Cloud Computing – State-of-the-Art and Future Research Trends

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TALK SUMMARY
Grid Computing vs. Cloud Computing

- Computational and data grids and clouds are large-scale distributed systems used for serving very large and complex applications.

- Grids and Clouds performance became more important due to the tremendous increase of users and applications.
The main idea of Grid Computing:

• To use a large number of distributed high-performance computational resources while minimizing the related operating costs in order to solve complex and computationally demanding problems that practically could not be solved on a single resource.
Cloud computing evolves from grid computing

Cloud computing is the clear architecture of choice for the bulk of information technology needs of the 21st century

Alexander Pasik, IEEE Roundup, the editors blog 2012.
Cloud Performance - Enterprises

• Several cloud performance issues will play a major role in the adoption of the Cloud Computing paradigm as a mainstream commodity in the enterprise world.

• Cloud performance should satisfy the requirements of all involved parties:
  • cloud providers
  • enterprises that use the cloud as a platform
  • end-users

Cloud Performance – Simulation

Performance Evaluation -Simulation

• The performance evaluation of clouds is often possible only by simulation rather than by analytical techniques, due to the complexity of the systems.

• Simulation can provide important insights into the efficiency and tradeoffs of scheduling in large-scale heterogeneous distributed systems, such as grids and clouds.

• Synthetic workloads – Traces from real systems.
Scheduling manages:

- the **selection** of resources for a job,
- the **allocation** of jobs to resources and
- the **monitoring** of jobs execution.
Data Centers – Green Cloud

• Data centers hosting Cloud applications consume huge amounts of electrical energy, contributing to high operational costs and carbon footprints to the environment.

• Therefore, we need Green Cloud computing solutions that can not only minimize operational costs but also reduce the environmental impact.

Cloud Scheduling – The Simulation Model

A task assignment model

Tasks to be scheduled

VM

VM

VM

VM

VM

VM

VM

VM

VM

VM
• The use of the *Cloud* is “cost-associative”: One pays only for the computing time which is equivalent to the total lease time of virtual machines.

• *Cost to performance efficiency* view.

• *Total lease time* (TL) of virtual machines while the system is in operation:

\[
LT = \sum_{i=1}^{P_{tot}} T_{lease(i)}
\]

Migration and Starvation Handling systems are incorporated to deal with job fragmentation.

• While the use of the meta-heuristics does impose a performance overhead due to their complexity in comparison to simpler heuristics, the experimental analysis shows that only a relatively small number of steps is required in order to achieve an optimized schedule.
Conclusions and Future Directions

• Advances in **processing, communication** and **systems/middleware** technologies had as a result:
  -- new paradigms and platforms for computing.

• The **Cloud computing paradigm** promises:
  -- on-demand scalability, reliability, and cost-effective high-performance.