# RELATIONAL VS NOSQL DATABASES

TECH VAULT

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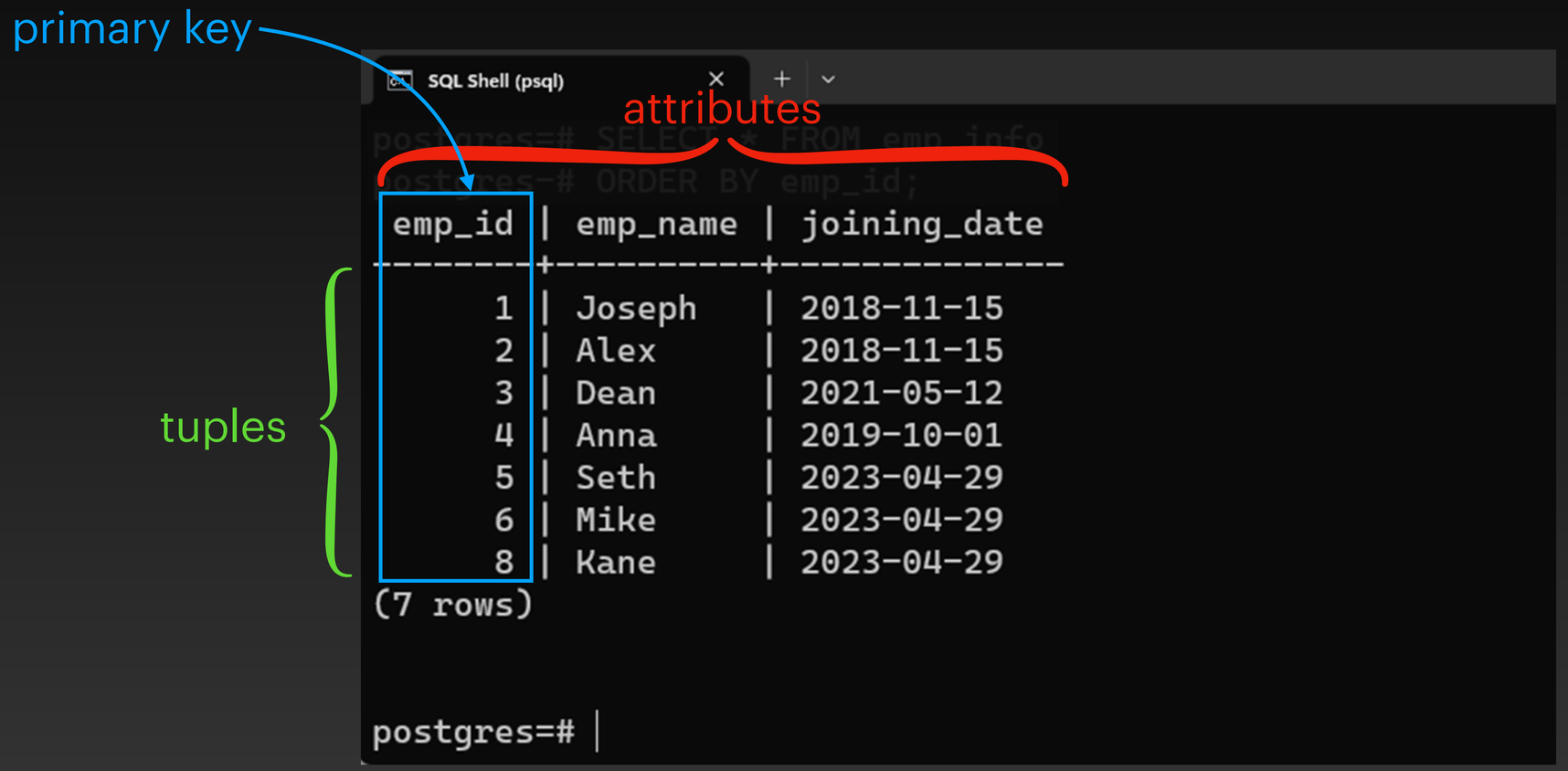
# Relations



# Shopping Order

Header

Order No.: **156**

Customer: **Bob**

Date: **05/06/2023**

Store Location: **London**

Line Items

| Item | Qty | Unit Price | Subtotal |
|---|---|---|---|
| Notebook | 5 | $5.00 | $25.00 |
| Pen | 3 | $2.00 | $6.00 |
| Total | | | $31.00 |

# Relational Database

Orders

| OrderID | Customer | Date | Location |
|---|---|---|---|
| 156 | Bob | 05/06/2023 | London |
| 160 | Alice | 07/04/2023 | Paris |
| 162 | Carl | 07/10/2023 | New York |

Line Items

| OrderID | Line | Item | Qty | UnitPrice |
|---|---|---|---|---|
| 156 | 1 | Notebook | 5 | $5.00 |
| 156 | 2 | Pen | 3 | $2.00 |
| 160 | 1 | TV | 1 | $450.00 |
| 160 | 2 | Microwave | 1 | $35.00 |
| 160 | 3 | Laptop | 2 | $1,250.00 |
| 162 | 1 | Chair | 4 | $120 |

Normalized

Join

# MongoDB

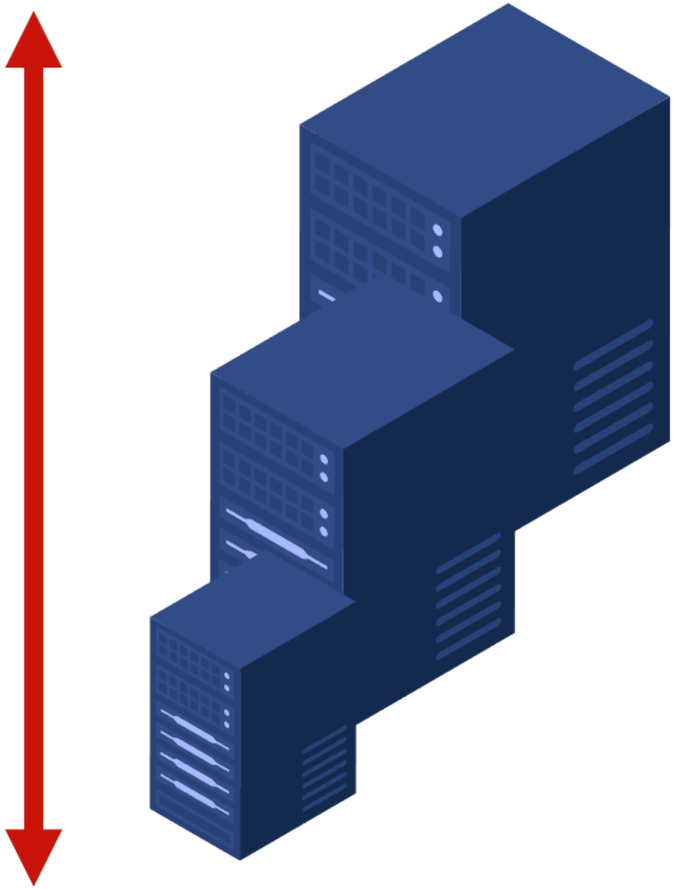
```
{
  "OrderID": 156,
  "Customer": "Bob",
  "Date": "05/06/2023",
  "Location": "London",
  "Items": [
    {
      "Item": Notebook,
      "Qty": 5,
      "Unit Price": 5.00
    },
    {
      "Item": Pen,
      "Qty": 3,
      "Unit Price": 2.00
    },
  ]
}
{
  "OrderID": 160,
  ...
```

All related data is together

No join needed

## Vertical Scaling

Increase or decrease the capacity of existing services/instances.



## Horizontal Scaling

Add more resources like virtual machines to your system to spread out the workload across them.

# Sharding

## Original Table

| CUSTOMER ID | FIRST NAME | LAST NAME | CITY |
|---|---|---|---|
| 1 | Alice | Anderson | Austin |
| 2 | Bob | Best | Boston |
| 3 | Carrie | Conway | Chicago |
| 4 | David | Doe | Denver |

## Vertical Shards

### VS1

| CUSTOMER ID | FIRST NAME | LAST NAME |
|---|---|---|
| 1 | Alice | Anderson |
| 2 | Bob | Best |
| 3 | Carrie | Conway |
| 4 | David | Doe |

### VS2

| CUSTOMER ID | CITY |
|---|---|
| 1 | Austin |
| 2 | Boston |
| 3 | Chicago |
| 4 | Denver |

## Horizontal Shards

### HS1

| CUSTOMER ID | FIRST NAME | LAST NAME | CITY |
|---|---|---|---|
| 1 | Alice | Anderson | Austin |
| 2 | Bob | Best | Boston |

### HS2

| CUSTOMER ID | FIRST NAME | LAST NAME | CITY |
|---|---|---|---|
| 3 | Carrie | Conway | Chicago |
| 4 | David | Doe | Denver |

# Transactions

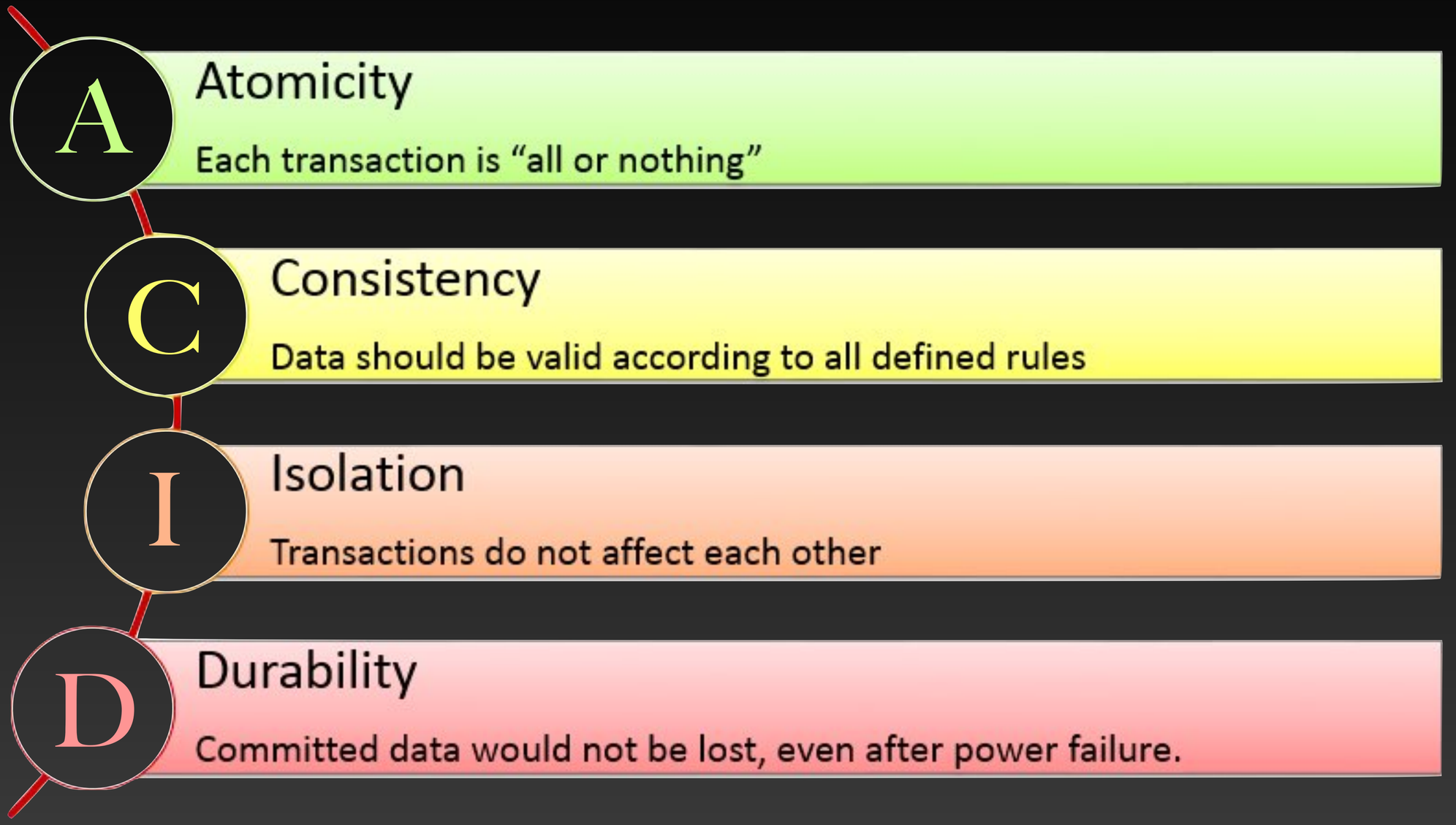
- Groups of operations that must happen together

- Example
  - Transfer $100 from account (A) to account (B)

**Account (A)**
Subtract $100 from balance

**Account (B)**
Add $100 to balance

# ACID Properties



# Summary

| | SQL Databases | NoSQL Databases |
|---|---|---|
| **Structure** | Relational, structured tables with schemas | Non-relational, flexible data models |
| **Flexibility** | Well-defined schemas, less flexible | Flexible schemas, easily adaptable to changes |
| **Query Language** | Standardized SQL | Varied, specific to the database type |
| **Scalability** | Typically vertical scaling | Horizontal scaling for distributed environments |
| **Data Integrity** | ACID compliant, strict data consistency | Eventual consistency, varying data consistency |
| **Use Cases** | Transactional systems, complex queries | Big data, real-time analytics, flexible schemas |