项目简介-技术组

数据库设计

黄玺

厦门大学　计算机科学系

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Outline

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Data, DB and DBMS

Data is a set of values of qualitative or quantitative variables.

Database is an organized collection of data containing its schemas, tables, queries, reports, views, and other objects.

DBMS database management system, which is a computer software application that interacts with the user, other applications, and the database itself and allows the definition, creation, querying, update, and administration of databases.

*Sometimes a DBMS is loosely referred to as a 'database'.

Databases As a Service

表: Table 1-1 Comparing data managing with files and DBs

Spec	**Files**	**Databases**
Storage	On disk	Managed by database
Data status	Raw	Organized
Availability	Load on use	Stable
Manageability	Messy	Ready for change, backup and administrating
Lots of small files	Tricky	Taken care by the impl of storage engine
Difficulty	Straight but troublesome	Need to learn and also troublesome...for maintainers :)

Outline

Dealing with volume, velocity and variety

Facts:

- Data is becoming semi-structured and unstructured, e.g. business transaction and web application data
- The scale of data sets is also growing rapidly
- Need more powerful systems to support real-time applications

MongoDB provides:

- Storage based on BSON (the very basis of NoSQL)
- Fast ops
- Scalability

Fig. 1-1 MongoDB Logo

Outline

Methodology

- Deploy MongoDB instances
- Design data schemas
- Run benchmark to check the performance
- Merge with Scrape system
- Maintain & iterate

Quick Demo

Outline

Facts and challenges

- The 1G mem of cheap servers cannot meet the need of MongoDB
- The disk size of our servers is also limited
- Top Level Design: How can we make things easy to use and iterate?
  - Monitoring
  - Automating
  - Transparency
  - Decoupling

Outline

Solution to hardware limitation: Scale-out

The following figures and texts are adapted from assets of Mining Massive Datasets by Leskovec, Rajaraman, and Ullman, Stanford University, 2016.
Non-public and non-commerical use only.

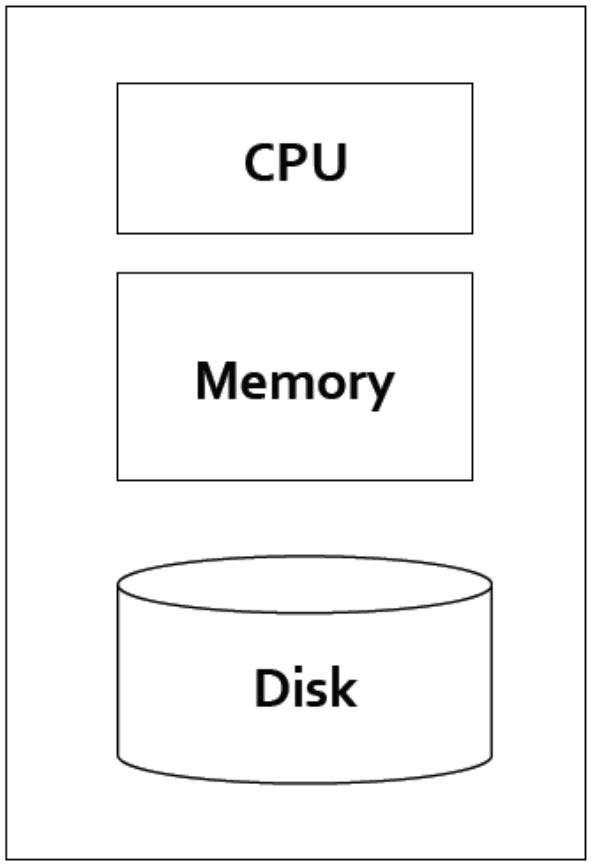


Fig. 2-1 Single Node Architecture

Solution to hardware limitation: Scale-out

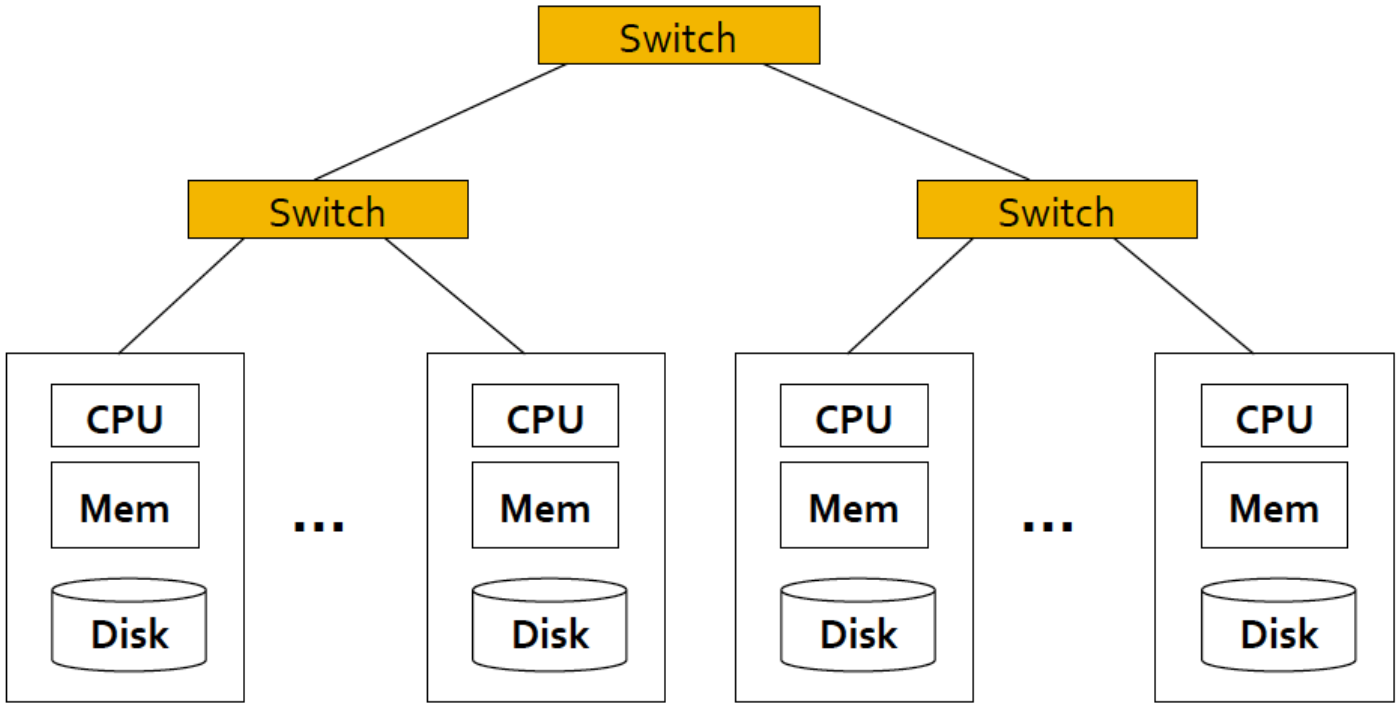


Fig. 2-2 Cluster Architecture

Solution to hardware limitation: Scale-out

Fig. 2-3 Racks

Cluster Computing Challenges

- Network bottleneck
- Distributed programming
- Node Failures
  - Hardware breakdown
  - Software malfunction
  - Unstable networking

Problems:

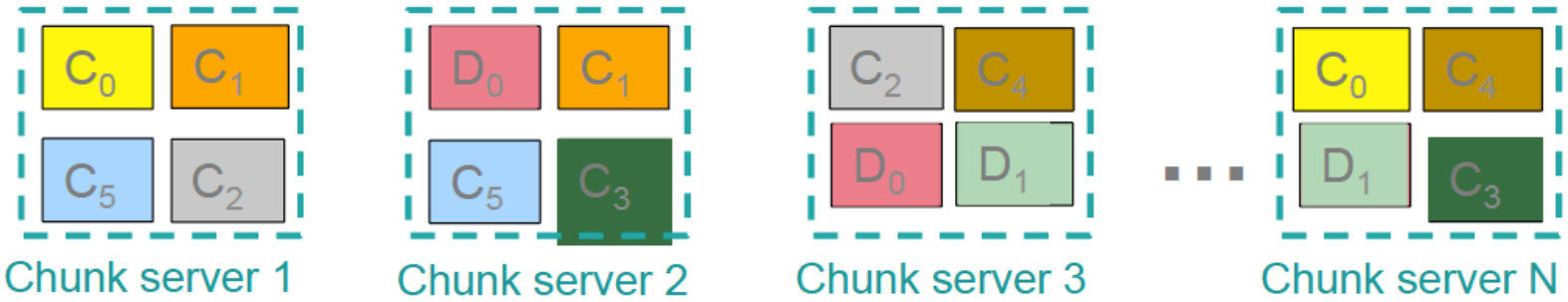
- How to store data persistently and keep it available if nodes can fail?
- How to deal with node failures during a long-running computation?
- How to hide most of the complexity of the distributed system?

Redundant Storage Infrastructure

- Distributed File System
  - Provides global file namespace, redundancy and availability
  - E.g. Google GFS, Hadoop HDFS
- Typical usage pattern
  - Huge files (hundreds of GB to TB and even PB)
  - Data is rarely updated
  - Reads and appends are common

Distributed File System

- Data kept in "chunks" spread across machines
- Each chunk replicated on different machines
  - Ensures persistence and availability



Chunk servers also serve as compute servers

Bring computation to data!

Distributed File System

- **Chunk servers**
  - File is split into contiguous chunks (16-64MB)
  - Each chunk replicated (usually 2x or 3x)
  - Try to keep replicas in different racks
- **Master node**
  - a.k.a. Name Node in Hadoop's HDFS
  - Stores metadata about where files are stored
  - Might be replicated
- **Client library for file access**
  - Talks to master to find chunk servers
  - Connects directly to chunk servers to access data

Distributed MongoDB

Problems:

- How to store data persistently and keep it available if nodes can fail?
- How to deal with node failures during a long-running computation?
- How to hide most of the complexity of the distributed system?

Todo:

- Auto-sharding
  - Replica
  - Balancing
  - Primary election
  - e.t.c.

DONE :)

Distributed MongoDB

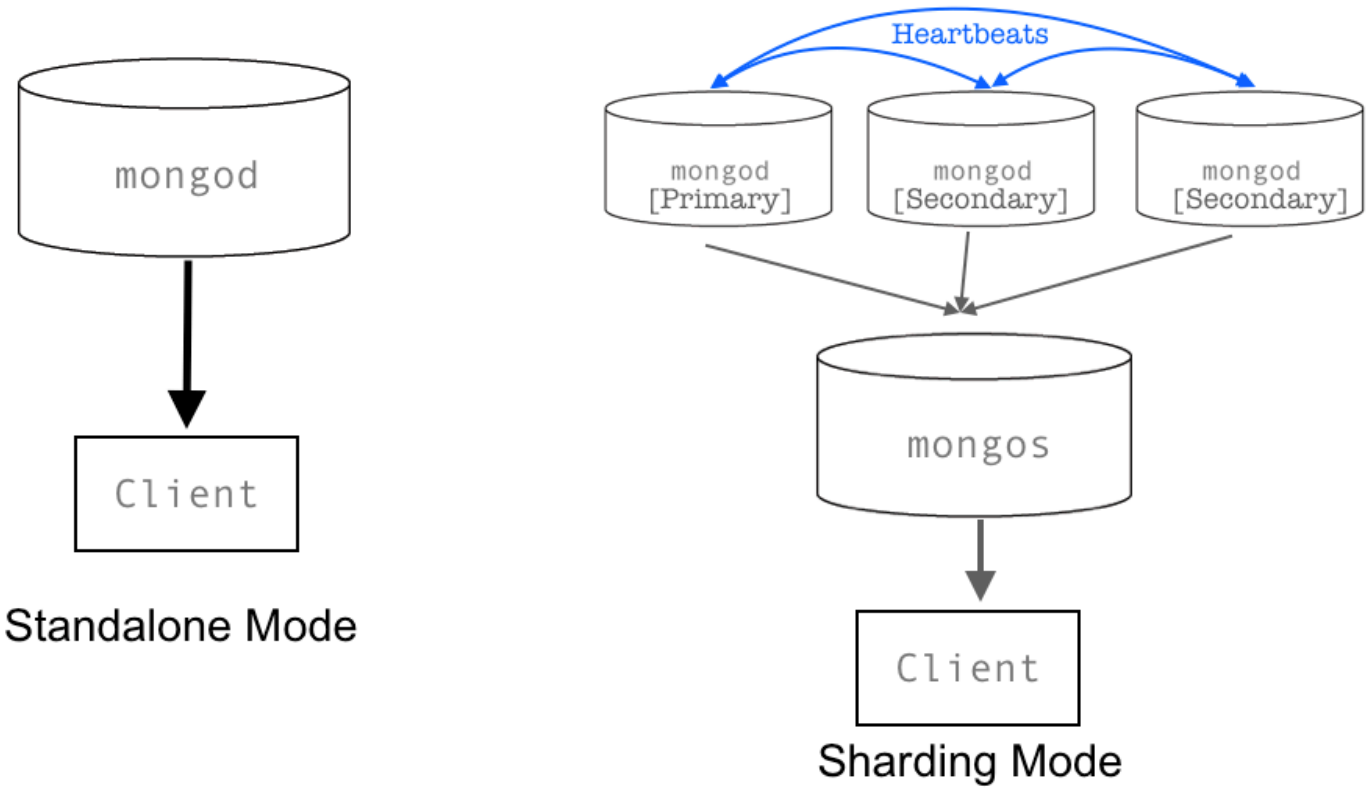


Fig. 2-4 Standalone and Sharding MongoDB Architecture

Any questions?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