



RealTerrain Studio - Complete Project Documentation

"From Earth to Engine"

Version: 1.0.0

Date: December 2024

Status: Ready to Build

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PROJECT OVERVIEW

What is RealTerrain Studio?

RealTerrain Studio is a professional terrain creation pipeline that transforms real-world geodata into production-ready Unreal Engine 5 landscapes.

Tagline: "From Earth to Engine"

Core Value Proposition:

- Convert real satellite data, elevation maps, and OpenStreetMap to UE5 in minutes
- No GIS expertise required - just select area and export
- One .rterrain file contains everything
- Perfect for game developers, architects, and filmmakers

Product Components

1. [QGIS Plugin \(Python 3.9+\)](#)

- Exports real-world terrain data
- 13 game profile presets
- Hardware validation system
- License management
- Single .rterrain file output

2. Unreal Engine 5 Plugin (C++)

- One-click import
- Automatic landscape creation
- Material application
- OSM object spawning with splines
- Complete road system with details

3. Backend (Supabase)

- License validation
- User management
- Payment processing (Stripe)
- Cloud processing queue

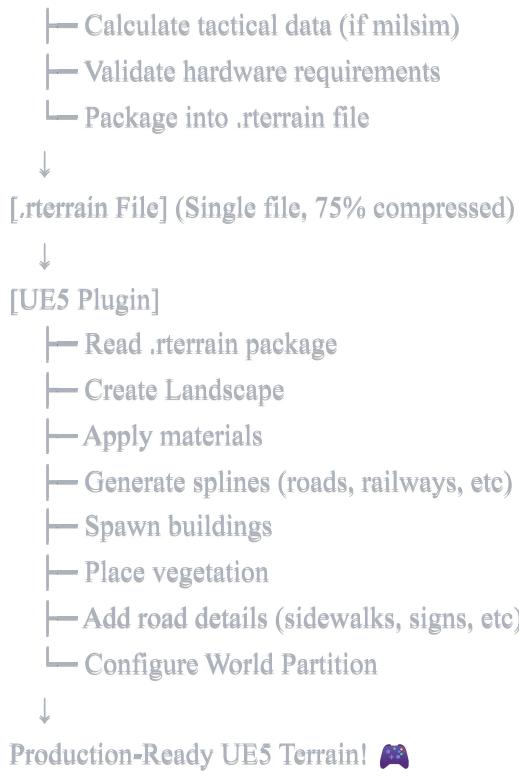
4. Website (Next.js)

- Landing page
- Documentation
- User dashboard
- Download portal

TECHNICAL ARCHITECTURE

Data Flow





Technology Stack

QGIS Plugin:

- Python 3.9+
- PyQt5 (UI)
- GDAL (geodata processing)
- Requests (API calls)
- NumPy (array operations)
- Supabase Python SDK
- Cryptography (license encryption)

UE5 Plugin:

- C++ (Unreal Engine 5.3+)
- Blueprint (user extensibility)
- Landscape API
- Spline Components
- Water Plugin integration

Backend:

- Supabase (PostgreSQL + Edge Functions + Storage)
- Stripe (payments)

- TypeScript (Edge Functions)

Website:

- Next.js 14
 - React
 - Tailwind CSS
 - Stripe Checkout
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✨ FEATURE LIST (COMPLETE)

🎮 13 Game Profiles

Pre-configured settings for different game types:

1. 🏅 **Military Simulation** - Tactical shooters (Arma, Squad)
2. 📖 **Open World RPG** - Exploration games (Skyrim-style)
3. 🏎️ **Racing Game** - Driving games (Forza-style)
4. 🏜️ **Survival** - Survival/crafting games (Rust, DayZ)
5. ✈️ **Flight Simulator** - Aviation (MSFS, X-Plane)
6. 💀 **Battle Royale** - BR games (PUBG-style)
7. 🏙️ **City Builder** - Strategy/simulation (Cities Skylines)
8. 👻 **Horror** - Atmospheric horror games
9. 💣 **Multiplayer Shooter** - FPS/TPS (Battlefield-style)
10. 🏠 **Architectural Viz** - Real estate, presentations
11. 🎥 **Film/Virtual Production** - Background plates, LED walls
12. 🎓 **Educational** - Schools, research
13. 🔐 **Custom** - Full manual control

Each profile auto-configures:

- Resolution
- Data sources
- Materials
- Special features

- Hardware requirements

Hardware & Engine Validation

Real-time system checking:

- RAM requirements (calculated)
- VRAM requirements (estimated)
- Disk space needed
- UE5 landscape limits (8192x8192 max)
- Texture limits
- Vegetation count warnings
- Instance limits
- Traffic light warnings:
 -  Safe
 -  Warning
 -  Critical (will fail)
- Auto-optimization suggestions
- Hardware upgrade recommendations

Data Sources

Elevation:

- SRTM (30m global, free)
- Lantmäteriet (Sweden high-res)
- LiDAR (where available)
- NASA ASTER (fallback)

Satellite Imagery:

- Sentinel-2 (10-20m, free)
- Landsat (30m, archive)
- Custom sources (configurable)

OpenStreetMap:

- Roads (all types: motorway → footpath)
- Buildings (with height, levels, type)

- Railways (all types)
- Power infrastructure
- Water bodies
- Natural features
- Points of Interest
- Land use zones
- Military installations
- Aviation (airports, runways)
- Street furniture
- **Total: 19+ OSM categories**

Complete Road System

Roads as Splines:

- Smooth curves with tangents
- Variable width
- Follows terrain perfectly
- Material blending
- LOD system

Road Details:

1. **Sidewalks (Trottoarer)** - Swedish standard 2m wide
2. **Curbs (Kantsten)** - 15cm granite, lowered at crossings
3. **Guard Rails (Vägräcken)** - W-beam, on curves/embankments
4. **Road Signs (Vägskyltar)** - Swedish standards (Trafikverket)
 - Speed limits
 - Warnings (curves, pedestrians)
 - Stop/Yield
 - Street names
 - No parking
5. **Road Markings:**
 - Center lines (dashed/solid)

- Edge lines
- Lane dividers
- Crosswalks (zebra)
- Stop lines
- Directional arrows

6. Street Lights - Every 20-30m

7. Traffic Signals - At intersections

8. Street Furniture:

- Benches
- Trash bins
- Bike racks
- Bus stops (heated!)
- Bollards

9. Drainage - Manholes, grates

Other Splines:

- **Railways** - Extra smooth, with ties, ballast, catenary
- **Power Lines** - Realistic catenary sag, towers
- **Rivers** - UE5 Water Plugin, flow direction
- **Fences** - Follow terrain exactly
- **Trails** - Hiking paths, bike paths

Procedural Generation

- **Buildings** - 3D from OSM footprints, regional styles
- **Roads** - Enhanced networks, proper width
- **Vegetation** - Density maps, species distribution
- **Fences/Walls** - Property boundaries
- **Detail Scatter** - Rocks, logs, debris

Environmental Features

- **Seasonal Variations** - 4 seasons (spring/summer/autumn/winter)
- **Weather Data** - Historical patterns, temperature

- **Water Flow** - Rivers, lakes, waterfalls
- **Sound Occlusion** - Echo zones, reverb
- **Time of Day** - Astronomically accurate sun/moon
- **Erosion Patterns** - Realistic weathering
- **Trail Networks** - Auto-generated hiking paths

Military Simulation Features

- **Tactical Analysis** - AI suggests defensive positions
- **Fortifications:**
 - HESCO barriers
 - Sandbags
 - Trenches (zigzag layouts)
 - Bunkers
 - Watchtowers
 - Roadblocks
 - Speed bumps
 - Wire obstacles
- **Cover Analysis** - Hard vs soft cover
- **Spawn Intelligence** - Player/enemy/objective spawns
- **Navmesh Hints** - Walkable areas, vehicle paths

Artist Tools

- **Reference Photos** - Auto-collected from Street View, Flickr
- **Color Palettes** - Extracted from satellite imagery
- **Minimap Generation** - Top-down styled
- **Viewshed Analysis** - Visibility calculations
- **Material Masks** - AI-generated (grass, rock, dirt, etc)

Workflow Features

- **Template System** - Save/load configurations
- **Multi-Resolution** - 5 LOD levels
- **Tile System** - Split huge areas (100km+)

- **Change Detection** - Re-export only changes
- **Batch Processing** - Multiple areas (Pro)
- **Cloud Processing** - Massive exports (Pro)

Developer Tools

- **Python API** - Automation scripting
- **CLI Tool** - Headless workflows
- **Custom Data Layers** - Import your own GIS data
- **Profile Sharing** - Community templates
- **Validation System** - Pre-export checks

Business Features

- **License System** - Hardware fingerprinting, Supabase validation
 - **Stripe Integration** - Payments, subscriptions
 - **Asset Marketplace** - Community ecosystem (future)
 - **White-Label** - Enterprise rebranding
 - **Analytics** - Usage tracking (opt-in)
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DEVELOPMENT ROADMAP

Phase 1 - MVP (12 weeks)

Deliverable: Working terrain export/import pipeline

Sprints:

1. Week 1: Project setup, folder structure
2. Week 2: QGIS plugin skeleton, UI, licensing
3. Week 3: Elevation data export
4. Week 4: Satellite imagery
5. Week 5: OSM data fetching (with chunking)
6. Week 6: Material generation
7. Week 7: UE5 plugin basics
8. Week 8: Testing, optimization, documentation
- 9-10. Weeks 9-10: Pro features (batch, LiDAR)
- 11-12. Weeks 11-12: Website, Stripe

Total Tasks: 26 **Status at End:** Launch-ready product

Phase 2 - Advanced Features (18 weeks)

Deliverable: Professional-grade features

Sprints: 13-14. Gameplay features (tactical, spawns, navmesh) 15-16. Procedural generation (buildings, roads, vegetation) 17. Environmental (seasons, weather, water) 18. Artist tools (references, palettes, minimap) 19. Workflow (templates, multi-res, tiles) 20. Data analysis (statistics, biomes) 21. Genre-specific (racing, survival) 22. Cloud processing 23. Advanced materials (erosion, trails, geology) 24. Advanced gameplay (assets, population, history) 25. Performance optimization 26. Extended platforms (Unity, Godot, Blender) 27. Educational & special uses 28. Virtual production 29. Developer tools (API, CLI) 30. Monetization (marketplace, white-label, analytics) 31. Game Profiles + Hardware Validation

Total Tasks: 54 (additional) **Total Project:** 80 tasks

Phase 3 - Growth (Year 2+)

- Additional engine support
- Mobile preview app
- VR preview
- AI-powered features
- Real-time collaboration
- International expansion

📦 FILE FORMAT SPECIFICATION

.rterrain Format

Structure:

Offset	Size	Content
0x00	4	Magic: 'RTER' (0x52544552)
0x04	4	Version (uint32)
0x08	4	Header size (uint32)
0x0C	N	Header JSON (UTF-8)
0x0C+N	...	Data blocks
EOF-32	32	SHA256 checksum

Header JSON:

json

```
{
  "format": "RealTerrain Package",
  "version": 1,
  "created": "2024-12-08T10:30:00Z",
  "plugin_version": "1.0.0",
  "project": {
    "name": "Stockholm City",
    "profile": "military_simulation",
    "location": "Stockholm, Sweden",
    "bbox": [18.0, 59.3, 18.1, 59.4],
    "area_km2": 15.2
  },
  "terrain": {
    "resolution_m": 5,
    "heightmap_size": [4096, 4096],
    "min_elevation": 0,
    "max_elevation": 125,
    "coordinate_system": "WGS84"
  },
  "content": {
    "osm_objects": 5234,
    "buildings": 1234,
    "roads_km": 45.6,
    "trees": 595000
  },
  "ue5": {
    "landscape_components": 64,
    "recommended_lod_levels": 5,
    "world_partition": true,
    "nanite_recommended": true,
    "estimated_vram_mb": 6800
  },
  "validation": {
    "min_ram_gb": 8,
    "min_vram_gb": 6,
    "warnings": []
  }
}
```

Data Blocks:

1. Heightmap (blosc compressed numpy array)
2. Satellite texture (JPEG, already compressed)
3. Material masks (blosc compressed)

4. OSM data (zlib compressed JSON)

5. Vegetation (zlib compressed JSON)

6. Splines (roads, railways, etc)

7. Road details (sidewalks, signs, etc)

8. Tactical data (if milsim)

Compression:

- Overall: ~75% size reduction
- Example: 350 MB → 87 MB

Benefits:

- Single file (can't lose parts)
 - Email-friendly (<100 MB)
 - Git LFS-friendly
 - Fast transfer
 - Integrity checksums
 - Version tracking
 - Multi-platform
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BUSINESS MODEL

Pricing Tiers

Free (Community):

- Price: \$0
- Max area: 5x5 km
- Basic features only
- UE5 export only
- Community support
- Watermark on exports
- Target: Hobbyists, students

Pro:

- Price: \$29/month or \$249/year
- Unlimited area
- All advanced features
- Unity + Godot export
- Cloud processing (50 GB/month)
- Priority support
- Commercial license
- No watermark
- Target: Indie developers, small studios

Enterprise:

- Price: \$99/user/month (min 5 seats)
- Everything in Pro
- White-label option
- API access
- Dedicated support
- Custom features
- Training included
- SLA guarantees
- Target: AA/AAA studios

Educational:

- Price: \$9/month
- Pro features
- Verified student/teacher
- Non-commercial use
- Target: Schools, universities

Revenue Streams

- 1. Subscriptions (70%)**
- 2. Perpetual licenses (10%)**
- 3. Asset marketplace (10% - future)**

4. Consulting/training (5%)

5. API usage (5%)

Revenue Projections

Year 1:

- 50,000 free users
- 2,000 Pro (\$58K/month)
- 20 Enterprise (\$20K/month)
- Total: ~\$1.05M/year

Year 2:

- 200,000 free users
 - 8,000 Pro (\$232K/month)
 - 80 Enterprise (\$80K/month)
 - Marketplace: \$30K/month
 - Total: ~\$4.5M/year
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MARKETING STRATEGY

Target Markets

1. Game Development (\$200B industry)

- Indie developers
- AA/AAA studios
- Mobile developers
- Mod creators

2. Architecture/Viz (\$10B market)

- Arch-viz studios
- Real estate
- Urban planning

3. Film & TV (\$50B market)

- Virtual production
- VFX studios

- Previsualization

4. Education (\$7T global)

- Schools (geography, geology)
- Universities (research)
- Training simulations

5. Military/Defense (\$2T global)

- Training simulators
- Mission planning

Marketing Channels

Content Marketing:

- YouTube tutorials (weekly)
- Blog posts (SEO optimized)
- Case studies
- Documentation

Community:

- Discord server
- Reddit (r/unrealengine, r/gamedev)
- Twitter/X devlog
- Forum engagement

Partnerships:

- Epic Games (Marketplace)
- Unity Technologies
- Quixel/Megascans
- QGIS community

Paid Advertising:

- Google Ads (search)
- YouTube ads (tutorials)
- Reddit ads (gamedev)
- LinkedIn (B2B)

