



RAD Studio™ 10.4

The Most Productive App Development Toolkit Just Got Better

Idera Inc. Developer Tools



Many Popular Technology Productivity Brands



6 Brands Dedicated to Developers



Delphi



C++Builder



RAD Studio



Interbase

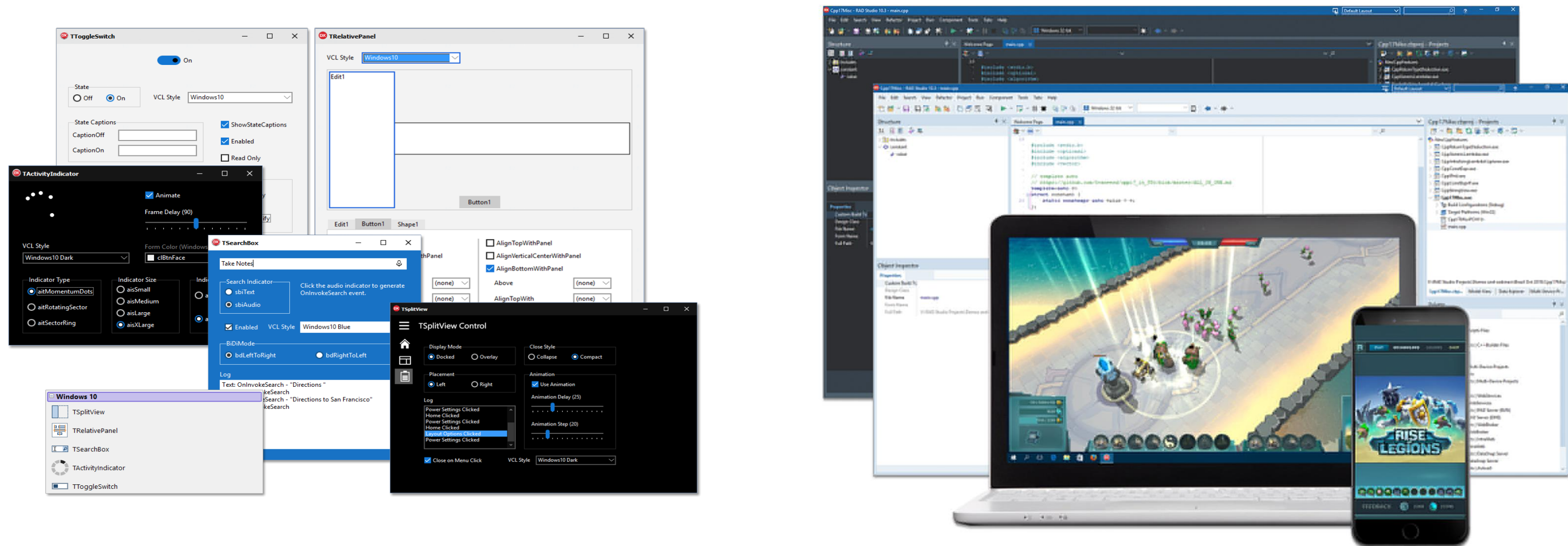


RAD Server



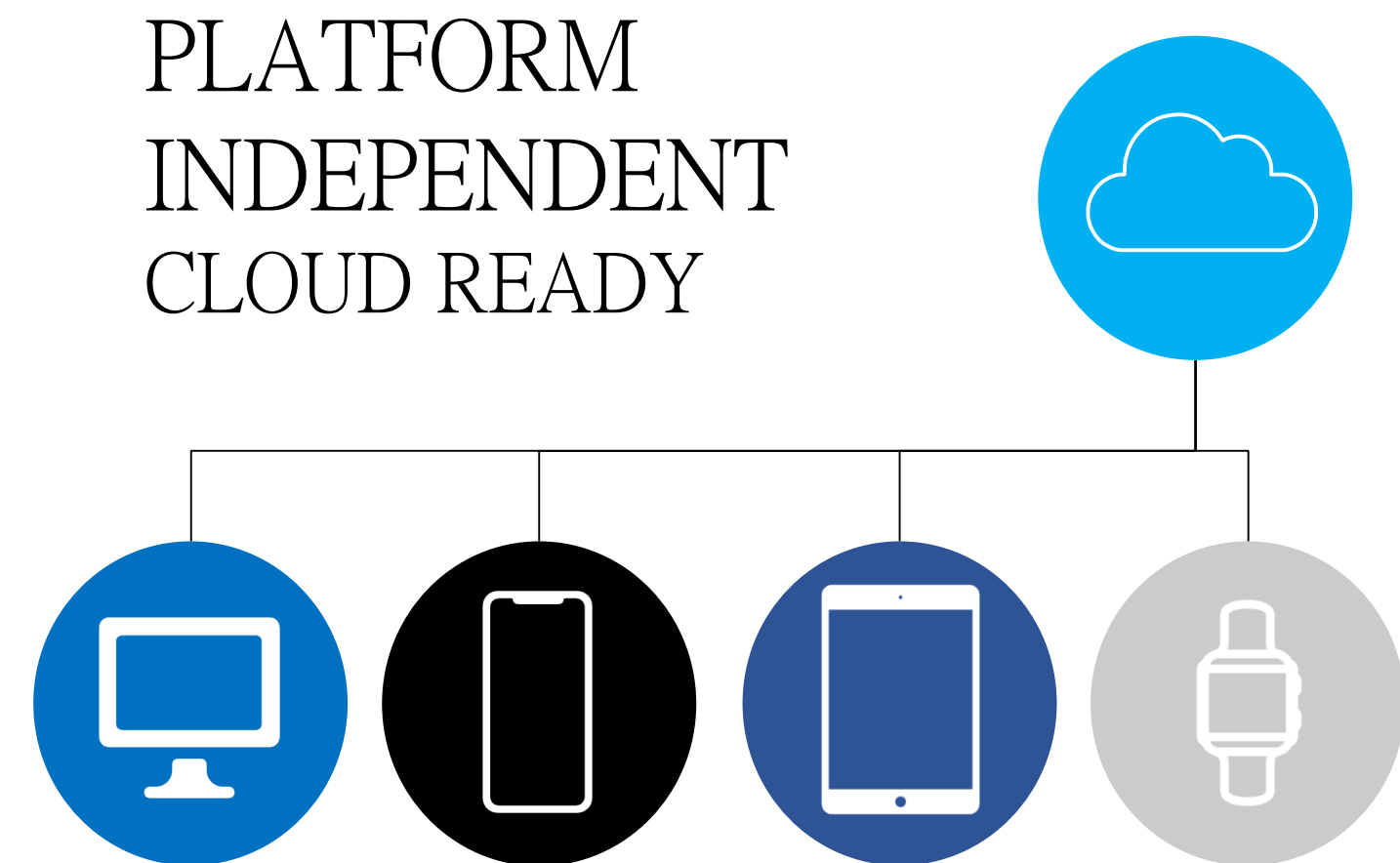
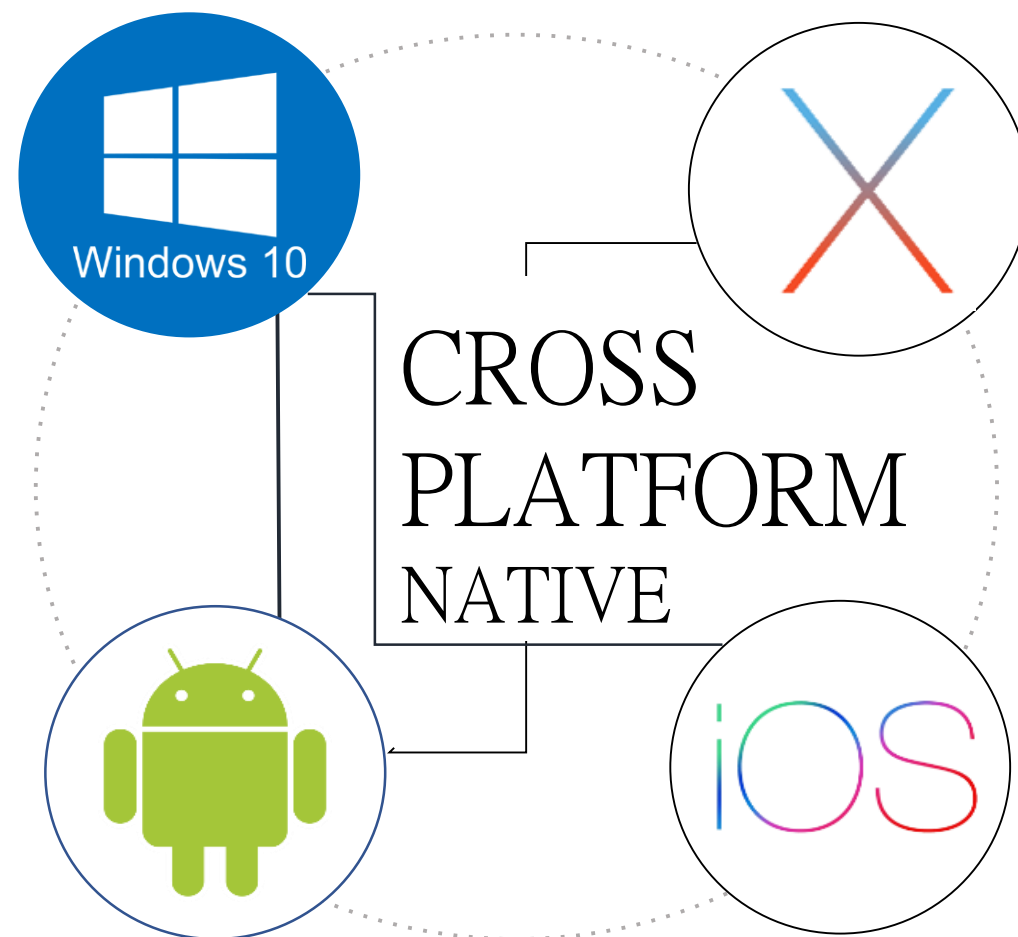
Fast, Visual Development

RAD Studio provides powerful VCL controls for Windows 10 and enables FMX multi-device application development for Windows, Mac, Linux, iOS and Android

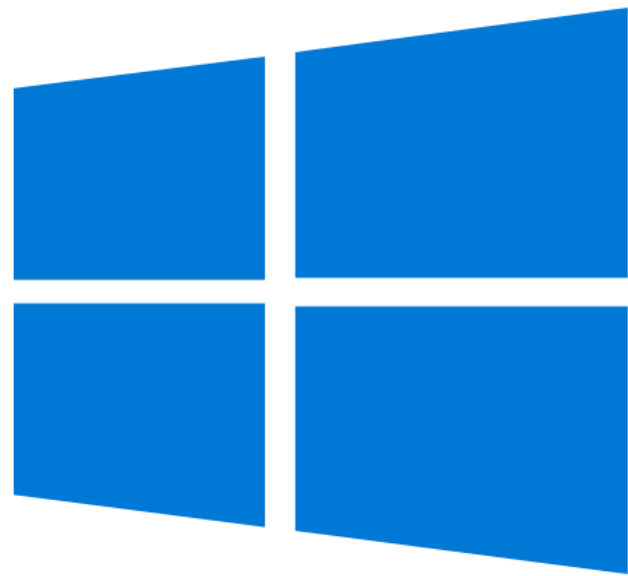


What is RAD Studio?

RAD Studio is the ultimate IDE with features both C++ and Delphi developers love: design, code, debug, and test for cross-platform deployment with native performance.



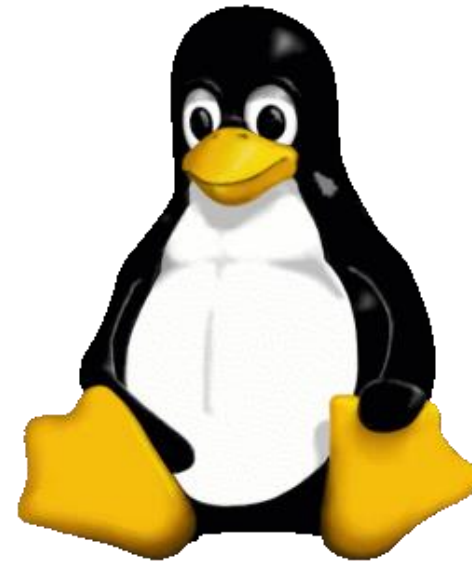
RAD Studio 10.4 Platform Support



Windows 10



macOS Catalina
(Delphi Only)



Linux 64-bit
Ubuntu & Red Hat
Enterprise
(Delphi Only)



Android 10
(64-bit support is
Delphi only)



iOS 13

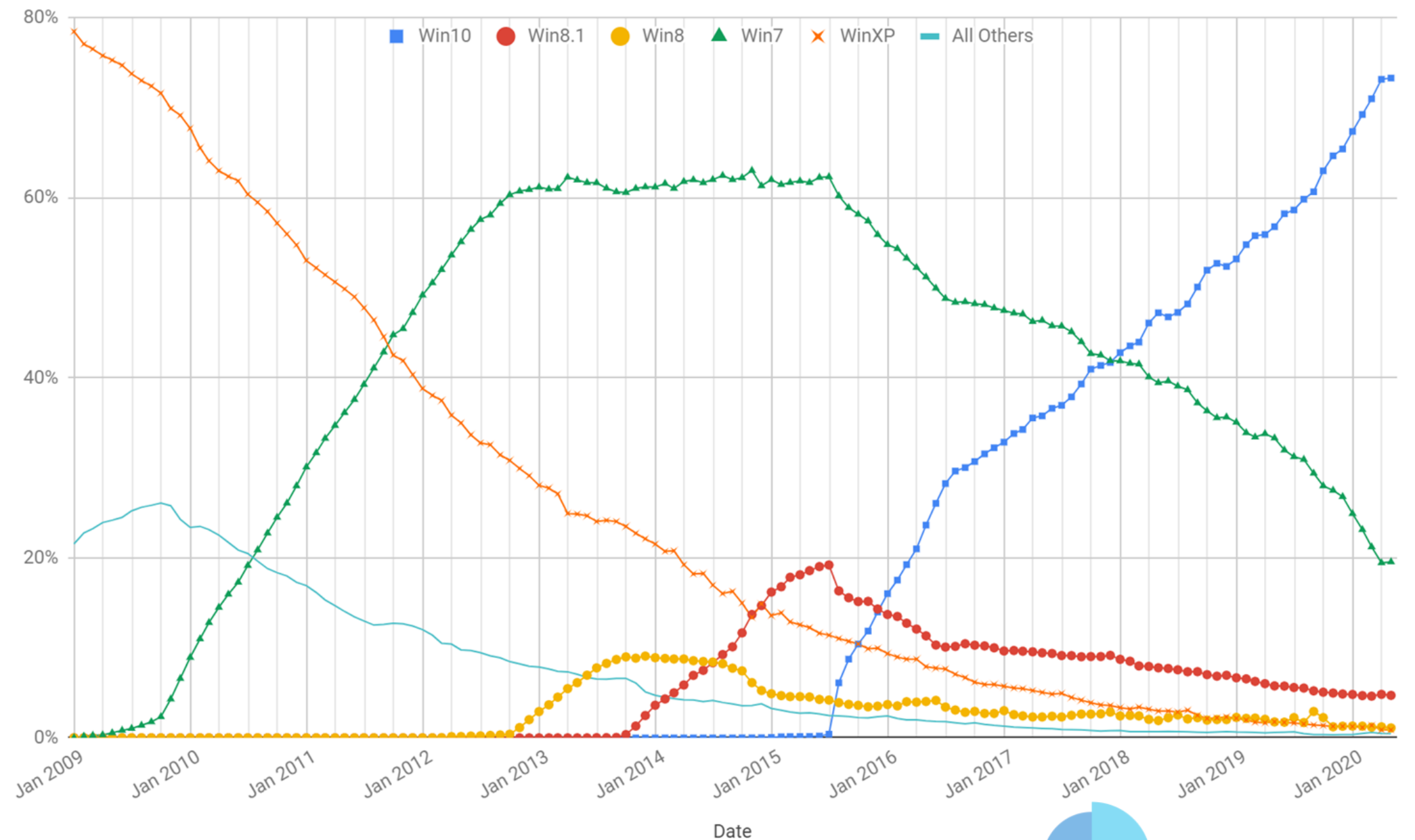
Officially Supporting!

Windows 10 is King

- The most important platform for our current customers
- Add Windows 10 features without breaking Windows 7 compatibility
- Microsoft stopped supporting Windows 7 in January 2020

Windows Desktop Operating System Versions

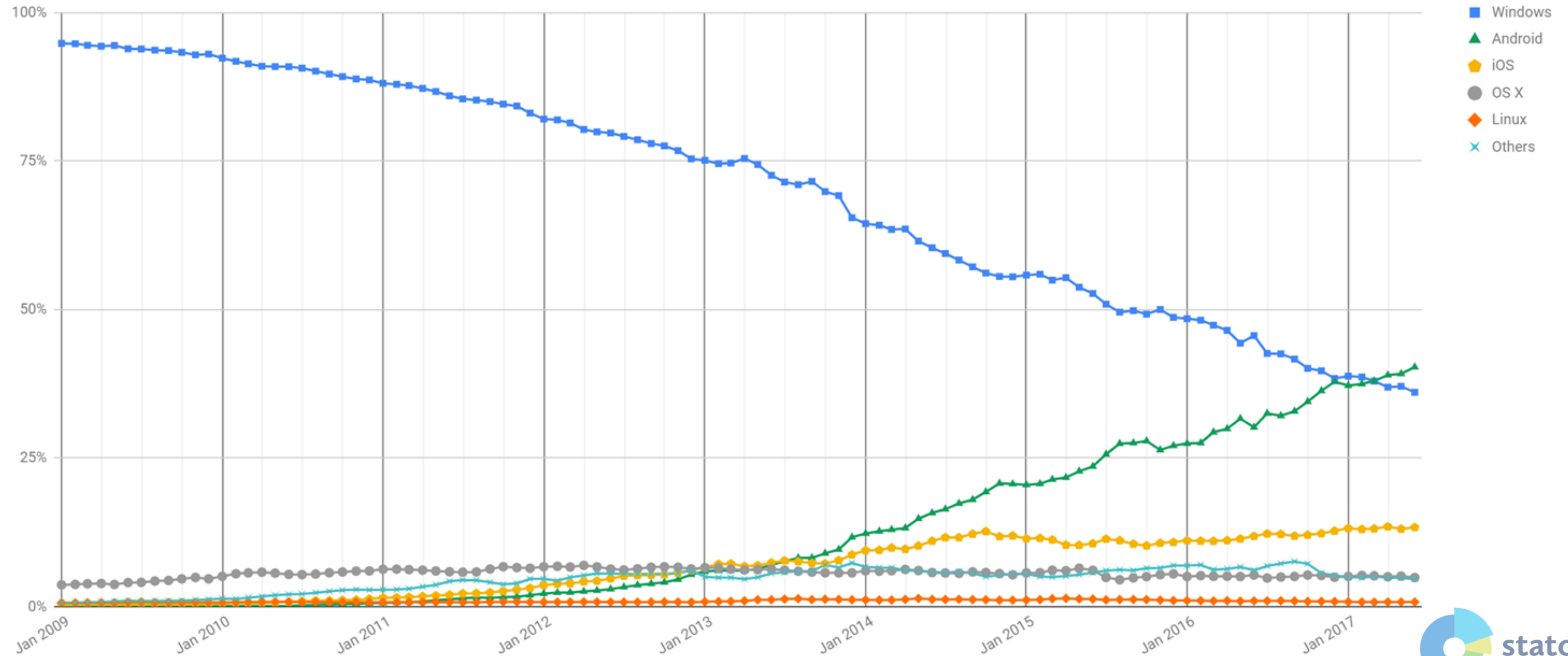
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Multi Device is the Future

Desktop, Mobile & Tablet Operating System Market Share Worldwide

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Most Business Use Still Starts with Desktops



Focused apps vs
replicating Desktops



More solutions to
extend Desktop Apps to
“Browsers”

10.4 Sydney Focus Themes...

● Windows 10 VCL Desktop Development

- Maintaining VCL as the best desktop UI library, with first-class High-DPI support
- Further platform integration with Chromium Edge
- Expanded C++ compilers and debuggers for Windows 10

● Delphi Multi-Device Development

- Expanding FireMonkey with components wrapping newer platform APIs
- Unified memory management

● Developer Productivity

- Delphi CodeInsight with LSP
- Reworked offline installation experience
- Delphi Managed Records

● ...1,000+ Quality and Feature Improvements!

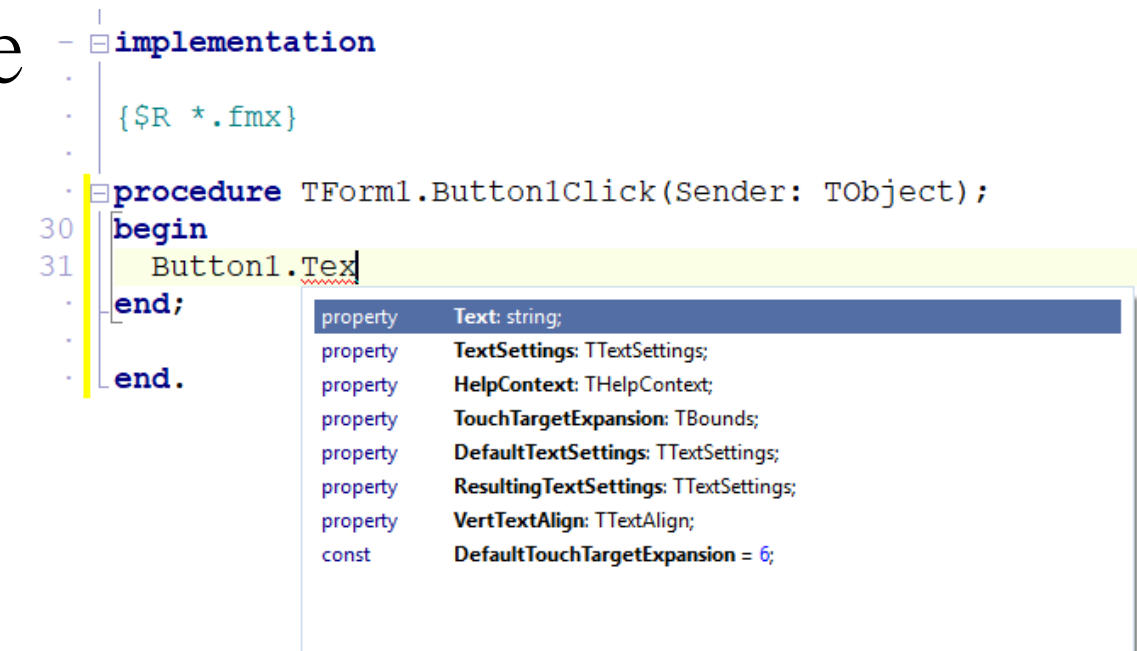


New Delphi Features

Major Delphi Code Insight Redesign

The largest and best improvement to Delphi's code tooling in many years

- 10.4 provides Code Insight using a Delphi implementation of the Language Server Protocol (LSP)
- LSP is a technique for calculating results for code completion, navigation or similar in a separate process
- The editor allows you to keep typing and working while providing Code Insight information
- You can also use code completion while debugging
- Extremely beneficial for large projects with millions of lines of code
- Accurate Error Insight results ('red squiggles') and errors shown in the Structure view



Delphi: CodeInsight via LSP

New Language Server Protocol server, 'delphilsp' process

- Based on the Delphi compiler, so what the compiler sees, it sees
- Provides code completion, parameter completion, tooltip insight and find declaration
- Also provides Error Insight, addressing incorrect red squiggles

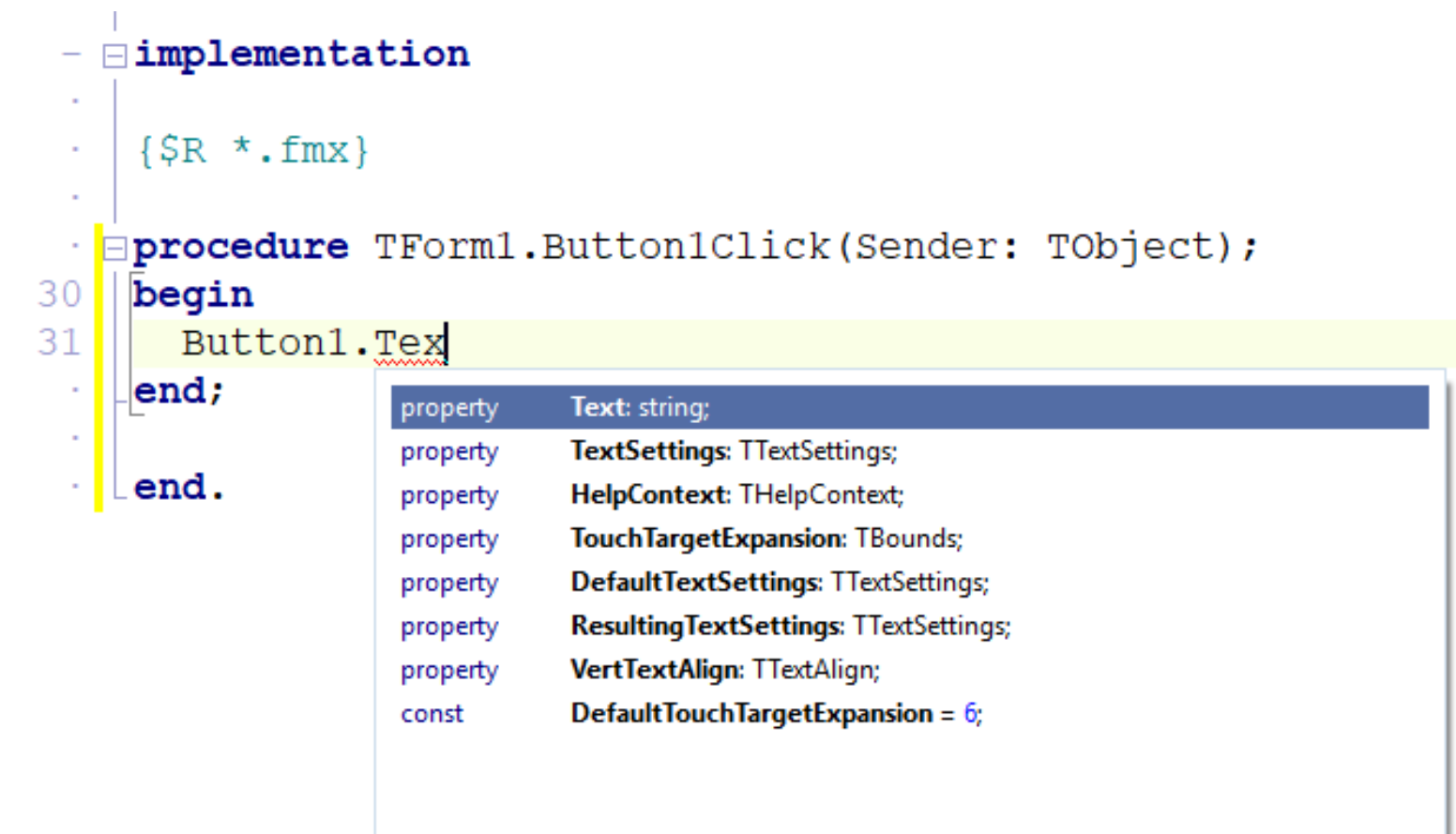
Multi-process architecture

Full ToolsAPI support: can write a non-LSP async CodeInsight provider - LSP is an implementation of our async API

Major Delphi Code Insight Redesign

The largest and best improvement to Delphi's code tooling in many years

- A major new feature and huge productivity improvement
- Code completion, parameter completion, tooltip insight, error insight, and find declaration
- All work asynchronously; the IDE remains responsive while working
- Handles large projects better, dedicated memory space outside the IDE
- Accurate: what the compiler sees, it sees
- New features!
 - Search completion results through typing
 - Code insight while debugging!



New in Delphi Language: Custom Managed Records

A top customer-requested addition to the Delphi language

- Delphi record type now supports custom initialization, finalization, and copy operations
- Customize how records get created, copied, and destroyed, by writing the code to be executed at the various steps
- This adds additional power to records in Delphi, a construct used to achieve better efficiency compared to classes

```
type
  TMyRecord = record
  private
    FNumber: Integer;
  public
    Value: Integer;
    class operator Initialize (out Dest: TMyRecord);
    class operator Finalize (var Dest: TMyRecord);
    class operator Assign (var Dest: TMyRecord;
      const [ref] Src: TMyRecord);
  end;
```

Delphi Language: Managed Records

Based on three new class operators:

<code>class operator Initialize</code>	invoked when memory is allocated
<code>class operator Finalize</code>	invoked when record goes out of scope
<code>class operator Assign</code>	used for <code>:=</code> , parameters passing by copy, etc

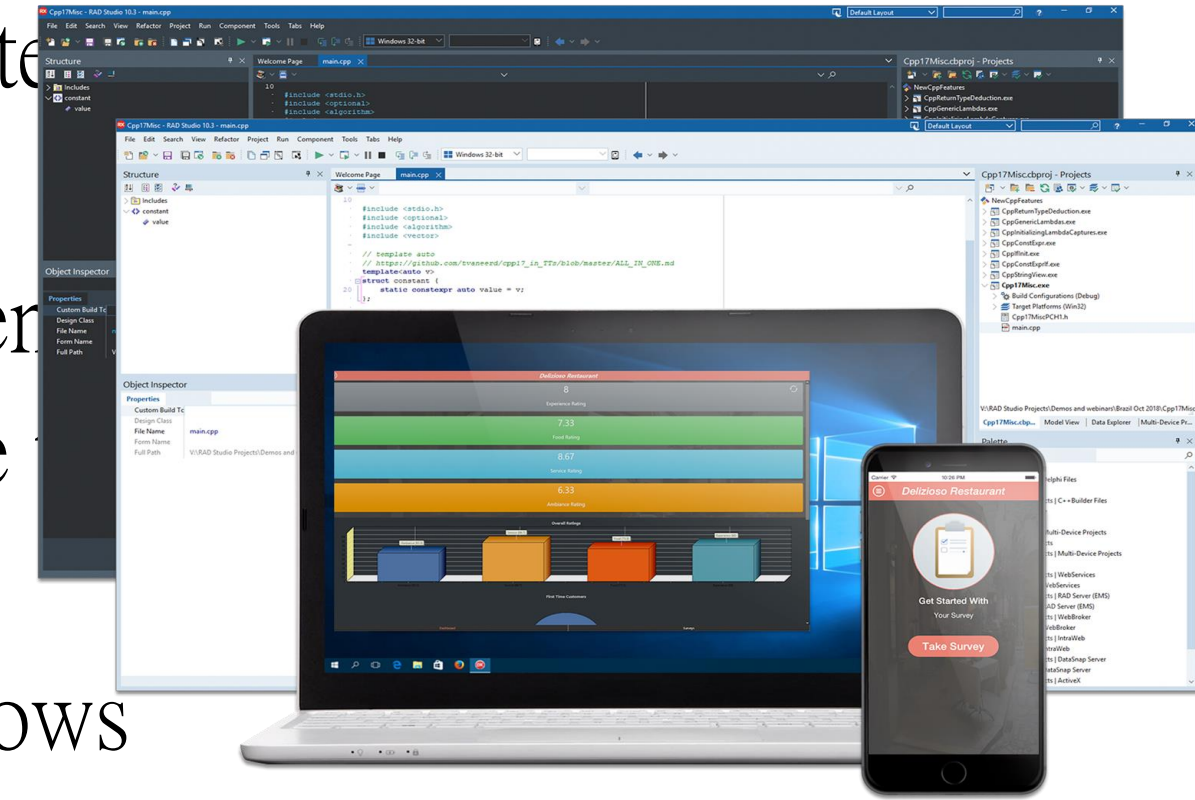
Can be used for standard records, but also for generic records

Opens up easy implementation of nice data structures with local data (no dynamic heap allocation)

Unified Memory Management for Delphi & C++

Enhanced compatibility with existing code and simpler coding for your apps

- Delphi memory management is now unified across all supported platforms - mobile, desktop and server
- Uses the classic implementation of object memory management
- The ARC model remains for string management and interface references for all platforms
- The creation and deletion of Delphi-style classes in C++ follows normal memory management just like any heap-allocated C++ class
- Consistency makes it much easier to add support for other platforms to your apps and server-side services



Delphi Language: Unified Memory Model

ARC memory model removed from mobile platforms

- All objects created must be freed
 - Use of try-finally blocks now important on all platforms
- Recommending use of Delphi LeakCheck to help transition

Other “NEXTGEN” features officially removed

- Brings back AnsiChar, AnsiString and the like
 - Use with care, as things work differently than on Windows (ANSI characters mapping, for example)
- Defaults to ZEROBYTESTRING OFF on all platforms (can be changed)

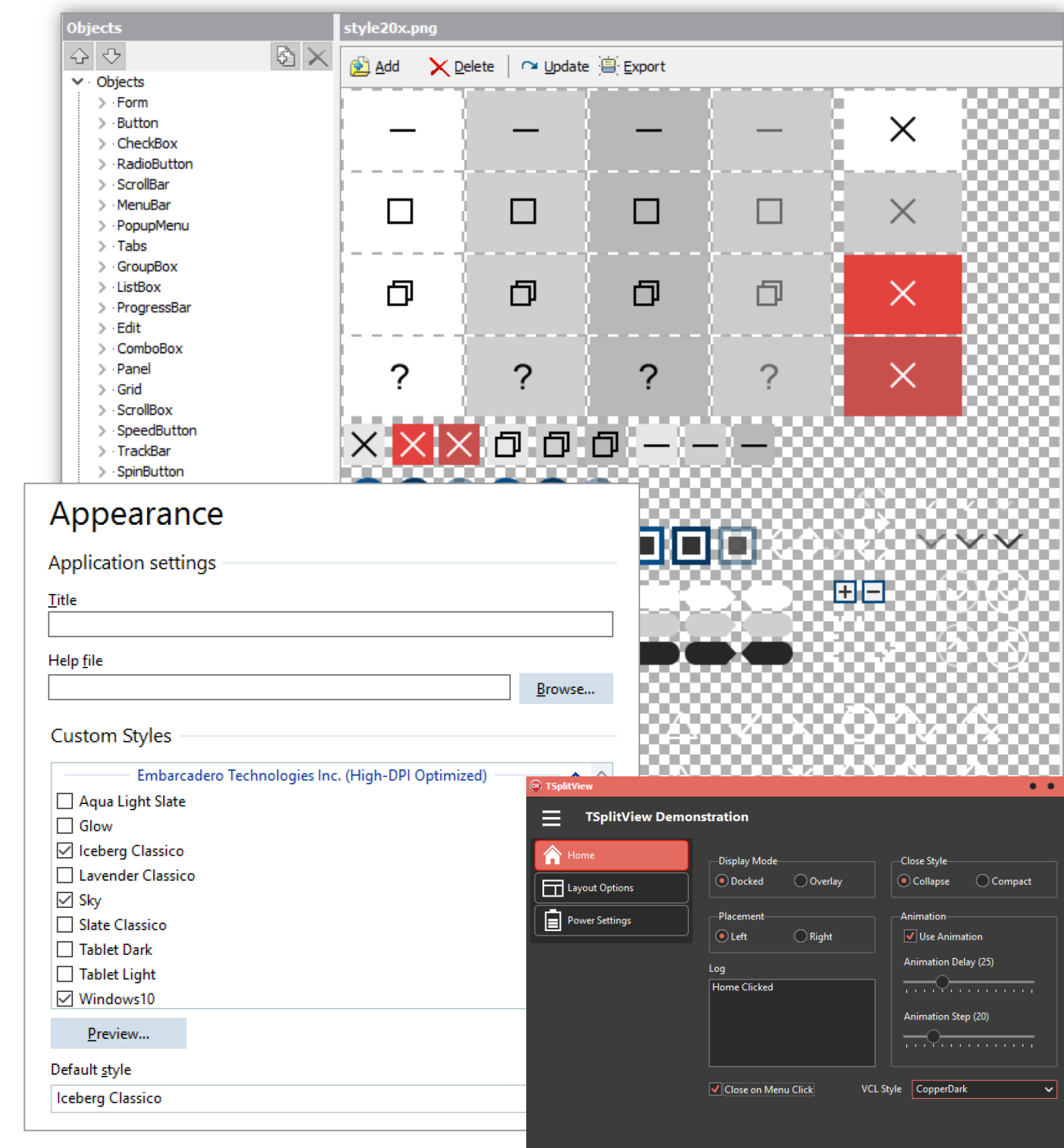


New VCL Features

New VCL Style Features for High DPI

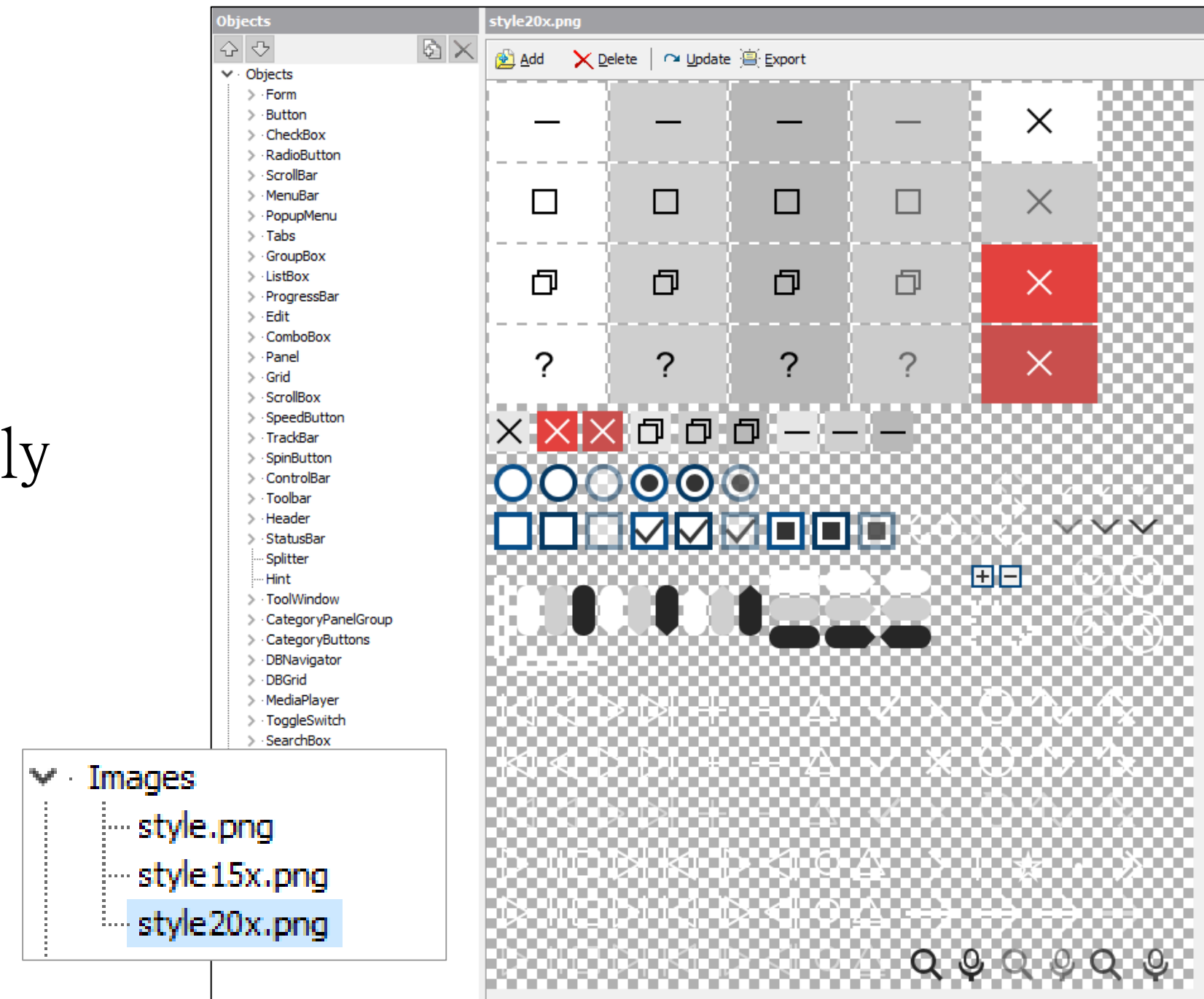
Design visually stunning Windows applications for any monitor

- The VCL Styles architecture has been significantly extended to support High DPI and 4K monitors
- All UI controls on the styled VCL form are now automatically scaled for the proper resolution of the monitor the form is displayed on
- Many default and premium VCL styles have been updated to support the new High-DPI style mode



VCL High-DPI Styles

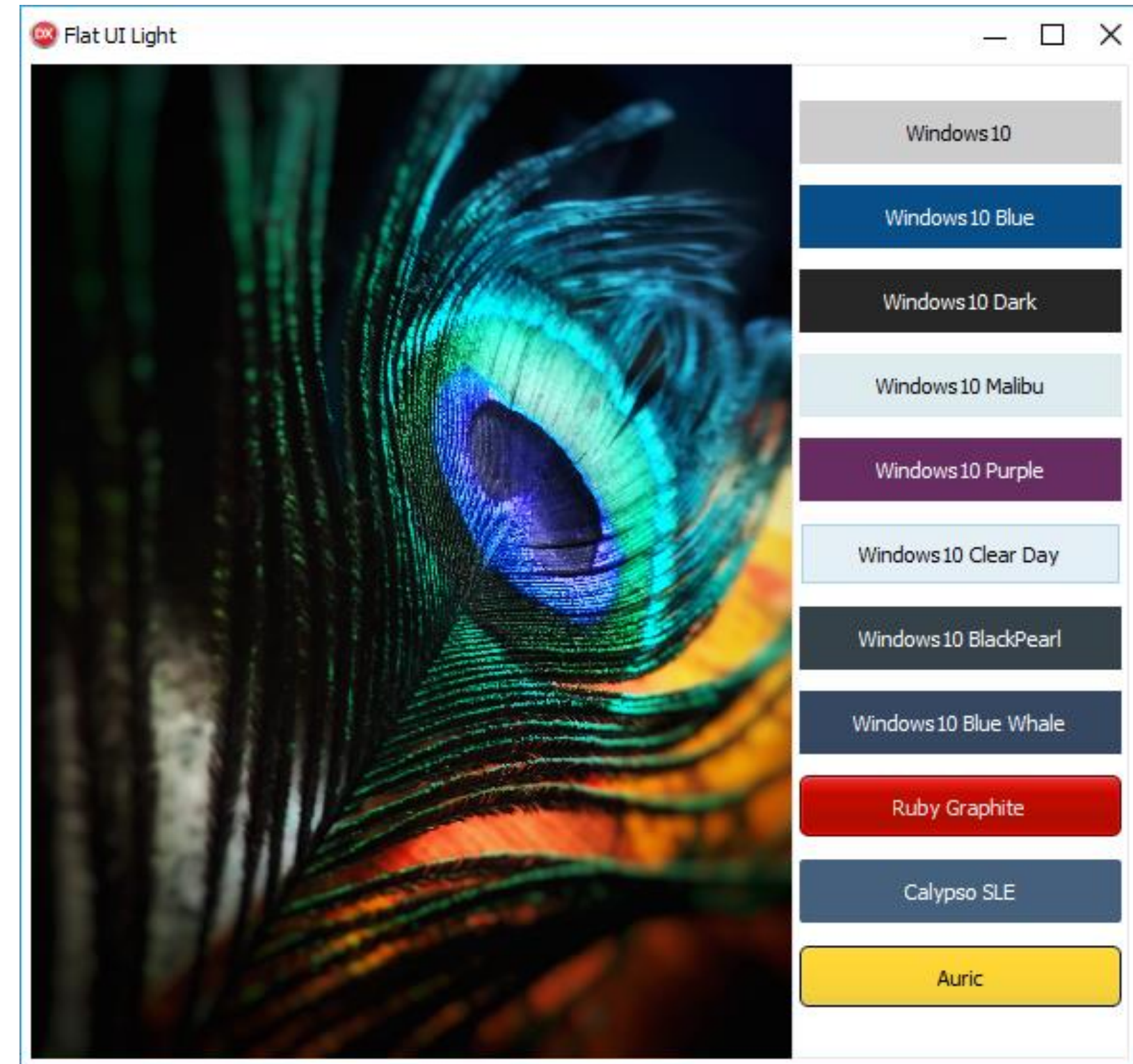
- The style designer supports additional images for specific objects and at various resolutions
 - [name]_15x (for 150% DPI)
 - [name]_20x (for 200% DPI)
- Style API has a scaled functionality, automatically detects elements for scaling



VCL Per Control Styling

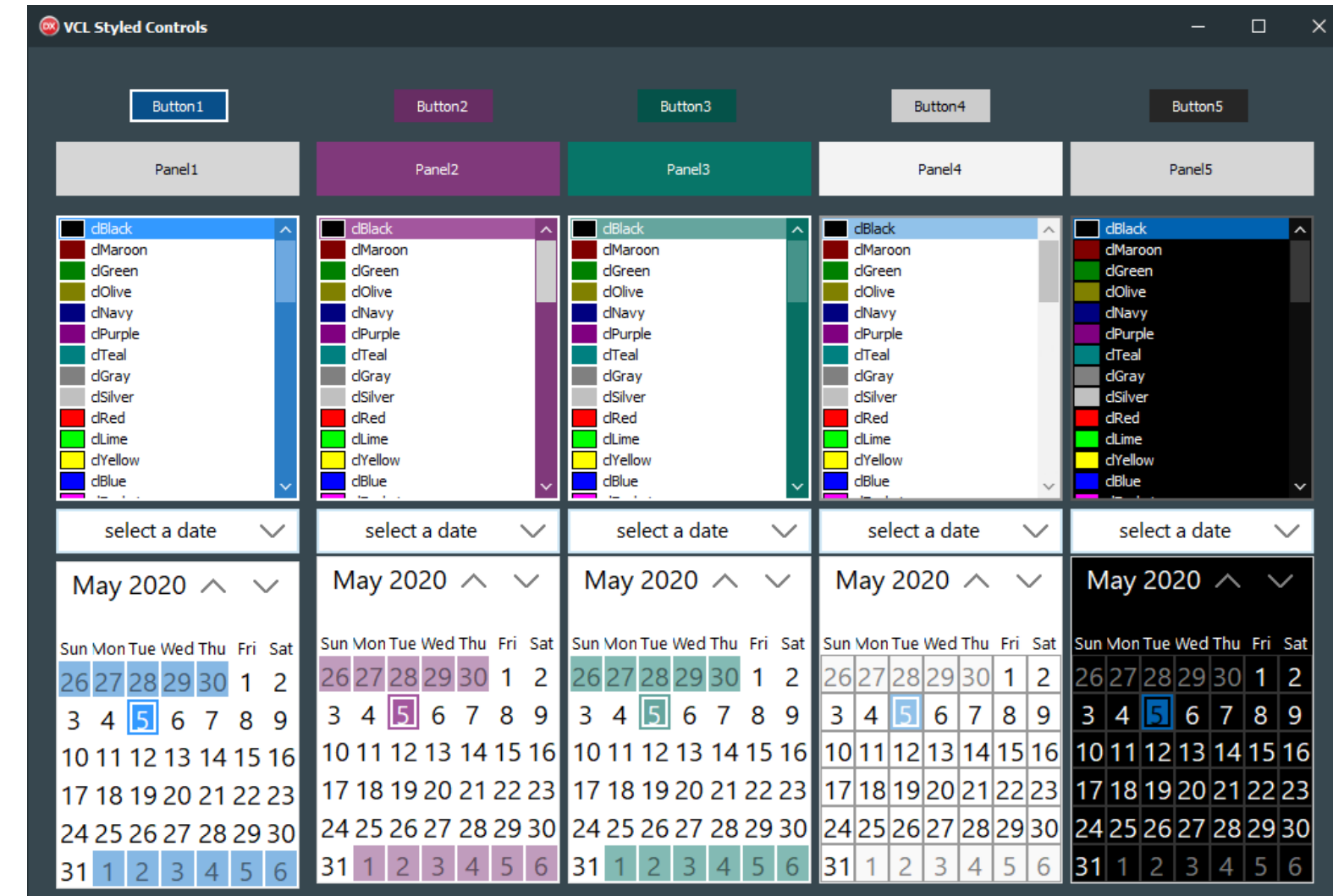
Next generation Windows application design

- Use multiple VCL styles in different forms within a single application
- Use multiple VCL styles for different visual controls on the same form
- Provides support for using the default platform theme and VCL styles in the same form or application
- Use third-party unstyled controls within a styled VCL application



VCL Per-Control Styling

- Multiple active styles per application
- Forms and controls can have specific style
- Property `TControl.StyleName`
 - Indicate style name (must be loaded)
 - Empty means parent style or default one
 - “Windows” means use platform theming (also for third party controls with no styles support)

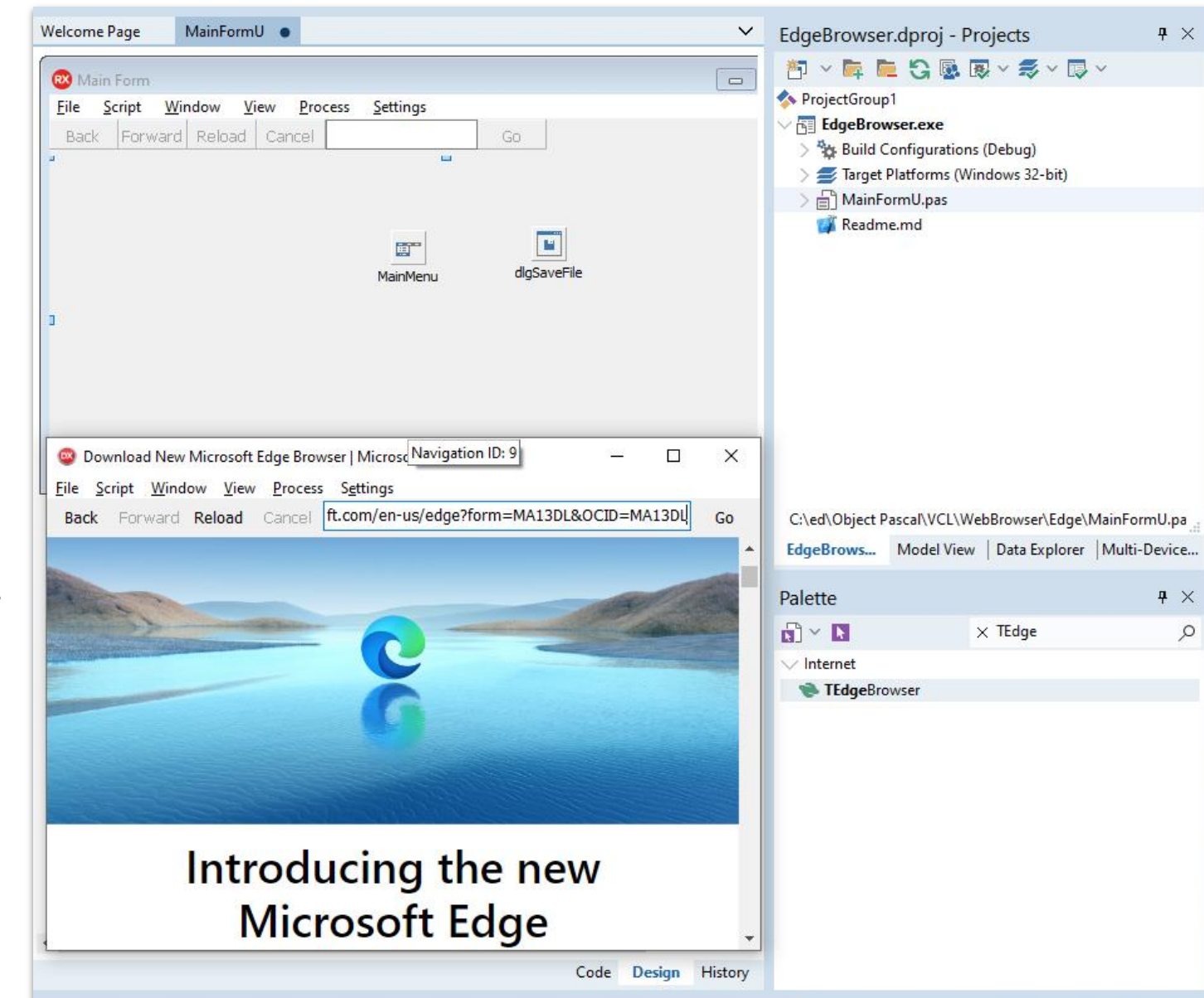


New VCL Components

Build stunning, modern Windows apps

New TEdgeBrowser Component

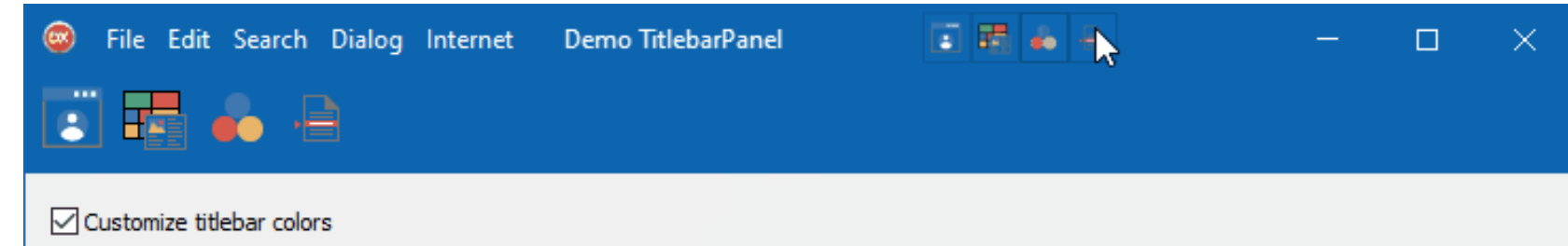
- Uses Microsoft's Edge WebView2 based on Chromium
- A much more modern and secure HTML engine,
compared to the old one based on Internet Explorer
 - Core engine automatically updated by Microsoft for security issues
- Classic TWebBrowser now has a dual implementation (Edge or IE)



New VCL Components

Build stunning, modern Windows apps

New VCL Component: TTitleBarPanel and custom native title bar



- Real Windows title bar, fully customizable
- Build modern enhanced title bars similar to the most popular word processing and web browser applications today:
 - Design UIs with modern features like tabs on the title bar, toolbars and buttons, search boxes, menus, even ribbons
- Easily customize your VCL form's native Windows title bar
 - Place VCL controls on the Windows title bar
 - Control the default painting of key elements - or have full custom painting!
 - Add new system buttons, to have more than Minimize/Restore/Close

Additional VCL Features

New TVirtualImage component

- Gets image from ImageCollection

ImageCollection improvements

- Refer to images of the collection by name (beside index)

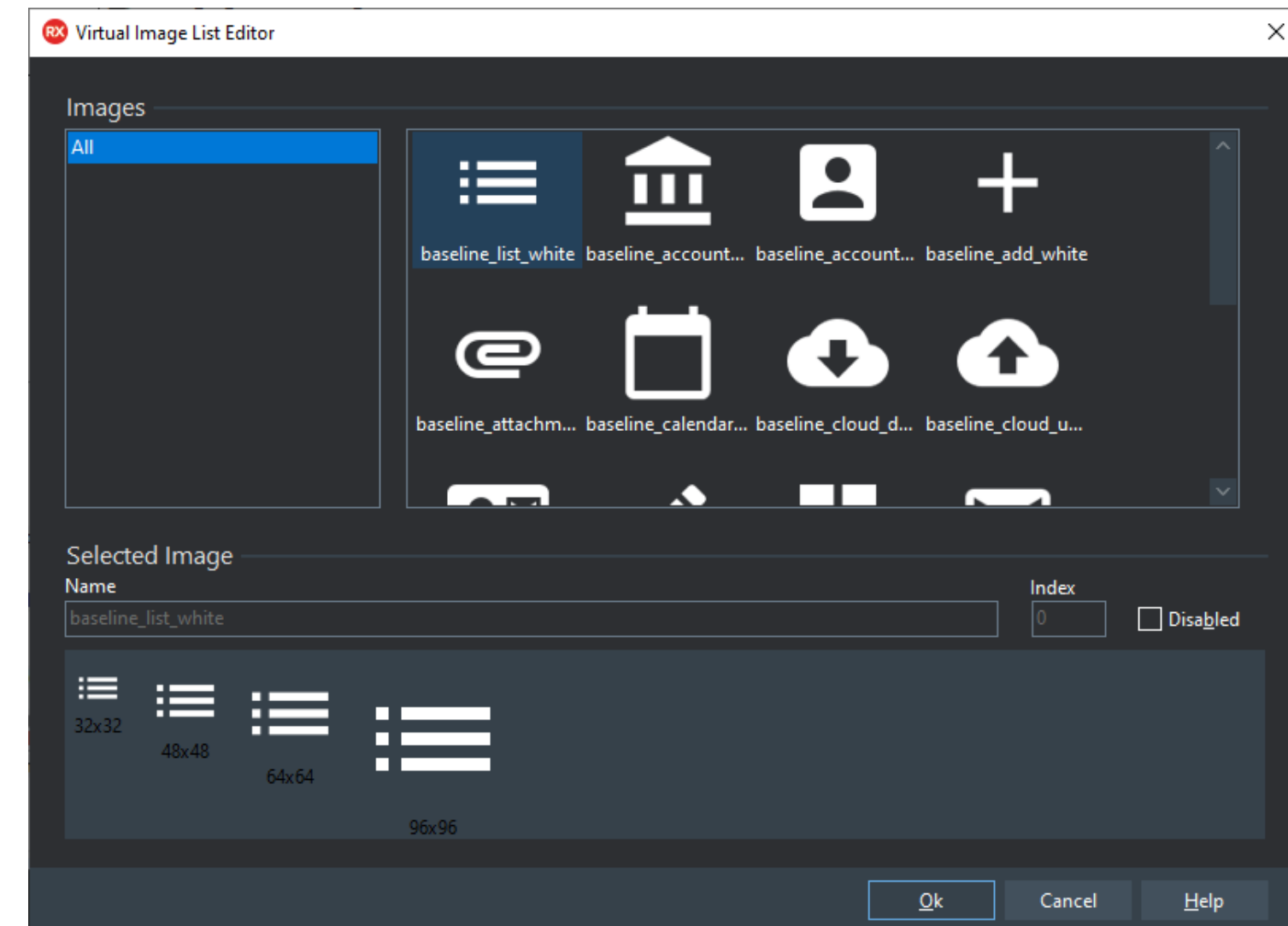
Improvement in bitmap scaling logic (plugin model)

- New TScaledGraphicDrawer class

Better scaling of all controls with embedded images

- DBNavigator, MediaPlayer, DbGrid navigator bitmap

Additional Windows APIs declarations and improvements



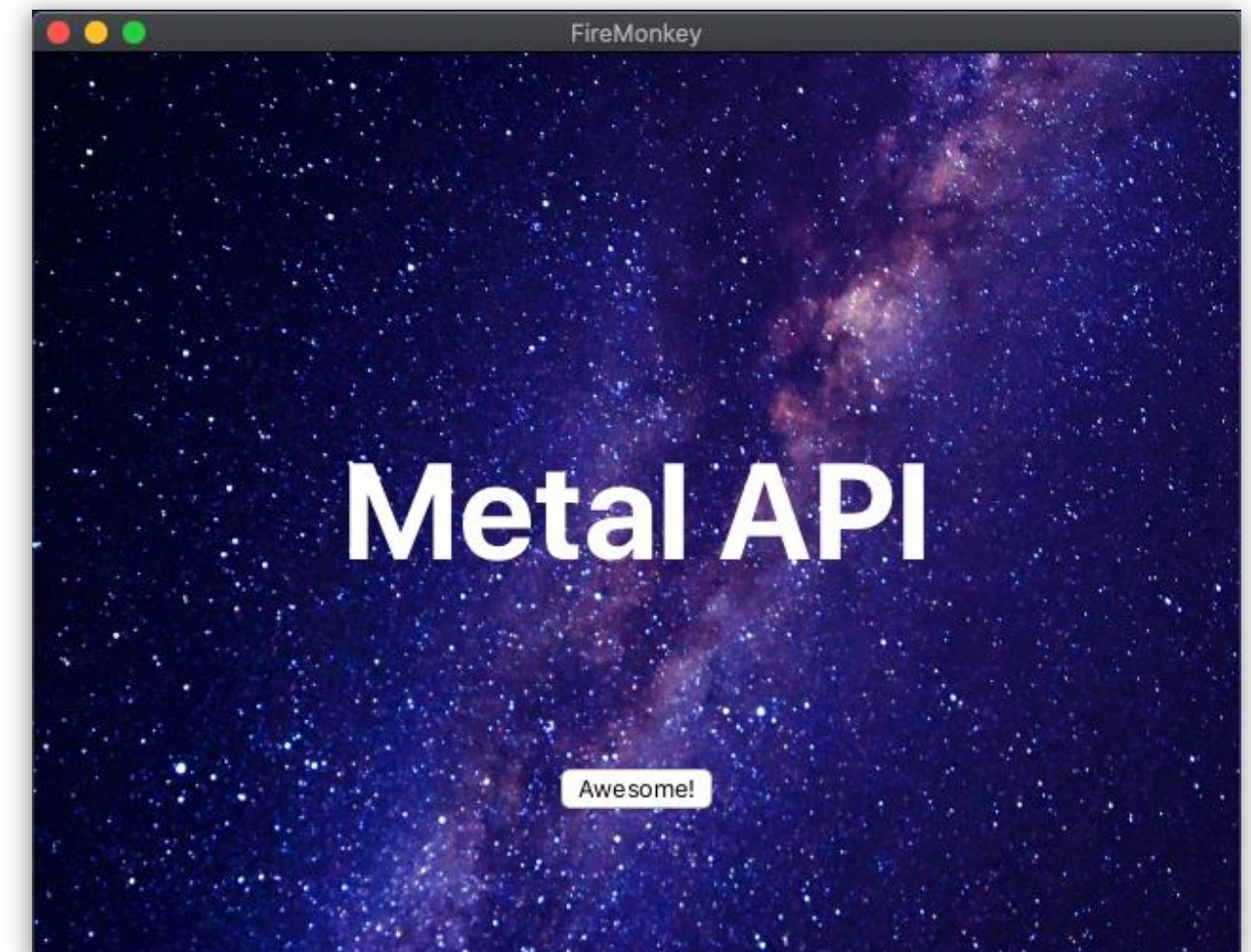


New FMX Features

Key FireMonkey Enhancements - iOS & macOS

Expanded support for Apple OS

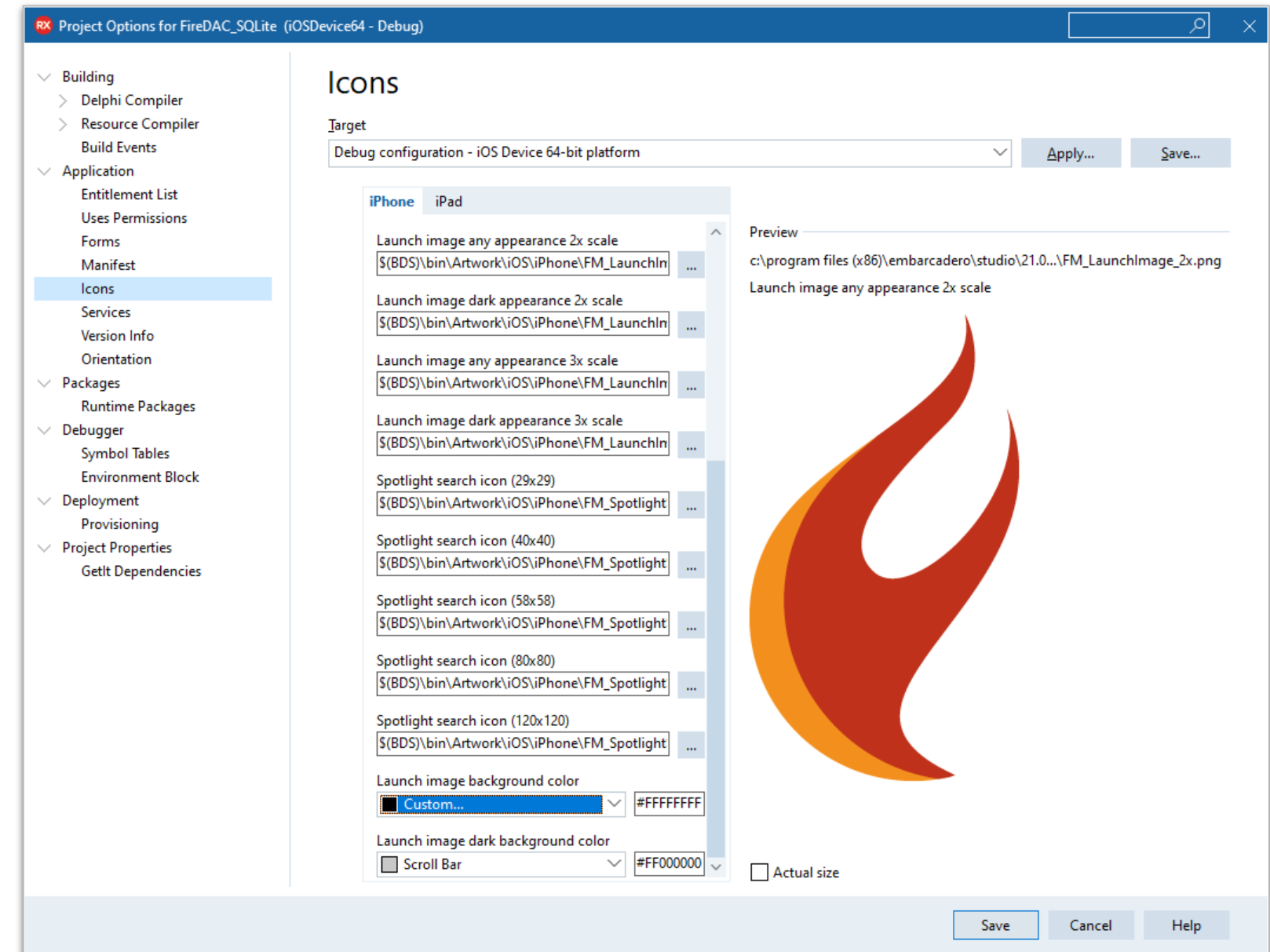
- **Metal Driver GPU Support:**
 - Build macOS (Delphi) and iOS applications (Delphi & C++Builder) against the Metal API, rather than the old Quartz API and OpenGL (deprecated by Apple)
 - FireMonkey Metal support offers a smooth migration to future requirements and better performance for screen rendering
- TWebBrowser is now implemented using the WKWebView API on iOS
- TMediaPlayer control now uses AVFoundation on macOS
- iOS Theme check and change notification



Key FireMonkey Enhancements - iOS

Address new launch screen requirement with RAD Studio 10.4

- Launch screen storyboard support provided through the IDE
- The launch screen uses
 - a centered icon (at different resolutions and different for light and dark mode)
 - a background color for each of the modes
- Developers can replace it with a custom built launch storyboard



Key FireMonkey Enhancements - Android

Target the latest Android versions and Google Play Store requirements with Delphi

- Installation of AdoptOpenJDK, Android SDK 25.2.5 and Android SDK r21
- Support for targeting Android 29 API level
 - Google requirement for store apps in August/November 2020
- Improvements in AppBundle support (introduced in 10.3.3)
 - New TAndroidHelper.ShouldNativeLibrariesBeExtracted method to return the value of the 'extractNativeLibs' manifest attribute (False for an app packaged as an app bundle)



Quality improvements in many areas including sensors, memo control, rendering

Key FireMonkey Enhancements - Windows & Linux

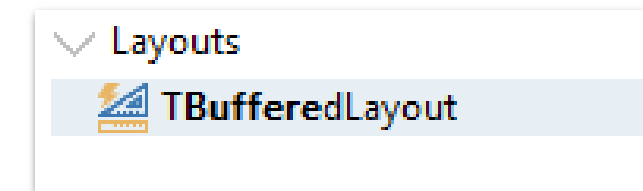
Expanded support for Desktop platforms

- Includes a brand new FMX implementation for the styled TMemo component on Windows, offering better support for IME (key for many international languages) and additional enhancements
 - Part of a full refactoring of TMemo styled presentation
- Changes in DirectX integration to better support Microsoft Store APPX model with FireMonkey applications
- Improved FMXLinux IDE level support for building Linux GUI applications (Ent/Arch edition):
 - FireMonkey Projects will include Linux as a platform
 - You can now add FMX components to your form with the Linux platform selected

Other General FireMonkey Enhancements

More FMX changes helping all developers leverage our great cross-platform UI library

- New TBufferedLayout control
 - Stores its graphical content (including subcontrols) in a memory buffer
 - Faster refresh of the UI of the control, can consume much more memory
- The Toolbar component in FireMonkey now has Hint, ShowHint, and ParentShowHint properties.
- Improved support for Emoji ZWJ Sequences
 - For example, 👨👩👧👦 Family: Man, Woman, Girl, Boy.
- Significantly increased the performance of rendering chars in TextLayout
 - For all platforms





New C++ Features

New Windows 64-bit C++ Debugger

New modern LLDB based debugger for Windows

- Address key C++ debugging scenarios, stability, and features
- Better evaluation and inspection
- Includes ‘formatters’ :
 - Allows you to evaluate and inspect complex types, including STL types (vector, deque, map etc), strings, and even your own custom complex types
- New foundation for future C++ debugger extensions

```
std::map<int, std::string> myMap {  
    { 0, "zero" }, { 1, "one" }, { 1000, "pelagic argosy" }  
};  
myMap[99] = "Brooklyn";  
if (myMap.size() > 3) {  
    e";  
}
```

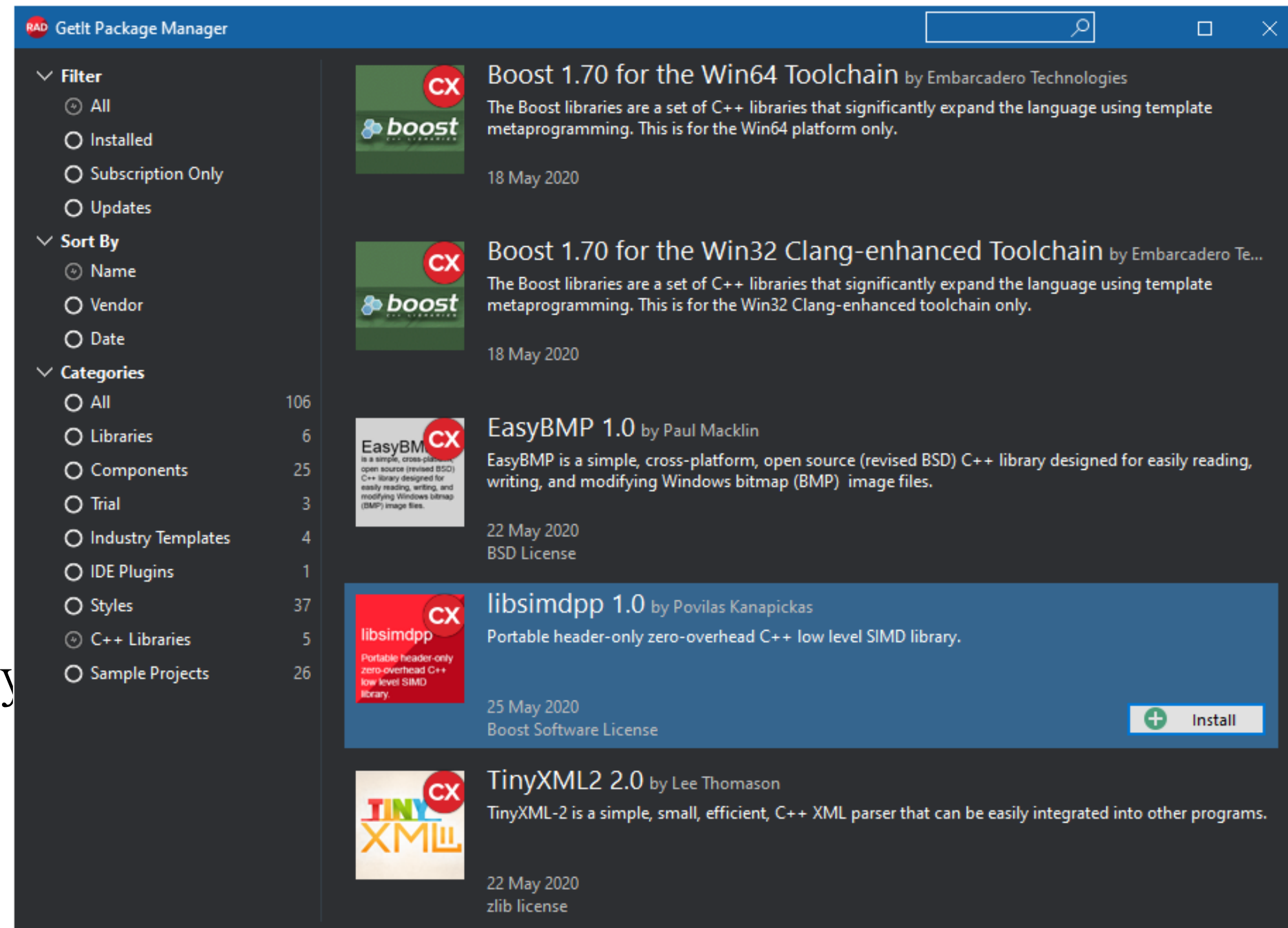
>	myMap	size=4
>	[0]	{...}
>	[1]	{...}
>	[2]	{...}
>	first	99
>	second	"Brooklyn"

Local Variables - Thread 4	
:0000000000406C32 TForm1::Button1Click(System::TObject*)(this	
Name	Value
> stdstring	"std::string evaluation - demo"
> stdwstring	"std::wstring evaluation"
> delphiString	"Delphi String evaluation"
> utf8String	"♥ Delphi UTF8 string evaluation"
> mySharedPtr	{...}
> _Ptr	0x0000000003bb1130
> m_str	"demo structure"
m_i	999
_Uses	1
_Weak	1

Expanded C++ Libraries Support

Support for common useful open source C++ libraries

- Several new key libraries can be downloaded via the GetIt Package Manager:
 - libSIMDpp
 - NemaTode
 - SDL
 - and others
- Boost 1.70
- CMake and RTL work to improve library compatibility



C++ - Other Enhancements

Toolchain performance and quality improvements

- Many improvements to CMake support
- Many C++ compiler fixes in areas around internal compiler errors (ICEs), debug info generation, Delphi-compatible RTTI generation, language extensions such as properties and closures, and exception handling
- The RTL has been updated with several missing methods that may be relied on by third party or open source C++ libraries
- General improvements, eg a new variadic version of Format(), and two new FreeAndNil signatures to match Delphi's changes and also enable previously incorrect usage to now be correct
- Support for ARC removal on mobile, matching the Delphi side

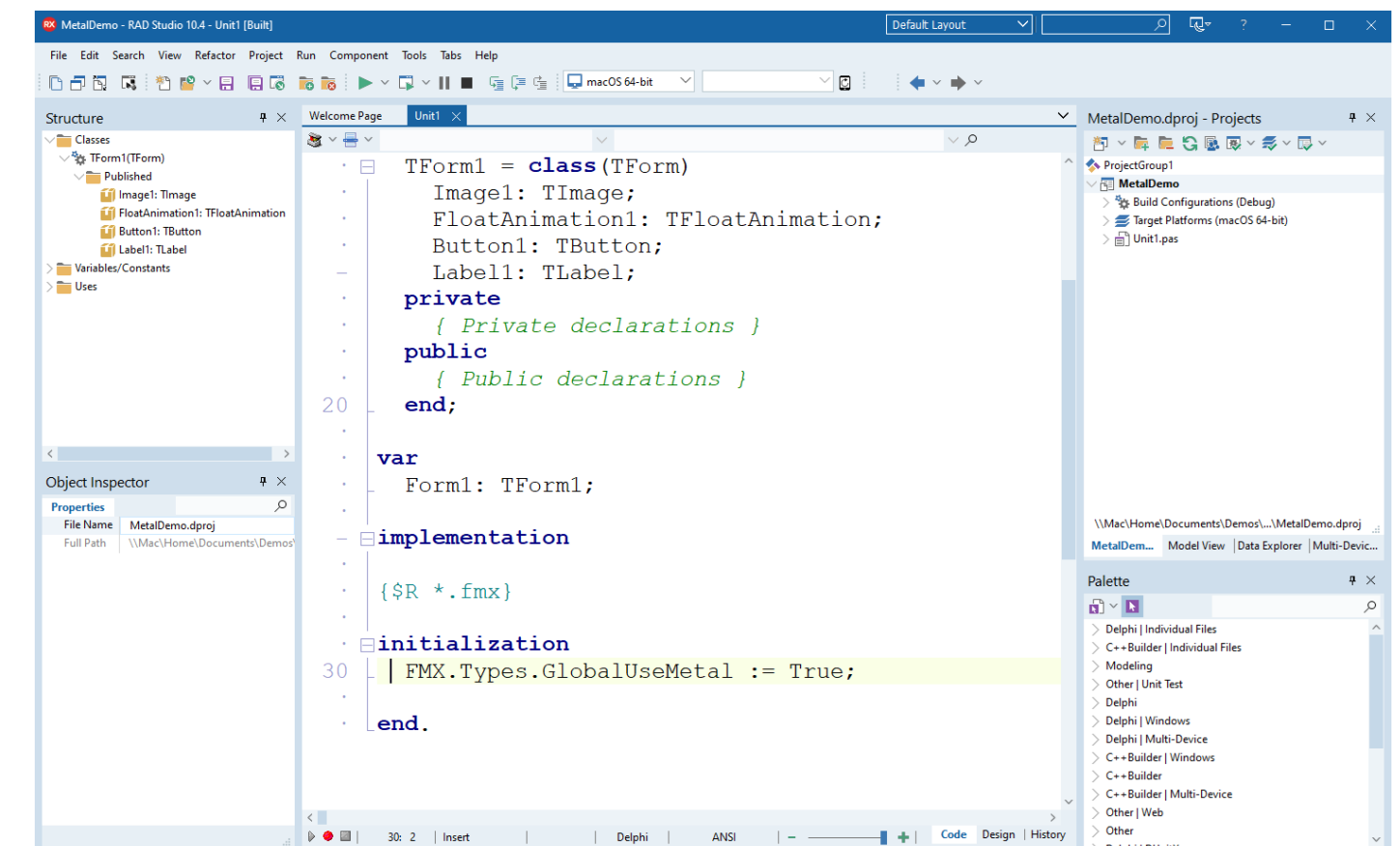


New IDE Features

IDE Improvements

Continuous enhancements of the development environment

- New IDE title bar (based on VCL TTitleBarPanel)
- Find in Files: searches current file & lists all results
- Editor status bar: change syntax highlighter, change file encoding, and adjust font size
- Quality: Object Inspector improvements; removed clipboard history; many other quality fixes
- Welcome Page Updates with IDE patches integrated - see and install patches easily



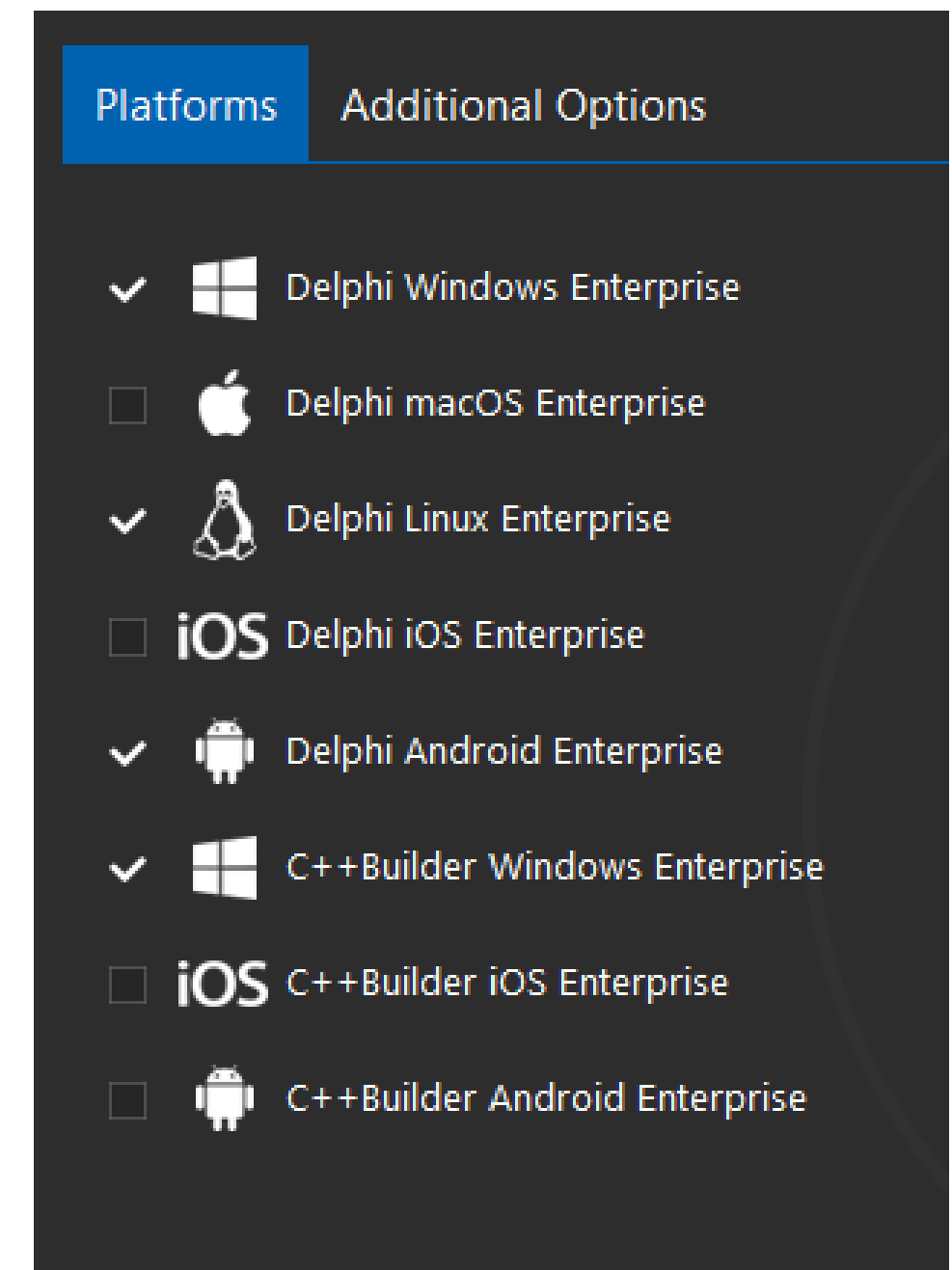


New Installer Features

New Offline Installer

Enhanced installation experience for online and offline users

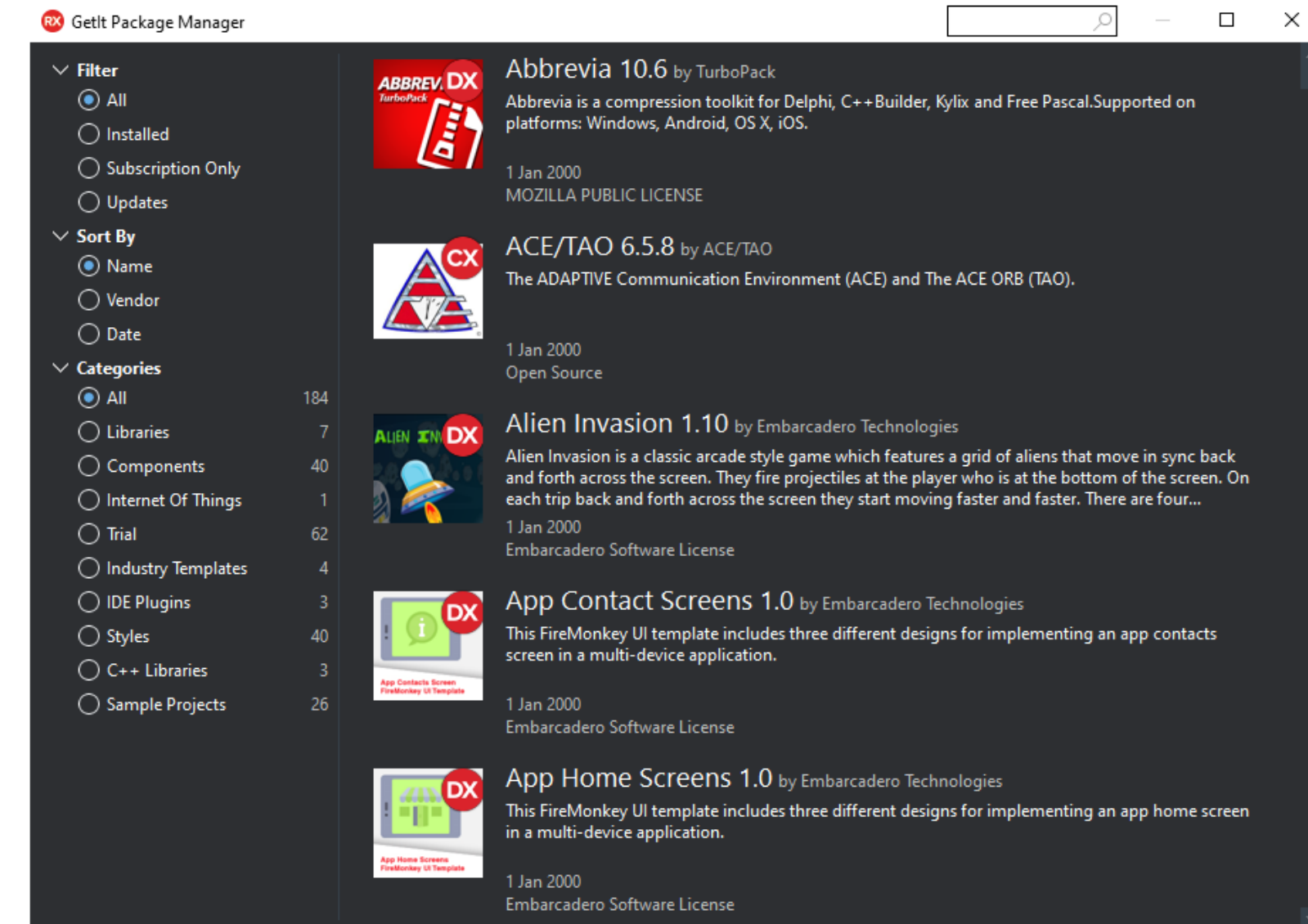
- Allows installing from a local configuration file including all features and platforms -- no internet connection required from the developer machine
- Offline and online installers are fully compatible, you can switch from one to the other as needed, when adding new platforms or installing updates
- Single installation options per platform (including both 32-bit and 64-bit versions when available)



GetIt Package Manager Enhancements

Easily install third party add-ons

- Update existing installed packages to a new version from within GetIt
- Improved GetIt listing filtering and sorting - by release date and subscription status
- Planning to deliver patches through GetIt in the future, providing a simplified installation experience





Quality & Enhancements

Key RAD Studio 10.4 Quality Details

One of the biggest quality focused releases to date

- Over 1,000 quality and performance enhancements, including:

- Over 700 customer reported issues in Quality Portal addressed

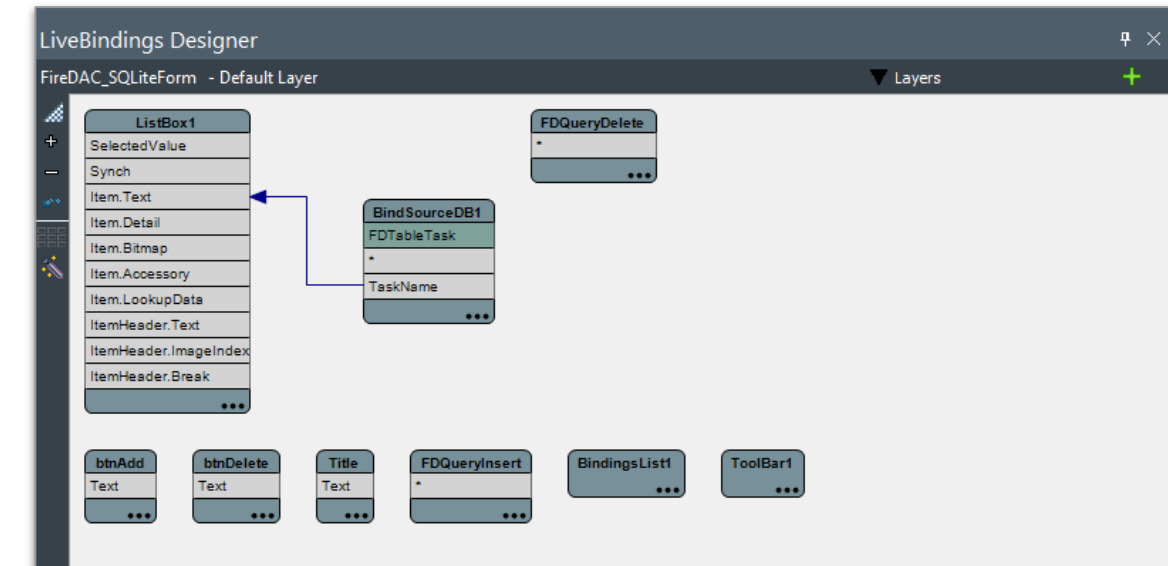
- Top Quality Focus Areas

- Visual Live Bindings
 - AppTethering
 - Parallel Programming Library
 - C++ toolchain
 - RTL performance

Visual LiveBindings performance and features

More flexibility and performance in mapping data to UI

- Large performance improvement in LB and underlying RTTI
- TField properties like DisplayWidth, Alignment, EditMask propagated to VCL and FMX bound controls
- Example of UI properties mapped to TDataSet/TField values:
 - VCL TStringGrid - DisplayWidth, DisplayLabel, Visible, ReadOnly
 - VCL TEdit - Size, Alignment, ReadOnly
 - VCL TMaskEdit - Size, Alignment, EditMask, ReadOnly
 - FMX TStringGrid - DisplayWidth, Size, Alignment, DisplayLabel, Visible, ReadOnly
 - FMX TEdit - Size, Alignment, ReadOnly



RTL Changes and Optimizations

Quality and performance improvements in key subsystems

- Additional AppTethering quality (a lot already in 10.3.3)
 - There is now an option to set tethering timeouts
 - A better mechanism to know when communication is done
- Parallel Programming Library (PPL) quality
 - Tasks WaitForAll and WaitFor performance and other enhancements
 - Plus new AMinTimeToWait parameter in ForceQueue
 - PPL exceptions improvements
- JSON reading optimization: TJSONReader is now 50% faster
- More flexible buffering from streams
 - New BufferSize parameter in TStream.CopyFrom
- Significant RTTI performance improvements
- New FreeAndNil function signature to help find misuse at compile time
 - `procedure FreeAndNil(const [ref] Obj: TObject); inline;`

New in FireDAC and Database

Powerful Universal Data Access Components for developing multi-device database apps

FireDAC

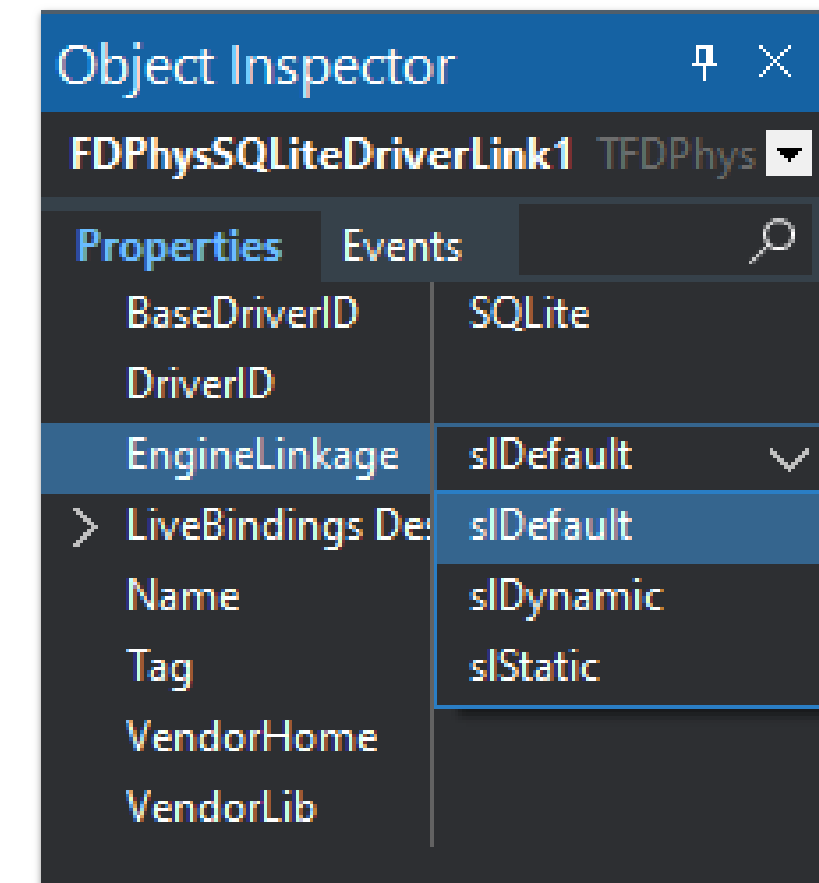
- FireDAC SQLite driver ability choose static or dynamic linkage for engine (via EngineLinkage property: slDefault or slStatic)
- FireDAC improvements for PostgreSQL, Firebird 3, and much more

Database

- DBImage component has new DoLoadPicture virtual method and OnLoadPicture event handler

RAD Server

- RAD Server TEMSDataSetResource now supports "total" value on get response for Sencha Ext JS VirtualStore



HTTP and REST and Cloud

Making it easy to invoke any remote web service and simplify data processing

- TNetHttpClient supports TLS 1.3
- RestRequest can cancel an Asynchronous request
- SOAP' s THTTPReqResp class has additional features
 - SendTimeout and UseDefaultCredentials properties
 - OnPostingData and OnHttpError events
 - Ability to set client certificate for all SOAP HTTP clients (TStreamLoader)
- TAmazonRegion type changed from enumerated value to a string
 - Additional regions can be added directly by developers
- Updated Indy to a recent version in the official repository



10.4 Sydney Summary

RAD Studio 10.4 SKUs

● Professional Editions, including Mobile platforms

- Includes IBLite (hassle free deployment)

● Enterprise Editions

- Include DataSnap, Full FireDAC support, RAD Server
- Single Site RAD Server deployment
- Now with IBToGo free deployment for mobile
- Enterprise Connector license, powered by CData

● Architect Editions

- Ext JS Pro license
- Aqua Data Studio license
- Ranorex term license
- Multi-Site RAD Server deployment

Delphi & C++Builder Community Edition remain available for 10.3.3. We plan to make a 10.4 version available in the future.

RAD Studio 10.4 Sydney — Highlights

One of the biggest releases ever!

- Major Delphi Code Insight improvements
- New Delphi language features
- Unified Memory Management across all supported platforms for Delphi and C++
- New VCL Components, Per-Control Styling, High DPI Styles and more
- Enhanced Delphi multi-device platform support
- Many database enhancements
- Unified installer for online & offline installations
- IDE usability and performance enhancements
- New debugger for Windows 64-bit for C++
- C++ toolchain performance and quality improvements
- Expanded C++ libraries support
- Enhanced CMake for C++ features and compatibility with other toolchains
- Over **1,000 quality** and performance improvements