Federated Community Cloud Team Report

Requirement 5: Frameworks to support seamless implementation of federated community cloud environments

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For the FCC Team
FCC Team Priority Action Plan

1. Define federated community cloud requirements and scenarios.

2. Identify how Hybrid Cloud and Cloud Broker elements described in the cloud Reference Architecture can be leveraged and harmonized in federated Community Cloud settings.

3. Document current usage patterns and projected near-term trends in existing cloud architectures with attention to tools used for effective support of federated user communities.

4. Present analysis of applicability of solutions used in existing cloud and grid communities to federated cloud scenarios, including topics related to technology, trust infrastructure, & governance.

5. Assess inter-cloud efforts by standards development organizations and other stakeholders for applicability to Federated Community Clouds.
PAP 1A: Define federated community cloud requirements.

Federated Community Cloud definition:

A cloud in which resources are provisioned for use by a community or by multiple communities of consumers from multiple organizations using methods that address shared needs or concerns.

Many Federated Community Clouds also make use of Cloud Brokerage and/or other aggregation of services (including non-cloud services) from multiple providers to meet the needs of their participating organizations. This is further discussed in PAP 2 below.
PAP 1A: Define federated community cloud requirements (cont’d).

Broadly speaking, use cases taken from the needs of virtual organizations (VOs) can be used to describe requirements for Federated Community Clouds.

VOs are defined as multi-organization constructs that use federation to share access to computing resources.

Typically include one or more of the following capabilities:

<table>
<thead>
<tr>
<th>privacy and security</th>
<th>internal organization roles</th>
</tr>
</thead>
<tbody>
<tr>
<td>compliance adherence</td>
<td>common governance</td>
</tr>
<tr>
<td>trust infrastructure</td>
<td>policies and procedures</td>
</tr>
<tr>
<td>membership</td>
<td>private communication</td>
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</tbody>
</table>
PAP 1B: Define federated community cloud scenarios.

Team chose several among thousands of potential virtual organization communities to focus its discussions. Example scenarios included:

- Catastrophic Dynamic Event Response
- Specialized Remote Medical Care
- Community-Based Response to an Emerging Software Service Need
- Research Data Sharing
- Federated Government Communities, Acquisition History and Research Knowledge Base
PAP 2: Identify how *Hybrid Cloud* and *Cloud Broker* elements apply to Federated Community Cloud settings.

- Elements often provided by cloud service brokers include single sign-on, a shared graphic user interface (GUI) for managing multiple infrastructures, resource discovery, billing, etc.

- In the context of cloud federation, common tools to access possibly disparate services for IaaS, PaaS and SaaS services often are used to provide simpler methods for streamlining use of these services by a given community.
PAP 2: Identify how *Hybrid Cloud* and *Cloud Broker* elements apply to Federated Community Cloud settings.

- Organizations (including VOs) may accomplish federation of disparate cloud services by adopting shared software methods, such as Cloud Service Broker and/or common Infrastructure-as-a-Service, Platform-as-a-Service or Software-as-a-Service technologies.

- VOs often unify services provided by multiple providers to provide “single pane of glass” consolidation of services for their users.
PAP #2: Virtual Organizations may use Shared Platforms to Federate Clouds.

**PaaS**
- Single Sign-on
- Graphical User Interface
- Workflow Services
- Other Shared Services
- Reporting

**Broker**
- Single Sign-on
- Graphical User Interface
- Workflow Services
- Resource Discovery
- Reporting

**SaaS**
- #1
- #2
- #n

**IaaS**
- #1
- #2
- #n
PAP 3: Document current usage patterns and projected near-term trends in existing FCC architectures & tools.

NIST Cloud Deployment Models

Public Cloud

- Hybrid Cloud
- Private Cloud
  - Organization A

- Federated Community Cloud

- Hybrid Cloud
- Private Cloud
  - Organization B
Demo Use Case

Example: EGI Federated Cloud

Resource Provider
GWDG
OCCI 1.1
CDMI 1.0

Resource Provider
CESNET
OCCI 1.1
CDMI 1.0

Resource Provider
CYFRONET
OCCI 1.1

Resource Provider
KTH
OCCI 1.1
CDMI 1.0

Resource Provider
CESGA
OCCI 1.1

Resource Provider
Venus-C
CDMI 1.0

Resource Provider
FZJ
OCCI 1.1

Resource Provider
IN2P3-CC
OCCI 1.1

User
x.509
SSH key
Lgn/Pswrd

Information
GLUE 2.0
LDAP

Monitoring
Nagios

VM metadata
Marketplace

Accounting
OGF UR
UR+ & StAR

Credit: Matteo Turilli, Oxford University
Example: FutureGrid

http://futuregrid.org
5 little Zillas in the Cloud

**DRBL**
Diskless Remote Boot in Linux

Provides a "diskless" and/or "systemless" environment for client machines

**Clonezilla**
Open Source Cloning System

A partitioning and disk cloning utilities similar to Ghost® and True image®

**Ezilla**

Provides unattended installation and web management interface for virtualization infrastructure

**Haduzzilla**
Hadoop Deployment

Provides unattended installation and web management interface for Hadoop infrastructure

**Cluster Deployment**

**P2P, P2V, V2V**

**Virtual Machine Manager (VMM)**

Provides cluster-based intranet search engine with Chinese word segmentation support

**Big Data Platform**

**Application Example**

Example: NCHC “CloudZilla”

Credit: Yao-Tsung Wang, NCHC
Example: NCHC “CloudZilla”

System Blocks of Ezilla

Credit: Yao-Tsung Wang, NCHC

Work in Progress

To support OCCI (Cloud Interop):

- We’re now based on OpenNebula
- But will add support to OpenStack via OCCI

VM#U1-1
VM#U1-2
VM#U2-1
VM#U2-2

OpenNebula
OpenStack

(Lowered by KVM)
(Lowered by Xen)

Micro Data Center
VM#U1-1
VM#U1-2

Mini Data Center
VM#U1-1
VM#U2-2

Resource Catalog

1. Register
2. Upload
3. Query
4. Download

Credit: Yao-Tsung Wang, NCHC
PAP 3: Document current usage patterns and projected near-term trends in existing FCC architectures & tools.

The Team also observed that several activities are being undertaken by the community that indicate the uptake of standards in real-world settings:

- Cloud Plugfest series (OGF, SNIA, ETSI)
- DMTF starting interoperability plugfests on CIMI
- Emergence of open source cloud broker products and tools, such as CompatibleOne, rOCCI, jOCCI, DeltaCloud, etc.
- Several EC-funded projects supporting federated clouds, including Contrail, FI-Ware, Helix Nebula
About Cloud Plugfests

The Cloud Interoperability Plugfest project (or "Cloud Plugfests" for short) is a co-operative community series designed to promote interoperability efforts on cloud-based software, frameworks, and standards among vendors, products, projects and implementations.

Next Cloud Plugfest:
December 11-13, 2012

Find out why you should attend the Cloud Plugfest.

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Locations:
Europe: Sophia-Antipolis, FR

http://cloudplugfest.org

Session Planning

Test Session Report

Results

Alan Sill, TTU    Requirement #5: Federated Com
PAP 4: Present analysis of applicability of solutions used in existing grid and cloud communities to FCC scenarios

Team analyzed existing grid and cloud communities extensively and extracted the following features:

- Federation of resources is usually enabled by federated identity management.
- Identity Provisioning approaches that provide a variety of levels in degree of security. In general, the grid community has paid more attention to creation of structures for use of strong authentication, role- and attribute-based authorization and isolation of multiple tenants than is common yet in cloud usage patterns.
PAP 4: Present analysis of applicability of solutions used in existing grid and cloud communities to FCC scenarios

Other important patterns from federated grids and clouds:

• *Delegation of Trust* is the concept of allowing another entity to act on your behalf (with permission).

• Grid and cloud communities are paying detailed attention to development of protocols, standards and usage patterns involving Federated Identity Management, including SCIM, VOMS, X.509, SAML, OpenID, WS-Federation, XACML, SPML, ADFS, etc., with many projects centered in this area.
PAP 5: Assess inter-cloud efforts by SDOs and other stakeholders for applicability to Federated Community Clouds.

**Intercloud definition:**

*For the purposes of this work on Federated Community Cloud Computing, “Intercloud Computing Initiatives” are described as work products created by SDOs and other organized computing industry associations specializing on “interconnecting cloud computing as a cloud of clouds”.*

Based on the works of current Intercloud initiatives, issues pertaining to FCC infrastructures may be classified in the following categories: discovery, engagement and operating between clouds.
PAP 5: Assess inter-cloud efforts by SDOs and other stakeholders for applicability to Federated Community Clouds.

Groups identified by the FCC Team as currently working on Intercloud standards, definitions and concepts:

- Alliance for Telecommunications Industry Standardization (ATIS)
- Institute of Electrical and Electronics Engineers (IEEE) P2301 & P2302 working groups.
- Global Inter-Cloud Technology Forum (GICTF).
- The Cloud Computing Interoperability Forum (CCIF).
- Cloud Standards Customer Council (CSCC).
- Open Grid Forum (OGF).
PAP 5: Assess inter-cloud efforts by SDOs and other stakeholders for applicability to Federated Community Clouds.

• We anticipate that USG Agencies will assume one or more of the roles of Cloud Broker, Intermediary Cloud Provider and Cloud Provider as defined in the NIST Cloud Computing Reference Architecture.

• In all likelihood, various USG Agencies will aggregate some or all of their cloud efforts and will engage as Cloud Brokers and Cloud Providers supplying services to Cloud Consumers from other areas of government, the general public, private sector, health care, public services, education, research, etc.

• FedRAMP process and concepts apply.