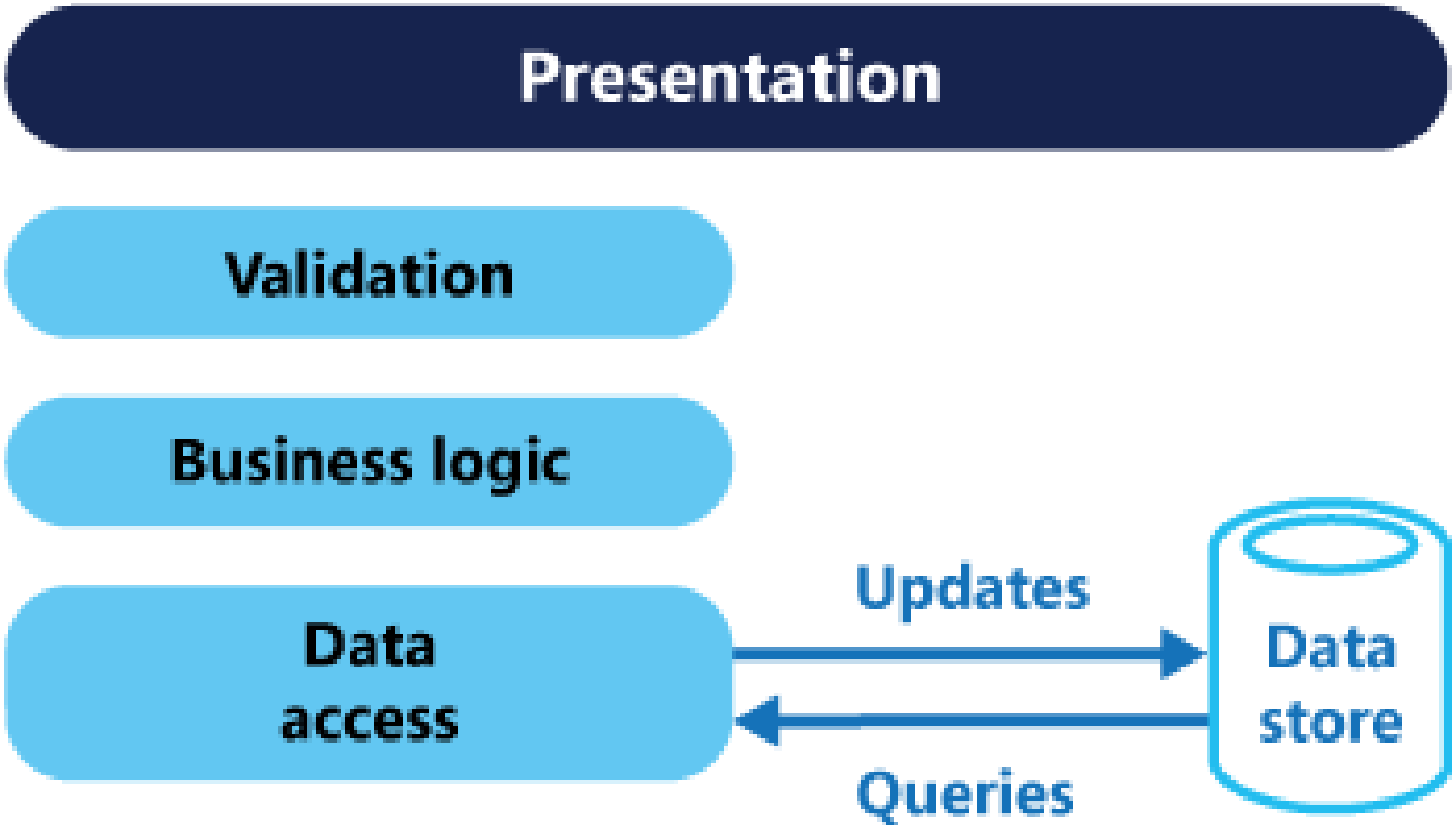
Software Architecture
Course's Code: CSE 483
Command Query Responsibility Segregation
(Chapter 8)

Chapter 8. CQRS Architecture

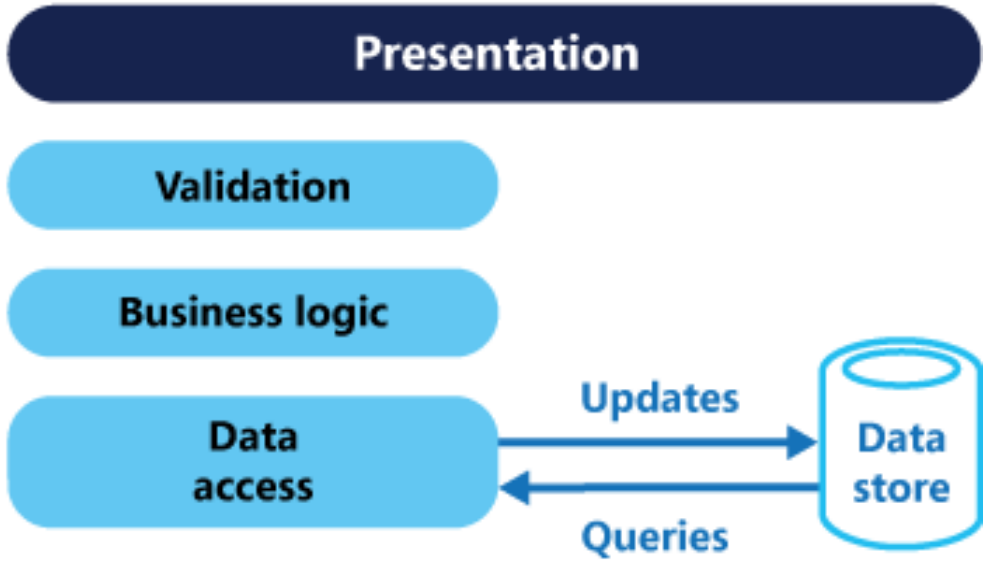
8.1 What is CQRS architecture?
8.2 The three Variants
8.3 Advantages and disadvantages

Context and Problems



Context and Problems

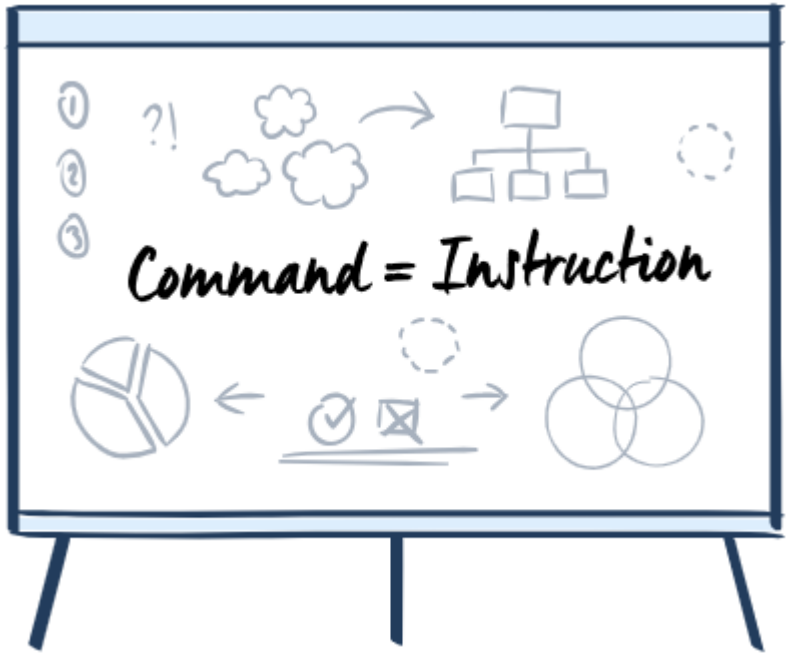
- Read and write workloads are often asymmetrical.
- Data contention can occur when operations are performed in parallel on the same set of data.



- Managing security and permissions can become complex, because each entity is subject to both read and write operations, which might expose data in the wrong context.

Commands vs Query

A **command** is an instruction, a directive to perform a specific task. It is an intention to change something.

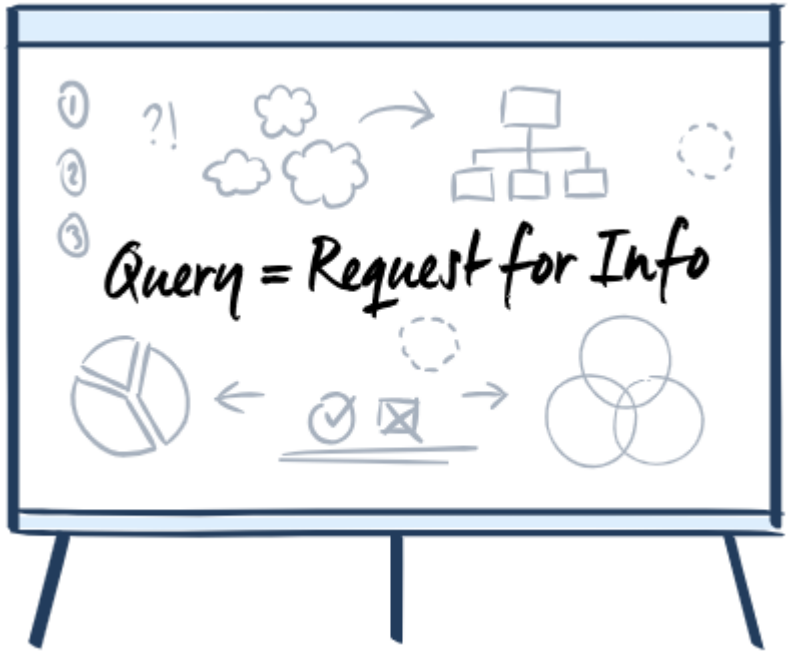


A command does something but does not return a result.

Commands vs **Query**

A **query** is a request for information.

A query returns a result but does not change the state.

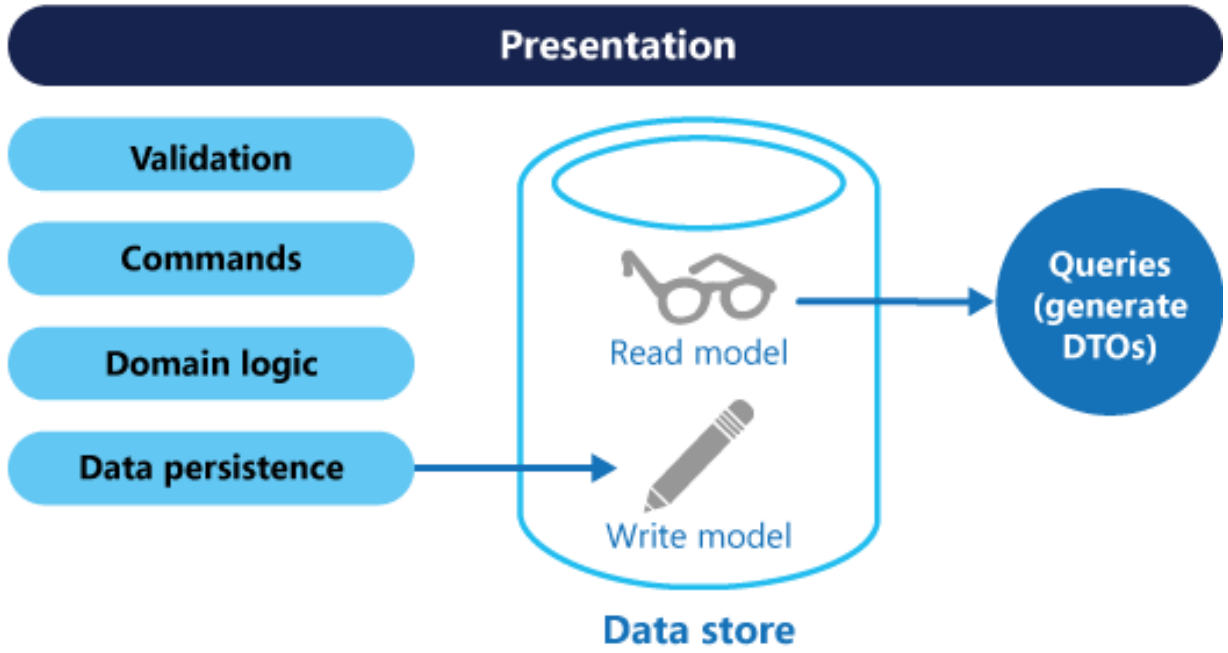


It is an intention to get data, or the status of data, from a specific place. Nothing in the data should be changed by the request.

What is CQRS Architecture?

- **CQRS** stands for **Command Query Responsibility Segregation**

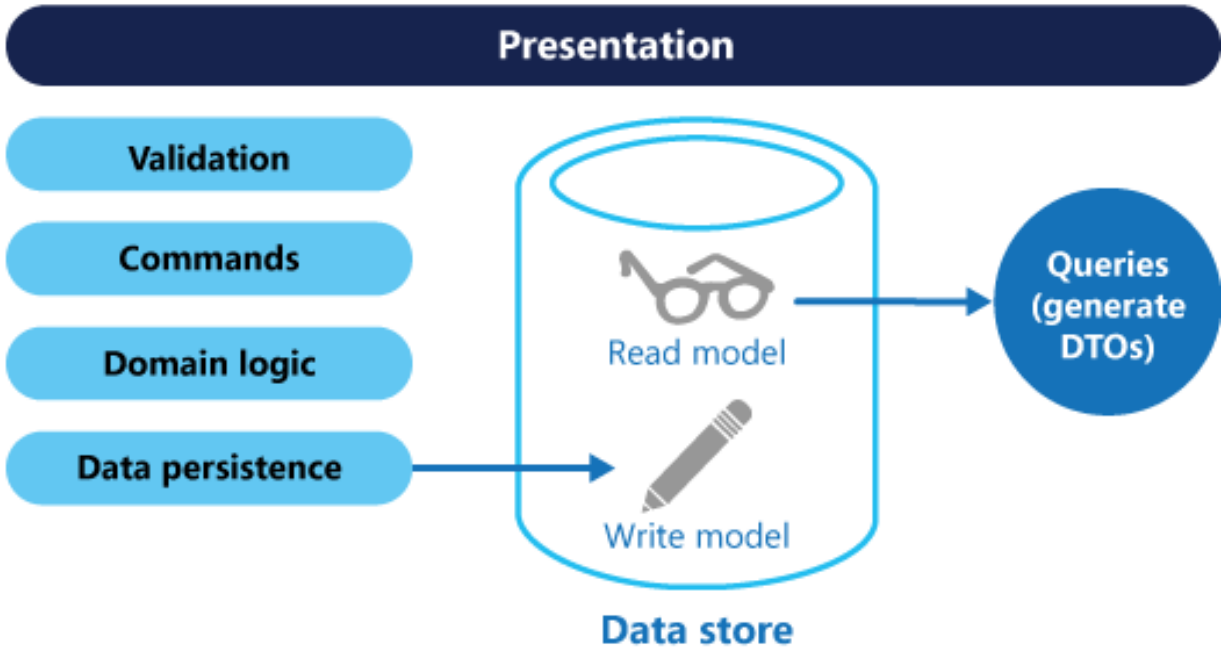
- CQRS is the segregation of the **responsibilities** of the **commands** and **queries** in a system



What is CQRS Architecture?

CQRS separates **reads** and **writes** into different models, using **commands** to update data, and **queries** to read data.

- Commands may be placed on a queue for asynchronous processing, rather than being processed synchronously.
- Queries never modify the database. Just returns data.



What is CQRS Architecture?

Three variants

- Single-database structure
- Two-database structure
- Event-sourcing structure

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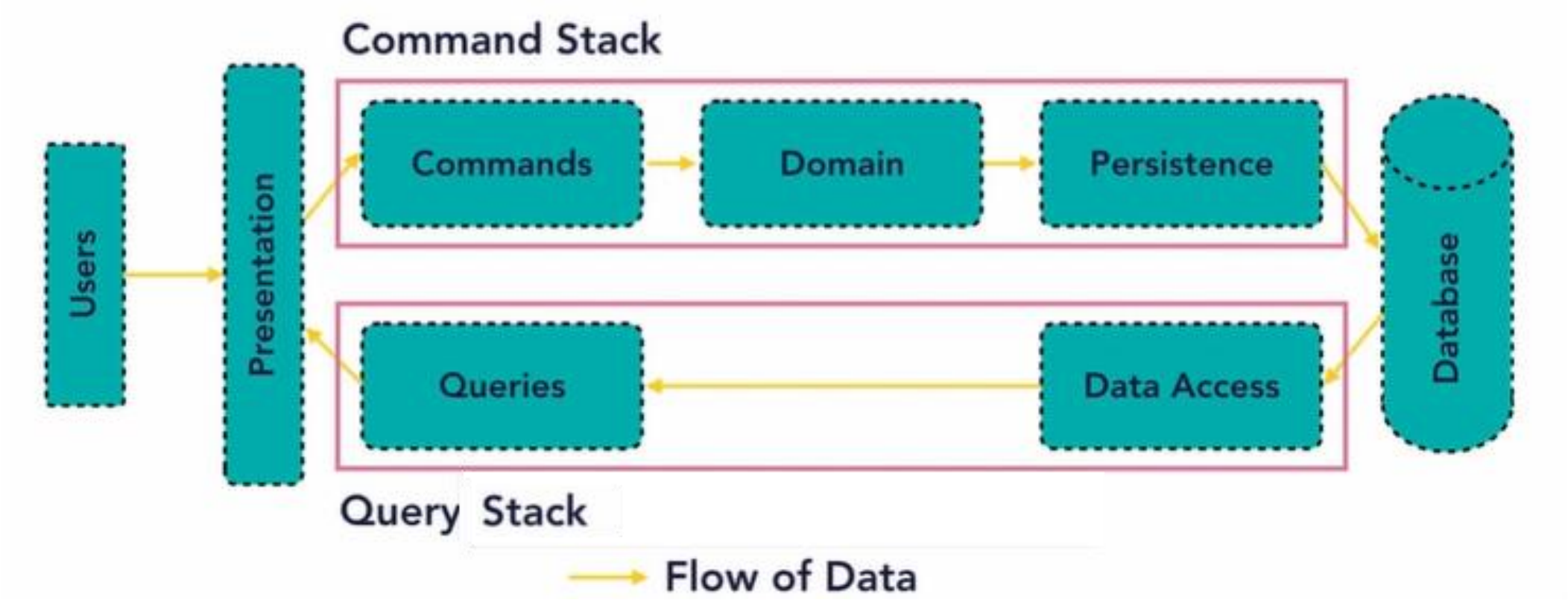
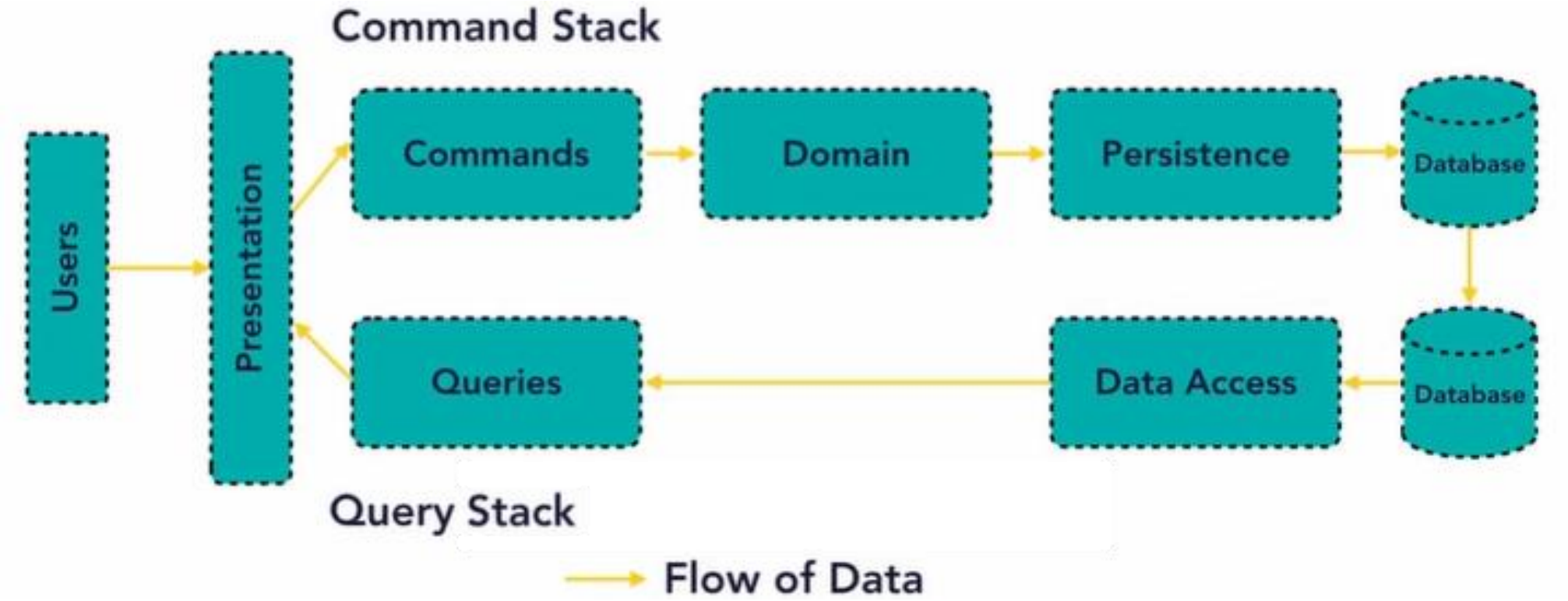
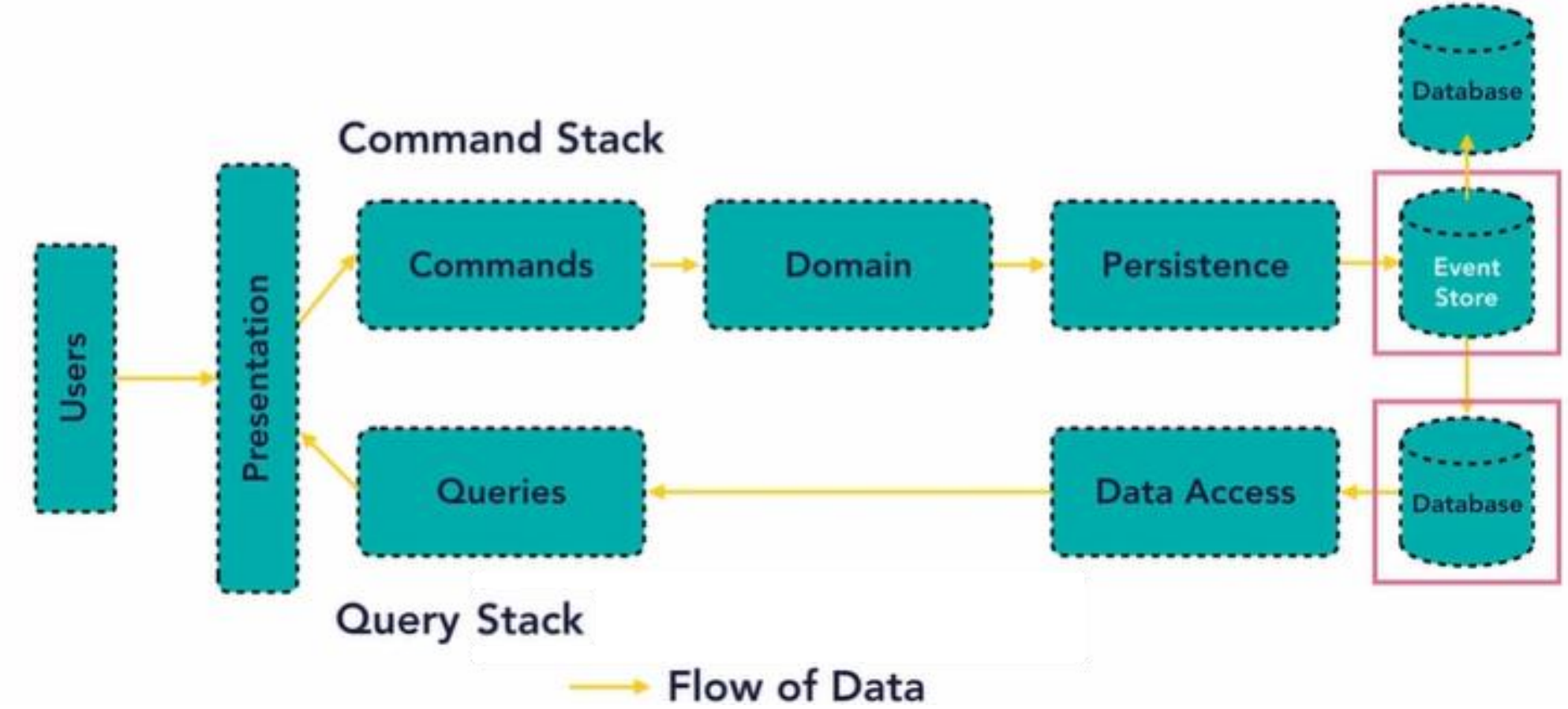
Single-Database structure



Two-Database structure



Event-Sourcing structure



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Advantages

Independent scaling: CQRS allows the read and write workloads to scale independently and may result in fewer lock contentions.

Optimized data schemas: The read side can use a schema that is optimized for queries, while the write side uses a schema that is optimized for updates.

Security. It's easier to ensure that only the right domain entities are performing writes on the data.

Separation of concerns: Segregating the read and write sides can result in models that are more maintainable and flexible.

Advantages and Disadvantages

Disadvantages

- **Complexity**: The basic idea of CQRS is simple. But it can lead to a more complex application design, especially if they include the Event Sourcing pattern.
- **Eventual consistency**: If you separate the read and write databases, the read data may be stale.