Improving the Vala developer experience

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July 22, 2022

What is Vala

A high-level language for writing apps for the Linux desktop

Vala code $\rightarrow$ C $\rightarrow$ native code

Created as a GNOME project in 2006

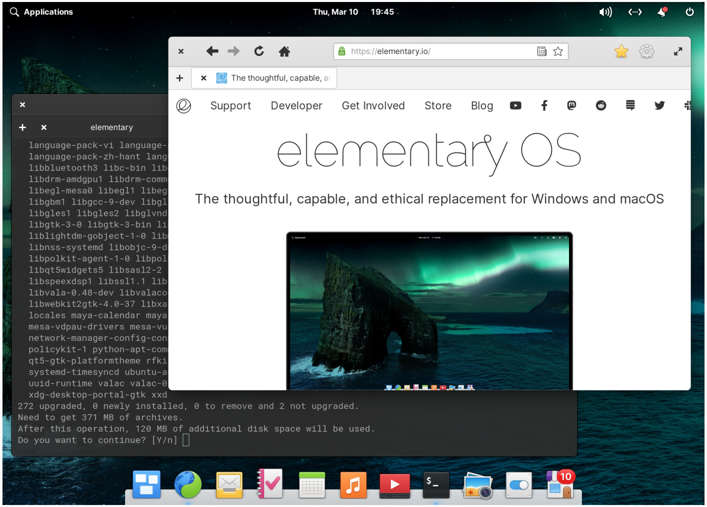
Alternative to C, C++, and C♯

Selling points:

- language constructs map to GLib, GObject
- use high-level abstractions at near-zero cost
- good interoperability with C

Who uses Vala

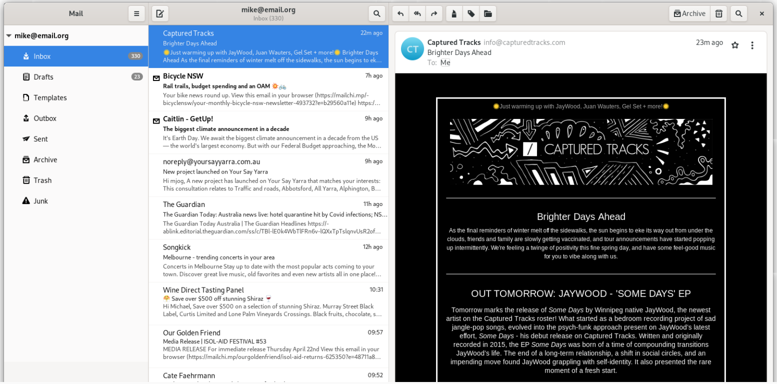
elementary OS uses Vala for everything—apps, libraries, core, window manager, etc



```
  language-pack-vi language-
  language-pack-zh-hant lang
  libbluetooth3 libc-bin lib
  libdrm-amdgpu1 libdrm-comm
  libegl-mesa0 libegl1 libeg
  libgbm1 libgcc-9-dev libgl
  libgles1 libgles2 libglvnd
  libgtk-3-0 libgtk-3-bin li
  liblightdm-gobject-1-0 lib
  libnss-systemd libobjc-9-d
  libpolkit-agent-1-0 libpol
  libqt5widgets5 libsasl2-2
  libspeexdsp1 libssl1.1 lib
  libvala-0.48-dev libvalaco
  libwebkit2gtk-4.0-37 libxa
  locales maya-calendar maya
  mesa-vdpau-drivers mesa-vu
  network-manager-config-con
  policykit-1 python-apt-com
  qt5-gtk-platformtheme rfki
  systemd-timesyncd ubuntu-a
  uuid-runtime valac valac-0
  xdg-desktop-portal-gtk xxd
272 upgraded, 0 newly installed, 0 to remove and 2 not upgraded.
Need to get 371 MB of archives.
After this operation, 120 MB of additional disk space will be used.
Do you want to continue? [Y/n]
```

Who uses Vala

On the GNOME side—Geary, Highscore (Games), Gitg, Boxes, Shotwell, Document Scanner



Captured Tracks 22m ago
Brighter Days Ahead
🌞Just warming up with JayWood, Juan Wauters, Gel Set + more!🌞 Brighter Days Ahead As the final reminders of winter melt off the sidewalks, the sun begins to ek…

Bicycle NSW 7h ago
Rail trails, budget spending and an OAM 💥🚲
Your bike news round up. View this email in your browser (https://mailchi.mp/-bicyclensw/your-monthly-bicycle-nsw-newsletter-493732?e=b29560a11e) https:/…

Caitlin - GetUp! 9h ago
The biggest climate announcement in a decade
It's Earth Day. We await the biggest climate announcement in a decade from the US — the world's largest economy. But with our Federal Budget approaching, the Mo…

noreply@yoursayyarra.com.au 9h ago
New project launched on Your Say Yarra
Hi mjog, A new project has launched on Your Say Yarra that matches your interests: This consultation relates to Traffic and roads, Abbotsford, All Yarra, Alphington, B…

The Guardian 11h ago
The Guardian Today: Australia news live: hotel quarantine hit by Covid infections; NS…
The Guardian Today Australia | The Guardian Headlines https://-ablink.editorial.theguardian.com/ss/c/TBl-lE0k4WbTlFRn6v-lQXxTpTslqnvUsR2of…

Songkick 12h ago
Melbourne - trending concerts in your area
Concerts in Melbourne Stay up to date with the most popular acts coming to your town. Discover great live music, old favorites and even new artists all in one place!…

Wine Direct Tasting Panel 10:31
🤗 Save over $500 off stunning Shiraz 🍷
Hi Michael, Save over $500 on a selection of stunning Shiraz. Murray Street Black Label, Curtis Limited and Lone Palm Vineyards Crossings. Black fruits, chocolate, s…

Our Golden Friend 09:57
Media Release | ISOL-AID FESTIVAL #53
MEDIA RELEASE For immediate release Thursday April 22nd View this email in your browser (https://mailchi.mp/ourgoldenfriend/isol-aid-returns-625350?e=48711a8…

Cate Faehrmann 09:52

CT Captured Tracks info@capturedtracks.com 23m ago
Brighter Days Ahead
To: Me

🌞Just warming up with JayWood, Juan Wauters, Gel Set + more!🌞

CAPTURED TRACKS

Brighter Days Ahead

As the final reminders of winter melt off the sidewalks, the sun begins to eke its way out from under the clouds, friends and family are slowly getting vaccinated, and tour announcements have started popping up intermittently. We're feeling a twinge of positivity this fine spring day, and have some feel-good music for you to vibe along with us.

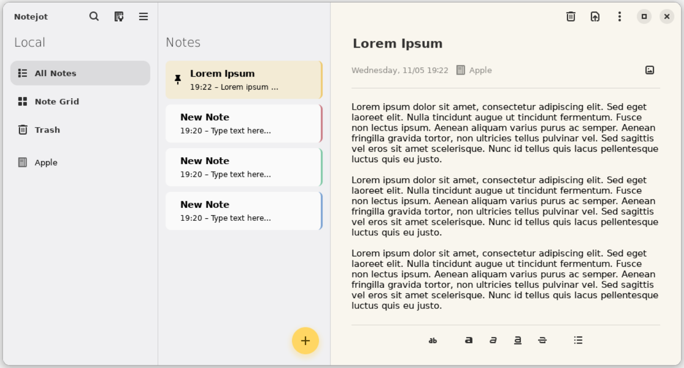
OUT TOMORROW: JAYWOOD - 'SOME DAYS' EP

Tomorrow marks the release of *Some Days* by Winnipeg native JayWood, the newest artist on the Captured Tracks roster! What started as a bedroom recording project of sad jangle-pop songs, evolved into the psych-funk approach present on JayWood's latest effort, *Some Days* - his debut release on Captured Tracks. Written and originally recorded in 2015, the EP *Some Days* was born of a time of compounding transitions JayWood's life. The end of a long-term relationship, a shift in social circles, and an impending move found JayWood grappling with self-identity. It also presented the rare moment of a fresh start.

Geary

Who uses Vala

A lot of new software created in Vala in the last five years



Lorem Ipsum

Wednesday, 11/05 19:22 Apple

Lorem ipsum dolor sit amet, consectetur adipiscing elit. Sed eget laoreet elit. Nulla tincidunt augue ut tincidunt fermentum. Fusce non lectus ipsum. Aenean aliquam varius purus ac semper. Aenean fringilla gravida tortor, non ultricies tellus pulvinar vel. Sed sagittis vel eros sit amet scelerisque. Nunc id tellus quis lacus pellentesque luctus quis eu justo.

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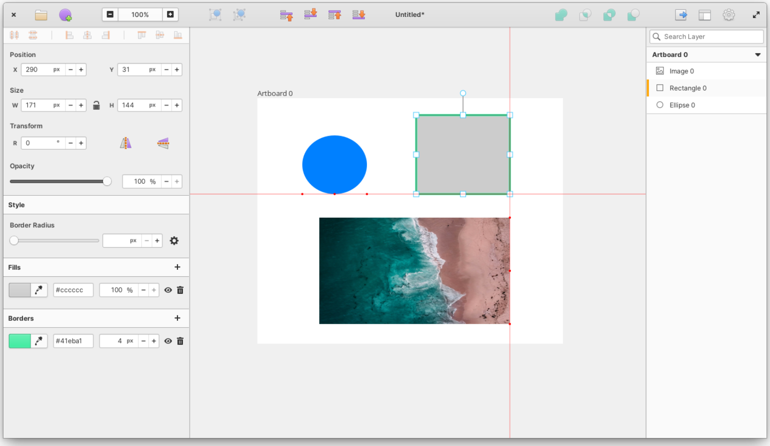
Lorem ipsum dolor sit amet, consectetur adipiscing elit. Sed eget laoreet elit. Nulla tincidunt augue ut tincidunt fermentum. Fusce non lectus ipsum. Aenean aliquam varius purus ac semper. Aenean fringilla gravida tortor, non ultricies tellus pulvinar vel. Sed sagittis vel eros sit amet scelerisque. Nunc id tellus quis lacus pellentesque luctus quis eu justo.

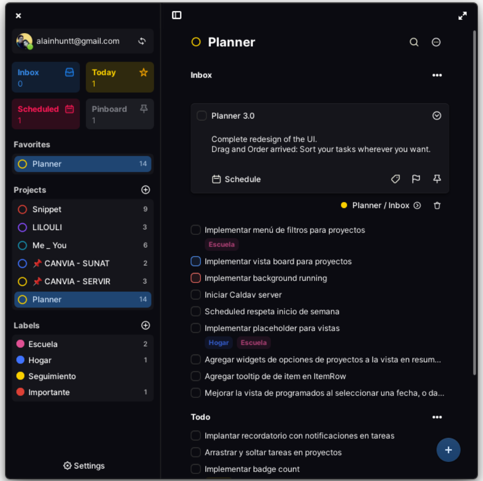
Notejot by @lainsce (304 stars)

Who uses Vala



Akira by @Alecaddd (4.8k stars)

Who uses Vala



Planner 3.0

Complete redesign of the UI.
Drag and Order arrived: Sort your tasks wherever you want.

- Implementar menú de filtros para proyectos (Escuela)
- Implementar vista board para proyectos
- Implementar background running
- Iniciar Caldav server
- Scheduled respeta inicio de semana
- Implementar placeholder para vistas (Hogar, Escuela)
- Agregar widgets de opciones de proyectos a la vista en resum...
- Agregar tooltip de de item en ItemRow
- Mejorar la vista de programados al seleccionar una fecha, o da...

Todo

- Implantar recordatorio con notificaciones en tareas
- Arrastrar y soltar tareas en proyectos
- Implementar badge count

Planner by @alainm23 (2k stars)

Who uses Vala

And more:

- Dino—instant messaging (1.9k stars)
- Tootle by @bleakgrey—Mastodon client (390 stars)
- Cawbird by @IBBoard—Twitter client (301 stars)
- Monitor by @stsdc—system monitor (249 stars)

Motivation

Vala is still used by a lot of software and new software continues to be written in Vala.

Therefore, we should improve the experience of developing software in Vala.

Make developers' lives easier—the first step to building a healthy ecosystem.

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Make developers’ lives easier—the first step to building a healthy ecosystem.

Discuss recent improvements to Vala development

Outline

Tooling

Why we need a language server

Provides online code intelligence—developers can iterate on design quickly

Provides refactoring services

Can integrate with a linter

A good language server makes a language attractive to use—Rust is supported by `rust-analyzer` and C♯ by `omnisharp-roslyn`

Language Server Protocol

Simplifies writing plugins for your language of choice in `$YOUR_FAVORITE_EDITOR`

Code intelligence can go into the server while clients (editors) can have a simple plugin to talk to the server.

In some cases no plugin is needed, just a few extra lines of config.

Vala Language Server

Work on a language server for Vala started in 2017

Development has been slow and steady in-between sprints—a lot of work done in last two years

The language server supports many features of the LSP

Still rough around the edges

Development:
https://github.com/vala-lang/vala-language-server

Language server features

Support for the LSP is on par with Rust Analyzer, Clangd, and Omnisharp:

- Completion
- Signature help
- Documentation on hover
- Code formatting
- Show hierarchy (calls, types)
- Inlay hints
- Refactoring (code actions, rename symbol)
- Code lenses (method overrides)

Editor support

A variety of editors now support Vala fully (syntax highlighting + code intelligence):

- Vim
- Neovim
- Kate
- Emacs
- Sublime Text
- GNOME Builder
- Visual Studio Code

Editor support

Visual Studio Code

- Install Vala plugin
- Currently over 12k installs

GNOME Builder

- Bundled with VLS
- Enable ”Vala Language Server” and disable ”GVLS”

Editor support

vim8/neovim

- Install coc.nvim
- Add this to your config (`:CocConfig`)
- Works well with vista.vim plugin.

```
    "languageserver": {
        "vala": {
            "command": "vala-language-server",
            "filetypes": ["vala", "genie"]
        }
    }
```

Or you can install nvim-lspconfig for neovim.

Editor support

Kate

- Enable built-in LSP plugin

Emacs

- Install lsp-mode

Editor support

Sublime Text

- Install the Vala-TMBundle and LSP packages
- Add config below to `LSP.sublime-settings`
- `Tools > LSP > Enable Language Server Globally... > vala-language-server`

```
    "clients": {
        "vala-language-server": {
            "command": [
                "/usr/bin/vala-language-server"
            ],
            "selector": "source.vala | source.genie"
        },
    }
```

Editor support - Tree sitter

Like LSP, Tree Sitter promises to be a standard way for editors to support languages.

TS API: built-in syntax highlighting and folding, easy to query document structure with grammar

Grammar and highlight spec for Vala: `https://github.com/vala-lang/tree-sitter-vala`

This is currently used by nvim-treesitter

Other tools

`valdo` is a tool for creating new Vala projects from templates. Inspired by C♯'s `dotnet new`.

Six community-made templates (so far). Anyone can add one by opening a PR at `https://github.com/vala-lang/valdo`

Examples:

- `valdo new` — creates new bare Vala project w/ Meson
- `valdo gnome` — creates new GNOME 40 app
- `valdo eos` — creates new elementaryOS app

Community

Community

General idea is to make it easier for people to get involved

IRC is great, but not everyone wants to use it.

Twitter—post updates on Vala

Discord—general discussion and help. (really popular, 228 members so far)

We've had a lot of success with these.

GitHub organization

Consolidate Vala critical infrastructure under @vala-lang

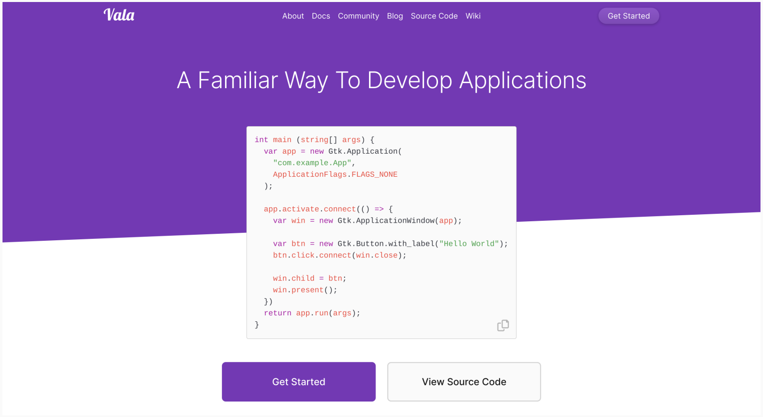
Choosing a popular platform lowers the barrier to entry for new contributors

Having this in one place makes it easy to track the development of the language and tooling

New website

New website: vala.dev

(vala-project.org will redirect you there now)



Vala
About Docs Community Blog Source Code Wiki
Get Started
A Familiar Way To Develop Applications
Get Started
View Source Code

```
int main (string[] args) {
  var app = new Gtk.Application(
    "com.example.App",
    ApplicationFlags.FLAGS_NONE
  );

  app.activate.connect(() => {
    var win = new Gtk.ApplicationWindow(app);

    var btn = new Gtk.Button.with_label("Hello World");
    btn.click.connect(win.close);

    win.child = btn;
    win.present();
  })
  return app.run(args);
}
```

WIP: `https://github.com/vala-lang/vala-www`

Future plans

Static analyzer

A static analyzer will help catch bugs and improve code quality.

GCC has `-fanalyzer`, clang has `scan-build`.

Work has started on a static analyzer for Vala. Idea is to have this integrated in `valac` and enabled with `--analyzer`.

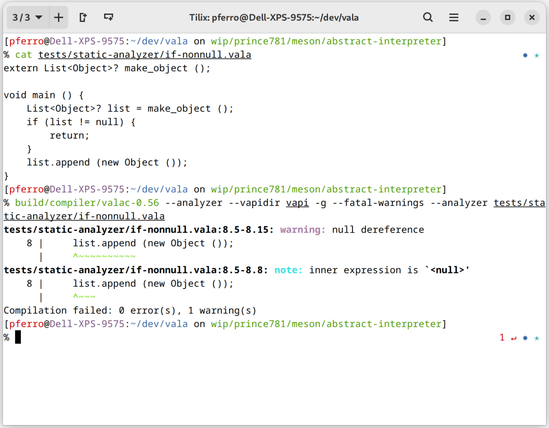
WIP: `https://gitlab.gnome.org/Prince781/vala/-/tree/wip/prince781/meson/abstract-interpreter`

Static analyzer - features

Current: non-null, arithmetic safety, unreachable code detection, assertion failures

Static analyzer - non-null

Can detect and prevent all null pointer accesses.

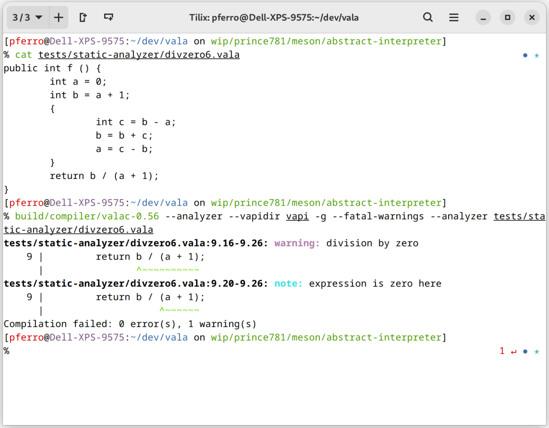


```
[pferro@Dell-XPS-9575:~/dev/vala on wip/prince781/meson/abstract-interpreter]
% cat tests/static-analyzer/if-nonnull.vala
extern List<Object>? make_object ();

void main () {
    List<Object>? list = make_object ();
    if (list != null) {
        return;
    }
    list.append (new Object ());
}
[pferro@Dell-XPS-9575:~/dev/vala on wip/prince781/meson/abstract-interpreter]
% build/compiler/valac-0.56 --analyzer --vapidir vapi -g --fatal-warnings --analyzer tests/sta
tic-analyzer/if-nonnull.vala
tests/static-analyzer/if-nonnull.vala:8.5-8.15: warning: null dereference
    8 |     list.append (new Object ());
      |     ^~~~~~~~~~~
tests/static-analyzer/if-nonnull.vala:8.5-8.8: note: inner expression is `<null>'
    8 |     list.append (new Object ());
      |     ^~~~
Compilation failed: 0 error(s), 1 warning(s)
[pferro@Dell-XPS-9575:~/dev/vala on wip/prince781/meson/abstract-interpreter]
%                                                                                1 ↵
```

Static analyzer - arithmetic safety

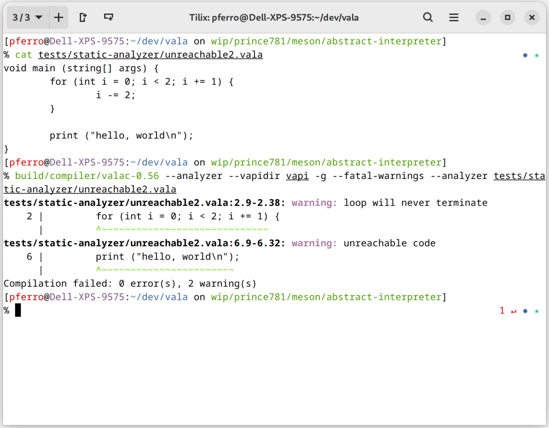
Can detect and prevent division by zero.



```
[pferro@Dell-XPS-9575:~/dev/vala on wip/prince781/meson/abstract-interpreter]
% cat tests/static-analyzer/divzero6.vala
public int f () {
        int a = 0;
        int b = a + 1;
        {
                int c = b - a;
                b = b + c;
                a = c - b;
        }
        return b / (a + 1);
}
[pferro@Dell-XPS-9575:~/dev/vala on wip/prince781/meson/abstract-interpreter]
% build/compiler/valac-0.56 --analyzer --vapidir vapi -g --fatal-warnings --analyzer tests/sta
tic-analyzer/divzero6.vala
tests/static-analyzer/divzero6.vala:9.16-9.26: warning: division by zero
    9 |         return b / (a + 1);
      |                ^~~~~~~~~~~
tests/static-analyzer/divzero6.vala:9.20-9.26: note: expression is zero here
    9 |         return b / (a + 1);
      |                    ^~~~~~~
Compilation failed: 0 error(s), 1 warning(s)
[pferro@Dell-XPS-9575:~/dev/vala on wip/prince781/meson/abstract-interpreter]
%                                                                             1 ↵
```

Static analyzer - loop nontermination

Can detect and prevent loop nontermination



```
[pferro@Dell-XPS-9575:~/dev/vala on wip/prince781/meson/abstract-interpreter]
% cat tests/static-analyzer/unreachable2.vala
void main (string[] args) {
        for (int i = 0; i < 2; i += 1) {
                i -= 2;
        }

        print ("hello, world\n");
}
[pferro@Dell-XPS-9575:~/dev/vala on wip/prince781/meson/abstract-interpreter]
% build/compiler/valac-0.56 --analyzer --vapidir vapi -g --fatal-warnings --analyzer tests/sta
tic-analyzer/unreachable2.vala
tests/static-analyzer/unreachable2.vala:2.9-2.38: warning: loop will never terminate
    2 |         for (int i = 0; i < 2; i += 1) {
      |         ^~~~~~~~~~~~~~~~~~~~~~~~~~~~~~
tests/static-analyzer/unreachable2.vala:6.9-6.32: warning: unreachable code
    6 |         print ("hello, world\n");
      |         ^~~~~~~~~~~~~~~~~~~~~~~~
Compilation failed: 0 error(s), 2 warning(s)
[pferro@Dell-XPS-9575:~/dev/vala on wip/prince781/meson/abstract-interpreter]
%                                                                              1 ↵
```

Improving the language

More expressive language: sum types, type constraints, monomorphization

More safety features: `unsafe` keyword and default non-null

Debugging

You can use `gdb` on Vala programs but it’s not a fun experience.

Fork GDB and add Vala support?

- Hijack expression parser to support Vala syntax
- Demangle function names
- Display GObject type hierarchy

Code actions

Improve the language server with more code actions and quick fixes

Have sophisticated quick fixes, a la Rust's `clippy`

In closing

There's been a lot of improvements to Vala development in the last 2 years

If you're interested you can go to `https://vala.dev`, check out `#vala` on IRC and our Discord