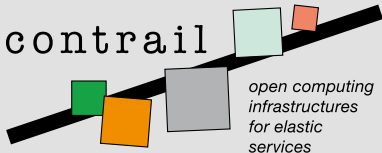


contrail



*open computing
infrastructures
for elastic
services*

Open Computing Infrastructures for Elastic Services

Contrail Approach

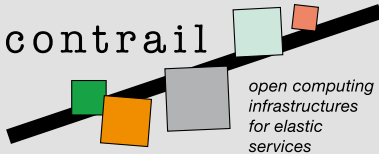
Yvon Jegou
INRIA, France

June 8th, 2011



Contrail is co-funded by the EC
7th Framework Programme
under Grant Agreement n° 257438

contrail



Contrail is co-funded by the EC 7th Framework Programme

Funded under: FP7 (Seventh Framework Programme)

Area: Internet of Services, Software & Virtualization (ICT-2009.1.2)

Project reference: 257438

Total cost: 11,29 million Euro

EU contribution: 8,3 million Euro

Execution: From 2010-10-01 till 2013-09-30

Duration: 36 months

Contract type: Collaborative project (generic)

Contrail Partners



Contrail Consortium

Partner Country	Research	SME	Industry
France	INRIA	EBM Web-Sourcing	
Germany	ZIB		
Italy	CNR		Tiscali
			HP-IIC
The Netherlands	VUA	GENIAS	
Slovenia		XLAB	
United Kingdom	STFC	Constellation	

Contrail is coordinated by Christine Morin, INRIA, France



1 Objectives

2 Conrail Architecture

3 The Conrail Framework



Contrail Objectives



Objectives

- Design, implement, validate and promote an open source software stack for cloud federations
- Develop a comprehensive Cloud platform integrating a full IaaS and PaaS offer
- Allow Cloud providers to seamlessly integrate resources from other Clouds with their own infrastructure
- Provide trusted Clouds by advanced SLA management
- Break the current customer lock-in situation by allowing live application migration from one cloud to another



Objectives Outline

- Cloud Federation
- Cooperation over Clouds
- Trust and Security
- Consumer lock in



Cloud Federation

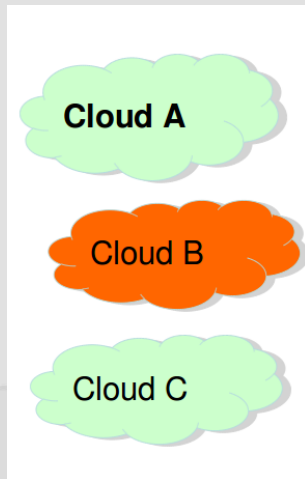
- Cloud federation for users
 - Cloud brokering
 - Cloud aggregation
- Cloud federation for providers
 - Cloud bursting



Cloud Federation

Federation for users

- user accesses the Cloud through the federation portal
- federation portal provides seamless access to multiple providers
- can aggregate resources from multiple providers



Cloud Federation

Various types

Cloud Brokering

- find the best provider for executing an application

Cloud bursting

- seamless integration of resources from another provider in the cloud

Cloud Aggregation

- provide the user with resources from different providers

Virtual Data Center

- Organization local data center extended *on the Cloud*



Cooperation over Clouds

- Resources, services shared by user communities using clouds as computing infrastructures
- Members of the same institution
 - virtual data center
- Members of a Virtual Organization
 - grid computing over clouds



Cooperation over Clouds

Virtual Data Center

- An organization with a data center
 - data center managed as a private cloud (cloud API)
 - peak load: submit requests to external clouds
- Virtual Data Center
 - user sees the same execution environment on external clouds as in the organization data center
 - accounting, bills to the organization
- Organization users can share data and services:
 - all services available on the organization data center are extended to the external providers
 - Contrail Virtual Infrastructure Network (VIN) acts as a VPN



Trust and Security in Contrail

- Identity management in a federation
- Protection
 - anonymity
 - data
 - performance
- Not all providers guarantee the same level of protection
- Formalized using SLA in Contrail
- Role-based authorization in user communities (VO)



Break consumer lock in

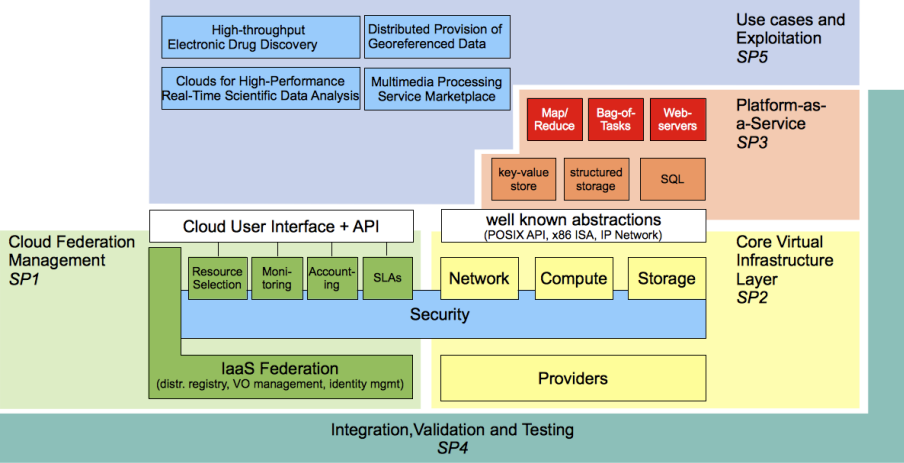
- Use open standards
 - OCCI for IaaS
 - OVF for application descriptions
 - CDMI for VM image storage
 - WS-Agreement for SLA
 - ...
- Still support major vendors
 - adaptors



Contrail Architecture



Conrail Big Picture



Integrated IaaS & PaaS in Open Source

Contrail IaaS

- Processor, network and storage virtualization
 - Virtual Execution Platform (VEP)
 - Virtual Infrastructure Network (VIN)
 - Global Autonomous File System (GAFS)
- Advanced resource allocation strategies for VEP

Contrail PaaS

- Application runtimes
 - Elastic web services
 - Map/reduce
 - Bag of tasks
- Database as a Service
 - SQL & non SQL storage services based on Scalarix



Integrated IaaS & PaaS in Open Source

Runtimes for elastic applications

High level storage services

IaaS



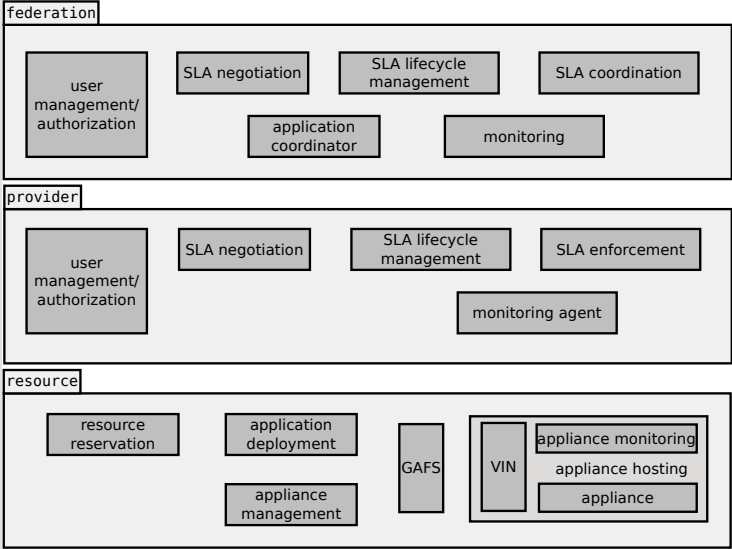
Contrail at Month 7

Software stack organized into 3 layers

- Federation layer
 - user portal to multiple providers
 - negotiates with providers
- Provider layer
 - business layer
 - SLA negotiation
 - monitoring
 - SLA enforcement
 - accounting, billing
- Resource layer
 - resource allocation
 - VM deployment
 - Virtualized networking
 - storage

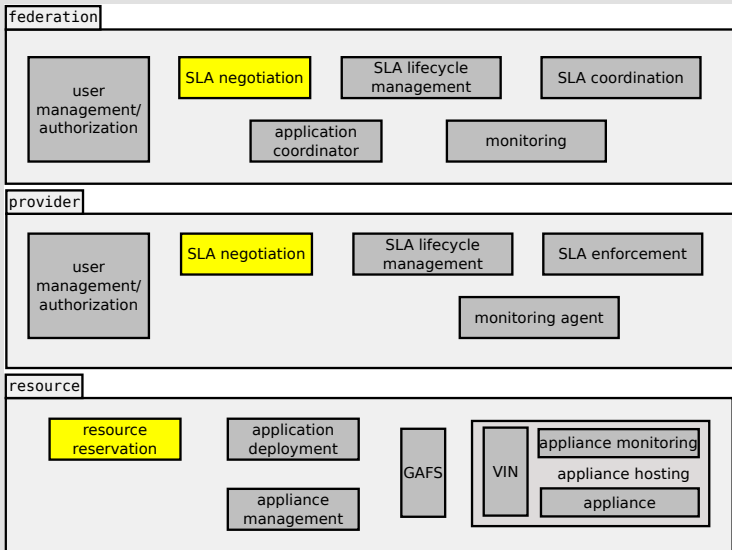


Architecture



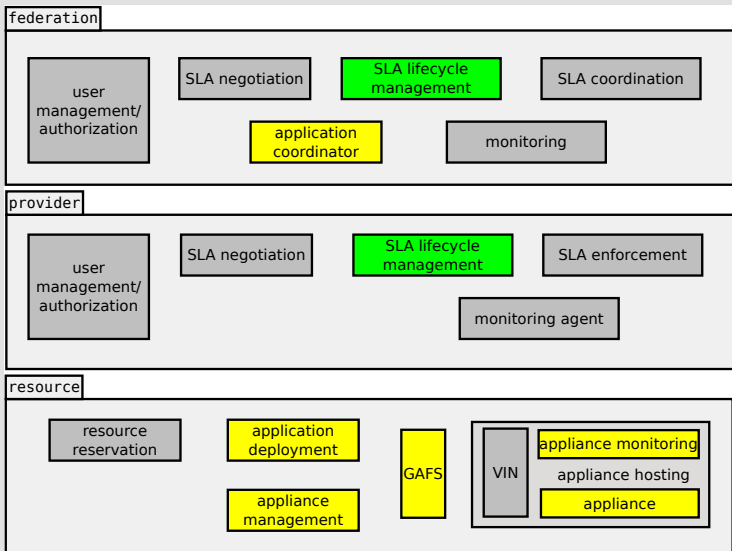
Architecture

SLA negotiation



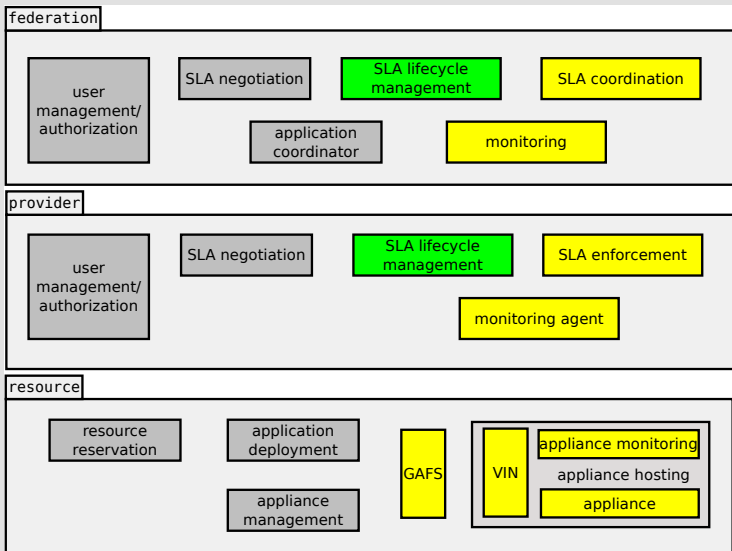
Architecture

Application deployment



Architecture

Operation



A Few Scenarios

SLA ↔ Application

- strong provisioning guarantees
- elasticity provided by SLA

Long term SLA

- application run under existing active SLA
- weak provisioning guarantees

Multiple applications

- compose applications under the same SLA
- means to provide elasticity

Provider-provider SLA

- cloud bursting
- storage provider to infrastructure provider



The Contrail Framework



API

- RESTfull architecture
 - SLA negotiation
 - resource reservation
 - application deployment
 - user → SLA → deployment → resources
- Publish-subscribe
 - monitoring
 - resources/applications → SLA enforcement → user



SLA and application

- SLAs and applications in different documents
 - SLA
 - resources (hard/soft), guarantees, pricing, ...
 - WS-Agreement (OGF *standard*)
 - plan to re-use SLA@SOI framework
 - Applications described in OVF
 - OVF is a DMTF standard
 - Linkage between both documents
- Combinations
 - single SLA \leftrightarrow single application
 - single SLA \leftrightarrow multiple applications
 - multiple SLAs \leftrightarrow single application
 - multiple SLAs \leftrightarrow multiple applications



OVF

- `DiskSection` meta-information about all virtual disks in the package;
- `NetworkSection` logical networks used in the package;
- `ResourceAllocationSection` reservations, limits, and shares on a given resource;
- `AnnotationSection`
- `ProductSection` product-information for a package;
- `EulaSection` license agreement;
- `StartupSection` how a virtual machine collection is powered on;
- `DeploymentOptionSection` discrete set of intended resource requirements;
- `OperatingSystemSection` the installed guest operating system of a virtual machine;
- `InstallSection` initialisation requirements on first boot;



Example: elastic master-worker

- One SLA template
 - negotiated through the federation layer
 - potentially with multiple providers
- One master OVF
 - may integrate a worker coordination task
- One worker OVF
- Elasticity management
 - master detects over/under-load
 - stop worker
 - requests deployment of new worker
 - coordination task in charge of integrating new workers



Contrail releases

- First release: May 2012
 - SLA: re-use SLA@SOI framework
 - infrastructure: OpenNebula
 - OVF applications
 - PaaS offer: map-reduce, bag-of-task
- Next steps
 - Elastic data centers
 - Security
 - Communities
 - Enhanced SLA support



Contacts

- www.contrail-project.eu
- Coordinator: Christine Morin, INRIA, Rennes, France
- Contact: Mr. Ad Emmen, emmen@genias.nl



Questions?

