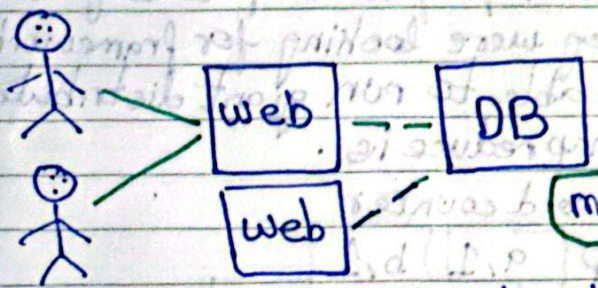
Property of the half blood prince

Introduction

- Infrastructure Types
  - Storage
  - Communication — RPC, threads and concurrency.
  - Computation — map/reduce

The goal is to create abstraction around these distributed systems, so it is much simpler to implement and build applications.

- Performance
  - Scalability: 2x computers → 2x throughput.
  - or we could pay programmers to ship and restructure more efficient code through better algorithms



As long as individual web server do not add that much load on the DB instance we can continue adding it

Buy more servers and redistribute traffic

this kind of scalability is unfortunately finite → adding more servers create DB bottlenecks.

- Fault Tolerance

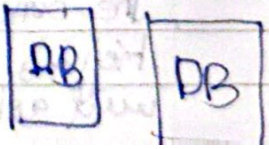
Building single computers can run without crashing for years However systems with 1000s of computers → means roughly 3 computer failures per day

need to add new techniques and design work → such as refactor DB into over multiple DB

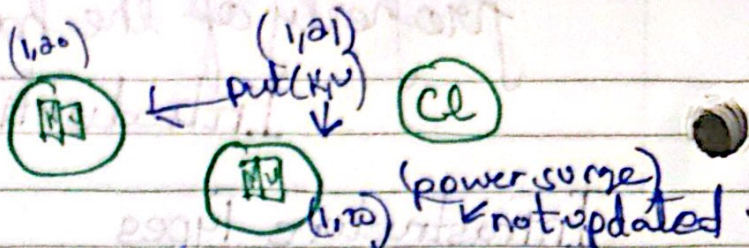
- Availability
- Recoverability

use non-volatile storage such as hard drive to set checkpoint

replication has replicas of the server (data)



- Topic - Consistency



put(K,V)
Get(K)

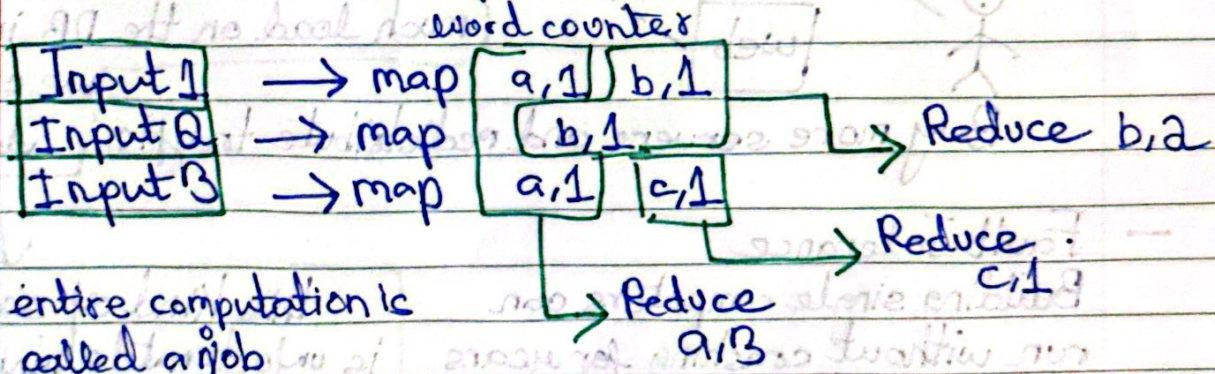
In a single computer and single DB instance we will not have any challange of consistency, however when we have many replicas of the same server, we have multiple keys with same value, however it is possible during put request by the client, the other key does not get updated and we get a consistency issue

- Strong consistent system: requires strong communication
- weak consistent system

have copies in different areas to be more sure data is not lost in an event of natural disaster and etc.

- Map Reduce

Google paper by google → for faster compute to go through a lot of servers. They were looking for framework so that they would be able to run giant distributed computation and that is what map reduce is.



entire computation is called a job

- Map(K,V)
  split v into words
  for each word w:
    emit(w, '1')

- Reduce(K,v)
  emit(len(v))

The bunch of computers that have map output with all the key as output, then say a single computer out of 1000 servers will ask each of those to give out that specific key for reduction