How to design a Big Data Platform

CS103 

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CS105 - Intro to Python

CS103 高频系统设计面试题精讲

Free Lecture: Nov 4th, 7:00 pm

Course: 11/13/2016 to 12/6/2016

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CS202 - Big Data Engineering

CS202 Big Data Engineer 实战训练营

Free Lecture: Nov 12th, 7:00 pm

Course: 11/18/2016 to 12/17/2016

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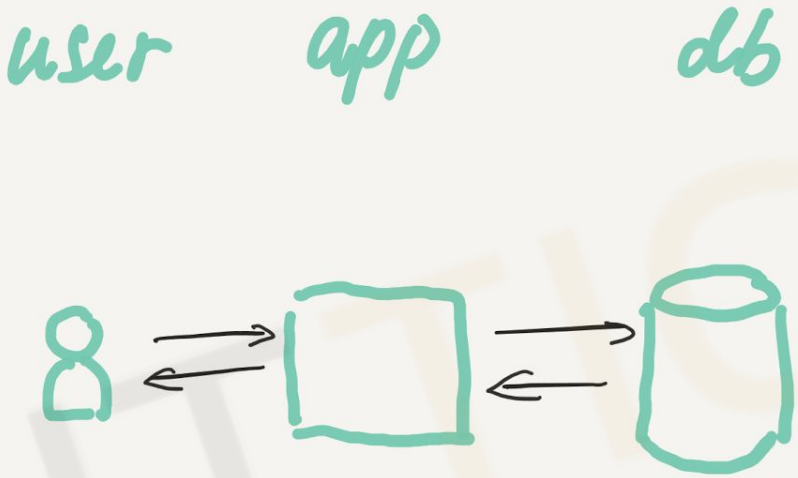
Agenda

- Infrastructure Evolution
- Data Pipeline
- Deployment Consideration
- Q&A

Agenda

- **Infrastructure Evolution**
- Data Pipeline
- Deployment Consideration
- Q&A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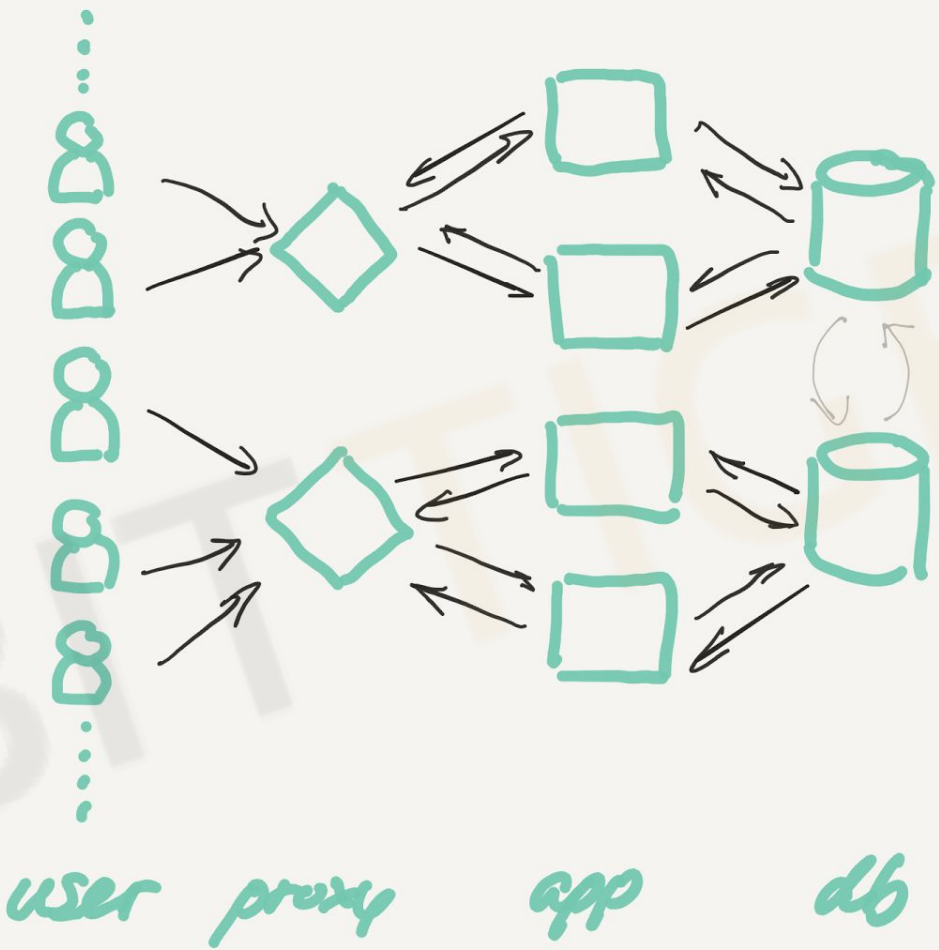
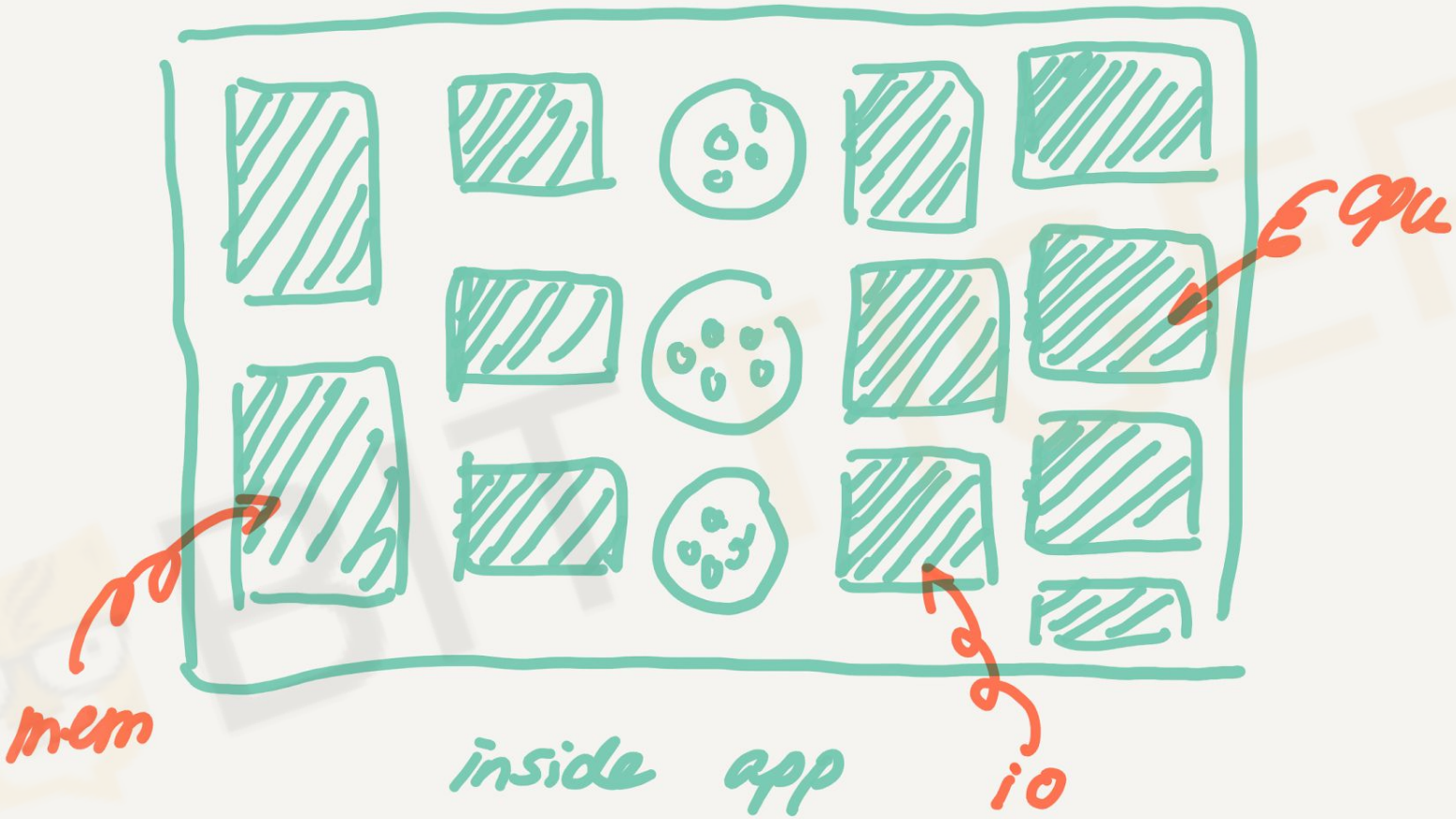
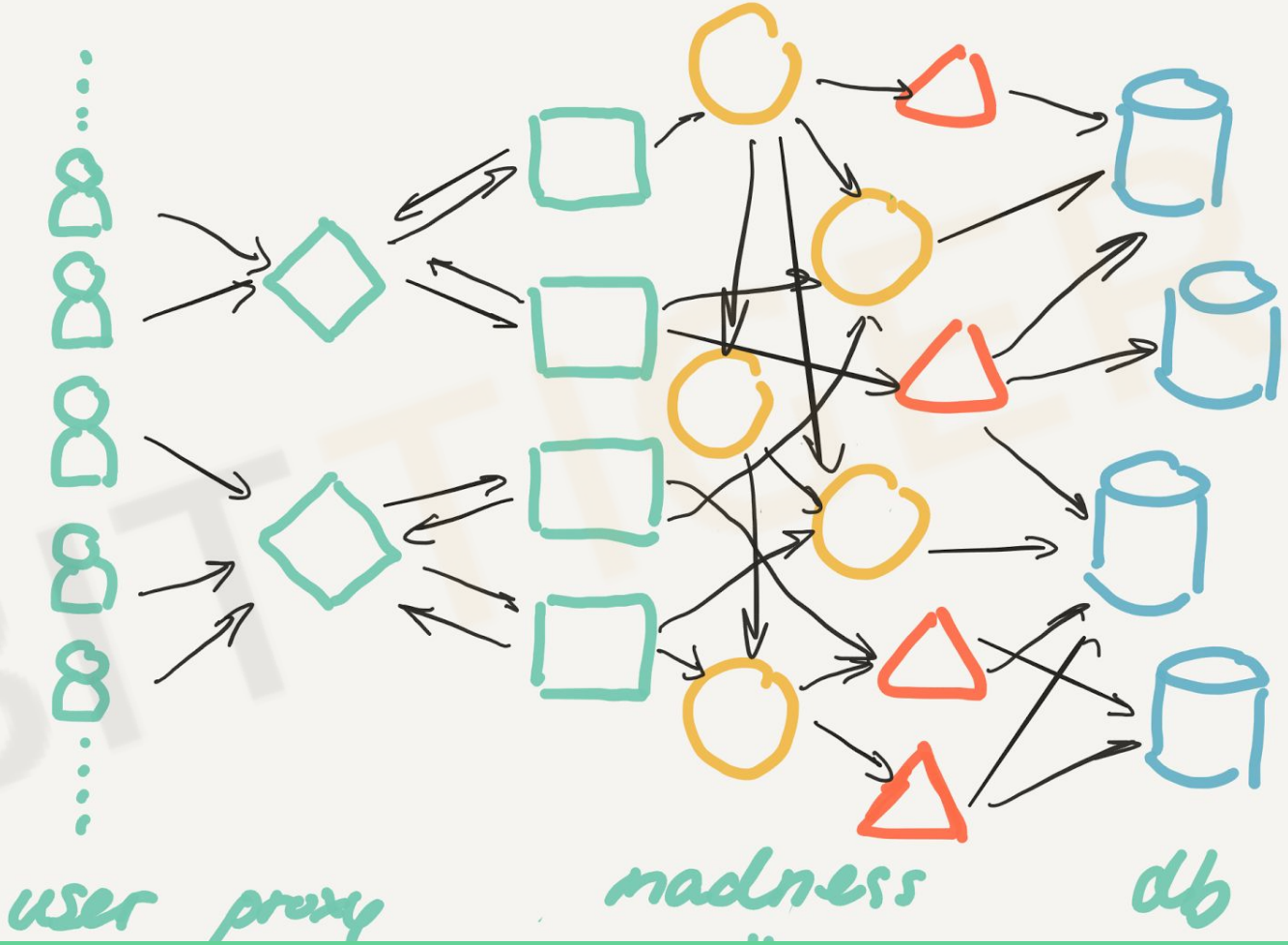


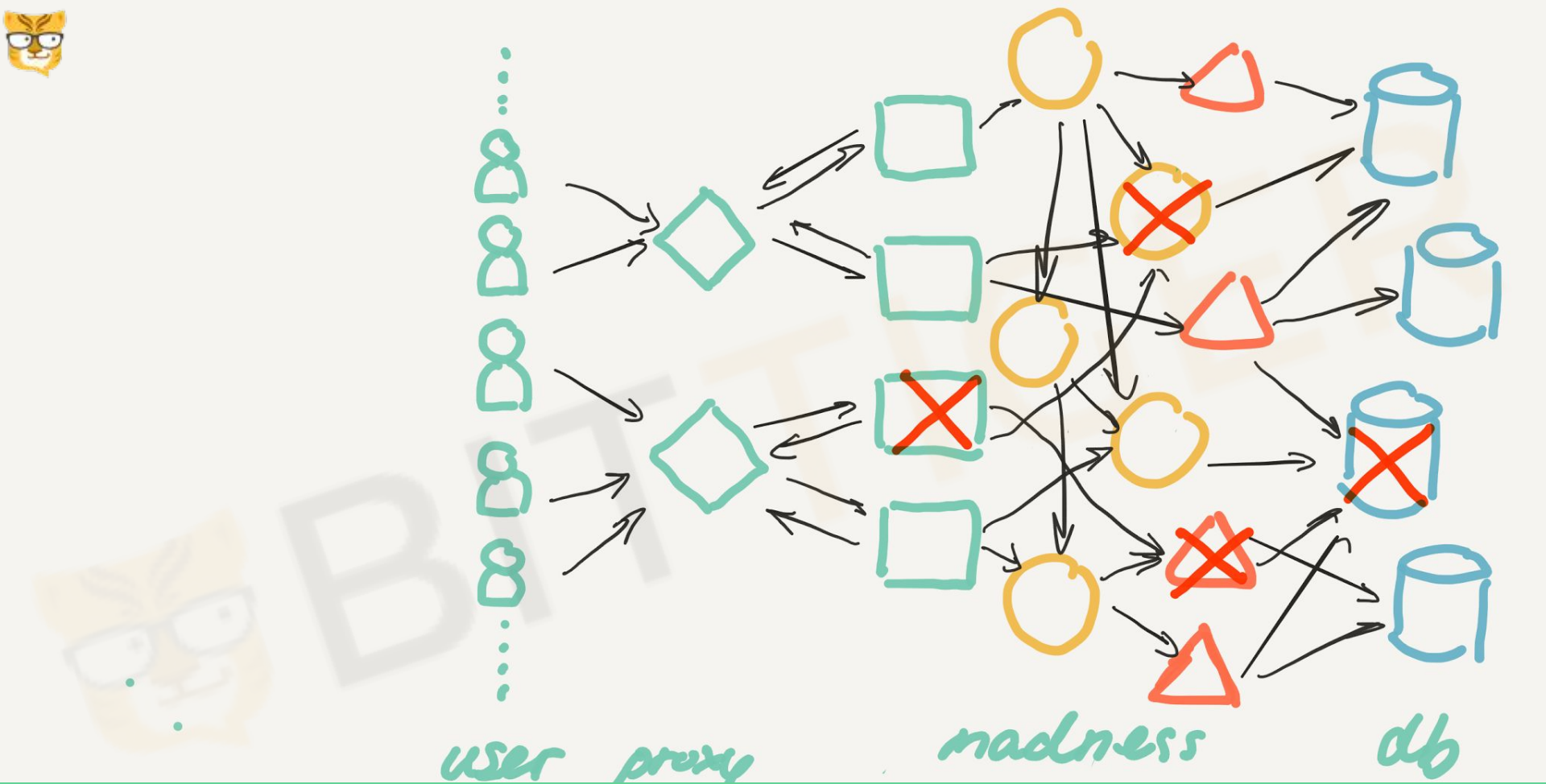
Heating Up



Unbalanced Requirements



The SOA



Failure is Normal

Infrastructure Challenges

- Computing power is limited on single server
- Network bandwidth is limited on single server
- Hard-drive disk space is limited on single server
- Failure always exist
  - Hardware failure
  - Netware failure

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Agenda

- Infrastructure Evolution
- **Data Pipeline**
- Deployment Consideration
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Data Pipeline

- Core piece of infrastructure that carries all the data in the company
  - **Loading/Receiving incoming data**
  - **Data storage**
  - **Data computation**

- LinkedIn handles Trillion messages per day
- Facebook generates at least 600TB data per day
- Uber processes user requests under 100ms

Data Pipeline

- Core piece of infrastructure that carries all the data in the company
  - Loading/Receiving incoming data
  - Data storage
  - Data computation

- Computing power is limited on single server
- Network bandwidth is limited on single server
- Hard-drive disk space is limited on single server
- Failure always exist

Data Pipeline

- In order to conquer the challenges distributed system is a must
  - Able to handle larger pressure
  - Higher chance of failure

- Designing for the whole company
  - High scalability ready for future growth
  - Be generic enough to support different teams

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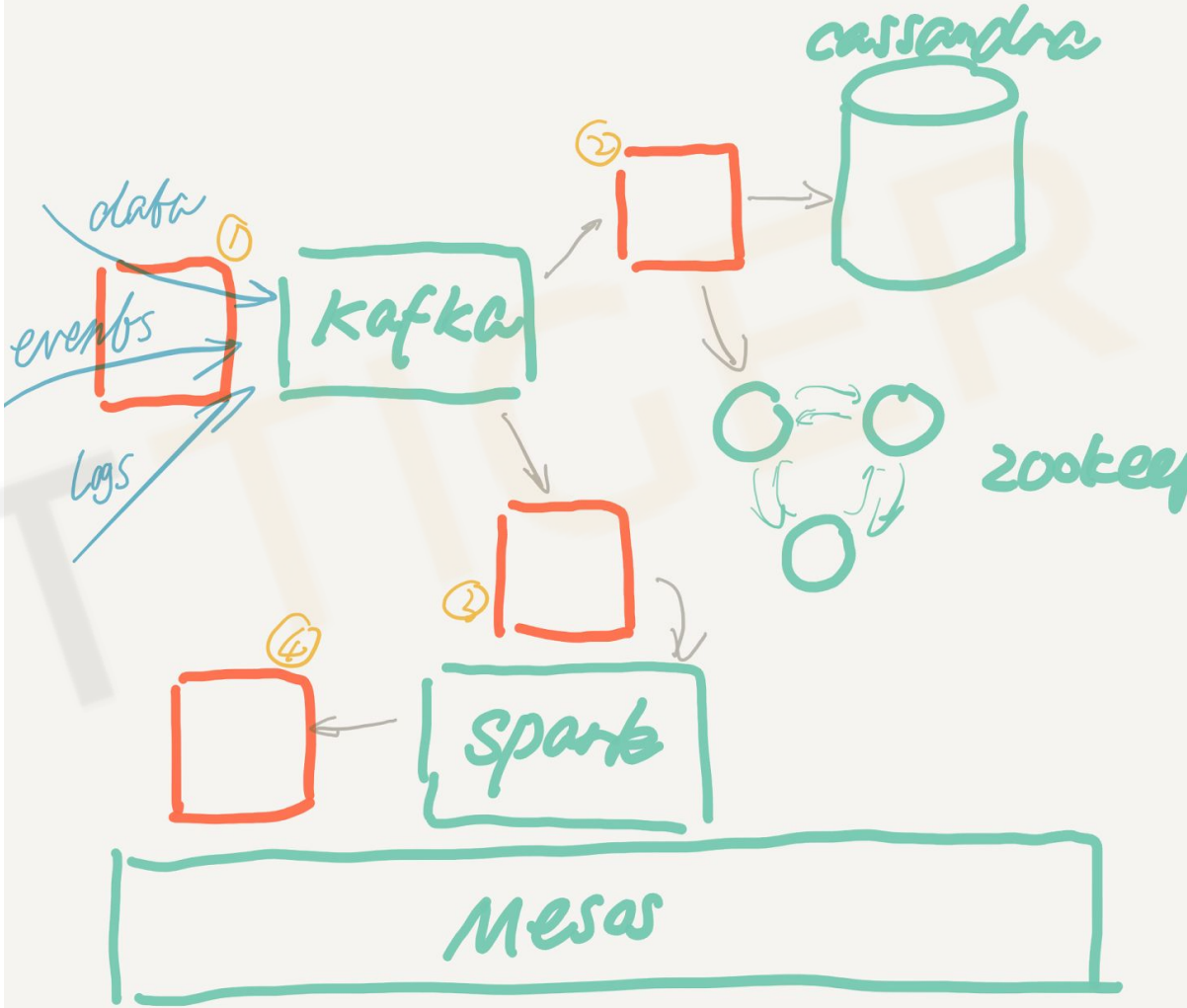
SMACK

Spark + Mesos + Akka + Cassandra + Kafka

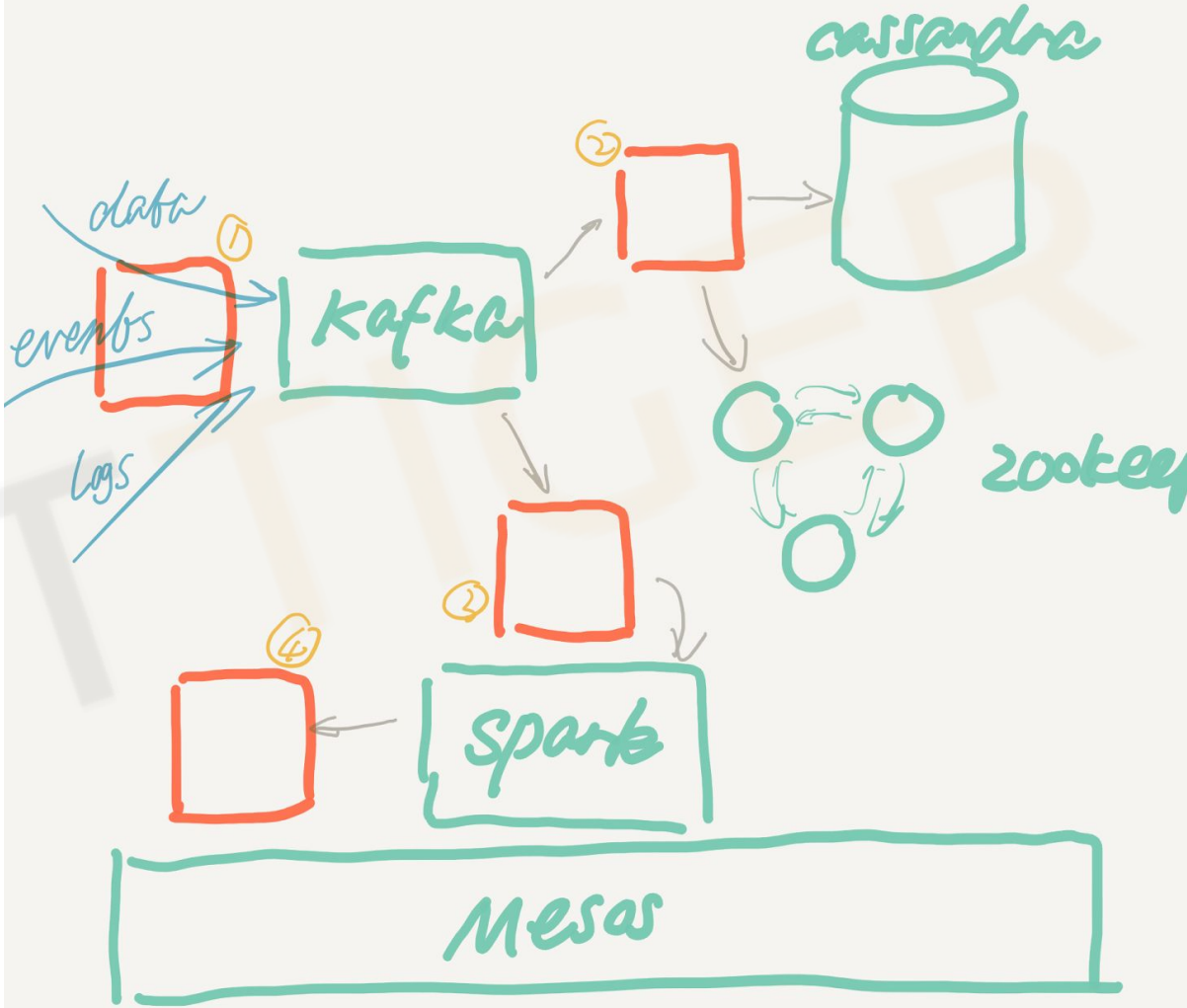
Common Data Pipeline

- Data ingestion layer
- Data storage layer
- Data computation layer
- Cluster scheduling layer



Data Ingestion Layer

- High throughput
- Merely a pass through
- Simple process logic
- Cannot serve as a storage layer



Apache Kafka

- An open-source distributed messaging system
  - Fast - hundreds MB/s from thousands of clients
  - Scalable - easily scale up and down without downtime
  - Durable - Messages are persisted on disk to prevent data loss

- Developed at LinkedIn using Scala

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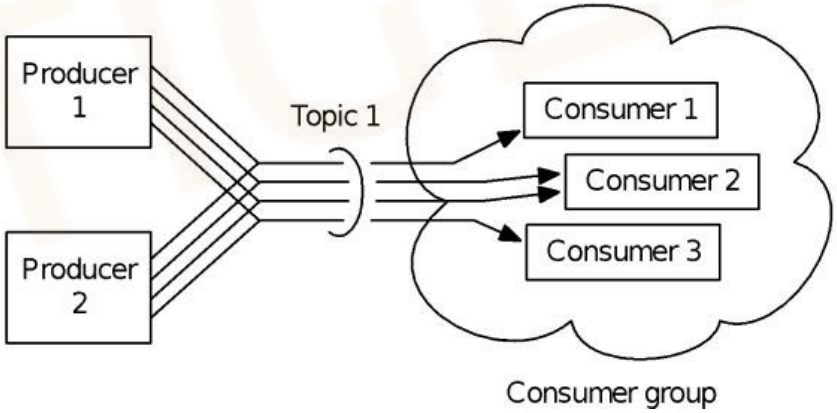
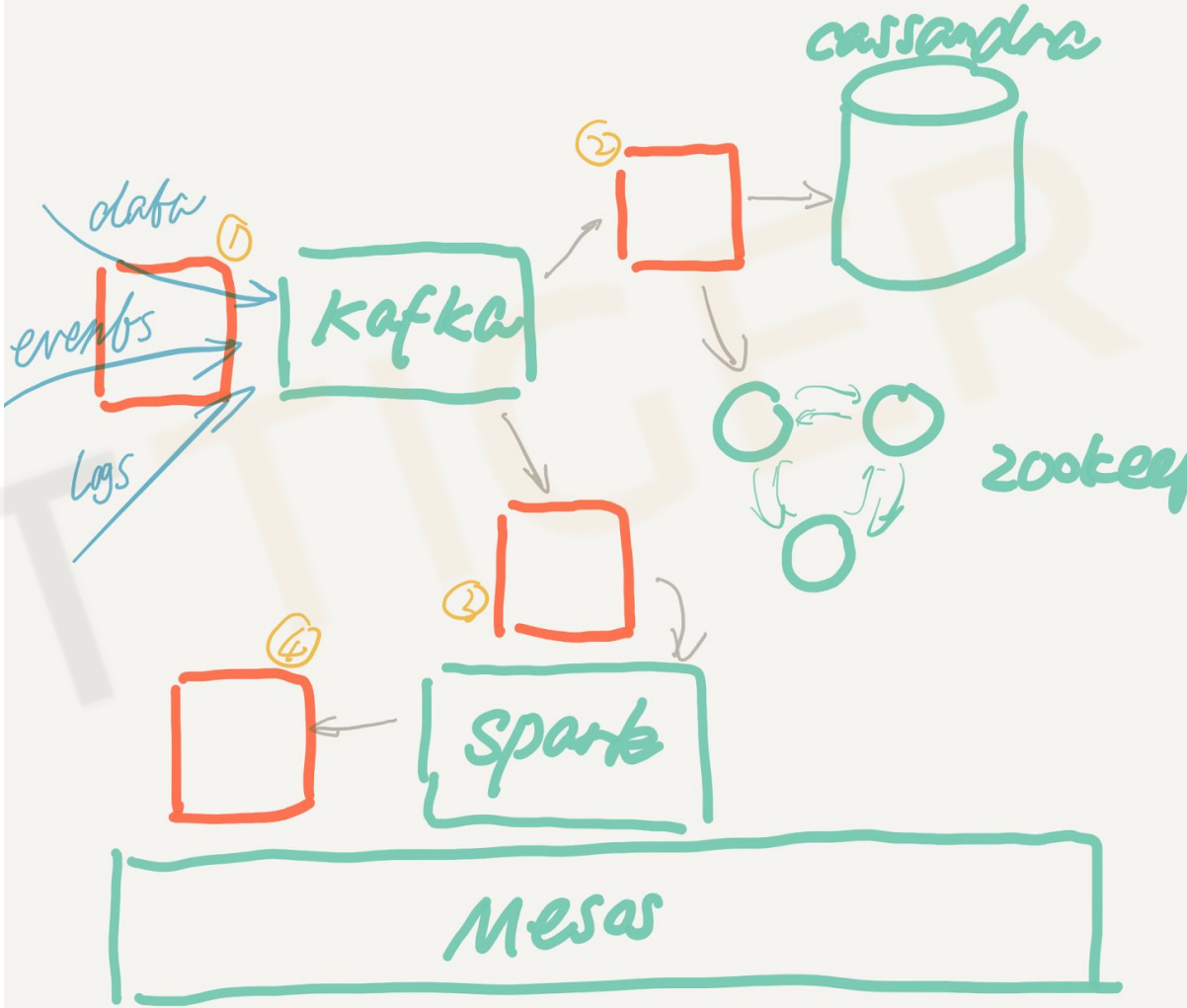
Apache Kafka

- People/User send data as Producer
  - Server logs
  - User activity data
- Services consume through Kafka
  - Backend data processing
  - Data storage



Data Storage Layer

- High availability
- Fault tolerance
- Handles high data volume
- Able to handle various types of data



Apache Cassandra

- An open source distributed storage system that provides
  - High availability
  - No single point of failure

- Inspired by Amazon DynamoDB and Google BigTable
- Developed in Facebook using Java

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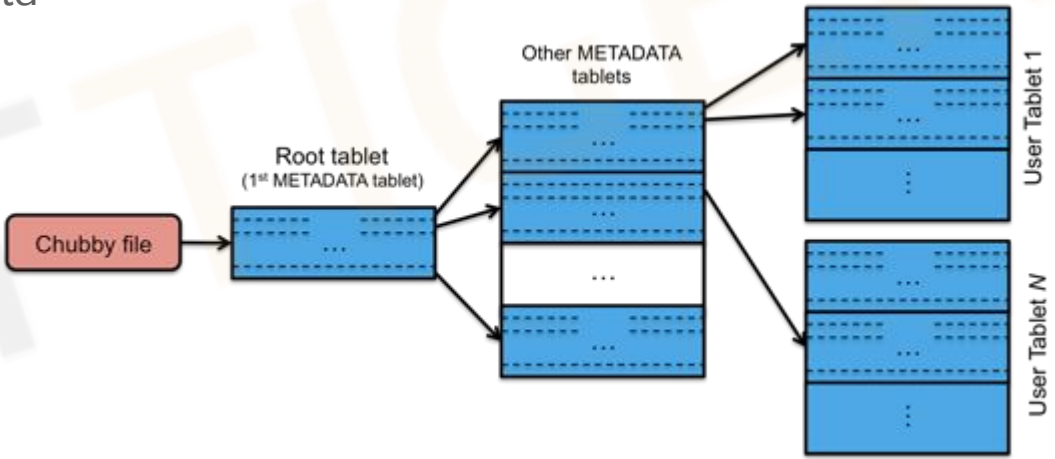
Apache Cassandra

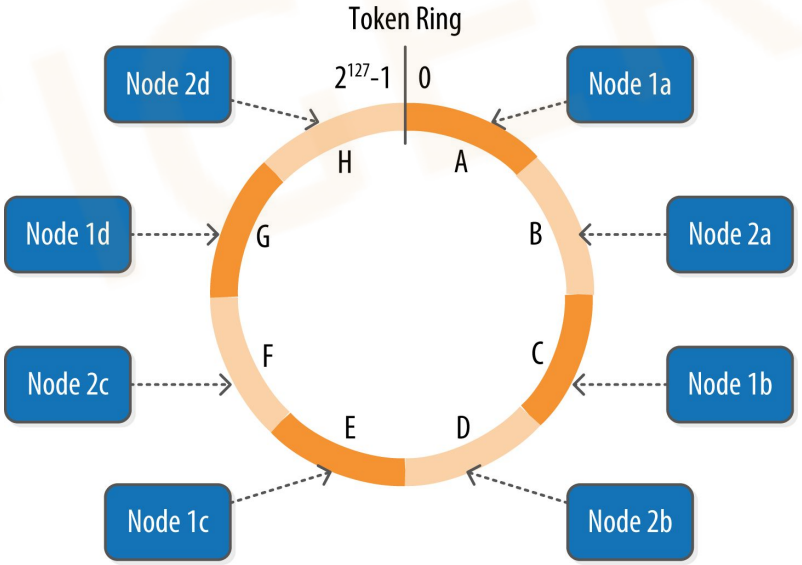
- A common approach is to split data into different servers
- A centralized store of metadata

- Single point of failure
- Overall capacity limited



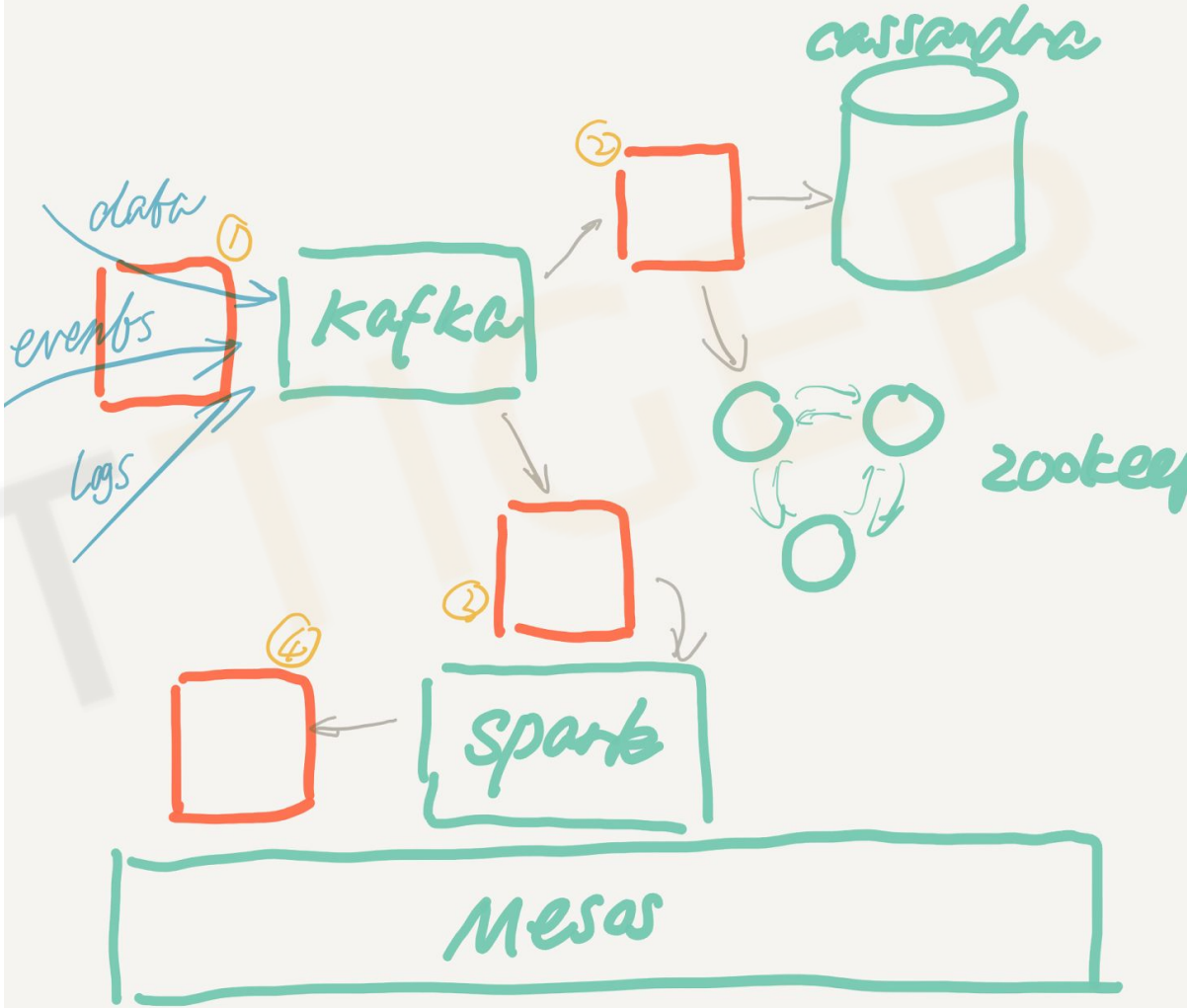
Apache Cassandra

- Data is distribution is not stored in a central place
- Data is calculated into a ring
- Each server takes up a portion



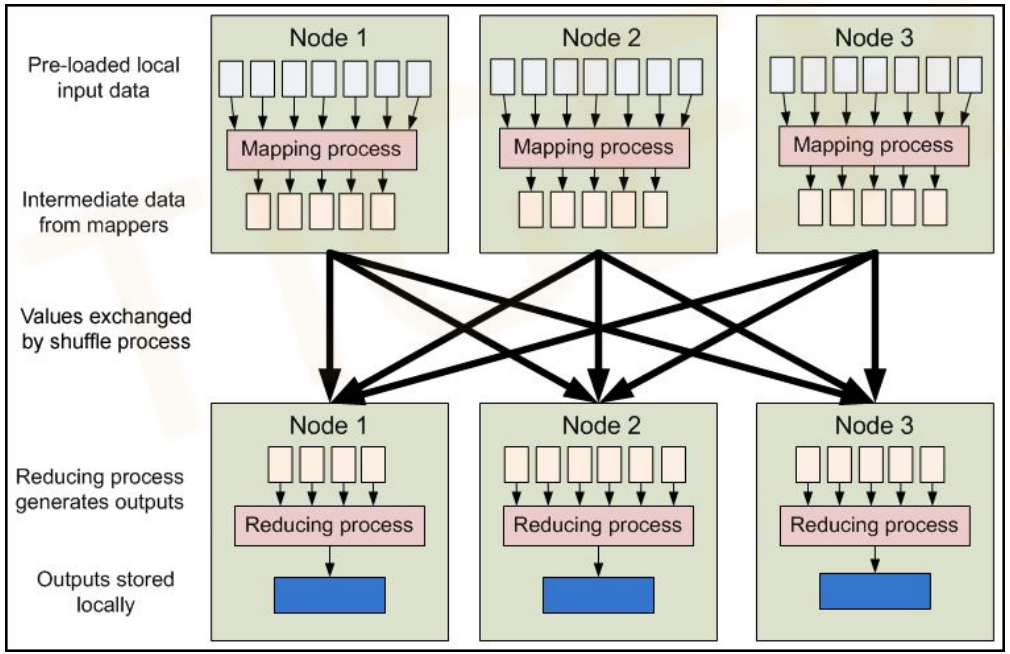
Data Computation Layer

- Highly available
- Fast computation
- Able to handle spike traffic
- Retry on failure



Apache Hadoop

- Distributed calculation
- Split any calculation into steps
  - Map
  - Reduce
- Think of 3*3 = 3 + 3 + 3



Apache Spark

- Open source cluster computing framework
  - Respond to limitations of Apache Hadoop
  - Computation optimization
  - In memory computing

- Developed at UC Berkeley by Matei Zaharia

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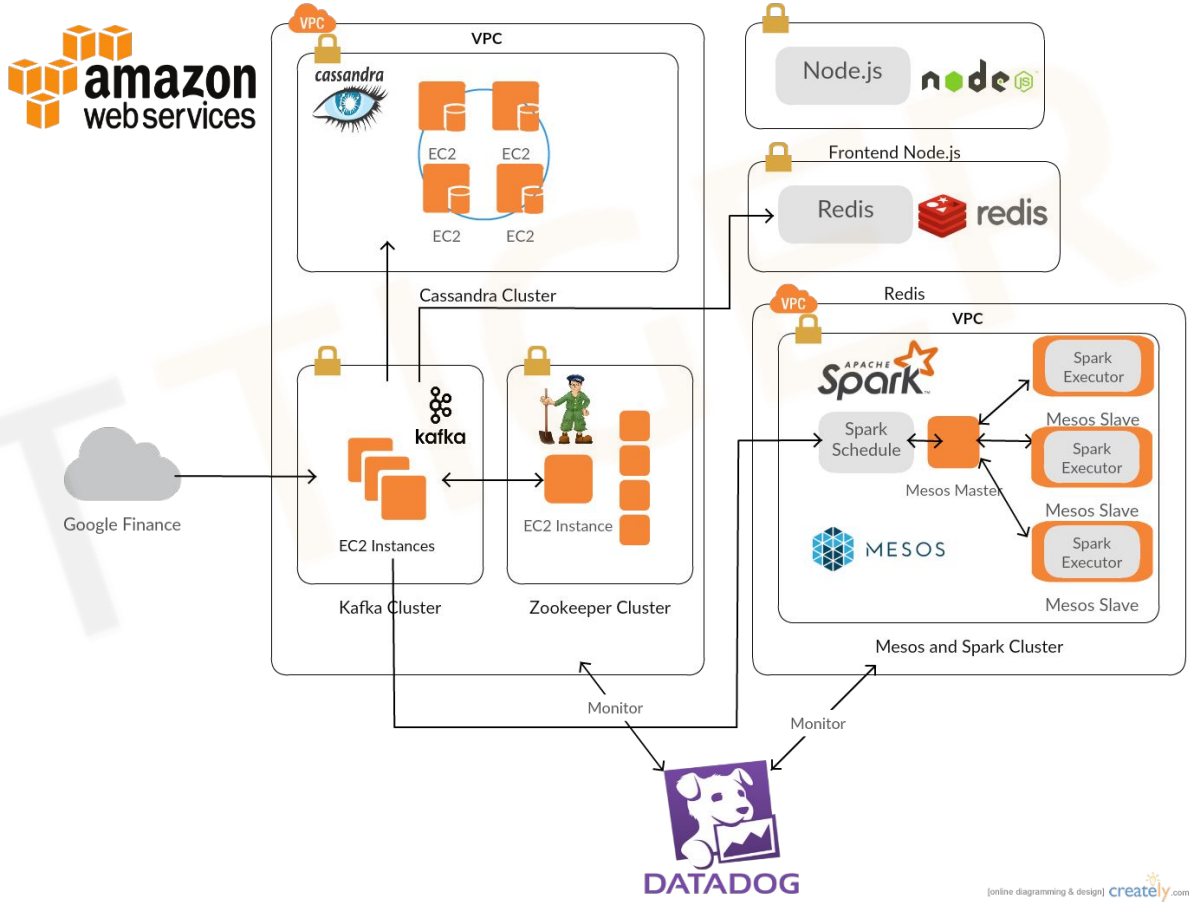
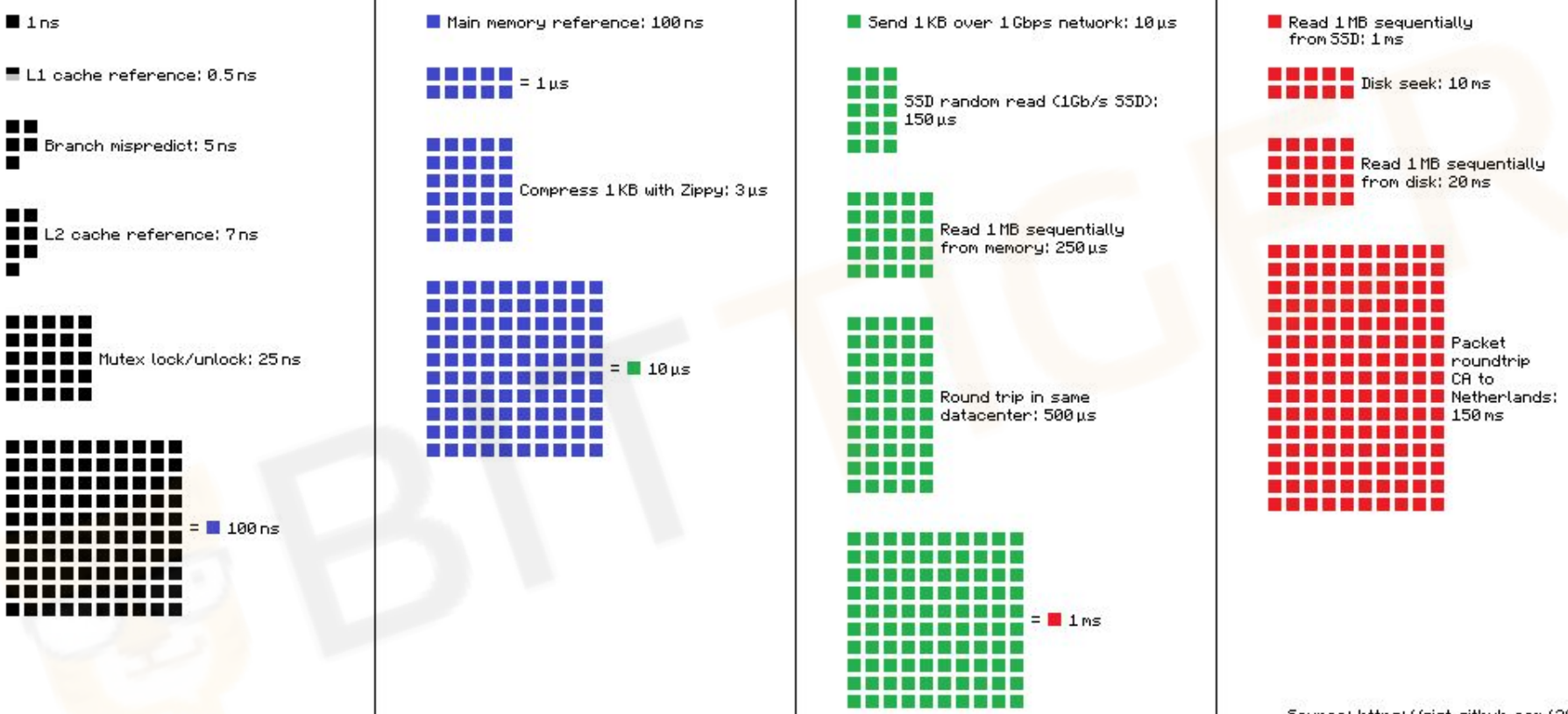
Deployment Consideration

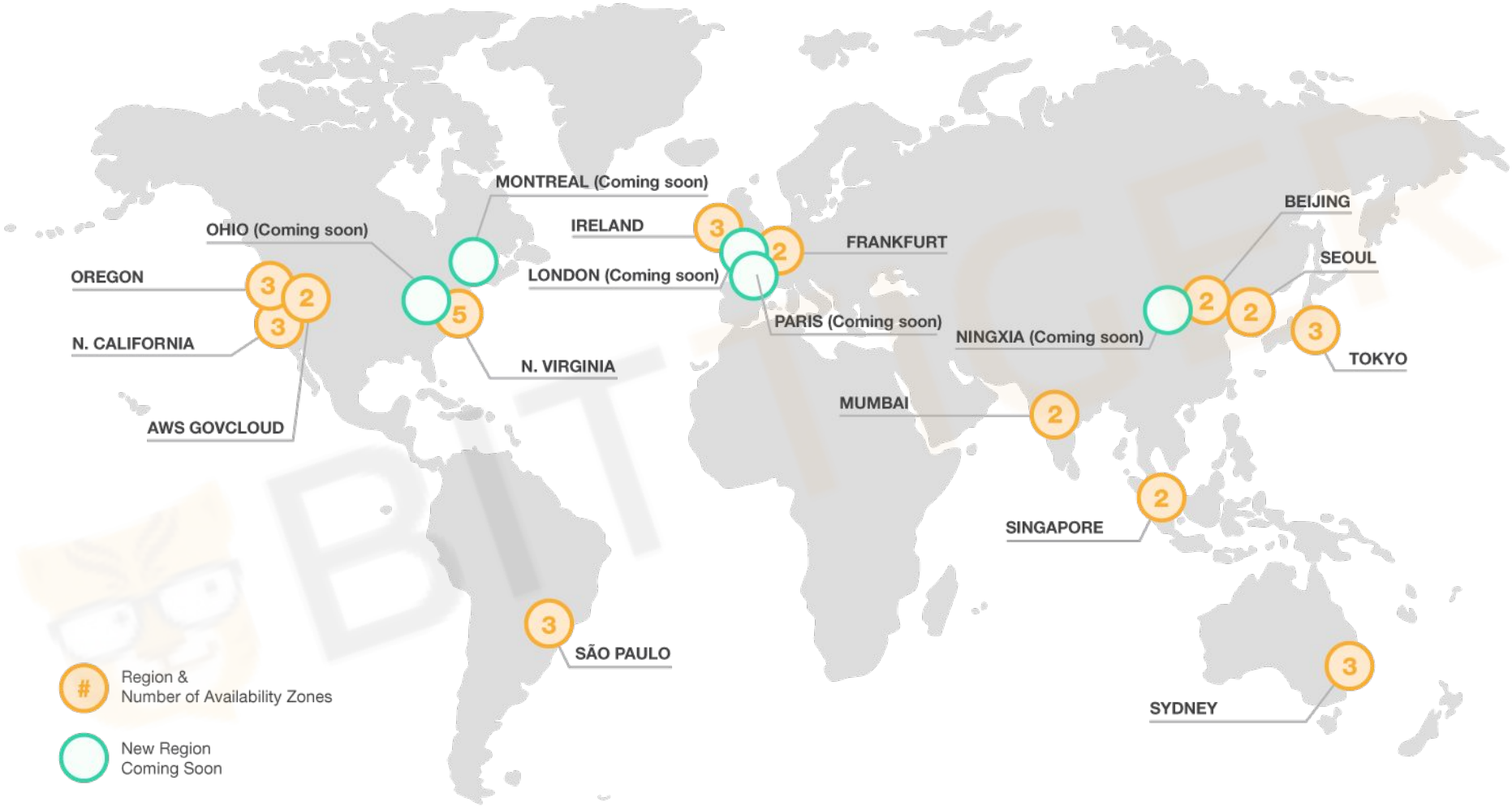
- Runs on Cloud Services for scalability
  - AWS
  - Google Cloud Services
- Always setup monitoring for improvement



Latency Numbers Every Programmer Should Know

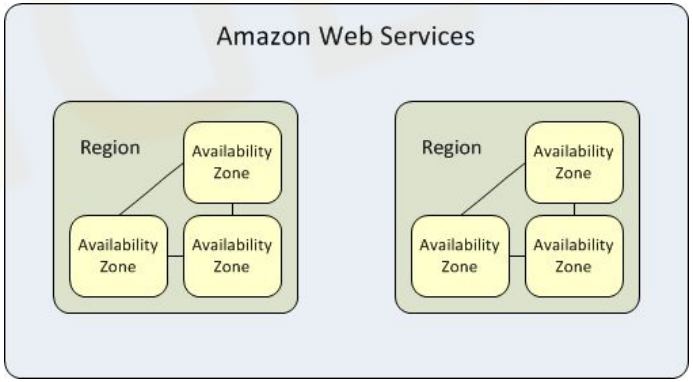


Source: https://gist.github.com/2841832


MONTREAL (Coming soon)
OHIO (Coming soon)
IRELAND
3
OREGON
3
2
LONDON (Coming soon)
2
FRANKFURT
BEIJING
SEOUL
2
2
3
5
N. CALIFORNIA
3
PARIS (Coming soon)
NINGXIA (Coming soon)
TOKYO
N. VIRGINIA
MUMBAI
2
AWS GOVCLOUD
2
SINGAPORE
3
SÃO PAULO
3
SYDNEY
Region & Number of Availability Zones
New Region Coming Soon

Region and Availability Zones

- Region is a Geolocation where AWS data center locates
  - us-east (North Virginia)
  - eu-west (Ireland)
- Every region has multiple availability zones
  - For high availability reasons
  - Earthquake, Tornado, etc
- Regions are independent
- Availability zones are connected
  - High performance network



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