Fundamentals of Cloud Computing

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Agenda

- Cloud Computing
  - Definition
  - Organizational Types
  - Service Models
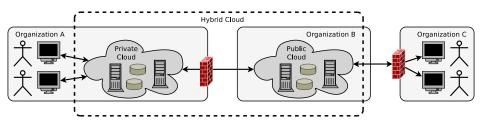 - Internal concept of cloud services

Definition

> *„By using virtualized computing and storage resources and modern Web technologies, cloud computing provides scalable, network-centric, abstracted IT infrastructures, platforms, and applications as on-demand services. These services are billed on a usage basis."*

- Part 1: Fundamental technologies – basis of cloud computing
    - **Virtualization** for shared and efficient resource utilization
    - **Web Services** (REST/SOAP) for communicating with the services
- Part 2: Cloud services and their characteristics
    - **IaaS, PaaS, SaaS**
    - **scalable** $\implies$ „elastic"
    - **network**-centric $\implies$ services/resources are accessible over the internet
    - **abstracted** $\implies$ independent of the concrete hardware
    - **on-demand** $\implies$ prompt request completion
    - **pay as you go**
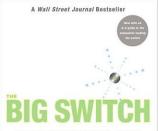
Organizational Types

- Public Cloud
  - Customer and provider do not belong to the same organization
- Private Cloud
  - Cloud services are provided from the users organization
- Hybrid Cloud
  - Cloud services from one or more Public and Private Clouds are used
  - Use cases: Manage load peaks, backup data in Public Clouds,...

Public Cloud vs. Private Cloud

- Reasons for using Public Cloud services
    - Users have no costs for purchase, operation and maintenance of own server hardware
    - Fully automated services
    - Virtualized resources (no driver issues)
    - Pay-as-you-go principle
    - Services are elastic
    - **Nicholas Carr: Transition of IT into the era of industrialization**
- Reasons for **not** using Public Cloud services
    - Fear for a lock-in situation
    - Security or privacy reasons
    - Local server hardware already exists

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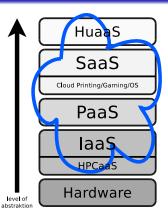
NICHOLAS CARR
author of "Is Google Making Us Stupid?"

Categories of Cloud Services

- HuaaS (Crowdsourcing)
  - Human creativity is offered as donation or for little cost
- SaaS
  - Software and associated data are hosted by the cloud service provider and accessed by the users via a web browser
- PaaS
  - Scalable runtime environment
  - No administrative effort for the users concerning the operation environment
- IaaS
  - Users run virtual server instances with unmodified applications
  - No direct contact to physical hardware for the users
  - Administrative user rights
  - Users can define the firewall rules independently

HuaaS

SaaS

Cloud Printing/Gaming/OS

PaaS

IaaS

HPCaaS

Hardware

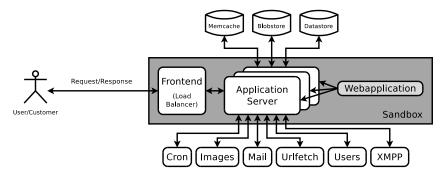level of
abstraktion

Let's examine Cloud Services in more Detail

- SaaS is not revolutionary
    - It has a history older than the cloud term itself
- Focus if the next slides:
    - Components of a Public Cloud PaaS
        - Example: Google App Engine
    - Components of a Private Cloud IaaS
        - Example: Eucalyptus

Google App Engine · https://appengine.google.com

- PaaS for webapplications in Python, Java or Go
- Scales the number of application server instances automatically
- Webapplications can use several infrastructure and storage services

- OpenSource reimplementations: AppScale and typhoonAE

Eucalyptus

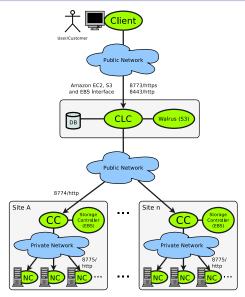`http://open.eucalyptus.com`

- Reimplementation of the AWS
- Cloud Controller (CLC)
  - Collects resource information from the CC
  - Operates as a Meta-scheduler
- Cluster Controller (CC)
  - Schedules the distribution of virtual machines to the NCs
  - Collects (free) resource information from the NCs
- Node Controller (NC)
  - Runs on every worker node
  - Controls the hypervisor
  - Provides resource information to the CC

Thank you for your Attention!

Die Slides of this talk can be found here:

`http://dl.dropbox.com/u/10971224/Folien_31_5_2012_Cloud_Computing.pdf`

Shortlink:

`http://tinyurl.com/cmwkfxh`