## **Game Battle System Architecture**

### **1. Core Principles & System Overview**

This document outlines a turn-based combat system designed for single-player encounters against one or more opponents (up to a maximum of 8 active combatants). The system prioritizes strategic, predictive gameplay while mitigating the most frustrating elements of random chance ("RNG") found in its inspirational architecture.

The core loop is turn-based and sequential. At the start of each turn, all combatants select an action. The order of action resolution is then determined by move priority and individual combatant Speed. Damage calculation is deterministic but includes minor variance to prevent encounters from becoming perfectly solvable mathematical equations. The system is built upon four primary pillars: a simplified stat system, a dual-category elemental system, a clear and predictable buff/debuff architecture, and a novel "Graze" mechanic that replaces the traditional accuracy "miss."

### **2. Combatant Attributes and Stats**

Each combatant is defined by a set of core attributes that govern their performance in battle. There is no switching; the player's unit and all enemy units are fixed for the duration of the encounter.

* **Level:** The primary scalar for a combatant's power. It is a direct input into the damage formula.
* **HP (Health Points):** The combatant's life force. When HP reaches 0, the combatant is defeated and removed from combat.
* **Strength (STR):** Governs the power of **Physical** moves. This stat is used as the offensive value in the damage formula for any move designated as Physical.
* **Power (POW):** Governs the power of **Magical** moves. This stat is used as the offensive value in the damage formula for any move designated as Magical.
* **Tenacity (TEN):** The universal defensive stat. It represents a combatant's physical and mental resilience. This stat is used as the defensive value in the damage formula against *all* incoming damaging attacks, regardless of whether they are Physical or Magical.
* **Speed (SPD):** Determines the order of action within a single priority tier. Higher Speed acts before lower Speed.

### **3. The Turn Sequence: A Step-by-Step Flow**

Combat proceeds in discrete turns, with each turn following a strict sequence of events.

**Phase 1: Start of Turn**

1. **Weather/Environment Effects:** Any persistent environmental effects that trigger at the start of a turn (e.g., damage from "Acid Rain") are resolved for all combatants simultaneously.
2. **Turn Counter Updates:** Any turn-based counters for buffs, debuffs, or field states are decremented by one. If a buff/debuff's duration reaches zero, it is removed.

**Phase 2: Action Selection**

1. The player selects an action for their character (Use a Move, Use an Item, Flee).
2. The AI for each enemy combatant selects an action. These actions are locked in.

**Phase 3: Action Resolution**This phase is the core of the turn and is executed sequentially, not simultaneously. The system determines the action order for all combatants at the start of this phase.

1. **Build Action Queue:** The system compiles a list of all selected actions.
2. **Sort Action Queue:** The list is sorted based on the following criteria, in order:  
   a. **Move Priority:** Each move has an integer priority level (e.g., from -1 to +5). Higher priority moves are placed earlier in the queue.  
   b. **Combatant Speed:** If two or more moves share the same priority level, the combatants' Speed stats are compared. The combatant with the higher Speed stat acts first.  
   c. **Random Tie-Break:** If two or more combatants have the same priority and the exact same Speed, the tie is resolved randomly.
3. **Execute Actions Sequentially:** The system processes the first action in the sorted queue from start to finish. Once it is fully resolved (including damage, effects, etc.), the next action in the queue is processed. This continues until all actions have been resolved.

**Phase 4: End of Turn**

1. **Check for Victory/Defeat:** The system checks if the battle's end conditions have been met (e.g., all enemies defeated, player's HP is 0). If so, the battle concludes.
2. **Loop:** If no end condition is met, the system loops back to Phase 1 to begin the next turn.

### **4. Action Resolution: The Damage Formula**

This is the process for resolving a single damaging move from an attacker against a defender.

**Step 1: Buff/Debuff Pre-computation (Attacker)**As per the design, buffs and debuffs are processed at the start of a combatant's action.

* **Damage-over-Time (DoT):** If the attacker is afflicted with a DoT like "Poison" or "Burn," the HP damage is calculated and applied to the attacker *now*.
* **Stat Buff/Debuff Check:** If the attacker has a temporary buff (e.g., "Strength Up"), the system flags that its OffensiveStat will be modified during damage calculation. This does not change the base stat, but is a temporary modifier for this action only.
* **Action-Altering Status:** If the attacker is afflicted with a status like "Stun" that would cause them to skip their turn, their action ends here.

**Step 2: Accuracy Check & The Graze Mechanic**Every move has an Accuracy value.

* --**Accuracy:** The move cannot fail its accuracy check and will always be a full hit. It proceeds to Step 3.
* 100**Accuracy:** The move cannot fail its accuracy check and will always be a full hit. It proceeds to Step 3.
* <100**Accuracy:** A random number is generated. If the roll succeeds (is within the accuracy threshold), the move is a **full hit**. If the roll fails, the move becomes a **Graze**. A flag is set (isGrazed = true) for the final damage calculation step. A grazed attack can never be a Critical Hit.

**Step 3: Base Damage Calculation**The core damage is calculated using the established formula.

* Determine OffensiveStat: Strength for Physical moves, Power for Magical moves.
* Determine DefensiveStat: Always the target's Tenacity.
* Calculate BaseDamage:

1. BaseDamage = (((2 \* Attacker\_Level/5 + 2) \* Move\_Power \* (OffensiveStat / DefensiveStat)) / 50) + 2

* **Step 4: Multiplicative Modifier Application**Modifiers are applied in a strict order. Let ModifiedDamage = BaseDamage.
* **Weather:** If an active weather condition affects the move's element (e.g., "Scorching Sun" boosting Fire moves), apply that multiplier (e.g., ModifiedDamage \*= 1.5).
* **Critical Hit:**
* If the move was flagged as a Graze in Step 2, this step is skipped.
  + The system performs a random roll against the move's critical hit chance.
* If successful, ModifiedDamage \*= 1.5 (or the game's standard crit multiplier). A critical hit ignores the attacker's negative offensive stat modifiers (e.g., "Strength Down") and the defender's positive defensive stat modifiers (e.g., "Tenacity Up").

1. **Attacker/Defender Stat Buffs:** If the move was not a critical hit, apply buffs/debuffs now.

* If attacker has "Strength Up" / "Power Up": ModifiedDamage \*= 1.5.
* If defender has "Tenacity Up": ModifiedDamage \*= 0.66 (or the inverse of the buff).
  + These effects are mutually exclusive with their opposites (e.g., an attacker cannot have both "Up" and "Down" for the same stat).
* **Elemental Effectiveness:** The system calculates the elemental multiplier based on the move's Offensive Element(s) and the target's Defensive Element(s). The final multiplier is the product of all interactions. (e.g., A "Metal" move vs. a "Creature" (2x) "Stone" (0.5x) target results in a 2 \* 0.5 = 1x multiplier). ModifiedDamage \*= ElementalMultiplier. This can result in multipliers like 0.25x, 0.5x, 1x, 2x, or 4x.
* **Random Variance:** ModifiedDamage \*= random\_float(0.85, 1.00).

1. **Graze Application:**

* If the isGrazed flag was set in Step 2, ModifiedDamage \*= 0.5. This is applied *after* all other calculations to ensure a grazed critical hit is not possible and that the penalty is consistent.
* **Step 5: Final Damage**The final ModifiedDamage value (rounded down to the nearest integer) is subtracted from the target's HP.

### **5. Status Architecture: Buffs & Debuffs**

The system uses a simple, non-stacking binary buff/debuff model. A combatant can either have a buff, a debuff, or neither for a given stat/condition. Applying a buff that is already active simply resets its duration.

* **Format:** (Effect\_ID, Duration\_in\_Turns)
* **Example Effects:**
  + **Strength Up:** Increases damage from Physical moves by 1.5x.
  + **Tenacity Down:** Causes the combatant to take 1.5x damage from all moves.
  + **Poison:** Target loses 8% of its max HP at the start of its action.
  + **Stun:** Target has a 100% chance to be unable to act on its next turn. The effect is consumed after the turn is skipped.
  + **Regen:** Target recovers 5% of its max HP at the start of its action.

### **6. Elemental System**

The elemental system is split into two categories to create clear offensive and defensive profiles.

* **Offensive Elements:** An attribute of a move (e.g., Fireball is "Fire", Sword Slash is "Metal"). A move can have one or more offensive elements.
* **Defensive Elements:** An attribute of a combatant (e.g., a Bear is "Creature", a Golem is "Stone" and "Arcane"). A combatant can have one or more defensive elements.

Interactions are resolved by comparing each of the move's Offensive Elements against each of the target's Defensive Elements. The final damage multiplier is the product of these individual interactions.

**Example Interaction Logic:**

* Move: "Dual Slash" (Offensive Elements: "Metal", "Wind")
* Target: "Gryphon" (Defensive Elements: "Creature", "Wind")

1. Check "Metal" vs. "Creature" -> 2x (Weakness)
2. Check "Metal" vs. "Wind" -> 1x (Neutral)
3. Check "Wind" vs. "Creature" -> 1x (Neutral)
4. Check "Wind" vs. "Wind" -> 0.5x (Resistance)
5. **Final Multiplier:** 2 \* 1 \* 1 \* 0.5 = 1x. The attack deals neutral damage.

This allows for complex interactions without requiring a massive, hard-to-memorize chart.

### **7. Field & Environmental Effects**

Field effects, primarily **Weather**, are global modifiers that affect all combatants.

* **Activation:** Weather can be pre-set at the start of a battle or triggered by scripted mid-battle events. **Critically, combatants themselves cannot learn moves to set or change the weather.**
* **Duration:** Weather lasts for a set number of turns (e.g., 5) or until the end of the battle, unless replaced by another scripted event.
* **Example Weathers:**
  + **Scorching Sun:** Boosts "Fire" offensive moves by 1.5x, weakens "Water" offensive moves by 0.5x.
  + **Acid Rain:** All combatants with the "Creature" or "Metal" defensive element take 5% max HP damage at the start of each turn.
  + **Mystic Fog:** All non-"Arcane" offensive moves have their accuracy lowered by 10%. (e.g., a 90 accuracy move becomes 80).