

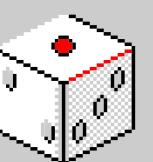
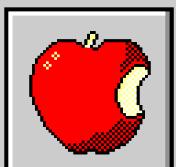


WHY ARE PEOPLE DEVELOPING INSIDE CONTAINERS?



How GitHub Codespaces
takes containerization
to the next level

by Rizel Scarlett



11:11PM

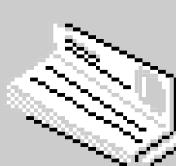
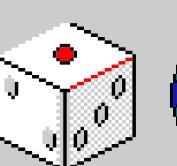
System Error



A fatal exception 0E76534801 has occurred at 0027:C87123 in VXD VMM.
Operating system has been stopped to prevent damage to your computer.

- * First off, what are containers??????
- * Why are people developing inside containers??????

Press any key to continue _



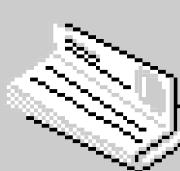
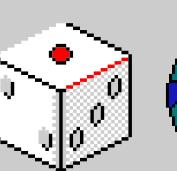
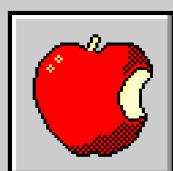
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"It works on
my machine" -
every engineer
every



Why does it fail on
other machines?

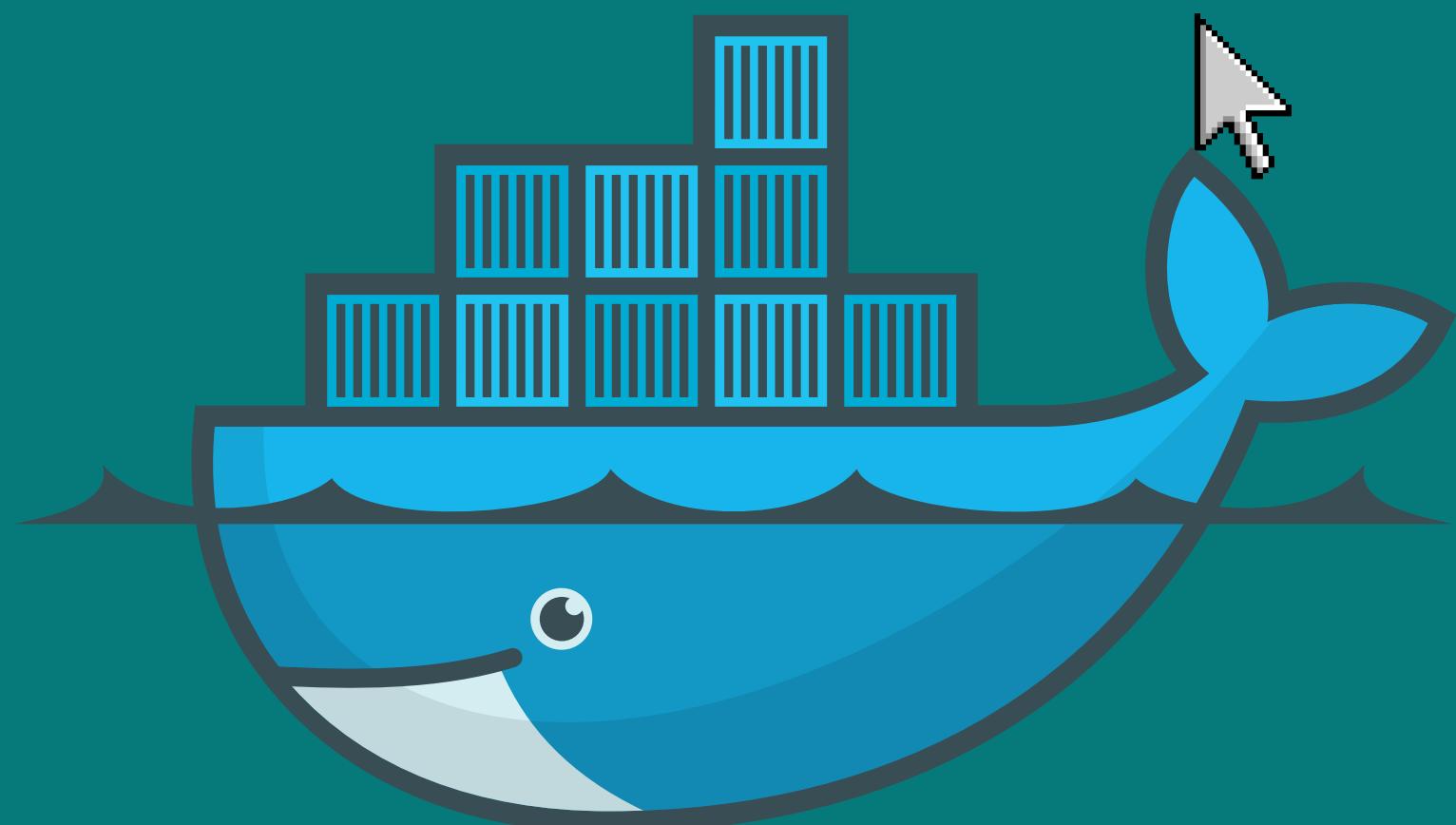
**Inconsistent
environments**



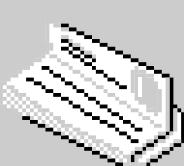
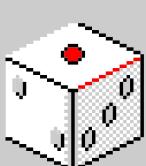
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(Enter Containers)

What is a container?

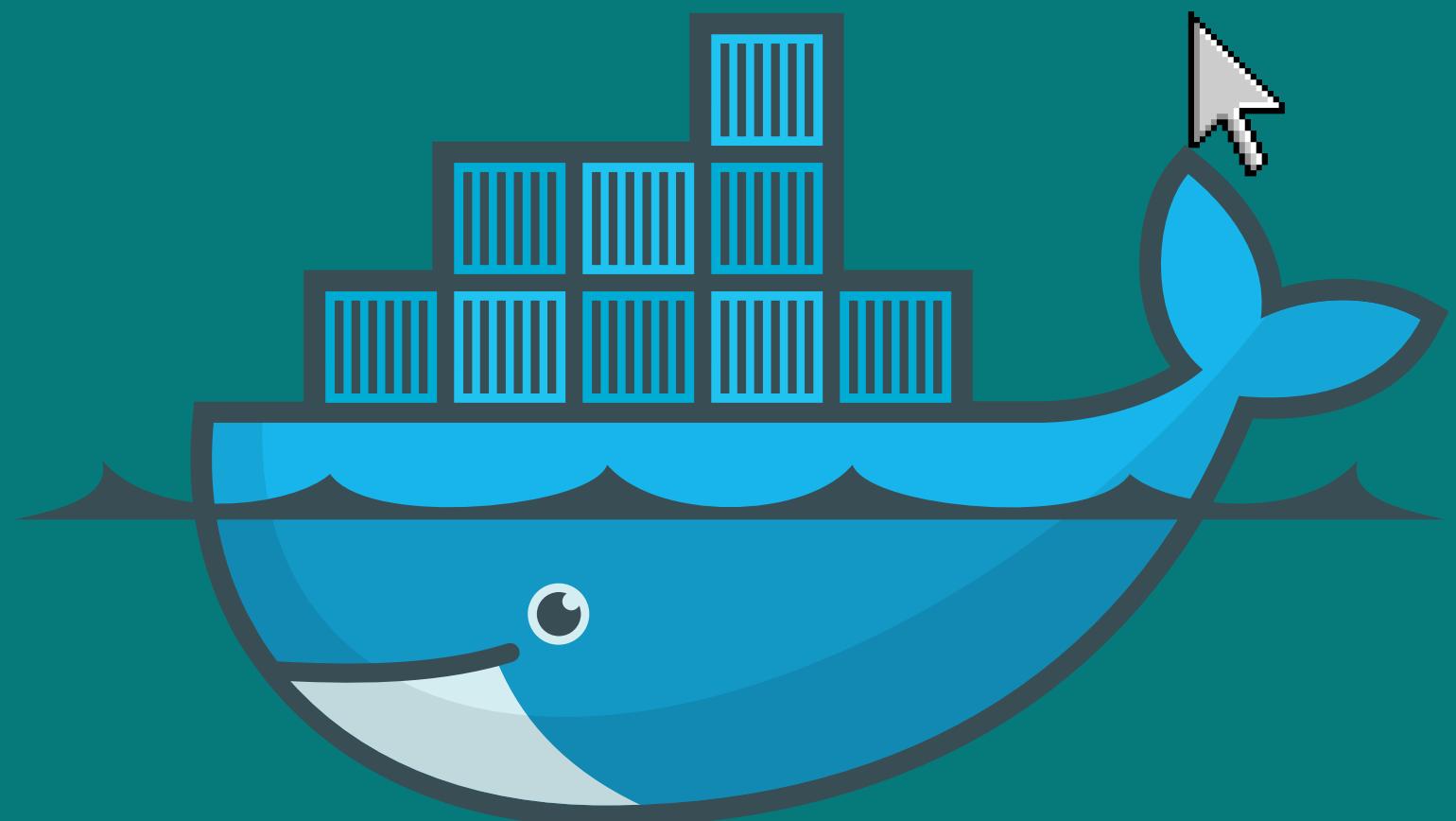
A screenshot of a presentation slide with a white background. At the top right is a red 'X' button. On the right side, there are vertical scroll bars. The main content area contains the following text:

"A container is a standard unit of software that packages up code and all its dependencies so the application runs quickly and reliably from one computing environment to another." - Docker

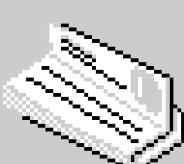
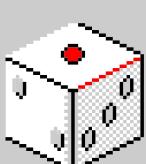


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Docker



- Founded March 2013
- Open Source platform
- Containers already existed, but this popularized the use

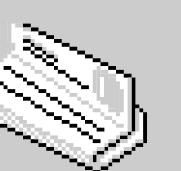
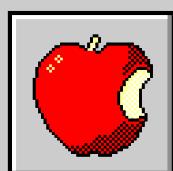


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Breaking it down



- Containers enable software engineers to program in a consistent environment.
- Dev mirrors production with same operating system, configurations, and dependencies.
- This ensures bugs and features behave the same across all environments



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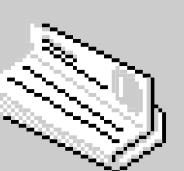
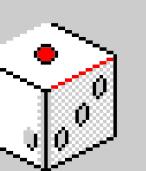
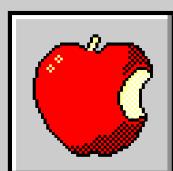
**LET'S GO BACK IN
TIME...**

1979



Chroot

- Changing the root directory for a given process
- Provides an isolated environment for build processes and dependencies



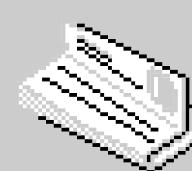
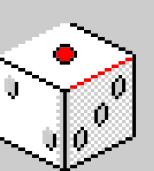
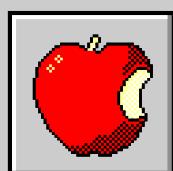
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2000



FreeBSD Jails

- Allows developers to isolate and test updates or changes without jeopardizing the integrity of the rest of the system.
- Designated IP address



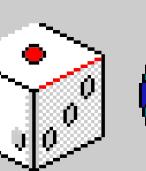
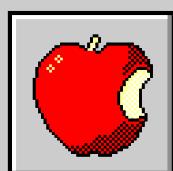
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2006



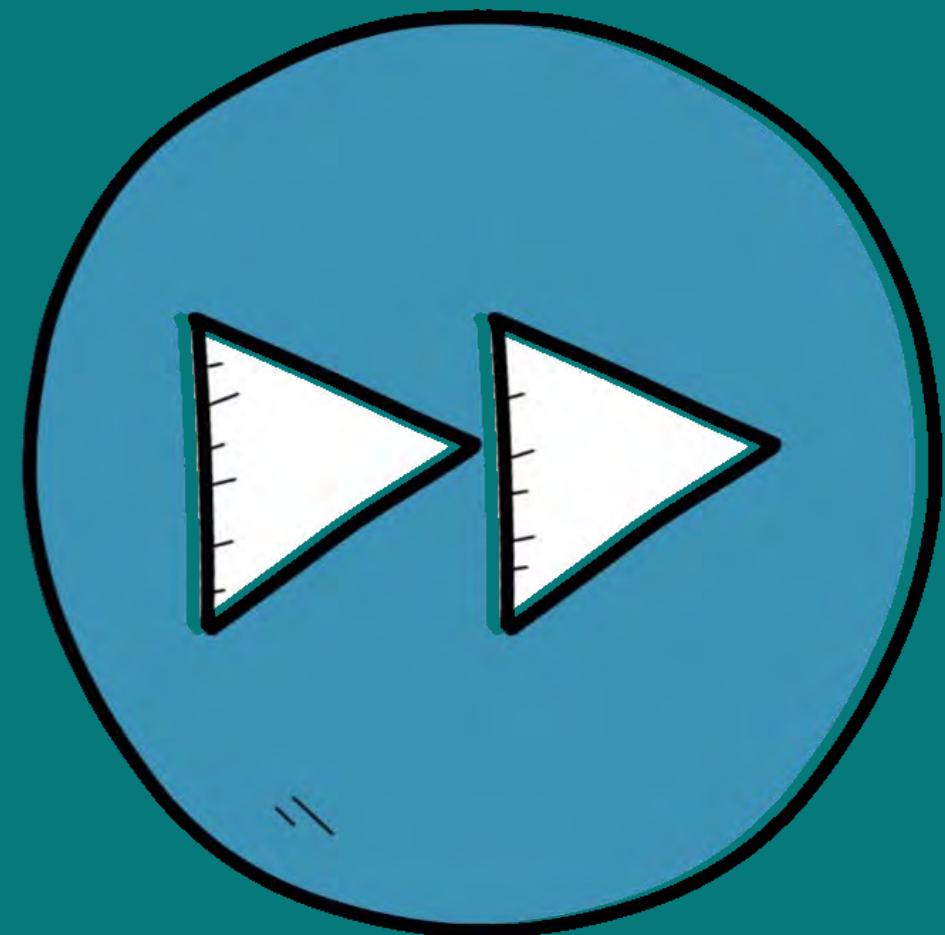
Process Containers aka Control Groups aka cgroups

- Limiting, accounting and isolating resource usage (CPU, memory, disk I/O, network)



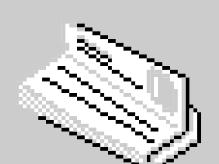
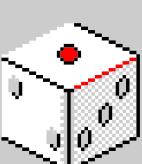
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Fast forward

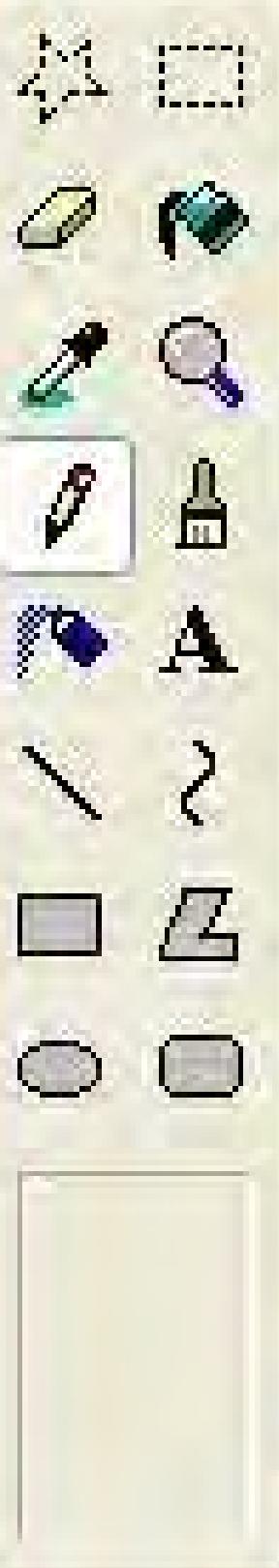


Docker

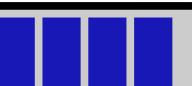
- Ease of use
- Introduced a suite of management and packaging tools for containerization



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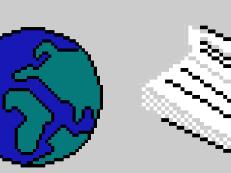
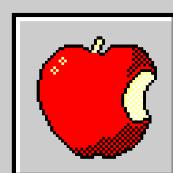
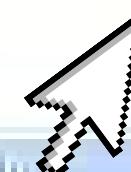


A



The pursuit

Running software reliably
from one environment to
another



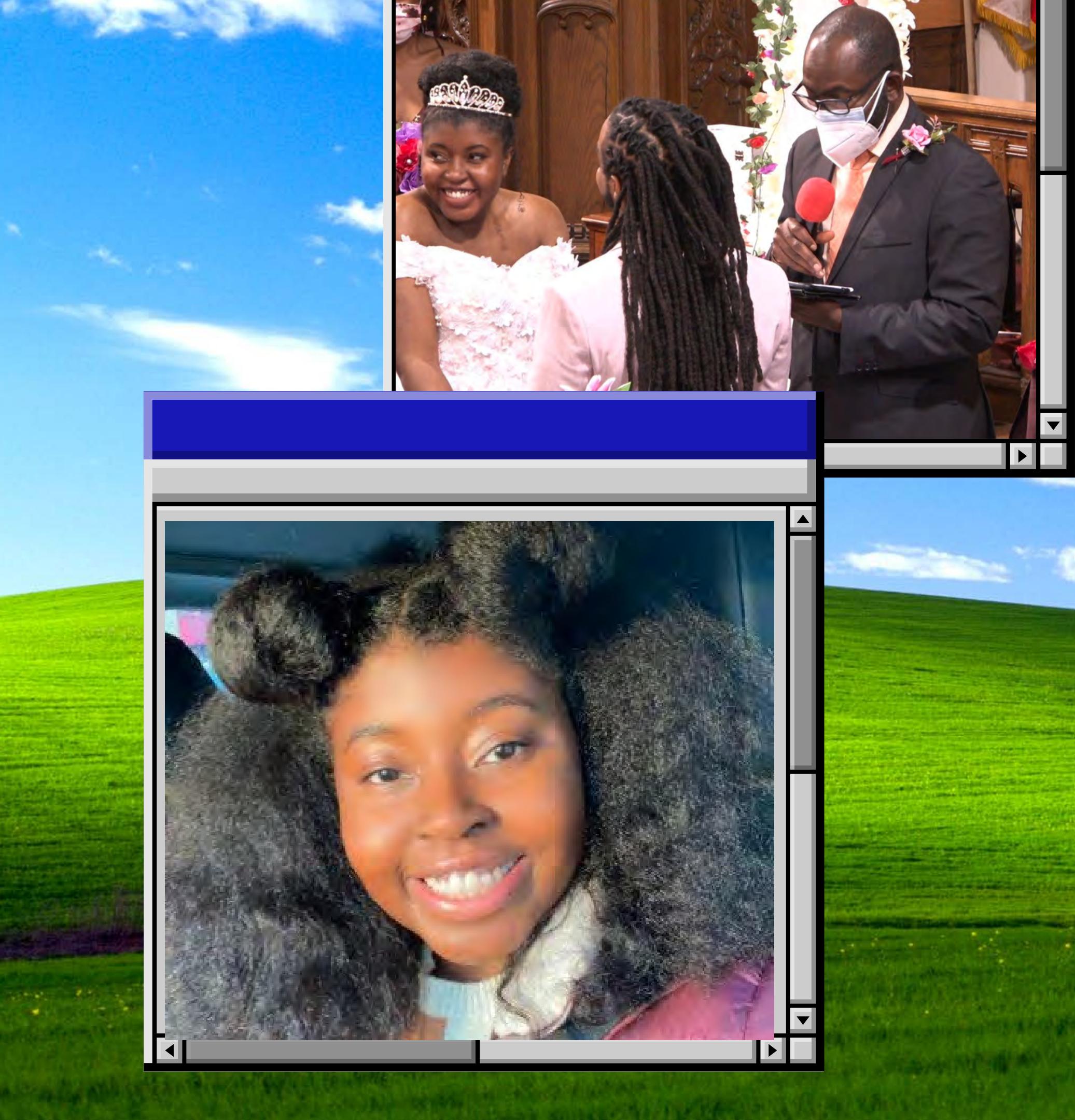
A large black silhouette of a bird, possibly a hawk or eagle, is positioned in the center of the image. It is facing towards the left. The background consists of a bright blue sky with scattered white clouds. The bird's silhouette is sharp and detailed, showing its wings and tail feathers.

**Codespaces takes
containerization to
the next level**

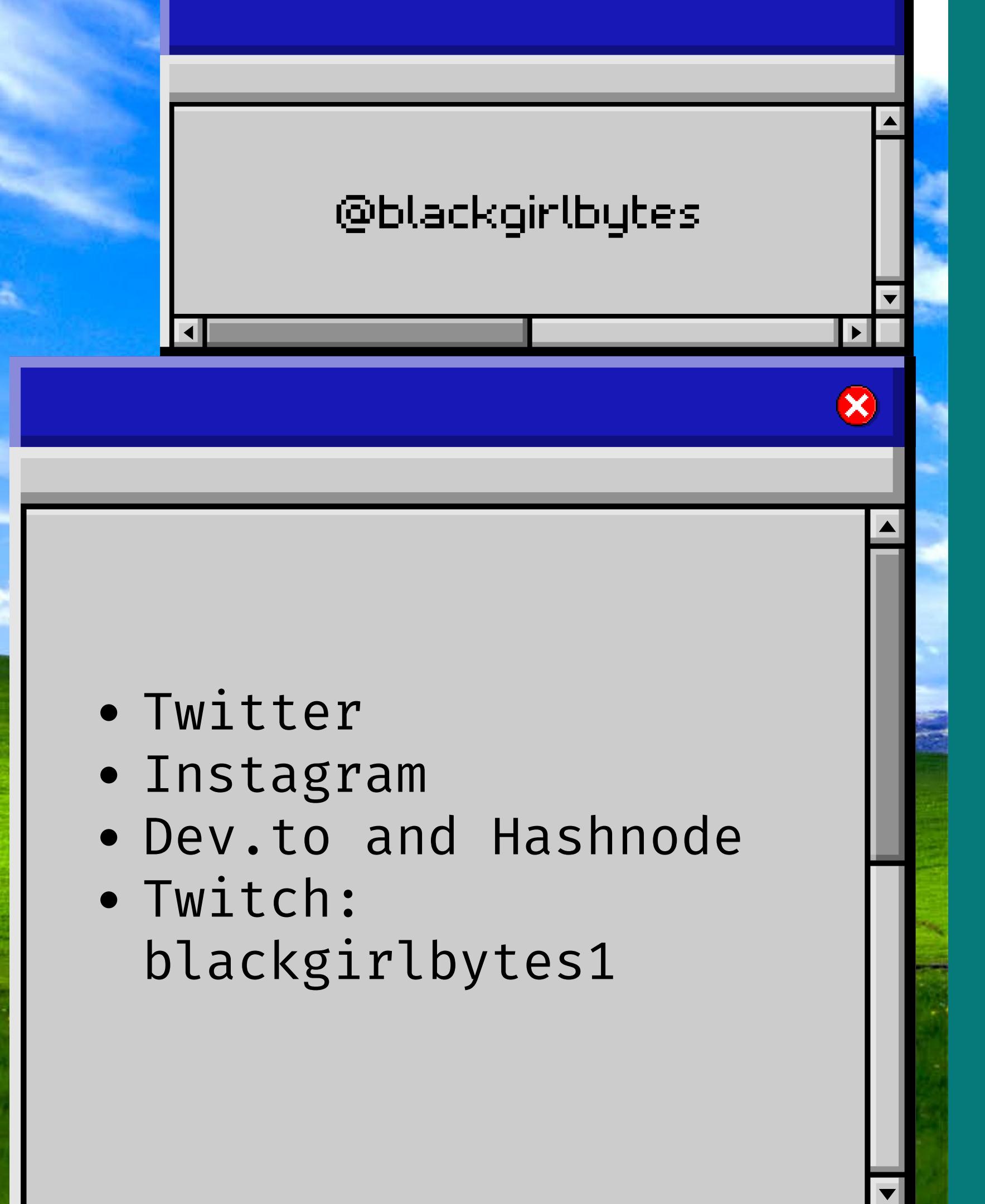


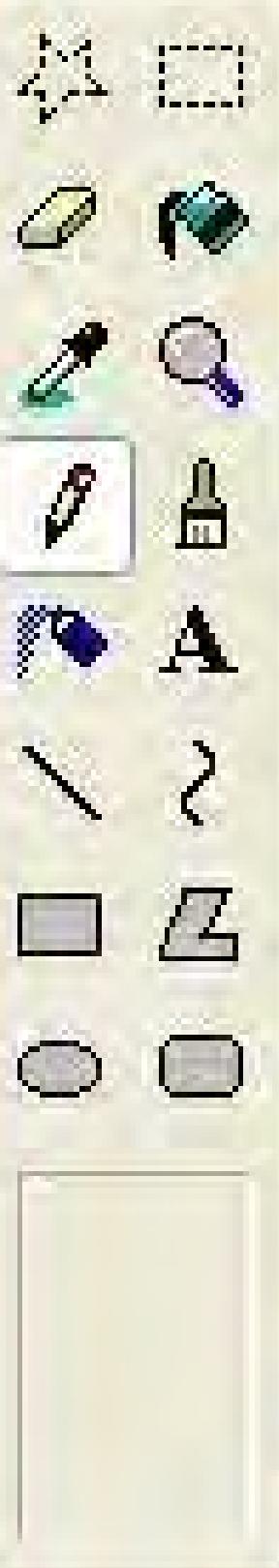
Hi, I'm Rizel
Scarlett!

- Junior Developer Advocate at GitHub
- Software Engineer for ~3 years
- Advisor and Director of G{Code}
- Addicted to social media

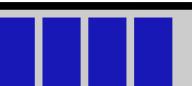


@blackgirlbytes

- 
- Twitter
 - Instagram
 - Dev.to and Hashnode
 - Twitch:
blackgirlbytes1

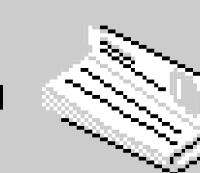
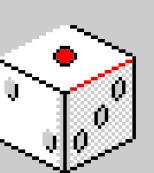
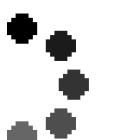


A



Agenda

- What is GitHub Codespaces?
- How it takes development to the next level

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GitHub Codespaces

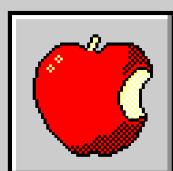


A screenshot of a web browser window. The main content area displays a slide with the following text:

Your fave IDE
(vs Code, JetBrains,
JupyterLab)

but in your browser

The browser window has a blue header bar with a red close button. The address bar and other browser UI elements are visible around the slide content.

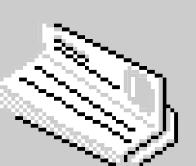
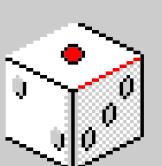


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GitHub Codespaces



When you work in a codespace, the environment you are working in is created using a development container hosted on a virtual machine.

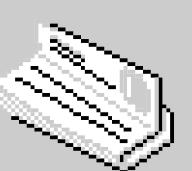
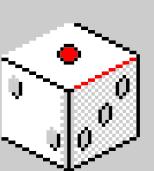


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GitHub Codespaces



GitHub Codespaces allows you to code in a container hosted in the cloud

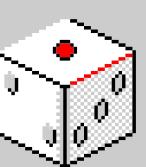


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THE CLOUD



the cloud ==
an environment that
doesn't reside on your
computer but rather on the
internet.



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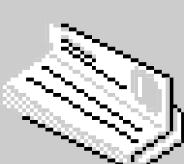
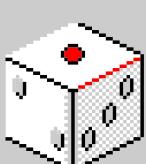
Codespaces is NOT the GitHub Web Editor



Codespaces and the web-based editor

Both the web-based editor and GitHub Codespaces allow you to edit your code straight from your repository. However, both have slightly different benefits, depending on your use case.

	web-based editor	Codespaces
Cost	Free.	Costs for compute and storage. For information on pricing, see " Codespaces pricing ."
Availability	Available to everyone on GitHub.com.	Available for organizations using GitHub Team or GitHub Enterprise Cloud.
Start up	The web-based editor opens instantly with a key-press and you can start using it right away, without having to wait for additional configuration or installation.	When you create or resume a codespace, the codespace is assigned a VM and the container is configured based on the contents of a <code>devcontainer.json</code> file. This set up may take a few minutes to create the environment. For more information, see " Creating a Codespace ."
Compute	There is no associated compute, so you won't be able to build and run your code or use the integrated terminal.	With Codespaces, you get the power of dedicated VM on which you can run and debug your application.
Terminal access	None.	Codespaces provides a common set of tools by default, meaning that you can use the Terminal exactly as you would in your local environment.
Extensions	Only a subset of extensions that can run in the web will appear in the Extensions View and can be installed. For more information, see " Using extensions ."	With Codespaces, you can use most extensions from the Visual Studio Code Marketplace.



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Benefits of GitHub Codespaces



Faster onboarding

Automate the onboarding process with configuration as code



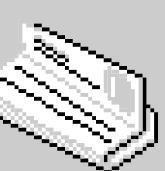
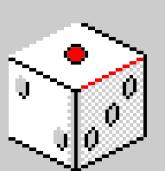
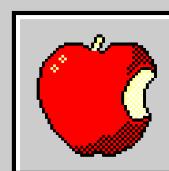
Code from anywhere

Browser based IDE means you can code from anywhere with internet



It works on both machines

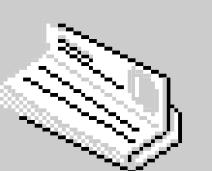
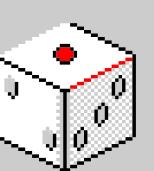
use of containers brings uniformity to developer environments



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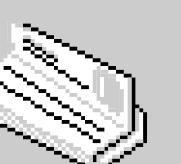
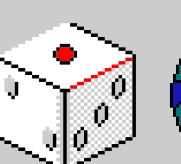
For onboarding new employees



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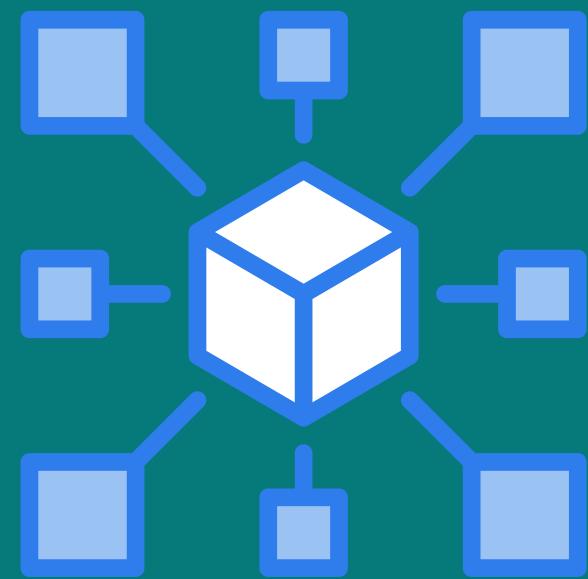
Configuration as Code

- Config files dictate how your app should run on an environment (platform, hardware, etc)
- Managing your config files in a repository with version control
- Using version control
=Centralized location, CI/CD, tracing bugs



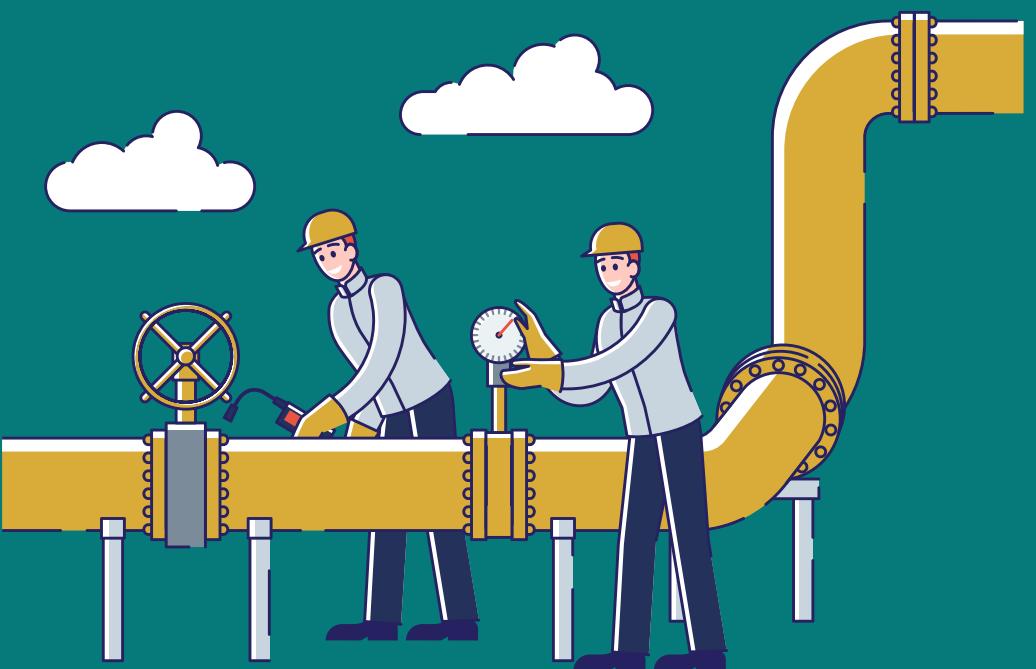
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Benefits of Config as Code



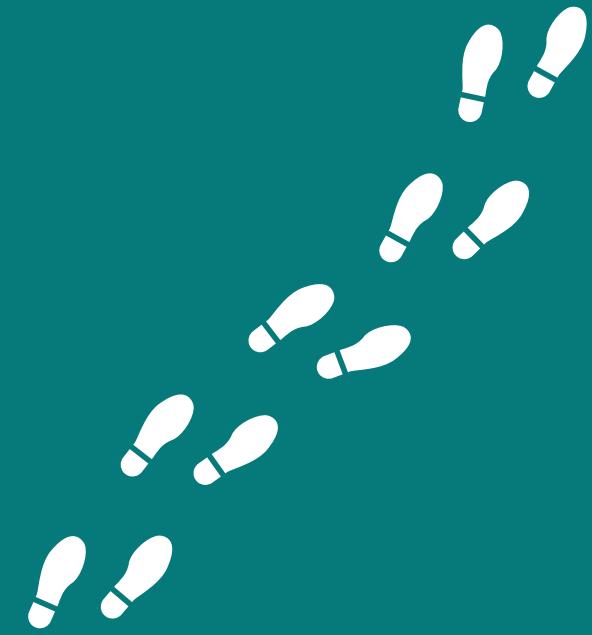
Centralization

One single source of truth



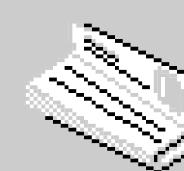
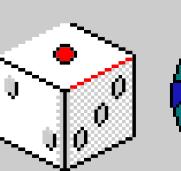
CI/CD

Enables linting, testing, and security scanning on your config files while you run those tests on your code.



Traceability

If bugs happen, you can look through source control to identify what changed



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devcontainer.json

```
{
  "name": "Node.js",
  "build": {
    "dockerfile": "Dockerfile",
    // Update 'VARIANT' to pick a Node version: 18, 16, 14.
    // Append -bullseye or -buster to pin to an OS version.
    // Use -bullseye variants on local arm64/Apple Silicon.
    "args": { "VARIANT": "16-bullseye" }
  },
  // Configure tool-specific properties.
  "customizations": {
    // Configure properties specific to VS Code.
    "vscode": {
      // Add the IDs of extensions you want installed when the container is created.
      "extensions": [
        "dbaeumer.vscode-eslint", // this is the extension id for eslint
        "esbenp.prettier-vscode", // this is the extension id for prettier
        "ms-vsliveshare.vsliveshare", // this is the extension id for live share
      ]
    }
  },
  // Use 'forwardPorts' to make a list of ports inside the container available locally.
  // "forwardPorts": [],
  // Use 'postCreateCommand' to run commands after the container is created.
  // "postCreateCommand": "yarn install",
  // Comment out to connect as root instead. More info: https://aka.ms/vscode-remote/containers/non-root.
  "remoteUser": "node"
}
```

- You can configure a codespace to automatically install
 - extension
 - env variables
 - Install commands
 - Build commands
 - Dockerfile
 - Port forwarding
 - Post-creation commands

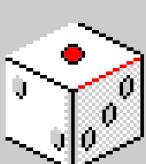


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Dockerfile

```
FROM node:16-bullseye
```

- Dockerfiles are used to automate the installation and configuration of a container.
- Contains a list of commands that the Docker client calls while creating an image.



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docker-compose.yml

```
version: '3.8'

services:
  app:
    build:
      context: ..
      dockerfile: .devcontainer/Dockerfile
    args:
      VARIANT: "3"
      NODE_VERSION: "none"

    volumes:
      - ..:/workspace:cached

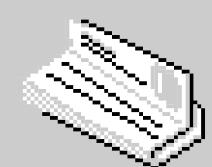
    command: sleep infinity

    network_mode: service:db

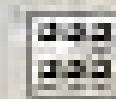
  db:
    image: postgres:latest
    restart: unless-stopped
    volumes:
      - postgres-data:/var/lib/postgresql/data
    hostname: postgres
    environment:
      POSTGRES_DB: my_media
      POSTGRES_USER: example
      POSTGRES_PASSWORD: pass
      POSTGRES_HOST_AUTH_METHOD: trust
    ports:
      - 5432:5432

    volumes:
      postgres-data: null
```

- Useful if you want to run multiple containers
 - run a database and a web server in a Codespace
 - you can use the docker-compose.yml file to run both containers



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Import Clips



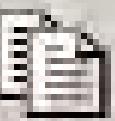
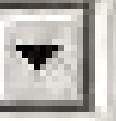
Clips Online



Help



Search for clips: Type one or more words...



Pictures



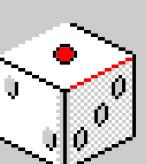
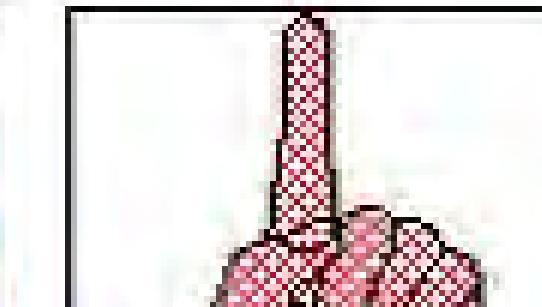
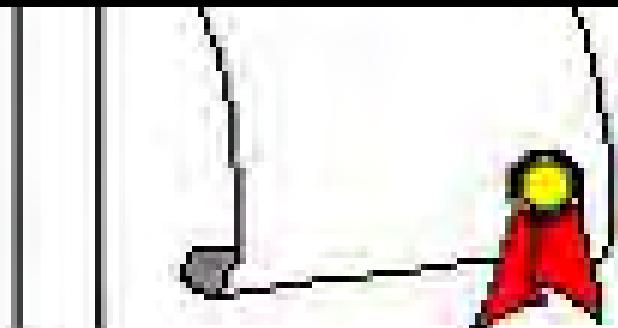
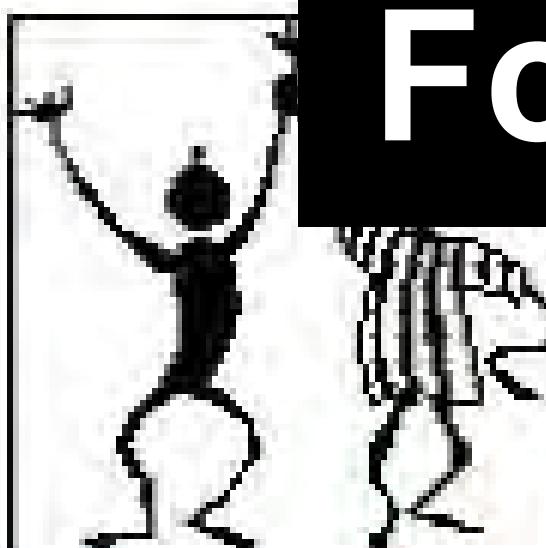
Sounds



Motion Clips

Clips 10 - 49 in Special Occasions

For the coding instructor

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The screenshot shows a Microsoft Edge browser window with the following details:

- Explorer Sidebar:** Contains sections for OPEN EDITORS, GROUP 1 (CodeSwing, index.html), GROUP 2 (index.html), GROUP 3 (# style.css), GROUP 4 (script.js), and CLOCK-CODESPACE-WD... (with files .devcontainer, .vscode, codeswing.json, index.html, LICENSE, main.tour, README.md, script.js, and # style.css).
- CodeSwing Tab:** Shows the file index.html.
- CodeTour Step #2 of 5 (Fix The Broken Clock):** A step in a tour titled "CodeTour Step #2 of 5 (Fix The Broken Clock)". It instructs the user to update the question mark to the number 6 by changing the code from <h1 id="six">?</h1> to <h1 id="six">6</h1>.
- Code Editor:** Displays the HTML, CSS, and JavaScript code for the clock.

HTML:

```
<html>
  <body>
    <div class="clock">
      <h1 class="hour hand hour-hand">12</h1>
      <h1 class="min hand min-hand">?</h1>
      <h1 class="second hand second-hand">?</h1>
    </div>
    <!-- update the question mark to the number 6 -->
    <h1 id="six">?</h1>
  </body>
</html>
```

CSS:

```
# style.css
# style.css > html
 1  html {
 2    background-size:cover;
 3    font-family:'helvetica neue';
 4    text-align: center;
 5    font-size: 10px;
 6  }
 7  h1 {
 8    color: #FFC312;
 9    text-shadow: 2px 2px 4px #000000;
10  }
11  body {
12    /* add your CSS here */
13 }
```

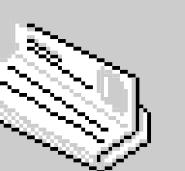
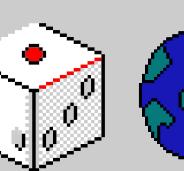
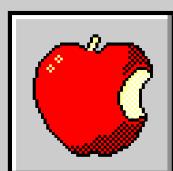
JavaScript:

```
JS script.js > ...
JS script.js > ...
 1  const secondHand = document.querySelector('.second-hand');
 2  const minsHand = document.querySelector('.min-hand');
 3  const hourHand = document.querySelector('.hour-hand');
 4  function setDate() {
 5    const now = new Date();
 6    const seconds = now.getSeconds();
 7    const secondsDegrees = ((seconds / 60) * 360) + 90;
 8    secondHand.style.transform = `rotate(${secondsDegrees}deg)`;
 9    const mins = now.getMinutes();
10    const minsDegrees = ((mins / 60) * 360) + ((seconds/60)*6) + 90;
11    minsHand.style.transform = `rotate(${minsDegrees}deg)`;
12    const hour = now.getHours();
```

I set up a devcontainer.json

```
{} devcontainer.json M X  
.devcontainer > {} devcontainer.json > [ ] extensions  
1  {  
2    "extensions": [  
3      "dbaeumer.vscode-eslint",  
4      "esbenp.prettier-vscode",  
5      "ms-vsliveshare.vsliveshare",  
6      "blackgirlbytes.deploy-to-github-pages",  
7      "tinkertrain.theme-panda",  
8      "codespaces-contrib.codeswing",  
9      "vsls-contrib.codetour",  
10     "streetsidesoftware.code-spell-checker"  
11   ]  
12 }  
13 }
```

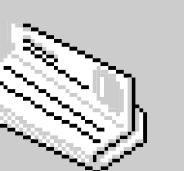
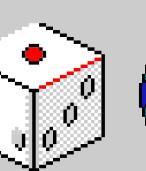
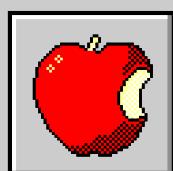
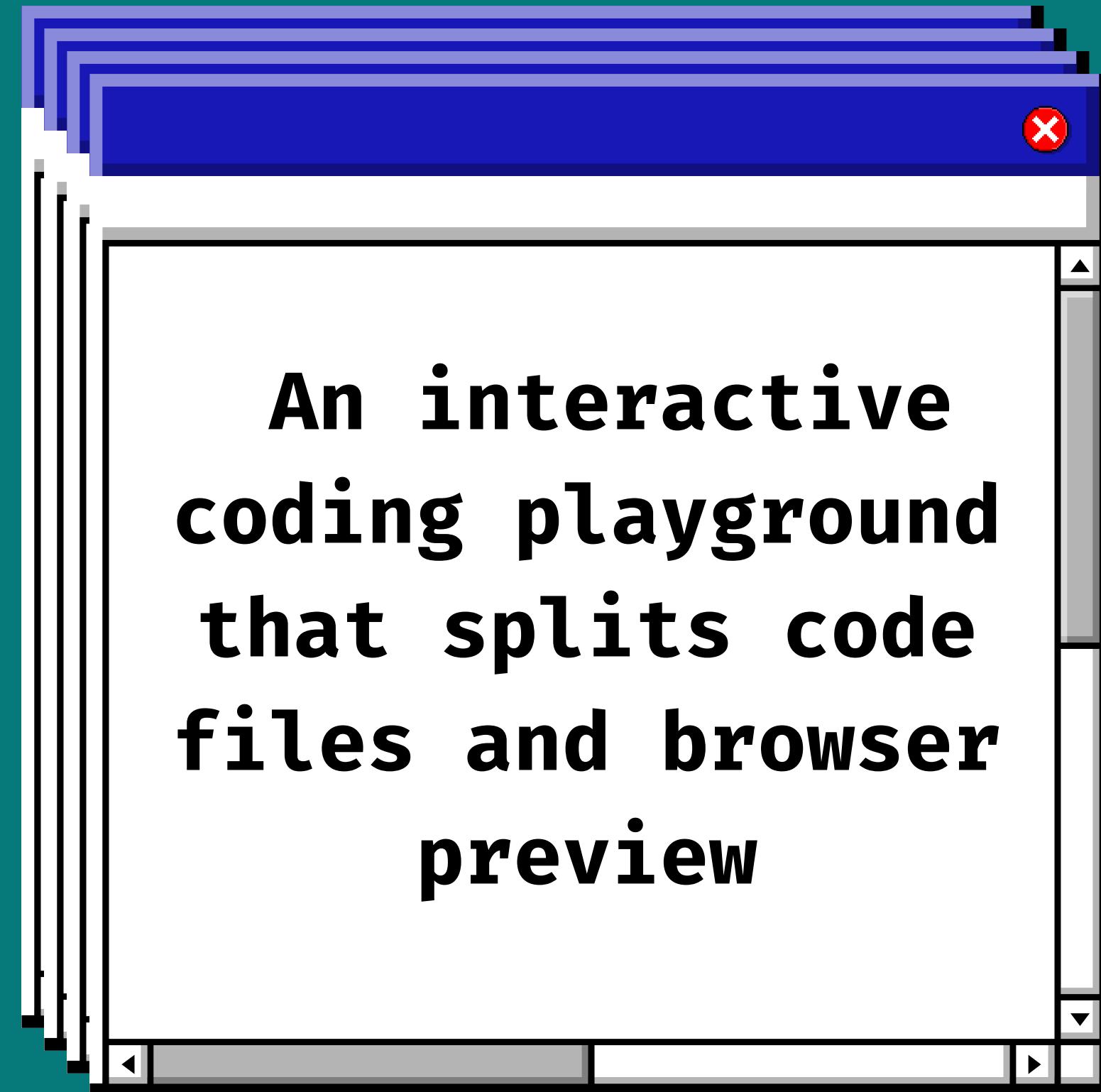
Installed
necessary
extensions



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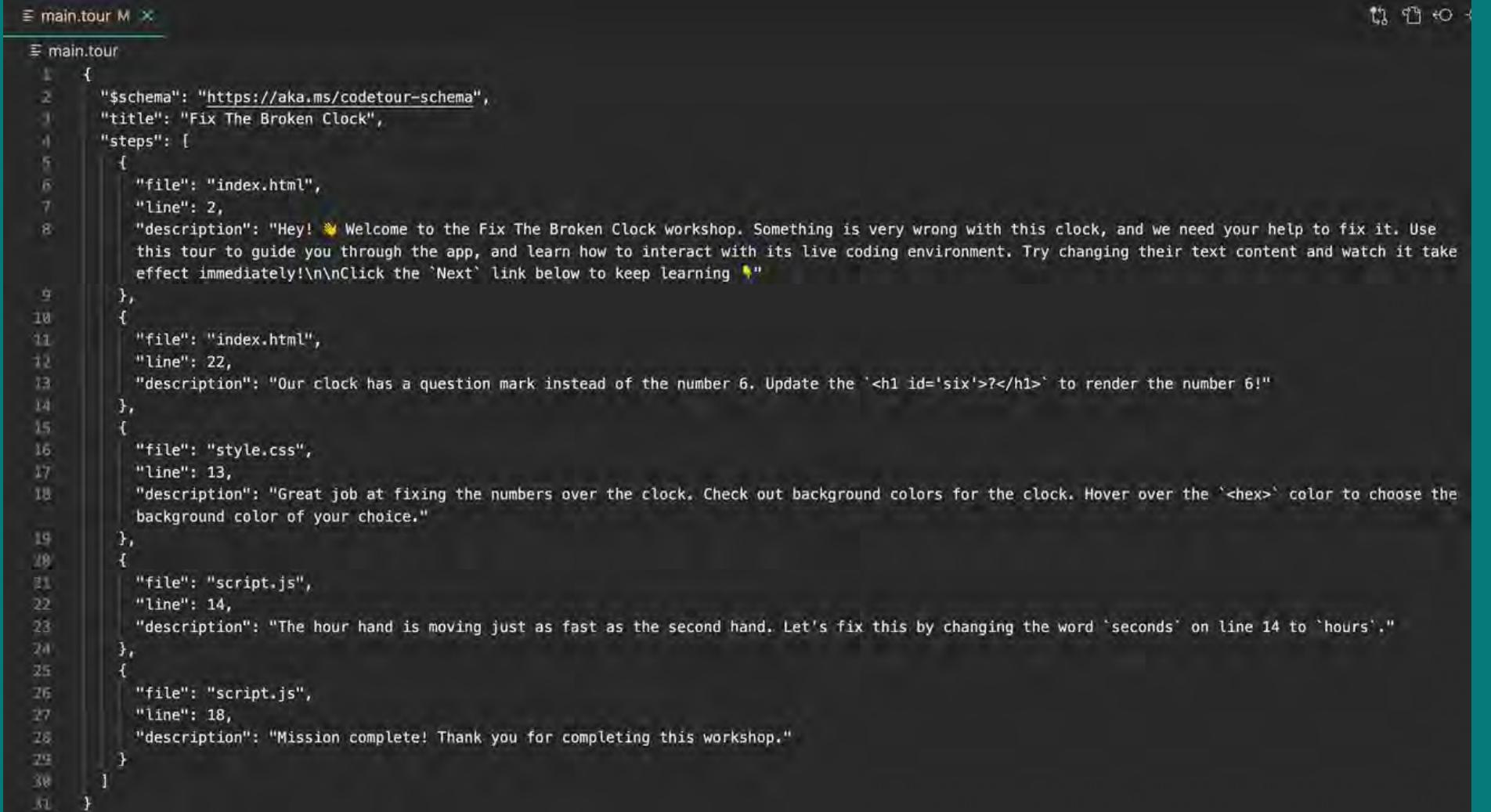
CodeSwing

```
{} codeswing.json M ✘  
---  
{} codeswing.json > ...  
1 {  
2   "scripts": [],  
3   "styles": [],  
4   "layout": "splitRight"  
5 }
```

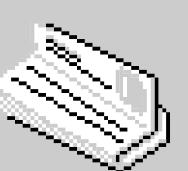
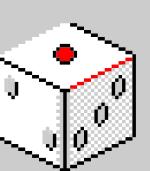
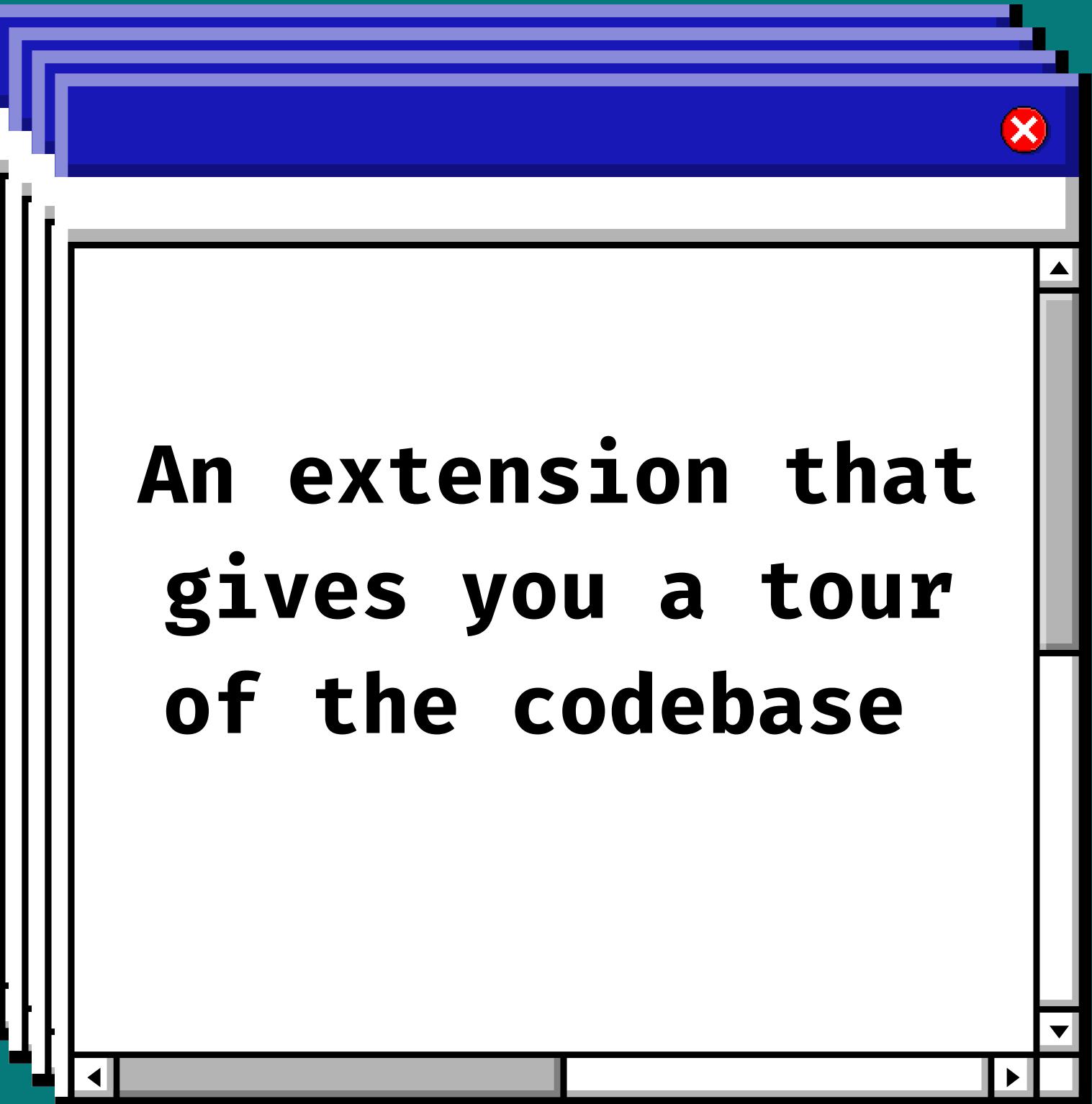


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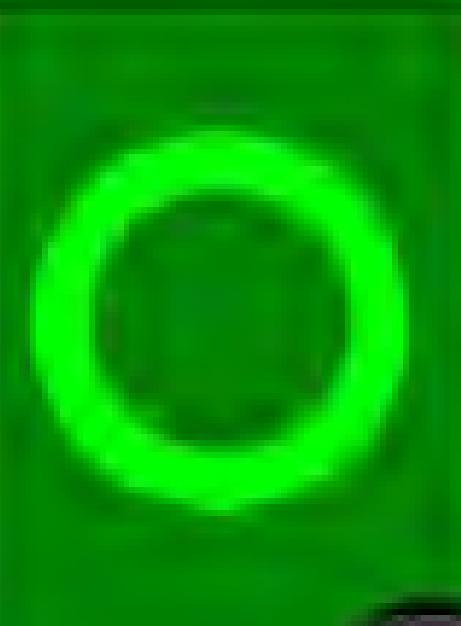
CodeTour



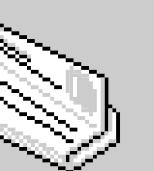
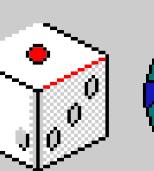
```
main.tour M ×
main.tour
1
2  "$schema": "https://aka.ms/codetour-schema",
3  "title": "Fix The Broken Clock",
4  "steps": [
5    {
6      "file": "index.html",
7      "line": 2,
8      "description": "Hey! 🎉 Welcome to the Fix The Broken Clock workshop. Something is very wrong with this clock, and we need your help to fix it. Use this tour to guide you through the app, and learn how to interact with its live coding environment. Try changing their text content and watch it take effect immediately!\n\nClick the 'Next' link below to keep learning 🎉"
9    },
10   {
11     "file": "index.html",
12     "line": 22,
13     "description": "Our clock has a question mark instead of the number 6. Update the '<h1 id='six'>?</h1>' to render the number 6!"
14   },
15   {
16     "file": "style.css",
17     "line": 13,
18     "description": "Great job at fixing the numbers over the clock. Check out background colors for the clock. Hover over the '<hex>' color to choose the background color of your choice."
19   },
20   {
21     "file": "script.js",
22     "line": 14,
23     "description": "The hour hand is moving just as fast as the second hand. Let's fix this by changing the word 'seconds' on line 14 to 'hours'."
24   },
25   {
26     "file": "script.js",
27     "line": 18,
28     "description": "Mission complete! Thank you for completing this workshop."
29   }
30 }
31 }
```



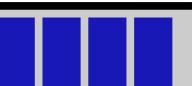
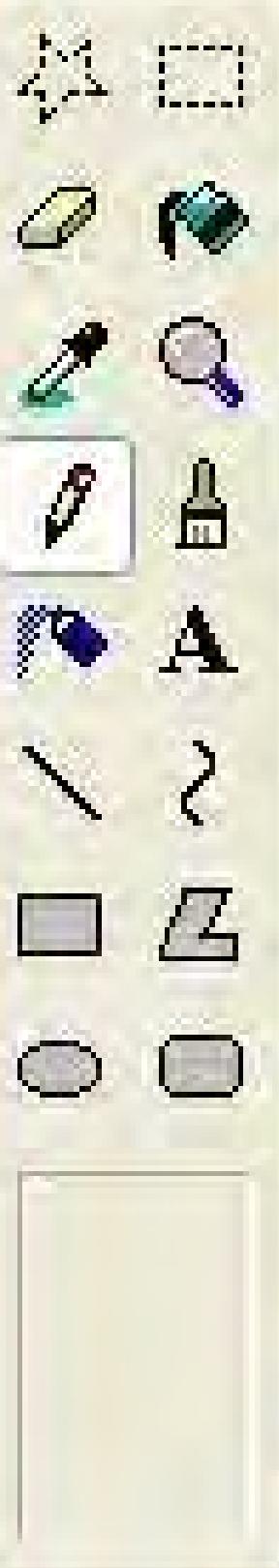
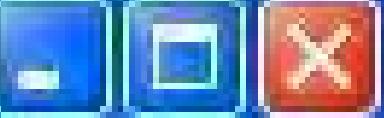
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For the programmer who likes
experimenting



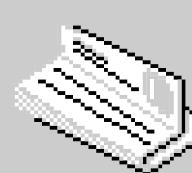
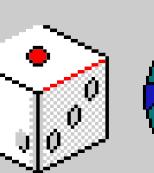
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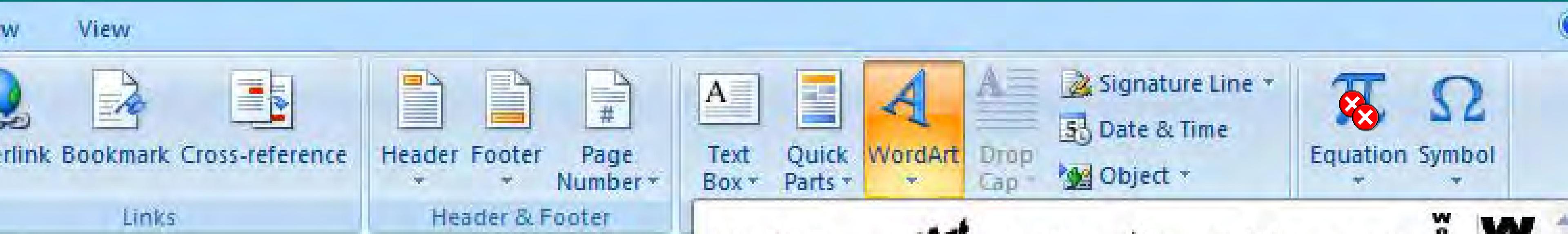


Templates

Try new frameworks
or skip the installation process with

<https://github.com/codespaces/templates>

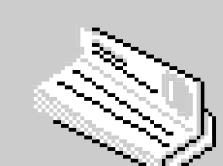
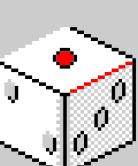




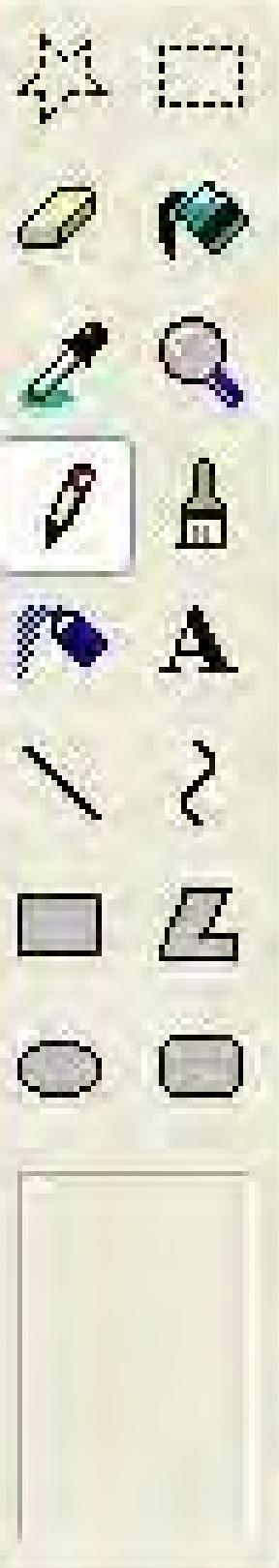
For the pair programmer

Word 2007 WordArt

DropDown



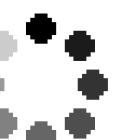
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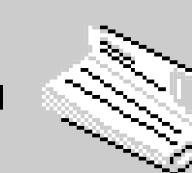
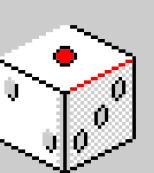
A



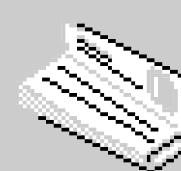
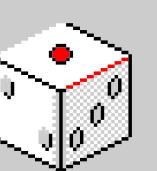
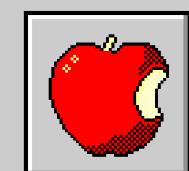
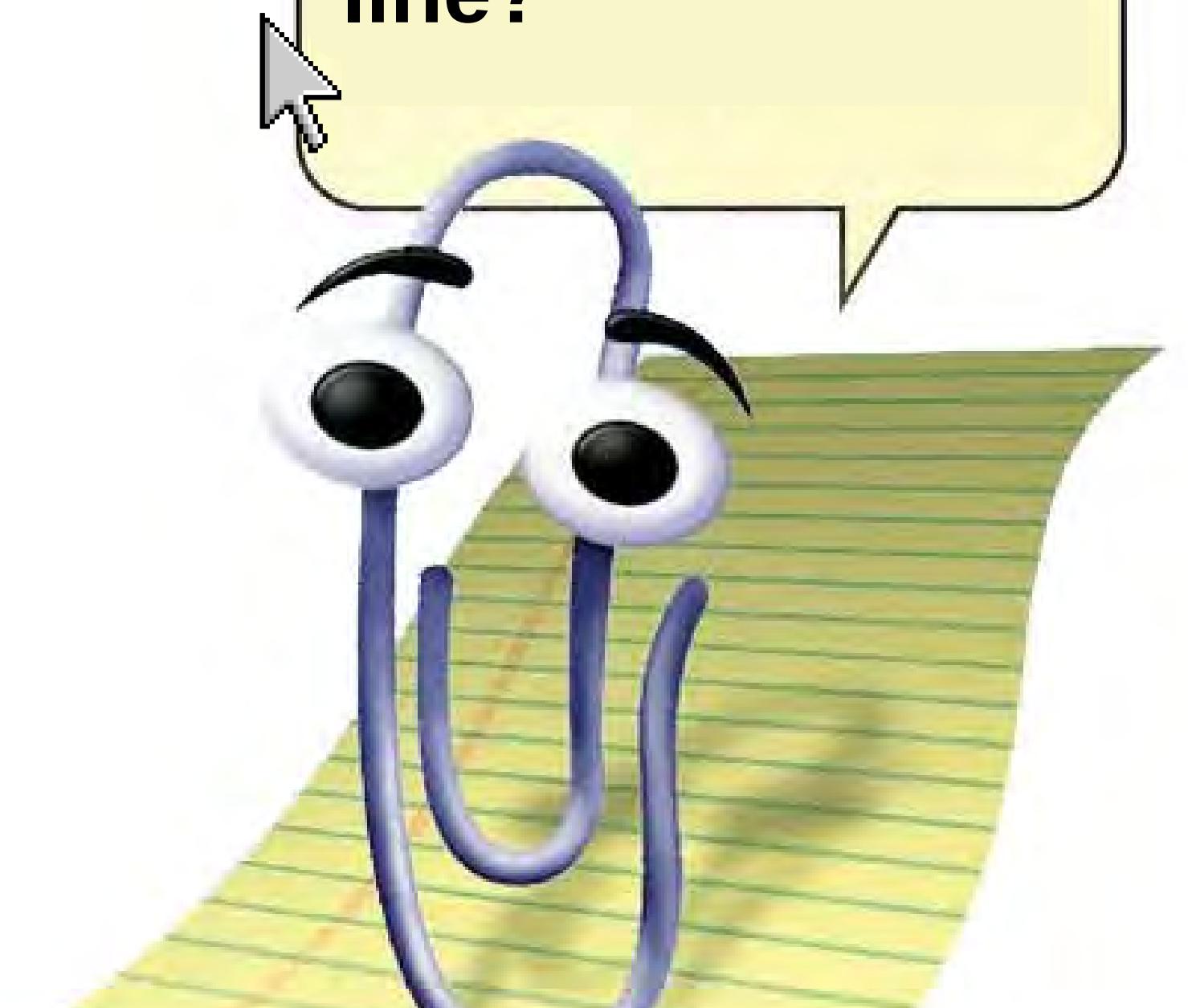
Enable port forwarding



Prove to your teammate that it DOES work on your machine



Did you know you
could manage
codespaces from
the command
line?



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rize1@Rizels-MacBook-Pro-2 ~ %

Codespaces GitHub Device Activation

github.com/codespaces

Github Content Hacks Gifts Open Source Info GCode Call for Pullrequests Schedule Acpoint

Owned by blackgirlbytes

blackgirlbytes/codespaces-forward-port

automatic doodle

main* Uncommitted changes

4-core • 1.27 GB • Last used 2 days ago

...

blackgirlbytes/oauth-github-nextjs

potential acorn

main* Uncommitted changes

4-core • 2.98 GB • Last used 4 days ago

...

blackgirlbytes/add-to-maintainer-group

fuzzy adventure

main* Uncommitted changes

2-core • 1.89 GB • Last used 11 days ago

...

Created from primer/react-template

didactic capybara

2-core • Retrieving... • Last used 18 days ago

...

blackgirlbytes/inviteCollaboratorAction

glowing space palm-tree

main* Uncommitted changes

2-core • Retrieving... • Expiring in 2 days

...

Owned by galaxy-bytes

```
-- zsh -- zsh (figterm) - zsh
rize1@Rizels-MacBook-Pro-2 ~ % gh codespace create
-r galaxy-bytes/pinkmoon
```

galaxy-bytes Codespaces Using GitHub Codespaces will ...
x x +

github.com/codespaces

GITHUB Content Focus Gifs Open Source Img GCode Call for Presentations Schedule Appoint...

blackgirlbytes/add-to-maintainer-group
fuzzy adventure
main* Uncommitted changes.

2-core • Last used 11 days ago ...

Created from primer/react-template
didactic capybara

2-core • Last used 18 days ago ...

blackgirlbytes/inviteCollaboratorAction
glowing space palm-tree
main* Uncommitted changes.

2-core • Expiring in 2 days ...

Owned by galaxy-bytes

galaxy-bytes/stable-diffusion
cuddly space pancake
main* Uncommitted changes.

6-core (1 GPU) • Last used about 20 hours ago ...

Owned by github

Created from github/codespaces-jupyter
opulent train

4-core • Last used about 20 hours ago ...

```
-- zsh -- zsh (figterm) - zsh
rize1@Rizels-MacBook-Pro-2 ~ % gh codespace create
-r galaxy-bytes/pinkmoon -b main
  ↵ Codespaces usage for this repository is paid for by galaxy-bytes
? Choose Machine Type: 2 cores, 4 GB RAM, 32 GB storage
blackgirlbytes-upgraded-potato-5vjp466p4rcpgwv
rize1@Rizels-MacBook-Pro-2 ~ %
```

The screenshot shows a web browser window with three tabs open:

- galaxy-bytes
- Codespaces
- Using GitHub Codespaces will ...

The main content area displays a list of codespaces:

- fuzzy adventure**
Created from primer/react-template
main · Uncommitted changes.
2-core · Last used 11 days ago
- didactic capybara**
Created from primer/react-template
main · Uncommitted changes.
2-core · Last used 18 days ago
- glowing space palm-tree**
Created from primer/react-template
main · Uncommitted changes.
2-core · Expiring in 2 days
- Owned by galaxy-bytes**
- upgraded potato**
galaxy-bytes/pinkmoon
main · No changes.
2-core · Active
- cuddly space pancake**
galaxy-bytes/stable-diffusion
main · Uncommitted changes.
6-core (1 GPU) · Last used about 20 hours ago

A modal dialog on the left side of the screen is titled "Choose Machine Type" and displays the following options:

- 2 cores, 4 GB RAM, 32 GB storage
- 4 cores, 8 GB RAM, 64 GB storage
- 6 cores, 12 GB RAM, 96 GB storage
- 8 cores, 16 GB RAM, 128 GB storage
- 10 cores, 20 GB RAM, 160 GB storage
- 12 cores, 24 GB RAM, 192 GB storage
- 14 cores, 28 GB RAM, 224 GB storage
- 16 cores, 32 GB RAM, 256 GB storage
- 18 cores, 36 GB RAM, 288 GB storage
- 20 cores, 40 GB RAM, 320 GB storage

-- zsh -- zsh (figterm) - zsh

rize1@Rizels-MacBook-Pro-2 ~ % gh codespace delete
-c CODESPACE-NAME

galaxy-bytes Codespaces Using GitHub Codespaces with +

blackgirlbytes-upgraded-potato-5vjp466p4rcpgwv

GitHub Content Hacks Gifs Open Source Info GCode Call for Pull Requests Schedule Appoint...

blackgirlbytes/add-to-maintainer-group
fuzzy adventure
main* Uncommitted changes. 2-core • Last used 11 days ago ...

Created from primer/react-template
didactic capybara 2-core • Last used 18 days ago ...

blackgirlbytes/inviteCollaboratorAction
glowing space palm-tree 2-core • Expiring in 2 days ...
main* Uncommitted changes.

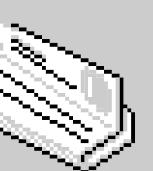
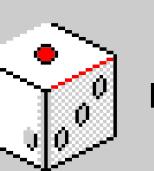
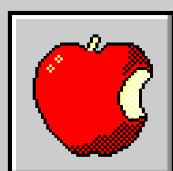
Owned by galaxy-bytes

galaxy-bytes/pinkmoon
memorable-name 2-core • Active ...
main No changes

galaxy-bytes/stable-diffusion
cuddly space pancake 6-core (1 GPU) • Last used about 20 hours ago ...
main* Uncommitted changes.



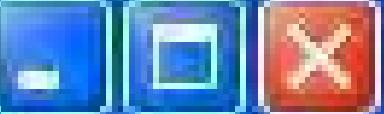
For the AI practitioner



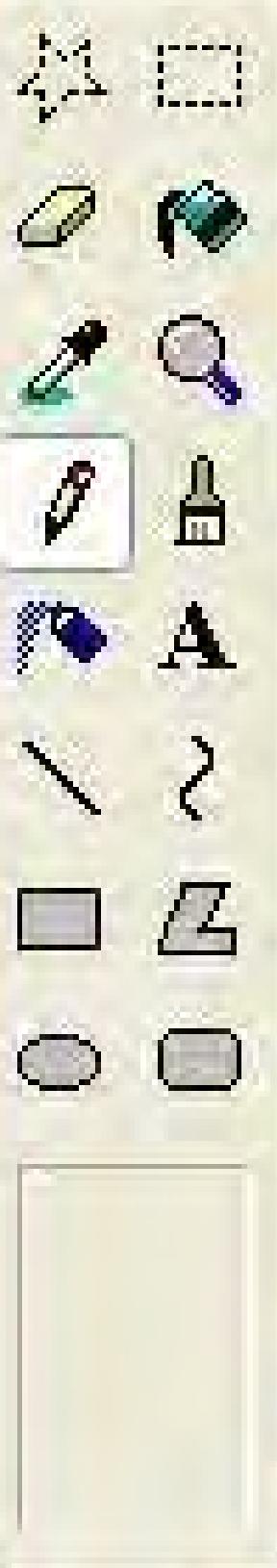
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untitled - Paint



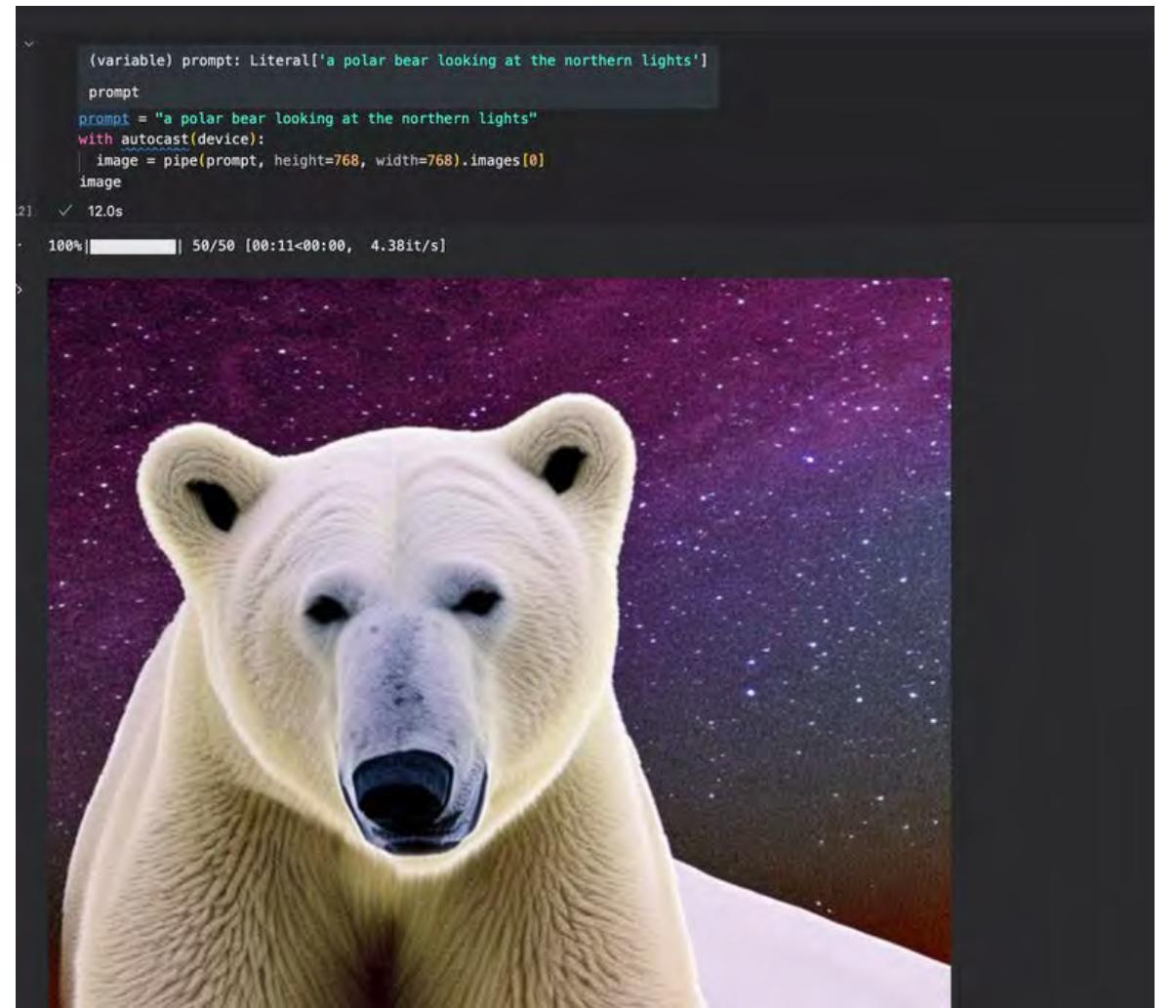
File Edit View Image Colors Help



Update prompt and run the cell to create art!

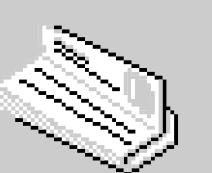
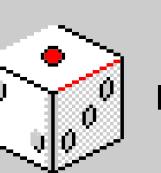
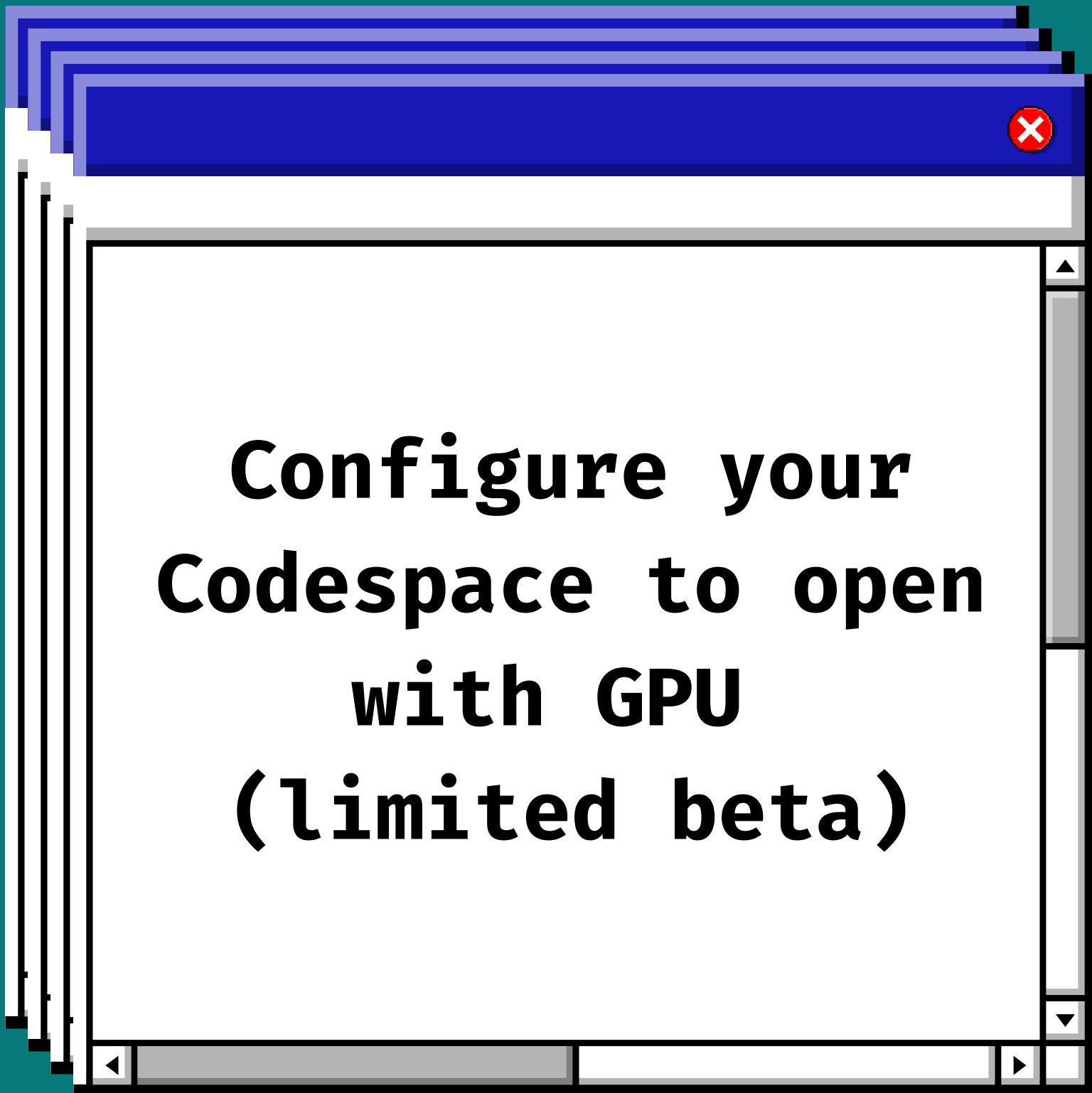
```
from torch import autocast
# Change prompt for image here!
prompt = "a cartoon black girl with cotton candy hair and a pink dress standing in front of a pink sky with cotton candy clouds"
with autocast(device):
    image = pipe(prompt, height=768, width=768).images[0]
image
```

13.4s
100% | 50/50 [00:11<00:00, 4.39it/s]



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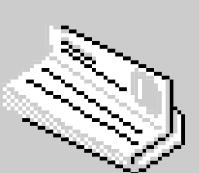
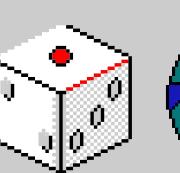
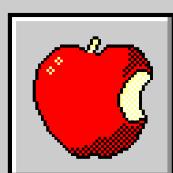
GPU-powered



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Hugging Face

A screenshot of a GitHub repository settings page. The left sidebar shows navigation options: General, Access, Collaborators and teams, Moderation options, Code and automation, Branches, Tags, Actions, Webhooks, Environments, Codespaces, and Pages. The main area is titled "Codespaces secrets". It contains a note: "Secrets are environment variables that are encrypted. Anyone with collaborator access to this repository can use these secrets for Codespaces." Below this is a "Repository secrets" section with a single entry: "HUGGING FACE TOKEN" (updated 2 hours ago). At the bottom is an "Organization secrets" section with the message "No organization secrets have been authorized for this repository." A green "New repository secret" button is located at the top right of the main area.



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stable-diffusion [Codespaces]

EXPLORER OPEN EDITORS STABLE-DIFFUSION [CODESPACES] Python 3

[Preview] README.md Quokka: What's New stable-diffusion-v2.ipynb

notebooks > stable-diffusion-v2.ipynb > Stable Diffusion

+ Code + Markdown | Run All | Clear Outputs of All Cells | Outline ...

Stable Diffusion 🎨

Stable Diffusion is a text-to-image latent diffusion model created by the researchers and engineers from CompVis, Stability AI, and LAION. It's trained on 512x512 images from a subset of the LAION-5B database. This model uses a frozen CLIP ViT-L/14 text encoder to condition the model on text prompts. With its 860M UNet 123M text encoder, the model is relatively lightweight and runs on a GPU with at least 10GB VRAM.

Getting Started

Install this notebook's requirements and download the pre-trained model from Hugging Face.

PROBLEMS DEBUG CONSOLE TERMINAL PORTS JUPYTER GITLENS

OUTPUT TERMINAL

Welcome to Codespaces! You are on our default image.
It includes runtimes and tools for Python, Node.js, Docker, and more.
See the full list here: <https://aka.ms/ghcs-default-image>
Want to use a custom image instead? Learn more here: <https://aka.ms/configure-codespace>

To explore VS Code to its fullest, search using the Command Palette (Command + Shift + P or F1).

Edit away, run your app as usual, and we'll automatically make it available for you to access.

```
@blackgirlbytes ~ /workspaces/stable-diffusion (main) $
```

OUTLINE TIMELINE

Wallaby.js core v1.0.1372 has been successfully installed.

Jupyter Server: Local Cell 1 of 8 Layout: U.S. Show All

windows screens...gif 1713160726-23...mp4

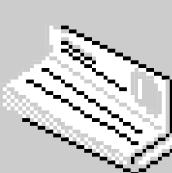
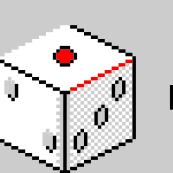


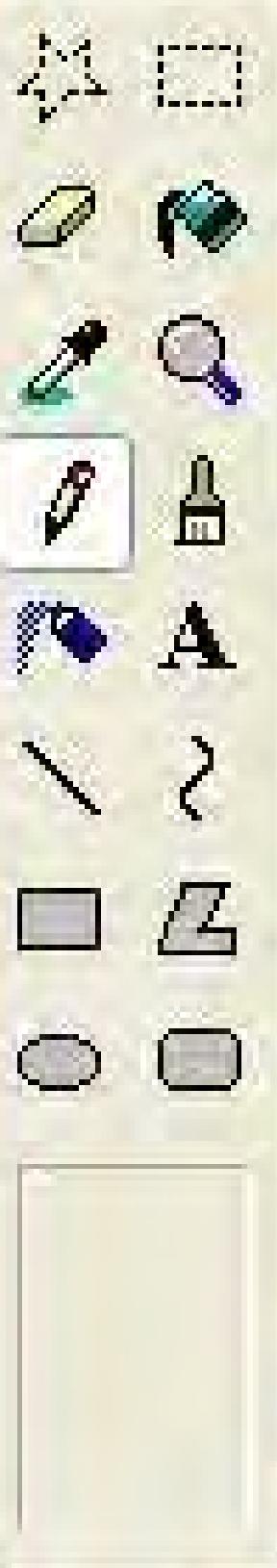
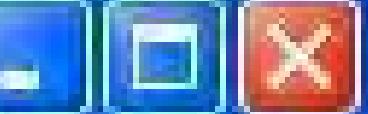
A

Recap



- Containers help you standardize environments
- With GitHub Codespaces you can:
 - streamline onboarding
 - code from anywhere
 - standardize environments
 - use templates
 - share forwarded ports
 - perform Data Science and Machine Learning tasks





A

Thank you!

