Cloud computing

https://www.youtube.com/watch?v=zaLJ6SIHztk&list=PLJcaPjxegjBWWtJHeKzGTTa5JF4UrO2o_&index=4

Virtualization

https://www.elithecomputerguy.com/2019/10/cloud-computing-virtualization-introduction/

Used to have one os on one machine
Now can have multiple os/fles on the same machine, easily migrate to the other machine as well
There are 2 types of hypervisor

- Type 1 hypervisor - enterprise production server
- Type 2 hypervisor - virtual box

- VMware ESXi and vSphere – https://www.vmware.com/products/esxi-and-esx.html
- VirtualBox – https://www.virtualbox.org

Download ubuntu server on VB
Jerry
123

DESKTOP UNBUNTU
Jerry

Cap 123 or 123

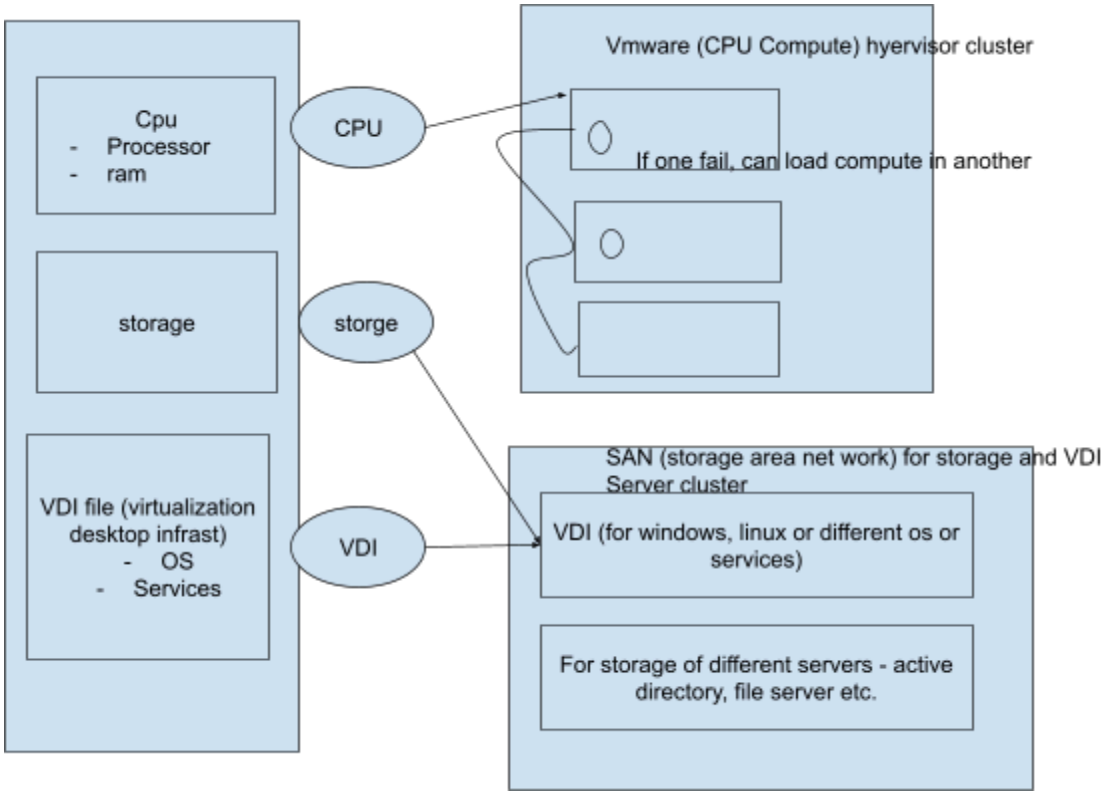
Cpu

- Executes instruction/code u wrote
- Process data and instruction directly loaded from ram
- Measure in speed of gigaherz
- The faster the better

Ram

- Temp store memory, CPU will need to access

Abstraction on cloud computing



Serverless architecture

- Make a call for the compute or cpu

Cluster of storage - SAN

- Only purpose is to store data
- U can replicate/back up your data, so that there is no fatal failures

Geo DNS

- Route based on IP address physical location

Software defined networking

- Programmatically route traffic depending on server load, data latency etc.
- If else if statements, CPU goes to 80 percent, route to another data center

More on abstractions of comput computing

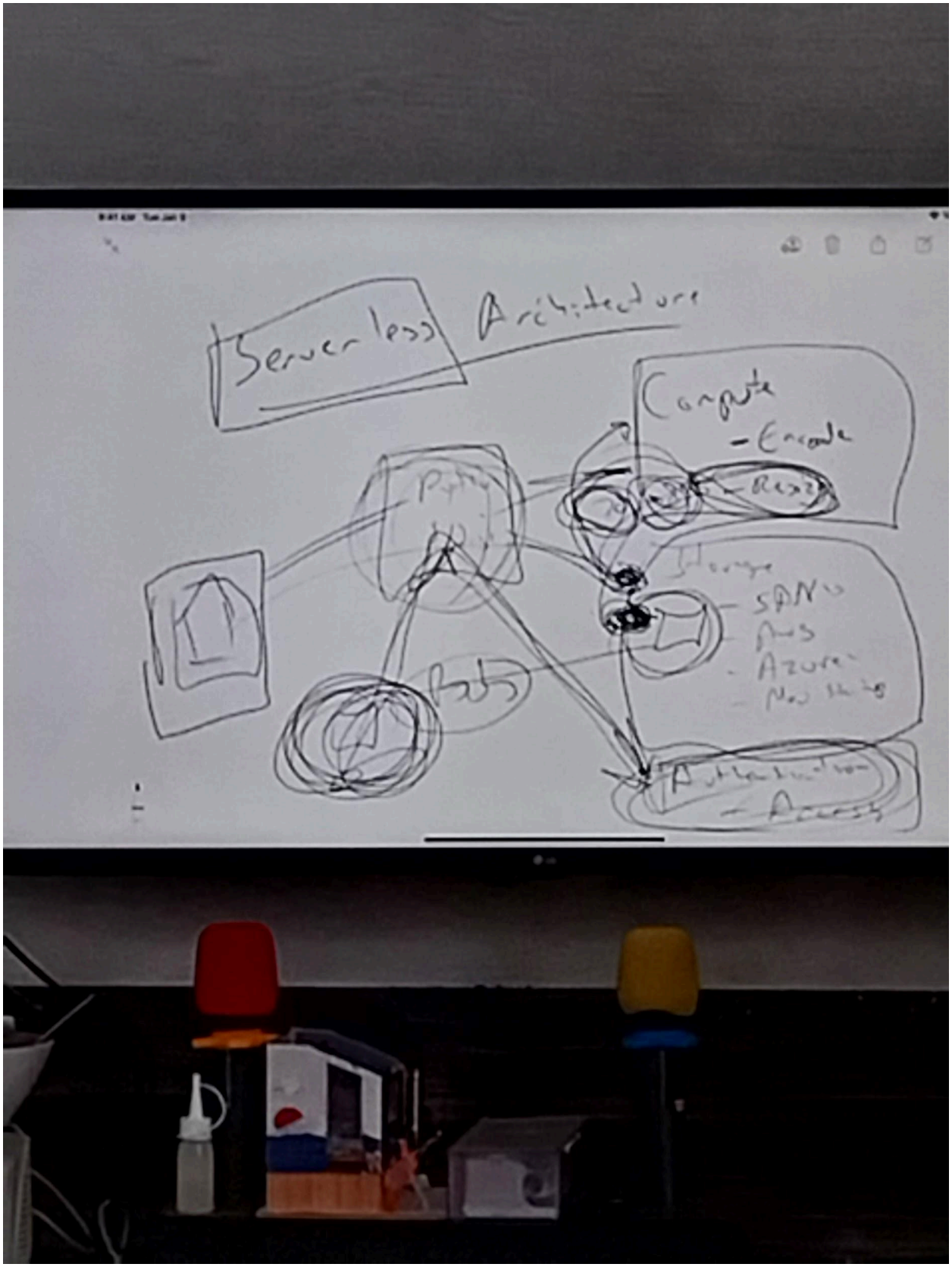
It is VMware hypervisor cluster

- Each hypervisor is installed on top of server hardware
- Each hypervisor can spin ups multiple vm

- When 1 VM failed, with hypervisor cluste, we can grab another VM
- Fault tolerant

Serverless architecture

- Use cloud compute, access and storage

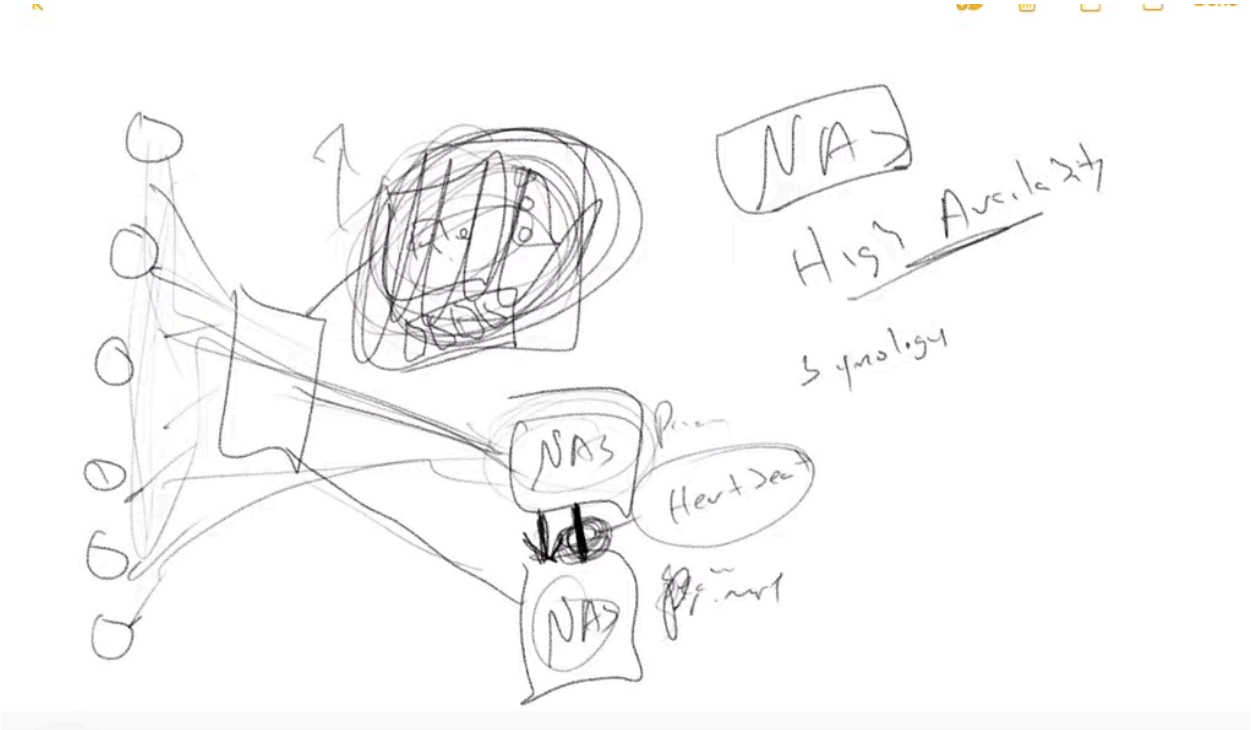

Serverless Architecture
Compute
- Encode
Storage
- SQS
- Azure
Authentication
- Access

Server clustering

AID is a data storage virtualization technology that combines multiple physical disk drive components into one or more logical units for the purposes of data redundancy, performance improvement, or both.

NAS - network access storage

- Users are routes to NAS primary
- NAS secondary is listening to heartbeat of NAS primary
- When primary failed, secondary promotes itself as primary

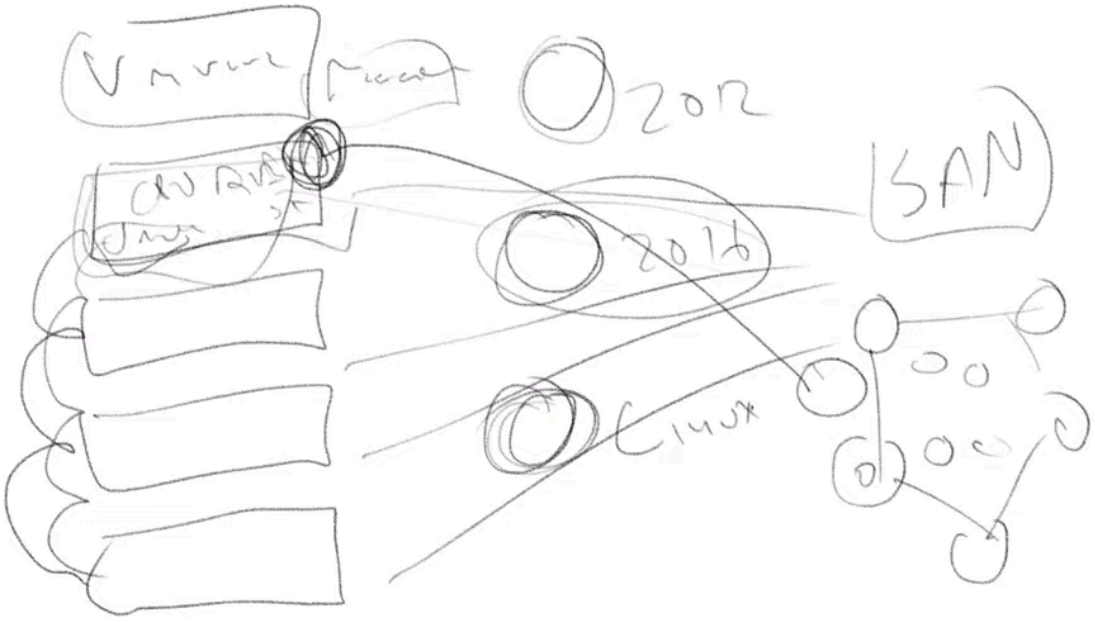


Microsoft active directory is database

- Similar to mysql
- For users to get access token thru username and password
- U can also use active directory cluster

Hypervisor cluster

- Bare metal server with cpu, ram and ds
- Install vm ware on bare metal
- With management software
- All ur OS are stored on SAN (storage area network) a storage cluster
- When user want to create an instance of linux
- One of server will conserve CPU, RAM and DS to run linux from SAN
- If this server failed, the management software will run the linux in another bare metal server



NAS High Availability (Synology) – multiple NAS devices can synchronize data, and if the heartbeat signal fails the other NAS will automatically promote itself to be primary NAS Active

Directory (Database) – AD Servers can be clustered for failover, and also be positioned to be geographically closer to the end user

Hypervisor Cluster (VMware) – Server instances are in a hypervisor running on physical machine. If a machine fails the instance will be automatically migrated to another physcical machine.

Replication Strategy

Replication Strategy – when data is written to one server by a user, that data must then be written to the other servers in the cluster. This process has to be configured based on your requirements.

Split Brain – If a heart beat signal is lost for non system failure reasons the secondary server may promote itself to be the primary server. When this happens users may be routed to both servers and changes will be haphazardly spread between the two servers.

Notifications – Make sure to setup notifications for problems. Since system failures will not be easily seen by users you may have major hardware issues build up without realizing it.

Load balancing

Multiple servers - route traffic to suitable server with less load for good performance

Use load balancing for fault tolerance

If u have load balancing cluster, easier to migrate.

- If want to upgrade hardware
- U can plug out and plug in
- And u do not have performance down time

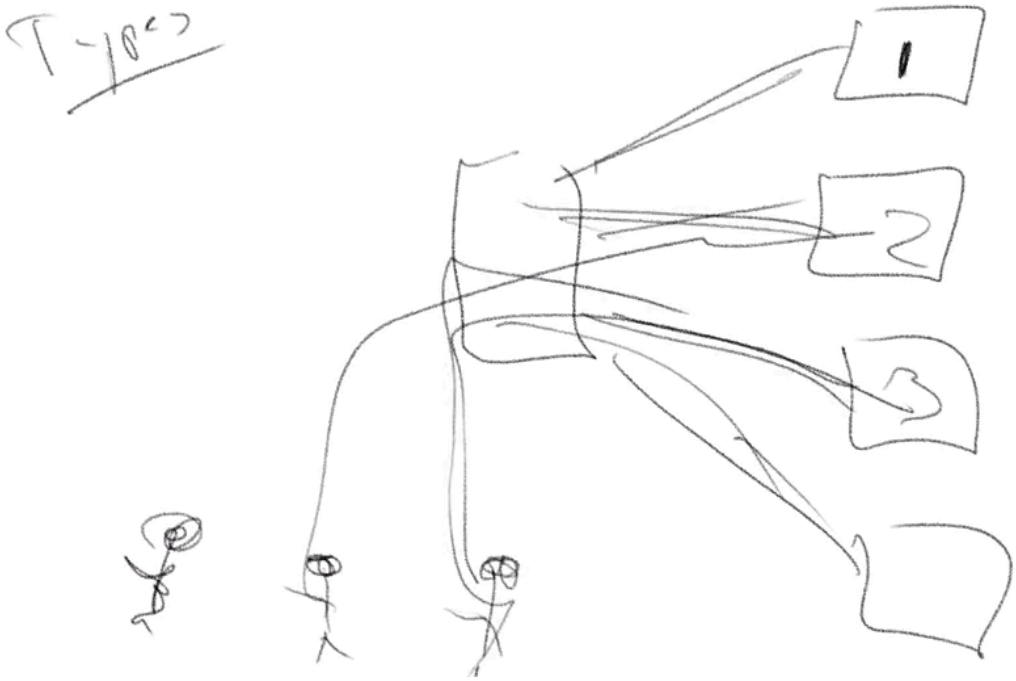
U can use load balancing for A/B testing

- 4 server with A config
- 1 server with B config
- U can see how these people interact with these websites

It is not a product, but an overall concept

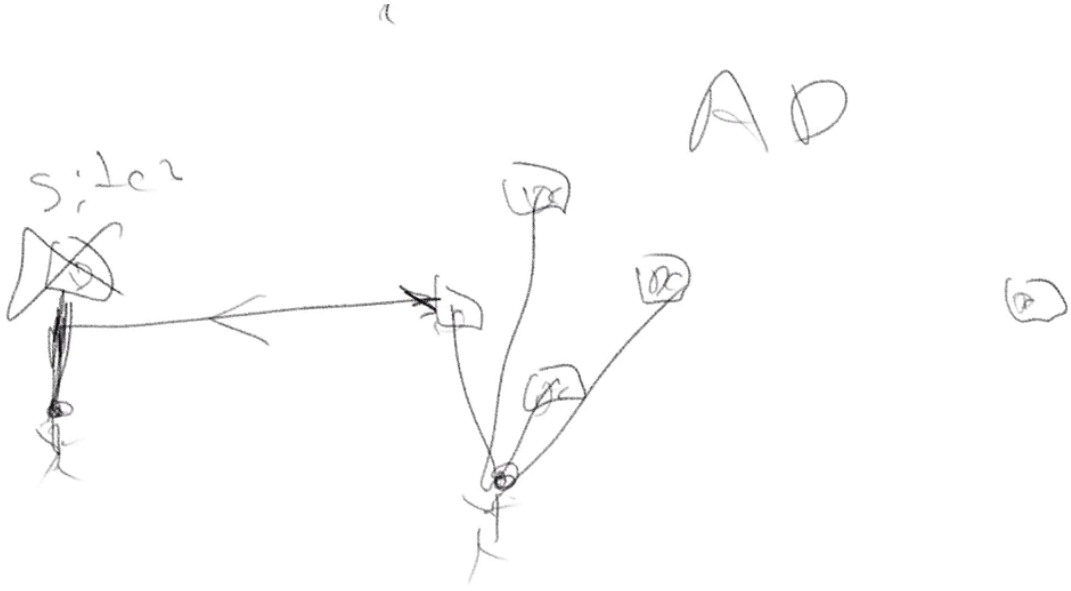
There are also different types

Purchase a physical load balancing hardware, connecting to different servers



Server software already have the load balancing built in to it

- MS active directory server



Loading balancing as a service (Cloudfare)

- U config on cloudfare to get user to the nearest server

Public and private cloud

No longer client server arch

Nowadays
Service oriented architecture (SOA)

- Think about services
- Need web service
- Just get service, not building it from scratch
- Outsource database service e.g. azure. We can connect app to database service

Maybe something in cloud, maybe something locally

- Mixture of infrastructure

Public cloud

Aws, azure, digital ocean (only spin up instance, less 1000 people), cloud flare
Own no hardware at all

Think strategically what stack do we need, so that down the road u won't bump into issues.

For complicated stack, go to azure ms.

- Ms stack (all below can communicate with each other)
- Active directory (user authentication, group control)
- Exchange sever (email)
- Team (slack)
- Ms SQL service
- File service
- Team service

For Aws stack

- Instance
- Virtual networking (u can choose how com is routed - make sure data residency is right in the country itself - route user to their own country database server)
- Mysql dB

private cloud (internal within your premises)

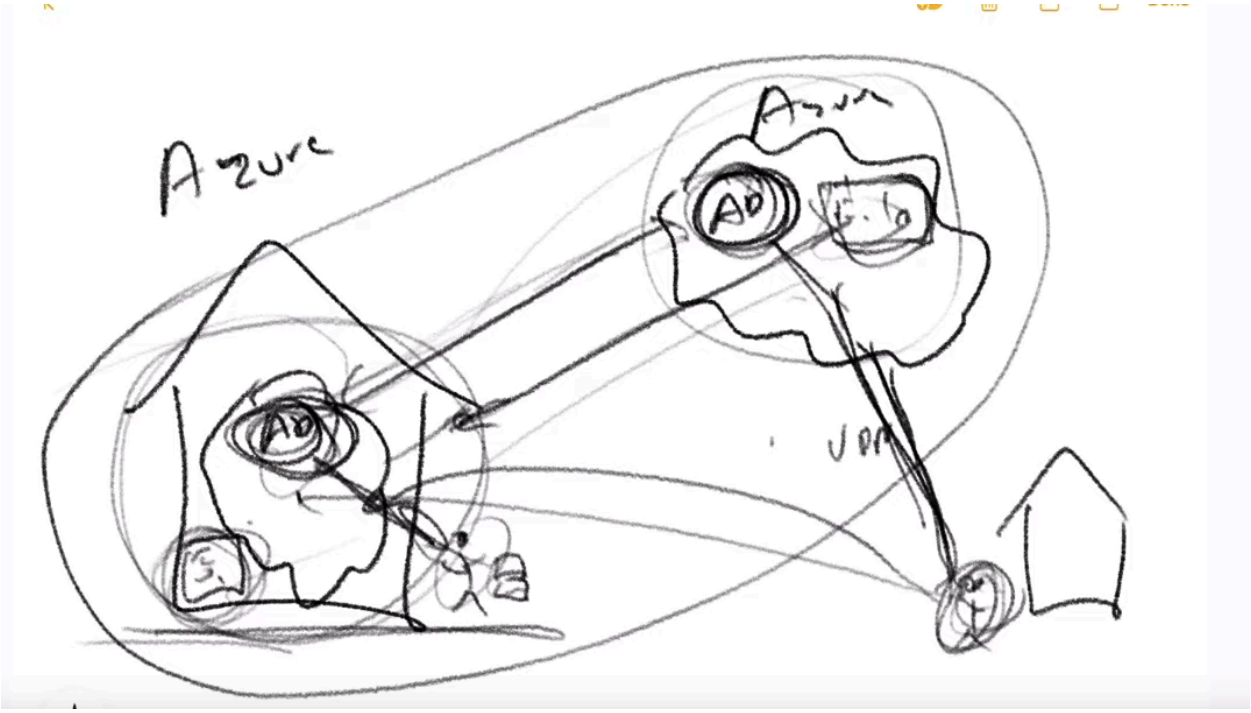
Cloud within your premises
San, active directory and server cluster within your premises

Think about Vendor, better go with big names:
VMware
Ms hyper v
Citrics
Sans
Ds

hybrid

Local sever ad

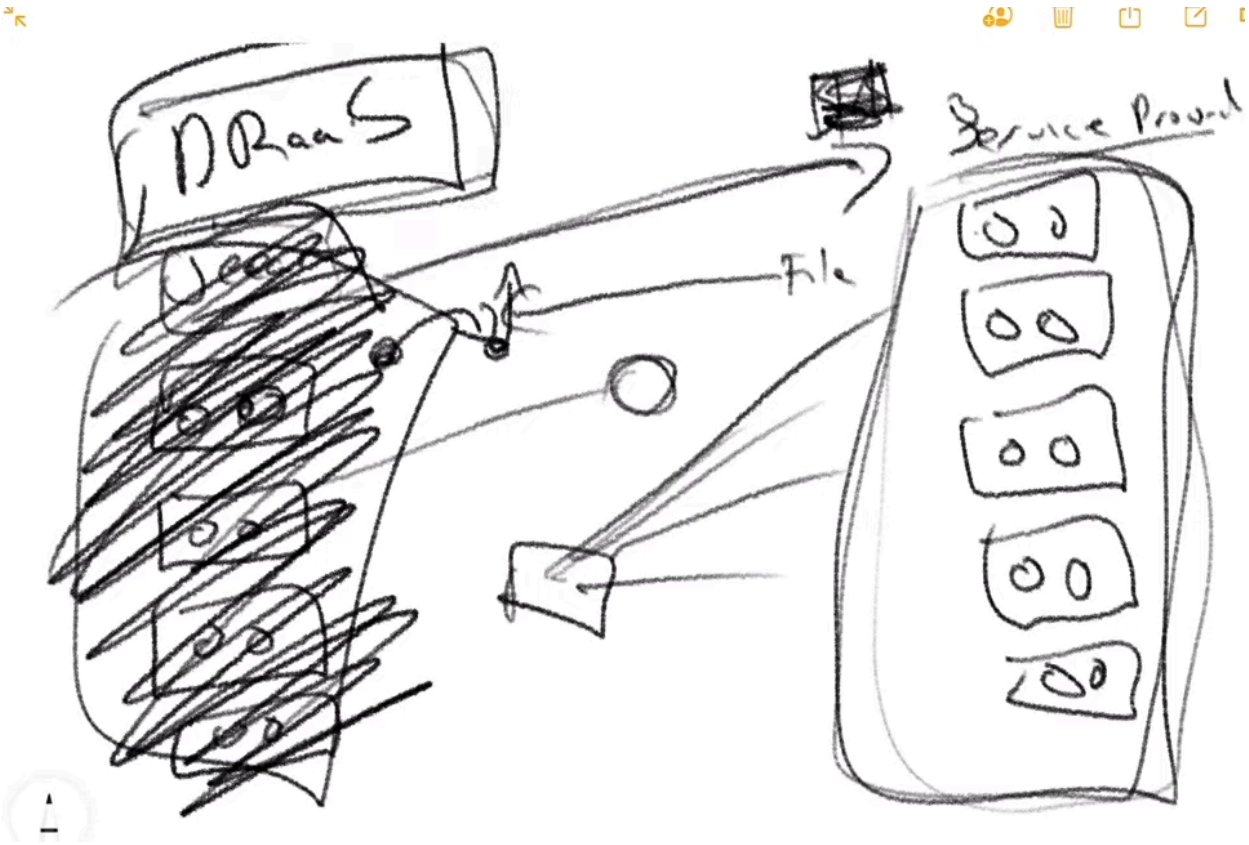
-vpn to on the cloud ad and file server



Disaster recovery as a service

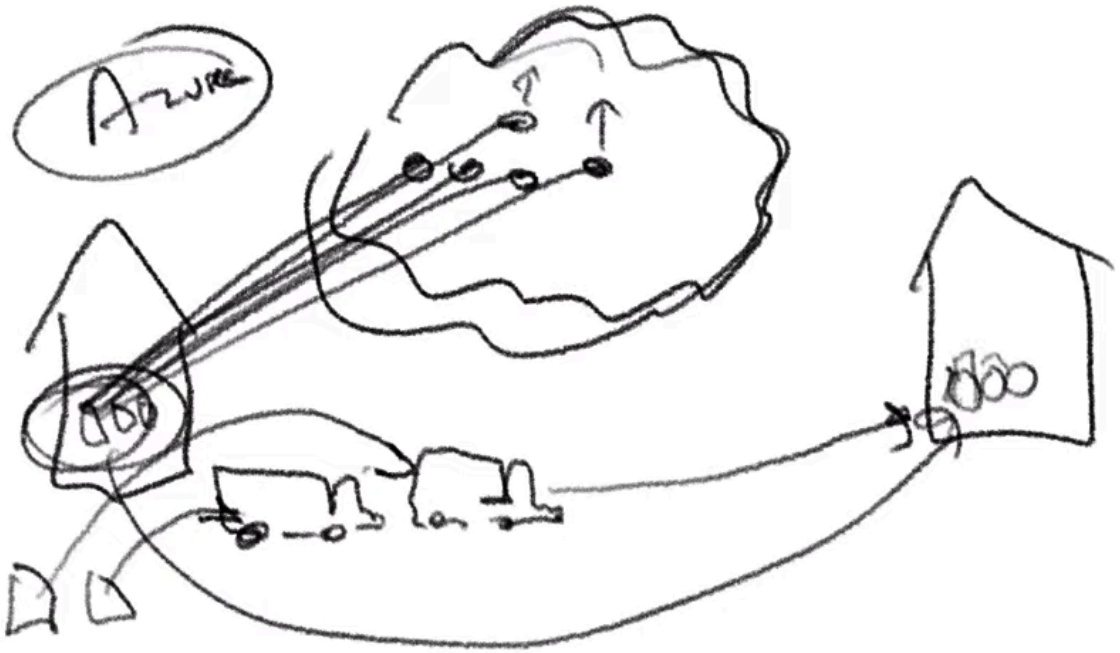
Veeam software
https://www.veeam.com/vm-backup-recovery-replication-software.html

- U spin up instances in ur hypervisor
- Use veean to backup ur data to a service prodividers, who keeps track of ur data
- However, if u hardware everything fails, ur service providers can spin up the instances on their side. So ur business can still be operational



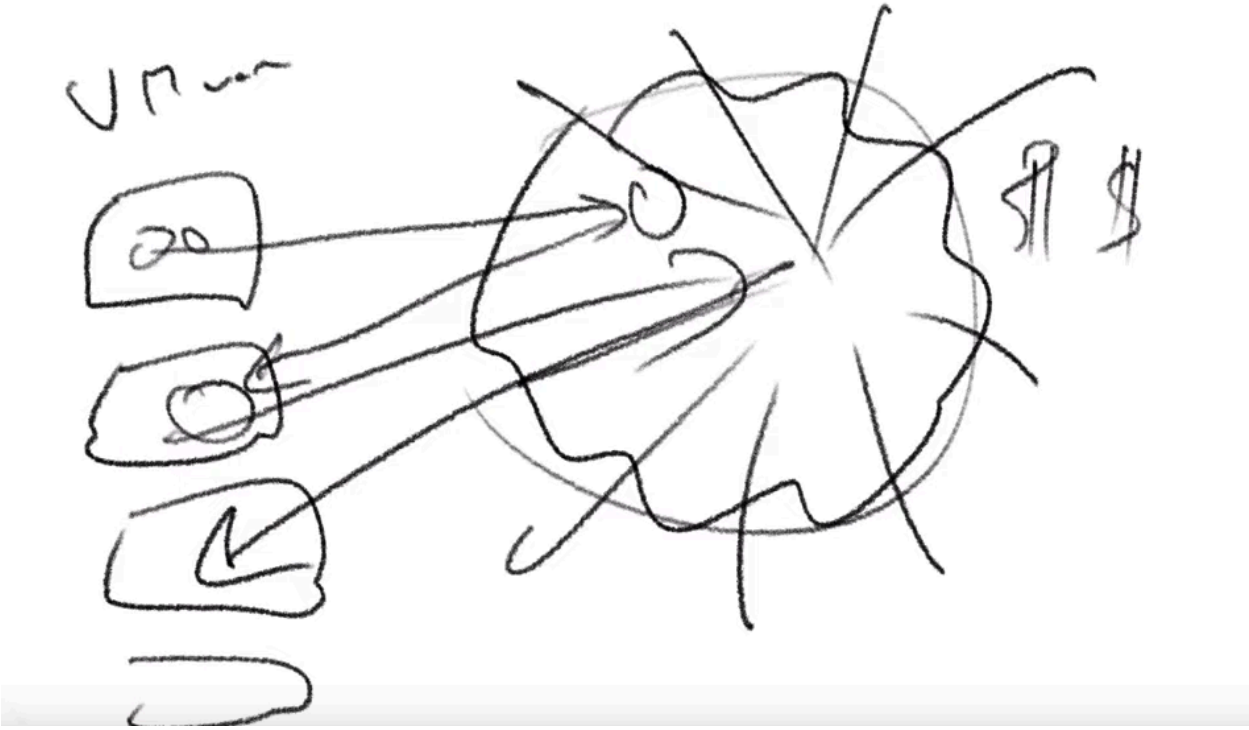
Physical moving the servers

- First spin all instances on azure cloud, still providing all services
- Then we can physically uplug all servers, and move them to the final destination



VMware also has cloud, with its software, u can easily spin up in vm cloud

- If u have 1 week of heavy server usage
- U can use vm cloud instead, just pay more money for it



Software as a service (SASS) - e.g.google drive

IMAP

IMAP allows you to access your email wherever you are, from any device. When you read an email message using IMAP, you aren't actually downloading or storing it on your computer; instead, you're reading it from the email service. As a result, you can check your email from different devices, anywhere in the world: your phone, a computer, a friend's computer.

IMAP only downloads a message when you click on it, and attachments aren't automatically downloaded. This way you're able to check your messages a lot more quickly than POP.

Trusted partners

There are 2 companies working together supporting each. U r not likely to be screw up

- Twitter suddenly stopped their api
- A lot of companies

Go to a trust partner when considering a SSAS.

Connect services instead of servers

- Donor with salesForce, if u have too many customers

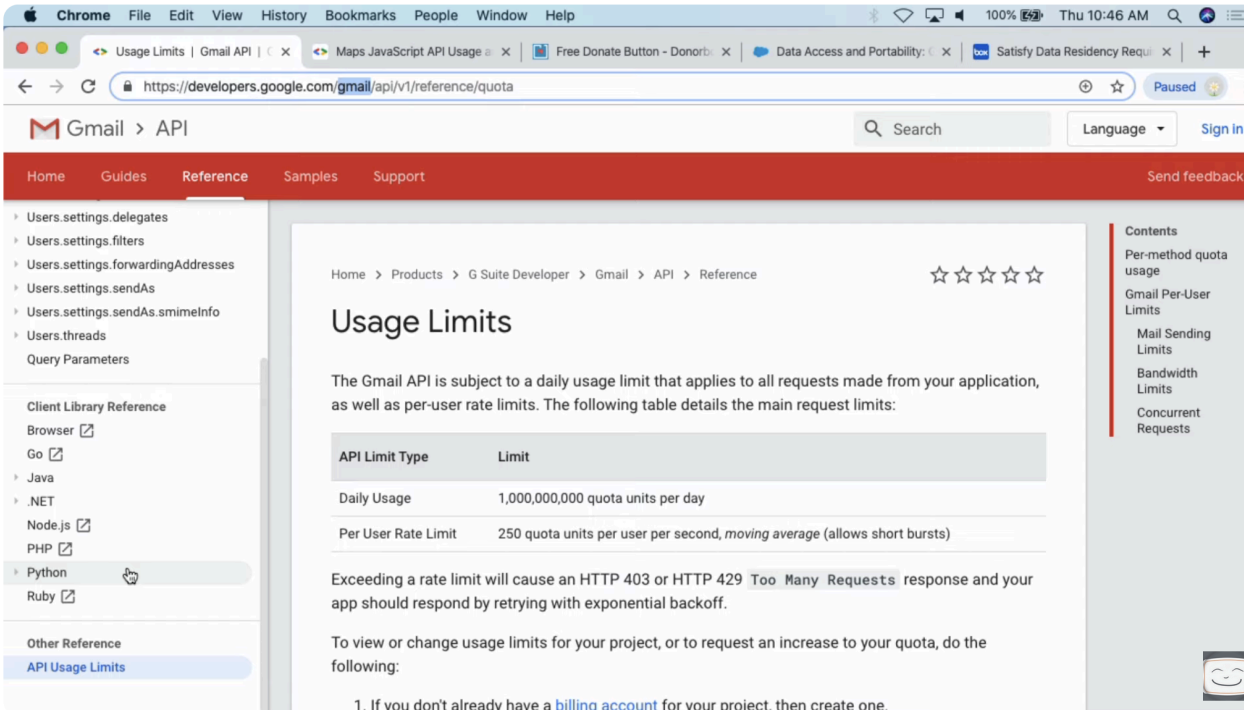
U can write script to com with the service through API, to access hidden functions

- Usually u cant access these functions in console

Gmail is a service, gmail also has API

U can use diff lang to communicate api

- Python was always widely adopted for comm with api
- There is usage limit e.g. requests are exp



Data portability

ur ability to pull out data from ssas - sales force, hoping to upload to a new system

- Sometimes u download data not the format u can upload
- What is the format of download data?
- It can be very difficult, how userful is the data?

Ability to download ur own info

Do not take it granted.

Data residency

Where is the user data is stored?
This is the privacy law.

Tell the SASS provider, where to store ur data for compliance issue.

Are they certified or compliant:?

Healthcare requires certain IT cert
HIPAA Compliance Definition
HIPAA compliance is **a living culture that healthcare organizations must implement within their business to protect the privacy, security, and integrity of protected health information**.

PCI

- A lot of companies use paypal
- Because they are PIC compliant, though it is more exp
- If paypal is hacked, they are held liable for it

PCI compliance, or payment card industry compliance, refers to 12 security standards for keeping customer card data secure.

Cloud Computing - PaaS Introduction (Platform as a Service) - Dev tools and OS -Heroku

https://www.youtube.com/watch?v=U9wiL_4RdYc&list=PLJcaPjxegjBWWtJHeKzGTTa5JF4UrO2o_&index=7

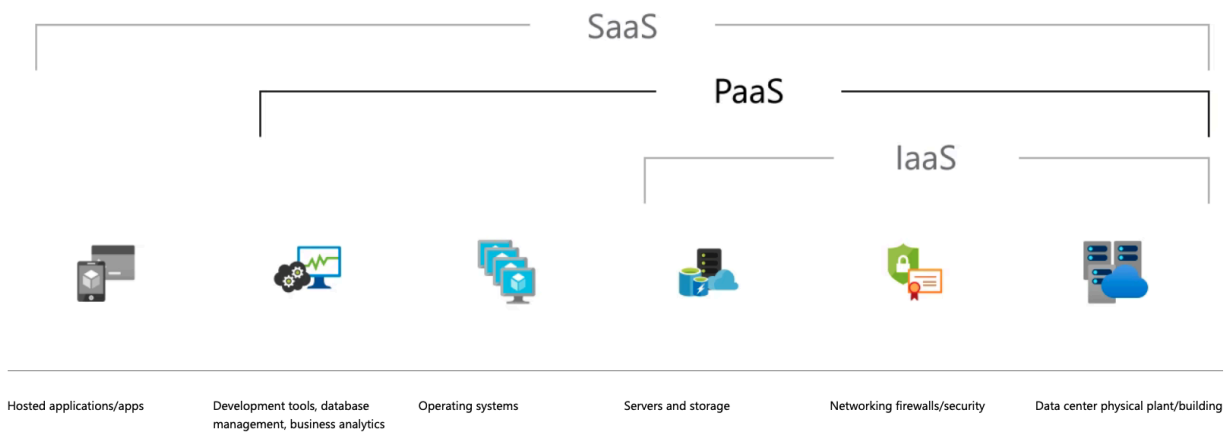
In old data, maintaining the server need to take care both software and hardware

- Dust out cpu fan
- Upgrade OS for security
- Maintain the codes

Platform as a service (PaaS) is a complete development and deployment environment in the cloud, with resources that enable you to deliver everything from simple cloud-based apps to sophisticated, cloud-enabled enterprise applications. You purchase the resources you need from a cloud service provider on a pay-as-you-go basis and access them over a secure Internet connection.

Like IaaS, PaaS includes infrastructure—servers, storage, and networking—but also middleware, development tools, business intelligence (BI) services, database management systems, and more. PaaS is designed to support the complete web application lifecycle: building, testing, deploying, managing, and updating.

PaaS allows you to avoid the expense and complexity of buying and managing software licenses, the underlying application infrastructure and middleware, container orchestrators such as Kubernetes, or the development tools and other resources. You manage the applications and services you develop, and the cloud service provider typically manages everything else.



PAAS

- if they support what languages
- what back up do they have

- Denial of service attack prevention

GoDaddy
- Web hosting plan

Hostgater
- Web hosting

Heroku
- Small container - container for different runtime for node
- More comprehensive than previous hosting

These above are just intermediary just make configuration easier
- If go cloud aws, u need to set up instance
- Configure docker
- Apache
- Then set up virtual private network
- Quite a lot of things to do

Infrastructure as a service (IAAS) - cloud computing Oracle

Server, data network and data center

Platform as a service heroku (intermediary, making hosting easier)

- Write some server code
- Upload and host, then it is functional
- While infrastructure is not like that (is not functional right away)
    - On its own, it is almost useless
    - Like DNS, bought from goddaddy
    - AWS glacier - back up datebase data, all u get is storage (Iaas). They tell u how to connect to it. U figure out how to connect to it
        - Diff from google drive, which has website UI to interact with (ssas)

Cloud is IAAS, IBM, oracle, aws, azure

- Provide authentication, so that u wont have to deal with server

Metal as a service

Rent dedicated physical server - performance is greater than virtual server

Very fast

Godaddy cannot handle large scale website

- U can rent 1 or 2 physical server
- Dedicated server
- 89 dollar a month

Imb cloud

- Has GPUs for ai

Data center colocation

Rent place and racks in data center (as well as network)

- Own physical servers myself
- Condo space for physical servers

If server is down, u need to fix it yourself

Need to figure out

- Size u need - u
- Power electricity u need e.g. how many amp
- Bandwidth
    - Speed g/s
- How many IP address
- Routing protocol
    - BGP - border gateway protocol
- Security
    - If u co-own a rack with others
    - Other people will be close to u
- Provision process
    - How long can they set up

Synology

AWS and azure cloud is not made for youtube

- Becuase data storage and bandwidth can break ur bank, costly
- So if u r just building a website, use cloud
- If u r building a youtube, use colocation facilities

Virtualization

Client server architecture

Good old day

Client computer that has an app
Server computer is a physical server

You have to deal with everything

- Services - softwares
- Server Operating system
- Physical servers
- Network
- Ports and Firewall able to route traffic

Companies using this arch are using legacy systems.

- No companies simply use just client server arch

In the past, everything is connected in one building
However, with people remote working, u cannt do this. U need cloud computing for people to gain access.

- Also, u need to think about hackers
- This open up for hackers to come in

Even when u r on the cloud, also need to think about security and segmentation.

Service oriented architecture

Focus on services, instead of physical server

U only worry about client app and services connected to.

SOA, Service Oriented Architecture, is the concept of designing infrastructure based on the services that are needed instead of focusing on the servers themselves. Designing with SOA in mind makes it easier to not only upgrade for future technologies, but also allows you to create layers of security that many be overlooked in standard client/ server architecture.

Services such as MySQL Databases can be provided from local MySQL Servers, Digital Ocean DBaaS Database as a Service offerings, or AWS MySQL “Compatible” options such as Aurora. SOA requires administrators to look at services as “black boxes”.

- Aurora is not mysql, just behave just mysql

They design their infrastructure based on simply connecting to services, and not focusing on how the services are specifically provided. Think of “email service” vs. Exchange Server.

Designing for SOA can provide built in security improvements as you add firewalls and network routes that prevent all systems from seeing all other systems.

“Like” or “Compatible” services offer the ability for legacy connections to systems whose backend may not be the original software. AWS Aurora uses a proprietary database backend, but allows software that requires MySQL to use MySQL type connections and SQL Statements so that there needs to be no modification of code.

- Not sql, but a database service compatible with sql but not sql anymore

These are blackbox services

- We do not know what is happening but if we own hardware server, we also might not know
    - Port
    - Firewall
    - Network setup
    - Security os patching
- But it is security at a scale

Client and sever problem

- Ftp upload ransomware to ftp server
    - Adding up vulnerability for other servers
    - Can transfer from one server to another
-

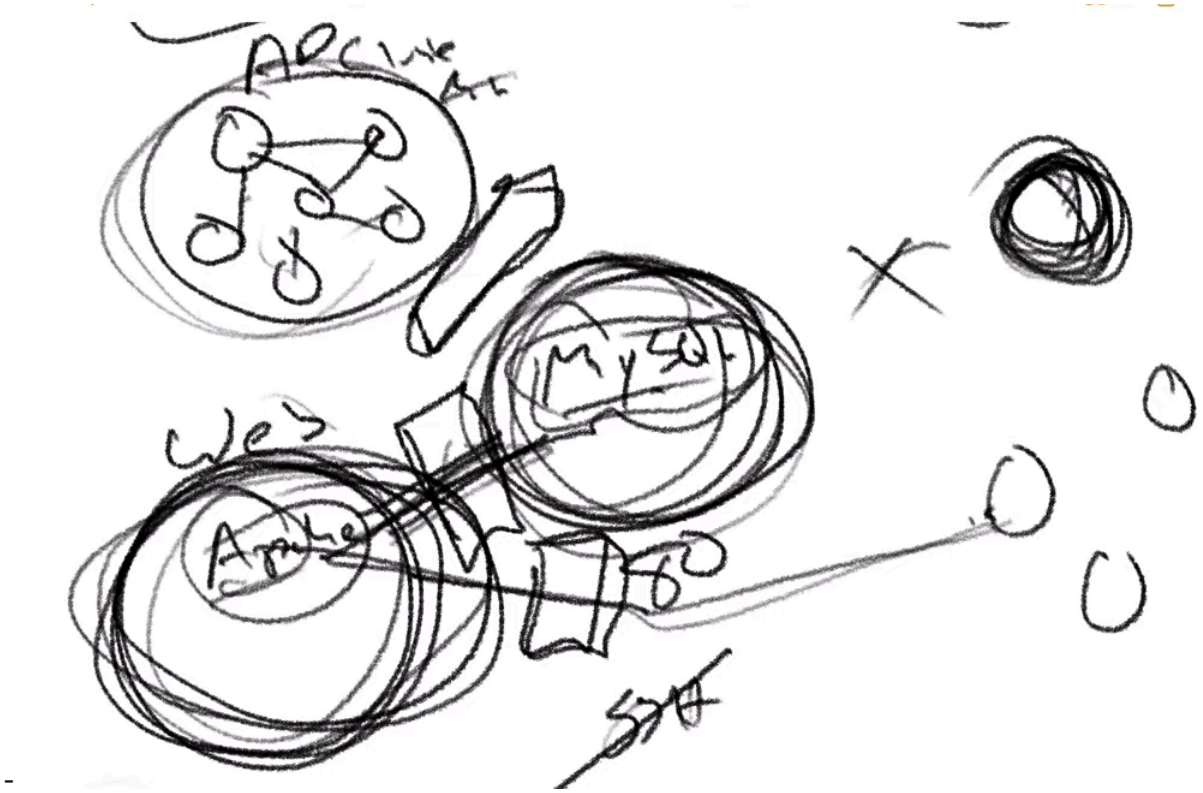
Better way

- Use virtualization to separate servers by creating instance of things
- Each cluster is segmented from other cluster

Mysql data base service
Digital ocean has mysql database service

Amazon aurora - compatible db

- Their backend is not mysql
- Auto scale to 64tb per database instance


ARCHIVE
MySQL
Web
Apache
SAN

Serverless architecture - calling a compute to perform a task directly- cloud function - identify images, and genone processing

Encoding video - compress and change format

- We do not care about os
- Hardware
- Patching

We are able to call compute to do something.

- And that compute that does it
- When u upload a file into a folder, ur software script call compute to encode the video
    - The compute grab the video file and do conversion

Administrator -> programmatic administration

- Maintaining infrastructure using normal programming
- Cloud function
    - Use function to recognize sig visual
    - Encoding
    - Able to call serverless architecture
    - That service will take over and do whatever u r doing

More and more u can code, much less about left and right click

- Administrator is connecting to diff services using 1000 lines of script
- Not longer left and right click

IBM cloud functions
AWS lamda features -> serverless compute service

Summary:
Serverless Architecture allows you to abstract out Compute from your infrastructure and call compute service from Cloud Functions. This means you get the results of a server like encoding video, or computer vision without needing to maintain an Operating System.

Event Driven Compute – means the compute services are called based on events that trigger them. Cloud Functions – are the way you call serverless services. They may also be called Azure Functions or Lambda Functions depending on the vendors naming strategy.

Programmatic Administration vs “Old” Administration – Serverless Architectures require knowing programming languages and have little to do with GUI based Systems Administration.

Languages – The languages that are required depend on the specific products from the vendors. Cost – Payment is based on compute time

Functions - to process ur input to output

Database on cloud

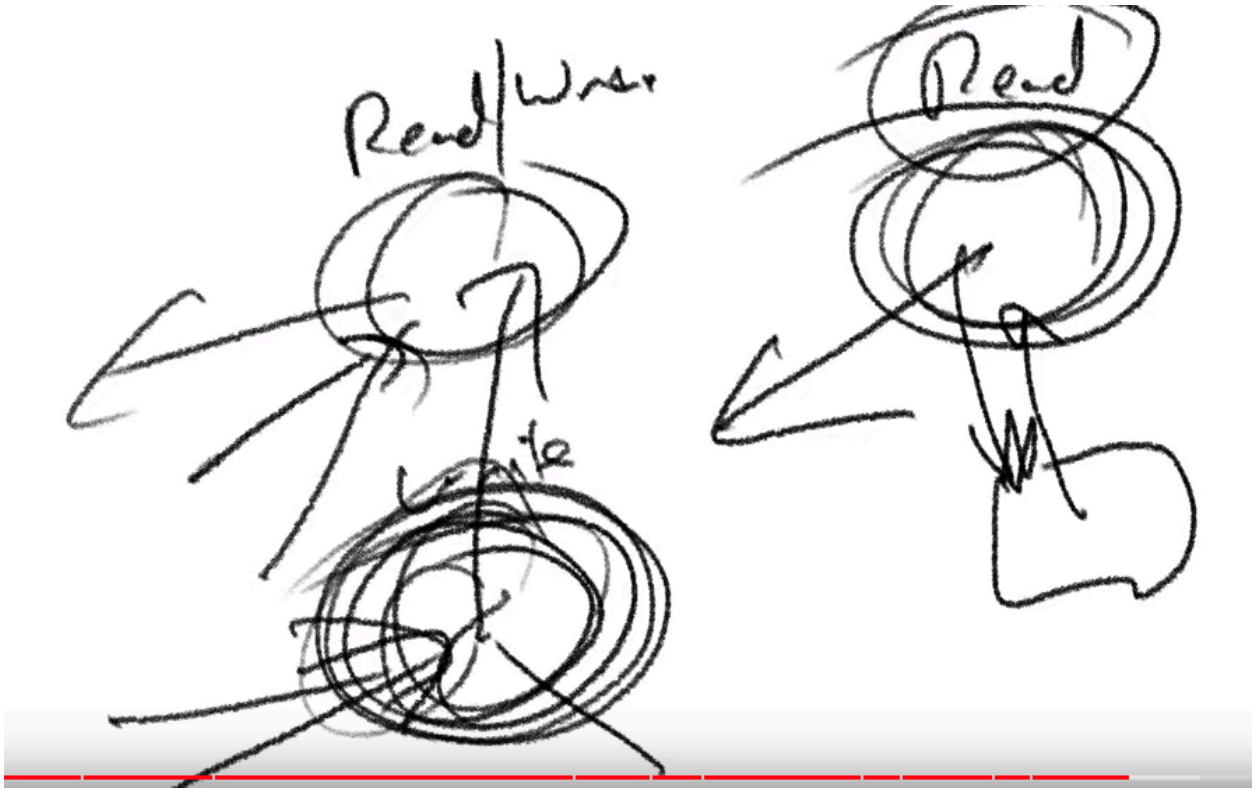
U can create multiple database

- One for user database
- Another stored on amazon cloud

Clusters – databases servers are setup in clusters so that if one fails the service is still available. They copy information to each other through a Replication Strategy.

Database Servers can be Read/Write, Read, and just Write. This allows administrators to deploy servers to perform best for what is required and for security.

- For security, make one of the db write only, and then replicate to other read only servers
-



Congrats u finished cloud computing
Did a good swim today but it is so tiring

Take a break to enjoy the moment