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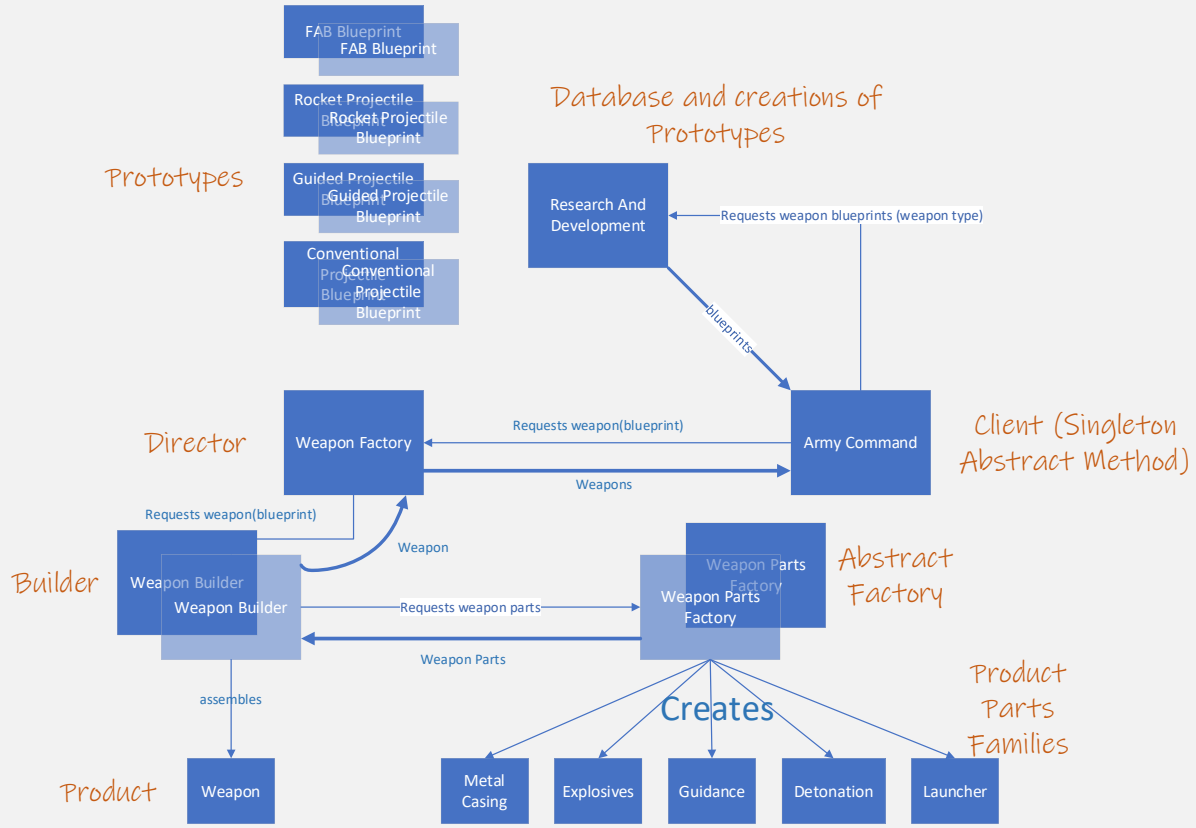
Exercise 3 : Creational Design Patterns

Theory

References

Books

1) Design Patterns: Elements of Reusable Object-Oriented Software, by Erich Gamma (Author), Richard Helm (Author), Ralph Johnson (Author), John Vlissides (Author), Grady Booch
2) https://refactoring.guru/design-patterns/book



Create the class hierarchy and the interactions using creational design patterns for the following system description

On the battlefield the requirements are constantly changing and there is constant assessment and feedback of the effectiveness of a weapon system on the battlefield to the manufacturers. The manufacture of a weapon from invention to use goes through the following stages

1) Research and Development (RND) produces the blueprints for a prototype weapon. The

blueprints are highly secret and only part of the blueprint information is available to the client
2) A set of factories are employed to create the relevant parts to a specific weapon type. The weapon assembling parts are of various categories that are wholly or partly common to all weapons but belong to specific families compatible with the weapon
3) A builder factory per weapon assembles the relevant parts to create the final weapon and a director orchestrates the assembly process
4) The army divisions contain the business logic of how to create and use the weapons. Each army division and army command are one of a kind objects

1) Types of weapons

The exercise focuses on ballistic weapons which belong to the following categories

a) Bombs
    a. Bomb Family (FAB, MOAB, JDAM, X69 etc)
b) Artillery Shells
    a. Conventional Shells of various sizes and filling (explosive, incendiary, chemicals, shrapnel, cluster munitions)
    b. Guided Projectile (Excaliber, Krasnopol, Caesar, etc)
    c. Mortar
    d. Rocket Artillery (MLRS , TOS, HIMARS, Smerch etc)

2) Weapons Parts

The parts that integrate a ballistic weapon are

a) Metallic Shell Casing
b) Propulsion
c) Guidance
d) Detonation
e) Explosive chemicals
f) ballistic weapon launch platform

3) Factories
a) Metallic Shell Factory
b) Propulsion Chemicals
c) Guidance Kits
d) Detonation module
d) Explosive Content
e) Ballistic Weapon Platform

The Interfaces that will be implemented are
1) IPrototype refers to the ability to clone the default implementation blueprints of a weapon system with the purpose to be configured in a specific battlefield requirements
2) Interfaces referring to the specification and design blueprints of each weapon IBombBlueprint, IConventionalArtilleryBlueprint, IGuideProjectileArtilleryBlueprint, IMortatBlueprint, IRocketArtilleryBlueprint
3) Interfaces referring to the parts of an artillery weapon : IMetalCasing, IPropulsionChemical, IGuidanceKit, IExplosiveContent, IProjectileLauncher, IProjectileDetonation
4) IAbstractWeaponFactory represent the creation of each weapon part type (metal casing, explosives etc
5) IWeapon contains the interface of how to identify and use the weapon
6) IWeaponBuilder represents the weapon part construction processes
7) IWeaponFactory Conducts the assembling process

The classes that will implemented are

1) Abstract Factory that will represent the creation of each weapon part type (metal casing, explosives etc)
    a. Abstract Factory Subclasses for each part CMetalCasingFactory, CPropulsionFactory, CGuidanceFactory, CExplosiveChemicalsFactory, CWeaponLaunchPlatformFactory
2) BuilderFactory it's a builder concrete class that has a construction method for each weapon part for example BombBuilder, ConventionalShellBuilder, etc. The class returns the weapon as a product. The BuilderFactory class uses the abstract factory concrete class to create compatible parts for the intended weapon.
3) ArmyFactory is a concrete class that builds various types of weapons according to the client specifications. It works as a director to the BuilderFactory class to guide the weapon creation process. It uses the builder and its construction methods to conduct weapon creation
4) ArmyCommand class is the client ordering weapons with specific specifications to the factory according to the blueprints for each weapon. Contains the business logic of how to configure the blueprints for the each battlefield demands