# Cohort 3 - Group 22: The Wafflers

## Eng1 Assessment 2

## Architecture

### Team Members:


Tunahan Sisman
Yousef Omar
Merrill Davis
Tom Comrie
Rohan Sandhu
Cameron Pounder
Daniel Redshaw

**Design Process**

From the project brief and from our requirements gathering, we found key themes regarding:

1. How the player interacts with the avatar and the buildings.
2. How the player's actions affect the time and scoring of the game.
3. How the game is displayed to the player and what the player can see.
4. What the player experiences whilst playing the game.

| Theme | User Requirements |
|---|---|
| 1 | UR_Interract/ UR_Movement |
| 2 | UR_Activity/ UR_Time/ UR_Resting (time) UR_Activity/ UR_Skill/ UR_Scoring/ UR_Win (scoring) |
| 3 | UR_Map/ UR_Appearance/ UR_Easy_Play |
| 4 | UR_User/ UR_Access/ UR_Enjoy |

From these themes we discussed the potential objects needed to fulfil the functional and non-functional requirements of the game, these requirements stem from the main user requirements above, and from those objects, we modelled our CRC cards. To create the CRC cards we used the tool Miro, an online sticky notes board. We chose to use this tool because it allowed us to visualise and collaborate together more easily as opposed to physical cards. We iterated our CRC card model twice as the first version we found did not satisfy most of our requirements when we tried implementing. For our final CRC cards version, we have 6 groups: main, buildings (within main), input, screens, clock and scoring. The roles and responsibilities of each object were influenced by the majority of the requirements we had established earlier and are shown in the table below.

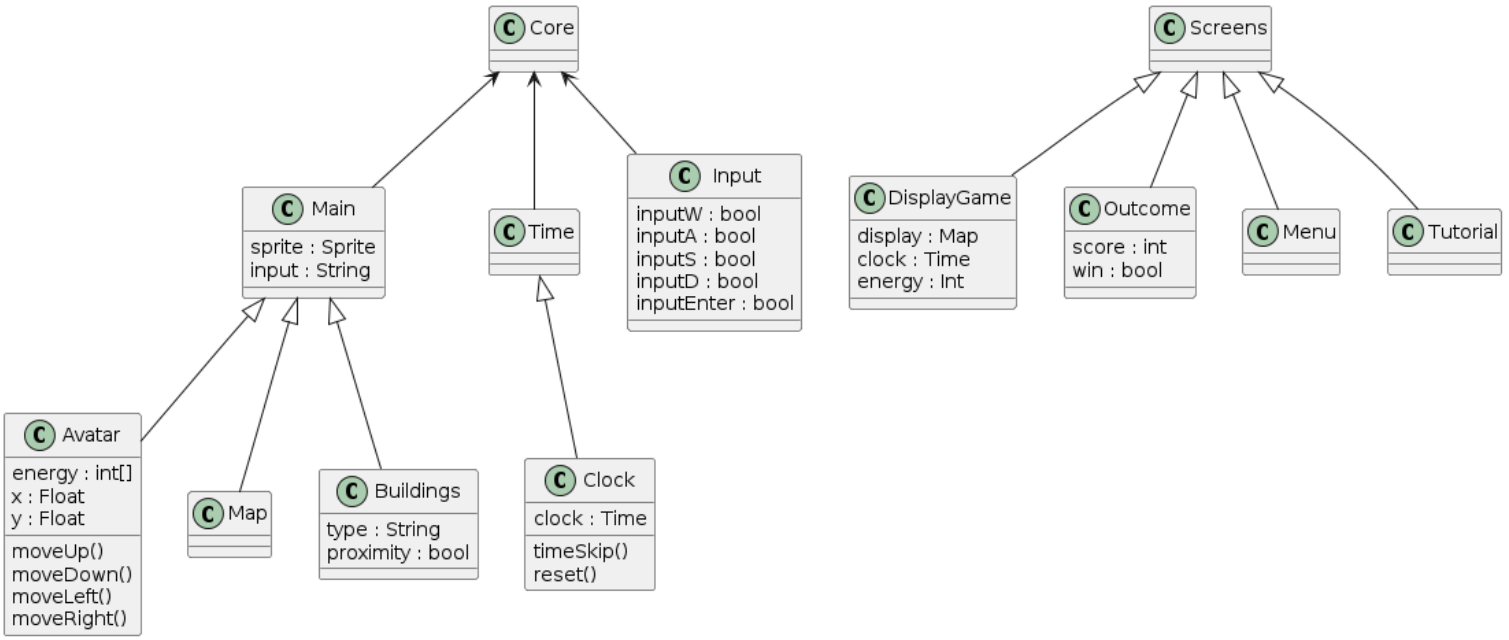
| Groups and their objects: | Functional/ Non-Functional Requirements: |
|---|---|
| Main<br>● Avatar<br>● Buildings<br>● Map | FR_Sprite (UR_Movement)<br>FR_Map (UR_Map) |
| Buildings<br>● Study building<br>● Food building<br>● Recreation building<br>● Sleep building | FR_Map_Locations (UR_Map)<br>FR_Buildings/ FR_Building_Activities (UR_Activity) |
| Input<br>● Keyboard (wasd)<br>● Keyboard (enter/space)<br>● Keyboard (esc) | FR_Movement (UR_Movement) FR_Interact (UR_Interract)<br>FR_Interaction (UR_Access) |
| Screens<br>● Display game<br>● Interaction pop-up<br>● Outcome<br>● Menu<br>● Tutorial | FR_Whole_Map/ FR_Time_Display (UR_Map)<br>FR_Energy_bar/ FR_In_Game_Time/ FR_Scalability (UR_Appearance)<br>NF_Display/ NF_Map (UR_Map) FR_Icon (UR_Interract) |

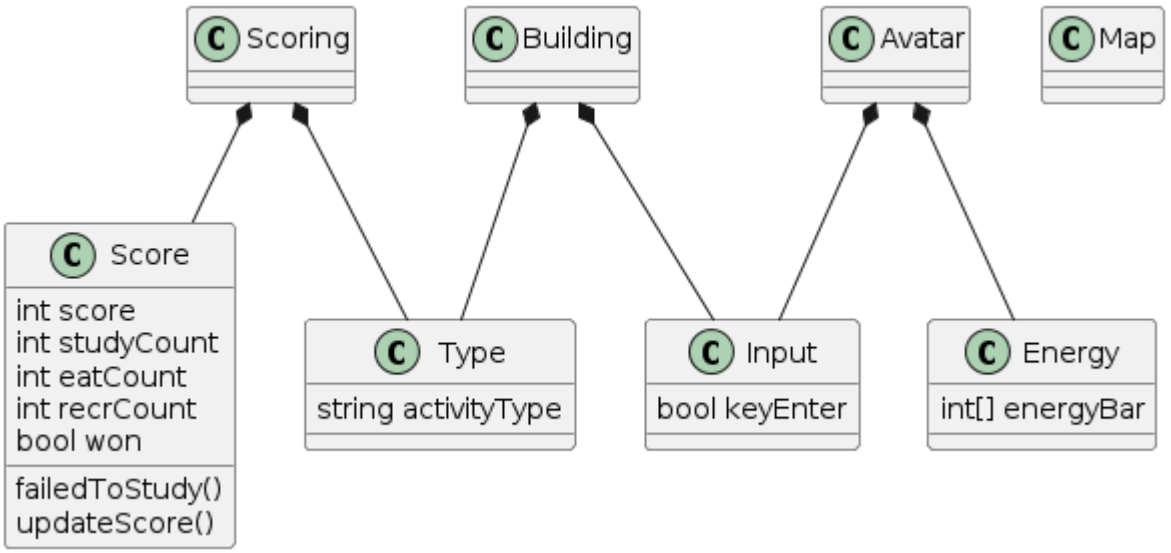
| | |
|---|---|
| • Settings | FR_End_Message (UR_Win)<br>FR_Score_Display (UR_Win)<br>FR_Menu_Screen (UR_Easy_Play)<br>FR_Tutorial (UR_Easy_Play)<br>FR_Music/ NF_Music/ NF_SFX (UR_Enjoy)<br>NF_Colour (UR_Access) |
| Clock<br>• Time<br>• Day | FR_Smooth_Time/ FR_Time_Drain/ FR_Time_Cut (UR_Time)<br>FR_Time_Sleep/ FR_Sleep (UR_Resting)<br>FR_Study (UR_Activity)<br>NF_Game_Time (UR_Time) |
| Scoring<br>• Energy bar<br>• Score | FR_Energy_Amount/ FR_Energy_Bar (UR_Activity)<br>FR_Score_Calc/ FR_Score_Dec/ FR_Study_Score/ FR_Recreation_Score/ FR_Overstudy/ FR_Forget_to_Eat/ FR_No_Recreation (UR_Scoring)<br>NF_Difficulty/ NF_Lose (UR_Skill)<br>NF_Win (UR_Win) |

**Structural**

The main tool we have used is the UML tool PlantUML, after considering the following tools: PlantUML, Microsoft Visio and LucidChart. The main advantage of using PlantUML was the tool support, such as those of google docs gizmo and its great documentation, and plain text encoding and definition system which made it the most simplistic and robust to use.

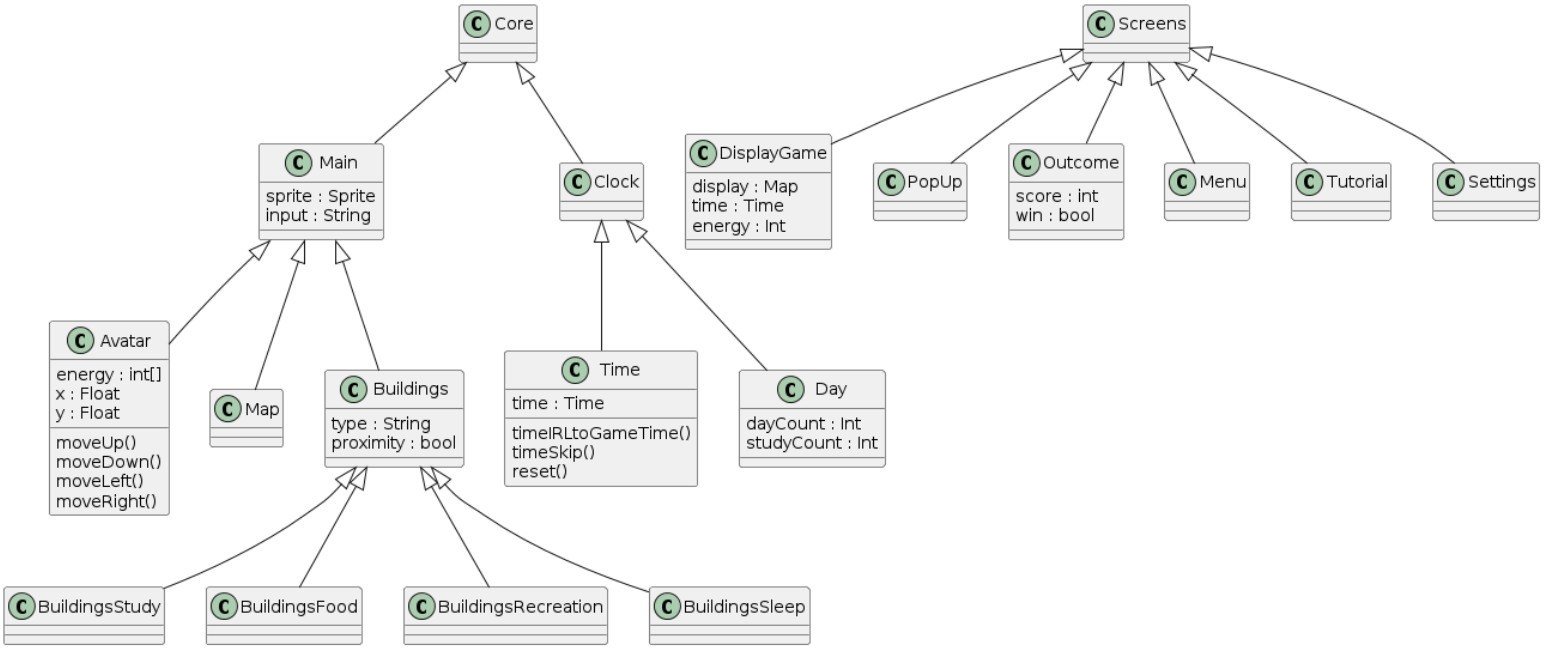
From the first CRC cards version, the groups: main, time and screen and input were our initial class plans and the group: scoring was a system within the game. And from that model, we created our first UML class diagram to establish an initial OOP structure along with our first entity component system for scoring: The unfilled arrows represent relationships where they inherit attributes from another class. The filled arrows represent relationships where they make use of each other.The core class is the central primary class of the system and the main class manages graphical elements and user inputs.



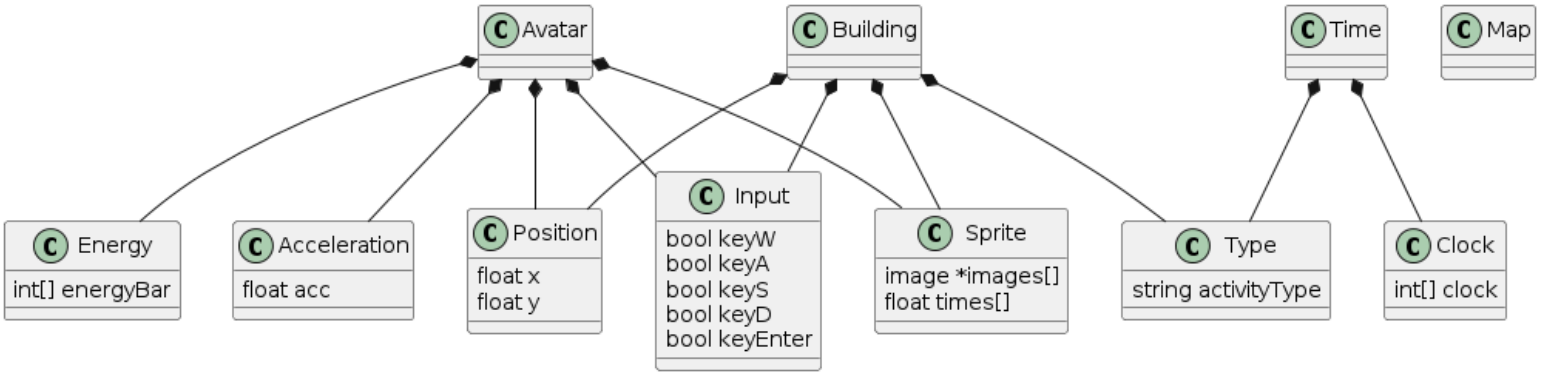



The way the scoring system works is that the component Score contains attributes which count the individual no. activities the entity Avatar has done (interaction) via the component Type) under the entity Building. Then, it will update the score based on the counts and if the avatar fails to study then the player cannot win (scoring), relating to theme 1 and theme 2 respectively. Additionally, the avatar can only do tasks based on energy level.

The second CRC cards model helped to establish a more detailed class diagram along with the input group now being a system alongside scoring:

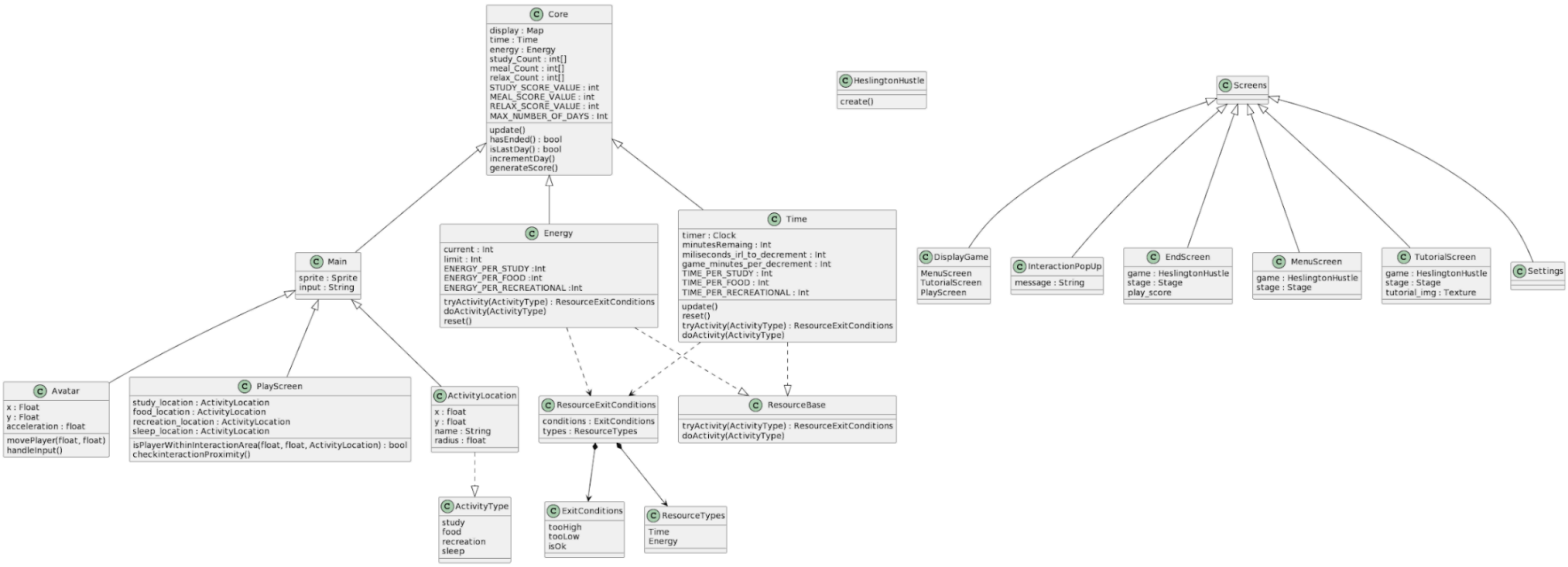


Through the addition of objects PopUp and Setting under the Screens class, the themes 3 and 4 were now properly met.




The way the input system works is that the component Input will affect the related components of: the entity Avatar (movements) and the entity Time from the entity Building (time skip), relating to theme 1 and theme 2 respectively.

Upon further implementation, we developed our class diagram again to be more thorough, with changes to class names, addition of classes and changes in some class relationships. to be more relevant to the game structure.




The final class diagram is taken from the built-in tool within the IntelliJ IDE. The generative tool allowed us to simply display the final class structure of the game more easily.

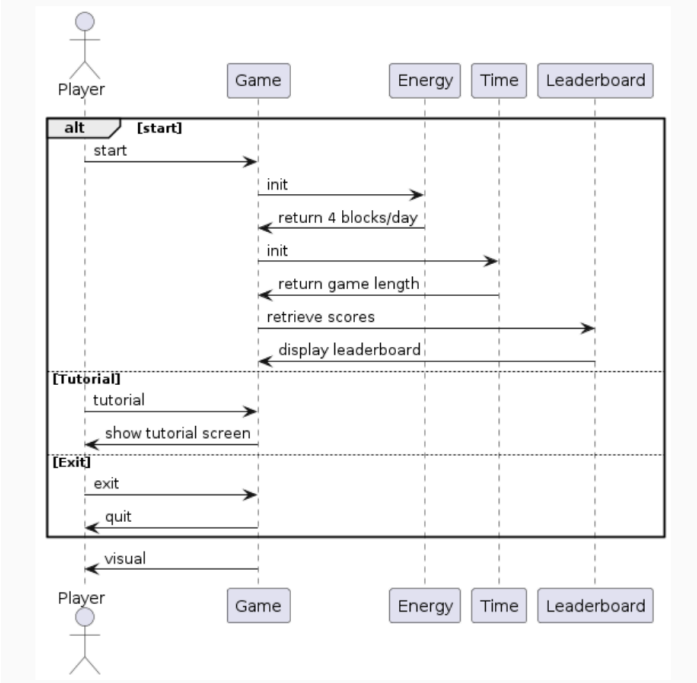
**Behavioural**

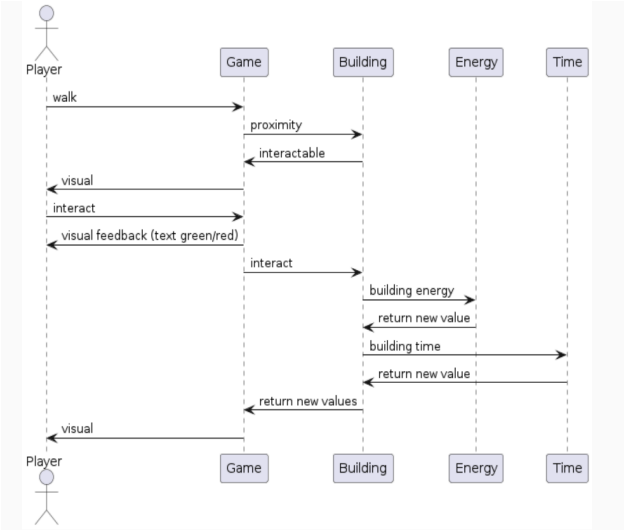
We created a set of initial sequence diagrams to represent a subset of the major interactions in the game. These were there to give us a feel for the interactions that will end up performed to progress towards the final goals of the game.

Entities acting in the following sequence diagrams, and their justification as entities:

- Energy: can be lost when studying or conducting activities, and can be gained when eating or sleeping.
- Time: a countdown for the game, when the timer reaches zero the game will end.
- Player: the player represents the user interacting with the game system
- Building: the building is an entity representing an abstract version of any building the the game such as those for sleeping, eating, recreational activities and studying. Each of those buildings is included as part of the specification of the game
- Game: Game in this context is an entity for the game itself where it will perform some functions and be able to display visuals to the user
- Score: Score is an entity for the scoring subsystem of the game to be used when the 7 days have passed

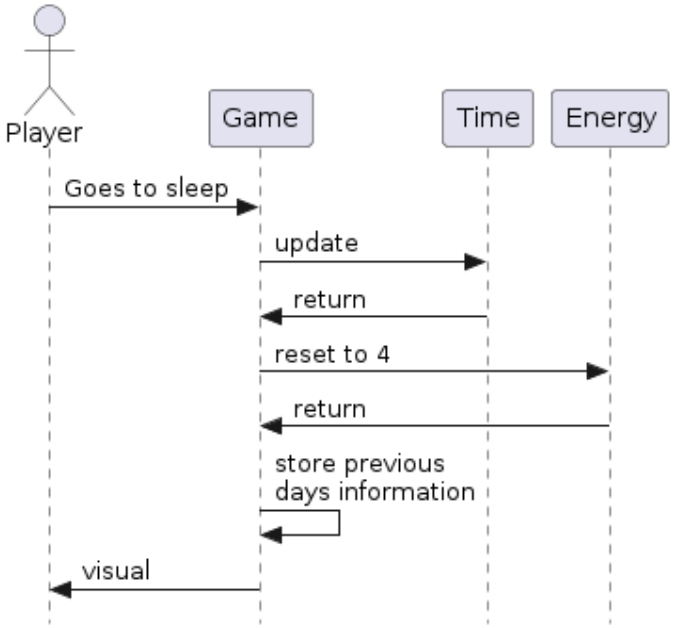
Scenarios Table:

| Scenarios | Code |
|---|---|
| 1. Player opens game   | skinparam style strictuml<br>Actor Player<br>Player -> Game: Start<br>Game -> Energy:init<br>Energy->Game:return 4 blocks/day<br>Game -> Time:init<br>Time -> Game:return game length<br>Game->Player:visual |
| 2. Playing the game | skinparam style strictuml<br>Actor Player<br>Player -> Game: walk<br>Game -> Building: |



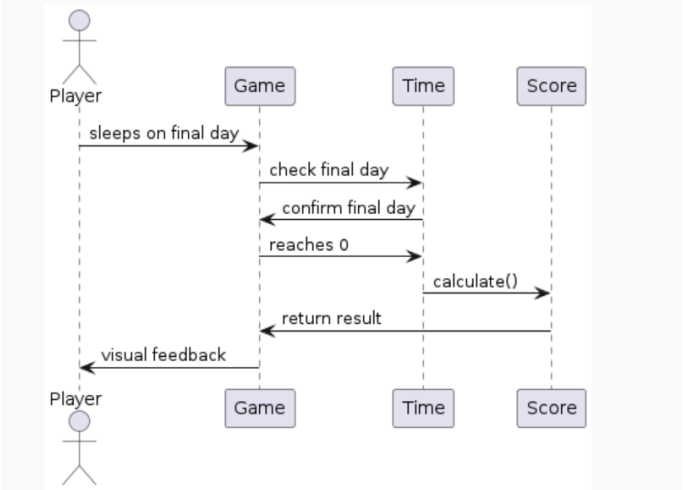

proximity
Building -> Game: interactable
Game -> Player: visual
Player ->Game: interact
Game ->Building: interact
Building ->Energy: --building energy
Energy ->Building: return new value Building ->Time: --building time
Time ->Building: return new value
Building -> Game: return new values
Game -> Player: visual

3 . Day ends




skinparam style strictuml
Actor Player
participant Game
Time-> Game: reaches multiple of\n day length
Game ->Time:update
Time -> Game: return
Game->Energy:reset to 4
Energy-> Game:return
Game->Game:store previous\ndays information
Game->Player: visual

4. Games end




skinparam style strictuml
Actor Player
Game <- Time: reaches 0
Game -> Score: calculate()
Score -> Game: return result Game->Player:visual

The solid arrows represent synchronous calls where a component waits for a response before continuing. The dashed line represents stages of the functions that were initiated by a call. The new features in this diagram are to check if the play has slept on the final day if so the game ends. There is also visual feedback turning red or green when the player interacts with a building.

| Diagram | Requirements |
|---|---|
| 1 Player Opens Game | FR_Controls, FR_Tutorial, NF_Availibility |
| 2 Playing the game | FR_Interaction, FR_Energy_Bar, FR_Interact, FR_In_Game_Time, FR_Map, FR_Map_Locations, FR_Score_Calc, FR_Energy_Bar, FR_Time_Display, FR_Movement, FR_Icon, FR_Sprite, FR_Time_Cut |
| 3 Day Ends | FR_Interaction, FR_Controls, FR_Study, FR_Buildings, FR_Time_Sleep, FR_Sleep |
| 4 Game Ends | FR_Scoring, FR_End_Message, FR_Sleep, FR_Study, FR_Score_Calc, FR_Score_Dec, FR_Score_Display, NF_Game_Time, NF_Win, NF_Lose, NF_Difficulty |

These sequence diagrams are high level overviews of sequential interactions between entities acting in the game ecosystem, intended to give an insight into the intended behaviour of the system. They have been created by interactive team discussion and have been designed in a way that they are justified by the associated requirements.

**References:**

Enhanced/ Enlarged versions of all diagrams are available in their original formats and sizing on the GitHub website in the appropriate order.