

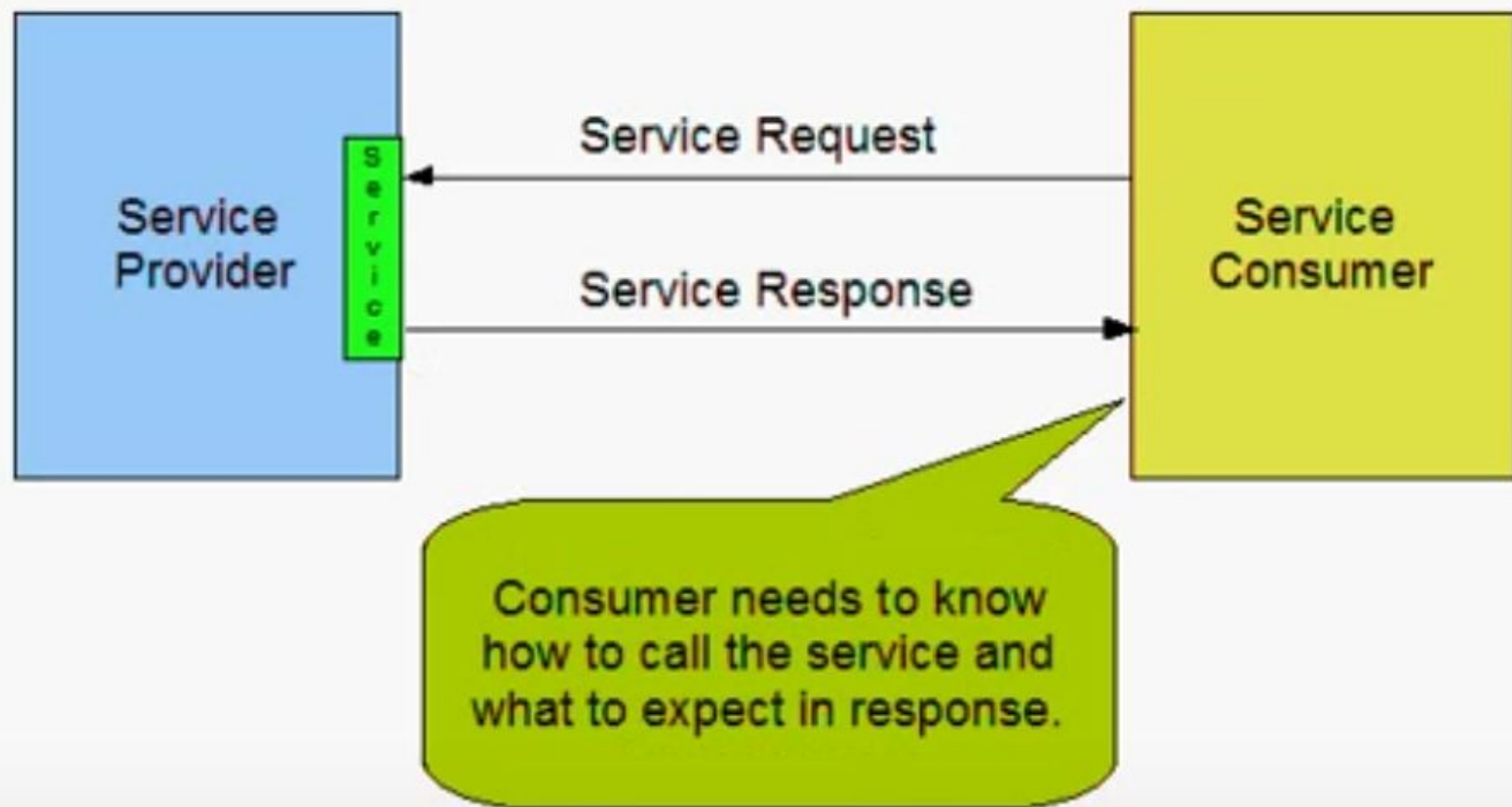
Introduction to Service-Oriented Architecture and Web Services

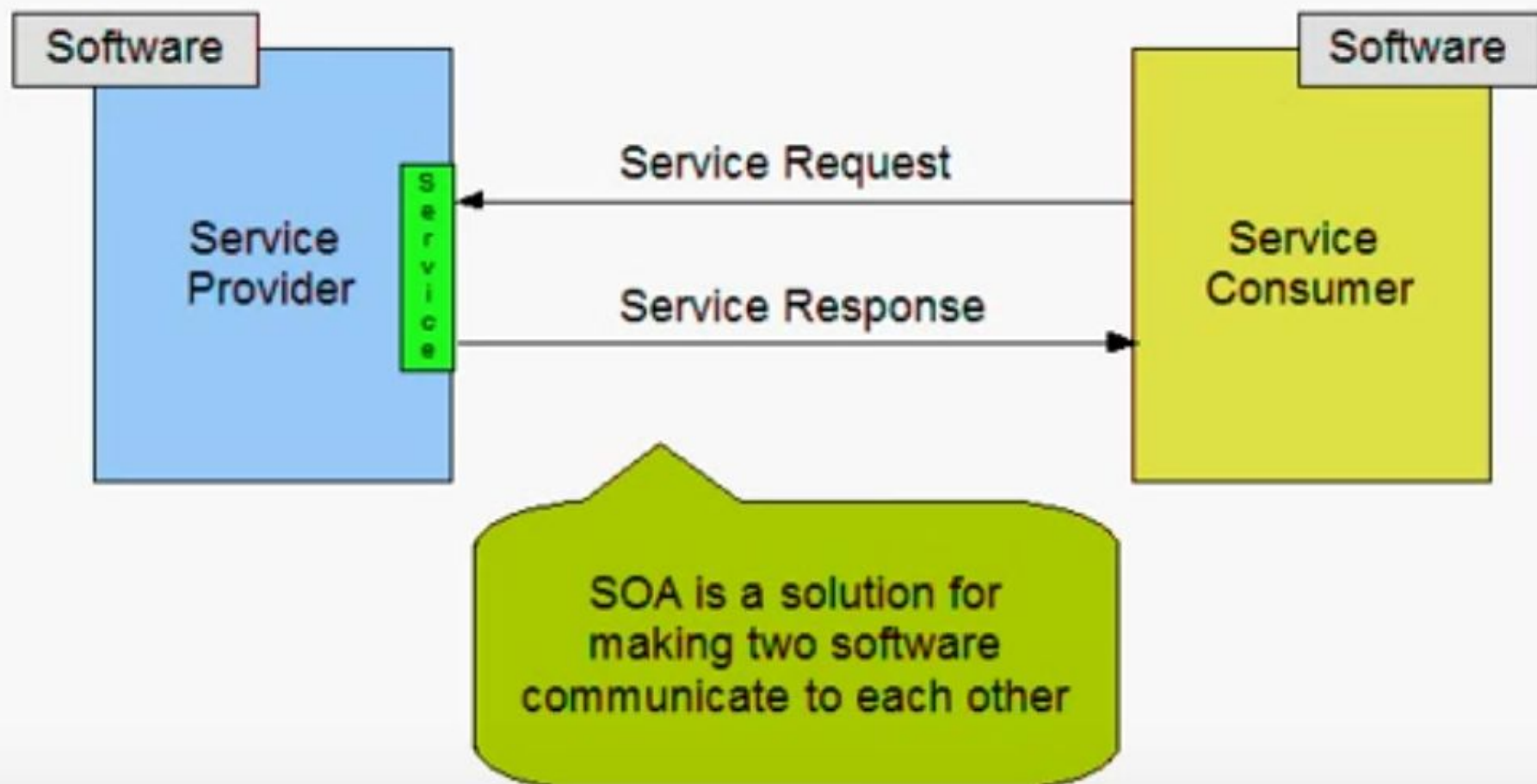
Service Oriented Architecture



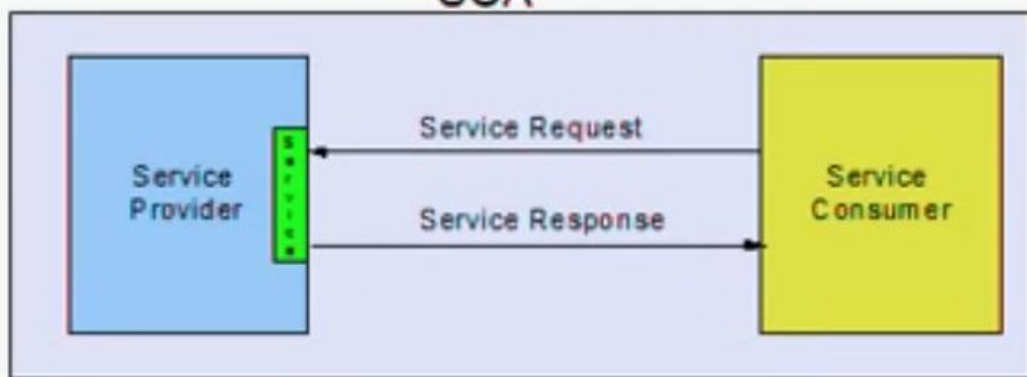


Service is a well defined function that does not depend on the state of other services.





SOA



Web Services is an
implementation of Services
Oriented Architecture
(SOA)

Terminologies

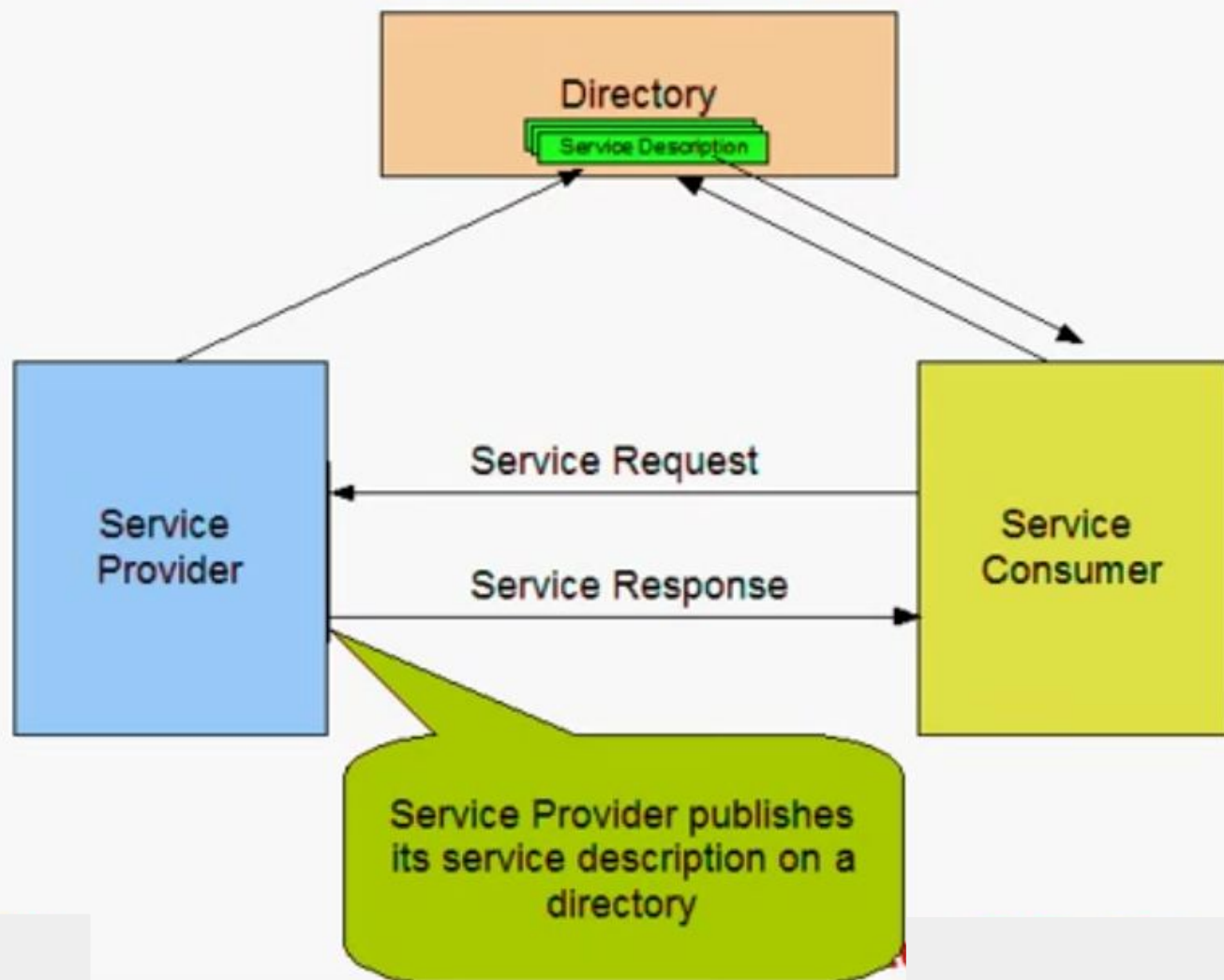
Service Oriented Architecture
(SOA)

Web Service

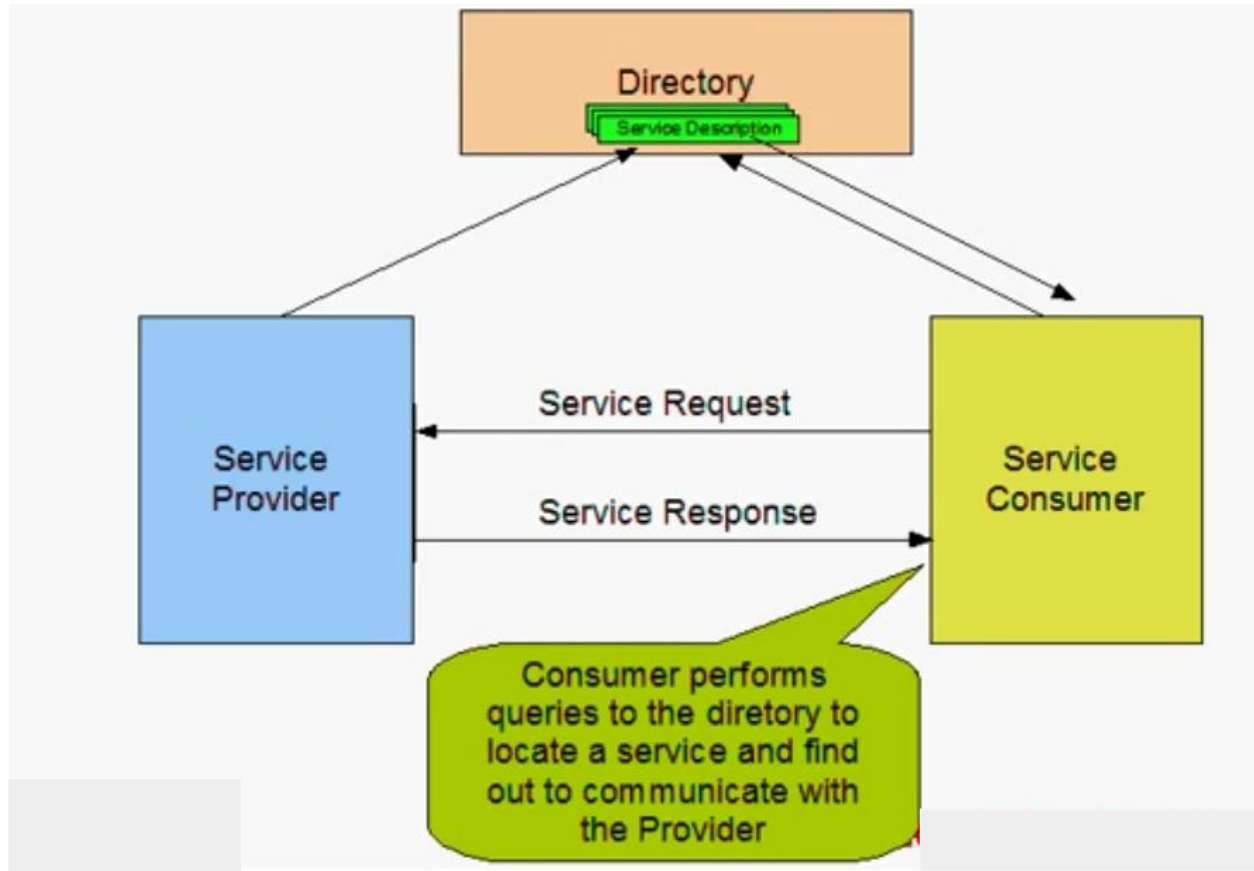
Simple Object Access Protocol
(SOAP)

Web Service Definition Language
(WSDL)

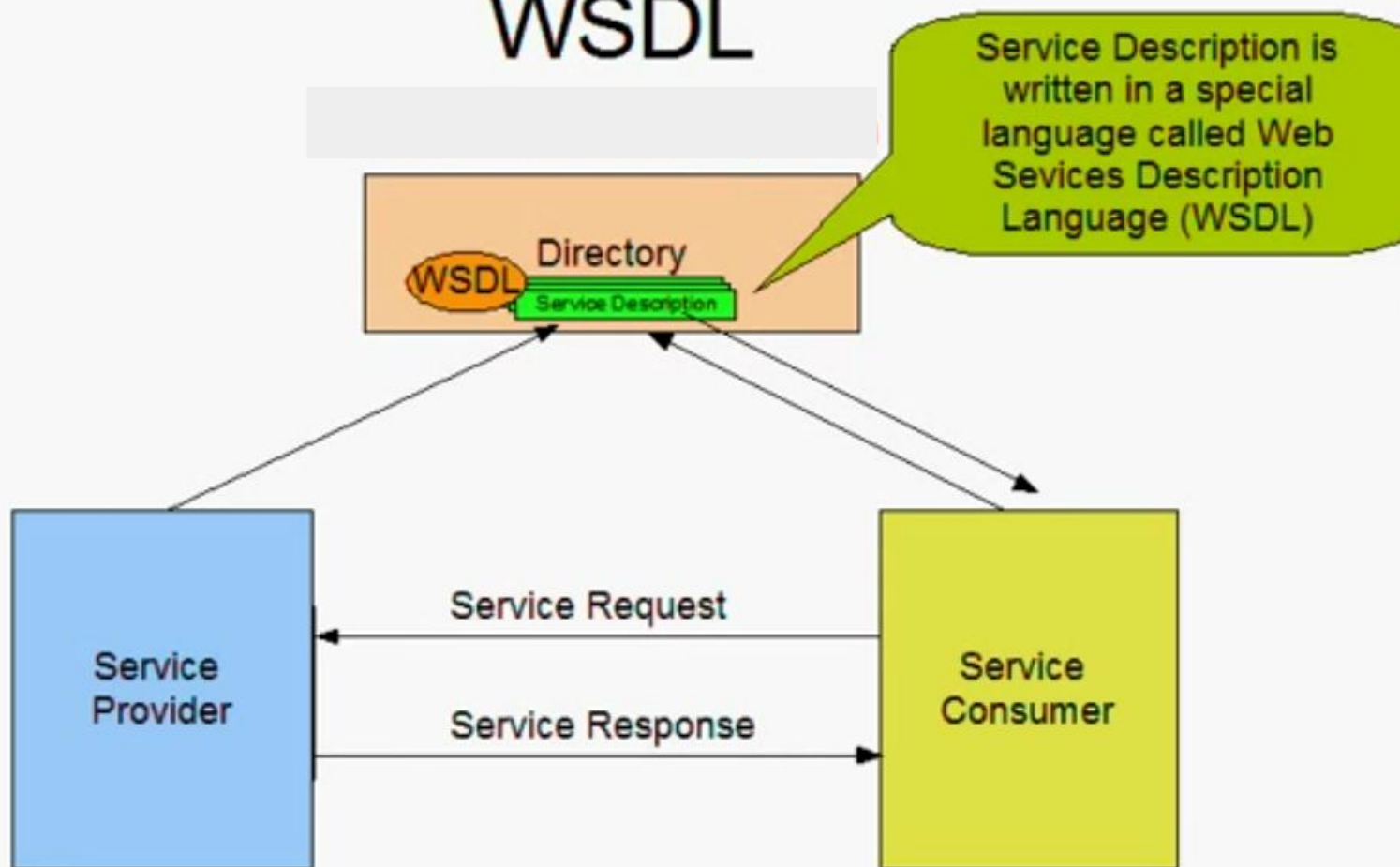
Extensible Markup Language
(XML)



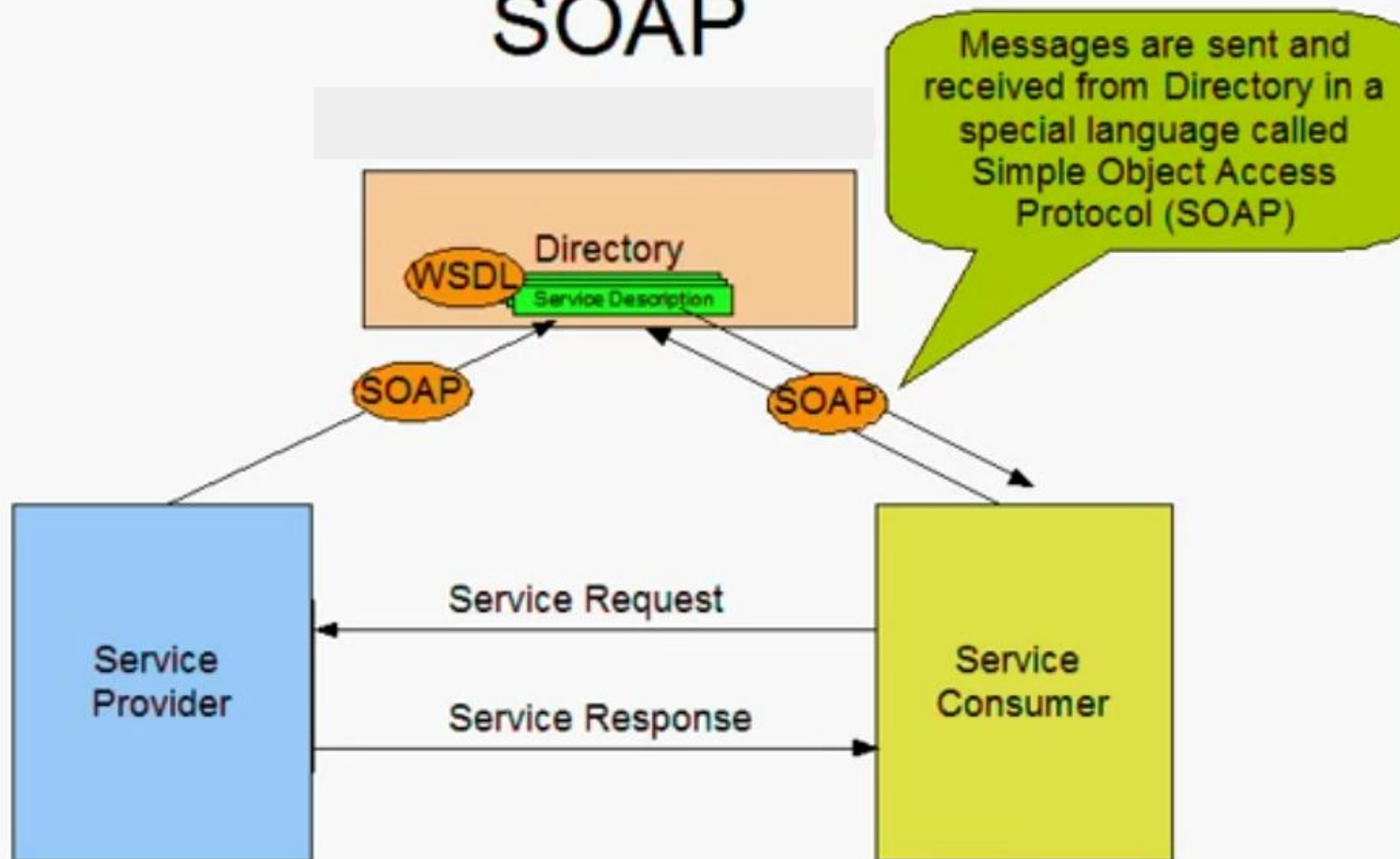
Directory Queries



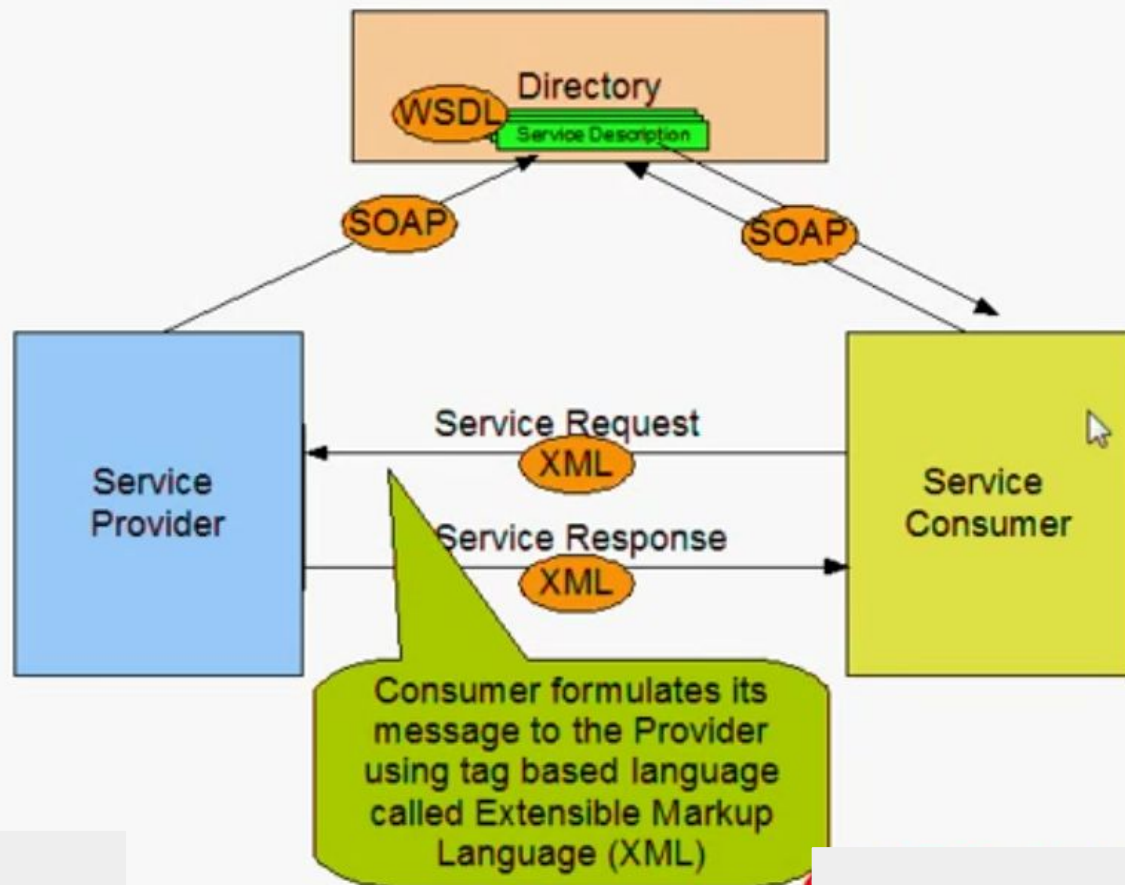
WSDL



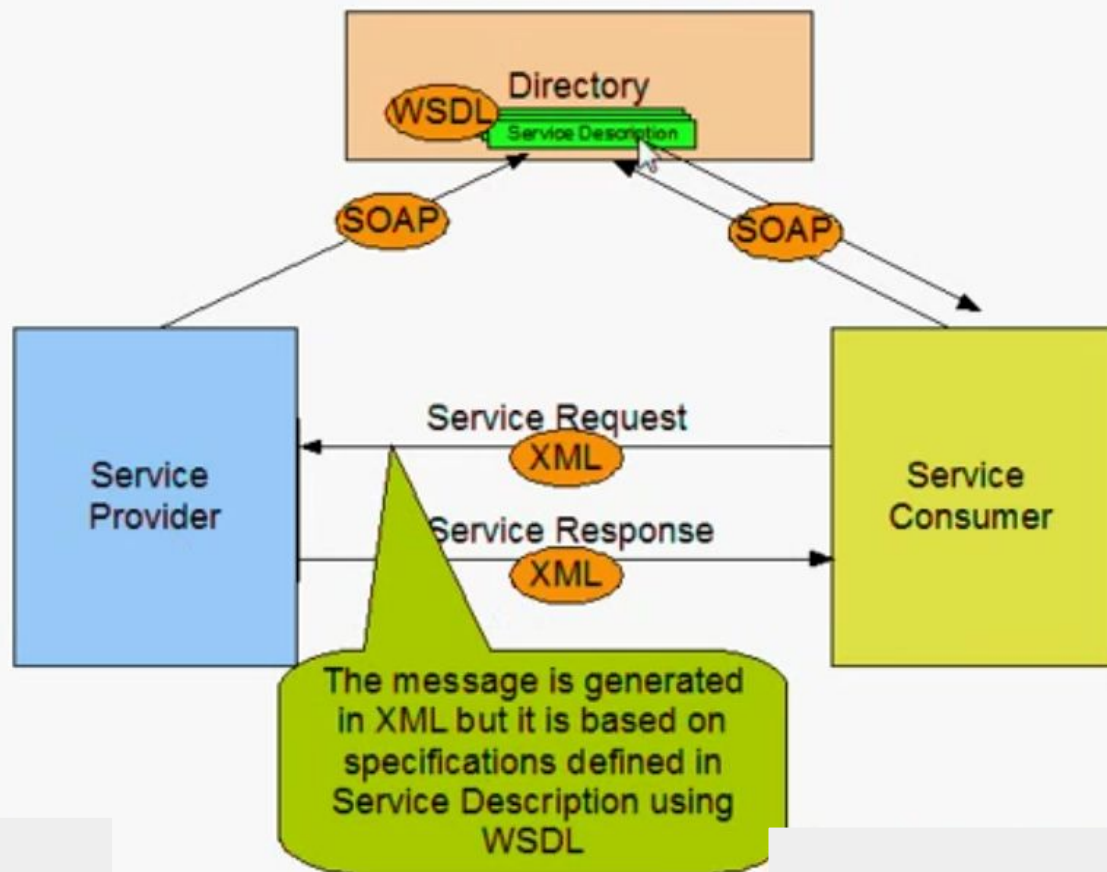
SOAP



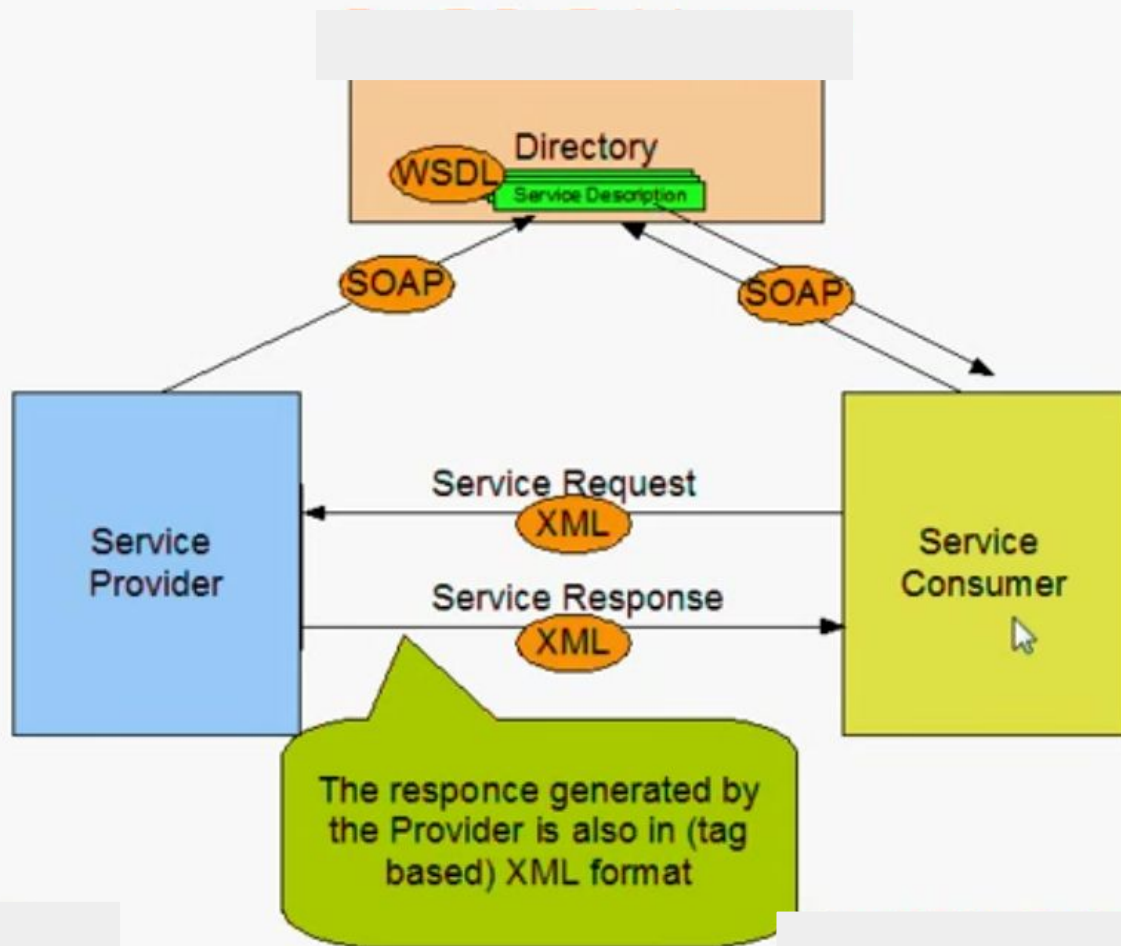
XML Message



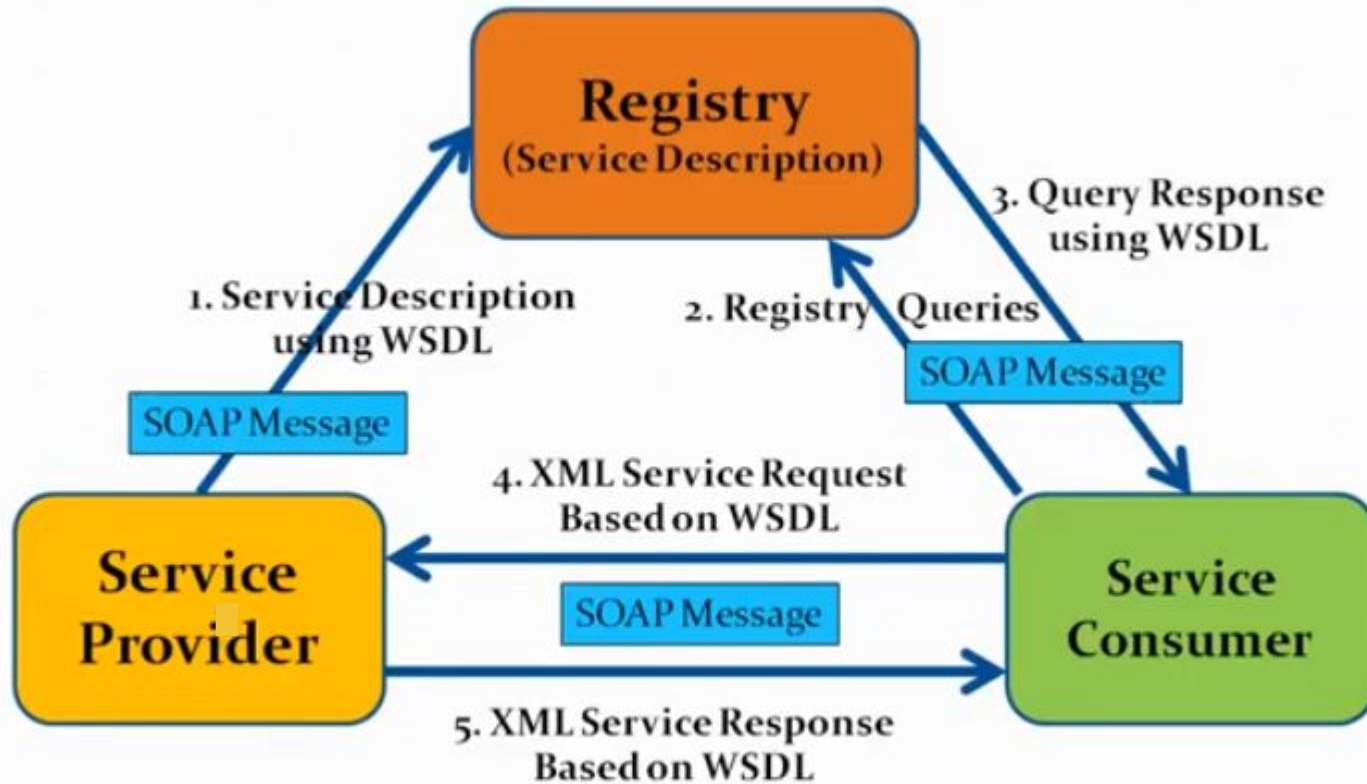
Messaging Based on WSDL



XML Response



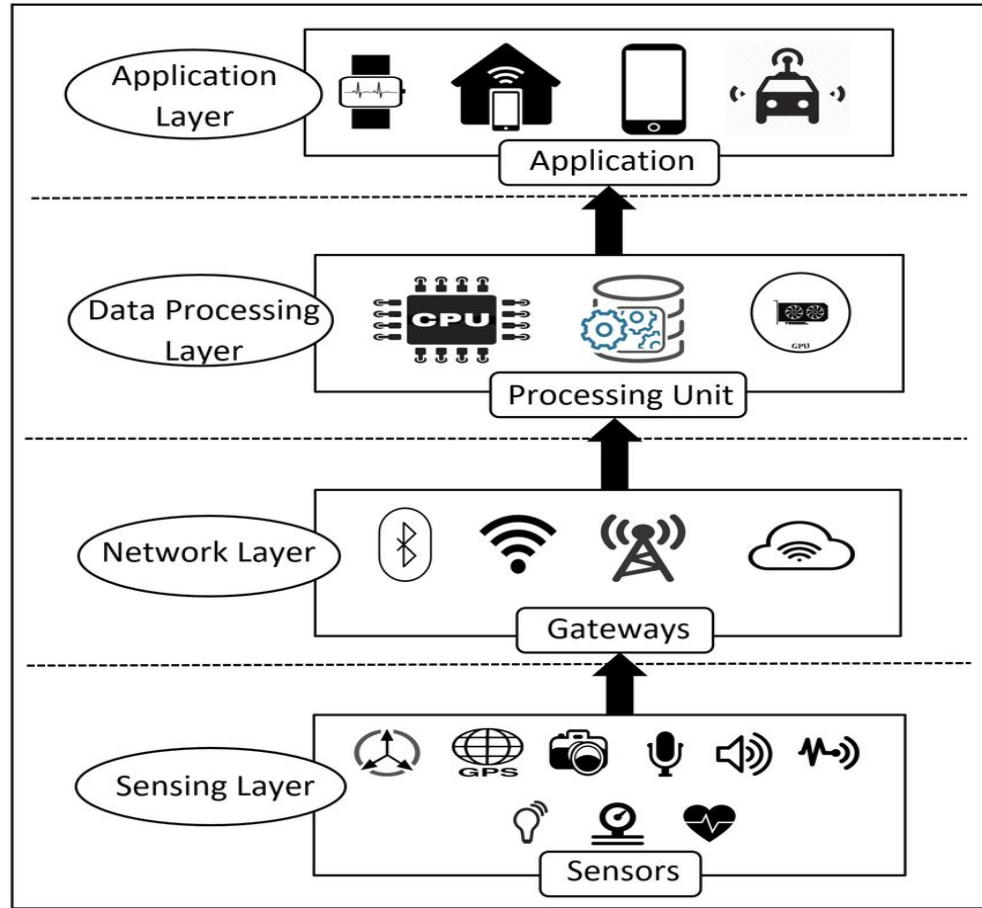
Web Service Framework:



IoT Service Oriented Architecture

- IoT aims to connect different things over the networks.
- As a key technology in integrating heterogeneous systems or devices, SOA can be applied to support IoT.
- SOA efficiently combines individual unit of software to provide higher level of functionality.
- SOA is an architecture based on reusable, well defined services implemented by IT components.
- SOA provides platform, technology and language independence.

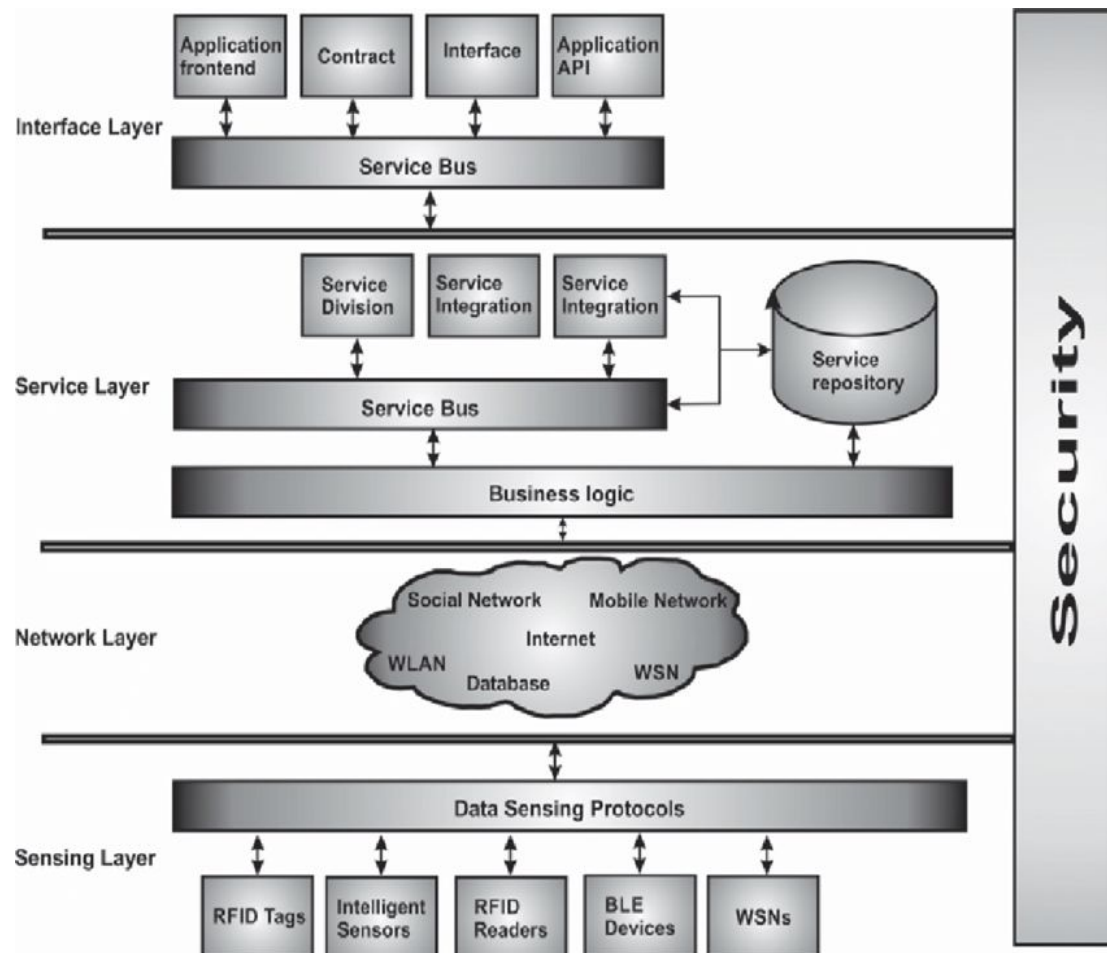
IoT Architecture



Why IoT Service Oriented Architecture?

If IoT devices are visible on an open network, including a building network or VPN, malware or hackers can reach them. With the service model, application architects would not put IoT devices on an open network at all; they put devices on a private subnet that is accessible only by the IoT services. These services are easier to secure as part of the IoT software itself.

IoT Service Oriented Architecture



Sensing Layer:

- This layer is integrated with existing hardware(RFID, Sensors, actuators,etc) to sense/control the physical world and acquire the data.
- In the sensing layer, the wireless smart systems with sensors are now able to automatically sense and exchange information among different devices.
- It is used to gather data from various object/devices/sensors.
- This layer consist of sensor connected devices, these are small, memory constrained often battery operated electronic devices with onboard sensors and actuators.

- These devices could either function as standalone sensing devices or be embedded as part of a bigger machinery for sensing and control.
- This layer acquires information with respect to basic resources (names, addresses and so on) and related attributes of objects by means of automatic identification and perception technologies such as RFID, Wireless sensor networks
- Sensors, RFID tags and all other uniquely identifiable objects acquire real time information.

Network Layer

- Network layer provides basic networking support and data transfer over wireless or wired networks.
- The various IoT devices of sensing layer to be connected to the internet via more powerful computing device called the IoT gateway
- Gateway aggregates data from numerous sensing devices and relays it to the cloud.
- IOT gateways are equipped with multiple communication capabilities like bluetooth, zigbee, LoRaWAN etc, to talk to the IoT devices on one end and connection to the internet based network on the other side(over WiFi, ethernet or cellular network)

- The data that is collected by Layer 1 devices need to be transmitted and processed. That's the network layer job.
- It connect these devices to other smart devices, servers and n/w devices
- It also handles the transmission of all the data.
- To design the networking layer in IoT, designers need to address issues such as n/w management technologies for heterogeneous n/ws(such as fixed, wireless, mobile, etc), energy efficiency in networks, QoS requirement, service discovery, and retrieval, data and signal processing, security and privacy.

Service Layer

- This layer creates and manages services.
- It provides services to satisfy user needs.
- It relies on the middleware technology that provides functionalities to seamlessly integrate services and applications in IoT.
- The middleware technology provides the IoT with a cost-efficient platform, where the hardware and software platforms can be reused.
- Functions: Data storage, heterogeneous data retrieval, data mining, data security, privacy protection.

- This layer include the various components:
 - Service discovery: It find objects that can offer the needed services and information in an efficient way.
 - Service Composition: It enables the interaction and communication among connected things.It schedule or re-create more suitable services in order to acquire the most reliable services to meet the request.

Application Layer:

- Provides interaction methods to user applications
- **application layer** delivering solutions like analytics, reporting, and device control to end users.