

## Enea® NFV Access: Lightweight Virtualization Platform for NFV and SD-WAN enabled Customer Premise Equipment

High networking performance with optimized dataplane, mixed virtualization technologies (optimized KVM and/or Docker containers), and complete VNF lifecycle management scaling from low to high end uCPE devices. Managed and orchestrated over NETCONF with dedicated management solution.

### Benefits

- ▶ **Minimal footprint:** Designed for high compute density on edge devices and standard servers. Does not require OpenStack.
- ▶ **High networking performance:** 10Gbps throughput
- ▶ **Container and VM support:** Supports virtualization with virtual machines and/or containers
- ▶ **Scalable:** From 1-core ARM edge device with single NIC to high-end x86 servers
- ▶ **Fast boot:** Boot speed optimization for best-in-class availability
- ▶ **NETCONF based management:** Platform and VNF lifecycle management with service function chaining all managed over NETCONF
- ▶ **Device management framework** supporting use case adoptable FCAPS functionality over NETCONF
- ▶ **Zero lock-in:** Open APIs and standards for portability and whitebox deployment

Enea NFV Access features a lightweight virtualization software runtime platform designed for deployment on edge devices at the customer premise. It is streamlined for high networking performance with minimal RAM footprint for both platform and VNFs, resulting in very high compute density. Enea NFV Access provides a foundation for vCPE agility and innovation, reducing cost and complexity for computing at the network edge.

### Functions and Features

- KVM: The standard virtualization engine for Linux based systems
- Docker: A standard platform for container virtualization, providing lightweight configuration using containers
- Virtual switching: Optimized OVS-DPDK provides high throughput and low latency
- EdgeLink: Orchestration interface for centralized VNF lifecycle management and service function chaining over NETCONF
- CLI-based VNF management: CLI access using virsh over libvirt
- FCAPS framework: Device management framework providing full FCAPS functionality to orchestration or network management systems
- Data plane: Includes optimized data plane drivers for OVS-DPDK, DPDK and OpenFastPath (OFFP)
- Zero Touch Provisioning over NETCONF using RFC 8071
- Software upgrade management over NETCONF

Enea NFV Access also features the Enea uCPE Manager, a platform and VNF management platform which controls and monitors the uCPE using NETCONF.

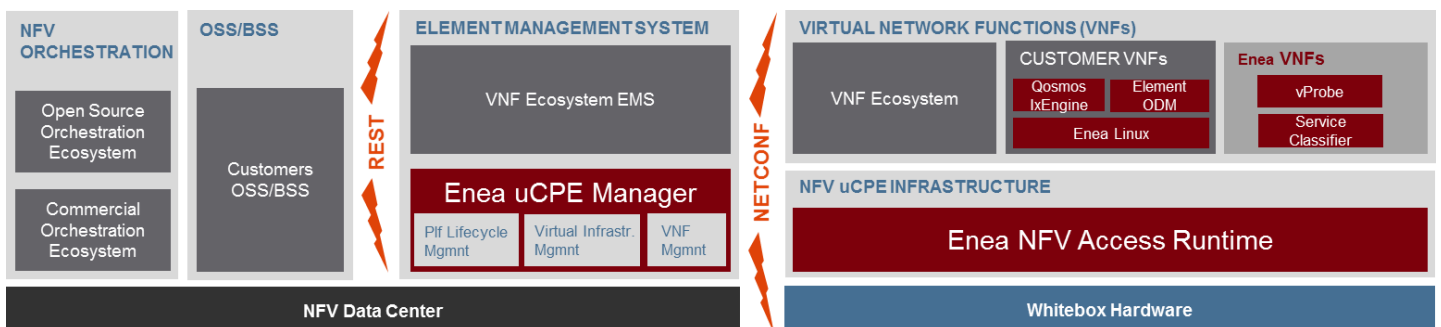


Figure 1. Enea NFV Access Deployment Overview

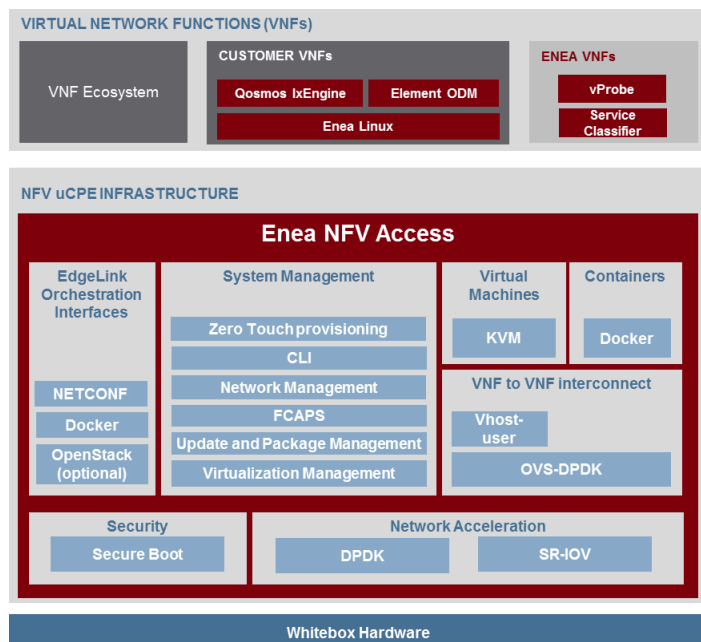


Figure 2. Enea NFV Access configuration.

## Configuration

Enea NFV Access can be set up to use containers, virtual machines, or a combination of these (see Figure 2). The VNFs communicate over an internal OVS bridge independently of virtualization implementation.

### EdgeLink NETCONF

EdgeLink NETCONF enables secure and standardized management along with ready to use management tooling for centralized management and orchestration. The EdgeLink NETCONF solution includes:

- Platform Management
  - FCAPS
  - Bare-metal Installation
  - ZTP
  - Software Management
  - Network/SFC
- VNF Management
  - Onboarding
  - Lifecycle management

All management is centralized in the Enea uCPE Manager tooling which integrates with Orchestration of choice. All management can be automated using Ansible or REST based scripting.

### Platform Management/FCAPS

Enea NFV Access integrates a powerful device management framework that is the foundation for full FCAPS functionality. The framework supports YANG modeling and NETCONF/REST northbound APIs.

Characteristics	Enea NFV Access	Competing alternatives
Platform RAM Footprint	< 1 GB	4-12 GB
Platform Disk Footprint	< 1 GB	4-12 GB
Platform CPU Footprint	1 core	2-4 cores
Platform Boot Speed (excl. BIOS)	< 3 seconds	10-30 seconds
Network Throughput over vSwitch	10 Gb IMIX Line Rate	1 Gb IMIX Line Rate
Network Latency over vSwitch	Average 10-15 $\mu$ s	Average 25-75 $\mu$ s

## Open Source Optimization

Enea NFV Access is built on open source components that have been optimized to provide better performance in terms of throughput, footprint and boot speed.

- Kernel optimizations reduce RAM and CPU footprint
- Data path optimizations provide high throughput and low latency
- Partitioning with core isolation and pinning maximizes system performance
- Boot speed optimization shorten time to boot

## Security Hardened

Enea NFV Access is security hardened and protected by Enea Security Response Team, ensuring rapid action on detection of a threat and confidential handling of security risks.

- Integrated Security
  - Patched with the latest security fixes and continuously updated
  - Validated against NVD (National Vulnerability Database) with zero vulnerabilities as criteria
  - Signed updates
  - Access control security policies are based on SELinux/sVirt
- Security Helpdesk
  - Available for expert security advice

## uCPE Management

Enea uCPE Manager is a management tool (VNF or standalone) for managing large scale deployments of uCPEs. It includes VNF onboarding, VNF lifecycle management, zero touch provisioning and alarms and events management. It uses NETCONF for southbound communication and GUI and REST for northbound interaction.

## Hardware Support

Enea NFV Access is available for both ARM- and x86-based hardware platforms:

- X86- based platforms: Xeon D (Reference plf. Xeon D-1521) , Denverton (Reference plf. C3858)
- ARM-based platforms: ARMv8 (Reference plf. Cavium Octeon TX)

Find out more on the Enea website!



Enea develops the software foundation for the connected society with a special emphasis on reducing cost and complexity at the network edge. We supply open-source based NFVI software platforms, embedded DPI software, Linux and Real-Time Operating Systems, and professional services. Solution vendors, Systems Integrators, and Service Providers use Enea to create new networking products and services faster, better and at a lower cost. More than 3 billion people around the globe already rely on Enea technologies in their daily lives. For more information: [www.enea.com](http://www.enea.com)