

1. Cloud Computing (1/4)

Hyunchan, Park

<http://oslab.jbnu.ac.kr>

Division of Computer Science and Engineering

Jeonbuk National University

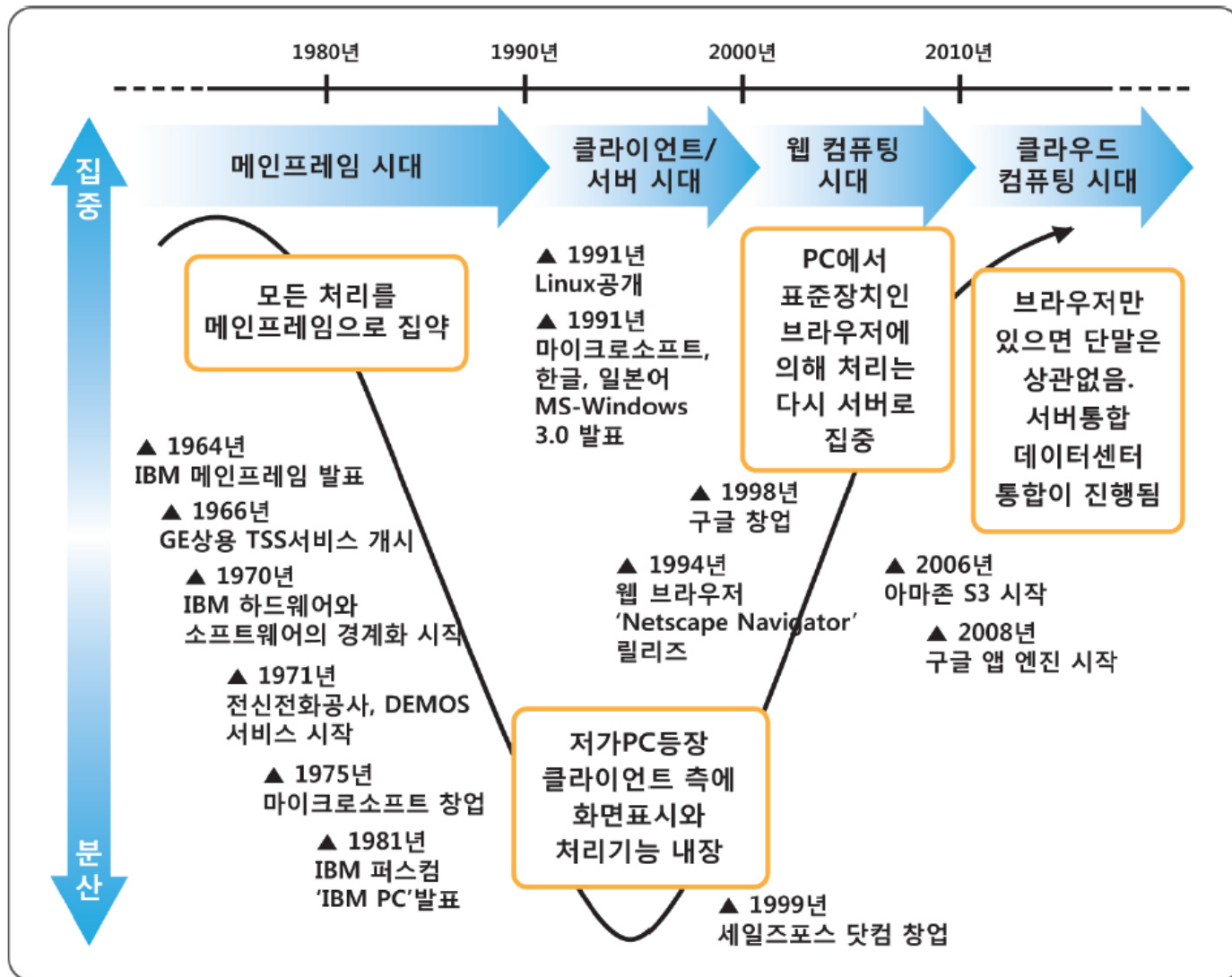
클라우드 컴퓨팅

<참고자료>

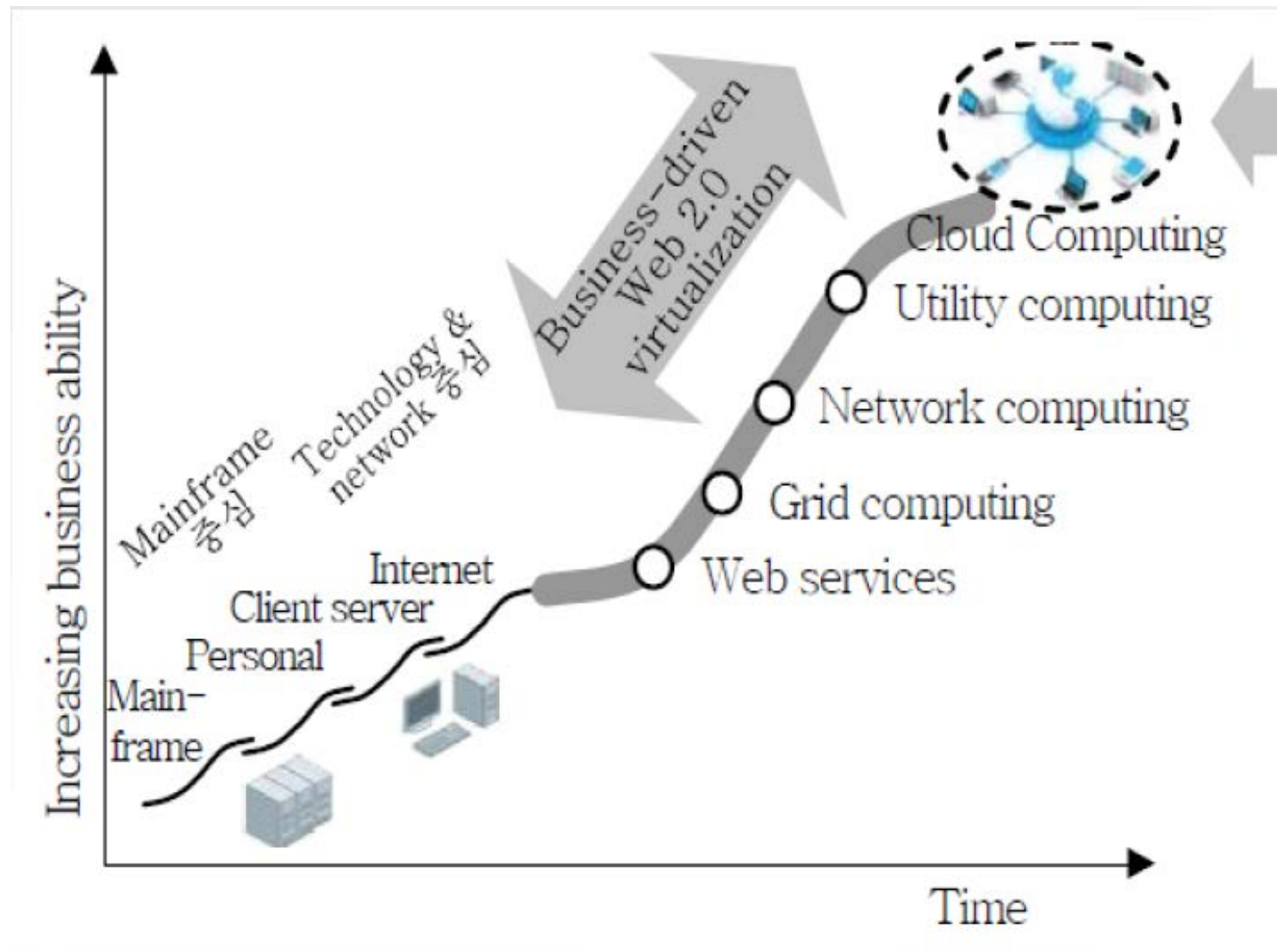
- 국립상해대학 Cloud computing lecture slide
- 2011 KERIS 이슈리포트 “스마트교육을 위한 클라우드 컴퓨팅 환경 구축”
- 2017 ITCEN “클라우드 컴퓨팅 기술 소개”
- 2015 ETRI “Enabling the Future of HPC in the Cloud”



컴퓨팅 시스템의 변천



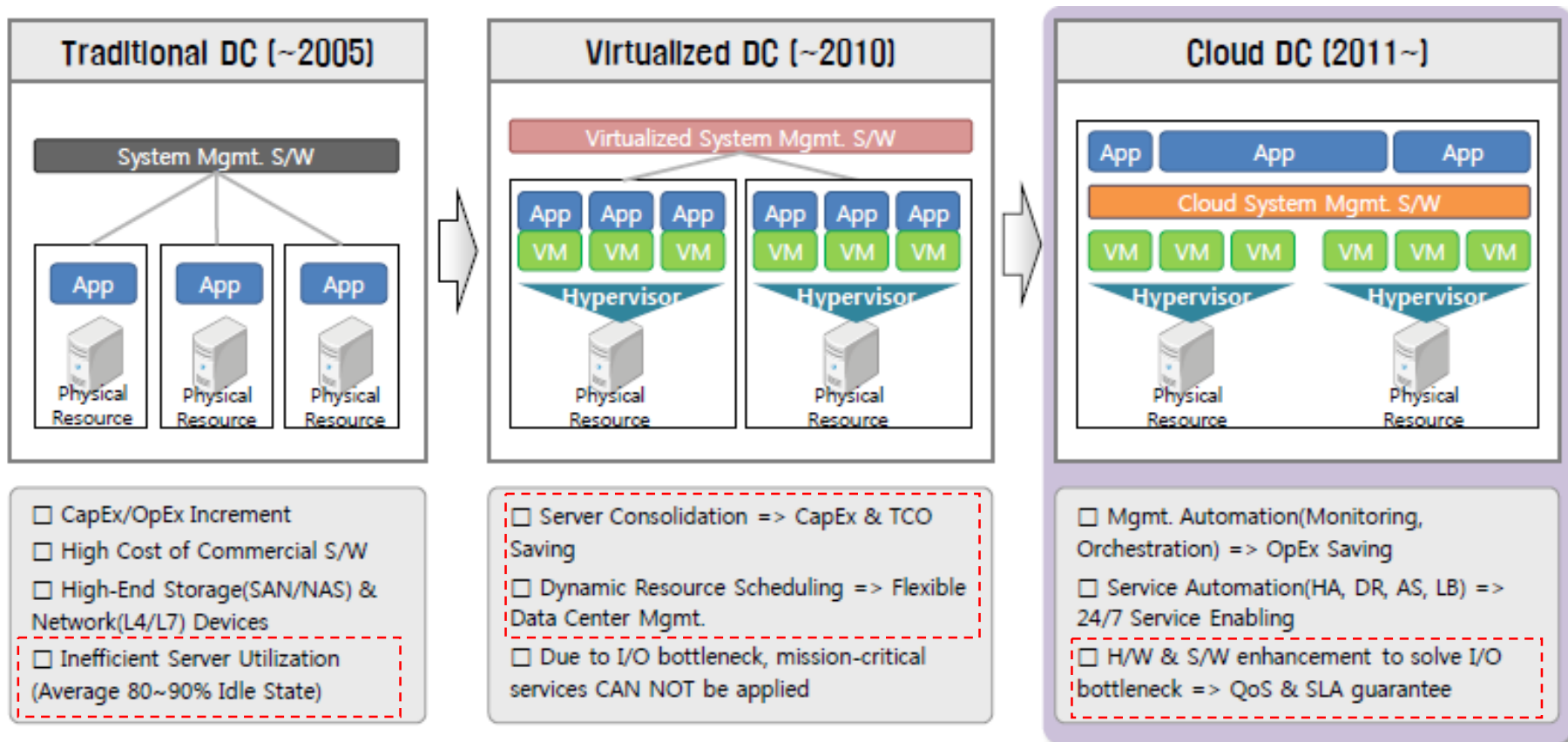
컴퓨팅 시스템의 변천



클라우드 컴퓨팅과 다른 컴퓨팅 구조 비교

구 분	유사점	차이점
그리드 컴퓨팅 (Grid Computing)	<ul style="list-style-type: none"> · 분산 컴퓨팅 구조 사용 · 가상화된 컴퓨팅 자원 제공 	<ul style="list-style-type: none"> · 그리드가 인터넷상의 모든 컴퓨팅 자원을 사용하는 반면, 클라우드는 사업자 소유의 클라우드 사용
유틸리티 컴퓨팅 (Utility Computing)	<ul style="list-style-type: none"> · 과금 방식 동일 	<ul style="list-style-type: none"> · 기술적인 문제 연관성 부재
서버 기반컴퓨팅 (Server Based Computing)	<ul style="list-style-type: none"> · 데이터 및 응용을 아웃 소싱 형태로 사용 	<ul style="list-style-type: none"> · 서버기반 클라우드가 클라이언트에서 입출력만하는 반면, 클라우드는 데이터 자체를 제공할 경우 클라이언트 자원 활용 가능
네트워크 컴퓨팅 (Network Computing)	<ul style="list-style-type: none"> · 데이터 및 응용을 아웃 소싱 형태로 사용 	<ul style="list-style-type: none"> · 네트워크 컴퓨팅은 사용자의 컴퓨팅 자원을 사용하며, 클라우드는 서버가 컴퓨팅 능력 제공

Evolution of Datacenter & Key Issues



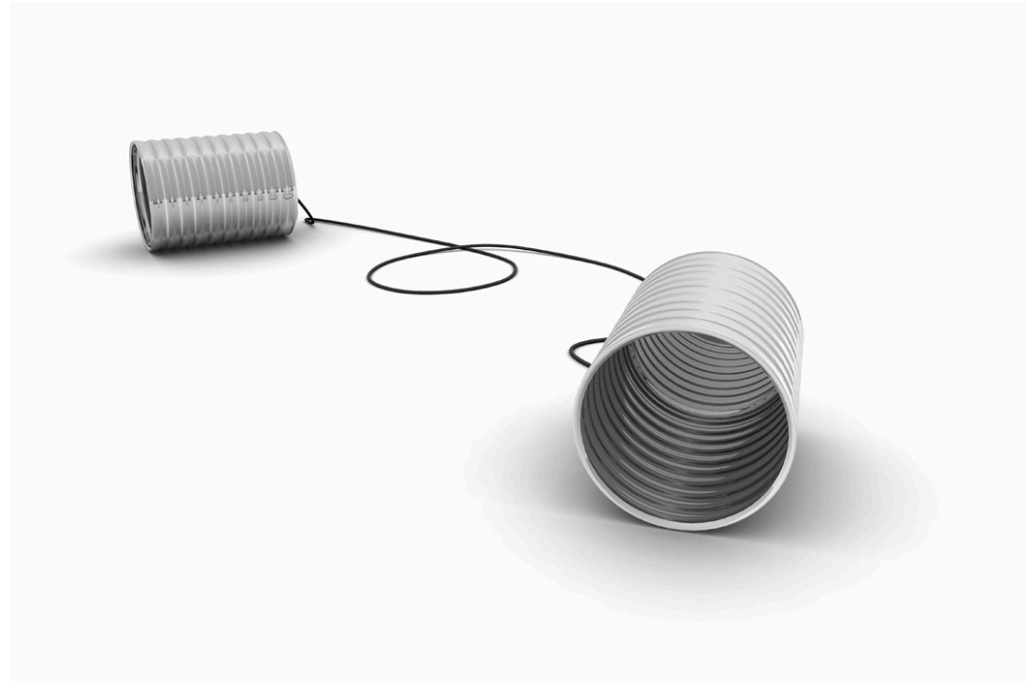
* Next-Generation Cloud Data Center Technologies, in Cloud Inspire 2013

- CapEx/OpEx: Capital expenditure/operating expenses
- TCO: Total cost of ownership, HA: High availability, DR: Disaster recovery, AS: Automated services, LB: Load balancing



Agenda

- What is Cloud Computing ?
 - Different perspectives
 - Properties and characteristics
 - Benefits from cloud computing
- Service and deployment models
 - Three service models
 - Four deployment models



What do they say ?

WHAT IS CLOUD COMPUTING ?

Cloud Definitions

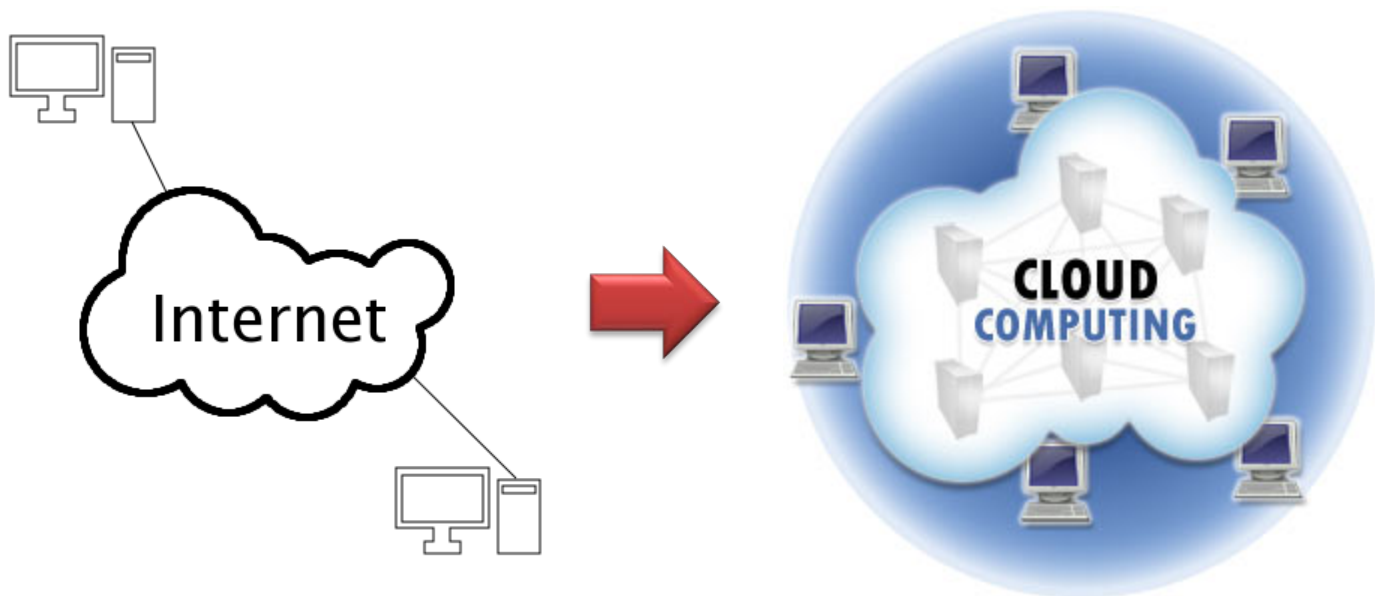
- Definition from *Wikipedia*
 - Cloud computing is **Internet-based computing**, whereby **shared resources, software, and information** are provided to computers and other devices **on demand**, like the electricity grid.
 - Cloud computing is a style of computing in which **dynamically scalable** and often **virtualized resources** are provided as a **service** over the Internet.



WIKIPEDIA
The Free Encyclopedia

Cloud Definitions

- Definition from *Whatis.com*
 - The name cloud computing was inspired by the cloud symbol that's often used to represent the Internet in flowcharts and diagrams. Cloud computing is a general term for anything that involves **delivering hosted services over the Internet.**



Cloud Definitions

- Definition from *Berkeley*
 - Cloud Computing refers to both the **applications delivered as services over the Internet** and the **hardware and systems software** in the datacenters that provide those services.
 - The services themselves have long been referred to as **Software as a Service (SaaS)**, so we use that term. The datacenter hardware and software is what we will call a Cloud.
 - When a Cloud is made available in a **pay-as-you-go** manner to the public..... The service being sold is **Utility Computing**.



Cloud Definitions

- Definition from *NIST* (*National Institute of Standards and Technology*)
 - Cloud computing is a model for enabling 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.
 - This cloud model promotes **availability** and is composed of five essential characteristics, three service models, and four deployment models.



National Institute of Standards and Technology
Technology Administration, U.S. Department of Commerce

Cloud Definitions

출 처	클라우드의 정의
포레스터 리서치	표준화된 IT 기반 기능들이 IP를 통해 제공되며, 언제나 접근이 허용되고, 수요의 변화에 따라 가변적이며, 사용량이나 광고를 기반한 과금 모델을 제공하며, 웹 혹은 프로그램적인 인터페이스를 제공하는 컴퓨팅
가트너	인터넷 기술을 활용하여 다수의 고객들에게 높은 수준의 확장성을 가진 자원들을 서비스로 제공하는 컴퓨팅의 한 형태
위키피디아	인터넷에 기반한 개발과 컴퓨터 기술의 활용을 말하는 것으로 인터넷을 통해서 동적으로 규모화 가능한 가상적 자원들이 제공되는 컴퓨팅
IBM	웹 기반 어플리케이션을 활용하여 대용량 데이터베이스를 인터넷 가상공간에서 분산처리하고 이 데이터를 데스크톱 PC, 휴대 전화, 노트북 PC, PDA 등 다양한 단말기에 불러오거나 가공할 수 있게 하는 환경을 제공
빌게이츠	개인 컴퓨터가 아닌 인터넷과 연결된 메인 컴퓨터에 저장해 놓고 인터넷만 접속해 있으면 어떤 단말기로도 원하는 문서 작업이 가능한 환경

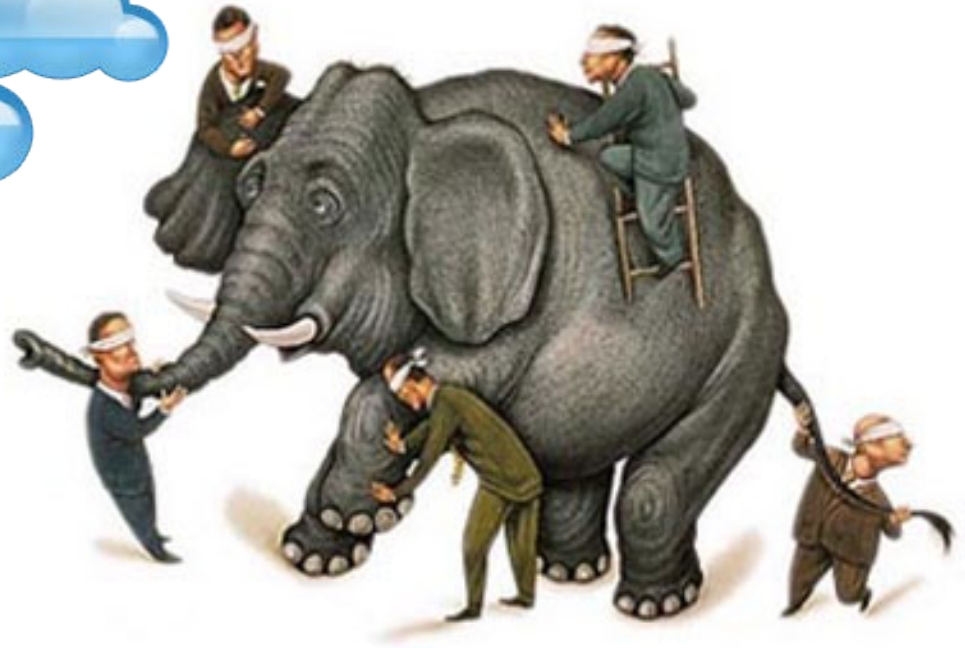
Even More Confusing ??



Cloud Disclaimers

- Talk from Oracle CEO **Larry Ellison**
 - We've redefined Cloud Computing to include everything that we already do. I don't understand what we would do differently other than change the wording of some of our ads.
- Talk from **Rich Stallman**
 - It's stupidity. It's worse than stupidity: it's a marketing hype campaign. Somebody is saying this is inevitable – and whenever you hear somebody saying that, it's very likely to be a set of businesses campaigning to make it true.





Properties and characteristics

WHAT IS CLOUD COMPUTING ?

In Our Humble Opinion

- Cloud computing is a paradigm of computing, a new way of thinking about IT industry but not any specific technology.
 - Central ideas
 - **Utility Computing**
 - **SOA** - Service Oriented Architecture
 - **SLA** - Service Level Agreement
 - Properties and characteristics
 - High **scalability** and **elasticity**
 - High **availability** and **reliability**
 - High **manageability** and **interoperability**
 - High **accessibility** and **portability**
 - High **performance** and **optimization**
 - Enabling techniques
 - (Hardware) Virtualization
 - Parallelized and distributed computing
 - Web service





DON'T TELL ME DETAILS!!
I DON'T CARE!!

- Perspective from user :
 - Users do not care about **how the works are done**
 - Instead, they only concern about what they can get
 - Users do not care about **what the provider actually did**
 - Instead, they only concern about their quality of service
 - Users do not want to own **the physical infrastructure**
 - Instead, they only want to pay as many as they used
- What does user really care ?
 - They only care about their “Service”



Utility Computing



- One service provisioning model
 - Service provider makes computing resources and infrastructure management available to the customer as needed, and charges them for specific usage rather than a flat rate.
 - Like other types of on-demand computing , the utility model seeks to maximize the efficient use of resources and/or minimize associated costs.

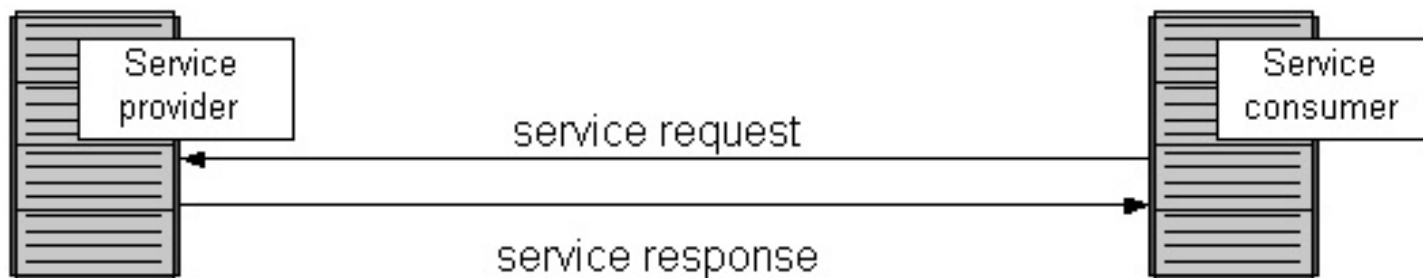
Service Oriented Architecture

- Definition

- Service Oriented Architecture (SOA) is essentially a collection of services which communicate with each other
- Contain a flexible set of design principles used during the phases of systems development and integration
- Provide a loosely-integrated suite of services that can be used within multiple business domains

- Approach

- Usually implemented by Web Service model



Quality Of Service

- Original definition
 - Quality of Service (QoS) is a set of technologies for managing network traffic in a cost effective manner to enhance user experiences for home and enterprise environments.
- Now QoS becomes to a broad term that is used following areas :
 - Customer care evaluations
 - Technological evaluations



Quality Of Service

- Customer care evaluations
 - QoS is usually measured in terms of issues that have a direct impact on the experience of the customer
 - Only issues that produce a negative effect on the goods and services received by the customer come under scrutiny
- Technological evaluations
 - QoS has to do with the efficient operation of various systems
 - This can lead to adjusting procedures or adapting software programs and code to achieve the desired effect while making a more efficient use of available resources

Service Level Agreement

- Definition

- A service-level agreement (SLA) is a contract between a service provider and a customer that specifies, usually in measurable terms (QoS), what services the service provider will furnish

- Common content in contract

- Performance guarantee metrics
 - Up-time and down-time ratio
 - System throughput
 - Response time
- Problem management detail
- Penalties for non-performance
- Documented security capabilities

