# The HACKade Game

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### Objective

- Our aim is to create educational games to allow kids to be exposed to different Cyber Security topics. Here are the following game modes we plan on implementing:
  - Capture the Flag
  - Defend the Crown
  - Network Collapse
  - Cyber Attack

#### Alternative Cost Modeling:

We chose the Application
Composition model of the
Constructive Cost Model
(COCOMO) II for our project. It
allows us to both develop a
prototype to test, and verify that
all gaming components are
working accurately.

```
Count number of screens, reports, and 3GL:
       screen: 5 (for each game mode and main screen)
       report: 2 (highscore, usernames)
Complexity Level of Screen and Report:
       Screens:
       Number of views: 8 (1st screen has 4 views, and one of the other 4 screens)
       Number of data tables: 2 (users and high score)
       Complexity Level: Medium
       Reports:
       Number of sections: 5 (overall game highscore, and highscore for each game mode)
       Number of data tables: 2 (users and high score)
       Complexity Level: Medium
Complexity Weight based off the chart:
       Complexity weight for each screen: 2
       Complexity weight for each report: 5
Object Point Count (OP):
       5*2 + 2*5 = 20
NOP
       NOP = [20 * (100-50)]/100 = 10
PROD: average = 13
Effort PM = NOP/PROD
       10/13 = 0.769 persons/month
```

#### • Cost of Hardware Products:

- We will need a laptop for every employee, Internet access, a projector, and a server.
  - The chosen server has the specs of 4 Cores, 3.80 GHz, 16GB RAM, which can cost approximately \$350 per month [6].
  - Every employee will need the same laptop. The option we chose is the Lenovo ThinkPad X1 Carbon Gen 10 (2022), which can cost around \$1100 per employee [8].
  - For a projector, it will cost on average around \$210 [2].
  - The average cost of Internet in the United States in approximately \$40 per month [11].
- As a result, the total estimated cost of hardware products for a month-long project is about \$8,300, and an additional \$350 per month to maintain.

#### Cost of Software Products:

We planned to utilize Python game libraries to help us create HACKade. For our project, we decided we will be using one of these frameworks called Pygame. Pygame is the best option as it allows us to manage all components of our game, such as user inputs, user movements, and different game modes, within one comprehensive platform [1][12]. As a result, the estimated cost for our software products is zero dollars as all available resources are open-source.

#### Cost of Personnel:

- The team will consist of seven people:
  - A project manager will oversee the development process, and the average salary is \$146,000 per year [13].
  - A software engineer is needed as well. The average cost of a software engineer is around \$169,000 per year [4].
  - Also, two programmers will be essential to produce the end-product.
     The average salary for a programmer is around \$81,000 per year [5].
  - Other personnel needed will be a game designer, writer, and quality assurance tester. The average salary for a game designer is \$66,700 per year, and the salary for a game writer is \$74,800 per year [14][15]. Also, the salary for a videogame tester is \$60,000 per year [16].
- We will assume that the client will outsource the maintenance of the product, so there will be no additional cost. Therefore, the total cost of personnel will be around \$42,500 dollars for the project.

### Project Timeline

- The start of the project is to begin on December 1st, 2022. The
  estimated total schedule for this project will be approximately
  one month, not including weekends and a holiday vacation
  week off for Christmas and the New Years. As a result, we can
  expect a full implemented project by January 6th, 2023.
- A team of seven professionals are expected to work 7-8 hours per day as is industry standard.

## Project Timeline

	PROJECT		
	DURATION	PROJECT START	
PROJECT NAME	(DAYS)	DATE	PROJECT END DATE
HACKade	36	December 1, 2022	January 6, 2023

		TASK DURATION			1/22	5/22	5/22	1/22	9/22	12/22	13/22	15/22	16/22	19/22	20/22	22/22	12/23/22	26/22	28/22	29/22	30/22	/23	/23	/23
TASK ID	TASK DESCRIPTION	(DAYS)	START DATE	END DATE	12/	12/5	12/6	12/	12/9	12/1	12/	12/3	12/1	12/1	12/2	12/2	12/2	12/2	12/2	12/2	12/2	1/3/	1/4/23	1/6/23
1	Introduce the team to project and assign tasks	1	December 1, 2022	December 2, 2022																				
2	Discuss design ideals of the game and redesign as necessary. Plan and schedule project.	2	December 2, 2022	December 6, 2022																				
3	Project Scope and Cost Measuring	1	December 5, 2022	December 6, 2022																				
4	Introduce game library, Pygame, and familiarise.	2	December 6, 2022	December 8, 2022																s .				
5	Visual Design Discussion	5	December 6, 2022	December 13, 2022																				
6	Basic Code Implementation	8	December 7, 2022	December 19, 2022																				
7	Rough game visual creation	6	December 12, 2022	December 20, 2022																				
8	Alpha testing, fundamental code reworked, and final design decisions	4	December 13, 2022	December 19, 2022																				
9	Visual art refinement	7	December 14, 2022	December 23, 2022																				
10	Coding Game Mode(Capture the Flag)	6	December 15, 2022	December 23, 2022																				
11	Coding Game Mode(Defend the Crown)	6	December 15, 2022	December 23, 2022																				
12	Coding Game Mode(Network Collapse)	6	December 15, 2022	December 23, 2022																				
13	Coding Game Mode(Cyber Attack)	6	December 15, 2022	December 23, 2022																				
14	Beta Testing	4	December 19, 2022	December 23, 2022														8						
15	Winter Holidays Week Off	4	December 26, 2022	December 30, 2022																				
16	Final Testing	3	January 2, 2023	January 5, 2023																				
17	Bug Fixing	4	January 2, 2023	January 6, 2023																				
18	Final version ready for release	0	January 6, 2023	January 6, 2023																				

### **Functional Requirements**

- A user shall be able to select the screens and play all four of the game modes in HACKade from the main screen along with high scores screen, tutorials screen, select skins screen, and exit screen.
- Each game mode shall perform efficiently, give an option to quit or continue after each game mode ends, and keep track of user scores.
- A user shall be able to quit a game mode any time by entering the escape key.
- Each user for the game shall be uniquely identified by their entered username.
- The system shall generate each game mode separately when prompted and treat each game mode as a separate game.
- A user shall be able to select to view high scores, change settings, select skins, and enter the tutorials from the main screen.
- HACKade shall start with the main screen, and return the main screen after quitting any previous screens except when the user chooses to view the high scores screen after completing a game mode.

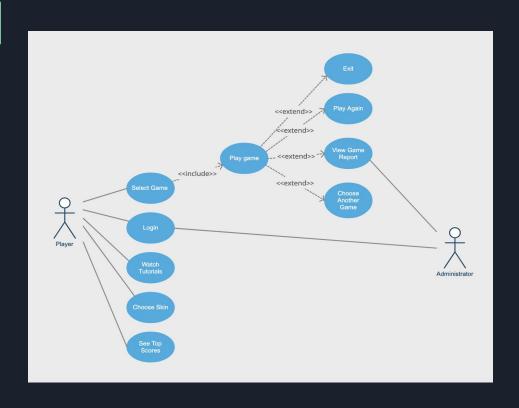
### Non-functional Requirements

- Program Requirements:
  - Usability Requirements:
    - HACKade shall be playable on the Windows, Macintosh, and Linux Operating Systems
  - Efficiency Requirements:
    - Performance Requirements:
      - HACKade shall run at a consistent 30 fps minimum on all 8th generation Intel Core processors or AMD Ryzen processors
    - Space Requirements:
      - HACKade shall take up no more than IGB of disk space
  - Dependability Requirements:
    - HACKade shall crash on no more than 0.5% runs on any computer meeting the minimum specifications
  - Security Requirements:
    - HACKade shall not access any files outside of its folder or allow outside programs to tamper with its code

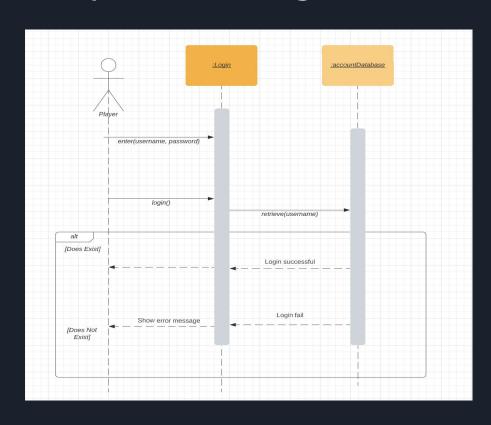
### Non-Functional Requirements

- Organizational Requirements:
  - Environmental Requirements:
    - HACKade shall be primarily developed in a carbon-neutral facility
  - Operational Requirements:
    - HACKade shall be available for free to all US students and teachers
  - Development Requirements:
    - HACKade shall be developed entirely by unpaid student volunteers
- External Requirements
  - Regulatory Requirements:
    - HACKade shall comply with all elements of COPPA
  - Ethical Requirements:
    - HACKade shall not provide any user data collected to third parties
  - Legislative Requirements:
    - Accounting Requirements:
      - HACKade development shall keep track of all spending
    - Safety/Security Requirements:
      - HACKade shall not collect the name or payment information of its users

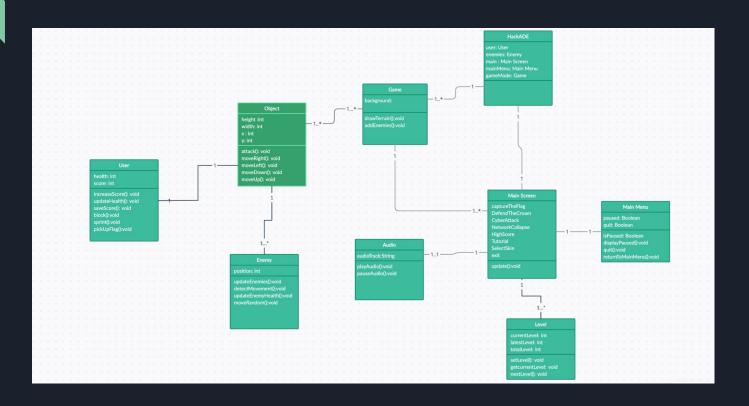
## Use-case Diagram



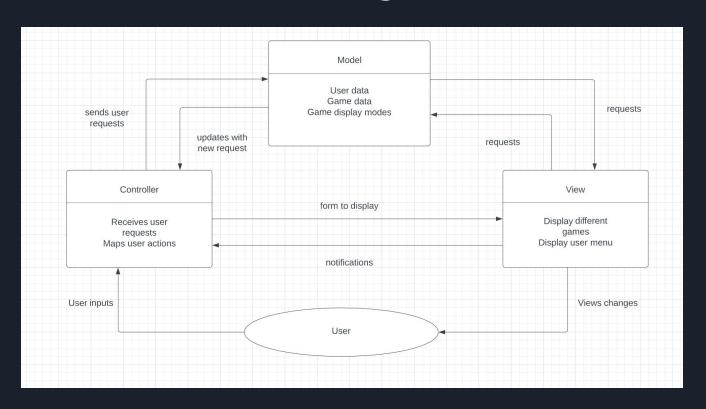
## Sequence Diagram for User Login



## Class Diagram



## Architectural Design





Welcome/Login Screen



Main Menu Screen



Capture the Flag Game



Pause Game



Won Game



Lose Game



**High Scores** 



Quit/Exit

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Thank you for your time.