

Project Team Functional requirements

State

FR1: The plant lifecycle must progress through states (Seedling → Growing → Mature → Wilting → Dead) based on conditions and time. (Wilting must be reversible)

Strategy

FR2: The system must select a watering strategy based on a plant's biome (e.g., Desert, Tropical, Indoor, Mediterranean, Wetland).

Command

FR3: Staff must be able to issue care commands to a plant: "Water" and "Fertilize".

FR4: Staff must be able to issue inventory and sales commands: "Restock" and "Purchase".

Abstract Factory

FR5: For a specified biome, the factory must create the correct "Pot" and "SoilMix" subtypes. Thus calling biome factory methods yields the appropriate concrete types (e.g., Desert → Sandy/Lime mix + Terracotta variant).

FR6: "createPlant" must combine factory methods and injects state, strategy and flyweight into the Plant.

Builder

FR7: The system must use the abstract factory to create variable parts of the Product (CustomPlantPackage)

Iterator

FR8: The system must provide iterators over "PlantBed" and "Greenhouse" to traverse plants deterministically without exposing the internal structure.

Flyweight

FR9: Species and care presets must be stored as flyweights identified by “SpeciesKey” to avoid duplication across plants.

Facade

FR10: “NurseryFacade” must expose a single API for common workflows: create plant/order, customize a package, check stock, apply care, and subscribe to updates.

Observer

FR11: "Plant", "InventoryService", and "SalesService" must publish events ("PlantEvent", "StockEvent", "OrderEvent") to observers ("NurseryHub", "StaffDashboard").

Mediator

FR12: "NurseryHub" must mediate interactions between "SalesService" and "StaffService" and "InventoryService" and fan out assignments to all registered "StaffDashboard" instances.

Non Functional Requirements

Scalability: The system supports up to 10,000 plants across 100 beds/greenhouses with linear tick time growth.

Reliability: Event delivery is guaranteed at least once within the same processing tick as the triggering action, observers must be idempotent so duplicate deliveries produce no additional side effects.

Usability: Common workflows (create order, customize package, apply care) are invocable through a single facade method each, requiring no subsystem knowledge

Security: Only authenticated staff roles can issue commands that mutate state (care, restock, purchase); unauthorized calls are rejected.