

# mOSAIC

## Facts, objectives and current results



**Dana Petcu**

Institute e-Austria Timisoara  
& West University of Timisoara  
Romania

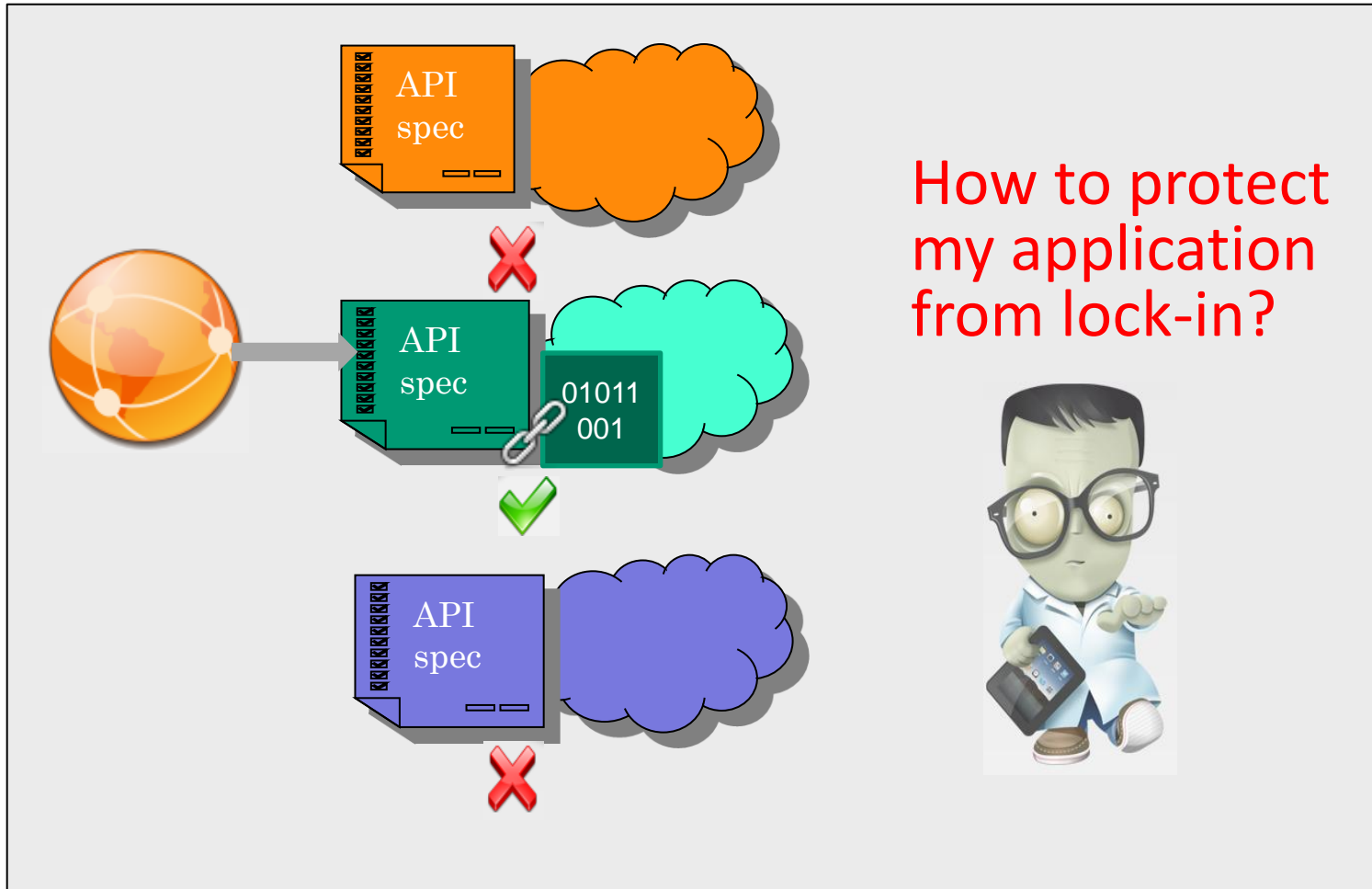
1

# Overview

1. **The problem: vendor-lock-in in Clouds**
2. **Target: portable applications**
3. **Objectives**
4. **Architecture**
5. **The role of open-source platforms**
6. **Further steps**

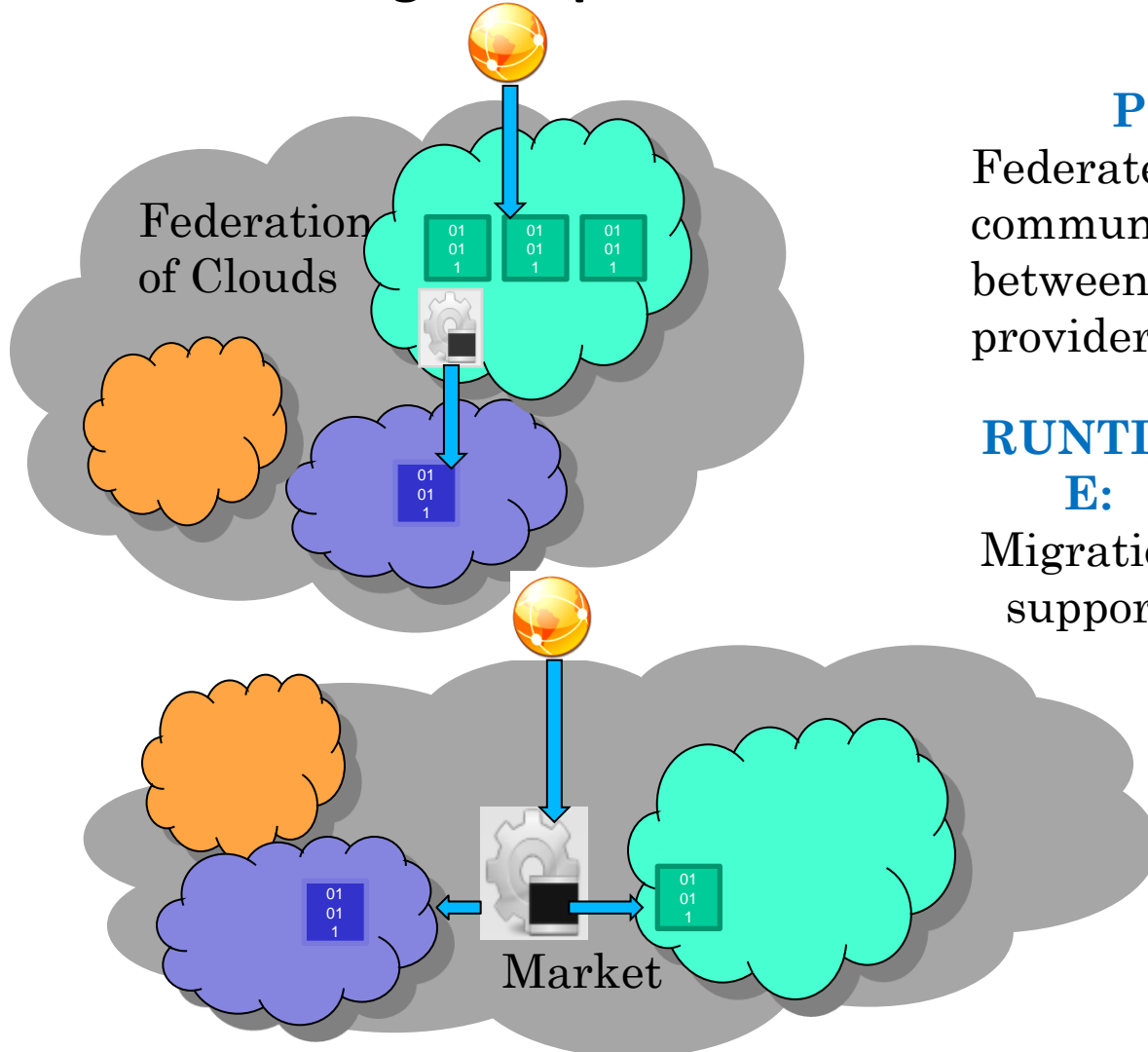


# Vendor lock-in, due to proprietary APIs

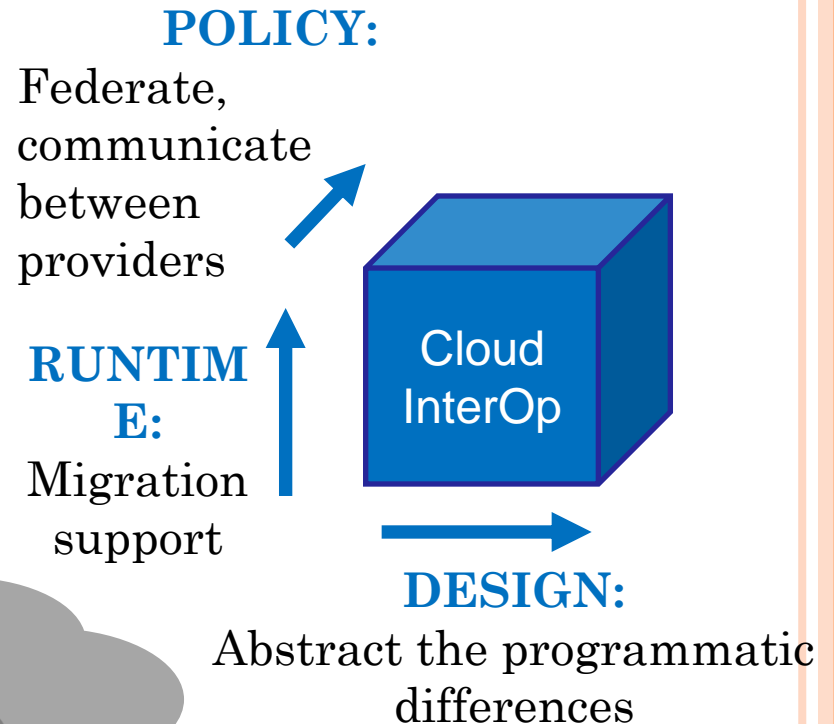


# Interoperability and portability: challenges

## Scenarios using multiple Clouds

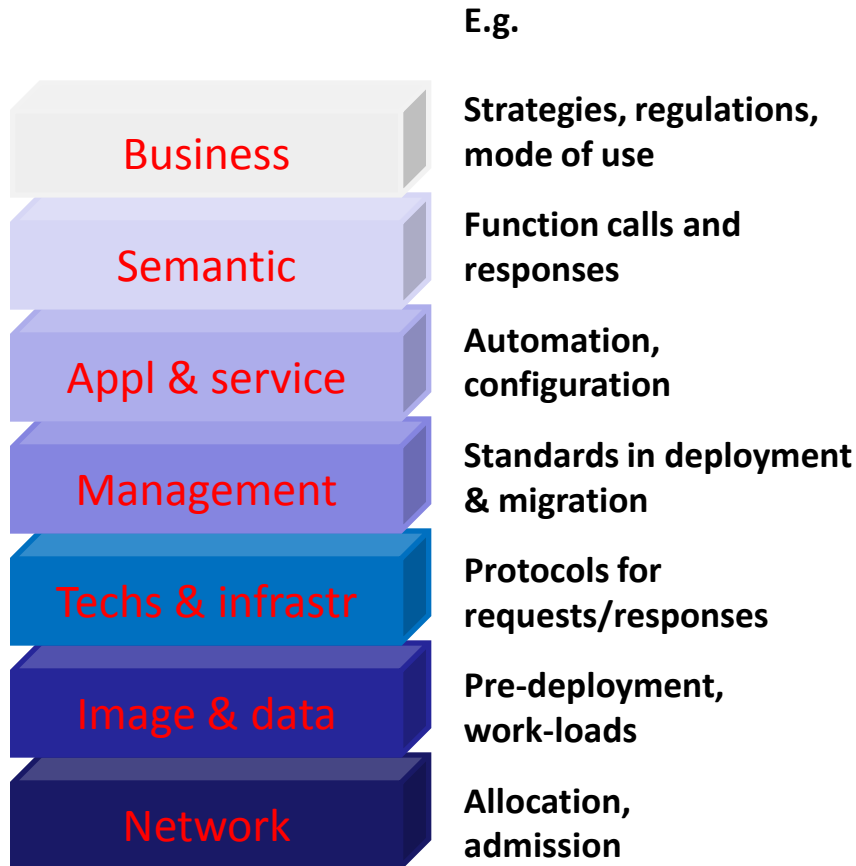


## Multi-dimensional problem

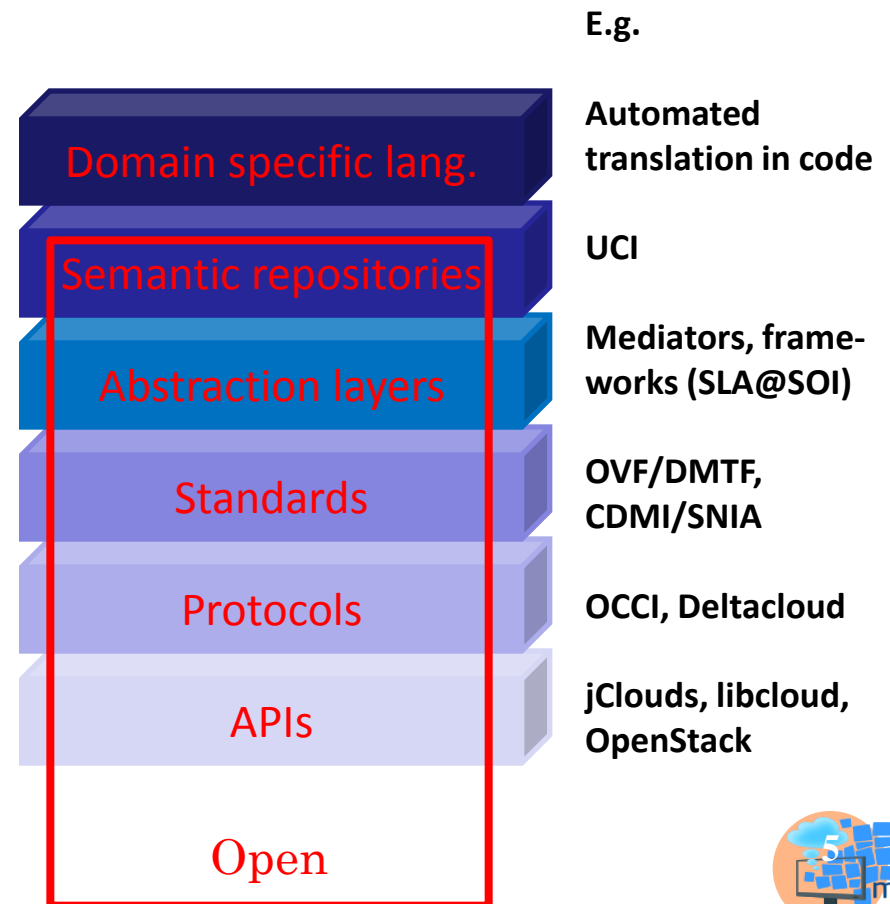


# Interoperability and portability: approaches

## Levels



## Techs



# PaaS – the worst case!

- ❖ each PaaS provider offers a special flavor in its design
- ❖ not all the features that are expected
  - rarely debug facilities,
  - no Security-as-a-Service
  - often not for private clouds
- ❖ portability is possible only between a small no.PaaSs
  - in case of open-source clones of the proprietary ones
- ❖ the problem escalates with the increase of no.PaaSs
  - increased no. in last two years



# Opens-source & PaaS

Platform Service |  
Hosting |  
Integrated solution

Platform Software |  
Software service |  
Deploy-based solution

## ❖ Well knows examples:

- Google's AppEngine, Microsoft's Azure, RackSpace's CloudSites, Amazon's Beanstalk, Salesforce's Force.com, Joyent's SmartPlatform

## ❖ Appl support – different approaches:

- Deploy code to specific VMs (Azure, Beanstalk)
- Develop using rules, platform deal with deployment (AppEngine, Heroku)
- Create metadata to be interpreted by PaaS at run-time (Force.com, OrangeScapes)

## ❖ **Open-source only to develop apps**

- to allow customization

## ❖ Deployment of middleware in data centers

## ❖ Easy way to deal with portability and interoperability (framework category)

## ❖ **Open-source have the potential to impact the market as...**

- PVM/Parallel
- Globus/Grid

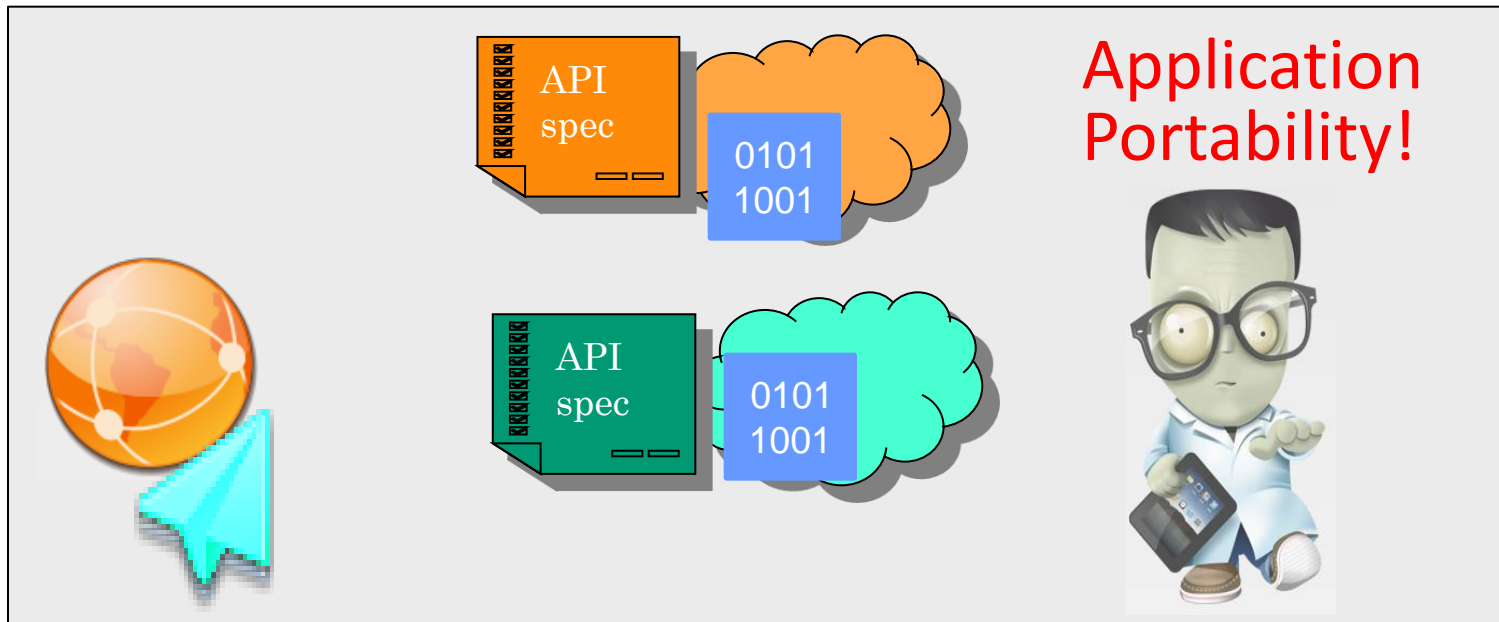


# mOSAIC:

## Open source API & Platform for multiple Clouds

marketing motto: “Flying through the Clouds”

1. a tool for **developing portable Cloud-applications** which can consume hardware and software resources offered by multiple Cloud providers;
2. an **open-source PaaS that can be easily deployable** by service providers and which can be customized and enhanced by service providers;
3. a **brokerage system** to support the decision of Cloud service provider selection at the deployment stage.





# mOSAIC as R&D collaboration effort



[www.mosaic-cloud.eu](http://www.mosaic-cloud.eu)

## Consortium:

1. Second University of Naples, Italy
2. Institute e-Austria Timisoara, Romania
3. European Space Agency, France
4. Terradue SRL, Italy
5. AITIA International Informatics, Hungary
6. Tecnalia, Spain
7. Xlab, Slovenia
8. University of Ljubljana, Slovenia
9. Brno University of Technology, Czech Republ.

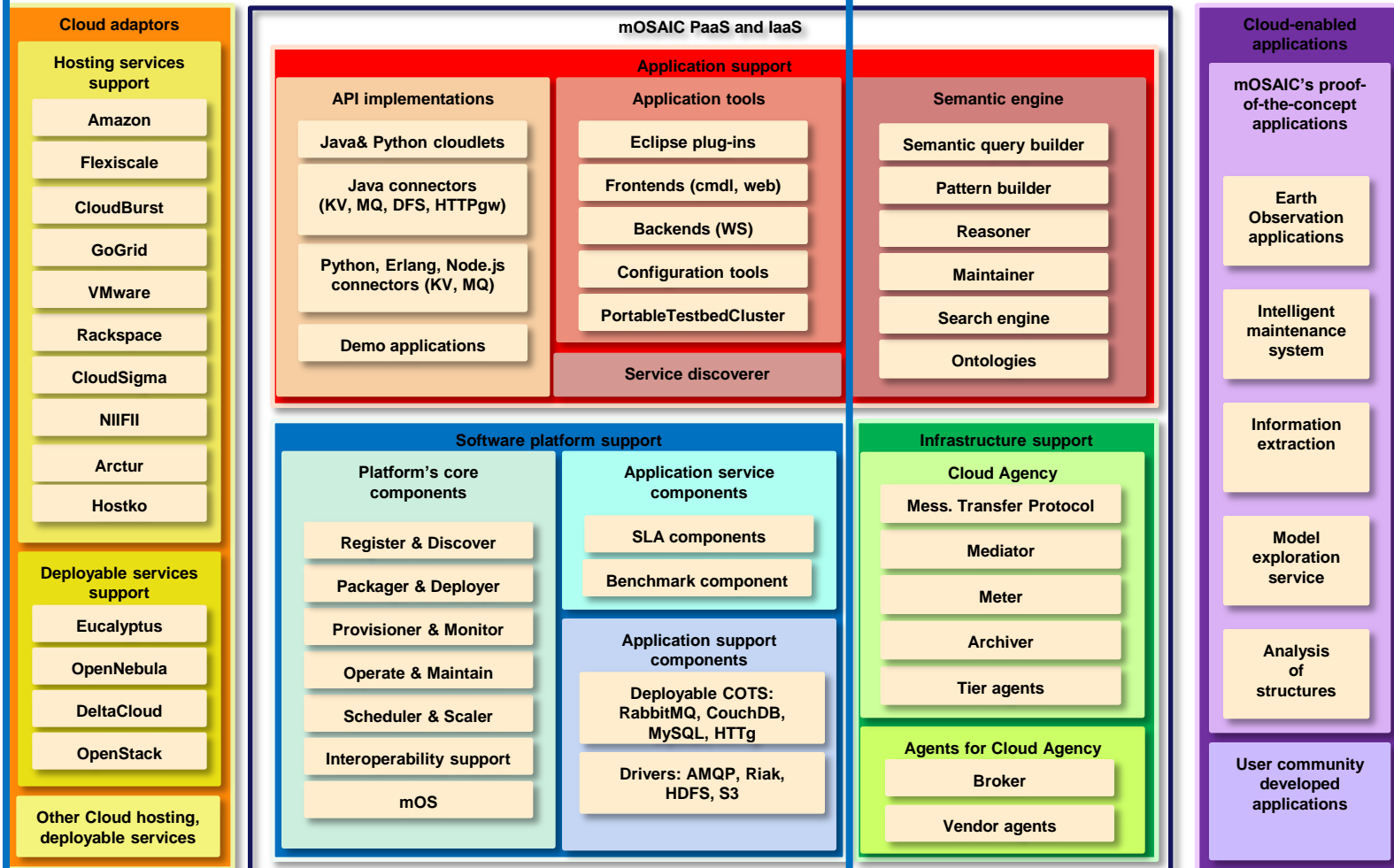


**September 2011:** 1<sup>st</sup> API implement. (Java)  
**September 2012:** 1<sup>st</sup> stable PaaS,  
2<sup>nd</sup> API impl. (Python)  
**March 2013:** Full software package



# Layered architecture

## Open-source and deployable PaaS



OS repository:

<https://bitbucket.org/mosaic>



# Usage scenario:

## ❖ Write component-based application

- Languages: Java, Python, NodeJS, Erlang
- Communications through message passing
- Respect the event-driven style of programming
- Find the proper functionalities with the Semantic Engine

## ❖ Debug your application on the desktop or on-premise server(s)

- Within Eclipse
- Use Personal Testbed Cluster using VirtualBox for the VMs

## ❖ Deploy your application in a Cloud

- Assisted by Cloud Agency and Broker (with SLAs)
- Provisioner of the platform if you have already credentials

## ❖ Monitor & modify the applications

- Control the life-cycle of the components (start/stop/replace)



# Open-source Platform Software

Product	AppScale	Cloud Foundry	ConPaaS	mOSAIC	OpenShift	TyphoonAE	WaveMaker
Owner	Univ. California	VMWare	Contrail Consortia	mOSAIC Consortia	RedHat	Tobias Rodäbel	VMWare
Site	appscale.cs.ucsb.edu	www.cloudfoundry.com	www.conpaas.eu	www.mosaic-cloud.eu	open shift.com	code.google.com/p/typhoonae	www.wave maker.com
Repository	appscale.googlecode.com/svn/	github.com/cloudfoundry	www.conpaas.eu/download/	bitbucket.org/Mosaic	github.com/openshift	code.google.com/p/typhoonae/downloads/	dev.wavemaker.com/wiki/bin/
Languages	Python, Java, Go	Java, Ruby, Node.js, Groovy	PHP	Java, Python, Node.js, Erlang	Java, Python, Perl, PHP, Ruby	Python	Java
Data Support	HBase, Redis Hypertable, MySQL Cluster, Cassandra, Voldermort, MongoDB, Memcache-DB	MongoDB, SQLFire, PostgreSQL, Redis	Scalaris, MySQL, XtreamFS	Riak, CouchDB, HDFS, Mem-cacheDB, Redis, MySQL	MySQL, MongoDB, Amazon RDS	MongoDB, MySQL, Berkeley DB JE	Amazon S3, Rackspace
OS	Ubuntu, CentOS on Xen, KVM	VMWare image	XtreemOS image	Linux, deploy mOS on top	Red Hat Virtualization	Debian, Ubuntu	VMWare image
Messaging	Channel	RabbitMQ	Own design	RabbitMQ	Own design	RabbitMQ, ejabberd, Channel	Own design
Clouds tested	Amazon EC2, Eucalyptus	VMWare	Own testbed	Amazon EC2, Eucalyptus, OpenNebula, Flexiscale ...	RightScale Rackspace, Smart-Cloud, Amazon	Google	EC2, Rackspace, OpSource, Eucalyptus
Interface	CLI, Web	CLI	Web	CLI, Web, REST	CLI, REST	CLI	Studio

# Open-source Platform Software

Product	CloudFoundry	mOSAIC	OpenShift
<i>Development support</i>	1	2	3
Dedicated to web apps or general	Web apps	General	Web apps
Desktop Cloud Simulator	Yes	Yes	No
API access	No	Yes	No
Thread access	Yes	No	Yes
Allows to choose stack components	Yes	Yes	No
Debugging mode	Yes	Yes	Yes
<i>Deployment support</i>	1	2	3
Lock-in when building own Cloud	Yes (VMWare)	No	Yes (RHE)
Web server (e.g. Tomcat)	Yes	Yes	Yes
Build-in-balancer	No	Yes	Yes
Performance analytics	Yes	No	Yes
Support multiple Cloud providers	Yes	Yes	Yes
Agreements SLA	No	Yes	No
Deploy with a special tool	Yes	No	No
Support Private Cloud	Yes	Yes	No
Allows to add third party components	Yes	Yes	Yes
<i>Execution support</i>	1	2	3
Command line (CLI)	Yes	Yes	Yes
Web console	No	Yes	Yes
Access to logs via web	No	Yes	Yes
Web based monitoring	No	No	Yes
Multitenant	Yes	Yes	Yes

# What's next?

- ❖ **Full integration & testing & benchmarking & promotion of mOSAIC PaaS - deadline Spring 2013**
- ❖ **Develop further the open-source and deployable PaaS: Improve platform services (e.g. new on-going projects)**
- ❖ **Use the platform and programming style for real applications**