NOTA DE PRENSA
PRESS RELEASE

Telefónica collaborates with Brocade, Cyan, Intel and Red Hat to showcase an orchestrated End-to-End Network Function Virtualization Architecture

- **The demo shows how an advanced and multi-vendor implementation of the ETSI ISG NFV architecture with intelligent orchestration of resources is capable to provide carrier grade performance**
- **The demo evidences the value of proper VNF design, a coherent information model and a true NFV orchestrator. It will be shown at the Intel booth #3D30 in the upcoming Mobile World Congress 2015**

Barcelona - March 2, 2015 – Telefonica announced today that it will present an end-to-end network-functions virtualization (NFV) scenario instantiation demonstration in collaboration with Brocade, Cyan, Intel and Red Hat at the Mobile World Congress event in Barcelona.

The demo uses the network virtualization framework based on the approach of ETSI ISG NFV and developed by Telefónica NFV Reference Lab. It showcases a Brocade VNF service chain deployed using standard TOSCA information models through the enhanced Cyan Blue Planet NFV Orchestration engine onto a network virtual function infrastructure.

The goal of the demo is to demonstrate how an advanced and multi-vendor implementation of the ETSI ISG NFV architecture with intelligent orchestration of resources is capable of providing carrier grade performance, while a regular cloud infrastructure is insufficient. The demo shows an NFV service orchestrator instantiating and operationalizing a VNF, both with and without enhanced platform awareness optimization techniques that take advantage of VIM (Virtual Infrastructure Manager) and the Intel® Open Network Platform Server features to deliver better performance and resource utilization.

In order to show the differences, two scenarios will be launched in parallel and compared in terms of performance results: a cloud-like scenario, where VIM will be forced on

purpose to allocate resources in a non-optimized way and a NFV ready scenario, where VIM is used to allocate resources on a deterministic way.

The demo will highlight the importance of:

- Industry standard, open and extensible information models such as Topology and Orchestration Specification for Cloud Applications (TOSCA) and Open Virtual Machine Format (OVF)
- Exposure of the performance enablers (NFVI attributes) in the virtual infrastructure manager (VIM) and OVF Descriptors
- End to End NFV service delivery with NFV intelligence built in at each layer: the VNF, Orchestrator, VIM and NFVI
- The ability to intelligently match the performance requirements of services and VNFs with the available NVFI by optimally placing VNFs on compute resources
- Demonstrate the differences of optimization techniques (NFVI attributes) on the VNF and highlight the full utilization of NFV hardware infrastructure processing capability

In this collaboration, Cyan's Blue Planet SDN and NFV platform will be used as the NFV service orchestrator, the Brocade Vyatta 5600 vRouter will be used as the VNF and Telefónica's VIM will be providing the virtual infrastructure manager role all running on NFV hardware infrastructure utilizing Intel processors.

To schedule a live demonstration at **Intel booth #3D30** at Mobile World Congress in Barcelona, March 2-5, 2015, contact marketing@cyaninc.com.

Telefónica NFV Reference Lab

"Telefónica NFV Reference Lab aims to help the ecosystem of partners and network equipment vendors to test and develop virtualized network functions leveraging on an advanced NFV orchestration framework and proper capabilities for deterministic resource allocation in the pool. NFV Reference Lab drives this adoption through the release of open source code, thus encouraging software developers to explore new NFV possibilities and all this from a well- designed and tiered architecture proposal. Its aim is to promote interoperability and provide a more open ecosystem so that telecommunications providers adapt and expand their network services more easily." Said Enrique Algaba, Network Innovation and Virtualisation Director, Telefónica I+D-Global CTO.

Brocade Vyatta 5600 vRouter

The Brocade Vyatta 5600 vRouter is the industry-leading virtual router leveraging Intel DPDK that showcases superior levels of performance and scale by full utilization of Intel®-based NFV hardware for Telco providers. Brocade's extensible and open operating system also highlights the ease of advanced interoperability for intelligent network service orchestrators like Cyan by utilizing common and open data models providing Telcos with the ability to deploy critical VNF's with confidence.

"This multi-faceted demonstration highlights precisely the advantages of the New IP in an open networking ecosystem: Rapid innovation by vendors, converging into an elegant solution driven by a leading NFV adopter, Telefonica. The ease of intelligent orchestration allows for true automation of the full capabilities for all components within the NFV ecosystem," said Kelly Herrell, Senior Vice President and General Manager, Software Networking, Brocade.

Cyan´s Blue Planet SDN and NFV Platform

Planet Orchestrate is Cyan's innovative multi-domain and multi-technology SDN and NFV orchestration application. Architected to be entirely modular, data and template-driven, Planet Orchestrate coordinates the intelligent allocation, creation and management of a wide range of virtual and physical resources and services. Focused on enabling operators to leverage the agility, flexibility and dynamism offered by SDN and NFV architectures, it supports a degree of automation not available via conventional management systems.

"The intelligent NFV orchestration and placement PoC with Telefonica at Mobile World Congress is a clear example of the power of collaboration as it relates to driving real-world NFV use cases," said Mike Hatfield, president, Cyan. "The multi-vendor platform provides a unique framework for showcasing how Brocade's VNF and Telefonica's VIM can expose performance requirements and characteristics to Cyan's enhanced infrastructure aware NFV orchestrator. The orchestrator intelligently places the VNFs on Intel servers to meet the VNF's specific performance needs and efficiently use compute resources to deliver end-to-end services. This is an important issue that needs to be solved by the industry for deployment of NFV-enhanced services at massive scale."

Enhanced Platform Awareness (EPA)

The demonstration shows a whole new level of intelligence for enhanced platform awareness and VNF workload placement in NFV orchestration. By employing open data models such as TOSCA and OVF with the ETSI NFV architecture, the orchestrator is able

to intelligently assign VNFs to the optimal hardware and software to meet new levels of performance and SLA predictability on Intel® processors.

"The Intel® Network Builders community is committed to advancing SDN/NFV by enabling a broad and rich set of commercial solutions based on open source and standards," said Rene Torres, Director of Marketing, Software Defined Networking Division, Intel Corporation. "The NFV demonstration with Telefonica is a good example of collaboration between Intel Network Builders members to drive performance improvements and innovation in NFV development."

Red Hat collaboration

Telefonica and Intel also collaborated with Red Hat, the world's leading provider of open source solutions, on upstream development of, and testing of many NFV supporting features in the NFV Reference Lab, including:

- vCPU pinning
- Large pages support
- NUMA aware scheduling, including CPU, memory, and I/O device layout
- SR-IOV device passthrough

As part of this collaboration, Red Hat designed, developed, and implemented these features in the upstream OpenStack community and relevant projects, including OpenStack Compute (Nova) and OpenStack Networking (Neutron).

Red Hat is not only a leader in the upstream OpenStack community, but also as a provider of carrier-grade, production-ready OpenStack solutions. Red Hat Enterprise Linux OpenStack Platform, a highly scalable Infrastructure-as-a-Service (IaaS) solution, is emerging as a leading cloud platform for NFV.

"Building the foundation for an open NFV infrastructure requires expertise in Linux, KVM, and OpenStack – all areas of open source where Red Hat is a leading contributor," said Radhesh Balakrishnan, general manager, OpenStack, Red Hat. "By collaborating on the NFV Reference Lab, we're not only bringing features and expertise back to the upstream OpenStack community and our carrier-grade Red Hat Enterprise Linux OpenStack platform, but also enabling CSPs to successfully implement their modernization plans through NFV."

About Telefónica

Telefónica is one of the largest telecommunications companies in the world in terms of market capitalisation and number of customers. With its best in class mobile, fixed and broadband networks, and innovative portfolio of digital solutions, Telefónica is transforming itself into a

'Digital Telco', a company that will be even better placed to meet the needs of its customers and capture new revenue growth.

The company has a significant presence in 21 countries and a customer base of more than 316 million accesses around the world. Telefónica has a strong presence in Spain, Europe and Latin America, where the company focuses an important part of its growth strategy.

Telefónica is a 100% listed company, with more than 1.5 million direct shareholders. Its share capital currently comprises 4.551.024.586 ordinary shares traded on the Spanish Stock Market and on those in London, New York, Lima, and Buenos Aires.

About Brocade

Brocade (NASDAQ: BRCD) networking solutions help the world's leading organizations transition smoothly to a world where applications and information reside anywhere. (www.brocade.com)

About Cyan

Cyan enables network transformation. The company's SDN and NFV solutions deliver orchestration, agility, and scale to networks, that until now, have been static and hardware driven. Serving carriers, enterprises, governments, and data centers globally, Cyan's open platforms provide multi-vendor control and visibility to network operators, making service delivery more efficient and profitable. For more information, please visit http://www.cyaninc.com or follow Cyan on Twitter at twitter.com/CyanNews.

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About Red Hat