

**RIET**

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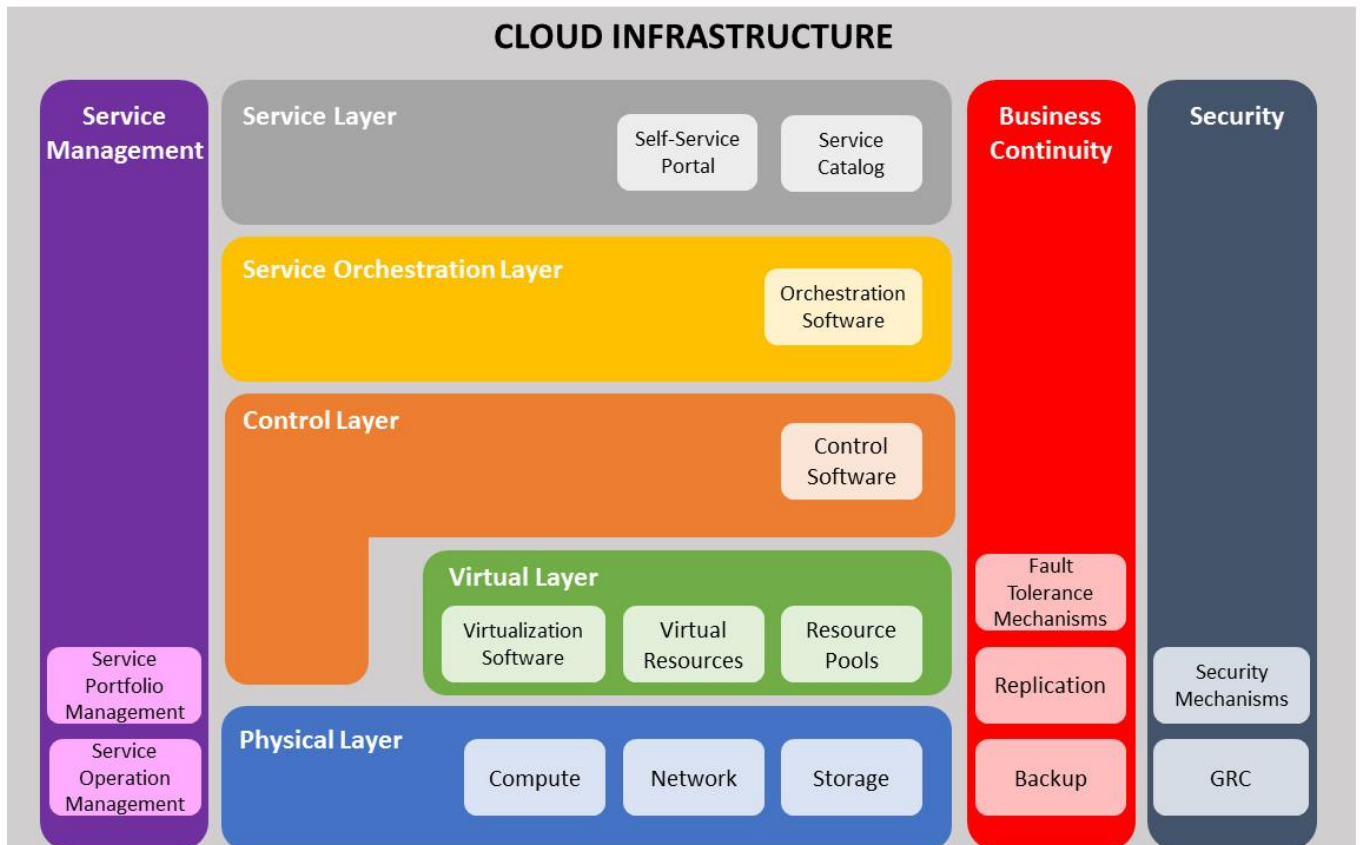
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# THE CLOUD COMPUTING REFERENCE MODEL

The cloud computing reference model is an abstract model that characterizes and standardizes the functions of a cloud computing environment by partitioning it into abstraction layers and cross-layer functions. This reference model groups the cloud computing functions and activities into five logical layers and three cross-layer functions.



The five layers are physical layer, virtual layer, control layer, service orchestration layer, and service layer. Each of these layers specifies various types of entities that may exist in a cloud computing environment, such as compute systems, network devices, storage devices, virtualization software, security mechanisms, control software, orchestration software, management software, and so on. It also describes the relationships among these entities.

The three cross-layer functions are business continuity, security, and service management. Business continuity and security functions specify various activities, tasks, and processes that are required to offer reliable and secure cloud services to the consumers. Service management function specifies various activities, tasks, and processes that enable the administrations of the cloud infrastructure and services to meet the provider's business requirements and consumer's expectations.

## Cloud computing layers

### Physical Layer



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- Foundation layer of the cloud infrastructure.
- Specifies entities that operate at this layer : Compute systems, network devices and storage devices. Operating environment, protocol, tools and processes.
- Functions of physical layer : Executes requests generated by the virtualization and control layer.

## **Virtual Layer**

- Deployed on the physical layer.
- Specifies entities that operate at this layer : Virtualization software, resource pools, virtual resources.
- Functions of virtual layer : Abstracts physical resources and makes them appear as virtual resources (enables multitenant environment). Executes the requests generated by control layer.

## **Control Layer**

- Deployed either on virtual layer or on physical layer
- Specifies entities that operate at this layer : control software
- Functions of control layer : Enables resource configuration, resource pool configuration and resource provisioning. Executes requests generated by service layer. Exposes resources to and supports the service layer. Collaborates with the virtualization software and enables resource pooling and creating virtual resources, dynamic allocation and optimizing utilization of resources.

## **Service Orchestration Layer**

- Specifies the entities that operate at this layer : Orchestration software.
- Functions of orchestration layer : Provides workflows for executing automated tasks. Interacts with various entities to invoke provisioning tasks.

## **Service Layer**

- Consumers interact and consume cloud resources via those layers.



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- Specifies the entities that operate at this layer : Service catalog and self-service portal.
- Functions of service layer : Store information about cloud services in service catalog and presents them to the consumers. Enables consumers to access and manage cloud services via a self-service portal.

## Cross-layer function

### Business continuity

- Specifies adoption of proactive and reactive measures to mitigate the impact of downtime.
- Enables ensuring the availability of services in line with SLA.
- Supports all the layers to provide uninterrupted services.

### Security

- Specifies the adoption of : Administrative mechanisms (security and personnel policies, standard procedures to direct safe execution of operations) and technical mechanisms (firewall, intrusion detection and prevention systems, antivirus).
- Deploys security mechanisms to meet GRC requirements.
- Supports all the layers to provide secure services.

### Service Management

Specifies adoption of activities related to service portfolio management and service operation management.

#### Service portfolio management :

- Define the service roadmap, service features, and service levels
- Assess and prioritize where investments across the service portfolio are most needed
- Establish budgeting and pricing
- Deal with consumers in supporting activities such as taking orders, processing bills, and collecting payments

#### Service operation management :



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- Enables infrastructure configuration and resource provisioning
- Enable problem resolution
- Enables capacity and availability management
- Enables compliance conformance
- Enables monitoring cloud services and their constituent elements