**Benefits to Network Equipment Manufacturers**

- **Time-to-Market:** Shorten vCPE product development cycle
- **Modular Architecture:** Framework built upon industry standards in a highly modular fashion with well-defined interfaces
- **Flexibility:** Supports different virtualization techniques and allows inclusion or exclusion of functionality to address different market segments
- **Performance:** Framework is optimized to deliver line-rate performance that scales linearly with the number of CPUs
- **High Quality:** Extensively tested in different hardware and software environments with real-time load scenarios
- **Field Proven:** Deployed in production networks
- **Lower cost & minimized risk:** Instantly delivers value through reduction in upfront capital commitment for R&D and eliminates risks associated with new development
- **Easy to Deploy:** Framework provides APIs for integration with industry standard ETSI MANO compliant NFV orchestrators

ALTEN Calsoft Labs Virtual CPE (vCPE) framework is a reusable software stack that can be used by Network Equipment Manufacturers (NEMs) to deliver customized vCPE solutions to telecom operators. The framework comes with a set of code libraries, support programs and APIs that help NEMs to shorten the R&D lifecycle to launch Enterprise or Residential vCPE solutions.

With ALTEN Calsoft Labs vCPE framework, NEMs can get a robust platform to develop vCPE solutions for different hypervisor and operating system environments, with seamless integration with ETSI MANO compliant NFV orchestrators. The framework is Intel® DPDK optimized to deliver line rate performance in fully virtualized (KVM, ESXi) and LinuX Container (LXC) based deployments.

**vCPE Framework Highlights:**

- Field Proven (already deployed in production networks)
- High Performance (Intel® DPDK optimized)
- Customizable (modular construction with separate data and control planes)
- Open standards based
- Scalable (performance scales linearly with the number of processors)
- Interoperable (offers easy integration with ETSI MANO compliant NFV orchestrators)
- Portable across different Hypervisor and OS environments

**Virtual CPE Framework**

**Typical vCPE Deployment Scenario**
**VNF Development**
- Architect, design and develop VNFs
- Intel® DPDK based VNF optimization
- Support for different virtualization architectures (LXC/Para/Full)
- Support for different virtual environments (VMware/KVM/Xen)

**VNF Benchmarking and Performance Tuning**
- Benchmarking VNF performance in Enterprise/Telco environments
- Performance improvements with Intel® DPDK based optimization
- Fast path optimization using offloading techniques

**VNF Management and Orchestration**
- Design and develop FCAPS & VNF lifecycle management framework
- Develop VNF packages and Service lifecycle management features
- Integrate with 3rd party NFV orchestrators or legacy NMS/OSS

**VNF Porting and Testing**
- Porting from custom silicon to COTS x86 platform
- Migration of VNFs to a different Hypervisor/OS environment
- VNF testing using industry leading test tools/equipment

**Ease of Deployment**
Solutions developed using ALTEN Calsoft Labs vCPE framework can be easily deployed on industry standard virtualization platforms. The vCPE framework offloads core CPE functionalities such as NAT, Stateful Firewall, Routing, VPN access, multi-service QoS and other complex traffic handling functions from customer premises equipment to the Service Provider cloud.

This reduces overheads associated with the management of multiple network elements at the customer premise. vCPE service instances can be created on demand to support multiple customers, and managed centrally, thereby reducing OpEx and enabling new revenue streams for service providers.

**Extendable vCPE Functions & Features**
The ALTEN Calsoft Labs vCPE framework adds scalability and flexibility to traditional CPE functions. Some of the core functions provided by the framework are as follows:
- VLAN (802.1Q, and Q-in-Q)
- DHCP server, DHCP client and DHCP relay
- Static and Dynamic NAT (with support for ALGs)
- Stateful Firewall
- Routing (RIP and OSPF)
- Static & Dynamic Virtual Routing and Forwarding (VRF)
- Multi-site Layer-3 VPN
- Quality of Service (QoS)
- CLI/SNMP based VNF management
- Service Provisioning Portal

The ALTEN Calsoft Labs vCPE framework allows NEMs to add new functions/features in their solutions to support enterprise and residential deployments.

**Other NFV Solution Accelerators**

- **Cloud VPN Gateway**
  Highly scalable carrier grade IPsec VPN Gateway solution on industry standard x86 servers

- **Virtual WLAN Controller**
  Based on the “central control, distributed forwarding” model for lightweight management, control and authentication

- **Virtual EPC**
  Fully featured virtualized core network for voice and packet data on 4G LTE, 3G UMTS and GSM networks

- **NFVOps Framework**
  Customizable NFVO framework, VNF manager and Virtual Infrastructure Manager compliant to ETSI MANO specifications.