Cloud Computing

- Software as a Service

Agenda

- Introduction
  - New business model
  - What is SaaS
- SaaS: properties
  - User and vendor view
  - Cloud properties
- SaaS: technique
  - Service layer
  - User interface
- Case Study
  - Salesforce.com

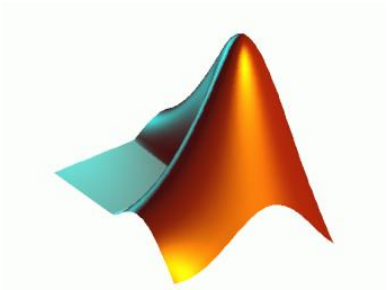
Service model

Definition

INTRODUCTION

Software

- In 21th century
  - We may not want to buy a software
    - Instead, software can be billed by usage
  - A professional software is much expensive
    - Someone may only need to use few times



How about rent?

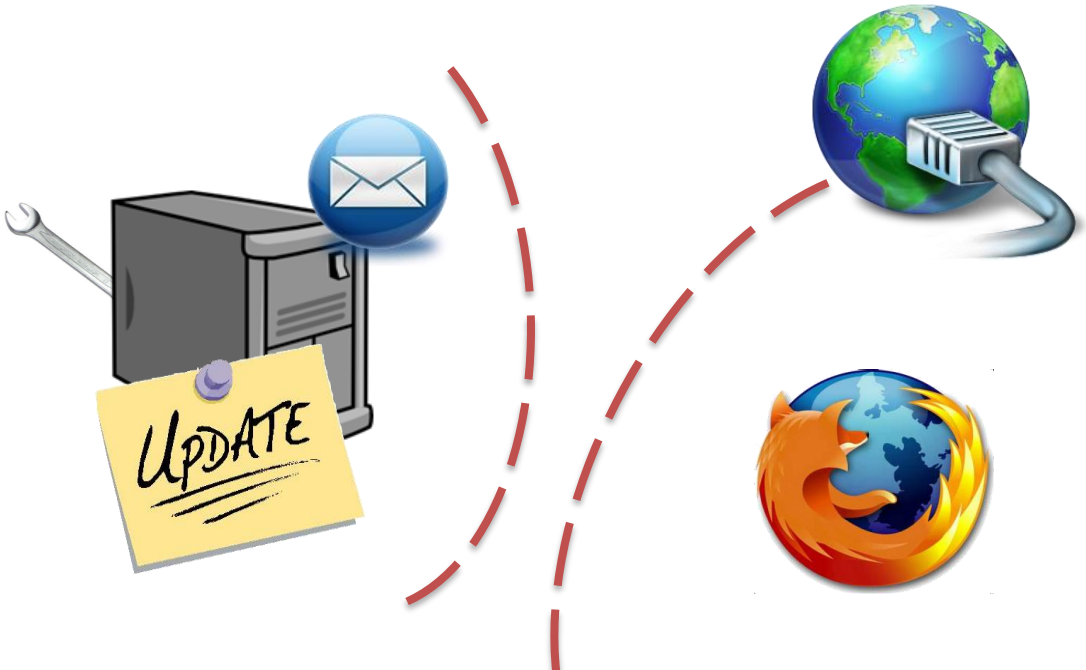
- Someone needs a software, but
  - Use few times
  - Have not much money
  - …
- Can we rent a software?
  - Decrease the TOC (total ownership cost)

ASP

- Application service provider (ASP) is one of the choice
  - ASP moves the applications to Internet
  - ASP packages software into an object that can be rented
- The provider is responsible for maintaining the hardware and for managing the system
  - Customers can focus on the usage
  - Customers need not to worry about the system's operation

Example

- E-mail service
  - The provider hosts the mail service, manages the system and maintains the hardware
  - The customer uses the service without buying the hardware and software license

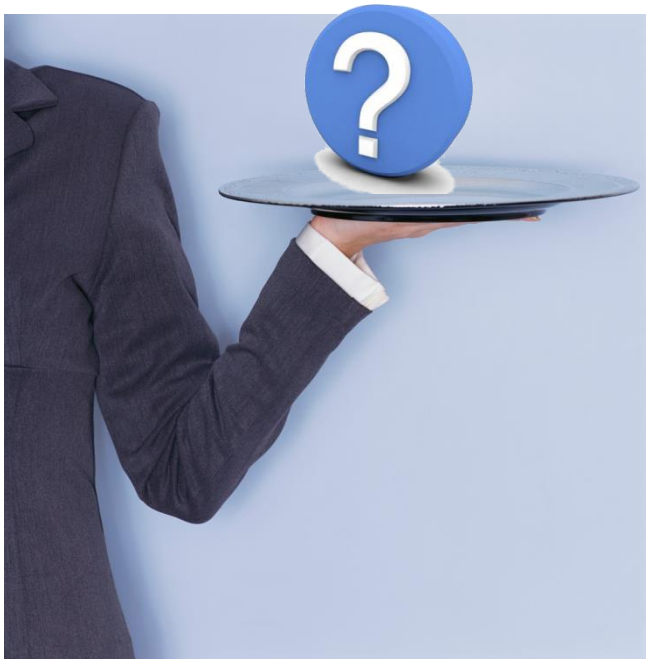


Benefit

- Consumers can reduce
  - Total ownership cost
  - Requirement of IT personnel
  - Maintenance and upgrade
- But there are some tradeoffs
  - Lock-in
  - Lengthy bid process
  - Loss of fine tuning

Software as a Service

- SaaS is another solution
  - Not sold off
  - Pay-as-you-go
  - Interact between client and back-end platform
- Compared
  - ASP is a provider
  - SaaS is a service model



Service model

Definition

INTRODUCTION

SaaS

- Software as a Service (SaaS)
  - delivering software as a service over the Internet
  - eliminating the need to install
  - simplifying maintenance and support
- SaaS not only has the advantage of the ASP, but also has extra benefit
  - Fit your requirement
  - Increasing or decreasing resources on demand
  - Easy to apply, easy to use and easy to leave

Definition

- In general, SaaS can be classified into 4 maturity levels by the mode of delivery and system maturity
  - Ad-hoc
  - Configurable
  - Multi-tenant
  - Scalability and customized

Ad-hoc

- The simplest architecture of SaaS
  - The vendor provides many hardware which can install the software user need.
  - Each customer has his own hosts and the applications run on these hosts.
  - The hosts and applications are independence for each other.
  - Customer can reduce the costs of hardware and administration.

Configurable

- The second level of SaaS which
  - Provides greater program flexibility through configurable metadata
  - Provides many instances to difference users through detailed configuration
  - Simplifies maintenance and updating of a common code base

Multi-tenant

- The third level of SaaS which
  - Adds multi-tenant to the second level
  - Provides a single program service to all customers by setting configurations
  - More efficient use of server resource than level 2, but ultimately is limited in its scalability

Scalability and Customized

- The last level of SaaS
  - SaaS adds the property of scalability and load-balance.
  - The system's capacity can increase or decrease to match demand.
  - Customers use the application on the SaaS similar as on the local host.

So, SaaS is…

- A service model that delivers software
  - Users believe that they use the dedicated machines and their own operating environments.
  - Vendors can deploy many kinds of software versions by changing the profile.
  - Consumers meet the requirements with few extra setting.
  - Vendors can serve lots of users and wide range of their needs.

Benefit
Accessibility
Elasticity
Manageability
Reliability

PROPERTIES

Characteristic

- SaaS is a new model of operation in the beginning
  - Providing service platform that users can use applications or software.
- In cloud computing, SaaS is one of three main service architectures
  - Using the benefit of cloud computing, SaaS can supply richer service on the web.

User view

- Companies
  - Low IT cost and management responsibility
  - Short development time
  - Pay-as-you-go
- End users
  - Low learning curve
    - Familiar or intuitive interface
  - Global access
    - Work on anywhere and anytime

Vendor view

- Integrate all IT and resource
  - Provide a high-end service
  - Reduce procurement and operating costs
  - Maintenance is easier, billing is easier
- Economies of scale
  - Winner-take-all
  - Build it once, run it everywhere and charge monthly use fees

With Cloud

- Accessibility
  - Access service anywhere and anytime
- Elasticity
  - Service all consumers
- Manageability
  - Easy to be controlled, maintained and modified
- Reliability
  - Access control and avoid the phishing web page

Benefit
Accessibility
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Reliability

PROPERTIES

Accessibility

- End user can access the service provided by vendor anywhere
  - School or home with the Ethernet
  - Wireless network or 3G, 4G and 5G
  - Any environment which can connect to Internet
- … and any platform
  - Any OS, like Windows, Linux, Unix, Mac OS
  - Any device, like desktop, notebook, smart phone

Accessibility
Portability
• Uniform access
• Thin client

Cross Platform

- Cross platform is one of the core concepts on SaaS accessibility
- Web Interface is one of solutions
  - User access service in Internet without any application installing
  - Any browser gains the same result
- Java is other solution
  - Applications can run on JVM without any extra setting

Accessibility vs Availability

- Availability is focused on the system's reliability
  - System's capable rate
  - Mean time between failures (MTBF)
  - Mean time to recovery (MTTR)
- In the high availability system, usually uses nines to correspond to the ratio
  - 99.9% means 8.67 hours of downtime per year
  - 99.999% means 315 seconds of downtime per year

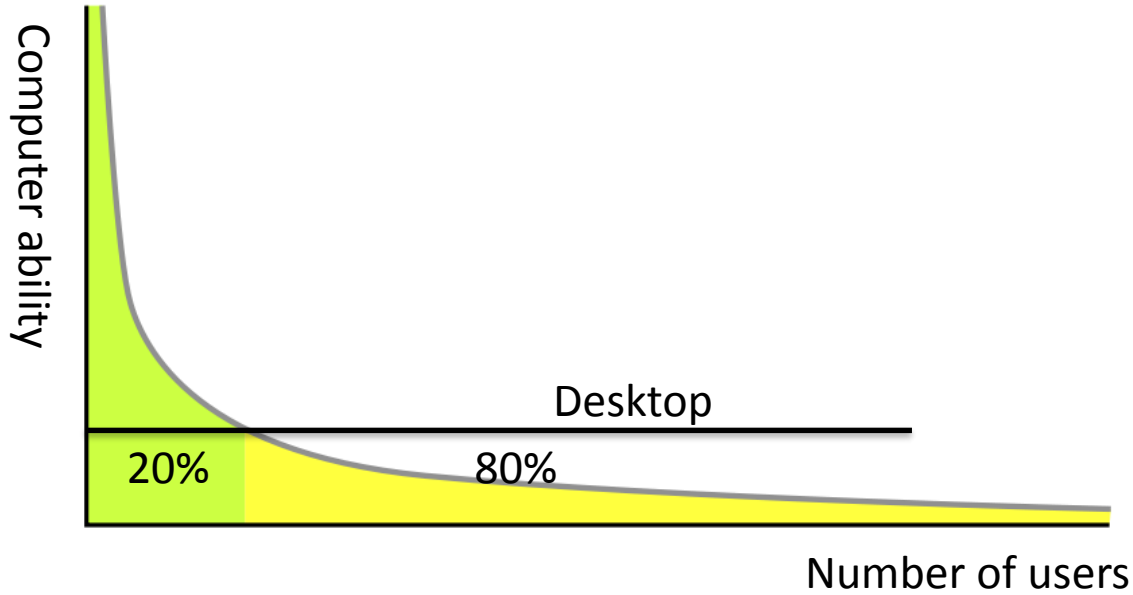
Benefit
Accessibility
Elasticity
Manageability
Reliability

PROPERTIES

Scalability
Elasticity
• Dynamic provision
• Multi-tenant design

Long Tail

- Most of users do not use all ability of a computer
  - Lots of computers are idle and waste the energy
- But few users cannot meet their requirement when using the desktop
  - Buying the professional server would also satisfy the long tail theory.



Scalability
Elasticity
• Dynamic provision
• Multi-tenant design

Multi-tenant

- In cloud computing, the number of users will not be limited to only few thousands
  - Lots of users use the same application architecture with few personal profiles
  - Re-build the hardware or re-design software is waste and unrealistic
- Instead, mass deployment with few metadata can reduce lots of time and money

Scalability
Elasticity
• Dynamic provision
• Multi-tenant design

Technique

- Virtual machine that a user run application on his independent system.
  - Developed the basis system which can install personnel plug-in or package
- Disk partition or independent structure scheme that a user stores information and file in his independent storage space.
  - All data is stored in the same storage device
  - Each user can only access his data by controlled application

Benefit
Accessibility
Elasticity
Manageability
Reliability

PROPERTIES

Manageability
Interoperability
• Control automation
• System monitoring
• Billing system

Centralization

- Cloud computing collect all data and all computing capacity in one or few data centers
  - Centralized management, deployment and update
- Consumer is not limited to local residents, instead, everyone can become a user of cloud computing service
  - Low-ability vendor supplied would decrease the user experience
  - The distance of user and data center could be larger than hundreds to thousands of kilometers

Manageability
Interoperability
• Control automation
• System monitoring
• Billing system

Deployment and Consistency

- Data centers would locate in the key cities
  - Google has 19 locations in the US, 12 in Europe, one in Russia, one in South America and three in Asia
  - User connect to nearest data center and reduce the connection latency
- Redundant data centers improve the reliability
  - One of the data center is down, users can access the other one, and users only feel a little delay.
  - But vendor should worry about the consistency between data centers

Manageability
Interoperability
- Control automation
- System monitoring
- Billing system

Benefit

- Centralization management increases the efficiency of management
  - Vendor can hire the professional IT staff
    - E.g. IBM's security chief or Steve Jobs.
  - Data center can increate the security, like buying an expensive and professional firewall
  - Any failure in data center can be repaired on time

Benefit
Accessibility
Elasticity
Manageability
Reliability

PROPERTIES

Security

- SaaS provides a group of service
  - Most of services need to authenticate
  - Service modules are integrated with each other
  - Access level should be controlled
- In user view
  - Login repeatedly is annoying
  - Avoid falling into the phishing website
- In vendor view
  - Carefully identify users
  - Reduce security risks

Authentication

- SaaS provides two kinds of authentication that handle different scenarios

- Many services in the same vendor
  - One authentication can access all of services in the same domain.
  - Unified management of the account permissions
- Many services in different vendors
  - Reduce the probability of account collisions

Availability
Reliability
- Fault tolerance
- System resilience
- System security

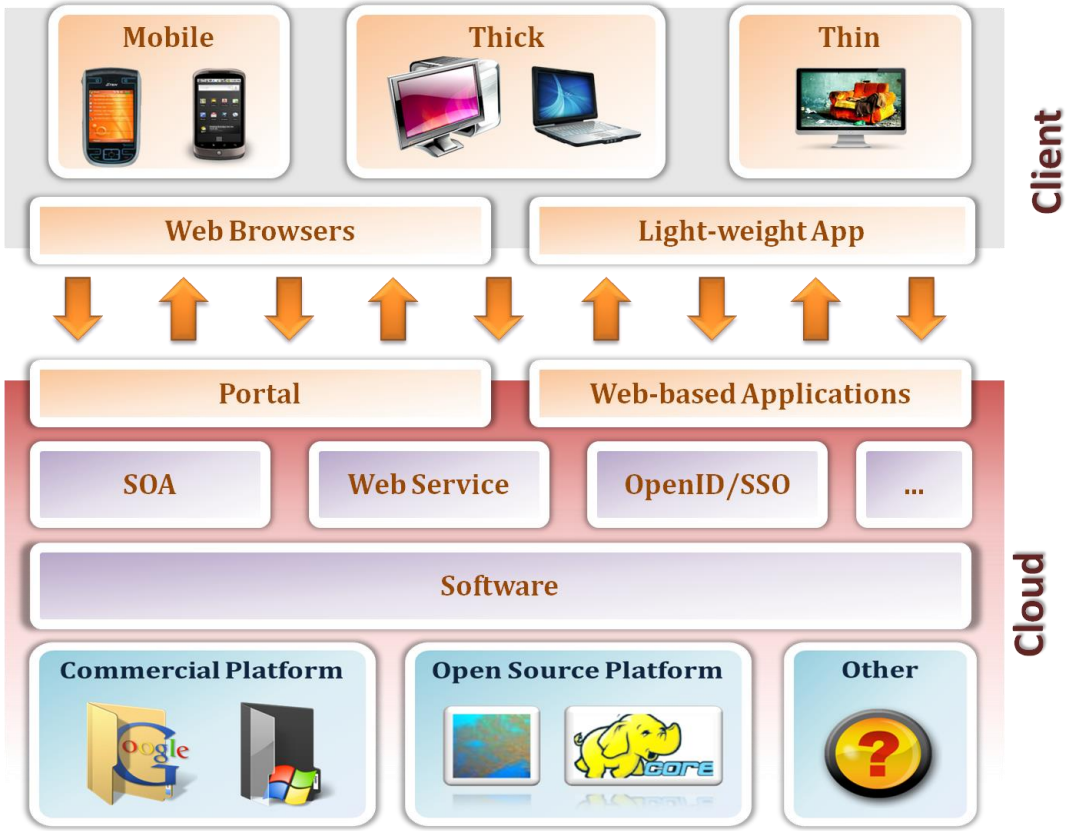
Advantage

- User
  - Avoid remembering lots of user account and password
  - Avoid falling into the phishing website
  - Increase the security factor
- Vendor
  - Easy to manage the user's privacy data
  - Reduce extra authentication center
  - Reduce legal liability

TECHNIQUE

Overview

- SaaS is a collection of lots of technology
  - Platform
  - Service layer
  - User interface



Overview (cont.)

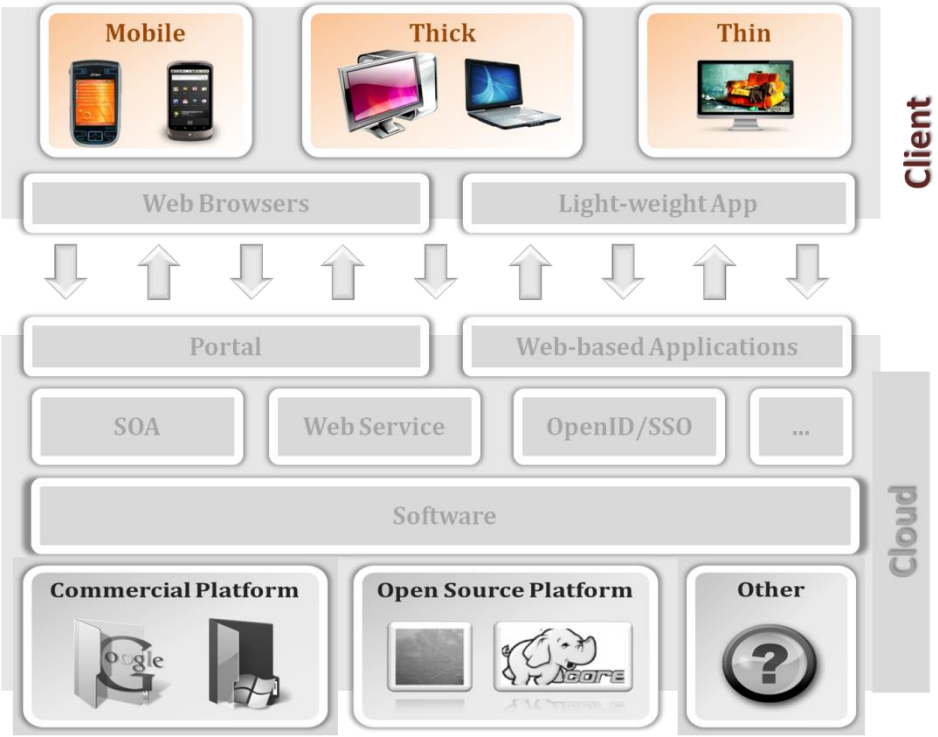
- Platform
  - Traditional or cloud platform that provides runtime environment
- Service layer
  - Communicates or integrates between services
  - Provides SaaS properties
- User interface
  - Supplies an interesting and interactive interface
  - Reduce the difficult to use

PaaS or IaaS

User Interface

Client device

- Client devices also affect user experience
  - The client device is expensive or cheap?
  - The client device is heavy or light?
  - The client device is useful or redundant?
- Precisely, what kind of devices we need?



Thin client and Thick client

Mobile device

CLIENT DEVICE

Thin client

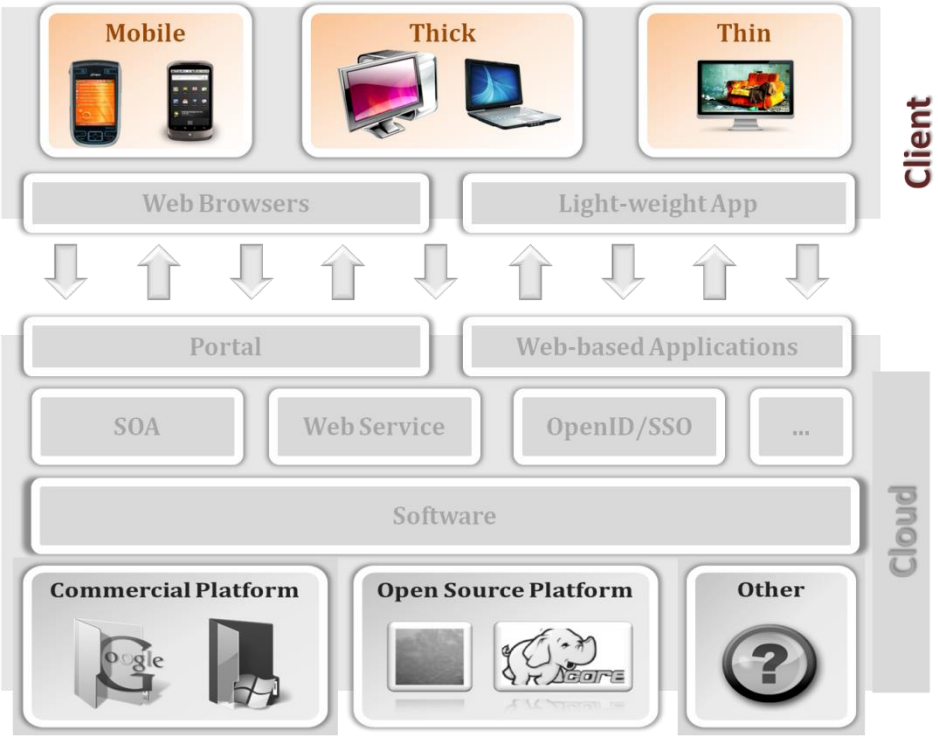
- If a user cares about the price of the device or the usage of time
  - Keep the core functionality and necessary interface
    - Reduce the hardware and design cost.
    - Reduce the energy usage.
    - Reduce the management and maintenance load.
  - Remove hard disk, heavy OS …etc.
    - Only reserve a monitor, I/O interface, communication interface and flash memory or CD-ROM.

Benefit

- Management
  - Remove the mechanical movable devices, like CD-ROM, can reduce the ratio of failure
  - Lots of data would not store in the client
- Cost
  - It would reduce the total cost without CD-ROM
  - Remove the extra hardware→ low energy consumption

vs Thick Client

- Thick clients, also call heavy clients, are full-featured computers
  - Compared with thin clients that lose full functionality without a network connection, thick clients can provide a full functionality.
  - Compared with thin client, thick client is more heavy and complex that would be used carefully.
- Both of two are used in many scenarios
  - Need to compute complexity jobs
  - Need to work in everywhere



Thin client and Thick client

Mobile device

CLIENT DEVICE

Mobile device

- Focus on the size of device and easy to use
  - Wifi is popular and widely used in the campus and commercial districts
  - Users may want to visit the website on the crowded bus to find the nearest restaurant
- Different with desktops, users use mobile devices for increasing efficiency that
  - Sending and receiving e-mail.
  - Finding the road map.
  - …etc.

Movable and Simple

- Unlike the laptop, a user needs a handheld device that can be easily used and portable
  - Small enough that can be handheld and put into the pocket
  - Lightweight enough that will not be a burden
  - Simple enough that can easily use and control
- There are two popular of mobile device
  - PDA
  - Smart phone

PDA

- PDA (personal digital assistant) is a device that functions as a personal information manager
  - A touchscreen for entering data
  - A memory card for data storage
  - Wifi and Bluetooth for Internet or exchanging data
- PDA also can use to
  - Browse the web
  - Display multimedia
  - Play game
  - GPS navigator

Smart Phone

- A smart phone is a phone that contain an open operating system
  - Can install third-part applications
  - Can be customized system without waiting patch
- Smart phone is now the popular mobile device
  - Compared with PDA, smart phone combines the ability of phone and computer
  - And more, smart phone can download the rich third-part applications, like games, weather or traffic information, news…etc.

Case Study

Salesforce

- Salesforce is one of the popular SaaS service vendors
  - An enterprise cloud computing company.
  - Hosting the applications.
  - The CRM (Customer Relationship Management) is the well-known product.
- Salesforce provides many solutions on CRM
  - Pay the rent per month
  - Consumer can focus on the business, rather than stuck in the development environment.

salesforce.com SOFTWARE
Success On Demand.™

Service model

- Company can not buy and maintain the expensive hardware and software license, instead,
  - Rent the hardware and software that reduce the cost
  - Use the service on Internet
  - Run the business applications, like CRM, HR, accounting, which are stable and reliable
  - Collaborate with each other
    - User can receive message immediately and friendly, like Facebook or twitter

Services

- Sales cloud
  - Supply faster and optimize all sales stages.
  - Business model and bid analysis.
- Chatter cloud
  - Exchange daily information by chatter without email or network disk.
  - Shared files and project states.
  - Track personnel, information and group.
- Force.com
  - An environment allows external developers to create add-on applications
    - HR application, inventory Application , IPhone or Android applications

Summary

- SaaS is not a single technique nor a new term
  - A group of old and new techniques
    - Server, platform, communication, interface and client device
  - The server and platform can use the cloud techniques or traditional techniques
  - Communication methods have to consider the cross-platform and multi-user environment
  - Interface needs to be simple and easy use
  - User device and interface affect the user experience

Reference

- Web sites
  - SaaS http://en.wikipedia.org/wiki/Software_as_a_service#Key_characteristics
  - Salesforce http://www.salesforce.com/tw/
  - WSDL http://www.w3.org/TR/wsdl20/
  - SOAP http://www.w3.org/TR/2007/REC-soap12-part1-20070427/#intro
  - OpenID http://openid.net/