

# SimGrid Cloud Broker: Simulation of Public and Private Clouds

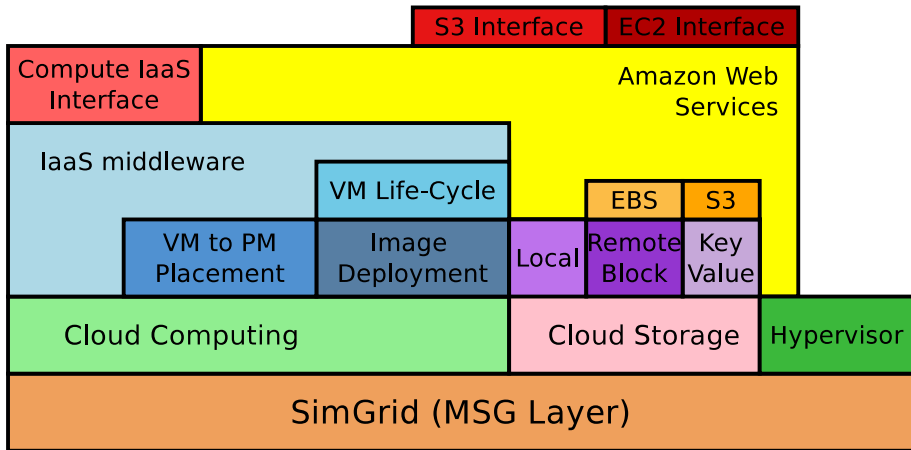
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CNRS – CC-IN2P3 / LIP (UMR 5668)



- SimGrid
  - simulates many different distributed systems: clusters, wide-area and local-area networks, peers over DSL connexions, data centers, etc
  - has models are theoretically and experimentally assessed
  - is scalable
  - exists for 13 years
- Simulation of Clouds
  - From an user point of view
  - From a cloud provider point of view
  - Evaluates application(s) running on Clouds
  - Evaluates different policies in Cloud middleware
  - Multi-Clouds (private and public)

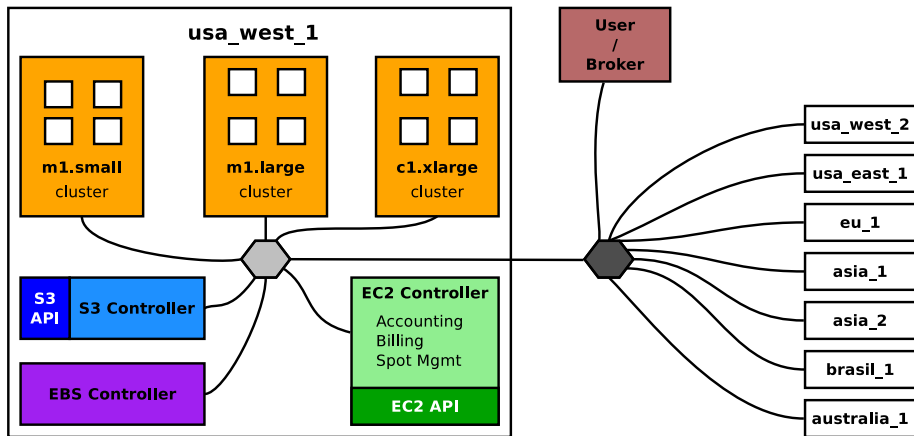
# Architecture



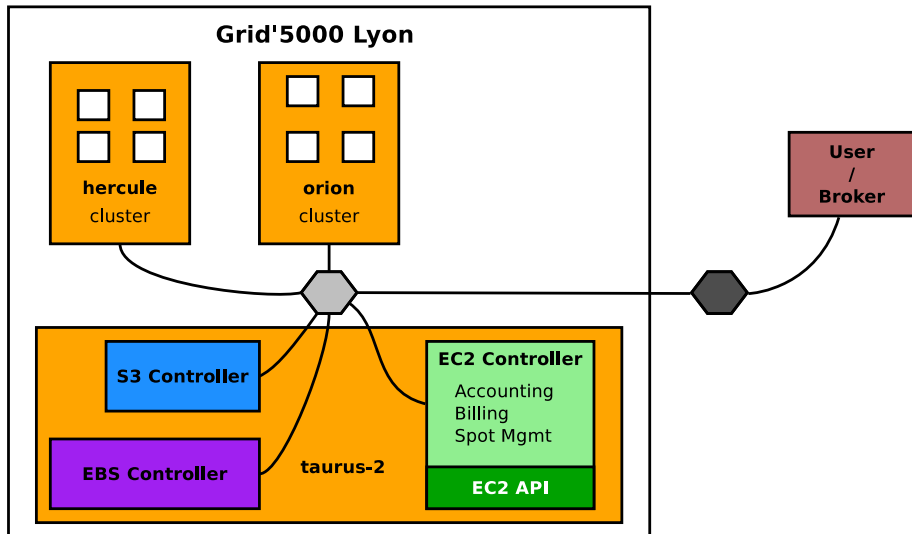
# Amazon Web Services

- S3 / EC2 API
- All the instance types
- All the regions of AWS
- On-demand and Spot Instances
- 3 types of storage: local, EBS and S3
- Accounting of network, computing and storage resources
- Models:
  - Spot instance prices: smart random, file and prediction model
  - Life cycle of VMs
  - Storage (3 models)
  - Compute
  - Network: VM inter/intra-regions and S3

# Amazon AWS Platforms



# IaaS Platforms Simulation



# IaaS Computing Simulation

- Basic compute API (loosely based on OpenStack)
- Eucalyptus and OpenStack models (in progress)

# Easy-to-use simulator

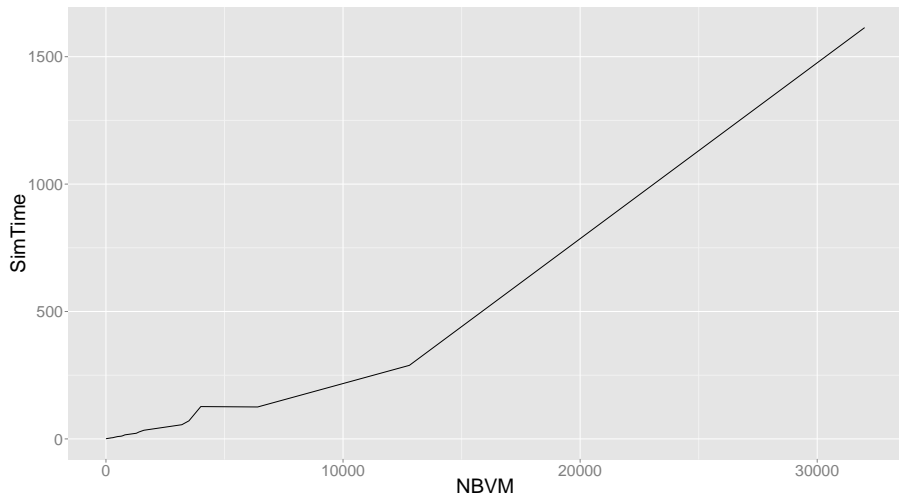
- Easy to use platform description
- One XML file to describe all the Clouds
- SimGrid users: only few modifications to migrate a SimGrid code to SGCB code
  
- Easy to replace and extend: VM image deployment and VM to PM mapping policies
- Modular approaches for all the models

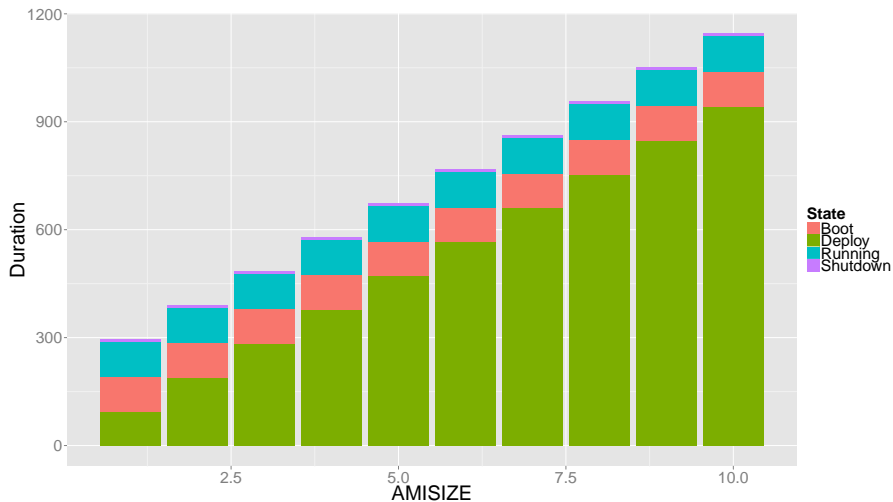


# Studying the scalability of SGCB

- Tested on the simulated AWS platform with all the models activated
- Mid-term goal: 1 millions VMs on 100,000 Hosts
- 4 types of scenario ( $1 \leq N \leq 500$ )
  - 1  $N$  instances m1.large in eu\_1
  - 2  $N$  instances of each instance types in eu\_1
  - 3  $N$  instances m1.large in all regions
  - 4  $N$  instances of each instance types in all regions

# Scalability of SGCB

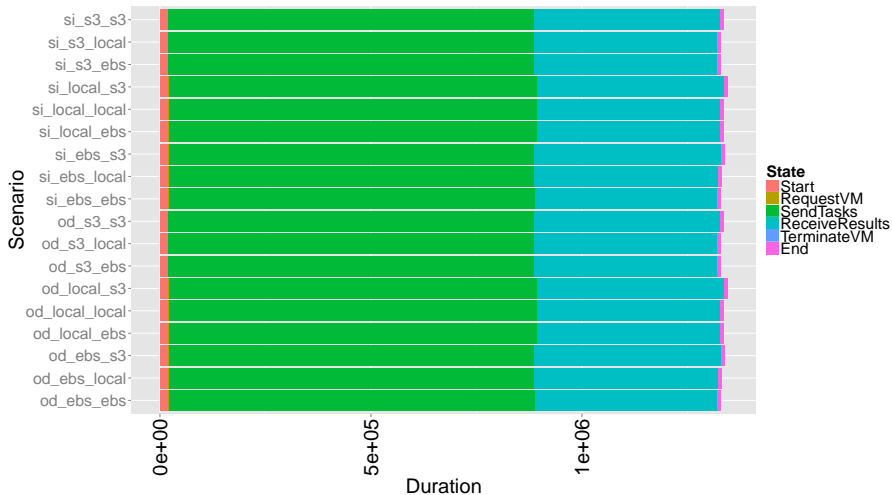


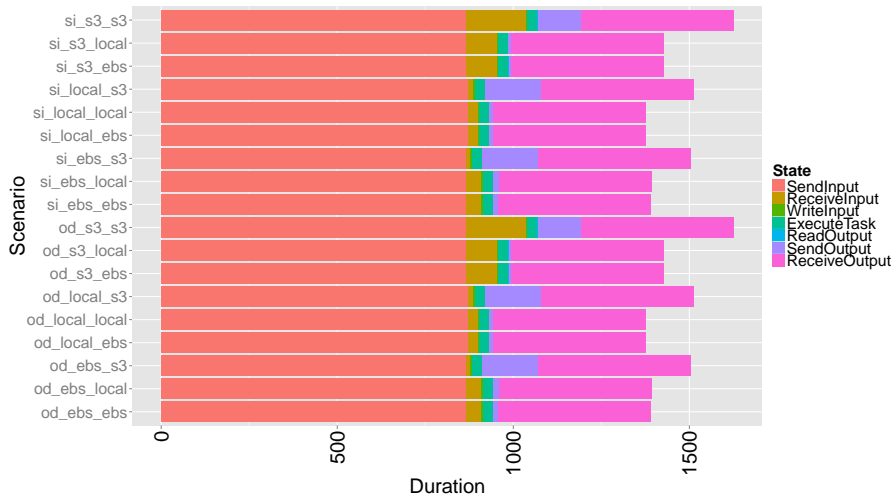


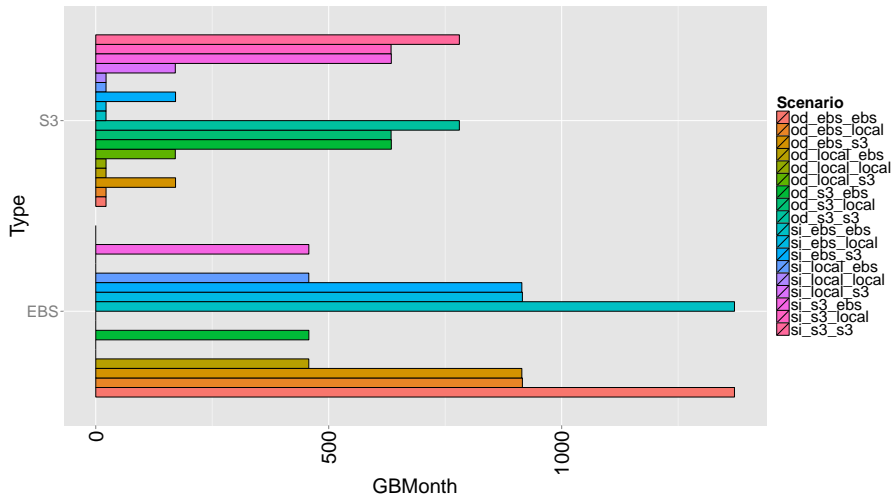
# Simple Bag Of Tasks scenario

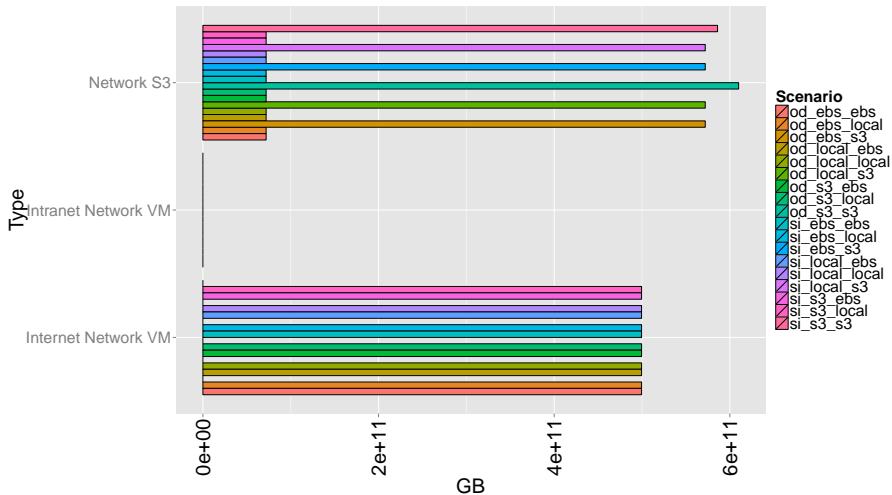
## BoT Characteristics

- 1,000 Tasks
- Input data: 1GB
- Output data: 500MB
- Storage Input and/or Output: Local, EBS ou S3
- 1 master (CeS): m2.2xlarge
- 5 slaves (CoS): m1.large

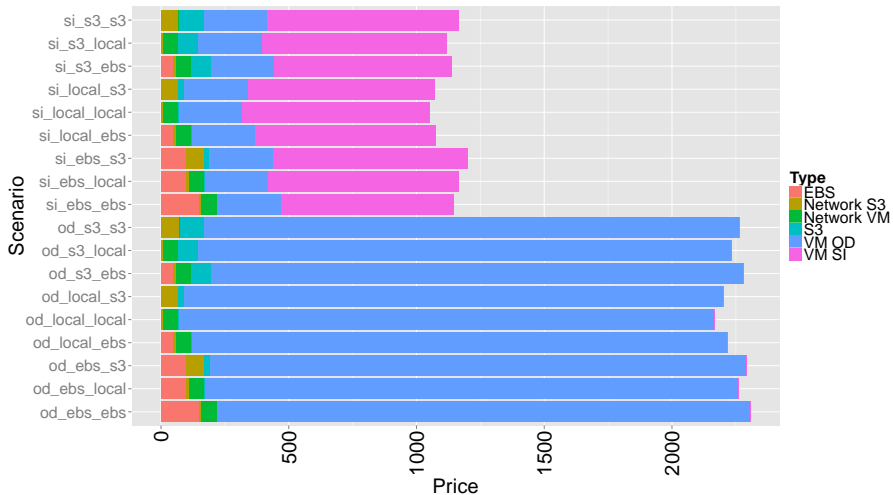


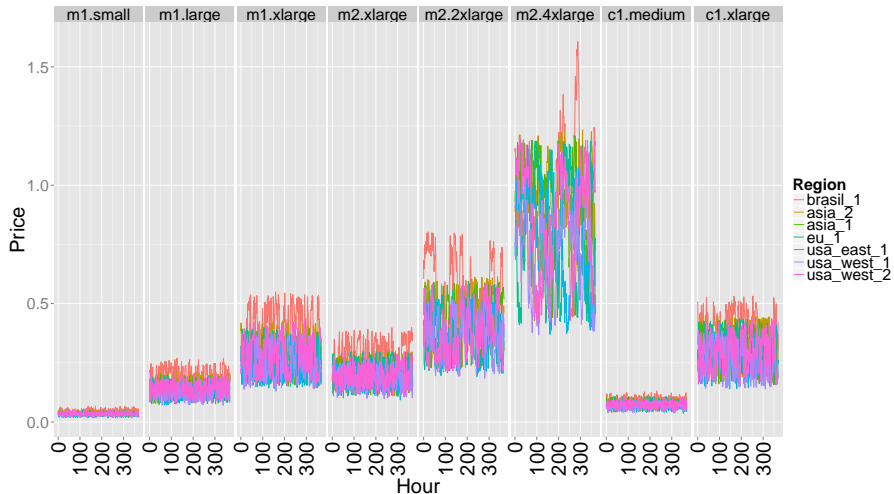












## SGCB usage in the Inria Avalon team

- Study different resource reservation and task allocation algorithms for Bag Of Tasks on Clouds
- Multi-regions applications and inter-region migration on AWS (Jose Luis Lucas – UCM)
- Scientific Workflows on Clouds (Dao Van Toan – Master internship)
- Applications composed of multiple VMs with security requirements (Arnaud Lefray – Doctorant)
- Component based applications on federated PaaS (FP7 PaaSage)

# Future work

- Validation of the simulation results with experiment on AWS
- Finer grain models for AWS
- Running the same experimentation on a private Cloud
- Study the different between OpenStack and OpenNebula on same hardware and applications
- Models for private Clouds
- Integrate works around live-migration
- Multi-core for VMs models in SimGrid
- Increase the scalability