Documentation in Research Software

RSE summer school 2024

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Raise your hand if you agree

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I have struggled to understand or use another person's software because of poor documentation

I feel confident that my software's documentation is clear enough for new users to get started quickly

Documentation is considered a priority in my current team or project

Good documentation is as important as the code itself

Clear documentation can make the difference between a project being reused by others or forgotten.

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Outline

- Documentation principles
- Documentation starting point
- Docs as code
- Hands on

Break

- Content creation strategies
- Documentation Generators/Deployment
- Hands-on

Hedgedoc - link to documentation resources

- Templates, links, and examples

https://rse-summer-school-documentation.readthedocs.io

https://github.com/jessica-mitchell/RSE_summer_school_documentation/
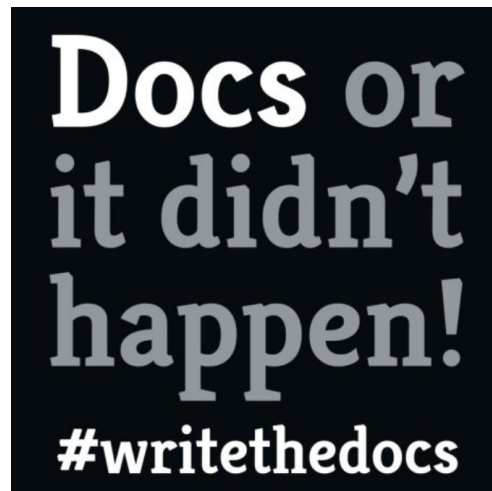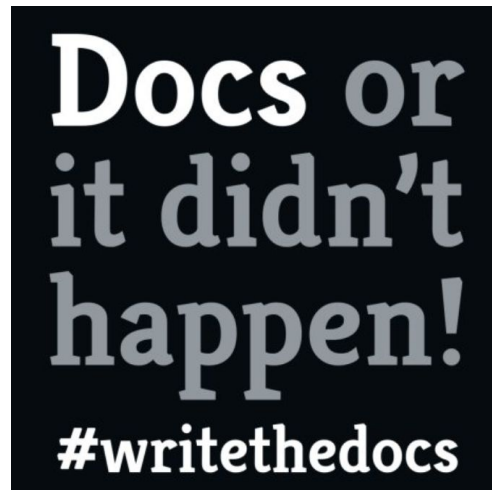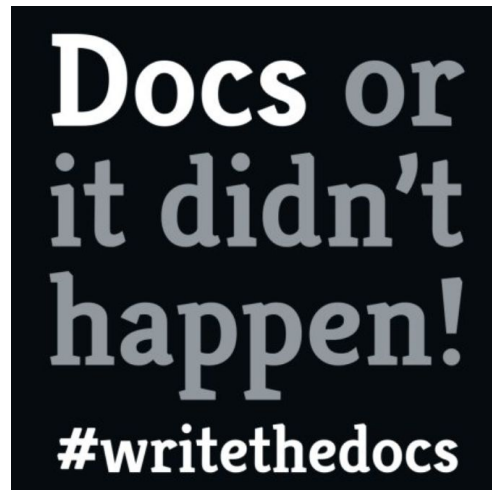
Why write software documentation?

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- Understand your code in 6 months
- Get people to use your code
  - They don't know how your project meets their needs.
  - They can't find how to install your code.
  - They can't see how to use your code.
- Increase contributions to your code
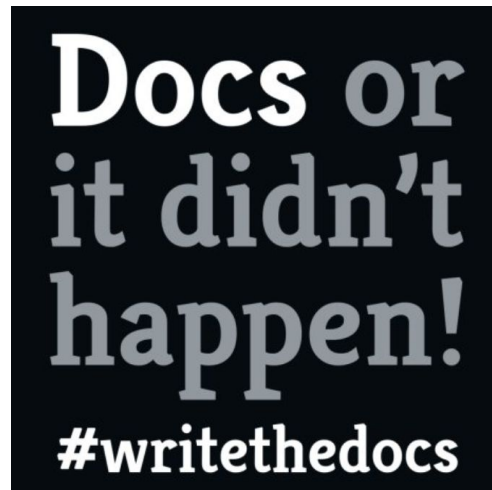- Improve your code
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Docs or it didn't happen!

#writethedocs

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Documentation - 'it's on my to do list'

Documentation needs to be evolving with the code

Documentation principles

Documentation principles

Documentation sources should be

- Nearby(or in) the source code
- Unique (single source of truth)

Content should be

- ARID (Accept (some) Repetition In Documentation)
- Skimmable
- Exemplary
- Consistent
- Current

Web Pages should be

- Discoverable
- Addressable
- Cumulative
- Complete
- Beautiful

Documentation should be

- Precursory
- Participatory

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Documentation as as whole should be

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- Participatory

Starting point - the essential documentation

- Consider both developer-facing and user-facing documentation

User-facing documentation enables users to understand and use the software

It *starts* with a good README
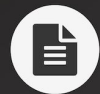
Make a README

Because no one can read your mind (yet)

What makes a good README?

- Description of the software
- Installation steps (including prerequisites!)
- Example use case
- How to contribute
- How to get help
- How to cite
- License

Beyond the README

- Installation instructions
- Tutorial - getting started
- Examples
- API
- Guides / How to's
- Glossary
- Troubleshooting / FAQs

Developer-facing documentation enables continued long-term development

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Code comments

```
VRTSTART        TS      WCHVERT
# Page 801

                CAF     TWO         # WCHPHASE = 2 ---> VERTICAL: P65,P66,P67
                TS      WCHPHOLD
                TS      WCHPHASE
                TC      BANKCALL    # TEMPORARY, I HOPE HOPE HOPE
                CADR    STOPRATE    # TEMPORARY, I HOPE HOPE HOPE
                TC      DOWNFLAG    # PERMIT X-AXIS OVERRIDE
                ADRES   XOVINFLG
                TC      DOWNFLAG
                ADRES   REDFLAG
                TCF     VERTGUID
```


PLEASE TELL ME AGAIN HOW YOUR CODE IS SELF-DOCUMENTING

AND NEEDS NO COMMENTS

Code from Apollo 11:
LUNAR_LANDING_GUIDANCE_EQUATIONS.agc
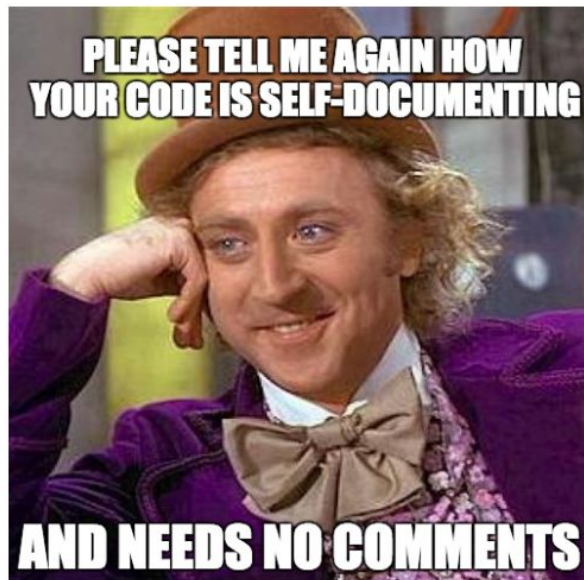
Developer-facing documentation enables continued long-term development

The details

Code comments

How to get things done

Workflows/ Guidelines

The big picture

Architecture/Road maps

Developer-facing documentation enables continued long-term development

Contributor Guidelines

- What are your expectations?
- What do you need help with?

Reviewer Guidelines

- How should reviewers communicate
- Checklist for reviewers

Style guide

- Define language and styles (e.g., American vs British; markup, bibliography style)
- Set specific rules for spelling, markup, using links
- Keep it light weight, and use pre-existing style guides for most things

Workflows/ Guidelines

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Workflows/ Guidelines

Docs as code

A **philosophy** that you should be writing documentation with the same tools as code

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- Docs in same repo as code
- Issue Trackers
- Version Control (Git)
- Plain Text Markup (Markdown, reStructuredText, Asciidoc)
- Code/Doc Reviews
- Automated Tests

When to use *docs as code*

- Any size project can implement these concepts

- Contributors are familiar with (or willing to learn)
  - scripting languages or plain text formats and
  - version control systems

UP TO DATE DOCUMENTATION

NOW THERE IS SOMETHING I HAVEN'T SEEN IN A LONG TIME.

imgflip.com

Docs in the repo

- You need a documentation folder nearby the source (within repository/source files)

```
repo
├── ACKNOWLEDGMENTS.md
├── code
│   ├── source.cpp
│   └── source.h
├── python
│   └── lib
│       └── api.py
├── docs
│   ├── index.rst
│   ├── installation.rst
│   ├── conf.py
│   ├── tutorial.rst
│   ├── contribrute_guidelines.rst
│   │
```

Issue trackers

- Track issues for documentation the same way you track issues with code

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  - **Define issue templates**
  - Use labels / tags / projects
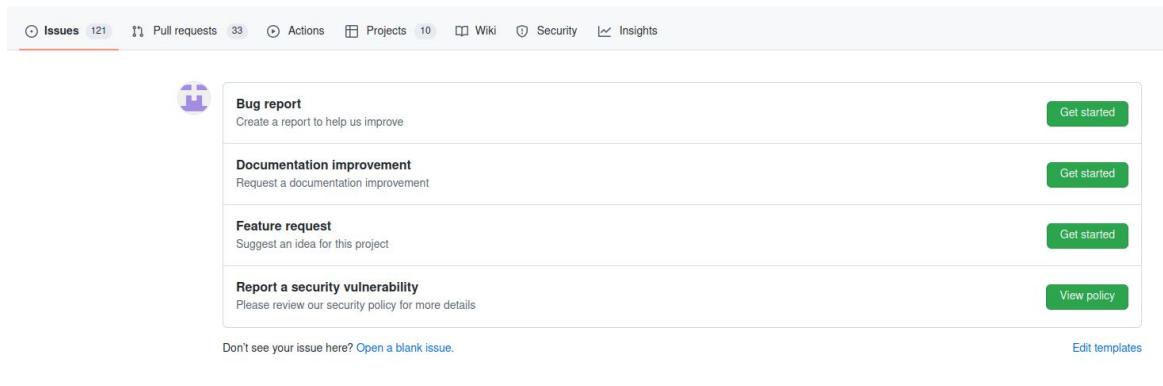
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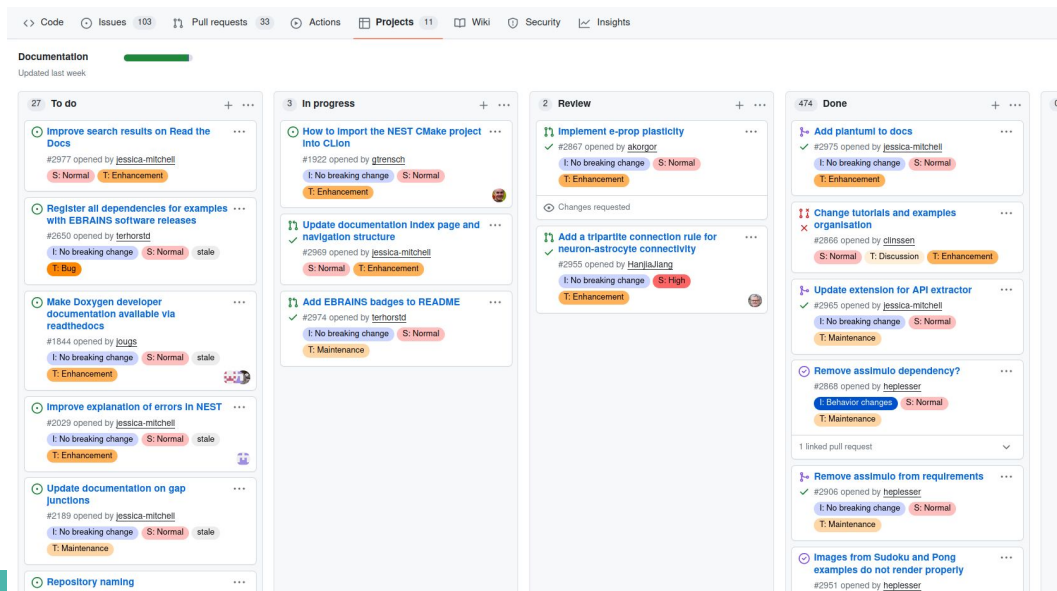
Version control system (e.g., git)

- Tracking every change to the documentation with commits
- History of who did what, when, and (hopefully) why

Plain text markup

- Well understood by developers
- You can use same editor (IDEs, vim, emacs etc.) as you would code

mdx

```
---
title: 'Example'
metaDescription: 'Example meta desc'
hidePage: true
---


### Code blocks

```js
async function main() {
  const allUsers = await
}
```
```

reStructured Text

```
.. _ref_label:

Some heading
------------

.. code-block:: python
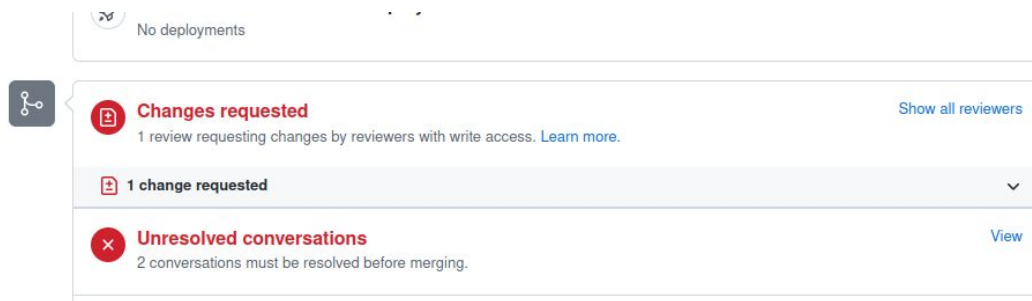
    import nest
```

Code and documentation reviews

- Pull(merge) requests that are documentation only OR code with documentation
- Select reviewers to oversee documentation aspects (language, links and references, style, structure . . .)
- Set guidelines for reviewers for ensuring documentation is correct

Automated Tests

- Check documentation build
- Check links
- Lint prose
- Check format
- Test examples

Make documentation a point in meetings

Things to work on

Do you have a *good* README? Is your code documented?

Do you have a way to track documentation-related issues?

Are you missing guidelines for contributions or developers?

Do you have a documentation generator? Hosting platform?

Do you have content you want to include? Further develop?

Do you have automated tests for documentation (link checkers, build check, prose linter)

Content development tips

Encourage community involvement

- Use subject matter experts (SMEs) to develop content alongside developers
- Ensure documentation is understandable by audience (consider non-native speakers)

Look for pre-existing content

- Look for workshop / lecture material or publications that might have relevant content for documentation

Use various visual elements

- Make sure your text is illustrative with code blocks, figures, graphs, and tables.

Consider that every page is page one

- A user needs to navigate to their goal from any point in your documentation.
- Use table of contents, breadcrumb trails, previous / next buttons, and appropriate links

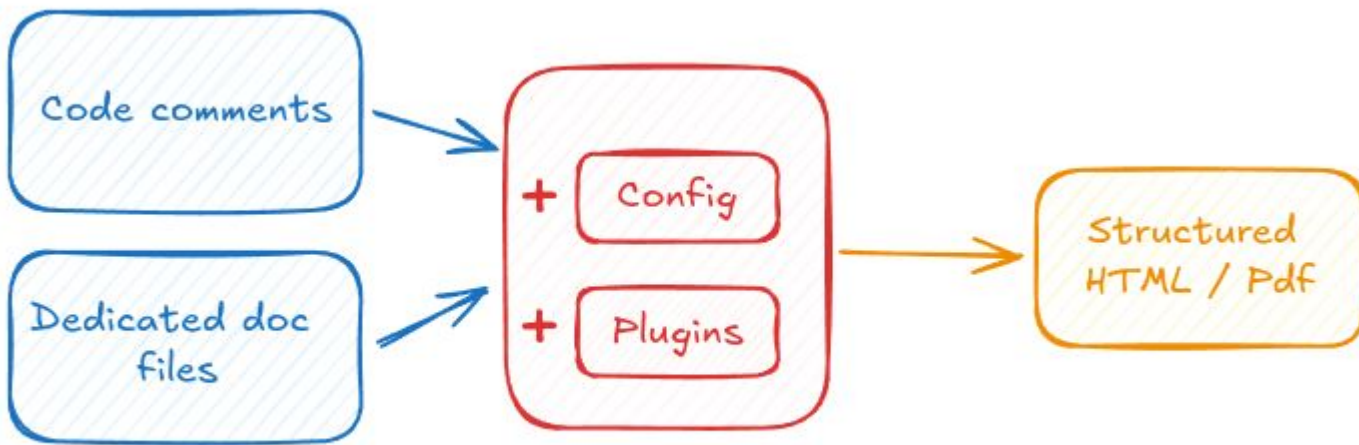# Write docs as you write code

- An example of tutorial-driven development
    - Tutorial-driven development puts the focus on user needs rather than code implementation.
    - The tutorial is written first, then the code.

AI the docs

- Generate comments / docstrings
- Check and improve language clarity (deepl.com/write)
- Write drafts or outlines

Always requires human review!

Documentation Generators

Documentation Generator	Compatible Languages	Markup language
Doxygen	C++ (C, Python, PHP, Java, C#, Objective-C, Fortran, VHDL, Splice, IDL, and Lex)	Custom syntax / Markdown
Sphinx	Python (C++, C, Javascript)	ReStructured Text / Markdown
MkDocs	Python	Markdown
Documenter.jl	Julia	Markdown
FORD	Fortran	Markdown
roxygen2 / Rmarkdown	R	Custom syntax / Markdown

Sphinx and MkDocs have Doxygen plugins and are supported by Read the Docs

Hosting platform

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Pages

Provide free hosting for open-source projects

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