Report on JPF

Introduction

Java path finder is a model checking framework for java. This can be used as a standalone software, eclips or netbeans plugins or can be run with command line. I have used the command lines to run the model checks. Before that, I used the jpf-core source to build the necessary .jar files for the command. I used Windows Powershell to run al lthe commands.

Folder Structure

This section explains the folder structures.

1. Apps: This folder contains the apps that were used to run the model checking with jpf.
2. jpf-core: This folder contains the jpf core cloned from the jpf-core github repository.
   i. bin: Contains the executables
   ii. build: Contains the generated .jar files for jpf.
3. output: Some outputs were too large for the powershell so, for a better understanding I created text files containing the outputs of the apps while running model checking with jpf.
4. Screenshots: This folder contains all the screenshots of the project.
5. Root:
   i. Report.docx: This is the Microsoft Word file that contains the report.
   ii. README.md: This is the mark down version of the report to be read by github repository (For a simplified view).
   iii. Report.pdf: pdf version of this report is also available here in this file.

Steps for model checking using JPF

The following steps were executed to run the simple java application.

1. Clone JPS-core repository: I cloned the jpf-core repository inside my project folder from the jpf-core github repository by running the following command:
   `git clone https://github.com/javapathfinder/jpf-core.git`
2. Build Jpf-core: Then, I navigated into the folder “jpf-core”. Now, I opened powershell and ran the following command to use gradle for building the .jar files:
   `./gradlew`
   This build the necessary .jar files for the jpf-core. Fig. 1 shows the output of the command.

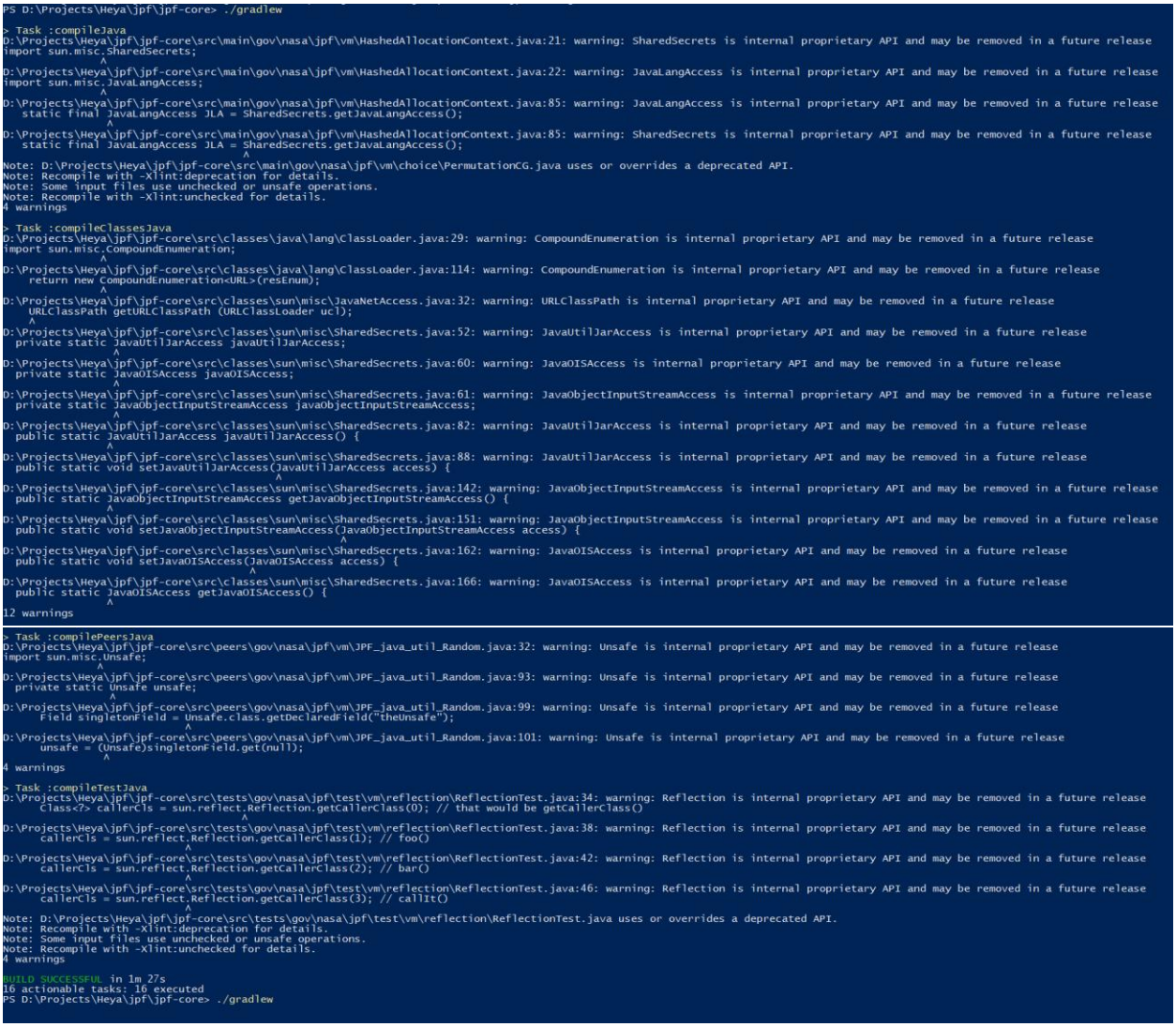


Fig 1: Building necessary .jar files

I also ran the following command to build again and this time I stored the outputs in a text file in the output folder mentioned in the folder structure.

```
./gradlew > ../output/jpfbuild.txt
```

3. Creating example java application "Rand.java": I created the following files in the project folder.

   Rand.java**:**

```
import java.util.Random;

public class Rand {
  public static void main (String[] args) {
    System.out.println("computing c = a/(b+a - 2)..");
    Random random = new Random(42);      // (1)
```

```
    int a = random.nextInt(2);            // (2)
    System.out.printf("a=%d\n", a);

    //... lots of code here

    int b = random.nextInt(3);            // (3)
    System.out.printf("  b=%d       ,a=%d\n", b, a);

    int c = a/(b+a -2);                   // (4)
    System.out.printf("=>  c=%d     , b=%d, a=%d\n", c, b, a);
  }
}
```

Rand.jpf:

```
target = Rand

cg.enumerate_random = true
report.console.property_violation=error,trace
```

4. Running the model check:

I ran the following command to run the model check.

```
../jpf-core/bin/jpf +cg.enumerate_random=true Rand
```

The output of the model check can be seen the screenshot in figure 2. I also wanted to store the output of the command in a file for a better understanding so, I again ran the following command.

```
../jpf-core/bin/jpf +cg.enumerate_random=true Rand >
..\output\randoutput.txt
```

This created a randoutput.txt file with the powershell outputs.

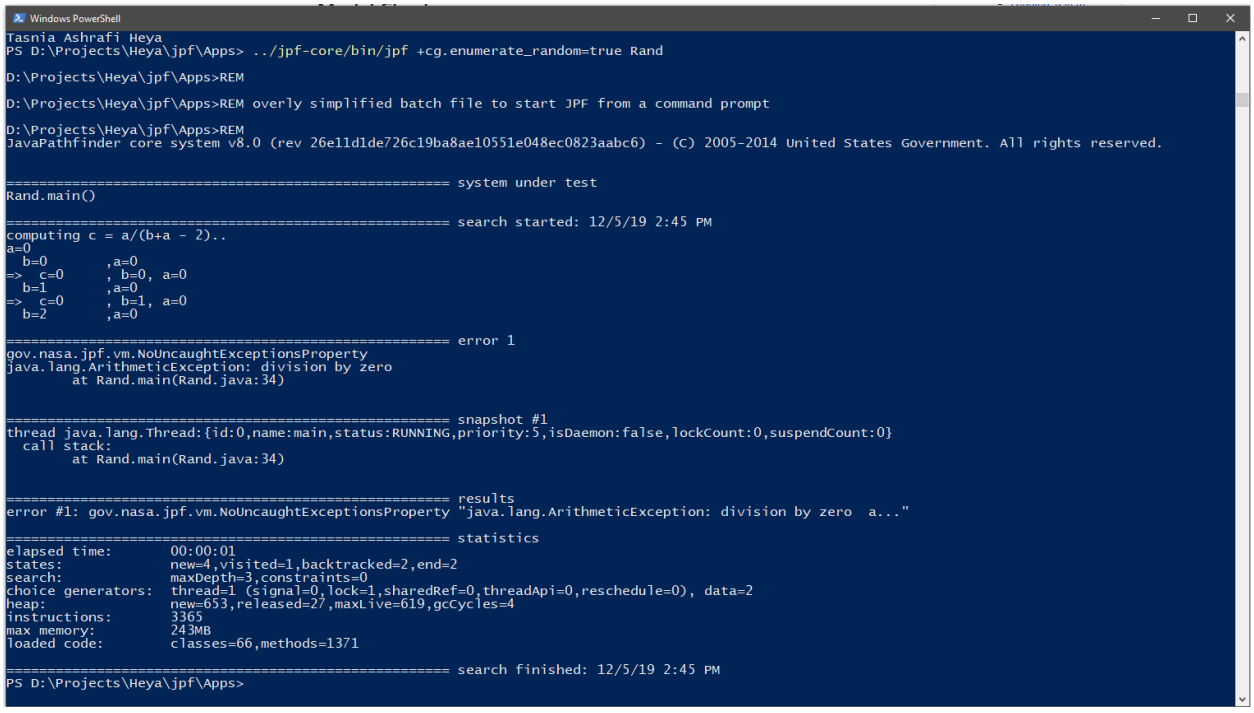


Figure 2: Running model check on Rand.java

5. Example2 App:

I also ran another example. The source code of the file is large to put here. It is under "Apps" folder with the name "RobotManager.java". A related jpf file was also created "RobotManager.jpf".

6. Example2 App model check:

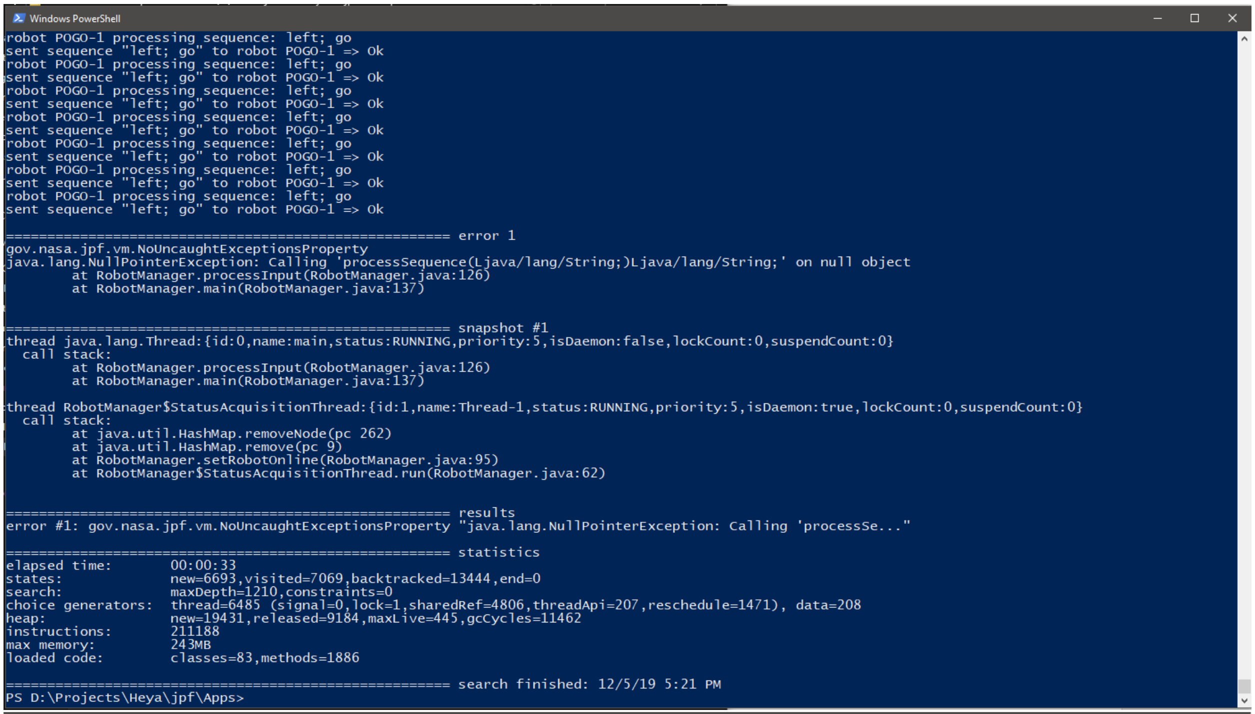
I ran the second example with the following command.

```
../jpf-core/bin/jpf +cg.enumerate_random=true RobotManager
```

The output of the command can be observed in figure 3. I also ran the following command to store the output in a text file by running the following command.

```
../jpf-core/bin/jpf +cg.enumerate_random=true RobotManager >
..\output\robotmanageroutput.txt
```

The output file is available in the "output" folder mentioned in the folder structure. The name of the output file is "robotmanageroutput.txt".



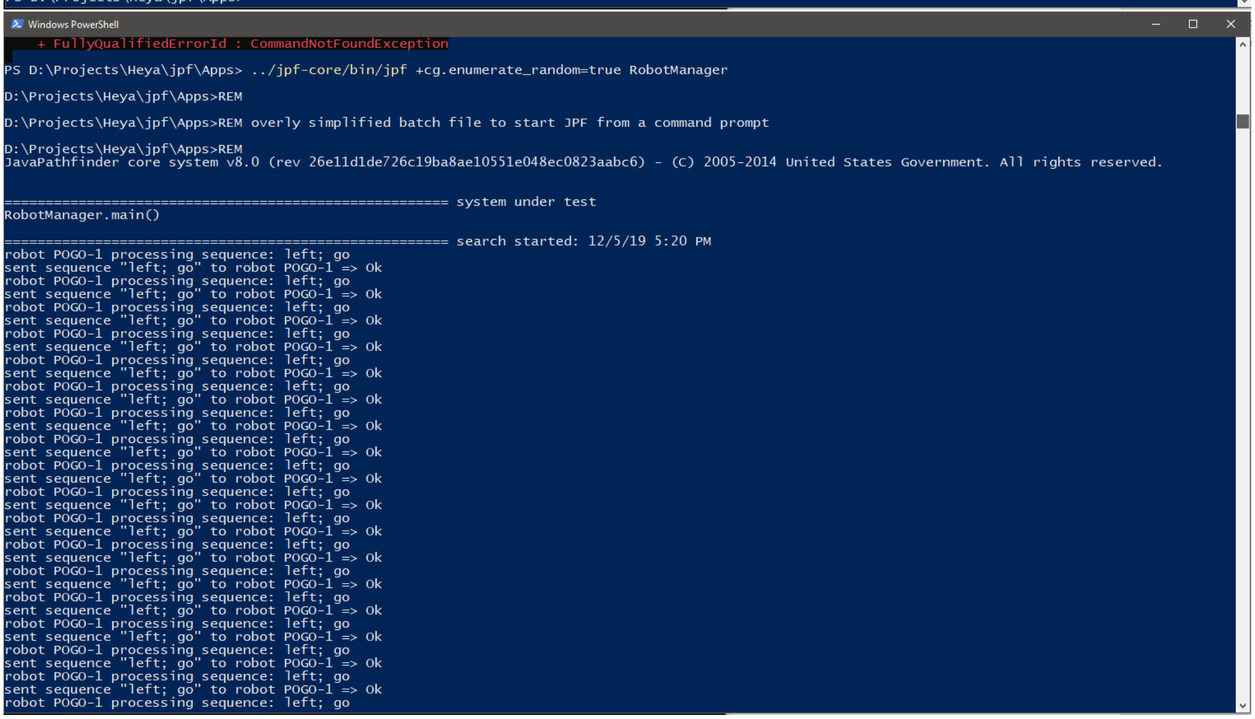


Figure 3: RobotManager model checking with jpf.