CS 245: Database System Principles

Notes 12: Distributed Databases

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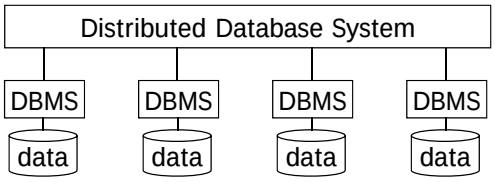
Distributed Databases



Advantages of a DDBS

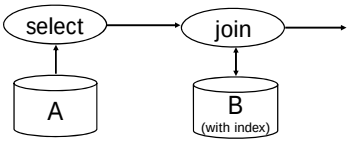
- Modularity
- Fault Tolerance
- High Performance
- Data Sharing
- Low Cost Components

Issues

- Data Distribution
- Exploiting Parallelism
- Concurrency and Recovery
- Heterogeneity

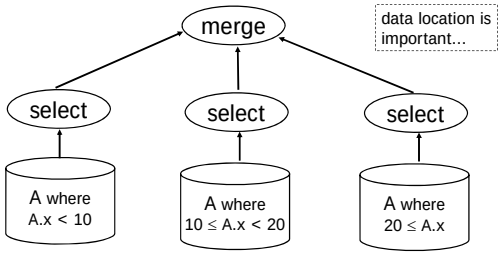
Parallelism: Pipelining

- Example:
  - $T_1 \leftarrow$ SELECT * FROM A WHERE cond
  - $T_2 \leftarrow$ JOIN T_1 and B



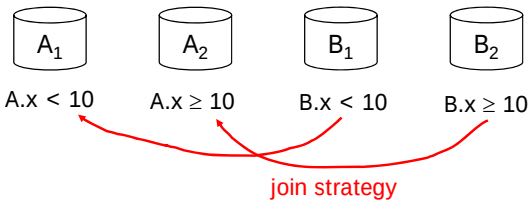
Parallelism: Concurrent Operations

- Example: SELECT * FROM A WHERE cond



Join Processing

- Example: JOIN A, B over attribute X



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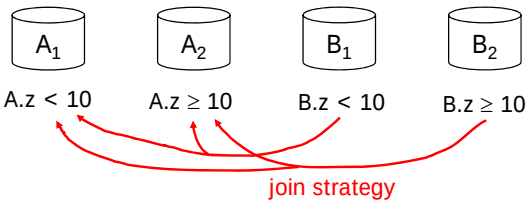
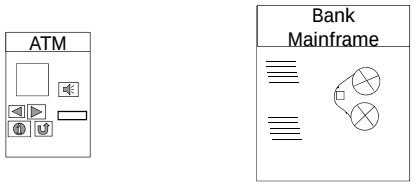


Concurrency & Recovery

- Two Phase Commit



2PC: ATM Withdrawl

- Mainframe is coordinator
- Phase 1: ATM checks if money available; mainframe checks if account has funds (money and funds are "reserved")
- Phase 2: ATM releases funds; mainframe debits account

Replicated Data Mangement

- Key to fault-tolerance, durability
- Illustrates transaction processing issues
- Various concurrency control/recovery algorithms available

Primary Copy Algorithm

- Updates run at primary site
- Backups repeat writes; backups allow "out-of-date" reads

Primary Site	
A	3
B	8
C	4
D	25

Backup Site 1	
A	3
B	8
C	4
D	25

Backup Site 2	
A	3
B	8
C	4
D	25

Primary Copy Algorithm

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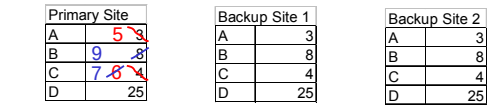

T1: A:5; C:6
T2: B:9; C: 7

Primary Copy Algorithm

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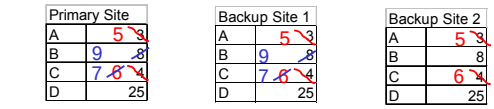

T1: A:5; C:6
T2: B:9; C: 7

propagate in order

To be covered in CS347

- More replicated data algorithms
- More commit protocols
- Distributed query processing
- Open Source Systems for Distributed Data
  - Storm, S4, Hadoop, Cassandra, Pregel, etc
- Peer to peer systems
- Distributed information retrieval
- And many, many more fun topics!!