Enea NFV Access: Lightweight and optimized uCPE without OpenStack

Optimized hardware cost at the customer premise through minimal hardware resource utilization, no need for OpenStack, and leveraging NETCONF to drive native Linux virtualization infrastructure.

Benefits

- **Minimal footprint**: Designed for high compute density on edge devices and standard servers. OpenStack is not required in the standard setup.
- **High networking performance**: 10Gbps throughput.
- **Container and VM support**: Supports virtualization with virtual machines and/or containers.
- **Scalable**: From 2-core ARM edge device with single NIC to high-end x86 servers.
- **Fast boot**: Boot speed optimization for best-in-class availability.
- **Multiple orchestration interfaces**: VNF lifecycle management and service function chaining from orchestrator or central office/point-of-presence control node VIM.
- **Device management framework**: Supporting FCAPS functionality in the platform.
- **Zero lock-in**: Open APIs and standards for portability and whitebox deployment.

Enea NFV Access optimizes hardware cost at the customer premise through minimal hardware resource utilization, by not requiring OpenStack, and by using NETCONF to drive the native Linux virtualization infrastructure. Minimizing hardware cost at the customer premise is crucial to ensure good margins, due to the scale of deployment. A cost-efficient uCPE requires low RAM footprint, minimal CPU overhead and optimized virtualized networking performance. OpenStack is intended for data center deployment; however, customer premise equipment’s hardware constraints makes OpenStack a suboptimal solution, since low hardware cost is a key criteria for business success.

Enea NFV Access is a lightweight and extensible virtualization platform for Universal Customer Premise Equipment (uCPE) and NFV Edge Devices. The design has been architected from the bottom up with the goal of providing a software infrastructure platform that is truly independent of hardware, VNF and Orchestration, and optimal for edge use cases.

Enea NFV Access includes the software virtualization platform and the Enea uCPE Manager, packaged as a VNF, a delocalized Virtual Infrastructure Manager (VIM) provided to manage the uCPE and the VNF’s lifecycle using NETCONF protocol. Enea uCPE Manager is a VIM and VNF Manager that integrates with orchestration using REST API’s. Enea uCPE Manager can be integrated with Multi-VIM orchestrators for OpenStack or VMware integration.

Based on architectural and design choices, specific platform level characteristics are provided. Enea NFV Access provides platform characteristics that allow uCPE vendors to minimize hardware cost through:

- Multi-processor architectures: x86 and ARM
- Minimized RAM footprint
- Minimized Disk footprint
- Minimized CPU utilization
- Optimized virtualized networking performance
- Optimizations for white-box hardware specifications
The table to the right compares selected Enea NFV Access characteristics to common uCPE solutions in the market.

Enea NFV Access main characteristics and features are based on specific architectural and design choices. The table below compare these choices with common uCPE solutions seen in the market.

<table>
<thead>
<tr>
<th>Characteristics</th>
<th>Enea NFV Access</th>
<th>Common uCPE solutions</th>
<th>Comment</th>
</tr>
</thead>
<tbody>
<tr>
<td>Platform RAM Footprint</td>
<td>Sub 1 GB</td>
<td>4-12 GB</td>
<td>Enea NFV Access is optimized for small CPU, RAM and Disk footprint and fast boot speed. To drastically reduce the hardware BOM.</td>
</tr>
<tr>
<td>Platform Disk Footprint</td>
<td>Sub 1 GB</td>
<td>4-12 GB</td>
<td></td>
</tr>
<tr>
<td>Platform CPU Utilization</td>
<td>Down to single core</td>
<td>2-4 cores</td>
<td></td>
</tr>
<tr>
<td>Platform Boot Speed</td>
<td>Sub 3 seconds</td>
<td>10-30 seconds</td>
<td></td>
</tr>
<tr>
<td>Virtualized Network Throughput over vSwitch</td>
<td>10 Gb IMIX Line Rate</td>
<td>1 Gb IMIX Line Rate</td>
<td></td>
</tr>
<tr>
<td>Virtualized Network Latency over vSwitch</td>
<td>Average 10-15 µs</td>
<td>Average 25-75 µs</td>
<td></td>
</tr>
</tbody>
</table>

**Platform foundation**

- Bottom up approach with optimizations and footprint reduction in every layer of the platform based on Open Source software
- Top down, adapting either Common Linux Distributions such as Centos or Ubuntu Preexisting CPE or Data Center platforms

**Feature set**

- Minimal extensible feature set
- Large feature set induced by OpenStack services presence

**VIM architecture**

- Delocalized VIM using NETCONF for management protocols
- Alternatively - Containerized OpenStack for solution requiring OpenStack compatibility at Customer Premise
- Localized VIM using OpenStack with OpenStack internal management protocols
- Delocalized VIM reduces uCPE CPU utilization, RAM and Disk footprint
  Containerizing OpenStack allows OpenStack to be an optional platform component

**Data plane**

- Optimized DPDK and OVS-DPDK and SR-IOV Networking for physical and virtualized network functions
- Enea NFV Access outperforms competition with data plane optimizations in combination with small RAM footprint
- DPKD, optimized OVS and SR-IOV for virtualized network functions

**Virtualization**

- Optimized KVM/QEMU and Docker Containers
- Optimized KVM/QEMU
- Docker Containers for minimized footprint

**Platform Feature Extensibility**

- Platform SDK enabling: Building custom kernel modules in host and VMs
  Building custom kernel configuration in host and VMs
  Native platform extensions
  VM and containers platform extensions
- Professional Services for custom configurations and extensions and VM-based extensions
- Extend the platform to adapt specifically to specific customer use cases

**Management Extensibility**

- SDK for NETCONF and YANG modelling support, for FCAPS and for customized Platform Management
- NETCONF protocol support for FCAPS
- Use NETCONF for standardized and extendible platform management beyond FCAPS

**VIM Feature Extensibility**

- Enea uCPE Manager is customizable and model-based VIM with REST northbound and NETCONF southbound APIs
- Not Available
- Customizing OpenStack is hard, complex and costly. Enea uCPE manager is designed to be extensible

Find out more on the Enea website!