Cloud computing

Yoni Krichevsky
ITC

Agenda

- Cloud computing – what it is
- Pluses and minuses
- Different layers
- Providers
- IaaS – Demo + Class exercise AWS

Cloud computing

Purpose of a company

Purpose of a software company

How to get there

IT infrastructure

Resources:

- Compute (CPU)
- Storage (hard disks)
- Memory (RAM)
- Databases
- Network – routers, cables…
- …

IT activities:

- Buy
- Host – rooms, air conditioning
- Install, upgrade
- User management
- Security patches
- Monitoring, fixing
- Support users
- Learn, train, hire experts

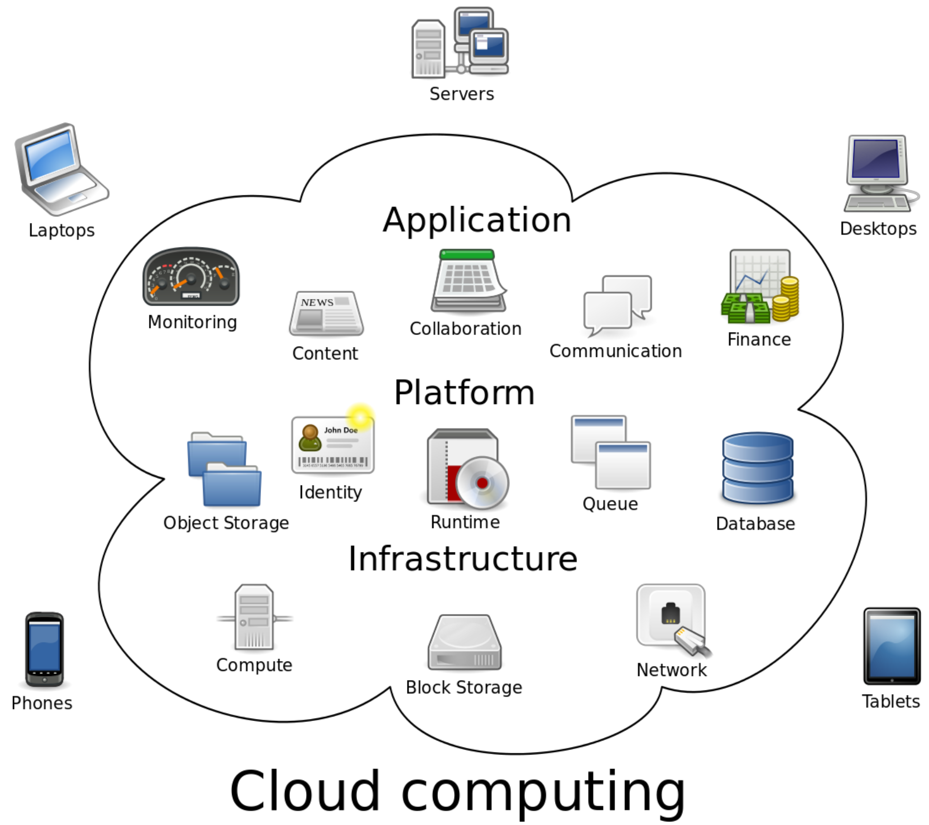
Before the cloud

Before the cloud

- On Prem (on Premises) – Every organization has all the IT infrastructure physically at company campus

- Pluses:
  - In control

Cloud computing



https://en.wikipedia.org/wiki/File:Cloud_computing.svg

- **Cloud computing** – buying on demand computer resources and services over the internet
- **Economies of scale** – resources shared between customers
- **Pay-as-you-go** model

Cloud computing – pluses

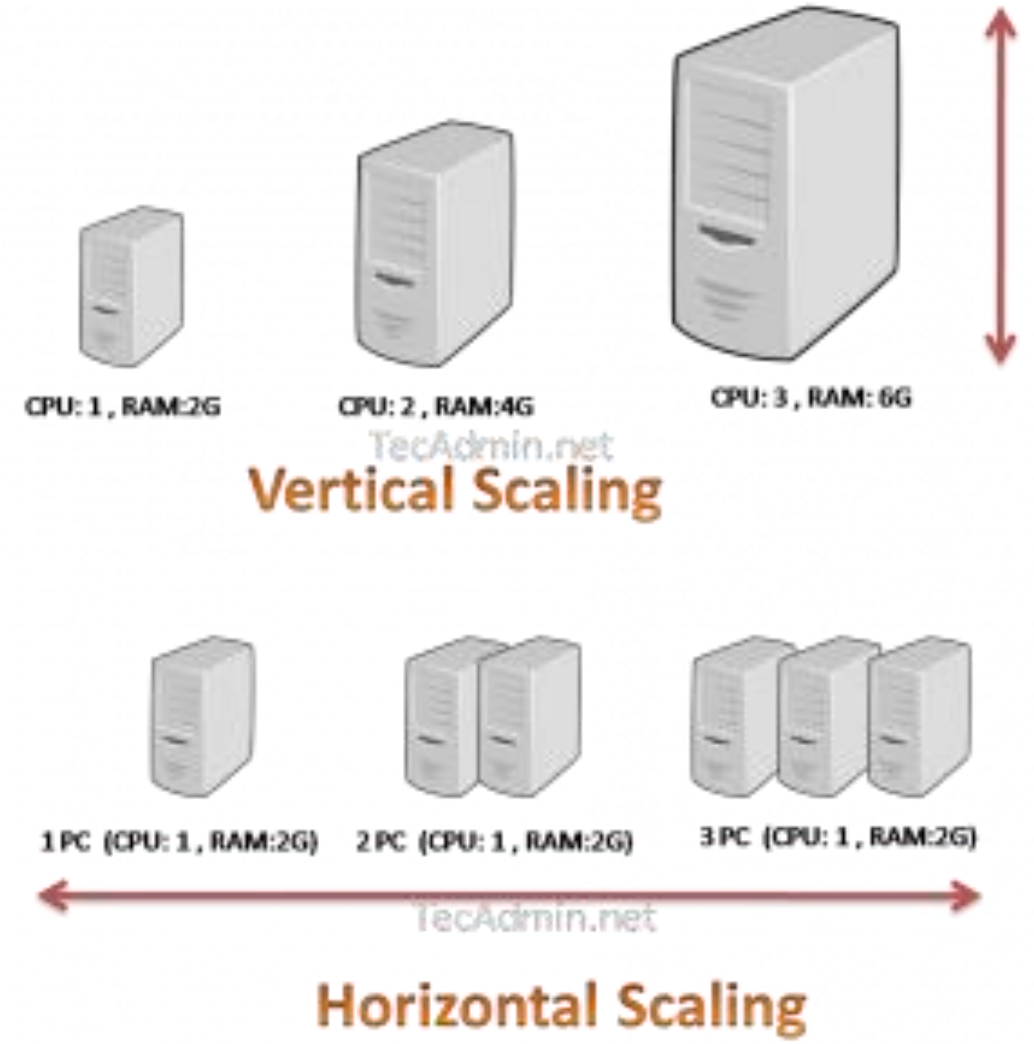
Focus on core business

Cloud computing – pluses

< itc >

Scalability

- Adaptivity to rapidly changing demand
- Scale up on demand, then scale down
- Limitless resources from client perspective
- Scalability – Horizontal, Vertical
- Manual, or automatic:
  - Time based – only weekends
  - Load based – CPU > 70%
  - Latency based – response > 10 ms



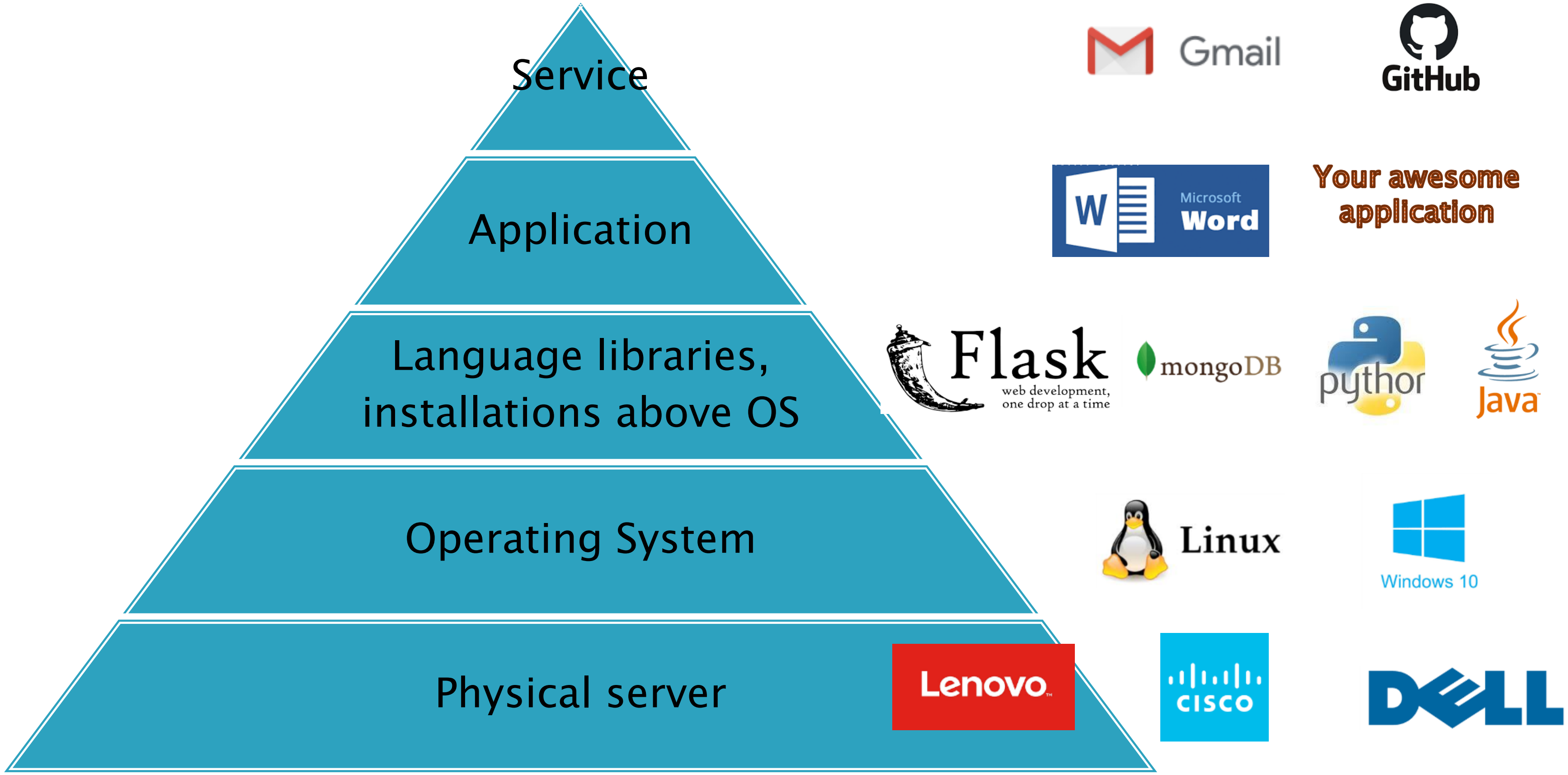
Cloud computing – mixed blessings

- Less in control – good or bad?
- Security, regulation – same, or better, but different. Part of the specialization outsourced to experts
- Cost
  - Especially for large organization that can do it cheaper themselves
  - Need to pay attention to bills and resources used
- Cloud vendor lock-in – can I switch?
- Latency (time for response) – are your customers local or global?

Possible solution: **Hybrid cloud** – part On Prem, part in the cloud

Cloud computing – layers

Computing Layers



Service

Application

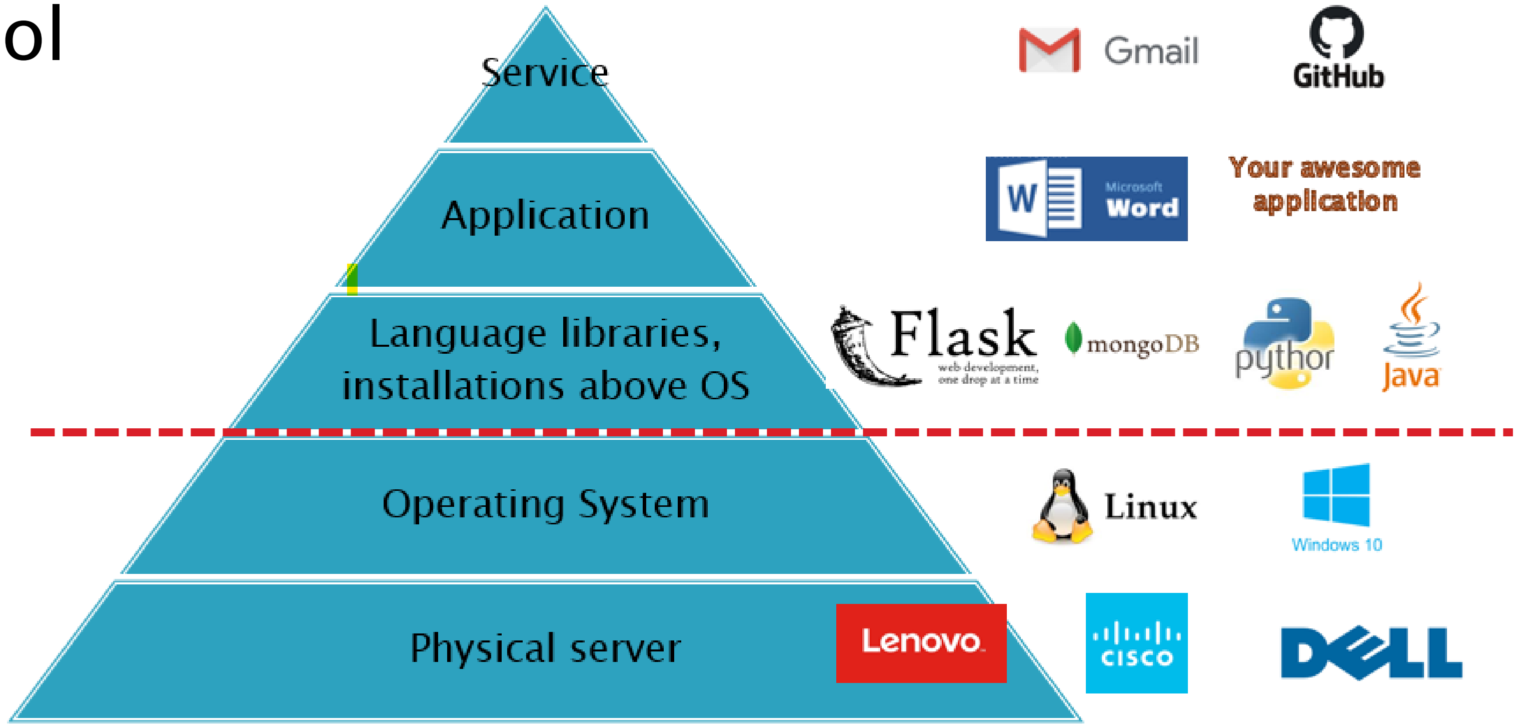
Language libraries, installations above OS

Operating System

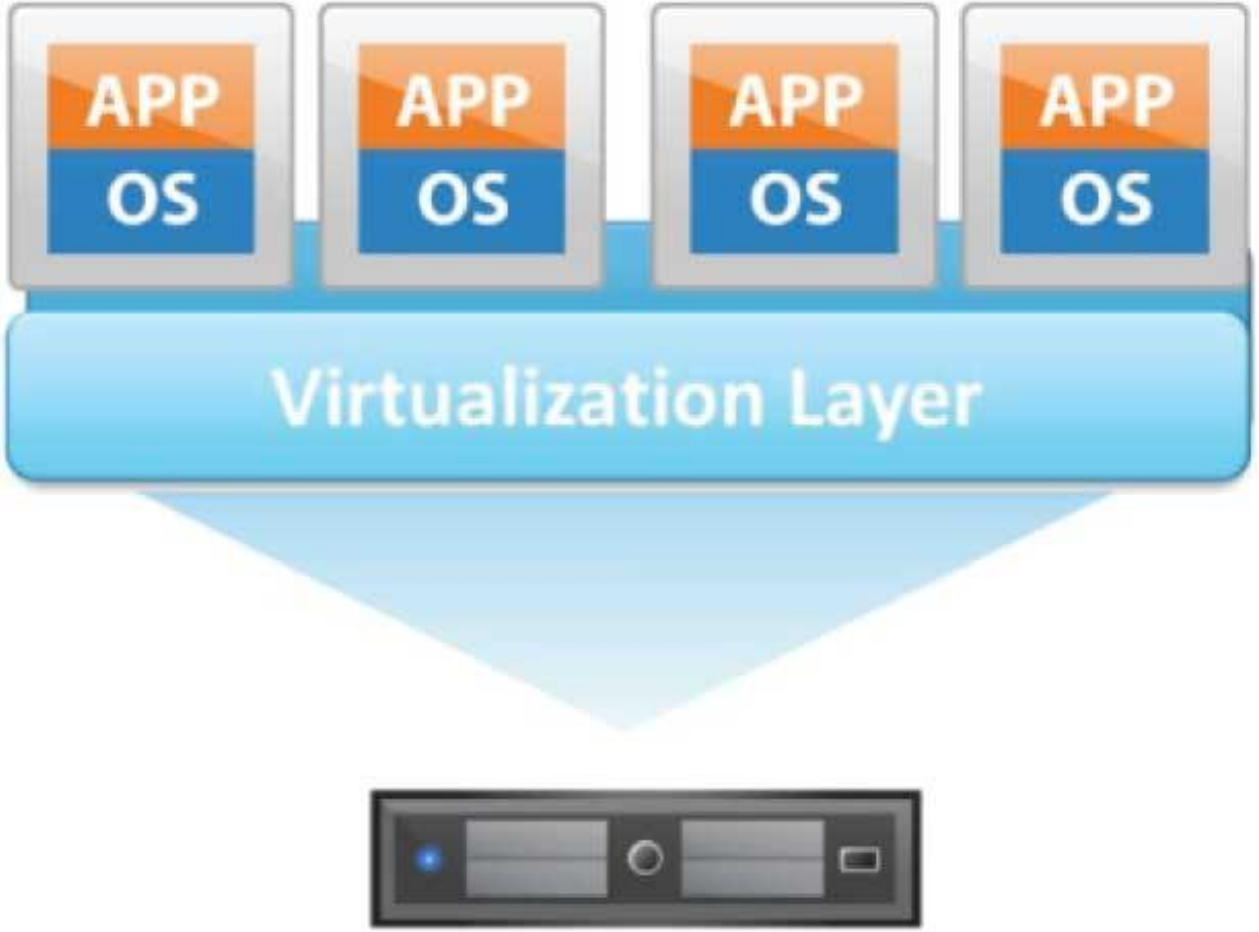
Physical server

Computing Layers – IaaS

- Infrastructure as a service
  - Get servers
  - Do everything above on your own
- Most complex. Need DevOps support
- Most freedom and control

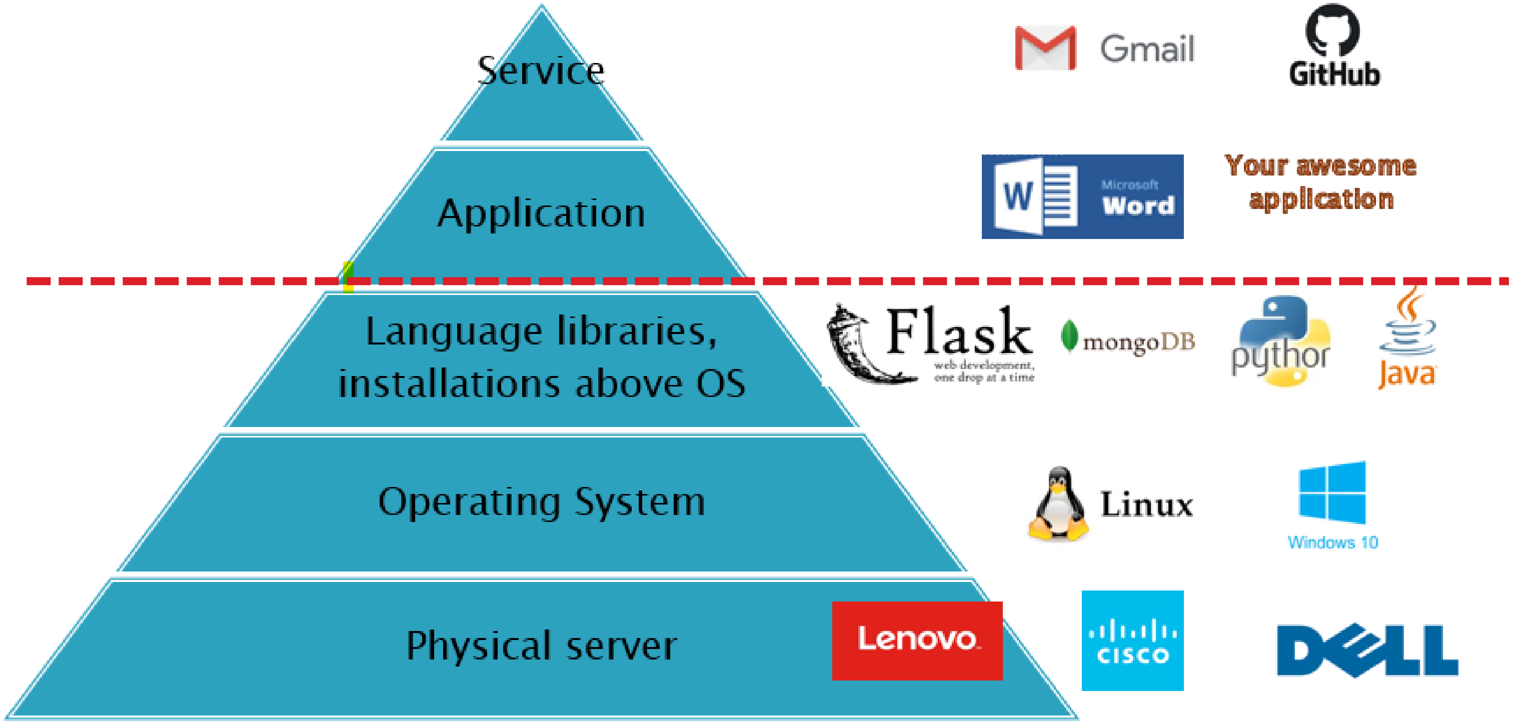


Virtualization



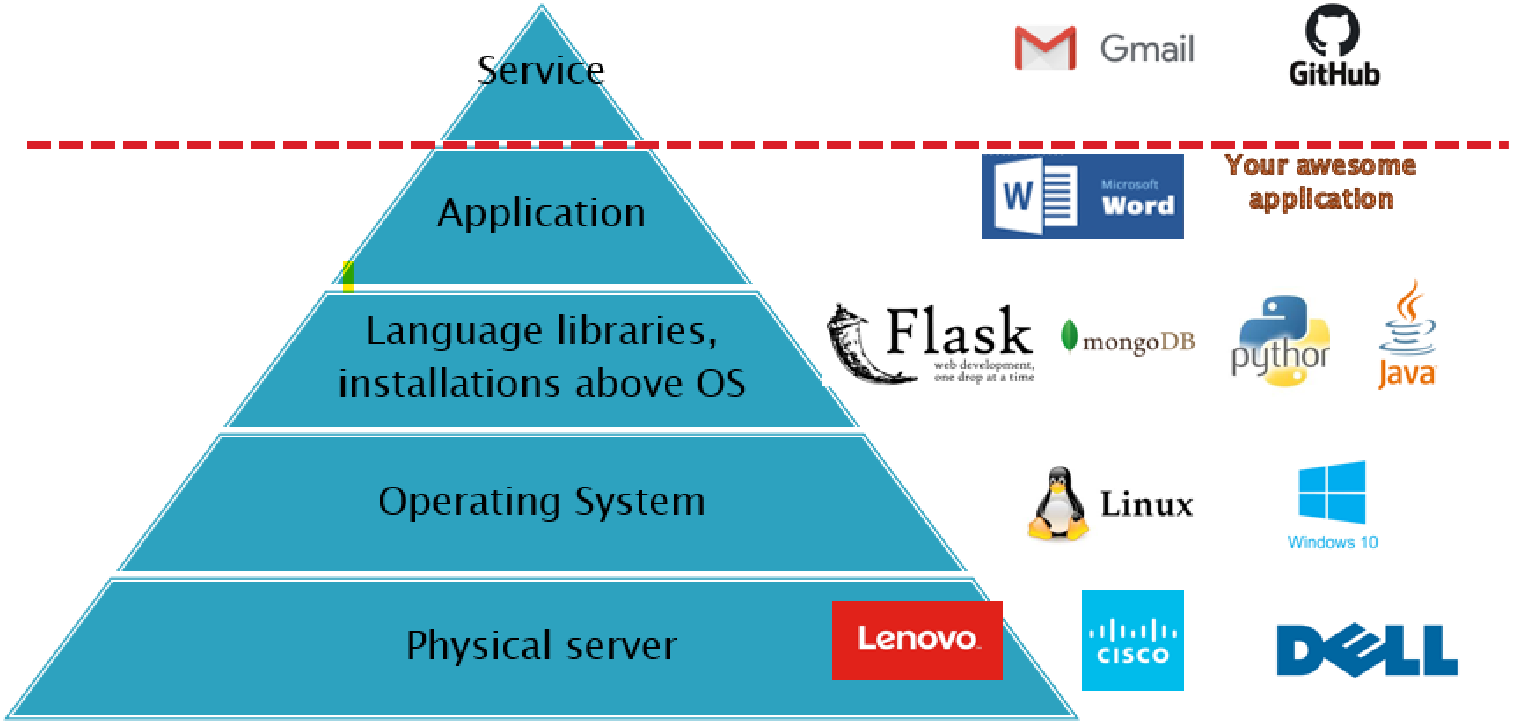
Computing Layers – PaaS

- **Platform as a Service**
  - Get environment with all the pre-requisites
  - Just deploy your application
- Less complex
- Less freedom



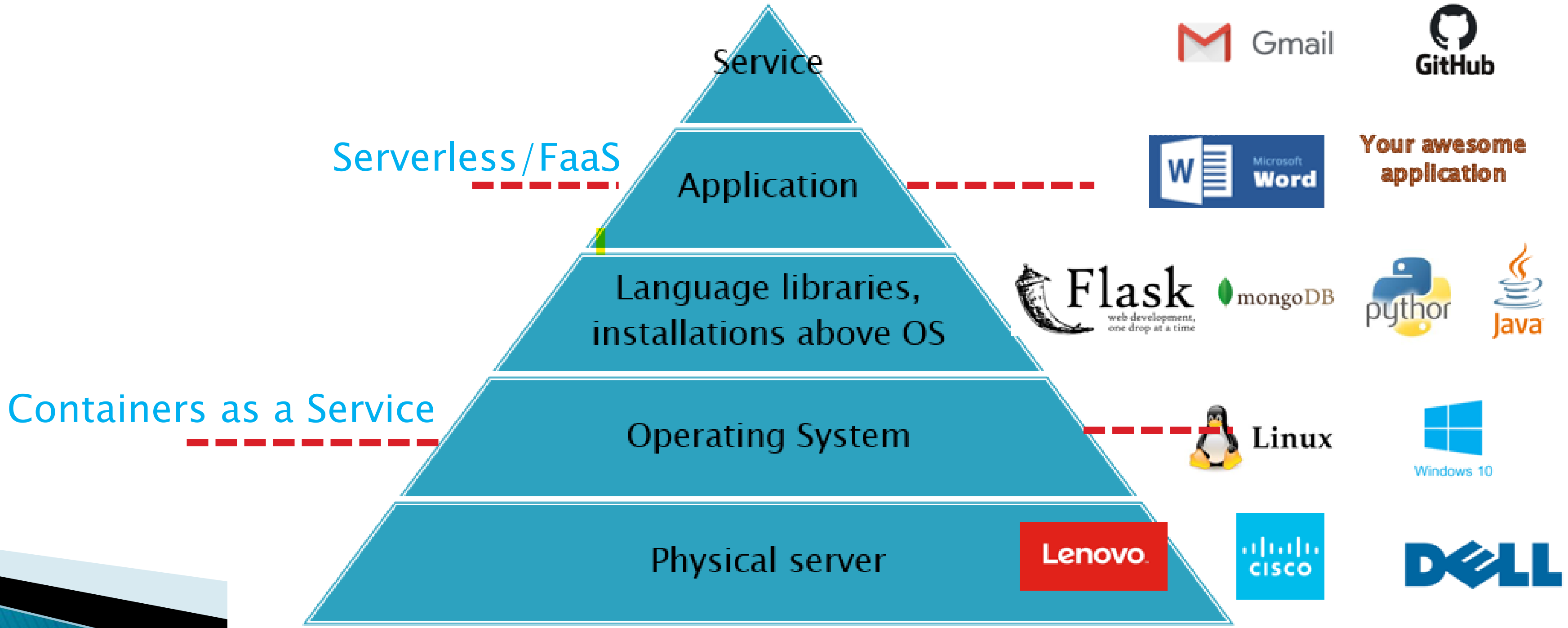
Computing Layers – SaaS

- Software as a Service
  - You don’t deploy anything, you are only a user
  - Just access a service via internet
  - By browser etc.
- Google Docs, Github



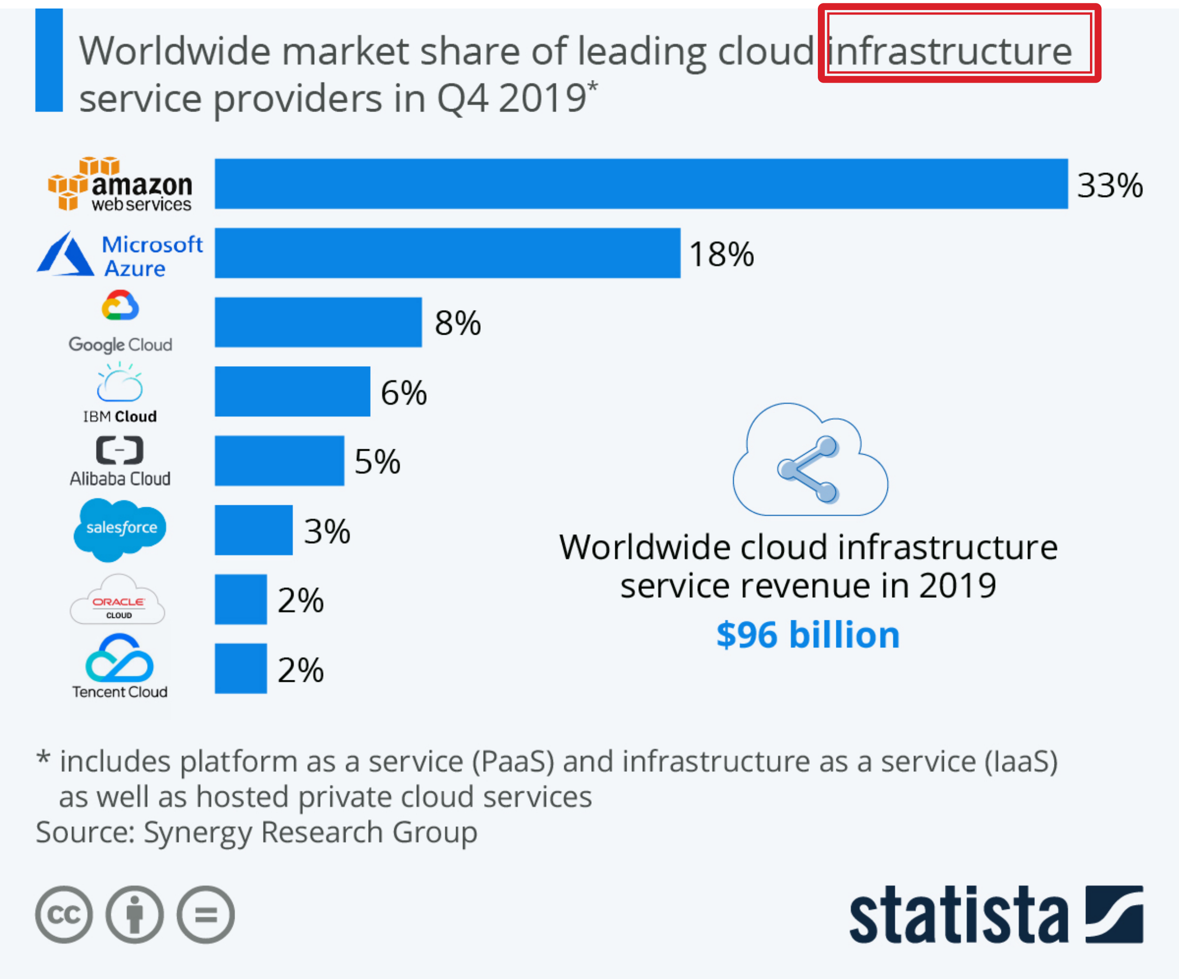
More Layers

- **Containers – CaaS – Container as a Service**
  - Instead of getting full Operating System, get a containerized environment
- **Serverless / FaaS – Function as a Service**
  - Don't even need to deploy an application, just deploy a function



Cloud providers

- Some providers give all levels – IaaS, PaaS, and more, some only part of the levels
- Leaders are slightly different in different levels



Worldwide market share of leading cloud infrastructure service providers in Q4 2019*

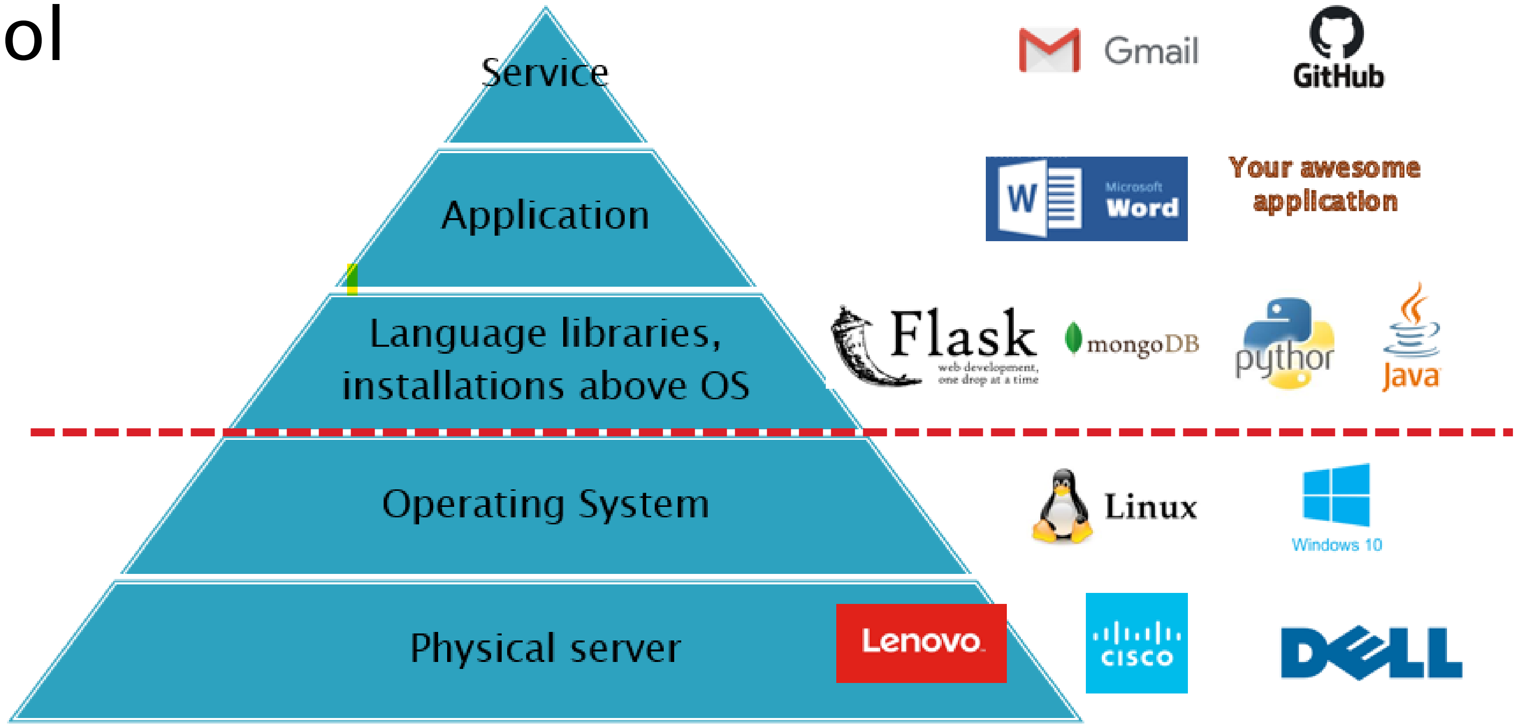
* includes platform as a service (PaaS) and infrastructure as a service (IaaS) as well as hosted private cloud services

Source: Synergy Research Group

Demo – AWS IaaS

< itc >

- **Infrastructure as a service**
  - Get servers
  - Do everything above on your own
- Most complex. Need **DevOps** support
- Most freedom and control



IaaS Ex – What we will learn / review

- Creating a Github repo
- Sign up to AWS
- Create SSH keys to work with AWS
- Create and connect to server on AWS
- Install git and python
- Configure git
- Get code from Github
- Install required Python modules
- Upload files to server from your PC
- Download files to server from internet
- Download files from server to your PC
- Run Python code on the server

IaaS Ex – 1 Github

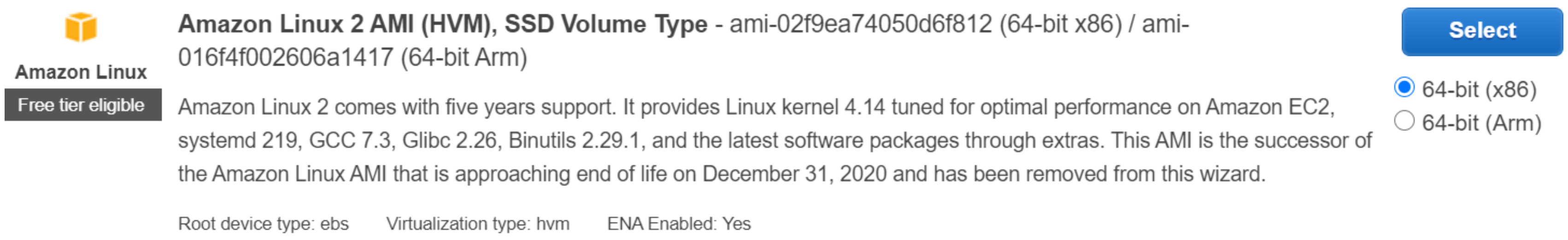
- Create a local Git repo with the following:
  - Attached plus_one.py Python file that reads a Pandas DF from file, transforms it and writes the result to file
  - Attached requirements.txt that includes Pandas
- Push this repo to Github public directory cloud-class
  - ***Note**: You can use private Repos, but then you will usually need to put an SSH key on the server to access Github – out of scope for this exercise*

IaaS Ex – 2 AWS signup and setup

- Create account in AWS: https://portal.aws.amazon.com/gp/aws/developer/registration/index.html
  - There is free tier where you get credits for free usage: https://aws.amazon.com/free
- Sign into AWS console: https://console.aws.amazon.com/
- Choose region Europe (Frankfurt) eu-central-1
- Go to EC2 service → Network & Security → Key pairs
- Create a SSH key pair
  - Windows / Putty – use ppk file
  - Mac / Linux – use pem file
- Save this file for future use in a secure location

IaaS Ex – 3 create the server

- Go to “EC2 service” → “Instances” → “Instances”
- Launch a new instance with “Launch Instances”
- Choose an AMI of the default AWS type (usually 1st in the list):



Amazon Linux

Free tier eligible

Amazon Linux 2 AMI (HVM), SSD Volume Type - ami-02f9ea74050d6f812 (64-bit x86) / ami-016f4f002606a1417 (64-bit Arm)

Amazon Linux 2 comes with five years support. It provides Linux kernel 4.14 tuned for optimal performance on Amazon EC2, systemd 219, GCC 7.3, Glibc 2.26, Binutils 2.29.1, and the latest software packages through extras. This AMI is the successor of the Amazon Linux AMI that is approaching end of life on December 31, 2020 and has been removed from this wizard.

Root device type: ebs Virtualization type: hvm ENA Enabled: Yes

Select

● 64-bit (x86)
○ 64-bit (Arm)

- Choose default options for instance type, and leave everything default
- Review and Launch
- For SSH key, choose the key that you created in step 2

IaaS Ex – 4 connect to the server

- Wait for the server to be running
- Copy the DNS of the server in "Instance summary" → "Public IPv4 DNS"
- Connect to it via SSH from your computer:
  - Default user is ec2-user, so host name is ec2-user@DNS, example: ec2-user@ec2-35-159-10-38.eu-central-1.compute.amazonaws.com
  - Linux / Mac – via OpenSSH and the PEM file.
    - `chmod 400 /path/my-key-pair.pem`
    - `ssh -i /path/my-key-pair.pem ec2-user@ec2-35-159-10-38.eu-central-1.compute.amazonaws.com`
    - Details: https://docs.aws.amazon.com/AWSEC2/latest/UserGuide/AccessingInstancesLinux.html
  - Windows (Putty) with PPK file:
    - Host name, like: ec2-user@ec2-35-159-10-38.eu-central-1.compute.amazonaws.com
    - Connection → SSH → Auth → Browse to choose the PPK file
    - Save the connection for future use
    - Details: https://docs.aws.amazon.com/AWSEC2/latest/UserGuide/putty.html
- For issues: https://docs.aws.amazon.com/console/ec2/instances/connect/docs

IaaS Ex – 5 setup the server

< itc >

- Install Python 3 (Python 2 is installed)
  - sudo yum install python3
- Install git: sudo yum install git
- Configure git
  - `git config --global user.email "<emailAddress>"`
  - `git config --global user.name "<gitUserName>"`
- Clone the git repo:
  - git clone HTTPS_URL (get from Github repo → Code → Clone → HTTPS)
- Install modules from requirements.txt:
  - pip3 install --user -r requirements.txt

IaaS Ex – 6 Upload, download files, run program

- Upload file 1.csv to repo directory on server from your computer using SCP client
  - Windows – can use program like WinSCP / MobaXterm, details: https://docs.aws.amazon.com/AWSEC2/latest/UserGuide/putty.html
  - Linux / Mac – using scp:
    - scp -i /path/my-key-pair.pem /path/my-file.txt ec2-user@ec2-35-159-10-38.eu-central-1.compute.amazonaws.com:path/
    - Details: https://docs.aws.amazon.com/AWSEC2/latest/UserGuide/AccessingInstancesLinux.html
- Download file 2.csv from the web to the repo directory on server:

```
wget "https://docs.google.com/uc?export=download&id=1gqDsky3SVNSsflMCp0URu_0NwmmRpc6y" -O 2.csv
```

- Execute plus_one.py
  - python3 plus_one.py 1.csv
  - python3 plus_one.py 2.csv
- Download back to your computer the output files: output1.csv and output2.csv
  - Windows – can use program like WinSCP / MobaXterm
  - Linux / Mac – using scp:
    - scp -i /path/my-key-pair.pem ec2-user@ec2-35-159-10-38.eu-central-1.compute.amazonaws.com:path/my-file.txt /path/

Thank you!