

Open Veins Technical and Narrative Gameplay Framework

Project Context: Open Veins - Action Roguelite Prototype

Engine Tools: Unreal Engine Blueprints Ecosystem

Author: Guilherme F. Martins www.guifamar.com

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1 Executive Summary and Industry Framework

Open Veins is an industrial-grade data-driven action roguelite framework that unifies deep systemic combat loops, modular asynchronous wave encounters, and a narrative engine rooted in historiographical memory and Brazilian indigenous cosmology. By decoupling hardcoded node logic from runtime execution through Primary Data Assets PDAs structural data contracts, event-driven dispatchers, and global world state tracking, this architecture provides a production-tested template for scalable game development.

2 Historiographical Architecture and Narrative Gameplay Integration

The core narrative of Open Veins is built upon the critical historiographical theories of Marc Bloch and Jacques Le Goff, treating memory not as a static historical record but as a dynamic space of permanent political and cultural dispute.

2.1 Theoretical Foundations and Spatial Memory

- Cyclical Trauma and Materialized Exploitation: The title Open Veins references historical structures of extraction and systemic depletion. Mechanical failure to manage regional threats results in territorial regression where biomes revert to active corruption and environmental hostility.
- History as a Core Mechanic: The conflict is framed as a struggle between competing narratives over the past. The corruption actively drains memory, identity, and culture, rewriting how the world perceives its own spirits and deities. Consequently, the player does not merely acquire gear or numbers; they restore the world's capacity to remember who it is.
- Collective Reconstruction: Reinterpreting Christopher Vogler's monomyth, the protagonist's journey is transformed into a collective restoration. Each region liberated and each spirit saved heals a fragment of the collective identity, dismantling centuries of narrative distortion.

2.2 Environmental Storytelling and Cosmetic Fluidity

- Minimalist Exposure Chris Solarski Principles: The game strips away verbose text exposition, communicating story evolution entirely through real-time environmental transformations during gameplay.
- The Purification Payoff: When a Corrupted Heart is severed, the spatial state shifts instantly without intrusive dialog screens:
 - Sunlight punctures dense canopies.
 - Enegrecid polluted water tables return to crystalline states.
 - Aggressive corrupted fauna gives way to peaceful native animals and protective spirits.
 - Ambient lighting, soundscapes, and color grading adjust dynamically to match the restored biome ecology.

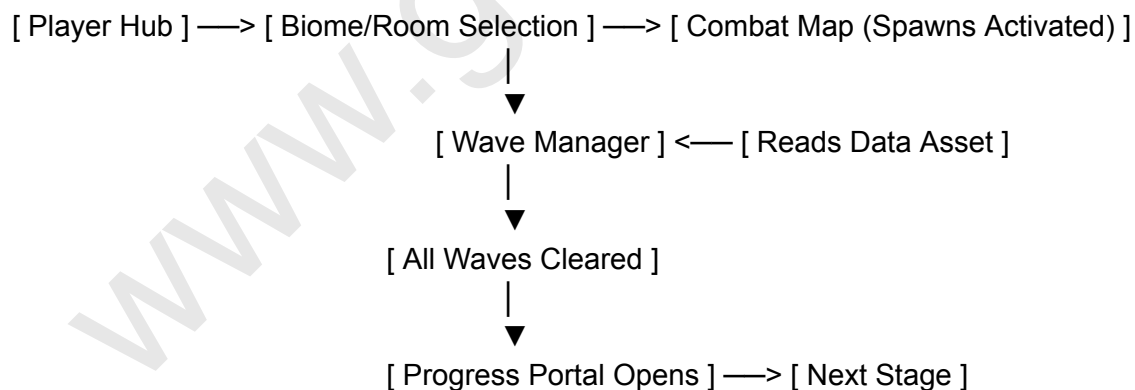
2.3 Indigenous Cosmology as a Systemic Web

- Cosmology over Folklore: Rather than treating entities like Anhangá, Curupira, Boitatá, and Tupã as superficial visual tropes or isolated boss encounters, they are woven into a living systemic organism where nature, humanity, and spirituality share a unified equilibrium.
- Liberation over Destruction: The primary objective is not to destroy these sacred entities but to sever the false identities and narratives imposed upon them by the corruption, turning mythology into a dynamic network of interdependencies.

3 Macro Progression Loop and World Architecture

The macro loop manages player traversal from a secure base hub through seed-driven biome selections to high-intensity wave encounters regulated by deterministic world state gating assets.

Plaintext



3.1 Biome Configuration and Data Seeding PDA BiomeConfig

- Primary Data Asset Architecture: Biomes are instantiated via configuration assets housing Gameplay Tags map sequence arrays MapSequence and dedicated boss level entries BossMap.

- Deterministic Room Gating: Level progression actors enforce hard locks on traversal portals, evaluating runtime completion arrays before allowing access to adjacent nodes.

4 Wave-Based Encounter System Architecture

The encounter orchestration framework handles complex entity lifecycle loops, asynchronous timer-based spawning, and reactive progression gating through isolated data contracts.

4.1 Struct Hierarchy and Data Contracts

To prevent memory serialization overhead and maintain compatibility with engine-level actor instantiation, all entity definitions rely on class reference metadata structures TSubclassOf Actor.

Structure Name	Field Key	Type Definition	Functional Responsibility
F BiomeConfig	Biome Tag	Gameplay Tag	Global unique key mapping for progression tracking and unlocks.
	MapSequence	Array Name	Ordered list of level asset identifiers defining the biome's seed.
	BossMap	Name	Target level name dedicated to the final boss climax encounter.
	Waves	Array F WaveConfig	Sequential container housing individual wave configurations.

F WaveConfig	NPCsToSpawn	Array F NPCSpawnInfo	Collection of specific individual entity descriptors allocated to the wave.
F NPCSpawnInfo	NPCClass	TSubclassOf Actor	Class type configuration lookup defining the blueprint template to spawn.
	SpawnDelay	Float	Time pacing value in seconds executed before processing the next array element.
	SpawnPointTag	Name	Actor search identifier tag used to pair the entity with world transforms.

4.2 Timed Asynchronous Spawning Loop BP WaveManager

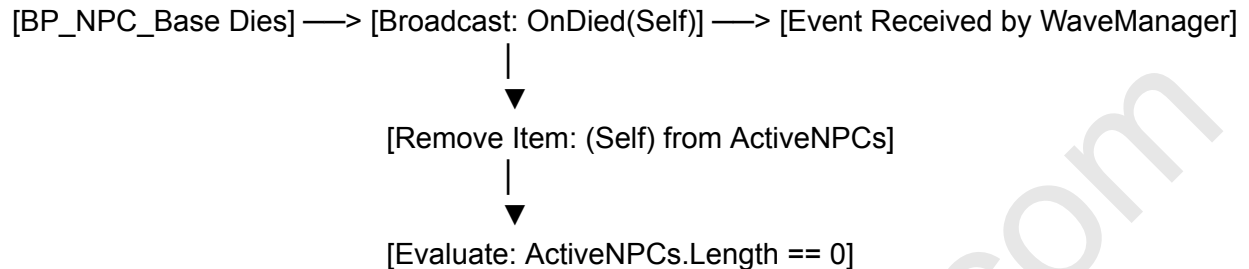
Entity instantiation relies on a recursive indexing sequence managed via custom delay and sequence tracking nodes, avoiding performance drops associated with single frame execution loops:

1. Index Verification: Evaluates whether CurrentNPCIndex is less than the length of the NPCsToSpawn array.
2. Spatial Resolution: Queries world actors matching the configured SpawnPointTag to retrieve transforms.
3. Instantiation: Executes SpawnActorFromClass using the target NPCClass.
4. Reference Registration: Pushes the resulting object reference into the ActiveNPCs tracking array.
5. Event Binding: Executes Bind Event to OnDied, linking the entity to the manager's death listener.
6. Recursion Pipeline: Increments CurrentNPCIndex by 1, triggers a Delay node using SpawnDelay data, and loops back to index verification.

4.3 Reactive Lifecycle Tracking and Death Slicing

To eliminate polling overhead and index corruption during simultaneous multi-entity destructions, the manager relies on direct object references passed through custom event signatures:

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4.4 Gated Verification and Wave Advancement

When `ActiveNPCs.Length` equals 0, a dual-gated verification check evaluates whether staging has fully completed to prevent premature portal activation:

- If `WaveSpawnFinished` is True: Evaluates if subsequent waves remain in the Waves array. If true, increments `CurrentWaveIndex`, resets `CurrentNPCIndex`, applies an inter-wave warm-up delay, and loops to the next wave. If false, triggers `UnlockEncounterCompletion`.
- If `WaveSpawnFinished` is False: Executes no action, allowing the background asynchronous spawning loop to continue populating the space.

4.5 Progression Portal Activation Pipeline BP Portal

Upon receiving the unlock signal, the portal executes a synchronized activation protocol:

1. Sets `IsPortalActive` to True.
2. Sets component visibility on Niagara or Cascade VFX assets to True.
3. Forces particle component reset Activate with Reset set to True to re-evaluate non-looping emitter bursts.
4. Modifies collision channels on static mesh bounds to Query and Physics.

5 Resource Loops and Kinetic Repulsion System Angá

The Angá system governs crowd control and tactical resource management during high-density wave encounters.

5.1 The Combat Drop: The 10 Percent Rule

- Probability Gate: Every defeated NPC triggers a Random Float in Range 0.0 to 1.0 check.
- Drop Threshold: A strict 10 percent chance less than or equal to 0.1 spawns an Angá Orb upon death, preventing infinite special attack spam as wave density scales.

5.2 The Magnetic Orb BP AngaOrb

- Spawning Mechanics: Instantiated via SpawnActor From Class at the defeated NPC's location with a vertical offset of plus 80.0 Z to bypass ground clipping.
- Homing Behavior: Utilizes VInterp driven by Event Tick to pull the orb toward the player character smoothly.
- Collection: On Component Begin Overlap with the player, it increments the resource pool, clamps the value, and executes Destroy Actor.

5.3 UI Resource Tracking WBP HUD OVEINS

- Progress Mapping: Mapped across a normalized float range between 0.0 and 1.0.
- Dynamic Feedback: Formatted string block displaying Current over Max, e.g., 100 / 100.
- Clamping: Resource acquisition is strictly capped at 100.0 using a Clamp Float node at the source.

5.4 Special Attack Execution IA SpecialAttack

Triggered via Right Mouse Button RMB input when resource thresholds are met:

1. Condition Gate: Evaluates if RunAnga is greater than or equal to MaxAnga 100 out of 100.
2. Visual Feedback: Executes casting montages Play Montage and spawns world particle systems Spawn System at Location.
3. Proximity Detection: Executes a Multi Sphere Trace For Objects with a 500.0 radius centered on the player.
4. Kinetic Repulsion Launch Character:
 - Direction Vector: Calculated via Normalized NPC Location minus Player Location.
 - Horizontal Force: Multiplied by scalar factor 3500.0.
 - Vertical Force Z: Vector addition of plus 600.0 Z to lift targets off ground planes and bypass friction.
 - Velocity Overrides: XYOverride and ZOverride set to True to completely negate prior NPC momentum.
5. Resource Reset: Clears resource values. Set RunAnga equals 0 immediately upon loop resolution.

6 The Hearts of Corruption and Territory War Architecture

Expanding procedural biomes such as the Amazon, Cerrado, or Pantanal operate as living circulatory systems governed by the Open Veins.

6.1 Anchor Points and Structural Mapping

- Sacred Places: Each map contains 3 to 5 physical anchor points, e.g., Ancestral Trees, Sacred Springs, Echo Stones, Council Clearings.

- Corruption Nodes: Each anchor point houses a Heart of Corruption, a physical pulsing branch of the Open Veins draining regional memory.

6.2 The Purification Ritual Run Time Event

Upon locating a Heart of Corruption, the player engages in an active purification challenge rather than a simple item pickup:

- The Challenge: The root awakens, triggering a focused area defense event, spiritual tracking mini-game, or mystic restraint-breaking sequence.
- Environmental Transformation: Defeating the challenge severs the vein, triggering immediate nonstop audiovisual shifts.

6.3 Territorial Persistence and Meta Game Conflict

- Saved Conquests: Purified Sacred Places remain cleaned across runs, physically altering the global map layout.
- The Counter Attack Defeat Penalty: Upon player death, the corruption retaliates by re-corrupting a subset of previously purified locations, maintaining structural tension without resetting total progress.
- Memory of the Land Collective Progression: Maintained peaceful zones permanently bless the player's future runs:
 - Purified Ancestral Tree: Grants max health bonuses.
 - Purified Sacred Spring: Accelerates resource regeneration.
 - Purified Clearing: Summons AI spirit animals to assist in subsequent runs.

6.4 Win Condition: Complete Equilibrium

- The Ultimate Objective: To complete the campaign, the player must achieve Full Equilibrium, simultaneously maintaining every Heart of Corruption across all biomes in a purified state.
- Systemic Collapse: When the entire network is cleansed, the Open Veins cease pulsing, the corruption collapses due to a lack of sustaining narrative, and the world wakes up with fully restored memory.

7 Defensive Architecture and Stability Engineering

- Simultaneous Death Slicing: Avoids out-of-bounds array reads during multi-entity deaths by using direct self references through event parameters rather than vulnerable integer indices.
- Null Pointer Suppression: Upstream validation guards IsValid verify data assets on BeginPlay to guarantee graceful shutdowns in non-combat or transition levels.
- Decoupled Communication: Completely eliminates expensive polling routines like Get All Actors of Class or hard casting, relying entirely on lightweight event dispatchers and structural tags.

8 Final Considerations: The Convergence of Narrative Mechanics and Deep Historical Resonance

In Open Veins, the ultimate resource in dispute is not gold, energy, or raw power; it is memory. Because a land does not disappear merely when its forests are destroyed; it disappears when no one is left who remembers who it was.

8.1 Mechanics as Historiography: Translating Theory into Play

The architecture of Open Veins demonstrates that systemic design and profound narrative depth are not mutually exclusive; rather, they can be engineered to reinforce one another seamlessly. By framing the traditional roguelite loop where runs reset, failure sets progress back, and enemies respawn not as mechanical tropes, but as a historiographical battleground of systemic extraction and cultural erasure, the game elevates procedural design into a vehicle for emotional and intellectual resonance.

Drawing from Marc Bloch and Jacques Le Goff, the project treats memory as a living territory under siege. The player's interaction with the Angá resource system and the Hearts of Corruption is literalized history-making:

- Extraction versus Restoration: Gathering Angá energy from fallen entities transforms standard combat loops into an act of reclaiming identity from systems designed to homogenize and drain culture.
- Spatial Reversion: The meta game consequence of a lost run where corruption reclaims a purified sanctuary mirrors historical backlashes against cultural reclamation, maintaining a high-stakes emotional weight behind every encounter.

8.2 Redefining the Medium: Videogames as Cultural Memory Archives

For the global games industry, Open Veins serves as a scalable technical framework that proves action roguelites can carry heavy grounded thematic weight without sacrificing arcade pacing or systemic clarity.

By anchoring indigenous Brazilian cosmology not as passive folklore or decorative surface-level lore but as an active interconnected ecological web typified by entities like Anhangá and Curupira, the architecture forces a paradigm shift. Players do not just clear floors or defeat bosses; they dismantle false historical impositions, unweave systemic distortions, and participate in a collective healing of the land.

Ultimately, this blueprint establishes that when narrative and mechanics are forged from the same structural foundation, a videogame transcends simple entertainment. It becomes a living archive, a medium capable of preserving, questioning, and restoring the profound historical memory of a world on the brink of forgetting itself.