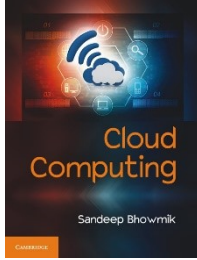


# **Cloud Computing**

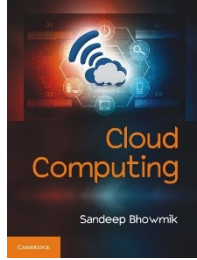
## **Chapter 3**

### **Benefits and Challenges**



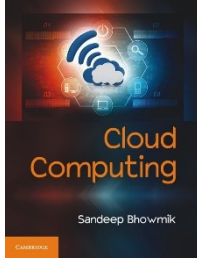
## The Transformation

- In the Cloud Computing era, users of computing are being addressed as Subscribers or Consumers.
- Computing is available in ready-to-use mode.
- One can subscribe to and consume any volume of computing (as well as computing resources) effortlessly.



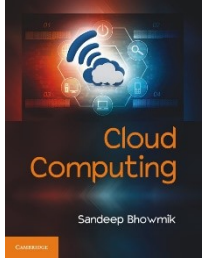
## Initial steps towards Cloud Computing

- 1999 - Initiative from Salesforce.com
  - The delivery of business (enterprise) applications via a ‘normal’ website was considered as the first-of-its-kind effort.
  - Salesforce’s successful effort encouraged other software firms to deliver business applications via Internet.
  - This was the first step towards cloud computing.



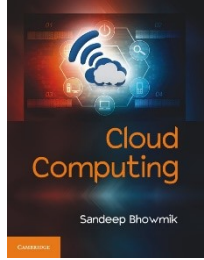
## Initial steps towards Cloud Computing

- 2002 - Initiative from Amazon
  - Amazon Web Service (AWS) was launched.
  - It delivered computing services over the Internet.
  - AWS provided a suite of services including storage.
- 2006 - Initiative from Google
  - ‘Google Docs’ introduced by Google brought cloud computing service to the public attention.



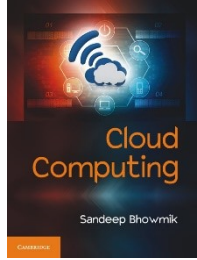
## Initial steps towards Cloud Computing

- 2006
  - Elastic Compute Cloud (EC2) introduced by Amazon.
  - Considered as the first concrete cloud service launched in the market.



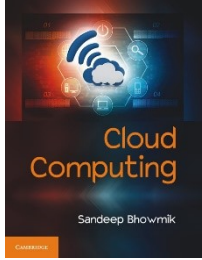
# Utility Computing

- It is the implementation of utility model of service delivery in the field of computing.



## What is Utility Service Model?

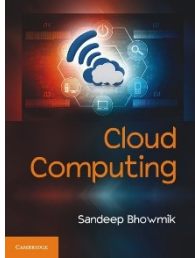
- A party arranges, owns, maintains and delivers some facility or service on-demand.
- This party is called vendor or provider.
- Other parties can access the facility or service
  - from remote location
  - as and when required
  - on payment basis
- These parties are known as consumers or subscribers.



## What is Utility Service Model?

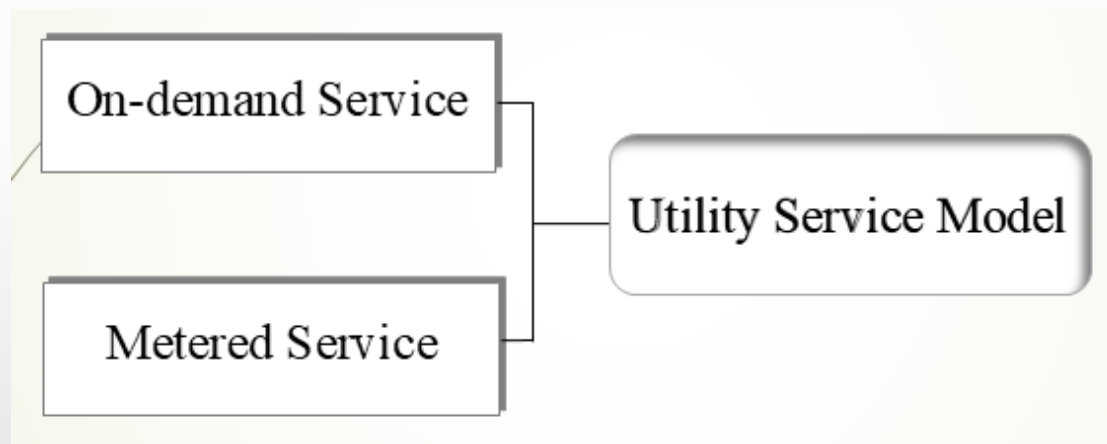
- The usages are metered at consumer's end.
- Bills are generated based on metered use.
- The billing can be of two types:
  - Fixed rental
  - Actual use-basis

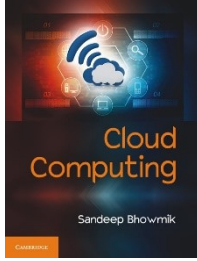




## What is Utility Service Model?

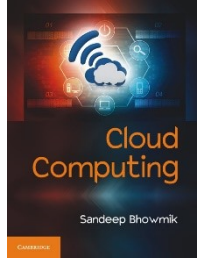
- Two aspects of utility model for service delivery





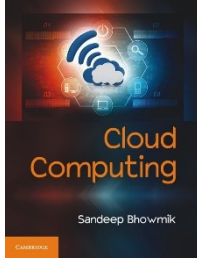
## Traditional way of computing vs. Cloud

- Still doubtful about computing cloud adoption?
  - There is a similar century old story of electricity power generation and supply.
  - There, choice had to be made between maintaining own power generation unit, or subscribing to outside professional service.
  - And we know which philosophy has swept the market.



## Traditional way of computing vs. Cloud

- In computing also we have similar choices -
  - Either maintain own computing setup,  
or
  - Consume cloud computing service managed by more competent set of people.



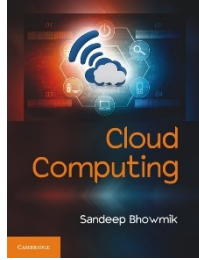
# Advantages in Cloud Model

## 1. The Utility Service Model

- Utility service model provides the facility of
  - very low initial investment
  - overall cost saving for subscribers

## 2. Metering and Billing

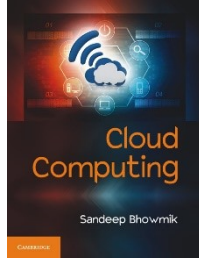
- Metering results in significant cost saving for users.



## Advantages in Cloud Model

### 3. Separation of Data Center Operation

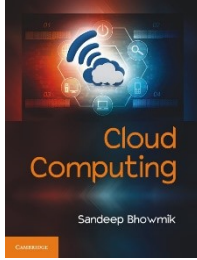
- Cloud vendor arranges and manages everything.
- It separates data center operations from activities at the users' end
- The users are relieved of
  - building computing infrastructure
  - maintaining the system
  - running upgrades
  - etc.



## The Benefits

There are numerous benefits of cloud computing –

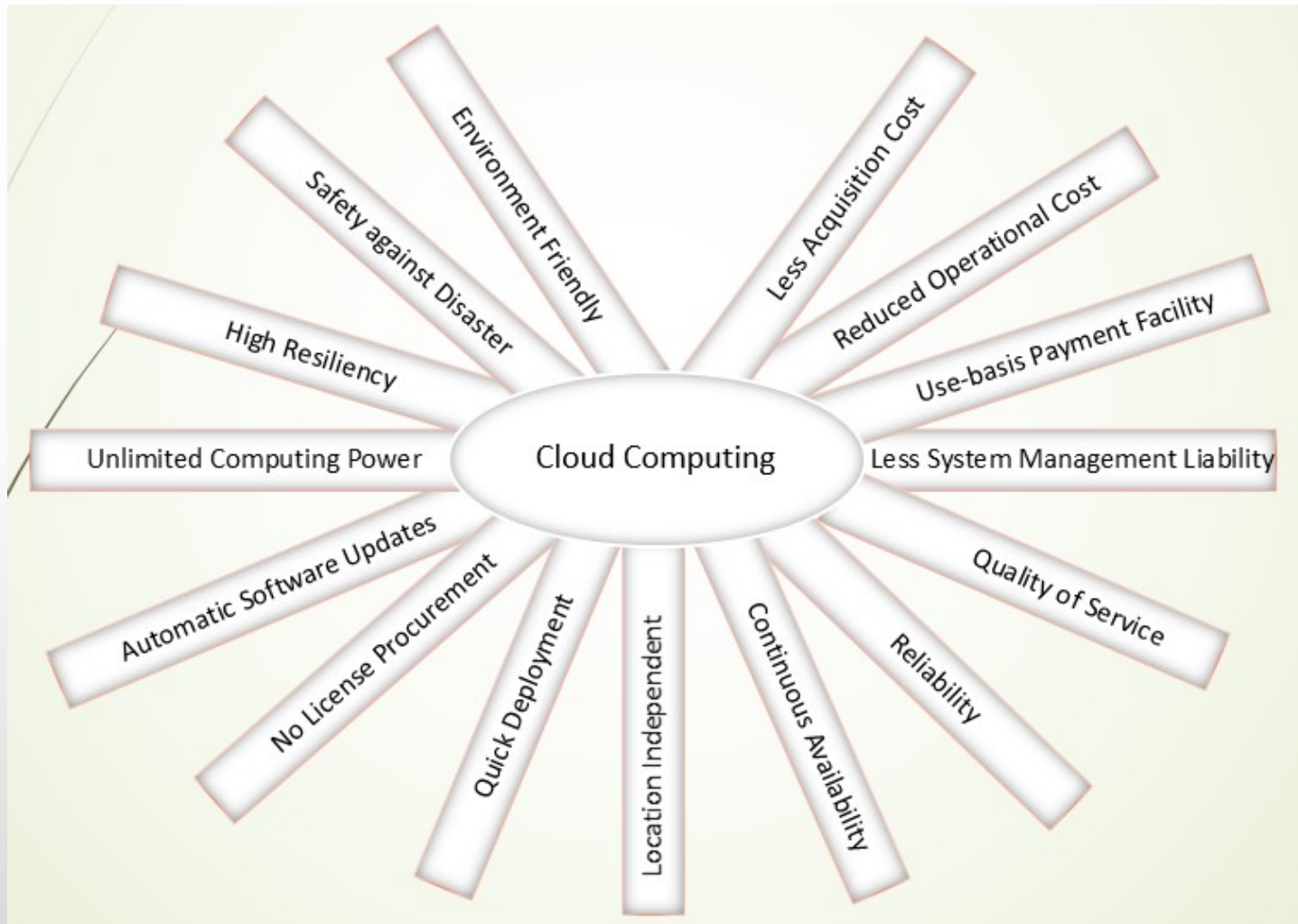
1. Less Acquisition/Purchase Cost
  - The initial investment of users adopting cloud computing is very low
2. Reduced Operational Cost
3. Reduced System Management Responsibility
4. Use-basis Payment Facility
5. Unlimited Computing Power and Storage
6. Quality of Service
7. Reliability



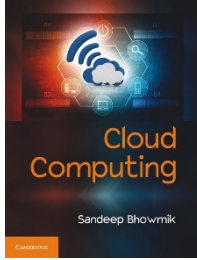
## The Benefits (Contd.)

8. Continuous Availability
9. Locational Independence/Convenience of Access
10. High Resiliency
11. Quick Deployment
12. Automatic Software Updates
13. No License Procurement
14. Safety against Disaster
15. Environment Friendly

## The Benefits at a Glance

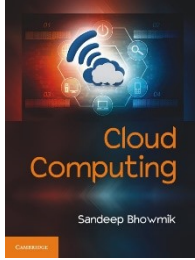






## The Challenges

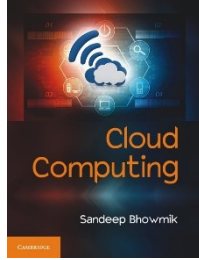
- Limited Portability between Cloud Providers
- Inter-operability Problem
- Data Security
- Reduced Control over Governance
- Multi-Regional Compliance and Legal Issues
- Bandwidth Cost



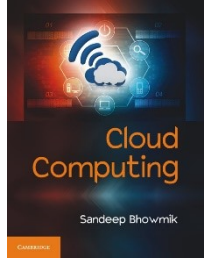
## Another Benefit

- Cloud computing promotes the idea of *ubiquitous computing*.
- Ubiquitous computing concept looks beyond personal computer like systems, and involves smart devices (anything with embedded electronic chips) to create network for better communication and data exchange.

# How Cloud Computing Addresses Business Challenges

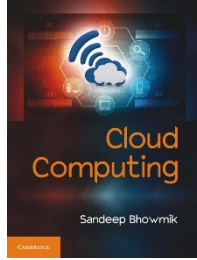


Business Challenges	Cloud Computing Solutions
Budget	Provides flexibility by maximizing utilization of available budget, with the scope for future growth
Business	Reduced time to market provides scope for rapid business growth
Mobility of users	Enables anywhere access from a variety of devices
Flexibility	Agile nature of cloud computing enables easier and quick changes
Scope of Growth	Scalable (or elastic) architecture enables rapid growth
Availability	Provides almost 24×7 availability
Recovery	Integrates reliable backup and disaster recovery mechanisms



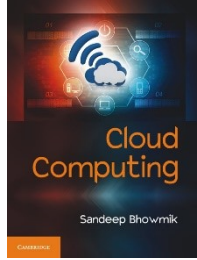
## The Ethical Issue

- Cloud computing philosophy is based upon a relationship of trustfulness between cloud computing vendor and its users.



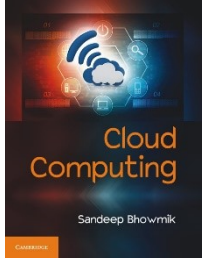
## Cloud - Network is the Computer

- Computing cloud comprises of a vast network of computing resources.
- The cloud is made of several heterogeneous computing systems spread over different geographic locations.
- The users visualize the entire thing as a single entity.



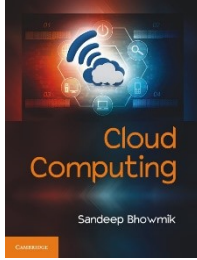
## The Challenge

- How applications running on those disparate systems communicate with each other?
- How processes/threads running on systems with different platform or architecture can communicate with each other?



# The Solution

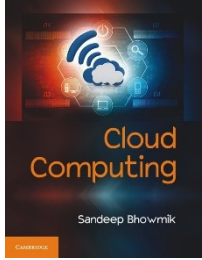
## Web Service



## Web-service

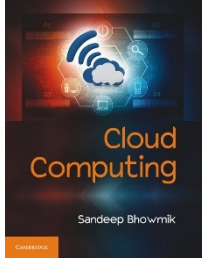
- Web service is the standardize way of establishing communication between two software systems over the internetwork.
- Due to this standardization, communication remains independent of
  - programming languages, or
  - platforms





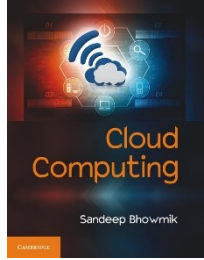
## Web-service

- Web service describes the method of establishing communication between two web-based applications.
- Web applications can communicate or publish their messages to the external world by using web services.



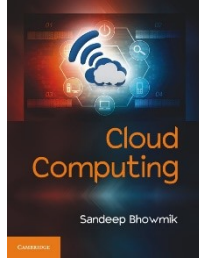
## Web-service

- Based on its implementation, a web service can either be
  - Simple Access Object Protocol (SOAP) based
  - Representational State Transfer (REST) compliant



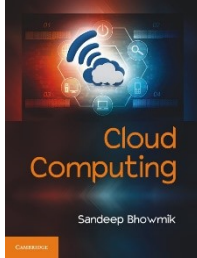
## SOAP & REST

- Both these approaches are useful and independent of
  - Computing architecture
  - Platform
  - Programming language



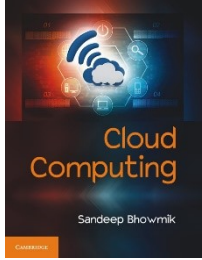
## SOAP vs. REST

SOAP	REST
It is a message communication protocol that is used to build network application.	It is an architectural style for network application.
Uses XML for formatting message.	Uses simpler messaging formats like JSON. Also supports XML.
XML parsing required.	XML parsing can be avoided by using JSON.
Defines own additional security over HTTPS.	Inherits security measures from the HTTPS.
It is a bit heavy.	Lighter than SOAP, response time is better.
It is complex than REST.	It is simple to use and easy to understand.



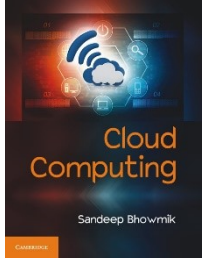
## SOAP vs. REST

SOAP	REST
SOAP uses services interfaces to expose the business logic.	REST uses Uniform Resource Locator (URI) to expose business logic.
SOAP oriented development is faster since it is supported by many tools.	Development times is longer due to limited tool support.
Less flexibility in controlling resources.	More flexibility in controlling resources.
Requires less knowledge in programming.	Requires more knowledge in programming.



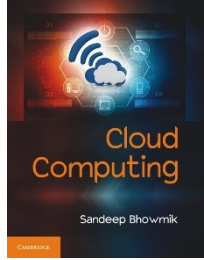
## SOAP & REST

- Both these approaches have been used by different cloud players.
- But, due to its simplicity, REST has gradually gained preference over SOAP in market.



## Cloud vs. Internet

- Two are different.
- Internet is a means for accessing cloud.
- Cloud computing is generally delivered via Internet.



**Thank You**