Object Oriented Databases

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Who's talking?

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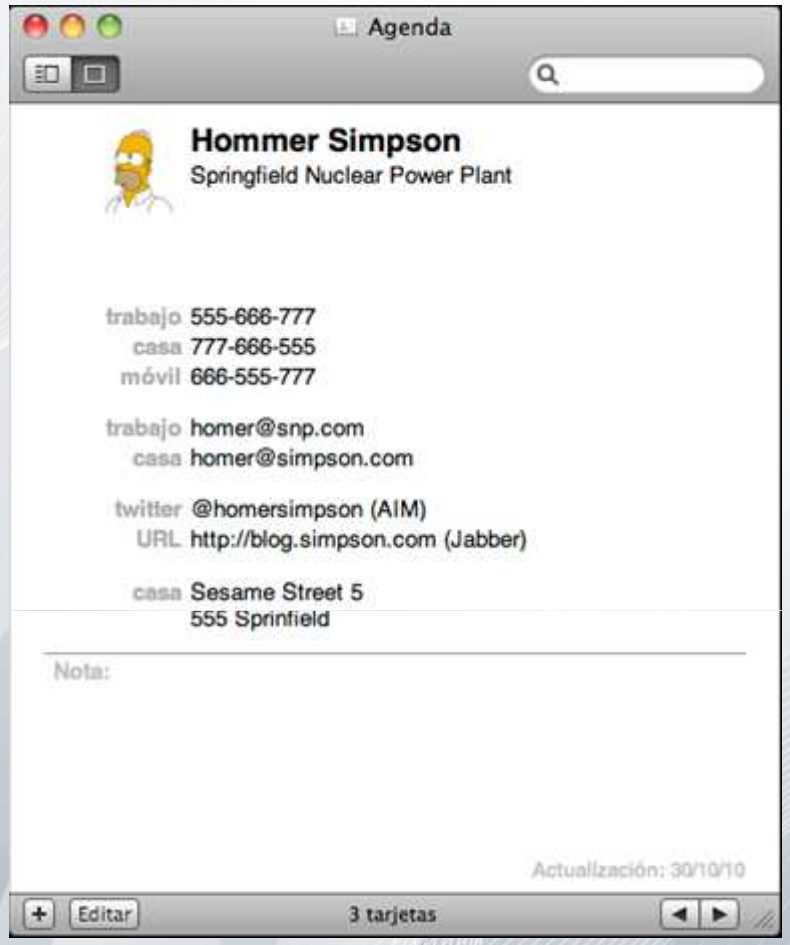
Main Topics

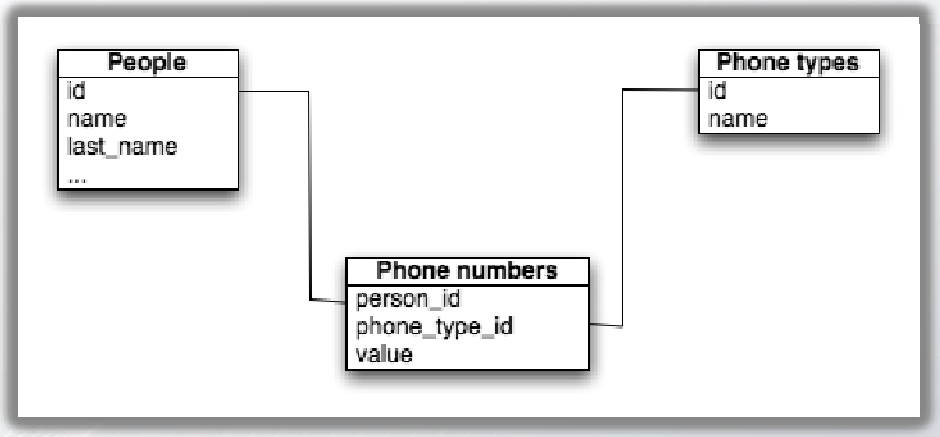
1. Document oriented databases
2. Introduction to JSON data format
3. Meet CouchDB
4. Meet MongoDB
5. CouchDB vs. MongoDB
6. Demo

Schema-free Document Oriented Database

Documental Databases



Relational Databases



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JSON Data Format

```
{
    "day": [ 2010, 01, 23 ],
    "products": {
        "apple": {
            "price": 10
            "quantity": 6
        },
        "kiwi": {
            "price": 20
            "quantity": 2
        }
    },
    "checkout": 100
}
```

Meet CouchDB

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Topics

1. Introduction to CouchDB
2. Create, Update, Remove, Query Operations
3. Views & Aggregation
4. Concurrency
5. Replication
6. Pros and cons
7. Resources

Main features

- Data is stored and returned in JSON format
- Queried via HTTP RESTful API
- Index building language: Javascript
- Simple and intuitive interface

Schema-less DB

```
{
        "_id": "debd7e7385464f4874dd2a38043f7825",
        "_rev": "3-839e43865b653a1ed73c3d21cc17c5dd",
        "name": "Homer",
        "last_names": ["Simpson", "Duff"],
        "phone_numbers":
        {
                "mobile": "555-666-777",
                “work": "666-777-555“,
                "bar": "777-666-555“
        },
        "interests": ["beer", "donuts", "couches"]
}
```

Key

```
{
    "day": [ 2010, 01, 23 ],
    "products": {
        "apple": {
            "price": 10
            "quantity": 6
        },
        "kiwi": {
            "price": 20
            "quantity": 2
        }
    },
    "checkout": 100
}
```

Restful HTTP API

- Create:
  - HTTP PUT /db/test
- Read:
  - HTTP GET /db/test
- Update:
  - HTTP PUT /db/test
- Delete:
  - HTTP DELETE /db/test

Querying the database

- Views: the way to arrange data to answer our questions

- Method to build views:
  Incremental MapReduce using Javascript

DEMO Map Reduce

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Example

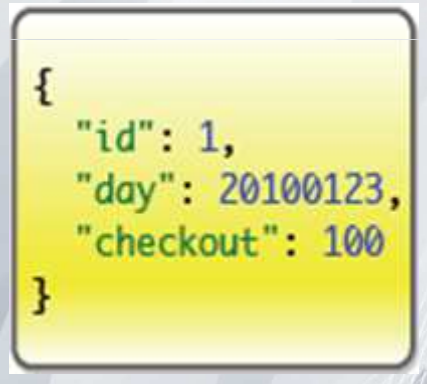
```
{
  "id": 1,
  "day": 20100123,
  "checkout": 100
}
```

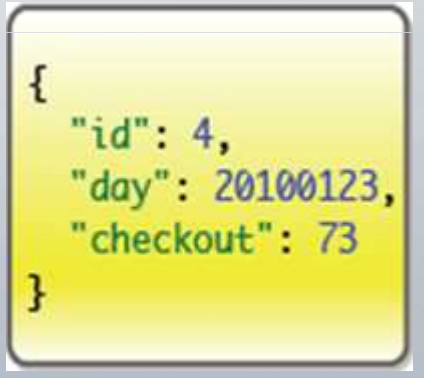
```
{
  "id": 2,
  "day": 20100123,
  "checkout": 42
}
```

```
{
  "id": 3,
  "day": 20100123,
  "checkout": 215
}
```

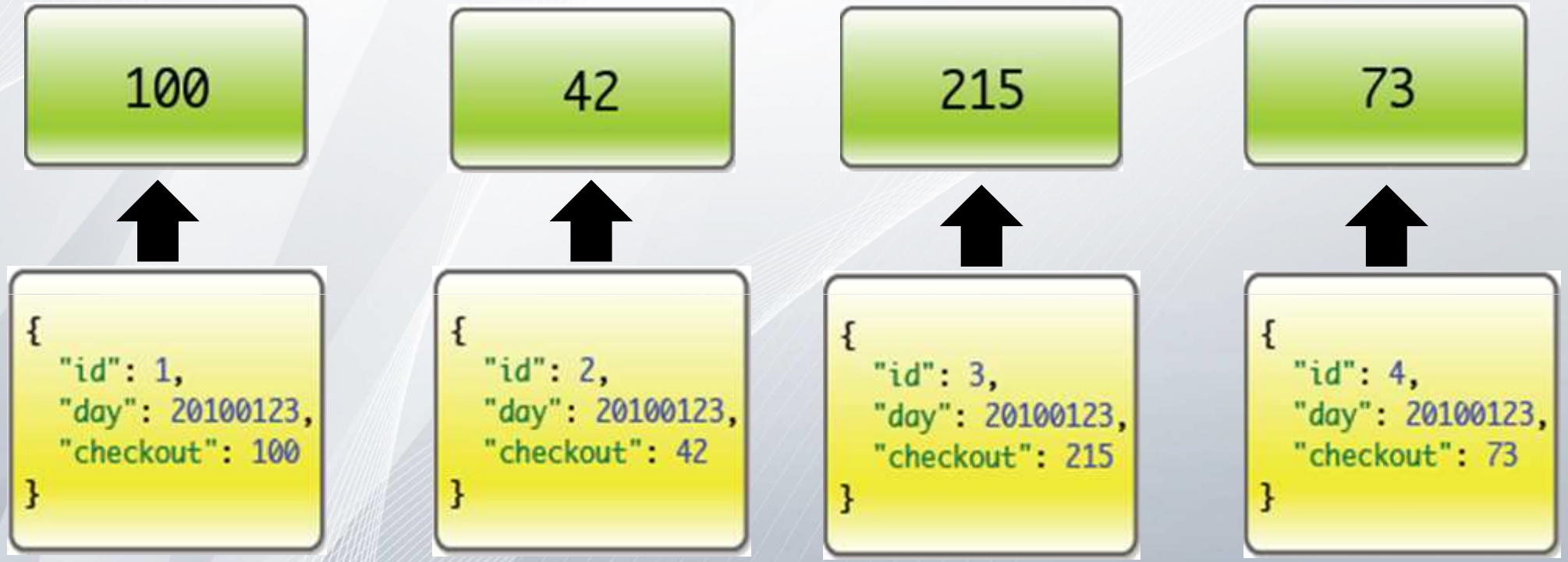
```
{
  "id": 4,
  "day": 20100123,
  "checkout": 73
}
```

How to find sum(checkouts) ?

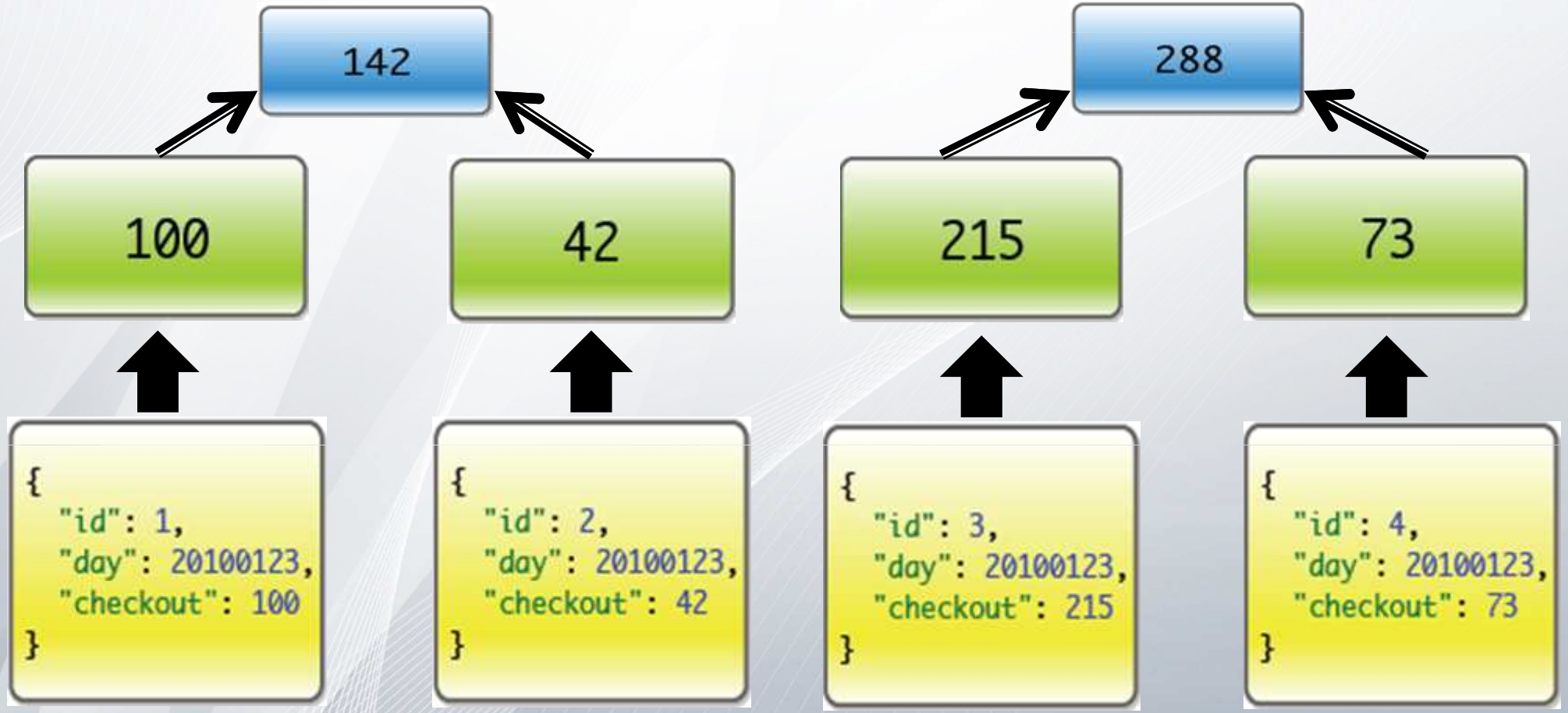




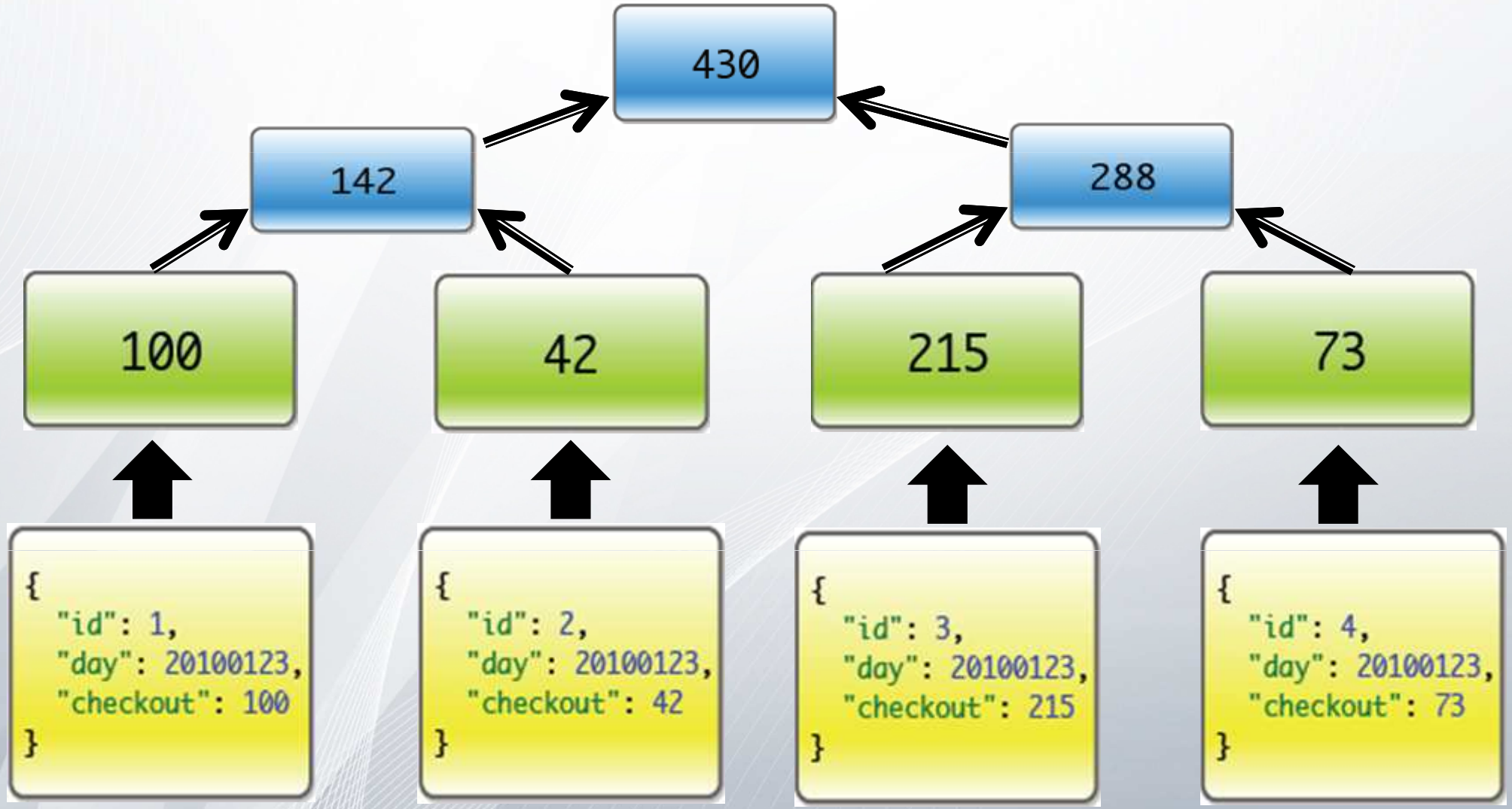
Simple Map : emit(checkout)



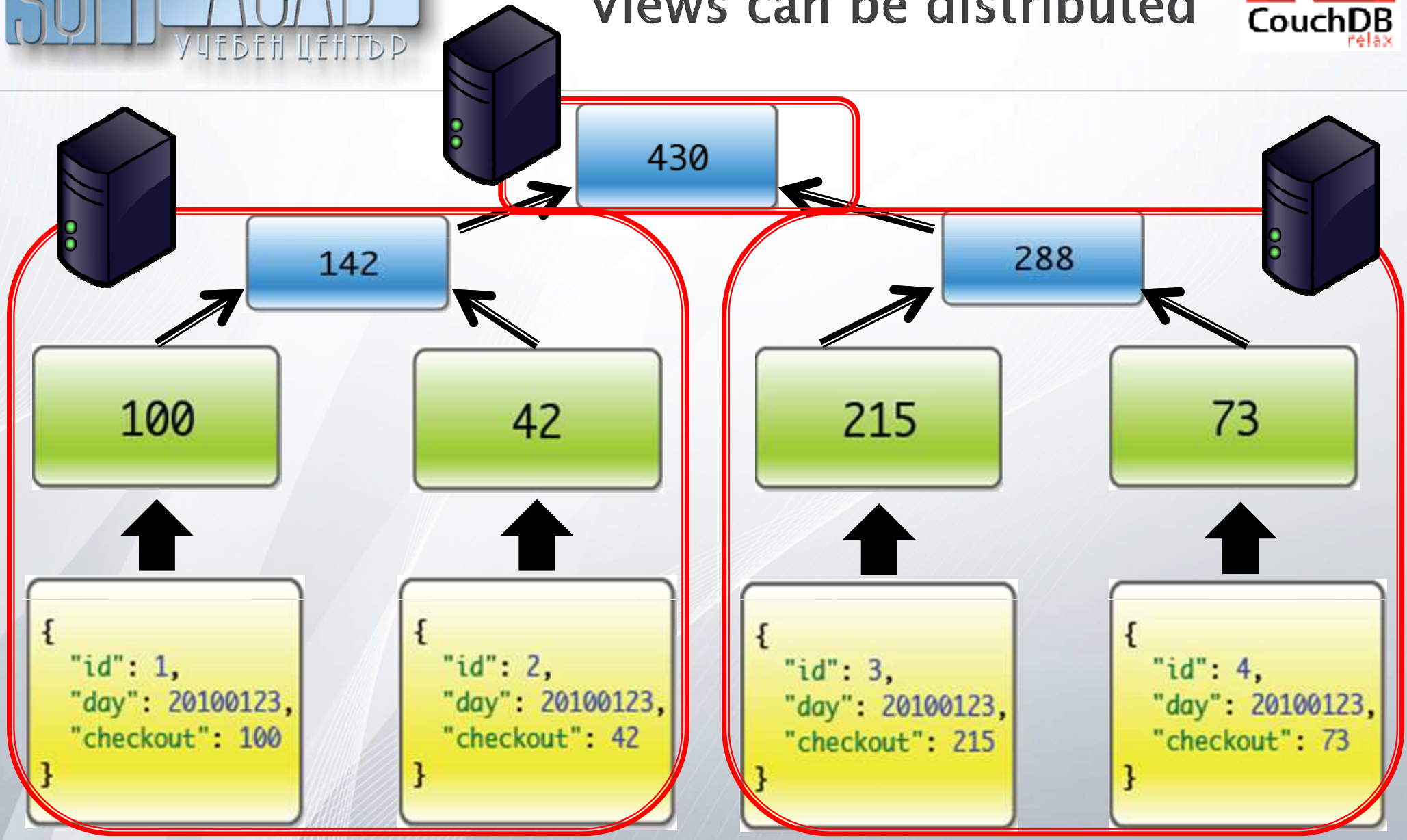
Simple Reduce : sum(checkouts)



Simple Reduce : sum(checkouts)



Views can be distributed



Views

- Views are useful for many purposes:
  - Filtering the documents in your database to find those relevant to a particular process.
  - Extracting data from your documents and presenting it in a specific order.
  - Building efficient indexes to find documents by any value.
  - Use these indexes to represent relationships among documents.
  - With views you can make all sorts of calculations on the data in your documents.

Typical document(2)

```
{
        "_id": "debd7e7385464f4874dd2a38043f7825",
        "_rev": "3-839e43865b653a1ed73c3d21cc17c5dd",
        "name": "Homer",
        "last_names": ["Simpson", "Duff"],
        "phone_numbers":
        {
                "mobile": "555-666-777",
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}
```

Concurrency

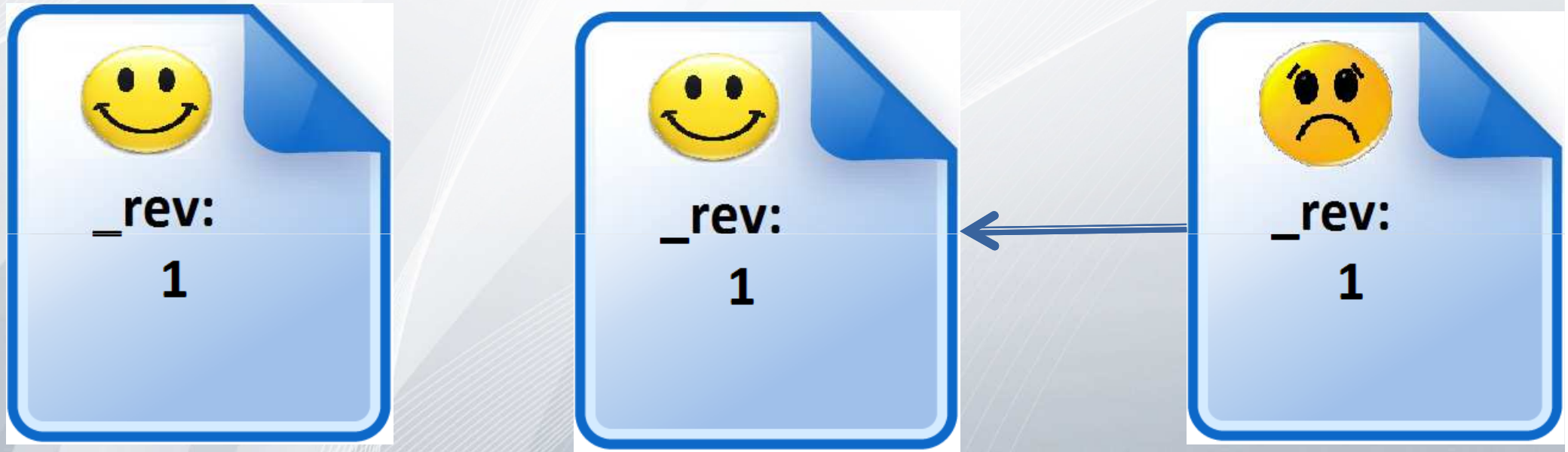
Temenujka

CouchDB

Sofroniy

Concurrency

Temenujka CouchDB Sofroniy



Concurrency

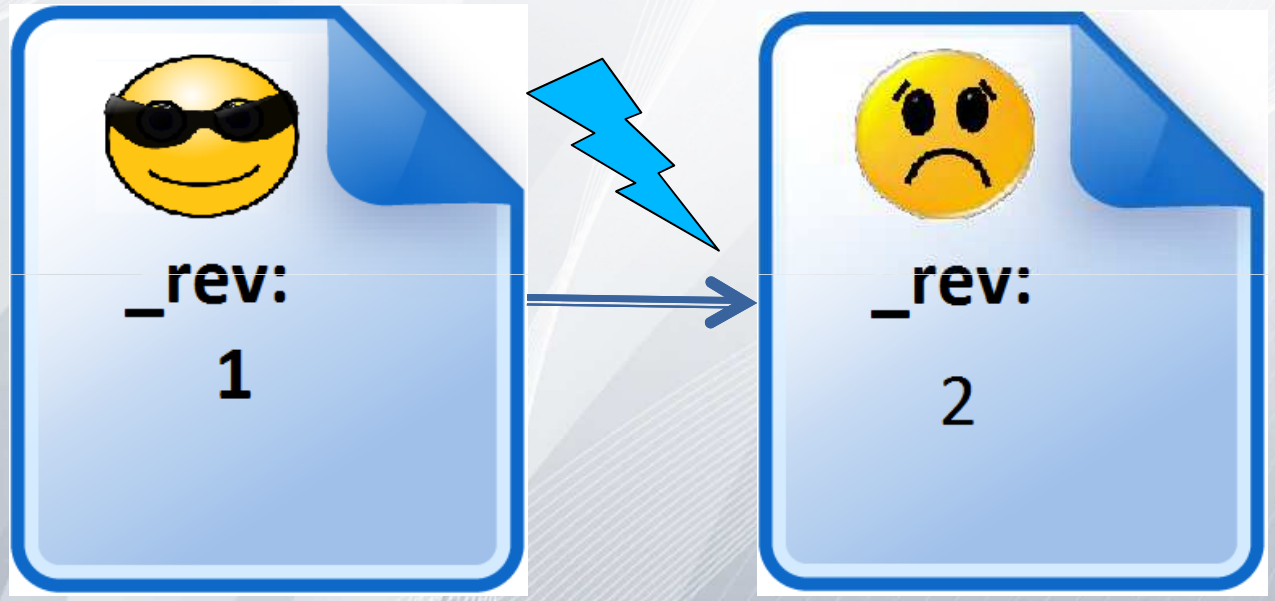
Temenujka

CouchDB

Concurrency

Temenujka

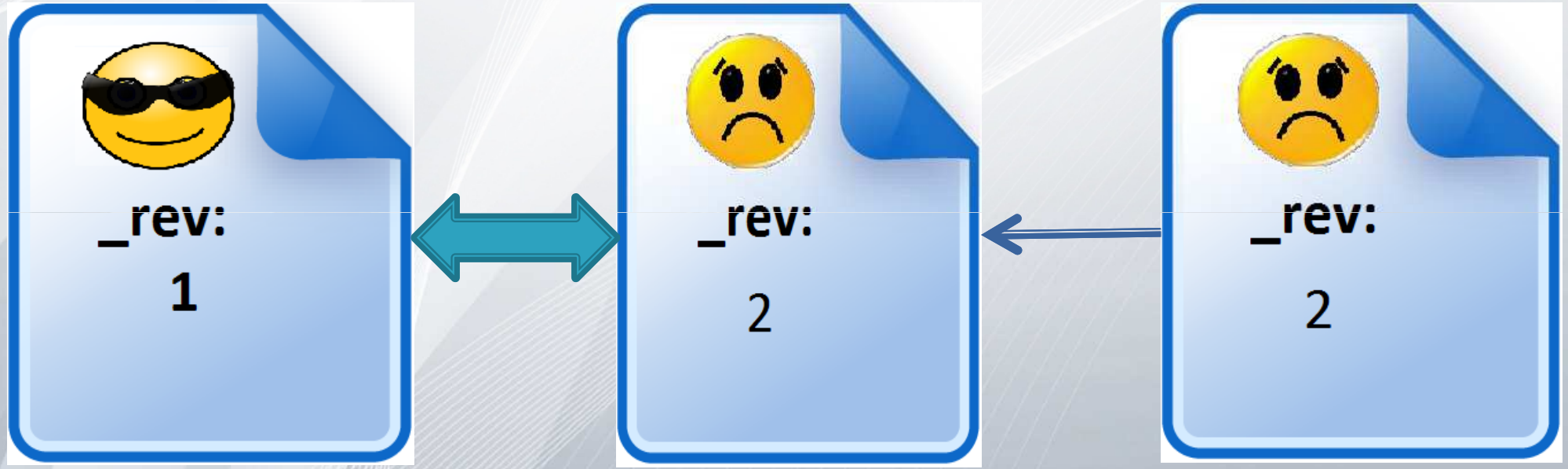
CouchDB



Concurrency

Temenujka

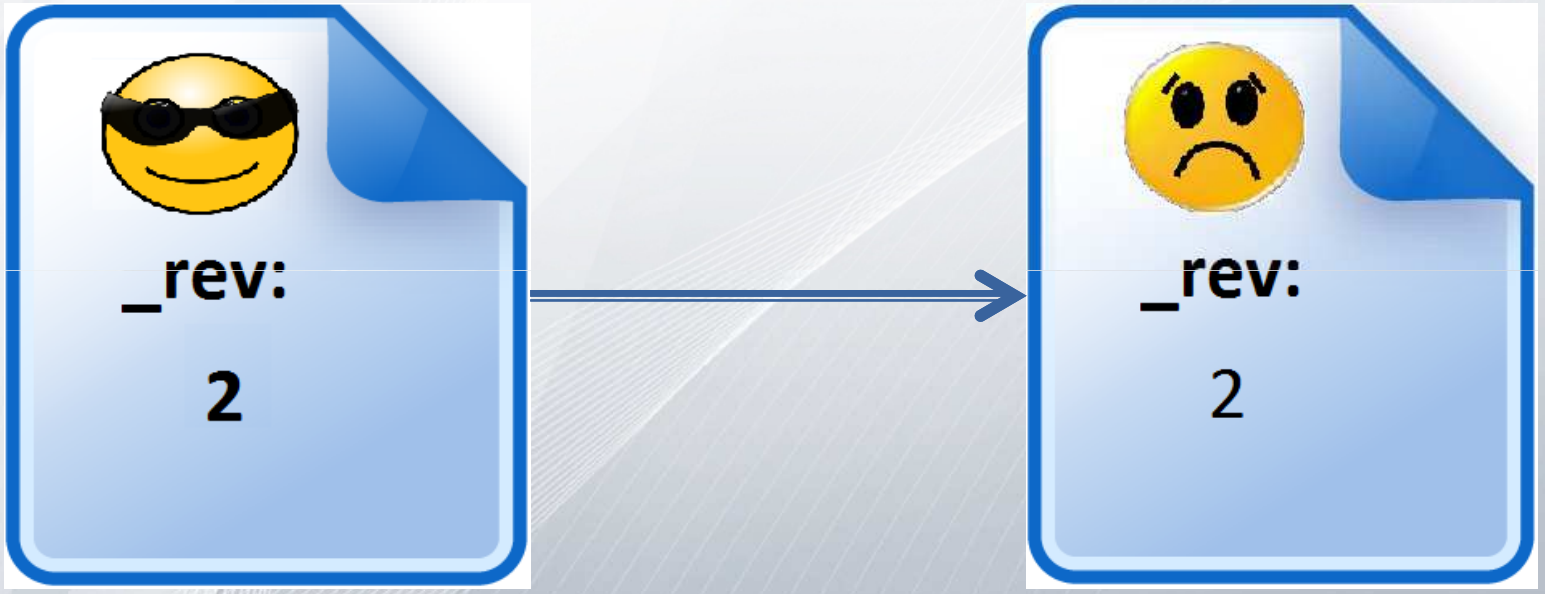
CouchDB



Concurrency

Temenujka

CouchDB

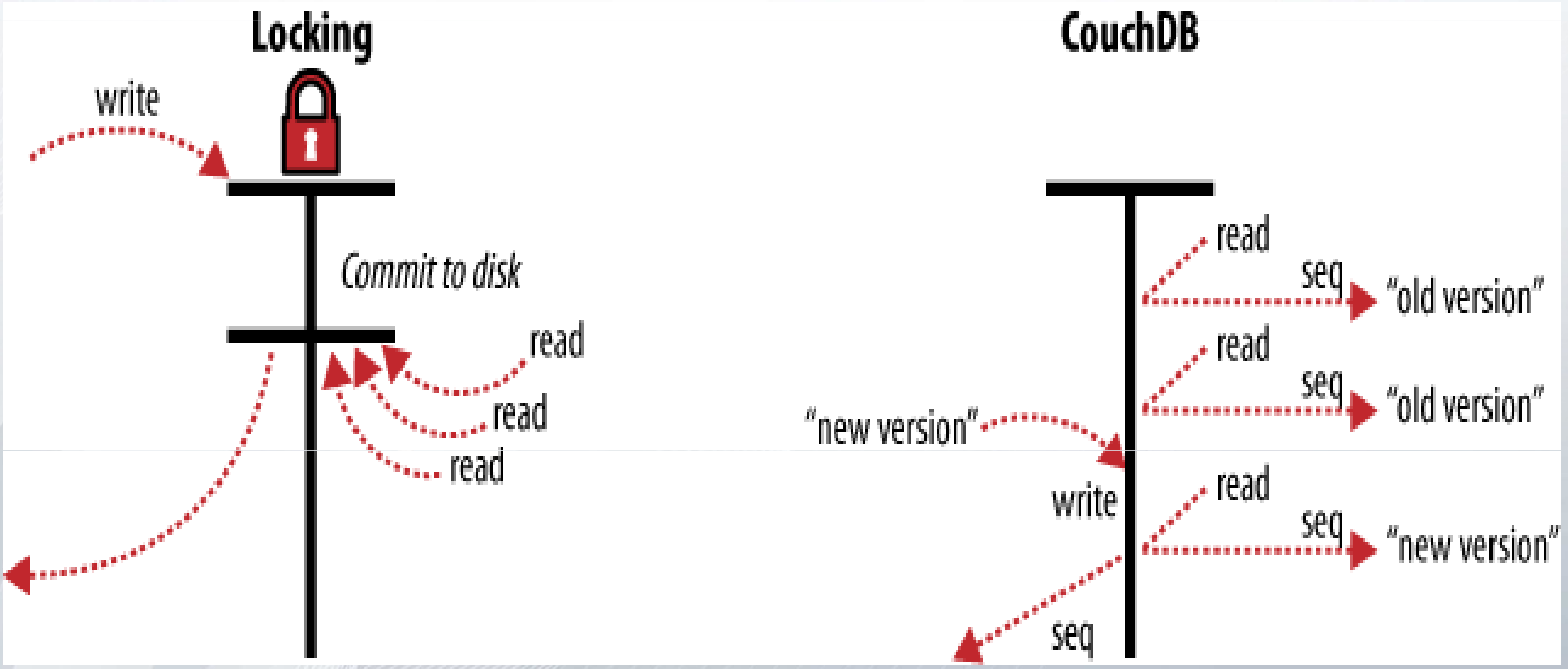


Concurrency

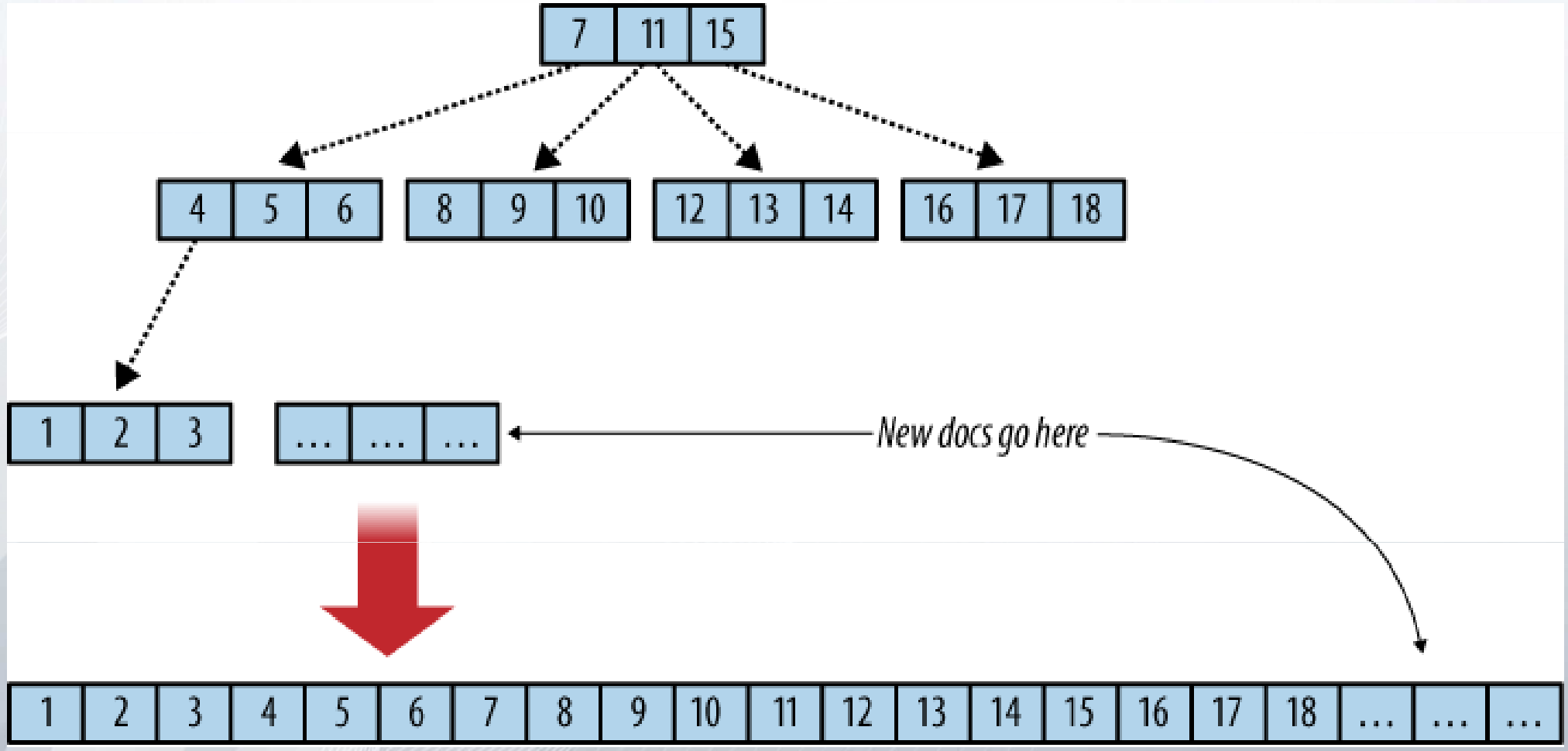
CouchDB

MVCC

- MVCC means no locking !



Under the hood



Replication

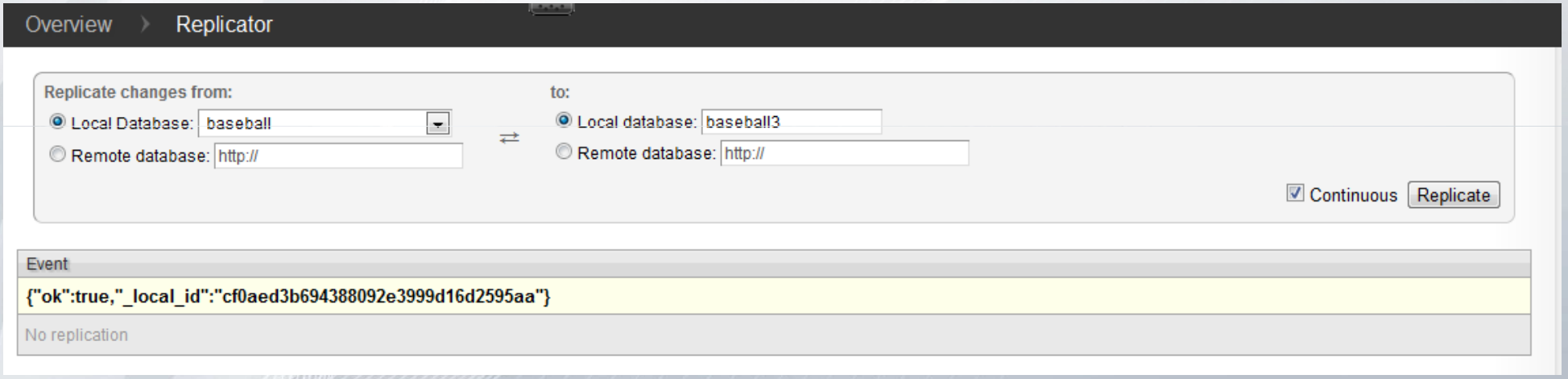
- What is replication ?
- It could be bidirectional
- Offline by default
- Continious replication

How to start replication?

- POST /_replicate

{"source":"database",
"target":"http://example.org/database"}

- By using Admin UI



Why CouchDB ?

- Fault tolerant (it's written in Erlang)
- Intuitive REST/HTTP interface
- Easy replication
- Deep structures and no schemas
- Stable and scalable, so it is successful in production
- The only database solution optimized for mobile

Why not CouchDB ?

- It's too new
- There is no security model
- Too slow for building views
- Doesn't support fancy SQL queries

I want more!

- Get it from here:

http://couchdb.apache.org/downloads.html

- Case studies :

http://www.couchbase.com/customers/case-studies

- Practice Map Reduce:

http://blog.mudynamics.com/wp-content/uploads/2009/04/icouch.html

Meet MongoDB

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Topics

1. Introduction to MongoDB
2. Create, Update, Remove Operations
3. Querying MongoDB
4. Concurrency
5. Indexes
6. Aggregation
7. Replication (Sharding)
8. Pros and cons

Intro

- Scale out rather than scale down
- Replace the row with the more flexible document
- Built for speed
- Drivers available for large range of programming languages
- Almost no administration needed

CRUD

- Create
- Update
- Delete

Querying MongoDB

- `find` and `findOne`
- Query Criteria and Conditionals
- Type – Specific Queries
- `$where`

Concurrency

- Database level locking
- Yielding

Indexes

- Almost identical to relational database indexes
- Geospatial indexes

Aggregation

- count
- distinct
- group
- Map/Reduce

Replication

- Master-Slave Replication
- Sharding

Pros and Cons

- Pros: scalable, fast, flexible, almost administration free
- Cons: no atomic operations, no validation

CouchDB vs. MongoDB

- MVCC (Multiversion concurrency control)
- Horizontal scalability
- Query Expression
- Atomicity
- Durability
- Map Reduce
- Javascript
- REST
- Performance
- Use cases

Questions?

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Thank you

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