Cloud Standards for the scientific community –and-beyond?

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SIENA – Taking Europe Towards Interoperable e-Infrastructures


A coordinated effort...

...towards the delivery of a future e-Infrastructures Roadmap....

...aligned with the needs of European and national initiatives and the evolving world.

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Joint Cooperation Report
EGI Cloud Profile
Virtualisation Task Force
Cloud Plugfests

Develop combined Cloud standards verification suite
Roots to Success - OGF-Europe

We also need to stop wasting time & resources reinventing the wheel. .... So where it makes sense, let’s be pragmatic & re-use others’ good results.

Neelie Kroes, VP for the Digital Agenda on 22/09/2011

OGF-Europe ensured all Europe’s Distributed Computing Infrastructures gain tangible benefits via SIENA

Tangible Benefits – European Middleware Initiative

- **EGI & DEISA/PRACE interoperability**
  Thanks to GIN/PGI cooperation with CREAM-BESM, ARC-BES, UNICORE-BES, EMI Consortium for the Unified Middleware Distribution.

- **Interoperability across Europe & the US**
  Thanks to GIN/PGI cooperation with GENESISII-BES & UNICORE-BES leading to joint efforts in XSEDE.

European leadership, in a truly global context.
Foundation for extended distributed computing infrastructure capabilities beyond current imagination.
SIENA in a year

EC Recognition & strong cross unit collaborations in EC together with national efforts

- SIENA Expert Group
  - Prestige – 40 to date
  - REB; SLG & IEG offering global coverage since June–Sept 2010

- Facilitating inter-SDO collaboration (SNIA, OGF, ETSI, DMTF, IEEE, OASIS) since June 2010

- SIENA contributing to SDO only group cloudsstandard.org through growing reputation since July 2010

- SIENA & NIST relations & regular exchanges collaboration since Nov 2010

- Cloudscape-III
  - Raising Awareness
  - high-level EC & speakers & re-focusing
  - Roadmap March 2011

- SIENA & NIST relations & regular exchanges collaboration since Nov 2010

- Regular meetings
  - Collaboration on complimentary parts of the respective roadmaps
  - SIENA REB members participating in the NIST cloud computing working groups.

- 102 participants
  - 30 speakers & roundtable participants
  - Keynote: Robert Madelin, DG INFSO Director-General, European Commission

- Roadmap version 1 launched & printed
  - 20 use cases & position papers printed
  - Streamed live on Channel
  - 16 interviews with speakers
SIENA Recommendations to date

Roadmap version 1

Discourage fragmentation while preserving innovation in the development of e-infrastructure

- Fund long-term development of open standards for interoperability of future EU research & eGov infrastructures
- Engagement of Public sector and commercial providers for shared standards requirements.
- Track emerging standards, technologies, and best practices for a structured repository of open standards and provide guidance to EU e-infrastructure projects and interact with worldwide initiatives
- Definition of sound security policies for access, use and provisioning of services within distributed infrastructures.
- Introduce guidelines for dealing with data privacy, long term data curation, liability and taxation issues for work across legislative boundaries.
- Fund procurement of open source or commercially provided software solutions allowing the research community to innovate in areas where they can add unique value beyond the scope of commercial solutions.
- Fund on-demand cross-domain provisioning of high-speed data transfer links with defined service level agreements.
- Involve Europeans citizens in e-science through volunteer computing (using, e.g., desktop grids and clouds).

Cloudscape III

- Highlight pros, cons, and existing cloud solutions
- For data synchronization industry should provide solutions for access to data in variety of devices outside of the PC.
- Testing activities and demonstrations of cloud standards, technologies and interoperability in different area
- Address integration between grid and cloud technology to increase cloud efficiency
- Apply grid know-how & solutions for cloud security issues
- Ethical strategies for sensitive and confidential data
- Harmonisation of security measures for a more competitive cloud provider market in Europe

Standards in the Cloud, ETSI event Sophia Antipolis
Building a set of interacting standards & operational best practices demonstrate these to various stakeholder communities, from user groups & projects at the national & international scale in research governments & public bodies.

- Goal to reduce costs of ICT implementation for ICT provider & consumer businesses.

Europe has built large scale e-infrastructures with attention paid to end user facing systems.

- These facilities are only able to be built & operated on top of different systems & services.

Services like Authentication, Authorisation & Accounting, monitoring & service discovery must be in place before any service like HPC cloud or database is made available.

- Otherwise each end-user facing system can only operate in isolation.

Standards in the Cloud, ETSI event Sophia Antipolis.
Some samples of Cloud Standards Activities

- **SNIA/CDMI- OGF/OCCI** plugfests aim to achieve real life interoperability of standards in existing implementations. (Santa Clara, CA and Dusseldorf, Germany, Sep 2011)

- **OVF** has become an International Standard (OVF ISO Version ISO/IEC DIS 17203)

- There are work in progress of the new **CIMI** (Cloud Infrastructure Management Interface) specification for IaaS Management.

- **2 new main efforts from OASIS:**
  - **Identity in the Cloud Technical Committee:**
    - Developing profiles of open standards for identity deployment, provisioning and management in cloud computing
  - **Privacy Management Reference Model Technical Committee:** Providing a guideline for developing operational solutions to privacy issues

- Shortly a release of **CDMI** version 1.0.1 (it will be submitted to **ISO JTC 1** ratification on Sep 2011)

Standards in the Cloud, ETSI event Sophia Antipolis
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<th>Grid Standards Activities</th>
<th>What’s out there?</th>
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<td><strong>JSDL</strong> (Job Submission Description Language) is a language for formulating the resource requirements for computational job, requests to be submitted to resources providers such as Compute Centers or more generally Grid Infrastructures. Currently supported via GRIDSAM/UNICORE5 and UNICORE6.</td>
<td><strong>GLUE</strong> schema is intended to describe the components of an e-Infrastructure as well as their state.</td>
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<td><strong>DAIS</strong> (Data Access and Integration Services standard) describes how different kinds of data sources ranging from relational (SQL) data bases to plain XML file repositories can be accessed remotely via Web Services.</td>
<td><strong>GridFTP</strong> is an extension of the standard File Transfer Protocol for use with Grid computing.</td>
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<td><strong>HPC-BP</strong> (High Performance Computing Basic Profile) is a recommendation which defines how to submit, monitor and manage jobs using standard mechanisms across different job schedulers or Grid middleware from different software providers.</td>
<td><strong>RNS/ByteIO</strong></td>
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<td><strong>BES</strong> (Basic Execution Services) defines basic services for Job submission and management. The current version is supported in UNICORE6.</td>
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<td><strong>UR and RUS</strong> (Usage Record ) standard is mainly used for exchanging accounting information across the infrastructure.</td>
<td><strong>WSI-BSP</strong> (WS-I Basic Security Profile) is an interoperability policy that addresses transport security, SOAP messaging integrity and many other related security considerations.</td>
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Supporting standards development for future projects

The roadmap has the opportunity to influence developments in Europe in the project area if it comes up with deliverables and proposals to help Europe be competitive in the areas of research, industry and eGovernment.

Y1 Review Recommendations

- **Technical contributions** – DCI Interoperability challenges – Venue for DCI – SDO collaboration; Cloud Profiling – Supporting OGF DCI Federation Working Group, EGI Virtualisation Task Force
- **eGovernment & Industry uptake** - Analysis of requirements & opportunities for uptake of DCI assets
- **Action Plan** - 1, 3 & 5 year stakeholder action plans – Industry, eGov, Research
- **European Industry** – Increased European membership & contributions
- **International Collaboration** - NIST – Common Requirements - Security & portability verified by the DCIs & NIST use cases; Recommendations - priorities on legislative actions and self-tasking action plans; Exchange between NIST WGs & SIENA REB
EGI Task Force Federated Clouds

• Stakeholders
  1. Resource Centres offer Cloud services
  2. Technology Providers tender solutions
  3. User communities consume cloud services

• 6 scenarios = 6 key federated cloud capabilities
  1. Manage VM instances
  2. Data access/transfer interface
  3. Cloud service information federation
  4. Resource consumption management
  5. Cloud service availability
  6. Notification & Automation

Source: David Wallom / Steven Newhouse - EGI Tech forum 21/09/2011
Sustainable Assets: European Grid Infrastructure

- European federation of resource providers
- Large scale distributed data processing services
- Scalable production infrastructure operating across administrative and trust boundaries
- Collaboration online environments for the ERA
- Service Desk and Consultancy
- Software services to operate the infrastructure

Main target: Scientists and researchers with data intensive computing needs

Sharing insights on Cloud
- Integration of Cloud & Virtualisation
- Federated Clouds Task Force
- Cloud Standards Adoption

Aim – Increase flexibility of infrastructure to expand user communities while allowing easier use of computing to push the boundaries of science.

Assets for Science
- Flexible, federated infrastructure with a diverse set of services
- Community driven ecosystem filled with vast array of experts

Assets for Industry
- Infrastructure for pre-competitive research
- Joint collaborations (software development, knowledge exchange)
- Market for resource providers

Assets for Government
- e-Infrastructure for compute or data intensive processing activities around public policy (e.g. civil/environmental protection, simulations for city planning and citizen trends).

EGI Standards Roadmap
https://documents.egi.eu/document/721
Sustainable Assets: VENUS-C

Robust cloud infrastructure running on an interoperable application environment
PaaS, IaaS, Storage as a Service
User-centric approach with 7 partner scenarios, 15 pilots with seed funds + 5 experiments
Industry quality providers (Engineering & Microsoft) + Experts in distributed computing and standards development (BSC & KTH)
Training platform

Sharing insights on Cloud
- User & developer experiences
- Cloud standards implementation
- Interoperability with StratusLab resources

Main target: Creating a sustainable infrastructure that enables cloud computing paradigms for the research communities

Aim – Expand Cloud usage across a broader and diverse user base than has been possible in the past

Assets for science
Platform for easy porting and execution of eScience applications

Assets for Industry
Innovation clusters coming from architecture and civil engineering: start-ups, spin-offs & portfolio of value-add services

Assets for Government
Platform interoperable with different providers avoids vendor lock in

Standards
Occi  CDMI  OVF  BES/JSDL  RUS  SAML

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Sustainable Assets: StratusLab

Open-source IaaS Cloud + Grid Services & Apps
Private or federated Cloud: Research & Public Services
Private & public Clouds for Industry
MPI clusters & MapReduce clusters
Foundation layer for PaaS & SaaS

Main target: resource providers deploying IaaS Cloud service offering

Sharing insights on Cloud
- User & developer experiences
- Cloud standards implementation – VENUS-C

Assets for science
Provision of Cloud distribution optimised for hosting Grid services + Cloud tools & APIs

Assets for Industry
Share pre-installed apps or customised desktop environments

Assets for Government
Pre-installed apps or desktop environments for agencies

Standards: Infrastructure & VMs
- OCCI
- CDMI
- OVF
- Authorisation & security
- XCAML & SAML

CDMI OVF

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**Sustainable Assets: European Desktop Grid Initiative**

**Supercomputing:** PRACE  
**Clusters:** EGI, Open Science Grid, D-Grid  
**Volunteer Desktop grids:** AlmereGrid, SZTAKI  
**Cloud:** 2 pilots in VENUS-C for Bioinformatics  
Sharing of resources with VENUS-C. StratusLab & OpenNebula.

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**Users are app developers & their communities**

**Assets for science**  
Apps from astronomy to medicine  
On-campus resource optimisation

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**Assets for industry**  
VENUS-C pilot potential for pharma & healthcare.  
Video surveillance  
Shared rendering capacity  
Finance & Simulation

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**Why integrating Cloud?**  
- Quality of Service  
- Software Distribution

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**Standards**  
OGF Grid & de facto standards

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**Distributed computing**

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**Siena**  
Standards and Interoperability for e-infrastructure implementation initiative
How to ratify Standards - A Practical Case Today on WSRF - Web Services REsource Framework

Production quality software delivered:
gCube

Diligent
Empower the Grid middleware

D4Science
Stabilize gCube by supporting user communities

D4Science II
Promote interoperability across eInfrastructures

Projects

Total costs 18M€

OGSI
Open Grid Service Infrastructure

WSRF
Web Services REsource Framework

WSRF v1.2
Std. & Reference implementations

GT3
Ref. Impl.

GT4
Ref. Impl.

GT5
No web service support

WS-DAIX
What reference?

Bottlenecks
SOAP engine – Axis 1.2RC: was adopted in 2004, but in 2007 it became obsolete
GT4 technology is old: projects components had to downgrade them to run on GT4
Missing
Lack of commercial solutions: no big vendor supported WSRF that was though very successful in the science domain

SDO Action Agendas are key to success

Unexpected
GT5 dropped support for WSRF standard, so new technologies and new frameworks are needed

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Interoperability Efforts

- Feed back experience from implementations, write implementation
- Experience documents and user guides
- Develop combined OCCI / CDMI / OVF verification suite
- Stress/scaling testing, performance studies at scale.
- Interoperability testing w/ OGF Cloud Interoperability efforts.
- Extending OCCI with monitoring / reservation capabilities.
- Integration with other OGF & relevant standards.

Active «Cloud Plugfests» OCCI & CDMI implementations
OVF integration under active development & progressing
Dates: Apr, Jul, Sep 2011 & Spring 2012

Purpose for vendors to bring implementations of CDMI & OCCI to test, identify & fix bugs in a collaborative setting Request SDOs to participate

- Remote participation encouraged
- Goals: Harmony testing
- Implementations and test instances are collected in a wiki http://plugfest.sniacloud.com/wiki/index.php

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Call to Action

How can Public and private sectors of the European economy better understand what to expect and what to target with standardised Cloud platforms?

Engaging with relevant SDOs/public & private bodies will attract the right level of people to perform demos/prototypes/interop tests/etc.

Govt. & EC could set the bar of readiness for the EU market.