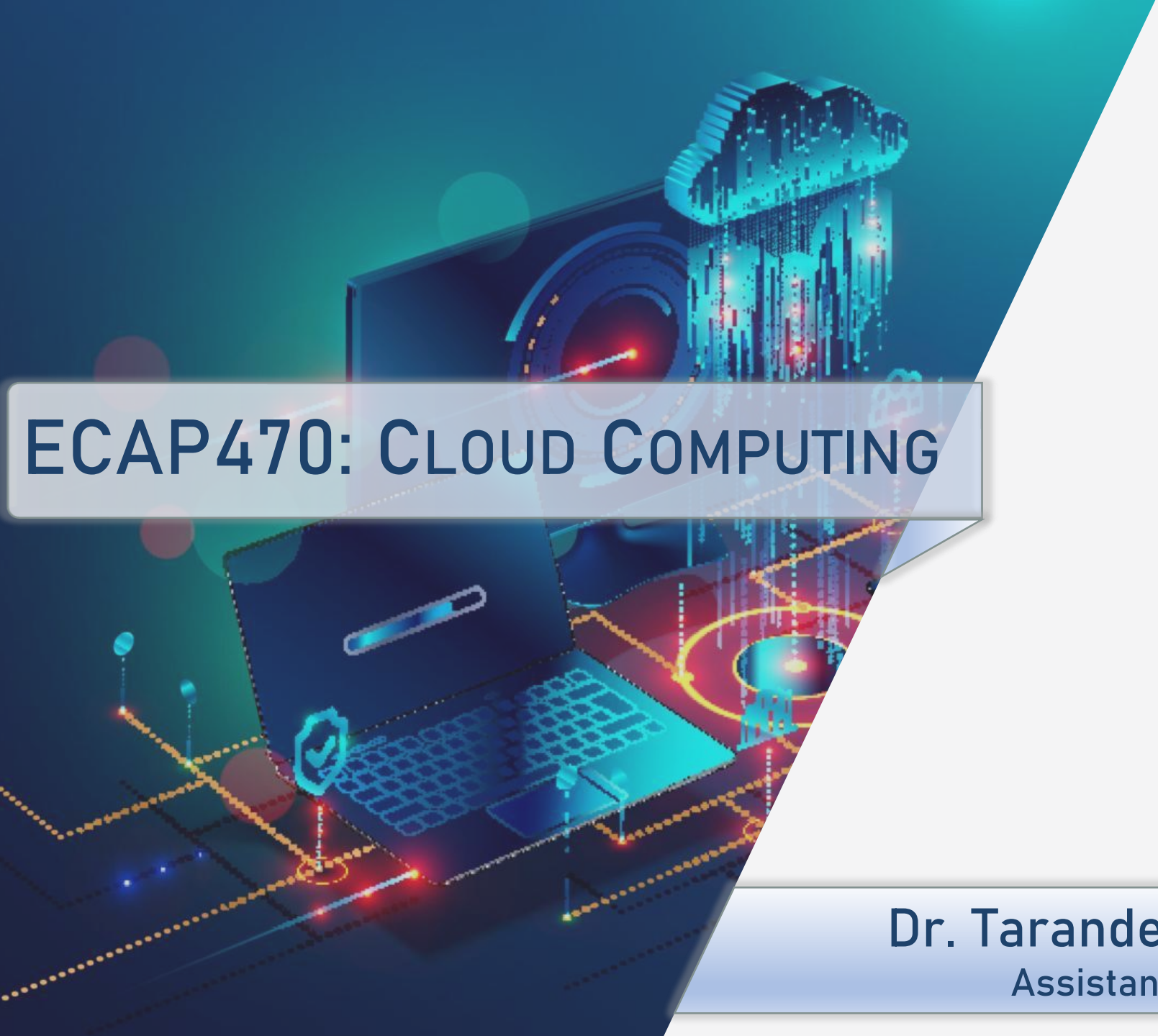

# ECAP470: Cloud Computing

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# Learning Outcomes

After this lecture, you will be able to

- ✓ Know about NIST cloud computing reference model.
- ✓ Explore the cloud cube model.

# Cloud Business Models

Cloud business models are all built on top of cloud computing, a concept that took over around 2006 when former Google's CEO Eric Schmit mentioned it.

# Cloud Business Models

- Most cloud-based business models can be classified as cloud services delivery.
- While the models are primarily monetized via subscriptions, they are monetized via pay-as-you-go revenue models and hybrid models (subscriptions + pay-as-you-go).

# Cloud Business Models

- NIST Cloud Computing Reference Model.
- Cloud Cube Model.

# NIST Cloud Computing Reference Model

- NIST's long-term goal is to provide leadership and guidance around the cloud computing paradigm to catalyse its use within industry and government.
- NIST aims to shorten the adoption cycle, which will enable near-term cost savings and increased ability to quickly create and deploy safe and secure enterprise solutions.

# NIST Cloud Computing Reference Model

NIST aims to foster cloud computing practices that support interoperability, portability, and security requirements that are appropriate and achievable for important usage scenarios.

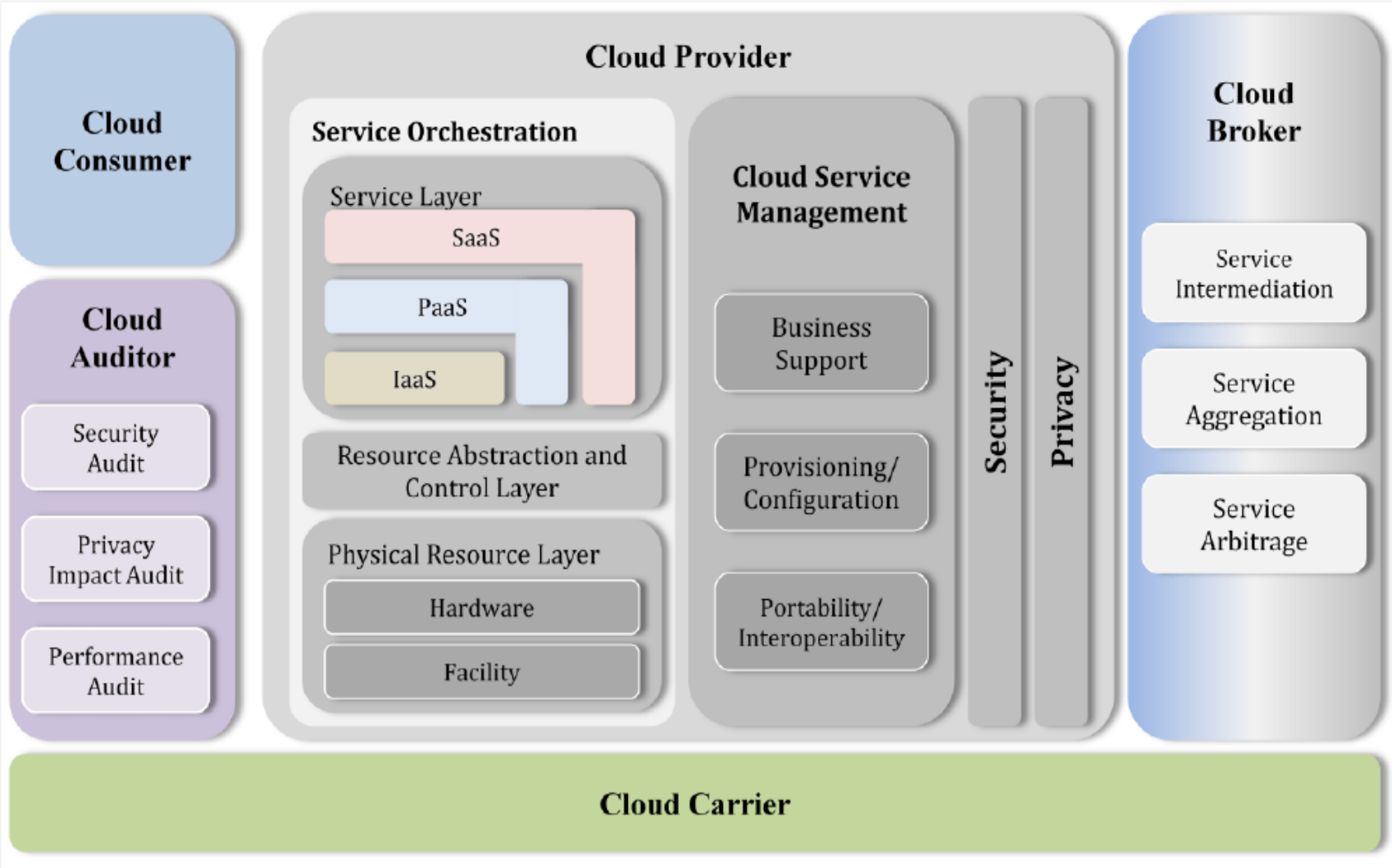
# NIST Cloud Computing Reference Model

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.

# NIST Cloud Computing Reference Model

- Promotes availability.
- Composed of five essential characteristics.
- Three service models.
- Four deployment models.

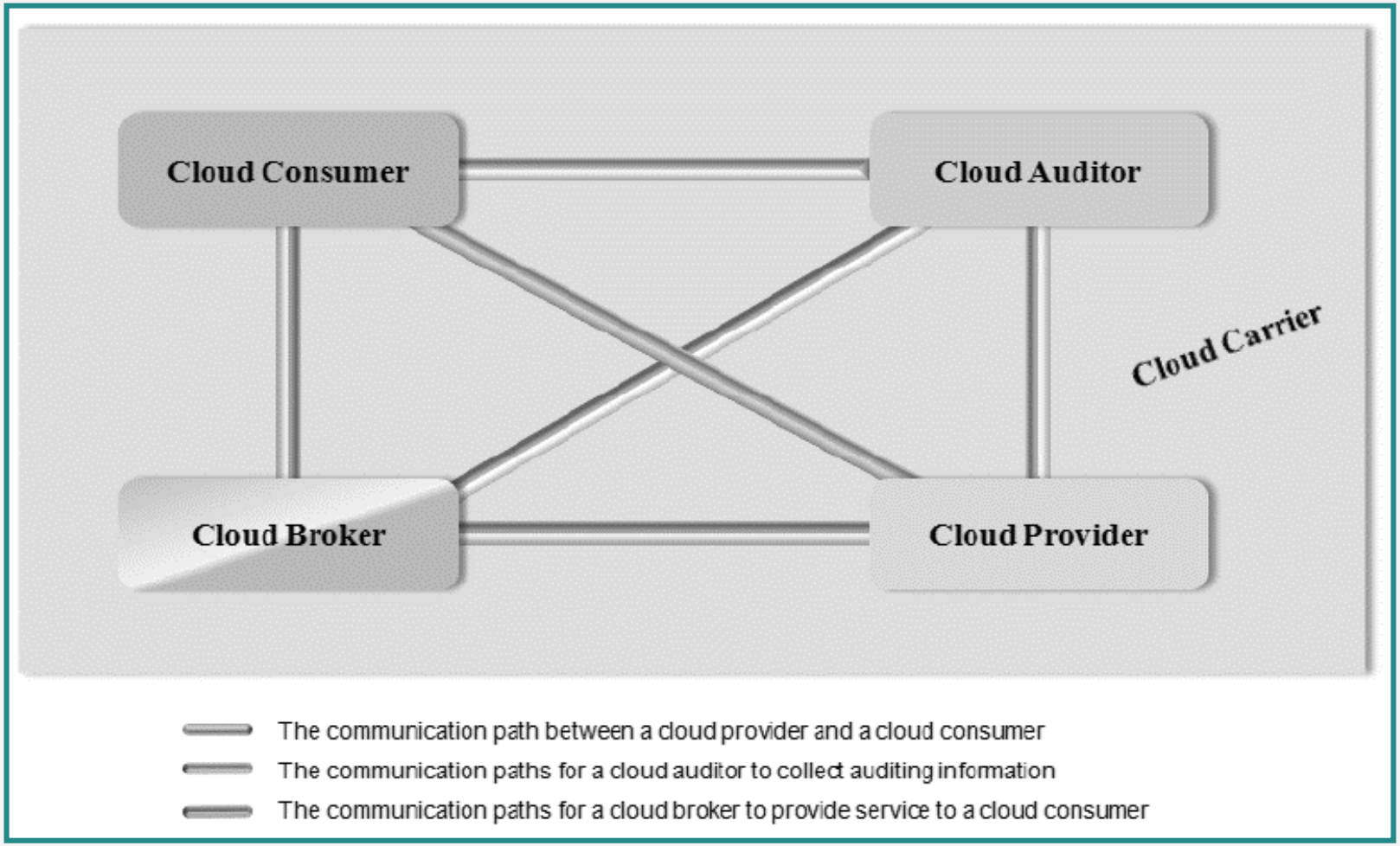
# NIST Cloud Computing Reference Model



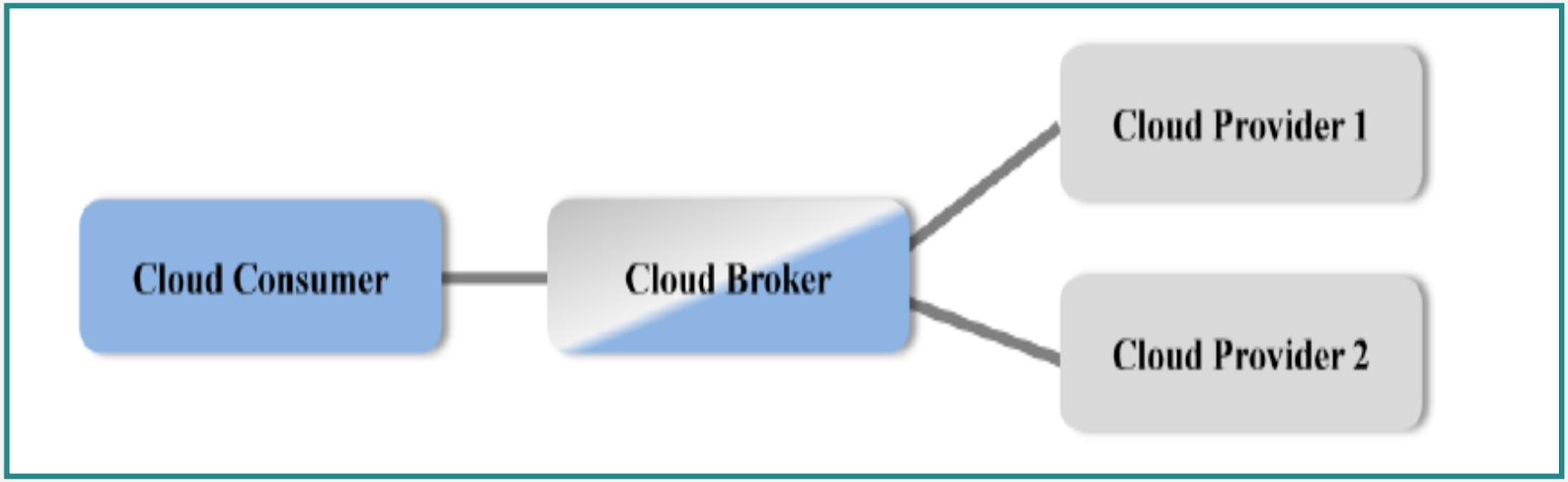
# Actors in Cloud Computing Reference Model

| Actor | Definition |
|---|---|
| **Cloud Consumer** | A person or organization that maintains a business relationship with, and uses service from, *Cloud Providers*. |
| **Cloud Provider** | A person, organization, or entity responsible for making a service available to interested parties. |
| **Cloud Auditor** | A party that can conduct independent assessment of cloud services, information system operations, performance and security of the cloud implementation. |
| **Cloud Broker** | An entity that manages the use, performance and delivery of cloud services, and negotiates relationships between *Cloud Providers* and *Cloud Consumers*. |
| **Cloud Carrier** | An intermediary that provides connectivity and transport of cloud services from *Cloud Providers* to *Cloud Consumers*. |

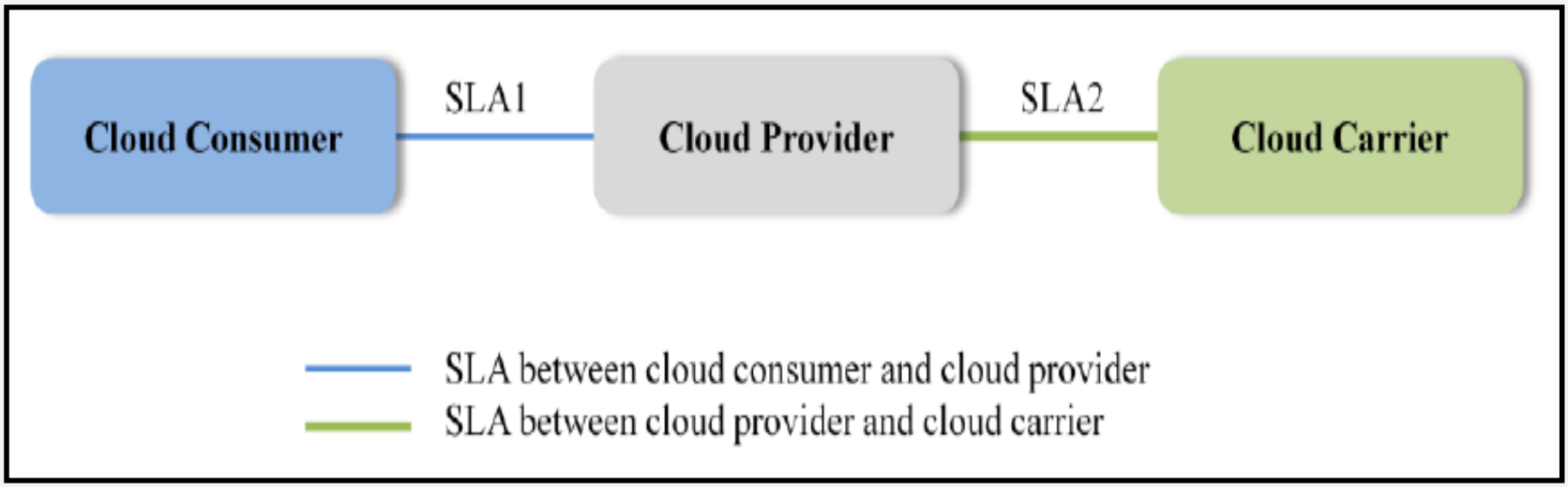
# Interactions Between the Actors in Cloud Computing



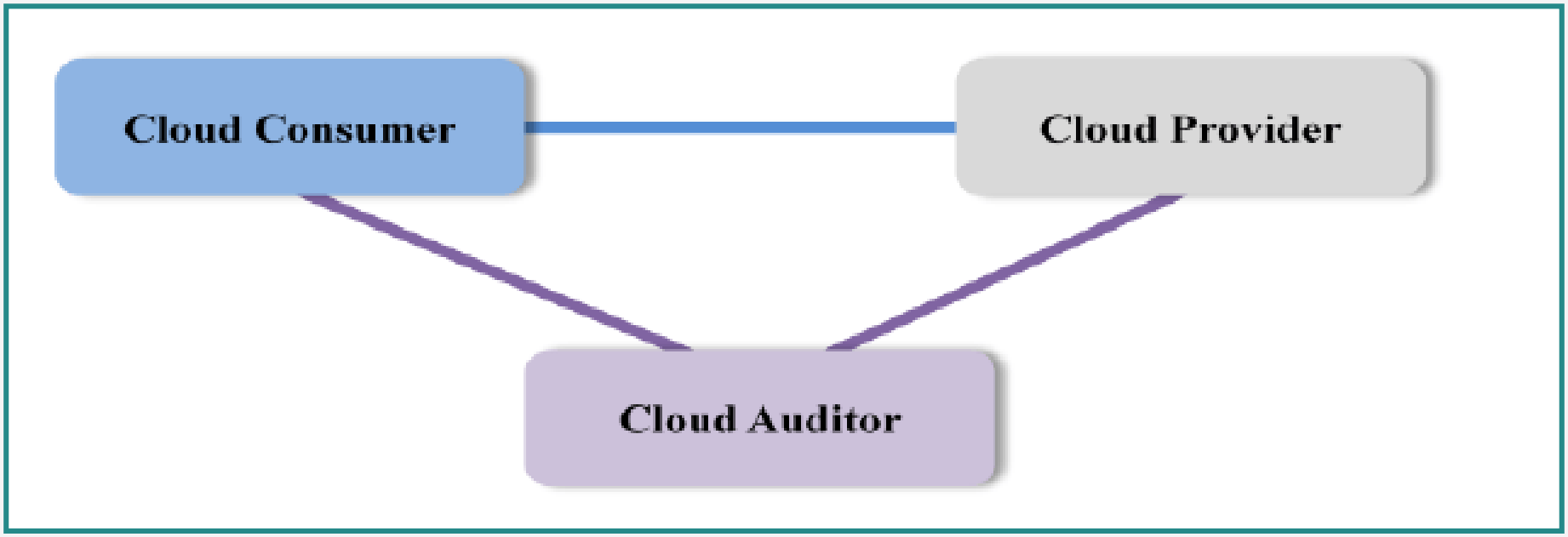
# Usage Scenario for Cloud Brokers



# Usage Scenario for Cloud Carriers



# Usage Scenario for Cloud Auditors

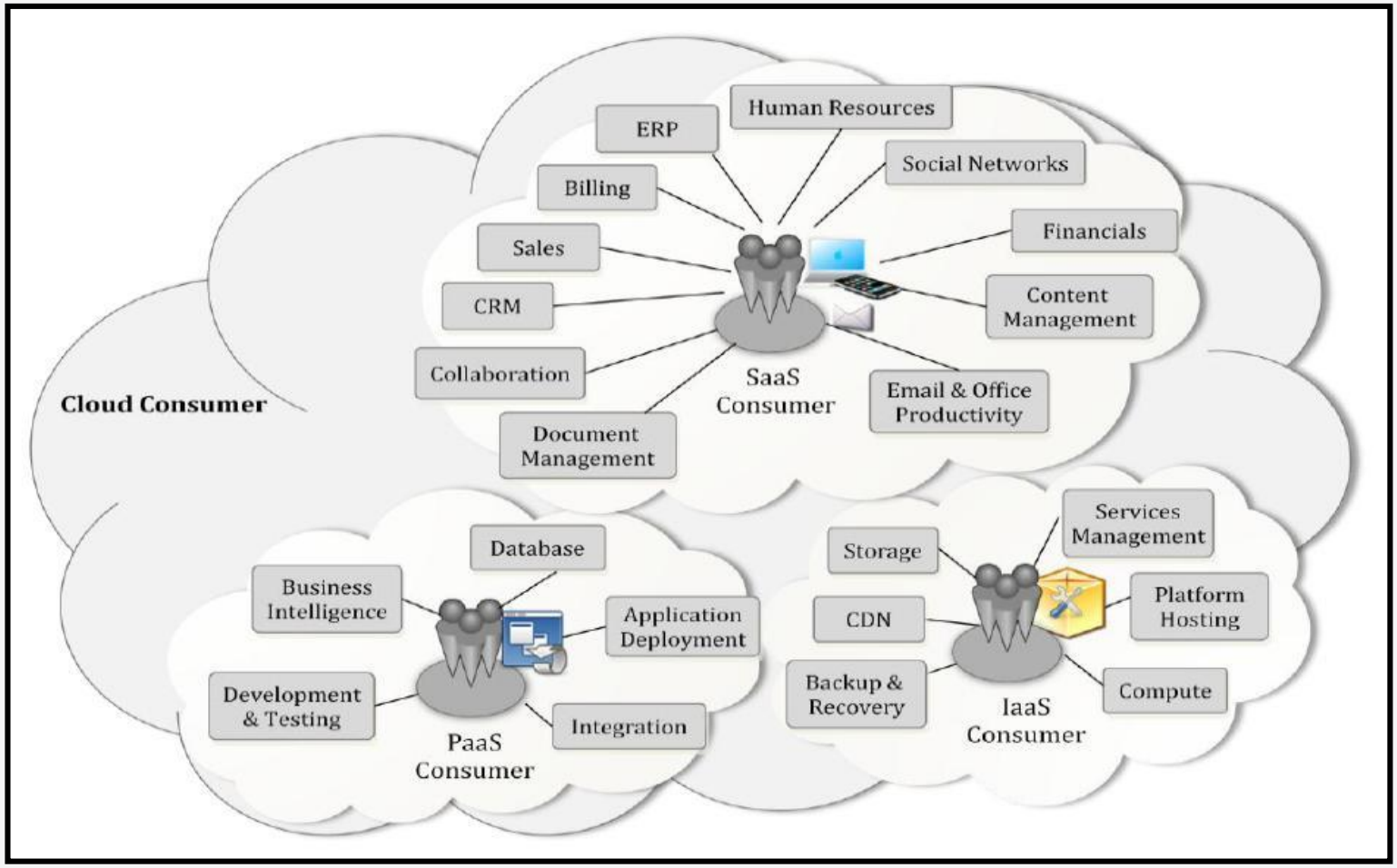


# Cloud Consumer

- Principal stakeholder for cloud computing service.
- Represents a person or organization that maintains a business relationship with, and uses the service from a cloud provider.

# Cloud Consumer

Example Services Available to a Cloud Consumer



# Cloud Provider

- A person, or an organization.
- An entity responsible for making a service available to interested parties.
- Cloud Provider:
  - acquires and manages the computing infrastructure required for providing the services,
  - runs the cloud software that provides the services, and
  - makes arrangement to deliver the cloud services to the Cloud Consumers through network access.

# Cloud Provider

A cloud provider's activities can be described in five major areas:

- service deployment,
- service orchestration,
- cloud service management,
- security, and
- Privacy.

# Cloud Auditor

- Cloud auditor is a party that can perform an independent examination of cloud service controls with the intent to express an opinion thereon.
- Audits are performed to verify conformance to standards through review of objective evidence.

# Cloud Broker

Cloud broker is an entity that manages the use, performance and delivery of cloud services and negotiates relationships between cloud providers and cloud consumers.

# Cloud Broker

A cloud broker can provide services in three categories:

- Service Intermediation.
- Service Aggregation.
- Service Arbitrage.

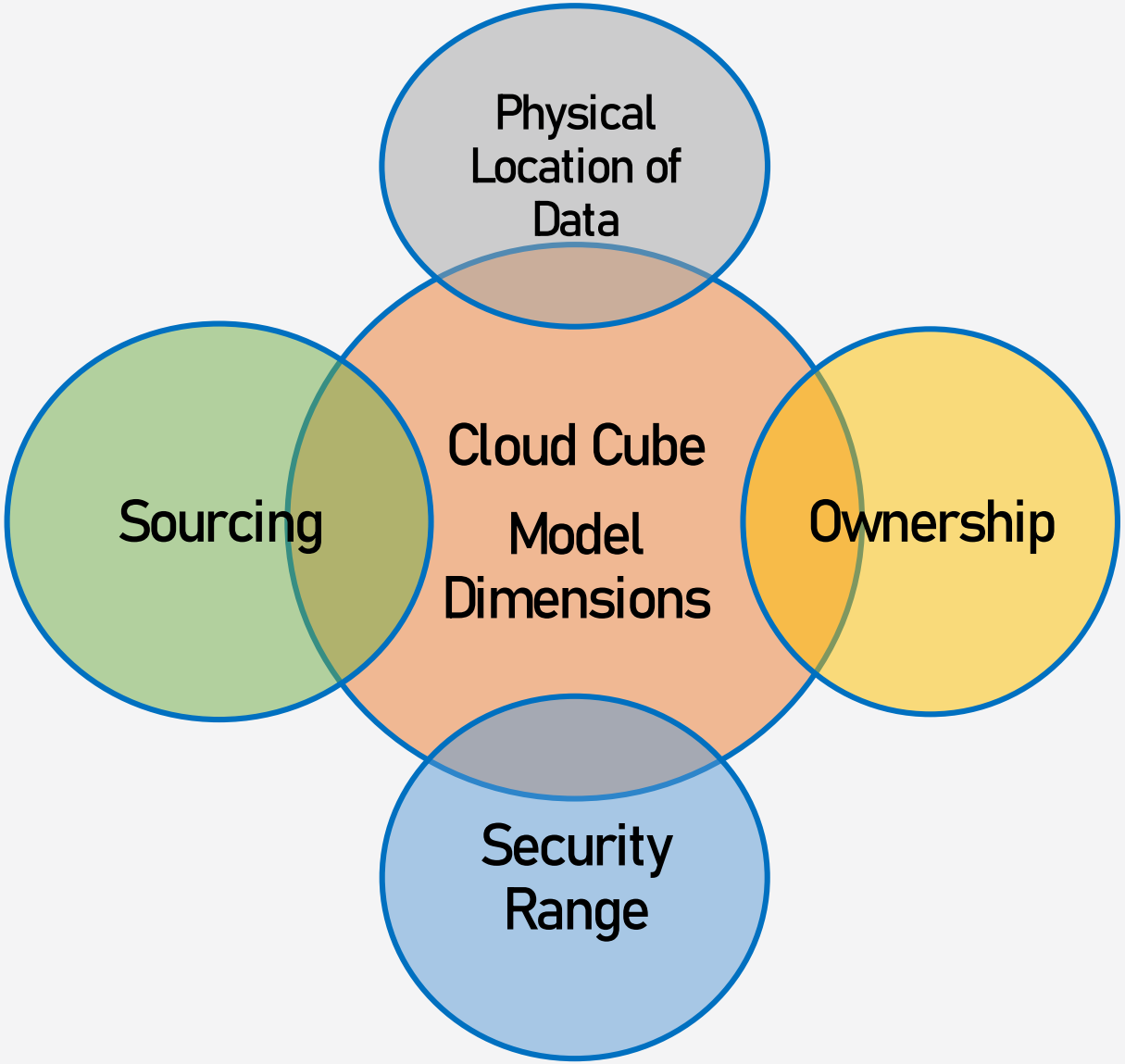
# Cloud Carrier

- Cloud carrier acts as an intermediary that provides connectivity and transport of cloud services between cloud consumers and cloud providers.
- Provide access to consumers through network, telecommunication and other access devices.

# Cloud Cube Model

- Jericho Forum has designed the Cloud Cube Model to help select cloud formations for secure collaboration.
- There are several “cloud formations”- or forms of cloud computing.
- Each offers
  - different characteristics,
  - varying degrees of flexibility,
  - different collaborative opportunities, and
  - different risks.

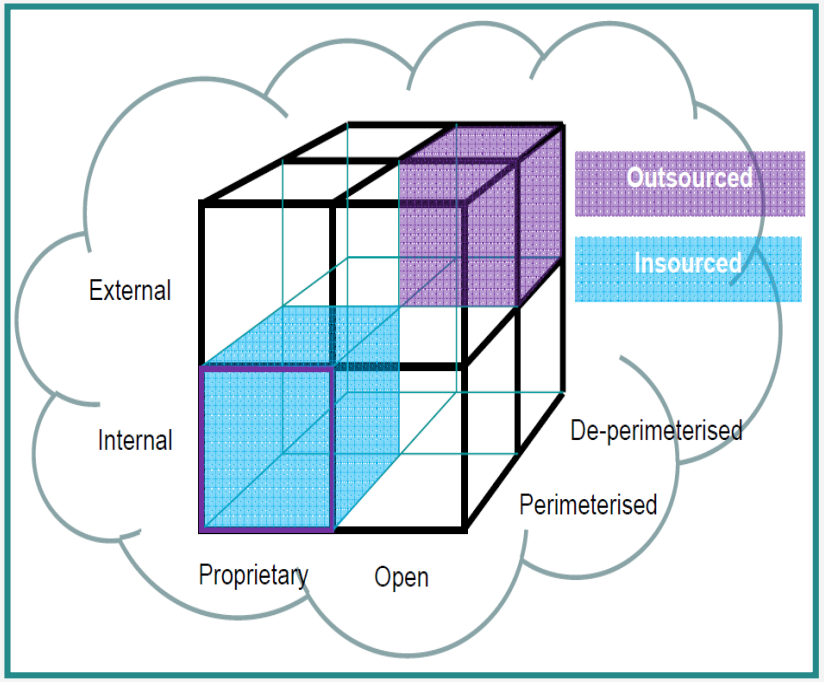
# Four Dimensions of Cloud Cube Model



# Four Dimensions of Cloud Cube Model

Cloud Cube Model effectively summarizes four dimensions:

- Internal/External.
- Proprietary/Open.
- Perimeterised/ De-perimeterized. Architectures
- Insourced/Outsourced.



# How to Secure Data in the Cloud Cube Model?

First you need to classify your data so as to know what rules must apply to protecting it:

- it's sensitivity, trust management.
- what regulatory/compliance restrictions apply on it.

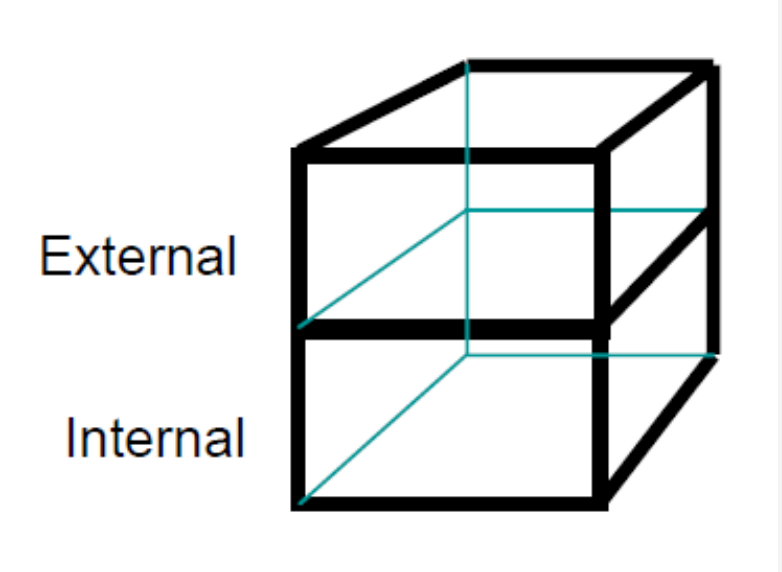
# How to Secure Data in the Cloud Cube Model?

We can only meet this requirement if we have universally adopted standards for:

- a data classification model.
- an associated standard for managing trust levels.
- standardised metadata that signals to “cloud security” what security needs be applied to each item of data.

# 1. Dimension: Internal (I)/ External (E)

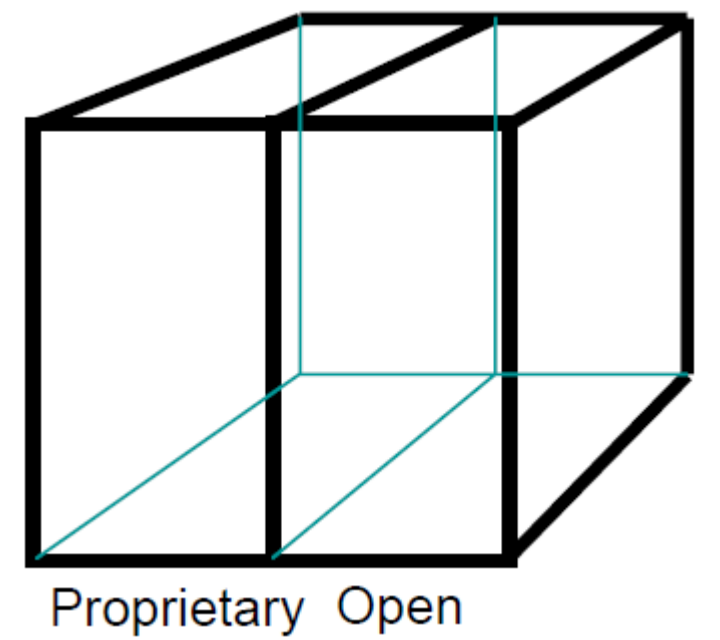
Defines the physical location of the data: where does the cloud form you want to use exist inside or outside your organization's boundaries.




- If it is within your own physical boundary then it is Internal.
- If it is not within your own physical boundary then it is External.

# 2. Dimension: Proprietary (P)/ Open (O)

This is the dimension that defines the state of ownership of the cloud technology, services, interfaces, etc.



# 2. Dimension: Proprietary (P)/ Open (O)

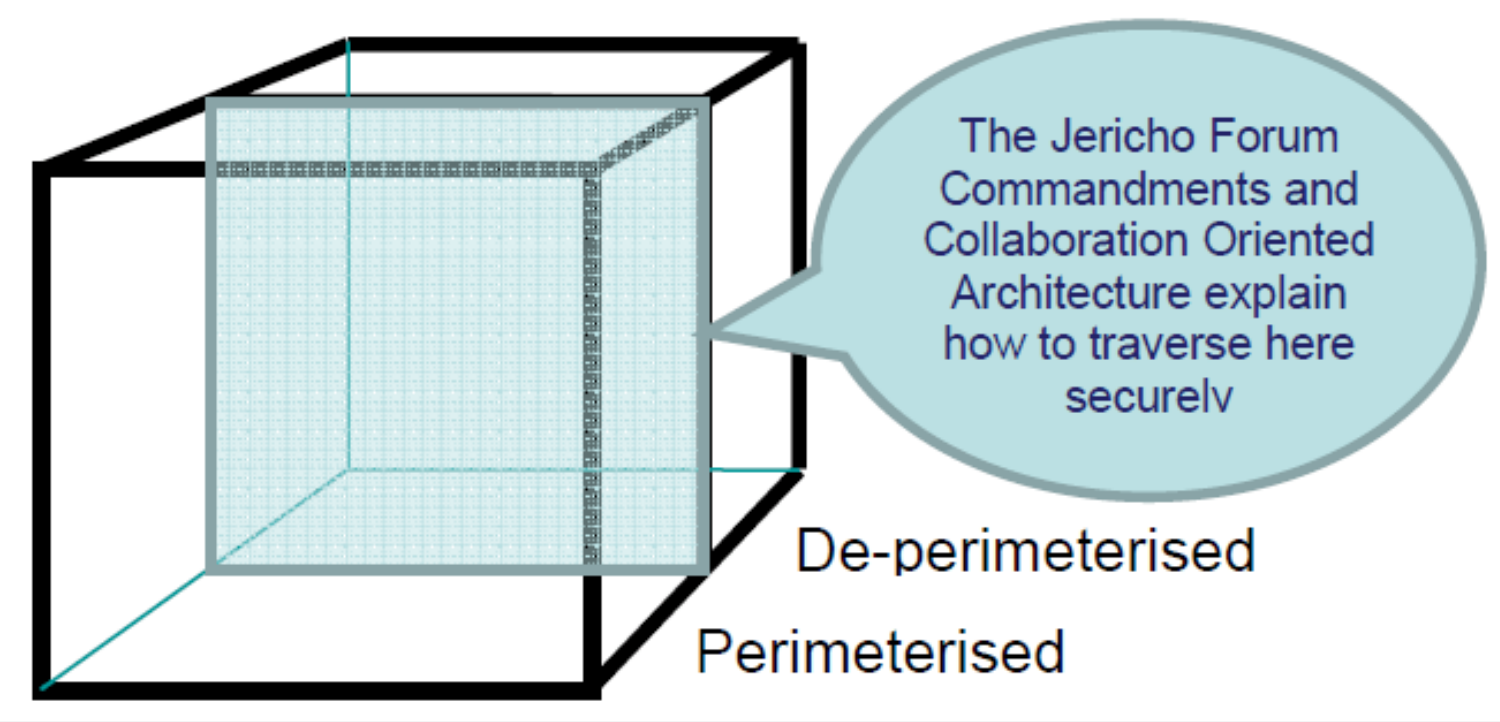
- Indicates the degree of interoperability, as well as enabling "data/application transportability" between your own systems and other cloud forms.
- Indicates the ability to withdraw your data from a cloud form or to move it to another without constraint.
- Indicates any constraints on being able to share applications.

# 2. Dimension: Proprietary (P)/ Open (O)

- Proprietary means that the organisation providing the service is keeping the means of provision under their ownership.
- Clouds that are Open are using technology that is not proprietary.
- Open services.

# 3. Dimension: Perimeterised (Per) / De-perimeterised (D-p) Architectures

Third dimension represents the "architectural mindset":



# 3. Dimension: Perimeterised (Per) / De-perimeterised (D-p) Architectures

- Perimeterised implies continuing to operate within the traditional IT perimeter, often signalled by “network firewalls”.
- De-perimeterised, assumes that the system perimeter is architected following the principles outlined in the Jericho Forum’s Commandments and Collaboration-Oriented Architectures (COA) Framework.

# 4. Dimension: Insourced/ Outsourced

A 4th dimension that has 2 states in each of the 8 cloud forms: Per(IP,IO,EP,EO) and D-p(IP,IO,EP,EO), that responds to the question:

"Who do you want running your Clouds?"

- Outsourced: the service is provided by a 3rd party.
- Insourced: the service is provided by your own staff under your control.

That's all for now...