## OOP Retake Exam - Mass Effect

The galaxy is a dangerous place - the vast void is full of starships which endlessly fight one another.

There are several **star systems** in the galaxy - Artemis Tau, Serpent Nebula, Hades Gamma and Kepler Verge. **Starships** can travel from one star system to another (if they are neighbouring) and **fight** **other starships**. A starship has **health**, **shields**, **damage**, **fuel** and shoots a specific **projectile** when attacking another ship. There are 3 types of starships - **Frigates**, **Cruisers** and **Dreadnoughts,** and each one respectively has different characteristics.

Your task is to implement each of the **ships** and a few **commands**. You are given a working engine.

## Project Structure

* **Engine** - holds the core classes for the game logic
* **Exceptions -** holds exceptions classes
* **GameObjects** 
  + **Enhancements** - ship upgrades that give bonuses
  + **Locations** - holds the **StarSystem** class
  + **Ships** - namespace for all the ship classes in the game
  + **Projectiles** - namespace for all the projectile classes used by ships
  + **Galaxy** - holds a colleciton of all star system. **TravelTo()** method offers functionality for ships to travel from one star system to another.
* **Interfaces -** holds all of the application's interfaces
  + **IStarship, IGameEngine, ICommandManager, IProjectile**

Study the provided code. Implement the necessary functionality by applying the best practices of Object-Oriented Programming and Object-Oriented Design.

## Commands

Implement the following commands:

* **create {shipType} {shipName} {starSystem} {enhancement1 enhancements2 ...}** - creates a new ship with the given name in the given star system. Optionally, an arbitrary number of enhancements can follow in the input string - they should all be **added** to the ship through the **AddEnhancement** method and their **effects applied**.
  + Success message: **Created {shipType} {shipName}**
* **attack {attackerShip} {targetShip} -** forces a ship to attack another. The attacking ship should **produce a projectile** and it should be given to the target ship to **respond** to it (study the methods of the **IStarship** and **IProjectile** interfaces to get a better idea).
  + Success message: "**{attackerShip} attacked {targetShip}"**If the ship is destroyed as a result, print "**{targetShip} has been destroyed**" as well.
* **plot-jump {shipName} {starSystem}** - changes the location of the given ship to the new star system.
  + Success message:"**{shipName} jumped from {startLocation} to {destinationLocation}**"
* **status-report {shipName}** - displays information about the ship in the following format:

|  |  |
| --- | --- |
| **If health > 0** | **If health <= 0** |
| **--{shipName} - {shipType}**  **-Location: {locationName}**  **-Health: {health}**  **-Shields: {shields}**  **-Damage: {damage}**  **-Fuel: {fuel}**  **-Enhancements: {enh1, enh2, ...}** | **--{shipName} - {shipType}**  **(Destroyed)** |

If there are no enhancements, print "**N/A**".

If the ship is a **frigate** (and not destroyed), it should also display the number of projectiles fired so far in the format:

|  |
| --- |
| **-Projectiles fired: {count}** |

* **over** - stops the game engine

## Ships

Ships should implement the **IStarship** interface. There are 3 types of ships:

* **Frigate** - has start **health 60**, **shields 50**, **damage 30** and **fuel 220**. Shoots a **ShieldReaver** with damage equal to its **own damage**.
* **Cruiser** - has start **health 100**, **shields 100**, **damage 50** and **fuel 300**. Shoots a **PenetrationShell** with damage equal to its **own damage**.
* **Dreadnought** - has start **health 200**, **shields 300**, **damage 150** and **fuel 700**. Shoots a **Laser** with damage equal to **half its shields + own damage**. Responds to an attack by raising its shields by **50** before the attack and removes them after it.

## Enhancements

Enhancements give a ship bonuses. Enhancement effect (shields, fuel and damage) should be applied to the ship when added through the **AddEnhancement** method. There are 3 enhancements the **EnhancementFactory** supports:

* **ThanixCannon** - gives a ship bonus **50 damage**.
* **KineticBarrier** - gives a ship bonus **100 shields**.
* **ExtendedFuelCells** - gives a ship bonus **200 fuel**.

## Projectiles

Projectiles should implement the **IProjectile** interface.

* **PenetrationShell** - removes **health** from the ship equal to the projectile's **damage**.
* **ShieldReaver** - removes **health** from the ship equal to **the projectile's damage**. It also removes **shields** from the ship equal to **2x the projectile's** **damage**.
* **Laser** - removes **shields** from the ship equal to the projectile's **damage**. If the damage is more than the ship's shields, it also takes health equal to the damage left. (e.g. **50 shields** and **100 health** - a laser of **80 damage** would remove **50** shields and **30** health, resulting in **0 shields** and **70 health** for the ship).

## Validations

Perform the following **validations**:

|  |  |
| --- | --- |
| **Exceptional conditions** | **Messages** |
| If a destroyed ship attacks/is attacked or tries to travel to another star system | Ship is destroyed |
| Creating a ship with a name that already exists | Ship with such name already exists |
| Attacking a ship that is not in the current star system | No such ship in star system |
| Attempting to travel to the same star system | Ship is already in {starSystemName} |

## Extending the Engine

Add and implement the following command (**without editing** the **GameEngine** and **CommandManager** classes):

* **system-report** **{starSystem}** - displays information about all ships in the given **star system** in the following format:

|  |
| --- |
| **Intact ships:**  **{information about ship\_1}**  **{information about ship\_2}**  **Destroyed ships:**  **{information about ship\_3}** |

Intact ships should be sorted by **health** in descending order and by **shields** as secondary criteria (again in descending order). Destroyed ships should ordered alphabetically by **name** in ascending order.

## Constraints

You are **NOT** allowed to edit the **GameEngine** and **CommandManager** classes in any way. You are also not allowed to change the provided interfaces. You may edit everything else, including the **MassEffectMain** class.

## Additional Notes

* The star systems will always be the same (Artemis-Tau, Serpent-Nebula, Hades-Gamma and Kepler-Verge).
* A ship's **health** and **shields** should not fall below **0**.
* The ship's fuel should be rounded to **1 digit** after the decimal point.

## Examples

### Zero Test #1

|  |  |
| --- | --- |
| **Input** | **Output** |
| create Frigate Normandy Serpent-Nebula ThanixCannon  create Dreadnought DestinyAscension Serpent-Nebula KineticBarrier  attack Normandy DestinyAscension  attack Normandy DestinyAscension  attack Normandy DestinyAscension  status-report DestinyAscension  plot-jump Normandy Artemis-Tau  status-report Normandy  over | Created Frigate Normandy  Created Dreadnought DestinyAscension  Normandy attacked DestinyAscension  Normandy attacked DestinyAscension  Normandy attacked DestinyAscension  DestinyAscension has been destroyed  --DestinyAscension - Dreadnought  (Destroyed)  Normandy jumped from Serpent-Nebula to Artemis-Tau  --Normandy - Frigate  -Location: Artemis-Tau  -Health: 60  -Shields: 50  -Damage: 80  -Fuel: 170.0  -Enhancements: ThanixCannon  -Projectiles fired: 3 |

### Zero Test #2

|  |  |
| --- | --- |
| **Input** | **Output** |
| create Frigate Normandy Hades-Gamma  create Cruiser Alarei Hades-Gamma  create Dreadnought Sovereign Kepler-Verge  status-report Alarei  attack Normandy Alarei  status-report Alarei  status-report Normandy  attack Alarei Normandy  status-report Normandy  plot-jump Sovereign Hades-Gamma  attack Sovereign Alarei  attack Normandy Sovereign  system-report Hades-Gamma  system-report Artemis-Tau  over | Created Frigate Normandy  Created Cruiser Alarei  Created Dreadnought Sovereign  --Alarei - Cruiser  -Location: Hades-Gamma  -Health: 100  -Shields: 100  -Damage: 50  -Fuel: 300.0  -Enhancements: N/A  Normandy attacked Alarei  --Alarei - Cruiser  -Location: Hades-Gamma  -Health: 70  -Shields: 40  -Damage: 50  -Fuel: 300.0  -Enhancements: N/A  --Normandy - Frigate  -Location: Hades-Gamma  -Health: 60  -Shields: 50  -Damage: 30  -Fuel: 220.0  -Enhancements: N/A  -Projectiles fired: 1  Alarei attacked Normandy  --Normandy - Frigate  -Location: Hades-Gamma  -Health: 10  -Shields: 50  -Damage: 30  -Fuel: 220.0  -Enhancements: N/A  -Projectiles fired: 1  Sovereign jumped from Kepler-Verge to Hades-Gamma  Sovereign attacked Alarei  Alarei has been destroyed  Normandy attacked Sovereign  Intact ships:  --Sovereign - Dreadnought  -Location: Hades-Gamma  -Health: 170  -Shields: 240  -Damage: 150  -Fuel: 555.0  -Enhancements: N/A  --Normandy - Frigate  -Location: Hades-Gamma  -Health: 10  -Shields: 50  -Damage: 30  -Fuel: 220.0  -Enhancements: N/A  -Projectiles fired: 2  Destroyed ships:  --Alarei - Cruiser  (Destroyed)  Intact ships:  N/A  Destroyed ships:  N/A |

### Zero Test #3

|  |  |
| --- | --- |
| **Input** | **Output** |
| create Dreadnought Sovereign Kepler-Verge ExtendedFuelCells KineticBarrier  create Dreadnought DestinyAscension Kepler-Verge ThanixCannon  status-report Sovereign  status-report DestinyAscension  attack Sovereign DestinyAscension  status-report DestinyAscension  attack DestinyAscension Sovereign  status-report Sovereign  attack DestinyAscension Sovereign  attack DestinyAscension Sovereign  status-report Sovereign  over | Created Dreadnought Sovereign  Created Dreadnought DestinyAscension  --Sovereign - Dreadnought  -Location: Kepler-Verge  -Health: 200  -Shields: 400  -Damage: 150  -Fuel: 900.0  -Enhancements: ExtendedFuelCells, KineticBarrier  --DestinyAscension - Dreadnought  -Location: Kepler-Verge  -Health: 200  -Shields: 300  -Damage: 200  -Fuel: 700.0  -Enhancements: ThanixCannon  Sovereign attacked DestinyAscension  --DestinyAscension - Dreadnought  -Location: Kepler-Verge  -Health: 200  -Shields: 0  -Damage: 200  -Fuel: 700.0  -Enhancements: ThanixCannon  DestinyAscension attacked Sovereign  --Sovereign - Dreadnought  -Location: Kepler-Verge  -Health: 200  -Shields: 200  -Damage: 150  -Fuel: 900.0  -Enhancements: ExtendedFuelCells, KineticBarrier  DestinyAscension attacked Sovereign  DestinyAscension attacked Sovereign  --Sovereign - Dreadnought  -Location: Kepler-Verge  -Health: 50  -Shields: 0  -Damage: 150  -Fuel: 900.0  -Enhancements: ExtendedFuelCells, KineticBarrier |