

Asteroid Mining

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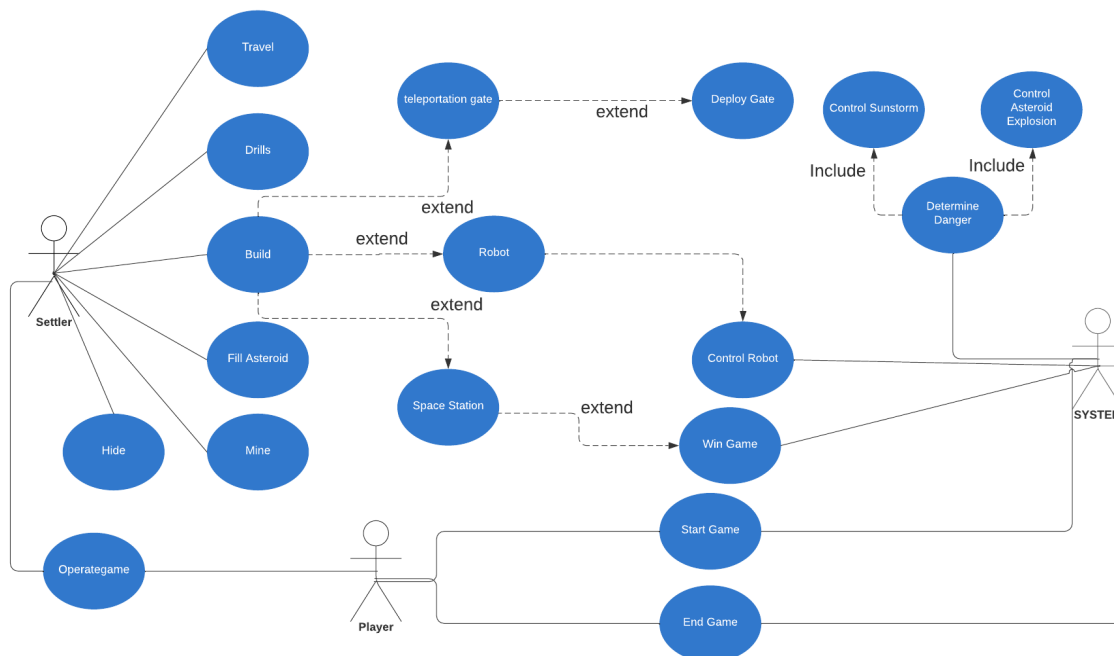
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5. Planning the skeleton

5.1 Real use-cases of the skeleton model

5.1.1 Use-case diagram



5.1.2 Use-case descriptions

Use-case name	Operate game
Short textual description	The Operating Game includes all controls made by the user playing the game to the settler which is the main protagonist of the game. The user controls the settler.
Actors	Settler, Player

Dialog, scenario	<p>Player controls the actions that are executed by Settler.</p> <ol style="list-style-type: none"> 1. Player can control the Settler to travel between different Places in the game. 2. Player can control the Settler to drill the rock mantle of an asteroid. 3. Player can control the Settler to Build a Teleportation Gate, Robot, or Space Station. 4. Player can control the Settler to Fill an Asteroid with a unit of resource. 5. Player can control the Settler to mine resources from the core of a drilled asteroid.
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Use-case name	Travel
Short textual description	Travel function is used to change the location of the settler from where it is to someplace else which most of the time is on another asteroid. This will be initiated by the command of the player but executed by the settler
Actors	Settler
Dialog, scenario	<ol style="list-style-type: none"> 1. The Settler can travel from one asteroid to the other using a spaceship 2. The settler can travel between asteroids through teleportation gates

Use-case name	Mine
Short textual description	<p>Mining is one of the tasks that only the settler has to execute for the extraction of metals. Mining can involve the mining of different elements like iron, uranium etc.</p> <p>This will be initiated by the command of the player but executed by the settler and not the robot.</p>
Actors	Settler
Dialog, scenario	<ol style="list-style-type: none"> 1. The Settler mines the asteroid which contains Iron, Carbon, Uranium or Water Ice. 2. The Settler mines an asteroid containing Water Ice at Perihelion leading to it getting sublimed. 3. The Settler mines an asteroid containing Uranium at Perihelion, leading to an explosion.

Use-case name	Build
Short textual description	Build use cases give settlers ability to build Robots, Gate, and a Space Station.
Actors	Settler

Dialog, scenario	<p>1. A Settler can build a robot if it has enough resources to do so.</p> <p>2. A Settler can build a pair of Teleportation Gates if it has enough resources.</p> <p>3. A Settler can build a Space Station if it collects enough resources on one asteroid, and in this case, the Player wins the game.</p>
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Use-case name	Drill
Short textual description	Drills mantle is one of the function executed by the settler to drill the asteroid in the core in order to reach the metals
Actors	Settler, robot
Dialog, scenario	<p>Drill action could be done by both Settler and Robot.</p> <p>1. Player controls Settler to execute this action</p> <p>Robot is controlled by the system itself, as an AI, to execute this action.</p> <p>If drill action is being executed while radioactive asteroid is on the perihelion, it will explode and kills the Settler and displace the Robot to another neighboring asteroid</p>

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Use-case name	Hide
Short textual description	Hide is one of the crucial functions that is executed by settler and robots to escape from Sunstorm.
Actors	Settler, robot
Dialog, scenario	<p>Hide action could be done by both Settler and Robot.</p> <p>1. Player controls Settler to execute this action</p> <p>Robot is controlled by the system itself, as an AI, to execute this action.</p> <p>Settler and Robot can only hide in hollow Asteroid.</p>

Use-case name	Space Station
Short textual description	Building the Space Station will be the aim of the settler. Since it's one of the things that the settler builds, extend is used

Actors	Settler
Dialog, scenario	<p>1- Player can control a settler which has to build the space station when it mines at least three units of resources then gather them in one asteroid, and it is one of the cases where the settlers can win the game.</p> <p>2- Player cannot execute the build space station action unless necessary resources are collected.</p>

Use-case name	Deploy Gate
Short textual description	Settler deploys teleportation-gates in the vicinity of the asteroid where settlers is on.
Actors	Settlers
Dialog, scenario	<p>Player executes the action of Settler to deploy the teleportation gates one at a time in different places.</p> <p>1. After deployment of pair gates, Settler and Robots could pass through these gates to travel to neighboring asteroid.</p>

Use-case name	Robot
Short textual description	The settler builds the Robot which itself will perform different functions like drilling and will be controlled by the system and not the settler
Actors	System
Dialog, scenario	<ol style="list-style-type: none"> 1. Players can control a settler to build an autonomous robot with necessary resources. 2. Robot is controlled by a system. 3. Robots can only travel in the range of Asteroids and only drill holes. 4. Sunstorm can damage robots unless they are hidden in a hollow asteroid.

Use-case name	Determine Danger
Short textual description	The major task of determining danger is to control all the possible dangers that would happen on an Asteroid Belt.
Actors	System
Dialog, scenario	<ol style="list-style-type: none"> 1. System creates a sun storm at some time of the game. 2. System controls all the explosive asteroids.

Use-case name	Fill Asteroid
Short textual description	Settlers can fill hollow asteroids with resources.
Actors	Settler
Dialog, scenario	If the asteroid is hollow, the player can control the settlers to fill the hollow asteroid with a unit of resource.

Use-case name	Teleportation gate
Short textual description	Settlers can build a pair of teleportation gates by using up two units of iron, a single unit of water ice and a single unit of uranium. This is deployed on an asteroid and is used to transfer the settler from one point to another.
Actors	Settler, Robot
Dialog, scenario	<ol style="list-style-type: none"> 1. Players can control a Settler which can build the teleportation gates with sufficient resources. 2. The gates can be deployed in the vicinity of the asteroid. 3. Settlers can carry the freshly built gates with themselves, but at the same time a single settler can only bring a pair of gates.

Use-case name	Control Robot
Short textual description	The Robots, made by Settlers, are actually controlled by the system through AI, majorly the robots are created to ease the task of the settler as it can survive a sun storm and explosion and can help the settler in drilling.
Actors	System, Robot
Dialog, scenario	<ol style="list-style-type: none"> 1.The Robot can drill the asteroids. 2. Sun storm occurs and the robot gets damaged if he is not hidden. 3. Sun storm occurs and the robot is saved because he is hidden. 4. If an explosion occurs then the robot is sent to another neighboring asteroid with no damage.

Use-case name	Start Game
Short textual description	System starts the game.
Actors	System, Player
Dialog, scenario	When the Player starts the game, the System initializes the important objects in the game.

Use-case name	End Game
Short textual description	When the players die or they achieve the goal, the game will finish.
Actors	System, Players
Dialog, scenario	<p>The game can end in two different ways.</p> <ol style="list-style-type: none"> 1. If all the settlers die, the system will end the game. 2. If settlers mine at least three units of each resource and collect the materials on a single asteroid, they can build a space station and the player wins the game.

Use-case name	Control Sun Storm
Short textual description	Sunstorm is one of the possible dangers that would happen on Asteroid Belt. And it is dangerous for the Settlers and Robots.
Actors	System
Dialog, scenario	<p>1- System will generate a sunstorm after a random amount of time and it is dangerous when it arrives in the asteroid belt.</p>

	<p>2- A settler can remain alive if it hides in the core of the hollow asteroid. A Sun Storm can kill a settler if the settler is not hidden in the core of a hollow asteroid.</p> <p>3- If a robot is hit by a sunstorm, its health will be decreased by some value. A Sun Storm can damage a robot if the robot is not hidden in the core of a hollow asteroid.</p>
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Use-case name	Determine Danger
Short textual description	This is an abstract way to present the major dangers the settler and robot can come across during the game. This further extends to specified cases like explosion and sun storm.
Actors	System
Dialog, scenario	<ol style="list-style-type: none"> 1. A sun storm occurs in the game. 2. An explosion occurs in the game.

Use-case name	Control Asteroid Explosion
Short textual description	It controls what will happen when settlers at perihelion and it mines to find Uranium (radioactive element).

Actors	System
Dialog, scenario	<ol style="list-style-type: none"> 1. Asteroids become explosive when they contain uranium. 2. A completely drilled radioactive asteroid explodes at perihelion. 3. When the asteroid explodes, it kills any Settler on it and displaces the Robots to the neighboring asteroid.

5.2 Plans of the skeleton's UI, dialogs

5.2.1 Player starts the game

After the user opens the game, A screen will appear to the user: "Click your mouse to start the game"

1. **User input:** \$Mouse_Click\$

System output: StartGame()

addObject(s1)

addObject(a1)

addResource(r1)

addVisitor(s1)

setPlace(a1)

Remark: addObject(a1) and addResource(r1) are called multiple times (the number of corresponding asteroids in the game)

5.2.2 Settler traveling

To travel through the asteroid belt, user has to press \$UP, DOWN, RIGHT, LEFT\$ keys.

1. **User input:** \$UP, DOWN, RIGHT, LEFT\$

System output: travel()

getPlace(): p1

getNeighbours(): places

Click on a place to travel!

2. **User input:** \$MOUSE_CLICK\$ on place p2

System output: addVisitor(s1)

removeVisitor(s1)

setPlace()

5.2.3 Settler Drills

To drill the not hollow asteroid, user has to press \$D_KEY\$.

1. **User input:** \$D_KEY\$

System output: drill()

getPlace(): a1

Is depth greater than 0?

2. **User input:** yes

System output: deepenHole(1)

5.2.4 Settler Mine

To mine the asteroid at aphelion, user has to press m key to exploit the resources.

1. **User input:** \$M_KEY\$

System output: mine()

getPlace(): a1

Is depth 0 and is the asteroid non-hollow?

2. **(case A) User input:** yes

(case A) System output: getResource(): r1

removeResource()

See sequence diagram 4.4.5. "Capacity Check".

(case B) User input: no

(case B) System output: drill()

5.2.5 Fill Asteroid

In order to Settler fill the hollow asteroid, the user(player) first selects a resource by mouse click and then presses \$F_KEY\$ to fill it.

1. **System output:** selects r1 parameter as a value
2. **User input:** \$MOUSE_CLICK\$ on resource r1

System output: A resource is selected.

3. **User input:** \$F_KEY\$

System output: putResource(r1)

getPlace(): a1

isHollow(): value

countResource(r1): num

Is the asteroid hollow and do you have enough resources?

4. **User input:** yes

System output: addResource(r1)

removeResource(r1)

5.2.6 Building the Robot

To build a robot user has to press the \$R_KEY\$ if he has necessary resources available.

1. **User input:** \$R_KEY\$

System output: buildRobot()

countResource("iron"): nIron

countResource("carbon"): nCarbon

countResource("uranium"): nUranium

Do you have enough resources?

2. **User input:** yes

System output: addObject(r1)

addVisitor(r1)

Robots are automatically controlled by the system from now on.

Remark: Robots are automatically controlled by the system since when it is built by the settler. Therefore, the test cases related operation against the robots is not denoted.

5.2.7 Building teleportation Gates

To build a robot user has to press the \$T_KEY\$ if he has necessary resources available.

1. **User input:** \$T_KEY\$

System output: buildTeleportationGates()

countResource("iron"): nIron

countResource("waterIce"): nWaterIce

countResource("uranium"): nUranium

Do you have enough resources?

2. **User input:** yes

System output: addGates()

5.2.8 Deploying the Gate

To deploy the already built pair of gates, user has to press \$G_KEY\$. User can deploy one gate at a one place and another to other place.

1. **User input:** \$G_KEY\$

System output: deployGate(t1)

addNeighbour(t1)

setPair(t2)

Please travel somewhere!

2. **User input:** \$UP, DOWN, RIGHT, LEFT\$

System output: travel()

3. **User input:** \$G_KEY\$

System output: deployGate(t2)

addNeighbour(t2)

setPair(t1)

gates=null

5.2.9 Settler Hides

To hide the settler at the core of the hollow of the asteroid which the settler is stepping on, the user has to press \$H_KEY\$.

1. **User input:** \$H_KEY\$

System output: hide()

getPlace(): a1

a1.isHollow(): bool

Is this asteroid hollow?

2. **User input:** yes

System output: isHidden = true

Succeeded to hide.

3. **User input:** no

System output: isHidden = false

Failed to hide.

5.2.10 Sunstorm occurs

Sun Storm is created by a system with fixed time. In order to escape from sunstorm, User can hide settler to core of hollow asteroid which it is stepping on by pressing \$H_Key\$

1. **User input:** test sunstorm

System output: createSunstorm(10) ~ System created sunstorm with fixed time 10 sec

addObject(sunstorm)

setTime(t)

SunStorm is occurring. Do you want to hide?

2. **(case A) 1. User input:** yes

(case A) System output: Please press the “H” key!

(case A) 2. User input: \$H_Key\$

(case A) System output: hide()

(case B) User input: no

(case B) System output: Nothing has happened.

3. **System output:** colisionWith(a1)

getVisitor(): visitor

Are you there and not hidden?

4. **User input:** yes

System output: die()

See sequence diagram 5.3.12. “Losing the game”.

Remark: colisionWith(a1) and getVisitor() are called multiple times (the number of corresponding asteroids in the game)

Remark: This test case is not committed to the authentic use case, however, you can demonstrate the functionality of it by the user input “test sunstorm”. Furthermore, createSunstorm() will be called by the System after the skeleton.

5.2.11 Control Asteroid Explosion

Fully Drilled and RadioActive Asteroids explode at the perihelion.

1. **User input:** test explosion

System output: determinePerihelion()

h1.checkExplosiveAsteroids()

ra1.isPerhelion(): bool

Is it on perihelion?

System: yes (automatically checked by the system because none of user inputs are required)

ra1.getVisitor(): v1

Are you there?

2. **User input:** yes

System output: die()

See sequence diagram 5.3.12. "Losing the game"

Remark: isPerhelion() is called multiple times (the number of corresponding radioactive asteroids in the game)

Remark: This test case is not committed to the authentic use case, however, you can demonstrate the functionality of it by the user input "test explosion". Furthermore, determinePerihelion() will be called by the System after the skeleton.

5.2.12 WaterIce sublimates

If the asteroid containing water ice is on the perhelion and fully drilled, then there must be a transition to sublimated state.

User input: test sublimate

System output: determinePerihelion()

a1.isPerhelion(): bool

a1.getResource(): Resource

Is it on perihelion, WaterIce and fullyDrilled?

System: yes (automatically checked by the system because none of user inputs are required)

Remark: isPerhelion() and getResource() are called multiple times (the number of corresponding asteroids in the game)

Remark: This test case is not committed to the authentic use case, however, you can demonstrate the functionality of it by the user input "test sublimate". Furthermore, determinePerihelion() will be called by the System after the skeleton.

5.2.13 Winning the Game

The player wins the game by building a spacestation. To build a spacestation, pressing \$S_KEY\$ is required.

1. **User input:** \$H_KEY\$

System output: buildSpaceStation()

countResource("iron"): nIron

countResource("waterIce"): nWaterIce

countResource("carbon"): nCarbon

countResource("uranium"): nUranium

Do you have enough resources?

3. **User input:** yes

System output: endGame()

5.2.14 User exits the Game

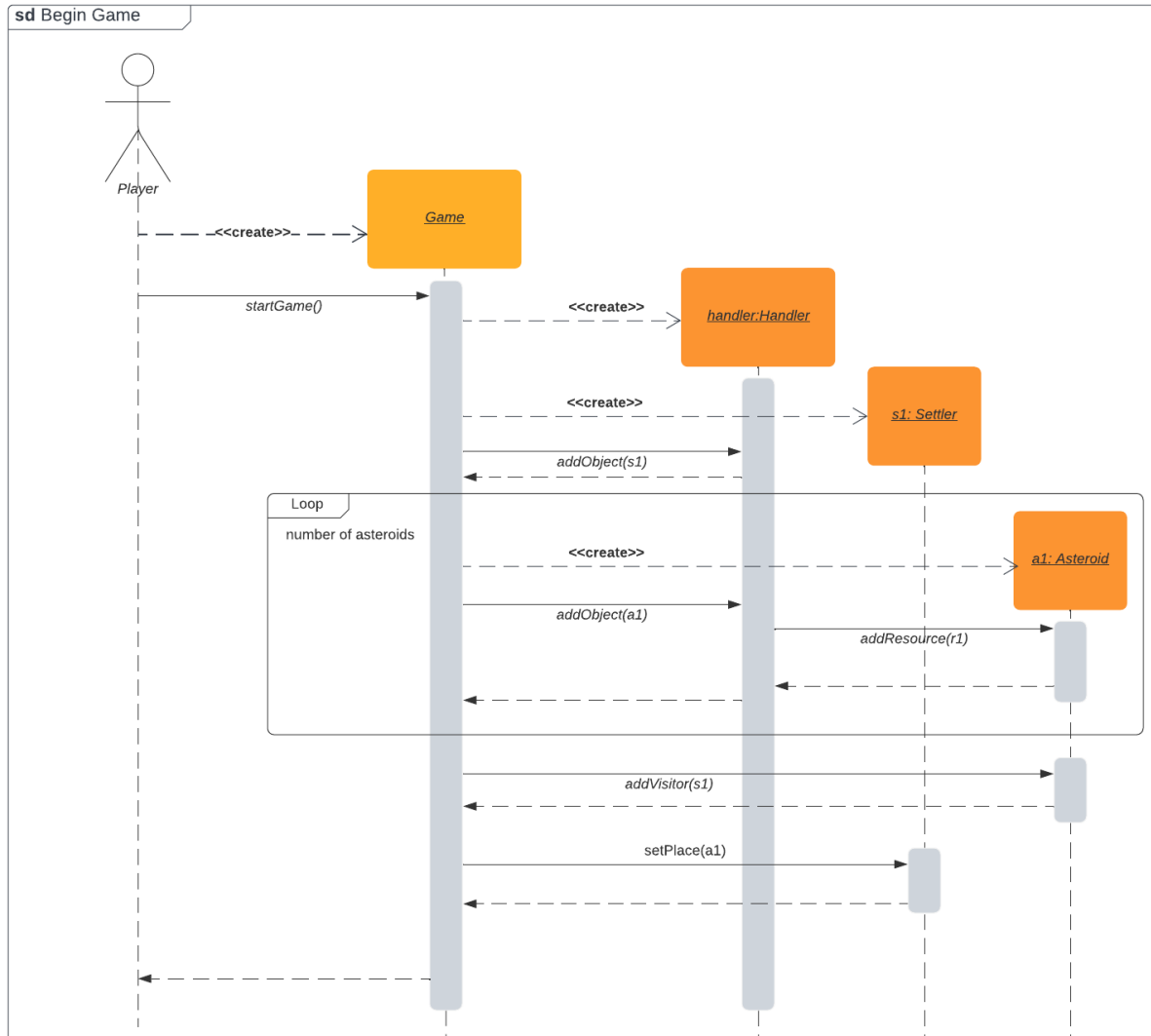
User can exit the game by pressing \$ESCAPE_KEY\$.

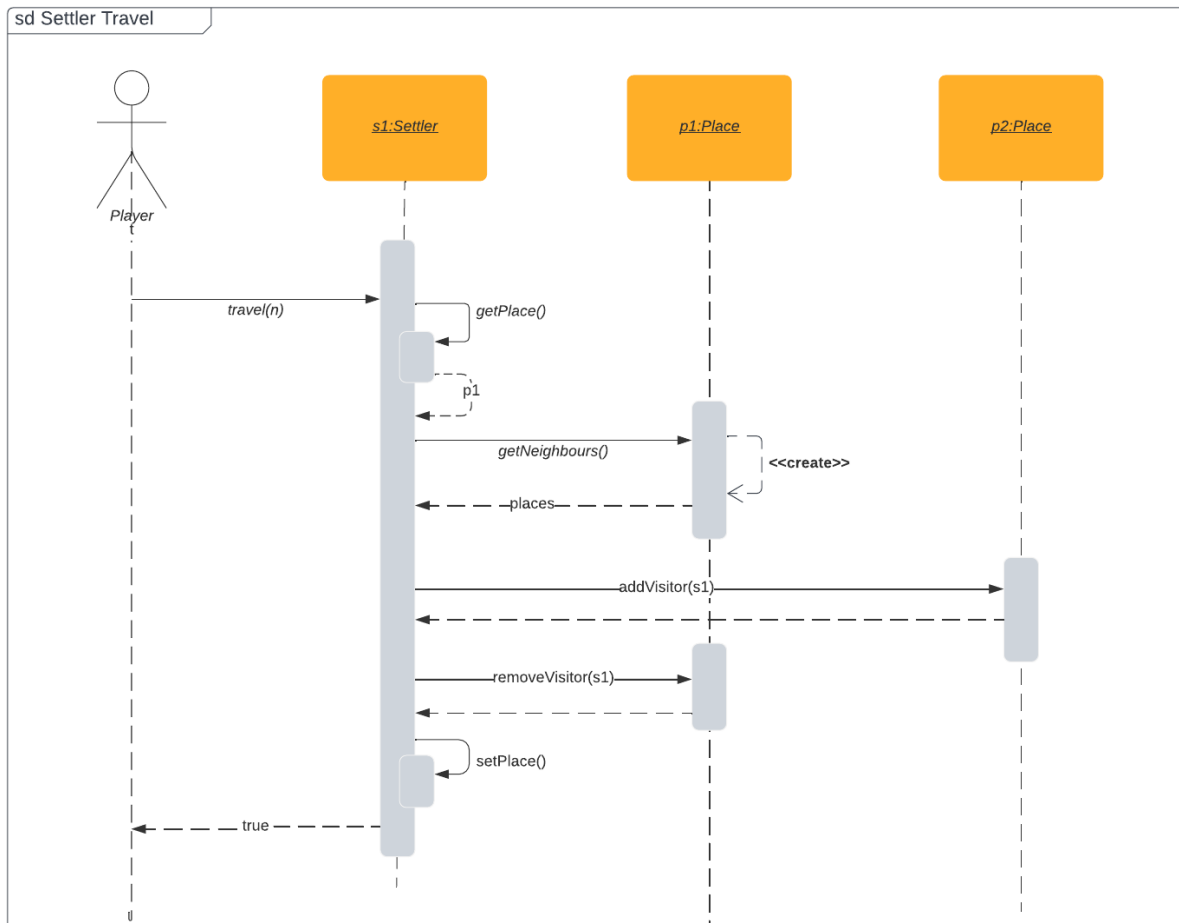
2. **User input:** \$ESCAPE_KEY\$

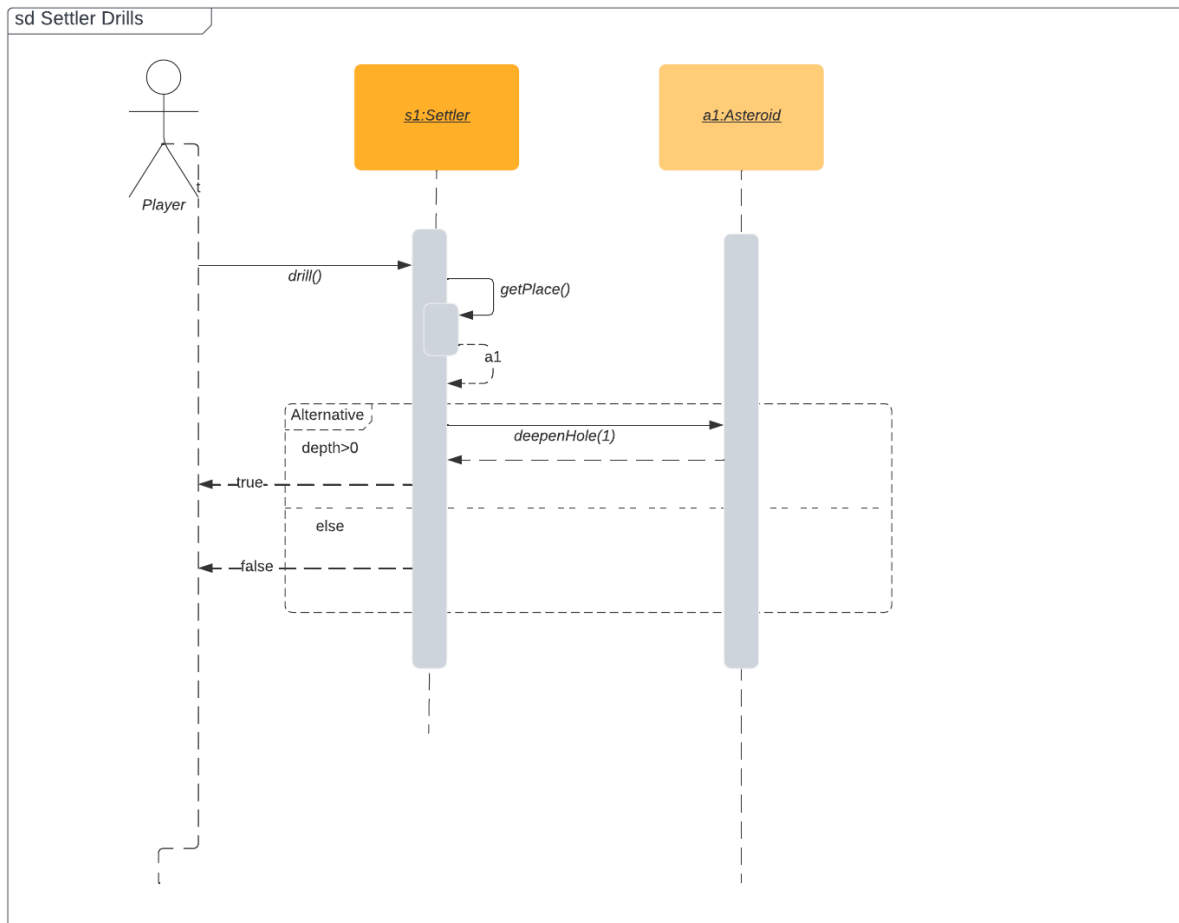
System output: endGame()

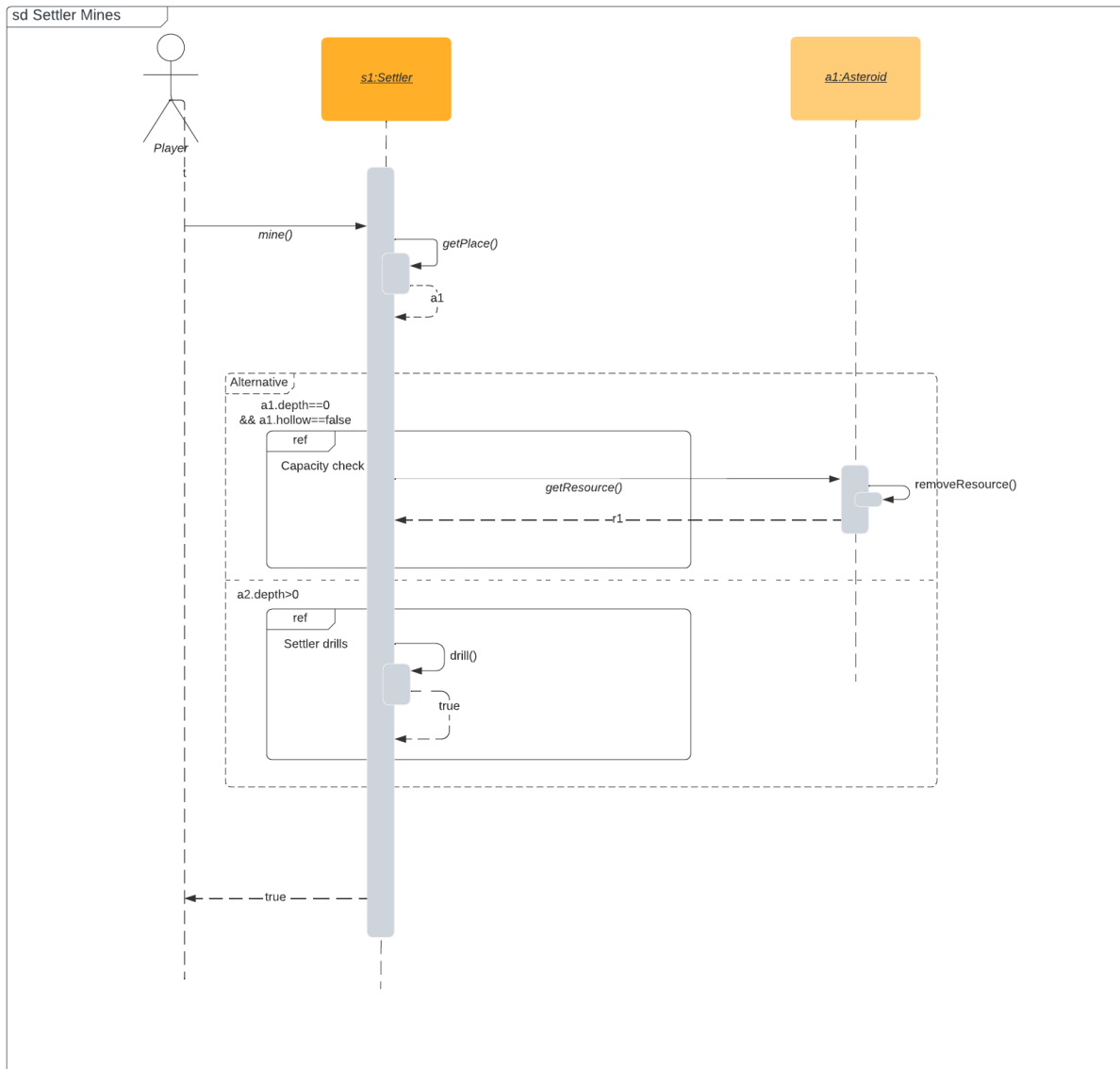
5.3 Detailed sequence diagrams for internal activities

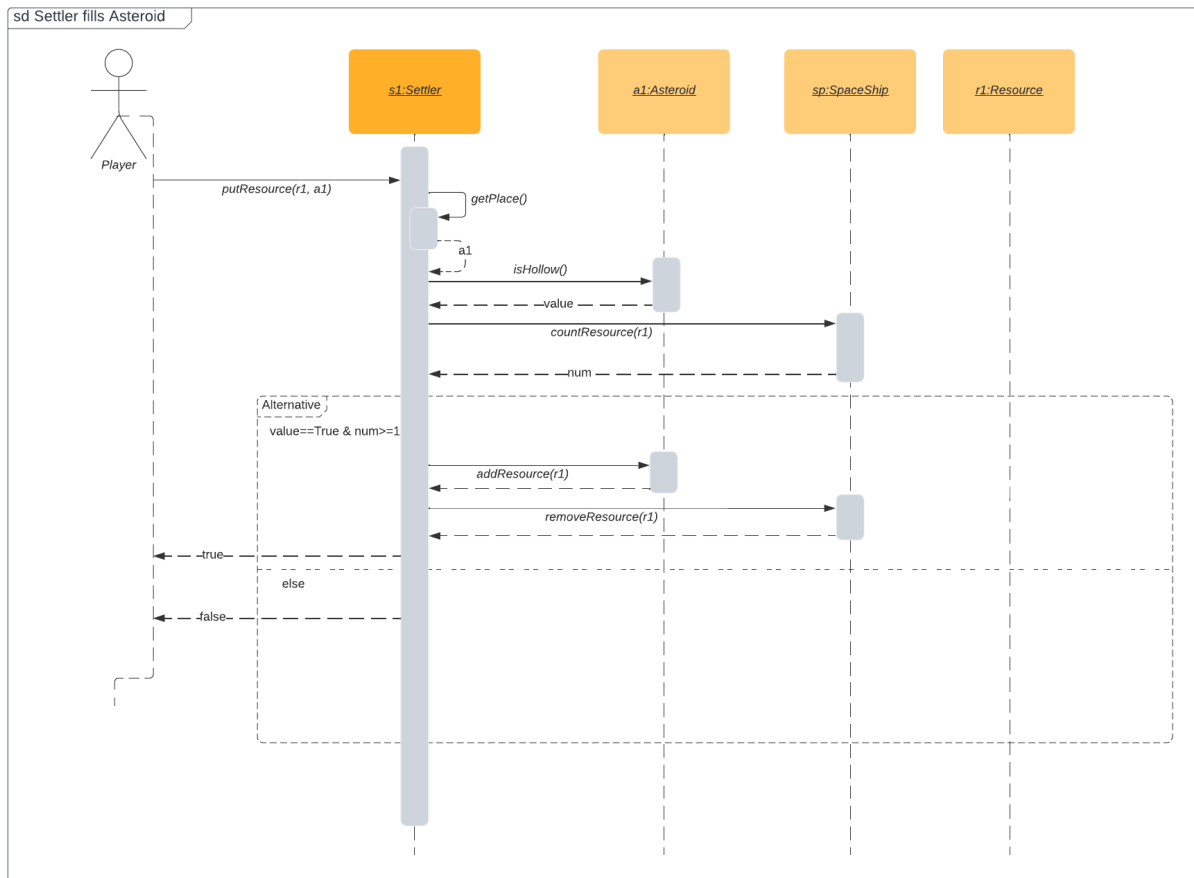
5.3.1 Initialization: Starting the game:

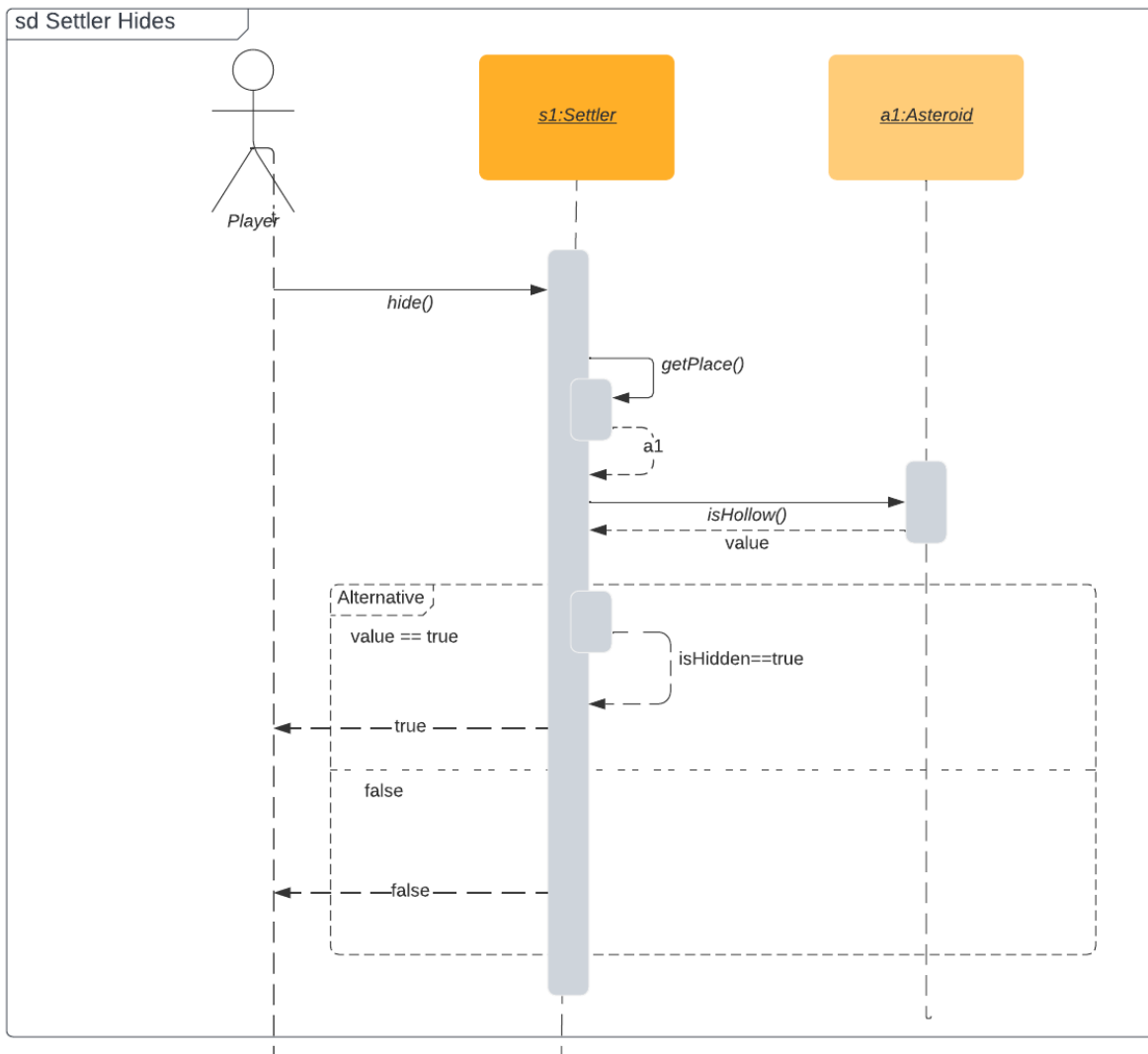


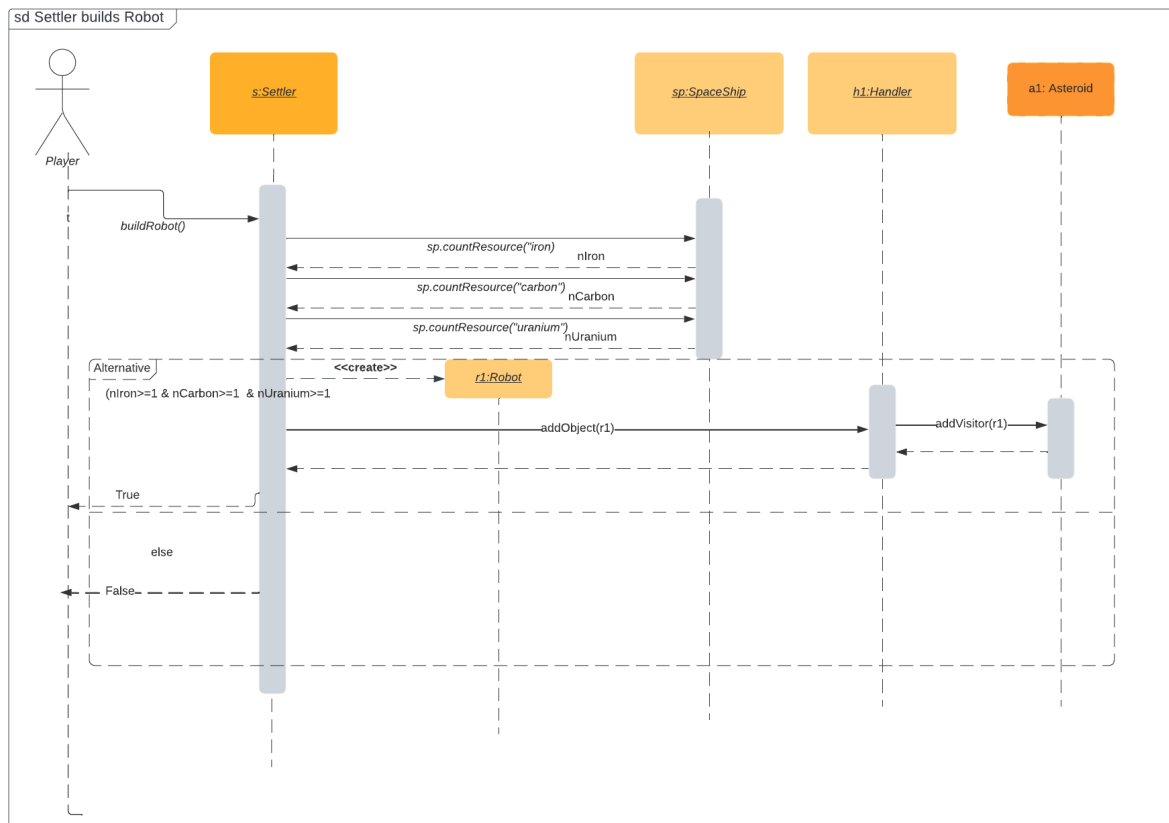
5.3.2 Settler Travels:

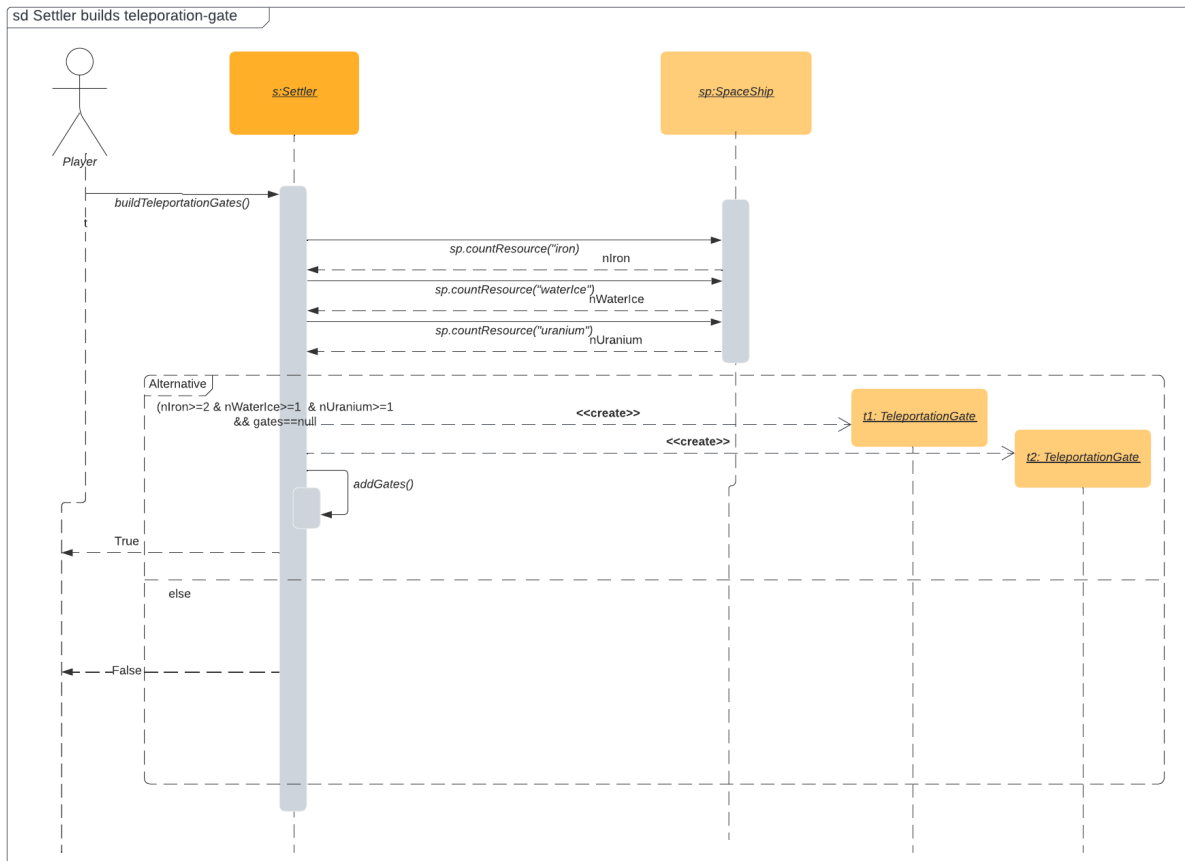
5.3.3 Settler Drills:

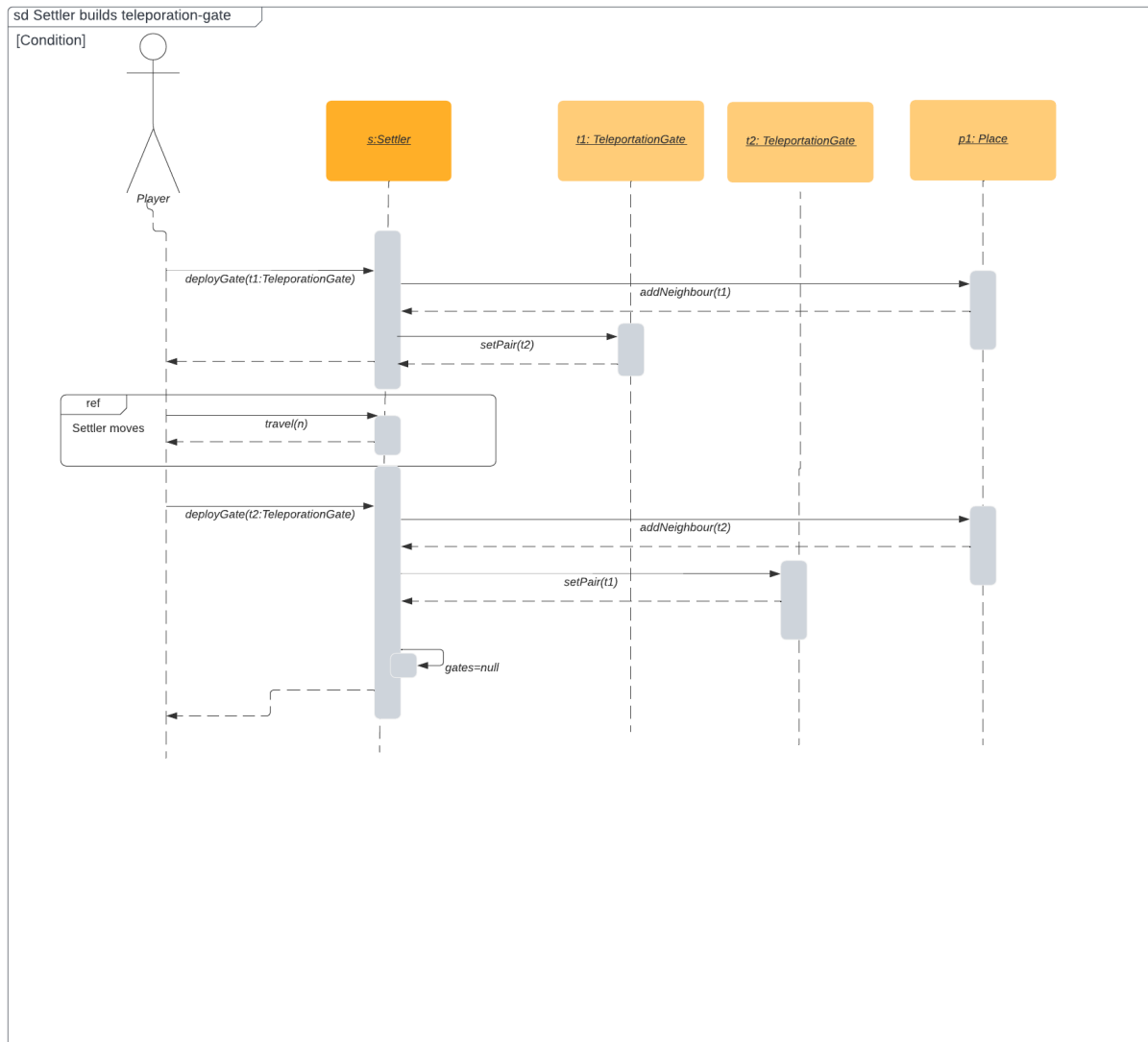
5.3.4 Settler Mines:

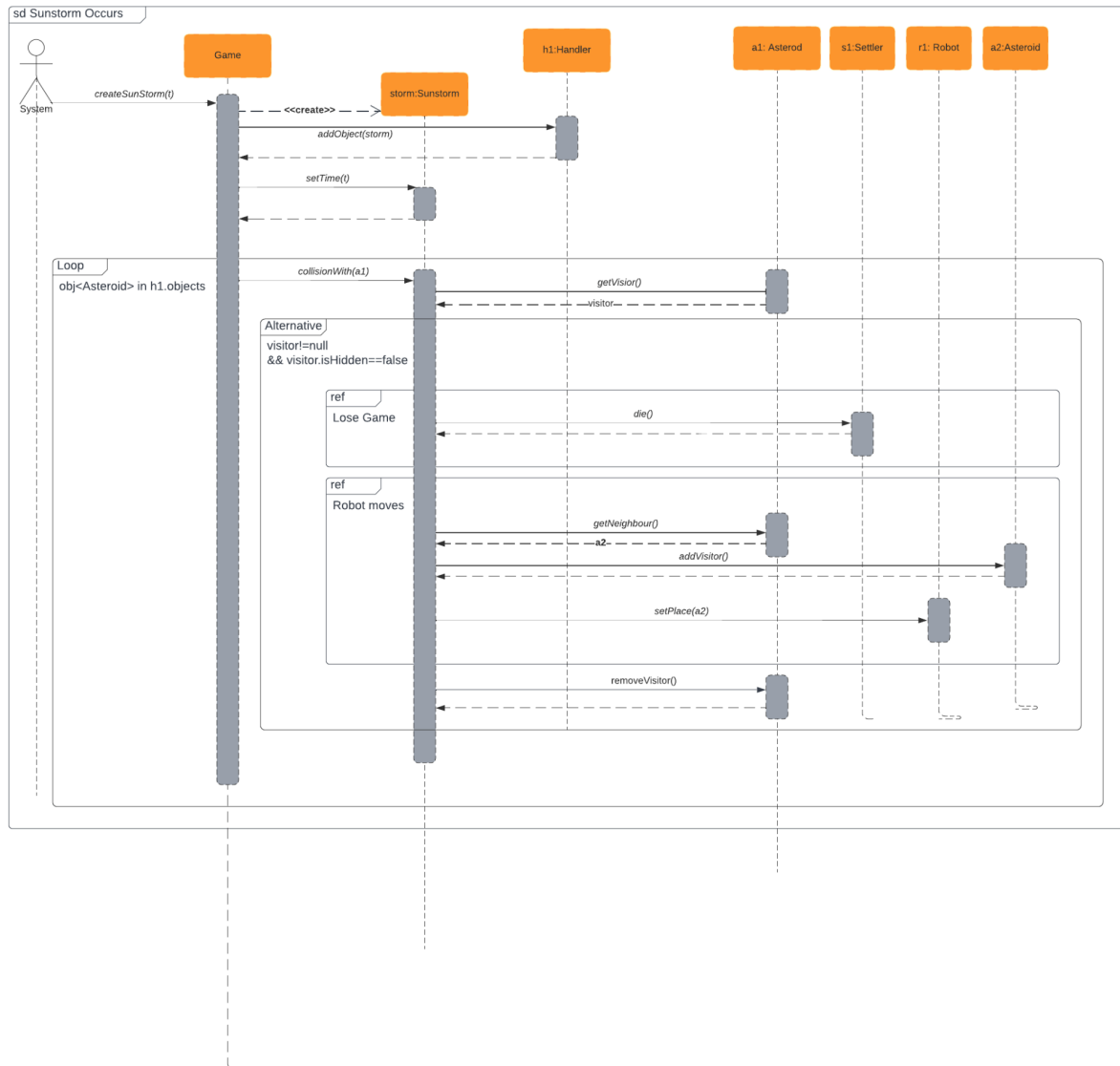
5.3.5 Settler Fills Asteroid:

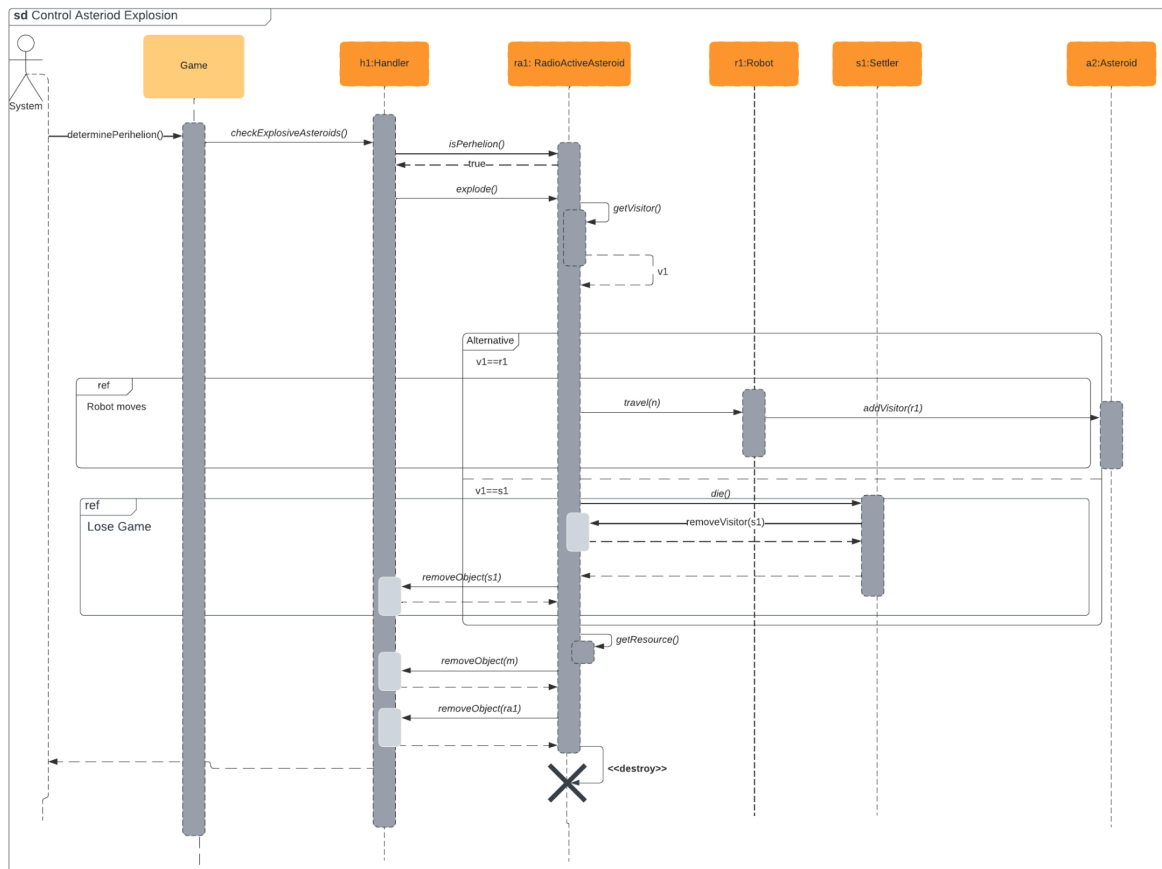
5.3.6 Settler hides in hollow asteroid:

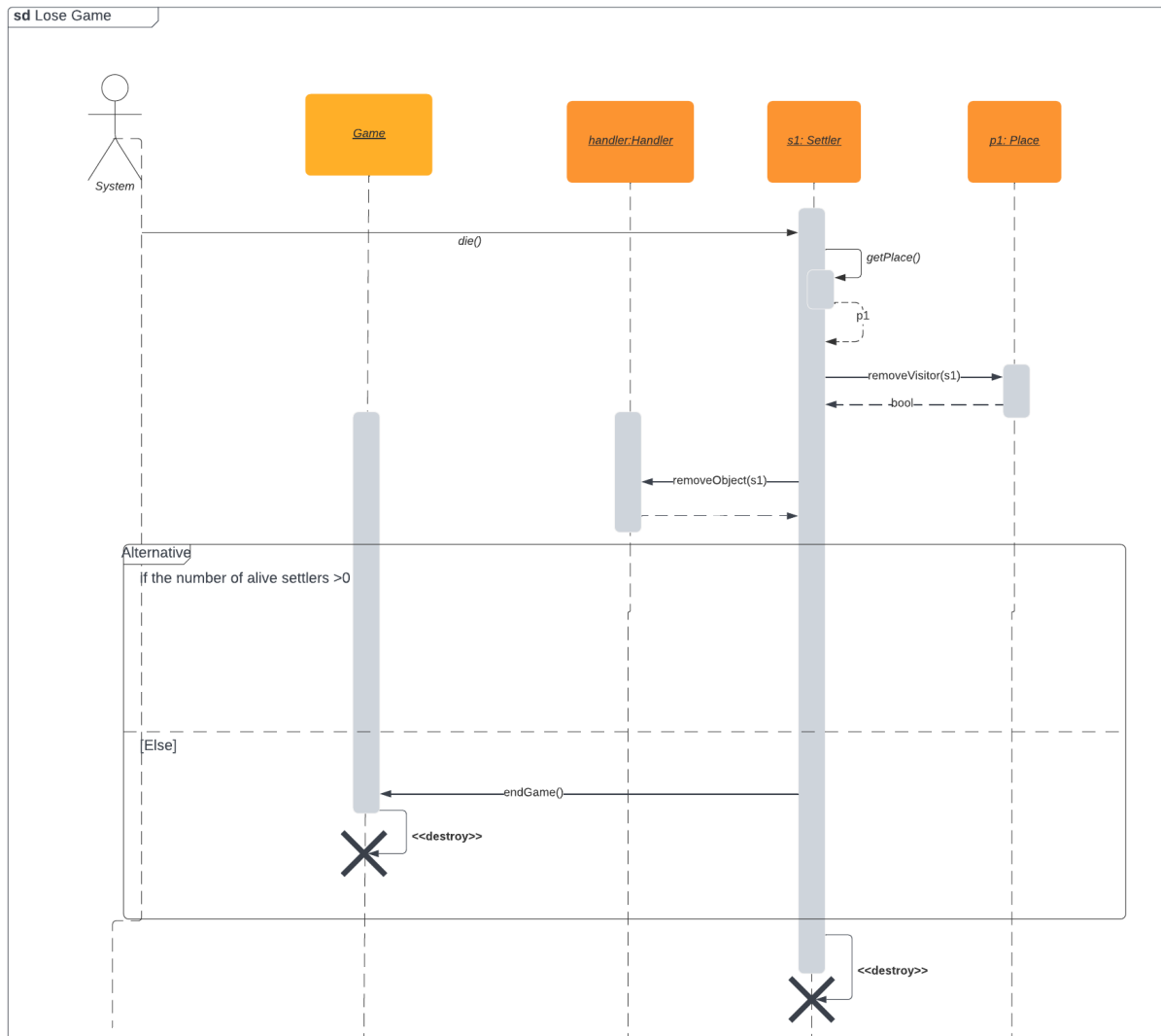
5.3.7 Settler builds Robot:

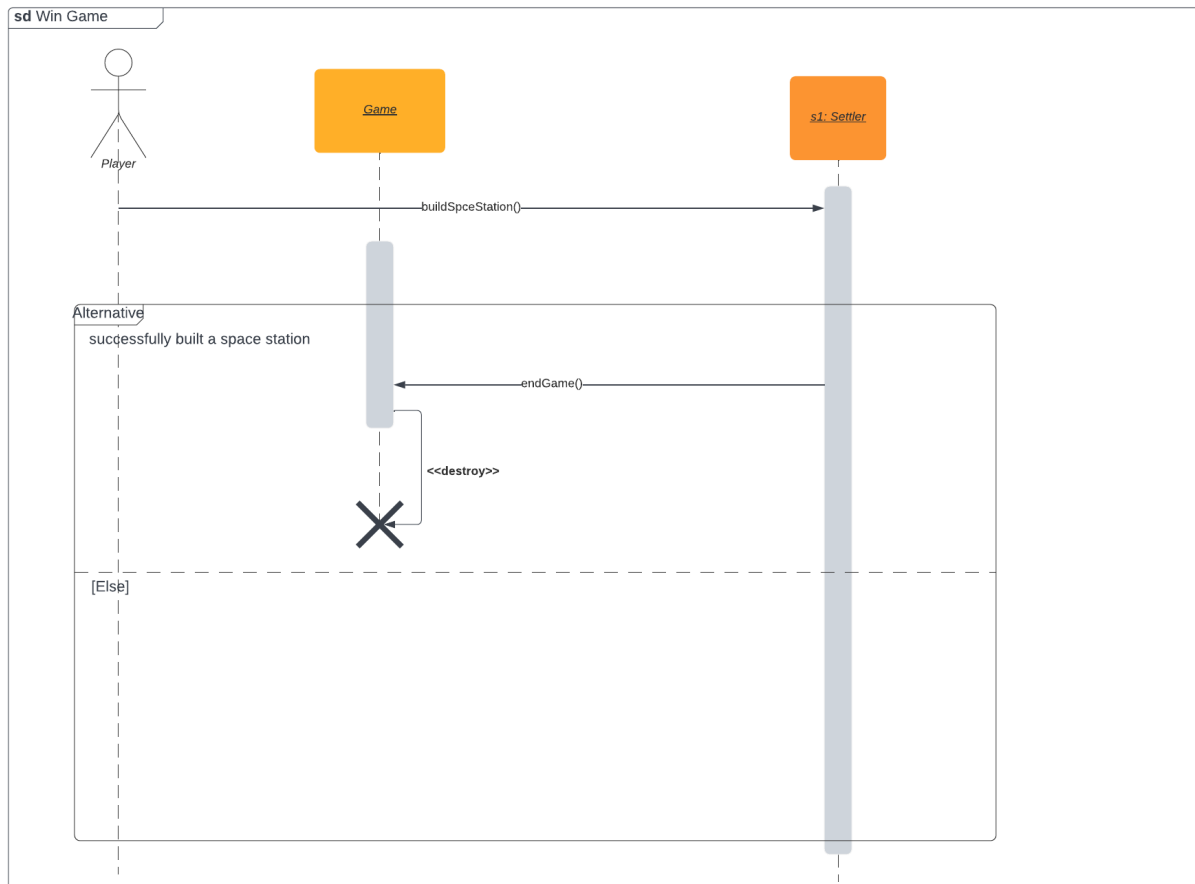
5.3.8 Settler builds Teleportation-Gate:

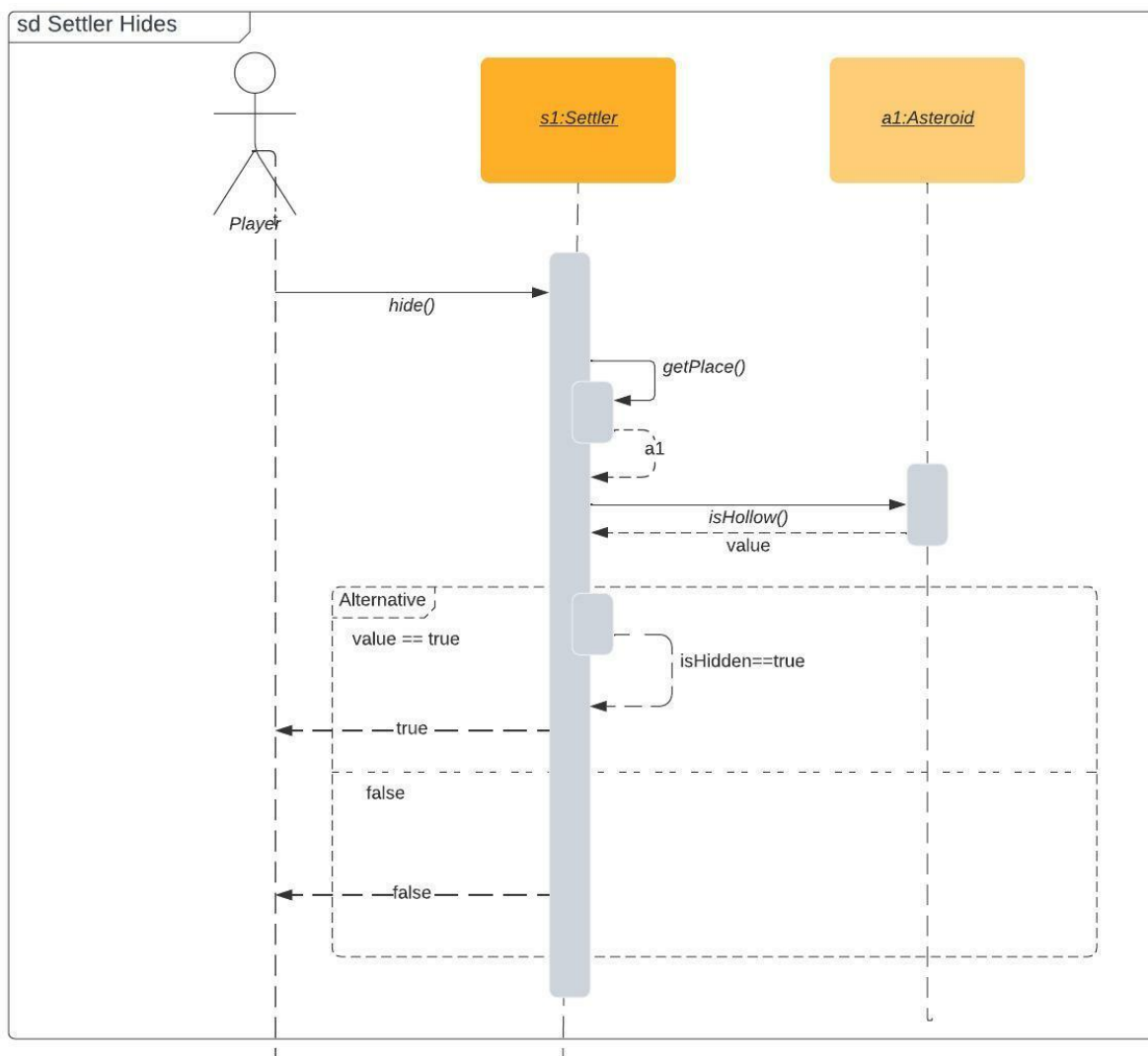
5.3.9 Settler deploys Gates:

5.3.10 SunStorm occurs:

5.3.11 Asteroid Explosion:

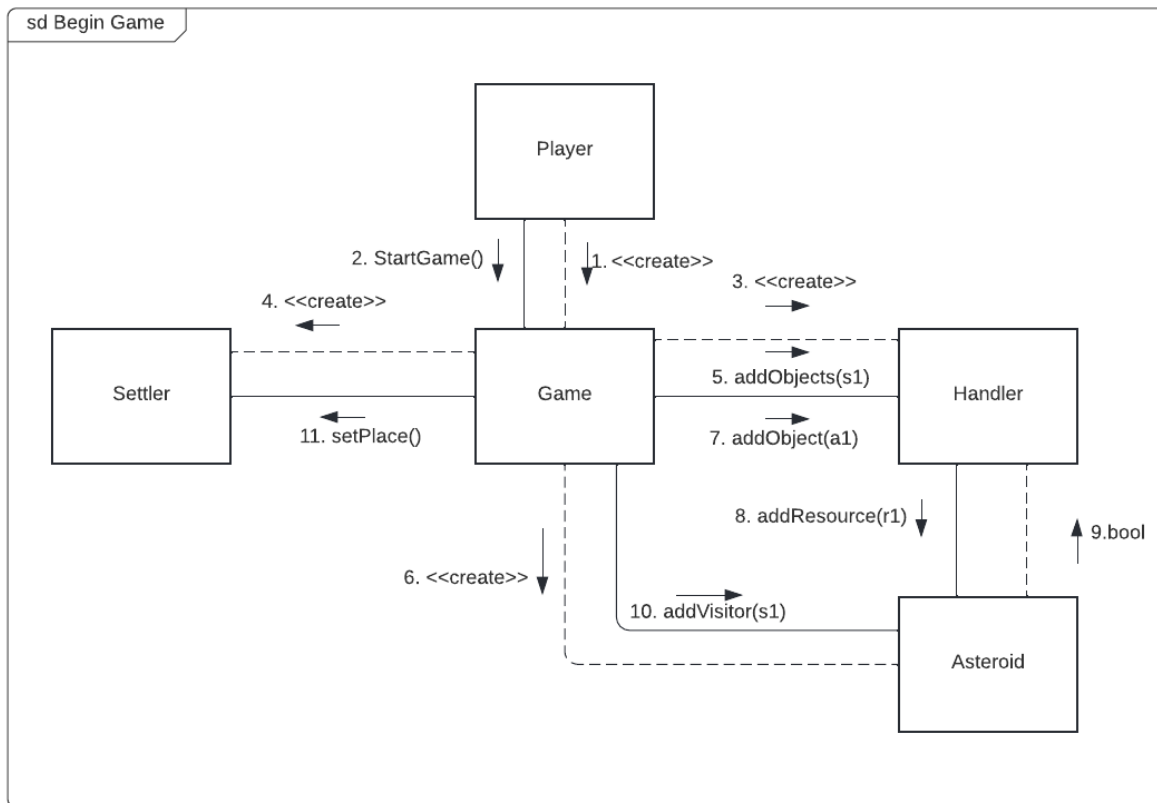
5.3.12 Losing the game:

5.3.13 Winning the game:**5.3.14 Settler Hides:**

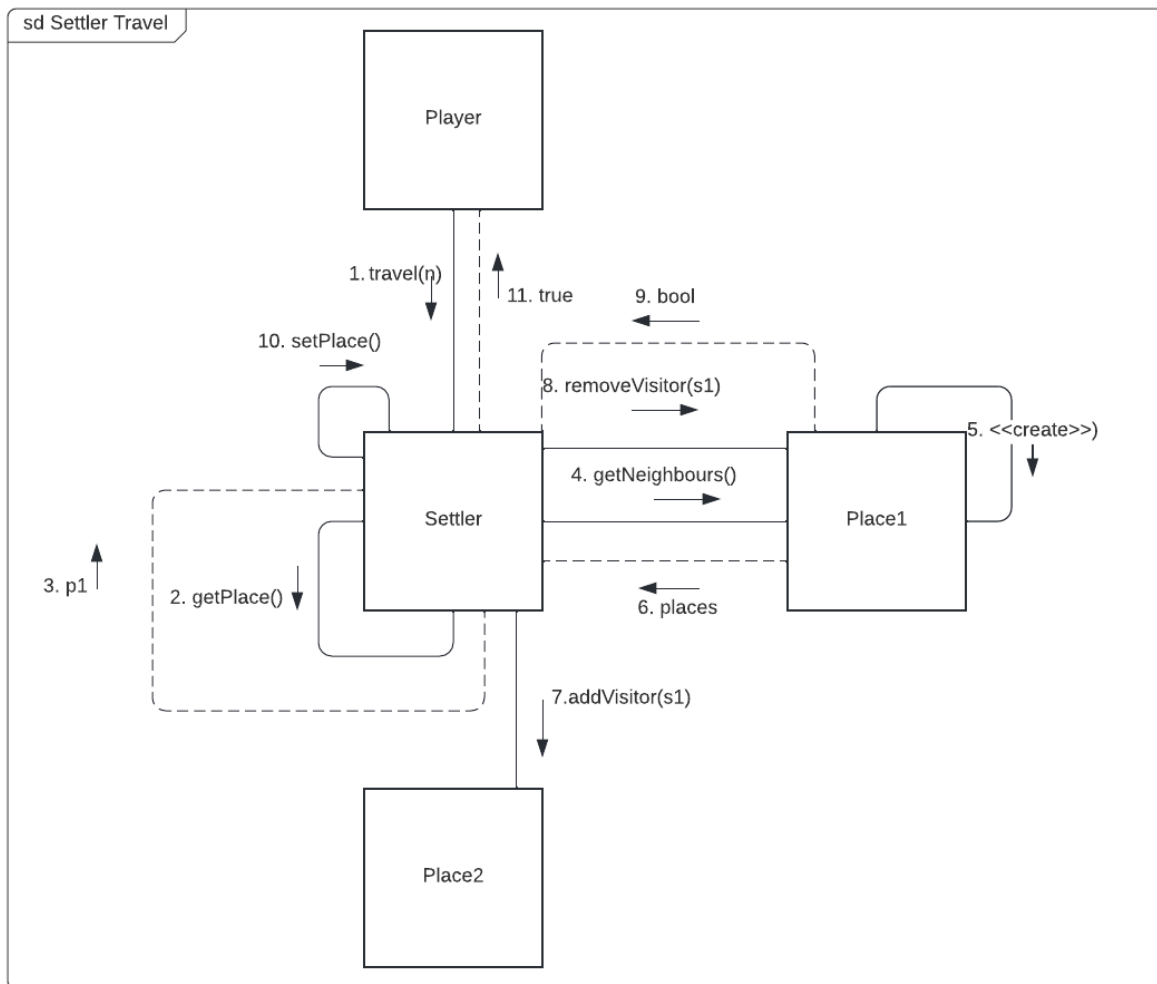


5.4 Communication diagrams

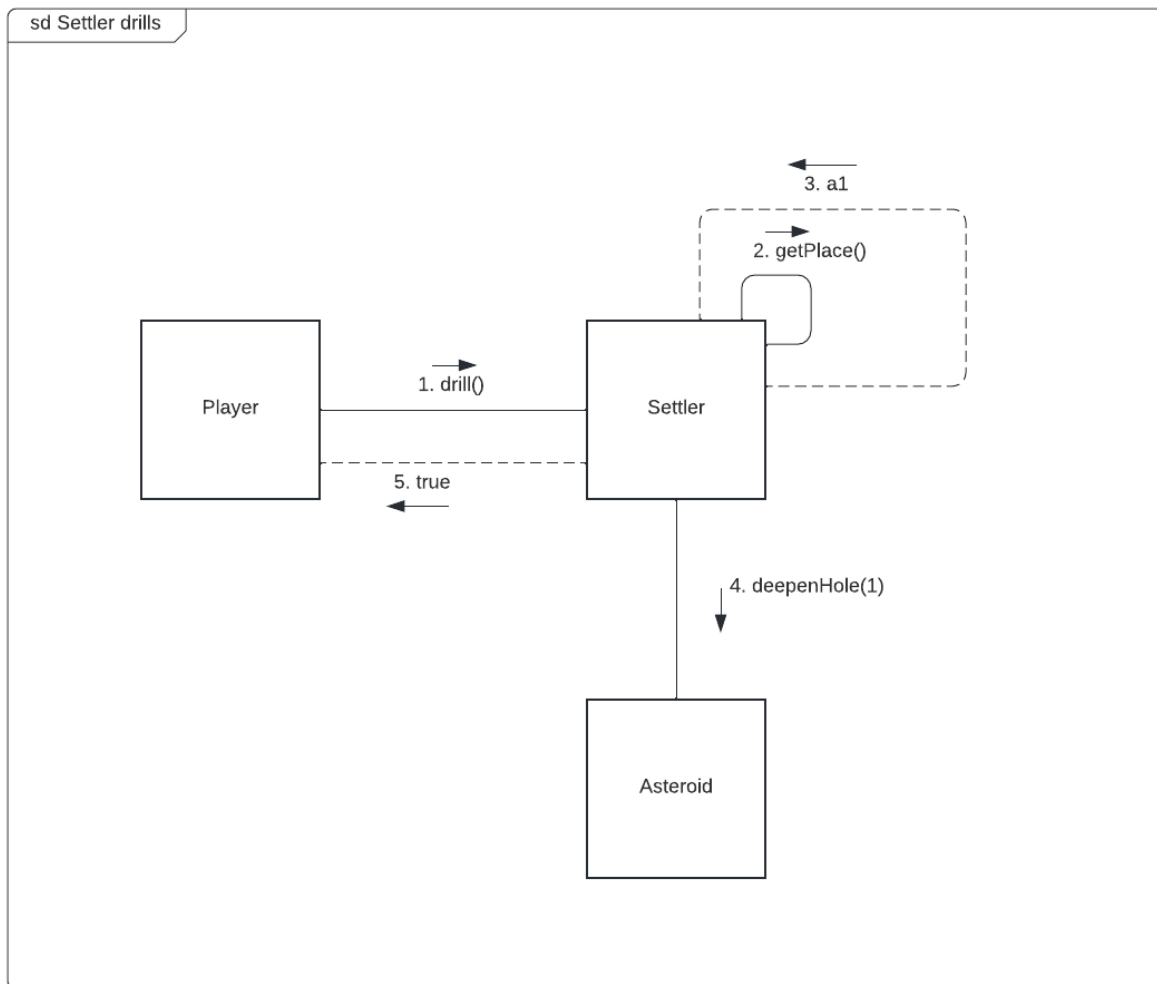
5.4.1 Initialization: Starting the game:



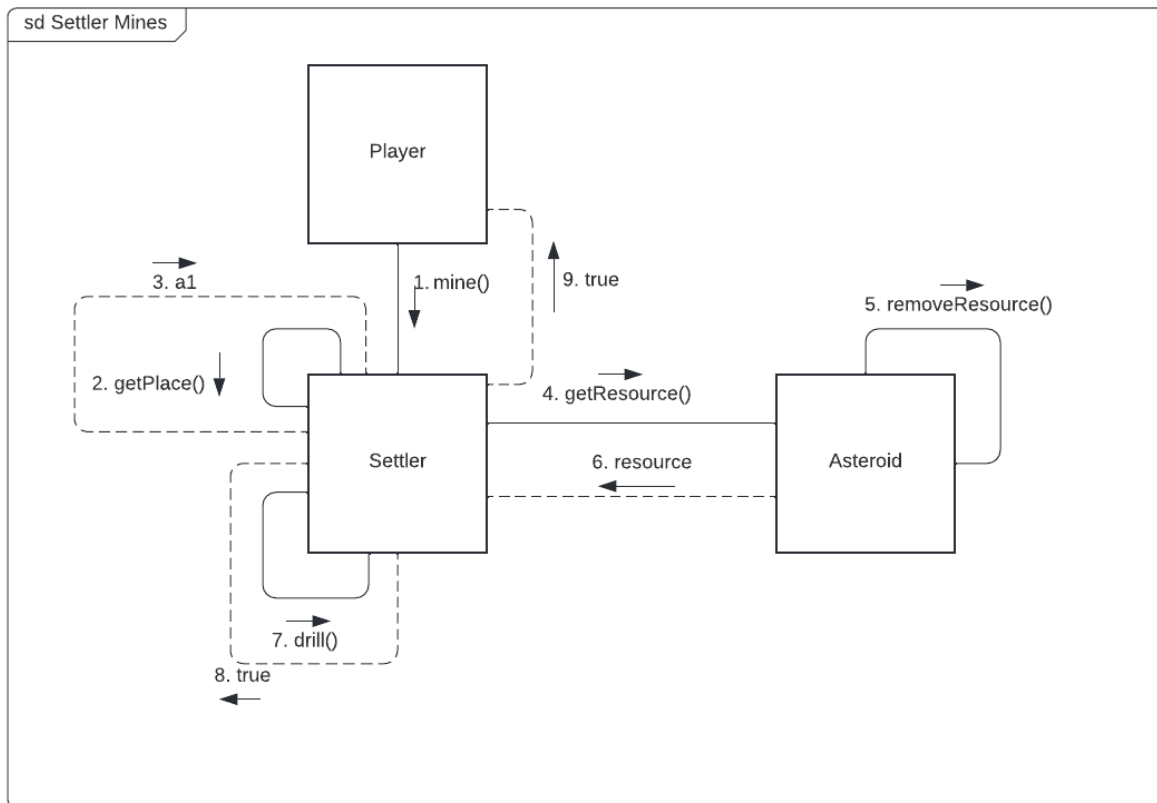
5.4.2 Settler travels:



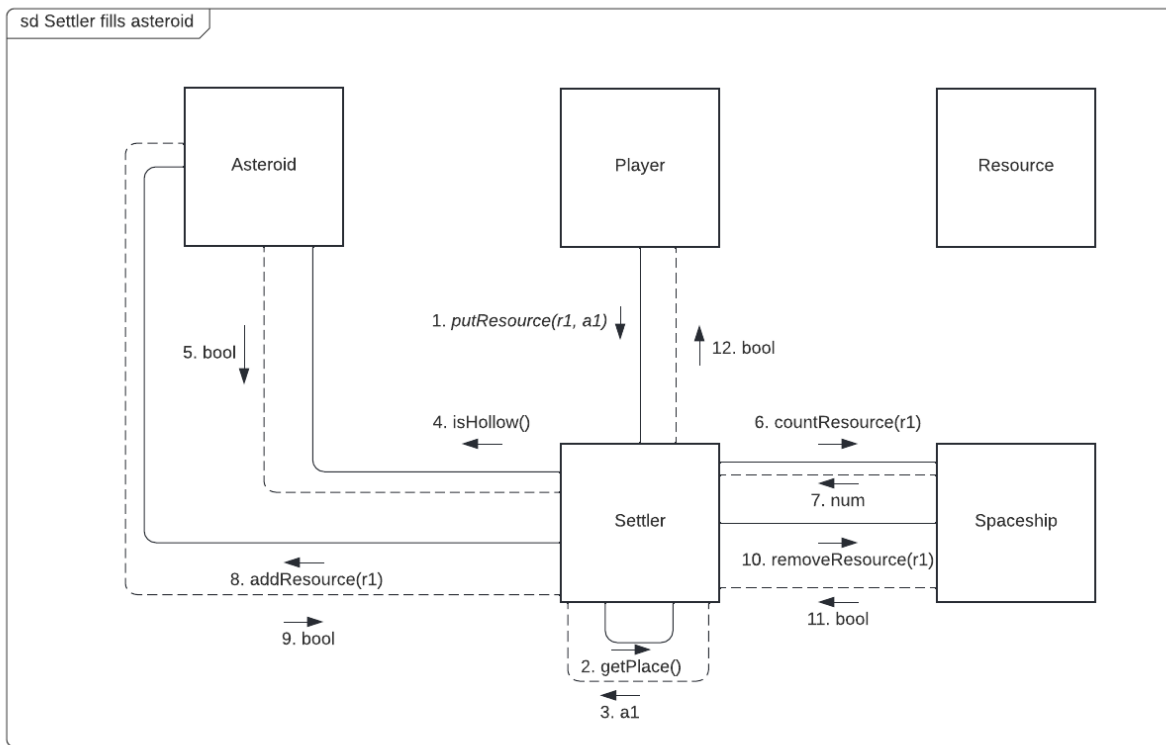
5.4.3 Settler drills:



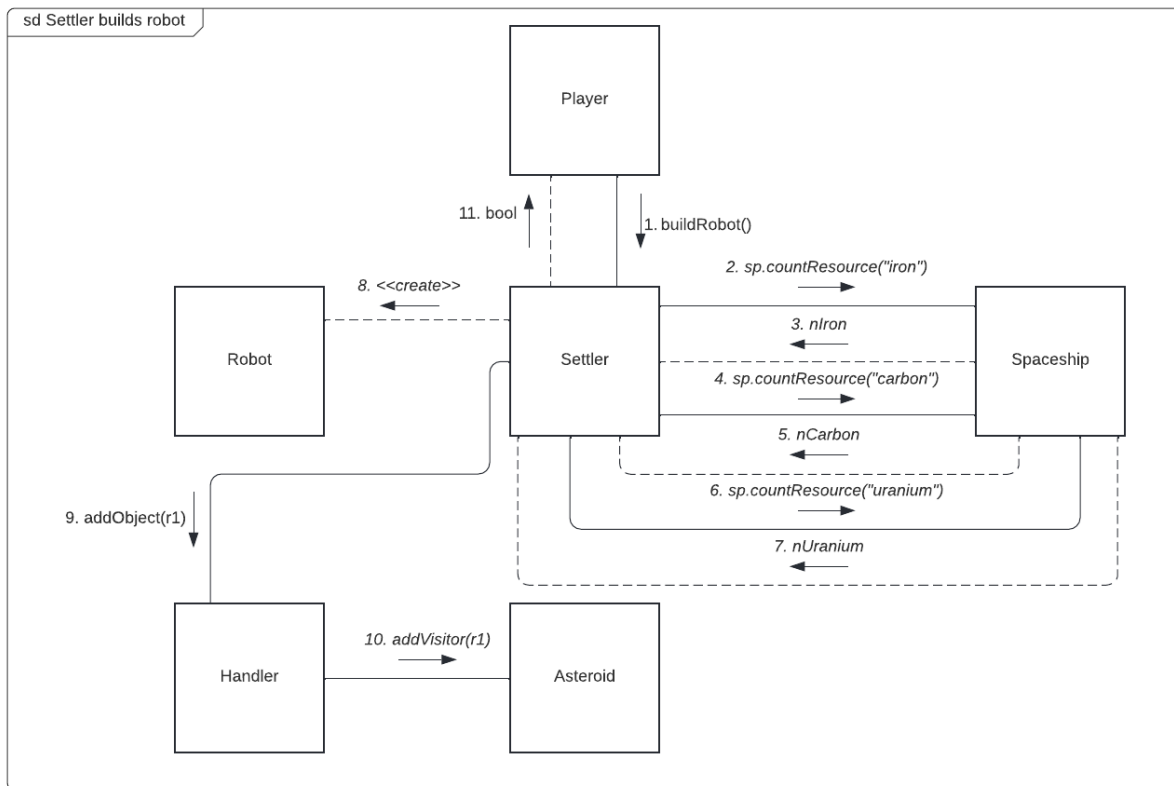
5.4.4 Settler mines:



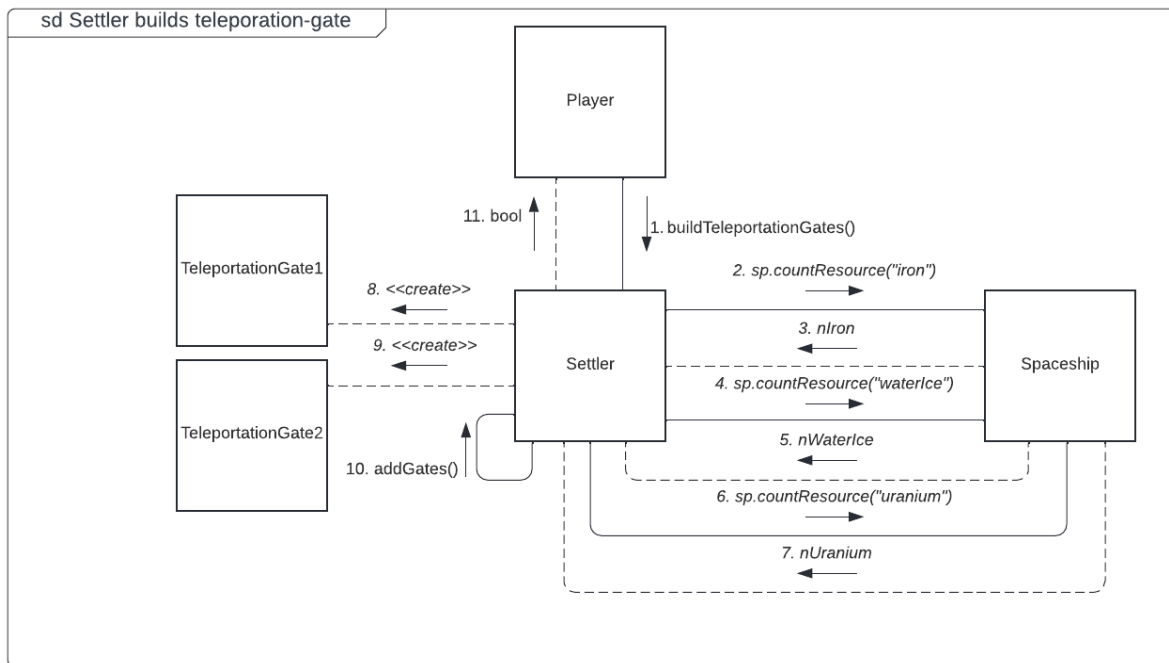
5.4.5 Settler fills Asteroid:



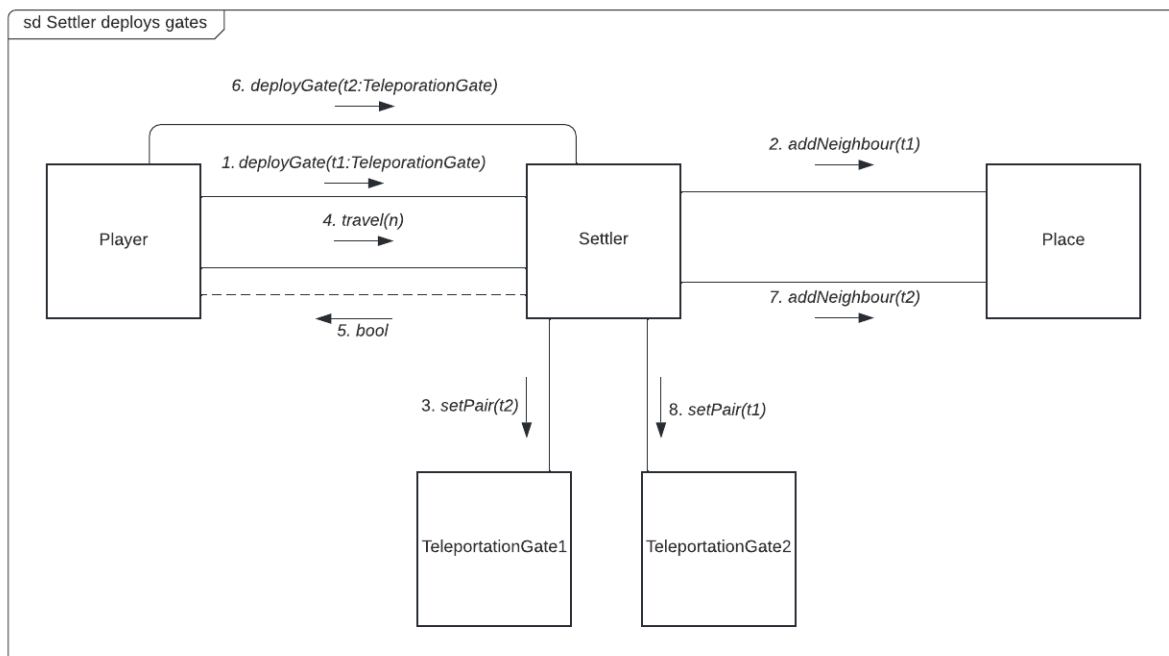
5.4.7 Settler builds Robot:



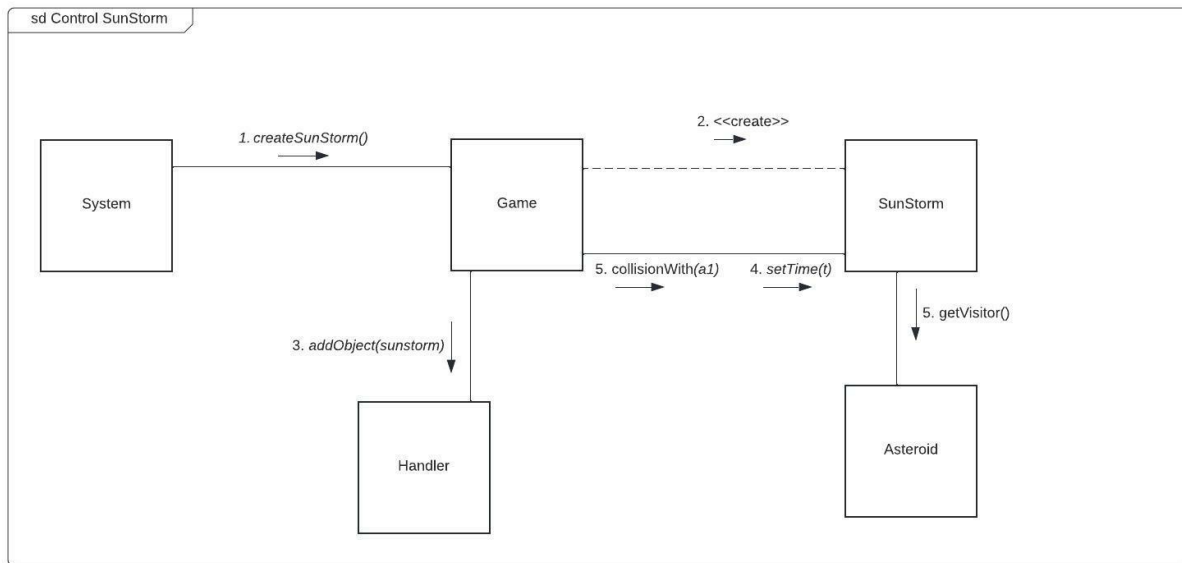
5.4.8 Settler builds Teleporation-Gate:



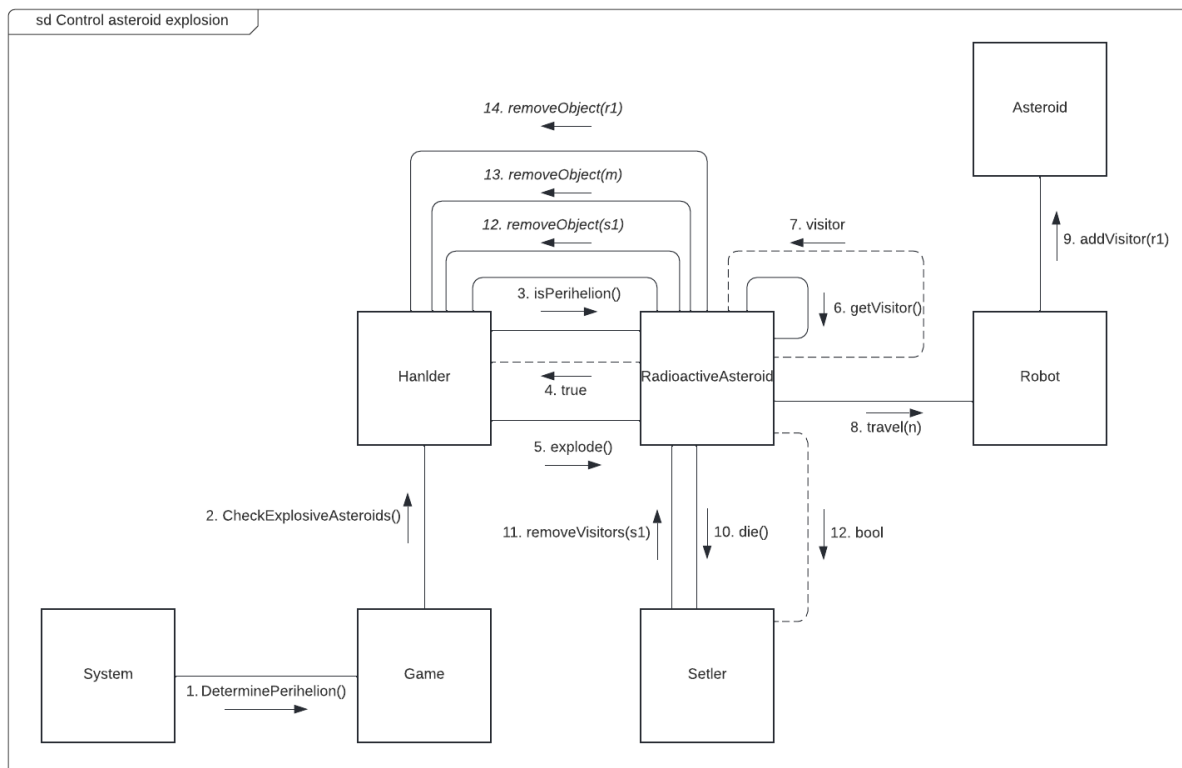
5.4.9 Settler deploys gates:



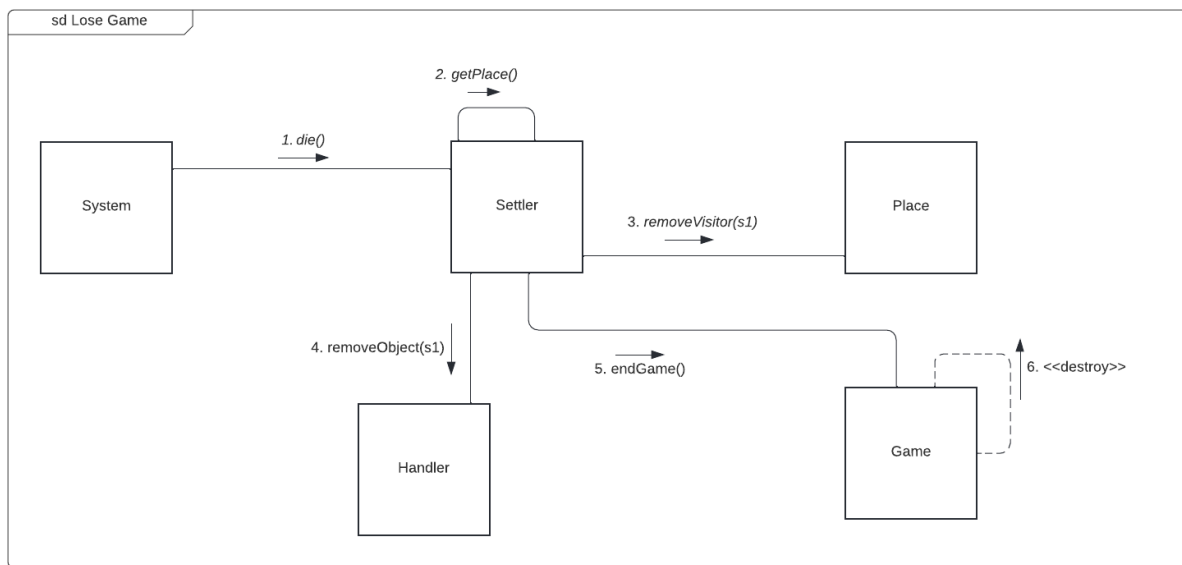
5.4.10 Sunstorm occurs:



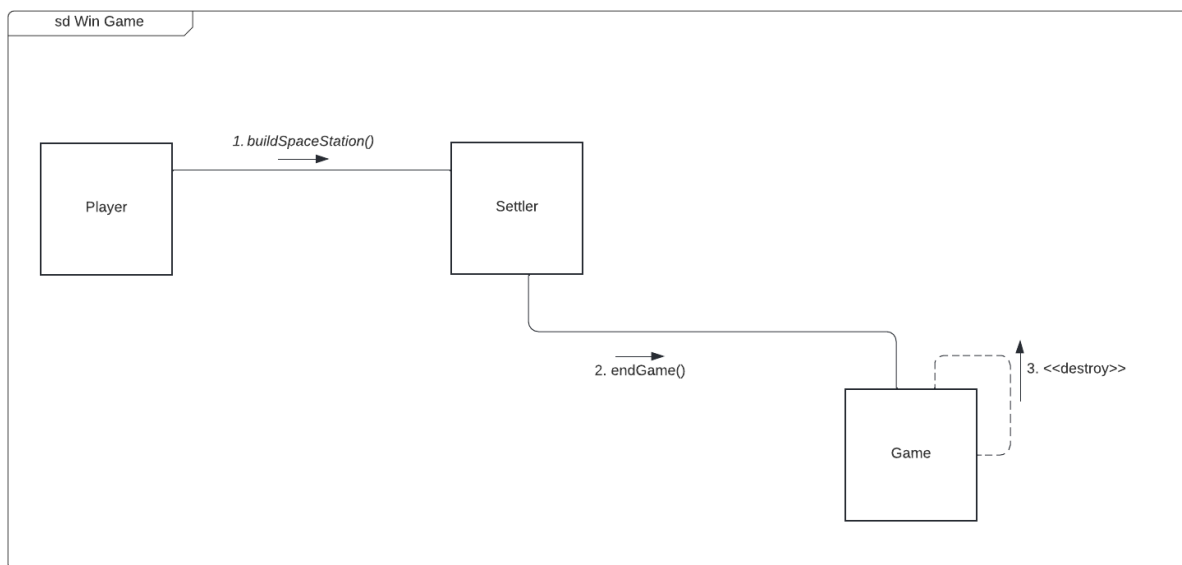
5.4.11 Asteroid explosion:



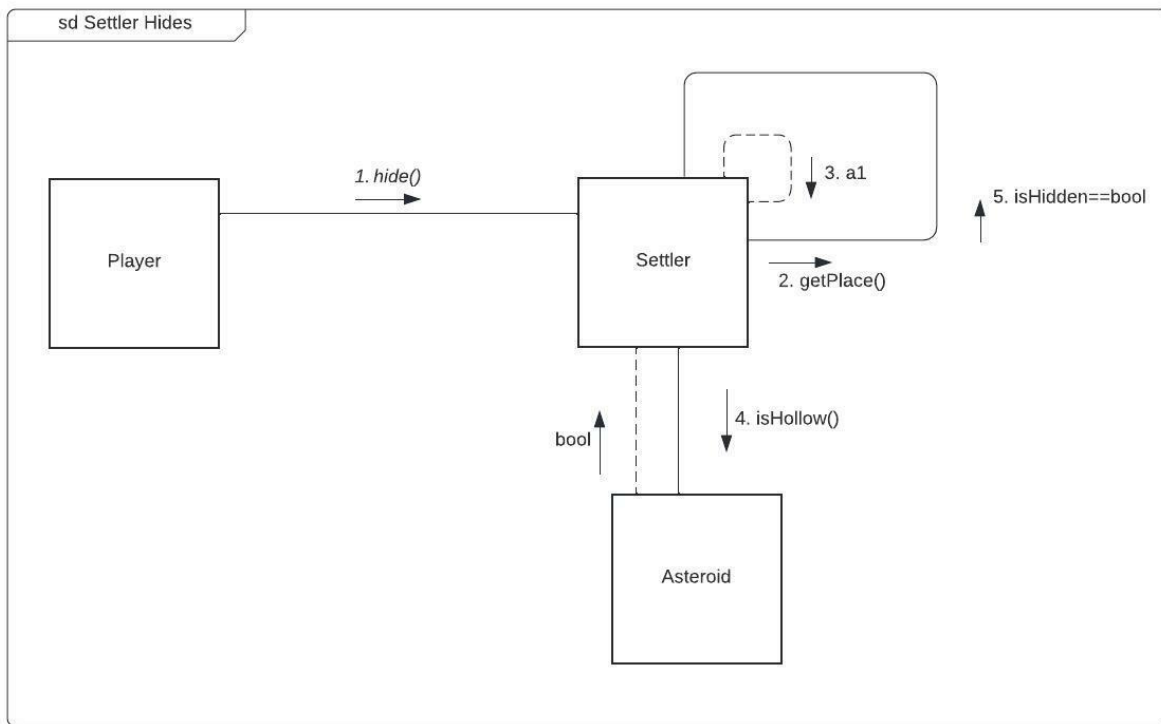
5.4.12 Losing the Game:



5.4.13 Winning the Game:



5.4.14 Settler Hides:



5.5 Protocol

Start (date & time)	Duration (hours)	Performer(s) name	Activity description
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16/03/2022 22:00	2 hours	Whole team	<i>Starting work on the new version of the use-case diagram and the descriptions of its cases, based on the previous version from the first submission. Discussing how to approach the rest of the skeleton plan, and agreeing to learn more about communication diagrams individually, so we would be ready to work productively in the next meeting.</i>
17/03/2022	4 hours 40 mins	Kasay, Tushig, Neda	Planned and discussed strategy for this documentation. Had look through sequence diagrams and communication diagrams.
17/03/2022 22:00	1.5 hours	Chaitanya, Janibyek	Worked on the new version of the sequence diagram by using the old perfect diagram. Compressed and increased quality of diagrams considering new use-cases.
18/03/2022 00:21	3 hours	Tushig	Planned and implemented communication diagrams.
18/03/2022 14:00	1 hour	Kasay	Verifying sequence diagram and communication diagram
18/03/2022 22:00	2 hours	Desoki, Janibyek	Did some brainstorming about the UI and its new features. Worked on the Skeleton's UI, dialogs.

20/03/2022	2 hours 39 mins	Kasay	Verifying sequence diagram and communication diagram. Also suggested some UI catalogues regarding test cases.
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