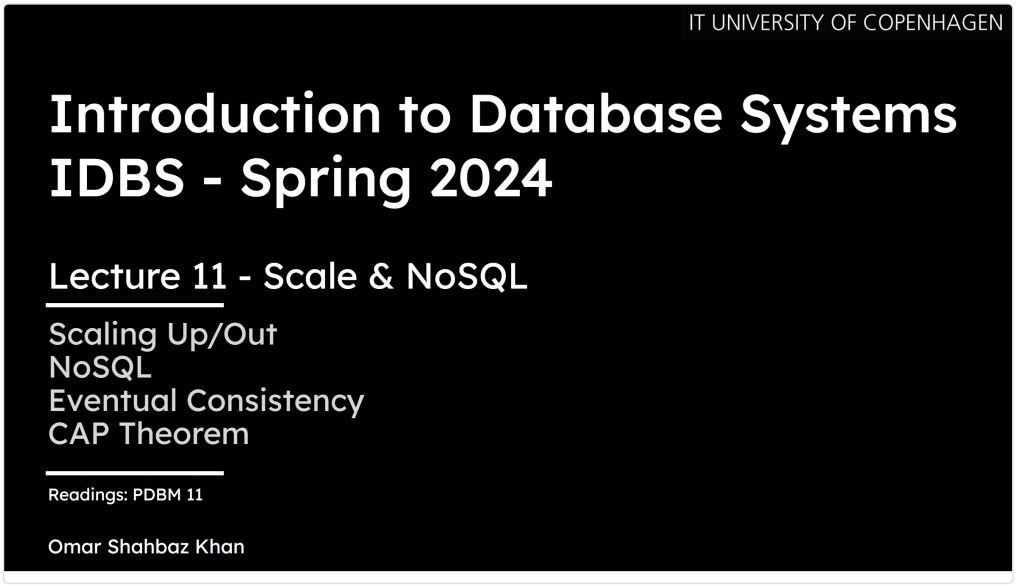
Scaling & NoSQL



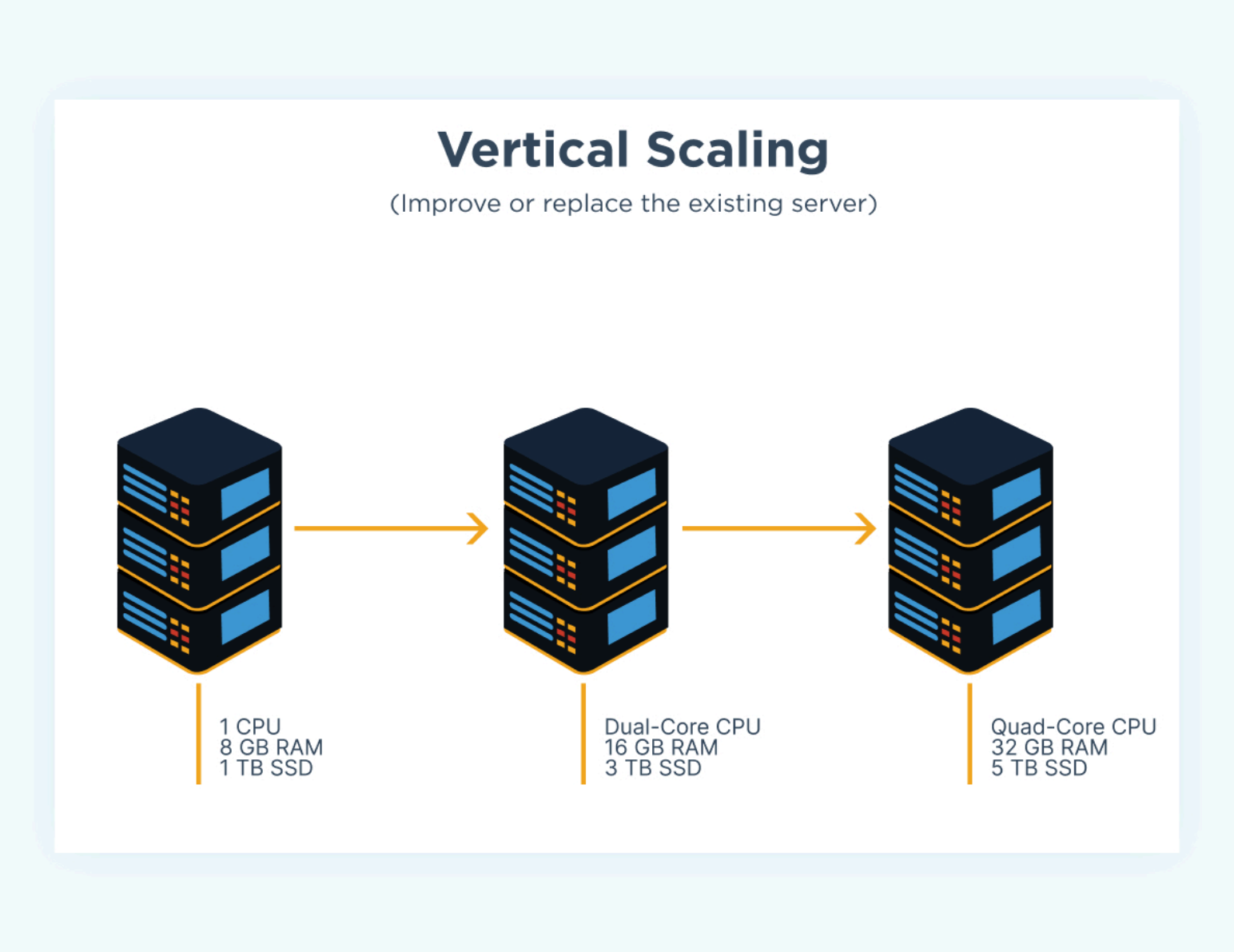
Scaling

Scaling in database systems refers to the process of improving a database's capacity to handle increased workloads, such as higher traffic, larger data volumes, or more complex queries. It ensures the database performs efficiently as demand grows.

Vertical scaling

Vertical scaling (or scaling up) is the practices of improving the performance of a database by upgrading the hardware/resources of a single server.

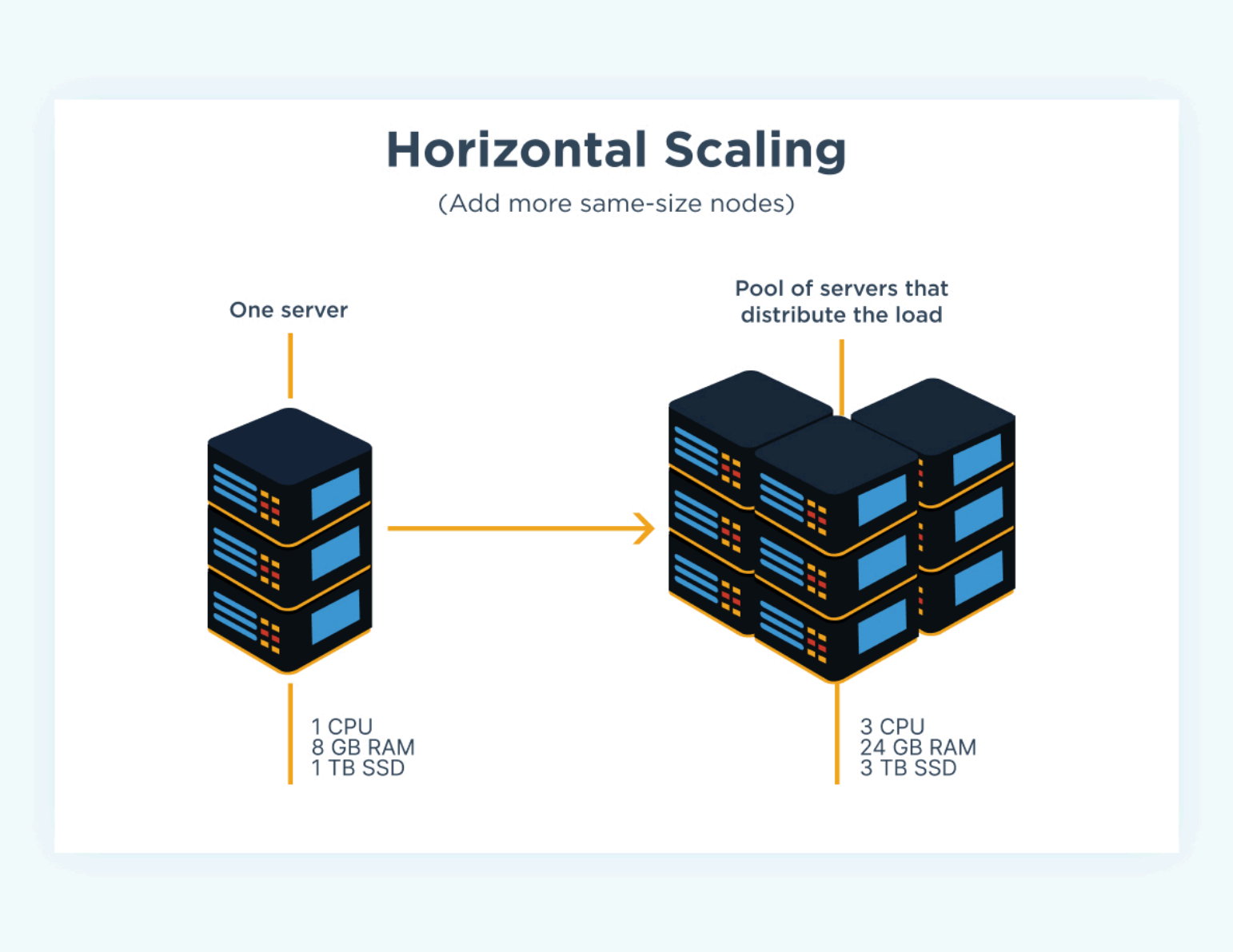
Vertical scaling comes with hardware induced limitations.



Horizontal Scaling

Horizontal scaling (or scaling out) involves distributing the database across multiple servers arranged in a Cluster.
The nodes in a cluster can balance the workloads out among one another and scaling is achieved by adding more nodes to

the cluster.



NoSQL

NoSQL is a category of database management systems (DMS) that is not relational as the traditional Relational Database. (See RDBMS)
There is not formal described schema of a NoSQL system, but it is usually Distributed.

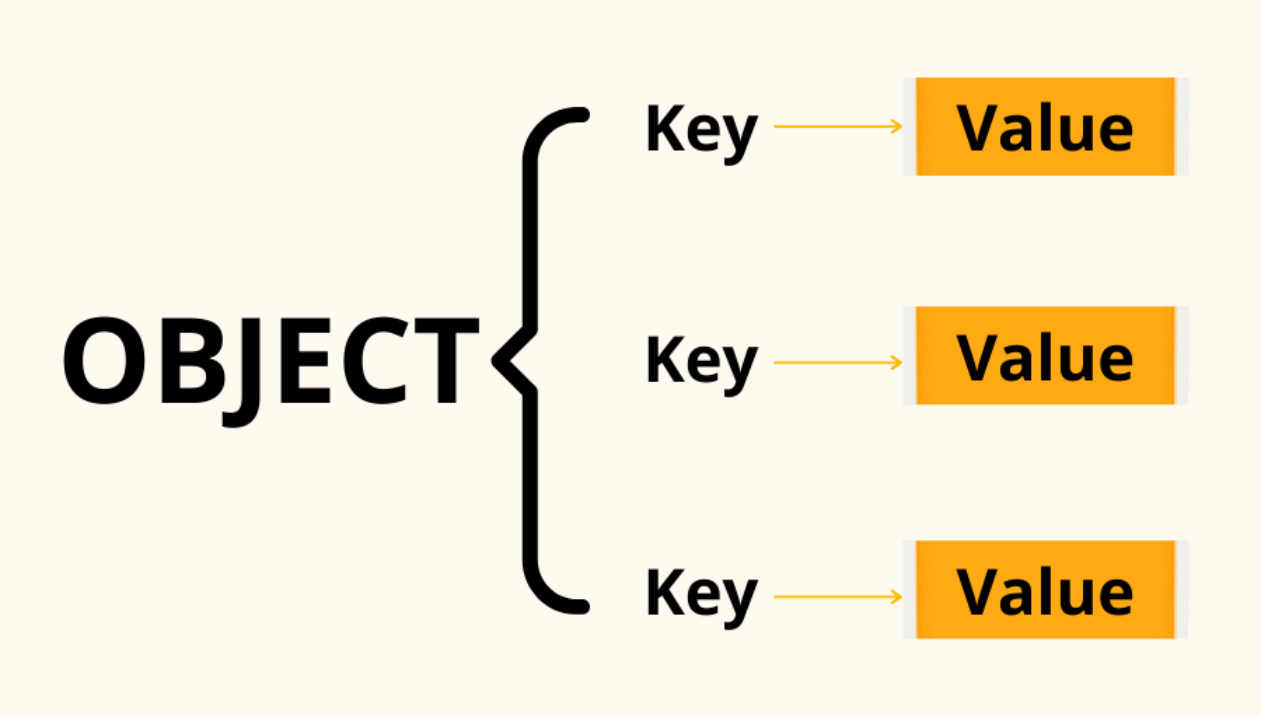
Data model

The data model for NoSQL is *Not relational* and their is no formally described schemas. NoSQL handles data that does not fit into a tables so well, such as JSON, Graphs pr key-value pairs.

Key-Value Stores

Key-Value stores is a map of "Key-Value" pairs.

A unique key points to a value and it can not be queried as in the traditional RDBMS', only read and write to the pairs is allowed.



Document Stores

Each value is a "document" - most often in the form of JSON or XML. Document stores are highly flexible and scalable because of their varying structure.

Graph Stores

Distributes Storage

Workload sharing
Redundancy (Replication)

Consisting Hashing

We bala

Virtual Servers

Use virtual servers to better distribute servers for more consistent hashing.

CAP Theorem

CAP stands for Consistency (C), Avaliability (A) and Partition Tolerance (P).

Consistency

Readers read the most recent update.

Tunable Consistency

Not a binary system
N replicas, R read quorum, W write quorum

$$R = W = 1 \text{ gives eventual consistency}$$

$$R + W > N \text{ gives strong consistency}$$

Availability

A valid answer is returned, even if one or more nodes are down

Partition Tolerance

A partition is when the network becomes disconnected - A distributed system works despite the network failure.