

Cloud Computing Essential Characteristics

Chathra Serasinghe

NIST

The National Institute of Standards and Technology (NIST) is an agency of the United States Department of Commerce whose mission is to promote American innovation and industrial competitiveness.

Founded in 1901; (as National Bureau of Standards), became NIST in 1988

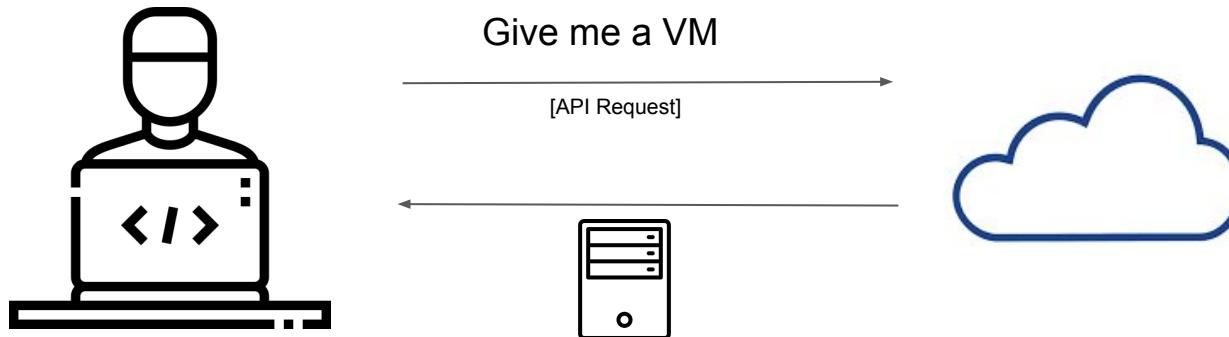
What are the essential characteristics of Cloud Computing?

Self Service

Customers expects immediate, on-demand access to cloud services. The cloud should provide self-service capabilities, enabling users to:

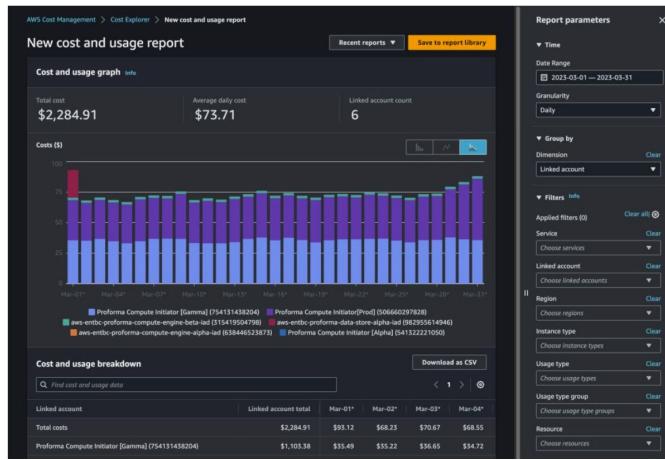
- Request
- Customize
- Pay
- Use

cloud services without the need for human operator intervention.



Per-Usage Metering and Billing

- Eliminates upfront commitment by users
- Services usually priced on a short term basis (e.g per Hour, per Sec)
- Metering should be done accordingly for different types of services
- Should report the usage for better transparency

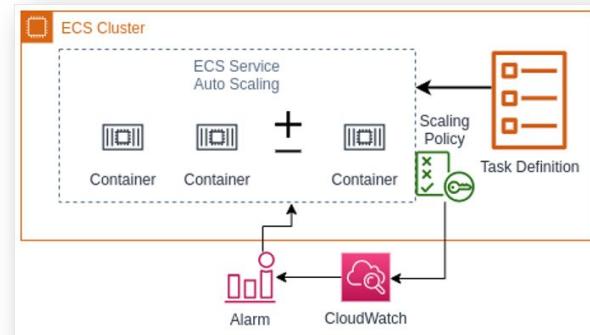
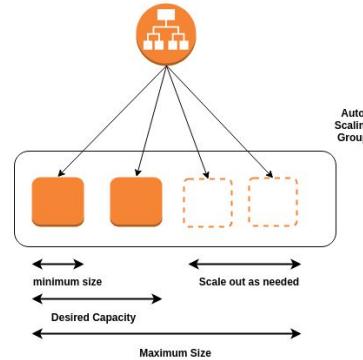


The screenshot shows two side-by-side sections. On the left, under "Storage pricing", it lists S3 Standard rates: First 50 TB / Month (\$0.025 per GB), Next 450 TB / Month (\$0.022 per GB), and Over 500 TB / Month (\$0.021 per GB). On the right, under "On-Demand Plans for Amazon EC2", it shows "Select a location type and region" (AWS Region: US East (Ohio)) and "Select an operating system, instance type, and vCPU to view rates" (Operating system: Linux, Instance type: All, vCPU: All). Below these, a table titled "Viewing 680 of 680 available instances" lists EC2 instance types with their On-Demand hourly rates, vCPUs, memory, storage, and network performance.

Instance name	On-Demand hourly rate	vCPU	Memory	Storage	Network performance
t4g.nano	\$0.0042	2	0.5 GiB	EBS Only	Up to 5 Gigabit
t4g.micro	\$0.0084	2	1 GiB	EBS Only	Up to 5 Gigabit
t4g.small	\$0.0168	2	2 GiB	EBS Only	Up to 5 Gigabit
t4g.medium	\$0.0356	2	4 GiB	EBS Only	Up to 5 Gigabit
t4g.large	\$0.0672	2	8 GiB	EBS Only	Up to 5 Gigabit

Elasticity

- Cloud Computing giving the **illusion of infinite computing resources available on demand**
 - But there are service limits you may have to consider
- Users expect cloud to rapidly allocate or deallocate resources in any quantity at any time
 - **Scale up** - provision more resources when application load increases
 - **Scale Down** - reduce provisioned resources when application load decreases
- How?
 - Manually
 - Scheduled
 - Auto-Scaling



Broad Network access

- Cloud tenant does not manage underlying infrastructure(i.e physical servers,Routers in cloud data centers)
- Computing facilities should be able to access from anywhere over the network
 - Over internet
 - Over intranet
- Location-Independent Access
 - Cloud user can access resources in different geographical region without any issue
- Accessibility Across Devices

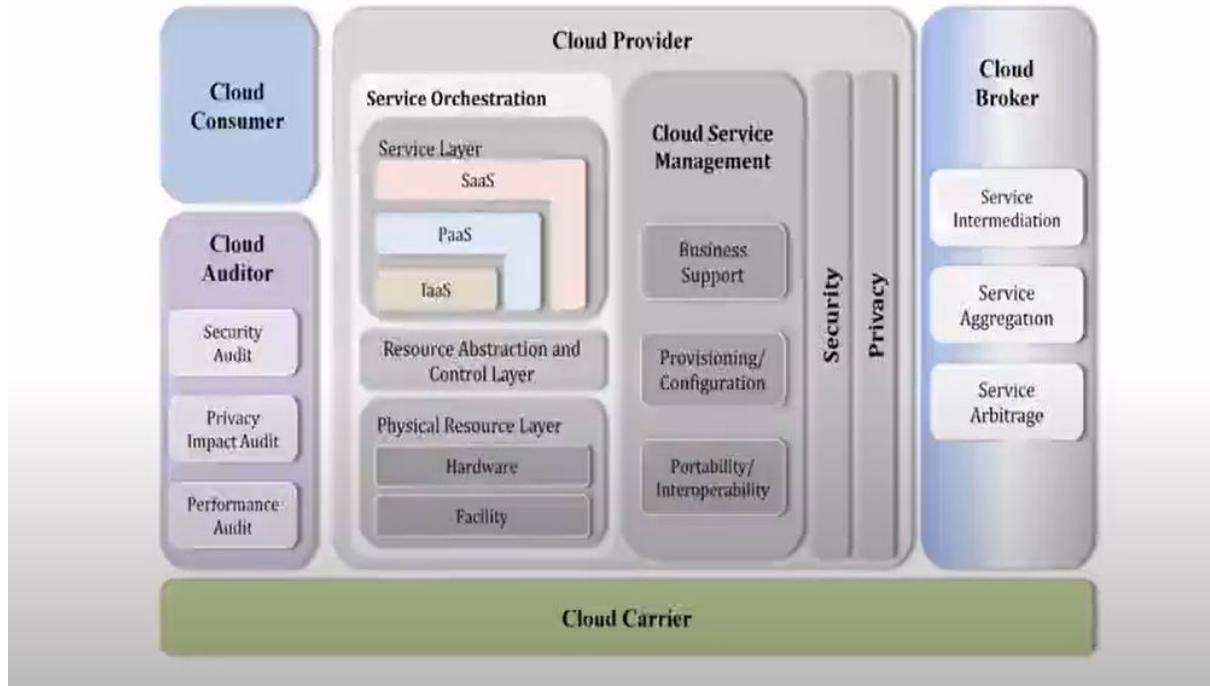
Resource Pooling

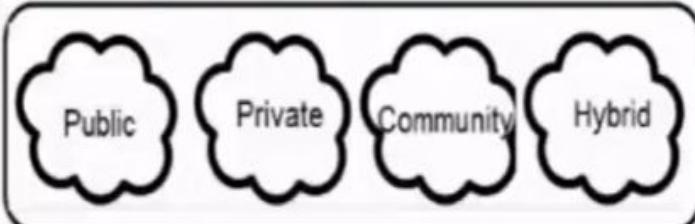
- Computing resources are pooled together to meet the demand of the consumers
- In a multi-tenant model, Cloud service provider can be dynamically allocate, deallocate, reassigned resources(Physical or Virtual) according to consumer demand
- Resource pooling is invisible to cloud users
- Resource pooling make cloud computing:
 - Affordable
 - Flexible
 - Scalable

NIST Cloud Computing Reference Architecture

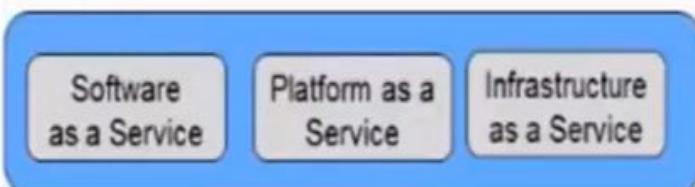
- With the rapid adoption of cloud technology, there was a pressing need for standard guidelines and references that could be used industry-wide.
- NIST, being a standard body, recognized this need and began work on developing a reference architecture for cloud computing.
- In 2011, NIST published its first edition of the "NIST Cloud Computing Reference Architecture".
- Post-publication, the NIST Cloud Computing Reference Architecture gained wide acceptance and was adopted by many organizations as a standard model for discussing, planning, and implementing cloud solutions. It helped standardize the conversation around cloud technologies and services.
- It is used by government bodies, institutions, and cloud service providers to facilitate discussions about cloud environments and to ensure a consistent approach to cloud architecture across various projects.

NIST Cloud Computing Reference Architecture





Deployment
Models



Service
Models

- On demand self service
- Rapid elasticity
- Broad network access
- Measured service

Resource Pooling with minimal management effort

Essential
Characteristics