

# *CLOUD COMPUTING*

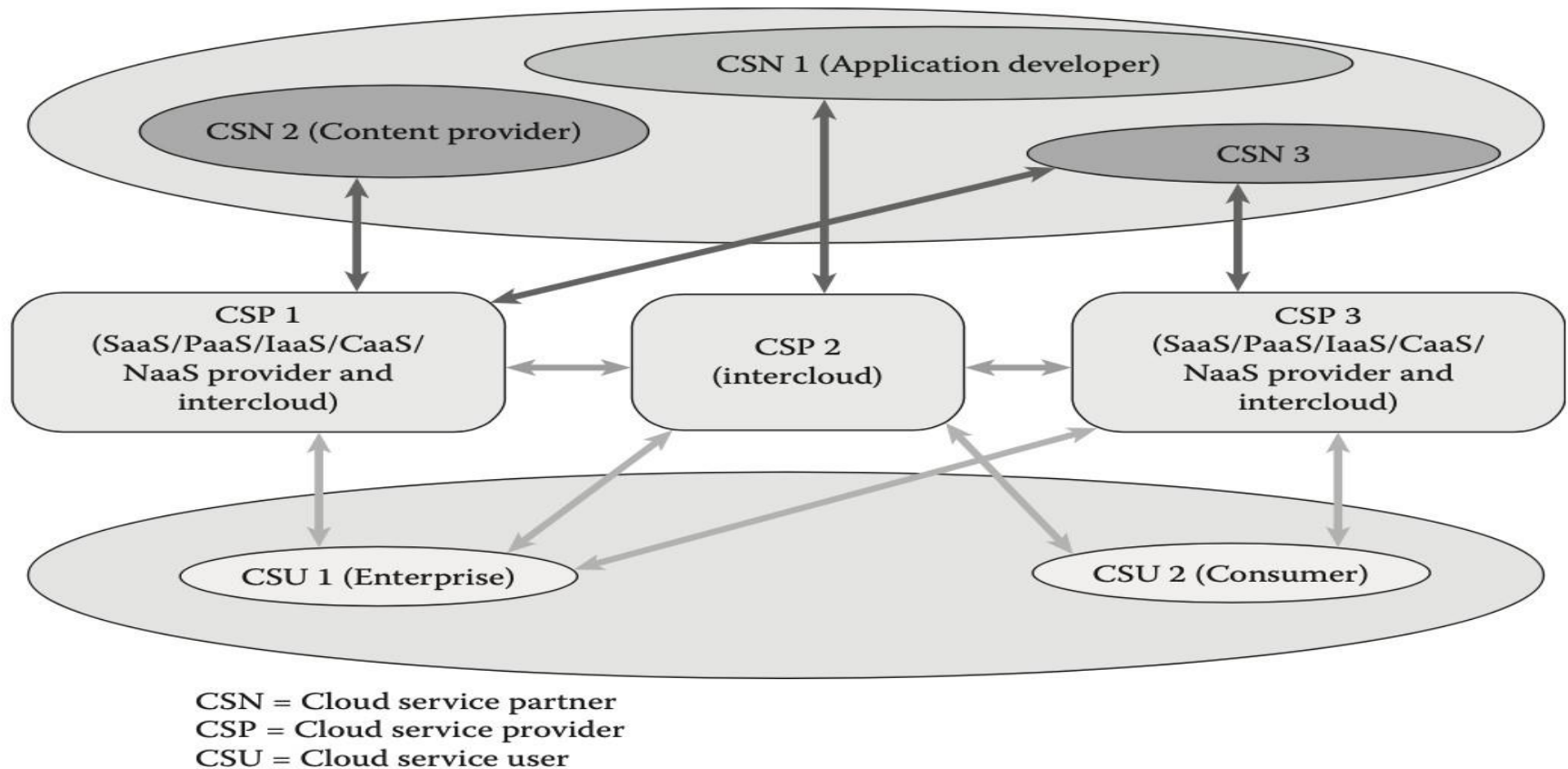
## *TOPIC*

ITU-T CLOUD  
COMPUTING  
REFERENCE  
ARCHITECTURE



- This architecture is somewhat broader in scope than the NIST architecture, and views it as a layered functional architecture.
- **ITU-T** (for Telecommunication Standardization Sector of the International Telecommunications Union) is the primary international body for fostering cooperative standards for telecommunications equipment and systems. It was formerly known as the CCITT. It is located in Geneva, Switzerland.
- The ITU-T document defines the three actors:
  - *Cloud service customer or user*
  - *Cloud service provider*
  - *Cloud service partner*

**Cloud service customer or user:** A party that is in a business relationship for the purpose of using cloud services. The business relationship is with a cloud service provider or a cloud service partner.



Actors with some of their possible roles in a cloud ecosystem.



- **Cloud service provider:** A party that makes cloud services available. The Cloud service provider focuses on activities necessary to provide a cloud service and activities necessary to ensure its delivery to the cloud service customer as well as cloud service maintenance. The Cloud service provider includes an extensive set of activities (e.g., provide service, deploy and monitor service, manage business plan, provide audit data and so forth) as well as numerous sub-roles (e.g., business manager, service manager, network provider, security and risk manager and the like).
- **Cloud service partner:** A party that is engaged in support of, or auxiliary to, activities of either the cloud service provider or the cloud service customer, or both. A cloud service partner's activities vary depending on the type of partner and their relationship with the cloud service provider and the cloud service customer. Examples of cloud service partners include cloud auditor and cloud service broker.

# ITU-T CLOUD COMPUTING REFERENCE ARCHITECTURE LAYERED ARCHITECTURE

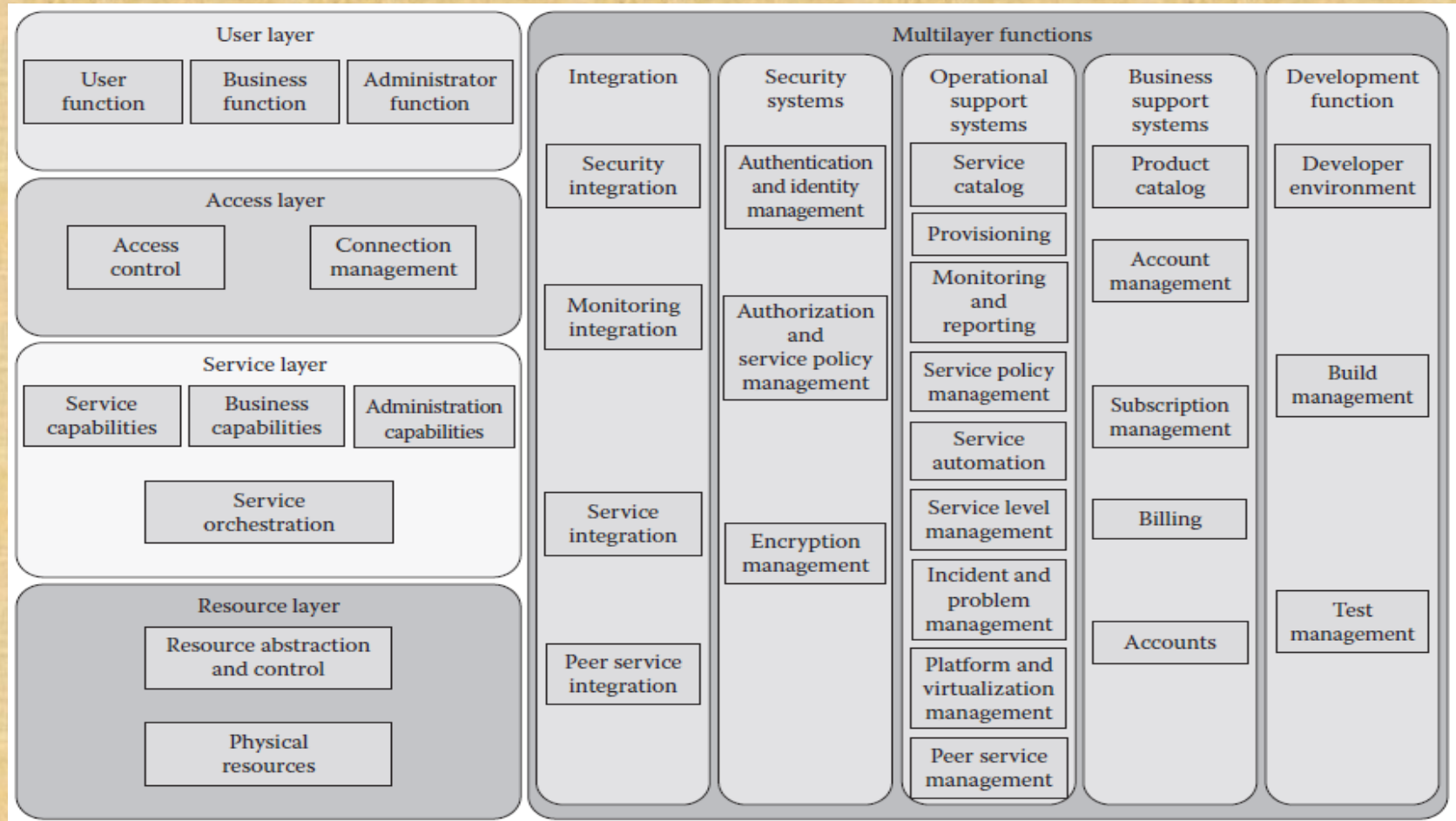


Figure: ITU-T Cloud Computing Reference Architecture Layered Architecture



- **Layered Architecture**

- The **user layer** is the user interface through which a cloud service customer interacts with a cloud service provider and with cloud services, performs customer-related administrative activities, and monitors cloud services.
- The **access layer** provides a common interface for both manual and automated access to the capabilities available in the services layer. These capabilities include both the capabilities of the services and also the administration and business capabilities.
- The **service layer** contains the implementation of the services provided by a cloud service provider (e.g., SaaS, PaaS, IaaS). The service layer contains and controls the software components that implement the services (but not the underlying hypervisors, host operating systems, device drivers, etc.), and arranges to offer the cloud services to users via the access layer.
- The **resource layer** consists of physical resources available to the provider and the appropriate abstraction and control mechanisms. For example, hypervisor software can provide virtual network, virtual storage, and virtual machine capabilities.



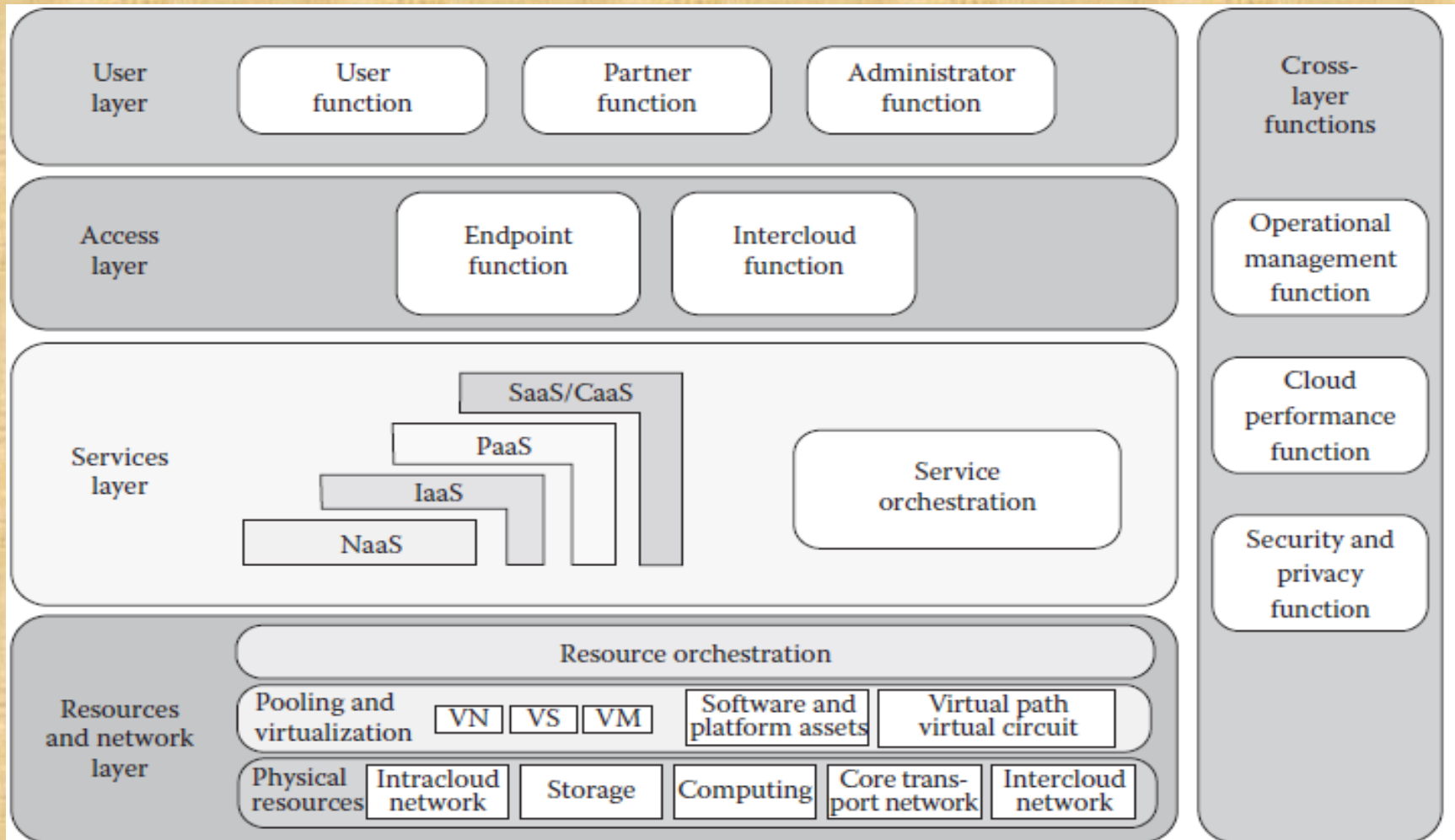
- The multilayer functions include a series of functional components that interact with functional components of the four other layers to provide supporting capabilities. It" includes **five categories of functional components**:
- **Integration**: Responsible for connecting functional components in the architecture to create a unified architecture. The integration functional components provide message routing and message exchange mechanisms within the cloud architecture and its functional components as well as with external functional components.
- **Security systems**: Responsible for applying security- related controls to mitigate the security threats in cloud computing environments. The security systems' functional components encompass all the security facilities required to support cloud services.
- **Operational support system (OSS)**: Encompasses the set of operational-related management capabilities that are required in order to manage and control the cloud services offered to customers. OSS is also involved in system monitoring, including the use of alarms and events.



- **Business support system (BSS):** Encompasses the set of business-related management capabilities dealing with customers and supporting processes, such as billing and accounts.
- **Development function:** Supports the cloud computing activities of the cloud service developer. This includes support of the development and/or composition of service implementations, build management and test management.



# ITU-T Cloud Computing Functional Reference Architecture



ITU-T cloud computing functional reference architecture.

The resources and network layer. This layer consists of three sub layers as defined in the list that follows:

### Resource orchestration Pooling and virtualization Physical resources

- **Resource orchestration:** The management, monitoring, and scheduling of computing, storage, and network resources into consumable services by the upper layers and users. It controls the creation, modification, customization, and release of virtualized resources.
- **Pooling and virtualization:** The virtualization function turns physical resources into virtual machines, virtual storage, and virtual networks. These virtual resources are in turn managed and controlled by the resource orchestration, based on user demand. Software and platform assets in the pooling and virtualization layer are the runtime environment, applications, and other software assets used to orchestrate and implement cloud services.

**Physical resources:** The computing, storage, and network resources that are fundamental to providing cloud services. These resources may include those that reside inside cloud data centers (e.g., computing servers, storage servers, and intra cloud networks) and those that reside outside data centers, typically networking resources, such as inter cloud networks and core transport networks.



# THANK YOU