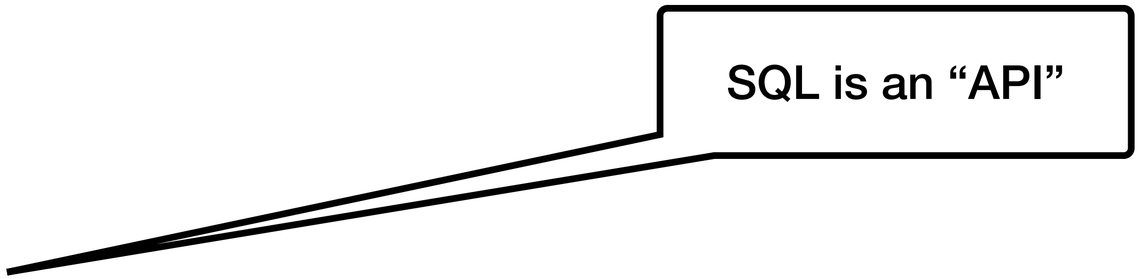
NoSQL

Big Data Systems

Dr. Rubi Boim

NoSQL

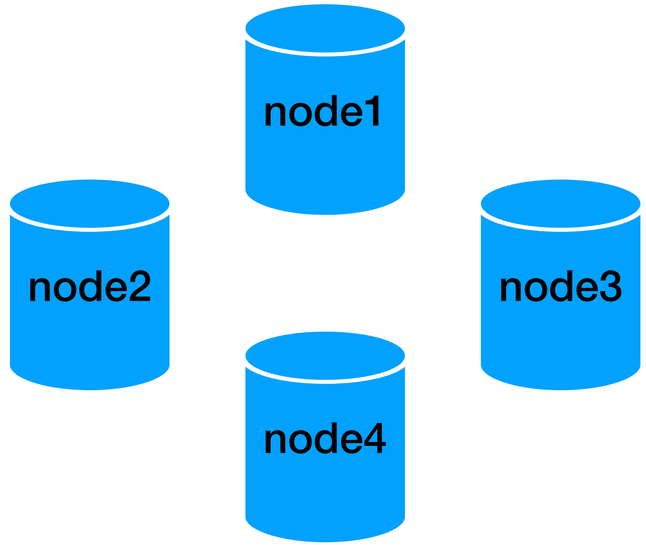
- Non SQL
- Not Only SQL
- Non schema SQL
- **Non Relational SQL**



- Most (distributed) Big Data storage / database systems

NoSQL - motivation

- Scaling issues of RDBMS
- Variety of data (schema-less)
- Read / write performance



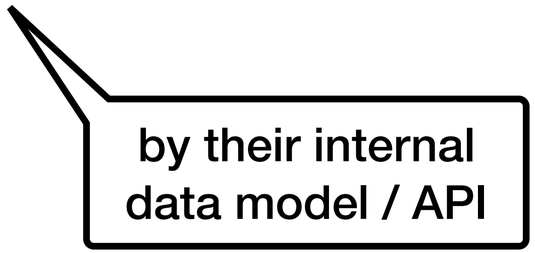
- Product needs of Google / Amazon / Facebook…

NoSQL - popular properties

- “Simpler" design / API
- Availability over Consistency
- **Performance over ACID transactions**
  extremely fast read/write at scale
- Distributed - scale wide (commodity hardware)
- Schema less
- Multi data center

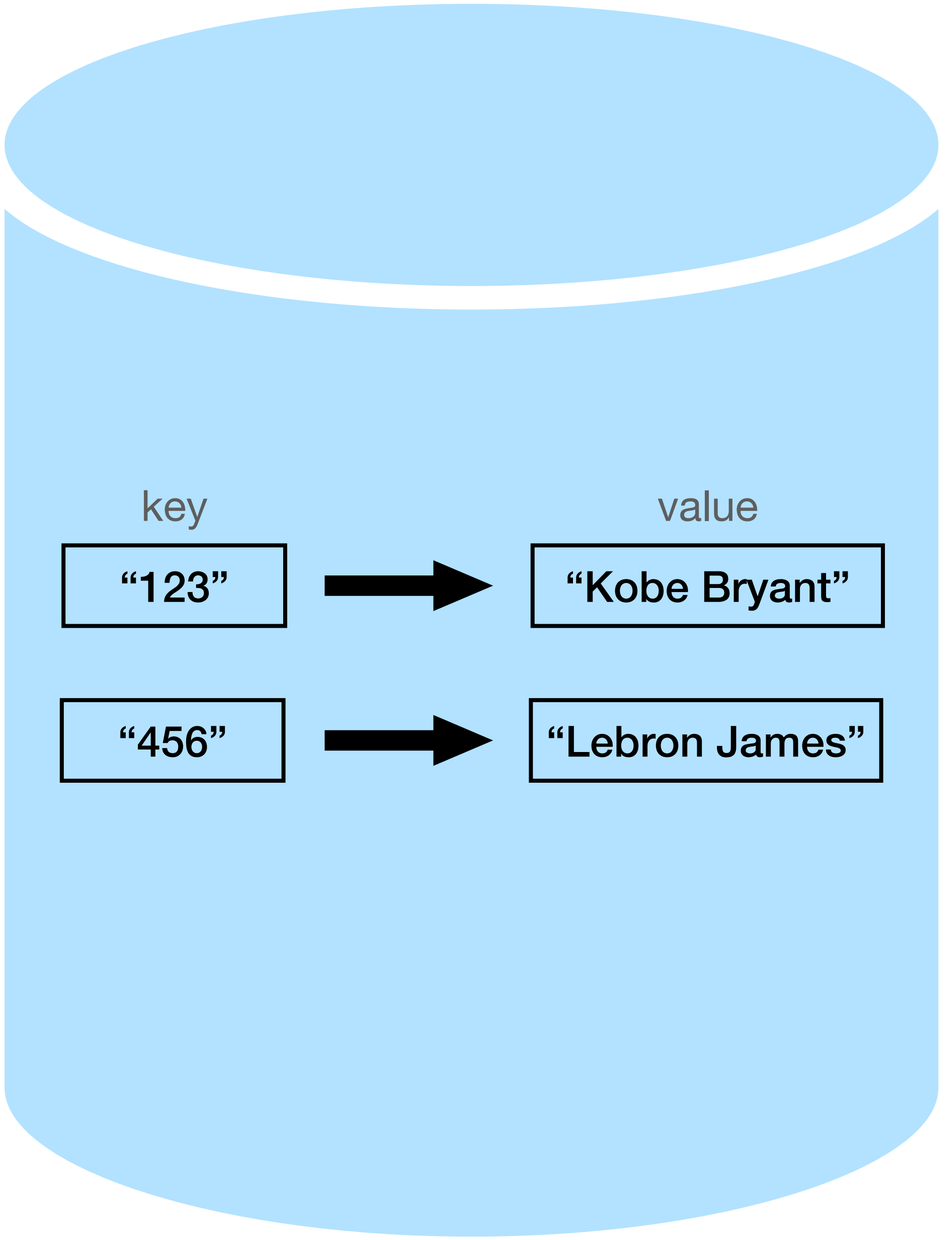
NoSQL - main types

- Key Value
- Document
- Graph
- **Wide column**



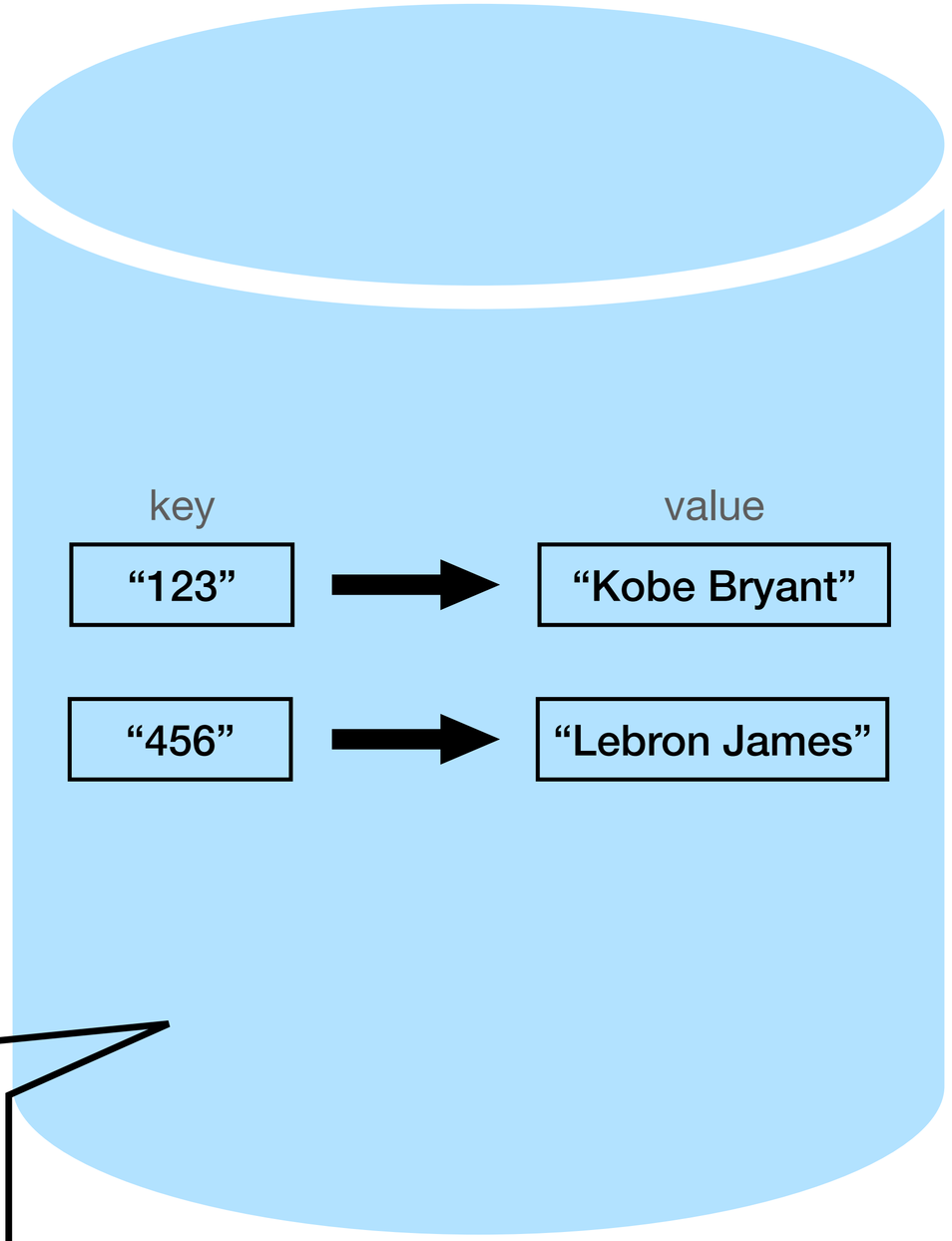
NoSQL - Key Value

- “Simplest” NoSQL database
- Hash table / dictionary
  key-value pairs
- CRUD API
  ```
  create(key/value)
  read(key)
  update(key/value)
  delete(key)
  ```



NoSQL - Key Value

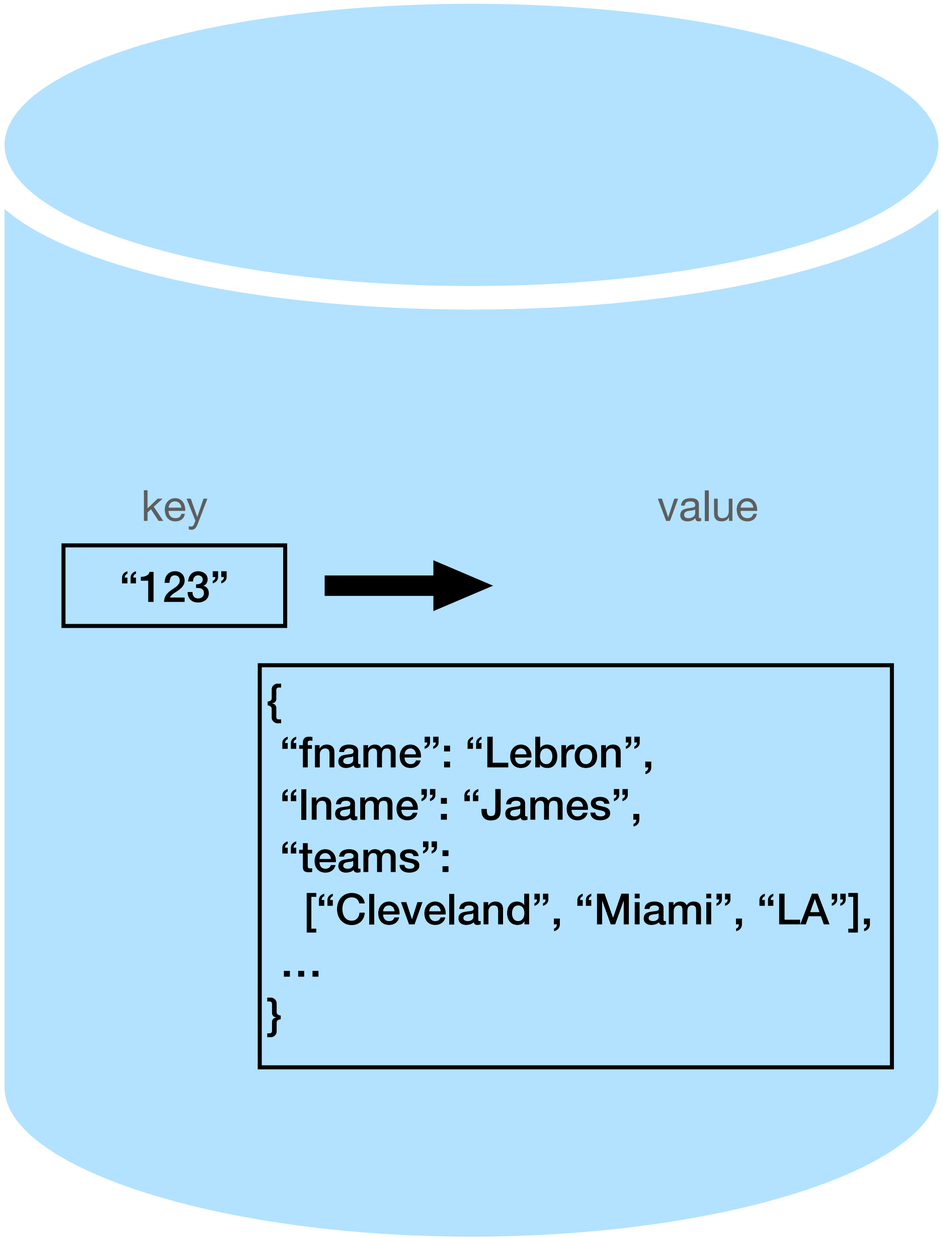
- “Simplest” NoSQL database
- Hash table / dictionary
  key-value pairs
- CRUD API
  ```
  create(key/value)
  read(key)
  update(key/value)
  delete(key)
  ```



popular systems
dynamo, levelDB,
redis, memcached

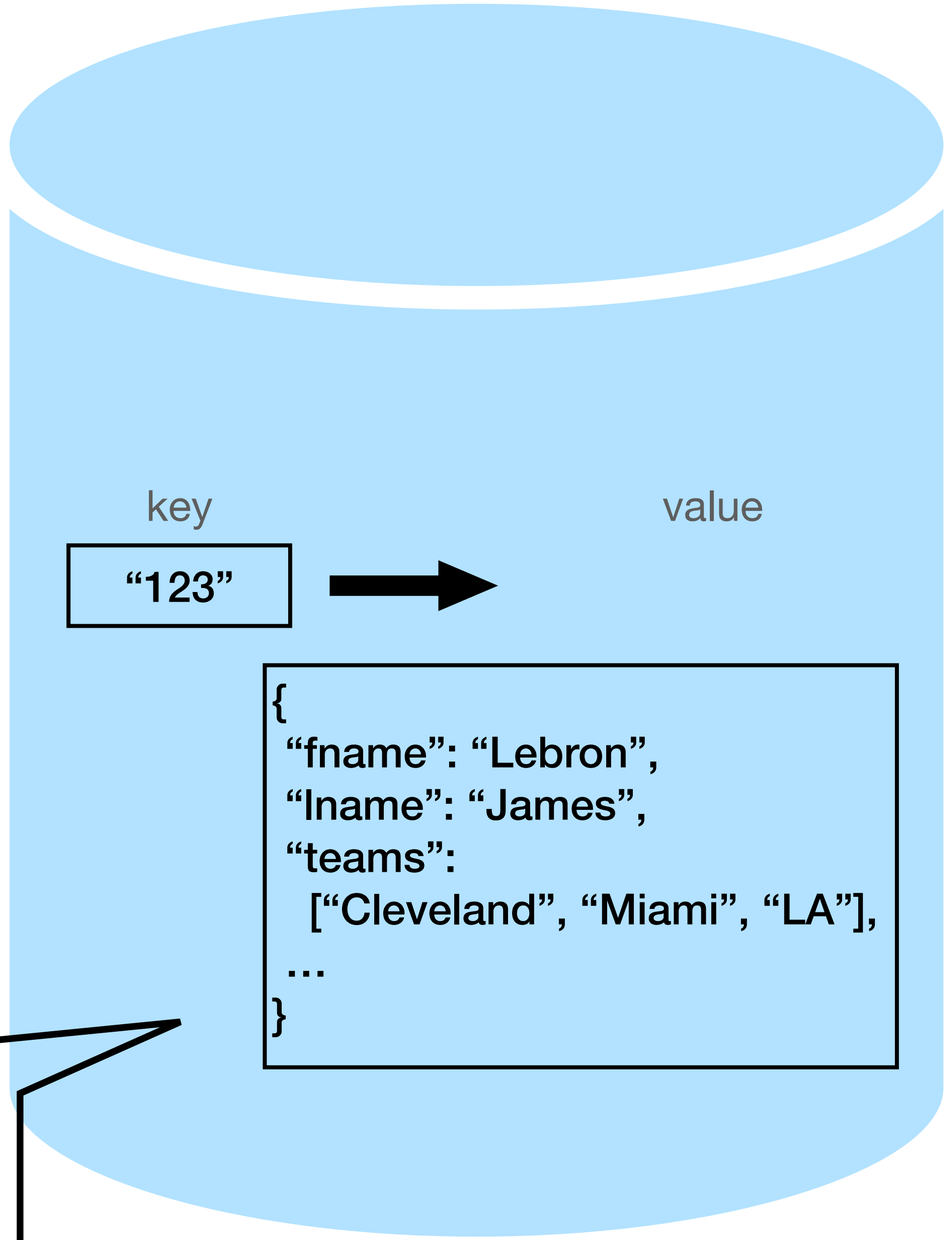
NoSQL - Document

- Scheme less “document”
  accessible by unique key
- Document encoding
  json / xml / yaml / bson
- Stores all information of a given object in a single place
- CRUD API
  but not only
  (find, sort…)



NoSQL - Document

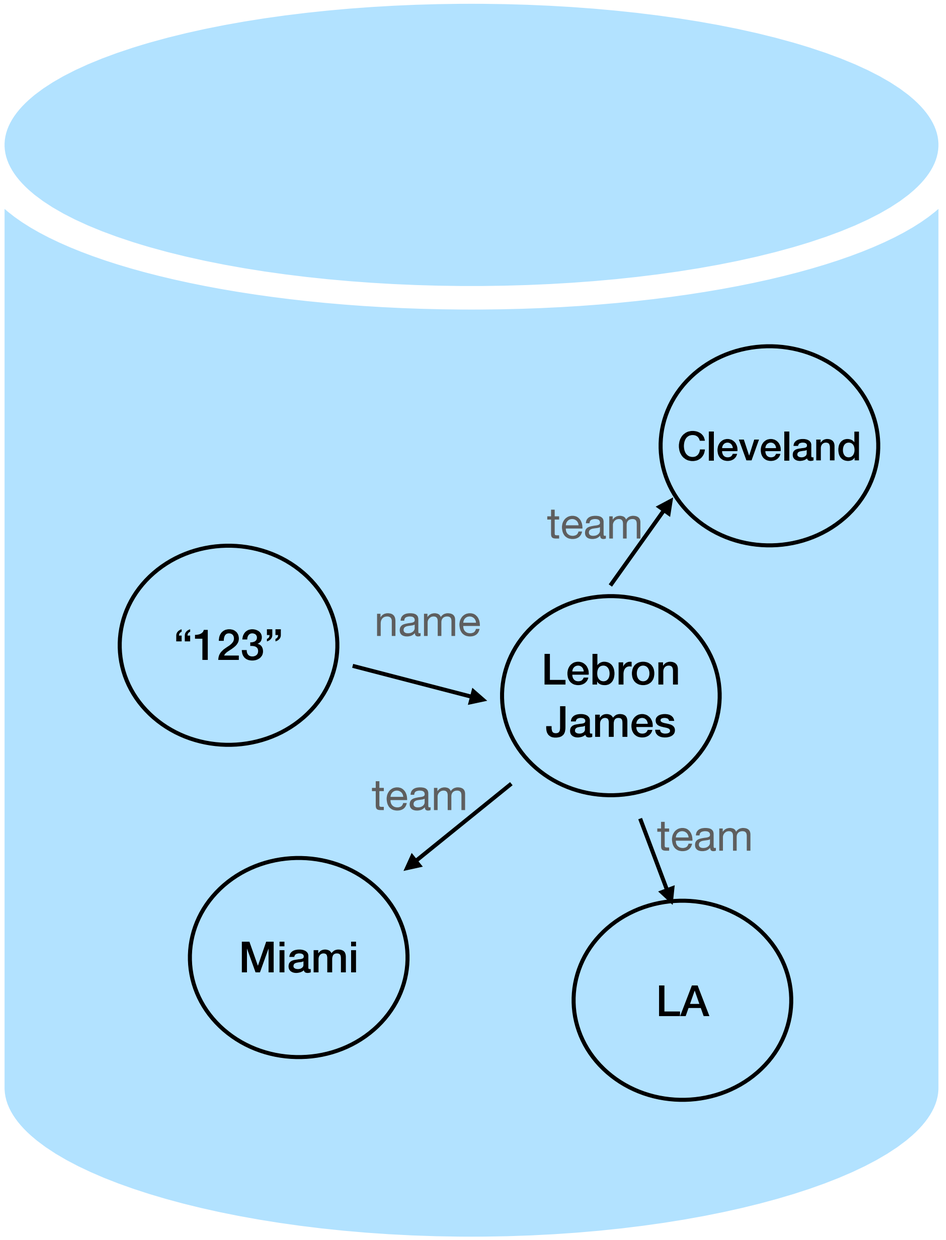
- Scheme less “document”
  accessible by unique key
- Document encoding
  json / xml / yaml / bson
- Stores all information of a given object in a single place
- CRUD API
  but not only
  (find, sort…)



popular systems
mongoDB, CouchDB

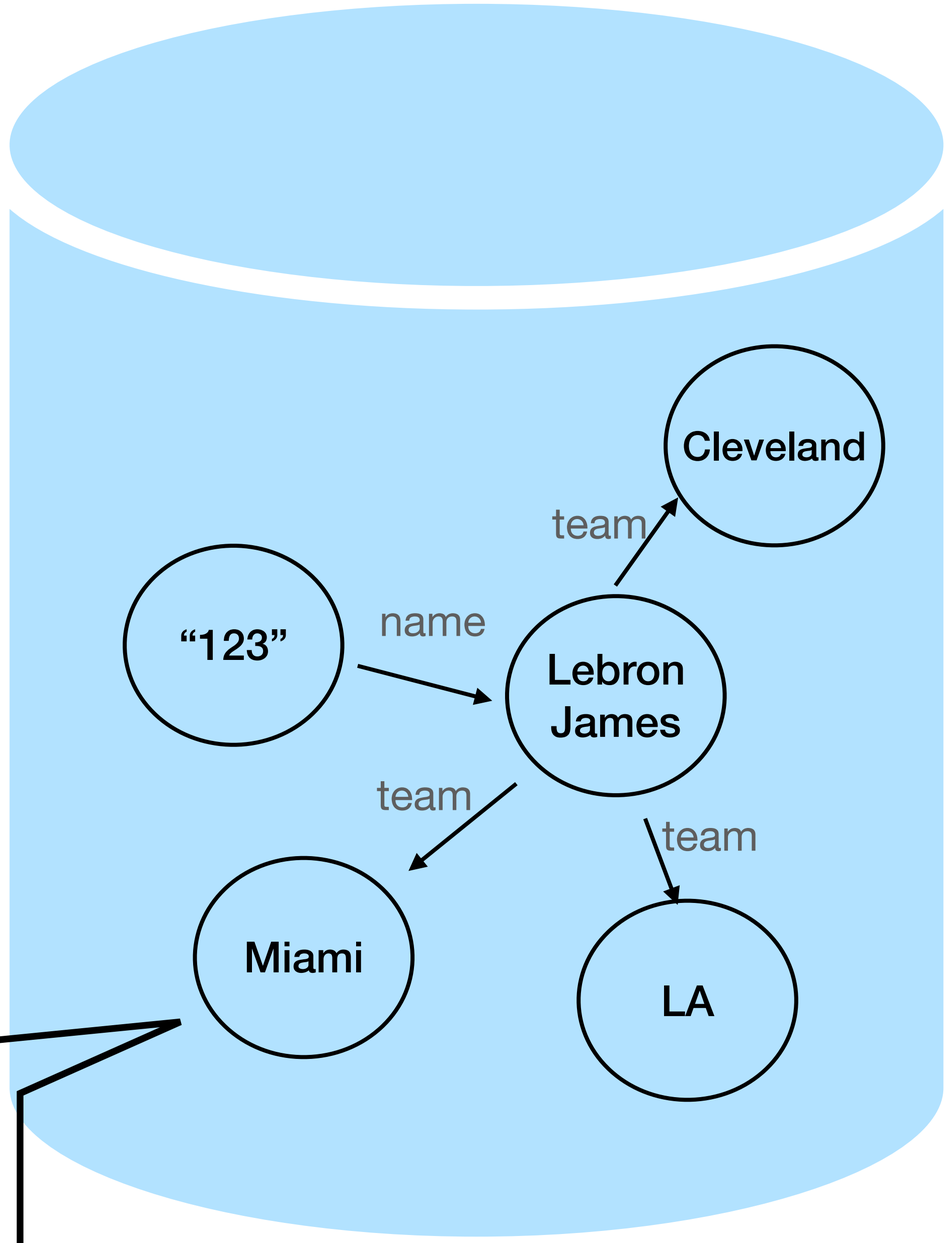
NoSQL - Graph

- Based on graph theory
  nodes, edges, properties, weights
- ACID / Transactions
  not always
- Built in graph algorithms



NoSQL - Graph

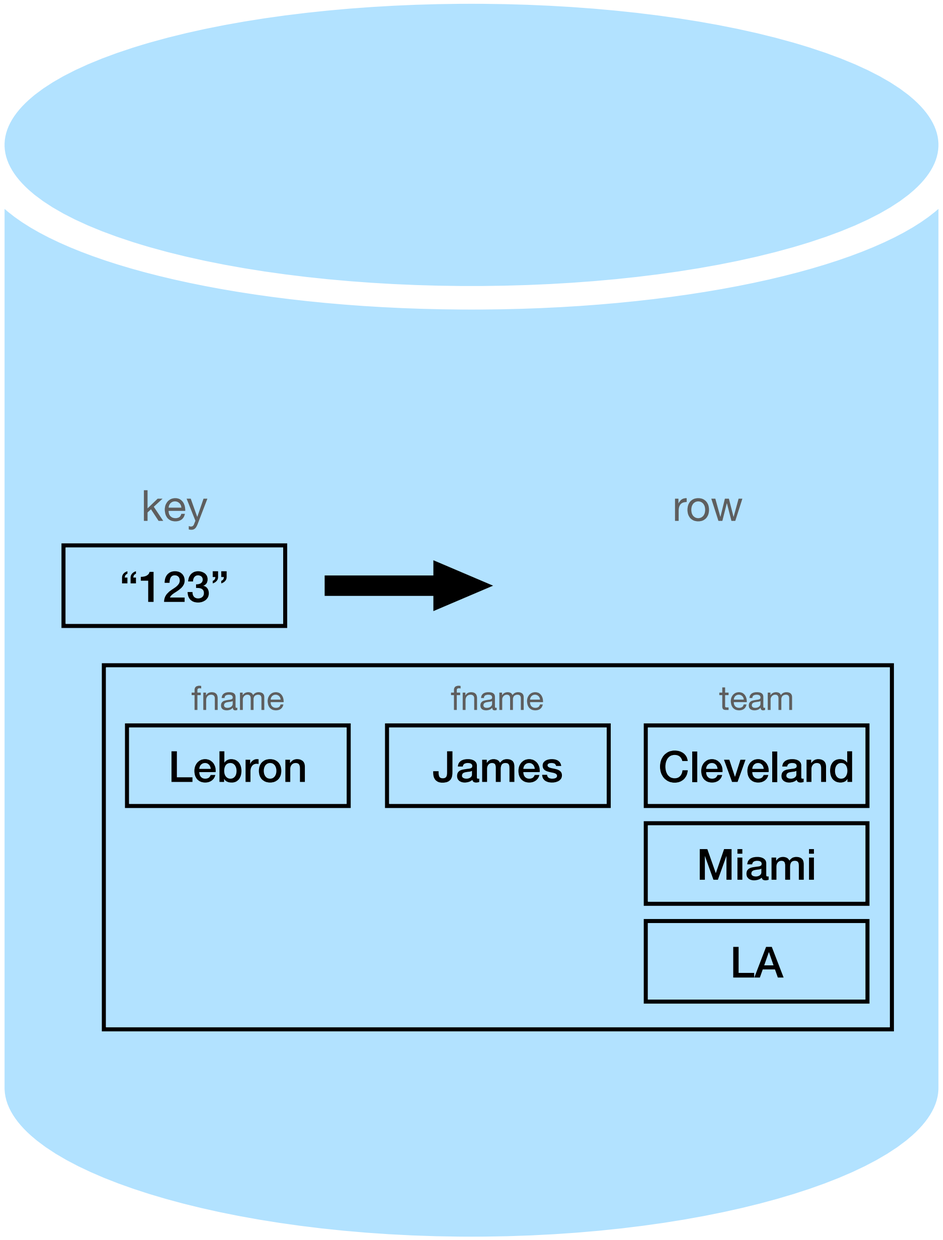
- Based on graph theory
  nodes, edges, properties, weights
- ACID / Transactions
  not always
- Built in graph algorithms



popular systems
neo4j, DataStax
enterprise graph

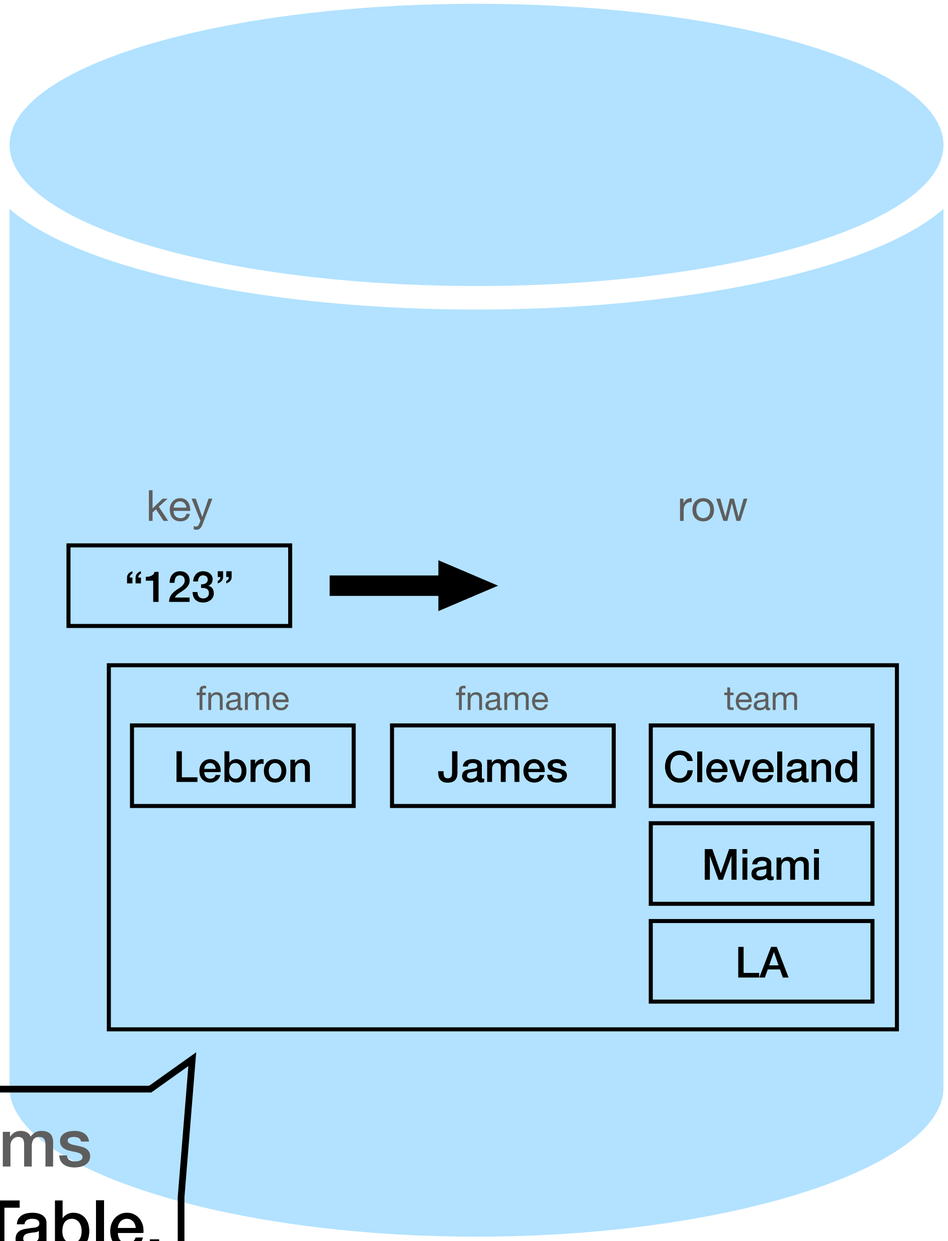
NoSQL - Wide column

- Tables, rows, columns
  can vary from row to row within a table
- Can be viewed as
  2-dimensional key-value store
- Custom API
  with some SQL sometimes (CQL)
- NOT a columnar database
  but can be sometimes



NoSQL - Wide column

- Tables, rows, columns
  can vary from row to row within a table
- Can be viewed as
  2-dimensional key-value store
- Custom API
  with some SQL sometimes (CQL)
- NOT a columnar database
  but can be sometimes



popular systems
Cassandra, BigTable,
DynamoDB, HBase

NoSQL - Wide column

- A lot more on these systems
- Stay tuned :)

ACID vs BASE

Basically **A**vailable
Soft state
Eventual consistency

ACID (reminder)

- **A**tomicity
- **C**onsistency
  correctness / referential integrity (foreign key) - NOT like in CAP
- **I**solation
- **D**urability

BASE

- **B**asically **A**vailable
  There will be a response even if node fails (response=fail)
- **S**oft state
  State can change even if no read/write are performed
  (the system is aiming towards consistent)
- **E**ventual consistency
  reads may be inconsistent, but over time will be consistent

ACID vs BASE

Most relational DBs
(Oracle, MySQL…)

Most NoSQL systems
(C*, BigTable, MongoDB,…)

NoSQL and CAP