# CLOUD COMPUTING

## Lecture One

# Course Logistics

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- Teaching methods
  - Lectures ( 50% on line)
  - Tutorial (Eng. Ahmed Yahia, Eng. Momen)

- Text books
  - *"Cloud Computing, Theory and Practice"* Dan C. Marinescu, Morgan Kaufmann
  - "Essentials of Cloud Computing" K. Chandrasekaran
  - *"The Big Switch: Rewiring the World, from Edison to Google" Nickolas Carr*

# Assessment

| Assessment | Percentage |
| --- | --- |
| Lab Work (Assignments) | 15% |
| Midterm exam | 15% |
| Quizzes and Assignments | 15% |
| Practical exam +Final Project | 15% |
| Final Exam | 40% |
| AWS academy<br>AWS Academy Cloud Foundations [96428] | 10% (Bonus) |

# Course contents

- Introduction to cloud computing

- Cloud computing Infrastructure

- Cloud computing platforms

- Virtualization

- Software containers

- Web services

- Serverless computing

- Cloud security

# Why studying cloud computing

- New trend in computer science that reshaped the IT map allover the world.

- Many business organization allover the world have moved their business to cloud.

- Many jobs in the market needs cloud computer experts.

- To answer when to use cloud and when not.

# Lecture one

- The meaning of cloud computing

- Introduction to cloud computing

- Serial and parallel computing.

- Distributed systems.

- Why cloud computing.

# What is the meaning of term "cloud"

- Cloud refers to Network or Internet in which you don't know exactly the **physical** location.

- Cloud is something that is **remote** and can be accessed through the Internet

- The location of the service may not be defined exactly but can be accessed through the internet.

# What is the meaning of cloud computing

- Delivering **computing resources** as **services** that can be accessed any time over a network most properly **Internet**. (using API)

- **Rent** computer resources rather than **buy** or construct it.

## Computer Resources

| | | |
|---|---|---|
| Memory | Processors | Disk Drives |
| Networks | Applications | Programs |

# Before the cloud

If you wanted to start an enterprise, you needed an IT shop

Massive costs in hardware, software, and power.

Need also administrative staff to run and maintain the computing equipment.

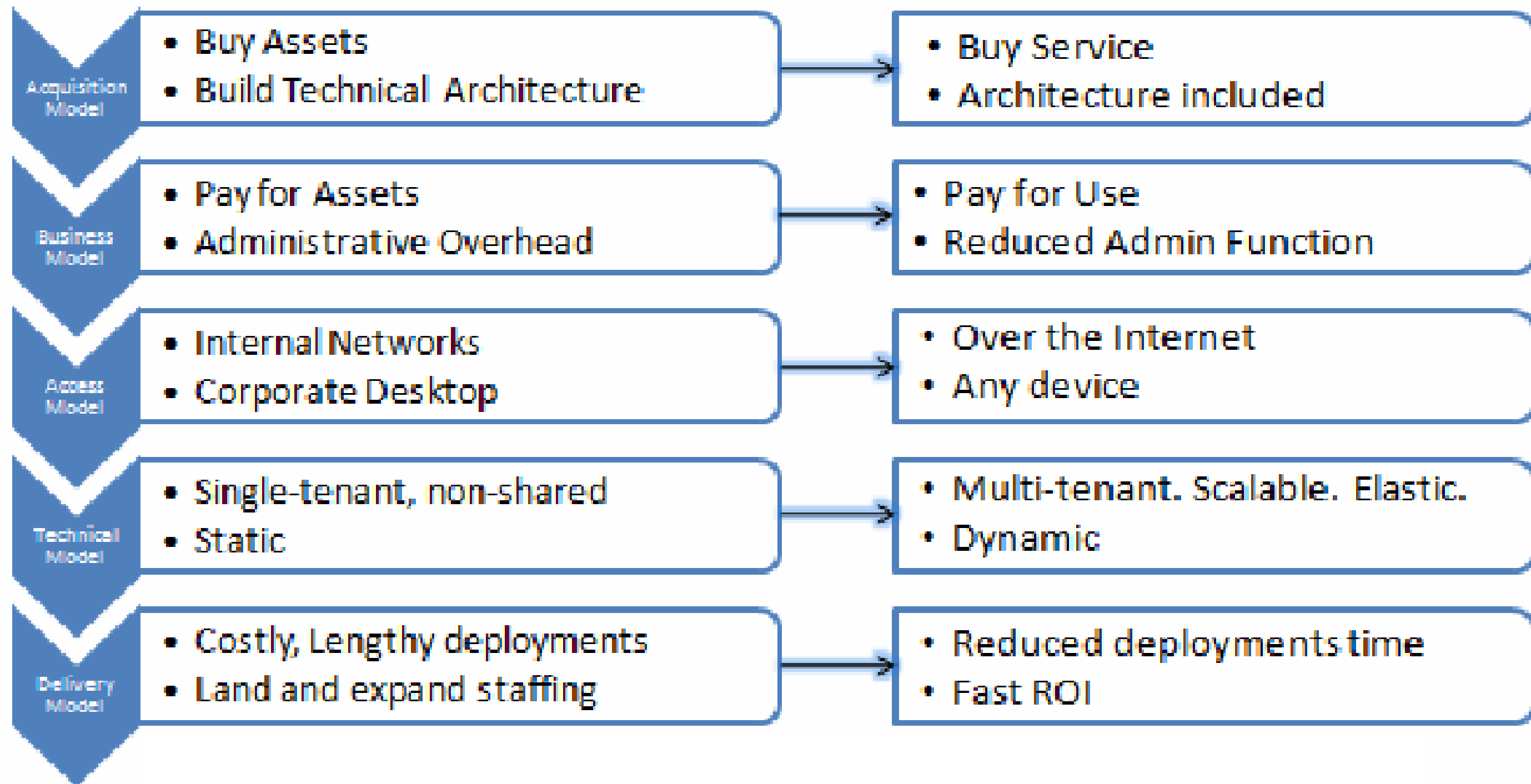If you need more extension you should buy more and more equipments.

# Risks before cloud

- If you get hardware devices that can not fulfill your needs?

- How to scale up or scale down your computing resources?

- Devices may be ideal (not used) for a long time but consuming power and passing working hour

## Traditional Computing

## Cloud Computing

**Acquisition Model**
- Buy Assets
- Build Technical Architecture

→

- Buy Service
- Architecture included

**Business Model**
- Pay for Assets
- Administrative Overhead

→

- Pay for Use
- Reduced Admin Function

**Access Model**
- Internal Networks
- Corporate Desktop

→

- Over the Internet
- Any device

**Technical Model**
- Single-tenant, non-shared
- Static

→

- Multi-tenant. Scalable. Elastic.
- Dynamic

**Delivery Model**
- Costly, Lengthy deployments
- Land and expand staffing

→

- Reduced deployments time
- Fast ROI

# Buy your server Vs. Select your server

## Traditional computing

## Cloud computing



Cloud Servers | Add Server

**Select Server Configuration**

- **Server Configuration**

    Image: Debian 6.0 (Squeeze)

    **Server Name**

    thecustomizewindows.com

    Only alphanumeric characters, periods, and hyphens are valid. Server Name cannot sta

- **Server Size**

| | RAM | Disk |
|---|---|---|
| ○ | 256 MB | 10 GB |
| ○ | 512 MB | 20 GB |
| ○ | 1024 MB | 40 GB |
| ○ | 2048 MB | 80 GB |
| ○ | 4096 MB | 160 GB |
| ○ | 8192 MB | 320 GB |
| ◉ | 15872 MB | 620 GB |
| ○ | 30720 MB | 1200 GB |

Create Server | Cancel

# Cloud providers

- Cloud providers provides developers with the recourses needed to build, manage, and deliver small and large-scale web and mobile applications.

- Cloud provider hosts resources and deliver it over Internet as services can be accessed by traditional protocols (HTTP) such compute, Database, big data analytics, IoT, machine learning, and more to streamline development.

- Cloud recourses can be scaled up or scaled down on demand.

# Interaction between provider and client



Client

Http request

Internet

Response message

Request message
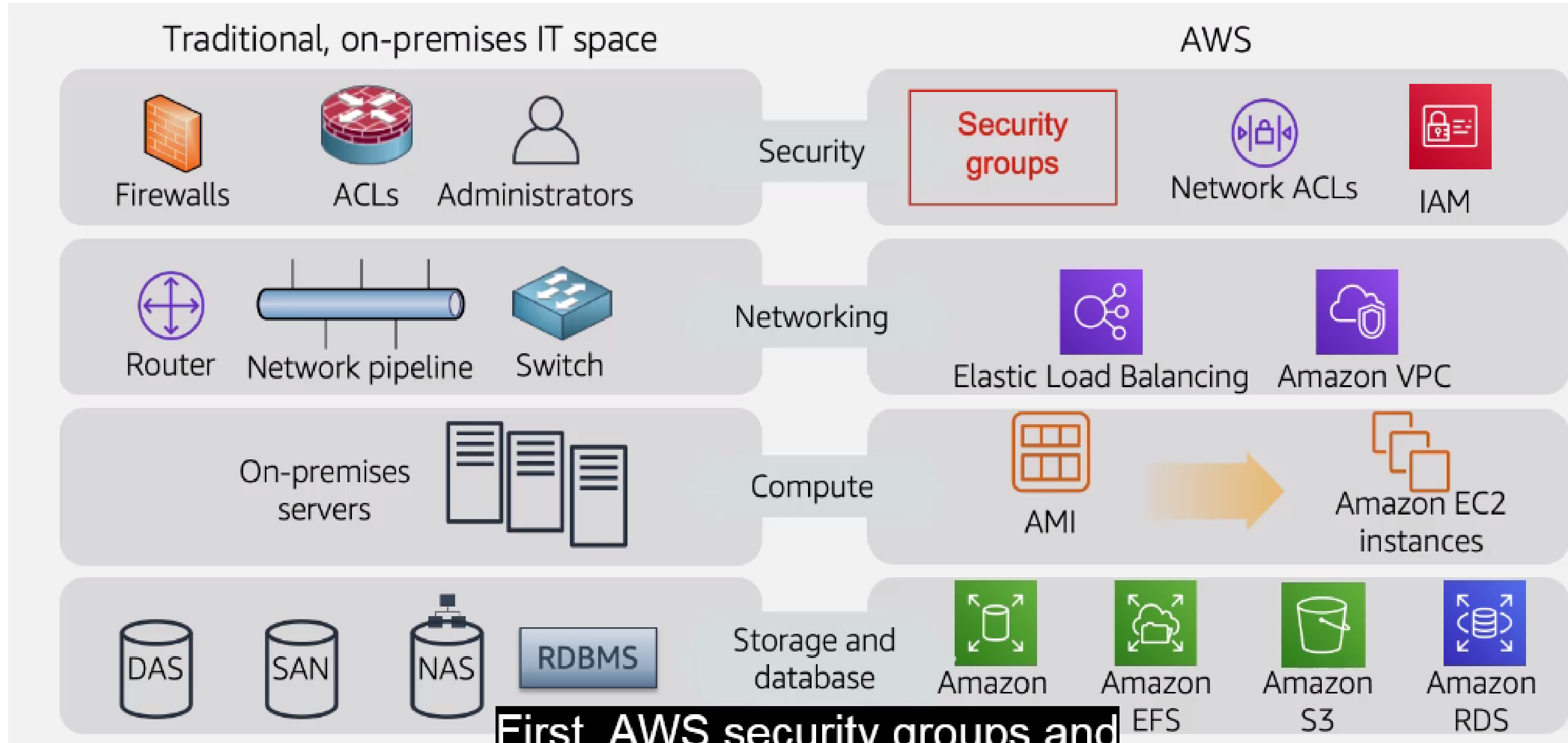
Cloud provider
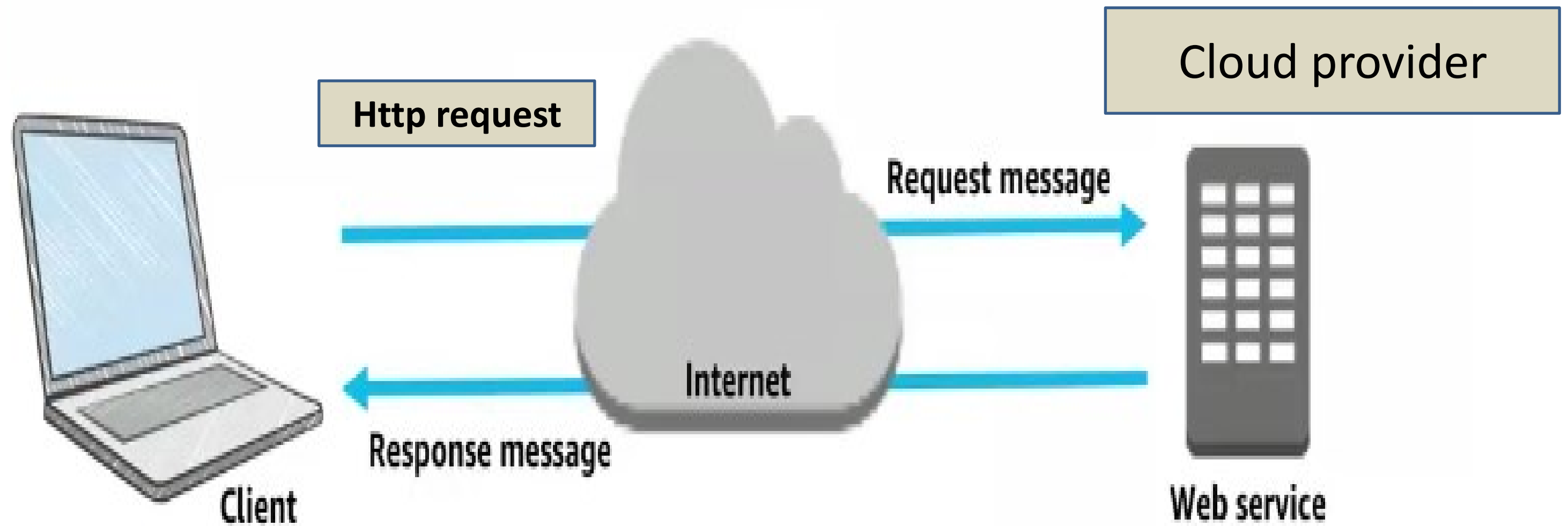
Web service

# Popular cloud providers

- Amazon Web Services. (AWS)

- Microsoft Azure.

- Google Cloud Platform.

- Alibaba Cloud.

- Salesforce.

- IBM.

- Digital Ocean.

- Dell.

- **Assignment 1**
- **( compare between cloud providers.. "services, cost, security, flexibility")**

# Traditional applications Vs. cloud applications



| Traditional, on-premises IT space | | | | AWS | | |
|---|---|---|---|---|---|---|
| Firewalls | ACLs | Administrators | **Security** | Security groups | Network ACLs | IAM |
| Router | Network pipeline | Switch | **Networking** | Elastic Load Balancing | Amazon VPC | |
| On-premises servers | | | **Compute** | AMI | → | Amazon EC2 instances |
| DAS | SAN | NAS | RDBMS | **Storage and database** | Amazon EFS | Amazon S3 |
| | | | | | | Amazon RDS |

First, AWS security groups and

# Traditional Computing

High cost

low scalability

Pay all in advance

Need a team of hardware and software to maintain

Security is managed by the organization

Less chance of data recovery

Take longer implementation time

# Cloud Computing

lower cost

high scalability

Pay as you go (use)

No need to a team of hardware and software to maintain

Security is managed by the cloud

High chance of data recovery

Take short implementation time

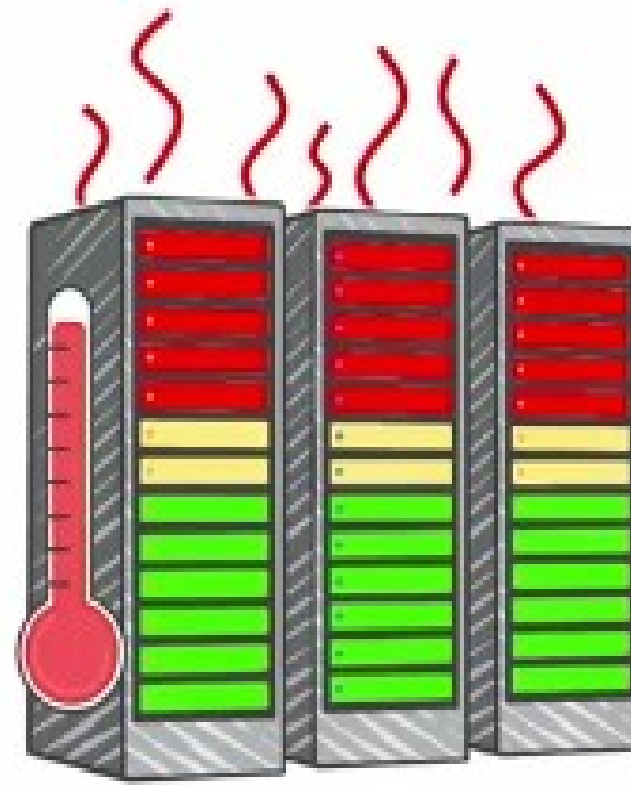# Server failure means system failure

## Traditional computing
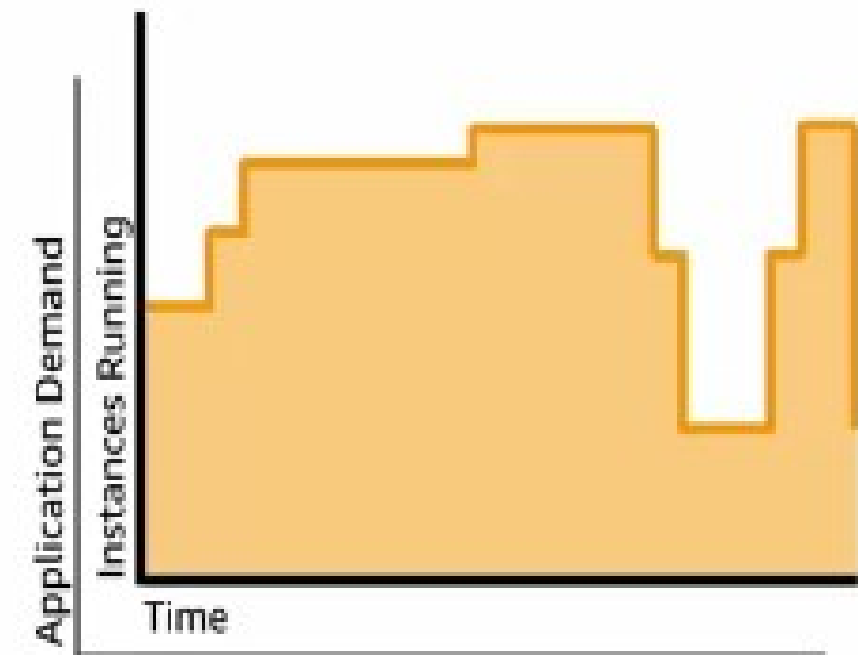
## Cloud computing

# Scalability



Overestimated server capacity

Underestimated server capacity

Scaling on demand

# Have you used cloud computing before???

## The answer is yes

- Using Google search.

- Your computer isn't playing much part in finding the answers you need.

- The words you type are passed to one of Google's super computers, which dig out your

  results and send them promptly back to you.

- The real work in finding your answers might be done by a computer sitting in California,

  Dublin, Tokyo, or Beijing; **you don't know—and most likely you don't care!**

# Cloud computing examples

- Your email is managed by Web-based services such as Hotmail came along and carried email off into the cloud.

- Where is your data ( your previous mails)

- All that you know that your emails are stored and processed through a server in some remote part of the world.

- Your mails are easily accessible from a Web browser, wherever you are and with any device.

# Cloud computing examples

- Google Documents allows you can to create a document, spreadsheet, presentation, or whatever you like using Web-based software.

- To write a document, instead of using Microsoft Word or, running on your computer, you can using similar software running on a PC at one of Google's world-wide data centers.

# Why cloud computing

Rabid development

Pay as you go

Reduce cost

Scalability

Reliability

Accessibility

# Cloud disadvantages

Loss of data and services if you are not connected to the Internet

Potential privacy and security risks of putting valuable data on someone else's system in an unknown location

What happens if your supplier suddenly decides to stop supporting a product or system you've come to depend on?

# NIST definition of cloud computing

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."

# *Big switch &*
# *fourth revolution*

- *A fundamental **shift** in the nature of computing is taking place, which is going from something that people and **businesses** had to supply locally, through their **own machines** and their own installed software, to much more of a **utility model** where a lot of the computer functions we depend on are supplied from big, central stations, big central utilities over the Internet.*

# Different computation service offered by cloud
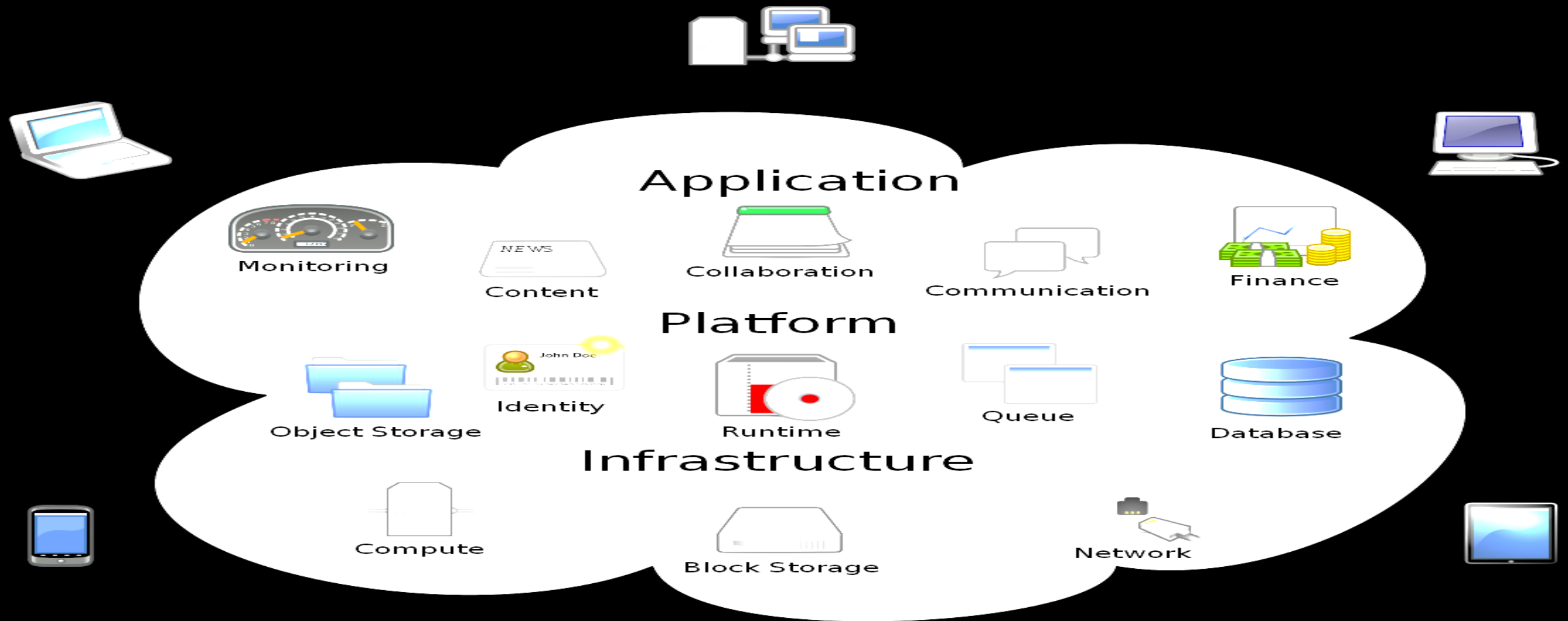
# Challenges for cloud computing

1. Availability of service: what happens when the service provider cannot deliver?

2. Data confidentiality and auditability, a serious problem.

3. Diversity of services, data organization, user interfaces available at different service providers limit user mobility; once a customer is hooked to one provider it is hard to move to another.

4. Data transfer bottleneck; many applications are data-intensive.

# AWS academy

- AWS Academy is to provide higher education institutions with a cloud computing curriculum that prepares students to pursue industry-recognized certifications and careers in the cloud.


- Course name:
- AWS Academy Cloud Foundations [96428]


- Course link

- https://awsacademy.instructure.com//courses/96428

# Cloud Foundations Course

- Module 1: Cloud Concepts Overview

- Module 2: Cloud Economics and Billing

- Module 3: AWS Global Infrastructure Overview

- Module 4: AWS Cloud Security

- Module 5: Networking and Content Delivery

- Module 6: Compute

- Module 7: Storage

- Module 8: Databases

- Module 9: Cloud Architecture

- Module 10: Automatic Scaling and Monitoring

# AWS certification exams

*This course helps prepare you for the AWS **Cloud Practitioner** certification exam*

## Available AWS Certifications

aws certified — Updated May 2019

### Professional
**Two years** of comprehensive experience designing, operating, and troubleshooting solutions using the AWS Cloud

- aws certified **Solutions Architect** Professional
- aws certified **DevOps Engineer** Professional

### Associate
**One year** of experience solving problems and implementing solutions using the AWS Cloud

- aws certified **Solutions Architect** Associate
- aws certified **SysOps Administrator** Associate
- aws certified **Developer** Associate

**Architect** | **Operations** | **Developer**

### Foundational
**Six months** of fundamental AWS Cloud and industry knowledge

**Cloud Practitioner**
- aws certified **Cloud Practitioner**

### Specialty
Technical AWS Cloud experience in the Specialty domain as specified in the **exam guide**

- aws certified **Advanced Networking** Specialty
- aws certified **Big Data** Specialty
- aws certified **Security** Specialty
- aws certified **Machine Learning** Specialty
- aws certified **Alexa Skill Builder** Specialty