

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
- Static server consolidation (12/1) through virtualization: Utilization level increased from 20% to 75%

➔ 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, ...

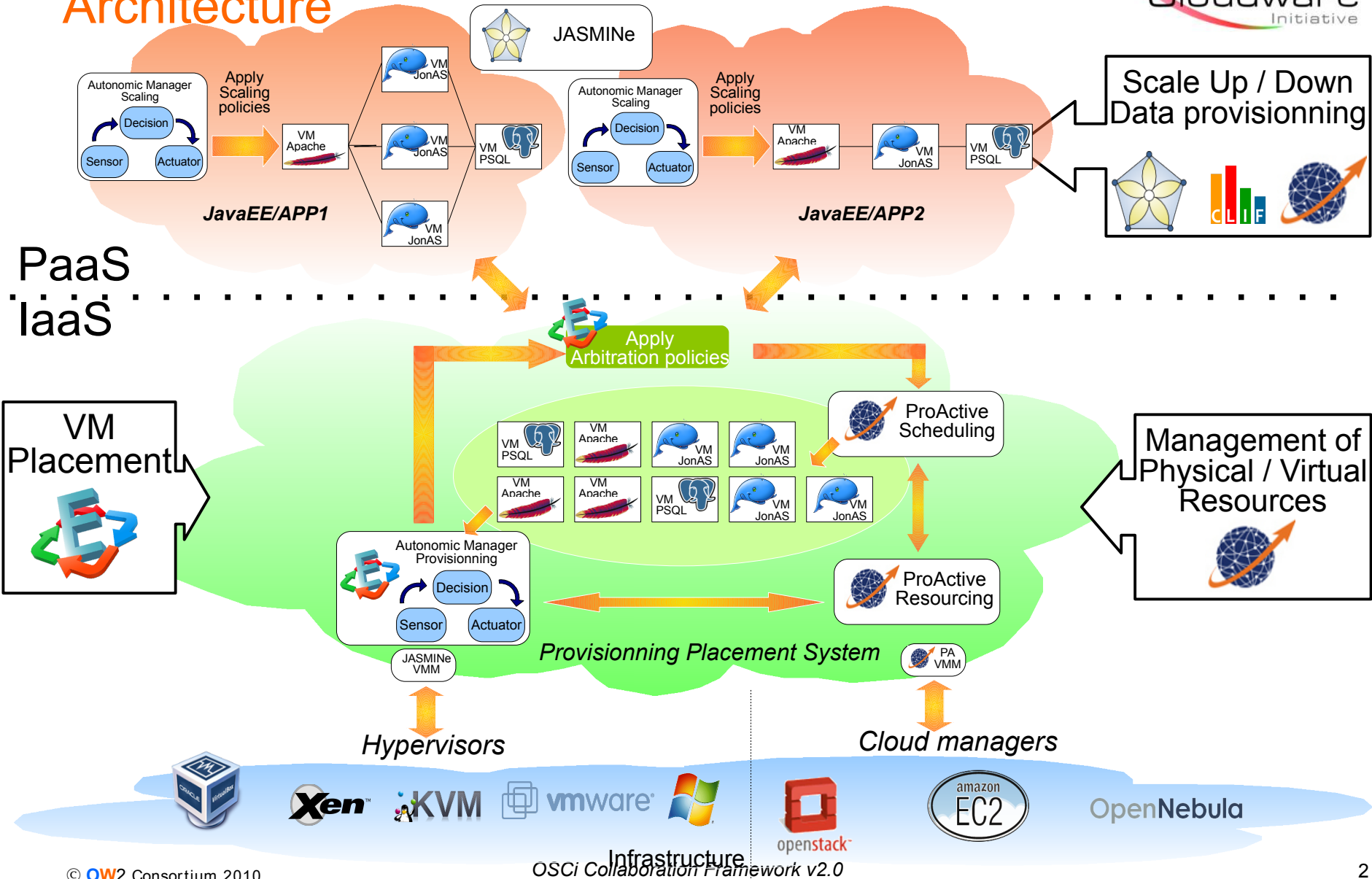
➔ Resources

- Collaborative Projects: SelfXL (ANR), 4caast (FP7), Easi-Clouds (ITEA2), Compatible One (FU10), Internetwork (973),...

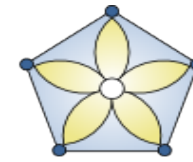
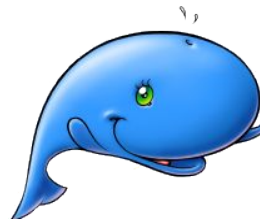


SHORT TERM
Work
in Progress

Self-sizing and green PaaS Architecture



JOnAS, Jasmine: Toolset for SaaS



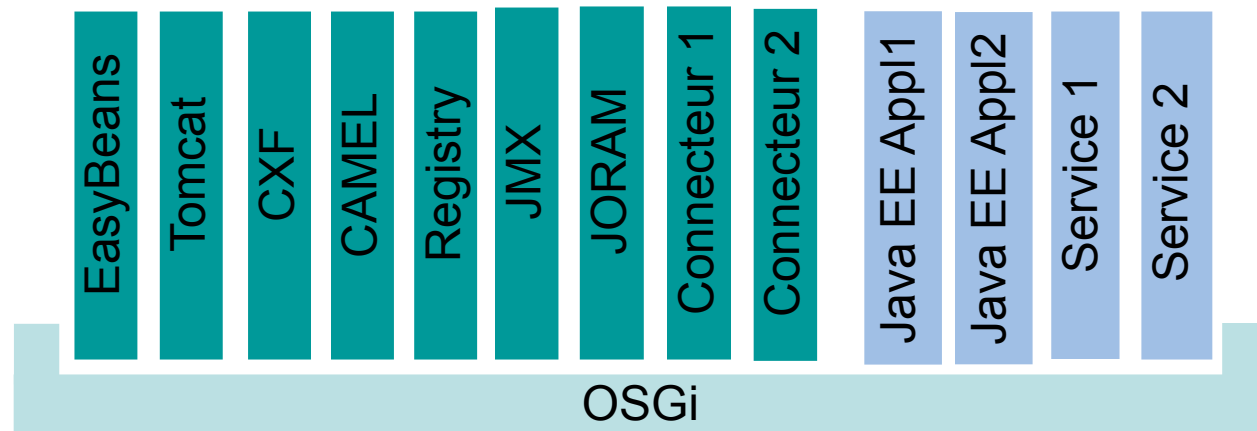
➔ **Deploy dynamically complex applications and services on Clouds**

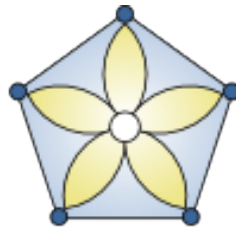
➔ **Smart Administration:**

- Supervision
- Self-management

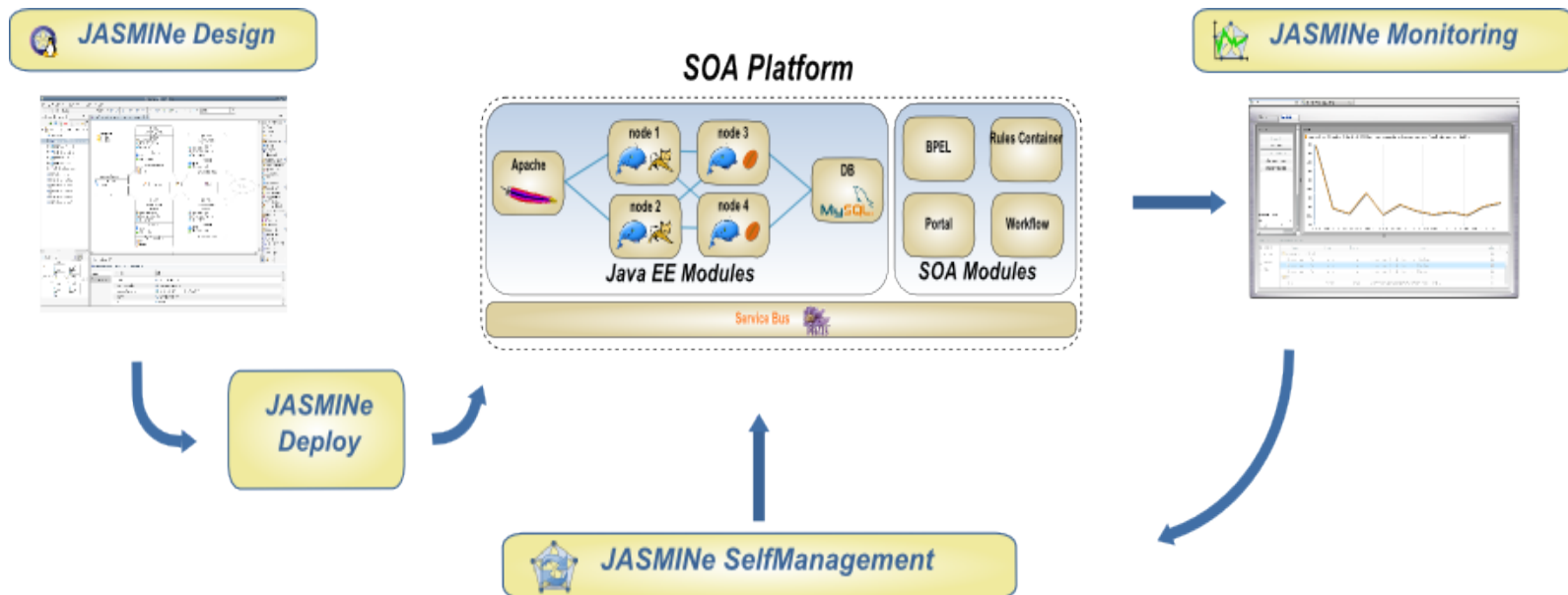
➔ **Technologies**

- JavaEE
- OSGi
- JOnAS
- JASMINe
- Orchestra

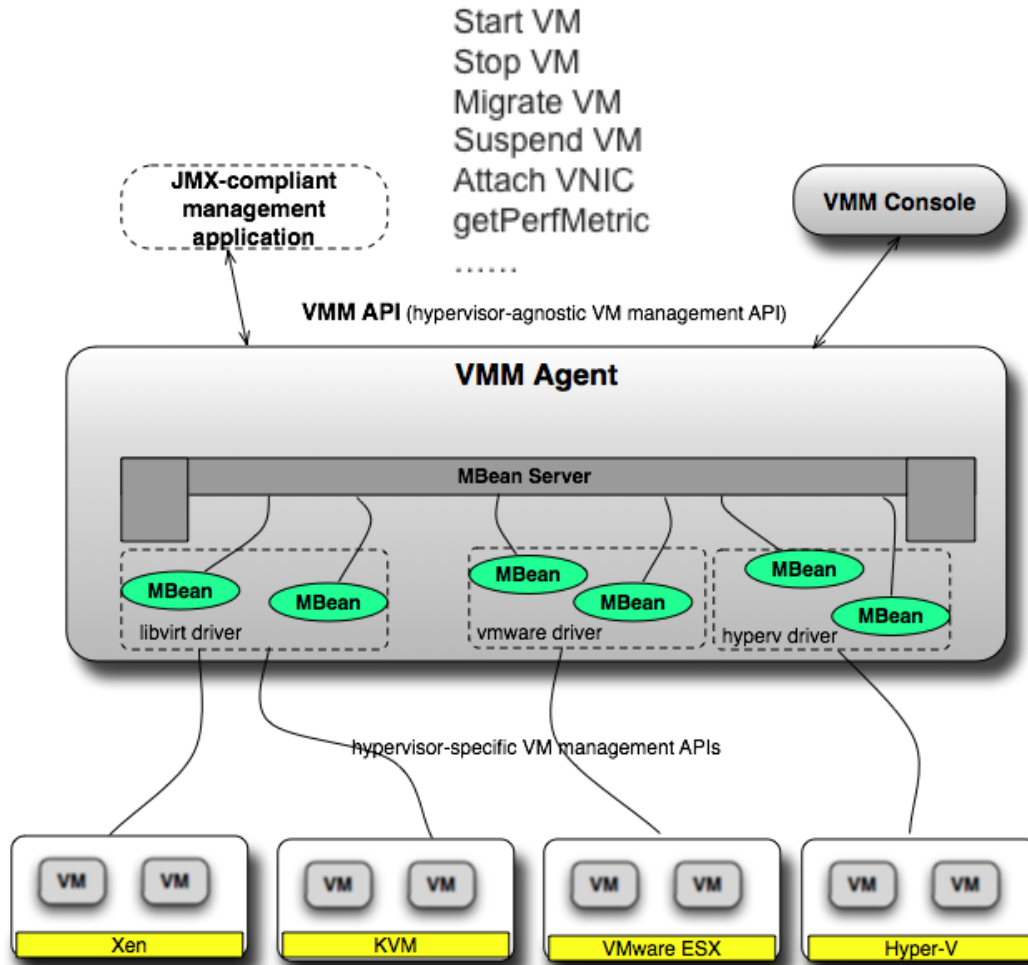




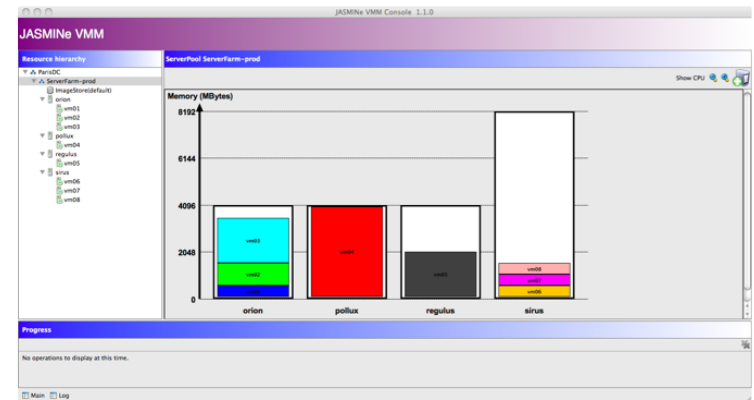
- ➔ Management tools for SOA platform
- ➔ Cross-platform (JOnAS AS prime target)
- ➔ Four main features: Design, Deploy, Monitoring, Self-*

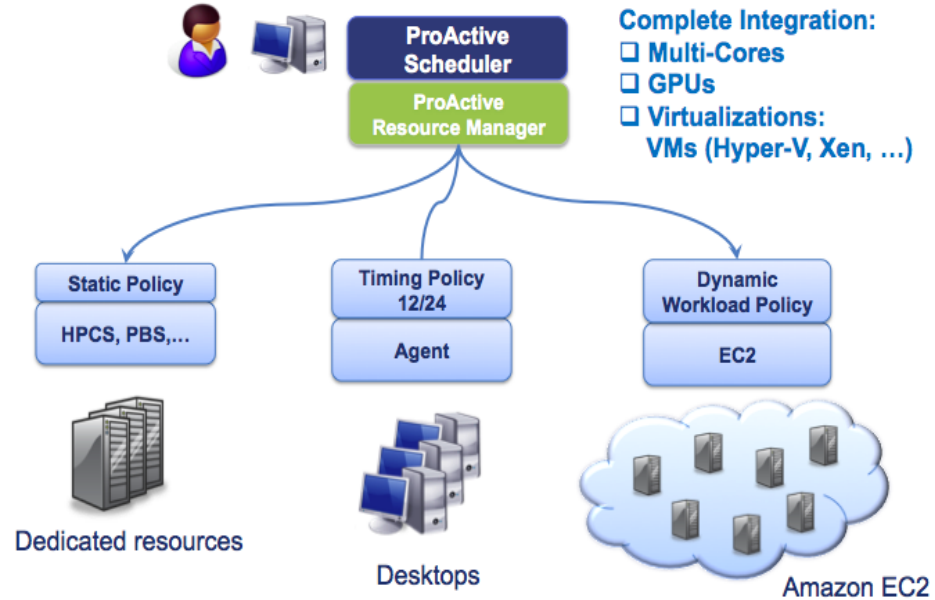
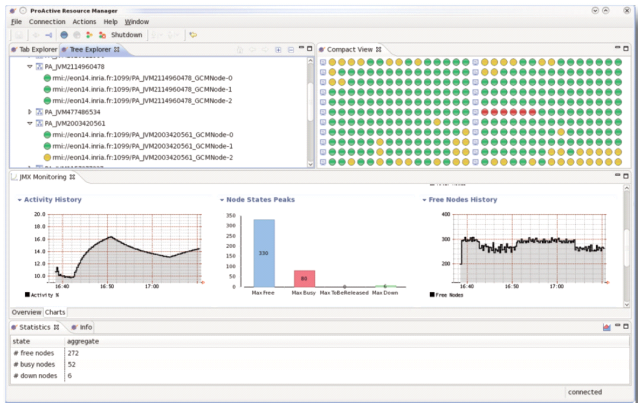


JASMINe Virtual Machine Management (VMM)



- ➔ **Support for multiple hypervisors:**
 - Open-source Xen and KVM
 - Citrix XenServer
 - VMware virtualCenter 2.x
 - Microsoft Hyper-V
- ➔ **using xenapi, libvirt, VI API, wmi**





- Complete Integration:**
- Multi-Cores
 - GPUs
 - Virtualizations:
VMs (Hyper-V, Xen, ...)

"Infinite" resources management

➔ Provisionning of new ressources in case of capacity overflow

Java EE PaaS as a virtual ressource

➔ Java applications deployment and services execution (EJBs, WS, OSGi, ...)

Java EE PaaS performance optimization

- ➔ EJB3.1 and asynchronous methods support
- ➔ Proactive Parallel library deployed as an OSGi service



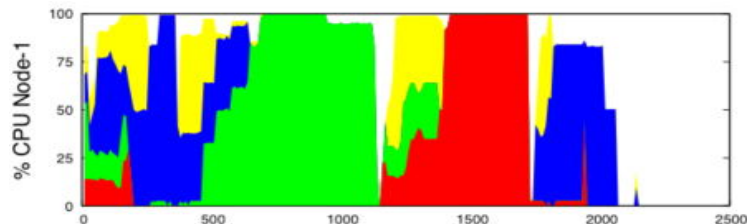
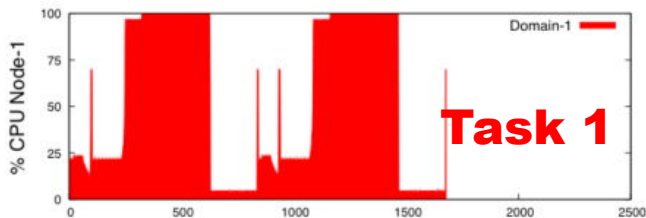
25% Energy Savings



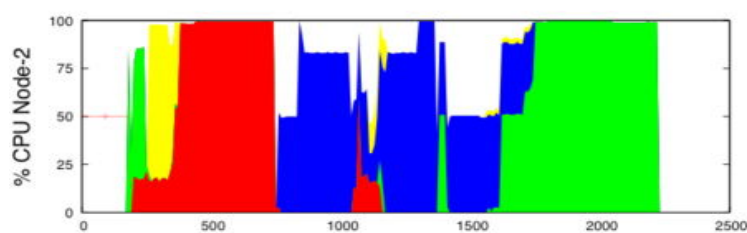
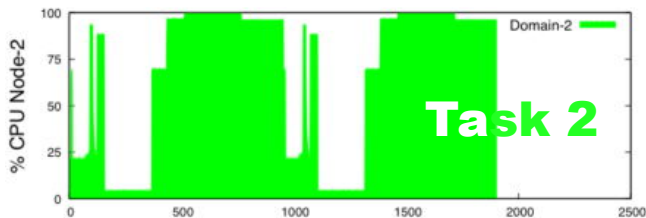
Before

After

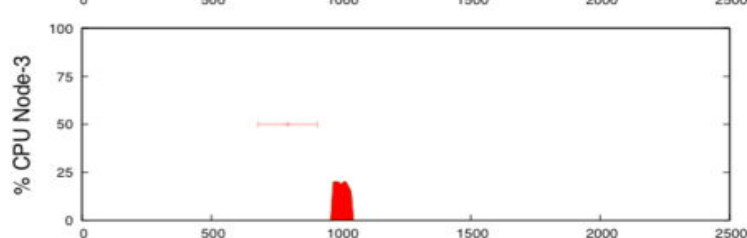
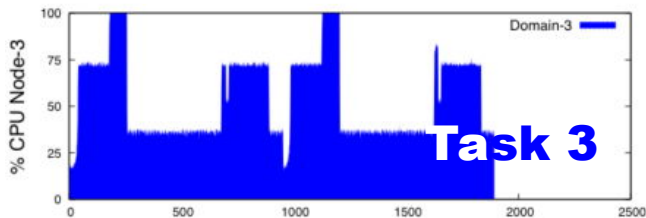
Server 1



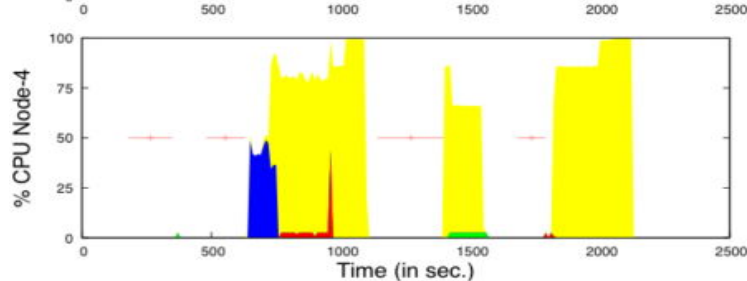
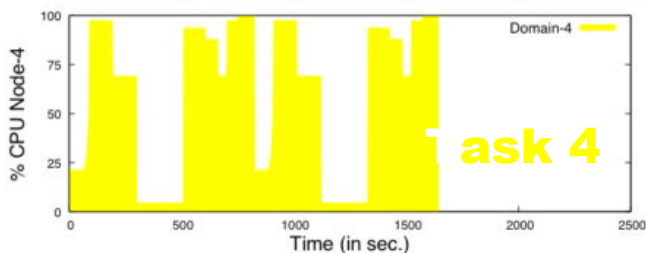
Server 2



Server 3



Server 4



Domain 1 recent actions

➔ Interactions with OpenStack

- 19 October conf call

➔ Better understanding of ProActive position

- still needs to be consolidated with Entropy

➔ Better understanding of PaaS/IaaS API and integration

- still needs to be consolidated
- standards versus “proprietary” features

➔ Started construction of a follow-up to SelfXL

- as a French collaborative research project
- either FUI 11 or ANR

Domain 1 questions

➔ General focus of the domain on elasticity

- how to include work on deployment, development tools, IaaS integration?
- should we keep it in this domain for now and extend the scope of the domain?
- is it too early to create another domain?

➔ Which next steps to integrate work from BUAA, ISCAS, NUDT, PKU?

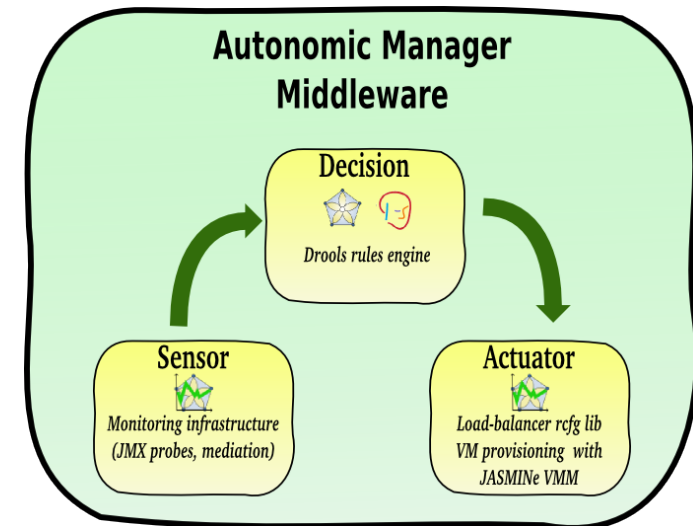
Cluster scaler: Principles

➤ Rules based decision module

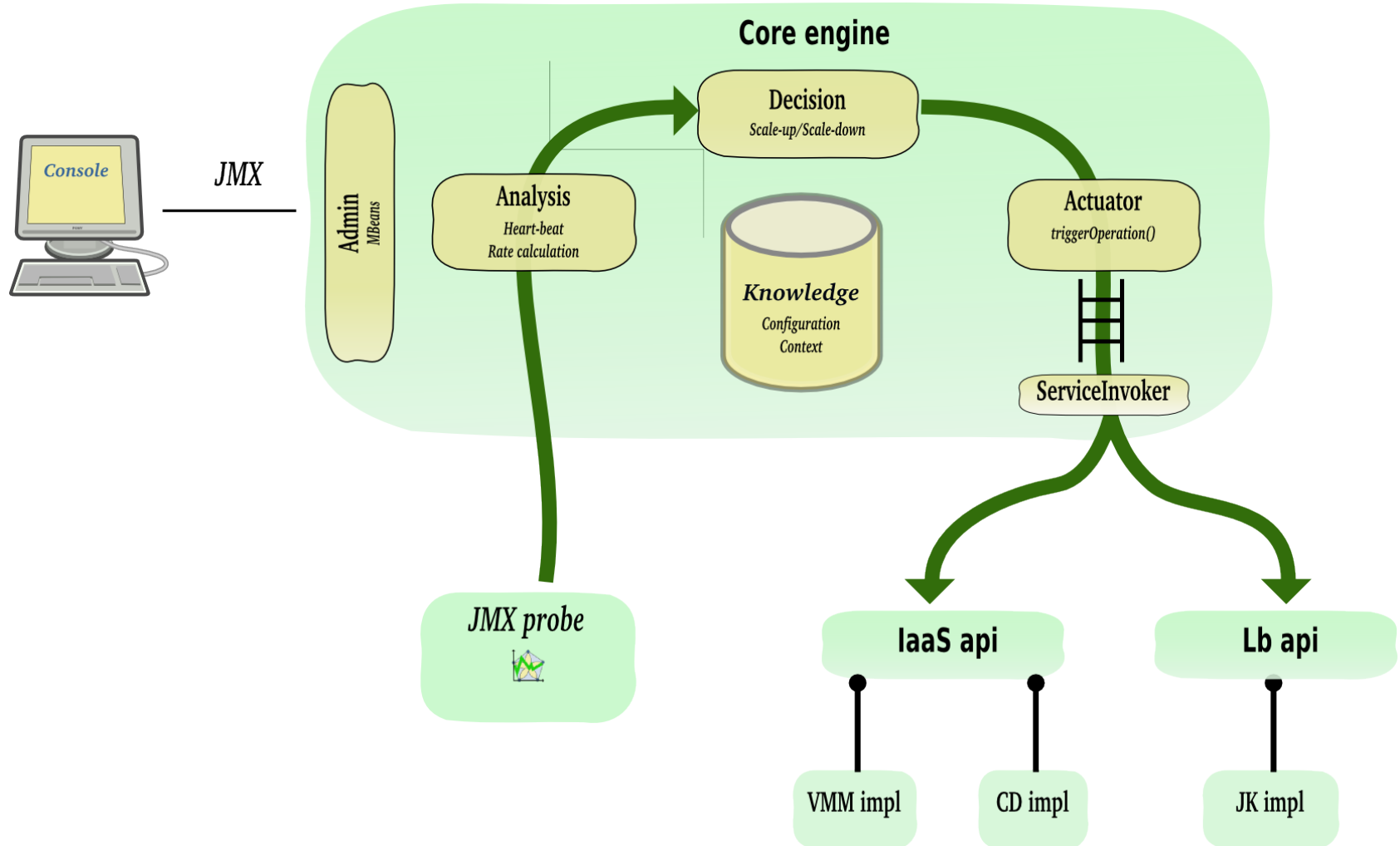
- Nodes monitoring (maintain node state)
 - Heartbeat impl tru cpu load indicator
- Rate aggregation
 - Servlet indicator
- Scale-up / Scale-down triggering

➤ Service oriented solution

- IaaS interface
 - VMM impl
 - Cluster Daemon impl
- Loadbalancer interface
 - Jk impl
- Modularization & dynamicity
 - Add new impl at runtime



Cluster scaler Architecture (control loop)



Integration with ISCAS

Short-term

- ➔ JOnAS enhance with ONCE Access Controller
- ➔ JASMINe enhance with ONCE Deployer
- ➔ CLIF enhance with ONCE Bench4Q

Mid-term

- ➔ JOnAS enhance with ONCE Work Manager, Access Controller, Resource Profiler
- ➔ JASMINe enhance with ONCE Capacity Planner

Long-term

- ➔ JOnAS , JASMINe enhance with ONCE autonomic mechanisms

Integration with ISCAS

Short-term

➔ JOnAS enhance with ONCE Access Controller

- Autonomic authorization for tenants

➔ JASMINe enhance with ONCE Deployer

- Application deployment plan visual design tool
- Application migration tool (migration app from other AS to JOnAS)
- Deployment constraint validation and conflicts resolution

➔ CLIF enhance with ONCE Bench4Q

- Open session, load fluctuation...

Mid-term

Long-term

Integration with ISCAS

Short-term

Mid-term

Long-term

➔ **JOnAS enhance with ONCE Work Manager, Access Controller, Resource Profiler**

- Building app-level multi-tenant PaaS Platform (tenants share one JOnAS on each server node)

➔ **JASMINe enhance with ONCE Capacity Planner**

- Adaptive Performance modeling for live workloads

Integration with ISCAS

Short-term

Mid-term

Long-term

➔ JOnAS , JASMINe enhance with ONCE autonomic mechanisms

- Bottleneck detection and adaptive resource provision
- Load balancing for dynamic heterogeneous cluster
- Policy self tuning