The GNOME™ Conference

GUADEC

Showing Up for Python in GNOME

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About Me

- Dan Yeaw (pronounced: Yaw)
- Originally from California, now live in Michigan
- Gaphor, Gvsbuild, PyGObject

Unleashing Interests with Python

```
>>> import pypokedex
>>> pokemon = pypokedex.get(name="Decidueye")
>>> pokemon.name
'decidueye'
>>> pokemon.types
['grass', 'ghost']
>>> pokemon.base_stats
BaseStats(hp=78, attack=107, defense=75, sp_atk=100, sp_def=100)
```

GNOME Python

- PyGObject is the GTK and related library bindings for Python

On PyGObject

> *The current state of the Python bindings for GObject-based libraries is making it really hard to recommend using Python as a language for developing GTK and GNOME applications.*

Emmanuele Bassi (2022)

Commits Over Time

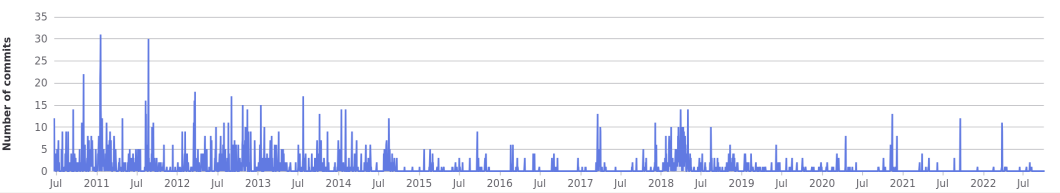


Figure 1: PyGObject Commits Over Time

- Major contributors left the project over time.
- Christoph Reiter heroically held things together since 2017.
- However, the number of changes started to fall off, especially after 2020.

Getting Involved in an Undermaintained Project

- Contributing to an undermaintained project can be difficult
- Each extra contribution is placing a burden on the developer
- Timely feedback to contributions is often not possible
- To outsiders, the GNOME project can feel hard to join, especially in these undermaintained areas

Community Building

- The GNOME Project Handbook greatly improves clarity on how to get involved
- The GNOME Foundation could also take a greater role

The State of Python in GNOME

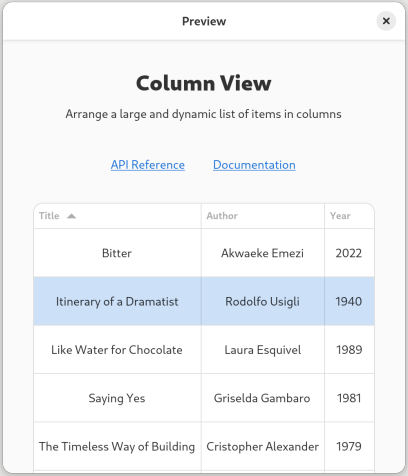
Issue and Merge Request Triage

- Closed about 200 issues
- Total issue count went from over 300 to 175
- Open or draft merge requests went from 30 to 19

Fundamental Types

- Most objects inherit from GObject
- GtkExpression, GtkRenderNode, and GtkEvent do not
- These are defined as a `GObject.TypeInstance`

Workbench Column View Example



Sorting

- Gtk provides an easy way to sort columns
- Create a Sorter and then pass in a `Gtk.PropertyExpression`
- `this -> item -> property`
- Unfortunately, it isn't so easy without Fundamental Types

Sorting without Expressions - Creating a Sorting Model

```
column_view = workbench.builder.get_object("column_view")
col1 = workbench.builder.get_object("col1")
col2 = workbench.builder.get_object("col2")
col3 = workbench.builder.get_object("col3")

model_func = lambda _item: None
tree_model = Gtk.TreeListModel.new(data_model, False, True, model_func)
tree_sorter = Gtk.TreeListRowSorter.new(column_view.get_sorter())
sorter_model = Gtk.SortListModel(model=tree_model, sorter=tree_sorter)
selection = Gtk.SingleSelection.new(model=sorter_model)
column_view.set_model(model=selection)
```

Sorting without Expressions - Creating Sorting Logic

```
def str_sorter(object_a, object_b, column):
    a = getattr(object_a, column).lower()
    b = getattr(object_b, column).lower()
    return (a > b) - (a < b)

def int_sorter(object_a, object_b, column):
    a = getattr(object_a, column)
    b = getattr(object_b, column)
    return (a > b) - (a < b)

col1.set_sorter(Gtk.CustomSorter.new(str_sorter, "title"))
col2.set_sorter(Gtk.CustomSorter.new(str_sorter, "author"))
col3.set_sorter(Gtk.CustomSorter.new(int_sorter, "year"))
```

Sorting with Expressions

```
col1_exp = Gtk.PropertyExpression.new(Book, None, "title")
col2_exp = Gtk.PropertyExpression.new(Book, None, "author")
col3_exp = Gtk.PropertyExpression.new(Book, None, "year")

col1.sorter = Gtk.StringSorter.new(col1_exp)
col2.sorter = Gtk.StringSorter.new(col2_exp)
col3.sorter = Gtk.NumericSorter.new(col3_exp)
```

https://pygobject.gnome.org

https://pygobject.gnome.org/

PyGObject

Search

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PyGObject

PyGObject is a Python package which provides bindings for GObject based libraries such as GTK, GStreamer, WebKitGTK, GLib, GIO and many more.

It supports Linux, Windows, and macOS and works with **Python 3.9+** and **PyPy3**. PyGObject, including this documentation, is licensed under the **LGPLv2.1+**.

Homepage

If you want to write a Python application for GNOME or a Python GUI application using GTK, then PyGObject is the way to go. To get started, check out the "GNOME Developer Documentation". For more information on specific libraries, check out the GNOME Python API documentation.

```
import sys

import gi
```

Packaging and Development Environment Improvements

Legacy Packaging

- setup.py requires arbitrary code execution
- pyproject.toml is a more explicit way to declare dependencies

The steps to build a Python project then can be separated:

1. Checkout the project
2. Install the build system
3. Execute the build

meson-python

meson-python is a build backend for Python leveraging Meson

pyproject.toml

```
[tool.meson-python.args]
setup = ["-Dtests=false", "-Dwheel=true", "--wrap-mode=nofallback"]
[build-system]
build-backend = "mesonpy"
requires = ["meson-python>=0.12.1", "pycairo>=1.16"]
```

Build and Test

```
$ meson setup _build
$ meson test -C _build
```

PDM

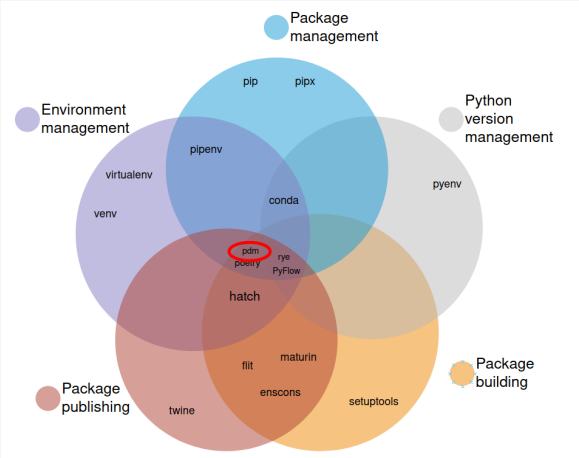

Figure 2: Packaging Categorization by Anna-Lena Popkes

Modernize API Docs

- Modernize building docs using GI-DocGen and Sphinx

Template

```
class Template(**kwargs)
```

Methods

```
classmethod from_file(filename)
    Parameters: filename

classmethod from_resource(resource_path)
    Parameters: resource_path
```

Main Branch

- Small change to rename the primary branch to main
- Improves exclusivity and standardization with other GNOME projects

Overview of Async IO

- Cooperative multitasking
- Scheduled concurrently, but not actually run at the same time
- Can provide large speedups if waiting on slower tasks

Async IO with my Kids

Async IO in Python

```python
import asyncio

async def hello():
    print('Hello ...')
    await asyncio.sleep(1)
    print('... World!')
async def main():
    await asyncio.gather(hello(), hello())
asyncio.run(main())
```

```
Hello ...
Hello ...
... World!
... World!
```

Python Async with Gbulb

Gbulb uses the full GLib EventLoop

```
import asyncio, gbulb

gbulb.install(gtk=True)

loop = asyncio.get_event_loop()
loop.run_forever(application=my_gapplication_object)
```

Experimental: Async IO Integration

```
async def idle_test():
    bus = await Gio.bus_get(Gio.BusType.SYSTEM)
    print(
        await bus.call(
            "org.freedesktop.DBus",
            "/org/freedesktop/DBus",
            "org.freedesktop.DBus",
            "ListNames",
            None, None, 0, -1,
        )
    )
```

Experimental: Async IO Integration

```
policy = GLibEventLoopPolicy()
asyncio.set_event_loop_policy(policy)
loop = policy.get_event_loop()
loop.run_until_complete(idle_test())

(['org.freedesktop.DBus', 'org.freedesktop.Notifications',
':1.129', ':1.108', 'org.freedesktop.portal.Desktop',
'org.freedesktop.background.Monitor', ':1.9',
'org.gnome.Mutter.DisplayConfig', 'org.freedesktop.systemd1',
'org.gnome.Mutter.IdleMonitor', ...
])
```

The Future

Wheels for Windows

- Python 3.8+ no longer loads DLLs on the path
- Building GTK using MSVC with `pip install pygobject` doesn't work for getting started
- Solution: build wheels of PyGObject with the DLLs included

Port to `libgirepository-2.0`

- `libgirepository` is now part of GLib
- The main enhancement is it now uses `GObject.TypeInstance` instead of C struct aliasing

Move API Docs

- Combine and merge the API docs to https://pygobject.gnome.org
- This would finish centralizing all docs

Our New Story

PyGObject is a great choice for building apps in GNOME.

Call to Action

https://gitlab.gnome.org/GNOME/pygobject

- Contributions of any kind will help continue to help the community thrive
- Submit and help triage issues
- Continue to help us improve the docs
- Help us fix bugs and implement features
- Add examples to Workbench
- Build projects with PyGObject
- Chat with us at #python:gnome.org

Wrap Up

Thanks!

Thank you so much to everyone who has contributed to PyGObject, and special thanks to Christoph Reiter and Arjan Molenaar who help maintain it.

License

Slides

https://github.com/danyeaw/presentations/tree/main/showing-up-for-python-in-gnome

Questions?