KALDRIS GAMES

OPERATION: URBAN STRIKE

Technical Design Document

Version 1.0 · 2026

Project: Operation: Urban Strike · Target platform: PlayStation 5

Studio: Kaldris Games · Contact: contact@kaldrisgames.com

1. Goals and budgets

The playable build is a 100 % functional POC validating mastery of 3D engines, tactical AI, 60 FPS optimisation and controller handling, ahead of the native port.

TARGET	PLAYABLE PROTOTYPE	NATIVE PS5
Resolution	1080p scalable (1920×1080)	Dynamic 4K / 1440p
Frame rate	60 FPS (VSync)	60 FPS (quality) / 120 FPS (perf.)
Load time	< 1,5 s	< 2,0 s
Memory	< 450 Mo	< 8,5 Go
Engine	Three.js r147	Unity 6 LTS (C#, IL2CPP) + module PlayStation
Controller	Gamepad API (mapping standard)	DualSense SDK (haptique + gâchettes)

2. Architecture



Classic scripts loaded in order (Three.js r147, GLTFLoader, SkeletonUtils, audio, geometry, models, weapons, post-processing, world, game): no build step, static deployment. The game strictly separates the player controller, the raycast shot manager and the render loop.

3. Rendering

- HDR pipeline: 4× MSAA half-float render, highlight extraction, two-level Gaussian blur, composite (chromatic aberration, radial blur, low-health desaturation, vignette, grain), ACES tone mapping.
- Lighting: directional light with soft PCF shadows (up to 3072^2), hemisphere, street lamps, simulated light cones, storm lightning, PMREM environment for reflections.
- Particles: two GPU systems (additive, normal), one draw call each.
- Dynamic resolution: 55–100 % based on measured frame time.
- Static merging: all static meshes are merged per material when a level is built.

4. Content pipeline

The environment, weapons, hands, vehicles, textures and audio are procedurally generated (rounded geometry, capsules, extruded profiles, canvas textures, WebAudio synthesis). Only the robot and soldier models are imported.

ASSET	SOURCE	LICENCE
RobotExpressive.glb	Tomás Laulhé (Quaternius) · three.js r147	CC0 1.0
three.js r147	mrdoob/three.js	MIT
GLTFLoader · SkeletonUtils	three.js r147	MIT
Procedural models, textures, audio	Kaldris Games creation	Studio-owned

5. Artificial intelligence

PATROL	CHASE	ATTACK	NEUTRALISED
patrol	chase	attack	dead

- Updated every frame; detection every 0.2–0.3 s (staggered) via field of view + raycast.
- Obstacle avoidance: angle tries (0, ±0.6, ±1.2, ±1.9 rad) with 0.6 s persistence.
- Shots: hit probability from distance, player movement and stance; difficulty (accuracy, damage).
- Animation: skeletal models (walk, run, idle, death), recoil, hit reaction, crouching.

6. Measured performance

Measurements taken with the built-in technical report (F3 / menu) on an NVIDIA GeForce RTX 4050 laptop, 1280×720, Chromium. Orange values exceed customary guidelines and will be addressed in the native port (instancing, LOD, pass grouping).

Playable prototype

METRIC	MEASURED	BUDGET / GUIDE
Load time	≈ 1 400 ms	**< 1 500 ms**
Frame rate	≈ 62 FPS	**60 FPS**
JS memory	82 Mo	**< 450 Mo**
Triangles	290 – 630 k	**< 750 k**
Draw calls	≈ 300 – 420 (ombres + post inclus)	**> 300 conseillé**
Geometries	≈ 430	**> 300 conseillé**
Textures	≈ 85	**< 60 (hors cibles RT)**

7. Testing and quality

- Automated checks: 1,600 weapon/attachment combinations built and animated without error; 10-block campaign (gates, checkpoints, resume, shop, final boss), Survival, online accounts, challenges, touch controls, pause, photo mode, defeat, victory.
- Memory stability to be re-verified on the current build (long campaign).
- Not yet done: physical gamepad tests, long-duration soak tests, PS5 hardware tests.

8. Technical risks

RISK	IMPACT	MITIGATION
Prototype ↔ UE5 gap	Reproducing the feel	Reference parameters documented (GDD)
DualSense SDK access	Delayed haptics	Dedicated phase 2; rumble simulation meanwhile
Third-party asset licences	Release blocker	Only external asset: Quaternius robot (CC0); replacement by an original model planned
4K optimisation	Frame rate	Dynamic resolution, LOD, instancing

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