

NoSQL Systems

Motivation

NoSQL: The Name

- "SQL" = Traditional relational DBMS
- Recognition over past decade or so:
 Not every data management/analysis problem is best solved using a traditional relational DBMS
- "NoSQL" = "No SQL" = Not using traditional relational DBMS
- "No SQL" ≠ Don't use SQL language

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Not every data management/analysis problem is best solved using a traditional DBMS

Database Management System (DBMS) provides....

multi-user storage of and access to massive amounts of persistent data.

Not every data management/analysis problem is best solved using a traditional DBMS

- Convenient Simple data model
 Multi-user declarative quey language
 Safe
 Persistent files OK
 Reliable redo OK
- Efficient ++4++

Massive +++

NoSQL Systems

Alternative to traditional relational DBMS

- + Flexible schema <
- + Quicker/cheaper to set up
- + Massive scalability <
- + Relaxed consistency → higher performance & availability
- No declarative query language → more programming
- Relaxed consistency → fewer guarantees

Example #1: Web log analysis

Each record: UserID, URL, timestamp, additional-info

Task: Load into database system

Data extraction - Nothing Data extraction - Nothing Verification -Schema specification -

Example #1: Web log analysis

Each record: UserID, URL, timestamp, additional-info

No SOL!

Task: Find all records for...

- Given UserID
- Given URL ✓
- Given timestamp ✓

Certain construct appearing in additional-info



Example #1: Web log analysis

Each record: UserID, URL, timestamp, additional-info

Task: Find all pairs of UserIDs accessing same URL



Example #1: Web log analysis

Each record: UserID, URL, timestamp, additional-info

Separate records: UserID, name, age, gender, ...

Task: Find average age of user accessing given URL

SOL-like Consistency

Example #2: Social-network graph

Each record: UserID₁, UserID₂

Separate records: UserID, name, age, gender, ...



Task: Find all friends of given user

Example #2: Social-network graph

Each record: UserID₁, UserID₂

Separate records: UserID, name, age, gender, ...

Task: Find all friends of friends given user



Example #2: Social-network graph

Each record: UserID₁, UserID₂

Separate records: UserID, name, age, gender, ...

Task: Find all women friends of men friends of given user

Example #2: Social-network graph

Each record: UserID₁, UserID₂

Separate records: UserID, name, age, gender, ...

Task: Find all friends of friends of friends of ... friends of given user

Not suitable for sal X Consistency

Example #3: Wikipedia pages

Large collection of documents Combination of structured and unstructured data

Task: Retrieve introductory paragraph of all pages about U.S. presidents before 1900



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