

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)
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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

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:

Enemy HP = (Your Expected DPS) × (Target TTK) × (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 | 1.0× | Tutorial fodder |
| Outer Walls | 1.5× | Archers on walls (ranged priority) |

| Zone | Difficulty | Special Mechanic |
|-----------------|------------|------------------------------|
| Inner Courtyard | 2.0× | Knight patrols, clear all |
| Castle Gate | 2.5× | Destroy gate while defending |
| Throne Room | 3.0× | 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) |

