FIT2099
Assignment 1
Due date: 11/04/2022 11:55 AEST

by

NG YEN KAI

TEH RONG WEN

LIM SENG ONN

WORK BREAKDOWN AGREEMENT

Deliverables:

Separate interaction(optional), class diagrams and design rationales for each requirement.

- ☐ REQ1: by Teh Rong Wen (31882617)
- ☐ REQ2: by Lim Seng Onn (32200250)
- ☐ REQ3: by Ng Yen Kai (32217021)
- ☐ REQ4: by Teh Rong Wen (31882617)
- ☐ REQ5: by Lim Seng Onn (32200250)
- ☐ REQ6: by Ng Yen Kai (32217021)
- ☐ REQ7: by everyone (all 3 members in the team)

Testing and Reviewing:

All members will be responsible for testing the requirements they have been assigned to.

- ☐ Lim Seng Onn will be reviewing Teh Rong Wen's tasks/requirements.
- ☐ Teh Rong Wen will be reviewing Ng Yen Kai's tasks/requirements.
- ☐ Ng Yen Kai will be reviewing Lim Seng Onn's tasks/requirements.

Deadlines

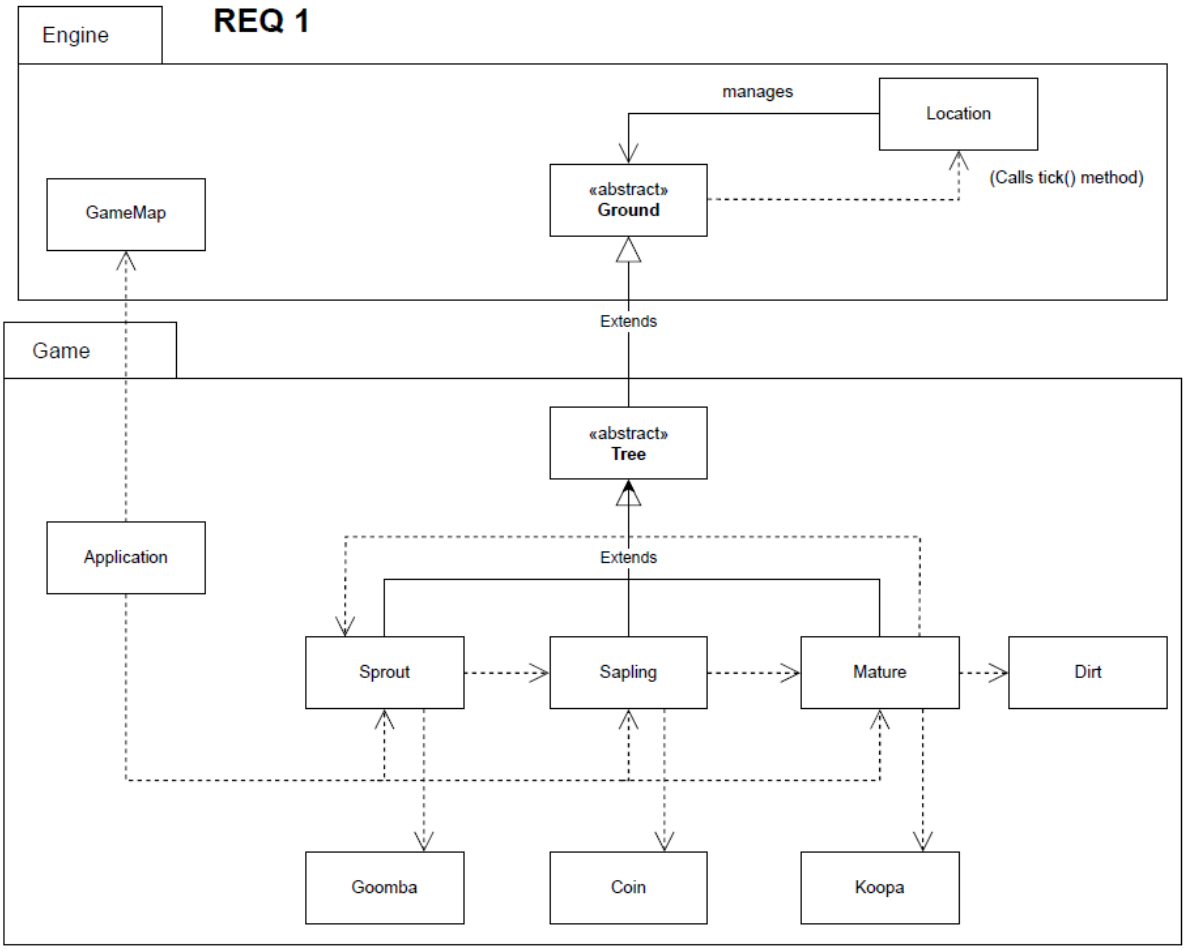
The dates by which the deliverable, test, and review need to be completed.

- ☐ Deliverable: Friday, 8th April 2022
- ☐ Testing: Saturday, 9th April 2022
- ☐ Review: Saturday, 9th April 2022

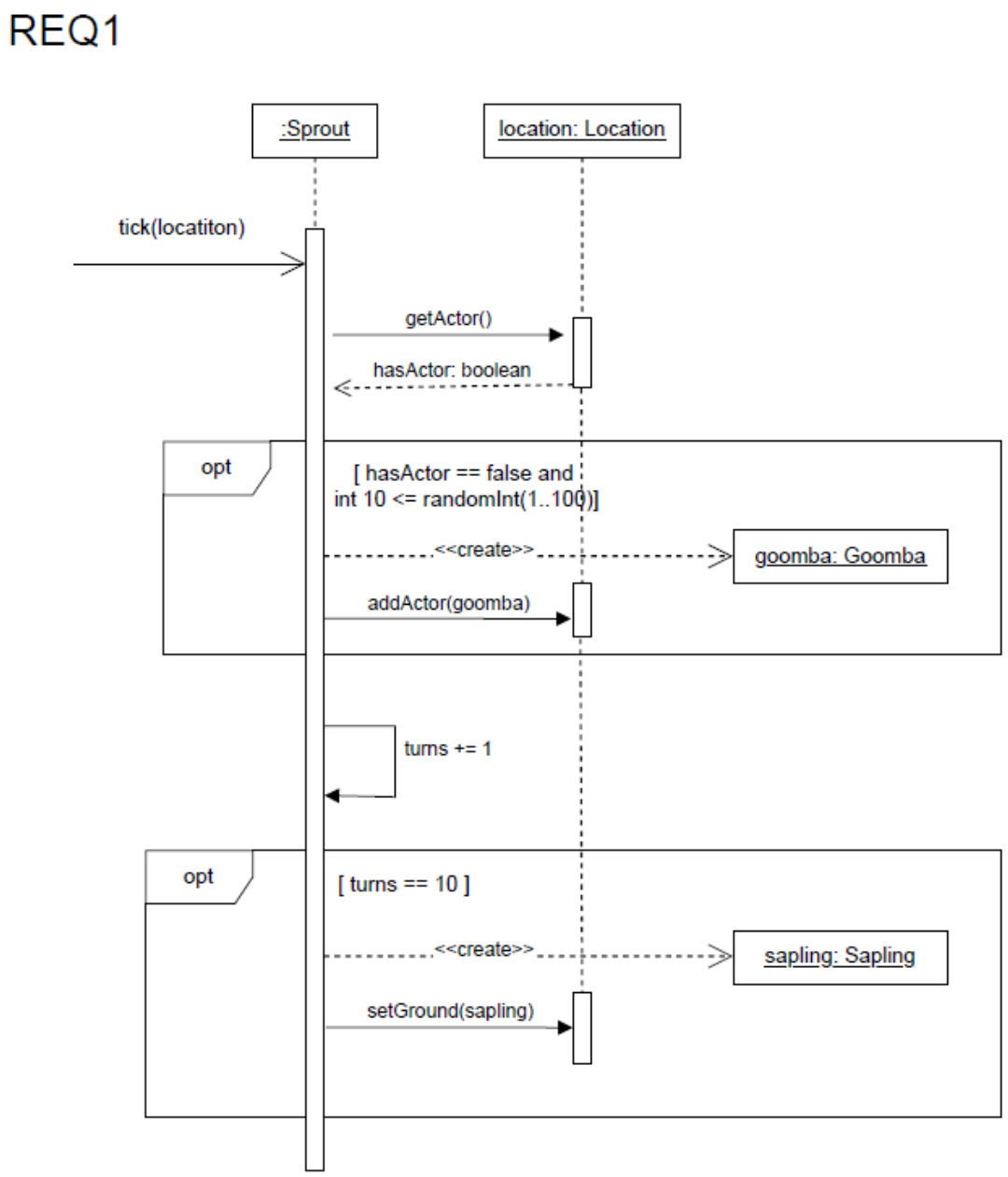
Signatures

Teh Rong Wen: I accept this WBA
Lim Seng Onn: I accept this WBA
Ng Yen Kai: I accept this WBA

UML Class Diagram (REQ 1)



Sequence Diagram (REQ 1)



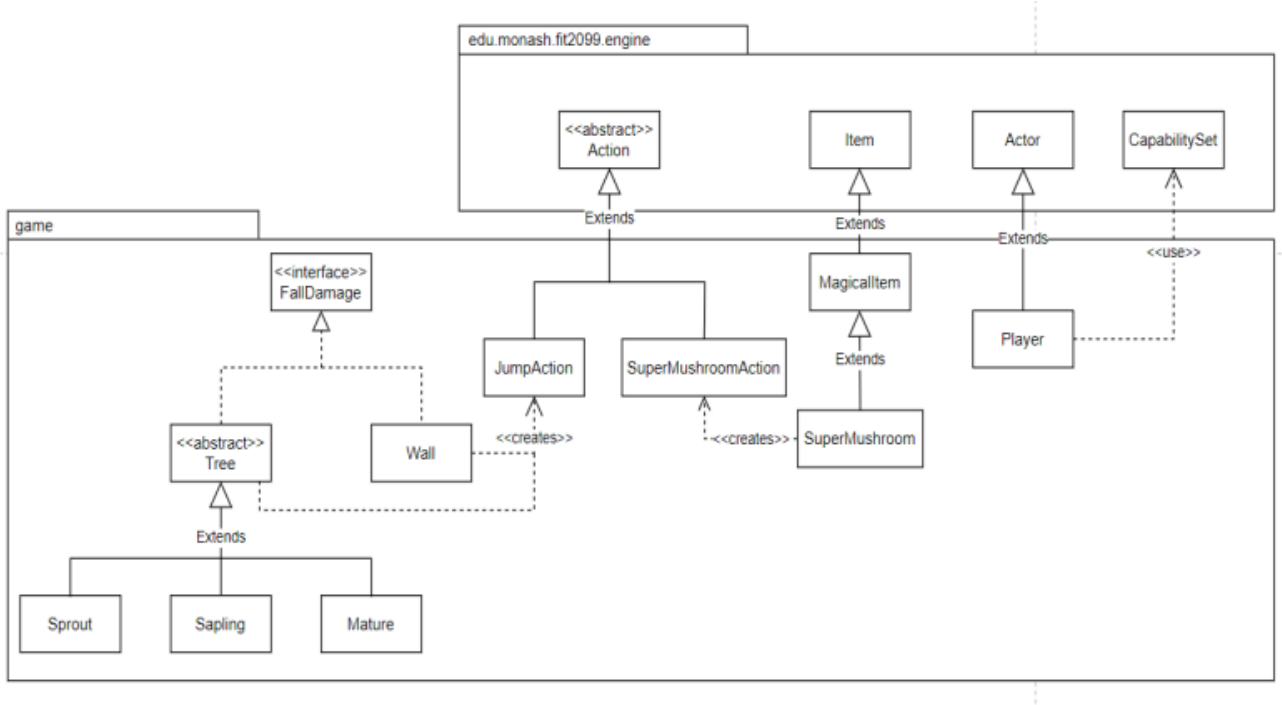
Design Rationale (REQ 1)

Sprout, sapling and mature extends tree. Since they are cycled and has common attribute/method such turns(int, counter for number of turns in the map), they can be categorized as tree. If it does not extend tree abstract class, it could be hard to understand their relation (It has cycle and common method/attribute). In future implementation, it is easier to create method/attributes that they share.

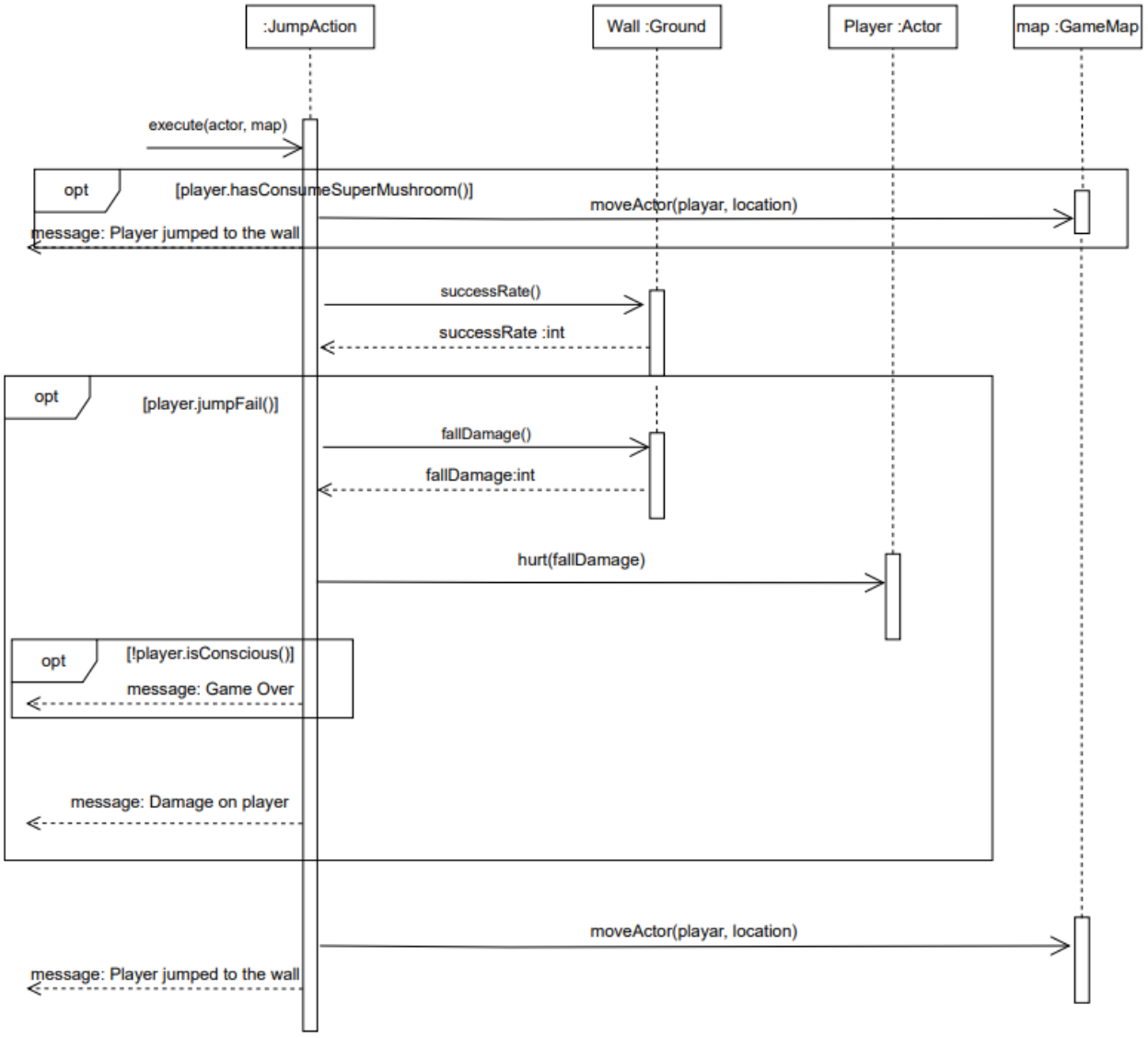
Places some sprouts on the map during the instantiation. Inside application, it randomly changes dirt to sprout after creating a game map. It randomly generates x and y within the size of the map and changes the ground to sprout if ground is dirt. This can be performed multiple times to place several sprouts.

Each tree subclasses requirements can be coded inside override tick(Location). It has Location as input param, so that can be used to add actor or change ground.

UML Class Diagram (REQ 2)



Sequence Diagram (REQ 2)



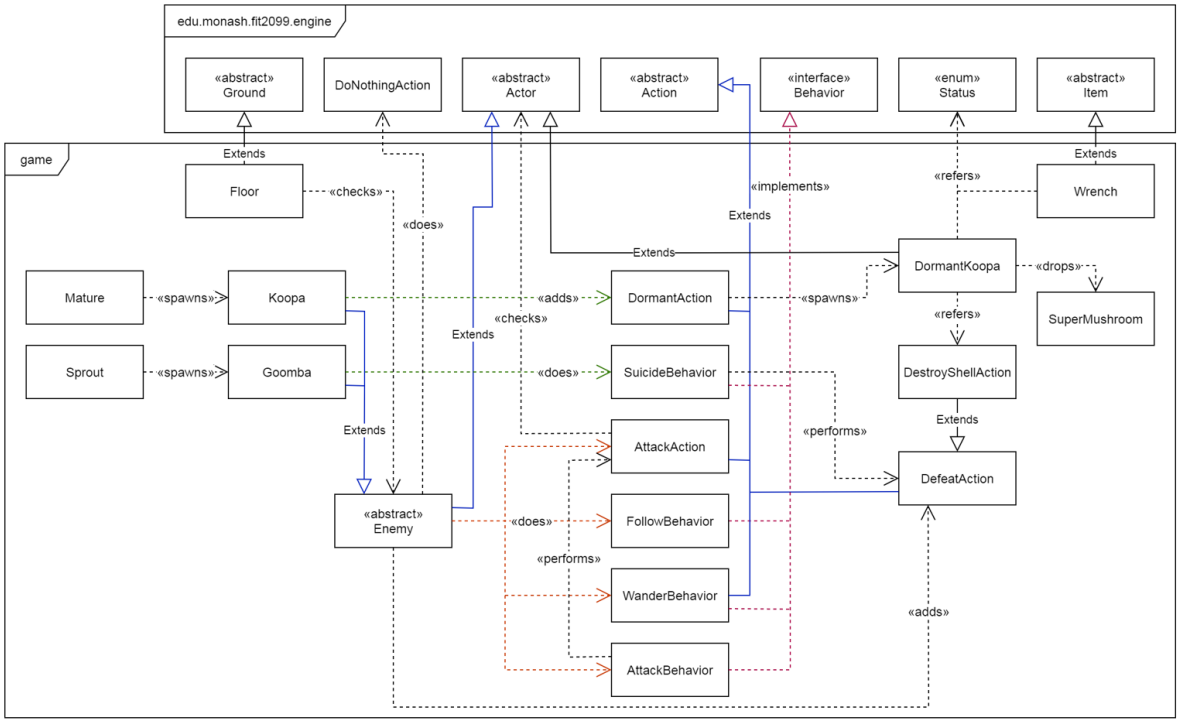
Design Rationale (REQ 2)

Tree and Wall ---<<creates>>---> JumpAction, *Wall ---<<creates>>---> ConsumeAction* and *Player ---<<use>>---> CapabilitySet*. In this game, different objects such as trees, walls and super mushrooms attach different actions that actor can perform on them. For example, trees and walls are high ground, they allow the actor, which is the player, to jump onto it. Based on object-oriented, the tree and wall are the objects. We can simply create JumpAction inside the Player class, however by doing this, we need to know which object the player wants to jump, it will require additional dependency between Player and Tree and Wall.

Besides, we also need to check whether the ground allows the player to jump onto it or not, checking the object classes using the if-else statement will also increase dependency. To align our design with the Reduce Dependency Principle, we discard this alternative and use a different approach that is shown in the class diagram above. The wall and tree <<creates>> jumpAction, which has the similar concept of Item class that <<creates>> pickUpAction that has been implemented inside the code given.

Different stages of Tree and Wall have different success rates that Player can jump onto it and if the player fails to jump onto it, they will cause different amounts of damage on the player. Based on the open-closed principle, classes should be open for extension but closed for modification. This is the rationale behind the presence of the FallDamage interface. By doing this, the classes implement it will have same method but different implementation, even there is another high ground will be added into our game in future, we can simply extend it from the interface created above

UML Class Diagram (REQ 3)



Design Rationale (REQ 3)

Per the requirements, enemies may not enter Floor as part of any of their actions. Thus, a new layer of abstraction Enemy was added, so Floor would not have to depend on each individual enemy in its checks for canActorEnter, creating high substitutability and lower coupling. The additional Enemy inheritance layer also helps for code reuse, as many of the enemy classes share the same features.

We also refactor the target.isConscious() conditional in AttackAction into its own class, DefeatAction. The first reason is that there is no reason for the attacker that called the Action to be the one to handle the logic for handling unconscious actors, breaking segregation. The second is that AttackAction should not be responsible for this to begin with, breaking single responsibility on top of its now misleading name. The third, used for the requirement, is that it allows for us to create a behavioral override to what happens to an actor when it is unconscious.

In its place, we might create a behavior which conditionally executes DefeatAction, a behavior which all relevant Actor subclasses should populate their behaviors with in

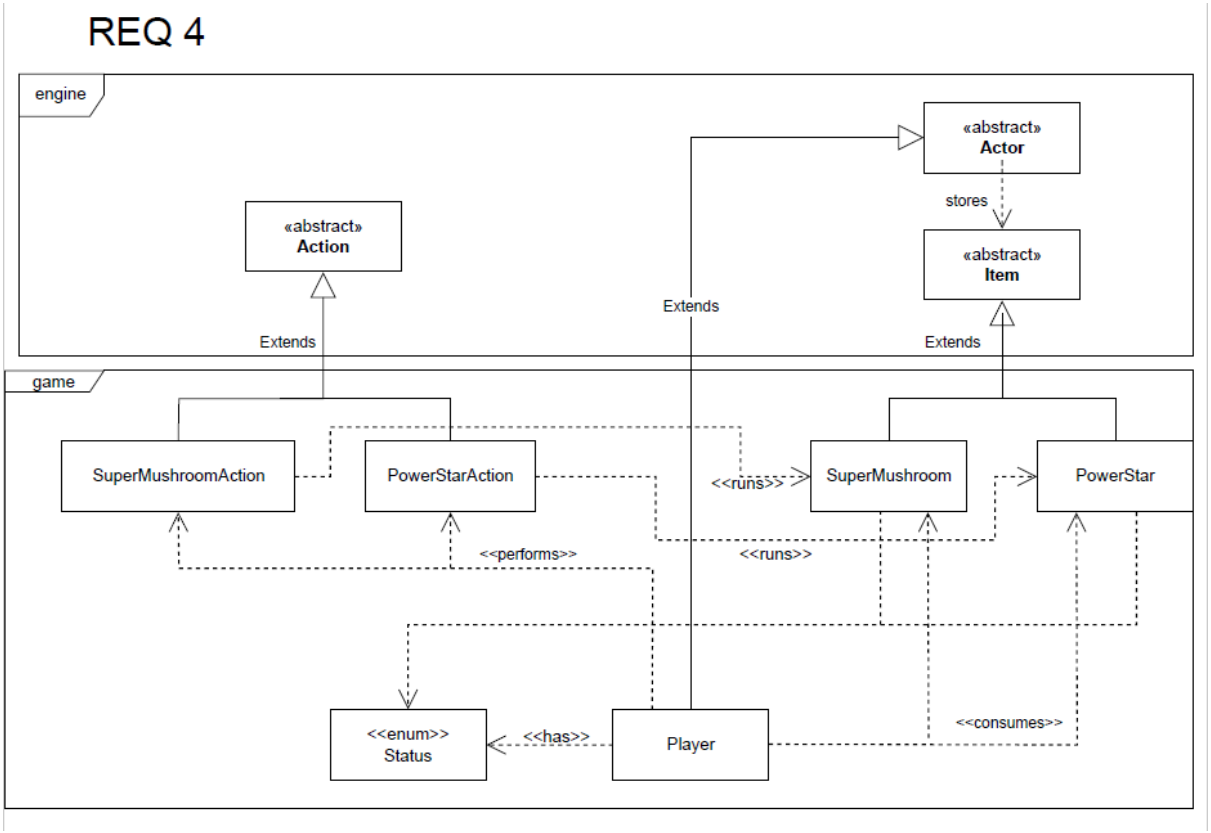
their constructors. There is still a significant issue with this method - there is a time lag between an actor being killed and it being considered dead. This is due to a limitation with the engine - there isn't a good way to force a playTurn event for an arbitrary actor.

The solution ultimately used is to keep the resultant Action inside AttackAction's attributes, such as DefeatAction or DormantAction, and have the correct action to perform on target's death be passed into AttackAction through its constructor. This would result in the need to pass in the action on defeat to all actions potentially defeating an actor, but allows only the Enemy subclasses overriding the on-defeat action to have the need for modification.

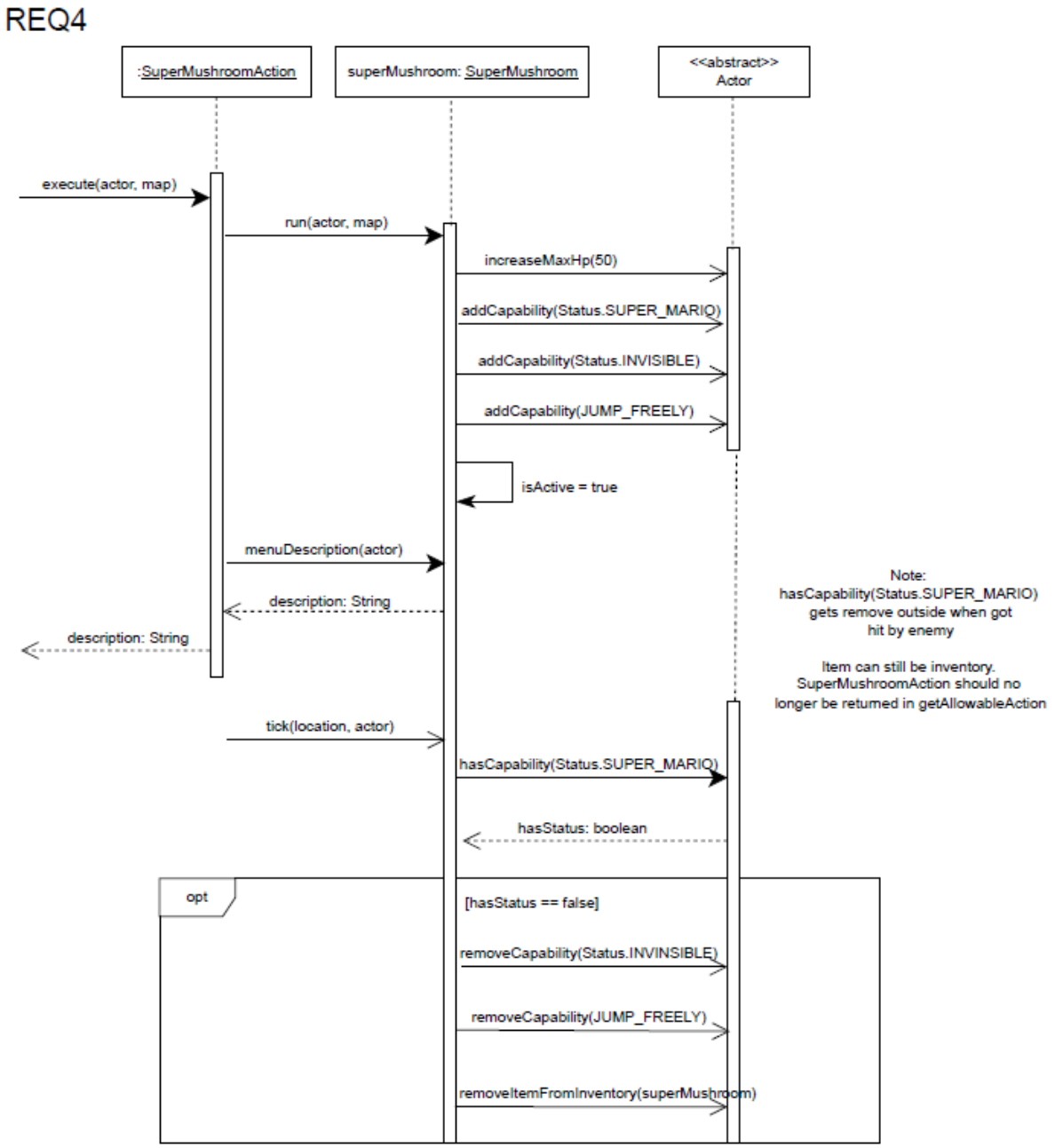
By having the Enemy control its own behavior on defeat, we would be able to override the default behavior, and replace it with ie. DormantAction for Koopas with minimal coupling. The DefeatAction refactor also allows us to create SuicideBehavior, extending DefeatAction, which calls its super conditionally. This may be undesirable if the goal is to delete Goomba without having it drop its items, but it should be easy to override its execute() to eg. delete its inventory before calling super() on itself.

We create a new DormantKoopa class in addition to Koopa, because both actors have vastly different behaviors, most of which are inherited from Enemy in Koopa, so it would be easier to think of them as separate entities. The SuperMushroom drop is also kept inside the dormant koopa, dropped upon defeat by DestroyShellAction, which refers to DefeatAction with a different menu description.

UML Class Diagram (REQ 4)



Sequence Diagram (REQ 4)



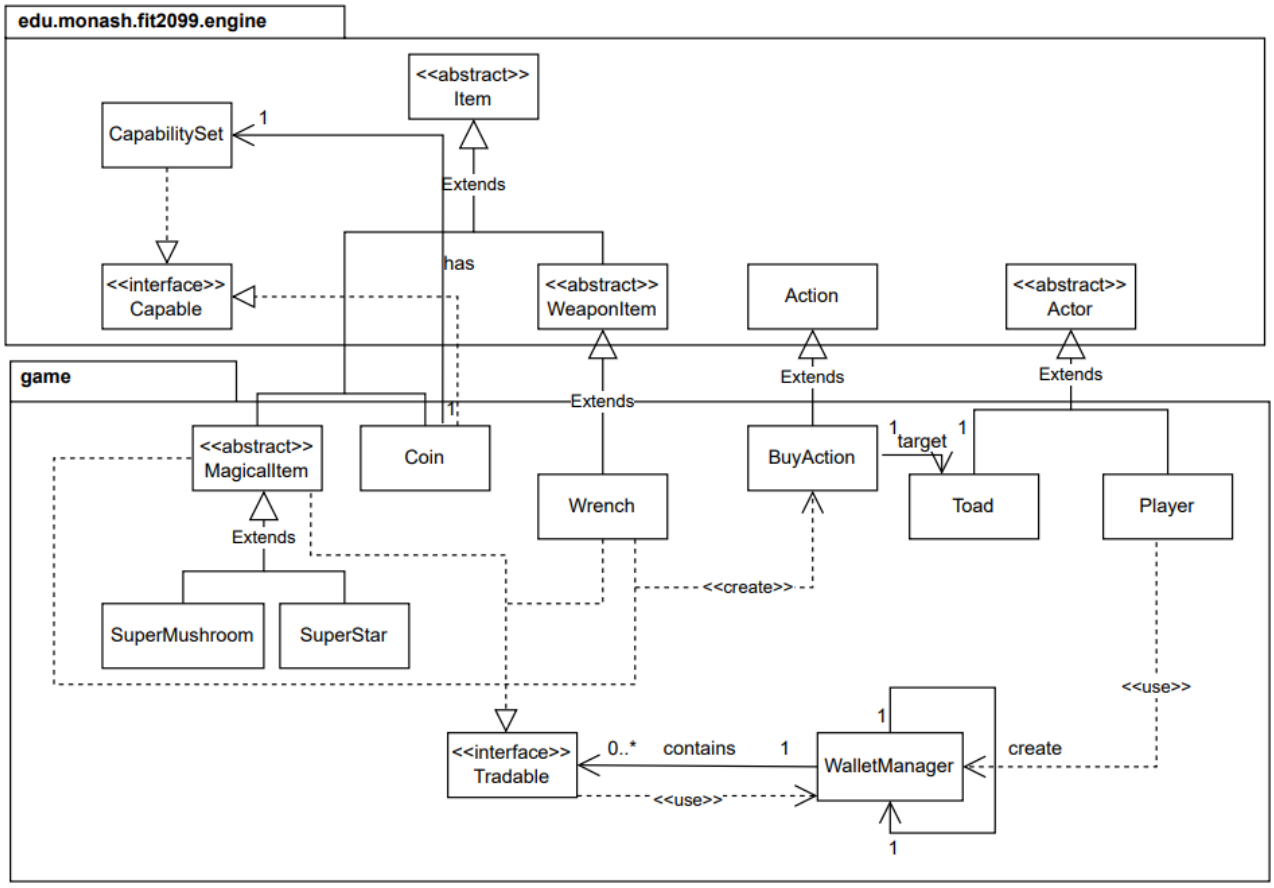
Design Rationale (REQ 4)

1 action for 1 consumable item. When a player picks up SuperMushroom, player has an option to consume it. When player consumes SuperMushroom, SuperMushroomAction runs and buffs the player. There is 1 action for 1 consumable item to give unique buff.

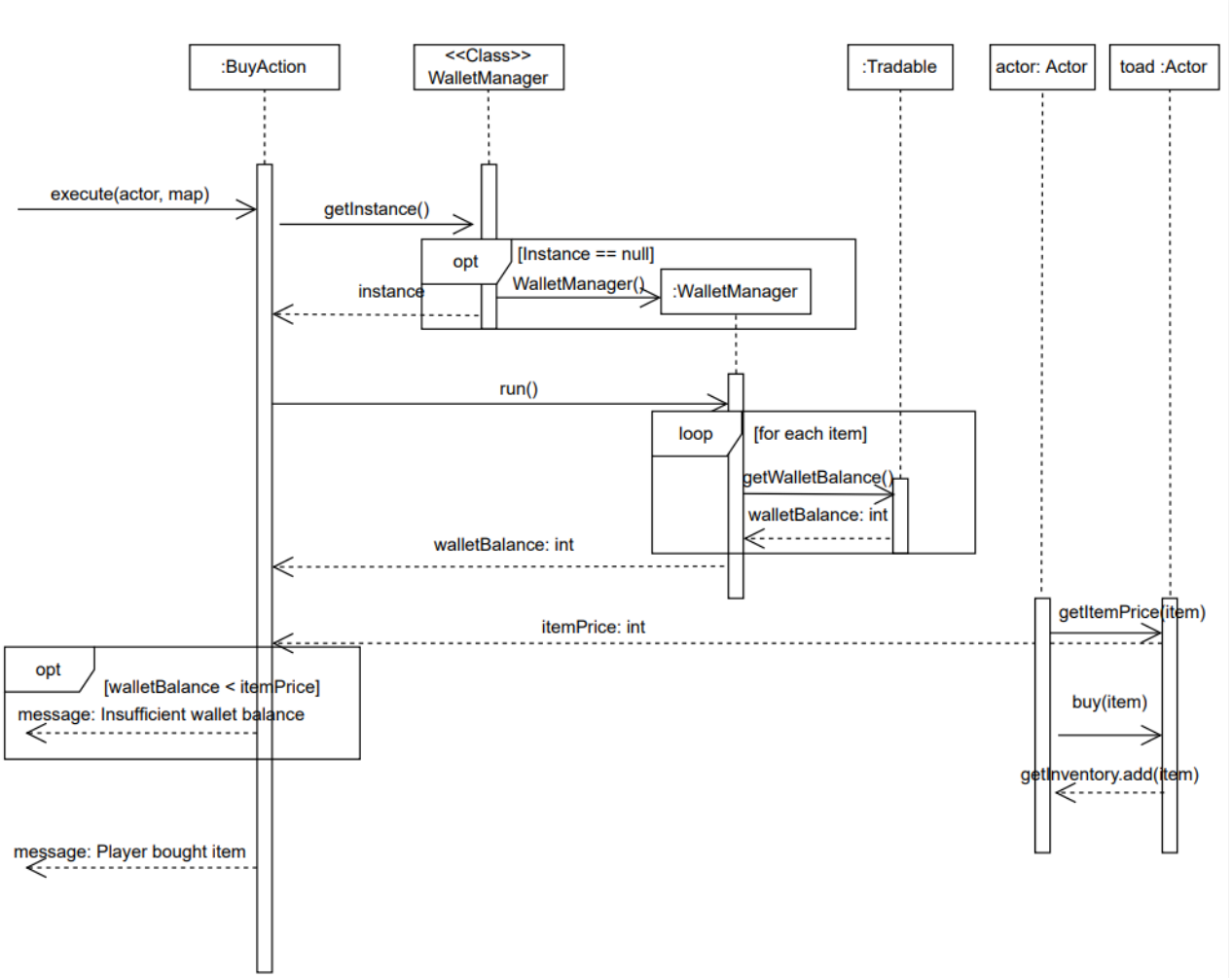
When execute method in action class runs, it calls run method of its item class. Since the item class can count the number of world cycle (tick), it can have counter for buff duration. After 10 cycles, PowerStar class can remove buffs that was added.

getAllowableActions inside consumable item class returns action class that can be performed. For example, in SuperMushroom, getAllowableActions method returns SuperMushroomActions. When the buff is active, getAllowableActions returns no action. By doing this, item that was consumed does not appear in allowable actions even though the item is still in inventory.

UML Class Diagram (REQ 5)



Sequence Diagram (REQ 5)



Design Rationale (REQ 5)

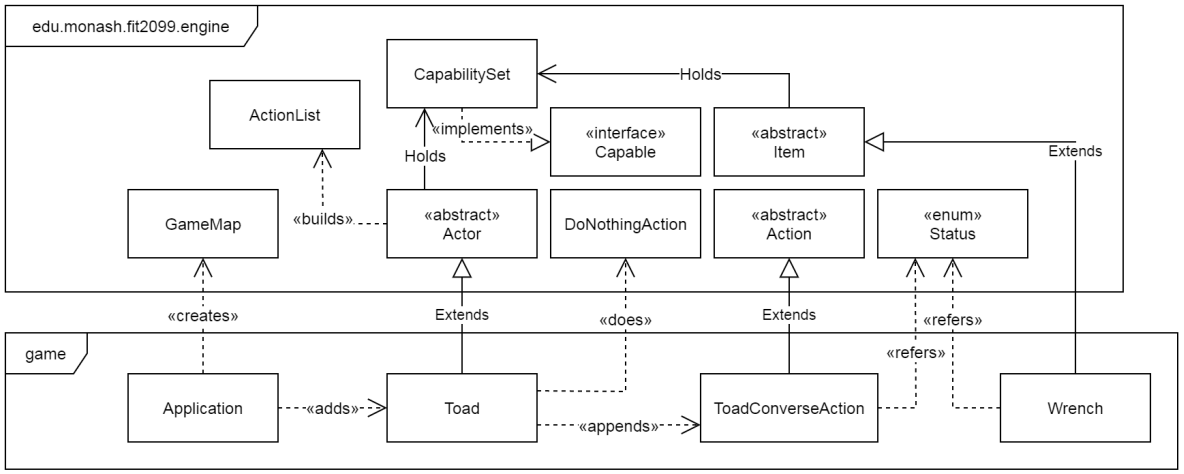
<<interface>> Tradable implemented by MagicalItem and Wrench. To follow open-closed principle, the MagicalItem and Wrench classes share the same method but different implementations. By using an interface as an abstraction, it can open for extension of the same method but different implementation.

MagicalItem---<<create>>--->BuyAction and *Wrench---<<create>>---> BuyAction*. The MagicalItem and Wrench are the objects that give the Actor(Player) an action to buy. We can simply create BuyAction inside the Player class, however by doing this, we need to know which object the player wants to buy, it will require additional dependency between Player and MagicalItem and Wrench. Besides, we also need to check whether the object allows the player to buy or not, checking the object classes using if-else statements will also increase dependency. To align our design with the Reduce Dependency Principle, we discard this alternative and use a different approach that is shown in the class diagram above.

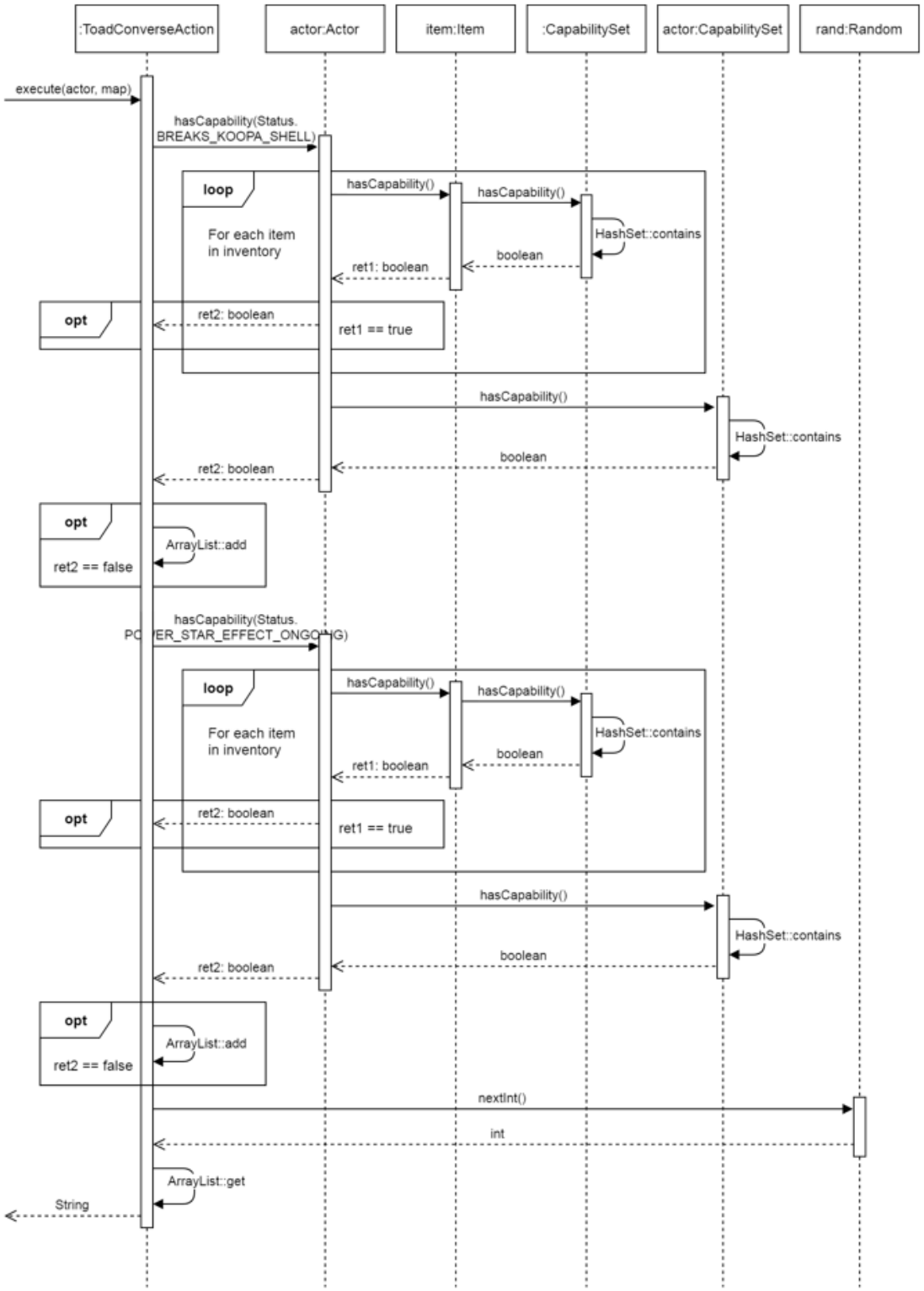
Coin has the Status.Spend. It will be added into its capability set that will be used when the player wants to buy items.

WalletManager has a list of tradable items that were bought by the player. It is a static class with a private constructor. The reason for doing this is because we only want an instance of WalletManager and the only way to get the instance is using the getInstance() method. WalletManager allows us to keep track with item bought by player and deduct the price of item from its wallet balance

UML Class Diagram (REQ 6)



Sequence Diagram (REQ 6)



Design Rationale (REQ 6)

For this requirement, we follow the conventions already laid out in the other game classes, and we conform to the design decisions made in the other requirements.

We create a new Toad class, extending Actor, as had been done in requirement 5, as the toad acts very much like an actor with no behavior (self-initiated actions), which we could just leave as a no-op with the DoNothingAction class, and otherwise functions very much like any other NPC. Thus, it is best implemented as a subclass of Actor for reusability and substitutability.

We add a new (subclass of) Action to the list of allowableActions in Toad, named ToadConverseAction. This action adds the "talk" feature to toad, and its addition into the list adds another option with which to interact with the actor.

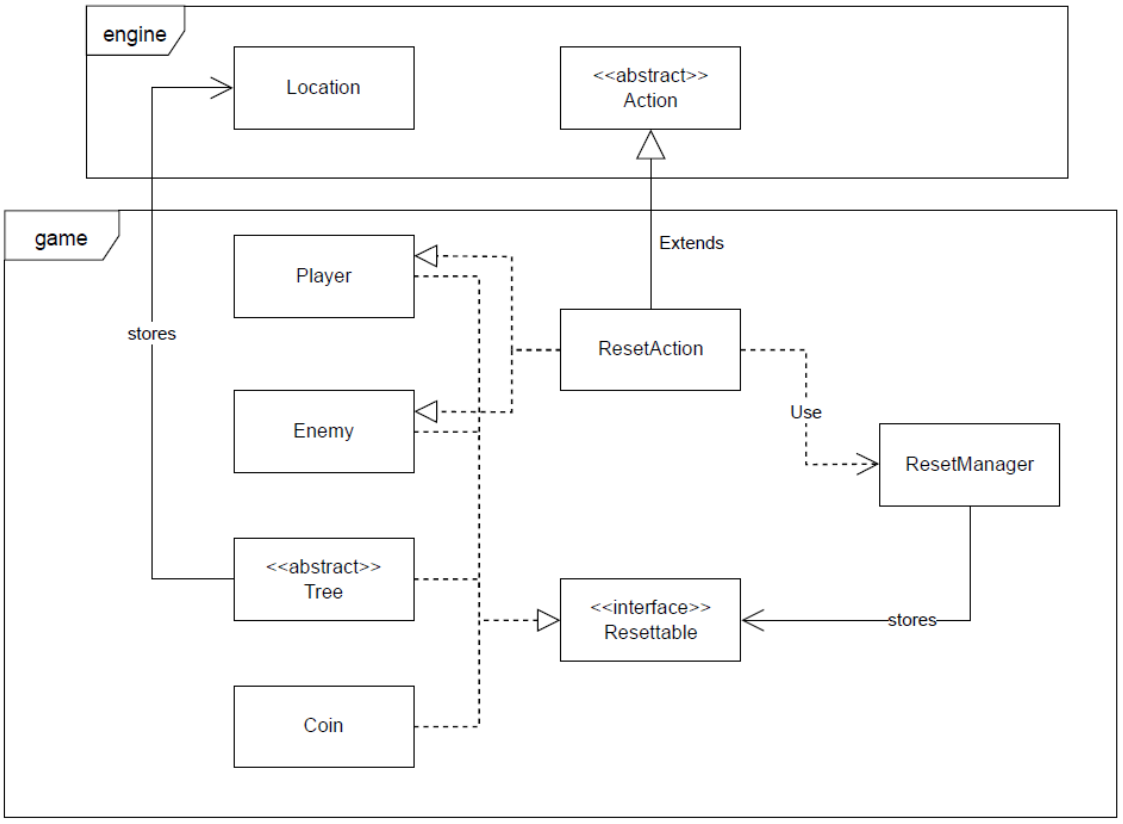
The action is not made more general, ie. as ConverseAction, because may of the conditional logic and dialog strings are not reusable. We also do not create another inheritance layer or interface as an abstraction for dialog-only actions, because it would not allow for much additional code reuse in terms of raw logic, and would not decrease coupling any further, as toad would still need a direct reference to its own ToadConverseAction, and there is no justifiable need to iterate between dialog-related actions in any class for the forseeable future.

The toad character is then added to the game through an addActor call to GameMap inside Application. The call is done in the aforementioned class, because Toad is a unique NPC with a lifetime that lasts for the entire length of the game. Thus, there is no need for any more specific class to manage the one Toad instance created at the start of the game. There may be need in the future to refactor the initial population of actors into its own manager class, for further logic, or multiple toad merchants in different areas or maps for in-game accessibility, but it should not be difficult as only the change of a single, atomic line in Application is necessary.

We also create a new Status value for the special effect of Wrench to destroy Koopa shells, used not only for the DestroyShellAction from requirement 3, but also for one of the checks inside ToadConverseAction. An alternative for both cases is to iterate through the Actor's inventory and compare each Item to an instance of Wrench. This requires a lot more logic and code to perform, does not reuse the hasCapability of Actor.

UML Class Diagram (REQ 7)

REQ7



Design Rationale (REQ 7)

We reuse the provided Resettable interface and ResetManager singleton class to implement the partial game reset feature. All classes relevant to the reset implement Resettable. This includes Player itself, the one who initiated the action, who would reset his own effects and restore to full health.

Since we have already made the classes Coin and Enemy from other requirements, we can just have them implement Resettable instead, reducing connascence with other enemy subclasses, or the parent Item class, especially since other items in the world are not affected.

We then add a ResetAction extending Action to implement the hotkey override feature and present a menu prompt. It then executes run() in ResetManager to loop through all the stored Resettables to execute their relevant methods.

Inside Player's ResetInstance, we also set a flag in player's attributes to prevent the ResetAction from showing up in its allowableActions list again, through a conditional check for this flag in Player's allowableActions override.

Inside Tree, we store its Location as an attribute on a call to tick(), instead of setting a flag to reset the Ground it is standing on to Dirt inside tick(). This way, we get to reference Location and do the logic inside resetInstance instead.

This prevents a race condition where the tree may stick around for an extra turn if tick() somehow ran before resetInstance gets to set the relevant flag, if the logic surrounding the calls to both magic were to be changed in the future. This creates a smaller connascence of timing by omitting the need to keep any of the two methods in mind when modifying the calling logic to the other.