CSCI317 Database Performance Tuning

Performance versus Logical Data Models

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Performance versus Logical Data Models

Outline

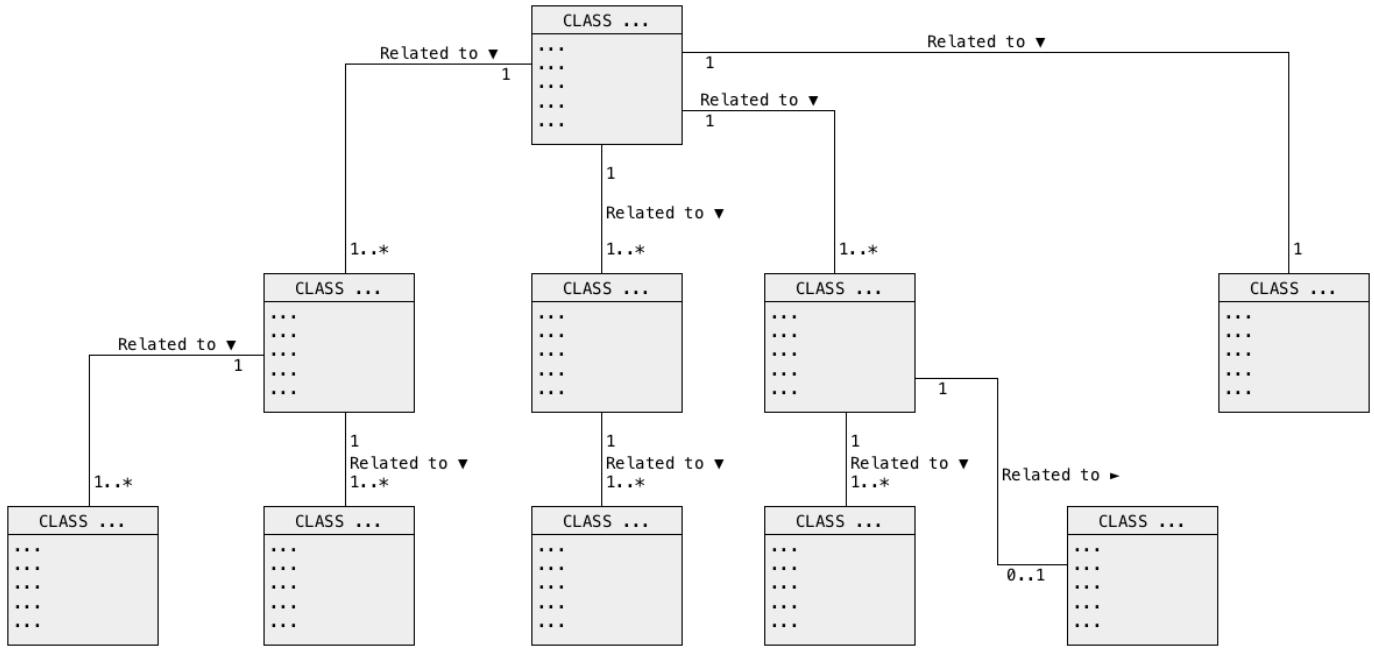
Categories of conceptual schemas

Depending on the multiplicities and structures of associations a conceptual schema may belong to one of the following categories of conceptual schemas

- hierarchical schemas
- network schemas
- multidimensional schemas
- graph schemas
- key-value schemas
- other schemas

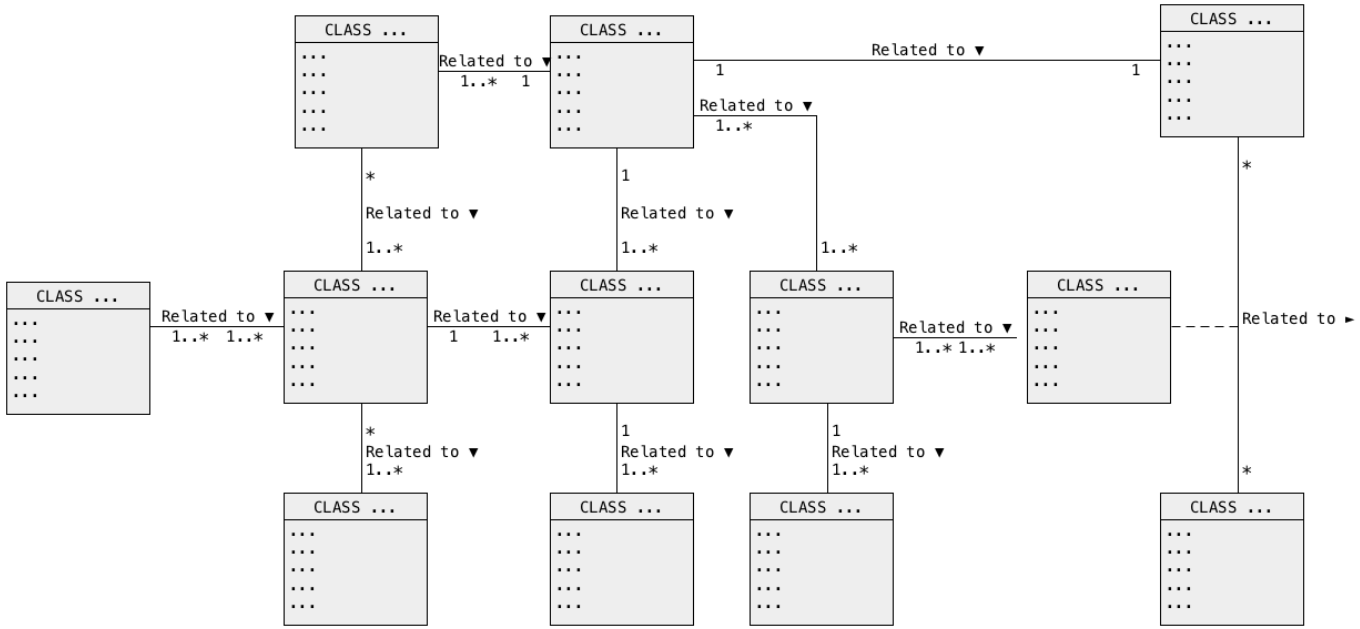
Hierarchical schemas

A conceptual schema belongs to a category of hierarchical schemas if all classes of objects are linked with "one-to-many" or "one-to-one" associations only and such that each object class is at most one "many" side of association



Network schemas

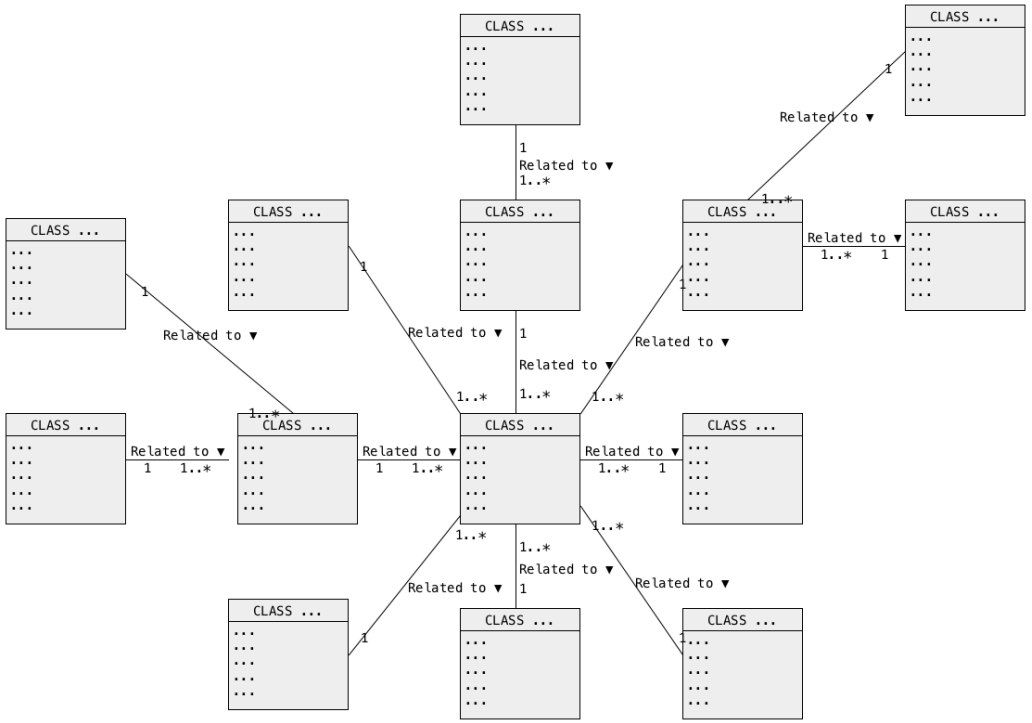
A conceptual schema belongs to a category of network schemas if it is not hierarchical schema and all classes of objects are linked with "one-to-many" or "one-to-one" associations or "many-to-many" associations



Multimensional schemas

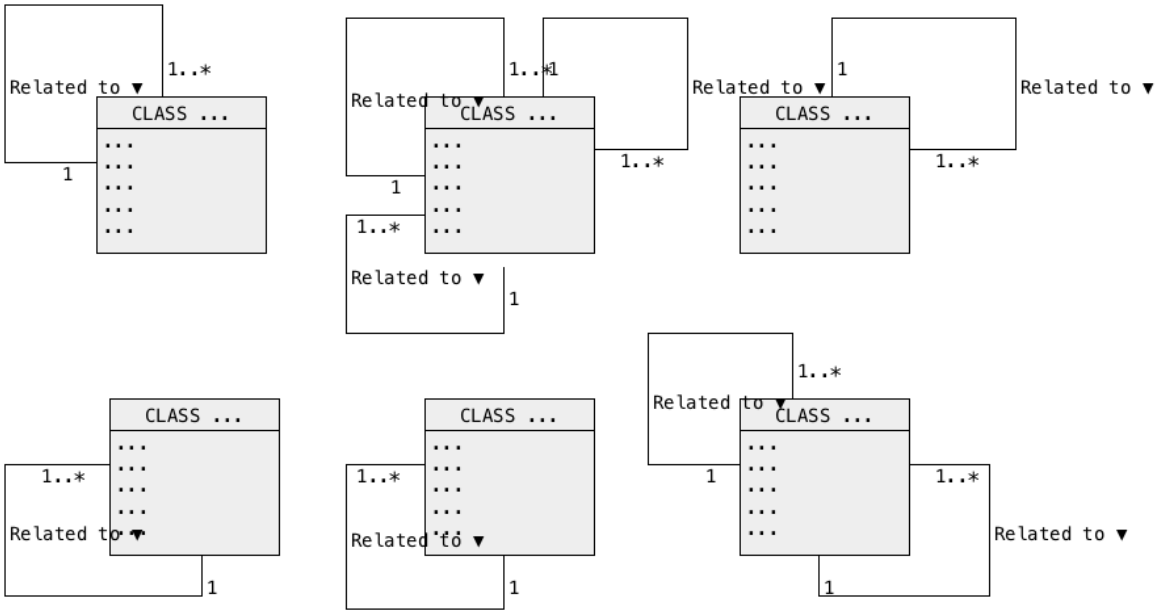
A conceptual schema belongs to a category of multidimensional schemas if it consists of star schemas only

A conceptual schema is a star schema if it consists of one central class of objects located on "many" side of the chains of "many-to-one"associations



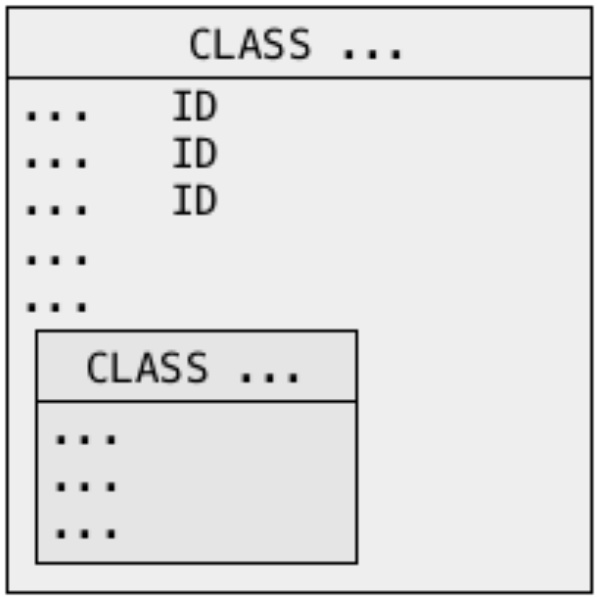
Graph schemas

A conceptual schema belongs to a category of graph schemas if all association link the same class on both sides



Key-value schemas

A conceptual schema belongs to a category of key-value if there are no associations and each class of objects has a composite identifier and the values attributes can be composite



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Categories of conceptual schemas

Logical data models and implementations

A wise choice of logical data model and implementation

Logical data models and implementations

Implementations of logical data models

- Relational data model => relational database systems
- JSON/BSON data model => NoSQL database systems
- XML data model => Native XML database systems (usually both XML and JSON/BSON)
- Datacube data model => Data warehouses (either native data cubes or relational database systems)
- Object-oriented data model => Native object-oriented database systems or object-oriented wrappers on top of relational database systems
- Big Table (HBase) data model => HBase distributed database system
- Graph data model => Graph database systems (Neo4j)
- Hybrid data model => Relational model with JSON/BSON, XML, and other complex values

Performance versus Logical Data Models

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A wise choice of logical data model and implementation

To improve performance the classes of conceptual schemas can be implemented by the following logical models:

- hierarchical schemas => JSON/BSON data model => NoSQL database systems
- hierarchical schemas => XML data model => Native XML database systems
- hierarchical schemas => Hybrid data model => Relational model with JSON/BSON, XML, and other complex values
- network schemas => Relational data model => relational database systems
- network schemas => Object-oriented data model => Native object-oriented database systems or object-oriented wrappers on top of relational database systems
- multidimensional schemas => Data warehouses (either native data cubes or relational database systems)
- graph schemas => Graph data model => Graph database systems
- key-value schemas => Big Table (HBase) data model => HBase distributed database system

A wise choice of logical data model and implementation

To improve performance the classes of conceptual schemas can be implemented by the following logical models:

- other schemas => Relational data model => relational database systems
- other schemas => Hybrid data model => Relational model with JSON/BSON, XML, and other complex values
- other schemas => JSON/BSON data model => NoSQL database systems
- other schemas => Big Table (HBase) data model => HBase distributed database system