CS315: Database Systems
NoSQL and Big Data Systems

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  1. Atomicity: Either all operations of a transaction are reflected or none are reflected
  2. Consistency: If a database is consistent before the execution of the transaction, it must be consistent after it
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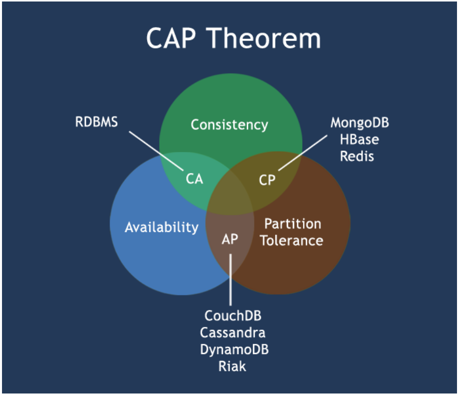
- Later changed since RDBMS is too powerful to always ignore
- NewSQL

CAP Theorem



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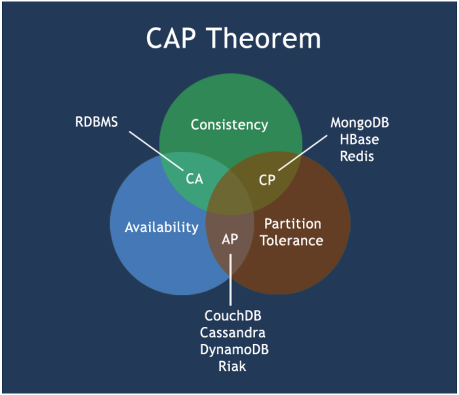

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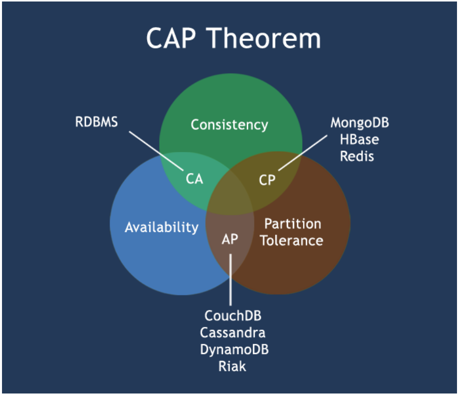

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- BASE is to counter ACID

Types

- Main types of NoSQL data stores:
  1. Columnar families
  2. Key-value stores
  3. Bigtable systems
  4. Document databases
  5. Graph databases

Columnar Storage

- Instead of rows being stored together, columns are stored consecutively
- A single disk block (or a set of consecutive blocks) stores a single column family
- A column family may consist of one or multiple columns
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- Two main types
  - Columnar relational models
  - Key-value stores and/or big tables

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- Example: MonetDB

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- Example: Cassandra, CouchDB, Tokyo Cabinet, Redis

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- Example: BigTable, HBase, Cassandra, HyperTable, SimpleDB

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- Example: MongoDB, CouchDB

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- Example: Neo4J, HyperGraph, Infinite Graph, Titan, FlockDB

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- NoSQL horizon is shifting rapidly
- Trend is for NoSQL as cloud computing and big data relies on it
- Many NoSQL systems are increasingly using features of RDBMS
- New paradigm of scalability with transaction support is NewSQL

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- When data is bigger than most standard machines can store or most algorithms can handle

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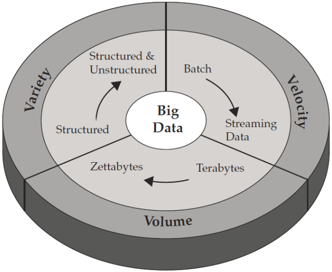
- Allows solving newer problems
  - Can also solve older problems better

Properties of Big Data



- 3 V's: volume, variety, velocity
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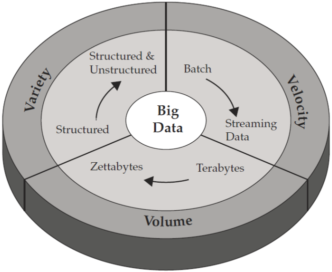

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- Extended V’s: veracity, validity, visibility, variability

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- Operations: Querying, indexing, analytics
  - Data mining, Information retrieval
  - Machine learning: Mahout on top of Hadoop

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- Many applications still do *not* require big data