**ADC501**

# Cloud    Computing

## Module 6

# Architecture for Cloud Application

# Cloud Architecture

- **Layer 1 (User/Client Layer)**
thin client, thick client, or mobile or any handheld device
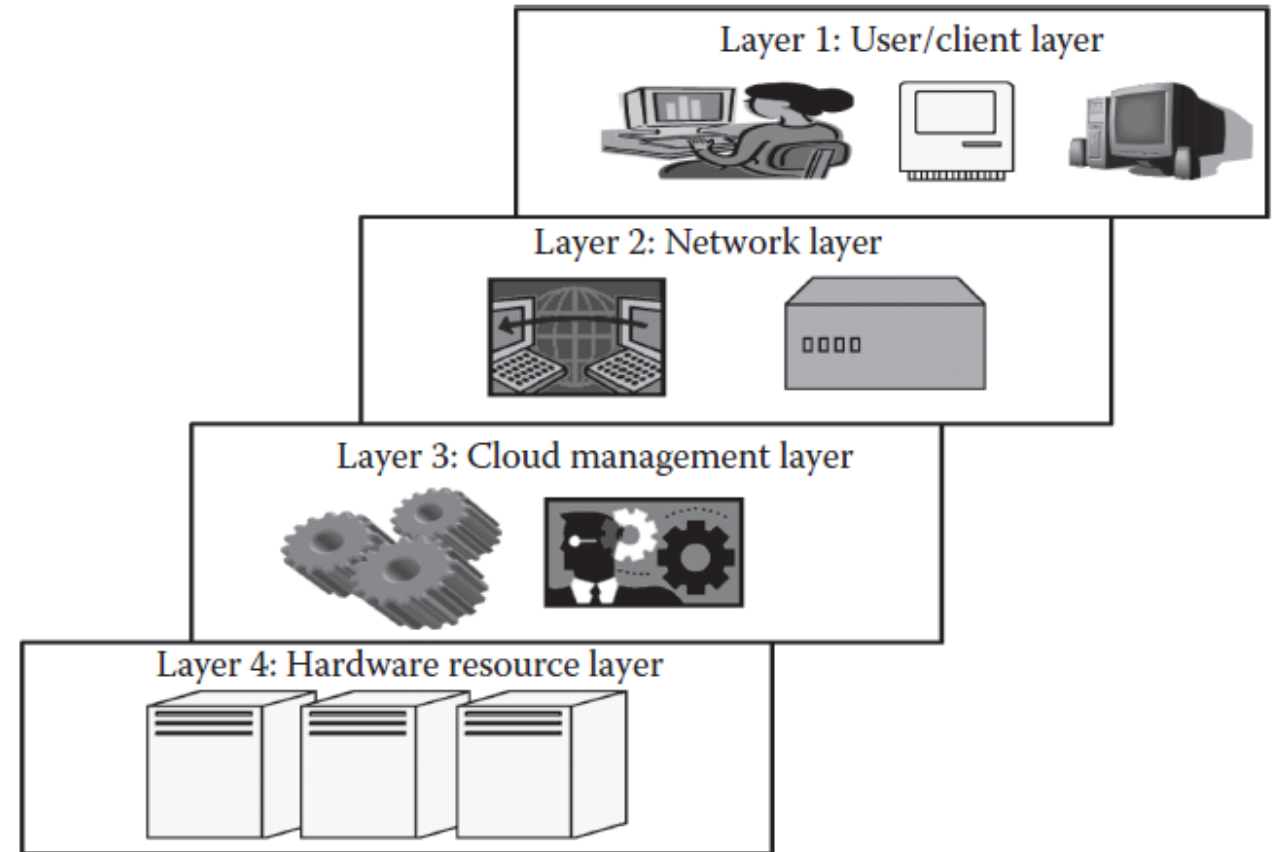
- **Layer 2 (Network Layer)**
Internet - public cloud

- **Layer 3 (Cloud Management Layer)**
softwares usually allow resource management (scheduling, provisioning, etc.), optimization (server consolidation, storage workload consolidation), and internal cloud governance

- **Layer 4 (Hardware Resource Layer)**
public cloud - a data center



**FIGURE 3.1**
Cloud architecture.

# Service Oriented Architecture (SOA)

- SOA is a flexible set of design principles and standards used for systems development and integration

- provides a loosely coupled set of services that can be used by the service consumers for meeting their service requirements within various business domains

- Generally, SOA is used by enterprise applications

- The programs running on cloud could be implemented using SOA-related technologies

- flexible and modular approach for delivering computing applications

- applications can be constructed from reusable software components called services
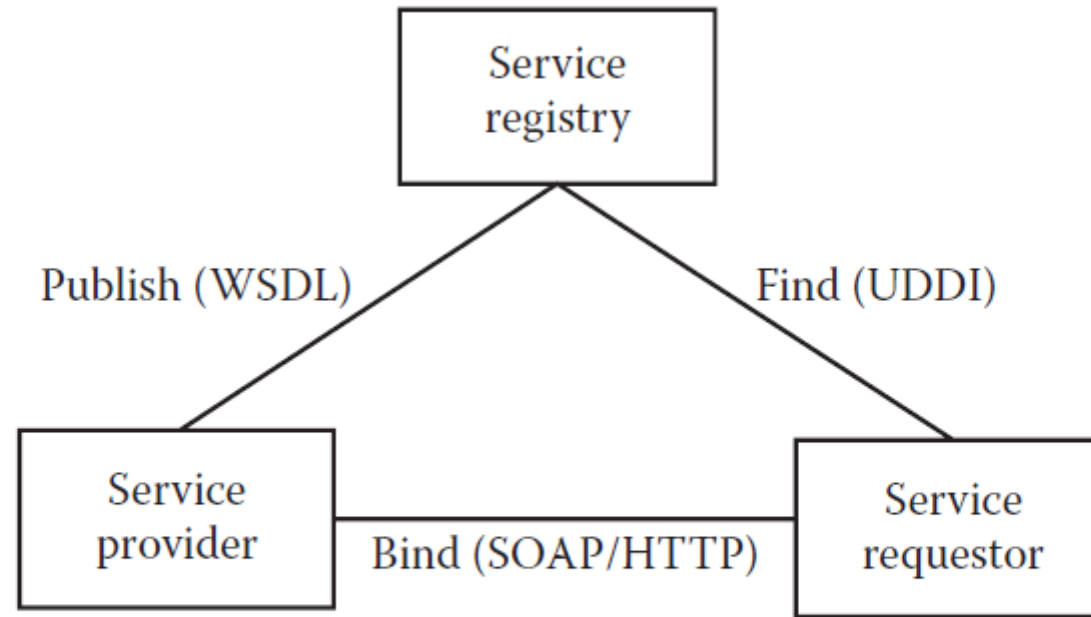
**FIGURE 6.1**
Services architectural model of SOA.

- Web Services Description Language (WSDL)

- Universal Description, Discovery, and Integration (UDDI)

- Simple Object Access Protocol (SOAP)

# Elements of a Service

Services have three main components

- Contract - A contract specifies the predicted needs of a consumer from a service and details about the service offered by the provider

- Interface - defines how to access a service and make use of it

- Implementation – actual realization of a service is called as implementation, Consumers may consider the implementation of a service as a black box entity

## service registry

- Lists of available services
- Means of using the services
- Dependencies if any
- Information about owner of the service
- The nature of service contracts

**Business Benefits of SOA**

- *Agility*

- *Cost reduction*

- *Increase in quality*

- *Quicker release to market*

- *Standardization*

SOA can be used as an enabling technology to leverage cloud computing - process of SOA using cloud computing

# Technologies Used by SOA

- *Web services*

- *SOAP*

- *RPC* - Remote procedure call (RPC) is a protocol that helps a program to request a service from another program located in another computer in a network

- *RMI-IIOP* - Java remote method invocation (RMI) interface over the Internet Inter-ORB Protocol (IIOP) - to deliver distributed computing capabilities to the Java platform - can be used to execute RPCs on another computer as defined by RMI

- *REST* - REpresentational State Transfer (REST) is a stateless architecture that runs over HTTP - used for effective interactions between clients and services

- *DCOM* - Distributed Component Object Model (DCOM) is a set of Microsoft concepts and program interfaces in which client program can request the services from a server program running on other computers in a network

- *WCF* - Windows Communication Foundation (WCF) provides a set of APIs in the .NET Framework for building connected, service-oriented applications

# Similarities and Differences between SOA and Cloud Computing

## Similarities

- both rely on the service concept to achieve the objectives. Service is a functionality or a feature offered by one entity and used by another
- Service delegation helps the people to use the services without being concerned about the implementation and maintenance details
- Services could be shared by multiple applications and users, thereby achieving optimized resource utilization
- promote loose coupling among the components or services, which ensures the minimum dependencies among different parts of the system

## Differences

- SOA mainly focus on business - services are horizontal - various services in cloud computing are usually layered - services in this case are vertical
- SOA is used for defining the application architecture - Cloud computing is a mechanism for delivering IT services
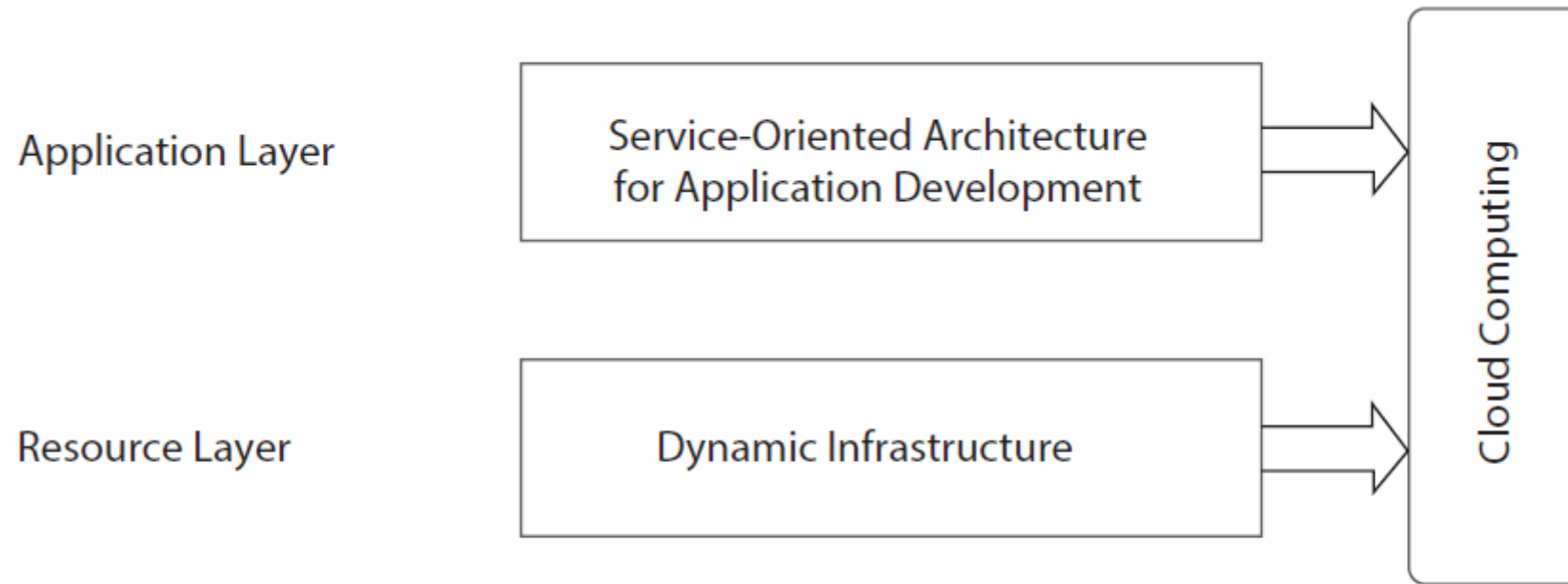
**Cloud computing open architecture (CCOA)** is an architecture for the cloud environment that incorporates the SOA

- architecture that is reusable and scalable

- develop a uniform platform for the cloud application development

- allow the cloud users to switch between the CSPs without the need to make significant changes in the application

- enable the businesses to run efficiently

- helps the CSPs to make more money by delivering quality services successfully
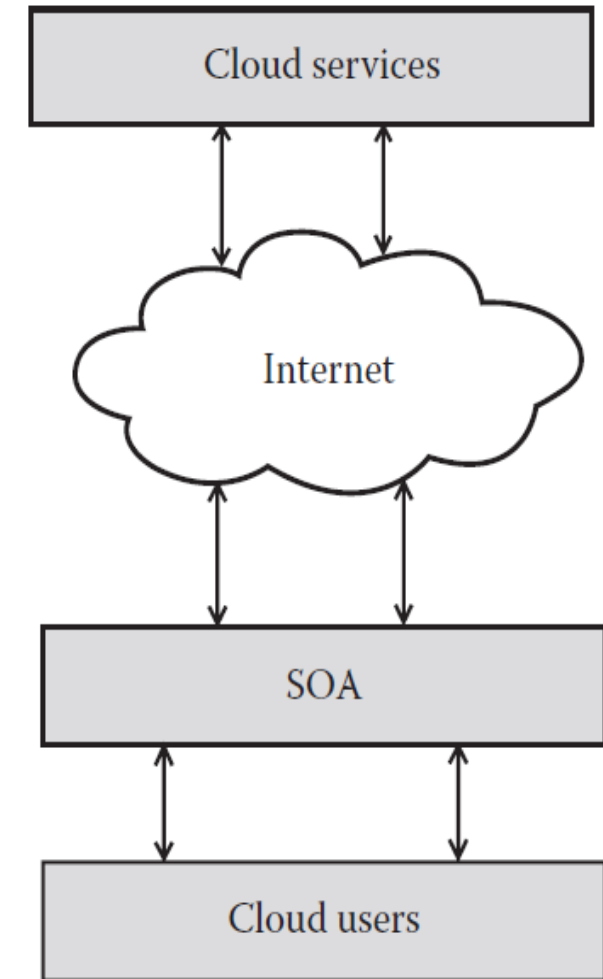


**FIGURE 6.2**
Convergence of SOA and cloud.

**FIG 12.1:** Together dynamic infrastructure and SOA result in cloud computing
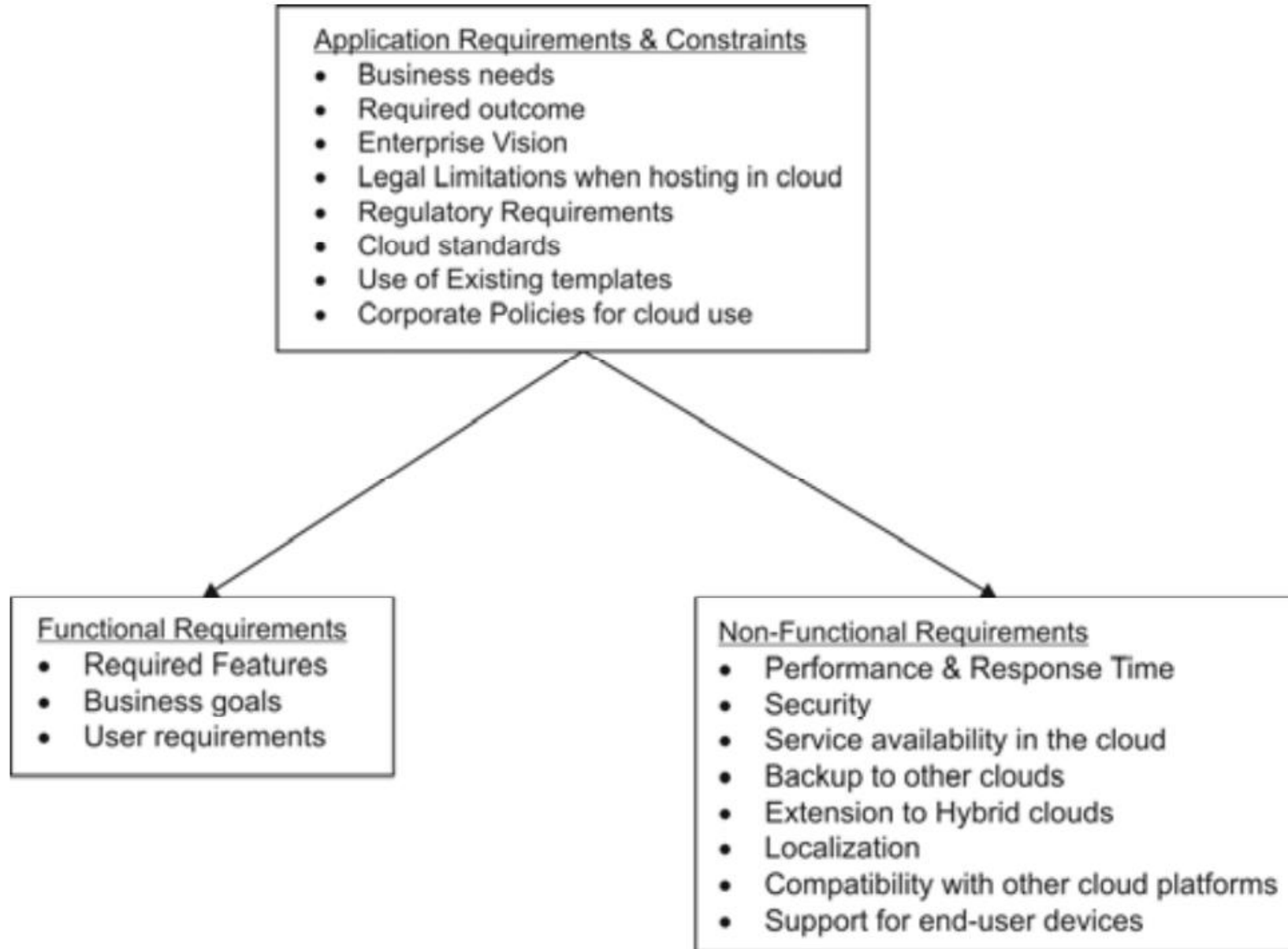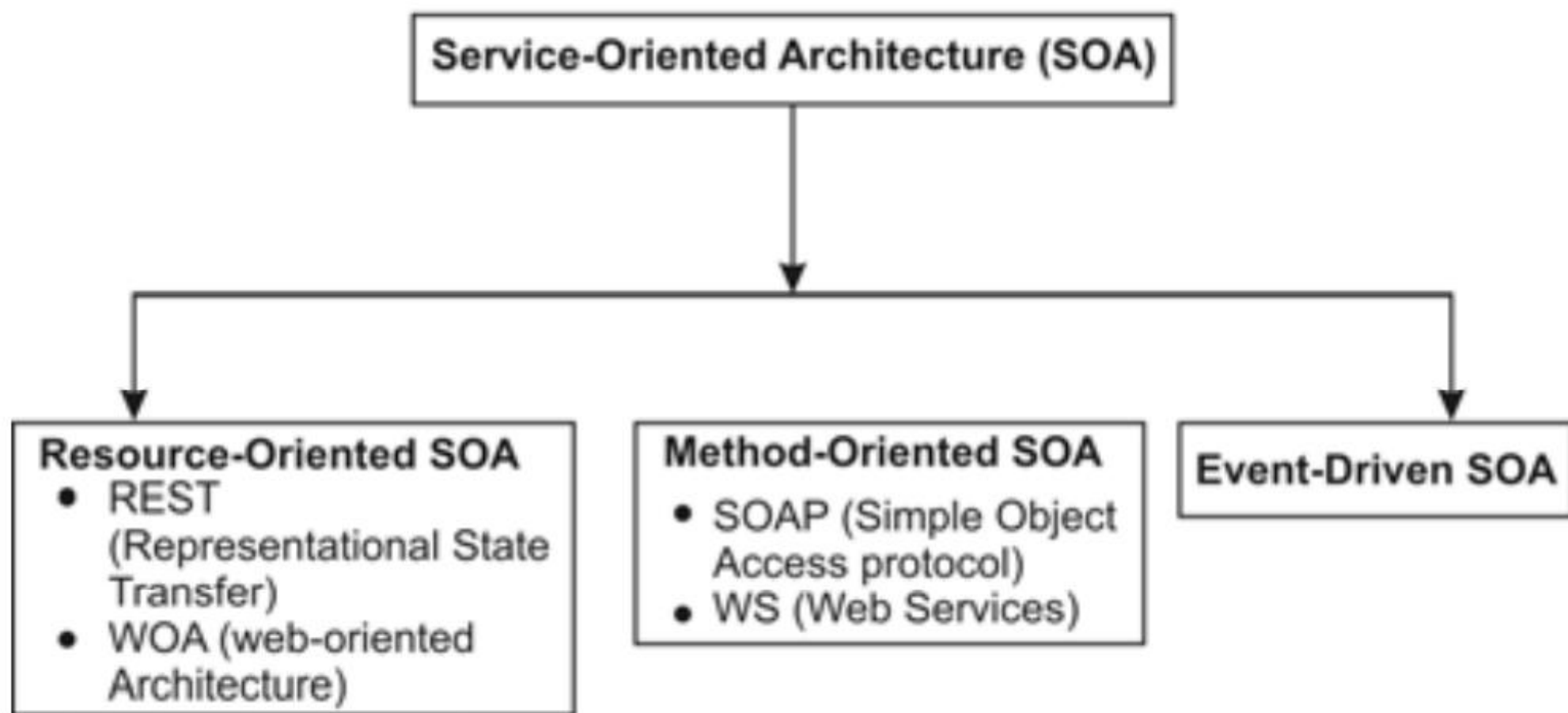
**Application Requirements & Constraints**
- Business needs
- Required outcome
- Enterprise Vision
- Legal Limitations when hosting in cloud
- Regulatory Requirements
- Cloud standards
- Use of Existing templates
- Corporate Policies for cloud use

**Functional Requirements**
- Required Features
- Business goals
- User requirements

**Non-Functional Requirements**
- Performance & Response Time
- Security
- Service availability in the cloud
- Backup to other clouds
- Extension to Hybrid clouds
- Localization
- Compatibility with other cloud platforms
- Support for end-user devices

**Figure 1: Cloud Application Requirements**

Figure 2: Common Interaction Patterns Used for SOA Applications

# Service Oriented Architecture (SOA)

| Resource Oriented SOA | Method Oriented SOA | Event Driven SOA |
|---|---|---|
| Resources, which are identified by logical URLs | Simple Object Access Protocol (SOAP) based Web services standards. | the **asynchronous** exchange of messages amongst applications and user devices. |
| client-server | It helps provide common request/reply interactions (between service provider and service consumer programs) | context-based automation. |
| no connection state | | |
| Resources should be **cachable** | | |
| Proxy servers | | |
| been used to design large-scale public clouds | | great value for real-time decision-making<br><br>sales teams, customer contact centers, and supply chain management |

**URL – uniform resource locator**

# Event-driven SOA

- Event-driven SOA (also known as SOA 2.0) is the current and advanced form of SOA

- events generally trigger the execution of activities

➢ **Parallelization within Cloud Applications**

➢ **Leveraging In-memory Operations for Cloud Applications**