Cloud Interoperability and Portability: Our vision

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1. Adressing Cloud Security
2. Cloud Interoperability and Portability
Addressing Cloud Security

- Understanding cloud security risks is related
- Relationships and dependencies between CC models
- How they are deployed

the foundation of the service model architecture
Addressing Cloud Security

The lower down the stack, the cloud service provider stops bearing responsibility, and the consumer becomes responsible for more security capabilities and management.
Addressing Cloud Security

SaaS

Security

Least consumer extensibility

Relatively high level of integrated security

Extensibility

Most integrated functionality

Integrated Features

Least consumer extensibility

Most integrated functionality
Addressing Cloud Security

1. **Security**

2. **Extensibility**
   - More extensible

3. **Integrated Features**
   - Customer ready features

4. **PaaS**
   - Less complete built-in capabilities
   - Securing the platform
   - More flexibility to layer on additional security
   - Applications developed on platform and developing them securely
Addressing Cloud Security

1. Provider
   - Protecting underlying infrastructure and abstraction layers
   - Less integrated security capabilities and functionality beyond that

2. Consumer
   - Reminder of stack - OSs, applications, content - managed/secure

- Integrated Features
  - Few if any application-like features
- Security
  - Enormous extensibility

- Extensibility

- IaaS
1 Addressing Cloud Security
Addressing Cloud Security

- About multi-tenancy: it requires building adequate security into a combination of the above techniques.

<table>
<thead>
<tr>
<th>Filtering</th>
<th>Permissions</th>
<th>Encryption</th>
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1. Adressing Cloud Security
2. Cloud Interoperability and Portability
Cloud Interoperability and Portability

- Interoperability and portability are closely related to the Cloud elasticity and multi-tenancy.
Interoperability:

- Concerned with ability of systems to communicate
- Requires communicated information is understood by receiving system

Why? Scaling one service across multiple disparate providers and operate and appear as one system.
2 Cloud Interoperability and Portability

Platform components deployed as:
• PaaS
• Platforms on IaaS

Application components deployed as:
• SaaS
• Applications using PaaS
• Applications on platforms using IaaS

- Platforms, cloud PaaS services and marketplaces (including app stores).
- Cloud services (SaaS, PaaS, IaaS) and programs for implementation of on-demand self-service.
# Cloud Interoperability and Portability

Requirements of *interoperability* at different categories

<table>
<thead>
<tr>
<th>Application</th>
<th>Platform</th>
<th>Management</th>
<th>Publication and Acquisition</th>
</tr>
</thead>
<tbody>
<tr>
<td>Discover instances of application components</td>
<td>Standard protocols for service discovery and information exchange</td>
<td>Standard interfaces for cloud services</td>
<td>Standard interfaces to these stores</td>
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<tr>
<td>Combine them with others at run time</td>
<td>Part of a distributed application</td>
<td></td>
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Solutions for Interoperability and Portability

- **Applications**: Standard interfaces, APIs
- **Platform**: Standard protocols
- **Management**: Standard interfaces
Cloud Interoperability and Portability

Portability:
- Ability to run components or systems written for one environment in others software and hardware environments.

Why?
- mitigate risk and increase flexibility
2 | Cloud Interoperability and Portability

- Application components across cloud PaaS services and traditional computing platforms
- Data components across different applications
- Platform components across cloud IaaS services and non-cloud infrastructure (platform source portability)
- Bundles containing applications and data with their supporting platforms (machine image portability)
Cloud Interoperability and Portability

Requirements of portability at different deployment levels

Google Dashboard

**SaaS**
- the cloud customer is substituting software applications with new ones

**PaaS**
- Some degree of application modification will be necessary to achieve portability

**IaaS**
- the applications and the data migrate and run at a new cloud provider
Cloud Interoperability and Portability

Functional Portability
- Ability to define application functionality QoS details in a platform-agnostic manner

Data Portability
- Ability for a customer to retrieve application data from one provider and import this into an equivalent application hosted by another provider

Services Enhancement
- Control APIs allow infrastructure to be added, reconfigured, or removed in real time, either by humans or programmatically based on traffic, outages or other factors
Cloud Interoperability and Portability

- Approaches to Cloud Interoperability and Portability

Building and using

1. open APIs
2. open protocols
3. standards
4. layers of abstractions
5. semantic repositories
6. domain specific languages
2 Cloud Interoperability and Portability

MODAClouds is an European research project that has as the main goal to provide methods, a decision support system, an open source IDE and run-time environment for the high-level design and deployment of applications on multi-Clouds.
My Life, and Past, as Seen Through Google's Dashboard
• http://online.wsj.com/news/articles/SB10001424127887324170004578638402779534498

Portability and Interoperability between Clouds: Challenges and Case Study
• http://web.info.uvt.ro/~petcu

IEEE Articles: (2012 IEEE Fifth International Conference on Cloud Computing and others)
• Design Patterns to Enable Data Portability between Clouds’ Databases
• Portable Data ManagementCloud for Field Science
• CSAL: A Cloud Storage Abstraction Layer to Enable Portable Cloud Applications

MODAClouds: MOdel-Driven Approach for design and execution of applications on multiple Clouds
• http://www.modaclouds.eu/

Thanks