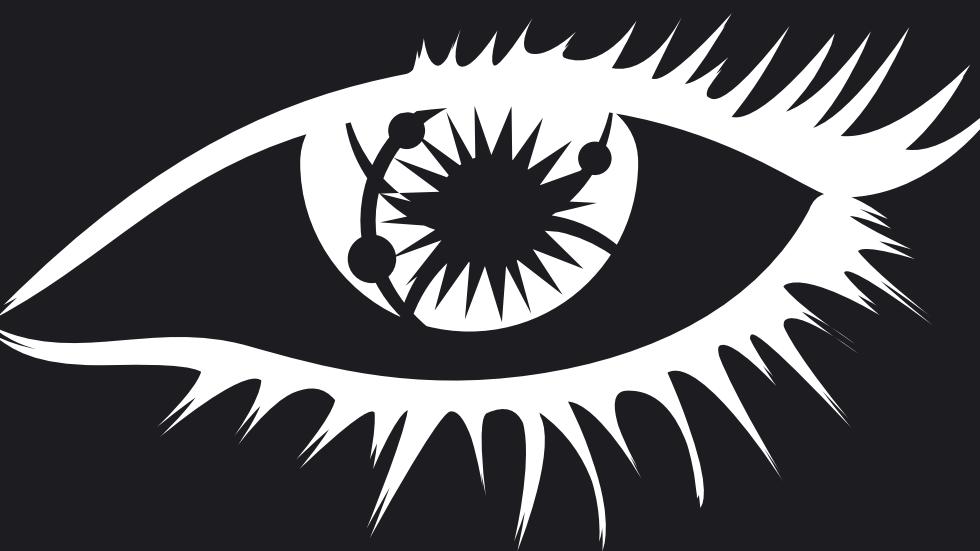
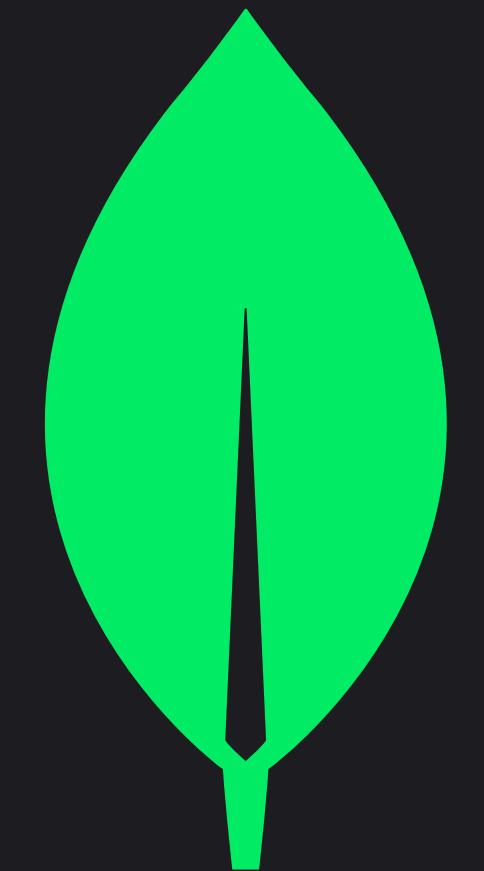
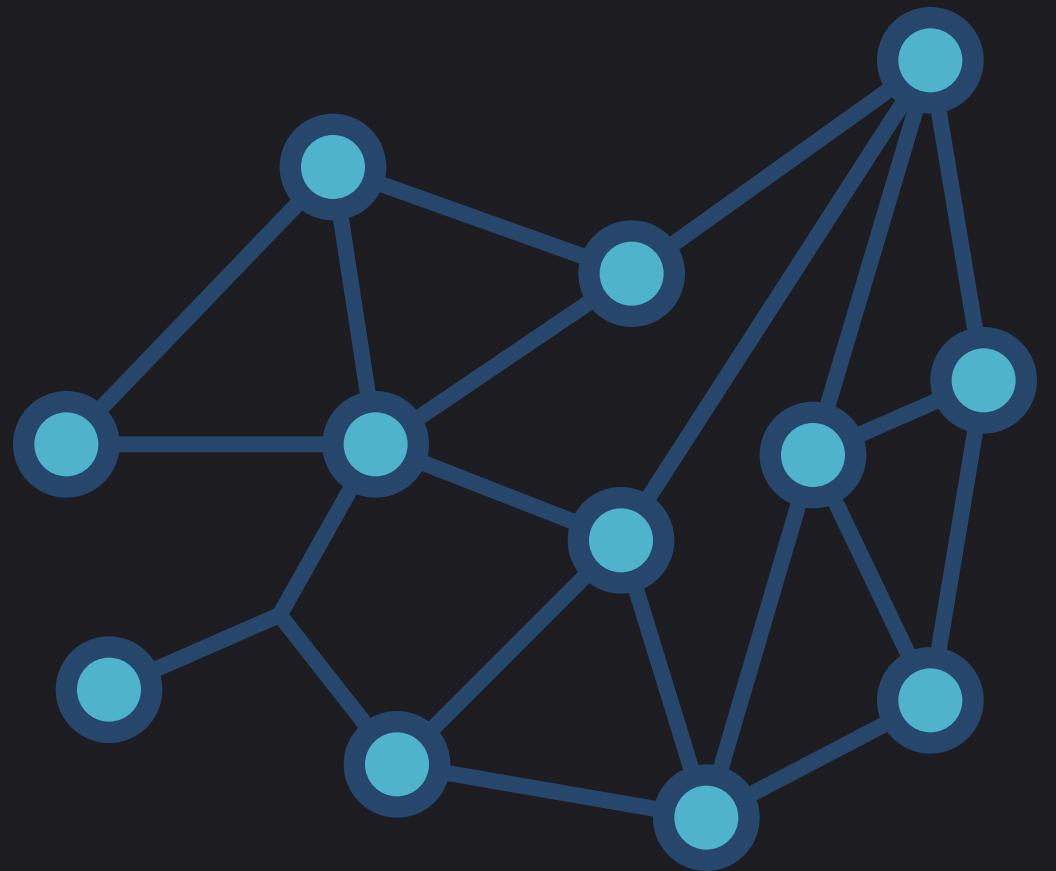
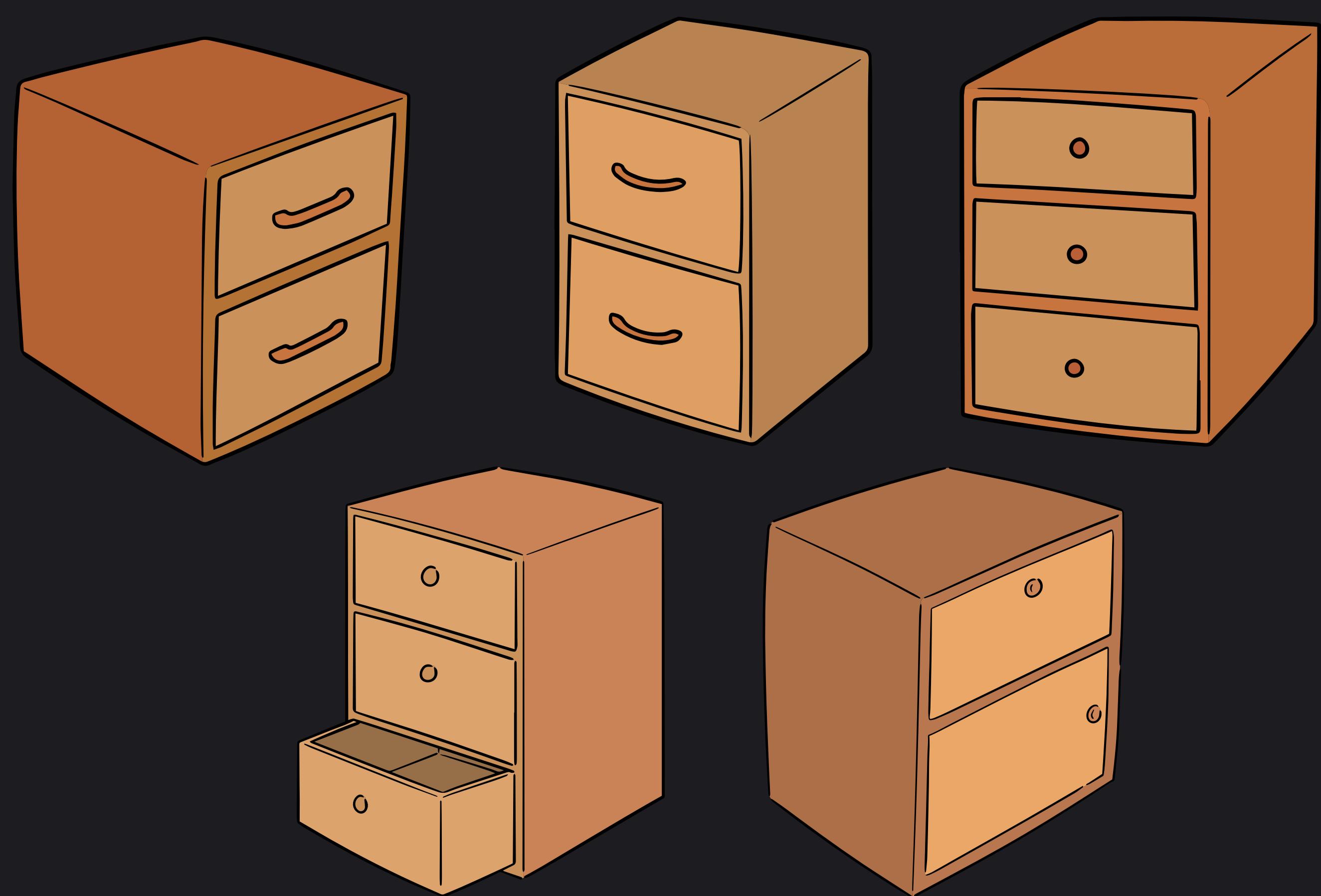


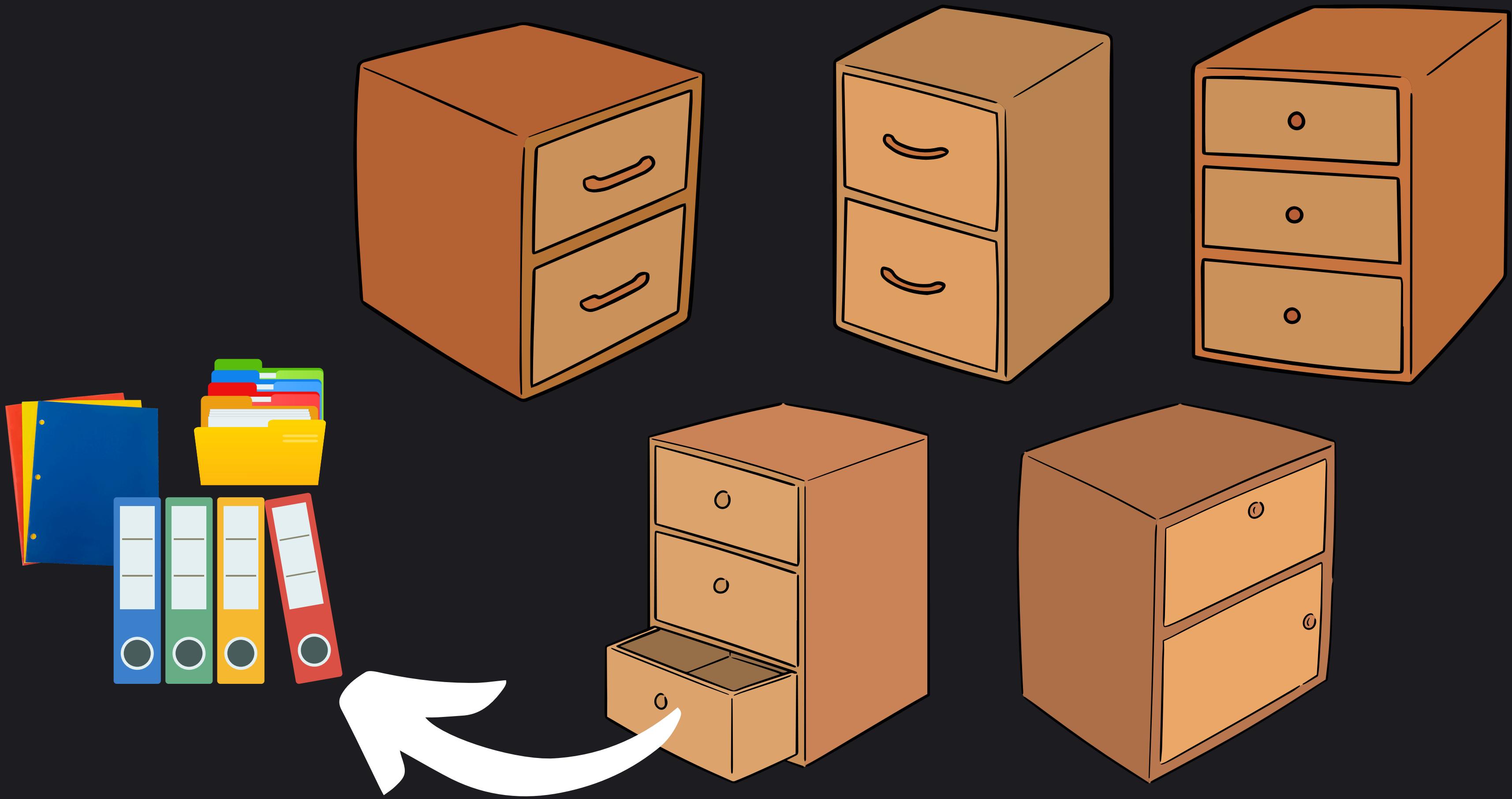
Database Essentials for System Design Interviews

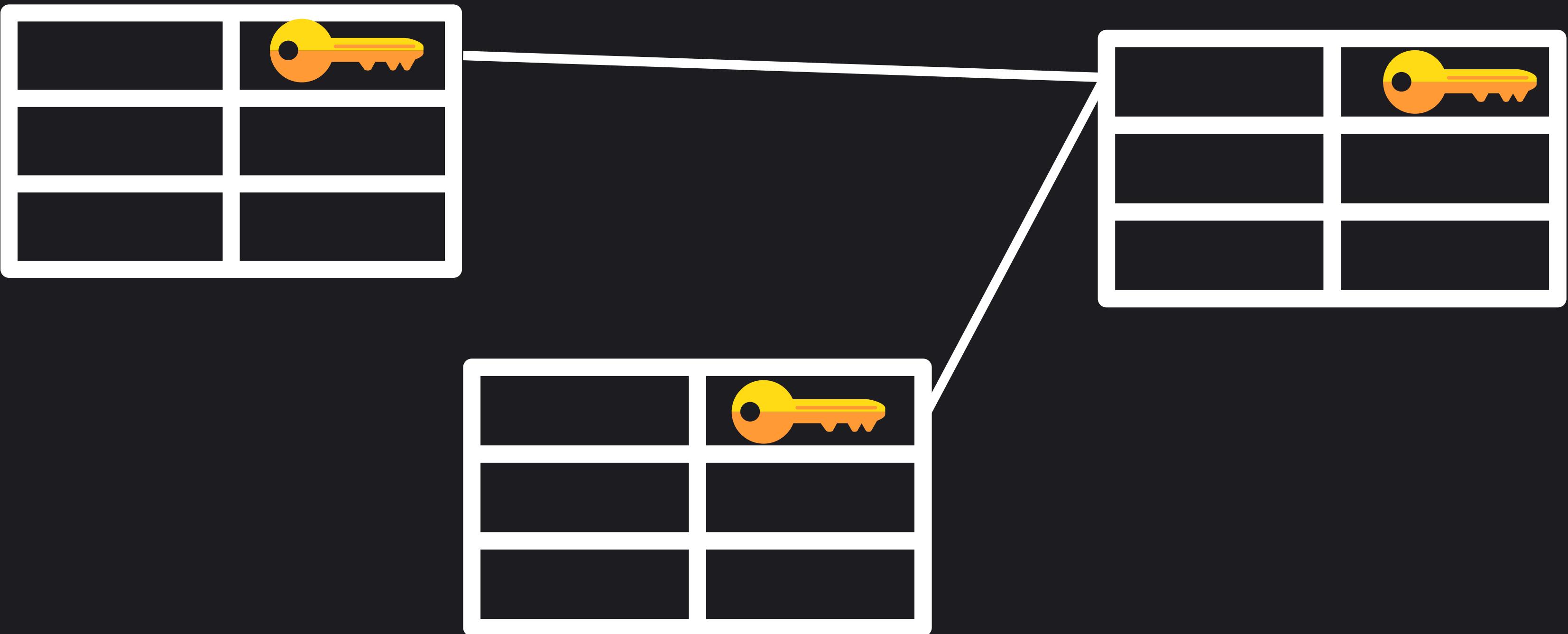
Different Types of Databases



Relational Databases









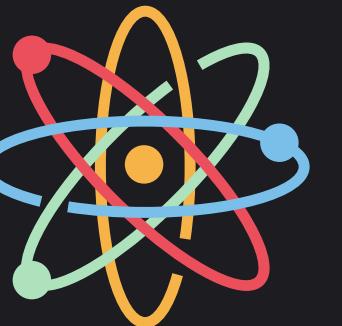


Great for transactions, complex queries, and integrity

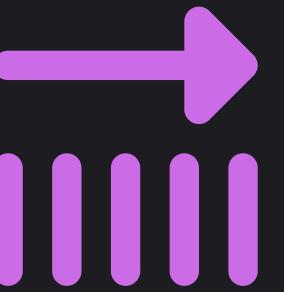
ACID Compliant

ACID Properties

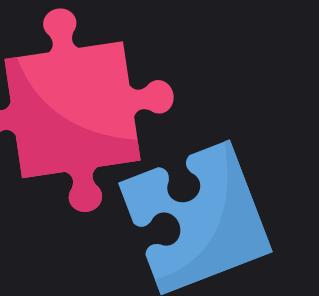
A



C



I

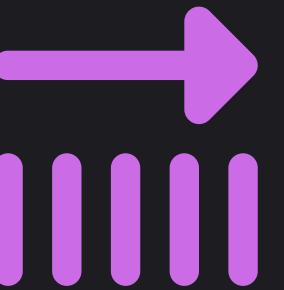
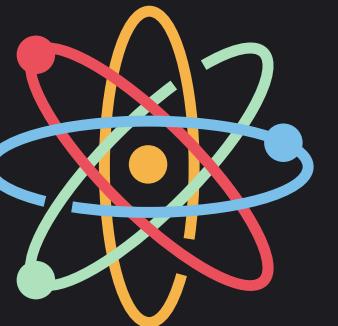


D

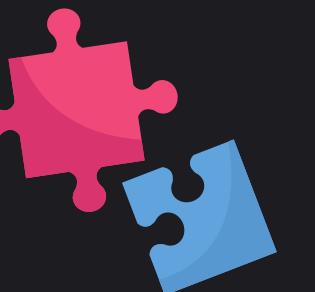


ACID Properties

Atomicity



C



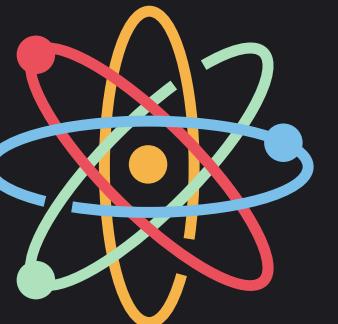
I



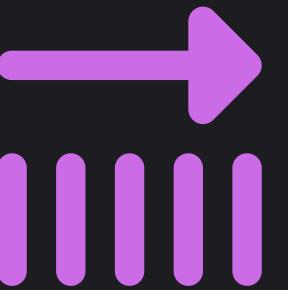
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ACID Properties

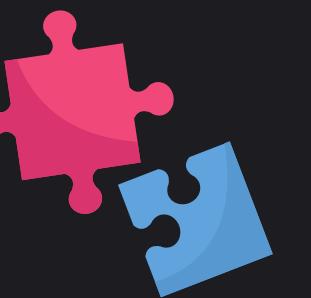
Atomicity



Consistency



I

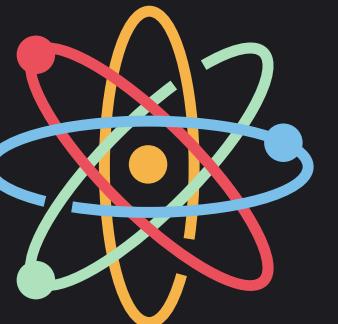


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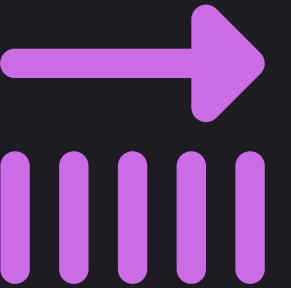


ACID Properties

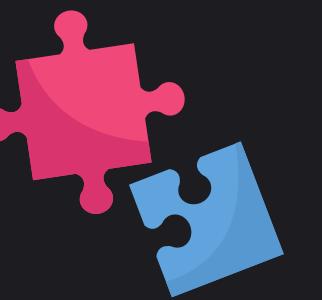
Atomicity



Consistency



Isolation

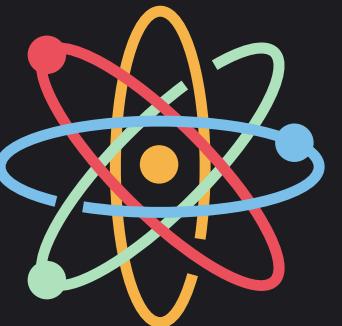


D

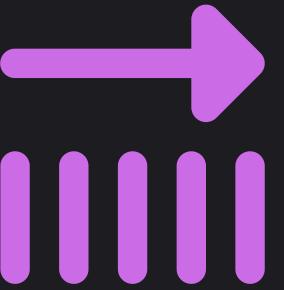


ACID Properties

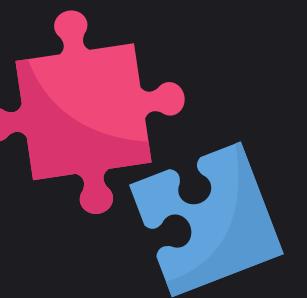
Atomicity



Consistency



Isolation



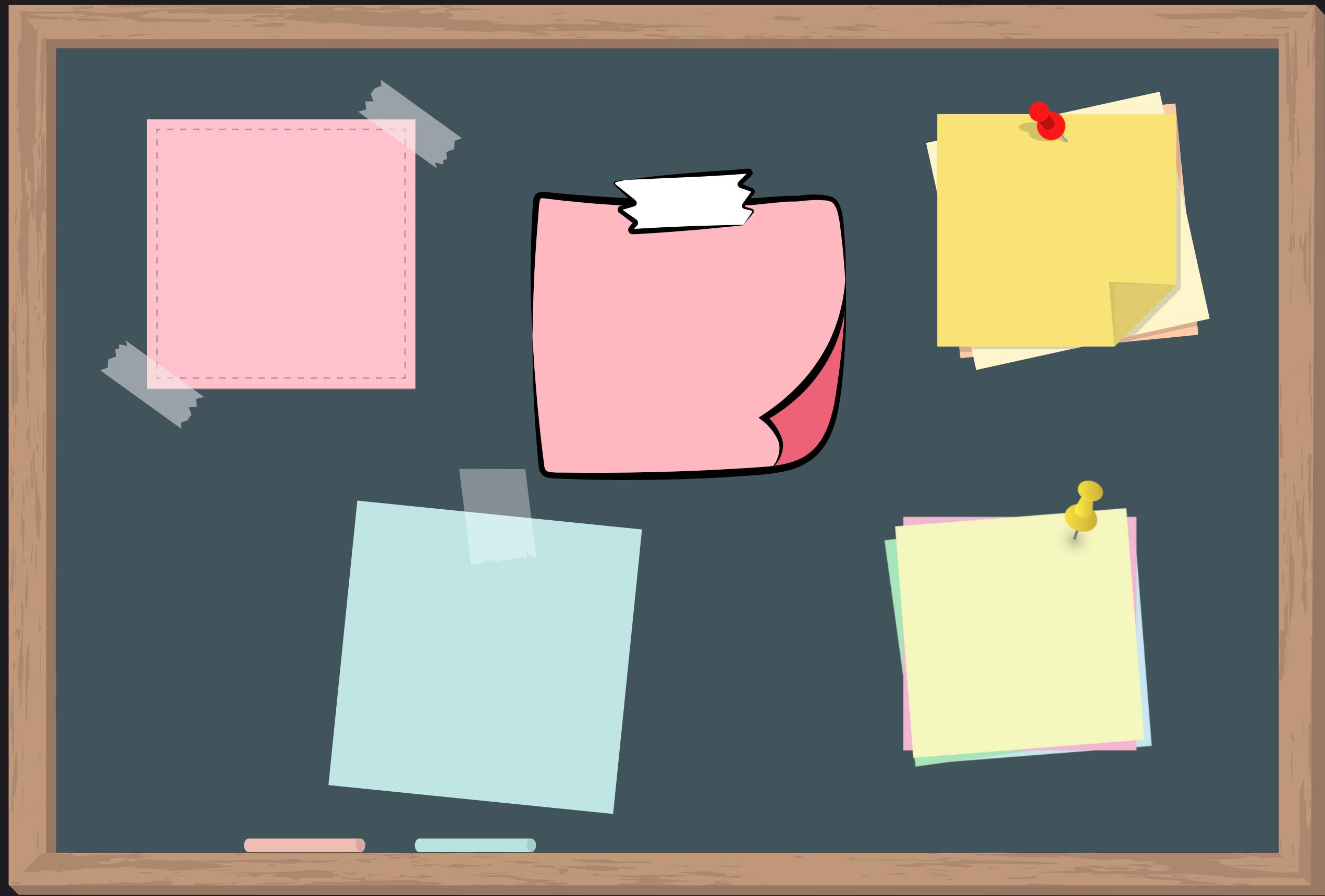
Durability

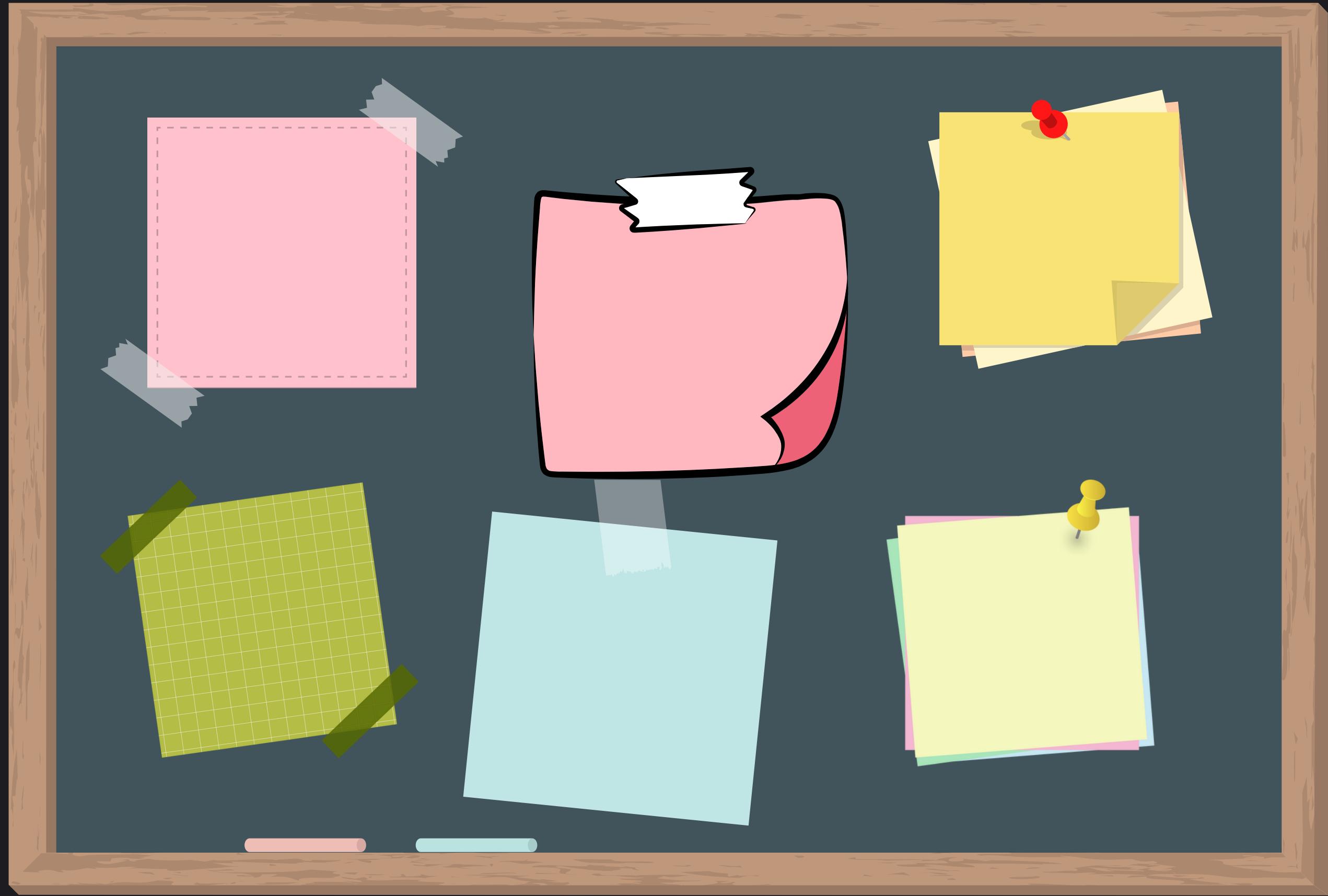


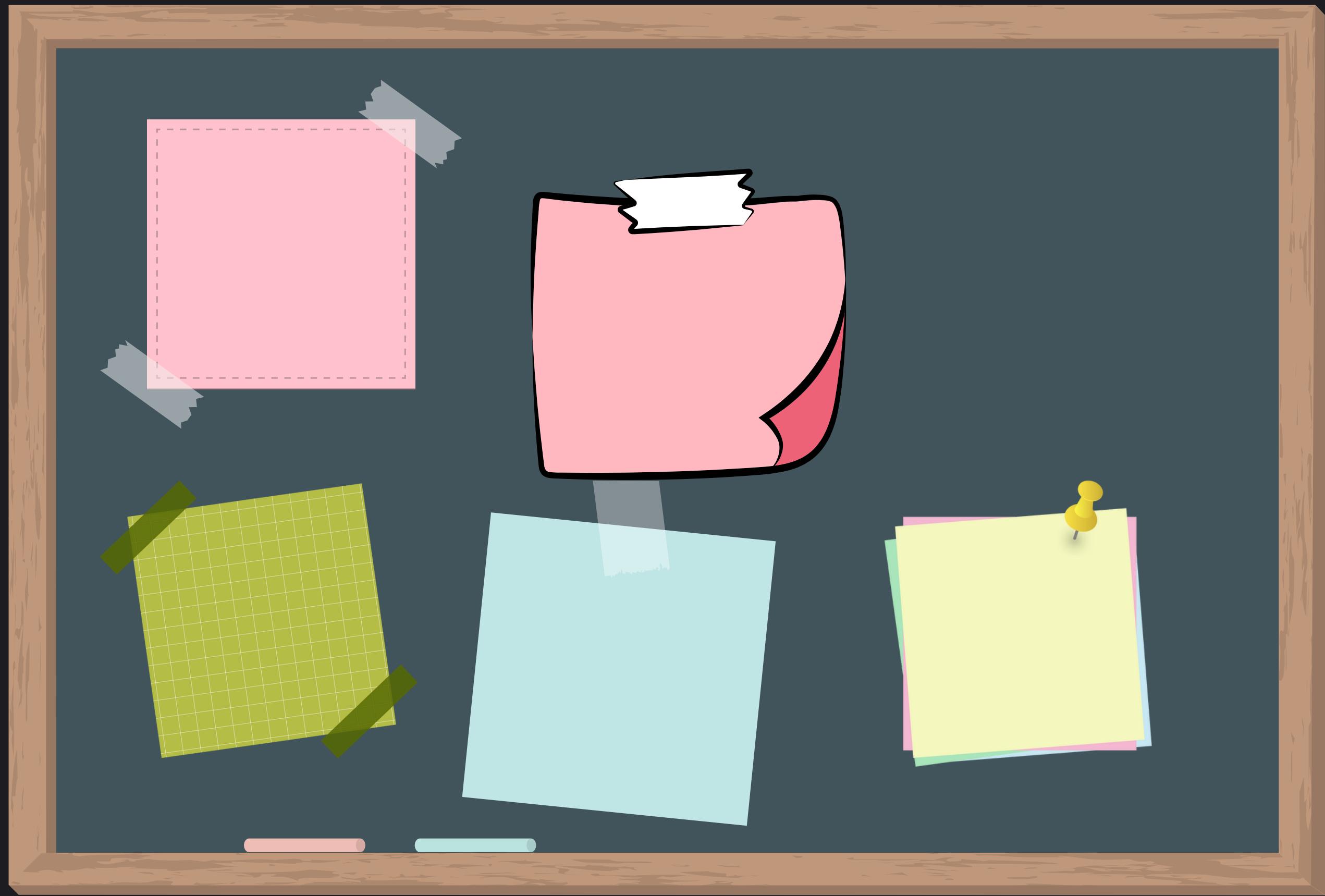
NoSQL Databases

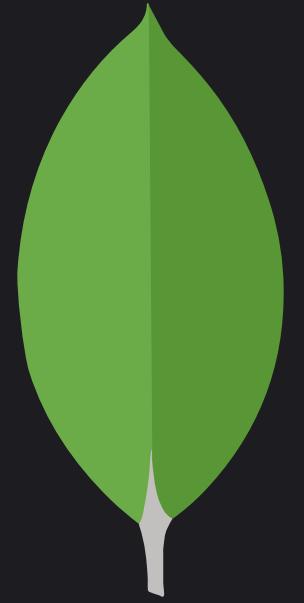
NoSQL Databases

A~~C~~IID



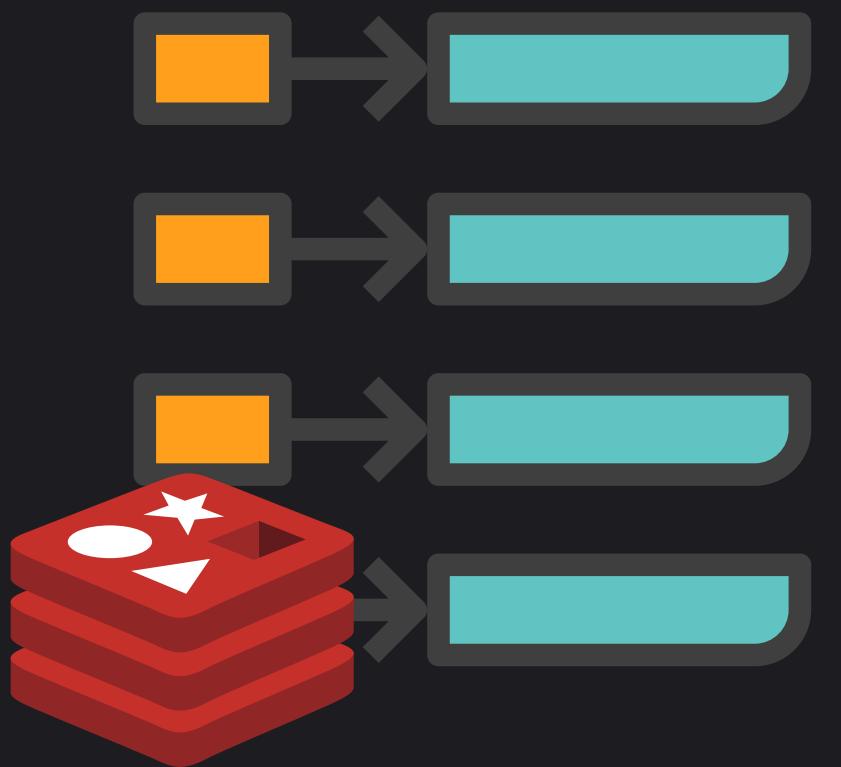


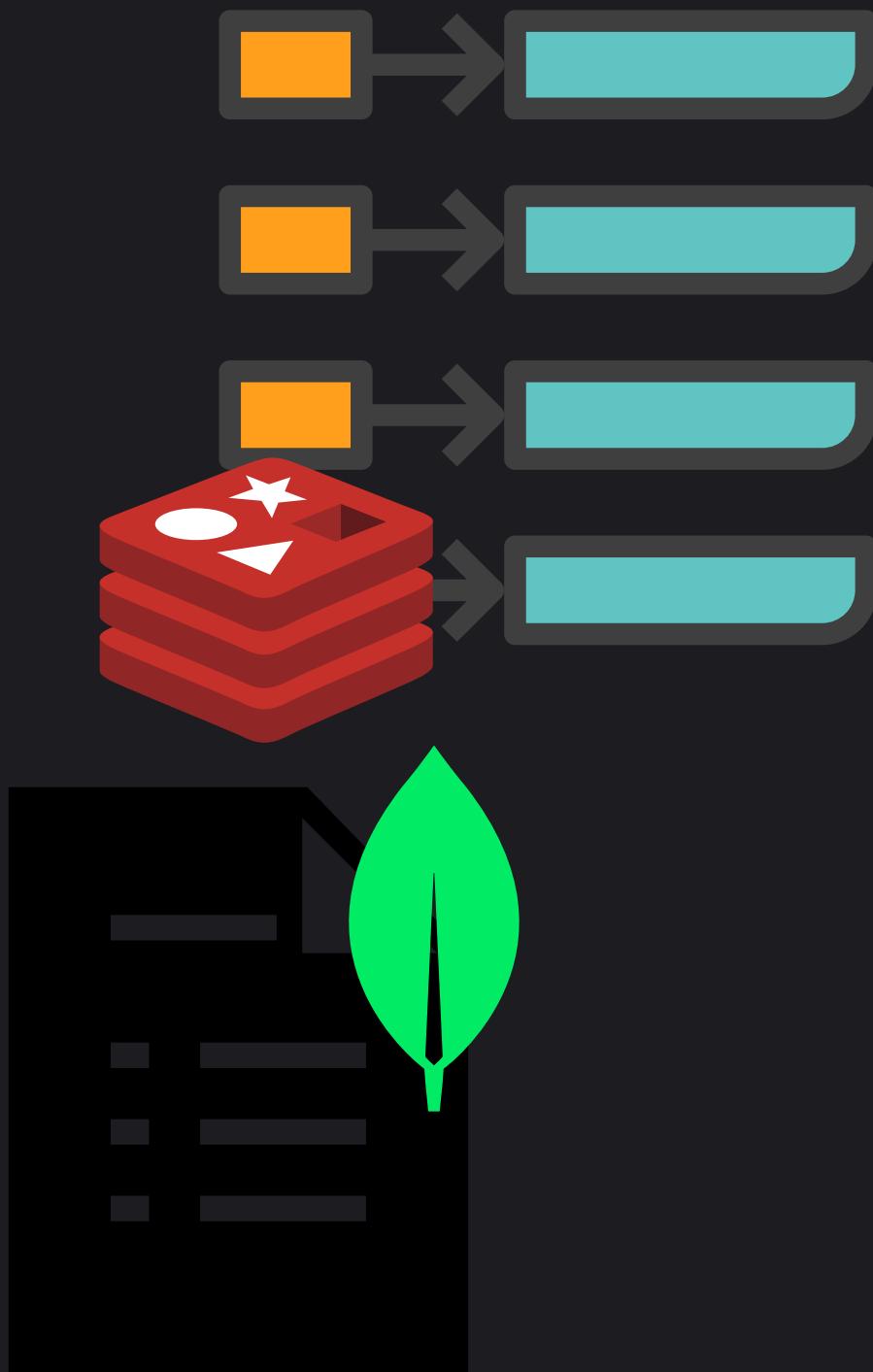


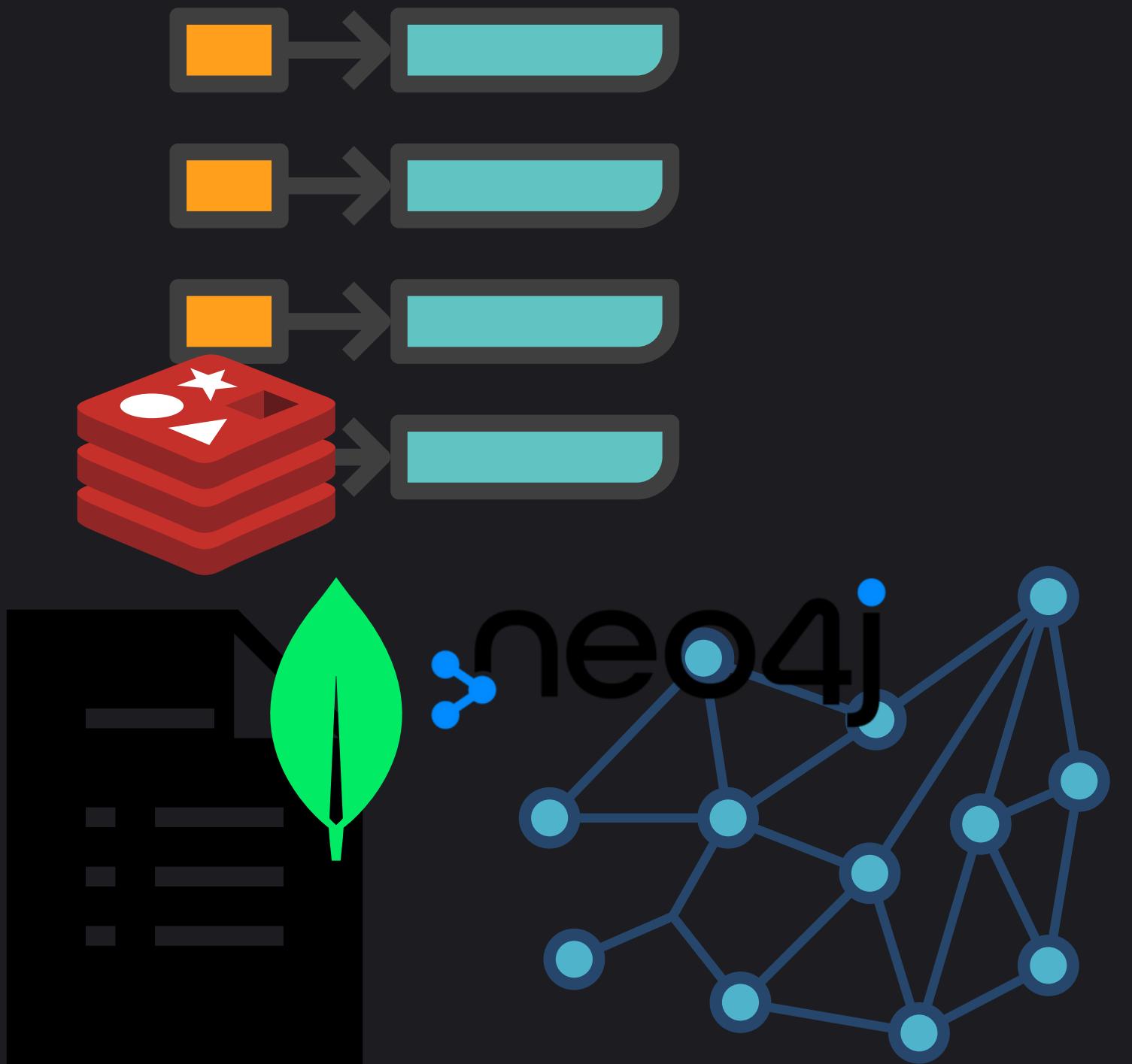


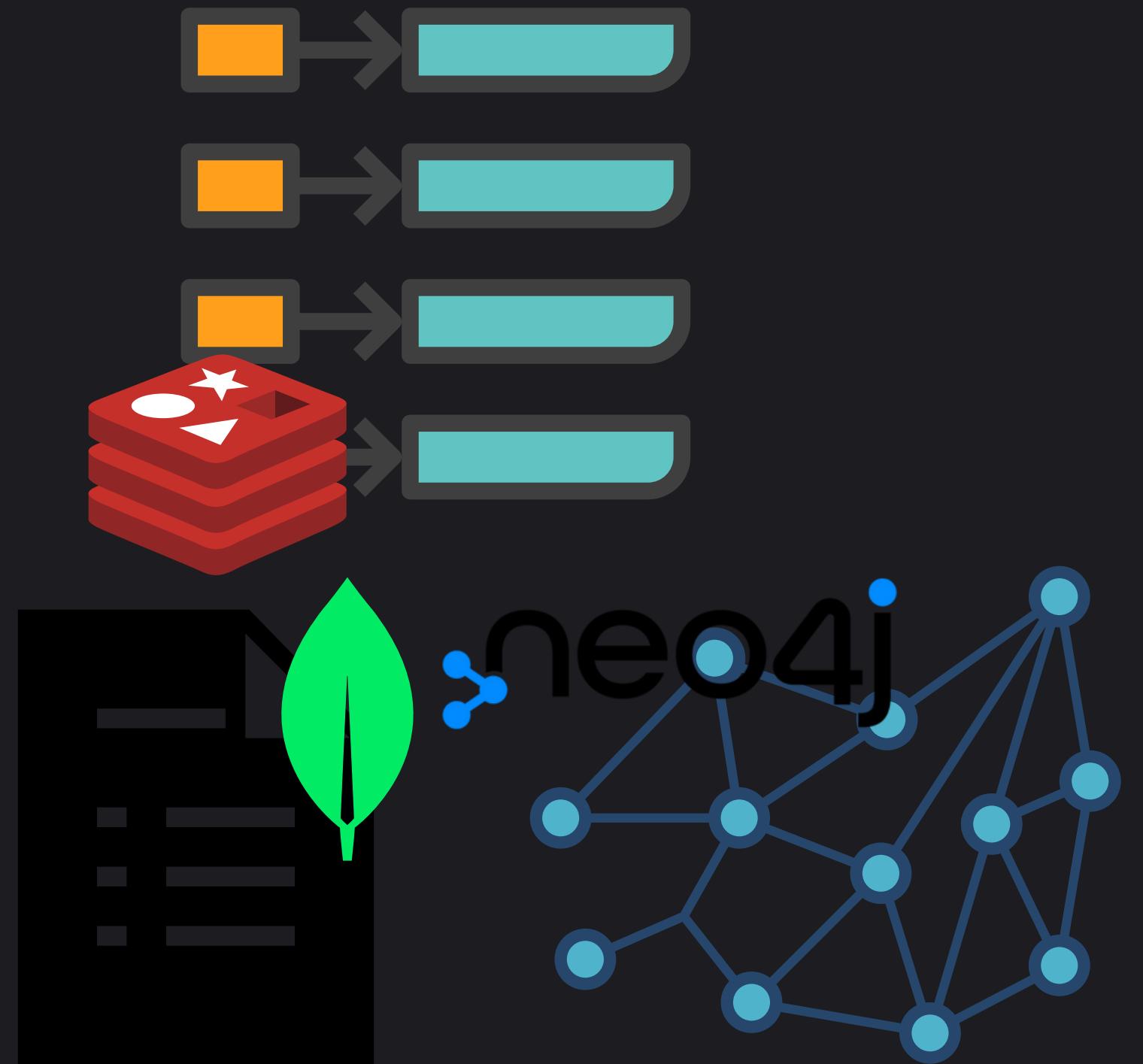
mongoDB

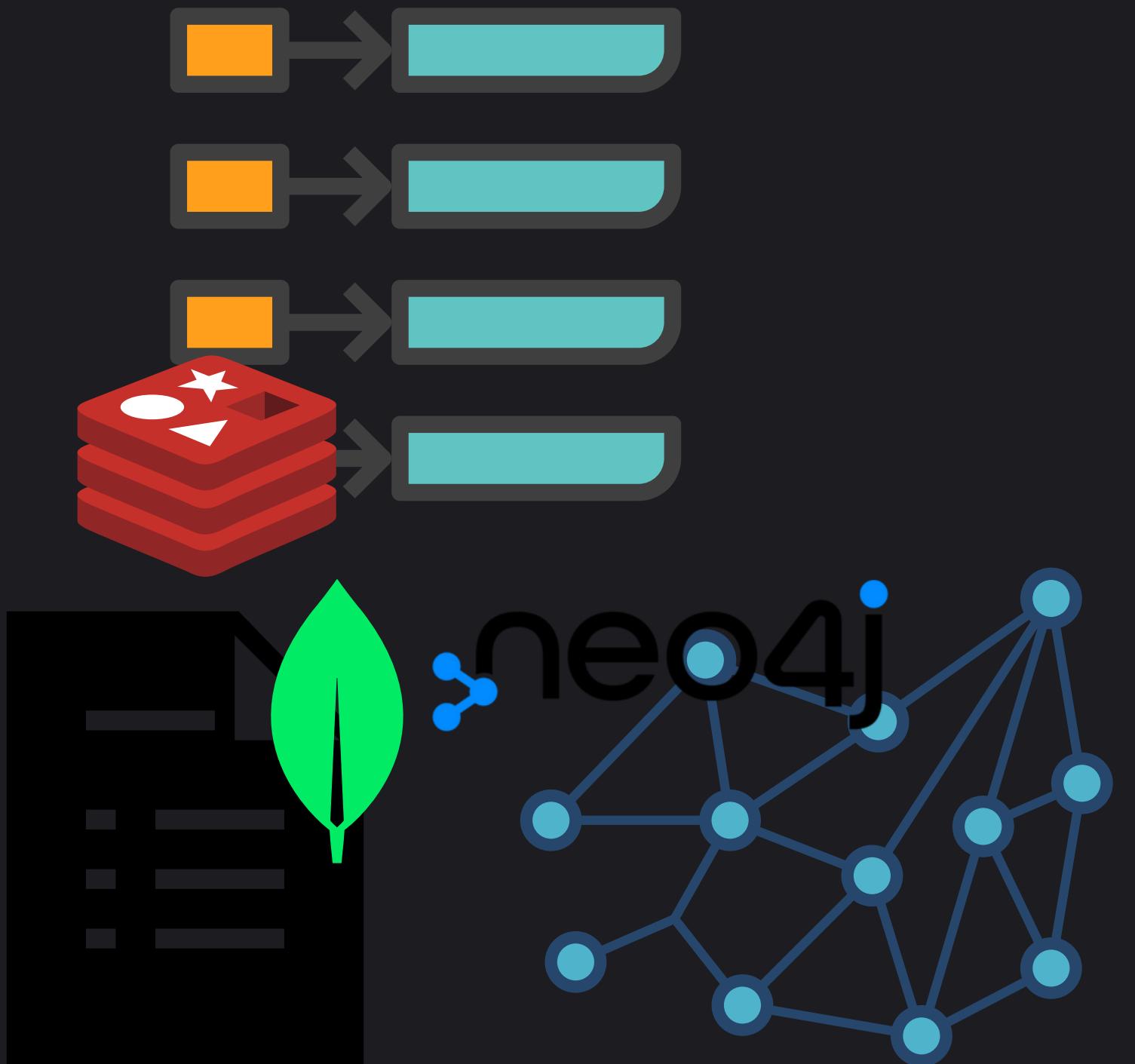






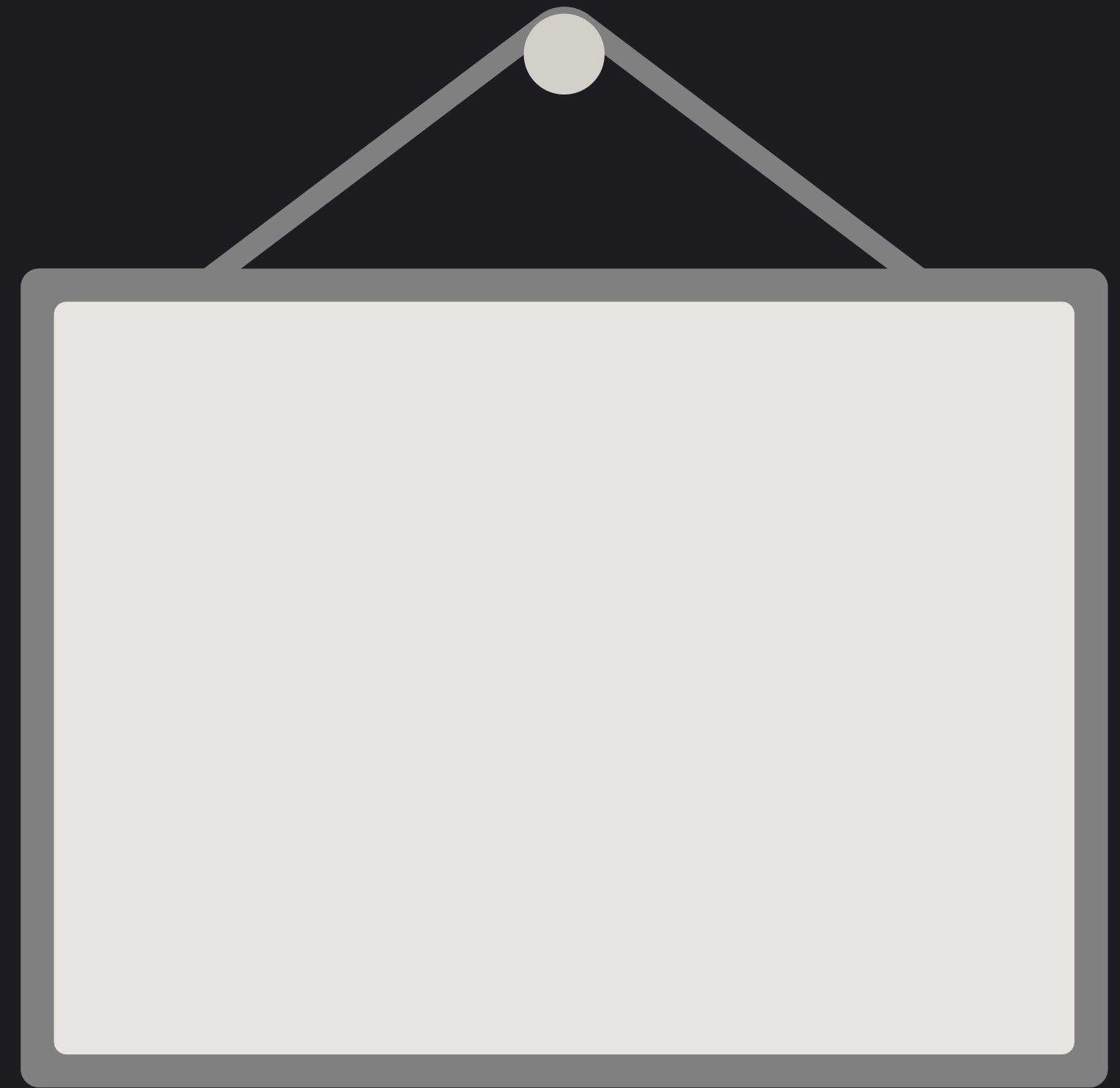


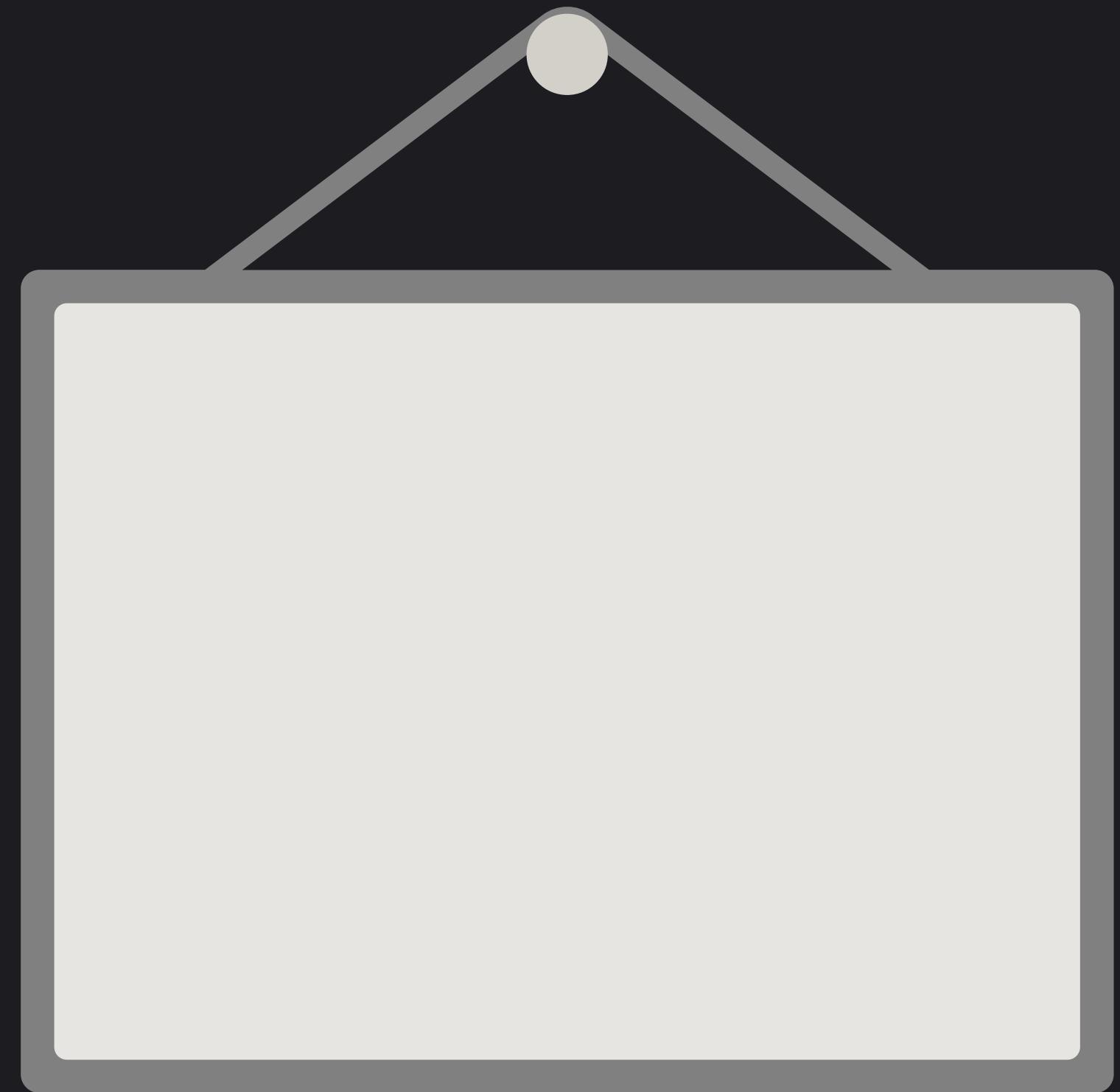
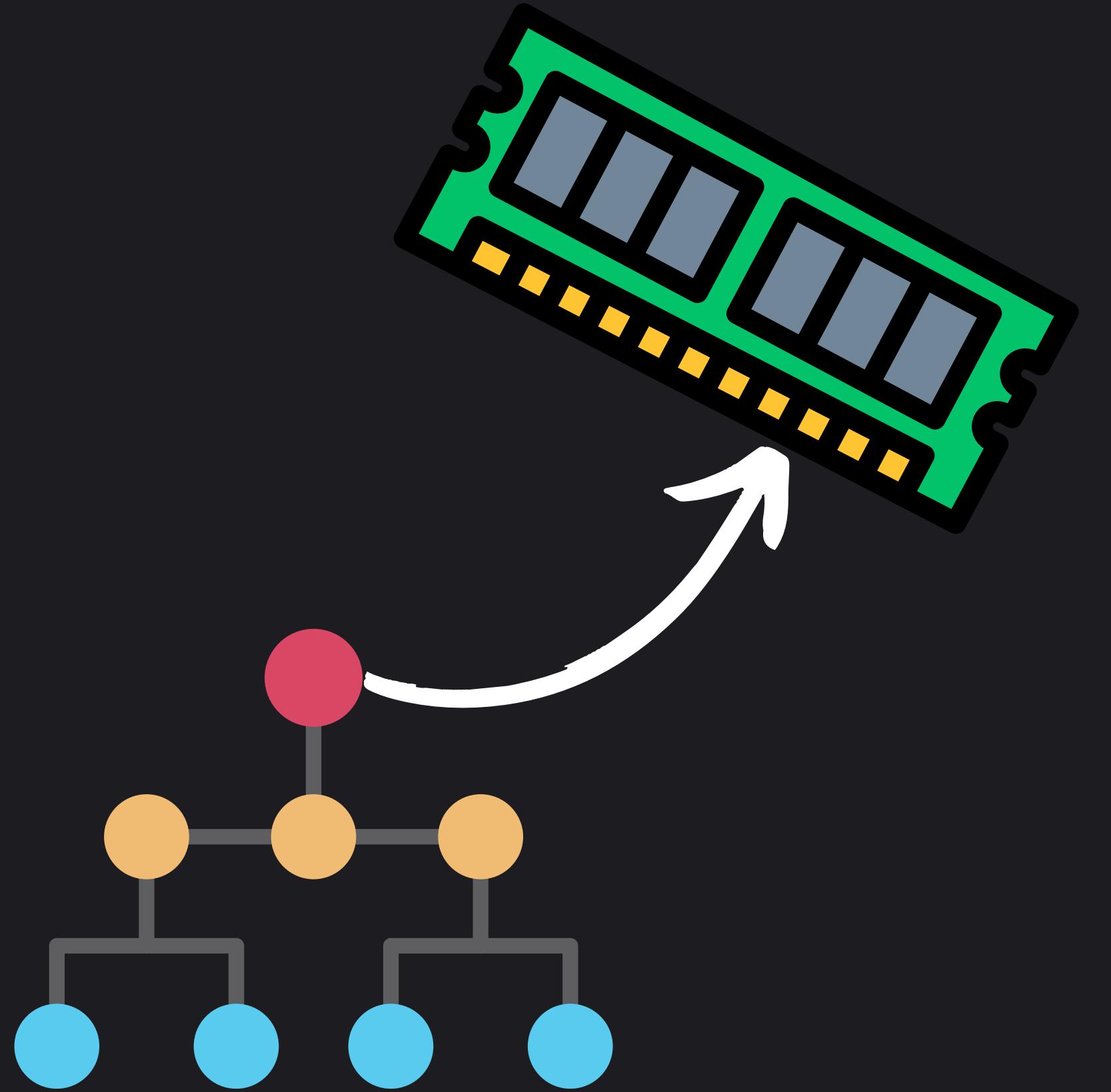




Ideal for scalability, quick iteration, and simple queries

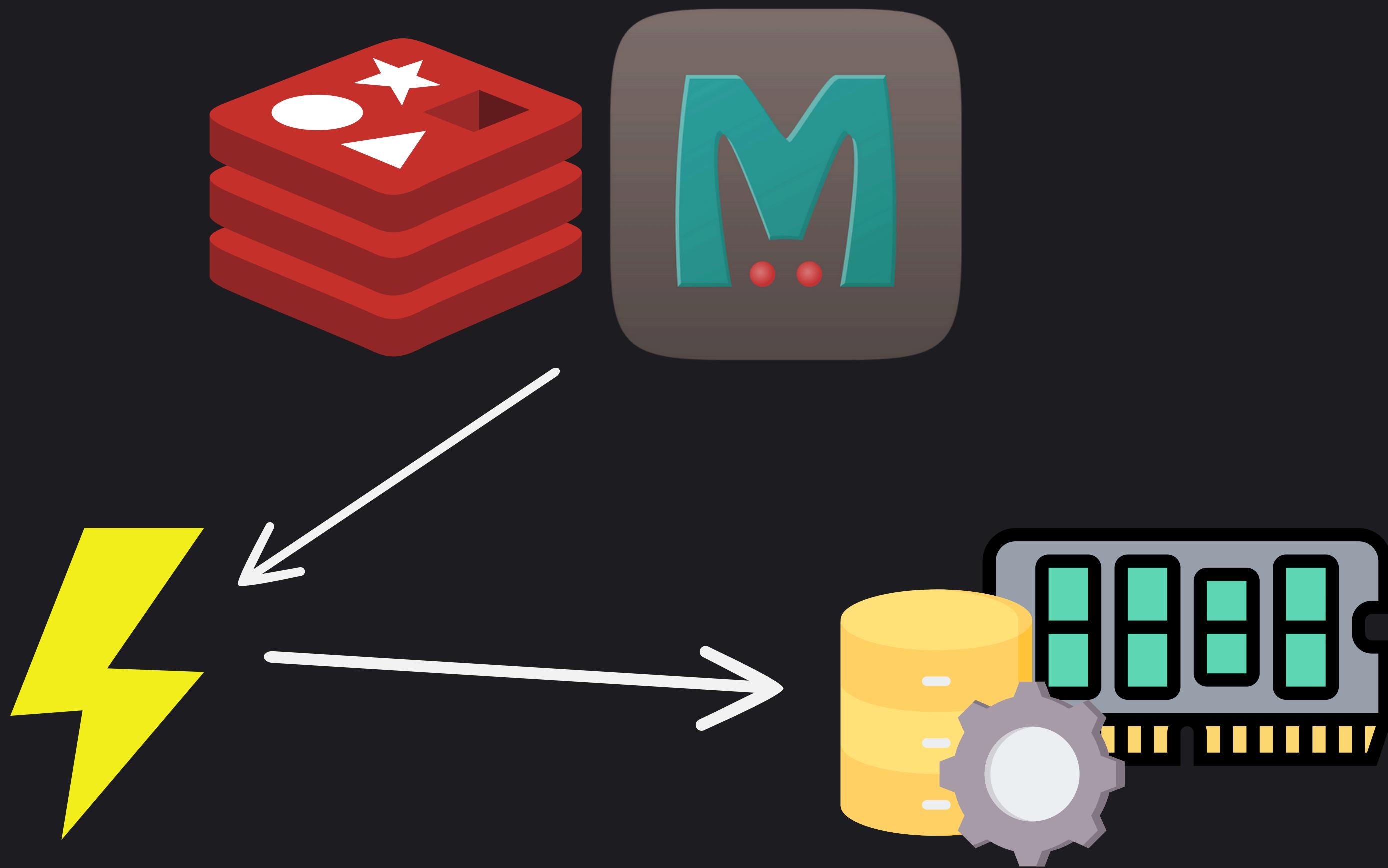
In-Memory Databases











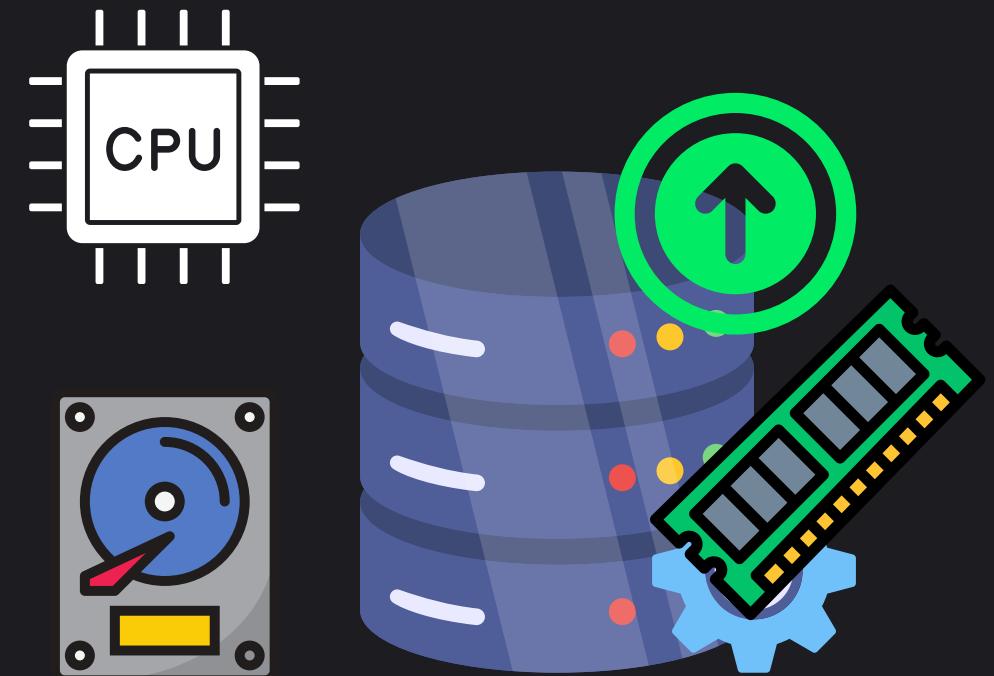
Database Scaling

Vertical Scaling

“Scale Up”

Vertical Scaling

“Scale Up”



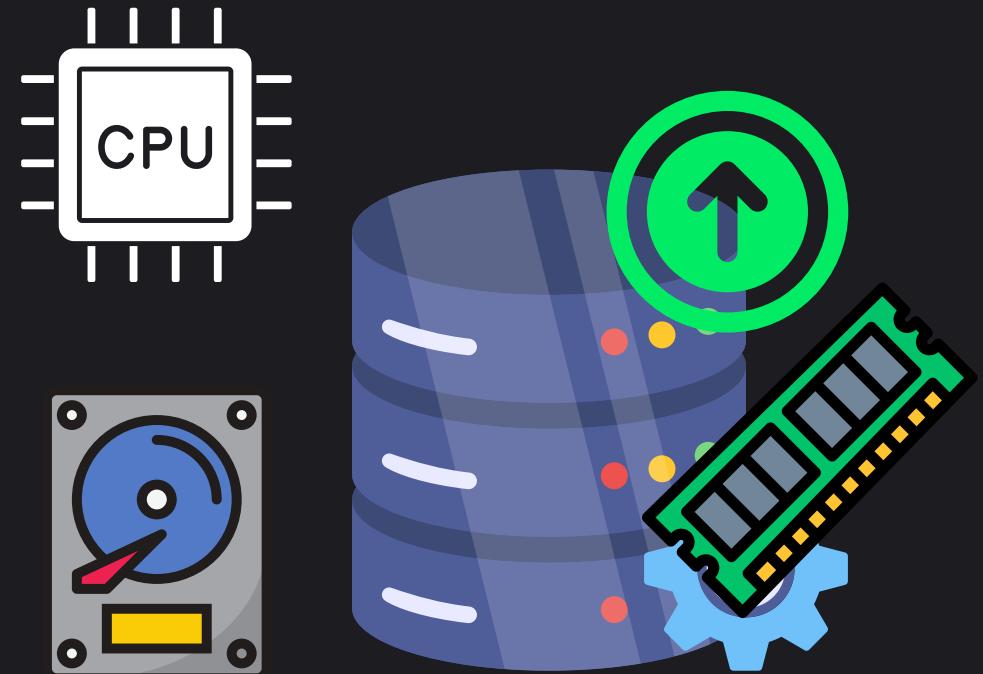
1. Increasing CPU power
2. Adding more RAM
3. Adding more disk storage
4. Upgrading Network

Vertical Scaling

“Scale Up”

Horizontal Scaling

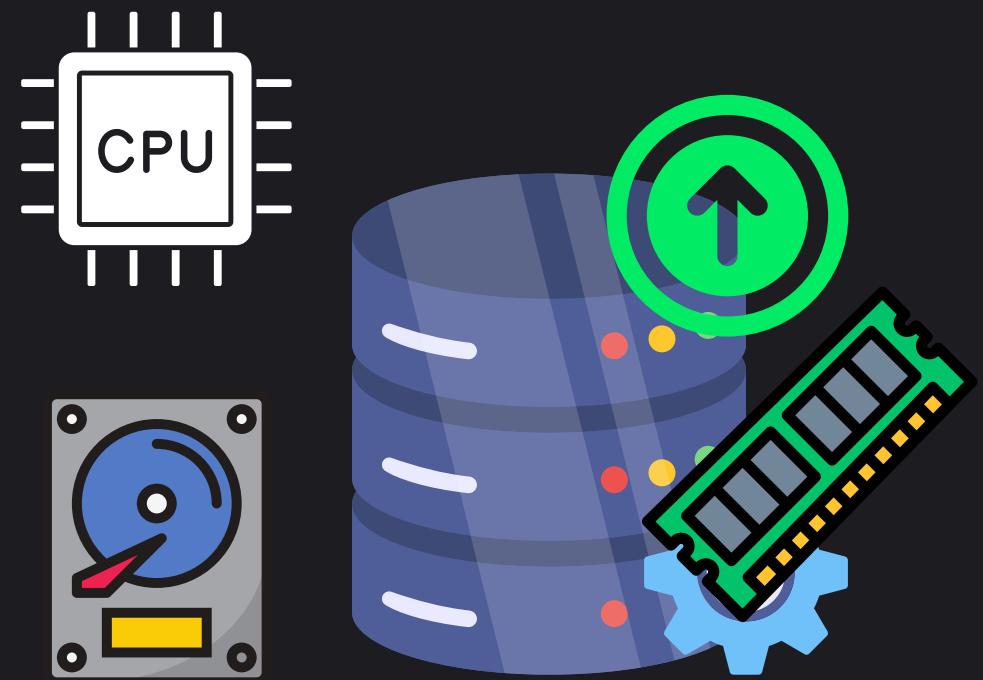
“Scale Out”



1. Increasing CPU power
2. Adding more RAM
3. Adding more disk storage
4. Upgrading Network

Vertical Scaling

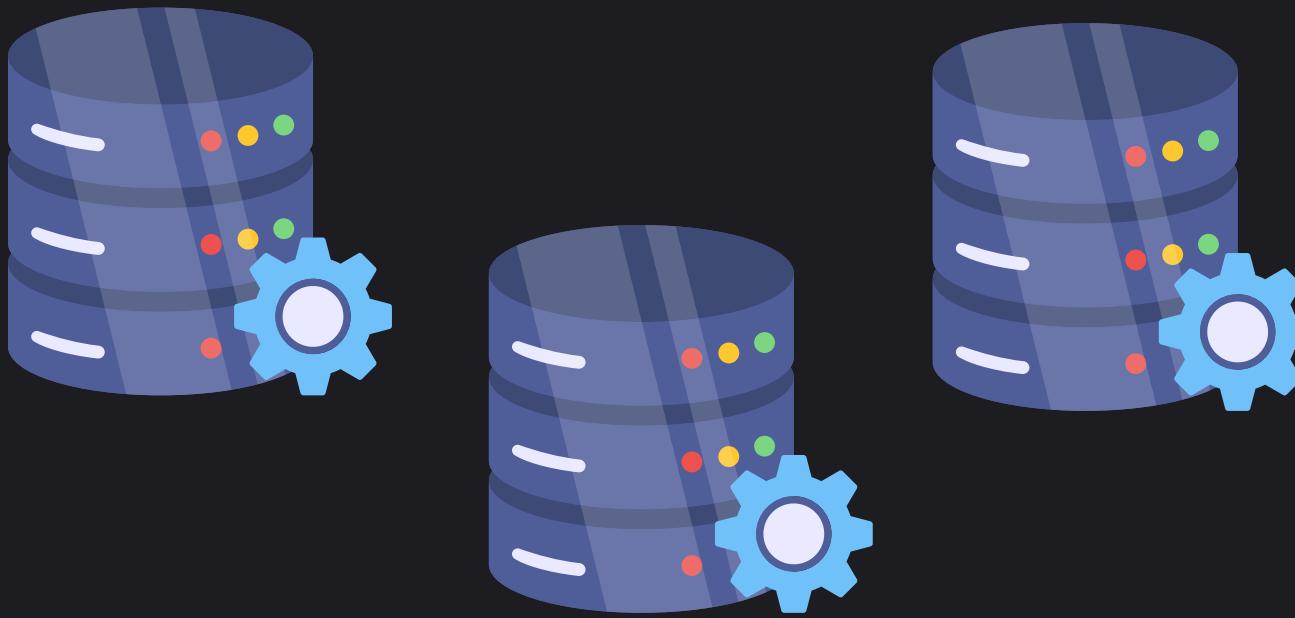
“Scale Up”



1. Increasing CPU power
2. Adding more RAM
3. Adding more disk storage
4. Upgrading Network

Horizontal Scaling

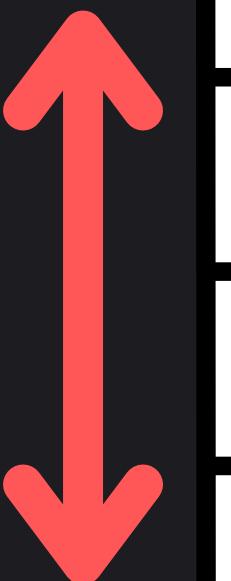
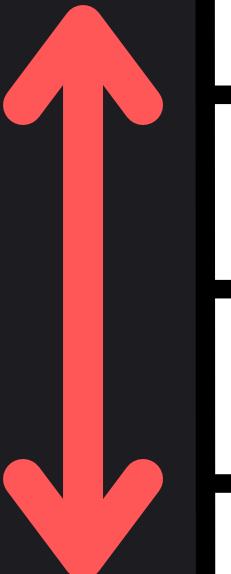
“Scale Out”

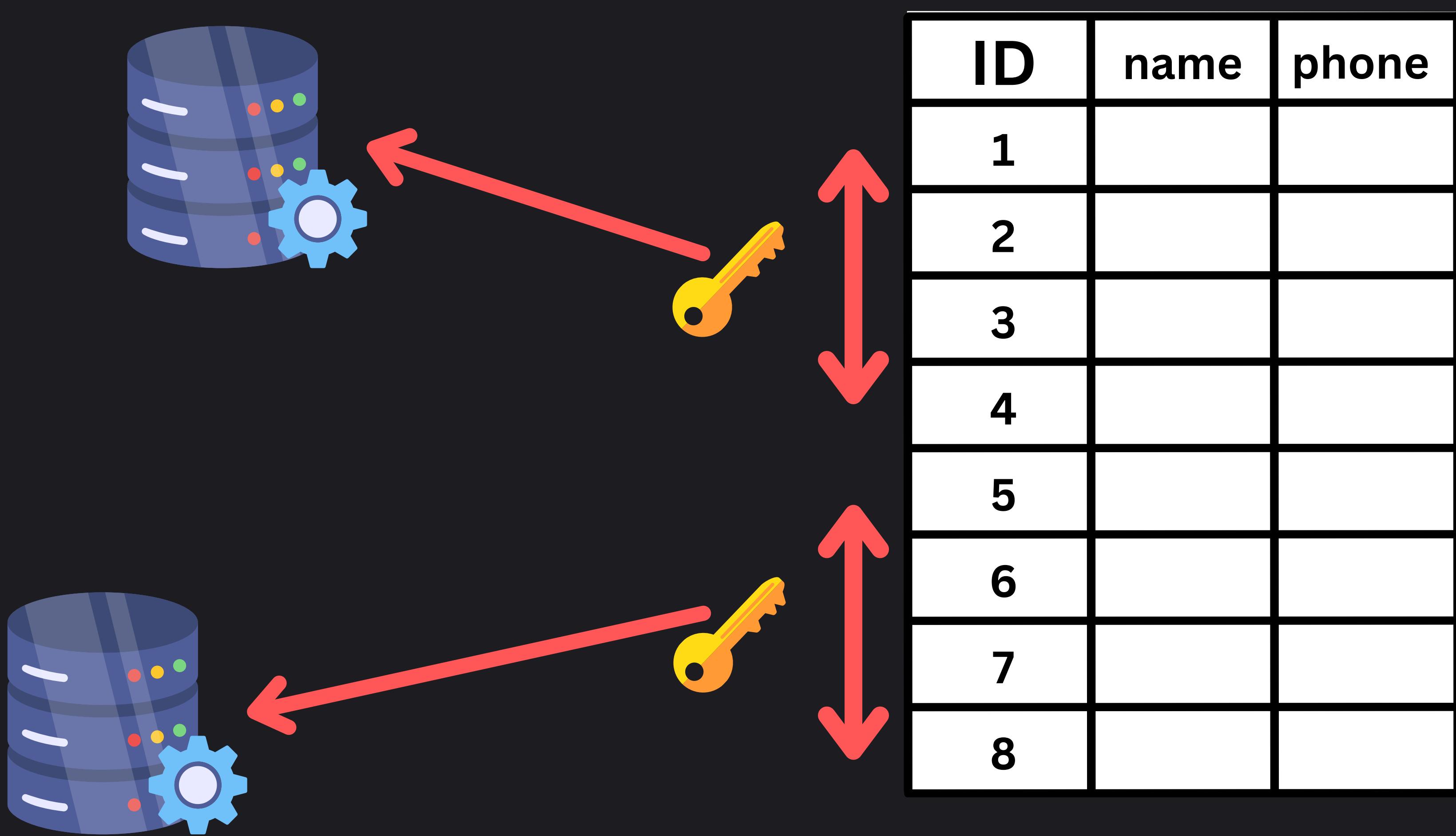


1. Database Sharding
2. Replication

Sharding

ID	name	phone
1		
2		
3		
4		
5		
6		
7		
8		





Sharding Strategies

Sharding Strategies

- Range-based Sharding: Based on the range of a given key

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- Directory-based Sharding: Lookup service to direct traffic to the database

Sharding Strategies

- Range-based Sharding: Based on the range of a given key
- Directory-based Sharding: Lookup service to direct traffic to the database
- Geographical Sharding: Based on geographic location.

Replication

Master



Read/Write



Slave



Slave

Master



Read/Write



Read Only

Slave



Slave

Master



Read/Write

Master



Read/Write

Database Performance

Database Performance



Caching

Database Performance



Caching



Indexing

Database Performance



Caching



Indexing

```
SELECT first_name, last_name  
FROM Employees  
WHERE department = 'Engineering'  
ORDER BY last_name;
```

Query Optimization

CAP Theorem

Consistency



Availability

Partition