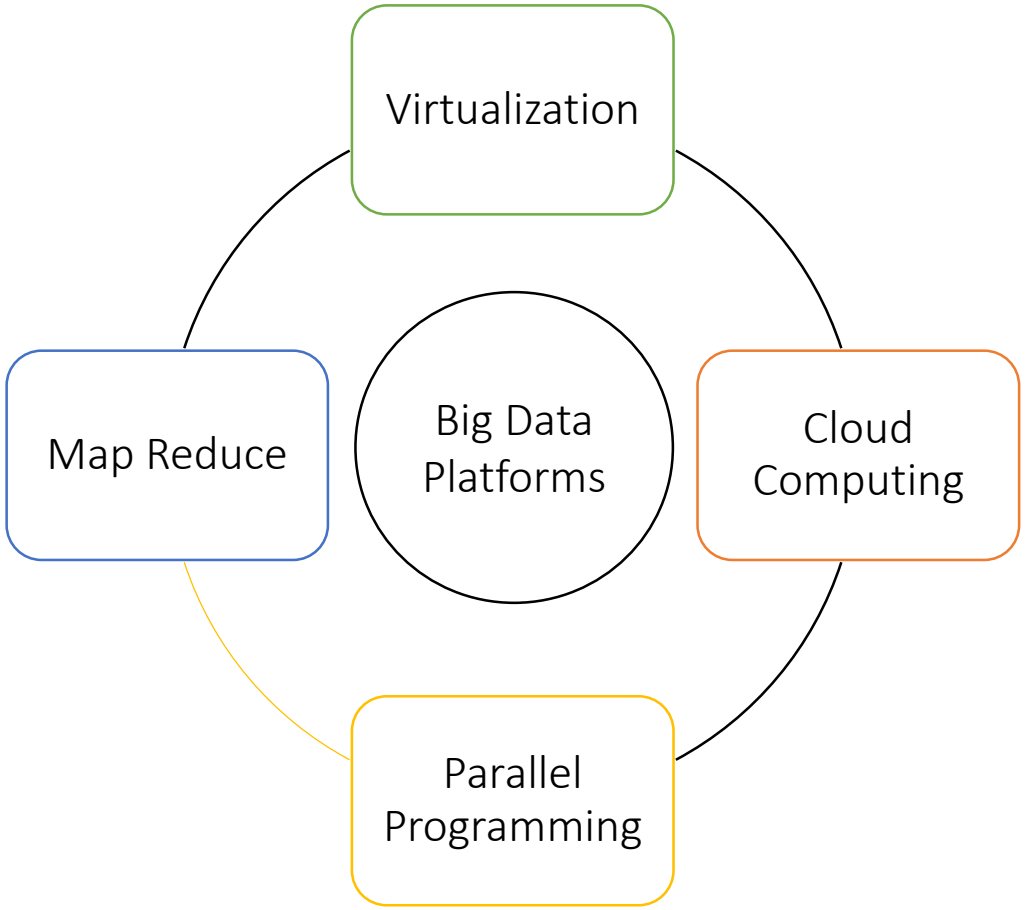
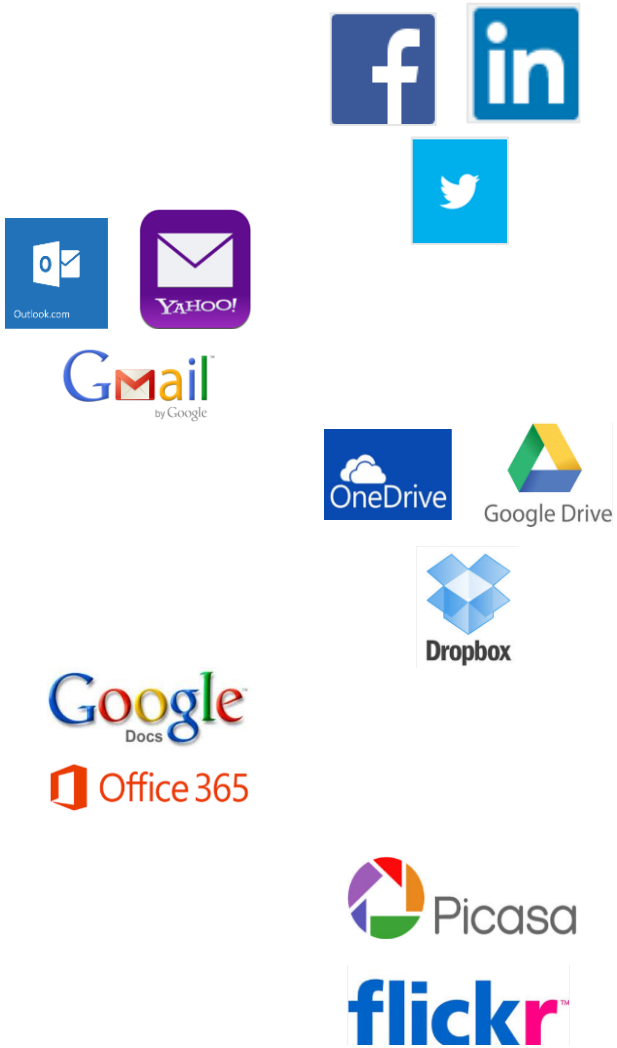
Big Data Platform Elements: Cloud Computing

Big Data Platform Elements



Cloud Computing

Have you used Applications Hosted on the Cloud?



What are some characteristics these applications have in common*?

- You typically sign up for service (free with ads, free trial, or subscription)
- You connect to the internet for access
- You don't need to "install" application software, and "version upgrades" are pushed seamlessly
- You expect reliable, on-demand, self-service of the application
- You expect ability to instantaneously upgrade (eg more storage, no ads, etc)
- You rely on the service provider for infrastructure (eg: you don't set up mail server)
- You rely on the service provider for security and privacy
- You rely on the service provider for backup and recovery

*Note: a lot of these services come with clients apps – we are not considering that scenario here.

What is Cloud Computing?

- “Cloud computing is a model for enabling convenient, on-demand network access to a shared pool of configurable computing resources (e.g., networks, servers, storage, applications, and services) that can be rapidly provisioned and released with minimal management effort or service provider interaction.
- Key enabling technologies include: (1) fast wide-area networks, (2) powerful, inexpensive server computers, and (3) high-performance virtualization for commodity hardware.”

http://www.intel.com/content/www/us/en/cloud-computing/cloud-101-video.html

Source: http://www.nist.gov/itl/cloud/

Deployment Models

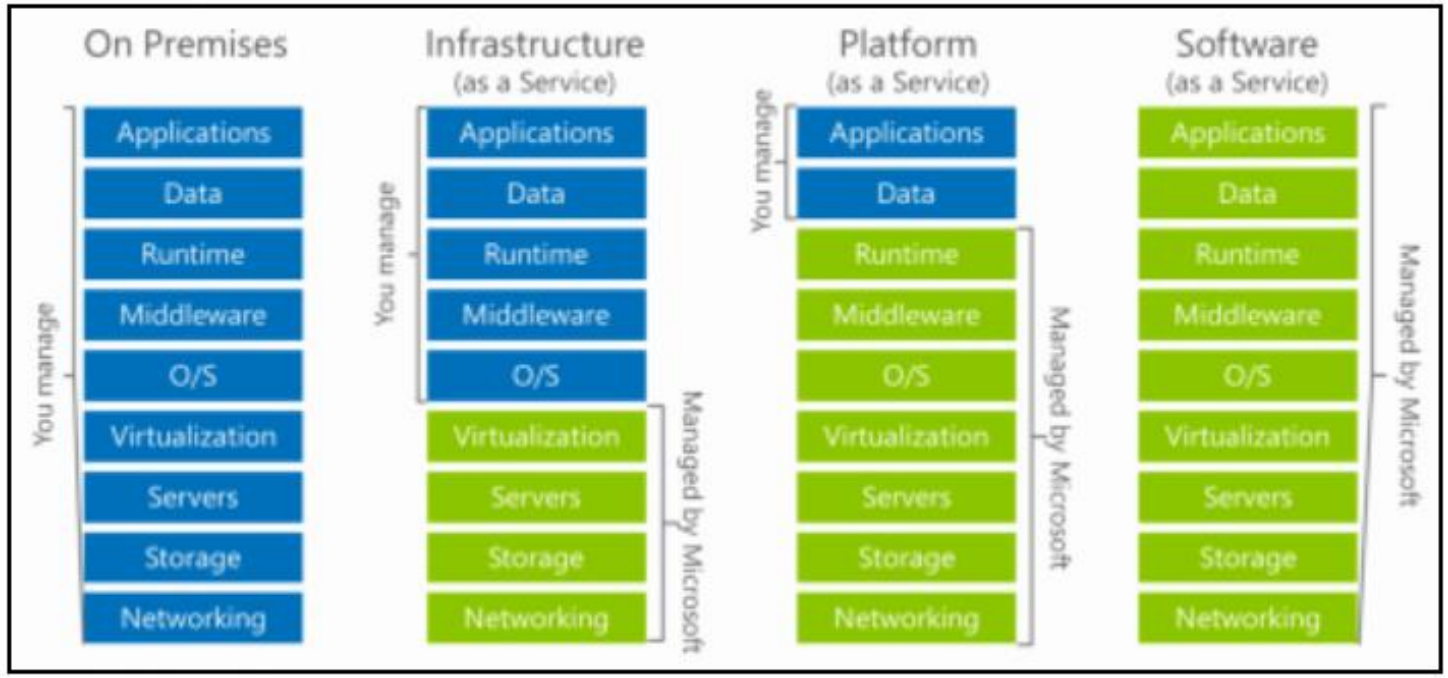
There are 3 basic deployment models in cloud computing:

- Private Cloud
  - Two kinds of private clouds:
    - On-Prem Private Cloud: On-Prem Data Center + Network Virtualization + Cloud Orchestration S/W
    - Externally Hosted Private Cloud (or Virtual Private Cloud): Logically isolated, user-defined, and user-controlled portion of a 3rd party hosted cloud (like AWS or Microsoft).
  - Provides high degree of Control
  - Good for highly-sensitive data and applications
- Public Cloud
  - Third-Party Provides Cloud Services (3 different service models - IaaS, PaaS, or SaaS)
  - Typically pay-as-you-go model (you pay for what you use)
  - Service Provider held to agreed upon availability, reliability, privacy and security standards
  - Provides high degree of Scalability
  - Example: Amazon AWS, Microsoft Azure, Google Cloud
- Hybrid Cloud
  - Combination of Private and Public Cloud
  - Allows you to pick desired level of Control vs Scalability

Four Service Models

(based on what parts of the stack the User controls vs what the Cloud Provider manages)

- **Private**: User controls everything from the networking to the applications. Example: user's on-premise datacenter.
- **IaaS**: User controls the application down to the underlying OS, and the Cloud Provider manages the virtualization layer and the hardware. Example: getting a virtual server in the cloud.
- **PaaS**: User controls application and data, and the Cloud Provider provisions the underlying supporting infrastructure, typically including operating system, programming-language execution environment, database, and web servers. This allows developers to focus on application development instead of worrying about underlying hardware and software layers.
- **SaaS**: User gains access to application software and databases. Cloud providers install and operate application software, and manage the infrastructure and platforms that run the applications. Example: O365 in the cloud.



Note: "Managed by Microsoft" is just an example – it's essentially cloud provider of your choice…

Reference: https://en.wikipedia.org/wiki/Cloud_computing

Image Source: http://cloudcomputing.sys-con.com/node/2932264

Key Characteristics

- On-demand self-service:

  A consumer can provision computing capabilities, as needed automatically without requiring human interaction with each service provider.

- Device and location independence:

  Users can access service using a web browser regardless of location or device used (e.g., PC, mobile phone).

- Resource pooling:

  Computing resources are pooled to serve multiple consumers, with different physical and virtual resources dynamically assigned and reassigned according to consumer demand.

- Scalability and elasticity:

  Dynamic on-demand provisioning of resources on a fine-grained, self-service basis in near real-time without users having to engineer for peak loads.

- Measured service:

  Resource usage can be monitored, controlled, and reported, providing transparency for both the provider and consumer of the utilized service.

Reference: *http://www.nist.gov/itl/cloud/* *and* *https://en.wikipedia.org/wiki/Cloud_computing*

Advantages and Risks

- Advantages
  - Scalability and elasticity by design (dynamic on-demand provisioning of resources)
  - Convenience by design (device and location independence)
  - Continuous Availability by design (on-demand self-service)
  - Improved Reliability due to use of multiple redundant sites
  - Faster Deployment since infrastructure set up is quick, and software integration is easier
  - Cost Reduction due to savings on sunk cost of infrastructure, licenses, and maintenance

- Risks
  - Limited Control over infrastructure, software, and data
  - Security and Privacy of data is at the mercy of the Service Provider
  - Dependency on the Provider can lead to vendor lock-in and migration challenges
  - Downtime of service can occur due to Service Provider outage or network access issues

Reference: https://en.wikipedia.org/wiki/Cloud_computing

Summary

- *"Cloud computing is a model for enabling convenient, on-demand network access to a shared pool of configurable computing resources (e.g., networks, servers, storage, applications, and services) that can be rapidly provisioned and released with minimal management effort or service provider interaction."*
  - Three Deployment Models: Private, Public, Hybrid.
  - Four Service Models: Private, IaaS, PaaS, SaaS.
  - There are Advantages and Risks involved in Cloud Computing that one must be aware.

- Spend a 5-10 minutes on each of these Sites: Amazon AWS, Microsoft Azure, Google Cloud
  - Do you now see a number of familiar terms on these sites?
  - What deployment models do they cover?
  - What service models do they cover?
  - Note how they all have very similar competing offers (including free trials to improve adoption).