

北京邮电大学

BEIJING UNIVERSITY OF  
POSTS AND TELECOMMUNICATIONS



# Mobile Internet

( Supporting Technologies of Mobile Internet  
/Cloud Computing )

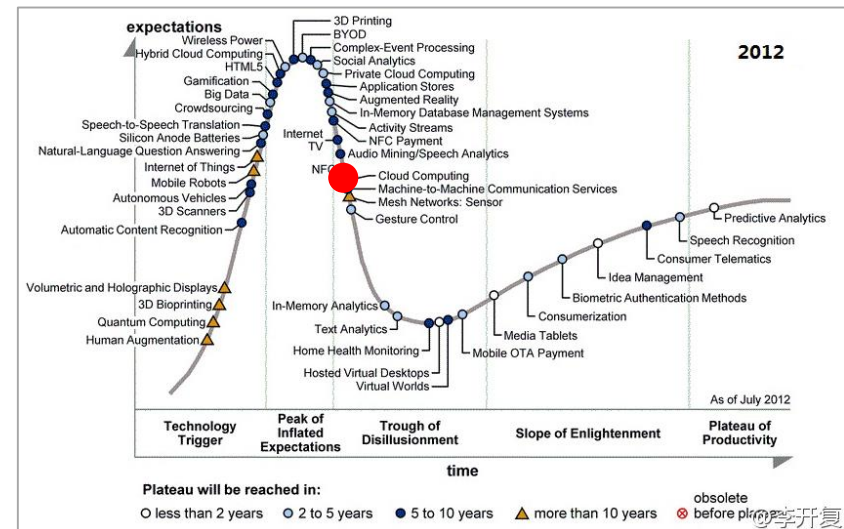
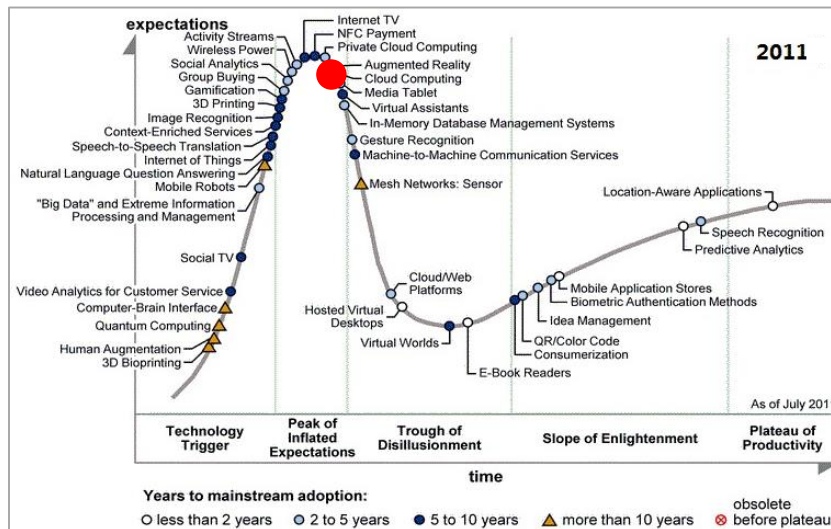
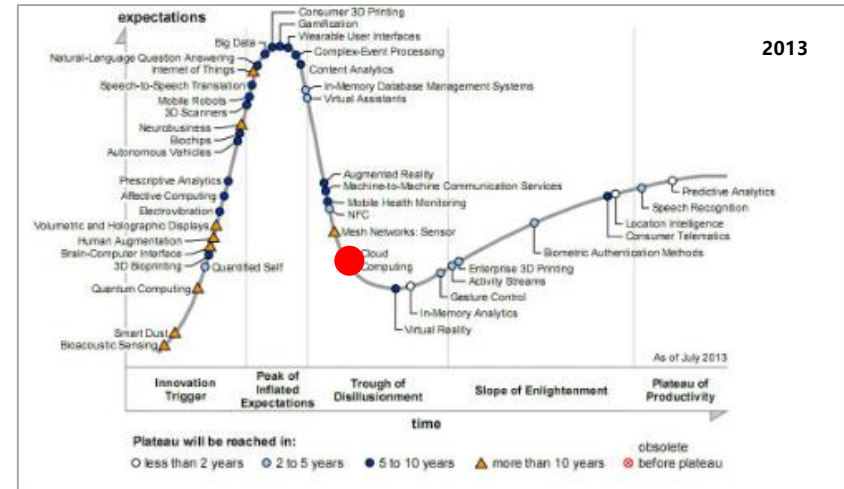
Xu Peng

BUPT  
State Key Lab. Of  
Networking and Switching Technology

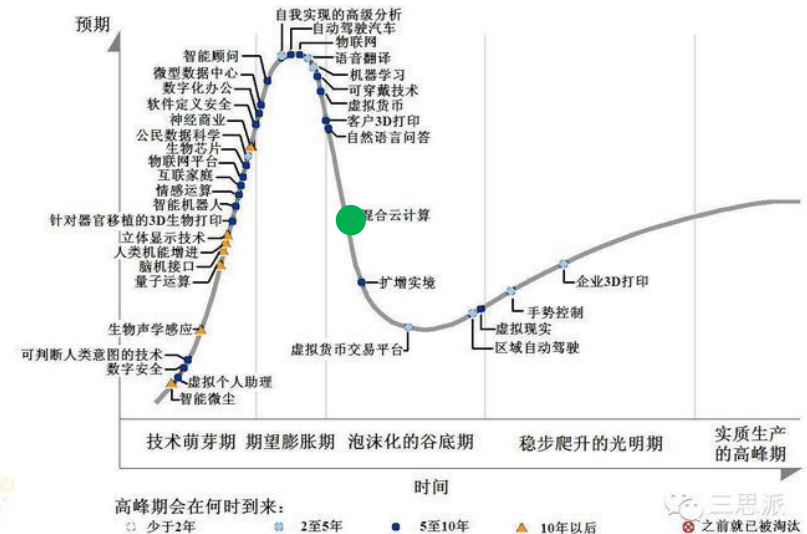
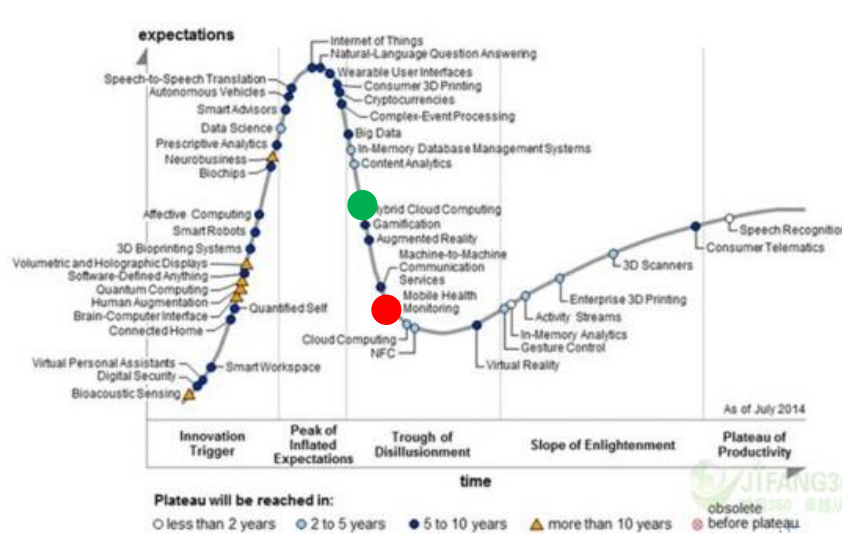
# Preface

## The Hype Cycle ( Gartner )

1. Technology Trigger
2. Peak of Inflated Expectations
3. Trough of Disillusionment
4. Slope of Enlightenment
5. Plateau of Productivity



# Preface



Gartner removed "Cloud Computing" from the hype cycle since 2015



Nov. 11st. 2016

- In the first 52s, the trading volume exceeded 1 billion yuans
- At 0:9:39, zhifubao handled the speak traffic of 0.12M transactions/s
- In the first 6:58, the trading volume exceeded 10 billion yuans

# Contents

- Features of Cloud Computing
  - Definition of Cloud Computing
  - Merge of Cloud Computing
  - Key Issues of Cloud Computing
- Applications of Cloud Computing



# Definition of Cloud Computing



- 云计算将IT相关的能力以服务的方式提供给用户，允许用户不了解提供服务的技术、没有相关知识以及设备操作能力的情况下，通过Internet获取需要服务。

【维基百科】

**M3型虚拟主机**  
臻于完美的普及型虚拟机产品



- 独立网页空间300M
- 数据库空间50M
- 独立日志空间150M
- 流量限制30G/月
- 数据库SQL 2000, ACCESS (WIN 2003)
- 数据库MySQL5, SQL Lite (UNIX)
- 支持.net1.0/2.0/3.5 (Win2003)

☒ G邮箱 3G/3个帐号

☐ M邮箱 150M/15个帐号

**1280元/年 5760积分/年**

 [购买](#) [查看详情](#)

**M3-BK虚拟主机**  
香港主机



- Windows 2008 R2
- IIS7
- 香港电讯盈科机房
- 500M网页空间
- 支持.net1.0/2.0/3.0/3.5
- 100M Sql Server 2005数据库空间
- 流量限制30G/月
- 并发连接数150个
- 域名绑定个数15个

原价1600元

优惠价**1200元/年 4000积分/年**

 [购买](#) [查看详情](#)

**G享虚拟主机-G1型**  
平易近人的跨平台虚拟机产品



- 独立网页空间1G
- 独立日志空间不限, 保留3个月
- 绿色G邮箱3G/3个帐号
- 流量限制50G/月
- 数据库空间SQL Server 2005 300M+ MySQL 5.0 300M
- 支持.net (1.0/2.0/3.0/3.5)
- 支持PHP4/5切换
- 域名绑定数20个

**1980元/年 9300积分/年**

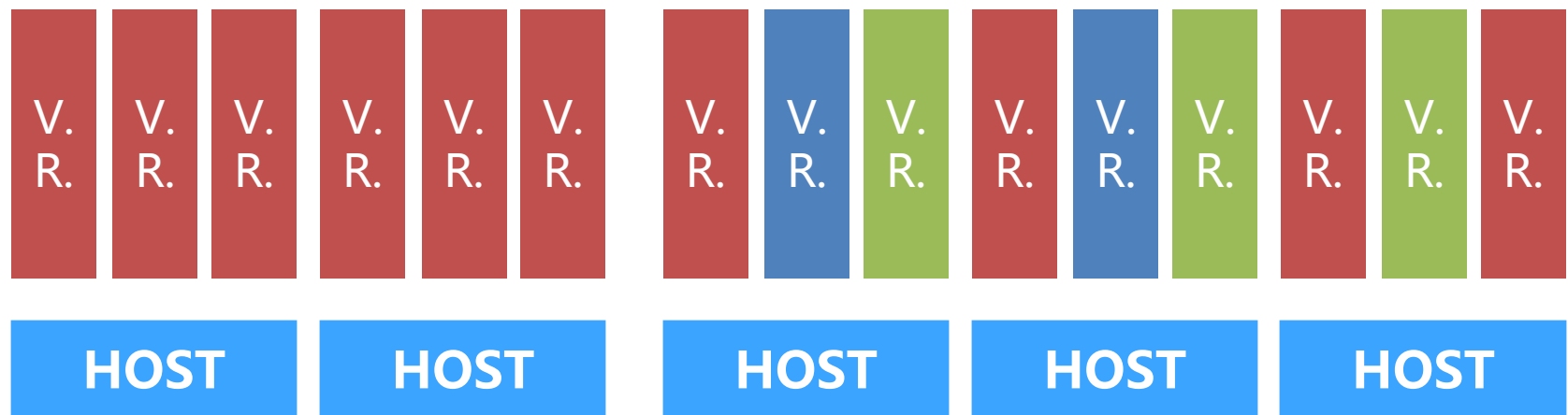
 [购买](#) [查看详情](#)

**Traditional  
VPS**



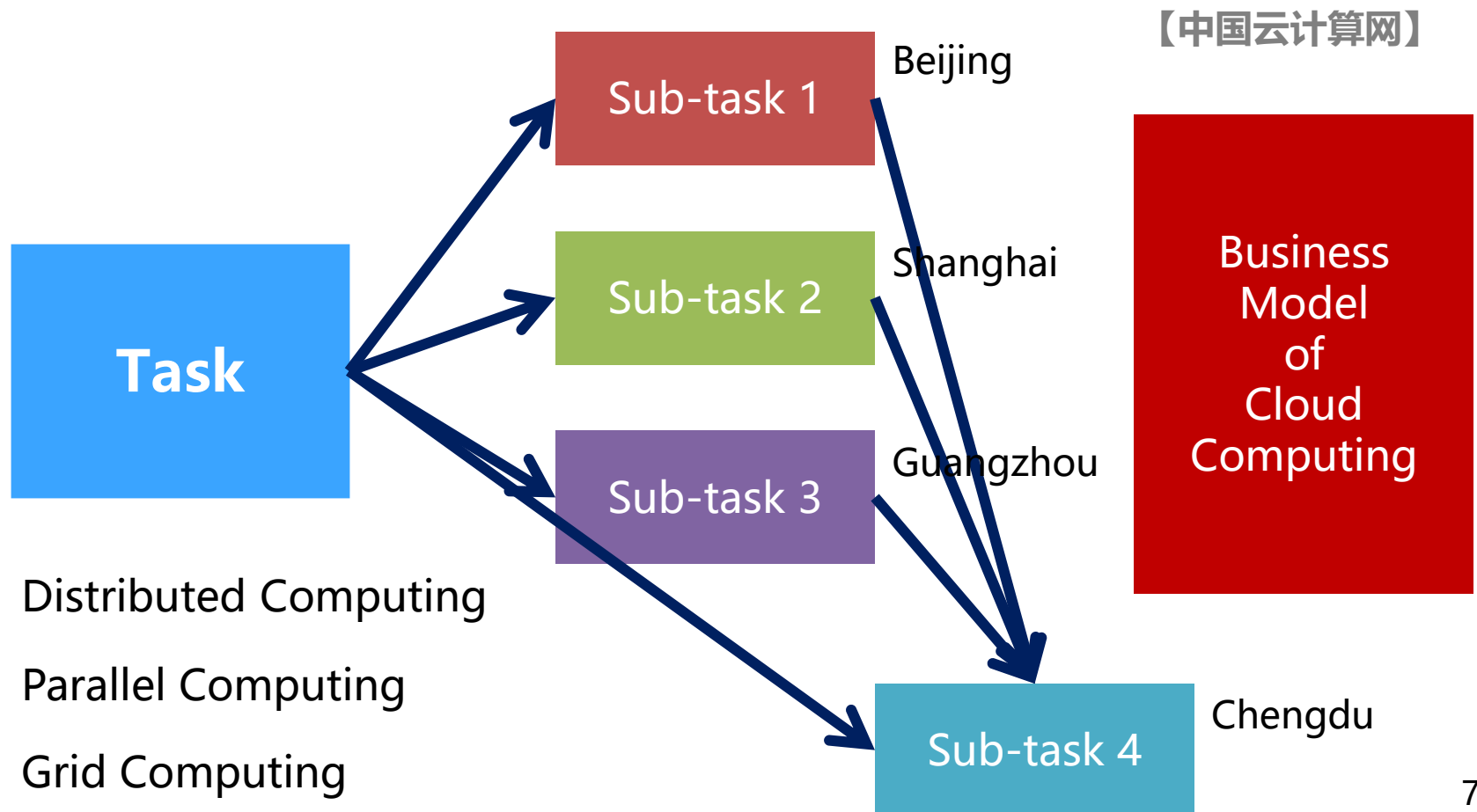
# Definition of Cloud Computing

- The definition mainly on “User Experience”
  - To provide resource as a “**Service**”
- The differences between Cloud Computing and traditional VPS
  - **Dynamic** vs. Static



# Definition of Cloud Computing

- 云计算是分布式计算 ( Distributed Computing )、并行计算 ( Parallel Computing ) 和网格计算 ( Grid Computing ) 的发展 , 或者说是这些科学概念的商业实现。



# Definition of Cloud Computing



- 云计算是一个具备高度扩展性和管理性并能够胜任终端用户应用软件计算基础架构的系统池。

【 Forrester Research 】

集群（Cluster）就是一组计算机，它们作为一个整体向用户提供一组网络资源。这些单个的计算机系统就是集群的节点。在用户看来，集群是一个系统，而非多个计算机系统。

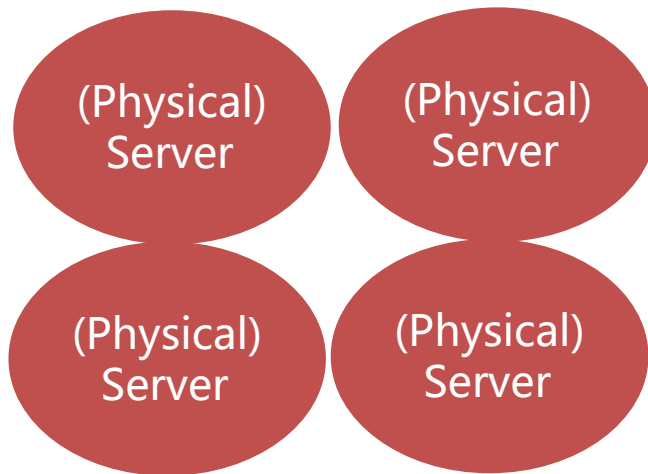
- 高可扩展性：集群系统的性能随着CPU个数的增加几乎是线性变化的
- 高可用性：集群中的一个节点失效，它的任务可以传递给其他节点，可以有效防止单点失效



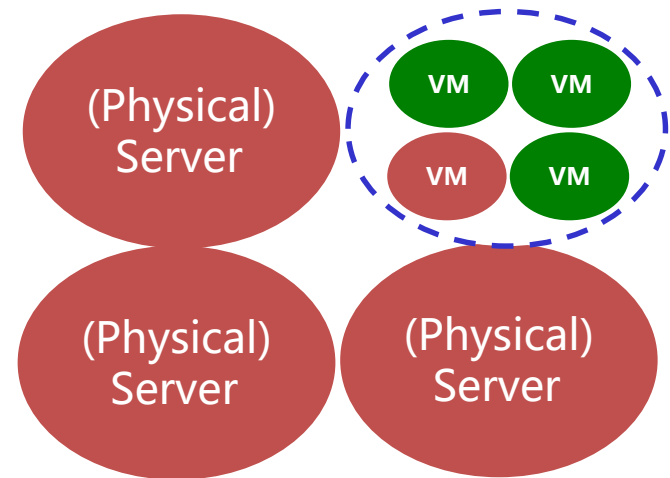


# Definition of Cloud Computing

- Same
  - Realization of Availability
  - Realization of Scalability
- Difference
  - Cluster: the element of scheduling is a physical server
  - Cloud Computing: the element of scheduling is a virtual server



**Cluster**



**Cloud Computing**

Resource Utilization Ratio is increased  
by adopting virtualization technologies



# Definition of Cloud Computing

- 云计算将IT相关的能力以服务的方式提供给用户，允许用户不了解提供服务的基础操作能力的情况下，通过Internet获取需要服务。  
**User Experience**  
【维基百科】
- 云计算是分布式计算（Distributed Computing）、并行计算（Parallel Computing）的发展，或者说这些科学概念的商业模式实现。  
**Business Model**  
【中国云计算网】
- 云计算是一个具备高度扩展性和管理性并能够胜任终端用户应用软件计算。  
**Virtualization**  
【Forrester Research】

# Definition of Cloud Computing



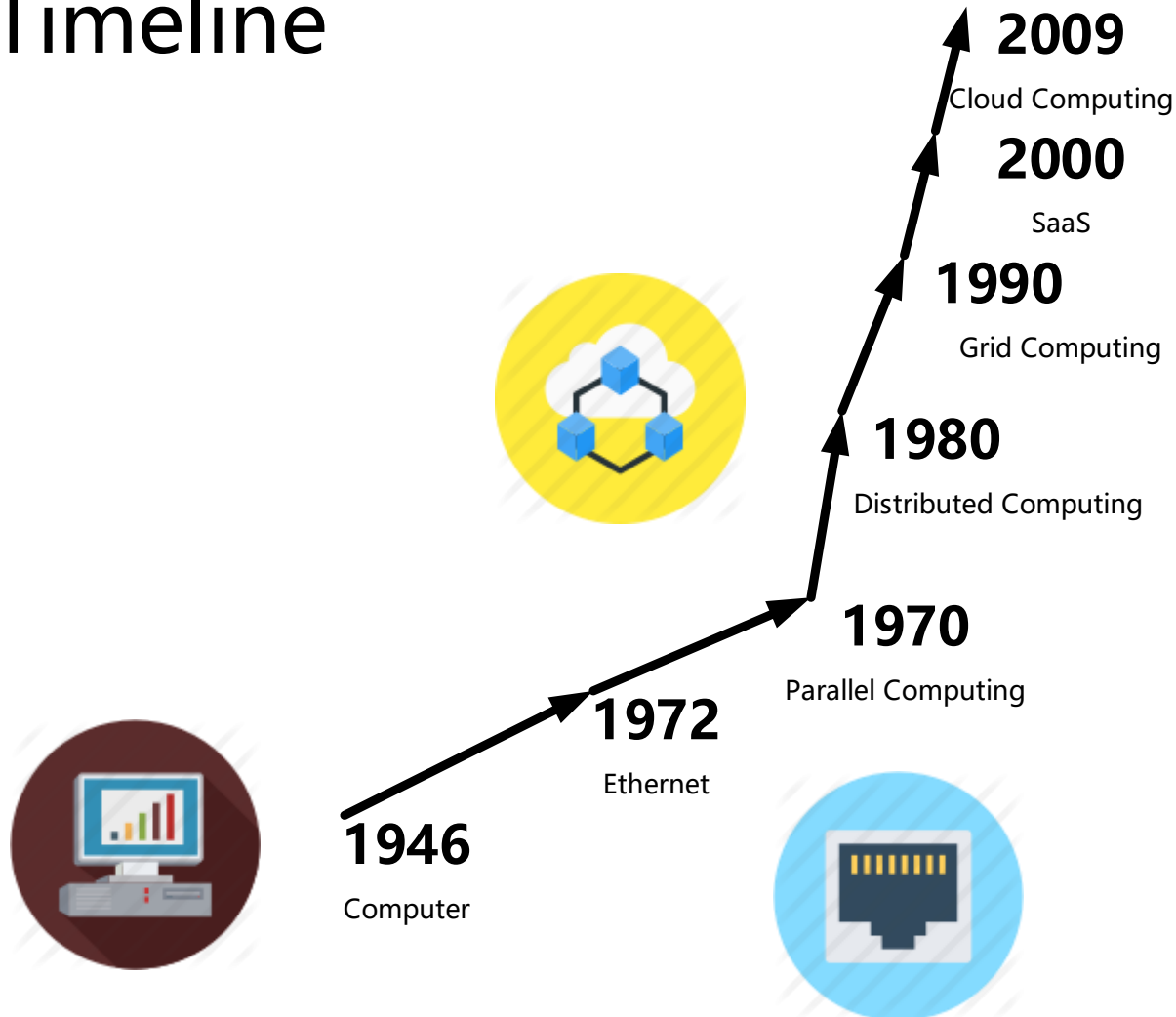
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  - Merge of Cloud Computing
  - Key Issues of Cloud Computing
- Applications of Cloud Computing



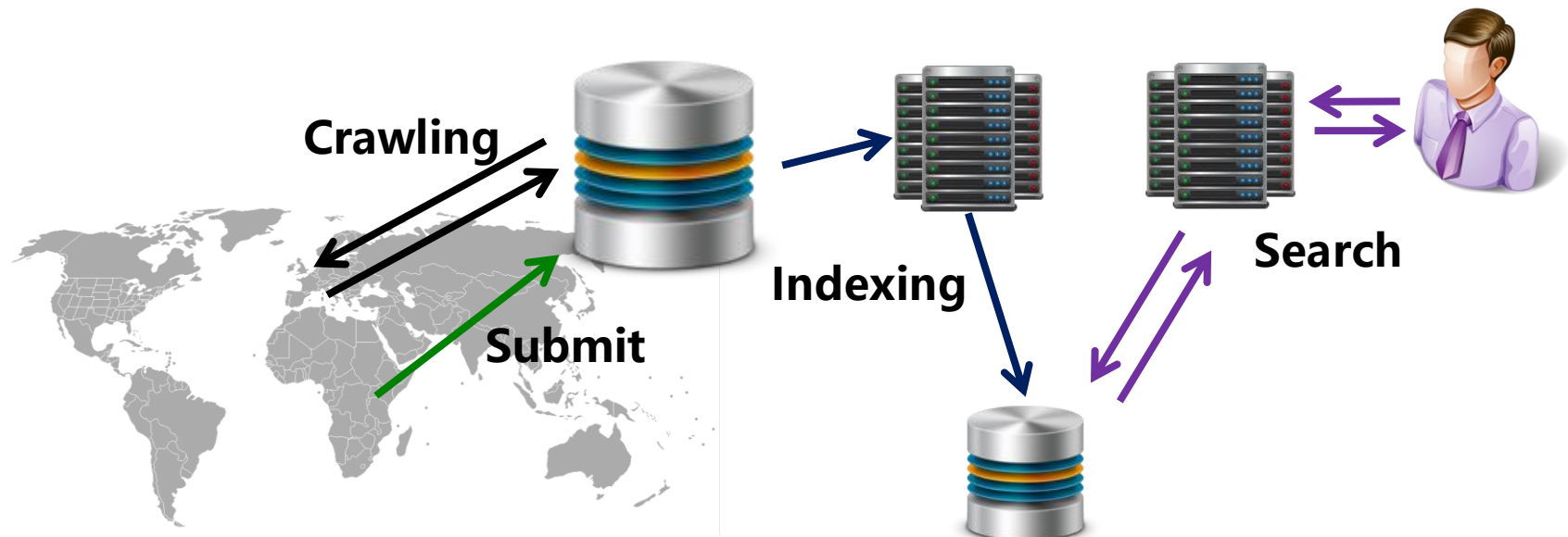
# Merge of Cloud Computing

- Timeline



# Merge of Cloud Computing

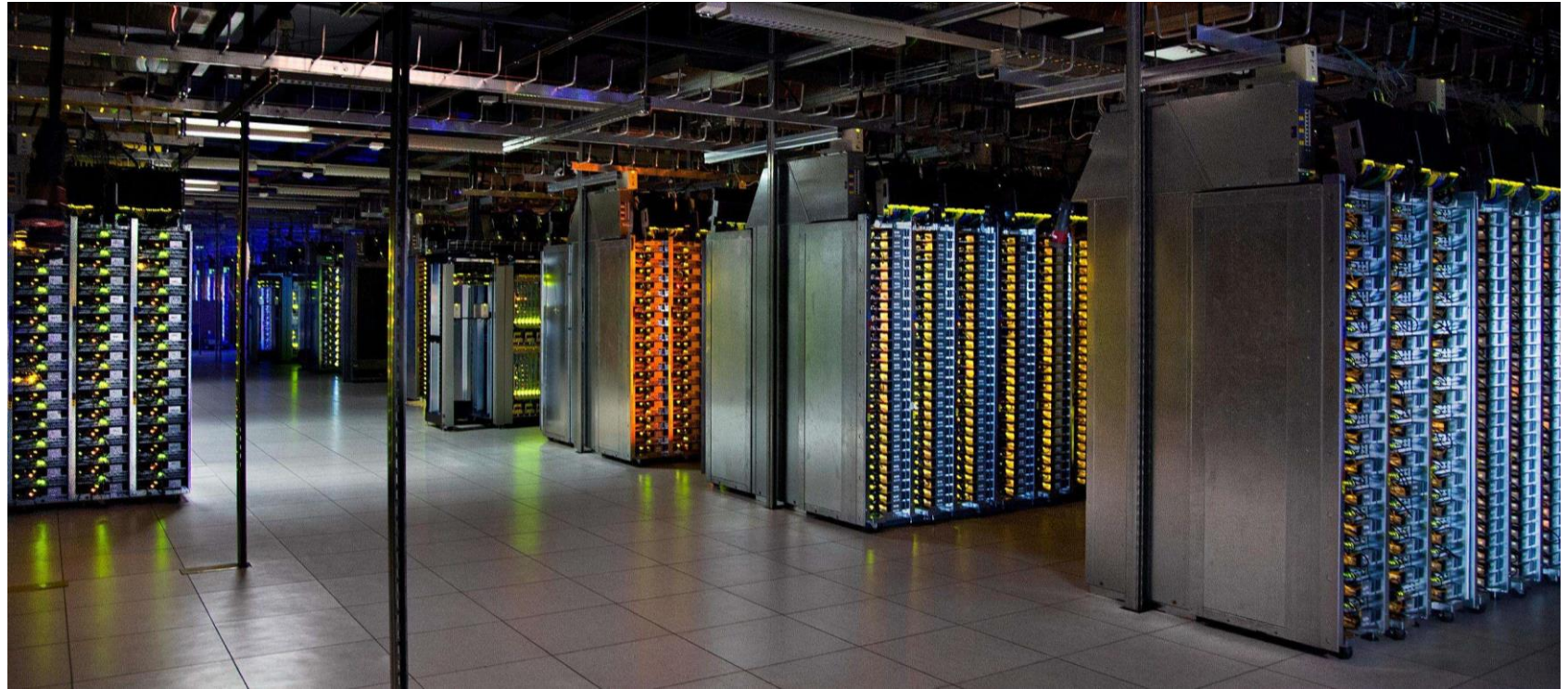
- Google (2009)
  - Number of Index: 1,000,000,000,000 pages
  - Volume of Data: More than 20PB
  - Number of Click: 300M



- Number of Servers: No less than 2M



# Merge of Cloud Computing



Is IT industry a GREEN industry?

# Merge of Cloud Computing

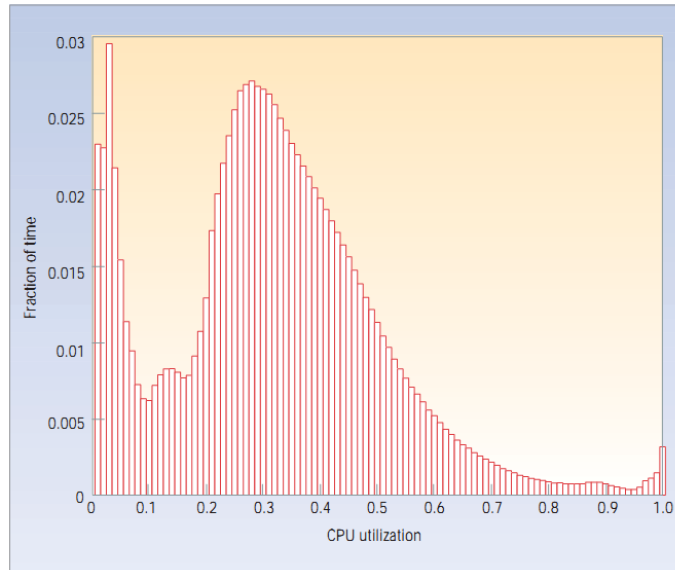


Figure 1. Average CPU utilization of more than 5,000 servers during a six-month period. Servers are rarely completely idle and seldom operate near their maximum utilization, instead operating most of the time at between 10 and 50 percent of their maximum utilization levels.

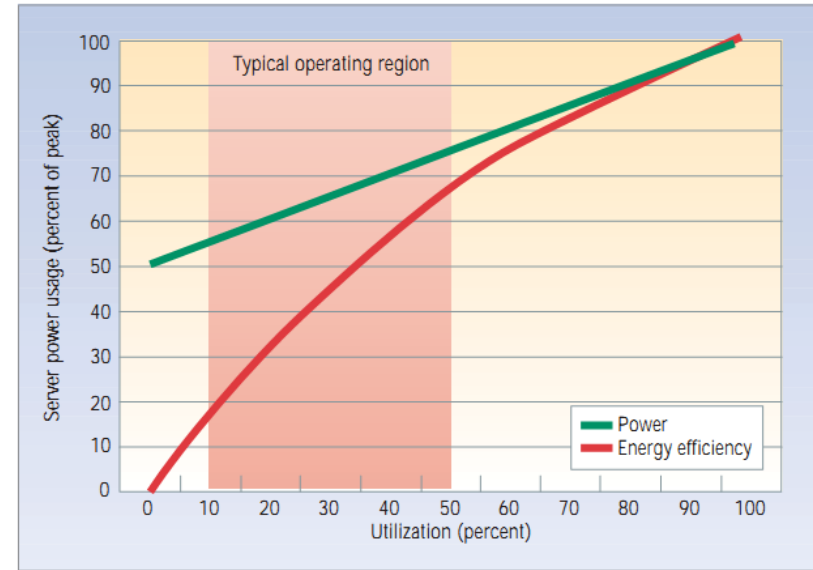
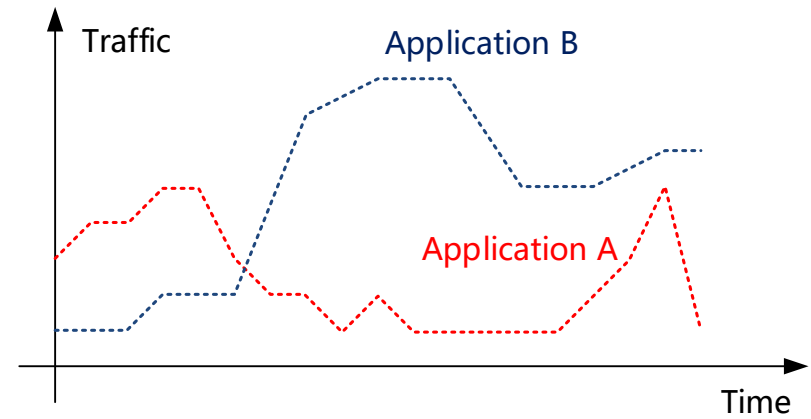
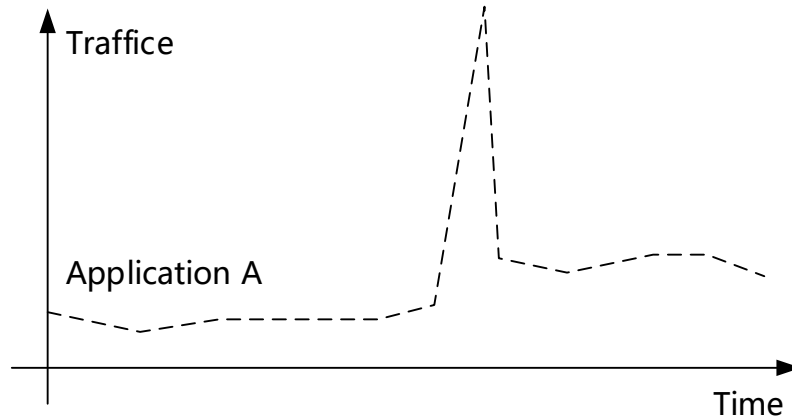


Figure 2. Server power usage and energy efficiency at varying utilization levels, from idle to peak performance. Even an energy-efficient server still consumes about half its full power when doing virtually no work.

The anger of Larry Page



# Merge of Cloud Computing



**SECRET**  
**Of**  
**"11.11"**

# Merge of Cloud Computing

- Problem solved by Cloud Computing
  - Resource Pool
    - Virtualization
    - Unite multiple low performance servers to handle large scale computation requirements
  - Service
    - Infrastructure as a Service (IaaS)
    - Platform as a Service (PaaS)
    - Software as a Service (SaaS)
  - Scheduling
    - Allocate resource to users from resource pool
    - Users' resource is distributed over multiple physical nodes for high availability and scalability
    - High resource utilization ratio and energy saving



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# Key Issues of Cloud Computing

- (Super) large Scale
  - 2M Servers in Google
  - Tens of thousands servers in Amazon, IBM, Microsoft

Must there be a lot of physical servers in one cloud ?





# Key Issues of Cloud Computing

- Virtualization
  - Vmware, XEN, KVM, Virtual PC ...



Is Virtualization mandatory ?

# Key Issues of Cloud Computing

- Universality

What are the distinguish features of your cloud?

## OpenStack



## 桌面云



## 其他云计算公司



## 云计算媒体



# Key Issues of Cloud Computing

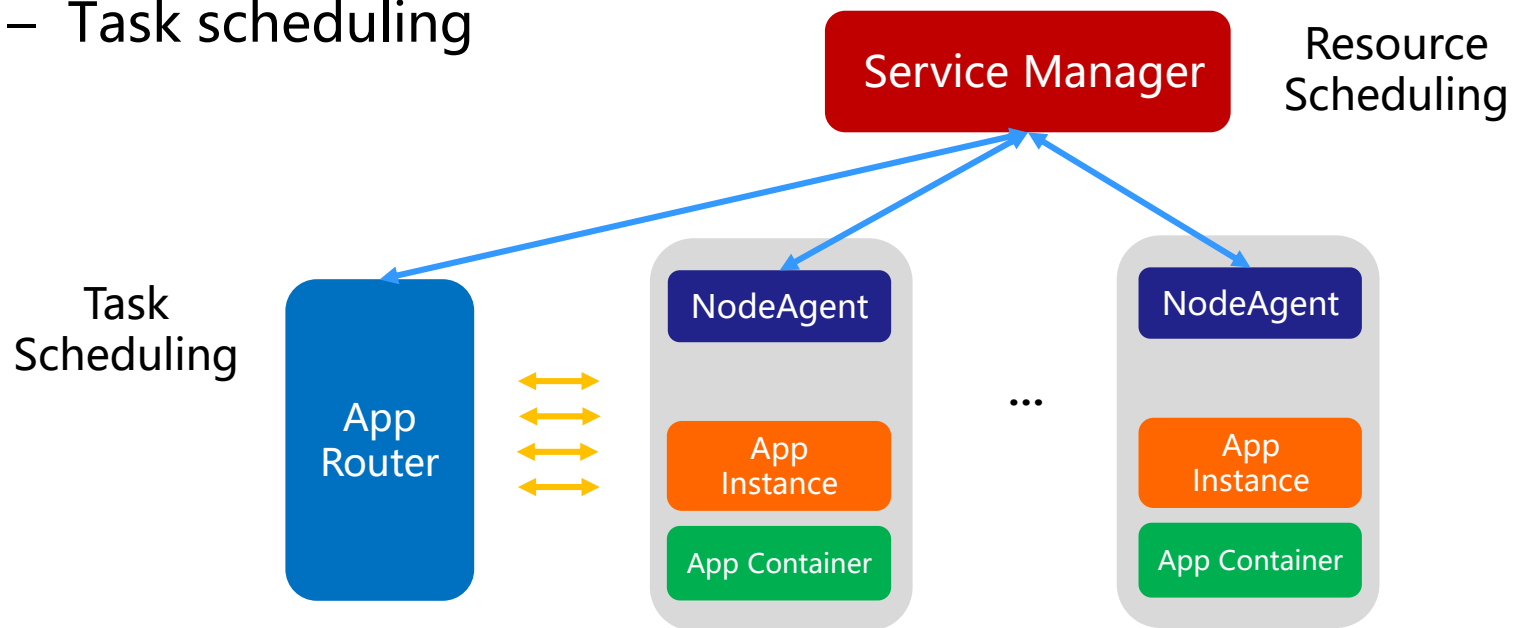
- Availability/Scalability

Redundancy is  
the key of Availability and Scalability



# Key Issues of Cloud Computing

- Scheduling
  - Resource scheduling
  - Task scheduling



Different scheduling mechanisms  
for different scenarios

# Key Issues of Cloud Computing

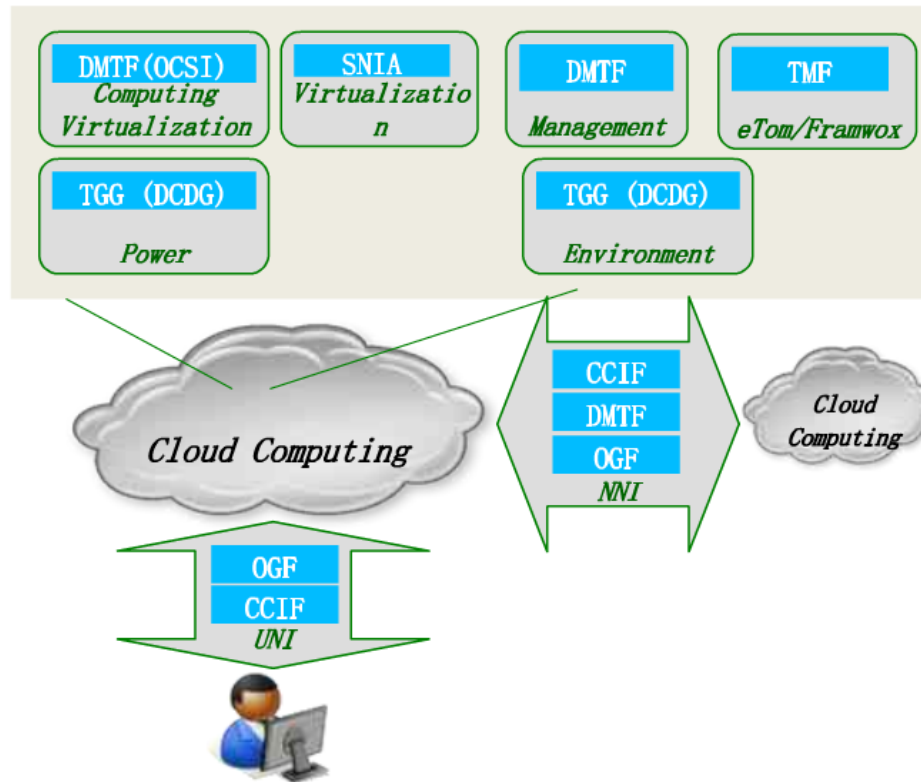
- Security (Privacy)



Do you  
feel safe?

# Key Issues of Cloud Computing

## • Standardization



	Google	Amazon	eBay	BT	Orange	Telefonica	Verizon	AT&T
DMTF				▲		▲		
SNIA								
TGG	▲		▲				▲	▲
OGF			▲					▲
Open Group		▲		▲				▲
OCM						▲		▲
CCIF					▲			
CSA							▲	
TMF				▲	▲	▲	▲	▲
Framwox								

▲:重要    ▲:一般

DMTF: Distributed Management Task Force  
 SNIA: Storage Network Industry Association  
 TGG: The Green Grid  
 OGF: Open Grid Forum  
 CCIF: Cloud Computing Interoperation Forum  
 CSA: Cloud Security Alliance  
 TMF: Telecom Management Forum

1. Too many standards = NO standards
2. What is the real standard? The Power of Open Source



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- Features of Cloud Computing
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  - Platform as a Service (PaaS)
  - Infrastructure as a Service (IaaS)



# Overview



Public Cloud

Hybrid Cloud

1. Cloud from multiple providers
2. Cloud combined with public and private

Private Cloud

Software as a Service  
( SaaS )

Platform as a Service  
( PaaS )

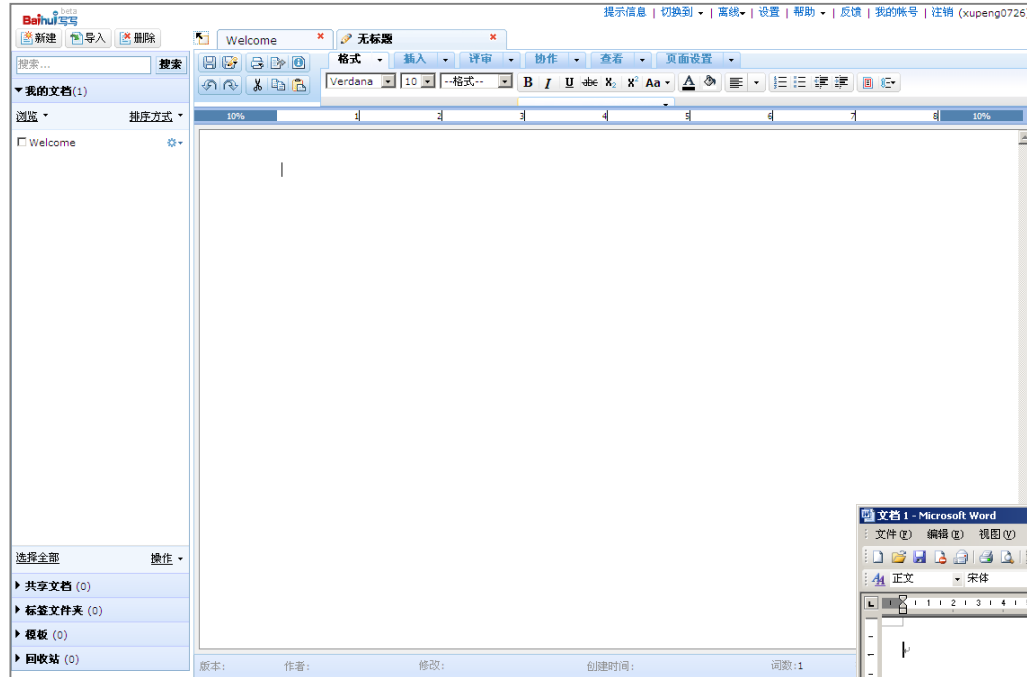
Infrastructure as a Service  
( IaaS )

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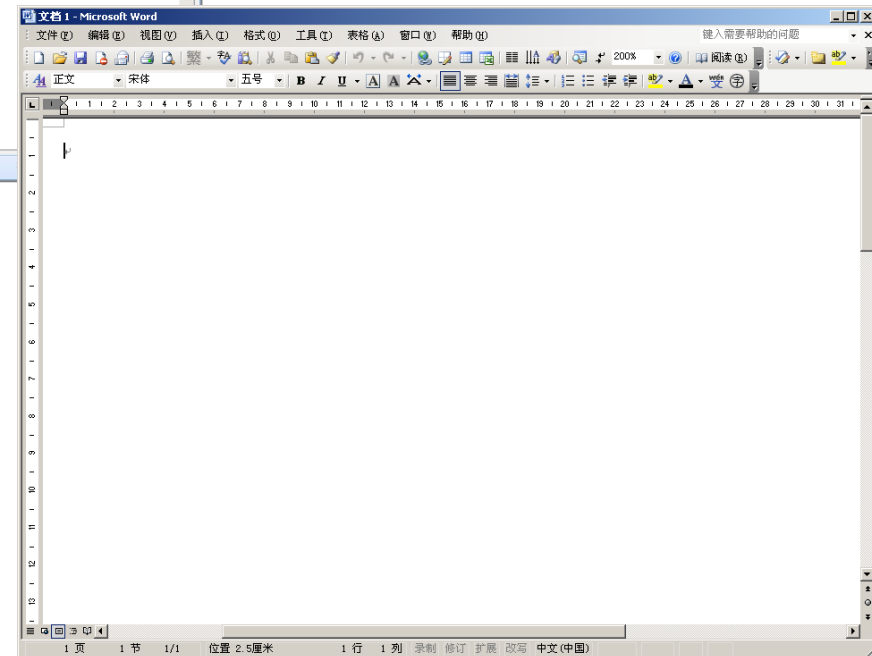
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# Software as a Service (SaaS)



Microsoft Office/Word



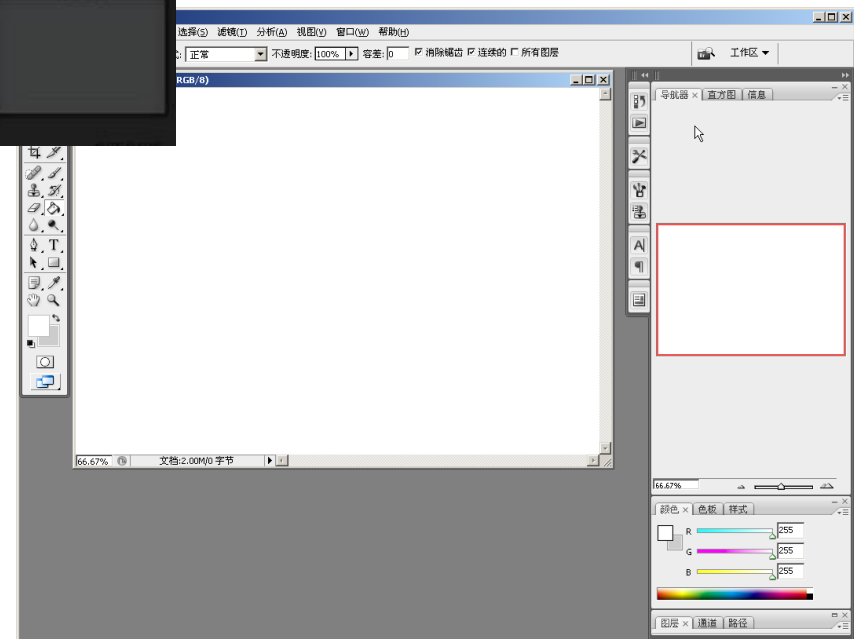
<http://www.zoho.com>  
<https://shimo.im>  
<https://www.processon.com>

# Software as a Service (SaaS)



<http://pixlr.com/editor/>

Adobe Photoshop



# Software as a Service (SaaS)



<http://wx.qq.com>

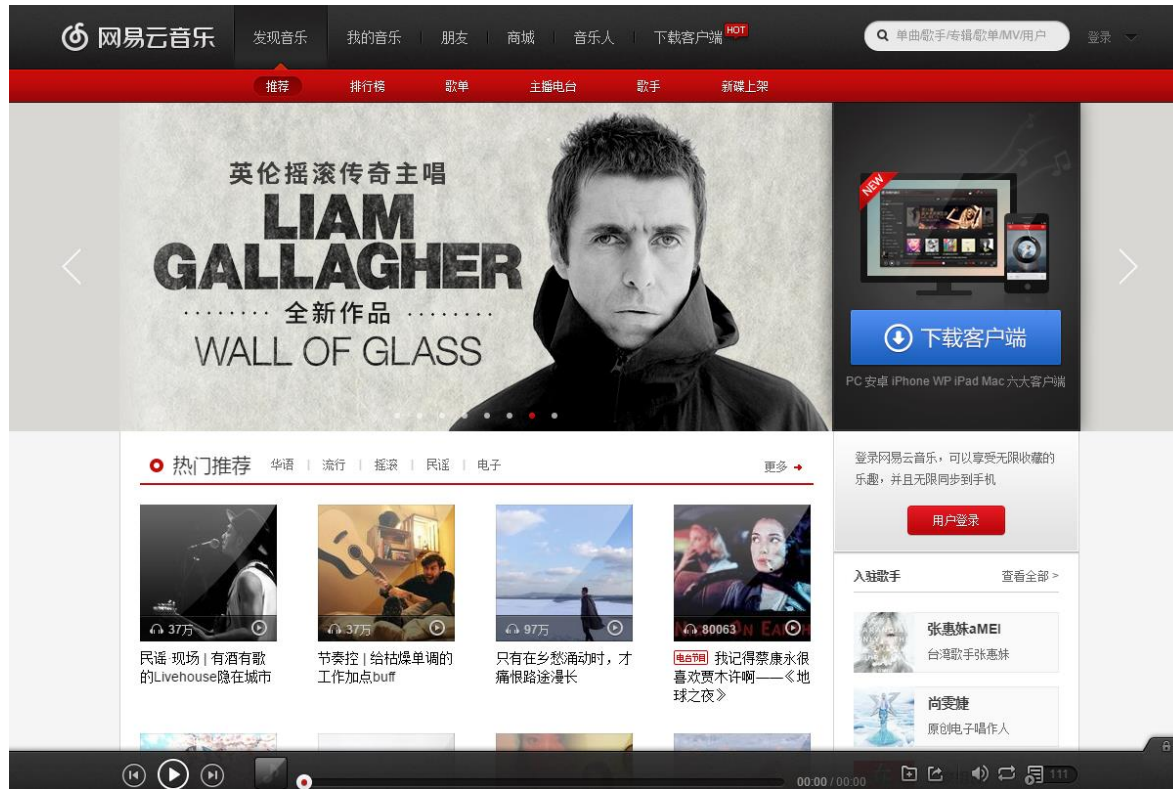


QQ



# Software as a Service (SaaS)

千千静听



<http://music.163.com>



# Software as a Service (SaaS)

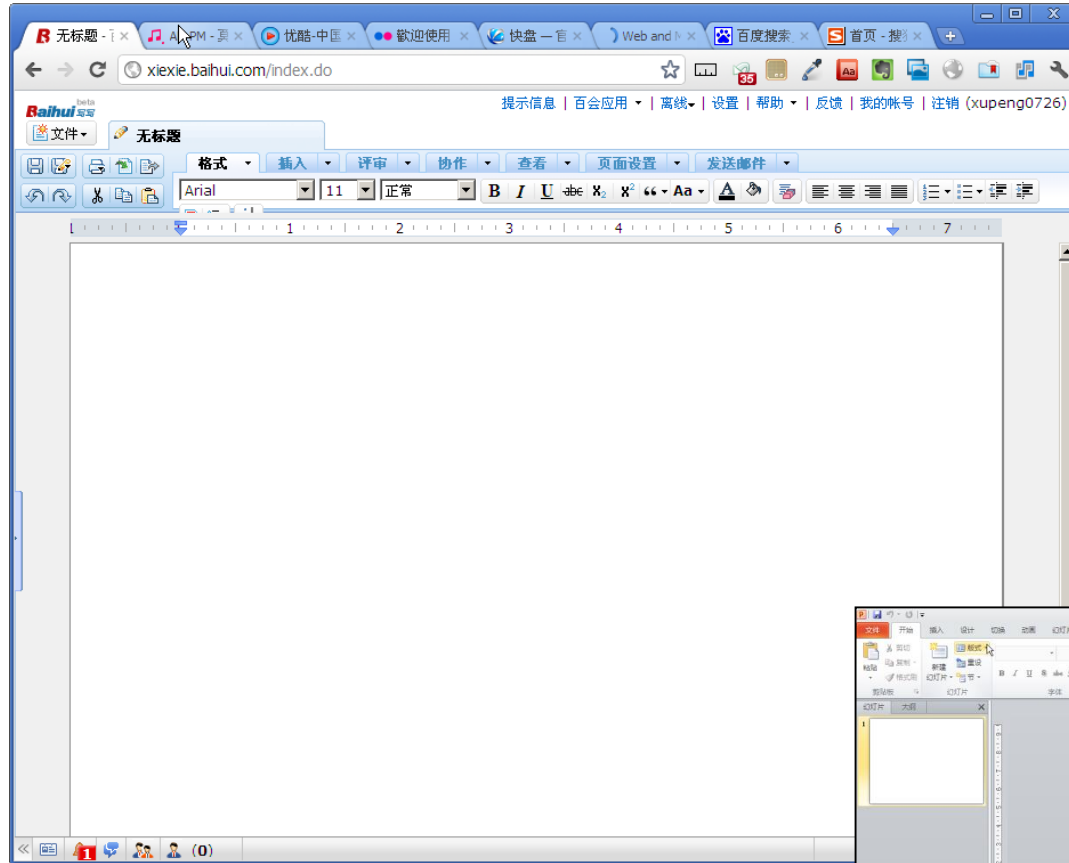


<http://www.youku.com>

QQ影音

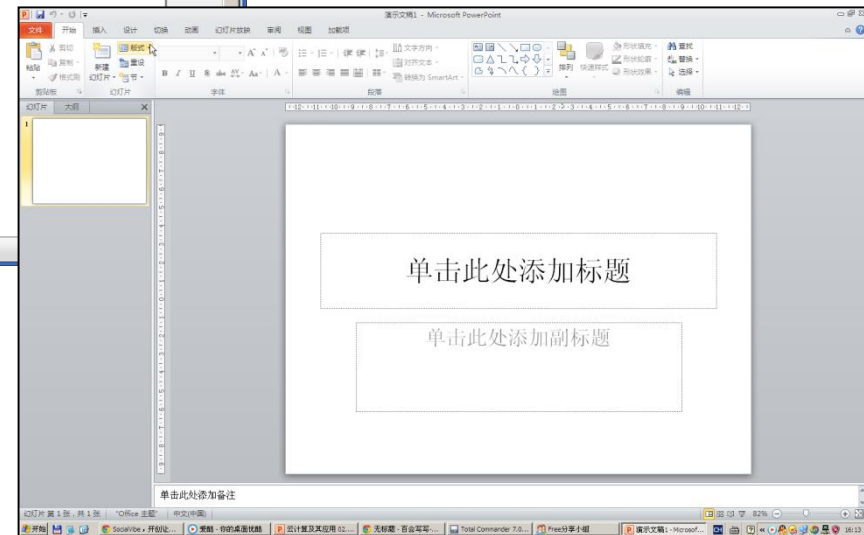


# Software as a Service (SaaS)



Browser

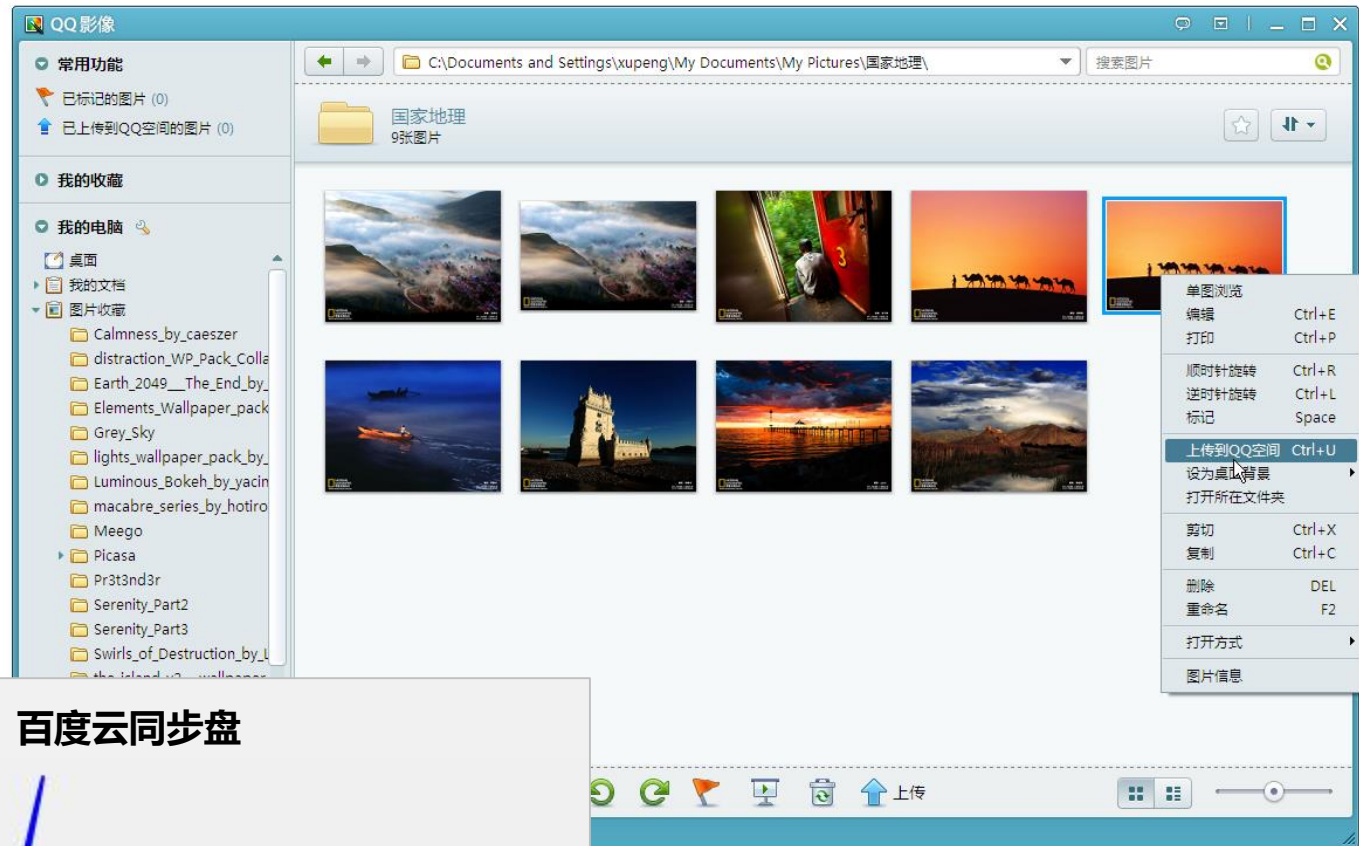
Microsoft Windows XP



# Software as a Service (SaaS)



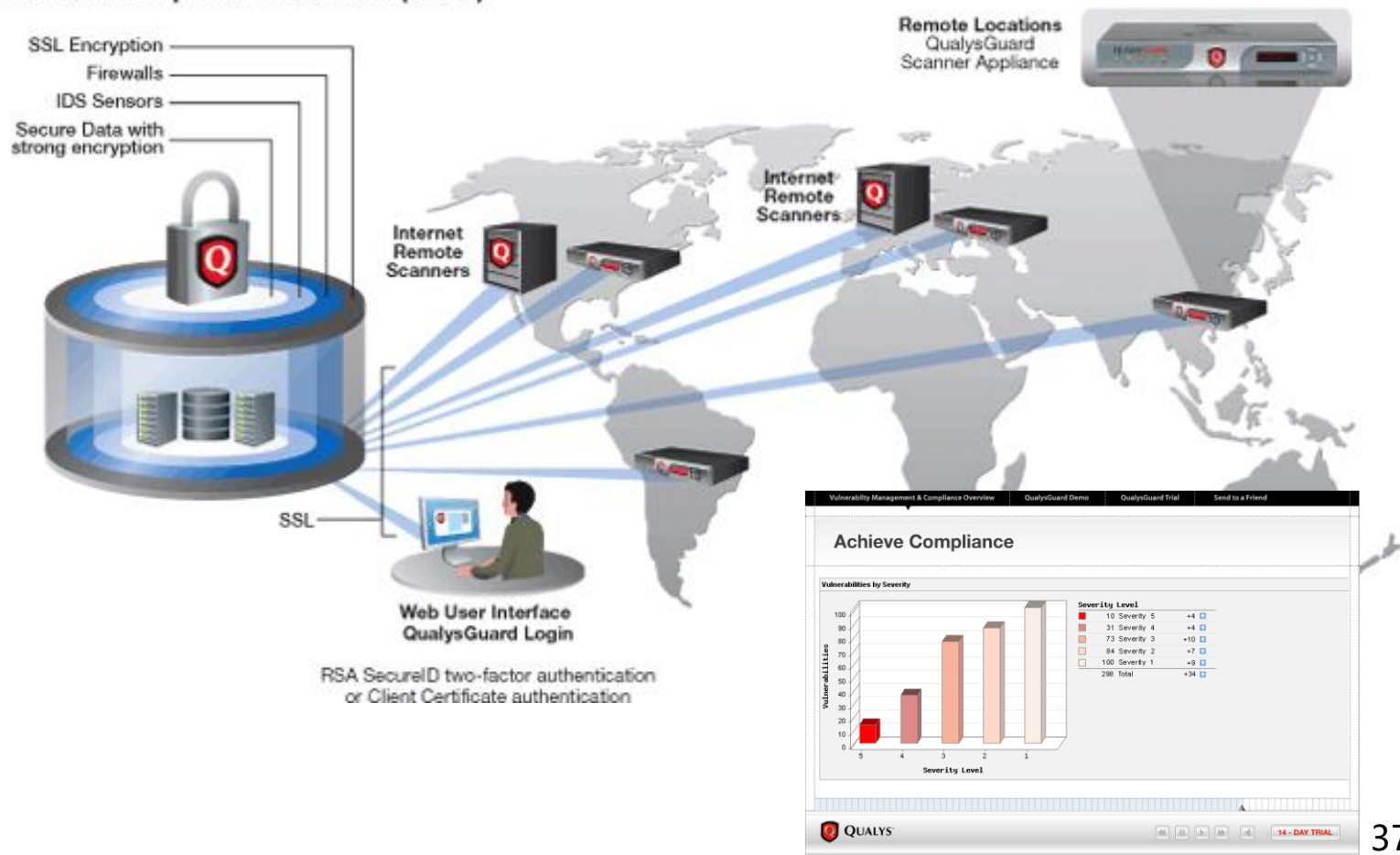
- SaaS vs S+S



# Software as a Service (SaaS)

- Management Service Provider (MSP)
  - Eg. <http://www.qualys.com>

## QualysGuard Secure Operations Centers (SOCs)





# Software as a Service (SaaS)



## Advantages

- Lower Risk in Deployment
  - Software
  - Hardware
  - Applicability
    - Trial & Buy
- Advanced Features
  - Online Cooperation
  - Online Synchronization



## Disadvantages

- Highly rely on the network
- User Experience
- Development Complexity

# Contents

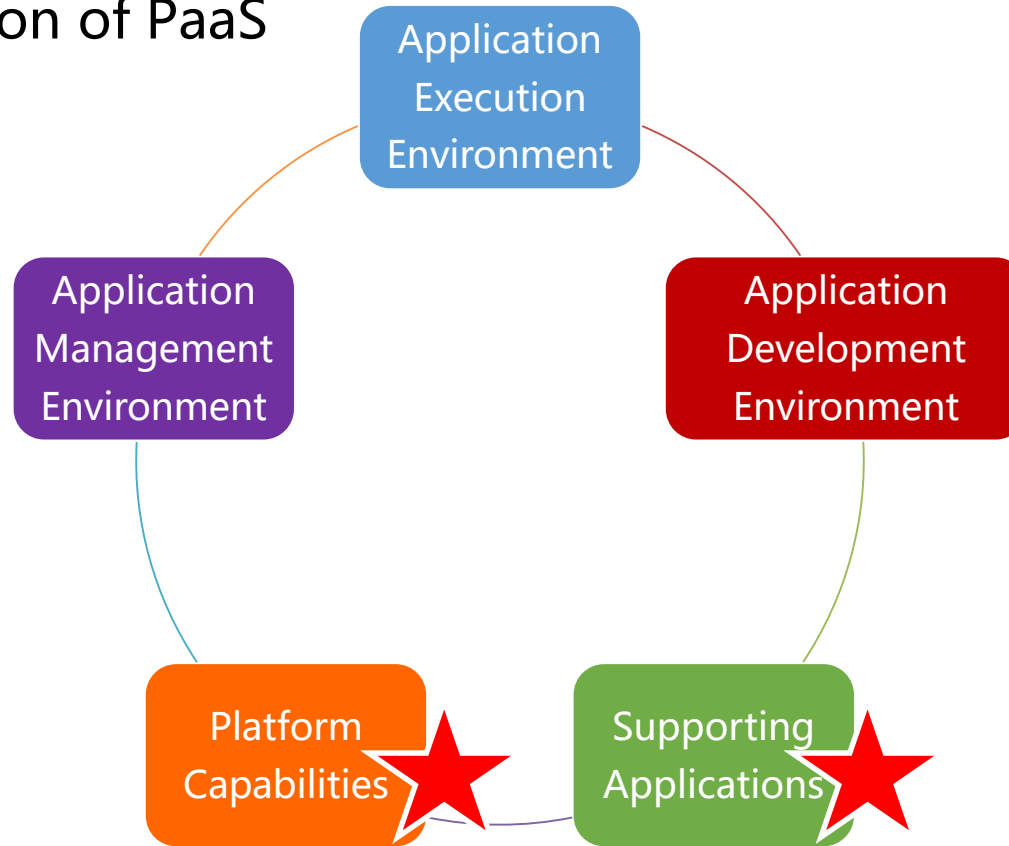
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  - Infrastructure as a Service (IaaS)





# Platform as a Service (PaaS)

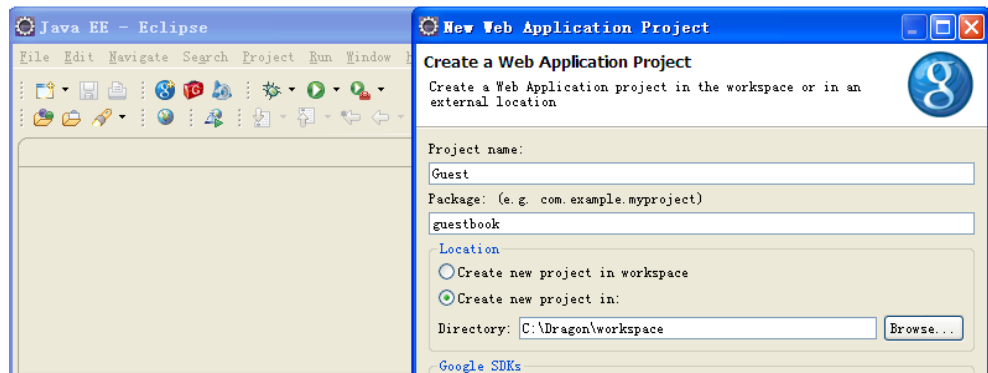
- Composition of PaaS



**“Platform Capabilities” and “Supporting Applications” are the key competition features of PaaS**

# Platform as a Service (PaaS)

- Google APP Engine ( GAE )
  - Supporting Java, Python
  - Resources for Application Provision
    - Application Execution Environment
    - Application Development Environment (offline)
    - Platform Capabilities
      - Google Account
      - Image Processing
      - Data Storage
      - Memcache
      - Mail
      - Domain Name
      - .....



What time is the right time to charge the developers?

# Platform as a Service (PaaS)

- <http://www.189works.com/>



The screenshot shows the homepage of 189works.com, a platform for mobile application development. The interface includes a navigation bar with links like '找创意' (Find Ideas), '找电信API' (Find Telecom APIs), '我要做手机开发' (I want to do mobile development), '我要提交作品' (I want to submit my work), and '我要参与讨论' (I want to participate in discussion). The main banner features the '天翼应用工厂' (Tianyi Application Factory) logo and the tagline '成就开发者价值的移动互联网创新平台!' (Mobile Internet innovation platform that achieves the value of developers!). Below the banner, there are sections for '开发者作品关注排行' (Developer Works Attention Ranking), '天翼空间销售排行' (Tianyi Space Sales Ranking), and '活跃开发者' (Active Developers). The '活跃开发者' section lists users like '邪恶力量' (Evil Power), '喔' (Wo), 'tanbin', '鱼香肉丝' (Yu Xiang Rou Si), and '在路上' (On the Road), each with their forum post count.

Only provide capabilities of  
telecommunication networks

out of date

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# Infrastructure as a Service (IaaS)

- Evolution of IT Resource Provision

Virtual Resource

(Physical) Equipment

Data Center (Rack, Power, Network, Air Condition...)





# Infrastructure as a Service (IaaS)

云计算基础服务

大数据（数加）>

安全>

域名与网站（万网）>

弹性计算

数据库>

存储与CDN

分析与搜索

云通信

网络

管理与监控

云服务器 ECS

从安全型到内存型、从进阶型到入门型的云服务器

FPGA 云服务器（邀测中）NEW

FPGA实例、低时延可编程硬件加速服务

GPU 云服务器 NEW

GPU实例、强大的计算性能、弹性按需扩展

块存储

可弹性扩展、高性能、高可靠的块级随机存储

专有网络 VPC

构建逻辑隔离网络，确保资源安全

高性能计算 HPC

加速深度学习、渲染和科学计算的 GPU 物理机

负载均衡 SLB

对多台云服务器进行流量分发的负载均衡服务

弹性伸缩

自动调整弹性计算资源的管理服务

云服务器ECS

购买右侧指定配置云服务器 可享受9.9元/月优惠，如果年付，还赠送 对象存储OSS、域名代金券、大数据产品代金券、clouder认证优惠等多项权益。 [详细规则](#)

优惠享受流程：① [注册阿里云账号](#) → ② [完成实名认证](#) → ③ [完成学生认证](#) → ④ [购买优惠产品](#)

• 配置亮点 | 采用全新系列III实例，具有更好的网络I/O和存储性能

1核 CPU

Intel Xeon E5-2682 v4

2G 内存

最新一代DDR4 内存

1M 带宽

VPC专有网络, I/O 优化

40G 系统盘

高效云盘

预装环境

地域

PHP运行环境(CentOS)

华北2

购买时长及金额

年付送套餐

¥118/年

¥59/半年

¥9.9/月

价格：¥ 1452/年，优惠后：¥ 9.9/月

立即购买

年付赠送（购买完后在这里领取）

对象存储OSS

40G存储 | 50G下行流量

高可靠的云存储服务

+

域名（.xin）

¥83代金券

.xin域名专属购买优惠

+

机器学习PAI

¥50代金券

面向学生提供免费的GPU资源

+

Clouder认证

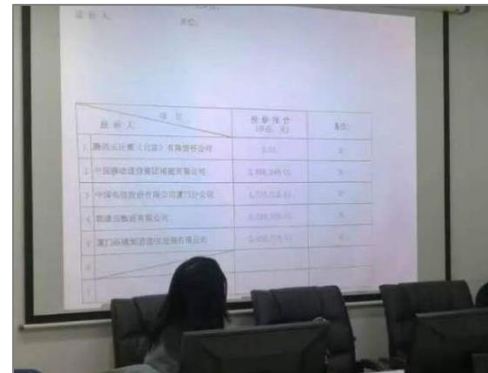
¥0 免费体验资格

权威的专项技能认证



# Infrastructure as a Service (IaaS)

- Think Different in IaaS
  - 0.01 Yuan



- Technical Service is a kind of product

