SUT: SecretHitlerGame

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Online multiplayer Board game(5 - 10 players)
https://secret-hitler.online/

Potential/active users: mostly board Game lovers
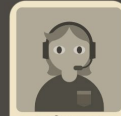
Backend: Java (1.5k LOC), postgresql, javelin
Frontend: React
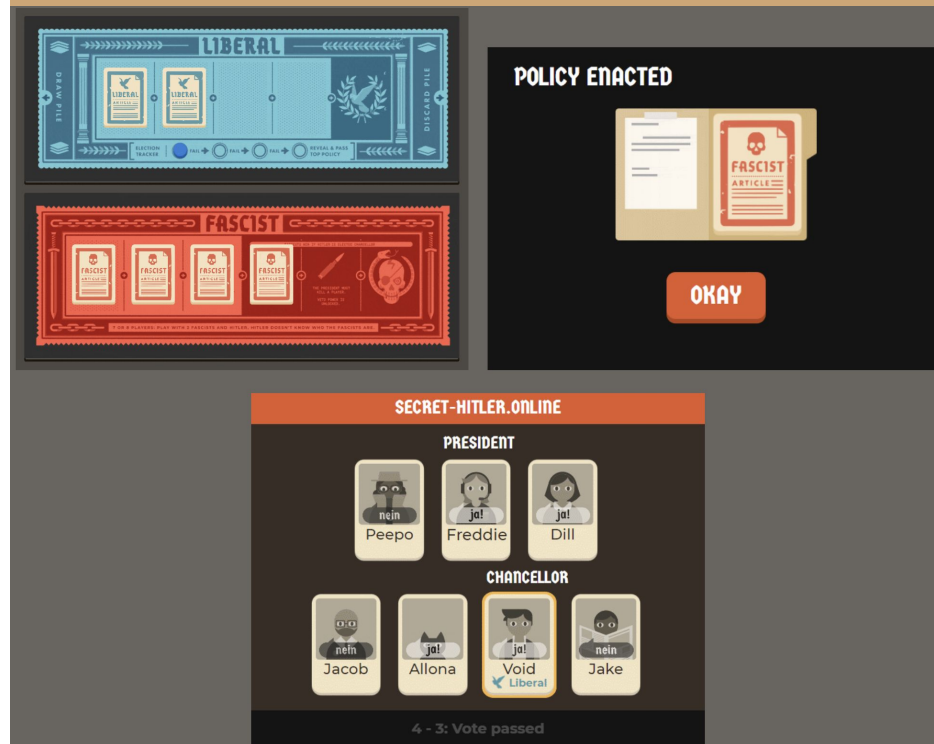
Tests and tools:

- Unit test: JUnit 5
- Mock test (unit): Mockito
- BlackBox test (functional/integration): Unirest and AssertJ
- Mutation analysis: PIT
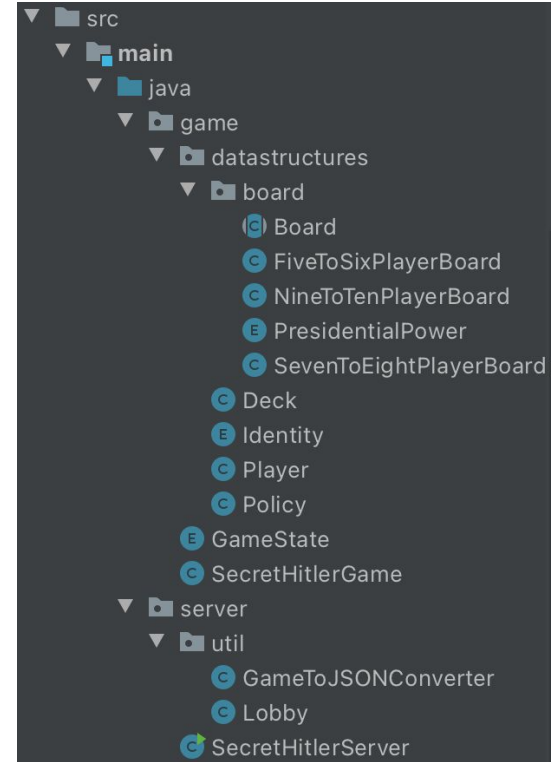- GUI test: Selenide
- Load test: Jmeter

Unit Test

106 unit tests, all passed except 1

Aim for high branch and statement coverage

JaCoCo Report

Challenges: game, Lobby

```
▼ ▮ src
  ▼ ▮ main
    ▼ ▮ java
      ▼ ▮ game
        ▼ ▮ datastructures
          ▼ ▮ board
            ⓒ Board
            ⓒ FiveToSixPlayerBoard
            ⓒ NineToTenPlayerBoard
            ⓔ PresidentialPower
            ⓒ SevenToEightPlayerBoard
          ⓒ Deck
          ⓔ Identity
          ⓒ Player
          ⓒ Policy
        ⓔ GameState
        ⓖ SecretHitlerGame
      ▼ ▮ server
        ▼ ▮ util
          ⓒ GameToJSONConverter
          ⓒ Lobby
        ⓖ SecretHitlerServer
```

Element	Missed Instructions	Cov.	Missed Branches	Cov.	Missed	Cxty	Missed	Lines	Missed	Methods	Missed	Classes
server		14%		15%	68	78	287	335	18	24	2	3
server.util		34%		17%	57	72	111	175	15	25	1	3
game		72%		58%	52	125	103	306	7	45	0	2
game.datastructures.board		96%		90%	4	36	2	50	1	17	0	5
game.datastructures		100%		100%	0	24	0	41	0	20	0	5
Total	1,939 of 3,805	49%	225 of 385	41%	181	335	503	907	41	131	3	18

Mock Test

6 unit-level mock tests for SecretHitlerServer

Test 3 public methods: ping(Context ctx), checkLogin(Context ctx) and createNewLobby(Context ctx)

Verify ctx.status() and ctx.result()

Challenge

1 failed test: checkLoginReturn400(), not accessible in real use, can be fixed with adding an early return

Functional Test

Focus on the business requirements of the application: APIs

Similar challenge as in mock test

Mutation Analysis

Pit Test Coverage Report

Project Summary

Number of Classes		Line Coverage		Mutation Coverage	
7		97%	75/77	98%	53/54

Breakdown by Package

Name	Number of Classes	Line Coverage		Mutation Coverage	
game.datastructures	3	100%	33/33	100%	19/19
game.datastructures.board	4	95%	42/44	97%	34/35

Report generated by PIT 1.5.2

Pit Test Coverage Report

Package Summary

game

Number of Classes		Line Coverage		Mutation Coverage	
1		60%	175/290	39%	62/159

Breakdown by Class

Name	Line Coverage		Mutation Coverage	
SecretHitlerGame.java	60%	175/290	39%	62/159

Report generated by PIT 1.5.2

```
51
52        private List<Player> playerList;
53        private Board board;
54        private Deck discard;
55        private Deck draw;
56
57        private int electionTracker;
58
59        private GameState state;
60        private GameState lastState = GameState.SETUP;
61
62        private Random random;
63
64        // The last president and chancellor that were successfully voted into office.
65        private String lastPresident;
66        private String lastChancellor;
67
68        private String currentPresident;
69        private String currentChancellor;
70
71        // Used during a session with the PRESIDENTIAL_POWER_ELECTION power active to remember the next president.
72        // The default state should be null.
73        private String nextPresident;
74        // The president that was elected to take power next (due to the PRESIDENTIAL_POWER_ELECTION power being active).
75        private String electedPresident;
76
77        // The player that was targeted with the last presidential power.
78        private String target;
79
80        // The options available to either the President or the Chancellor during the legislative session
81        private List<Policy> legislativePolicies;
82
83        private boolean didElectionTrackerAdvance = false;
84
85        private HashMap<String, Boolean> voteMap;
```
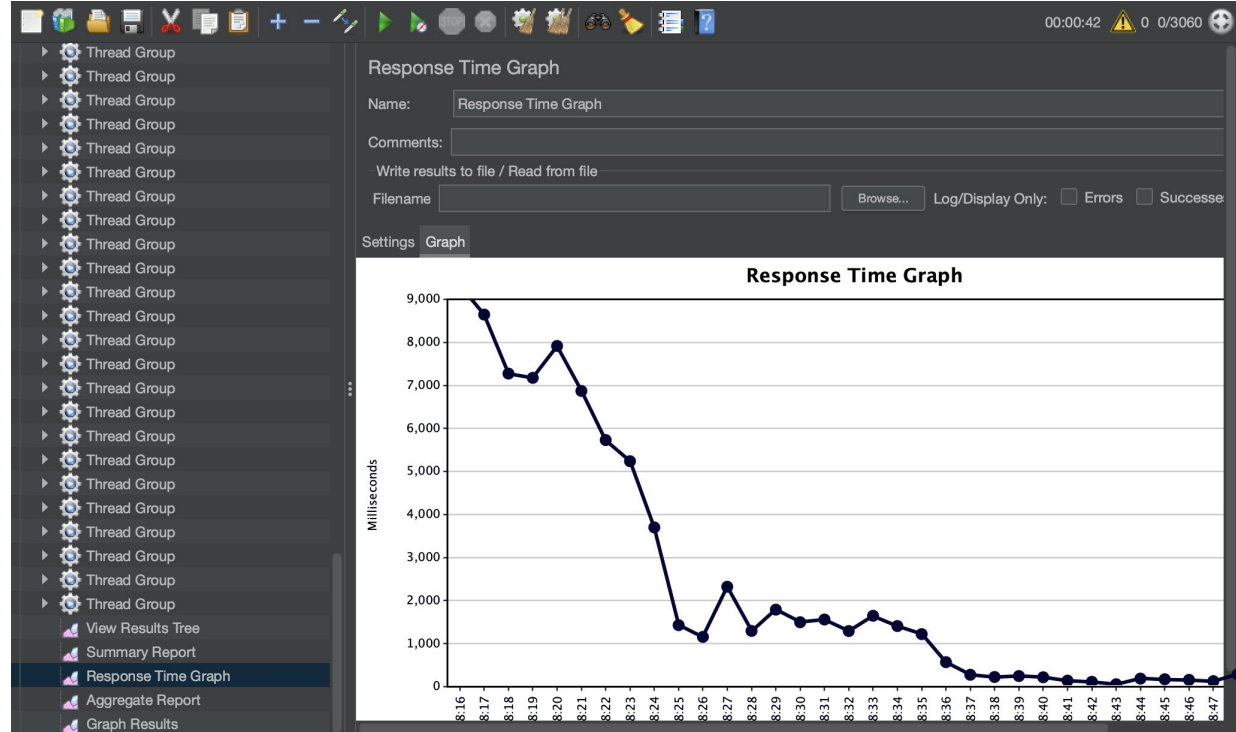
GUI Test

10 tests, 3 failed

Identity page not showing up, most likely is a rendering / websocket issue
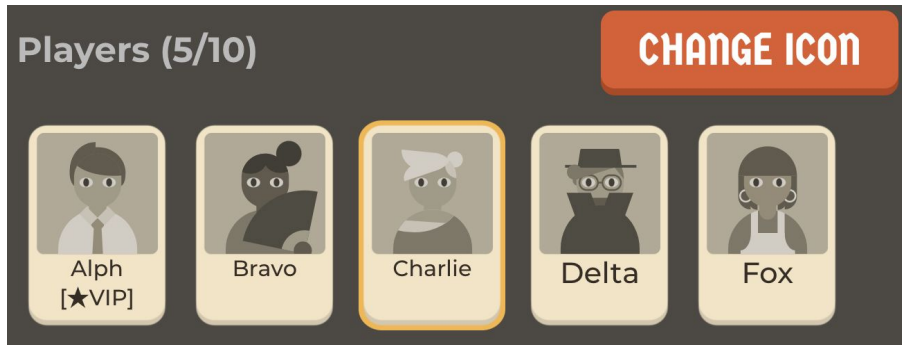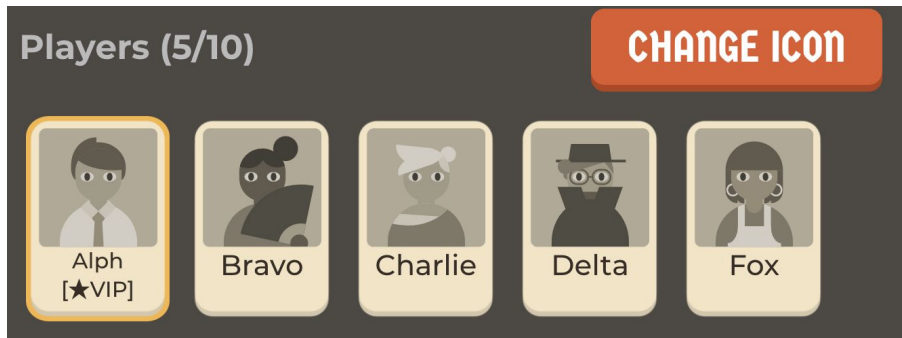
Did not encounter similar issues in real use

Had some rendering/display issues

Load Test

Another flaw: Size the name is different after current character

React rendering related issue

Conclusion

1. The SUT is mostly bug-free, well-documented
2. Importance to do an all around testing in software: Unit, GUI, Load test etc.
3. V Model Test - Testing early which could provide better reachability