Telefonica Completes Multi-Vendor SDN Proof-of-Concept Trial

Worked with multiple vendors (ADVA Optical Networking, Ciena, Huawei and Infinera) to show how SDN can enable faster service creation

MADRID – November 18, 2014- Telefonica SA (NYSE: TEF) today announced the successful completion of a multi-domain and multi-vendor SDN interoperability proof-of-concept trial, which included working with ADVA Optical Networking (Frankfurt: ADV), Ciena (NYSE: CIEN), Huawei and Infinera (NASDAQ: INFN). Telefonica utilized its IETF-based Application Based Network Operations (ABNO) orchestrator-controller to demonstrate how it can enable faster creation of new services across multi-vendor optical transport networks when using a SDN hierarchical-controller architecture.

With SDN network abstraction and hybrid control, Telefonica was able to orchestrate domains leveraging distributed control planes, which enable optimized path calculation to minimize network resource utilization, and to provide greater scalability with faster, more efficient service restoration.

With this innovative activity, Telefonica was able assess the state of the industry with regards to multi-domain control in a SDN environment, so that it is better prepared to evolve its business.

Key Facts:

- Northbound REST APIs were used between the two controller layers. The ABNO orchestrator-controller was able to get the network topology for each domain from the individual domain controllers, and then use this information to determine how to set up an end-to-end service. It then used the API to pass the request for service set-up for each domain to the individual third-party domain controllers.

- ADVA Optical Networking contributed with four nodes of its SDN enabled FSP 3000 optical layer system featuring Reconfigurable Optical Add/Drop Multiplexers (ROADMs) and the new ADVA Network Hypervisor. This new technology enables carriers to develop virtual optical networks that support multi-tenancy and single operator ownership on a shared underlying physical infrastructure.

- Ciena demonstrated how its SDN software can easily and openly communicate with third party controllers to enable rapid service creation in a compound control system. In the trial, Ciena’s Navigate multilayer path computation engine received requests from the ABNO orchestrator and then used its Navigate multilayer path computation engine to calculate an optimal path through the 5430 Packet-Optical Platform. It then used an open interface to the 5430 to request the OneConnect Intelligent Control Plane to signal the multi-hop connection and enable dynamic restoration in case of network faults.

- Huawei contributed the T-SDN Controller (as a part of Huawei SoftCom strategy portfolio) and the OptiX OSN 8800 Intelligent Optical Transport Platforms located in China for this trial. Driven by Telefonica ABNO orchestrator controller through RESTful NBI, Huawei T-SDN controller can interwork with the orchestrator and APPs, and make the optical network more elastic, efficient, intelligent and open. Meanwhile, Huawei has been designing and implementing some enhancements to standard to promote the progress of Transport SDN technology and commercial deployment.

- Infinera supplied its Intelligent Transport Network™ featuring the DTN platform controlled via Infinera’s Open Transport Switch (OTS) SDN software. The OTS software provides an innovative, lightweight Web2.0 approach that facilitates transport network abstraction and
programmability along with rapid DevOps innovation of new features. Telefonica was able to integrate their ABNO controller with OTS’s REST APIs to extract the transport layer topology and dynamically provision on-demand capacity. Earlier this year, Telefonica demonstrated Network-as-a-Service using the ABNO controller and the Infinera OTS as seen in this video.

**Executive Comment**

“Software Defined Networks allows operators to optimize the network utilization as well as to reduce our operational costs,” said Javier Gavilán, planning and technology director for Transport, Core, Platforms and Mobile Devices at Telefónica. “Telefonica demonstrates its interested in SDN/NFV technologies as a way to evolve our networks to the future demands. We need to push the industry to have standard solutions, which enables interoperability between our vendors.”

“We’re happy to support Telefonica’s effort to achieve SDN-enabled multi-domain coordination,” said Christoph Glingener, CTO, ADVA Optical Networking. “Due to our leading position and our experience with SDN in the transport layer we understand the importance of multi-vendor interoperability and are actively driving network programmability.”

“This trial shows that with truly open, modular and cooperative SDN solutions, network operators like Telefonica are able to simplify network operations in real-world scenarios that involve multiple vendors and geographies,” said Steve Alexander, SVP and CTO, Ciena. “Telefonica has been a leader in innovation, and these trials demonstrate how SDN can enable rapid service creation across multi-vendor optical transport networks.”

“We’re very glad to verify the successful interoperability of REST NBI with Telefonica ABNO orchestrator.” said Zha Jun, President of Fixed Network Product Line, Huawei. “This POC trial will help Telefonica to further improve the efficiency of service provisioning, and move faster to the target of multi-vendor interoperability. Huawei will collaborate with Telefonica and standard organizations continuously to speed up the commercialization of T-SDN.”

“Infinera’s objective with OTS is to provide a rich abstraction for the industry’s most open, software controllable and intelligent transport platform to help carriers speed new service deployment and reduce costs through network optimization.” said Stu Elby, SVP Data Center and SDN at Infinera “We are pleased to work with Telefonica on this multi-vendor proof of concept demonstration.”

**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 24 countries and a customer base that amounts almost 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 (Madrid, Barcelona, Bilbao and Valencia) and on those in London, New York, Lima, and Buenos Aires.

To learn more about Telefonica visit [http://www.telefonica.com](http://www.telefonica.com).

**About ADVA Optical Networking**
At ADVA Optical Networking we're creating new opportunities for tomorrow's networks, a new vision for a connected world. Our intelligent telecommunications hardware, software and services have been deployed by several hundred service providers and thousands of enterprises. Over the past twenty years, our innovative connectivity solutions have helped to drive our customers’ networks forward, helped to drive their businesses to new levels of success. We forge close working relationships with all our customers. As your trusted partner we ensure that we're always ready to exceed your networking expectations. For more information on our products and our team, please visit us at: http://www.advaoptical.com.

About Ciena

Ciena (NYSE: CIEN) is the network specialist. We collaborate with customers worldwide to unlock the strategic potential of their networks and fundamentally change the way they perform and compete. Ciena leverages its deep expertise in packet and optical networking and distributed software automation to deliver solutions in alignment with its OPn architecture for next-generation networks. We enable a high-scale, programmable infrastructure that can be controlled and adapted by network-level applications, and provide open interfaces to coordinate computing, storage and network resources in a unified, virtualized environment. For updates on Ciena news, follow us on Twitter @Ciena or on LinkedIn http://www.linkedin.com/company/ciena. Investors are encouraged to review the Investors section of our website at http://www.ciena.com/investors, where we routinely post press releases, SEC filings, recent news, financial results, and other announcements. From time to time we exclusively post material information to this website along with other disclosure channels that we use.

About Huawei

Huawei is a leading global information and communications technology (ICT) solutions provider with the vision to enrich life through communication. Driven by customer-centric innovation and open partnerships, Huawei has established an end-to-end ICT solutions portfolio that gives customers competitive advantages in telecom and enterprise networks, devices and cloud computing. Huawei’s 150,000 employees worldwide are committed to creating maximum value for telecom operators, enterprises and consumers. Our innovative ICT solutions, products and services have been deployed in over 170 countries and regions, serving more than one third of the world's population. Founded in 1987, Huawei is a private company fully owned by its employees.

For more information, please visit Huawei online: http://www.huawei.com/

About Infinera

Infinera (NASDAQ: INFN) provides Intelligent Transport Networks for network operators, enabling reliable, easy to operate, high-capacity optical networks. Infinera leverages its unique large scale photonic integrated circuits to deliver innovative optical networking solutions for the most demanding network environments. Intelligent Transport Networks enable carriers, cloud network operators, governments and enterprises to automate, converge and scale their data center, metro, long-haul and subsea optical networks. To learn more about Infinera visit http://www.infinera.com, follow us on Twitter @Infinera and read our latest blog posts at blog.infinera.com.