Scheduling Hybrid Workloads in Shared Cloud Infrastructures

DALIBOR Klusáček1 AND GABRIELA PODOLNÍKOVÁ2
1CESNET a.s., Czech Republic — 2Faculty of Informatics, Masaryk University, Czech Republic
klusacek@cesnet.cz, xpodoln@fi.muni.cz

1. MOTIVATION
This work describes the recent research concerning scheduling in shared cloud infrastructures. Our goal is to automate and improve current status by introducing:

- automated load-balancing
- reclaiming of inactive resources
- advanced fair-sharing mechanisms
- improved VM scheduling policies

2. SHARED CLOUD-BASED INFRASTRUCTURE

MetaCentrum infrastructure:

- infrastructure is mostly virtualized
- currently using OpenNebula platform
- delivering flexible IAAS
- VMs may host grid worker nodes
- PBS-Pro uses grid worker nodes
- load-balancing done “by hand”

3. NEW VM SCHEDULER

New scheduler for OpenNebula [1, 3]:

- multiple queues for pending VMs
- application of complex policies
- multi-resource aware fair-sharing [2]
- multiple (re)scheduling approaches

Resource fair-sharing

pending VMs

fair-share-like prioritization

pending VMs

VM rescheduling and overbooking

running VMs

fair-share-like rescheduling

running VMs

overbooking

Multiple scheduling algorithms

Round-robin

fixed window

Backfilling

node reservation to avoid VM starvation

4. HYBRID WORKLOADS AND GLOBAL SCHEDULING

Workload Characteristics:

- hybrid (mixed) workloads
- cloud VMs and grid worker nodes
- grid worker nodes execute “grid jobs”

Load-balancing layer:

- global resource manager managing applications’ shares (e.g. MESOS)
- applications must be modified
- yet another framework

VM life-cycle problems:

- “pure” cloud workload is growing
- pay-per-use model is not used
- very low CPU/RAM reclaiming

Proposed cloud-integrated solution:

- no new resource manager
- load-balancing via cloud layer
- using cloud VM scheduler

5. CONCLUSION AND FUTURE WORK

Current status:

- large portion of the infrastructure is managed by OpenNebula middleware
- hybrid workloads (cloud and grid)
- default VM scheduler is used
- new advanced scheduler is tested [3]

Future work includes:

- automated load-balancing using advanced VM scheduler
- cross-application fair-sharing
- active resource reclaiming
- fair-share driven overbooking

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REFERENCES