Cloud Computing

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About the presenter

- Information Systems Analyst
- Scrum master
- Web Content Management System (Plone)
  - www.jyu.fi
  - Koppa
  - Moniviestin
- Figuring out:
  - Data and application integration
  - Identity Management
  - Cloud computing
Lecture objectives

- Identify different kinds of cloud computing models
- Understand the basic economics behind cloud computing services
- Have a closer look on Google App Engine
- Know a little bit about security issues in the cloud
What is Cloud Computing?
What is Cloud Computing?

Defining Infrastructure Clouds, **Randy Bias** (2009)

![Diagram of cloud computing infrastructure]

- Your Application(s)
- Essential Infrastructure Services (Mail relay, authentication, directory services, config mgmt, monitoring)
- Servers (physical, virtual)
- Core Infrastructure Services (DNS, DHCP, NTP, Image mgmt)
- Storage (NAS and SAN)
- Network (Routers, switches, firewalls, loadbalancers)
- Facilities (Power, cooling, space)

What is Cloud Computing?

- SPI 3 layer model:
  - Software as a Service
    - Out of the box software without the box
  - Platform as a Service
    - Application frameworks
    - APIs
  - Infrastructure as a Service
    - Virtual or physical hardware
What is Cloud Computing?

Defining the Cloud Computing Framework, **David Linthicum** (2009)

- Storage-as-a-Service
- Database-as-a-Service
- Information-as-a-Service
- Process-as-a-Service
- Application-as-a-Service
- Platform-as-a-Service
- Integration-as-a-Service
- Security-as-a-Service
- Management/Governance-as-a-Service
- Testing-as-a-Service

http://cloudcomputing.sys-con.com/node/811519
What is Cloud Computing?

Cloud Taxonomy & Ontology - Draft v1.4 - Hoff

- Data
- Voice
- Video
- PC
- Embedded
- Mobile
- Salesforce.com
- Google Apps
- Oracle OnDemand
- Google AppEngine
- Force.com
- Coghead
- GoGrid CloudCenter API
- Amazon EC2
- GoGrid
- FlexiScale

- Database
- Messaging
- Queuing
- IAM/Auth
- Mgmt
- IPAM/DNS
- Load & Transport
- Security
- IAM/Auth
- VMM
- Grid/Cluster Utility
- Images
- Network
- Storage
- Compute
- Hardware
- Integration & Middleware
- Core Connectivity & Delivery
- Abstraction
- Software as a Service (SaaS)
- Presentation Modalities
- Presentation Platform
- APIs
- Applications

Governance/Provisioning/Orchestration/Autonomic/Security/Compliance/Monitoring/SLA Management/Billing

Resource

Infrastructure

Facilities

Power

HVAC

Space

Software as a Service (SaaS)
Cloud Computing Computing Ontology (1/2)

Toward a Unified Ontology of Cloud Computing, Lamia Youseff, Maria Butrico, Dilma Da Silva (2008):

Presentation:
http://www.collab-ogce.org/gce08/images/7/76/LamiaYouseff.pdf
Cloud Computing Ontology (2/2)

- Software as a Service (SaaS)
- Platform as a Service (PaaS)
- Infrastructure as a Service (IaaS)
- Data Storage as a Service (DaaS)
- Communications as a Service (CaaS)
- Hardware as a Service (HHaaS)
Economics of cloud computing (1/2)

Traditional IT cost structure

- Capital expenses
- Operation expenses
Economics of cloud computing (2/2)

Cloud computing cost structure

Capital expenses

Operation expenses
Security

- Seven cloud computing risks by Gardner (2008):
  1. Privileged user access
     - They are not your admins looking at the data
  2. Regulatory compliance
     - You are responsible for your data. Not the service provider.
  3. Data location
     - Do you know where your data is?
     - Safe harbor
  4. Data segregation
     - How is your data isolated from other clients in the cloud?
     - Encryption
  5. Recovery
     - How do you backup and later recover your data in a disaster?
  6. Investigative support
     - Want to see your log files?
  7. Long-term viability
     - What happens when the cloud goes poof?
About the data: ACID, CAP, BASE

● ACID
  o Atomicity - A transaction is all or nothing
  o Consistency - Only valid data is written to the database
  o Isolation - Pretend all transactions are happening serially and the data is correct
  o Durability - What you write is what you get

● CAP
  o Consistency - Your data is correct all the time. What you write is what you read.
  o Availability - You can read and write and write your data all the time
  o Partition tolerance - If one or more nodes fails the system still works and becomes consistent when the system comes online.
About the data: ACID, CAP, BASE

- BASE
  - Basically Available - system seems to work all the time
  - Soft state - it doesn't have to be consistent all the time
  - Eventually consistent - becomes consistent at some later time

"Everyone who builds big applications builds them on CAP and BASE: Google, Yahoo, Facebook, Amazon, eBay, etc"

Drop ACID and think about data: http://blip.tv/file/1949416/
Google App Engine

- Platform as a Service
- Python or Java web programming environment

Closer look by Asko Soukka
CASE: vuokra-asunnot

"A visual search engine (mashup) for the rental apartments currently available at the area of Jyväskylä."
### Vapaat vuokra-asunnot Jyväskylässä

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Pohjois-Karjalan ja Kymenlaakson kunnat, jopa 100 km:n matkan järjestelmä.

Vuokra-asunnot.appspot.com
CASE: vuokra-asunnot.appspot.com

- Runs on Google App Engine (GAE) platform (in Python)
- Scrapes data from rental apartment agents' web pages
- Is a rich JavaScript application (on SproutCore)
- Geocodes new addresses using Google Maps API
- Visualizes available addresses using Google Maps API
- Stores resolved geolocations on GAE for future use
Google App Engine (GAE)

- Provides restricted Python or Java environment
- Both open and proprietary libraries; proprietary database
- Free SDK; deployment tools and IDE-plugins available
- No startup costs, easy to scale, predictable TCO
- No naked custom domain support
- No custom SSL certificate support
- Moderate risk of vendor lock-in
SproutCore *(the client app)*

- A framework for rich (thick) web applications
- Responsive desktop-like GUI (completely asynchronous)
- Saves on bandwidth and processor time usage
  - After the GUI has been downloaded (and cached)...
  - ...only data is transferred between browsers and GAE
- Accessibility needs special attention *(WCAG 2.0, ARIA)*
- Alternatives: Cappuccino, GWT *(Google)*, YUI3 *(Yahoo)*
JYVÄSKYLÄN YLIOPISTO

Google app engine

Google Maps

KESKISUOMEN VUOKRAISÄNNÄT LKV

Opiskelijoiden vuokravaltioys

Avara
Amazon Web Services

- One of the first cloud computing providers
- Virtualized building blocks
- Elastic Compute Cloud (EC2)
- SimpleDB
- Simple Storage Service (S3)
- CloudFront
  - Similar to Akamai’s CDN
- SaaS, PaaS, IaaS + kitchen sink
Windows Azure Platform

- **Windows Azure**
  - Ability to run Microsoft ASP.NET Web applications or .NET code in the cloud
  - FastCGI support with PHP
- **Microsoft SQL Azure**
  - Cloud-based relational database service built on MS SQL Server
- **AppFabric**
  - Connects Windows Servers to cloud services and vice versa
  - Data integration tool
  - Access Control
- **SaaS, PaaS**
Facebook

- Is Facebook SaaS?
- Is Facebook PaaS?
- Is Facebook IaaS?

- Is Facebook IRaaS?
- Interpersonal Relationship as a Service

- Pistelaskuri
Questions & Answers