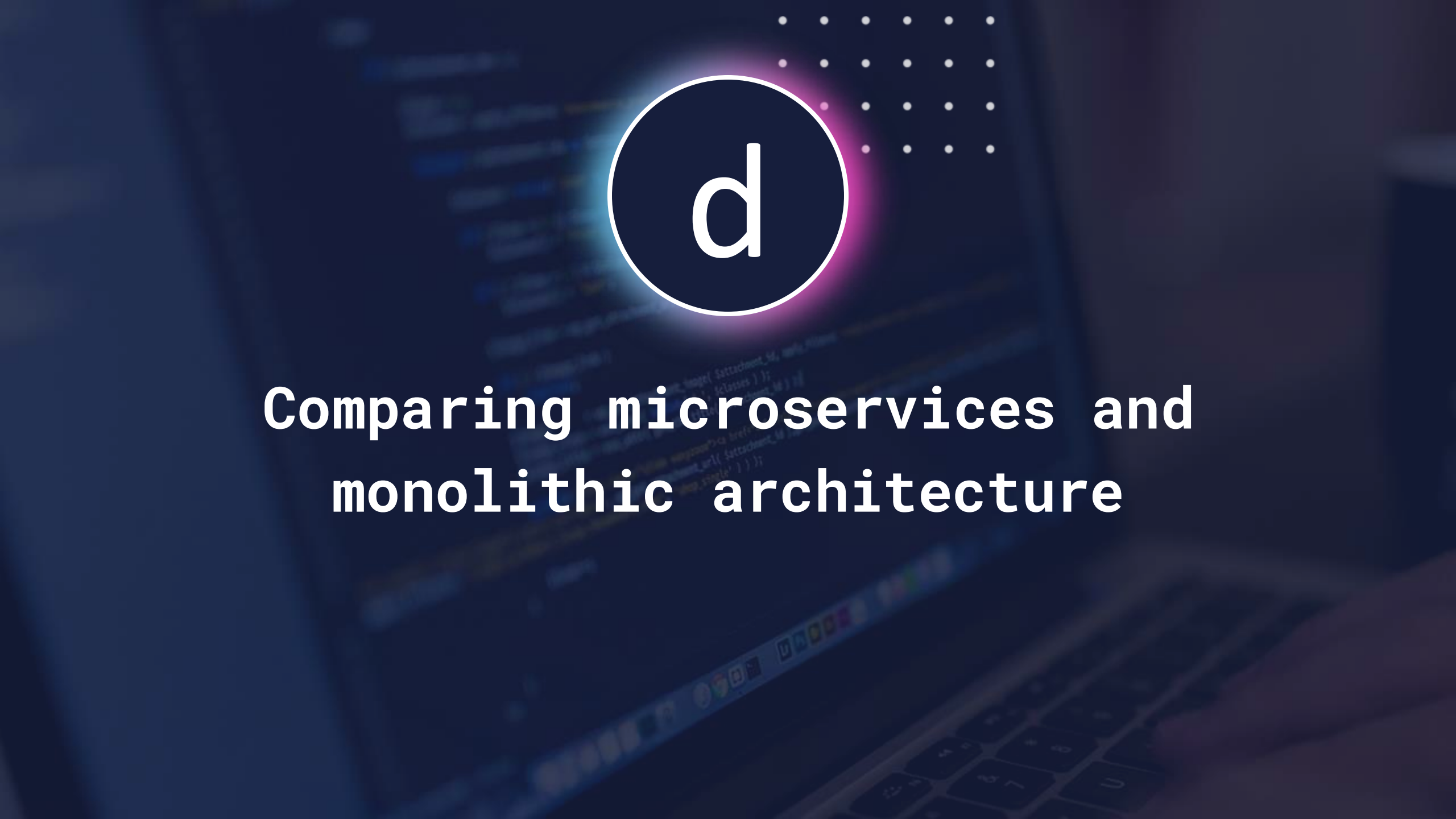


Comparing microservices and monolithic architecture

Learning objectives

- **Understand** the structure of a **monolithic architecture** and how it **differs from microservices** in terms of deployment, development, and maintenance.
- Understand **case studies** where the transition from a monolithic to a microservices architecture solved specific business or technical challenges.
- Understand **modular monoliths**
- Know when to **choose** one **architecture** over the other

Monolithic architecture

- The entire application is built and deployed as one unit.
- Components are often tightly coupled, making changes or updates challenging.
- All parts of the application share the same resources and codebase.

Pros of monolithic design

- d — Single application to deploy
- d — Single database
- ⚙ — Simple to develop, build, test and deploy
- S — Simple communication between components
- c — Easy to scale

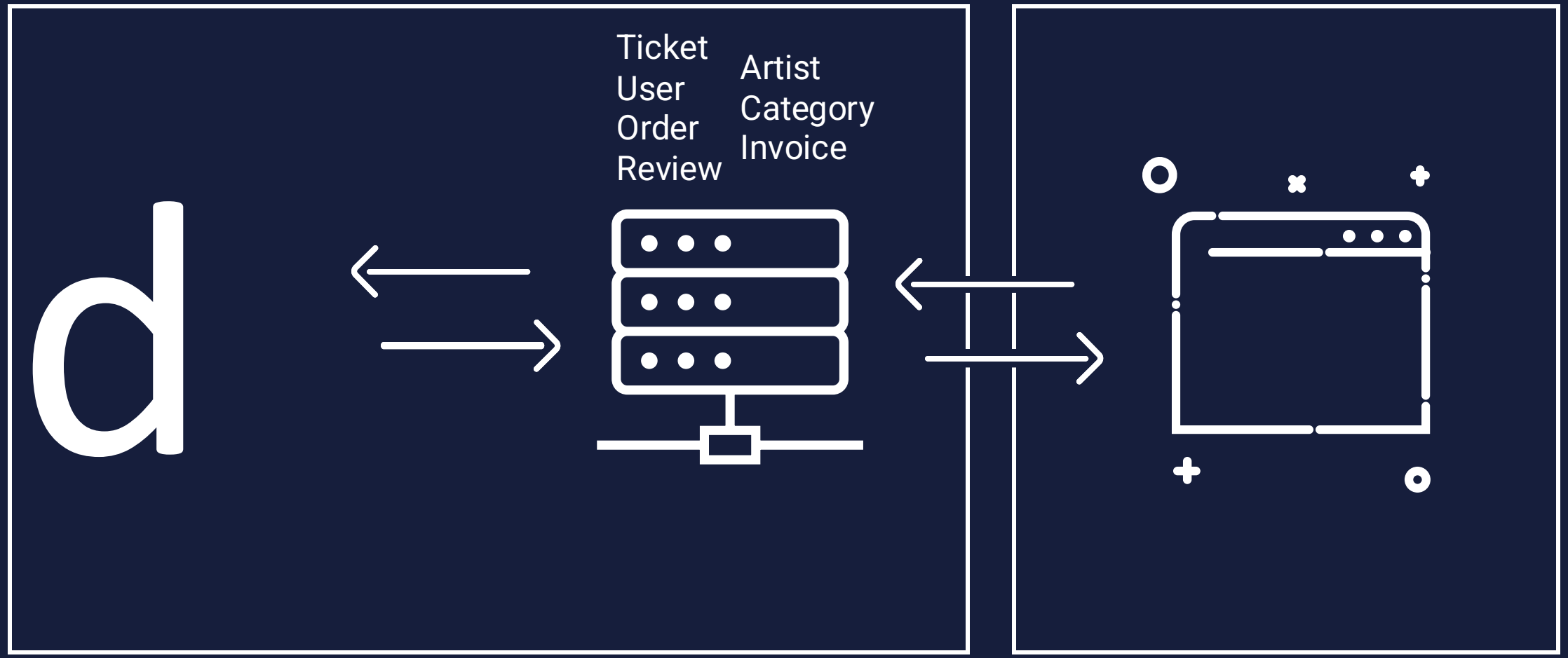
Cons of monolithic design

- M — Code harder to understand
- X — No emerging technologies
- d — Scale unnecessary parts
- d — Huge database
- w — Hard to add team members / learn code base

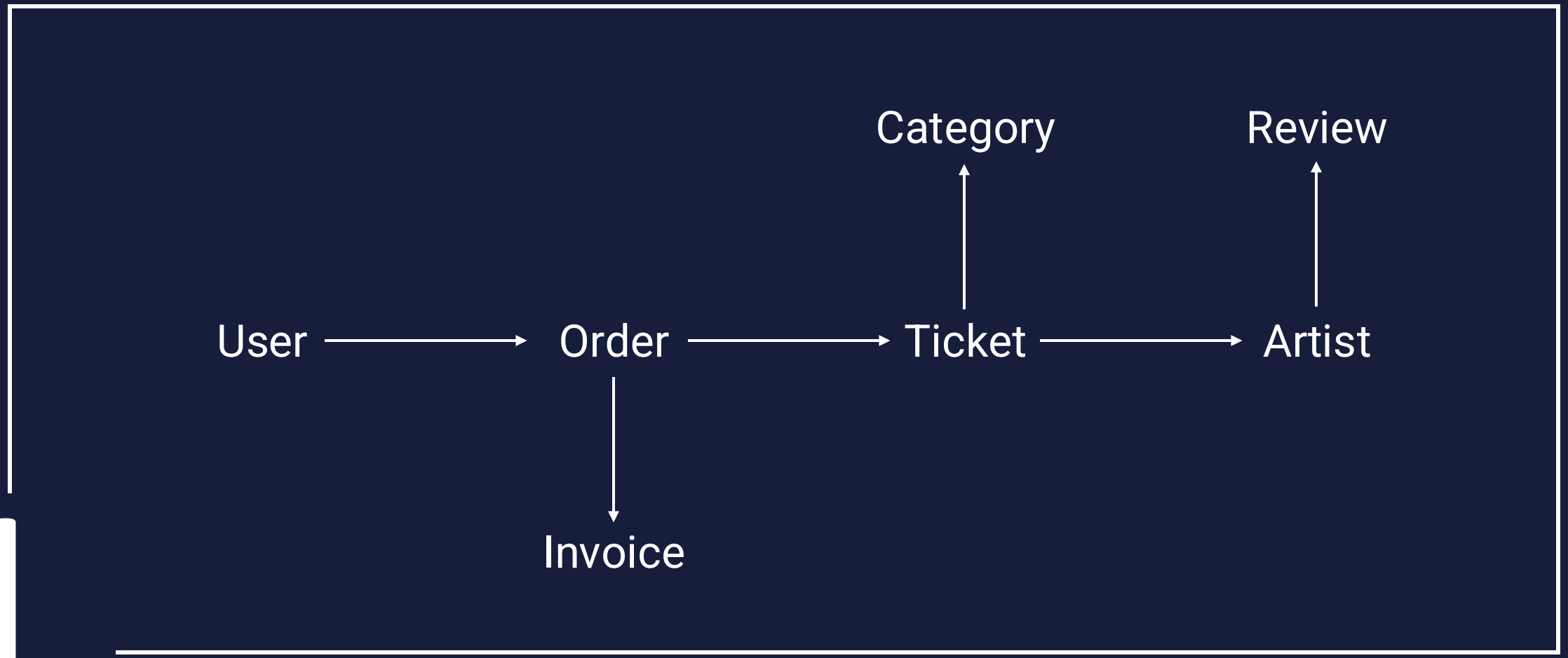
Monolithic design

- Tickets for concerts
- Single database
- Single user interface

Monolithic design



Monolithic design - backend



Exercise

Analyze and deconstruct a monolithic application

Software lifecycle

p

Development workflow

Multiple teams might work on the same codebase, which can lead to conflicts

h

Deployment process

Packaged and deployed as a single executable / archive

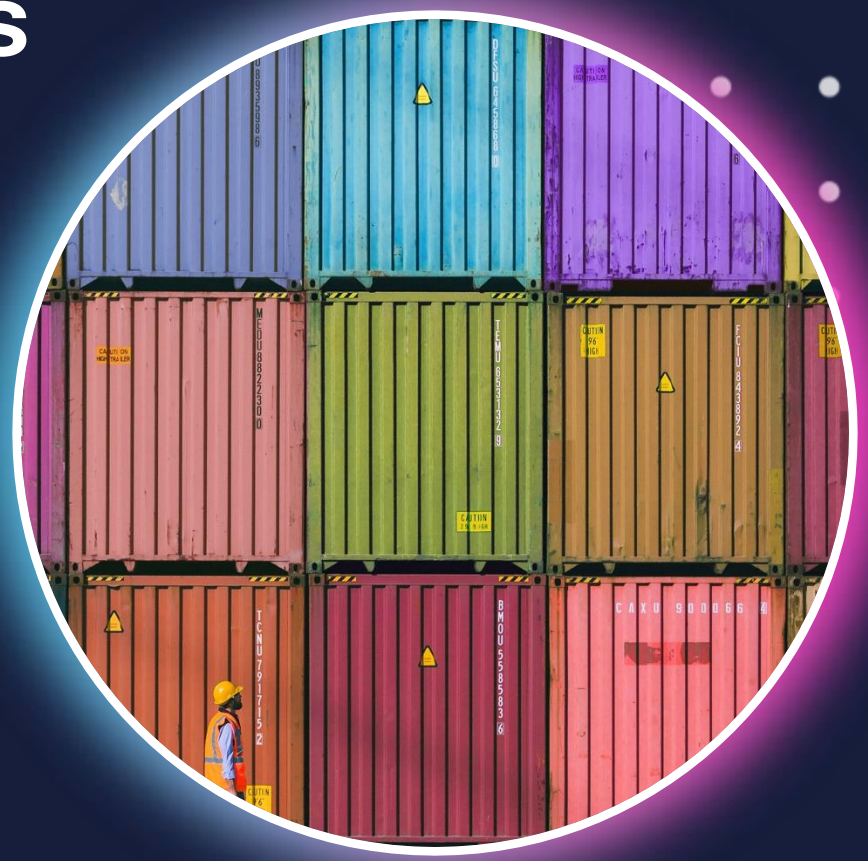
b

Maintenance

Updating one part of the application also (typically) affects other parts

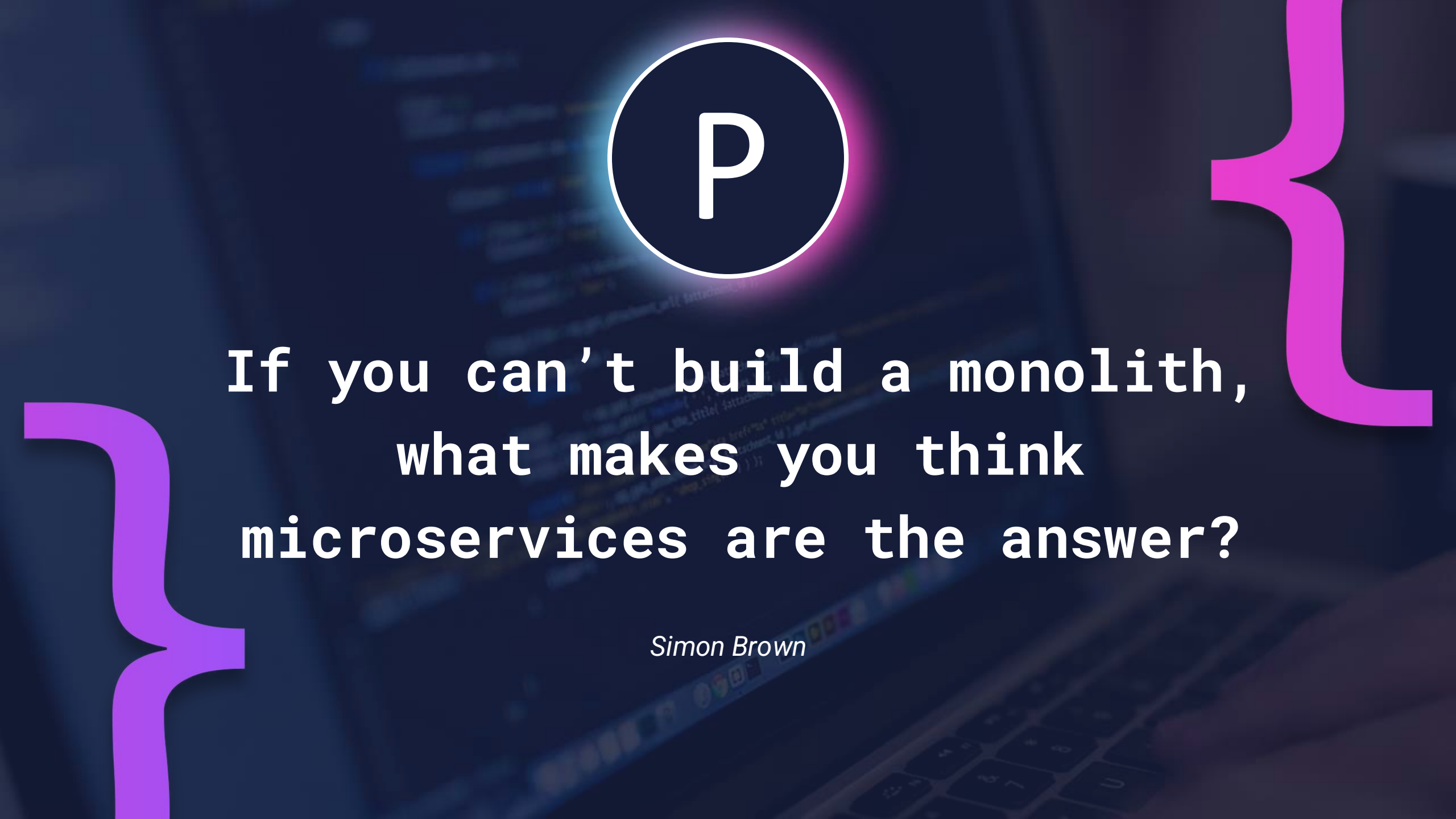
Containerization in monolithic applications

- Common but not necessary
- It helps to run in the same environment
- It’s easier to manage dependencies and deployment processes
- Containerizing a monolith doesn’t solve the scalability and maintenance issues



Microservices

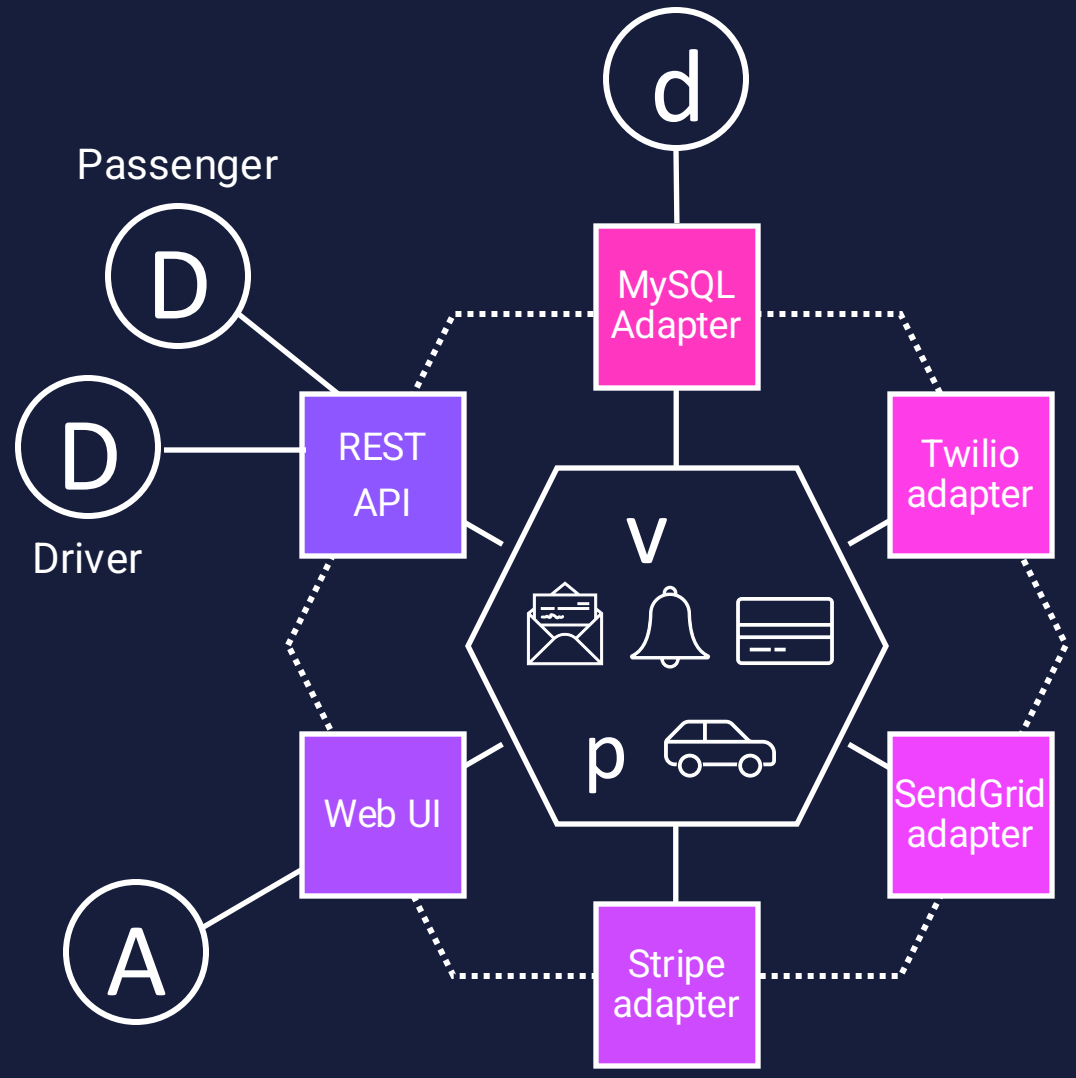
- P — Software development practices
- m — Increase development speed
- d — Scaling up
- k — Not bound to a certain technology
- . — Principles and patterns


If you can't build a monolith, what makes you think microservices are the answer?
Simon Brown

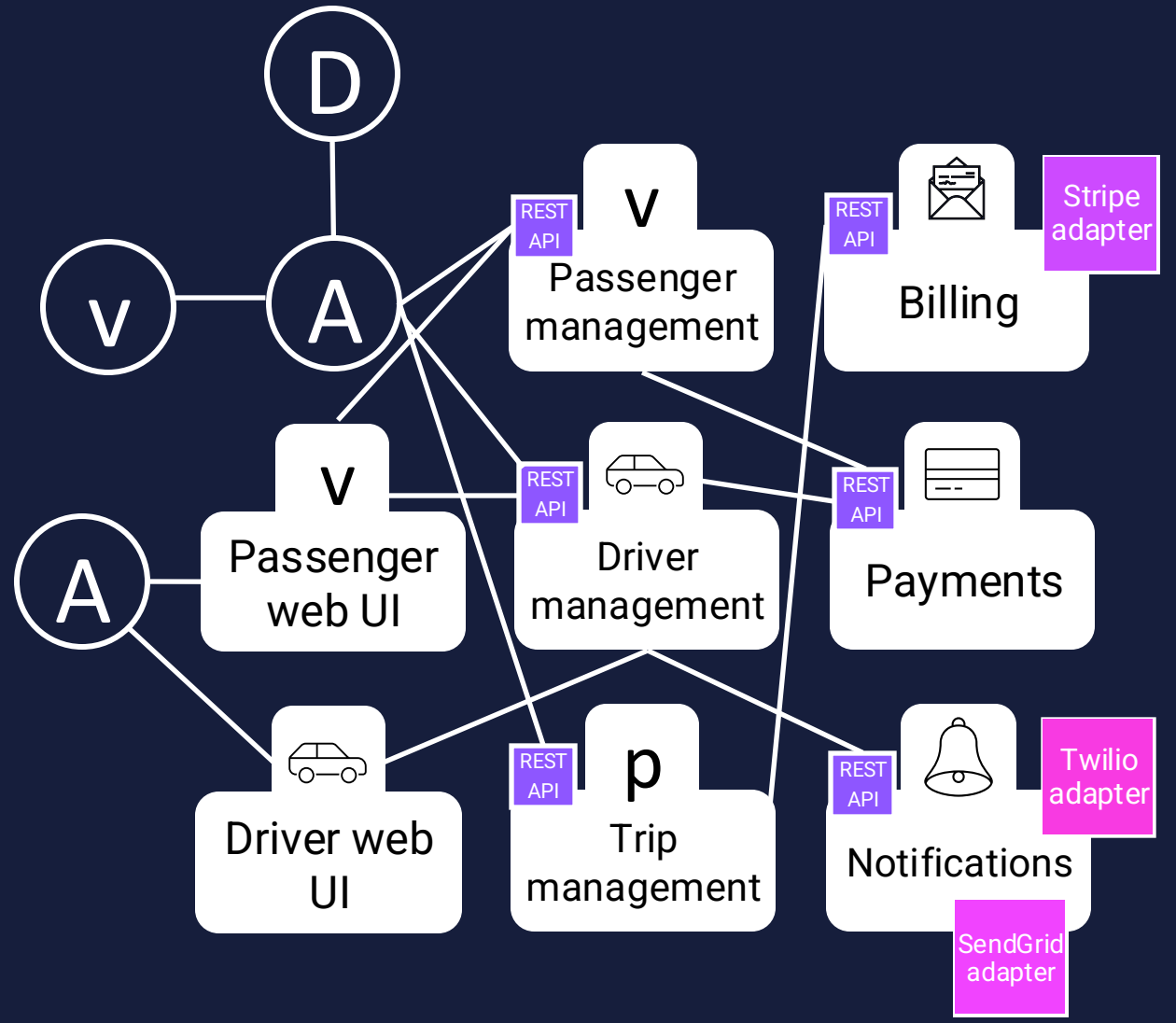
Exercise

Microservices vs monoliths

Monolith vs microservices



Monolithic architecture



Microservices architecture

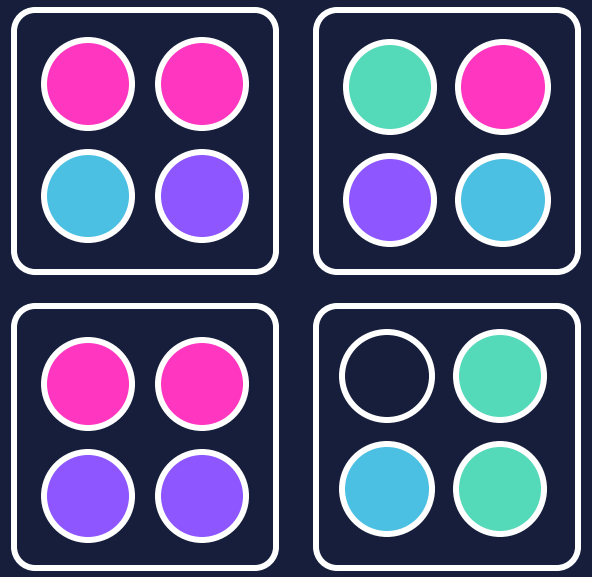
Monolith vs microservices

A monolith application combines all its functionality into a single process...

...and scales by replicating the entire application across multiple servers

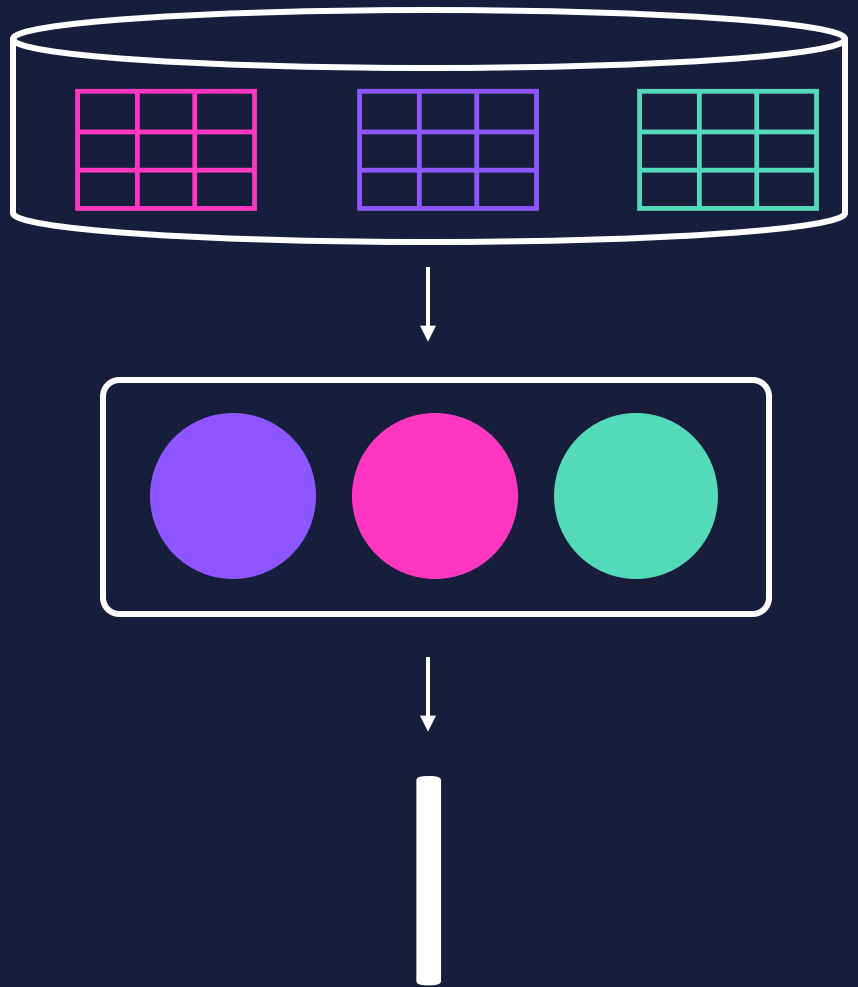
A microservice architecture separates functionality into individual services...

...scaling by distributing and replicating them across servers as needed

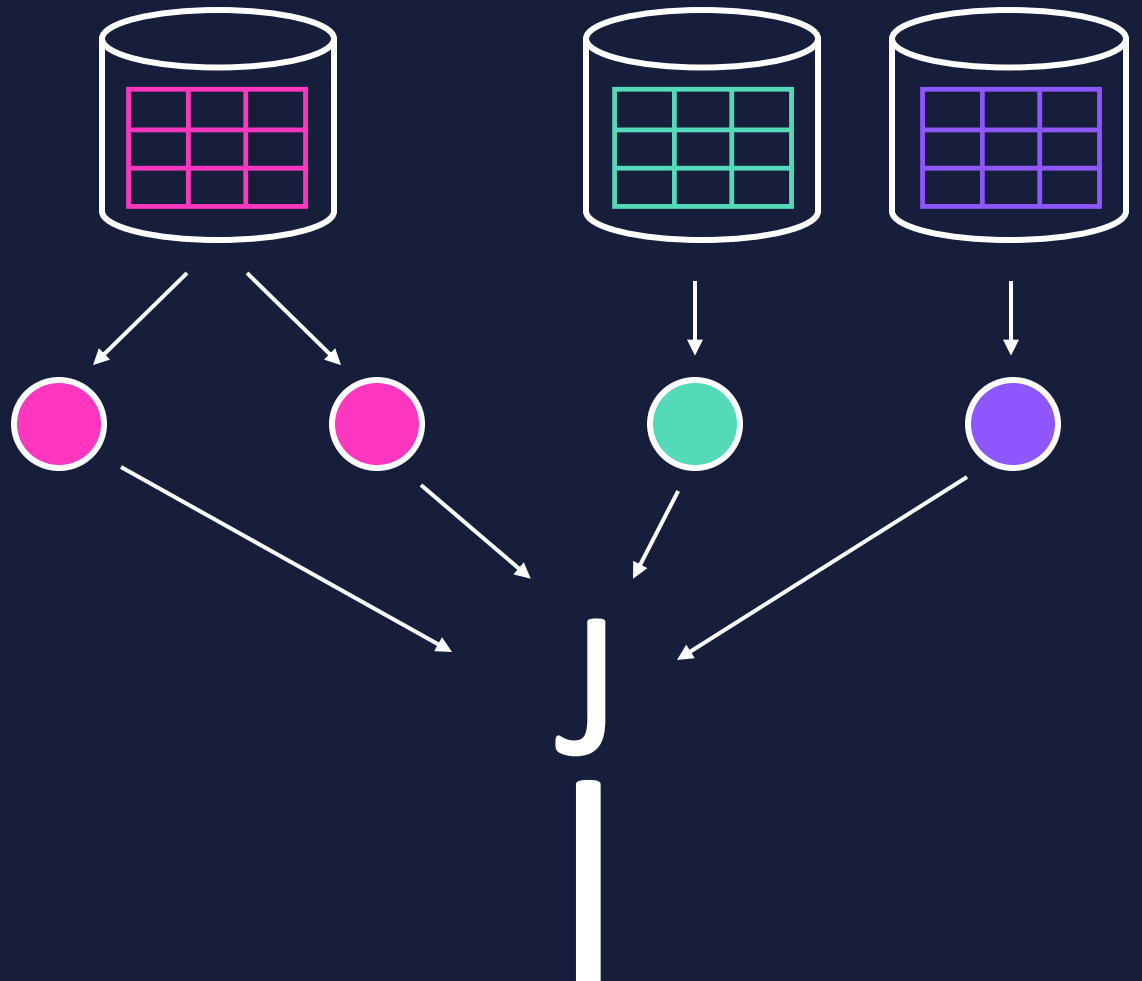


Decentralized data management

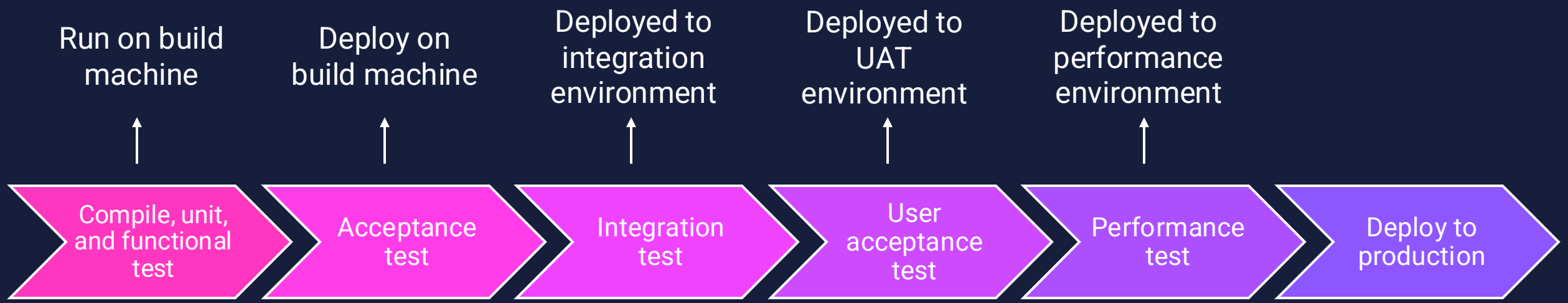
Monolith - single database



Microservices - application databases



Infrastructure automation

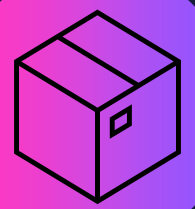


- Scale up or down as needed
- Speed up deployment cycles
- Built for resilience and high availability

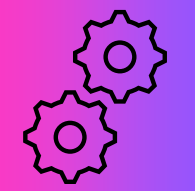
12 factor app

B

One **codebase** tracked in revision control, many deploys.



Explicitly declare and isolate **dependencies**.



Store **config** in the environment.

12 factor app

Treat **backing services** as attached resources.

Y

Strictly **separate** build and run **stages**.

O

Execute the app as one or more stateless **processes**.

12 factor app

Export services via **port binding**.

Scale out via the process model (**concurrency**).

Maximize robustness with fast startup and graceful shutdown (**disposability**).

12 factor app

Keep development, staging, and production as similar as possible (**dev/prod parity**).

Treat **logs** as event streams.

Run admin/management tasks as **one-off processes**.

There's always a third option...

Modular monoliths

- A modular monolith is an architectural style where a monolithic application is designed with a modular structure internally.
- Clear boundaries between modules within the monolith.
- Still deployed as one unit but with better internal organization.

Pros of modular monoliths

- Easier to understand and modify individual modules
- Improved code organization and maintainability
- Easier to onboard new developers due to clear module boundaries
- Can serve as a steppingstone towards microservices if needed

Cons of modular monoliths

C

Cannot scale modules independently at runtime

Z

Changes in one module still require redeploying the entire application

Use cases modular monoliths

When the application doesn’t warrant microservices

Teams with limited resources or early-stage startups

Exercise

Choosing the right design

Which of the following statements best describes a monolithic architecture?

{A} An application composed of small, independent services that communicate over well-defined APIs.

{B} An application where all components are interconnected and interdependent, deployed as a single unit.

{C} An architecture that allows each service to be developed, deployed, and scaled independently.

{D} An application that uses containers to isolate services from each other.

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What is a primary advantage of a microservices architecture over a traditional monolithic architecture?

{A} Simplified deployment due to a single codebase.

{B} Reduced complexity in managing distributed systems.

{C} Unified technology stack across the entire application.

{D} Easier scaling of specific components independently.

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Which of the following best describes a modular monolith (a.k.a. "majestic monolith")?

{A} A monolithic application with no internal modularity.

{B} A microservices application that is deployed as multiple units.

{C} A monolithic application designed with a modular internal structure but still deployed as a single unit.

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Next up:

Building and containerizing microservices

Questions or suggestions?

maaikejvp@gmail.com

See you tomorrow!