

ARCADIA

Newsletter Vol. 3— June 2016

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



Editorial

Dear Readers,

Welcome to our third 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**:

- ♦ How the ARCADIA framework could support the NFV-to-SDN convergence
- ♦ Report on the 1st ARCADIA workshop that was organized during EuCNC 2016 conference
- ♦ Dissemination activities in the second semester of 2016
- ♦ Plenary meetings in Galway and Genoa

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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Tailoring the needs for NFV-to-SDN convergence

An opportunity for the ARCADIA framework

Network Function Virtualization (NFV) is the ground-breaking innovation trend in networking and “softwarization” has been the buzzing word for NFV since its very beginning; in fact, the main objective has ever been the implementation of Virtual Network Functions (VNFs) in the computing domain, while the network infrastructure has been largely seen as the dumb substrate that provides mere connectivity between the software instances. However, there has always been the latent awareness that carrying out specific operations over dedicated hardware

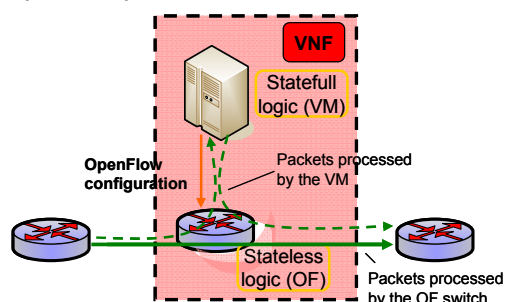


Fig. 1 Example of simple offloading to an OpenFlow switch

still could have been convenient for performance and efficiency reasons. As a matter of fact, packet filtering and classification, deep packet inspection, encryption, and QoS enforcement are all intensive packet-processing tasks whose hardware realization outperforms software implementation by orders of magnitude. In this respect, a hybrid implementation made of software components deployed on general purpose CPUs and specialized tasks running on network devices represents the most interesting evolution for more efficient NFV systems.

The challenging vision is the realization of “hybrid” VNFs, which execution is split between standard VMs/containers in the computing domain and dedicated hardware in the networking domain. To this aim, some main aspects must be addressed: i) a tighter integration between the computing and networking domain, which should build a common execution environment, ii) suitable software development paradigms that enable to split the execution on different targets, and iii) proper orchestration over the mixed computing/networking environment.

The **tighter integration between computing and networking** has been an on-going process for several years. The main target is network programmability, which allows greater flexibility in network behavior than what allowed

by legacy communication protocols. The most relevant effort in this field falls under the concept of Software-Defined Networking (SDN), and envisions a clear separation between the data plane (aka data-path) and the control plane.

Concerning software development and orchestration aspects, in our opinion the ARCADIA framework could provide an effective solution. The ARCADIA development paradigm is based on micro-services, which are elementary software units that can be composed in service graphs to build complex applications, and a Context Model, which includes requirements, policies, and optimization objectives for orchestrating, deploying and managing ARCADIA applications over multiple IaaS platforms. The combination of the micro-services approach with a rich Context Model provides a powerful tool to develop, orchestrate and deploy hybrid network functions over programmable infrastructures. For example, specific micro-services instances could be developed to perform packet processing either on general-purpose CPUs or on dedicated hardware, by exposing the same service interface and by making them available in the ARCADIA software repository. Software developers are thus able to specify the function they need when developing their applications, while the most suitable instance (hardware-accelerated or general-purpose) is selected at run time by the orchestration logic (ARCADIA Smart Controller), according to the current execution environment and the service provider policies.

Figure 2 shows an indicative example of how an ARCADIA application could be deployed over a mixed computing/networking environment.

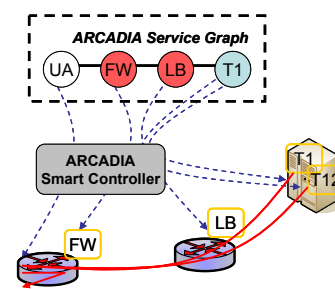


Fig. 2 ARCADIA application deployed over an integrated computing/networking infrastructure

We will follow with attention the evolving landscape for network programmability and we are going to integrate such aspects in our framework. Further, we believe that a more rigorous formalization for including network programmability aspects into software development paradigms should be undertaken by relevant standardization bodies in this field; in this respect, our intention is to propose this topic as a further enhancement for TOSCA.



Scientific workshop organized by ARCADIA



The first ARCADIA workshop was held in Athens during the European Conference on Networks and Communications (EuCNC) 2016. The workshop was a great opportunity for the project to discuss its architecture, on-going work, prototype implementation and to establish connections with other related initiatives. The workshop provided an overview of on-going work in the EU projects ARCADIA and INPUT, presentation of related initiatives, and contributions from other researchers and projects. At least 40 participants attended the workshop, including people

from the industry (telcos, vendors), people from SMEs active in the 5G domain, as well as people from the academia and research institutes.

One of the key topics presented and discussed was the current techno-economic transformation of networks driven by the ever growing deployment of IT equipment within communication infrastructures, with the prime aim to realize most legacy functions in software. This trend will ultimately deploy a large amount of computing and storage resources into the network, building a vast programmable execution environment that open the opportunities for far more services beyond mere voice/data transport (5G networks). The cutting-edge technologies in this field are mainly the Network Function Virtualization (NFV) and the Software-Defined Networking (SDN), which are very promising. However, their real potential is currently overlooked and it was suggested during the workshop to avoid being "seduced" by the buzz words in NFV/SDN, since the implementation of their full potential is very challenging and many aspects still need investigation.



Finally, the main objectives and the on-going research activities in the INPUT project were presented. The INPUT project is targeting fog computing paradigms by exploiting ICT installation at the Telcos' network edge. The main motivation is the increasing virtualization trend, with an ever larger number of applications and services moved to the cloud, and the difficulty to meet stringent QoS constraints for interactive and multimedia applications.

Dissemination activities

Members of the ARCADIA consortium have presented ARCADIA concepts in various conferences and workshops in the first half of 2016. More specifically there was an ARCADIA presence in the following events:

- Net Futures 2016 conference that was held in Brussels from 20 to 21 April 2016. There was also a demo of the ARCADIA orchestrator focusing on the deployment and orchestration of distributed applications over programmable infrastructure.
- European Conference on Networks and Communications (EUCNC 2016) that was held in Athens from 27 to 30 June 2016.



Plenary meetings in Galway and Genoa



The 3rd and 4th plenary meetings of the ARCADIA project took place in Galway (22-23 March, hosted by NUIG) and Genoa (16-17 June, hosted by CNIT) respectively.

The work carried out in the context of WP2 was consolidated and the preparation of the ARCADIA use cases has started. Various issues concerning the implementation of the ARCADIA platform software components were discussed and resolved. Information on the upcoming first review meeting of the ARCADIA project on 9 September 2016 in Brussels was also provided.

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