEMORY_ERROR 0 NOT_STARTED 0 STARTED 0 RUN_ERROR 0
> NO_COVERAGE 3
-----
```

```
> org.pitest.mutationtest.engine.gregor.mutators.NegateConditionalsMutator
```

```
>> Generated 87 Killed 21 (24%)
> KILLED 21 SURVIVED 1 TIMED_OUT 0 NON_VIABLE 0
> MEMORY_ERROR 0 NOT_STARTED 0 STARTED 0 RUN_ERROR 0
> NO_COVERAGE 65
-----
```

```
[INFO] -----
[INFO] BUILD SUCCESS
[INFO] -----
[INFO] Total time: 35.874 s
[INFO] Finished at: 2018-05-11T14:30:34-04:00
[INFO] Final Memory: 18M/208M
```

[INFO] -----

PITECLIPSE – eclipse plugin usage
➤ <https://marketplace.eclipse.org/content/pitclipse>

HTML Coverage Report

← → ↺

file:///E:/Marist/Semester2/SoftwareVerificationAndMaintenance/roomScheduler/pict

Pit Test Coverage Report

Project Summary

Number of Classes	Line Coverage	Mutation Coverage
4	22% <div><div></div><div>114/510</div></div>	17% <div><div></div><div>56/323</div></div>

Breakdown by Package

Name	Number of Classes	Line Coverage	Mutation Coverage
roomscheduler	3	23% <div><div></div><div>106/454</div></div>	18% <div><div></div><div>54/299</div></div>
utility	1	14% <div><div></div><div>8/56</div></div>	8% <div><div></div><div>2/24</div></div>

roomscheduler.java – coverage report

Mutations

81	1. negated conditional → NO_COVERAGE
86	1. removed call to roomscheduler/RoomScheduler::addRoom → NO_COVERAGE
89	1. removed call to roomscheduler/RoomScheduler::removeRoom → NO_COVERAGE
92	1. removed call to roomscheduler/RoomScheduler::listRooms → NO_COVERAGE
95	1. removed call to roomscheduler/RoomScheduler::scheduleRoom → NO_COVERAGE
98	1. removed call to roomscheduler/RoomScheduler::listSchedule → NO_COVERAGE
101	1. removed call to roomscheduler/RoomScheduler::importRoomSchedule → NO_COVERAGE
104	1. removed call to roomscheduler/RoomScheduler::exportRoomSchedule → NO_COVERAGE
107	1. removed call to java/io/PrintStream::println → NO_COVERAGE
109	1. removed call to utility/Utility::sleepFor → NO_COVERAGE
110	1. removed call to utility/Utility::clearScreen → NO_COVERAGE
115	1. removed call to java/io/PrintStream::println → NO_COVERAGE
116	1. removed call to java/io/PrintStream::println → NO_COVERAGE
117	1. removed call to utility/Utility::sleepFor → NO_COVERAGE
126	1. removed call to java/io/PrintStream::println → NO_COVERAGE
127	1. removed call to java/io/PrintStream::println → NO_COVERAGE
128	1. removed call to java/io/PrintStream::println → NO_COVERAGE
129	1. removed call to java/io/PrintStream::println → NO_COVERAGE
140	1. removed call to utility/Utility::clearScreen → NO_COVERAGE
141	1. removed call to roomscheduler/RoomScheduler::roomSchedulerBanner → NO_COVERAGE
144	1. removed call to java/io/PrintStream::println → NO_COVERAGE
145	1. removed call to java/io/PrintStream::println → NO_COVERAGE
146	1. removed call to java/io/PrintStream::println → NO_COVERAGE
147	1. removed call to java/io/PrintStream::println → NO_COVERAGE
148	1. removed call to java/io/PrintStream::println → NO_COVERAGE
149	1. removed call to java/io/PrintStream::println → NO_COVERAGE

room.java – coverage report

Mutations

39	1. removed call to roomscheduler/Room::setName → KILLED
41	1. negated conditional → KILLED
44	1. removed call to roomscheduler/Room::setCapacity → KILLED
45	1. removed call to roomscheduler/Room::setBuilding → SURVIVED
46	1. removed call to roomscheduler/Room::setLocation → SURVIVED
47	1. removed call to roomscheduler/Room::setMeetings → KILLED
65	1. mutated return of Object value for roomscheduler/Room::getName to (if (x != null) null else throw new RuntimeException) → KILLED
90	1. mutated return of Object value for roomscheduler/Room::getBuilding to (if (x != null) null else throw new RuntimeException) → KILLED
107	1. mutated return of Object value for roomscheduler/Room::getLocation to (if (x != null) null else throw new RuntimeException) → KILLED
116	1. replaced return of integer sized value with (x == 0 ? 1 : 0) → KILLED
134	1. mutated return of Object value for roomscheduler/Room::getMeetings to (if (x != null) null else throw new RuntimeException) → KILLED

meeting.java – coverage report

Mutations

37	1. removed call to roomscheduler/Meeting::setStartDate → KILLED
38	1. removed call to roomscheduler/Meeting::setStartTime → KILLED
39	1. removed call to roomscheduler/Meeting::setStopTime → KILLED
41	1. negated conditional → KILLED
42	1. removed call to roomscheduler/Meeting::setSubject → NO_COVERAGE
44	1. removed call to roomscheduler/Meeting::setSubject → KILLED
54	1. mutated return of Object value for roomscheduler/Meeting::toString to (if (x != null) null else throw new RuntimeException) → NO_COVERAGE
73	1. mutated return of Object value for roomscheduler/Meeting::getStartDate to (if (x != null) null else throw new RuntimeException) → KILLED
82	1. mutated return of Object value for roomscheduler/Meeting::getStartTime to (if (x != null) null else throw new RuntimeException) → KILLED
100	1. mutated return of Object value for roomscheduler/Meeting::getStopTime to (if (x != null) null else throw new RuntimeException) → KILLED
118	1. mutated return of Object value for roomscheduler/Meeting::getSubject to (if (x != null) null else throw new RuntimeException) → KILLED

utility.java – coverage report

Mutations

45	1. negated conditional → NO_COVERAGE
50	1. removed call to java/lang/Thread::interrupt → NO_COVERAGE
67	1. removed call to java/lang/Thread::sleep → NO_COVERAGE
70	1. removed call to java/lang/Thread::interrupt → NO_COVERAGE
84	1. mutated return of Object value for utility/Utility::getCurrentTime to (if (x != null) null else throw new RuntimeException) → NO_COVERAGE
93	1. removed call to utility/Utility::sleepFor → NO_COVERAGE
97	1. mutated return of Object value for utility/Utility::getCurrentDate to (if (x != null) null else throw new RuntimeException) → NO_COVERAGE
107	1. mutated return of Object value for utility/Utility::getCurrentDateTime to (if (x != null) null else throw new RuntimeException) → NO_COVERAGE
119	1. replaced return of integer sized value with (x == 0 ? 1 : 0) → NO_COVERAGE
121	1. replaced return of integer sized value with (x == 0 ? 1 : 0) → NO_COVERAGE
134	1. replaced return of integer sized value with (x == 0 ? 1 : 0) → NO_COVERAGE
136	1. replaced return of integer sized value with (x == 0 ? 1 : 0) → NO_COVERAGE
150	1. replaced return of integer sized value with (x == 0 ? 1 : 0) → KILLED
163	1. replaced return of long value with value + 1 for utility/Utility::getDateDiffInDays → SURVIVED
174	1. replaced return of long value with value + 1 for utility/Utility::getTimeDiffInMinutes → KILLED
187	1. negated conditional → NO_COVERAGE
	2. negated conditional → NO_COVERAGE
190	1. replaced return of integer sized value with (x == 0 ? 1 : 0) → NO_COVERAGE
204	1. negated conditional → NO_COVERAGE
	2. negated conditional → NO_COVERAGE
205	1. negated conditional → NO_COVERAGE
	2. negated conditional → NO_COVERAGE
208	1. replaced return of integer sized value with (x == 0 ? 1 : 0) → NO_COVERAGE
219	1. mutated return of Object value for utility/Utility::getPrettyPrintJson to (if (x != null) null else throw new RuntimeException) → NO_COVERAGE