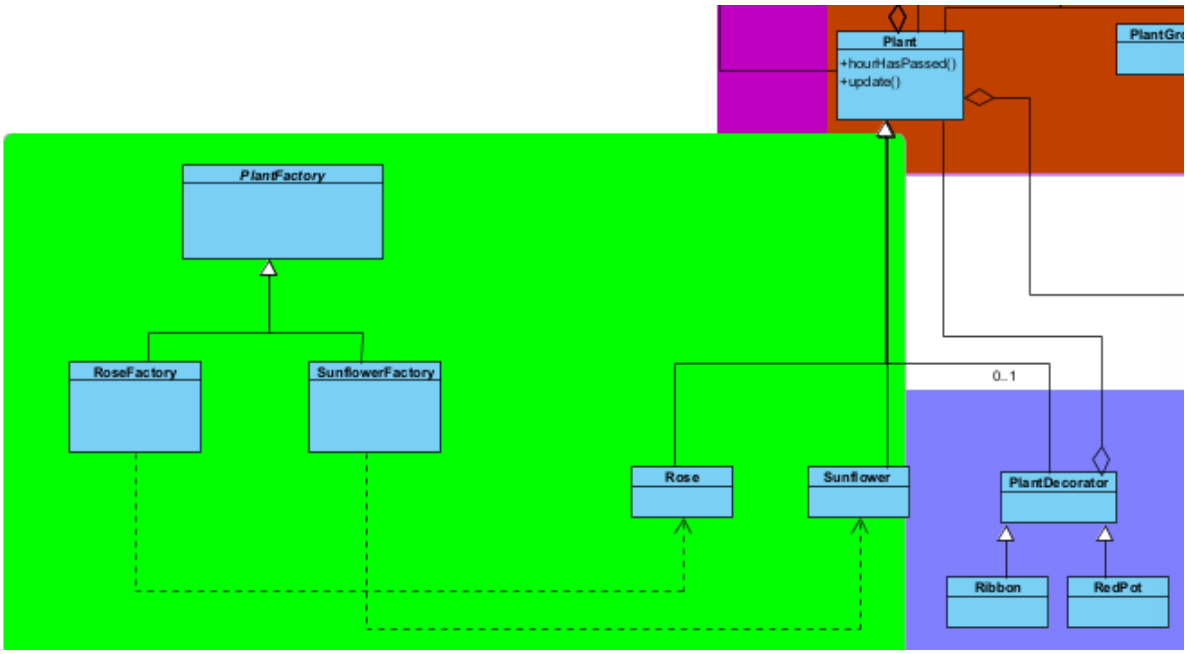
COS 214 </CODE BLOODED>

FUNCTIONAL REQUIREMENTS:

PLANT CREATION AND MANAGEMENT:

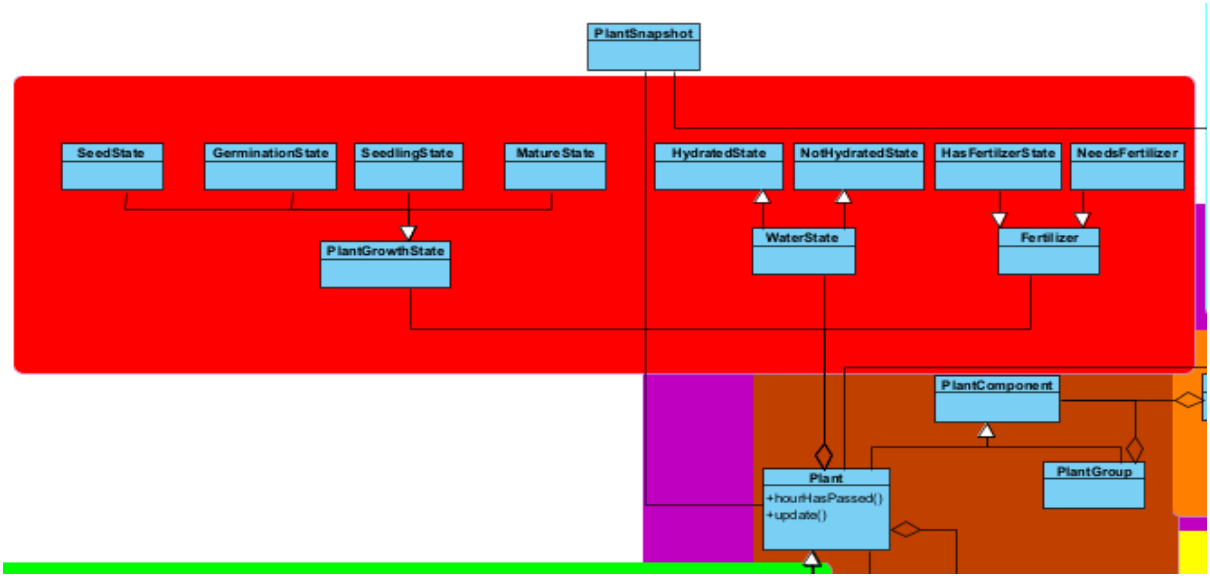
The system shall create different plant types through a unified plant factory interface.

FACTORY DESIGN PATTERN: PlantFactory creates Roses and SunFlowers without exposing the concrete classes.



The system shall transition plants through distinct life stages with state-specific behaviours and care requirements.

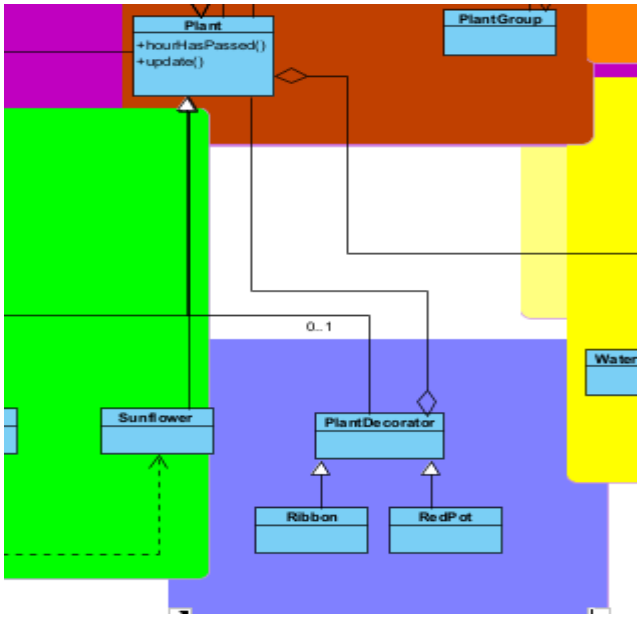
STATE DESIGN PATTERN: Plant objects change watering frequency, fertilizer needs based on Seedling/Growing/Mature/Flowering states.



CUSTOMER CUSTOMIZATION & ORDERS:

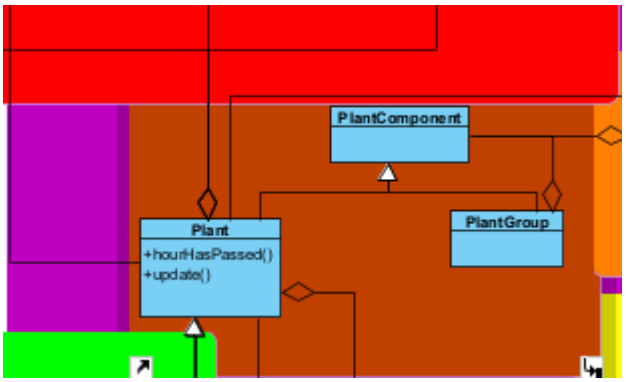
The system shall allow customers to add decorative elements to plant purchases.

DECORATOR DESIGN PATTERN:



The system shall group individual plants and arrangements into customer orders for bulk processing.

COMPOSITE DESIGN PATTERN: Order contains Plants and PlantGroups uniformly.



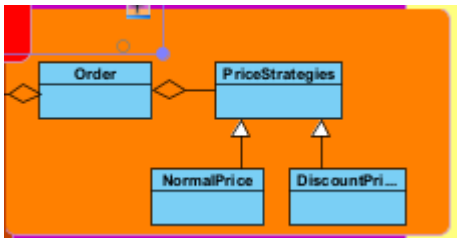
The system shall copy customization configurations from one plant to another for similar orders.

PROTOTYPE DESIGN PATTERN: Clone decorated plants; copies all decorator layers to new plant.

PRICING & BUSINESS LOGIC:

The system shall calculate plant prices using different strategies (seasonal pricing, bulk discounts, membership rates).

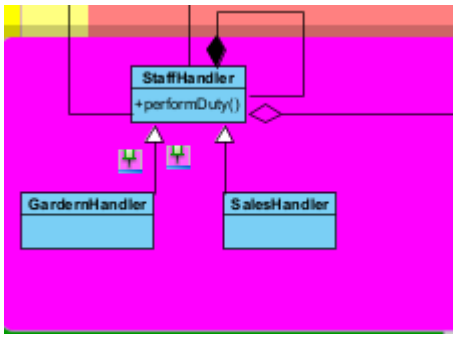
STRATEGY DESIGN PATTERN: Interchangeable PricingStrategy objects: SeasonalPricing, BulkDiscountPricing, MembershipPricing.



SELF MANAGAMENT & TASK PROCESSING:

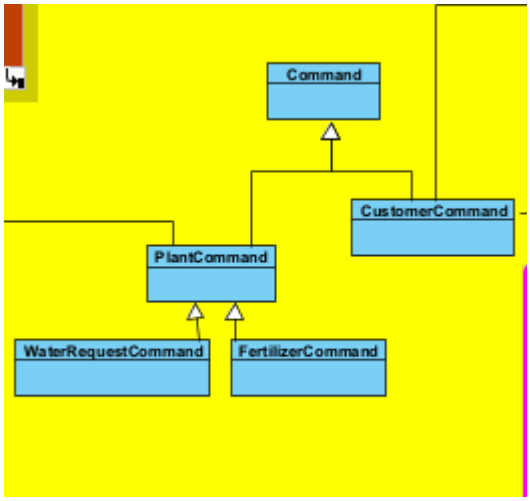
The system shall route staff requests through management hierarchy until someone with appropriate authority handles them.

CHAIN OF RESPONSIBILITY: Each staff level checks if they can handle request, otherwise passes to next level.



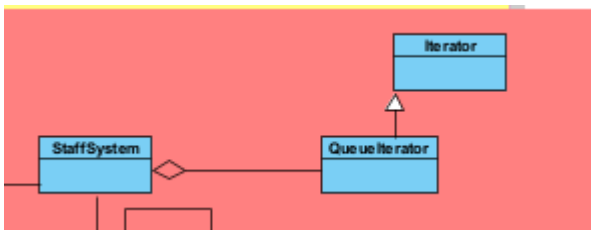
The system shall assign and track individual tasks for staff members with execution and completion logging.

COMMAND DESIGN PATTERN: Task queue holds Command objects; staff execute commands and log completion status.



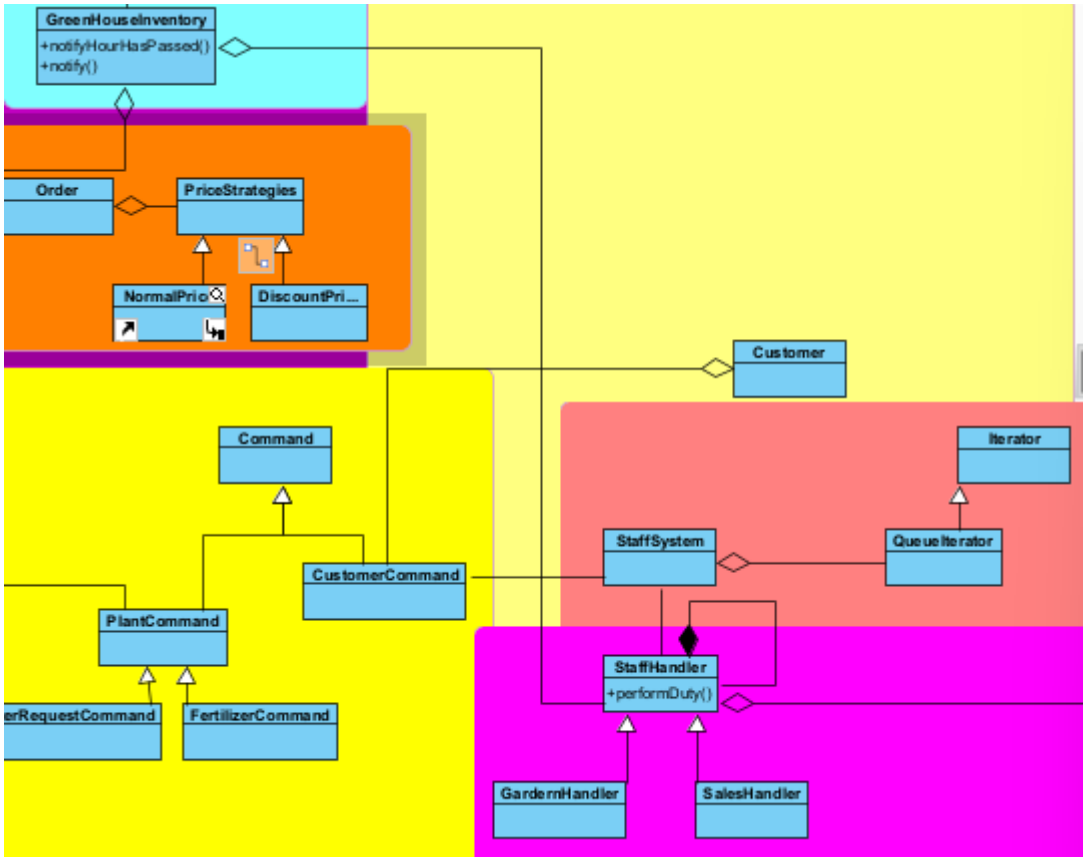
The system shall iterate through staff task queues and pending work assignments for daily scheduling.

ITERATOR DESIGN PATTERN: Traverse TaskQueue collections.



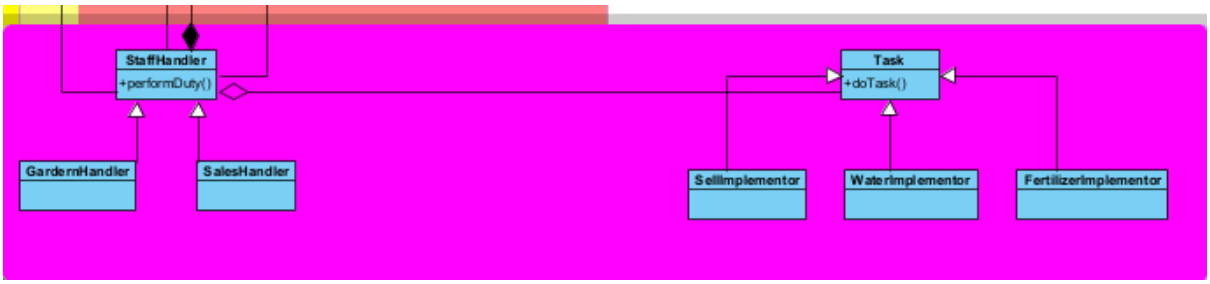
The system shall coordinate communication between staff roles and inventory systems without direct coupling.

MEDIATOR DESIGN PATTERN: StaffCoordinator manages: "Salesperson needs plant" → "Notify greenhouse staff" → "Update inventory". Central mediator handles all inter-department communication and notifications.



The system shall separate staff task definitions from their specific implementation methods.

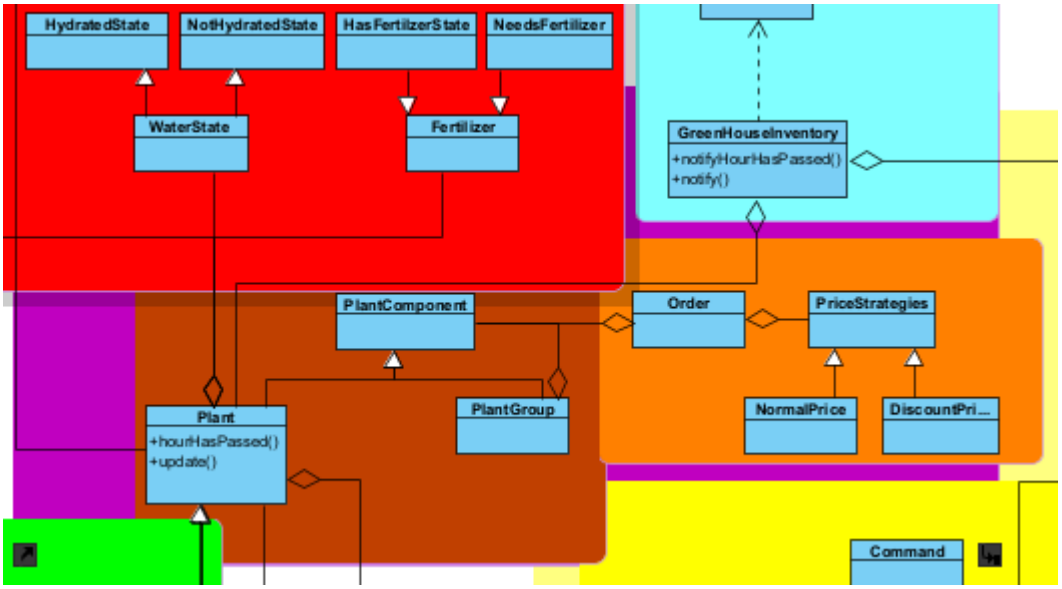
BRIDGE DESIGN PATTERN: Staff roles work with task abstraction while implementation varies by department.



INVENTORY & MONITORING:

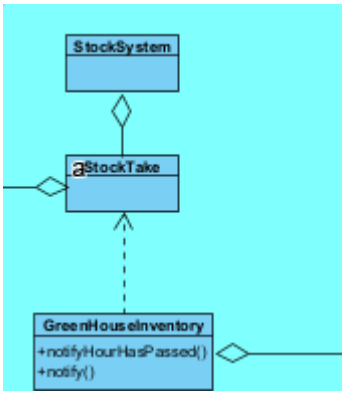
The system shall automatically notify relevant staff when plant inventory levels change or deadlines approach.

OBSERVER DESIGN PATTERN: Plants register with inventory observers; state changes trigger notifications to subscribed staff. Inventory notifies the relevant participants when stock levels change.



The system shall save and restore complete inventory snapshots for audit trails and rollback capabilities.

MEMENTO DESIGN PATTERN: Capture Inventory snapshot of objects containing all plant quantities, locations, and states. Inventory creates/stores/restores Memento objects for inventory state management.



NON-FUNCTIONAL REQUIREMENTS:

Performance

The system shall efficiently manage memory for inventories containing up to 100 plant instances by sharing common plant characteristics.

- Design Pattern: Prototype
- Description: Share immutable species data across cloned plant instances

The system shall provide fast iteration over staff task queues and plant collections with O(1) iterator operations.

- Design Pattern: Iterator
- Description: STL-compatible iterators for efficient container traversal

Maintainability

The system shall isolate communication complexity between staff roles, inventory systems, and customer services.

- **Design Pattern:** Mediator
- **Description:** StaffSystem centralizes inter-department communication, reducing coupling

Scalability

The system shall organize plants, orders, and staff hierarchies to support nursery expansion from 1 to 100+ plants.

- **Design Pattern:** Composite
- **Description:** Hierarchical structures for plant categories and order groupings

Reliability

The system shall maintain complete inventory snapshots enabling rollback to any previous state within 24-hour periods.

- **Design Pattern:** Memento
- **Description:** Capture and restore complete GreenHouseInventory objects

Flexibility

The system shall support runtime addition of new plant customization options without code changes.

- **Design Pattern:** Decorator
- **Description:** Stack new customization types on existing plant objects dynamically

Usability

The system shall provide consistent task processing workflows across all staff roles and departments.

- **Design Pattern:** Command
- **Description:** Uniform task execution interface regardless of task type

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