CLOUD COMPUTING APPLICATIONS
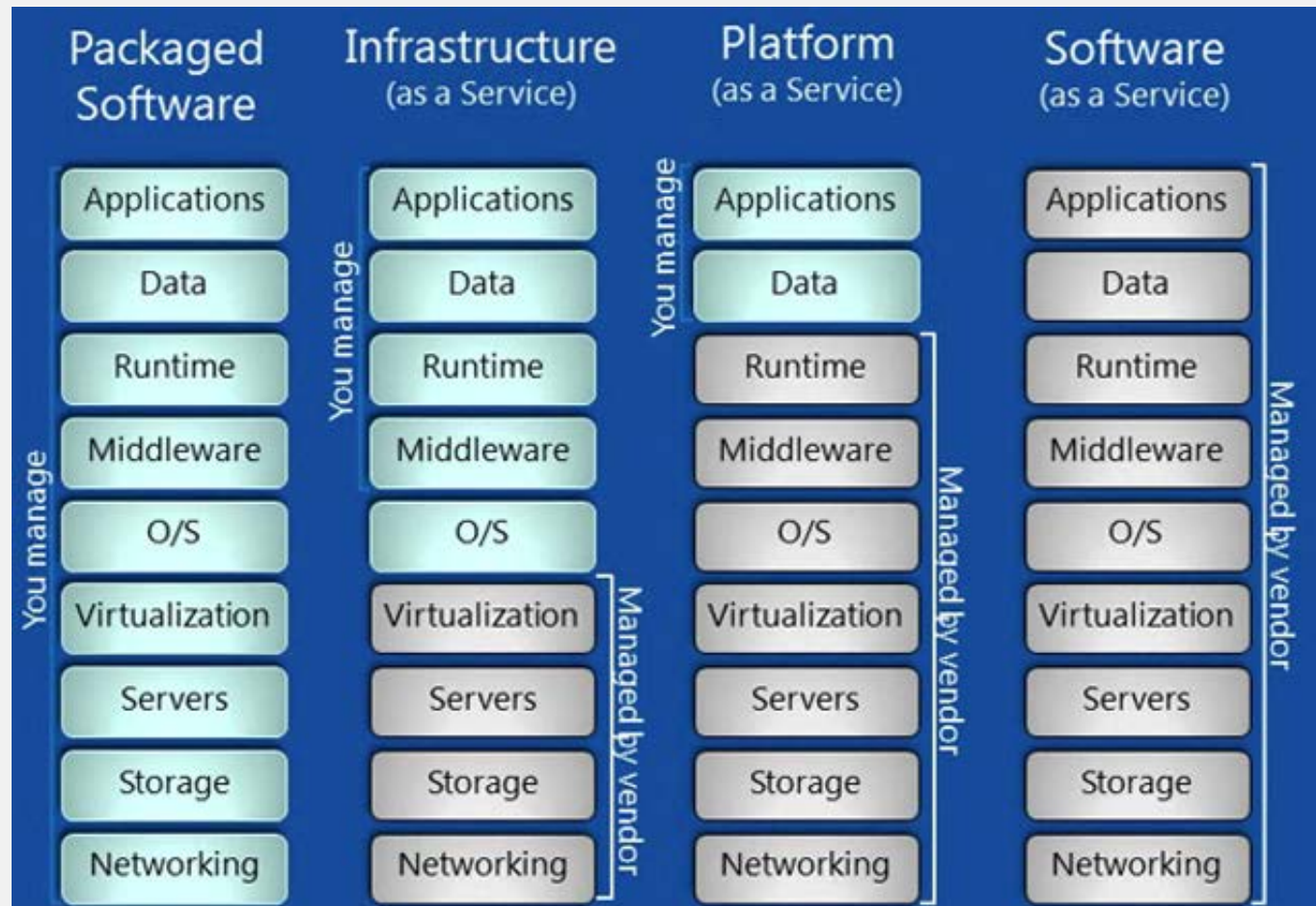
CLOUD SERVICES

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Objective

- Compare IaaS, PaaS, and SaaS

- Look at what services major Cloud companies provide and how they provide them

IaaS, PaaS, and SaaS Comparison

Cloud Fundamentals

- Infrastructure as a Service (IaaS): basic compute and storage resources
  - On-demand servers
  - Amazon EC2, VMWare, vCloud

- Platform as a Service (PaaS): Cloud application infrastructure
  - On-demand application-hosting environment
  - For example, Google AppEngine, Salesforce.com, Windows Azure, Amazon

- Software as a Service (SaaS): Cloud applications
  - On-demand applications
  - For example, GMail, Microsoft Office Web Companions

Platform as a Service (PaaS)

- PaaS is a Cloud computing service that offers a platform for users to run applications on the Cloud

- PaaS is a level above IaaS because unlike IaaS, PaaS does not require users to develop their own operating system environment

Platform as a Service (PaaS)

- Middle ground between SaaS and IaaS

- Development platform
  - Customers use it to develop applications that benefit from the scalability of the Cloud without fully developing their own solution using an IaaS provider

- Offers an application development platform that will automatically scale with demand

The Benefits of the Cloud

The Cloud is about cheap, on-demand capacity

✓ = Managed for You	Standalone Servers	IaaS	PaaS	SaaS
Applications	✗	✗	✗	✓
Runtimes	✗	✗	✓	✓
Database	✗	✗	✓	✓
Operating system	✗	✗	✓	✓
Virtualization	✗	✓	✓	✓
Server	✗	✓	✓	✓
Storage	✗	✓	✓	✓
Networking	✗	✓	✓	✓

Platform as a Service (PaaS)

Official definition of PaaS from NIST standard

"The capability provided to the consumer is to deploy, onto the Cloud infrastructure, consumer-created or acquired applications created using programming languages, libraries, services, and tools supported by the provider. The consumer does not manage or control the underlying Cloud infrastructure, including network, servers, operating systems, or storage, but has control over the deployed applications and possibly configuration settings for the application-hosting environment."

Example: Google

PaaS

Runtime environment,
database, development
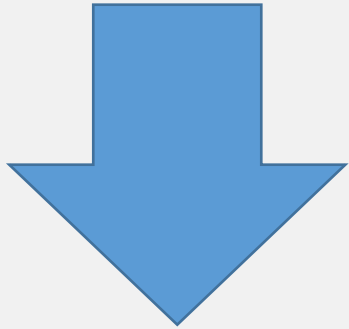
Google
App
Engine
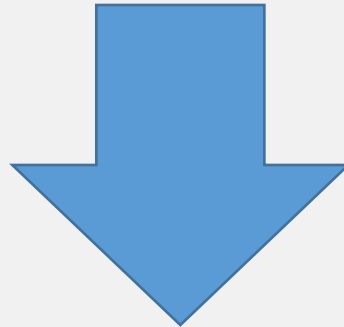
Amazon

AWS, EC2

Example: Windows Azure

- PaaS
  - Application platform in the Cloud
- Provides
  - *Compute*
    - Web, worker, and VM role
  - *Storage*
    - Blob, Table, Queue, and Azure SQL server
  - *Application fabric*
    - Service bus, access control
    - Future: cache, integration, and composite

More Cost Effective

- PaaS can be better for costs than IaaS, because systems are optimized to run applications efficiently

- IaaS may only provide hardware, and thus, clients must be in charge of load balancing and networking

Multi-tenancy

- PaaS is better suited for **multi-tenancy** because the PaaS provider optimizes its infrastructure for use by many providers

- Multi-tenancy means that many users may share the same physical computer and database

Multi-tenancy

- PaaS is better suited for multi-tenancy than an IaaS because an IaaS may (1) provide each user with his own virtual machine and (2) create a clear separation of resources

- However, in a PaaS, users may share the same machine, database, etc.

Vendor Lock-in

- PaaS may lock in applications by requiring users to develop apps using proprietary interfaces and languages

- This means that it may be difficult for users to go to another vendor to host their app

- Businesses may risk their future on the dependability of the PaaS

Development Tools

- Often, a PaaS will offer browser-based development tools

- In this way, developers can create their own applications online

- Ease of deployment: the platform takes care of the scaling for you

Principles of Software Development

- As a developer, your objective is to create an application in the quickest, most effective way possible

- You should not create applications using convoluted methods that may take a long time to complete

- The user only sees the end product, not the development process

PaaS vs. IaaS

- When you use the Cloud, remember that your decisions have long-term consequences

- If you choose to use a PaaS and get your application vendor locked in, then your business may fail if the PaaS greatly increases the vendor's prices

- You will not be able to move to another Cloud since your app cannot be easily migrated to somewhere else

PaaS vs. IaaS

- An app that is used to fulfill a temporary need may be handled by a PaaS solution

- An app that needs to be deployed quickly may be faster developed by a PaaS

- If your software team is small, it may be better to develop a PaaS and let the PaaS provider handle the OS and networking for your team