

Cloud Computing 101

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Cloud Computing Principles

- Technology is abstracted away from the user.
 - e.g. hardware and software management is the responsibility of the cloud provider
- Location-independent (if you have enough bandwidth)
- Cloud Services have a scalable architecture
- Dynamic
- Request-driven
- Clouds have multi-tenancy
- Several clients using the same resources

Features of Cloud

- Scale and Elasticity
- Resource pooling
- Location independence
- On-demand self-service provisioning
- Web services interfaces
- Billing and metering services
- Monitoring and measuring performance
- Providing security to customers

What is Cloud Computing?

Gartner

- Cloud computing is a style of computing in which scalable and elastic IT - enabled capabilities are delivered as a service using internet technologies.

Forrester Research

- A standardized IT capability (services, software, or infrastructure) delivered in a pay-per-use, self-service way.

NIST

- Cloud computing is a model for enabling ubiquitous, 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.

Everything as a Service

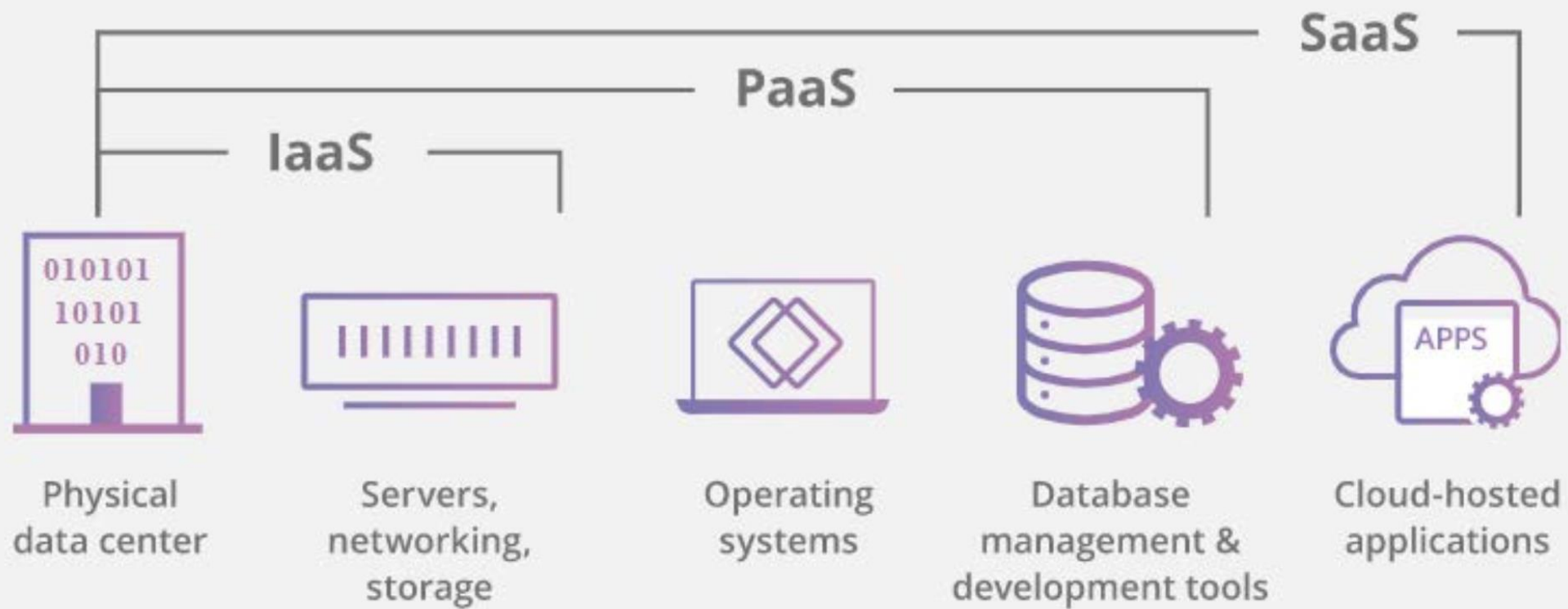
- Traditionally applications ran on dedicated hardware
- Clouds provide everything (hardware, software, applications, etc.) as a service

The Business Case for the Cloud

- Supporting business agility
- Reducing capital expenditure

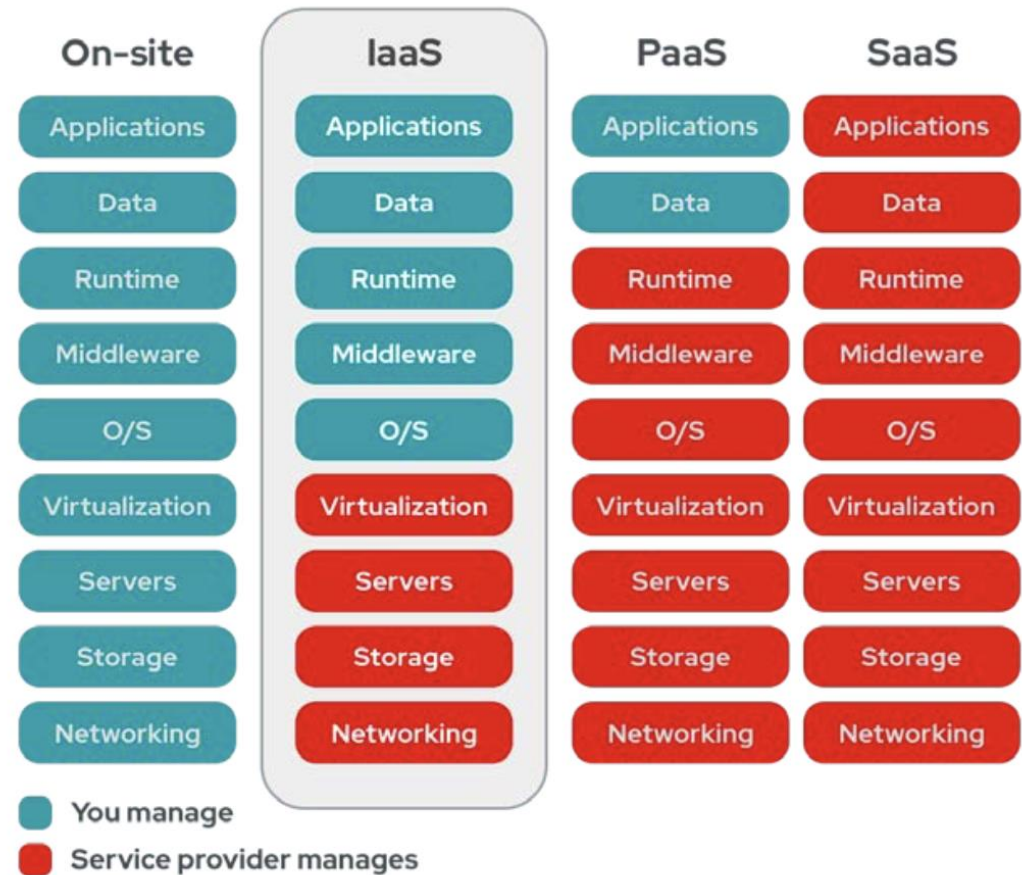
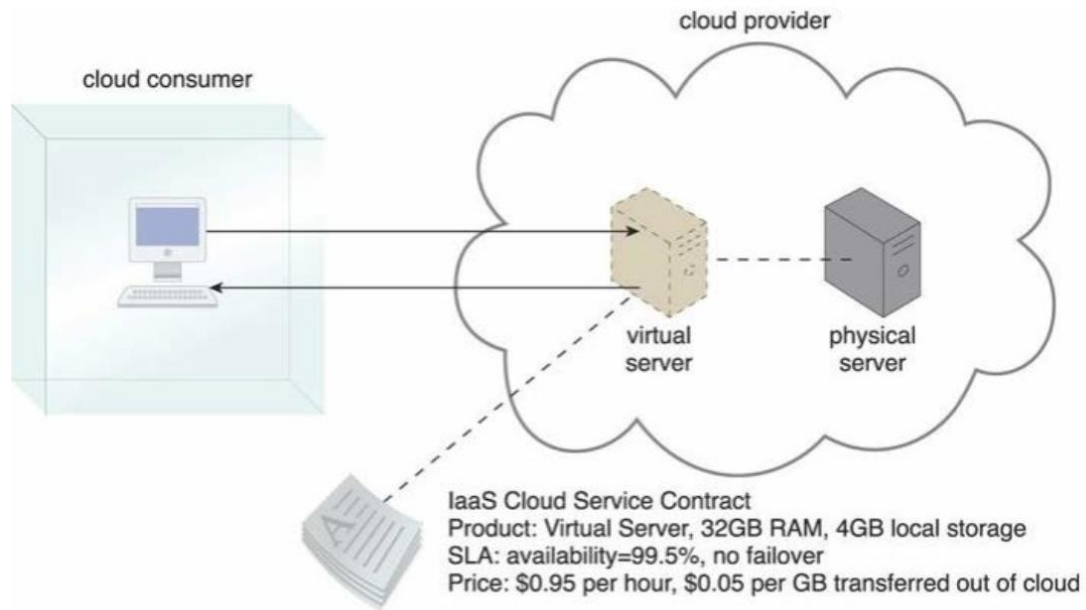
Cloud Service/ Delivery Models

- Cloud Software as a Service (SaaS)
 - Use provider's applications over a network
- Cloud Platform as a Service (PaaS)
 - Deploy customer-created applications to a cloud
- Cloud Infrastructure as a Service (IaaS)
 - Rent processing, storage, network capacity, and other fundamental computing resources



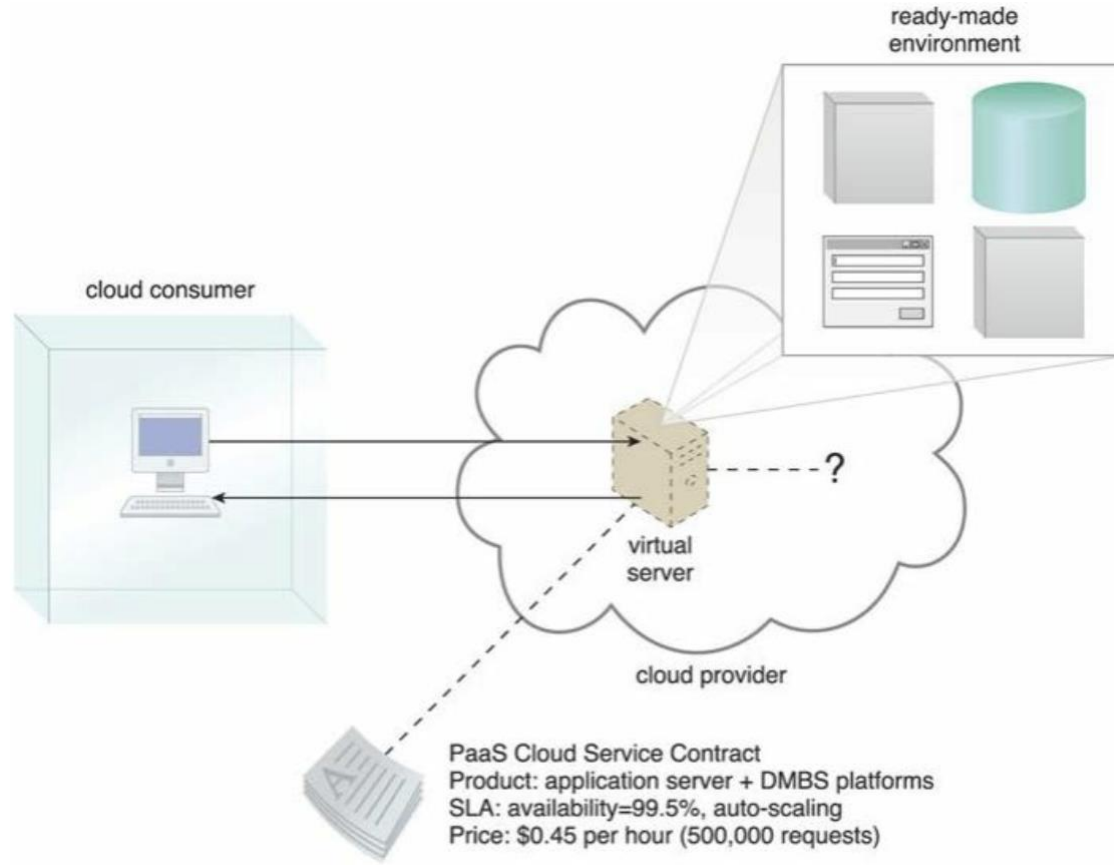
Infrastructure as a Service (IaaS)

- Delivery of a compute foundation as a service.
 - servers
 - networking technology
 - storage
 - data center space
- Includes the delivery of
 - operating systems and
 - virtualization technology to manage the resources.
- Customer rents computing resources rather than buying and installing them
- Paid on a usage basis
- May include dynamic scaling
- Agreed on service level



Platform as a Service (PaaS)

- Delivers a solution stack (ready-made) for both
 - software development and
 - a runtime environment
- Easy to develop applications
- May be constrained
- Danger of lock-in
- allow you to focus on the deployment and management of your applications.
- Cloud consumer is spared the administrative burden of setting up and maintaining the bare infrastructure IT resources



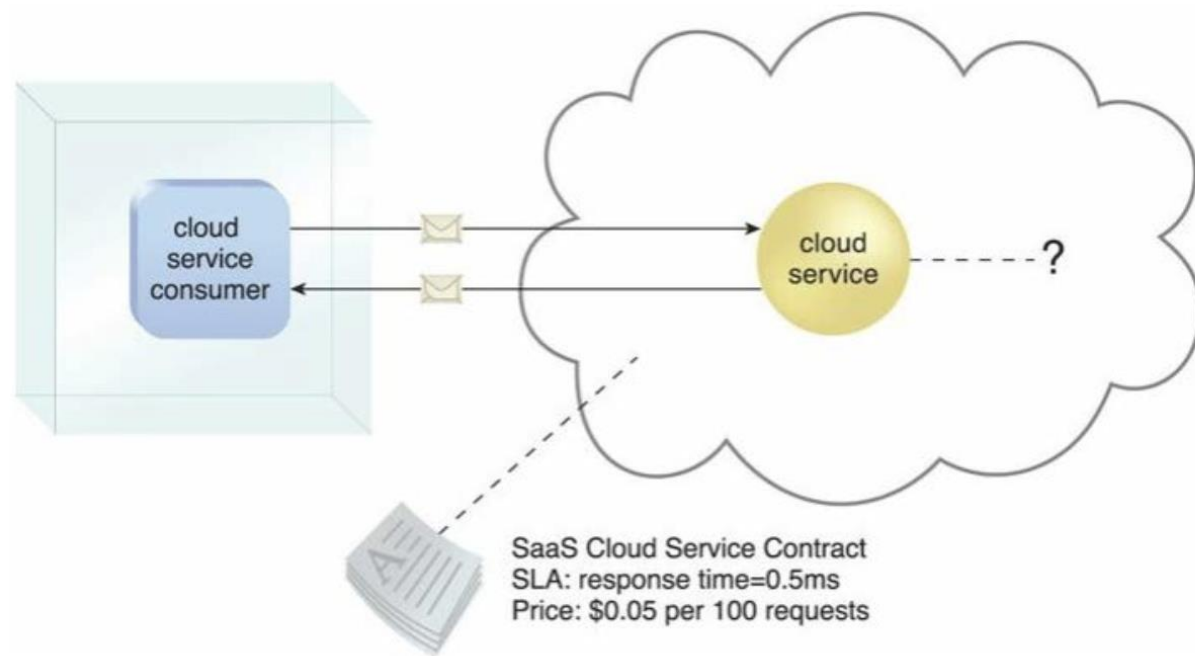
<https://www.rednat.com/en/topics/cloud-computing/wnat-is-paas>

On-site	IaaS	PaaS	SaaS
Applications	Applications	Applications	Applications
Data	Data	Data	Data
Runtime	Runtime	Runtime	Runtime
Middleware	Middleware	Middleware	Middleware
O/S	O/S	O/S	O/S
Virtualization	Virtualization	Virtualization	Virtualization
Servers	Servers	Servers	Servers
Storage	Storage	Storage	Storage
Networking	Networking	Networking	Networking

■ You manage
■ Service provider manages

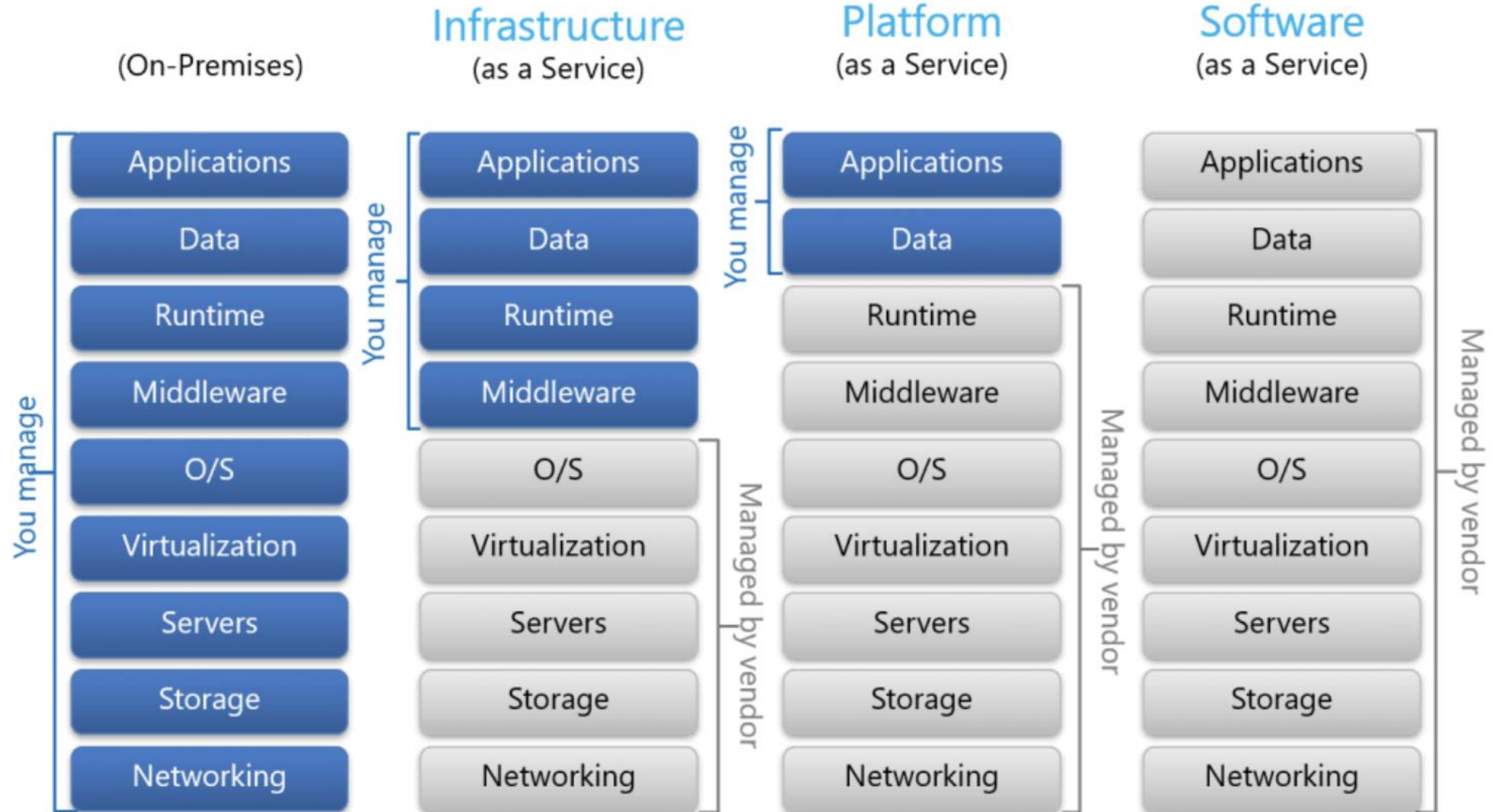
Software as a Service (SaaS)

- Service provider offers specific applications offered as a “product”
 - hosted by the provider
 - Consumed by the customer
- May be customised by the customer
- Information stored by the provider
- No necessity to purchase any hardware
- The SaaS vendor
 - Operates
 - Maintains and
 - Supports all the software, hardware, and communications technology
- The price is on a per-use basis and involves no upfront capital costs.



On-site	IaaS	PaaS	SaaS
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Virtualization	Virtualization	Virtualization	Virtualization
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Storage	Storage	Storage	Storage
Networking	Networking	Networking	Networking

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Choosing between IaaS, PaaS, SaaS

IaaS

- Flexibility, finer control, & performance
- Still need some level of infrastructure maintenance
- Scaling, configuration, security

PaaS

- Speedy development, better integration, automated scaling, no maintenance needs
- Relatively low-customization, Vendor lock-in

SaaS

- Fastest for common applications
- Little customization

Cloud service/ delivery models variations

Many specialized variations of the three base cloud delivery models have emerged

- Storage as a Service
- Database as a Service
- Security as a Service
- Communication as a Service
- Integration as a Service
- Testing as a Service
- Process as a Service

Cloud Deployment Models

- **Private cloud**

- enterprise owned or leased. Resources are dedicated to enterprise

- **Public cloud**

- Sold to the public, mega-scale infrastructure

- **Hybrid cloud**

- composition of two or more clouds. Mostly deployment between public and private

- **Community cloud**

- shared infrastructure for specific community

- **Personal cloud**

- your own cloud – belongs to you

- Cloud computing often leverages:
 - Massive scale
 - Virtualization
 - Resilient computing
 - Low cost software
 - Geographic distribution
 - Service orientation
 - Advanced security technologies

Selection of a Cloud Service

Know what you want first

- What services are available?
- What is your pricing model?
- What are your scaling options?
- What are your security measures?
- Where are your datacenters located?
- What are SLA terms?
- Customer support
- Reputation

References

- <https://www.cloudflare.com/learning/cloud/what-is-the-cloud/>
- <https://www.redhat.com/en/topics/cloud-computing/what-is-iaas>
- <https://www.redhat.com/en/topics/cloud-computing/what-is-paas>
- <https://www.redhat.com/en/topics/cloud-computing/what-is-saas>
- Cloud Computing: Concepts, Technology & Architecture, Thomas Erl, et al., Prentice-Hall, 2013,
- The Datacenter as a Computer – Designing Warehouse-Scale Machines, 3rd Edition, Morgan & Claypool Publishers, 2019
- Cloud design patterns: Prescriptive architecture guidance for cloud applications, Homer, Alex, et al. , 2014.