contrail

*open computing
infrastructures
for elastic
services*

Using Open Standards for Interoperability

Issues, Solutions, and Challenges facing Cloud Computing

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Outline

- Obstacles to cloud adoption
- Standards Landscape for the Cloud
- Cloud Federations
- Focus on the Contrail system

Obstacles to Cloud Adoption: Trust and Dependability

- Need to increase confidence in clouds
  - Provide guarantees to customers
    - Quality of Service – QoS
    - Quality of Protection – QoP
- How to achieve this?
  - Service Level Agreements – SLA
    - Security enforcement – QoP
    - Performance guarantees
  - Monitoring
  - Auditing

Obstacles to Cloud Adoption: Interoperability and Portability

- Customers want to mitigate the risks and have higher flexibility based on business requirements
  - Applications should work the same way regardless of the Cloud platform
  - Applications should work identically in terms of functionalities
  - Data formats

- Problem more accentuated when moving from IaaS to PaaS

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Avoid vendor lock-in!

Interoperability & Portability

The case of IaaS

- One application and multiple providers

But

- Cloud applications made of virtual machines
- Different providers
  - → different VM models
  - → different image formats
  - → different contextualization means
- Multi VM applications
  - → different networking models
- Cloud storage
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- Application migration or restart after checkpoint/snapshot
  - difficult to redeploy on a different provider

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What about

- Performance
- QoS, ...
- Placement
  - → (anti-)affinity
  - → localization
- Auditing
- Security
- ?

Lack of Trust & Interoperability

- Blocks elasticity and pay-as-you-go concepts
- May keep major players such as governments, healthcare and banking away from the Cloud

Interoperability needed for small players to enter the market

- Adaptation to different Cloud models is afordable for large compagnies

Standards Landscape for the Cloud

OVF (Open Virtualization Format) from DMTF: distributed applications packaging

CIMI (Cloud Infrastructure Management Interface) from DMTF: virtual infrastructure management

CDMI (Cloud Data Management Interface) from SNIA: interoperability of Cloud storage

OCCI (Open Cloud Computing Interface) from OGF: protocol and API for IaaS management tasks

WS-Agreement from OGF: Service Level Agreement negotiation and enforcement

UR (Usage Record) from OGF: resource usage

SAML (Security Assertion Markup Language) from OASIS: authentication and user attributes

...

Cloud Federations

Why Cloud Federations?

- Cloud brokering
- Cloud bursting
- Cloud aggregation

- Select best offers to reduce costs
- Improve resource exploitation
- Combine resources from different cloud providers

- Improve dependability: critical services on different providers
- Integrate domain-specific Cloud providers

Interoperability and Portability ease emergence of Cloud Federations

Federations Improve Cloud Accessibility

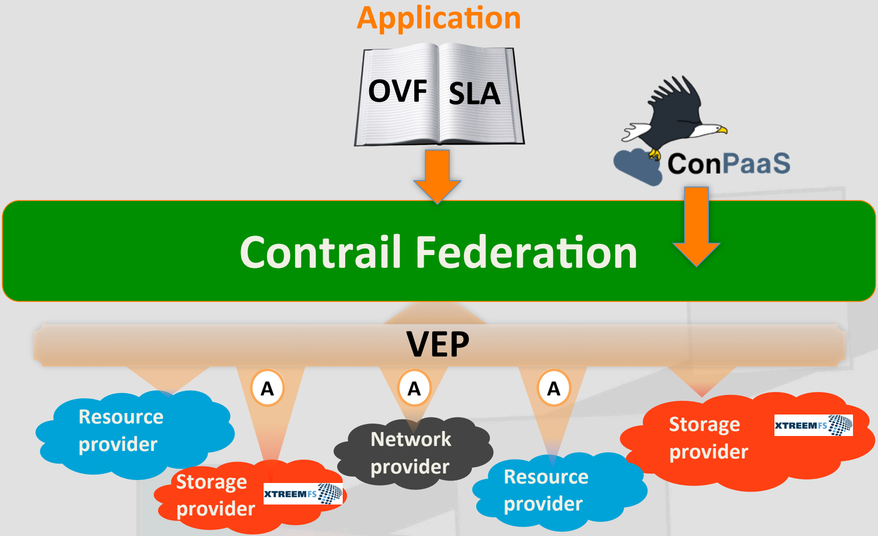
- Federation layer can select a povider from
  - Application description
    - → ie. disk image type
  - Deployment constraints (SLAs)
- Protocol adaptation between user and provider
- Conversions between providers

Focus on Contrail Project

Objectives

- Manage cloud federations
  - IaaS and PaaS
- Service Level Agreements
- Main components
  - federation portal
  - SLA management: negotiation, enforcement at federation and provider levels
  - VEP, Virtual Execution Platform: application lifecycle on a Cloud provider.
    - deployment, elasticity, snapshots, ...
    - under SLA constraints: placement, QoP
  - ConPaaS, PaaS framework: bag-of-tasks, map-reduce, ...
  - VIN: application nerwork
  - GAFS: storage on the Cloud
  - monitoring

Contrail Federation Overall Architecture

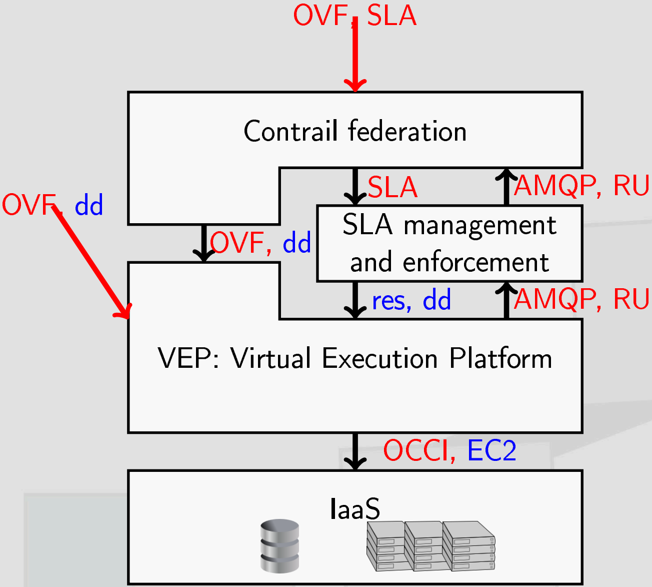


Standards in Contrail

Contrail exploits open standards and open protocols

- **OVF** for distributed application description
- **CDMI** for storage (partial support)
- **OCCI** for IaaS providers
  - libcloud, δ-Cloud?
- SLA management compatible with **WS-Agreement**
- VEP based on **CIMI** API
- User attribute management based on **SAML**
- Identity management: OAuth and Shibboleth
- **AMQP** for monitoring

Contrail Stack: Documents



Conclusion

- Trust, interoperability and portability are important for Cloud adoption
- Contrail exploits standards when possible
- Standards improve interoperability
  - → but standards do not always guarantee portability!
  - → OCCI
  - → WS-Agreement

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Contrail is coordinated by Christine Morin, INRIA, France

www.contrail-project.eu

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COOPERATION

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