

Cloud Computing Evaluation from a Nordic eScience User Perspective

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About Me

- Helmut Neukirchen
- Associate professor
Computer Science
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- Research fields:
 - Software Engineering
 - Distributed Systems



About Cloud Computing

- Historic example: Amazon invested into hardware to handle Christmas shopping peak.
 - Now, Amazon sells idle CPU time (“pay as you go”).
- ⇒ Cloud computing: Provide computational resources on demand and access them via a network.
 - Users do not need to invest into hardware.
 - Users can scale on demand.
 - Don’t care about underlying hardware (virtualisation).
 - Cheaper (economy of scale, averaging, multiplexing, energy, ...).



Classification of Clouds

- **Public cloud:** Offer paid resources via the Internet.
- **Private cloud:** Use virtualisation in own datacenter.
 - E.g. to ease changing underlying hardware:
 - If machine needs to be replaced or rebooted: just move seamlessly Virtual Machine image from one machine to another.
 - E.g. allows to give users superuser privilege.
 - Can install their own software within virtual machine sandbox.
- **Hybrid cloud:** Scale from private into public cloud.
 - Seamlessly if private cloud uses same cloud management API interface as public cloud.



About the NEON (Northern Europe Cloud Computing) project

- Funded by NDGF – the Nordic DataGrid Facility.
- Partners from Sweden, Norway, Denmark, Finland, Iceland.
- Start: 1/2010, End: 12/2010 .
- **Goal: Reviewing the cloud promises**
 - What can cloud computing give to the Nordic eScience community?
 - Only using cloud for non High-Performance Computing considered!
- **through hands-on experiments.**
 - Obtain real user experience, get real cost data.
- Evaluation included:
 - Private cloud software stacks: Eucalyptus, OpenNebula.
 - Public cloud: Amazon Elastic Compute Cloud (EC2).



Gap Analysis: Private Cloud

- A pain (or even failed) to set up.
 - Even worse: rapidly evolving \Rightarrow many updates.
- Not feature complete.
 - Typically, pure computing virtualisation only.
 - Tendency towards Amazon API.
 - Cloud storage services just starting.
- No integration with existing authentication & authorization infrastructure (AAI).



Gap Analysis: Public cloud

- Easy to use, instantly available.
- Feature rich.
 - Computing, storage, data base, load balancing...
 - But: no automated means to control costs (i.e. quota management).
 - Not in the interest of public cloud provider!
 - Third party software (RightScale) helps.
- Privacy concerns or even legal restrictions.
- No integration with existing AAI.



Cost Analysis: Private cloud

- Still moving target:
Administrative costs not yet predictable!
- In contrast to public cloud:
No extra costs for network transfer in/out of cloud.

Cost Analysis: Public cloud

- Prices (CPU hour) highly competitive.
- No upfront hardware investment needed.
- Need to pay for network transfer in/out.
 - Data lock-in: expensive to transfer data.
 - ⇒ Data/Storage intensive applications not suitable.
- “Economic Denial of Service”.
 - If cloud identity is subject of theft, high costs might get created.



Conclusions

- Public cloud offerings:
 - Mature.
 - Recent Amazon EC2 outage puts question mark on availability.
 - Competitive prices.
- Private cloud software stacks:
 - Not mature, yet. Expected to be in 2012. ⇒ Wait with private clouds!
- Approx. 20% of the jobs running in Nordic HPC centers suitable to be off-loaded to public cloud.
 - Jobs with small memory requirements, not I/O or data intensive.
 - ⇒ Would make these 20% available for “real” HPC jobs.
- Users will anyway use public cloud, so stay ahead.
 - ⇒ National contact points for users (support, better pricing).



- Thank you for your attention!
- Any questions?
- Further readings from the NEON project:
 - <http://uni.hi.is/helmut>
 - Publications
 - Articles in Conference Proceedings (2011)
 - Technical reports (2010)
- Want to experiment on your own?
 - Amazon grants very easy to get!

