

SOLUTION BRIEF

Communications Service Providers
Virtual Customer Premises Equipment



Telco Systems* NFVTime-OS is Foundation of Secure, Flexible vCPE

Innovative software runs on a wide range of Intel® architecture CPUs, adds award-winning cybersecurity and MANO-Lite for zero-touch deployment.



Introduction

Communications services providers (CommSPs) are looking to network functions virtualization (NFV) to give them the network agility required to serve the growing cloud access and services needs of their enterprise customers. This market evolution is driving the demand for virtual customer premises equipment (vCPE)—a new class of demarcation device that leverages the processing capability of an Intel® processor-powered server configured with multiple service-providing virtual network functions (VNFs). The use of VNFs adds agility to the edge of the network by allowing CommSPs to easily deploy or wind down customer services to meet customer needs.

To provide the foundation for vCPE, Telco Systems* has developed NFVTime-OS, an NFV infrastructure “operating system (OS)” for vCPE deployments that delivers a complete NFV environment combining open source virtualization and performance software with its own technology for security and manageability.

NFVTime-OS provides a turnkey solution with all the benefits of open source software, but with added security, performance, and management and orchestration (MANO) features that CommSPs require.

NFVTime-OS Highlights

- Support of any Intel® Atom® or Intel® Xeon® processor
- Small footprint and low resource consumption
- High per-core processing and networking performance
- Zero vCPE pre-configuration and self-automated image installation
- An open and flexible NFV-OS
- DPDK and SR-IOV acceleration
- Secured vCPE device boot capability ensures the device boots using only trusted software
- Virtual switching and VNF service chaining available for all third-party VNF applications that are certified on NFVTime-OS
- Full vCPE Lifecycle management for both the NFVTime NFVI OS and VNFs, including support for remote upgrade, backup, restore, and provisioning
- Proven interoperability and performance-tested support for third-party VNFs from Cisco,* Brocade,* Silverpeak,* Palo Alto Networks,* Fortinet,* Check Point,* and other Kernel-based Virtual Machine (KVM)* VNFs

NFVTime-OS Benefits for Communications Services Providers

Telco Systems NFVTime-OS suite enables CommSPs and managed services providers (MSPs) utilizing NFV to generate agile, cost-effective managed services with minimal pre-investment. Compared to fixed-function devices, the NFVTime-OS suite facilitates the cost and performance benefits of NFV that come from separating hardware from software and network functions. It also allows CommSPs and MSPs to mix and match between vendors and technologies, which can shorten time to revenues.

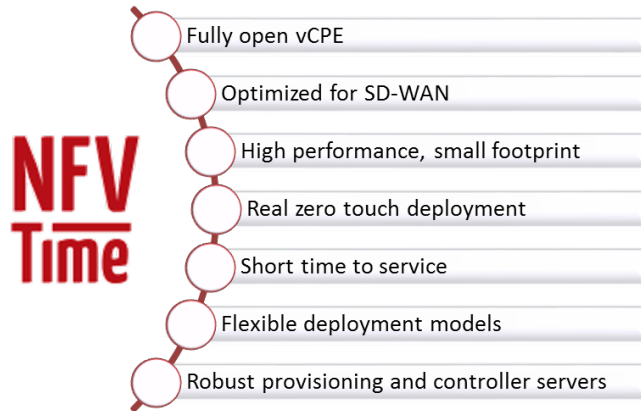


Figure 1. NFVTime-OS Benefits¹

NFVTime-OS Architecture

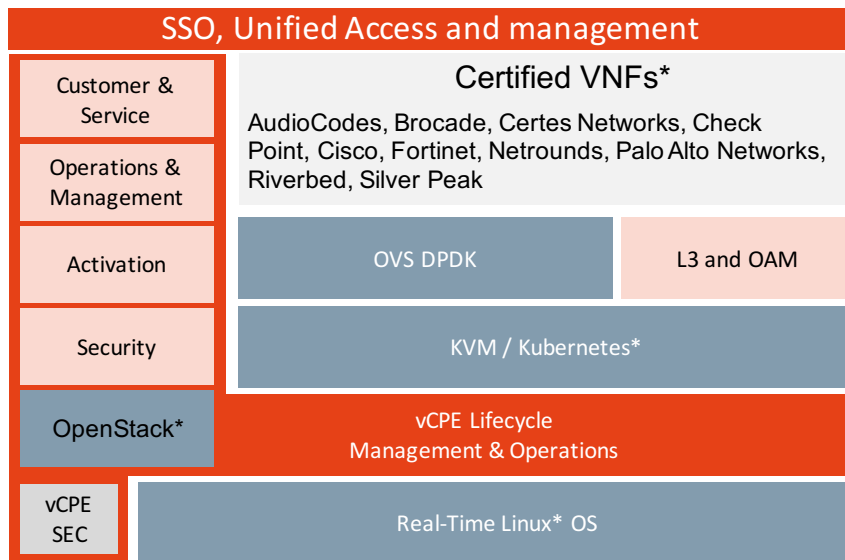


Figure 2. NFVTime-OS Block Diagram

The key software blocks in NFVTime-OS include the following:

- **vCPE Lifecycle Management and Operation:** Provides activation, operations, and security functionality
- **Virtual Network Switch:** Leverages Open vSwitch* integrated with the Data Plane Development Kit (OVS-DPDK) for fast data plane performance
- **Virtualization/Containerization:** Supports Kernel Virtual Machine (KVM) hypervisor or Kubernetes* containerization environment
- **OpenStack*:** Software module for creating VMs, configuring the service chaining, and controlling compute, storage, and networking services
- **Hardware OS:** Real-time Linux*
- **VNFs:** Any third-party VNF, including those that have been certified by Telco Systems. Telco Systems's NFVTime-OS can create service chains for all certified third-party VNFs for added service deployment flexibility.

MANO-Lite Brings Zero-Touch Deployment and Provisioning

A key Telco Systems innovation in NFVTime-OS is MANO-Lite management and orchestration (MANO) functionality, which provides zero-touch service deployment and services lifecycle management. The MANO-Lite software is not a comprehensive, network-wide MANO system, but instead is designed to provide valuable functionality for devices running NFVTime-OS. MANO-Lite components include:

- **Centralized OpenStack Controller:** A centralized controller in the MANO-Lite server works with the local OpenStack agent in the NFVTime-OS to download and configure VNF images, including setting up VMs and configuring service chaining.
- **Provisioning Server:** This component handles Zero-Touch Provisioning, including home calling and disaster recovery functionality.

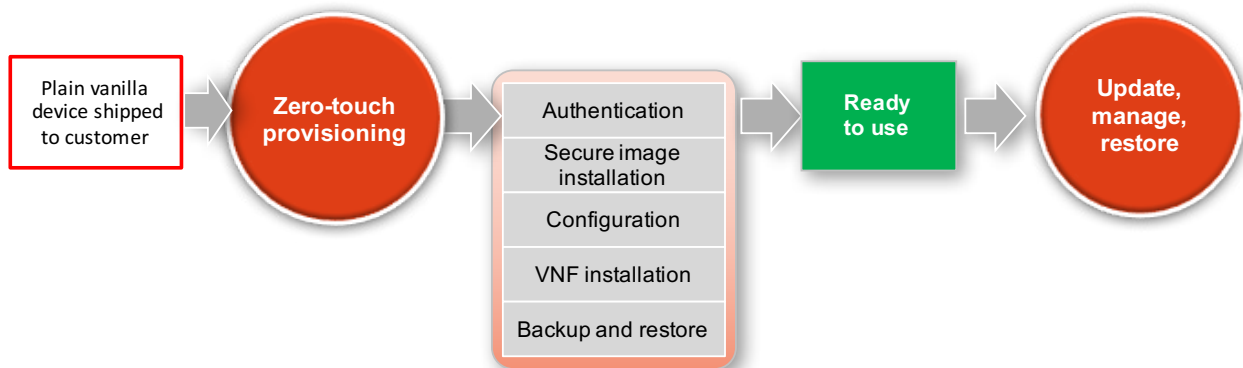


Figure 3. Zero-touch provisioning and auto activation

With MANO-Lite, a CommSP can ship out a server loaded with a default software image to the customer, where it can be deployed by a nontechnical resource who needs only to install it and connect it to the carrier network.

Once that is done, the switch will “phone home” to the provisioning server that downloads the latest version of NFVTime-OS along with the device configuration for that server. With that software, MANO-Lite then begins downloading the appropriate VNFs from the provisioning server. NFVTime-OS then configures the virtual machines, the VNFs, and the networking functions and begins operation. NFVTime-OS can also detect and activate hardware features such as processors with Intel® QuickAssist Technology encryption and compression that may be needed by certain applications. Once service is operational, MANO-Lite provides ongoing upgrade, backup/restore, monitoring, and security functionality during the lifetime of that service.

Award-Winning Cybersecurity

The security embedded into open source software is not carrier grade, and so Telco Systems has developed its own embedded security app for NFVTime-OS featuring critical vCPE security functionality. This starts with a “secured boot” capability developed by Telco Systems to ensure that the vCPE device boots using only trusted software. Other embedded security functions include security for install and update as well as advanced access control and single sign-on (SSO) functionality to reduce the risk of physical tampering.

NFVTime-OS is also integrated with Telco Systems’s award-winning NFV CyberGuard cybersecurity system² designed to protect NFV systems by using special collector sensors that gather data about patterned and non-patterned security attacks to the vCPE control plane, service chain, and logic flows. It sends that data to a special analytics engine that processes the information in real time and can trigger network-wide cybersecurity actions if necessary.

Designed for a Wide Range of Intel CPUs

Because enterprises have different needs and budgets for different branch office sizes, it’s important for NFVTime-OS to operate on a wide range of servers. The software is designed to be flexibly deployed on four- or eight-core Intel architecture CPUs, ranging from the Intel Xeon processors E3-15XX to Intel Atom processors C27XX. The processors offer the performance and low latency needed to power the virtualization functions, the communications VNFs, and the service VNFs such as firewalls, WAN optimization, or routing.

NFVTime-OS makes use of Intel® Hyper-Threading Technology for parallelization of virtualization tasks, allowing the OS to be executed in one physical core. With OVS-DPDK running on a second physical core, there are two or six cores (depending on the CPU) available for processing of service-provisioning VNFs. The software also takes advantage of Intel® Virtualization Technology (Intel® VT), a growing portfolio of technologies and features that make virtualization practical.

Two Hardware Deployment Options

Telco Systems offers its customers two deployment methods for NFVTime. CommSPs and MSPs can choose from a wide range of certified Intel architecture-based servers or order Telco Systems's own CloudMetro* family of networking devices, which include the CloudMetro 10 and the CloudMetro 100, which come preloaded with NFVTime.

The CloudMetro 10 is based on the Intel® Core™ i3-6100 3.7 GHz dual-core processor or the Intel Core i7-4790S 4 GHz processor with up to 6 gigabit Ethernet ports that are MEF 2.0 compliant for carrier Ethernet 2.0 layer two, MPLS, and IP-Plus Services.

The CloudMetro 100 server comes with either the Intel® Core™ i7-4790S 4GHz quad-core Processor or the Intel Core i5-4590S 3.7GHz Quad-Core Processor. It features 3 x 10 GbE and 12 x 1 GbE user ports that are also MEF certified to provide the complete range of carrier Ethernet services.

vCPE That Helps CommSPs Embrace Customer Changes

CommSPs are poised to become big players in managed services thanks to the service deployment agility offered by vCPE. The NFVTime-OS combines compatibility with OpenStack and other open source software with the security, performance, and MANO functions that CommSPs need. Designed for a wide range of Intel architecture-based servers, CommSPs can standardize on NFVTime-OS to serve all sizes of remote offices.

About Telco Systems

Telco Systems delivers a portfolio of carrier Ethernet and MPLS-based demarcation, aggregation, and vCPE solutions that enables service providers to create intelligent, service-assured, CE 2.0-compliant networks for mobile backhaul, business services, and cloud networking. Telco Systems's end-to-end Ethernet, SDN/NFV-ready product portfolio delivers significant advantages to service providers, utilities, and city carriers competing in a rapidly evolving telecommunications market. Telco Systems is a wholly owned subsidiary of BATM Advanced Communications (LSE: BVC). To learn more, visit Telco Systems at <http://www.telco.com>.

About Intel

Intel (NASDAQ: INTC) is a world leader in computing innovation. The company designs and builds the essential technologies that serve as the foundation for the world's computing devices. As a leader in corporate responsibility and sustainability, Intel also manufactures the world's first commercially available "conflict-free" microprocessors.³ Additional information about Intel is available at newsroom.intel.com and blogs.intel.com and about Intel's conflict-free efforts at conflictfree.intel.com.



¹ Figures are courtesy of Telco Systems.

² <http://cybersecurity-excellence-awards.com/2017-cybersecurity-product-awards-winners-finalists/>

³ "Conflict-free" refers to products, suppliers, supply chains, smelters, and refiners that, based on our due diligence, do not contain or source tantalum, tin, tungsten or gold (referred to as "conflict minerals" by the U.S. Securities and Exchange Commission) that directly or indirectly finance or benefit armed groups in the Democratic Republic of the Congo or adjoining countries.

Intel technologies' features and benefits depend on system configuration and may require enabled hardware, software or service activation. Performance varies depending on system configuration. **No computer system can be absolutely secure.** Check with your system manufacturer or retailer or learn more at intel.com.

© 2017 Intel Corporation. Intel, the Intel logo, Xeon, Atom, and Intel Core are trademarks of Intel Corporation or its subsidiaries in the U.S. and/or other countries.

* Other names and brands may be claimed as the property of others.