Projektowanie oprogramowania systemów
System software design

Politechnika Gdańska

Katedra systemów multimedialnych

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PLAN OF THE COURSE AND ASSESSMENT

- Lecture:
    - first half of semester
    - finished by exam
- Project
    - second half of semester
- Assessment:
    - exam – 50%
    - project – 50%

Agenda

- System Development Life Cycle (SDLC)
- Business Analysis
- Analysis – methods
- Solutions Architecture
  - What is IT architecture
  - Architecture development method
  - Architecture governance
  - Reference models
  - Content metamodel
- Specific dedicated solutions
  - Mobile
  - Cloud
- DevOPS
- Developers tools
- Project management
- Design patterns, tests

IT Architecture

- Enterprise Continuum
- Governance
- Reference Model – TRM / IIIRM
- Content Framework

IT Architecture

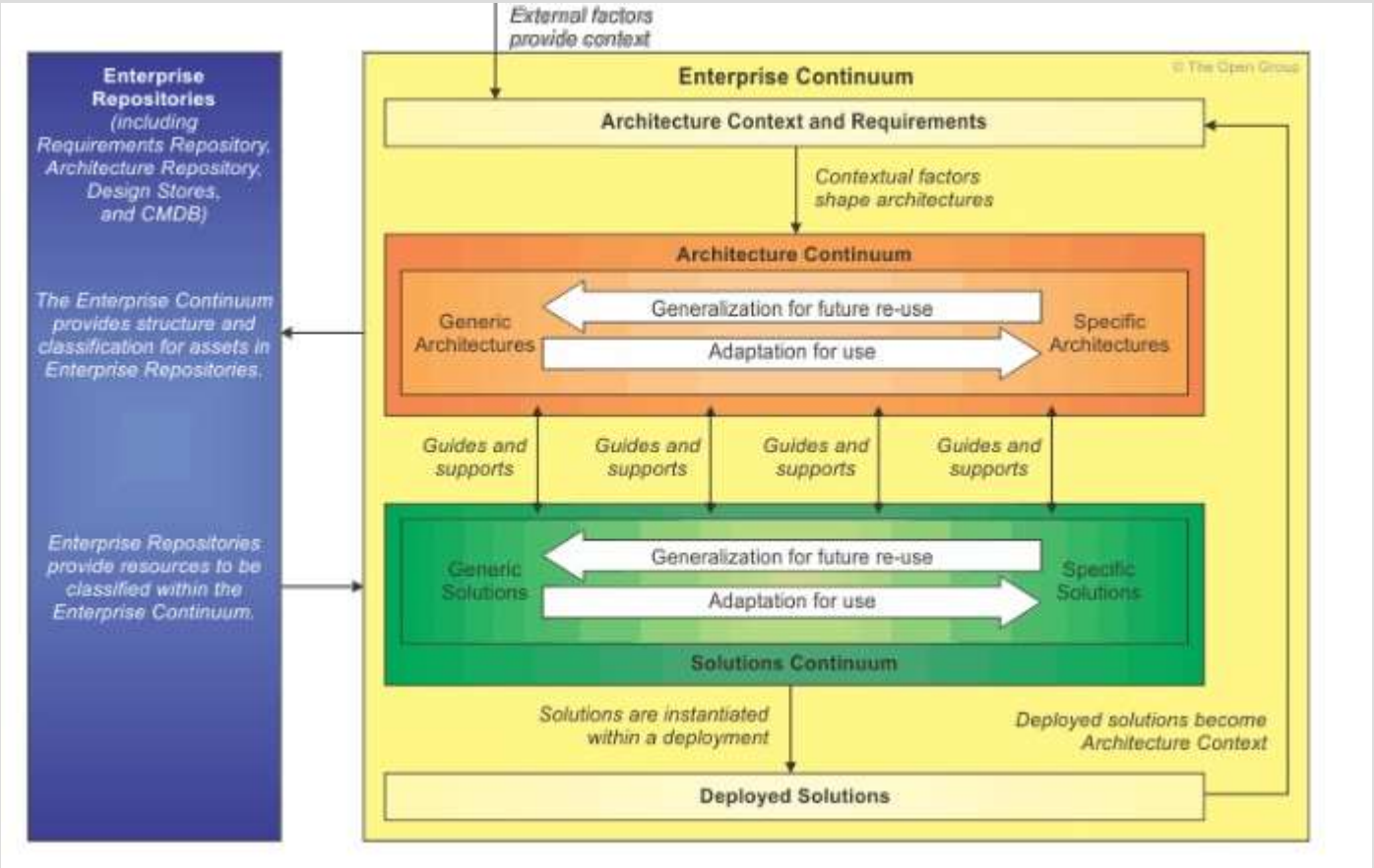
- **Enterprise Continuum**

  The Enterprise Continuum provides **methods for classifying architecture** and solution artifacts, both internal and external to the Architecture Repository, as they evolve from **generic Foundation** Architectures to **Organization-Specific** Architectures.

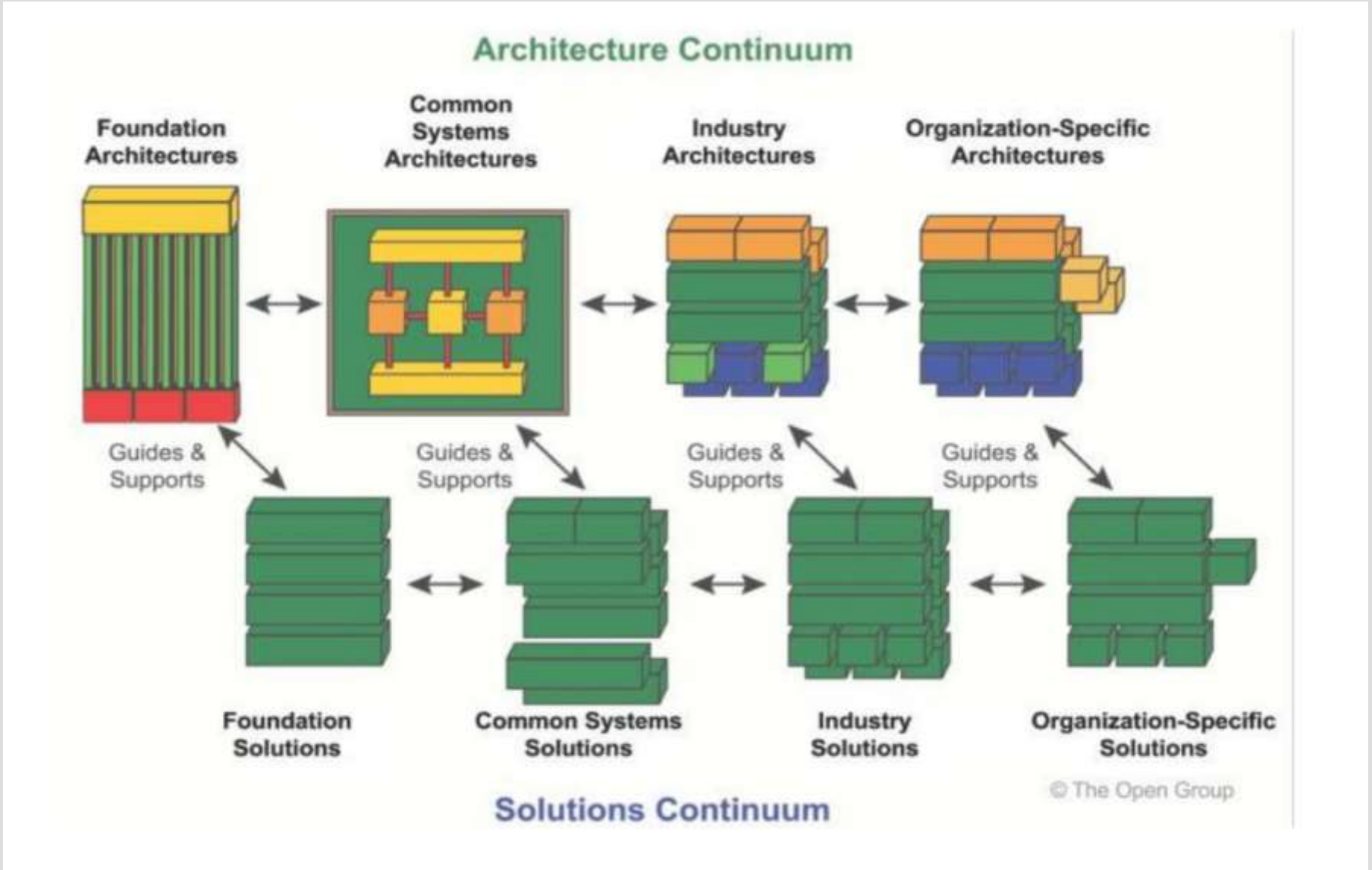
  The Enterprise Continuum enables the organization of **re-usable** architecture artifacts and solution assets to maximize the enterprise architecture investment opportunities

IT Architecture

Achitecture Continuum



IT Architecture



IT Architecture

Architecture Partitioning

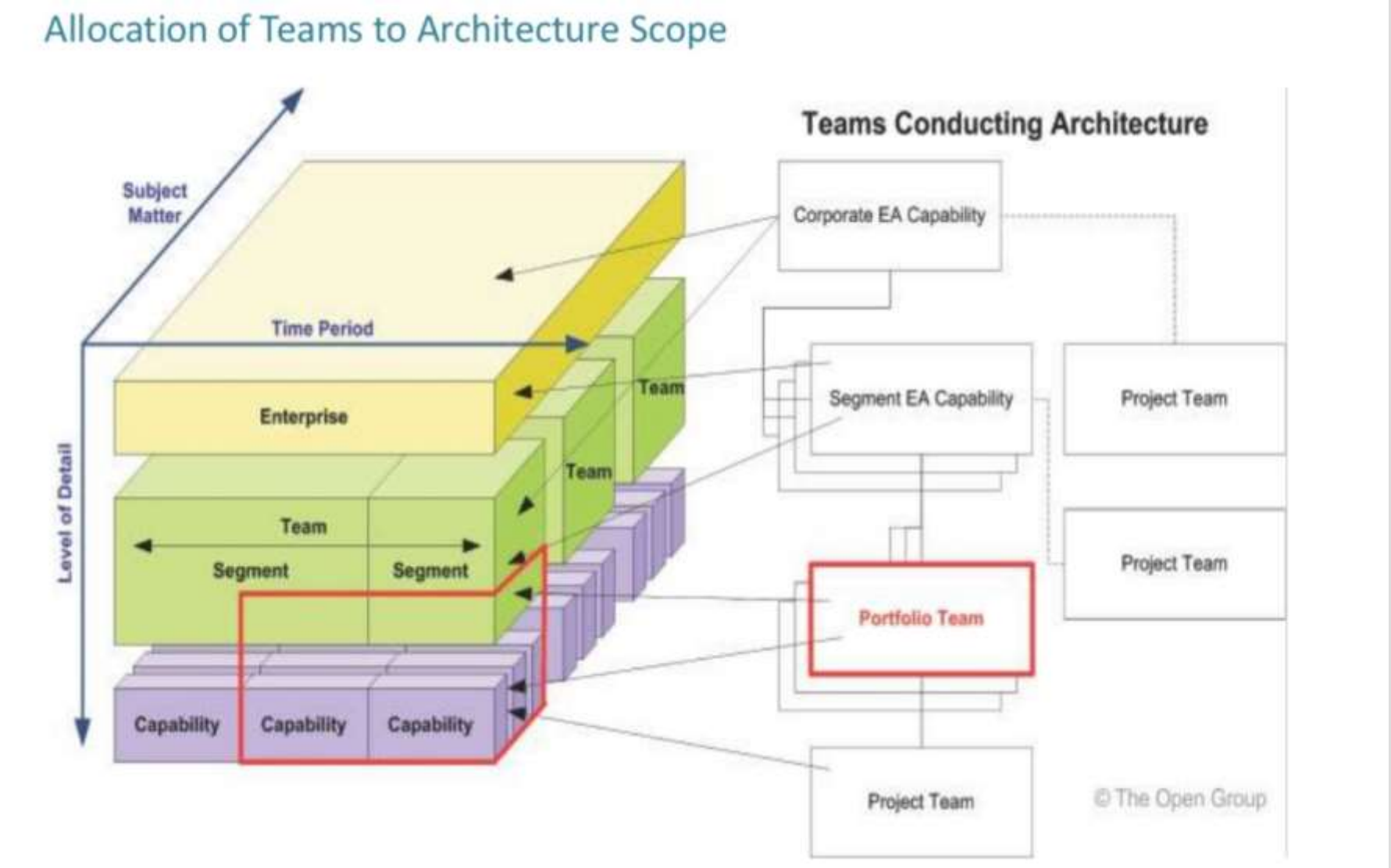
Architectures are partitioned because:

• Organizational unit architectures conflict with one another

• Different teams need to work on different elements of architecture at the same time

• Effective architecture re-use requires modular architecture segments.

IT Architecture



IT Architecture

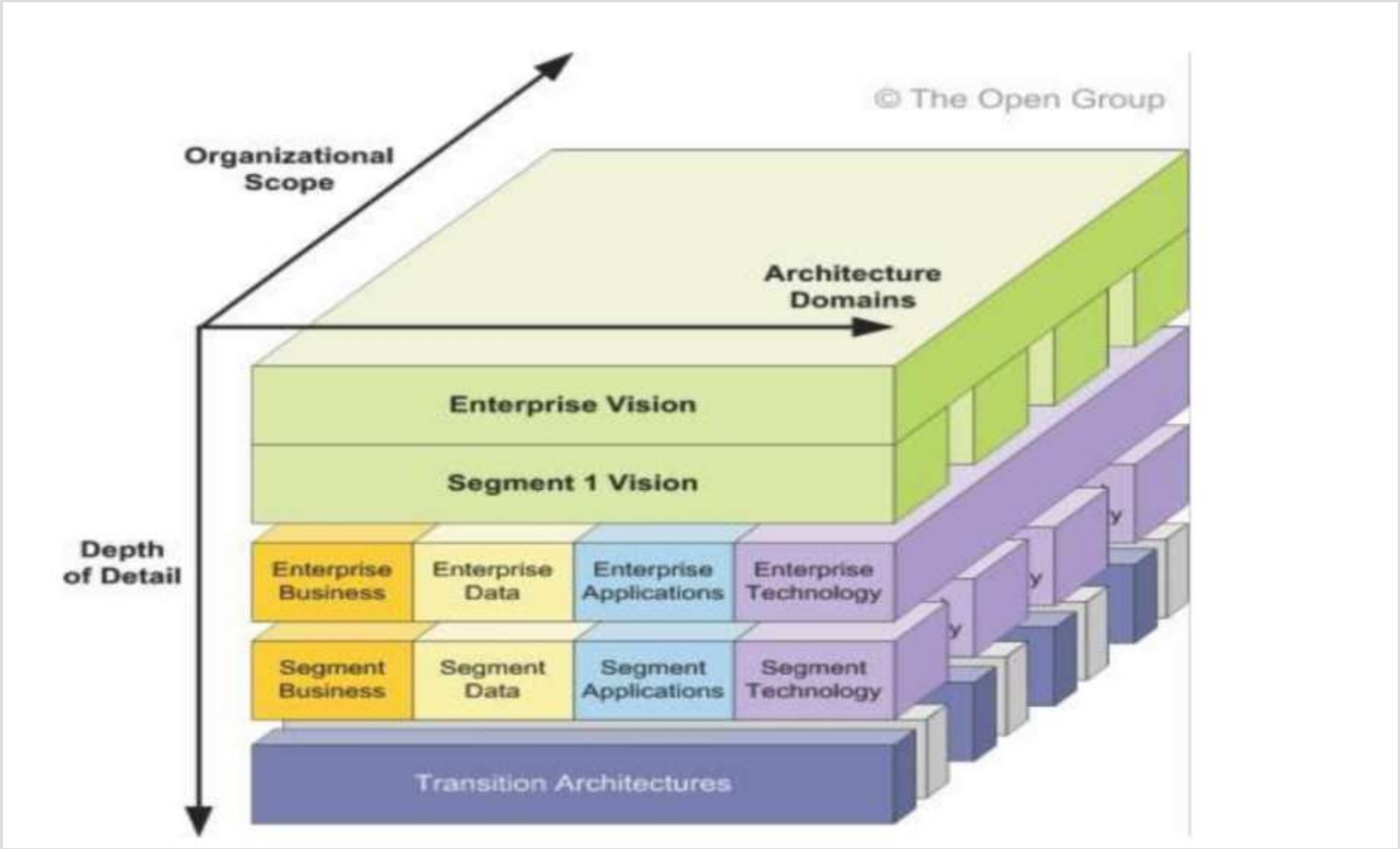
Integration

Creation of partitioned architectures runs the **risk of producing a fragmented and disjointed collection of architectures** that cannot be integrated to form an overall big picture

In order to mitigate against this risk,

- standards for content integration should be defined
- architecture governance should address content integration - architectural compliance
- Content frameworks, can be used to specify standard building blocks and artifactst hat are the subject of content integration standards

IT Architecture

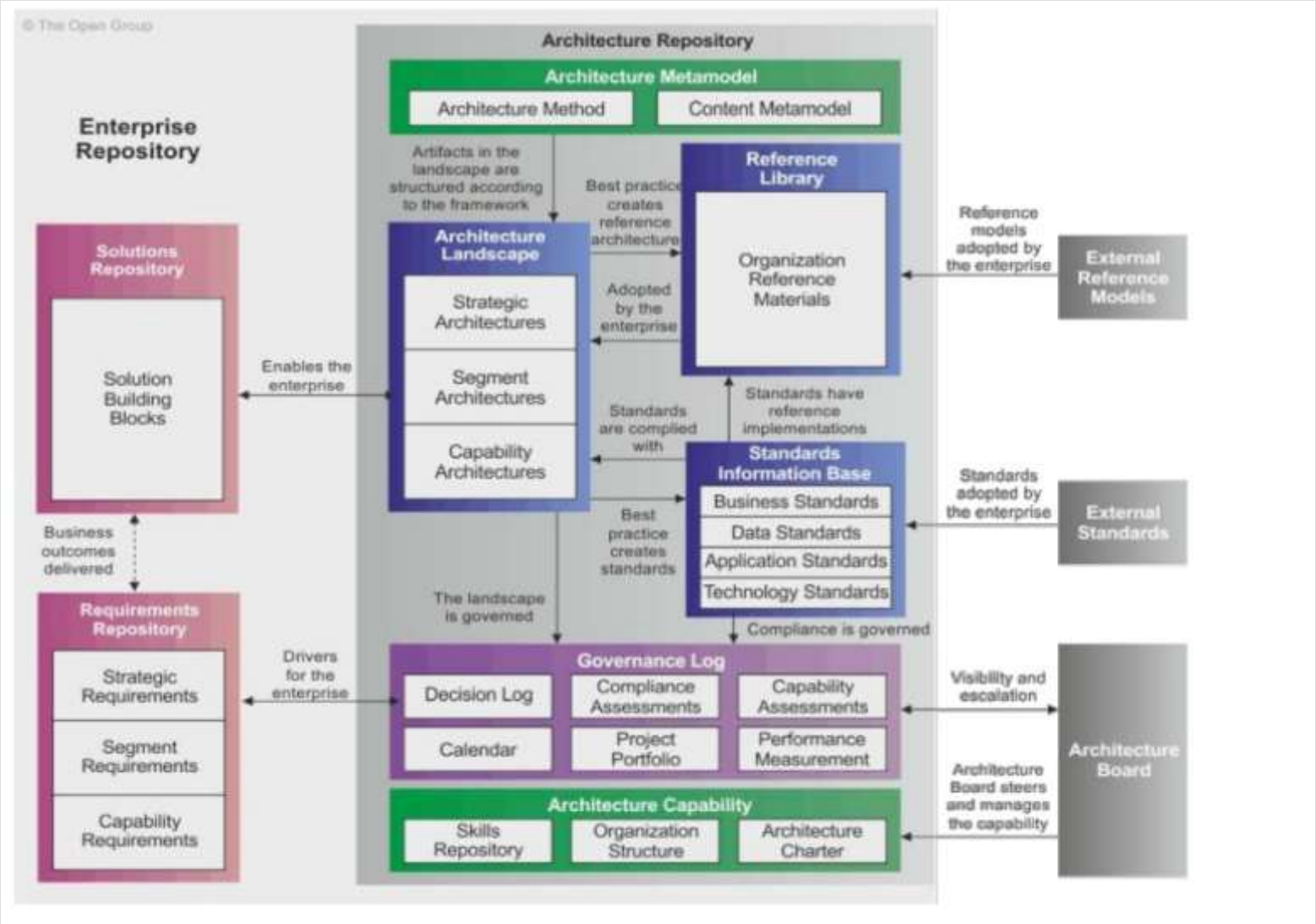


IT Architecture

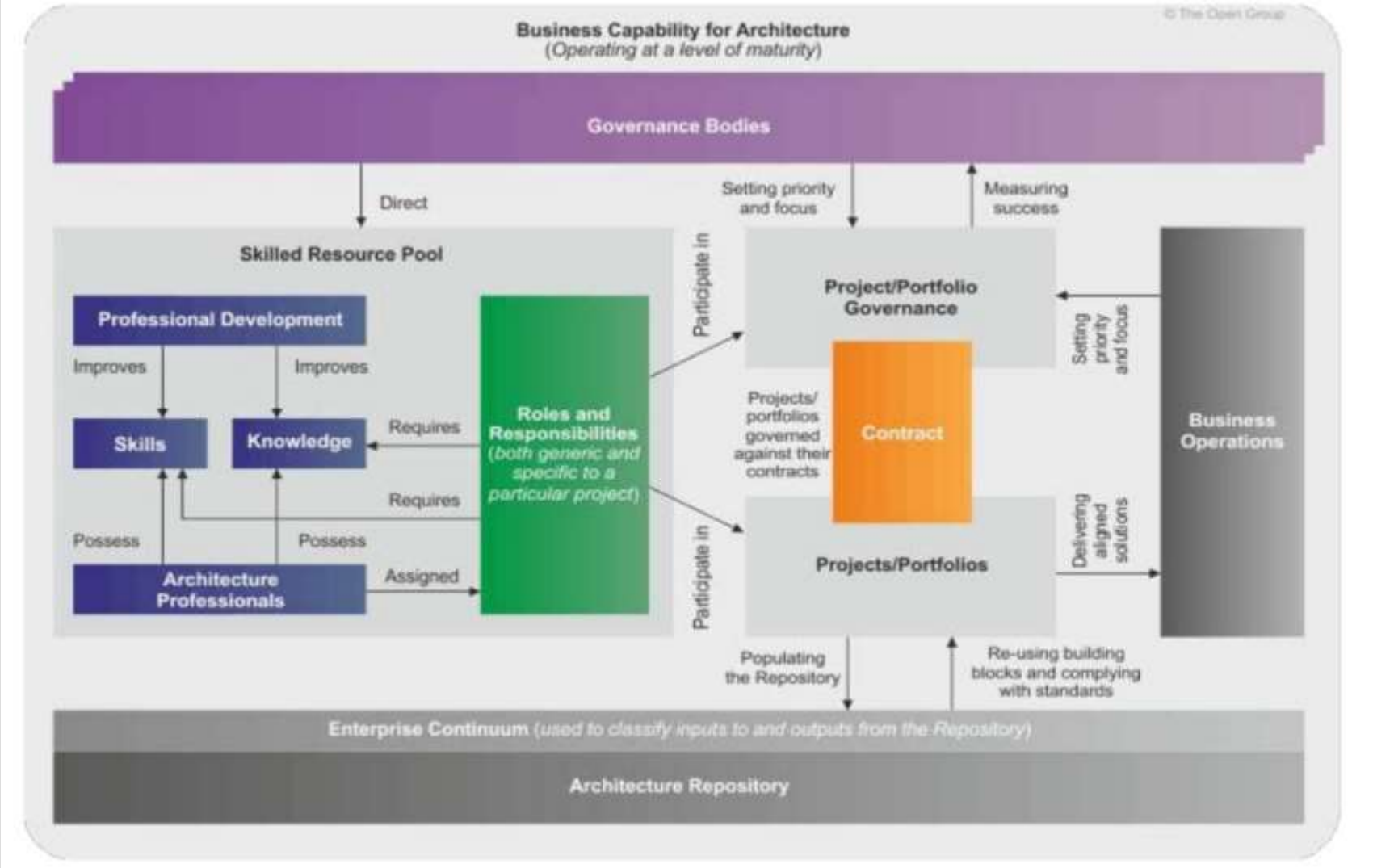
- **Architecture Repository**

- High level classes of architectural held within an Architecture Repository:
    - The **Architecture Metamodel** describes the organizationally tailored application of anarchitecture framework.
    - The **Architecture Capability** defines the parameters, structures, and processes for governance of the Architecture Repository.
    - The **Architecture Landscape** presents an architectural representation of assets in use.
    - The **Standards Information Base** captures the standards to which architecture must comply.
    - The **Reference Library** provides guidelines, templates, patterns, and other forms ofreference material .
    - The **Governance Log** provides a record of governance activity across the enterprise

IT Architecture



IT Architecture



IT Architecture

- **Architecture governance** is the practice and orientation by which enterprise architectures and other architectures are managed and controlled at an enterprise-wide level.

Architecture governance typically operate within a hierarchy of governance structures,

- Corporate governance
- Technology governance
- IT governance
- Architecture governance

IT Architecture

Characteristics of Governance

Discipline All involved parties will have a commitment to adhere to procedures, processes, and authority structures established by the organization.

Transparency All actions implemented and their decision support will be available for inspection by authorized organization and provider parties.

Independence All processes, decision-making, and mechanisms used will be established so as to minimize or avoid potential conflicts of interest.

Accountability Identifiable groups within the organization - e.g., governance boards who take actions or make decisions - are authorized and accountable for their actions.

Responsibility Each contracted party is required to act responsibly to the organization and its stakeholders.

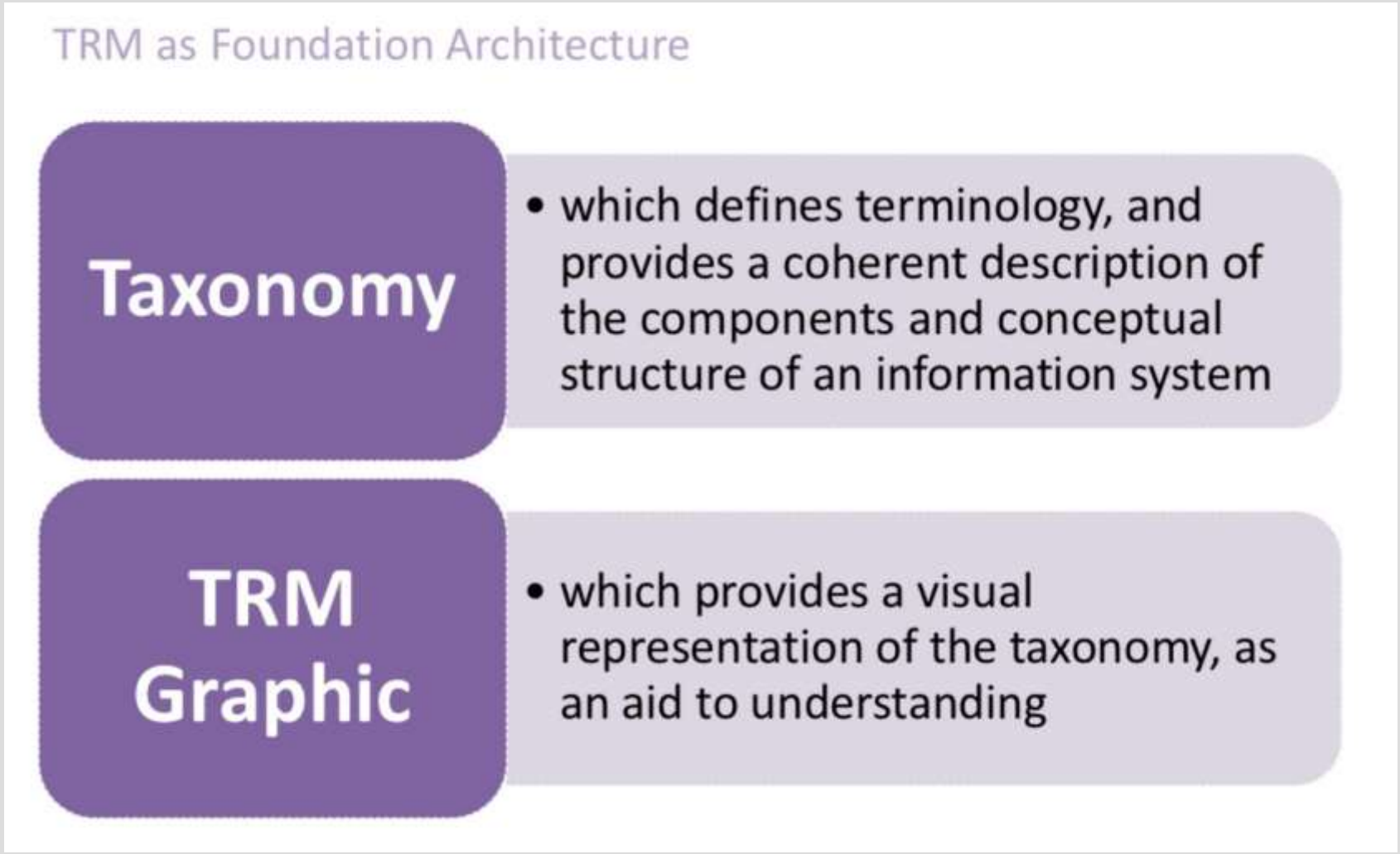
Fairness All decisions taken, processes used, and their implementation will not be allowed to create unfair advantage to any one particular party.

IT Architecture

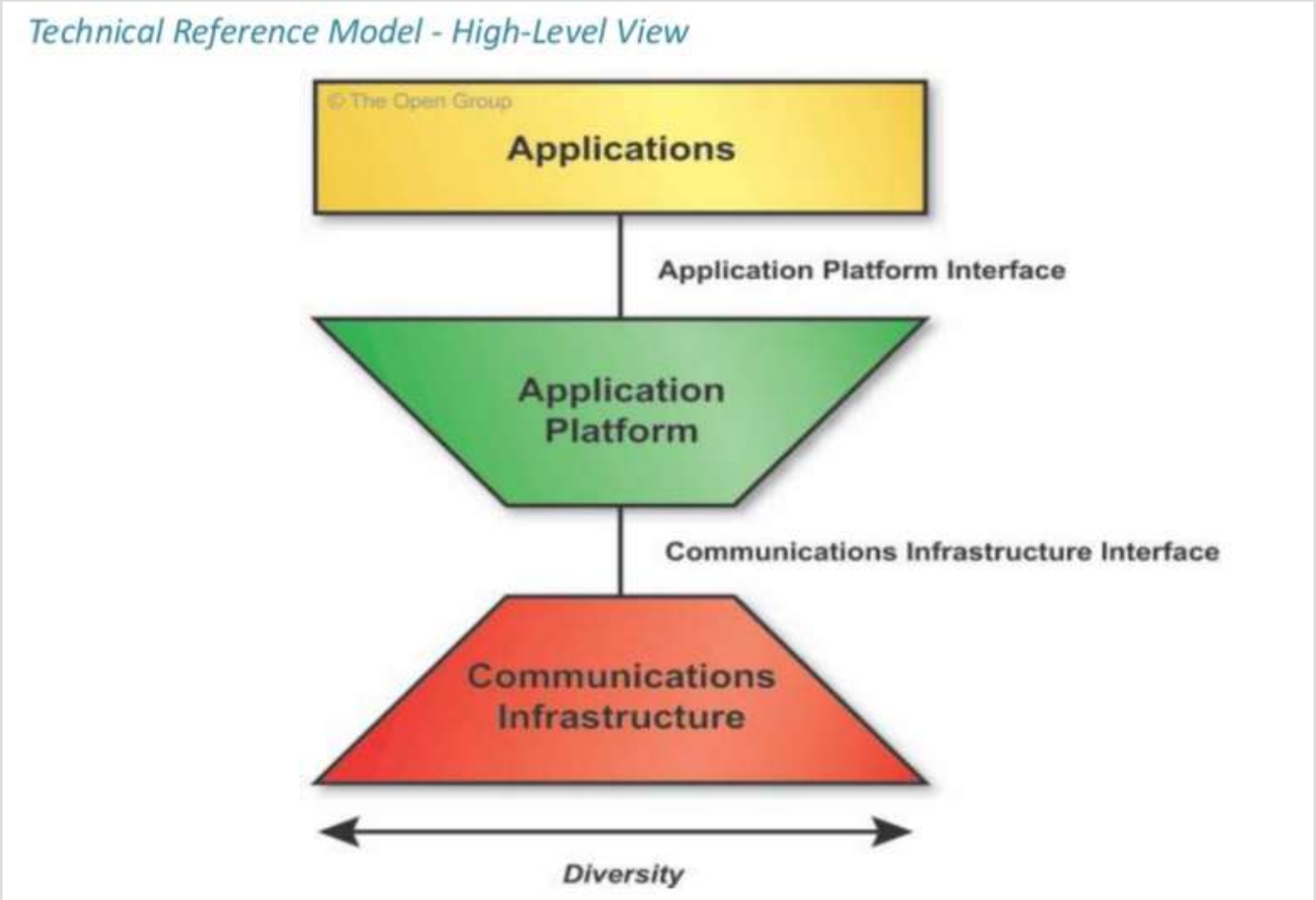
- **Architecture Skills Framework**

- A typical architecture team undertaking the development of an enterprise architecture as described in TOGAF would comprise the following roles:
  - Architecture Board Members
  - Architecture Sponsor
  - Architecture Manager
  - Architects for:
    - Enterprise Architecture (which can be considered as a superset of Business, Data, Application, and Technology Architecture)
    - Business Architecture
    - Data Architecture
    - Application Architecture
    - Technology Architecture
  - Program and/or Project Managers
  - IT DesignerAnd many others

IT Architecture



IT Architecture



IT Architecture

The high-level TRM seeks to emphasize two major common architectural objectives:

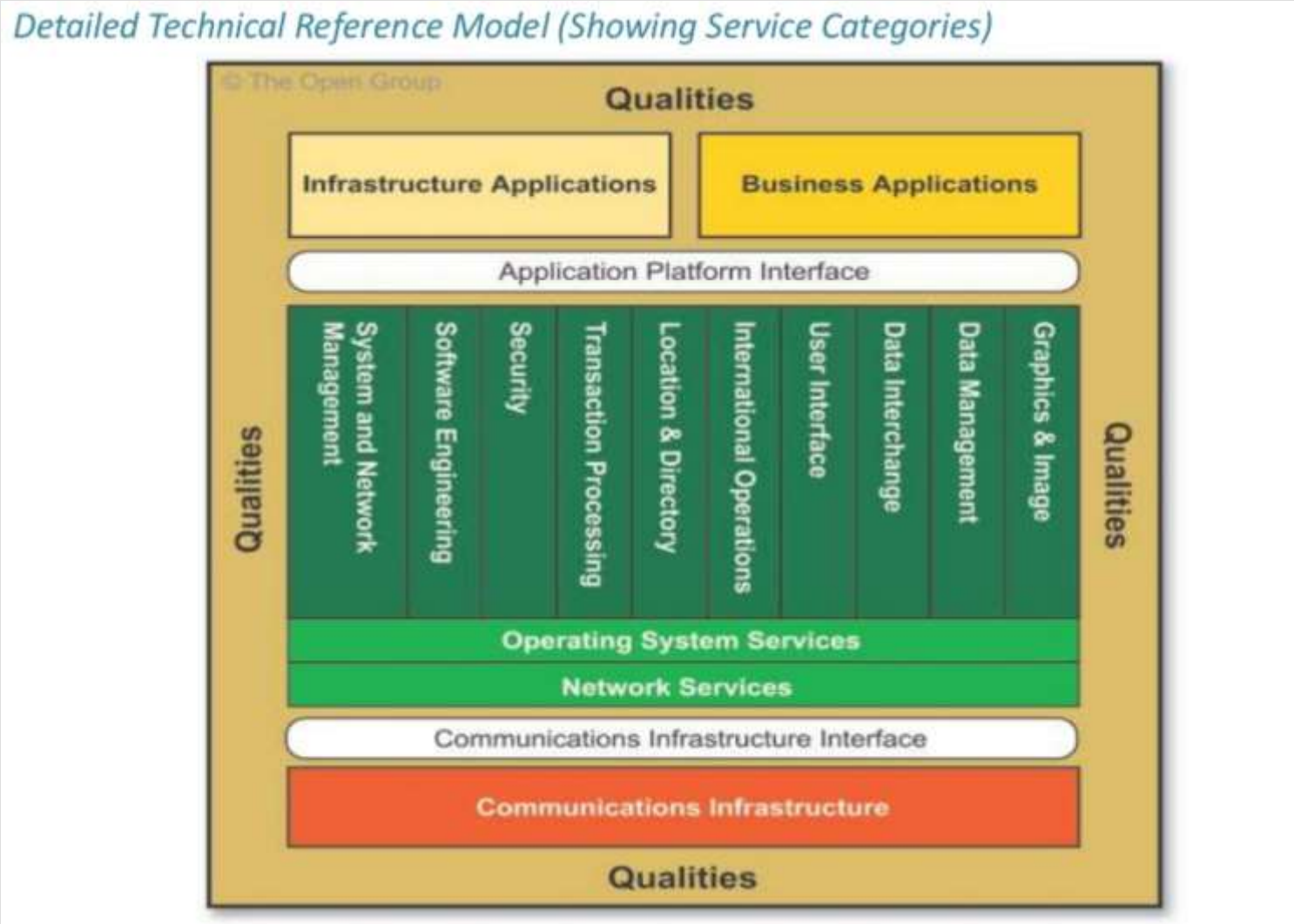
Application Portability

- via the Application Platform Interface

Interoperability

- via the Communications Infrastructure Interface

IT Architecture



IT Architecture

Integrated Information Infrastructure Reference Model

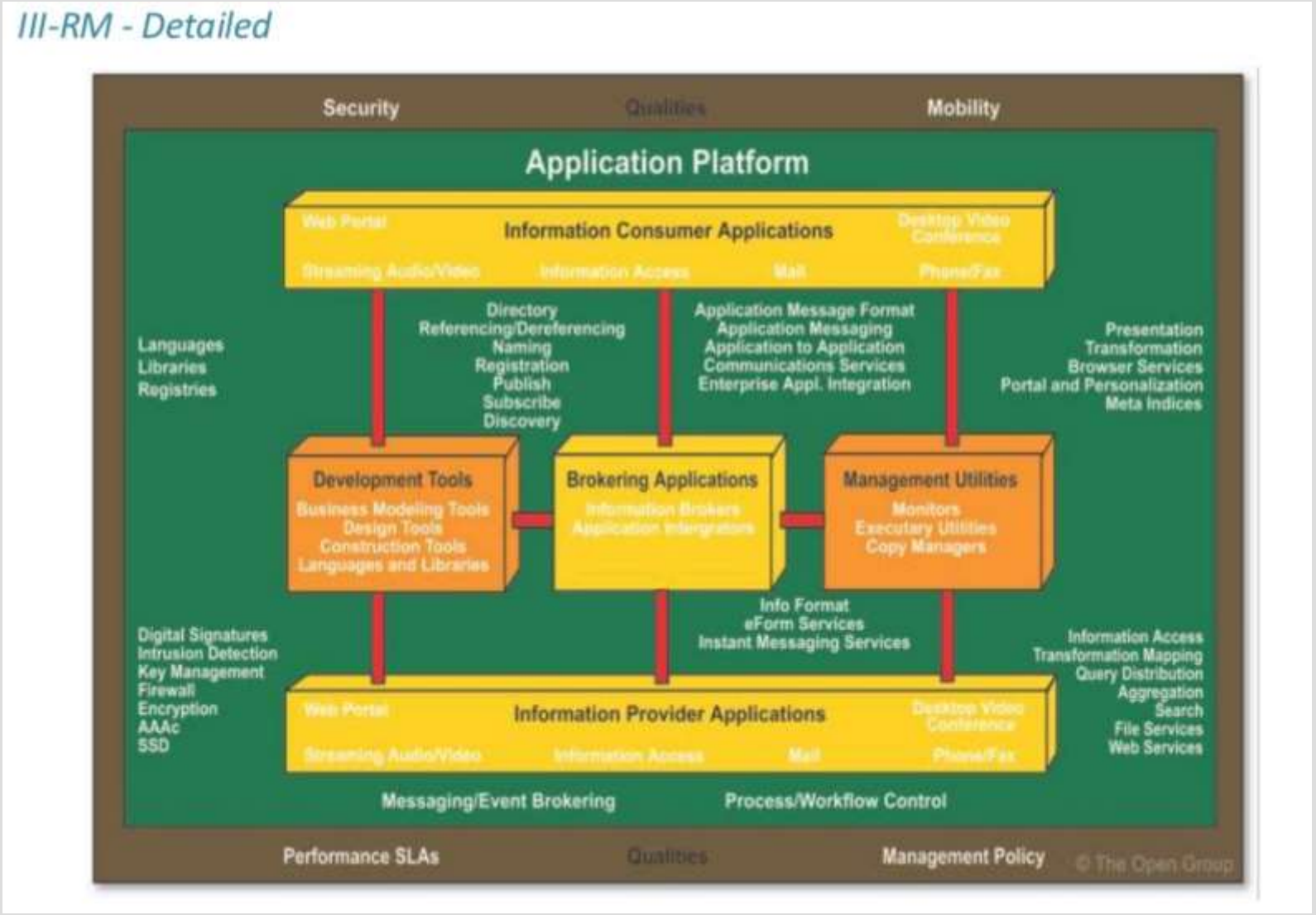
Taxonomy

- which defines terminology, and provides a coherent description of the components and conceptual structure of an integrated information infrastructure

III-RM Graphic

- which provides a visual representation of the taxonomy, and the inter-relationship of the components, as an aid to understanding

IT Architecture



IT Architecture

Important Sites:

http://www.opengroup.org/
http://www.enterprise-architecture.info/
http://www.togaf.org/
http://www.togaf-modeling.org/

IT Architecture CLOUD

Introduction

High performance networks and advanced development of internet is the basis for cloud computing .

Cloud computing has started taking shape incorporating virtualization and on demand deployment and internet delivery of services.

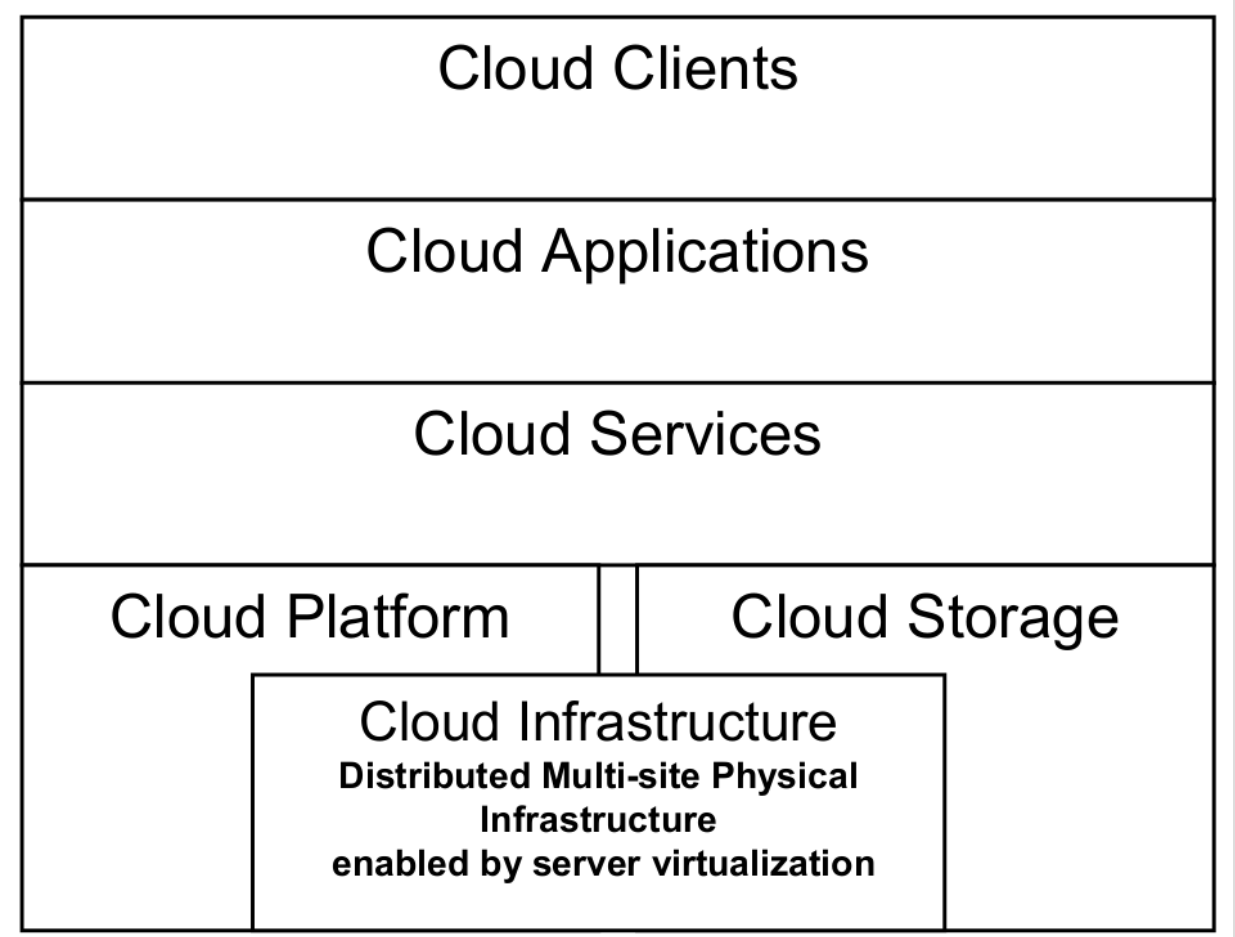
IT Architecture CLOUD

Cloud is a pool of virtualized computer resources networked, which can:

- Host a variety of workloads.
- Batch-style back-end jobs.
- Interactive user-facing applications.
- Workloads can be deployed and scaled out quickly through the rapid provisioning of virtual machines or physical machines.
- Support redundant, self recovering, highly scalable programming models that allow workloads to recover from many unavoidable hardware / software failures.
- Monitor resource use in real time to enable rebalancing of allocations when needed

IT Architecture CLOUD

- Cloud Computing Stack of Services



IT Architecture CLOUD

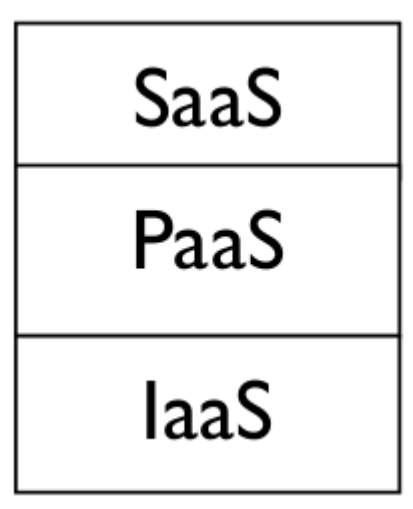
- **Architectural Layers of Cloud Computing**

In the cloud computing stack, there are three basic layers
that together create cloud environment. They are:

1.Infrastructure as a Service(IaaS)

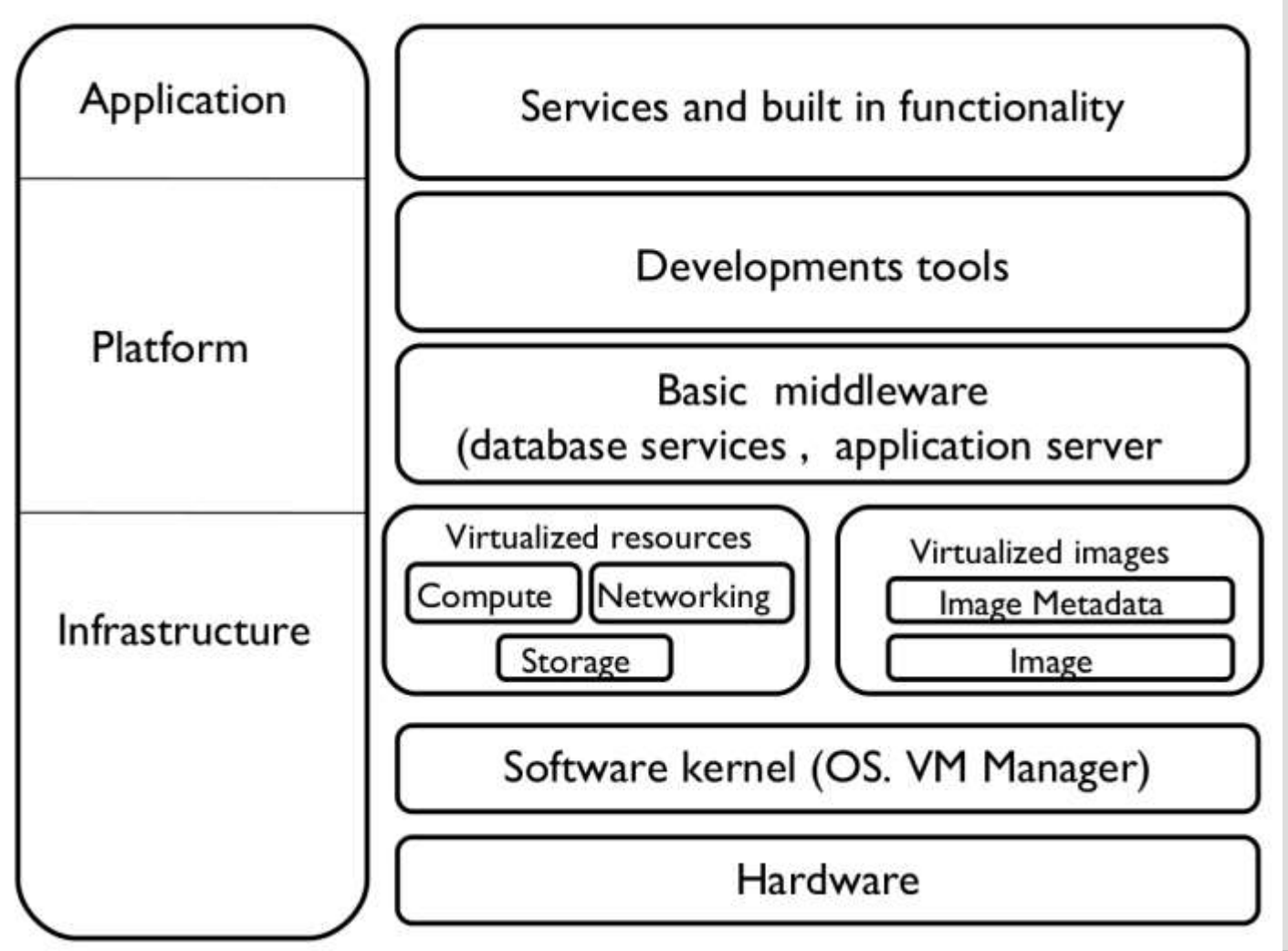
2.Platform as a Service (PaaS)

3.Software as a Service (SaaS)



IT Architecture CLOUD

- **Framework of cloud computing**



IT Architecture CLOUD

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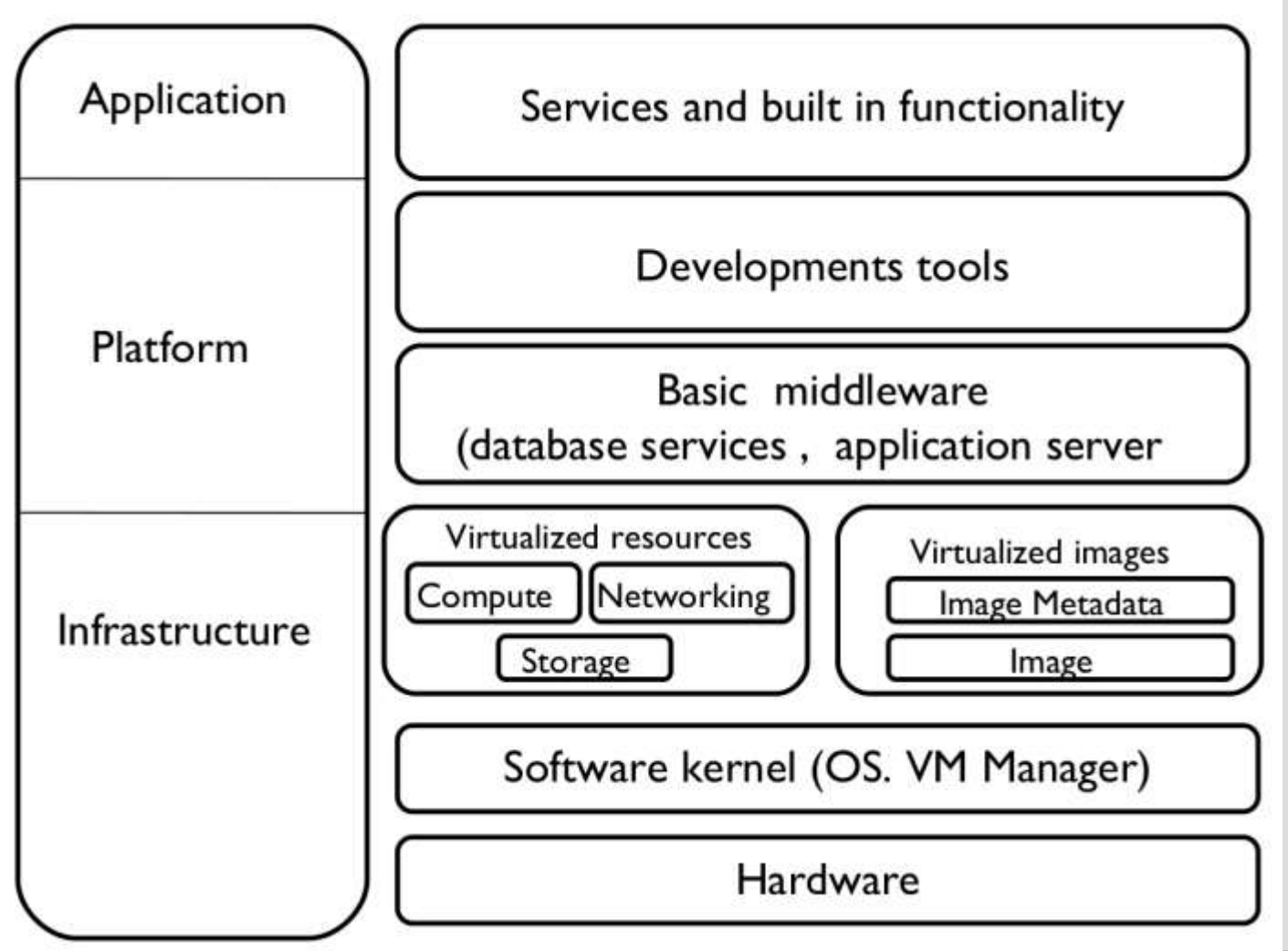


IT Architecture CLOUD

Virtual infrastructure management and Cloud Computing

- For building the cloud environment a variety of requirements must be met to provide a uniform and homogeneous view of the virtualized resources.
- Virtual Infrastructure Management is the key component to build the cloud environment which does the dynamic orchestration of virtual machines on a pool of physical resources.

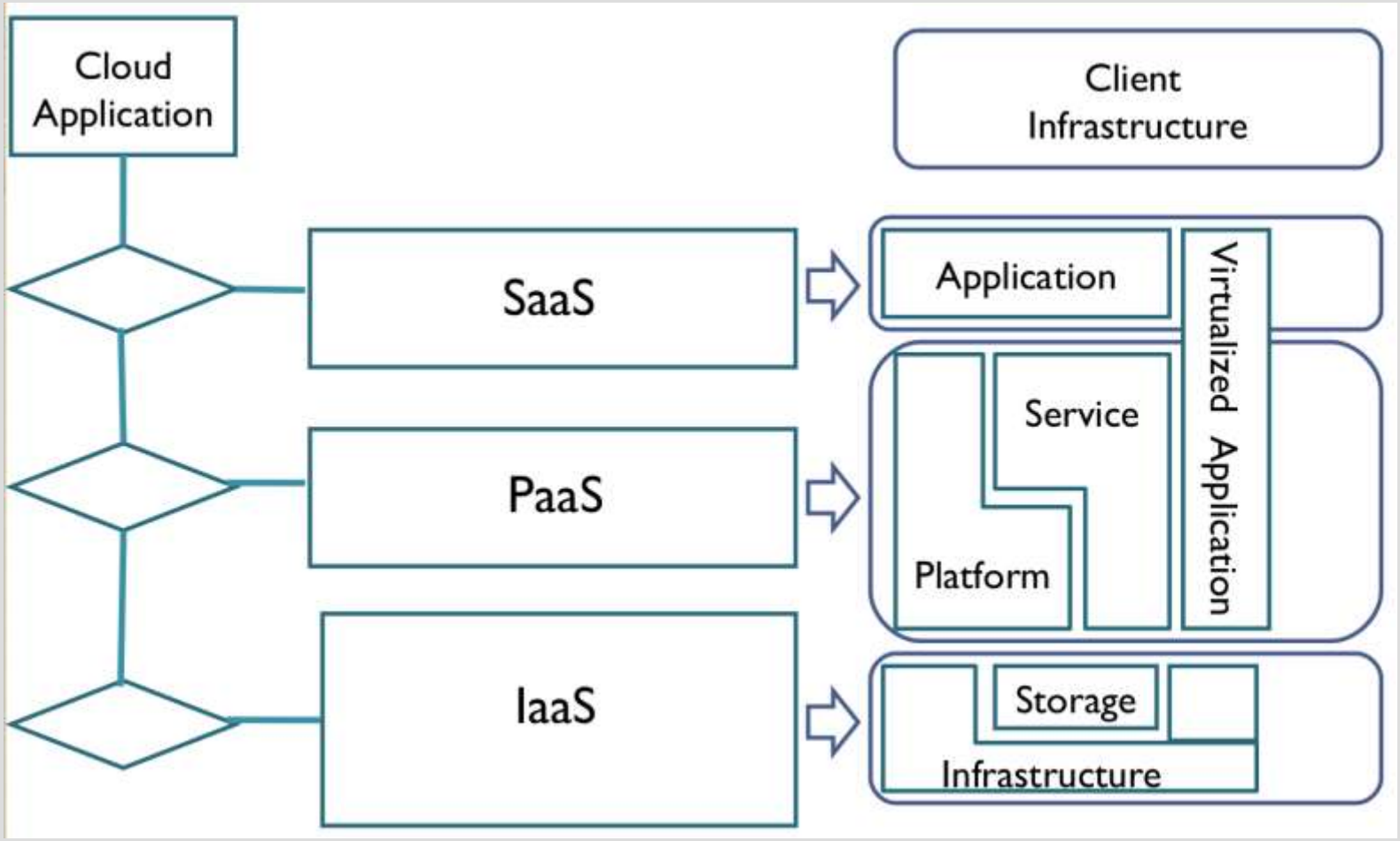
IT Architecture CLOUD

Virtual infrastructure management and Cloud Computing

- Virtual infrastructure management provide primitives to schedule and manage VMs across multiple physical hosts.
- Cloud management provide remote and secure interface for creating controlling and monitoring virtualized resources on IaaS.

IT Architecture CLOUD

View of Cloud Deployment



IT Architecture CLOUD

Software as a Service

It is a Deployment/Delivery model

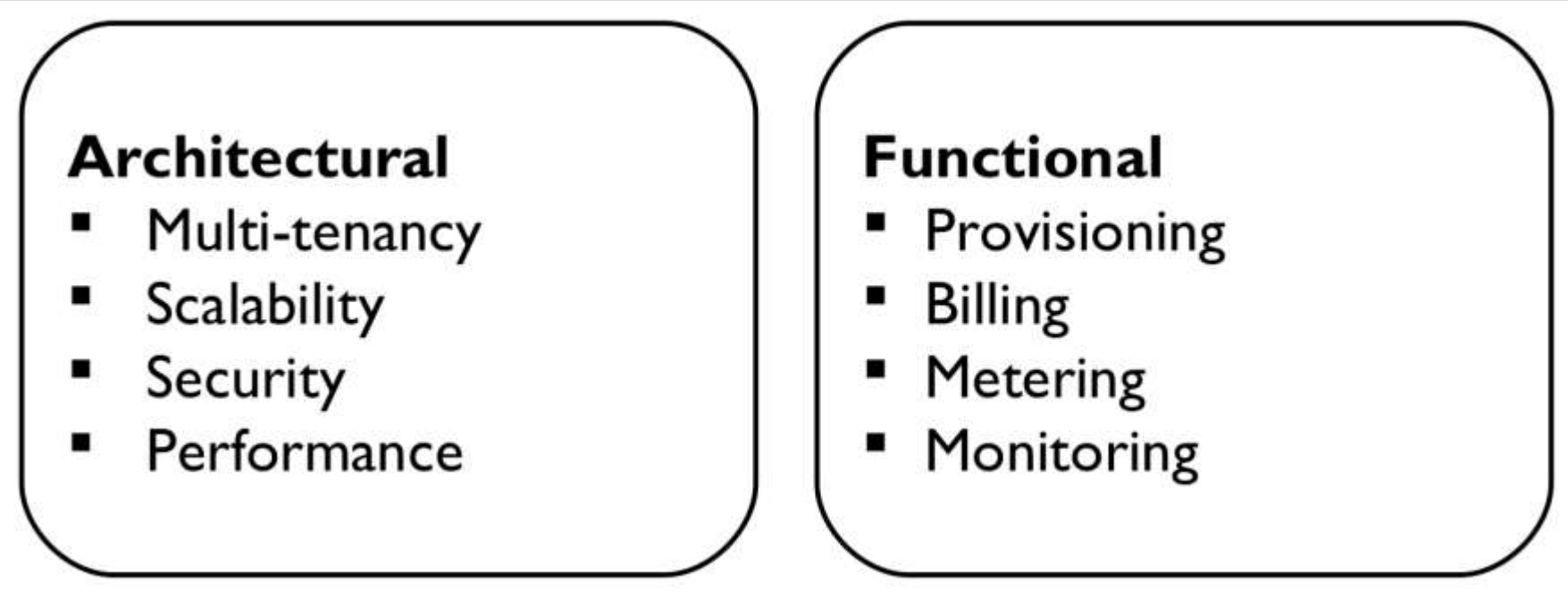
- Hosted and managed by vendor
- Delivered across the internet

It is a Business Model : usage-based pricing(vs. perpetual license model of on –premise software).Examples:

- Per user per month
- Per transaction
- Per GB of storage per month

IT Architecture CLOUD

Software as a Service



IT Architecture CLOUD

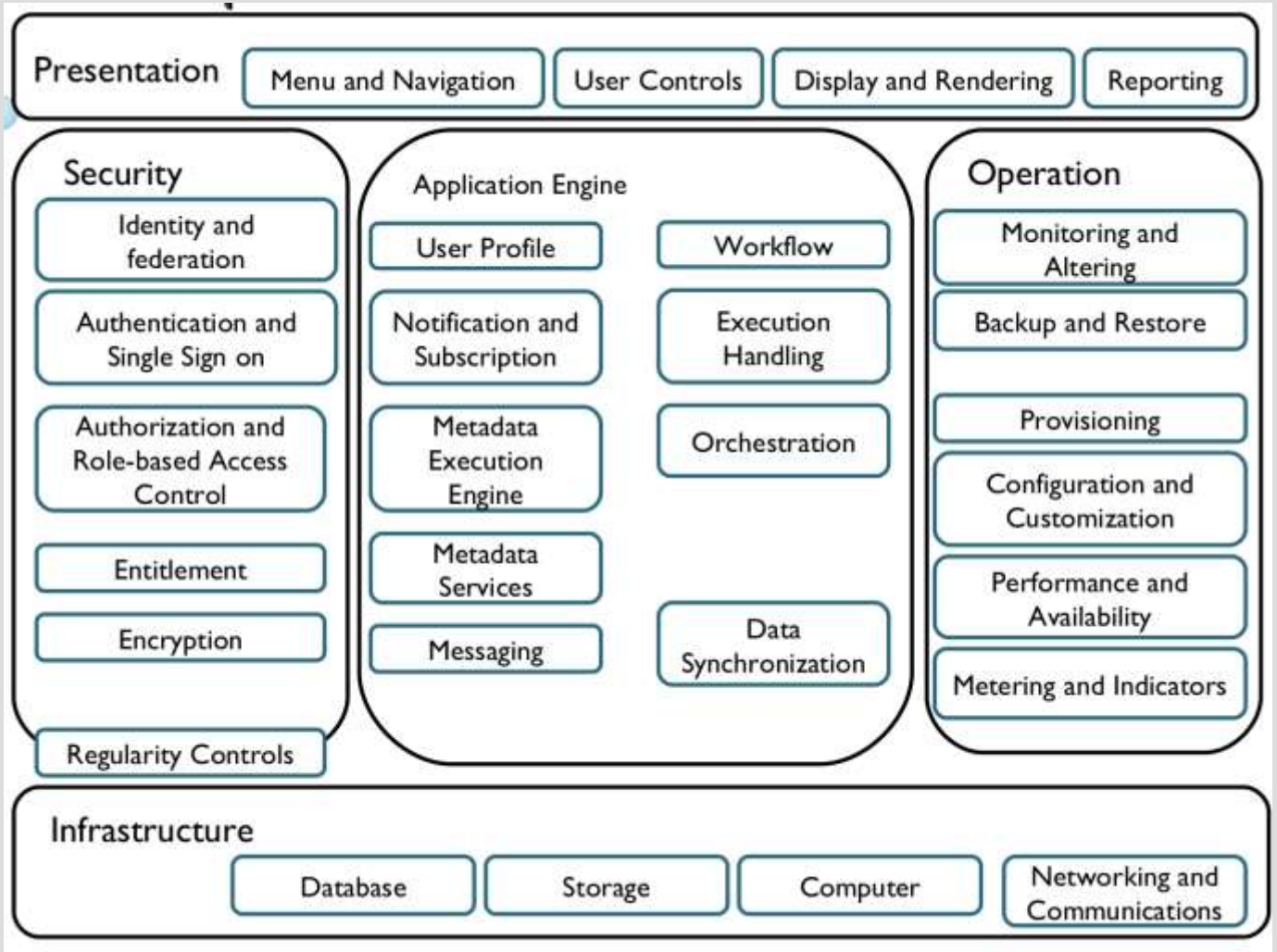
MULTI-TENANCY

- A Multi-tenants application lets customers (tenants) share the same hardware resources, by offering them one shared application and database instance, while allowing them to configure the application to fit there needs as if it runs on dedicated environment.

These definition focus on what we believe to be the key aspects of multi tenancy:
1.The ability of the application to share hardware resources.
2.The offering of a high degree of configurability of the software.
3.The architectural approach in which the tenants make use of a single application and database instance.

IT Architecture CLOUD

Conceptual framework of Software as a Service



IT Architecture CLOUD

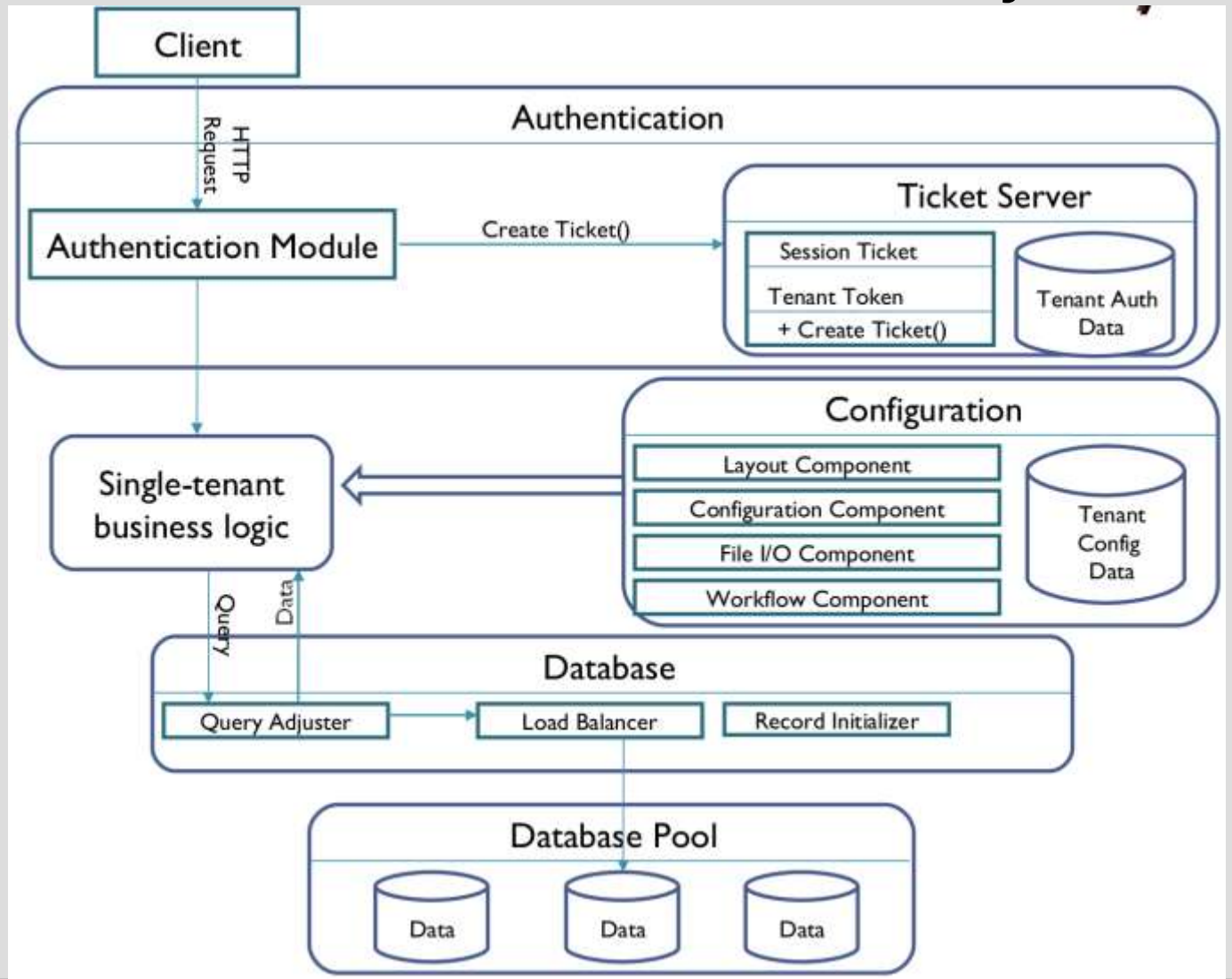
Migrating to Cloud Environment

The Software can be redeployed in cloud environment as Software as a Service (SaaS).

The main sections of the software can be mapped to the SaaS architecture.

IT Architecture CLOUD

Architectural Overview for Multi-tenancy



IT Architecture CLOUD

SaaS Applications

User requirements / Use cases	Type of environment in cloud	Impact
Payroll processing	IaaS (VM) Cloud storage and SaaS	1. Processing time will be reduced. 2. Hardware requirements will be reduced. 3. Number of users can be increased with scalability. 4. Maintenance cost will be reduced.
Project Management	PaaS and Cloud storage	1. Processing time can be reduced. 2. Project execution time and cost can be reduced. 3. Efficient way of utilization of skill sets and manpower can be attained.
e-Governance & Office automation	IaaS Cloud storage SaaS	1. Hardware cost can be reduced. 2. CPU processing time can be reduced. 3. Accountability can be maintained. 4. Maintainance cost can be reduced. 5. Reduces energy consumption.
e-Learning	Cloud storage IaaS PaaS SaaS	1. Hardware cost can be reduced. 2. CPU processing time can be reduced. 3. Accountability can be maintained.

IT Architecture CLOUD

SOA and Cloud Computing

In cloud environment we adopt the bundling of resources into layers of

- Saas
- Paas
- Iaas

And furthur add a layer for business process management with the concept of service oriented architecture(SOA).

SOA is a base for furthur building of cloud environment for composite application with work flow concepts.