DATABASE

CSE3103 : Database

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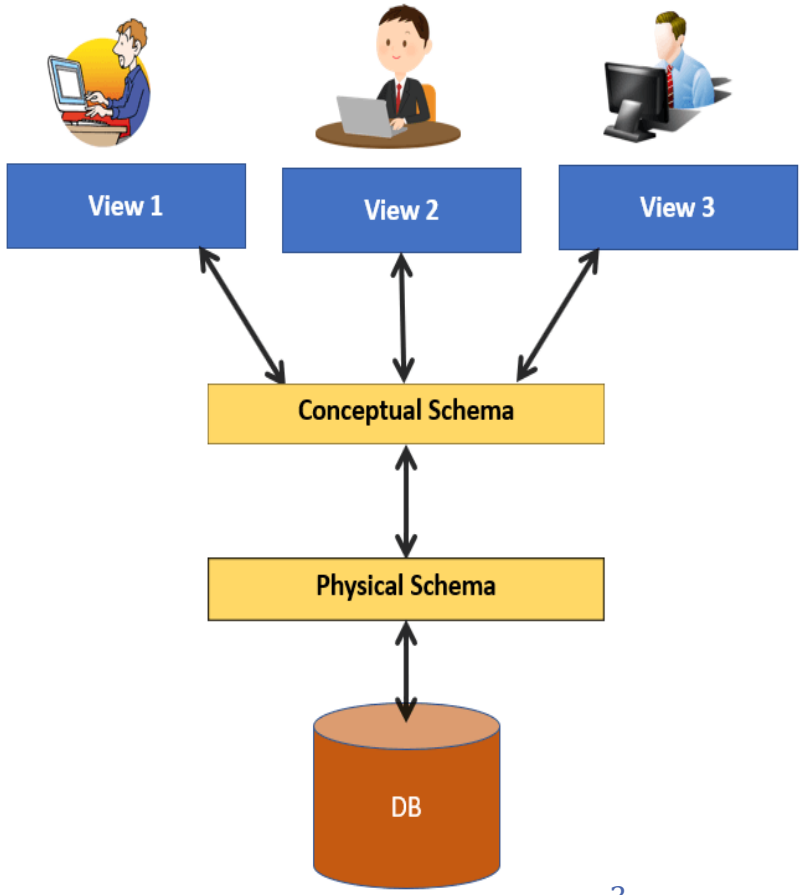
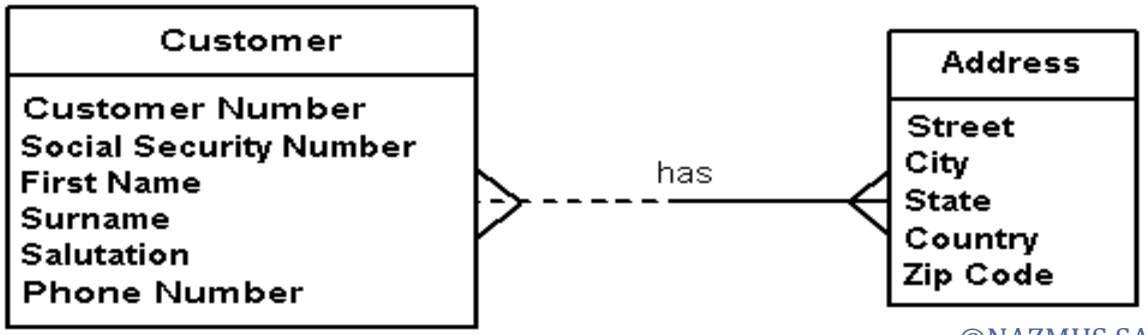
Instances and Schemas

- **Schema**– describe the overall design of the database.
- **Physical schema**– Overall physical structure of the database.
- **Logical Schema** – Overall logical structure of the database
  - Example: The database consists of information about a set of customers and address and the relationship between them.
- **Sub Schema**– Describe the different views of the database.





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Instances

Instances and Schemas

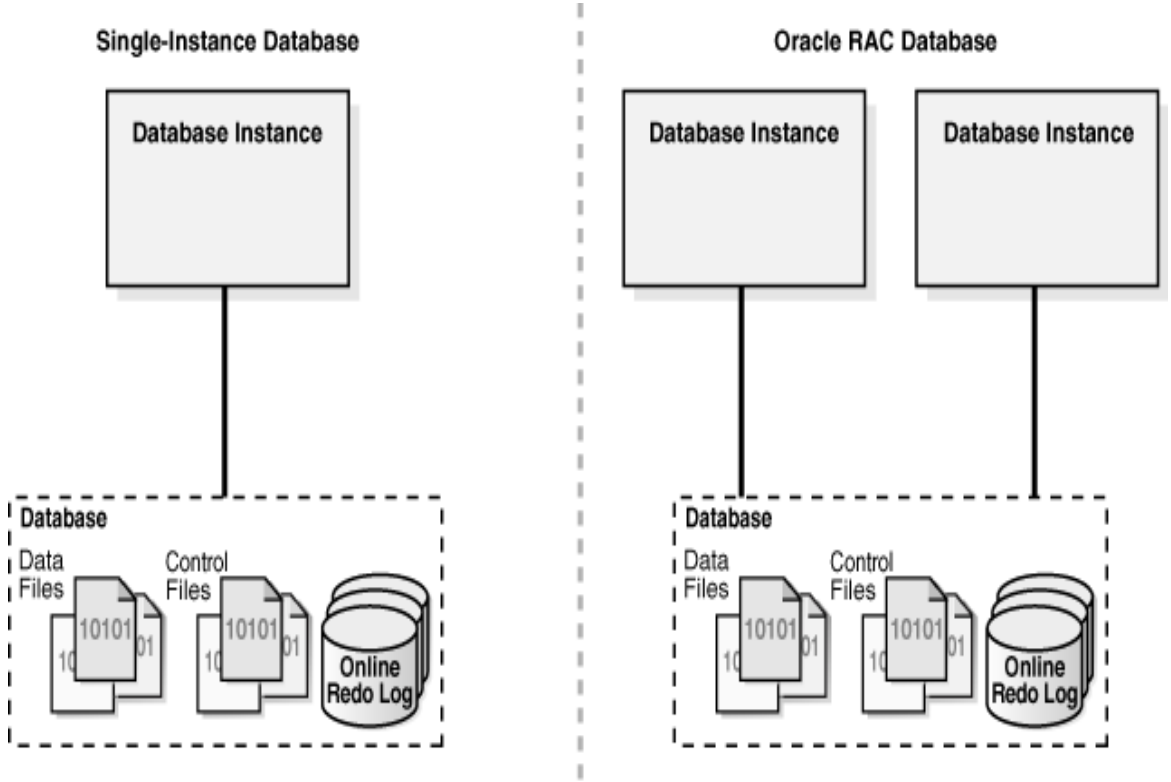
- **Instance** – the actual Database Applications content of the database at a particular point in time.
  - Analogous to the value of a variable.

Database schema (names of columns + the types associated with them)

Name	DOB	Address	Job	Scale
String	*Date*	*String*	*String*	*Int*

A database instance

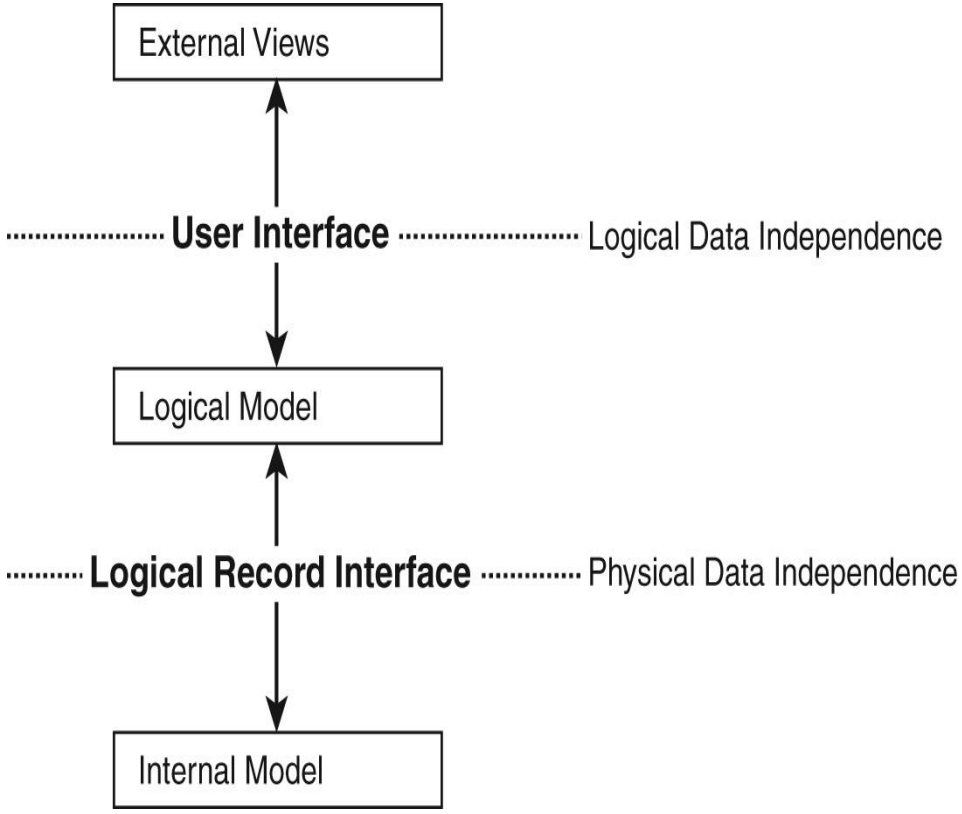
Name	DOB	Address	Job	Scale
A. Johnson	2/04/1960	London	Programmer	12
B. Holiday	3/10/1947	Leeds	Analyst	14
C. Clark	12/08/1971	York	Programmer	10



Instances and Schemas

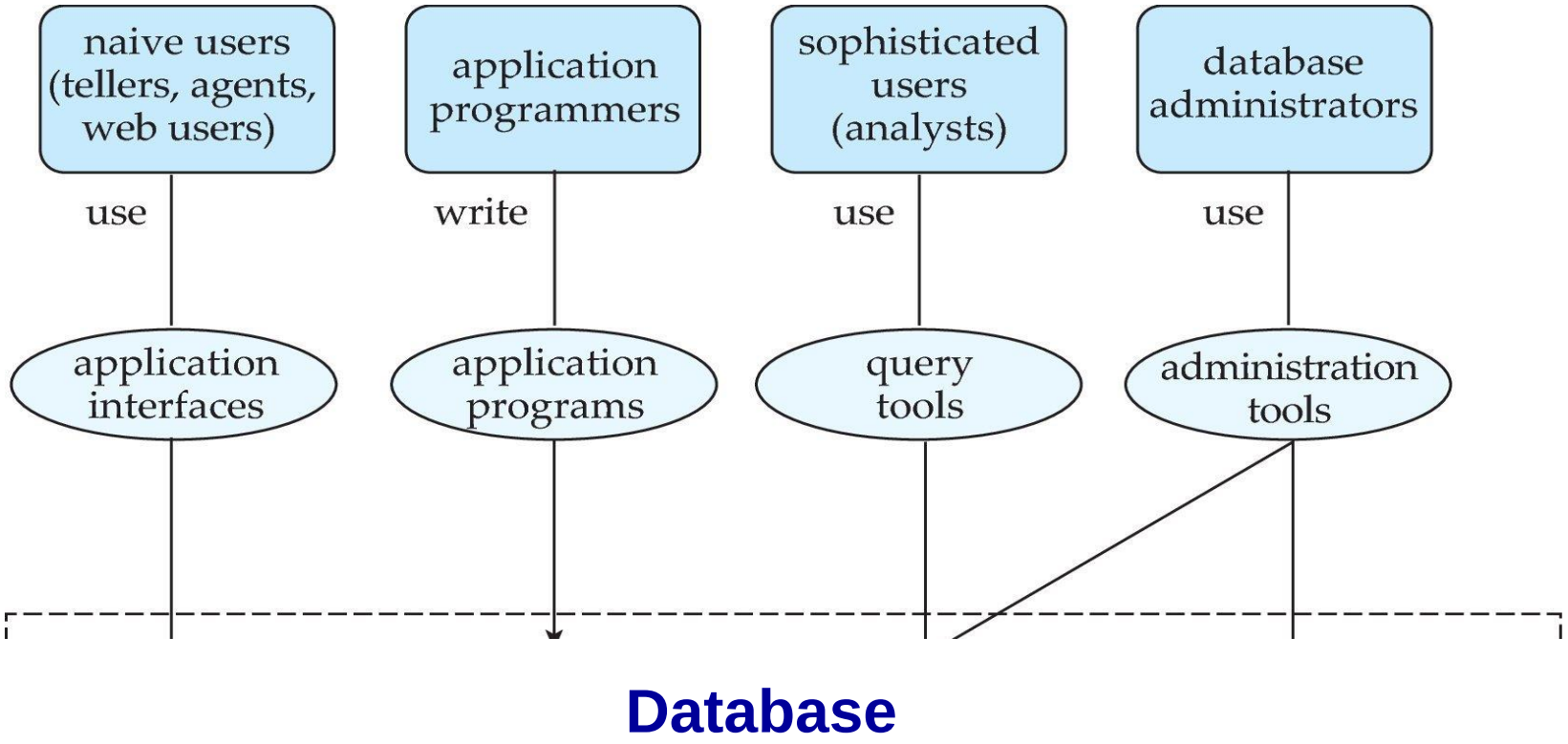
Data Independence – Application that ensures the protection of data or structure is stored.

- **Physical Data Independence** – the ability to modify the physical schema without changing the logical schema
  - Applications depend on the logical schema
  - In general, the interfaces between the various levels and components should be well defined so that changes in some parts do not seriously influence others.
- **Logical Data Independence** – the ability to modify the logical schema without changing the View Level.



Database Users & DBA Activities

- **Application Programmer**
- **Sophisticated User**
- **Specialized User**
- **Naïve User**



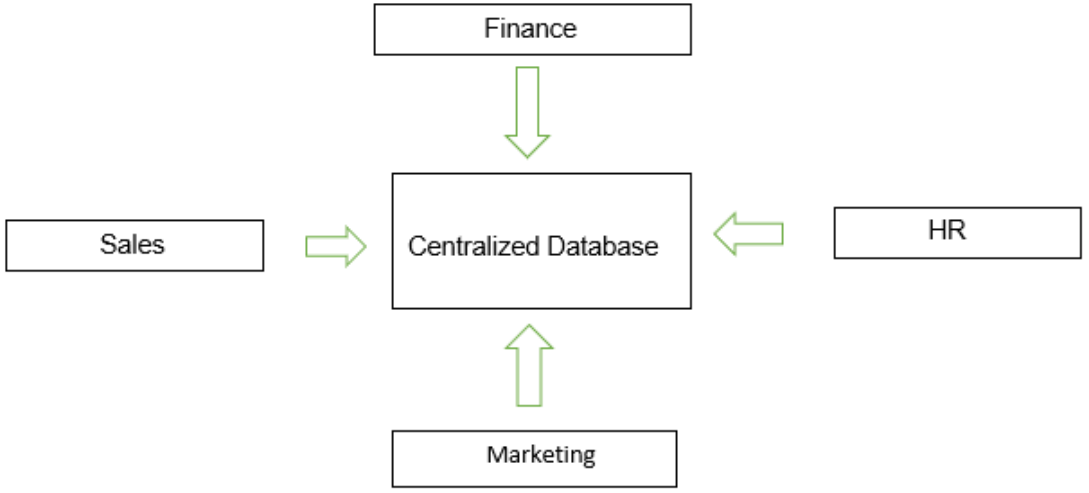
Data Definition Language (DDL)

- Specification notation for defining the database schema
  Example: **create table** *instructor* (
  ID **char**(5),
  name **varchar**(20),
  dept_name **varchar**(20),
  salary **numeric**(8,2))
- DDL compiler generates a set of table templates stored in a ***data dictionary***
- Data dictionary contains metadata (i.e., data about data)
  - Database schema
  - Integrity constraints
    - Primary key (ID uniquely identifies instructors)
  - Authorization
    - Who can access what

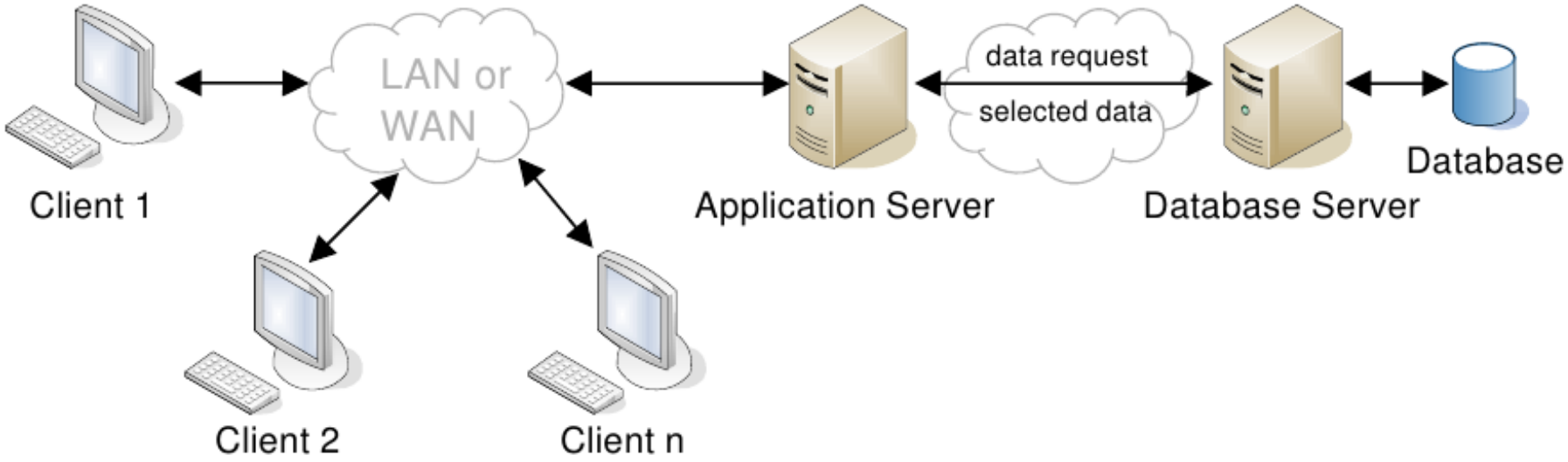
Data Manipulation Language (DML)

- Language for accessing and manipulating the data organized by the appropriate data model
  - DML also known as query language (Procedural &Declarative)
- Two classes of languages
  - **Pure** – used for proving properties about computational power and for optimization
    - Relational Algebra
    - Tuple relational calculus
    - Domain relational calculus
  - **Commercial** – used in commercial systems
    - SQL is the most widely used commercial language

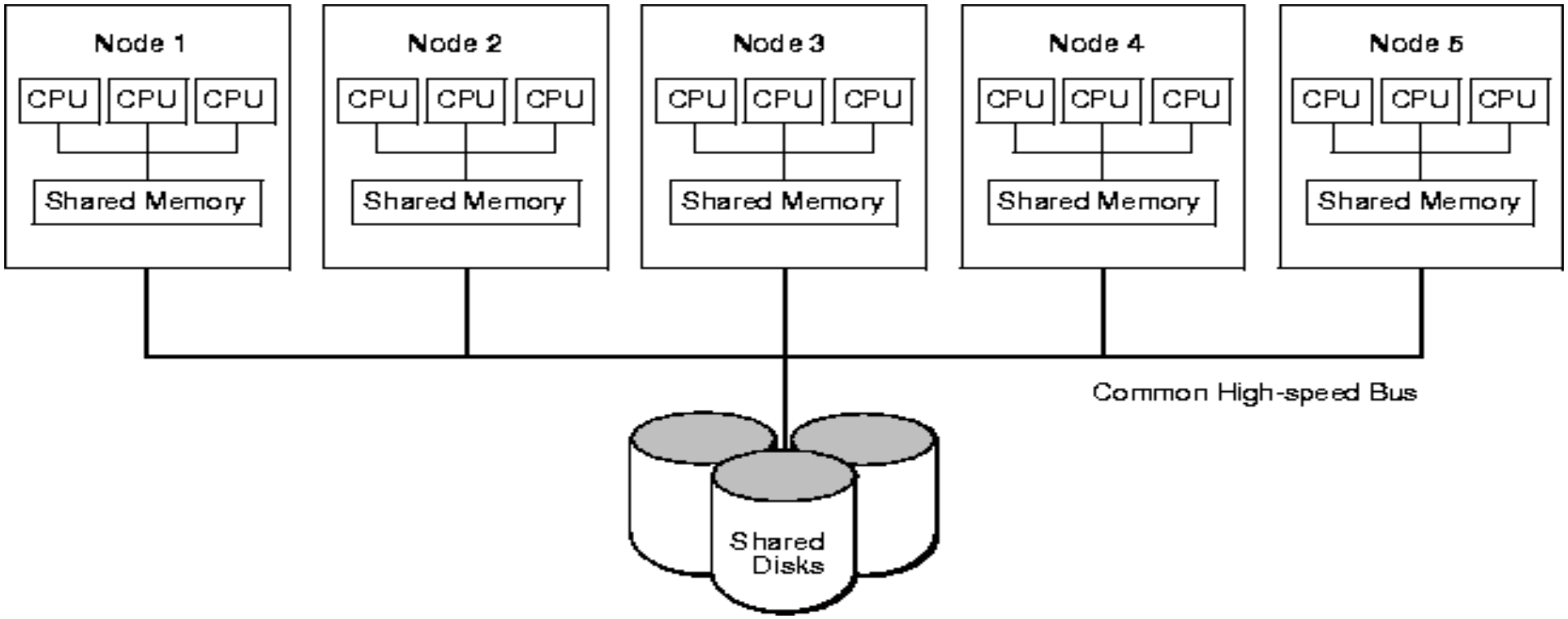
Database Architecture: Centralized Database



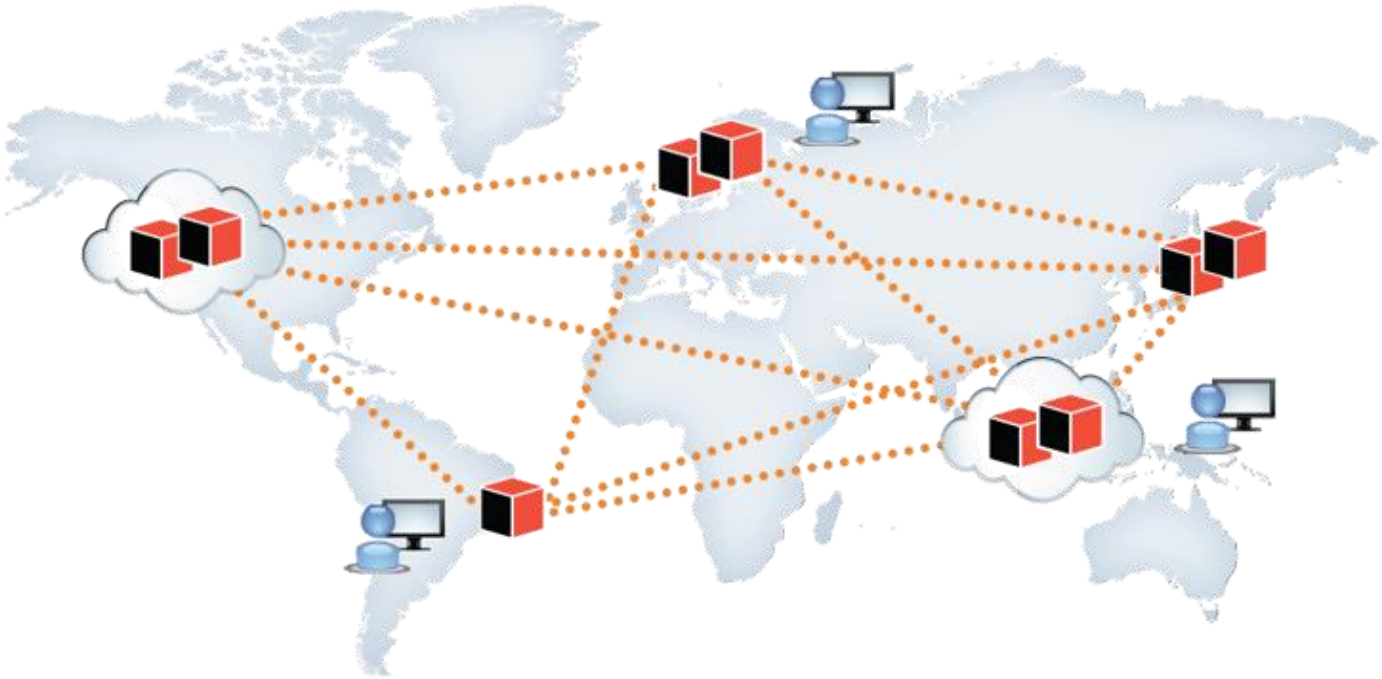
Database Architecture: Client Server Database

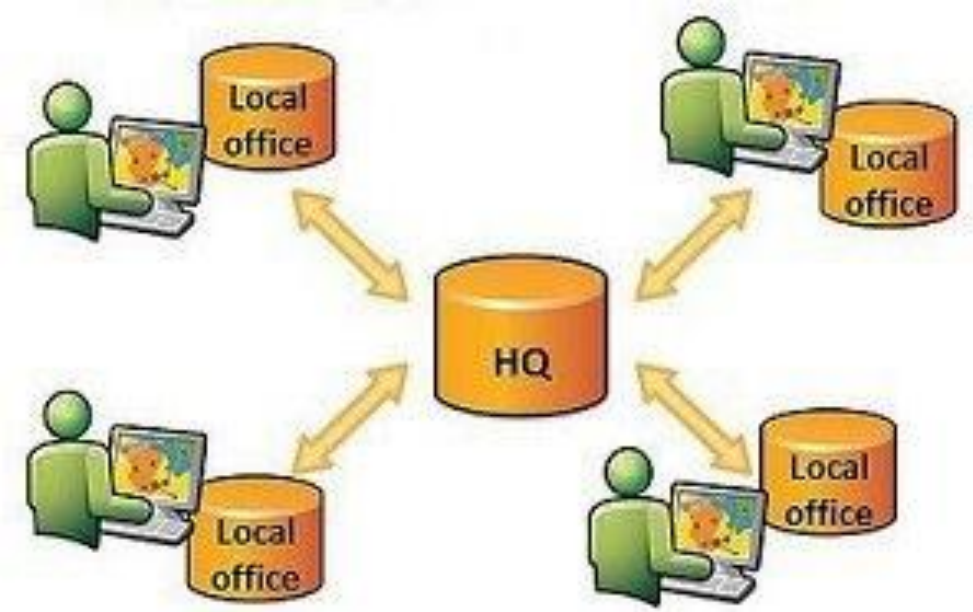


Database Architecture: Parallel Database



Database Architecture: Distributed Database





DBMS
data
database
distributed
parallel
shared
system
architecture
processing
network
performance
systems
access
processors
centralized
Distributed
DDBMS
DBMSs
memory
technology
computer
multiple
sites
Parallel
processor
may
major
fragments
typically
across
fact
eliminates
reliability
distribution
communication
also
many
replicated
discuss
make
provide
often
local
decentralized
directly
com
Date
sometimes
computing
single
one
split
order
scalable
architectures
referred
operational
disks
large
resources
islands
remote
defined
controlled
based
require
physically
within
users
site
machines
like
Database
applications
computers
control
scalability
approach
improve
distinction
logical
nothing
share
Shared
databases
management
transparent
application
number
dis
user
per
makes
Management
bottleneck
interconnection
Figure
administered
mode
organizational
nodes
definition
development
consists
logically
way
global
incompatible
structure
collection
provides
associated
stored
disk
partitioned
used
least
must
System
capable