

**moz://a**

The  
Alan Turing  
Institute

# Introduction to Binder(Hub)

and why YOU should build a BinderHub

2019.03.18

Alex Morley

Mozilla Fellow, contributor to The Turing Way



# Agenda

## 1. Binder

What it is and why it's super awesome.

## 2. Binderhub

How it works and why it works that way.

## 3. Workshop Goals

Why YOU should build a BinderHub and what everyone wants to get out of the workshop.

# Market Research for Binder

(done reproducibly)

Indicate how much you agree with the following statements  
using traffic lights.

Practice:

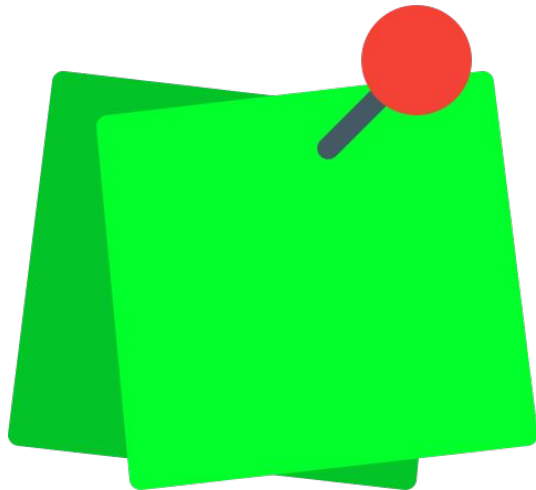
# Market Research for Binder

(done reproducibly)

Indicate how much you agree with the following statements  
using traffic lights.

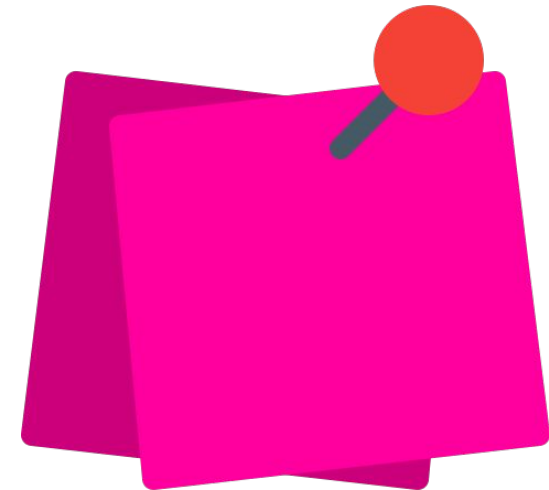
Practice:

I feel fully caffeinated this morning.



Agree

Disagree

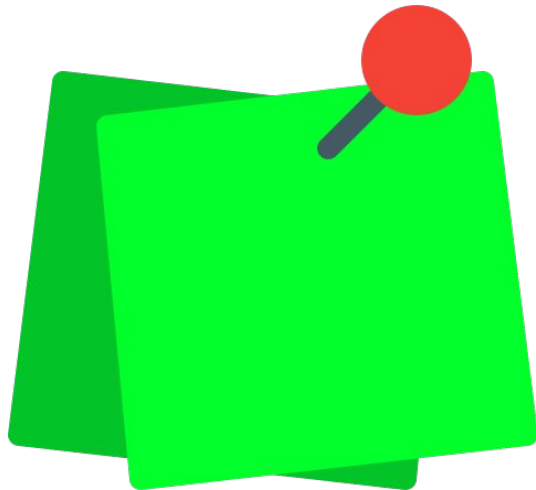


# Market Research for Binder

(done reproducibly)

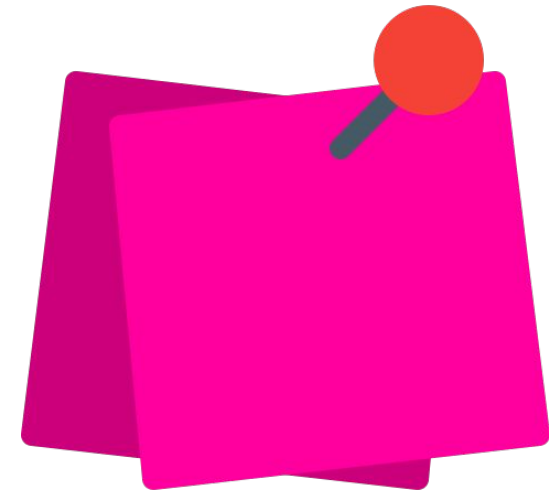
Indicate how much you agree with the following statements  
using traffic lights.

Today I am using: Windows



Agree

Disagree

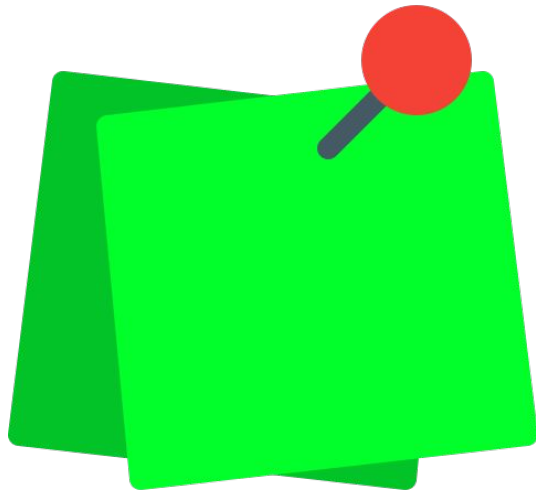


# Market Research for Binder

(done reproducibly)

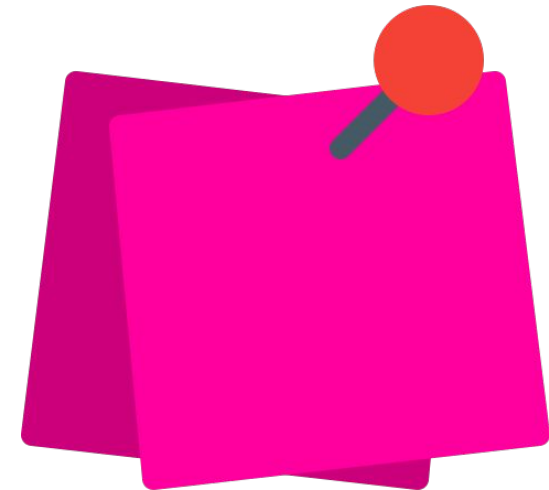
Indicate how much you agree with the following statements  
using traffic lights.

Today I am using: Mac (OSX)



Agree

Disagree

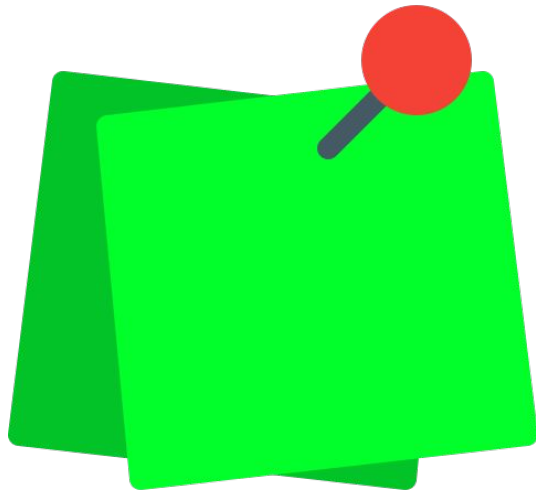


# Market Research for Binder

(done reproducibly)

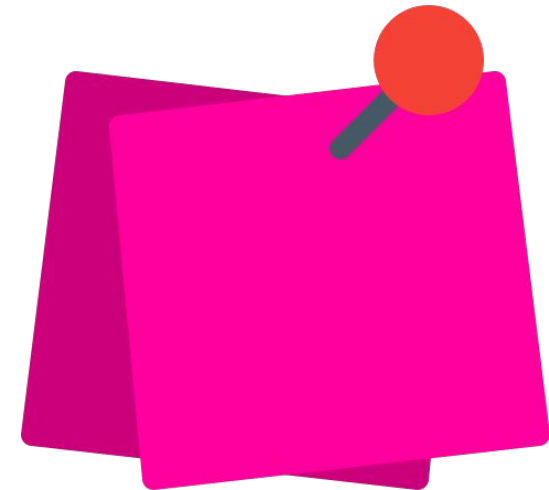
Indicate how much you agree with the following statements  
using traffic lights.

Today I am using: Linux (any flavour)



Agree

Disagree

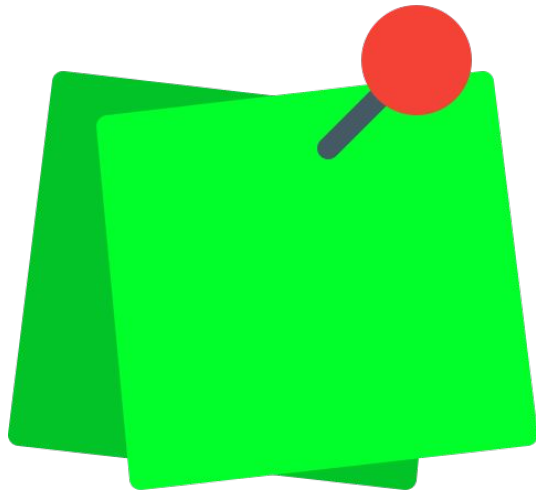


# Market Research for Binder

(done reproducibly)

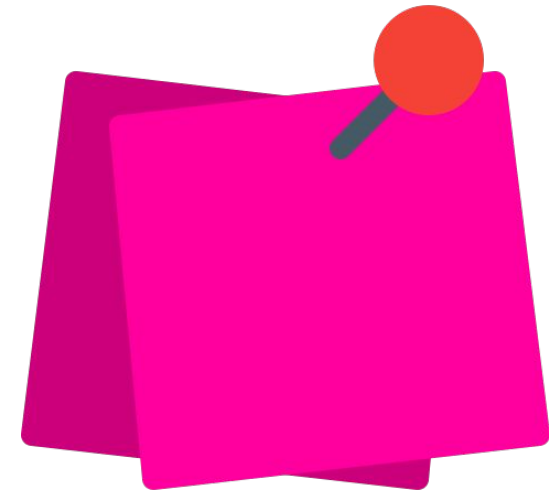
Indicate how much you agree with the following statements  
using traffic lights.

I have heard of Binder before.



Agree

Disagree



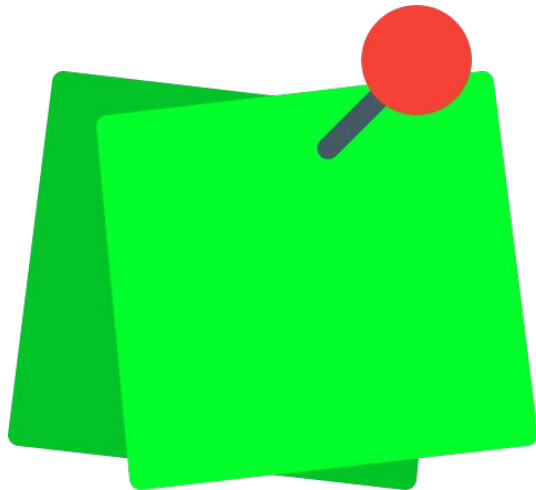


# Market Research for Binder

(done reproducibly)

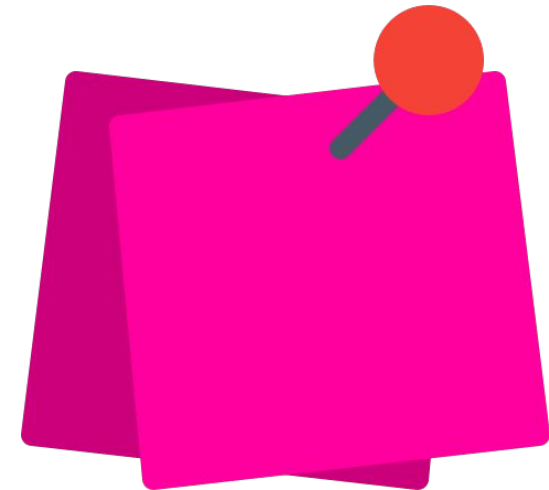
Indicate how much you agree with the following statements  
using traffic lights.

I have used binder to look at someone else's  
research.



Agree

Disagree

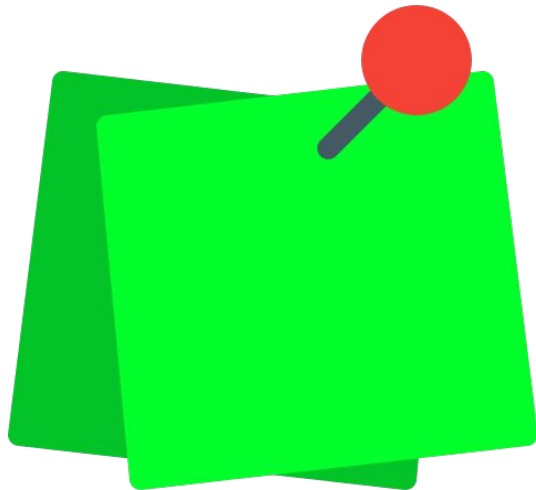


# Market Research for Binder

(done reproducibly)

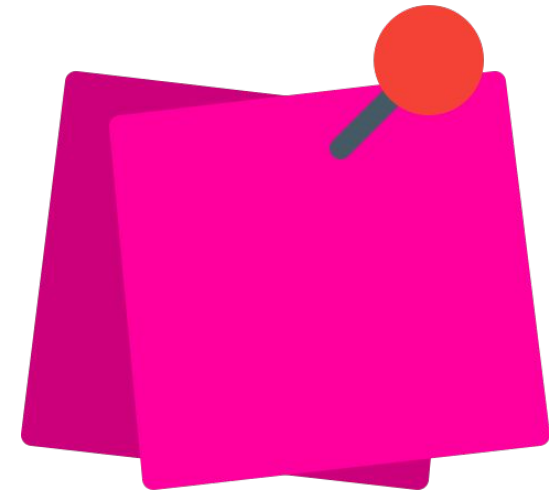
Indicate how much you agree with the following statements  
using traffic lights.

I have used Binder to share my own work.



Agree

Disagree

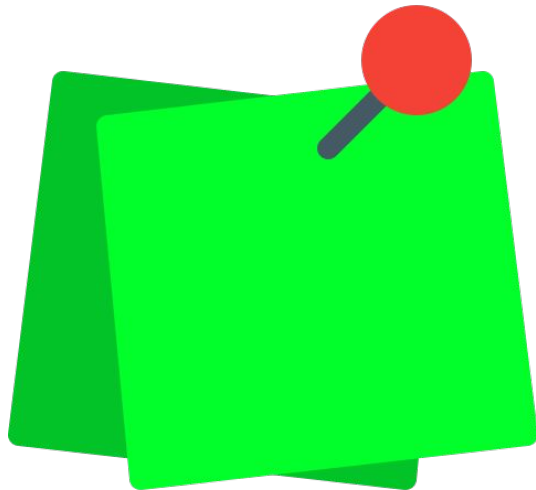


# Market Research for Binder

(done reproducibly)

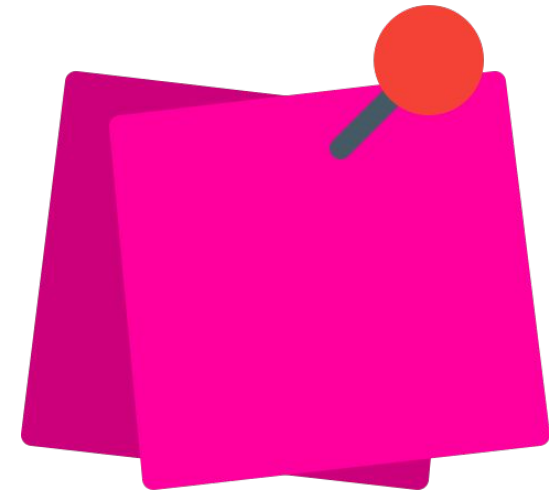
Indicate how much you agree with the following statements  
using traffic lights.

I have a good understanding of how Binder  
works.



Agree

Disagree

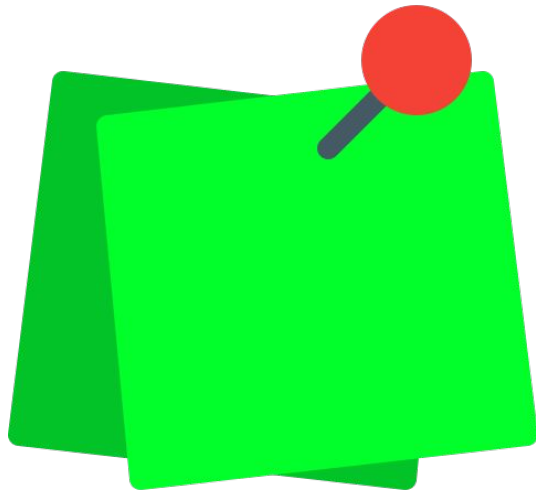


# Market Research for Binder

(done reproducibly)

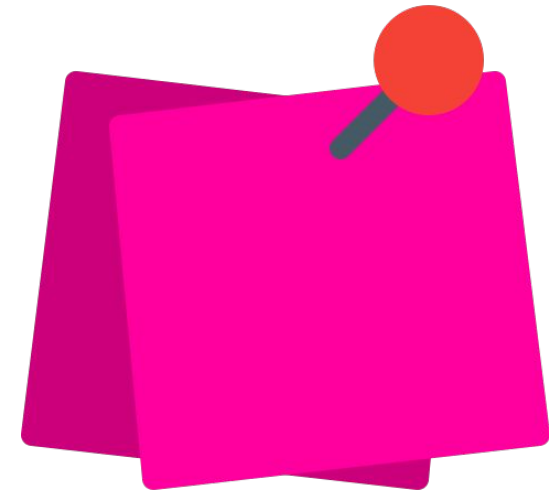
Indicate how much you agree with the following statements  
using traffic lights.

I have heard (something like) these words  
before: "Oh, it worked on my computer?"



Agree

Disagree

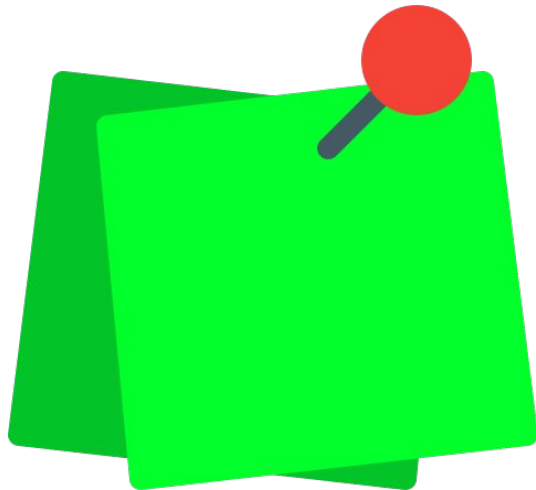


# Market Research for Binder

(done reproducibly)

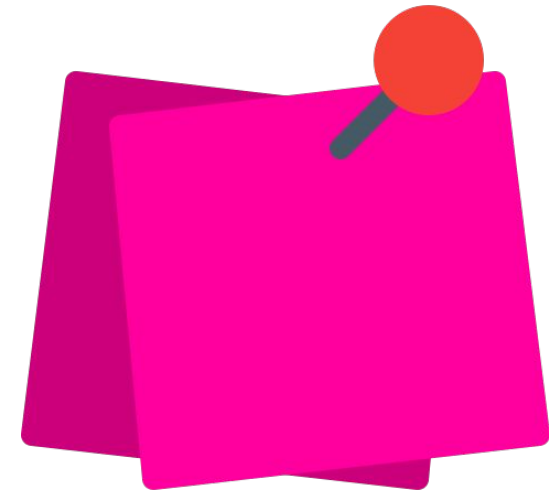
Indicate how much you agree with the following statements  
using traffic lights.

I have heard (something like) these words  
before: "Oh, it was working yesterday?"



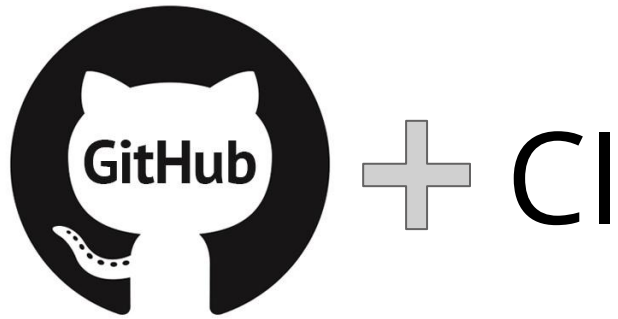
Agree

Disagree



# Why Binder?

Oh, it was  
working  
yesterday?



Oh, it worked  
on my  
computer?



# Binder

*A totally* fictional user story.

# Binder

*A totally fictional user story.*

The screenshot shows a GitHub repository page for 'alexmorley / binder-demo'. The top navigation bar includes a search bar, links for 'Pull requests', 'Issues', 'Marketplace', and 'Explore', and a user profile icon. The repository header shows 'alexmorley / binder-demo' with 'Unwatch' (1), 'Star' (0), and 'Fork' (0) buttons. Below the header, tabs for 'Code', 'Issues' (0), 'Pull requests' (0), 'Projects' (0), 'Wiki', 'Insights', and 'Settings' are visible. The main content area shows 'No description, website, or topics provided.' with an 'Edit' button and a 'Manage topics' link. A summary bar displays '1 commit', '1 branch', '0 releases', and '1 contributor'. Below this, a 'Branch: master' dropdown and a 'New pull request' button are shown, along with 'Create new file', 'Upload files', 'Find File', and a green 'Clone or download' button. The commit history shows 'alexmorley Initial commit' with the latest commit hash 'f52964f' from 'a minute ago'. A file list shows 'README.md' as the 'Initial commit' from 'a minute ago'. The file content area displays 'binder-demo' in a large font. The footer includes copyright information '© 2019 GitHub, Inc.', links for 'Terms', 'Privacy', 'Security', 'Status', and 'Help', the GitHub logo, and links for 'Contact GitHub', 'Pricing', 'API', 'Training', 'Blog', and 'About'.

Search or jump to... Pull requests Issues Marketplace Explore

alexmorley / binder-demo Unwatch 1 Star 0 Fork 0

<> Code Issues 0 Pull requests 0 Projects 0 Wiki Insights Settings

No description, website, or topics provided. Edit

Manage topics

1 commit 1 branch 0 releases 1 contributor

Branch: master New pull request Create new file Upload files Find File Clone or download

alexmorley Initial commit Latest commit f52964f a minute ago

README.md Initial commit a minute ago

README.md

binder-demo

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# Binder

Add a file:

The screenshot shows the GitHub interface for the repository 'alexmorley / binder-demo'. The top navigation bar includes links for Pull requests, Issues, Marketplace, and Explore. The repository header shows 1 commit, 1 branch, 0 releases, and 1 contributor. Below this, a row of buttons includes 'Branch: master', 'New pull request', 'Create new file' (circled in red), 'Upload files', 'Find File', and 'Clone or download'. The commit history shows an initial commit by alexmorley. The file list shows 'README.md' as the initial commit. The main content area displays the text 'binder-demo'.

alexmorley / binder-demo

Unwatch 1 Star 0 Fork 0

Code Issues 0 Pull requests 0 Projects 0 Wiki Insights Settings

No description, website, or topics provided. Edit

Manage topics

1 commit 1 branch 0 releases 1 contributor

Branch: master New pull request Create new file Upload files Find File Clone or download

alexmorley Initial commit Latest commit f52964f a minute ago

README.md Initial commit a minute ago

README.md

binder-demo

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# Binder

Add some data to the file

The screenshot shows the GitHub web interface for the repository `alexmorley / binder-demo`. The repository has 1 watch, 0 stars, and 0 forks. The `data.csv` file is open in the editor, showing the following content:

```
1 question_tag,number_agree,number_disagree
2 heard_of_binder,12,0
3 used_binder,4,8
4 share_binder,3,9
5 understand_binder,6,6
```

The `Commit new file` dialog is open, showing the file name `Create data.csv` and a text area for an optional extended description. The commit options are:

- ☒ Commit directly to the `master` branch.
- ☐ Create a **new branch** for this commit and start a pull request. [Learn more about pull requests.](#)

At the bottom of the dialog are two buttons: **Commit new file** (green) and **Cancel** (grey).

# Binder

Specify a few requirements

The screenshot shows the GitHub web interface for the repository 'alexmorley / binder-demo'. The repository has 1 watch, 0 stars, and 0 forks. The 'Code' tab is selected, showing the file 'requirements.txt'. A modal dialog titled 'Commit changes' is open, allowing the user to commit the changes to the 'master' branch. The dialog includes a text input for the commit message, a larger text area for an optional extended description, and two radio buttons for the commit strategy. The 'Commit changes' button is green, and the 'Cancel' button is grey.

Search or jump to... Pull requests Issues Marketplace Explore

alexmorley / binder-demo Unwatch 1 Star 0 Fork 0

Code Issues 0 Pull requests 0 Projects 0 Wiki Insights Settings

binder-demo / requirements.txt or cancel

Edit file Preview changes Spaces 2 Soft wrap

1 matplotlib

**Commit changes**

Update requirements.txt

Add an optional extended description...

☒ Commit directly to the master branch.

☐ Create a new branch for this commit and start a pull request. [Learn more about pull requests.](#)

Commit changes Cancel

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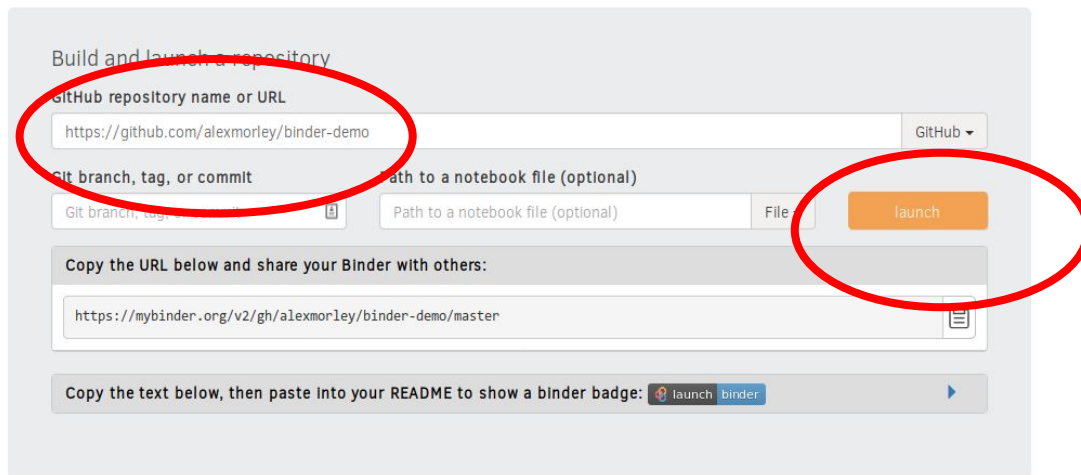
# Binder

Copy-paste the github repo name into mybinder.org. Click Launch.



Turn a Git repo into a collection of interactive notebooks

Have a repository full of Jupyter notebooks? With Binder, open those notebooks in an executable environment, making your code immediately reproducible by anyone, anywhere.

A screenshot of the Binder web interface. The "GitHub repository name or URL" input field is circled in red and contains the text "https://github.com/alexmorley/binder-demo". Below it, the "Git branch, tag, or commit" field is also circled in red. To the right, the "Path to a notebook file (optional)" field is visible. A red circle highlights the orange "launch" button. Below the input fields, there is a section titled "Copy the URL below and share your Binder with others:" with a text box containing the URL "https://mybinder.org/v2/gh/alexmorley/binder-demo/master". At the bottom, there is a section titled "Copy the text below, then paste into your README to show a binder badge:" with a badge that says "launch binder".

How it works



Enter your repository information

# Binder

Open a notebook

Files

Running

Clusters

Select items to perform actions on them.

☐ 0

/

Name

<input type="checkbox"/>	<div>data.csv</div>	
<input type="checkbox"/>	<div>README.md</div>	
<input type="checkbox"/>	<div>requirements.txt</div>	

Upload

New

Notebook:

Python 3

Other:

Text File

Folder

3 B

3 B

4 B

# Binder


The possibilities are endless

 jupyter Untitled Last Checkpoint: 5 minutes ago (unsaved changes)



File Edit View Insert Cell Kernel Widgets Help

Trusted

Python 3 

       Run    Code  

## The Possibilities are endless

```
In [ ]: import anything_from_requirements.txt
```

# Binder

Submitting Changes Back to the Repo

# How did this all happen?!

BinderHub. Not quite magic.

Build and launch a repository

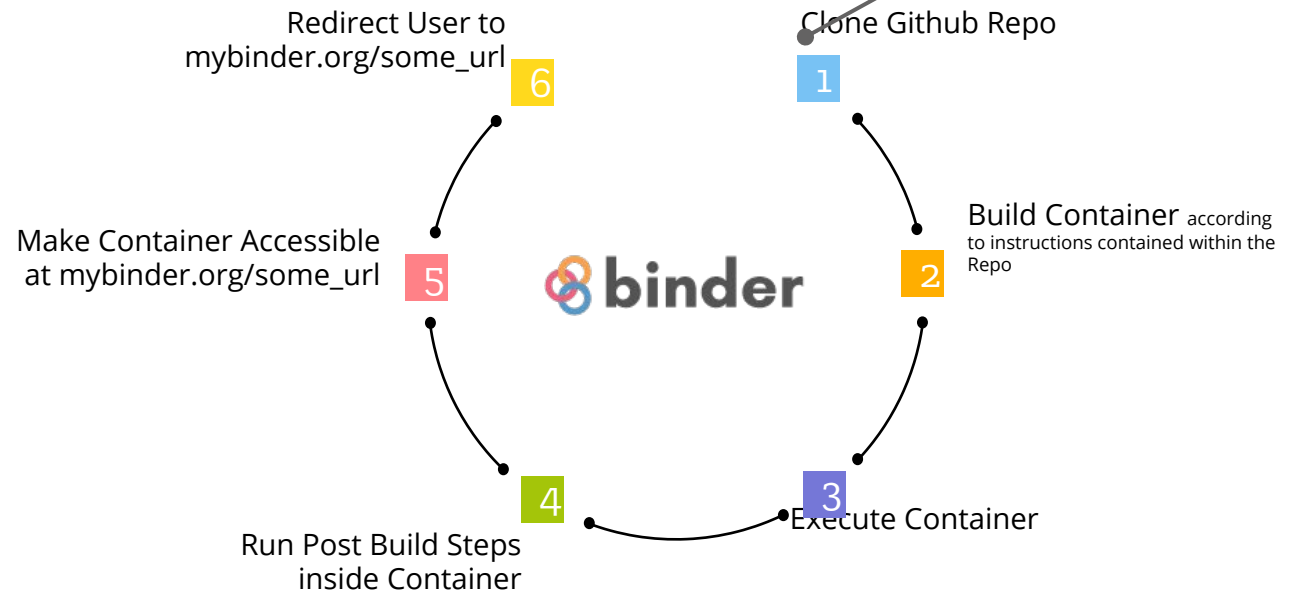
GitHub repository name or URL

GitHub ▾

Git branch, tag, or commit



Path to a notebook file (optional)

File ▾launch



# BinderHub

Build and launch a repository

GitHub repository name or URL

GitHub ▾

Git branch, tag, or commit



Path to a notebook file (optional)

File ▾

launch

Clone Github Repo

1



# BinderHub

Build and launch a repository

GitHub repository name or URL

GitHub ▾

Git branch, tag, or commit



Path to a notebook file (optional)

File ▾

launch

Clone Github Repo

1



repo2docker

2

Build Container  
according to instructions  
contained within the Repo

# BinderHub

Build and launch a repository

GitHub repository name or URL

GitHub ▾

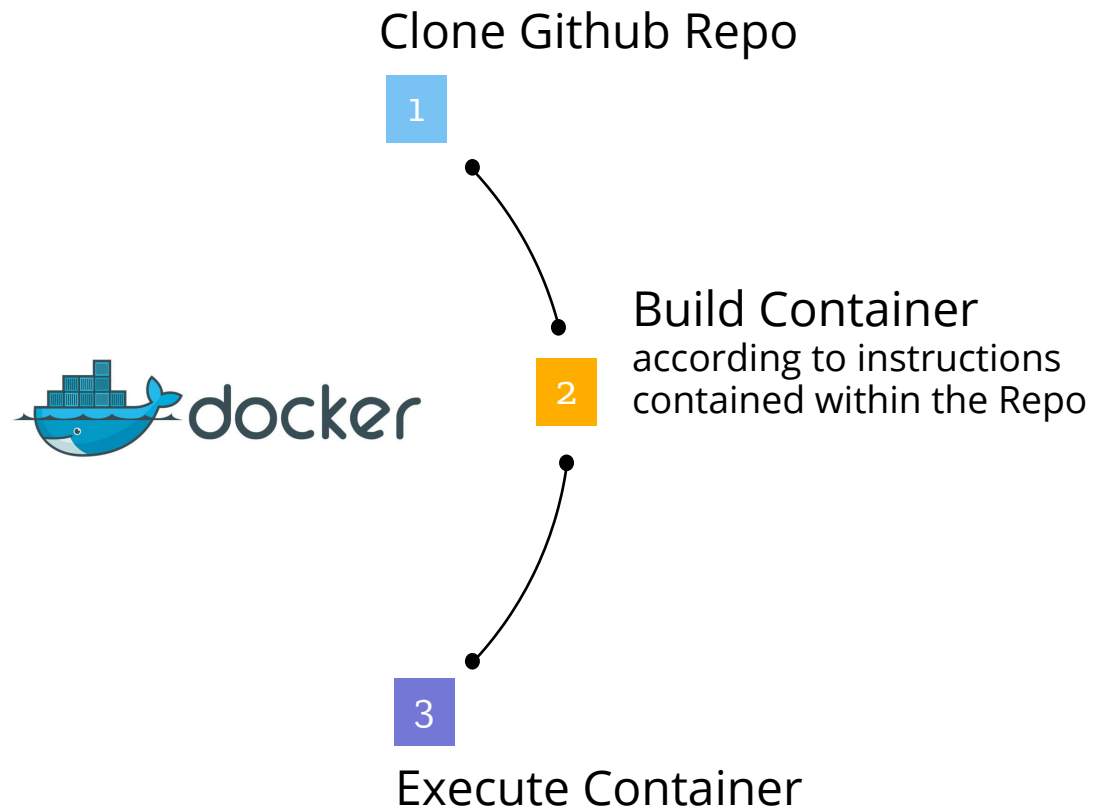
Git branch, tag, or commit



Path to a notebook file (optional)

File ▾

launch



# BinderHub

Build and launch a repository

GitHub repository name or URL

GitHub ▾

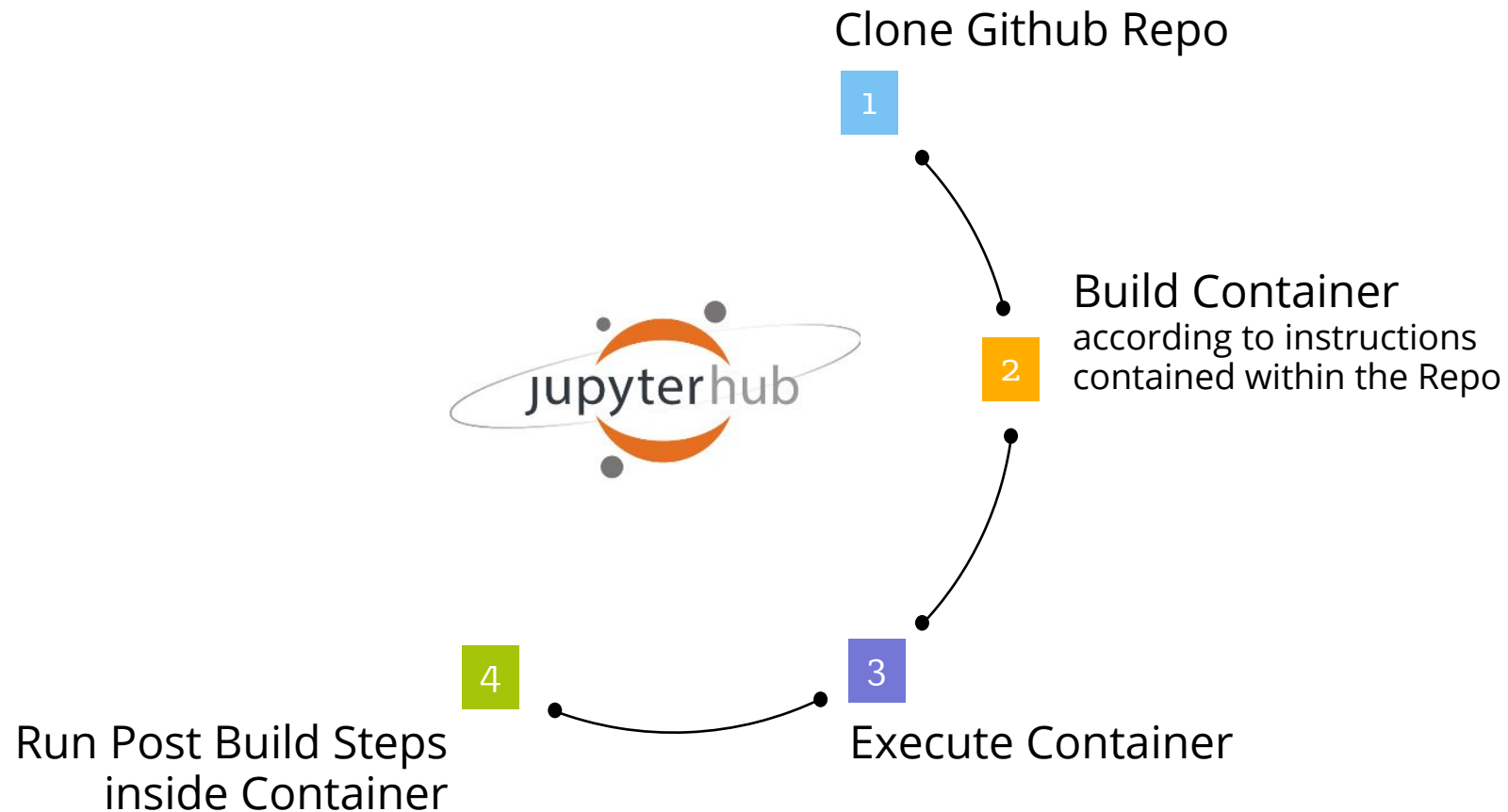
Git branch, tag, or commit



Path to a notebook file (optional)

File ▾

launch



# BinderHub

Build and launch a repository

GitHub repository name or URL

GitHub ▾

Git branch, tag, or commit

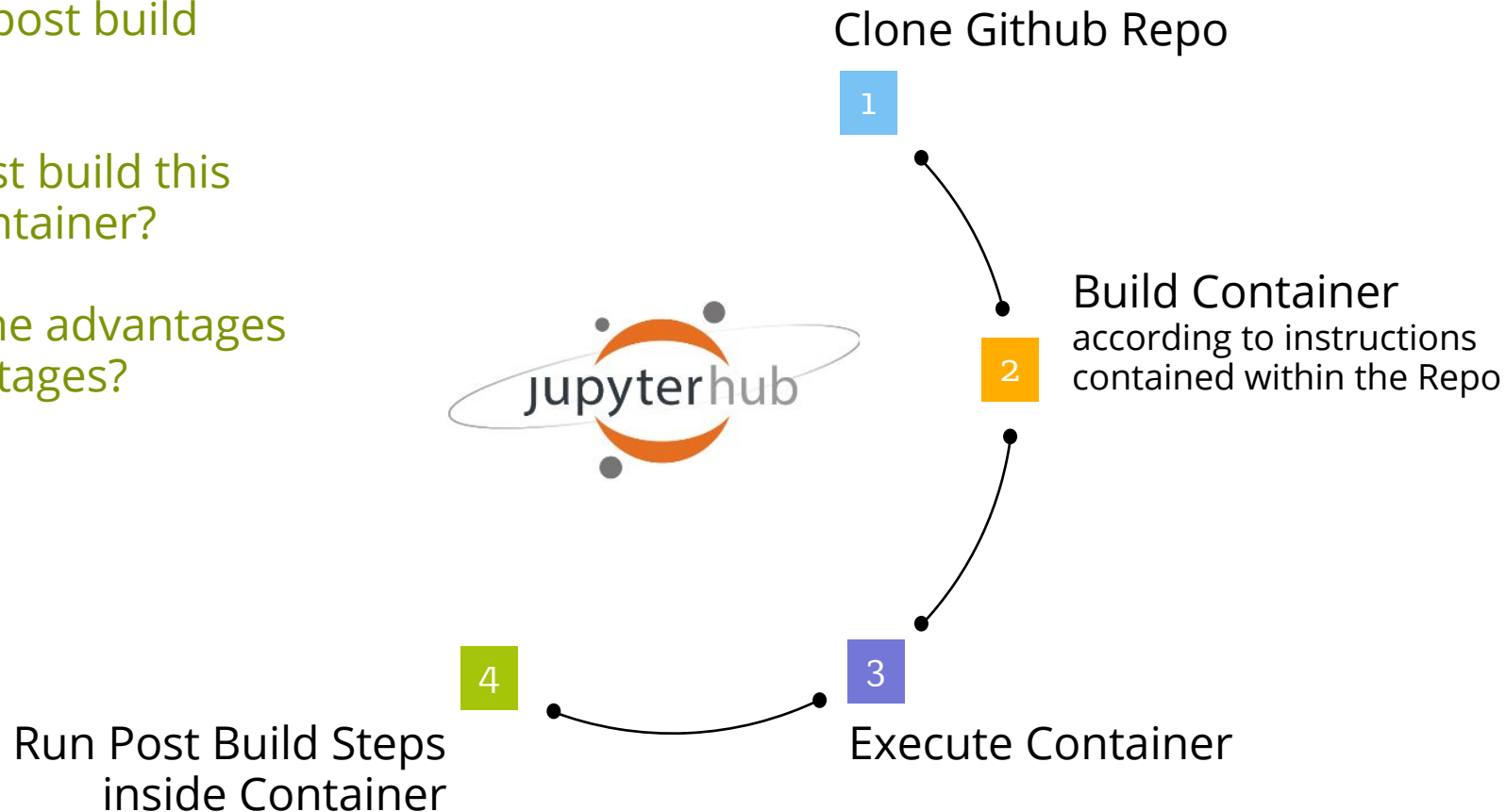


Path to a notebook file (optional)

File ▾

launch

- Why run a post build step?
- Why not just build this into the container?
- What are the advantages & disadvantages?



# BinderHub

Build and launch a repository

GitHub repository name or URL

GitHub ▾

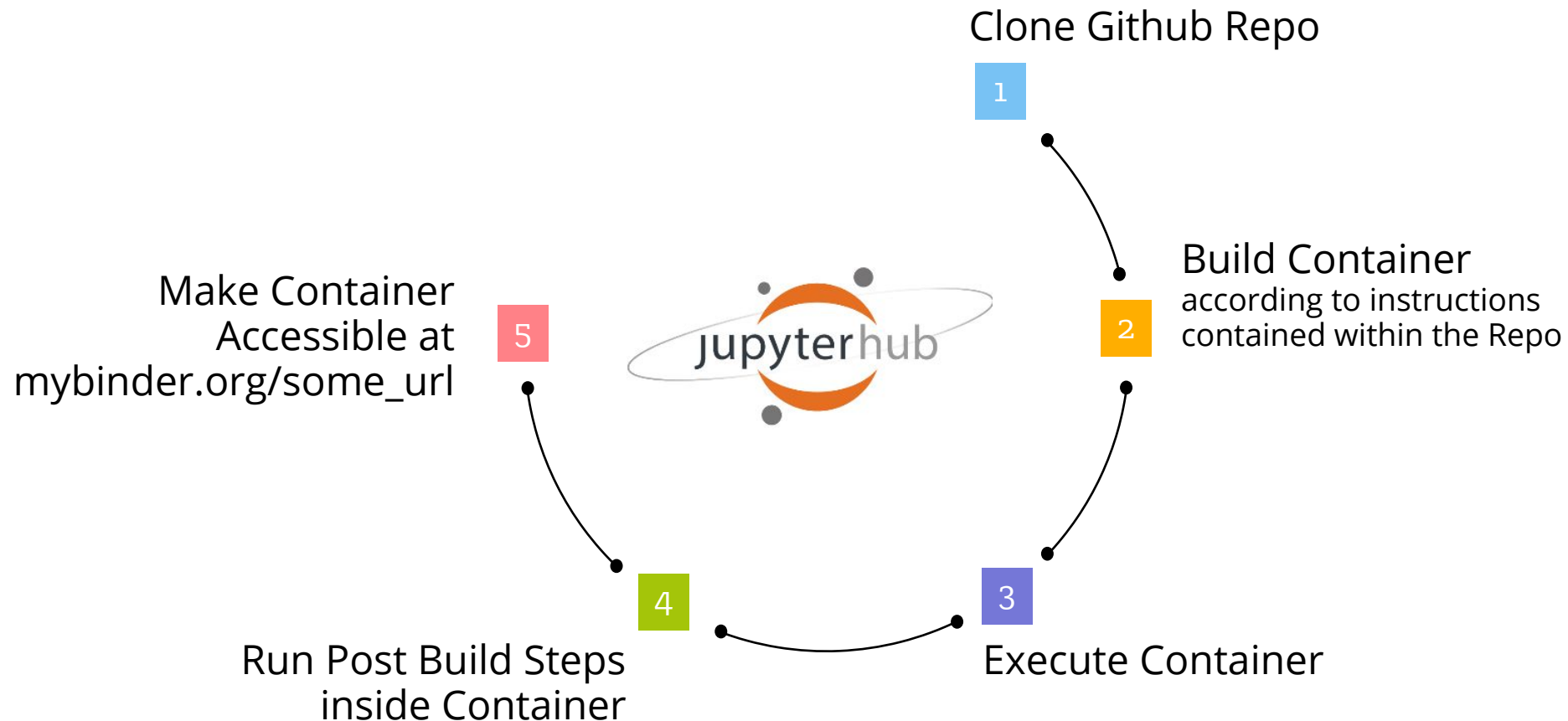
Git branch, tag, or commit



Path to a notebook file (optional)

File ▾

launch



# BinderHub

Build and launch a repository

GitHub repository name or URL

GitHub ▾

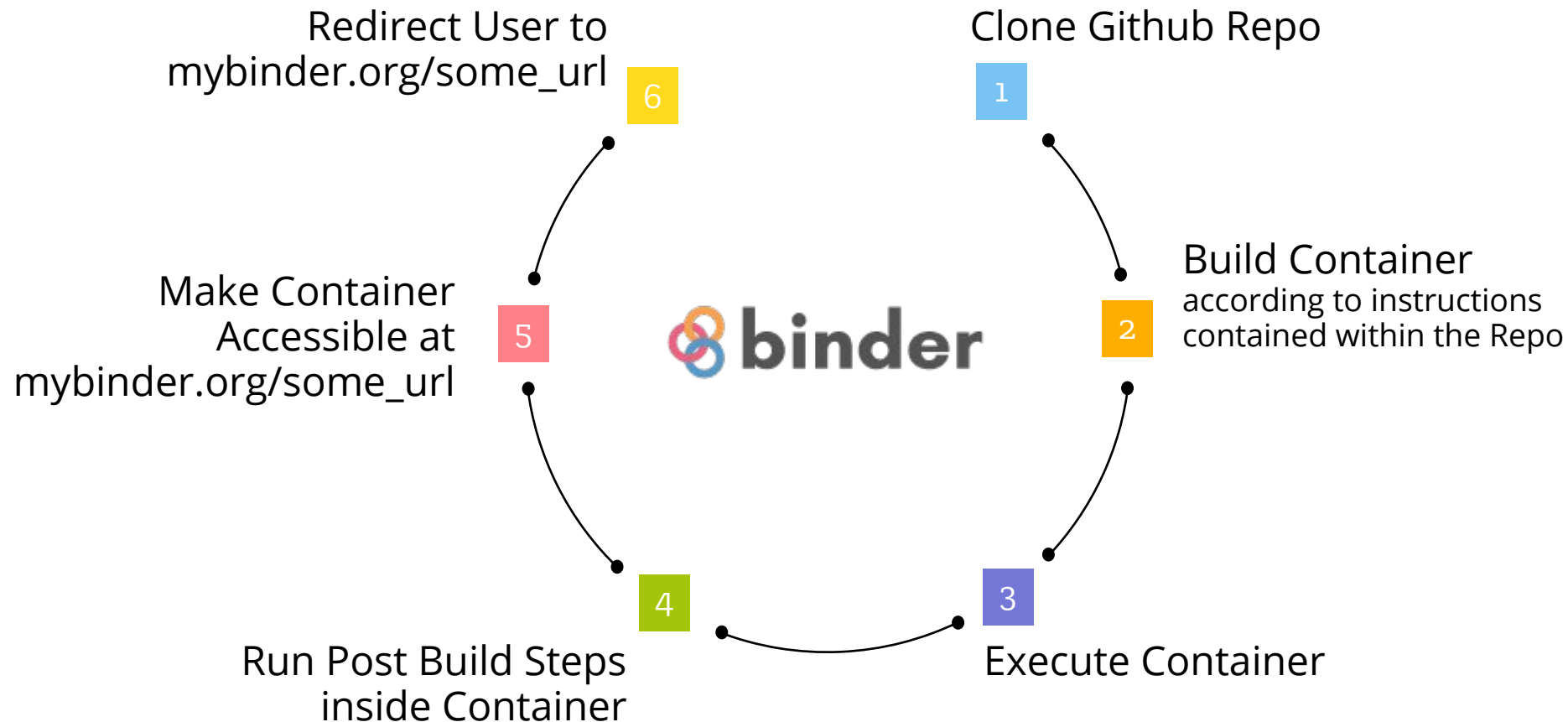
Git branch, tag, or commit



Path to a notebook file (optional)

File ▾

launch



# How did this all happen?!

No magic. Just glueing together lots of other software.

Build and launch a repository

GitHub repository name or URL

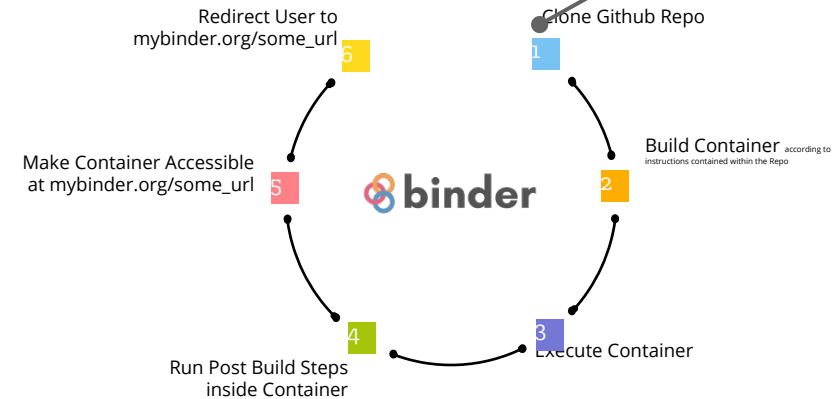
GitHub

Git branch, tag, or commit

ⓘ

Path to a notebook file (optional)

File



A few more...



repo2docker



So can I just  
``pip install  
binderhub?``

Not quite. At least, it won't do  
what you think.

**Why can we not just run this all from one  
server?**

- 1.
- 2.
- 3.

So can I just  
``pip install  
binderhub?``

Not quite. At least, it won't do  
what you think.

**Why can we not just run this all from one  
server?**

1. Resource Intensive
2. Resource Control
3. Security

# Solution: Kubernetes



The solution that strikes fear and passion into sysadmins around the world.

**Why can we not just run this all from one server?**

1. Resource Intensive - **Cluster Management**
2. Resource Control - **Container Management**
3. Security - **Container Isolation**

# Problem? Kubernetes



The solution that strikes fear and passion into sysadmins around the world.

**Err that sounds great? Why does it strike fear into anyone?**

Can be a pain to set up correctly.

# Solution: Zero-to-Binderhub

Fear no more!

## **What we'd like from you:**

- Make a note of which bits were tricky.
- Think about what doing this “for real” at home/your workplace? What extra would you need / want?
- Add these thoughts/notes on stickies and put them in the Parking Lot - we're going to try fix them this afternoon!

Thanks for  
listening :)