Cloud computing et Virtualisation : applications au domaine de la Finance

Denis Caromel, CEO ActiveEon

Orchestrate and Accelerate Applications

Open Source Cloud Solutions
Hybrid Cloud: Private with Burst Capacity

Orchestrate and Accelerate Applications
Company
ActiveEon Overview

- **ActiveEon**, a software company born of INRIA, founded in 2007, HQ in the French scientific park Sophia Antipolis

- **Co developing** with INRIA *ProActive Parallel Suite®,* a Professional Open Source middleware for parallel, distributed, multi-core computing

- **Core mission:** Scale Beyond Limits

- **Providing a full range of services** for ProActive Parallel Suite

- **Worldwide** production customers and users:
A Wide Range of Services

- **Training and Certification**
  - Accelerate learning process

- **Consulting**
  - Optimize your infrastructure and maximize ROI

- **Technical Support - Subscription**
  - The guarantee of a quick and efficient assistance

- **Integration-Development**
  - Get ActiveEon’s products fine tuned to your specific needs

- **Partnerships**
  - With OEMs and ISVs
ActiveEon VOSTOK

Moscow, Techno Park
ActiveEon accepted in Skolkovo Foundation

Non-profit organization
Development Foundation of the Center for Development and Commercialisation of new technologies
DEcision
November 25, 2011
Moscow
On the submitted project fulfilling the criteria in the sub-clause E of the clause 2 of Regulations on granting and voiding the membership in the creation and support project of Skolkovo Innovation center
Non-profit organization Development Foundation of the Center for Development and Commercialisation of new technologies, reviewed the application of Denis Carmel for preliminary expertise of “ProActive Parallel Suite” project dated November 8, 2011, on the basis of the protocol of the Expert collegiates meeting on November 25, 2011 (focus “strategic computer technologies and software”) on the issue of the submitted project fulfilling the criteria in the sub-clause E of the clause 2 of Regulations on granting and voiding the membership in the creation and support project of Skolkovo innovation center in accordance to the clause 12 of Regulations for preliminary project expertise
deCided
that the submitted project fulfills the criteria in the sub-clause E of the clause 2 of aforementioned Regulations.
Responsible secretary of Expert collegiates (Signature) D.V. Dudina

ProActive Parallel Suite
ProActive Parallel Suite
HPC Workflow & Parallelization

Scheduling & Orchestration

Cloud & Grid IaaS

GPU nodes
The ProActive PACA Grid Platform

Production Platform operated by:

- INRIA
- Université Nice Sophia Antipolis
- Activeeon

Total:
- 1,368 Cores (soon 1,428)
- 480 GPU CUDA Cores
- 30TB Storage (soon 150 TB)

Publically Available Today
ProActive Parallel Suite
Technology & Solutions

HPC Workflow & Parallelization
Studio for HPC, Workflow Visualization
Native Tasks (MPI, OpenMP, Multi-thread, GPU)
Java APIs for Parallelization & Distribution
Matlab & Scilab Distributed Computing

Orchestration & Scheduling
Multi-Application & Multi-Tenant
Portal with Data Management, Remote Visualization
APIs (Java, REST, CLI)
Integration in existing Applications and Web Portals

Cloud & Grid IaaS
Physical Machines (Servers, Clusters, Desktops) and Virtual (Hyper-V, VMware, KVM, Xen; OpenStack)
Dynamic Policies, Full accounting of resource usage
Public Cloud Burst (EC2, Azure, Data Centers)
**Orchestration Portal with Graphical Workflow Visu**

![Orchestration Portal Screenshot](https://node0.cloud.sophia.inria.fr:8888/portal/)

### Jobs List

<table>
<thead>
<tr>
<th>Job ID</th>
<th>State</th>
<th>User</th>
<th>Progress</th>
<th>Priority</th>
<th>Duration</th>
<th>Name</th>
</tr>
</thead>
<tbody>
<tr>
<td>101</td>
<td>Stalled</td>
<td>dcarome1</td>
<td>40 / 45</td>
<td>Normal</td>
<td></td>
<td>Pa_Workflow_Job</td>
</tr>
<tr>
<td>100</td>
<td>Finished</td>
<td>dcarome1</td>
<td>45 / 45</td>
<td>Normal</td>
<td>1m 30s 949ms</td>
<td>Pa_Workflow_Job</td>
</tr>
<tr>
<td>99</td>
<td>Finished</td>
<td>dcarome1</td>
<td>45 / 45</td>
<td>Normal</td>
<td>1m 40s 20ms</td>
<td>Pa_Workflow_Job</td>
</tr>
</tbody>
</table>

### Details

**Tasks**

- **split**
- **else**
- **worker**
- **continuation**
- **else_split**
- **else_rep**
- **merge**
- **else_merge**
- **loop**
- **end**

**Output**

```
[err2@node7:18:05:51] Task 0: Test STDERR
[err2@node7:18:05:51] Task 0: Test STDOUT
[err2@node7:18:05:51] Task 0: Test STDERR
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```

**ProActive Parallel Suite**
ProActive Parallel Suite @ DEXIA, Belfius

• Run Monte Carlo Simulations to predict losses in credit portfolio value due to evolutions in credit parameters

• Compute how much value a portfolio loses/gains in each simulation in order to price a portfolio

• The simulation software runs as a back-end server and exposes itself as a service addressable by a front-end.

• Deployed on Citrix servers also used for Virtualization of Desktop PCs

Users need reactivity

Speed up simulations

Distribute the computations
100% Virtual Infrastructure
UC: Acceleration of Financial Valuations

C++ library developed by Pricing Partners
Pricing solution dedicated to highly complex derivatives,
Greek computation
How Does it Work?
Price-it Computing Distribution

Price-it Excel

Regular Price-it Excel Interface

ProActive Scheduler

Automatic execution via job scheduler

Pool of shared resources

Price-it Excel

Price-it Excel

Excel
Increased Productivity: Reduces Price-it Execution Time by 6 or more!

Use Case: Bermuda Vanilla, Model American MC

Test conditions:
- One computation is split in 130 tasks that are distributed
- Each task uses 300ko

More than 3 times faster with only 4 nodes!

Even 6 times faster with 9 nodes!
Integration: Scilab and Matlab, Applications

Static Policy
- LSF

Timing Policy
- 12/24
- Desktops

Dynamic Workload Policy
- EC2

Dedicated resources
- Desktops
- Amazon EC2
American/Bermudian basket option pricing in highly distributed & heterogeneous environment (Cloud architecture)

- Use of Monte Carlo pricing methods
  - Optimal exercise boundary computation (Ibanez & Zapatero)
  - Classification of continuation and exercise values (Picazo)

Use of ProActive for simplified deployment and source code independence
Currently developed (Benguigui, 2012)

High performance computing in hybrid architecture (Cloud/GPU)

- “Optimal” exploitation of GPU (SIMT parallelism, fast access memory use, coalesced memory access, dynamic resource allocation,...)

- Hybrid GPU/Cloud deployment (problem decomposition for fine/coarse grained parallel approach, dynamically/abstractly resource exploitation,..)

- Validation on large-scale parallel platform