Data Engineering Implications of the DevOps Architecture

INTRODUCTION TO DEVOPS

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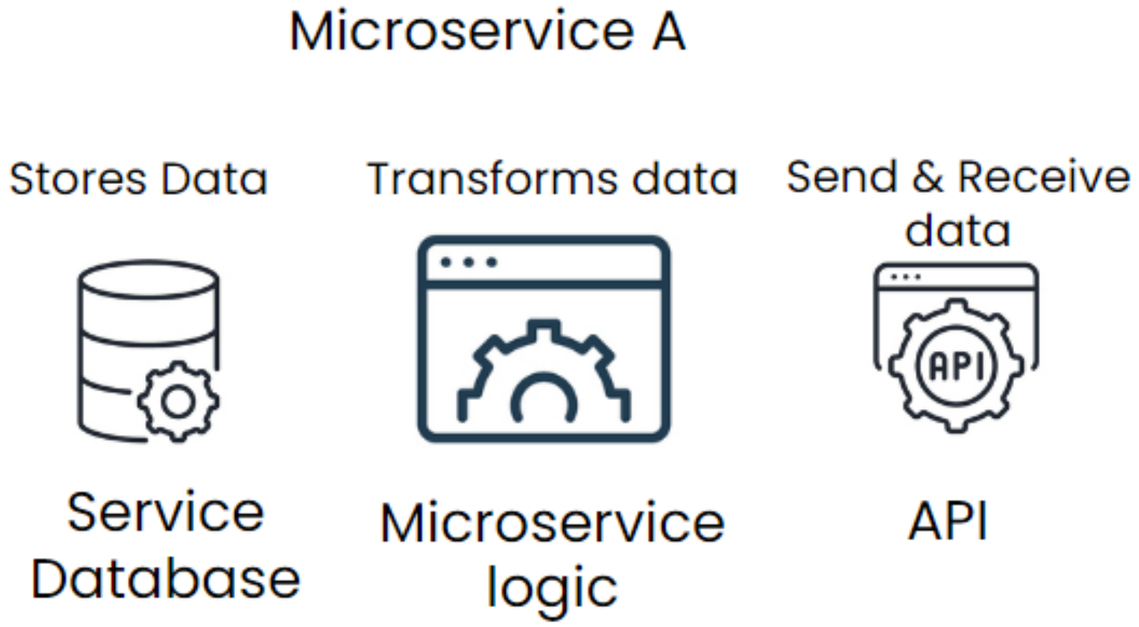
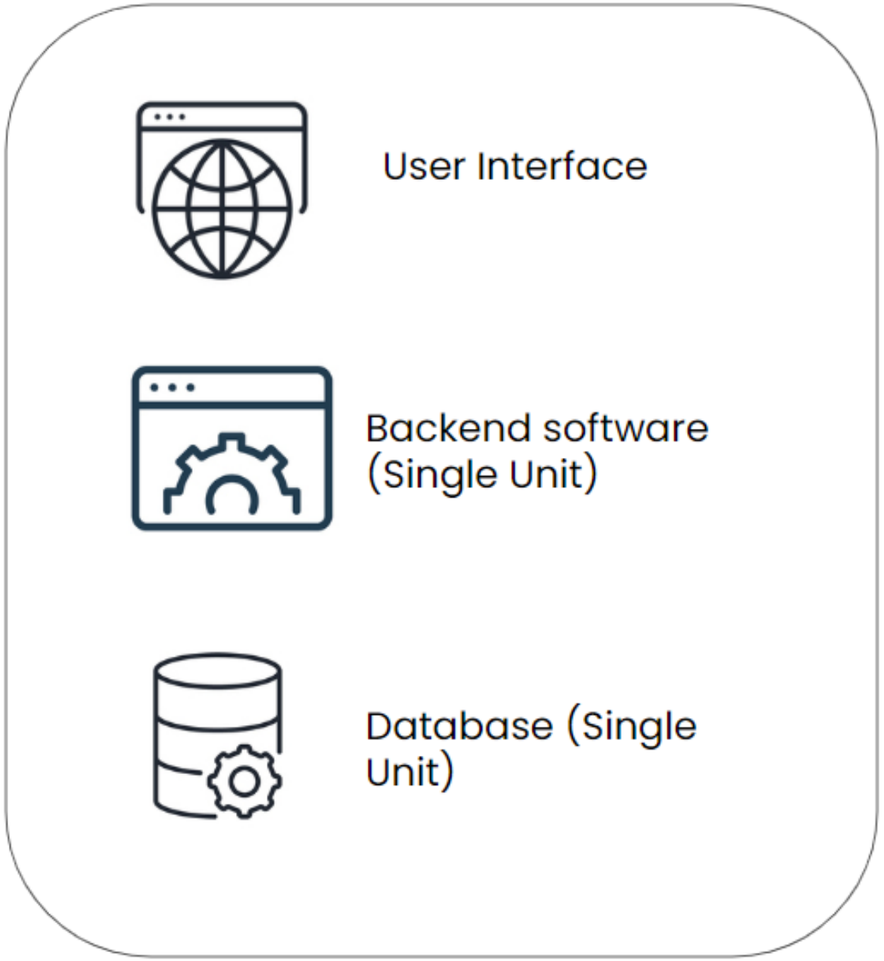
Microservices architecture



- Microservices are small-scale software programs
- Microservices deployed separately
- Each microservice take care of a different functionality
- Each microservice has its own data and logic
- They store the data in private databases

Monolithic architecture



- Opposite of the microservices architecture
- A big single unit
- Much simpler compared to microservices
- Maintenance and change is very hard and risky

Monolithic Architecture

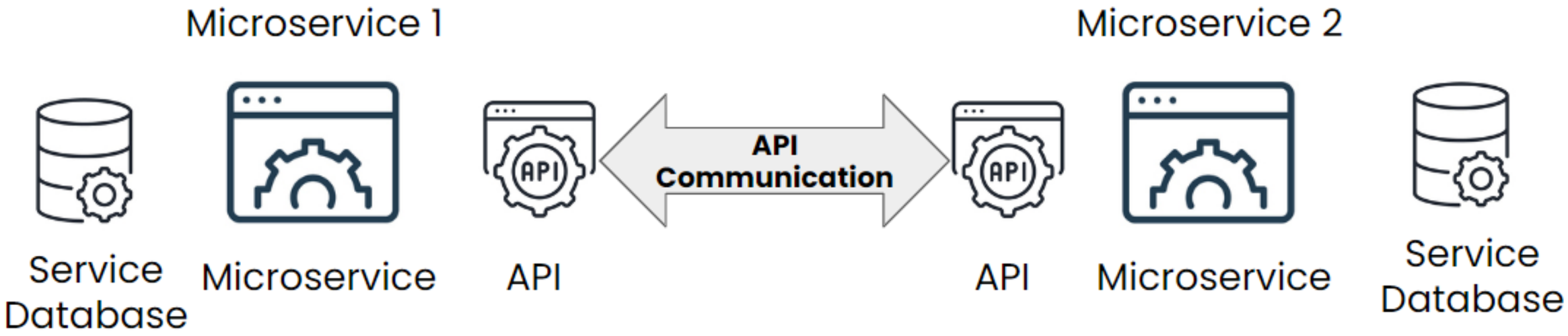
- Limited number of databases
- All application uses the same databases
- Could be a viable option for small scale applications

Microservices Architecture

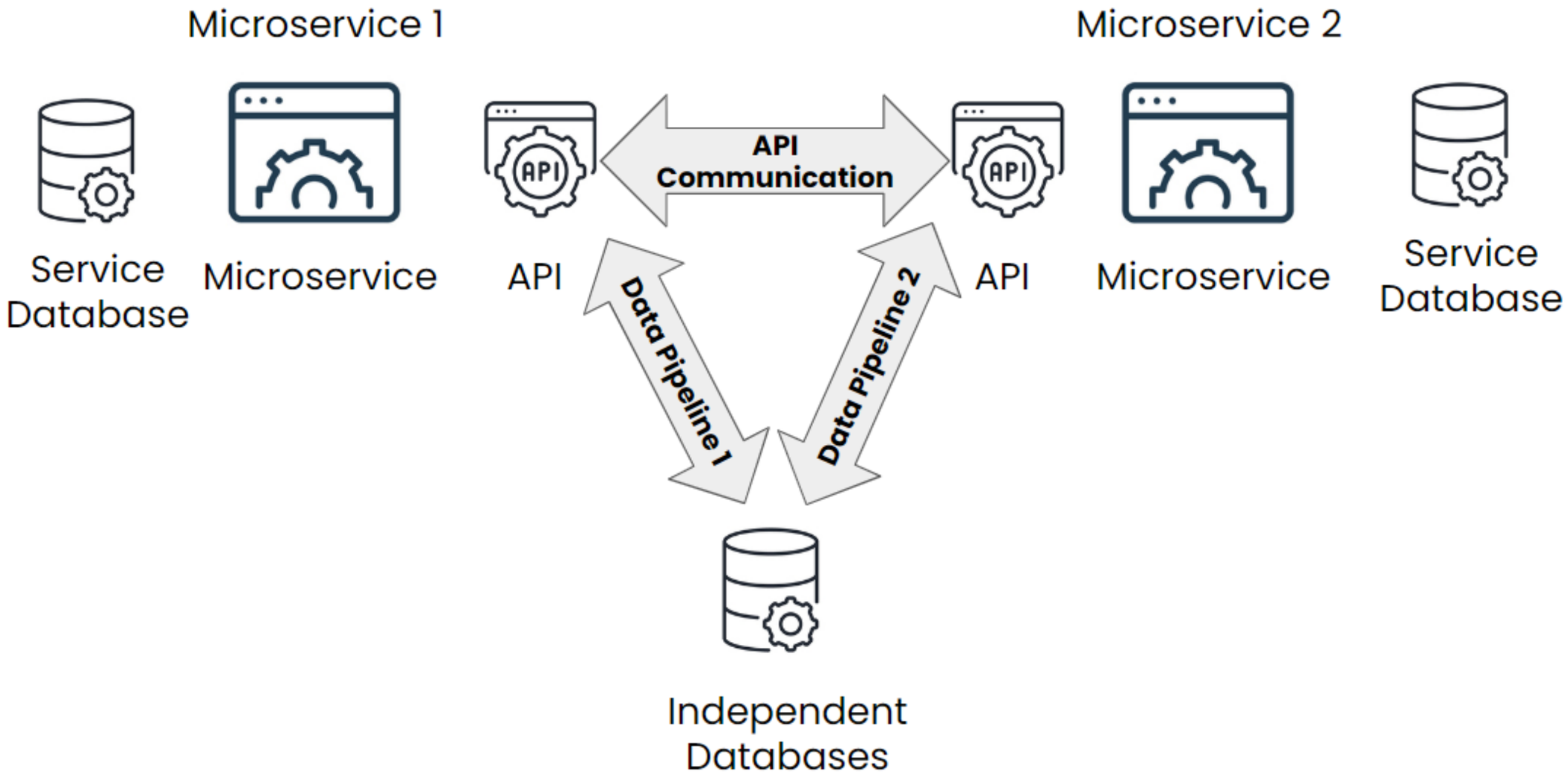
- A database for each microservice
- Microservices must do API calls to reach another services database
- Microservices are effective in large organizations and complex products

Microservices private databases

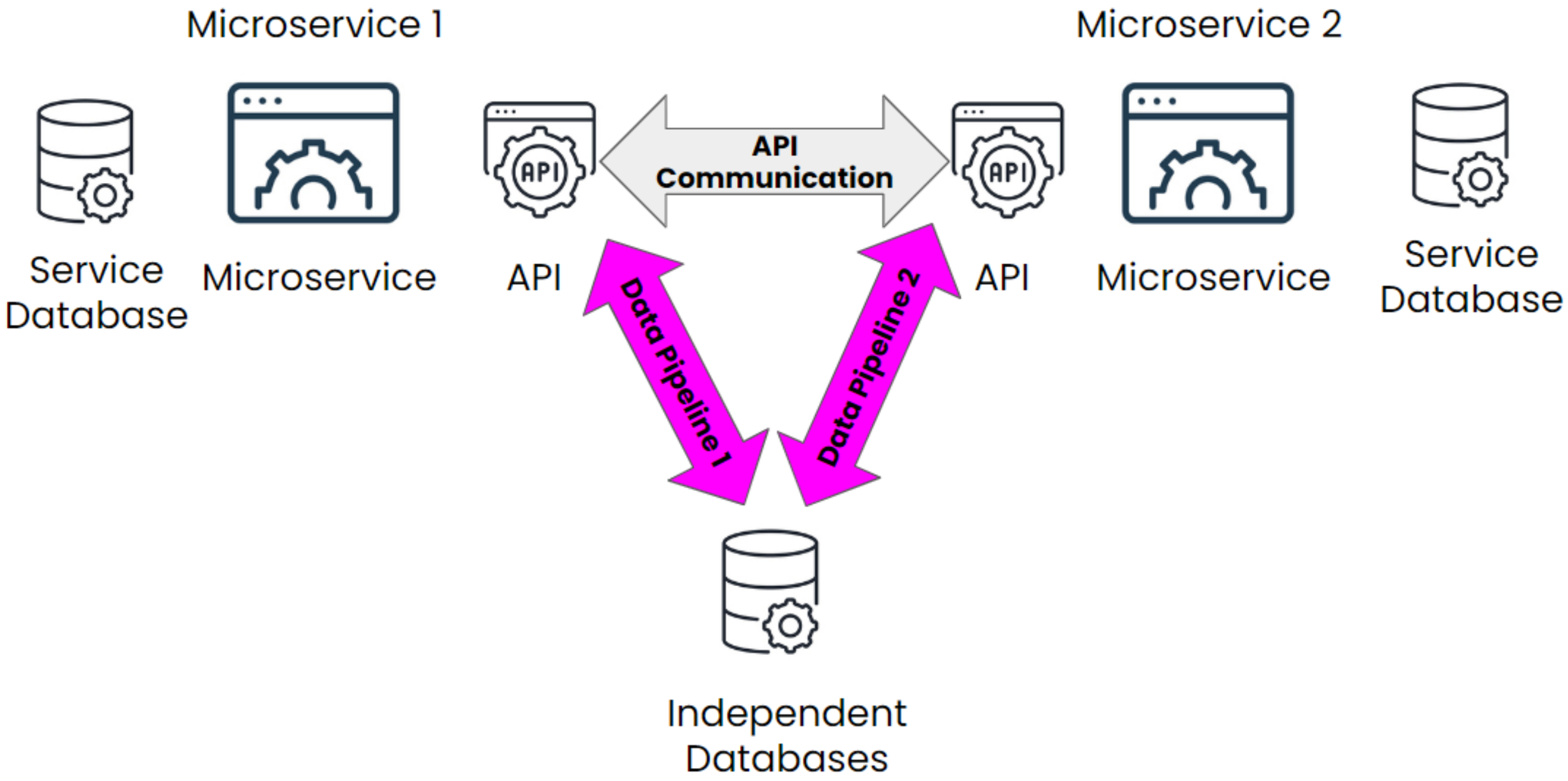
- Some product functionalities require collaboration from multiple microservices
- Microservices can not access each others databases freely, so they do API calls
- Microservices always communicate with each other.



Data Engineering applications in microservices



Data Engineering applications in microservices



Let's practice!

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Data Pipelines

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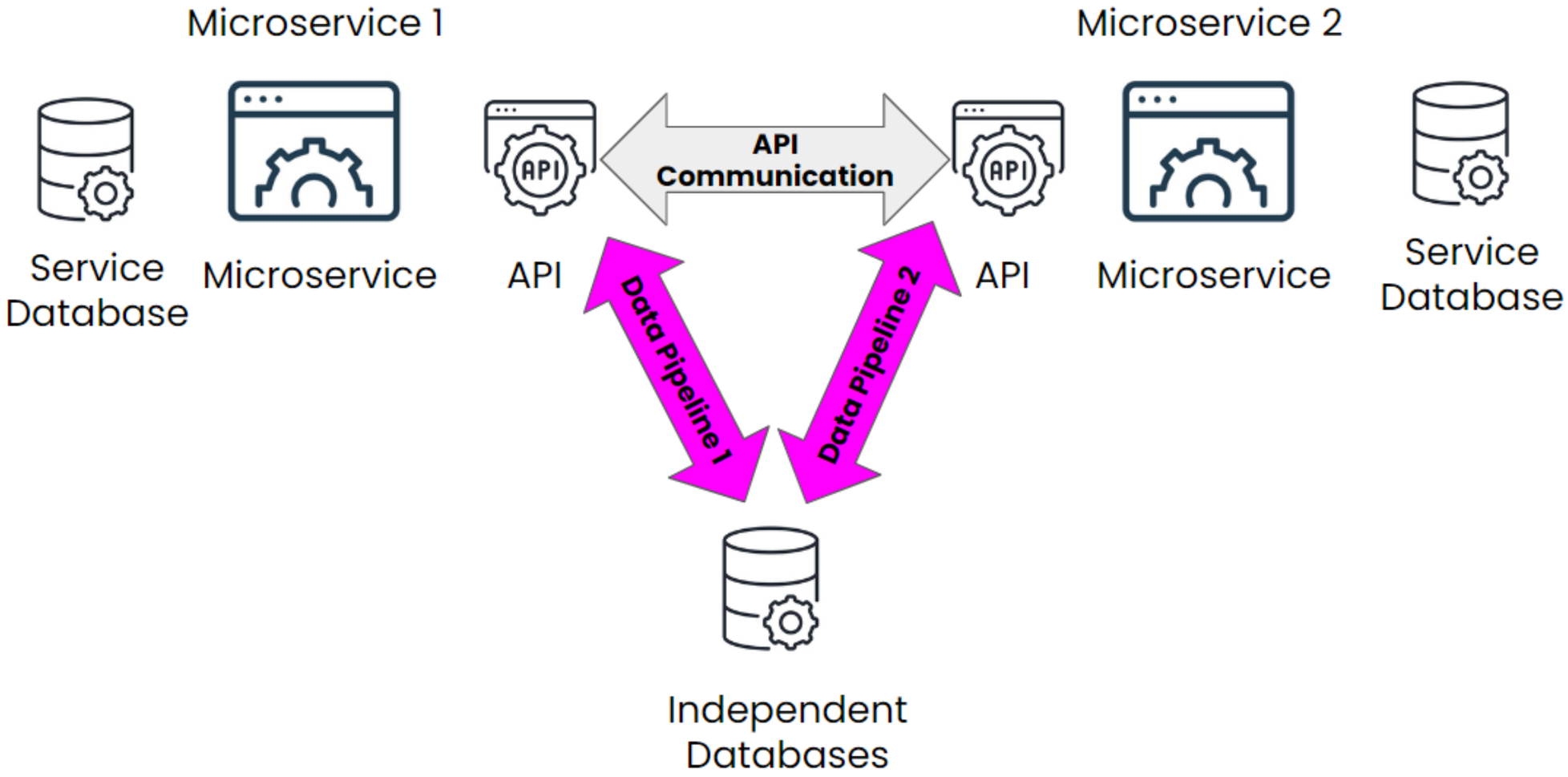
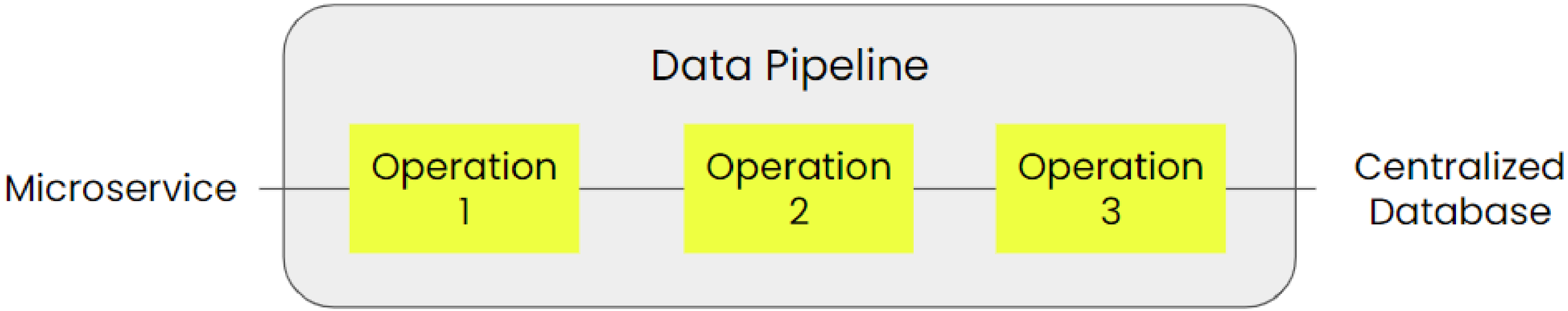
Data pipelines



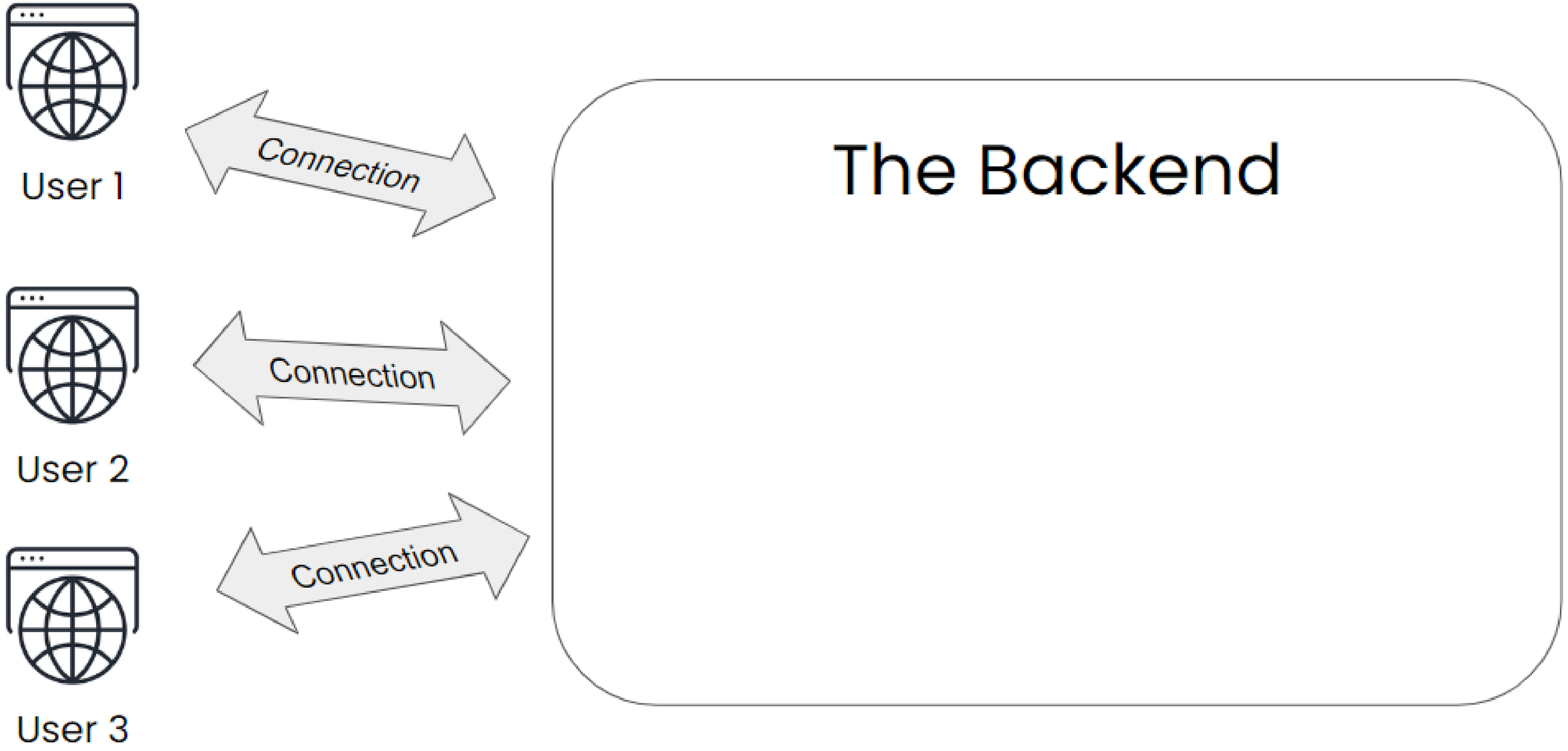
ETL

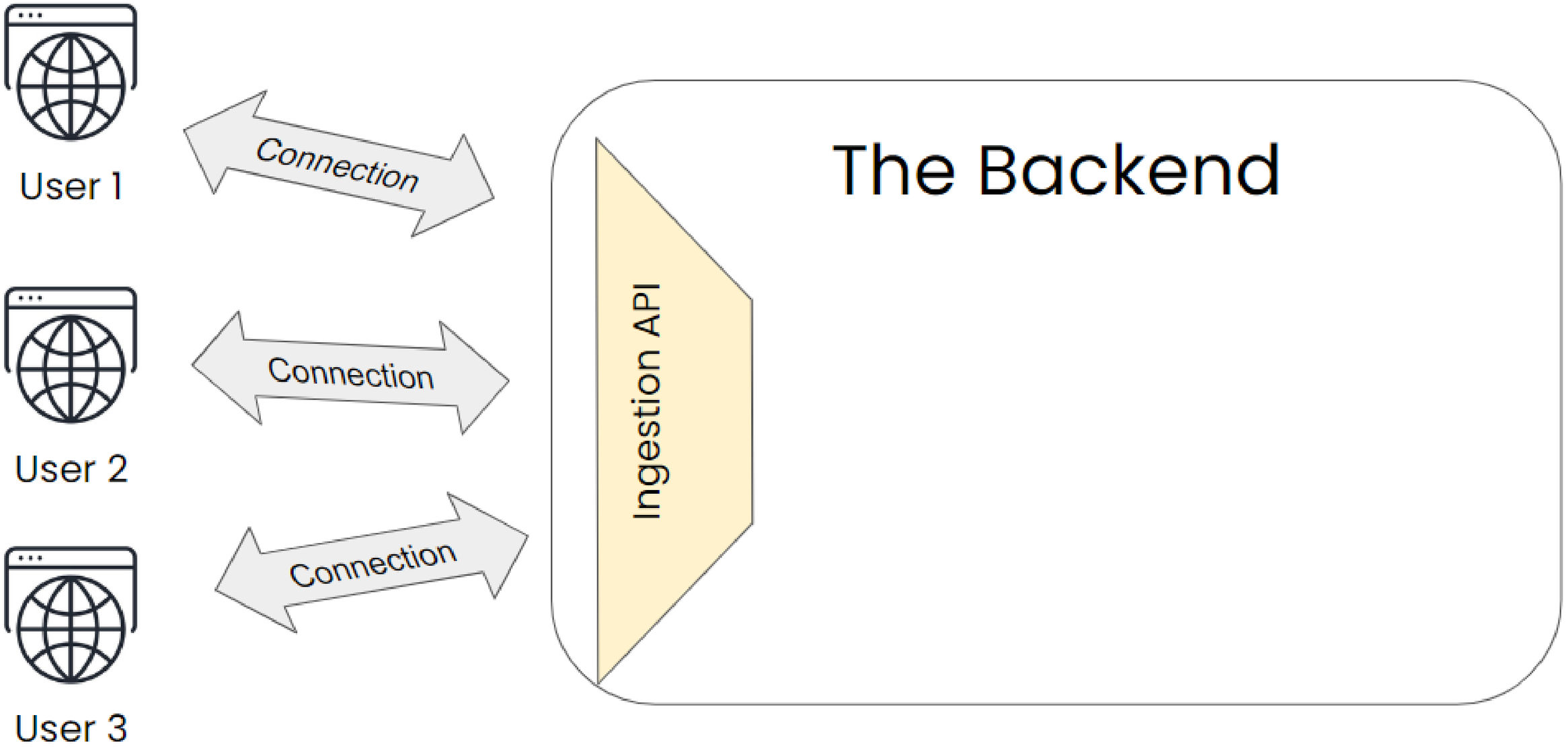
[1] https://www.istockphoto.com/nl/vector/data-extract-transform-load-gm1361894912-434102842?phrase=ETL

Batch processing



- Move offline data in batches
- Batch Processing: A large amount of data


User 1
Connection
User 2
Connection
User 3
Connection
The Backend


User 1
Connection
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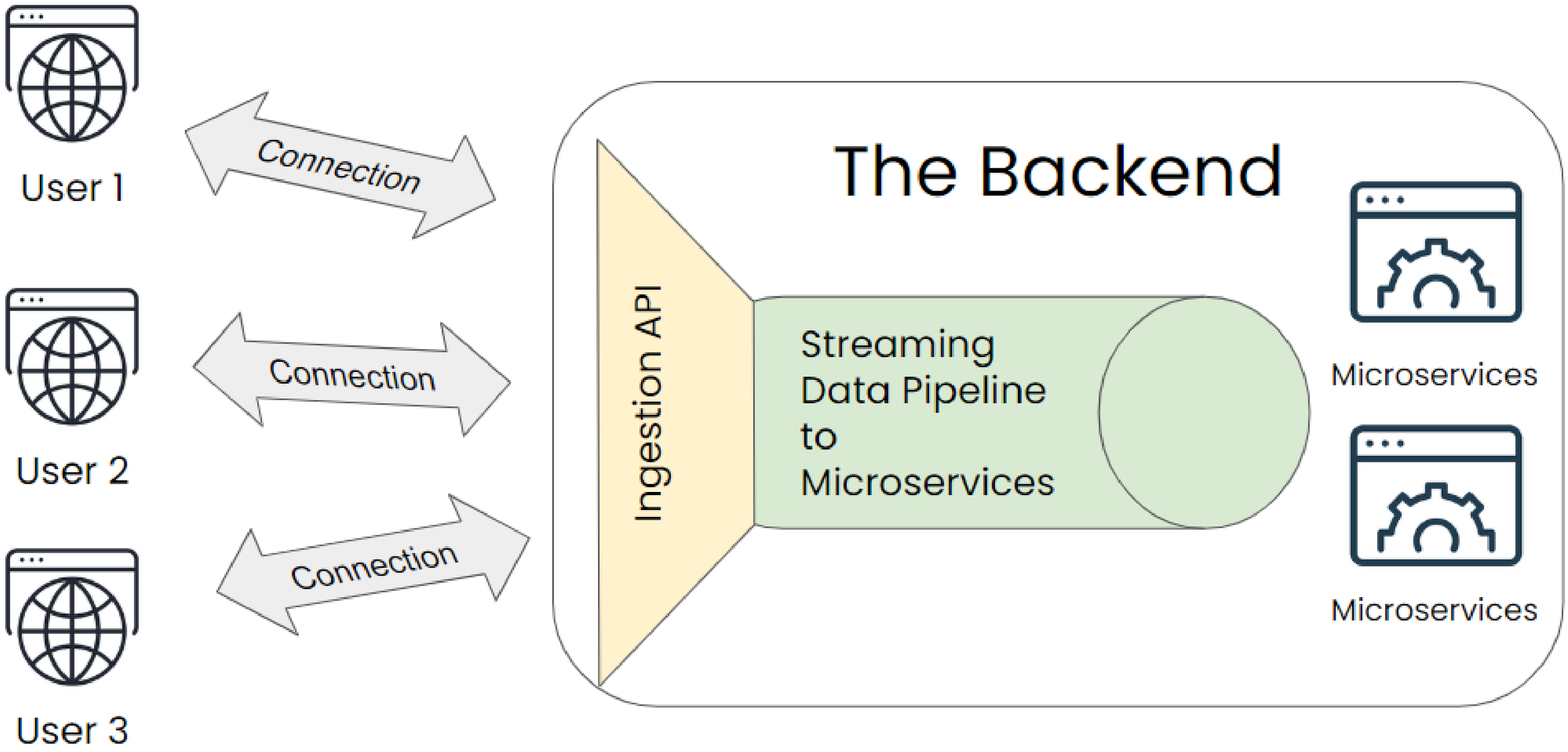
The Backend
Ingestion API


User 1
User 2
User 3
Connection
Connection
Connection
The Backend
Ingestion API
Streaming
Data Pipeline
to
Microservices
Microservices
Microservices

Recap

- Data Engineering is an integral part of Infrastructure Engineering
- Data pipelines are robust tools important for handling data
- Batch processing works on regular schedules, stream processing works continuously
- Batch processing is useful for handling the accumulated data
- Stream processing handles the real-time

Let's practice!

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Analytics & Reporting with DevOps

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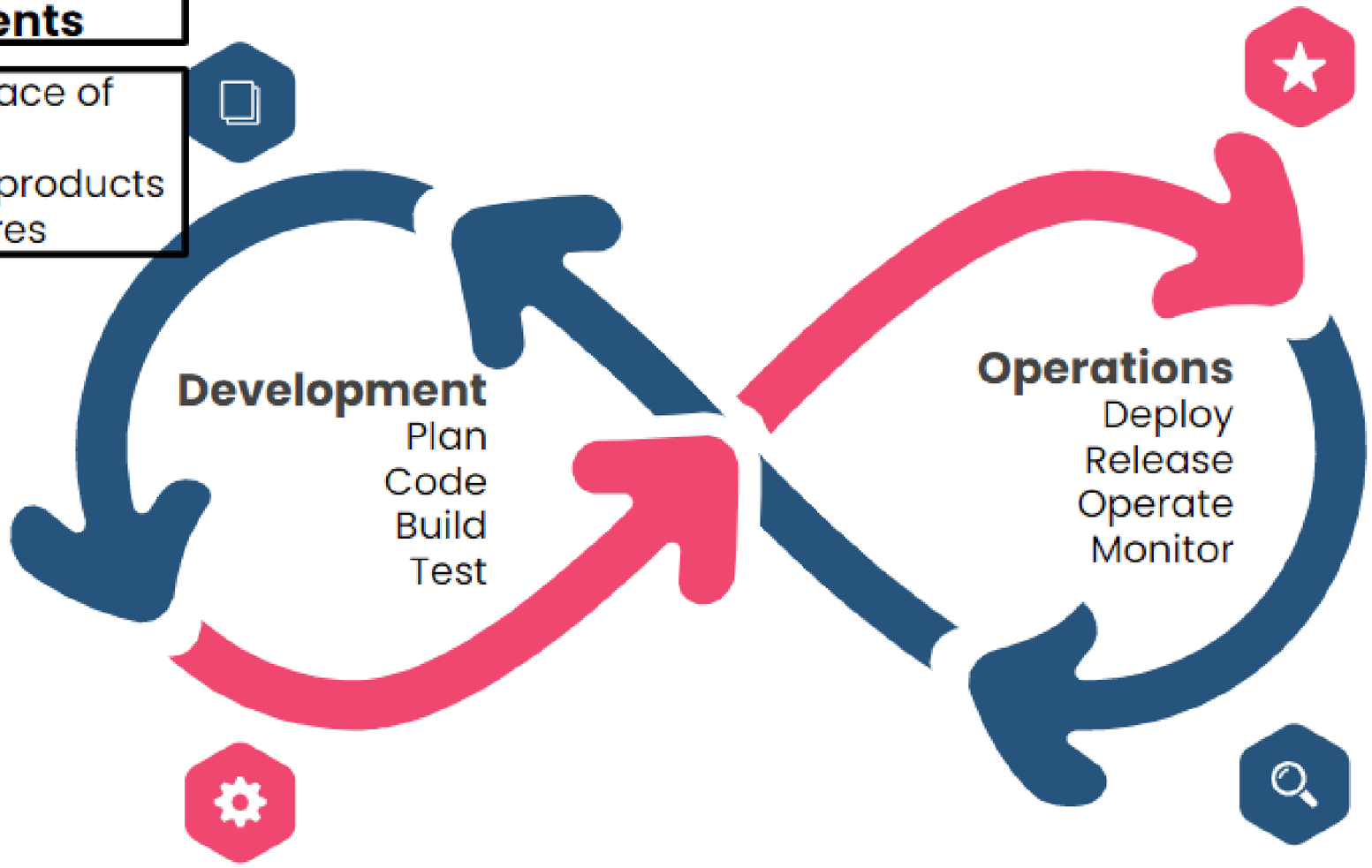
DevOps benefits for reporting

- Handling Multiple Data Sources in harmony
- Producing many logs during the change management process

Requirements

-Track the pace of innovation
-Number of products & new features



Requirements

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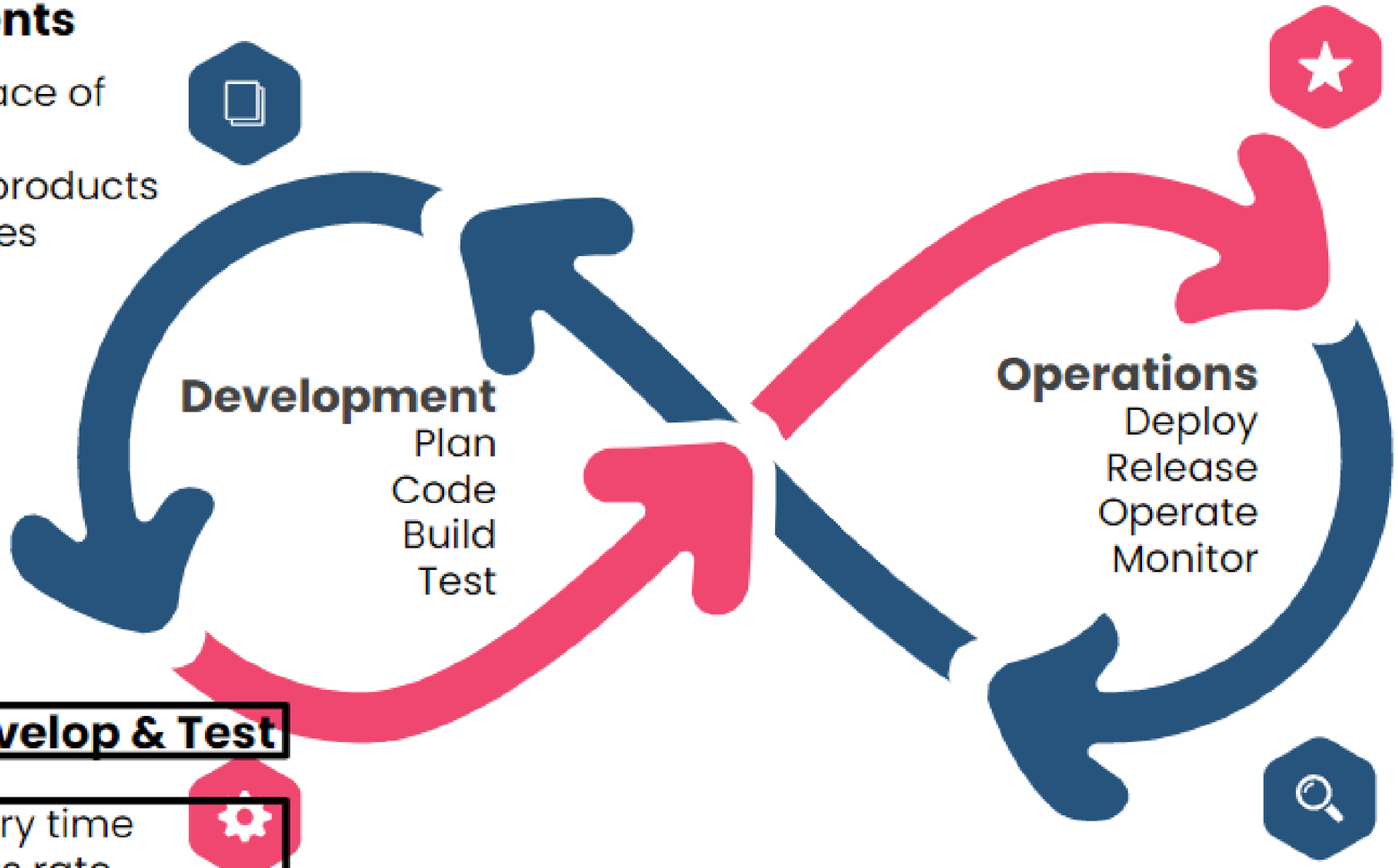
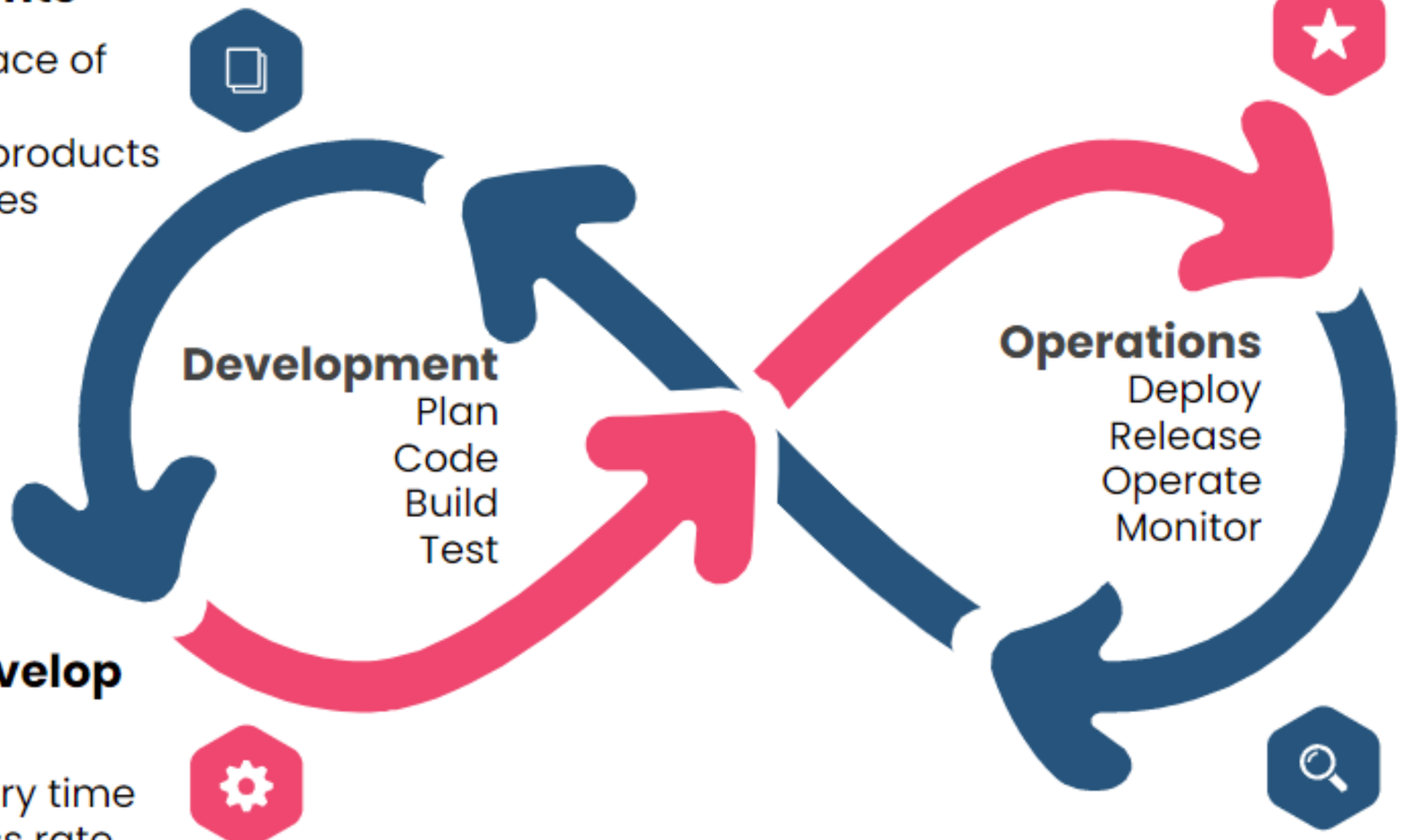


Design, Develop & Test

-Track delivery time
-Pipeline pass rate
-Track development time

Requirements

-Track the pace of innovation
-Number of products & new features



Deploy, Review

-Measure the success of experiments
-Quality of the Products

Design, Develop & Test

-Track delivery time
-Pipeline pass rate
-Track development time

Requirements

-Track the pace of innovation
-Number of products & new features

Development
Plan
Code
Build
Test

Operations
Deploy
Release
Operate
Monitor

Deploy, Review

-Measure the success of experiments
-Quality of the Products

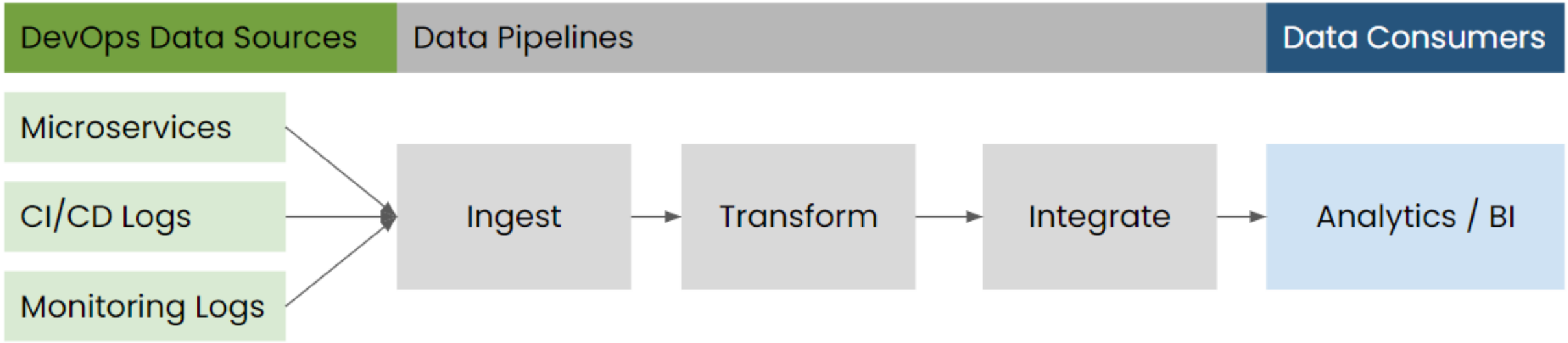
Design, Develop & Test

-Track delivery time
-Pipeline pass rate
-Track development time

Launch, Operate & Monitor

-Measure Post-Release Issues

Reporting architecture For DevOps



- DevOps produces a lot of data
- Data sources are spread out
- Data needs to be collected and moved to a database
- Data Scientists can use the data for insights, reports, and dashboards

Let's practice!

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Tools: Ecosystem

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Requirements

- Business and engineering interaction
- Used throughout the software change management process
- Project Management Tools
- Communication Tools

[1] https://atlassian.design/foundations/logos [2] https://slack.com/media-kit [3] https://discord.com/branding

Version Control Software

- Main change management technology is git
- Git is a protocol used for version control
- Git ensures multiple developers can work on the same software
- Git has many implementations, most common ones are GitHub and GitLab

[1] https://git-scm.com/downloads/logos [2] https://github.com/logos [3] https://about.gitlab.com/press/press-kit/

Build Tools

- Software needs to be built to become executable
- Main build tools are: Maven and Gradle

[1] https://maven.apache.org/ [2] https://gradle.com/brand/

CI/CD Tools

- CI/CD pipelines are the main principles of DevOps
- CI/CD pipelines ensure automated building, testing, and deployment of software
- Main CI/CD tools are Jenkins and CircleCI

circleci

[1] https://www.jenkins.io/press/ [2] https://circleci.com/legal/trademark-guidelines/

Deployment

- Microservices are developed and deployed independently from each other
- Containers imitate separate machines
- Microservices are deployed on separate containers
- Containers: Docker and Podman
- Container orchestration: Kubernetes

[1] https://www.docker.com/company/newsroom/media-resources/ [2] https://podman.io/ [3] https://kubernetes.io/

Monitoring Tools

- Products need to be closely monitored and observed for quality and reliability issues
- Monitor the DevOps health and change management metrics
- Example tools used for monitoring are SignalFX and AppDynamics

[1] https://www.splunk.com/en_us/products/observability.html?301=/en_us/devops.html

Data management tools: Kafka

- Kafka is a message publishing system
- Kafka is heavily used in microservices architecture
- Microservices keep a journal of the work they do on Kafka

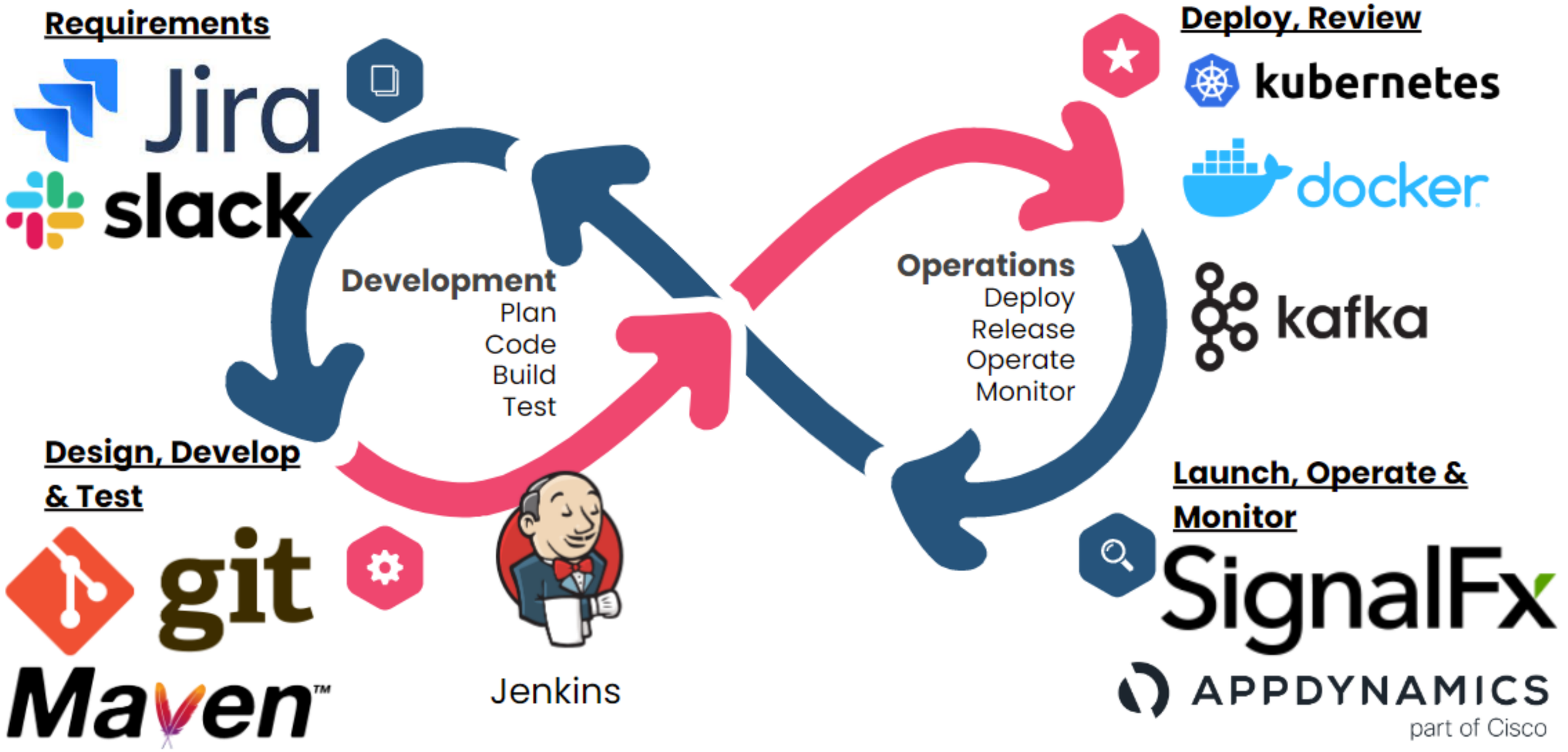
[1] https://kafka.apache.org/trademark

Data pipeline management tools

- Most tools used for both batch and streaming processing
- Main tools used for data pipeline management are: Apache Airflow, Hevo Data, and Prefect

[1] https://cwiki.apache.org/confluence/display/AIRFLOW/Airflow%20logos [2] https://design.hevodata.com/ [3] https://www.prefect.io/newsroom/logos/

Recap


Requirements
Jira
slack
Development
Plan
Code
Build
Test
Operations
Deploy
Release
Operate
Monitor
Deploy, Review
kubernetes
docker
kafka
Design, Develop & Test
git
Maven™
Jenkins
Launch, Operate & Monitor
SignalFx
APPDYNAMICS
part of Cisco

Let's practice!

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