Research paper presentation- Team 4

Quality of Cloud Services

By David Bermbach

Presented by:
Inno Irving V. Estrera
Viet Nguyen
Swetha Chinthalapati

Overview

- What are Cloud services
- Why Quality is important
- What is Cloud service Benchmarking
- Benchmarking Measures
  - Consistency
  - Security
  - Availability

Conclusion

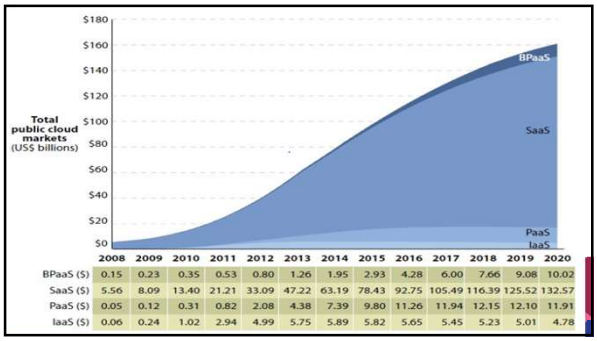
Cloud Services

- Iaas, Paas and Saas

From author's perspective:

"A software system running in the cloud whose functionality is consumed programmatically by applications over the internet protocols."

- Black box to applications
- Independent of deployment model
- Expected to adapt to application workloads while maintaining the quality goals.
- Less driven by Deployment model but more by Usage model



	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
BPaaS ($)	0.15	0.23	0.35	0.53	0.80	1.26	1.95	2.93	4.28	6.00	7.66	9.08	10.02
SaaS ($)	5.56	8.09	13.40	21.21	33.09	47.22	63.19	78.43	92.75	105.49	116.39	125.52	132.57
PaaS ($)	0.05	0.12	0.31	0.82	2.08	4.38	7.39	9.80	11.26	11.94	12.15	12.10	11.91
IaaS ($)	0.06	0.24	1.02	2.94	4.99	5.75	5.89	5.82	5.65	5.45	5.23	5.01	4.78

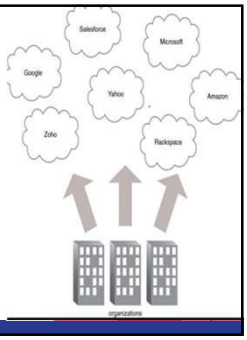
Cloud Consumers

Focus:

- Cost savings
- Convenience of managed services
- On demand capacity changes

Quality:

- Documentation
- Advertisements



Quality: Expect the unexpected

- Availability, Latency and Scalability
- Observable quality is better than guaranteed quality.
- Without practical knowledge of quality details
  - Unexpected negative surprises
  - Obscure application behaviour
  - Inefficiency of performance
- How to solve this?

CLOUD SERVICE BENCHMARKING

Why do we need Benchmarking

Use case 1:

- In 2011, Alexander Lenk and colleagues
- Performance tests on AWS EC2 instances
- Constant performance variations
- Why?
  - Two different CPU Types - AMD Opteron and Intel Xeon
  - Difference in floating point and integer operations

7

Why do we need Benchmarking

Use case 2:

- In 2015, Master Students from Technische Universität, Berlin
- Performance Benchmarking on VMs
- Comparison between open-stack based SME Cloud provider and AWS
  - Compute capacity
  - RAM
  - Disk Throughput
  - Network Bandwidth

8

Cloud Service Benchmarking

- A way to systematically study the quality of Cloud services based on experiments.
- Mimics the applications by load testing and stress testing
- Tracks the quality metrics to get meaningful results

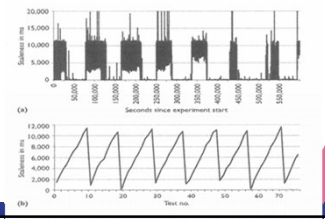
9

Consistency of Cloud Storage Services

- Inconsistency window: staleness
- Bounded for staleness ?
- Benchmarking approach for AWS S3: provoke the worst possible consistency behavior to obtain probabilistic upper bounds staleness
  - 12 distributed machines -> poll a target key
  - 1 other machine -> periodically updating the same key
  - Experiential time: 1 week

10

Consistency of Cloud Storage Services(cont.)



11

Security of Cloud Storage Services

Performance or Security

Sensitive data

Data in transit security

Experiments:

Apache Cassandra with Transport Layer Security(TLS)- outperform, hidden impact of TLS

Amazon's DynamoDB service shows no performance impact

Apache HBase: 12-node HBase = unsecure 6-node cluster

12

Consistency of Cloud Storage Services(cont.)

- Should service like HBase be avoided?
- When should hosted service be an excellent choice?
- Weight security and performance

13

Availability of Web APIs

3 months experiments over performance and availability:

- 15 hand-picked Web APIs(variety of application areas, countries, sizes, ...)
- Periodically called all 15 Web APIs over HTTP and HTTPS, ping API host.
- Results:
  - The expected: vary based on geolocation of client -
  - The unexpected:

14

Cloud Service Benchmarking for Developers

- Select existing benchmark implementations as similar as possible to application workload
- Benchmark tools to better understanding the quality of all options.
- Either single provider or federated setup
- Micro-benchmarks for testing non-functional properties.
- Lastly, monitoring and periodically benchmarking

15

Conclusions

- Unexpected behavior recurs in all kind of cloud services
- Never assume cloud services behave like traditional on-premises environments
- Should always expect the unexpected and be prepare
- No assumptions, but experiments.

16

Critique

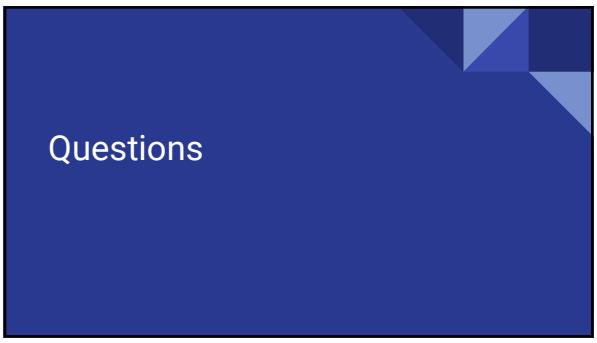
Evaluation

Strengths

Weaknesses

18


Evaluation
Analysis
Gaps
Future Work
19


Questions