
Assignment Report

SFWRENG 2AA4 (2026W)

Assignment 1

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GitHub URL

<https://github.com/alephnull1678/settlers-of-catano>

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1 Executive summary

Logan Sedore ► *This assignment involved creating a design-focused program simulation for the settlers of the Catan board game. This implementation of the game required a system capable of manipulating players, resources, tiles, and building pieces while maintaining proper SOLID and OO design principles. With careful implementation using these principles, a UML diagram was created to capture the entities and relationships present in the game. This model was then translated into program code using interface-driven design and appropriate use of parent and child classes. Design decisions include the use of generic catalog abstractions for representing resource quantities, the SRP between entity classes, and the use of immutable snapshots to prevent unintended state mutations. A functioning simulation was successfully implemented from the UML design, capable of managing players, distributing resources, consuming building costs, and maintaining consistent game state transitions. This design prioritizes the correctness of program structure, ensuring the proper implementation of SOLID, OO, and GRASP principles.* ◀

2 Requirements traceability

Req ID	Status	Implemented in	Design considerations
R1.1	Implemented	Player, PlayerHand, MapPlayerHand	Player entity encapsulates resources and building capabilities, delegating inventory handling to specialized components.
R1.2	Implemented	Catalog<T>, MapCatalog<T>	Generic catalog abstraction used to model quantities of resources and pieces uniformly, supporting extensibility and reuse.
R1.3	Implemented	PieceHandler, Piece, Building, Road, Settlement, City	Piece hierarchy models domain entities with specialization, enabling polymorphic handling of buildable structures.
R1.4	Implemented	Board, HardWiredBoard, StaticBoard, Tile, Node	Board topology is represented through tile and node relationships. A predefined configuration ensures deterministic simulator behaviour.
R1.5	Implemented	Game, Dice, RegularDice, MultiDice	Dice behaviour is abstracted through interfaces, allowing different dice implementations while maintaining rule-driven simulation.
R1.6	Implemented	Validator, Action	Validation logic is separated from gameplay execution to enforce rules independently and improve maintainability.
R1.7	Implemented	Player.consumePiece, PlayerHand.removeHand, PieceHandler	Building actions are treated as atomic transactions combining piece consumption and resource payment. Rollback ensures consistency if payment fails.
R1.8	Implemented	Catalog.snapshot()	Snapshot functionality provides read-only views of inventories, preserving encapsulation and preventing unintended mutation.
R1.9	Implemented	Player.chooseAction()	Randomized action selection supports autonomous simulator behaviour without requiring human interaction.
R1.10	Implemented	Full system integration	All domain entities interact to form a functioning simulation core consistent with Catan gameplay rules and constraints.

3 Design and domain modeling

Logan Sedore ► *Elaborate on this phase. Follow the pointers in the assignment and share additional insights if applicable.* ◀

4 Translating engineering models to program code

Logan Sedore ► *Elaborate on this phase. Follow the pointers in the assignment and share additional insights if applicable.* ◀

5 Using Generative AI

Logan Sedore ► *Elaborate this phase. Follow the pointers in the assignment and share additional insights if applicable.* ◀

6 Implementation

Logan Sedore ► *Elaborate this phase. Follow the pointers in the assignment and share additional insights if applicable.* ◀

7 Reflection on the engineering process

Logan Sedore ► *Elaborate on the overall experience. Follow the pointers in the assignment and share additional insights if applicable.* ◀

8 Roles and responsibilities

The team members contributed equally to the deliverable. **Logan Sedore** ► *This is the ideal situation, but in case the workload has not been equal, please, report accordingly.* ◀

- **TODO: John Doe** contributed to the conceptual design and the implementation of RQ1.1.
- **TODO: ...**