



SKIA

Leveraging SKIA in RAD Studio



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 **embarcadero**

Agenda

- 1 Introduction to SKIA**
- 2 Features**
- 3 SKIA in RAD Studio**
- 4 Architecture**
- 5 Demo**
- 6 Case Study**
- 7 Q&A**

Who am I?

- Pre-sales consultant at Embarcadero Technologies
- 15 years developing Delphi applications
- Linux micro-services developed with Delphi
- FullStack web development
(Laravel, Codeigniter, Bootstrap, Vue...)
- Docker enthusiast





1 Introduction to SKIA

What is SKIA?

“Skia is an open source 2D graphics library which provides common APIs that work across a variety of hardware and software platforms. It serves as the graphics engine for Google Chrome and ChromeOS, Android, Flutter, and many other products.” - skia.org



What is SKIA?

- Originally developed by Skia inc.
- Purchased by Google in 2005
- Made Open Source in 2008
- Actively maintained and sponsored by Google
- ANGLE backed, which translates OpenGL ES calls into vendor's native APIs

Almost Native Graphics Layer Engine

SKIA Platforms

All the most popular platforms in the world, such as:

- Windows
- macOS
- iOS (including simulator)
- Android (including simulator)
- Linux (main distributions)
- FuchsiaOS
- Tizen
- tvOS
- watchOS



Windows



iOS

Linux (main distributions)

TIZEN™



FuchsiaOS



Fuchsia

Tizen

tvOS

watchOS

What is SKIA?

Some projects where SKIA is being used



android





2 Features

2D DRAWINGS

Shapes, paths and texts

ANTIALIASING

High quality drawings with smoothing of jagged edges

RTL LANGUAGE

Support for texts in Persian, Arabic, Hebrew and other right-to-left languages

SVG

Rendering and creation

PARALLELISM

Possibility to draw in background threads in a really parallel way

UNICODE

Render and string parser (grapheme iterators)

IMAGE FORMATS

BMP, GIF, ICO, JPG, PNG, WBMP, WEBP, and raw images

PDF

Creation of PDF documents

IMAGE/COLOR FILTERS

Apply any type of filter to adjust photo colors, color drawings, produce effects

ANIMATED IMAGE FORMATS

Lottie, Telegram Stickers, Animated GIF, and Animated WEBP

ADVANCED FONT PROPERTIES

Font weight, families fallbacks, max number of lines, line spacing, justified text and more

SHADER LANGUAGE STANDARDIZATION

Create a single shader code to execute drawings with the GPU on any platform



SKIA in RAD Studio

SKIA in RAD Studio

“Skia4Delphi is a cross-platform 2D graphics API for Delphi and C++Builder based on Google's Skia Graphics Library. Provides common 2D APIs by abstracting complexities in implementing low-level libraries used behind, such as OpenGL, Vulkan, DirectX, and Metal, among others”



SKIA in RAD Studio

The library conceptually exists in 4 parts

SKIA API

Console, FMX, VCL

UI Controls

FMX, VCL

Codecs for image controls

FMX, VCL

Rendering

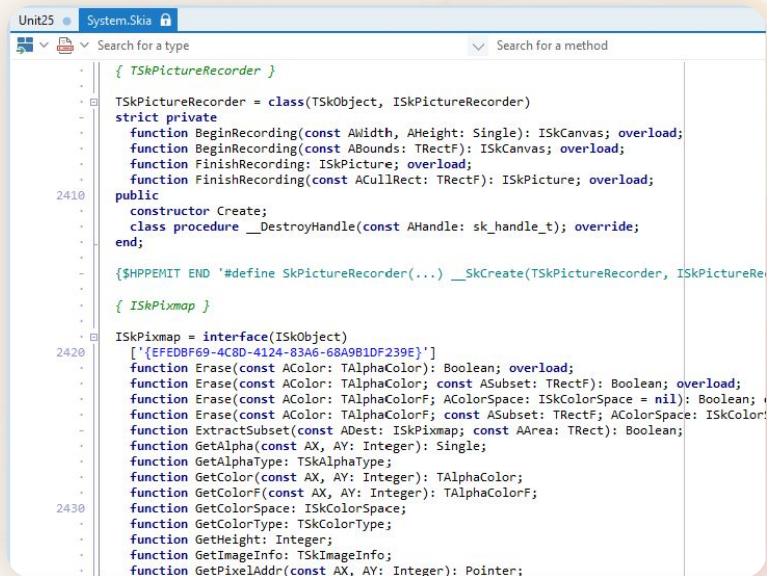
FMX

SKIA in RAD Studio

SKIA API

Access to the pure SKIA library, through a single unit:

Skia.pas or **Skia.hpp**



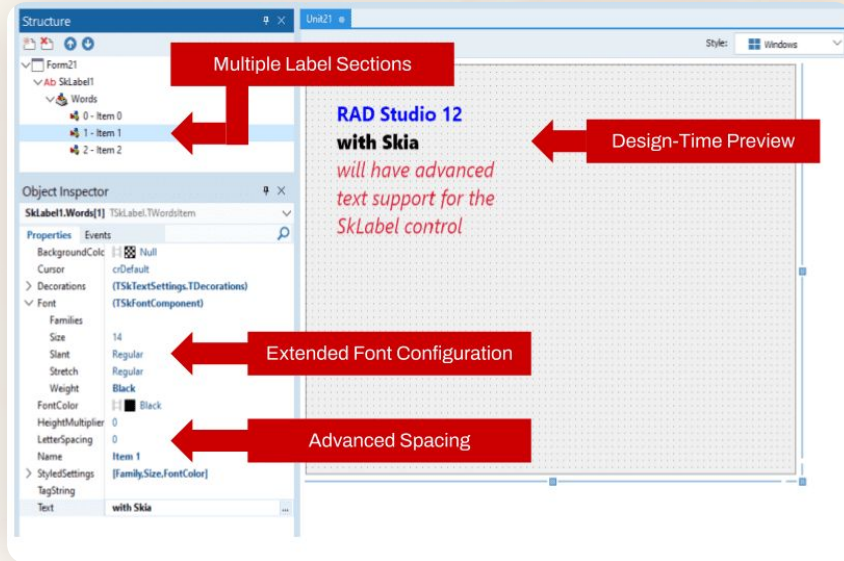
```
Unit25 System.Skia
Search for a type Search for a method
{ TSKPictureRecorder }
TSKPictureRecorder = class(TSkObject, ISkPictureRecorder)
strict private
function BeginRecording(const AWidth, AHeight: Single): ISkCanvas; overload;
function BeginRecording(const ABounds: TRectF): ISkCanvas; overload;
function FinishRecording: ISkPicture; overload;
function FinishRecording(const ACullRect: TRectF): ISkPicture; overload;
2410 public
constructor Create;
class procedure __DestroyHandle(const AHandle: sk_handle_t); override;
end;
{$HPPERMIT END 'define SkPictureRecorder(...) __SkCreate(TSKPictureRecorder, ISkPictureRecorder)'}
{ ISkPixmap }
ISkPixmap = interface(ISkObject)
2420 ['{EFEDBF69-4C8D-4124-83A6-68A981DF239E}']
function Erase(const AColor: TAlphaColor): Boolean; overload;
function Erase(const AColor: TAlphaColor; const ASubset: TRectF): Boolean; overload;
function Erase(const AColor: TAlphaColor; AColorSpace: ISkColorSpace = nil): Boolean; overload;
function Erase(const AColor: TAlphaColorF; const ASubset: TRectF; AColorSpace: ISkColorSpace = nil): Boolean; overload;
function ExtractSubset(const ADest: ISkPixmap; const AArea: TRect): Boolean;
function GetAlpha(const AX, AY: Integer): Single;
function GetAlphaType: TSkAlphaType;
function GetColor(const AX, AY: Integer): TAlphaColor;
function GetColorF(const AX, AY: Integer): TAlphaColorF;
2430 function GetColorSpace: ISkColorSpace;
function GetColorType: TSkColorType;
function GetHeight: Integer;
function GetImageInfo: TSkImageInfo;
function GetPixelAddr(const AX, AY: Integer): Pointer;
```


SKIA in RAD Studio

UI Controls

(for both FMX and VCL)

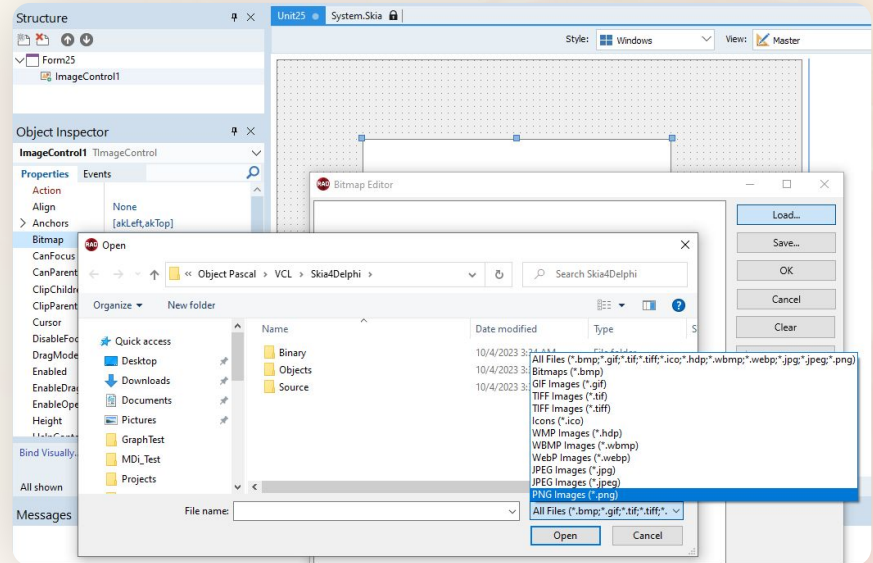
- **TSkAnimatedImage**
Play Lottie, Telegram stickers, animated GIF and animated WebP
- **TSkLabel1**
Font weight, Font slant, multiple styles in text, BiDi (Right-to-Left). Justify horizontal alignment, and much more
- **TSkPaintBox**
Use OnDraw event to draw with Skia API directly on control
- **TSkSvg**
Load icons svgs, change colors and wrap mode



SKIA in RAD Studio

Codecs for image controls

Native support for new image formats like WebP in **FMX** and **VCL** (load and save)



SKIA in RAD Studio

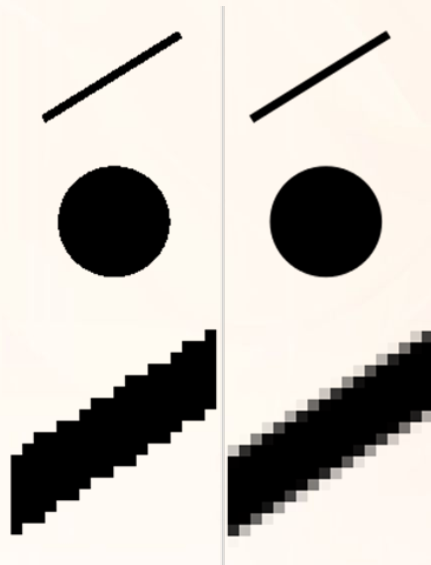
App Rendering

- Replacement of FMX graphic engine with SKIA
- Improve the quality of drawings; smoothing of jagged edges
- Gain up to 50% increase in graphics performance
- Increase drawing fidelity
- Adds support for right-to-left languages

SKIA in RAD Studio

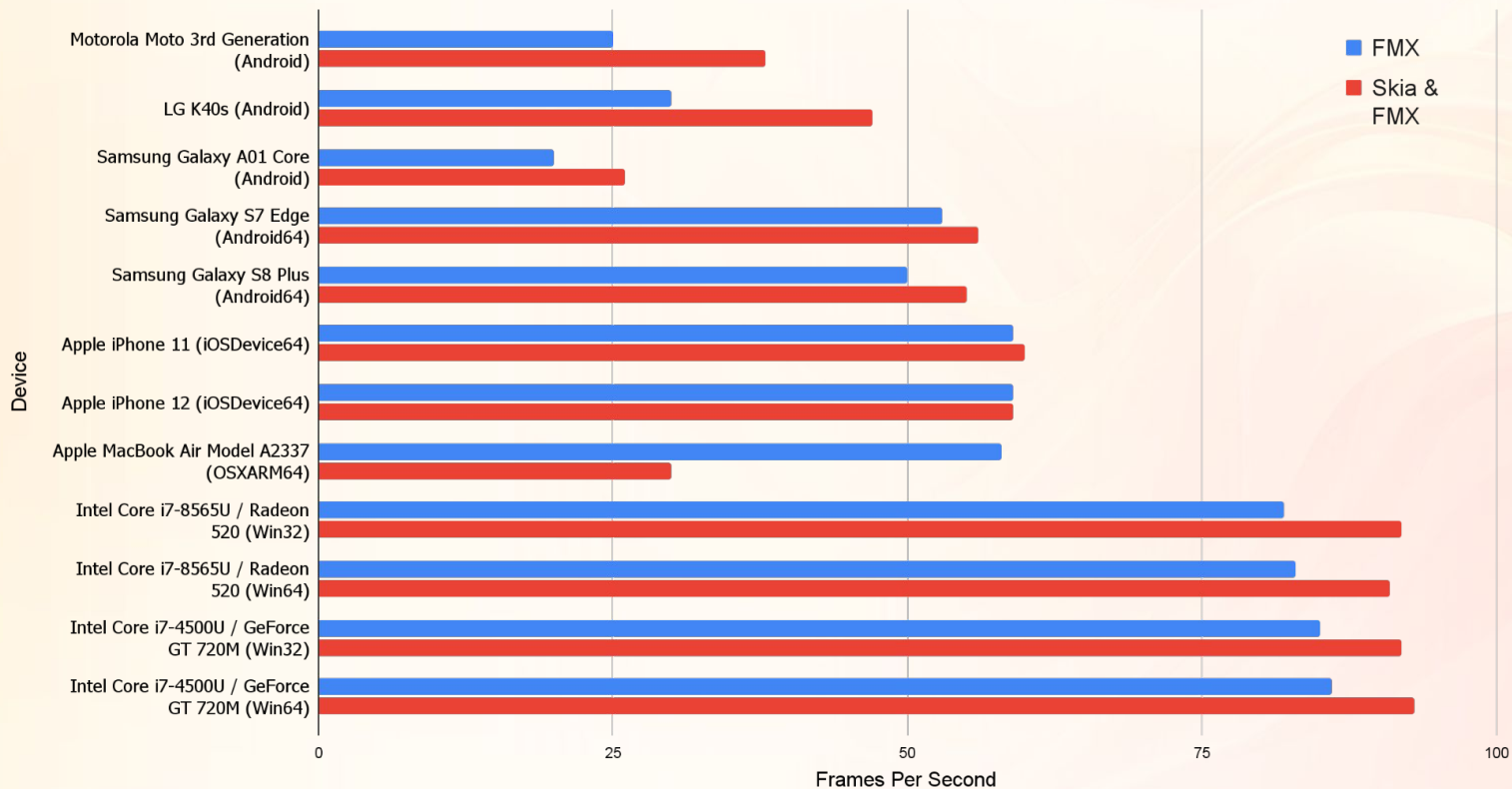
Just one line of code

```
FMX.Skia.GlobalUseSkia := True;
```



Improved drawing with anti-aliasing in Skia (on the right)

App Rendering Benchmarks



FireMonkey Skia support for all platforms

For both in **C++Builder** and **Delphi (FMX & VCL)**

Leveraging the Skia4Delphi open-source project

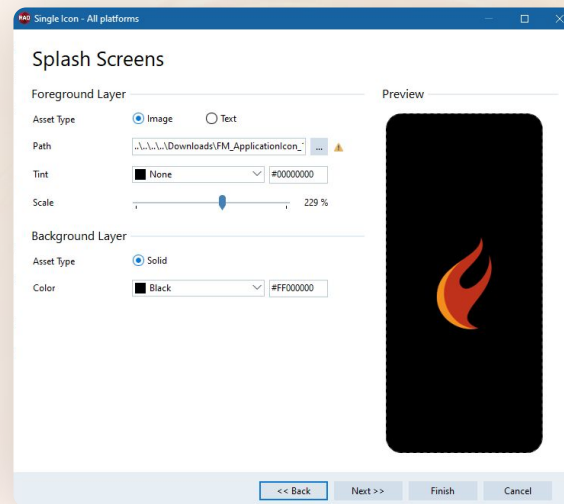
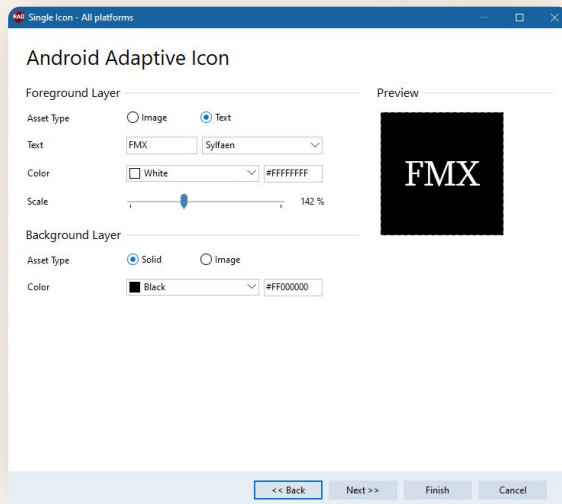
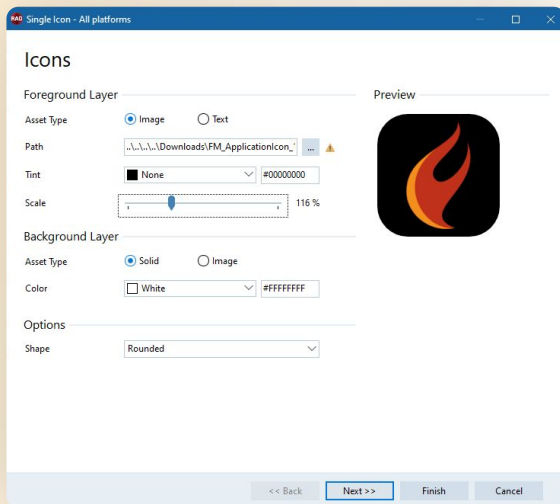
Including additional capabilities not found in the open-source project:

- Vulkan support - Enhanced graphical performance and energy efficiency on Android compared to OpenGL ES
- Skia Shading Language (SKSL) for effects and filters
- WebP Encoder
- Native printer for Windows and PDF printing for all platforms

Used also for new icon and splash wizard

New Icon and Splash Wizard

Internally using multiple SKIA features



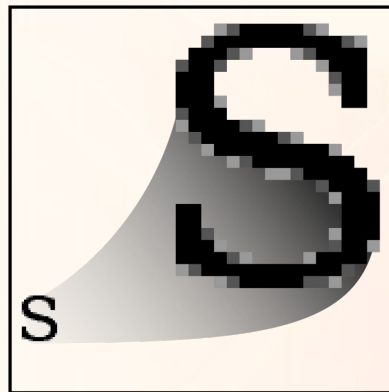
The background features a vibrant gradient from light pink at the top to deep orange at the bottom. Overlaid on this are several layers of semi-transparent, wavy, ribbon-like shapes that create a sense of depth and movement. On the left side, a large, bold, orange number '4' is positioned. The word 'Architecture' is written in a clean, white, sans-serif font, centered horizontally and partially overlapping the '4' and the wavy patterns.

Architecture

Architecture

SVG format

- Resolution independent and scalable (vector based)
- Easier editing and customization
- Much smaller file sizes
- For icons, always prefer SVG over static images like PNG
- Thousands of free icons and images available on web



Raster
GIF, JPEG, PNG



Vector
SVG

Architecture

Why Vector Formats?



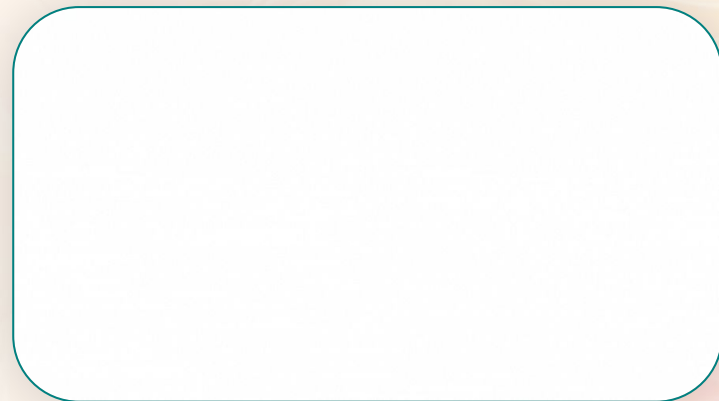
Architecture

```
<?xml version="1.0" encoding="UTF-8" standalone="no"?> <svg xmlns:dc="http://purl.org/dc/elements/1.1/" xmlns:cc="http://creativecommons.org/ns#" xmlns:rdf="http://www.w3.org/1999/02/22-rdf-syntax-ns#"
xmlns:svg="http://www.w3.org/2000/svg" xmlns="http://www.w3.org/2000/svg" xmlns:xlink="http://www.w3.org/1999/xlink" xmlns:sodipodi="http://sodipodi.sourceforge.net/DTD/sodipodi-0.dtd"
xmlns:inkscape="http://www.inkscape.org/namespaces/inkscape" width="702.22321" height="307.65875" id="svg2" version="1.1" inkscape:version="0.48.0 r9654" sodipodi:docname="EnigmaLogo.svg" style="display:inline"
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```

Architecture

Lottie Animation Benefits

- Resolution independent and scalable vector format
- Lightweight, 600% smaller when compared to GIF
- Extraordinary performance with smooth animation
- Thousands of free Lottie (JSON) animations available on web



lottiefiles.com — lordicon.com — useanimations.com — icons8.com/animated-icons — iconscout.com/free-lotties

Architecture

Vector animations

Lottie is a JSON based animation format

Name	Type	Size	Relative
dev_coding.tgs	tgs (zipped JSON)	55,834	-
dev_coding.mp4	mpeg4 (lossy)	373,642	7x
dev_coding.json	lottie (JSON)	583,485	10x
dev_coding.gif	gif (lossless)	5,020,259	90x



Architecture

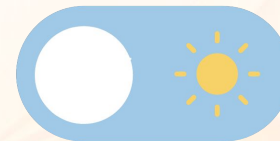
User Interface Design

SVG & Lottie make it easy for designer to create smooth and high resolution user interface templates. Then with Skia4Delphi you can make the UI match perfectly.

Make motion part of your UI/UX!

Other uses:

- About screens
- splash screens
- installers
- user onboarding
- wizards...



Redistributables

Platform	Library	Size
Win32	sk4d.dll	18 mb
Win64	sk4d.dll	19 mb
Android	libsk4d.so	21 mb
Android64	libsk4d.so	25 mb
iOSDevice64	sk4d.a	32 mb
Ubuntu64	libsk4d.so	23 mb
RedHat64	libsk4d.so	23 mb
OSX64	sk4d.dylib	21 mb
OSXARM64	sk4d.dylib	20 mb



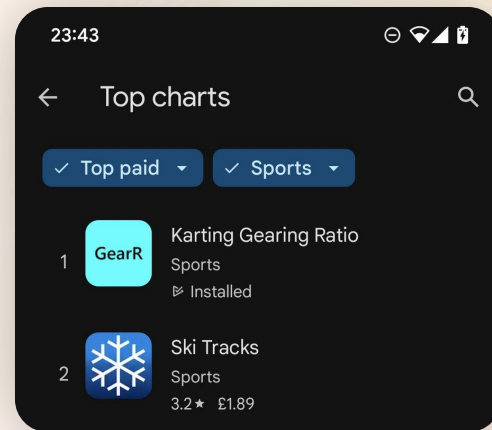


Demo

The background features a vibrant orange-to-yellow gradient with fluid, wavy patterns that resemble liquid or smoke. On the left side, a large, bold, orange number '6' is partially visible. The text 'Case Study' is centered horizontally and partially overlaps the '6'.

Case Study

Case Study



Q&A



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