Open Grid Forum

OGF Standards for the Cloud

Alan Sill – OGF VP of Standards, Texas Tech University
Andy Edmonds – OCCI co-chair, Intel Corporation
Thijs Metsch – OCCI co-chair, Platform Computing

ISO/IEC JTC 1 SC38 Open Meeting and Cloud Summit
May 18, 2011
DMTF Alliance Partner Technical Symposium
May 16-20, Boulder, Colorado

Open Forum – Open Standards

OPEN GRID FORUM

OGF Organizational Members and Sponsors

OpenGridForum
OPEN FORUM | OPEN STANDARDS

Gold Organizational Members

CYBERA
FUJITSU
ORACLE

Emerald Sponsors (OGF 30)

CISCO
Microsoft

Silver Organizational Members

Future Grid
Altair Engineering
Fermilab
AIST
UNICORE
University of Virginia
SURF NET
INTERNET2
NetApp Go further, faster
MIMOS
GRID FORUM KOREA
ca
Grid Consortium Japan グリッド協議会
GF
canarie

Project Members

euindiagrid 欧印グリッド

OGF and the Standards Development Process

- OGF began, based on previous roots in Grid Forum, Global Grid Forum and the Enterprise Grid Alliance, as an **open community** committed to driving the **rapid adoption** and evolution of **large-scale applied distributed computing**.
- Its current mission is to provide a vehicle for development of **open standards** of practical utility in such infrastructures.
- OGF contributors and members consist of representatives of **large-scale grid and cloud providers** and their user communities, with an emphasis on participants from **high transaction-rate, high throughput and high performance computing** projects.
- It is committed on a long-term basis to an **open, community-based and democratic process** for standards development and organizational operations.

Overview of Standards Areas

OpenGridForum
OPEN FORUM | OPEN STANDARDS

Applications	Architecture
Compute	Data
Infrastructure	Liaison
Management	Security

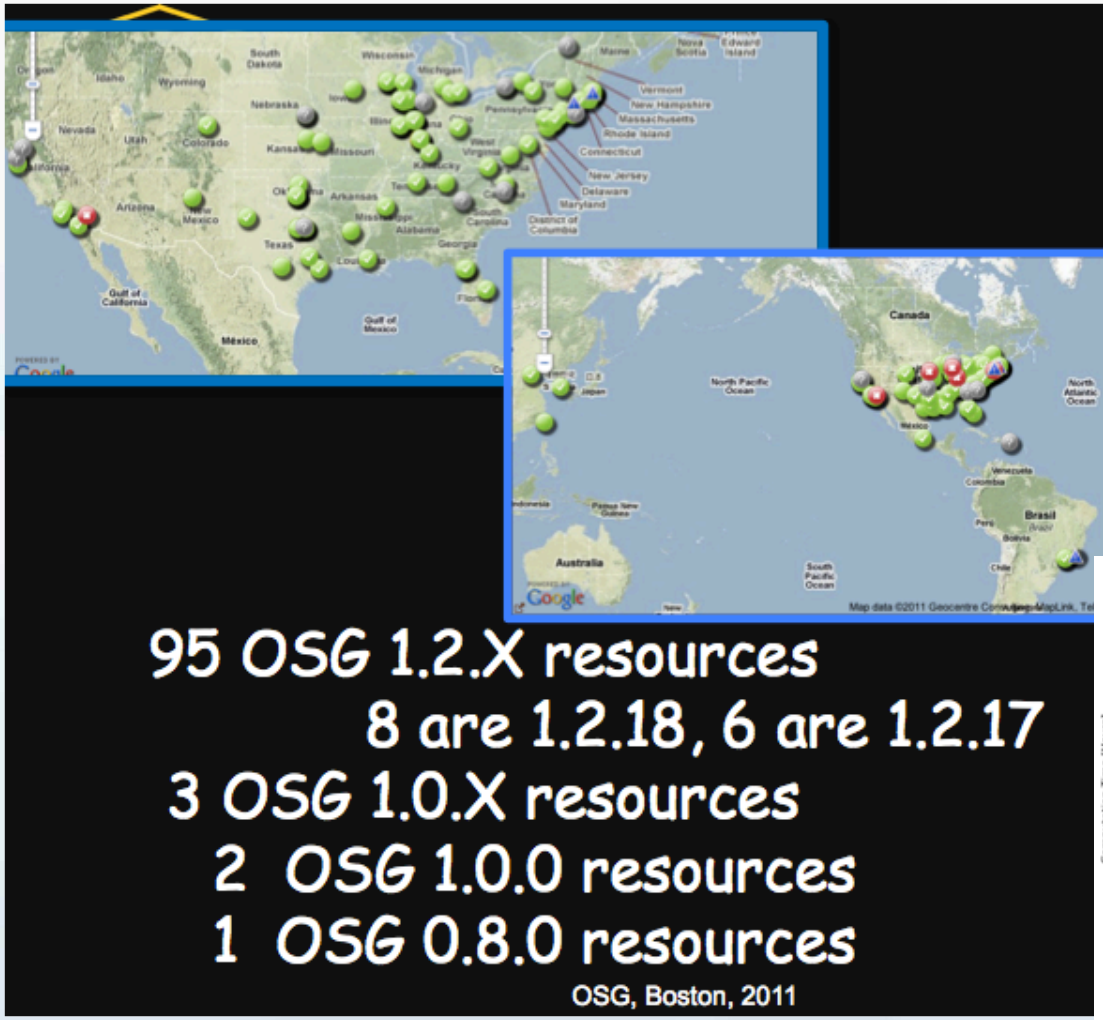
OGF Standards Working Groups

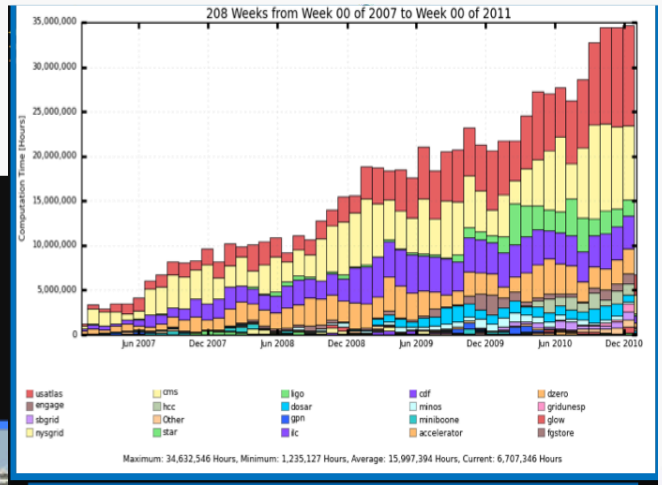
Applications	Distributed Resource Management Application API WG (drmaa-wg) Grid Remote Procedure Call WG (gridrpc-wg) Simple API for Grid Applications WG (saga-wg)
Architecture	OGSA Naming Working Group (ogsa-naming-wg) Open Grid Services Architecture WG (ogsa-wg) Production Grid Infrastructure WG (pgi-wg) Reference Model Working Group (rm-wg)
Compute	Grid Resource Allocation Agreement Protocol WG (graap-wg) Grid Scheduling Architecture RG (gsa-rg) High Performance Computing Profile WG (hpcp-wg) Job Submission Description Language WG (jsdl-wg) OGSA Basic Execution Services WG (ogsa-bes-wg) OGSA Resource Selection Services WG (ogsa-rss-wg)
Data	Data Format Description Language WG (dfdl-wg) Database Access and Integration Services WG (dais-wg) Digital Repositories Research Group (dr-rg) Grid File System Working Group (gfs-wg) Grid Storage Management WG (gsm-wg) GridFTP WG (gridftp-wg) Info Dissemination WG (infod-wg) OGSA ByteIO Working Group (byteio-wg) OGSA Data Movement Interface WG (ogsa-dmi-wg)
Infrastructure	Firewall Virtualization for Grid Applications WG (fvga-wg) Grid High-Performance Networking RG (ghpn-rg) Network Mark-up Language Working Group (nml-wg) Network Measurement and Control WG (nmc-wg) Network Measurements Working Group (nm-wg) Network Service Interface WG (nsi-wg) Open Cloud Computing Interface WG (occi-wg)
Liaison	Standards development organizations Collaboration on networked Resources Management (scrm-wg)
Management	Access to Remote Instrumentation in a distributed environment – Working Group (ari-wg) Distributed Computing Infrastructure Federation Working Group (dcifed-wg) GLUE Working Group (glue) OGSA Resource Usage Service WG (rus-wg) Usage Record WG (ur-wg)
Security	Certificate Authority Operations WG (caops-wg) Firewall Issues RG (fi-rg) Levels of Authentication Assurance Research Group (loa-rg) OGSA Authorization WG (ogsa-authz-wg)

OGF Initiated, Developed and Shepherded Grid Computing!

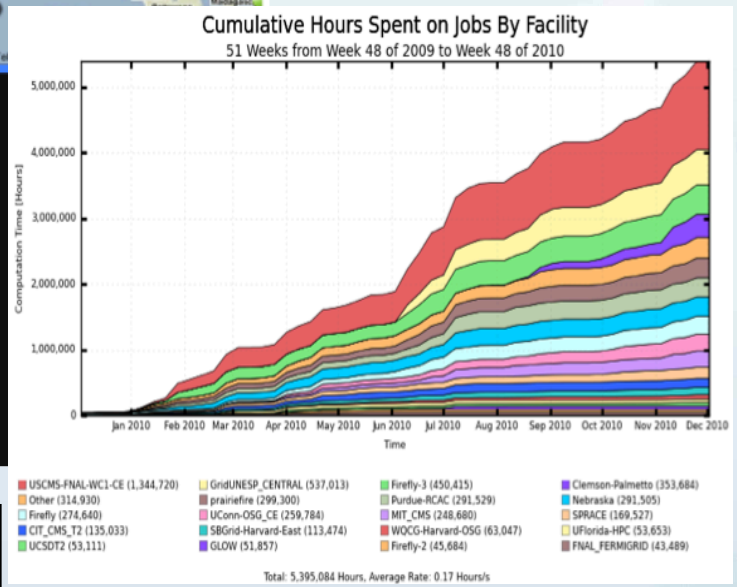
- Since its inception in 2001, OGF has developed and encouraged adoption of a large number of standards in
  - compute-intensive,
  - data-intensive,
  - infrastructure-related and
  - job management related topics
- These enjoy a high degree of adoption in ***all areas*** of grid computing. (Summary at http://www.ogf.org/standards/)
- A large number of implementations exist that ***permeate*** *the fields of large-scale computational infrastructure* and that ***form the basis*** *of the current production-oriented distributed scientific computational and data grids.*

Open Science Grid in 2011





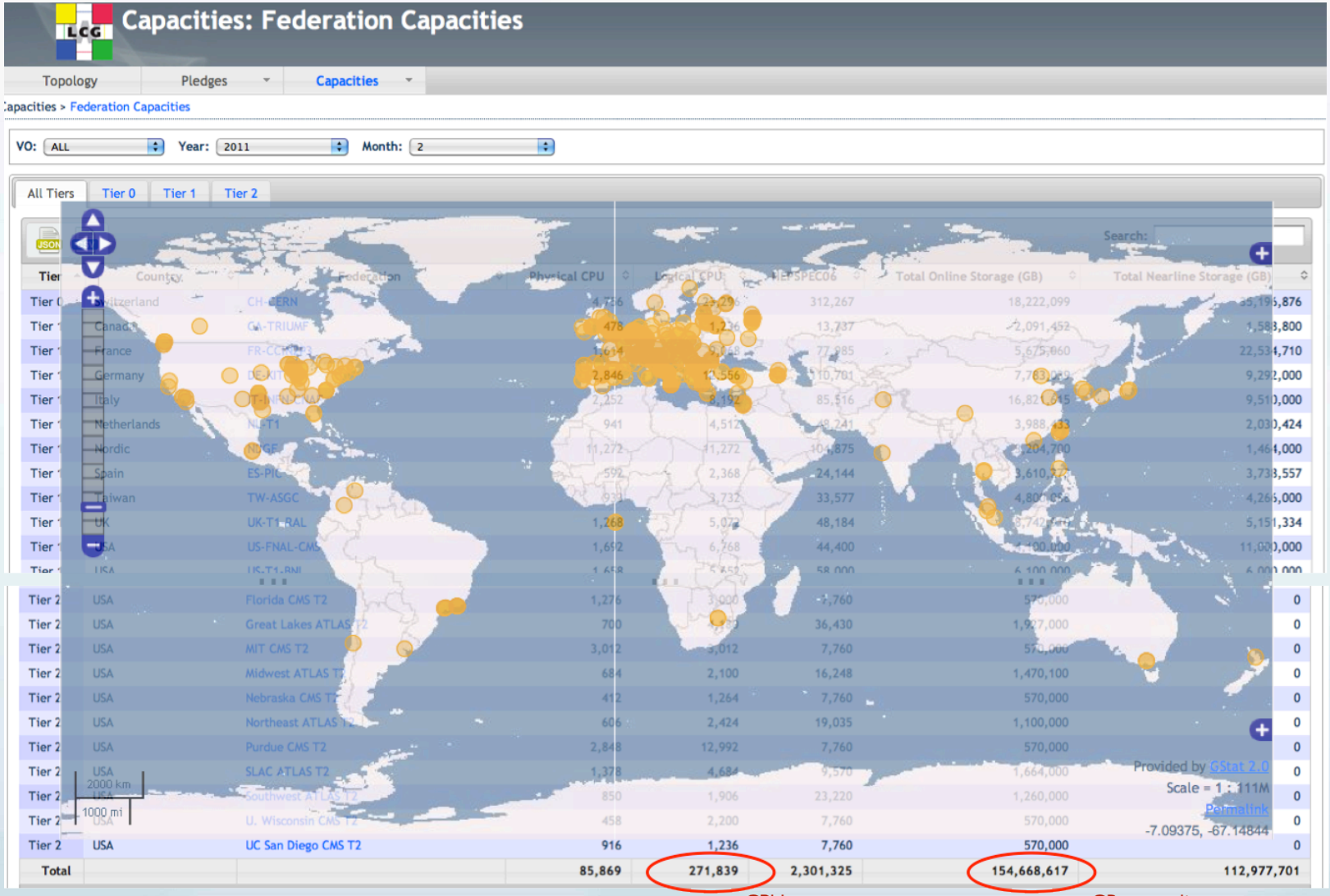
Daily Usage of >1,000,000 hours/day
20 Communities showing usage (~4 are multi-science)



US-Based National Science Shared Infrastructure

WLCG in 2011 - One of Many Large-Scale Production Grids:

OpenGridForum
OPEN FORUM | OPEN STANDARDS



CPU cores

GBytes online

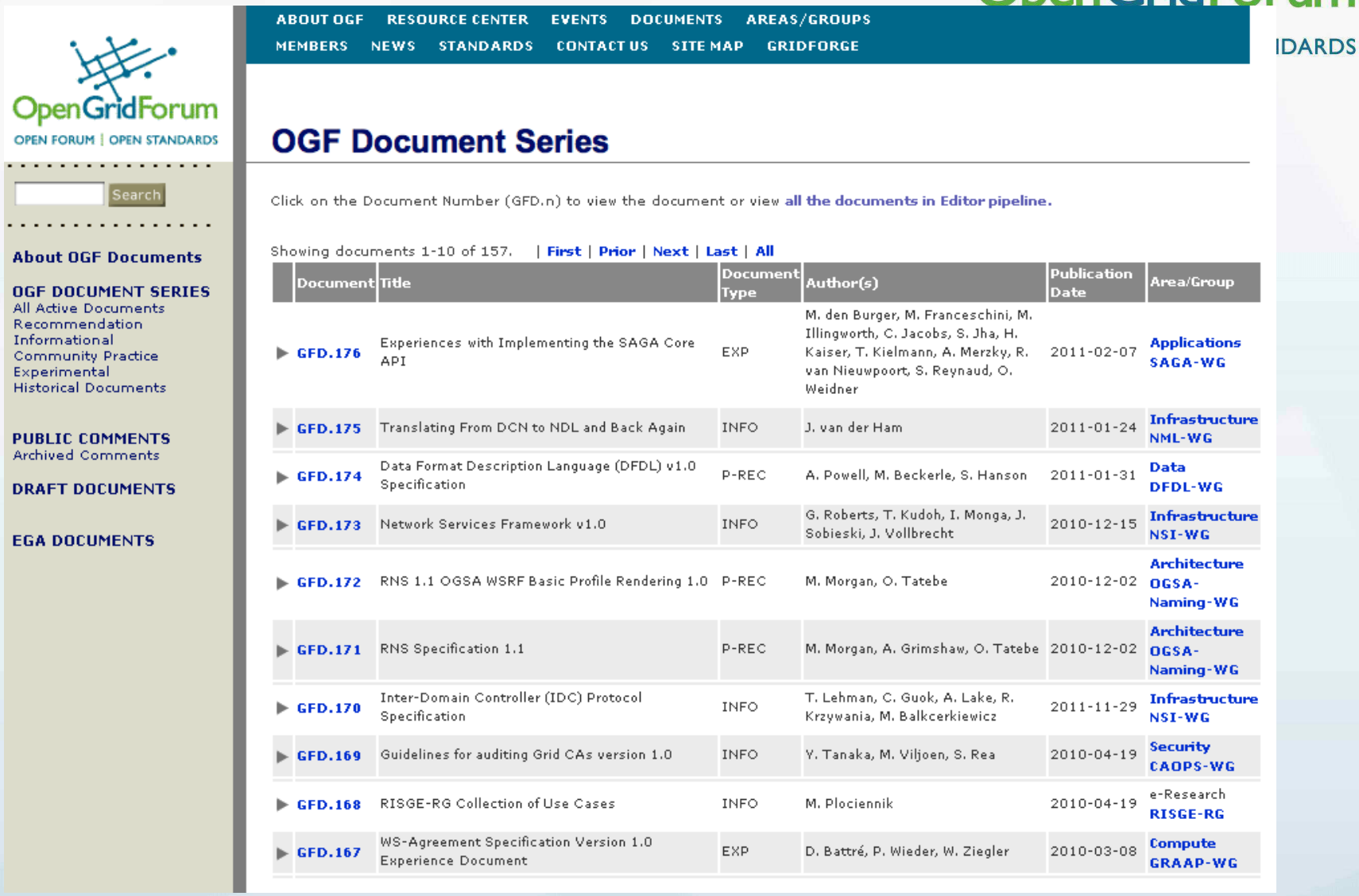
OGF and International Standards

- OGF views its mission as integrally tied to the creation and implementation of **practical standards** of use across a wide variety of boundaries.
  - Interoperability and utility for implementation for multiple stakeholders, both commercial and academic, is essential
  - Interoperability and usability across international boundaries for efforts pursued on a global basis is required
- OGF's approach to standards creation and curation promotes development of standards that will be of use in **large-scale production deployments**.
- Standards are developed by **participants** in these projects.
- Now extending these efforts to cloud computing.

OGF Is Also Already Very Active In The Cloud!

- We have recently produced related standards applicable to cloud computing that are rapidly becoming the dominant ones in their categories, including
  - OCCI - Open Cloud Computing Interface
  - DFDL - Data Format Definition Language
  - WS-Agreement (2007) and WS-Agreement Negotiation (just ended public comment) – SLAs and license agreement management in clouds
- We also have formal MoUs and other collaborative working agreements in place with other standards development organizations, including DMTF, SNIA, OGC and CSA.
- There are *dozens of working implementations* of the above standards already in place!

Open Grid Forum Documents



OGF standards

OpenGridForum
OPEN FORUM | OPEN STANDARDS

The standards and implementations listed here, representing only a partial list of OGF implementations, form the backbone of current business and scientific DCI production distributed computing.

Implementations of OGF standards

This page contains a list of software implementations of various OGF specifications. The information has been provided by members of the Grid community, and has not been verified by the OGF. As such, the OGF makes no statement about the accuracy of the information provided.

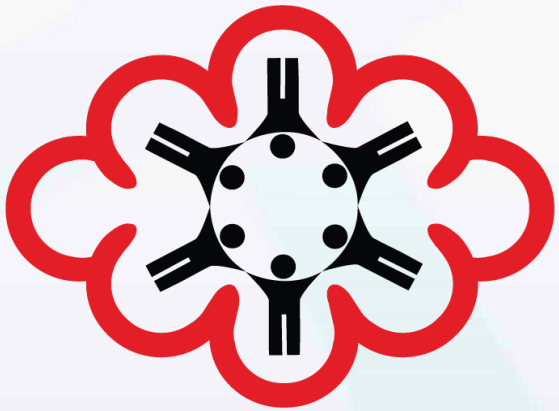
If you have implemented an OGF specification (or several) as part of your project or product and would like to be listed, or would like to report inaccurate information in the table below, please send email to **standards@ogf.org**.

Software / Link	Specifications Implemented	Organization
SAGA-C++	**SAGA:** GFD.90, GFD.144 C++ and Python bindings	Louisiana State University (USA)
JavaSAGA	**SAGA:** GFD.90, GFD.144 Java and Python bindings	Vrije Universiteit Amsterdam (Netherlands)
JSAGA	**SAGA:** GFD.90 partial implementation Java and Python bindings	IN2P3 (France)
DESHL	**SAGA:** GFD.90 partial implementation Java binding	DEISA (EU), EPCC (UK)
BES++ for LSF/SGE/PBS	**BES/HPCBP/JSDL:** GFD.108, GFD.111, GFD.114, GFD.136	Platform Computing
Windows HPC Server 2008	**BES/HPCBP/JSDL:** GFD.108, GFD.111, GFD.114, GFD.136	Microsoft
Genesis II	**BES/HPCBP/JSDL:** GFD.108, GFD.111, GFD.114, GFD.115, GFD.135, GFD.136, GFD.149 **ByteIO:** GFD.72, GFD.87, GFD.88 **RNS:** GFD.101 **WS-Naming:** GFD.109 **Security Profiles:** GFD.131, GFD.132, GFD.138	University of Virginia (USA)

http://www.ogf.org/gf/page.php?page=Standards::Implementations

OpenGridForum

OPEN FORUM | OPEN STANDARDS

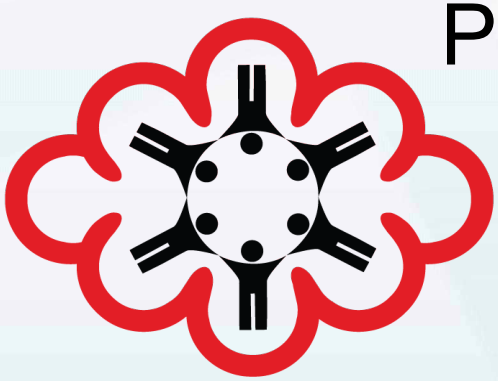


The Cloud Protocol & API

OPEN CLOUD COMPUTING INTERFACE

What?

OpenGridForum
OPEN FORUM | OPEN STANDARDS



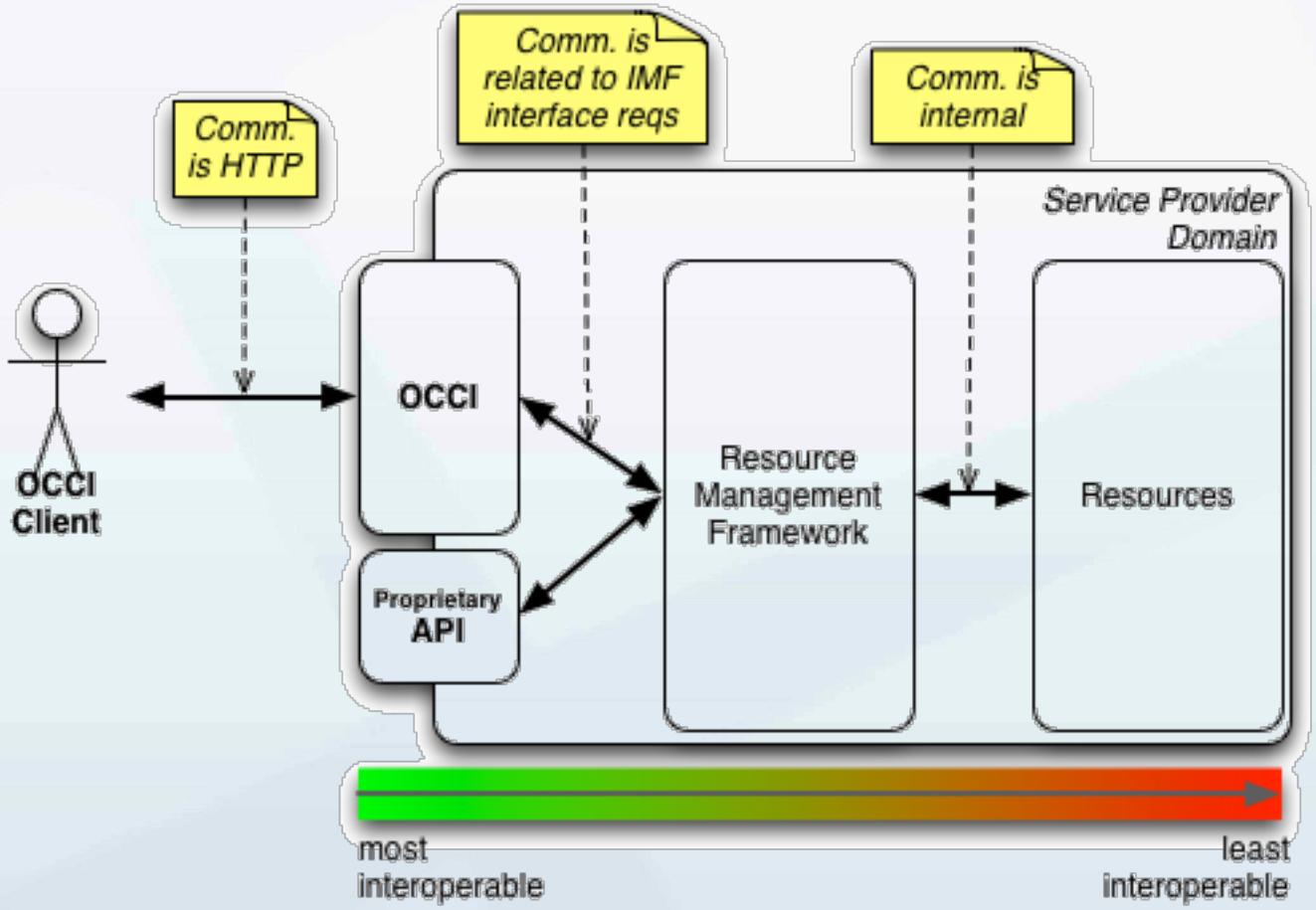
Protocol and API for Management Of Cloud Service Resources.

OCCI was originally initiated to create a remote management API for IaaS, PaaS model based Services

http://occi-wg.org/about/

OCCI's Position

OpenGridForum
OPEN FORUM | OPEN STANDARDS



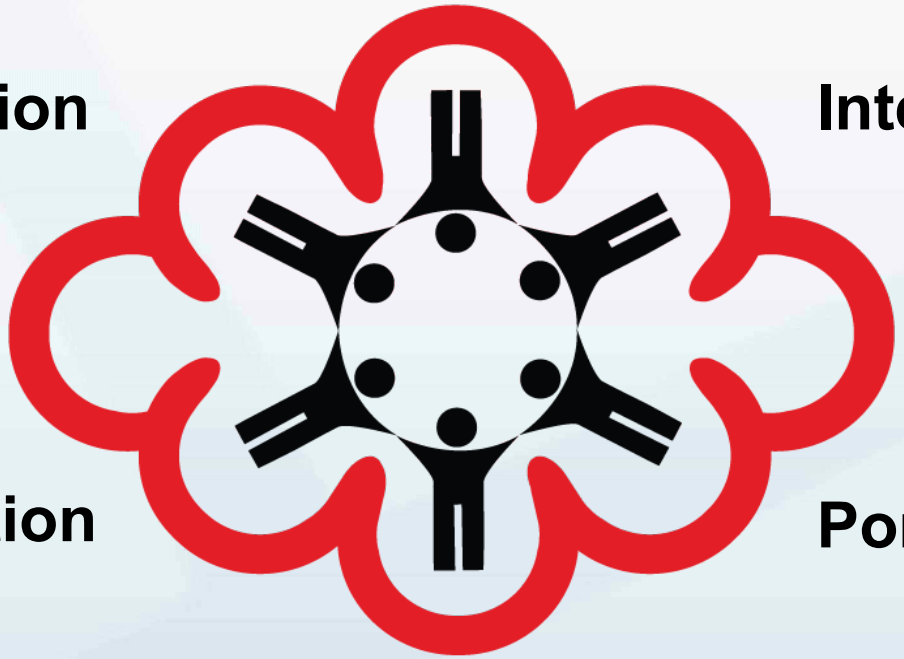
Goals

OpenGridForum
OPEN FORUM | OPEN STANDARDS

Community driven and defended

Innovation

Interoperability



Integration

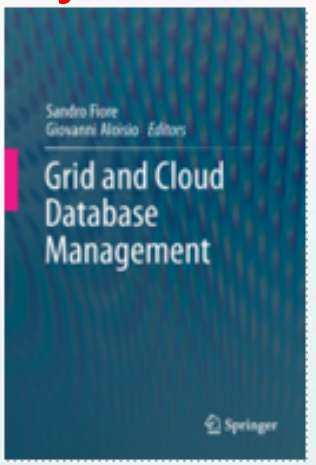
Portability

Open! – no intellectual lock-in

OCCI Description

OpenGridForum
OPEN FORUM | OPEN STANDARDS

- We focus on flexibility, simplicity, extensibility
- Specification (v1.1)
  - Modular: 3 complementary documents
    - Core
    - Infrastructure
    - HTTP
- Model
  - Categorise, identify, link and operate on RESTful resources
    - Resources are Infrastructure e.g. Compute Resource
  - Adaptable, discoverable, extensible, **truly** open
  - Initially targeted at IaaS but can accommodate other levels, including PaaS*.



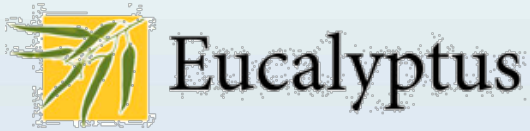
- A. Edmonds, T. Metsch, and A. Papaspyrou, “Open Cloud Computing Interface in Data Management-related Setups,” Springer Grid and Cloud Database Management, Jul. 2011.

OCCI Features

- Definition of Basic ‘types’ (compute, storage etc.)
  - Discovery system for supported Resources
  - **Extension** mechanism
- Support of various mechanisms:
  - Dynamic composition
  - Tagging/Grouping of Resources
  - Templating mechanisms
- Resource handling
  - Resources are linkable (Link)
  - Resources are actionable (Action)
- Full CRUD on Resources and Links
  - Current transport is done via HTTP

OCCI Impact

- Recommended by **UK** G-Cloud, **EU** SIENA Roadmap
- Only open IaaS standard considered so far by **US** NIST
- Agreement reached to submit OCCI to DMTF-CMWG
  - Encourage adoption, increase industry feedback, build collaborative efforts toward future versions
- Work register established for future development
- Many implementations*
- Testing and tooling support
  - ANTLR lexer/parser
  - Python Test & Compliance tool (both standalone and cloud-based)



* http://occi-wg.org/community/implementations/

Upcoming

- OVF and CDMI interoperability → output of OCCI meetings at this DMTF symposium
- Monitoring & SLA extensions → DGSI (€1.4M), SLA@SOI (€15.2M)
- Planned collaboration with European FP7 SAIL (€20.7M) focused on Networking
- OCCI over AMQP transport (Note: REST does not mandate HTTP!): FI-ware (€43M)

Summary and Conclusions

- OGF is a well-established vehicle for creation, dissemination, implementation and adoption of useful cross-cutting standards for distributed grid and cloud computing software environments.
- Our *greater than decade-long track record* has produced a very large number of widely adopted standards implemented across many fields.
- OGF's involvement in cloud computing standards is firmly underway and well established.
- OGF provides a *trusted, effective path* to future software infrastructure standards development.

Questions

Alan Sill – alan.sill *at* ttu.edu

Joel Replogle – replogle *at* ogf.org

Andy Edmonds – andrewx.edmonds *at* intel.com, @dizz

Thijs Metsch – tmetsch *at* platform.com, @befreax

Twitter: #OCCI

OpenGridForum

OPEN FORUM | OPEN STANDARDS

Backup

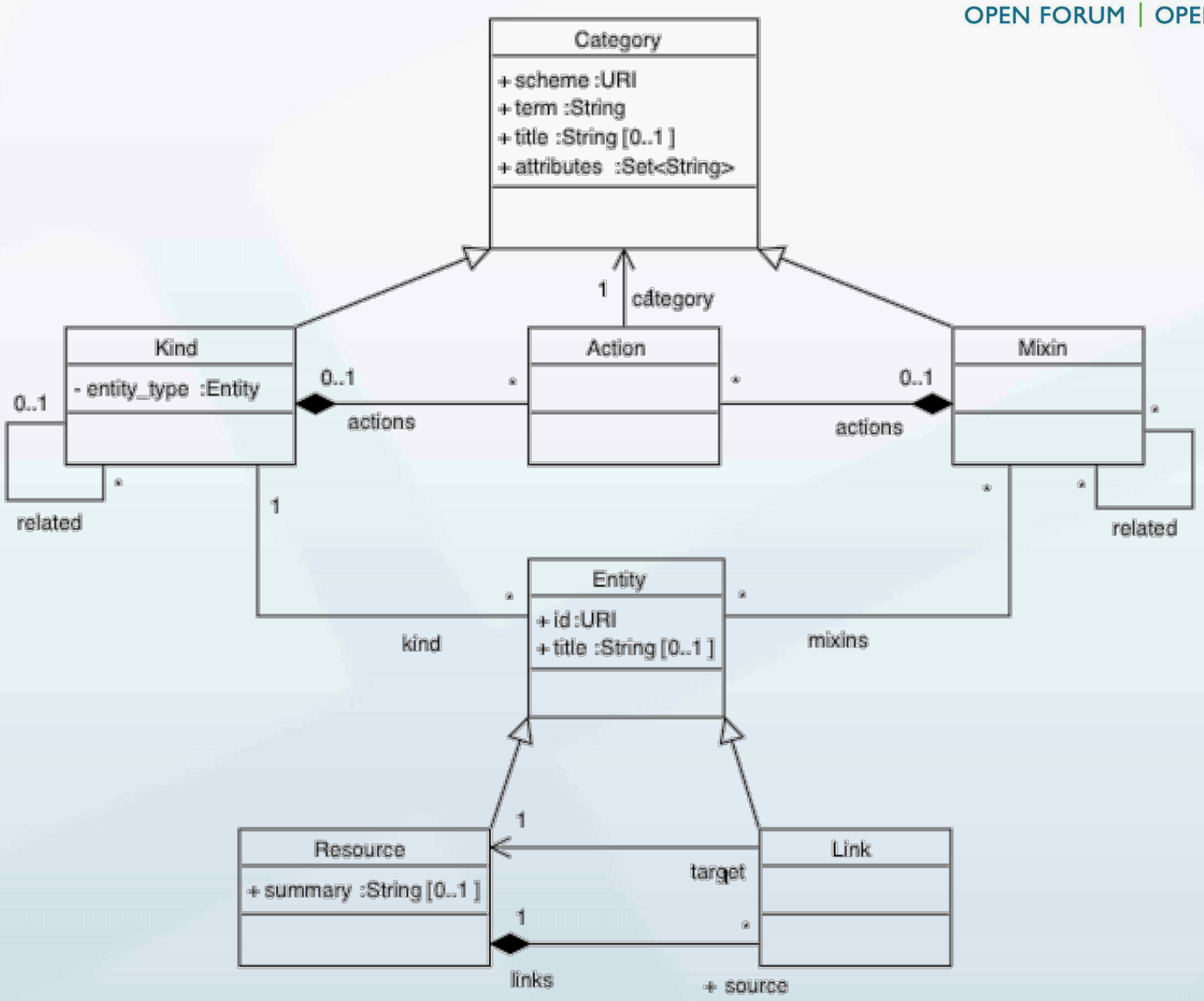
SLIDES

OCCI Features

- Discovery system for supported Resources
  - Types (kind, mixins) offered for instantiation are advertised
- Kinds: basic types of a offering (compute, storage etc.)
- Mixins
  - Dynamic composition
  - Tagging
  - OS and Resource Templating
  - Extension mechanism
- Full CRUD on Resources and Links
- Resources are linkable (Link)
- Resources are actionable (Action)
- Batch atomic operations are supported (multipart)
- Current transport == HTTP, resources rendered in header or body

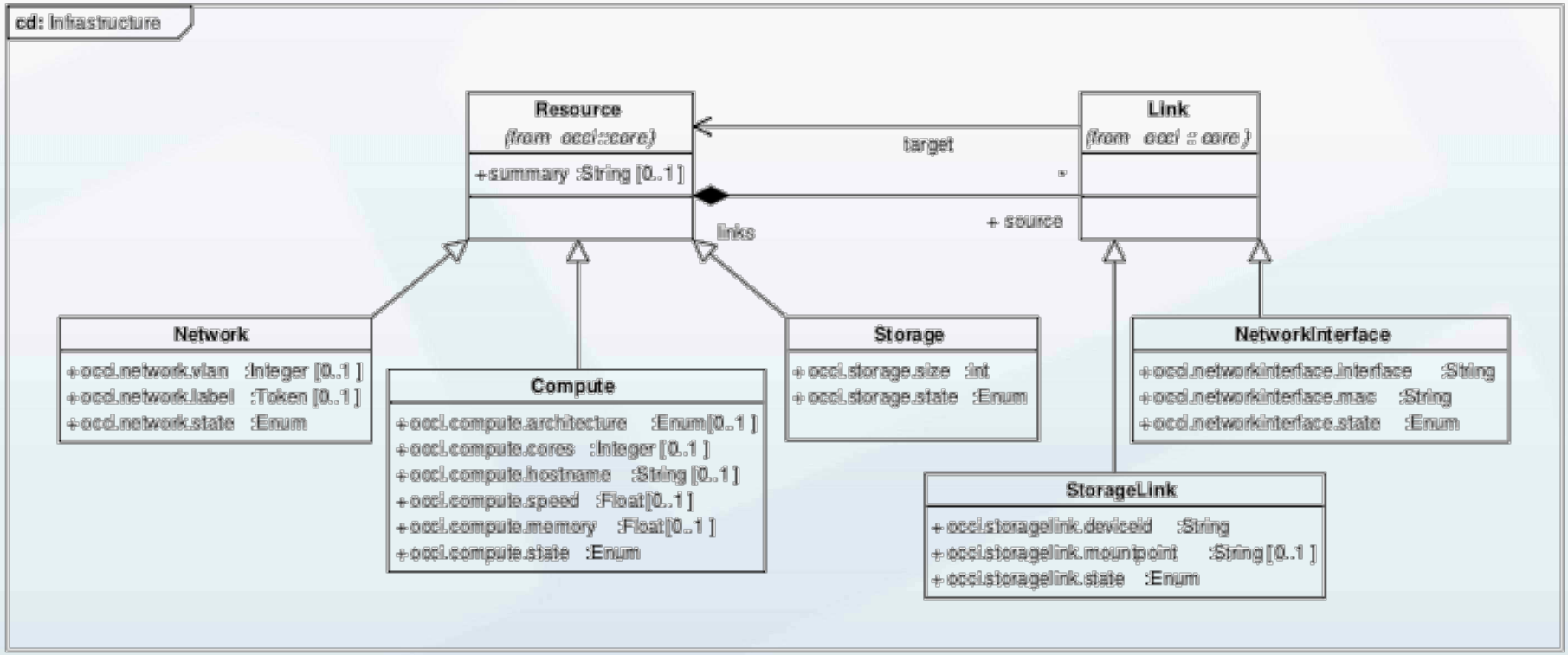
OCCI Core Model

OpenGridForum
OPEN FORUM | OPEN STANDARDS



OCCI Infrastructure Model

OpenGridForum
OPEN FORUM | OPEN STANDARDS



Note *OCCI::Core Resource and Link are extended by this Model*

OCCI Working Group

OpenGridForum