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}`
	`--{shipName} - {shipType}`
	`(Destroyed)`

`-Health: {health}`
`-Shields: {shields}`
`-Damage: {damage}`
`-Fuel: {fuel}`
`-Enhancements: {enh1, enh2, ...}`	

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	`Ship is destroyed`

to another star system	
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