CLOUD COMPUTING

Contents

I. Introduction

- Cloud computing has been defined differently by many users and designers. IBM, a major player in cloud computing, has defined it as follows: "A cloud is a pool of virtualized computer resources. A cloud can host a variety of different workloads, including batch-style backend jobs and interactive and user-facing applications."

- virtualize 虚拟化 workload 工作量，工作负荷 batch 批，批量，成批 backend 后端的

I. Introduction

- The concept of cloud computing has evolved from cluster, grid, and utility computing. Cluster and grid computing leverage the use of many computers in parallel to solve problems of any size. Utility and Software as a Service (SaaS) provide computing resources as a service with the notion of pay per use. Cloud computing leverages dynamic resources to deliver large numbers of services to end users. Cloud computing is a high-throughput computing (HTC) paradigm whereby the infrastructure provides the services through a large data center or server farms. The cloud computing model enables users to share access to resources from anywhere at any time through their connected devices.

- leverage 充分利用 throughput 吞吐量 whereby 靠那个；借以
  server farm 大型机服务器

I. Introduction

- The cloud will free users to focus on user application development and create business value by outsourcing job execution to cloud providers. In this scenario, the computations (programs) are sent to where the data is located, rather than copying the data to millions of desktops as in the traditional approach. Cloud computing avoids large data movement, resulting in much better network bandwidth utilization. Furthermore, machine virtualization has enhanced resource utilization, increased application flexibility, and reduced the total cost of using virtualized data-center resources.

- scenario 方案；情况；脚本 desktop 台式（计算）机；桌面 utilization 利用 virtualization 虚拟化

I. Introduction

- The cloud offers significant benefit to IT companies by freeing them from the low-level task of setting up the hardware (servers) and managing the system software. Cloud computing applies a virtual platform with elastic resources put together by on-demand provisioning of hardware, software, and data sets, dynamically. The main idea is to move desktop computing to a service-oriented platform using server clusters and huge databases at data centers.

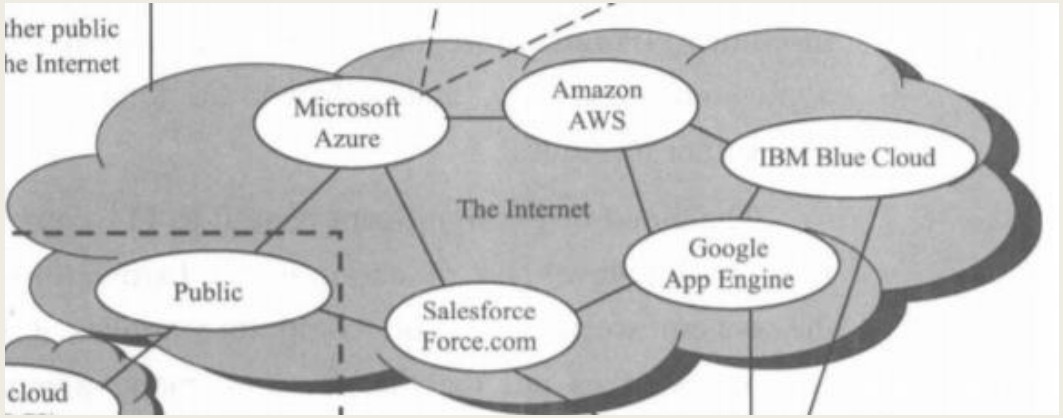
- elastic 有弹性的；可伸缩的 provision 提供，供应 server cluster 服务器集群

I. Introduction

- Cloud computing leverages its low cost and simplicity to benefit both providers and users. Cloud computing intends to leverage multitasking to achieve higher throughput by serving many heterogeneous applications, large or small, simultaneously.

II. Public, Private, and Hybrid Clouds

- A public cloud is built over the Internet and can be accessed by any user who has paid for the service. Public clouds are owned by service providers and are accessible through a subscription. The callout box in top of figure shows the architecture of a typical public cloud.



- Many public clouds are available, including Google App Engine (GAE), Amazon Web Services (AWS) , Microsoft Azure, IBM Blue Cloud, and Salesforce.com's Force.com.

- hybrid 混合的 subscription 订购；订阅 callout 标注 callout box 标注框

II. Public, Private, and Hybrid Clouds

- The providers of the aforementioned clouds are commercial providers that offer a publicly accessible remote interface for creating and managing VM instances within their proprietary infrastructure. A public cloud delivers a selected set of business processes. The application and infrastructure services are offered on a flexible price-per-use basis.

- Aforementioned 前面提到的

II. Public, Private, and Hybrid Clouds

- A private cloud is built within the domain of an intranet owned by a single organization. Therefore, it is client owned and managed, and its access is limited to the owning clients and their partners. Its deployment was not meant to sell capacity over the Internet through publicly accessible interfaces. Private clouds give local users a flexible and agile private infrastructure to run service workloads within their administrative domains.

- deployment 部署；展开

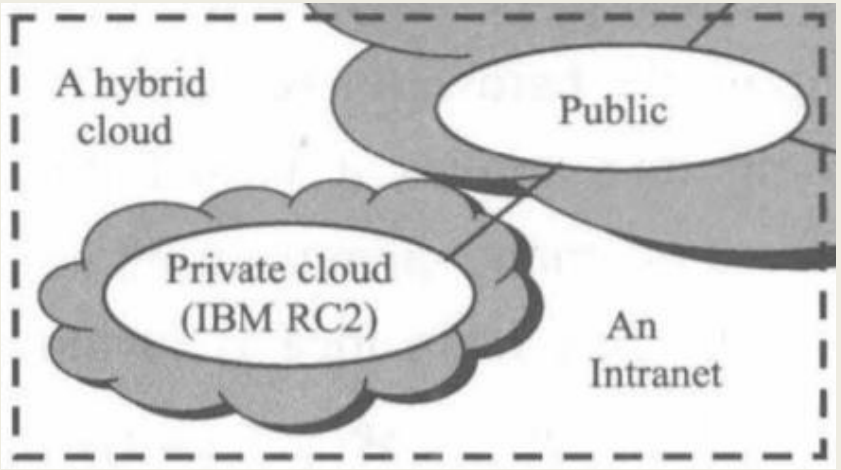
II. Public, Private, and Hybrid Clouds

- A private cloud is supposed to deliver more efficient and convenient cloud services. It may impact the cloud standardization, while retaining greater customization and organizational control. Intranet-based private clouds are linked to public clouds to get additional resources.

- agile 敏捷的；灵活的 customization 定制；用户化

II. Public, Private, and Hybrid Clouds

- A hybrid cloud is built with both public and private clouds, as shown at the lower-left comer of Figure. Private clouds can also support a hybrid cloud model by supplementing local infrastructure with computing capacity from an external public cloud.



- For example, the Research Compute Cloud (RC2) is a private cloud, built by IBM, that interconnects the computing and IT resources at eight IBM Research Centers scattered throughout the United States, Europe, and Asia. A hybrid cloud provides access to clients, the partner network, and third parties.

II. Public, Private, and Hybrid Clouds

- In summary, public clouds promote standardization, preserve capital investment, and offer application flexibility. Private clouds attempt to achieve customization and offer higher efficiency, resiliency, security, and privacy. Hybrid clouds operate in the middle, with many compromises in terms of resource sharing.

- resiliency 弹性；复原力

III. Cloud Design Objectives

- Despite the controversy surrounding the replacement of desktop or deskside computing by centralized computing and storage services at data centers or big IT companies, the cloud computing community has reached some consensus on what has to be done to make cloud computing universally acceptable.

- deskside 桌边（型）的

III. Cloud Design Objectives

- The following list highlights six design objectives for cloud computing:
- **Shifting computing from desktops to data centers**: Computer processing, storage, and software delivery is shifted away from desktops and local servers and toward data centers over the Internet.
- **Service provisioning and cloud economics**: Providers supply cloud services by signing service-level agreements (SLAs) with consumers and end users. The services must be efficient in terms of computing, storage, and power consumption. Pricing is based on a pay-as-you-go policy.

- pay-as-you-go即付即用（的）

III. Cloud Design Objectives

- **Scalability in performance:** The cloud platforms and software and infrastructure services must be able to scale in performance as the number of users increases.
- **Data privacy protection:** Can you trust data centers to handle your private data and records? This concern must be addressed to make clouds successful as trusted services.

- scale 攀登；（阶梯）逐步升高

III. Cloud Design Objectives

- **High quality of cloud services**: The Quality of Service (QoS) of cloud computing must be standardized to make clouds interoperable among multiple providers.
- **New standards and interfaces**: This refers to solving the data lock-in problem associated with data centers or cloud providers. Universally accepted APIs and access protocols are needed to provide high portability and flexibility of virtualized applications.

- interoperable 可互操作的；能互用的 lock-in 锁定；同步

IV. Enabling Technologies for Clouds

- Clouds are enabled by the progress in hardware, software, and networking technologies summarized in Table.

Technology	Requirements and Benefits
Fast platform deployment	Fast, efficient, and flexible deployment of cloud resources to provide dynamic computing environment to users
Virtual clusters on demand	Virtualized cluster of VMs provisioned to satisfy user demand and virtual cluster reconfigured as workload changes
Multitenant techniques	SaaS for distributing software to a large number of users for their simultaneous use and resource sharing if so desired

- multitenant 多租户的

IV. Enabling Technologies for Clouds

Technology	Requirements and Benefits
Massive data processing	Internet search and web services which often require massive data processing, especially to support personalized services
Web-scale communication	Support for e-commerce, distance education, telemedicine, social networking, digital government, and digital entertainment applications
Distributed storage	Large-scale storage of personal records and public archive information which demands distributed storage over the clouds
Licensing and billing services	License management and billing services which greatly benefit all types of cloud services in utility computing

- personalize 使个性化 telemedicine 远程医疗 social networking 社交网络 archive档案；档案馆；档案室 licensing 发给许可证；许可；特许 billing 开（账）单；记账

IV. Enabling Technologies for Clouds

- These technologies play instrumental roles in making cloud computing a reality. Most of these technologies are mature today to meet increasing demand. In the hardware area, the rapid progress in multi-core CPUs, memory chips, and disk arrays has made it possible to build faster data centers with huge amounts of storage space. Resource virtualization enables rapid cloud deployment and disaster recovery. Service-oriented architecture (SOA) also plays a vital role.

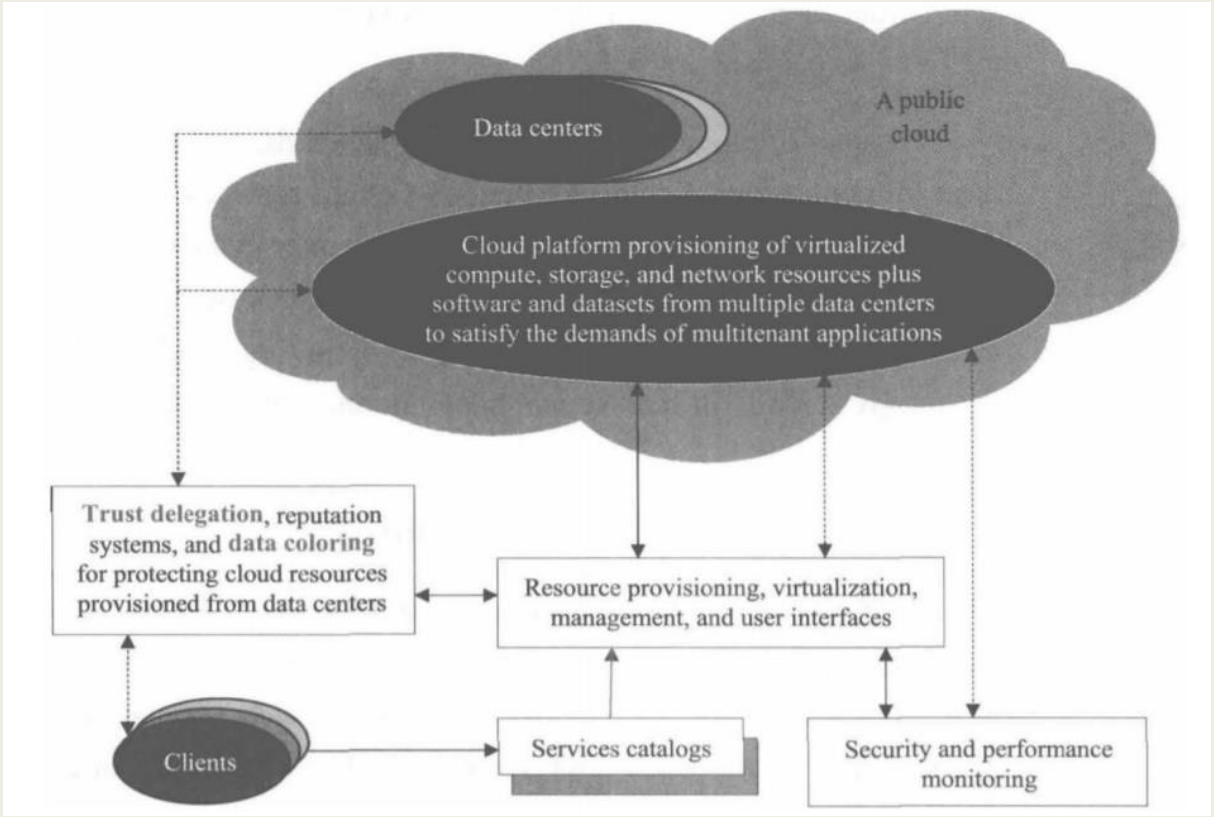
- disk array 磁盘阵列

IV. Enabling Technologies for Clouds

- Progress in providing SaaS, Web 2.0 standards, and Internet performance have all contributed to the emergence of cloud services. Today's clouds are designed to serve a large number of tenants over massive volumes of data. The availability of large-scale, distributed storage systems is the foundation of today's data centers. Of course, cloud computing is greatly benefitted by the progress made in license management and automatic billing techniques in recent years.

- tenant 租户，承租人

V. A Generic Cloud Architecture



- Figure shows a security-aware cloud architecture.

V. A Generic Cloud Architecture

- The Internet cloud is envisioned as a massive cluster of servers. These servers are provisioned on demand to perform collective web services or distributed applications using data-center resources. The cloud platform is formed dynamically by provisioning or deprovisioning servers, software, and database resources. Servers in the cloud can be physical machines or VMs. User interfaces are applied to request services. The provisioning tool carves out the cloud system to deliver the requested service.

- envision 想象；设想

V. A Generic Cloud Architecture

- In addition to building the server cluster, the cloud platform demands distributed storage and accompanying services. The cloud computing resources are built into the data centers, which are typically owned and operated by a third-party provider. Consumers do not need to know the underlying technologies. In a cloud, software becomes a service.

V. A Generic Cloud Architecture

- The cloud demands a high degree of trust of massive amounts of data retrieved from large data centers. We need to build a framework to process large-scale data stored in the storage system. This demands a distributed file system over the database system. Other cloud resources are added into a cloud platform, including storage area networks (SANs\database systems, firewalls, and security devices. Web service providers offer special APIs that enable developers to exploit Internet clouds. Monitoring and metering units are used to track the usage and performance of provisioned resources.

V. A Generic Cloud Architecture

- The software infrastructure of a cloud platform must handle all resource management and do most of the maintenance automatically. Software must detect the status of each node server joining and leaving, and perform relevant tasks accordingly.

V. A Generic Cloud Architecture

- Cloud computing providers, such as Google and Microsoft, have built a large number of data centers all over the world. Each data center may have thousands of servers. The location of the data center is chosen to reduce power and cooling costs. Thus, the data centers are often built around hydroelectric power. The cloud physical platform builder is more concerned about the performance/price ratio and reliability issues than sheer speed performance.

- hydroelectric 水力发电的；（电）由水力发的

V. A Generic Cloud Architecture

- In general, private clouds are easier to manage, and public clouds are easier to access. The trends in cloud development are that more and more clouds will be hybrid. This is because many cloud applications must go beyond the boundary of an intranet. One must learn how to create a private cloud and how to interact with public clouds in the open Internet. Security becomes a critical issue in safeguarding the operation of all cloud types.

- safeguard 保护，维护

THANK YOU