Session 01

Web Programming

Overview of web development

Instructors

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SOCIETE GENERALE

Uprizon
A bold company

Present yourself

- Academic background
- Alternance / Company
- Career projection
- Experience in web development
- Familiarity with Angular, Spring Boot and Git

Grading

20%

TP

Building a blogging platform

80%

Final project

Building another web application

Resources

Google Drive

All slides can be found on this link

tinyurl.com/web-dauphine

Sessions

Session #01	Overview of Web development		📖	
Session #02	Building a frontend application with Angular	💻	📖	
Session #03	Building a backend application with Spring Boot	💻	📖	
Session #04	Implementing RESTful API	💻	📖	
Session #05	Hands on frontend (Grid, Navigation, Form)	💻	📖	
Session #06	Bootstrap and unit testing in frontend	💻	📖	
Session #07	Communication Frontend <-> Backend	💻	📖	
Session #08	Advanced topics (Devops, Monitoring, Authentication, …) & Final project		📖	
Session #09	Final project with focus on Backend	💻		
Session #10	Final project with focus on Frontend	💻		

Technical stack

Database

PostgreSQL

Backend

Java 21
Spring Boot 3.2.x

Frontend

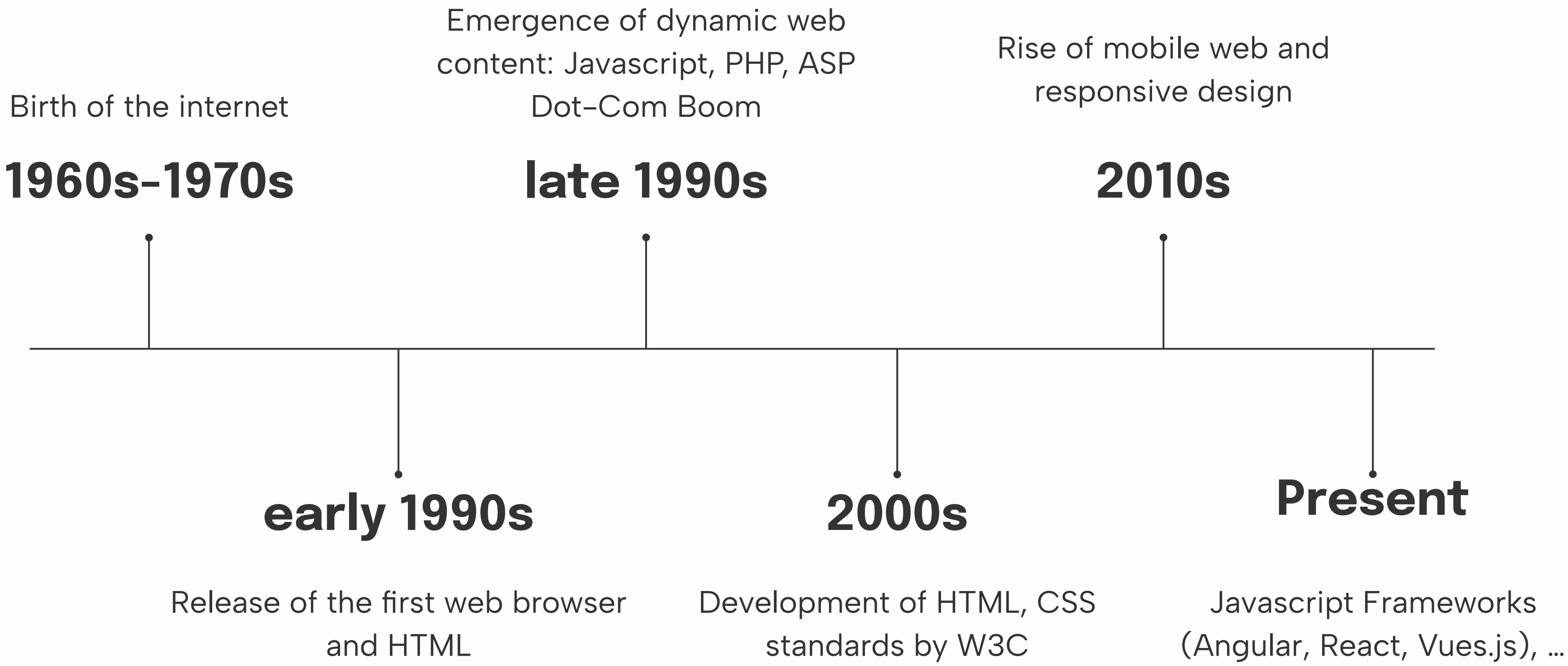
Typescript
Angular 17

01

Architecture

Some key milestones in web development and evolution of web architecture

Web’s milestones



1960s-1970s

Birth of the internet

early 1990s

Release of the first web browser and HTML

late 1990s

Emergence of dynamic web content: Javascript, PHP, ASP
Dot-Com Boom

2000s

Development of HTML, CSS standards by W3C

2010s

Rise of mobile web and responsive design

Present

Javascript Frameworks (Angular, React, Vues.js), …

Static website

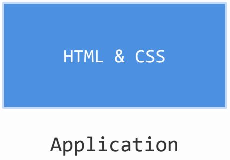
In the early days of the web, website were primarily static, consisting of **HTML** files with basic styling using **CSS**.

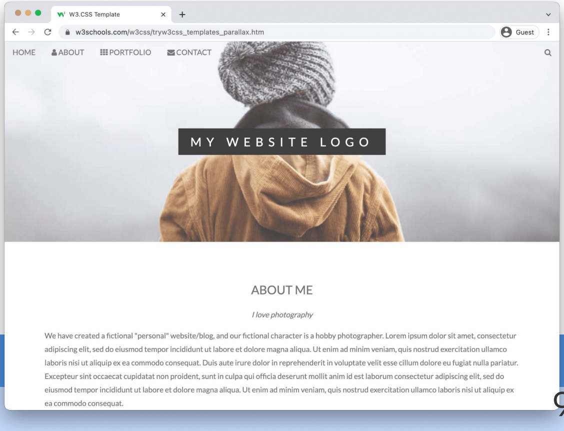
Content was **hardcoded** into HTML files, and updating content required **manual editing of the HTML**.

Technical stack : HTML, CSS

Use cases : Informational websites, landing pages, …

Static website architecture





ABOUT ME

I love photography

We have created a fictional "personal" website/blog, and our fictional character is a hobby photographer. Lorem ipsum dolor sit amet, consectetur adipiscing elit, sed do eiusmod tempor incididunt ut labore et dolore magna aliqua. Ut enim ad minim veniam, quis nostrud exercitation ullamco laboris nisi ut aliquip ex ea commodo consequat. Duis aute irure dolor in reprehenderit in voluptate velit esse cillum dolore eu fugiat nulla pariatur. Excepteur sint occaecat cupidatat non proident, sunt in culpa qui officia deserunt mollit anim id est laborum consectetur adipiscing elit, sed do eiusmod tempor incididunt ut labore et dolore magna aliqua. Ut enim ad minim veniam, quis nostrud exercitation ullamco laboris nisi ut aliquip ex ea commodo consequat.

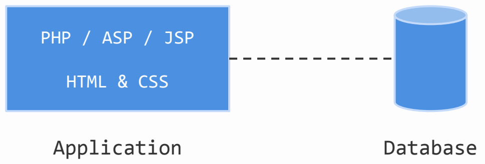
Dynamic website with Database

Server-side scripts allowed websites to generate **dynamic content** by **querying databases** for data and rendering it on the fly.

This led to the rise of dynamic web applications where users could **interact with content**, **submit forms**, and receive personalized responses.

Technical stack: HTML, CSS, PHP, ASP, JSP

Dynamic website architecture



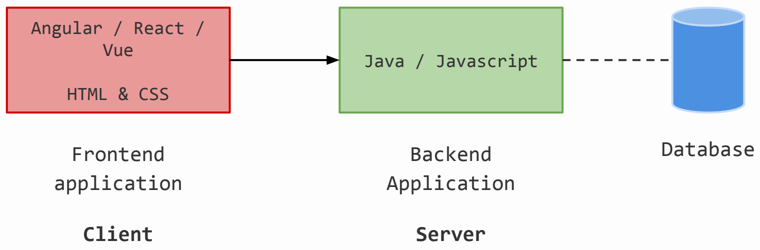
Client-Server (Monolithic)

AJAX (Asynchronous JavaScript and XML) revolutionized web development by enabling **asynchronous communication** between the client and server.

This allowed for more interactive and responsive web applications where **data could be fetched from the server** without reloading the entire page.

Client-side scripting languages like **JavaScript** became more prominent, enabling richer user experiences.

Client-Server architecture

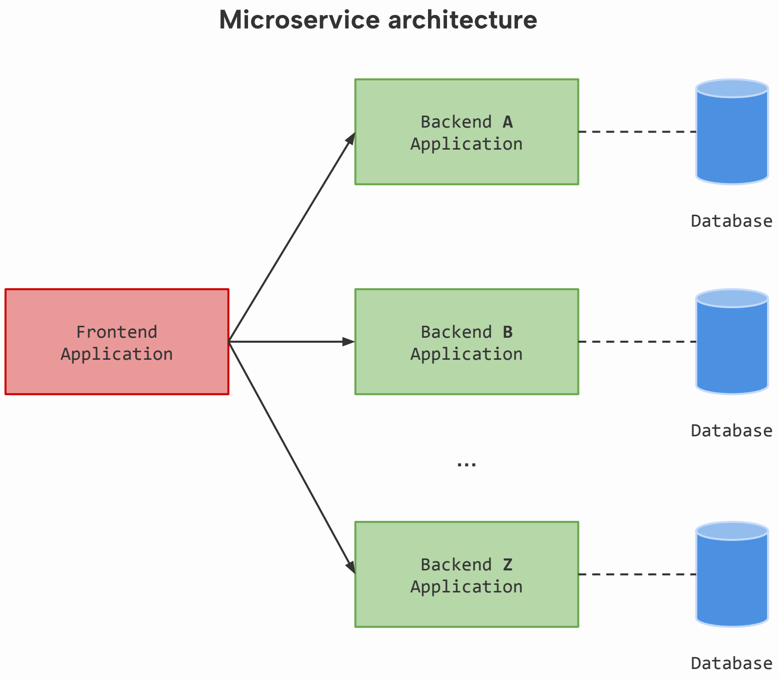


Microservice architecture

As web applications grew in **complexity** and **scale**, the monolithic architecture became less suitable for maintaining and scaling applications.

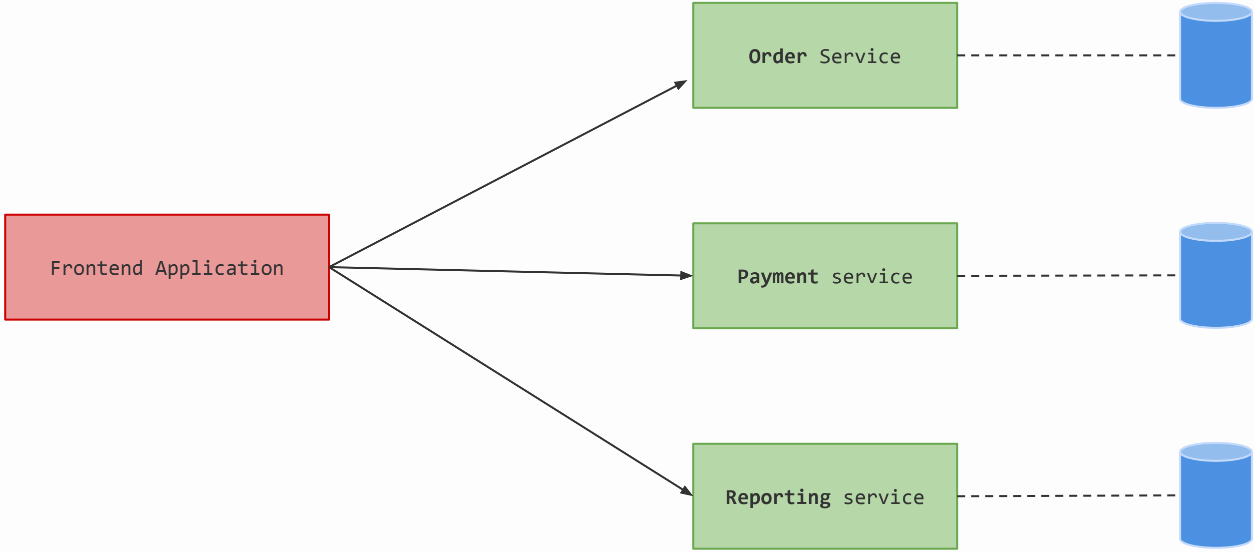
Microservices architecture emerged as an alternative approach, **breaking down applications into smaller**, **loosely coupled services** that can be developed, deployed, and scaled independently.

Each microservice **focuses on a specific business** function and **communicates** with others **through APIs**



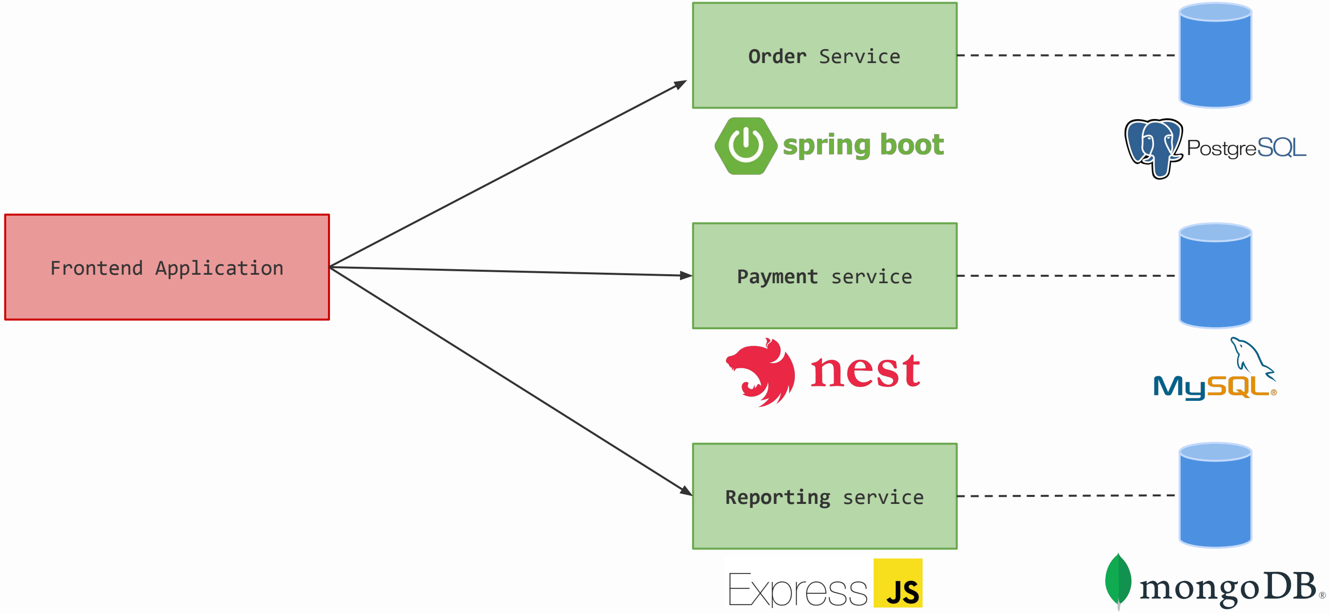
Microservice architecture

Each microservice focuses on a **specific business function**



Microservice architecture

It allows us to break down applications into **smaller** and **independent** unit



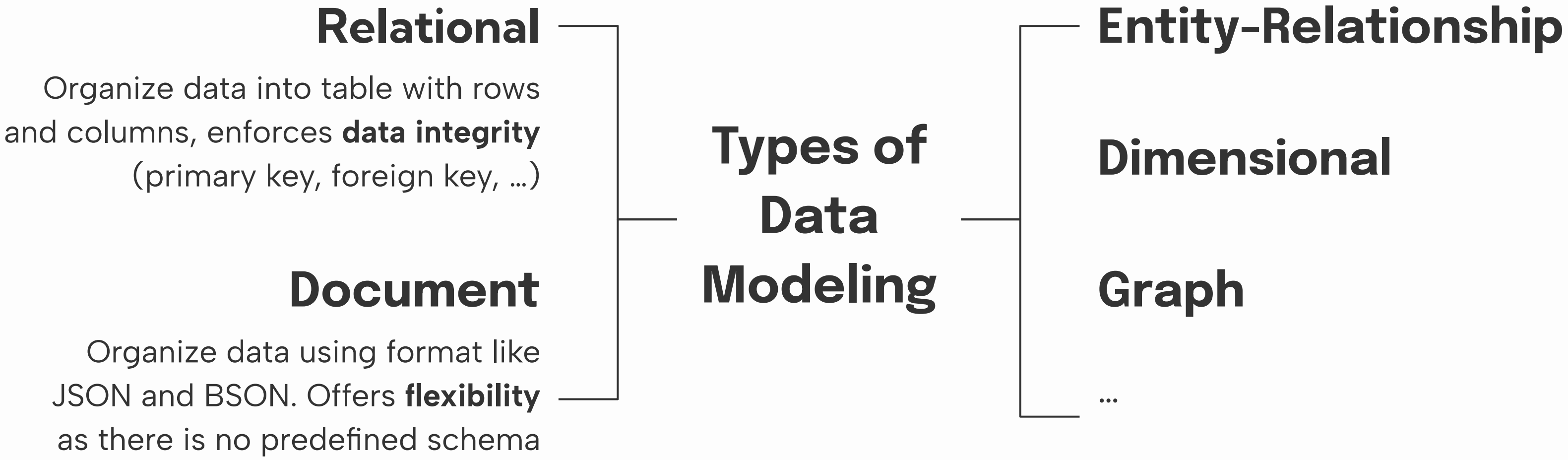
02

Data Modeling

Relational data modeling

What is a data model ?

A collection of **metadata** that represents the logical organization, shape and meaning of data



Relational

Organize data into table with rows and columns, enforces **data integrity** (primary key, foreign key, …)

Document

Organize data using format like JSON and BSON. Offers **flexibility** as there is no predefined schema

Types of Data Modeling

Entity-Relationship

Dimensional

Graph

…

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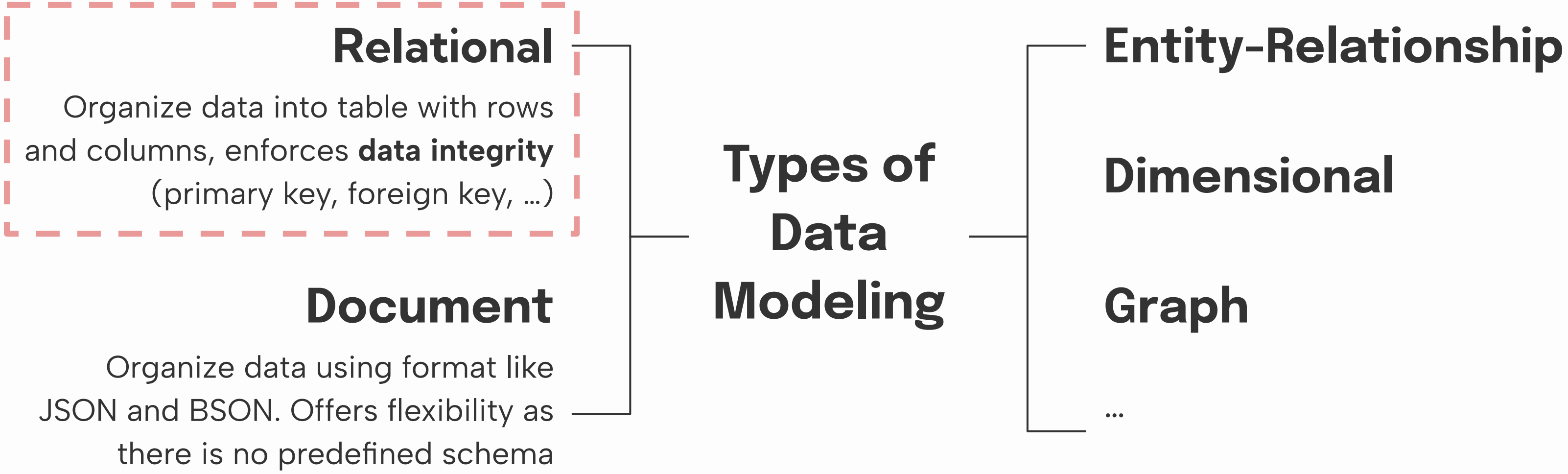

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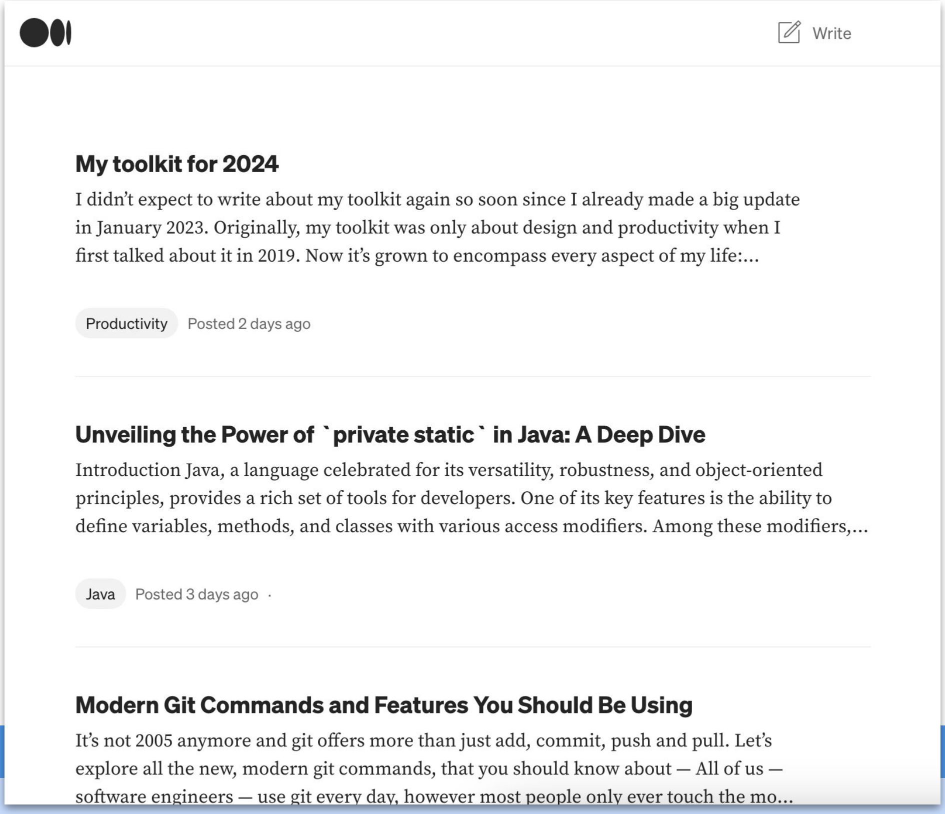
Modelisation of a blogging platform



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Productivity Posted 2 days ago

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Java Posted 3 days ago ·

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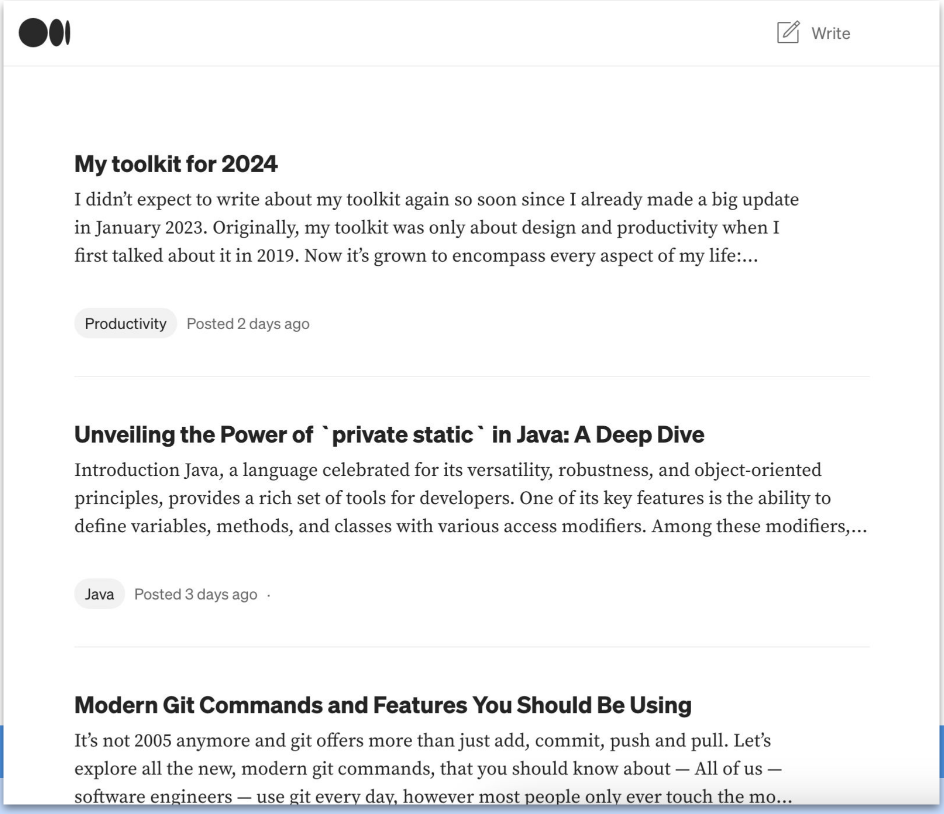

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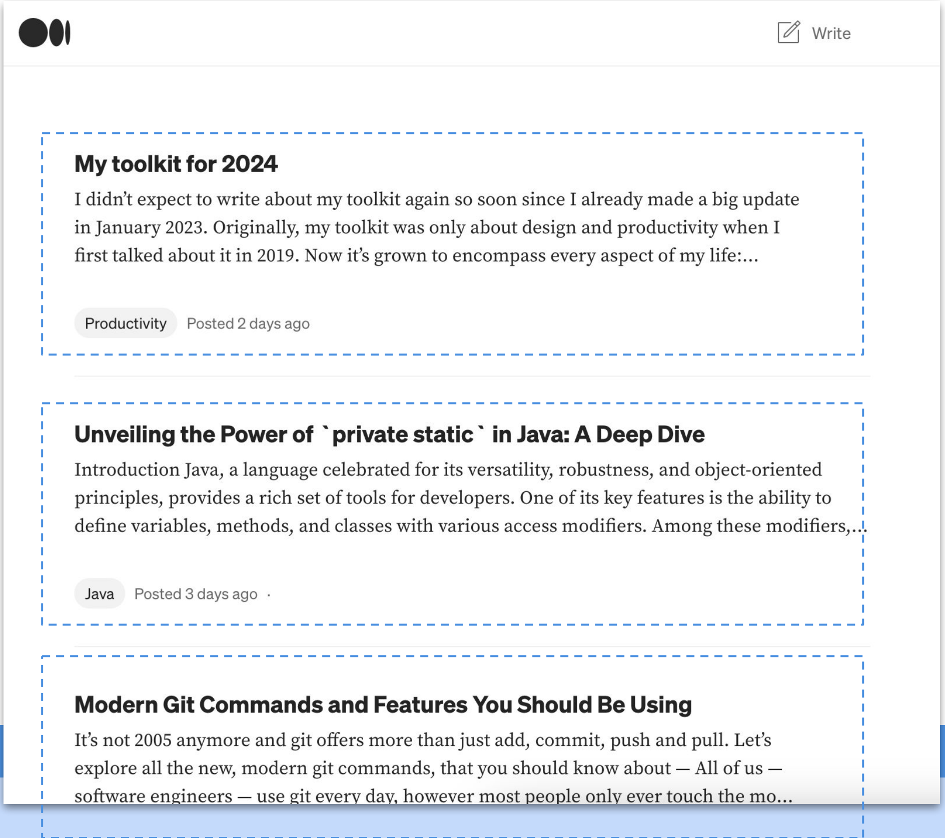

Write

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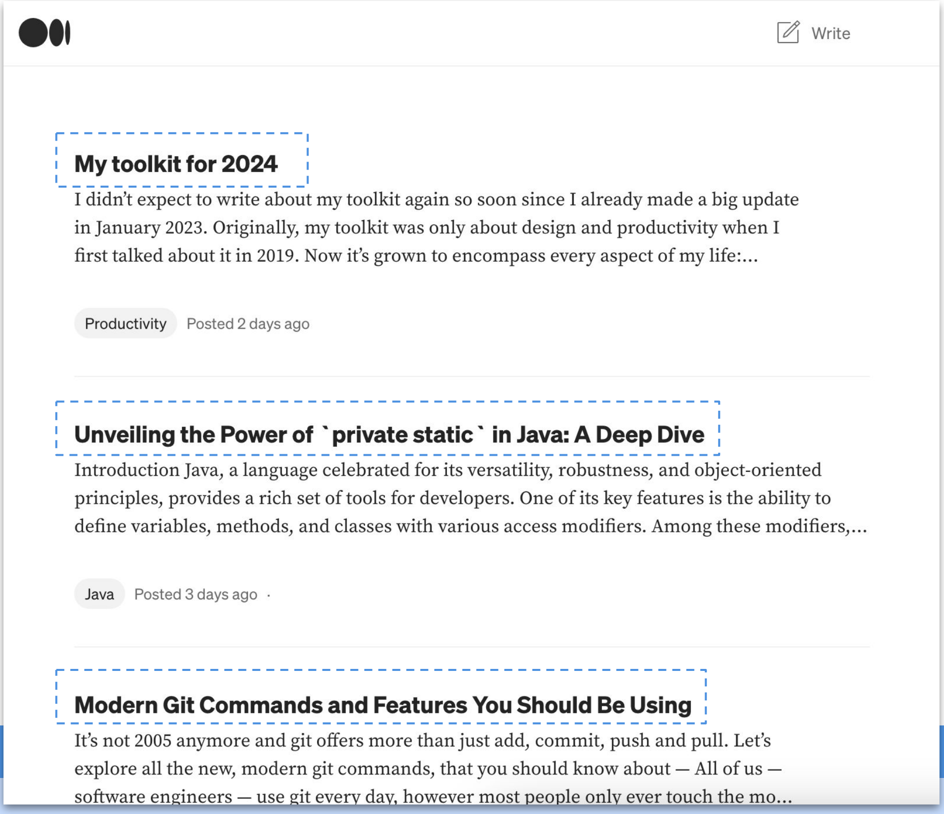

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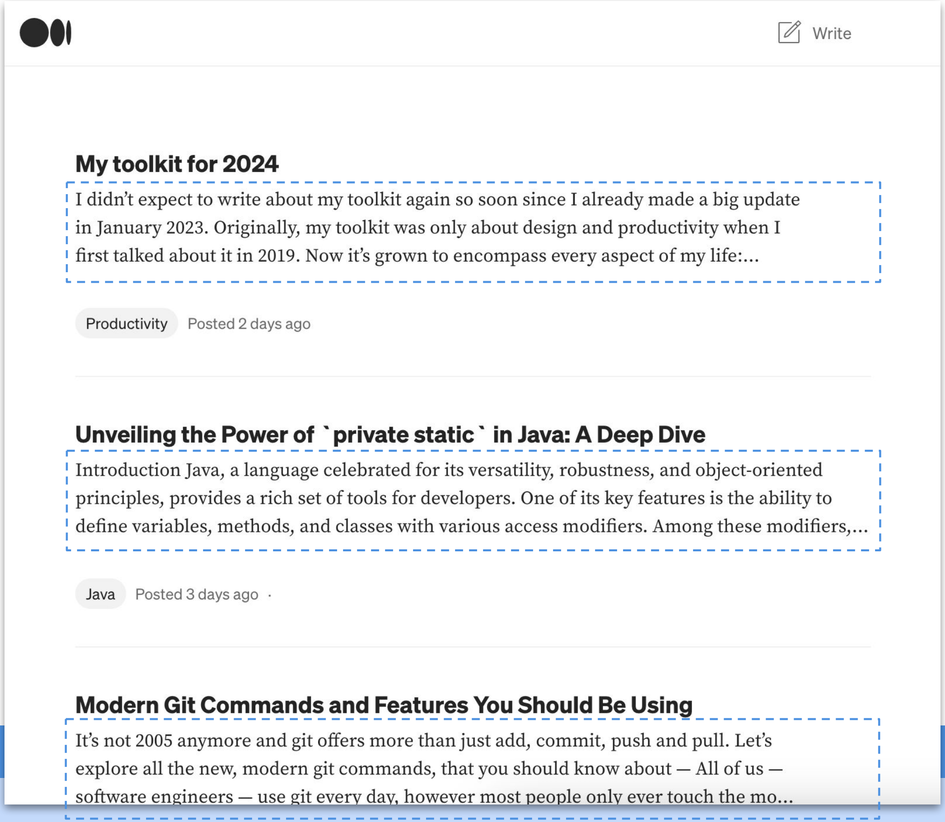

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- Title
- Content

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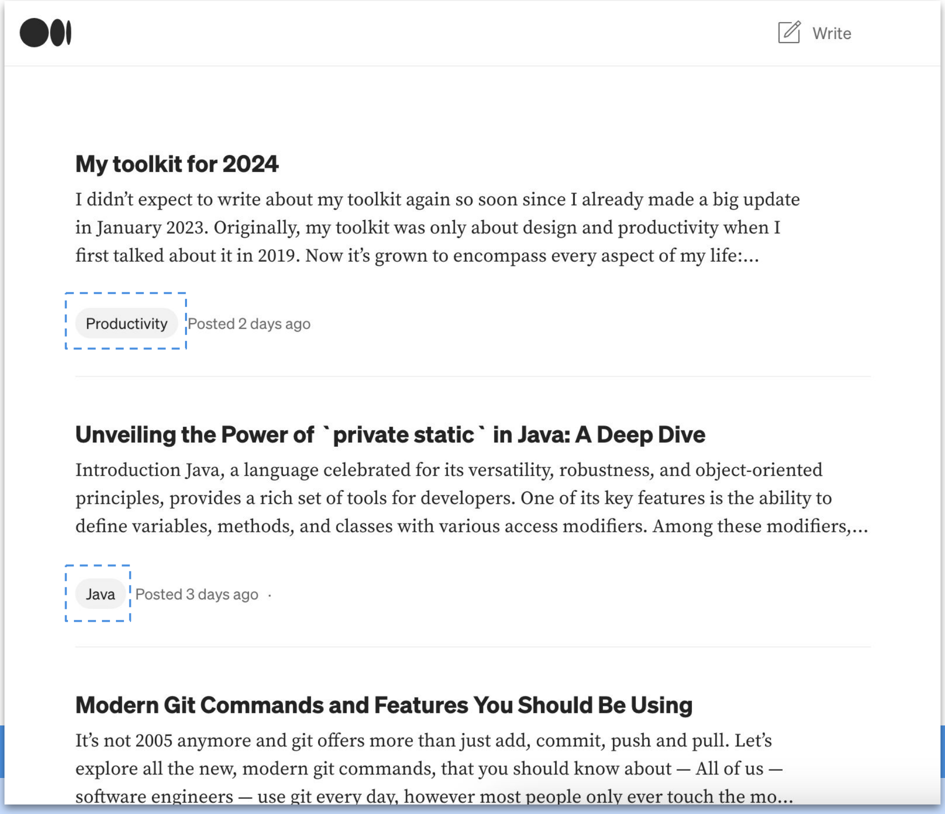

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Each Post have a

- Title
- Content
- Category

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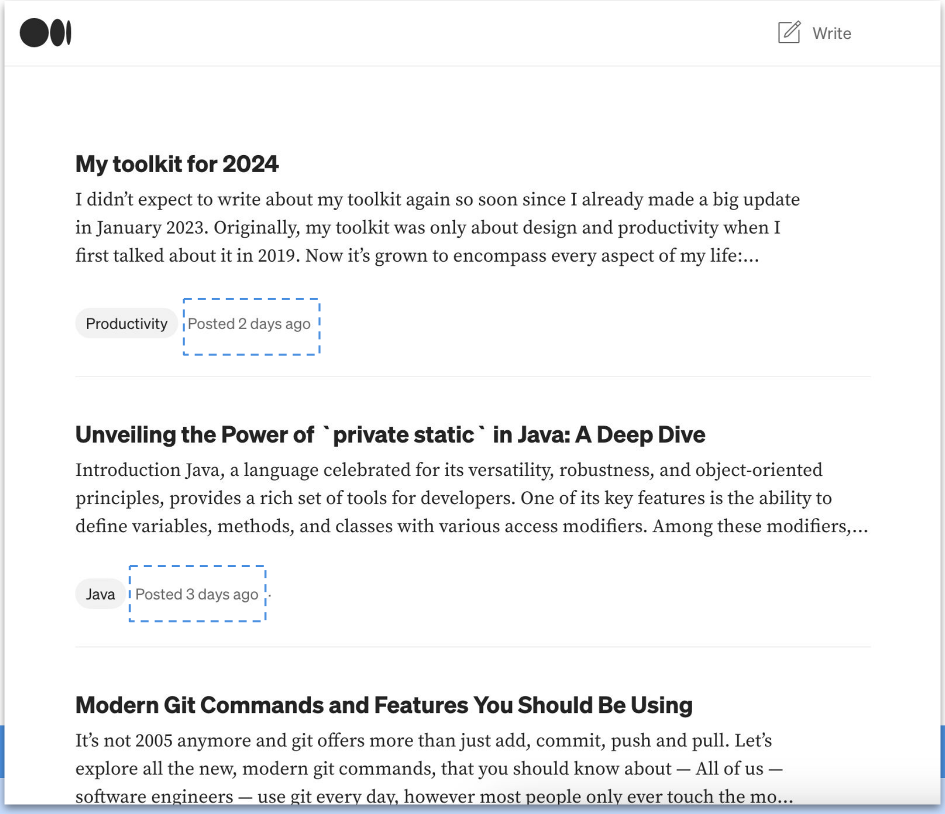

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A blogging platform allow individual to publish content in the form of posts

Each Post have a

- Title
- Content
- Category
- Creation date

Modelisation of a blogging platform

post				
id	title	content	created_date	category
1	My toolkit for 2024	I didn’t expect to write about my toolkit again so soon since I already made a big update in January 2023. Originally, my toolkit was …	31/03/2024	Productivity
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Modelisation of a blogging platform

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What will happens when we add another new post with the same category ?

Modelisation of a blogging platform

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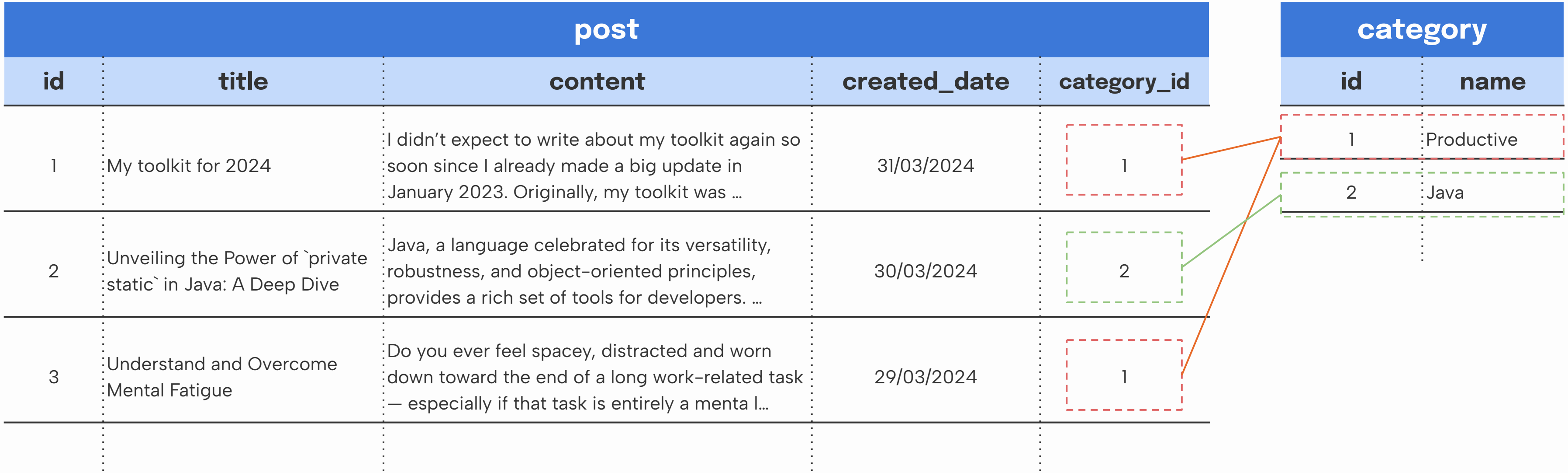
3	Understand and Overcome Mental Fatigue	Do you ever feel spacey, distracted and worn down toward the end of a long work-related task — especially if that task is entirely a menta l…	29/03/2024	Productivity

Modelisation of a blogging platform



post				
id	**title**	**content**	**created_date**	**category_id**
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category	
id	**name**
1	Productive
2	Java

Modelisation of a blogging platform

post

id	title	content	created_date	category_id
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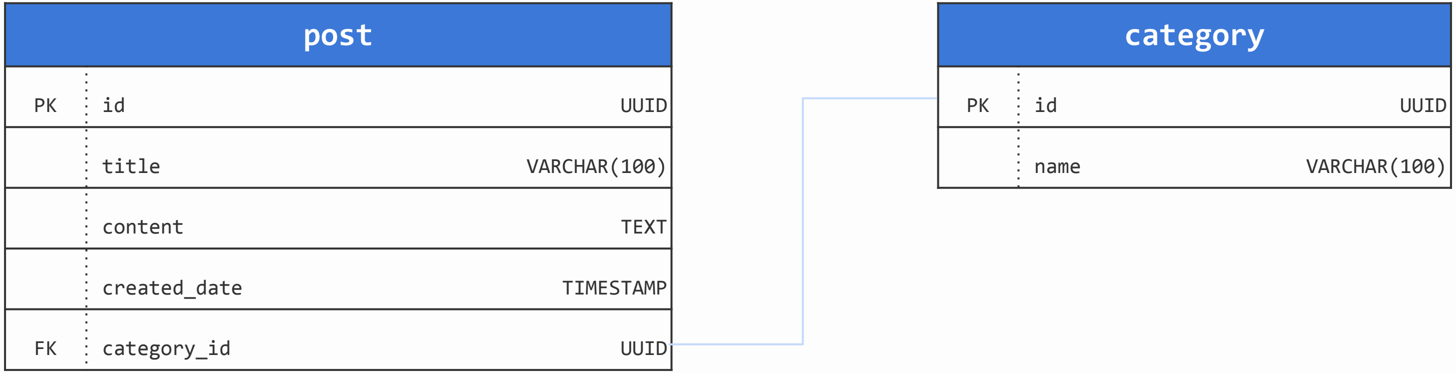
category

id	name
1	Productive
2	Java

Having a foreign key and a category table ensure **data consistency** across the database

Database diagram



post		
PK	id	UUID
	title	VARCHAR(100)
	content	TEXT
	created_date	TIMESTAMP
FK	category_id	UUID

category		
PK	id	UUID
	name	VARCHAR(100)

Modelisation in PostgreSQL

Create **category** table

```
CREATE TABLE category (
    id              UUID,
    name            VARCHAR(100),
    PRIMARY KEY (id),
    UNIQUE(name)
);
```

Create **post** table

```
CREATE TABLE post (
    id              UUID,
    title           VARCHAR(100),
    content         TEXT,
    created_date    TIMESTAMP,
    category_id     UUID,
    PRIMARY KEY (id),
    FOREIGN KEY (category_id) REFERENCES category(id)
);
```

Populate data

```
INSERT INTO category (id, name)
VALUES (gen_random_uuid(), ‘Productive’),
       (gen_random_uuid(), ‘Java’);


INSERT INTO post (id, title, content, created_date, category_id)
VALUES (
          gen_random_uuid(),
          ‘Title’,
          ‘Content’,
          ‘2023-10-28 11:30:30’,
          (SELECT id FROM category WHERE name = ‘Productive’)
);
```

Scripts

Script to **create** the tables (Category and Post)

create-tables.sql

Script to **populate** data

populate-data.sql

Remote PostgreSQL database

Create and **Connect** to a remotely **PostgreSQL** database via **Elephant SQL**

Elephant SQL

PostgreSQL

Use case 1 : Library

Designing and modeling a **library** management system.

The library has **books**, **authors** and **borrowers**.

Use case 2 : Music streaming service

Designing and modeling for a **music streaming service**.

The service should support **songs**, **playlists**, **album**, **artists** and a **playlist** belongs to a **user**.

Use case 3 : Marketplace

Designing and modeling for a **marketplace**.

The marketplace allows users to **buy** and **sell products**.

It will also allows support of multiple **categories** for each products and also ability to add a **review** on each product.

03

Version control with Git & GitHub

Getting started with Git and GitHub

What is version control

Version control is a system that **records changes** to files over time so that you can recall specific versions laters.

Industry standards

git has become the industry standard for version control, widely adopted by organizations and developers worldwide

Importance of a version control

Collaboration

Multiple developers can work on the same project simultaneously without interfering with each other's work

Branching and merging

Allow developers to create branches for feature development or bug fixes and merge changes into the main codebase

History tracking

Every change made to files is recorded, enabling easy retrieval of previous versions

Backup and recovery

Repositories act as backups, reducing the risk of losing code due to accidents or hardware failures

Git repository hostings

GitHub

Owned by Microsoft, one of the largest and most popular git repository hosting

Bitbucket

Owned by Atlassian, provides integration with Jira and Confluence

AWS CodeCommit

Provided by Amazon Web Services, provides integrations other AWS services

GitLab

Offer entire DevOps lifecycle, issue tracking, code review, …

Azure DevOps

Offers cloud-hosted options, with CI/CD pipelines and agile project management, …

Git repository hostings

used for labs & final project

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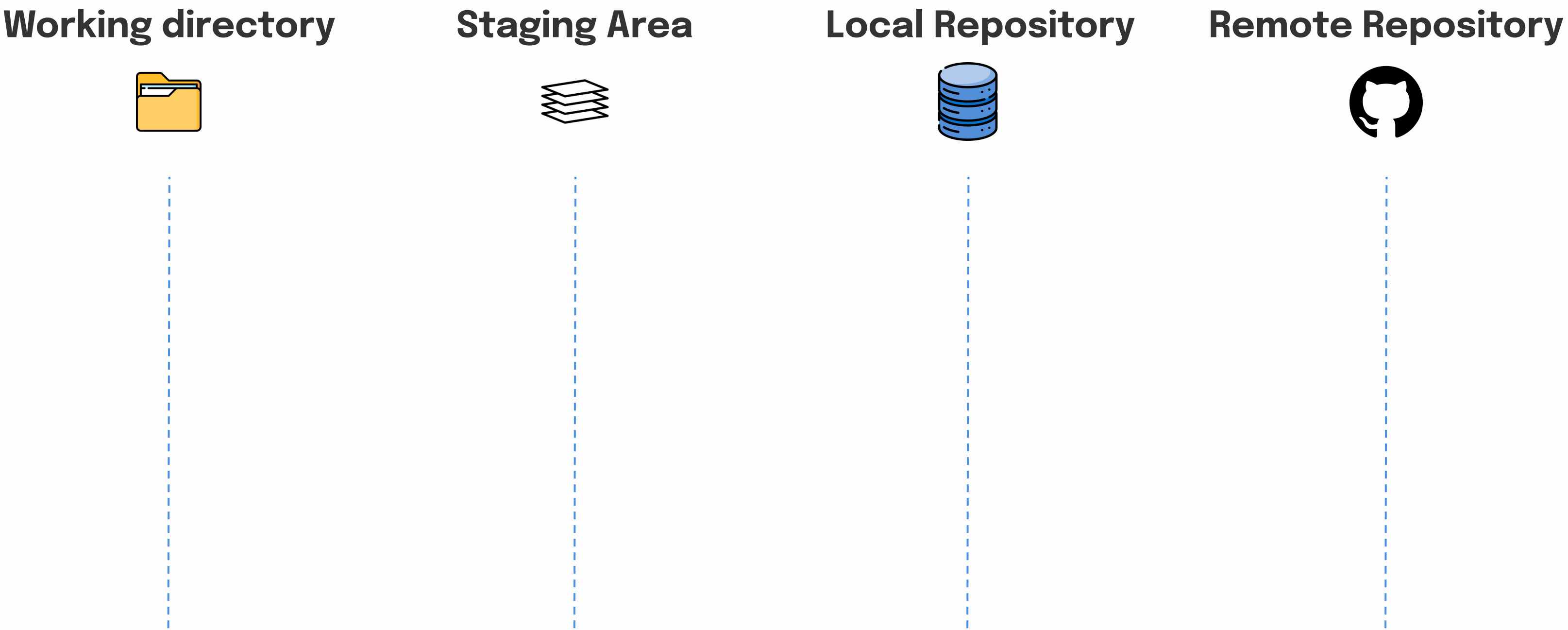
How Git works



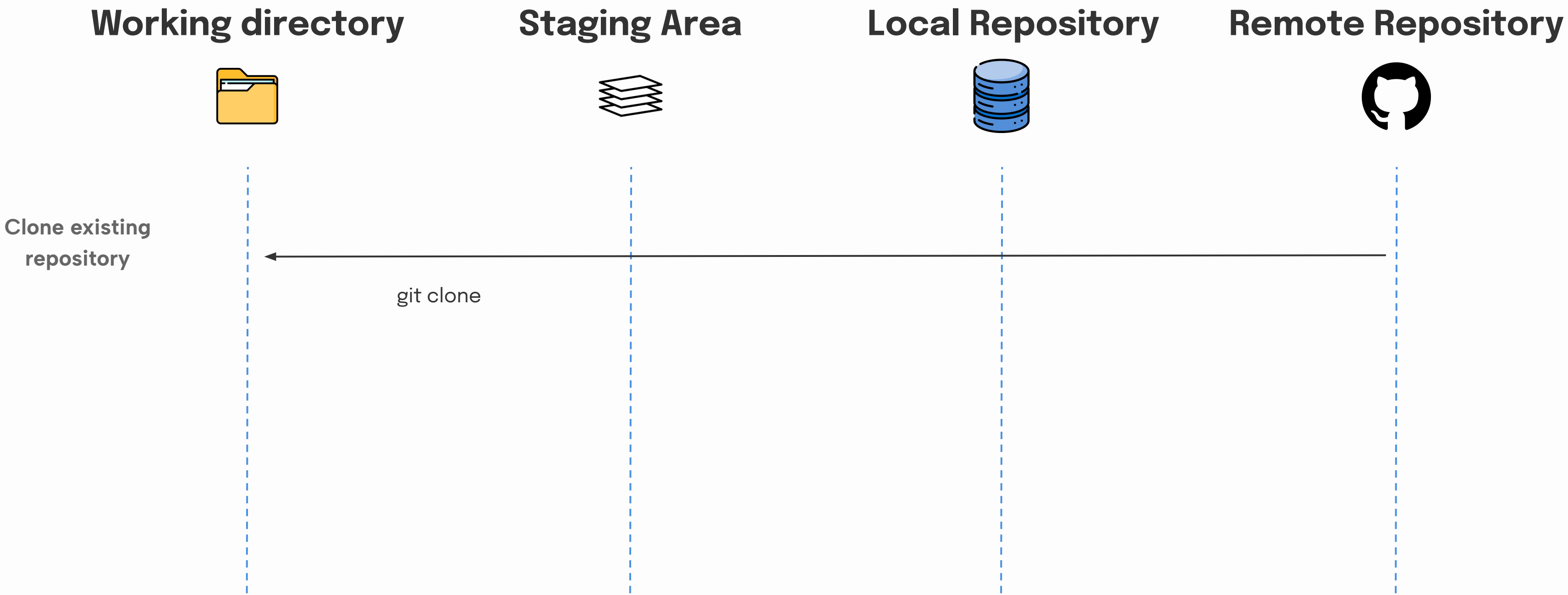
Working directory

Staging Area

Local Repository

Remote Repository

How Git works



Working directory

Staging Area

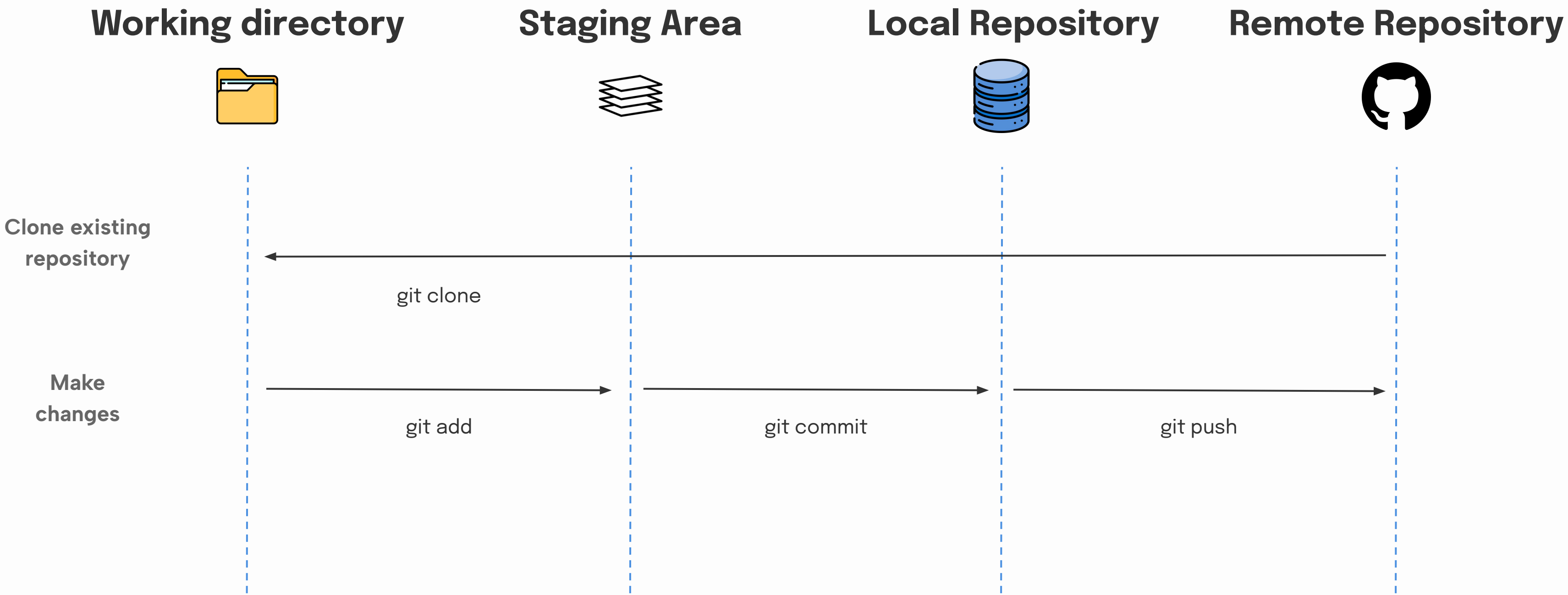
Local Repository

Remote Repository

Clone existing repository

git clone

How Git works



Working directory

Staging Area

Local Repository

Remote Repository

Clone existing repository

git clone

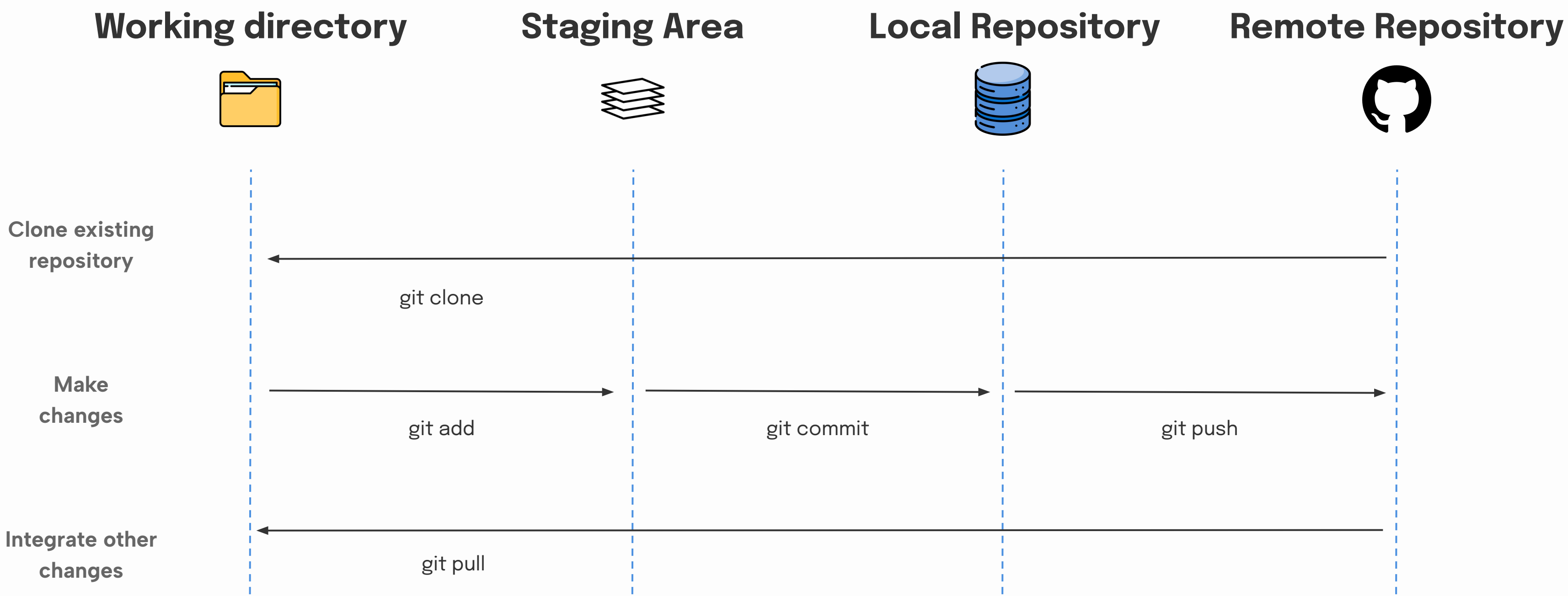
Make changes

git add

git commit

git push

How Git works



Working directory

Staging Area

Local Repository

Remote Repository

Clone existing repository

git clone

Make changes

git add

git commit

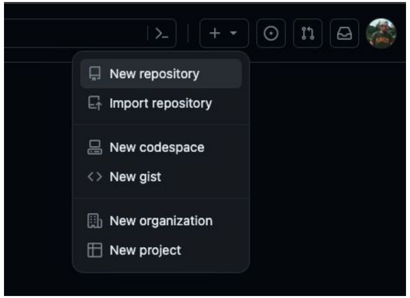
git push

Integrate other changes

git pull

Getting started with Git and GitHub

Steps to **create** and **connect** to a remotely **repository on Github**

Step 1	**Login to GitHub** Follow this documentation to sign up if you don’t have an account
Step 2	**Create new repository** Follow this documentation to learn more 🔗 github.com/new  New repository Import repository New codespace New gist New organization New project

Getting started with GitHub

Steps to **create** and **connect** to a remotely **repository on Github**

Step 3	**Clone project locally, by running command** `git clone https://github.com/USERNAME/REPOSITORY_NAME`
Step 4	**Make a changes** aka code…

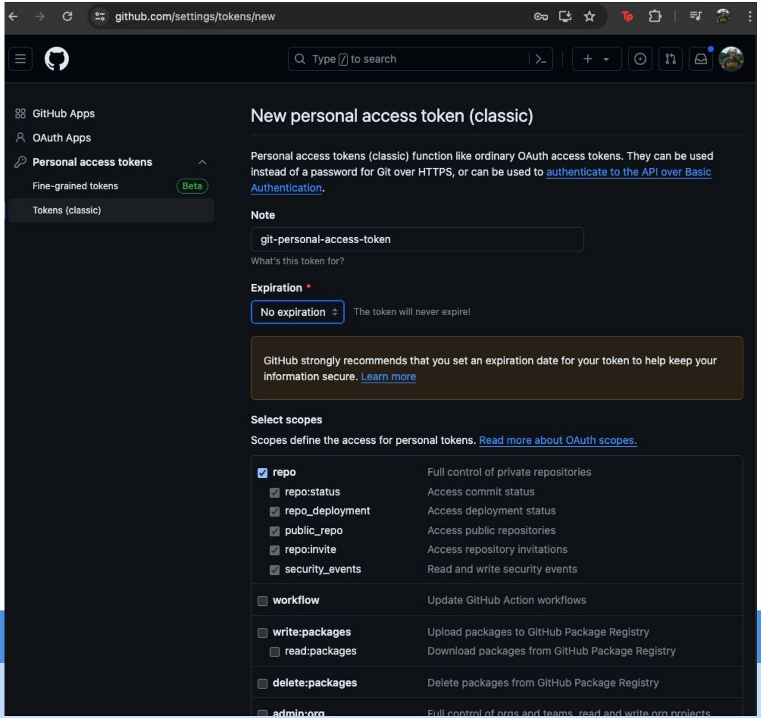
Step 5	**Commit and push changes into remotely repository**
	`git add .`
	`git commit -m “COMMIT_MESSAGE”`
	`git push origin BRANCH_NAME`

Getting started with GitHub

You will be prompted to add your **username** and **password**.

For the password you will have to Generate a classical personal access token with “repo” as scope

🔗 new github token



New personal access token (classic)

Personal access tokens (classic) function like ordinary OAuth access tokens. They can be used instead of a password for Git over HTTPS, or can be used to authenticate to the API over Basic Authentication.

Note

git-personal-access-token

What's this token for?

Expiration *

No expiration ⇕ The token will never expire!

GitHub strongly recommends that you set an expiration date for your token to help keep your information secure. Learn more

Select scopes

Scopes define the access for personal tokens. Read more about OAuth scopes.

☑ **repo**	Full control of private repositories
☑ repo:status	Access commit status
☑ repo_deployment	Access deployment status
☑ public_repo	Access public repositories
☑ repo:invite	Access repository invitations
☑ security_events	Read and write security events
□ **workflow**	Update GitHub Action workflows
□ **write:packages**	Upload packages to GitHub Package Registry
□ read:packages	Download packages from GitHub Package Registry
□ **delete:packages**	Delete packages from GitHub Package Registry
□ **admin:org**	Full control of orgs and teams, read and write org projects

Getting started with GitHub

Steps to **pull** changes from a remote Github **repository**

Step 1	**Fetch references from remote repository** `git fetch`
Step 2	**Pull changes** `git pull`

🔗 Git Cheat Sheet

Feeling lazy ?

If you don’t feel like learning git command line, download **Github Desktop** which provide a graphical user interface for the Git version control system.

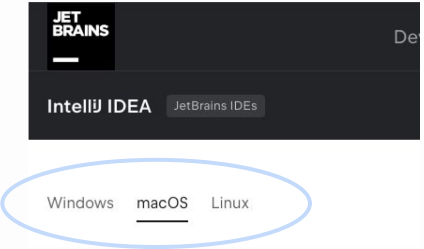
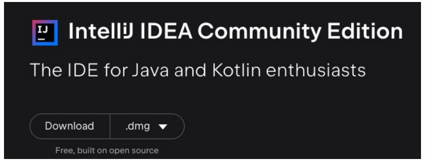
It allows users to perform common **Git operations** such as committing, branching, merging, and syncing repositories.

Github Desktop

04

Before next session

Download a Java IDE

Step 1	Head over to jetbrains.com/idea/download
Step 2	Select your OS (Windows, macOS or Linux)  JET BRAINS De IntelliJ IDEA JetBrains IDEs Windows macOS Linux
Step 3	Download Intellij IDEA Community Edition (free)  IntelliJ IDEA Community Edition The IDE for Java and Kotlin enthusiasts