

Mugen-Kai: Final Design Document

Version 1.0 — December 2024

Part 1: Core Identity

Game Concept

A roguelite wave-survival game that fuses Vampire Survivors' accessibility with Magic: The Gathering's deck-building depth and Balatro Cryptid's infinite scaling potential. Built in Rust (Bevy) for maximum performance.

The Pitch

"Vampire Survivors meets Magic: The Gathering with infinite scaling crits."

Primary Game Mode

Siege Castle — Zone-based progression through a castle with objectives per zone, culminating in a final boss.

Part 2: Card System

Deck Building (Pre-Run)

Your deck is a **probability table**, not a draw pile.

Card in Deck	Weight
Fire Imp (x5)	25%
Ember Hound (x3)	15%
Inferno Knight (x2)	10%
Ember Staff (x3)	15%
Molten Core (x4)	20%
etc.	etc.

- More copies of a card = higher probability to roll it
- No "running out" of cards — infinite rolls against your probability weights
- Deck composition is your strategy layer

Card Types

Weapons (= Lands)

Attribute	Value
Slot Limit	None
Can Die	No
Combines	Yes (Vampire Survivors style)
Purpose	Generate Color Affinity + Weak auto-attack + Spell effects built-in

Examples:

- Ember Staff: +10 Red Affinity, shoots weak fireballs
- Flame Sword: +15 Red Affinity, melee sweep
- Inferno Blade (evolved): +35 Red Affinity, faster attacks, burn DoT

Creatures (= Your Army)

Attribute	Value
Slot Limit	Soft cap per type (respawn mechanic)
Can Die	Yes (respawns on timer)
Combines	Yes (3x same → evolution)
Purpose	Main damage dealers

Examples:

- Fire Imp → Flame Fiend → Inferno Demon

- Ember Hound → Hellhound Alpha → Cerberus
- Inferno Knight → Inferno Warlord → Inferno Titan

Artifacts (= Consumables)

Attribute	Value
Slot Limit	N/A (consumed on acquire)
Can Die	N/A
Combines	No
Purpose	Permanent stat buffs for the run

Types:

- Global: "+10% crit to all creatures"
- Color-Specific: "+30% damage to Fire creatures"
- Type-Specific: "+50% attack speed to Melee creatures"
- Creature-Specific: "Trolls gain +100% HP"

More specific = stronger buff, narrower use case.

Prophecies (= Emergency Triggers)

Attribute	Value
Slot Limit	1 active
Purpose	Defensive emergency ability

How They Work:

- Unlock via conditions during run (not pre-selected)
- Triggers when conditions met (low HP, creatures dead, etc.)
- Examples: Shield burst, AoE knockback, mass heal, brief invincibility

Part 3: Color Affinity System

What Is Affinity?

Color Affinity = (Number of Color Weapons Equipped) × (Base Affinity per Weapon)

Affinity Thresholds (Red Example)

Red Affinity	Bonus
0-10	Base fire damage (no bonus)
11-25	+10% fire creature damage
26-50	+25% fire creature damage, +10% attack speed
51-75	+50% fire creature damage, unlock Tier 2 Mega Crit
76-100	+100% fire creature damage, fire attacks gain burn DoT
100+	+1% damage per point above 100 (overflow)

Color Identities

Color	Creature Style	Signature Mechanic
Red	High damage, aggressive	Burn DoT, attack speed
Blue	Control, mages	Slow, crowd control
Green	Tanks, nature	High HP, regeneration
White	Healers, support	Shields, healing auras
Black	Necromancy, death	Summons, life steal
Colorless (Eldrazi)	Game-breaking	Extreme cost, extreme power

Part 4: Creature Mechanics

Dual Scaling Paths

Path A: Kill-Based XP (Per-Creature)

Each creature gains XP from its own kills.

Troll Level Progression:

Level 1 → 2: 10 kills

Level 2 → 3: 25 kills

Level 3 → 4: 50 kills

...

Max Level: 10

Each level grants: +10% damage, +10% HP, slight attack speed increase.

Path B: Card Evolution (Duplicates)

Drawing duplicate creatures triggers evolution.

3x Fire Imp → Flame Fiend (resets to L1, higher base stats)

3x Flame Fiend → Inferno Demon (resets to L1, even higher stats)

Interaction

- Level 7 Troll + 2 more Troll cards = choice
- Keep L7 Troll + add two L1 Trolls? OR
- Combine into L1 Troll Chieftain (200% base stats)?
- Sometimes evolving is worse short-term but better long-term

Creature Control

Formation System

[Back Line] — Ranged, Supports

[Mid Line] — You (player)

[Front Line] — Melee, Tanks

[Free Roam] — Assassins

Creature Types & Behavior

Type	Position	Behavior
Melee	Front	Body-blocks enemies, charges nearest
Ranged	Back	Stays near you, auto-targets
Support	Mid	Orbits you, AoE heals/buffs
Assassin	Free	Ignores formation, hunts priority targets

Control Modes

Auto Mode (Default):

- Creatures follow type behavior automatically
- Good for casual play

Command Mode (Right-Click):

- Right-click ground → selected creatures move there
- Right-click enemy → focus fire that target

Formation Lock (Toggle):

- Creatures maintain relative position to you
- Good for kiting and defensive play

Death & Respawn (Nafiri Mechanic)

- Creatures can die (killed by enemies)
- Dead creature → respawn timer starts
- Timer scales with creature tier (rarer = longer respawn)
- Respawns at Level 1
- Keeping creatures alive = better DPS (they keep their kill XP levels)

Part 5: Leveling & Progression

Kill-Based Leveling

25 kills = 1 level = 1 card roll from your probability deck

Visual: "Murder Meter" — circle fills with blood, pulses on level up.

Card Roll Process

1. Kill threshold reached
2. System rolls against your probability table
3. Card appears in inventory
4. Auto-equip rules apply (or manual equip)
5. If duplicate creature → evolution prompt

Auto-Equip Rules (Customizable)

- "Always equip Red creatures"
- "Prioritize highest rarity"
- "Never equip Green artifacts"
- "Auto-combine duplicates"

Pity System

Condition	Guarantee
Level 5 (if no creatures yet)	First creature card
Level 15	Rare+ card
Level 30	Epic+ card
Level 50	Legendary card
10 rolls without creature	Next roll = 100% creature
10 rolls without artifact	Next roll = 100% artifact

Trash Mechanic

- Trash an unwanted card → +5% quality bonus on next roll
 - Stacks up to +50%
 - Lets you "sculpt" your probability mid-run
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Part 6: The 3-Tier Crit System

Independent Probability Tiers

Each tier has its own separate roll chance.

Tier	Chance (Example)	Multiplier
Tier 1: Normal Crit	35%	2× damage
Tier 2: Mega Crit	18%	damage ² (squared)
Tier 3: Super Crit	5%	damage ⁴ (capped power tower)

Crit Overflow

When crit chance exceeds 100%, overflow converts to bonus crit damage.

Example:

- 120% Tier 1 Crit Chance
- Result: Always crits + 20% bonus to crit multiplier
- Base T1 = 2× → With overflow = 2.2×

Scaling Example

Inferno Warlord at Level 60:

- Base damage: 643
- Affinity bonus: +50%
- Artifact bonus: +20%

- Kill XP bonus: +70%
- Final base: ~1,200 damage

Roll	Chance	Damage
Normal	42%	1,200
T1 Crit	35%	2,400
T2 Mega	18%	1,440,000
T3 Super	5%	2+ trillion

Expected DPS from Warlord alone at L60: **~9.5 million**

Part 7: Enemy Scaling

Philosophy

Bad: Enemies just get more HP (sponges).

Good: Enemies get new behaviors + HP scales to match your damage curve.

Track 1: Stat Scaling

Target Time-to-Kill (TTK):

- Fodder: 0.5-1 second
- Elite: 3-5 seconds
- Mini-boss: 15-30 seconds
- Boss: 60-120 seconds

Formula:

$$\text{Enemy HP} = (\text{Your Expected DPS}) \times (\text{Target TTK}) \times (\text{Difficulty Modifier})$$

Scaling Table:

Level	Your DPS	Fodder HP	Elite HP	Boss HP
10	90	68	360	8,100
30	850	637	3,400	76,500
50	45,000	33,750	180,000	4,050,000
70	850M	637M	3.4B	76.5B

Enemy Damage:

$$\text{Enemy Damage} = \text{Base} \times (1.15)^{(\text{Wave Number})}$$

Scales slower than HP — you don't get one-shot, but pressure increases.

Track 2: Behavior Scaling

New enemy types every 5 waves:

Waves	New Behavior
1-5	Basic fodder (walk + melee)
6-10	Ranged enemies (archers, mages)
11-15	Fast enemies (wolves, flankers)
16-20	Shield enemies (block frontal)
21-25	Healers (restore other enemies)
26-30	Commanders (buff nearby enemies)
31-35	Splitters (spawn 2 on death)
36-40	Phasing (ignore frontline sometimes)
41-45	Reflectors (return % damage)
46-50	Elemental Resist (counter your color)
51+	Combinations of all above

Director System (Adaptive AI)

Metrics Tracked:

- Your DPS, HP%, creature count, time since damage taken

Responses:

Your State	Director Action
Stomping	Spawn more elites, add counter-color enemies
Comfortable	Standard wave composition
Struggling	Reduce spawn rate, add health drops
Nearly Dead	Brief pause, spawn weaker enemies

Counter-Color Spawning:

- If you're mono-Red, Director spawns Water enemies at Wave 20+
- Water enemies take 50% less fire damage
- Prevents "solved" autopilot builds

Part 8: Boss Design

Structure

Every 10 waves = Boss encounter.

Phase System:

- Phase 1 (100-70% HP): Basic attack pattern
- Phase 2 (70-40% HP): New attack + summons adds
- Phase 3 (40-0% HP): Enrage mode, faster, AoE danger zones

Example: Frost Giant (Wave 10 Boss)

HP: 25,000 (scales with your DPS)

Damage: 150 per hit

Attacks:

- Slam: 1.5s telegraph, AoE front, kills creatures in zone
- Ice Breath: Cone, slows creatures 50%
- Summon: 4 Ice Wolves every 20 seconds

Phase 2 (70% HP):

- Ground Freeze: Random ice patches (damage + slow)

Phase 3 (40% HP):

- Enrage: 30% faster attacks
- Blizzard: Screen-wide slow, dodge ice shards

Boss Rewards

- Guaranteed Rare+ card roll
- Bonus artifact
- Large XP/kill credit burst

Part 9: Map Structure (Siege Castle)

Zones

[Spawn Area] → [Outer Walls] → [Inner Courtyard] → [Castle Gate] → [Throne Room]

Zone Details

Zone	Difficulty	Special Mechanic
Spawn Area	1.0x	Tutorial fodder
Outer Walls	1.5x	Archers on walls (ranged priority)

Zone	Difficulty	Special Mechanic
Inner Courtyard	2.0x	Knight patrols, clear all
Castle Gate	2.5x	Destroy gate while defending
Throne Room	3.0x	Final boss + elite guards

Optional Areas

- **Dungeons/Prisons:** Side areas with rare loot, increased difficulty
- **Shrines:** Buffs for completing challenges
- Similar to Diablo dungeons — not required, but rewarding

Time Pressure (Optional Toggle)

- Reinforcement waves from behind every 2 minutes
- Encourages forward momentum
- Not a death timer, just increasing pressure
- Can be disabled for casual play

Part 10: Difficulty Settings

Smart Difficulty (Not Just +HP)

Setting	Effect
Easy	Slower spawns, weaker Director, no counter-color
Normal	Standard balancing
Hard	Smarter enemies, aggressive Director, more counters
Nightmare	Director actively counters your build, elites everywhere

Difficulty affects enemy **behavior and intelligence**, not just stats.

Part 11: Technical Notes

Engine

- **Language:** Rust
- **Framework:** Bevy (ECS architecture)
- **Target:** 100,000+ entities at 60 FPS

Math Handling

- Use `break_infinity` library for numbers beyond f64
- T3 Super Crits capped at damage^4 to prevent overflow
- Scientific notation display (1.00E+12)

Performance Priorities

- GPU instancing for rendering
 - Spatial partitioning for collision
 - Sparse set storage for status effects
 - Parallel systems for AI
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Part 12: What's Next (Implementation Checklist)

Phase 1: Data Definition

- Creature Roster:** 5-10 creatures per color with full stats
- Weapon Roster:** Base weapons + combo evolution trees
- Artifact Roster:** ~20 artifacts with buff values
- Enemy Roster:** Fodder, elite, boss per zone
- Affinity Thresholds:** Exact numbers for all 5 colors

Phase 2: Core Systems

- Probability deck system

- Kill-based leveling
- Card roll + auto-equip
- Creature spawning + positioning
- Basic combat (auto-attack)
- Affinity calculation

Phase 3: Creature Systems

- Kill XP tracking
- Evolution (3x duplicate)
- Death + respawn timers
- Formation/positioning
- Command mode (right-click)

Phase 4: Scaling Systems

- 3-tier crit implementation
- Crit overflow math
- Enemy HP scaling formula
- Director AI (adaptive spawning)
- Behavior unlocks per wave

Phase 5: Content

- Siege Castle map layout
- Zone objectives
- Boss encounters (1 per 10 waves)
- Optional dungeon areas

Phase 6: Polish

- UI/UX (inventory, formation editor, probability display)
- Visual effects (crit tiers, evolution, etc.)
- Audio
- Balance tuning

Prototype Scope (First Build)

One color (Red) + One map (Siege Castle) + Core loop only

Appendix: Quick Reference Tables

Card Type Summary

Type	Limit	Dies	Evolves	Purpose
Weapons	None	No	Yes	Affinity + weak damage
Creatures	Soft	Yes	Yes	Main damage
Artifacts	N/A	N/A	No	Permanent buffs
Prophecies	1	N/A	No	Emergency trigger

Scaling Summary

System	How It Scales
Creature Kill XP	+10% stats per level, max L10
Card Evolution	3× same → next tier
Affinity	Weapon count → threshold bonuses
Artifacts	Stack permanently all run
Crit Overflow	100%+ → bonus crit damage

Crit Tiers

Tier	Multiplier	When It Matters
T1	2×	Early-mid game
T2	damage ²	Mid-late game (the hockey stick)
T3	damage ⁴	Extreme late (god killer)

Document Version 1.0 – Ready for implementation phase