nephele

Horizon 2020

eNd to End scalable and dynamically reconfigurable oPtical arcHitecture for application-awarE SDN cLoud datacentErs

NEPHELE is developing a dynamic optical network infrastructure that aims to overcome current architectural limitations and drastically reduce cost and power consumption, enabling cloud datacenters to scale gracefully. The industry-driven project brings together seven leading organizations across Europe.

At a glance: NEPHELE

Project Website

www.nepheleproject.eu

Project coordinator

Hercules Avramopoulos

Institute of Communication & Computer Systems
National Technical University of Athens
Tel: +30 210 772 2076
Fax: +30 210 772 2077
email: hav@mail.ntua.gr

Duration

February 2015 – January 2018

Partners

National Technical University of Athens (GR), Seagate (UK), Gesellschaft für Wissenschaftliche Datenverarbeitung mbH Göttingen (DE), Mellanox Technologies (IL), Nextworks (IT), University of Patras (GR), Interoute (IT)

Grant Agreement no: *645212*

Funding: *H2020-ICT-2014*

EC contribution: *3 million €*

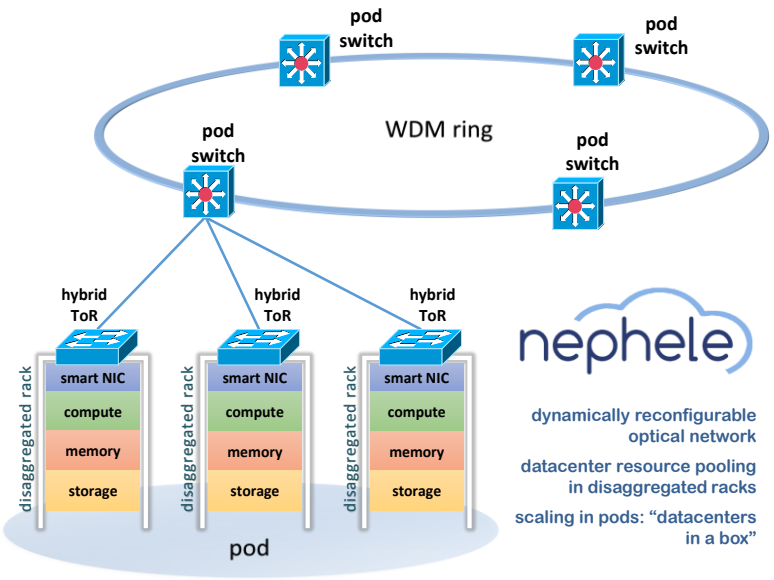
THE FRAMEWORK PROGRAMME FOR RESEARCH AND INNOVATION
HORIZON 2020

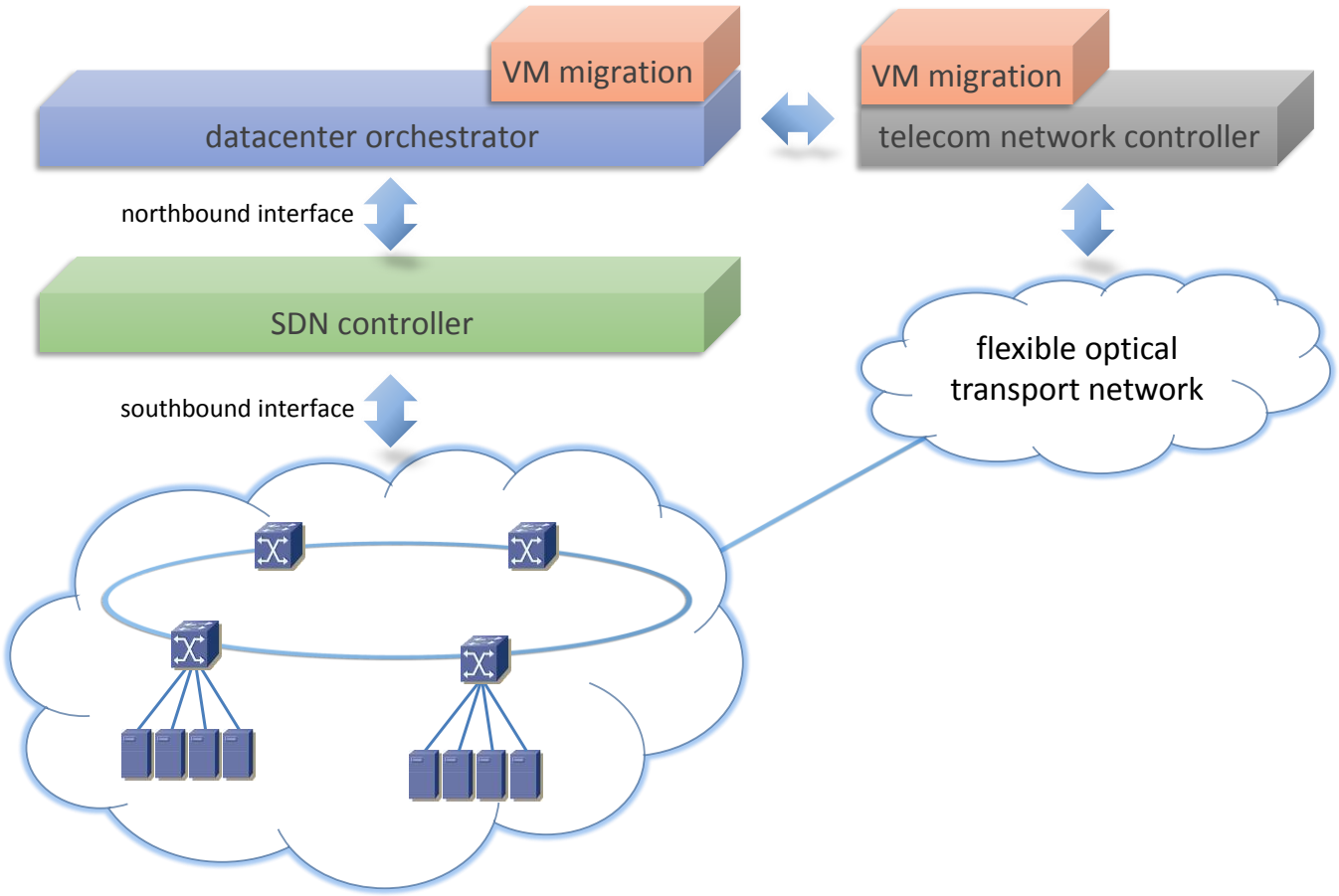
The Challenge

The proliferation of cloud-based applications is stimulating a relentless growth in the underlying datacenter infrastructure. Scaling-out the datacenter is generating enormous connectivity requirements whereas the emerging concept of resource disaggregation is further raising the bar in network capacity and latency. Traditional datacentre network architectures scale super-linearly with the number of servers, imposing a ceiling on the maximum economically-viable datacenter dimensions. Content providers face the challenge of scaling their infrastructure in a cost-effective manner, in order to improve their services to the end-user.

Vision

NEPHELE aims to develop a dynamic optical network infrastructure for future scale-out, disaggregated datacenters. NEPHELE builds on the enormous capacity of optical links and leverages hybrid optical switching to attain the ideal combination of high bandwidth at reduced cost (-30%) and





power (-80%), compared to current datacenter networks.

An end-to-end development path is pursued, extending from the datacenter architecture to the overlaying control plane and interface to the application, in order to deliver a fully functional networking solution.

Project Objectives

NEPHELE's hybrid electronic-optical network architecture scales linearly with the number of datacenter hosts and consolidates compute and storage networks over a single, Ethernet optical TDMA network. Low latency, hardware-level dynamic re-configurability and quasi-deterministic QoS are supported in view of disaggregated datacenter deployment scenarios. A fully functional control plane overlay is being developed, comprising a Software-Defined Networking (SDN) controller along with its interfaces. The southbound interface abstracts physical layer infrastructure and allows dynamic hardware-level network reconfigurability. The northbound interface links the SDN controller with the application requirements through an Application Programming Interface. NEPHELE's innovative control plane enables Application Defined Networking and merges hardware and software virtualization over the hybrid optical infrastructure. It also integrates SDN modules and functions for inter-datacenter connectivity, enabling dynamic bandwidth allocation based on the needs of migrating VMs, as well as on existing Service Level Agreements for transparent networking among telecom and datacenter operators' domains.

Technology Exploitation

NEPHELE is developing an end-to-end solution extending from the datacenter architecture and optical subsystem design, to the overlaying control plane and application interfaces. Driven by user needs, the project aims to bridge innovative research in datacenter networking with near-market exploitation, achieving transformational impact in energy consumption and cost that will allow datacenters to continue to scale. NEPHELE's objectives address a vigorous multi-billion Euro market and the industrial partners of the consortium hold considerable market shares across the value chain. NEPHELE will therefore strengthen Europe's industrial position in the field of cloud datacenter technologies.