How Public Clouds Affect Us All

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Today we will discuss the Concepts:

- Compute history
- Public Cloud as a new step in computing
- Hypervisor and virtualization vs. containers
- What is a Public Cloud?
- Cloud Security
- Designing Apps for Cloud
- Cloud pricing
- Why Public Cloud?

Compute history

1819-1849
Charles Babbage
2-nd Difference Engine
Build in 2002+
London, Mountain View

1949-1961
IBM releases first production computers
1961 – Mainframe System 360

Personal Computers
1975 – Apple II
1981 – IBM PC

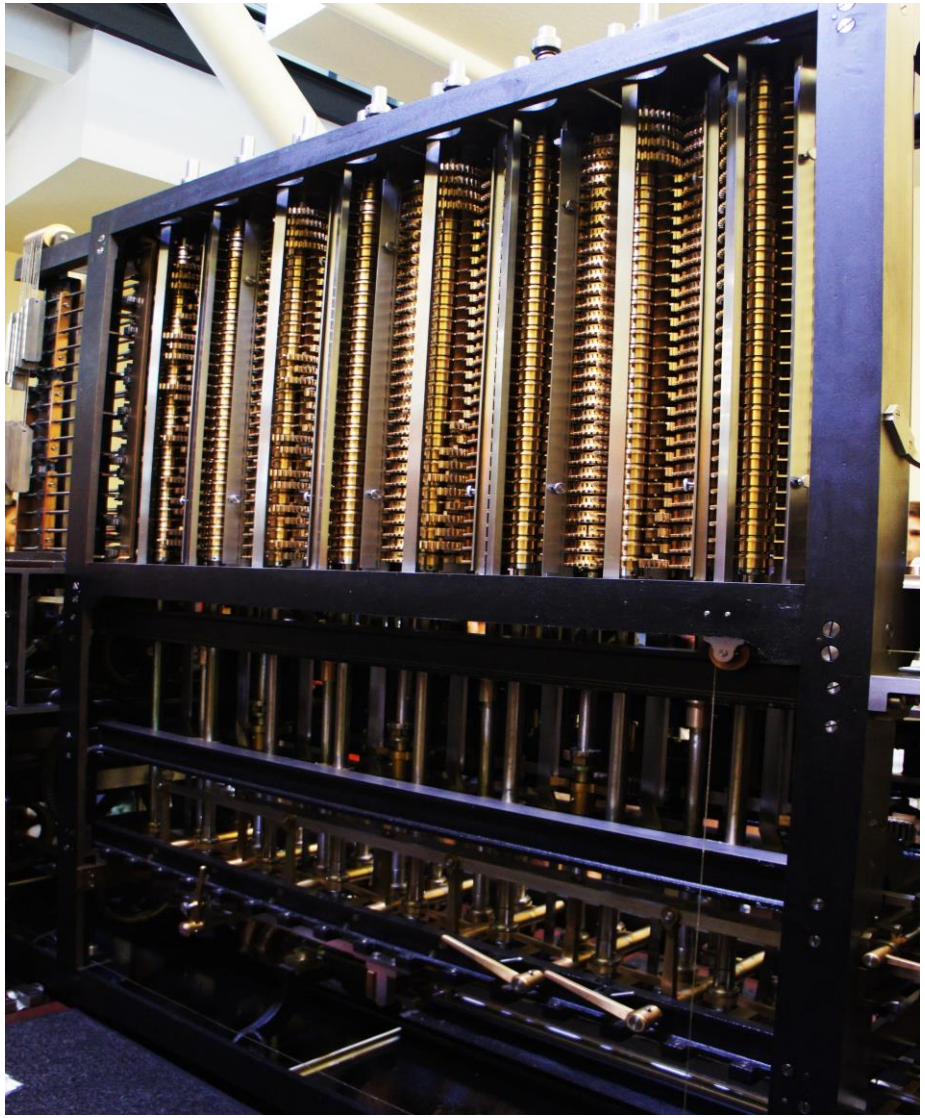
2000
Windows Server 2000

2001
VM-Ware
2013 – v5.5

2006
Amazon Cloud - AWS

2013
Docker Containers
Open source

Charles Babbage 2-nd difference Engine



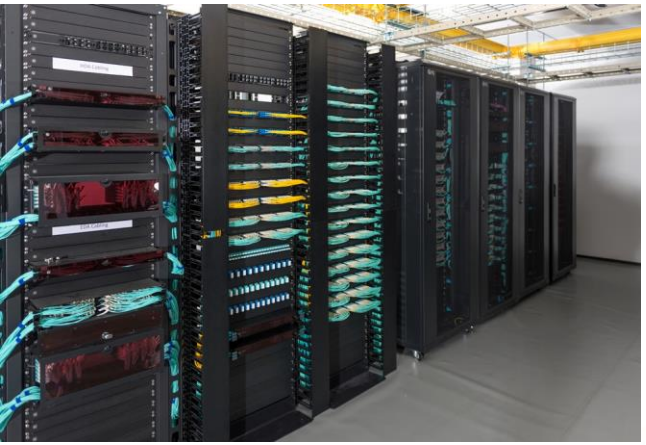
- Designed in 1819-1849
- How it works?
- Calculate math tables
- Mechanical printer to print results
- Built in 2000’s – by Google
- Demonstrated in Mountain View Computer Museum, CA

IBM Main Frame Series 360

released 1964

- Single big computer
- Used today as system Z
- Software compatibility
- No scalability
- No redundancy

Intel Processors + Windows Server 2000

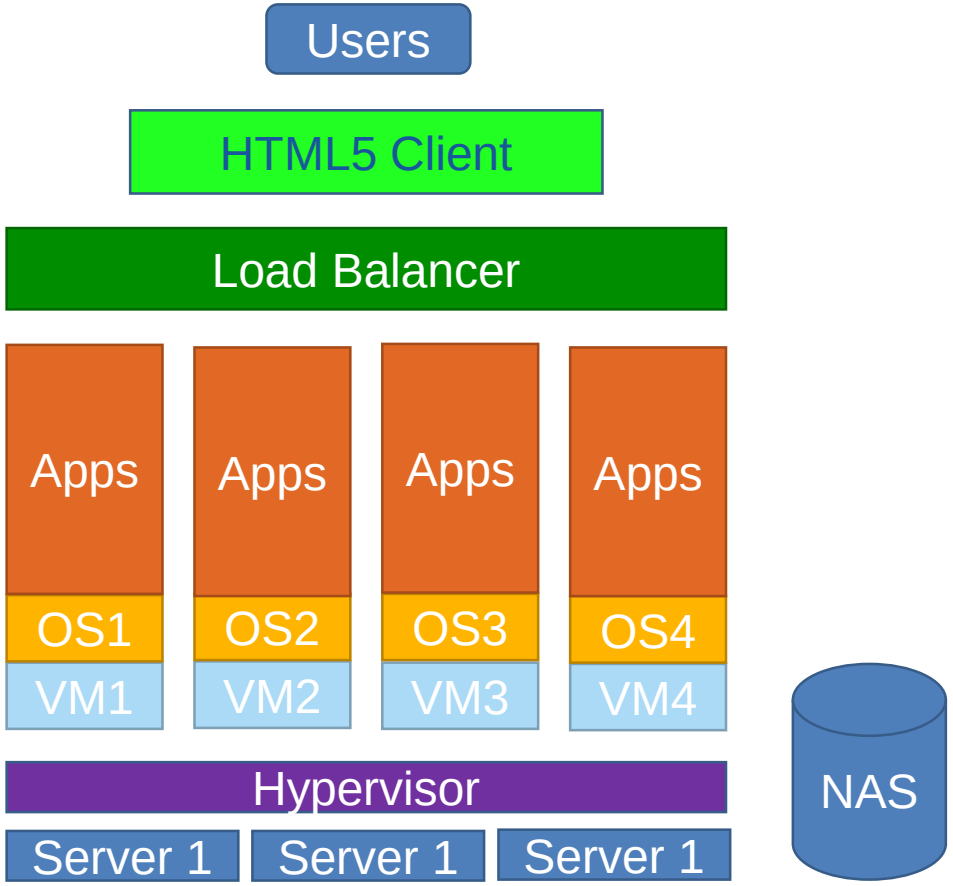


- multiple servers can serve one application
- Networking used to communicate between servers
- Separation of storage from server:
  - SAN – Storage Area Network
  - NAS – Network Attached Storage
- Load Balancers /Traffic Managers
- Scalability – add servers
- High Availability:
  - Redundant components – power supplies, disks
  - Hot Swappable components
  - multiple servers
- Major OS:
  - Linux
  - Windows Server

Disadvantages:

- long re-build time after failure

Hypervisors: separation of computing from physical servers. VM-Ware.



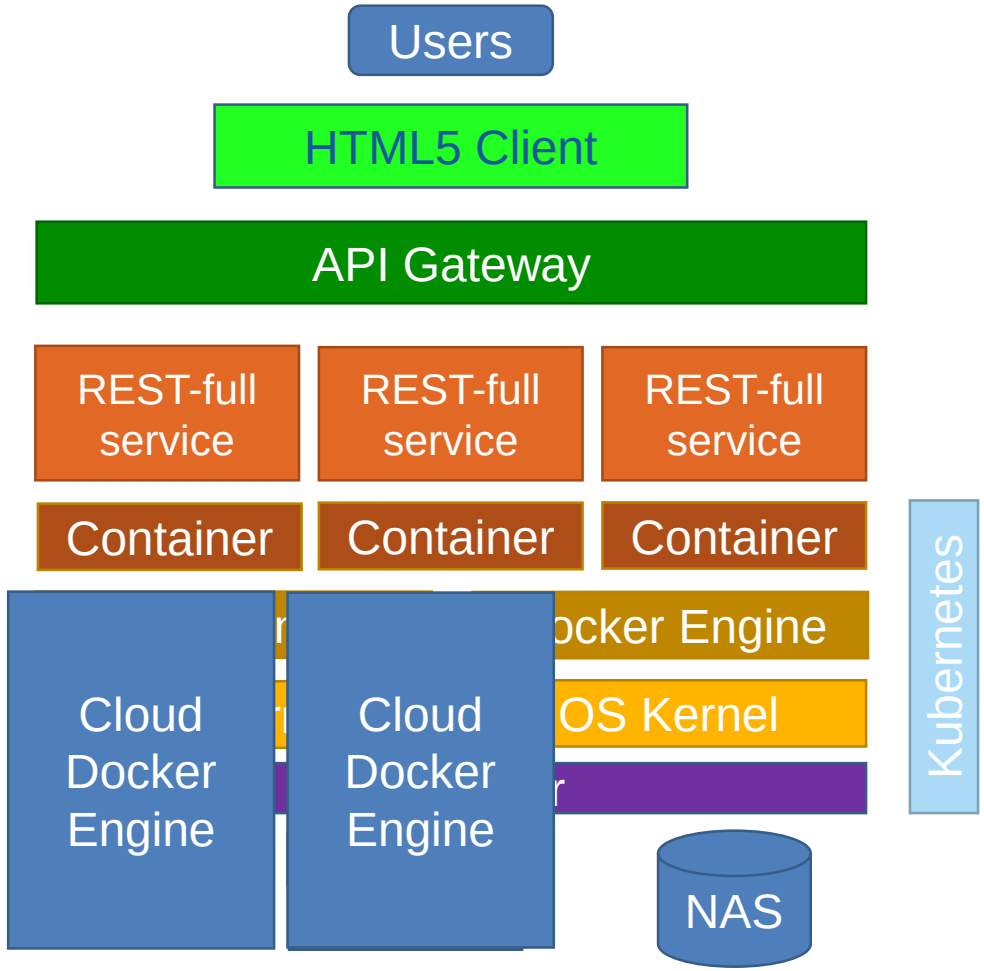
Advantages:

- No dependency on hardware
- Storage separation from Compute
- Can move VM between servers without stopping
- Can take a server offline for repair
- Can balance the load between multiple servers
- Use LTM – Local Traffic Manager aka Load Balancer

Shortcomings:

- VM start time still 5-10 min, similar to physical server boot
- Cannot move to another vLAN
- Cost, especially Windows VMs
- Provisioning of ‘physical servers’ based on peak use. inefficiency.
- OS and DB upgrades downtime

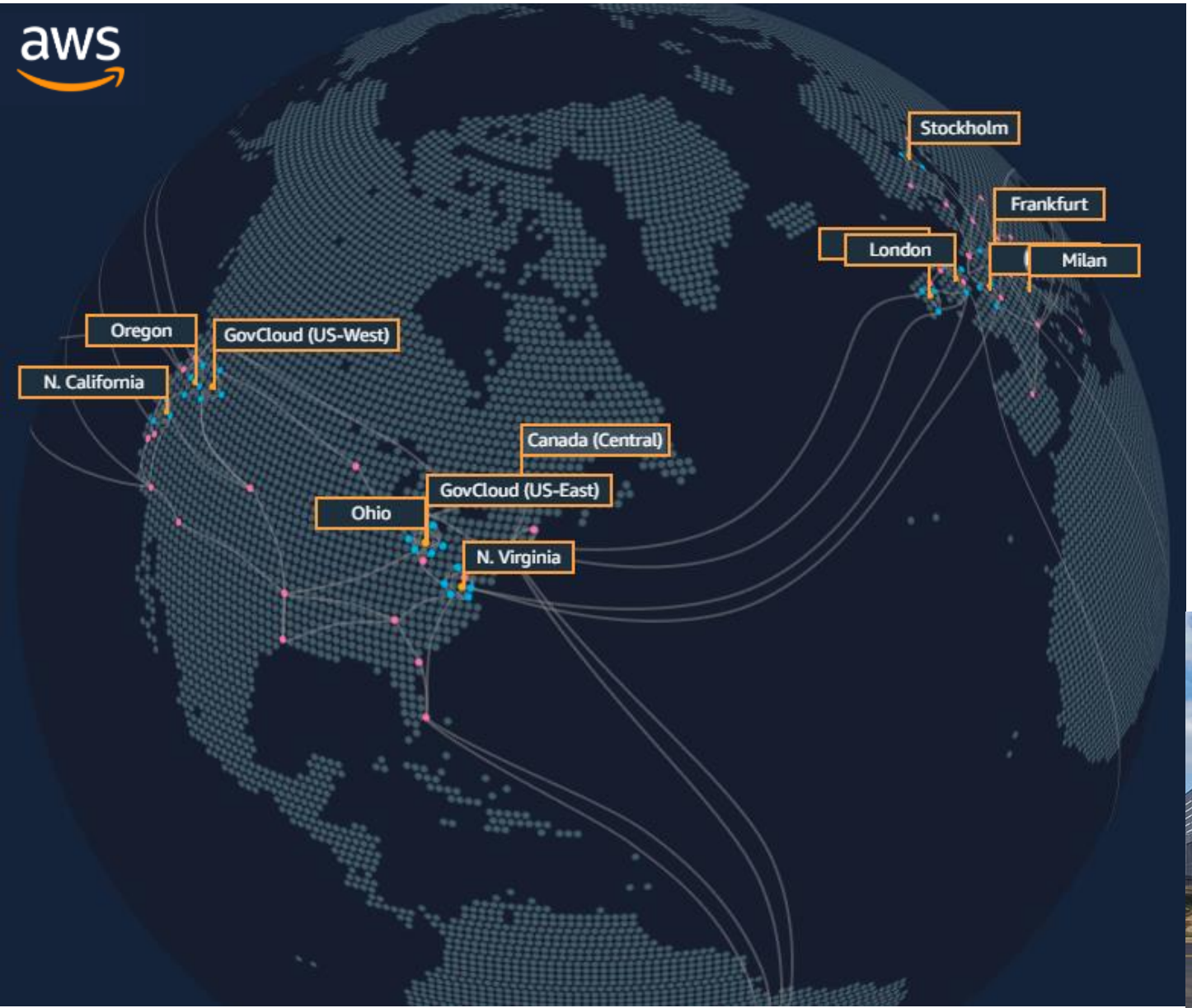
Containerization, Docker, Kubernetes



Advantages:

- Lightweight
- Kubernetes automates deployment and scaling apps
- Kubernetes can span hosts across public, private, or hybrid clouds
- Container takes 60ms to start vs. 5-10 min VM
- Use GTM – Global Traffic Manager aka Load Balancer

What is a public cloud?



Amazon AWS
Google Cloud
IBM Cloud

Microsoft Azure
Digital Ocean

Efficiency, Security, Redundancy, Global

- Datacenters worldwide
- Secure state-of-the-art facility
- computers built for cloud –
  - minimize unnecessary parts
  - no redundancy in a single computer
- private fiber networking to other centers
- Energy efficiency designed on DC level
  - hot and cold isles
  - no cooling in Google Belgium DC
- Elastic Scalability

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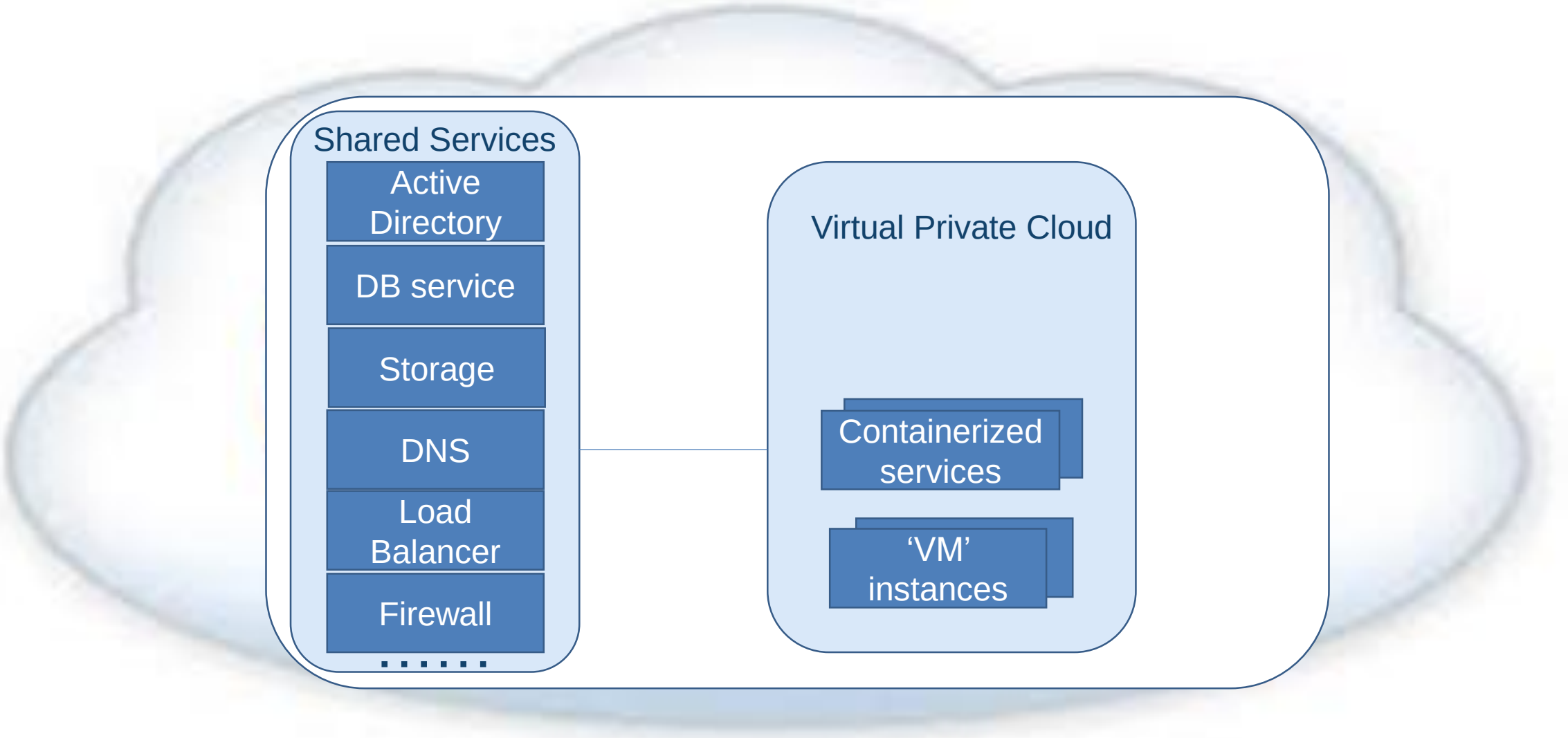
Cloud components



Cloud Security

- Excellent physical security of datacenters
- Seamless patching of cloud services – DB, OS, other services
- ‘Perimeter security’ for Virtual Private Cloud
- Shared services are shared ☺ No separation of clients.
- App must use encryption at transit and at rest
  - storage access
  - DB access
  - encrypted DB records
  - encrypted storage records
- Secure communication from client computers to the cloud
- Edge Devices

Designing Applications for Cloud

Cloud-**ready** application:
prepared to run on public or private cloud

Cloud-**native** app created for public cloud:

- containerized
- security for public cloud – encryption in transit and at rest
- use cloud-specific storage – S3, Azure Blob
- use cloud services
- use cloud Database system.

Start from analyzing what is your application doing when deployed on dedicated server to understand needs for cloud.

Pricing

- Compute instances – by cores, memory, attached disk space
  - Linux vs. Windows
- Storage – by performance
  - S3 storage Amazon & other vendors, Azure Blob
  - Egress charge – ‘selling data to users’ model like Netflix.
- Database service
- Firewall service

Amazon EC2 instances:

	vCPU	Memory	Usage charge
m5.large	2	8 GiB	$0.096 per Hour
m5.xlarge	4	16 GiB	$0.192 per Hour
m5.2xlarge	8	32 GiB	$0.384 per Hour
m5.4xlarge	16	64 GiB	$0.768 per Hour
m5.8xlarge	32	128 GiB	$1.536 per Hour

Pricing Containers

AWS Fargate ECS container instance, US East zone	Price
per vCPU per hour	$0.04048
per GB per hour	$0.004445

Supported Configurations

CPU	Memory Values
0.25 vCPU	0.5GB, 1GB, and 2GB
0.5 vCPU	Min. 1GB and Max. 4GB, in 1GB increments
1 vCPU	Min. 2GB and Max. 8GB, in 1GB increments
2 vCPU	Min. 4GB and Max. 16GB, in 1GB increments
4 vCPU	Min. 8GB and Max. 30GB, in 1GB increments

Why Public Cloud? Innovation

Innovation in Hardware:

- Better compute
- New approach to storage
- New level of networking

Innovation in Software:

- Smaller, lighter components – containers
- Elastic scalability, no limits
- Rolling updates
- More programming jobs ☺

Why Public Cloud?

- Lower Cost in the long term (TCO – Total Cost of Ownership)
- Best Networking technology
- Elastic scalability
- Higher standard of security
- No need to upgrade infrastructure components – OS, DB etc
  - cost
  - downtime
- No need to replace hardware
- New Concept of Storage – Amazon S3, Azure Blob
- High durability of cloud storage
- Availability of global deployment
- Availability of multi-location redundancy

How Public Cloud affects us all?

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Questions?

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