



🔧 Official Technical Documentation & Architecture Specification • whoopi.dev

The Next-Generation Cross-Platform UI Framework & 240Hz Ultra Rendering Engine for .NET

Engineered for extreme visual fidelity, sub-millisecond hardware composition, 16-region surgical dirty-rectangle tracking, and 100% open-source flexibility across Windows, macOS, Linux, iOS, Android, and WebAssembly.



Official Website: whoopi.dev



Explore Developer Guide

**240
Hz**

Ultra Composition
Refresh Rate

**0.32
ms**

Average Hardware
Frame Pass

**512
MB**

Dedicated Skia
GPU VRAM Cache

**100%
Free**

MIT Licensed •
Zero Telemetry

ARCHITECTURE & PIPELINE

How the Whoopi Ultra Composition Engine Works

Whoopi eliminates traditional immediate-mode bottlenecks with an asynchronous retained-mode Server Compositor, lock-free binary delta batches, and hardware-accelerated GPU rasterization.

1. Whoopi XAML & IL

Compiled XamlX + Roslyn
Zero-Reflection Bindings

2. Retained Visual Tree

Whoopi.Base & Controls
Batched Delta Transport

3. Ultra Compositor

16x Surgical Dirty Rects
Adaptive Grace Ticks

4. Skia GPU 240Hz

512 MB VRAM Cache
D3D12 / Vulkan / Metal

STAGE 01

Ahead-of-Time XAML IL

Every .axaml and .xaml file is compiled directly into MSIL bytecode (CompileWhoopiXamlTask) with strongly-typed Roslyn source generators.

STAGE 02

Lock-Free Batch Transport

UI thread property updates are serialized into pooled binary CompositionBatch streams and dispatched to the render thread with zero UI blocking.

STAGE 03

16-Region Surgical Clipping

ServerCompositionTarget tracks up to 16 independent dirty rectangles (MergeEagerness = 600), redrawing only the exact pixels that changed.

STAGE 04

512MB GPU Resource Cache

Vector paths, glyph atlases, blur shaders, and bitmaps remain resident in a 512 MB VRAM cache (Whoopi.Skia), achieving 240Hz frame pacing.

Benchmark Comparison: GPU Resource Cache & Refresh Throughput

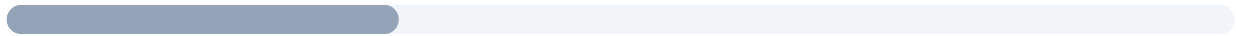
 Whoopi Ultra Composition Engine (v12.2 • UltraPerformance Profile) **240 FPS • 0.32 ms • 512 MB VRAM** Cache



 Whoopi High-Fidelity Profile (Cubic HighQuality Interpolation) **120 FPS • 0.55 ms • 768 MB VRAM** Cache



 Legacy Desktop UI Frameworks (Default Unoptimized Pipeline) **60 FPS • 3.80 ms • 28 MB VRAM** Cache



DYNAMIC ENGINE TUNING

Whoopi Render Engine Profiles Specification

Configure at startup via `.UseWhoopiRenderEngine()` or switch dynamically at runtime via `WhoopiRenderEngine.SetProfile()`.

Profile Name	Target Refresh Rate	GPU VRAM Cache	Dirty-Rect Regions	Bitmap Sampling	Recommended Workload
UltraPerformance	240 Hz	512 MB	16 Independent Regions	MediumQuality	High-frequency trading terminals, real-time telemetry, 240Hz displays
HighFidelity	120 Hz	768 MB	12 Independent Regions	HighQuality (Cubic)	Visual design studios (Whoopi Studio Pro), CAD & media editors
Balanced	60 Hz	256 MB	10 Independent Regions	HighQuality	General enterprise desktop applications & productivity suites
PowerSaver	30 Hz	64 MB	4 Independent Regions	LowQuality	Battery-constrained mobile devices, embedded IoT panels, kiosks

WHY CHOOSE WHOOPI

Key Advantages & Exclusive Capabilities

Designed from the ground up to empower modern .NET engineers with uncompromising speed, visual elegance, and complete freedom.



4 Dynamic Rendering Profiles

Switch seamlessly at runtime between **UltraPerformance (240Hz)**, **HighFidelity (120Hz Cubic)**, **Balanced (60Hz)**, and **PowerSaver (30Hz Eco)** via `WhoopiRenderEngine.SetProfile()`.



Whoopi Studio Pro Visual Designer

Includes a 100% free interactive visual UI builder, live Property Inspector, 240Hz Stress Benchmark Suite, and instant XAML code generator—no commercial subscriptions required.



100% Unified Whoopi Assemblies

Every library, theme, analyzer, and build task compiles cleanly under the `Whoopi.*` namespace and binary identity (`Whoopi.Base.dll`, `Whoopi.Controls.dll`, `Whoopi.Themes.Fluent.dll`).



Built-In Glassmorphism & Mica

First-class Windows 11 Mica & Acrylic blur transparency paired with ready-to-use CSS-like style classes: `Classes="accent"`, `Classes="glass"`, and `Classes="pill"`.



Real-Time Engine Telemetry API

Query live compositor FPS, EMA frame time (ms), total frames, active targets, and rendered visual counts anytime via `WhoopiRenderEngine.GetStats()`.



Standalone NuGet Package

Ships as a self-contained NuGet package (`Whoopi.12.2.999.nupkg`) targeting `net8.0` with zero external commercial build-service dependencies.

WRITE ONCE, RENDER EVERYWHERE

Supported Operating Systems & Platforms

Pixel-perfect consistency across every major desktop, mobile, embedded, and web runtime.



Windows

Win32 • Direct3D / ANGLE • Win11
Mica



macOS

Native AppKit • Metal GPU Backend



Linux Desktop

X11 • Wayland • Vulkan / OpenGL



iOS & iPadOS

UIKit • Metal Hardware Acceleration



Android

Native Activity • Vulkan / GLES 3.0



WebAssembly

Browser HTML5 Canvas • WebGL 2.0

REAL-WORLD APPLICATIONS

Primary Industry Use Cases



Financial & Trading Terminals

Ideal for 240Hz real-time order books, candlestick charting, and multi-monitor financial dashboards where sub-millisecond dirty-rect updates prevent frame drops.



Audio DAWs & Creative Studios

Powers complex node graphs, timeline editors, and hardware-accelerated spectrum analyzers with zero garbage-collection stutter on the render thread.



Medical & Industrial HMI / IoT

Runs directly on Windows, Linux X11/Wayland,
or embedded Linux Framebuffer (DRM/KMS)
with deterministic GPU memory limits and
high-contrast themes.

DEVELOPER GUIDE

Quick Start & Code Reference

1. Activate Whoopi Ultra Rendering Engine in Program.cs

```
using System;
using Whoopi;
using Whoopi.Rendering;

namespace MyWhoopiApp
{
    internal class Program
    {
        [STAThread]
        public static void Main(string[] args) => BuildWhoopiApp()
            .StartWithClassicDesktopLifetime(args);

        public static AppBuilder BuildWhoopiApp()
            => AppBuilder.Configure<App>()
                .UsePlatformDetect()
                .UseWhoopiRenderEngine(WhoopiRenderProfile.UltraPerformance) // 240Hz
                .WithInterFont()
                .LogToTrace();
    }
}
```

2. Modern Whoopi XAML Window with Mica & Glassmorphism (MainWindow.axaml)

```
<Window xmlns="https://github.com/whoopiui"
        xmlns:x="http://schemas.microsoft.com/winfx/2006/xaml"
        Title="Powered by Whoopi UI (https://whoopi.dev)"
        TransparencyLevelHint="Mica,AcrylicBlur"
        Background="#0B0E14">

    <StackPanel Spacing="16" Margin="32">
        <Button Classes="accent" Content="🚀 Launch 240Hz Action" />
        <Button Classes="pill glass" Content="💎 Glassmorphism Capsule" />
        <ToggleSwitch Content="Enable 16-Region Surgical Dirty-Rects" IsChecked="True" />
    </StackPanel>
</Window>
```

3. Switch Profiles & Read Live Telemetry at Runtime

```
// Dynamically switch between UltraPerformance, HighFidelity, Balanced, or PowerSaver
WhoopiRenderEngine.SetProfile(WhoopiRenderProfile.HighFidelity);

// Read real-time compositor metrics:
WhoopiRenderStats stats = WhoopiRenderEngine.GetStats();
Console.WriteLine($"Engine: {stats.EngineName} | FPS: {stats.CurrentFps:F1} | FrameTi
```

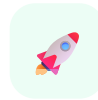
TECHNICAL REFERENCE

Core Assemblies & NuGet Distribution



Core Framework Assemblies

- `Whoopi.Base.dll`: Visual tree, layout, styling & `WhoopiRenderEngine`.
- `Whoopi.Controls.dll`: Windowing, UI controls & `AppBuilder`.
- `Whoopi.Markup.Xaml.dll`: Ahead-of-Time XamlX IL compiler.
- `Whoopi.Themes.Fluent.dll` / `Fluent2.dll`: Modern glass, pill & accent themes.



Hardware Graphics Backends

- `Whoopi.Skia.dll`: 512 MB VRAM cache & cubic high-DPI sampling.
- `Whoopi.Win32.dll`: Win32 windowing, Direct3D 11/12 & Win11 Mica.
- `Whoopi.Vulkan.dll` / `Whoopi.OpenGL.dll` / `Whoopi.Metal.dll`.
- `Whoopi.Desktop.dll`: Unified cross-platform desktop bootstrapper.



NuGet Deployment & Studio

- **NuGet Package:** build-output/nuget/Whoopi.12.2.999.nupkg
- **Visual Studio & Standalone Designer:** WhoopiWindowsApp.exe (Whoopi Studio Pro)
- **Control Gallery:** ControlCatalog.Desktop.exe

Whoopi UI Framework & Ultra Composition Engine

Official Website: <https://whoopi.dev> • Version 12.2.999 LTS • Released under the MIT License

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