General Report on Phase 4

What is done:

1. Features which were not complete on the Phase 3 were completed and now they work as expected: Leader board works as expected and shows the best scoring users within the 7 or 30 days, as well as single player game play is works as expected both in terms of task specifications and our design.
2. There is a little fix in login functionality. Same user cannot log in twice in the same session after this fix.
3. Multiplayer level implemented and works as close as possible to the task specifications. We used peer-to-peer socket communication between the both clients. One client's receiver socket acts as a server socket to the other client's sender a.k.a client socket. They communicate information regarding their positions, usernames, their missiles' positions and other metadata like whether they have died and how much hit points they took from the boss.
4. GUI tests enhanced and tests for game play have also added.
5. Game play implementation (please refer to the Phase 2 report for this, overall game play logic is same except for little modifications like hit point values, alien movement frequency etc.) is moved to the client side. Back in Phase 3, we tried to send each movement on the game screen to the back end, which resulted in a significant HTTP request overhead. Instead, we now play the game on the front end and we only send the final results to the back end.
6. Unnecessary endpoints at our API were removed. For Postman listing, you can refer to the link on Phase 2 report. For Swagger documentation, please refer to the deploymentAddress/swagger-ui.html.
7. Backend unit tests were fixed (please refer to the Phase 2 document) by creating random usernames at each registration. Now these tests can be run more than once safely.

What is missing/not perfect:

1. The main simplifying assumption we made in the multiplayer level is that each player actually shoots to their own boss but they communicate how much hit points they took from their own boss and hence they can compute how much hit points were taken in total. That is, if player1 takes 1 HP from the boss, they send this information to their opponent, the opponent sums this data with how much HP they took, extracts from the total HP of the boss and vice versa. In theory, this assumption should work but in practice, there is a natural latency in socket communication which results in different calculation in both players. Nevertheless, we tried different methods for making this potential difference minimal and preventing it changing the final winner.
2. "Go to the main page" button works problematically after the multiplayer level. If you die in any of the single player levels, this button will redirect you to the main page and you can start playing another game as expected. However, after the multiplayer level, the program slows down significantly and any click or mouse movement you will make will be rendered very slowly. This may be because of we were trying to play the multiplayer level on a single host and thus memory of our computers were overfilled. We tried to debug this issue, unfortunately it still stays as a problem.