CENG3004: Software Engineering

LIFE SIMULATION

with our rules

Design Document

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Contents

1 Overview

Our application aims to perform one of the most difficult tasks in the world: To give users a good time. Who is our customers? Everyone want to fun!

With our application, users can create their own players and families, manage them in real-time, and perhaps even build their dream life.

Players have 8 kinds of needs: energy, hunger, bladder, hygiene, sociality, and fun. They can meet their basic needs at home such as sleeping, going to the toilet, taking a shower, eating, and chatting with housemates. At the same time, players can play games, watch movies, and do research on the computer; they can read fiction, non-fiction, or educational books; or they can do house hobbies. Players can also go out; can go to work, shopping, and travel. Of course, this fun job has its hard sides. For example, if the user leaves their player hungry for 32 hours, I'm sorry they will learn that their player is dead the next time.

Now our application has single-player usage. But in the future, our users will be able to visit each other's homes online and their players can interact with each other. We will even have mini-games in our app.

2 Design Goals

Goal's Concern	**Related Requirement Identifier**	**Description**
Reliability	NR-1	The application checks the validity of the mailing address entered while the User is being a member.
Security	NR-2	The user's password must be at least 8 and at most 16 characters and must contain at least one letter, at least one number, and at least one special character.
Security Reliability	NR-3	The application requires entering the password twice in terms of validation
Data integrity	NR-4	The application checks e-mail address and username in the database, if these matches ask for different login
Recoverability	NR-5	The application sends a password reset email to the user if the user click the "Forgot Password" button
Portability	NR-6	The application runs on Android and IOS platforms.
efficiency	NR-7	A website should be capable enough to handle 1000 users without affecting its performance.
Operability	NR-8	The application requires an internet connection to work
Timeliness	NR-9	The application clock runs simultaneously with real timezone.

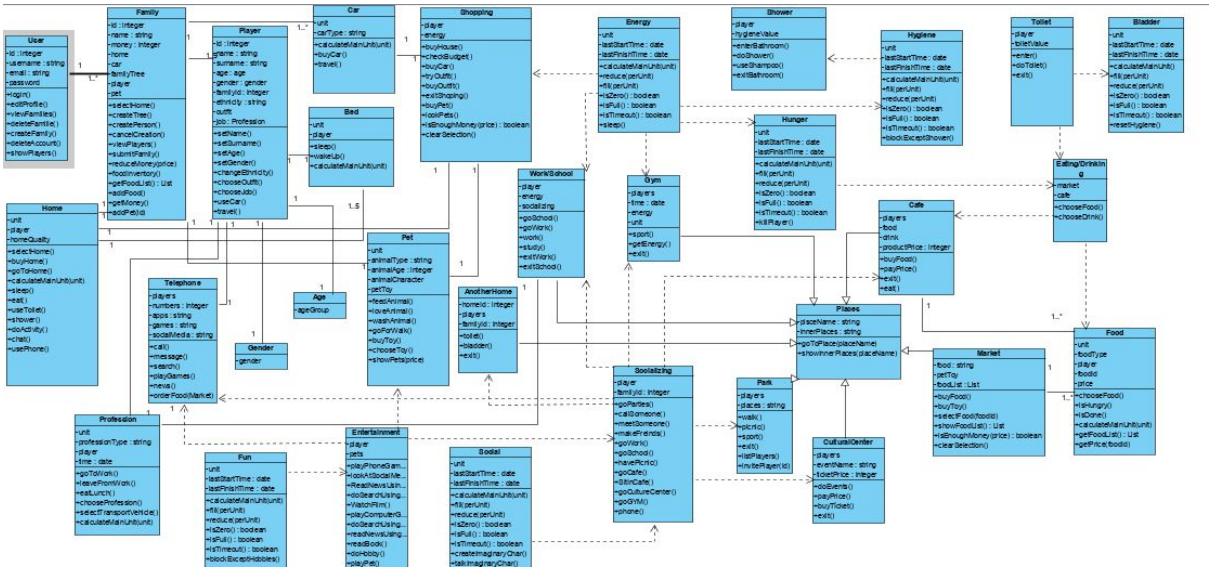
Accessibility	NR-10	Each family consists of at least 1 and at most 5 players.
Relevance	NR-11	When the family creation is completed, the application automatically determines the family fund. The family fund is determined for how many players the family holds, with $ 2000 per player -> 2000 x (number of players) = family accumulation
Capacity	NR-12	A User can have up to 5 families.
Capacity	NR-13	Each player's inventory capacity is 5 slots.
Relevance	NR-14	The Player returns to the home screen as a result of the User canceling the action of the Player.
Timeliness	NR-15	Needs consist of 10 main units, every unit consist of small units. between 0-1 refers 1.main unit between 1-2 refers 2nd main unit, between 2-3 refers 3rd main unit, between 3-4 refers 4th main unit between 4-5 refers 5th main unit, between 5-6 refers 6th main unit, between 6-7 refers 7th main unit between 7-8 refers 8th main unit, between 8-9 refers 9th main unit, between 9-10 refers 10th main unit. These small units essential for the mechanism of the application
Scalability	NR-16	The small units fill the main units completely, the need will show that the main unit is full.
Timeliness Regulatory	NR-17	Level of needs updates every minute whether the character in action or not. In terms of cancellation of action, small units calculated by the application.
Regulatory Relevance	NR-18	Every need decreases 1 small unit per minute unless there is an action that affects the current need.
Manageability	NR-19	The actions that ensure the filling of the needs are terminated when they reach the max minute they can be carried out when they are not canceled or filing the relevant need before this time expires.
Manageability	NR-e1	The main unit of energy need is 1440; The 2nd, 3rd, and 4th major units are 60; The 5th, 6th, 7th, and 8th main units are 120; The 9th and 10th main units consist of 180 small units.
Relevance	NR-e2	When "Go to Work" action is performed and it ends; the player’s energy decrease 90 units if there is no car, 60 if there is a cheap car, 40 if it has a normal car and 20 units if it has an expensive car.
Timeliness	NR-e3	Energy needs decreased by 1.8 small unit per minute while doing an activity
Relevance	NR-e4	Energy needs to be filled according to the quality of the items. If it’s

		cheap it fills 2 units, If it's normal quality fills 2.5 unit and if it's expensive fills 3 units per minute
Relevance	NR-e5	Energy needs to fill 6 small units while drinking "Energy Drink"
Relevance	NR-e6	Energy needs to fill 2 small units while eating "Dessert"
Relevance	NR-e7	Energy needs to fill 1 small unit while "Rest in Bed"
Manageability	NR-e8	When energy needs drop to 0, If there is any other action taken by the acter, it will be canceled even if the character is punished. The character returns to the home environment and starts performing the "Sleep in Bed" action.
Timeliness Manageability	NR-e9	The character cannot perform "Sleep in Bed" action in 30 minutes when it drinks "Coffee"
Manageability Relevance	NR-e10	The act of sleeping is canceled by itself when the player's energy is full.
Timeliness	NR-e11	The nap action is automatically canceled after 2 hours.
Relevance	NR-b1	The 1st main unit of toilet action consists of 60 small units, the other main units consist of 40 small units.
Timeliness Relevance	NR-b2	Toilet needs decrease 1 small unit per minute when character awake, decrease 1 small unit per 2 minutes and decrease 9 small units when the character is consuming "Beverage"
Timeliness Relevance	NR-b3	Toilet need is filled 80 small units per minute during the "Use the Toilet" action.
Manageability	NR-b4	When the toilet needs dropdown to 0, the hygiene needs to drop to 0 and the toilet need is full.
Relevance	NR-hu1	The 1st main unit of hunger energy needs is 720; The 2nd, 3rd, 4th, 5th, 6th, and 7th major units are 30; The 8th, 9th and 10th main units consist of 60 small units.
Timeliness	NR-hu2	The hunger need decrease 1 small unit per 2 minutes while character sleeping
Timeliness	NR-hu3	The hunger need "Main Dishes" consumes 60 small units per minute.
Timeliness	NR-hu5	The hunger need "Drinks" consumes 2 small units per minute.
Timeliness	NR-hu7	The hunger need "Desserts" consumes 10 small units per minute.
Timeliness	NR-hu9	The hunger need "Snacks" is consumed, while 5 small units per minute.
Timeliness	NR-hu4	Main Dishes can be consumed for a maximum of 6 minutes.
Timeliness	NR-hu6	Drinks can be consumed for a maximum of 5 minutes.

Timeliness	NR-hu8	Drinks can be consumed for a maximum of 5 minutes.
Timeliness	NR-hu10	Snacks can be consumed for a maximum of 5 minutes.
Interoperability	NR-hu11	The character dies when hunger needs dropdown to 0
Interoperability	NR-20	Character deleted from the system when it died
Relevance	NR-hy1	Every 10 main units of hygiene need consist of 288 small units
Relevance	NR-hy2	Hygiene needs to decrease 2 small units per minute while doing the activity
Relevance	NR-hy3	Hygiene needs to decrease 60 small units when coming back from work or school
Relevance	NR-hy4	While the player is showering, the player's hygiene requirement fills according to the quality of the home; 144 units if cheap, 192 units if normal and 288 small units if expensive.
Accessibility	NR-hy5	When hygiene need reaches 0, It is not acceptable for the player to do anything other than taking a bath after the action it is doing
Relevance	NR-21	Sold homes and cars should not appear on the list.
Relevance	NR-f1	Every 10 main units of fun need consist of 120 small units
Timeliness Relevance	NR-f2	Fun need decrease 2 small units per minute when Player at the job
Timeliness Relevance	NR-f3	Fun need decrease 1,5 small units per minute when Player at the school
Timeliness Relevance	NR-f4	Fun need decrease 2 small units per minute while Player is doing homework
Timeliness Relevance	NR-f5	Fun need increase 1 small unit per minute while Player eating
Accessibility	NR-f6	When fun need reaches 0, it is not acceptable for the player to do anything except fun things after the action it is doing

3 System Models

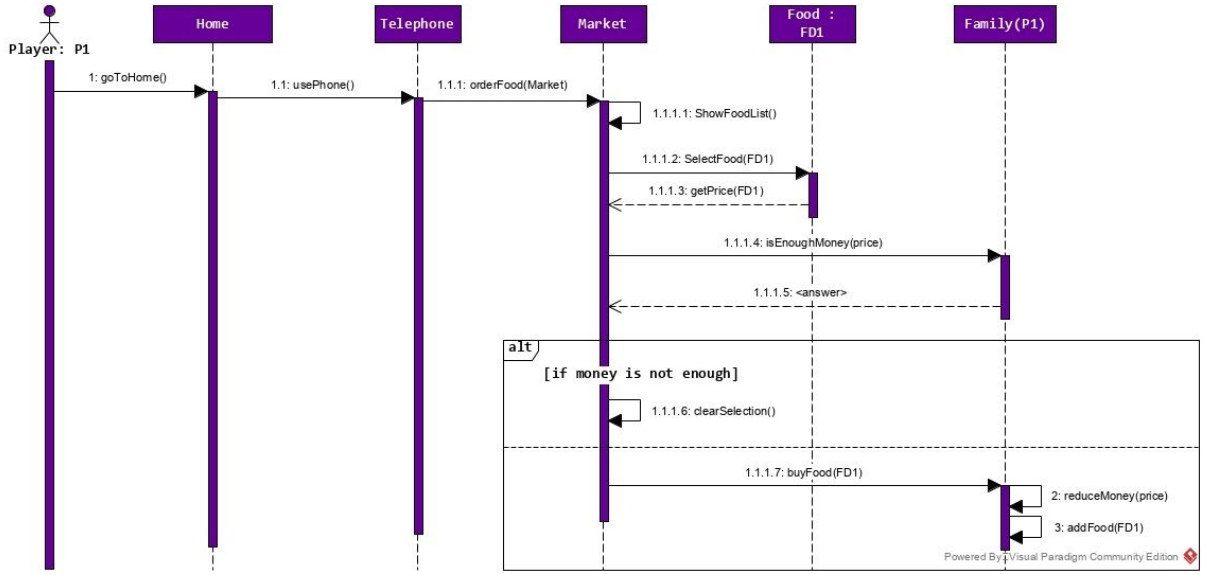
3.1 Class Diagram



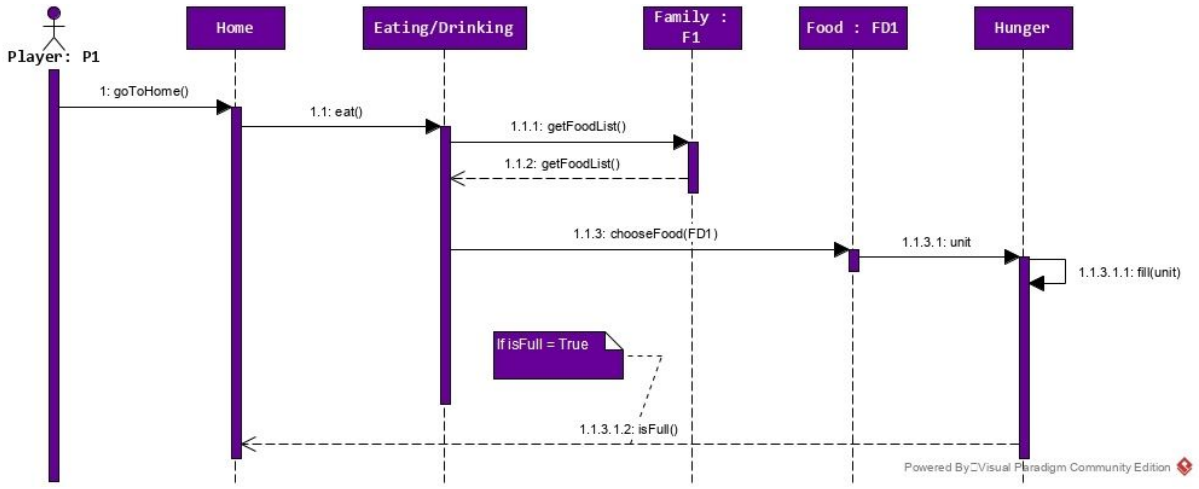
[class diagram link]

3.2 Sequence Diagrams

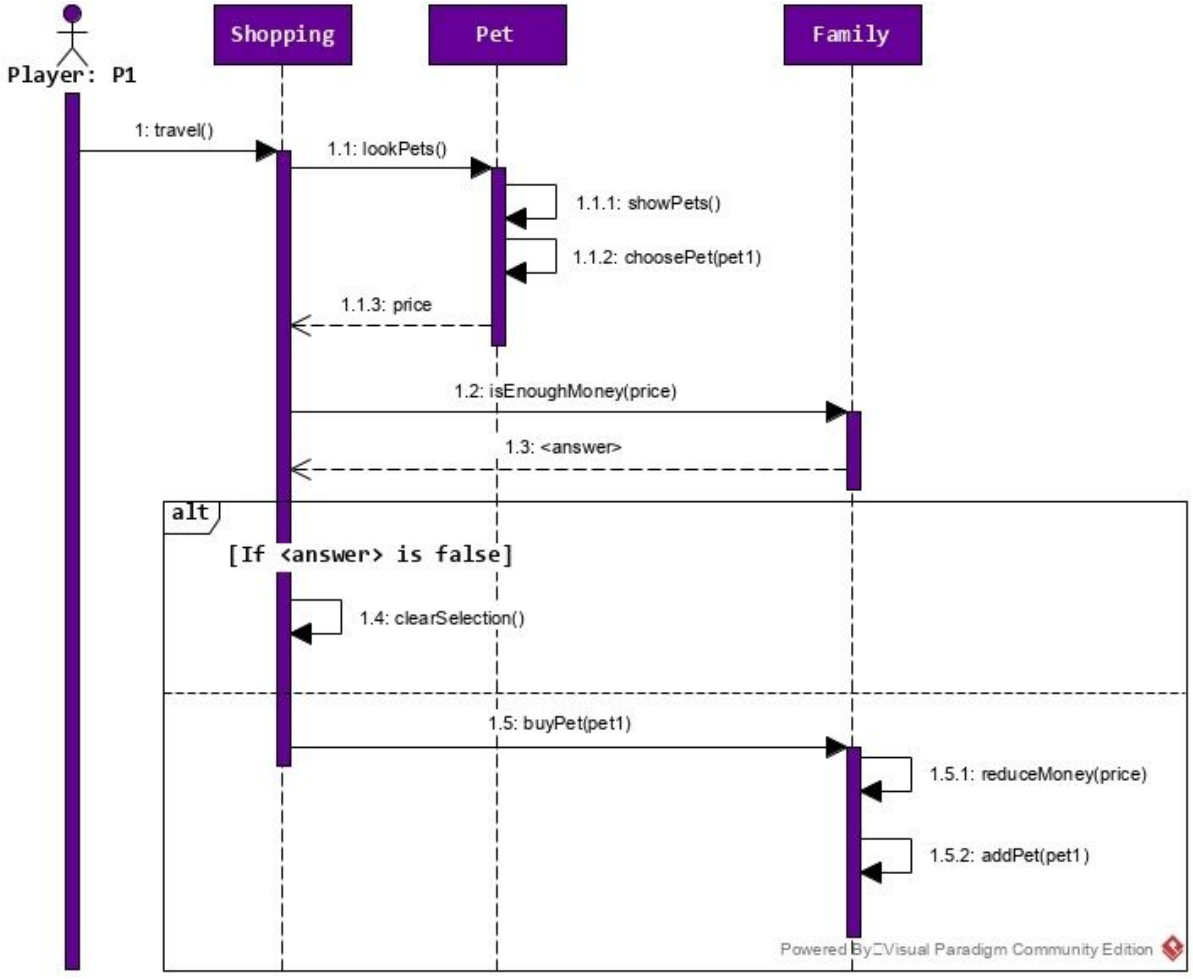
3.2.1 Order Food with Mobilephone



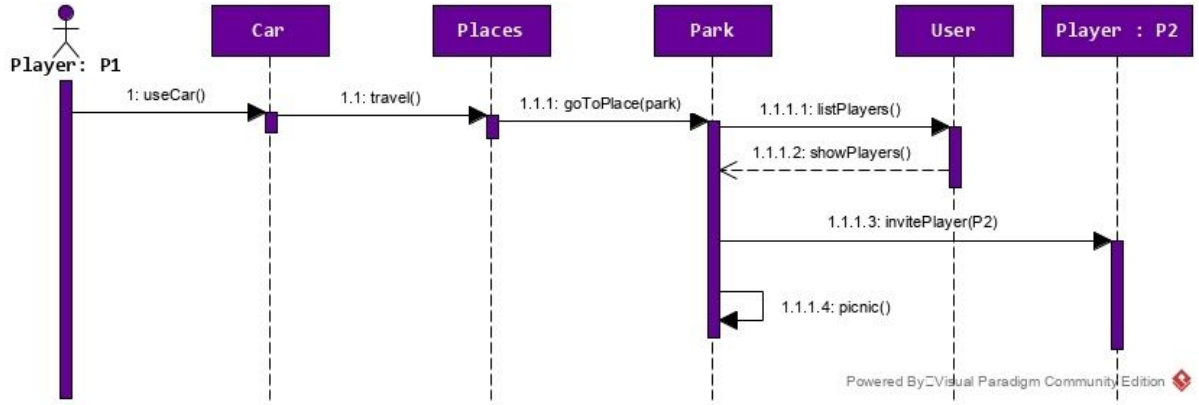
3.2.2. Eat at the Home



3.2.4. Buy a Pet

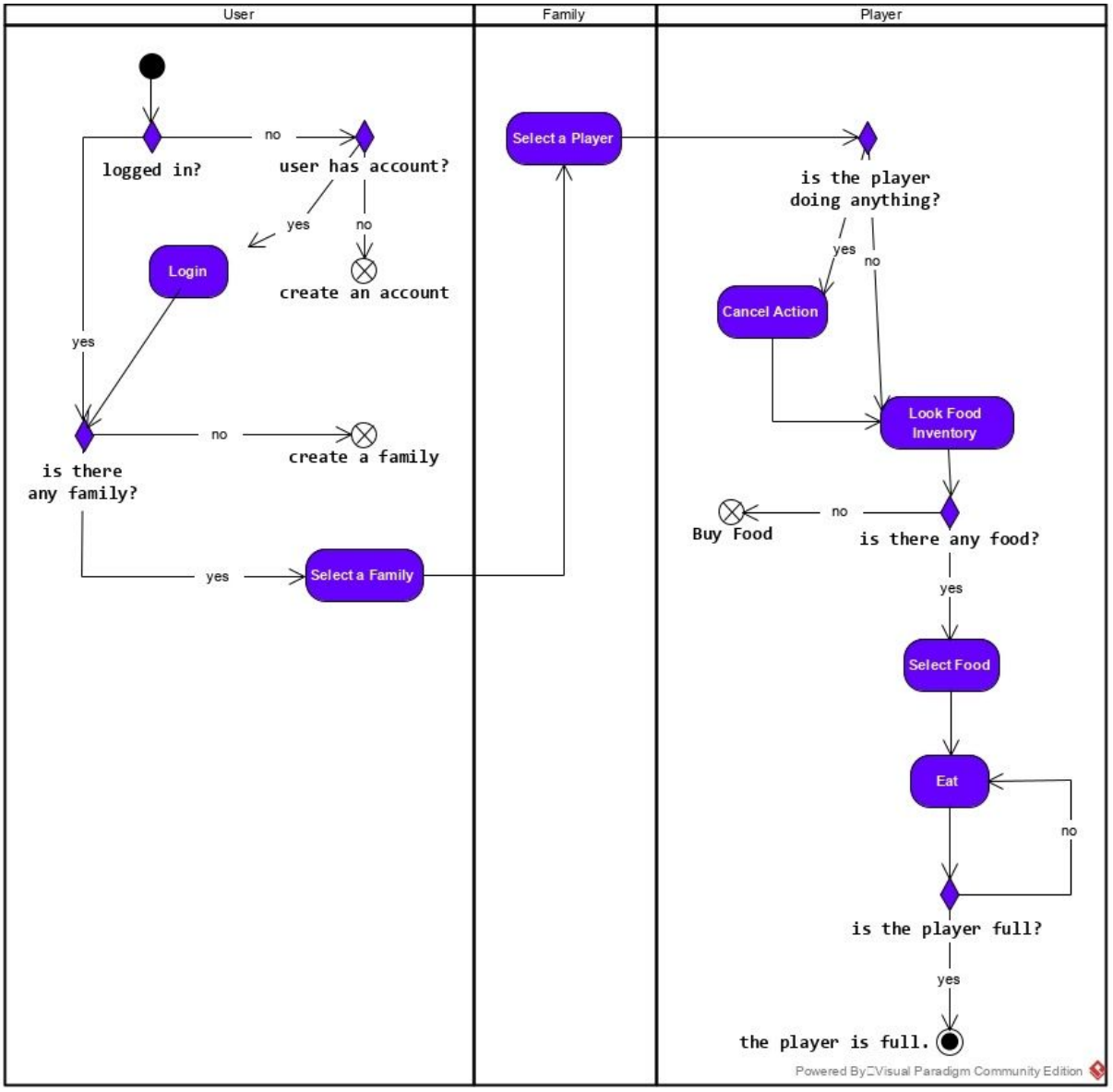


3.2.4. Go to the Picnic

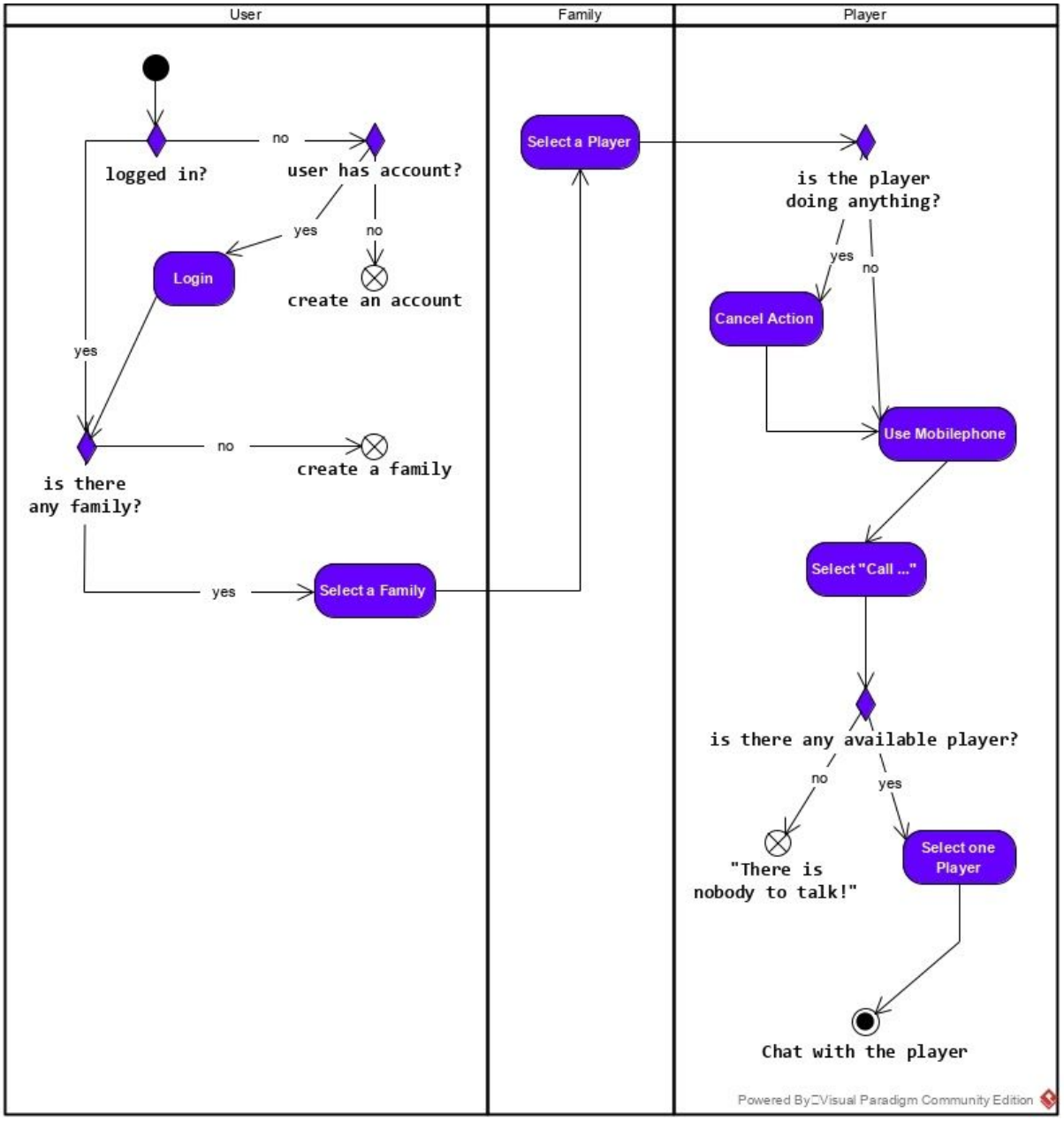


3.3 Activity Diagrams

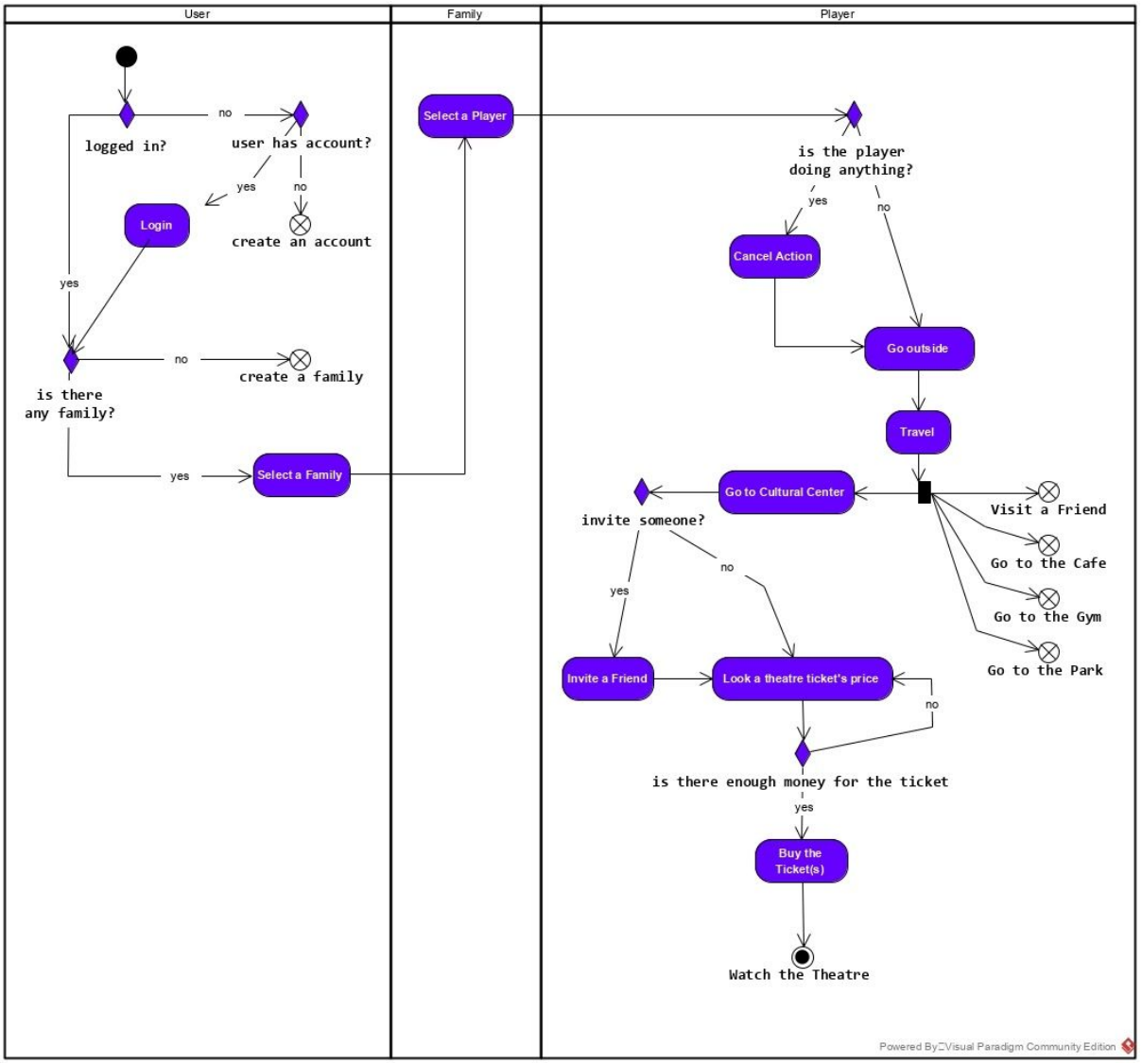
3.3.1. Eat at the Home



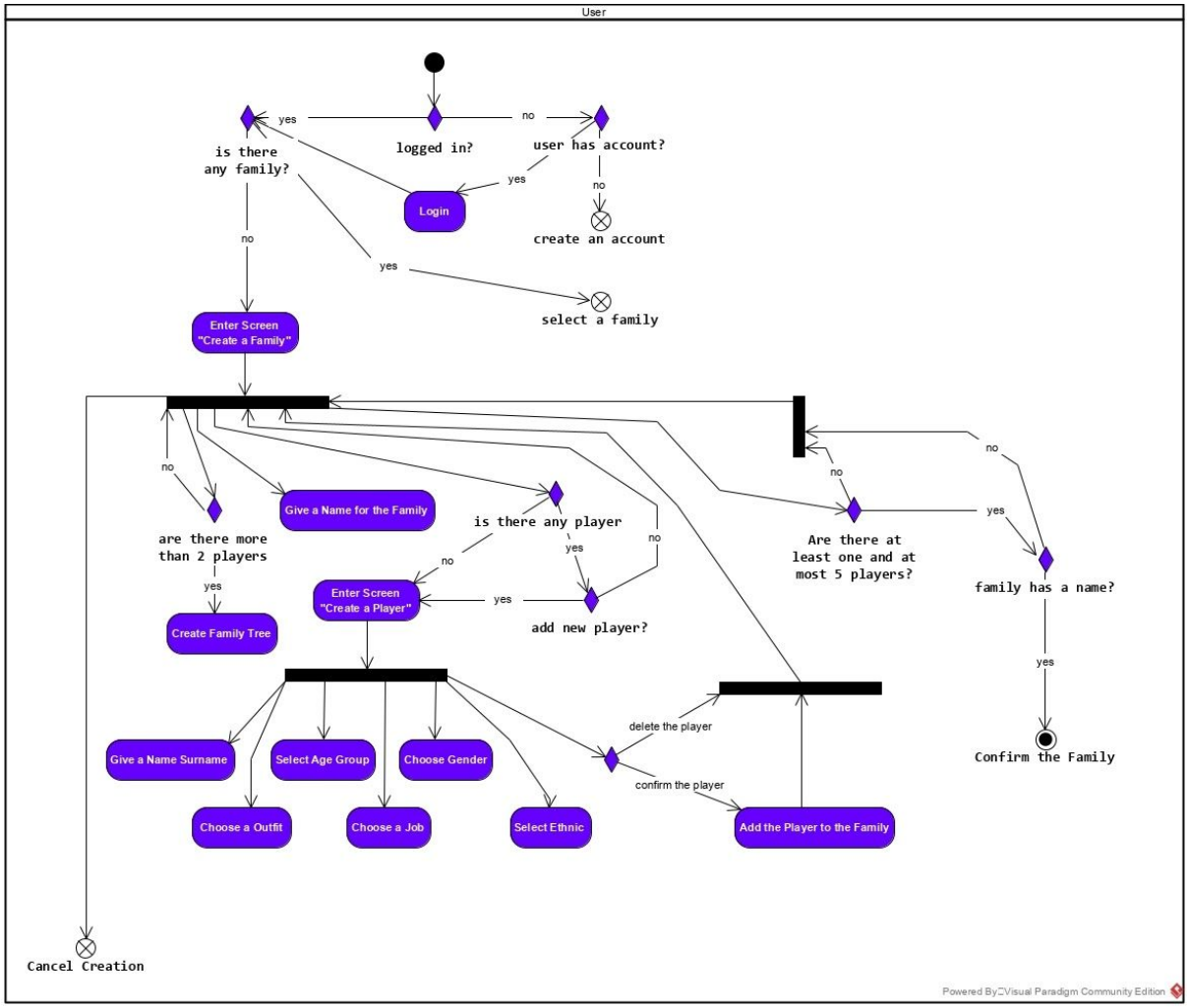
3.3.2. Chat with another Player



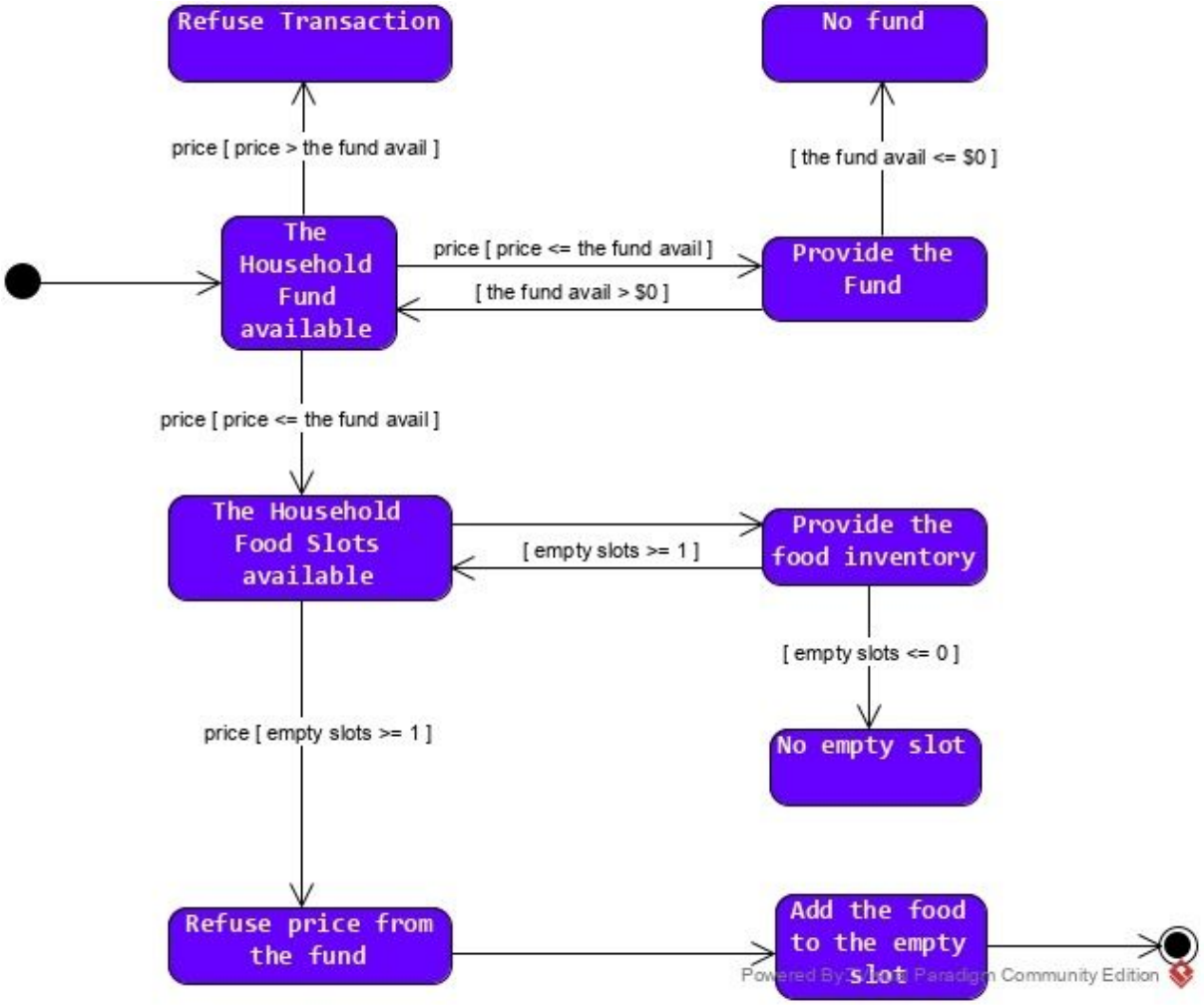
3.3.3 Go to the Theatre



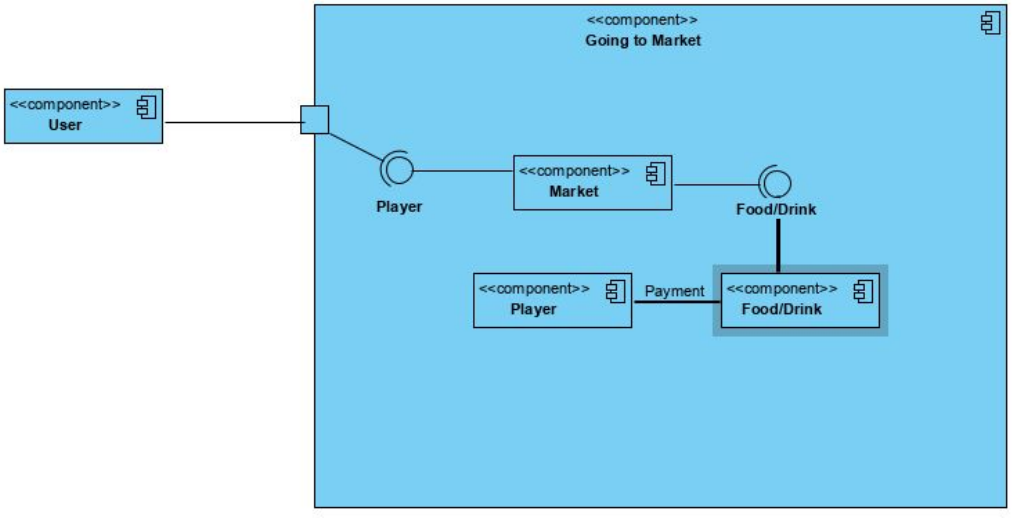
3.3.4. Create a Family



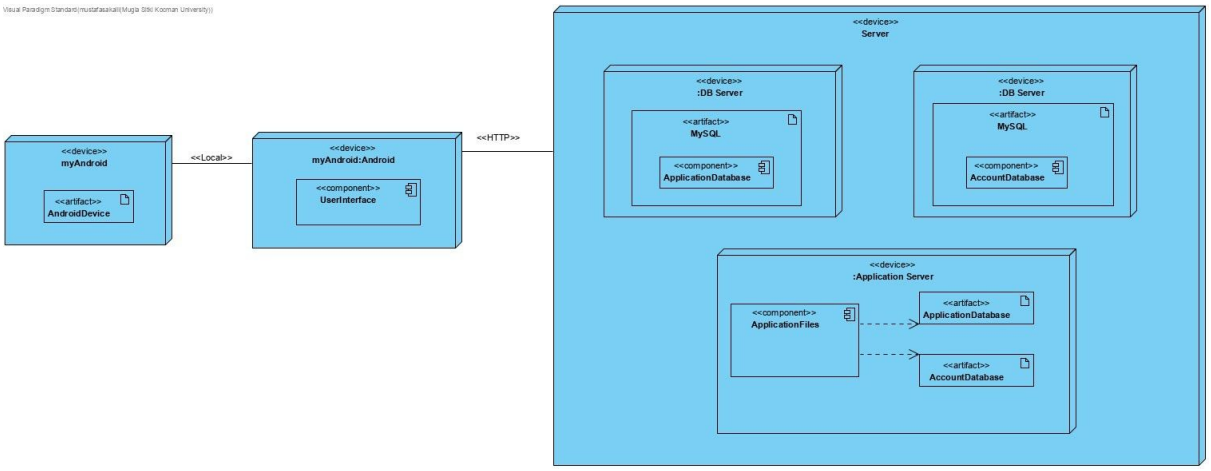
3.4 Statechart Diagram



4 Subsystem Decomposition



5 Hardware / Software mapping



6 Other Design Concerns (use relevant subsections

6.1 Concurrency

Users must first choose the player when they want to have their players do something. In other words, it is not possible for the two players to send an action request at the same time. Also, the same user is not allowed to log in to multiple devices at the same time to avoid syncing problems. Even so, we took some precautions.

- **Order Food with Mobile Phone:**

Case: When one player is in the process of getting food when another player who lives in the same house wants to buy food.

Method: In this case, the system queues the players according to the start times of the action and does not allow them to start to the next player of the queue buy food before the previous is over.

- **Go To The Picnic:**

Case: When one player is in the process of inviting other players when another player wants to do the same thing.

Method: When one of the players approves to invite, the list of invitations is refreshed. When other players want to confirm the invitation, the person they choose is compared with the renewed list, and if they want to select the selected one, an error message is returned and the renewed list is displayed, and it is expected to re-select.

- **Eat at Home:**

Case: Players who live in the same house choose the same food and want to confirm it to eat.

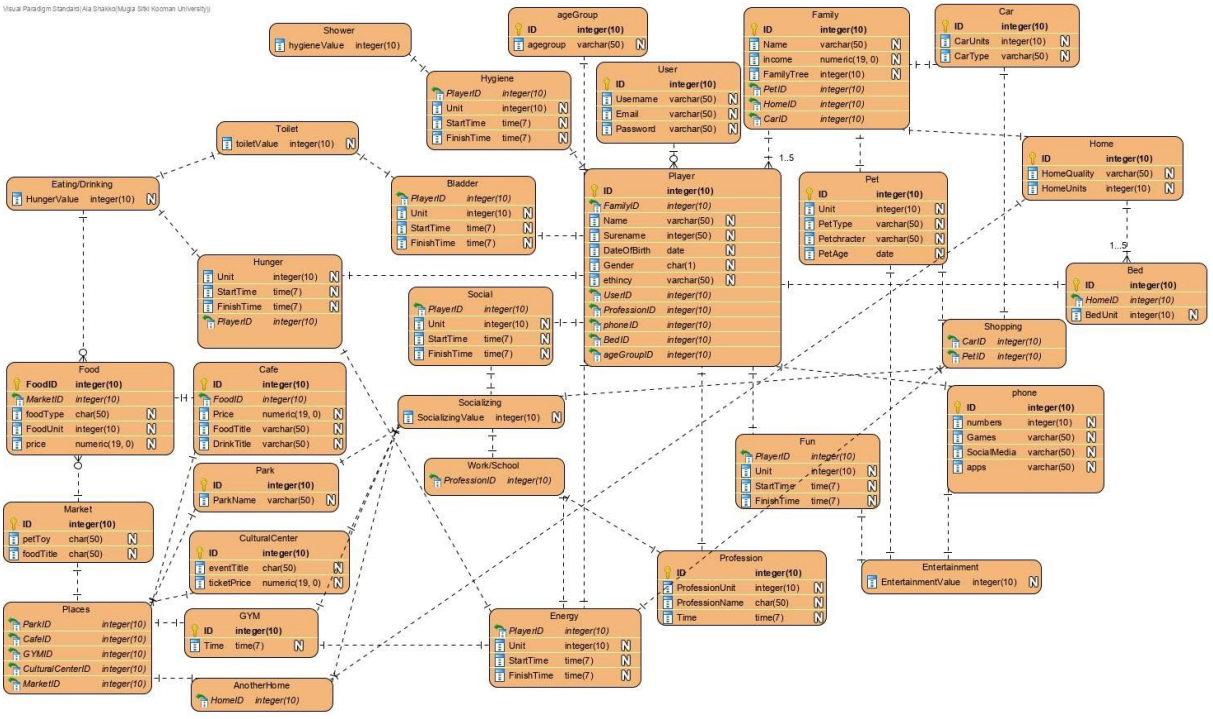
Method: As in the case while inviting other players, after confirming the choice of either of them, the list of dishes at home is renewed. If the food's stock has dropped to zero, an error message will be displayed and the list will be refreshed. However, if the stock of the food is not 0, the transaction takes place from the renewed stock and proceeded without errors.

- **Buy Pet:**

Case: Situations where two people from the same family make purchases simultaneously (consecutively).

Method: Although it is not possible for the same user to operate at the same time for two different players, sometimes there may be problems due to the connection slowness. Therefore, the system puts purchase requests in order according to their timestamps and makes transactions according to this queue.

6.2 Data Management



[data management link]

6.3 Global Resource Handling

Actors Classes → ↓	Home	Work/School	Bed	Pet	Gym	Shower	Hygiene	Cafe	Eating/Drinking	Car	Shopping
User	select()	select()	select()	select()	select()	select()	select()	select()	select()	select()	select()
Character	goHome() increaseEnergy()	goWork() goSchool() decreaseEnergy() increaseSocialize()	goBed() increaseEnergy() decreaseSocialize()	petAnimal()	goGym() decreaseEnergy()	goShower()	increaseHygiene()	goCafe() decreaseEnergy() increaseSocialize()	goEat() goDrink() increaseEnergy()	travel()	goShopping() decreaseEnergy()

global resource handling link

6.4 Boundary Conditions

Initialization

- **What data need to be accessed by the application to start properly ?**
  Application must access application database first to load necessary files to run application
- **What data need to be accessed to load user's settings ?**
  Account Database must be reached to load user's information and settings
- **What user has to do to begin play?**
  User must create character to play the game
- **What the user interface show first?**
  User interface first show login page, this page require username and password

Termination

- **Can application run with single subsystem?**
  No, more than one subsystem require to work
- **Are subsystems notified if a single subsystem terminates?**
  Yes, other subsystems notifies synchronously.
- **How are these subsystem terminations submitted to application database?**
  Application database will be notified immediately after subsystem terminations.
- **Does the application work when it encounters an android-related issue?**
  No, application will be terminated and notify database about this.

Failure

- **How does the system behave when a node or communication link fails?**
  System transmits the error report and directs the application to restart
- **How does application behave when it face android related issue?**
  It requires restart and notify database about this issue. Keep user's settings saved
- **How does application behave when it encounters a network-related issues?**
  It ask for user to make sure device has a internet connection. If problem persist, application shutdown .
- **How does the system recover from failure?**
  System force application to restart

7 Glossary

User: The person who plays the game

Character/Player: Character played by the user, user controls character/player.

Family: Character and its parents, wife, child, and pet.

Energy: The measure that determines the cost of movement of the character. May reduce or increase depends on the user's decisions. If energy downs 0, the character leaves whatever it is doing at that moment and starts to sleep at home. There are several things exist in the game that increases energy level such as:

-Desserts increase 10 units per minute
-Rest in the bed increase a unit per minute
-Consuming energy drink increase 30 units per minute

Work: Activity that increases or decreases the character's energy. The character has to go to work every day. Work performance increases a unit at the end of every day. When the character doesn't go to work, performance decreases 5 units.

Starvation/Hunger: Consumes character's energy 1 unit per minute, in sleep, it decreases 1 unit per two minutes.

-Breakfast, lunch, and dinner fills 60 unit per minute
-Liquid foods fill 2 unit per minute but it affects toilet need
-Snacks fill 5 units per minute
-Desserts fill 10 units per minute

Toilet: A physical need that character needs to meet. Decrease a unit per minute. If this metric goes down 0, this means the character has to go toilet

-While sleeping, it drops a unit per 2 minute
-If the toilet goes down 0, hygiene also goes 0

Hygiene: Another physical need that characters need to meet. Decrease a unit per minute, If this drops to zero, the character has to take a shower

-When it reaches 0 characters cannot accept any other task from the shower
-60 units decrease when the character comes from work or school
-Activities decrease a unit per minute more than other things

Entertainment: Character needs entertaining activities to maintain its lifecycle. Decrease a unit per minute. In works, decrease 2 units per minute, in school decrease 1.5 units per minute, while eating fills a unit per minute. There are several ways to entertain character. There are several ways to achieve this in the system.

-Mobile Phone: Mobile phone has 3 subtopics such as a game, social media, and news. They are filling units respectively 5, 2, and 1 per minute.

Socializing: Socializing one of the other needs of character. By default it decreases a unit per minute, on school or work fills a unit per minute. They are a few exceptions such as;

-Sleeping: While sleeping it decrease a unit per 5 minutes

-Face to Face: It fills 72 units per minute while having face to face conversations

-Phone: It fills 48 units per minute while having phone conversations

-Picnic: This activity fills 100 units per minute

-Restaurant, Cafe or Culture Center: These activities fills 100 units per minute if character not doing these alone

Home: Home section consists of bed, toilet, bathroom, foods(beverages,snacks, desserts), entertainment(computer/game console, books, hobbies) and as a last socializing. If the character lives alone, socializing does not appear.

Outer Places: Outer places consist of work/school, shopping, travel and socializing. If the character is alone in the outer places, socializing does not appear.

Foods and Vegetables: System consist of 4 kinds of food types. These are main dishes, beverages, desserts and snacks. These foods cost in order $20, $5, $10, $8. Also these have smaller parts

-Main Dishes: Breakfast, lunch, dinner

-Beverages: Water, coffee, fruit juice, energy drink and tea

-Desserts: Pasta, souffle, baklava and milk desserts

-Snacks: Chocolate, biscuit, candy, chips and french fries.

8 Appendix

Presentation Video Youtube Link: https://youtu.be/frRPhH45bt0