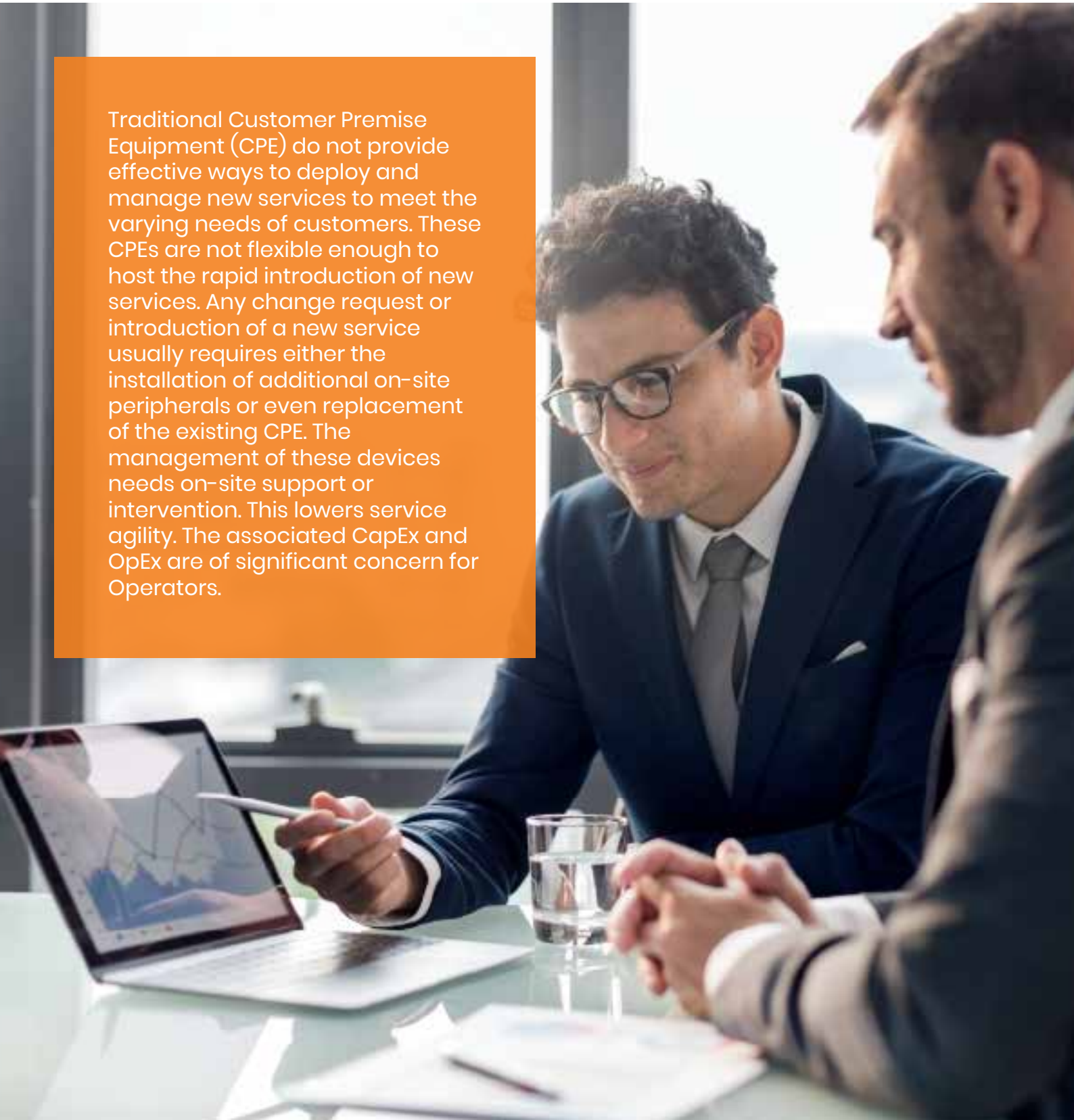# VCPE FRAMEWORK

Traditional Customer Premise Equipment (CPE) do not provide effective ways to deploy and manage new services to meet the varying needs of customers. These CPEs are not flexible enough to host the rapid introduction of new services. Any change request or introduction of a new service usually requires either the installation of additional on-site peripherals or even replacement of the existing CPE. The management of these devices needs on-site support or intervention. This lowers service agility. The associated CapEx and OpEx are of significant concern for Operators.

ACL Digital vCPE Framework

Reusable high performance DPDK optimized software stack that can be used by Network Equipment Manufacturers (NEMs) to develop customized vCPE solutions for network operators.

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

ACL Digital field-proven vCPE Framework has been used to develop scalable VNFs for enterprise and residential broadband networks including vCPE, IPSec VPN Gateway, Tunneling Gateway, Virtual Service Edge Router, etc. that have been deployed by operators.

vCPE Framework - Highlights

- **High Performance**
  - ➤ 10G/40G line rate packet processing
  - ➤ Data path performance scales linearly with number of CPU cores
  - ➤ Supports VirtIO, SR-IOV, Direct access & PCI pass through modes

- **Flexible Deployment Options**
  - ➤ Intel x86 COTS platforms
  - ➤ OpenStack cloud
  - ➤ Private and Public clouds

- **Modular Architecture**
  - ➤ Customizable data path and control plane

- **Multiple NIC support**
  - ➤ Niantic 82599, Fortville 10/40G, Third party NICs with DPDK support

- **Control Plane Orchestration**
  - ➤ Virtual Machines (VMs) managed by OpenStack
  - ➤ Linux Containers (LXCs) managed by Docker, Kubernetes or Mesos
  - ➤ OpenStack orchestrated Containers

ACL Digital Services

ACL Digital dev offers product engineering services to NEMs to help them reduce time-to-market to develop high performance vCPE solutions for residential and enterprise deployments. Our services include:

- **VNF Development & Customization**
  - ➤ Architect, design and develop VNFs
  - ➤ Support LXC/Para/Full Virtualization architectures
  - ➤ Support for different virtual environments (VMware/KVM/Xen)

- **VNF Management & Orchestration**
  - ➤ Design and develop FCAPS & VNF lifecycle management framework
  - ➤ Develop VNF packages for deployments such as VPN G/w, Firewall
  - ➤ Integrate & test with 3rd party NFV orchestrators or legacy NMS/OSS

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

- **VNF Porting & Testing**
  - ➤ Porting from custom silicon to COTS x86 platform
  - ➤ Migration of VNFs across different Hypervisors/OS environments
  - ➤ Testing VNF using industry leading test tools/equipment

vCPE Features

■ **IPv4 support**

DNS client, ICMP, ARP, Static routing, DHCP server, client and relay, IPv4 ACL

■ **IPv6 support**

Static routing, DHCP server and client, Neighbor Discovery Protocol, IPv6 ACL

■ **VLAN**

IEEE 802.1Q , 802.1ad

■ **Routing**

OSPFv2/OSPFv3, RIPv1 / RIPv2/RIPng, BGPv4

■ **Network Address Translation**

SNAT, DNAT, Masquerading

■ **Firewall**

IP tuple based, Stateful & Application-aware

■ **Security**

DPI, Intrusion detection, Intrusion prevention

■ **Virtual Private Network (VPN)**

Site-to-Site & Remote access VPN, Unicast & Multicast data, IKE-v1, IKE-v2 with Rekey, Virtual IP Pool, DHCP, Intel CMB, DES/3DES, AES, MD5, SHA1, SHA256 algorithms, Dead Peer Detection, NAT-T, IKE Fragmentation, Jumbo frames and 3GPP standards TS 33.320

■ **Tunnelling**
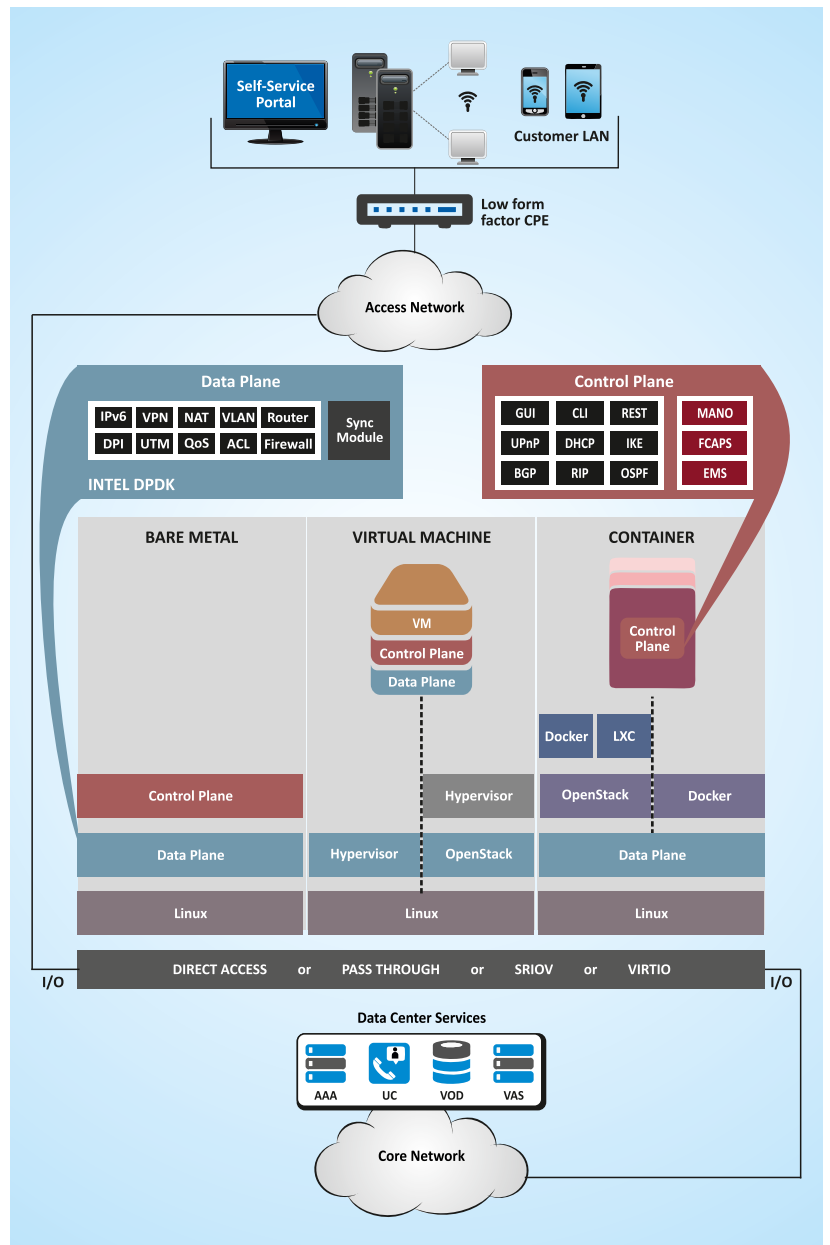
MPLS, EoGRE

■ **Quality of Service (QoS)**

Ingress QOS - Metering, Egress QoS - Shaping
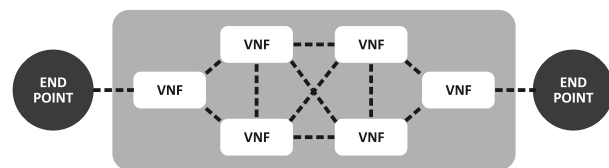
■ **Universal Plug and Play**

SSDP

■ **Management**

CLI, Web GUI, REST APIs, Multi-level logging

vCPE Service Chaining

VNFs built on top of this framework can be used in different service chains or pipelines to cater to various customer-specific use cases.