Cloud Services I Cloud Concepts

Overview

- Cloud computing: definition
- On premise vs in the cloud
- The big 5
- Benefits, pros & cons
- Characteristics
- Service models (IaaS, PaaS and SaaS)
- Deployment models (Private, Public, Hybrid)
- Architecture
- Security and privacy

Goals 1/2

The **junior-colleague**
- can define the term "cloud computing" including its three parts.
- can explain the term "server provisioning".
- can differentiate between user perspective and back end.
- can identify and describe the differences between on-premise and cloud.
- can recall at least 4 big cloud service providers.
- can explain at least 5 (potential) benefits of using the cloud.
- can explain Pros and Cons of cloud of 4 aspects.
- can explain the five essential characteristics of cloud computing.
- can describe the difference between elasticity and scalability.
- can reason the benefit of scaling via a graph.
- can describe the difference between vertical and horizontal scaling.
- can describe the difference between pets and cattle in a cloud setting.
- can link pets and cattle to different scaling methods.
- can describe the differences cloud service models.
- can link existing cloud services to the correct service model.

Goals 2/2

The **junior-colleague**

- can link different persons and their role to the correct service model.
- can describe and distinguish the differences cloud deployment models.
- can describe the cloud architecture.
- understands and can explain different security and privacy issues.

How would you define cloud computing?

Definition

Cloud computing is **shared pools of configurable computer system resources** and **higher-level services** that can be **rapidly provisioned** with minimal management effort, often over the Internet. - *Wikipedia*

Shared pools of conf. comp. sys. resources

AWS eu-central-1

Source: https://www.nilsjuenemann.de/2014/07/04/new-aws-region-eu-central-in-germany/

It's not magic…

There is no cloud
it's just someone else's computer
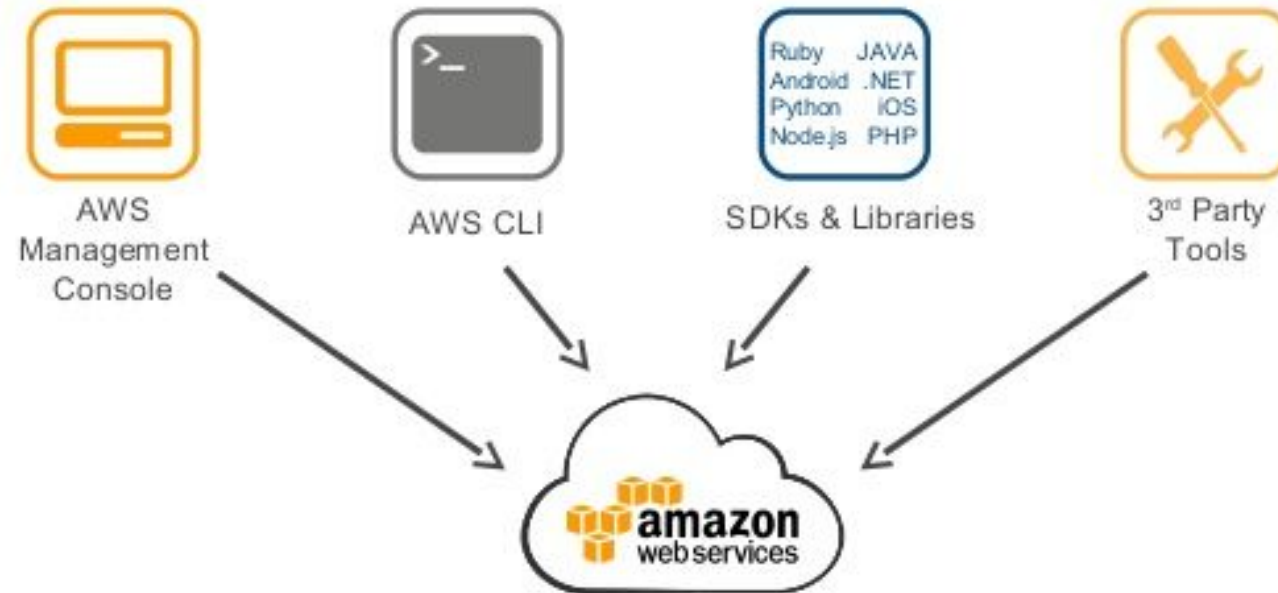
Higher-level services...

Explore Our Products

AWS products

Rapidly provisioned

AWS Resource Provisioning and Management

Provisioning and Management of AWS resources is completely self-service using the AWS API

AWS Management Console   AWS CLI   SDKs & Libraries   3rd Party Tools

Ruby   JAVA
Android   .NET
Python   iOS
Node.js   PHP

amazon web services

→ Provisioning

provision

/prəˈvɪʒ(ə)n/ 🔊

verb

gerund or present participle: **provisioning**

1. supply with food, drink, or equipment, especially for a journey.
   "civilian contractors were responsible for provisioning these armies"

Source: https://www.google.com/search?q=provisioning

Definition of: server provisioning

server provisioning

Setting up a server for use in the network. It may refer to installing the operating system and other system software, as well as making adjustments in the software control panels, or it may refer to assigning an already-configured server to a particular customer. See provision.

∧Top

Source: https://www.pcmag.com/encyclopedia/term/60750/server-provisioning
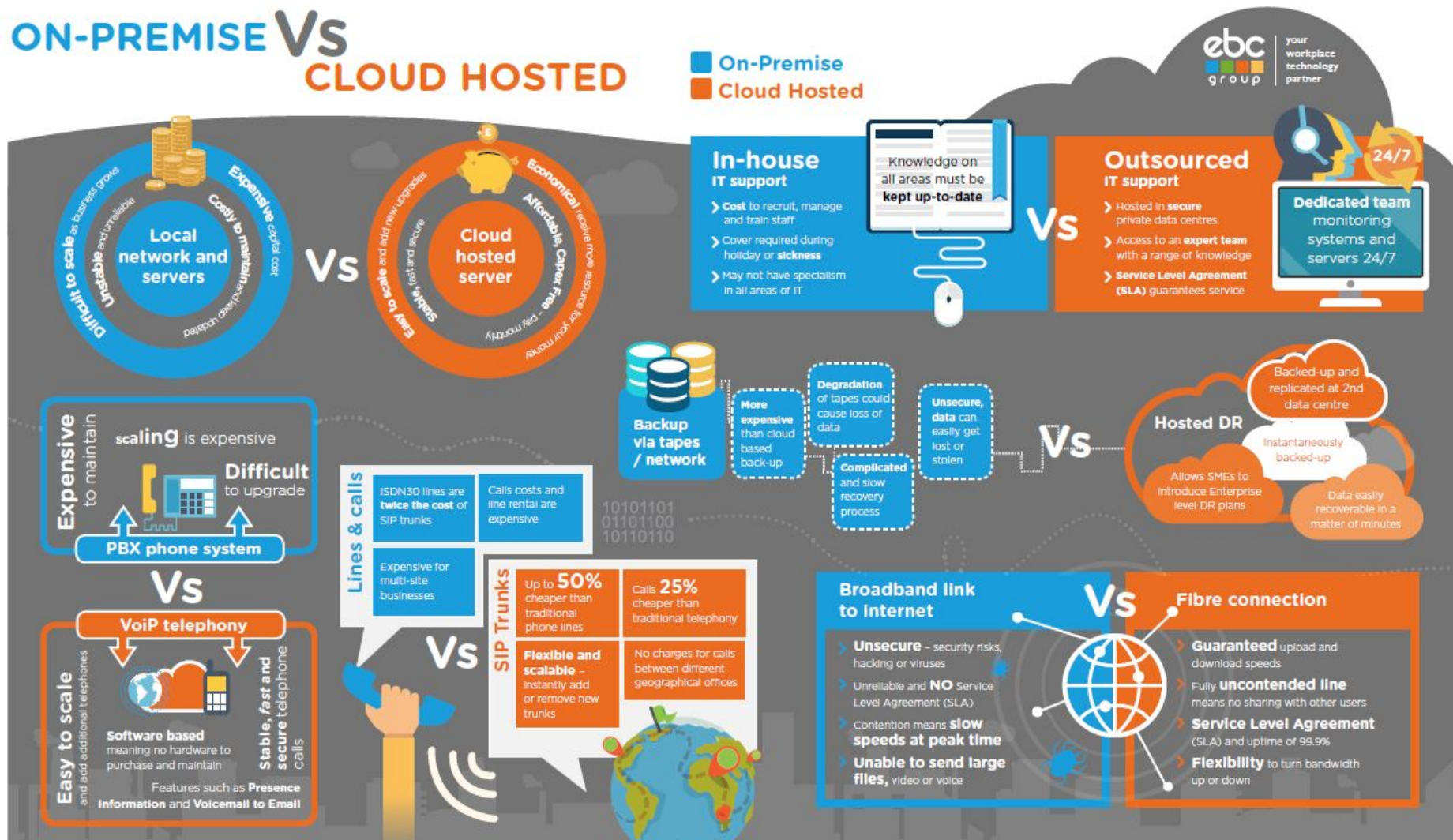
User perspective vs back end
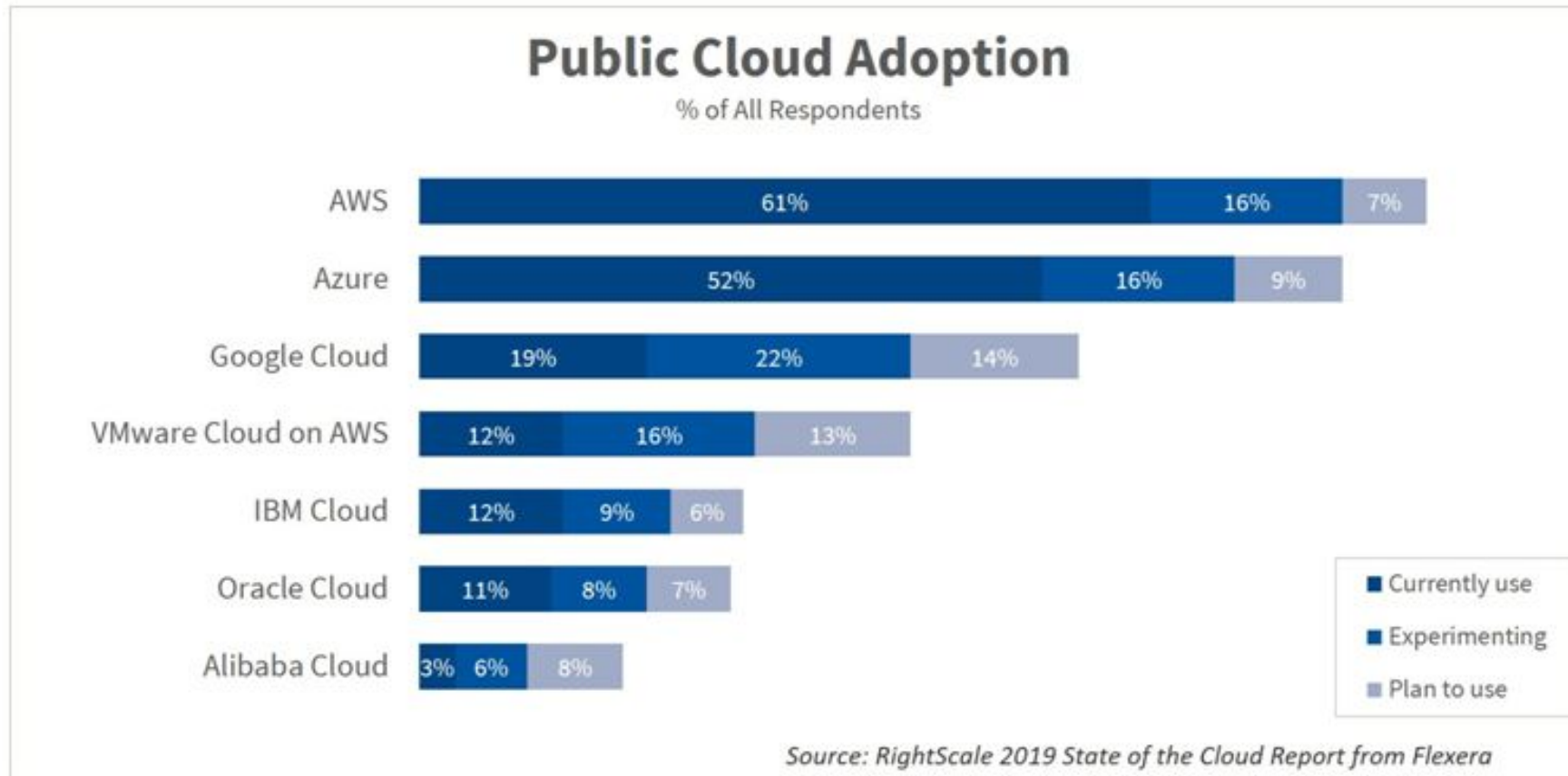
It depends case by case!

From the user's perspective, this model requires **minimal management** and interaction with IT staff, streamlined provisioning processes, and provides **dramatic cost savings** over traditional IT [Calheiros09].

On the back end, cloud computing requires the establishment of complex networking, storage, and server configurations that optimally are configured to be self-monitoring and self-healing.
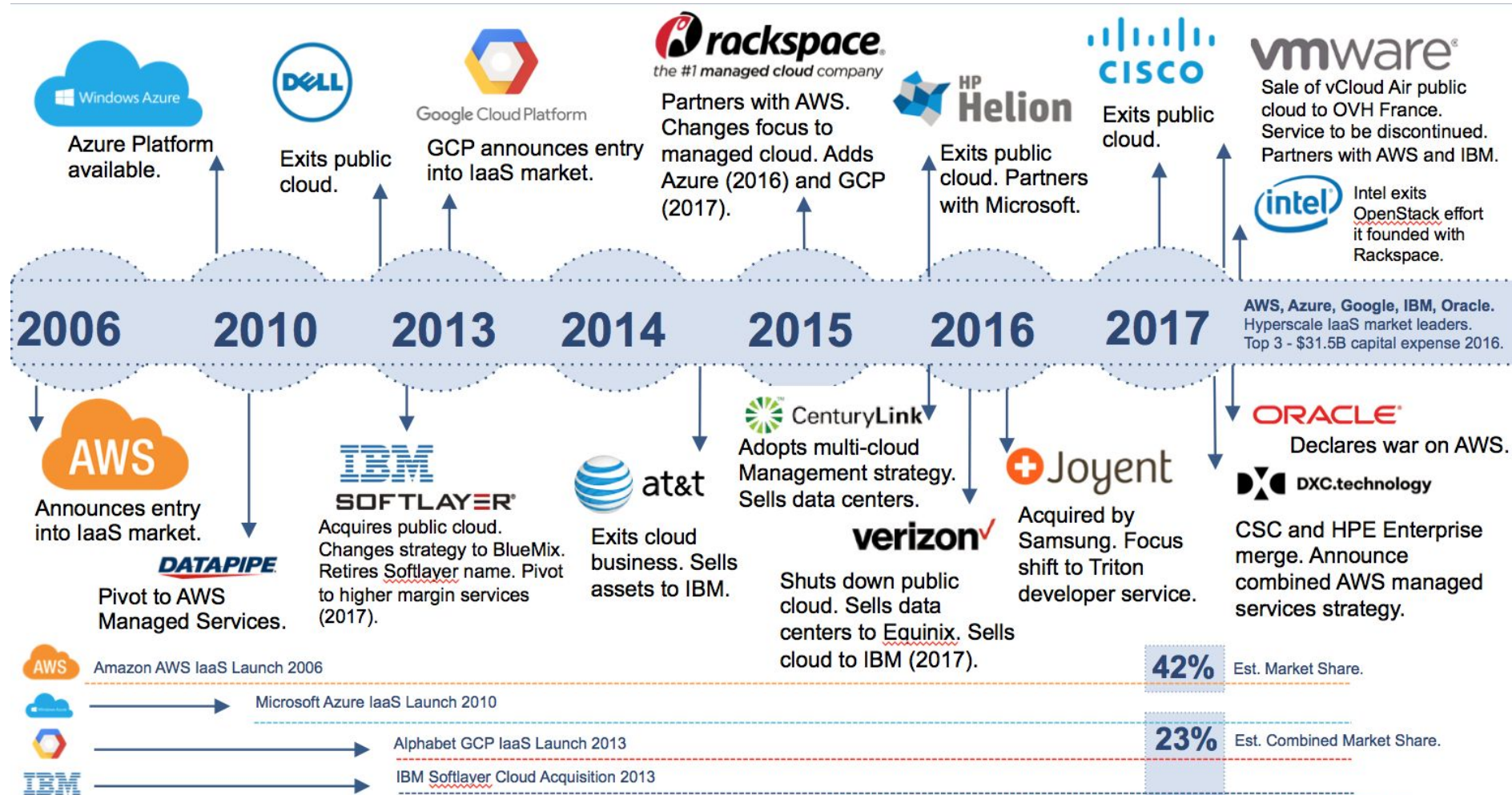
The difference…

The big 5...

Public Cloud Adoption
% of All Respondents

	Currently use	Experimenting	Plan to use
AWS	61%	16%	7%
Azure	52%	16%	9%
Google Cloud	19%	22%	14%
VMware Cloud on AWS	12%	16%	13%
IBM Cloud	12%	9%	6%
Oracle Cloud	11%	8%	7%
Alibaba Cloud	3%	6%	8%

Source: RightScale 2019 State of the Cloud Report from Flexera

The last 14 years... (Just for information.)

Source: https://medium.com/@dougpollei/there-can-be-only-one-37667ff80647

Five essential characteristics (Defined by NIST)
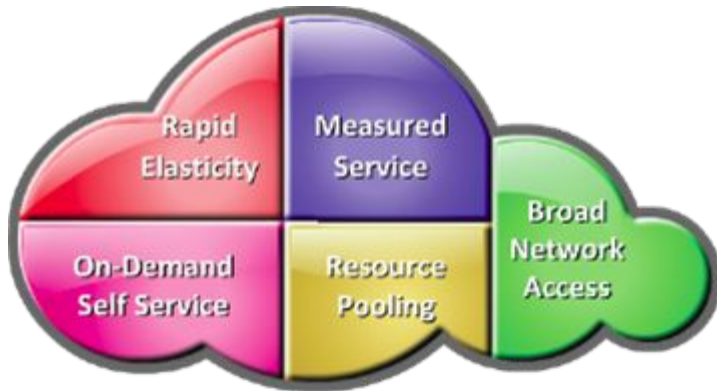
- On-demand self-service
- Broad network access
- Resource pooling
- Rapid elasticity
- Measured service

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On-demand self-service

The users can access the services from anywhere, anytime, and any location. This will increase the availability of cloud computing services.
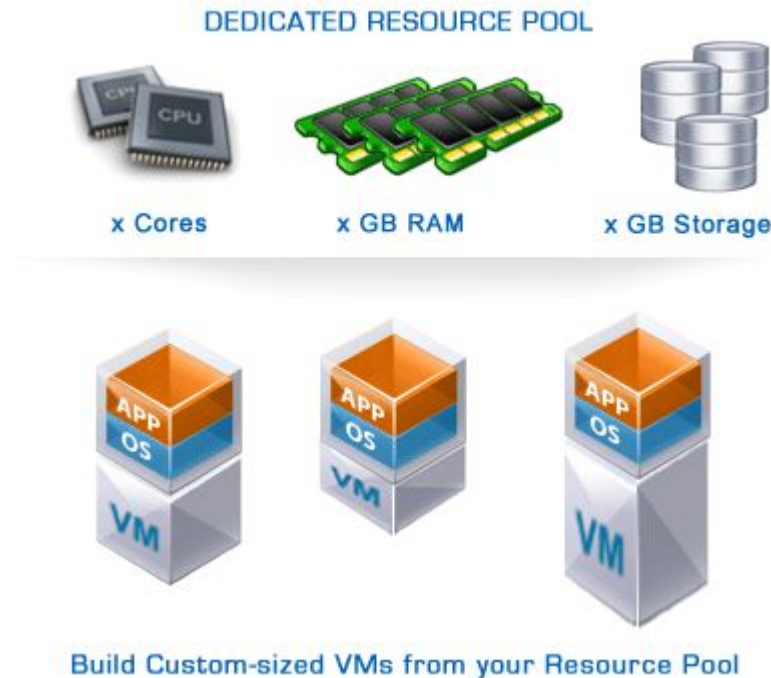
Broad network access

The client can access the services from any device (e.g. smartphone, tablet, laptop, or desktop computer) over the internet.

→ Regions

Choose a datacenter close to the most end-users for lower network latency.

Resource pooling

DEDICATED RESOURCE POOL

x Cores   x GB RAM   x GB Storage

Build Custom-sized VMs from your Resource Pool

The Cloud computing provider has to invest its money in proper hardware, configuration, and maintenance. The provider has to keep an eye on physical infrastructure usage.
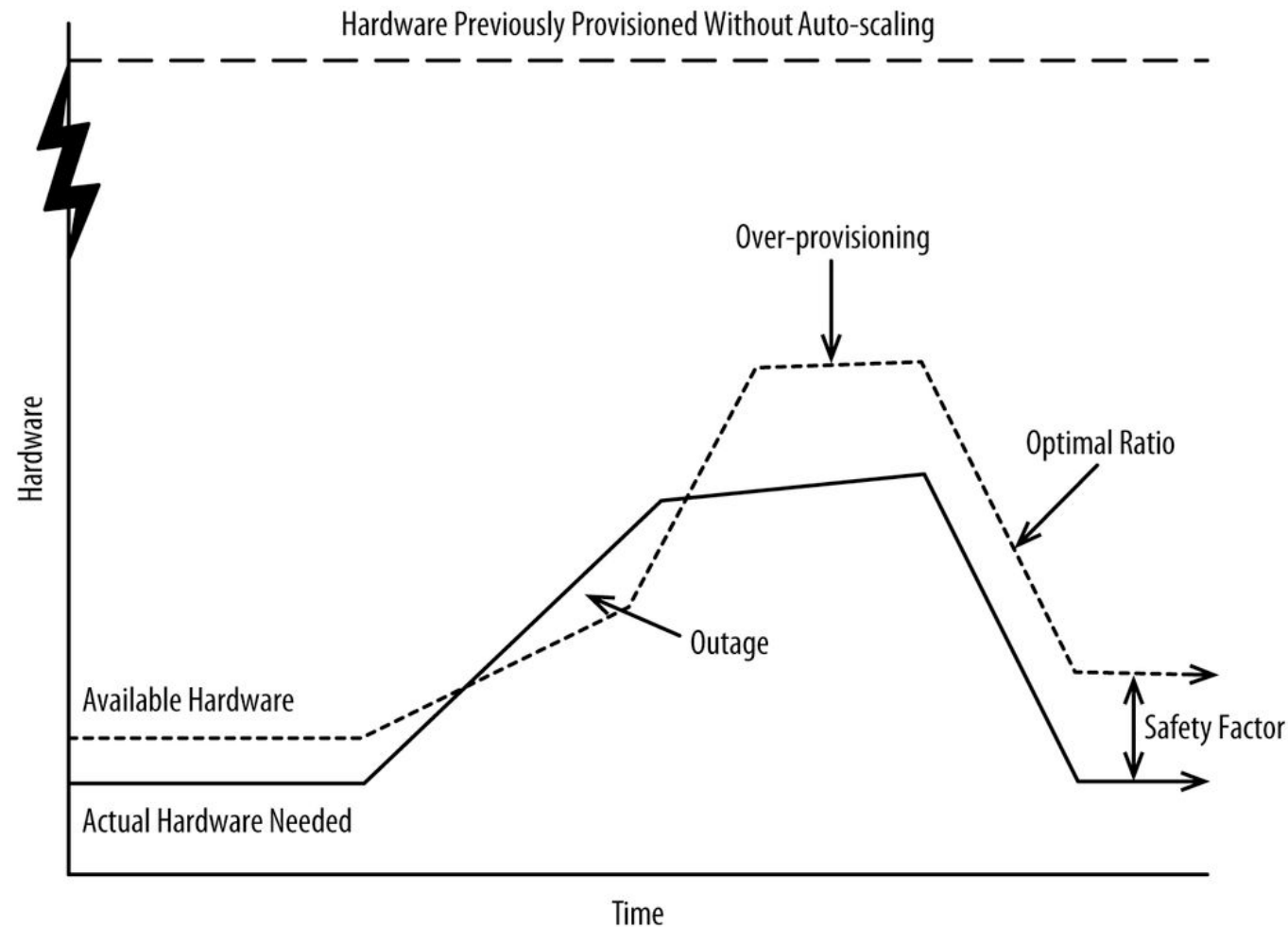
Rapid elasticity

Capabilities can be elastically provisioned and released, in some   cases automatically, to scale rapidly outward and inward commensurate with demand. To the consumer, the capabilities available for provisioning often appear to be unlimited and can be appropriated in any quantity at any time.

→ Elasticity v.s. scalability (used interchangeably)

Elasticity in cloud infrastructure involves **enabling the hypervisor to create virtual machines or containers with the resources to meet the real-time demand**.

Scalability often is discussed at the application layer, highlighting **capability of a system, network or process to handle a growing amount of work**, or its potential to be enlarged in order to accommodate that growth.

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→ Why scaling? (important!)

Hardware Previously Provisioned Without Auto-scaling

Over-provisioning

Optimal Ratio

Outage

Available Hardware

Safety Factor

Actual Hardware Needed

Hardware

Time

→ Vertically vs horizontally scaling (important!)

Scale vertically or scale-up/down: This type of scalability can work with any application to a limited degree. Scaling up would be accomplished by **moving the application to a bigger virtual machine or by resizing the VM**.

Scale horizontally or scale-in/out: **Provisioning more instances of the application tiers on additional virtual machines and then dividing the load between them.**

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→ Vertically vs horizontally scaling (important!)

"Pets vs Cattle"

Scale Up
- Servers are like pets.
Pets are given names, are unique, lovingly hand raised and cared for. When they get ill, you nurse them back to health

Scale Out
- Servers are like cattle.
Cattle are given numbers and are almost identical to each other. When they get ill, you get another one.

> "Future application architectures should use Cattle but Pets with strong configuration management are viable and still needed"
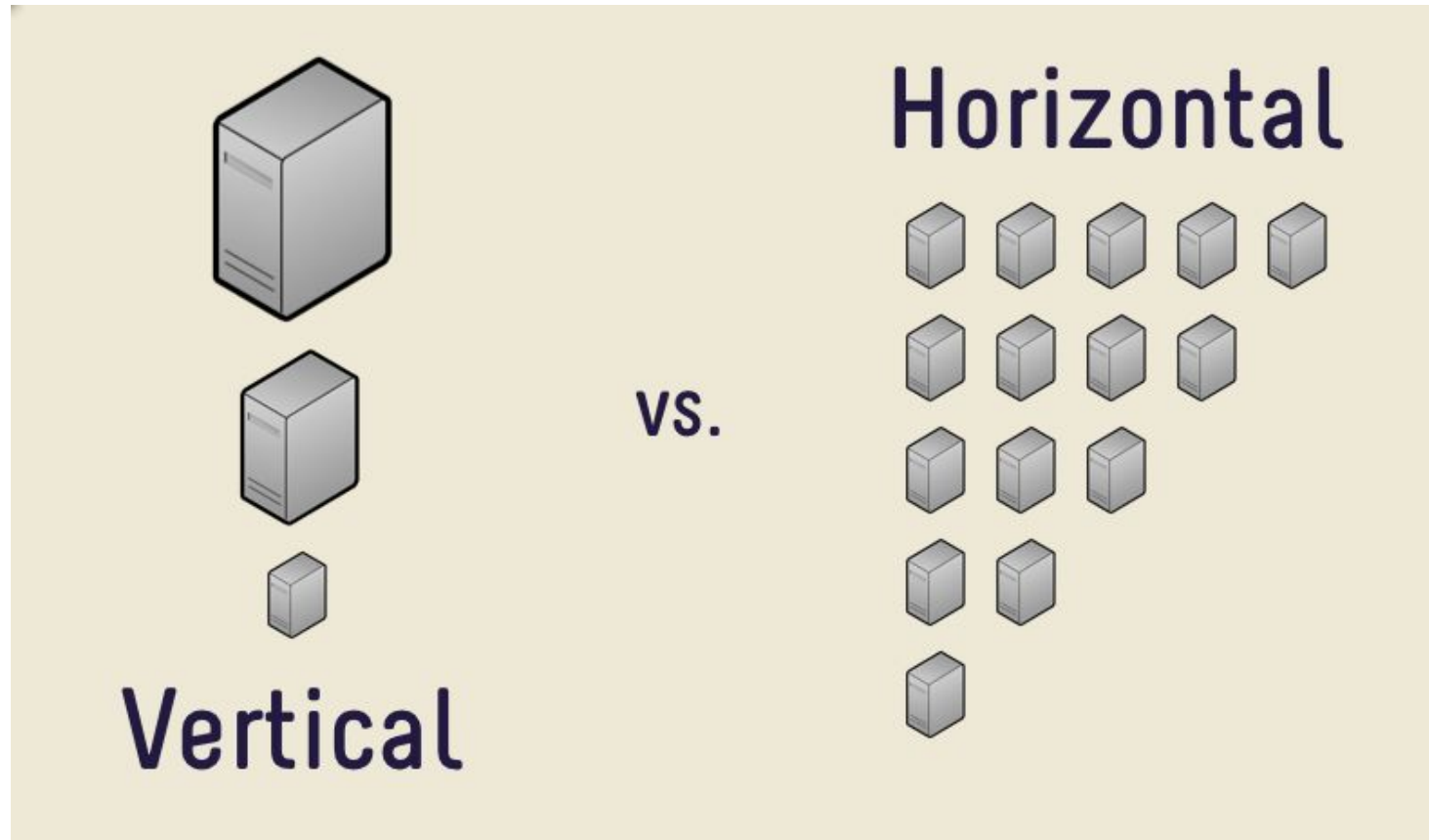> - Tim Bell, CERN

The above adapted from Tim Bell, CERN
http://www.slideshare.net/noggin143/20121017-openstack-cern-accelerating-cience

Source: https://cohesive.net/2017/10/5-concepts-to-truly-understand-cloud-computing.html

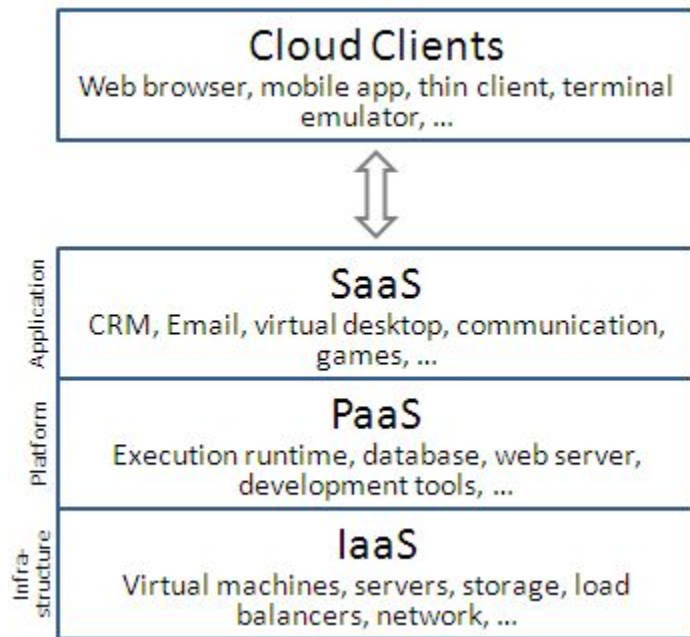# → Vertically vs horizontally scaling (important!)

Measured Service

Mostly, Cloud computing services will come with monthly subscription and usage fees. Cloud service providers will charge by usage of measured resources, like disk space and processing capability, with respect to time. Providers use **monitoring** to measure the resources. Monitoring can also be a service.
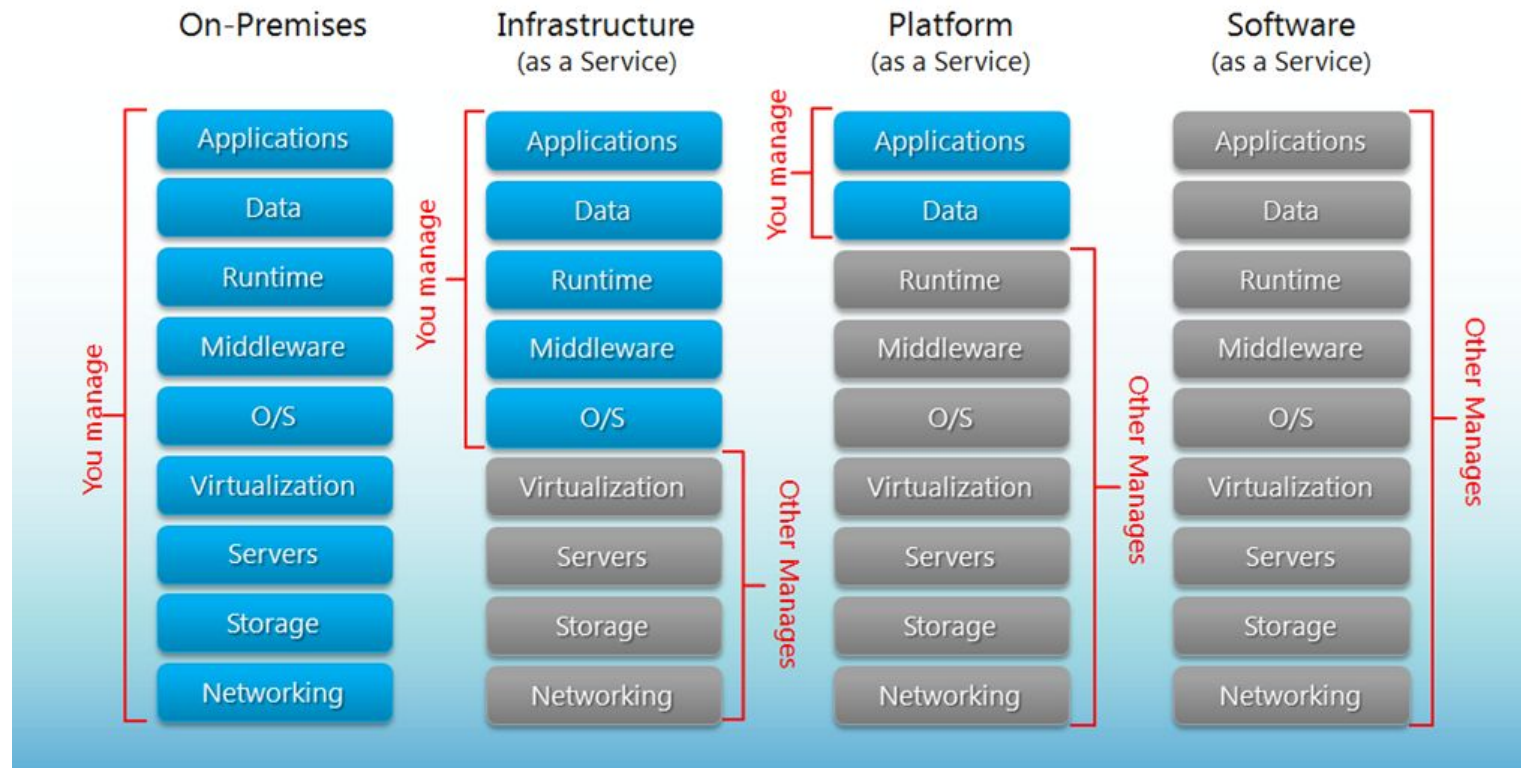
Service models (Service-Oriented Architecture)

Cloud Clients
Web browser, mobile app, thin client, terminal emulator, ...

Application

SaaS
CRM, Email, virtual desktop, communication, games, ...

Platform

PaaS
Execution runtime, database, web server, development tools, ...

Infra-structure

IaaS
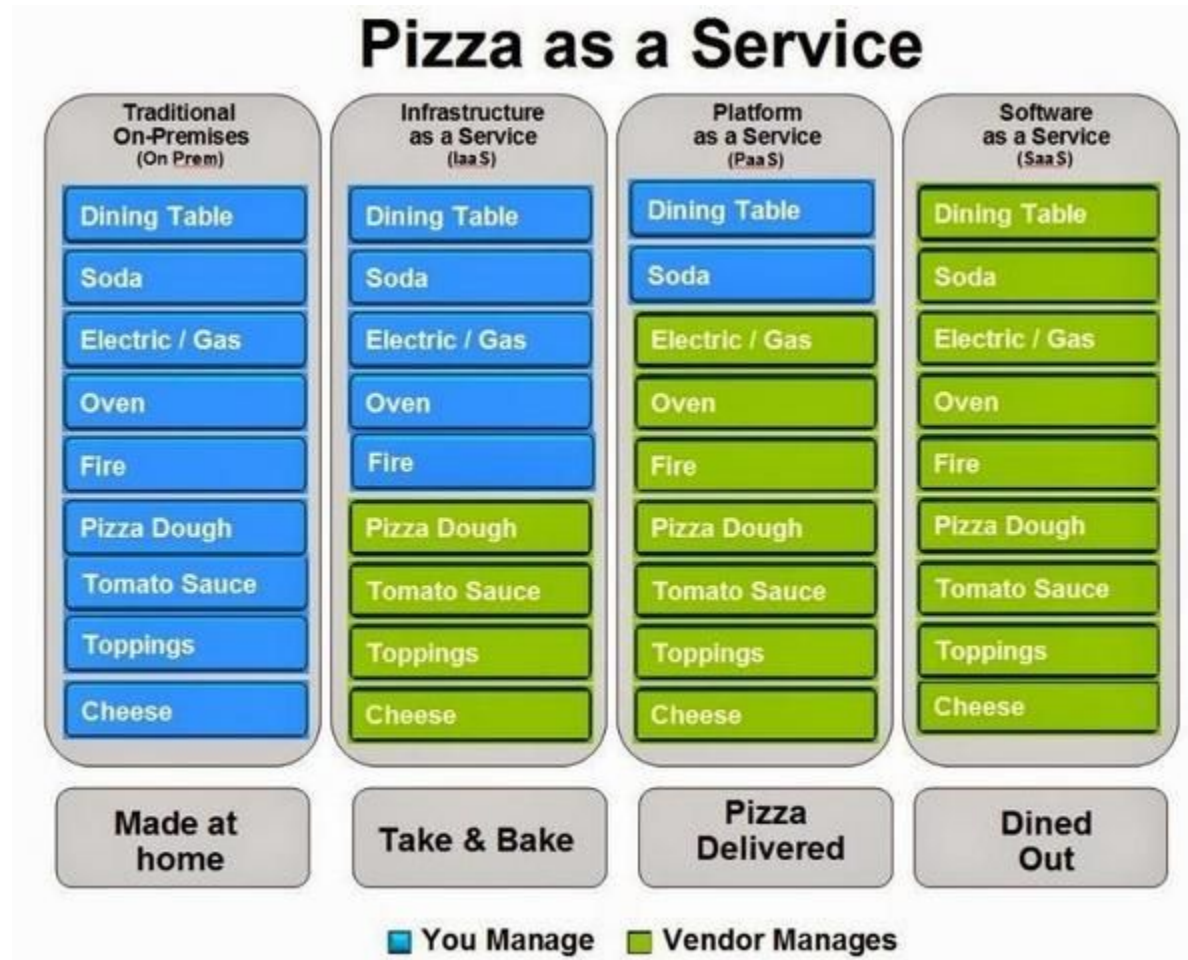Virtual machines, servers, storage, load balancers, network, ...

These models offer **increasing abstraction**; but these need not be related. For example, one can provide SaaS implemented on physical machines (bare metal), without using underlying PaaS or IaaS layers, and conversely one can run a program on IaaS and access it directly, without wrapping it as SaaS.

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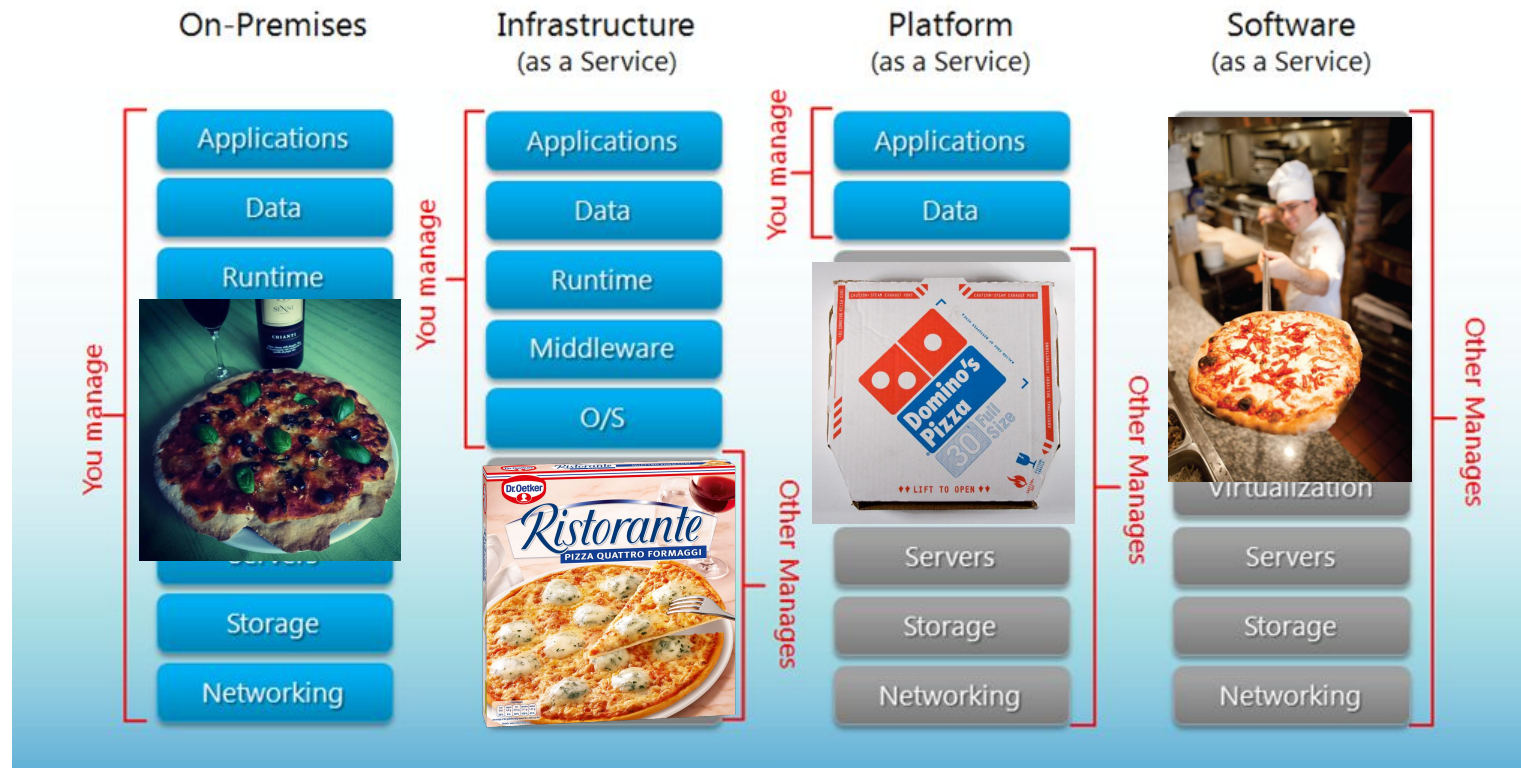# Service models (Service-Oriented Architecture)

Separation of Responsibilities

Service models (Service-Oriented Architecture)

Source: https://pbs.twimg.com/media/BuNBBsqIcAEDeoU.jpg
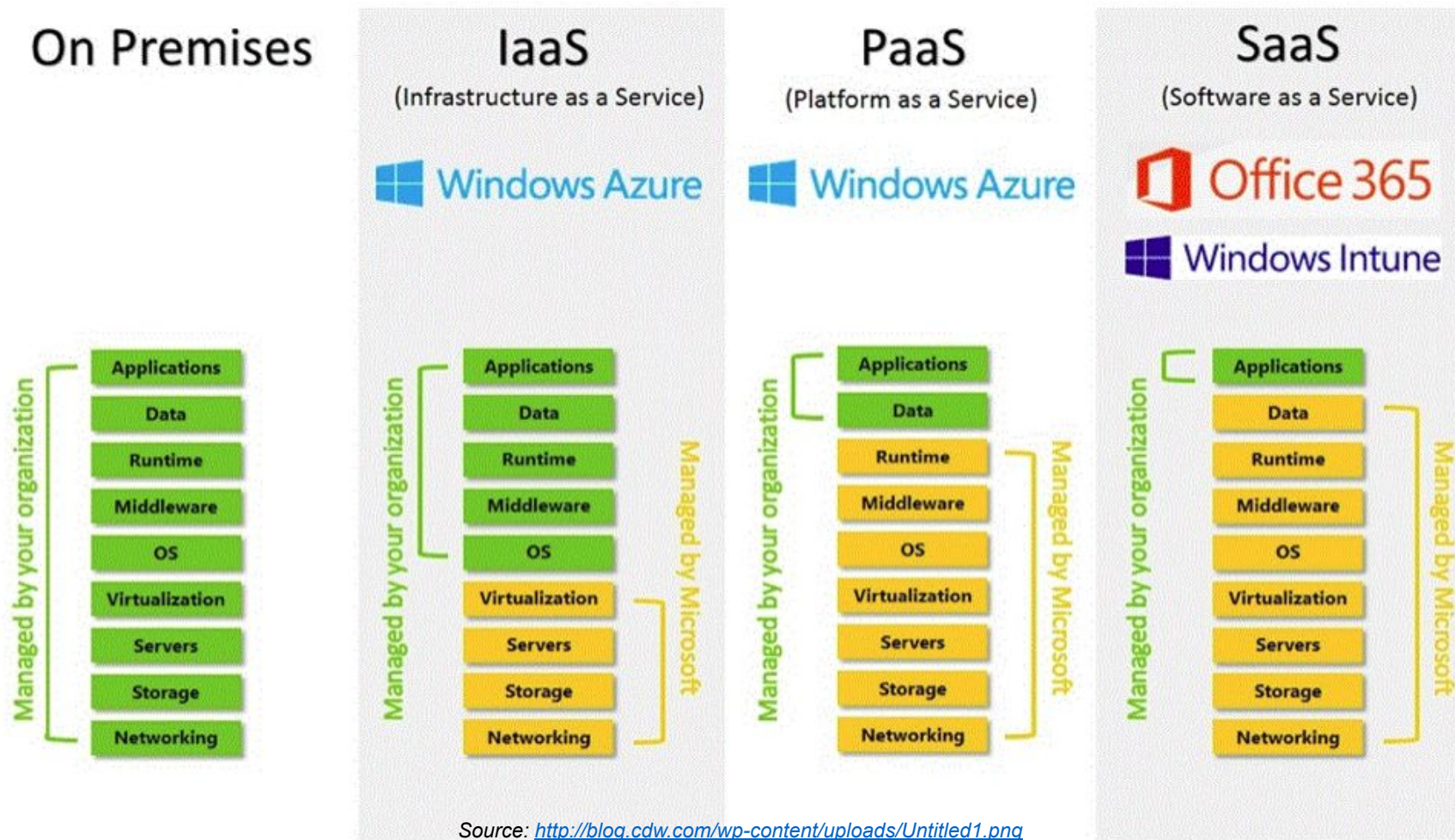
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Separation of Responsibilities

Service models (Service-Oriented Architecture)

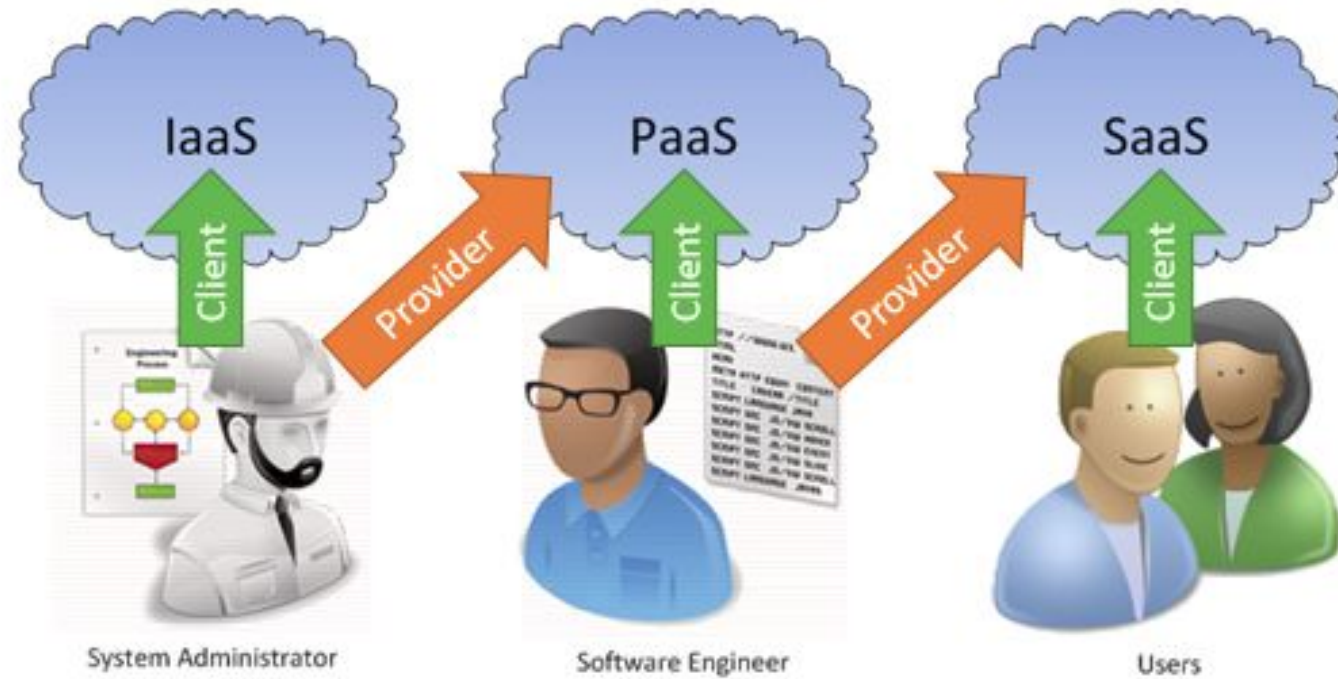Source: http://blog.cdw.com/wp-content/uploads/Untitled1.png

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Service models (Service-Oriented Architecture)

SERVICE is the key
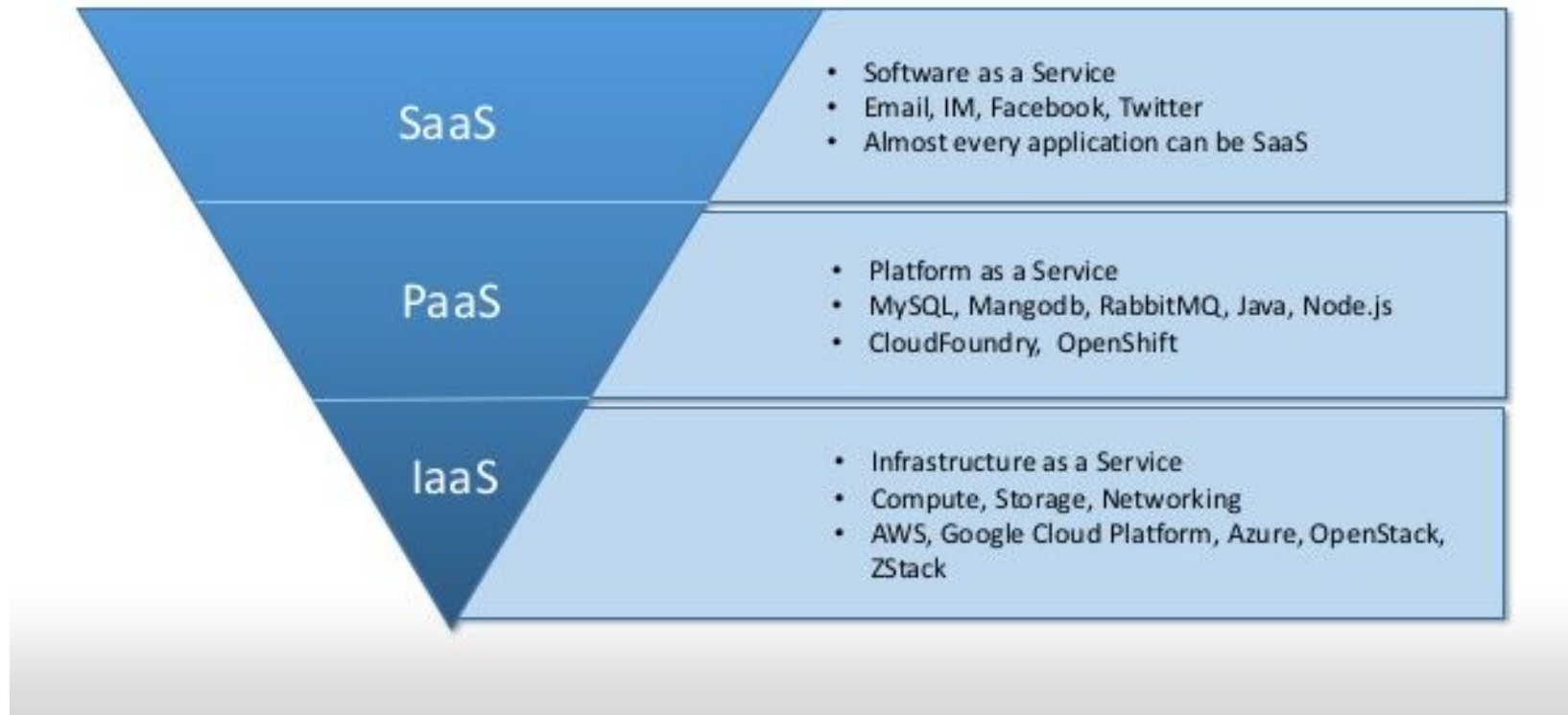
SaaS	• Software as a Service • Email, IM, Facebook, Twitter • Almost every application can be SaaS
PaaS	• Platform as a Service • MySQL, Mangodb, RabbitMQ, Java, Node.js • CloudFoundry, OpenShift
IaaS	• Infrastructure as a Service • Compute, Storage, Networking • AWS, Google Cloud Platform, Azure, OpenStack, ZStack

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Service models (Service-Oriented Architecture)

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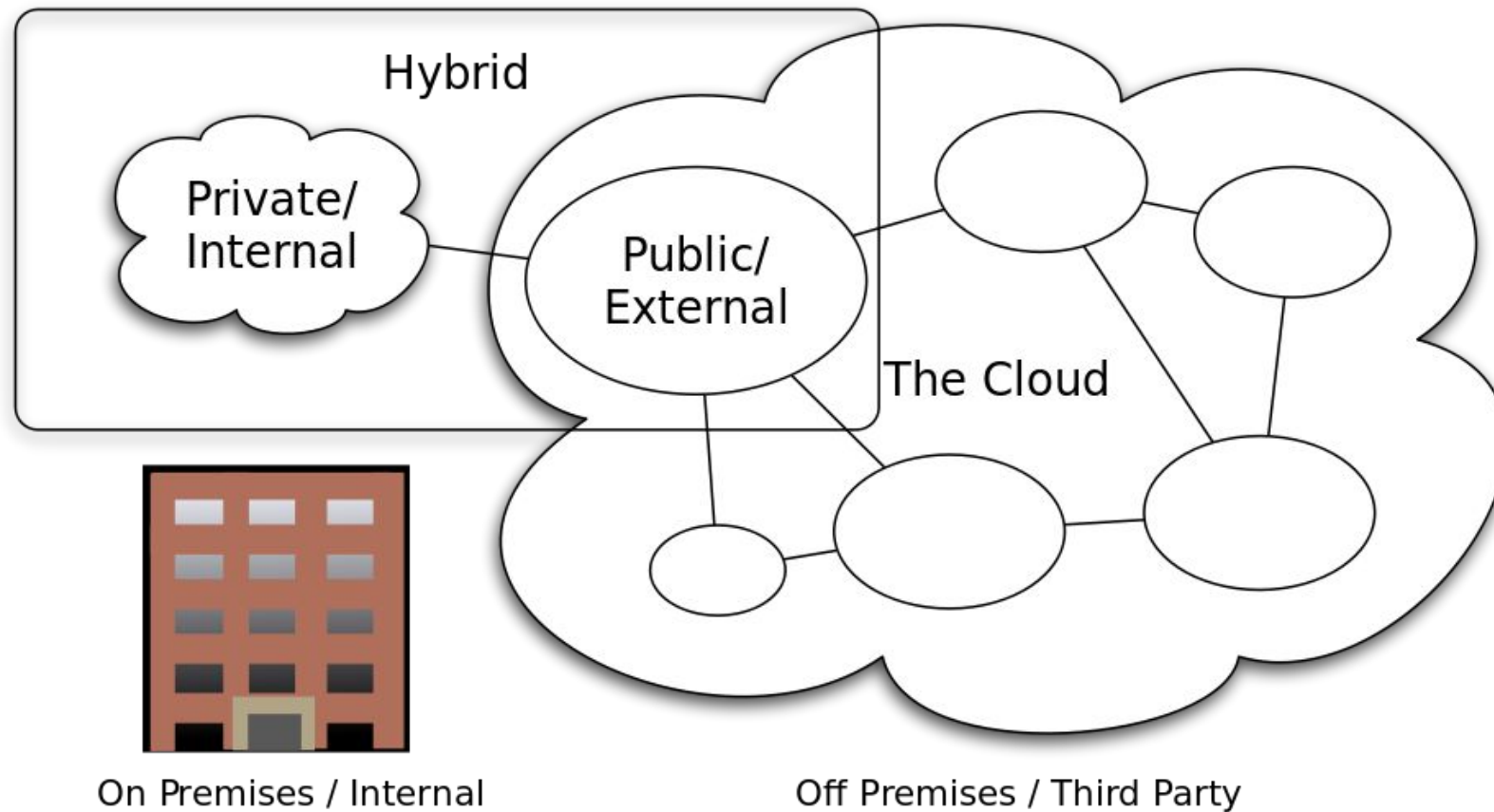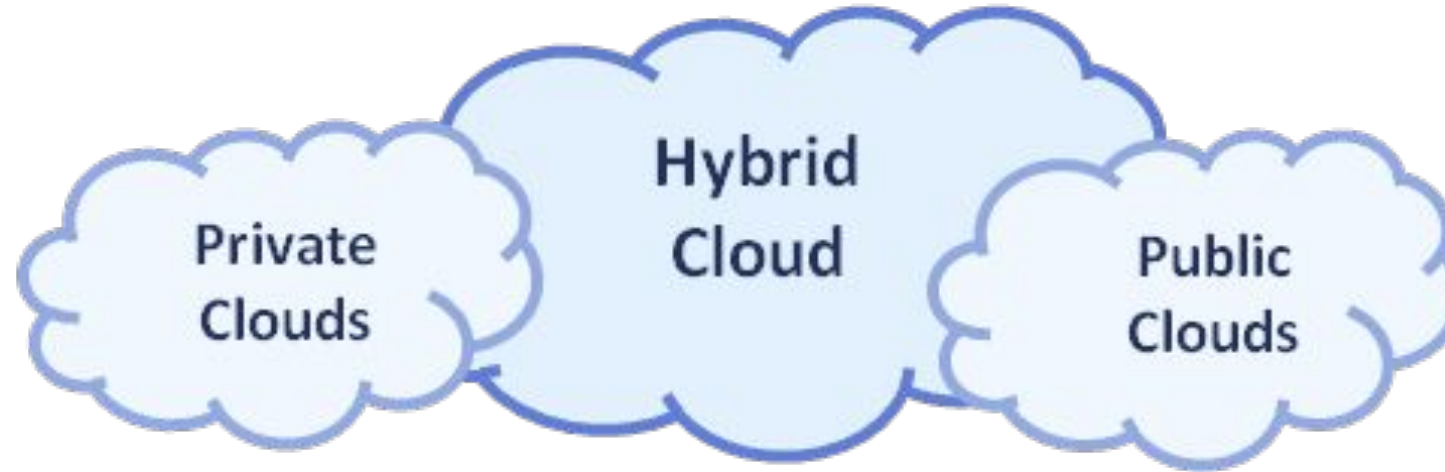
Deployment models

Cloud Computing Types

Deployment models

Cloud computing comes in three forms: **public** clouds, **private** clouds, and **hybrid**s clouds. Depending on the type of data you're working with, you'll want to compare public, private, and hybrid clouds in terms of the different levels of security and management required.

Private Cloud

Private cloud is cloud infrastructure operated solely for a single organization, whether managed internally or by a third-party, and hosted either internally or externally.[2] Undertaking a private cloud project requires a significant level and degree of engagement to virtualize the business environment, and requires the organization to reevaluate decisions about existing resources.

Self-run data centers[87] are generally capital intensive. They have a significant physical footprint, requiring allocations of space, hardware, and environmental controls. These assets have to be refreshed periodically, resulting in additional capital expenditures.

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

Public Cloud

A cloud is called a "public cloud" when the services are rendered over a network that is open for public use.

Technically there may be little or no difference between public and private cloud architecture, however, security consideration may be substantially different for services (applications, storage, and other resources) that are made available by a service provider for a public audience and when communication is effected over a non-trusted network. Generally, public cloud service providers like Amazon Web Services (AWS), Microsoft and Google own and operate the infrastructure at their data center and access is generally via the Internet.

Hybrid Cloud

Gartner, Inc. defines a hybrid cloud service as a cloud computing service that is composed of some combination of private, public and community cloud services, from different service providers.[92] A hybrid cloud service crosses isolation and provider boundaries so that it can't be simply put in one category of private, public, or community cloud service. It allows one to extend either the capacity or the capability of a cloud service, by aggregation, integration or customization with another cloud service.

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

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Questions?