Interoperability in Cloud Federations

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Cloud Federation

- Application: a set of virtual machines and data volumes connected by a virtual network to be deployed at IaaS level
- Federation: common entry point for multiple cloud providers

- Federation: cloud broker, cloud bursting, community cloud, ...

Diagram:

- Cloud Federation
  - Provider 1
  - Provider 2
  - Provider n
Cloud Federation

- Application: a set of virtual machines and data volumes connected by a virtual network to be deployed at IaaS level
- Federation: common entry point for multiple cloud providers
- A user submits an application to the federation

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Cloud Federation

- **Application**: a set of virtual machines and data volumes connected by a virtual network to be deployed at IaaS level
- **Federation**: common entry point for multiple cloud providers
- A user submits an application to the federation, the federation selects providers to run the application

Federation: cloud broker, cloud bursting, community cloud, ...

![Diagram of Cloud Federation](contrail-project.eu)
Needs for Interoperability

- One application description, for multiple providers

But

- Cloud applications made of virtual machines
  - different providers support different VM models
- Multi VM applications
  - different networking models
- Cloud storage
  - different cloud storage models
- Application migration or restart after checkpoint
  - redeploy on a different provider
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- Other
  - monitoring, security, authorization, accounting, ...
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- Other
  - monitoring, security, authorization, accounting, ...
- Even more...
  - performance, QoS, ...

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Means to Provide Interoperability at Federation Level

- Provider selection
  - the federation selects providers which can run the applications

- Application selection
  - applications can provides alternative solutions (VM images)
  - specialize applications for the selected providers

- Application conversion
  - convert applications to the selected providers
  - VM image conversion, ...
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- **Avoid lock-in at federation level**
  - use open standards
  - use open protocols
The Contrail Proposition

- **Objectives of Contrail**
  - manage distributed applications/services lifecycle at federation level
  - manage application elasticity
  - provide QoS and QoP guarantees through Service Level Agreements

- **Contrail standard base**
  - OVF standard (from DMTF) for application description (no extension)
  - CDMI standard (from SNIA) for storage (not yet implemented)
  - VEP layer integrating SLA support based on CIMI proposition (from DMTF) for application lifecycle management
  - OCCI (from OGF) and δcloud API for IaaS interface
  - application checkpoints in OVF format
  - SLA management using SLA@SOI framework (should be compatible with WS-Agreement OGF standard)

- **Contrail specific components**
  - VIN: networking
  - VEP: application management
  - ConPaaS: elastic PaaS framework
Questions

1. The most prominent solutions for interoperability?

2. Are these approaches appropriate to solve the full spectrum of interoperability problems?

3. Are these taken-up by the application developers?

4. Are these taken-up by the providers?

5. How the Cloud networking research can support interoperability?
Questions

1. The most prominent solutions for interoperability?
   - use of standards

2. Are these approaches appropriate to solve the full spectrum of interoperability problems?
   - use of standards is appropriate
   - but new standards emerge slowly

3. Are these taken-up by the application developers?
   - application developers limited by providers offering

4. Are these taken-up by the providers?
   - current public cloud providers use proprietary API and formats
   - some private cloud frameworks support standard formats (OVF)

5. How the Cloud networking research can support interoperability?
   - provide a common networking framework for the Cloud
Conclusion

Interoperability

- would encourage small players to enter the market
- would encourage large organizations to move to the Cloud
- can foster competition
- should be beneficial for end users
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