Esperienze di standardizzazione, interoperabilità e interdisciplinarità a livello internazionale

Elisabetta Ronchieri

Summary

- Open solutions

- Roadmaps for adopting cloud computing properly

- Task Force

- A Promising Product

- Conclusions

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OPEN SOLUTIONS

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Open solutions

- Wide adoption of open-source software and open-standards allows:
  - customers not to fear vendor lock-in
  - institutions to participate in a growing market that provide a wide variety of cloud technology and service providers
- Open solutions are developed with a process open to all interested parties
- Open standards are important in general, because they ensure interoperability in a well-designed formalism
- Open standards in the field of health care, financial services, automotive, retail, energy and others favor a more quick and easy sharing of information at a lower costs

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Open Standards

- **DMTF's Open Virtualization Format (OVF)** is a packaging standard designed to address the portability and deployment of virtual appliances

- **DMTF's Open Cloud Standards Incubator** focuses on standardizing interactions between cloud environments by developing cloud management use cases, architectures and interactions

- **CMWG's Cloud Infrastructure Management Interface (CIMI)** is an interface to manage cloud infrastructure

- **OGF's Open Cloud Computing Interface (OCCI)** is a Protocol and API for all kinds of Management tasks suitable to serve many cloud models in addition to **IaaS**, including e.g. **PaaS** and **SaaS**

- SNIA's Cloud Data Management Interface (CDMI) defines the functional interface that applications use to create, retrieve, update and delete data elements from the Cloud

Open Standards

- Security, access and identity policy standards -- e.g., **OASIS SAML, XACML, SPML, WS-SecurityPolicy, WS-Trust, WS-Federation, KMIP, and ORMS**

- Content, format control and data import/export standards -- e.g., **OASIS ODF, DITA, CMIS, and SDD**

- Registry, repository and directory standards -- e.g., **OASIS ebXML and UDDI**

- SOA methods and models, network management, service quality and interoperability -- e.g., **OASIS SCA, SDO, SOA-RM, and BPEL**

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Open Initiatives

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ROADMAPS - NIST

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NIST – National Institute of Standards and Technology

- **The technology leadership role** in support of the United States Government (USG) to a secure and effective adoption of the cloud computing model

- **A central role** in defining and advancing standards, and collaborating with USG Agency CIOs, private sector experts, and international bodies to identify and reach consensus on cloud computing technology & standardization priorities

Roadmap

- **Purpose consists of**
  - fostering adoption of cloud computing by federal agencies and support the private sector
  - reducing uncertainty by improving the information available to decision makers
  - facilitating the further development of the cloud computing model
- Scope is
  - **to prioritize strategic and tactical requirements** that must be met for USG agencies to further cloud adoption;
  - **to define and recommend interoperability, portability and security standards, guidelines, and technology** that need to be in place to satisfy these requirements; and,
  - **to candidate Priority Action Plans (PAPs)** which are recommended for voluntary self-tasking by the cloud computing stakeholder community to support standards, guidelines, and technology development.

The Identified Requirements [R1]

1. **International voluntary consensus-based interoperability, portability, and security standards** to ensure that investments do not become obsolete and to easily change cloud providers

2. **Solutions for high-priority Security Requirements** to inspire confidence and trust to a level where security is not perceived to be an impediment to the adoption of cloud computing

3. Technical specifications to enable development of consistent, high-quality Service-Level Agreements

4. **Clearly and consistently categorized cloud services**
   - both to allow *customers to understand the types of cloud services and better select which of them are suitable to meet their business objectives*
   - *and to allow providers to have a clear guidance where interoperability and portability must exist within similar categories of cloud services*

5. Frameworks to support seamless implementation of federated community cloud environments

Identified Requirements [R1]

6. Technical security solutions which are de-coupled from organizational policy decisions

7. Defined unique government regulatory requirements, technology gaps, and solutions

8. Collaborative parallel strategic "future cloud" development initiatives

9. Defined and implemented reliability design goals

10. Defined and implemented cloud service metrics

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ROADMAPS - SIENA

SIENA - Standards and Interoperability for eInfrastructure implemeNtation initiAtive

- **A Support Action** (2010-2012) funded by the European Commission under FP7 (2007-13) Capacities programme

- **Aimed at** accelerating and coordinating the **adoption and evolution of interoperable Distributed Computing Infrastructures (DCIs)** through reinforcement of the **open standards message**

- **Especially,**
  - SIENA favors the **adoption of interoperability and standards for infrastructure implementation** in relation to the European DCI community & Standard Development Organizations (SDOs),
  - It elaborates the future research infrastructure scenario **through a roadmap** by **fulfilling requirements from both academia and industry**, and **connecting into relevant SDOs** in order to produce relevant standards and best practices,
  - and SIENA also supports, plans and organizes a **series of outreach events** such as **Cloudscape III** and **Cloudscape IV**

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Roadmap

- **Purpose has consisted of**
  - assessing the situation, identifying challenges, and making recommendations to support research in Europe

- **Scope for such a European e-infrastructure is**
  - to empower productivity of research communities through ubiquitous, trusted, easy trans-national access to services for data, computation, communication, and collaborative work in the ERA

- **Scope applies also**
  - to computing in industry and the public sector (e.g. e-government)

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Standards and Interoperability for
eInfrastructure implementation initiative

Roadmap on Distributed
Computing Infrastructure for
e-Science and Beyond in Europe

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Some of the Identified Challenges [R3]

- Conflicting and inappropriate requirements
- **Standardization challenges** mainly because of the amount of organizations involved in cloud standardization efforts
- **Security challenges** addressed by industry and government in completely different ways
- **Data Management challenges** mainly because of the vast amount of data collectors used by research projects.
- **Challenges in understanding terminology and approaches**
- **Legal and regulatory environments**, e.g. cross-border data movement
- **Globalization challenges** due to no appropriated set of agreed and accepted standards for portability or interoperability
- **Entrepreneurship challenges** because of the lack of atmosphere conducive to entrepreneurial activity in Europe
- **Collaboration efforts** in order to effectively reuse open solutions

Recommendations: Immediate Actions [R3]

- The following actions will be covered in the next 12 months:
  - **Establish an e-infrastructure implementation advisory group**
  - **Determine optimum deployments of cloud computing for research applications**
  - **Strengthen, collaborative international dialogue for achieving interoperability and portability**
  - **Strive for a common approach for contributing to the European Digital Market**
  - **Expand support for DCI efforts to provide mechanisms to federate across multiple cloud suppliers**
  - **Introduce measures to provide open access to all relevant SDO standard documentation**
  - **Introduce business models for use of clouds by research**
  - **Review public sector procurement regulations**
  - **Re-use tangible and intangible assets produced by DCIs**
  - **Establish an e-infrastructure Implementation Advisory Group**

Recommendations: Medium Term Actions [R3]

- The following actions will be covered in a maximum of three years:

  - **Co-ordinate harmonization of global regulations for trans-national data flows**

  - **Create an inventory of grid and cloud standards for research, and proven implementations, aligned with the NIST Cloud Standards Inventory and similar activities of other relevant groups and organizations**

Roadmap Feedback

"The SIENA Roadmap demonstrates that Europe has a huge potential for innovation. I encourage you all to pay particular attention to this Roadmap, to discuss it, to question it, bring it together with other aspects that may also need particular attention. Essentially to help calibrate it and bring its recommendations into actions so that Europe can be not only cloud friendly but also cloud active" Mario Campolargo, Director DG INFSO Emerging Technologies and Infrastructures at the EC, Cloudscape IV keynote on cloud computing for the Digital Agenda.

TASK FORCE – EGI FEDERATED CLOUDS

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Objectives

- **Integration of virtualised resources with EGI's production infrastructure** – e.g. monitoring, accounting and resource publishing

- **End-user requirements**

- **Technical feedback to technology providers** - the deployment of their implementations needs to address any changes

- **Early adopters** – They are all the user communities willing to verify the resulting virtualised infrastructure

- **Recommendations** – They face issues that need to be addressed by other areas of EGI – e.g. policies, operations, support and dissemination.

From M. Turilli's presentation [R4]

Mandate, Activities and Outputs

- **Mandate** - 18 months, September 2011 – March 2013

- **Workgroups** - Investigate a specified set of capabilities for a federation of clouds. VM/Data management, information system, accounting, monitoring, notification, federated AAI, VM repository and brokering

- **Engagement** - identification of resources centres and user communities willing to commit actively to this Task Force

- **Dissemination** - periodic "success stories" through dissemination channels

- **Blueprint document** - advice/full documentation to resource providers/ users on how to engage with the federated virtualised environment

- **Test bed** - deploy interfaces and services for a federated cloud on the basis of the Task Force blueprint and the available standards and technologies.
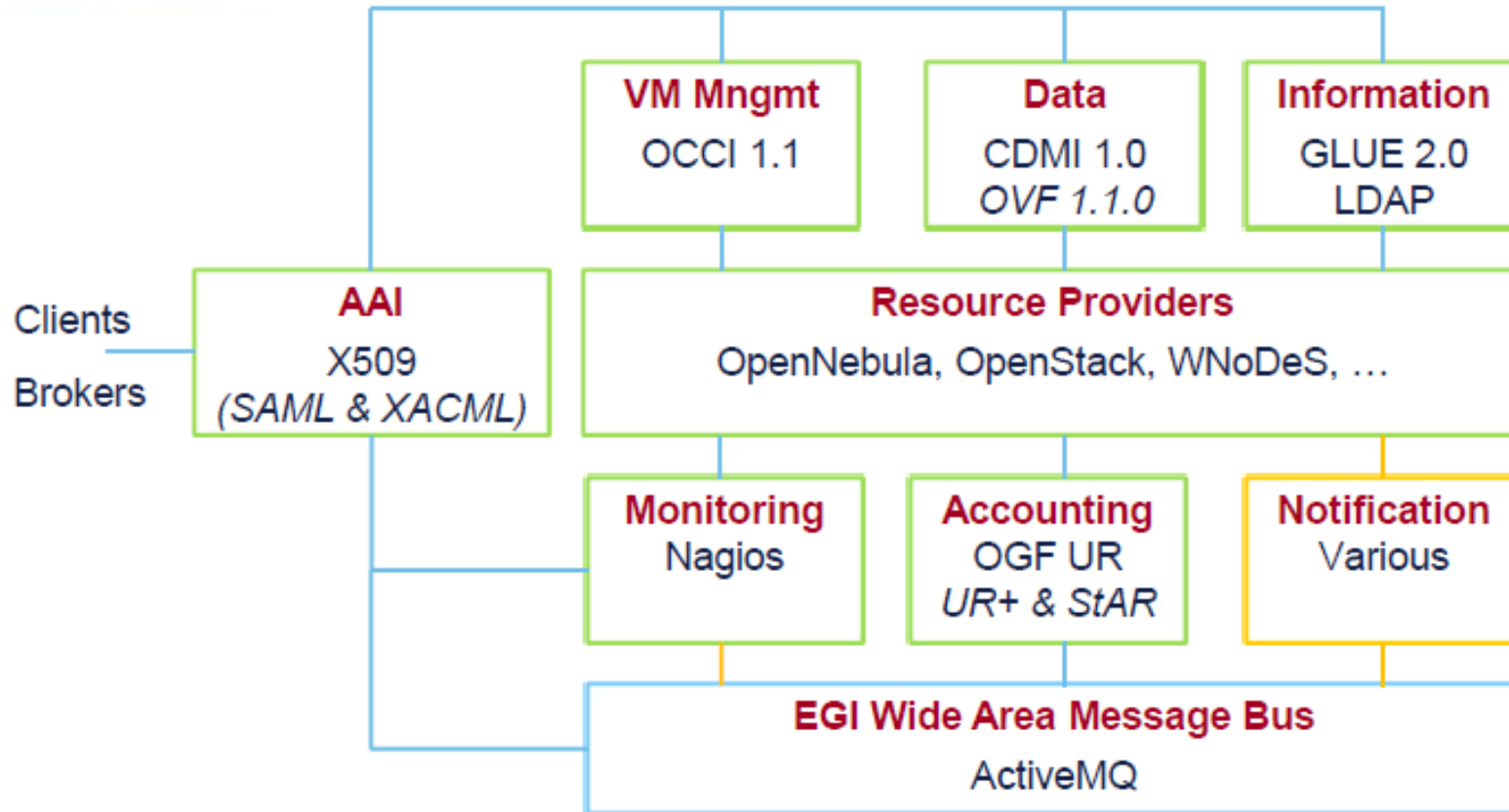
From M. Turilli's presentation [R4]

Principles

- **Standards and validation** - the goal of the TF effort is to produce a validation procedure for clouds federation based on the emerging standards in Cloud Computing. E.g. OVF, OCCI, CDMI, etc.

- **Resource typologies** - EGI offers already a number of validated services to the community. Virtualisation and Cloud Computing should be considered just as another type of resource to integrate into the existing production infrastructure.

- **Heterogeneous implementation** - there should be no specific mandate on the implementation of virtualisation/cloud technology but only the validation of a prescribed set of functionalities, standards and interfaces.

- **Provider agnosticism** - no distinction should be made on the nature of each provider. Private, public, research and business oriented should make no difference once the federation criteria have been established and agreed upon.

From M. Turilli's presentation [R4]

Testbed

From M. Turilli's presentation [R4]

Consolidation

- **Period** – Mar/Sep 2012

- **Federation** with OCCI/CDMI deployment

- **Monitoring** Metrics and Availability -> performance

- **Publishing Information** through GLUE2 extension and its usage from the Resource Providers

- **Accounting** OGF UR extension

- **Federated AAI** throuth RP account integration and VOs

- **Image management** by supporting multiple storage model

- **Reviewing available solutions of brokering**

From M. Turilli's presentation [R4]

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A PROMISING PRODUCT

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WNoDeS – Worker Nodes on Demands

- **A software framework** created by INFN **to integrate grid and cloud resource provisioning through virtualization**:
  - **Key feature:** all resources (provided via Grid or Cloud or else) are taken from a common pool to avoid static partitioning.
  - **Key feature:** resource matchmaking policies are handled by an LRMS (i.e. either LFS or Torque/Maui at the moment).

- **Scalable and reliable** – it is in production at several Italian centers, including the INFN Tier 1 since November 2009
  - Currently managing about 2,000 on demand Virtual Machines (VMs) there in the same time.

From E. Ronchieri's presentation [R5], and D. Salomoni's presentation [R6]

WNoDeS – Worker Nodes on Demands

- **Totally transparent** for grid users and users of traditional computing centers batch systems

- **Leveraging** proven **open source software technologies** like Linux KVM, Torque/Maui, EMI gLite middleware

- **Non-invasive for an existing farm** - WNoDeS can **coexist and share resources** with a traditional computing cluster not using virtual machines

- **WNoDeS version 2.0.0-2 ready for EMI 2** to be released on May 18, 2012

- **The production solution for integrating grid and cloud infrastructure offered by IGI**

From E. Ronchieri's presentation [R5], and D. Salomoni's presentation [R6]
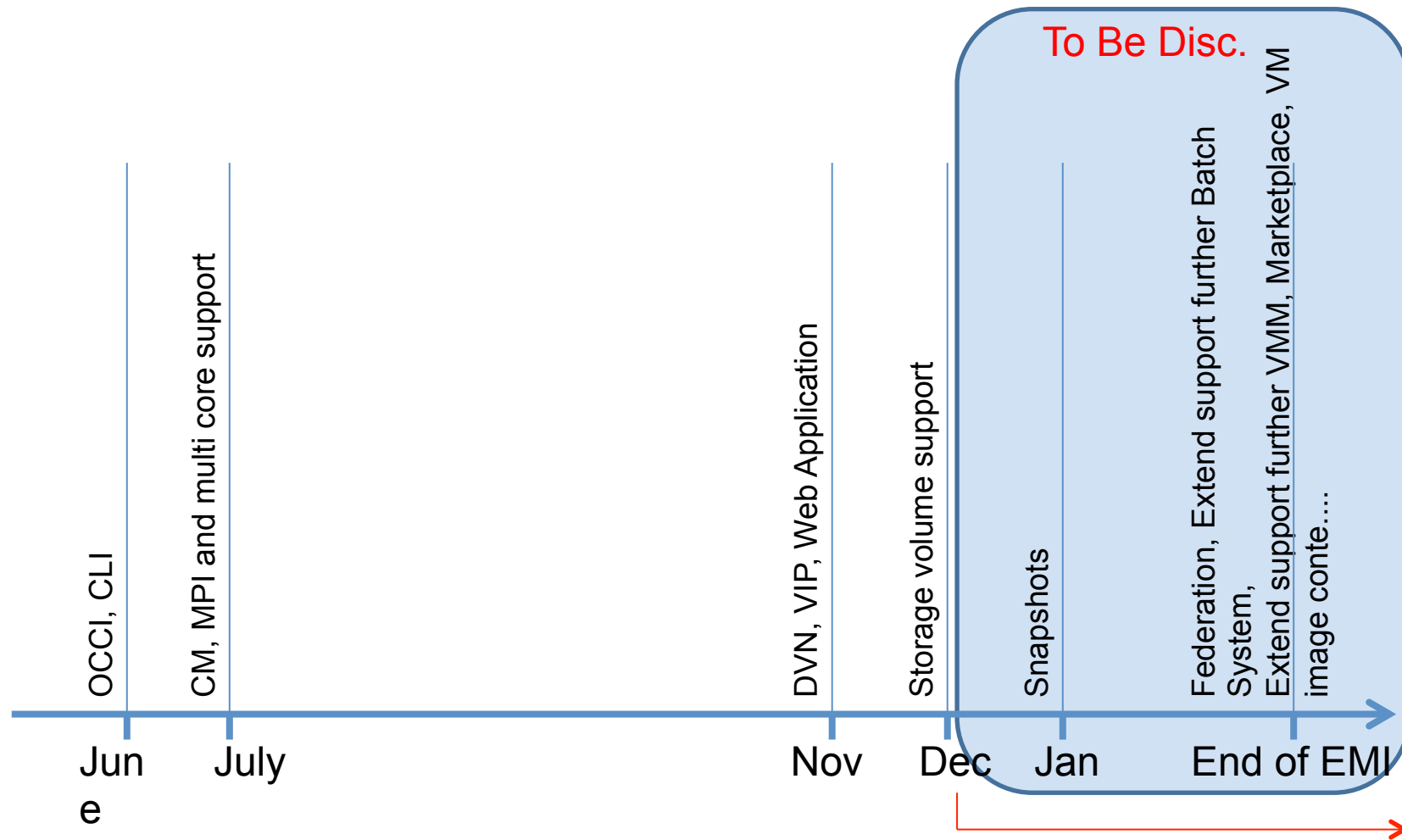
Some Upcoming Features

- **Several of the following features will be released in the coming months also as EMI updates**

- **Interactive usage** – This supports self-instantiation of VMs by local users:
  - These VMs can be used for e.g. analysis tasks, testing purposes, and so on.
  - As with other WNoDeS services, resources can be taken from the general purpose Tier 1 farm (no service partitioning, unless one specifically configures it.)

- **Cloud computing**
  - OCCI compliance – This will be compliant to OCCI 1.1 (validated e.g. through doyouspeakocci) and accessible via a CLI
  - Web interface
  - Both implementations will use x.509 + VOMS to authenticate and authorise users

Some Upcoming Features

- **Dynamic virtual networks** – This will not require using 802.1q to partition networks and will allow dynamic instantiation of private VLANs (either local or across multiple sites) and address assignment for VM isolation – a much needed feature in cloud environments
  - more details in Marco Caberletti's presentation [R7]
- **Integration of multiple authentication methods** – The current WNoDeS cloud Web application and OCCI interface use X.509 + VOMS
  - this will be extended to support federated access
- **Storage volume support** – This will allow dynamic instantiation and connection to VMs of persistent storage volumes

From D. Salomoni's presentation [R6]

WNoDeS Timeline

To Be Disc.

OCCI, CLI

CM, MPI and multi core support

DVN, VIP, Web Application

Storage volume support

Snapshots

Federation, Extend support further Batch System,
Extend support further VMM, Marketplace, VM image conte....

Jun e   July   Nov   Dec   Jan   End of EMI

From D. Salomoni's presentation [R6]

2013

CONCLUSIONS

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Conclusions

- Wide adoption of open-source software and open-standards should be the goal of everyone in the future

- Up to now there have been a lot of cloud initiatives at international level funded by European Commission and local governments producing excellent outcomes in terms of standards adoption, open software adoption, sustainability and roadmap, such as Stratuslab, WNoDeS and SIENA

- SIENA & NIST have developed a working relationship to help exchange efforts in common needs, recommendations and next steps

- The near future, nevertheless, needs to consider the period of austerity that is afflicting the whole world and that will delay further developments in this area

- WNoDeS, for example, is a collaboration between INFN and IGI. Therefore, **solutions to mantain this framework and continue to be leader in this area need to be found by INFN**

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