BLAISE PASCAL MAGAZINE 102

Multi platform /Object Pascal / Internet / JavaScript / WebAssembly / Pas2Js /
Databases / CSS Styles / Progressive Web Apps
Android / IOS / Mac / Windows & Linux

D11.1

Delphi VCL4Python
Python install help
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The Droste effect: picture in picture in picture
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CONTENT

ARTICLES

From Your Editor Page 4
Cartoon, from our Technical Advisor Page 5
By Jerry King
Delphi VCL4Python Page 7
By Max Kleiner
Python install help Page 12
By Detlef Overbeek
The latest release of Delphi 11.1 Page 20
By Detlef Overbeek
Creating a Daily Snaphot of Lazarus with GIT Page 35
By Michael van Canneyt
The Droste effect: picture in picture in picture Page 42
By David Dirkse
Pas2JS: Leveraging Typescript to use existing Javascript libraries Page 46
By Michael van Canneyt
Library support in PAS2JS Page 57
By Michael van Canneyt
Pas2JS: Using multiple forms and routing Page 67
By Michael van Canneyt
Understanding Electron Page 89
By Detlef Overbeek

ADVERTISERS

LIB Stick BlaisepascalMagazine Archive Page 88
LIB Stick + Subscription + two books Page 6
Lazarus Handbook Pocket Page 56
Lazarus Handbook HardCover Page 45
Lazarus Handbk Pocket + Subscription Page 75
Barnsten Delphi Dag Page 19
Barnsten Delphi Offer Page 66
SuperPack Page 34
kbmMW Page 96

Niklaus Wirth

Pascal is an imperative and procedural programming language, which Niklaus Wirth designed (left below) in 1968–69 and published in 1970, as a small, efficient language intended to encourage good programming practices using structured programming and data structuring. A derivative known as Object Pascal designed for object-oriented programming was developed in 1985. The language name was chosen to honour the Mathematician, Inventor of the first calculator: Blaise Pascal (see top right).

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From your editor

Hello dear readers,
the next issue is finally available and now we need to explain why certain things happen.
In my country (Holland) it is springtime.
Now because of the rising temperatures it is very nice to go out again and even Corona seems to vanish.

This is exactly what I had in mind when I tried to create an event in the Hortus Botanicus in Leiden.
The plan was great: some of you were very enthusiast, but there were to few of you.
Since I had to confirm the reservation within 2 weeks the risk was to large there wouldn't be enough participants.
Now I advised my colleges from Barnsten to use a later date for their event in May because than it might be even warmer and no more real danger of Corona. That will be on Thursday the 19th of May in the Dutch “Brooklyn” Breukelen.

Alas that is not the only reason for being cautious. Mr. Putin demonstrated he is a very fearful men with a syndrome persecution madness. This results in aggression and oppressing his own people and even attacking Ukraine.

To alleviate their fate of being driven from home we need to help them. That's why we addressed some advertisement for them to get free subscriptions, a book and even a whole programming tool from Componets4Developers.

I haven't seen many others but I urge them to do something alike so these people will be able to train for a better future. Lazarus itself is for free for everybody and Delphi has a community tool. Of course you can choose to help them in your own way. I hope you will do so.

We all need to go on with our lives and one way is to do programming.

Again, Michael van Canneyt (for Lazarus and FPC) has been able to explain quite some things about programming for the web and on the road to that goal he created new abilities for Pas2JS.

Especially the explanation of how to use multiple forms is very interesting. A MUST READ.

There is some extra news about Delphi 11.1 and how to use it. The option to view the effect of styles in design time is very helpful.
Because Artificial Intelligence is getting bigger and better and thus more interesting I wanted again to have an article on that subject.
There are some extra instalments to make and Max Kleiner explains them, I try to make it easy to install all the necessary tools : Python it self and some extra’s from Delphi.
Jim McKeeth is organising an event about Artificial Intelligence on 30 of March. See the address below.

For Lazarus is the planning to do this as well, not through Python but with a direct tool which will be developed soon. Its not we don't want Python, but it is an extra step and that is not necessary in FPC.
At the end of the article list I explain things about Electron, how it works and what you can use it for.

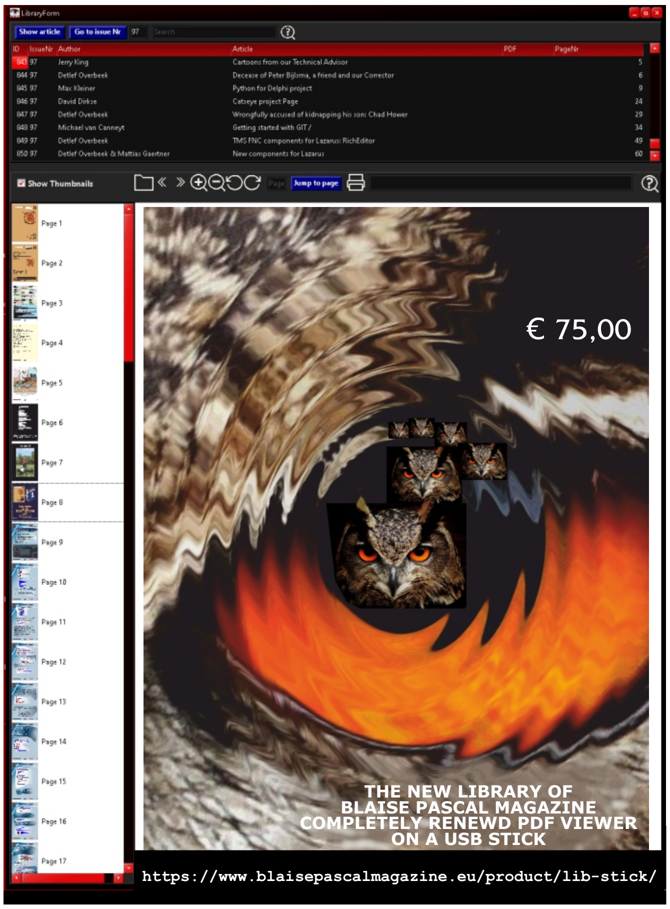
Pleas take a look at Jims online event
(*see the address below*):
Thank you,

Detlef

`https://register.gotowebinar.com/register/8998248551997116685?source=eloqua`

From our Technical advisor: Cartoons from Jerry King

"Dad, let's play hide and go seek. I'll hide your data, and you seek it. And when you can't find it, you pay me to return it."



ID	IssueNr	Author	Article	PDF	PageNr
843	97	Jerry King	Cartoons from our Technical Advisor		5
844	97	Detlef Overbeek	Decease of Peter Bijlsma, a friend and our Corrector		6
845	97	Max Kleiner	Python for Delphi project		9
846	97	David Dirkse	Catseye project Page		24
847	97	Detlef Overbeek	Wrongfully accused of kidnapping his son: Chad Hower		29
848	97	Michael van Canneyt	Getting started with GIT /		34
849	97	Detlef Overbeek	TMS FNC components for Lazarus: RichEditor		49
850	97	Detlef Overbeek & Mattias Gaertner	New components for Lazarus		60

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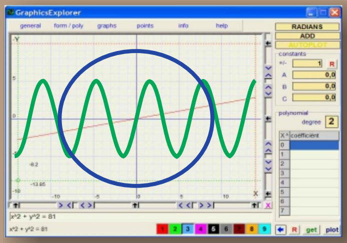
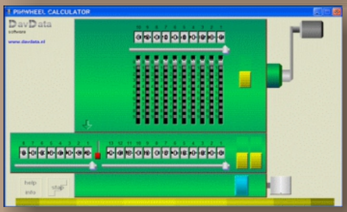
DAVID DIRKSE





```
procedure ;
var
begin
 for i := 1 to
9 do
  begin
```

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DELPHI VCL 4 PYTHON

maXbox Starter 92-1 Code with VCL Python

AUTHOR: MAX KLEINER

People lie, numbers don't. – unknown.

starter expert

ABSTRACT:

In the last few Articles we have seen that **P4D** is a set of free components that wrap up the **Python** packages into **Delphi** and **Lazarus (FPC).** This time we go(t) the other way round: How can we show the **Python** User to profit from the **VCL** Components. To be able to use this article you should read the Articles from **Issue Nr: 96 Page 9 / Nr: 97 Page 9 / Nr: 98 Page 9 /** Its all available on your LIB stick.

You need to install Python first. In a separate Article: **INSTALLING PYTHON** in this issue is a guide for making the necessary installments.

INTRODUCTION

We create **Python** extension modules from **Delphi** classes, records or functions. It can be the beginning of a long journey to provide **Delphi's VCL** library as a certain **Python module** to build powerful Windows GUI out from a Script.

The **Python** module we take a look at is called: `DelphiVCL.pyd`
It can be simply installed from the shell via `pip`:

```
pip install delphivcl
```

It supports:
- **Win32 & Win64 x86** architectures
- **Python** cp3.6, cp3.7, cp3.8, cp3.9 and cp3.10

For other platforms, check out **DelphiFMX4Python.**

Another way to install is explicit with:

```
python.exe -m pip install delphivcl
```

in case you want to install the `32bit` version with the `32bit executable`.

On **Win,** the standard **Python** installer already associates the `.py` extension with a file type `(Python.File)` and gives that file type an open command that runs the interpreter `(G:\Program Files\Python\python.exe "%1" %*)`.
This is enough to make scripts executable from the `command prompt`.
We can use the **python-dll** as we use a **windows dll**.
Therefore `*.pyd` files are **dll-libraries**, but there are a few differences:
So far you have to know 3 different file types you can import from, after installed a known package like **Delphi VCL:**

❶ `*.py:`	The norm input source code that we had written.
❷ `*.pyc:`	The compiled bytecode. If you import a module, Py will build a *.pyc file that contains bytecode to make importing it again later easier and faster.
❸ `*.pyd:`	The mentioned windows dll file for Python.

If you have a `DLL` named `bee.pyd`, then it must have a function `PyInit_bee()`.
You can then write **Python** "import bee", and **Python** will search for `bee.pyd` (`as well as bee.py`, `bee.pyc`) and if it finds it, will attempt to call `PyInit_bee()` to initialize it.
Of course you don't link your `.exe` with `bee.lib`, as that would cause **Windows** to require the `DLL` to be present, we load it dynamically at runtime.

```
import importlib.machinery, importlib.util
def new_import(ext_file):
      loader = importlib.machinery.ExtensionFileLoader("DelphiVCL",ext_file)
      spec   = importlib.util.spec_from_file_location("DelphiVCL",ext_file,
         loader = loader, submodule_search_locations=None)
#print("spec", spec, spec.loader, modulefullpath, __file__)
```

```
https://github.com/maxkleiner/DelphiVCL4Python/blob/main/tests/___init__.py
```

The project which we introduce is in the subdirectory **Delphi** and generates a **Python** extension module (*a DLL with extension "pyd" in Windows*) that allows you to create a user interface using **Delphi** from within **Python.**
A part of the **VCL** or **LCL** (almost and maybe) is wrapped with a few lines of code!

The small demo `TestApp.py` gives you a flavour of what is possible.
The machinery by which this is achieved is the `WrapDelphi` unit.
The subdirectory `DemoModule` demonstrates how to create **Python** extension modules using **Delphi,** that allow you to use in Python, functions defined in **Delphi.**
Compile the project and run `test.py` from the `command prompt` (e.g. py `test.py`).

The generated `pyd` file should be in the same directory as the **Python** file.
This project should be easily adapted to use with **Lazarus** and **FPC.**
After compiled to the `DelphiVCL.pyd` we want to use it in a **Python** script, which is the main topic of this article:

```
from delphivcl import *
```

Python code in one module gains access to code in another module, by the process of importing it. The import statement is the most common way of invoking the import machinery, but it is not the only way.

First we check our **Python** installation.
Python 3.* provides for all user and current user installations.
All user installations place the `Py-dll` in the **Windows System directory** and write the registry info to `HKEY_LOCAL_MACHINE`.
Current user installations place the `dll` in the install path and the registry info in `HKEY_CURRENT_USER` version **< PY 3.5.**

So, for current user installations we need to try and find the install path or package path since it may not be on the system path as an environment var.
In our case we set a const to demonstrate:

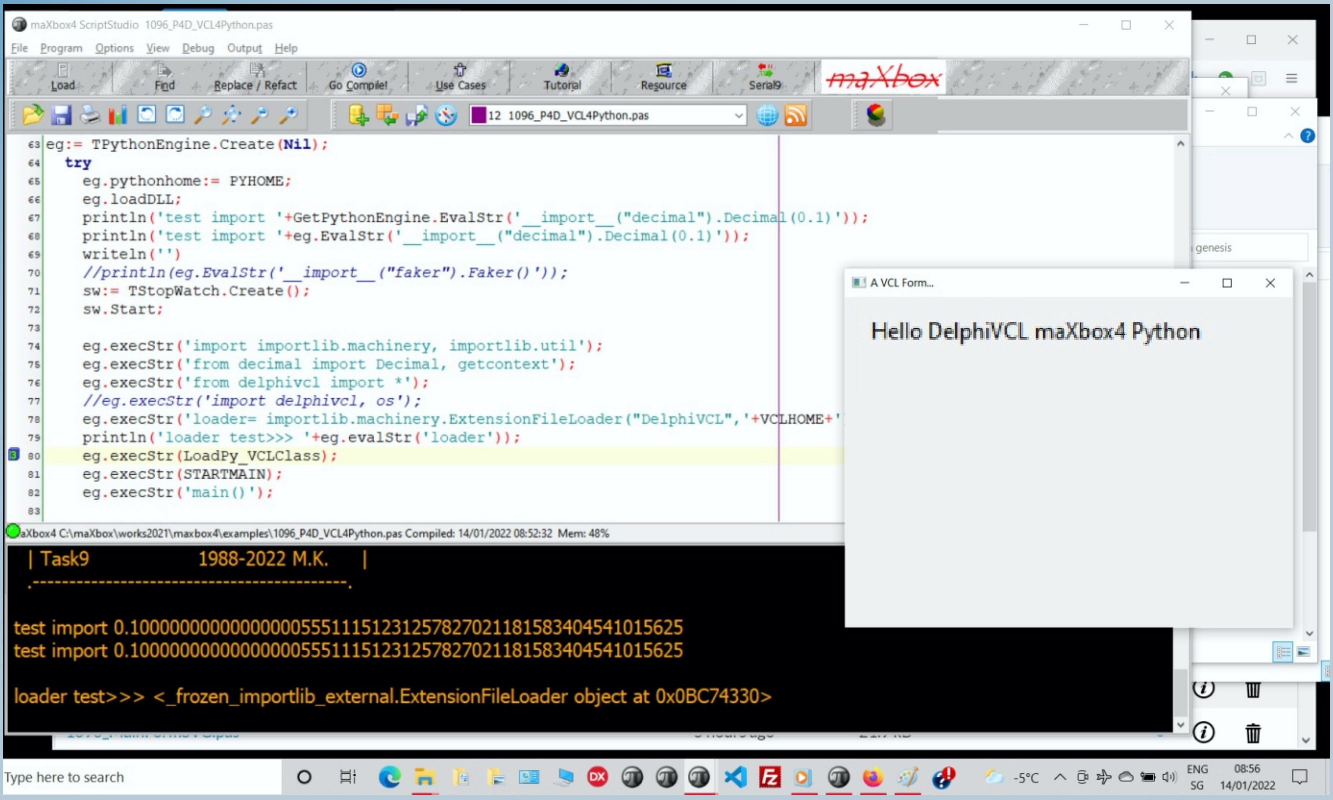
```
Const PYHOME   ='C:\Users\max\AppData\Local\Programs\Python\Python36-32\';
      VCLHOME ='r"C:\users\max\appdata\local\programs\python\python36-32\lib\site-packages\delphivcl\win32\delphivcl.pyd"';
```

So next we load the dll (with or without import statement possible), call the **VCL** class and start the main procedure:

```
eg:= TPythonEngine.Create(Nil);
try
  eg.pythonhome:= PYHOME;
  eg.loadDLL;

  ...

  eg.execStr(LoadPy_VCLClass);
  eg.execStr(STARTMAIN);
  eg.execStr('main()');
```



```
eg:= TPythonEngine.Create(Nil);
  try
    eg.pythonhome:= PYHOME;
    eg.loadDLL;
    println('test import '+GetPythonEngine.EvalStr('__import__("decimal").Decimal(0.1)'));
    println('test import '+eg.EvalStr('__import__("decimal").Decimal(0.1)'));
    writeln('')
    //println(eg.EvalStr('__import__("faker").Faker()'));
    sw:= TStopWatch.Create();
    sw.Start;

    eg.execStr('import importlib.machinery, importlib.util');
    eg.execStr('from decimal import Decimal, getcontext');
    eg.execStr('from delphivcl import *');
    //eg.execStr('import delphivcl, os');
    eg.execStr('loader= importlib.machinery.ExtensionFileLoader("DelphiVCL",'+VCLHOME+'
    println('loader test>>> '+eg.evalStr('loader'));
    eg.execStr(LoadPy_VCLClass);
    eg.execStr(STARTMAIN);
    eg.execStr('main()');
```

maXbox4 C:\maXbox\works2021\maxbox4\examples\1096_P4D_VCL4Python.pas Compiled: 14/01/2022 08:52:32 Mem: 48%

```
| Task9               1988-2022 M.K.     |
.----------------------------------------.

test import 0.1000000000000000055511151231257827021181583404541015625
test import 0.1000000000000000055511151231257827021181583404541015625

loader test>>> <_frozen_importlib_external.ExtensionFileLoader object at 0x0BC74330>
```

A VCL Form...

Hello DelphiVCL maXbox4 Python

We can see the simple VCL-form as it says "Hello":

https://github.com/maxkleiner/DelphiVCL4Python/tree/main/samples/HelloWorld

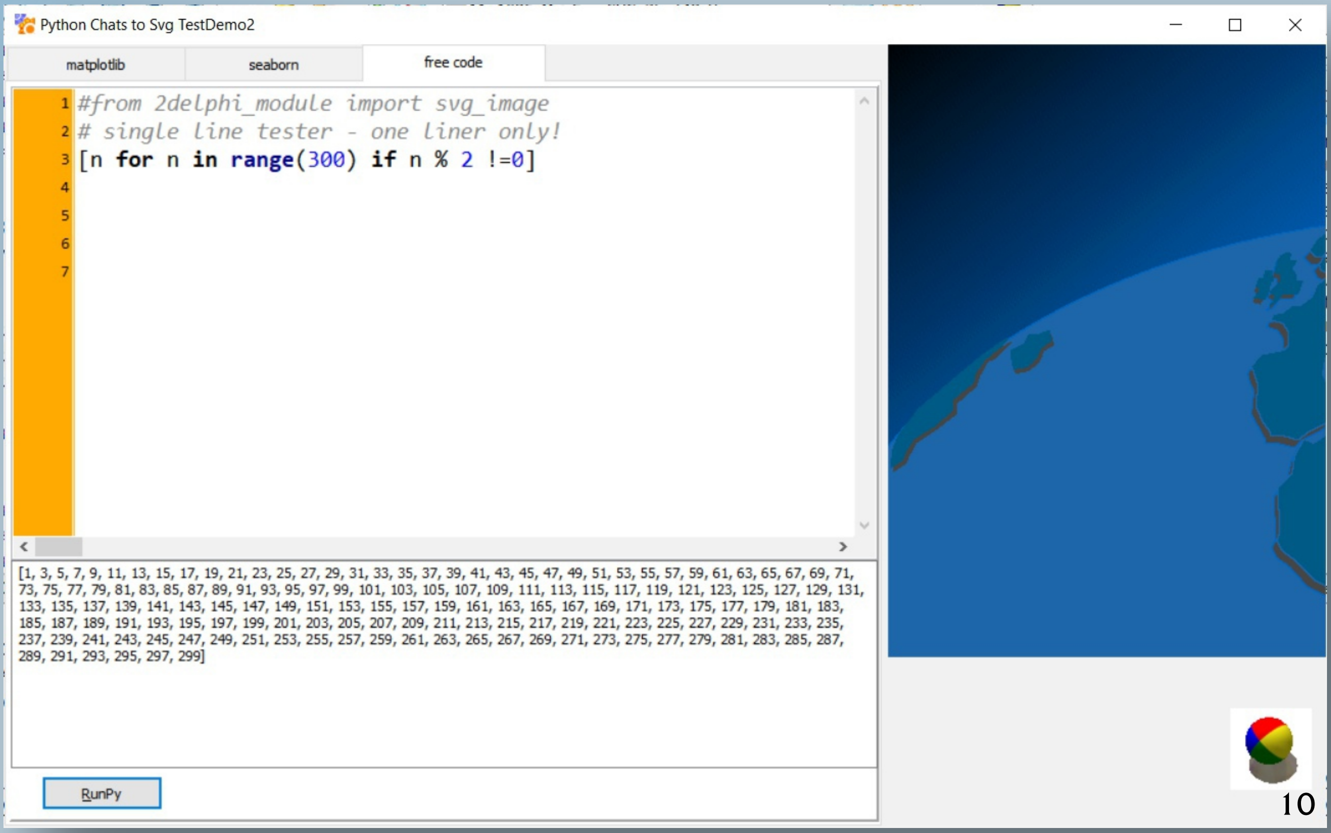
As a special proof of concept I run the **hello world sample** with **P4D** in a **maXbox** script to show the compatibility between the two type- and memory layout systems. But of course normally the script runs in a shell or with **PyScripter.** As a caveat I can run this "test toggle workaround" only once, could be that a finalizer, dispose or destructor is missing.

```
STARTMAIN =
  'def main():                                  '+LF+
  '  Application.Initialize()                   '+LF+
  '  Application.Title = "Hello Python"         '+LF+
  '  Main = MainForm(Application)               '+LF+
  '  Main.Show()                                '+LF+
  '  FreeConsole()                              '+LF+
  '  Application.Run()                          '+LF+
  ,  Main.Destroy()                             ';
```

We pass with the **MainForm()** call our initialized Application to a **Python** class defined in **LoadPy_VCLClass** which has the class name '**class MainForm(Form)**: with two method-functions (def in class):

```
def __init__(self, owner):
def __on_form_close(self, sender,
action):
```

Imagine on the **VCL-form** from **Python** is a **SynEdit-control** which enables to script in **Pascal** and **Python** together, fascinating it:



```
#from 2delphi_module import svg_image
# single line tester - one liner only!
[n for n in range(300) if n % 2 !=0]
```

```
[1, 3, 5, 7, 9, 11, 13, 15, 17, 19, 21, 23, 25, 27, 29, 31, 33, 35, 37, 39, 41, 43, 45, 47, 49, 51, 53, 55, 57, 59, 61, 63, 65, 67, 69, 71,
73, 75, 77, 79, 81, 83, 85, 87, 89, 91, 93, 95, 97, 99, 101, 103, 105, 107, 109, 111, 113, 115, 117, 119, 121, 123, 125, 127, 129, 131,
133, 135, 137, 139, 141, 143, 145, 147, 149, 151, 153, 155, 157, 159, 161, 163, 165, 167, 169, 171, 173, 175, 177, 179, 181, 183,
185, 187, 189, 191, 193, 195, 197, 199, 201, 203, 205, 207, 209, 211, 213, 215, 217, 219, 221, 223, 225, 227, 229, 231, 233, 235,
237, 239, 241, 243, 245, 247, 249, 251, 253, 255, 257, 259, 261, 263, 265, 267, 269, 271, 273, 275, 277, 279, 281, 283, 285, 287,
289, 291, 293, 295, 297, 299]
```

In **P4D** you do have the mentioned memo with ExecStrings:

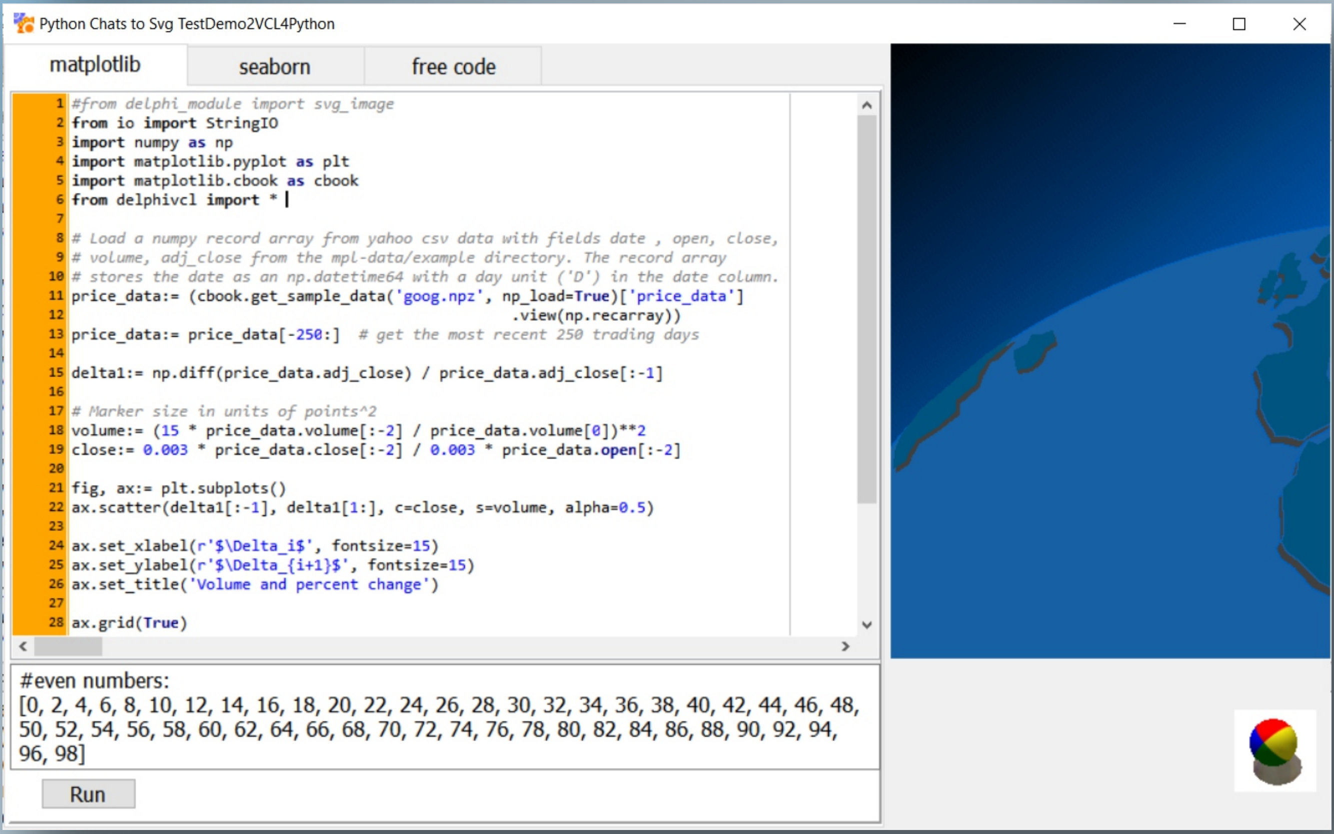
```
procedure TForm1.Button1Click(Sender: Tobject);
  begin PythonEngine1.ExecStrings( Memo1.Lines );
end;
```

This explains best the code behind, to evaluate an internal **Python** expression or statement. You are responsible for creating one and only one **TPythonEngine** instance.

CONCLUSION

The **VCL/LCL** is a mature **Windows/Linux** native **GUI** framework with a huge library of included visual components and a robust collection of 3rd party components and classes. It is the finest framework for native **Windows** applications, and we can use it with **Python!**
Python has only one type of module object, and all modules are of this type, regardless of whether the module is implemented in **Python, Delphi, FreePascal, C**, or something else.

VCL4Python topics
- **https://learndelphi.org/python-native-windows-gui-with-delphi-vcl/**
- **http://www.softwareschule.ch/examples/weatherbox.txt**
- **http://www.softwareschule.ch/examples/pydemo37.htm**
- **https://github.com/maxkleiner/DelphiVCL4Python**
- **https://t.co/1NhgxqNr7B**



```
#from delphi_module import svg_image
from io import StringIO
import numpy as np
import matplotlib.pyplot as plt
import matplotlib.cbook as cbook
from delphivcl import * 

# Load a numpy record array from yahoo csv data with fields date , open, close,
# volume, adj_close from the mpl-data/example directory. The record array
# stores the date as an np.datetime64 with a day unit ('D') in the date column.
price_data:= (cbook.get_sample_data('goog.npz', np_load=True)['price_data']
                                                    .view(np.recarray))
price_data:= price_data[-250:]  # get the most recent 250 trading days

delta1:= np.diff(price_data.adj_close) / price_data.adj_close[:-1]

# Marker size in units of points^2
volume:= (15 * price_data.volume[:-2] / price_data.volume[0])**2
close:= 0.003 * price_data.close[:-2] / 0.003 * price_data.open[:-2]

fig, ax:= plt.subplots()
ax.scatter(delta1[:-1], delta1[1:], c=close, s=volume, alpha=0.5)

ax.set_xlabel(r'$\Delta_i$', fontsize=15)
ax.set_ylabel(r'$\Delta_{i+1}$', fontsize=15)
ax.set_title('Volume and percent change')

ax.grid(True)
```

```
#even numbers:
[0, 2, 4, 6, 8, 10, 12, 14, 16, 18, 20, 22, 24, 26, 28, 30, 32, 34, 36, 38, 40, 42, 44, 46, 48,
50, 52, 54, 56, 58, 60, 62, 64, 66, 68, 70, 72, 74, 76, 78, 80, 82, 84, 86, 88, 90, 92, 94,
96, 98]
```

PYTHON INSTALL HELP
Addittional Installer

AUTHOR: DETLEF OVERBEEK

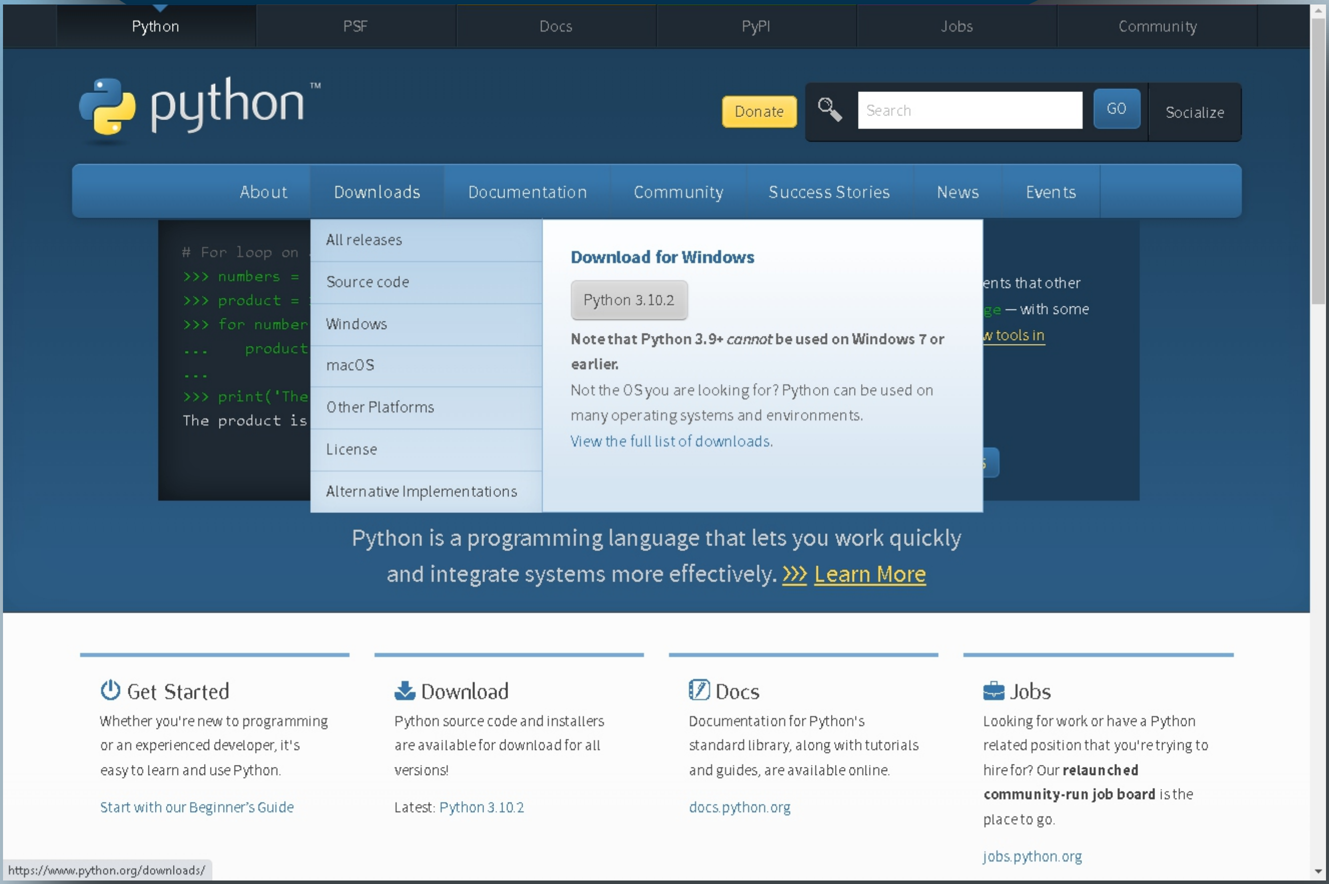
starter expert

INSTALLATION PROCEDURES FOR PYTHON AND DELPHI4PYTHON

If you follow the guidelines of this article it will be fairly easy for you to handle.
For **Lazarus** we will have an other implementation because we will make **Lazarus** directly approachable for the use of special Libraries we need to connect to for **Artificial Intelligence**. That will probably become available in the next Issue (103). That said we will also create a future possibility to have **Python for Lazarus.**

There might be a confusion about several titles for the **Delphi** Projects, there is **Delphi4Python** and there is **Python4Delphi** as well of course **Python** itself.First of all yo need to install **Python.**
You need to have the program because all other subjects use it.

The **"Delphi for Python"** way means you will install a group of components for direct use and get about 34 example programs. Its nice to install them, because otherwise you will need to get the Python4Delphi which is much harder and confusing to install as well get it organized.
So I will give a short explanation.
Installing **Python** (in this case for **Windows**)
To download it go to: `https://www.python.org/`
(there is of course a list of beta versions if you want to use those, but I advise you to chose a stable version).



Download for Windows

Python 3.10.2

Note that Python 3.9+ *cannot* be used on Windows 7 or earlier.

Not the OS you are looking for? Python can be used on many operating systems and environments.

View the full list of downloads.

```
# For loop on
>>> numbers =
>>> product =
>>> for number
...     product
...
>>> print('The
The product is
```

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ge — with some
w tools in

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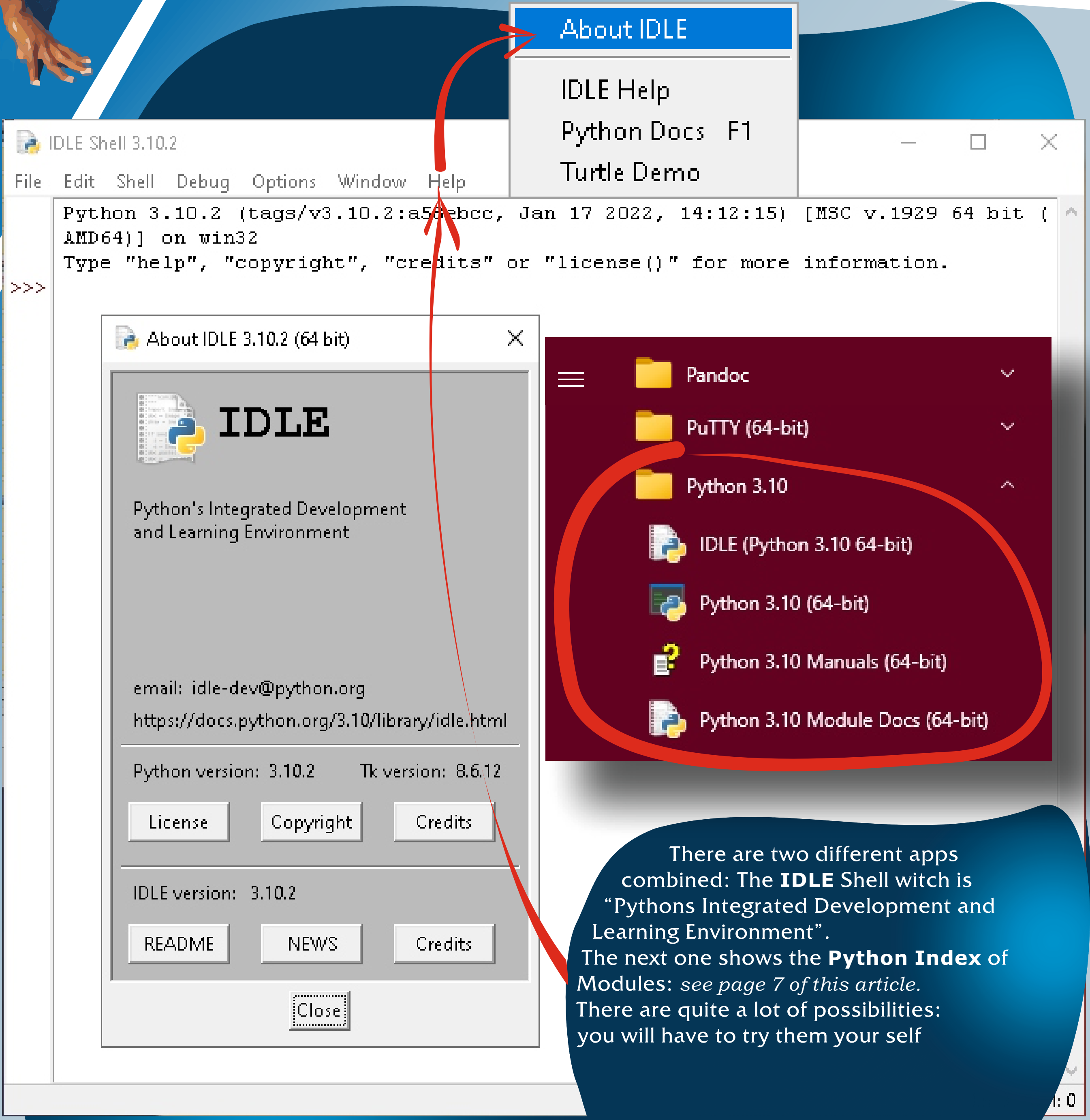
https://www.python.org/downloads/



```
Python 3.10.2 (tags/v3.10.2:a58ebcc, Jan 17 2022, 14:12:15) [MSC v.1929 64 bit (
AMD64)] on win32
Type "help", "copyright", "credits" or "license()" for more information.
>>>
```

About IDLE 3.10.2 (64 bit)

IDLE

Python's Integrated Development and Learning Environment

email: idle-dev@python.org

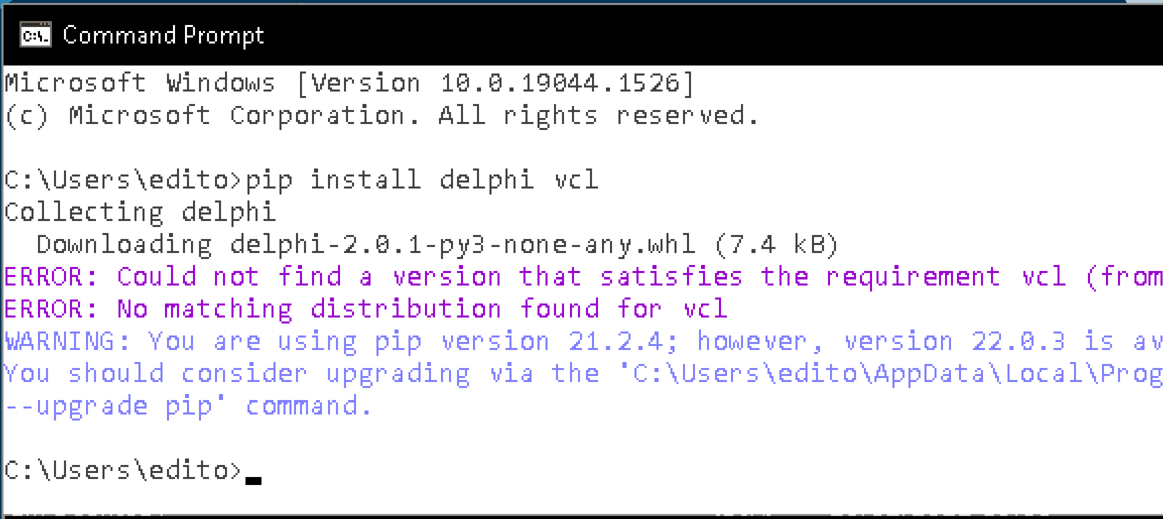
https://docs.python.org/3.10/library/idle.html

Python version: 3.10.2 Tk version: 8.6.12

IDLE version: 3.10.2

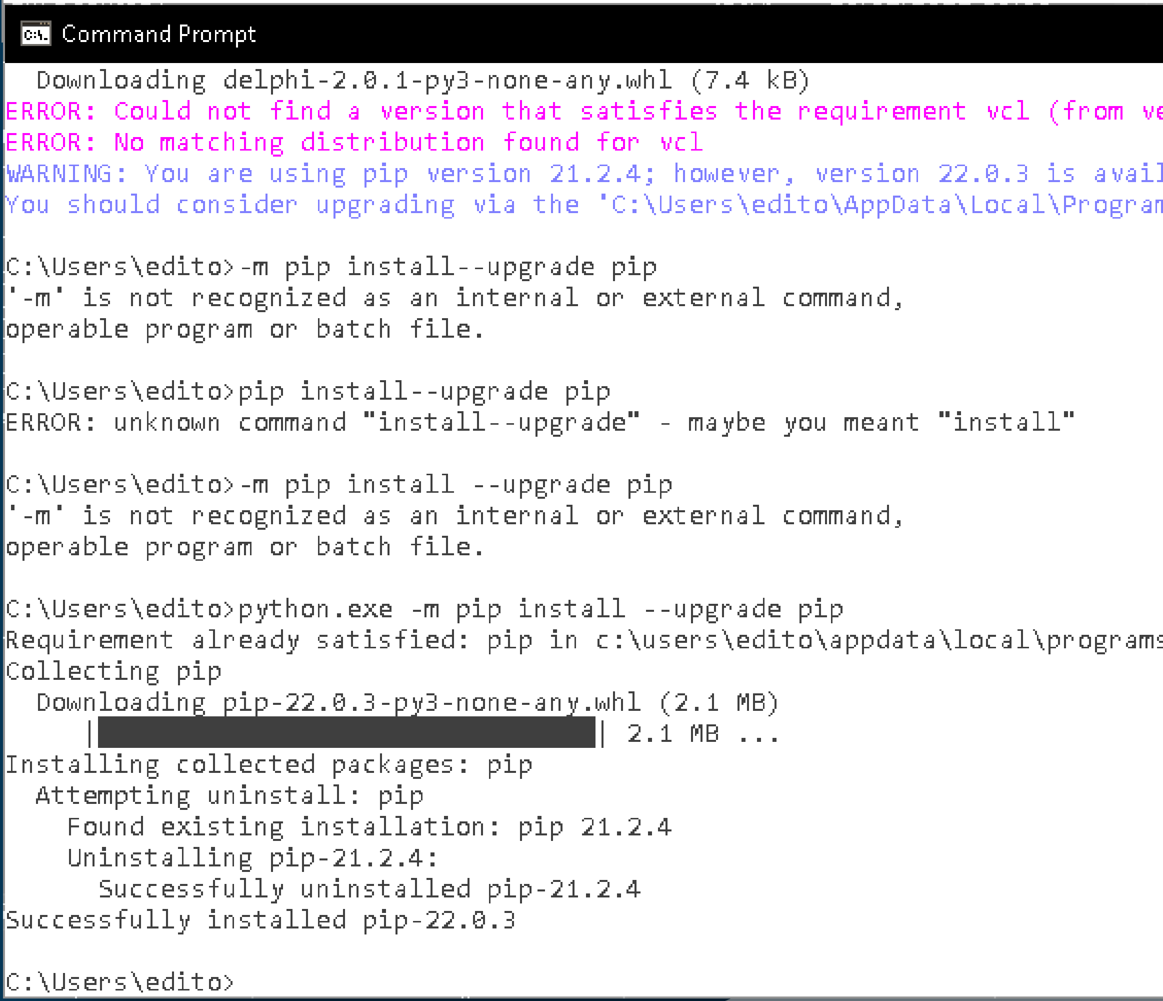
README
NEWS
Credits
Close
Pandoc
PuTTY (64-bit)
Python 3.10
IDLE (Python 3.10 64-bit)
Python 3.10 (64-bit)
Python 3.10 Manuals (64-bit)
Python 3.10 Module Docs (64-bit)

There are two different apps combined: The **IDLE** Shell witch is "Pythons Integrated Development and Learning Environment".
The next one shows the **Python Index** of Modules: *see page 7 of this article.*
There are quite a lot of possibilities: you will have to try them your self

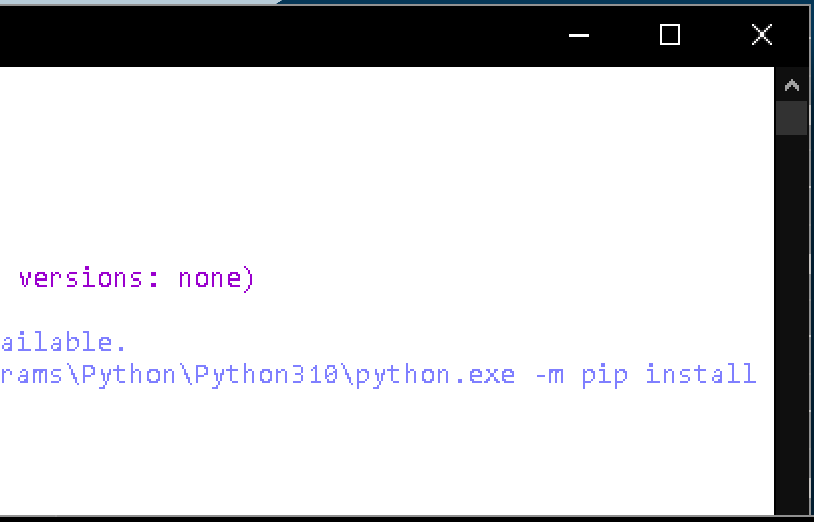


```
Microsoft Windows [Version 10.0.19044.1526]
(c) Microsoft Corporation. All rights reserved.

C:\Users\edito>pip install delphi vcl
Collecting delphi
  Downloading delphi-2.0.1-py3-none-any.whl (7.4 kB)
ERROR: Could not find a version that satisfies the requirement vcl (from
ERROR: No matching distribution found for vcl
WARNING: You are using pip version 21.2.4; however, version 22.0.3 is av
You should consider upgrading via the 'C:\Users\edito\AppData\Local\Prog
--upgrade pip' command.

C:\Users\edito>_
```

I have inverted the **Command Prompt** which is shown here, so they will be better readable. Please read the text and it will help you during installation. You can set the PDF file to show two pages side by side, so can read the whole texst.

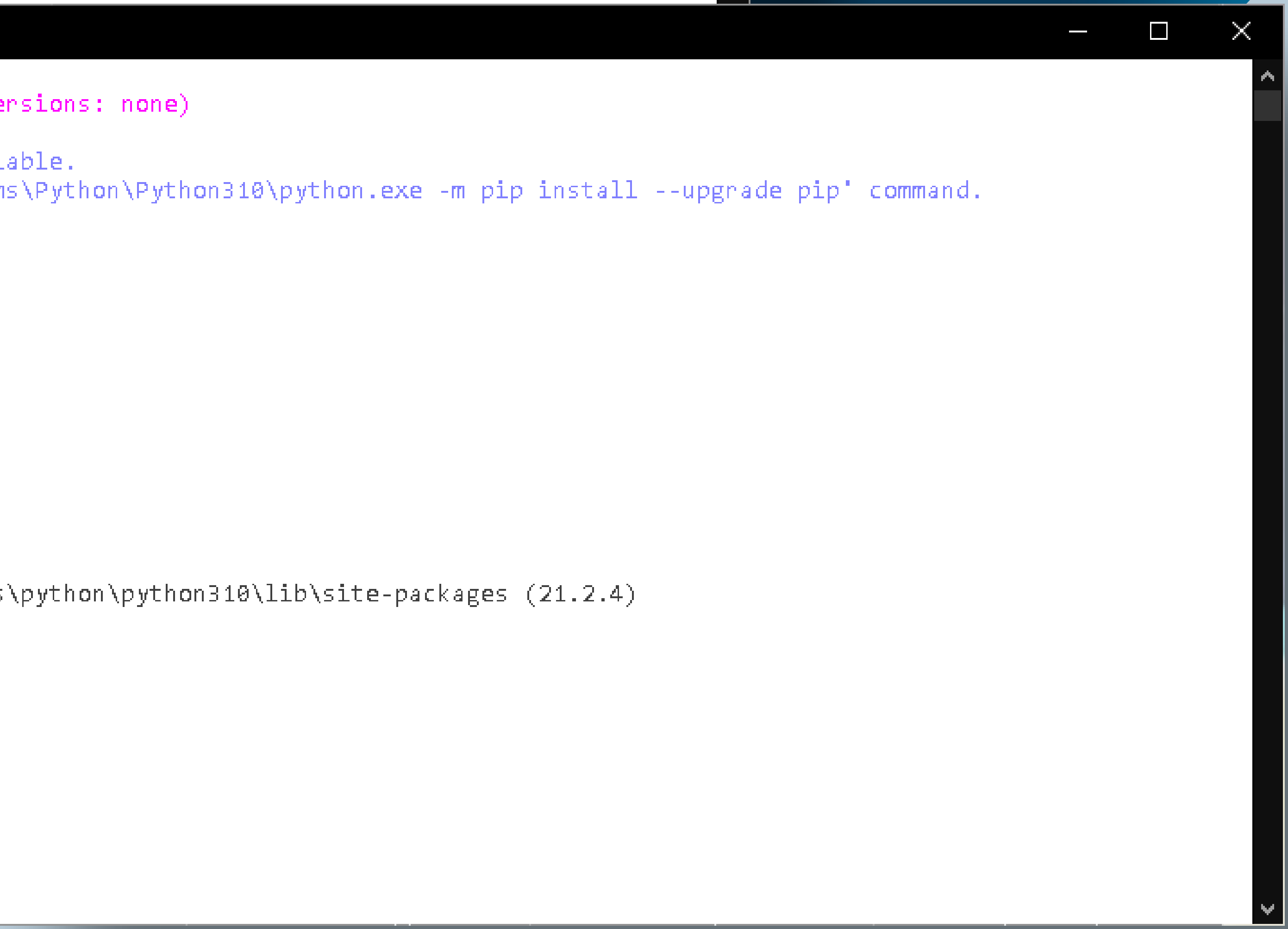


```
  Downloading delphi-2.0.1-py3-none-any.whl (7.4 kB)
ERROR: Could not find a version that satisfies the requirement vcl (from ve
ERROR: No matching distribution found for vcl
WARNING: You are using pip version 21.2.4; however, version 22.0.3 is avail
You should consider upgrading via the 'C:\Users\edito\AppData\Local\Program

C:\Users\edito>-m pip install--upgrade pip
'-m' is not recognized as an internal or external command,
operable program or batch file.

C:\Users\edito>pip install--upgrade pip
ERROR: unknown command "install--upgrade" - maybe you meant "install"

C:\Users\edito>-m pip install --upgrade pip
'-m' is not recognized as an internal or external command,
operable program or batch file.

C:\Users\edito>python.exe -m pip install --upgrade pip
Requirement already satisfied: pip in c:\users\edito\appdata\local\programs
Collecting pip
  Downloading pip-22.0.3-py3-none-any.whl (2.1 MB)
     |████████████████████████████████| 2.1 MB ...
Installing collected packages: pip
  Attempting uninstall: pip
    Found existing installation: pip 21.2.4
    Uninstalling pip-21.2.4:
      Successfully uninstalled pip-21.2.4
Successfully installed pip-22.0.3

C:\Users\edito>
```

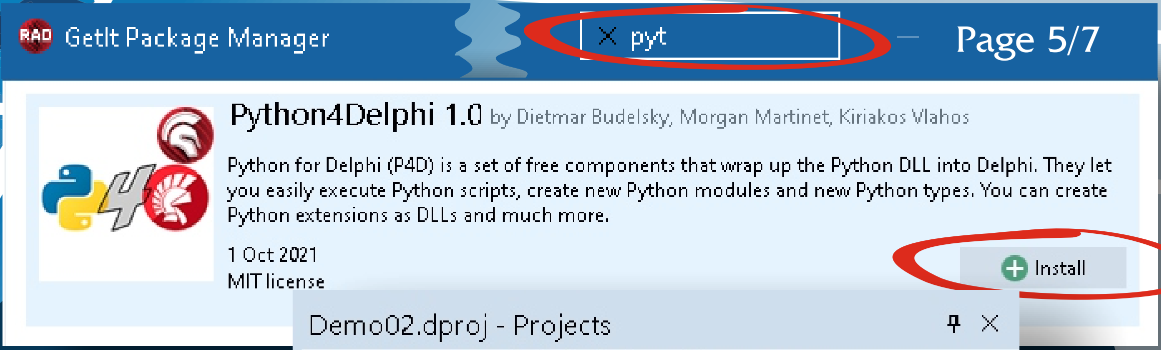


```
 versions: none)

ailable.
rams\Python\Python310\python.exe -m pip install
```

I have inverted the **Command Prompt** which is shown here, so they will be better readable.
Please read the text and it will help you during installation.
You can set the PDF file to show two pages side by side, so can read the whole texst.



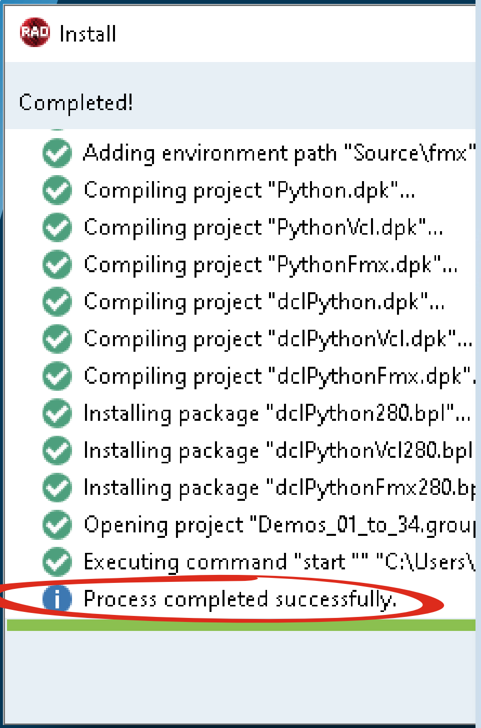
```
ersions: none)

lable.
ns\Python\Python310\python.exe -m pip install --upgrade pip' command.










s\python\python310\lib\site-packages (21.2.4)
```



Python4Delphi 1.0 by Dietmar Budelsky, Morgan Martinet, Kiriakos Vlahos

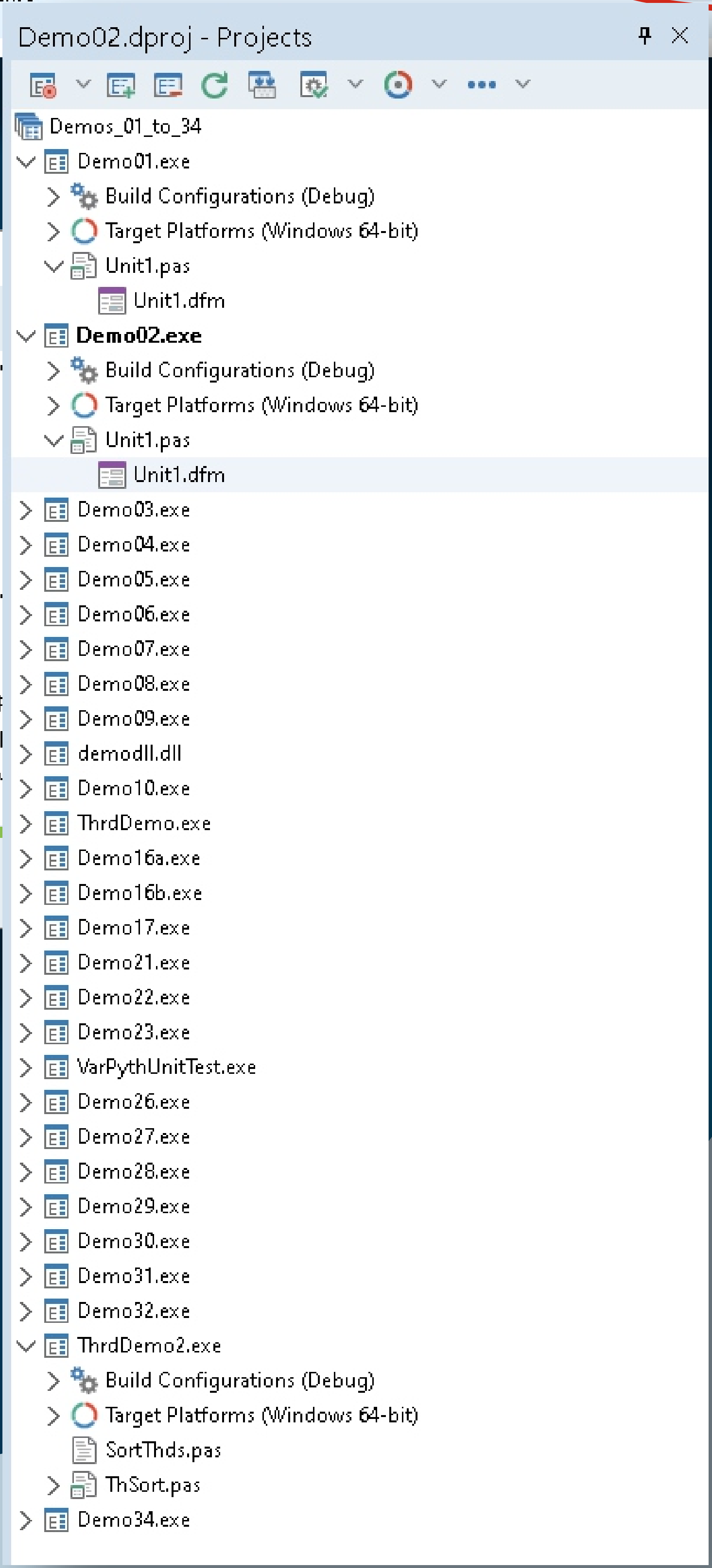
Python for Delphi (P4D) is a set of free components that wrap up the Python DLL into Delphi. They let you easily execute Python scripts, create new Python modules and new Python types. You can create Python extensions as DLLs and much more.

1 Oct 2021
MIT license



Completed!

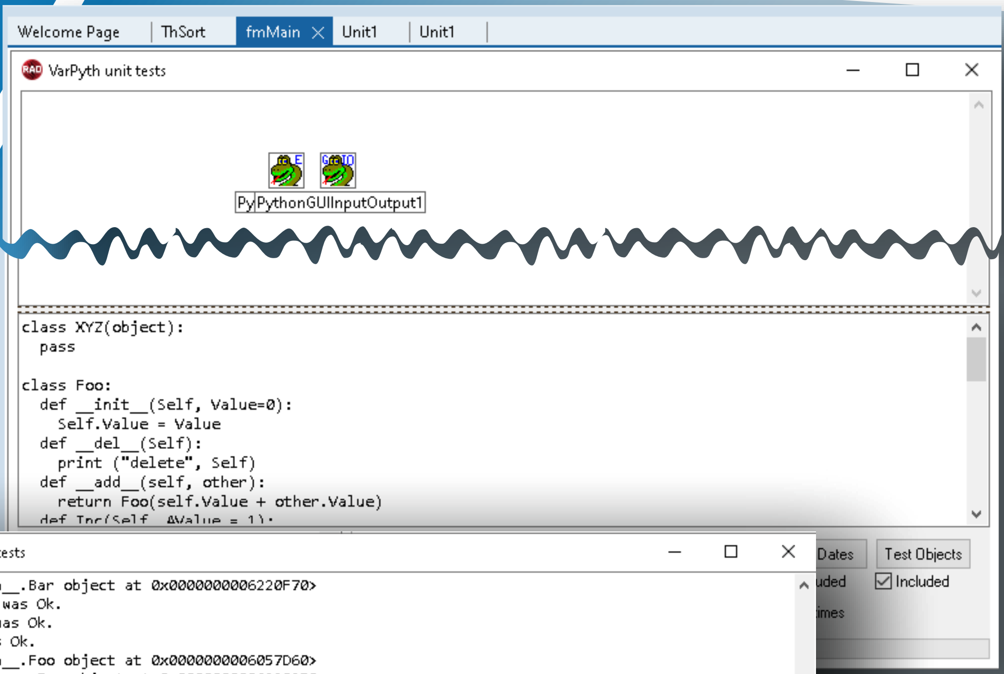
```
Adding environment path "Source\fmx"
Compiling project "Python.dpk"...
Compiling project "PythonVcl.dpk"...
Compiling project "PythonFmx.dpk"...
Compiling project "dclPython.dpk"...
Compiling project "dclPythonVcl.dpk"...
Compiling project "dclPythonFmx.dpk".
Installing package "dclPython280.bpl"...
Installing package "dclPythonVcl280.bpl
Installing package "dclPythonFmx280.bp
Opening project "Demos_01_to_34.grou
Executing command "start "" "C:\Users\
Process completed successfully.
```



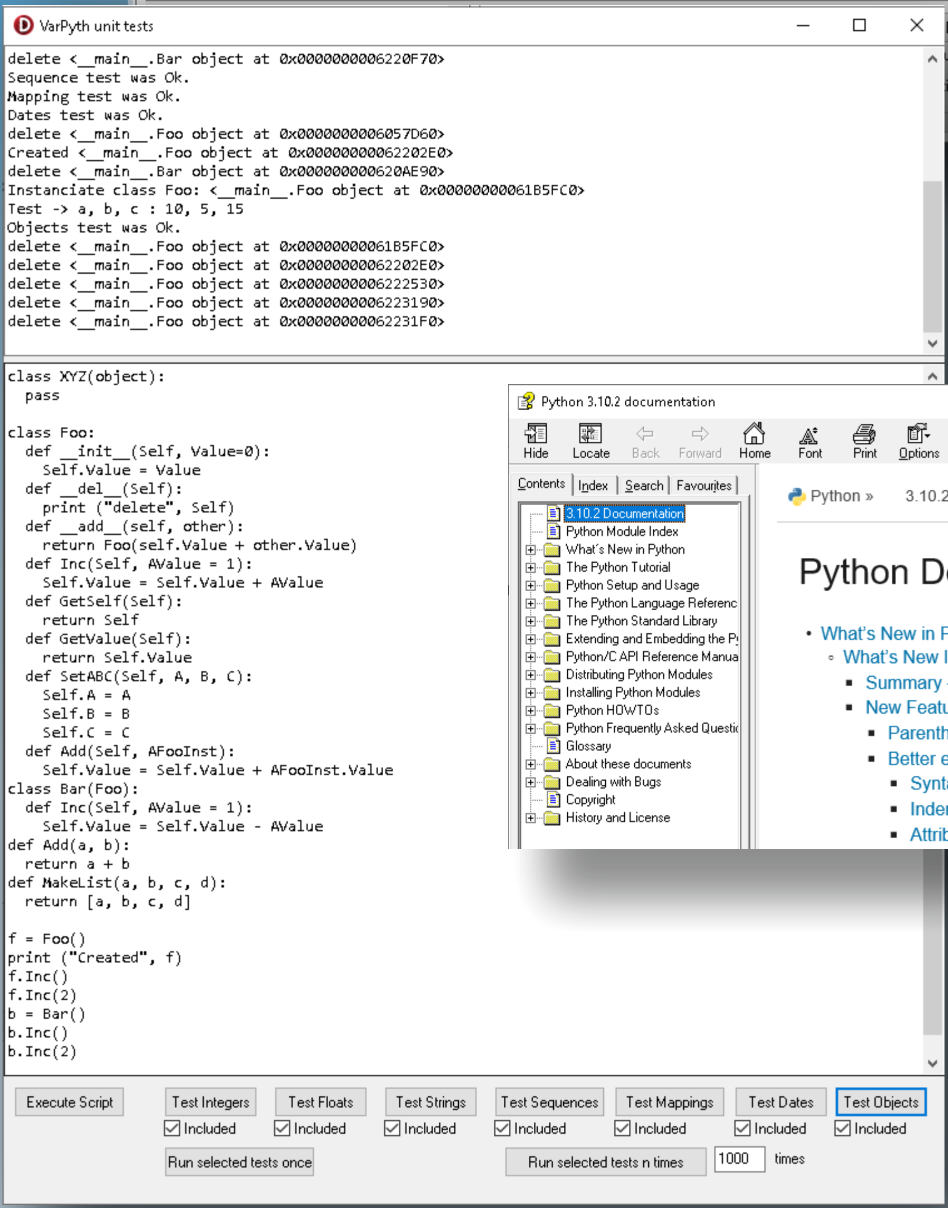
```
Demos_01_to_34
  Demo01.exe
    Build Configurations (Debug)
    Target Platforms (Windows 64-bit)
    Unit1.pas
      Unit1.dfm
  Demo02.exe
    Build Configurations (Debug)
    Target Platforms (Windows 64-bit)
    Unit1.pas
      Unit1.dfm
  Demo03.exe
  Demo04.exe
  Demo05.exe
  Demo06.exe
  Demo07.exe
  Demo08.exe
  Demo09.exe
  demodll.dll
  Demo10.exe
  ThrdDemo.exe
  Demo16a.exe
  Demo16b.exe
  Demo17.exe
  Demo21.exe
  Demo22.exe
  Demo23.exe
  VarPythUnitTest.exe
  Demo26.exe
  Demo27.exe
  Demo28.exe
  Demo29.exe
  Demo30.exe
  Demo31.exe
  Demo32.exe
  ThrdDemo2.exe
    Build Configurations (Debug)
    Target Platforms (Windows 64-bit)
    SortThds.pas
    ThSort.pas
  Demo34.exe
```

Installation of the components of Delphi for Python works inside Delphi and the easiest way is to handle it is through the GetIt Package manager.
Search for "Pyt" (*See at the top*) and the click install.
The demo apps and components will be installed automatically.

Some are shown on the *next page 6 of this article*

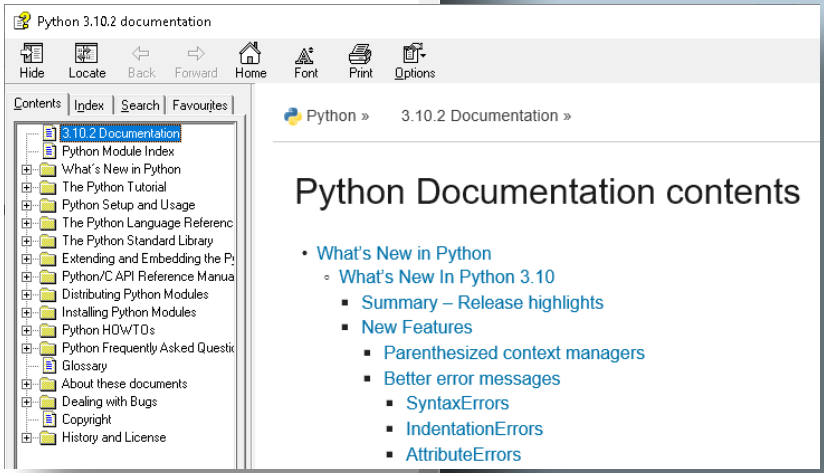


```
class XYZ(object):
  pass

class Foo:
  def __init__(Self, Value=0):
    Self.Value = Value
  def __del__(Self):
    print ("delete", Self)
  def __add__(self, other):
    return Foo(self.Value + other.Value)
  def Inc(Self, AValue = 1):
```



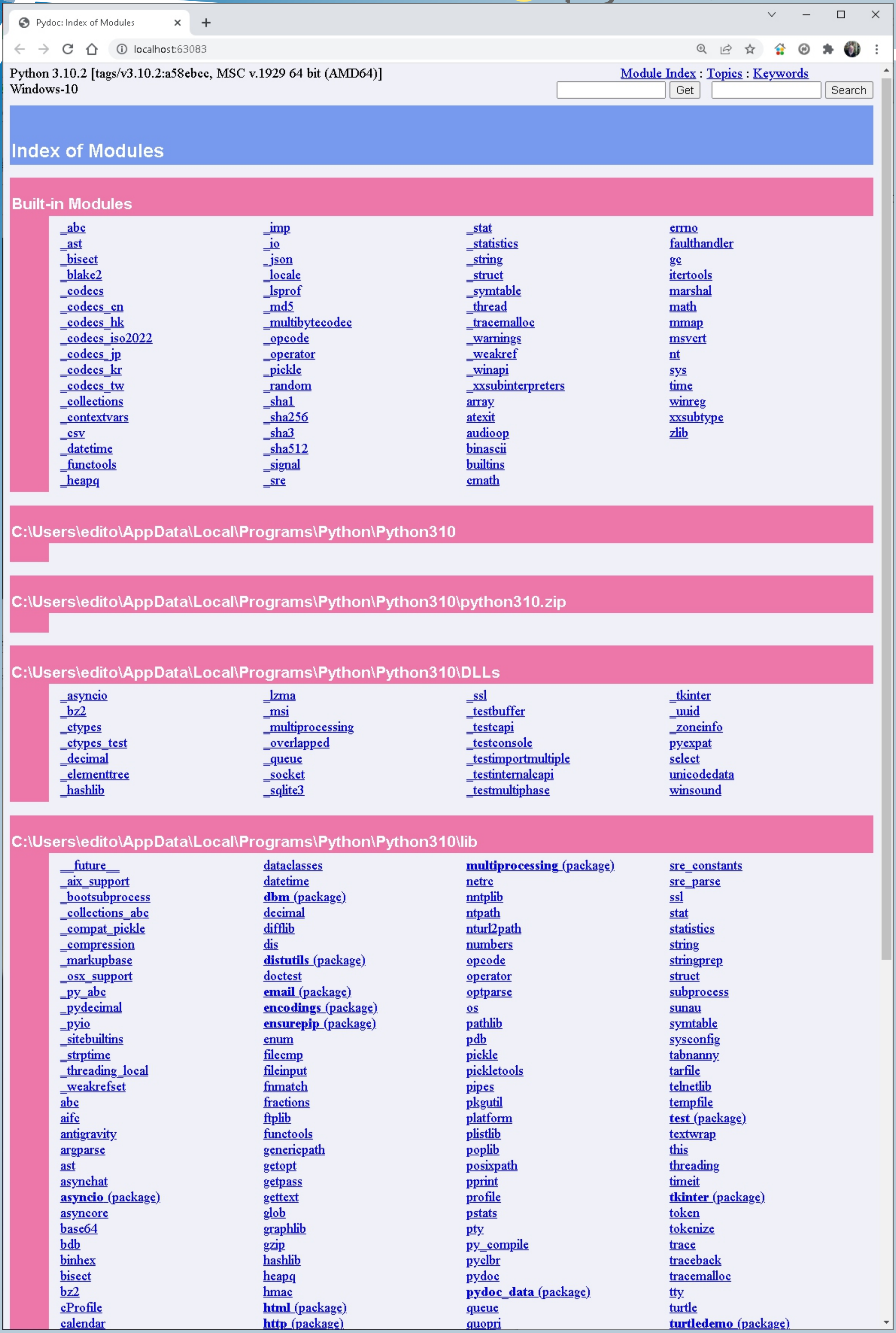
```
delete <__main__.Bar object at 0x0000000006220F70>
Sequence test was Ok.
Mapping test was Ok.
Dates test was Ok.
delete <__main__.Foo object at 0x0000000006057D60>
Created <__main__.Foo object at 0x00000000062202E0>
delete <__main__.Bar object at 0x000000000620AE90>
Instanciate class Foo: <__main__.Foo object at 0x00000000061B5FC0>
Test -> a, b, c : 10, 5, 15
Objects test was Ok.
delete <__main__.Foo object at 0x00000000061B5FC0>
delete <__main__.Foo object at 0x00000000062202E0>
delete <__main__.Foo object at 0x0000000006222530>
delete <__main__.Foo object at 0x0000000006223190>
delete <__main__.Foo object at 0x00000000062231F0>
```

```
class XYZ(object):
  pass

class Foo:
  def __init__(Self, Value=0):
    Self.Value = Value
  def __del__(Self):
    print ("delete", Self)
  def __add__(self, other):
    return Foo(self.Value + other.Value)
  def Inc(Self, AValue = 1):
    Self.Value = Self.Value + AValue
  def GetSelf(Self):
    return Self
  def GetValue(Self):
    return Self.Value
  def SetABC(Self, A, B, C):
    Self.A = A
    Self.B = B
    Self.C = C
  def Add(Self, AFooInst):
    Self.Value = Self.Value + AFooInst.Value
class Bar(Foo):
  def Inc(Self, AValue = 1):
    Self.Value = Self.Value - AValue
def Add(a, b):
  return a + b
def MakeList(a, b, c, d):
  return [a, b, c, d]

f = Foo()
print ("Created", f)
f.Inc()
f.Inc(2)
b = Bar()
b.Inc()
b.Inc(2)
```



Python Documentation contents

- What's New in Python
  - What's New In Python 3.10
    - Summary – Release highlights
    - New Features
      - Parenthesized context managers
      - Better error messages
        - SyntaxErrors
        - IndentationErrors
        - AttributeErrors



Python 3.10.2 [tags/v3.10.2:a58ebcc, MSC v.1929 64 bit (AMD64)]
Windows-10

Module Index : Topics : Keywords

Index of Modules

Built-in Modules

_abc	_imp	_stat	errno
_ast	_io	_statistics	faulthandler
_bisect	_json	_string	gc
_blake2	_locale	_struct	itertools
_codecs	_lsprof	_symtable	marshal
_codecs_cn	_md5	_thread	math
_codecs_hk	_multibytecodec	_tracemalloc	mmap
_codecs_iso2022	_opcode	_warnings	msvcrt
_codecs_jp	_operator	_weakref	nt
_codecs_kr	_pickle	_winapi	sys
_codecs_tw	_random	_xxsubinterpreters	time
_collections	_sha1	array	winreg
_contextvars	_sha256	atexit	xxsubtype
_csv	_sha3	audioop	zlib
_datetime	_sha512	binascii	
_functools	_signal	builtins	
_heapq	_sre	cmath	

C:\Users\edito\AppData\Local\Programs\Python\Python310

C:\Users\edito\AppData\Local\Programs\Python\Python310\python310.zip

C:\Users\edito\AppData\Local\Programs\Python\Python310\DLLs

_asyncio	_lzma	_ssl	_tkinter
_bz2	_msi	_testbuffer	_uuid
_ctypes	_multiprocessing	_testcapi	_zoneinfo
_ctypes_test	_overlapped	_testconsole	pyexpat
_decimal	_queue	_testimportmultiple	select
_elementtree	_socket	_testinternalcapi	unicodedata
_hashlib	_sqlite3	_testmultiphase	winsound

C:\Users\edito\AppData\Local\Programs\Python\Python310\lib

__future__	dataclasses	**multiprocessing** (package)	sre_constants
_aix_support	datetime	netrc	sre_parse
_bootsubprocess	**dbm** (package)	nntplib	ssl
_collections_abc	decimal	ntpath	stat
_compat_pickle	difflib	nturl2path	statistics
_compression	dis	numbers	string
_markupbase	**distutils** (package)	opcode	stringprep
_osx_support	doctest	operator	struct
_py_abc	**email** (package)	optparse	subprocess
_pydecimal	**encodings** (package)	os	sunau
_pyio	**ensurepip** (package)	pathlib	symtable
_sitebuiltins	enum	pdb	sysconfig
_strptime	filecmp	pickle	tabnanny
_threading_local	fileinput	pickletools	tarfile
_weakrefset	fnmatch	pipes	telnetlib
abc	fractions	pkgutil	tempfile
aifc	ftplib	platform	**test** (package)
antigravity	functools	plistlib	textwrap
argparse	genericpath	poplib	this
ast	getopt	posixpath	threading
asynchat	getpass	pprint	timeit
asyncio (package)	gettext	profile	**tkinter** (package)
asyncore	glob	pstats	token
base64	graphlib	pty	tokenize
bdb	gzip	py_compile	trace
binhex	hashlib	pyclbr	traceback
bisect	heapq	pydoc	tracemalloc
bz2	hmac	**pydoc_data** (package)	tty
cProfile	**html** (package)	queue	turtle
calendar	**http** (package)	quopri	**turtledemo** (package)

Datum en tijd
do 19 mei 2022
09:00 – 17:00 CEST

Locatie
Van der Valk Hotel Breukelen
91 Stationsweg
3621 LK Breukelen

Restitutiebeleid
Geen refunds

barnsten

Kom naar de Delphi Dag 2022!

Wat hebben we hiernaar uitgekeken! Een LIVE Delphi dag met interessante sessies verzorgd door Delphi Experts.

Wat kunt u verwachten?

Maak kennis met ervaren Delphi experts die u tijdens hun boeiende sessies meer vertellen over de door hen gebruikte technieken, nieuwe technologieën, Delphi innovaties zoals bijvoorbeeld het gebruik van Delphi in combinatie met Mendix (Low-Code en Web) en Python (AI).

Bent u of gaat u bestaande applicaties migreren? Onze sprekers kunnen u daar zeker bij helpen! Of leer meer over Duster, de ideale tool om u te ondersteunen bij de migratie van uw Delphi code naar de nieuwste versie. Buiten de sessies om heeft u alle gelegenheid om contact te hebben met de sprekers en collega-ontwikkelaars.

Wie zijn de sprekers?

De sprekers vandaag zijn Delphi MVP's Bob Swart (Bob Swart Training & Consultancy), Danny Wind (The Delphi Company) en Marco Geuze (GDK Software). Ook zal Laurens van Run van het bedrijf Mendrix een interessante presentatie verzorgen.

Alle sessies zijn nederlands gesproken.

Dagprogramma

09:00	-	09:30	-	Welkom met koffie/thee en lekkers
09:30	-	09:45	-	Opening door Barnsten
09:45	-	10:45	-	Gebruik Delphi met Python in Artificial Intelligence Neural Networks - door Danny Wind
10:45	-	11:15	-	Pauze
11:15	-	12:15	-	Delphi en Mendix - een mooi duo - door Marco Geuze en Kees de Kraker
12:15	-	13:00	-	Lunch
13:00	-	14:00	-	High quality and maintainable code in Delphi - door Laurens van Run van Mendrix
14:10	-	5:10	-	Duster migratie tool - door GDK Software
15:10	-	15:30	-	Pauze
15:30	-	16:30	-	Delphi (Automatisch Testbaar) Web Development met IntraWeb - door Bob Swart
16:30	-	16:45	-	Q&A

Kosten en voorwaarden:

De toegangsprijs is € 99,-- excl. BTW en incl. toegang tot alle sessies, koffie/thee/frisdranken, snack en lunch. De tickets zijn niet te annuleren, maar kunnen wel worden overgedragen aan een collega. Sessies en datum kunnen wijzigen in geval van onvoorziene omstandigheden.

https://www.eventbrite.nl/e/tickets-delphi-dag-2022-290410775447

DELPHI 11.1 THE LATEST VERSION UPDATE OR UPGRADE?

RAD Studio 11.1
embarcadero
Copyright© 2022 Embarcadero Technologies, Inc. All Rights Reserved. Pat.: https://www.embarcadero.com/patents

The SplashScreen:The New Logo

ABSTRACT

UPDATE: A change in information, a modification of existing or known data. An update is a concept that in itself means that there is an improvement.
UPGRADE: Upgrading is the process of replacing a product with a newer version of the same product. An upgrade is a concept that in itself means that there is an increase in value.
I felt it necessary to clarify for myself the difference, because among other things I wanted to know what is the real nature of the latest version.
According to this is **Delphi 11.1** an **Upgrade,** and that means we need to expect it as a new version, which in consequence means you have to replace the older version 11.

INSTALLING

MIGRATION

Because of that you need to (make a backup) create a Migration file before you install the new version:
Installing will help you to first uninstall and then install. After the install you can set your original migration file to recreate your settings as much as possible to overcome the endlessly and irritating reinstalling of all kinds of components. This means the creation of a migration file. Let us start with that. In windows choose pen the program overview by clicking the (probably - left bottom) Windows Symbol. Here you search for Embarcadero and will see Figure 1.

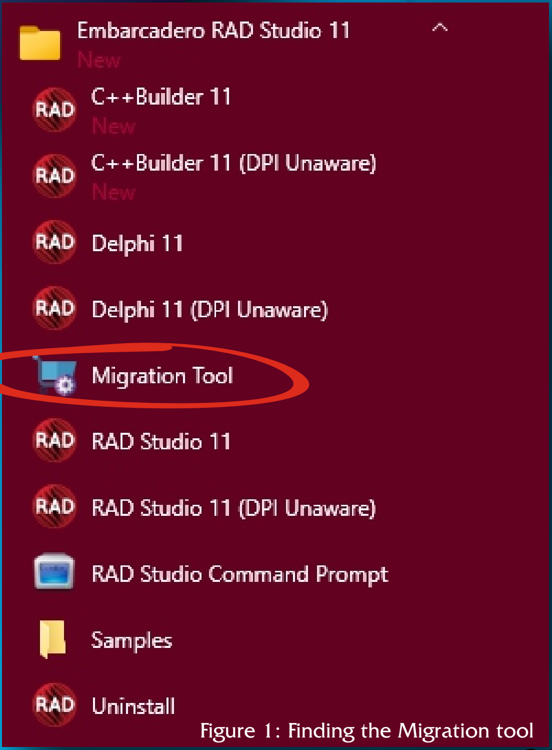
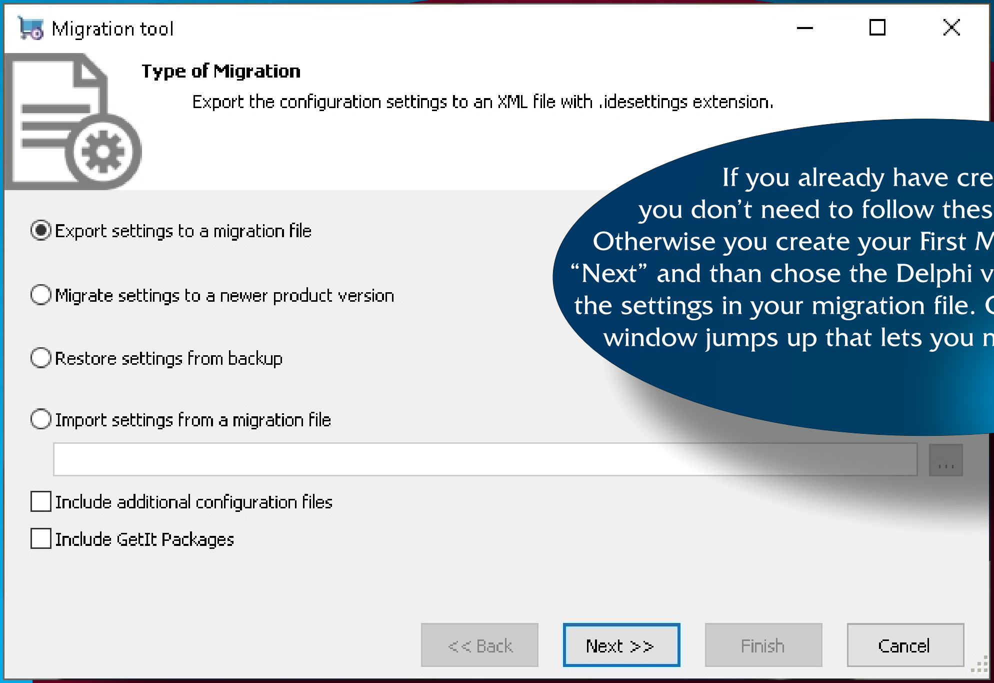

Embarcadero RAD Studio 11
New
C++Builder 11
New
C++Builder 11 (DPI Unaware)
New
Delphi 11
Delphi 11 (DPI Unaware)
Migration Tool
RAD Studio 11
RAD Studio 11 (DPI Unaware)
RAD Studio Command Prompt
Samples
Uninstall

Figure 1: Finding the Migration tool



Migration tool

Type of Migration

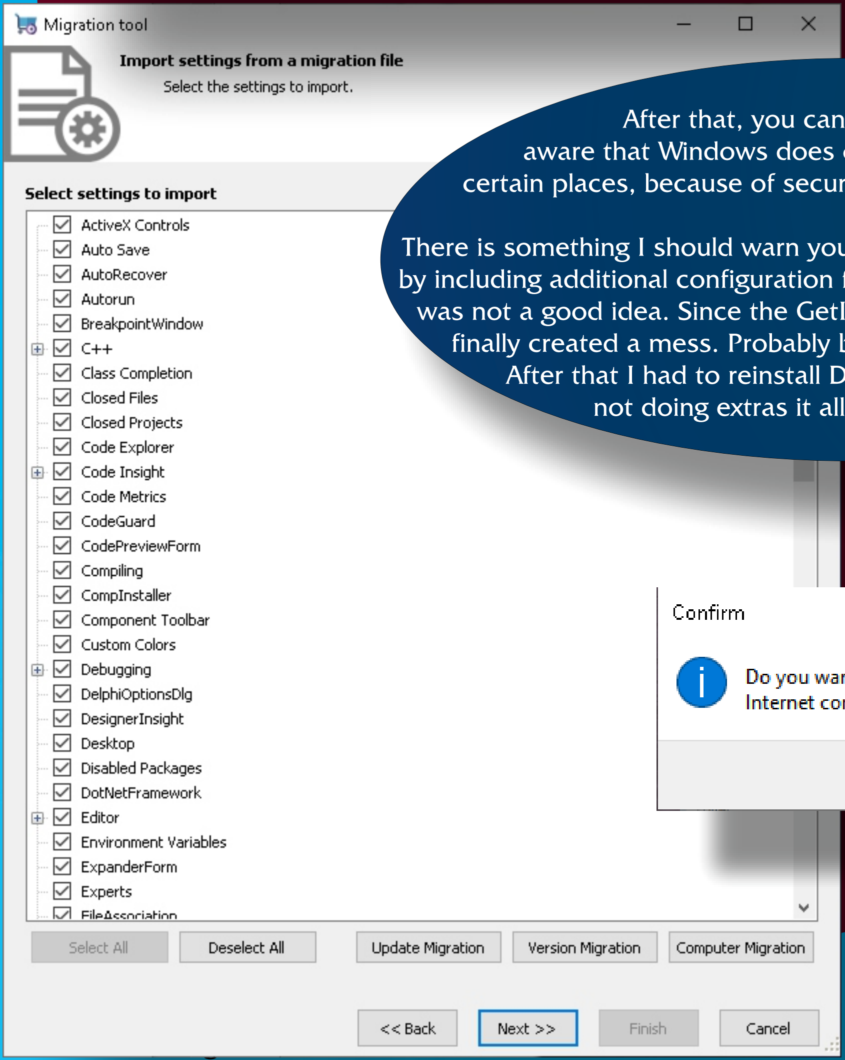
Export the configuration settings to an XML file with .idesettings extension.

(●) Export settings to a migration file
( ) Migrate settings to a newer product version
( ) Restore settings from backup
( ) Import settings from a migration file

[ ] Include additional configuration files
[ ] Include GetIt Packages

If you already have created a file you don't need to follow these steps. Otherwise you create your First Migration file. Click "Next" and than chose the Delphi version you want to put the settings in your migration file. Click"Next" again and a window jumps up that lets you make choices.

Figure 2: Export settings



Migration tool

Import settings from a migration file

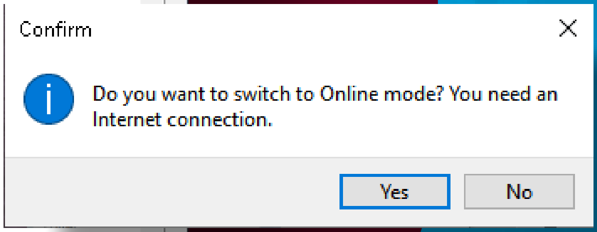
Select the settings to import.

Select settings to import

- [✓] ActiveX Controls
- [✓] Auto Save
- [✓] AutoRecover
- [✓] Autorun
- [✓] BreakpointWindow
- [✓] C++
- [✓] Class Completion
- [✓] Closed Files
- [✓] Closed Projects
- [✓] Code Explorer
- [✓] Code Insight
- [✓] Code Metrics
- [✓] CodeGuard
- [✓] CodePreviewForm
- [✓] Compiling
- [✓] CompInstaller
- [✓] Component Toolbar
- [✓] Custom Colors
- [✓] Debugging
- [✓] DelphiOptionsDlg
- [✓] DesignerInsight
- [✓] Desktop
- [✓] Disabled Packages
- [✓] DotNetFramework
- [✓] Editor
- [✓] Environment Variables
- [✓] ExpanderForm
- [✓] Experts
- [✓] FileAssociation

After that, you can save the file. Be aware that Windows does only allow you to save it in certain places, because of security reasons.

There is something I should warn you about: I tried to do a complex export by including additional configuration files and Include GetIt packages. That was not a good idea. Since the GetIt files caused quite a lot of work and finally created a mess. Probably because there were newer files. After that I had to reinstall Delphi 11.1 and after simply not doing extras it all worked.

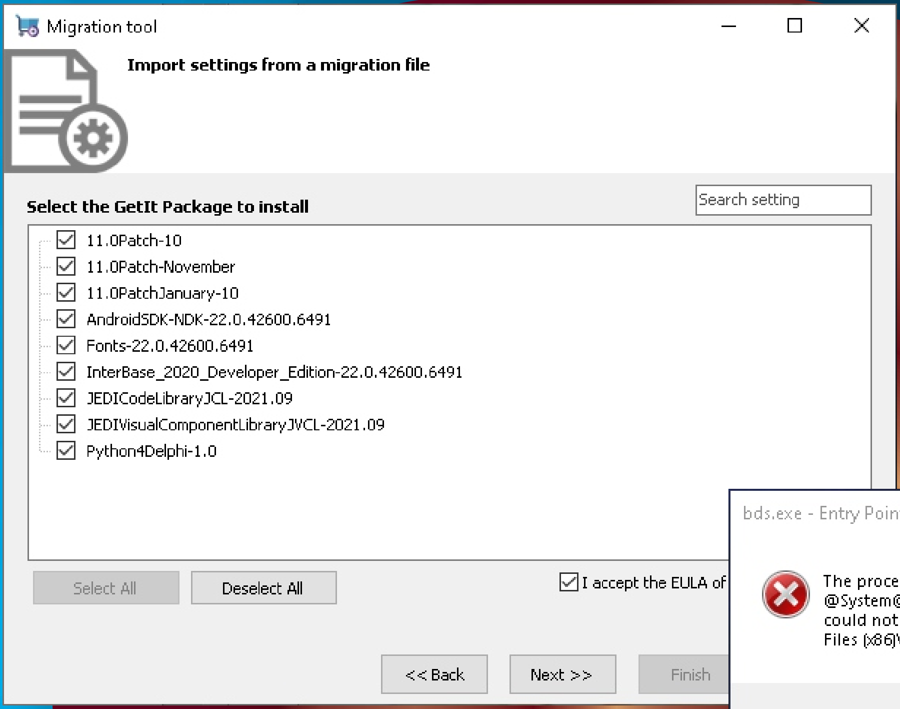


Confirm

Do you want to switch to Online mode? You need an Internet connection.

Figure 3: You'd better be sure

Figure 4: Settings for import



Migration tool

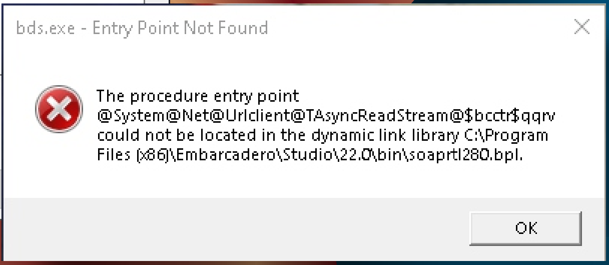
Import settings from a migration file

Select the GetIt Package to install

Search setting

- [x] 11.0Patch-10
- [x] 11.0Patch-November
- [x] 11.0PatchJanuary-10
- [x] AndroidSDK-NDK-22.0.42600.6491
- [x] Fonts-22.0.42600.6491
- [x] InterBase_2020_Developer_Edition-22.0.42600.6491
- [x] JEDICodeLibraryJCL-2021.09
- [x] JEDIVisualComponentLibraryJVCL-2021.09
- [x] Python4Delphi-1.0

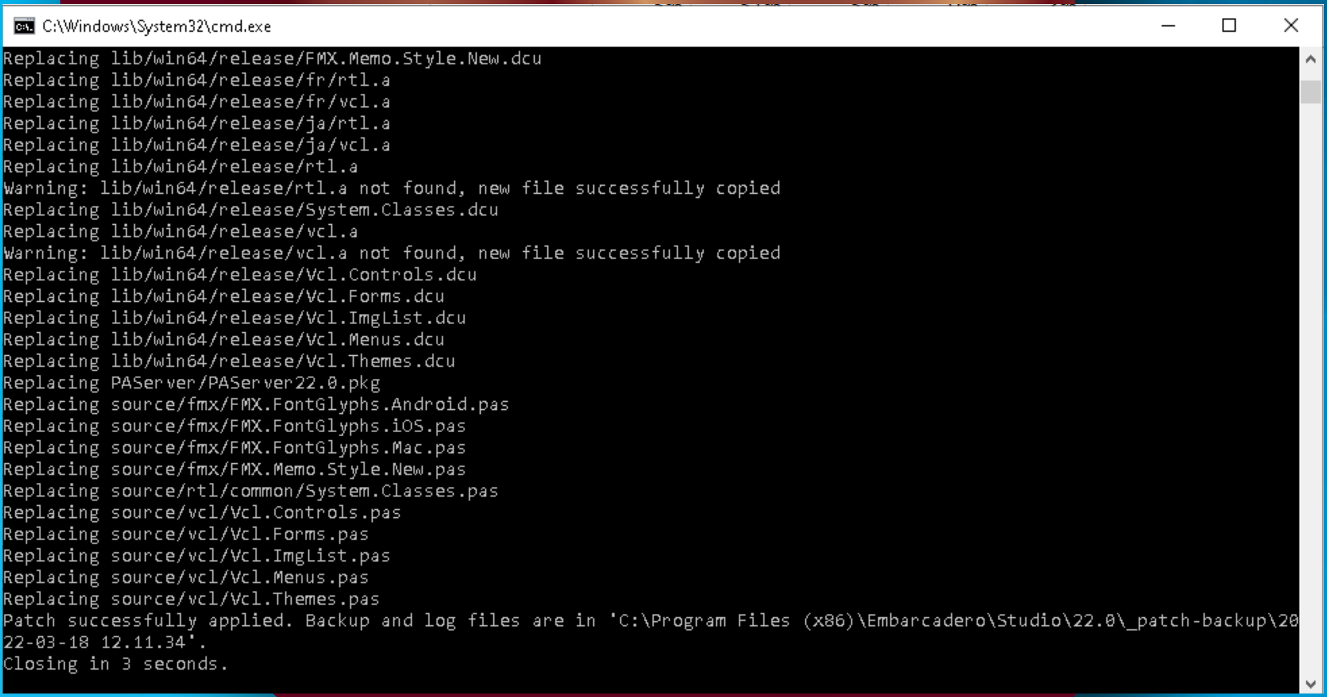
[x] I accept the EULA of



bds.exe - Entry Point Not Found

The procedure entry point @System@Net@Urlclient@TAsyncReadStream@$bcctr$qqrv could not be located in the dynamic link library C:\Program Files (x86)\Embarcadero\Studio\22.0\bin\soaprtl280.bpl.

Figure 5/6: here you select the GetItPackage:
the problem is that if you choose to do so your new version of **GeIt** will become a problem.



C:\Windows\System32\cmd.exe

```
Replacing lib/win64/release/FMX.Memo.Style.New.dcu
Replacing lib/win64/release/fr/rtl.a
Replacing lib/win64/release/fr/vcl.a
Replacing lib/win64/release/ja/rtl.a
Replacing lib/win64/release/ja/vcl.a
Replacing lib/win64/release/rtl.a
Warning: lib/win64/release/rtl.a not found, new file successfully copied
Replacing lib/win64/release/System.Classes.dcu
Replacing lib/win64/release/vcl.a
Warning: lib/win64/release/vcl.a not found, new file successfully copied
Replacing lib/win64/release/Vcl.Controls.dcu
Replacing lib/win64/release/Vcl.Forms.dcu
Replacing lib/win64/release/Vcl.ImgList.dcu
Replacing lib/win64/release/Vcl.Menus.dcu
Replacing lib/win64/release/Vcl.Themes.dcu
Replacing PAServer/PAServer22.0.pkg
Replacing source/fmx/FMX.FontGlyphs.Android.pas
Replacing source/fmx/FMX.FontGlyphs.iOS.pas
Replacing source/fmx/FMX.FontGlyphs.Mac.pas
Replacing source/fmx/FMX.Memo.Style.New.pas
Replacing source/rtl/common/System.Classes.pas
Replacing source/vcl/Vcl.Controls.pas
Replacing source/vcl/Vcl.Forms.pas
Replacing source/vcl/Vcl.ImgList.pas
Replacing source/vcl/Vcl.Menus.pas
Replacing source/vcl/Vcl.Themes.pas
Patch successfully applied. Backup and log files are in 'C:\Program Files (x86)\Embarcadero\Studio\22.0\_patch-backup\20
22-03-18 12.11.34'.
Closing in 3 seconds.
```

Figure 7: Not knowing this I executed it and than a lot of time was used to install all the old Getit packages.

I was not able to start Delphi again.
The easiest solution I found was reinstalling.
Since I am using the `.iso` file (`RADStudio_11_1_esd_10_8973a.iso`)
it does not need that much time to do it all over. Much better than it ever was....

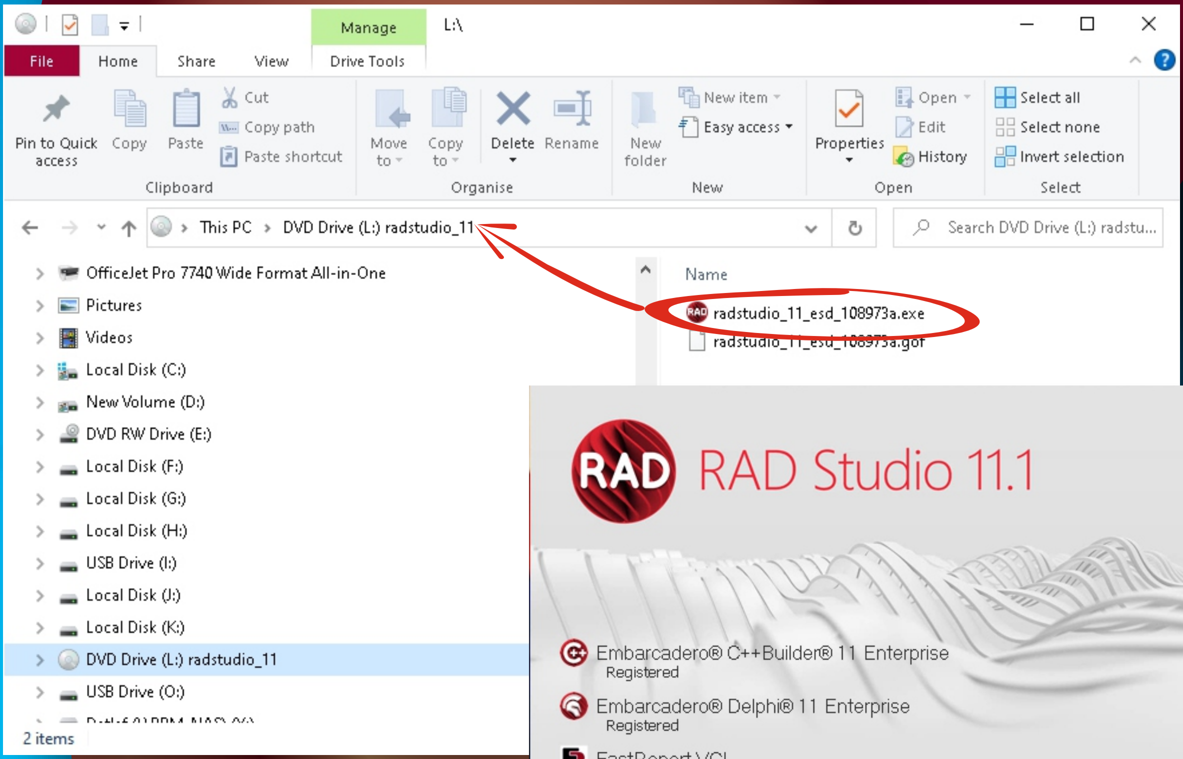
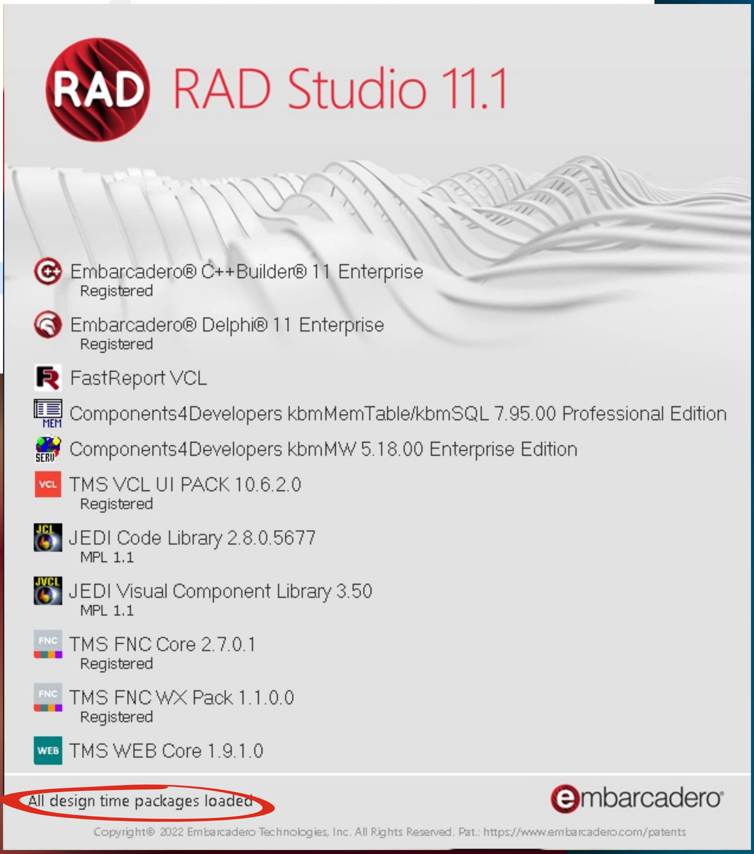


Figure 7:
For installing you will find if you use the .iso a new virtual DVD player.

Unpacked to a virtual DVD drive the number of the Delphi version is 11. But do not worry. its correct.


RAD Studio 11.1

Embarcadero® C++Builder® 11 Enterprise
Registered
Embarcadero® Delphi® 11 Enterprise
Registered
FastReport VCL
Components4Developers kbmMemTable/kbmSQL 7.95.00 Professional Edition
Components4Developers kbmMW 5.18.00 Enterprise Edition
TMS VCL UI PACK 10.6.2.0
Registered
JEDI Code Library 2.8.0.5677
MPL 1.1
JEDI Visual Component Library 3.50
MPL 1.1
TMS FNC Core 2.7.0.1
Registered
TMS FNC WX Pack 1.1.0.0
Registered
TMS WEB Core 1.9.1.0

All design time packages loaded

embarcadero

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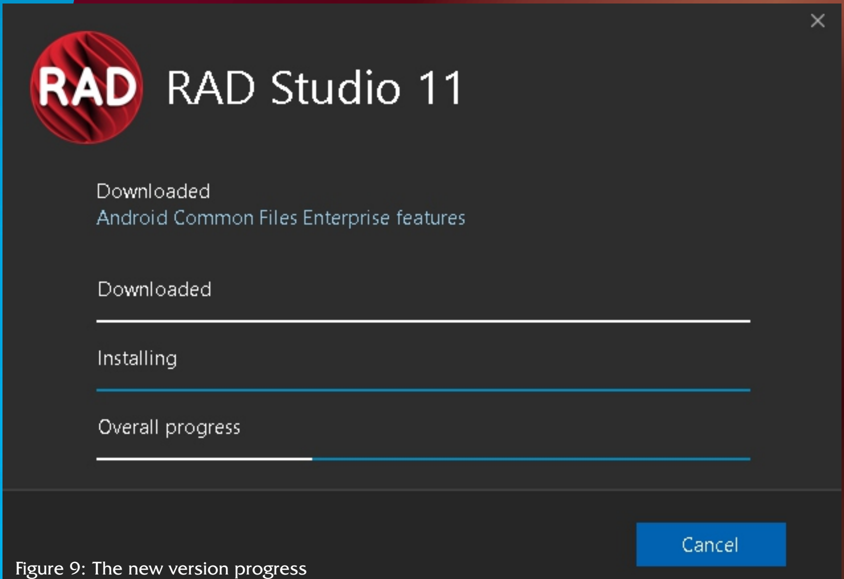
Figure 8: The new version starts:

After creating
the Migration setting file you can start.
We need to find out what are the essential new things for
this version, and that's exactly what I want to do in this article...

If you have a version of **Delphi** 11 it will ask you if you want it to be uninstalled.
Alas that needs to be done.


RAD Studio 11

Downloaded
Android Common Files Enterprise features

Downloaded

Installing

Overall progress

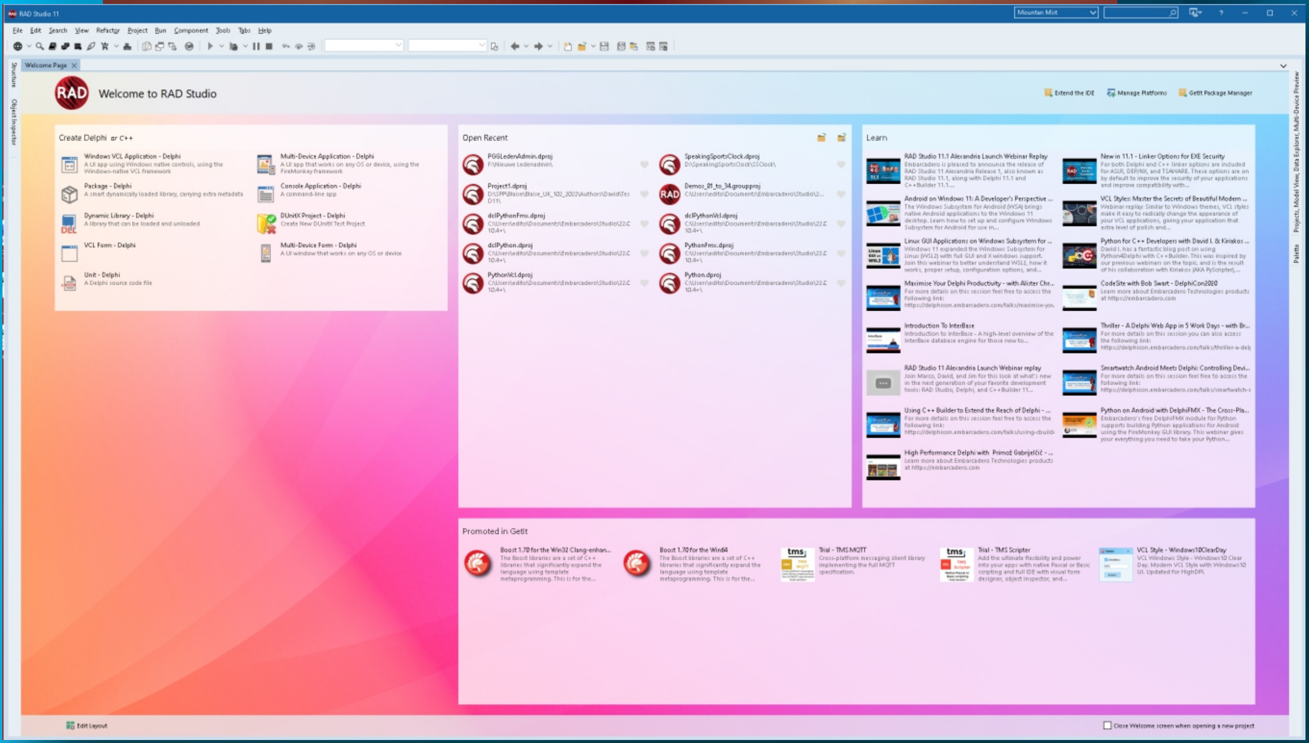
Cancel

Figure 9: The new version progress

Here I show what is new and updated in the 11.1 version:

❶ IMPROVED IDE

Figure 10: The new version is shown for the first time



Welcome to RAD Studio

Create Delphi or C++

Windows VCL Application - Delphi
A UI app using Windows native controls, using the Windows-native VCL framework

Multi-Device Application - Delphi
A UI app that works on any OS or device, using the FireMonkey framework

Package - Delphi
A smart dynamically loaded library, carrying extra metadata

Console Application - Delphi
A command-line app

Dynamic Library - Delphi
A library that can be loaded and unloaded

DUnitX Project - Delphi
Create New DUnitX Test Project

VCL Form - Delphi

Multi-Device Form - Delphi
A UI window that works on any OS or device

Unit - Delphi
A Delphi source code file

Open Recent

PGGLedenAdmin.dproj
F:\Nieuwe Ledenadmin\

SpeakingSportsClock.dproj
D:\SpeakingSportsClock\SSClock\

Project1.dproj
D:\SPP\Blaise\Blaise_UK_102_2022\Authors\David\Tes
D11\

Demos_01_to_34.groupproj
C:\Users\edito\Documents\Embarcadero\Studio\2...

dclPythonFmx.dproj
C:\Users\edito\Documents\Embarcadero\Studio\22.C
10.4+\

dclPythonVcl.dproj
C:\Users\edito\Documents\Embarcadero\Studio\22.C
10.4+\

dclPython.dproj
C:\Users\edito\Documents\Embarcadero\Studio\22.C
10.4+\

PythonFmx.dproj
C:\Users\edito\Documents\Embarcadero\Studio\22.C
10.4+\

PythonVcl.dproj
C:\Users\edito\Documents\Embarcadero\Studio\22.C
10.4+\

Python.dproj
C:\Users\edito\Documents\Embarcadero\Studio\22.C
10.4+\

Learn

RAD Studio 11.1 Alexandria Launch Webinar Replay
Embarcadero is pleased to announce the release of RAD Studio 11 Alexandria Release 1, also known as RAD Studio 11.1, along with Delphi 11.1 and C++Builder 11.1....

New in 11.1 - Linker Options for EXE Security
For both Delphi and C++ linker options are included for ASLR, DEP/NX, and TSAWARE. These options are on by default to improve the security of your applications and improve compatibility with...

Android on Windows 11: A Developer's Perspective ...
The Windows Subsystem for Android (WSA) brings native Android applications to the Windows 11 desktop. Learn how to set up and configure Windows Subsystem for Android for use in...

VCL Styles: Master the Secrets of Beautiful Modern ...
Webinar replay: Similar to Windows themes, VCL styles make it easy to radically change the appearance of your VCL applications, giving your application that extra level of polish and...

Linux GUI Applications on Windows Subsystem for ...
Windows 11 expanded the Windows Subsystem for Linux (WSL2) with full GUI and X windows support. Join this webinar to better understand WSL2, how it works, proper setup, configuration options, and...

Python for C++ Developers with David I. & Kiriakos ...
David I. has a fantastic blog post on using Python4Delphi with C++Builder. This was inspired by our previous webinars on the topic, and is the result of his collaboration with Kiriakos (AKA PyScripter),...

Maximise Your Delphi Productivity - with Alister Chr...
For more details on this session feel free to access the following link:
https://delphicon.embarcadero.com/talks/maximise-you

CodeSite with Bob Swart - DelphiCon2020
Learn more about Embarcadero Technologies products at https://embarcadero.com

Introduction To InterBase
Introduction to InterBase - A high-level overview of the InterBase database engine for those new to...

Thriller - A Delphi Web App in 5 Work Days - with Br...
For more details on this session you can also access the following link:
https://delphicon.embarcadero.com/talks/thriller-a-delp

RAD Studio 11 Alexandria Launch Webinar replay
Join Marco, David, and Jim for this look at what's new in the next generation of your favorite development tools: RAD Studio, Delphi, and C++Builder 11...

Smartwatch Android Meets Delphi: Controlling Devi...
For more details on this session feel free to access the following link:
https://delphicon.embarcadero.com/talks/smartwatch-a

Using C++Builder to Extend the Reach of Delphi - ...
For more details on this session feel free to access the following link:
https://delphicon.embarcadero.com/talks/using-cbuild

Python on Android with DelphiFMX - The Cross-Pla...
Embarcadero's free DelphiFMX module for Python supports building Python applications for Android using the FireMonkey GUI library. This webinar gives your everything you need to take your Python...

High Performance Delphi with Primož Gabrijelčič - ...
Learn more about Embarcadero Technologies products at https://embarcadero.com

Promoted in GetIt

Boost 1.70 for the Win32 Clang-enhan...
The Boost libraries are a set of C++ libraries that significantly expand the language using template metaprogramming. This is for the...

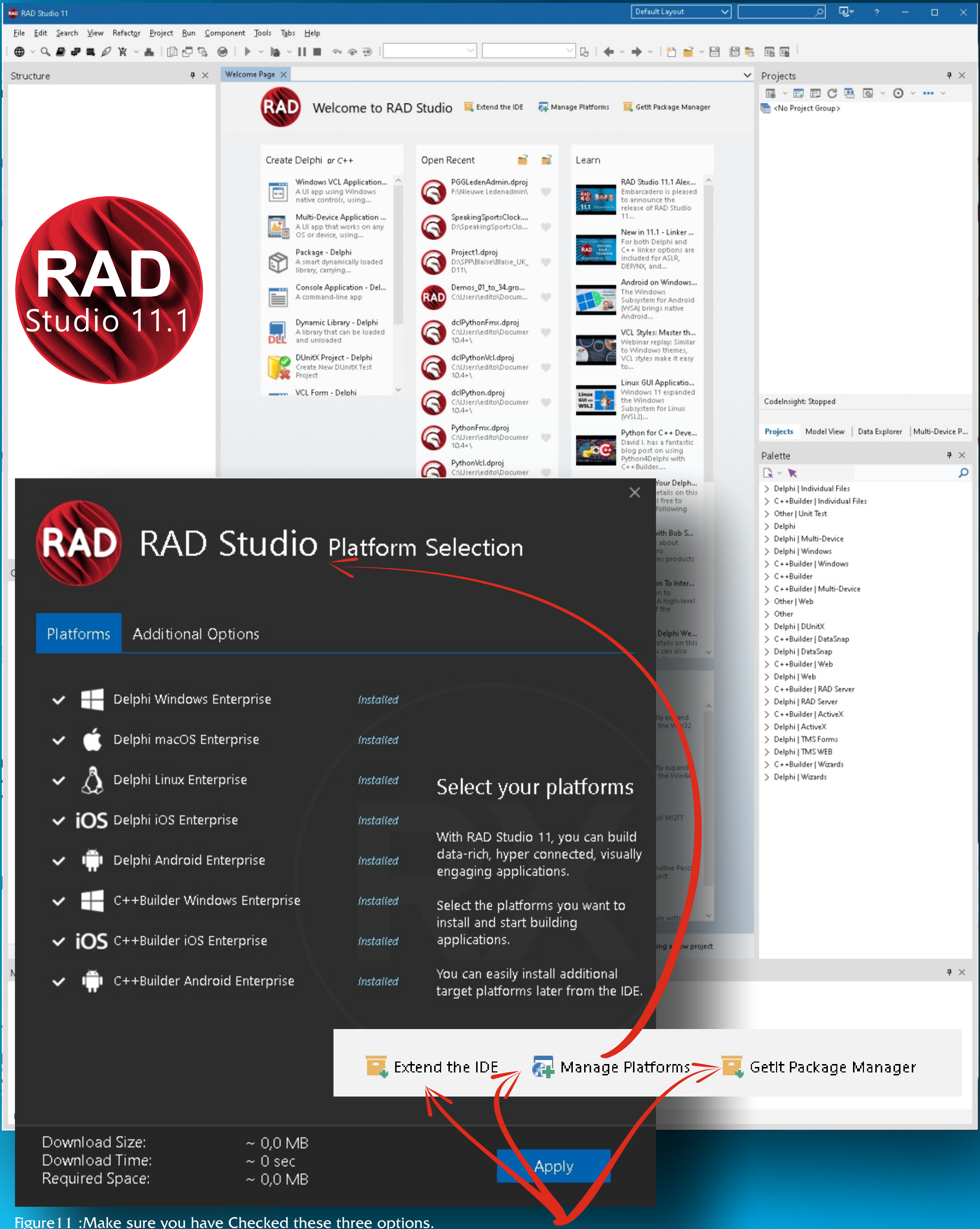
Boost 1.70 for the Win64
The Boost libraries are a set of C++ libraries that significantly expand the language using template metaprogramming. This is for the...

Trial - TMS MQTT
Cross-platform messaging client library implementing the full MQTT specification.

Trial - TMS Scripter
Add the ultimate flexibility and power into your apps with native Pascal or Basic scripting and full IDE with visual form designer, object inspector, and...

VCL Style - Windows10ClearDay
VCL Windows Style - Windows10 Clear Day. Modern VCL Style with Windows10 UI. Updated for HighDPI.

Close Welcome screen when opening a new project



Create Delphi or C++

- Windows VCL Application... A UI app using Windows native controls, using...
- Multi-Device Application ... A UI app that works on any OS or device, using...
- Package - Delphi A smart dynamically loaded library, carrying...
- Console Application - Del... A command-line app
- Dynamic Library - Delphi A library that can be loaded and unloaded
- DUnitX Project - Delphi Create New DUnitX Test Project
- VCL Form - Delphi

Open Recent

- PGGLedenAdmin.dproj F:\Nieuwe Ledenadmin\
- SpeakingSportsClock.... D:\SpeakingSportsClo...
- Project1.dproj D:\SPP\Blaise\Blaise_UK_D11\
- Demos_01_to_34.gro... C:\Users\edito\Docum...
- dclPythonFmx.dproj C:\Users\edito\Documer 10.4+\
- dclPythonVcl.dproj C:\Users\edito\Documer 10.4+\
- dclPython.dproj C:\Users\edito\Documer 10.4+\
- PythonFmx.dproj C:\Users\edito\Documer 10.4+\
- PythonVcl.dproj C:\Users\edito\Documer

Learn

- RAD Studio 11.1 Alex... Embarcadero is pleased to announce the release of RAD Studio 11...
- New in 11.1 - Linker ... For both Delphi and C++ linker options are included for ASLR, DEP/NX, and...
- Android on Windows... The Windows Subsystem for Android (WSA) brings native Android...
- VCL Styles: Master th... Webinar replay: Similar to Windows themes, VCL styles make it easy to...
- Linux GUI Applicatio... Windows 11 expanded the Windows Subsystem for Linux (WSL2)...
- Python for C++ Deve... David I. has a fantastic blog post on using Python4Delphi with C++Builder....

RAD Studio Platform Selection

Platforms | Additional Options

✓ Delphi Windows Enterprise	Installed
✓ Delphi macOS Enterprise	Installed
✓ Delphi Linux Enterprise	Installed
✓ Delphi iOS Enterprise	Installed
✓ Delphi Android Enterprise	Installed
✓ C++Builder Windows Enterprise	Installed
✓ C++Builder iOS Enterprise	Installed
✓ C++Builder Android Enterprise	Installed

Select your platforms

With RAD Studio 11, you can build data-rich, hyper connected, visually engaging applications.

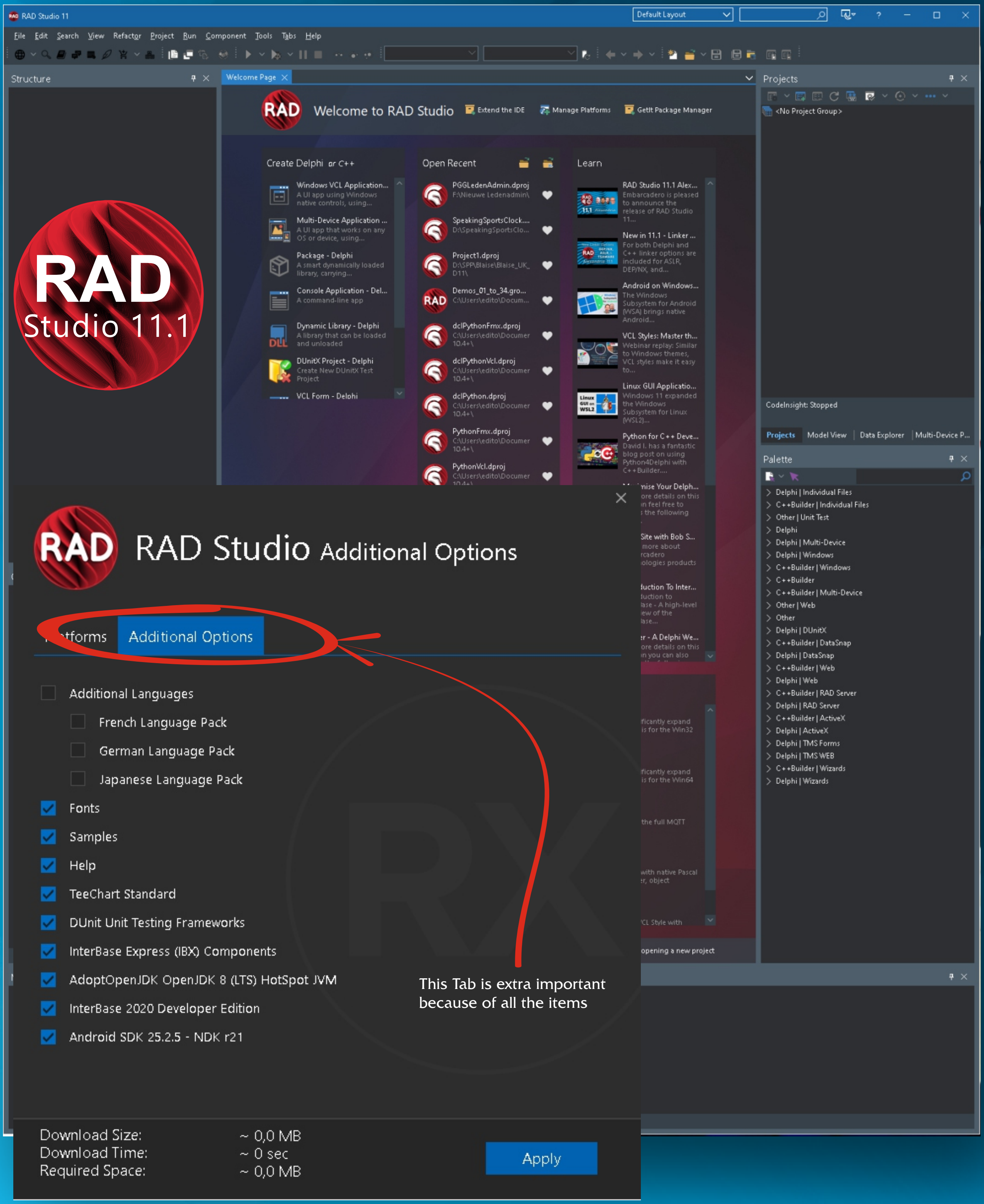
Select the platforms you want to install and start building applications.

You can easily install additional target platforms later from the IDE.

Extend the IDE | Manage Platforms | GetIt Package Manager

Download Size: ~ 0,0 MB
Download Time: ~ 0 sec
Required Space: ~ 0,0 MB

Figure11 :Make sure you have Checked these three options.



RAD Studio Additional Options

Platforms | Additional Options

- [ ] Additional Languages
  - [ ] French Language Pack
  - [ ] German Language Pack
  - [ ] Japanese Language Pack
- [x] Fonts
- [x] Samples
- [x] Help
- [x] TeeChart Standard
- [x] DUnit Unit Testing Frameworks
- [x] InterBase Express (IBX) Components
- [x] AdoptOpenJDK OpenJDK 8 (LTS) HotSpot JVM
- [x] InterBase 2020 Developer Edition
- [x] Android SDK 25.2.5 - NDK r21

This Tab is extra important
because of all the items

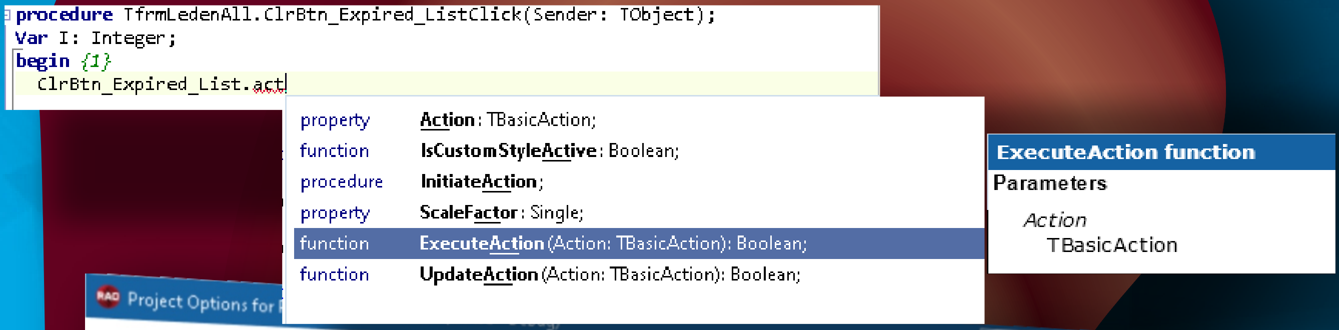
Download Size:	~ 0,0 MB
Download Time:	~ 0 sec
Required Space:	~ 0,0 MB

Apply

Figure12 : The dark mode and the menu showing Additional options

CODE INSIGHT

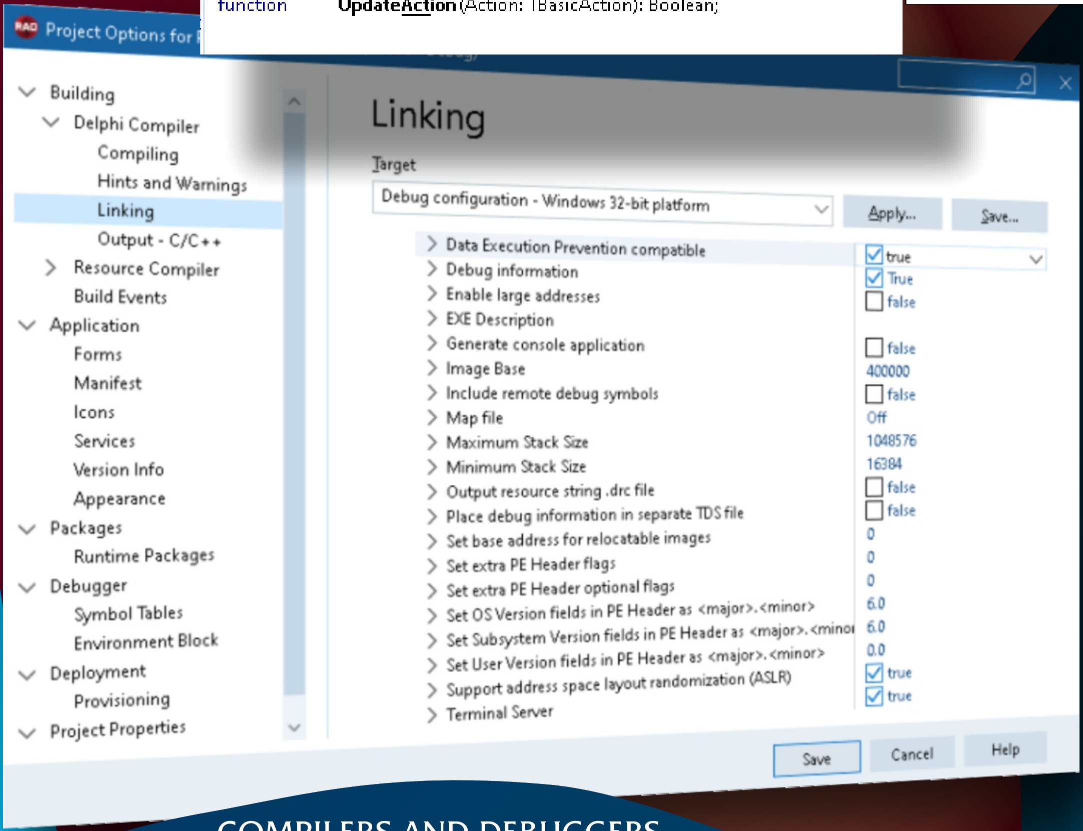
Code Insight for **Delphi,** is improved. The **Delphi LSP (Language Server Protocol architecture)** engine is greatly improved with most projects loading and **UPDATING ERROR INSIGHT** between 5 and 30 times faster. Type parameters are now visible when completing a class declaration, including **T** in a generic declaration, and showing set types.



```
procedure TfrmLedenAll.ClrBtn_Expired_ListClick(Sender: TObject);
Var I: Integer;
begin {1}
  ClrBtn_Expired_List.act
```

```
property    Action: TBasicAction;
function    IsCustomStyleActive: Boolean;
procedure   InitiateAction;
property    ScaleFactor: Single;
function    ExecuteAction(Action: TBasicAction): Boolean;
function    UpdateAction(Action: TBasicAction): Boolean;
```

ExecuteAction function
Parameters
Action
TBasicAction



Linking

Target
Debug configuration - Windows 32-bit platform

Data Execution Prevention compatible	✓ true
Debug information	✓ True
Enable large addresses	false
EXE Description	
Generate console application	false
Image Base	400000
Include remote debug symbols	false
Map file	Off
Maximum Stack Size	1048576
Minimum Stack Size	16384
Output resource string .drc file	false
Place debug information in separate TDS file	false
Set base address for relocatable images	0
Set extra PE Header flags	0
Set extra PE Header optional flags	0
Set OS Version fields in PE Header as <major>.<minor>	6.0
Set Subsystem Version fields in PE Header as <major>.<minor	6.0
Set User Version fields in PE Header as <major>.<minor>	0.0
Support address space layout randomization (ASLR)	✓ true
Terminal Server	✓ true

COMPILERS AND DEBUGGERS

Improved stability and performance of **Delphi** compilers for various platforms. The **Delphi macOS 64-bit ARM** and **Android 64**-bit debuggers are now based on the **LLDB** debugger architecture, which was already in use for the **Delphi iOS** 64-bit debugger.

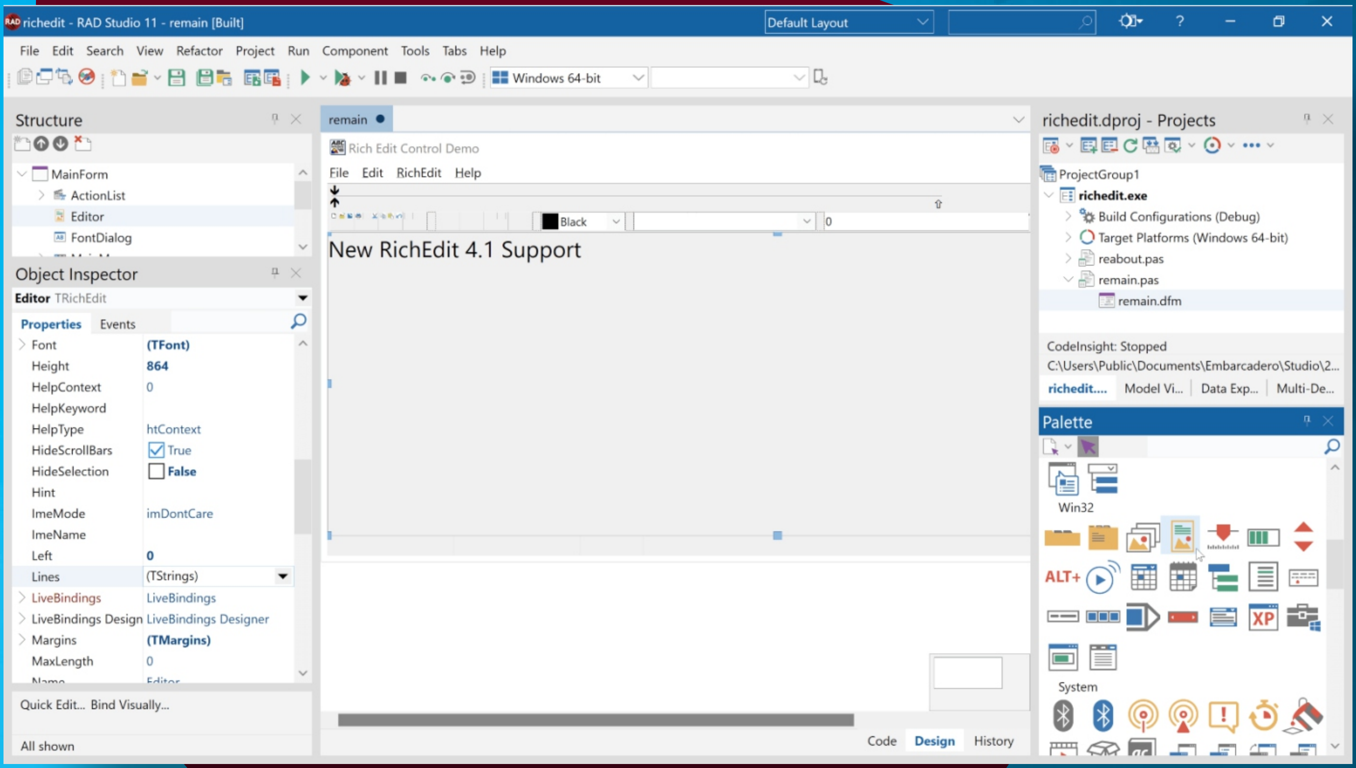
As a result, **Delphi** debuggers are unified on this technology for most of the supported platforms, as a way to deliver increasingly better quality over time. Moreover, there are quality improvements for a better **Delphi RTL** integration,

WIKIPEDIA

The LLDB Debugger (LLDB) is the debugger component of the LLVM project. It is built as a set of reusable components which extensively use existing libraries from LLVM, such as the Clang expression parser and LLVM disassembler. LLDB is free and open-source software under the University of Illinois/NCSA Open Source License, a BSD-style permissive software license. Since v9.0.0, it was relicensed to the Apache License 2.0 with LLVM Exceptions.

RTL, UI AND DATABASE LIBRARIES

- There are new Optimizations and quality improvements to the core Delphi RTL in the 11.1 Release.
- New `TURLStream` class, a `TStream` descendant with support for **async operations**.
- Support for **Windows 11** and **Server 2022** in the `TOSVersion` data structure. VCL enhancements to `TTreeView`, `TRichEdit`, `TEdgeBrowser`, `TLabelledEdit` and `TNumberBox`, `flickering` and `DoubleBuffering`, **VCL** high-DPI and scaling.
- New Demo through **GetIt** showing the use of **WinUI 3** library in Delphi.
- **FireMonkey** quality improvements to **TListView,** improved **Android SDK** integration, `TWebBrowser`, `Windows` high-DPI-related issues, and performance.
- **FireDAC** adds Structure View integration and offers support for **MariaDB 10.6, SQLite Encrypted Edition** (SEE), and **Firebird 4** new data types.
- **RAD Studio 11.1** also improves **DataSnap** quality and the ability to deploy a WebBroker application on Android.
- **RAD Server** adds **SysAdmin** endpoints including logs handling, backups management, and database validations, plus integrated deployment for **RSLite.**
  You can find some details about **RSLite** at
  `https://ashleyit.com/` or a demo
  `https://ashleyit.com/rs/rslite/`

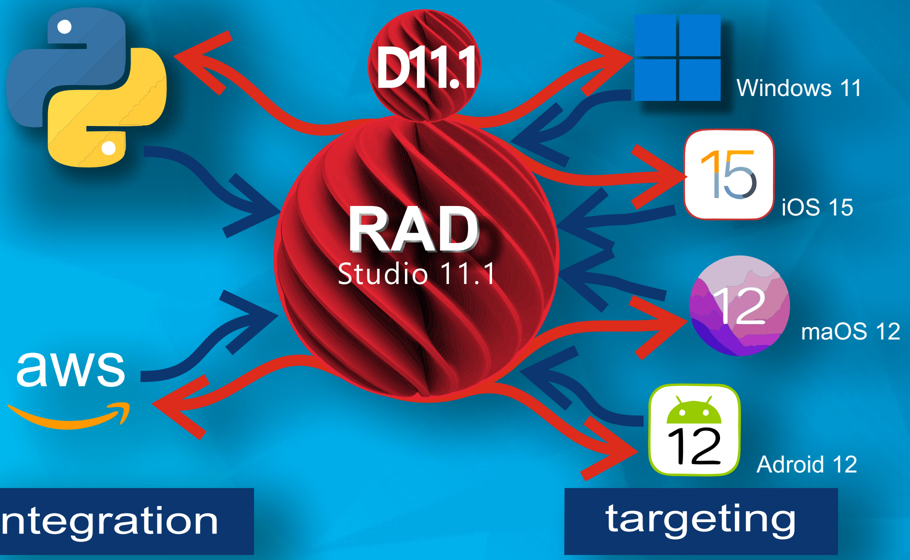

richedit - RAD Studio 11 - remain [Built]
Default Layout
File Edit Search View Refactor Project Run Component Tools Tabs Help
Windows 64-bit
Structure
MainForm
ActionList
Editor
FontDialog
Object Inspector
Editor TRichEdit
Properties Events
remain
Rich Edit Control Demo
File Edit RichEdit Help
Black
New RichEdit 4.1 Support
Code Design History
richedit.dproj - Projects
ProjectGroup1
richedit.exe
Build Configurations (Debug)
Target Platforms (Windows 64-bit)
reabout.pas
remain.pas
remain.dfm
CodeInsight: Stopped
C:\Users\Public\Documents\Embarcadero\Studio\2...
richedit.... Model Vi... Data Exp... Multi-De...
Palette
Win32
System
Quick Edit... Bind Visually...
All shown

Font	(TFont)
Height	864
HelpContext	0
HelpKeyword	
HelpType	htContext
HideScrollBars	✓ True
HideSelection	False
Hint	
ImeMode	imDontCare
ImeName	
Left	0
Lines	(TStrings)
LiveBindings	LiveBindings
LiveBindings Design	LiveBindings Designer
Margins	(TMargins)
MaxLength	0

INTEGRATION / NEW PLATFORM TARGETING

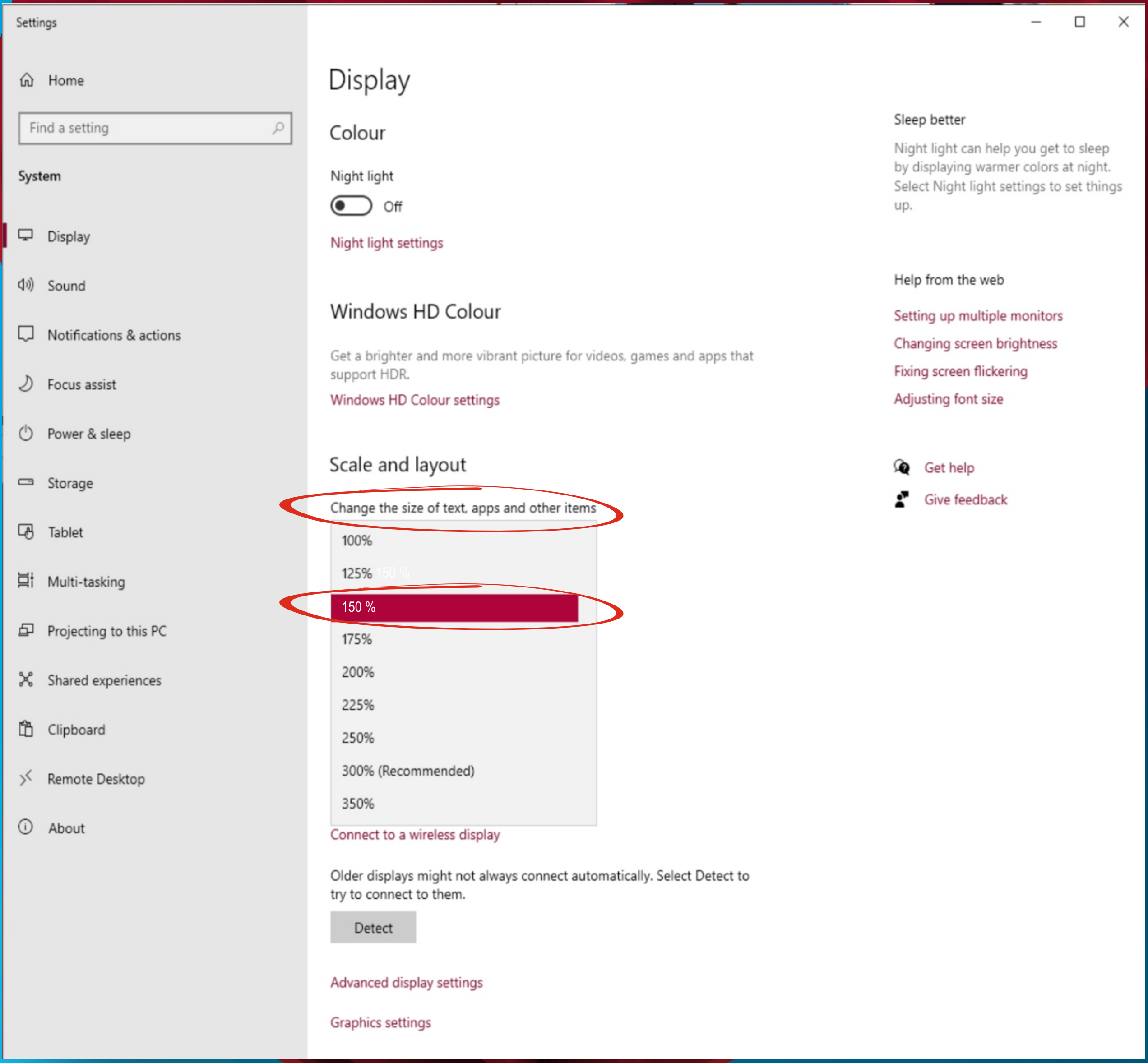
Starting the **11 Alexandria** release, **Enterprise** and **Architects** users get a preview of the new **AWS (Amazon Web Service) SDK** for **Delphi** (*licensed from Appercept*), and in the future new releases are expected.
https://blogs.embarcadero.com/appercepts-new-aws-sdk-for-delphi-available-with-rad-studio-and-delphi-enterprise-and-architect/

Customers have access to free **Delphi UI** libraries for **Python** developers, and can also use **Python** libraries in **RAD Studio** applications. **RAD Studio 11.1** delivers official support to operating systems released after 11.0 shipped: **Windows 11, macOS 12 Monterey, iOS 15, and Android 12!** **(***Python for Delphi will be an article in the next issue***)**



RAD ON 4K+ SCREENS!

RAD Studio 11 adds high-DPI support to the IDE, enabling developers to work on larger, high-resolution screens. Full support for the latest 4k+ high-resolution monitors improves daily developer activities with cleaner, sharper fonts and icons, and high-resolution support throughout the IDE windows, including in the VCL and FMX form designers and code editor. FireMonkey for Windows now uses the same DP model (rather than Pixel model) of all platforms, offering a significant enhancements of the apps rendering on Windows HighDPI and 4K monitors.



Get a brighter and more vibrant picture for videos, games and apps that support HDR.

Change the size of text, apps and other items

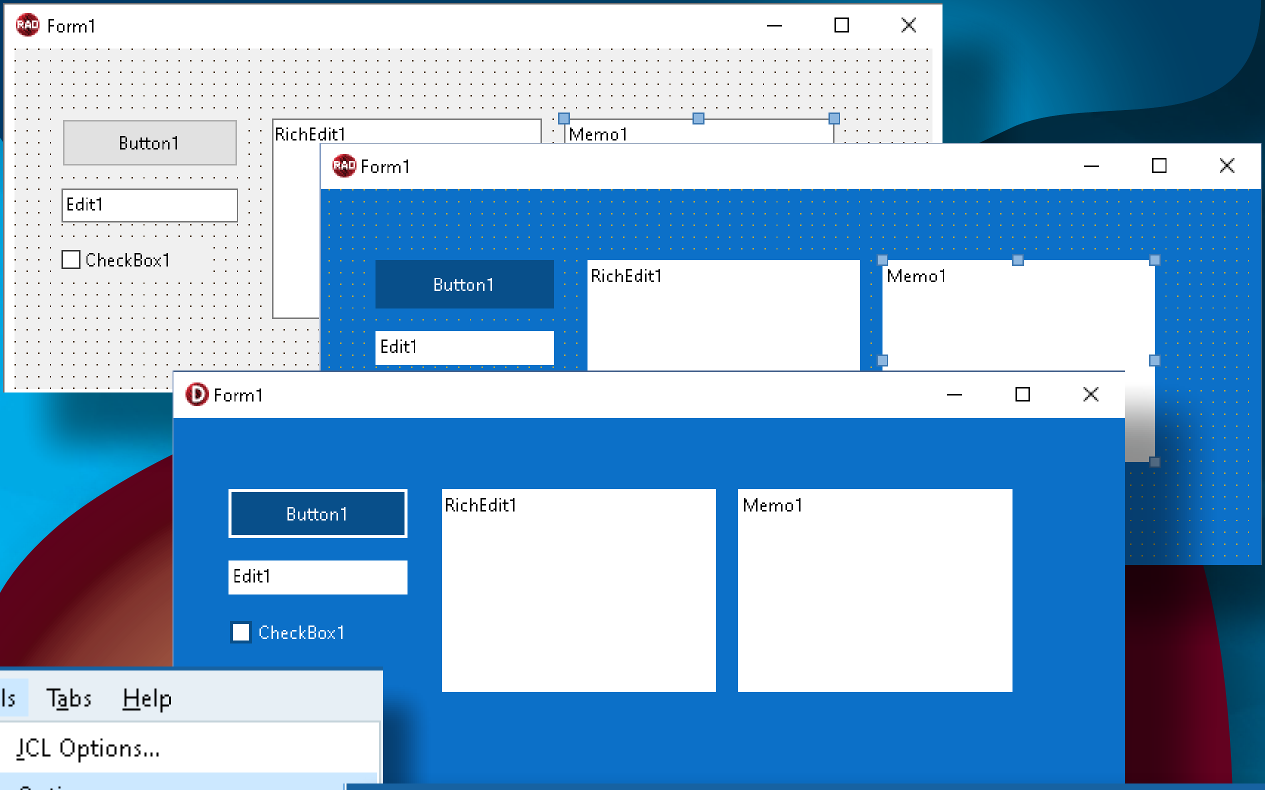
100%
125%
[✓ 150 %]
175%
200%
225%
250%
300% (Recommended)
350%

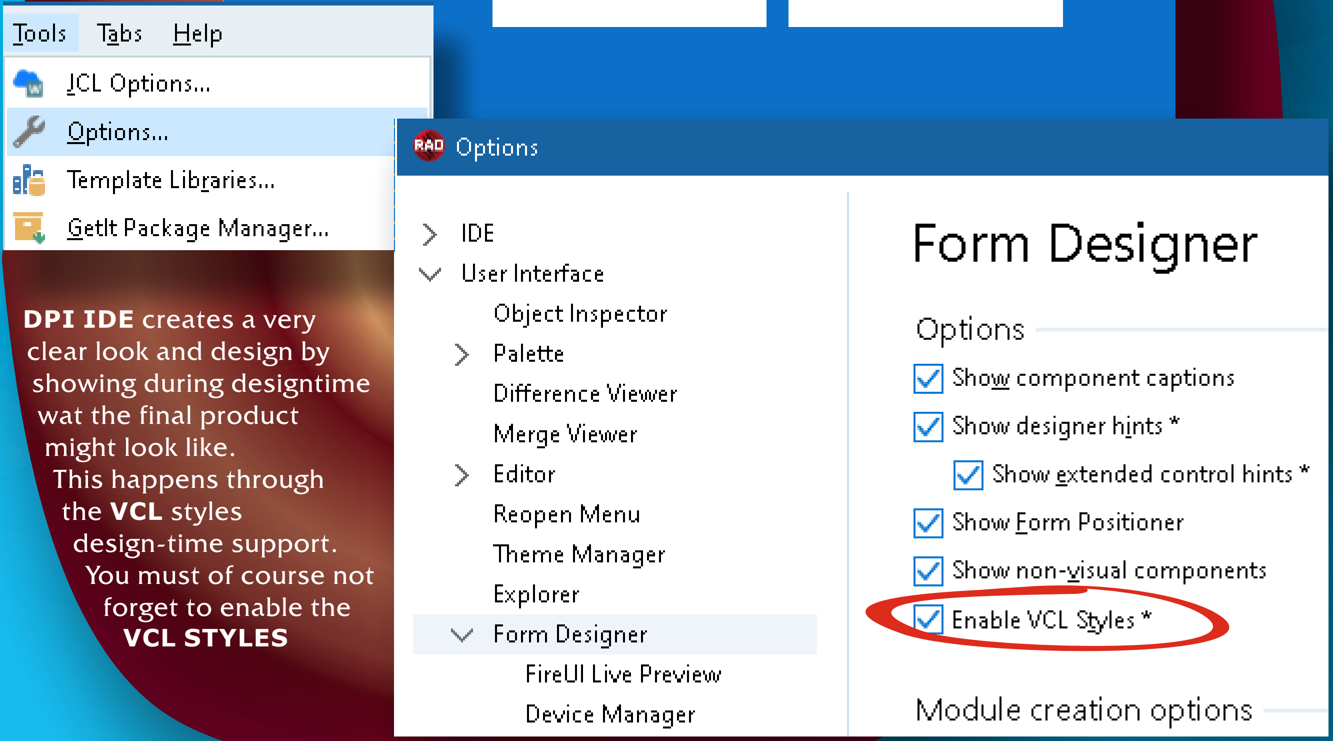
Older displays might not always connect automatically. Select Detect to try to connect to them.

Night light can help you get to sleep by displaying warmer colors at night. Select Night light settings to set things up.

VCL STYLES AT DESIGN TIME

VCL Styles now provides design-time support:
Prototype stylish **UIs** even faster by seeing immediately at design-time how your styled forms and controls will look when running.
Viewing at design time how styles will impact the **UI** at runtime improves the design and testing process for modern **UIs.** Creating better **UIs** faster is **especially useful when working with per-control styles.**





Form Designer

Options
- ✓ Show component captions
- ✓ Show designer hints *
  - ✓ Show extended control hints *
- ✓ Show Form Positioner
- ✓ Show non-visual components
- ✓ Enable VCL Styles *

DPI IDE creates a very clear look and design by showing during designtime wat the final product might look like.
This happens through the **VCL** styles design-time support.
You must of course not forget to enable the **VCL STYLES**

COMPILE POSSIBLE FOR ANDROID API 30

Android API and Libraries updated - **API 30, Google Play V3, Android X.**

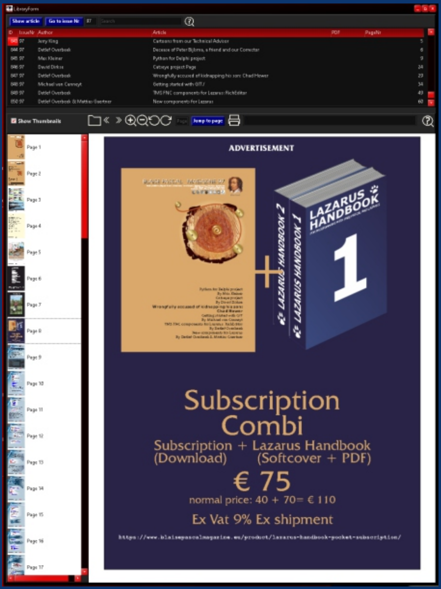
This includes the latest billing **API** (*required by Google Play Store*). Enhanced **Delphi RTL** for **Android,** supporting for **Android API** level 30.
Support for the new "AndroidX" libraries.
In-app **purchase component** to help monetize your applications.
You can of course do without. There is an investigation from the **EEC** if this is allowed.

Android solution **Google** Play Billing Library Version 4.
Enhanced **FireMonkey Application** Platform for creating native **Android ARMv7** applications for **Android 11, 10, Pie (9.0), Oreo (8.1)**

DEVELOPMENT FOR M-SERIES APPLE SILICON

Compile for **macOS** and eventually use the new universal package for **AppStore** submission.
You can now compile for both existing **Intel** and new **M-series macOS** processors (**Apple Silicon**).
Compiling for the newest processor versions enables the fastest performance across all platforms, and supports universal packaging for the **macOS** app store.

With RAD Studio 11 it is possible to compile binaries for **macOS ARM.**
Since the new M1 processor is incredibly fast it is more than important to create native apps for it.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https://www.blaisepascalmagazine.eu/product/lazarus-handbook-pocket-subscription/

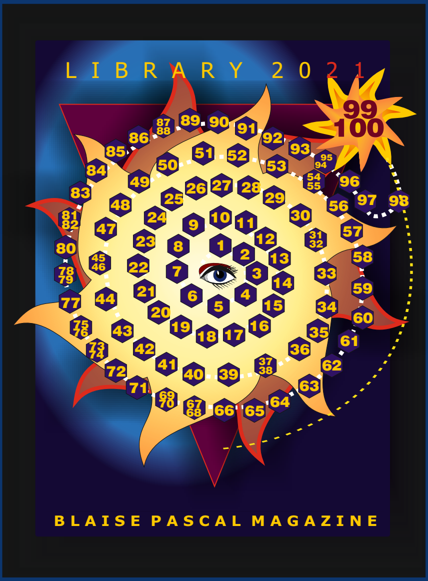
Including the new designed LIB STICK Program

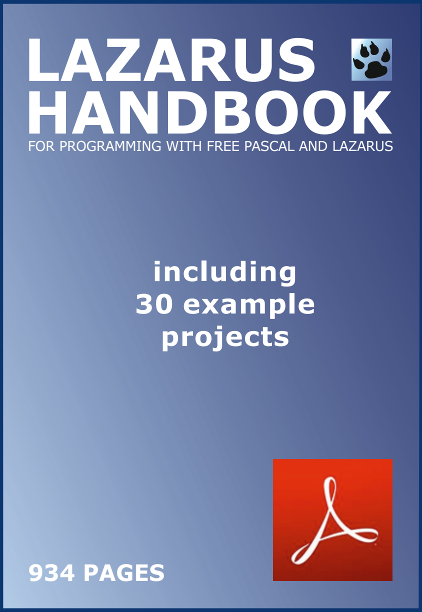
SUPER OFFER

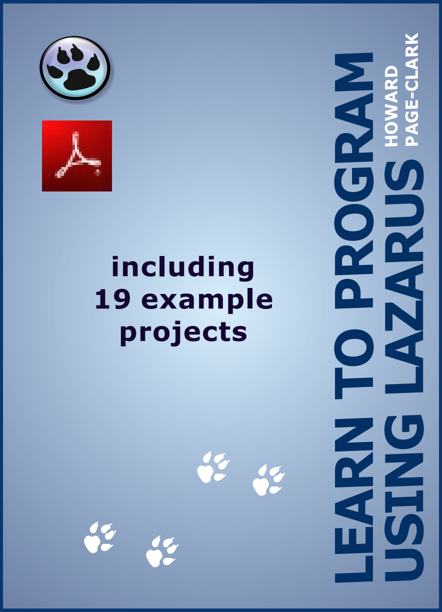
€ 150 ex Vat

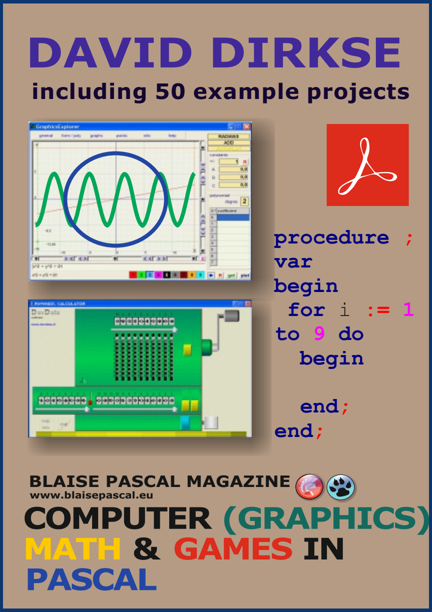
Normal Price € 280

75+60+50+35+50




LAZARUS HANDBOOK
FOR PROGRAMMING WITH FREE PASCAL AND LAZARUS
including 30 example projects
934 PAGES





BLAISE PASCAL MAGAZINE 102
D11.1
Delphi VCL4Python
Python install help
The latest release of Delphi 11.1
The Droste effect: picture in picture in picture
Using Electron making explanations
Library support in PAS2JS
Pas2JS: Leveraging Typescript to use existing Javascript libraries
Pas2JS: Using multiple forms and routing
Understanding Electron

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USING A DEVELOPMENT VERSION OF LAZARUS

By Michaël Van Canneyt

starter expert

ABSTRACT
Lazarus evolves continuously.
Because it is an open source project, you don't need to wait for a release to be able to use the latest features. In this article we show how to compile and use the latest development version of the **Lazarus IDE.**

❶ INTRODUCTION

The **Lazarus team** keeps on developing the **Lazarus IDE** and the **LCL** (*the Lazarus Component Library*). If you are eager to use one of the new features, it is not necessary to wait for the official release of a new version of **Lazarus.**
Because **Lazarus** is an open source project, you can perfectly install the latest sources and build **Lazarus** for yourself.
The sources of **Lazarus** are available publicly on **Gitlab:**
`https://gitlab.com/freepascal.org/lazarus/lazarus`
In order to build **Lazarus** yourself, you need 2 things:

■ AN EXISTING LAZARUS INSTALLATION.

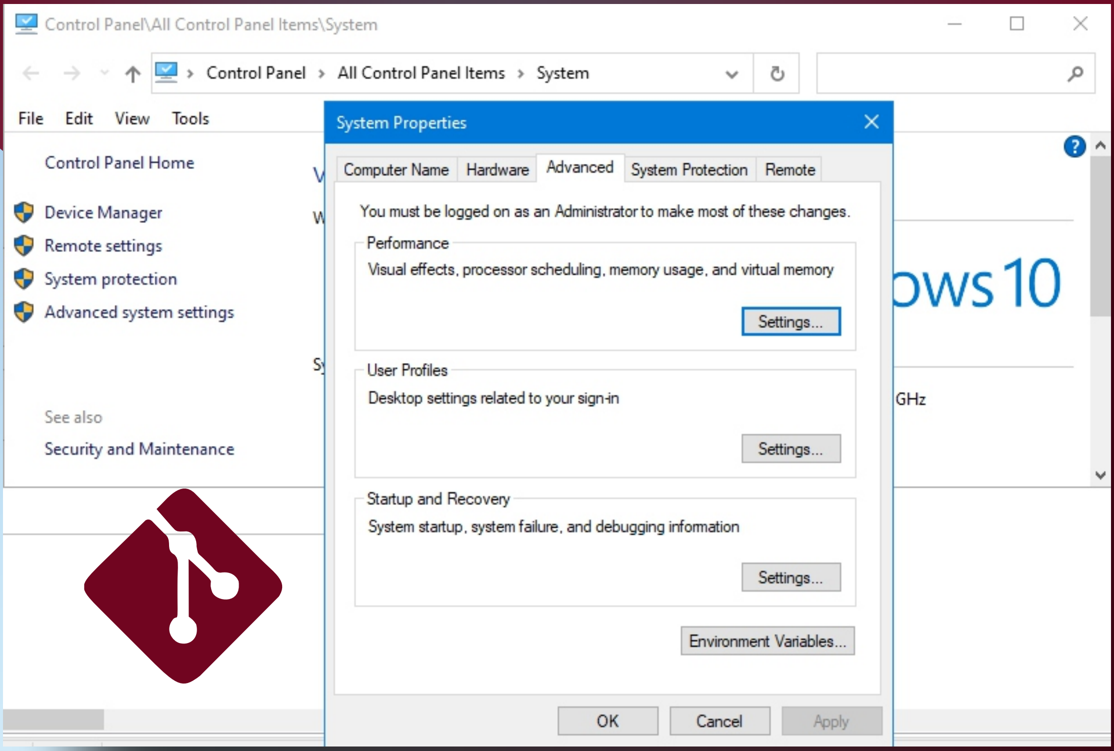
At the moment of writing, this is version 2.2.0, sing **Free Pascal** compiler 3.2.2. In this text we assume Lazarus is installed in its default location: `C:\Lazarus`

■ A GIT CLIENT.

This is not really a necessity, but makes life easier if you want to update **Lazarus** on a regular basis. The **Lazarus** installation has everything to build a new version of **Lazarus.** This should not come as a surprise, because the **Lazarus IDE** rebuilds itself as soon as you install a new package in the IDE. You can make do without **git,** as it is always possible to download lazarus sources in a **zip** file:
`https://gitlab.com/freepascal.org/lazarus/lazarus/-/archive/main/lazarus-main.zip`
This URL gives you a ZIP file with the latest version of Lazarus.

SOME PRELIMINARIES

Building **Lazarus** requires you to enter some commands on the command-line: **Lazarus** is built using the **GNU Make tool,** which is a command-line tool.


Control Panel\All Control Panel Items\System

Control Panel > All Control Panel Items > System

File Edit View Tools

Control Panel Home

Device Manager

Remote settings

System protection

Advanced system settings

See also

Security and Maintenance

System Properties

Computer Name | Hardware | Advanced | System Protection | Remote

You must be logged on as an Administrator to make most of these changes.

Performance

Visual effects, processor scheduling, memory usage, and virtual memory

Settings...

User Profiles

Desktop settings related to your sign-in

Settings...

Startup and Recovery

System startup, system failure, and debugging information

Settings...

Environment Variables...

OK Cancel Apply

Figure 1: System control panel page with advanced settings

The tool is called **`make`**, and is installed together with **Free Pascal** on **Windows. Linux** or **Mac** installations have a **`make`** tool installed by default. To be able to use the make tool, it must be in a directory that is included in the **`PATH`** environment variable. So, you must make sure this is the case, Again, on **Linux** and **Mac** this is normally the case.

If you are on **Windows,** and have **Delphi** installed, you will also have the **Delphi make** tool installed. It serves the same purpose as the **GNU make** tool, but has much less features. It is therefore important that when you enter the **`make`** command on the command-line, that the correct version of make is used.

During its installation procedure, **Delphi** changes the **`PATH`** environment variable to include the directory with the **Delphi** version of make (*as well as the other delphi tools*). So, it is imperative that the **`PATH`** environment variable must be set in such a way that the directory with the **FPC** version of make comes before the one with the **Delphi** version of make. **Delphi** no longer uses its make tool, so changing this will not damage the **Delphi** installation.

To set the **PATH** variable, in the **Windows Control Panel**, choose 'System'. In this dialog, the 'Advanced system settings' link must be used , in which case you will see a dialog pop up which resembles *figure 1 on page 2*.

The 'Environment variables...' button in the bottom-right of that dialog allows you to set the environment variables of Windows. There are 2 sets of variables: user-specific variables (*at the top*) or system variables. Both will contain a **PATH** variable.
In the command-line window, both **PATH** variables will be used. The directories in the system **PATH** variable take precedence over the ones in the user-specific **PATH** variable.
If you have **Delphi** installed, it is therefore best to change the system **PATH** variable. Select the **'PATH'** variable, and press the 'Edit...' button. A special dialog will pop up in which the contents of the **PATH** variable have been split into lines: one per directory, *see figure 2 on page 3*.
In this dialog the 'New' button can be used to add a new directory to the **PATH**.
The directory to add is:

```
C:\lazarus\fpc\3.2.2\bin\x86_64-win64
```

If you have the **Win32** version of lazzrus installed, the directory to use is:

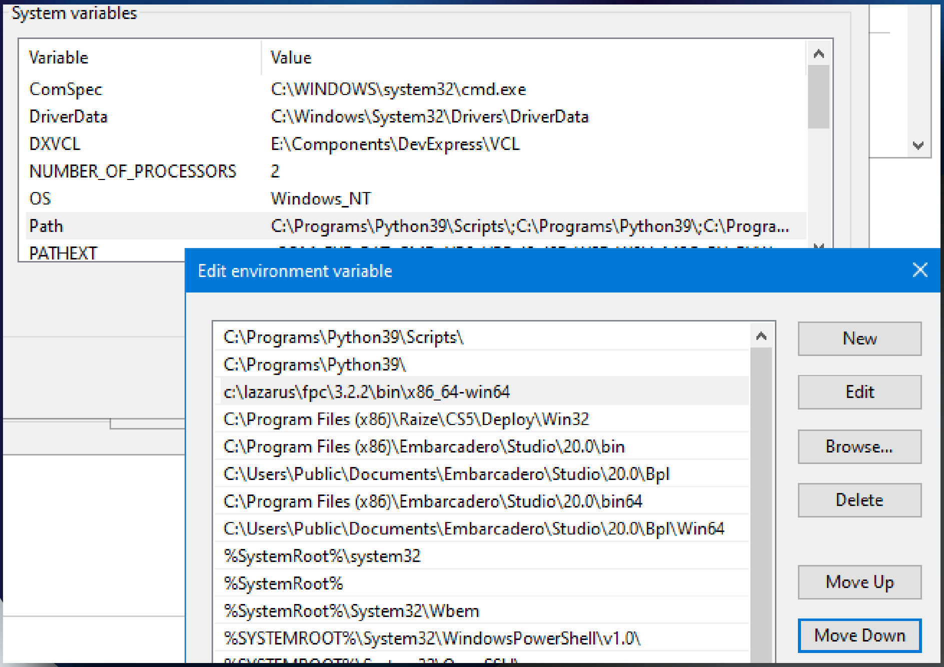
```
C:\lazarus\fpc\3.2.2\bin\i386-win32
```

if you have another version of **Lazarus** (or **Free Pascal**), you may need to adapt the path. You can use the 'Move up' and 'Move down' buttons to move the new directory before the entry of the **Delphi IDE** (*as visible in figure 2 on page 3*).
After you confirm the new **PATH** settings with the 'OK' button, you can check that the correct version of make is called, by entering the following command on the command-prompt:

```
make -v
```

The output will be something like this:

```
c:\Development\lazarus>make -v
GNU Make 3.80
Copyright (C) 2002 Free Software Foundation, Inc.
This is free software; see the source for copying conditions.
There is NO warranty;
not even for MERCHANTABILITY or FITNESS FOR A PARTICULAR PURPOSE.
```



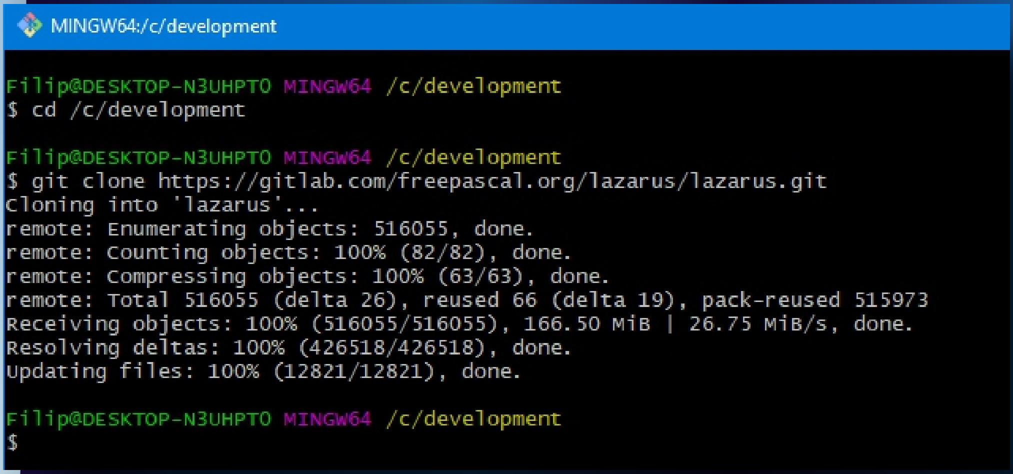
Variable	Value
ComSpec	C:\WINDOWS\system32\cmd.exe
DriverData	C:\Windows\System32\Drivers\DriverData
DXVCL	E:\Components\DevExpress\VCL
NUMBER_OF_PROCESSORS	2
OS	Windows_NT
Path	C:\Programs\Python39\Scripts\;C:\Programs\Python39\;C:\Progra...
PATHEXT	

```
C:\Programs\Python39\Scripts\
C:\Programs\Python39\
c:\lazarus\fpc\3.2.2\bin\x86_64-win64
C:\Program Files (x86)\Raize\CS5\Deploy\Win32
C:\Program Files (x86)\Embarcadero\Studio\20.0\bin
C:\Users\Public\Documents\Embarcadero\Studio\20.0\Bpl
C:\Program Files (x86)\Embarcadero\Studio\20.0\bin64
C:\Users\Public\Documents\Embarcadero\Studio\20.0\Bpl\Win64
%SystemRoot%\system32
%SystemRoot%
%SystemRoot%\System32\Wbem
%SYSTEMROOT%\System32\WindowsPowerShell\v1.0\
```

Figure 2: Environment variables dialog

DOWNLOAD USING GIT

In an earlier series of articles in **Blaise Pascal Magazine,** the installation and use of **Git** has been covered in depth. In this article we will therefore limit the instructions to the download of Lazarus sources.
The repository can be cloned from:
`https://gitlab.com/freepascal.org/lazarus/lazarus.git`
or, if you prefer to use **SSH:**
`git@gitlab.com:freepascal.org/lazarus/lazarus.git`



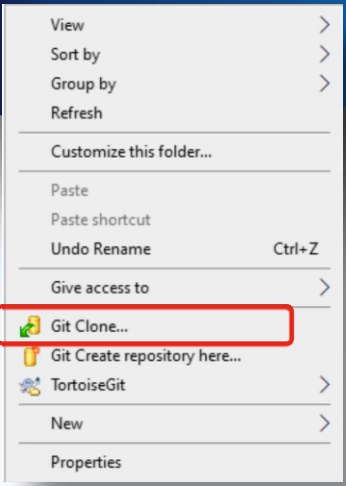
```
MINGW64:/c/development

Filip@DESKTOP-N3UHPTO MINGW64 /c/development
$ cd /c/development

Filip@DESKTOP-N3UHPTO MINGW64 /c/development
$ git clone https://gitlab.com/freepascal.org/lazarus/lazarus.git
Cloning into 'lazarus'...
remote: Enumerating objects: 516055, done.
remote: Counting objects: 100% (82/82), done.
remote: Compressing objects: 100% (63/63), done.
remote: Total 516055 (delta 26), reused 66 (delta 19), pack-reused 515973
Receiving objects: 100% (516055/516055), 166.50 MiB | 26.75 MiB/s, done.
Resolving deltas: 100% (426518/426518), done.
Updating files: 100% (12821/12821), done.

Filip@DESKTOP-N3UHPTO MINGW64 /c/development
$
```

Figure 3: Git clone on the command-line

We'll install the lazarus sources below a directory `C:\Development\`
Obviously, you're free to choose whatever directory you want.
If you have **Git** for **Windows** installed, then you can clone the sources with the following command in the **Git** bash window:

```
cd /c/Development
git clone https://gitlab.com/freepascal.org/lazarus/lazarus.git
```

This is also the command you can give on **Mac** or **Linux,** and the output will look like *figure 3 on page 4*. If you are using **TortoiseGit,** then you can use the context menu of the **Windows file explorer:**



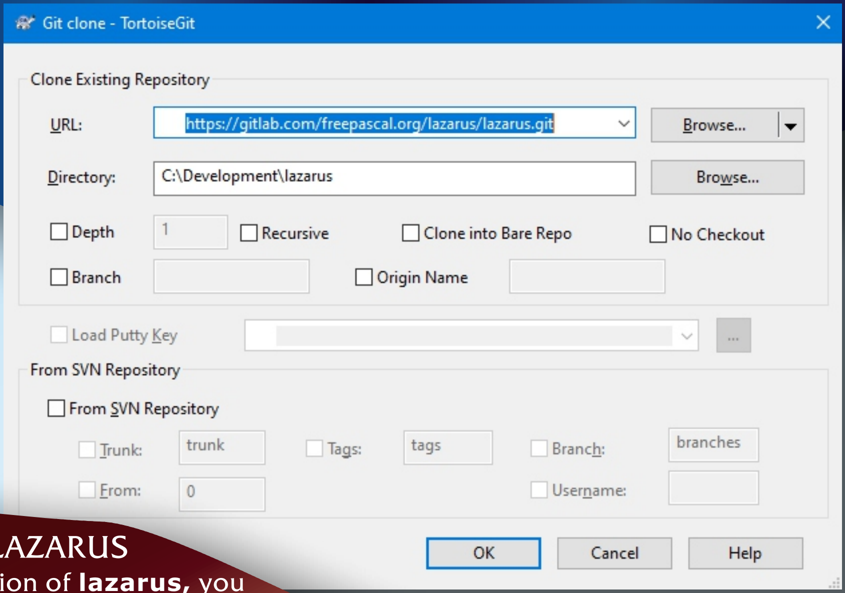
Doing so, will show the Git clone dialog, shown in *figure 4 on page 5*, where you can enter the URL mentioned above. See the first article of the Using Git series (BPM issue 97, 98 and 99/100). After the initial clone operation, you can always update the sources with the git pull command.

BUILDING LAZARUS

When the git clone operation is complete, **Lazarus** can be built. For this, the windows command-line windows must be used. Do not attempt to use the bash shell from your **Git** for windows installation: this build environment is not supported.
Building the **Lazarus IDE** is a matter of 2 commands:

```
cd c:\Development\Lazarus
make bigide
```

The `make bigide` will actually build **Lazarus,** together with some commonly used packages. Building **Lazarus** takes some time. The make command will also build `Startlazarus.exe` and some other tools.
When make stops running, please take a look at the output of the make command - in particular, check whether errors are displayed or not.
If not, all went well, and a `lazarus`, `startlazarus` and `lazbuild` command will be present in the build directory.



URL: https://gitlab.com/freepascal.org/lazarus/lazarus.git
Directory: C:\Development\lazarus
Depth: 1
Trunk: trunk
Tags: tags
Branch: branches
From: 0

Figure 4: Tortoise Git clone dialog

CONFIGURING LAZARUS

To start your new version of **lazarus,** you must use the newly created application binary.
You can start it in the **Explorer,** but it is of course easier to create a shortcut on the desktop: in the **File explorer**, simply drag the lazarus executable to the desktop while keeping the Alt key pressed. (*Or use the context menu 'New - shortcut' in the fle explorer*).

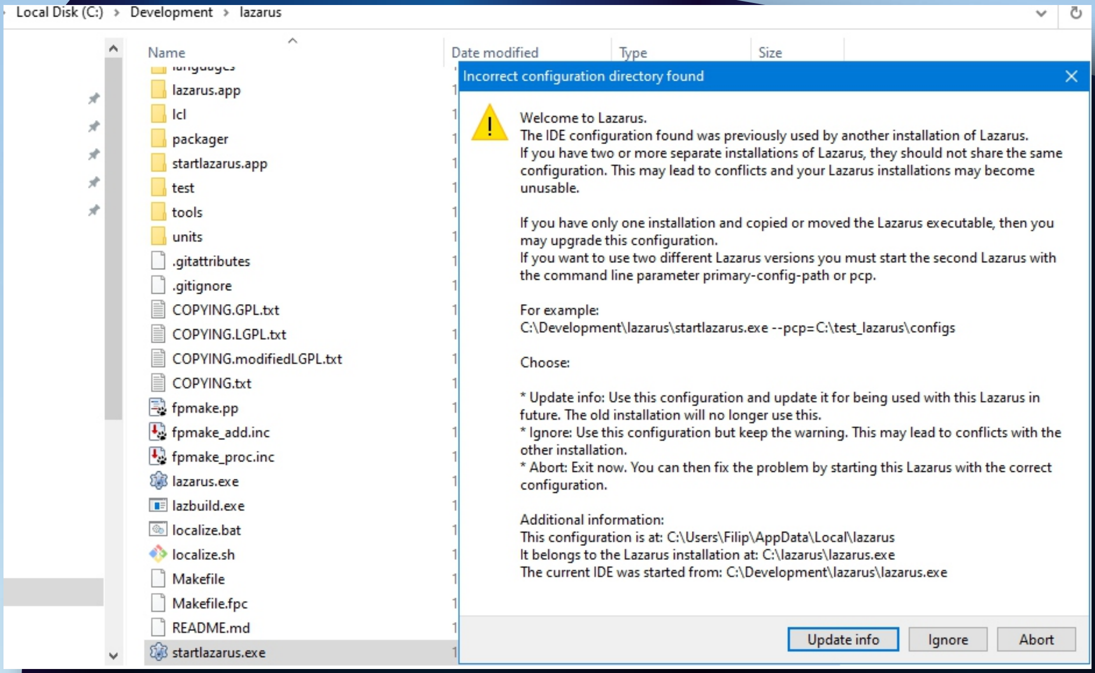
When you first start the new **Lazarus**, you may get some dialogs in which **Lazarus** tells you that the settings have changed: *see figure 5 on page 6 and figure 6 on page 6.*
If you wish to use two separate configurations for your installed lazarus and the newly compiled **Lazarus,** you should cancel here, and adapt the shortcut so it contains the commandline option -pcp indicated in *figure 6 on page* 6, for example:

```
--pcp=C:\test_lazarus\configs
```

You can of course choose any directory you want for the configuration.
When you did all this, you will probably still get the Lazarus installation check-up dialog shown in *figure 7 on page 7.* In particular, the **GDB (gnu debugger)** location will be missing.
You can reuse the one from the original lazarus installation:

```
C:\lazarus\mingw\x86_64-win64\bin\gdb.exe
```

To ensure that you are now really working with the latest lazarus, you can check the **Help - About Lazarus dialog.** It should display the latest version number, which is 2.3.0 at the time of writing of this article, as can be seen in *figure 8 on page 7.*



Incorrect configuration directory found

Welcome to Lazarus.
The IDE configuration found was previously used by another installation of Lazarus.
If you have two or more separate installations of Lazarus, they should not share the same configuration. This may lead to conflicts and your Lazarus installations may become unusable.

If you have only one installation and copied or moved the Lazarus executable, then you may upgrade this configuration.
If you want to use two different Lazarus versions you must start the second Lazarus with the command line parameter primary-config-path or pcp.

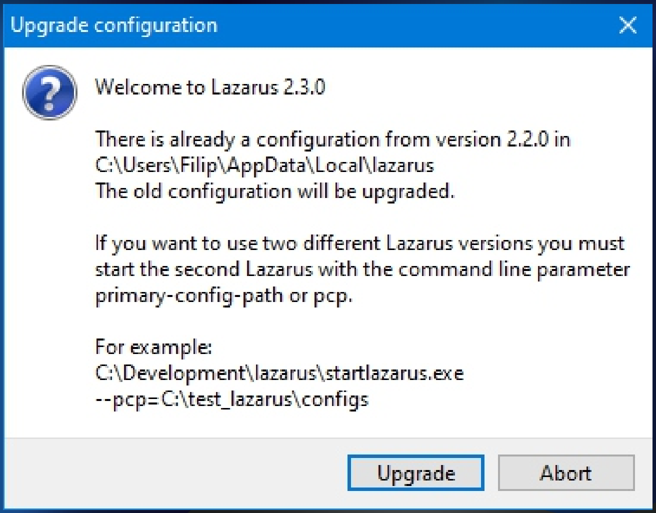
For example:
C:\Development\lazarus\startlazarus.exe --pcp=C:\test_lazarus\configs

Choose:

* Update info: Use this configuration and update it for being used with this Lazarus in future. The old installation will no longer use this.
* Ignore: Use this configuration but keep the warning. This may lead to conflicts with the other installation.
* Abort: Exit now. You can then fix the problem by starting this Lazarus with the correct configuration.

Additional information:
This configuration is at: C:\Users\Filip\AppData\Local\lazarus
It belongs to the Lazarus installation at: C:\lazarus\lazarus.exe
The current IDE was started from: C:\Development\lazarus\lazarus.exe

Figure 5: Starting a new Lazarus version for the first time


Upgrade configuration

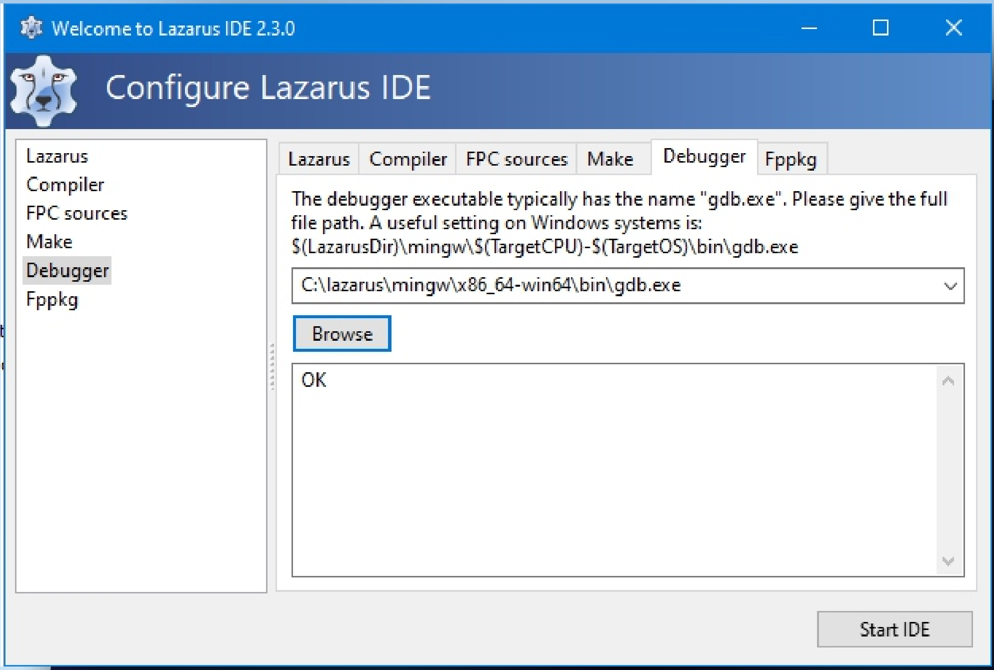
Welcome to Lazarus 2.3.0

There is already a configuration from version 2.2.0 in
C:\Users\Filip\AppData\Local\lazarus
The old configuration will be upgraded.

If you want to use two different Lazarus versions you must start the second Lazarus with the command line parameter primary-config-path or pcp.

For example:
C:\Development\lazarus\startlazarus.exe
--pcp=C:\test_lazarus\configs

Figure 6: Creating a new confiuration or not


Welcome to Lazarus IDE 2.3.0

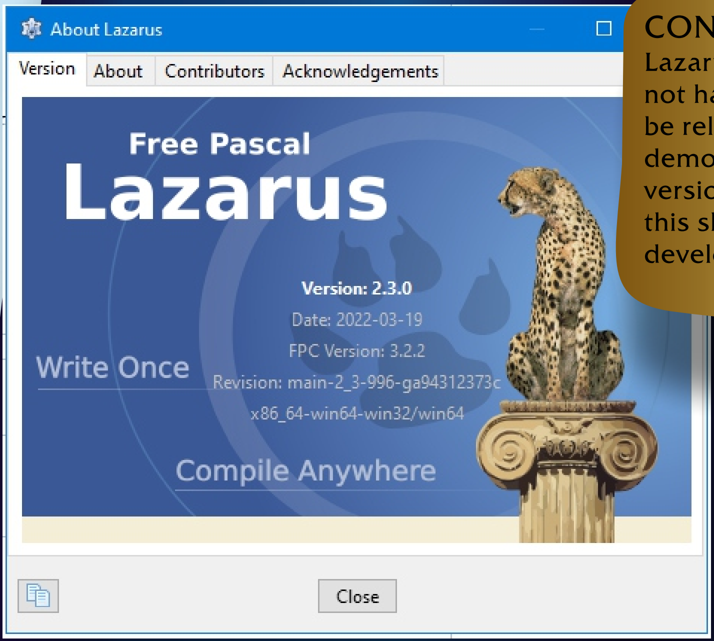
Configure Lazarus IDE

The debugger executable typically has the name "gdb.exe". Please give the full file path. A useful setting on Windows systems is:
$(LazarusDir)\mingw\$(TargetCPU)-$(TargetOS)\bin\gdb.exe

C:\lazarus\mingw\x86_64-win64\bin\gdb.exe

```
OK
```

Figure 7: Lazarus start-up check-up result


About Lazarus

Version: 2.3.0
Date: 2022-03-19
FPC Version: 3.2.2
Revision: main-2_3-996-ga94312373c
x86_64-win64-win32/win64

Figure 8: 'About Lazarus' version check

CONCLUSION

Lazarus is an open source tool. This means you do not have to wait for the latest version to be released. Instead, in this article we have demonstrated how you can build your own version of Lazarus:
this should be within reach for every Object Pascal developer, regardless of the level of expertise. . .

starter expert

By David Dirkse

starter expert

Figure 1: The Cats Eye

INTRODUCTION

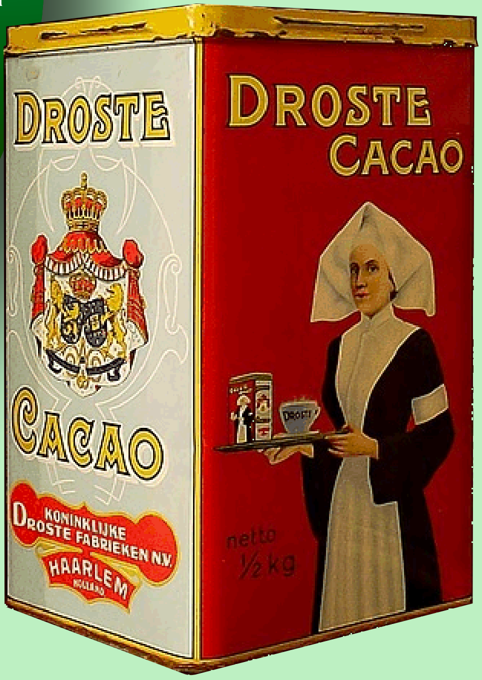
David has created the so called **Droste** effect program: Just for fun! The **Droste** effect is nothing but a picture in a picture in a picture etc. Its nice to how this is handled and as an extra you get some nice extra controls for free. So he created the Droste-Effect-App. So thank David Dirkse and if your interested buy his book about **Computer, Math & Games and Graphics**.
Available at:
https://www.blaisepascalmagazine.eu/product/books-computer-graphics-math-games-download-pdf/

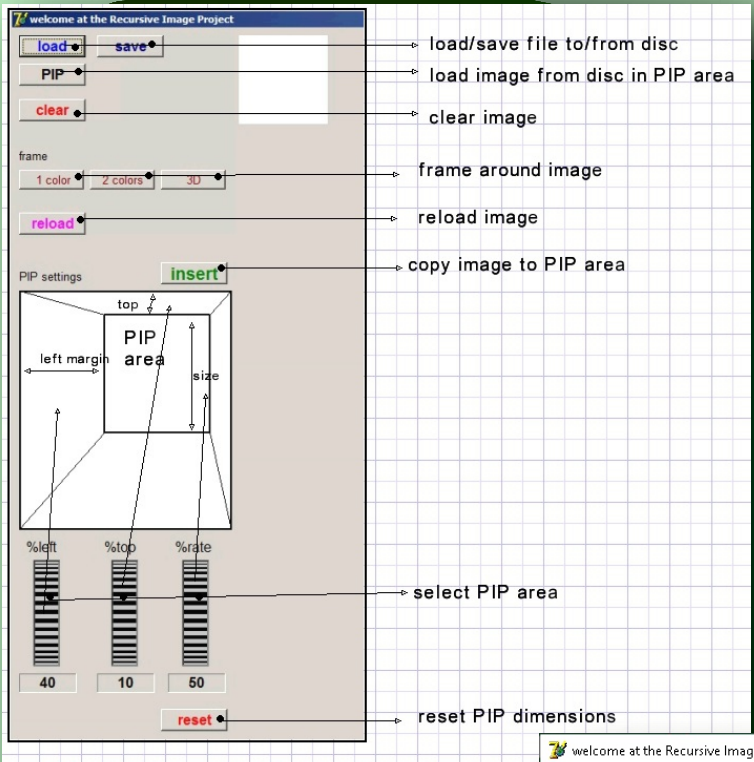
SOME SHORT STORY ABOUT THE "DROSTE EFFECT"

The **Droste effect**, known in art as an example of **mise en abyme** **(***ranslation placement at the escutcheon's center: depiction of the escutcheon itself within an „escutcheon": image within an image : story within a story.* **),**
is the effect of a picture recursively appearing within itself, in a place where a similar picture would realistically be expected to appear.
This produces a loop which mathematically could go on forever, but in practice only continues as far as the image's resolution allows. The effect is named after a Dutch brand of cocoa, with an image designed in 1904.
It has since been used in the packaging of a variety of products. Apart from advertising, the **Droste effect** is displayed on the tins and boxes of **Droste** cocoa powder which displayed a nurse carrying a serving tray with a cup of hot chocolate and a box with the same image, designed by **Jan Misset**. The effect has been a motif, too, for the cover of many comic books, where it was especially popular in the 1940s.

Mathematics

The appearance is recursive: the smaller version contains an even smaller version of the picture, and so on. Only in theory could this go on forever, as fractals do; practically, it continues only as long as the resolution of the picture allows, which is relatively short, since each iteration geometrically reduces the picture's size.

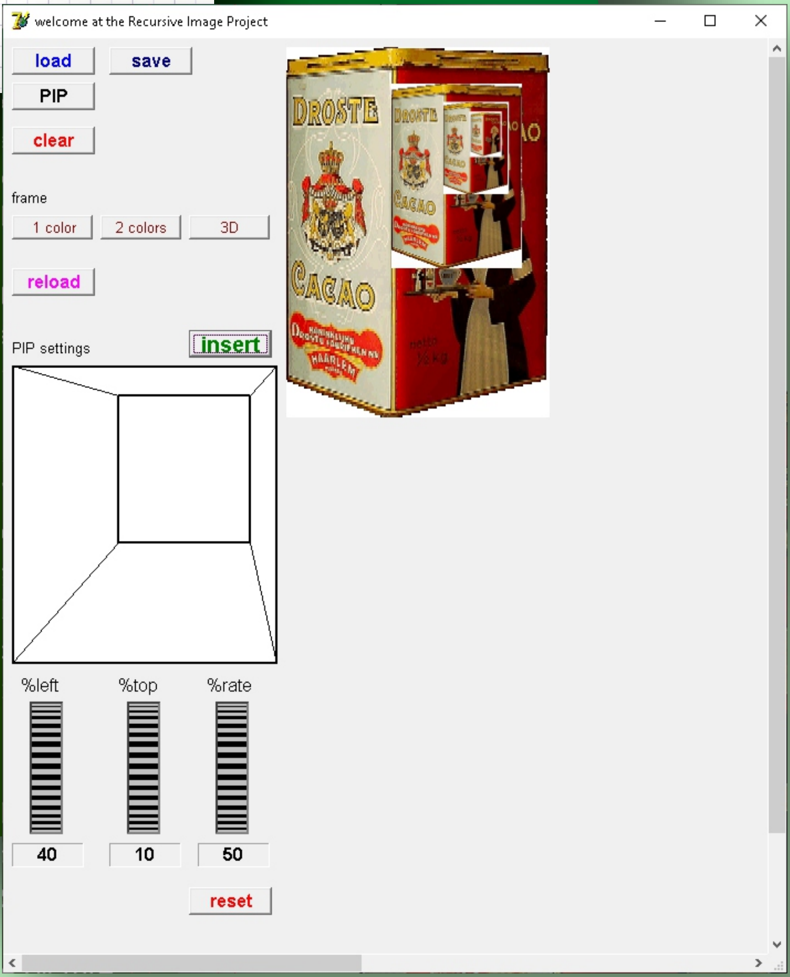




PIP (Picture in Picture) project

This is all create in Delphi 7.
Take a look and see the
difference on the next page.

At the top you see the functionality of the app. Its all very easy.
Of course if you want to see the code used for this: as a subscriber you have the projects (D7+D11.1) available.
It is originaly written in **Delphi 7,** but I recreated it in **Delphi 11.1 (Alexandria).**
As you can see on page 3 of this article I used the new **VCL** style sheet and chose the "Ruby Graphite". In the next issue I' ll explain how it works.

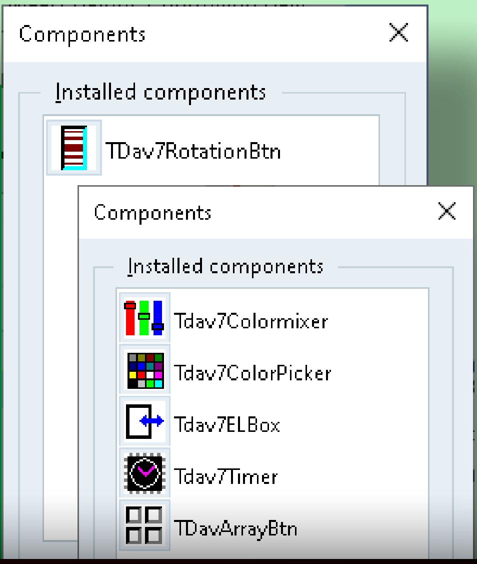


COMPONENTS TO INSTALL:

- `Rotation button` (separate component) and a group of 5 components:

- `Colormixer`
- `ColorPicker`
- `ElBox`
- `DavTimer`
- `Arraybtn`

The components are available for subscribers of course and in an earlier version (Issue 65, page 20) I explained how to install the components.



Components

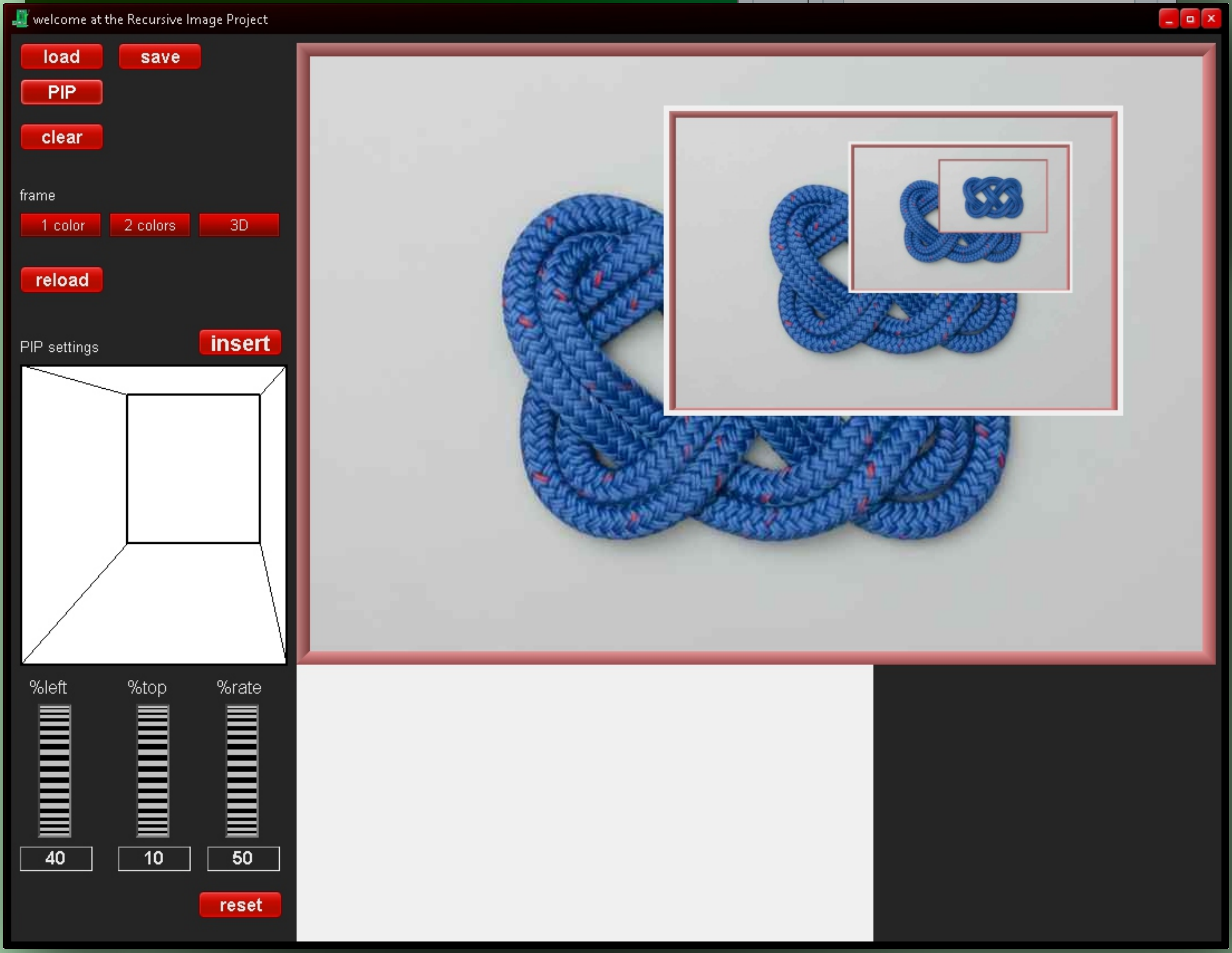
Installed components

TDav7RotationBtn

Components

Installed components

Tdav7Colormixer
Tdav7ColorPicker
Tdav7ELBox
Tdav7Timer
TDavArrayBtn



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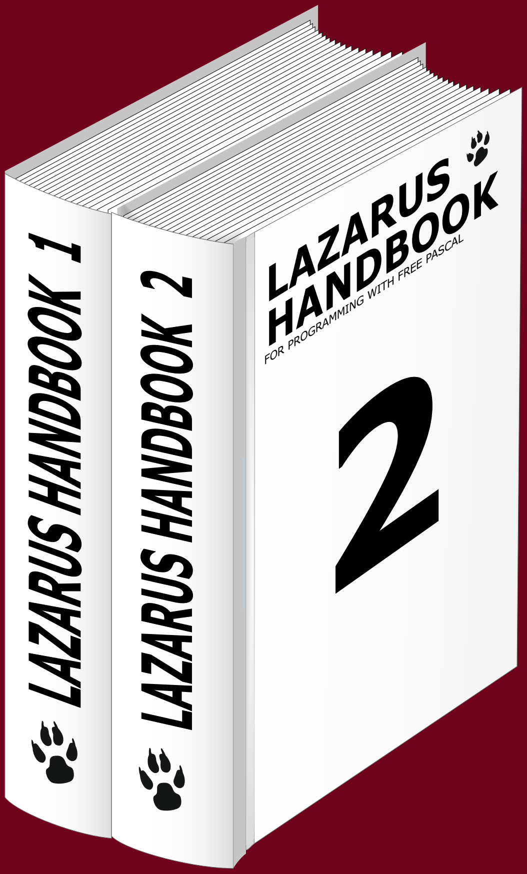

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Multi platform /Object Pascal / Internet / JavaScript / WebAssembly / Pas2Js / Databases / CSS Styles / Progressive Web Apps Android / IOS / Mac / Windows & Linux
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Delphi VCL4Python
Python install help
The latest release of Delphi 11.1
The Droste effect: picture in picture in picture
Using Electron making explanations
Library support in PAS2JS
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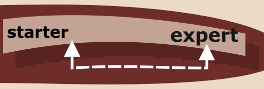
LEVERAGING TYPESCRIPT DECLARATIONS IN PAS2JS

By Michael van Canneyt

ABSTRACT
PAS2JS: contains a tool to convert **TypeScript** declaration modules to a pascal unit with external class definitions. This can be used to create import units for many **Javascript** libraries. In this article, we show how to use this tool.



❶ INTRODUCTION

To say that there are a lot of free **Javascript** libraries or frameworks out there is an understatement.

Normally, any **Javascript** class or function can be used in **PAS2JS:** By falling back on assembler blocks, any Javascript function can be called. The transpiler will happily insert any **Javascript** in your final transpiled code. But if the transpiler has external declarations for the **Javascript** classes or functions, the transpiler can and will check your code against the definitions it has.

Plain **Javascript** has a major drawaback: it is not typesafe. To remedy this, people at **Microsoft** created **TypeScript:** a type system for **Javascript.** It is a superset of **Javascript,** which is transpiled to **Javascript.**
(*One of the authors of TypeScript was also one of the creators of Delphi*)
This type system is made popular by **Angular** and other large **Javascript** frameworks. People writing **TypeScript** code face the same problem as **Pas2JS** users: how to make use of the many **Javascript** libraries, and still write **Typesafe** code?
The answer to this problem are declaration modules (*files with extension .d.ts*): these modules do not implement any functionality. They just describe the **API** offered by an external **Javascript** library. The **TypeScript** compiler reads this declaration and uses it to validate the **TypeScript** code that makes use of the **Javascript** library: It serves exactly the same purpose as a **PAS2JS** unit with external classes.
Many plain **Javascript** libraries offer such a **TypeScript** declaration module in their distribution.
But there are also a lot of libraries that do not offer such a declaration module.
Because there are a lot of **TypeScript** programmers, there is an ongoing effort to describe these **JAVASCRIPT** libraries: the DefinitelyType d repository on **Github.**

It is available at:
`https://github.com/DefinitelyTyped/DefinitelyTyped/`

It contains many tens of thousands of declaration modules. **TypeScript** programmers that wish to use a **javascript** library can just check out this repository and use the declaration module of the package they wish to use in their project. PAS2JS could use a similar repository of import units. Indeed, ideally, the **TypeScript** declaration modules can just be re-used so all the hard work of all these **TypeScript** would benefit the **PAS2JS** users as well.

Fortunately, this is possible to a certain extent:
The upcoming version of pas2js comes with a tool that converts a **TypeScript** declaration module to a pascal unit with external definitions: `dtstopas`.
Better yet, an online service exists which makes this possible today.
Last but not least, the tool and the webservice have been integrated in the **Lazarus IDE.**
You can create an import unit directly in your project from within the **Lazarus IDE:** Simply use the File-New menu item.
We'll discuss each of these possibilities in turn.

2 DTS2PAS

The **dts2pas** tool is a small command-line tool which will transform a *.d.ts file to a pascal unit. Running it without options (or option -h) gives the following output:

```
Usage: dts2pas [options]
Where options is one or mote of:
-a --alias=ALIAS           Define type aliases (option can be speficied multiple times)
                           where ALIAS is one of
                           a comma-separated list of Alias=TypeName values
                           a @FILE : list is read from FILENAME, one line per alias
-h --help                  Display this help text
-i --input=FILENAME        Parse .d.ts file FILENAME
-l --link=FILENAME         add {$linklib FILENAME} statement. (option can be specified -o -
-output=FILENAME           Output unit in file FILENAME
-s --setting=SETTINGS      Set options. SETTINGS is a comma-separated list of the following
                           coRaw
                           coGenericArrays
                           coUseNativeTypeAliases
                           coLocalArgumentTypes
                           coUntypedTuples
                           coDynamicTuples
                           coExternalConst
                           coExpandUnionTypeArgs
                           coaddOptionsToheader
                           coInterfaceAsClass (*)
                           coSkipImportStatements
                           Names marked with (*) are set in the default.
-u --unit=NAME             Set output unitname
-w --web                   Add web unit to uses, define type aliases for web unit
-x --extra-units=UNITLIST  Add units (comma-separated list of unit names) to uses
                           This option can be specified multiple times.
```

From this output we can see the minimal operation options are:
`dts2pas -i 7zip-min/index.d.ts -o 7zip.pp`
This will run the declaration conversion on the file `7zip-min/index.d.ts` and will write the resulting pascal file to `7zip.pp`
This is what the declaration input file looks like:

```
export function unpack(pathToArchive: string,
                       whereToUnpack: string,
                       errorCallback: (err: any) => void): void;
export function unpack(pathToArchive: string,
                       errorCallback: (err: any) => void): void;
export function pack(pathToDirOrFile: string,
                       pathToArchive: string,
                       errorCallback: (err: any) => void): void;
export function   list(pathToArchive: string,
                            callback: (err: any, result: Result[]) => void): void;
export function          cmd(command: string[],
                       errorCallback: err: any) => void): void;
export interface Result {
       name: string;
       date: string;
       time: string;
       attr: string;
       size: string;
       compressed: string;
}
```

And this is what the tool produces as output
(*lines have been formatted for better readability*):

```
Unit _7zip;

{$MODE ObjFPC}
{$H+}
{$modeswitch externalclass}

interface

uses SysUtils, JS;

{$INTERFACES CORBA}
Type
   // Forward class definitions
   TResult = Class;
   Tunpack_errorCallback = Procedure (err : JSValue);
   // Ignoring duplicate type Tunpack_errorCallback (errorCallback)
   Tpack_errorCallback = Procedure (err : JSValue);
   Tlist_callback = Procedure (err : JSValue; result : array of TResult);
   Tcmd_errorCallback = Procedure (err : JSValue);
   TResult = class external name 'Object' (TJSObject)
       name : string;
       date : string;
       time : string;
       attr : string;
       size : string;
       compressed : string;
end;

Procedure cmd(command : array of string;
      errorCallback   : Tcmd_errorCallback);
      external name 'cmd';

Procedure list(pathToArchive : string;
      callback : Tlist_callback);
      external name 'list';

Procedure pack(pathToDirOrFile : string;
      pathToArchive : string;
      errorCallback : Tpack_errorCallback);
      external name 'pack';

Procedure unpack(pathToArchive : string;
      whereToUnpack : string;
      errorCallback : Tunpack_errorCallback);
      external name 'unpack'; overload;

Procedure unpack(pathToArchive : string;
      errorCallback : Tunpack_errorCallback);
      external name 'unpack'; overload;

implementation
end.
```

Some things to note:

- types are prepended with T: **Javascript** is case sensitive, and often you will encounter variables with the same name as a type, but with different casing - a class name usually starts with a capital. To avoid name clashes, the tool prepends a T to type names.
- The tool correctly spots overloaded versions and marks them as such.
- The tool creates auxiliary types for complex function argument types.
- The special **any** type is replaced with **JSValue.**
- The **JS** unit is automatically used.

The resulting file can be compiled as-is:

```
> pas2js 7zip.pp
Info: 11458 lines in 6 files compiled, 0.3 secs
```

The `dts2pas` tool has several options, we'll explain them here (*using the long version of each option*):

alias This can be used to define type aliases. Aliases can be specified in 2 ways:

❶ As a comma-separated list of `Name=Alias` pairs:
`--alias=AType=MyType`
This will replace every occurence of the `AType` in the declaration file with `MyType`

❷ Using a @ character, a filename to load a list of `Name=Alias` pairs (*one per line*):
`--alias=@MyAliasFile.lst`
This will read file `MyAliasFile.lst`. Each line of the file must contain a pair.

help	Display a help text
input	as seen, this is used to specify the input file to parse.
link	with an argument `FILENAME` will insert a linklib statement:

```
{$linklib FILENAME}
```

When using the resulting unit, this will insert an import statement in the final Javascript:

```
import FILENAME from "FILENAME";
```

output	with an argument `FILENAME` sets the output filename.
setting	with an argument `SETTINGS` sets various conversion options, they are discussed below. Names marked with (*) are set in the default
unit	with an argument `NAME` sets the output unitname to `NAME`. When not specified, it is deduced from the output filename. .
web	Adds the web unit to the uses clause and defines type aliases for all web unit classes: this unit is part of pas2js and contains definitions of all classes exposed by the browser.
extra-units	with an argument `UNITLIST` will add the units in `UNITLIST` (*a comma separated list of unit names*) to the uses clause. Some TypeScript modules depend on other modules using import statements: the `dts2pas` tool will not recursively translate these other modules, but if you have translated them already, this option can be used to add the converted unit names

The **setting** argument accepts a comma-separated list of named flags that influence the conversion process and the generated code. When translating **TypeScript** to **Pascal,** sometimes choices must be made because some **TypeScript** structures to not translate oneon-one to pascal constructs. Many of these choices are controlled using the flags which you can specify in the settings option. Here is an overview:

`coRaw` This will not generate a unit header or implementation section. You can use this to generate an include file.

`coGenericArrays`
Instead of using array of Type for array types, the converter tool will write arrays as `TArray<Type>`. There is no functional difference in **PAS2JS** between the 2 declarations.

`coUseNativeTypeAliases`
This will translate some basic types such as long to Integer.

`coLocalArgumentTypes`
If auxiliary types are generated for methods, these will be generated in a Type section within the class, for example:

```
type
    TSomeClass = Class
    Public
       Type
           TMyMethod_B_Array = Array of integer;
       Function MyMethod(B : TMyMethod_B_Array) : Integer;
end;
```

The default behaviour is to generate a global type with the class name prepended:

```
type
   TSomeClass_MyMethod_B_Array = Array of integer;
   TSomeClass = Class
   Public
       Function MyMethod(B : TSomeClass_MyMethod_B_Array) : Integer;
   end;
```

`coUntypedTuples`
A tuple* in **TypeScript** is a fixed-length array of values. If the dts2pas tool can determine the type of the element, it will generate a typed array:
(In mathematics, a tuple is a finite ordered list (sequence) of elements.)

```
   Type
       TSomeTuple = array[1..3] of string;
```

If this flag is set, the array element will be untyped (type JSValue):

```
   Type
       TSomeTuple = array[1..3] of JSValue;
```

`coDynamicTuples`
A tuple in TypeScript is a fixed-length array of values. The `dts2pas` tool will declare the type with the same number of elements. However, javascript allows you to specify less elements than in the definition of the tuple. To accomodate for this, using this flag you can let the converter generate a dynamic array:

```
       Type
           TSomeTuple = array of string;
```

`coExternalConst`
A constant in a TypeScript declaration will be translated literally. For example:

```
const myConst = "Hello, World";
```
Is translated as:
```
const
  myConst = 'Hello, World';
```

This means the constant is duplicated in the pascal code. Using the flag `coExternalConst`, the constant is translated as a reference instead:

```
const
  myConst : String; external name 'myConst';
```

`coExpandUnionTypeArgs`
A variable of union type in **TypeScript** can have one of the possible types in the union type. This cannot be expressed in Pascal, so the default behaviour is to replace this with the **JSValue** catch-all type:

```
function func (a : string | number) : int;
```

is translated to **Pascal** as

```
function func (a : jsvalue) : integer;
```

With the `coExpandUnionTypeArgs` switch, for function or method arguments with union type, the converter will create overloaded versions for each type. In the above example this means the following declarations are produced:

```
function func (a : string) : integer; overload;
function func (a : double) : integer; overload;
```

`coaddOptionsToheader`
If this switch is present, the converter will insert a comment with the used conversion options to the unit header. If the unit needs to be regenerated, the options used to create the original are available.

`coInterfaceAsClass`
TypeScript knows interface definitions. The standard behaviour of the dts2pas tool is to translate this to an interface definition. With this switch, the interface will be declared as a **Pascal** class.

`coSkipImportStatements`
Any import statements in a **TypeScript** module are written to the converted pasal file as comments. With this option, these comments are not generated.

❸ THE WEB-BASED SERVICE

On the **Free Pascal** server, a **(cgi)** web service exists that can be used to translate any file from the **DefinitelyTyped** repository to a **Pascal** unit. The service is located at

```
https://www.freepascal.org/~michael/service/dts2pas.cgi
```

On the server, the **DefinitelyTyped** repository is checked out, and is updated daily. By specifying a file name (relative to the types directory in the repository), the service outputs the translated unit. Using the following URL

```
https://www.freepascal.org/~michael/service/dts2pas.cgi/
convert/?file=7zip-min/index.d.ts&unit=7zip
```

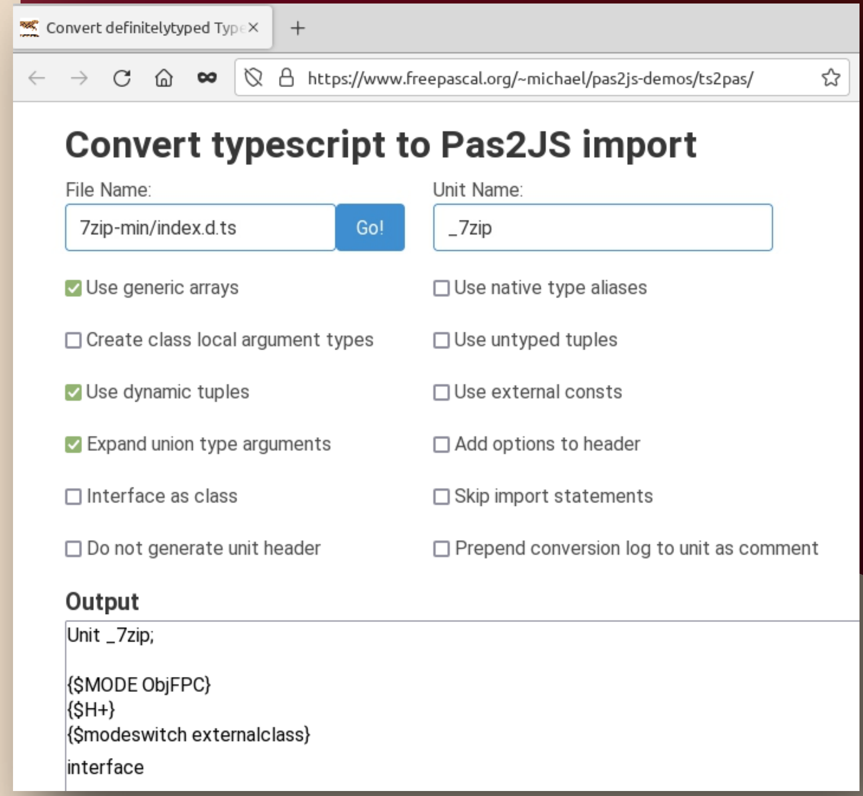
(*the line has been split for readability*) you will get the same file as in the result above. The following query variables are accepted, they have the same meaning as their commandline counterparts.

file	the file to convert, relative to the types directory in the **DefinitelyTyped** repository
unit	the unit name to use.
aliases	Aliases to to use, using the same format as the command-line tool.
extraunits	Extra units to add to the command-line tool.
prependlog	Insert conversion log as comments in the source.
flagname=1	Switch on any of the flags mentioned earlier.

You can get a list of files available for conversion, one per line:

```
https://www.freepascal.org/~michael/service/dts2pas.cgi/list?raw=1
```

By leaving out the `raw=1` the output is a **Javascript** array variable definition. The latter option is used in a small web page, shown in figure 1 on page 7:


Convert definitelytyped Type
https://www.freepascal.org/~michael/pas2js-demos/ts2pas/
Go!

Convert typescript to Pas2JS import

File Name: 7zip-min/index.d.ts

Unit Name: _7zip

[✓] Use generic arrays
[ ] Use native type aliases
[ ] Create class local argument types
[ ] Use untyped tuples
[✓] Use dynamic tuples
[ ] Use external consts
[✓] Expand union type arguments
[ ] Add options to header
[ ] Interface as class
[ ] Skip import statements
[ ] Do not generate unit header
[ ] Prepend conversion log to unit as comment

Output

```
Unit _7zip;

{$MODE ObjFPC}
{$H+}
{$modeswitch externalclass}
interface
```

Figure 1: dts2pas web front-end

`https://www.freepascal.org/~michael/pas2js-demos/ts2pas/`

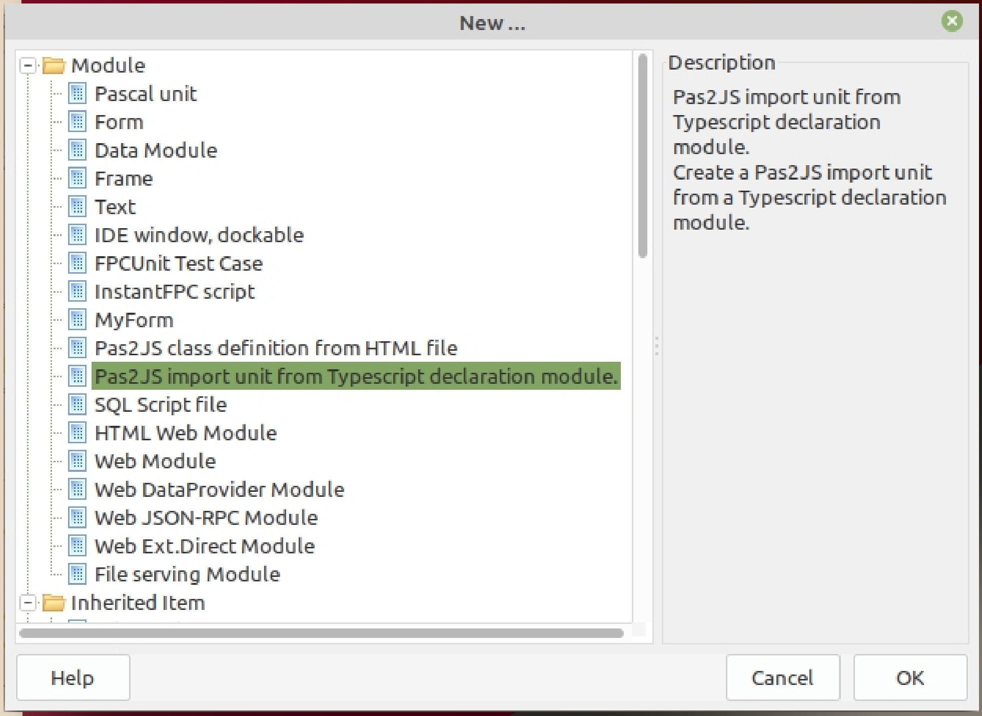
This page (*obviously written in pas2js*) is a simple front-end to the service. The service and front-end page will still be extended to provide more options, such as entering aliases or uploading a **TypeScript** file to convert.

❹ INTEGRATION IN THE LAZARUS IDE

Both the web-based service as the command-line tool have been integrated in the **Lazarus IDE:** using the File-New menu, you can directly convert a **TypeScript** file and make the resulting pascal file part of your program, *see figure 2 on page 8.*

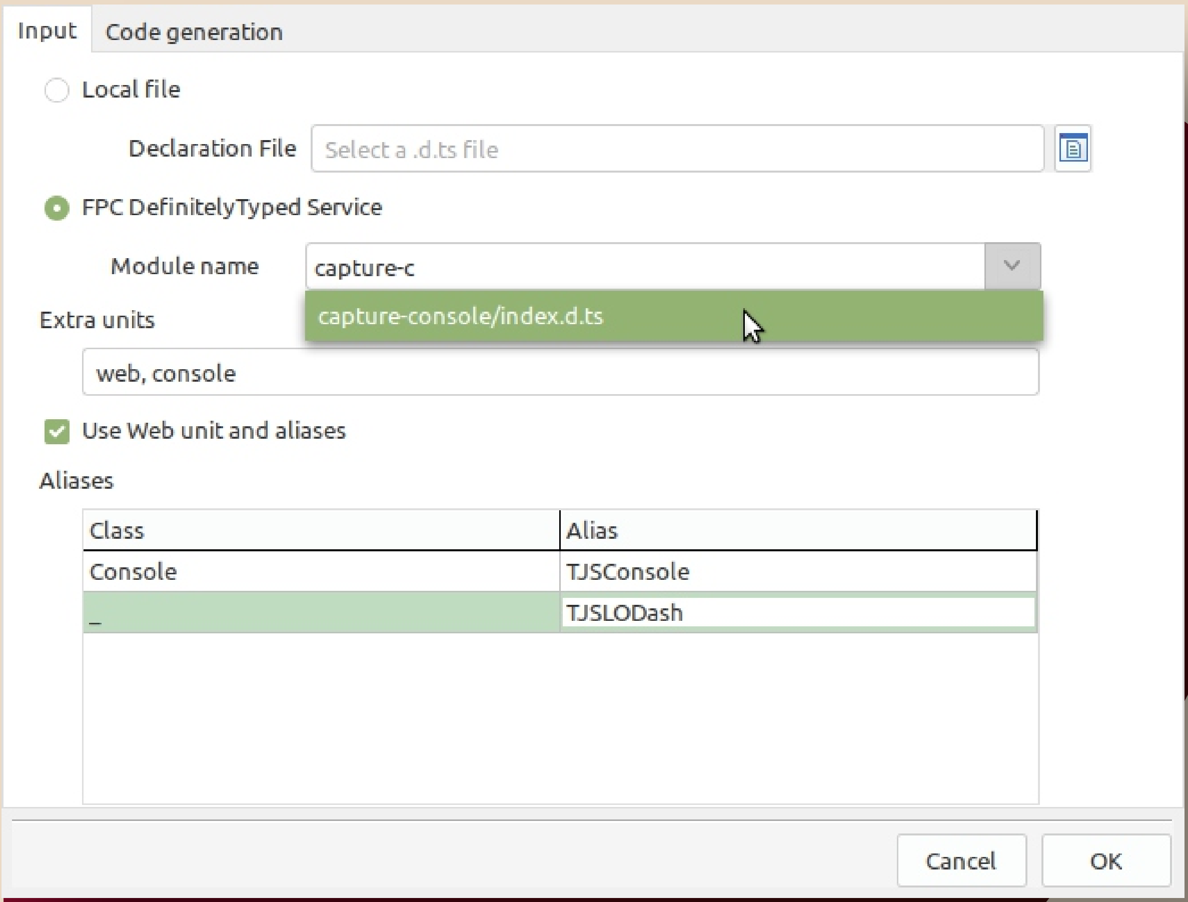
When clicked, a small wizard pops up which allows you to select a description file from disk, or you can opt to use the web-based service:
enter the name of a module - a list of matching files will be presented as soon as you enter 2 characters: *see figure 3 on page 9.*
On the same tab, you can enter extra units, aliases and indicate that the web unit must be used - together with all known aliases: basically the same options as available in the web interface or command-line.

The second tab (*figure 4 on page 9 of the wizard page*) allows you to specify the conversion settings (*or flags*).
When done, you can click OK, and the IDE will create a new unit, part of your **PAS2JS** project, containing the converted **TypeScript** declaration module.
If all goes well, it is ready to use, as *seen in figure 5 on page 10*



Pas2JS import unit from Typescript declaration module.
Create a Pas2JS import unit from a Typescript declaration module.

Figure 2: The File-New entry to import a TypeScript descripton file



( ) Local file

Declaration File: Select a .d.ts file

(●) FPC DefinitelyTyped Service

Module name: capture-c

capture-console/index.d.ts

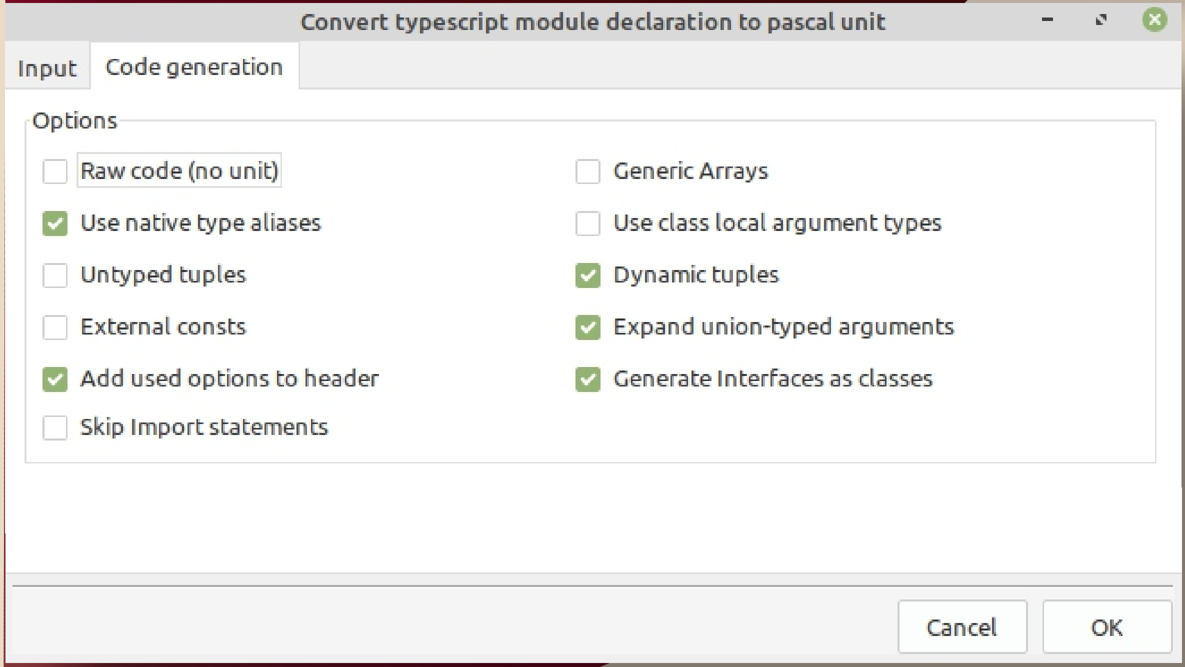
Extra units: web, console

[✓] Use Web unit and aliases

Aliases

Class	Alias
Console	TJSConsole
_	TJSLODash

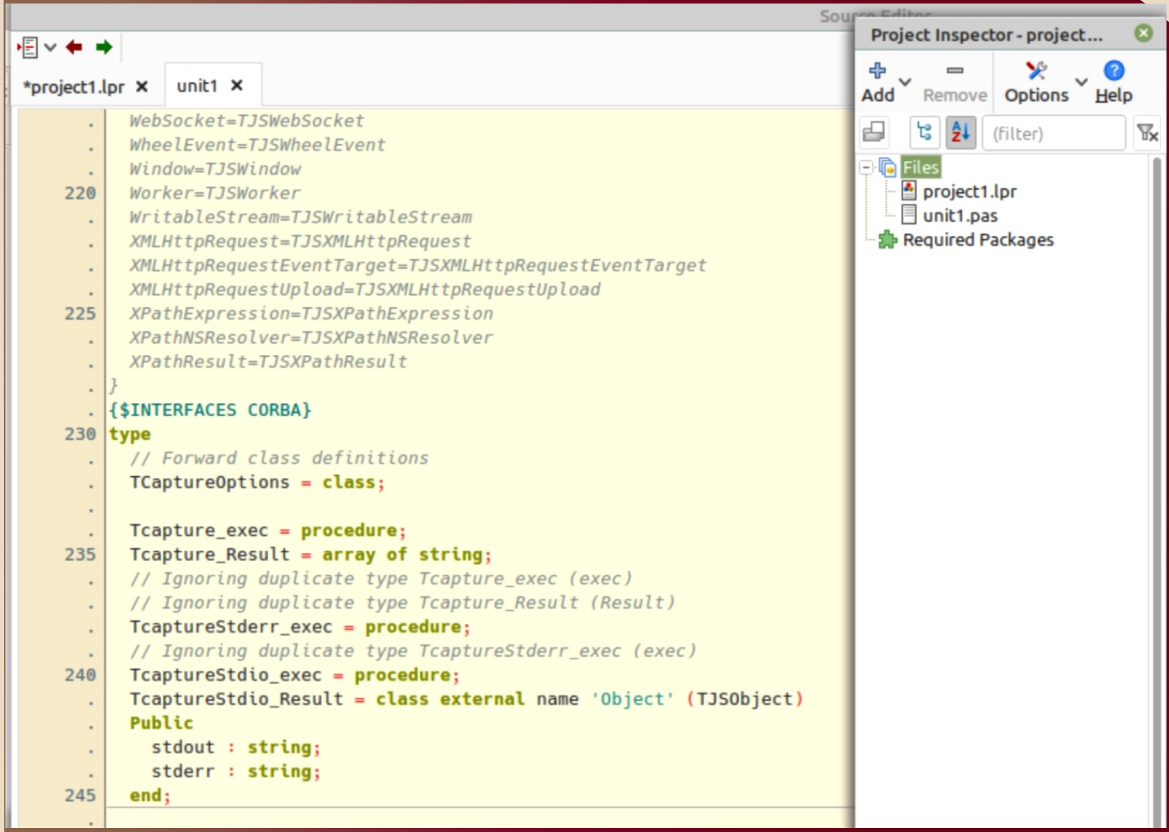
Figure 3: Selecting a TypeScript file or module



Options

[ ] Raw code (no unit)	[ ] Generic Arrays
[✓] Use native type aliases	[ ] Use class local argument types
[ ] Untyped tuples	[✓] Dynamic tuples
[ ] External consts	[✓] Expand union-typed arguments
[✓] Add used options to header	[✓] Generate Interfaces as classes
[ ] Skip Import statements	

Figure 4: Setting the conversion flags



```
  WebSocket=TJSWebSocket
  WheelEvent=TJSWheelEvent
  Window=TJSWindow
  Worker=TJSWorker
  WritableStream=TJSWritableStream
  XMLHttpRequest=TJSXMLHttpRequest
  XMLHttpRequestEventTarget=TJSXMLHttpRequestEventTarget
  XMLHttpRequestUpload=TJSXMLHttpRequestUpload
  XPathExpression=TJSXPathExpression
  XPathNSResolver=TJSXPathNSResolver
  XPathResult=TJSXPathResult
}
{$INTERFACES CORBA}
type
  // Forward class definitions
  TCaptureOptions = class;

  Tcapture_exec = procedure;
  Tcapture_Result = array of string;
  // Ignoring duplicate type Tcapture_exec (exec)
  // Ignoring duplicate type Tcapture_Result (Result)
  TcaptureStderr_exec = procedure;
  // Ignoring duplicate type TcaptureStderr_exec (exec)
  TcaptureStdio_exec = procedure;
  TcaptureStdio_Result = class external name 'Object' (TJSObject)
  Public
    stdout : string;
    stderr : string;
  end;
```

Figure 5: The converted result is part of your project

❺ CONCLUSION

At the time of writing this article, the **DefinitelyTyped** contained well over 36.000 declaration files. Theoretically, these can now all be used in **PAS2JS** You may wonder why the converted units are not made part of the **PAS2JS** repository. The answer to this question is twofold:

- The archive evolves continously: the **PAS2JS** units would be outdated almost daily.
- The conversion is not always perfect:
  sometimes some manual work is needed to fix the generated unit.

Javascript and **Typescript** have a lot of idioms which do not always translate well to **Pascal.** What is more, the declaration files are sometimes ‘messy‘ – despite being more strict than **Javascript, TypeScript** still leaves a lot of room for interpretation and the translator sometimes simply cannot translate correctly what is being defined in **TypeScript:**

Different people may have used different methods to describe the same **Javascript** interface and some descriptions may translate better to pascal than others.
Some declarations are simply outdated:
TypeScript has evolved, but the declaration files have not been updated accordingly.
The **Javascript/Typescript** parser included in **Free Pascal** is not perfect either:

IT TRANSLATES WELL OVER 99% OF THE FILES IN DEFINITELYTYPED, BUT NOT 100%.

Still, using the tool does most of the work for you. Even if some manual work is involved, the amount of work that you must still do will be negligable compared to writing the import units manually.

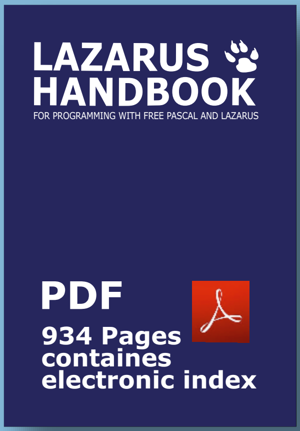
The books

Sewn POCKET ,
almost thousand pages

written by the makers of FPC and Lazarus

934 Pages in two books 50 € (euro)

+



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Including the PDF, INDEX and Code Examples

LIBRARY SUPPORT IN PAS2JS

BY MICHAËL VAN CANNEYT

D11 starter expert

PAS2JS & LIBRARIES

ABSTRACT

This article is meant to show a new feature: With version 2.2, **PAS2JS** introduces library support in the compiler. Libraries in **PAS2JS** translate to **Javascript** modules: independent blocks of **Javascript** code which must be explicitly imported in another block. In this article we show to use them.

❶ INTRODUCTION

For the experienced pascal programmer, using libraries is not uncommon. Till recently, using libraries in **PAS2JS** was not possible.
With release 2.2 (released on 22-02-2022) of **PAS2JS** libraries can now also be used in **PAS2JS**

For the pascal programmer, libraries - (**DLL**s in **Windows**) - are independent programs which export certain functions and variables.
In **Javascript,** a similar concept exists: **Modules.**

Modules can import symbols from other modules, and can export symbols to other modules.
It is therefore natural to transpile a **Pascal** library to a **Javascript** module, and this is now what can be done with **PAS2JS**

- Import symbols from a **module.**
- Create a **module** that exports functions and variables.

In contrast to **Delphi,** no special precautions are needed for using strings or classes in a **PAS2JS** library: in particular, there is no need to enable a module to use shared memory.

2 JAVASCRIPT MODULES

Javascript modules are nothing but **Javascript** files which export a number of symbols, but which otherwise do not share any code or namespaces. Especially the latter is important. By default, if you link 2 **Javascript** scripts to a **HTML** page:

```
<script src="script1.js"></script>
<script src="script2.js"></script>
```

then the code script1 has access to all symbols (variables, functions etc.) of **`script2`**, and vice versa. This means they can modify or even annihilate each others' working.
With Javascript modules, this is not the case.
Take the following HTML snippet:

```
<script type="module"
src="script1.js"></script>
<script type="module"
src="script2.js"></script>
<script src="script3.js"></script>
```

Here script1, **`script2`** and **`script3`** have distinct namespaces. They do not interfere with each other: both script1 and **`script2`** can have a variable **`MyVar`**, but each has a local copy of this variable. If **`script2`** writes to **`MyVar`**, it will only modify its own copy.
What is more, **`script3`** has no access to the symbols defined in **`script1`** and **`script2`**.
Only modules can import symbols of other modules. Imagine **`script1.js`** has the following content

```
export const MyText1 = "Hello,";
export const MyText2 = " World!";
```

As you can see, it exports 2 constants, **`MyText1`** and **`MyText2`**.
This means **`script2.js`** can use these constants as follows:

```
import { MyText1, MyText2 } from "./script1.js";
document.title = MyText1+MyText2;
```

When loading **script2**, the browser will also automatically load **script1.js**, there is no need to include it explicitly in the **HTML** file. The file script1 must of course exist in the specified location.
In contrast with **script2**, **script3** can never access the symbols, because it is not a module itself. Only modules can import and export symbols.
It is of course possible to share some symbols between modules and non-modules by attaching them to a global symbol such as the window.

❸ IMPORTING LIBRARIES

To import symbols from a module (written in Pascal or not) 2 things are needed:

- a **linklib** directive:

  ```
  {$linklib ./my-file.js myfile}
  ```

  this will be transformed to the following Javascript

  ```
  import * as myfile from "./my-file.js";
  ```

  Javascript supports some more fine-grained import statements, but these are not yet supported in Pas2JS. The myfile name is optional, in which case the filename without path or extension will be used.

- an external declaration for each function or variable exported by the module (the declaration has been split over 2 lines for readability):

  ```
  Function MyFunction (S: String) : Integer;
     external name 'myfile.myFunction';
  var
     MyVar : String; external name 'myfile.myVar';
  ```

  Note that these external names contain the prefix 'myfile.' as part of their name: this is because all symbols of the module are available as **myfile.NNN**, due to the way the import statement is constructed from the **{$Linklib }** directive.

Note that the use of the **{$Linklib }** directive also requires the use of the module compiler target. More about this later.

❹ WRITING LIBRARIES

To write a library using **Pas2JS,** you can write a library just as you would in **Delphi** or **Free Pascal,** using the library keyword, instead of the default program keyword:

```
library htmlutils;
  {$mode objfpc}
  // Your exports Here
  // exports a, b, c;
begin
  // Your library initialization code
here
```

However, this is not enough. A new transpiler target was introduced: module.
The reason for introducing a new target is the following:

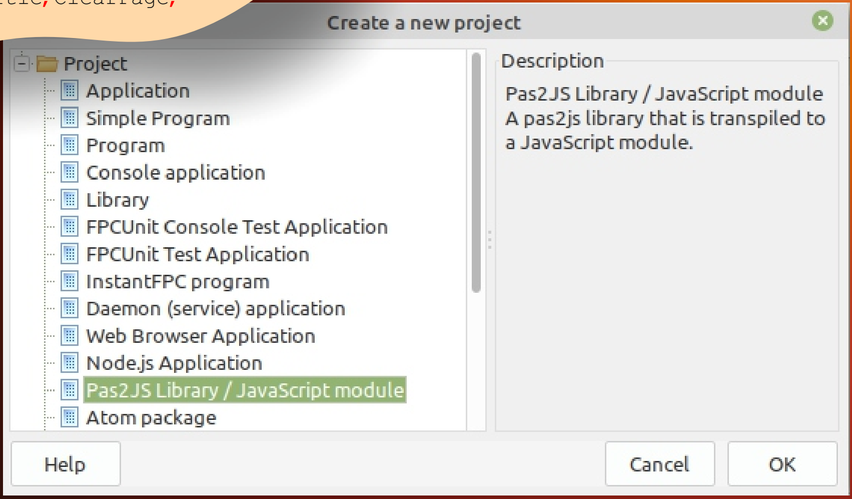
Depending on the target, the transpiler will include a **Pas2JS** `rtl.run();` statement at the end of the generated Javascript (or not). The output for the **nodejs** target includes such a statement, but the browser target does not - because, as a rule, the `rtl.run()` statement is included in the `.html` file: this will ensure that **HTML** tags and their ids have been processed by the browser before the program is run.

Since a library *(or module)* can be used both in **node.js** and in the browser, a new target has been created: module. This target will always include the `rtl.run()` statement.
The `{$Linklib}` directive also requires the use of the module target.
No import statement will be generated, unless the target is set to module.

❺ CREATING JAVASCRIPT MODULES USING PASCAL

So, how to use libraries and `{$Linklib}` directives to create Javascript modules?
We will demonstrate this with an example.
We create a library that allows to clear the **HTML** page below a certain tag (*identified by it's id attribute*), and which allows to set the page title. This is quite simple:

```
library htmlutils;

uses web;

Var   DefaultClearID : String;

Procedure SetPageTitle(aTitle : String);
begin
   Document.Title:=aTitle;
end;

Procedure ClearPage(aBelowID : String);
Var
   EL : TJSElement;
begin
   if (aBelowID='') then aBelowID:=DefaultClearID;
   if (aBelowID='') then el:=Document.body
   else
      el:=Document.getElementById(aBelowID);
   if Assigned(El) then El.innerHTML:='';
end;

exports
   DefaultClearID, SetPageTitle, ClearPage;

end.
```



Description

Pas2JS Library / JavaScript module
A pas2js library that is transpiled to a JavaScript module.

Figure 1: Pas2JS module support in the Lazarus new project menu

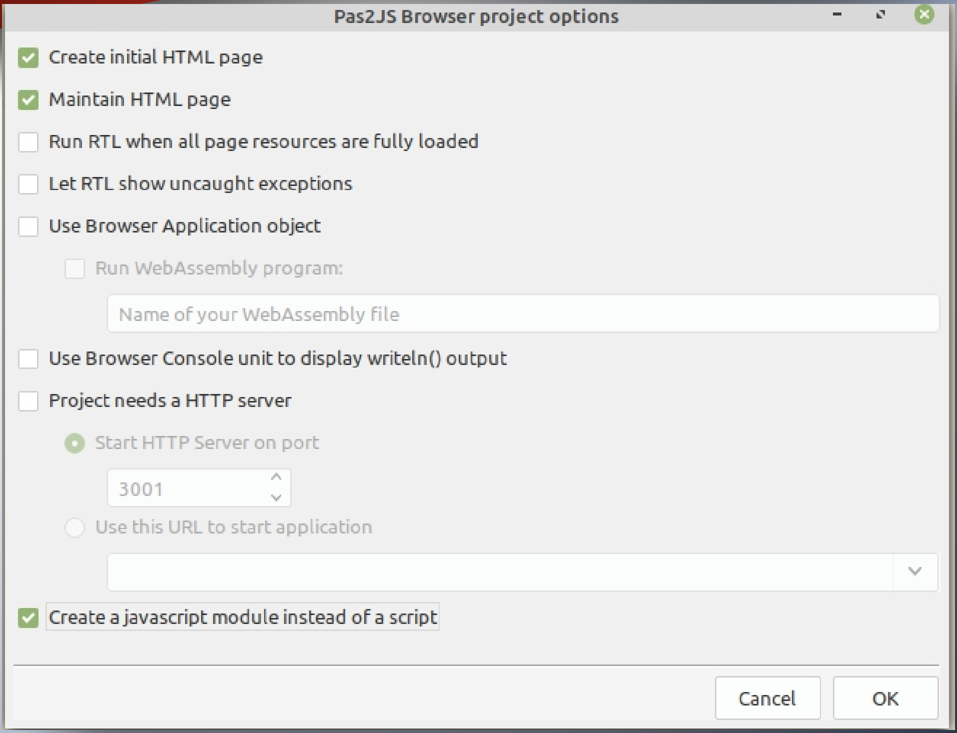
To demonstrate the export of variables, we also export a variable `DefaultClearID`. The value of this variable is used to determine which **HTML** tag to clear. If it is not set, and no tag ID was specified in the call to `ClearPage`, the whole **HTML** body element is cleared.

This library can be compiled with the `-Tmodule` target:

```
/home/michael/bin/Pas2JS -Tmodule -Jirtl.js -Jc htmlutils.pas
```

The **Lazarus IDE** has support for creating a **Pas2JS** library in the `Project-New project` menu, which will set all necessary options, as can be seen in *figure 1 on page 3.*
As indicated earlier, to use a library (or module), we must use again a **Javascript** module: only **javascript** modules can use other modules. To create this module, we have 2 options:

- Create another library.
- Create a program.


Pas2JS Browser project options

- [✓] Create initial HTML page
- [✓] Maintain HTML page
- [ ] Run RTL when all page resources are fully loaded
- [ ] Let RTL show uncaught exceptions
- [ ] Use Browser Application object
  - [ ] Run WebAssembly program:
    - Name of your WebAssembly file
- [ ] Use Browser Console unit to display writeln() output
- [ ] Project needs a HTTP server
  - Start HTTP Server on port: 3001
  - Use this URL to start application
- [✓] Create a javascript module instead of a script

Cancel OK

Figure 2: Pas2JS program as module support in the Lazarus new project menu

It is clear why a library will work: the **Javascript** script will need to have the `module` type and must be compiled with the module target. However, a program will also work.

From the **Javascript** point of view, there is no difference between a library and a program. From a **Pascal** point of view, the only factor of importantce is whether you want to export symbols from your module. If you do, then you must create a library.

For demonstration purposes, we'll create a program, because the **Lazarus IDE** wizard then also creates a **HTML** page which we will need to show the functionality of our library.
In older versions of **Lazarus** the **TargetOS** of our program must manually be set to module in the compiler options. In the latest (*trunk, hence not yet released*) version, the **Project - New project dialog** already offers an option which does this for you, *see figure 2 on page 4.*

We start by creating all code that is needed to import the library:

```
program htmlutilsdemo;

{$mode objfpc}
{$linklib ./htmlutils.js utils}

uses
  Web;
Procedure SetPageTitle(aTitle : String);
  external name 'utils.SetPageTitle';
Procedure ClearPage(aBelowID : String);
  external name 'utils.ClearPage';
var
  DefaultClearID : string;
      external name 'utils.vars.DefaultClearID';
```

Note the `utils.vars.DefaultClearID`: the prefix vars is needed for all variables exported by a **Pas2JS**-created library.
To use these routines, we create a HTML page with 2 edits (`IDs edtTitle, edtBelowID`) and a checkbox (ID `cbUserDefaultClearID`) and 2 buttons (IDs `btnSetTitle` and `btnClear)`. These edits can be used to specify a page title and an element ID, the `onclick` event handlers of the buttons will call our imported functions.
The element definitions are bound to the **HTML** tags in the `BindElements` function:

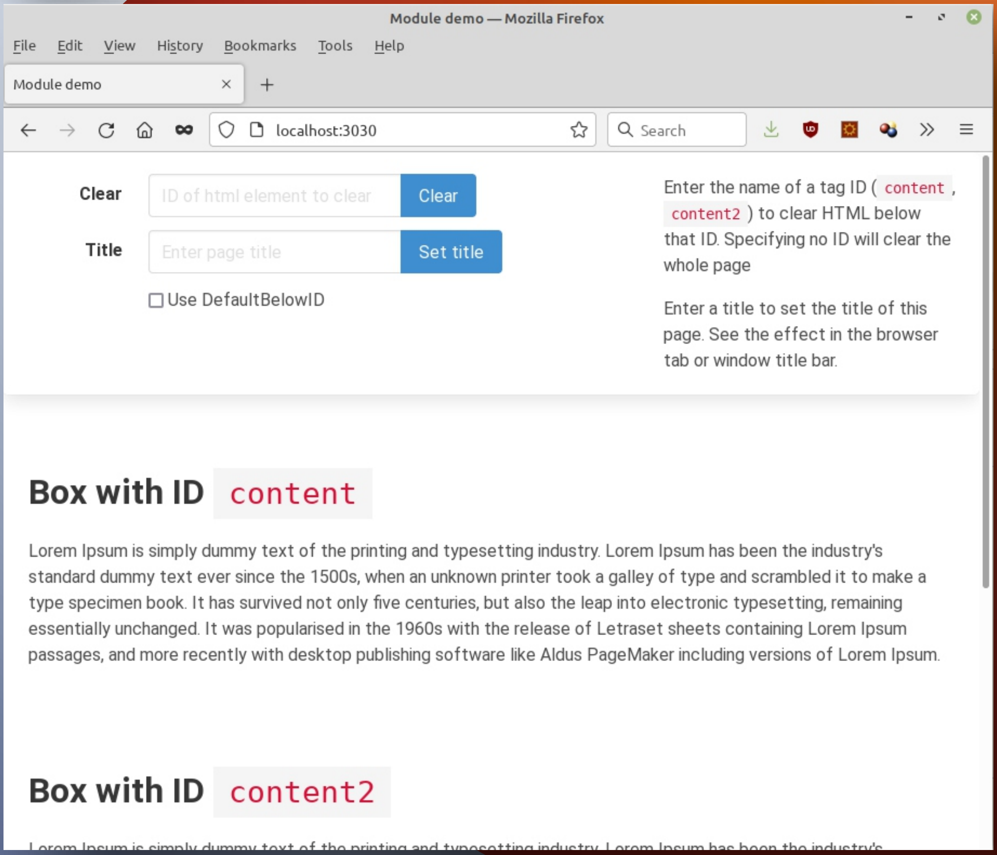
```
Var
   BtnSetTitle,BtnClear : TJSHTMLButtonElement;
   edtTitle,edtBelowID,cbUseDefaultClearID : TJSHTMLInputElement;
Procedure BindElements;

begin
   TJSElement(BtnSetTitle):=Document.getElementById('btnSetTitle');
   BtnSetTitle.OnClick:=@DoSetTitle;
   TJSElement(BtnClear):=Document.getElementById('btnClear');
   BtnClear.onclick:=@DoClear;
   TJSElement(edtTitle):=Document.getElementById('edtTitle');
   TJSElement(edtBelowID):=Document.getElementById('edtBelowID');
   TJSElement(cbUseDefaultClearID):= Document.getElementById('cbUseDefaultClearID');
end;
```

The `BindElements` function is called in the program startup code.
The `DoSetTitle` and `DoClear` methods are callbacks that will call our imported function:

```
function DoSetTitle(aEvent: TJSMouseEvent): boolean;
begin
  Result:=False;
  SetPageTitle(edtTitle.Value);
end;
```

The **DoClear** function is a little longer, since it must take into account the value of the **cbUseDefaultClearID** element:

```
function DoClear(aEvent: TJSMouseEvent): boolean;
begin
  Result:=False;
  if cbUseDefaultClearID.Checked then
    begin
      DefaultClearID:=edtBelowID.value;
      ClearPage('');
    end
  else
    begin
      DefaultClearID:='';
      ClearPage(edtBelowID.value);
    end;
end;
```


Module demo — Mozilla Firefox
File Edit View History Bookmarks Tools Help
Module demo
localhost:3030
Search
Clear
ID of html element to clear
Clear
Title
Enter page title
Set title
Use DefaultBelowID

Enter the name of a tag ID (content , content2) to clear HTML below that ID. Specifying no ID will clear the whole page

Enter a title to set the title of this page. See the effect in the browser tab or window title bar.

Box with ID content

Lorem Ipsum is simply dummy text of the printing and typesetting industry. Lorem Ipsum has been the industry's standard dummy text ever since the 1500s, when an unknown printer took a galley of type and scrambled it to make a type specimen book. It has survived not only five centuries, but also the leap into electronic typesetting, remaining essentially unchanged. It was popularised in the 1960s with the release of Letraset sheets containing Lorem Ipsum passages, and more recently with desktop publishing software like Aldus PageMaker including versions of Lorem Ipsum.

Box with ID content2

Figure 3: Our page in action

The HTML will not be presented here, except to show that the script tag must be modified, the type of the script must be set to module:

```
<script type="module" src="htmlutilsdemo.js"></script>
```

(again, in the latest development version of Lazarus, this is already done for you).
The resulting HTML page can be seen in see *figure 3 on page 6*, it is available online at
`https://www.freepascal.org/~michael/pas2js-demos/modules/htmlutils/`

6 EXPORTING CLASSES

In the **exports** statement only variables and functions can be specified. Despite this restriction, it is possible to use classes which are exported from libraries.
The simplest way to do so is to create a function that creates an instance of a class.
Alternatively, for global instances, you can declare a variable of type of the desired class.
To demonstrate this, we'll rewrite our example to use a class called **THTMLUtils**:

```
library htmlutils;

uses web;

Type
  THTMLUtils = class(TObject)
Public
  DefaultClearID : String;
  Procedure SetPageTitle(aTitle : String);
  Procedure ClearPage(aBelowID : String);
end;

Procedure THTMLUtils.SetPageTitle(aTitle : String);
begin
  Document.Title:=aTitle;
end;

Procedure THTMLUtils.ClearPage(aBelowID : String);

Var EL : TJSElement;

begin
  if (aBelowID='') then aBelowID:=DefaultClearID;
  if (aBelowID='') then el:=Document.body
  else
     el:=Document.getElementById(aBelowID);
  if Assigned(El) then El.innerHTML:='';
end;
```

Since we cannot export a class directly from our module, in order for users of the library to be able to use the class, we must export a function that creates an instance of the class:

```
Function CreateUtils : THTMLUtils;
begin
Result:=THTMLUtils.Create;
end;
exports
CreateUtils;
end.
```

Obviously, if you need to specify options to your class' constructor you'll need to define these options in your function.

Note: Due to a bug in the released **Pas2JS** compiler it is necessary to disable optimizations when compiling this library:
in the `Custom options` part of the compiler options dialog, the -O- option must be added.
This bug has meanwhile been fixed.

To use this class, we must also rewrite our program.
We start by defining the `THTMLUtils` class as an external class:

```
program htmlutilsdemo;

{$mode objfpc}
{$linklib ./htmlutils.js utils}
{$modeswitch externalclass}

uses JS, Web;

type
  THTMLUtils = class external name 'Object' (TJSObject)
  Public
    DefaultClearID : String;
    Procedure SetPageTitle(aTitle : String);
    Procedure ClearPage(aBelowID : String);
  end;

Function CreateUtils : THTMLUtils; external name 'utils.CreateUtils';
```

Note the use of the `{$moduleswitch externalclass}`, needed to be able to define external classes.
Now, to use this class, we must also rewrite our program a little. We define a variable of the class, which we use in our callbacks:

```
Var
  BtnSetTitle,BtnClear : TJSHTMLButtonElement;
  edtTitle,edtBelowID,cbUseDefaultClearID : TJSHTMLInputElement;
  UtilsObj : THTMLUtils;

function DoSetTitle(aEvent: TJSMouseEvent): boolean;
begin
  Result:=False;
  UtilsObj.SetPageTitle(edtTitle.Value);
end;

function DoClear(aEvent: TJSMouseEvent): boolean;
begin
  Result:=False;
  if cbUseDefaultClearID.Checked then
     begin
       UtilsObj.DefaultClearID:=edtBelowID.value;
       UtilsObj.ClearPage('');
     end
  else
     begin
       UtilsObj.DefaultClearID:='';
       UtilsObj.ClearPage(edtBelowID.value);
     end;
end;
```

We initialize the variable with the CreateUtils call exported from our library:

```
begin
  UtilsObj:=CreateUtils;
  BindElements;
end.
```

The resulting page works in exactly the same way as the original example, only now it uses a class. You can test this at:

`https://www.freepascal.org/~michael/pas2js-demos/modules/classes/`

For this simple example, exporting a variable of the correct type is also sufficient. It requires only a few changes. In the library, the `CreateUtils` function can be replaced with an exported variable declaration:

```
var Utils:THTMLUtils;

exports Utils;

initialization
  Utils:=THTMLUtils.Create;
end.
```

The variable is initializd in the initialization section of the library.
To use this variable, only a small change is needed in our program.
We remove the 'CreateUtils' function, and change the declaration of the UtilsObj variable:

```
var
  UtilsObj:THTMLUtils; external name 'utils.vars.Utils';
```

And of course the statement to assign the variable must be removed.
After these changes, again the example will function as the original example.
You can convince yourself at the live demo:
`https://www.freepascal.org/~michael/pas2js-demos/modules/classusingvar/`

❼ CONCLUSION

In this article we've shown one of the latest features of the **Pas2JS** transpiler: libraries and how to use them. We've also shown that libraries in **Pas2JS** are more powerful than libraries in native code: there is no need for special memory managers, and classes can be used as-is. There are some small glitches in the library support for classes: the optimization switch, and using overloads is possible but requires some tweaking of the external names. Despite this, the support for modules is sufficiently mature to be used in production.

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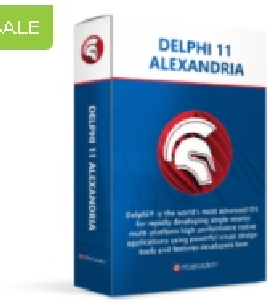

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starter expert

PAS2JS 3

ABSTRACT

In this article we show how to reduce coding when creating forms in a **PAS2JS** web application. Additionally we show how routing can be used to show multiple forms in an **SPA (Single Page Application)** and keep the browser experience of the user intact.

1 INTRODUCTION

The previous articles showed how to implement a **PAS2JS** dialog, and how to switch to another dialog when the user logged in. All the examples shared a common approach:
whether they used the **WebWidget** components or plain HTML classes, they always had one field per HTML tag element in the web page: the field was either a **TWebWidget** component or one of the HTML classes found in the Web unit. This is identical to how Delphi code deals with forms.
For example, the login page resulted in this declaration:

```
TMyApplication =
class(TBrowserApplication)
edtEmail    : TJSHTMLInputElement;
edtPassword : TJSHTMLInputElement;
btnLogin    : TJSHTMLButtonElement;
procedure doLoginClick(aEvent: TJSEvent);
```

This is of course similar to a form declaration in Delphi. In the previous articles, these "form declarations" were created manually.
In the following lines, we show how to generate such a declaration directly from the HTML file.

In **Delphi,** it is very common to show a second form with code like this:

```
Procedure TMainform.mnShowUserClick(Sender:Tobject);
var
frm:TUserForm;
begin
frm:=TUserForm.Create(Self);
frm.Show;
end
```

It is possible to mimic this behaviour in a web application. But this is in fact not really how a user will expect a web application to function:
when the user form appears as shown in the code, the user expects to be able to use the browser's back button to return to the previous form, or to reload the page using the refresh button.

The solution for this problem is called routing. With each form of the application, a URL is associated.
The URL must contain enough information to reconstruct the form.
For example, the following 3 URLs could be used to respectively show the overview of users,create a new user and edit user with ID 123:

```
/users/
/users/new
/users/123
```

If the user is currently viewing URL /`users`, and navigates to the details of user 123 then the URL becomes `/users/123`.
When the user wants to go back to the overview of users, he'll press the back button.

The application should catch this event and present the user again with the overview of the users. We'll explain how this can be achieved in a **PAS2JS** application.

2 GENERATING FORM DECLARATIONS

To avoid having to manually create a form declaration for each HTML file in a web application, a tool called **html2form** has been created. Its sources are distributed with **Pas2JS,** in the directory `tools/html2form`. It is a command-line application. When executed with the `-h` command-line option, you get some help messages which explain the various options:

◘	**help**	show a help message
◘	**below-id=ID**	Only create fields for child elements of element ID in the **HTML** page.
◘	**formclass=NAME**	The name of the pascal "form" class to create.
◘	**form-file**	Generate also a form .frm file (see below?).
◘	**getelementfunction=NAME**	Name of `getelementByID` function: this is the function that is used in a `BindElements method to look up an HTML element based on` their ID attribute.
◘	**events**	When specified, the tool will emit code to bind event handlers to methods.
◘	**input=file**	With this option, you specify the html file to read.
◘	**map=file**	Read a mapping file, which is used to map HTML tags to **Pascal** classes, based on tag and attributes. By default, the tool maps HTML tags to the native Javascript `HTMLElement` child classes.
◘	**no-bind**	By default, the `BindElements` call which maps variables to actual instances is called from the class constructor. When this option is specified, the call to `BindElements` is omitted from the constructor
◘	**output=file**	The pascal file to write a unit to.
◘	**parentclass=NAME**	Name of pascal "form" parent class. There is no fixed `TForm` class in **Pas2JS,** so the tool needs a class name. By default, this class is `Tcomponent`.
◘	**exclude=List**	You can specify a comma-separated list of IDs to exclude: for these Ids, no field will be created. If the value for this option starts with **@,** then the remainder of the option is assumed to be a filename, and the list is loaded from the file.

These options give you an idea of the possibilities.

So, how to use this tool?
Let's take the `index.html` file from our previous examples
– it contains a login dialog – and run it through the tool using the following command-line:

```
html2form --input=index.html -o frmlogin.pas -f TLoginForm
```

The result is a file that looks like this (*some comments have been removed*):

```
unit frmlogin;
{$MODE ObjFPC}
{$H+}

interface

uses js, web,Classes;

Type
  TLoginForm = class(TComponent)
  Published
    edtEmail : TJSHTMLInputElement;
    error : TJSHTMLElement;
    edtPassword : TJSHTMLInputElement;
    btnContinue : TJSHTMLButtonElement;
  Public
    Constructor create(aOwner : TComponent); override;
    Procedure BindElements; virtual;
end;

implementation

Constructor TLoginForm.create(aOwner : Tcomponent);

begin
  Inherited;
  BindElements;
end;

Procedure TLoginForm.BindElements;
begin
  edtEmail:=TJSHTMLInputElement(document.getelementByID('edtEmail'));
  error:=TJSHTMLElement(document.getelementByID('error'));
  edtPassword:=TJSHTMLInputElement(document.getelementByID('edtPassword'));
  btnContinue:=TJSHTMLButtonElement(document.getelementByID('btnContinue'));
end;

end.
```

This "form" declaration will compile as-is and can be added to the **Pas2JS** project.
Many controls on a page need some kind of event handler: a button without event handler is of little use.
Luckily, the **html2form tool** can also generate event handlers for you. For this, a convention is used. When looking at a tag, all attributes that begin and end with an underscore character (_) are considered event names. The value of the attribute is the event handler method name.
To demonstrate this, we modify the index.html a little.
The login button becomes:

```
<button id="btnContinue"
  class="button is-block is-info is-large is-fullwidth"
  _click_="DoLoginClick">
  Continue <i class="fa fa-sign-in aria-hidden="true"></i>
</button>
```

The idea is that the 'click' event for the `btnContinue` button is handled by a method called `DoLoginClick`.
We run again the **HTML2FORM TOOL** on this file, but we also pass the -event command-line option:

```
html2form --input=index.html -o frmloginbase.pas --event -f TBaseLoginForm
```

As you see, we also specify another name for the class file and the unit name. The reason for this will become apparent soon.
The resulting class has more methods:

```
 TBaseLoginForm = class(TComponent)
Published
   edtEmail : TJSHTMLInputElement;
   error : TJSHTMLElement;
   edtPassword : TJSHTMLInputElement;
   btnContinue : TJSHTMLButtonElement;
   Procedure DoLoginClick(Event : TJSEvent); virtual; abstract;
Public
   Constructor create(aOwner : TComponent); override;
   Procedure BindElements; virtual;
   Procedure BindElementEvents; virtual;
end;
```

The `BindElementEvents` is where the events are bound to the callbacks:

```
Procedure TBaseLoginForm.BindElementEvents;
begin
  btnContinue.AddEventListener('click',@DoLoginClick);
end;
```

Note that the callbacks are marked `virtual; abstract;`.
This is configurable:
If you prefer, you can also simply generate virtual methods with an empty body.

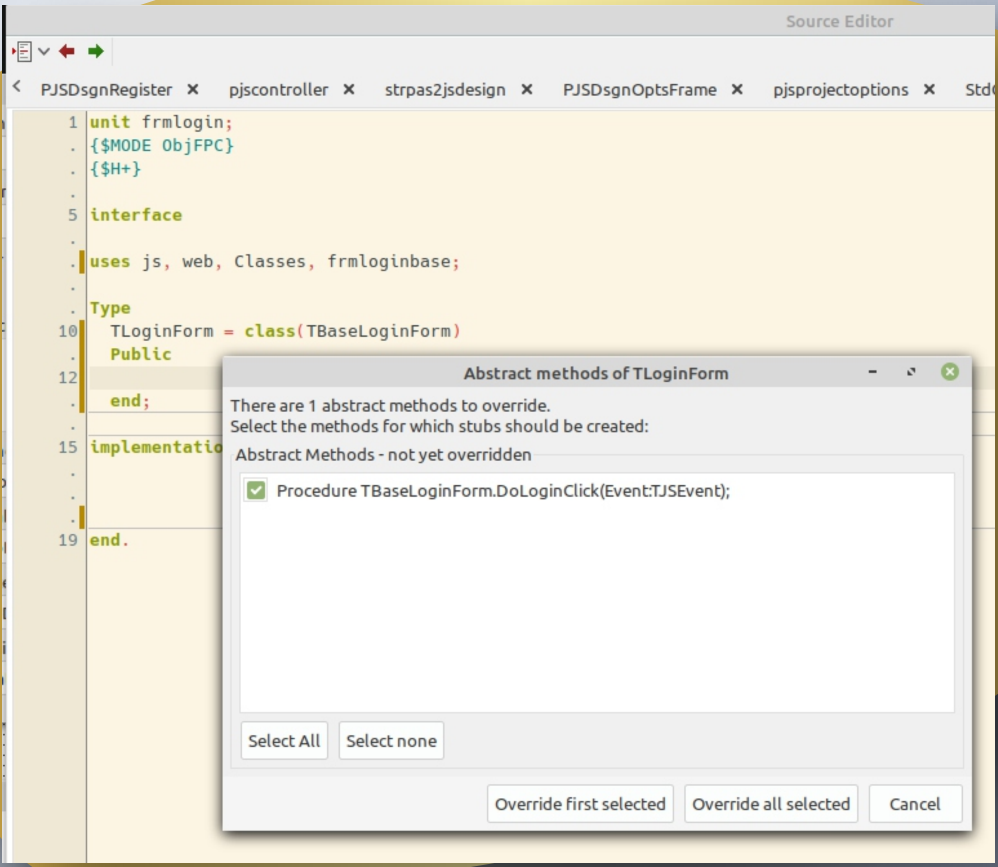
But there is a reason for making these methods abstract:
The class above is not meant to be used directly:
If you generate a class from the HTML file, it can happen that the HTML changes, and you must change the class definition.
If you do this and regenerate the file, any changes you made to the file will be lost.
This is of course not very convenient.
Instead, the above file is generated with abstract methods.
To actually code the form's business logic, you create a new unit with a descendent of `TBaseLoginForm`:

```
unit frmlogin;
{$MODE ObjFPC}
{$H+}

interface
uses js, web, Classes, frmloginbase;

Type
  TLoginForm = class(TBaseLoginForm)
  Public
end;
implementation

end.
```



```
unit frmlogin;
{$MODE ObjFPC}
{$H+}

interface

uses js, web, Classes, frmloginbase;

Type
  TLoginForm = class(TBaseLoginForm)
  Public

  end;

implementatio

end.
```

Abstract methods of TLoginForm

There are 1 abstract methods to override.
Select the methods for which stubs should be created:

Abstract Methods - not yet overridden

✓ Procedure TBaseLoginForm.DoLoginClick(Event:TJSEvent);

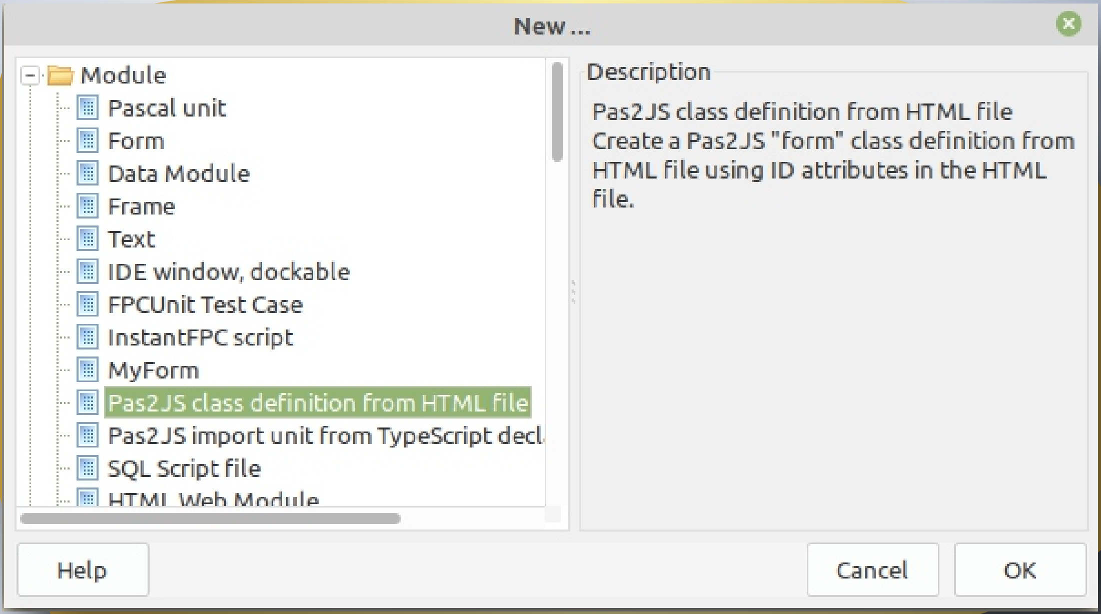
Figure 1: override abstract methods

In this 'form' class, we override the abstract methods, and implement the **GUI** logic of the form. Now, when the **HTML** File changes, we can simply regenerate the **frmloginbase** unit, and continue to work in the **frmlogin** unit.

Overriding the abstract methods can be done trivially in the **Lazarus** IDE:
The dialog under the **Source - Refactoring - Abstract** methods menu (*see figure 1 on page 5*) allows you to do this with a couple of mouseclicks.
This dialog is also available from the source editor context menu popup, or you can attach a shortcut key to it.
The resulting code looks like this:

```
 TLoginForm = class(TBaseLoginForm)
procedure DoLoginClick(Event: TJSEvent); override;
Public
end;

implementation
procedure TLoginForm.DoLoginClick(Event: TJSEvent);
begin
end;
```



Pas2JS class definition from HTML file
Create a Pas2JS "form" class definition from HTML file using ID attributes in the HTML file.

Figure 2: Create a class definition from an HTML File

All that is needed is to code the necessary **UI** or business logic.
If you forget to implement some abstract methods, the compiler will warn you about this when you create an instance of a class which has abstract methods:

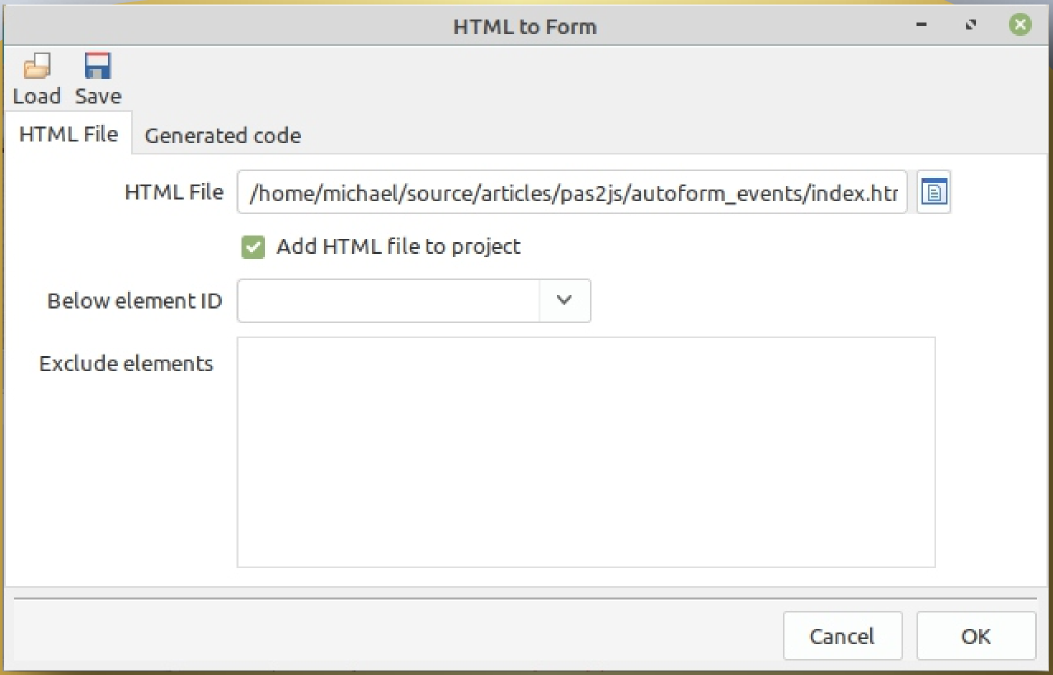
```
frmlogin.pas(29,14) Warning:
Constructing a class "TLoginForm" with abstract method "DoLoginClick"
```

If you have the **latest development version of Lazarus**, this whole process has been automated in the IDE.
In the **File-New** dialog, you can choose the **Pas2JS** Class definition from HTML file option (*see figure 2 on page 6*). When you choose this, you will be presented with a dialog that allows you to enter all possible options for the generating of the class definition, *see figure 3 on page 7* and *figure 4 on page 7*.
In this dialog, you can also opt to add the HTML file to the **Lazarus** project.

Once all the options have been set, the **IDE** will create the unit with the class declaration, and adds the new file to the project. In *figure 4 on page 7* you can see that more options are available in the dialog than on the command-line.

In these screenshots, you see two toolbuttons: With these buttons you can load and save theoptions set in this dialog: this allows you to quickly re-use the same options for all forms in your application, and also allows you to use the saved options in an automated build procedure: the command-line appplication can read this file as well.

To ensure that you can recreate the class definitions at any given moment, the IDE automatically stores the options used to generate the unit in the Lazarus project file (*the .lpi file*). In the project inspector, you can use the context menu to regenerate one or more (*the selected units*) or all html form class files (*see figure 5 on page 8*).



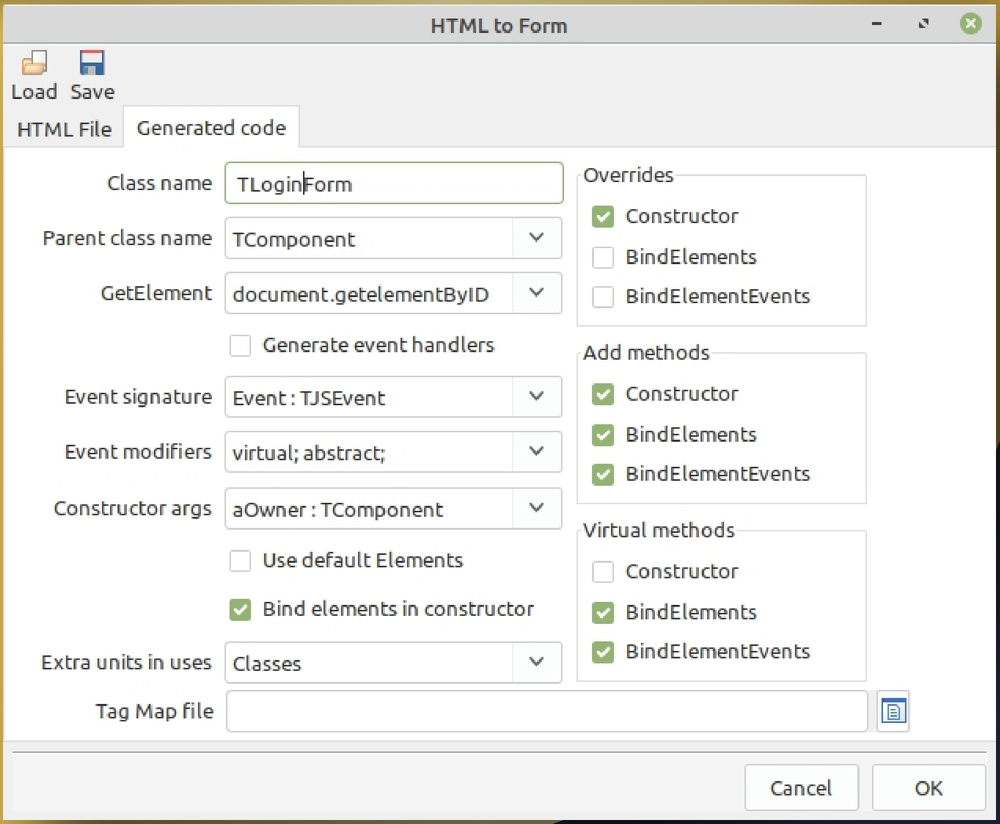
HTML File: /home/michael/source/articles/pas2js/autoform_events/index.htr

[✓] Add HTML file to project

Below element ID:

Exclude elements:

Figure 3: Options for creating a class definition from an HTML File



Class name: TLoginForm

Parent class name: TComponent

GetElement: document.getelementByID

[ ] Generate event handlers

Event signature: Event : TJSEvent

Event modifiers: virtual; abstract;

Constructor args: aOwner : TComponent

[ ] Use default Elements

[✓] Bind elements in constructor

Extra units in uses: Classes

Tag Map file:

Overrides
- [✓] Constructor
- [ ] BindElements
- [ ] BindElementEvents

Add methods
- [✓] Constructor
- [✓] BindElements
- [✓] BindElementEvents

Virtual methods
- [ ] Constructor
- [✓] BindElements
- [✓] BindElementEvents

Figure 4: More options for creating a class definition from an HTML File

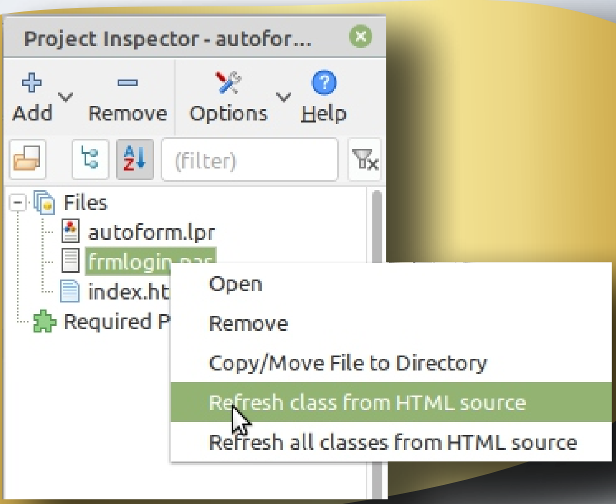

Project Inspector - autofor...
Add
Remove
Options
Help
(filter)
Files
autoform.lpr
frmlogin.pas
index.ht
Required P
Open
Remove
Copy/Move File to Directory
Refresh class from HTML source
Refresh all classes from HTML source

Figure 5: Quickly regenerate the class definitions from their HTML files

3 NAVIGATING FROM ONE FORM TO THE NEXT

A web application usually shows one form at a time:
for instance, an overview of projects is shown, and when the user clicks a project, the overview disappears, and the details for the selected project is shown.

In a **SPA** (**Single Page Application**) this usually happens by showing all 'forms' below a designated HTML tag (*let's give it an id: form-parent*). This operation resembles docking a form in a main form in **Delphi.**

There are several ways to do this: all forms can be made part of the html - you just insert their HTML below the designated tag `form-parent`, give each form's top level HTML an ID. Then we can just show or hide parts of the HTML by adding or removing the following style element to the top level tag of the forms: `style="display: none;"`

You could make the routine that does this part of the form constructor, and just create the form you need. This is easy and convenient if there are only a few forms in your application. But in an application with many forms, the page's HTML will become unwieldy.
Far better and easier is to have the HTML for each form in a separate file. By loading the HTML file at runtime, we can replace the HTML below the `form-parent` tag, and the browser will happily refresh the screen with your new form.

A difficulty with this approach is that loading a file from the server is an asynchronous operation; it takes some time. But this is not a big issue: we can start loading the forms as soon as the page is loaded. A second issue is of course that we should not reload a form each time it is opened: once it was loaded, we better keep the HTML somewhere in the browser, so we don't need to download it again next time the form is shown.

To help with all this, **Pas2JS** comes with a unit called `Rtl.TemplateLoader`. This unit will load a bunch of files (*called templates*) and keep them in some memory structure.
When it is time to load a form, the needed template is requested from the template loader, and the form can be shown. If the template loader does not have it yet, you will need to tell it to load it and wait till it is loaded: the component will notify you when it was loaded so you can display the form.

The **TTemplateLoader** class is defined as follows:

```
TTemplateLoader = Class(TComponent)
   Procedure RemoveRemplate(aName : String);
   Function FetchTemplate(Const aName,aURL : String) : TJSPromise;
   Procedure LoadTemplate(Const aName,aURL : String;
                                    aOnSuccess : TTemplateNotifyEvent = Nil;
                                    AOnFail : TTemplateErrorNotifyEvent= Nil);
   Procedure LoadTemplates(Const Templates : Array of String;
                                    aOnSuccess : TTemplateNotifyEvent = Nil;
                                    AOnFail : TTemplateErrorNotifyEvent= nil);
   Property BaseURL : String ;
   Property Templates[aName : String] : String ;
   Property OnLoad : TTemplateNotifyEvent;
   Property OnLoadFail : TTemplateErrorNotifyEvent;
end;
```

The method names speak for themselves:

RemoveTemplate	clears the template with name **aName**.
FetchTemplate	Loads the template from URL **aURL** and stores the template with name **aName**. Returns a promise you can use to wait for the result.
LoadTemplate	Loads the template from URL **aURL** and stores the template with name **aName**. You can optionally specify 2 event handlers, which will be called when the template is loaded or when the load fails.
LoadTemplates	Passes a list of strings, strings at even indexes are the names of templates, strings at odd indexes are the URLS to load. You can optionally specify 2 event handlers, which will be called when a template is loaded.

The property names are equally clear:

BaseURL	All urls in **FetchTemplate, LoadTemplate(s)** are relative to this URL.
Templates	Here you can access a loaded template by name. If the template does not exist, an empty string is returned.
OnLoad	Allows you to set a global template load notification event. This is called in addition to the ones specified in the load call.
OnFail	Allows you to set a global template load failure notification event.

To demonstrate the use of this component, we'll make a web page with 3 "forms" – actually an HTML template file, and a button to show each form. The HTML template files will have an accompanying form declaration (we now know how to generate one quickly), which we will instantiate once the HTML has been loaded. For this, we need 3 html files:

❶ The global HTML file. We'll name it **index.html**, and it will contain the buttons to display the 2 forms. This file would normally contain a menu, nav bar etc: the things which are always the same in every form.
❷ The HTML file for the first form, a login page: we'll name it **login.html**.
❸ The HTML file for the second form, a projects list page: we'll name it **projects.html**.
❹ The HTML file for the third form, a users list page: we'll name it **users.html**.

Each HTML file will be accompagnied by a class form file, and we'll add some events to it, to demonstrate the capability of the html-to-form converter.

The `index.html` file is quite simple (*we show just the HTML body*):

```
<div class="container">
  <div class="box">
    <button class="button is-primary" id="btnLogin"
                _click_="DoLoginClick">Login</button>
    <button class="button is-info" id="btnProjects"
                _click_="DoProjectsClick">Projects</button>
    <button class="button is-info" id="btnUsers"
                _click_="DoUsersClick">Users</button>
  </div>
  <div class="box form-container" >
    <div id="form-parent" >
      <div class="notification is-info is-light">
        Click one of the buttons above.
      </div>
    </div>
  </div>
</div>
```

As you can see, there are 3 buttons, plus some tags that use **Bulma CSS** to create a visually more pleasing HTML page.
From this we use the File-New wizard to create a `frmIndex.pp` unit with the following class:

```
TIndexForm = class(TComponent)

Published
  btnLogin : TJSHTMLButtonElement;
  btnProjects : TJSHTMLButtonElement;
  btnUsers : TJSHTMLButtonElement;
  form_parent : TJSHTMLElement;
  procedure DoLoginClick(Event : TJSEvent);
  procedure DoProjectsClick(Event : TJSEvent);
  procedure DoUsersClick(Event : TJSEvent);
Public
  constructor create(aOwner : TComponent); override;
  procedure BindElements; virtual;
  procedure BindElementEvents; virtual;
end;
```

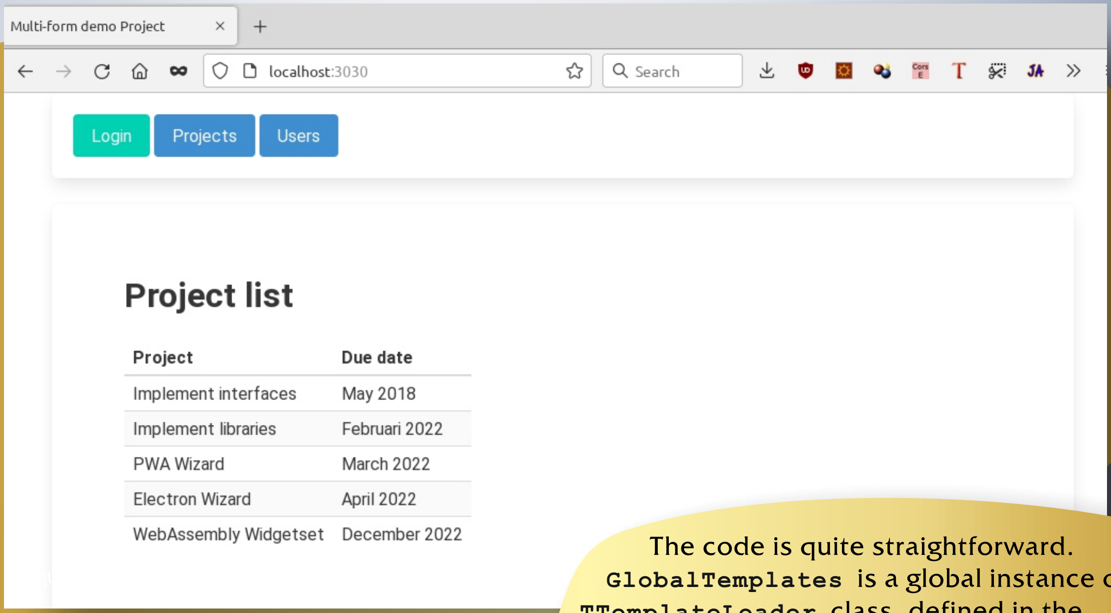
We do the same for the login, projects and users HTML files:
For these files, the IDE will generate a class definition that looks much like the above.
After doing this, we end up with 4 units in our project: `frmIndex`, `frmLogin`, `frmProjects` and `frmUsers`.
For simplicity, we will deviate from the 'proper' way to do things and simply implement the needed functionality in the units themselves.
The `TIndexForm` class is the 'main' form of our application. In this form, we must implement the logic for navigation between the login, projects and users form. Here is the logic to show the login page:

```
procedure TIndexForm.DoLoginClick(Event: TJSEvent);

Procedure ShowLogin;
begin
  form_parent.innerHTML:=GlobalTemplates.Templates['login'];
  FreeAndNil(FCurrentForm);
  FCurrentForm:=TLoginForm.Create(Self);
end;

procedure DoShowLogin(Sender: TObject; const aTemplate: String);
begin
  ShowLogin;
end;

begin
if GlobalTemplates.Templates['login']<>'' then  ShowLogin
else
  GlobalTemplates.LoadTemplate('login','login.html',@DoShowLogin);
end;
```



Project list

Project	Due date
Implement interfaces	May 2018
Implement libraries	Februari 2022
PWA Wizard	March 2022
Electron Wizard	April 2022
WebAssembly Widgetset	December 2022

The code is quite straightforward. `GlobalTemplates` is a global instance of the `TTemplateLoader` class, defined in the `Rtl.TemplateLoader` unit. If the template is known, then the `ShowLogin` is called. If the template is not yet known, it is loaded, and in the success handler, `ShowLogin` is called. For simplicity, we didn't use a failure event handler.

The ShowLogin routine enters the template HTML below the HTML tag with id `form-parent`. It then destroys any previous form instance in `FCurrentForm` - a variable that keeps the current form. Finally it creates the new form class and saves it.

That's all there is to it. For the `Projects` and `Users` pages, a similar routine is made, only the names differ. The result after pressing the `Projects` button is shown in *figure 6on page 11.*

4 USING A FACTORY PATTERN

The routines to show the login, projects, an users pages are the same. All that differs is the class name, and the name of the template and html file. If there are a lot of forms, then repeating the above code is of course not very efficient.
So, an obvious improvement to reduce code is to create a routine (*or better, a class*) which does all this in one call. It would also be nice if we could just pass a form name which says which form must be shown, without having to specify a class or a HTML file name.
To achieve this, we create a TFormManager class in a frmBase unit, which looks like this:

WIKIPEDIA *In class-based programming, the* ***factory method pattern*** *is a creational pattern that uses factory methods to deal with the problem of creating objects without having to specify the exact class of the object that will be created. This is done by creating objects by calling a factory method - either specified in an interface and implemented by child classes, or implemented in a base class and optionally overridden by derived classes - rather than by calling a constructor.*

```
TFormManager = Class(TComponent)
Public
  Procedure RegisterForm(aClass : TBaseFormClass;
                         const aName : String = '';
                         aHTMLFile : String = '');
  Procedure UnregisterForm(aName : string);
  Procedure ShowForm(aName : string;
                 OnShow : TFormProcedure = nil);
  Property CurrentForm : TBaseForm;
  Property FormParent : TJSHTMLElement;
  Class property Instance : TFormManager;
end;
```

The `Instance` class property returns a global instance, which can be used to manage all forms.
With the `RegisterClass` routine, we can register a form class, using a name with which it can be shown, and a HTML file with which to load the HTML for the form. You can choose these last 2 parameters at will, but if you don't specify them, some defaults will be taken.
The `ShowForm` method can then be used to show a form using just the name used to register the form; A callback handler can be specified: it will be called when the form is shown.
The `ShowForm` routine looks much like the `OnClick` handler which we presented before, with as an addition a call to the `OnShow` handler that can be passed to the method:

```
procedure TFormManager.ShowForm(aName: string; OnShow: TFormProcedure);
Var Idx : Integer; Reg : TFormRegistration;

   Procedure ShowForm;
   var html : string;
   begin
      If Assigned(FCurrentForm) then FreeAndNil(FCurrentForm);
      html:=GlobalTemplates.Templates['form:'+Reg.Name];
      FFormParent.innerHTML:=html;
      FCurrentForm:=Reg.FFormClass.Create(Self);
      If Assigned(OnShow) then OnShow(Self,FCurrentForm);
   end;

   procedure FormFailed(Sender: TObject;
                        const aTemplate, aError: String;
                        aErrorcode: Integer);
   begin
      Writeln('Error loading form template',aTemplate,' : ',
      aError,' (Code:',aErrorCode,')');
   end;

   procedure HaveForm(Sender: TObject; const aTemplate: String);
   begin
      ShowForm;
   end;

   begin
      Idx:=FForms.IndexOf(aName);
      if Idx=-1 then
         Raise EForms.CreateFmt(SErrUnknownForm,[aName]);
      Reg:=TFormRegistration(FForms.Objects[Idx]);
      if GlobalTemplates.Templates['form:'+Reg.Name]='' then
         GlobalTemplates.LoadTemplate('form:'+Reg.Name,Reg.HTML,
                                      @HaveForm,@FormFailed)
      else
         ShowForm;
end;
```

The `OnClick` handlers of our menu buttons in the index form can now be reduced to the following:

```
procedure TIndexForm.DoLoginClick(Event: TJSEvent);
begin
  FormManager.ShowForm('login');
end;

procedure TIndexForm.DoProjectsClick(Event: TJSEvent);
begin
  FormManager.ShowForm('projects');
end;

procedure TIndexForm.DoUsersClick(Event: TJSEvent);
begin
  FormManager.ShowForm('users');
end;
```

Obviously, before this can work, the login, projects and users forms need to be registered. In the **RegisterForm** method of the **TFormManager** class, the **aClass** parameter is of type **TBaseFormClass**. This class reference type is also defined in the **frmBase** unit:

```
TBaseForm = class(TComponent)
Public
  Class Function FormName : String; virtual;
  Class Function FormHTMLFileName : String; virtual;
  Class Procedure Register;
end;
TBaseFormClass = class of TBaseForm;
```

The **Register** class method looks like this:

```
class procedure TBaseForm.Register;
begin
   With TFormManager.Instance do
      RegisterForm(Self,FormName,FormHTMLFileName);
end;
```

The FormName and FormHTMLFileName look like this:

```
class function TBaseForm.FormName: String;
Var P : integer;

begin
   Result:=LowerCase(ClassName);
   if Result.StartsWith('tfrm') then
      Result:=Copy(Result,5,Length(Result)-4)
   else if Result.StartsWith('t') then
      Result:=Copy(Result,2,Length(Result)-1);
   if Result.EndsWith('form') then
   begin
      P:=Pos('form',Result);
      Result:=Copy(Result,1,P-1);
   end;
end;

class function TBaseForm.FormHTMLFileName: String;
begin
   Result:=FormName+'.html';
end;
```

The result of all this code is that the line

TFrmLogin.Register;

will register the form class **TFrmLogin** with name **login** and html file **login.html**. The mechanism presented here is of course just a convention which makes life easier; you can perfectly invent other algorithms. The start of our program becomes therefore:

```
TUsersForm.Register;
TProjectsForm.Register;
TLoginForm.Register;
FIndex:=TIndexForm.Create(Self);
FormManager.FormParent:=FIndex.form_parent;
```

Note that the **TIndexForm** is not registered: It has no associated HTML which must be loaded: the index.html file is already loaded.

5 ROUTING

We have now reduced the code it takes to show a form to a one-liner in an `onclick` handler. However, this does not solve our principal problem: the use of the back and forward buttons in the browser:
if the user first opens the projects list and then goes to the users list, he will naturally assume he can go back to the projects list by hitting the back button.
With the application as it is coded now, if you press the back button while the users list is shown, either

- Nothing will happen if the demo is the first page loaded in your browser.
- Or you will be taken back to the website you were looking at before you opened the demo.

The solution to this problem is called routing: with each form we associate an URL.
As the user navigates between the forms, the URL changes.
This is easy with a website where each form is an actual and separate HTML page.

But how to do this in a **Single Page Application (SPA)**?
Luckily, in **HTML 5**, this is possible: the browser offers access to the history mechanism of your browser page. You can be notified if the URL changes, and you can also change the URL. Since we are creating a **SPA (Single Page Application)** we must of course try to avoid a page reload, and remain in the current page.
But how to stay on the same page when we require that the URL must change when navigating from one form to another? This also is possible: the hash part of the URL can be used. The following 3 URLs are the same page:

```
http://localhost:3000/index.html#/login
http://localhost:3000/index.html#/users
http://localhost:3000/index.html#/projects
```

These are 3 different URLs, but they all refer to the same HTML page. When you are on the last URL in the list, and press the back button, the browser will see that the previous URL is actually the same page, and will not reload the page from the webserver.
This mechanism can be further expanded, you can pass more information in the URL.
The following can refer to 1 page (*a fictitious project detail page*), which will – in turn – show the details for project 1, a new project and project 2.

```
http://localhost:3000/index.html#/project/1
http://localhost:3000/index.html#/project/new
http://localhost:3000/index.html#/project/2
```

What is more, the user can copy the URL, send it to someone else, and the receiver can open the application and be presented with the same page.

So, how to achieve this?
The **Pas2JS RTL** comes with a webrouter unit, which implements a `TRouter` class. This class allows you to associate a callback with a route. A route is simply a URL fragment: when the URL changes, the router will catch the browse event for it, and match the new URL with the list of known routes. If it finds a route definition that matches the URL, it will call the registered callback for that route.

For example, these are possible routes for our application:

```
/login
/project
/project/new
/project/:ID
/user
/user/:ID/Tab/:TAB
/user/:ID/
/*
```

Notice the `:ID` and `:TAB` in these routes. They present parameters: any string that does not contain a / character. When the router matches the URL, it will replace ID with what was actually in the URL. This means that the following URL fragments:

```
/project/123
/project/789
```

will result in a match for the route `/project/:ID`, but with `ID` set to `123` and `789`, respectively.

You can also use the wildcard character * to match any **URL** fragment.
This can be used for example to register an error page if no matching URL was found, or to handle all `URLS` that start with a certain fragment in a single route definition.
The following is the declaration of the `TRouter` class, with only the most important methods:

```
TRouter = Class(TComponent)
  Procedure DeleteRoute(aIndex : Integer);
  Function RegisterRoute(Const aPattern : String;
                                aEvent: TRouteEvent;
                                IsDefault : Boolean = False) : TRoute;
  function FindHTTPRoute(const Path: String;
                                Params: TStrings): TRoute;
  function GetRoute(const Path: String;
                                Params: TStrings): TRoute;
  Function RouteRequest(Const aRouteURL : String;
                                DoPush : Boolean = False) : TRoute;
  Property Routes [AIndex : Integer] : TRoute ;
  Property RouteCount : Integer;
  Property BeforeRequest : TBeforeRouteEvent;
  Property AfterRequest : TAfterRouteEvent;
end;
```

The purpose of these methods should be clear:

◘ **DeleteRoute**	Delete given route by index.
◘ **RegisterRoute**	Register a callback for a route: the aPattern is a pattern to match with the URL. If the URL matches the route, then aEvent is called. If `isDefault` is `True` then this route is used if no matching route can be found for a given URL fragment.
◘ **FindHTTPRoute**	Find a route definition for Path, and return parameter values in Params. Returns the route definition. If no route is found, Nil is returned.
◘ **GetRoute**	calls FindHTTPRoute, and raises an exception if no route was found.
◘ **RouteRequest**	Perform the routing for a request with URL frament aRouteURL. If DoPush is true, the new route is pushed onto the browser's URL history.
◘ **Routes**	Array access to the registered routes.
◘ **RouteCount**	The number of known routes.
◘ **BeforeRequest**	An event that is fired before handling a routing request.
◘ **AfterRequest**	An event that is fired after handling a routing request.

How can we use this object to show our forms automatically in the application ?
A simple mechanism suggests itself: each form registers a route starting with the form name used to create the form.
This means that our three forms must register 3 routes:

```
/login
/projects
/users
```

Now we can pluck additional fruits of the factory pattern that we introduced earlier. We can use the **RegisterForm** call to register a route for the form.
To allow a form to register multiple routes for itself, we create a **FormRoutes** method in **TBaseForm**:

```
class function TBaseForm.FormRoutes: TStringDynArray;
begin
  Result:=[FormName];
end;
```

This method (*which can return multiple routes*) is then used to register the routes for the form in the form manager's **RegisterForm** method. This method starts with some sanity checks, before adding a form registration object to a list. The **FormRoutes** method is then used to register the various routes for the form:

```
function TFormManager.RegisterForm(aClass: TBaseFormClass;
                                   const aName: String;
                                   aHTMLFile: String):
                                   TRouteDynArray;

Var
          aRoute,N,H : String;
          aRoutes : TStringDynArray;
          aReg : TFormRegistration;
          Idx : Integer;

begin
   // Some cleanup
   N:=aName;
   if N='' then N:=aClass.FormName;
   H:=aHTMLFile;
   if H='' then H:=aClass.FormHTMLFileName;
   // Create and save form registration.
   aReg:=TFormRegistration.Create(aClass,N,H);
   FForms.AddObject(N,aReg);
   // Register routes
   aRoutes:=aClass.FormRoutes;
   SetLength(Result,Length(aRoutes));
   Idx:=0;
   for aRoute in aRoutes do
   begin
      Result[Idx]:=Router.RegisterRoute(aRoute,@DoFormRoute,False);
      Inc(Idx);
   end;
   // Save routes in registration.
   aReg.FRoutes:=Result;
end;
```

As a last step, the created routes are saved in the form registration. This is needed in the **DoFormRoute** method, which will be called when the route is matched.
In the **DoFormRoute** method, we start with looking up the form registration associated with the route. The **HasRoute** helper function checks if the given route is in the array of routes for that form registration.

```
procedure TFormManager.DoFormRoute(URl: String;
           aRoute: TRoute;
           Params: TStrings);
Var
   Idx : Integer;
   Reg : TFormRegistration;
begin
   // Find the form registration for this route:
   Reg:=Nil;
   Idx:=FForms.Count-1;
While (Reg=Nil) and (Idx>=0) do
   begin
      Reg:=TFormRegistration(FForms.Objects[Idx]);
      if Not Reg.HasRoute(aRoute) then
         Reg:=Nil;
      Dec(Idx);
   end;
   // If we found a registration, show the form
   if Assigned(Reg) then
      ShowForm(Reg.Name,
      procedure (sender: TObject; aForm : TBaseForm)
      begin
         aForm.ShowRoute(URL,aRoute,Params);
      end);
end;
```

Finally, if a valid form registration is found, then we show the form using the existing ShowForm method. In the `OnShow` callback we call a new method of our base form class, `ShowRoute`:

```
procedure TBaseForm.ShowRoute(const aURL: String; aRoute: Troute; aParams: TStrings);
begin
   Writeln('Showing route for URL ',aURL,' with pattern: ',
   aRoute.FullPath,' and params : ',aParams.CommaText);
end;
```

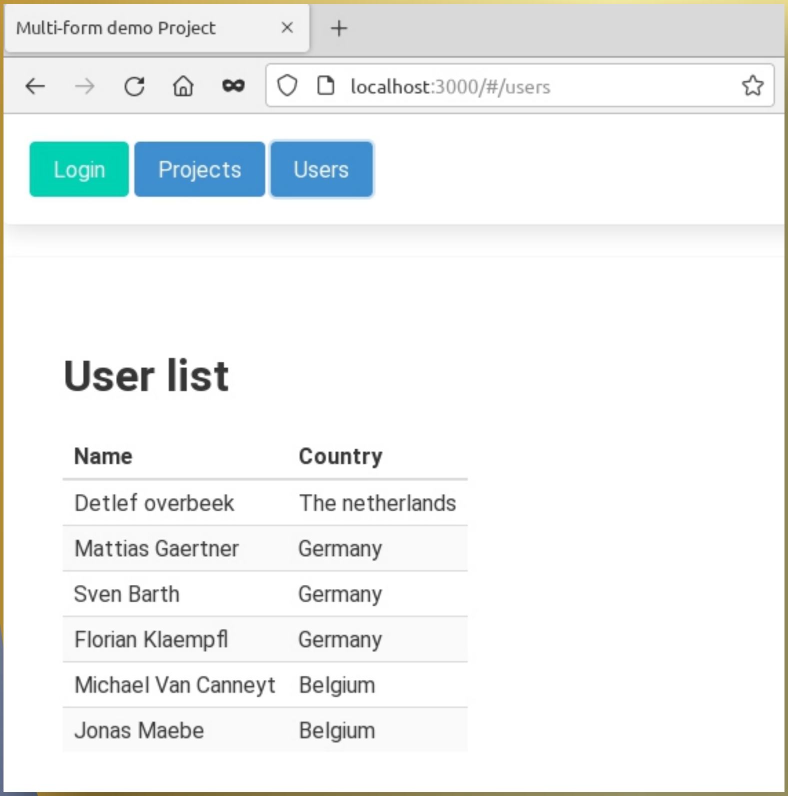
This virtual method can be overridden to let the form act on the particular route that was used to show the form. For instance, to react on parameters in the route.
So, now that we have our routing in place, how to use it? This is simple, and we actually end up with less code. The 3 buttons in the index.html page to show our 3 forms can now be replaced with 3 anchor elements:

```
<div class="box">
<a class="button is-primary" id="btnLogin" href="#/login">Login</a>
<a class="button is-info" id="btnProjects" href="#/projects">Projects</a>
<a class="button is-info" id="btnUsers"    href="#/users">Users</a>
</div>
```

As you can see, the `button` HTML tag has been replaced with an anchor HTML tag `(a)`. In the anchor tag's `href` attribute, we enter the route for the form that must be shown: `#/`, followed by the form name.
The `click` handler has also been removed: it is no longer needed.

If we now regenerate the class file associated with our `index.html` file, we notice that the `click` handlers are gone. The navigation is now handled by the router.

The result can be seen in *figure 7 on page 18*. Notice how in in the address bar of the browser, the route is now displayed within the URL's hash. As you navigate between forms, the URL will change as you switch forms. Additionally, if you now use the back and forward buttons of the browser, you will actually switch forms !
With this mechanism, you are giving the user a real browser experience.
Incidentally, note that the hyperlink elements look exactly like button elements used before: this is one of the perks of using a **CSS framework**.



User list

Name	Country
Detlef overbeek	The netherlands
Mattias Gaertner	Germany
Sven Barth	Germany
Florian Klaempfl	Germany
Michael Van Canneyt	Belgium
Jonas Maebe	Belgium

Figure 7: Multi-form project using routing

6 ROUTE PARAMETERS

To demonstrate the use of parameters in the URL, we change the projects overview page to show links to a 'project details' page for a project:

```
 <tr>
   <td>
   <a href="#/project/1">Implement interfaces </a>
   </td>
   <td>
   May 2018
   </td>
</tr>
```

The HTML of the project detail page (project.html) looks like this:

```
 <h1  id="pagetitle"
      class="title is-3">Project:
      <span id="hdrProjectName">?</span>
</h1>
<div  id="lblNotFound"
      class="notification is-danger is-light is-hidden">
      Project %d not found !</div>
<div  class="field">
   <label class="label">Project Name</label>
   <div class="control">
   <input   class="input"
            id="edtProjectName"
            type="text"
            placeholder="Project name">
   </div>
</div>

<div  class="field">
   <label class="label">date due</label>
   <div   class="control has-icons-left">
      <input   class="input is-success"
               type="text" id="edtDueDate"
               placeholder="project due date">
      <span class="icon is-small is-left">
         <i class="las la-calendar-check"></i>
      </span>
   </div>
</div>

<div class="field is-grouped">
   <div class="control">
      <button id="btnSave"
               class="button is-link">
         Save
      </button>
   </div>
   <div class="control">
      <button id="btnCancel"
               class="button is-link is-light">
         Cancel
      </button>
   </div>
</div>
```

When we generate the form for this HTML, we call the form class TProjectDetailForm, and we override the following methods:

```
Procedure ShowRoute(Const aURL : String;
                          aRoute : TRoute;
                          aParams : TStrings); override;
Class function FormHTMLFileName: String; override;
Class function FormRoutes: TStringDynArray; override;
```

Since the form class name differs from the html file name (the convention that was presented earlier), we need to give the form factory the correct HTML file name:

```
class function TProjectDetailForm.FormHTMLFileName: String;
begin
Result:='project.html';
end;
```

Since we wish to obtain the value of the form ID as a parameter in the URL, we must register a fitting route for this:

```
class function TProjectDetailForm.FormRoutes: TStringDynArray;
begin
Result:=['/project/:ID']
end;
```

The result is that project ID will be passed to the ShowRoute in the ID parameter.

We can now use this parameter to load the correct project data. If a wrong ID or a false ID is loaded an error message is displayed:
The user can type an arbitrary or outdated URl in the browser address bar, and we must be prepared to deal with errors.
With a simple **Bulma CSS** class (`is-hidden`), a HTML element can be shown or hidden.

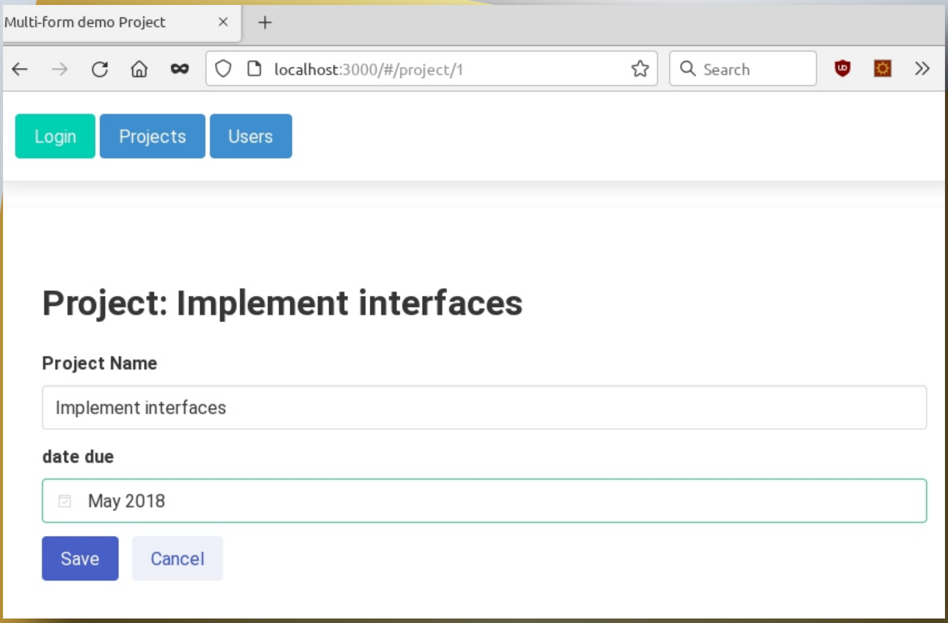
Showing a warning is thus simply a matter of removing the `is-hidden` CSS class from the HTML element that shows the warning.

The data is loaded from 2 arrays of values (`ProjectNames` and `ProjectDates`).

```
procedure TProjectDetailForm.ShowRoute(const aURL: String;
                                       aRoute: TRoute;
                                       aParams: TStrings);
Const
   NotFound = 'Project "%s" not found!';

Var
   aID : NativeInt;
   aError,aName,aDue : String;

begin
   aID:=StrToInt64Def(aParams.Values['ID'],-1);
   // Show an error if the ID is unknown.
   if (aID<1) or (aID>ProjectCount) then
   begin
       aError:=Format(NotFound,[aParams.Values['ID']]);
       lblNotFound.innerText:=aError;
       lblNotFound.classList.remove('is-hidden');
       Exit;
   end;
   // Show project data
   aName:=ProjectNames[aID];
   aDue:=ProjectDates[aID];
   hdrProjectName.InnerText:=aName;
   edtProjectName.value:=aName;
   edtDueDate.value:=aDue;
end;
```



Project: Implement interfaces

Project Name

Implement interfaces

date due

May 2018

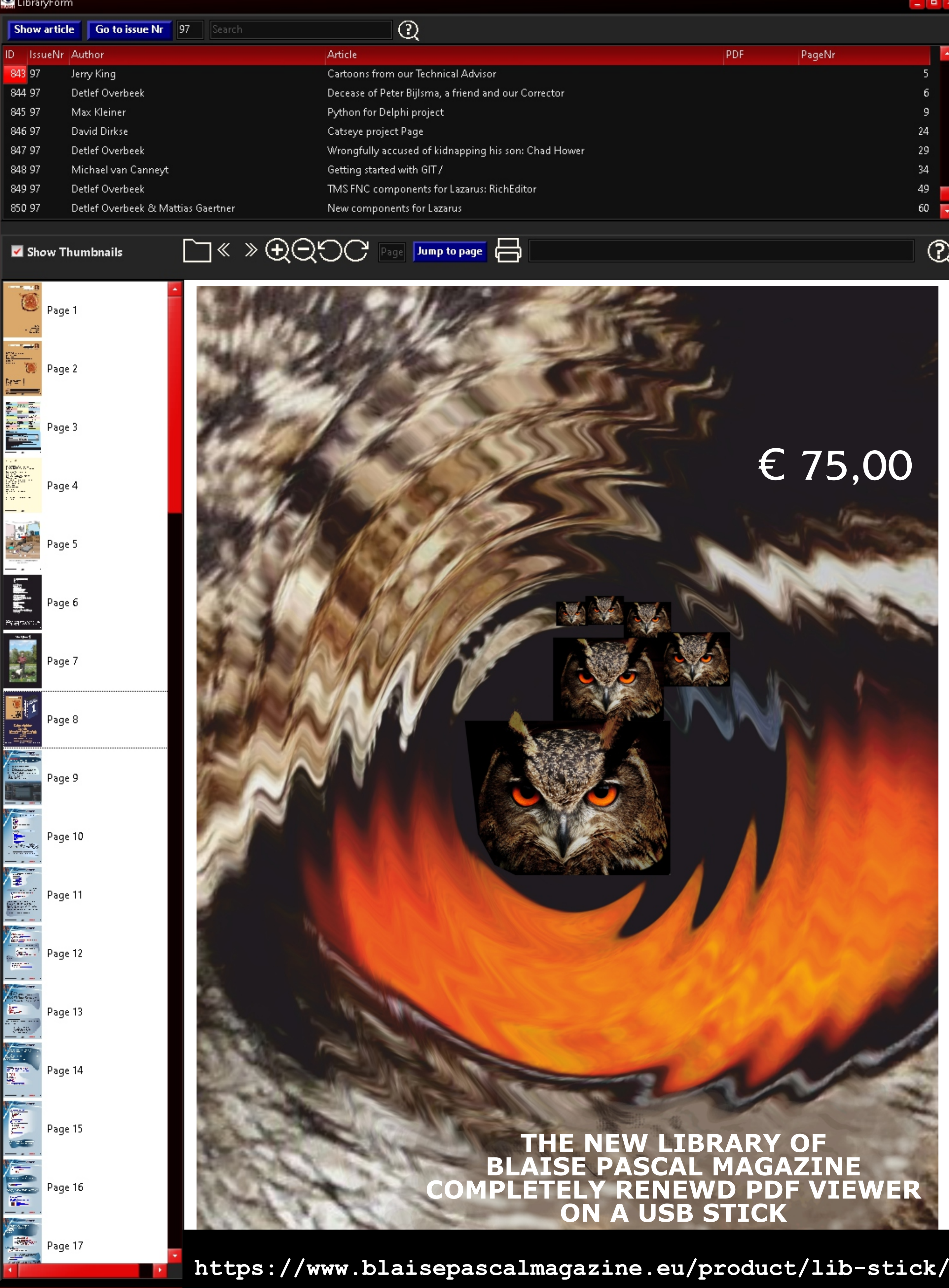
Figure 8: Routing parameters in action

The last lines are not very different from what you would do in a regular **VCL** Class: only the property names are different.

The result of this code can be seen in *figure 8 on page 23*.
NOTE the **URL** which contains the project **ID.**
As you navigate between the various projects, you can always go back to a previously visited project with the browser's back button.

7 CONCLUSION

In this article, we've shown how to present the user with an actual browser experience:
back and forward buttons for navigation now work. In doing so, the work needed to show forms was significantly reduced:
Using a router and changing buttons to anchor elements in the html reduces code.
There are still small glitches: when reloading the page, you will return to the initial page, even though the URL contains the route for the last visited page. It would also be nice if data for the projects could be loaded from an actual database.
We will deal with these issues in a next contribution.



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ABSTRACT

Electron is a platform to enable you to create desktop applications of any size that can run on **Linux MacOS** and **Windows.** Because it is possible through **Pas2JS** to create Website applications it is worth exploring other options for creating applications for the desktop. **Electron** is one other possibility. In this article I 'll explain what **Electron** is and what one can achieve with it.

INTRODUCTION

Electron is basically a platform that enables you to easily built a **Graphical User Interface (GUI)**, It combines the **Node.JS (*1)** with **Chromium(*2)** (the open source foundation of Google Chrome).

Electron enables you to have easy access at the parts of your computer that the browser's sandbox can not access.
As an example: Web apps cant get through to the filesystem. It does not have access or hook into the operating system API which a desktop app needs.

Most web applications aren't available when there isn't a reliable internet connection. Electron is a runtime environment that allows you to create desktop applications with **HTML5, CSS,** and **JavaScript.**

It's an open source project started by **Cheng Zhao,** an engineer at **GitHub.** Previously called **Atom Shell, Electron** is the foundation for **Atom,** a cross-platform text editor by **GitHub** built with web tech.

ELECTRON

ELECTRON

(formerly known as **ATOM SHELL**) is a free and open-source (started by "**Cheng Zhao"**)software framework developed and maintained by **GitHub.** It allows for the development of desktop **GUI** applications using web technologies: it combines the **Chromium** rendering engine and the **Node.JS** runtime.
It was originally built for **Atom.** **Electron** is the main **GUI** framework behind several open-source projects including **Atom,**
GitHub Desktop, Light Table,
Visual Studio Code, EverNote,
WordPress Desktop and
Eclipse Theia.

WIKIPEDIA

__ATOM__ is a free and open-source text and source code editor for macOS, Linux, and Windows with support for plug-ins written in JavaScript, and embedded Git Control. Developed by GitHub, Atom is a desktop application built using web technologies. Most of the extending packages have free software licenses and are community-built and maintained. Atom is based on Electron (formerly known as Atom Shell), a framework that enables cross-platform desktop applications using Chromium and Node.js.
Atom was initially written in CoffeeScript and Less, but much of it has been converted to JavaScript. Atom was released from beta, as version 1.0, on 25 June 2015. Its developers call it a "hackable text editor for the 21st Century", as it is fully customizable in HTML, CSS, and JavaScript.

Electron combines the CHROMIUM CONTENT MODULE and **Node.js** runtimes. **Chromium** and **Node** are both wildly popular application platforms in their own right, and both have been used independently to create ambitious applications.
Electron brings the two platforms together to allow you to use JavaScript to build an entirely new class of application.
Anything you can do in the browser, you can do with **Electron.**
Electron apps comprise multiple processes. There is the "main" process and several "renderer" processes. (*See schema on page 6 of this article*). The main process runs the application logic, and can then launch multiple renderer processes, rendering the windows that appear on a user's screen rendering **HTML** and **CSS.**
Both the main and renderer processes can run with **Node.JS** integration if enabled.

SIMPLE EXPLANATION:

suppose you create a form within the **Chromium** Browser and use that as your runtime environment for your Desktop application.
So that is actually a Web browser environment but one that can run on your desktop or even in your Web Bowser (as long as they are Chromium based: **Edge / Chrome /FireFox / Safari / Opera / Dolphin etc.**)
So remember it must be installed on your desktop and has the advantage that it will look on all OS's the same.
That is its great trump card.

WIKIPEDIA

Node.js *is an open-source, cross-platform, back-end JavaScript runtime environment that runs on the* ***V8*** *engine and executes JavaScript code outside a web browser.*

Node.js lets developers use JavaScript to write command line tools and for server-side scripting—running scripts server-side to produce dynamic web page content before the page is sent to the user's web browser.

Consequently, Node.js represents a "JavaScript everywhere" paradigm, unifying web-application development around a single programming language, rather than different languages for server-side and client-side scripts.
Though `.js` *is the standard filename extension for JavaScript code, the name "Node.js" does not refer to a particular file in this context and is merely the name of the product.*

Node.js has an event-driven architecture capable of ***asynchronous I/O.***
(In computer science, asynchronous I/O (also non-sequential I/O) is a form of input/output processing that permits other processing to continue before the transmission has finished.*)*

These design choices aim to optimize throughput and scalability in web applications with many input/ output operations, as well as for real-time Web applications (e.g., real-time communication programs and browser games).

The Node.js distributed development project was previously governed by the Node.js Foundation, and has now merged with the JS Foundation to form the OpenJS Foundation, which is facilitated by the Linux Foundation's Collaborative Projects program.

V8 *is an open-source JavaScript engine developed by the Chromium Project for Google Chrome and Chromium web browsers.*
The project's creator is Lars Bak.
The first version of the V8 engine was released at the same time as the first version of Chrome: 2 September 2008.

Chromium *is a free and open-source web browser project, principally developed and maintained by Google.*
This codebase provides the vast majority of code for the Google Chrome browser, which is proprietary software and has some additional features.

The Chromium codebase is widely used.
Microsoft Edge, Samsung Internet, Opera, and many other browsers are based on the code.
Moreover, significant portions of the code are used by several app frameworks.

Google does not provide an official or stable version of the Chromium browser. All versions released with the Chromium name and logo are built by other parties.

https://en.wikipedia.org/wiki/Chromium_(web_browser)

Figure1: Droste effect

EXAMPLE:

You want to do something necessary and a must have: You need to view/search and edit a folder where ever your documents are. Browser applications are not capable of accessing the file system without user interaction.

With **Node.JS,** you can implement all the features necessary, but you can't create a **Graphical User Interface**, as a result your application would be worthless.
By combining the browser environment with **Node.JS,** you can use **Electron** to create an application where you can open and edit docs as well as provide a User Interface for doing so.
So you need **Node.JS** together with Chromium.
See figure 2 right top

CHROMIUM CONTENT MODULE

Chromium is the open source version of **Google's Chrome** web browser. It has most of the feature and same code with small differences and the licensing.
The **Google-authored** portion is shared under the 3-clause **BSD** license.
Other parts are subject to a variety of licenses, including **MIT, LGPL, Ms-PL,**
and an **MPL / GPL / LGPL** tri-license, while **Node.js** uses a permissive **MIT** license for the main library.
The **MIT** license applies to all parts of the **Node.**
The Content Module is the core code that allows **Chromium** to render web pages in independent processes and use **GPU** acceleration.
The Content Module includes only the core technologies required to render **HTML, CSS,** and **JavaScript.**

You can find the Chromium licensing here:
`https://www.chromium.org/chromium-os/licensing/`

The part of the license that applies to Node.js here:
`https://github.com/joyent/node/blob/`

it is commonly known as the MIT license, which you can compare to here:
`http://www.opensource.org/licenses/mit-license.php`

This license, which is officially known as the Expat License, is here:
`http://www.gnu.org/licenses/license-ist.html#Expat`

a complete explanation you can find here:
`https://en.wikipedia.org/wiki/MIT_License`

Electron is a simple runtime. Like the way you use Node from the command line, you can run Electron applications using the Electron command-line tool.

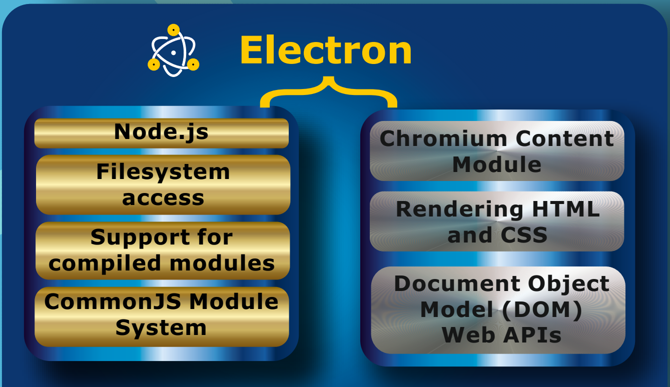
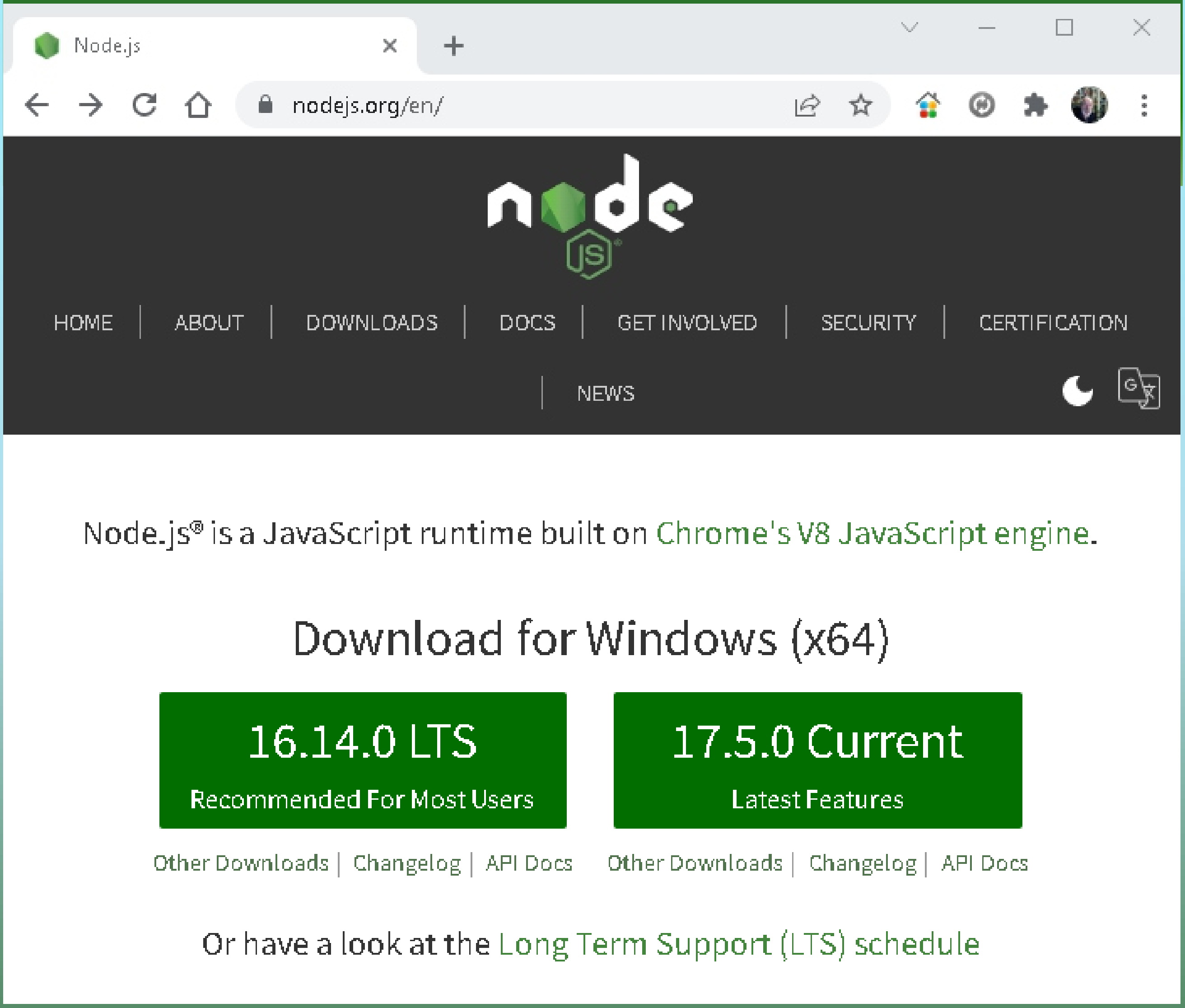


Figure 2: Electron combines the core web browsing component of Chromium with the low-level system access of Node.

WHAT IS NODE.JS?

For the first 15 years of its existence, **JavaScript** wasn't much used because it just applied within the web browser.
There wasn't a good way of support for running **JavaScript** on the server. There were projects, but hardly ever used.
The **Node.JS** project was initially released in 2009, as an open source, cross-platform runtime for developing server-side applications using JavaScript.
It used **Google's** open source **V8 engine** (*See page 3 of this article*) to interpret **JavaScript** and added API's for accessing the filesystem, creating servers, and loading code from external modules.

Over the last few years, **Node** has become very popular and is used for a wide range of purposes, from writing web servers, to control (*example*) **IOT (Internet Of Things)** or building desktop applications.
Node comes bundled with a package manager called **NPM (Node Package Manager)**, which makes the more than 250,000 libraries available in its registry.



Node.js® is a JavaScript runtime built on Chrome's V8 JavaScript engine.

Download for Windows (x64)

Or have a look at the Long Term Support (LTS) schedule

Figure 3: Node.Js Download

REASONS TO USE ELECTRON

When you create applications for a web browser, you have to be cautious in what technologies you choose to use and how you write your code: You're writing code that will be executed on a computer not owned by you.

Your users could be using the latest version of a modern browser such as Chrome or Firefox, or they could very well be using an outdated version of Internet Explorer.

❶ You have little to no say in where your code is being rendered and executed.
❷ You have to be ready for anything.
❸ You must write code for the lowest common denominator of features that have the widest support across all versions of all browsers in use today.

When you build your applications with **Electron,** you're packaging a particular version of **Chromium** and **Node.js,** so you can rely on whatever features are available in those versions. You don't have to concern yourself with what features other browsers and their versions support.

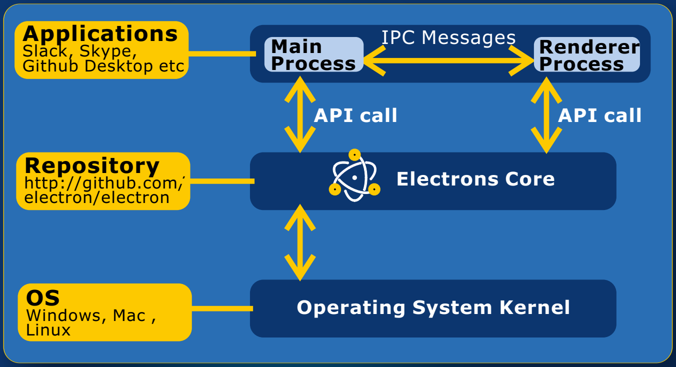


Figure 5: Overview of the layered architecture a very high-level overview of Electron and applications built using Electron.

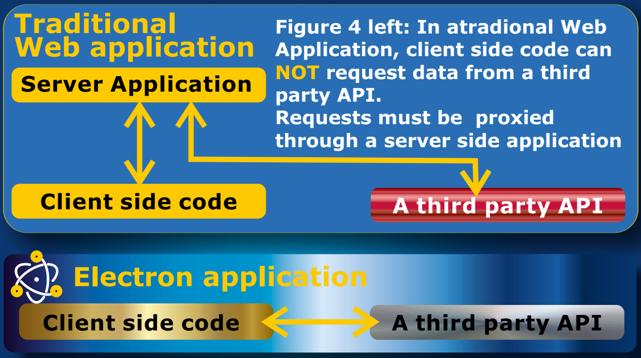


Figure 4 left: In atradional Web Application, client side code can NOT request data from a third party API. Requests must be proxied through a server side application

Figure 4 Bottom: In an Electron application, clients-side code has all of the same privileges as the server sidecode and therefore CAN make requests to a third - party API directly

MAIN PROCESS

Electron has 2 parts to it:
the main process and the rendering process.

❶ The main process has very important responsibilities.
It responds to application lifecycle events: such as starting up, quitting, preparing to quit, going to the background, coming to the foreground, and more.

❷ The main process is also responsible for communicating to native operating system APIs.
If you want to display a dialog box to open or save a file, you do it from the main process.

RENDERING

The main process can create and destroy renderer processes using **Electron's Browser-Window** module. Renderer processes can load web pages to display a **GUI**. Each process takes advantage of **Chromium's multiprocess architecture** and runs on its own thread. These pages can then load in additional **JavaScript** files and execute code in this process.

CRITICISM

Electron applications have been criticized for incurring significant overhead when compared with native applications with similar functionality. Applications built with **Electron** can take up more storage and **RAM,** and may run at less speed than a similar app built with technologies native to the operating system.

VERSIONS

In September of 2021, **Electron** moved to an 8 week release cycle between major versions to match the release cycle of **Chromium Extended Stable** and to comply with a new requirement from the **Microsoft Store** that requires browser-based apps to be within two major versions of the latest release of the browser engine.

Electron actively supports the latest three stable major versions. From September 2021 to May 2022, four major versions were temporarily supported due to the change in release cycles.

Unlike normal web pages, you have access to almost all the Node.js APIs in your renderer code. Renderer processes are isolated from each other and unable to access operating system integration **APIs. Electron** includes the ability to facilitate communication between processes to allow renderer processes to communicate with the main process in the event that they need to trigger an Open or Save File dialogue box or access any other OS-level integration.

Electron supports only **Windows 7** and later. For multimedia-focused applications, **Electron** is typically a better choice because **Electron** supports more codecs out of the box.

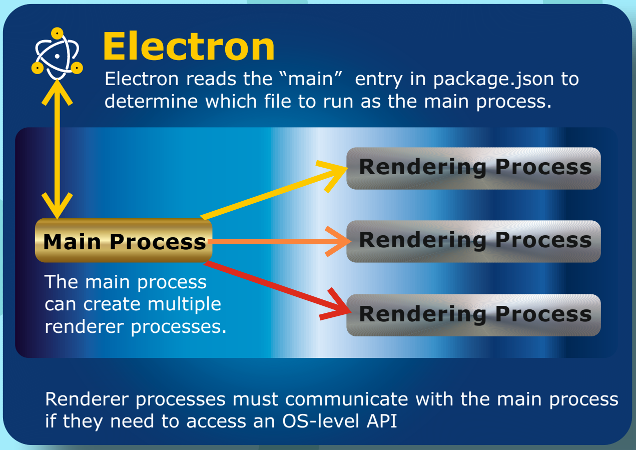

Electron
Electron reads the "main" entry in package.json to determine which file to run as the main process.
Main Process
Rendering Process
Rendering Process
Rendering Process
The main process can create multiple renderer processes.
Renderer processes must communicate with the main process if they need to access an OS-level API

Figure X: Electron's multiprocess architecture

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