Snooze: A Self-Organizing, Self-Healing and Self-Optimizing Cloud Management System

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Key Features

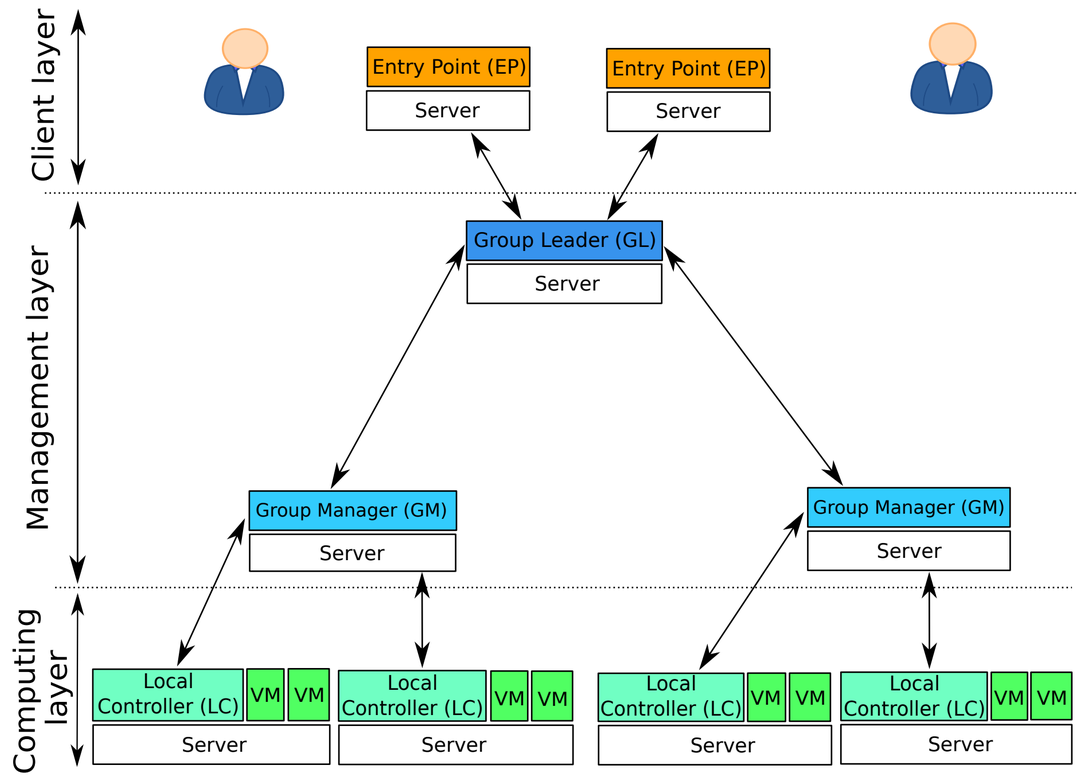
Snooze: an open-source management system for Infrastructure-as-a-Service clouds with:

- Self-organizing and healing hierarchical architecture
- Self-optimization for energy savings
  - Dynamic virtual machine (VM) consolidation and live migration
  - Server overload and underload mitigation
  - Power management

Experimentally Validated on the Grid'5000 Testbed

- French experimental testbed to support experiment-driven research on large-scale parallel and distributed systems
- 10 sites linked by a dedicated Gigabit network
- More than 8000 cores

Architecture

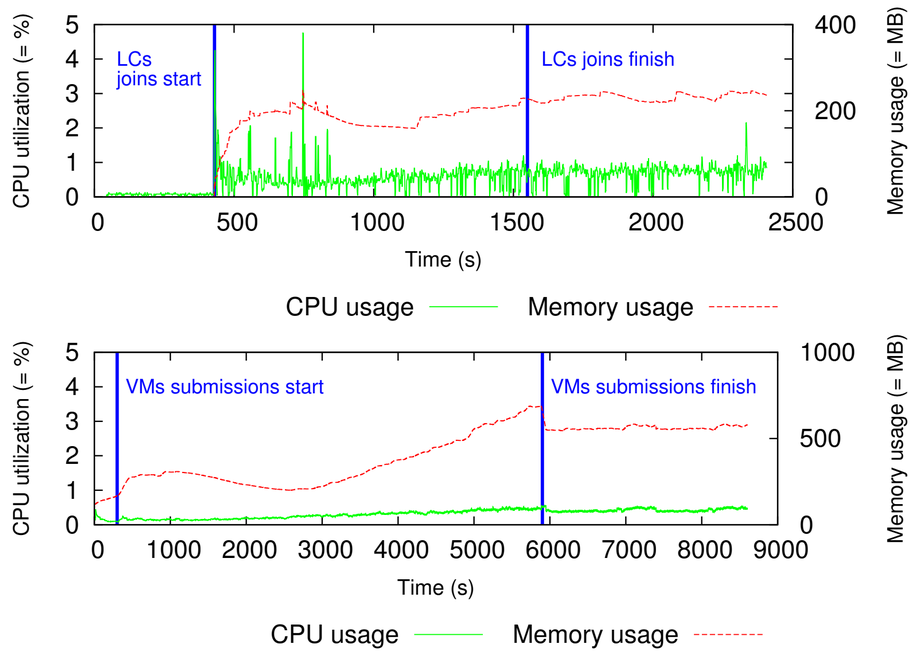


Validation of the Self-Organization Property

System services join time for different topologies

Time \ Topology	GL scalability **1 GL 5K GMs**	GM scalability **1 GL - 1 GM 5K LCs**	System scalability **1 GL - 1K GMs 10K LCs**
30 seconds	1485 GMs	509 LCs	-
1 minutes	3861 GMs	1043 LCs	979 GMs - 482 LCs
3 minutes	4656 GMs	2520 LCs	983 GMs - 1492 LCs
10 minutes	4689 GMs	2633 LCs	1000 GMs - 7436 LCs
15 minutes	4645 GMs	4283 LCs	1000 GMs - 9593 LCs
20 minutes	**4629 GMs**	**4300 LCs**	**1000 GMs - 10000 LCs**

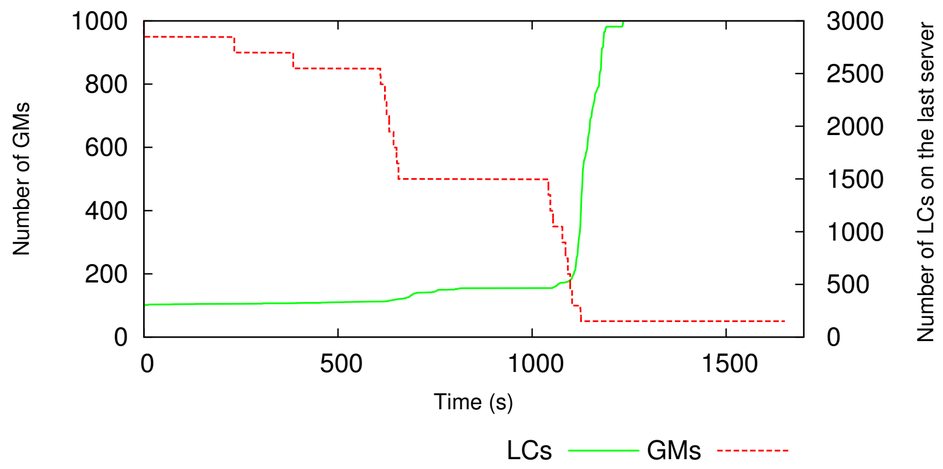
GM CPU and memory utilization



Validation of the Self-Healing Property

Experiment setup: 1000 GMs and 3000 LCs (50 per server)

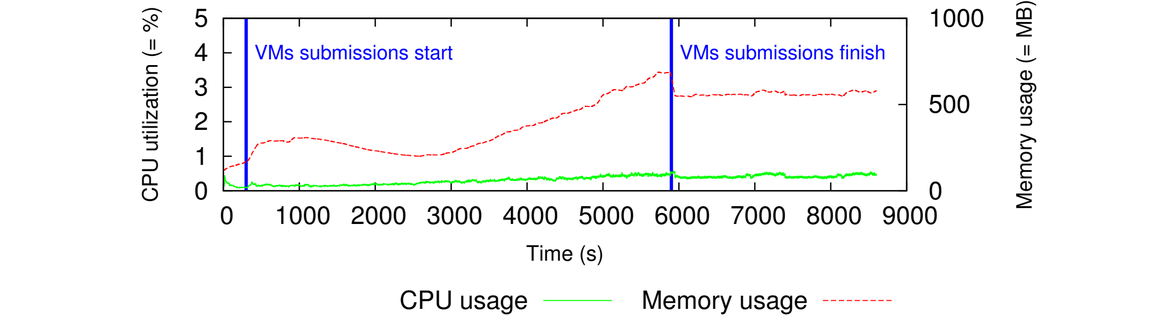
- GMs are killed by groups of 50 at arbitrary times
- **All LCs rejoin a living GM**



Validation of the Self-Optimization Property

Experiment setup: Two GMs, 31 LCs (power-metered)

- Extensible pool of VMs, each running an HTTP server
- Apache and stress benchmarks to generate requests (resp. load)
- Load balancing between the VMs via HAProxy
- Autoscaling of VMs based on the HAProxy load



- **Up to 67% energy savings**

http://snooze.inria.fr

References

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