ProActive Parallel Suite and OW2 OSCi:
From Multi-Cores to Multi-Clouds
D. Caromel, et al.

Agenda

1. CLOUD Computing & Virtualization
2. OSCi 4 Domains
3. ProActive Parallel Suite
   Programming, Scheduling, Resourcing
4. Use Cases & Demos
5. Conclusion: Cloud Revolution ?

Cloud Computing Revolution ?
1990: PCs
2000: Internet for Companies
2010: Cloud for Companies

Concept: John McCarthy in 1961 originally coin the expression “Utility Computing” (Electricity, Water, Gas)

Today: How could we do without Internet and Google Search? In 2020: Cloud taken for granted?

Today: We buy Network, Hardware, Software, Services
Tomorrow: Cloud Services (hiding N, H, S)
CLOUD: the Multi-Core Push
Symetrical Multi-Core: 8-ways Niagara II

- 8 cores
- 4 Native threads per core
- Linux see 32 cores!
Today Off The Shelf Multi-Cores, 3 GHz

- Intel Xeon 5670, 6 cores
- **Moore’s Law rephrased:** Nb. of Cores double /18-24 months
- **Key expected Milestones:** Cores per Chips (OTS)
  - 2012: 32 to 64
  - 2014: 64 to 128
- **1 Million Cores Parallel Machines in 2014**

AMD's Opteron 6174, “Magny-Cours”, 12 cores
Virtualization

Source: http://www.apac.redhat.com
Virtualization

Sun, Blog Marc Hamilton
Virtualization
What we Used to do as Syst. Admin.
OW2 OSCi
Open Source Cloud initiative
OW2 OSCi
Open Source Cloud initiative

4 Strategic Domains

- Self-sizing and green PaaS
- Massively Distributed Services
- BI 4 Cloud
- Massively Distributed clouds
Domain 1: Self-sizing and green PaaS

Goal: improve the platform efficiency

- Performance
- Energy cost

Challenges

- Cluster growth/shrink capabilities according to workload
- Data center multi-tenancy with limited capacities requires arbitration policies
- Data center placement for minimizing the energy consumption

Use case: Orange Infrastructure

- Large-scale data centers (+40,000 x86 servers)
- JavaEE JOnAS middleware stack: +250 applications, +1,000 application server instances

Technologies

- OW2: JOnAS, Jasmine, ProActive, Clif, Entropy
- 3rd party: Xen, KVM + Collaboration in progress: OpenStack, OpenNebula, Ubuntu
- Technology to be developed:

Partners

- Bull, Ecole Mines Nantes, Inria, Orange, ActiveEon
- O-Engine, Iscas, Buaa, PKU, UCM, …
Self-sizing and green PaaS Architecture

Scale Up/Down Data provisioning

Provisioning Placement System

PaaS

IaaS

VM Placement

Hypervisors

Cloud managers

© OW2 Consortium 2010

OSCi Workshop 2010
Domain 2: Massively Distributed Services

† Goal: Massive Heterogeneous Services with clouds
   ▪ Distributed Service Bus (DSB) made of Petals nodes organized in domains/clouds
   ▪ Highly distributed service architectures

† Challenges
   ▪ Large scale P2P distributed registry
   ▪ QoS policy management over heterogeneous domains
   ▪ Inter clouds interoperability

† Technologies
   ▪ OW2: Petals ESB, ProActive
   ▪ 3rd Party: Eucalyptus, OpenNebula, NiftyName, OpenStack, ...
   ▪ Technology to be developed:...

† Partners
   ▪ Petals Link, ActiveEon, Inria, USP, Fokus

SHORT TERM

OPEN SOURCE CLOUDWARE initiative
Domain 2: Massively Distributed Services

Architecture / Technologies

SAAS
- Governance
- Monitoring
- Management

PAAS
- Orchestration / composition / choreography

IAAS
- Resource virtualization

Federated Distributed Service Bus
- Company A DSB domain
- Company B DSB node
- Public DSB domain
- Company C Service
- Company D DSB domain
BI4cloud, providing images pre-compiled with components for Business Intelligence from industry’s leading vendors

OW2 members:
- Ingres
- Talend
- Jaspersoft
- Engineering/SpagoBI
- BonitaSoft

3rd Party/non OW2 partners:
- usharesoft
Domain 3: OW2 BI4Cloud initiative

Ingres Database
Talend DI, DQ, MDM
Jasper iReports
Spago BI
Bonita BPM

UShareSoft Appliance Builder

Amazon EC2 AMIs
VMWare images available on OW2 website
Other appliance packages... (TDB)

individual AMIs are loaded by members into Amazon's public storage. Users can instantiate their own image using EC2's dashboard or other tools such as ElasticFox.

users are also able to download VM images from OW2 and launch the stock on their local
Domain 4: Massively distributed clouds

✿ Goal: improve sovereignty and privacy
   - non hierarchical and massively distributed cloud
   - Next generation cloud architecture

✿ Challenges
   - Large scale distributed clouds, super elasticity for massively decentralized systems
   - Security, safety and privacy e.g. cryptography for the masses, personal control
   - High speed public network

✿ Use Case: domestic cloud for citizens

✿ Technologies
   - Key R&D trend for next 5 years
   - Technology to be developed:...

✿ Partners
   - INRIA Sardes (JB Stefani), other partnership to be developed including 3rd party technology providers (e.g. Hedera Tech)
Massively distributed clouds
Architecture (as for 2015 - Draft)
3. ProActive Parallel Suite
Cloud Solution: ProActive Parallel Suite

ProActive Parallel Suite

Java Parallel Toolkit
Multi-Platform Job Scheduler
Resource Manager

Used in Production Today:
50 Cores → 300 Cores 2010

Strong Differentiation:

- Java Parallel Programming + Integration +
- Portability: Linux, Windows, Mac +
- Versatility: Desktops, Cluster, Grid, Clouds = Perfect Flexibility

aMaDEUS
Your technology partner
ProActive Programming: Active Objects
ProActive Programming View

![Monitoring Interface]

Virtual nodes:
- DefaultVN
- PA_JVM4076823
- SharedNodes
- PA_JVM309323672
- PA_JVM1655225638
- PA_JVM11328241877
- PA_JVM1987850513
- PA_JVM1410156958
- PA_JVM196741187

Active objects:
- Active by itself
- Serving request
- Waiting for request
- Waiting for result (wait by necessity)
- Migrating
- Secure and Active

Pending Requests:
- Pending requests: 1, 3, 30

Nodes:
- RMI Node
- HTTP Node
- RMI/SSH Node

JVMs:
- Standard JVM
- JVM started with Globus

Hosts:

GPU nodes
ProActive Programming View

GPU nodes
Scheduling & Resourcing
ProActive Scheduling
ProActive Scheduling Big Picture

- Multi-platform Graphical Client (RCP)
- File-based or LDAP authentication
- Static Workflow Job Scheduling, Native and Java tasks, Retry on Error, Priority Policy, Configuration Scripts,…
- Dynamic and Static node sources, Resource Selection by script, Monitoring and Control GUI,…
- ProActive Deployment capabilities: Desktops, Clusters, Clouds,…

ProActive Scheduler

ProActive Resource Manager
Workflow Example: Picture Denoising

- with selection on native executable availability (ImageMagik, GREYstoration)
  - Multi-platform selection and command generation
- with file transfer in pre/post scripts
Clusters to Grids to Clouds: e.g. on Amazon EC2
Private, Public & Hybrid Clouds

ProActive Scheduler

ProActive Resource Manager

Static Policy
LSF

Timing Policy 12/24
Desктopсs

Dynamic Workload Policy
EC2

"Cloud Bursting!"

Dedicated resources

Desктopсs

Amazon EC2
Use Case 1: OMD2
Distributed Multi-Disciplinary Optimizations
HPC
ProActive OMD2 Demo

1000 Cores
Production Cloud Portal
Use Case 2:
Bonita BPM to Clouds with ProActive Parallel Suite on an IT Map-Reduce Application
BonitaSoft + ProActive: BPM Map/Reduce in the Cloud
Video:
BonitaSoft + ProActive: BPM Map/Reduce in the Cloud
Real Live Demo: ProActive Scheduler & Resource Manager
## Industrial (1750) & Cloud Revolution Compared

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<thead>
<tr>
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<th>Industrial Revolution</th>
<th>Cloud Revolution</th>
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<tbody>
<tr>
<td><strong>Concept</strong></td>
<td>Mechanization and centralization of manufacturing activities</td>
<td>Computing as a Utility Centralization of Data Center</td>
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<tr>
<td><strong>Technology</strong></td>
<td>Supporting new technos (Mechanic, Tool Machines, etc.)</td>
<td>Distributed Computing Virtualization Multi-Cores Network</td>
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<tr>
<td><strong>Socio Economical Factors</strong></td>
<td>Large new demand was ready to use the new offer. (A change in business attitude &amp; organization)</td>
<td>IT Cost Reduction Pressure CIO Nightmare CEO Out-of-DataCenter CapEx</td>
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inston S. Wardley (CSC) Scott Stewart

All elements converge for a strong Cloud Revolution
Conclusion: OW2 OSCi initiative

4 Strategic Domains
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- Massively Distributed clouds

→ Fine Grain CLOUD management: Pricing at the second (like GSM)
Elastic Clouds

→ Full-Fledged Cloud Solution in OS
http://proactive.inria.fr
Thank you for your attention!