



CompatibleOne : Designing an Energy Efficient Open Source Cloud Broker

November 1-3, 2012
Xiangtan, Hunan, China

Julien CARPENTIER

Jean-Patrick Gelas, Laurent Lefevre, Maxime Morel,
Olivier Mornard, Jean-Pierre Laisne

- Introduction and Objectives
 - Ecosystem
 - State of art
 - Project
- CompatibleOne Core
 - General Architecture
 - Monitoring
- CompatibleOne Energy Framework
 - Energy probes list
 - Architecture
 - Ganglia User Interface

Executives partner



Use case partner



Documentation management



Collaborative applications



Accounting and billing



Physical platform migration



Distributed remote 3D rendering

Interoperability between cloud services : to be constructed

Portability between cloud services : much more difficult
SaaS, IaaS, PaaS, etc. have very different APIs

No mature standards for cloud computing (except HTTP)

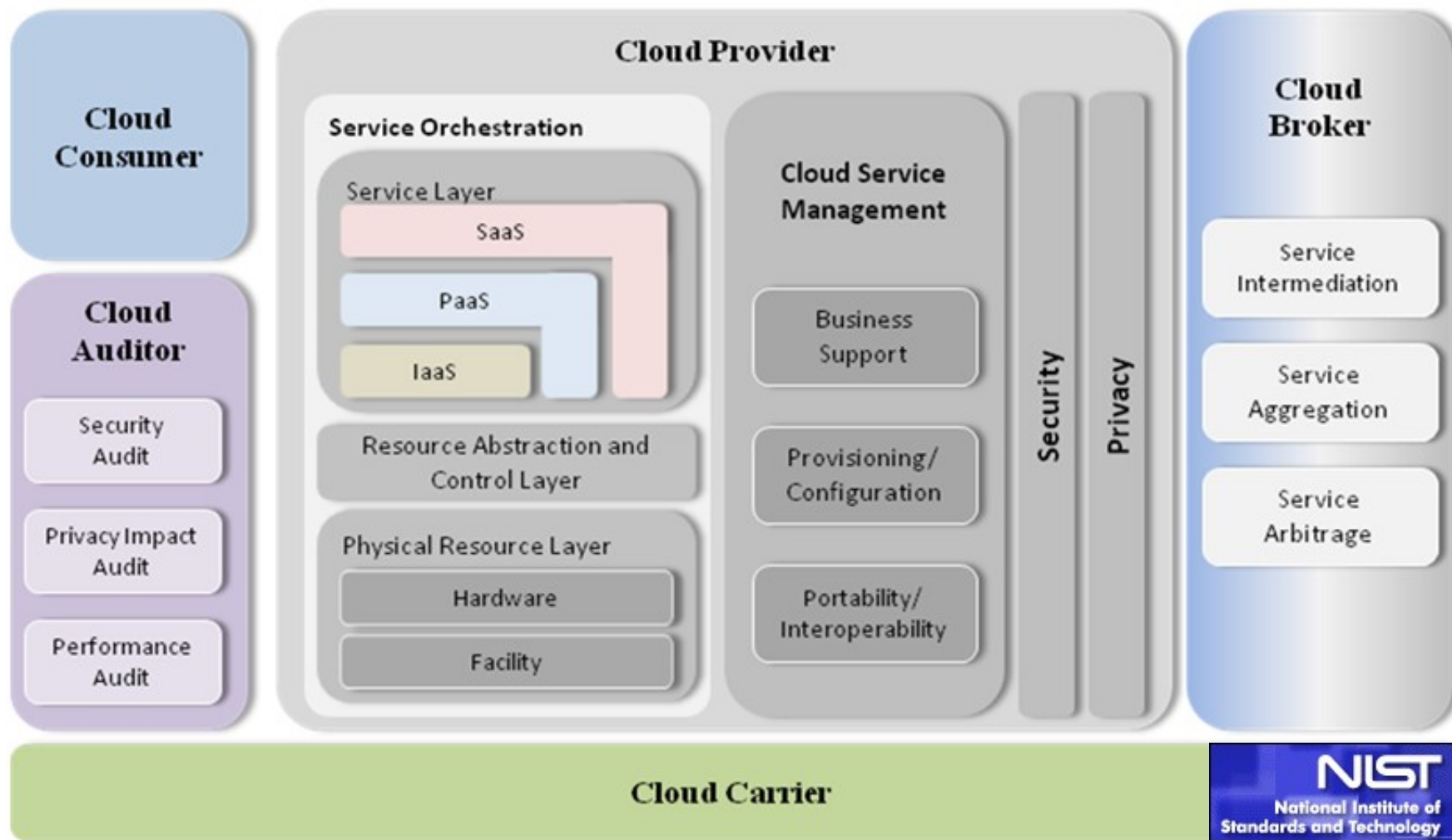
→ Interoperability and portability to be provided and maintained by Cloud Service Brokers

- **Software-as-a-Service**
 - Federate application providers & integrate different services
- **Platform-as-a-Service**
 - Provide a feature-rich, industry standard run time to build cloud aware applications
 - Facilitate the distribution and deployment of innovative services
 - Multi-tenant platform (deployment, application execution)
 - Abstraction layer allowing its utilization through high-level services
- **Infrastructure-as-a-Service**
 - Provision infrastructures, global abstraction of ressources
 - Standardized interface unifying diverse models used by IaaS platforms (Amazon EC2, SunCloud API, ...)
- No vendor lock-in (Open standard and Open Source)

CompatibleOne clouds innovations :

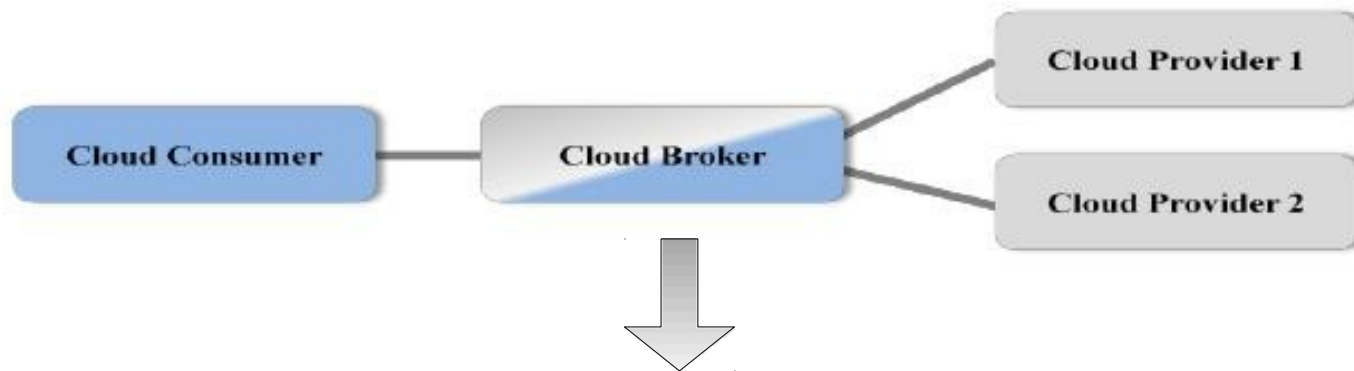
- **Federate** heterogeneous Service Providers
- **Brokering capabilities**
- **Energy** monitoring and **Energy efficient** management





[...] A cloud broker is an entity that manages the use, performance and delivery of cloud services and negotiates relationships between cloud providers and cloud consumers [...]

NIST Cloud Computing Reference Architecture, Special Publication 500-292



Intermediation	Value-added services like reporting, identity management, security
Aggregation	Data integration and secure migration between multiple cloud providers
Arbitrage	Flexibility and opportunistic choices according to selection criterion

PROCCI (proxy) IaaS :

OpenNebula.org

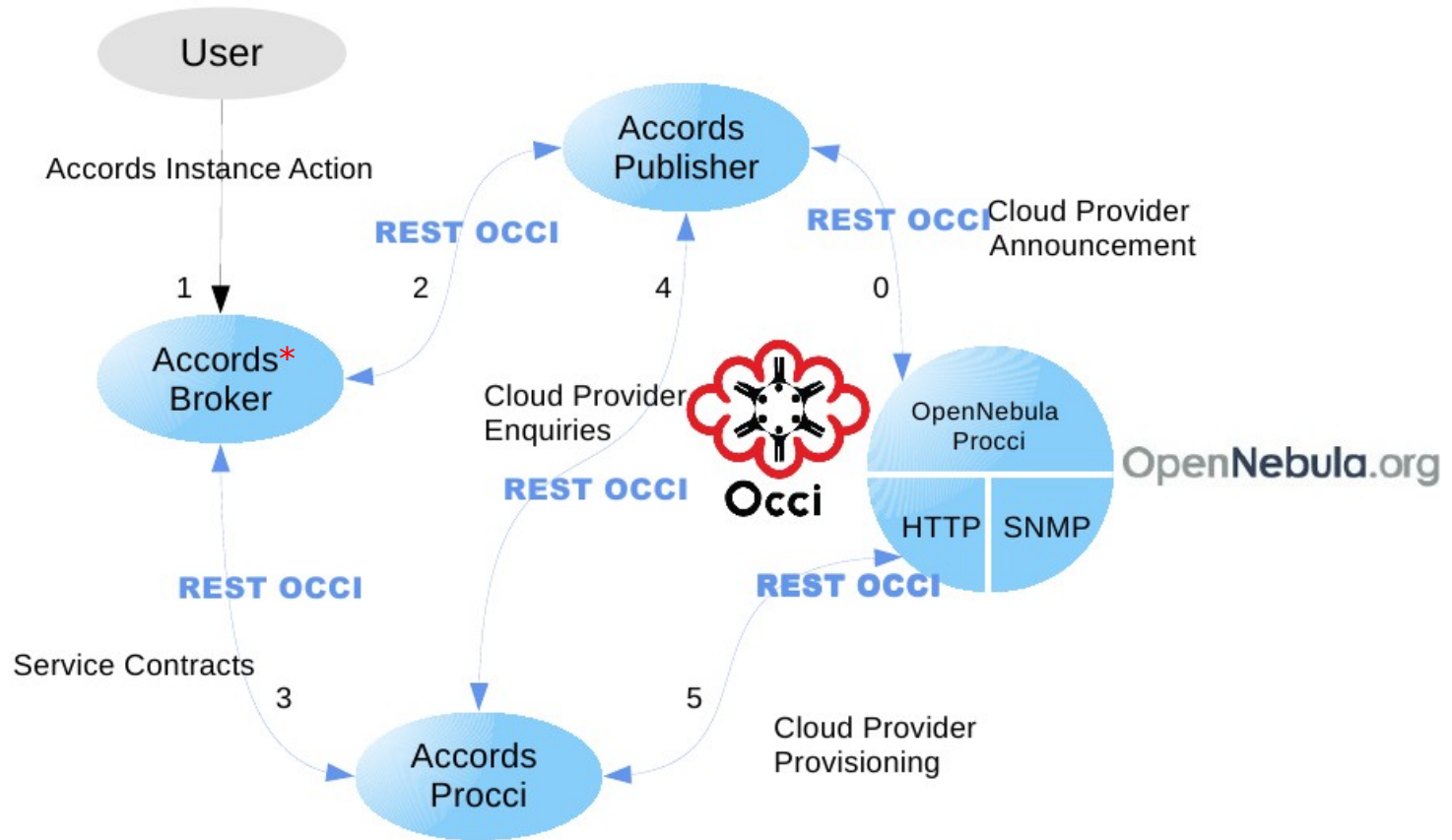
The Open Source Toolkit for Cloud Computing

SlapOS



OpenNebula provisioning :

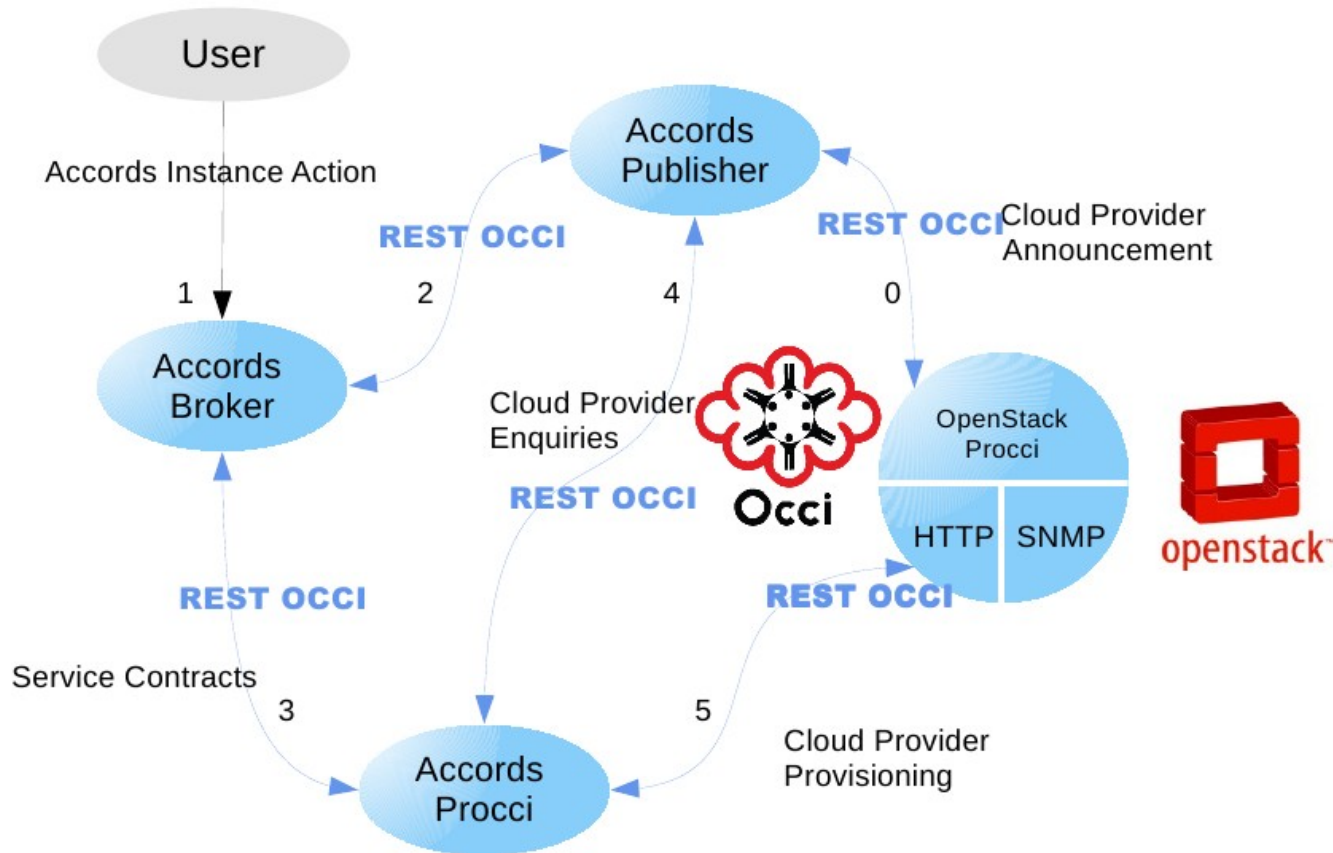
User scenario : A user wants to deploy services (VMs) on some OpenNebula infrastructure

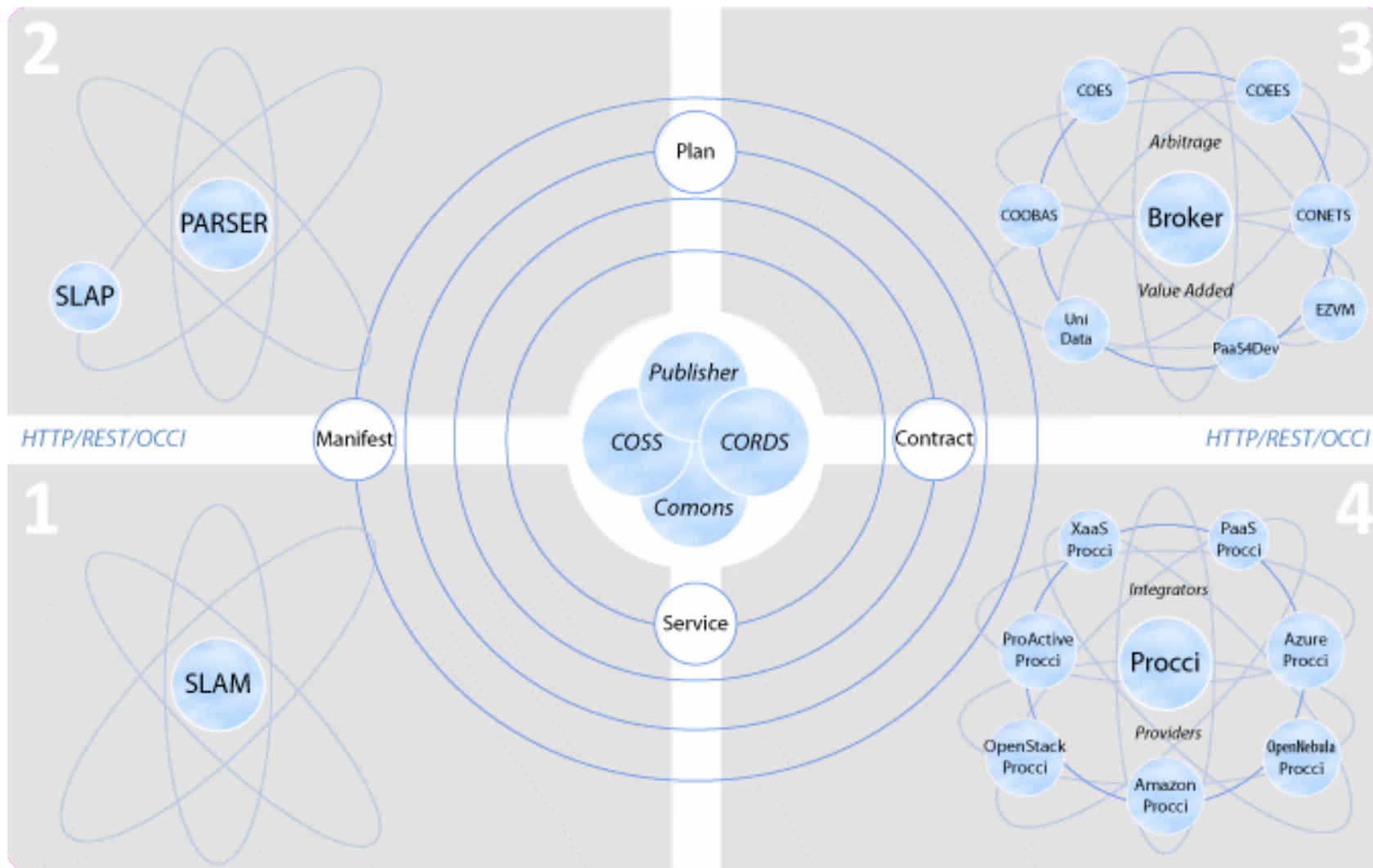


* *Advanced Capabilities for CompatibleOne Resources Distribution Services*

OpenStack provisioning :

User scenario : A user wants to deploy services (VMs) on some OpenStack infrastructure





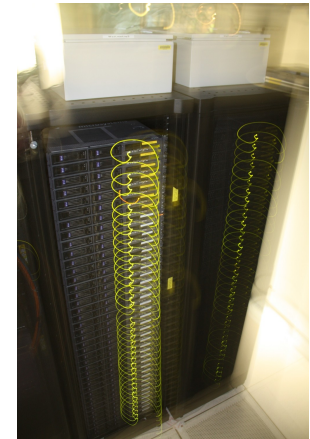
INRIA RESO team in CompatibleOne :

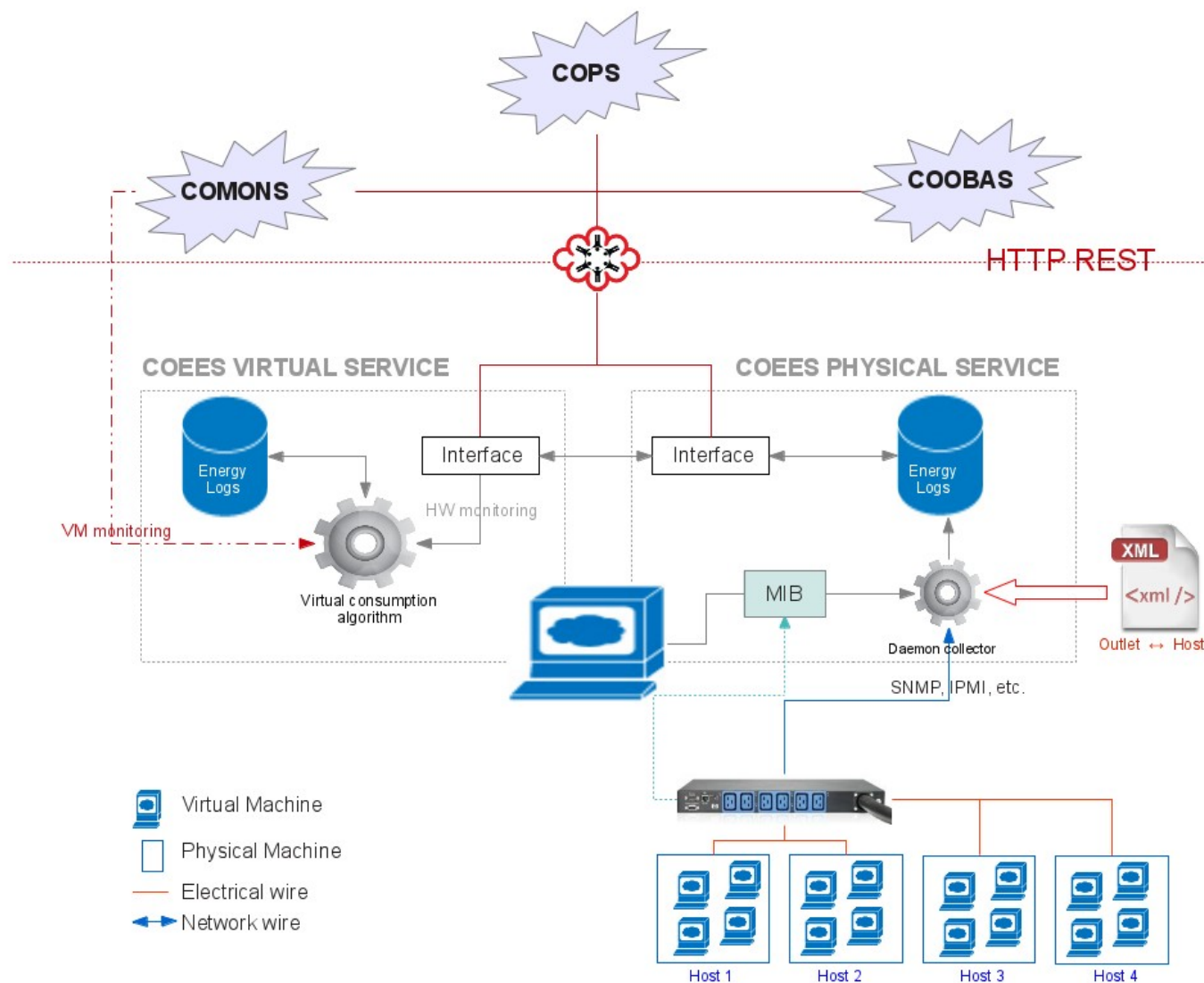
- Technology watch and expertise in energy efficiency
- Design an energy data collector module with a high-abstraction level to the system
- Propose energy aware and energy efficient cloud components

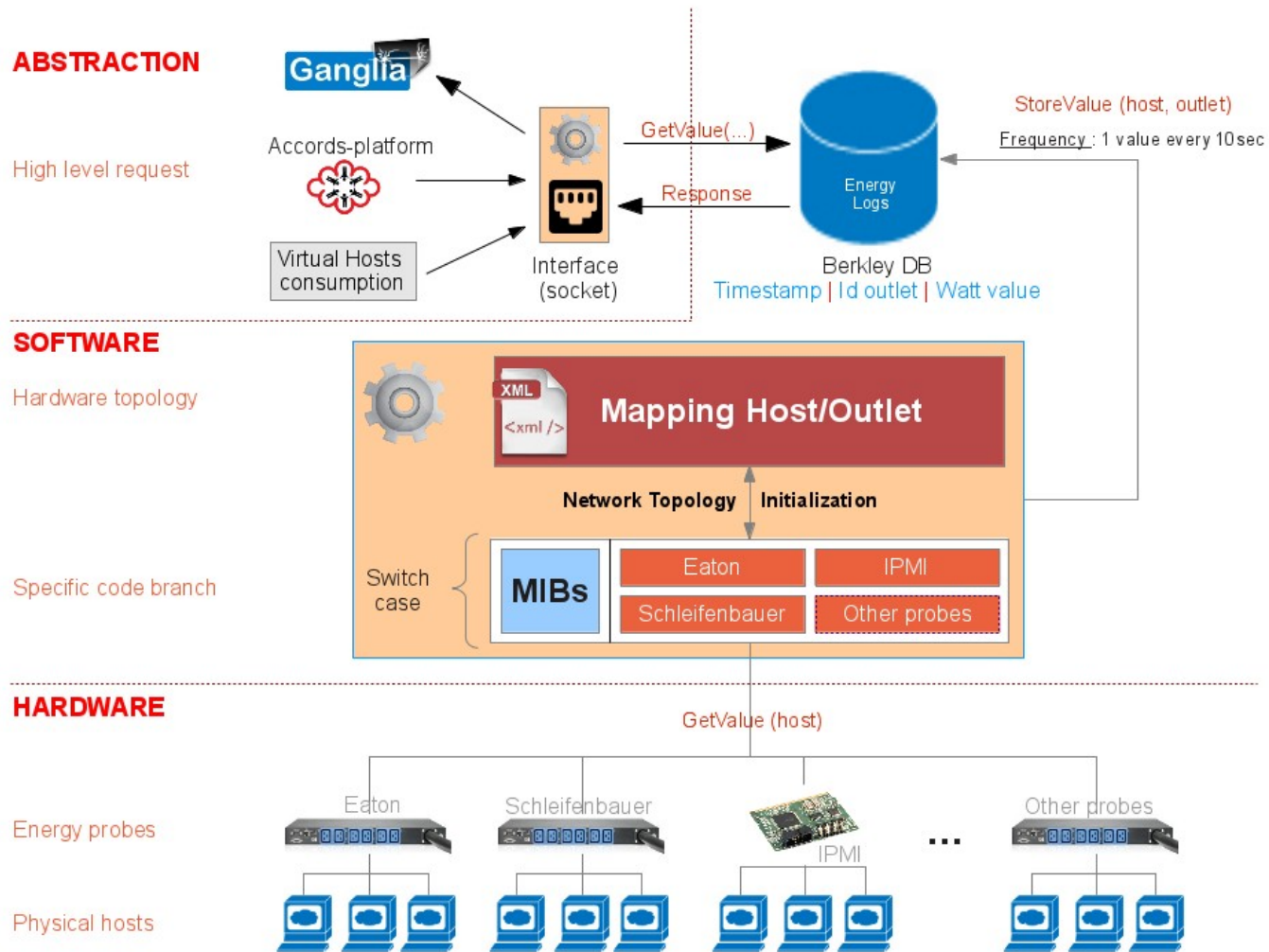
3-layers Energy Data Collector :

- Probes layer : hardware and software probes.
 - Specific layer depending on probes providers.
- Intermediate concentrator layer : gather and consolidate data.
 - Store data with a maximum of details (Berkeley DB).
 - Expose data through dedicated frontend (RESTful, Ganglia)
- CompatibleOne Energy Efficient Services :
 - Data are "adapted" to the CompatibleOne requirements (format, semantic, abstraction).

Name	Protocol(s) / Link(s)	Frequency	Resolution
Eaton	Serial or SNMP / Ethernet	5s	1 W
Schleifenbauer	SNMP / Ethernet	3s	0.1 W
OmegaWatt	IrDA / Serial	1s	0.125 W
Dell iDrac6	IPMI / Ethernet	5s	7 W

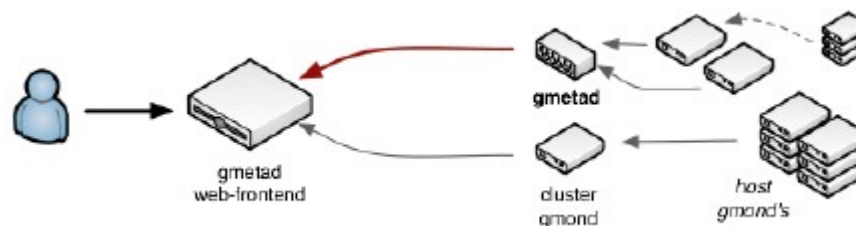






Ganglia :

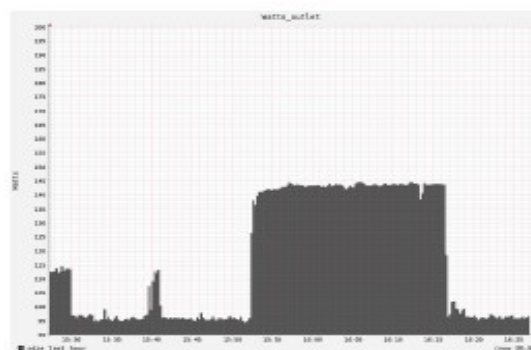
monitoring system for high-performance computing



gmond : a service run on each monitored node/server and collect metrics

gmetad : provide data consolidation and storage into a Round Robin Database (RRD)

Watt value





RESO Cluster Report for Wed, 07 Mar 2012 16:16:28 +0100

Get Fresh Data

Metric **load_one** Last **hour** Sorted **descending**

Physical View

CompatibleOne

INRIA CompatibleOne Grid > RESO > --Choose a Node

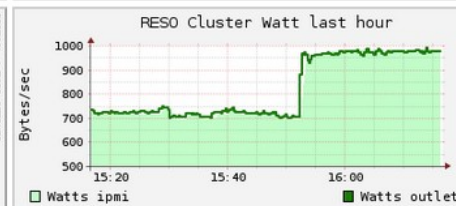
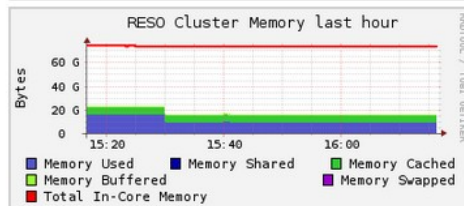
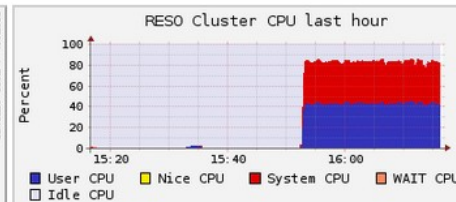
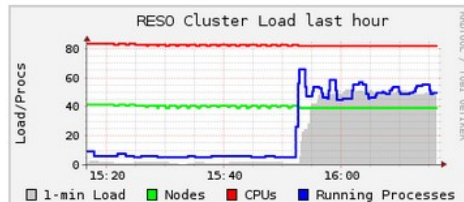
Overview of RESO

CPU's Total: **81**
 Hosts up: **39**
 Hosts down: **0**

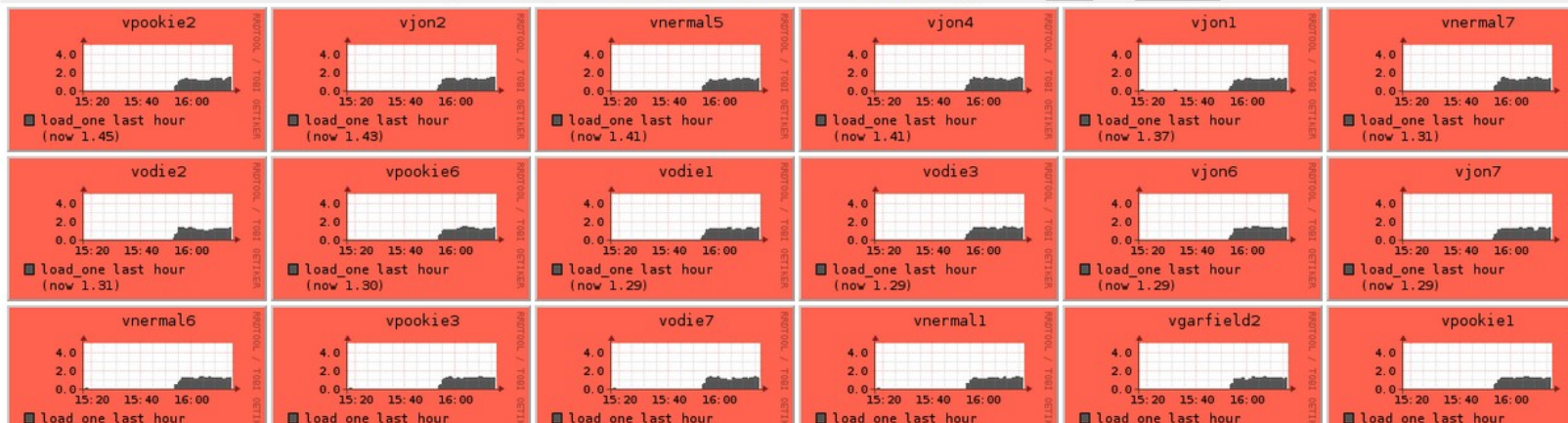
Avg Load (15, 5, 1m):
45%, 59%, 60%

Localtime:
2012-03-07 16:16

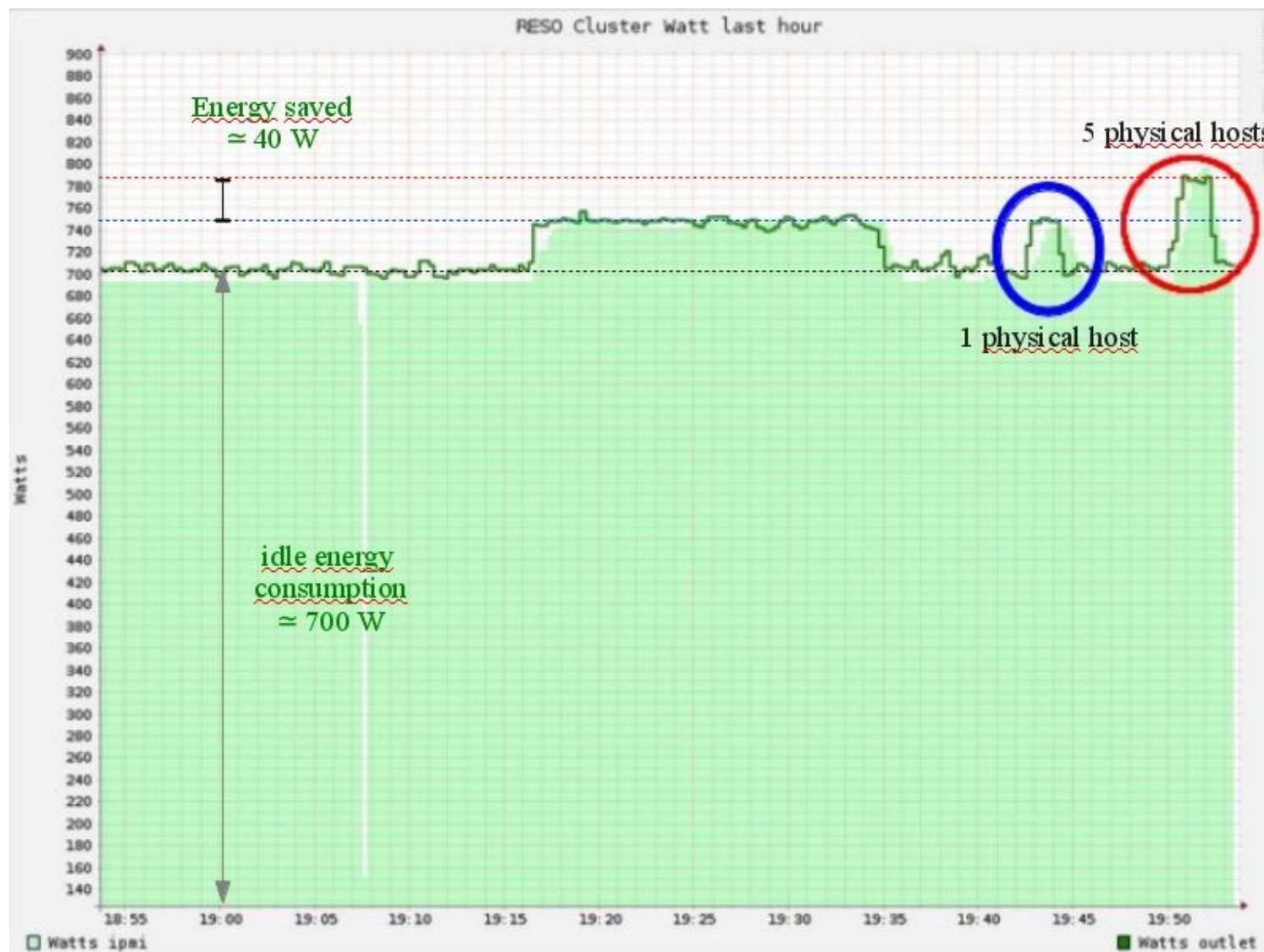
Cluster Load Percentages



Show Hosts: yes no | RESO **load_one** last hour sorted **descending** | Columns **6** Size **small**







谢谢关心

Promoting freedom in the cloud

<http://compatibleone.org/>

- **Contribute**
- **Share**
- **Spread the word**

Julien CARPENTIER

julien.carpentier@inria.fr

INRIA Research Engineer
The French Institute for Research in Computer Science