Name: Johnathan Van Vliet Mark ______________________/50

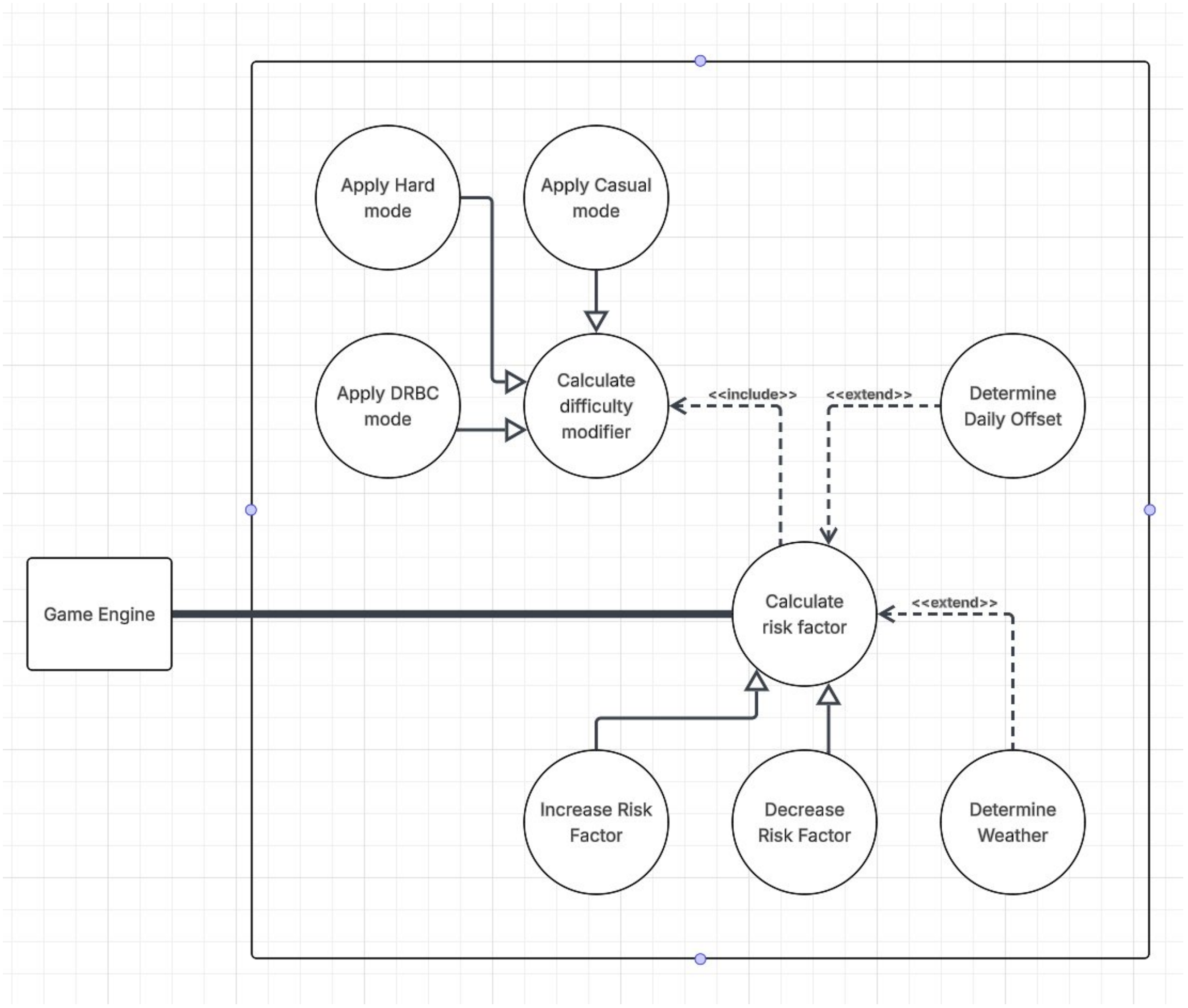
1. Brief introduction __/3

The following document describes the dynamic weather and difficulty systems within the game Just Fishing by Starfish Studios. These two systems are written together because they are both a part of and dependent upon one another.

Due to several factors and events within the game, some of which are random, a fishing trip may be more or less difficult than usual. This system manages that difficulty to keep gameplay new and exciting.

2. Use case diagram with scenario __14

Use Case Diagrams



Scenarios

Name: Increase Risk Factor

Summary: Increases the risk factor by a certain amount

Actors: Game engine

Preconditions: Player performs a risky behavior

Basic sequence:

> **Step 1:** Choice data is received
>
> **Step 2:** Risk factor information is retrieved
>
> **Step 3:** Risk factor data is calculated by adding the new value to the old one

Exceptions:

> **1:** Risk factor reaches maximum value, at which point the player hits a loss condition

Post conditions: Risk factor is sent to game engine which uses it to determine the success rate of other actions. UI is updated with new risk factor.

Priority: 1*

ID: RF_INC

Name: Decrease Risk Factor

Summary: Decreases the risk factor by a certain amount

Actors: Game engine

Preconditions: Player performs a safer behavior

Basic sequence:

> **Step 1:** Choice data is received
>
> **Step 2:** Risk factor information is retrieved
>
> **Step 3:** Risk factor data is calculated by subtracting the new value from the old one

Exceptions:

> **Step 1:** Risk factor reaches minimum value, at which point the value is kept at the minimum value

Post conditions: Risk factor is sent to game engine which uses it to determine the success rate of other actions. UI is updated with new risk factor.

Priority: 1*

ID: RF_DEC

Name: Determine Daily Risk Offset

Summary: Randomly generates an offset to the current risk factor and adds it to the current risk factor

Actors: Game engine

Preconditions: A new day begins

Basic sequence:

Step 1: Get current risk factor
Step 2: Generate random offset
Step 3: Add offset to current risk factor

Exceptions:
1: The game ends, at which point the days stop counting and the risk calculation stops

Post conditions: Risk factor is sent to game engine which uses it to determine the success rate of other actions. UI is updated with new risk factor.
Priority: 2*
ID: RF_DAY

Name: Determine weather
Summary: Randomly determines the weather each morning. The weather will increase or decrease the risk factor
Actors: Game engine
Preconditions: A time of day is reached or a new day begins
Basic sequence:
Step 1: Generate random number
Step 2: Determine weather conditions using random number
Step 3: Add offset to current risk factor

Exceptions:
1: The same weather conditions are determined, in which case the risk factor is not changed.
2: The game ends, at which point time stops moving and weather stops changing.

Post conditions: Risk factor is sent to game engine which uses it to determine the success rate of other actions. UI is updated with new risk factor. Background assets and sound change to reflect
Priority: 3*
ID: RF_WEA

Name: Calculate difficulty modifier
Summary: Modifies risk factor based on current difficulty
Actors: Game engine
Preconditions: Risk factor is changed
Basic sequence:
Step 1: Detect risk factor change
Step 2: Modify risk factor based on selected difficulty

Exceptions:
1: Casual mode is selected, which results in no change

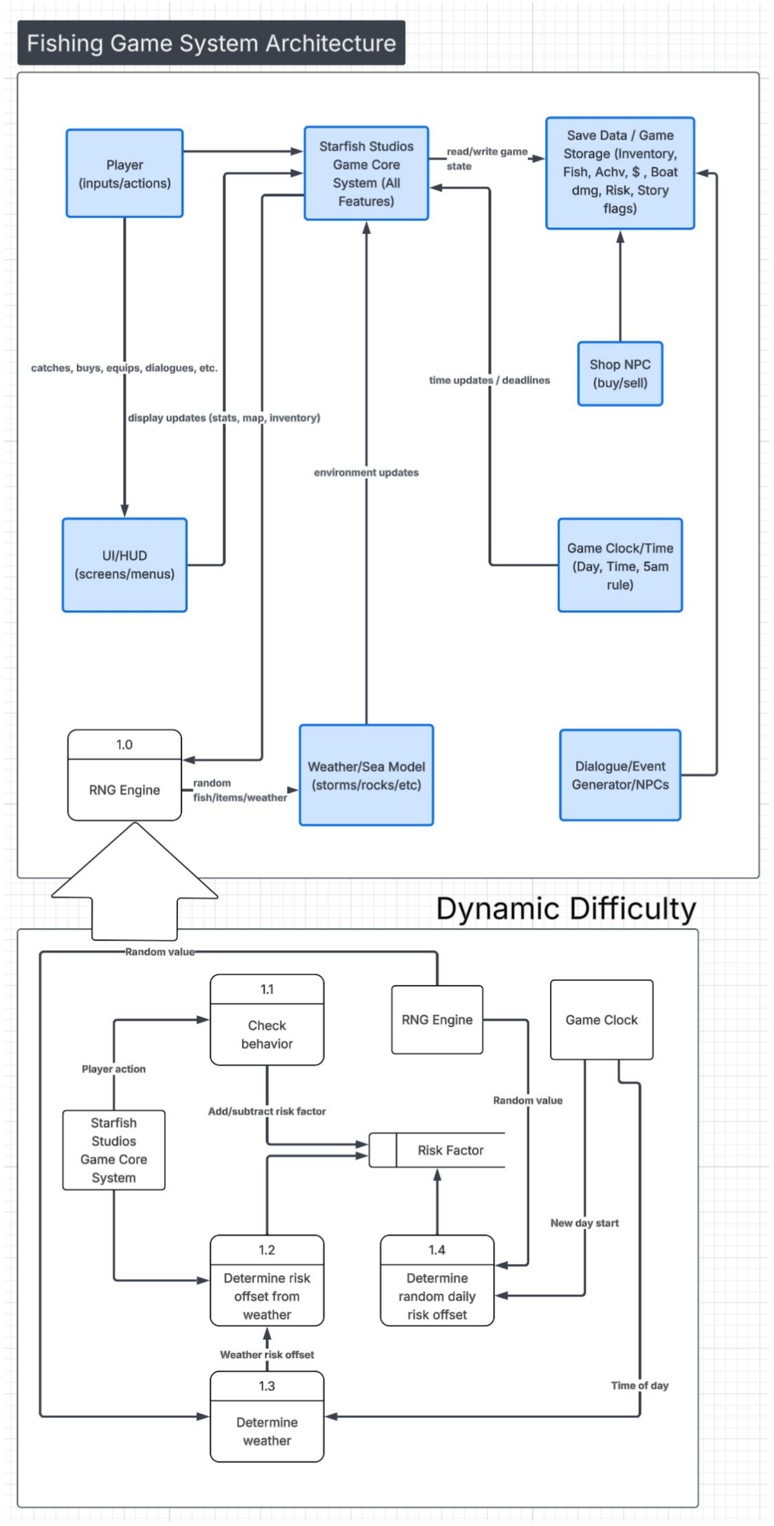
Post Conditions: The Game Engine uses the new risk factor rather than the pre-adjusted one.

Priority: 3*
ID: RF_DIF

*The priorities are 1 = must have, 2 = essential, 3 = nice to have.

3. Data Flow diagram(s) from Level 0 to process description for your feature ______14

Data Flow Diagrams


Fishing Game System Architecture
Player (inputs/actions)
Starfish Studios Game Core System (All Features)
read/write game state
Save Data / Game Storage (Inventory, Fish, Achv, $, Boat dmg, Risk, Story flags)
catches, buys, equips, dialogues, etc.
display updates (stats, map, inventory)
time updates / deadlines
Shop NPC (buy/sell)
environment updates
UI/HUD (screens/menus)
Game Clock/Time (Day, Time, 5am rule)
1.0
RNG Engine
random fish/items/weather
Weather/Sea Model (storms/rocks/etc)
Dialogue/Event Generator/NPCs
Dynamic Difficulty
Random value
1.1
Check behavior
RNG Engine
Game Clock
Player action
Add/subtract risk factor
Random value
Starfish Studios Game Core System
Risk Factor
New day start
1.2
Determine risk offset from weather
1.4
Determine random daily risk offset
Weather risk offset
1.3
Determine weather
Time of day

Process Descriptions

```
// INITIALIZATION
GLOBAL RiskFactor = 0.0
GLOBAL CurrentWeather = "Clear"

FUNCTION MainDifficultyLoop():
  WHILE GameIsRunning:
    // 1.1 CHECK BEHAVIOR (Player Action Input)
    player_risk = GameCore.GetPlayerActions()
    behavior_offset = CheckBehavior(player_risk)

    // Update Risk Factor based on skill/actions/luck
    // behavior_offset can be positive or negative
    RiskFactor += behavior_offset

    // 1.2 & 1.3 WEATHER AND TIME
    current_time = GameClock.GetTimeOfDay()
    CurrentWeather = DetermineWeather(current_time)
    weather_offset = CalculateWeatherRisk(CurrentWeather)
    RiskFactor += weather_offset

    // 1.4 DAILY RANDOMIZATION
    IF GameClock.IsNewDayStart():
      random_seed = RNGEngine.GetRandomValue()
      daily_offset = DetermineDailyOffset(random_seed)

    // behavior_offset can be positive or negative
      RiskFactor += daily_offset

    GameCore.ApplyDifficulty(RiskFactor)

    WAIT(Next)
```

4. Acceptance Tests ______9

Success-Based Dynamic Difficulty

Test Num	Description	If	Then
TEST 1	Player is being risky	Process risky actions	Behavior offset is positive and risk factor increases
TEST 2	Player is being safe	Process safe actions	Behavior offset is negative and risk factor decreases

Risky actions will be simulated by feeding the game engine with an extreme number of randomized risky behavior value. The resulting risk value will then be logged.

Environmental Difficulty

Test Num	Description	If	Then
TEST 3	Weather transitions	Weather changes states, such as from “stormy” to “clear”	Weather offset is changed and risk factor is changed accordingly
TEST 4	Time of day reaches a threshhold	Time of day reaches dusk/night	Risk factor increases drastically

Daily Randomization

Test Num	Description	If	Then
TEST 5	New day is triggered	It is a new day	The system pulls a random seed from the RNG Engine and applies an offset to risk factor
TEST 6	New day is not triggered	It is not a new day	The system does nothing and continues

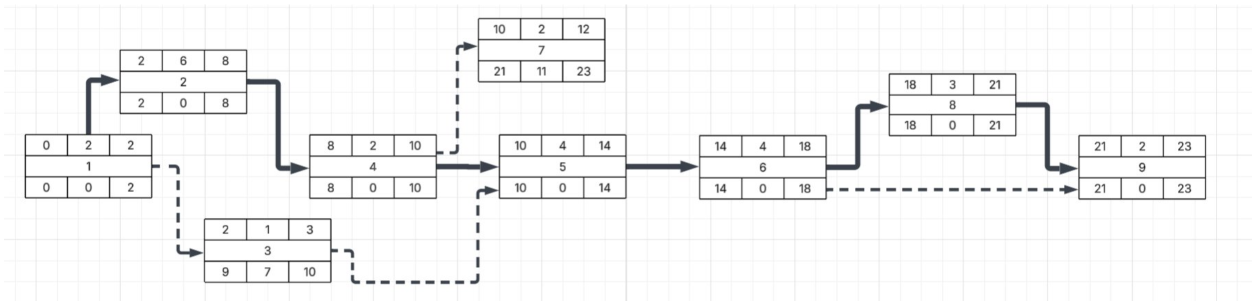
5. Timeline _______/10

Example:

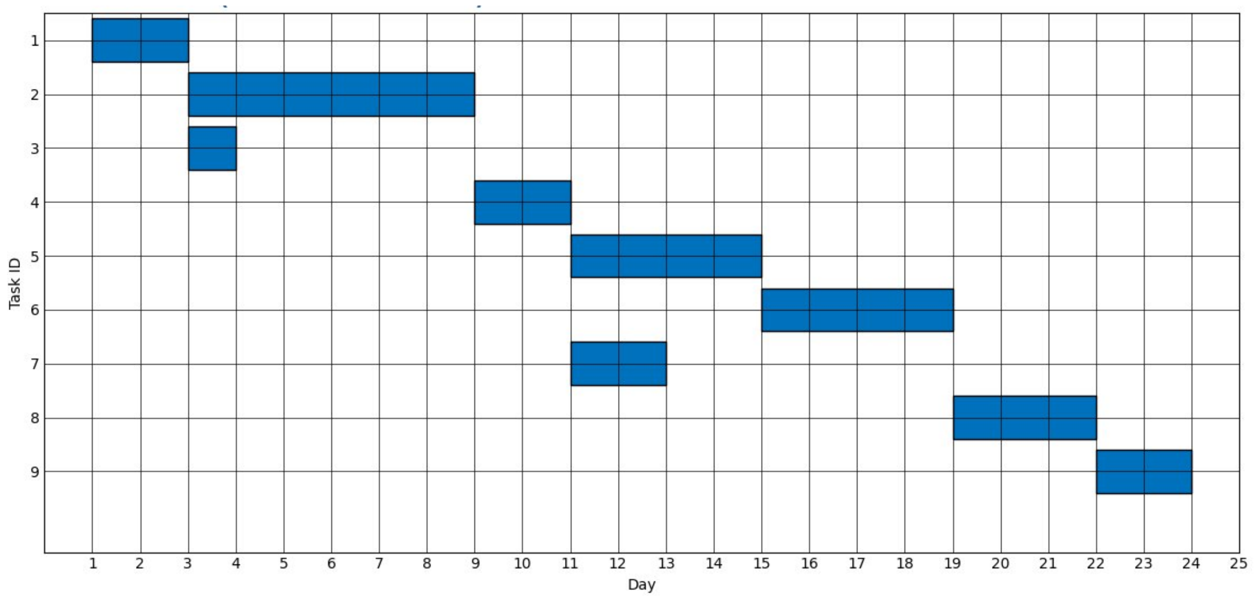
Work items

Task	Duration (Days)	Predecessor Task(s)
1. Requirements Collection	2	-
2. Action Risk Calculation	6	1
3. Weather Design	1	1
4. Riskiness Database Construction	2	2
5. Programming	4	4,3
6. Integration and Balancing	4	5
7. User Documentation	2	4
8. Testing	3	6
9. Installation	2	6, 8

Pert diagram



Gantt timeline


Task ID
Day