

# ARCADIA

*Newsletter Vol. 2— December 2015*

**A Novel Reconfigurable By Design Highly Distributed Applications Development Paradigm Over Programmable Infrastructure**



## Editorial

Dear Readers,

Welcome to our second issue of **ARCADIA** Newsletter that we would like to present to you! Here you can find updated information on the progress of our project and read news related to **ARCADIA**, which we hope will be of interest to you.

In this issue, we have prepared the following selection of articles in order to provide a deeper look into the work being done in the context of the EU-funded project **ARCADIA**:

- ♦ A description of the ARCADIA framework
- ♦ An article on the envisaged relation between ARCADIA framework and the network infrastructure
- ♦ Dissemination activities in the second semester of 2016
- ♦ Plenary meeting in Athens

We will regularly keep you updated with the most recent news about the status of the project, the consortium dissemination activities and a recommendation of conferences that might be of interest to you. Moreover, we kindly invite you to also regularly consult our website: **<http://www.arcadia-framework.eu>**

We are happy to invite you to follow our activities with this newsletter and we are looking forward to your feedback.

Yours sincerely,

The **ARCADIA** consortium

## Project details

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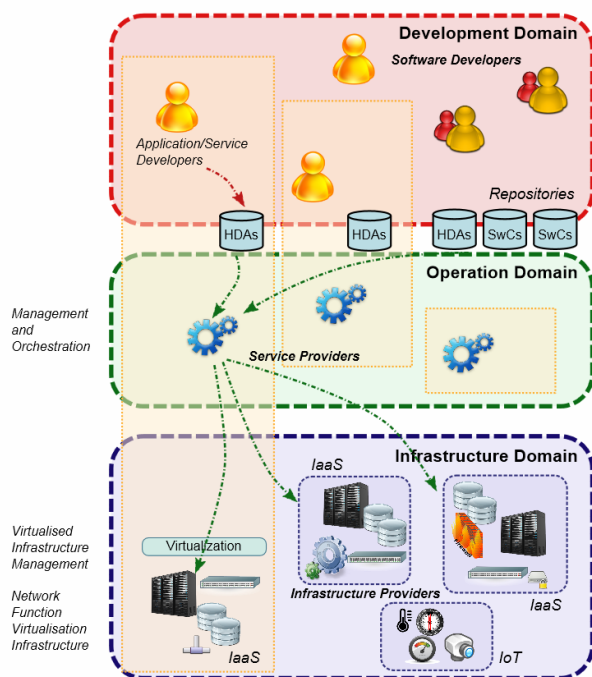
# ARCADIA: a sophisticated framework for HDAs

## Overview

After 6 months of internal discussion, ARCADIA delivered in the second half of its first year of activity the general reference architecture for the project (see deliverable D2.3, available at the project's website). According to its mission, ARCADIA is targeting a software development paradigm that enables programmers to take into account the execution context, so as to include requirements, configuration and deployment hooks, and adaptation capabilities into their applications.

## A framework spanning multiple domains

The ARCADIA Framework spans over three domains: *Development*, *Operation* and *Infrastructure*.

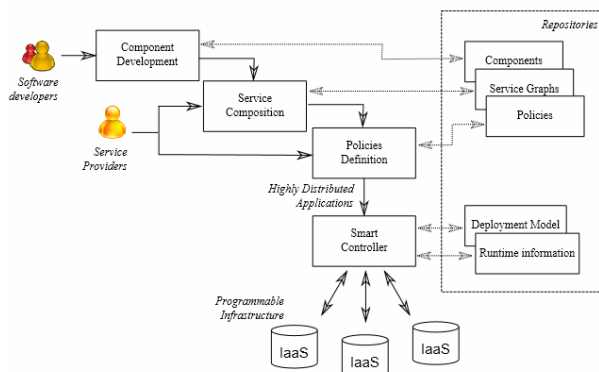


The **Development domain** concerns the creation of applications and services. The overall organization reflects a similar logic to recent software architectures, like TOSCA and the NFV framework. The Development domain encompasses both the implementation of individual software components and their chaining to build complex applications (service graphs). In the ARCADIA ecosystem, repositories are used by software developers to publish their applications, and they also act as cata-

logue for service providers to browse and retrieve available applications and services. The **Operation domain** interprets the service graph and carries out the deployment, configuration, and life-cycle management processes of the application. The availability of metadata in addition to the core logic enables to automate such processes. The Operation domain includes the orchestration logic and the control interfaces to deploy the HDA over multiple programmable infrastructures; it also includes deployment policies. The **Infrastructure domain** is the collection of heterogeneous programmable infrastructures. It also provides virtualization layers to abstract the physical infrastructure and to make virtual resources available on top of it. Though there may be a large range of virtualized devices (cloud resources, transport networks, IoT), ARCADIA will mainly focus on a limited set of resources, namely computing, networking and storage.

## High-level description of the ARCADIA Framework

The ARCADIA Framework is made of the following stages: software development, application instantiation, application execution. The Software Development paradigm entails a cyclic and nested process to build Components and Services incrementally, from basic bricks (Component Development) to complex graphs (Service Composition). Application instantiation consists of enriching service graphs with deployment policies (Policies Definition), concerning the Service Providers' strategies to make the optimal usage of the underlying infrastructure. Finally, application execution is performed by the Smart Controller, which automates the processes of deploying, executing and monitoring distributed applications, by properly management of the underlying virtual and physical resources. The three stages are woven in a com-



## A tighter control of the networking infrastructure

Cloud Management Software (CMS) provides high-level abstraction and virtualization of the underlying computing, networking and storage resources. The mapping of virtual resources to physical servers and network devices is not a trivial task; CMS traditionally implement this function for computing aspects, but not for networking.

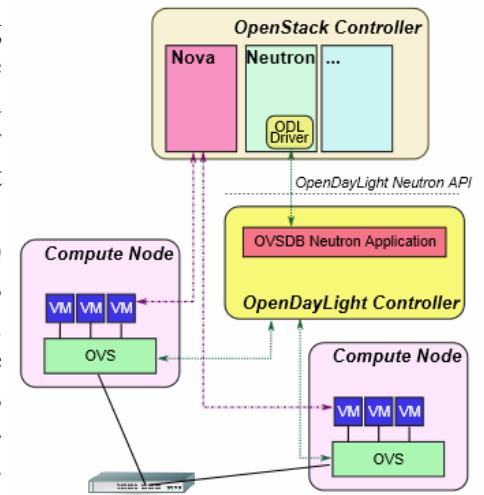
The design of Highly-Distributed Applications (HDAs) is and will be increasingly demanding for tight bounds on bandwidth, latency, jitter, availability, resilience, security, and traffic isolation. Traffic engineering is the only viable solution in very high-density installations like the data centers, to avoid the technical and economical burden of heavy overprovisioning. In this context, Software Defined Networking (SDN) entails a tighter and more flexible control of the networking infrastructure, but its application in CMS is currently largely unexplored. For example, OpenStack includes an SDN mechanism driver that uses an SDN controller (OpenDayLight) to configure Open vSwitch (OvS) instances in the physical servers, but does not provide any control over the networking infrastructure.

HDAs require that all physical networking devices should be brought together under the control of the SDN controller and a high-level business logic should define networking strategies. The business logic should be part of an orchestrator, which deploys HDAs according to the execution requirements and the infrastructure policies.

In ARCADIA, we pursue a tighter control of the networking infrastructure following the main vision depicted above. We are currently designing

- an SDN application, running in the OpenDayLight framework, which manages both the OvS instances and the networking infrastructure, and
- an allocation algorithm that optimizes usage of both the computing and networking infrastructure, according to energy efficiency principles, to be part of the Smart Controller.

We are targeting at showing a preliminary implementation within 6 months, and at proposing the OpenDayLight application to the OpenStack community.



## Dissemination activities

Members of the ARCADIA consortium have presented ARCADIA concepts in various conferences and workshops in the second half of 2015. More specifically there was an ARCADIA presence in the following events:

- BdkCSE'2015 – Big Data, Knowledge and Control Systems Engineering Conference, that was held from 5 to 6 November 2015 in Sofia, Bulgaria.
- Sustainable Data Centers and Cloud Computing (SD3C) Workshop, part of 8th IEEE/ACM Intl Conference on Utility & Cloud Computing, 7-10 December 2015, Limassol, Cyprus.
- Cloud Forward 2015, 6-8 October 2015, Pisa, Italy.
- DATA 2015 conference, 20-22 July 2015 Brussels, Belgium.
- UNIFI annual workshop, 14 November 2015, Berlin, Germany.
- 3rd Annual Privacy Workshop, 30 October 2015, Berlin, Germany.
- GEN6 project workshop, 21 April 2015, Athens, Greece.
- PCI 2015 - Critical Infrastructure Protection Workshop, 1-3 October 2015, Athens, Greece.



## Plenary meeting in Athens



The 2nd plenary meeting of the ARCADIA project took place in Athens from 10 to 11 of November 2015. It was organized by Wings ICT Solutions. All the partners were represented and the involved people had the chance to share their knowledge and to plan their next steps in progressing the project.

The next meeting will be organized by NUIG, the partner responsible for the whole project coordination. It will be hosted in Ireland in the beginning of March 2016. The main issues for discussion will be on the implementation of the ARCADIA framework.

### Project Coordinator



Insight Centre for Data Analytics  
National University of Ireland  
Galway

Project Manager: Dr. Adegboyega Ojo

Tel: +353 91 495336

Email: [adegboyega.ojo@insight-centre.org](mailto:adegboyega.ojo@insight-centre.org)

### Consortium



Univerza v Ljubljani



Do you want to know more about **ARCADIA** project?

### Contact Us



<http://www.arcadia-framework.eu>



[adegboyega.ojo@insight-centre.org](mailto:adegboyega.ojo@insight-centre.org)



<https://www.linkedin.com/groups/6949809>



[https://twitter.com/eu\\_arcadia](https://twitter.com/eu_arcadia)

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